

MIL-M-52612A(ME)  
14 May 1987  
SUPERSEDING  
MIL-M-52612(ME)  
30 April 1968

MILITARY SPECIFICATION

MATS, LANDING, ALUMINUM

MEDIUM DUTY XM19

This specification is approved for use within the USA Belvoir Research, Development, and Engineering Center, Department of the Army, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers three types of medium duty, aluminum landing mats, as well as ancillary items.

1.2 Classification. The mats shall be of the following types as specified (see 6.2):

Type I - Standard mat  
Type II - Half mat  
Type III - Repair mat

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation.

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Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: USA Belvoir Research, Development, and Engineering Center, ATTN: STRBE-TSE, Fort Belvoir, VA 22060-5606 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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AMSC N/A

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## SPECIFICATIONS

## FEDERAL

- NN-P-71 - Pallet, Material Handling, Wood, Stringer Construction, 2-Way and 4-Way (Partial).
- NN-P-530 - Plywood, Flat Panel.
- QQ-A-250/11 - Aluminum Alloy 6061, Plate and Sheet.
- QQ-S-781 - Strapping, Steel and Seals.
- MMM-A-132 - Adhesive, Heat Resistant, Airframe Structural, Metal to Metal.
- PPP-B-601 - Boxes, Wood, Cleated-Plywood.
- PPP-T-60 - Tape, Packaging, Waterproof.

## MILITARY

- MIL-C-104 - Crates, Wood; Lumber and Plywood Sheathed, Nailed and Bolted.
- MIL-T-704 - Treatment and Painting of Materiel.
- MIL-C-5541 - Chemical Film and Chemical Film Materials for Aluminum and Aluminum Alloys.
- MIL-C-7438 - Core Material, Aluminum, for Sandwich Construction.
- MIL-A-8625 - Anodic Coatings, for Aluminum and Aluminum Alloys.
- MIL-A-25463 - Adhesive, Metallic Structural Sandwich Construction.
- MIL-C-81346 - Compound, Deck Covering, Nonslip, Lightweight, for Aluminum Alloy Mats.
- MIL-A-83377 - Adhesive Bonding for Aerospace Systems, Guidelines for.

## STANDARDS

## FEDERAL

- FED-STD-595 - Colors.

## 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-621 - Test Method for Pavement Subgrade, Subbase, and Base Course Materials.
- MIL-STD-889 - Dissimilar Metals.

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2.1.2 Other Government documents and drawings. The following other Government documents and drawings form a part of this specification to the extent specified herein. Unless otherwise specified, the issues shall be those in effect on the date of the solicitation.

DEPARTMENT OF COMMERCE

PS-1 - Industrial Plywood.

(Application for copies should be addressed to the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20017.)

DRAWINGS

ME

TA13220E5655 - Landing Mats Assembly, Medium Duty.

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

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted shall be those listed in the issue of the DoDISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS shall be the issue of the non-Government documents which is current on the date of the solicitation.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualifications.

(Application for copies should be addressed to the American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017.)

HARDWOOD PLYWOOD MANUFACTURING ASSOCIATION (HPMA)

ANSI/HPMA HP 1983 - Hardwood and Decorative Plywood.

(Application for copies should be addressed to the Hardwood Plywood Manufacturing Association, 1825 Michael Faraday Drive, P.O. Box 2789, Reston, VA 22090.)

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(Non-Government standards and other publications are normally available from the organizations which prepare or which distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

## 3. REQUIREMENTS

3.1 Description. The landing mat assembly and the ancillary items shall be as shown on the top assembly TA13220E5655 and as specified herein.

<u>Drawing Number</u>	<u>NSN Number</u>
13216E9533	5680-00-089-5924
13216E9234	5680-00-089-5929
13216E9233	5680-00-089-5930
13216E9236	5680-00-089-5934
13216E9536	5680-00-930-1526
13216E9537	5680-00-089-5921
13216E9534	5680-00-089-5922
13216E9528	5680-00-930-1524
13216E9529	5680-00-930-1525
13216E9531	5680-00-089-5919
13216E9532	5680-00-089-5919
13216E9535	5680-00-933-3122
13216E9217	5680-00-089-5928
13216E9218	5680-00-933-3121
13216E9215	5680-00-089-5925
13216E9216	5680-00-933-3120
13216E9539	5680-00-933-3119

3.1.1 Drawings. The drawings forming a part of this specification are end product drawings. No deviation from the prescribed dimensions or tolerances is permissible without prior approval of the contracting officer. Where tolerances could cumulatively result in incorrect fits, the contractor shall provide tolerances within those prescribed on the drawings to insure correct fit, assembly, and operation of the landing mats or ancillary items. Any data (e.g., shop drawings, layouts, flow sheets, processing procedures, etc.) prepared by the contractor or obtained from a vendor to support fabrication and manufacture of the production item shall be made available, upon request, for inspection by the contracting officer or designated representative.

3.2 First article. Unless otherwise specified (see 6.2), a sample shall be subjected to first article inspection (see 4.3 and 6.3). Any changes or deviations of landing mat and ancillary items from the approved first article during production will be subject to the approval of the contracting officer. Approval of the first article will not relieve the contractor of his obligation to furnish landing mat and ancillary items conforming to this specification.

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3.3 Materials. Materials shall be as specified herein and on the drawings. Materials not specified shall be selected by the contractor and shall be subject to all provisions of this specification.

3.3.1 Material deterioration prevention and control. The mat and ancillary items shall be fabricated from compatible materials, inherently corrosion resistant or treated to provide protection against the various forms of corrosion and deterioration that may be encountered in any of the applicable operating and storage environments to which the mat and ancillary items may be exposed.

3.3.1.1 Dissimilar metals. Dissimilar metals shall not be used in intimate contact with each other unless protected against galvanic corrosion. Dissimilar metals and methods of protection are defined and detailed in MIL-STD-889.

3.3.1.2 Identification of materials and finishes. The contractor shall identify the specific material, material finish or treatment for use with component and subcomponent, and shall make information available upon request to the contracting officer or designated representative.

3.3.2 Recovered materials. For the purpose of this requirement, recovered materials are those materials which have been collected from solid waste and reprocessed to become a source of raw materials, as distinguished from virgin raw materials. The components, pieces and parts incorporated in the mat and ancillary items may be newly fabricated from recovered materials to the maximum extent practicable, provided the mat and ancillary items produced meet all other requirements of this specification. Used, rebuilt or remanufactured components, pieces and parts shall not be incorporated in the mat and ancillary items.

3.4 Honeycomb core. The honeycomb core shall conform to MIL-C-7438, grade B, except that the material shall be alloy 5056, temper H19 and the density shall be 8.6 pounds per cubic foot. Core material shall be 0.0025 inch thick, and the hexagon cell size shall be 1/8 inch. Thickness of the core shall be 1.372 inches  $+0.010$  inch. All surfaces of the core shall be clean and free from corrosion, and the top and bottom surfaces shall be free from burrs, skips, and scratches which might affect the bonding of the core to the skin. The core material combination number is 8.6-1/8-25(5056-H19), as defined in MIL-C-7438.

3.4.1 Shear strength. The core shall develop a minimum shear strength of 550 psi in the "W" direction (direction perpendicular to the core ribbons) when tested as specified in 4.5.2.1.

3.5 Adhesive.

3.5.1 Core to rail adhesive. This adhesive shall be a two component epoxy resin adhesive potting compound capable of bonding aluminum alloy with pressure. A suggested manufacturer is Kaiser Aluminum and Chemical Company, conforming to the requirements of Kaiser Aluminum and Chemical Company's specification number KLMS-1107, Revision A, with an issue date of 11 January 1968 (see 6.8).

3.5.1.1 Lap shear. When tested in accordance with 4.5.2.4, the lap shear strength shall equal or exceed the following minimums:

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Test temperature	Minimum average psi
70 $\pm$ 5 °F	1800
180 $\pm$ 5 °F	1800
-67 $\pm$ 5 °F	1000

3.5.1.2 Application process. A process specification conforming to MIL-A-83377 shall be prepared and submitted for approval. An approved process may not be changed without approval of the contracting officer.

3.5.2 Core to skin adhesive. The adhesive used to bond the core to the upper skins shall be a solvent free, 100 percent solids, thermosetting, supported modified epoxy adhesive capable of bonding to unprimed aluminum surfaces, and conforming to MIL-A-25463, type I, class 2. The adhesive shall contain less than 1 percent volatiles, and its unit weight shall be 0.060 - 0.095 pounds per square foot and shall conform to the following additional requirements when tested in accordance with 4.5.2.6.

## a. Tensile shear

- (1) Ambient (75  $\pm$  5 °F) - 3,250 min psi
- (2) Hot (180  $\pm$  5 °F) - 2,800 min psi
- (3) Cold (-67  $\pm$  5 °F) - 3,250 min psi

## b. Climbing drum sandwich peel strength

- (1) Ambient (70  $\pm$  5 °F) - 50 lbs/3 in. width
- (2) Hot (180  $\pm$  5 °F) - 30 lbs/3 in. width
- (3) Cold (-67  $\pm$  5 °F) - 50 lbs/3 in. width

c. Flatwise tensile strength (375  $\pm$  5 °F) - 300 psi

3.6 Skins. The top and bottom mat skins shall be fabricated from 0.063  $\pm$  0.0035 inch thick 6061 aluminum alloy sheet in the T6 temper conforming to QQ-A-250/11. Dimensions are as follows:

Top Skin - 47.72  $\pm$  0.030 inches X 47.72  $\pm$  0.030 inches

Bottom Skin - 48.00  $\pm$  0.020 inches X 48.00  $\pm$  0.020 inches  
 - 0.040 inches X 48.00  $\pm$  0.040 inches

3.6.1 Flatness. Skins, after having been cut to size, shall be flat with no abrupt buckles, kinks or waves.

3.6.2 Bow. No point on an unbonded skin shall be more than 0.5 inches from a flat reference plane when tested in accordance with 4.5.2.2.

3.6.3 Short cycle flatness. Local deformations shall not exceed 0.015 inch within 3 inches when tested in accordance with 4.5.2.3.

3.7 Assembly. Mats shall be fabricated so as to be capable of satisfactory assembly with like mats when tested as specified in 4.5.2.7.

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3.8 Landing mats and ancillary items. Landing mats and ancillary items shall be furnished in the quantities specified (see 6.2 and 6.4).

<u>Item</u>	<u>Drawing Number</u>
1. Turn Adapter, Male Overlap.	13216E9215
2. Turn Adapter, Male Underlap.	13216E9216
3. Turn Adapter, Female Overlap.	13216E9217
4. Turn Adapter, Female Underlap.	13216E9218
5. Anchor Attachment, Male.	13216E9233
6. Anchor Attachment, Female.	13216E9234
7. Edge Anchor Assembly.	13216E9236
8. Access Adapter, Overlap/Underlap.	13216E9533
9. Starting Connector 48.86 In.	13216E9535
10. Turn Adapter, Overlap/Underlap 15° Turndown	13261E9539

3.9 Mat shear strength. Mats shall exhibit a minimum shear strength of 520 pounds per square inch (psi) when tested in accordance with 4.5.2.8.

3.10 Rolling load. Type I and II mat assemblies shall be capable of withstanding 1,000 coverages, and type III assemblies 340 coverages of a 25,000 pound +100 pounds single wheel load applied by an aircraft tire having a minimum pressure of 250 psi over a maximum contact area of 100 square inches on mat assemblies installed on a soil having a Californis Bearing Ratio (CBR) of 4 or less.

3.11 Identification marking. The mats and ancillary items shall be identified in accordance with MIL-STD-130, except that only the NSN and the manufacturer's name shall be required on the mats and only the NSN and manufacturer's identification number shall be required on the ancillary items.

### 3.12 Finishing.

#### 3.12.1 Mats.

3.12.1.1 Upper surface. The upper surface of the mats shall be treated in accordance with MIL-T-704, and coated with a chemical film conforming to MIL-C-5541, type and grade optional, class 1; or with an approved adhesive bonding pretreatment bonding process. The upper, or wearing surface, shall then be coated with an antiskid coating conforming to MIL-C-81346, except that the color shall match color number 34094 of FED-STD-595. The antiskid coating shall completely and evenly coat the wearing surface of the mat to a dry film thickness of 5 to 10 mils. The antiskid coating shall extend over the wearing (top) surface of the mat but shall not be applied to the connector rails which are on each edge of the mat, except to that portion of their surface which joins the mat wearing surface.

3.12.1.2 Lower surface. The lower surface shall be treated and coated as specified in MIL-T-704, type B, color as specified in 3.12.1.1.

3.12.2 Ancillary items. The ancillary items shall be finished as specified in 3.12.1.2.

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3.12.3 Locking bar. The locking bars shall be anodized in accordance with MIL-A-8625, type I or II, class 1.

3.13 Fabrication process specification. The contractor shall submit a detailed fabrication process, reflecting the procedure which will be used to produce production mat assemblies, to the contracting officer for approval. This process shall include but is not limited to the following:

- a. Procedures for assembling rails, core, and skins.
- b. Procedure for bonding the core to the skins.
- c. Welding procedure (see 3.18.3).
- d. Procedure for use of core to rail adhesive.
- e. Treatment and painting process.
- f. Application of nonskid coating.
- g. Packaging procedure.
- h. Quality control measures.

Approval of the fabrication process specification shall not relieve the contractor of his obligation to supply mats conforming to this specification. Any changes or deviations from the approved process specification shall not be acceptable without prior approval of the contracting officer.

3.14 Detailed requirements. The landing mats shall be as follows:

3.14.1 Type I, standard mat. Type I mats shall be as shown on drawing 13216E9528, and as specified herein. Each mat shall be furnished with one locking bar (drawing 13216E9536). The weight of the mat, without locking bar, shall be 70.5 pounds  $\pm$  1.5 pounds.

3.14.2 Type II, half mat. Type II mats shall be as shown on drawing 13216E9529, and as specified herein. Each mat shall be furnished with one locking bar (drawing 13216E9536). The weight of the mat, without locking bar, shall be 41 pounds  $\pm$  1.5 pounds.

3.14.3 Type III, repair mats. Type III mats shall be as shown on drawing 13216E9530, and as specified herein. Each mat shall be furnished with three locking bars (2 bars as specified in drawing 13216E9537 and 1 bar as specified in drawing 13216E9534). The weight of the mat, without locking bars, shall be 91 pounds  $\pm$  2 pounds.

3.15 Workmanship.

3.15.1 Welding. Unless otherwise specified on the end product drawings, welding shall be done in accordance with the requirements of this specification. Prior to the fabrication of any weldment, the contractor shall prepare and submit to the contracting officer for approval, a joint welding procedure to cover all welding, including a general outline for the repair of base material and welded joints. Included with the welding procedure shall be an isometric or perspective drawing showing the location and configuration of each joint. These procedures shall also address the proposed method of surface preparation prior to welding. The procedure shall be qualified in accordance with the ASME Boiler and Pressure Vessel Code, Section IX. All welds to be qualified shall be made



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on the same alloy, gauge and temper of material, with the same filler materials, and in the same position as will be used in production. All surfaces of parts to be welded shall be free from scale, paint, grease, rust, oxide film and other foreign matter. Any change in procedure during fabrication shall require re-qualification in accordance with the requirements of the ASME Boiler and Pressure Vessel Code, Section IX.

3.15.2 Workmanship specimens. The contractor shall prepare specimens representing each typical weld joint utilized in the fabrication of the mat. These specimens shall be furnished prior to the first article. Acceptable specimens shall represent the minimum acceptable weld quality and will be used as standard during production.

3.15.3 Welders. Prior to performing production welding for this specification, welders and welding operators shall be qualified as prescribed in the following listed code:

ASME Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualifications.

The contractor shall provide the contracting officer with the certification that the qualification tests as prescribed have been successfully completed and that such qualification is effective as defined by the particular code. Test specimens shall be made on the same alloy, gauge and temper of material with same filler materials and in the same position as will be used in production.

3.15.4 Welding characteristics.

3.15.4.1 Weld contour. Weld beads shall be smooth, regular, and free of undercut and spatter, and shall not exceed .075 inches in height above the top surface of the mat. Weldments may be machined. Grinding is not permitted.

3.15.4.2 Weldment standard. Production weldments shall be equal to or better than standard samples (see 3.15.2).

3.15.4.3 Weld penetration. Full penetration of both surfaces shall be indicated in skin to rail weldments examined as specified in table I, item 6.

4. QUALITY ASSURANCE PROVISIONS

4.1.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.1.2 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of

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all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use 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 specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Component and material inspection. The contractor is responsible for insuring that components and materials used are manufactured, examined, and tested in accordance with referenced specifications and standards.

4.2 Classification of inspection. Inspection shall be classified as follows:

- a. First article inspection (see 4.3).
- b. Quality conformance inspection (see 4.4).
- c. Inspection of packaging (see 4.6).

4.3 First article inspection.

4.3.1 Sample. The contractor shall furnish not less than 2100 square feet of the medium duty landing mat system or not less than one or more of each type of landing mat or ancillary item being furnished (see 6.2), for examination and testing within the time frame specified (see 6.2) to prove prior to starting production that his production methods will produce the landing mat system, individual mats or ancillary items that comply with the requirements of this specification. When the contractor is to furnish the landing mat system, not less than the following quantities of mat shall be furnished:

105	Type I	Standard mat
42	Type II	Half mat
4	Type III	Repair mat assemblies
	Ancillary items as required to install 2100 square feet of landing mat shall be provided.	

Examination and test shall be as specified in section 4; and, unless otherwise specified herein, all examination and tests shall be conducted by the contractor subject to surveillance and approval by the Government (see 6.3). When specified (see 6.2), the Government will conduct any or all of the first article examination and tests, as specified (see 6.2).

4.3.2 Examination. The landing mat assemblies shall be examined as specified in 4.5.1. Presence of one or more defects shall be cause for rejection.

4.3.3 Tests. The landing mats shall be tested as specified in 4.5.2 except that 5 of the type I, and 2 of the type II mats selected (see 3.2) shall be tested in accordance with 4.5.2.8.

4.4 Quality conformance inspection.

4.4.1 Unit of product. Each mat and locking bar assembly and each ancillary item shall be a unit of product.

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4.4.2 Sampling.

4.4.2.1 Mat assemblies. Sampling for examination conforming to table I (except item 110) and for the test prescribed in 4.5.2.5, shall be in accordance with MIL-STD-105. Prescribed Acceptable Quality Levels (AQLs) are 0.01 for major defects and 0.025 for minor defects.

4.4.2.2 Parts, components, and ancillary items. Sampling for examination conforming to table I and for all tests prescribed in 4.5.2.1 through 4.5.2.4 and for 4.5.2.6 shall be in accordance with MIL-STD-105. Prescribed AQLs are as indicated in 4.4.2.1.

4.4.2.3 Special sampling.

4.4.2.3.1 Beam shear test. Sampling for examination of item 110 in table I and for the beam shear test in 4.5.2.8 shall be in accordance with the following plan: 1st, 5th, 80th, 100th, 500th, 1000th, 1500th, 2500th, and 4000th mat, and thereafter a minimum of 1 mat for each 4000. Failure of either test prescribed in 4.5.2.8 shall necessitate requalification as prescribed in 4.5.2.8.3.

4.4.2.3.2 Assembly test sampling. Sampling for the test prescribed in 4.5.2.7 shall be in accordance with MIL-STD-105. Prescribed AQL for this test is 0.01.

4.4.3 Examination. Units of product selected in accordance with 4.4.2.1 and 4.4.2.2 shall be examined as specified in 4.5.1.

4.4.4 Tests. Samples selected in accordance with 4.4.2 shall be tested as specified in 4.5.2.

4.5 Inspection procedure.

4.5.1 Component and mat assembly. The components and mat assemblies shall be examined in accordance with table I. Presence of one or more defects shall be cause for rejection of the mat or ancillary item as applicable.

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TABLE I. Examination Schedule 1/

Core	Core to Rail Adhesive	Core to Skin Adhesive	Skins	Rails	Ancillary Items	Locking Bars	Mats	Defects	Requirement Paragraph
X	X	X	X	X	X	X	X	MAJOR 101. Material not as specified. 102. Materials not resistant to corrosion and deterioration, or treated to be resistant to corrosion and deterioration for applicable storage and operating environments.	3.3, 3.4 3.5, 3.6 3.7, 3.12 3.3.1
X	-	X	X	X	X	X	X	103. Dissimilar metals as defined in MIL-STD-889 are not effectively insulated from each other.	3.3.1.1
-	-	-	-	-	-	-	X	104. Contractor does not have documentation available for identification of material, material finishes, or treatment.	3.3.1.2
-	-	-	-	-	X	-	X	105. Used, rebuilt or re-manufactured components, pieces, or parts incorporated in the mat and ancillary items.	3.3.2

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TABLE I. Examination Schedule<sup>1/</sup>(Cont'd)

Core	Core to Rail Adhesive	Core to Skin Adhesive	Skins	Rails	Ancillary Items	Locking Bars	Mats	Defects	Requirement Paragraph
-	-	-	-	-	-	-	X	106. Antiskid coating not applied as specified.	3.12.1.1
-	-	-	-	-	-	-	X	107. Weight in access of allowable.	3.14.1, 3.14.2, 3.14.3
-	X	X	X	X	-	-	X	108. Processes not in accordance with approved process specification.	3.13
-	-	-	-	-	-	-	X	109. Welding method not as specified.	3.15
-	-	-	-	-	-	-	X	110. Weld penetration not as specified. <sup>2/</sup>	3.15.4.3
-	-	-	-	-	-	-	X	111. Welds containing cracks, pits, overlaps, craters and undercutting.	3.15.4.1
							MINOR		
X	-	-	-	-	-	-	-	201. Configuration not uniform.	3.4
X	-	-	-	-	-	-	-	202. Workmanship not as specified.	3.15
-	-	-	X	-	-	-	-	203. Surface contains buckles and kinks.	3.6
-	-	-	-	-	-	X	-	204. Locking bar not anodized as specified.	3.12.3
-	-	-	-	-	-	X	X	205. ID marking missing or illegible.	3.11

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TABLE I. Examination Schedule 1/ (Cont'd)

Core	Core to Rail Adhesive	Core to Skin Adhesive	Skins	Rails	Ancillary Items	Locking Bars	Mats	Defects	Requirement Paragraph
-	-	-	-	-	-	-	X	206. Finishing not as specified.	3.12
-	-	-	-	-	-	-	X	207. Weld bead contour not as specified.	3.15.4.1

1/ Perform examinations marked "X".

2/ Examine as shown in figure 3.

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4.5.2 Tests.4.5.2.1 Core shear strength.

4.5.2.1.1 Sample preparation. Shear sample shall be fabricated by bonding a 0.063 inch alloy 6061 T6 aluminum skin to both top and bottom of a 4-inch by 7-inch section of honeycomb core (the 4-inch dimension shall be parallel to the core ribbon direction) with a film supported adhesive conforming to 3.5.2. The bonding process and cure cycle shall be identical to that used in mat fabrication.

4.5.2.1.2 Test method. Shear tests shall be performed in the manner indicated in figure 1. The deflection rate shall be 0.50 inches per minute, +0.10 inches per minute. Shear strength shall be determined by the following formula:

$$F = \frac{P}{2w (t - .063)}$$

Where F = Shear strength (psi)  
 P = Ultimate failing load (lbs)  
 w = Sample width (inches)  
 t = Sandwich thickness (inches)

Nonconformance to 3.4.1 shall constitute failure of this test.

4.5.2.2 Skin bow test. Place a skin of the size specified unrestrained on a flat reference plane. The bottom surface of the panel shall be not more than 1/2-inch above the reference plane at any place. Invert the panel and check the upper surface in the same manner. Nonconformance to 3.6.2 shall constitute failure of this test.

4.5.2.3 Local deformation. Local deformation shall be measured by placing a skin of the specified size on a flat reference plane and utilizing a 3-inch scale and feeler gauge to determine magnitude. Deformations exceeding 0.015 inch in accordance with 3.6.3 shall constitute failure of this test.

4.5.2.4 Core to rail adhesive lap shear. Determine average shear strength in the manner specified in MMM-A-132 for type I adhesives. Failure to attain the average strengths prescribed in 3.5.1.1 shall constitute failure of this test.

4.5.2.5 Core to rail adhesive application. Two 1/16-inch holes shall be drilled into the area of the finished mat occupied by the adhesive. These holes shall be drilled to a depth of .60 inches with a 1/16-inch fluted drill bit at two locations approximately 8 inches on each side of the exit opening. The bit shall be examined for evidence of adhesive at depths of 0.02 and 0.5 inches. If no evidence of adhesive is found at depths in excess of 0.02 inches, additional holes will be drilled to determine the extent of the unfilled cavity. Cavities in excess of 0.02 inches deep within 12 inches in length are considered minor defects. Those exceeding 12 inches in length as well as those in excess of 0.5 inches deep of any length shall be considered major defects.

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4.5.2.6 Core to skin adhesive. Core to skin adhesive shall be tested in accordance with table II.

TABLE II. Test Schedule.

Property	Test Method	Test Number
Tensile shear	MMM-A-132	1, 2, & 7
Peel	MIL-A-25463	1, 2, & 3
Flatwise tensile	MIL-A-25463	4, 5, & 6

Nonconformance to 3.5.2 shall constitute failure of this test.

4.5.2.7 Assembly test. The mats shall be assembled as shown in figure 2. Inability of any mat being tested, to fit without the exercise of force in excess of that required to fit the first article mats, shall constitute failure of this test.

4.5.2.8 Mat shear strength.

4.5.2.8.1 Static short beams. Specimen size shall be 4 by 7 by 1.50 inches and shall be obtained from the areas of the test panels as indicated:

- Type I mat - 2A, 2B, 2C, 2D, 3, and 4 of figure 4.
- Type II mat - 2A, 2B, 2C, and 2D of figure 5.
- Type III mat - 2A, 2B, 2C, and 2D of figure 6.

Tests shall be conducted as prescribed in figure 7 and shear strength calculated by the following formula:

$$F = \frac{P}{2w (t - 0.063)}$$

- Where F = Shear strength (psi)
- P = Ultimate failing load (lbs)
- w = Specimen width (inches)
- t = Sandwich thickness (inches)

Nonconformance to 3.9 shall constitute failure of this test.

4.5.2.8.2 Static edge member. Specimen size shall be 9.50 by 10.50 by 1.50 inches and shall be obtained from the test panel from areas of the test panel indicated:

- Type I mats - 1A through 1H of figure 4.
- Type II mats - 1A through 1F of figure 5.
- Type III mats - 1A through 1F of figure 6.



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Tests shall be conducted as prescribed in figures 8, 9, and 10 and shear strength calculated by the following formula.

$$F = \frac{5P}{8.5w (t - 0.063)}$$

Where F = Shear strength (psi)  
 P = Ultimate failing load (lbs)  
 t = Specimen width (inches)  
 w = Sandwich thickness (inches)

Nonconformance to 3.9 shall constitute failure of this test.

4.5.2.8.3 Requalification after a beam shear failure. If any specimen in the test arrangements of figures 3, 4, and 5 fails to meet the required 520 psi, immediate steps will be taken by the contractor to:

- a. Determine the cause.
- b. Isolate affected products.
- c. Take corrective action.
- d. Submit objective written evidence and data to the contracting officer for review. This presentation shall include, as a minimum, a record of execution of the procedure indicated in table III.

TABLE III. Requalification requirements.

Estimated Cause of Failure	STEP 1 Number of mats to be tested after corrective action has been taken	STEP 2 If no additional failures are encountered from Step 1.	STEP 3 If another failure is encountered during Step 1.
A. Cause Established	3 sequenced at discretion of manufacturer.	Proceed with manufacturing.	Repeat Step 1 after analysis by manufacturer.
B. Probable cause	4 sequenced at discretion of manufacturer.	Proceed with manufacturing.	If failure mode is the same, discontinue production until cause is established and corrective action taken.
C. Unknown	5 sequenced at discretion of manufacturer.	If cause is still unknown, assume random failure and discontinue testing. If cause is now	If failure mode is the same, discontinue production until cause is established and corrective action taken.

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TABLE III. Requalification requirements. (Cont'd)

Estimated Cause of Failure	STEP 1 Number of mats to be tested after corrective action has been taken	STEP 2 If no additional failures are encountered from Step 1.	STEP 3 If another failure is encountered during Step 1.
		identified as "established" or probable", proceed as in A or B above accordingly.	

4.5.2.9 Rollover load.

4.5.2.9.1 Installation of test mats. An area of soil approximately 26 by 68 feet shall be utilized to prepare a subgrade having a California Bearing Ratio (CBR) of 3.5 to 4.0. The test installation shall contain type I and type II mats installed as shown in figure 11. Type III mats will be used as replacement mats for two type I mats. The ends of the mats along the longitudinal edges of the test section shall be anchored or otherwise restrained to prevent the vertical and limit the lateral movement of the mat edges.

4.5.2.9.2 Roll coverage. The mats in the test section shall be subjected in the manner prescribed in 4.5.2.9.5 to an equivalent of 1,000 rollover coverages by an aircraft tire inflated to a minimum pressure of 250 psi with a 25,000 pound +100 pound load applied over a maximum contact area of 112 square inches. Coverages shall be applied at a maximum speed of 4 miles per hour (mph). Mat failure necessitating replacement in excess of 10 percent of the mats receiving 100 percent of the coverage prior to completion of the required number of equivalent coverages shall constitute failure of this test.

4.5.2.9.3 Subgrade CBR.

4.5.2.9.3.1 Initial CBR. Initial CBR shall be determined in accordance with MIL-STD-621. Readings shall be taken at the surface and at depths of 6 and 12 inches at two locations. The two locations shall be outside the center 10 by 40 foot test lane. The initial CBR shall be the average of these readings and shall be not less than 3.5 nor more than 4.0.

4.5.2.9.3.2 Subsequent CBR. Upon each occasion of a mat having failed, the CBR of the soil immediately underneath will be determined by averaging the reading at the surface and at depths of 6 and 12 inches. At the conclusion of an equivalent of 500 coverages (see 4.5.2.9.4) the CBR shall be determined at two locations within the test lane in the same manner as prescribed in 4.5.2.9.3.1. These locations shall be a minimum of 30 feet apart. If the average CBR exceeds 4.3, the test shall be halted and the subgrade reconstructed to a CBR of 3.5 to 4.0.

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4.5.2.9.4 Equivalent coverage. The required equivalent coverage shall be calculated initially and at the completion of an equivalent of 500 coverages. Initial determination of required coverages is calculated by inserting the average CBR as determined in 4.5.2.9.3.1 in the following equation:

$$\text{Log}_{10} \text{ Coverages} = \left[ \frac{99.35}{\frac{3086 - 32}{\text{CBR}}} - 0.65 \right]$$

At completion of an equivalent of 500 coverages, the remaining coverages required shall be computed by using the average of all 12 CBR readings taken as prescribed in 4.5.2.9.3.1 and 4.5.2.9.3.2 and inserting in the aforementioned equation to determine equivalent coverages at that average CBR. The resultant number of coverages shall be divided by 2 to determine remaining coverages required. If the subgrade must be reconstructed (see 4.5.2.9.3.2), the additional coverages required shall be determined by using the average CBR of the reconstructed subgrade in the equation to obtain coverages required. Remaining required coverages shall be 1/2 of this number.

4.5.2.9.5 Coverage application. Coverages shall be applied in the 10 by 64 foot center of the 24 by 64 foot test section (see figure 11). Coverage shall be started at one side of the test lane by moving forward at a maximum speed of 4 mph and then back in the same path to complete two coverages. The tire shall then be shifted laterally the width of the tire print and the procedure repeated a sufficient number of times to cover the width of the test lane. The interior 100 inches of the test lane shall then receive six additional coverages and the innermost 60 inches another coverages, making a total of ten coverages for the center 60 inches of the test lane. This cycle shall constitute ten coverages for purposes of this specification. Subsequent coverages shall be applied by repeating this cycle as necessary to obtain the required number of coverages as determined by 4.5.2.9.4.

#### 4.6 Inspection of packaging.

4.6.1 First article pack inspection. The first article pack shall be examined for the defects specified in 4.6.2.3. Presence of one or more defects shall be cause for rejection.

#### 4.6.2 Quality conformance inspection of pack.

4.6.2.1 Unit of product. For purpose of inspection, a completed pack prepared for shipment of either of the following shall be considered a unit of product:

- Completed pack of type I, II, or III mat assemblies.
- Completed pack of ancillary items.

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4.6.2.2 Sampling. Sampling for examination shall be in accordance with MIL-STD-105.

4.6.2.3 Examination. Samples selected in accordance with 4.6.2.2 shall be examined for the following defects. AQL shall be 1.0 percent defective.

- 112. Quantity of mats per pack not as specified for level A or C (see 5.3.1, 5.3.2).
- 113. Pack for mats not fabricated as specified for level A or C (see 5.3.1, 5.3.2, figures 12, 13, 14).
- 114. Ancillary items not boxed as specified for level A or C (see 5.3.1.4, 5.3.2).
- 115. Ancillary items created as specified for level A (see 5.3.1.4).
- 116. Strapping not zinc coated for level A (see 5.3).
- 117. Ancillary items not unitized as specified for level C (see 5.3.2).
- 118. Marking incorrect, missing, or illegible (see 5.4).

## 5. PACKAGING

5.1 First article pack. The contractor shall furnish a first article pack for examination within the time frame specified (see 6.2), to prove, prior to starting production packaging, that the applied packing and marking comply with the requirements of this specification. Examination shall be as specified in section 4 and shall be subject to surveillance and approval by the Government (see 6.5). The first article pack may be accomplished utilizing either the first article model or a production model. If the first article model is utilized, and the Government requests a comparison between the first article and a production model, any packing shall be removed by the contractor at no expense to the Government.

5.2 Preservation. Preservation of the mat and ancillary items is not required.

5.3 Packing. Packing shall be level A or C as specified (see 6.2).

5.3.1 Level A.

5.3.1.1 Type I. Twenty-four mats shall be stacked one on top of the other on a pallet conforming to NN-P-71, type V, class 1, group II, III, and IV, grade A. The size of the pallet shall be modified as shown in figure 12 herein. Twenty-five locking bars shall be assembled with the mats and taped in place with 1-inch wide tape conforming to PPP-T-60, type IV. Side and top panels of the pallet inclosure fabricated in accordance with figure 13 shall be assembled and fastened as shown in figure 14. The pack shall then be secured by strapping conforming to QQ-S-781, class B, of the size and positioning shown in figure 14.

5.3.1.2 Type II. Thirty-two mats shall be assembled with 33 locking bars and stacked in two adjacent stacks, 16 high each and packed as specified in 5.3.1.1, except that the side and end panel heights shall be reduced.

5.3.1.3 Type III. Sixteen mats shall be assembled with required locking bars and packed as specified in 5.3.1.2.

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5.3.1.4 Ancillary items. The ancillary items listed in table V shall be packed, as indicated, in boxes conforming to PPP-B-601, overseas type, style optional. The boxed ancillary items shall in turn be unitized in a crate conforming to MIL-C-104, type I, class 2, style a.

TABLE IV. Ancillary items per unitized load.

Nomenclature	Number Required	Drawing Number	Remark
a. Starting connectors	15	13216E9535	Pack items (a) - (g) in single box
b. Turn adapters	15	13216E9215	
c. Turn adapters	15	13216E9216	
d. Turn adapters	15	13216E9217	
e. Turn adapters	15	13216E9218	
f. Turn adapters	30	13216E9539	Pack 750 (h) & (i) in 5 like boxes Pack in 10 like boxes.
g. Access adapters	75	13216E9533	
h. Anchor attachments	375	13216E9233	
i. Anchor attachments	375	13216E9534	
j. Edge anchors	760	13216E9236	

5.3.2 Level C. Packing of mats shall be as specified for level A except that strapping shall be finish A. Ancillary items shall be packed as specified for level A except that boxes shall be domestic type. Unitization shall be in a single crate, or on one or more wood pallets conforming to NN-P-71, type optional. Individual boxes shall be secured to pallets with flat steel strapping, size as applicable for the load weight.

5.4 Marking. Marking for shipping and storage shall be in accordance with MIL-STD-129.

## 6. NOTES

6.1 Intended use. The landing mats are intended for use as a runway, taxiway, and apron surfacing for temporary airfields.

6.2 Ordering data. Procurement documents should specify the following:

- a. Title, number and date of this specification.
- b. Type of mat required (see 1.2).
- c. Time frame required for submission of first article (see 3.2 and 4.3.1).
- d. Quantity of mats and ancillary items required (see 3.8).
- e. Samples not less than 2100 square feet of the medium duty landing mat system or not less than one or more of each type of landing mat or ancillary item (see 4.3.1).
- f. Time frame required for submission of first article pack (see 5.1).
- g. Level of packing required (see 5.3).

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6.3 First article. When a first article inspection is required, the items should be a preproduction model. The first article should consist of the items specified in 4.3.1. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examinations, tests, and approval of the first article test results and disposition of the first article.

6.4 Quantities of mats and ancillary items required. Quantities of mats and ancillary items required for 125,000 square feet of landing area are listed in supply catalog, SC 5680-97-CL-E03. When spare mat or ancillary items are required, quantities for each must be specified.

6.5 First article pack. Any changes or deviations of production packs from the approved first article pack will be subject to the approval of the contracting officer. Approval of the first article pack will not relieve the contractor of his obligation to pack and mark the mat assemblies and ancillary items in accordance with this specification.

6.6 Quality assurance provisions (QAP). The contracting officer should require the contractors to maintain records of all QAP inspections. A suggested paragraph is as follows:

"The contractor shall maintain complete records of all examinations and tests performed to verify the requirements of classified QAP characteristics. The records shall include, as a minimum, lot size, sample size, drawing requirements, actual measurement, number and type of deficiencies found, quantity approved, quantity rejected, and corrective action taken when applicable."

6.7 Data requirements. The contracting officer should include requirements for such data as technical publications, instructional materials, illustrated parts list, and contractor's maintenance and operational manual to be furnished with each mat set.

6.8 Adhesive copy request. Request for copies of "KLMS-1107 Specifications for Kaiser Aluminum Honeycomb Core Landing Mat Potting Compound" should be addressed to Kaiser Aluminum and Chemical Sales, Inc., Oakland, California 71792.

6.9 Subject term (key word) listing.

Mat, aluminum  
Mat, landing

6.10 Changes from previous issue. Asterisks (or vertical lines) are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodian:  
Army - ME

Preparing activity:  
Army -ME

Project 5680-A147

MIL-M-52612A (ME)

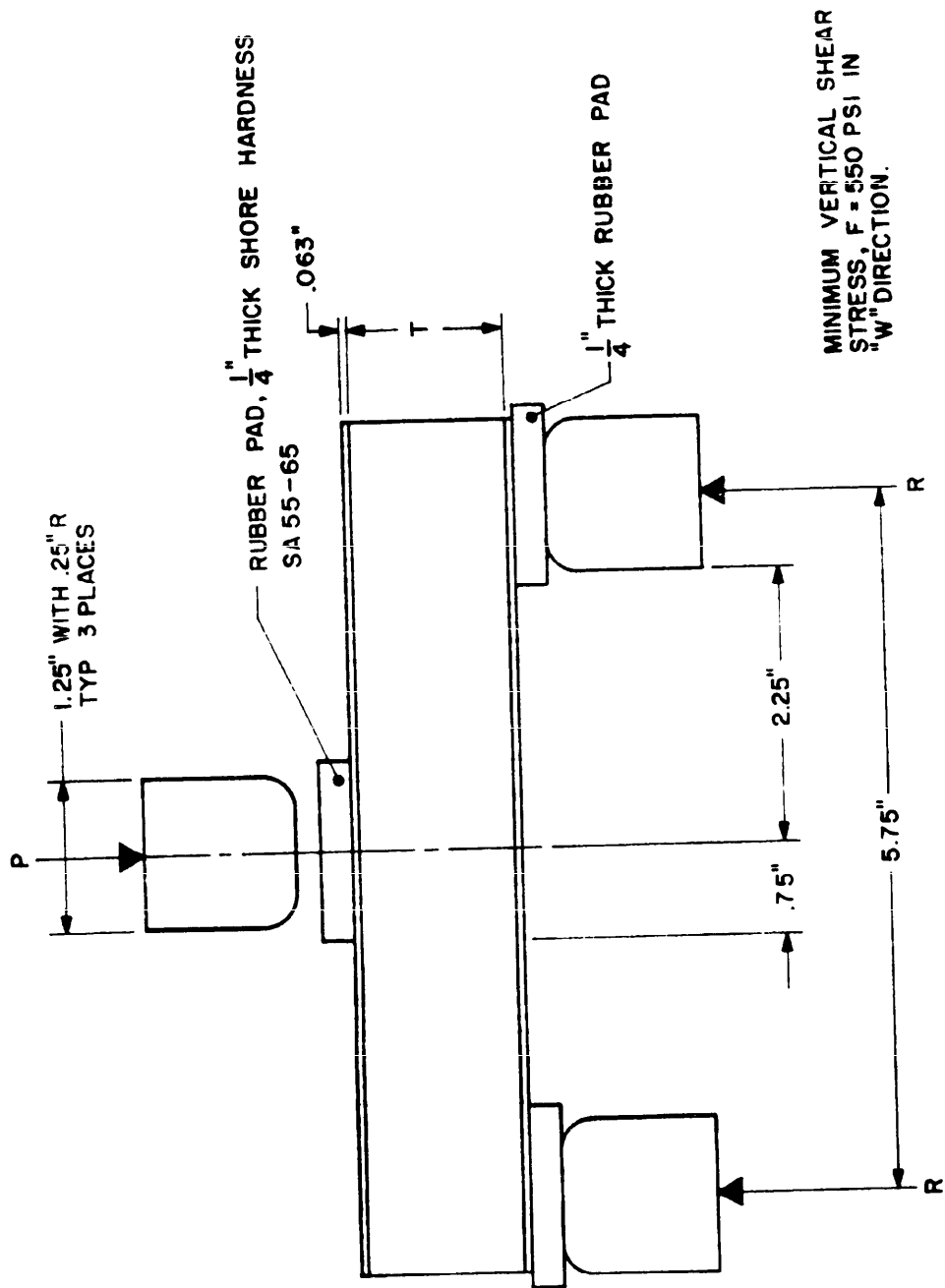
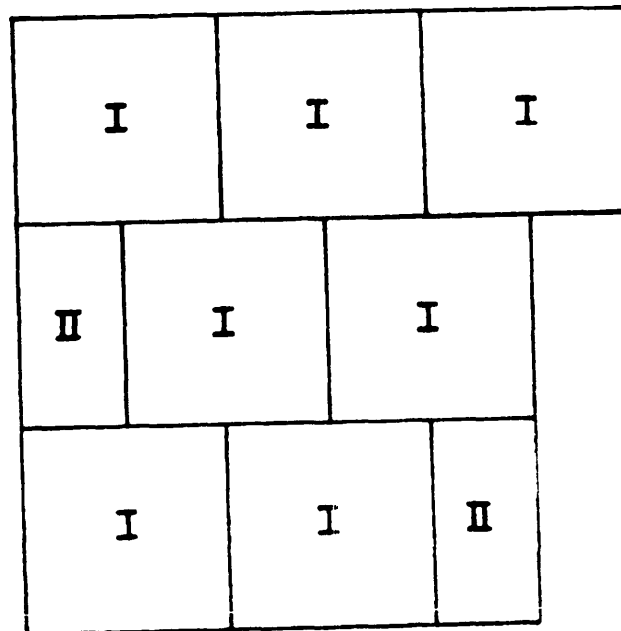


FIGURE I. FLEXURAL SHEAR BEAM TEST  
CX-1202

## MIL-M-52612A (ME)



Mats denoted by I & II in the figure shall be selected, at the time of acceptance of the first article model, from mats conforming to the specification and drawings. These mats will be retained for use in this test for the duration of the contract and may be shipped as a part of the final lot. These mats shall be used as a base for interchangeability tests. Each test mat shall be placed in each position indicated for that type mat. Inability of the test mat to mate with the base mats without force in excess of that required to mate the base mats shall constitute failure of the test.

Figure 2. ASSEMBLY TEST LAYOUT.

CX1642A



MIL-M-52612A (ME)

DX-1204

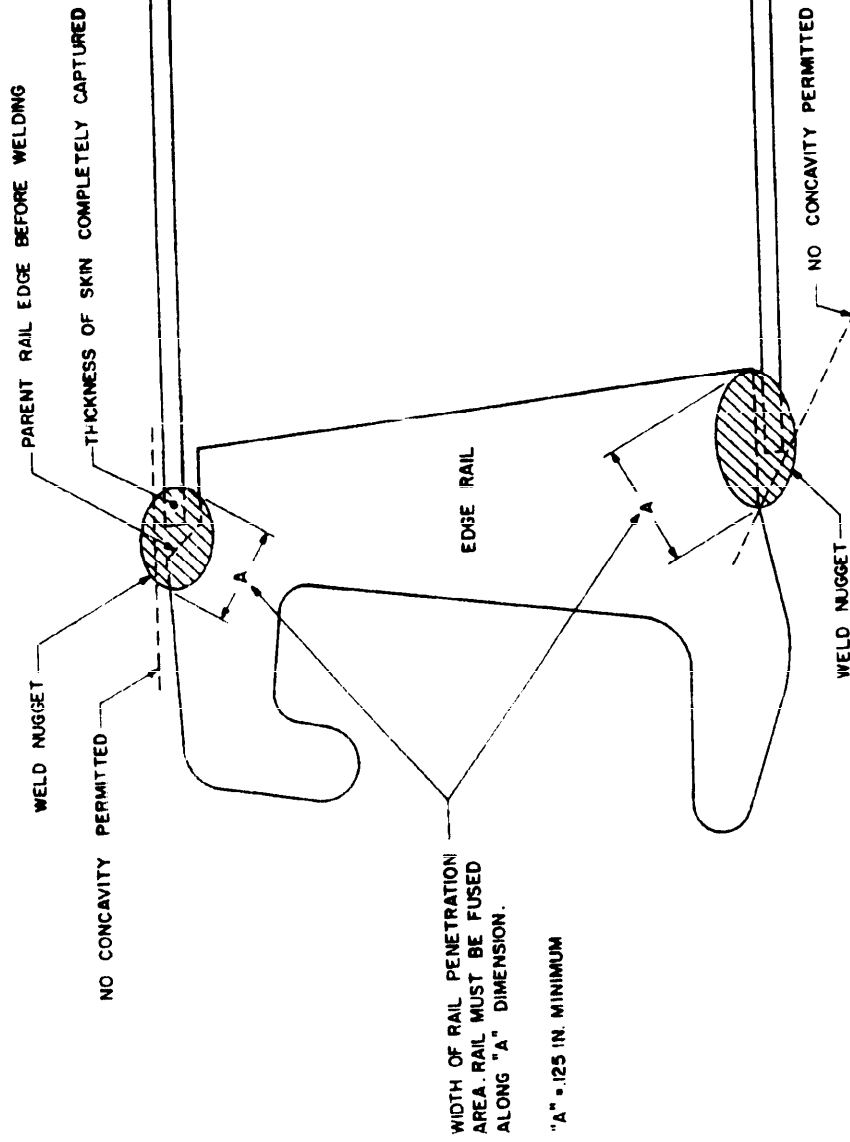


FIGURE 3. SKIN-TO-RAIL WELD SHOWING PENETRATION OF SKIN AND RAIL

MIL-M-52612A (ME)

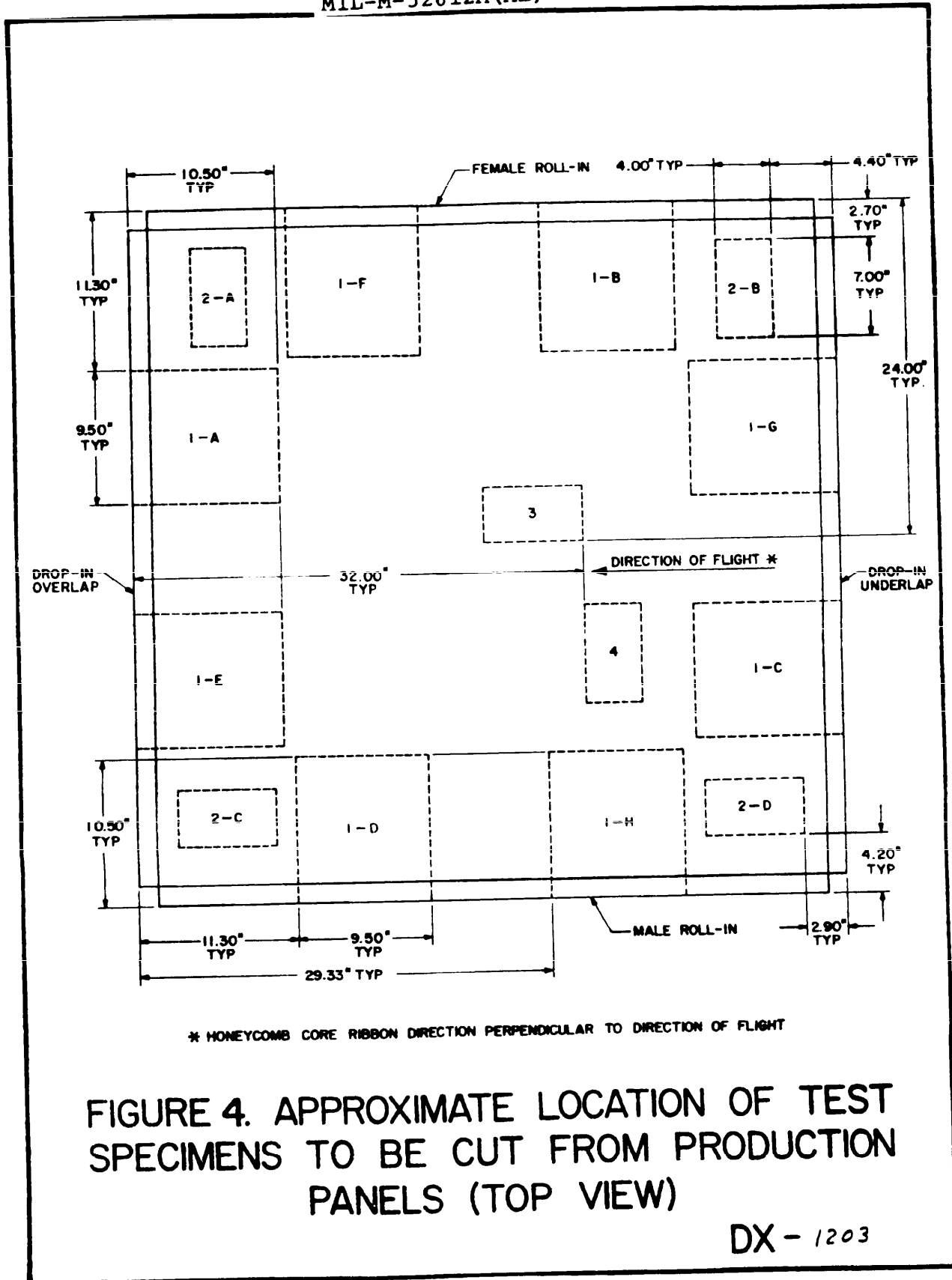


FIGURE 4. APPROXIMATE LOCATION OF TEST SPECIMENS TO BE CUT FROM PRODUCTION PANELS (TOP VIEW)

DX - 1203

MIL-M-52612A (ME)

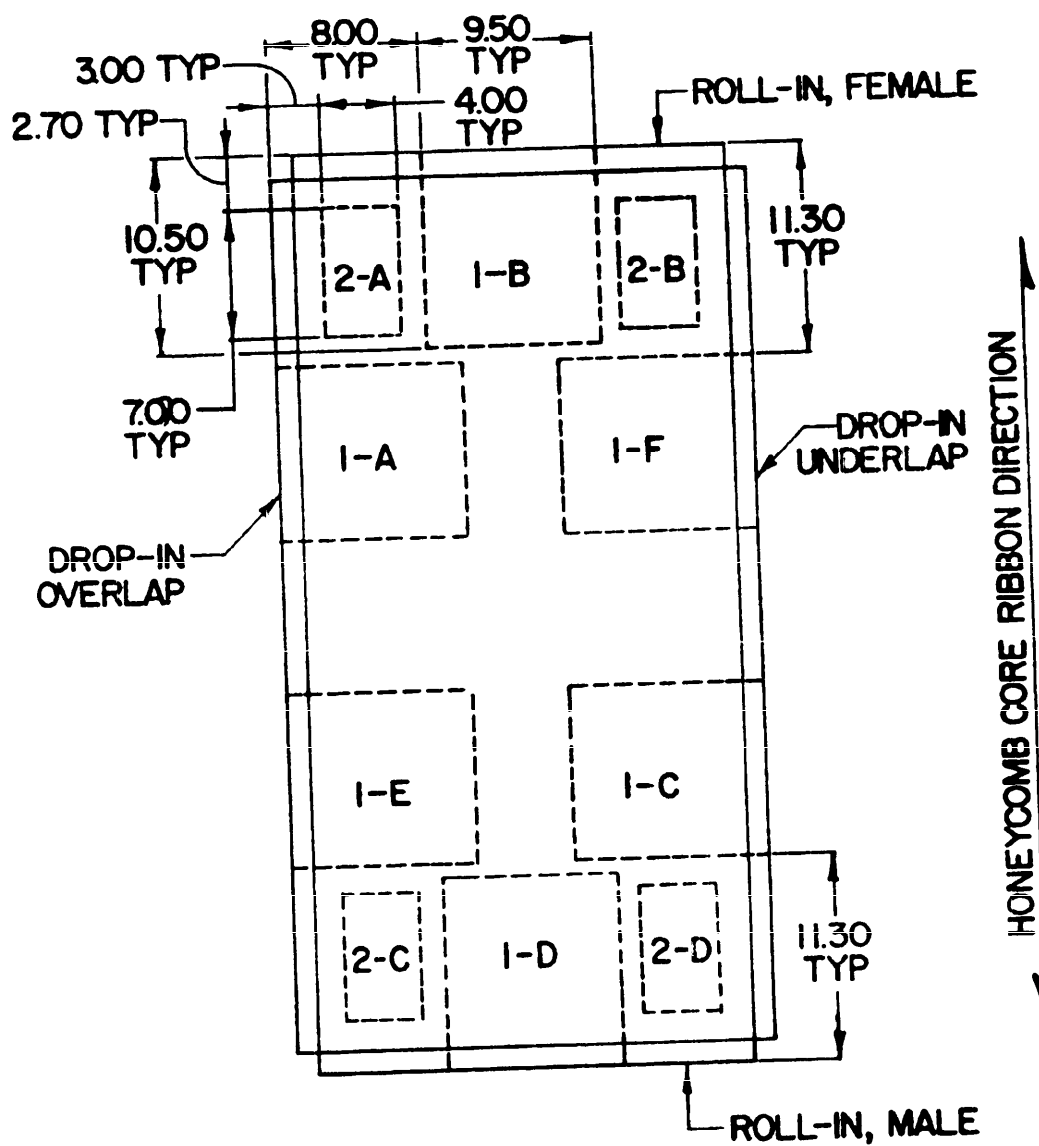


Figure 5. LOCATION OF TEST SPECIMENS FROM TYPE II MATS.

CX1643

MIL-M-52612A (ME)

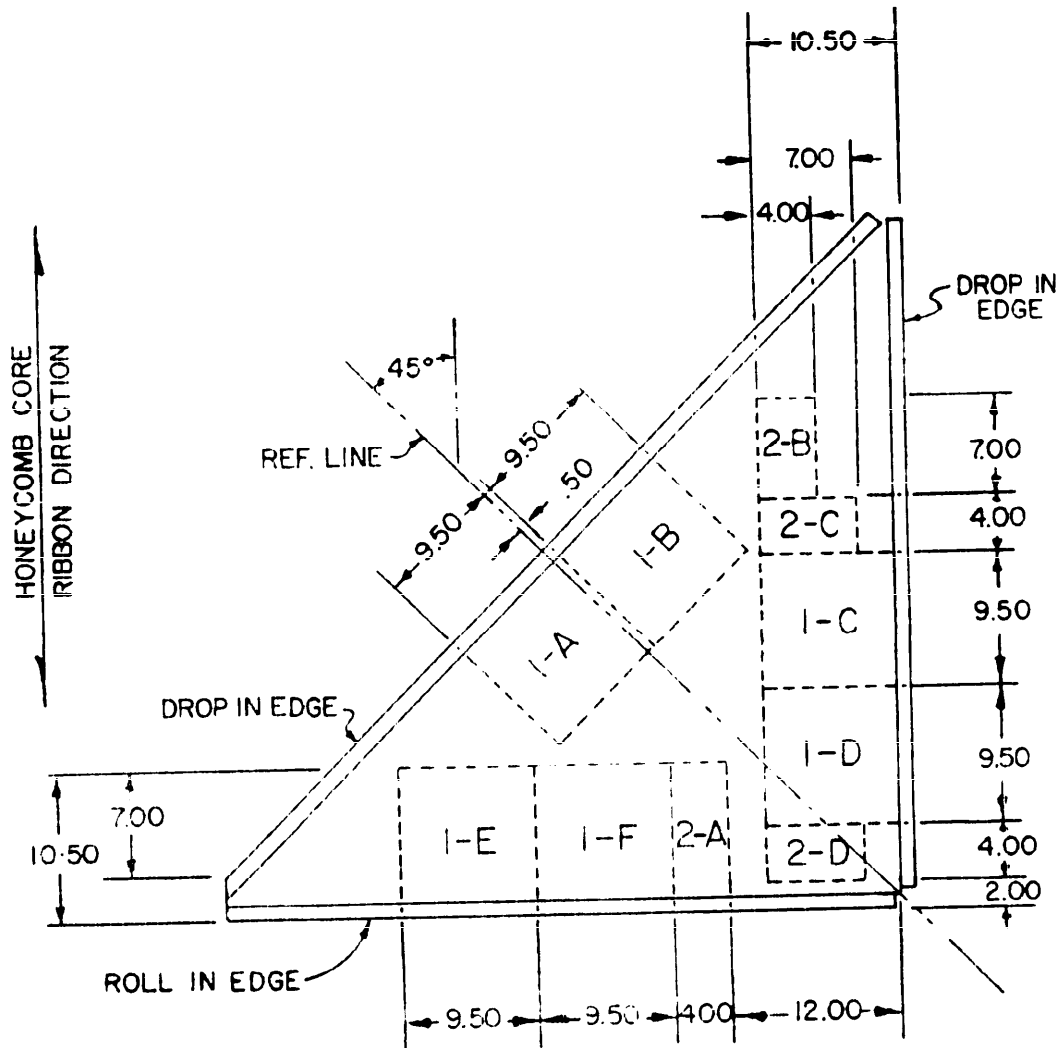
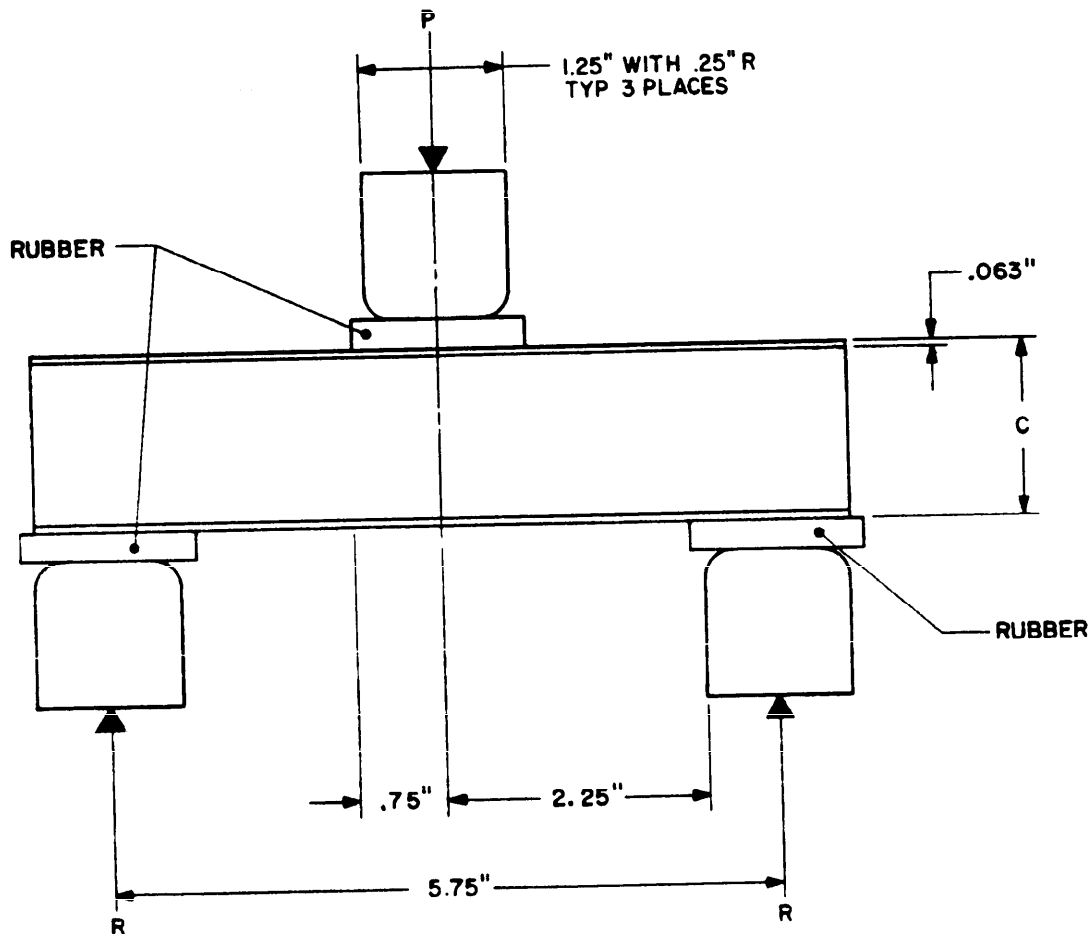


Figure 6. LOCATION OF TEST SPECIMENS FROM TYPE III MATS CX1644

MIL-M-52612A (ME)

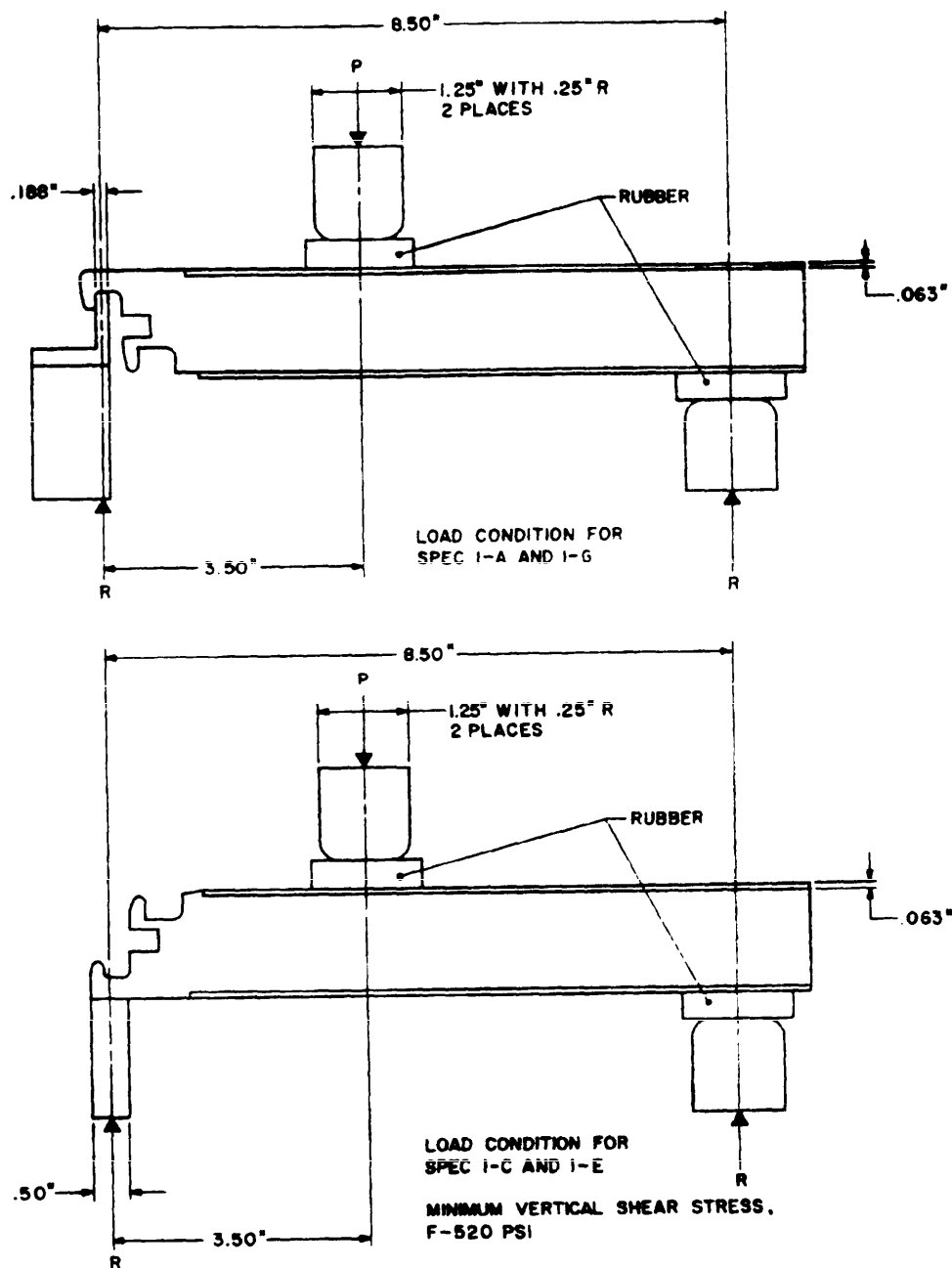


A .25 IN. THICK RUBBER PAD, SHORE HARDNESS  $S_0$  55 TO 65, SHALL BE USED UNDER THE 1.25 IN. WIDE BLOCK AS SHOWN. THE TEST MACHINE CROSSHEAD SPEED SHALL BE SET FOR .50 IN. PER MINUTE MOTION. MINIMUM VERTICAL SHEAR STRESS, F-520 PSI.

FIGURE 7. STATIC SHORT BEAM SHEAR TEST

CX-1205A

MIL-M-52612A (ME)

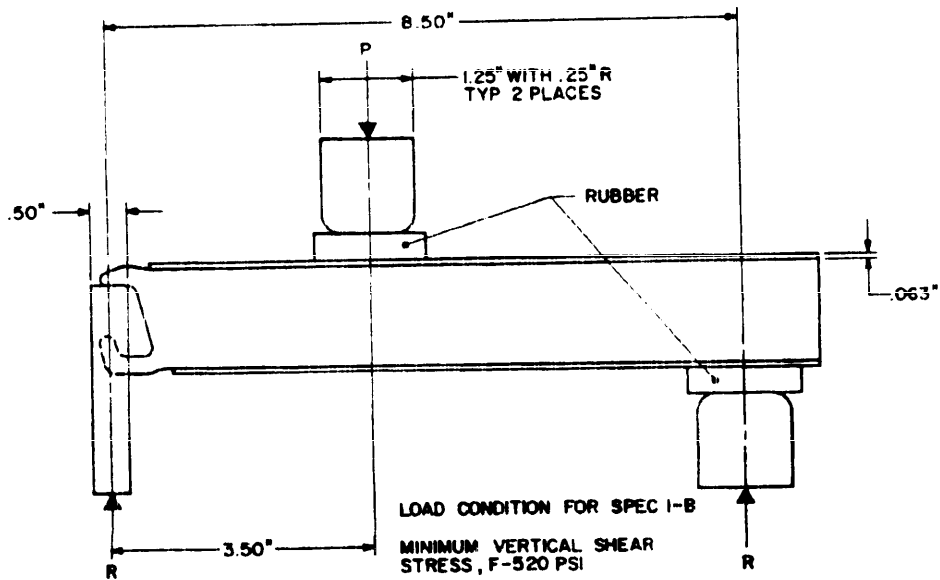
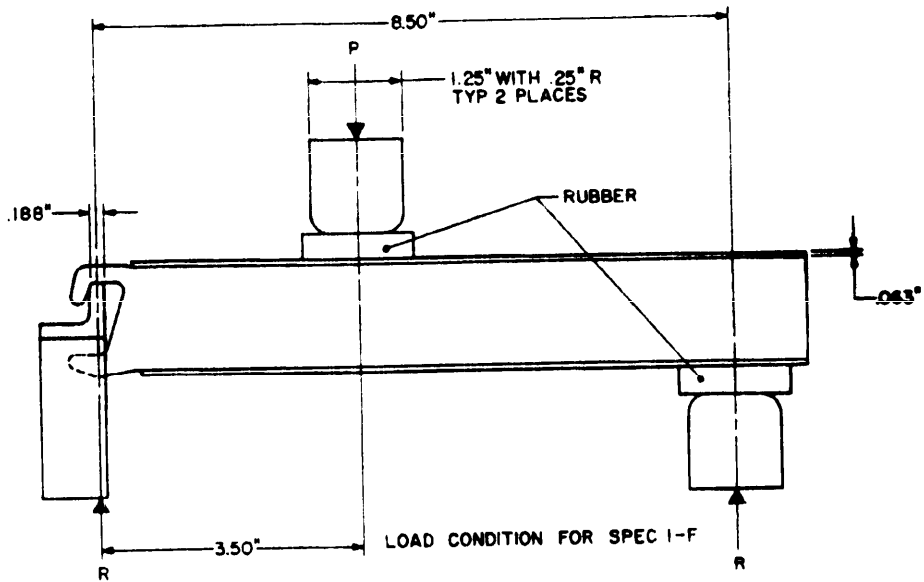


A .35 IN. THICK RUBBER PAD, SHORE HARDNESS  $S_D$  55 TO 65, SHALL BE USED UNDER THE 1.25 IN. WIDE BLOCKS AS SHOWN. THE TEST MACHINE CROSSHEAD SPEED SHALL BE SET FOR .50 IN. PER MINUTE MOTION.

FIGURE 8. STATIC EDGE MEMBER SHEAR TEST

DX-1206

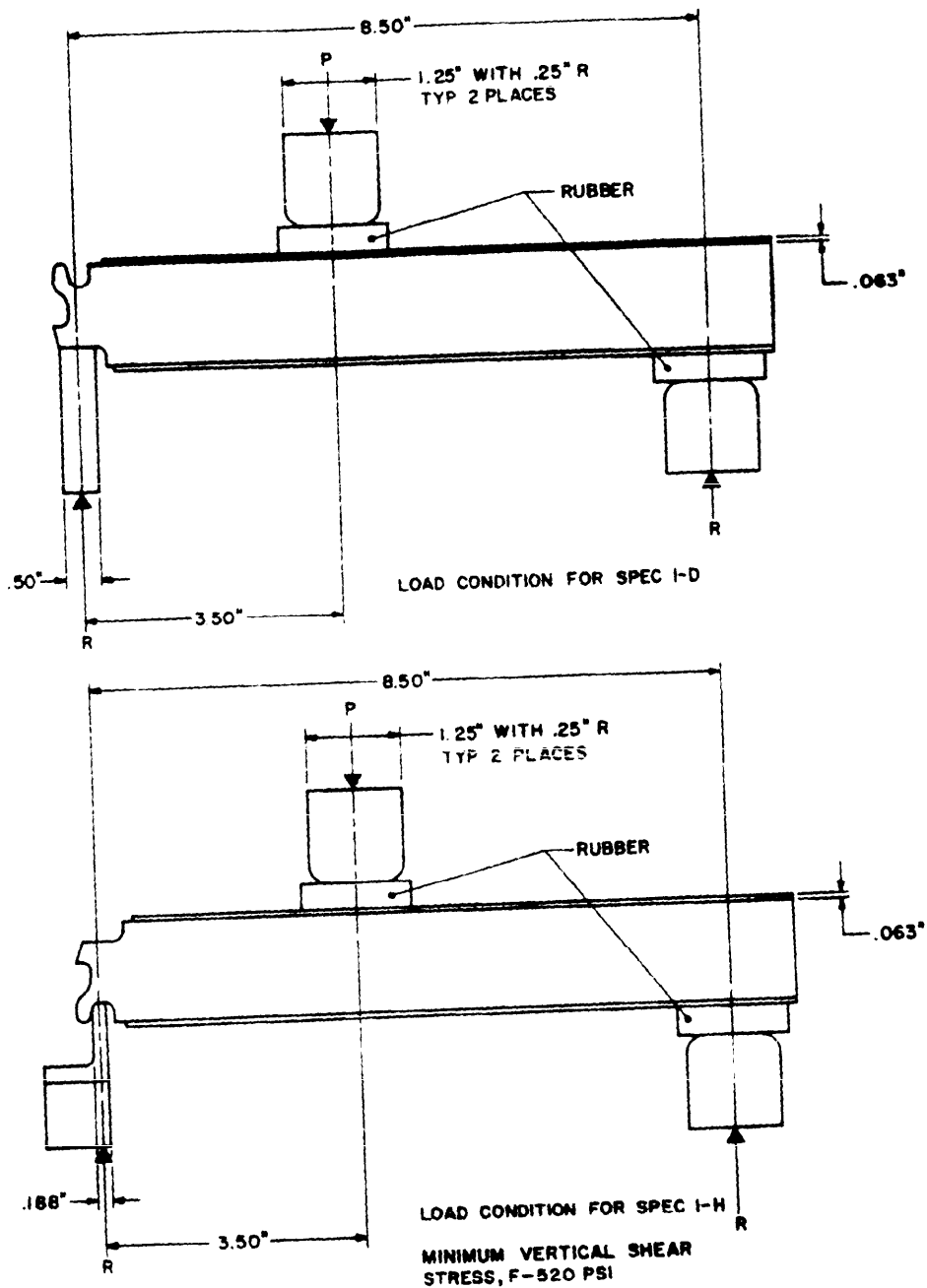
MIL-M-52612A (ME)



A .35 IN. THICK RUBBER PAD, SHORE HARDNESS  $S_d$  55 TO 65, SHALL BE USED UNDER THE 1.25 IN. WIDE BLOCKS AS SHOWN. THE TEST MACHINE CROSSHEAD SPEED SHALL BE SET FOR .50 IN. PER MINUTE MOTION.

FIGURE 9. STATIC EDGE MEMBER SHEAR TEST  
DX-1207

MIL-M-52612A (ME)



A .38 IN. THICK RUBBER PAD, SHORE HARDNESS  $S_0$  55 TO 65, SHALL BE USED UNDER THE 1.25 IN. WIDE BLOCKS AS SHOWN. THE TEST MACHINE CROSSHEAD SPEED SHALL BE SET FOR .50 IN. PER MINUTE MOTION.

FIGURE 10. STATIC EDGE MEMBER SHEAR TEST

DX-1208



MIL-M-52612A (ME)

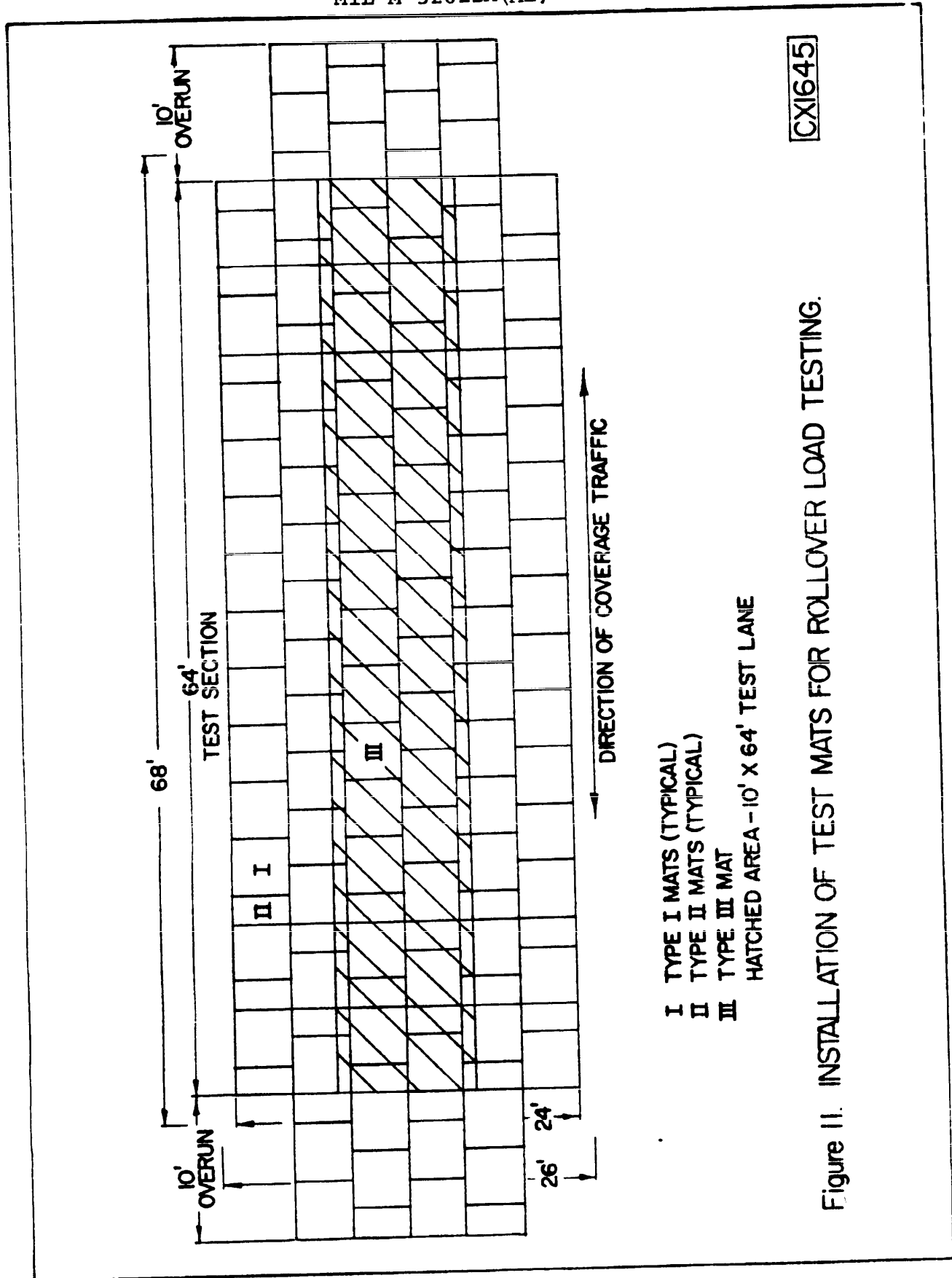
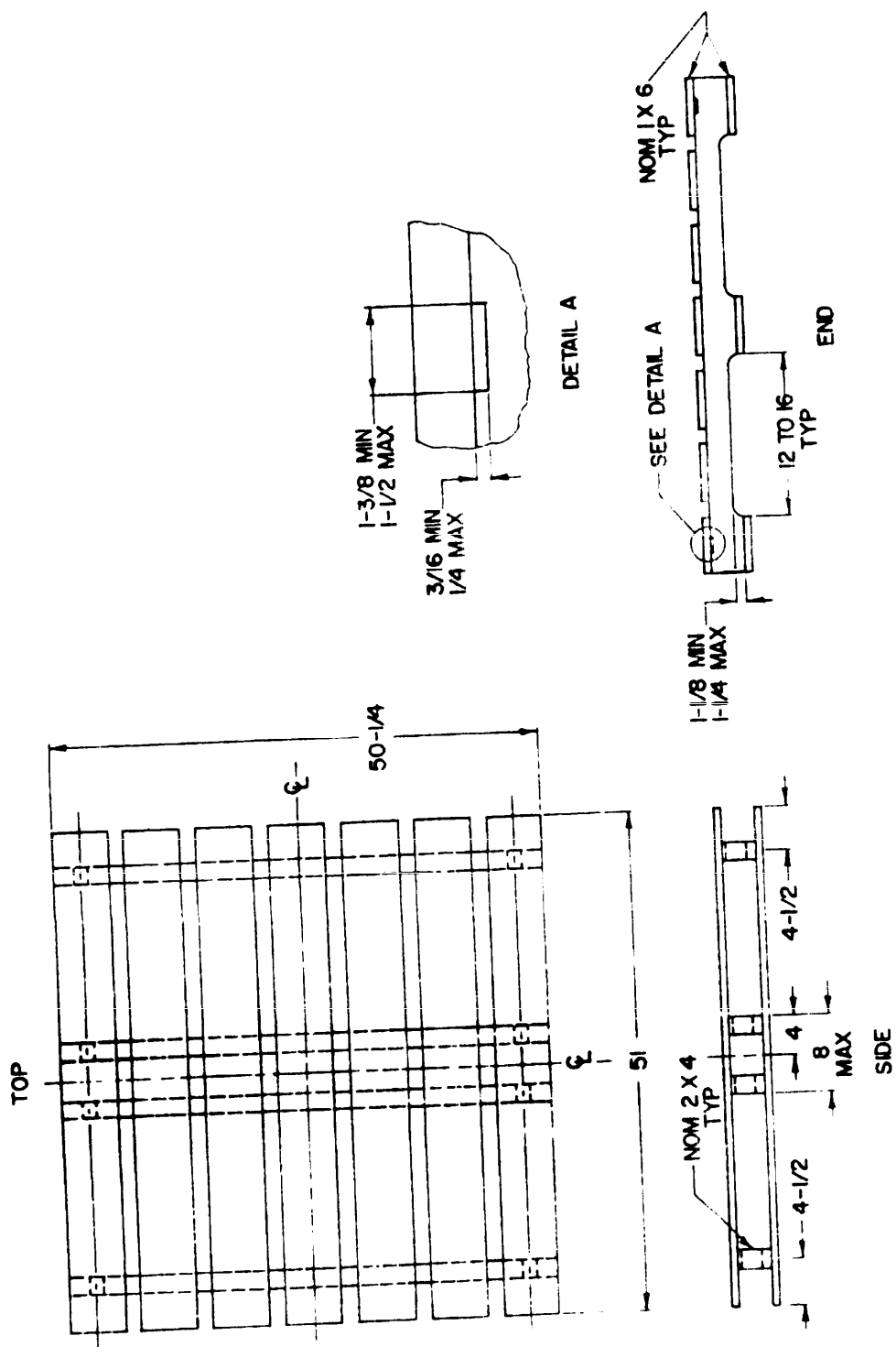


Figure II. INSTALLATION OF TEST MATS FOR ROLLOVER LOAD TESTING.

MIL-M-52612A (ME)



NOTE: SPACE OPENING BETWEEN TOP DECK BOARDS SHALL BE APPROXIMATELY 2 INCHES.

CX1612

Figure 12 PACKING LEVEL A, PALLET DETAIL

MIL-M-52612A (ME)

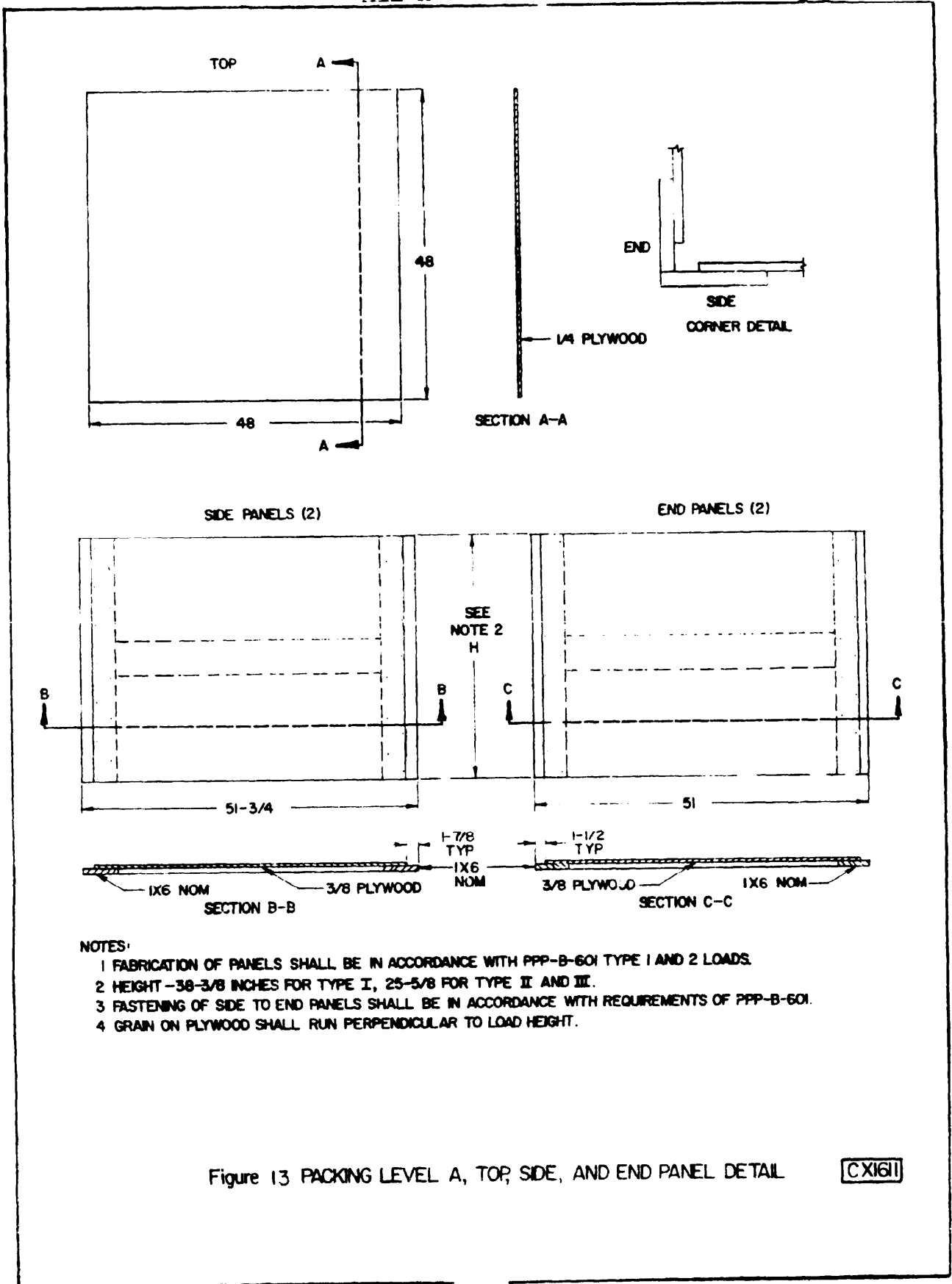
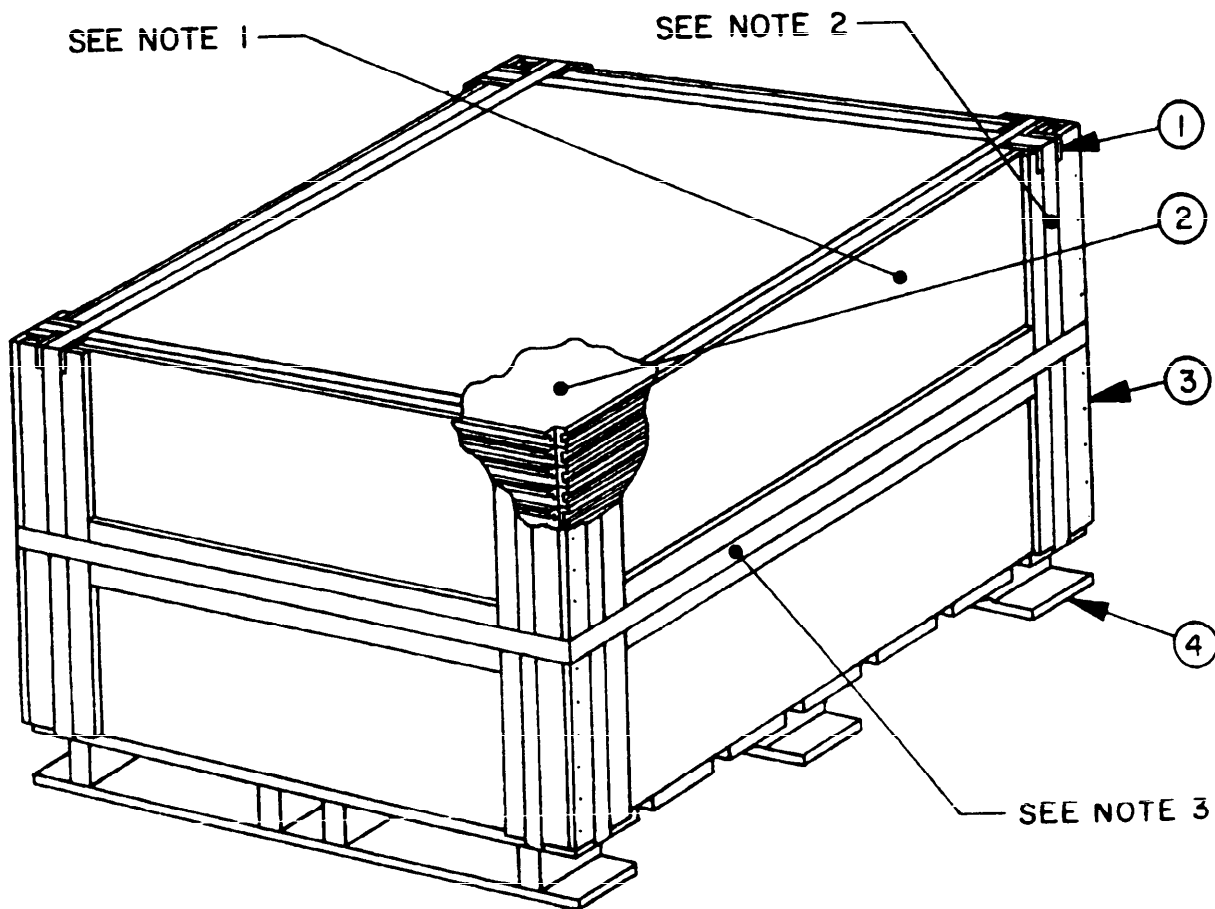


Figure 13 PACKING LEVEL A, TOP, SIDE, AND END PANEL DETAIL

CXIGI

## MIL-M-52612A (ME)



## LEGEND

- ① CORNER EDGE PROTECTORS 3-1/4 INCH APPROX.
- ② LANDING MATS.
- ③ NOM 1 X 6
- ④ PALLET

## NOTES:

- 1 PLYWOOD SHALL CONFORM TO NN-P-530, GROUP A OR B; ANSI/HPMA HP 1983, GRADE 3-4, TYPE I; OR PSI, GRADE C-D WITH EXTERIOR GLUE.
- 2 STRAPPING SHALL CONFORM TO QQ-S-781 TYPE I, CL B (HEAT TREATED) 1.25 X .031.
- 3 STRAPPING SHALL CONFORM TO QQ-S-781 TYPE I, CL B 2.00 X .050.

**FIGURE 14. Packing level A, unit pack assembly.**

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DEPARTMENT OF THE ARMY

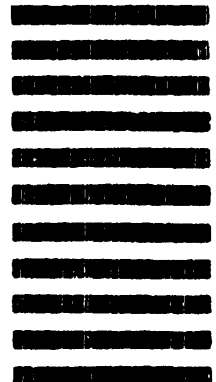


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## STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

<b>1. DOCUMENT NUMBER</b> MIL-M-52612A(ME)	<b>2. DOCUMENT TITLE</b> Mats, Landing, Aluminum Medium Duty XM19
<b>3a. NAME OF SUBMITTING ORGANIZATION</b>  	<b>4. TYPE OF ORGANIZATION (Mark one)</b> <input type="checkbox"/> VENDOR  <input type="checkbox"/> USER  <input type="checkbox"/> MANUFACTURER  <input type="checkbox"/> OTHER (Specify): _____
<b>3b. ADDRESS (Street, City, State, ZIP Code)</b>  	
<b>5. PROBLEM AREAS</b> <b>a. Paragraph Number and Wording:</b>          <b>b. Recommended Wording:</b>          <b>c. Reason/Rationale for Recommendation:</b>          	
<b>6. REMARKS</b>          	
<b>7a. NAME OF SUBMITTER (Last, First, MI) - Optional</b>  	<b>b. WORK TELEPHONE NUMBER (Include Area Code) - Optional</b>  
<b>c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional</b>  	<b>8. DATE OF SUBMISSION (YYMMDD)</b>  