INTERNATIONAL STANDARD ISO 3582

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Cellular plastic and cellular rubber materials — Laboratory assessment of horizontal burning characteristics of small specimens subjected to a small flame

Matières alvéolaires à base de plastiques ou de caoutchoucs — Méthode de laboratoire pour la détermination du comportement au feu de petites éprouvettes soumises, en position horizontale, à une flamme de faible intensité

First edition — 1978-11-15

UDC 678.4/.8-496.8 : 536.468

Ref. No. ISO 3582-1978 (E)

Descriptors : cellular materials, plastics, cellular plastics, rubber, rubber products, flammability testing, burning rate, test specimens.

Price based on 7 pages

FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up 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.

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.

International Standard ISO 3582 was developed jointly by Technical Committees ISO/TC 45, *Rubber and rubber products*, and ISO/TC 61, *Plastics*, and was circulated to the member bodies in April 1975.

It has been approved by the member bodies of the following countries :

Belgium	Italy	Sweden
Brazil	Mexico	Switzerland
Canada	Netherlands	Thailand
Czechoslovakia	New Zealand	Turkey
Egypt, Arab Rep. of	Poland	United Kingdom
France	Portugal	U.S.S.R.
Hungary	Romania	Yugoslavia
Ireland	Spain	

The member body of the following country expressed disapproval of the document on technical grounds :

Germany, F.R.

Printed in Switzerland

Cellular plastic and cellular rubber materials — Laboratory assessment of horizontal burning characteristics of small specimens subjected to a small flame

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies a small-scale laboratory screening procedure for comparing the relative horizontal burning characteristics of small specimens of cellular plastic and cellular rubber materials exposed to a low energy source of heat. It is intended only for the purpose of assessing quickly and simply the horizontal burning characteristics of small specimens of the materials as such, i.e. considered without reference to the environmental conditions under which the materials, or products made from them, may be used. In consequence it is not possible to establish a correlation between the results of this test and the performance of such materials or products under actual service conditions. The test is restricted to specimens of thickness greater than 5 mm. Results of tests on specimens of different thickness are not comparable.

This test method is not intended to be used to assess potential fire hazards in use.

2 REFERENCES

ISO 291, *Plastics — Standard atmospheres for conditioning and testing.*

ISO 471, *Rubber — Standard temperatures, humidities and times for the conditioning and testing of test pieces.*

3 SIGNIFICANCE OF TEST

Tests made on a material under the conditions specified here can be of considerable value in comparing the horizontal burning characteristics of different materials, in controlling manufacturing processes or in assessing any change in horizontal burning characteristics prior to, or during, use. Correlation with performance under actual service conditions is not implied, and the finished product should be tested in the form in which it will finally be used by a test method appropriate to products fulfilling a similar purpose.

It is essential to appreciate that this method of test is not intended, and cannot be used, to assess the potential fire hazard of a material or product in use. Assessment of fire hazard would require consideration of such factors as fuel contribution, intensity of burning, products of combustion and also environmental factors such as intensity of source, orientation of exposed material and ventilation conditions.

4 GENERAL

4.1 Horizontal burning characteristics, as measured by this test procedure, are affected by such factors as density, any anisotropy of the cellular material and the thickness of the specimen.

Certain materials may shrink from the applied flame without igniting. In this event, test results are not valid and additional test specimens may be required to obtain ten sets of data. If the test specimens continue to shrink from the applied flame without igniting, these materials are not suitable for evaluation by this method of test.

4.2 Inter-laboratory trials have shown that many variables influence the reproducibility of the results of this type of test. For this reason the procedure laid down must be adhered to in all respects, especially as regards the use and construction of the test chamber.

4.3 For certain materials which exhibit burning only along the upper surface of the test specimen, the mass loss should be measured and reported, if required.

4.4 The horizontal burning characteristics of some cellular plastic and cellular rubber materials may change with time. It is accordingly advisable to make tests before and after ageing by an appropriate procedure, details of which should be given in the test report.

5 APPARATUS

5.1 Test chamber, constructed of non-combustible materials, for example asbestos insulating board on a steel frame, having inside dimensions of 600 ± 5 mm length, 300 ± 5 mm width and 760 ± 5 mm height, and being otherwise as shown in figure 1. To allow easy access between tests, the chamber may be designed so that the front panel containing the window is removable, but, if so constructed, provision shall be made for ensuring that a draught-proof seal is obtained when the panel is in position. The chamber shall be used in a fume cupboard.

The chamber shall be draught free, yet permit normal thermal circulation of air past the specimen during burning.

5.2 Burner, of internal diameter 9,5 ± 0,5 mm. A gaseous hydrocarbon fuel shall be used to provide the standard flame shown in figure 2. This flame shall maintain a temperature of 1 000 ± 100 °C at a height of 13 ± 1 mm above the burner top.

NOTE — Propane, of at least 93 % purity, supplied through a jet of diameter 0,3 ± 0,1 mm, is suitable for provision of the specified flame and temperature. This jet size is such that the propane pressure required to obtain the standard flame is less than 7 kPa.

5.3 Wing top, having an opening of internal length 48 ± 1 mm and internal width 3,0 ± 0,2 mm, fitted to the burner.

5.4 Support gauze, 215 mm long, 75 mm wide and having 13 mm of its length bent to form a right angle as shown in figure 3. It shall consist of 6,4 mm mesh gauze constructed from 0,8 mm diameter stainless steel wire. A minimum of four supports shall be available.

5.5 Support holder, constructed from mild steel as shown in figure 4 so that :

a) the gauze is maintained with its long axis to within 1° of the horizontal, and parallel to the 600 mm dimension of the test chamber;

b) the nearest end of the specimen is 13 ± 1 mm above the burner wing top (see figure 2);

c) the space both above and below the specimen is unobstructed;

d) a means is provided for positioning the burner in the correct position relative to the specimen;

e) the gauze is equidistant from the front, back, and sides of the test chamber, and is 175 ± 25 mm above the base of the test chamber.

5.6 Timing device, accurate to ± 1 s.

5.7 Measuring scale, graduated in millimetres.

5.8 Balance, (if necessary), accurate to ± 1 mg.

6 NUMBER, SIZE, MARKING AND WEIGHING OF TEST SPECIMENS

6.1 Ten test specimens shall be cut from a representative sample of the material. Care shall be taken to remove all dust and any particles from the surfaces.

6.2 The standard test specimen shall be 150 ± 1 mm long by 50 ± 1 mm wide. Materials supplied in thicknesses over 13 mm shall be cut to 13 ± 1 mm thickness, any skin having been removed. Materials supplied in thicknesses of 13 mm or less shall be tested at the thickness supplied, provided that this is not less than 5 mm, and in this case skins need not be removed.

NOTE — Tests made on test specimens of different thicknesses are not comparable and tests made in different directions of anisotropy may also not be comparable.

6.3 Each test specimen shall be weighed, if required (see 4.3), and shall be marked across its width with a line 25 mm from one end, referred to hereafter as the gauge mark. For thin samples which have a skin on one side only, which is normally the exterior surface of the material, the gauge mark shall be placed on the surface with the skin.

7 CONDITIONING OF SPECIMENS

The material shall not be tested less than 72 h after manufacture. Prior to the test, the test specimens shall be preconditioned in accordance with the requirements of ISO 291 or ISO 471, as appropriate.

8 TEST PROCEDURE

8.1 Adjustment of flame

8.1.1 Ensure that the lid of the chamber (5.1) is closed and the fume cupboard fan is off.

8.1.2 Adjust the burner (5.2) and gas pressure to provide a blue flame with a temperature of 1 000 ± 100 °C, 13 ± 1 mm above the wing top (5.3). The visible portion of the flame shall be 38 ± 1 mm high with a clearly defined inner cone 6 ± 1 mm high. These heights shall be measured, for example with pre-set calipers.

8.1.3 Turn off the gas.

8.2 Adjustment of specimen support

Place a clean specimen support gauze (5.4) in the holder (5.5) so that the lower surface of the test specimen will be 13 ± 1 mm above the tip of the burner wing top as shown in figure 2. The relative positions of burner and holder shall be such that when the test specimen is in position, one edge of the flame is in line with the end of the specimen and the other edge of the flame extends into the test specimen as shown in figure 2. The centre of the wing top shall be directly under the centre line of the test specimen when positioned. Ensure that the front panel of the test chamber is sealed.

8.3 Positioning of specimen

Open the glass sliding door and place a test specimen on the support in such a manner that :

a) the surface on which the gauge mark has been made is uppermost;

b) the end farthest away from the gauge mark is touching the 13 mm bent-up portion of the support gauze;

c) its longitudinal axis is parallel to that of the support gauze.

8.4 Conduct of test

8.4.1 Turn on and ignite the gas, and simultaneously start the timing device (5.6).

8.4.2 Immediately close the glass sliding door of the test chamber, and close the door of the fume cupboard.

8.4.3 Note and record the severity of the burning characteristics of the test specimen, i.e. warping, charring, melting, dripping and whether any drips continue to burn on reaching the floor of the chamber.

8.4.4 After 60 s, turn off the gas or remove the burner.

8.4.5 Stop the timing device when the test specimen flame reaches the gauge mark, and record the time, (t_b), in seconds.

8.4.6 If the whole of the upper surface has not been consumed, stop the timing device when the test specimen flame extinguishes, i.e. the time at which the yellow or other characteristic flame in contact with the main body of the test specimen disappears, and record the time (t_e).

In some cases, the test specimen flame may extinguish within the gas flame. In these cases the extinction time shall be taken as the time when the discolouration imparted to the flame disappears.

NOTES

1 For certain materials which exhibit burning only along the upper surface of the test specimen, the mass loss should be measured and reported, if required.

2 Drips falling into the burner should be ignored unless a visible change occurs in the flame. In this case, the test on that test specimen should be abandoned, and after cleaning the burner and wing top, a new test specimen should be substituted.

8.5 Measurement of extent burnt

8.5.1 Open the test chamber lid and switch on the fume cupboard fan, open the glass sliding door, and remove the test specimen and the specimen support.

8.5.2 Measure and record the extent burnt (L_e), which is equal to 150 mm minus the distance from the unburnt end to the nearest evidence (such as charring) of the flame front along the upper surface of the test specimen.

8.6 Measurement of mass loss

Reweigh the test specimen, if required (see 8.4.6).

NOTE — The reweighing shall not include anything which has fallen from the test specimen.

8.7 Preparation for the next test

8.7.1 Burn and clean off any residues remaining on the specimen support. Use at least four specimen supports in strict rotation to allow each to cool to room temperature before re-use.

8.7.2 Examine the burner, wing top and glass sliding door for cleanliness, and clean if necessary.

8.7.3 Check the flame size at least after every five tests.

8.7.4 Close the test chamber lid, switch off the fume cupboard fan, and repeat the procedure from 8.2 for the other test specimens.

9 CALCULATIONS

9.1 If the flame front passes the gauge mark.

9.1.1 Calculate the burning rate, in millimetres per second, from the formula

$$\frac{125}{t_b}$$

where t_b is the time, in seconds, at which the flame reaches the gauge mark.

9.1.2 Calculate the mean burning rate.

9.2 If the flame front does not reach the gauge mark

9.2.1 Calculate the burning rate, in millimetres per second, from the formula

$$\frac{L_e}{t_e}$$

where

t_e is the time, in seconds, when the flame is extinguished;

L_e is the extent burnt, in millimetres.

9.2.2 Calculate the mean values of :

a) the burning rate;

b) the extinction time;

c) the extent burnt;

d) the mass loss (if required).

10 TEST REPORT

The test report shall include the following :

a) The statement :

"The test described in this report has provided information which may be used for quality assurance purposes provided the user/manufacturer is aware of the importance of this quality in the context of fire hazard assessment. The safety authorities should exercise a degree of caution in using test data by themselves in an absolute sense."

b) A description of the material tested including :

1) the nominal apparent density of the material;

2) the thickness, to the nearest millimetre, of the test specimens;

3) presence or absence of skins;

4) the direction of any anisotropy relative to the test specimen dimensions;

5) conditioning treatment;

6) any prior treatment before testing, other than cutting, trimming and conditioning.

c) A description of the burning characteristics of the material, i.e. warping, charring, melting, dripping, and whether any drips continued to burn on reaching the floor of the chamber.

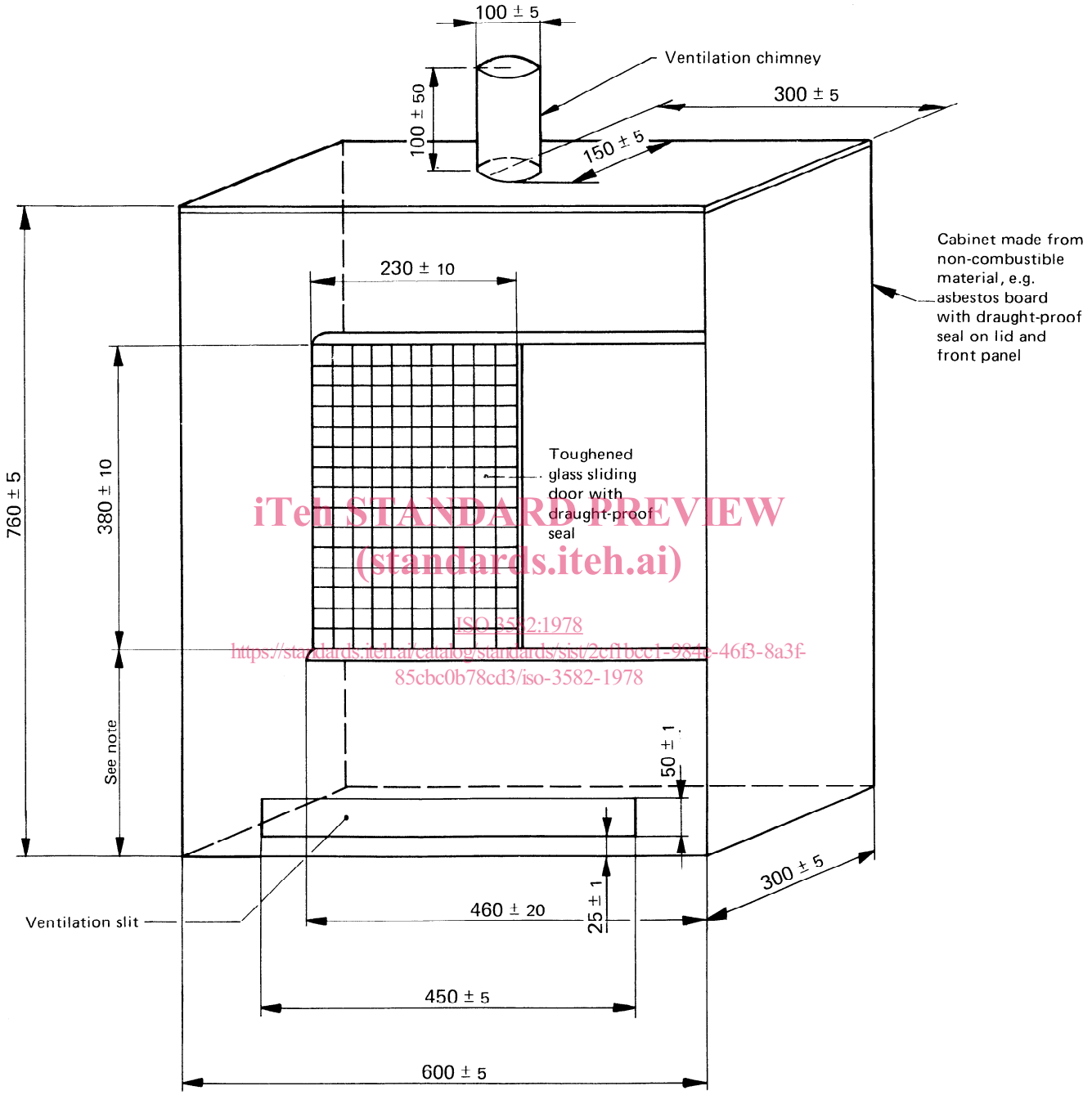
d) The mean extent burnt.

e) The mean extinction time.

f) The mean burning rate.

g) The mean mass loss (if required).

Dimensions in millimetres



The dimensions shown are internal

NOTE — It is recommended that the bottom of the window is approximately 25 mm below the normal position of the gauze during the test (see figure 4).

FIGURE 1 — **Test chamber**

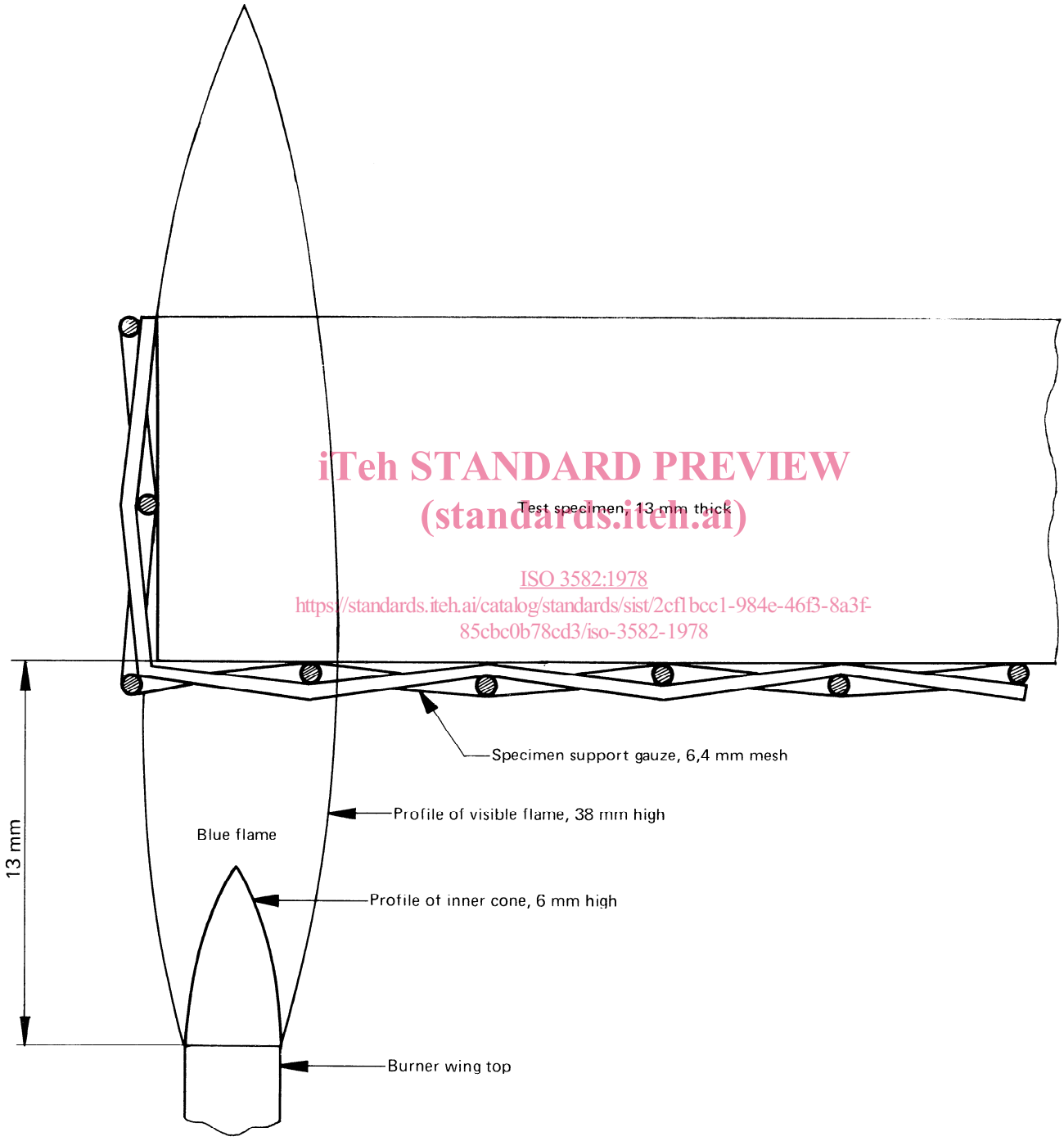


FIGURE 2 – **Details of flame and relative positions of burner wing top, test specimen and specimen support gauze**

Dimensions in millimetres

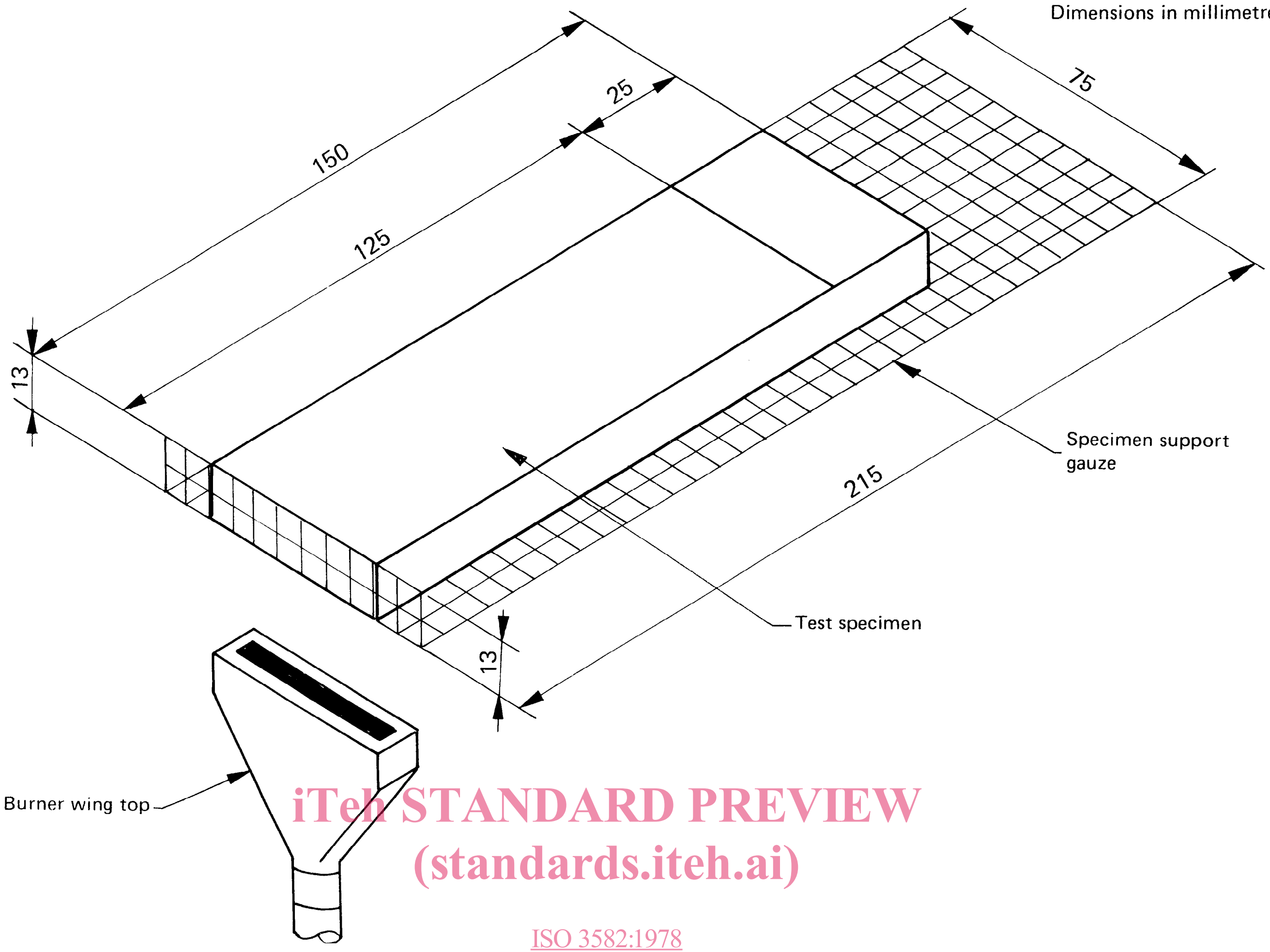


FIGURE 3 – **Test specimen and specimen support gauze (5.4)**

Dimensions in millimetres

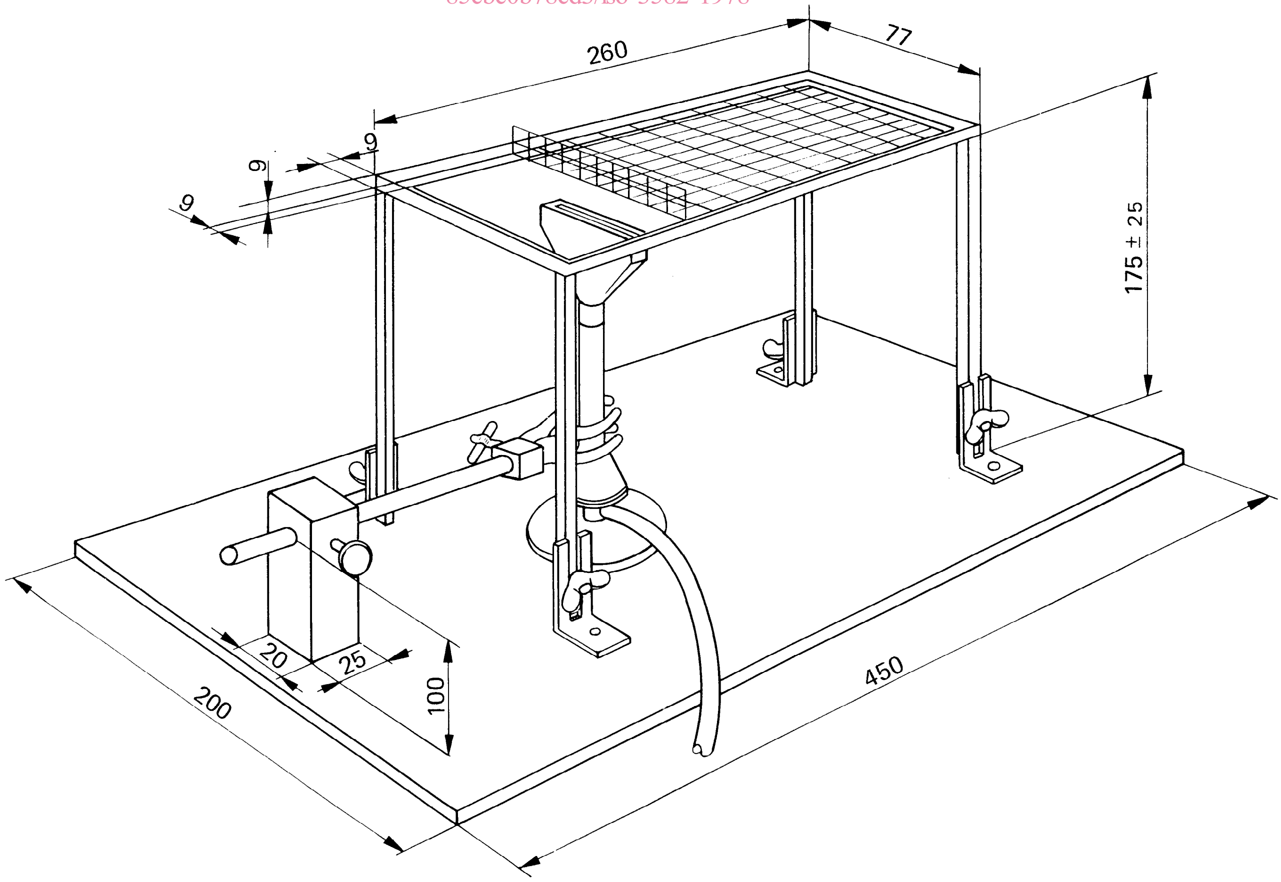


FIGURE 4 – **Support gauze holder (5.5)**