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## PACKAGING OF LARGE EQUIPMENT, CONSOLES, STRUCTURE, ETC., IN WOOD CRATES, OPEN OR CLOSED STYLE

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### **1.0 SCOPE**

This standard provides design and fabrication requirements for wooden crates (open/closed), for shipment of large/heavy equipment, consoles, structures, etc.

### **2.0 REFERENCE**

- 2.1 Lockheed Packaging Standard LPS 40-001 (General Requirements Specification)
- 2.2 Wood Crate Design Manual, Agriculture Handbook #252
- 2.3 Quality of Wood Members, ASTM D6199, Class 2, Group 2

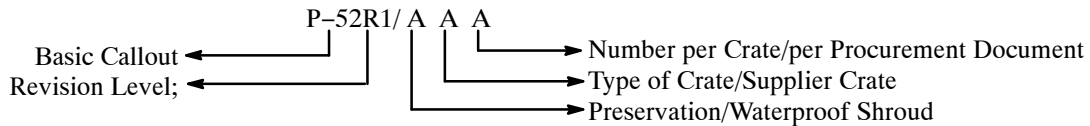
### **3.0 REQUIREMENTS**

#### **3.1 GENERAL**

- 3.1.1 The design and construction standards specified herein are minimum requirements. Deviations to these requirements may be permitted, providing that such actions meet or exceed the minimum provisions of this standard, and result in no additional cost to the delivered article.
- 3.1.2 The crate(s) shall provide adequate protection to its contents during handling, stacking, shipment/storage, and of suitable quality and workmanship to assure acceptance by common carriers.
- 3.1.3 The crate(s) shall be designed to minimize the weight and cube dimensions wherever practical, assuring acceptance by carrier at lowest transportation rate.
- 3.1.4 All crates/contents with a gross weight of 200 pounds or over, or with any dimension 60 inches or over, shall be provided with skids to facilitate handling (see Figure 1).
- 3.1.5 The item(s) shall be properly secured to the crate base with bolts, straps or blocking, to prevent movement during handling/shipment. Sufficient clearance shall be provided between the item(s) and the crate frame.
- 3.1.6 Items subject to damage from moisture, corrosion, dirt, etc., shall be enclosed in a waterproof shroud of sufficient thickness to withstand the environmental conditions normally encountered during transit.
- 3.1.7 When practical, the size of crate(s) may be reduced by partial disassembly of the major segments/components, by nesting of like configured items within each other.
- 3.1.8 Unless otherwise specified in the procurement document, selection of the style or type of crate design shall be optional, providing that the general requirements of this standard are met.
- 3.1.9 Guideline for construction and assembly of open/closed crates are detailed in the Wood Crate Design manual (see Paragraph 2.2). Equipment requiring impact/shock mitigation protection may utilize a "Floating Bed" style crate (see Figure 4), or other shock mitigating designs (e.g., shear mounts, friction damping, etc.).
- 3.1.10 Lumber used to fabricate crates/skids shall meet or exceed construction grade for Wood Groups II, III or IV of ASTM D6199, Class 2, Group 2. Workmanship shall be of good commercial quality, free from defects which may affect its ability to protect contents during the normal handling/shipping environment.

**3.2 UNIT PACKAGING**

3.2.1 Unit packaging shall be in accordance with the designated requirements selected from Table 1 , Table 2 and Table 3 , as invoked by the Lockheed Packaging Standard (LPS) callout on the procurement document. The LPS suffix letter contained in each table specifies the type of preservation, protection and packing to apply to the item(s). The suffix letters following the basic callout (P-52R1) identifies the applicable preservation (Table 1 ), type of crate (Table 2 ), quantity per crate (Table 3 ), in that order .



3.2.2 Crates may be designed for reusable purposes (demountable frame/cover using bolts in lieu of nails) when such provisions will facilitate unloading or when a reshipment probability exists.

3.2.3 When the major assembly consists of multiple subassemblies not normally attached to the major unit, such equipment may be packaged in wood/corrugated containers with suitable cushioning/dunnage, in lieu of crating.

3.2.4 Item(s) shall be uniformly loaded and secured to the crate(s) in accordance with the provisions of this standard.

**3.3 INTERMEDIATE PACKAGING**

Not applicable.

**3.4 PACKING**

3.4.1 Crate(s) as packed, shall protect each item during handling/shipping and shall meet the minimum requirements of this standard and common carriers, for acceptance for safe transportation at the lowest rate to the point of delivery.

3.4.2 Enclose or attach a copy of the packing slip to the crate.

**3.5 MARKING (Unless otherwise specified in the contract or Purchasing Document use the following criteria)**

3.5.1 Unit Package Marking – Label or mark each crate to show at least part number per contracting document, quantity of items (when containing multiples) LMSSC contracting document number, supplier identity, handling restrictions, and destination. Additional markings may be specified in the LMSSC detail specification or drawing.

3.5.2 Intermediate Marking

Not applicable.

3.5.3 Shipping Container Marking – Same as Paragraph 3.5.1 (shipping container is the unit package).

**4.0 QUALITY ASSURANCE**

4.1 Packaging shall be accomplished in such a manner as to prevent physical damage to, or degradation of, the packaged items during delivery to the using activity. It shall be the prerogative of LMSSC to return damaged items, at supplier’s expense, when such damage is attributable to improper or inadequate protection.

**5.0 NOTES**

5.1 The following information is intended as a guide to suppliers in meeting the requirements of this standard:

<u>Commodity</u>	<u>Military/Commercial Specifications</u>
Wood Crate Design Manual	Agriculture Handbook 252
Crates, Wood Sheathed	MIL-C-104
Crates, Wood, Open	MIL-C-3774
Packaging Material Sheet	A-A-59135, Class 2, Grade B
Cushioning Material, Foam Plank	A-A-59136, Class 1, Grade A, Type 1
Lumber and Allied Products	MIL Handbook 7
Polyurethane Foam, Rigid/Plastic	MIL-P-26514, Type 1, Class 2, Grade B
Quality of Wood Members	ASTM D6199, Class 2, Group 2
Securement of Cargo	ASTM D5728
Crates, Wood	MIL-C-104

<b>LPS Suffix</b>	<b>Table 1 Preservation/Protection Requirements</b>
A	Item(s) shall be enclosed in a waterproof shroud of sufficient durability and shall be properly secured to withstand transportation environments.
B	Item(s) with bare metallic surfaces shall be protected with proper type of preservatives, oils, greases, etc., overwrap with a shroud/cover as required.
C	Item(s) shall be protected as specified in the procurement document or detail specification as applicable.
D	Method of preservation shall be in accordance with supplier's commercial packaging normally provided for similar products.
E	No specific shroud/preservative is required.

<b>LPS Suffix</b>	<b>Table 2 Type of Crate</b>
A	Unless otherwise specified, suppliers commonly furnished crate may be utilized providing that protection of contents and general provisions of this standard are met.
B	Open style crate(s) (see Figure 2) shall be furnished.
C	Closed style crate(s) (see Figure 3) shall be furnished.
D	A floating bed style crate (see Figure 4) shall be furnished. (Open/closed type is optional.) <u>NOTE:</u> Frame/cover may be omitted if not essential to protection or to facilitate loading on carrier equipment.

<b>LPS Suffix</b>	<b>Table 3 Number of Items per Crate</b>
A	The number of items shall be as specified in the procurement document or LMSSC specification.
B	The number of items shall be at suppliers' option providing that all applicable requirements of this standard are met.
C	The number of items shall not exceed one (1) each or one (1) assembly per crate.

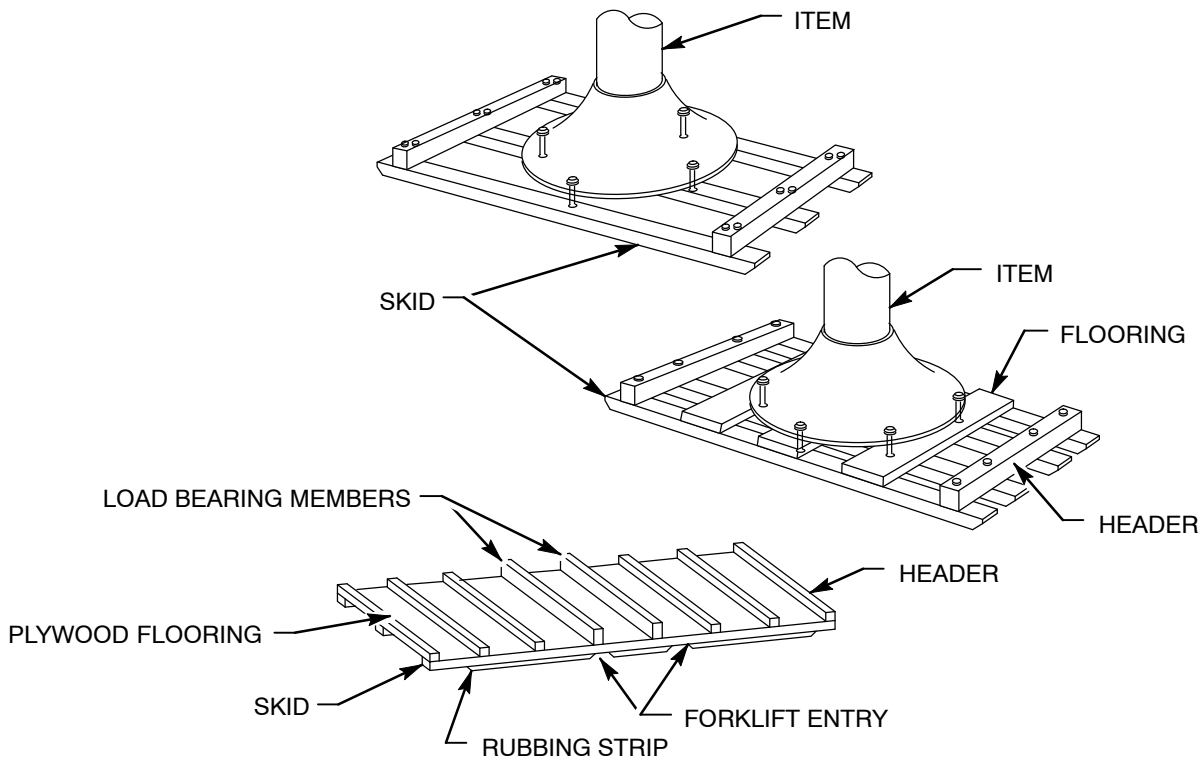


Figure 1. Skid Examples

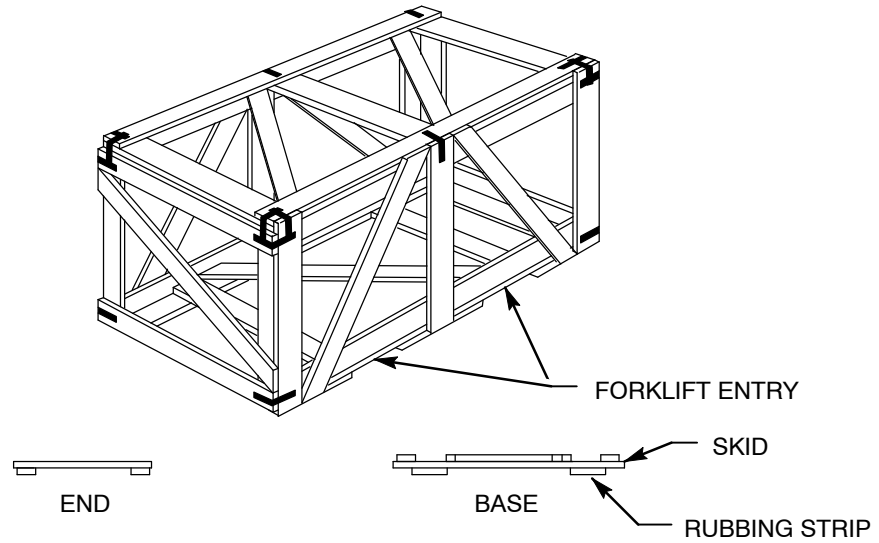


Figure 2. Open Crate

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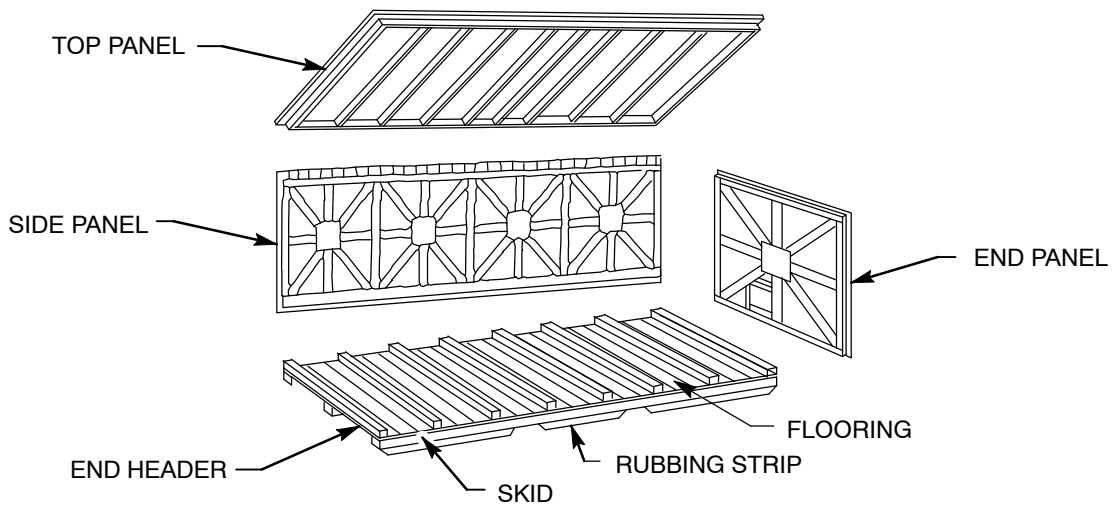
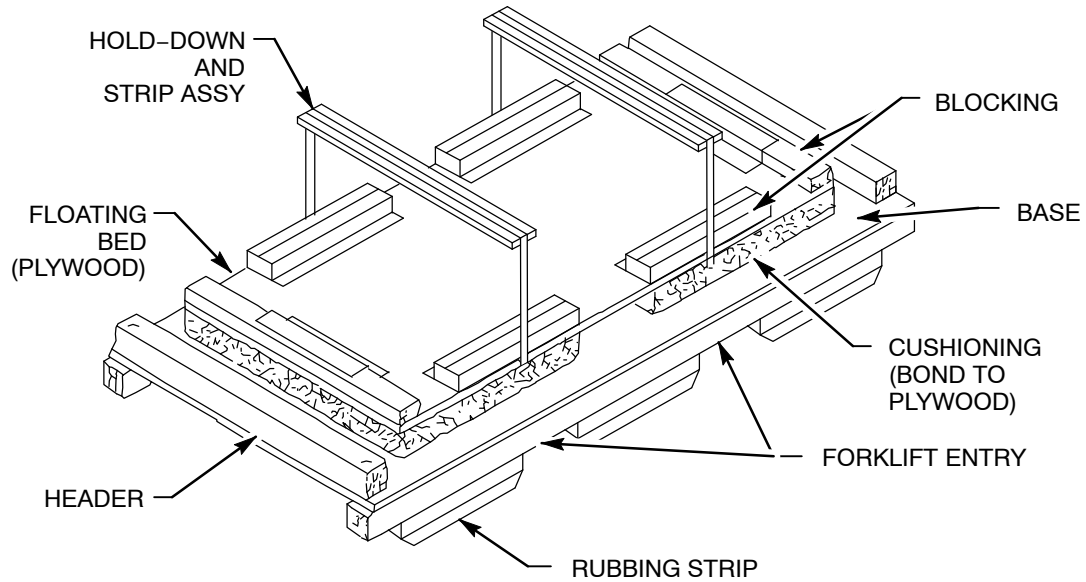


Figure 3. Closed Crate

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**Figure 4. Floating Skid Base**

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**NOTE:** Determination of cushioning selection should include the following considerations:

1. Rough handling and shipping environment associated with the shipment.
2. Proper thickness, density and load bearing characteristics of the cushioning material.
3. Fragility of the article to be shipped.
4. Load bearing surface area of the article in relation to the gross weight of the loaded article (pounds/square/inch) vs. the cushioning load bearing and creep characteristics under continual load.
5. Maximum deflection of load anticipated during handling/shipment.
6. Capability of the bonding adhesive to adhere to both cushioning/base.
7. Lateral shear/tensile strengths of the cushioning material are adequate.