

MIL-P-52971
1 October 1979

MILITARY SPECIFICATION

PALLETS, MATERIAL HANDLING, GENERAL CARGO

40 x 48 INCH, NON-WOOD, 4-WAY

This specification is approved for use by all Departments and Agencies of the Department of Defense

1. SCOPE

1.1 Scope. This specification covers performance requirements and design characteristics for reusable, non-wood, 4-way, 40 x 48 inch pallets for military general cargo (see 6.1).

1.2 Classification. Pallets shall be of two types as determined by their load rating (see 6.2).

Type I - 1,500 pound dynamic load capacity; 6,000 pound static load capacity.

Type II - 3,000 pound dynamic load capacity; 12,000 pound static load capacity.

2. APPLICABLE DOCUMENTS

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

FSC 3990

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: US Army Mobility Equipment Research and Development Command, ATTN: DRDME-DS, Fort Belvoir, VA 22060 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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SPECIFICATIONS

FEDERAL

- | | |
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| QQ-S-781 | - Strapping, Steel, and Seals. |
| PPP-S-760 | - Strapping, Nonmetallic (and Connectors). |

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| MIL-S-21859 | - Support Sets, Stacking, Material Handling Pallet. |
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STANDARDS

FEDERAL

- | | |
|-------------------|---|
| FED. TEST METHOD | - Preservation, Packaging, and Packing |
| STD. No. 101 | Materials: Test Procedures. |
| FED. STD. No. 313 | - Material Safety Data Sheets, Preparation and Submission of. |

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- | | |
|-------------|--|
| MIL-STD-105 | - Sampling Procedures and Tables for Inspection by Attributes. |
| MIL-STD-129 | - Marking for Shipment and Storage. |

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

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- D1185 - Standard Methods of Testing Pallets.
- D1929 - Standard Method of Test for Ignition Properties of Plastics.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

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UNIFORM CLASSIFICATION COMMITTEE, AGENT

Uniform Freight Classification.

(Application for copies should be addressed to the Uniform Classification Committee, ATTN: Tariff Publishing Officer, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.)

NATIONAL MOTOR FREIGHT TRAFFIC ASSOCIATION, INC., AGENT

National Motor Freight Classification.

(Application for copies should be addressed to the American Trucking Associations, Inc., ATTN: Traffic Department, 1616 P Street, NW, Washington, DC 20036.)

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal Agencies.)

3. REQUIREMENTS

3.1 First article (preproduction model). The contractor shall furnish 20 pallets as specified (see 6.2), for examination and testing within the time frame specified to prove, prior to starting production, that his production methods will produce pallets that comply with the requirements of this specification. Examination and tests shall be as specified in Section 4 and shall be subject to surveillance and approval by the Government (see 6.3).

3.2 Materials. Materials used for pallet fabrication shall be optional with the contractor and shall result in a pallet which will meet the performance requirements specified herein. Pallets may be a composite of materials, except that wood shall not be used for any pallet components (see 6.4).

3.3 Dimensions and weight. Pallets shall be 40 x 48 inches in length and width. Height shall be the minimum necessary to insure efficient use of fork trucks and pallet jacks. Weight shall not exceed 35 pounds for Type I pallets and 50 pounds for Type II pallets.

3.4 Color. Unless otherwise specified, pallets shall be a dark lusterless color (see 6.2).

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3.5 Design characteristics.

3.5.1 Handling provisions. Pallets shall provide full 4-way entry. Not less than 3-1/2 inches of unobstructed height shall be provided to accommodate pallet jacks and fork trucks. The design shall permit easy entry of pallet jacks. Wings or other provisions shall be provided to permit handling of loaded pallets with bar slings, chains, rope, and cable. Pallets shall be capable of being moved on both roller and belt type conveyor systems without creating delays or blockages. When specified (see 6.2), pallets shall be designed to accept pallet support sets conforming to MIL-S-21859, size 1.

3.5.2 Load securement. Pallets shall be designed to permit securement of loads to the pallet with strapping conforming to QQ-S-781, Class 1, or PPP-S-760, with shrink film or with stretch film. The design shall allow strapping to be secured to or pass under the top deck. Strapping shall not pass completely beneath the pallet posts, stringers, or lower deck.

3.5.3 Cleanability. Pallets shall have no places which cannot be directly and openly reached for cleaning. Fabrication materials and coatings, if used, shall be unaffected by industrial cleaning solvents, detergents, steam, and by the effects of scrubbing or scouring.

3.5.4 Corrosivity. Metal pallets or metal components of pallets shall be of corrosion resistant material or shall have such components treated to resist formation of corrosion. Dissimilar metals shall not be used in direct contact with one another.

3.5.5 Nestability. Type I pallets shall be nestable to permit quantities of empty pallets to be stored together in minimum space and handled at one time. Acceptable degree of nesting shall be determined in accordance with 4.5.2.6.

3.6 Performance characteristics.

3.6.1 Ignition properties of pallet material. The flash ignition temperature of pallet materials in finished form shall be not less than 600° F when tested as specified in 4.5.2.8.

3.6.2 Health hazard characteristics. Harmful concentrations of identifiable toxic vapors or chemicals shall not be released from the pallet as a consequence of the heat generated from expected transportation and storage conditions. In addition, the contractor shall determine the products or

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compounds released from the pallet as a result of combustion, and any special precautions required as a result thereof. Compliance with this requirement shall be in the form of certification in accordance with 4.5.2.9.

3.6.3 Handleability. The pallet shall be capable of being moved without suffering damage by fork trucks by normal pick up and carry, and by pushing and pulling when tested as specified in 4.5.2.3.

3.6.4 Structural integrity. The pallet shall not suffer damage which will impair its intended functions or exceed the limits specified when subjected to the standard pallet tests specified in 4.5.2.2 and the stacking test specified in 4.5.2.7.

3.6.5 Coefficient of friction. When specified (see 6.2), the coefficient of friction between the bottom surface of a pallet and a smooth steel surface shall be not less than 0.3; and for a broom finish concrete surface not less than 0.35. The coefficient of friction between the pallet upper surface and corrugated fiberboard shall be not less than 0.45. Determinations shall be as specified in 4.5.2.10.

3.6.6 Strappability. The edges of the top deck of the pallet shall be capable of withstanding the force created by tensioning of strapping used to secure loads to the pallet. Permanent deformation of any top deck edge shall not exceed 1/2 inch when tested as specified in 4.5.2.11.

3.7 Marking. Each pallet shall be marked with the rated load limit, the manufacturer's name, the month and year of manufacture, and the letters "US." The markings shall be applied during manufacture of the pallet by being molded in, or by branding or embossing. Characters shall be not less than 1/2 inch high. Markings shall be applied at one location on the pallet which is visible when the pallet is both loaded and empty; location of the marking shall not interfere with normal use of the pallet. Any additional markings shall be as specified (see 6.2).

3.8 Workmanship. Finished pallets shall be smooth and free of splinters or other surface imperfections having the potential for causing personal injury or restricting use of the pallet. Each pallet shall have a constant height and the corners shall be square. Finished pallets shall be clean.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified (see 6.2), in the contract, the contractor is responsible for the performance of all inspection requirements specified herein. Except as otherwise specified in the contract, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein unless

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disapproved by 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 supplies and services conform to prescribed requirements.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- (a) Preproduction inspection.
- (b) Quality conformance inspection.
- (c) Inspection of packaging.

4.3 Preproduction inspection.

4.3.1 Examination. The preproduction pallets shall be examined as specified in 4.5.1. Presence of one or more defects shall be cause for rejection.

4.3.2 Tests. The preproduction pallets shall be tested as specified in 4.5.2. Failure of any test shall be cause for rejection.

4.4 Quality conformance inspection.

4.4.1 Sampling. Sampling for examination shall be in accordance with MIL-STD-105.

4.4.2 Examination. Samples selected in accordance with 4.4.1 shall be examined for the defects listed in 4.5.1. AQL shall be 2.5 percent defective.

4.5 Inspection procedure.

4.5.1 Examination. The pallets shall be examined for the following major defects:

- 101. Size not as specified.
- 102. Weight exceeds limit specified for type.
- 103. Provisions for fork lifts and pallet jacks not adequate.
- 104. Wings or other provisions for sling handling not incorporated.
- 105. Type I pallet not nestable.
- 106. Inaccessible areas incorporated into design causing cleaning difficulties or inability for water to drain.
- 107. Design will not permit securing of load by various means as specified.
- 108. Components not completely secured together if so constructed.
- 109. Dissimilar metals in direct contact with one another.
- 110. Color not as specified.

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- 111. Pallet will not lie flat on level surface.
- 112. Required marking not on pallet.
- 113. Workmanship not as specified.

4.5.2 Tests. Pallets shall be tested in accordance with the following procedures and exceptions.

4.5.2.1 Test conditions and conditioning. Unless otherwise specified (see 6.2), all tests shall be performed after pallets have been conditioned for not less than 6 hours at $75^{\circ} \pm 5^{\circ}$ F. In addition, for tests specified in 4.5.2.4 pallets shall be conditioned for not less than 6 hours at $-25^{\circ} \pm 2^{\circ}$ F; the tests shall be performed immediately after removal from the conditioning atmosphere.

4.5.2.2 Standard pallet tests. Pallets shall be subjected to the static load, shock load, vibration resistance and diagonal rigidity tests contained in ASTM D1185 following the procedures contained herein with the following exceptions. Lumber supports used in the static load and shock load tests need not be seasoned. Except for the diagonal rigidity test, the pallet shall be loaded with its rated load. Drop height for the diagonal rigidity test shall be 40 inches unless otherwise specified (see 6.2). Twelve pallets, three for each of the four required tests, shall be utilized.

4.5.2.3 Handling tests. Five previously untested pallets shall be tested in accordance with Method 5011 of FED. TEST METHOD STD. No. 101 with the following exceptions. The procedure for hoisting with grabs is not applicable for pallets. A roller, instead of skate-wheel, conveyor with a capacity to support the pallet with its rated load, shall be used for the conveying test. The procedure for hoisting with slings shall be limited to that part concerned with undersling handling utilizing the wings or other provisions for such handling. Pallets shall be loaded with their rated weight fully distributed for these tests. A fully distributed load is one which has its weight evenly distributed over the top surface of the pallet as it rests on a flat surface, and which has its elements interlocked.

4.5.2.4 Low temperature test. Three previously untested pallets, conditioned at the low temperature as specified in 4.5.2.1, shall be subjected to the diagonal rigidity test in accordance with 4.5.2.2.

4.5.2.5 Failure criteria. For standard pallet tests, including the low temperature tests, the failure criteria shall be as specified in the appropriate procedure. In the diagonal rigidity test, increase in the diagonal measurement in excess of 1 inch shall constitute failure. For the handling tests, inability to perform any of the procedures, damage to the pallet resulting in unserviceability or dumping of the load shall be considered failure.

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4.5.2.6 Nesting. One pallet shall be placed onto a like pallet to determine the degree of nesting. A pallet, other than the bottom one, nesting with over two-thirds of its overall height exposed shall be termed not nestable.

4.5.2.7 Stacking. Pallets shall be stacked four high with their rated load; on a stable, level surface; the load on each pallet shall be stable and rigid. The stack shall remain for a period of 48 hours. Collapse of the stack, or any tilting or instability caused by pallet deformation shall constitute failure of the test. If, the principal supporting structure is a non-metallic material, the test shall be repeated at a temperature of $140^{\circ}\text{F} \pm 10^{\circ}$ and 90 percent relative humidity for a period of 48 hours.

4.5.2.8 Ignition temperature. The flash ignition temperature of plastic pallet material in finished form shall be determined in accordance with ASTM D1929.

4.5.2.9 Health hazard characteristics.

4.5.2.9.1 During transportation and storage. The pallet contractor shall certify that the pallet, when subjected to a temperature of $230^{\circ}\text{F} \pm 10$, will not release harmful vapors or chemicals in amounts exceeding the threshold limit values for the materials involved. Certification and threshold limit values shall be in accordance with FED. STD. No. 313.

4.5.2.9.2 During combustion. The pallet contractor shall provide certification which itemizes the products of combustion, states the threshold limits values for the combustion products, describes any special fire fighting procedures and personal protective equipment required. Findings and certification, in the form of a Material Safety Data Sheet, shall be in accordance with FED. STD. No. 313.

4.5.2.10 Coefficient of friction.

4.5.2.10.1 Lower surface. The coefficient of friction of the lower pallet surface shall be calculated with the formula

$$Cf = \frac{F}{W}$$

where: F = horizontal force or pull required to move loaded pallet.
W = weight of loaded pallet.

A low coefficient indicates low resistance to sliding; a high coefficient indicates the opposite. A pallet, carrying an evenly distributed load of 250-400 pounds, shall be pulled over the specified surfaces. A suitable measuring device shall be used to determine the magnitude of the force

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required to move the loaded pallet. Surfaces over which the pallet shall be moved to determine the coefficient of friction shall be galvanized steel and broom finished concrete.

4.5.2.10.2 Upper surface. The coefficient of friction of the upper pallet surface shall be calculated with the formula

$$C_{fu} = \tan \theta$$

where θ = the maximum angle of inclination of the pallet before the load begins to slide due to its weight alone. The pallet shall be loaded with an evenly distributed load as specified in 4.5.2.10.1. If the load is not contained in a corrugated fiberboard box, a sheet of domestic class corrugated fiberboard, 350 pound bursting strength, shall be secured to the bottom of the load. One edge of the pallet shall be raised until the load begins to slide because of its weight alone. The angle of inclination of the pallet just before the load begins to slide shall be measured.

4.5.2.11 Strapping test. Position a 40 x 40 x 40-inch wood container (crate or box) on the upper deck of the pallet so that the container edges and pallet edges are parallel and no portion of the container overhangs the pallet edges. The container shall be centered on the pallet with respect to the 48-inch direction. Strap the container to the pallet with a single strap running over the top of the container, around the edges of the pallet, and beneath the upper deck of the pallet. If the pallet design incorporates a unique method of securing strapping to the pallet edges, that method shall be used. A turnbuckle and a tension measuring device shall be incorporated in a vertical section of the strap. The strapping shall conform to QQ-S-781, Class 1, Type I or IV, finish optional, 1/2 x 0.020 inch. Tension shall be applied to the strap until 300 pounds is indicated on the measuring device or until the pallet edge fails, whichever occurs first. Permanent deformation of the pallet edges by more than 1/2 inch or destruction of the pallet edges, or inability to achieve the specified tension level because of pallet edge flexibility shall constitute failure of this test. The test shall be repeated on the remaining two pallet edges.

4.6 Inspection of packaging.

4.6.1 Quality conformance inspection.

4.6.1.1 Unit of product. A bundle of pallets prepared for shipment shall be the unit of product.

4.6.1.2 Sampling. Sampling for examination shall be in accordance with MIL-STD-105.

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4.6.1.3 Examination. Samples selected in accordance with 4.6.1.2 shall be examined for the following defects. AQL shall be 2.5 percent defective.

- 112. Pallet bundles exceed specified height.
- 113. Pallet bundles not secured as specified.
- 114. Marking incomplete, illegible, or missing.

5. PACKAGING

5.1 Packing. Packing of pallets shall be Level A or C, as specified (see 6.2).

5.1.1 Level A. Pallets shall be nested or stacked together in bundles which do not exceed 41 inches in height. Each bundle shall be secured with not less than two straps which shall pass through the bottom pallet, encircle the bundle, and pass through the top pallet as on the bottom pallet, if possible. Straps shall be parallel with each other and shall be located 6-8 inches from the pallet edges. Strapping shall conform to QQ-S-781, Class 1, Type I or IV, Finish A or B, 3/4 x 0.020 inch minimum size.

5.1.2 Level C. Unless otherwise specified (see 6.2), uniform quantities of pallets shall be secured in bundles which shall not exceed 55 inches in height. Bundles shall be secured together with strapping in a manner which will assure safe delivery at lowest rates in accordance with Uniform Freight Classification Rules or National Motor Freight Classification Rules.

5.2 Marking. Marking for shipment and storage shall be in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. Pallets covered by this specification are intended to be used as an alternate to 40 x 48 inch wood pallets for carrying military general cargo. Pallets are compatible with all modes of transport and types of handling and storage utilized throughout the Department of Defense. The pallets are not intended for ammunition. Pallets produced in accordance with this specification are intended to be reusable.

6.2 Ordering data. Procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Type of pallet required (see 1.2).
- (c) Time frame required for submission of preproduction model (see 3.1).
- (d) When color shall be other than specified (see 3.4).

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- (e) When pallet design must accommodate pallet support sets (see 3.5.1).
- (f) When specific coefficient of friction values are required (see 3.6.5).
- (g) Additional markings required (see 3.7).
- (h) If contractor is not to perform inspection (see 4.1)
- (i) If conditioning is to be other than specified (see 4.5.2.1).
- (j) When diagonal rigidity test height shall be other than 40 inches (see 4.5.2.2).
- (k) Level of packing required (see 5.1).
- (l) If pallets are not to be bundled for Level C (see 5.1.2).

6.3 Preproduction model. Any changes or deviations of production pallets from the approved preproduction model during production will be subject to the approval of the contracting officer. Approval of the preproduction model will not relieve the contractor of his obligation to furnish pallets conforming to this specification.

6.4 Recycling. Pallet materials should be capable of being reused economically for the manufacture of new pallets. If they are not reusable or recyclable, pallets should be disposable in a manner which will not pollute or litter the environment (see 3.2).

Custodians:

Army - ME
Navy - SA
Air Force - 99

Preparing activity:

Army - ME

Project 3990-0150

Review activities:

Army - SM, AT, GL
Navy - OS, SH
Air Force - 69
DLA - GS

User activities:

Army - AL

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