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## Rubber- or plastics-coated fabrics for water-resistant clothing — Specification —

## Part 3:
Natural rubber- and synthetic rubber-coated fabrics



*Supports textiles revêtus de caoutchouc ou de plastique pour vêtements imperméables à l'eau — Spécifications —*



*Partie 3: Tissus revêtus de caoutchouc naturel ou de caoutchouc synthétique*

Reference number
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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.



International Standard ISO 8096-3 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*.



ISO 8096 consists of the following parts, under the general title *Rubber- or plastics-coated fabrics for water-resistant clothing — Specification*:

*Part 1: PVC-coated fabrics*

*Part 2: Polyurethane- and silicone elastomer-coated fabrics*

*Part 3: Natural rubber- and synthetic rubber-coated fabrics*

Annexes A to L of this part of ISO 8096 form an integral part of the standard.



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# Rubber- or plastics-coated fabrics for water-resistant clothing — Specification —

# Part 3:
## Natural rubber- and synthetic rubber-coated fabrics

## 1 Scope

This part of ISO 8096 specifies requirements for fabrics coated on one or both sides or for double-texture fabrics in which a natural rubber or synthetic polymer of a type other than those specified in ISO 8096-1 and ISO 8096-2 is used and which are primarily intended for water-resistant clothing.



## 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 8096. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 8096 are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.



ISO 105-B02 : 1988, *Textiles — Tests for colour fastness — Part B02: Colour fastness to artificial light: Xenon arc fading lamp test.*

ISO 105-E02 : 1987, *Textiles — Tests for colour fastness — Part E02: Colour fastness to sea water.*

ISO 105-X12 : 1987, *Textiles — Tests for colour fastness — Part X12: Colour fastness to rubbing.*

ISO 1407 : 1976, *Rubber — Determination of solvent extract.*

ISO 1419 : 1977, *Fabrics coated with rubber or plastics — Accelerated ageing and simulated service tests.*

ISO 1420 : 1978, *Rubber- or plastics-coated fabrics — Determination of resistance to penetration by water.*

ISO 1421 : 1977, *Fabrics coated with rubber or plastics — Determination of breaking strength and elongation at break.*

ISO 2231 : 1973, *Fabric coated with rubber or plastics — Standard atmospheres for conditioning and testing.*

ISO 2286 : 1986, *Rubber- or plastics-coated fabrics — Determination of roll characteristics.*

ISO 2411 : 1973, *Fabrics coated with rubber or plastics — Determination of the coating adhesion.*

ISO 2497 : 1973, *Methyl ethyl ketone for industrial use — List of methods of test.*

ISO 2602 : 1980, *Statistical interpretation of test results — Estimation of the mean — Confidence interval.*

ISO 3207 : 1975, *Statistical interpretation of data — Determination of a statistical tolerance interval.*

ISO 4674 : 1977, *Fabrics coated with rubber or plastics — Determination of tear resistance.*

ISO 5280 : 1979, *Xylene for industrial use — Specification.*

ISO 7269 : 1987, *Rubber — Determination of free sulfur.*

ISO 7780 : 1987, *Rubbers and rubber latices — Determination of manganese content — Sodium periodate photometric methods.*

ISO 8053 : 1986, *Rubber and latex — Determination of copper content — Photometric method.*

## 3 Technical requirements

### 3.1 Physical and chemical requirements

The material shall comply with the requirements given in tables 1 and 2 or tables 3 and 4 as appropriate.

### 3.2 Colour fastness requirements

The material shall comply with the requirements of table 5.

**WARNING — Natural rubber and the majority of synthetic rubber elastomers swell greatly in the presence of dry-cleaning fluids. Consequently, it is recommended that these materials are not dry-cleaned, as damage to the coated fabric may result. In addition, retention of dry-cleaning fluids within the coated fabric may create a toxicity or, in certain cases, a skin hazard.**

## 4 Sampling

Samples shall be taken which are representative of the manufacturing batch from which they are drawn. Specimens for testing shall be taken from these samples in accordance with figure 1. The specimens shall be taken not less than 1 m from the end of the roll and not within 10 cm of a selvedge. Subject to annex A, sampling shall be carried out at the discretion of the testing authority.

## 5 Testing and compliance

**5.1** The performance values specified in tables 1, 2, 3, 4 and 5 are those required of the manufacturing batch as a whole.

**5.2** The method of selecting test specimens from each sample shall be in accordance with the scheme for selection of test specimens shown in figure 1.

**5.3** Tests shall be conducted as specified in tables 1, 2, 3, 4 and 5 on specimens extracted from each sample.

**5.4** In the event of dispute, the results of the tests conducted as specified in tables 1 and 3 shall be subject to analysis in accordance with the provisions of annex B.

In such event, if the lower confidence limit of the mean as calculated in accordance with annex B, is at or above a requirement described as "minimum" in table 1 or table 3, the bulk of the coated fabric which the sample represents shall be deemed to comply with the requirements of this part of ISO 8096 in respect of that physical property. If the upper confidence limit of the mean as calculated in accordance with annex B is at or below a requirement described as "maximum" in table 1 or table 3, the bulk of the coated fabric that the sample represents shall be deemed to comply with the requirements of this part of ISO 8096 in respect of that physical property.

**5.5** If the lower confidence limit of the mean as calculated in accordance with annex B is below a requirement described as "minimum" in table 1 or table 3, or if the upper confidence limit of the mean as calculated in accordance with annex B is above a requirement described as "maximum" in table 1 or table 3, two further samples shall be taken from the same source as the original sample and test specimens shall be taken from each sample so that duplicate tests may be conducted in respect of that physical property. The re-test results and the results of the first series of tests in respect of that physical property shall jointly be subject to analysis in accordance with the provisions of annex B. If the lower confidence limit of the mean so calculated in accordance with annex B is still below a requirement described as "minimum" in table 1 or table 3, or if the upper confidence limit of the mean so calculated is still above a requirement described as "maximum" in table 1 or table 3, the bulk of the coated fabric which the samples represent shall be deemed not to comply with the requirements of this part of ISO 8096.

If the lower confidence limit of the mean is at or above a requirement described as "minimum" in table 1 or table 3, or if the upper confidence limit of the mean is at or below a requirement described as "maximum" in table 1 or table 3, the bulk of the coated fabric which the samples represent shall be deemed to comply with the requirements of this part of ISO 8096 in respect of that physical property.

**5.6** If any of the specimens tested for requirements given in tables 2, 4 or 5 fails to comply with the appropriate requirements, the tests which the specimen has failed shall be repeated twice. For this purpose, two further samples shall be taken from the same source as the original sample and test specimens shall be taken from each sample so that duplicate tests may be conducted. If all the re-test results comply with the appropriate requirements of table 2, 4 or 5, the bulk of the coated fabric that the samples represent shall be deemed to comply with the requirements of this part of ISO 8096. If any of the results of the re-tests are not in accordance with the appropriate requirements of table 2, 4 or 5, the bulk of the coated fabric that the samples represent shall be deemed not to comply with the requirements of this part of ISO 8096.



## 6 Marking

Each roll of coated fabric shall have a label attached bearing the following information:

a) the name and/or distinctive mark of the manufacturer and means of identifying the manufacturing batch number;

b) the reference number of this part of ISO 8096 (i.e. ISO 8096-3) and the appropriate grade reference, i.e. NRL, NRM, NRH, SRD, SRV or SRC.

**Table 1 — Performance requirements for fabrics coated with natural rubber (index methods)** [1)]

| Property | Limit | Requirements | | | Method of test |
|---|---|---|---|---|---|
| | | Grade | | | |
| | | NRL | NRM | NRH | |
| Total mass/unit area ($g/m^2$) | min. | 465 | 445 | 500 | ISO 2286 |
| Tearing force (N) | | | | | |
| longitudinal | min. | 75 | 75 | 75 | ISO 4674 Method A1 |
| transverse | min. | 75 | 75 | 75 | |
| Breaking load (N) | | | | | |
| longitudinal | min. | 860 | 990 | 550 | ISO 1421 [2)] |
| transverse | min. | 450 | 710 | 550 | ISO 1421 [2)] |
| Coating adhesion (as received) (N/50 mm) | min. | 35 | 35 | 35 | ISO 2411 |
| Coating adhesion after ageing for 168 h at 70 °C and not less than 95 % r.h. | min. | Not less than 90 % of the adhesion strength exhibited prior to ageing | | | Annex C |
| Bending length (cm) | | | | | |
| longitudinal | max. | 7,2 | 5,9 | 8,3 | Annex D |
| transverse | max. | 3,1 | 2,7 | 3,8 | Annex D |

1) See 5.4.

2) In the event of dispute, the CRE method shall be used.



**Table 2 — Performance requirements for fabrics coated with natural rubber (pass/fail methods)** [1)]

| Property | Limit | Requirements | | | Method of test |
|---|---|---|---|---|---|
| | | Grade | | | |
| | | NRL | NRM | NRH | |
| Resistance to water penetration (as received) (kPa) | min. | 27 | 27 | 27 | Annex E |
| Resistance to water penetration after flexing (kPa) | min. | 14 | 14 | 14 | Annex F |
| Copper content (parts per million) | max. | 50 | 50 | 50 | Annex G |
| Manganese content (parts per million) | max. | 100 | 100 | 100 | Annex H |
| Acetone extract [% $(m/m)$] | max. | 10 | 10 | 10 | Annex J |
| Free sulfur [% $(m/m)$] | max. | 0,6 | 0,6 | 0,6 | Annex K |
| State of cure | — | There shall be no evidence of tackiness | | | Annex L |

1) See 5.6.

**Table 3 — Performance requirements for fabrics coated with a synthetic polymer, e.g. polychloroprene (index methods) [1)]**

| Property | Limit | Requirements | | | Method of test |
|---|---|---|---|---|---|
| | | Grade | | | |
| | | SRD | SRV | SRC | |
| Total mass/unit area ($g/m^2$) | max.<br>min. | 325<br>270 | <br>235 | <br>125 | ISO 2286<br>ISO 2286 |
| Coating mass ($g/m^2$) | | Back | Total | Face | |
| | max.<br>min. | 70<br>35 | 185<br>120 | <br>70 | ISO 2286<br>ISO 2286 |
| Tearing force (N) | | | | | |
| longitudinal<br>transverse | min.<br>min. | 70<br>70 | 65<br>65 | 30<br>30 | } ISO 4674 Method A1 |
| Breaking load (N) | | | | | |
| longitudinal<br>transverse | min.<br>min. | 1 110<br>1 110 | 1 080<br>1 010 | 615<br>530 | ISO 1421 [2)]<br>ISO 1421 [2)] |
| Coating adhesion (N/50 mm) | min. | 100 | 70 | 70 | ISO 2411 |
| Bending length (cm) | | | | | |
| longitudinal<br>transverse | max.<br>max. | 10,5<br>9,0 | 3,6<br>3,9 | 3,4<br>3,6 | Annex D<br>Annex D |

1) See 5.4.

2) In the event of dispute, the CRE method shall be used.



**Table 4 — Performance requirements for fabrics coated with a synthetic polymer, e.g. polychloroprene (pass/fail methods) [1)]**

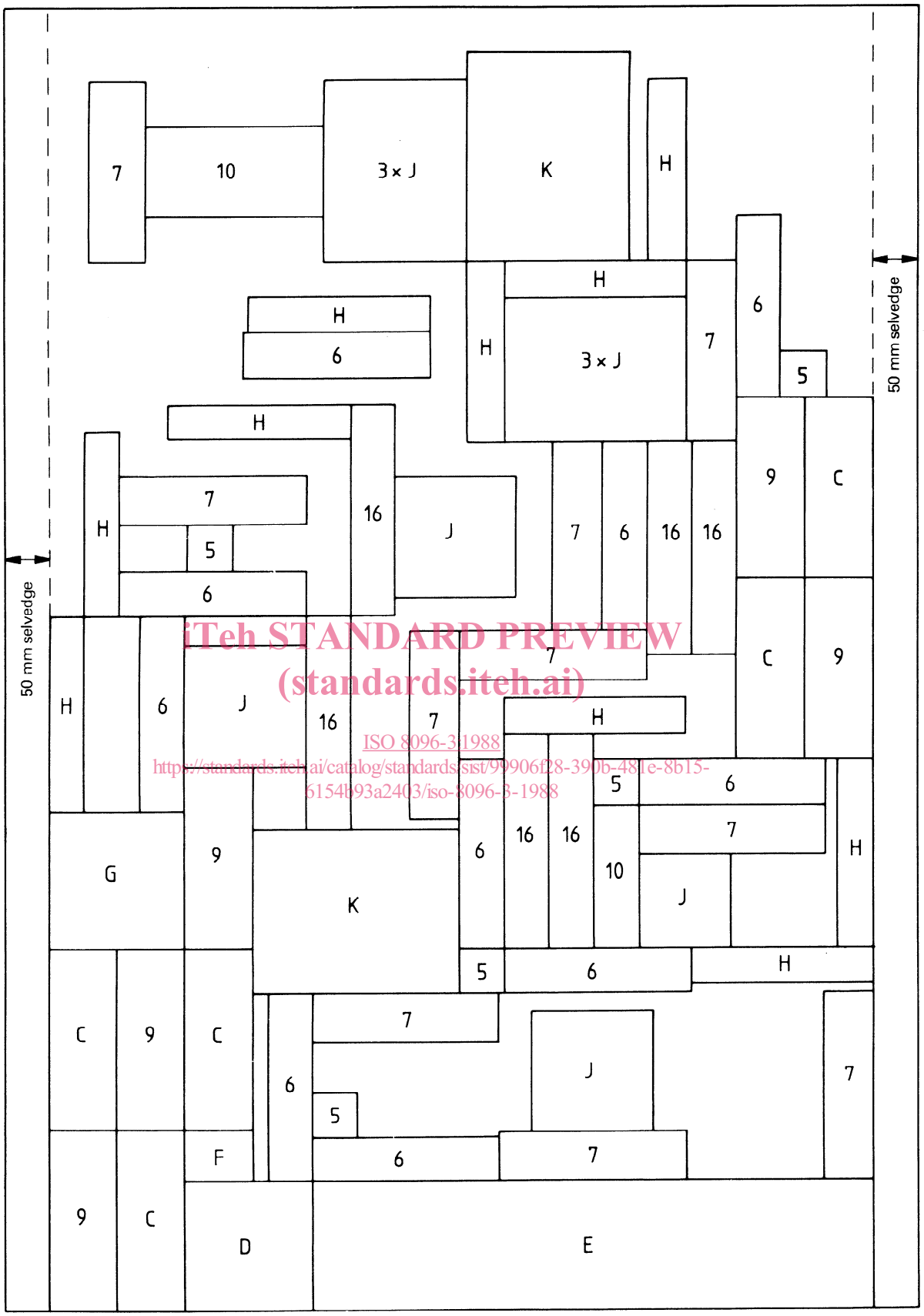
| Property | Limit | Requirements | | | Method of test |
|---|---|---|---|---|---|
| | | Grade | | | |
| | | SRD | SRV | SRC | |
| Resistance to water penetration (as received) (kPa) | min. | 27 | 55 | 34 | Annex E |
| Resistance to water penetration after flexing (kPa) | min. | 14 | 34 | 20 | Annex F |
| Resistance to cracking | — | No cracks at −20 °C | | | ISO 4675 |
| State of cure | — | There shall be no evidence of tackiness | | | Annex L |

1) See 5.6.

**Table 5 — Colour fastness requirements**

| Property | Limit | Requirements for all grades | Method of test |
|---|---|---|---|
| Colour fastness to artificial light (xenon arc) | min. | 5 [1)] | ISO 105-B02 |
| Colour fastness to rubbing | min. | 4-5 | ISO 105-X12 |
| Colour fastness to sea water | min. | 4-5 | ISO 105-E02 |

1) The colour fastness ratings specified are those of that side of the coated fabric worn outermost. (This will normally, in the case of fabrics coated on one side only, be the uncoated or substrate side, but not necessarily so.)






**Key**

Letters C to K refer to the annexes to this part of ISO 8096.
Specimens for annex L are selected from any suitable place on the sample.

| | | | |
|---|---|---|---|
| 5 | Mass determinations | 9 | Coating adhesion |
| 6 | Breaking strength determinations | 10 | Cold cracking |
| 7 | Tear strength determinations | 16 | Rub fastness determinations |

**Figure 1 — Scheme for selection of test specimens**

# Annex A
(normative)

# Sampling

**A.1** In the event of dispute, the following sampling requirements shall apply.

**A.2** A sample shall be taken from each manufacturing batch identified as such in accordance with clause 3 at a frequency of not less than one sample per 200 running metres.

**A.3** Unless otherwise specified by the purchaser, samples shall not be taken within 1 m of the end of the roll or within 10 cm of a selvedge.

**A.4** The size of sample taken from each manufacturing batch shall be such that the aggregate size of the samples is sufficient to enable test specimens to be selected for the purposes of fulfilling the appropriate test requirements in tables 1, 2 and 5, or tables 3, 4 and 5, respectively.

**A.5** The specimens for testing shall be selected from the samples taken in accordance with clause A.4 so that all samples are represented by specimens in each of the tests conducted in accordance with the appropriate requirements of tables 1, 2 and 5, or tables 3, 4 and 5, respectively.

**A.6** In the case of multi-coloured samples, all colours shall be represented by the specimens selected for colour fastness testing in accordance with table 5.

# Annex B
(normative)

## Determination of the standard deviation and confidence interval of the mean

**B.1** The distribution of test results in the tests for physical properties given in tables 1 and 3 shall be taken to be normal.

**B.2** The test results obtained from the tests for physical properties given in tables 1 and 3 shall be subjected to statistical analysis and an estimate of the standard deviation $s$ shall be made in accordance with ISO 3207, i.e.

$$s = \sqrt{\frac{\sum (x - \bar{x})^2}{n - 1}}$$

**B.3** The 95 % confidence interval of the mean shall be calculated assuming a two-sided case in accordance with the provisions of ISO 2602 and the lower limit of the mean of the population taken to be

$$\bar{x} - \frac{t_{0,975}}{\sqrt{n}} s$$

and the upper limit of the mean of the population shall be taken to be

$$\bar{x} + \frac{t_{0,975}}{\sqrt{n}} s$$

**B.4** In the case of re-tests as required by 5.5, the results of the first series of tests shall be included amongst the results of the re-tests for the purposes of estimating the standard deviation and the confidence interval of the mean.



# Annex C
(normative)

## Determination of coating adhesion strength after ageing

**C.1** Determine the actual coating adhesion strength in accordance with ISO 2411, and record the result.

**C.2** Take five further specimens from the same source as the specimens used for determination of coating adhesion strength in clause C.1. Expose the specimens to an atmosphere of 70 °C and not less than 95 % relative humidity for a period of 168 h in accordance with the recommendations in ISO 1419, oven method.

**C.3** Remove the specimens from the oven, expose them to the standard atmosphere for conditioning and testing specified in ISO 2231 and allow the specimens to attain equilibrium.

**C.4** Determine the coating adhesion strength in accordance with ISO 2411.

**C.5** Express the mean coating adhesion strength obtained as in clause C.4 as a percentage of the coating adhesion strength obtained as in clause C.1.

# Annex D
(normative)
# Determination of bending length

## D.1 Principle

A rectangular strip of fabric is supported on a horizontal platform in a direction perpendicular to one edge of the platform. The strip is traversed in the direction of its length so that an increasing part overhangs and bends down under its own weight. When the tip of the specimen has reached a plane passing through the edge of the platform and inclined at an angle of 41° 30′ below the horizontal, the overhanging length is equal to twice the bending length of the specimen.

## D.2 Apparatus

**D.2.1** The essential features are shown in figure D.1.

**D.2.2** On the horizontal platform P rests a slide S graduated on its upper surface with a scale which indicates bending length directly in units and tenths of a unit. For the angle of inclination of 41° 30′ (see clause D.1), unit graduations of the scale on the slide are uniformly spaced 20 mm apart. When the front edge of the slide coincides with the front of P, the zero of the scale on S coincides with a datum line D on the instrument. Two sighting lines $L_1$ and $L_2$ passing through the upper forward edge of P and inclined at an angle of 41° 30′ below the horizontal are inscribed on the transparent side pieces of the instrument. The under surface of S is covered with a layer of high friction material such as sheet rubber and the upper surface of P is polished so that, when S is moved, it will carry forward a specimen placed between the slide and the surface P. The width of the slide S shall be 25 mm and its mass shall be 10 g ± 2 g per centimetre length.

The range of the instrument is governed by its size. It is convenient to be able to determine bending lengths of about 80 mm to 100 mm, in which case the overhanging length of the specimen is 160 mm to 200 mm.

## D.3 Test specimens

Five specimens 25 mm wide and 200 mm long with their longer edge parallel to the longitudinal direction of the sample, and five specimens of the same size but with their longer edge parallel to the transverse direction of the sample, shall be preconditioned and brought to equilibrium in accordance with ISO 2231.



## D.4 Procedure



Place the instrument on a level table. Place the specimen on the platform P with one end coincident with the front edge of the platform. The slide S is placed on the specimen so that the zero

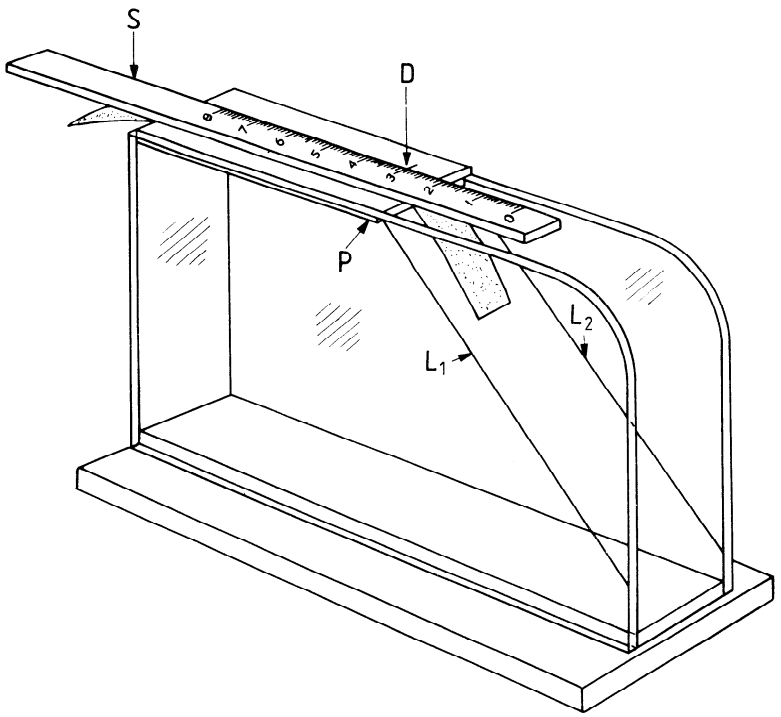



Figure D.1 — Fixed angle flexometer

of the scale is in line with the mark D. Push the slide forward so that the specimen is made to project over the edge of P and bends down under its own weight. Move the slide forward until the end of the specimen comes into line with the two lines $L_1$ and $L_2$.

Should the specimen twist, align the mid-point of the end with $L_1$ and $L_2$. After an interval of 6 to 8 s, read on the scale S the bending length of the specimen. (A minor readjustment of the position of the slide may have to be made immediately before this reading is taken.) Repeat this operation with the other face of the specimen up, and again at the other end of the specimen, first with the original face up and then with the specimen turned over.

It will be found helpful in carrying out this procedure to place the flexometer so that the zero of the scale lies towards the observer and at a level that enables the scale on S to be read with comfort. The position of the end of the specimen relative to the sighting lines may be observed in a mirror suitably placed or attached to one side of the instrument. Read the bending length from the scale for each specimen in turn.

### D.5 Expression of results

Record the maximum bending length obtained as in clause D.4 in both the longitudinal and transverse directions and report these values as the bending lengths, in centimetres.

## Annex E
(normative)



## Determination of resistance to water penetration



**E.1** The apparatus specified in method B of ISO 1420 shall be modified by replacing the pressure gauge specified for one graduated in kilopascals or kilonewtons per square metre with a maximum capacity of 100 kPa. A draw-off valve shall also be fitted to enable water pressure to be released after testing.

**E.2** Employing the apparatus described in clause E.1, and raising the pressure at the rate of 10 kPa/min, test 10 specimens at the pressure indicated in table 2 or table 4, as appropriate, maintaining the indicated pressure for 2 min before opening the draw-off valve. Five specimens per side of the coated fabric shall be tested.

**E.3** Record the pressure at which any damp patches appear. Disregard any results where lateral leakage has occurred and repeat the test on a fresh specimen.

**E.4** Calculate the arithmetic mean of the 10 results so obtained and report this value as the resistance to water penetration, in kilopascals.