

LUCKY PLASTICS AND CHEMICALS CO. LTD  
157, DEVELOPED PLOT INDUSTRIAL ESTATE  
OLD MAHABALIPURAM ROAD  
PERUNGUDI  
CHENNAI - 600 096

TE 7532

Fire Propagation test

Metex Ceilings Ltd.

Fire propagation test to B.S. 476 : Part 6 : 1981 on EXCEL-TONE  
ceiling boards for Metex Ceilings Ltd.

Metex Ceilings Ltd., Unit 3, Silverdale Road, Hayes, Middlesex,  
UB3 3BQ

February 1990

This report may only be reproduced by the sponsor in full, without  
comment, abridgement, alteration or addition, unless otherwise agreed in  
writing by The Loss Prevention Council.

#### SUMMARY

A sample of EXCEL-TONE ceiling boards, was submitted to a fire propagation test in accordance with B.S. 476 : Part 6 : 1981 on 12 December 1989.

The material achieved a fire propagation index of 8.6 comprising sub-indices of  $i_1$  of 3.5,  $i_2$  of 3.8 and  $i_3$  of 1.3.

## 1 OBJECTIVE

To determine the fire propagation index of EXCEL-TONE ceiling boards, when subjected to the fire propagation test specified in S. 476 Part 6 : 1981<sup>1</sup>, at the request of Herex Ceilings Ltd.

## 2 SAMPLE

2.1 The sample was stated by the sponsor to be EXCEL-TONE mineral-fibre acoustic ceiling board, a mineral-wool based tile, coated on one face with a paint coating in 3 coats (1 base coat and 2 finish coats).

2.2 Further details of the composition of the sample have been given by the sponsor and are recorded on a confidential file.

2.3 The sample was received on 27 November 1989.

2.4 The material was supplied as five specimens each measuring 225mm x 225mm x 14.4mm thick, these dimensions were within the tolerances specified in the standard.

2.5 The sample was found to weigh approximately  $4.19\text{kg/m}^2$ . The paint coating was white colour.

## 3 CONDITIONING

The test specimens were conditioned to equilibrium with air at  $23 \pm 2^\circ\text{C}$  and  $50 \pm 10\%$  relative humidity, as required by the standard. The weight of one sample on 29 November 1989 was 1003g, and on 30 November 1989 was 1003g.

## 4 PROCEDURE

4.1 Three specimens were subjected to test, only the coated face of each specimen was exposed to the heat.

4.2 The test was carried out on 12 December 1989.

4.3 The ambient temperature at the start of the test was  $17^\circ\text{C}$ .

4.4 In the test, the difference between the average temperature of the flue gases from each specimen and the ambient temperature was measured continuously from the time at which the gas jets were ignited. The temperature was measured by means of two thermocouples with their measuring junctions located in the bowl of the apparatus as required by the standard. The mean temperature rise above the ambient for the three specimens at various times throughout the test was determined.

5 RESULTS

5.1 Temperature measurements

Table 1. Temperature rise for calibration sheet and specimens

Time t min	Calibration sheet °C	Temperature rise for Specimens		
		a °C	b °C	c °C
0.5	16	20	20	20.5
1	22.5	28	28	29
1.5	27.5	34.5	35	36.5
2	31	41	41	42
2.5	34.5	47	46	46.5
3	37	52.5	51.5	52
4	62.5	81	81	80.5
5	97	126.5	126	126.5
6	125	161	160.5	160
7	148	187	191	188.5
8	166.5	206	212	207
9	181.5	224	227.5	225.5
10	190.5	233.5	237.5	236.5
12	207.5	245.5	250	249.5
14	217.5	253.5	257	259
16	226.5	258.5	262	264.5
18	232	263.5	266.5	269.5
20	235.5	268	269.5	272.5

t - time in minutes from the time at which the gas jets were ignited.

$\theta_s$  - temperature rise in °C of the flue gases for the test specimen at time t.

$\theta_c$  - temperature rise in °C of the flue gases for the calibration specimen at time t.

a, b and c represent individual specimens giving valid test results.

## 5.2 Observations

No intumescence or deformation of any specimen occurred that affected the required gas input.

No melting or slumping occurred that prevented the material from being exposed to the heating conditions.

Air flow through the apparatus was not restricted by fallen material or by soot accumulation in the chimney.

## 6 CALCULATION METHOD FOR INDICES OF PERFORMANCE

### 6.1 Index of performance of specimens

The index of performance,  $S$ , for each of the specimens from which a valid result is obtained shall be calculated from the sub-indices,  $s_1$ ,  $s_2$  and  $s_3$  according to the respective temperature range as follows:

$$S = s_1 + s_2 + s_3$$

where

$$s_1 = \sum_{t=4}^{t=3} (\theta_s - \theta_c) / 10t - \text{sub-index of performance for values of } t \text{ from 4 to 3 minutes at 4 minute intervals.}$$

$$s_2 = \sum_{t=4}^{t=10} (\theta_s - \theta_c) / 10t - \text{sub-index of performance for values of } t \text{ from 4-10 minutes at 1 minute intervals.}$$

$$s_3 = \sum_{t=12}^{t=20} (\theta_s - \theta_c) / 10t - \text{sub-index of performance for values of } t \text{ from 12-20 minutes at 2 minute intervals.}$$

In computations, only the positive values of  $(\theta_s - \theta_c) / 10t$  are used.

## 6.2 Fire propagation index

The index of overall performance,  $I$ , (fire propagation index), of the product shall be calculated from the individual results of each test as follows:

$$I = i_1 + i_2 + i_3$$

where

$$i_1 = \frac{1}{3} [(s_1)_a + (s_1)_b + (s_1)_c]$$

$$i_2 = \frac{1}{3} [(s_2)_a + (s_2)_b + (s_2)_c]$$

$$i_3 = \frac{1}{3} [(s_3)_a + (s_3)_b + (s_3)_c]$$

The suffix R in the fire propagation index indicates that more than three specimens have been tested in order to obtain three valid results.

## 7 CALCULATIONS

### 7.1 Index of performance of specimens

The index of performance,  $S$ , for each specimen is given in Table 2.

Table 2 Index of performance

Specimen	$S$	$s_1$	$s_2$	$s_3$
a	8.3	3.4	3.7	1.2
b	8.6	3.4	3.9	1.3
c	8.8	3.7	3.8	1.3

## 7.2. Fire propagation index.

The fire propagation index, I, is the index of overall performance:

$$I = i_1 + i_2 + i_3$$

$$i_1 = \frac{3.4 + 3.4 + 3.7}{3} = 3.5$$

$$i_2 = \frac{3.7 + 3.9 + 3.8}{3} = 3.8$$

$$i_3 = \frac{1.2 + 1.3 + 1.3}{3} = 1.3$$

$$I = 8.6$$

## 8 CONCLUSION

A sample of EXCEL-TONE ceiling boards, as described in this report, when tested in accordance with B.S. 476 : Part 6 : 1981, achieved a fire propagation index, I, of 8.6 which is made up of sub-indices  $i_1$  of 3.5,  $i_2$  of 3.8 and  $i_3$  of 1.3 .

The test results relate only to the behaviour of the test specimens of the product under the particular conditions of test, they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use.

## 9 REFERENCE

- 1 Fire tests on building materials and structures. Part 6. Fire propagation test for products. British Standard 476 : Part 6 : 1981. British Standards Institution, London, 1981.

Test and report by:

*S. Warbus*

S. Warbus  
Technical Officer

SW/MB  
1 February 1990

Approved by:

*Richard Earle*

*pp.* R.A. Jones  
Head of Testing  
Building Section

*P.J. Field*

P.J. Field  
Laboratory Manager