

TT-S-001657 (COM-NBS)

October 8, 1970

## INTERIM FEDERAL SPECIFICATION

### SEALING COMPOUND--SINGLE COMPONENT, BUTYL RUBBER BASED, SOLVENT RELEASE TYPE (FOR BUILDINGS AND OTHER TYPES OF CONSTRUCTION)

This Interim Federal Specification was developed by the National Bureau of Standards, Washington, D. C. 20234, based upon currently available technical information. It is recommended that Federal agencies use it in procurement and forward recommendations for changes to the preparing activity at the address shown above.

#### 1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers the properties of a single component, solvent release type, butyl rubber based sealing compound for sealing, calking, and glazing operations in buildings and other types of construction.

1.2 Classification. The sealing compound shall be furnished in the following types as specified (see 6.2):

Type I - This type shall be suitable for use in calking guns at temperatures above 40 deg. F. (5 deg. C.). [1]

Type II - This type shall be suitable for application with a putty knife at temperatures above 40 deg. F. (5 deg. C.). [1]

#### 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:

##### Federal Specifications:

- SS-R-406 - Road and Paving Materials; Methods of Sampling and Testing.
- PPP-B-636 - Box, Fiberboard.
- PPP-C-96 - Cans, Metal, 28 Gage and Lighter
- PPP-D-729 - Drums; Metal, 55 gallon (for Shipment of noncorrosive material).
- 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).

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[1] The sealing compound covered by this specification shall be formulated to withstand without failure a maximum total joint movement of 10 percent of the nominal joint width.

To clarify the meaning of 10 percent maximum total joint movement, the following hypothetical examples are given:

If a building joint is filled on the hottest day of the year the maximum seasonal movement of 10 percent will occur in the extension only and none in compression, beyond the original nominal joint width. Likewise if a joint is filled on the coldest day of the year, the maximum seasonal movement of 10 percent will occur in compression only and none in extension, i.e., beyond the original nominal width. At all other times of sealant installation there will

be a combination of extension and compression beyond the nominal width of the joint. The combinations might be 2.5 percent in extension and 7.5 percent in compression; 5 percent in extension and 5 percent compression; 6 percent in extension and 4 percent in compression; or any other such combination of extension and compression totaling a maximum of 10 percent.

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Fed. Test Method Std. No. 141 - Paint, Varnish, Lacquer and Related Materials; Method of Inspection, 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.)

(Single copies of this specification and other Federal Specifications required by activities outside the Federal Government for bidding purposes are available without charge from Business Service Centers at the General Services Administration Regional Offices in Boston, New York, Washington, D.C., Atlanta, Chicago, Kansas City, Mo., Fort Worth, 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:

C33 - Specifications for Concrete Aggregates.  
C150 - Specifications for Portland Cement.  
D1191 - Methods of Testing Concrete Joint Sealers.  
D2202 - Method of Test for Slump of Oil and Resin-Base Caulking Compounds.  
D2203 - Method of Test for Staining of Oil and Resin-Base Caulking Compounds.  
D2452 - Method of Test for Extrudability of Oil and Resin-Base Caulking Compounds.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103.)

Uniform Classification Committee:

Uniform Freight Classification.

(Application for copies should be addressed to the Uniform Classification Committee, Room 202 Union Station, Chicago, Ill. 60606.)

National Motor Freight Association, Inc:

National Motor Freight Classification.

(Application for copies should be addressed to the American Trucking Association, Inc., 1616 P Street, N. W., Washington, D. C. 20036.)

### 3. REQUIREMENTS

3.1 Material. The sealing 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 had or pressure gun or by hand tool. The compound when set shall form a semi-elastic type solid capable of maintaining a seal against water, wind, and dirt.

3.2 Stability. The compound in the original container shall be suitable for at least 12 months from the time of delivery when stored at a temperature not exceeding 80 deg. F. (27 deg. C.).

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

#### 3.4 Detail requirements.

3.4.1 Color. The color of the sealant, after drying 5 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).

3.4.2 Bubble formation. When tested on aluminum and concrete as prescribed in 4.3.2, not more than 25% of the total test surface on either substrate should be covered with bubbles.

3.4.3 Tenacity. The sealant compound when bent as prescribed in 4.3.3 shall not show any cracking, separation, delamination, or adhesion loss.

3.4.4 Shrinkage. The compound when tested on glass as prescribed in 4.3.4 shall not shrink more than 25.0 percent.

3.4.5 Slump. The compound shall not slump more than 0.15 inch when tested as prescribed in 4.3.5.

3.4.6 Extrudability (For Type 1 compound only). The compound shall have value of not more than 9 seconds per ml. when tested as prescribed in 4.3.6.

3.4.7 Stain. The compound shall not show a "stain index" greater than 2.50 when tested as prescribed in 4.3.7. In the alternative method, the maximum stain value shall not be greater than 1.0.

3.4.8 Tack-free time. When tested as prescribed in 4.3.8, no sealant material shall adhere to the polyethylene strip when the later is pulled from the layer of compound.

3.4.9 Adhesion loss, cracking, and discoloration after aging. After ultraviolet and cold box exposure testing as prescribed in 4.3.9, the compound shall not receive a rating greater than two (2) in any one of the areas of (1) Adhesion, (2) Edge Cracking, or (3) Center Cracking. Any color change after exposure shall be reported and the compound shall not show a degree of color change that is unacceptable to the purchaser.

3.4.10 Bond-cohesion. When tested as prescribed in 4.3.10 with standard mortar, glass and aluminum, or other specified substrate, the total loss in bond area and cohesion among the 3 specimens tested (for each substrate), shall be no more than 1.5 square inches.

#### 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, 1012 and/or 1031 of Fed. Test Method Std. No. 141, as applicable.

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4.2.1 Inspection of preparation for delivery. An inspection shall be made to determine that 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 deg. +/- 3.6 deg. F. (23 deg. +/- 2 deg. C.) 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 Bubble formation. Accessory materials required are: (1) Aluminum plates, 16 to 24 gauge, approximately 3 inches (7.6 cm.) by 5 inches (12.7 cm), (2) Cement mortar blocks [2], approximately 2 inches (5.1 cm.) by 4 inches (10.2 cm.) prepared as described in ASTM standard D-1191, (except for size and other changes noted in 4.3.10.2.1), (3) Template, steel or brass, 1/8 inch (0.3 cm) high, 3-3/4 inches (9.5 cm.) by 1 inch (2.5 cm.) inside and approximately 4-3/4 inches (12 cm.) by 2 inches (5.1 cm.) outside, (4) Spatula, steel with knife edge, (5) Oven, convention type, controlled at 122 deg. +/- 2 deg. F. (50 deg. +/- 1 deg. C.).

Procedure. Prepare three test specimens on each substrate. Center the template on the substrate under test and completely fill the space within the template with a portion of the compound. Using the spatula, strike the surface of the compound flat to a uniform 1/8 inch (0.3 cm.) thickness. With the thin knife edge of the spatula, cut all around the outside edge of the compound and lift the template straight up and off.

Condition the specimens for 48 hours at standard conditions, then place them in the oven at 122 deg +/- 2 deg. F. (50 deg. +/- 1 deg. C.) for 72 hours. After heat exposure, allow the specimens to cool at standard conditions for 1 hour.

Examine each specimen for gas bubbles, and estimate and report the surface area covered by the bubbles to the nearest 0.1 sq. in. (0.25 sq. cm.) for each substrate.

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[2] Other substrates such as brick, cast stone, marble, stainless steel, etc., may be specified either in place of the standard materials, or in addition to them at the request of the purchaser.



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4.3.3 Tenacity. Apparatus and materials required are: (1) Thin aluminum panels, 3 inches (7.6 cm.) wide by 5 inches (12.7 cm.) long by approximately 0.01 inch (0.3 mm.) thick; (2) Template, as described in 4.3.2; (3) Spatula, steel with knife edge; (4) Oven, forced draft type having a temperature controlled at 158 deg. +/- 4 deg. F, (70 deg. +/- 2 deg. C.); (5) Freezer chest or cold box having a temperature controlled at -10 deg. +/- 5 deg. F. (123 deg. +/- 3 deg. C.); (6) Mandrel or rod with a diameter of 1/4 inch (0.64 cm.) and with a suitable holder or rack to support the rod.

Procedure. Clean the template and aluminum panels with methyl ethyl ketone or similar solvent [3]. Prepare three (3) test specimens. Center the template on an aluminum panel and carefully fill it with test compound, avoiding air pockets. Strike off the surface of the compound flat to a uniform 1/8 inch (0.32 cm.) thickness. With the thin knife edge of the spatula, cut all around the outside edge of the compound and lift the template straight up and off.

Cure the specimens for at least 24 hours at standard conditions. Then expose the following cycle three (3) times:

16 hours at 158 deg. +/- 4 deg. F. (70 deg. +/- 2 deg. C.)

8 hours at -10 deg. +/- 5 deg. F. (-23 deg. +/- 3 deg. C.)

At the end of the third cycle, while in the freezer at -10 deg. F. (-23 deg. C.), sharply bend the plate in half across its width over the 1/4 inch (0.64 cm.) diameter mandrel. Take no more than one second to make the bend.

Examine the sealant and report any cracking and loss of adhesion. Very minor crazing of the thin surface skin may be disregarded. If two (2) specimens pass and one (1) fails of the three specimens tested, the test shall be repeated. If two (2) or more specimens fail, the compound is rated as having failed.

4.3.4 Shrinkage. Apparatus and accessory materials required are: (1) titrating buret marked in 0.1 ml., (2) brass ring approximately 2-5/8 inches (6.7 cm.) in inside diameter and 1/2 inch (1.27 cm.) wide, with ends ground flat, (3) 2 ground glass cover plates, 3 to 3-1/2 inches (8 cm.) in diameter, (4) leveling tool for spreading compound, designed to lay down a 1/8 inch layer of sealant, as shown in Figure 1, (5) distilled water.

Procedure. Adhere the brass ring to one of the ground glass plates. Determine the volume of the ring by filling it with distilled water at standard temperature from a titrating buret. The water from the buret shall be slowly added so that there are no air bubbles when the glass cover plate is centered on the ring. Record the amount of water required to fill the ring, to the nearest 0.03 ml. as  $V_{f7}$ .

Spread a 1/8 inch (0.32 cm.) layer of compound in the ring using the leveling tool to form good contact with ring and glass. Pour distilled water from the buret into the ring until it is exactly filled (without air bubbles), as determined by covering with the other glass plate. Record how much water is required to fill the ring using the buret (reading the buret to an accuracy of 0.03 ml.) and designated the amount as  $V_{i7}$ .

Pour the water from the ring and let the specimen set at standard conditions for a period of 14 days. At the end of this exposure period, repeat the filling of the ring using the buret and distilled water and record the volume of water as  $V_{f7}$ . Calculate the shrinkage of the sample as follows:

$$\text{Percent Shrinkage} = V_{f7} - V_{i7}$$

$$\frac{\quad}{V_{r\gamma} - V_{i\gamma}} \times 100$$

Where:

$V_{r\gamma}$  = Volume of ring.

$V_{f\gamma}$  = Volume of water required to fill the ring after 14 days exposure.

$V_{i\gamma}$  = Volume of water required to fill the ring before 14 days exposure.

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[3] Methyl ethyl ketone and similar solvents are both toxic and flammable and should be handled with caution in a well-ventilated hood.

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4.3.5 Slump. Perform the test in accordance with ASTM Standard D 2202. Figure 2 illustrates the flow test jig in this procedure.

4.3.6 Extrudability. Equipment and accessories required are: (1) Press Flow Extrusion Rheometer as described in ASTM Standard D 2452, (Fig. 3); (2) air supply and pressure gauge accurate to 1 psi; (3) stand clamps to hold Rheometer; (4) weight per gallon cup; (5) triple beam balance accurate to one gram; (6) chemical balance; (7) stop watch.

Procedure. After conditioning Rheometer at standard conditions for at least 4 hours, remove both ends from Rheometer and stand the Rheometer tube on a horizontal surface, bottom up. Insert follower plate and fill with sealant, avoiding air pockets<sup>[4]</sup>. Strike off filled tube, flat, with spatula. Replace top and orifice caps and connect to air supply.

Adjustment of Air Pressure: Adjust air pressure to 60 psi and open air valve. If pressure drops, readjust to 60 psi while extrusion is in progress. Close air valve and discard extruded sealant. The equipment is now ready for testing.

Place assembly in a stand so that the sealant is extruded onto a triple beam balance. Open air valve start stop watch simultaneously. After extruding approximately 50 grams of compound, close air valve and click stop watch simultaneously. Weigh to the nearest 0.01 gram of the exact amount of compound extruded. Calculate the seconds per gram by dividing the number of seconds elapsed by the number of grams extruded and designate this value as S.

Determine the density of the compound using a weight per gallon cup as described in Method 4184.1 of Fed. Test Method Std. No. 141.

Extrudability, expressed in seconds per milliliter of sealant is determined by the formula:

$$E = S \times D$$

Where:

S = seconds per gram of sealant.

D = density = grams per milliliter of sealant.

4.3.7 Stain. Perform the test in accordance with ASTM Standard D 2203 (Figure 4).

4.3.8 Tack-free time. Accessory materials required are (1) Brass weight, 40 grams, approximately 1-1/2 by 3/4 by 1/4 inches (3.8 x 1.9 x 0.6 cm.), (2) Template, steel or brass as described in 4.3.2, (3) Clear, low density polyethylene film strips, approximately 5 by 1 by 0.004 +/- 0.002 inches (12.7 cm x 2.5 cm. x 0.1 mm.), (4) Aluminum plate, approximately 3 inches (7.6 cm.) by 5 inches (12.7 cm.), (5) Spatula, steel with knife edge.

Procedure. Center the template on the aluminum plate and completely fill the space within the template with a portion of the compound. Using the spatula, strike the surface of the compound flat to a uniform 1/8 inch (0.3 cm.) thickness. With the thin knife edge of the spatula, cut all around the outside edge of the compound and lift the template straight up and off. Expose the test specimen in the laboratory for 24 hours at standard conditions.

At the end of the exposure period, center the polyethylene film strip lengthwise along the top surface of the compound and set the brass weight in the center of the top of the strip for 30 seconds. Remove weight, and then progressively withdraw the plastic film (with thumb and forefinger) at right angles to the compound (Figure 5). Note if any sealant compound adheres to

the film.

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[4] If the sample under test is Cartridge-Packed, the portion of sealant used to fill the rheometer tube shall be extruded from a newly opened, filled cartridge using a conventional caulking gun. If the compound cannot be extruded because of hardened portions blocking the passage of the sealant through the nozzle, the extrusion test shall be regarded as failed; and the procedure stopped at this point.

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4.3.9 Adhesion loss, cracking and discoloration after aging. Apparatus and equipment required: (1) Reflective aluminum shield approximately 18 inches (46 cm.) high by 24 inches (61 cm.) by 36 inches (91 cm.), (2) Two RS-1 ultraviolet sun lamps on adjustable holders. New sun lamps should be lighted 24 hours before using in test. Maximum life of lamps is 500 hours, (3) Three aluminum channels 6 inches (15 cm.) long by 3/4 inch (1.0 cm.) wide by 3.8 inch (0.9 cm.) deep, inside dimensions, (4) Freezer chest or cold box having a temperature controlled at -10 deg. +/- 5 deg. F. (-23 deg. +/- 3 deg. C.), (5) Steel spatula, (6) Masking tape.

Procedure. Clean the three aluminum channels with methyl ethyl ketone or similar solvent [3]. Use masking tape to seal the open ends of the channels. Fill the channels with the sealant to be tested avoiding bubbles and air pockets and strike off level with the spatula. Condition the filled channels for 48 hours at standard conditions before further testing.

With the reflective shield in place, adjust the sun lamps so the temperature at the surface of the aluminum channels is 140 deg. +/- 5 deg. F. (60 deg. +/- 3 deg. C.). Normally, the sun lamps need to be approximately 30 inches (76 cm.) from the sample to accomplish this.

Cycle the filled channels as follows:

- (1) Place the channels under the sun lamps with the shield in place for 8 hours.
- (2) Remove the channels from under the sun lamps and immediately place in the freezer at -10 deg. +/- 5 deg. F. (-23 deg. +/- 3 deg. C.) for 16 hours.

At the conclusion of 10 cycles, inspect the samples for cracking, adhesion loss and color changes. Using the attached photographic standards as guidelines (Figures 6a, 6b, and 6c), rate each channel for edge cracking, center cracking and adhesion loss. Ratings range from 0-no damage after exposure to 5-severe damage after exposure. If any two of the three specimens under test show failures in either edge cracking or center cracking or adhesion loss, greater than a two (2) rating, this sealant shall be considered as failing the ultraviolet, cold box exposure test.

Any color change of the sealant on exposure should also be noted and reported.

#### 4.3.10 Bond-cohesion.

4.3.10.1 Apparatus Required. (1) Extension machine; (2) Cold box or chamber maintained at -10 deg. +/- 5 deg. F. (-23 deg. +/- 3 deg. C.); (3) Oven, forced draft type having a temperature controlled at 158 deg. +/- 4 deg. F. (70 deg. +/- 2 deg. C.); (4) Oven, convection type having a temperature controlled at 122 deg. +/- 2 deg. F. (50 deg. +/- 1 deg. C.).

The machine used in this test shall be so designed that the test specimens can be automatically extended at a continuous rate of 1/8 inch per hour. The extension shall be 12-12 percent of the nominal 1/2 inch width to 9/16 inch. The machine may be similar to the one shown in Figures 7a, 7b, or the one described in SS-R-406 method 223.11, or in ASTM Standard D 1191, as shown in Figure 7c. The machine should be equipped with grips of sufficient thickness to resist elastomeric sealants with high tensile strength.

4.3.10.2 Accessory materials. The standard accessory blocks and plates (substrates) used in the test are: (1) Portand cement mortar; (2) plate

glass; (3) aluminum alloy[5].

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[3] Methyl ethyl ketone and similar solvents are both toxic and flammable and should be handled with caution in a well-ventilated hood.

[5] Other substrates such as brick, cast stone, marble, stainless steel, etc., may be specified either in place of the standard materials, or in addition to them at the request of the purchaser.

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4.3.10.2.1 Mortar blocks. Mortar blocks, 1-by 1-by 3-inches shall be prepared as described in ASTM D-1191. The cement shall conform to Type III of the Specifications for Portland Cement (ASTM C150). The sand (fine aggregate) shall conform to the requirements of Specifications for Concrete Aggregate (ASTM C33, Fine Aggregate). The exceptions to this requirements in ASTM D 1191 are: (1) the blocks shall be 1-by 1-by 3 inches; (2) the blocks shall be surfaced by wet grinding on an iron lap with No. 60 silicon carbide or aluminum oxide grain.

4.3.10.2.2 Plate glass. Glass accessory plates shall be 1/4 by 1 by 3-inch water-white polished plate glass. Prior to use, the glass 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 [3], [6].

4.3.10.2.3 Aluminum. The aluminum plates shall be 1/4 by 1 by 3 inch aluminum alloy, 6063-T5 or 6061-T6 clear anodized a minimum of 20 minutes over a scale free finish. Prior to use the aluminum shall be cleaned as specified for the plate glass in 4.3.10.2.2 [7].

4.3.10.3 Preparation of test specimens. Prepare three test specimens for each substrate materials that is used with the sample under test. After maintaining the unopened sample at standard conditions for at least 24 hours apply a bead of sealant, 1/2 by 1/2 by 2 inches between parallel by 1 by 3 inch faces of two similar accessory blocks or plates as shown in Figures 8a, 8b, 8c, and 8d. Wood or metal spacer bars are used to form the proper size of bead. Polyethylene tape, paraffin, silicone stopcock grease, or any other suitable mold release agent is applied to the inside surfaces of the spacers to prevent adhesion of the spacers to the sealant. Adhesive tape, rubber bands, or clamps are used to hold the test assembly together before and after filling with the compound.

4.3.10.4 Testing. Allow the test assemblies to set for 24 hours at standard conditions. Then proceed as follows:

1. Dry the samples for 7 days at 122 deg. +/- 2 deg. F. (50 deg. +/- 1 deg. C.) in a convection oven.
2. Then place the specimens in a cold box at -10 deg. +/- 5 deg. F. (-23 deg. +/- 3 deg. C.) for 24 hours. At the end of this time, while in the cold box, move the spacer bars out away from the sealant. However, retain the spacer bars in the test assembly.
3. Remove the samples from the cold box and condition them for 1 hour at standard conditions. Then age them for 7 days at 158 deg. +/- 4 deg. F. (70 deg. +/- 2 deg. C.) in a forced draft oven.
4. Following this aging, place the specimens in a cold box at -10 deg, +/- 5 deg. F. (-23 deg. +/- 3 deg. C.) for 24 hours.
5. The specimens while frozen are then placed in the grips of the extension machine and extended from the original 1/2 inch width to 9/16 inch at -10 deg. +/- 5 deg. F. (-23 deg. +/- 3 deg. C.), at the rate of 1/8 inch per hour. After the extension is completed, any initial failure is recorded. Then spacers, 9/16 inch in diameter, are placed between the blocks or plates and the stretched specimens are removed from the machine and allowed to warm up for 3 hours in air at standard conditions (Figure 7d). At the end of the 3 hours, the specimens are examined for bond cohesion breaks and adhesion loss. The total loss in cohesion and adhesion should be estimated to the

nearest 0.1 square inch for each sample. The loss in bond area and cohesion among the 3 specimens tested for each substrate should be totaled and recorded.

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- [3] Methyl ethyl ketone and similar solvents are both toxic and flammable and should be handled with caution in a well-ventilated hood.
  - [6] At the request of the sealant manufacturer the detergent cleaning step shall be omitted from the specified cleaning procedure.
  - [7] All non-porous substrate material shall be cleaned as specified for the plate glass in 4.3.10.2.2 except as indicated in [6]. Porous accessory blocks, other than standard mortar shall be dried and cleaned as specified for mortar in 4.3.10.2.1.



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## 5. PREPARATION FOR DELIVERY

### 5.1 Packaging. Packaging shall be level A, or C as specified (see 6.2).

5.1.1 Level A. The compound shall be unit packaged in cartridges containing approximately 1/10 gallon, or 1 gallon cans conforming to PPP-C-96, type V, class 2. The containers must be resistant to ambient humidity for a period of not less than one year. When the cartridge is utilized, the inner ply of the tube shall be impervious to the compound and provide adequate for the product packaged.

5.1.2 Level C. The compound shall be unit packaged in cartridges containing approximately 1/10 gallon, or 1 gallon cans. The packaging shall be in accordance with the manufacturers standard practice, providing it insures protection for the product during shipment and safe delivery to its destination.

5.2 Intermediate packaging. (Applicable to cartridges only.) Intermediate packaging shall be level A, B, or C as specified (see 6.2).

5.2.1 Level A. Twelve filled cartridges 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 waterproof sealed in accordance with the appendix to PPP-B-636.

5.2.2 Level B. Twelve filled cartridges shall be packaged in accordance with 5.2.1 except that the box shall be in accordance with PPP-B-636, class-domestic and shall be closed and sealed in accordance with method I of the appendix I of the appendix to PPP-B-636.

5.2.3 Level C. Twelve filled cartridges shall be packaged in containers of the type normally used for the product, providing that it insures protection for the filled cartridges during shipment and safe delivery to its destination.

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

5.3.1 Level A. Unless otherwise specified (see 6.2) four intermediate packages of cartridges, or four-filled 1 gallon cans shall be conforming to PPP-B-636, class weather-resistant. The boxes shall be closed, waterproof sealed and strapped in accordance with the appendix to PPP-B-636. Five and fifty-five gallon quantities shall be furnished in 5 gallon pails conforming to PPP-P-704, type I, class 3, or in drums conforming to PPP-D-729, type II, respectively.

5.3.2 Level B. Four intermediate packages of cartridges, or four filled 1 gallon cans shall be packed in a close-fitting box conforming to PPP-B-636, class-domestic. The boxes shall be closed and sealed in accordance with method I of the appendix to PPP-B-636. Five and fifty-five gallon quantities shall be furnished in 5 gallon pails conforming to PPP-P-704, type I, class 3 or in drums conforming to PPP-D-729, type II, respectively.

5.3.3 Level C. Four intermediate packages of cartridges, or 4 filled 1 gallon cans shall be packed in boxes in accordance with the manufacturers standard practice. Five and fifty-five gallon quantities shall be furnished in pails or drums in accordance with the manufacturers standard practice. The manufacturers standard practice shall be acceptable, providing that this will assure carrier acceptance and safe arrival at destination in compliance with the Uniform Freight Classification or the National Motor Freight

Classification.

5.4 Marking. The marking shall be in accordance with 5.4.1 or 5.4.2 as specified (see 6.2).

5.4.1 Civil Agencies. In addition to markings required by the contract or order, 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, interior packages and shipping containers shall be marked in accordance with MIL-STD-129.

## 6. NOTES

6.1 Intended use.

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6.1.1 The sealant compound covered by this specification is intended to seal joints in all types of structures where a total joint movement of 10 percent or less may be expected and where tightness against dust, dirt, wind, and water is required. Some of the uses of the compound include the bedding of glass or panels in channels, sealing lap joints in gutters, ducts, flashings, curtain walls and associated millions, and as a general purpose construction calking. It is often used for channel glazing up to 100 united inches where a butyl sealing tape or a chemically curing material is the primary sealant. It may be used in butt joints where total movement does not exceed 10 percent. Producers of the nominal joint width, of butyl base sealants list many other and varied uses for this type of sealing compound.

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. Type 1 material is of a soft consistency that can be applied with either a hand or power gun. Type 2 is about the same consistency as glazing putty and is generally applied with a hand tool.

6.1.3 The sealant should be applied to an area that is dry and free of dust, dirt, oil, grease, or old loose calking material. Good practice includes stiff brush dusting and blowing on masonry surfaces and a solvent wipe with mineral spirits meeting TT-T-291 on glass and metal. Although priming is generally not required, if priming of specific substrates is required by the producer, it shall be done to his recommendations.

6.1.4 Whenever possible, the compound shall not be applied to a joint at temperatures under 40 deg. F. (5 deg. C.). 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 limit the formation of a strong bond between the sealant and the substrate.

6.1.5 Wherever possible a back-up material or bond breaker should be used with the sealant in joints where some movement will occur. This will control sealant depth and insure a good bond to the sides of the joint. The back-up material or bond breaker 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 material for use with his product.

6.1.6 Modification of a compound by the addition of liquids or powders to alter the flow properties shall not be permitted. Flow characteristics other than those specified herein may be agreed upon by the supplier and purchaser.

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

6.2 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) Quantity of cartridges and 1 gallon cans required in shipping containers (5.3.1).
- (d) Selection of applicable levels of packaging and packing required (see 5.1, 5.2, and 5.3).
- (e) Marking required (see 5.4).

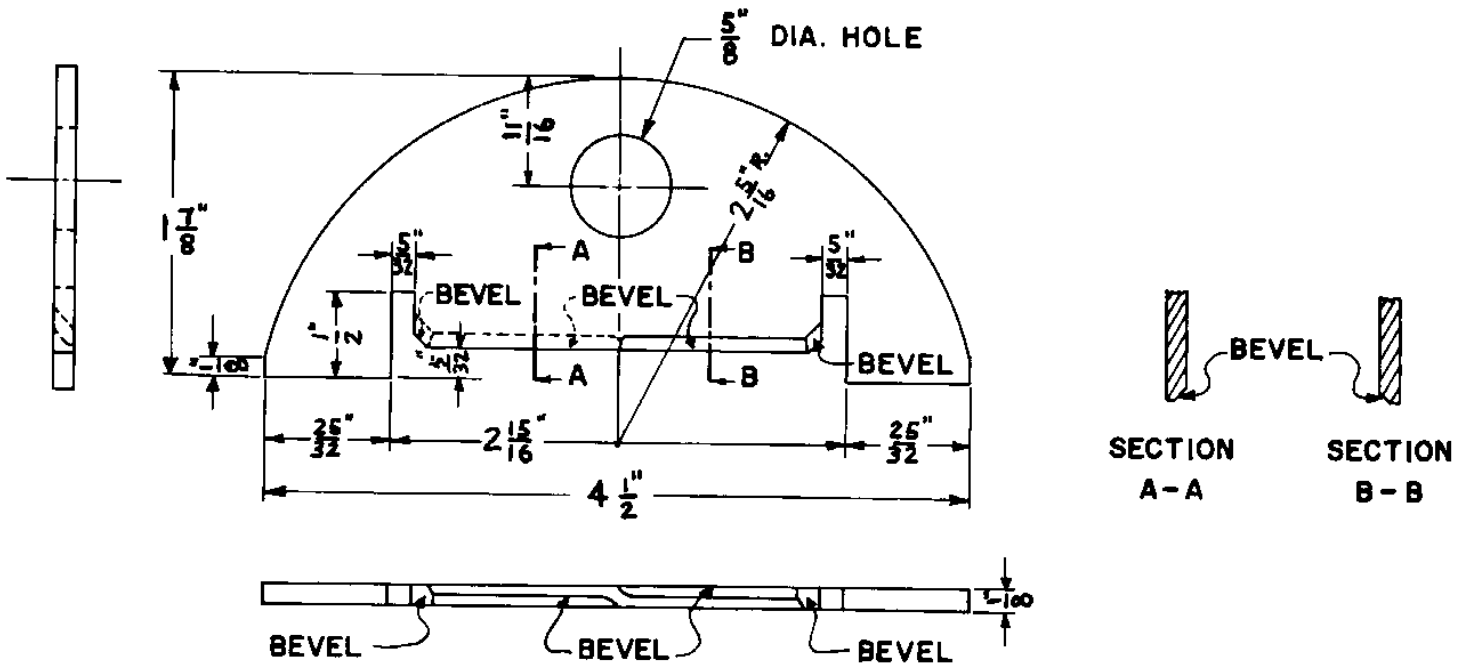


FIG. 1. TOOL FOR LEVELING SEALING COMPOUND IN THE SHRINKAGE TEST SPECIMEN.

Specimen.]

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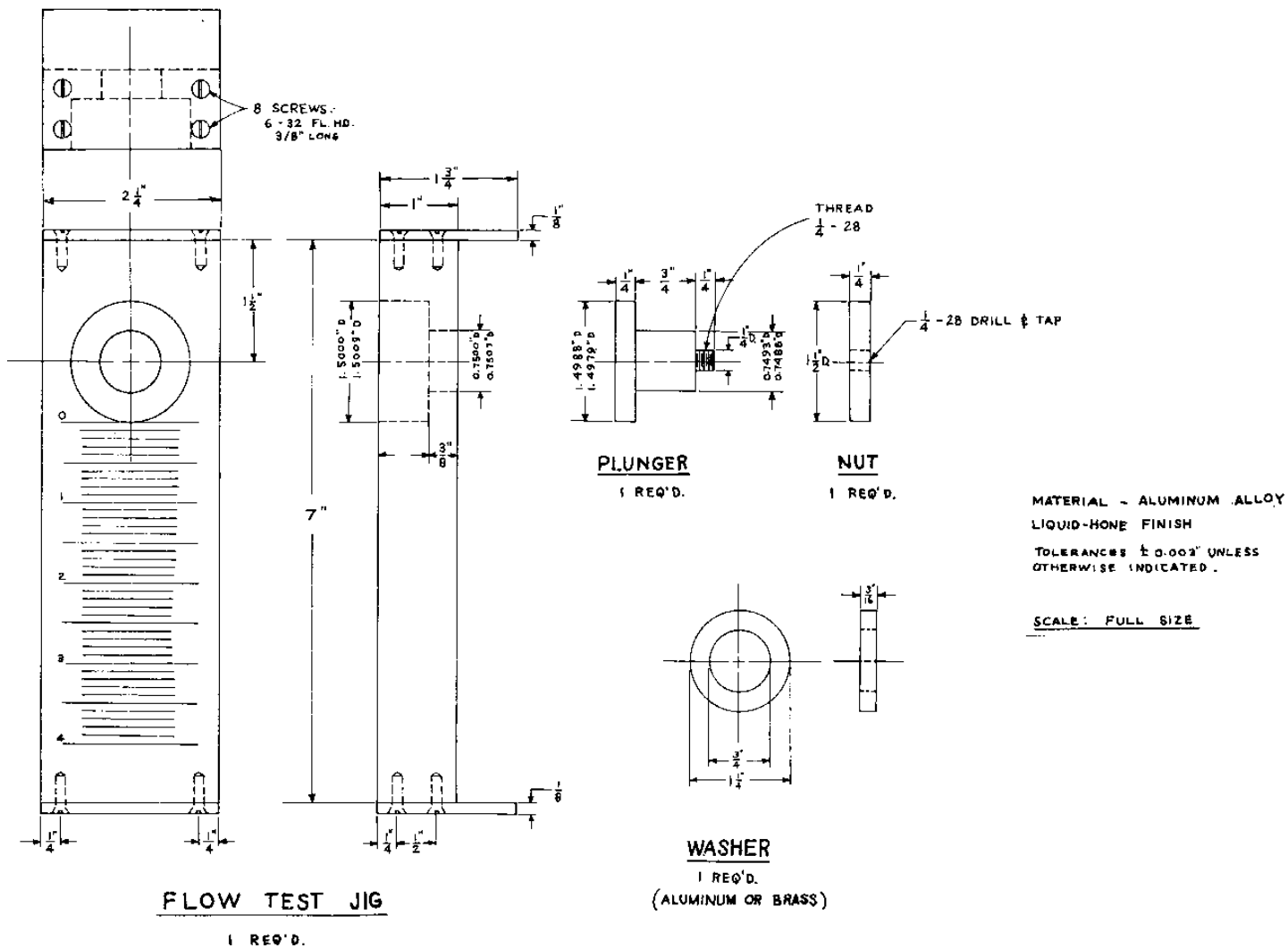


FIG. 2. FLOW TEST JIG USED FOR THE DETERMINATION OF SLUMP.

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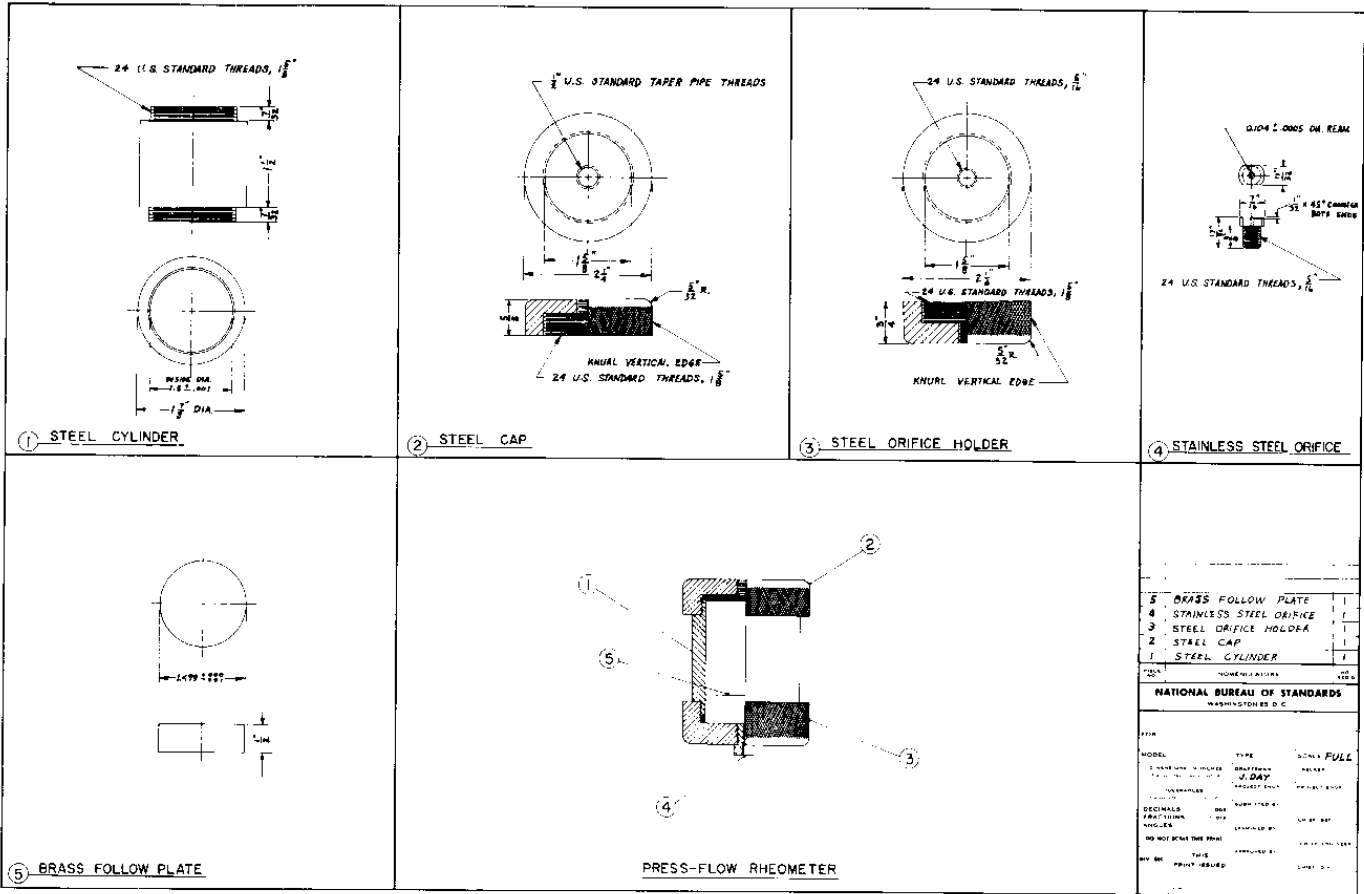


FIG. 3. DRAWING OF PRESS-FLOW EXTRUSION RHEOMETER FOR EXTRUDABILITY TEST.

Extrudability Test.]

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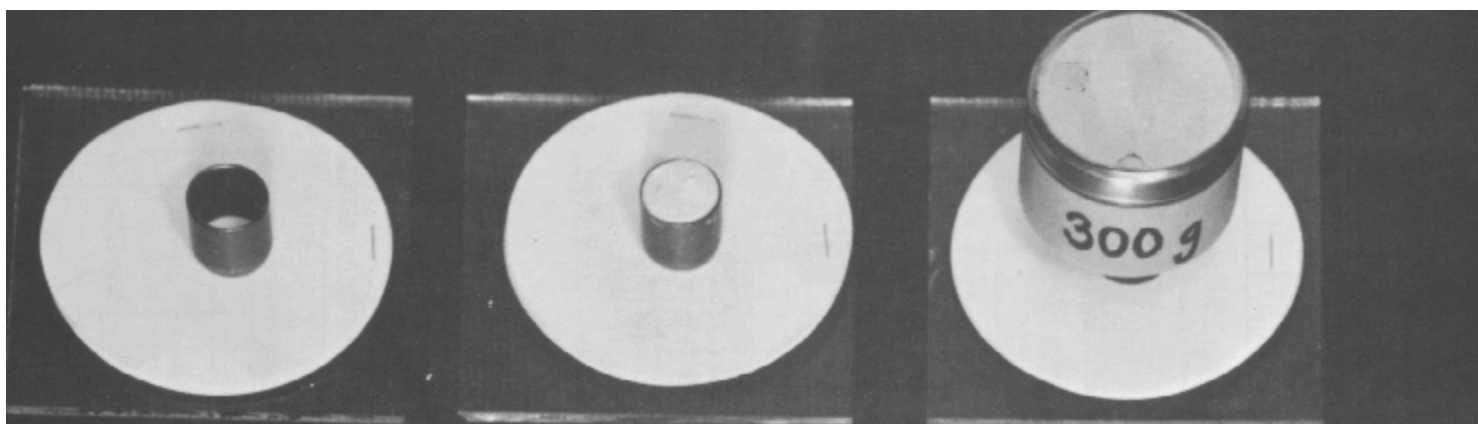


FIG. 4. STAGES IN THE STAIN TEST PROCEDURE.

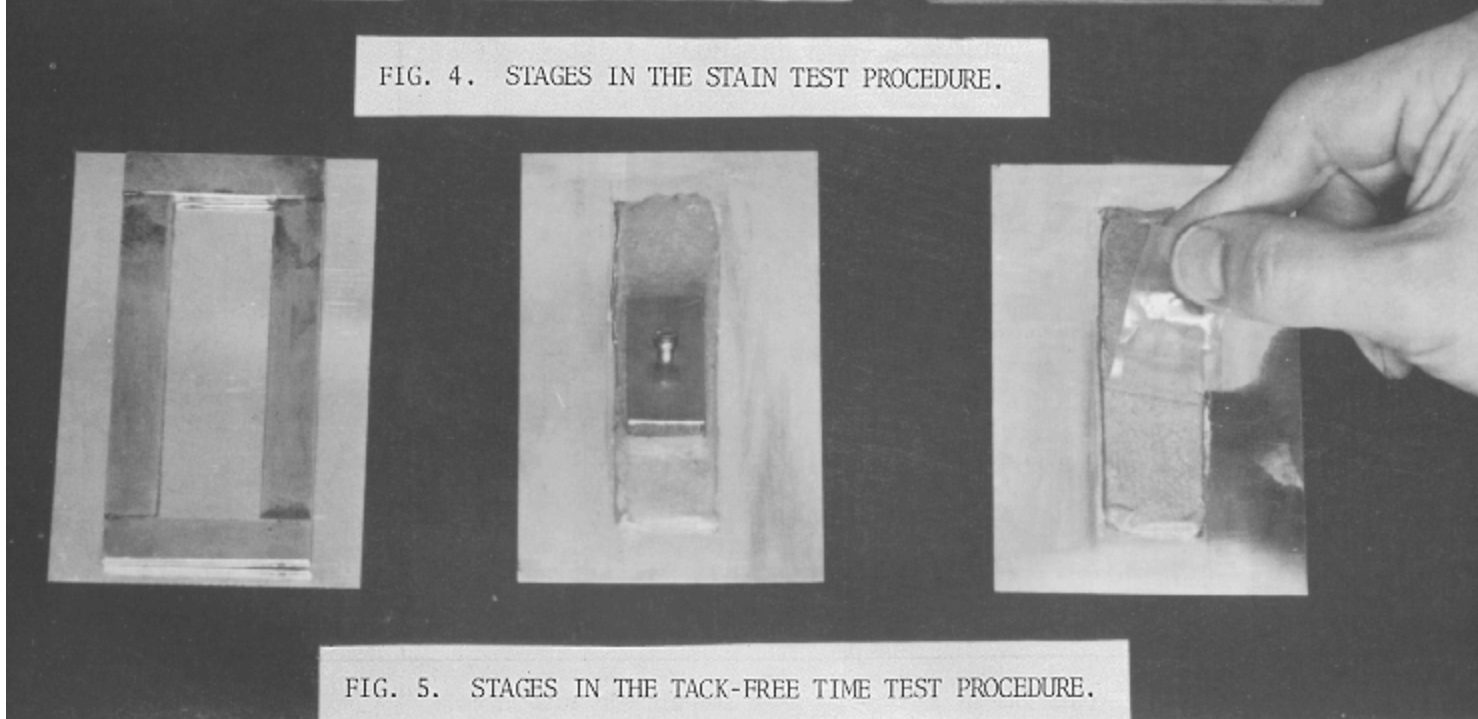
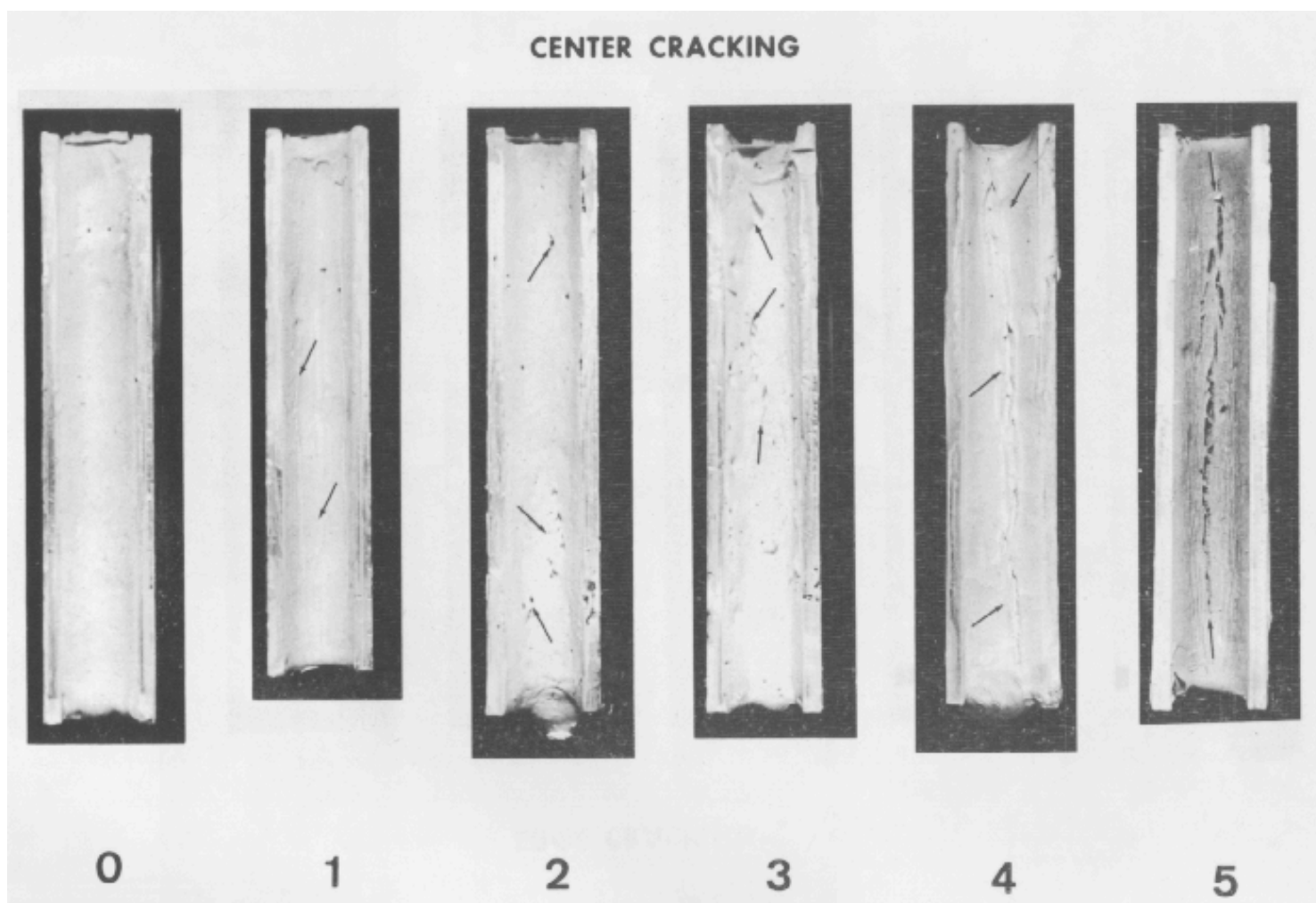


FIG. 5. STAGES IN THE TACK-FREE TIME TEST PROCEDURE.

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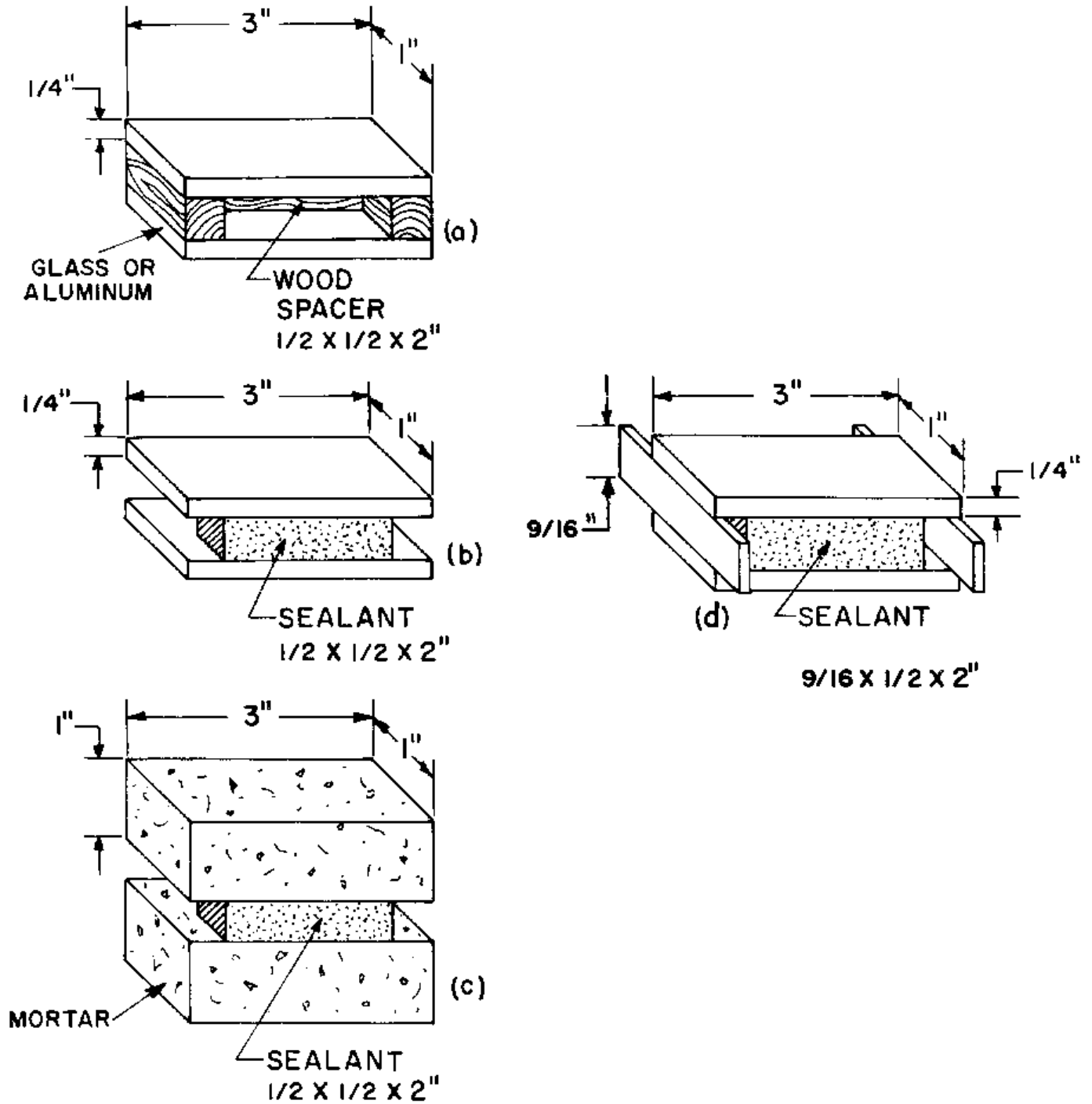


FIG. 8. TEST SPECIMENS IN EXTENSION TEST (a) PREPARED SPECIMEN BEFORE PLACEMENT OF SEALANT, (b) SEALANT WITH SPACERS REMOVED, (c) SEALANT BETWEEN MORTAR BLOCKS, (d) SEALANT IN THE EXTENDED STATE.