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AEROSPACE STANDARD

AS 1130

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Revised

AIR-LAND DEMOUNTABLE CARGO PALLETS

1. PURPOSE

The purpose of this Aerospace Standard is to provide a specification for air-land demountable cargo pallets. Pallet nets used in conjunction with these pallets are described in AS 1131.

2. SCOPE

2.1 This specification establishes dimensional, structural, and environmental requirements for a series of air-land cargo pallets which are compatible with AS 832, Air-Land Demountable Cargo Containers.

2.2 Pallet nominal dimensions are given in Table I. Pallets are further classified as to handling provisions:

2.2.1 Type I pallets are designed for use on conveyor systems only and incorporate no lifting provisions.

2.2.2 Type II are designed for use on conveyor systems and provide for additional handling as follows:

2.2.2.1 Type II-A pallets have fittings at corners to allow handling by crane and sling.

2.2.2.2 Type II-B pallets have forklift pockets for handling by forklift trucks.

2.2.2.3 Type II-C pallets incorporate all the handling provisions of Type II-A and II-B.

3. REQUIREMENTS

3.1 General:

3.1.1 Unless otherwise stated, all requirements listed below apply to all types of pallets covered by this specification.

3.1.2 Materials: Materials shall be those which experience and/or tests have demonstrated to be suitable and dependable for use on aircraft and in the handling of cargo.

3.1.3 Dimensions: External dimensions of pallets shall be as specified in Table I and Figure 1.

3.1.4 Construction: Construction shall be rugged, weatherproof, and minimizing maintenance and original cost by eliminating unnecessary moving parts such as movable lifting or securing devices. All fittings and appurtenances shall be within maximum overall outside dimensions of pallets. (Mating devices that support, transfer, position and secure pallets shall be provided by transportation carrier, transferring equipment or terminal facility.) Pallet construction shall have sufficient structural strength to withstand without permanent deformation the static and dynamic loads and the impact shock encountered in normal carrier service.

3.1.5 Cresting: Pallets shall be capable of traversing a 2 degree crest or valley with no permanent deformation or damage. To meet this condition, pallets uniformly loaded to gross weight shall be capable of being supported at the cresting point through a roller contact of 80 inch minimum width with a roller of 1.5 inch maximum diameter.

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TABLE I PALLET DIMENSION [1]

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OVERALL LENGTH L. IN.	OVERALL WIDTH W. IN.	MINIMUM THICKNESS T. IN.	A. IN.	B. IN.	C. IN.	D. IN.
+ 0 117.75 - .187	96 + 0 -.187	[2]	9.42	15.43	9.37	16.5
+ 0 238.5 - .25	96 + 0 -.187	[2]	9.42	15.43	8.75	17.0

NOTES

[1] See Figure 1 for Dimension Locations

[2] For Type I 2.0 Inches
For Type II 5.5 Inches

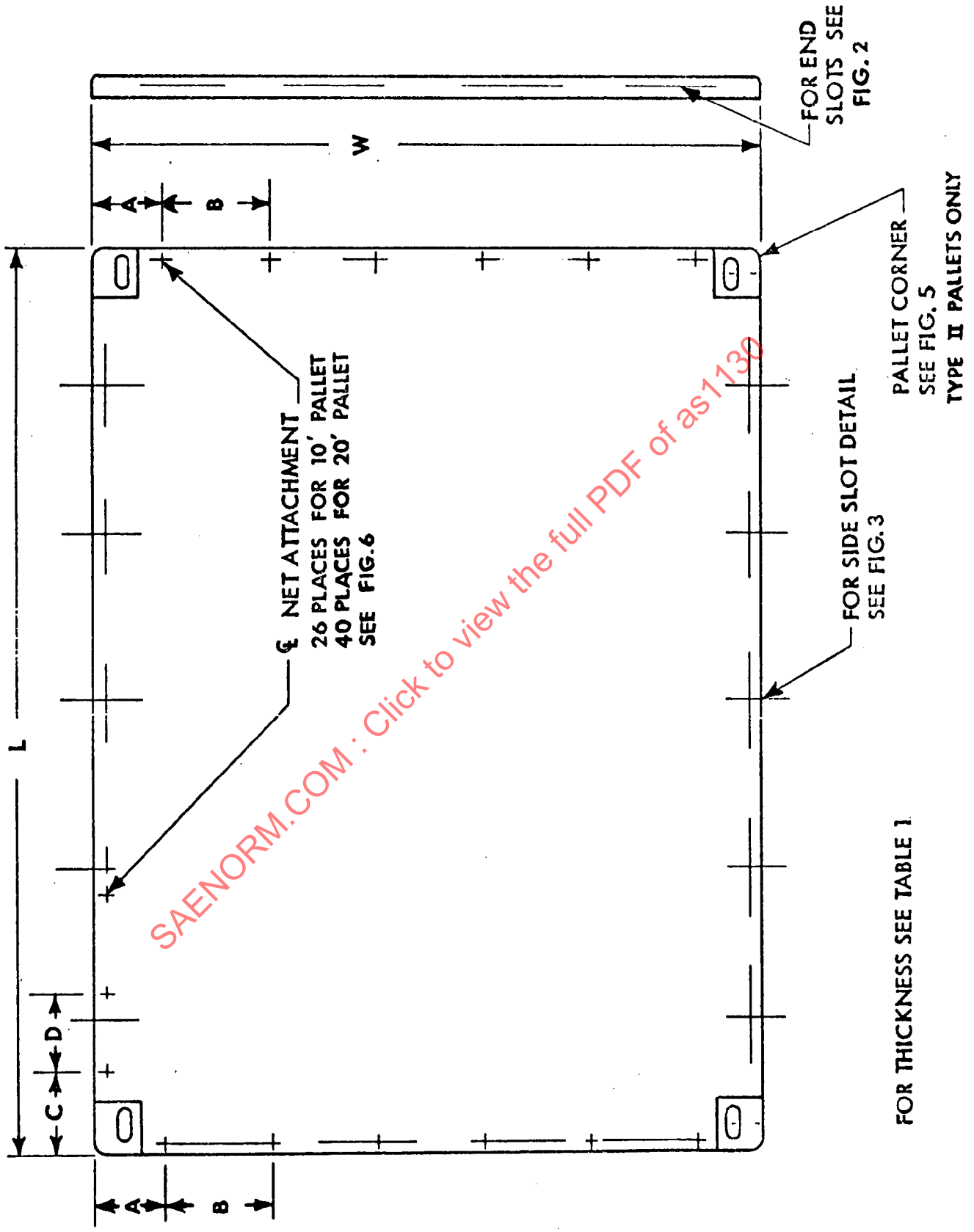


Figure 1 : SAE PALLET AS1130

3.1.6 Pallet Surfaces: The top and bottom surface of the pallet shall be parallel, flat and continuous. No structure shall protrude below the lower surface. It shall provide for support and ease of movement of the rated distributed load in minimum conveyor systems described in paragraphs 3.1.6.1, 3.1.6.2, and 3.1.6.3.

3.1.6.1 Four rows of rollers equally spaced over a minimum width of 76 inch measured between centers with each row composed of 1.5 inch diameter rollers 3 inch long and spaced on 10 inch centers. Pallet must travel perpendicular to roller axes.

3.1.6.2 Swivel casters with 1 inch diameter wheels and contact length 2 inch located on 12 inch x 12 inch grid pattern. Pallets must travel in any direction.

3.1.6.3 Ball transfer units with 1 inch diameter balls located on 5 inch x 5 inch grid pattern. Pallets must travel in any direction.

3.1.7 The pallet edges (length "L") shall have a minimum thickness of 2 inch from the lower surface for Type I and 5.5 inch from lower surface for Type II.

3.1.8 Type II pallets shall incorporate fittings on all four corners conforming to Figure 5 and/or tineways for fork lifting per Figure 4. The fittings shall have top, bottom, end, and side openings that will accommodate hooks, shackles, slings, or other engaging pickup devices mounted on spreaders for manual, semi-automatic, or automatic operation.

3.1.9 Net attachments shall be compatible with configuration per Figures 1 and 6.

3.1.10 The edges of the pallet between the restraint provisions shown in Figure 3 shall be smooth and continuous except for the tineways and corner fittings. No projections shall be allowed from this surface.

3.2 Design Loads:

3.2.1 The pallet shall be designed for the following gross weight:

(a) 10 ft pallet - 12,500 pounds
(b) 20 ft pallet - 25,000 pounds

The 20 ft pallet shall be designed for a gross weight of 14,900 pounds in any 10 ft section of the pallet.

3.2.2 While supported on a roller system in accordance with paragraph 3.1.6.1, the pallet loaded to gross weight shall withstand the following load factors with the cargo's center of gravity assumed to vary:

(a) Plus and minus 5% of the pallet length measured from the centerline;

(b) Plus and minus 10% of the width (96 in.) measured from the centerline;

(c) 48 inch vertically measured from pallet bottom surface;

(d) To achieve above asymmetric conditions, cargo density shall be assumed to vary linearly.

3.2.2.1 The pallet shall be designed to the following operational load factors when the load is restrained to the pallet.

Forward	- 1
Aft	- 1
Up	- 1
Down	- 3
Side	- 1

Under these conditions, the pallet shall exhibit no permanent deformation.

3.2.2.1 Continued:

The pallet shall be designed for the following ultimate load factors based on its gross weight when the load is restrained to the pallet.

Forward	- 1.5
Aft	- 1.5
Up	- 2.5
Down	- 5.0
Side	-1.5

Under ultimate load conditions, the pallet may exhibit permanent deformation but will not rupture to the extent of discharging cargo.

All loads are mutually exclusive except that a 1 g down load may be considered to act concurrently with forward, aft, and side load.

3.2.2.2 Fore, Aft, Up loads shall be reacted by a minimum fitting as shown in Figure 8 inserted in side restraint slots shown in Figure 3. The design shall allow the fore and aft loads to be reacted by the following number of load bearing slots along one side of the pallet only:

10 ft pallet - 2 slots
20 ft pallet - 5 slots

The ultimate fore and aft load for any slot shall be 18,750 pounds. The load bearing slots shall be considered to be either one or both sides of the pallet.

Up load shall be reacted by a minimum fitting as shown in Figure 9 inserted in the side restraint slots shown in Figure 3. The pallet shall be designed to be restrained against vertical loads with 50% to 60% of the total number of slots equally distributed on each side.

3.2.2.3 End restraint slots as shown in Fig. 2 shall be designed to restrain a 10 ft pallet for ultimate forward, aft and vertical up loads when used in conjunction with restraint fittings in accordance with Figure 7.

3.2.2.4 Each of the four base corners of the pallet shall be capable of reacting a 18,750 pound load in either the longitudinal or lateral direction.

3.2.3 The pallet shall withstand without permanent deformation a forklift wheel load of 6,000 pounds on each of two wheels on 30 inch centers anywhere on the pallet and 9,000 pounds per wheel within 1.5 ft of any edge while resting on a surface of sufficient strength and continuity to adequately support the pallet. (Wheel footprint is assumed to be 22 square inches with a width of 7 inch.)

3.2.4 Type II-A and II-C pallets shall be capable of withstanding without permanent deformation a uniformly distributed load equal to twice gross weight while supported by slings or frames connected to the four corner fittings.

3.2.5 Type II-B and II-C pallets shall be capable of withstanding without permanent deformation a uniformly distributed load equal to twice gross weight while supported by a forklift truck.

3.2.6 While supported on a roller system in accordance with paragraph 3.1.6.1, the pallet shall withstand 400 pounds per square foot using operational load factors per paragraph 3.2.2.1.

3.3 Environmental Criteria:

3.3.1 The pallet shall be designed and built using materials which will provide maximum serviceability under intended environmental conditions.

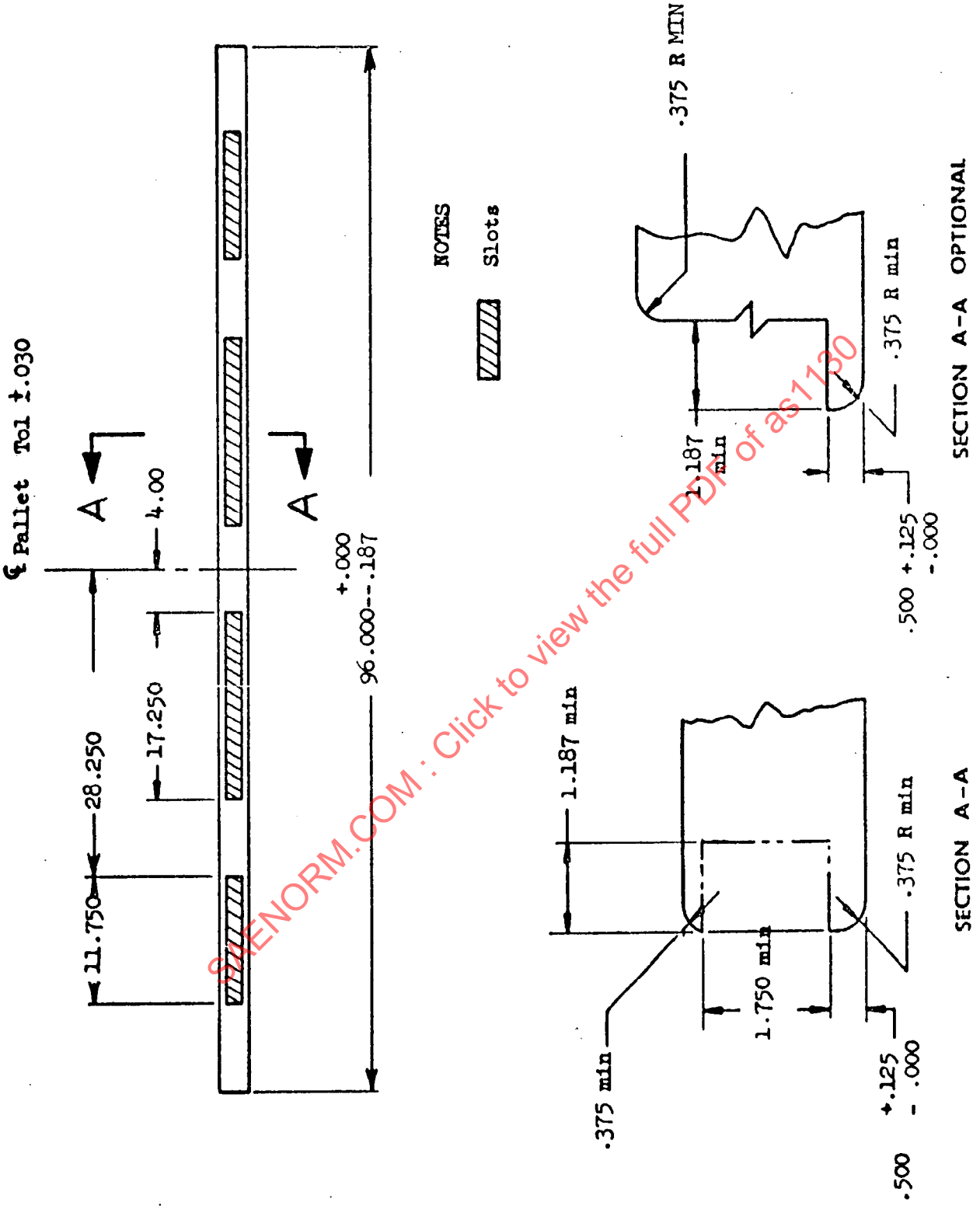
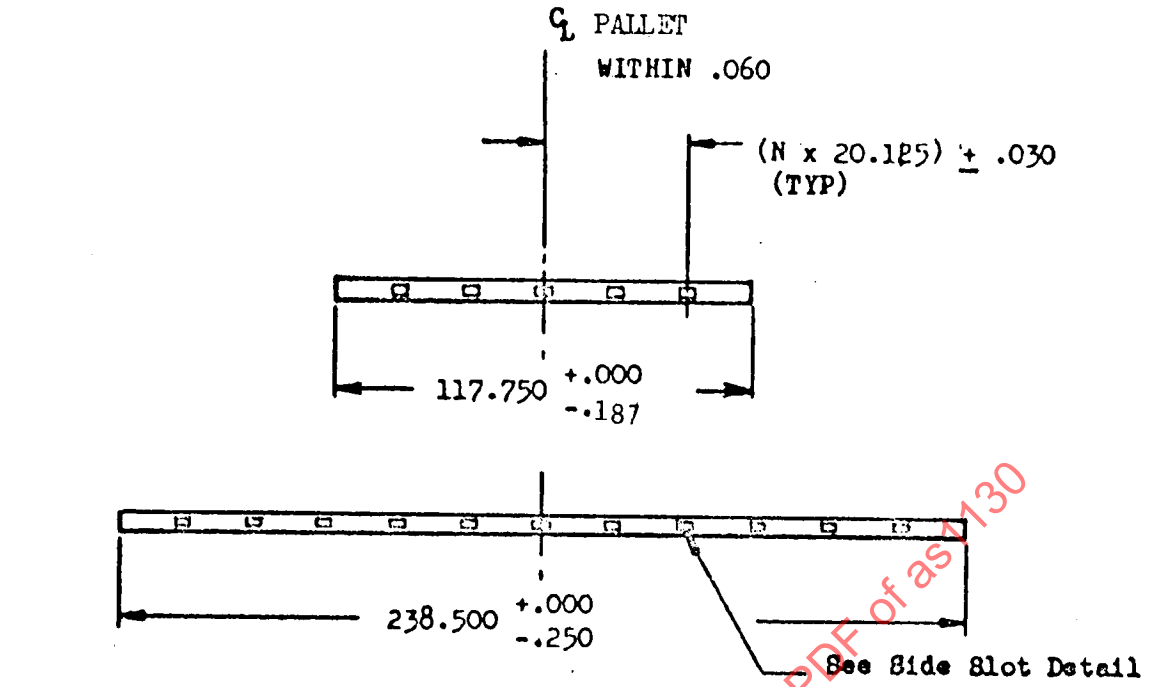


Figure 2 ; END SLOTS
AS 1130 Pallet



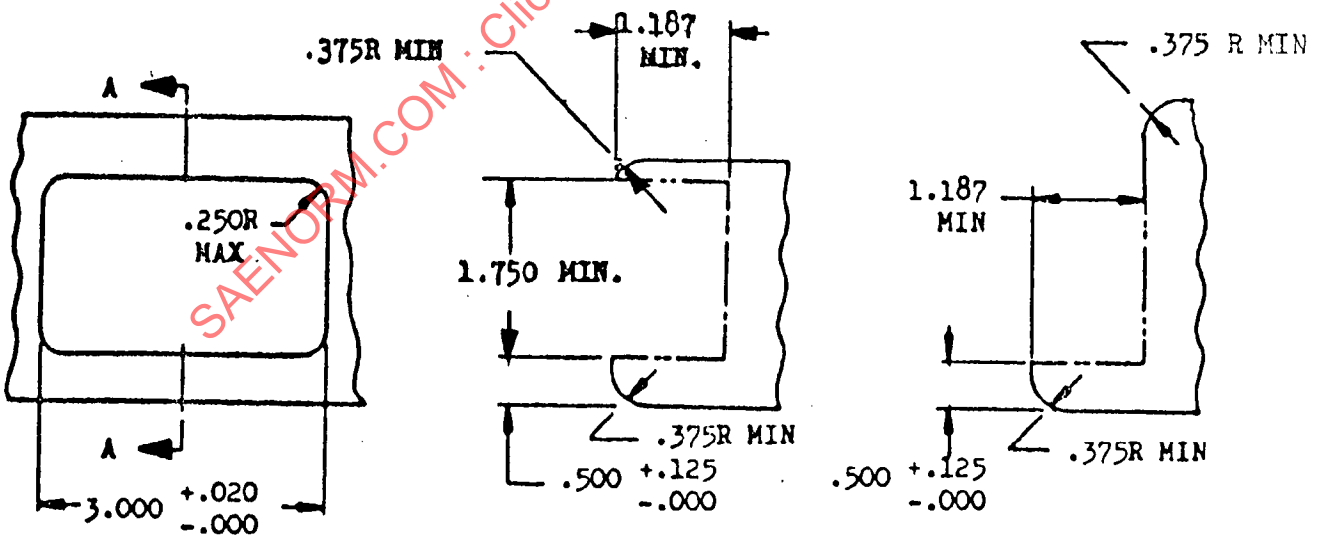


Figure 3
SIDE SLOT DETAIL & LOCATION
AS 1130 Pallet

3.3.2 The structural and operational integrity of the pallet shall be maintained in a temperature environment from -65 F to +160 F.

3.3.3 All components of the pallet shall be protected against deterioration or loss of strength in service due to weathering, corrosion, abrasion or other causes where the type of material used requires such protection.

3.4 Cargo Tie Down Provisions:

The cargo net attachment fittings shall include the provision for attaching a cargo tie down fitting each capable of reacting a 5,000 pound ultimate load in any direction except outwards.

4. TESTING REQUIREMENTS

4.1 Scope:

4.1.1 The tests are static in nature to minimize complexity and cost of required testing facilities. As far as practical, applied static loads take into account the combined static and dynamic loads anticipated in service.

4.1.2 It is intended that tests shall be non-destructive in nature and not result in damage to the pallet unless ultimate load conditions are employed.

4.1.3 Test equipment and methods of testing described are not meant to be restrictive. Alternate equivalent methods to accomplish the desired result may be employed.

4.2 Load Factors:

Unless otherwise required, operational load factors are employed in all tests.

In selected cases, tests may be repeated under ultimate load conditions when required for substantiation of analytical data. If this becomes necessary, the pallet so tested may not be used in service until all component parts that exhibit permanent deformation are replaced.

4.3 Test Criteria:

4.3.1 A pallet shall be considered satisfactory if, upon inspection before and after testing, its dimensions fall within those specified in Table I and in applicable manufacturing drawings.

4.3.2 When tests are repeated under ultimate load conditions, a pallet shall be considered within acceptable structural limits if it exhibits permanent deformation but does not rupture to the extent of discharging cargo.

4.3.3 Test instrument calibration shall be traceable to limits established by the National Bureau of Standards.

4.4 Recommended Test Equipment:

4.4.1 Handling and Securing:

4.4.1.1 When restraint or movement on an aircraft system is simulated, the test system shall be in accordance with paragraph 3.1.6.1. Latches and guide rails of suitable strength shall be provided to guide the pallet along the conveyor and secure it at its latch points. The test system shall be of sufficient length to permit cycling of the longest pallet to be tested.

4.4.1.2 A crane or lifting means with capacity to lift twice the gross weight of the loaded pallet shall be provided. Sufficient height shall exist under the hook to permit positioning the pallet vertically on either side or end.

4.4.1.3 Bridle chains, cable or spreaders with capacity to lift the loaded pallet at the four corners with appropriate capacity hooks or shackles shall be provided.

4.4.1.4 A net per AS 1131 shall be provided.

4.4.2 Structural:

4.4.2.1 Sufficient payload to meet test load requirements shall be provided. Where appropriate, water or load producing devices may be used.

4.4.2.2 An industrial forklift or equivalent equipment capable of a maximum load of 12,000 pounds on one axle with a minimum wheel width of 7 inch and a maximum footprint area of 22 square inches per wheel on 30 inch wheel centers shall be provided.

4.4.2.3 An industrial forklift or equivalent equipment capable of lifting 10 ft or 20 ft pallets loaded to twice their gross weight shall be provided.

4.5 Test Procedure - Prototype Pallet:

4.5.1 Test #1 - Lifting:

4.5.1.1 Type II-A and II-C pallets shall be loaded to twice gross weight and lifted vertically from the four corner fittings. After lifting, the pallet shall be suspended for not less than five minutes and then lowered to the ground. Permanent deformation shall not occur.

4.5.1.2 Type II-B and II-C pallets shall be loaded to twice gross weight and lifted clear of the ground by using a forklift truck of suitable capacity. After lifting, the pallet shall be suspended for not less than five minutes and then lowered to the ground. Permanent deformation shall not occur.

4.5.2 Test #2 - Pallet Strength:

4.5.2.1 Type I, II-A, II-B and II-C pallets shall have the base resting on a surface of sufficient strength and continuity to adequately support the pallet. An industrial forklift loaded to an axle weight of not less than 12,000 pounds (including the weight of the truck) or 6,000 pounds per wheel (applied to a contact area not greater than 22 square inches, assuming a wheel width of not less than 7 inch and wheel centers of 30 inch) shall then be maneuvered over the entire pallet top surface to load the pallet to maximum gross weight. An industrial forklift loaded to 9,000 pounds per wheel shall then be maneuvered over the area extending 1.5 feet from any edge. No permanent deformation or failure shall occur.

4.5.2.2 While retained on the aircraft loading system or its equivalent, the pallet shall be uniformly loaded to 1,200 pounds per square foot. The load shall be applied to an area five feet wide centered in the pallet and the load shall equal but not exceed three times maximum payload. No permanent deformation or failure shall occur.

4.5.2.3 The pallet under test shall be latched to the aircraft system or its equivalent. The number of latches shown in paragraph 3.2.2.2 shall be engaged on one side and adjusted by suitable means to assure contact with the end of the latch receptacle slot. With a net per AS 1131 attached to the pallet, a uniformly distributed load equal to the gross weight shall be applied to one 96 inch end of the net. The center of gravity of the load shall be 48 inch vertically measured from the pallet bottom surface and within the lateral and longitudinal limits specified in paragraph 3.2.2. No permanent deformation or failure shall occur.

Repeat 4.5.2.3 for 10 ft pallet using only restraints in fore and aft slots in accordance with Figure 7.

4.5.2.4 With the pallet on the aircraft system or its equivalent, 50% to 60% of all the latches per Fig. 9 equally distributed on both sides shall be engaged and adjusted by suitable means to assure vertical restraint. With a net per AS 1131 attached to the pallet, a uniformly distributed load equal to the gross weight shall be applied to one side (10 ft or 20 ft) of the net. The center of gravity of the load shall be 48 inch vertically measured from the pallet bottom surface and within the lateral and longitudinal limits specified in paragraph 3.2.2. No permanent deformation or failure shall occur.

4.5.2.5 The pallet shall be suspended upside down from the aircraft loading system or its equivalent. Between 50% and 60% of the total number of latches equally distributed on both sides shall be engaged and adjusted by suitable means to assure contact when the load is applied. The pallet shall have a load equal to the gross weight uniformly distributed tied down with a net per AS 1131. No permanent deformation or damage shall occur.

This test shall be repeated for 10 ft pallets using only restraint in accordance with Figure 7.

4.5.2.6 The pallet shall be uniformly loaded to gross weight and cycled one hundred times over a substantially level section of the aircraft system or equivalent at a minimum speed of 60 ft per minute. Each cycle shall be equal to twice pallet length. At test speed, draw-bar pull shall be 3% of gross weight. Maximum variation of draw-bar pull from the first to the last cycle shall not exceed 0.5% of gross weight.

4.5.2.7 Attachment Receptacle Test:

a. Cargo Tie Down - A two stud bulk cargo tiedown fitting shall be used to fit the receptacle shown in Figure 6. With the pallet latched to the aircraft system or its equivalent, 50% to 60% of all the latches equally distributed on both sides shall be engaged and adjusted by suitable means to assure vertical restraint. The pallet receptacle shall be tested by applying a 5,000 pound tension load in all directions, horizontal to vertical. The load application point shall be 0.83 inches or less from the head of the stud.

b. Net attachment - A one stud net attachment fitting as shown in Fig. 6 shall be engaged in the net attachment receptacle shown in Figure 6. The pallet receptacle shall be tested by applying a 3,000 pound tension load in all directions, horizontal to vertical. The load application point shall be 0.83 inches or less from the head of the stud.

4.5.3 Test Procedure:

Production Pallets - To show compliance with this specification standard, commercial inspection and quality control methods and practices shall be used to assure that production units are not inferior to the article tested.

Where changes are made to production units and product similarity can not be clearly established, the first product so changed shall be retested to show compliance with this specification.

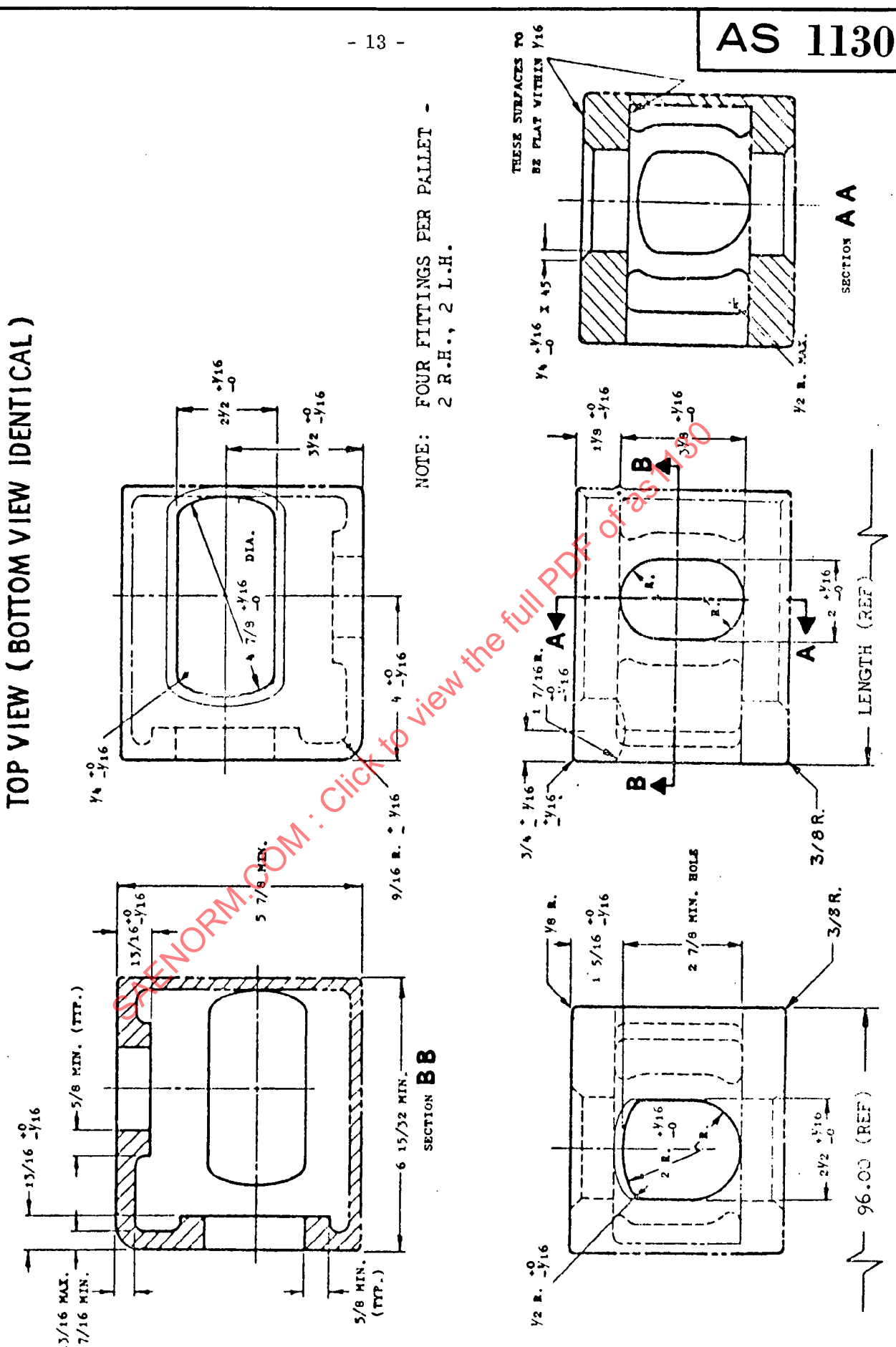
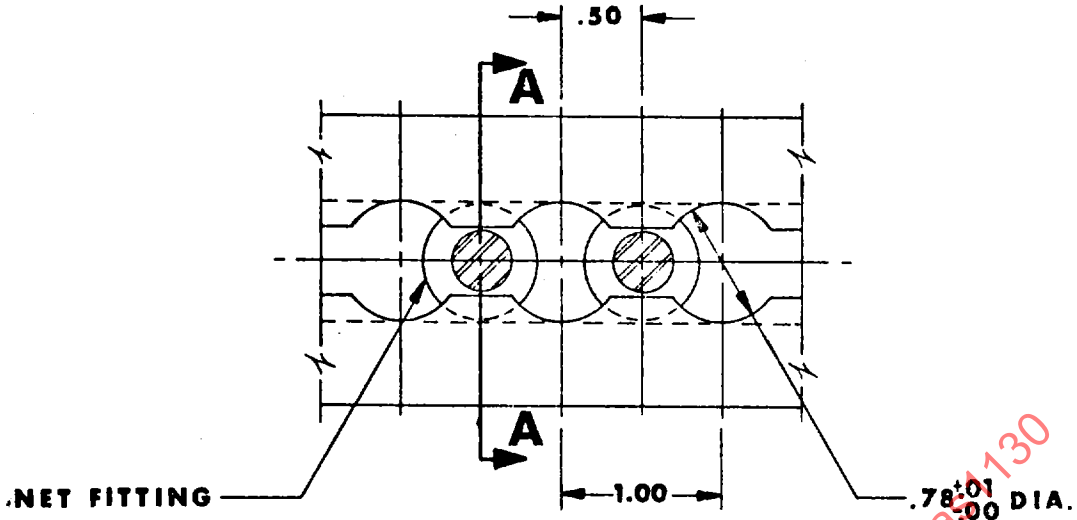
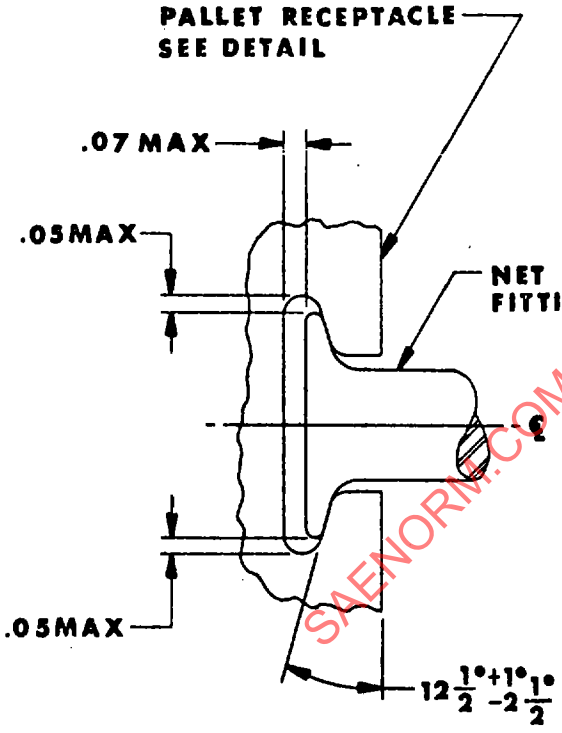
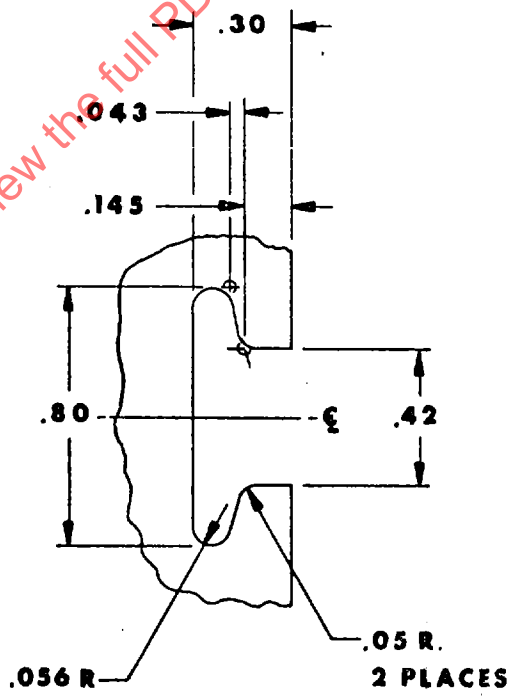


Figure 5 CORNER FITTING





SECTION A-A



RECEPTACLE DETAIL

FIGURE 6

CARGO NET TIE-DOWN RECEPTACLE

AS1130 PALLET