



Designation: B 660 – 02

Standard Practices for Packaging/Packing of Aluminum and Magnesium Products¹

This standard is issued under the fixed designation B 660; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope*

1.1 These practices describe methods of packaging/packing aluminum and magnesium products, in preparation for storage or shipment, both foreign and domestic. Assuming proper and normal handling in transit, these practices are designed to deliver the products to their destination in good condition. For DoD redistribution, see Supplementary Requirements.

1.2 Aluminum and magnesium products must be preserved and packed so as to be adequately protected from possible damage during shipment and storage. Major damage types are:

1.2.1 Mechanical, including bending, crushing, denting, scratching, or gouging during handling and storage; and abrasions resulting from vibration during transport of the material.

1.2.2 Corrosion, or water stain, resulting from exposure of packed material to water, either externally applied, or as condensate caused by temperature variations in a humid atmosphere.

NOTE 1—A complete metric companion to Practices B 660 is being developed—Practices B 660M; therefore, no metric equivalents are presented in these practices.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

- D 779 Test Method for Water Resistance of Paper, Paperboard, and Other Sheet Materials by the Dry-Indicator Method²
- D 1732 Practices for Preparation of Magnesium Alloy Surfaces for Painting³
- D 1974 Practice for Methods of Closing, Sealing, and

- Reinforcing Fiberboard Boxes²
- D 3950 Specification for Strapping, Nonmetallic (and Joining Methods)²
- D 3951 Practice for Commercial Packaging²
- D 3953 Specification for Strapping, Flat Steel and Seals²
- D 4727/D 4727M Specification for Corrugated and Solid Fiberboard Sheet Stock (Container Grade) and Cut Shapes²
- D 5168 Practice for Fabrication and Closure of Triple-Wall Corrugated Fiberboard Containers²
- D 5486/D 5486M Specification for Pressure-Sensitive Tape for Packaging, Box Closure, and Sealing²
- F 1667 Specification for Driven Fasteners: Nails, Spikes and Staples⁴

2.2 ANSI Standard:

ANSI/AHA A135.4 Basic Hardboard⁵

2.3 Federal Specifications:⁶

- A-A-1249 Paper, Wrapping, Tissue
 - A-A-1671 Tape, Gummed (Paper, Reinforced, Asphalt Laminated)
 - A-A-55057 Panels, Wood/Wood-Based; Construction and Decorative
 - PPP-B-566 Box, Folding, Paperboard
 - PPP-C-96 Can, Metal, 28 Gage and Lighter
 - PPP-D-705 Drum, Shipping and Storage: Steel 16 and 30 Gallon Capacity
 - PPP-D-723 Drum, Fiber (inactive for new design)
 - PPP-D-729 Drum, Shipping and Storage: Steel, 55 Gallon
 - PPP-P-704 Pails, Metal: (Shipping, Steel, 1 through 12, Gallons)
 - PPP-T-495 Tubes, Mailing, and Filing
- #### 2.4 Federal Standards:⁶
- APA-PS1 U.S. Product Standard (For Construction and Industrial Plywood)
 - FED-STD-101 Preservation, Packaging and Packing Materials: Test Procedure
- #### 2.5 Military Specifications:⁶

¹ These practices are under the jurisdiction of ASTM Committee B07 on Light Metals and Alloys and are the direct responsibilities of Subcommittee B07.03 on Aluminum Alloy Wrought Products.

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² *Annual Book of ASTM Standards*, Vol 15.09.

³ *Annual Book of ASTM Standards*, Vol 02.05.

⁴ *Annual Book of ASTM Standards*, Vol 01.08.

⁵ Available from American National Standards Institute, 25 W. 43rd St., 4th Floor, New York, NY 10036.

⁶ Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, Attn: NPODS.

*A Summary of Changes section appears at the end of this standard.

- MIL-C-11796 Corrosion Preventive Compound, Petroleum, Hot Application
- MIL-P-17667 Paper, Wrapping, Chemically Neutral (Non-Corrosive) (inactive for new design)
- MIL-PRF-121 Barrier Materials, Greaseproof, Waterproof, Flexible, Heat-Sealable
- MIL-PRF-16173 Corrosion Preventive Compound, Solvent Cutback, Cold Application
- MIL-PRF-32033 Lubricating Oil, General Purpose, Preservative (Water Displacing, Low Temperature)
- MIL-PRF-7870 Lubricating Oil: General Purpose, Low Temperature

2.6 *Military Standard:*⁶

MIL-STD-129 Marking for Shipment and Storage

2.7 *Other Standards:*⁷

Aluminum Standards and Data-Protective Oil for Aluminum

3. Classification

3.1 *Levels of Protection*—The following levels of protection apply equally to preservation and packing.

3.1.1 *Level A*—The degree required for protection against the most severe conditions known or anticipated to be encountered during shipment, multiple rough handling, and intransit storage.

3.1.2 *Commercial Packaging*—The degree required for protection of material during shipment from supplier to user for

⁷ Available from The Aluminum Association, 900 19th St., NW, Washington, DC 20006.

immediate use or limited storage in a dry, heated storage facility. The methods and materials employed by the supplier to satisfy the requirements of the commercial distribution system to provide protection against corrosion, deterioration, and damage during shipment to a user may be used.

4. Terminology

4.1 *Definitions:*

4.1.1 *corner protector*—protective material placed under ties to protect edges of a package.

4.1.2 *deckboard*—piece of lumber at right angles to stringers or skids of a pallet to form a bearing surface.

4.1.3 *filler*—piece of material placed in a package to fill void space for the purpose of squaring out the contents.

4.1.4 *framing member*—parts forming the main structure of a crate.

4.1.5 *gross weight*—bare item weight and the weight of all packaging and packing materials.

4.1.6 *header*—member of skid-type base used to join the ends of two or more skids and provide added strength to the base.

4.1.7 *interleaving*—placement of a sheet of protective material between two adjacent pieces of metal.

4.1.8 *net weight*—bare item weight.

4.1.9 *nominal*—referring to lumber size, rough sawn commercial size of soft wood lumber common to the industry.

4.1.10 *splice*—to unite or join the ends of material such as lumber, plywood, or paper overlaid veneer.

4.1.11 *tension tied*—securement applied with mechanical tools.

TABLE 1 Packaging (Preservation) and Packing for Level A (Note—For Commercial Packaging, See Section 8)

Product	Preservation (6.1.1)	Packing (Section 7) for Barrier, see Table 2	Maximum ⁴ Net Weight Per Container (7.17)
Bar, rod and wire (cold-finished, drawn, extruded, rolled, and forged):			
Coiled, bare	AL-oiled, Mg-Chrome pickled (6.1.1.1-6.1.1.3)	Wrapped coils (Fig. 1). Wrap with one layer of Type IIB barrier.	120
Coiled, covered	none required	Wrapped coils (Fig. 1). Wrap with one layer of Type IIB barrier.	120
Spooled for military requirements: 5, 10, 15, 20, 30, lb per spool (other: standard commercial weights)	none required	Wooden boxes (Figs. 2-5). Boxes shall be case-lined with one layer of Type IIA barrier or two layers of Type III barrier.	300
Straight lengths	AL-oiled, Mg-Chrome pickled (6.1.1.1-6.1.1.3)	Wooden boxes (Figs. 6-8). Boxes shall be case-lined with one layer of Type IIA barrier or two layers of Type III barrier. or Corrugated fiberboard boxes, Class weather-resistant (S6.1) or Fiber-drums (7.14)	1000 ^B 300 200
Blooms and billets	See ingot
Bus conductors (cold-finished, drawn, extruded and rolled)	See bar, straight lengths
Cable (bare and covered):			
Size 1/0 and smaller	none required	Wrapped coils (Fig. 1). Wrap with one layer of Type IIB barrier. or Reels (Fig. 9).	(bare) 250 (covered) 200 (bare) 1250 (covered) 1000
Size larger than 1/0	none required	Reel (Fig. 9).	(bare) 1600 (covered) 1300

TABLE 1 *Continued*

Product	Preservation (6.1.1)	Packing (Section 7) for Barrier, see Table 2	Maximum ⁴ Net Weight Per Container (7.17)
Casting and forgings, finished.	none required	Wooden boxes (Figs. 2-5) or Style Fig. 10). Boxes and crates shall be case lined with one layer of Type IIA barrier or two layers of Type III barrier.	2000
Castings and forgings, rough	none required	Bare bundles (Fig. 11).	1000
Conduit	See ANSI schedule pipe.	...	
Extruded profiles (metal less than 1 lb per linear foot) ^C	AL-oiled, Mg-Chrome-pickled (6.1.1.1-6.1.1.3)	Wooden boxes (Figs. 6-8). Boxes shall be case lined with one layer of Type IIA barrier or	2000
Fittings (pipe and conduit)	AL-oiled, Mg-Chrome-pickled (6.1.1.1-6.1.1.3)	Corrugated fiberboard boxes, Class weather-resistant (S6.1)	300
	External threads shall be covered with suitable thread protectors.	Wooden boxes (Figs. 2-5) or Style 1 crate (Fig. 10) dependent upon size of fittings. Boxes and crates shall be case lined with one layer Type IIA barrier.	100
Foil ^{D,E}	Foil shall be wound on aluminum fiber or steel cores. End of coil shall be secured with pressure sensitive tape. Sheared edges shall be protected from flanges and adjacent coils with suitable edge protectors. Each coil, or coils (see 7.10) shall be wrapped with aluminum 0.001 in. thick aluminum foil. Foil wrap shall be a conformable wrap completely enclosing the coil or coils and edge protectors on each core or dowel (Fig. 12).	Wooden boxes (Figs. 2-5). Coils shall be suspended by extended cores or wood dowels through the core. Core extension or dowel shall be inserted in wood flanges so that periphery of coil does not contact inner surface of box (Fig. 12). Minimum flange thickness shall be as specified in 7.10.	500
		Corrugated fiberboard boxes, Class weather-resistant (S6.1) suspended as above.	300
Flat	none required	Wooden boxes (Figs. 2-5). Contents shall be wrapped with one separate layer of Type IIA barrier.	500
		Corrugated fiberboard boxes, Class weather-resistant (S6.1)	300
Forgings	See castings	...	
Forging stock	See bar	...	
Impact extrusions	none required	Wooden boxes (Figs. 2-5). Boxes shall be lined with one layer of Type IIA barrier.	700
		Corrugated fiberboard boxes, Class weather-resistant (S6.1)	300
Ingots:	500 lb per piece and over	Loose	...
	30–500 lb per piece	Bare bundles (Fig. 13). Size of bundle straps shall be as shown in Table 3. A minimum of two straps shall be used per bundle.	3500
	Less than 30 lb per piece	Pallets (Fig. 14). Size pallet straps shall be as shown in Table 3. or Self-palletized bundle. Interlocking ingots that are self-palletized may be shipped in strapped bundles not over 42 in. high. Bundle shall be strapped with a minimum of one 3/4-in. steel strap.	2500 1500
Grained and granulated ingot and shot	Product to be packed in wood boxes (Figs. 2-5), shall be packaged in Federal Specification PPP-B-566, boxes, folding, paperboard.	Wooden boxes (Figs. 2-5)	500
		or	70
		Federal Specification PPP-P-704 Steel Pails (7.12). Pails shall not be overpacked.	650
		or	550
		Federal Specification PPP-D-705 and PPP-D-729 Steel Drums (7.13). Drums shall not be overpacked.	
		or	
		Federal Specification PPP-D-723 Fiber Drums (7.15). Drums shall not be overpacked.	

TABLE 1 *Continued*

Product	Preservation (6.1.1)	Packing (Section 7) for Barrier, see Table 2	Maximum ⁴ Net Weight Per Container (7.17)
Paste and powder	Product to be packed in wooden boxes (Figs. 2-5) shall be packaged in 1, 2, or 10 lb friction top can in accordance with Federal Specification PPP-C-96, Type V, Class 2.	Wooden boxes (Figs. 2-5). or	50
		Federal Specification PPP-D-705 or PPP-D-729 Steel Drums (7.13). Drums shall not be overpacked.	600
Plate: ^F Flat and tapered	Al see Table 4, Mg see Table 5.	Pallets (Figs. 15-18) with pallet enclosures (Fig. 19, Fig. 20, and Fig. 21). Contents shall be wrapped with one layer of Type IIA barrier or two layers of Type III barrier.	4000
Circles	Al see Table 4, Mg see Table 5.	Pallets (Figs. 15-18) with pallet enclosures (Fig. 19, Fig. 20, and Fig. 21). Contents shall be wrapped with one layer of Type IIA barrier or two layers of Type III barrier.	4000
Floor and tread Plate and abrasive Tread plate	none required	Pallets (Figs. 15-18). Secure contents to pallet with minimum two lengthwise and two girthwise straps, size 1¼ by 0.031 in.	10 000
Screw machine stock	See bar	...	
Sheet: ^G Flat and tapered 90 lb per piece or less or 15 ft in length or less	Al see Table 4, Mg see Table 5.	Pallet enclosure (Fig. 21) Contents of box shall be wrapped with two layers of Type IIA barrier or one layer of Type IIA barrier and one layer of Type III barrier.	4000 (Not to exceed 200 sheets)
Over 90 lb per piece or over 15 ft in length	Al see Table 4, Mg see Table 5.	Pallets (Figs. 15-18) with pallet enclosures (Fig. 19 and Fig. 20). Contents shall be wrapped with two layers of Type IIA barrier.	4000
Coiled	Al-coiled, Mg-Chrome-pickled (6.1.1.1-6.1.1.3)	Pallets (Figs. 15-18) with pallet enclosure (Fig. 20). Contents shall be wrapped with one layer of Type IIA barrier or two layers of Type III barrier.	4000
Roofing and siding	none required	Pallets (Figs. 15-18) with pallet enclosures (Fig. 19 and Fig. 20). Contents shall be wrapped with one layer of Type IIA barrier.	4000
Structural profiles (extruded and rolled) ^G Less than 150 lb per piece	Al-none required. Mg-Chrome-pickled.	Wooden boxes (Figs. 6-8). Boxes shall be case lined with one layer of Type IIA barrier or two layers of Type III barrier. or Corrugated fiberboard boxes, Class weather-resistant (S.1.7.1)	1000 300
150 lb per piece and over Tubular products (drawn, extruded, and welded): Coiled	Al-none required. Mg-Chrome-pickled.	Loose	...
Coiled	Al-oiled, Mg-oiled (6.1.1.1-6.1.1.3). Stagger wound coils shall be tied through the core in two places with twine or pressure sensitive tape. Pancake or level layer would coils shall not be tied.	Style 1 crates (Fig. 10). Crates shall be case lined with one layer of Type IIA barrier.	700
Straight lengths	Al-oiled, Mg-Chrome-pickled (6.1.1.1-6.1.1.3). When the wall thickness of tube is less than 2½ % of the outside diameter, boxes shall be lined with suitable cushioning material.	Wooden boxes (Figs. 6-8). Boxes shall be case lined with one layer of Type IIA barrier, or Corrugated fiberboard boxes Class weather-resistant (S6.1). or Fiber tubes (7.16).	300 800
ANSI schedule pipe	Al-no preservative required. Mg-Chrome pickled (6.1.1.1-6.1.1.3). External threads shall be covered with suitable protectors.	Wooden boxes (Figs. 6-8). Boxes shall be case lined with one layer of Type IIA barrier or two layers of Type III barrier. or Style 2 and 3 crates Fig. 22 to Fig. 23). Crates shall be case lined with one layer of Type IIA barrier. or Fiber tubes (7.16).	800 4000 200
Construction pipe	Al-no preservative required. Mg-Chrome pickled (6.1.1.1-6.1.1.3).	Same as for ANSI scheduled pipe above.	See Packing

TABLE 1 *Continued*

Product	Preservation (6.1.1)	Packing (Section 7) for Barrier, see Table 2	Maximum ^A Net Weight Per Container (7.17)
Welding and brazing rod Coiled	none required	Wrapped coils (Fig. 1). Wrap with one layer of Type IIA barrier or two layers of Type III barrier.	120
Straight lengths, 36 in.	Package 5 lb per fiber tube with metal ends or 10 lb per fiberboard carton. 10 fiber tubes or 8 cartons shall be overpacked in a weather-resistant fiberboard carton in accordance with Practice D 1974. All corners and seams of boxes, including manufacturer's joint, shall be sealed with Specification D 5486/D 5486M, Type III or IV, Class 1, minimum 2 in. wide tape.	Wooden boxes (Figs. 2-5). Fiberboard boxes shall be overpacked in wooden boxes.	1000
Inert gas welding electrode	1, 5, 10, 12½, 15, or 30 lb spools. Individual spools shall be adequately protected by application of moisture-resistant barrier and packaged single or in multiple in fiberboard boxes Practice D 1974, Type CF, Class weather-resistant.	Fiberboard boxes in accordance with Practice D 1974, Type CF, Class weather-resistant, Grade V3c. All corners and seams of boxes, including manufacturer's joint, shall be sealed with Specification D 5486/D 5486M, Type III or IV, Class 1, minimum 2 in. wide tape. Three ⅝ by 0.015 in. flat steel straps, one lengthwise and two girthwise, shall be applied to each box. Maximum gross weight and dimensions of the box specification shall not be exceeded. or Wooden boxes (Figs. 2-5). Intermediate fiberboard boxes overpacked in wooden boxes, shall be closed in accordance with the closure method prescribed above for the fiberboard shipping in wooden containers.	See Packing 1000

^A Maximum weights specified in this table are for shipments to DoD only.

^B Weight may be increased to 2000 lb for large quantities for manufacturing when specified in the contract or order.

^C For metal weighing 1 lb/linear foot or more, see structural profiles.

^D Foil is sheet metal less than 0.006 in. thick.

^E Foil for food handling applications shall be preserved and packed as specified in the contract or order.

^F Classification of sheet and plate: Sheet is 0.006 through 0.249 in. thick; plate is 0.250 in. and thicker.

^G For metal weighing less than 1 lb/linear foot, see extruded profiles.

ASTM B660-02

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TABLE 2 Minimum Requirements for Paper and Barrier Materials (See Table 1)^A

Type	Tensile Strength in Weaker Direction FTMS 2038	Stretch in Creped Direction FTMS 2038	Contact Corrosivity FTMS 3005	Oil Resistance FTMS 3017	Water Resistance Test Method D 779	Military/Federal Specification
I. Interleaving: ^B						
A. 10 lb, uncreped	1½		No corrosion	No delamination, embrittlement, or disintegration		A-A-1249, Tp II
B. 30 lb, uncreped	10					MIL-P-17667, Tp 1 ^C
II. Exterior and interior						
A. Uncreped ^D	65	...	No corrosion	No penetration for 24 hr min and no delamination, embrittlement, or disintegration	24	
B. Creped ^{EF}	35	20			24	
III. Exterior and interior wrap, non-reinforced						
A. Uncreped	30	...	No corrosion	No penetration for 24 h min and no delamination, embrittlement, or disintegration	24	MIL-PRF-121:
B. Creped	25	15			24	Tp I, Gd A, Cl 1 Tp I, Gd A, Cl 2

^A The minimum requirements listed in Table 2 are based on the results of tests performed in accordance with the test methods outlined in FED-STD-101, and Test Method D 779.

^B Interleaving paper shall be nonabrasive to aluminum surfaces, and have a hydrogen ion concentration (pH) of between 4.5 and 7.5.

^C Except that spring back and identification requirements shall not apply, that the pH value shall be that shown in Footnote B, and that corrosive properties shall be tested for aluminum and magnesium only.

^D Shall have random dispersed reinforced, or a reinforcement spacing not less than 12 threads per foot in both directions.

^E Shall have random dispersed reinforcement, or a reinforcement spacing not less than 12 threads per foot in the longitudinal direction.

^F Tensile strength shall apply only in the reinforced direction.

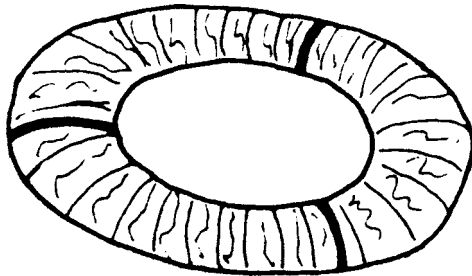


FIG. 1 Paper Wrapped Coil^H

^H For coiled bar, rod, wire, cable AWG 10 or less, and coiled brazing rod.

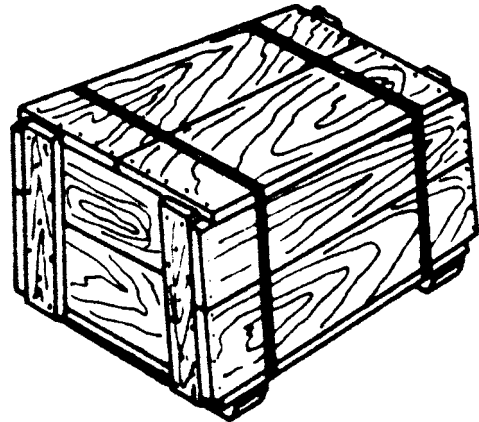


FIG. 4 Style 4 Nail Wood Box^A

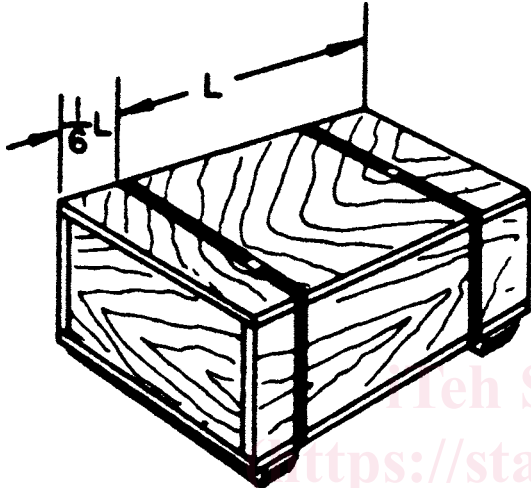


FIG. 2 Style 1 Nail Wood Box^A

Alternate form of cleats

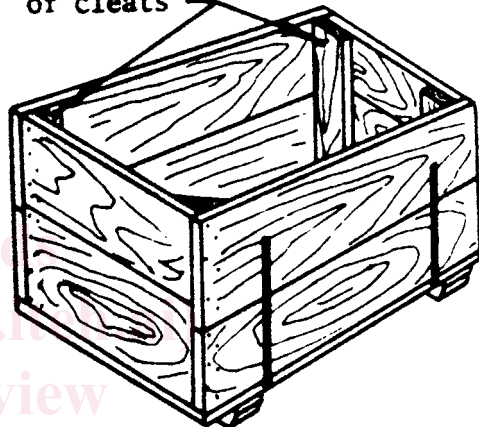


FIG. 5 Style 5 Nail Wood Box^A

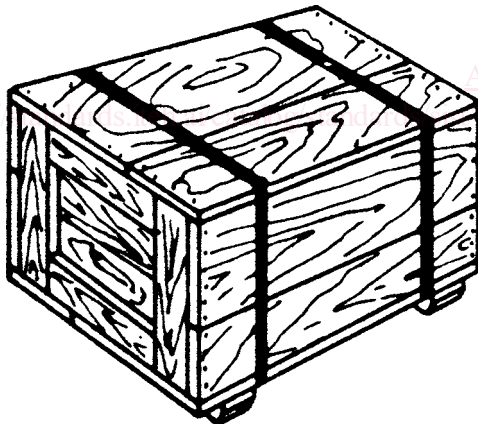


FIG. 3 Style 2 Nail Wood Box^A

- ^A These boxes are for:
- (1) Grained and granulated ingot and shot;
 - (2) Paste and powder,
 - (3) Fittings—(pipe and conduit);
 - (4) Spooled bar, rod, wire;
 - (5) Castings and forgings, finished;
 - (6) Foil, coiled and flat;
 - (7) Impact extrusions;
 - (8) Welding and brazing rod, straight; and
 - (9) Inert gas welding electrodes.

5. General Requirements

5.1 *Materials, Methods, and Containers*—Materials, methods, and containers shall conform to the requirements of this standard. Those exceeding the requirements may be substituted as negotiated by purchaser and producer or supplier.

5.1.1 Materials not covered by applicable specifications or not specifically described herein shall be of high quality and shall be compatible with and protect the contents.

5.1.2 *Splicing Requirement*—When container members must be spliced to obtain the required length or width, the adjacent edges of the two pieces being spliced shall be

butt-jointed as specified in 5.1.2.1 and each piece fastened to the splice board. The fastening shall conform to the requirements specified for construction of the panels being spliced. Nails must be clinched.

5.1.2.1 Splice boards shall be applied to extend on each side of the joint at least two times the width of and the same thickness as the box boards.

5.1.3 The inside dimensions of boxes shall be commensurate with the size of the item.

5.2 Internal Packaging Materials:

5.2.1 *Material Compatibility*—Internal packaging materials shall not adversely affect the contents.

5.2.2 *Blocking and Bracing*—Articles not completely filling the shipping container shall be blocked, braced, fastened, or otherwise secured. Articles having projecting parts that may be broken or may puncture the container shall be rigidly supported, suspended, or otherwise protected. Clearance of at least

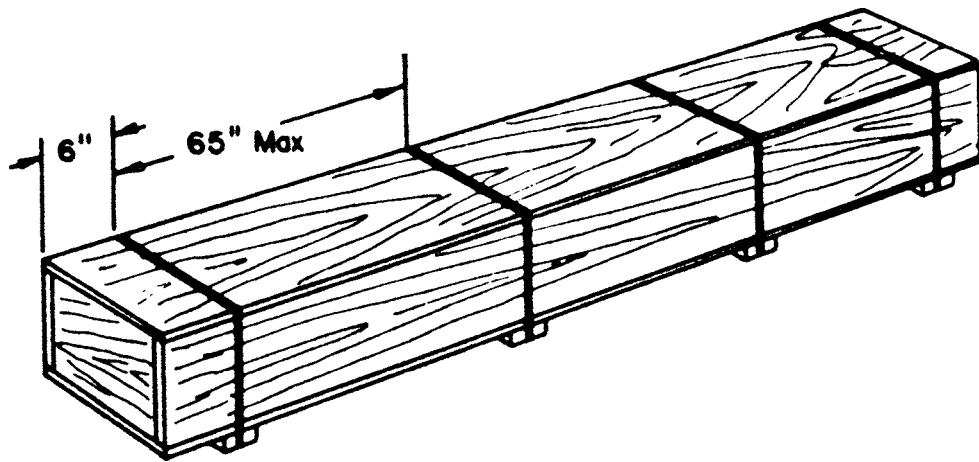


FIG. 6 Style 1 Nail Wood Box^B

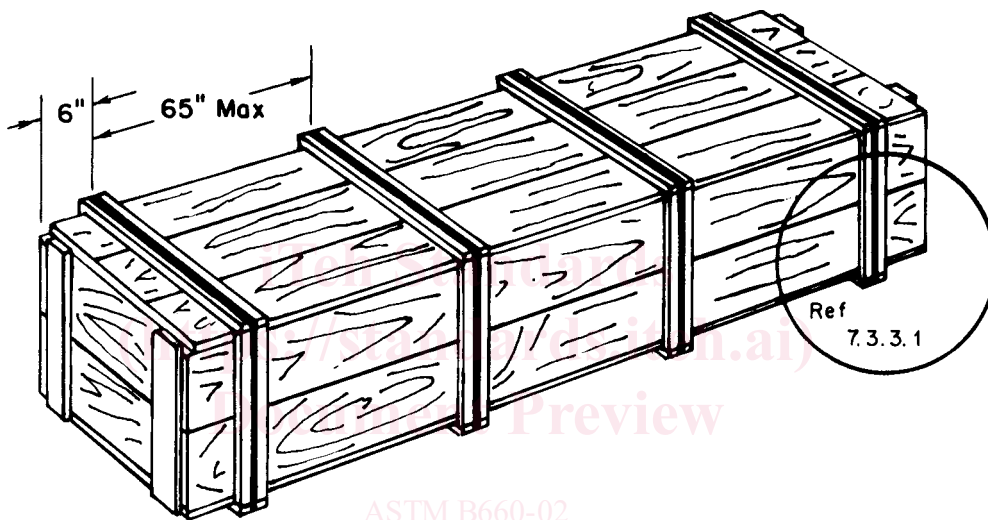


FIG. 7 Style 4 Nail Wood Box^B

1 in. shall be provided between projecting parts and the adjacent inside face of the container. Blocking and bracing shall be prevented from coming in direct contact with any unprotected surface of the item by use of suitable cushioning material.

5.3 Handling:

5.3.1 General—Containers and pallets in their shipping configuration shall be provided with lifting and hoisting provisions commensurate with their weight, size, and intended mode of transportation to ensure safe and efficient movement.

5.3.2 Hoisting—Convenient means shall be provided on all shipping containers (except Fig. 24, Fig. 25, Fig. 26, and Fig. 27) and pallets weighing more than 200 lb gross which will permit hoisting by attaching suitable slings at the bottom of the containers and pallets.

5.3.3 Forklift Truck Compatibility—Unless otherwise specified herein and except Fig. 24, Fig. 25, Fig. 26, and Fig. 27, boxes, containers, and pallets grossing over 200 lb must be capable of being handled from at least two sides by forklift trucks. For DoD use, standard 40 by 48 in. pallets must have four-way forklift entry. Openings shall be a minimum of 3 in. high and at least 20 in. apart inside-to-inside, symmetrically

about the center of balance. Containers may have a single opening 40 in. wide or more to provide forklift access.

6. Detailed Requirements

6.1 Packaging Preservation—Packaging shall be Level A, or commercial preservation as follows:

6.1.1 Level A—Detailed requirements for packaging (preservation) of aluminum and magnesium products are listed alphabetically by product in Table 1. When Level A is specified, items shall be preserved in accordance with the detailed requirements outlined herein.

6.1.1.1 Cleanliness—Surfaces shall be commercially clean, and free from loose mill scale, dirt, foreign matter, or corrosion. The presence of residual rolling oil shall not be considered foreign matter.

6.1.1.2 Preservatives—Oil used for preservation of aluminum products shall conform to the requirements of Aluminum Standards and Data-Protective Oil for Aluminum, MIL-PRF-32033 or MIL-PRF-7870. Oil used for preservation of magnesium products shall conform to the requirements of MIL-PRF-16173, Grade 2, or MIL-C-11796, Class 3. Chrome pickle

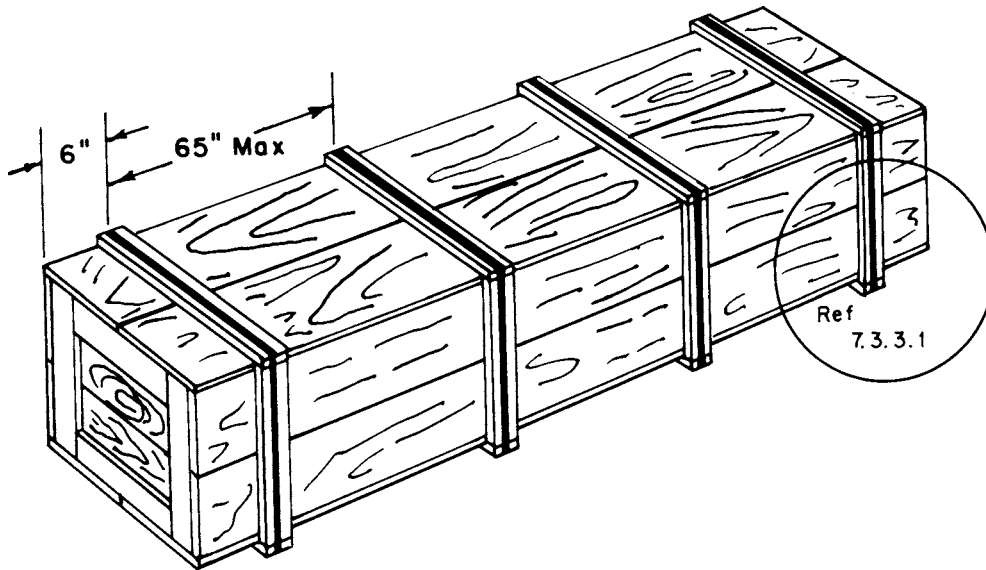


FIG. 8 Style 2 Nail Wood Box^B

^B For Bar, Rod, Shapes, Tubular Products and Wire

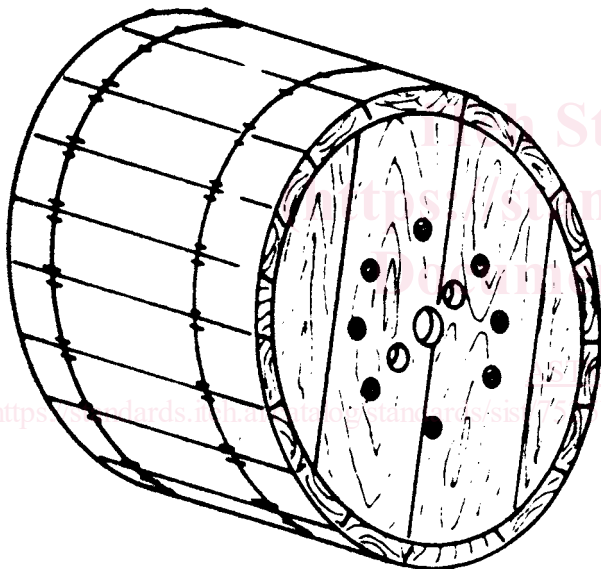


FIG. 9 Lagged Reel (Export Reel)¹

¹ For cable.

treatment of magnesium products shall conform to the requirements of Practices D 1732.

6.1.1.3 *Application of Preservative Coating*—The application of corrosion-preventive material demands careful attention; compounds shall not be applied to surfaces that show signs of moisture, condensation, frost, dirt, or other contaminants. The maximum corrosion resistance is obtained only by a thorough coating of a contaminant-free surface. It is essential that articles treated are not unduly handled until film is set. Application may be by dipping, brushing, rolling, spraying, or flowing onto the surface.

6.1.1.4 *Interleaving*—The interleaving paper shall fully cover the metal; for manual application, paper shall extend 1 in. beyond sides and ends, for machine application, paper may be same size as the metal provided the metal is fully covered.

6.1.1.5 *Wraps*—Application of wraps shall be in accordance with Table 1. Products may be machine-wrapped or hand-wrapped.

6.1.2 *Commercial Preservation*—When commercial preservation is specified, items will be given the degree of protection normally employed by the supplier against corrosion, deterioration, and damage during shipment.

6.2 *Material Requirements:*

6.2.1 *Fiberboard*—Fiberboard for boxes and liners shall conform to the requirements of Specification D 4727/ D 4727M, class weather-resistant.

6.2.2 *Paper and Barrier Material*—Paper and barrier material shall conform to the requirements of Table 2.

6.2.3 *Wood*—The species of wood indicated in Table 6 and classified into groups as shown shall be used. The groups are set up to include, in any one group, species of woods that have approximately similar characteristics important to box design. These characteristics include density, flexural and compressive strength, stiffness, shock absorption, and nailholding power. When any species of wood is specified, any one or more species in the same group may be used. Groups I and II may be interchanged. Groups III and IV may be interchanged.

6.2.4 *Lumber*—All lumber dimensions used in these practices are nominal sizes except where minimum sizes are specified. At least one surface, which is to be placed on the outside of boxes, crates, or pallet closures, shall be sufficiently smooth to permit legible marking, stenciling, or printing. Pieces shall be cut true to length. The boards shall be free of defects that materially weaken them, expose the contents of the box to damage, or interfere with the prescribed fabrication or nailing.

6.2.5 *Plywood*—Unless otherwise specified, plywood used to fabricate cleated panels shall conform to Federal Specification Product Standard APA-PS1 and Federal Specification A-A-55057, standard interior (Grade C-D) with exterior glue.

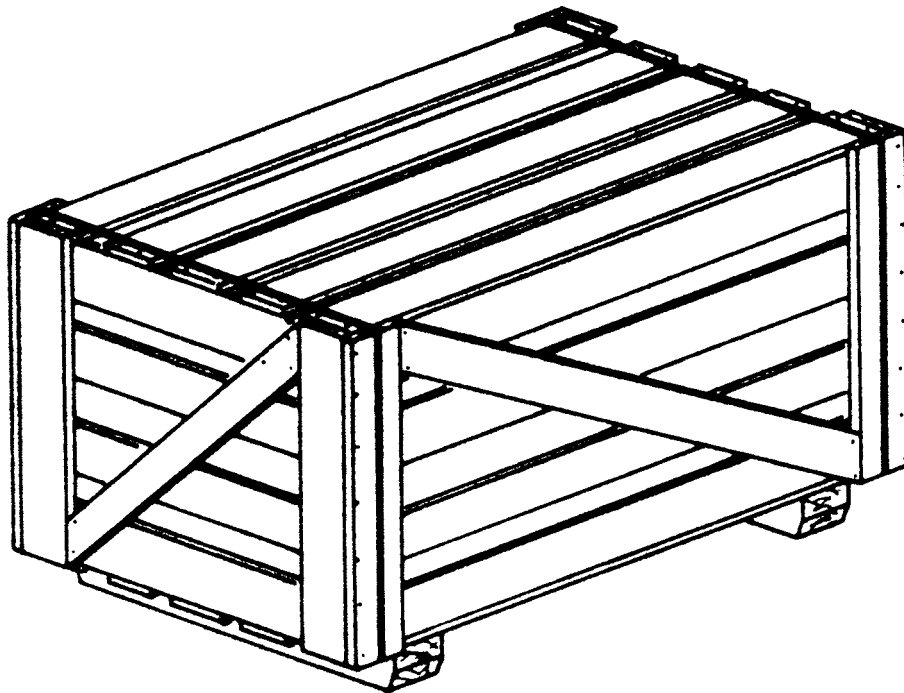


FIG. 10 Style 1 Crate, Open^F
^F For castings, fittings, and coiled tube.

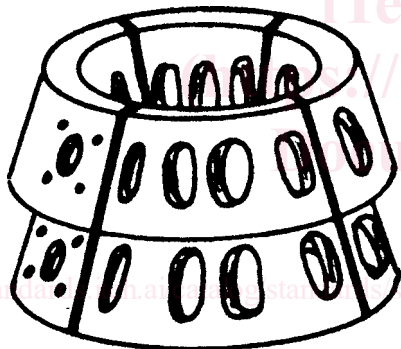


FIG. 11 Strapped Bundle for Castings and Forgings

6.2.6 *Hardboard*—Unless otherwise specified, hardboard shall be in accordance with ANSI/AHA A135.4. When appropriate, hardboard or other composite boards may be used in lieu of plywood for panel stock provided that they are weather resistant and are so sized that they will perform to the same level as plywood.

6.2.7 *Nails and Staples*—Nails and staples shall conform to Specification F 1667 or equivalent. All unclined nails shall be cement-coated or chemically etched, except for Style 18 (spiral-shanked) and ring-shanked nails which are also acceptable.

6.2.8 *Strapping*—Flat steel strapping shall conform to Specification D 3953, Type 1, Finish A. Equivalent nonmetallic strapping conforming to Specification D 3950 may be used when comparable strength requirements are satisfied.

6.2.9 *Tapes*—Tapes shall conform to the requirements of Federal Specifications A-A-1671 or Specification D 5486/D 5486M as applicable.

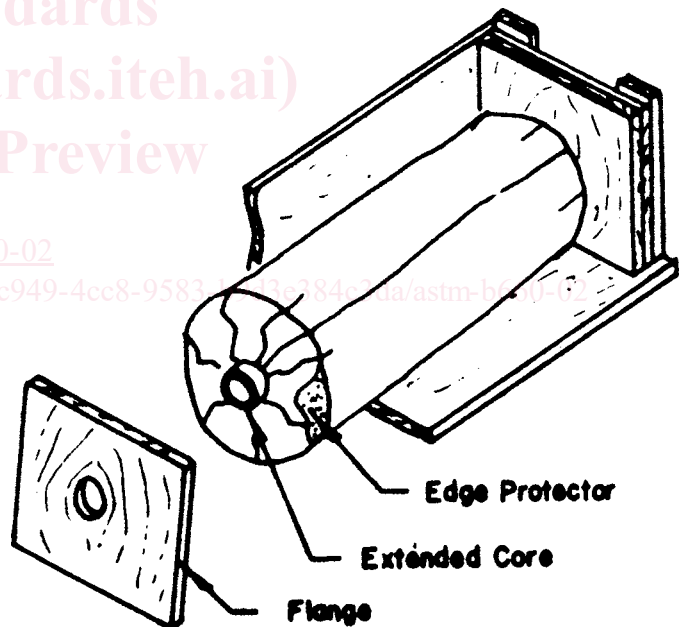


FIG. 12 Coil Foil Packing (See 7.9)

6.3 *Packing*—Packing shall be Level A or commercial packing in accordance with Sections 7 and 8.

NOTE 2—Only one type, class, or size of material shall be packed in a single container.

7. Level A Packing

7.1 *General*—When Level A is specified in the contract or order, items shall be packed in accordance with the requirements in Table 1. When Table 1 provides a choice of several containers for a particular product, any one of the containers

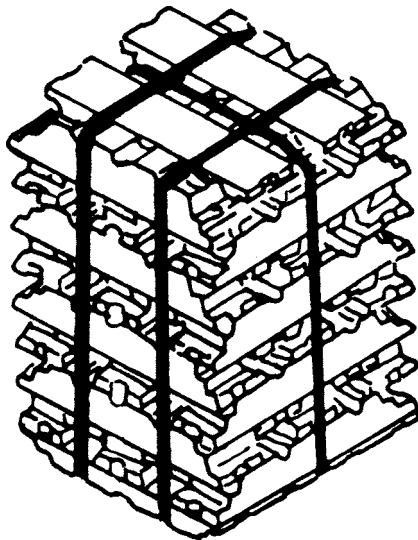


FIG. 13 Strapped Bundle for Ingot (See 7.7)

TABLE 3 Strap Sizes for Boxes and Bundles (6.2.8) (Figs. 2-8, Fig. 1, Fig. 11, Fig. 14, and Fig. 13)

Type of Package	or	Weight of Contents, lb	Flat Steel Strapping, in.
Pallets	...	Less than 700	5/8 by 0.020
...		...	3/4 by 0.023
Bundles	...	700 to 2000	3/4 by 0.023
...			

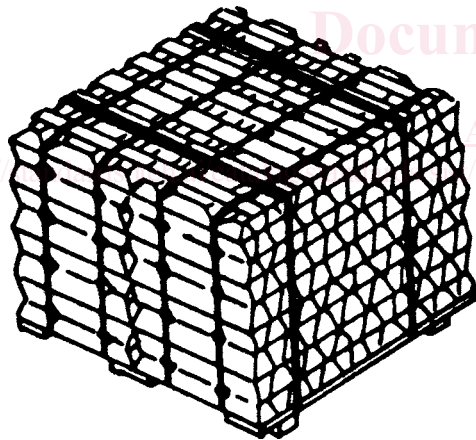


FIG. 14 Pallet for Ingot (See 7.7)

may be selected for use, unless specifically prohibited by the contract or order. This section provides requirements applicable to packing procedures and construction details for containers and methods not covered by specification reference.

7.2 Boxes (Figs. 2-8)—When required by Table 1, boxes shall be constructed as follows:

7.2.1 Top and Bottom Panels—Top and bottom panels shall consist of a complete covering of lumber. Panels for boxes, Figs. 2 and 6, shall be without cleats. Panels for boxes, Fig. 7 and Fig. 8, shall be with cleats. Thickness of panels shall be in accordance with Table 7.

TABLE 4 Preservation of Aluminum Sheet and Plate (See Table 1)

Product	Preservation ^{A,B}
Abrasive tread plate	None required
Flat and tapered sheet and plate, and all circles:	
Clad, all alloys:	None required
Circles less than 12 in. in diameter	
Flat, tapered and circles 12 in. in diameter and over	Interleaved
Nonclad:	
Circles less than 12 in. in diameter	None required
Flat, tapered and circles 12 in. in diameter and over:	
Heat-treatable alloys, all tempers ^B	Oiled (6.1.1.1-6.1.1.3) ^C
Non-heat-treatable alloys: ^B	
Annealed	Interleaved (6.1.1.4)
Other than annealed:	
0.060 in. thick and over	Interleaved (6.1.1.4)
Less than 0.060 in. thick	Oiled (6.1.1.1-6.1.1.3) ^C
Painted, chemical conversion coated, and anodized sheet and plate	Interleaved (6.1.1.4)
Floor and tread plate	None required
Coiled sheet	Oiled (6.1.1.1-6.1.1.3) ^C
Perforated sheet	Oiled (6.1.1.1-6.1.1.3) ^C
Roofing and siding sheet	None required

^A Interleaving paper shall be Type 1 paper (Table 2). For metal 0.090 in. thick and less interleaving paper shall be minimum 10-lb basis weight; for metal over 0.090 in. thick interleaving paper shall be minimum 15-lb basis weight.

^B Heat-treatable alloys are the 2000, 6000, and 7000 groups. Non-heat-treatable alloys are the 1000, 3000, and 5000 groups.

^C For other than DOD requirements, oil at mill option.

TABLE 5 Preservation of Magnesium Sheet and Plate (See Table 1)

Product	Preservation ^{A,B}
Flat sheet and plate:	
Less than 0.005 in. thick	Oiled (6.1.1.1-6.1.1.3) or Oiled and interleaved (6.1.1.1-6.1.1.4) or Chrome-pickled and interleaved
0.005 in. and thicker	None or Oiled (6.1.1.1-6.1.1.3)

^A Interleaving paper shall be as specified for aluminum sheet and plate (Table 4 Footnote A).

^B Preservation desired must be as specified in the contract or order.

7.2.2 Side and End Panels—Side and end panels shall consist of a complete covering of lumber, unless otherwise specified. Thickness and panels shall be in accordance with Table 7.

7.2.2.1 Panels for boxes, Fig. 2 and Fig. 6, 11½ in. or less in depth and not more than 16 ft long shall be of one-piece construction and without cleats, except that end panels may be two-piece, cross-grain-laminated to obtain the required thickness. Side panels more than 16 ft long may be of two-piece butt joint and splice construction (5.1.2) without cleats.

7.2.2.2 Panels for boxes, Fig. 3, Fig. 4, Fig. 5, Fig. 7, and Fig. 8, more than 11½ in. in depth shall be with cleats, except for side panels for boxes, Fig. 3, Fig. 4, and Fig. 5.

7.2.3 Cleats—When required by 7.3.2.1 and 7.3.2.2 cleats shall be in accordance with Table 7. Cleats shall be nailed or stapled.

7.2.3.1 Positioning of Cleats—Cleats for end panels, Fig. 3 and Fig. 5, shall be placed across the grain of the panel board