

MIL-A-21366A(SHIPS)  
16 February 1966

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SUPERSEDING  
MIL-A-21366(SHIPS)  
1 August 1958  
(See 6.2)

MILITARY SPECIFICATION  
ADHESIVE, FOR BONDING PLASTIC TABLE TOP MATERIAL  
TO ALUMINUM

1. SCOPE

1.1 This specification covers a flexible adhesive for bonding plastic table top material conforming to MIL-T-171 to aluminum, at room temperature with only nominal pressure.

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-A-250/11 - Aluminum Alloy 6061 Plate and Sheet.
- TT-E-485 - Enamel, Semi-Gloss, Rust-Inhibiting.
- PPP-C-96 - Cans, Metal, 28 Gage and Lighter.
- PPP-D-705 - Drums: Metal Shipping, Steel (Over 12 and Under 55 Gallon).
- PPP-D-729 - Drums: Metal, 55 Gallon (for Shipment of Noncorrosive Material).

MILITARY

MIL-T-17171 - Table Top, Plastic, Thermosetting Resin

STANDARD

MILITARY

MIL-STD-129 - Marking for Shipment and Storage.

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

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

OFFICIAL CLASSIFICATION COMMITTEE

Uniform Freight Classification Rules.

(Copies may be obtained from the Official Classification Committee, 1 Park Avenue at 33rd Street, New York, N. Y. 10016.)

CODE OF FEDERAL REGULATIONS

49 CFR 71 - 78 - Interstate Commerce Commission Rules and Regulations for Transportation of Explosives and Other Dangerous Articles.

(Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C. 20402 )

MANUFACTURING CHEMISTS ASSOCIATION MANUAL

L-1 Warning Labels.

FSC 80 0

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(Copies may be obtained from the Manufacturing Chemists Association, Inc., 1625 Eye Street, N. W., Washington 6, D. C.)

**3. REQUIREMENTS**

3.1 Material. - The adhesive shall be a one part system. It may be a neoprene-resin combination or other combination of ingredients which will meet all applicable requirements of this specification.

3.2 Physical requirements. -

3.2.1 Storage life. - The adhesive as furnished by the manufacturer shall conform to the requirements of this specification after being stored in unopened containers for 6 months from date of manufacture at a temperature of  $80^{\circ} \pm 9^{\circ}\text{F}$ . in accordance with 4.4.1.

3.2.2 Working consistency. - The adhesive shall remain easily brushable or trowellable for at least 4 hours at room temperature, when thoroughly mixed and ready for use in accordance with the manufacturer's instructions and when tested in accordance with 4.4.2. The use of recommended solvents or thinners to accomplish this will be acceptable.

3.2.3 Solubility. - When tested in accordance with 4.4.3, the adhesive shall not separate or exhibit any settling out of ingredients throughout its usable life.

3.2.4 Adhesive strength. - Specimens, prepared in accordance with 4.4.4.1, shall meet the requirements specified in 3.2.4.1 and 3.2.4.2.

3.2.4.1 Tensile edge lift adhesive strength. - When tested in accordance with 4.4.4.2, the average adhesion value of ten tensile edge lift adhesion specimens shall exceed 20 pounds per inch of width.

3.2.4.2 Dead load adhesive strength. - When tested as specified in 4.4.4.3, not more than 25 percent of the specimens shall have failed after 24 hours at each temperature.

3.3 Identification marking and instructions. - Each container of adhesive material shall be labeled, giving identification, adequate instruction for use and application of contents. The labels shall be adhered to the containers with a water-resistant adhesive and the labels shall be waterproofed by a coating that does not smear or blur the markings. The following information shall be indicated on the label:

- (a) Name of manufacturer, nomenclature, specification number, date of manufacture, and lot or batch number.
- (b) Mixing instructions, including recommended solvents, if necessary.
- (c) Application procedure, including surface preparation and cleaning, recommended film thickness, spread method, number of coats, drying time, and method of cleaning equipment.
- (d) Maximum and minimum allowable open time of adhesive coated material from coating to assemble.
- (e) Maximum usable storage and pot life.
- (f) Any other pertinent information relative to the use and storage of the adhesive, including safety precautions.

3.4 Workmanship. - Workmanship shall be in accordance with best commercial practice for this class of material.

**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 Sampling for quality conformance inspection. -

4.2.1 Lot. - For purposes of sampling, examinations and tests, a lot shall consist of all adhesive produced under essentially the same conditions and offered for delivery at one time.

4.2.2 Sampling for examination of filled containers. - A random sample of filled containers shall be taken in accordance with the sampling plan given in table I for the examination specified in 4.3.1.

Table I - Sampling for examination.

Lot size Number of filled containers	Sample size Number of filled containers to be sampled	Number of defective containers	
		Major defects Accept	Total defects Accept
up to 8	all	0	0
9 to 90	5	0	1
91 to 280	13	1	3
281 to 500	20	2	5
501 to 1200	32	3	7
1201 to 3200	50	5	10

4.2.2.1 Defects defined. - A major defect is a defect that is likely to result in failure, or to reduce materially the usability of the unit of product for its intended purpose. A minor defect is a defect that is not likely to reduce materially the usability of the unit of product for its intended purpose, or is a departure from established standards having little bearing on the effective use or operation of the unit. Total defects is major and minor defects combined. Any number of defects greater than the applicable acceptance number is a rejection number and shall be cause for rejection of the lot represented by the sample.

4.2.3 Sampling for tests. - From each lot, a one-quart sample or equivalent quantity shall be taken at random for tests specified in 4.3.2.

#### 4.3 Quality conformance inspection. -

4.3.1 Examination of filled containers. - Each filled container taken as specified in 4.2.2 shall be examined for defects of construction of the container and the closure, for evidence of leakage, for identification markings and instructions. Each filled container in the sample shall also be weighed to determine amount of contents. Any container that is found not in conformance with section 5 of this document shall be subject to rejection. If the number of defective or nonconforming containers in the sample exceeds the applicable acceptance number specified in table I, this shall be cause for rejection of the lot represented by the sample.

4.3.2 Quality conformance tests. - The material taken in accordance with 4.2.3 shall be subjected to the tests specified in 4.4.2, 4.4.3, and 4.4.4. If the sample is found to be not in conformance with this specification, this shall be cause for rejection of the lot represented by the sample.

#### 4.4 Test procedures. -

4.4.1 Storage life. - The adhesive shall be stored in unopened containers for 6 months from date of manufacture, at a temperature of  $80^{\circ} \pm 9^{\circ}\text{F}$ . After this storage period the adhesive shall be evaluated for conformance to the requirements of 3.2.1. If the stored adhesive meets the requirements, the supplier shall submit to the procurement activity a certified test report showing compliance with the storage requirements of 3.2.1. Unless otherwise specified (see 6.1), the storage life test need not be conducted for future procurement until such times as there is a change in the adhesive formulation or method of manufacture.

4.4.2 Working consistency. - Two 4-ounce samples of thoroughly mixed adhesive shall be weighed in clean beakers of suitable size, having a diameter between 2 and 3 inches. One sample shall remain uncovered and undisturbed for 4 hours at  $80^{\circ} \pm 9^{\circ}\text{F}$ . and 50 plus or minus 5 percent relative humidity. At the end of this period, it shall be brushed or trowelled, whichever is recommended for application, to determine conformance to 3.2.2.

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4.4.3 Solubility. - The second 4-ounce sample of adhesive, weighed in a beaker as specified in 4.4.2, shall have 4 ounces of the manufacturer's recommended solvent added to it and then thoroughly mixed by stirring. Fifteen minutes after stirring, the mixture shall be examined for conformance to 3.2.3.

4.4.4 Adhesion. -

4.4.4.1 Specimen preparation. - Twenty-two test specimens consisting of a strip of plastic table top material bonded to aluminum shall be prepared as follows:

- (a) Assembly. - The plastic table top material shall conform to MIL-T-17171 and shall be 1 by 6 inches by the thickness of the material. The aluminum shall conform to temper T6 of QQ-A-250/11 and shall be 2 by 6 inches by not less than 1/16 inch thick. The mating surfaces of the plastic and the aluminum shall be cleaned by wiping with a rag saturated with alcohol or trichloro-ethylene and allowed to dry. Each mating surface shall then be given separate uniform coats of the adhesive in accordance with the manufacturers instructions. An adjustable "doctor blade" as shown in figure 1 may be used for applying a controlled film thickness of adhesive. Adequate time, as recommended by the manufacturer, shall be allowed for drying between coats and prior to joining for bonding. The two materials shall then be positioned with their center-lines coinciding, allowing a 1/2 inch overhang of the plastic laminate with respect to the aluminum to accommodate a loading bar or clamp. The materials shall then be assembled (see figure 1) and subjected to the pressure specified below.
- (b) Bonding pressure. - The assembled specimens shall be firmly joined by means of a 3-inch diameter steel roller which is weighted to exert a 45-pound load on the face of the plastic table top material. The roller shall be passed over the length of the assembly five times in the same direction to insure full contact. A modified wringer type roller is shown in figure 2. The upper steel roller is 3 inches in diameter and is weighted to exert the 45-pound load on the face of the plastic table top material. The lower 3-inch diameter steel roller has a 3/4-inch thick rubber facing which makes an effective 4-1/2 inch diameter which is driven at 60 revolutions per minute. Each assembly is passed between the rollers five times.
- (c) Time after assembly. - The prepared specimens shall be allowed to stand for 10 days at  $80^{\circ} \pm 9^{\circ}$  F. and 50 plus or minus 5 percent relative humidity before testing as specified in 4.4.4.2 and 4.4.4.3 for conformance to 3.2.4.1 and 3.2.4.2, respectively.

4.4.4.2 Tensile edge lift adhesion. - Ten adhesion specimens shall be tested by a method where the rate of loading is 0.5 inch per minute. The plastic laminate shall be lifted away from the aluminum and the load required to cause a 1/16 inch edge separation between the aluminum and the laminate shall be measured. The load shall be applied through a loading bar, as shown in figure 3, placed in the plane of the specimen at right angles to its long dimension, in such a direction as to cause separation at the edge adjacent to the loading bar. The results shall be averaged.

4.4.4.3 Dead load adhesion. - Twelve specimens, prepared as specified in 4.4.4.1, shall be subjected to a dead weight load of 10 pounds for 24 hours at each of the following temperatures:  $20^{\circ} \pm 2^{\circ}$  F.,  $73.4^{\circ} \pm 2^{\circ}$  F., and  $122^{\circ} \pm 2^{\circ}$  F. The weights shall be suspended from the 1/2 inch overhanging plastic laminate by means of loading bar (see figure 3). A 1/16 inch separation between laminate and aluminum constitutes a failure. A recommended test set-up for the dead load test is shown in figure 4.

## 5. PREPARATION FOR DELIVERY

5.1 Domestic shipment and early material use and for storage for onboard use. -

5.1.1 Preservation and packaging. - Preservation and packaging, which may be the supplier's commercial practice, shall be sufficient to afford adequate protection against deterioration and physical damage during shipment from the supply source to the using activity and until early material use and may conform to the supplier's commercial practice when such meets these requirements.

5.1.2 Packing. - Packing shall be accomplished in a manner which will insure acceptance by common carrier at the lowest rate, and will afford protection against physical or mechanical damage during direct shipment from the supply source to the using activity for early material use. The shipping containers or method of packing shall conform to the Uniform Freight Classification Rules and Regulations or other carrier regulations as applicable to the mode of transportation and may conform to the supplier's commercial practice when such meets these requirements.

5.1.3 Marking. - Shipment marking information shall be provided on interior packages and exterior shipping containers in accordance with the supplier's commercial practice. The information shall include nomenclature, Federal stock number or manufacturer's part number, lot number, date (month and year) of manufacture, size, contract or order number, supplier's name, and destination.

5.1.4 Storage for onboard use. -

5.1.4.1 Preservation and packaging. - The adhesive shall be furnished in cans or drums, as specified (see 6.1).

5.1.4.1.1 Cans. - Quantities of 1 gallon or less shall be packaged in cans conforming to type V, class 2 of PPP-C-96. Exterior plan B coating and side seam stripping shall be required. One gallon containers shall be provided with wire handles which shall be galvanized or protectively coated to resist corrosion.

5.1.4.1.2 Drums. - Drums of over 12 and under 55 gallon capacities shall conform to PPP-D-705. Fifty-five gallon containers shall conform to type III of PPP-D-729. Exterior coating of drums shall conform to TT-E-485.

5.1.4.2 Packing. - Adhesive, packaged as specified (see 6.1), shall be packed in accordance with 5.1.2.

5.1.4.3 Marking. - In addition to any special marking required by the contract or order, or herein (see 3.3), interior and shipping containers shall be marked in accordance with MIL-STD-129.

5.1.4.3.1 Hazardous chemicals. - All packages containing hazardous chemicals shall have affixed there-to such warning labels and markings as may be required by the Interstate Commerce Commission Regulations, CFR Title 49, Part 71 - 78 and the Manufacturing Chemists Association Manual L-1.

5.2 Domestic shipment and storage or overseas shipment. - The requirements of levels of preservation, packaging, packing and marking for shipment shall be specified by the procuring activity (see 6.1).

(5.2.1 The following provides various levels of protection during domestic shipment and storage or overseas shipment, which may be required when procurement is made (see 6.1):

5.2.1.1 Preservation and packaging. -

5.2.1.1.1 Level A. - The adhesive shall be furnished in 1 pint, 1 quart, or 1 gallon cans or 16 gallon, 30 gallon, or 55 gallon drums as specified (see 6.1).

5.2.1.1.1.1 Cans. - Containers of 1 gallon or less shall conform to type V, class 2 or PPP-C-96. Exterior plan B coating and side seams stripping shall be required and 1 gallon cans shall be provided with corrosion resistance coated or galvanized wire handles.

5.2.1.1.1.2 Drums. - Drums of over 12 and under 55 gallon capacities shall conform to PPP-D-705. Fifty-five gallon containers shall conform to type III of PPP-D-729. Exterior coating of drums shall conform to TT-E-485.

5.2.1.1.2 Level C. - Preservation and packaging shall be sufficient to afford adequate protection against deterioration and physical damage during shipment from supply source to the using activity for early material use. This level may conform to the supplier's commercial practice when such meets the requirements of this level.

5.2.1.2 Packing. -

5.2.1.2.1 Levels A and B. - Adhesive furnished and packaged in cans as specified (see 6.1) shall be packed for domestic or overseas shipment as specified (see 6.1) in accordance with the appendix of PPP-C-96. Adhesive furnished in drums shall require no additional packing. When specified (see 6.1) the containers may be palletized for shipment. Pallets shall conform to MIL-P-3938 or MIL-P-15011 at the option of the supplier and palletized unit loads shall be in accordance with MIL-STD-147.

5.2.1.2.2 Level C. - Adhesive packaged as specified shall be packed in accordance with 5.1.2.

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**5.2.1.3 Marking.** - Marking for shipment shall be in accordance with 5.1.4.3 and 5.1.4.3.1.)

**6. NOTES**

**6.1 Ordering data.** - Procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) If storage life test is required (see 4.4.1).
- (c) Quantity of adhesive and size of containers required (see 5.1.4.1 and 5.2.1.1.1).
- (d) Preservation, packaging, packing, and marking required other than 5.1 (see 5.2).
- (e) Special marking, if required (see 5.1.4.3).

**6.2 CHANGES FROM PREVIOUS ISSUE.** - THE EXTENT OF CHANGES (DELETION, ADDITION, ETC.)  
PRECLUDE THE ANNOTATION OF THE INDIVIDUAL CHANGES FROM THE PREVIOUS ISSUE OF THIS  
DOCUMENT.

Preparing activity:  
Navy - SH  
(Project 8040-N018Sh)

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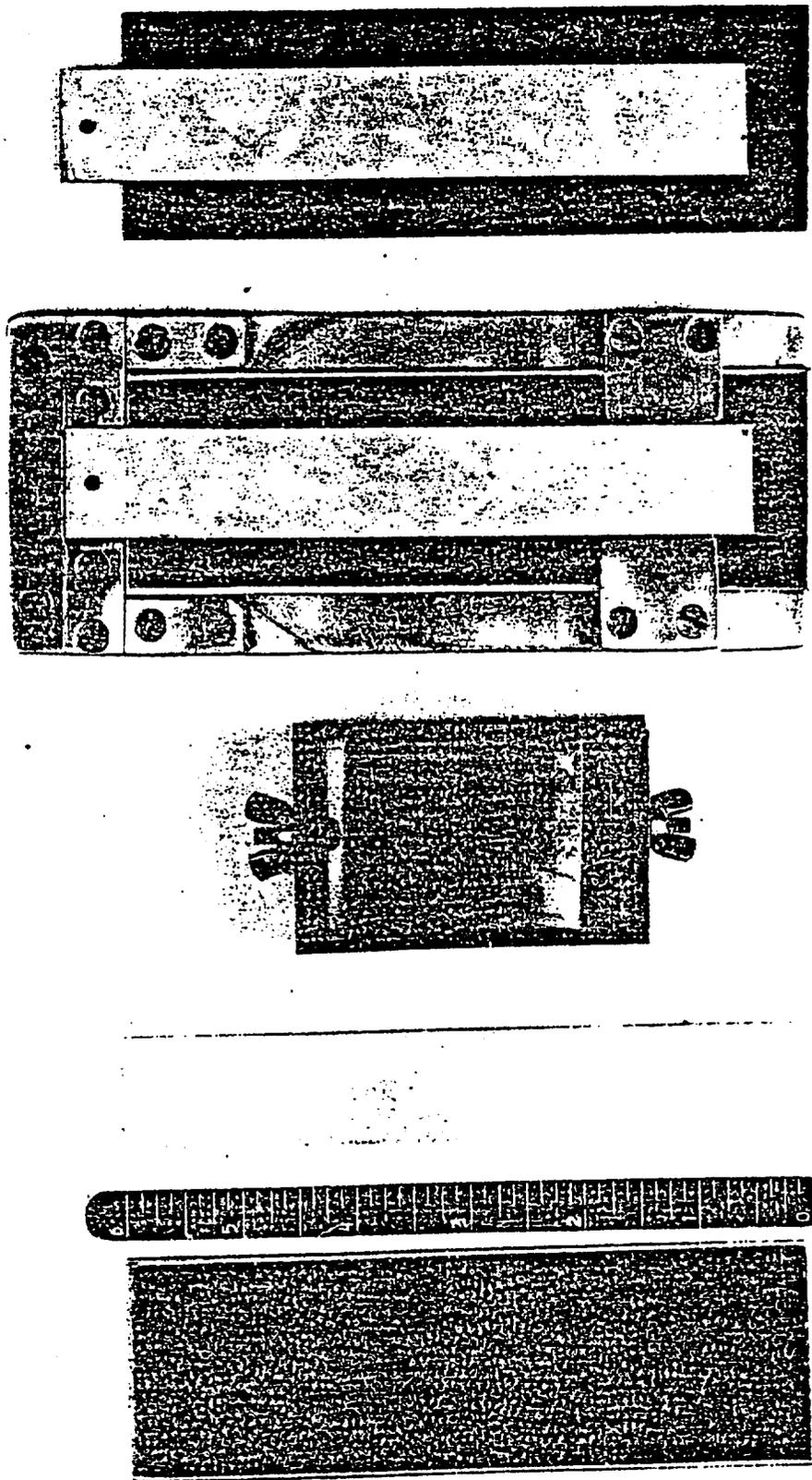


Figure 1 - "Doctor blade" applicator and specimen assembly.

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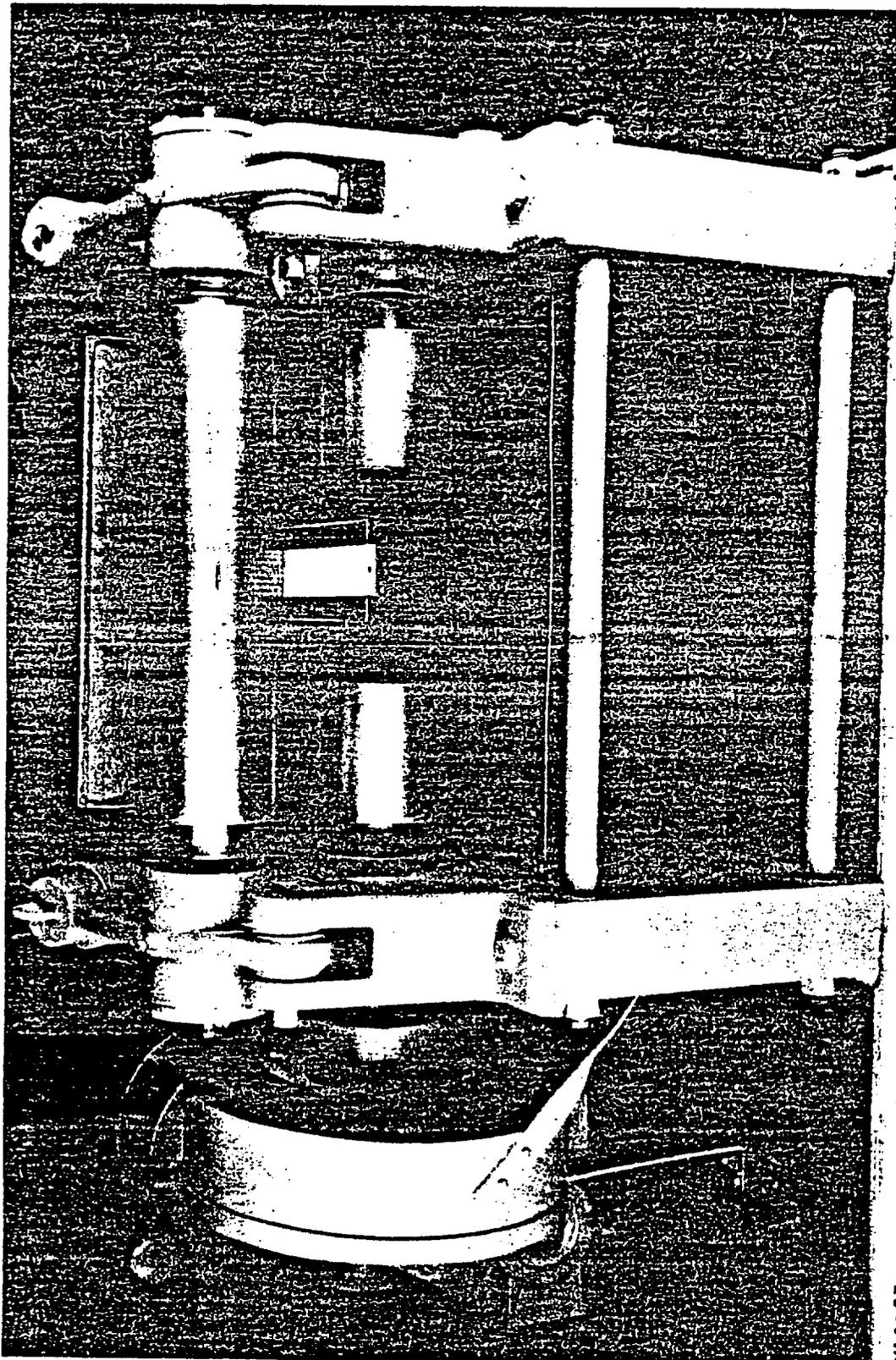
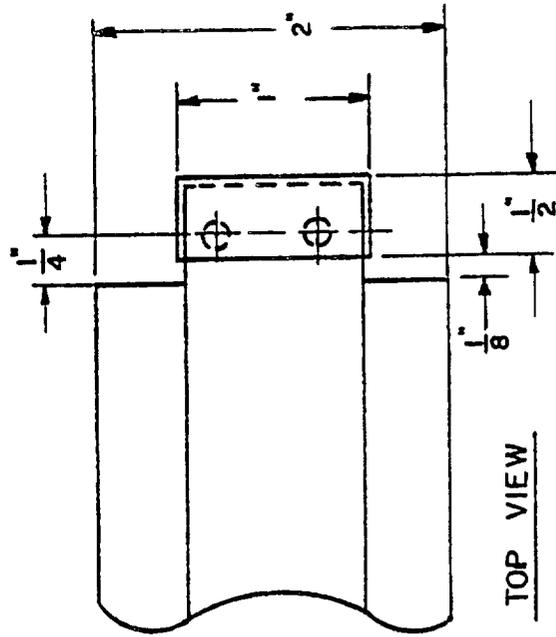
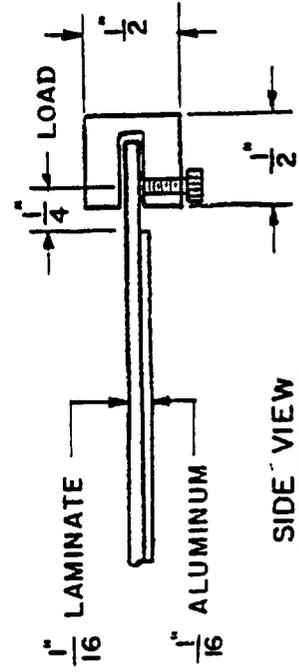


Figure 2 - Wringer roller equipment

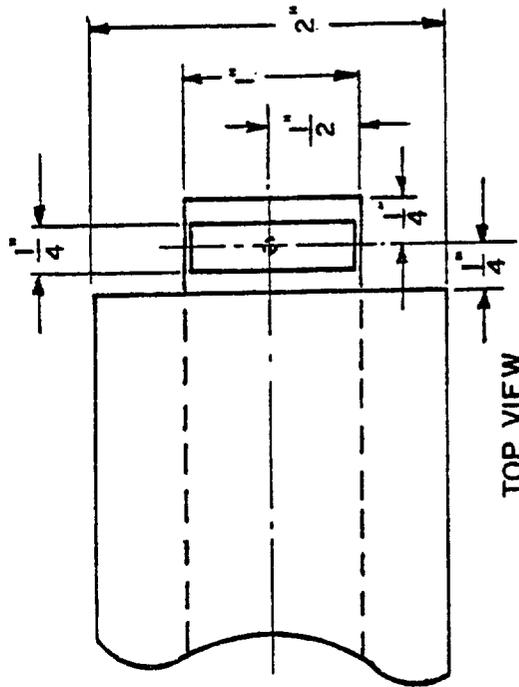


TOP VIEW

TENSILE EDGE - LIFT  
LOADING CLAMP

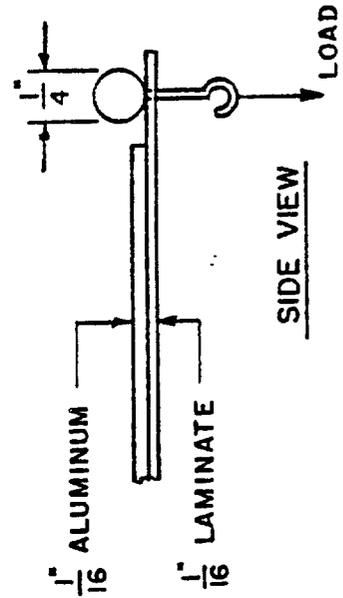


SIDE VIEW



TOP VIEW

DEAD LOAD LOADING BAR



SIDE VIEW

Figure 3 - Detail of loading bar and clamp for dead load and tensile edge-lift tests.

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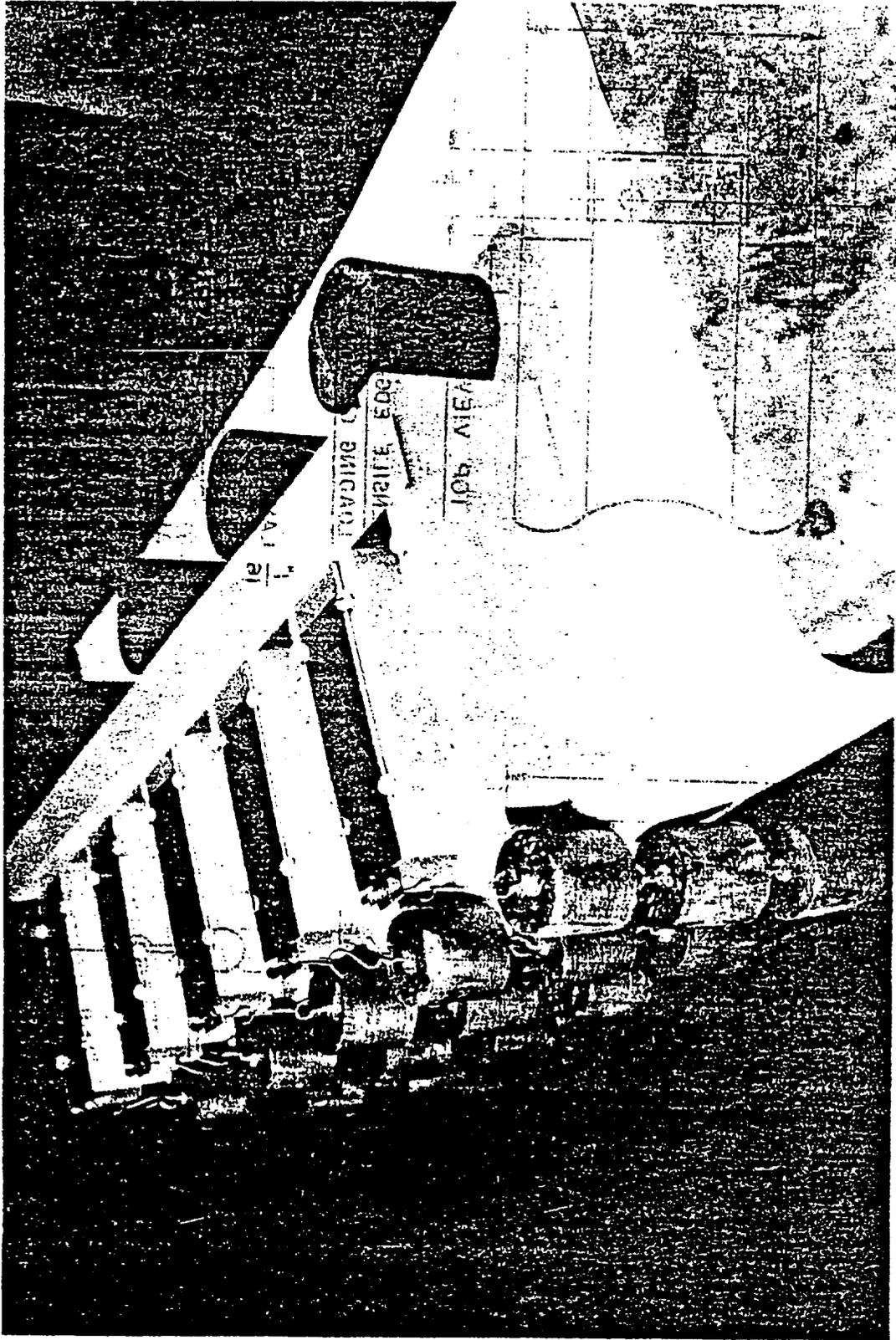


Figure 4 - Apparatus for dead load test.

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