

INCH - POUND  
MIL-PRF-32076 (AR)  
1 December 2000

## PERFORMANCE SPECIFICATION FOR UNITIZATION OF AMMUNITION

This Specification is approved for use by the U.S. Army Armament Research, Development and Engineering Center and is available for use by all Departments and Agencies of the Department of Defense.

### 1. SCOPE

1.1 Scope. This specification covers the minimum unitization requirements for procurement of packaged ammunition items on 4 way entry pallets used by the Department of Defense, United States Government.

### 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

#### 2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issue of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2)

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: US Army Tank-Automotive and Armaments Command, Armament Research, Development and Engineering Center, ATTN: AMSTA-AR-QAW-E, Picatinny Arsenal, NJ 07806-5000 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 8140

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## STANDARDS

## FEDERAL

FED-STD-595	Colors Used in Government Procurement
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## DEPARTMENT OF DEFENSE

MIL-C-53072	Chemical Agent Resistant Coating (CARC) System Application Procedures and Quality Control Inspection
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MIL-STD-171	Finishing of Metal and Wood Surfaces
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MIL-STD-810	Environmental Test Methods and Engineering Guidelines
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MIL-STD-1916	DOD Preferred Methods of Acceptance of Product
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(Unless otherwise indicated, copies of the above specifications, standards and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094)

2.2.2 Other government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation. See section (6.5)

## DRAWINGS

ACV00561	Unit Load Marking for Shipment and Storage, Ammunition and Explosives
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## PUBLICATIONS

EVT-TP-1-86	Transportability Testing Procedures
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(Copies of the above publication are available from US Army Defense Ammunition Center, 1 C-tree Road, SMAAC-DET, McAlester, OK 74501-9053)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of documents, which DOD adopted, are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation. (see 6.2)

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM-B117	Standard Practice for Operating Salt Spray (Fog) Apparatus
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ASTM-D610	Evaluating Degree of Rusting on Painted Steel Surfaces
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(Application for copies should be addressed to the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959).

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

### 3. REQUIREMENTS

3.1 First article. When specified in the contract (see 6.2) a sample of unit loads and pallets shall be subjected to first article inspection in accordance with paragraph 4.2.

3.2 Materials. Unless otherwise specified, the selection of the materials is the prerogative of the contractor as long as all articles submitted to the government fully meet the interface and interoperability, ownership and support, operating, and environmental requirements specified.

3.3 Ownership and support. The unit load shall possess the following life cycle characteristics.

3.3.1 Safety. Each unit load shall present no physical handling hazards to the persons handling the unit load.

- a. Interference. Strapping cannot interfere with the entry height of the pallet forklift openings.
- b. Splicing. Splicing of strapping shall not be permitted.
- c. Strap end. The end of a strap on the underside of the joint shall extend at least 152mm (6 in) beyond the seal to permit subsequent tightening of loosened strapping.
- d. Tensioning. Strapping shall be tensioned to retain the load with minimal shifting.
- e. Seals. If painted seals are used, all surfaces must be painted. Gritted backed seals shall not be permitted. Strapping shall only be joined with a double notch joint.

3.3.2 Color. All pallet materials shall be non-reflective. Surfaces of metal and plastic components shall be forest green No. 34079 or black No. 37030 in accordance with FED-STD-595. Wood surfaces shall be natural wood color or color obtained from preservative treatment. The silver gray finish of galvanized strapping is acceptable. Seals may be of any color.

3.3.3 Unit load criteria. Only one unit load having a reduced quantity of ammunition shall be permitted per lot. Otherwise, unit loads shall only be made up with full layers.

3.3.4 Unit load markings. Markings in accordance with drawing ACV00561 shall be applied to each unit load.

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3.4 Interface and interoperability. Each unit load shall accommodate the following requirements and interfaces.

3.4.1 Forklift truck capability. Unit load designs, shall be capable of being handled safely, by forklift trucks of rated capacity appropriate to the gross weight and geometry of the unit load.

3.4.2 Size and weight. The unit load shall be in the form of a rectangular parallelepiped. The unit load shall be stable and provide a level top for ease in stacking. The unit load shall not exceed 1816 kg (4000 lbs) in weight, 1118 mm (44 in) in length, 1372 mm (54 in) in width and 1372 mm (54 in) in height. Unless otherwise specified, minimum height of a unit load shall be 686 mm (27 in).

Packages shall at least be flush with the pallet deck dimensions, no spaces are allowed between packages within the unit load or spaces between the packages and the outside pallet deck dimensions. Fiberboard packages may not extend beyond the pallet deck dimensions. For other than fiberboard packages, it is allowable to have packages extend beyond the pallet deck dimensions, but, not more than 20 percent of the bottom surface area of the package may extend past a pallet deck dimension.

Dunnage may be applied to eliminate any spacing. Metal pallets shall have metal dunnage and plastic pallets shall have plastic dunnage. Dunnage for wood pallets shall meet the insect and decay resistance of paragraph 3.6.3.

3.4.3 Pallet. The following requirements pertain to the interfacing of the pallet with existing material handling equipment in the DOD/NATO inventory. Alternatively, wood pallets conforming to ASME Part Number MH1/9-11 BW 4048P may be used in lieu of the requirements of this paragraph.

3.4.3.1 General.

3.4.3.1.1 Size. Pallet size shall be 1016 mm (40 in) in length and 1219 mm (48 in) in width, plus or minus 6 mm (0.25 in). Pallets of sizes other than 1016 mm (40 in) in length and 1219 mm (48 in) in width shall not be used unless first authorized by the procuring activity.

3.4.3.1.2 4-way entry. Full 4-way entry capability of the pallet shall be provided.

3.4.3.1.3 Bottom surface. The load-bearing surface in contact with the ground (pallet footprint) shall be a minimum of 40 percent of the top deck area.

3.4.3.1.4 Forklift tine opening. The forklift slots shall be a minimum of 89 mm (3.5 in) in height and a minimum of 254 mm (10 in) in width, in two places, on all four sides of the pallet.

3.4.3.1.5 Height. The pallet height shall be 140 mm (5.5 in) maximum.

3.4.3.1.6 Flatness. When the pallet bottom is placed on a flat surface, the pallet top shall not vary more than 6 mm (0.25 in) from the average pallet height.

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3.4.3.1.7 Squareness. The difference in the length of two diagonal corners shall not exceed 19 mm (0.75 in).

3.4.3.1.8 Wings. Width of the wings shall not be less than 64 mm (2.5 in).

3.4.3.1.9 Identification marking. The following marking shall be applied to the pallet for identification:

Specification number (MIL-PRF-32076)  
Manufacturer's name and address  
Preservative marking – if applicable- see paragraph 3.6.5.

3.4.3.2 Wood. (Following requirements apply to wood pallets and dunnage only.)

3.4.3.2.1 Fasteners. Type and location of fasteners (pattern) shall be maintained on all pallets.

3.4.3.2.2 Species of wood. Species of wood or wood group shall be maintained on all pallets.

3.4.3.2.3 Deterioration. There shall be no evidence of decay, rot or insect infestation on any pallet or dunnage

3.4.3.2.4 Wood checks, splits, shakes and knots. Checks, splits and shakes shall not exceed the width of the board. Knots shall not be over 3/8 the width of the board.

3.4.3.2.5 Wane. All boards shall be free of wane.

3.4.3.2.6 Warp. A board shall exhibit no more than 2 mm (0.063 in) of bow per 300 mm (1 ft) of length. A cup shall not exceed 6 mm (.25 in) in a 200 mm (8 inch) width. A twist shall not exceed 6 mm (.25 in) per 300mm (1 ft) of length in a 200mm (8 in) board width.

3.4.3.2.7 Heat treatment. All non-manufactured wood used in the palletized load shall be heat treated to a core temperature of 56 degrees Celsius for a minimum of 30 minutes. The pallet manufacturer and the manufacturer of wood to build dunnage for the palletized load, shall be affiliated with an inspection agency accredited by the U.S. Department of Agriculture. The pallet manufacturer and the manufacturer of wood used for dunnage for the palletized load shall ensure traceability to the original source of heat treatment. Each pallet and dunnage made of non-manufactured wood, shall be marked to show the conformance to the International Plant Protection Convention Standard. Pallets and dunnage made of non-manufactured wood shall be heat treated and marked appropriately. The quality mark for the pallet shall be placed on two opposite end posts on the same side as the preservative marking (3.6.5). The quality mark for the dunnage shall be placed on two opposite sides of the dunnage.

3.4.4 Top lift capability. When specified, the unit load shall be capable of being lifted from the top with one, two, three and four-leg slings. Minimum openings in the top lifting devices shall be no less than 45 mm (1.75 in) with an outside dimension no greater than 120mm (4.75 in) and a thickness not greater than 35 mm (1.375 in). Maximum unit load weight, when top lift capability is specified, shall not exceed 1136 kg (2500 lb).

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3.4.5 Slinging. Unit loads shall be able to be lifted with double basket (double loop) type chain slings under the wings.

3.5 Operating. Each unit load shall operate under and after exposure to the following conditions without loss of performance. Note: Each unit load being tested shall be 10 percent greater in weight than the actual production weight when being tested.

3.5.1 Stacking. Unit loads shall be capable of nesting vertically, limiting horizontal sliding or shifting and allowing for stacking up to four additional unit loads. Unit loads shall be compatible with stacking on or under other unit loads.

3.5.2 Stability. The unit loads shall have the ability when stacked on a field site of not becoming unstable due to geometrical changes of the load.

3.5.3 Horizontal impact. Unit loads shall be able to withstand shear forces, including, diagonally, distorting loads and other horizontal forces resulting from accelerations and decelerations suffered in transit and impacts when being handled by a crane.

3.5.4 Loose cargo vibration. The method of securing the packages to the pallet shall demonstrate the necessary reliability and tension after being subjected to vibrations encountered while being transported from originator to an ultimate field destination.

3.5.5 Edgewise drop. The unit load shall be able to withstand shock forces which can be imposed on it from typical rough handling and during transportation. The securing method shall exhibit adequate tensioning and the ability to maintain unit load integrity.

3.5.6 Unit load integrity. The unit load at the completion of the environmental test shall show a final load integrity confirmation by the conduct of a Rollover Test and conduct of a Removal Securing Method Test.

3.5.7 Rail impact. When specified, unit loads shall be able to withstand the impacts of railcar switching.

### 3.6 Environmental.

3.6.1 Temperature. Unit loads containing plastic components in the pallet or plastic used as the securing method shall be tested at minus 54 degrees Celsius (minus 65 degrees Fahrenheit) and at plus 76 degrees Celsius (plus 165 degrees Fahrenheit). All other materials shall be tested at ambient temperature.

3.6.2 Corrosion resistance. All metal parts shall have the ability to resist corrosion.

3.6.3 Insect and Decay Resistance. All wood components used in the fabrication of a unit load and pallet shall be able to resist insects and decay. Alternatively, the preservative treatments specified in Appendix A may be utilized.

3.6.4 Moisture content. The moisture content of the wood pallet and dunnage shall be no more than 19 percent prior to preservative treatment.

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3.6.5 Preservative treatment markings. Each wood pallet shall be marked near the center of an outside stringer or block in letters 25.4mm (one inch) minimum in height to identify the preservative. Once the preservative is identified, two letters will be designated by the Government (see 6.7.3) that shall be applied to each pallet. Also each assembled or unassembled dunnage of the unit load shall be marked with the designated letters.

3.6.6 Solar Radiation. All plastic components of pallets, unit loads and plastic securing methods shall be able to perform its function after exposure to solar radiation.

3.6.7 Drainage. Drainage shall be provided on all pallets. Water shall not be able to accumulate in depressions or pockets.

3.6.8 Chemical agent resistance. When specified, pallet components and top lift assemblies shall be of a material, usually plastic or metal that can resist chemical agents. All metal pallets and top lift assemblies shall have a coating applied in accordance with finish 5.1.1 plus 20.24 of MIL-STD-171 and color 34094 of FED-STD-595. Paint application shall conform to MIL-C-53072.

## 4. VERIFICATION

TABLE I REQUIREMENTS/VERIFICATION CROSS-REFERENCE MATRIX

<u>METHOD OF VERIFICATION</u>	<u>CLASSES OF VERIFICATION</u>
NA – Not Applicable	
1 - Analysis	A - First Article
2 - Demonstration	B - Conformance
3 - Examination	
4 - Test	

Title	Section 3 Requirement	Verification Method				Verification Class		Section 4 Verification	
		NA	1	2	3	4	A		B
Ownership/support	3.3.	X							4.4
Safety	3.3.1	X							4.4.1
Interference	3.3.1.a				X		X	X	4.4.1.a
Splicing	3.3.1.b				X		X	X	4.4.1.b
Strap ends	3.3.1.c				X		X	X	4.4.1.c
Tensioning	3.3.1.d					X	X	X	4.4.1.d
Seals	3.3.1.e				X		X	X	4.4.1.e
Color	3.3.2				X		X	X	4.4.2
Unit load criteria	3.3.3				X		X	X	4.4.3

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Unit load markings	3.3.4				X		X	X	4.4.4
Interface/interoperability	3.4	X							4.5
Forklift truck capability	3.4.1					X	X		4.5.1
Size and weight	3.4.2				X		X	X	4.5.2
Pallet	3.4.3	X							4.5.3
General	3.4.3.1	X							4.5.3.1
Size	3.4.3.1.1				X		X	X	4.5.3.1.1
4-Way entry	3.4.3.1.2			X			X	X	4.5.3.1.2
Bottom surface	3.4.3.1.3				X		X	X	4.5.3.1.3
Forklift tine opening	3.4.3.1.4				X		X	X	4.5.3.1.4
Height	3.4.3.1.5				X		X	X	4.5.3.1.5
Flatness	3.4.3.1.6				X		X	X	4.5.3.1.6
Squareness	3.4.3.1.7				X		X	X	4.5.3.1.7
Wings	3.4.3.1.8				X		X	X	4.5.3.1.8
Identification markings	3.4.3.1.9				X		X	X	4.5.3.1.9
Wood	3.4.3.2	X							4.5.4
Fasteners	3.4.3.2.1				X		X	X	4.5.4.1
Species of wood	3.4.3.2.2				X		X	X	4.5.4.2
Deterioration	3.4.3.2.3				X		X	X	4.5.4.3
Checks, splits, knots	3.4.3.2.4				X		X	X	4.5.4.4
Wane	3.4.3.2.5				X		X	X	4.5.4.5
Warp	3.4.3.2.6				X		X	X	4.5.4.6
Heat Treatment	3.4.3.2.7				X		X	X	4.5.4.7
Top lift capability	3.4.4			X			X		4.5.5
Slinging	3.4.5			X			X		4.5.6
Operating	3.5	X							4.6
Stacking	3.5.1				X		X		4.6.1
Stability	3.5.2				X		X		4.6.2
Horizontal impact	3.5.3				X		X		4.6.3
Loose cargo vibration	3.5.4				X		X		4.6.4
Edgewise drop	3.5.5				X		X		4.6.5
Unit load integrity	3.5.6				X		X		4.6.6
Rail impact	3.5.7				X		X		4.6.7
Environmental	3.6	X							4.7
Temperature	3.6.1				X		X		4.7.1
Corrosion resistance	3.6.2				X		X	X	4.7.2
Insect/decay resistance	3.6.3				X		X	X	4.7.3
Moisture content	3.6.4				X		X	X	4.7.4
Preservative markings	3.6.5				X		X	X	4.7.5
Solar radiation	3.6.6				X		X		4.7.6
Drainage	3.6.7				X		X		4.7.7
Chemical agent resistance	3.6.8				X		X		4.7.8

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4.1 Classification of verifications. The inspection requirements specified herein are classed as follows:

- a. First article inspection (see 4.2)
- b. Conformance inspection (see 4.3)

4.1.1 Verification conditions. Unless otherwise specified, all inspections shall be performed on all required unit loads and pallets, with the test conditions specified in the paragraphs in Table I.

#### 4.2 First article inspection.

4.2.1 Samples. First article inspection shall be performed with representative production unit loads and pallets of an order, when a first article sample is required (see 3.1). This inspection shall include the verifications listed in Table I. The following Table II shows the number of unit loads and pallets needed for first article inspection.

TABLE II Number of unit loads/pallets for first article

<u>Number</u>	<u>Type of Test</u>
6 unit loads	4.4.1.a, 4.4.1.b, 4.4.1.c, 4.4.1.d, 4.4.1.e, 4.4.3, 4.4.4, 4.5.2, 4.5.5, 4.5.6, 4.7.2
3 unit loads	4.5.1, 4.6.1, 4.6.2, 4.6.3, 4.6.4., 4.6.5, 4.6.6, 4.6.7, 4.7.1
6 pallets	4.4.2, 4.5.3.1.1, 4.5.3.1.2, 4.5.3.1.3, 4.5.3.1.4, 4.5.3.1.5, 4.5.3.1.6, 4.5.3.1.7, 4.5.3.1.8, 4.5.3.1.9, 4.5.4.1, 4.5.4.2, 4.5.4.3, 4.5.4.4, 4.5.4.5, 4.5.4.6, 4.5.4.7, 4.7.2, 4.7.3, 4.7.4, 4.7.5, 4.7.6, 4.7.7, 4.7.8

4.2.2 First article rejection. If any assembly, component or test specimen fails to comply with any of the applicable requirements, the first article sample shall be rejected. If any sample fails, the contractor shall rework the failed sample or unit load/pallet as applicable. Once the design failure is corrected, the applicable test shall be repeated in its entirety.

#### 4.3 Conformance verification

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4.3.1 Inspection lot formation. Lot formation shall be in accordance with Section 4 of MIL-STD-1916.

4.3.2 Acceptance criteria. If any component, assembly or test specimen fails to comply with the applicable requirements, the lot shall be rejected.

4.3.3 Classification of characteristics

4.3.3.1 Definitions. For examinations and tests cited herein or when required by contract; critical, major, and minor characteristics are defined in Section 3 of MIL-STD-1916.

4.3.3.2 Acceptance criteria. If any component, assembly or test specimen fails to comply with the applicable requirement, the lot shall be rejected.

4.3.4 Verification alternatives. The manufacturer may propose alternative test methods, techniques, or equipment, including the application of statistical process control, tool control, or cost effective sampling procedures to verify performance. (See the contract for alternatives that replace verifications required by this document.)

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**CONFORMANCE INSPECTION****CLASSIFICATION OF CHARACTERISTICS**

PARAGRAPH	TITLE	SHEET 1 OF 1		DRAWING NUMBER	
4.3.3.3	<b>Unit load</b>			NEXT HIGHER ASSEMBLY	
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE	
CRITICAL:	None				
MAJOR:					
101	No strapping interference	Level I	3.3.1.a	Test	4.4.1.a
102	Proper tensioning of straps	Level IV	3.3.1.d	Measure	4.4.1.d
103	4000 lb load limit	Level I	3.4.2	Measure	4.5.2.a
104	Maximum size	Level I	3.4.2	Visual	4.5.2.a
105	No underhang and no space between packages	Level I	3.4.2	Visual	4.5.2.c
106	Less than 20 percent overhang	Level I	3.4.2	Measure	4.5.2.e
107	Fiberboard boxes, no overhang	Level I	3.4.2	Visual	4.5.2.d
108	Minimum height 27 inches	Level I	3.4.2	Measure	4.5.2.b
MINOR:					
201	No strap splicing	Level IV	3.3.1.b	Visual	4.4.1.b
202	6 inch strap ends	Level IV	3.3.1.c	Measure	4.4.1.c
203	Seals (double notch)	Level I	3.3.1.e	Visual	4.4.1.e
204	Full layers	Level I	3.3.3	Visual	4.4.3
205	Unit load marking; missing, incorrect or illegible	Level IV	3.3.4	Visual	4.4.4
NOTES:					

AMSC Form 1570b-E, 1 Jul 89

Replaces AMSC Form 1570, 1 Feb 85, which may not be used.

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**CONFORMANCE INSPECTION**  
**CLASSIFICATION OF CHARACTERISTICS**

PARAGRAPH	TITLE	SHEET 1 OF 2		DRAWING NUMBER	
4.3.3.4	<b>Pallet</b>			NEXT HIGHER ASSEMBLY	
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE	
CRITICAL:	None				
MAJOR:					
101	Corrosion resistance	Para 4.7.2	3.6.2	Test	4.7.2
102	Insect/decay resistance (wood)	Para 4.7.3.	3.6.3	Test	4.7.3
103	Moisture content (wood)	Level IV	3.6.4	Measure	4.7.4
104	Preservative marking; missing, incorrect or illegible (wood)	Level IV	3.6.5	Visual	4.7.5
105	Size	Level I	3.4.3.1.1	Measure	4.5.3.1.1
106	4-way entry	Level I	3.4.3.1.2	Visual	4.5.3.1.2
107	Flatness	Level I	3.4.3.1.6	Visual	4.5.3.1.6
108	Squareness	Level I	3.4.3.1.7	Measure	4.5.3.1.7
109	Fasteners	Level IV	3.4.3.2.1	Visual	4.5.4.1
110	Species of wood or wood group	Level IV	3.4.3.2.2	Visual	4.5.4.2

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**CONFORMANCE INSPECTION  
CLASSIFICATION OF CHARACTERISTICS**

PARAGRAPH	TITLE	SHEET 2 OF 2		DRAWING NUMBER
4.3.3.4	<b>Pallet</b>			NEXT HIGHER ASSEMBLY
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
MAJOR CON'T				
111	Decay or evidence of insect infestation	Level IV	3.4.3.2.3	Visual 4.5.4.3
112	Checks, splits and shakes	Level IV	3.4.3.2.4	Visual 4.5.4.4
113	Knots	Level IV	3.4.3.2.4	Visual 4.5.4.4
114	Wane	Level IV	3.4.3.2.5	Visual 4.5.4.5
115	Warp	Level IV	3.4.3.2.6	Visual 4.5.4.6
116	Heat Treatment	Level IV	3.4.3.2.7	Visual 4.5.4.7
MINOR:				
201	Color	Level I	3.3.2	Visual 4.4.2
202	Bottom surface area	Level I	3.4.3.1.3	Measure 4.5.3.1.3
203	Forklift openings	Level I	3.4.3.1.4	Measure 4.5.3.1.4
204	Height	Level I	3.4.3.1.5	Measure 4.5.3.1.5
205	Wings	Level I	3.4.3.1.8	Measure 4.5.3.1.8
206	Identification markings; missing, incorrect or illegible	Level I	3.4.3.1.9	Visual 4.5.3.1.9
NOTES:				

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**CONFORMANCE INSPECTION****CLASSIFICATION OF CHARACTERISTICS**

PARAGRAPH	TITLE	SHEET 1 OF 1		DRAWING NUMBER
4.3.3.5	<b>Components</b>			NEXT HIGHER ASSEMBLY
CLASSIFICATION	EXAMINATION OR TEST	CONFORMANCE CRITERIA	REQUIREMENT PARAGRAPH	INSPECTION METHOD REFERENCE
CRITICAL:	None			
MAJOR:				
101	Corrosion resistant	Para 4.7.2	3.6.2	Test 4.7.2
102	Insect resistant, dunnage	Para 4.7.3	3.6.3	Test 4.7.3
103	Moisture content, dunnage	Level IV	3.6.4	Measure 4.7.4
104	Preservative marking, dunnage; missing, incorrect or illegible	Level IV	3.6.5	Visual 4.7.5
MINOR:				
201	Seals	Level I	3.3.1.e	Visual 4.4.1.e
NOTES:				

AMSC Form 1570b-E, 1 Jul 89

Replaces AMSMC Form 1570, 1 Feb 85, which may not be used.

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### 4.4 Ownership and support.

#### 4.4.1 Safety

a. Interference. Visually inspect the forklift tine opening of unit loads. Any unit loads having straps positioned within the fork tine openings that will cause interference with material handling equipment shall be rejected.

b. Splicing. Visually inspect the strapping of unit loads for splices. Any strapping with a splice shall be rejected.

c. Strap end. Strap ends on strapping of unit loads shall be measured for a minimum of 6 inches. Any ends less than 6 inches in length shall be rejected.

d. Tensioning. The hook of a scale (commonly known as a fish scale) shall be positioned behind a strap at the midpoint at the top and side of a unit load. Pull the scale until a reading of 9 kg (20 lb) is obtained. Measure the distance between the packages and strapping. Any straps with a measurement that exceeds 38 mm (1.5 in) shall be rejected. All straps shall be inspected for tensioning.

e. Seals. All painted seals on unit loads shall be visually inspected for gritted backing. Any strapping, with painted seals having gritted backing shall be rejected. Joints other than double notched seals shall be rejected.

4.4.2 Color verification. Surfaces of metal and plastic pallet components shall match the specified color chip requirement. Any component not matching the color requirement, the unit load shall be rejected.

4.4.3 Unit load criteria. Unit loads of a given lot shall be visually inspected to see that no more than one unit load has a reduced quantity. All unit loads shall be made up of only full layers. Otherwise, the lot shall be rejected.

4.4.4 Unit load marking. Markings shall be applied to the unit load as per drawing ACV00561. If markings are missing, incorrect or illegible, the unit load shall be rejected.

### 4.5 Interface/interoperability.

4.5.1 Forklift truck capability. Unit loads shall be lifted clear of the ground a minimum of 50 mm (2 in), transported a distance of at least 15 m (50 ft) and lowered. Test shall be conducted on two adjacent sides. Each tested side shall be accomplished in 30 seconds.

Within the 15 m (50 ft), parallel pairs of 25 mm (1 in) by 152 mm (6 in) boards, of a length to extend completely across the aisle and spaced 1372 mm (54 in) apart, are laid flat at intervals of 3.8m (12.5 feet). Board angles to the truck's path shall be 90, 60 and 75 degrees respectively with the left wheel striking the 60 degree boards first and the right wheel striking the 75 degree board first.

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Any tendency of the unit load to be unstable while on the forklift truck or any difficulty in inserting or removing the forklift tines from the unit load shall constitute a failure of the test.

#### 4.5.2 Size and weight.

a. The unit loads shall be weighed and measured. No unit load shall weigh over 1818 kg (4000 lb) and not one of the dimensions, length 1118 mm (44 in) , width 1372 mm (54 in), and height 1372 mm (54 in) shall be exceeded, otherwise reject.

b. Measure the height of the unit loads; if less than 686 mm (27 in) reject.

c. Visually check the unitized load. If any spacing is found between packages within the unit load or spaces between the packages and the outside pallet deck dimension, reject. Tolerance of plus or minus 3 mm (1/8 in) is allowed.

d. Visually check the unitized load. If fiberboard packaging are not flush with the pallet deck dimensions, reject. Tolerance of plus or minus 3 mm (1/8 in) is allowed.

e. By measuring and calculating, unit loads having packages (other than fiberboard) with more than 20 percent of the package's bottom surface area extending beyond the pallet deck dimensions shall be rejected.

f. Visually check the unitized load. If the dunnage is other than metal or plastic , when used on metal or plastic pallets respectively, the unit load shall be rejected. If dunnage used on wood pallets does not meet the insect and decay resistance verification of paragraph 4.7.3, the unit load shall be rejected.

#### 4.5.3 Pallet. The following verifications pertain to the pallet.

##### 4.5.3.1 General.

4.5.3.1.1 Size. Measure the pallet length and width. The length of 1016 mm (40 in) and the width of 1219 mm (48 in) shall be within the plus or minus tolerance of 6 mm (0.25 in), otherwise reject.

4.5.3.1.2 4-Way entry. Pallet shall be checked for complete 4-way entry with a forklift. Forks shall be fully extended through all four sides of the pallet. Reject if not demonstrated.

4.5.3.1.3 Bottom surface. Measure the bottom deck boards (skids) and calculate the surface area. Calculate the top deck area. If the total bottom deck boards (skids) area is less than 40 percent of the top deck area, the pallet shall be rejected.

4.5.3.1.4 Forklift tine openings. The openings on the four pallet sides shall be measured and compared to the criteria of 3.4.3.d. Any opening smaller than the criteria shall be rejected.

4.5.3.1.5 Height. The height of a pallet shall be measured. Any pallet exceeding 140 mm (5.5 in) shall be rejected.

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4.5.3.1.6 Flatness. Measure the pallet height at the four corners and at the midpoints of the perimeter. Average the eight measurements. Place the pallet on a flat surface. At the same eight points, measure the distance from the flat surface to the pallet top. No measurement shall exceed the average pallet height by more than 6 mm (0.25 in) otherwise reject.

4.5.3.1.7 Squareness. Measure the two diagonals of the top deck. If the difference in the two measurements is greater than 19 mm ( 0.75 in), it shall be rejected.

4.5.3.1.8 Wings. Measure the width of the wings on both sides of the pallet. A pallet with a wing less than 64 mm (2.5 in) shall be rejected.

4.5.3.1.9 Identification marking. Visually inspect for presence of identification markings. If missing, incorrect or illegible then reject.

#### 4.5.4 Wood pallets.

4.5.4.1 Fasteners. Pallets not having the correct fasteners, number or pattern, not completely driven or have points protruding shall be cause for rejection.

4.5.4.2 Species of wood. Pallets not being fabricated of the correct species or wood group shall be cause for rejection.

4.5.4.3 Deterioration. A pallet and wood dunnage that show evidence of decay, rot or insect infestations is cause for rejection.

4.5.4.4 Wood checks, splits, shakes and knots. A pallet that exhibits a check, a split or a shake that is longer than the width of the board is cause for reject. A pallet having a knot over 9.5 mm (3/8 in) the width of the board is cause for rejection.

4.5.4.5 Wane. A pallet that exhibits wane is cause for rejection.

4.5.4.6 Warp. A board used to fabricate a pallet that exhibits more than 2 mm (0.063 in) of bow per 300 mm (1 ft) of length or 6 mm (0.25 in) of cup in a 200 mm (8 in) width or 6 mm (0.25 in) twist per 300 mm (1 ft) length in a 200 mm (8 in) board width is cause for rejection.

4.5.4.7 Heat Treatment. The heat treatment marking on each of the pallet and dunnage shall be visually inspected for conformance to the requirements of 3.4.3.2.7 for content, legibility, and location. If marking does not comply then the lot shall be rejected. The pallets and dunnage, shall also be examined for the presence of pests or evidence of infestation (e.g. worm holes). Any visually obvious infestation or evidence of infestation of any pallet in the sample lot shall be cause for rejection..

4.5.5 Top lift capability. The unit load shall be suspended by the top lifting device with a four legged sling, three legged sling, two legged sling and one legged sling. Danger of slippage or disengagement when the load is suspended, or loss of integrity (example: boxes falling out), shall be cause for rejection of the unit load.

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4.5.6 Slinging. The unit load shall be lifted, swung and lowered by use of double basket (double loop) chain slings. When the unit load is suspended and swung, slippage of the slings, disengagement of containers or strapping, or loss of packages shall be cause for rejection of the unit load.

4.6 Operating.4.6.1 Stacking test.

a. Test. Apply to the top of the unitized load under test, not less than four times its weight, for a period of one hour, using a pallet base identical to the base of the unit load under test. Remove top weight from the unit load, and after an interval of one hour reapply the load for one more hour.

b. Satisfactory performance criteria. Measure the settlement/compression in the first hour and the amount it recovers after unloading. Express the difference in these two values as a ratio of first settlement. Measure the settlement from the start of the second hour to the end of the second hour and also its recovery after having been unloaded for one hour the second time.

Again, express the difference as a ratio in a similar manner to the first series of measurements. The two ratios when added together should not be greater than 0.5. However, if the residual tension as measured by a strap testing instrument (see 3.3.1) is more than 50 percent of the original tension before application of the load, then the unit load shall be accepted.

Example:

	First Hour	Second Hour
Settlement under 4W	= 20 mm (0.78 in)	15 mm (0.59 in)
Recovery under no load	= 15 mm (0.59 in)	10 mm (0.39 in)
Difference	= 5 mm (0.19 in)	5 mm (0.19 in)
Ratio	= 1:4 = .25	1:3 = .33
	.25 + .33 = .58 which being greater than .5 is not acceptable	

4.6.2 Stability test.

a. Test. After completion of the stacking test, place the load on a level paved surface. Apply a load, not less than three times its weight, via a similar pallet base with its corresponding sides parallel but offset by a distance of 0.2H (H = unit load height) from the center of gravity of the unit load under test. Measure the change of inclination to the horizontal of the base of the upper pallet.

b. Satisfactory performance criteria. The change of inclination of the base of the upper pallet/second unit load to the horizontal measured at hourly intervals. When not less than three such hourly readings indicate that an accumulative value of 1 degree 30 minutes shall not be exceeded, then this shall be considered satisfactory.

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4.6.3 Horizontal impact test.

a. Test. With the aid of a pendulum-type rig, a horizontal shock force shall be imparted to the unit load by allowing the load to impinge not more than 150 mm (5.9 inch) from its bottom face against stops, with an impact velocity of 2134 mm/sec (7 ft/sec) if some form of solid stop is used, or 3200 mm/sec (10.5 ft/sec) if shock absorbing buffer is used (the two impulses being approximately equivalent). The unit load shall first be set on its base so that one side is 90 degrees to the direction of the motion, the test applied, and then the test shall be repeated three more times with each remaining side leading in turn.

Alternative Test to the Pendulum-type Rig Test. An incline-impact tester consisting of a two-rail steel track inclined 10 degrees from the horizontal, a rolling carriage (dolly) and a rigid bumper/wall can be used in lieu of the pendulum-type rig.

b. Satisfactory performance criteria. Any distortion due to elongation of the diagonal length of the load should be capable of being reduced to acceptable limits by a force of 909 kg (2000 lbs.) applied parallel to the base along the top edge of the load. Acceptable limits of distortion are when the plan view of the load has not been displaced at any point by more than:

- (1) On the 1219 mm (48 in) sides plus or minus 51 mm (2 in).
- (2) On the 1016 mm (40 in) sides plus or minus 38 mm (1.5 in).
- (3) The strapping or retaining material should not be fractured or unserviceable.

4.6.4 Loose Cargo vibration test.

a. Test. On a platform of suitable capacity the load shall be placed on, but not fastened to the platform and vibrated for a total of three hours for each unit load as follows: The amplitude shall be 13 mm (0.50 in) (25 mm {1 in} double amplitude) and a frequency of 3 to 5 HZ. Restraining devices (fence, barricades or blocking) that do not restrict the vertical or rotational movement of the unit load is acceptable. The frequency shall be steadily increased until the pallet begins to leave the platform or slightly rock on the platform (until a 1.6 mm {1/16 in} thick feeler gage shall be momentarily slid freely between every point between the pallet and platform at some instant during the cycle). Half way through this test the unit load shall be rotated 90 degrees, and frequency reset for the duration of the test.

b. Satisfactory performance criteria. The failure of the load to withstand vibrations normally can be assessed by measuring the residual tension in the strapping after the test; if this is still greater than half the original tension, the load can be accepted. Damage to the pallet, which prevents continued use or transport or damage to a container, which prevents access to the contents, or which results in spillage of the contents constitutes test failure.

NOTE: In practice it may be found advisable to carry out both tests in a series of short test runs equaling 90 minutes. It may be difficult to obtain equipment which reproduces exactly the pure vibratory motion required. In this case some variation of frequency and amplitude is acceptable, provided that amplitudes are adjusted to give the same energy input. A "fence" or other device that minimizes horizontal movement but does not impede vertical movement should restrain the load.

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4.6.5 Edgewise drop test.

a. Test. In conducting the edgewise drop test, the unit load may be handled with any convenient equipment, such as a forklift, a hoist, or a block and tackle. The edgewise drop shall be performed on a smooth level concrete surface (or similarly unyielding surface). The unit load shall be positioned with one edge of the base supported on a sill approximately 152 mm (6 inches) high. The unsupported opposite edge shall then be raised and allowed to fall freely to the concrete surface from a height as determined below to be used for Combat or Training :

<u>GROSS WEIGHT OF UNIT LOAD</u>	<u>HEIGHT OF RAISED EDGE OF UNIT LOAD</u>
less than 273 kg (600 lb)	711 mm (28 in)
273 kg (600 lb) – 455 kg (1000 lb)	610 mm (24 in)
455 kg (1000 lb) – 682 kg (1500 lb)	508 mm (20 in)
682 kg (1500 lb) – 909 kg (2000 lb)	432 mm (17 in)
909 kg (2000 lb) – 1364 kg (3000 lb)	381 mm (15 in)
1364 kg (3000 lb) - 1818 kg (4000 lb)	305 mm (12 in)

The test shall be applied once to each base edge of the unit load.

b. Satisfactory performance criteria. Structural damage to the unit load, which would result in either spilling of the contents or failure of the unit load during subsequent handling tests, shall be cause for rejection. There should be no evidence of a substantial amount of shifting of the contents within the unit load that would create conditions likely to cause damage during shipment, storage or handling. The amount of shifting shall be determined by measuring the displacement of packages relative to other packages or relative to the pallet. If the shifting/displacement exceeds 51 mm (2 in), the unit load is unacceptable.

4.6.6 Unit load integrity.4.6.6.1 Rollover test.

a. Test. The load shall be laid on its side on two timber runners, 102 mm (4 in) by 102 mm (4 in), in cross section placed on a level paved area. The runners shall be parallel to one another and at such a distance apart that one runner supports the pallet edge and the other supports the top edge. No part of the palletized load shall fall out when the whole load is supported in this fashion. The load shall be tested on two adjacent sides.

b. Satisfactory performance criteria. No part of the load shall become detached.

4.6.6.2 Securing method removal test.

a. Test. Following all of the above tests, the unit load shall be squared up within 51 mm (2 in) of its original shape and positioned on a flat level surface. The securing means shall be cut and removed.

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b. Final criteria of acceptability. The assembly structure (the pallet, structural or protective members, and securing method) shall not have failed, nor have permitted individual parts of the unit load assembly to become unattached or separated, to such a degree that safe transport, handling and storage of the unit load is prohibited after each stage of testing above. Latches, handles or other protrusion of packages and containers shall not be damaged beyond usefulness or to the extent that removal of the contents is prohibited.

4.6.7 Rail impact. Simulate box car coupling and/or slack run-in/out effects when ammunition is transported by rail, Test to be conducted in accordance with EVT-TP-1-86. A designated number of unit loads will be specified for test. With the unit loads properly block and braced, the loaded box car is brought to a velocity of 6 km per hour (4 mph) and impacted into a parked train of box cars. This test is repeated at 10 km per hour (6 mph), 13 km per hour (8.1 mph) and a reverse 13 km per hour (8.1 mph). Acceptance is that the unit loads can be mechanically handled out of the rail car without spillage or human intervention. Any unit load failing to be removed from the rail car shall constitute rejection of the unit load procedure.

#### 4.7 Environmental.

4.7.1 Temperature. All tests in para 4.6, except 4.6.7 shall be conducted at ambient temperature 21 degrees Celsius (70 degrees Fahrenheit) plus or minus 7 degrees Celsius (20 degrees Fahrenheit). Unit loads having plastic components shall also be tested at minus 54 degrees Celsius (minus 65 degrees Fahrenheit) and at plus 76 degrees Celsius (plus 165 degrees Fahrenheit).

4.7.2 Corrosion resistance. Metal pallets, strapping and seals shall pass a 5 percent salt spray test for a minimum of 150 hours in accordance with ASTM B 117. When CARC is specified, the duration of the salt spray test shall be 336 hours. The metal surfaces shall show no more than 0.03 percent of surface rust in a 51 mm (2 in) square area per ASTM D 610. The test samples for one unit load shall be six 102 mm x 152 mm (4 in x 6 in) panels per day at various intervals, four 6 inch pieces of strapping and six seals per lot of material.

4.7.3 Insect and Decay Resistance. (Wood pallets only). Unless one of the wood preservatives in paragraph 6.8 are used six pallets and an equal number of dunnage material shall be placed in a partially shaded site within 80 km (50 miles) of Gulfport, MS for a period of 48 months or in an open field in Central Panama for 36 months or under a three-tiered forest canopy in the high-rainfall area bordering the Gulf of Mexico for 36 months. The pallets shall be placed five feet apart. A 1016 mm (40 in) x 1219 mm (48 in) piece of 19.1 mm (.75 in) plywood shall be placed on top of each pallet. The associated dunnage shall be placed on top of the plywood. Pallets shall be in direct contact with the earth.

4.7.3.1 Performance assessment. At the end of the specified periods visual ratings shall be determined for each component of the pallet and any dunnage. Numerical ratings shall be given as follows:

<u>Rating</u>	<u>Decay Class</u>
0	NONE
1	Suspicious only

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- |     |  |
|-----|--|
| 2   | Small spots only, or less than one half of the surface area showing superficial decay.   |
| 2.5 | General, but estimate little loss in strength. Estimate that less than 10 percent of cellulose in item is destroyed. More than one half of the surface area may show some decay. |
| 3.0 | General. Some loss of strength is occurring. Estimate that from 10 to 50 percent of cellulose in item is destroyed.  |
| 4.0 | Heavy decay, estimate serious loss in strength. Estimate that more than 50 percent of cellulose filler in item is decomposed.  |
| 5.0 | Practically destroyed, estimate that more than three-fourths of cellulose in item is decomposed.   |

Analysis of Data. All wood components shall have an average rating of 3.0 or less. If rating is greater than 3.0 the preservative treatment offered shall be rejected.

4.7.4 Moisture content. During production, the moisture content of pallets and dunnage shall be measured prior to treatment. If moisture content exceeds the requirement, then the pallet or dunnage shall be rejected.

4.7.5 Preservative marking. The two letters designated by the Government shall be applied. Markings that are missing, incorrect or illegible shall be cause for rejection.

4.7.6 Solar radiation. All plastic components of pallets, unit loads and plastic securing components shall be tested per Method 505.4 of MIL-STD-810. The tests of 4.6.2 thru 4.6.7 shall be conducted after the conclusion of this test.

4.7.7 Drainage. From a standard garden sprinkler can, 2 gallons of water shall be dispensed evenly over the pallet top. No more than 1 ounce of water shall remain in depressions or cavities of the pallet. More than 1 ounce of collection from a single pallet shall be cause for rejection.

4.7.8 Chemical agent resistance. The contractor shall verify by demonstration, examination or test that the paint protects the metal pallet and metal top lift assemblies from chemical agent attack (see MIL-C-53072).

## 5. PACKAGING.

5.1 Packaging. For acquisition purposes, the detailed packaging requirement shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by Department of Defense personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Departments System Command. Packaging data retrieval is available from the managing Military Department's of Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

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## 6. NOTES.

(This section contains information of a general or explanatory nature, which may be helpful, but is not mandatory).

6.1 Intended use. The unitized loads of ammunition covered by this specification are military unique and exceed commercial application. Loads will be used by military personnel and must be able to withstand adverse conditions typically found in the battlefield and also withstand the effects of multiple storage and reshipment worldwide, by all modes of transportation, for possibly up to 30 years. In commercial applications, unitized loads are normally broken down and consumed at its first destination.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of original documents referenced (see 2.2).
- c. Requirements for submission of first article sample.
- d. What conformance verification is necessary (see 4.3).
- e. Packaging requirements (see 5.1).
- f. Top lift capability, when required.
- g. Rail impact test when required.
- h. Chemical agent resistance coating (CARC), when required.

6.3 First article. A first article verification is required. The pallets and unit loads to be tested will be a first article sample. The contracting officer should include specific instructions in Acquisition Documents regarding arrangements for examinations and test approval of the documents for first article sample.

6.4 Subject term (key word) listing.

- a. Pallet
- b. Unit Load

6.5 Definitions.

a. Dunnage. Separators or spacers placed in voids between rows or layers of packages to insure a firm and stable load.

b. Pallet. A portable, horizontal, rigid, composite platform used as a base for assembling, storing, stacking, handling, and transporting goods as a unit load.

c. Unit load. A unit load consists of a number of packages made up into one load, securely strapped or fastened on a pallet so that the whole is handled as a unit and because of its size must be handled mechanically.

d. Unitization. Assembly of packages comprised of one type of items of supply into a single unit load, so that the load can be handled as a single unit throughout the distribution system.

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e. Wing. Portion of the deck or decks which projects beyond the stringers or blocks, designed for lifting by crane attachment.

6.6 Recycled, recovered, or environmentally preferable materials. Recycled, recovered or environmentally preferable materials should be used to the maximum extent possible provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

6.7 Reference information.

6.7.1 Source for unit load testing. The U.S. Army Defense Ammunition Center (DAC), ATTN: SMAAC-DEV, 1C Tree Road, McAlester Army Ammunition Plant, McAlester, OK, 74501-9053, may be contacted to perform unit load test (see 4.6).

6.7.2 Source for ASME MH1. This document may be obtained from the American Society of Mechanical Engineers, Three park Avenue, New York, NY 10016.

6.7.3 Source for preservative treatment markings. If preservative other than specified in Appendix A are utilized, the two letter designation can be obtained from the TACOM-ARDEC, ATTN: AMSTA-AR-WEP-RP, Rock Island, IL, 61299-7300.

Custodians:  
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Preparing Activity  
Army – AR

(Project 8140-0216)

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APPENDIX A

A.1 SCOPE

A.1.1 Scope. The appendix details the alternate preservative treatment methods for wood pallets and assembled and unassembled dunnage.

A.2 APPLICABLE DOCUMENTS.  
(This section is not applicable to this appendix.)

A.3 PROCEDURE

A.3.1 Preservative treatment. Pallets and assembled or unassembled dunnage, shall be completely immersed for a minimum of one minute in one of the listed wood preservative solutions. All interior and exterior surfaces (when wood parts are dipped) are to be completely inundated with preservative. Care shall be exercised to assure complete coverage of all surfaces of the board. After the dip treatment, the pallets and dunnage shall be air dried for a period of 24 hours minimum in a well ventilated area allowing full air circulation around all surfaces of the wood. Accelerated drying in an oven or kiln is permitted provided oven or kiln temperature does not exceed 71 degrees Celsius (160 degrees Fahrenheit). The pallets and dunnage shall be thoroughly dried prior to use on the unit load. Moisture content of the wood shall not be over 19% before treatment. Alternatively, pallets dunnage thereof may also be completely flooded for a minimum of one minute in preservative.

A.3.1.1 Copper-8-quinolinolate reduced with water down to a minimum of 1.8 percent as a solution.

A.3.1.2 Zinc Naphthenate reduced with water down to a minimum of 3 percent zinc as metal.

A.3.1.3 Copper Naphthenate reduced with water down to a minimum 2 percent copper as metal.

A.3.2 Preservative concentration level. The concentration of the applicable preservative in the tank shall be checked in accordance with manufacturer's recommendations prior to utilization of the dipping tank and every eight hours of use thereafter.

A.3.3 Presence of preservative. The wood component shall show evidence of discoloration.

A.3.4 Preservative treatment markings. Each pallet shall be marked near the center of an outside stringer or block in letters 25.4 mm (one inch) minimum in height. The letters "PA" shall be marked on all pallets and dunnage subjected to copper-8-quinolinolate preservative treatment. The letters "PB" shall be marked on all pallets and dunnage subjected to zinc naphthenate preservative treatment. The letters "PC" shall be marked on all pallets and dunnage subjected to the copper naphthenate preservative treatment.

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A.3.5 SUGGESTED SOURCES OF SUPPLY

A.3.5.1 Copper-8-quinolinolate. Copper-8-quinolinolate preservative (PQ-56), may be obtained from ISK Biosciences, Industrial Biocides Division, 6075 Poplar Ave., Suite 306, Memphis, TN 38119, or equivalent.

A.3.5.2 Zinc naphthenate. Zinc naphthenate (M-GARD W550), may be obtained from Mooney Chemicals, Inc. 2301 Scranton Road, Cleveland, OH 44113, or equivalent.

A.3.5.3 Copper naphthenate. Copper naphthenate (M-GARD W510 or Cunapsol-5, as applicable), may be obtained from Mooney Chemicals, Inc. 2301 Scranton Road, Cleveland, OH 44113, or ISK Biosciences, Industrial Biocides Division, 6075 Poplar Ave, Suite 306, Memphis, TN 38119, or equivalent.

A.4 ACCEPTANCE

A.4.1 Presence of wood preservative. A sample of 5 pallets shall be selected at random, from each lot, for this test. Four individual boards of each pallet shall be subjected to the applicable preservative test. If one or more boards fail to meet the applicable requirement, the pallet or dunnage shall be classed defective. Failure of any pallet or dunnage to comply with the requirements is cause for rejection of the lot. For testing assembled or unassembled dunnage, 5 sample sets shall be selected, and two boards of each set shall be tested.

A.4.2 Copper-8-quinolinolate.

A.4.2.1 Test materials. The materials and equipment required are as follows:

A.4.2.1.1 Copper-8-quinolinolate check (indicator). The formulation contains 10 parts by weight, of sodium diethyldithiocarbamate trihydrate and 90 parts by weight of distilled water.

A.4.2.1.2 Dropper. An ordinary glass tube eye-dropper may be used.

A.4.2.2 Test procedure. Two drops of copper-8-quinolinolate check (indicator) shall be applied to the wood surface. An immediate dark brown coloration and the spreading of the drops shall indicate copper-8-quinolinolate treatment.

A.4.3 Alternate method for copper-8-quinolinolate.

A.4.3.1 Test materials. The material and equipment required are as follows:

A.4.3.1.1 Reagent. Dissolve 0.5 grams chrome azurol "S" concentrate and 5.0 grams sodium acetate in 80 ml of distilled water and then dilute further to 500 ml total with distilled water.

A.4.3.1.2 Sprayer. Common manual (fly) sprayer type applicator may be used.

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A.4.3.2 Test procedure. Spray solution over surface of dried wood. A deep blue color reveals the presence of copper (from the copper-8-quinolinolate).

A.4.4 Zinc naphthenate.

A.4.4.1. Test materials. The material and equipment required are as follows:

A.4.4.1.1 Reagent. Dissolve 0.1 grams of dithizone (diphenylthiocarbazone) in either 100 ml of methyl ethyl ketone (Note: This solution may be stored for a long period of time.) or 100 ml of chloroform (Note: This solution needs to be made fresh each day.)

A.4.4.1.2 Eye dropper. Any ordinary eye dropper may be used.

A.4.4.2 Test procedure. Five drops of the solution shall be applied to the wood surface. The indicator will turn red when zinc is present. The color green indicates that the preservative is not present. Both colors fade quickly in the presence of light.

A.4.5 Copper naphthenate.

A.4.5.1 Test materials. The material and equipment required are as follows:

A.4.5.1.1 Reagent. Dissolve 0.5 grams chrome azurol "S" concentrate and 5.0 grams sodium acetate in 80 ml of distilled water and then dilute further to 500 ml total with distilled water.

A.4.5.1.2 Sprayer. A common manual (fly) sprayer type applicator may be used.

A.4.5.3 Test procedure. Spray solution over surface of dried treated wood. A blue color reveals the presence of copper (from copper naphthenate).

A.4.6 Moisture content. Moisture content of the pallet and any dunnage shall be measured prior to treatment. Moisture content that is greater than 19% is cause for rejection .

A.4.7 Marking for treatment. Pallets and dunnage of each lot shall be visually checked to see if the applicable marking is applied. Marking that is missing , incorrect or illegible is cause for rejection.

# STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

## INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7, and send to preparing activity.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

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### I RECOMMEND A CHANGE:

1. DOCUMENT NUMBER  
MIL-PRF-32076

2. DOCUMENT DATE (YYYYMMDD)  
20001201

3. DOCUMENT TITLE UNITIZATION OF AMMUNITION

4. NATURE OF CHANGE *(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)*

5. REASON FOR RECOMMENDATION

### 6. SUBMITTER

a. NAME *(Last, First, Middle Initial)*

b. ORGANIZATION

c. ADDRESS *(Include Zip Code)*

d. TELEPHONE *(Include Area Code)*  
(1) Commercial  
(2) AUTOVON  
*(if applicable)*

7. DATE SUBMITTED  
(YYYYMMDD)

### 8. PREPARING ACTIVITY

a. NAME U.S. Army TACOM-ARDEC

b. TELEPHONE *Include Area Code)*  
(1) Commercial  
(973) 724-6674

(2) AUTOVON  
880-6674

c. ADDRESS *(Include Zip Code)*

ATTN: AMSTA-AR-QAW-E, B-12  
Picatinny Arsenal, NJ 07806-5000

**IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:**  
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