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6 September 1956

MILITARY SPECIFICATION

# PLASTIC FILM, POLYETHYLENE, FOR BALLOON USE

## 1. SCOPE

1.1 Scope.-This specification covers polyethylene plastic film furnished as flat tubing, and suitable for balloon use.

## 2. APPLICABLE DOCUMENTS

2.1 The following specification and standards, of the issue in effect on date of invitation for bids, form a part of this specification:

SPECIFICATION

Federal

| | |
|---|---|
| LLL-B-631 | Boxes, Fiber Corrugated (For Domestic Shipment) |

STANDARDS

Military

| | |
|---|---|
| MIL-STD-129 | Marking for Shipment and Storage |
| MIL-STD-130 | Identification Marking for U.S. Military Property |

(Copies of documents 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. Unless otherwise indicated, the issue in effect on date of invitation for bids shall apply.

American Society for Testing Materials
Test Method D1238-52T Measuring Flow Rates of Thermoplastics by Extrusion Plastometer
Test Method D882-54T Tensile Properties of Thin Plastic Sheets and Films

FSC 9330

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(Copies of the ASTM Test Methods may be obtained from the American Society for Testing Materials, 1916 Race Street, Philadelphia 3, Pennsylvania)

3. REQUIREMENTS

3.1 Qualification.-The polyethylene film furnished under this specification shall be a product which has been tested and has passed the qualification tests (see 4.5).

3.2 Material.-The polyethylene film shall be extruded from homogenized virgin resin, Bakelite Type DFD-5500 - Natural, or equal.

3.3 Physical properties.-The physical properties for polyethylene film shall be as follows:

3.3.1 Melt index.-The film shall have a melt index no greater than 1.1 grams per 10 minutes, when tested in accordance with ASTM test method D1238-52T.

3.3.2 Cold brittleness temperature.-The cold brittleness temperature shall not be higher than minus 68 degrees Centigrade (minus 90.4 degrees Fahrenheit) when tested in accordance with 4.5.5.

3.3.3 Toughness.-The toughness of the film, when subjected to the tests described in 4.5.6, shall be such that the measured time intervals are not less than the minimum time interval specified below for each film thickness.

| film thickness, inches | minimum time interval, seconds |
|---|---|
| 0.0015 | 0.0331 |
| 0.0020 | 0.0335 |

3.3.4 Tensile strength and elongation.-Polyethylene film of the thicknesses specified in 3.4.1 shall have the following minimum average tensile strength and elongation, when tested in accordance with ASTM test method D882-54T, method C.

| | Machine Direction | Transverse Direction |
|---|---|---|
| Tensile strength, psi | 2500 | 2000 |
| Elongation, percent | 250 | 400 |

3.4 Dimensions.-The dimensions for film covered by this specification shall be as follows:

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3.4.1 Thickness.-The film shall have one of the two following nominal thicknesses, as specified by the procuring activity.

0.0015 inch
0.0020 inch

3.4.1.1 Thickness tolerance.-The film thickness tolerance shall be plus or minus 0.00030 inch.

3.4.2 Width.-The film shall be furnished as flat tubing of a width to be specified by the procuring activity. (Flat widths usually lie within the range from 20 to 54 inches.)

3.4.2.1 Flat width tolerance.-The flat width tolerance of polyethylene tubing shall be plus or minus 3/16 inch for flat widths of 30 inches or less and shall be plus or minus 1/2 inch for flat widths greater than 30 inches.

3.4.3 Length.-The film shall be furnished in continuous strips of a minimum length to be specified by the procuring activity. Each strip shall be wrapped on a core as specified in 5.1. Each strip so wrapped shall constitute a roll.

3.5 Color.-The color of the polyethylene film shall be the natural color of film extruded from the pure resin specified in 3.2. No coloring material shall be employed to alter the natural color.

3.6 Identification of product.-Each roll shall be durably and legibly marked by means of a tag, securely attached to the roll in such a manner that it remains in place until the last bit of material is used. The information included on the tag shall be in accordance with Standard MIL-STD-130, with,"Width, Actual Yardage and Net Yardage" as added information.

3.7 Workmanship.-The film shall be clear and shall be free from excessive irregularities such as blemishes, striations, gel particles, pin-holes, flow lines, fullness, and blocking. Reference standards shall be used where practicable as a guide to indicate the difference between acceptable and unacceptable quality of film material with respect to the irregularities listed above.

4. QUALITY ASSURANCE PROVISIONS

4.1 Classification of tests.-The inspection and testing of polyethylene plastic film shall be classified as follows:

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a. Acceptance tests (See 4.2)
b. Qualification testing (See 4.5)

4.2 Acceptance tests.-Acceptance tests shall consist of:

a. Individual tests (See 4.2.1)
b. Sampling plans and tests (See 4.2.2)

4.2.1 Individual tests.-Individual tests shall consist of the following tests specified under test methods (4.4):

a. Examination of product (See 4.4.1)
b. Thickness measurement (See 4.4.2)
c. Width measurement (See 4.4.3)
d. Length measurement (See 4.4.4)

4.2.2 Sampling plans and tests

4.2.2.1 Lots.-The definition, formation, and size of lots shall be as specified below:

4.2.2.1.1 Resin lots.-Resin lots shall correspond to batches supplied by the resin manufacturer. Each resin lot shall contain only material from a single batch. Resin lot sizes shall not exceed 80,000 pounds.

4.2.2.1.2 Plastic film lots.-10,000 feet of film, plus or minus 500 feet, shall be considered as material for one film lot. All the film in a given lot shall have the same nominal thickness and shall have been produced under essentially the same conditions.

4.2.2.2 Sampling Plan A.-One sample of resin shall be extracted from each resin lot and tested in accordance with 4.5.4. If the sample fails to meet the requirements specified in 3.3.1, five more samples shall be extracted and tested. All five samples must pass the second test, otherwise film extruded from this lot shall not be acceptable for balloon use.

4.2.2.3 Sampling Plan B.-A sample of film shall be removed from each roll in a given lot of film. The length of each sample shall be adequate for the purposes of the tests specified under this sampling plan. The samples from a given film lot shall be treated as a group. From each group of samples, six samples shall be selected at random. Two of the six samples shall be tested for cold brittleness temperature as specified in 4.2.2.3.2, two shall be tested for toughness as specified in 4.2.2.3.3, and the remaining two shall be tested for tensile strength as specified in 4.2.2.3.4.

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4.2.2.3.1 Removal of film samples.-The film samples may be removed either from finished rolls or from rolls in the production stage. In either case, each sample shall be clearly identified with the roll from which it is taken. Samples shall normally be removed from the beginning or end of a roll, but the Government reserves the right to remove samples from within rolls when deemed necessary.

4.2.2.3.2 Cold brittleness temperature sampling.-Four specimens shall be cut from each of the two samples selected for the cold brittleness test. The specimens shall be approximately seven inches square and shall be free from surface damage. All eight specimens shall be tested in accordance with 4.5.5. No more than one specimen per sample shall exhibit a shattered tear.

4.2.2.3.3 Toughness sampling.-Two creased specimens shall be taken from the left side of each of the two samples chosen for the toughness test, and two from the right side. Each specimen shall be approximately seven inches square and shall be free from surface damage. All eight specimens shall be tested in accordance with 4.5.6. At least six of the specimens shall pass the test. No more than one specimen failure shall be allowed per sample.

4.2.2.3.4 Tensile strength sampling.-One specimen shall be cut from each of the two samples selected for the tensile strength test, and shall be tested in accordance with 4.5.7. Both specimens must meet the requirements of 3.3.4.

4.2.2.4 Sampling Plan B test failure.-In the event that the test results specified in 4.2.2.3.2, 4.2.2.3.3, 4.2.2.3.4, are not fully met by the specimens from a particular lot, acceptance of that lot shall be withheld. Individual rolls in that lot may be accepted under the conditions specified in 4.2.2.5.

4.2.2.5 Rejection and retest.-Each roll, in which a sampling plan B test failure occurs, shall be removed from the production lot and shall not be resubmitted. The rolls remaining in the lot shall constitute a secondary lot, and shall be retested as follows:

4.2.2.5.1 The sample from each roll in the secondary lot shall be subjected to the test or tests which caused failure of the production sampling test.

4.2.2.5.2 In performing the test or tests specified in 4.2.2.5.1, the method of testing, sampling and evaluation of

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results shall be as specified in the appropriate section of the qualification test procedures stated in this specification.

4.2.2.5.3 Rolls which fail the additional testing specified in 4.2.2.5.1, shall be considered unacceptable for balloon use and shall not be resubmitted.

4.2.2.5.4 Rolls which pass the additional tests specified in 4.2.2.5.1 may be accepted, provided that at least 60 percent of the rolls in the secondary lot pass the additional tests. If 40 percent or more of the rolls in the secondary lot show test failure during the additional testing, the entire production lot shall be considered unacceptable for balloon use and shall not be resubmitted.

4.3 Test conditions

4.3.1 Atmospheric conditions.-Unless otherwise specified, all tests are to be conducted at ambient pressure and humidity at a temperature in the range of plus 20 to plus 30 degrees Centigrade, (plus 68 to plus 86 degrees Fahrenheit.)

4.4 Test methods

4.4.1 Examination of product.-Polyethylene film shall be visually inspected to determine conformance to the requirements of 3.7.

4.4.2 Thickness measurement test

4.4.2.1 Apparatus.-The apparatus shall consist of a thickness gauge measuring thicknesses up to at least 0.0030 inch accurate to 0.00005 inch and exerting on the film a pressure of 2 ounces over a flat circular area having a diameter of 1/8 inch, plus or minus 1/64 inch.

4.4.2.2 Procedure

a. A thickness test series consisting of 5 readings shall be made once on each roll of film.

b. Five readings of film thickness, accurate to 0.00005 inch, shall be taken at equal intervals around a representative cross-section of the flat tubing, and the average of the five readings shall be considered the average thickness.

4.4.2.3 Results.-The film shall not be acceptable for balloon use if:

a. The average thickness does not meet the requirements of 3.4.1 and 3.4.1.1.

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b. The minimum reading is less than 0.00120 inch for 0.0015 inch film or less than 0.00170 inch for 0.0020 inch film, or the maximum reading is greater than 0.00190 inch for 0.0015 inch film or 0.00250 inch for 0.0020 inch film.

4.4.3 Width measurement test

4.4.3.1 Apparatus.-The apparatus shall consist of a steel tape graduated to at least 1/16 inch intervals.

4.4.3.2 Procedure.-One flat width measurement shall be made on each roll of film using the same representative cross section of the tubing as is used for thickness measurement under 4.4.2.2.

4.4.3.3 Results.-The film shall not be acceptable for balloon use if it does not meet the tolerances of 3.4.2.1. However, if the initial test strip does not meet the tolerance, two additional specimens shall be taken from the same roll. If both of these do meet the tolerance, the roll of film shall not be rejected because of flat width.

4.4.4 Length measurement test.-Suitable means shall be employed to prove compliance with the film strip minimum length requirements (3.4.3).

4.5 Qualification testing.

4.5.1 Qualification test material.-For qualification testing, a minimum of 50 feet of each thickness of film for which qualification is sought shall be submitted on a roll, and shall be tested for approval by the qualifying activity (see 6.3 and 6.3.1). Material shall be identified with the manufacturer's own identification number and any additional information required by the letter of authorization.

4.5.2 Qualification required.-Prior to actual procurement, the product which this specification covers shall pass the qualification tests specified herein. If the product is later modified in any way, the modified form shall be subjected to and shall pass the same qualification tests.

4.5.3 Qualification tests.-Qualification tests shall consist of all tests described under Test methods and those tests outlined below:

a. Melt index test
b. Cold brittleness temperature test
c. Toughness test
d. Tensile strength and elongation test

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4.5.4 Melt index test results.-The melt index number for the sample material shall meet the requirements specified in 3.3.1.

4.5.5 Cold brittleness temperature test.-Four test specimens shall be removed from the sample roll and tested as specified herein. Each specimen shall be cut approximately 7 by 7 inches and contain no surface damage such as scratches.

4.5.5.1 Test apparatus.-The apparatus shall consist of:

a. A cold chamber capable of being cooled uniformly to minus 72 degrees Centigrade (minus 97.6 degrees Fahrenheit) or below.

b. A 60 degree, inclined plane ball tester having a 36 inch elevation and a 5 inch diameter drumhead (figure 1), or the mechanical equivalent.

c. A 2.0, plus or minus 0.1 inch, diameter steel ball weighing 1.0 plus or minus 0.1 pound.

d. A cold temperature certified thermometer capable of measuring temperatures from plus 10 degrees Centigrade (plus 50 degrees Fahrenheit) to minus 90 degrees Centigrade (minus 130 degrees Fahrenheit) with one degree Centigrade divisions.

4.5.5.2 Test procedures.-The film specimen shall be securely clamped in the drumhead without undue stretching or creasing. The drumhead shall be placed in the inclined plane ball tester and the temperature lowered to minus 68 degrees Centigrade (minus 90.4 degrees Fahrenheit). The ball and tester shall be exposed to this temperature for at least 30 minutes just prior to testing. The film and clamp shall be exposed to this temperature for at least 10 minutes prior to breaking. To break the specimen, the ball shall be allowed to roll freely down the track and burst through the film. It shall be noted whether the type of tear is a ductile tear or a shattered tear or whether a tear does not occur. (figures 2, 3, and 4). This procedure shall be repeated for the remaining specimens.

4.5.5.3 Test results.-If more than one specimen exhibits a shattered tear, the film shall not be acceptable for balloon use. Ductile tears shall not be cause for rejection.

4.5.6 Toughness test.-This test is employed to determine the toughness of polyethylene film by piercing it with a free falling ball. Eight test specimens shall be removed from the sample roll.

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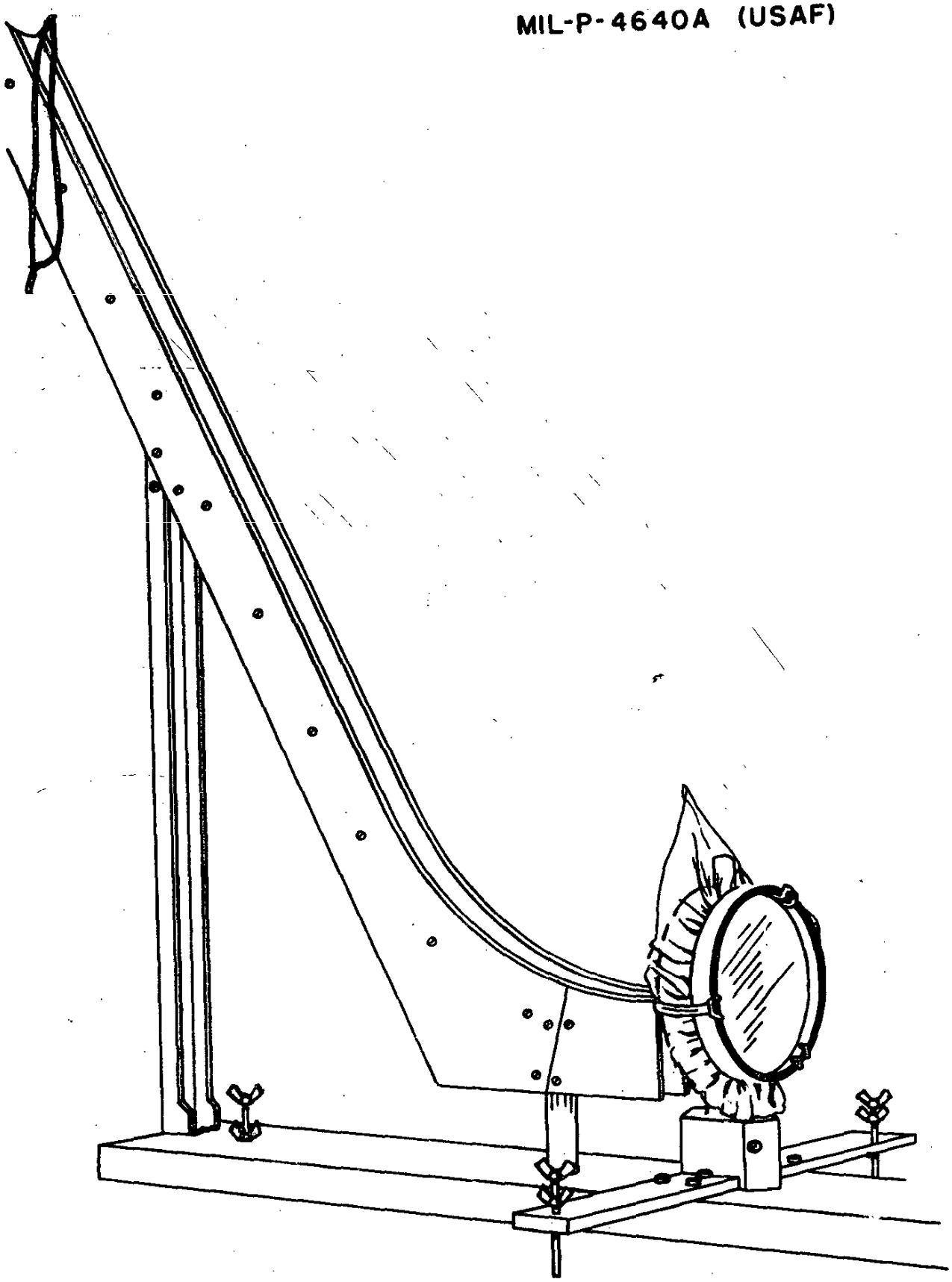

FIGURE 1
INCLINED PLANE BALL TESTER

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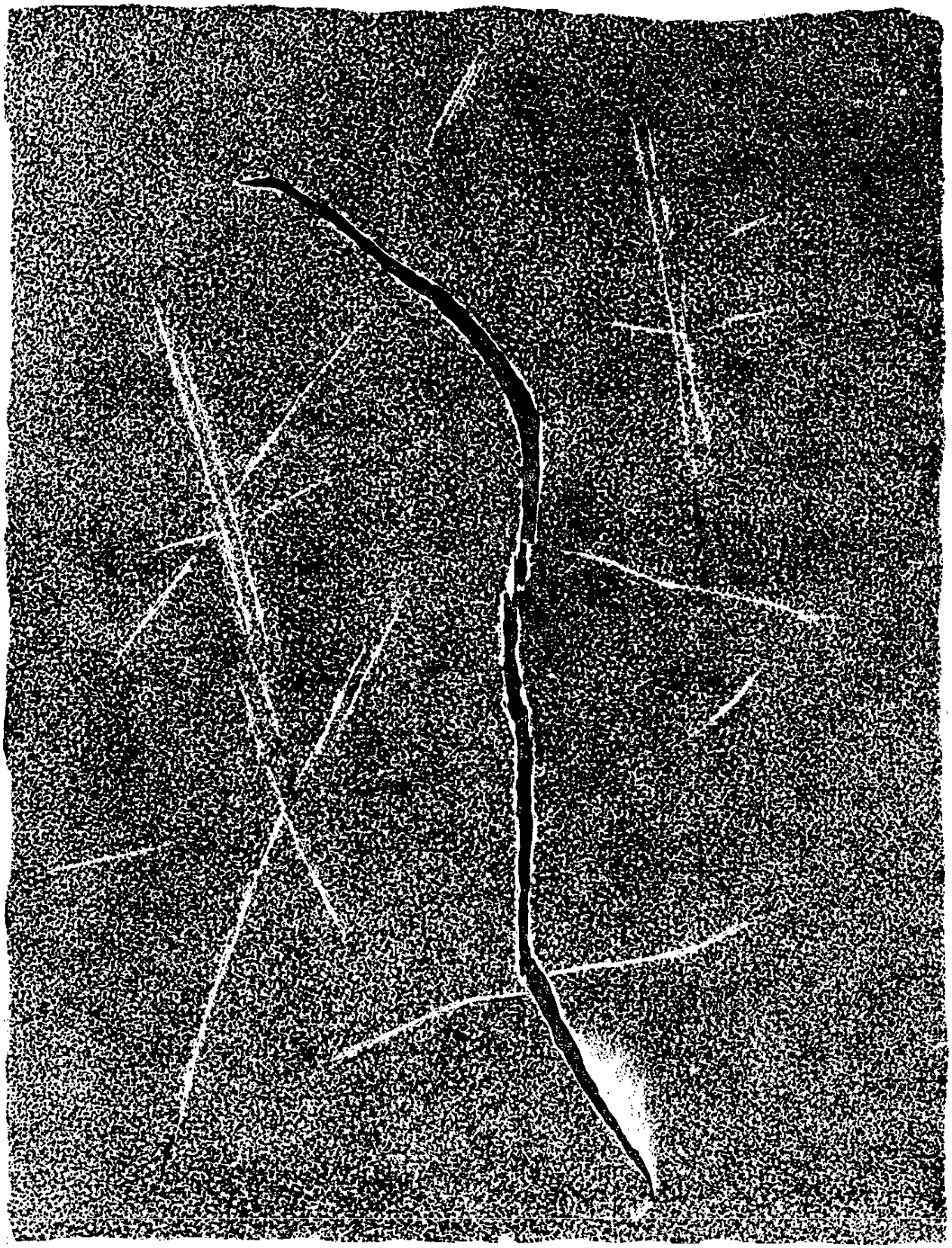

FIGURE 2

DUCTILE (SINGLE LINE) TEAR

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FIGURE 3

DUCTILE (Y BRANCHED) TEAR

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FIGURE 4

SHATTERED TEAR

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All eight specimens shall be creased material, with specimens chosen equally from each side of the flat tubing. The specimens shall be approximately 7 by 7 inches containing no surface damages such as scratches or slits.

4.5.6.1 Test apparatus (figure 5).

a. A steel ball weighing 2.30 plus or minus 0.01 pound, and having a diameter of 2.50 plus or minus 0.01 inch.

b. A means of magnetically releasing the ball and measuring the distance from release point to film.

c. An adjustable ball holder which can be set so that the magnet face (or top of ball) is 34 7/16 plus or minus 1/32 inch, above the actuation position of the first reference point consisting of the upper photo-electric cell and light described in d. below.

d. Two photo-electric cells placed in a vertical plane below and to one side of the test specimen. The time interval of the passage of the ball over the vertical space between these references points when no obstructing film is present shall be 0.0300 plus or minus 0.0001 second. The position of the light and photocell at the second reference point shall be adjusted to obtain this time interval.

e. A 4 inch diameter drumhead to hold the specimen securely in a fixed position 32 3/16 plus or minus 1/16 inch, below the magnet face (or top of the ball).

f. An electronic interval counter capable of recording time intervals to the nearest 0.0001 second.

4.5.6.2 Test procedures.

a. The film shall be securely clamped taut in the drumhead, but without undue stretching or creasing, with the crease directly in the path of the falling ball.

b. The ball shall be released and the time interval of its passage between the photocells, after having pierced the film, shall be recorded. This shall be repeated for the remaining specimens.

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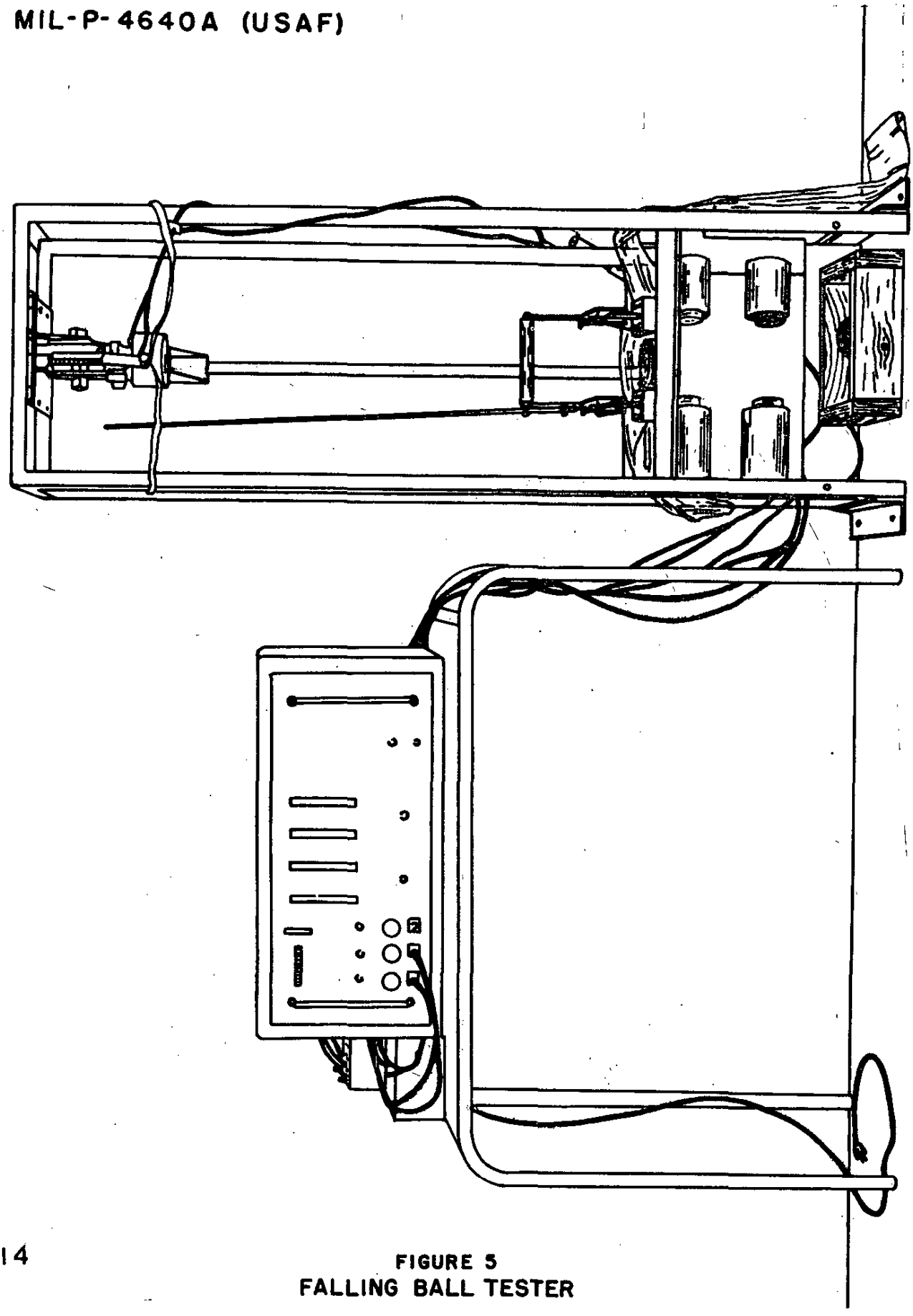

FIGURE 5
FALLING BALL TESTER

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c. The time interval for the passage of the ball between photocells shall not be less than that listed below:

| 0.00150 inch material | 0.0020 inch material |
|---|---|
| 0.0331 second | 0.0335 second |

4.5.6.3 Test results.-Of the eight specimens tested per sample roll, not more than two specimens shall fail to meet the values specified herein. Of the two permissible faulty specimens, not more than one shall be from the same side of the flat tubing. If the specimens of film are incapable of meeting the requirements of this paragraph, the film from which they were selected shall not be acceptable for balloon use.

4.5.7 Tensile strength and elongation test.-Two specimens extracted from the sample roll and tested for tensile strength and elongation shall meet the requirements of 3.3.4.

4.5.7.1 Test results.-If the tensile strength and elongation test numbers for either specimen are less than those specified in paragraph 3.3.4, the sample film shall not be acceptable for balloon use.

5. PREPARATION FOR DELIVERY

5.1 Unit packaging.-The film shall be put on paper core rolls 3 inches inside diameter by 1/4 inch minimum wall thickness. Core to extend 1 inch beyond film on both ends.

5.1.1 Interior packaging.-Each roll of film shall be individually wrapped with minimum of one layer of soft-textured material with minimum of 1/8 inch thickness, backed by 30 or 40 pound wrapping paper. Overlap shall be a minimum of 2 inches and shall be held in place with a pressure-sensitive tape. Wrapping material shall extend beyond core length, leaving sufficient material to pack into center of core and provide complete end protection.

5.1.2 Cushioning.-Interior wrapper specified in 5.1.1 will provide cushioning.

5.2 Exterior packaging.-Each roll shall be individually packed for shipment in a corrugated fiber box in accordance with LLL-B-631, style OLC with full overlap, double wall A-flute, and butted joints. Provision shall be made by the contractor to eliminate end play in the container.

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5.2.1 Domestic packing.-As specified in 5.1 and 5.2.

5.3 Marking of shipment.-Interior packages and exterior shipping containers shall be marked in accordance with Standard MIL-STD-129. The shipment marking nomenclature shall be:

"Plastic Film, Polyethylene, For Balloon Use"

6. NOTES

6.1 Intended use.-The polyethylene film covered by this specification is intended primarily for use in the fabrication of balloons using a natural shape or cylindrical design.

6.2 Ordering data.-Procurement documents should include the following information.

a. Title, number and date of this specification.

b. Film thickness, width and minimum roll length dimensions.

6.3 Qualification.-With respect to products requiring qualification, awards will be made only for such products as have, prior to the bid opening date, been tested and approved for inclusion in the applicable Qualified Products List whether or not such products have actually been so listed by that date.

6.3.1 The attention of suppliers is called to this requirement, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification on products covered by this specification may be obtained from the qualifying activity below:

Commander
Air Force Cambridge Research Center
ATTN: CRZDP
L. G. Hanscom Field
Bedford, Massachusetts

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# SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No. 119-R004

INSTRUCTIONS

This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity *(as indicated on reverse hereof)*.

SPECIFICATION

| ORGANIZATION *(Of submitter)* | CITY AND STATE |
|---|---|

| CONTRACT NO. | QUANTITY OF ITEMS PROCURED | DOLLAR AMOUNT |
|---|---|---|
| | | $ |

MATERIAL PROCURED UNDER A

☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3. IS THE SPECIFICATION RESTRICTIVE?

☐ YES ☐ NO IF "YES", IN WHAT WAY?

4. REMARKS *(Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)*

| SUBMITTED BY *(Printed or typed name and activity)* | DATE |
|---|---|
| | |

DD FORM 1 APR 63 1426 REPLACES NAVSHIPS FORM 4863, WHICH IS OBSOLETE C-8279