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दृढ़ जालीदार तापीय ऊष्मारोधी सामग्री —  
परीक्षण पद्धति

भाग 8 लौ की ऊंचाई, जलने का समय और  
द्रव्यमान की हानि  
( पहला पुनरीक्षण )

**Rigid Cellular Thermal Insulation  
Materials — Methods of Test**

**Part 8 Flame Height, Time of  
Burning and Loss of Mass**

( *First Revision* )

ICS 27.220, 91.120.10

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## FOREWORD

This Indian Standard (Part 8) (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Thermal Insulation Sectional Committee had been approved of the Chemical Division Council.

This standard was first published in 1985. In this revision the following changes have been incorporated:

- a) Conditioning time of the test specimen has been changed;
- b) Tolerance value has been introduced for the inner cone flame temperature of standard gas burner;
- c) Tolerance has been introduced in test specimen size;
- d) The unacceptability criterion of any test specimen has also been changed; and
- e) Reference clause has been incorporated.

The composition of the Committee, responsible for the formulation of this standard is given in [Annex A](#).

In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'.

*Indian Standard***RIGID CELLULAR THERMAL INSULATION MATERIALS —  
METHODS OF TEST****PART 8 FLAME HEIGHT, TIME OF BURNING AND LOSS OF MASS***( First Revision )***1 SCOPE**

**1.1** This standard prescribes a small-scale laboratory screening method for comparing relative extent and time of burning and loss of mass of rigid cellular thermal insulation materials. This test procedure should only be used to determine relative burning characteristics.

**1.2** In the course of burning fumes, vapours, or both, are produced that could be dangerous to workers. The operator must be protected with appropriate measures.

**1.3** This standard does not claim to resolve all of the safety issues, if any, connected to its use. The user of this standard is accountable for establishing suitable safety, health, and environmental practices and determining whether any regulatory restrictions apply prior to use.

**2 REFERENCES**

The standards listed below contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revisions, and parties to agreements based on this Indian Standard are encouraged to investigate the possibility of applying the most recent editions of these standards indicated below:

<i>IS No.</i>	<i>Title</i>
IS 3069 : 2020	Glossary of terms, symbols and units relating to thermal insulation materials ( <i>second revision</i> )
IS 11239 (Part 2) : 2019/ISO 845 : 2006	Method of test for rigid cellular thermal insulation materials: Part 2 Apparent density ( <i>second revision</i> )

**3 TERMINOLOGY**

For the purpose of this standard, the definitions given in IS 3069 shall apply.

**4 PRINCIPLE**

The specimen is mounted in a vertical chimney with a glass front and ignited with a bunsen burner for ten seconds. The height and duration of flame and the mass percent retained by the specimen are recorded.

NOTE — This method, which is only a small-scale procedure, should not be a criterion for fire hazard.

**5 CONDITIONING**

Unless otherwise specified, the test specimens shall be conditioned at  $27\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$  and  $(65 \pm 5)$  percent relative humidity for at least 24 h.

**6 APPARATUS****6.1 Test Chimney**

Conforming to the dimensions in [Fig. 1](#), [Fig. 2](#) and [Fig. 3](#). The body of the chimney may be either galvanized or stainless steel. In it an insert made of 0.025 mm aluminium foil is fastened. The insert is held in place by a stainless steel channel which carries three pins to support the specimen. A heat-resistant glass panel forms the front wall of the chimney. A scale, reading in millimetres, graduated at 10 mm intervals shall be provided at one side of the glass panel for determining flame height (see [Fig. 1](#) and [Fig. 4](#)). The scale begins 50 mm above the bottom of the chimney.

**6.2 Timer**

Capable of measuring to the nearest 0.1 second for determining the duration of burning.

**6.3 Burner**

A standard gas burner with 9.5 mm inside diameter barrel capable of producing a flame with an inner cone of  $960\text{ }^{\circ}\text{C} \pm 10\text{ }^{\circ}\text{C}$  is required to ignite the specimens.

**6.4 Balance**

Capable of weighing to the nearest 0.01 g for weighing the specimen.

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### 6.5 Aluminium Weighing Dishes

Disposable, 50 mm in diameter are required to collect dripping polymer.

### 6.6 Test Chamber

A relatively draught-free laboratory hood. The fan should be turned off during the test and should be turned on immediately following the test to remove products of combustion, which in some cases may be toxic.

## 7 TEST SPECIMEN

Six specimens of size  $(250 \text{ mm} \pm 1 \text{ mm}) \times (20 \text{ mm} \pm 0.5 \text{ mm}) \times (20 \text{ mm} \pm 0.5 \text{ mm})$  shall be obtained by sawing without deformation of the cellular structure. If any specimen varies by more than 10 percent from the average density of the six specimens, the sample should be considered unacceptable for testing by this method.

## 8 PROCEDURE

**8.1** Determine the density of each specimen in accordance with IS 11239 (Part 2).

**8.2** Weigh and record the mass ( $W$ ) of each specimen to the nearest 0.01 g.

**8.3** Weigh and record the mass ( $S$ ) of the specimen support to the nearest 0.01 g.

**8.4** Weigh and record the mass ( $D$ ) of disposable weighing dish for each specimen to the nearest 0.01 g.

**8.5** Ignite and adjust the burner so that the inner blue cone is 25 mm to 35 mm high. Further adjust the burner until the temperature at the top of the inner cone is  $960 \text{ }^\circ\text{C} \pm 10 \text{ }^\circ\text{C}$ .

NOTE — To obtain  $960 \text{ }^\circ\text{C}$ , it may be necessary to use a propane burner with propane gas, or a natural gas burner with natural gas. In order to minimize the time and frequency required for temperature calibration, it is necessary to maintain steady supply of gas. Thermocouples have been found useful to make this temperature measurement.

**8.6** Impale the specimen on the three pins of the specimen support, with the top of the specimen even with the top of the specimen support as shown in Fig. 3. Higher density cellular plastics may require that holes be drilled in the specimen to allow insertion of the pins. When required, the holes should be drilled at the time of specimen preparation

(if holes are drilled the specimen shall be weighed after drilling holes).

**8.7** Line the chimney with aluminium foil so that it is against the sides and back of the chimney and flush with the bottom. Place the shining side of the aluminium foil towards the test specimen. A new liner should be installed for each specimen.

**8.8** Place the specimen support in the chimney so that the top of the specimen is even with the top of the chimney as shown in Fig. 4.

**8.9** Place the disposable weighing dish on a support centered 75 mm below the chimney as shown in Fig. 4.

**8.10** Put the glass front in place and ignite the specimen by placing the inner cone of the burner flame under the centre of the specimen for 10 seconds. Simultaneously with placing the flame under the specimen, start the timer to determine the time to extinguishment ( $T$ ). Keep the burner at an angle of about  $15^\circ$  from the vertical as shown in Fig. 4.

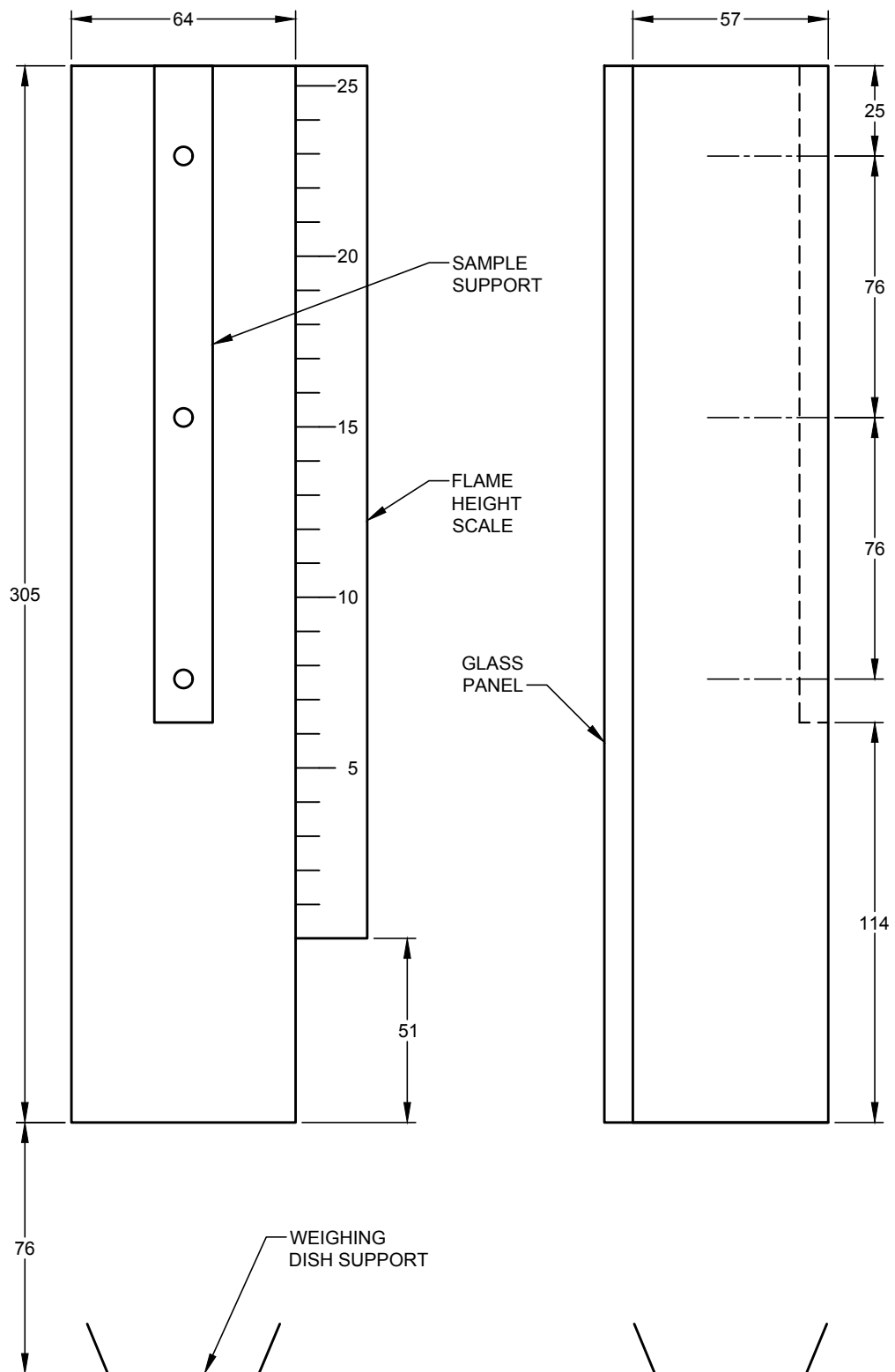
NOTE — Accurate positioning of the burner is facilitated by use of a cradle to hold the burner at the proper angle and distance from the specimen.

**8.11** Measure the maximum flame height ( $H$ ), during combustion of the specimen, to the nearest 10 mm with the flame height scale on the front of the chimney and record. If the flame rises above the top of the scale, record as  $250 + \text{mm}$ .

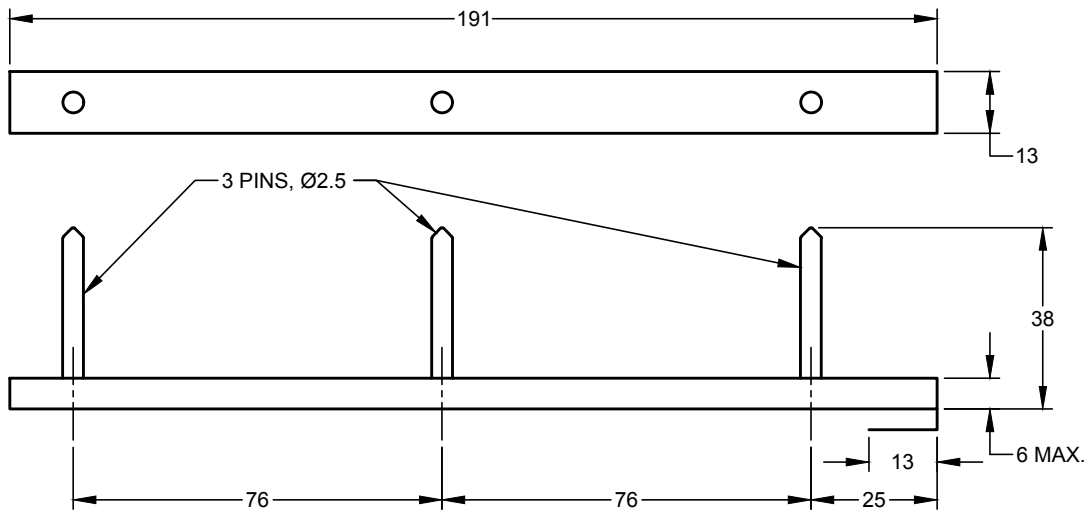
**8.12** Stop the timer when combustion of the specimen ceases and record as time to extinguishment ( $T$ ) to the nearest second. If the time of extinguishment is less than 10 seconds note the time but continue to apply the flame for full 10 seconds. If droppings burn, after specimen extinguishes,  $T$  shall be taken when the drops extinguish.

**8.13** After cooling remove the specimen support and specimen and weigh, without removing the specimen, to the nearest 0.01 g and record ( $S$ ). Weigh the disposable weighing dish containing the droppings and record ( $D$ ). If droppings accumulate in the burner, they must be removed and included in the weight.

**8.14** Clean the specimen support and repeat the procedure given in 8.6 to 8.13 until all specimens have been ignited.

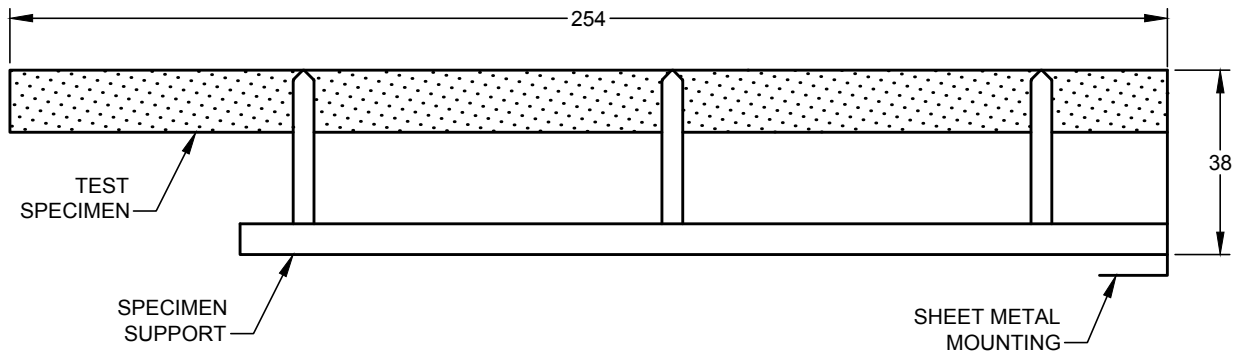


All dimensions in millimetres.  
FIG. 1 CRITICAL DIMENSIONS OF CHIMNEY



All dimensions in millimetres.

FIG. 2 CRITICAL DIMENSIONS OF SPECIMEN SUPPORT



All dimensions in millimetres.

FIG. 3 TEST SPECIMEN INPOLED ON SPECIMEN SUPPORT (SIDE VIEW)

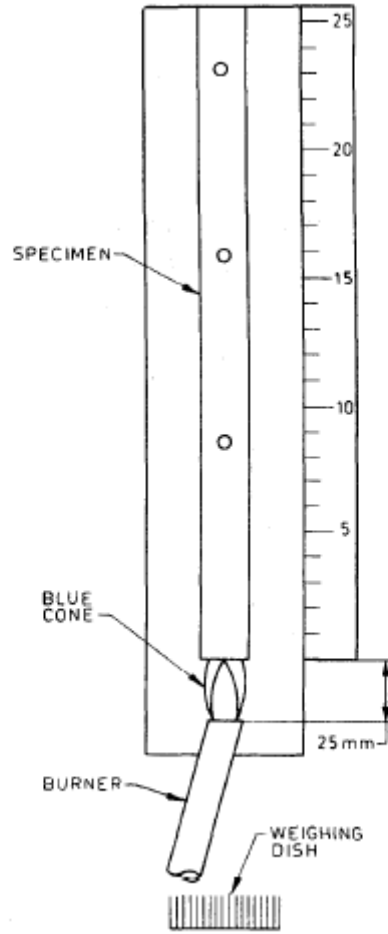


FIG. 4 BURNER POSITION UNDER SPECIMEN IN CHIMNEY (FRONT VIEW)

## 9 CALCULATIONS

Calculate the mass percent of the specimen retained after ignition by the equation

$$PWR = \frac{(S_2 - S_1) - (D_2 - D_1)}{W} \times 100$$

where

- $PWR$  = percent mass retained by entire specimen, including drips;
- $S_2$  = mass, in g, of specimen and specimen support after ignition;
- $S_1$  = mass, in g, of the specimen support;
- $D_2$  = mass, in g, of disposable weighing dish with droppings after ignition;
- $D_1$  = mass, in g, of the disposable weighing dish; and
- $W$  = mass, in g, of the specimen.

## 10 REPORT

The report shall include the following:

- a) Reference to this standard;
- b) Description and identity of the material, including the type of material or trade name, manufacturer's lot number, or other identifying information;
- c) Average density;
- d) Average time to extinguishment for the six specimens to the nearest second;
- e) Number of specimens that produced flaming drips;
- f) Average mass percent retained for the six specimens;
- g) Average flame height for the six specimens to the nearest 25 mm;
- h) Temperature and relative humidity of air during storage prior to conditioning and storage time; and
- j) Temperature and relative humidity of air during flame testing.



## ANNEX A

*(Foreword)*

## COMMITTEE COMPOSITION

Thermal Insulation Sectional Committee, CHD 27

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