MIL-P-27443E(USAF)

24 Feb 67
SUPERSEDING
See Section 6

MILITARY SPECIFICATION

PALLETS, CARGO, AIRCRAFT, TYPE HCU-6/E,
HCU-12/E, AND HCU-10/C

1. SCOPE

1.1 Scope. Pallets, cargo, aircraft, covered by this specification have a capacity of 10,000 pounds and 5,000 pounds.

1.2 Classification. Aircraft cargo pallets covered by this specification shall be of the following types, as specified (see 6.2).

Type I - 10,000 pounds capacity designated HCU-6/E

Type II - 5,000 pounds capacity designated HCU-12/E

Type III - 5,000 pounds capacity designated HCU-10/C

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

Federal

QQ-P-416	Plating, Cadmium (Electrodeposited)
QQ-S-781	Steel Strapping, Flat
MMM-A-132	Adhesive, Heat Resistant, Airframe Structural, Metal to Metal

Military

MIL-D-1000	Drawings, Engineering and Associated Lists
MIL-S-7998	Sandwich Construction Core Material, Balsa Wood
MIL-A-9067	Adhesive Bonding, Process and Inspection, Requirements for

FSC 1670

STANDARDS

Military

MIL-STD-105	Sampling Procedures and Tables For Inspection By Attributes
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-143	Specifications and Standards, Order of Precedence for the Selection of
MIL-STD-810	Environmental Test Methods for Aerospace and Ground Equipment
MS 33586	Metals, Definition of Dissimilar

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

3. REQUIREMENTS

3.1 Preproduction. This specification makes provisions for preproduction inspection.

3.2 Selection of specifications and standards. Specifications and standards for necessary commodities and services not specified herein shall be selected in accordance with MIL-STD-143.

3.3 Materials

3.3.1 Protective treatment. When materials are used in the construction of the pallets that are subject to deterioration when exposed to climatic and environmental conditions likely to occur during service usage, they shall be protected against such deterioration in a manner that will in no way prevent compliance with performance requirements of this specification. The use of any protective coating that will crack, chip, or scale with age or extremes of climatic and environmental conditions shall be avoided.

3.3.2 Metals. Metals shall be of the corrosion-resistant type or treated to resist corrosion due to salt spray or atmospheric conditions likely to be met in storage or normal service.

3.3.2.1 Dissimilar metals. Contact between dissimilar metals shall be avoided wherever possible. Wherever such contacts are unavoidable, they shall be insulated in a manner approved by the procuring activity. Dissimilar metals are defined in MS 33586.

3.3.3 Adhesive. The adhesive used for bonding, whether for metal-to-metal or metal-to-core, shall conform to the requirements of MMM-A-132, Type I, Class 3, and shall pass all the tests in Section 4.

3.4 Design and construction. The pallets shall be so designed and constructed that no parts shall work loose in service. It shall be built to withstand the strains, jars, vibration, and other conditions incident to shipping, storage, installation, and service.

3.4.1 Reliability. The pallet shall be designed and constructed as specified herein to assure optimum service life under all service conditions specified herein, and shall be acceptably demonstrated during the testing specified herein.

3.4.2 Maintainability. The pallet shall have a minimum number of parts consistent with reliability and good engineering design practice. Where practical, its design shall permit easy assembly, disassembly, location of trouble sources, maintenance with tools and equipment normally available commercially, and by service maintenance personnel with a minimum of training.

3.4.3 Construction. The pallet shall be constructed as an integral unit and shall not require assembly or attachment of separate parts during operational use. The pallet shall be a bonded sandwich construction; i.e., core to skins, core to edge structure, and skins to edge structures. The bottom surface shall be a continuous sheet of 0.080 ± 0.004 inch 7075 - T6 aluminum. The top and bottom surfaces shall fasten to the edge structure with rivets, in the corners only, as shown on figures 1, 2, and 3 as applicable, in addition to the bonding procedure. Separate rivets for the top surface and separate rivets for the bottom surface are required. Through riveting of top and bottom surfaces with a single rivet is not acceptable. The core material between the metal outer surfaces and the edge structures shall be balsa wood in accordance with MIL-S-7998, and shall be end grain with a density of not less than 6 pounds per cubic foot. The top surface shall be constructed of a continuous sheet of 0.063 ± 0.004 inch 6061 - T6 aluminum.

3.4.3.1 Balsa wood. The balsa wood shall be in accordance with MIL-S-7998. Paragraphs 3.2, 3.5, and 4.2.4 of MIL-S-7998 shall not apply. In addition to the defects listed in paragraph 3.7 of MIL-S-7998, the following defects are acceptable:

a. Scattered pin holes up to 3/32 inch diameter.
b. Stains (mild blue or mineral) not associated with decay are acceptable.
c. Checks no deeper than 1/2 inch, and no wider than 1/32 inch are acceptable, provided they are filled with adhesive.

d. Sound, tight knots are permissible.
e. Occasional bird's eye blemishes up to 3/8 inch in width are permissible.
f. Wane shall be permitted on two edges, the width shall not exceed 3/32 inch.

3.4.4 Center-of-gravity. The vertical center-of-gravity shall be 48-inches above the pallet surface for Type I pallets and 36-inches above the pallet surface for the Type II and Type III pallets. The loads shall be uniformly distributed for each type of pallet (see 6.3.1).

3.4.5 Load configuration. The load for each pallet shall be rectangular cubes (boxes). The cubes for Type I pallets shall be approximately 20-inches wide by 20-inches long by 12-inches high. The cubes for the Type II and Type III pallets shall be approximately 20-inches long by 24-inches wide by 12-inches high. All cubes shall be free to move relative to adjacent cubes.

3.4.6 Edge structure. An edge structure (rail) shall be provided on the entire periphery of the pallet. The rail shall consist of a lip and means for attaching tiedown rings and the bonded sandwich constructed section. The tiedown rings shall be as specified in 3.4.7. The mitered corners of the rails shall be reinforced to withstand the tests in 4.5.2 and 4.5.6. The bonded sandwich construction shall be fastened to the edge structure as specified in 3.4.3 and figures 1, 2, and 3 as applicable. The top and bottom skins shall be flush to not more than .020 inch below flush with the edge structure as shown on figures 1, 2, and 3 as applicable.

3.4.6.1 Lip. A lip (see 6.3.4) shall be provided on the entire periphery of the edge structure; the lip shall conform to figures 4, 5, and 6 as applicable. The cross sectional shape and dimensions of the lip shall be as shown on figure 7. The lip shall be capable of mating with the aircraft rail system and shall withstand the performance requirements specified in 3.5.1 and the test specified in 4.5.10. At the option of the supplier the lip may be cored, and the top edge of the rail may be relieved its entire length to provide clearance for tiedown ring rotation as specified in 3.4.7.1 and shown on figures 8 and 9 as applicable. Cutouts in the lip shall be spaced as shown on figures 4, 5, and 6 as applicable and shall be a minimum of 1 1/8 inch deep measured from the outside edge of the lip. A 1/8 inch maximum fillet will be permitted at the inside of the cutout.

3.4.7 Tiedown rings. Tiedown rings shall be provided around the pallet periphery to secure a net (see 6.3.5). Rings on each side shall be located on 20-inch centers, ± 1/8 inch. Minimum clear opening of the rings shall be 1 1/4 inches, with a maximum cross-section dimension of 1/2 inch. When not used for tiedown, the rings shall not interfere with the entry of the pallet into a rail section as shown on figure 10. The pivot point of the

ring shall be outside the usable surface edge. For Type I pallets twenty two tiedown rings shall be provided. The rings on the 88 inch sides shall start on the pallet center line; on the 108 inch sides the rings shall be symmetrical about the center line. For Type II and Type III pallets sixteen rings shall be provided. The rings shall start on the center lines of both the 54 inch and 88 inch sides.

3.4.7.1 Ring capacity and movement. Each ring shall be capable of at least 240° of free movement in a vertical plane that intersects the pallet edge at right angles. Each ring shall be designed to sustain a 7,500 pound tension load along any line in this plane within the angular limits. Each ring shall also be designed to sustain a 7,500 pound load along any line originating at the attachment point in a vertical plane extending above the pallet and parallel to the edge without permanent deformation.

3.4.7.2 Ring replacement. Rings shall be installed in a manner that will permit replacement. However, the design shall be such that the ring attaching pin retention method shall be positive.

3.4.8 Requirements for processing and inspection of adhesive bonding. A titled, numbered, and dated process specification shall be prepared by the bidder and shall be submitted for approval with the bid. The process specification shall be prepared in accordance with MIL-A-9067.

3.4.9 Forklift entries. Openings shall be provided on the 88-inch sides of the Type III pallet to accept forklift tines. The openings shall be spaced symmetrically about the centerline and shall be 2-3/4 inches high by 10 inches wide and spaced 26 inches center-to-center. The openings shall run entirely through the pallet. Reinforcements shall be provided around the openings to prevent damage to the pallet when the forklift tines are engaging the pallet. The openings shall be smooth throughout the entire length of the tunnel to prohibit hangup of the tines. The 2-3/4 by 10-inch tunnel shall be a constant cross section throughout.

3.5 Performance.

3.5.1 Ultimate load. When uniformly loaded to its rated capacity (see 6.3.1), the load being restrained to the pallet by nets (see 6.3.5), installed between rails as shown on figure 10, and resting on three rows of conveyors as specified in 3.5.4.1, the pallet shall withstand a dynamic load of eight times the force of gravity(g's) for a period of time not less than 0.1 second. The pallet need not be serviceable after undergoing such a load; however, the pallet shall remain in one piece.

3.5.2 Static load. When supported by conveyors as specified in 3.5.4.1, the pallet shall be capable of supporting a uniformly distributed static load (see 6.3.2) without permanent deformation.

3.5.3 Hoisting capabilities.

3.5.3.1 Corner Hoist. When uniformly loaded to rated capacity (see 6.3.1), the pallet shall be capable of withstanding, without permanent deformation, hoisting by means of four cables attached to the four tiedown rings adjacent to the four corners and accelerated to 1.8g.

3.5.3.2 Forklift. When uniformly loaded to rated capacity (see 6.3.1), the Type I pallet shall withstand lifting, without deformation, by a forklift truck having 72-inch-long by 8-inch-wide tines spaced 42 inches center to center for Type II pallets the tines shall be 54 inches long by 6 inches wide and spaced 42 inches center to center. The Type III pallet shall withstand lifting, without permanent deformation, by a forklift with 54-inch long by 6-inch wide tines spaced 26 inches center-to-center. The forklift tines shall engage the pallet through the openings.

3.5.4 Traversable capabilities.

3.5.4.1 Conveyor. When uniformly loaded to rated capacity (see 6.3.1), the pallet shall be capable of transversing roller conveyor with 2-inch diameter by 3 1/2 inch long rollers spaced on 10 inch centers. The pallet shall be supported by a row of conveyor along each side and along the centerline.

3.5.4.2 Ball casters. When uniformly loaded to rated capacity (see 6.3.1), the pallet shall be capable of omnidirectionally traversing a grid of 1-1/4 inch diameter steel ball casters spaced 5 inches on center. The ball casters shall be the spring-loaded type, with each ball supporting 50 pounds ultimate.

3.5.4.3 Conveyor Ramp. When uniformly loaded to rated capacity (see 6.3.1), the pallet shall withstand being towed over a 17°, 10-foot long ramp connecting two horizontal surfaces. The pallet shall be supported by conveyors as specified in 3.5.4.1. The pallet shall be towed parallel to both and 88 and 108 inch sides for Type I pallets, and both the 54 inch and 88 inch sides for the Type II and Type III pallets.

3.5.5 Environmental conditions. The pallet shall be capable of withstanding the following conditions:

a. Salt-sea atmosphere

b. Temperatures ranging from -65° to +160° Fahrenheit (F)

c. Rain

3.6 Part numbering of interchangeable parts. All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable. The item identification and part number requirements of MIL-

D-1000 shall govern the manufacturer's part numbers and changes thereto.

3.7 Dimensions. The overall dimensions of the pallet shall be as shown on figures 4, 5, and 6 as applicable.

3.8 Weight. The overall weight of the pallet shall not exceed 300 pounds for Type I, 160 pounds for Type II, and 215 pounds for Type III.

3.9 Finishes and protective coatings. Steel and steel parts other than corrosion-resistant steel shall be cadmium plated in accordance with QQ-P-416, Type II, Class 1.

3.10 Identification of product. Equipment, assemblies, and parts shall be marked for identification in accordance with MIL-STD-130.

3.11 Workmanship. Workmanship shall be of the highest quality to insure proper functioning under conditions to which the pallet may be subjected. Unsatisfactory workmanship, such as loose, cocked, or inadequately headed rivets; distorted or loose bushings and pins; or rough, malformed, misaligned, or improperly fabricated fittings shall be considered as defects. All corners shall be rounded, sharp edges, burrs, or protrusions shall not be permitted. Tiedown ring attaching hardware shall be positively attached to the pallet rail (bolted, welded, or press fit).

3.12 Government-loaned property. The following property will be loaned by the Government to be used in testing pallets:

a. For Type I pallets, two each HCU-7/E side nets and one each HCU-15/C top net.

b. For Type II and III pallets, two each HCU-11/C side nets and one each HCU-16/C top net.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Classification of inspection. The inspection of the pallet shall be classified as follows:

a. Preproduction inspection . . . . . .See 4.3

b. Quality conformance inspection . . . . . .See 4.4

4.3 Preproduction inspection.

4.3.1 Test samples. The test sample shall consist of two pallets representative of the production equipment except the test samples shall not be riveted. The samples shall be identified with the manufacturer's part number and such other information as required by the procuring activity (see 4.3.2).

4.3.2 Preproduction tests. The preproduction tests shall consist of all tests described under 4.5 and shall be conducted on each sample in the following sequence:

Sample No. 1	Sample No. 2
Examination of product (4.5.1)	Examination of product (4.5.1)
Tap test (4.5.1.1)	Tap test (4.5.1.1)
Load test (4.5.2)	Environmental tests (4.5.7 through 4.5.7.4.1)
Peel test (4.5.1.2)	Static test (4.5.8)
Conveyor test (4.5.3)	Ultimate test (4.5.9)
Forklift test (4.5.4)	Destruction analysis (4.5.11)
Steel ball caster test (4.5.5)	
Tiedown ring test (4.5.6 and 4.5.6.1)	
Lip test (4.5.10)	
Destruction analysis (4.5.11)	

4.4 Quality conformance inspection. The quality conformance inspection shall consist of the following:

a. Individual test. . . . . .See 4.4.1

b. Sampling test . . . . . See 4.4.2

4.4.1 Individual test. Each pallet shall be subjected to the test specified in 4.5.1.

4.4.2 Sampling test.

4.4.2.1 Lot. A lot shall consist of pallets manufactured under essentially the same conditions and submitted for inspection at substantially the same time.

4.4.2.2 Sampling. Sampling for examination and tests shall be in accordance with MIL-STD-105, general inspection level II.

4.4.2.3 Examination. Samples selected in accordance with 4.4.2.2 shall be examined as specified in 4.4.2.5. The AQL shall be 0 percent defectives for critical defects, 1, 2, and 3; 1.5 percent defectives for critical defect number 4; 2.5 percent defective for major defects, and 6.5 percent defective for minor defects.

4.4.2.4 Tests. Samples selected in accordance with 4.4.2.2 shall be tested as specified in 4.5.2 and 4.5.2.1. The AQL shall be 1.5 percent defectives for paragraph 4.5.2 and 2.5 percent defectives for paragraph 4.5.2.1. The test in paragraph 4.5.2 shall be performed first.

4.4.2.5 Classification of defects. All dimensional characteristics are considered defective when out of tolerance. The classification of defects for pallets shall be as follows:

Critical

1. Length, width, and lip dimensions out of tolerance.

2. Skin not bonded.

3. Pallet not processed in accordance with approved process specification.

4. Failed lift test.

Major

101	Weight exceeds maximum tolerance
102	Lock notches out of tolerance
103	Adhesive bond test (plug) less than 100 percent wood failure
104	Tiedown ring missing
105	Tiedown ring mounting hardware loose

106	Rivet missing
107	Wrong rivets
108	Wrong skin material
109	Parts not plated in accordance with QQ-P-416
110	Part not marked in accordance with MIL-STD-130
111	Thickness exceeds tolerance

Minor

201	Corner gap exceeds tolerance
202	Skin to rail gap exceeds tolerance
203	Adhesive flash not cleaned off
204	Rivet too close to edge of skin
205	Cocked rivet

4.4.2.6 Rejection and retest. When a specified sample (see 4.4.2.2) from a lot fails to meet the specification, acceptance of all pallets in the lot shall be withheld until the extent and cause of failure have been determined. The Contractor shall fully explain to the Government representative the cause of failure and the action taken to preclude recurrence. After correction of the lot, all of the sampling tests shall be repeated on one pallet from this lot.

4.4.2.6.1 Individual tests may continue. For production reasons, individual tests or other sampling plans may be continued pending the investigation of a sampling test failure. But final acceptance of the entire lot shall not be made until it is determined that the lot meets all the requirements of the specification.

4.4.2.6.2 Defects in pallets already accepted. The investigation of a test failure could indicate that defects may exist in pallets already accepted. If so, the contractor shall fully advise the procuring activity of all the defects likely to be found and the method of correcting them.

4.5 Test methods.

4.5.1 Examination of product. The pallet shall be inspected to determine compliance with the requirements specified herein with respect to materials, workmanship, marking, tap test, and peel test.

4.5.1.1 Tap test. Each pallet shall be inspected for continuity of bond, top surface and bottom surface, by tapping the bonded area with a small metal or plastic hammer. Each square foot of surface area shall be tapped not less than one time in each quadrant. Any void area or blister, which is evidenced by a comparatively dull tapping sound, shall be cause for rejection of the pallet.

4.5.1.2 Peel test. For each four (4) hours run of pallets cured, one (1) test specimen shall be fabricated for production rates of 1 to 20 pallets per day; two (2) test specimens shall be fabricated for production rates of 21 to 40 pallets per day; for production rates of 41 pallets or more per day three (3) test specimens shall be fabricated. The specimens shall be 8 inches wide, 12 inches long, and 2¾ inches thick (tolerances on width and length, plus ½ inch minus 1/16 inch; thickness, plus 1/8 inch minus 1/32 inch). All test specimens shall be fabricated from the same materials as the pallets, processed and bonded in the same manner as the pallets they represent. After curing, each specimen shall be peeled top and bottom and the metal to wood joints on the peeled specimens inspected. An acceptable metal to wood joint shall consist of not less than 100 percent wood failure. Local areas of high density wood (growth rings) shall be exempt from this requirement providing the high density wood is randomly scattered and does not exceed three (3%) percent of the surface area. Core block glue lines are not considered as wood. After 200 consecutive samples are tested without a failure, the peel test shall be reduced to one test specimen per shift.

4.5.2 Load test. While supporting a uniformly distributed test load (see 6.3.3), the pallet shall be slowly lifted with a hoist by means of four cables attached to the four tiedown rings adjacent to the four corners. The pallet shall be completely raised off the floor, held in that position for 1 minute, and then returned to the floor. An alternate method shall be a loading device to simulate a lifted load; i.e., a method of securing the four corner tiedown rings and applying an evenly distributed flexible test load (see 6.3.3) to the pallet. This procedure shall be repeated 10 times. For sample testing, the test load procedure shall be reduced on each test sample to two times. During the test any separation of the mitered corners shall be cause for rejection. Upon completion of the test, evidence of permanent deformation shall be cause for rejection.

4.5.2.1 Plug test. One plug or button shall be cut from the top surface of each pallet sample selected in accordance with 4.4.2.2. The plug or button shall be not less than 1.7 inches in diameter and shall be peeled in such a manner that the pallet surface shall not be damaged. The metal to wood bond of the peeled plug or button shall be inspected. An acceptable metal to wood bond shall consist of not less than 100 percent wood failure. The location of the plug or button shall be randomly selected; however, no

plug or button shall be removed less than 6-inches from the edge of the useable surface of the pallet. The method to be used to remove the bond test plug or button and the repair of the test area shall be outlined in the Process Specification submitted in accordance with MIL-A-9067.

4.5.3 Conveyor test. While supporting a uniformly distributed load (see 6.3.1) and supported by conveyors as specified in 3.5.4.1, the pallet shall be subjected to the following tests. Any permanent deformation of the pallet shall be cause for rejection.

4.5.3.1 The Type I pallet shall be moved a minimum of 10,000 feet in a direction parallel to the 108 inch dimension at a minimum speed of 30 fpm. Any increment of movement shall be a minimum of 25 feet.

4.5.3.2 Type I, Type II and Type III pallets shall be moved a minimum of 10,000 feet in a direction parallel to the 88 inch dimension at a minimum speed of 30 fpm. Any increment of movement shall be a minimum of 25 feet.

4.5.3.3 The Type II and Type III pallets shall be moved a minimum of 10,000 feet in a direction parallel to the 54 inch dimension at a minimum speed of 30 fpm.

4.5.3.4 While supporting a uniformly distributed load (see 6.3.1), the pallet shall be towed up, and over a 17°, 10 foot long ramp connecting two horizontal ramps at a minimum towing cable speed of 20 fpm. This test shall be repeated 50 cycles, 25 cycles in a direction parallel to the longest dimension and 25 cycles in a direction parallel to the shortest dimension. The ramps shall be constructed of roller conveyor as specified in 3.5.4.1. Each time over the crest of the 17° ramp is one cycle.

4.5.4 Forklift test. While supporting a uniformly distributed load (see 6.3.1) and resting upon the roller conveyor, the pallet shall be lifted by means of a forklift truck. For the Type I pallet, the tines shall be 72 inches long by 8 inches wide, spaced 42 inches center to center. For the Type II pallet, the tines shall be 54 inches long by 6 inches wide, spaced 42 inches center to center. For the Type III pallet, the tines shall be 54 inches long by 6 inches wide, spaced 26 inches center to center, the forklift tines shall engage the Type III pallet through the forklift openings. The pallet shall be raised to a height of one (1) foot and held one (1) minute, then lowered to rest on the conveyor. This procedure shall be repeated ten (10) times. At the completion of the tests any permanent deformation shall be cause for rejection.

4.5.4.1 Forklift wedge test. The pallet shall be placed on a smooth, dry, concrete surface without shoring and loaded uniformly (see 6.3.1). Forklift truck tines, with an end radius of not less than 1/4 inch, configured and spaced as specified (see 4.5.4), use Type II pallet spacing for Type II and

III pallets, shall be wedge under the pallet and withdrawn. The tines shall be wedged under the pallet at right angles to the long dimension side. This test shall be conducted five (5) times from each side of the pallet. Upon completion of the tests, any evidence of permanent deformation shall be cause for rejection.

4.5.5 Steel ball caster test. While supporting a uniformly distributed load (see 6.3.1), the pallet shall be positioned upon a grid of 1 inch to 1 1/4 inch diameter steel ball casters spaced 5 inches on center. The pallet shall be moved horizontally over the casters for 1,500 feet in the longitudinal direction and 1,500 feet in the transverse direction. Any increment of movement shall be a minimum of 10 feet. Upon completion of the test, any permanent deformation shall be cause for rejection.

4.5.6 Tiedown ring test. Two tiedown rings, one located at the pallet corner and the other located midway on the long side shall be subjected to identical loading tests. In a plane that intersects the attachment point and is perpendicular to the pallet surface and edge, the ring shall be sequentially loaded to 7,500 pounds along lines that form 30°, 45°, 90°, 135°, and 180° with the upper pallet surface. In a vertical plane that intersects the attachment point and is parallel to the pallet edge, a 7,500 pound load shall be applied sequentially in two directions parallel to the upper pallet surface and at 45° and 135° angles with this surface. The pallet shall be placed in a horizontal plane and two adjacent corner rings pulled simultaneously and then two center rings pulled simultaneously in accordance with the test diagram as shown in figures 11 and 12 as applicable. Evidence of permanent deformation to the pallet shall be criteria for rejection. The load during each test shall be applied for not less than three (3) times each.

4.5.6.1 Ring movement test. Compliance with the free movement requirements of 3.4.7.1 shall be demonstrated for each ring.

4.5.7 Environmental tests. The pallet shall be subjected to the following environmental tests in the order shown:

4.5.7.1 High temperature test. The pallet shall be subjected to high temperature in accordance with method 501 of MIL-STD-810. After the soak period and at the prescribed temperature, the pallet shall be loaded with a flexible, uniformly distributed load (see 6.3.1) and subjected to 50 consecutive cycles of loading as follows without permanent deformation. One cycle shall have a maximum duration of 30 seconds.

a. Lift the pallet completely off the floor by four tiedown rings located adjacent to the corners on the 88 inch sides.

b. Lower the pallet to rest on a 4 by 4 by 88 inch long support beneath the short centerline. The lifting device shall be completely free of weight support while the pallet is at rest on the 4 x 4.

4.5.7.2 Rain test. The pallet shall be subjected to rain in accordance with method 506.1 of MIL-STD-810.

4.5.7.3 Salt spray test. The pallet shall be subjected to salt spray in accordance with procedure I, method 509, of MIL-STD-810.

4.5.7.4 Core resistance and low temperature test. Five 3/8 inch diameter holes shall be drilled through the sandwich construction. One hole shall be in the center of the pallet and two each on the transverse and longitudinal centerline 25 inches from the pallet edge. The pallet shall then be subjected to the following immersions in the sequence listed:

a. Immerse 3 hours in water at room temperature; the absolute pressure of air above the liquid shall be reduced to approximately 2 1/2 inches Mercury (Hg).

b. Soak in a cold chamber for 4 hours at -65°F.

c. Stabilize at room temperature and then repeat a.

d. Repeat b.

4.5.7.4.1 After completion of the immersions specified in 4.5.7.4, the temperature shall be maintained at -65°F and the pallet subjected to 20 cycles of the high temperature lift test specified in 4.5.7.1.

4.5.8 Static test. While supported by three rows of conveyor located as specified in 3.5.4.1, parallel to the shortest side, the pallet shall be loaded with a static load (see 6.3.2). The load shall remain on the pallet for 1 hour. Permanent deformation as a result of this test shall be cause for rejection.

4.5.9 Ultimate load test. A uniformly distributed load (see 6.3.1) with a specified center of gravity (see 3.4.4) shall be placed on the pallet and tied down with nets (see 6.3.5). The rails shall be located approximately 103 inches apart for Type I and 88 inches apart for Type II and Type III. The pallet shall be restrained against forward movement by engagement of two slots on 40 inch centers on each side directly opposite each other. The entire assembly shall be subjected to a dynamic load of 8 g's for a period of time not less than 0.1 second in the forward direction. The pallet shall be restrained in place without any part of the pallet breaking or becoming delaminated; however, permanent deformation will be acceptable.

4.5.10 Lip test. A section of edge structure 7 1/2 inches or longer shall be prepared for testing by isolating, by milling or other suitable means, a 0.500 ± .005 inch wide segment of the lip. The lip segment shall be isolated down to the edge structure, a maximum fillet radius of 3/16 is acceptable. The 1/2 inch wide lip segment shall be tested by applying a 1250 pound load 1/4 inch in from the outer edge of the lip segment. The direction of the load shall be from the bottom of the lip segment and perpendicular to the pallet bottom surface. The load shall be applied for 3 minutes. Any permanent deformation in excess of 0.030 inch shall be cause for rejection.

4.5.11 Destruction analysis. Each test sample shall be cut up and tested for bond and penetration. Care shall be used in cutting the test samples for analysis so that excess heat is not induced into the adhesion line. All parts of the pallet shall be permanently identified. The tests shall be as follows:

a. Each rail shall be cut from the pallet so that six-inches of the sandwich structure is still intact. From each rail section, four each one-inch samples shall be prepared, one from each end and two from the center, for lap joint tensile shear tests between the skin and rail sections. MIL-A-132 shall be used as a guide in preparing and performing lap joint tensile shear tests. The test specimens shall meet the requirements of MIL-A-132 test number one. The remainder of the sandwich construction shall be cut into eight equal (approximately) pieces.

b. Using a one-inch square steel mandrel, apply a 900 pound load to the top surface of one of the test panels. At the option of the supplier, the corners of the mandrel may be slightly rounded. The test panel may be from either test pallet number one or two. The test specimen shall withstand the 900 pound load. Permanent deformation of the test panel in the load area shall not exceed .005 inch in depth. Deflection while under load shall not exceed .015 inch.

c. The top and bottom skin shall be peeled from each test piece to determine adhesion bond. An acceptable adhesion bond shall be not less than 95 percent wood failure and not more than 5 percent cohesion failure; cohesion failure shall leave evidence of adhesion on both the metal and wood surface.

4.6 Inspection of the preservation, packaging, packing, and marking for shipment and storage. The inspection of the preservation, packaging, packing, and marking for shipment and storage shall be in accordance with the requirements of Section 5, or the documents specified therein.

5. PREPARATION FOR DELIVERY

5.1 Preservation, packaging, and packing.

5.1.1 Level A and B. Pallets shall be shipped in strapped bundles of five each, with protective wood strips where banding contacts pallets. Skids equal to 2 by 4 inch lumber shall be attached with the banding in such a manner as to accommodate forklift handling. Strapping shall conform to Specification QQ-S-781.

5.1.2 Level C. Pallets shall be packed in such a manner as to afford protection against damage during direct shipment from the supply source to the first receiving activity for immediate use.

5.2 Marking. Interior packages and exterior containers shall be marked in accordance with MIL-STD-129. The shipment marking nomenclature shall be as follows:

a.	For Type I	Pallet, Cargo, Aircraft HCU-6/E.
b.	For Type II	Pallet, Cargo, Aircraft HCU-12/E.
c.	For Type III	Pallet, Cargo, Aircraft HCU-10/C.

6. NOTES

6.1 Intended use. The HCU-6/E, HCU-12/E, and HCU-10/C pallets are intended for use in the transportation of cargo in aircraft and within air freight terminals. No deviations will be made to the specification unless coordinated with the Federal Aviation Agency.

6.2 Ordering data. Procurement documents should specify the following:

a. Title, number, and date of this specification

b. Type required (see 1.2)

c. Applicable level of preservation, packaging, and packing (see section 5).

6.3 Definition. For the purpose of this specification, the following definition will apply:

6.3.1 Uniformly distributed load. A uniformly distributed load is defined as rectangular units. The total load weight for the Type I pallet shall be 10,000 pounds capacity. The total load weight for the Type II and Type III pallet shall be 5,000 pound capacity.

6.3.2 Static load. The static load for the Type I pallet shall be 45,000 pounds, for the Type II and Type III pallet the static load shall be 27,500 pounds.

6.3.3 Load test. The load for the Type I pallet shall be a uniformly distributed load of 18,000 pounds, for the Type II and Type III pallet the uniformly distributed load shall be 9,000 pounds.

6.3.4 Lip. The lip is defined as the protruding portion of figures 1 through 9 as applicable. The lip protrudes out from the edge structure a distance of 1 1/4 inch, is flat on top, 1 inch high, and is angled on the bottom surface (the angle rises 15/32 inch and is 1 1/4 inch long). At the option of the supplier, the lip is either solid or cored. Tolerances are as specified on figures 1 through 9 as applicable.

6.3.5 Nets. For Type I pallet, use two each side nets HCU-7/E, and one each HCU-15/C top net. For either Type II or III pallets, use two each HCU-11/C side nets and one each HCU-16/C top net. Nets for applicable pallets will be Government Loan Property (GLP).

6.3.6 Supersession data. This specification includes the requirements of Military Specifications MIL-P-27700A (USAF) dated 8 June 1964, MIL-P-27443D (USAF) dated 4 June 1964, and MIL-P-27648B(USAF) dated 4 March 1964.

6.3.7 Asterisks. Asterisks are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

Custodian:
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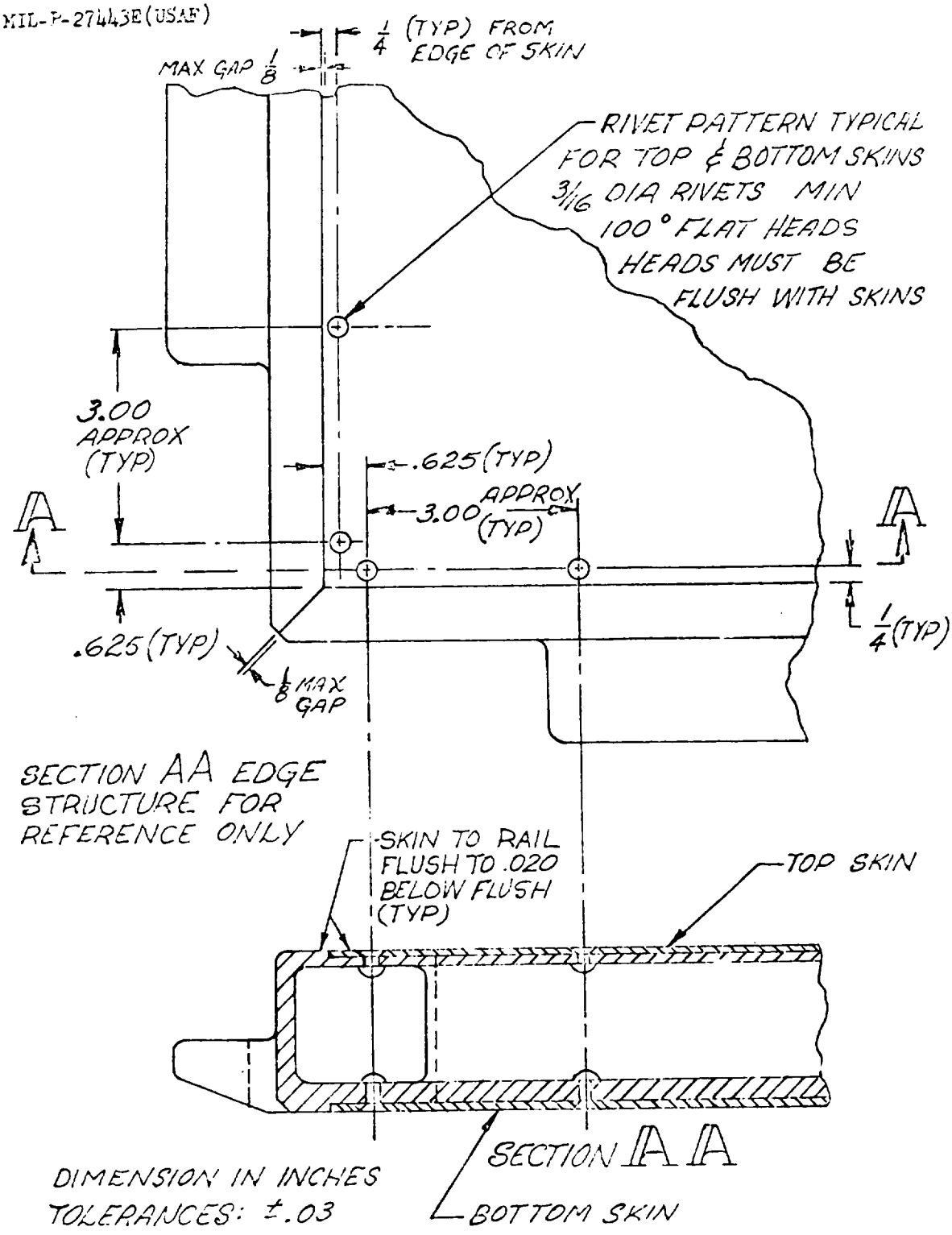
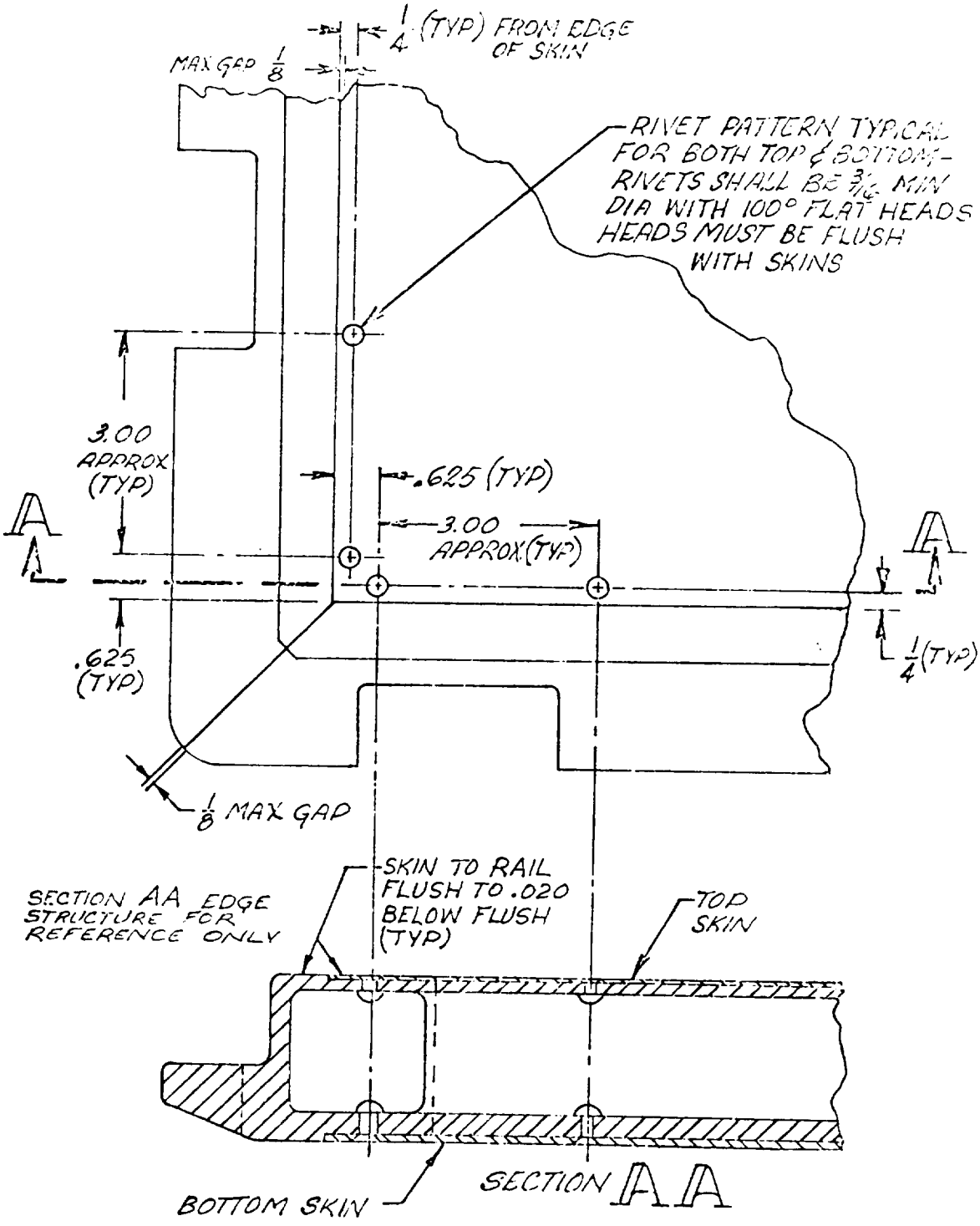


FIGURE 1 TYPICAL CORNER DETAIL & SKIN RIVET PATTERN TYPE I PALLET



DIMENSIONS IN INCHES - TOLERANCES: ±.03

FIGURE 2 TYPICAL CORNER DETAIL TYPE II PALLET

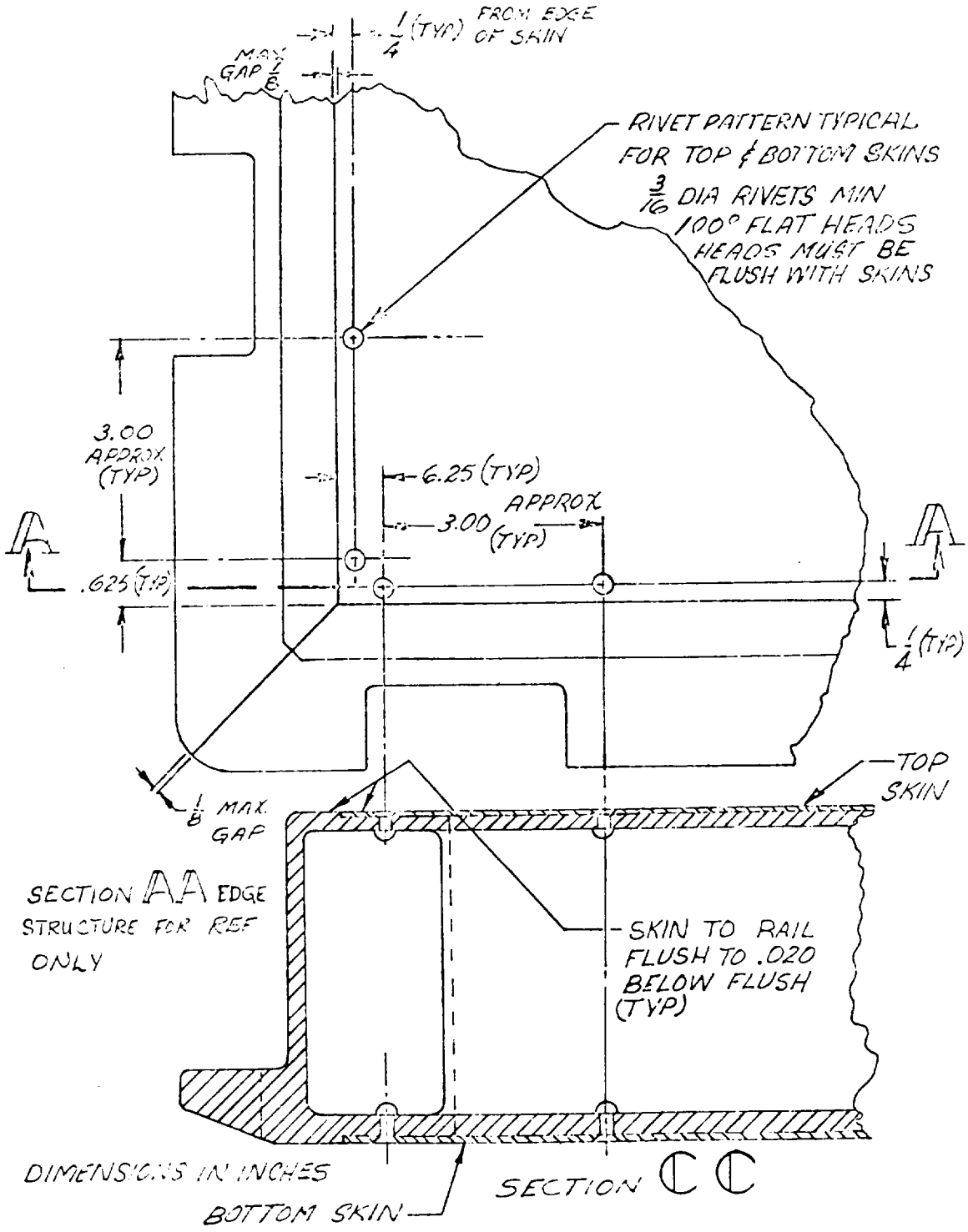


FIGURE 3 TYPICAL CORNER DETAIL & SKIN RIVET PATTERN FOR TYPE III PALLET

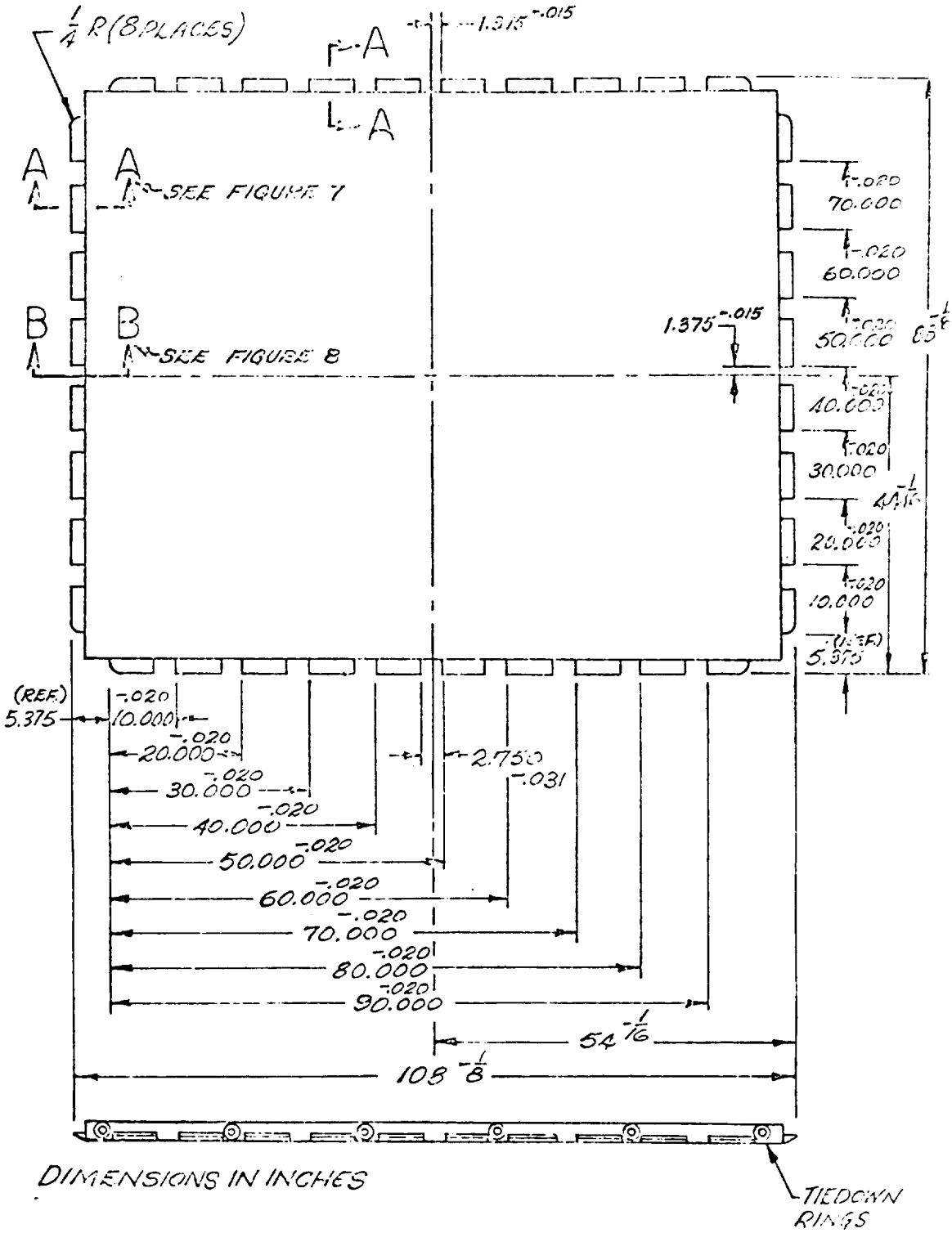


FIGURE 4 - PALLET, TYPE I

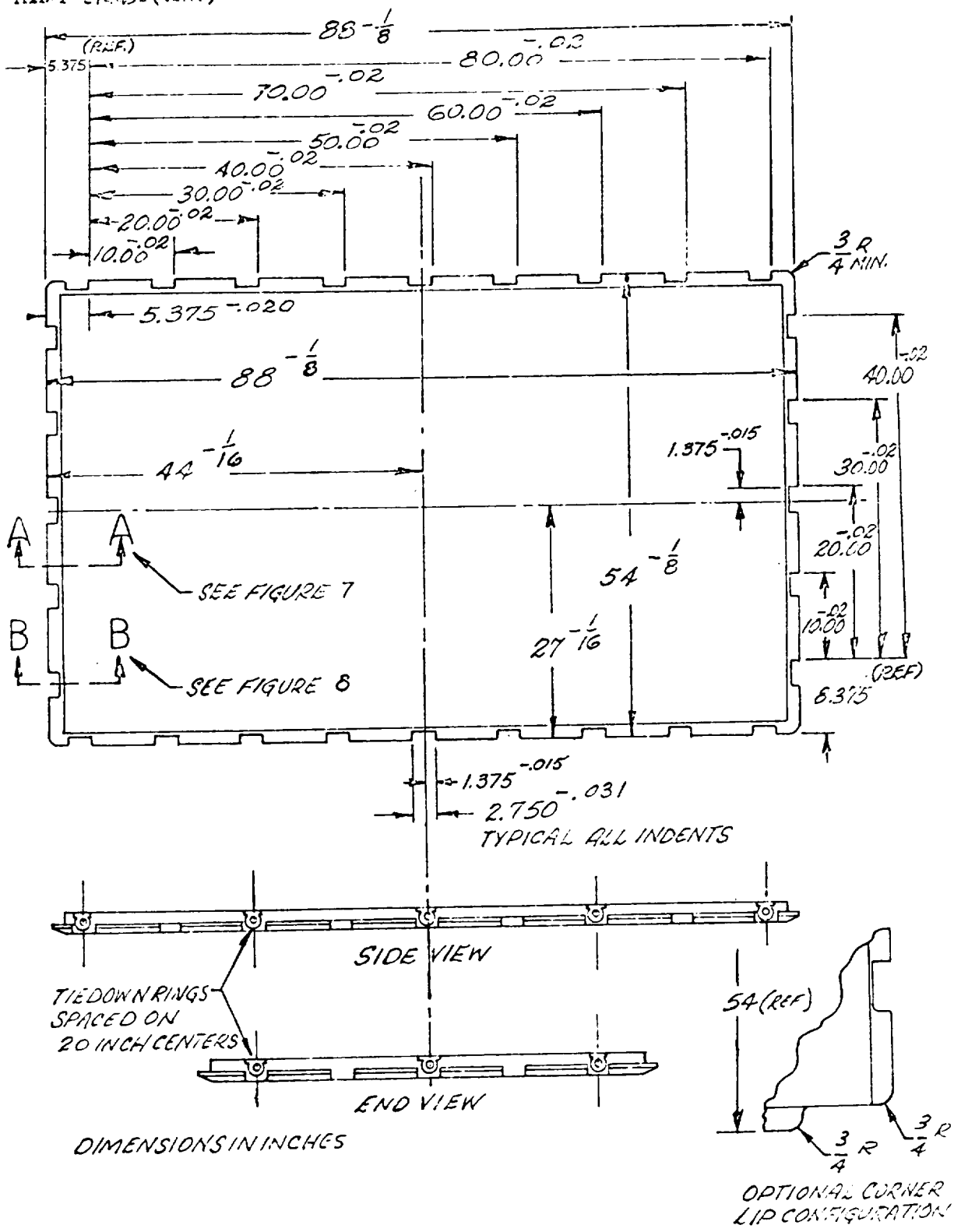


FIGURE 5 PALLET TYPE II

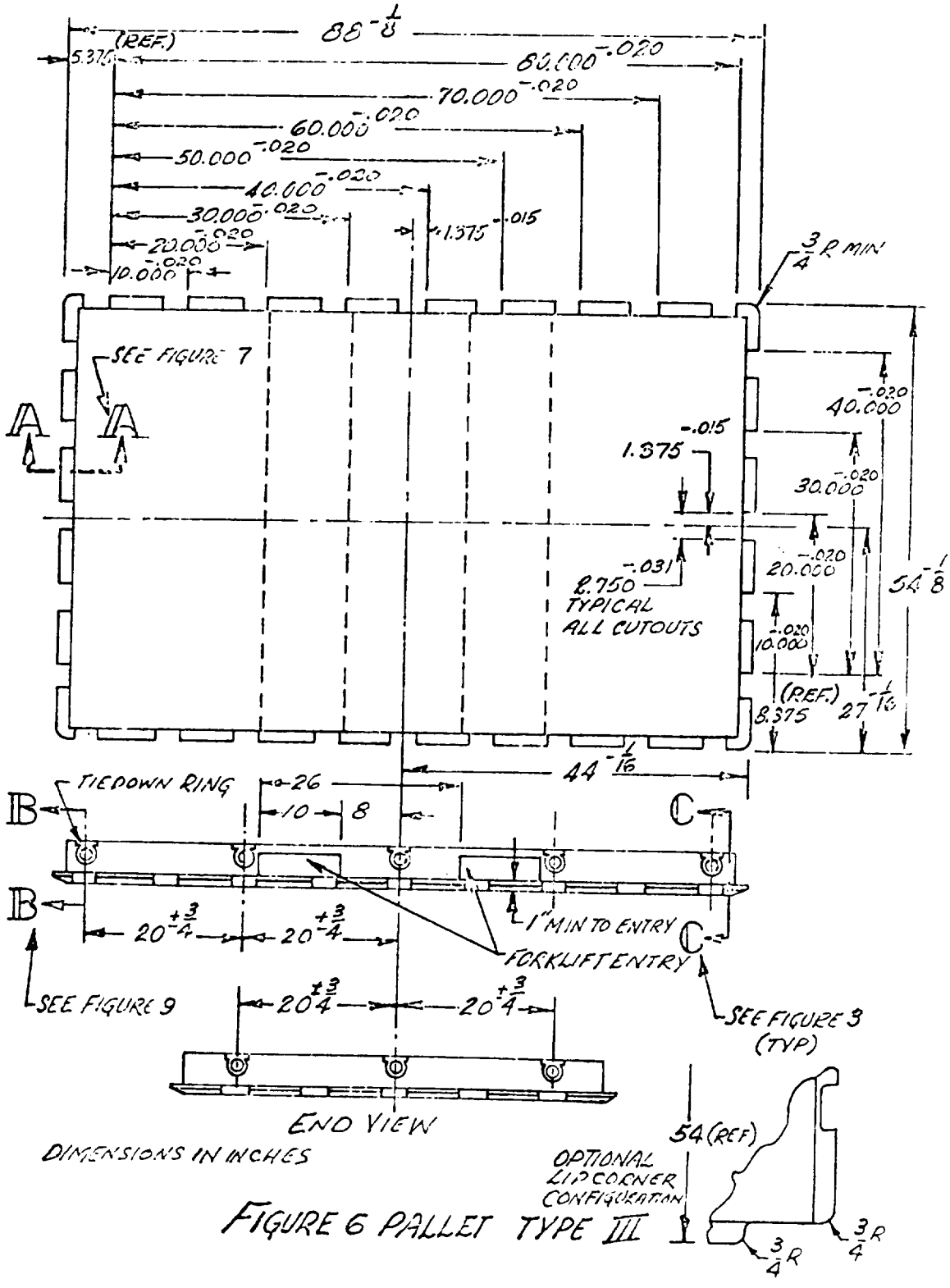
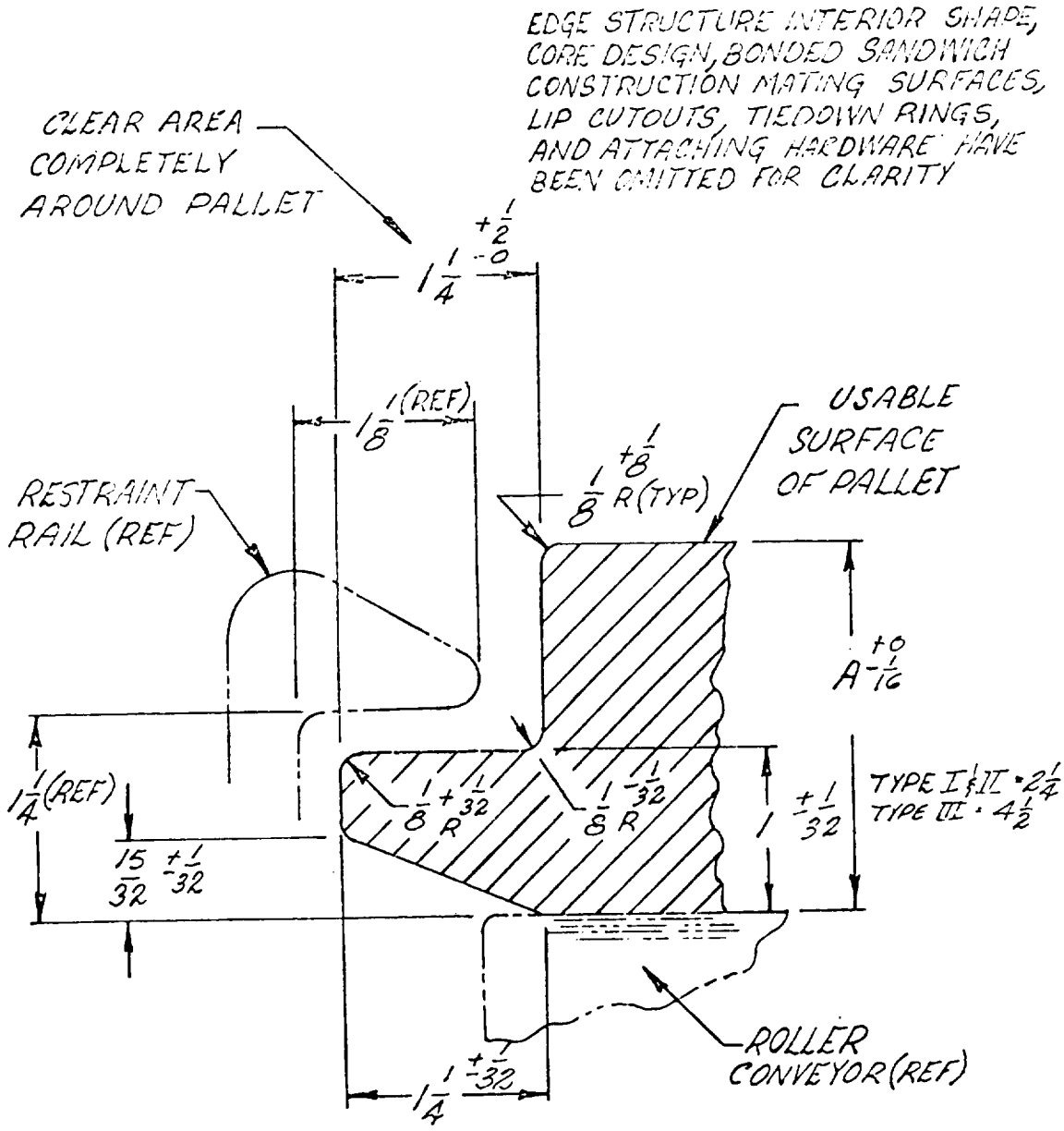


FIGURE 6 PALLET TYPE III



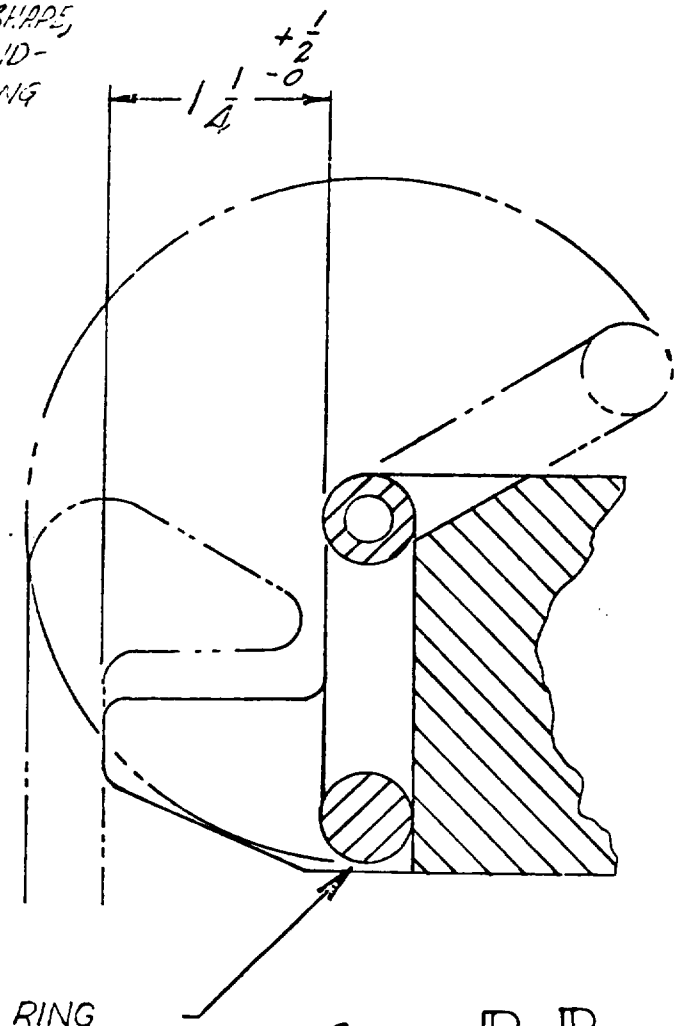
SECTION AA

SEE FIGURE 4, 5 & 6 AS APPLICABLE

DIMENSIONS IN INCHES

FIGURE 7 SECTION THRU PALLET TYPE I, II, & III

EDGE STRUCTURE INTERIOR SHAPE, CORE DESIGN, BONDED SANDWICH CONSTRUCTION MATING SURFACES, AND ATTACHING HARDWARE HAVE BEEN OMITTED FOR CLARITY

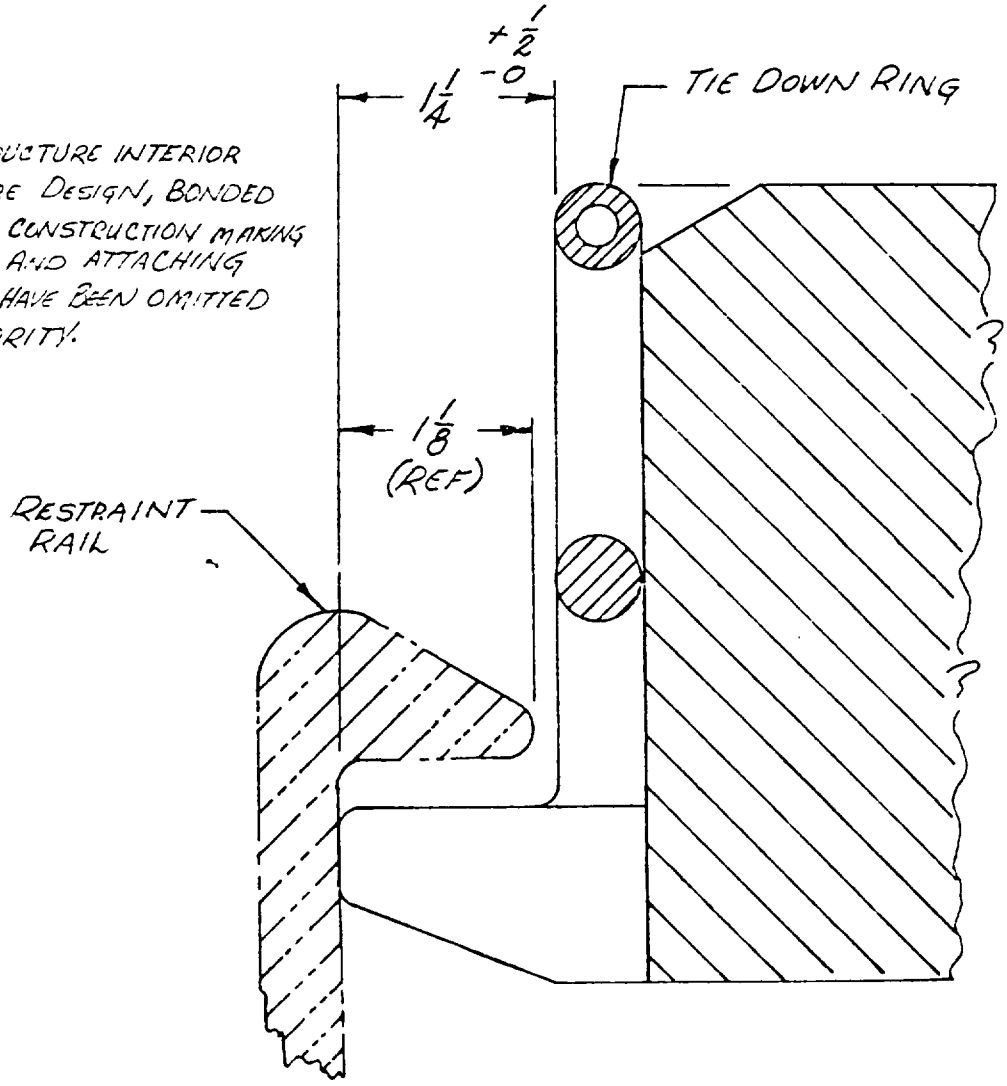


TIEDOWN RING MUST CLEAR BOTTOM OF PALLET

SECTION B B
SEE FIGURE 4 & 5 AS APPLICABLE

DIMENSIONS IN INCHES

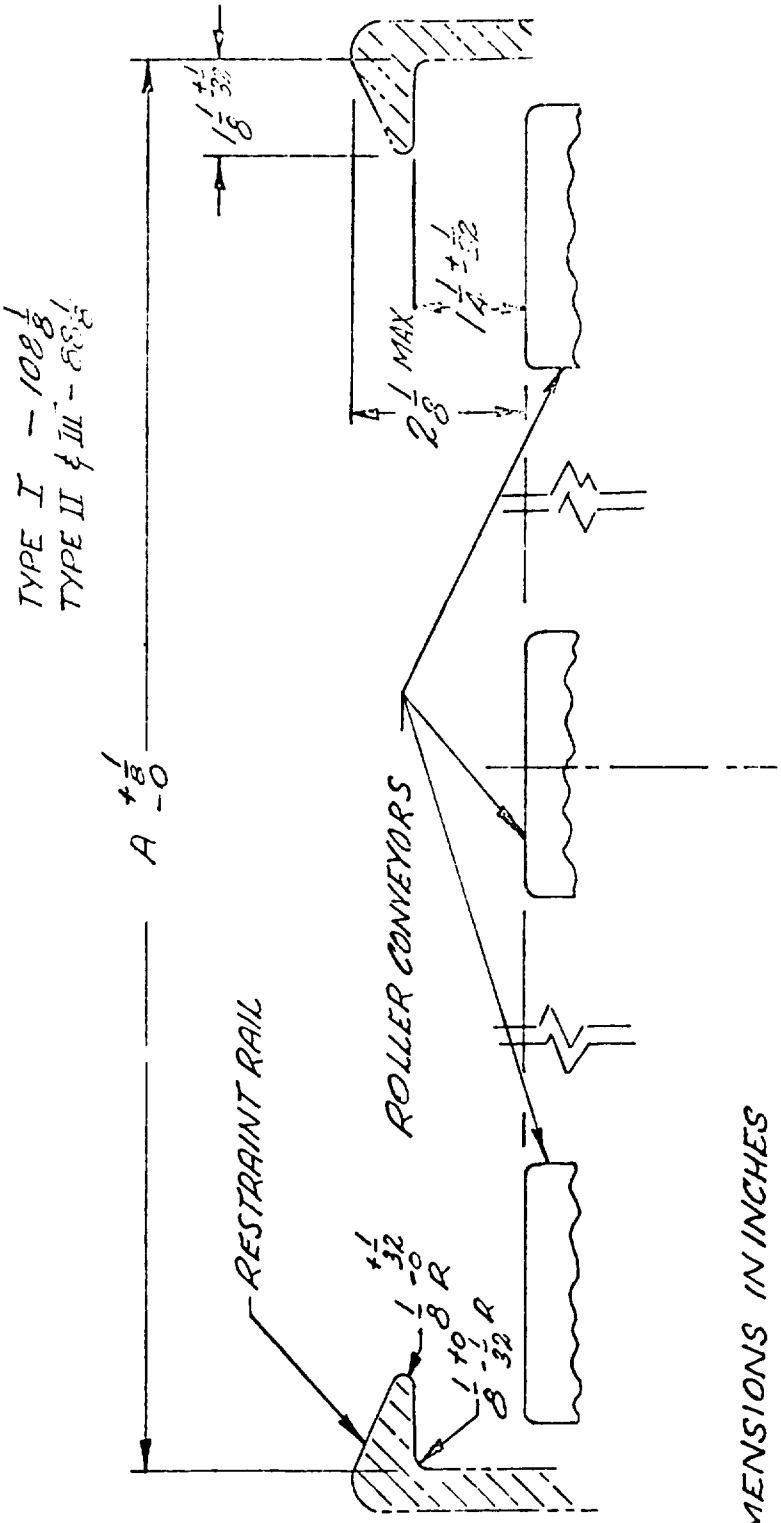
FIGURE 8 RING CLEARANCE
TYPE I & II PALLETS



SECTION B B
SEE FIGURE 6

DIMENSIONS IN INCHES

FIGURE 9- RING CLEARANCE
TYPE III PALLET



DIMENSIONS IN INCHES

FIGURE 10 RESTRAINT RAILS & CONVEYORS

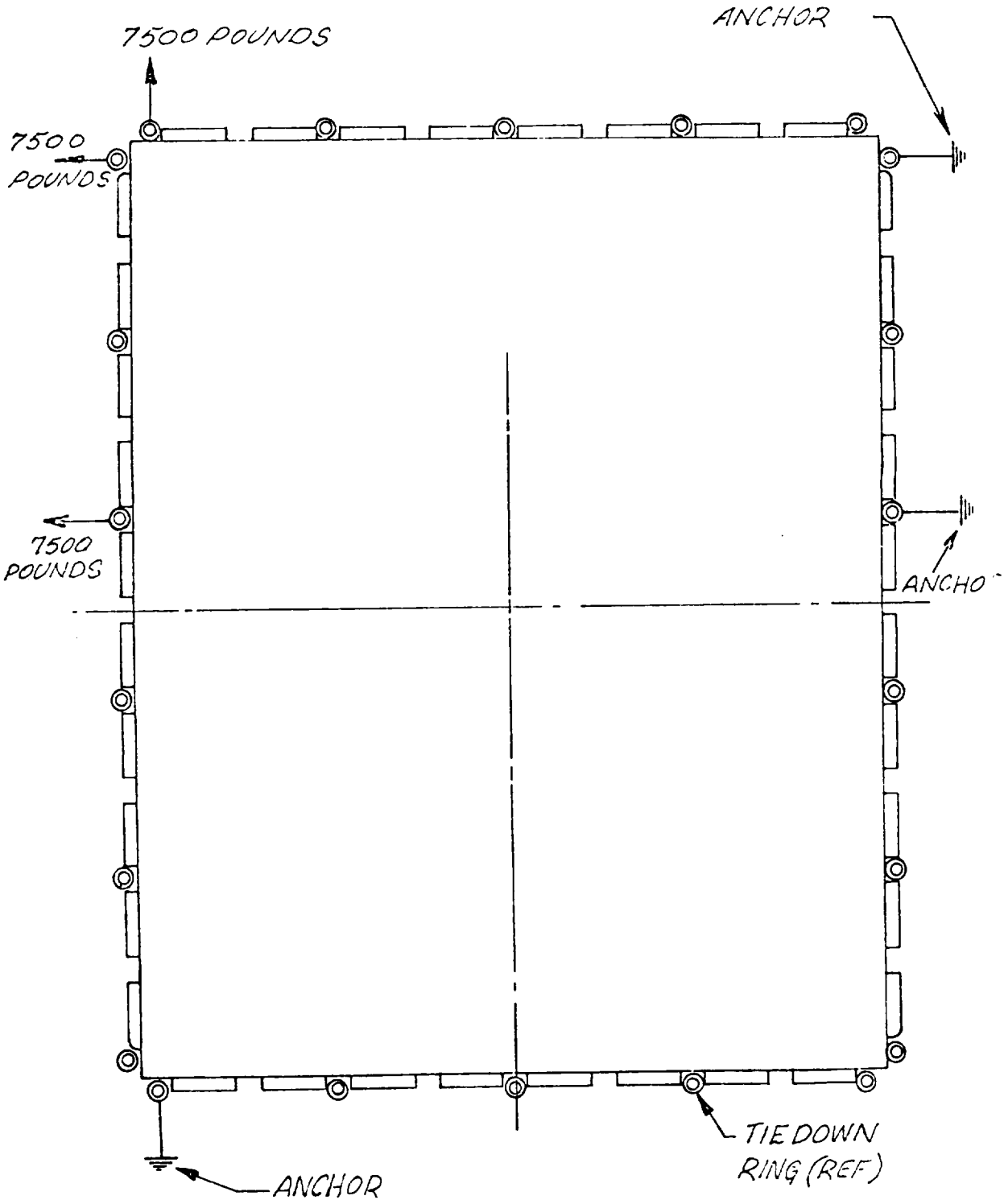


FIGURE 11 TEST DIAGRAM, TYPE I PALLET

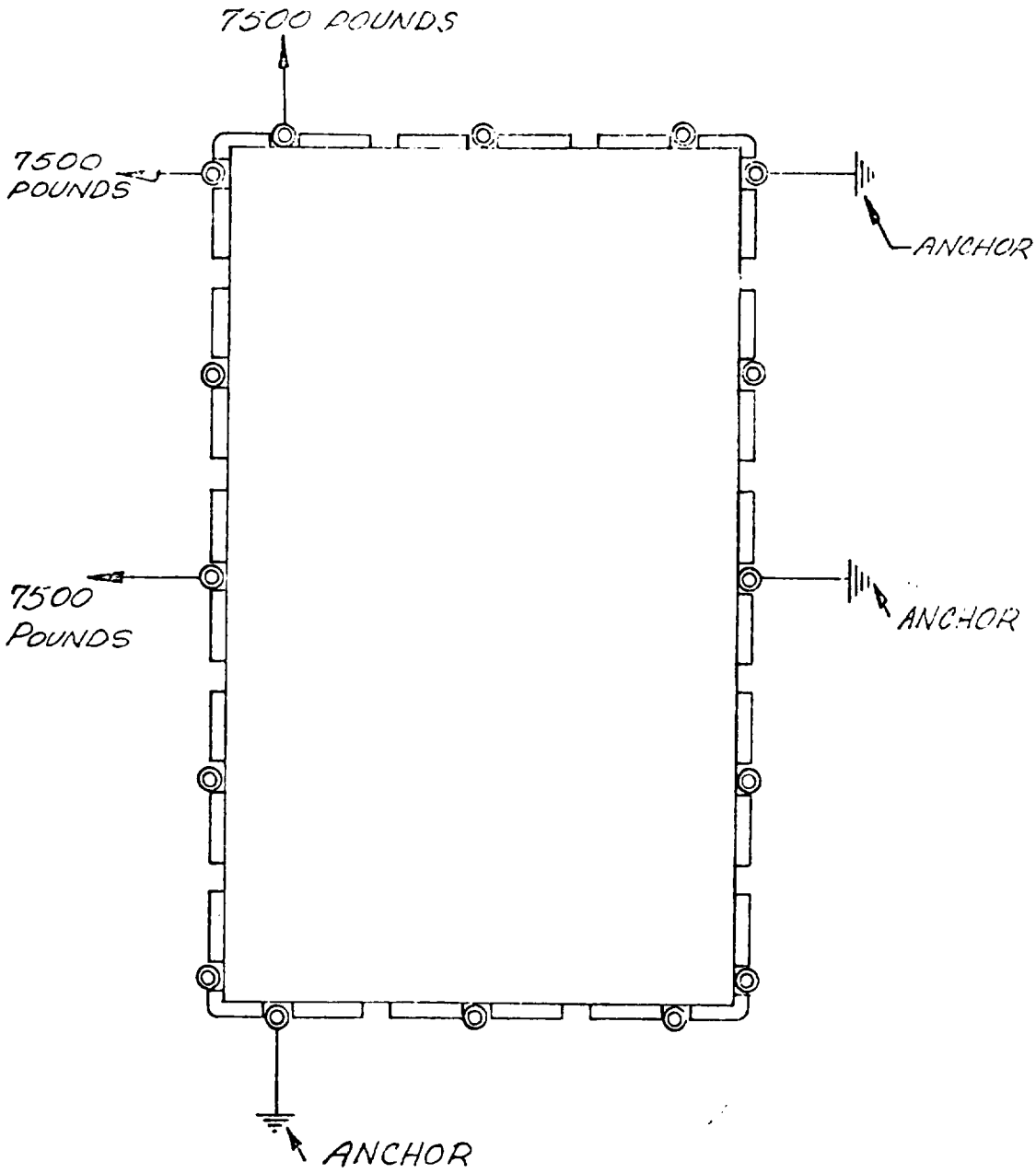


FIGURE 12 TEST DIAGRAM TYPE II AND III PALLETS

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