

TT-S-230a

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SUPERSEDING

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FEDERAL SPECIFICATION

SEALING COMPOUND, SYNTHETIC-RUBBER BASE, SINGLE COMPONENT, CHEMICALLY CURING (FOR CALKING, AND GLAZING IN BUILDING CONSTRUCTION)

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers the properties of a single component cold-applied synthetic rubber base joint sealant, chemically curing type, for sealing, calking, or glazing application in buildings and other types of constructions.

1.2 Classification. The sealing compound covered by this specification shall be of the following types, as specified (see 6.4):

Type I - Flow, self-leveling.
Type II - Nonsag.

2. APPLICABLE DOCUMENTS

2.1 Specification and standards. The following specifications and standards, of the issues in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

Federal Specifications:

SS-R-406 - Road and Paving Materials; Methods of Sampling and Testing.
PPP-B-585 - Boxes, Wood, Wirebound.
PPP-B-601 - Boxes, Wood, Cleated-Flywood.
PPP-B-621 - Boxes, Wood, Nailed and Lock-Corner.
PPP-B-636 - Box, Fiberboard.
PPP-B-640 - Boxes, Fiberboard, Corrugated, Triple-wall.
PPP-C-96 - Cans, Metal, 28 Gage and Lighter.
PPP-F-320 - Fiberboard, Corrugated and Solid, Sheet Stock
(Container Grade), and Cut Shapes.
PPP-P-704 - Pails, Metal: Shipping, Steel, (1 through 12 Gallon)

Federal Standards:

Fed. Std. No. 123 - Marking for Domestic Shipment (Civilian Agencies).
Fed. Test Method Std. No. 141 - Paint, Varnish, Lacquer and Related
Materials; Methods of Inspection, Sampling, and Testing.
Fed. Test Method Std. No. 601 - Rubber: Sampling and Testing.

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, D. C., 20402.

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(Single copies of this specification and other product specifications required by activities outside the Federal Government for bidding purposes are available without charge at the General Services Administration Regional Offices in Boston, New York, Washington, D. C., Atlanta, Chicago, Kansas City, Mo., Dallas, Denver, San Francisco, Los Angeles, and Seattle, Wash.

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies.)

Military Standards:

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-129 - Marking for Shipment and Storage.

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

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

American Society for Testing and Materials (ASTM) Standards

- C 510 - Method of Test for Staining and Color Change of One-or-Two Part Joint Sealants.
- D 1191 - Methods of Testing Concrete Joint Sealers.

(Copies of the above publications may be obtained from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.)

3. REQUIREMENTS

3.1 Material. The sealant compound shall be furnished as a single component material packaged in sealed cartridges (plastic, metal, or cardboard) or in larger containers (metal cans, pails, or drums). The compound shall be a homogeneous mixture of a proper consistency suitable for immediate application by hand or pressure caulking gun, or by a hand tool. The compound when completely cured shall form a rubber-like solid capable of maintaining a seal against water, wind, and dirt.^{1/}

3.2 Types. The sealant shall be available in two types as follows:

Type I (self-leveling) shall be a compound which has sufficient flow to give a smooth level surface when applied in a horizontal joint at temperatures between 40° and 122° F.

Type II (Nonsag) shall be a compound which permits application in vertical joints without sagging at temperatures between 40° and 122° F. (see 6.2).

3.3 Stability. The compound in the original unopened container shall be stable for at least six months when stored at a temperature not exceeding 80° F.

3.4 Toxicity. Under normal application conditions and adequate ventilation, the compound shall not be considered toxic.

3.5 Detail requirements.

^{1/} Unlike the two-component rubber base sealants, some of the one component formulations cure at a relatively slow rate after installation. The exact cure time depends on the width and depth of the sealant, as well as the ambient temperature and relative humidity.

3.5.1 Color. The color of the sealant, after curing 14 days in air at standard conditions of temperature and relative humidity shall be any specific color agreed upon by the purchaser and supplier (see 4.3.1 for definition of standard conditions).

3.5.2 Rheological properties.

3.5.2.1 Type I (flow, self-leveling compound). The flow of a self-leveling compound shall be such that when tested as prescribed in 4.3.2.1 it shall exhibit a smooth level surface.

3.5.2.2 Type II (nonsag compound). The flow of the non-sag compound shall be such that when tested as prescribed in 4.3.2.2 it shall not sag or flow more than 3/16 inch in vertical displacement.

3.5.3 Extrusion rate. The compound types I and II shall have an extrusion rate of not more than 1 minute when tested as prescribed in 4.3.3.

3.5.4 Hardness property. The compound after 21 days' cure shall show a hardness reading of not less than 15 nor more than 50, when tested for Shore "A" hardness (Shore Durometer-instantaneous method) as prescribed in 4.3.4.

3.5.5 Weight loss, cracking, and chalking after heat aging. The compound shall not lose more than 12 percent of its original weight nor shall it show any cracks or chalking after heat treatment at 180° F, when treated as prescribed in 4.3.5.

3.5.6 Tack-free time. The compound shall cure to a tack-free condition in not more than 72 hours from the time of mixing, when tested as prescribed in 4.3.6.

3.5.7 Stain and color change.^{2/} The compound shall not cause any visible stain on the top surface of a white cement mortar base, when tested as prescribed in 4.3.7. The compound itself shall not show a degree of color change that is unacceptable to the purchaser, when tested as prescribed in 4.3.7.

3.5.8 Durability (bond-cohesion). When tested as prescribed in 4.3.8, with mortar, glass, and aluminum or any other specified accessory base material, the total loss in bond area and cohesion area among the three specimens tested (for each type of accessory material) shall be less than 1.5 square inch after the completion of 3 test cycles. The losses in area shall be estimated to the nearest 0.1 square inch (see 4.3.8.5 regarding the presence of bubbles).

3.5.9 Adhesion in peel.^{3/} When tested as prescribed in 4.3.9, with mortar, glass, and aluminum or any specified material, the average peel strength obtained for the sample shall be not less than 10 lbs. In addition the compound shall show no more than an average 50 percent adhesive loss.

3.6 Adhesion in peel after ultraviolet radiation through glass.^{4/} When tested as prescribed in 4.3.10 the average peel strength obtained for the sealant sample shall be less than 10 lbs. In addition the compound shall show no more than 50 percent adhesive loss.

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 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 that supplies and services conform to the prescribed requirements.

4.2 Sampling and inspection should be in accordance with methods 1011, 1021, and/or 1031 of Fed. Test Method Std. No. 141, as applicable.

^{2/} Compounds that are to be used exclusively for metal or glass or both, without any contact whatsoever to porous masonry such as concrete, brick, stone, etc., need not be tested for stain or color change unless such a test is specified by the purchaser.

^{3/} Other accessory materials such as cast stone, brick, marble, stainless steel, etc., shall be used in the test in place of, or in addition to, the standard base materials when requested by the purchaser.

^{4/} The test shall be performed when the sealant bonding area to glass may be affected by the sun's rays passing through the glass.

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4.2.1 Inspection of preparation for delivery. An inspection shall be made to determine that the packaging, packing, and marking comply with the requirements in section 5. Defects shall be scored in accordance with table I. For examination of interior packaging the sample unit shall be one shipping container fully prepared for delivery selected at random just prior to the closing operations. Sampling shall be in accordance with MIL-STD-105. Defects of closure listed shall be examined on shipping containers fully prepared for delivery. The lot size shall be the number of shipping containers in the end item inspection lot. The inspection level shall be S-2 with an AQL of 4.0 defects per hundred units.

Table I. Classification of preparation for delivery defects

| Examine | Defects |
|---------------------------------|--|
| Marking (exterior and interior) | Omitted; incorrect; illegible; improper size, location, sequence, or method of application. |
| Materials | Any component missing or damaged. |
| Workmanship | Inadequate application of component such as incomplete closure of container flaps, loose strapping, inadequate stapling, or distortion of container. |

4.3 Laboratory tests.

4.3.1 Standard conditions for laboratory tests. The standard conditions of temperature and relative humidity referred to in the following sections are defined as $73.4^{\circ} \pm 2^{\circ}$ F. and 50 ± 5 percent, respectively. The sealant sample shall be held in the unopened container for at least 24 hours at standard conditions before the laboratory tests are started.

4.3.2 Rheological properties.

4.3.2.1 Type I (flow, self-leveling compound). Apparatus and accessory materials required are: (1) controlled temperature box, $40^{\circ} \pm 2^{\circ}$ F.; (2) stainless steel channel (type 304, No. 2-B finish, approximately No. 16 gage), with inside dimensions $3/4$ inch wide, $1/2$ inch deep, 6 inches long, and closed at both ends (figure 1-a). The channel shall be cleaned with methyl ethyl ketone or similar solvent followed by a thorough cleaning with a detergent solution and a final rinse with distilled or deionized water and then air dried. Before preparing the test assembly, 100 grams of compound, in a closed container and metal channel, shall be conditioned at $40^{\circ} \pm 2^{\circ}$ F. for 2 hours. At the end of the conditioning period, the compound shall be poured into the conditioned channel, held horizontally at $40^{\circ} \pm 2^{\circ}$ F. and then maintained at this temperature for 2 hours. At the end of this period the compound shall be examined for flow properties.

4.3.2.2 Type II (nonsag compound). Apparatus and accessory materials required for this test are: (1) oven, convection type controlled at $122^{\circ} \pm 2^{\circ}$ F.; (2) cold box, controlled at $40^{\circ} \pm 2^{\circ}$ F.; (3) two stainless steel channels (type 304, 2-B finish, approximately No. 16 gage) with inside dimensions $3/4$ inch wide, $1/2$ inch deep, and 6 inches long with the top end open and the back surface extended 2 inches (figure 1-b). Before preparing the test assemblies the two channels shall be exposed for 2 hours, one at $40^{\circ} \pm 2^{\circ}$ F. and the other at $122^{\circ} \pm 2^{\circ}$ F. At the end of the conditioning period, the channels shall be removed from the respective chambers and filled with the compound within 10 minutes. The filled channels shall then be returned to their respective conditioning chambers and set in a vertical position with the 2-inch extension in the base position. At the end of $1/2$ hours the channels shall be removed from the chambers and the sag of the compound at the lower ends measured to the nearest $1/16$ inch.

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4.3.3 Extrusion rate. Accessory materials required are: (1) 6-ounce capacity air powered calking gun with front opening of 0.540 ± 0.002 inch, inside diameter, ("Semco", "Pyles" or similar type); (2) 6-ounce polyethylene cartridge with plunger; (3) 50 p.s.i air supply; (4) pint container; (5) stopwatch. Place a sufficient amount of the compound into the 6-ounce cartridge to completely fill the cartridge with plunger in place. The filled cartridge shall be set aside, vertically, at standard conditions for 3 hours. At the end of 3 hours, with no nozzle added to the cartridge, the compound shall be gunned at 50 p.s.i. pressure into the empty pint container. A stopwatch shall be used to time the extrusion (figure 2). The compound meets the requirement for extrusion rate if the time required to empty the cartridge does not exceed one minute.

4.3.4 Hardness property.

4.3.4.1 Preparation of specimens. Accessory materials required are: (1) Shore Durometer (model A), or equivalent; (2) brass frame with inside dimensions 5 by $1\frac{1}{2}$ by $\frac{1}{4}$ inch thick; (3) 2 aluminum plates, 3 by 6 inch (16 to 24 gage); (4) thin knife blade; (5) metal straight edge. The instrument used to measure hardness shall be the Shore Durometer, model A or equivalent described in Federal Test Method Standard No. 601, Method 301. All readings shall be taken by the instantaneous method using a pressure of about 822 grams. (For obtaining precise readings, the use of a stand is recommended for holding the Durometer fitted with the 822 gram load.) Center the brass frame on the aluminum plate and fill the opening with a portion of the sample, striking off the compound flat with a straight edge. Lift up frame from sealant after running a thin knife blade along the inside edge of the frame. Two such specimens shall be prepared (figure 3A, B, D).

4.3.4.2 Curing of hardness specimens. The test specimens shall be cured for a total of 21 days as follows: 7 days at standard conditions; 7 days at standard temperature and 100 percent relative humidity; 7 days at standard conditions.5/

4.3.4.3 Hardness measurements. At the end of the 21 days' curing period, hardness measurements shall be made with the Durometer at standard conditions. Three readings shall be taken on each specimen and the average of six readings regarded as the accepted value.

4.3.5 Weight loss, cracking, and chalking after heat aging. Apparatus and materials required are: (1) forced draft oven controlled at $180 \pm 2^\circ$ F. (2) balance sensitive to 0.01g. (3) materials listed in 4.3.4.1. After weighing two aluminum plates to the nearest 0.01g, two specimens shall be prepared as described in 4.3.4.1 and weighed to the nearest 0.01g. The specimens shall be exposed for 7 days at standard conditions. Following this exposure period they shall be placed in an oven controlled at $180 \pm 2^\circ$ F. for an additional 14 days. At the end of the heat treatment the specimens shall be allowed to cool for 1 hour at standard conditions and weighed to the nearest 0.01g. The percentage weight loss of the compound (based on the original net weight of the compound) shall be calculated for each specimen. The average weight loss in percent obtained from the two specimens shall be the accepted value. The compound shall be examined for cracks and chalking.

4.3.6 Tack-free-time. Accessory materials required are: (1) brass weight 30g. approximately 1-5/8- by 1- by 1/8 inch; (2) 2 polyethylene strips (clear), approximately 4- by 0.004 ± 0.002 inch; (3) materials listed in 4.3.4.1. The specimen shall be prepared as described in 4.3.4.1. After the specimen has been exposed in air for 72 hours at standard conditions the polyethylene film shall be pressed on the top surface of the compound with the brass weight (30g.) for 30 seconds. The film shall then be progressively withdrawn at right angles to the compound (figure 4). The sample meets the requirement if the film pulls off from the specimen without any sealant adhering to it.

4.3.7 Stain and color change. Test shall be performed in accordance with ASTM Standard - C-510. Figure 5 illustrates the step in the preparation of the stain test specimens.

4.3.8 Durability (bond-cohesion).

5/ The manufacturer may request other conditions than those specified in 4.3.4.2 for the curing period provided they meet the following requirements: (1) the curing period shall extend for 21 days, (2) the temperature during the curing period shall not exceed 180° F., (3) the amended curing conditions shall be applied also to the Durability, adhesion in peel, and violet radiation tests described in subsequent sections.

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4.3.8.1 Extension machine. The machine used in this test shall be so designed that the test specimen while at a temperature of $0^{\circ} \pm 2^{\circ}\text{F}$, can be extended to 150 percent (to 9/16 inch) of its original width (3/8 inch) at a uniform rate of 1/8 inch per hour. The machine shall be similar in design to the one described in SS-R-406, method 223.11, paragraph 7.1, or in ASTM D 1191. Figures 6a and 6b illustrate two such types of machines with 1/8 inch stainless steel grips to accommodate high tensile strength rubber base compounds.

4.3.8.2 Accessory materials. The accessory test blocks used in the durability test shall be (1) Portland cement mortar; (2) plate glass; (3) aluminum alloy.^{6/}

4.3.8.2.1 Mortar blocks. Cement mortar blocks, 3- by 2- by 1 inch shall be prepared as prescribed in SS-R-406, method 223.11, paragraph 7.2, or in ASTM D 1191, except that each block shall be surfaced by wet grinding on an iron lap with No. 60 silicon carbide or aluminum oxide abrasive grain.

4.3.8.2.2 Plate glass. Glass accessory plates shall be 3-by 2-by $\frac{1}{8}$ inch plate glass. Prior to use, the glass shall be cleaned as specified for the steel channel in 4.3.2.1.

4.3.8.2.3 Aluminum. The aluminum plates shall be 3-by 2-by approximately 1/8 inch aluminum alloy; 6063-T5 or 6061-T6, anodized a minimum of 20 minutes over a scale free finish. Prior to use, the aluminum shall be cleaned as specified for the steel channel of 4.3.2.1.^{7/}

4.3.8.3 Preparation of test specimens. Three test specimens shall be prepared for each accessory material that is used with the sample under test. Place a portion of the sample as a bead 3/7-by 3/4-by 2 inch between parallel 3-by 2-inch faces of two similar blocks or plates as shown in figure 7a, b, c. Wood spacers, 3/8-by 2-inch, with a groove 1/4-by 1/8-by 2-inch cut out of one side, shall be used to give the proper size of the bead and also to allow moisture to penetrate the sealant. Polyethylene coated paper or similar vapor permeable release agent shall be placed on the spacer to prevent the sealant from bonding to the wood (figure 7d). Rubber bands, tape, or clamps shall be used to hold the test assembly together before and after filling with the compound. In the case of a flow, compound masking tape lined with wax paper may be used to retain the compound in place until it reaches an initial set.^{8/}

4.3.8.3.1 Curing of durability specimens. The specimens shall be cured as specified in 4.3.4.2.^{8/} After the first four or five days of curing, an attempt shall be made to separate the spacers and release agent from the sealant but to continue to keep spacers between the blocks. If the spacers cannot be released at this time without pulling the sealant, further attempts should be made on subsequent days.

4.3.8.4 Cycling procedure. Following the 21 day cure period, the specimens shall be put through the following cycle three times:

(a) Specimens (with 3/8 inch spacers between blocks or plates but not in contact with compound) shall be heated for 24 hours in a forced draft oven controlled at $150^{\circ} \pm 2^{\circ}\text{F}$.

(b) Specimens shall be allowed to cool to room temperature and then immersed in distilled or deionized water at standard temperature for 7 hours.

^{6/} Other accessory materials such as brick, cast stone, wood, stainless steel, etc. may be specified either in place of the standard materials, or in addition to them, in the durability test at the request of the purchaser.

^{7/} Any nonporous accessory materials other than glass and aluminum shall be cleaned before use as prescribed in 4.3.2.1.

^{8/} Accessory base materials shall be primed with the manufacturer's recommended primer or surface conditioner only when such treatment is specified by the seller and agreed upon by the purchaser.

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- (c) Specimens shall be surface dried and placed in cold box held at $0^{\circ} \pm 2^{\circ}\text{F.}$ for not less than 8 hours.
- (d) Specimens shall be placed (frozen) in the grips of the extension machine and extended from the original $3/8$ inch width to $9/16$ inch at $0^{\circ} \pm 2^{\circ}\text{F.}$ at the rate of $1/8$ inch per hour.
- (e) After the extension is completed, spacers, $9/16$ inch in diameter shall be placed between the blocks and the blocks removed from the cold box and allowed to warm up for 3 hours in air at standard conditions (figure 7e). At the end of 3 hours, the specimens shall be examined for bond and cohesion breaks.
- (f) To start the second cycle the specimens shall be placed with the original $3/8$ inch spacers, in the oven at $158^{\circ} \pm 2^{\circ}\text{F.}$, so that the 3 by 2 inch face of each specimen rests on the oven shelf.^{9/}

At the end of the third cycle, the total loss in bond and cohesion shall be estimated to the nearest 0.1 inch.

4.3.8.5 Formation of bubbles. Any expansion or "blowing" of the compound from the original dimensions of the joint shall be measured and noted in the report. On the completion of the measurements of bond and cohesion loss, each test specimen shall be cut in half through the middle of the sealant and examined for bubbles. The presence of bubbles averaging more than $1/16$ inch in diameter which covers more than $1/2$ the area of the sealant shall be rated as failure. The presence of bubbles averaging $1/16$ inch or less in diameter in any amount shall not be cause for failure provided bond and cohesion requirements are met.

4.3.9 Adhesion in peel. This test is made on plate glass, anodized aluminum and Portland cement mortar after the specimens have been cured as specified herein. It is performed in a testing machine in which the sealant (sealed to cloth) is peeled back at an angle of 180 degrees at a separation rate of 2 inches per minute (see footnote 6/).

4.3.9.1 Apparatus and accessory materials required are: (1) testing machine with tension grips capable of pulling at a rate of separation of 2 inches per minute with a dial or chart indicator calibrated in 1-lb. units; (2) two 6-by 3-inch pieces of $1/4$ inch plate glass; (3) two 6-by 3 inch pieces of anodized aluminum (same type as described in 4.3.8.2.3); (4) two 6-by-3 by $3/8$ inch mortar slabs prepared as described in 4.3.8.2.1 except for size; (5) desized grade A air-plane fabric, 4.28 ounces per yard, 80/84 count, or any suitable cloth that will adhere to the sealant (six 6-by 3-inch pieces); (6) paper masking tape, 1-inch wide. A strip of 1 inch paper masking tape shall be placed across the width of the plate so that the lower edge of the tape is parallel to the lower edge of the plate and 2 inches above it (figure 8A). A portion of the sample shall be spread on the surface of the plate to a thickness of $1/8$ inch over an area from the top edge of the tape to the bottom of the plate and the entire width of the plate (figure 8B). The cloth, approximately 6- by 3-inches is smeared with the compound at one end over an area of 3- by 3-inches and forced into the cloth using a spatula. The impregnated cloth is laid over the $1/8$ inch layer of compound without entrapping air. Then the assembly shall be rolled with a glass rod using proper spacers so that the thickness of the compound between the cloth and the test surface is $1/16$ inch (figure 8C).

4.3.9.2 Curing of peel test specimens. The specimens shall be cured as specified in 4.3.4.2 (footnote 6/ also applies to the curing of peel test specimens). After the specimen has cured the first 3 or 4 days, the cloth shall be coated with a thin layer of the sealant to minimize cloth adhesion failure (figure 8D). After 7 days' curing, the surface of the cloth shall be cut through with a sharp razor blade to the base surface leaving two strips of sealant and cloth 1-inch wide, separated by a space about $3/8$ inch wide (figure 8E). In the case of very slow curing systems, it may be necessary to cut or cover the 1-inch strips at a later time during the cure periods, than specified.

- 2/ The joint usually recovers to the original $3/8$ inch width during the 24 hour period in the oven. If necessary, a 2-lb. weight may be placed on the top block or plate to hasten recovery of the joint. If complete recovery does not occur at the end of the 24 hour heating period, the test specimen in question shall be rated as "failure" and the cycling discontinued.

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4.3.9.3 Peel test procedure. Immediately following the 21 days' cure period the test specimens shall be immersed in distilled or deionized water at standard temperature for 7 days'. At the end of the immersion period, each specimen shall be prepared for testing by wiping dry and releasing 1 inch of the cloth and masking tape from the base. Then the specimen shall be placed in the testing machine and the cloth peeled back at an angle of 180°. The rate of separation of the jaws shall be 2 inches per minute. The sealant shall be pulled for one minute and the average value in pounds indicated by a dial or recording chart on the machine be noted. If the cloth peels from the sealant, during testing, such values obtained shall be disregarded. In such instance the compound shall be cut across with a sharp blade in order to get separation at the interface to the test surface (figure 9). Four strips shall be tested for each base material and the average peel values recorded in pounds. Any sample of sealant showing an average peel strength of less than 10 lbs. shall be regarded as failed for the specific base material. Those samples showing 10 or more lbs. peel strength shall not show more than 50 percent adhesive loss to pass the test.

4.3.10 Adhesion in peel after ultraviolet radiation exposure through glass. Two plate peel strength specimens shall be prepared and cured as specified in 4.3.9, 4.3.9.1, and 4.3.9.2. At the end of the 21 day cure period the test specimens with the sealant surface facing away from the light source, shall be placed on the drum of an accelerated weathering machine as specified in 4.3.7. The specimens shall be exposed to the UV radiation for 200 hours with or without water spray. Following the exposure the specimens shall be immersed in distilled or deionized water for 7 days' and peel strength obtained as prescribed in 4.3.9.3.

5. PREPARATION FOR DELIVERY

5.1 Packaging. Packaging shall be level A, B, or C, as specified (see 6.4).

5.1.1 Level A.

5.1.1.1 Cartridges. The filled cartridges of compound (see 3.1), in quantities as specified (see 6.4), shall be packaged in a close-fitting box conforming to PPP-B-636, class weather-resistant. Each cartridge shall be inserted in a full height cell formed by slotted fiberboard or polystyrene partitions. The fiberboard shall meet the requirements of PPP-F-320, class domestic, type CF, variety SW, grade 200. The box shall be closed and waterproofed in accordance with the appendix to the box specification.

5.1.1.2 Metal containers. The compound furnished in quantities as specified (see 6.4), shall be packaged in a container conforming to PPP-C-96, type V, class 1 or PPP-P-704, type II, class 1, 2, 3, or 4.

5.1.2 Level B.

5.1.2.1 Cartridges. Twelve filled cartridges of compound shall be packaged in a box conforming to PPP-B-636, class domestic. Each cartridge shall be inserted in a full-height cell formed by slotted fiberboard or polystyrene partitions. The fiberboard shall meet the requirements of PPP-F-320, class domestic, type CF, variety SW, grade 200. The box shall be closed in accordance with method I of the appendix to the box specification.

5.1.2.2 Metal containers. The compound furnished in quantities as specified (see 6.4), shall be packaged in a container conforming to PPP-C-96, type V, class 1 or PPP-P-704, type II, class 1, 2, 3, or 4.

5.1.3 Level C. The compound shall be packaged to afford protection against deterioration and damage during shipment from the supplier to the initial destination.

5.2 Packing. Packing shall be level A, B, or C, as specified (see 6.4).

5.2.1 Level A.

5.2.1.1 Cartridges. The unit packages of cartridges in quantities as specified (see 6.4), shall be packed in a box conforming to PPP-B-585, class 3; PPP-B-601, overseas type; PPP-B-621,

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class 2; PPP-B-636, class weather-resistant; or PPP-B-640, class 2. The box shall be closed and strapped in accordance with the appendix to the applicable box specification. The gross weight of the PPP-B-636 box shall not exceed the weight limitations of the box specification. When the gross weight of the wood or triple-wall boxes exceeds 250 pounds skids shall be provided in accordance with the applicable specification.

5.2.1.2 Metal containers. The compound shall be packed in accordance with the appendix to PPP-C-96 as specified for overseas shipment. No packing is required for the PPP-P-704 pails.

5.2.2 Level B.

5.2.2.1 Cartridges. Four unit packages of cartridges shall be packed in a close-fitting box conforming to PPP-B-636, class domestic. The box shall be closed in accordance with method I of the appendix to the box specification.

5.2.2.2 Metal containers. The compound shall be packed in accordance with the appendix to PPP-C-96 for domestic shipment. No packing is required for the PPP-P-704 pails.

5.2.3 Level C. The compound shall be packed to insure carrier acceptance and safe delivery at destination in containers complying with the rules and regulations applicable to the mode of transportation.

5.3 Standard packaging (civil agencies). The standard packaging and packing for civil agencies shall be specified in 5.1.2 and 5.2.2, respectively.

5.4 Marking.

5.4.1 Civil agencies. In addition to markings required by the contract or order the interior packages and shipping containers shall be marked in accordance with Fed. Std. No. 123.

5.4.2 Military agencies. In addition to markings required by the contract or order the interior packages and shipping containers shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use.

6.1.1 The joint sealing compound covered by this specification is intended to seal joints in all types of structures where some movement is expected and where tightness against dust, dirt, wind, and water is required. Some of the uses of the compound as a sealer include channel glazing, bedding and sealing around panels and lights of curtain wall structures, sealing window and door perimeters, sealing the joints between precast concrete panels, sealing flashings and expansion joints, and pointing brick and stone masonry. Producers of rubber base joint sealers list many other and varied uses for this type of sealer.

6.1.2 The compound is supplied as a one-component material in metal, cardboard, or plastic cartridges, as well as in bulk containers of various capacities.

6.1.3 The compound supplied in cartridges shall be installed with either a hand or power gun. Bulk compound shall be installed with a calking gun or with a handtool. It is of prime importance that the joint be dry and free of dust, dirt, oil, grease, or old loose calking before the compound is placed in the joint.

6.1.4 The compound shall not be applied to surfaces coated with lacquer or paint. Such coatings shall be removed before applying the compound. Before applying the compound to masonry joints previously treated with water repellent solutions, a laboratory test for bond shall be made as described in 4.3.8, using the specified type masonry and water repellent solution as accessory materials. It is recommended that the sealing compound producers be consulted before applying a compound to concrete treated with retardants surface curing and mold release agents.

6.1.5 Unless specifically agreed upon by supplier and purchaser, the compound shall not be applied in contact with joint fillers such as asphaltic materials, oil base calkings, or any other sealants in which the bonding properties and adverse effects resulting from the combination are not known.

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6.1.6 Producers often recommend the use of a specific primer or surface conditioner for specific surfaces. The primer or conditioner is designed to assure adhesion of the compound to a specific surface. In all cases where primers or conditioners are recommended with a compound it is advisable to have the durability and peel strength tests made with the primer in question.

6.1.7 Whenever possible the compound shall not be applied to a joint at temperatures under 40°F. At such temperatures a film of moisture is likely to form on the surfaces of the joint as a result of condensation. This moisture film which can be entirely invisible under certain atmospheric conditions may prevent the formation of a strong bond between the compound and the substrate.

6.1.8 Wherever possible a back-up material should be used with sealant in a moving joint to insure good bond to sides of the joint. The back-up material should be completely inert, non-rigid, and also shall not form a strong bond to the sealant itself. The sealant producer should recommend the proper back-up material for his product for a particular substrate and joint design.

6.1.9 Although the compounds are available in several colors, a freshly cured compound may be painted any desired color provided the producer approves such procedure.

6.1.10 Modification of a compound by the addition of liquids or powders to alter its flow properties shall not be permitted.

6.1.11 Standard pack for civil agencies. The standard pack requirements in 5.3 are intended for use in procurements of stores stock replenishments. Procuring officers should use the standard pack requirements when it is known that the material will be shipped from a supplier to a domestic warehouse, supply depot or intermediate storage point for temporary storage, subsequent issue or shipment to eventual user.

6.2 Other suitable flow characteristics may be agreed upon by the supplier and purchaser or specifier. Special nonsag properties may be required in unusually large joints and lesser flow characteristics may be required in sloping joints where perfect leveling is not desired.

6.3 This specification covers joint sealants which are capable of resisting joint movements not exceeding a total of 50 percent of the nominal joint width. For example, a joint with a nominal width of 1/2 inch should be so designed that it never expands to more than 5/8 inch (25 percent movement) nor contracts to less than 3/8 inch (25 percent movement) throughout its expected performance life.

6.4 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in procurement documents:

- (a) Title, number, and date of this specification.
- (b) Type of product required (see 1.2).
- (c) Selection of applicable levels of packaging and packing required.
(see 5.1 and 5.2).
- (d) Quantity of cartridges required in unit package (see 5.1.1.1).
- (e) Quantity of compound and size of container required (see 5.1.1.2 and 5.1.2.2).
- (f) Quantity of unit packages required in shipping container (see 5.2.1.1).

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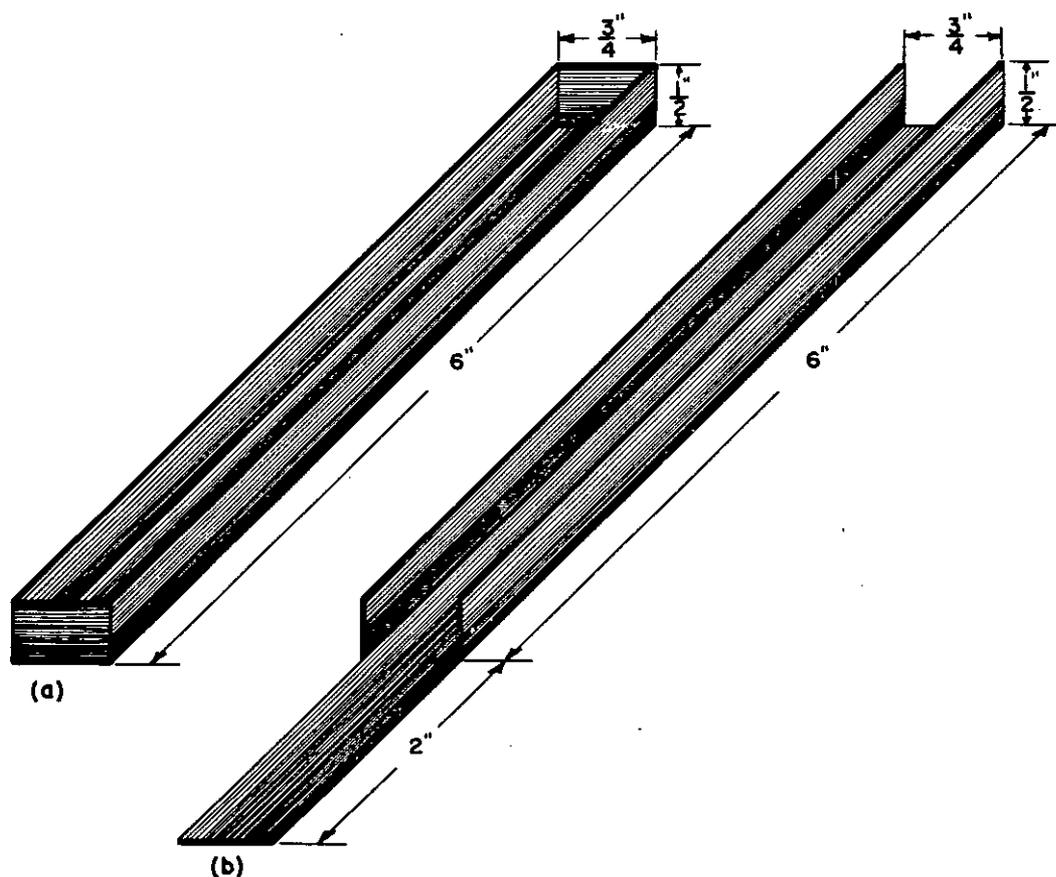


Fig. 1. Channels used for determining rheological properties, (a) for self leveling or flow type compound (class A), (b) for non-sag type compound (class B)

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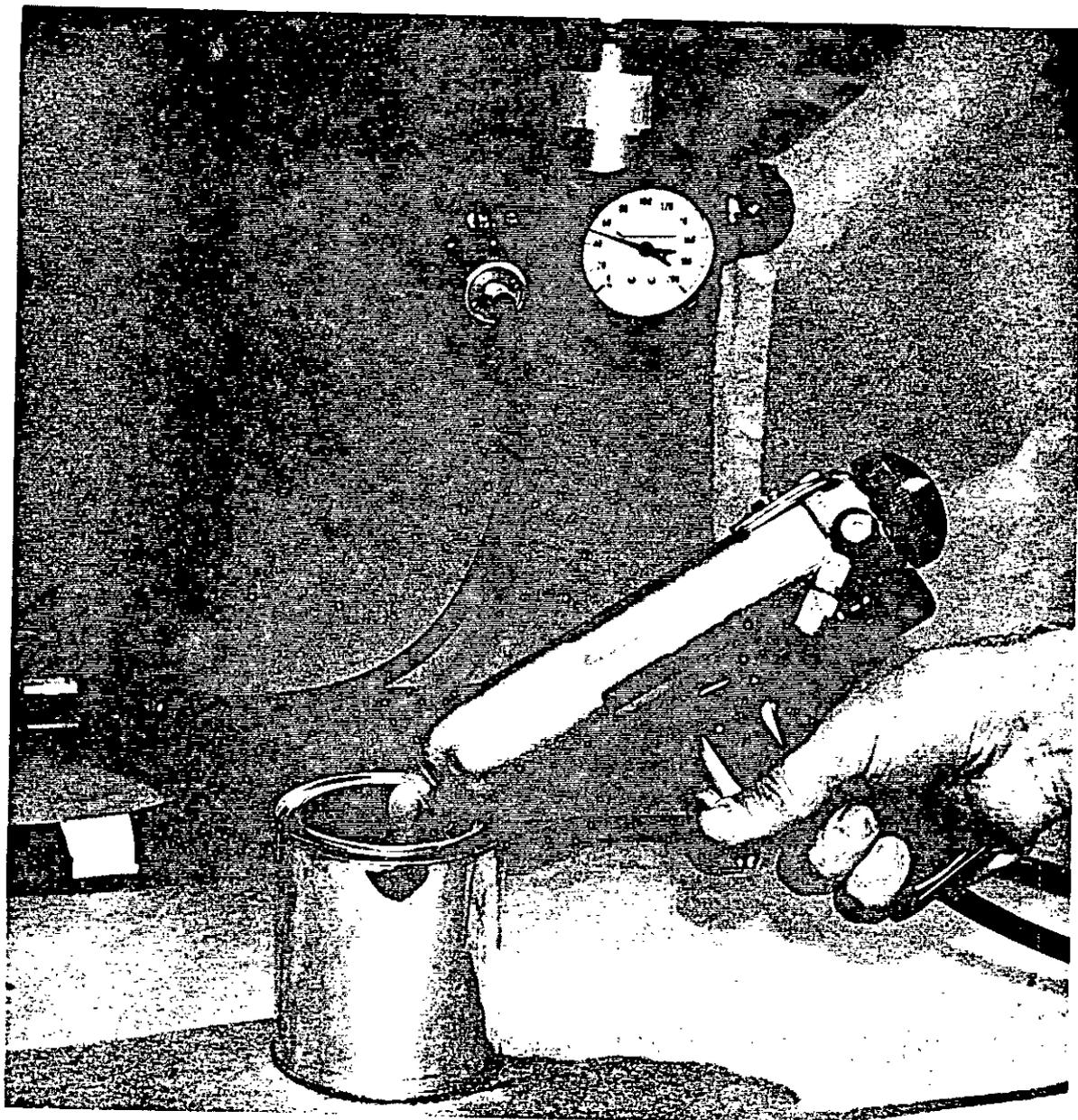


Fig. 2. Application life test using a 6 oz. power gun containing a 6 oz. cartridge without added nozzle, and operated at 50 p.s.i.

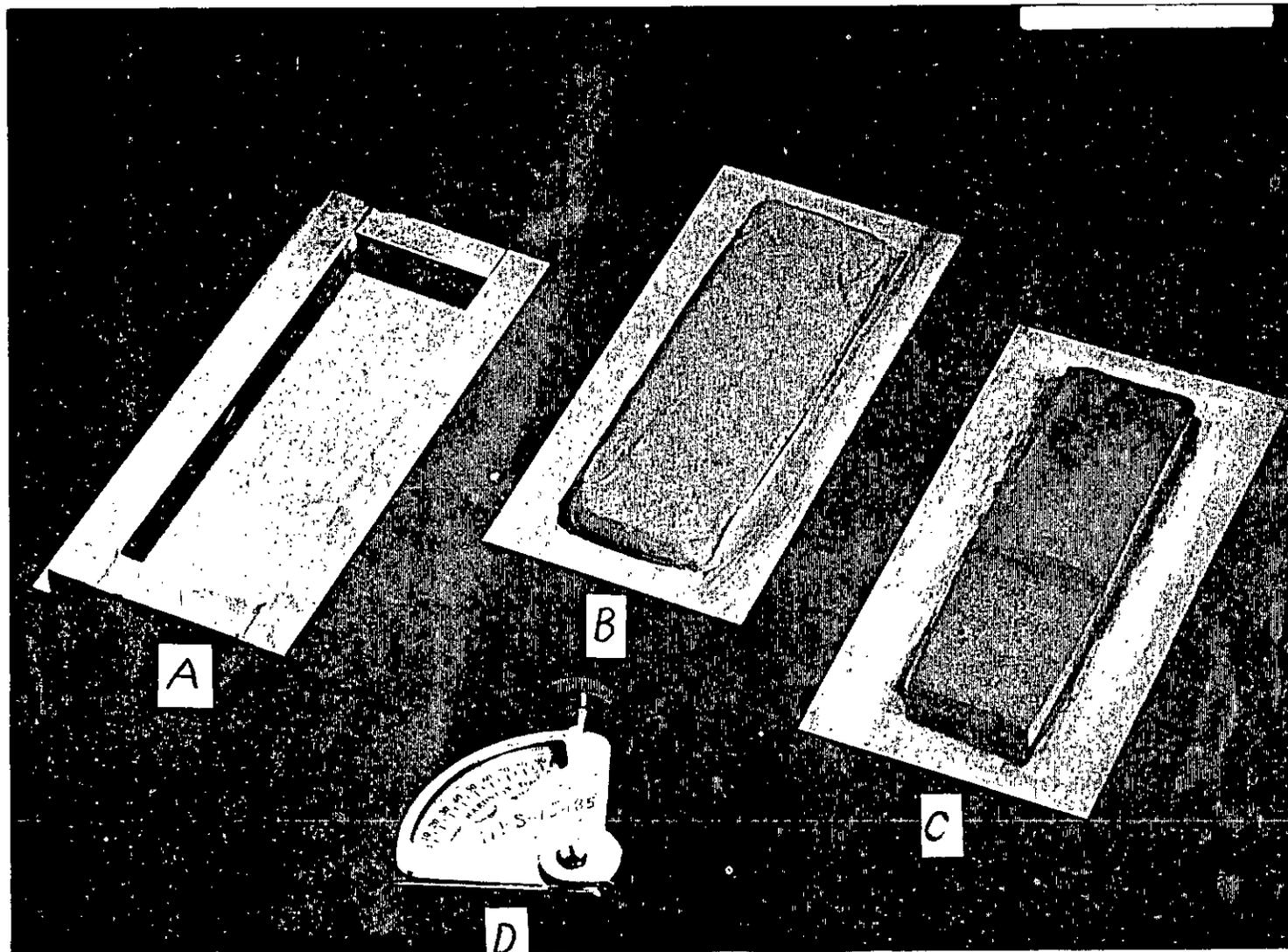


Fig. 3. Stages in the preparation of hardness test specimen, (A) frame, (B) specimen for hardness at standard condition, (C) specimen for hardness after heat aging, (D) Shore Durometer. Note: Specimen C, is not used in the testing of one-component sealants. Operating stand with constant load not shown.

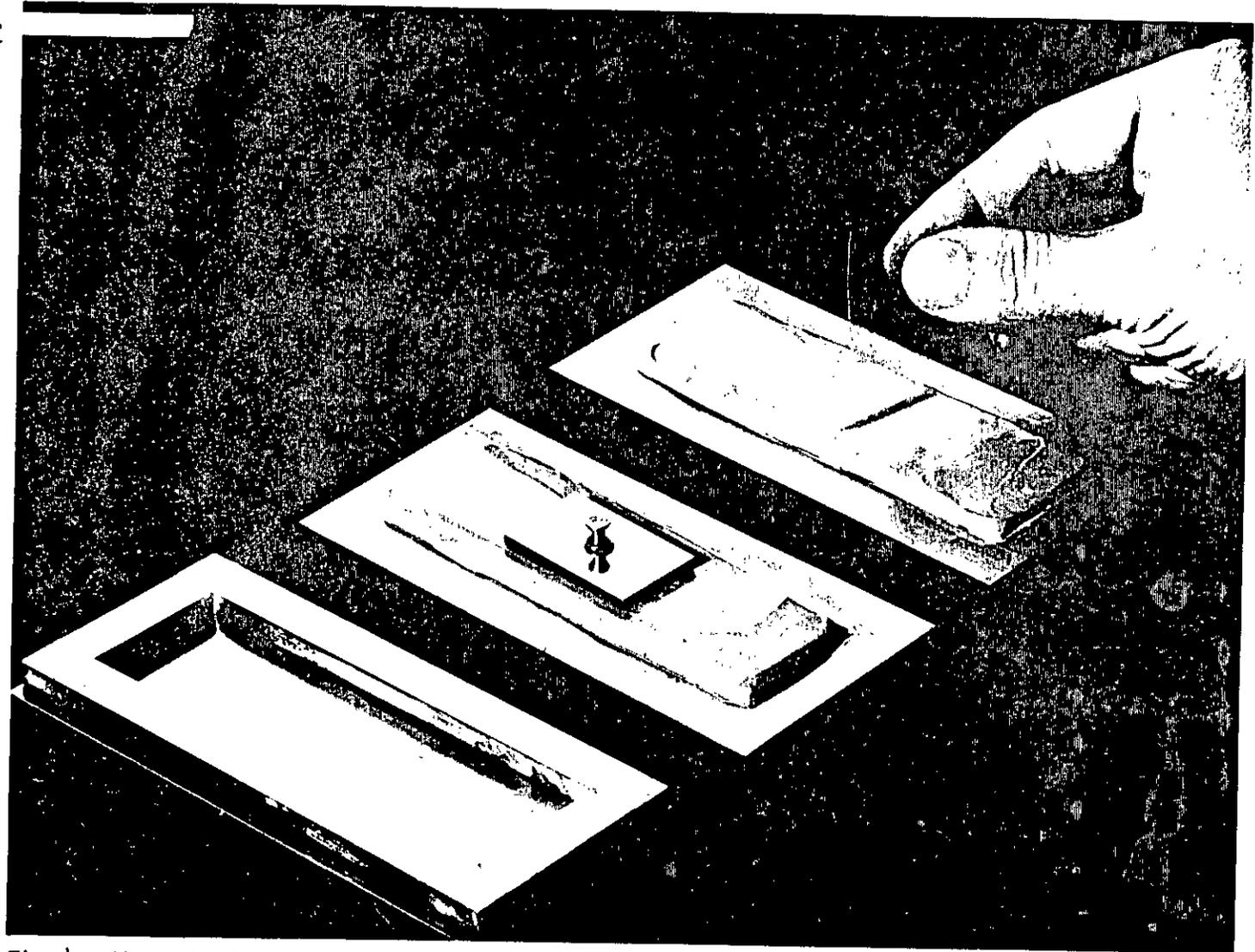


Fig. 4. Stages in the tack-free time test procedure.

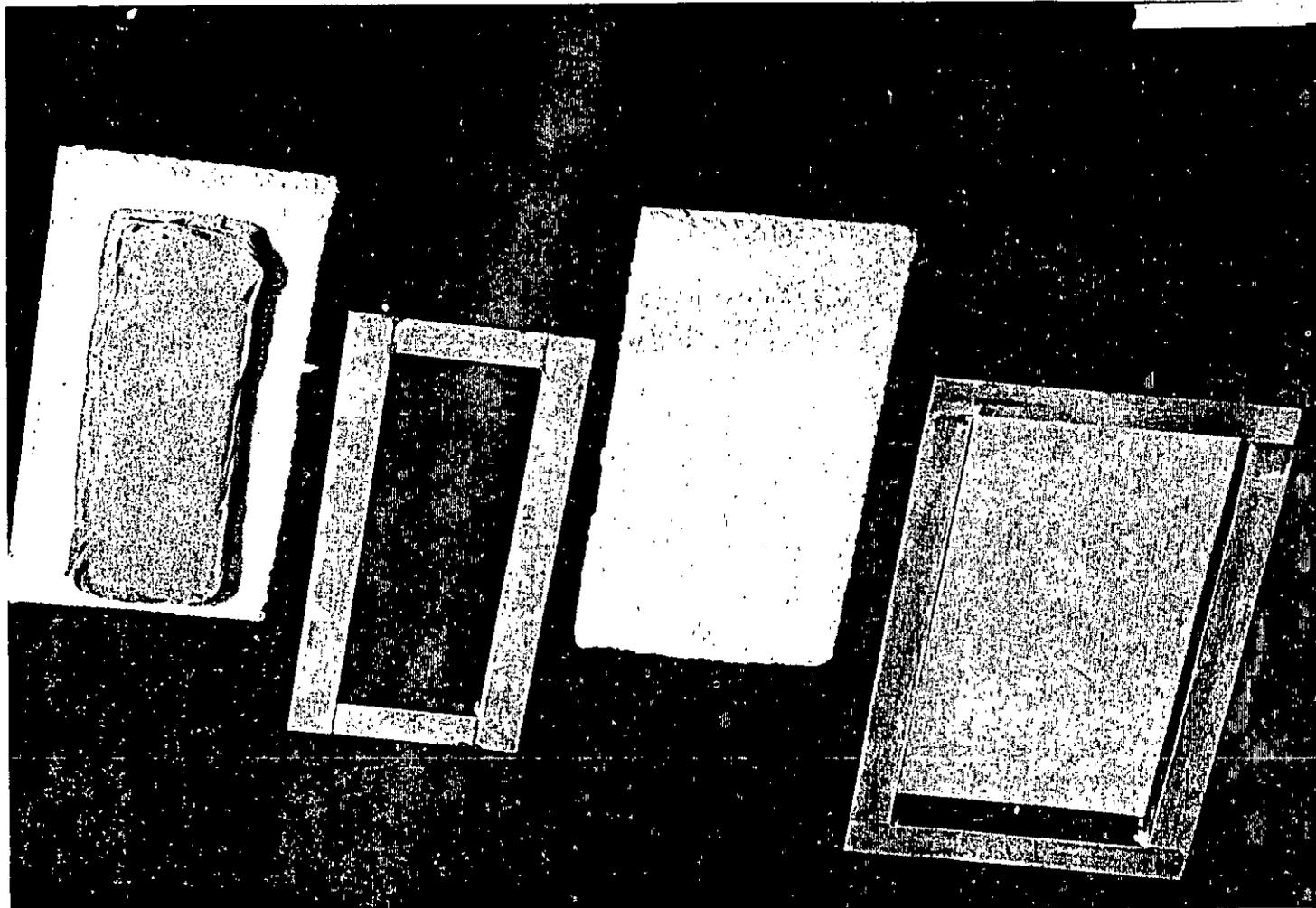


Fig. 5. Stages in the preparation of the stain test specimen.

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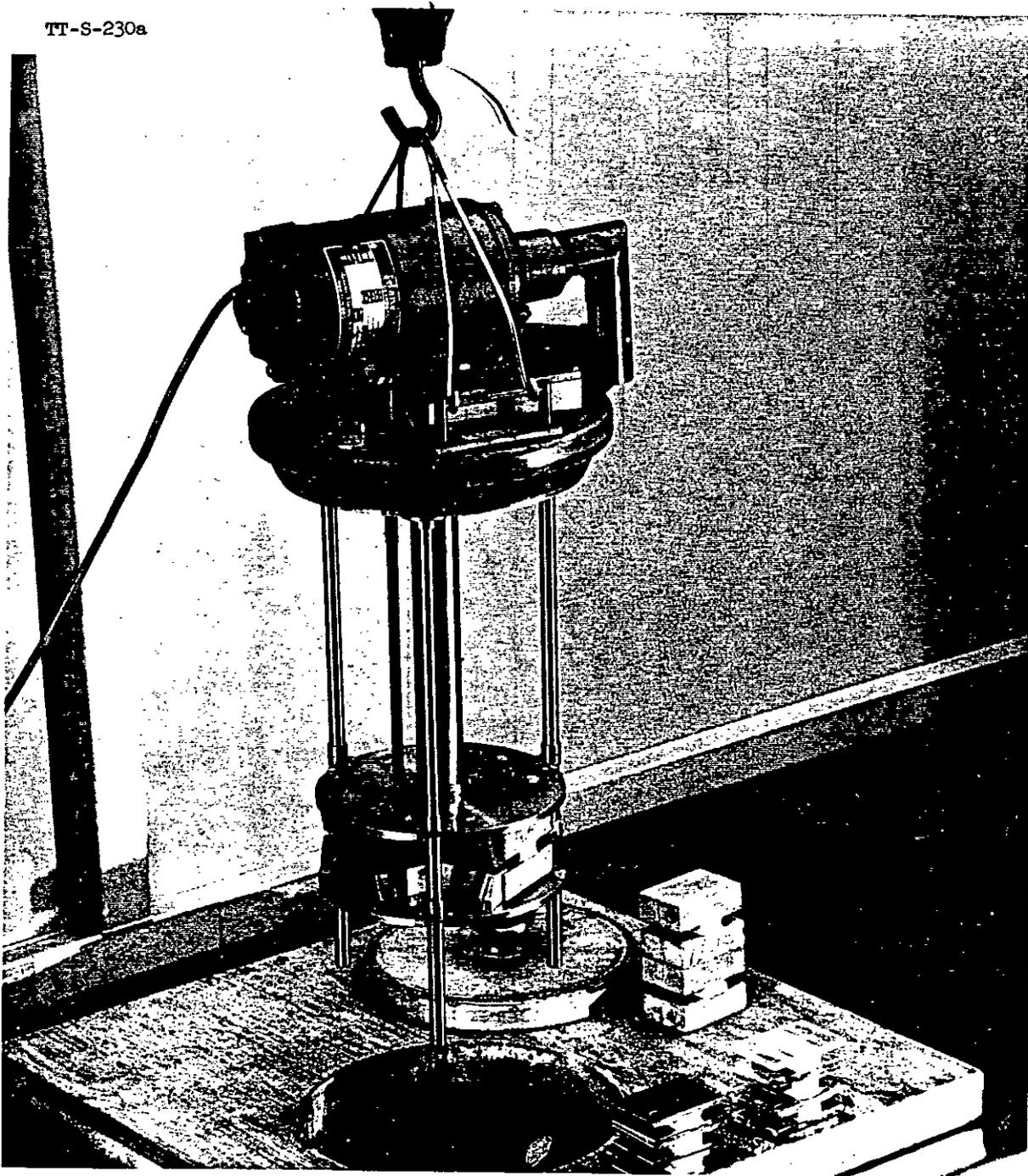


Fig. 6a. Motor driven extension machine and specimens used in durability test.

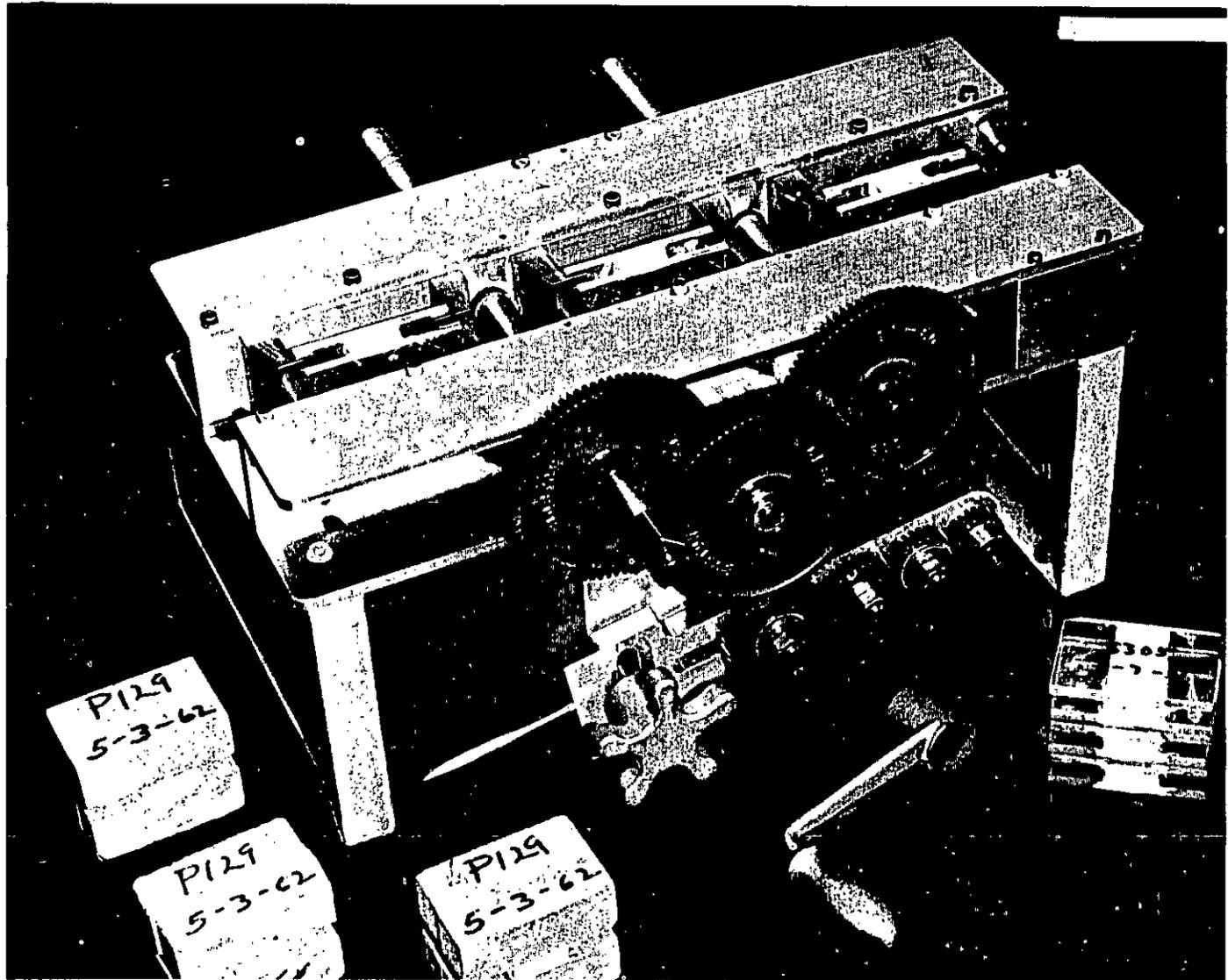


Fig. 6b. Motor driven extension machine used in the durability test.

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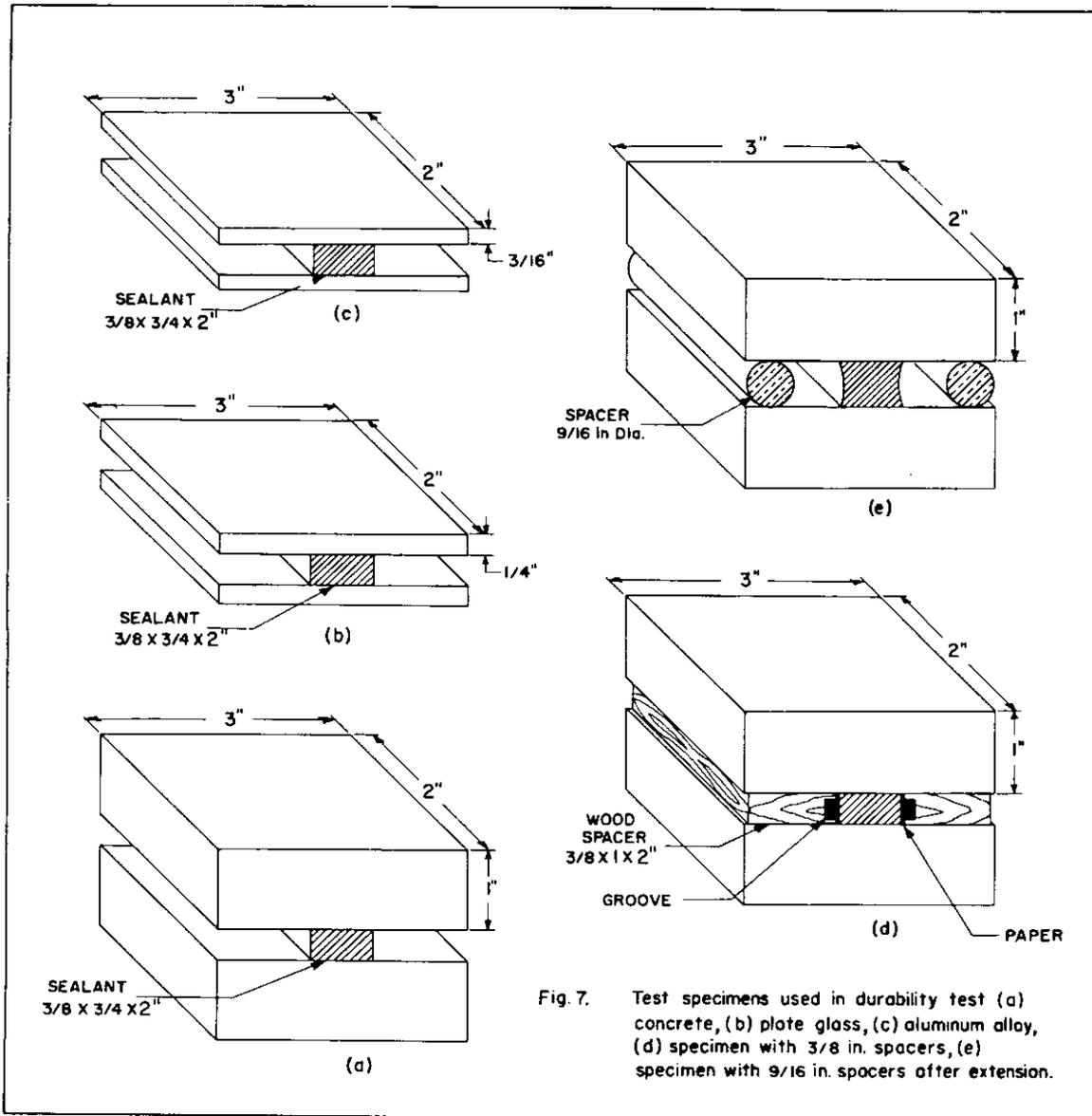


Fig. 7. Test specimens used in durability test (a) concrete, (b) plate glass, (c) aluminum alloy, (d) specimen with 3/8 in. spacers, (e) specimen with 9/16 in. spacers after extension.

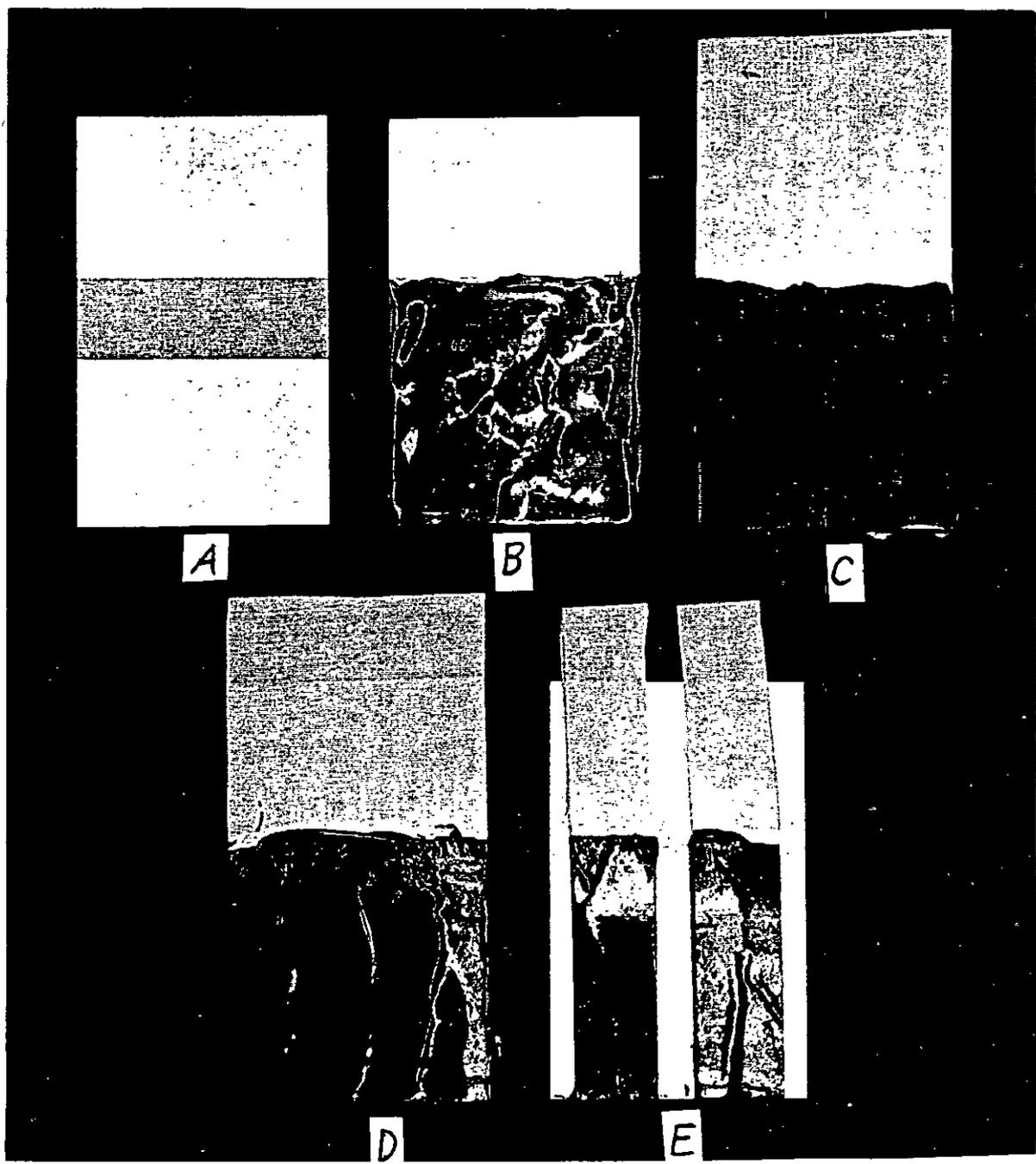


Fig. 8. Stages in the preparation of the adhesion in peel specimen.

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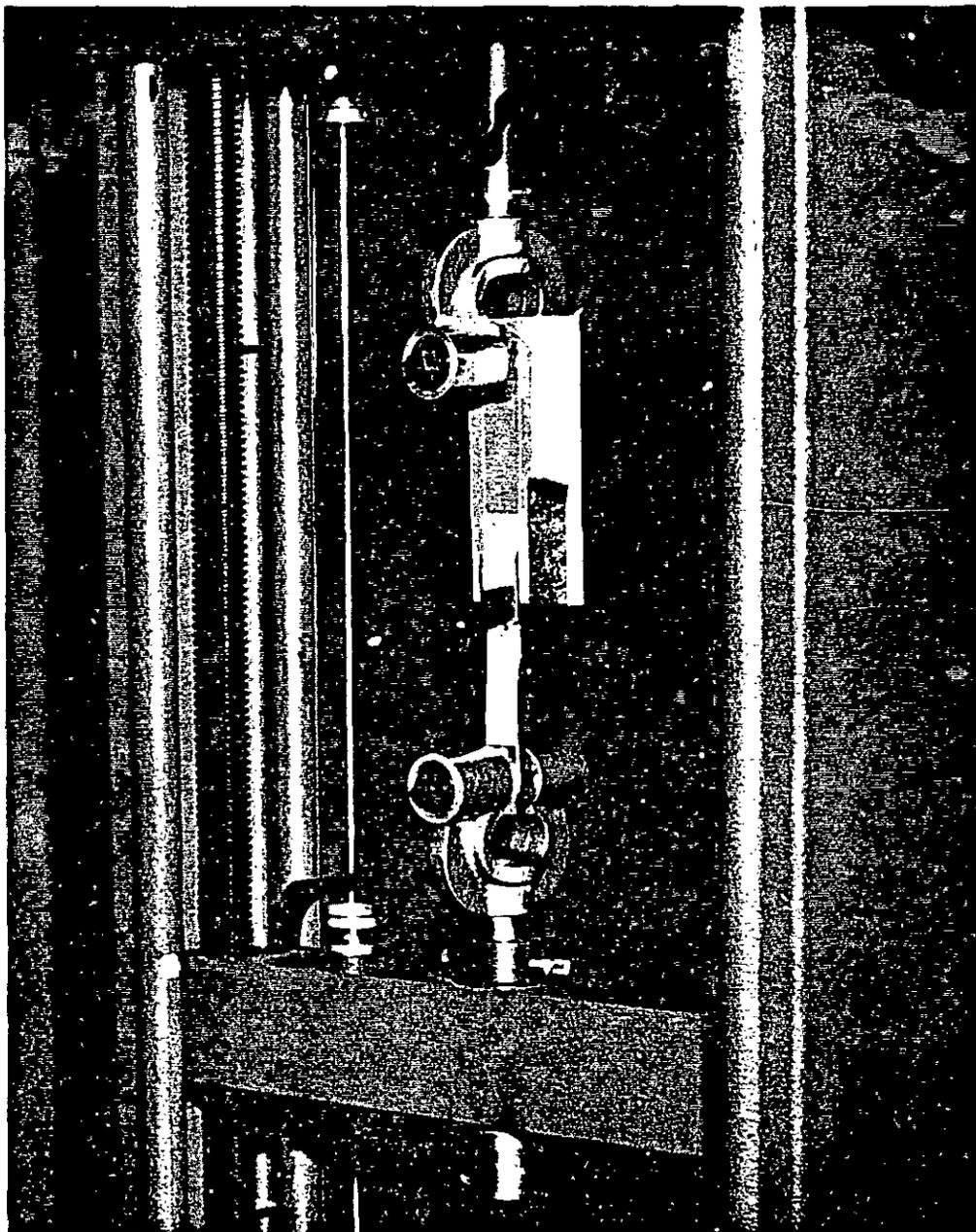


Fig. 9. Extension machine used in the adhesion in peel test.

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