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MILITARY STANDARD  
STEEL MILL PRODUCTS  
PREPARATION FOR SHIPMENT AND STORAGE



FSC PACK

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DEPARTMENT OF DEFENSE  
Washington, DC 20301

Steel Mill Products Preparation for Shipment and Storage

MIL-STD-163C

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## 1. SCOPE

1.1 Scope. This standard describes the minimum requirements for materials, methods, containers, and procedures for the preservation, packing, and marking of steel mill products. Materials, methods and containers not listed in this standard will not be used without prior approval of the procuring activity. Quality assurance provisions are given in the appendix of this standard and forms a mandatory part of this standard.

1.2 Application. This standard is intended for use in new procurements and by military activities which physically process steel mill products for shipment and storage.

## 2. REFERENCED DOCUMENTS

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

### SPECIFICATIONS

#### FEDERAL

FF-N-105	- Nails, Wire; Brads and Staples.
NN-P-530	- Plywood; Flat Panel.
QQ-S-781	- Strapping, Steel, and Seals.
VV-L-800	- Lubricating Oil, General Purpose, Preservative, (Water Displacing, Low Temperature).
CCC-C-467	- Cloth, Jute (or Kenaf) Burlap.
PPP-B-621	- Boxes, Wood, Nailed and Lock-Corner.
PPP-C-650	- Crates, Wood, Open and Covered.
PPP-D-723	- Drums; Fiber.
PPP-L-1607	- Lagging, Wood, Wirebound.
PPP-T-97	- Tape; Pressure-Sensitive Adhesive, Filament Reinforced.

#### MILITARY

MIL-P-3420	- Packaging, Materials, Volatile Corrosion Inhibitor Treated Opaque.
MIL-I-8574	- Inhibitor, Corrosion Volatile, Utilization.
MIL-C-16173	- Corrosion Preventive Compound, Solvent Cutback, Cold Application.
MIL-C-16286	- Tubes, Steel, Seamless, Marine Boiler Application.

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MIL-B-52775                      - Barbed Tape, Obstacle, General Purpose  
   and Barbed Tape, Fence Topping.

## STANDARDS

### FEDERAL

FED. TEST METHOD                - Preservation, Packaging and Packing  
STD. No. 101                    Materials: Test Procedures.

### MILITARY

MIL-STD-129                    - Marking for Shipment and Storage.  
MIL-STD-731                   - Quality of Wood Members For Containers  
   and Pallets.  
MIL-STD-1186                  - Cushioning, Anchoring, Bracing, Blocking,  
   and Waterproofing; with Appropriate  
   Test Methods.

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

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

### AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

#### ASTM Standard A700

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

## 3. DEFINITIONS

3.1 Battens. A strip of wood attached to a container to reinforce it.

3.2 Binder. Any material used for securement.

3.3 Bundle. Two or more articles fastened together by suitable means usually without compression so as to form a shipping unit.

3.4 Crosspieces. Supports placed across the width of the unit or units for protection of the shipment in transit.



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3.5 Edge protector. Metal cushion placed under strap to protect edges of load.

3.6 Fiber-hardboard. A hard-pressed nonlaminated fiberboard manufactured from cellulose fibers.

3.7 Fiber-hardboard box. An entirely enclosed container lined or unlined, with a top and bottom made of hard-pressed fiberboard.

3.8 Fillers. One or more wood pieces placed under binders in packages containing different sizes, for the purpose of squaring out piles for application of binders.

3.9 Lagging. Strips of wood used in making a covering over a cylindrical shaped pack such as a reel.

3.10 Length pieces. Supports placed lengthwise of unit or units shipped, for protection during transit.

3.11 Lift. A unit that can be handled by mechanical equipment.

3.12 Loose. Single pieces that can be handled individually.

3.13 Metal container. A receptacle covered with sheet steel for protection.

3.14 Packaging. The processes and procedures used to protect material from deterioration and damage, including appropriate cleaning, drying, preserving, packing and marking.

3.15 Pack. A lift, or number of lifts or hand bundles, secured in at least one direction into a single unit.

3.16 Packing stiffeners. A wood piece of any required dimension used to prevent a flexible pack from bending.

3.17 Platform. A structure of bearing pieces placed on runners at right angles, so that the load rests on the bearing pieces.

3.18 Plywood box. An entirely enclosed container, lined or unlined, with a top and bottom made of plywood, nailed to cleats.

3.19 Preservation. Application of protective measures, including cleaning, drying, preservative materials, barrier materials, cushioning, and containers when necessary.

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3.20 Separator. Any material used in any direction for dividing and maintaining necessary clearance for the protection of material in transit.

3.21 Skeleton platform. A platform with appreciable space between bearing pieces.

3.22 Skid or separator protection. Material used to prevent damage to steel by skids or separators.

3.23 Skids. Supports beneath material and fastened to unit.

3.24 Stencil. Information applied by means of a stencil.

3.25 Tag. Means used to describe contents or supply shipping information attached to unit.

3.26 Tally (or packing list). Itemized report of all steel shipped.

3.27 Tension-tied. Securement of strapping applied with mechanical tools.

3.28 Ties. Metal strapping or wire used for securing packs.

3.29 Wood box. An entirely enclosed container lined or unlined; made of wood.

#### 4. GENERAL REQUIREMENTS

4.1 General. Materials not covered by specifications or which are not specifically described herein shall be of the best quality and shall be suitable for the purpose intended.

4.2 Preservatives. Unless otherwise specified, the preservatives specified in Section 5 shall conform to Table I.

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TABLE I. Types of Preservatives

<u>Type</u>		<u>Specification</u>
A	Light preservative oil, water displacing (cold application).	VV-L-800
B	Hard film preservative (175° F melting point of nonvolatile fraction), solvent cut-back, cold application; sometimes used for edge protection of coils or lifts of sheets.	MIL-C-16173, Grade 1
C	Hard-drying varnish, resinous or plastic coating; generally applied to black tubular steel products. The material used shall give protection in accordance with that obtained by good commercial practice.	

4.2.1 Application of preservative coating. The application of corrosion preventive material demands careful attention; compounds shall not be applied to surfaces which show signs of moisture, condensation, frost, rust, loose mill scale, 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.

4.2.2 Volatile corrosion inhibitors. When specified in procurement documents, volatile corrosion inhibitor treated carriers conforming to MIL-P-3420 shall be used. When used, such use and the application of volatile inhibitors shall be subject to the limitations of MIL-I-8574.

4.3 Barrier materials. The protective wrapping material shall be as follows (unless otherwise specified, the values given are nominal).

4.3.1 Kraft wrapping paper (creped or uncreped).

4.3.1.1 50-pound paper. The paper shall have a basic weight of 50 pounds per 500 sheets 24 x 36 inches. The bursting strength shall be 35 pounds and the tearing resistance not less than 100 grams in either direction.

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4.3.1.2 60-pound paper. The paper shall have a basic weight of 60 pounds per 500 sheets 24 x 36 inches. The bursting strength shall be 42 pounds and the tearing resistance not less than 130 grams in either direction.

4.3.2 Oil-resistant, water-repellent paper. This paper shall be 100 percent unbleached kraft with a high-finish waterproof, noncorrosive, and oil-resistant surface. The paper shall be of such nature as to permit the folding and shaping ordinarily encountered in manual and machine packaging operations without mechanical failure.

4.3.2.1 45-pound creped paper. The paper shall have a basic weight of 45 pounds per 500 sheets 24 x 36 inches. The bursting strength shall be 32 pounds and the tearing resistance not less than 87 grams in either direction. The paper shall be treated with wax or synthetic resin.

4.3.2.2 60-pound creped paper. The paper shall have a basic weight of 60 pounds per 500 sheets 24 x 36 inches. The bursting strength shall be 42 pounds and the tearing resistance not less than 130 grams in either direction. The paper shall be treated with wax or synthetic resin.

4.3.2.3 80-pound paper. The paper shall have a basic weight of 80 pounds per 500 sheets 24 x 36 inches. The bursting strength shall be 56 pounds and the tearing resistance not less than 190 grams in either direction.

#### 4.3.3 Waterproof paper.

4.3.3.1 Duplexed, creped one direction. The sheet shall consist of two sheets of paper made from 100 percent sulfate laminated with asphaltum or its equivalent. The paper before creping shall have a minimum basic weight of 30 pounds per 500 sheets 24 x 36 inches, the basic weight of asphaltum shall be 30 pounds. The fabricated sheet shall show no substantial bleeding due to asphalt penetrations when tested by suspension for 5 hours in air uniformly heated to 150° F. The fabricated sheet shall meet the following minimum requirements:

Tensile strength per inch width (minimum). <sup>1/</sup>	15 pounds
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Water-resistance (dry indicator method) <sup>2/</sup> (minimum).	3 hours
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Stretch in creped direction (minimum).	20 percent
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<sup>1/</sup> Test to be performed in accordance with FED. TEST METHOD STD. NO. 101, METHOD 2038.

<sup>2/</sup> Test to be performed in accordance with FED. TEST METHOD STD. NO. 101, METHOD 3022.

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4.3.3.2 Duplexed-reinforced, creped one direction. The sheet shall consist of two sheets of paper made from 100 percent sulfate fiber laminated with asphaltum or its equivalent, in which are imbedded cords or strands of fiber running in one or both directions of the paper not more than 1/2-inch apart. The paper, before creping shall have a minimum basic weight of 30 pounds per 500 sheets 24 x 36 inches, the basic weight of the asphaltum shall be 30 pounds. The fabricated sheet shall show no substantial bleeding due to asphaltum penetrations when tested by suspension for 5 hours in air uniformly heated to 170° F. The fabricated sheet shall meet the following minimum requirements:

Tensile strength per inch width (minimum). <sup>1/</sup>	15 pounds
Water-resistance (dry indicator method) <sup>2/</sup> (minimum).	12 hours
Stretch in creped direction (minimum).	10 percent

4.3.3.3 Duplexed-reinforced two directions. The sheet shall consist of two sheets of paper made from 100 percent sulfate fiber laminated with asphaltum, in which are imbedded cords or strands of fiber running in any two directions of the paper, not more than 1 inch apart. The paper shall have a minimum basic weight of 30 pounds per 500 sheets 24 x 36 inches. The basic weight of asphaltum shall be 60 pounds minimum. The fabricated sheet shall meet the following minimum requirements:

Tensile strength per inch (minimum). <sup>1/</sup>	20 pounds
Water-resistance (dry indicator method) <sup>2/</sup> (minimum).	24 hours

4.3.3.4 Coated fabric sheeting, lined, uncreped. This paper shall consist of one sheet of paper made from 100 percent sulfate fiber laminated to cotton sheeting with asphalt. The paper shall have a minimum basic weight of 30 pounds per 500 sheets 24 x 36 inches. The cotton sheeting shall have a weight of 1 pound per 7 yards, 36 inches wide. The basic weight of asphaltum shall be 30 pounds.

4.3.3.5 30-45 duplex. This paper shall consist of water-resistant, neutral, synthetic resin-impregnated, and laminated creped paper.

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4.3.4 Burlap. Burlap shall conform to CCC-C-467.

4.4 Wood.

4.4.1 Lumber. Lumber for containers shall be as specified in MIL-STD-731. All lumber dimensions specified herein are nominal except in the box tables where actual sizes are used.

4.4.2 Plywood. Plywood shall conform to NN-P-530, Grade A (PS-51, Grade 3-4, Type II) or Grade B (PS 1, C-D, interior with exterior glue).

4.5 Nails and staples. Nails and staples shall conform to FF-N-105. Nails shall be coolers, corkers, sinkers, standard box, or commons.

4.6 Soft rod, soft annealed wire and rope. Soft rod for securing lifts and soft annealed wire and rope for lifts or bundles shall be as specified under the specific product (see Section 5).

4.7 Strapping. Strapping shall conform to QQ-S-781, Class 1, Type I or IV and Class 2, Type V. Strapping used for box corner and edge reinforcement shall conform to QQ-S-781, Type II. Strapping shall be Finish B unless Finish A is specified. Strapping sizes specified herein shall be the minimum required.

4.8 Tape. Tape for securing rigid conduit and electrical metallic tubing shall conform to PPP-T-97, Type IV.

4.9 Container construction, packing and securing methods.

4.9.1 General. This paragraph covers container construction, packing and securing methods, and includes the construction of, or reference to appropriate specifications for all containers, platforms, skid systems, lifts, ties, and reels used for shipping steel products.

4.9.2 Classification. For ease and simplicity of referencing and use, containers and platforms having common characteristics have been grouped and assigned a class-numerical identity as follows:

Class 1-----Wood boxes (see 4.9.3)  
Class 2-----Crates (see 4.9.4)  
Class 3-----Drums (see 4.9.5)  
Class 4-----Tin mill platforms (see 4.9.6)  
Class 5-----Skid systems (including skeleton platforms and  
metal packs for cut lengths (see 4.9.7)  
Class 6-----Bundling (see 4.9.8)

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Class 7-----Hand bundles (see 4.9.9)  
Class 8-----Secured lifts (without skids) (see 4.9.10)  
Class 9-----Sheathed lift (metal container without skids)  
(see 4.9.11)  
Class 10-----Reels, spools (see 4.9.12)  
Class 11-----Special containers (see 4.9.13)

4.9.3 Class 1 - Wood boxes (see Figure 1). Class 1 boxes shall be constructed in accordance with PPP-B-621 except as specified herein.

4.9.3.1 Box skids. Boxes with a gross weight of 200 pounds or over shall be provided with a minimum of two nominal 3 x 4 inch skids. Skids shall be placed parallel to and extend the full width of the box and shall be positioned not closer than 2-1/2 inches nor more than one-sixth the length of the box from each end of the box. The distance between skids measured between the inside edges shall not exceed 48 inches. Additional skids, as required shall be positioned so as to divide the distance between the end skids into units of equal length. The skids shall be notched, as applicable, to provide clearance for strapping. The skids shall be secured to the box by 12d nails specified in 4.5. The nails shall be driven from the inside through the bottom into the skids (in two staggered rows) and shall penetrate a minimum of 3/4 the thickness of the skids. The bottom half of skid ends shall be beveled at an angle of 45 degrees plus or minus 5 degrees (see Figure 13a).

4.9.3.2 Nailing. When nailing sides, top and bottoms to ends, nails of a size not less than those specified in Tables II, III, and IV shall be used. Each piece in the side, top, or bottom shall have at least two nails at each nailing end.

TABLE II. Bar boxes  
(All groups of woods)

Weight of Contents	Sides (min. thickness)	Top and bottom (min. thickness)	Min. size of nails	Ends (min. thickness)
Pounds	Inches	Inches		Inches
Up to 560	25/32	25/32	7d	2 ply -- 1-1/2
561 to 1120	1-1/16	25/32	*7d & 9d	2 ply -- 2-3/8
1121 to 2240	1-1/16	1-1/16	12d	2 ply -- 2-1/4

\*Use 9d as minimum for securing sides to ends.

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TABLE III. Boxes for tubular products  
Determination of thickness of ends, tops and bottoms

Weight of contents	Sides - top and bottom (min. thickness)	Min. size of nails	Ends (min. thickness)
Pounds	Inches		Inch
Up to 560	5/8	6d	25/32
561 to 1120	5/8	6d	*1 or 2-ply 1-1/2

\*Combined thickness (reverse grain of separate plies).

TABLE IV. Styles 2, 4 and 5 boxes  
Determination of thickness of ends, tops, and bottoms and thickness and width of cleats

Weight of contents (Pounds)	Sides minimum thickness (inches)	Top and bottom minimum thickness (inches)	Size of nails	Ends minimum thickness (inches)	Cleats minimum thickness (inches)	Cleats minimum width (inches)	Size of nails
Groups I and II Woods							
Up to 280	5/8	5/8	6d	5/8	5/8	2-1/4	5d
281 to 560	25/32	25/32	7d	25/32	25/32	3-5/8	6d
561 to 1120	1-1/16	1-1/16	12d	1-1/2	25/32	3-1/4	9d
Over 1120		(Do not use Groups I and II Woods)					
Groups III and IV Woods							
Up to 280	13/16	3/8	5d	13/16	13/16	2-1/4	6d
281 to 560	13/16	13/16	7d	13/16	13/16	3-5/8	7d
561 to 1120	1-1/16	13/16	7d	1-1/16	13/16	3-5/8	7d
1121 to 2240	1-1/16	1-1/16	12d	1-3/4	1-1/16	4-1/8	12d



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4.9.3.3 Blocking. Blocking of the box contents shall be in accordance with MIL-STD-1186.

4.9.3.4 Strapping. When ties are referred to as applied to boxes, they apply to flat bands or round wire steel strapping as specified in 4.7. All straps shall be applied perpendicular to the edges of the box and shall be drawn tight so as to sink into the wood at the edges. All strapping shall have a minimum joint efficiency of not less than 75 percent.

4.9.3.5 Bar boxes. The bar box shall be used for bars and cut length material. The ends are relatively small, whereas the length may be many feet. Side, top, and bottom section 9-1/2 inches or less in width shall be made of one piece, whenever possible. All ends are of two pieces, grains crossed. End thickness specified in Table II shall be the combined thickness of the two crossgrained pieces of each end.

4.9.3.5.1 Board splicing. When splicing box boards, the boards shall be butted and a splice board shall be applied which must extend on each side of the joint at least three times the width of the board being spliced. The splice board shall also equal the width and thickness of the box boards. Nails must be clinched. An alternate method is to laminate two thicknesses by nailing together and clinching the nails (see Figure 3). Splice boards are then not required. Wherever laminated parts are used, care should be exercised to prevent superimposed joints.

4.9.3.5.2 Box liners. Boxes shall be lined with waterproof paper or oil-resistant water-repellent paper as specified for the specific product in Section 5. The inside size of the box shall correspond with the length and cross-sectional area of the contents as nearly as possible. To prevent shifting of the contents, fillers shall be used to take up any voids (see Figure 2).

4.9.3.5.3 Strapping. Girthwise tension straps not less than 3/4 by 0.023 inch shall be used for reinforcement. For boxes weighing over 560 pounds, at least two nail-on straps shall be applied crosswise over each end and extending under the girthwise straps nearest the ends. Each such strap shall be nailed into ends at intervals not exceeding 3 inches and nails securing ends of straps shall be similarly spaced but no strap end shall be secured by less than two nails. Straps shall be secured to the ends, sides, tops, and bottoms with sixpenny nails except at points where only one thickness of lumber occurs, when a smaller nail shall be used. Girthwise straps shall be placed about 4 inches from each end and intermediate straps shall be used at not over 36 inch intervals where it is necessary to splice top or bottom boards girthwise straps place from 2 to 3 inches on both sides of the splice shall be provided (see Figure 2).

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4.9.3.6 Boxes for tubular products. Construction and strapping of boxes for tubular products shall be similar to bar boxes (4.9.3.5), except that lumber is as shown in Table III and end strapping is not required. Spacing of the bands shall not exceed 4 feet (see Figure 4).

4.9.3.7 Boxes for coils. Wood boxes for coils shall conform to Styles 2, 4, and 5 (see Figures 5a, 5b, 5c, and 6). Refer to Table IV for construction details.

4.9.3.7.1 Cleats. On Styles 2 and 5 the ends of cleats which are placed across the grains of the end boards shall be 1/16 inch from the inside surface of the top and bottom. The sides, top, and bottom shall extend over the cleats. When Style 2 is used, filler cleats must be placed vertically on ends to protect the longitudinal band. On Style 4 the cleat shall be placed across the grain of the end boards and shall extend within 1/8 inch of the outside surface of the top and bottom. Only the sides shall extend over the cleats. For loads over 560 pounds an additional cleat must be placed at center of each end.

4.9.3.7.2 Nailing. Size of nails shall be not less than shown in Table IV.

4.9.3.7.3 Strapping (minimum requirements). For weights of boxes not exceeding 560 pounds, four 12-1/2 gage round straps or four 5/8 by 0.020 inch flat bands shall be used to secure the top and bottom to the sides. Straps shall be not more than 4 inches from the ends. For weights of boxes over 560 pounds, three 1-1/4 by 0.035 inch bands (two girthwise and one longitudinal), or five 3/4 by 0.035 inch band or five 8-gage straps (three girthwise and two longitudinal), shall be used (see Figures 5a, 5b, and 5c).

4.9.3.8 Boxes for tin plate and terne plate (short terne).

4.9.3.8.1 Construction. Each box shall be made with 13/16 inch sides and ends, with 3/8 inch top and bottom boards. Unless otherwise specified top and bottom boards shall be cut with short dimension of the box. Tops and bottoms made of plywood shall be 3-ply and not less than 5/32 inch in thickness and water-resistant (see Figure 7).

4.9.3.8.2 Nailing. Sides shall be attached to ends with bright nails not less than 1-3/4 inches long. Tops and bottom shall be nailed with bright nails not less than 1-3/8 inches long and spaced not more than 2-1/2 inches apart. When plywood is used for tops and bottoms nail spacing shall not exceed 3 inches.

#### 4.9.3.8.3 Strapping (see Figure 7 and 4.9.3.4).

4.9.3.9 Boxes for stainless steel plates, sheet and strip. Boxes for these steel products shall be plywood, nailed wood, or fiber-hardboard.

4.9.3.9.1 Plywood box. The plywood shall be not less than 5/32 inch thick. If splicing is necessary, the joint shall be covered with a cleat not less than 3-1/2 inches wide, secured to the plywood. For boxes up to 96 inches long, one intermediate cross batten shall be used; for boxes over 96 inches long, two intermediate cross battens shall be used. Cross battens shall be not less than 2-1/2 inches wide and secured to the side rails, of proper thickness to contact the box top and level with the rail top (see Figures 8, 9, and 10).

4.9.3.9.1.1 Sides and ends. The size of the sides and ends shall be as follows:

<u>Inside depth of box (inches)</u>	<u>Minimum thickness ends and sides (inches)</u>
5/8 to 1	2-1/4 by depth of box
Over 1 to 2	1-3/4 by depth of box
Over 2 to 3	1-3/16 by depth of box

4.9.3.9.1.2 Strapping. Strapping, 3/4 by 0.035 inch, or 8-gage high-tensile wire shall be placed girthwise over end cleats and intermediate cleats.

4.9.3.9.2 Nailed wood boxes. Tops and bottoms shall be not less than 1/2 inch and the bottom must have two 3-1/2 by 3/4 inch lengthwise cleats for widths 30 inches or less, and three lengthwise cleats for widths over 30 inches. Tops shall be set inside the sides and ends and firmly secured with wooden strips, approximately 1 by 1 inch. Where girthwise bands are used, filler strips of required thickness shall be inserted to support bands. The sides and ends shall be as specified in 4.9.3.9.1.1 (see Figure 9).

4.9.3.9.2.1 Intermediate bottom cleats. Intermediate bottom cleats shall be not less than 3/4 by 2-1/2 inches and shall be secured at the ends with staples or metal bands.

4.9.3.9.2.2 Strapping. Strapping, 3/4 by 0.035 inch, or 8-gage high-tensile wire shall be placed girthwise over end cleats and intermediate cleats with addition of corner reinforcements as shown in Figure 9.

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4.9.3.9.3 Fiber-hardboard box. The fiber-hardboard shall be not less than 1/8 inch thick. The top and bottom shall be in one piece and not spliced. For boxes up to 96 inches long, one intermediate cross batten shall be used; for boxes over 96 inches long, two intermediate cross battens shall be used. Cross battens shall be not less than 2-1/2 inches wide, secured to the side rails, of proper thickness to contact the box top and level with the rail top (see Figures 8 and 11).

#### 4.9.4 Class 2 crates.

4.9.4.1 Unsheathed (open) crates. When specified, unsheathed crates conforming to PPP-C-650, Style A, Type II, shall be used for shipment of stainless steel tubing or similar steel products.

#### 4.9.5 Class 3 drums.

4.9.5.1 Fiber drums. When specified, fiber drums equal to or better than Type II, Grade A, of PPP-D-723 shall be used for wire products. Net weight of fiber drums shall not exceed 550 pounds.

#### 4.9.6 Class 4 tin mill platforms.

4.9.6.1 Construction. Boards making up the tops of platforms shall be not less than 3/4 inch thick and shall be uniform in thickness producing a smooth continuous surface. The lumber shall be either Group III or Group IV wood, or Douglas Fir. Deck sizes should be the same size or slightly smaller than plate size but never larger (see Figure 12). Runners shall be not less than 2-1/2 inches and not more than 4 inches high. They shall be of sufficient number to prevent the platforms from sagging. Tops shall be firmly secured to the runners with nails not less than 2-1/4 inches long nor lighter than 11 gage, and spaced not more than 2-1/2 inches apart. Nails shall be overdriven 1/8 inch to provide a smooth surface. When cross strapping is used, runners shall be notched on the top edge for the proper accommodation of the straps. Ends of runners shall be beveled (see Figure 13a).

#### 4.9.7 Class 5 skid systems.

4.9.7.1 General. All skids shall be of sound lumber of nominal 3 x 4 inch size. It is important that the length of skids be equal to the full dimension of the package along the direction in which they are used. Skid ends shall be beveled as shown in Figure 13. Straps must be stapled to skids with corrosion-resistant staples. One staple shall be applied to each bevel. The number of skids to be used under a given pack is indicated in the specific details applying to each product, except as specified in 4.9.7.3 through 4.9.7.5.

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4.9.7.2 Protectors. Steel protectors or cushions shall generally be used under all strapping on sheet packs or unit loads. Three common types are illustrated herein. Such protectors shall be of a minimum thickness of 20 gage. Protectors shall be either a strip of steel as in Figures 13a and 13b, or a type of formed clip as roughly illustrated in Figure 13c. Protectors, unless formed, shall be of minimum width of 3 inches. Protectors used over skid ends shall overlap the end as in Figure 13a.

4.9.7.2.1 Bottom protection. Flat sheet stock utilizing skid systems and skeleton platforms. Figures 14, 15, 16, 17, 26, and 27, shall have not less than a 5/32 inch thick piece of plywood, the same size as the load placed on the bottom of the sheet stock prior to securing the sheets to the skids or platform.

4.9.7.3 Lengthwise skids. The arrangement shown in Figure 14 is general for all cases utilizing lengthwise skids only. This skid system is suitable for the safe shipment of practically all sheets. Only two skids are illustrated, but the number actually used shall be as given in the specific details applying to each product.

4.9.7.4 Crosswise skids. Figure 15 illustrates the general arrangement for the use of skids at right angles to the long dimensions of the package. End skids shall be set approximately 5 to 10 inches in from the end of the package, spaced to allow sufficient clearance for fork trucks.

4.9.7.5 Lengthwise skids with cross bearing pieces. The arrangement shown in Figure 16 is general for packing wide sheets of light gages or long narrow (under 22 inches) sheets and strip of all gages, side by side on one set of skids. End protectors consisting of channels of a minimum thickness of 20 gage extending approximately the width of the unit, shall be used when the number of piles on the framework exceeds two. Cross bearing pieces shall extend at least 4 inches beyond the sides of the lengthwise skids and shall be equal in length to the full width of the unit. Cross bearing pieces shall vary in thickness from 1 to 2 inches and shall vary in spacing from a minimum of 12 inches in the clear to a maximum of 18 inches in the clear, depending on the load they will have to carry. End cross bearing pieces shall be nailed to the skids and placed at the extreme ends of the skids.

4.9.7.6 Skeleton platforms. Skeleton platforms (see Figures 16 and 17a) consist either of lengthwise skids with crosswise bearing pieces, or crosswise skids with lengthwise bearing pieces.

4.9.7.7 Metal packs for cut lengths. Types of metal packs are shown in Figure 18. Oiled material shall be wrapped with oil-resistant waterproof material. Material not oiled shall be wrapped with one layer of waterproof

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material. The wrapped lift is then enclosed, top, bottom, sides, and ends with light-gage metal. If the top protective sheet is composed of more than one piece it shall be made continuous with a lock-seam or lapped approximately 10 inches. In the pack illustrated as Type A, Figure 18, the sides and the ends shall be completely covered by the top and bottom pans, the top pan overlapping the bottom pan. The Type B pack illustrated in Figure 18 is made with top and bottom protector sheets and with metal channels to protect the sides and ends.

#### 4.9.7.7.1 Skids and strapping.

4.9.7.7.1.1 Skids. Skids are used on all packs and are nominal 3- by 4-inch lumber.

4.9.7.7.1.2 Strapping. Straps shall consist of 1-1/4 by 0.031 inch flat bands or 8-gage high-tensile wire. If wire is used, corner protectors shall be applied unless the metal side and end protection is 20-gage or heavier. When 8-gage high tensile wire is used instead of 1-1/4 by 0.031 bands, the number of straps indicated below shall be increased 50 percent. Straps shall be stapled to skids with corrosion-resistant staples. Material shall conform to 4.7.

4.9.7.7.1.3 For lifts up to 120 inches long. Two lengthwise straps and skids shall be used for widths up to and including 48 inches; three lengthwise straps and skids shall be used for widths over 48 inches. Two crosswise straps shall be used for lift lengths up to and including 84 inches; three crosswise straps shall be used for lift lengths over 84 to 120 inches.

4.9.7.7.1.4 For lifts over 120 inches long. Two lengthwise straps and skids shall be used for widths up to and including 48 inches; three crosswise straps shall be used for lengths up to 144 inches; for longer lengths add one strap for each additional 5 feet or fraction thereof. It is not practical to use lengthwise skids for lengths over 192 inches; for longer lengths skeleton platforms must be used.

4.9.7.8 Combination wood fiber-hardboard packs for cut lengths. This pack may be used at the contractor's option in lieu of metal packs for stainless steels as indicated under product designations. Types of combination wood fiber-hardboard packs are shown in Figures 10, 11, and 21. Oiled material shall be wrapped with a layer of oil-resistant waterproof paper. Material not oiled shall be wrapped with one layer of waterproof paper. The paper, wrapped product is then enclosed, top, bottom, sides, and ends with a combination of wood fiber-hardboard materials. In the pack illustrated in Figure 11, the sides, ends, and bottom shall be completely covered by wood and the top by fiber.

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4.9.7.8.1 Skids and strapping.

4.9.7.8.1.1 Skids. Skids are used on all packs and are nominal 3- by 4-inch lumber.

4.9.7.8.1.2 Strapping. Straps shall consist of 1-1/4 by 0.031 inch flat bands or 8-gage high tensile wire. When 8-gage high tensile wire is used instead of 1-1/4 by 0.031 bands, the number of straps indicated in 4.9.7.8.1.3 and 4.9.7.8.1.4 shall be increased 50 percent. Straps shall be stapled to skids with corrosion-resistant staples. Material shall be as specified in 4.7.

4.9.7.8.1.3 For lifts up to 120 inches long. Two lengthwise straps and skids shall be used for widths up to and including 48 inches; three lengthwise straps and skids shall be used for widths over 48 inches.

4.9.7.8.1.4 For lifts over 120 inches long. Two lengthwise straps and skids shall be used for widths up to and including 48 inches; three crosswise straps shall be used for lengths up to 144 inches; for longer lengths add one strap for each additional 5 feet or fraction thereof. It is not practicable to use lengthwise skids for lengths over 192 inches; for longer lengths skeleton platforms must be used.

4.9.8 Class 6 bundling. Steel products such as tubular products, rigid conduit, and electrical metallic tubing (EMT) are bundled for shipment. All pieces are tied into bundles with soft annealed wire or jute rope as specified under the product (see Section 5).

4.9.9 Class 7 hand bundles.

4.9.9.1 General. Hand bundles of cut length steel products shall be strapped or tied with round wire or flat steel strapping. The minimum number of straps or ties shall be two. Except where short lengths of the product will not permit, the straps and ties shall be no less than 18 inches from each end. The weight of hand bundles shall not exceed 200 pounds.

4.9.9.1.1 Hand bundles. Hand bundles of coiled wire or coiled rod shall have a minimum of three straps or ties (see Figures 22 and 43).

4.9.10 Class 8 secured lifts (without skids).

4.9.10.1 General. Lifts of steel products shall be strapped or tied in accordance with Table V or as indicated under the specific steel product in Section 5.



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TABLE V. Girthwise Strapping Requirements for Billets, Slabs, Sheet Bar, and Bar Steel in Secured Lifts.

Length of lift (See Note 1)	Flat strapping 1-1/4" x 0.031" (See Note 2)	No. 5 Soft Rods (See Note 3)	8-Gage H-T Wire Strapping (See Note 2)
To 10 feet	3	3	5
Over 10 to 20 feet	4	4	6
Over 20 to 30 feet	5	5	8
Over 30 to 45 feet	6	6	9
Over 45 feet	7	7	11

Notes:

1. Ties shall be secured not less than 18 inches from each end. All additional ties shall be evenly spaced between the end ties.

2. See 4.7.

3. The size of soft rod ties when used, also annealed wire ties for bundles, shall be as listed under the specific product.

4.9.10.2 Protectors. Light-gage steel protectors or heavy waterproof fiber cushions shall be used under straps and ties of sheet, plate, and coiled steel products where it is essential for protection of finish, shape, or the wrapping material under the strapping.

4.9.11 Class 9 metal-sheathed lifts (container without skids). Metal-sheathed lifts shall be constructed in cylindrical or rectangular cross section as shown in Figure 42. The sheet metal shall be 30-gage minimum thickness. Ends of Styles A and B lifts shall be of Group I or II woods, of minimum thickness of 2-1/2 inches and cut to snugly fit the inside dimensions of the lift. Traverse cross straps shall be nailed to the ends of Styles A and B lifts as indicated. Ends of Styles C and D lifts shall have their outer flaps folded a minimum of 12 inches over the container and be secured by a tensioned flat steel strap in accordance with Figure 42. Metal sheathed lifts fabricated of more than one piece of metal shall have the pieces interlocked or overlapped. Overlapped joints shall be spot welded or banded to prevent the end tube sections from sliding off.

4.9.12 Class 10 reels and spools.

4.9.12.1 Reels. Reels for steel products such as wire rope shall be constructed in a manner similar to that shown by Figure 45. The steel product on the reel shall be protected by layers of greaseproof (if preserved)



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and waterproof paper that extends completely around the reel. The paper shall be tacked to the flanges of the reel. Reels shall be completely enclosed with wood lagging with boards touching each other or with the wire-bound wood lagging conforming to PPP-L-1607, Type I or II, applied in accordance with the appendix thereto. When reels are enclosed with wood lagging, lagging boards shall be the same thickness as the flange but not thicker than 2-inch lumber and shall be nailed to the outside of the flanges of the reel extending across each flange and secured with two 8-gage high-tensile round wire or 3/4 by 0.031-inch flat straps drawn tight around the circumference. Lagging on reels 36 inches in diameter and larger shall extend within 1/4 inch of outside edges of flanges. For reels having heads up to 36 inches in diameter use 13-gage high-tensile wire or 5/8 by 0.020-inch straps. Ties shall be stapled at intervals of approximately 15 inches.

4.9.12.2 Spools. Spools shall be standard commercial quality and type and size normally used for the steel products.

#### 4.9.13 Class 11 special containers.

4.9.13.1 General. Containers other than those listed in this standard which require special design or construction shall be constructed of material specified herein. The containers shall be subject to the approval of the technical agency concerned.

4.10 Air shipment. When metal plates, strips, sheets, bars, rods, angle stock, tubes, and pipe are to be shipped by air, they shall be packed in accordance with the following:

- (a) Plates, strips, and sheets shall be packed in snug-fitting boxes reinforced with metal straps (see Figures 7, 8, 9, 10, and 11) or in metal packs (see Figures 18, 34, 35, and 36).
- (b) Bars, rods, angle stock, tubes, and pipe shall be packed in snug-fitting Class 2 crates with solid wood ends or Class 1 boxes (see Figures 2, 3, and 4).
- (c) Single pieces or bundles of steel stock shall have a snug-fitting wood cap secured over each end of single pieces and bundles. End caps shall be fabricated as shown in Figure 46. Lumber and construction of end caps shall be as specified in 4.9.3.5 for bar boxes. Straps should be secured to end caps with staples. The caps shall be a minimum of 18 inches in length and a minimum of 2-1/2 inches square at the end. End caps shall be secured to each other by flat or round wire steel strapping (see 4.7).

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## 5. DETAILED REQUIREMENTS

5.1 Preservation and packing. Preservation and packing shall be Level A or Commercial as specified.

5.1.1 Level A. The steel mill products are arranged alphabetically in this section. Under each product, paragraph A contains the preservation requirements and paragraph B the packing requirements. In cases where the standard paragraph does not apply to a given product, it is so noted. Containers specified herein for the packing of individual items shall be constructed in accordance with the requirements of 4.9.

5.1.1.1 Bars, alloy steel, cold finished; bar, alloy steel, centerless ground or rough-turned (including aircraft steel, stainless steel and shell steel).

A. Preservation. When specified, cold finished and centerless ground alloy bars shall be protected against corrosion with a single coat of Type A preservative (see Table I). Rough-turned bars shall be shipped without protective coating unless specified.

B. Packing. Rough-turned bars up to and including 1-1/2 inches in diameter and cold finished alloy steel bars and centerless ground bars shall be shipped in Class 1 wooden boxes or in Class 9 metal-sheathed lifts. Rough-turned bars over 1-1/2 inches in diameter shall be shipped in secured lifts (when specified, lifts shall be provided with an applicable type skid system). Weight of box or container shall be 2,240 pounds maximum and of lifts 6,000 pounds maximum.

- (1) For details of wooden box construction see 4.9.3 and Figure 2.
- (2) Metal-sheathed lifts (see 4.9.11 and Figure 42).
- (3) Secured lifts, shall be secured in accordance with Table V.

5.1.1.2 Bars, alloy steel, hot-rolled (including aircraft steel, stainless steel, and shell steel).

A. Preservation. When specified, a brush, spray, or dip coat of Type A preservative shall be applied (see Table I).

B. Packing. Bars shall be shipped in secured lifts (when specified, lifts shall be provided with an applicable type skid system), or when specified, shall be boxed. Lifts and boxes shall contain bars of one size and quality only. Lifts shall be secured with flat bands, 1-1/4 by 0.031 inch, tension-tied 8-gage high-tensile wire, or hand-tied double wrapped No. 5 rods. (See schedule of ties, Table V.) Rounds, squares and similar shapes

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under 3/8 inch shall be packed in hand bundles tied with No. 12-gage soft annealed wire or equivalent and then secured into lifts (see Figures 37, 38, and 39). Lifts shall not exceed 6,000 pounds maximum.

5.1.1.3 Bars, carbon steel, cold finished; bars, carbon steel, centerless ground, rough-turned.

A. Preservation. All cold finished and centerless ground bars shall be adequately protected against rusting with a single coat of Type A preservative (see Table I). Unless otherwise specified, rough-turned bars shall be shipped without preservative.

B. Packing. Rough-turned bars up to and including 1-1/2 inches in diameter and cold finished carbon steel bars and centerless ground bars shall be shipped in Class 1 wooden boxes or Class 9 metal-sheathed lifts (when specified, lifts shall be provided with an applicable type skid system). Rough-turned bars over 1-1/2 inches in diameter shall be shipped in secured lifts (when specified, lifts shall be provided with an applicable type skid system). Weight of boxes or containers shall be 2,240 pounds maximum and of lifts 6,000 pounds maximum.

- (1) For details of wooden box construction, see Figure 2 and 4.9.3.
- (2) Metal-sheathed lifts (see 4.9.11 and Figure 42).
- (3) Secured lifts, shall be secured in accordance with Table V.

5.1.1.4 Bars, carbon steel, hot-rolled, and bar-size shapes.

A. Preservation. When specified a brush, spray, or dip coat of Type A preservative shall be applied (see Table I).

B. Packing. Hot-rolled carbon steel bars and bar-size shapes shall be shipped in secured lifts, (when specified, lifts shall be provided with an applicable type skid system), or when specified shall be shipped in Class 1 boxes. Lifts shall contain bars or shapes of one size and quality only. Lifts shall be securely tied with flat bands 1-1/4 by 0.031 inch, tension-tied 8-gage high-tensile wire, or hand-tied double-wrapped No. 5 rods. See schedule of ties, Table V. Rounds, squares, and similar shapes under 3/8 inch shall be packed in hand bundles tied with No. 12-gage soft annealed wire or equivalent and then secured into lifts (see Figures 37, 38, and 39). Lifts shall not exceed 6,000 pounds maximum. If stack piling or nesting is required on squares or flats or on bar-size shapes, the contract or order shall so specify.

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5.1.1.5 Bars, concrete reinforcing.

A. Preservation. Not required.

B. Packing. Concrete reinforcing bars shall be shipped in secured lifts (see Figure 41). Lifts shall contain bars of one size and quality only. Lifts shall be securely tied in accordance with schedule of ties, Table V. When specified, lifts shall be provided with an applicable type skid system. Lifts shall not exceed 6,000 pounds maximum.

5.1.1.6 Billets, carbon, or alloy steel (including tube rounds).

A. Preservation. Not required.

B. Packing. Billets over 3 inches shall be shipped loose and billets 3 inches or under shall be shipped loose or in secured lifts (see similar lift, Figure 37) depending on mill facilities. Lifts shall contain billets of one size and quality only. Weight of lifts shall be 6,000 pounds maximum. Lifts shall be securely tied in accordance with schedule of ties, Table V.

5.1.1.7 Billets, shell steel, carbon, or alloy.

A. Preservation. Not required.

B. Packing. Billets shall be shipped loose or in secured lifts (see similar lift, Figure 37). Lifts shall contain billets of one size and quality only. Lifts shall be securely tied in accordance with schedule of ties, Table V.

5.1.1.8 Blooms.

A. Preservation. Not required.

B. Packing. Blooms shall be shipped loose.

5.1.1.9 Conduit, rigid.

A. Preservation. Not required.

B. Packing.

(1) Secured lifts. Rigid conduit in sizes larger than 1-1/2 inches nominal diameter shall be shipped in Class 8 secured lifts. When specified, lifts shall be provided with an applicable type skid system.

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(2) Primary bundles. Rigid conduit 1-1/2 inches and under nominal diameter shall be packed in bundles in accordance with the following table. Bundles shall be securely tied with jute rope, tape or metal ties. Accessories shall be packed in boxes or shipped loose with the ends protected. Primary bundles shall be packed for shipment in master lifts in accordance with standard industry practice. The weight shall not exceed 4,200 pounds per master lift (plus 5 percent tolerance to allow for such variables as wall thickness).

Rigid conduit-bundling practice for size 1-1/2 inches  
and under nominal diameter

Size (inches)	Piece per bundle	Weight (Pounds)	
		Per foot	Per bundle
1/4	24	0.425	103
3/8	18	.568	103
1/2	10	.852	82
3/4	5	1.134	57
1	5	1.684	82
1-1/4	3	2.281	69
1-1/2	3	2.731	81

#### 5.1.1.10 High speed and tool steel.

##### 5.1.1.10.1 Hot rolled bars.

A. Preservation. When specified hot rolled bars shall be protected, by an application of Type A preservative (see Table I).

B. Packing. Hot rolled bars shall be shipped in bundles, secured lifts (when specified lifts shall be provided with an applicable type skid system) or in Class 1 boxes. For bars of any size up to 3 inches on an order covering several different sizes or grades, when the quantity of a size or grade is too small to secure in a single lift, the individual sizes or grades shall be segregated and secured in bundles then packed in secured lifts. Bars 1/2 inch and smaller shall be shipped in Class 1 wood boxes when the quantity in one order is too small to permit adequate securement and protection in lifts. Bars 3 inches and over shall be shipped loose. Except as specified above, the practices set forth under 5.1.1.2 are applicable. For boxing, refer to 4.9.3 and Figure 2.

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5.1.1.10.2 Cold finish and rough-turned bars.

A. Preservation. Cold finished and rough-turned bars shall be protected by an application of Type A (see Table I).

B. Packing. Cold finished bars of all sizes and rough-turned bars 1-1/2 inches and under shall be shipped in Class 1 wood boxes (see 4.9.3 and Figure 2) or Class 9 metal-sheathed lifts (see 4.9.11 and Figure 42). Wood boxes shall be fully lined with oil-resistant water-repellant paper. Rough-turned bars over 1-1/2 inch in diameter shall be shipped in Class 8 secured lifts (see 4.9.10). When specified, lifts shall be provided with an applicable skid type system. Rough-turned bars 3 inches or over in diameter may be shipped loose. Except as specified herein, the requirements of 5.3 shall apply.

5.1.1.10.3 Plates, sheets, and cut-length strip.

A. Preservation. Unless otherwise specified, these products shall be protected by a coating of Type A preservative (see Table I).

B. Packing. The above products shall be shipped in Class 1 boxes. Hot rolled products 0.125 inch thick and over shall be shipped in bundles or in secured lifts (when specified, lifts shall be provided with an applicable type skid system). When Type A preservative is used, bundles and lifts shall be wrapped with oil-resistant waterproof paper. Except as stated above, the practices as set forth under 5.1.1.16 B, 5.1.1.32, and 5.1.1.39 are applicable. For details of box construction, see 4.9.3.

5.1.1.10.4 Strip in coils and wire in coils.

A. Preservation. Strip and wire coils shall be protected by an application of Type A (see Table I).

B. Packing. These products shall be shipped in boxes. Each coil shall be wrapped with oil-resistant waterproof paper. Except as stated, the practices as set forth under 5.1.1.36 and 5.1.1.51 are applicable. For details of box construction see 4.9.3.

5.1.1.10.5 Hot rolled rods in coils.

A. Preservation. Not required.

B. Packing. Hot rolled rods in coils shall be shipped as individual coils, secured with four looped metal ties not lighter than two strands of No. 12 gage wire twisted together. Rod coils shall be shipped unprotected.

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5.1.1.11 Hot rolled and cold drawn pressure and mechanical tubing. Seamless steel tubes for marine boiler application shall be prepared in accordance with MIL-T-16286.

A. Preservation. Unless otherwise specified these products shall be protected by a coating of Type A, preservative (see Table I).

B. Packing. Hot rolled and cold drawn pressure and mechanical tubing 15-gage and heavier and in sizes 1-1/2 inches O.D. and larger shall be shipped in Class 8 secured lifts (when specified, lifts shall be provided with an applicable type skid system) or when specified, in Class 1 boxes. Sizes under 1-1/2 inches O.D. shall be shipped in secured lifts. Weight of lifts shall be 6,000 pounds maximum.

- (1) When shipped in secured lifts, material shall be securely tied, using 1-1/4 by 0.031 inch or heavier bands. Lifts shall be securely tied with a minimum of two ties up to 6 feet, a minimum of three ties for lengths up to 10 feet; for lifts from 10 feet to 25 feet four ties shall be used; for lifts over 25-feet five ties shall be used.
- (2) Hot-rolled and cold-drawn pressure and mechanical tubing lighter than 15-gage shall be shipped in boxes (see Figure 4).

Note: Steel tubes, furnace tubes, some boiler tubes and some mechanical tubes may require end protection in order to insure arrival in fit condition for expanding into headers, drums, and heat exchangers. When tube end protection is required the nature of the protective material and its method of attachment shall be approved by the procuring activity.

5.1.1.12 Hot-rolled redraw-tubing and cold drawn redraw tubing (13 gage and heavier).

A. Preservation. When specified, Type A preservative (see Table I) shall be applied.

B. Packing. Hot-rolled redraw tubing and cold-drawn redraw tubing in size 5 inches O.D. and above shall be shipped in Class 8 secured lifts, provided the weight allowed permits a minimum of 7 tubes per bundle.

- (1) When shipped in secured lifts, material shall be securely tied, using 1-1/4 by 0.031 inch or heavier bands. Lifts shall be securely tied with a minimum of three ties for lengths up to 10 feet; for lifts over 25 feet a minimum of five ties shall be used. Weight of lifts is 6,000 pound maximum. When specified, lifts shall be provided with an applicable type skid system.



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5.1.1.13 Hot-rolled rods in coils, all grades.

A. Preservation. Not required.

B. Packing. Hot-rolled rods in coils shall be shipped as individual coils secured with four looped metal ties not lighter than two strands of No. 12 gage wire twisted together or with 3/4 by 0.031 inch bands (see Figure 21).

5.1.1.14 Ingots.

A. Preservation. Not required.

B. Packing. Ingots shall be shipped loose.

5.1.1.15 Wrought thin-walled pipe 6 inch to 36 inch outside diameter, 0.141-inch to 0.500-inch wall thickness (does not include any product covered under steel tubular products).

A. Preservation. When specified, unpainted pipe shall be coated with Type A preservative (see Table I).

B. Packing. Where wrought thin-walled pipe, not specially coated or painted, is supplied in different diameters on one order and with diameters varying by 2-inch to 8-inch increments, the pieces shall be telescoped into a single shipping unit, when permitted by the contractor and order when permitted by the latest rules of the Association of American Railroads. When telescoping of pipes is not provided for in the contract or order, pipe shall be shipped in Class 8 lifts (when specified lifts shall be provided with an applicable type skid system). Lined and specially coated; lined and specially coated and wrapped, or unlined, specially coated and wrapped pipe shall be shipped loose, not telescoped.

5.1.1.16 Plates, alloy steel.

A. Preservation. When specified, plates shall be coated with Type A preservative (see Table I).

B. Packing. Plates may be shipped loose or in secured lifts. Weight of secured lifts shall not exceed 6,000 pounds maximum and shall contain plates of one size and quantity only. Lifts are tension-tied with flat bands 1-1/4 by 0.031 inch or 8-gage high-tensile wire, using suitable edge protectors. If 1-1/4 by 0.031-inch bands are used, not less than 3 cross-wise ties shall be used for plates up to 12 feet long; for longer plates,



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add one tie for each additional 6 feet or fraction thereof. If 8-gage high-tensile wire is used, not less than three crosswise ties shall be used for plates up to 8 feet long; for longer plates, add one tie for each additional 4 feet of length or fraction thereof.

5.1.1.17 Plates, carbon steel (including floor plates).

A. Preservation. When specified, the plates shall be coated with Type A preservative.

B. Packing. Plates may be shipped loose or in secured lifts. Weight of secured lifts shall not exceed 6,000 pounds maximum and shall contain plates of one size and quantity only. Lifts are tension-tied with flat bands 1-1/4 by 0.031 inch, or 8-gage high-tensile wire, using suitable edge protectors. If 1-1/4 by 0.031 inch bands are used, not less than three crosswise ties shall be used for plates up to 12 feet long; for longer plates, add one tie for each additional 6 feet of length or fraction thereof. If 8-gage high-tensile wire is used not less than three crosswise ties shall be used for plates up to 8 feet long, for longer plates, add one tie for each additional 4 feet of length or fraction thereof.

5.1.1.18 Plates, stainless steel (hot-rolled grades).

A. Preservation. None.

B. Packing. Plates may be shipped loose, in secured lifts or boxed when specified. Weight of secured lifts shall not exceed 6,000 pounds maximum and shall contain plates of one size and quantity only. Lifts are tension-tied with flat bands, 1-1/4 by 0.031, or 8-gage high-tensile wire, using suitable edge protectors. If 1-1/4 by 0.031 inch bands are used, not less than three crosswise ties shall be used for plates up to 12 feet long; for longer plates, add one tie for each additional 6 feet of length or fraction thereof. If 8-gage high-tensile wire is used, not less than three crosswise ties are used for plates up to 8 feet long; for longer plates, add one tie for each additional 4 feet of length or fraction thereof.

5.1.1.19 Plates, stainless steel, polished.

A. Preservation. When specified, plates shall be coated with Type A preservative (see Table I).

B. Packing. Stainless steel polished plates shall be shipped in wooden boxes, or in wood and fiber-hardboard boxes, or in metal packs, or in wood and fiber-hardboard packs, at the contractors option. Weight of boxes shall be 2,240 pounds maximum, metal and wood fiber-hardboard packs, 6,000 pounds maximum. The regular method of protecting polished surfaces is to interleave with soft nonabrasive paper.

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- (1) For details of box and pack construction and ties, see 4.9 and Figures 8, 11, and 18.
- (2) When shipped in metal containers each lift shall be wrapped with water-repellant paper and shall be protected with fiberboard. The metal containers consist of metal waster wrapped sheets. Edge protection, either inside or outside the package, shall be afforded (see Figure 18).

#### 5.1.1.20 Railroad rails.

- A. Preservation. None
- B. Packing. Railroad rails are shipped loose.

#### 5.1.1.21 Sheet bar.

- A. Preservation. None
- B. Packing. Sheet bar shall be shipped in secured lifts. Lifts shall contain sheet bar of one size and quality only. Weight of lifts shall be 6,000 pounds maximum. Flat bands, 1-1/4 by 0.031 inch tension-tied, 8-gage high tensile wire, or No. 5 rods double-wrapped and securely tied shall be used. See schedule of ties, Table V. (When specified, lifts shall be provided with an applicable type skid system.)

#### 5.1.1.22 Sheet circles, all gages and grades.

- A. Preservation. When specified, sheet circles shall be coated with Type A preservative (see Table I).
- B. Packing. Sheet circles over 17 inches in diameter shall be shipped in secured stacks on platforms. Circles are piled in single stacks on a wooden platform having skids not over 4 inches high with a protector sheet on top. The height of stack should not exceed the diameter. The stack shall be metal-wrapped or fiber-hardboard wrapped at the contractors option. If metal wrapped, the wrapping shall be spot welded along the seam or secured with a circumferential band. The top of the metal wrapping shall overlap the top of the circle pile and be flattened down over the edges under top protector sheet, or top protector sheet may be larger than the circles and overlap the sides. If fiber-hardboard wrapped, the top protector sheet shall be as large as the outside of the coil wrapper (see Figure 21), the stack so wrapped shall be banded (3/4 inch by 0.031 inch or heavier) with two bands to each stack. Each stack shall then be secured to an individual wooden platform (with commercial tops, 1 inch thick, rounded or square), with two 1-1/4 by 0.031 inch bands. Lift weights depend on diameter of circles, but in no case shall exceed 6,000 pounds (see Figure 28).

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Circles, 17 inches in diameter or smaller, shall be shipped stacked in multiple piles in wood boxes or metal packages with platforms. Boxes described for coils in 4.9.3.7 shall be used. Whenever Type A preservative is specified, the material shall be wrapped in grease-resistant paper. Weight of box shall be 2,240 pounds maximum. Weight of metal wrapped or fiber-hardboard packs depends on diameter of circles, but in no case shall exceed 6,000 pounds (see Figure 28).

5.1.1.23 Sheet coils, cold rolled.

A. Preservation. When specified, sheet coils shall be preserved with Type A preservative (see Table I).

B. Packing. Cold rolled sheet coils shall be individually wrapped with oil-resistant, waterproof paper, then with light-gage protector sheets and skidded (see Figure 19). Each coil shall be tension-tied with 3/4 by 0.031 inch bands, or heavier, using at least three crosswise bands and one circumferential band. (The circumferential band is applied next to the steel, under the paper wrapping.) Narrow coils shall be packed in groups, weight of group not to exceed 6,000 pounds.

5.1.1.24 Sheet coils, electrical.

A. Preservation. None

B. Packing. Electrical sheet coils wide enough to permit individual coil packing shall be wrapped with reinforced waterproof paper and then with light-gage protector sheets and skidded. Each coil is tension-tied with 5/8 by 0.020 inch bands, or heavier, using at least three crosswise bands. On sheets of 24 inches wide and over, a circumferential band is applied next to the steel, under the paper wrapping. Coils shall be skidded in accordance with Figure 14, or placed on platforms as shown in Figure 15. Coils may be similarly packaged in groups and placed on platforms as shown in Figure 26, or packed in water-repellent paper-lined wooden boxes. (For details of box construction, see 4.5.3.) Weight of box shall be 2,240 pounds maximum and weight of coil group on platform 6,000 pounds maximum.

5.1.1.25 Sheet coils, cold-rolled, stainless steel.

A. Preservation. None

B. Packing. Stainless steel sheets in coils shall be shipped in wooden boxes or individually wrapped. Each coil shall be wrapped with a layer of waterproof paper, and either packed in boxes or, if individually wrapped, covered with light gage protector sheets or fiber-hardboard protector sheets at the contractor's option and skidded (see Figures 5 and 19).

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Coils of different sizes and grades shall not be packed in the same box. Box weight shall be 2,240 pounds maximum for Styles 2, 4, or 5 as described in 4.9.3.

5.1.1.26 Sheet coils, hot-rolled.

A. Preservation. Sheet coils shall be coated with Type A preservative.

B. Packing. Hot-rolled sheet coils shall be tension-tied with 3/4 by 0.031 inch bands or heavier, in four crosswise places. In addition, one circumferential band shall be used for coils 24 inches wide and over (see Figure 29). The sheet coils shall be wrapped in oil-resistant paper. Coils may be packed in groups, maximum weight 6,000 pounds (see Figure 30).

5.1.1.27 Sheet coils, hot-rolled, pickled, and oiled.

A. Preservation. When specified, sheet coils shall be coated with Type A preservative (see Table I).

B. Packing. Hot rolled, pickled, and oiled sheet coils shall be individually wrapped with oil-resistant waterproof paper, then with light-gage protector sheets and skidded (see Figure 19). Each coil shall be tension-tied with 3/4 by 0.031 inch bands, or heavier, using at least three crosswise bands in addition to one circumferential band for coils 24 inches wide and over. (The circumferential band shall be applied next to the steel, under the wrapping paper.) Coils may be packed in groups, weight of group not to exceed 6,000 pounds (see Figure 20).

5.1.1.28 Sheets, cold-rolled, and enameling stock.

A. Preservation. When specified, sheets shall be coated with Type A preservative (see Table I).

B. Packing. The above products shall be shipped in metal packs as described in 4.9.7.7 (see Figure 18). Weight of pack shall not exceed 6,000 pounds maximum.

5.1.1.29 Sheets, cold-rolled, stainless steel.

A. Preservation. When specified, Type A preservative shall be used (see Table I).

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B. Packing. Stainless steel sheets shall be shipped in wooden boxes, or in wood and fiber-hardboard boxes, or in metal packs or in fiber-hardboard packs, at the contractor's option. Weight of boxes shall be 2,240 pounds maximum and of metal packs or wood fiber-hardboard packs, 6,000 pounds maximum. Polished surfaces shall be interleaved with soft nonabrasive paper.

#### 5.1.1.30 Sheets, electrical.

A. Preservation. None

B. Packing. Electrical sheets shall be shipped in metal packs as described in 4.9.7 (see Figure 18). Widths under 2 inches shall be shipped in water-repellent paper-lined wooden boxes. (For details of box construction see 4.9.3.) Weight of box shall be 2,240 pounds maximum and of metal packs 6,000 pounds maximum.

#### 5.1.1.31 Sheets, galvanized, and long ternes: All gages (including painted, corrugated, coated, and electroplated).

A. Preservation. None

B. Packing. Galvanized sheets, long ternes, coated and painted sheets, all gages, formed or flat, shall be packed in accordance with (1) or (2) below. Weight of packs shall be 6,000 pounds maximum.

- (1) Sheets shall be shipped in metal packs as described in 4.9 (see Figure 18).
- (2) Sheets shall be prepared as illustrated in Figure 26 using 3- by 4-inch end beveled skids applied lengthwise. Polyethylene barrier material shall be interleaved between wood skids and the bottom sheets. A waster sheet of the same configuration and other physical characteristics as the material being packed shall be placed on top of the lift. The lift shall be banded using 1-1/4 by 0.031-inch flat steel strapping; one band applied lengthwise around lift and the number of girthwise bands determined by the length (see 4.9.7.7.5 and 4.9.7.7.6). Steel protectors, applied the full width and length of the load, shall be used under all bands. Banding and steel protectors shall be applied over the waster sheet.

#### 5.1.1.32 Sheets, hot rolled (18-gage and heavier - not including can and drum stock).

A. Preservation. Unless otherwise specified, sheets shall be coated with Type A preservative.

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B. Packing. Hot rolled sheets (18-gage and heavier) shall be shipped in secured lifts on 3- by 4-inch skids. When sheets on secured lifts are protected with Type A preservative, they shall be wrapped in oil-resistant paper. Weight of secured lift shall be 6,000 pounds maximum (see Figures 26 and 27). Ties shall be stapled to skids with cement-coated staples, one staple being applied to each bevel. Protectors shall be used under ties.

- (1) For lifts up to 120 inches long. Use two lengthwise ties and skids for widths up to and including 54 inches; use three lengthwise ties and skids for widths over 54 inches; use two crosswise ties on lengths up to 84 inches; and three crosswise ties on lengths over 84 inches to 120 inches.
- (2) For lifts up to 120 inches long (alternate method). Such lifts shall be placed on crosswise skids as follows: Two crosswise skids for lengths up to 72 inches and three crosswise skids for lengths over 72 inches to 120 inches. Not less than three ties shall be used on any lift even though only two skids are necessary due to short length. If sheets are oiled, use two lengthwise ties in addition.
- (3) For lifts over 120 inches long. Use three crosswise ties and skids for lengths up to 144 inches; for longer lengths add one tie and one skid for each additional 5 feet or fraction thereof. If sheets are oiled use two lengthwise ties in addition.

All ties are to be tension-tied. Ties consist of 1-1/4 by 0.031-inch flat bands.

#### 5.1.1.33 Sheets, hot-rolled, pickled and oiled, sheets, hot-rolled and annealed.

A. Preservation. Unless otherwise specified, sheets shall be coated with Type A preservative (see Table I).

B. Packing. The above products shall be shipped in metal packs as described in 4.9 (see Figure 18). Weight of metal packs shall be 6,000 pounds maximum.

#### 5.1.1.34 Skelp (coils and cut lengths).

A. Preservation. None required.

B. Packing.

- (1) Coils. Coils shall be shipped individually or, when specified, in secured groups having a weight of 6,000 pounds maximum. If shipped individually, coils shall be securely tied in four places

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with tension-tied bands or with bands or wire that have been twisted by means of tongs or forks. If shipped in groups, a minimum of two ties shall be used on individual coils, the group to be secured with a minimum of three ties (see Figures 23 and 30).

- (2) Cut length. Skelp in cut lengths shall be shipped loose, or in secured lifts of 6,000 pounds maximum. Lifts are securely tied (oval lifts are generally furnished) with flat bands 1-1/4 by 0.031 inch, tension-tied 8-gage high-tensile wire or hand-tied double-wrapped No. 5 rods (see Figure 25 and schedule of ties, Table V). Securing cut lengths into hand-bundles is not required. Skelp 36 inches and wider shall be shipped loose.

5.1.1.35 Slabs.

A. Preservation. None required.

B. Packing. Slabs shall be shipped loose or in secured lifts, depending on mill facilities. Lifts shall contain slabs of one size and quality only. Weight of lifts shall be 6,000 pounds maximum. Flat bands, 1-1/4 by 0.031 inch, tension-tied 8-gage high-tensile wire or No. 5 rods double-wrapped and securely tied shall be used (see schedule of ties, Table V).

5.1.1.36 Strips, cold-rolled in coils.

A. Preservation. Type A preservative shall be used (see Table I), when specified.

B. Packing. Cold rolled strips in coils shall be wrapped in oil-resistant paper and shipped in wooden boxes or in metal-wrapped packs. (For box construction refer to 4.9.3). Metal wrapped packs shall be similar to those used for cold rolled sheets (see Figures 18, 19, and 20). Coils of different sizes and grades shall not be packed in the same box or container. Weight shall be 2,240 pounds maximum for wooden boxes and 6,000 pounds maximum for metal wrapped packs.

5.1.1.37 Strip, cold-rolled, in cut lengths (see 5.1.1.41).

5.1.1.38 Strip, hot-rolled in coils.

A. Preservation. None required.

B. Packing. Hot rolled strip in coils shall be shipped securely tied with tension-tied bands, or with bands or wire that have been hand twisted by means of tongs or forks. When specified, strip coils shall be



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packed in groups. The weight of groups shall not exceed 6,000 pounds (see Figure 24).

5.1.1.39 Strip, hot-rolled, in cut lengths.

A. Preservation. Unless otherwise specified, strips shall be coated with Type A preservative (see Table I).

B. Packing. Cut lengths of strip are usually packed in unwrapped secured lifts (see Figures 25 and 33). However, when Type A preservative is specified, the strip shall be wrapped in oil-resistant paper. Strip under 2 inches shall be secured in hand bundles, using three soft wire ties or flat mill bands for bundles up to 10 feet and one additional tie for every 3 feet of additional length. Such hand bundles shall then be assembled into secured lifts. Secured lifts shall be tied, using not lighter than 1-1/4 by 0.031 inch tension-tied bands, 8-gage high tensile wire, or (on oval lifts) hand tied No. 5 rods. Use three ties for lengths up to 10 feet and one additional tie for every 3 feet of additional length. If wire is used, the number of ties shall be increased 50 percent. Package weight shall be 6,000 pounds maximum.

5.1.1.40 Strip, hot-rolled, pickled and oiled in coils.

A. Preservation. Strips shall be coated with Type A preservative (see Table I).

B. Packing. Hot rolled strip, pickled and oiled, in coils shall be packed as individual coils (Figure 31) or coil groups secured to skeleton platforms (Figure 32). When specified coil or coil groups shall be packed in metal packs or wooden boxes. Weight of coil groups and metal wrapped packs shall be 6,000 pounds maximum.

- (1) Individual coils or coil groups shall be wrapped with one layer of oil-resistant waterproof paper securely tied with four cross-wise ties or a spiral wire tie.
- (2) When coils are packed in metal wrapped packs, the coil or group of coils shall be wrapped with oil-resistant waterproof paper.

5.1.1.41 Strip, hot-rolled, pickled and oiled in cut lengths; strip, cold rolled in cut lengths.

A. Preservation. Unless otherwise specified, strips shall be coated with Type A preservative (see Table I).

B. Packing. The strips shall be wrapped in oil-resistant waterproof paper and shipped in wooden boxes or metal-wrapped lifts.



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- (1) Box construction. For general construction of the box, refer to 4.9.3. Maximum weight shall be 2,240 pounds.
- (2) Metal wrapped lifts. When shipped in metal wrapped lifts, either one of the types of packages illustrated in Figures 34 or 35 shall be used. The wrapped lift is covered top, bottom, sides, and ends with light-gage metal to form a metal container. If the top protective sheet is composed of more than one piece, it shall be made continuous with a lock-seam or lapped approximately 10 inches. A minimum of three crosswise ties shall be used for lifts up to 10 feet. For lifts over 10 feet in length, use one additional tie and skid for each 3 feet of additional length. Two lengthwise ties shall also be used. Flat bands 1-1/4 by 0.031 inch or 8-gage high-tensile wire shall be used. When 8-gage high-tensile wire is used instead of 1-1/4 by 0.031 inch bands, the number of ties indicated above shall increase 50 percent. Ties shall be stapled to skids. Weight of metal wrapped lifts shall be 6,000 pounds maximum.

#### 5.1.1.42 Strip, stainless steel, cold-rolled in coils.

A. Preservation. None required.

B. Packing. Cold rolled stainless steel strip in coils shall be shipped in wooden boxes or individually wrapped. Each coil shall be interleaved with kraft paper and shall be wrapped with a single layer of either crepe paper or water repellent paper and another layer of waterproof paper, and either packed in boxes or if individually wrapped, covered with light-gage protector sheets or fiber-hardboard protector sheets at the contractor's option and skidded (see Figures 5 and 19). Coils of different sizes and grades shall not be packed in the same box. Narrow coils shall be packed in groups, weight of group not to exceed 6,000 pounds. Box weight shall be 2,240 pounds maximum for Styles 2, 4, or 5 as described in 4.9.3. For heavier weights, similar boxes of sturdier construction shall be used.

#### 5.1.1.43 Strip, stainless steel, cold-rolled, in cut lengths.

A. Preservation. None required.

B. Packing. Stainless steel strip, in cut lengths shall be shipped in wooden boxes, or in wood and fiber-hardboard boxes, or in metal packs or in wood and fiber-hardboard packs at the contractor's option. Weight of boxes shall be 2,240 pounds maximum, and of metal or wood fiber-hardboard packs, 6,000 pounds maximum. The regular method of protecting polished surfaces is to interleave with soft nonabrasive paper.

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5.1.1.44 Structural shapes.

A. Preservation. Unless otherwise specified, surface protection such as painting, oiling and the application of other rust-resistant compounds, is not required.

B. Packing. Structural shapes shall be shipped loose or in secured lifts. Lifts shall not contain structural shapes of more than one cross sectional size and quality. Lifts shall be securely tied with flat bands, 1-1/4 by 0.031 inches, or hand-tied No. 5 rods double-wrapped. A minimum of three ties shall be used for lengths up to 12 feet. For longer lengths, add one tie for each additional 6 feet of length or fraction thereof. If shipped in secured lifts, weight of lifts shall be 6,000 pounds maximum.

5.1.1.45 Tie plates and joint bars.

A. Preservation. None required.

B. Packing. The above products shall be shipped loose or in hand-tied wire secured bundles not exceeding 150 pounds.

5.1.1.46 Tin plate and terne plate (short ternes), can-making quality black plate.

A. Preservation. None required.

B. Packing. Tin and terne plate and can-making quality black plate shall be shipped in boxes or metal containers as described below.

- (1) Multiple-package metal wrapped unit. Each unit shall be fully wrapped with water-repellent paper and metal, as illustrated in Figure 36. Such units shall be mounted on platforms with solid tops 13/16 inch thick with runners not over 4 inches high (2-1/2 inch high runners are furnished unless otherwise specified). Multiple-package units usually consist of 1,120 sheets.
- (2) Boxes. Each box shall be made with 13/16 inch sides and ends and 3/8 inch top and bottom boards (see Figure 7). Boxes shall be strapped as follows: 20 inches long or less, two lengthwise ties; over 20 to 26 inches long; two lengthwise ties and one crosswise tie; over 26 inches long, two lengthwise and two crosswise ties. If round wire is used it shall be not less than 14 gage, and if flat strap, not less than 3/8 inch by 0.020 inch. When specified, tinplate boxes shall be paper lined; otherwise a top and bottom sheet of paper shall be used. The paper used shall be wax-impregnated paper of not less than 50 pounds basis weight.

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#### 5.1.1.47 Tubing, electrical metallic (EMT).

A. Preservation. None required.

B. Packing. All sizes of electrical metallic tubing shall be packed in standard bundles in accordance with the following table and securely tied with jute rope, round wire, steel strapping, or tape. Accessories shall be shipped in boxes or cartons. Primary bundles shall be packed for shipment in master lifts in accordance with standard industry practice. The weight shall not exceed 4,200 pounds per master lift (plus 5 percent tolerance to allow for such variables as wall thickness).

Electrical Metallic Tubing - Bundling Practice For

Size (inches)	Standard bundle	Approximate weights (pounds)	
		per piece	per bundle
3/8	20	2.50	50
1/2	10	3.21	32
3/4	10	4.88	49
1	10	7.11	71
1-1/4	5	10.00	50
1-1/2	5	11.80	59
2	3	15.00	45

#### 5.1.1.48 Tubing, stainless (mechanical and pressure tubing).

A. Preservation. For pickled finish, none required. For polished or buff finish, tubing shall be individually wrapped in water-repellent paper or placed in chipboard tubes prior to boxing.

B. Packing. Stainless tubing of wall thickness 0.200 inch and less shall be shipped in boxes or crates. All thicknesses greater than 0.200 inch shall be shipped loose, in bundles or in Class 8 lifts (when specified lifts shall be provided with an applicable type skid system).

- (1) Box and crate construction. For general construction of boxes and crates, including instruction for nailing, size, and kind of lumber, and other details, see 4.9.3.

#### 5.1.1.49 Tubular products, steel.

A. Preservation. Unless otherwise specified, all sizes of black pipe shall be protected with a single coat of Type C (see Table I) coating on the outside surface. On all pipe, Type B preservative shall be applied to threads on both the coupling and field ends before shipment.

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B. Packing. Standard pipe (including standard weights, extra strong and double extra strong), line pipe, English gas and steam pipe, and oil-country goods shall be packed as follows:

Sizes over 1-1/2 inches nominal diameter shall be shipped loose unless otherwise specified.

Sizes 1-1/2 inches nominal diameter and smaller shall be bundled as shown in the following tabular listing:

Steel tubular products - bundling practice for sizes 1-1/2 inch and under nominal diameter.

Nominal diameter (inches)	Weight per linear foot (pounds)	Pieces per bundle	Feet per bundle (approx.)	Pounds per bundle (approx.)
STANDARD-WEIGHT PIPE				
1/8	0.24	30	630	151
1/4	.42	24	504	212
3/8	.57	18	378	215
1/2	.85	12	252	214
3/4	1.13	7	147	166
1	1.68	5	105	176
1-1/4	2.28	3	63	144
1-1/2	2.73	3	63	172
EXTRA STRONG PIPE				
1/8	.31	30	630	195
1/4	.54	24	504	272
3/8	.74	18	378	280
1/2	1.09	12	252	275
3/4	1.47	7	147	216
1	2.17	5	105	228
1-1/4	3.00	3	63	189
1-1/2	3.63	3	63	229
DOUBLE EXTRA STRONG PIPE				
1/2	1.71	7	140	240
3/4	2.44	5	100	244
1	3.66	3	60	220
1-1/4	5.21	3	60	313
1-1/2	6.41	3	60	385

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## Steel tubular products - bundling practice for sizes 1-1/2 inches and under nominal diameter. (Cont'd)

Nominal diameter (inches)	Weight per linear foot (pounds)	Pieces per bundle	Feet per bundle (approx.)	Pounds per bundle (approx.)
ENGLISH GAS TUBES				
1/8	0.28	30	630	176
1/4	.39	24	504	197
3/8	.59	18	378	223
1/2	.83	12	252	212
3/4	1.18	7	147	173
1	1.67	5	105	175
1-1/4	2.40	3	63	151
1-1/2	3.01	3	63	190
ENGLISH STEAM TUBES				
1/8	0.34	30	630	214
1/4	.48	24	504	242
3/8	.71	18	378	268
1/2	.98	12	252	247
3/4	1.42	7	147	209
1	2.03	5	105	213
1-1/4	2.86	3	63	180
1-1/2	3.54	3	63	223

- (2) Method of bundling. All pieces shall be securely tied into bundles with soft annealed wire or with a minimum of three tension-tied 5/8-inch by 0.020-inch flat bands. When wire is used, two strands of No. 14 or No. 15-gage wire shall be used for each tie, wrapped twice around the bundle. One strand of No. 12-gage wire, wrapped twice around the bundle may be used instead. When wire is used, a minimum of four ties shall be applied on lengths up to 22 feet and one additional tie for every 6 feet 6 inches over 22 feet. When bands are used, a minimum of 3 ties shall be applied on lengths up to 22 feet.
- (3) Thread protection. Metal or fiber thread protectors shall be applied on field ends of threaded material on sizes over 1-1/2 inches. On bundle sizes 1-1/2 inches and under fiber or metal-thread protectors shall be applied on the field end of each piece; or the field end of each bundle may be wrapped with burlap to prevent damage to the exposed threads. On tubing, casing and drill pipe, the coupling threads shall also be protected with metal coupling thread protectors. Wrapping with paper is not recommended.

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5.1.1.50 Wire, high carbon and special grades, and alloy wire (including galvanized wire).

A. Preservation. Type A preservative shall be used (see Table I). (Protective coating is not applied on galvanized or black annealed wire.)

B. Packing. Alloy wire and high carbon round wire such as bright drawn, tinned, liquor finished, oil tempered, music, needle, card wire, and others, except galvanized and black annealed shall be shipped in coils or cut lengths, prepared as follows:

- (1) Coils up to and including 16 inches ID. Each coil shall be wrapped with one layer of 45-pound oil-resistant creped paper and a second layer of creped 30-30-30 waterproof paper. Wrapped coils shall be packed in fiber drums or in wooden boxes. For fiber drum and box construction see 4.9. See Figures 43 and 44, "wrapped" and "unwrapped" coil of wire.
- (2) Coils larger than 16 inches ID shall be shipped either individually wrapped or boxed.
  - (a) Individually wrapped. Each coil shall be wrapped with one layer of oil-resistant 60-pound creped paper followed by a second layer of 30-30-30 waterproof creped reinforced paper, or its equivalent, securely tied by a spiral tied wire or by 4 individual ties. All wrappings shall have approximately 50 percent overlap. See Figures 43 and 44, "wrapped" and "unwrapped" coil of wire.
  - (b) Boxed. Each coil shall be wrapped with one layer of grease resistant 60-pound creped paper and a second layer of 30-30-30 waterproof creped paper. Coils shall be packed in wooden boxes. For box construction, see 4.9.3.
  - (c) Card wire shall be wrapped as shown under paragraph (1) and packed into fiber drums or tight barrels lined with a 50-pound roofing paper.
  - (d) Galvanized wire 0.10 inch and heavier and black annealed high carbon wire in coils 16 inches ID and larger shall be shipped bare securely fastened with four ties.
- (3) Cut length material shall be shipped in wooden boxes (Figure 2) or in Class 9 metal-sheathed lifts (4.9.11 and Figure 42), with the exception of short lengths (36 inches or less), which shall be shipped in hand bundles, securely wrapped in reinforced waterproof material.

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Weight of packs shall be approximately as follows:

Fiber drums	<u>Pounds</u> 550
Boxes or metal containers	2,240

5.1.1.51 Wire, low carbon (carbon 0.25 percent maximum) (including galvanized wire).

A. Preservation. When specified, Type A preservative shall be used (see Table I).

B. Packing. Low carbon round wire such as bright basic and Bessemer black annealed, galvanized and other low carbon wire except tinned and lacquer finished or bare unfinished wire shall be shipped in coils or cut lengths prepared as follows:

- (1) Coils less than 16 inch ID. Each coil shall be wrapped with a single layer of 45-pound plain creped paper. Wrapped coils shall be packed in fiber drums or boxes lined with 50-pound roofing paper and with a creped 30-30-30 waterproof bag. See Figures 43 and 44 "wrapped" and "unwrapped" coils of wire.
- (2) Coils 16 inches ID and larger shall be shipped bare, securely fastened with four ties, unless finish is important or material is to be further processed, in which case wrapping should be specified. If wrapping is specified, each coil shall be wrapped with one layer of 60-pound plain creped paper, or its equivalent, and a second layer of 30-30-30 waterproof creped reinforced paper or its equivalent. Wrapping shall be securely tied with a spiral tie wire or with four individual ties. If wire is oiled the first layer of paper shall be oil-resistant. All wrapping shall have an overlap of approximately 50 percent (see Figures 43 and 44, wrapped and unwrapped coil of wire).
- (3) Tinned and lacquer finished low carbon wire and bare unfinished wire shall be shipped in coils prepared the same as high carbon wire (5.1.1.50).
- (4) Cut length material shall be shipped in wooden boxes (Figure 2) or in class 9 metal-sheathed lifts (4.9.11 and Figure 42), with the exception of short lengths (36 inches or less), which shall be shipped in hand bundles, securely wrapped with reinforced waterproof material. Weight of packs shall be approximately as follows:

Fiber drums	<u>Pounds</u> 550
Boxes or metal containers	2,240

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5.1.1.52 Wire products.

A. Preservation. When specified, fence, netting and barbed wire shall be coated with Type A preservative (see Table I).

Fence posts - paint.

Concrete mesh - preservative not required.

B. Packing. Wire products are packed as follows:

- (1) Fence and netting wire shall be shipped in rolls, unprotected.
- (2) Fence posts shall be shipped in bundles. Cylindrical posts shall be bundled in units of 10; all other types in bundles of five posts.
- (3) Concrete reinforcement mesh shall be shipped in rolls, or sheets in bundles, unprotected.
- (4) Barbed wire shall be wrapped on metal spools of approximately 80 rods.
- (5) Barbed tape; general purpose obstacle and fence topping shall be packed in accordance with MIL-B-52775.

5.1.1.53 Wire rope and strand, carbon steel, all types (including galvanized).

A. Preservation. Lubrication as provided by the manufacturer according to service requirements of the products acts as a protective coating. Unless otherwise specified, the entire length of wire rope, after closure, shall be protected by a single coat of Type B preservative (see Table I). Type B preservative will not be required on galvanized rope or strand.

B. Packing. Wire rope and strands shall be shipped in coils or on reels.

- (1) Individual coils such as aircraft strand, bright tie rope, elevator rope, lubricated rope and oil field rope, including galvanized shall be wrapped with one layer of 30-30-30 waterproof creped paper and a second layer of 30-60-30 waterproof, reinforced creped paper, and securely tied with four individual ties. Wrapped coils shall be skidded in accordance with Figure 14, or secured on platforms as shown in Figures 20 or 32.
- (2) When wire rope and strands are shipped on reels, the product shall be protected as specified in 4.9.12.1.



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#### 5.1.1.54 Wire, stainless steel.

A. Preservation. None required.

B. Packing. Stainless steel wire shall be shipped in coils, spools, or cut lengths prepared as follows:

- (1) Coils less than 16 inch ID. Each coil shall be wrapped with a layer of 45-pound creped paper and packed in fiber drums conforming to 4.9.5.1.
- (2) Coils 16 inch ID and larger.
  - (a) When coils are shipped loose, each coil shall be wrapped with one layer of 60-pound creped paper and a second layer of reinforced waterproof 30-30-30 creped paper or its equivalent, secured with a spiral wire tie or with four individual ties.
  - (b) When coils are boxed, each coil shall be wrapped with a layer of 60 pound creped paper. All wrappings shall have approximately 50 percent overlap. Wood boxes shall conform to 4.9.3.7 and Table IV.
- (3) Spools. The wire shall be protected with 45-pound kraft paper wrapped around the wire between the flanges of the spools. The spools shall be packed in wooden boxes lined with 30-30-30 waterproof paper, with separators between spools when steel spools are used. Wood boxes shall conform to 4.9.3.7 and Table IV.
- (4) Cut lengths. Cut lengths shall be wrapped in 30-30-30 reinforced waterproof paper and shipped in wood boxes (Figure 2) or in Class 9 metal-sheathed lifts (4.9.11 and Figure 42), with the exception of short lengths (36 inches or less). Short lengths shall be shipped in hand bundles securely wrapped with reinforced waterproof material. The weight of wood boxes and metal lifts shall not exceed approximately 2,240 pounds; of hand bundles, approximately 200 pounds.

#### 5.1.1.55 Wheels (rough-turned).

A. Preservation. None required.

B. Packing. Wheels shall be shipped loose.

5.1.2 Level C. The steel mill products shall be preserved and packed to afford protection against deterioration and damage during shipment from the contractor to the initial destination and to assure carrier acceptance at

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lowest ratings in compliance with Uniform Freight Classification rules or National Motor Freight Classification rules.

5.1.3 Commercial. The steel mill products shall be preserved and packed in accordance with ASTM Standard A 700.

5.2 Marking.

5.2.1 Military packaging. For the purposes of marking, the definitions contained herein (Section 3), in MIL-STD-129 and in ASTM Standard A 700 shall apply. Abbreviations, marking, and marking material as well as the method and size of markings shall be in accordance with MIL-STD-129 and ASTM Standard A 700. In case of conflict, the order of precedence shall be (1) this document, (2) MIL-STD-129, (3) ASTM Standard A 700.

5.2.1.1 Exterior markings. The location and applicability of markings on shipping containers (boxes, crates, drums, reels or spools, coils, and wrapped or sheathed lifts) shall be in accordance with MIL-STD-129, except as specified herein. Wrapped or sheathed plates and structural shapes which present a configuration too thin for side markings and secured lifts of plates, similar structural products, and loose or unpacked items which preclude compliance with normal marking requirements shall be stenciled, labeled or tagged on the top surface or other area most suitable for this purpose.

5.2.1.2 Unpacked items (loose-unsecured). The markings for shipment shall appear on all unpacked items as required, except as indicated herein. When it is impracticable to apply the markings with tags or labels, markings shall be accomplished by stenciling the required information directly on the item and by painting the applicable color for the Transportation Priority Code on the end of the item.

5.2.1.2.1 Structural shapes and pipe. Each structural shape and piece of pipe shall be marked with required markings for shipment except that the following markings need only be applied on two of the top pieces of the shipment:

- (a) Contract data markings.
- (b) Name and address of the consignee (coded and in the clear) for shipments within the Continental Limits of the U.S. except Alaska and Hawaii.

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5.2.1.2.2 Plates. Each quality plate (such as flange quality and firebox quality) shall be marked with the required marking for shipment. Each plate other than quality plate shall be marked with the required marking for shipment except that markings in 5.2.1.2.1 (a) and (b) need only be applied on two of the top plates of the shipment.

5.2.2 Commercial packaging. Marking shall be as specified in ASTM A 700. In addition, the National Stock Number (NSN) or part number, quantity and unit of issue, contract or delivery order number, and address shall be shown.

Custodians:

Army - ME

Navy - SA

Air Force - 99

Preparing activity:

Army - ME

Project: Pack-0525

Review activities:

Army - SM

Navy - AS, OS, YD

DLA - IS

User activities:

Army - MI

Navy - EC, SH

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## APPENDIX

### QUALITY ASSURANCE

#### 10. Quality Assurance Provisions.

10.1 Scope. This appendix establishes the inspection methods and procedures necessary to achieve the desired quality assurance. This appendix is a mandatory part of this standard.

#### 20. Referenced documents.

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

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.

30. Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements specified herein. The contractor may utilize his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the standard where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

30.1 Material inspection. The contractor is responsible for insuring that materials used are manufactured, examined, and tested in accordance with referenced documents or as specified herein.

#### 40. Quality conformance inspection.

40.1 Inspection stages. Inspection shall be in two stages as follows:

- (a) The first stage shall include inspection of materials; preservation, wrapping, and blocking methods and processes; and the container construction requirements.
- (b) The second stage shall include inspection of the container closure requirements, markings after container closure, pallet construction, methods of securing to the pallet and pallet enclosure.

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40.2 Unit of product. For the purpose of inspection, a unit of product for the first stage of inspection shall be a complete pack with the container not closed. For the second stage of inspection, a unit of product shall be a completed pack with the container closed and secured to the pallet with pallet enclosure when applicable in its final prepared for shipment stage.

40.3 Sampling. Samples for each examination shall be selected at random from each inspection lot in accordance with procedures prescribed in MIL-STD-105.

40.4 Examination. Samples selected in accordance with 40.3 shall be examined for defects for packaging and packing Levels A, B, and C. Acceptable Quality Level (AQL) shall be 4.0 percent defective.

TABLE I-A. Examination for Defects

Defects
101. Materials do not conform to referenced specifications or are not as specified herein. Each incorrect material shall constitute one defect.
102. Steel mill products not clean.
103. Preservatives not applied as specified.
104. Preservation required but not accomplished.
105. Boxes grossing 200 pounds or more not produced with skids.
106. Skids size not as specified.
107. Location and attachment of skids not as specified.
108. Containers not constructed as specified.
109. Nailing not as specified.
110. Blocking of box contents not in accordance with referenced document.
111. Inside dimensions of container does not correspond with dimensions of the contents as close as possible.

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TABLE I-A. Examination for Defects (Cont'd)

<u>Defects</u>
112. Weight limitations of containers and bundles exceeded.
113. Straps and ties not as specified.
114. Strap protectors not used as required and not constructed as specified.
115. Size of straps and ties not as specified.
116. Number of straps or ties and location not as specified.
117. Marking not as specified.

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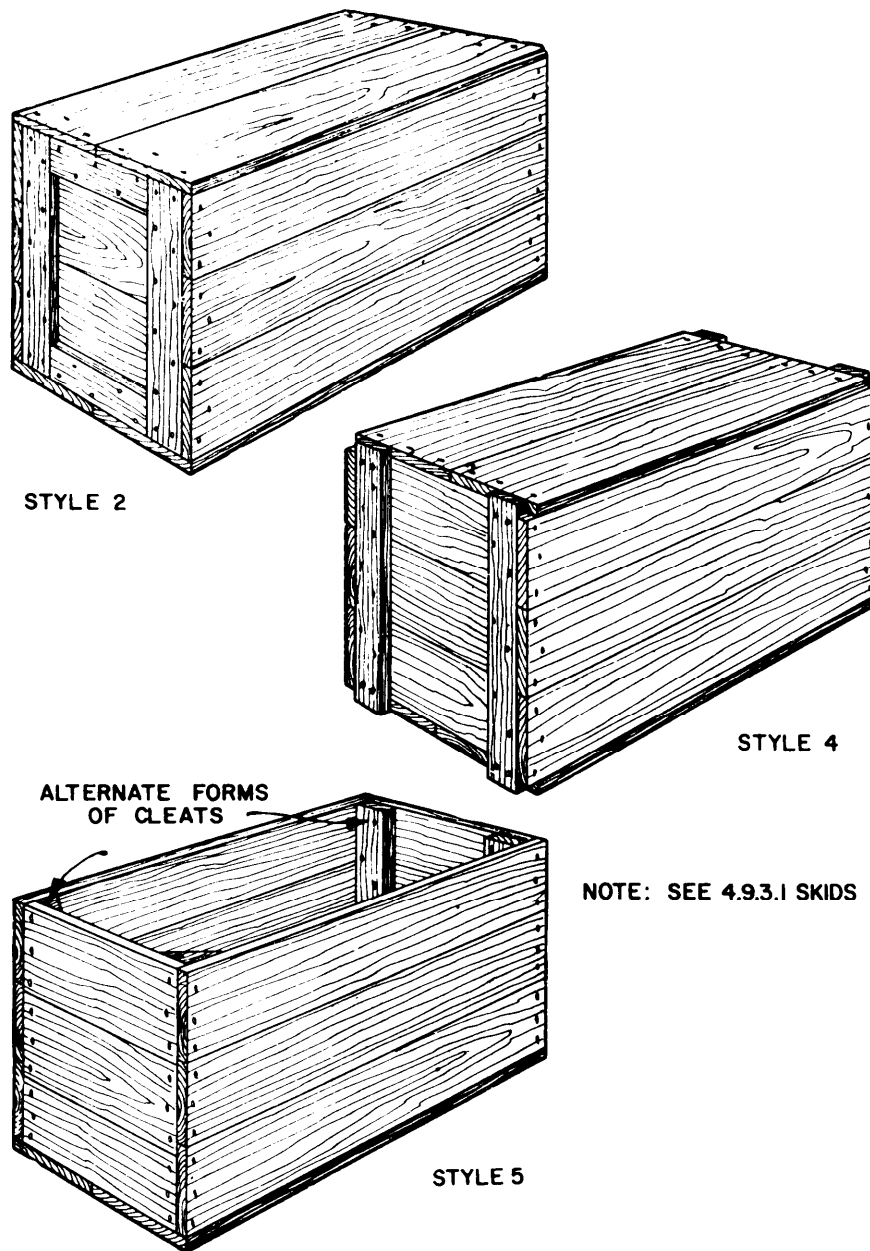


FIGURE 1. Nailed wood boxes for shipping steel products.

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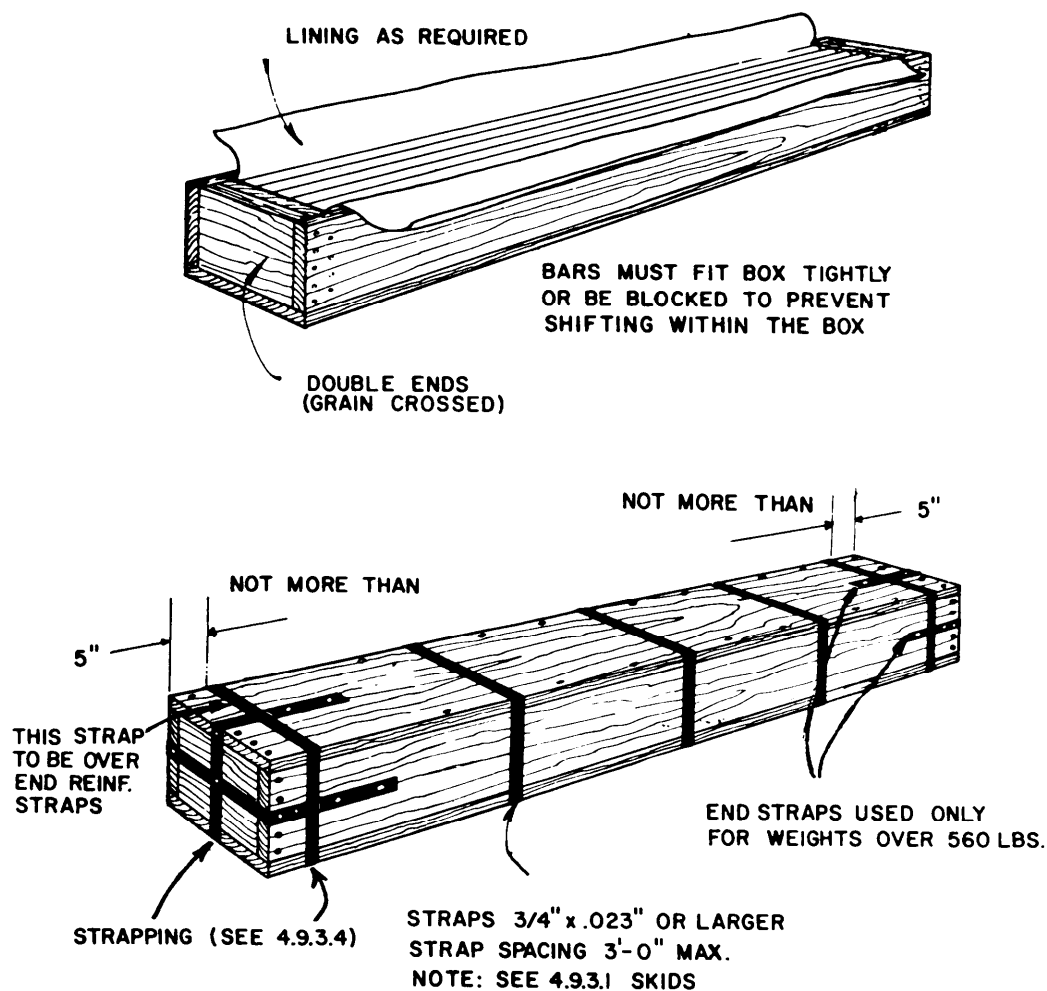


FIGURE 2. Boxes for bars, wire, rods, and strip, all in cut lengths.

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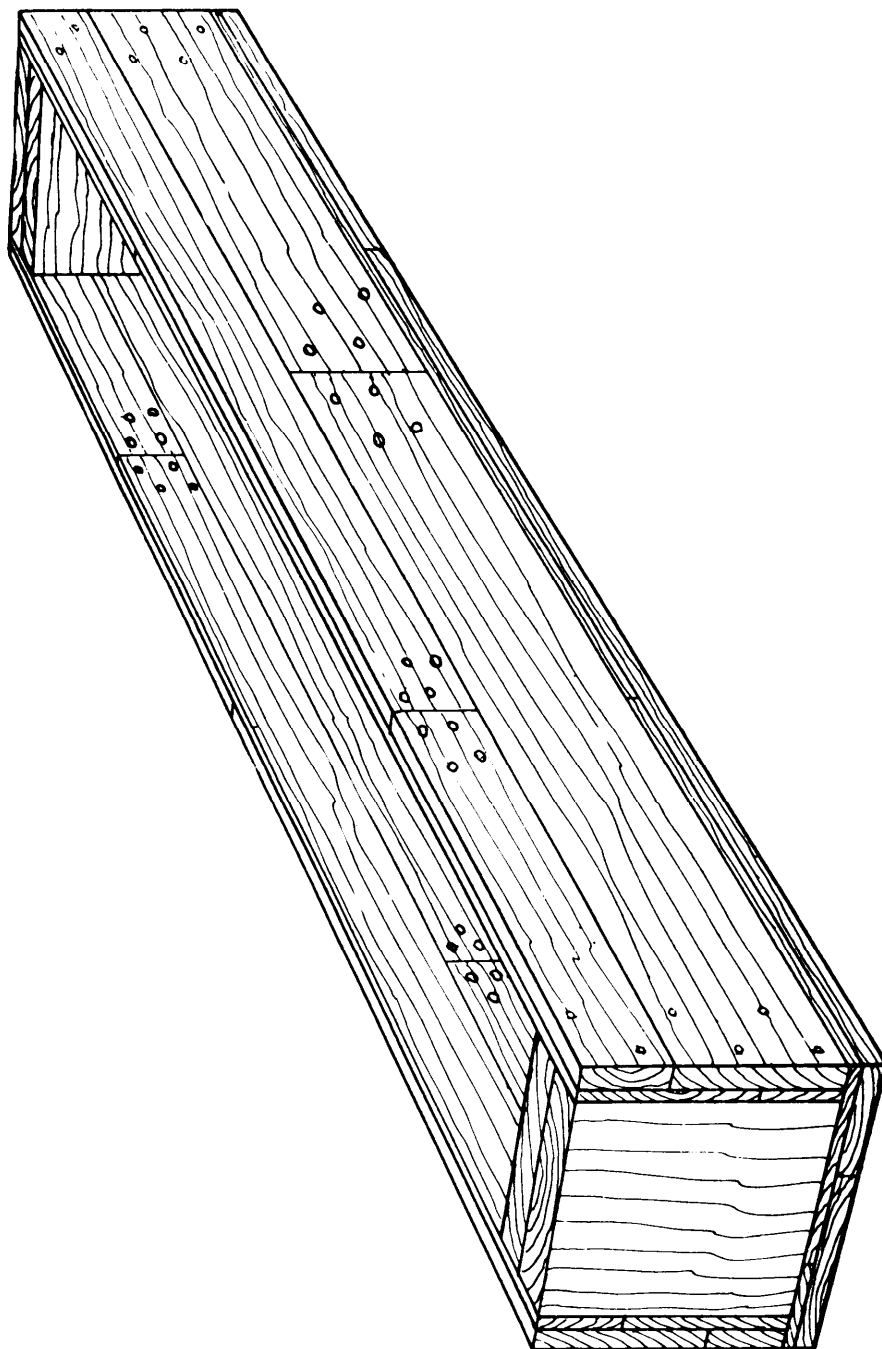


FIGURE 3. Boxes for bars, wire, rods, strips, and tubular products  
all in cut lengths alternate laminating method.

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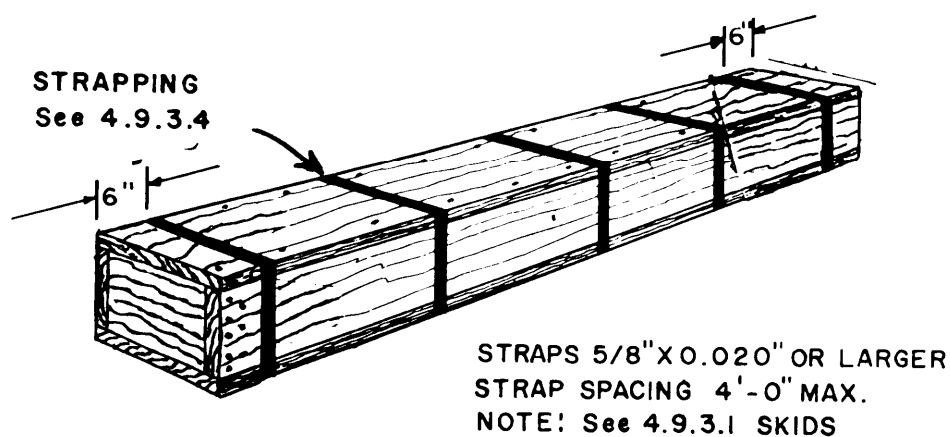
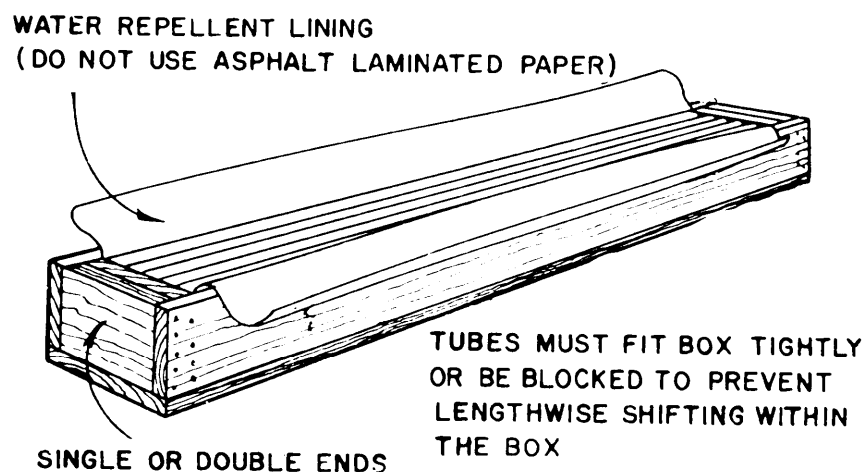


FIGURE 4. Boxes for tubular products.

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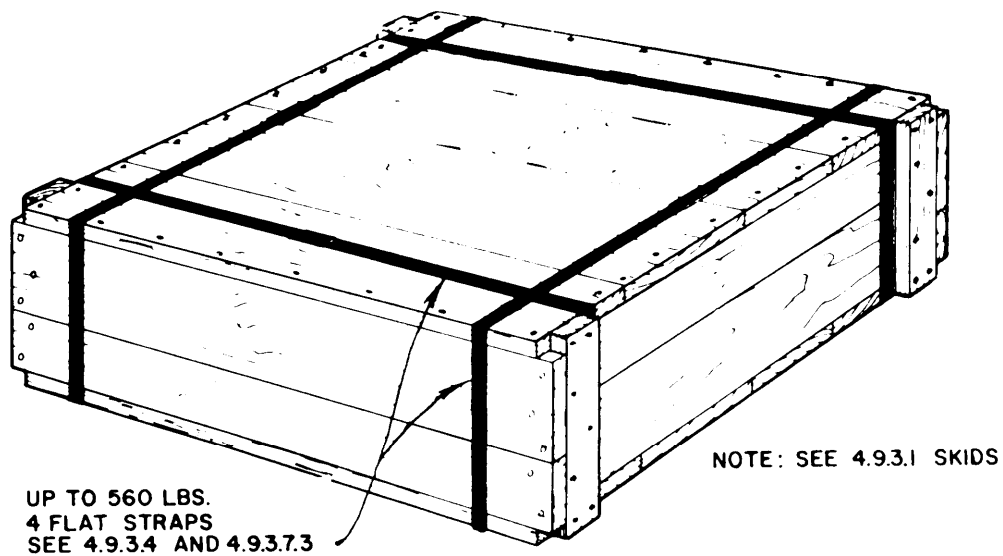


FIGURE 5. Boxes for coiled steel products, strapping methods.

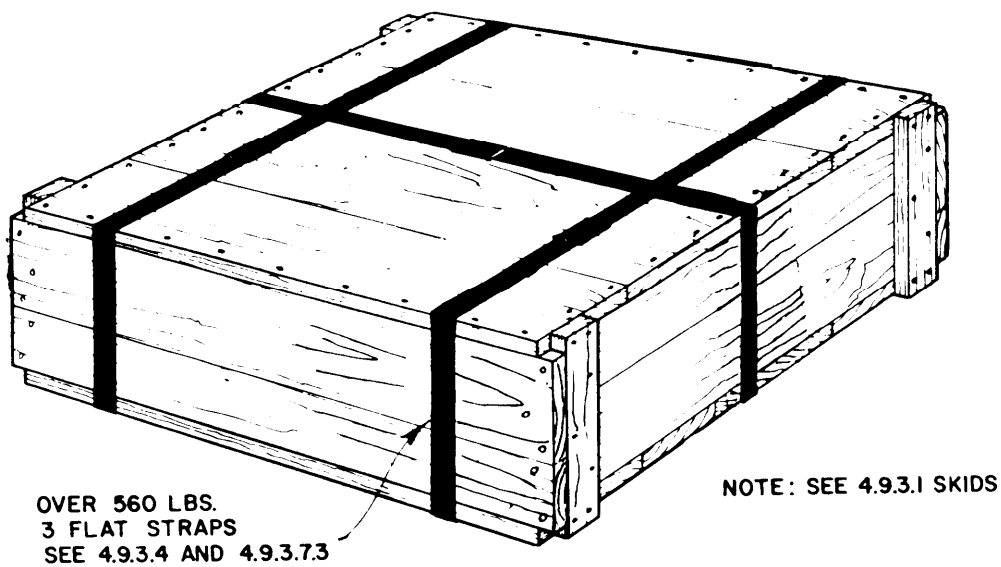


FIGURE 5a. Boxes for coiled steel products. Strapping methods.

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NOTE: See 4.9.3.1 SKIDS

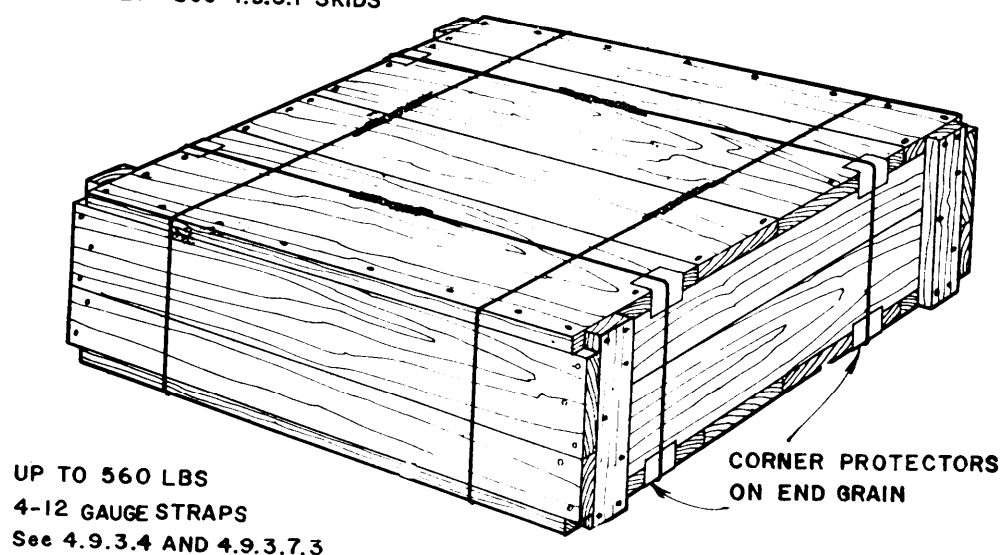


FIGURE 5b. Boxes for coiled steel products. Strapping methods.

NOTE: SEE 4.9.3.1 SKIDS

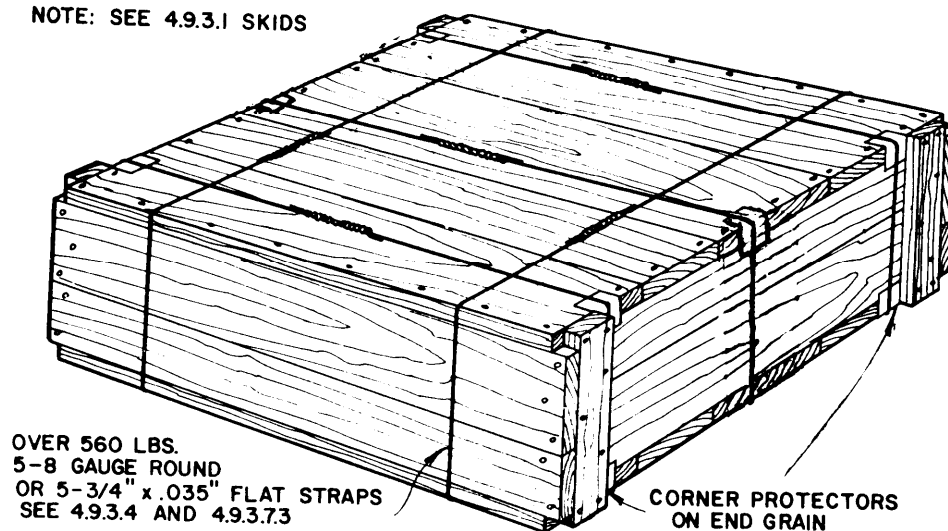


FIGURE 5c. Boxes for coiled steel products. Strapping methods.

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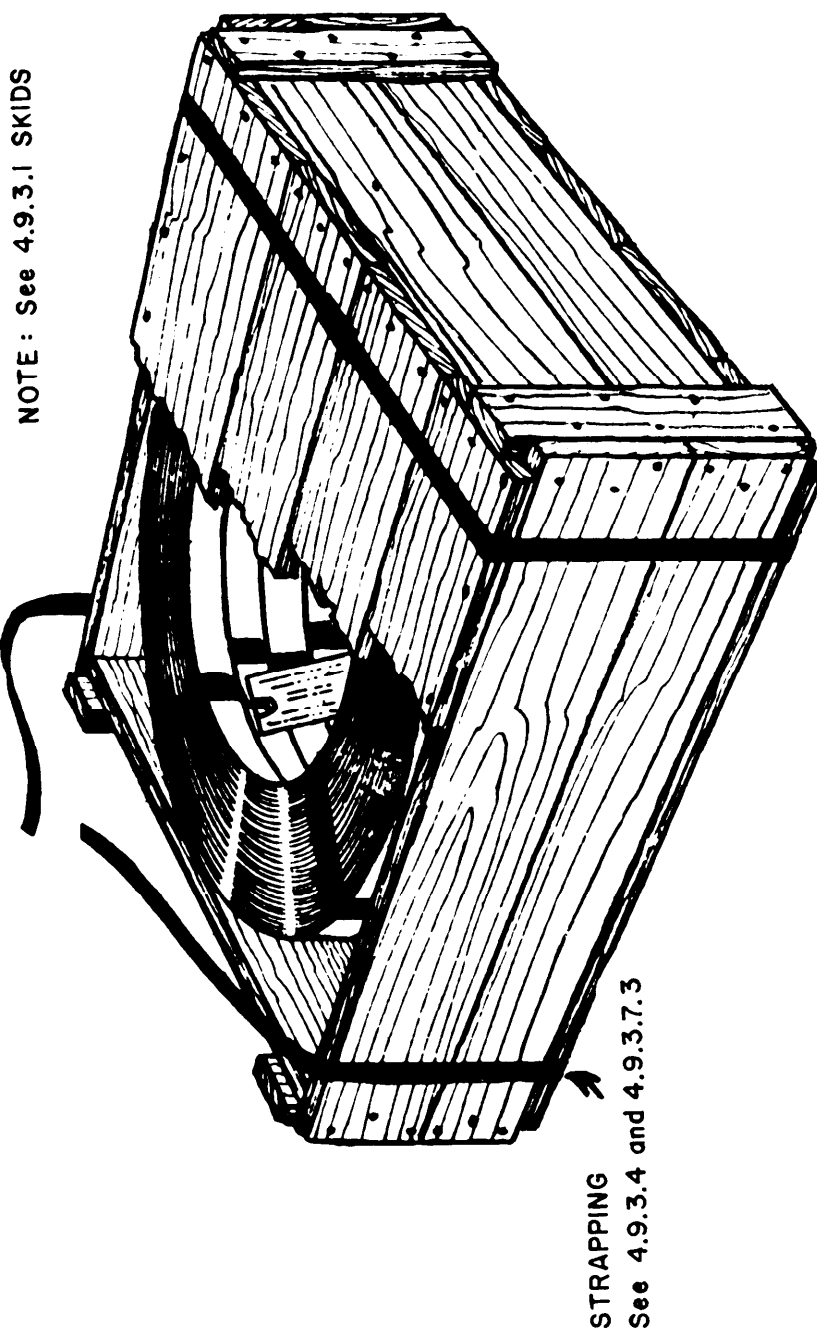


FIGURE 6. Coiled strip packed into a style 4 nailed wood box.

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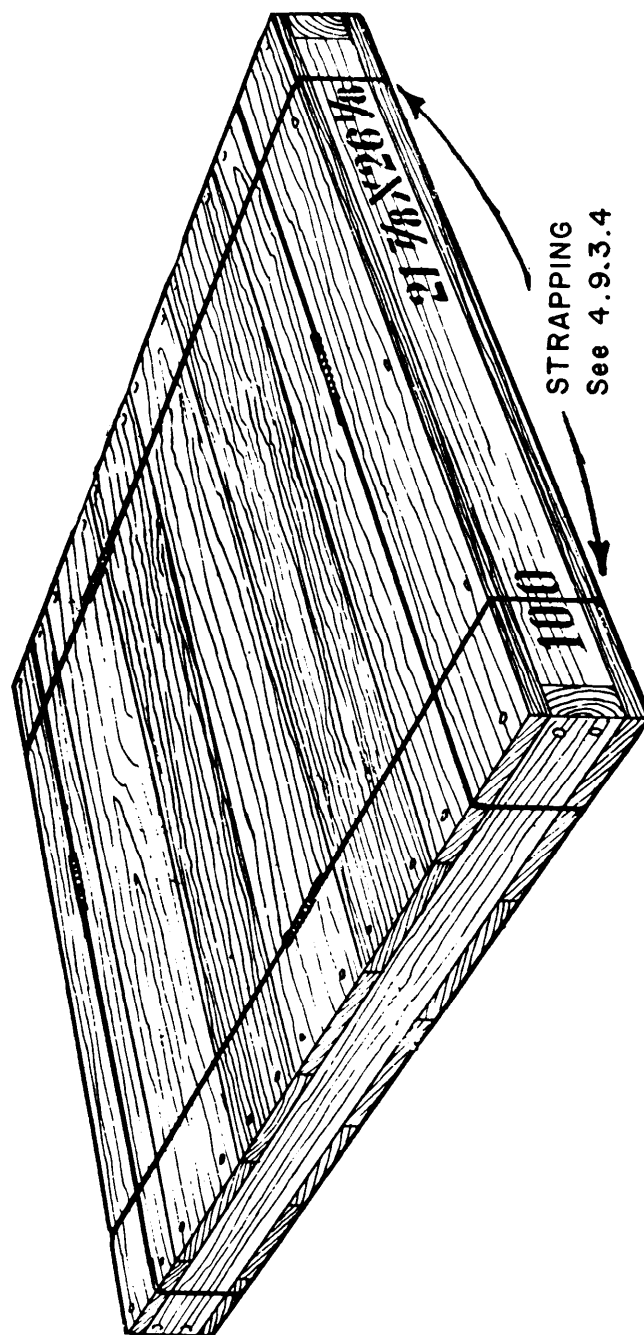


FIGURE 7. Tin plate and terne plate (short terne) boxes.

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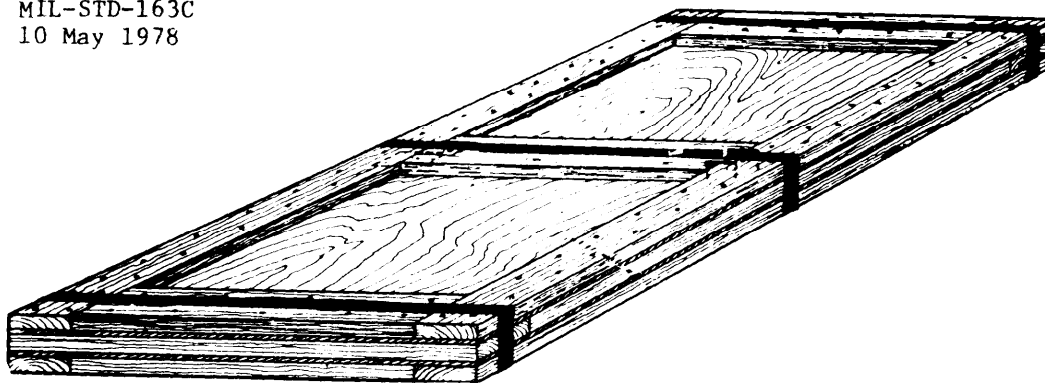


FIGURE 8. Plywood box for stainless steel plates, sheet and strip.  
(See 4.9.3.9.1).

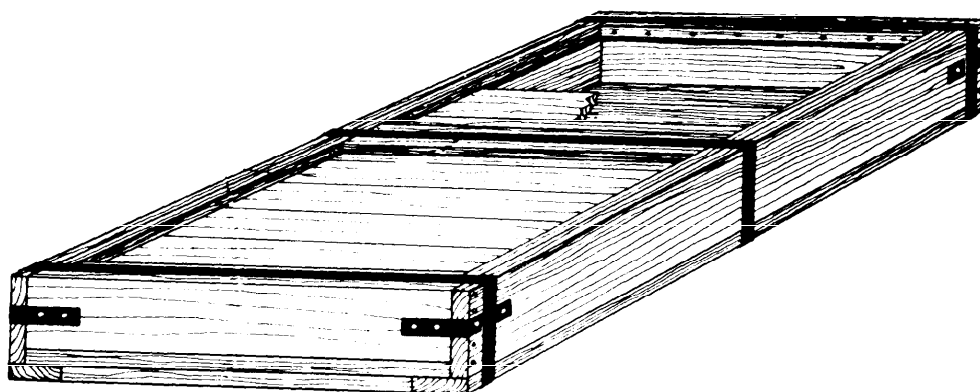


FIGURE 9. Nailed wood box for stainless steel plates, sheet and strip  
(See 4.9.3.9.2).

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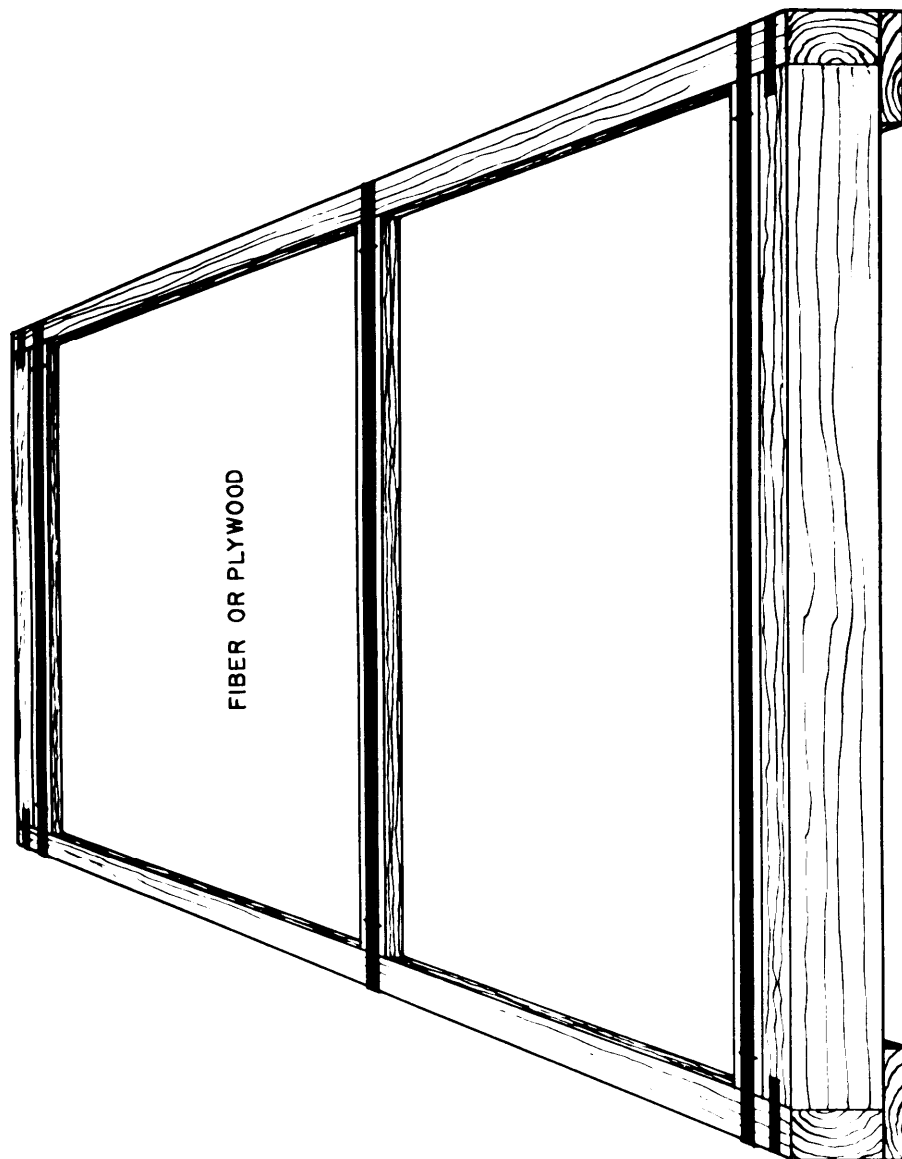
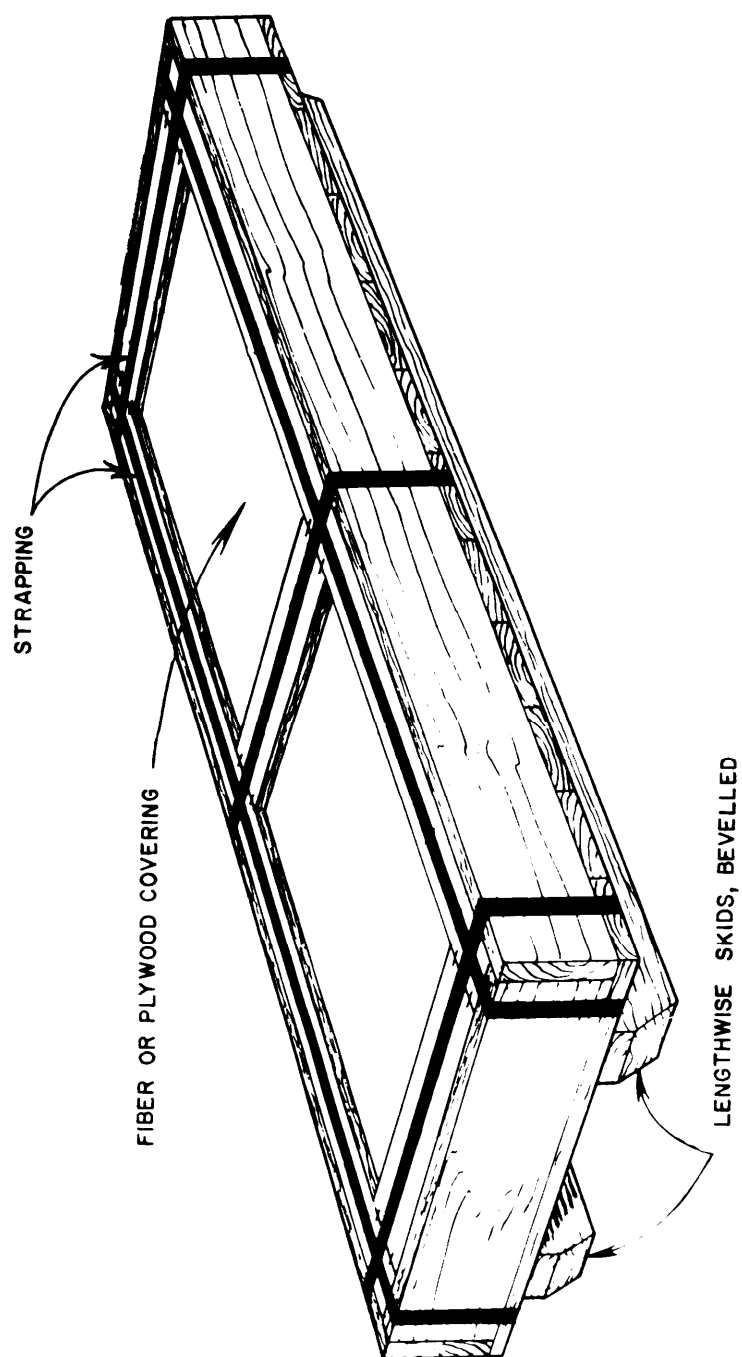


FIGURE 10. Fiber hardboard or plywood boxes for stainless steel plates, sheet and strip  
(see 4.9.3.9.3).

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FIGURE 11. Combination wood-fiber pack for cut lengths.

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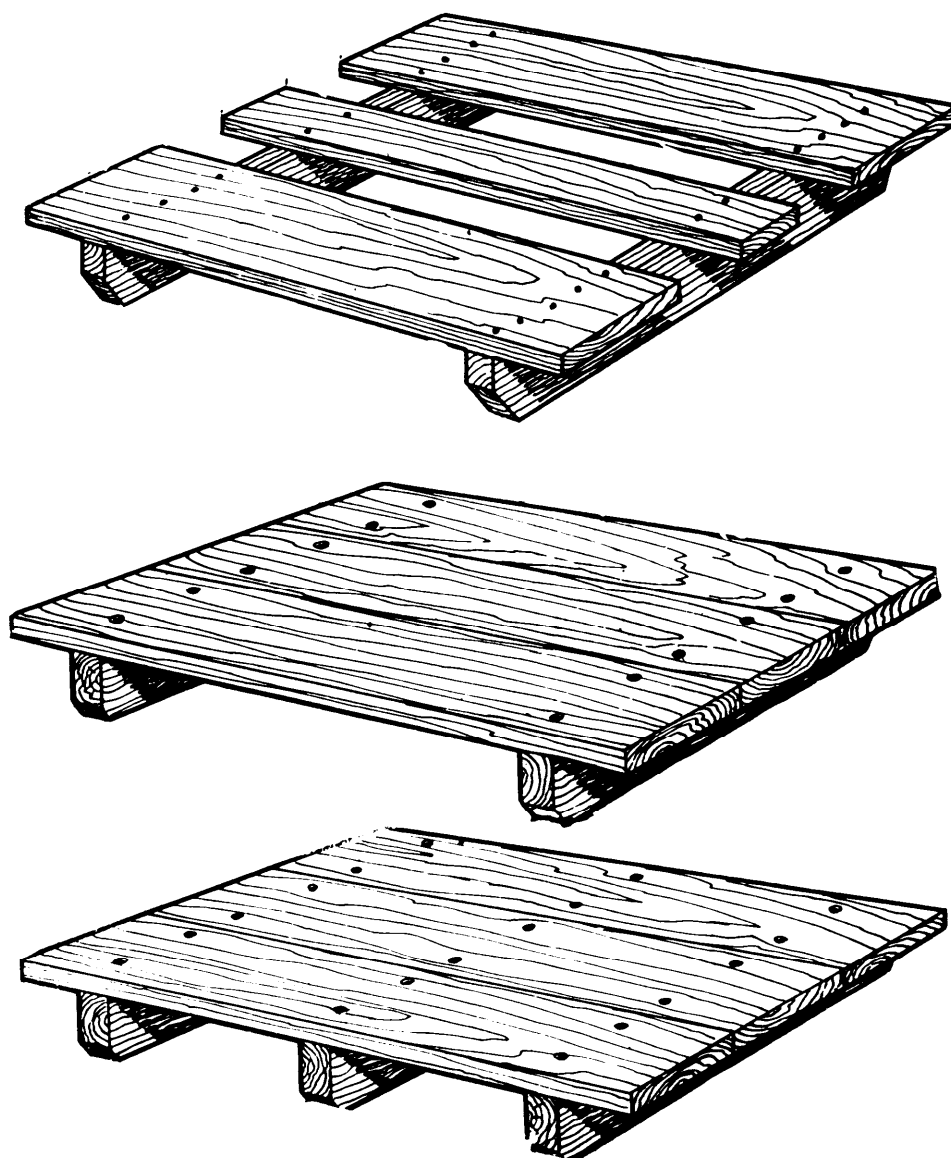
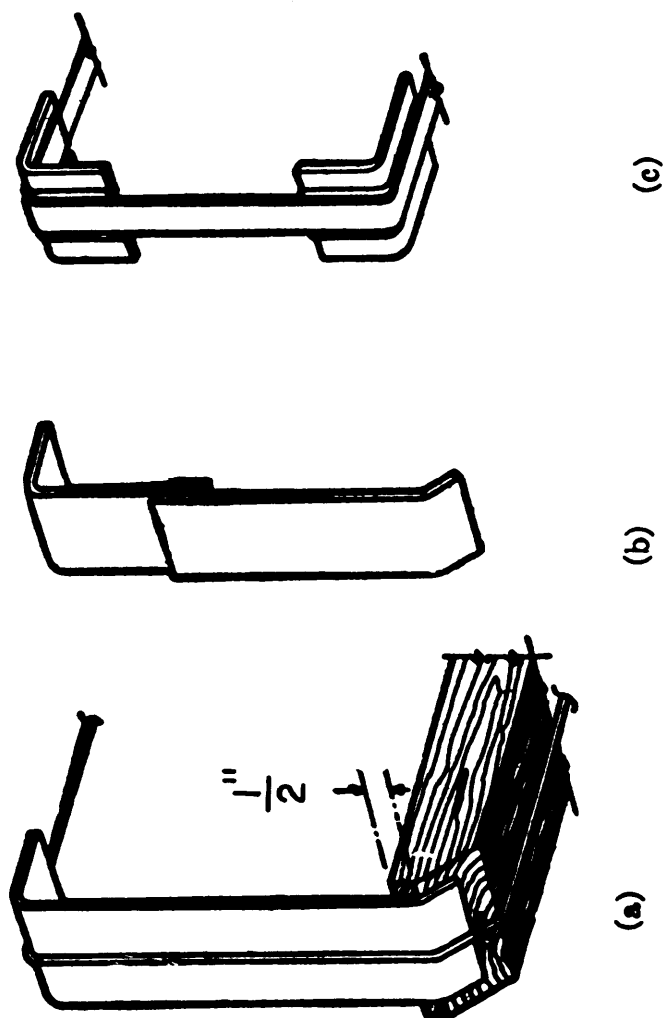


FIGURE 12. Tin mill platforms.

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**FIGURE 13. Protectors for use with skid systems.**

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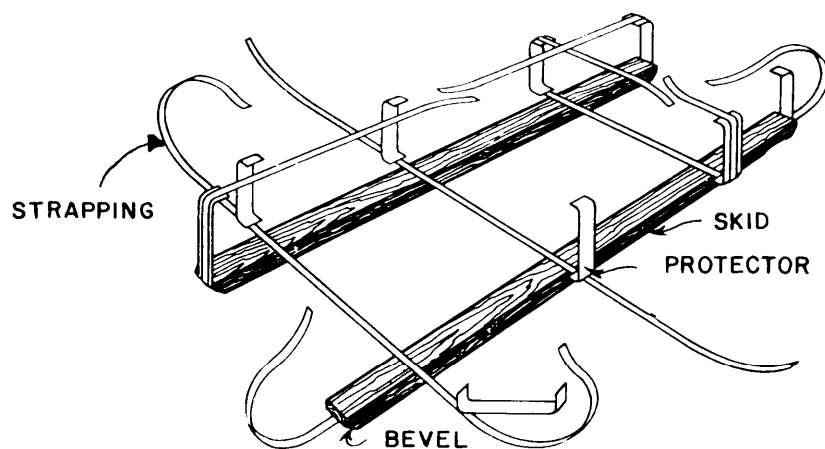


FIGURE 14. Lengthwise skid system.

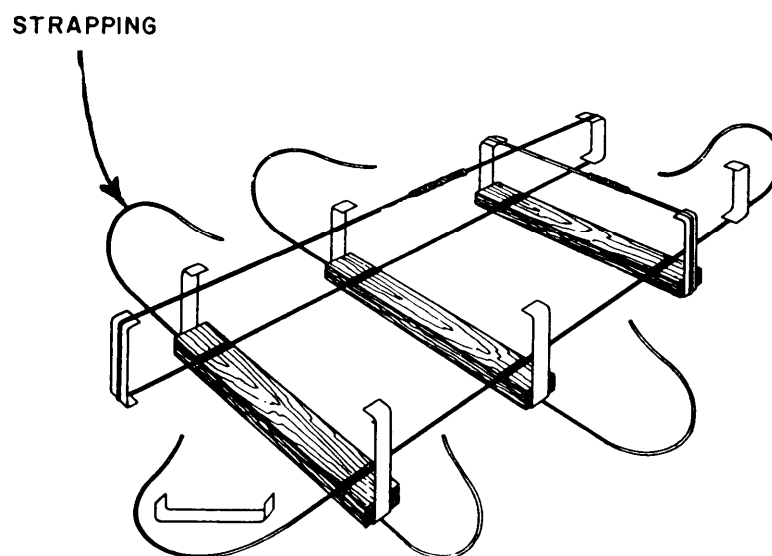


FIGURE 15. Crosswise skid system.

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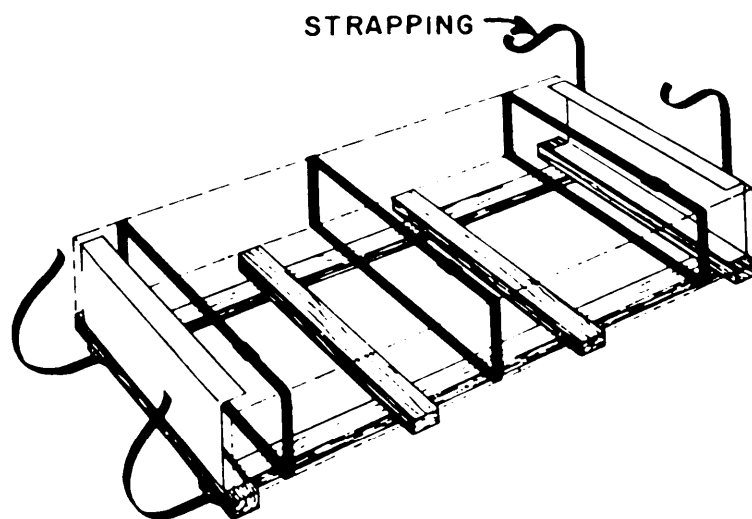


FIGURE 16. Lengthwise skids with cross bearing pieces  
(considered a skeleton platform).

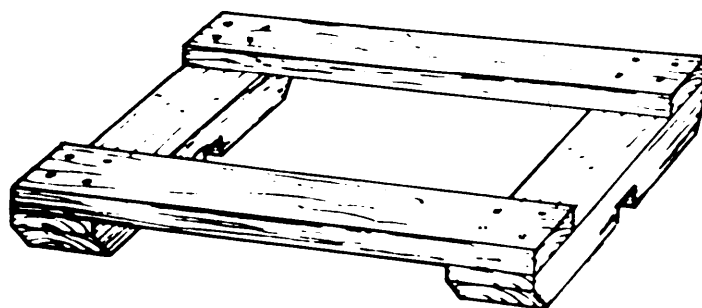


FIGURE 17. Skeleton platform.

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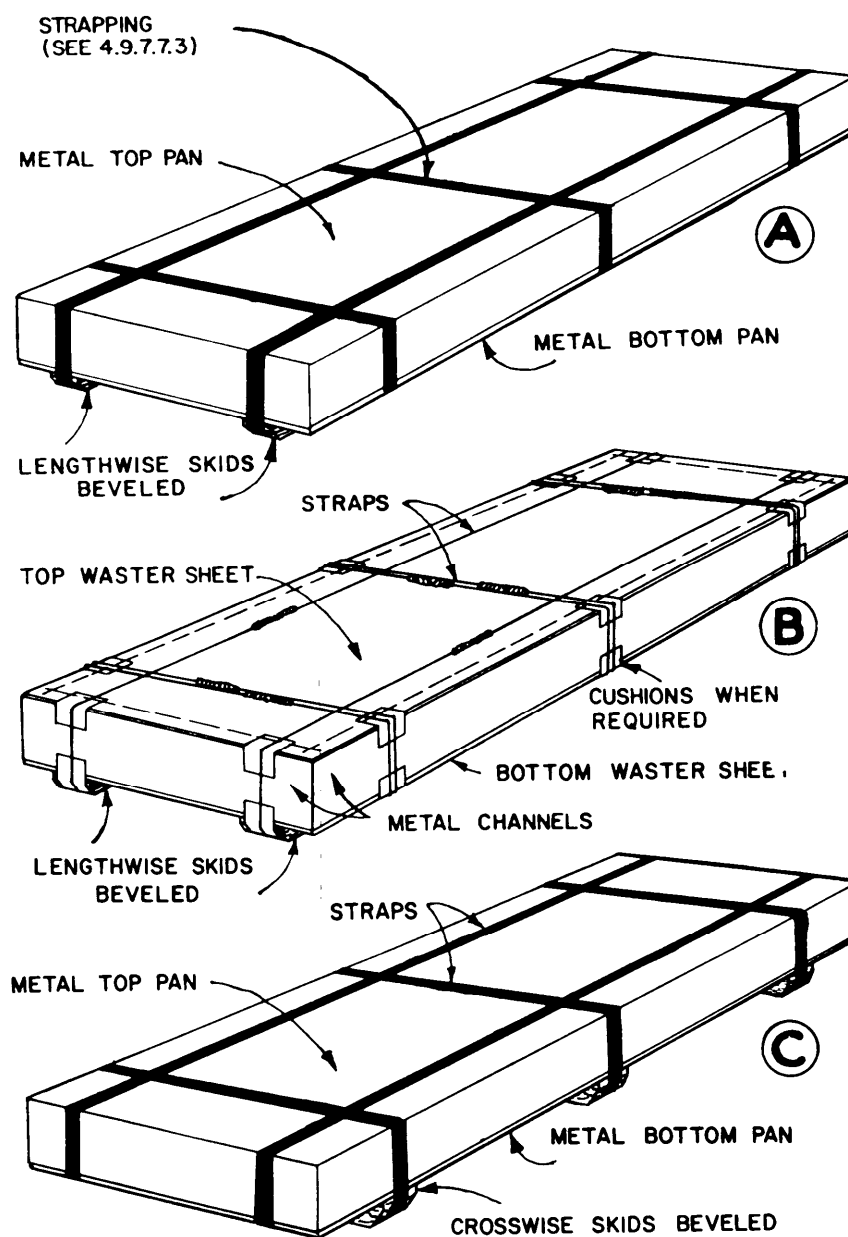


FIGURE 18. Metal packs for cut lengths.

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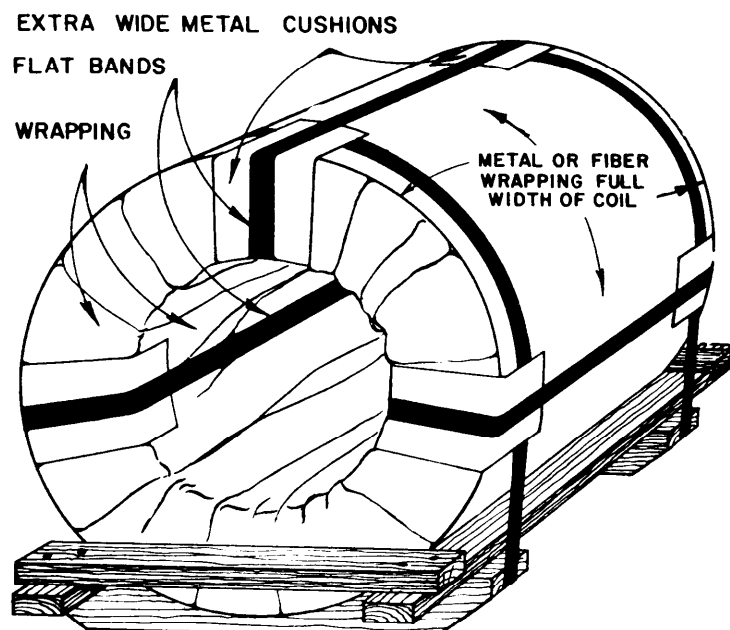


FIGURE 19. Wrapped sheet coil secured to skids.

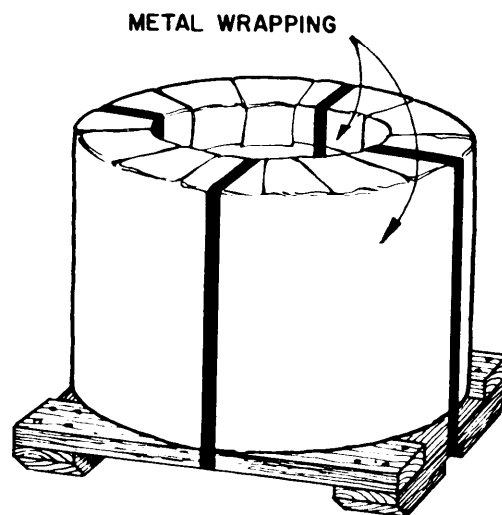


FIGURE 20. Wrapped group of narrow coils secured to platform.

X-3299

MIL-STD-163C  
10 May 1978

X-3300

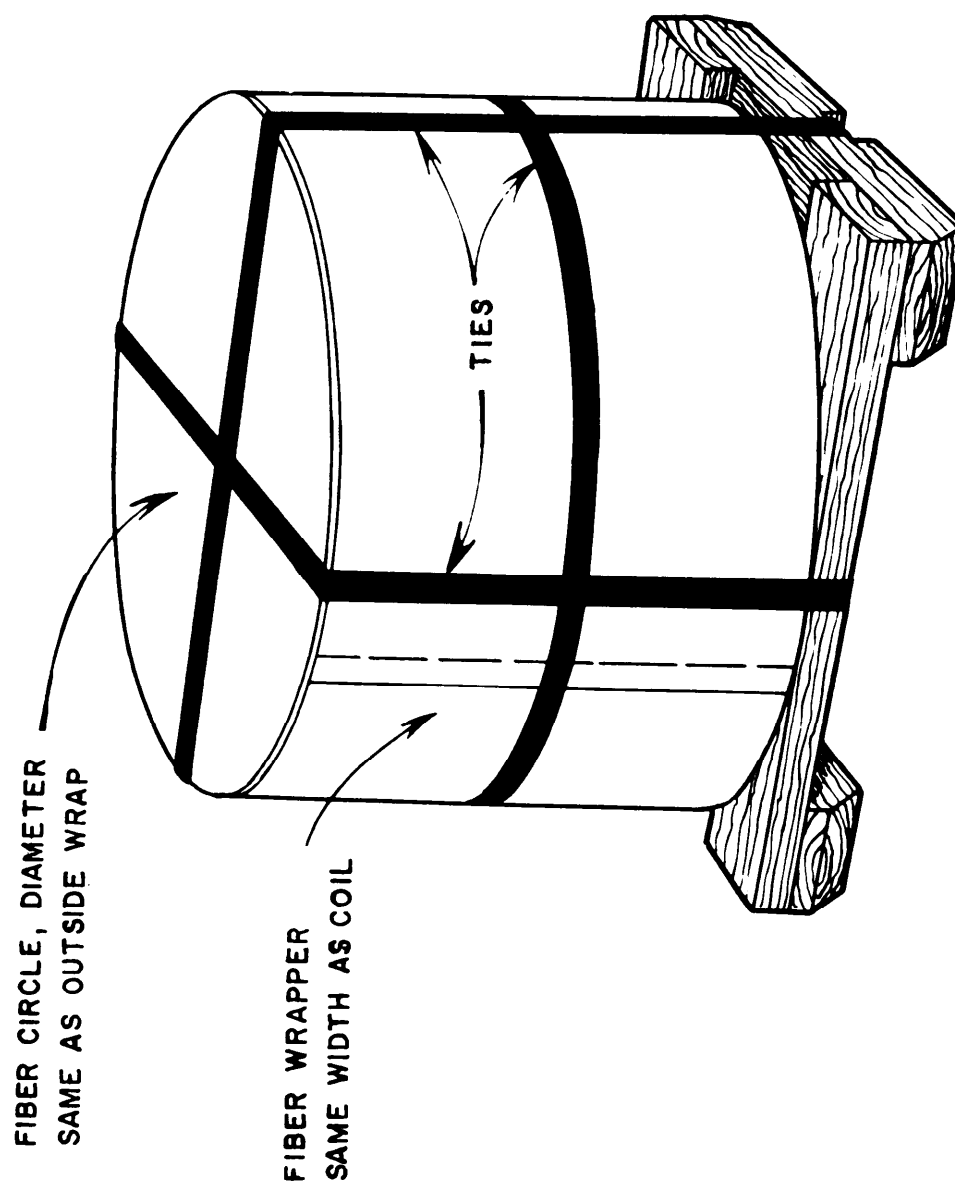


FIGURE 21. Coil wrapped with fiber-hardboard and secured to platform.

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10 May 1978

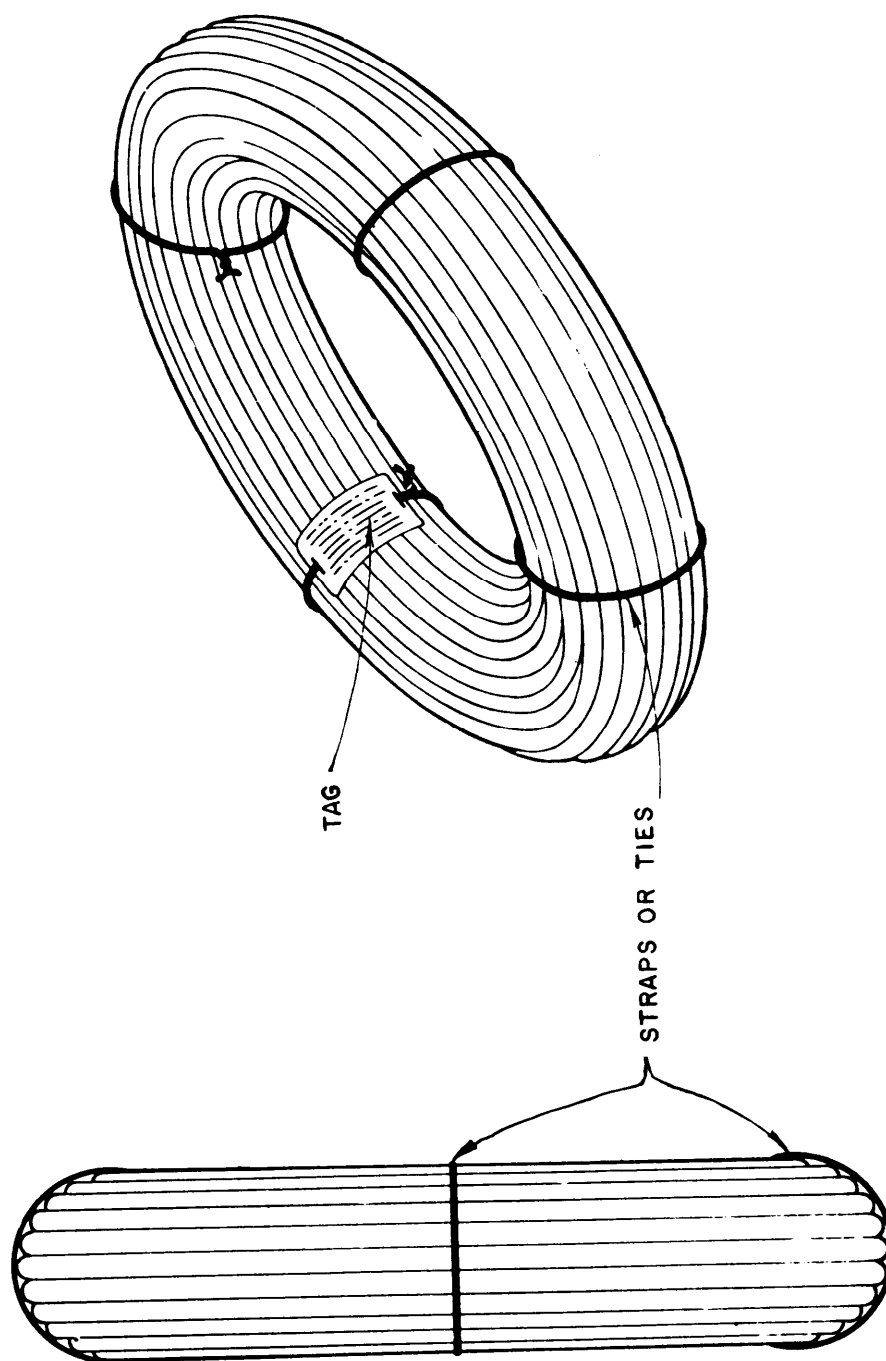


FIGURE 22. Typical rod coil.

X-3301

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10 May 1978

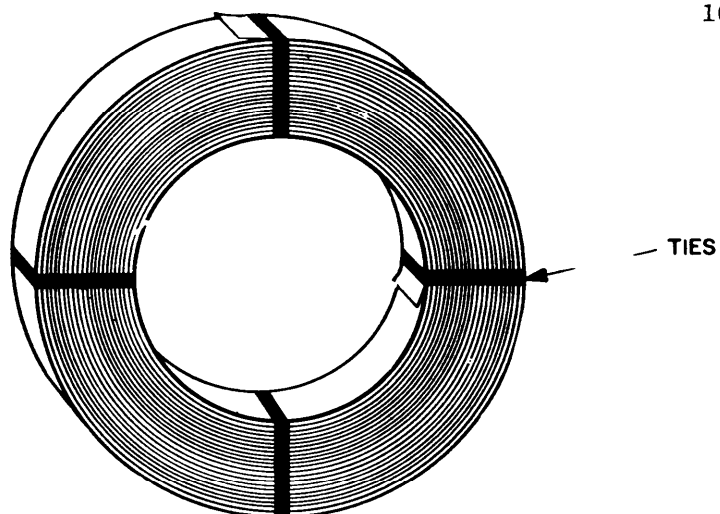


FIGURE 23. Unwrapped single coil.

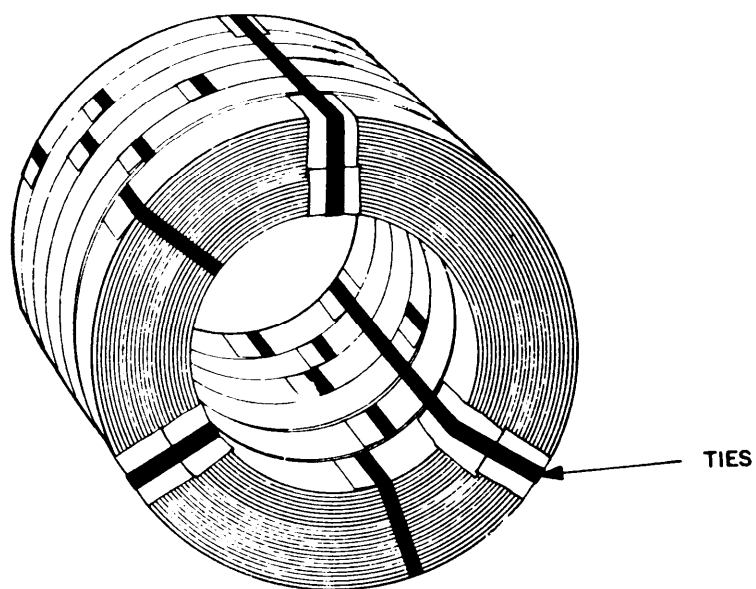


FIGURE 24. Unwrapped group of coils.

X-3302

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10 May 1978

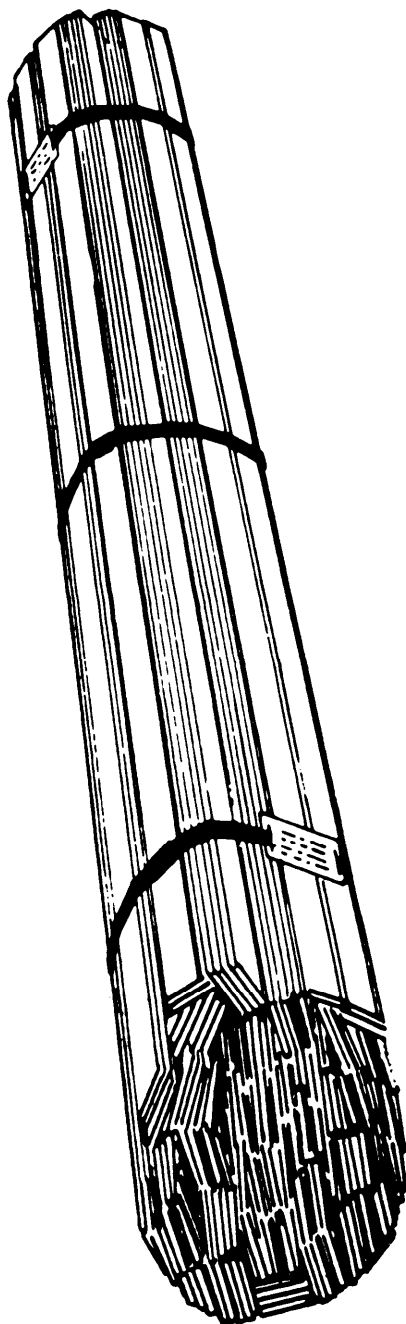
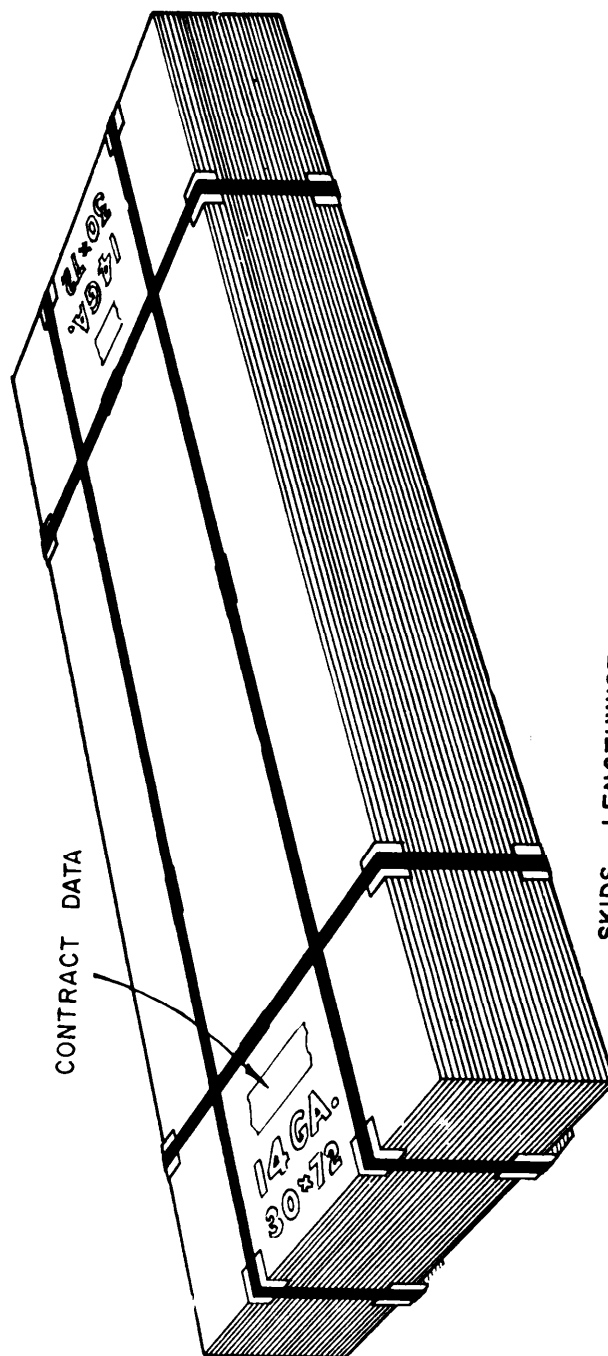


FIGURE 25. Secured lift (oval) of cut lengths.

X-3303

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X-3304



SKIDS - LENGTHWISE OR CROSSWISE FOR SHEETS  
UP TO AND INCLUDING 120" LONG  
CROSSWISE FOR SHEETS OVER 120" LONG

FIGURE 26. Typical sheet lift, lengthwise skids.

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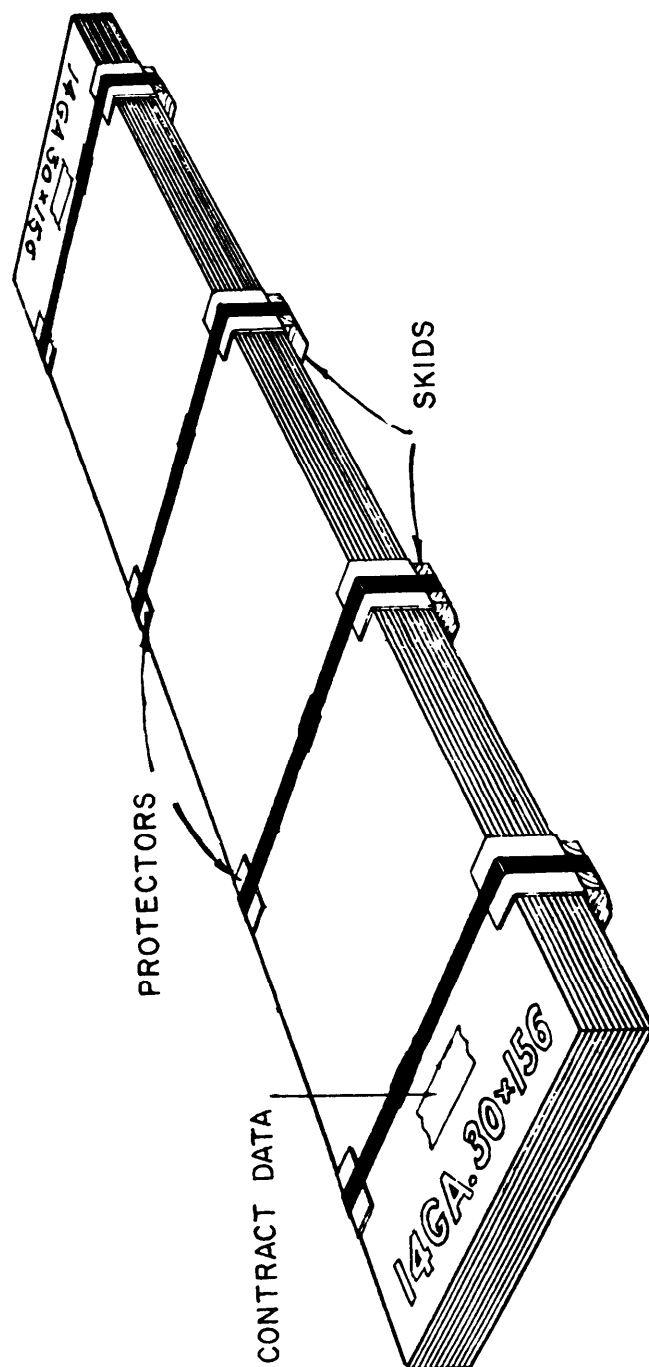


FIGURE 27. Typical sheet lift, crosswise skids.

X-3305



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10 May 1978

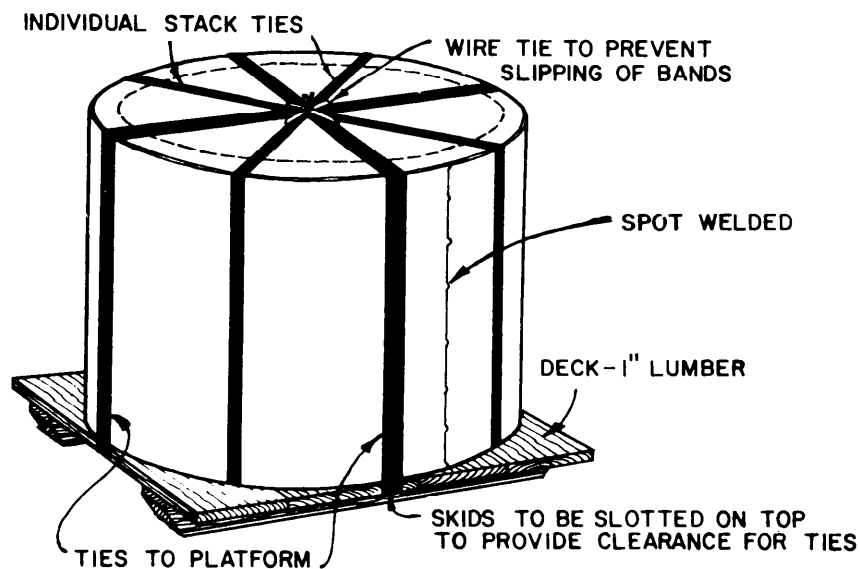
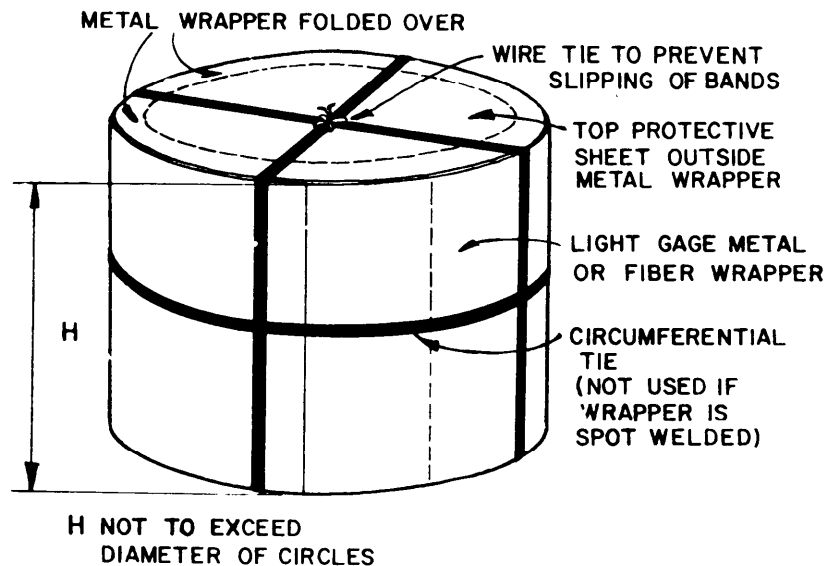


FIGURE 28. Sheet circles, method of packing.

X-3306

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10 May 1978

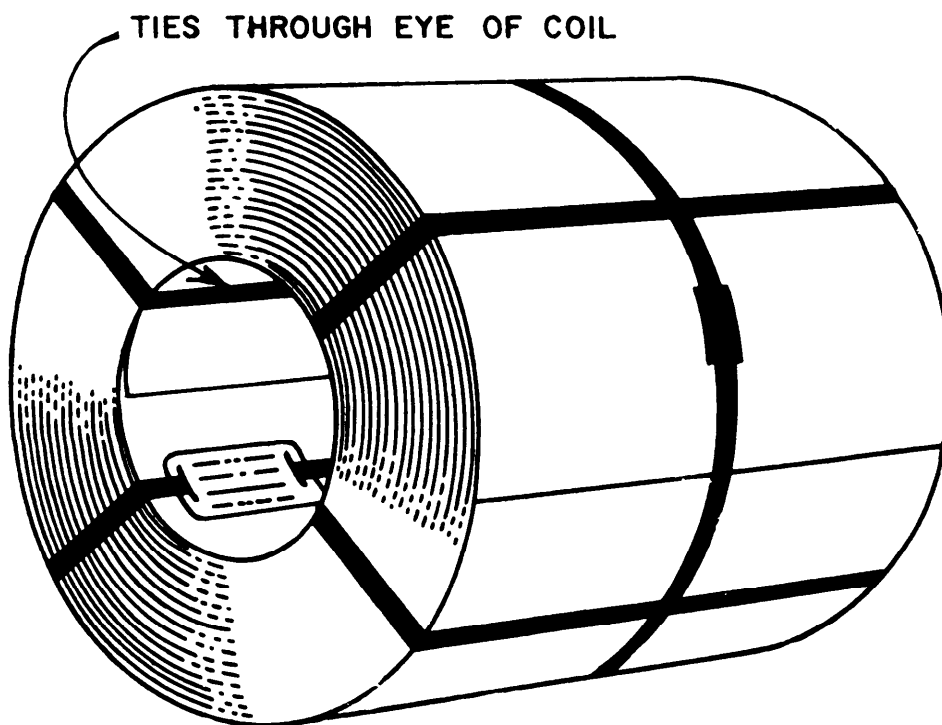


FIGURE 29. Unwrapped sheet coil.

X-3307

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10 May 1978

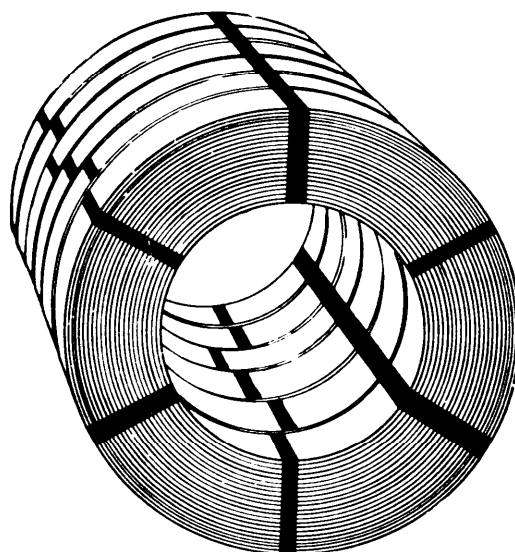


FIGURE 30. Unwrapped group of coils (strip) secured into unit.

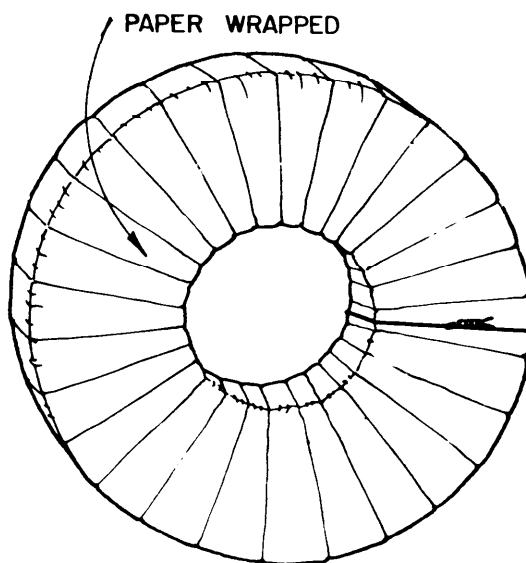


FIGURE 31. Spirally wrapped strip coil.

X-3308

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10 May 1978

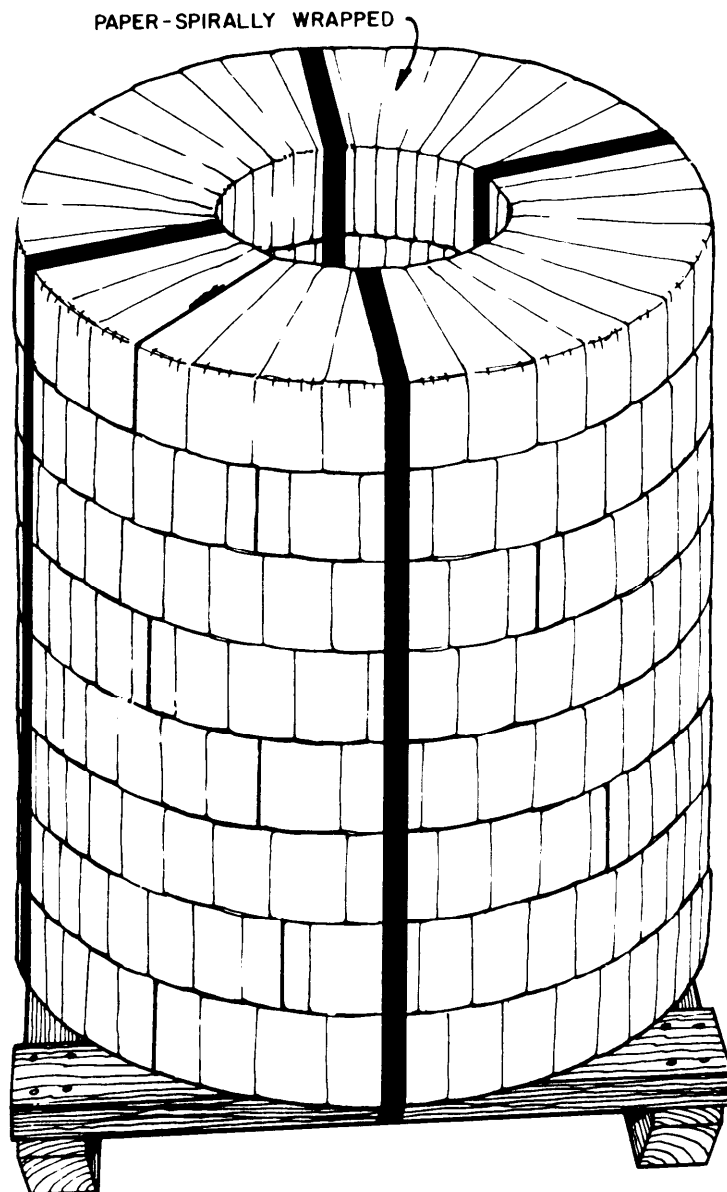


FIGURE 32. Group of spirally wrapped strip coils secured to skeleton platform.

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X-3310

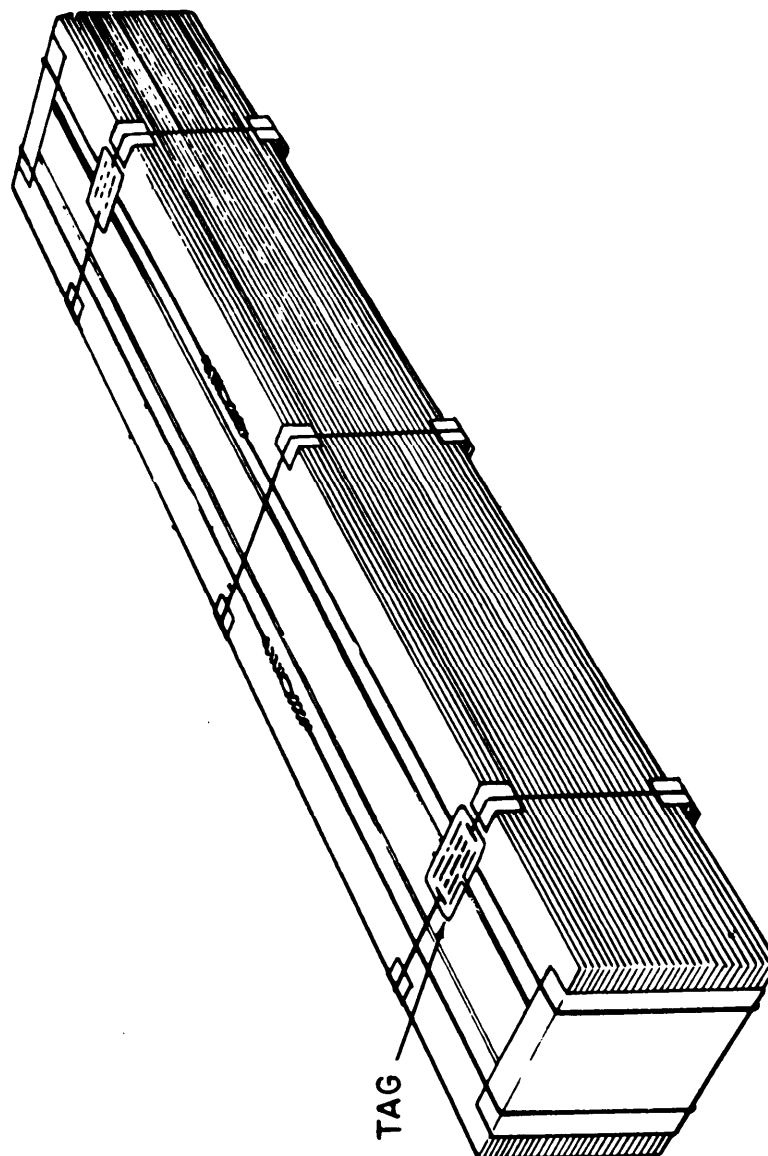


FIGURE 33. Unwrapped secured lift of strip.

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10 May 1978

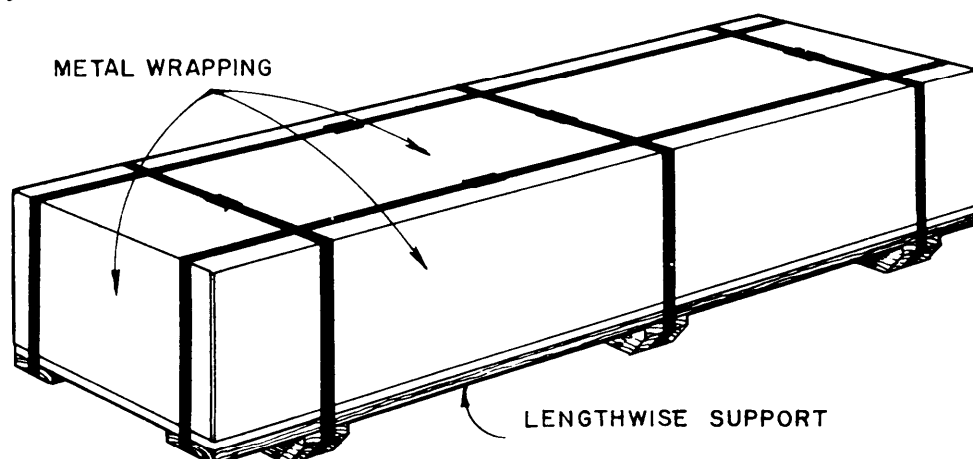


FIGURE 34. Metal wrapped lift of strip (lengthwise skids may also be used).

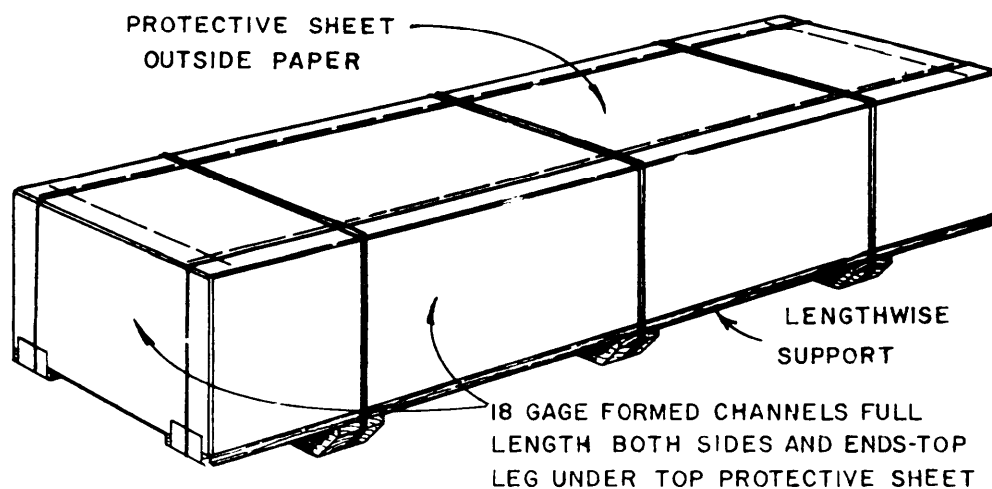


FIGURE 35. Metal wrapped lift of strip (lengthwise skids may also be used).

X-3311

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10 May 1978

X-3312

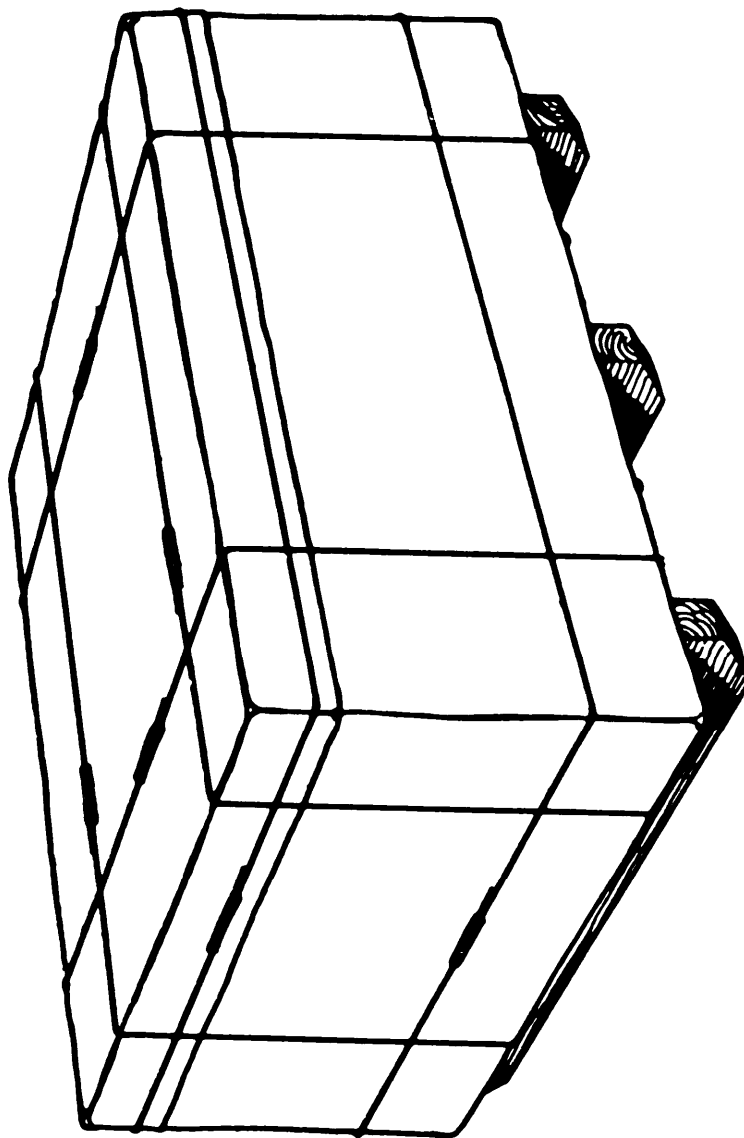


FIGURE 36. Typical multiple-pack metal wrapped unit.

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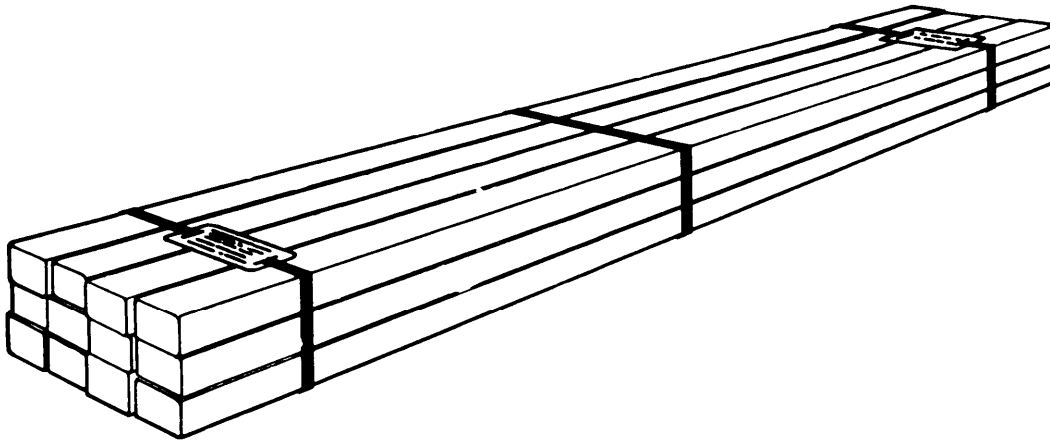


FIGURE 37. Typical secured lift of squares.

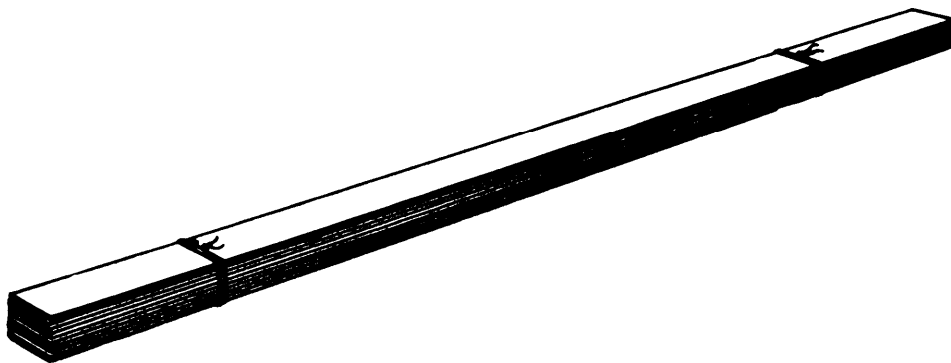


FIGURE 38. Typical hand bundle secured with soft annealed wire or mill type bands.

X-3313



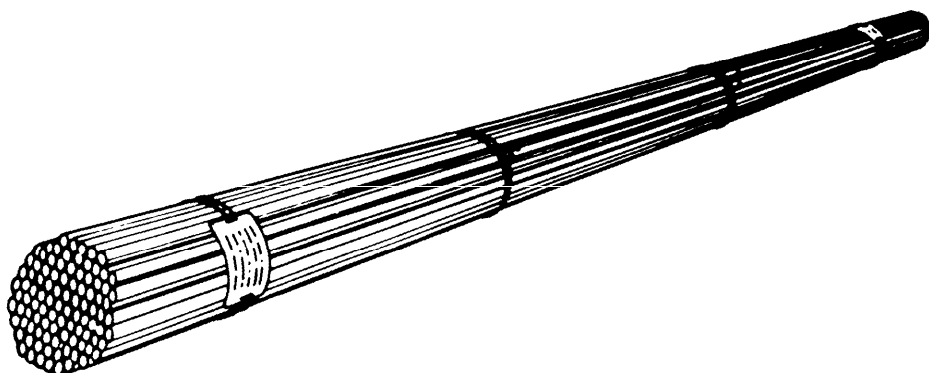


FIGURE 39. Typical secured lift of rounds.

METHOD OF INSERTING LOOSE TAG  
BEFORE COMPLETION OF BUNDLE

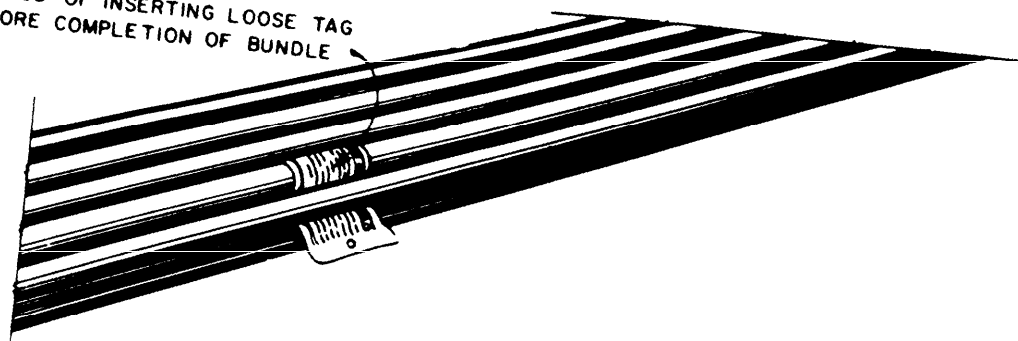


FIGURE 40. Placement of marking tag inside a secured lift.

X-3314

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10 May 1978

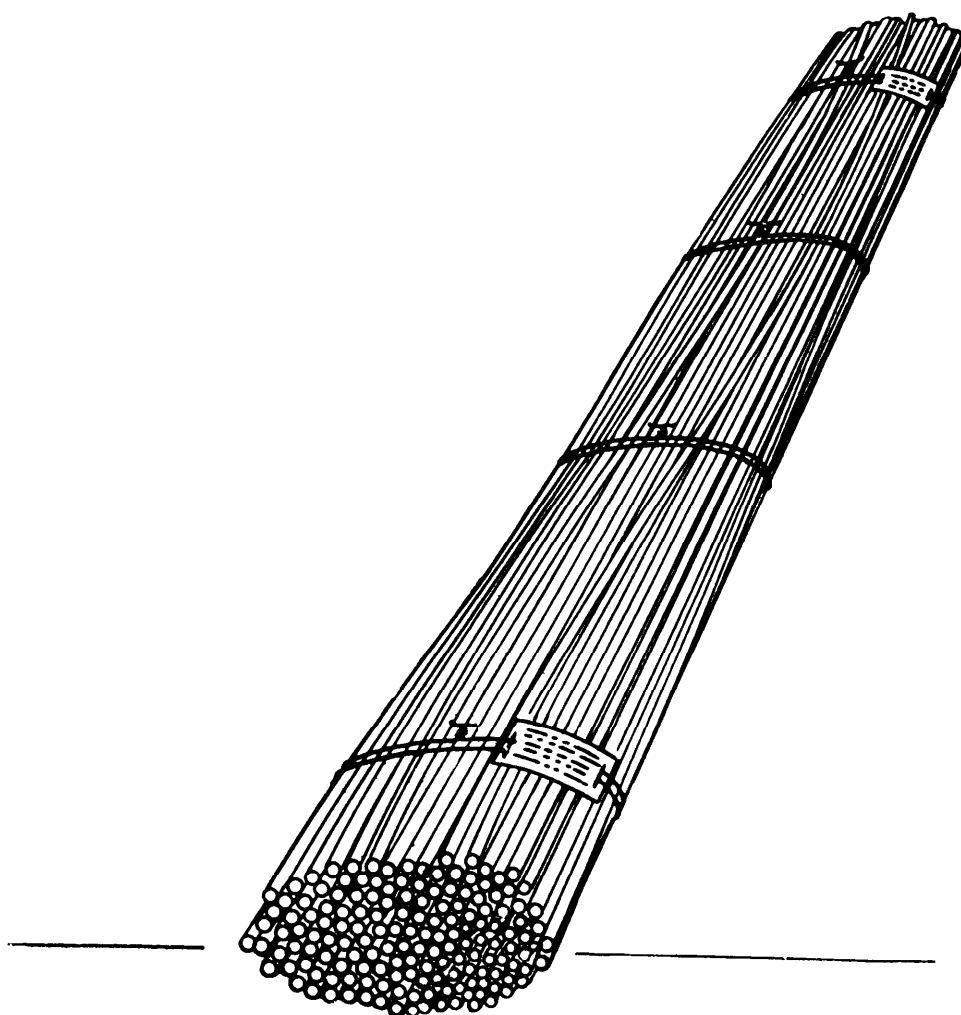


FIGURE 41. Secured lift of concrete reinforcing bars.

X-3315

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**SHEATHED LIFT (METAL CONTAINER) (SEE 4.9.11)**

**STYLE A & B - WITH WOODENDS**

**STYLE C & D - WITH FOLDED END FLAPS**

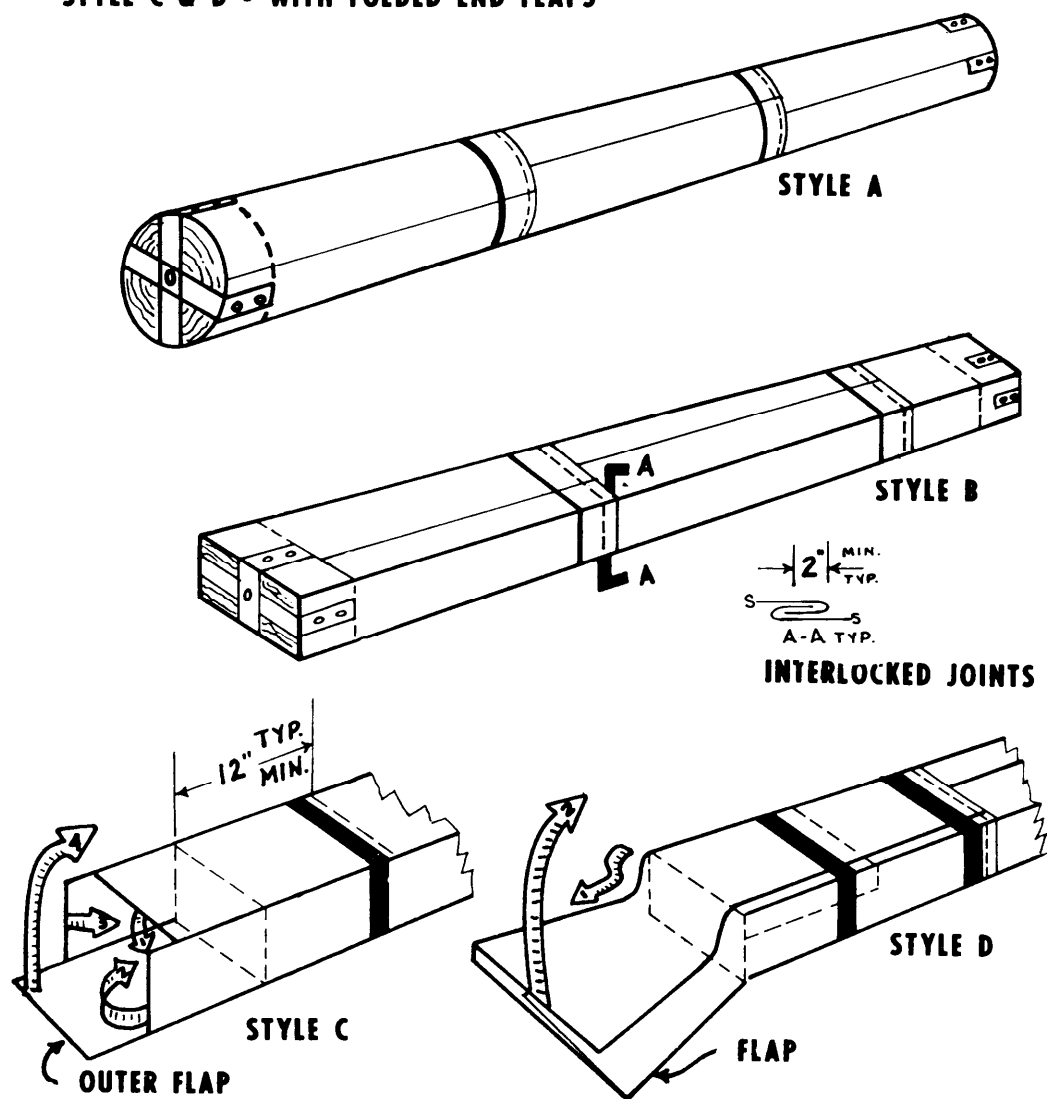


FIGURE 42

X-3316

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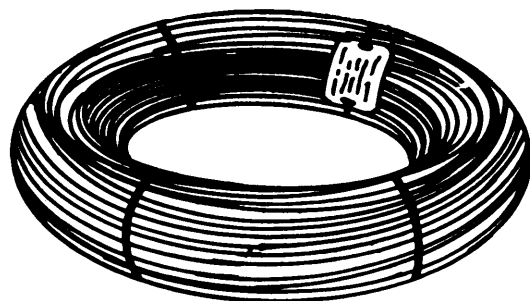


FIGURE 43. Unwrapped coil of wire.

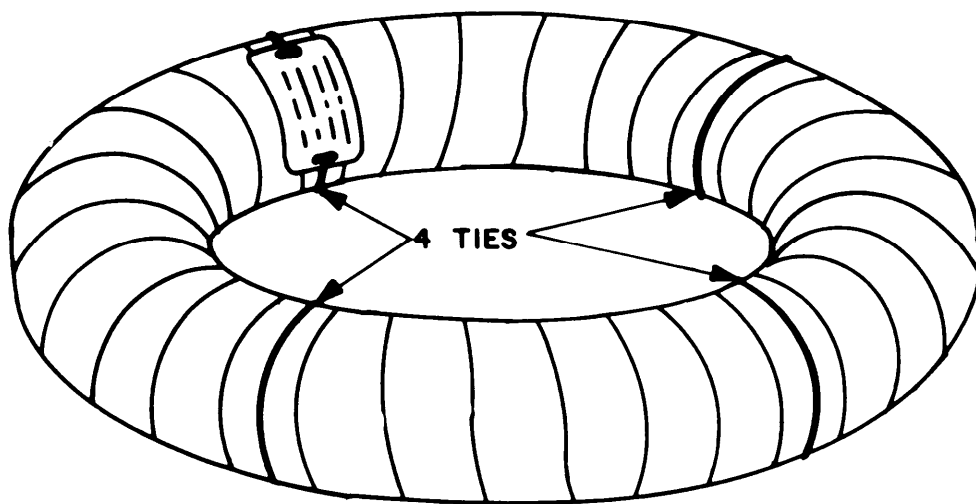


FIGURE 44. Wrapped coil of wire.

X-3317

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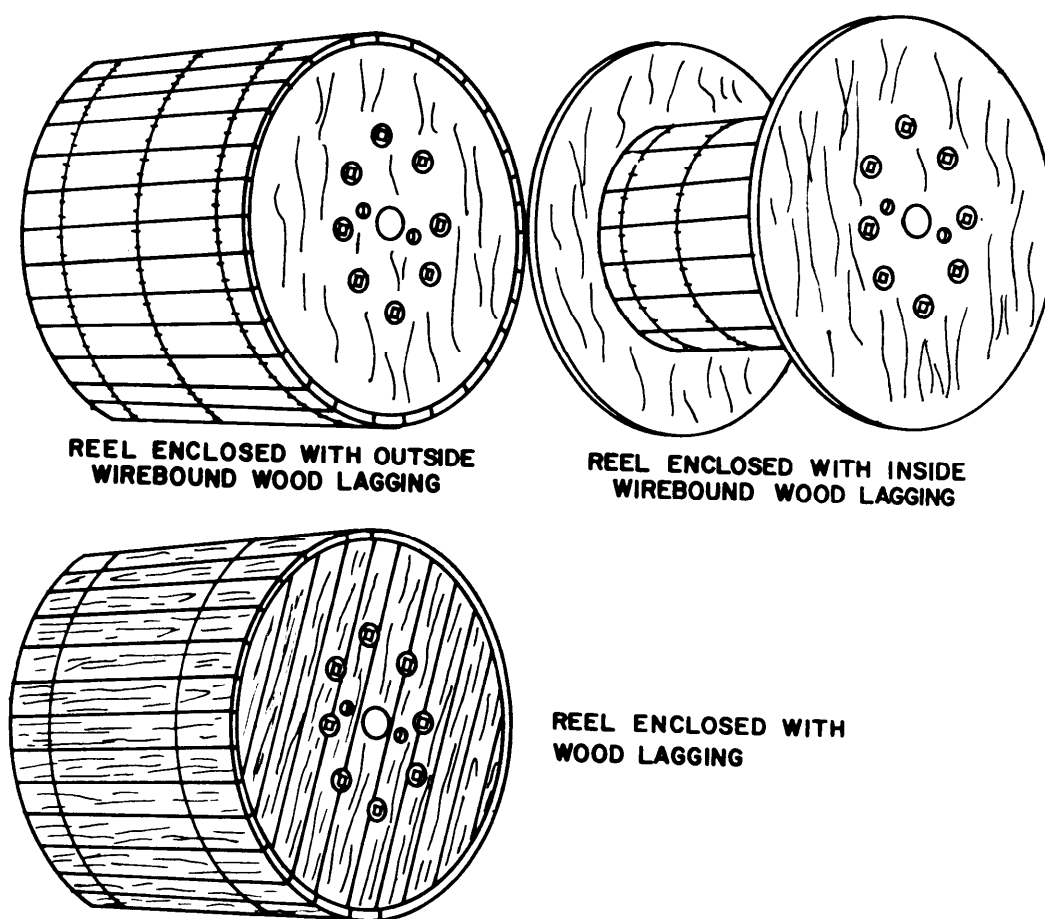


FIGURE 45. Typical reel of wire rope enclosed with wood lagging or wirebound wood lagging (see 4.9.12.1 and 5.1.1.5.3).

X-3318

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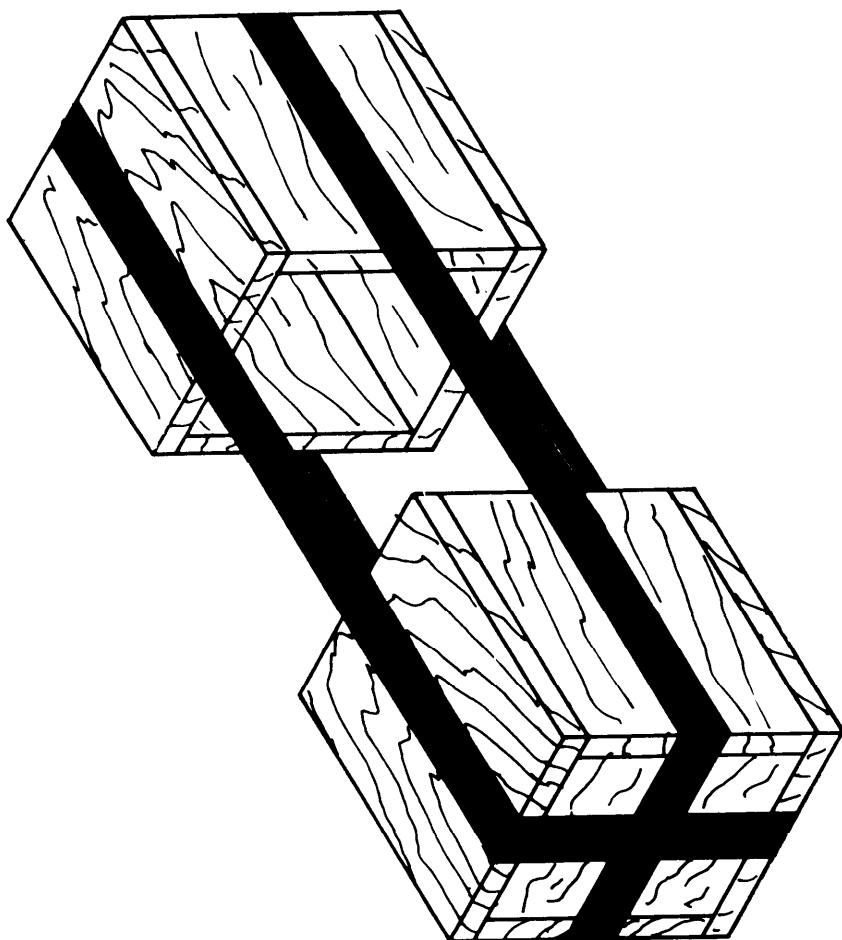


FIGURE 46. End caps for air shipment.

X-3319

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