

REPORT ON THE FIRE RESISTANCE PROPERTIES OF A
PLASTER-BOARD TIMBER FRAME PARTITION

1. INTRODUCTION

1.1 Test Sponsor

New Zealand Fibrous Plaster Manufacturers' Association Inc.,
PO Box 1087, Wellington.

1.2 The test was in accordance with ISO 834-1975(E) Fire-resistance tests - Elements of building construction. The fire resistance of non load-bearing test specimens shall be the time, expressed in minutes, to failure under one or more of the following criteria:

1.3 Insulation

For elements of construction, such as partitions which have the function of separating two parts of a building,

(a) The average temperature of the unexposed face of the specimen shall not increase above the initial temperature by more than 140°C.

(b) The maximum temperature at any point of this face -

- shall not exceed the initial temperature by more than 180°C; and

- shall not exceed 220°C irrespective of the initial temperature.


1.4 Integrity


"Initial integrity failure" is deemed to occur when either -

(a) cracks, holes or other openings are formed in the test specimen such that flames or hot gases can pass sufficient to cause ignition of a cotton pad; or

(b) sustained flaming, having a duration of at least 10 seconds, appears on the unexposed face of the test specimen.

"Ultimate integrity failure" is deemed to occur when the partition collapses.


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2. DESCRIPTION OF SPECIMEN

2.1 General

The wall specimen represented a non load-bearing timber stud partition 4000mm high x 3000mm wide, covered on both sides with one layer of nominal 19mm thick "Fyrwall Plasterglass (1979)".

2.2 Construction

2.2.1 Framing


The framing was constructed of pinus radiata, borically treated timber, nominally 100mm x 50mm. It consisted of floor and ceiling plates and perimeter studs fixed to the specimen holder with 16mm bolts at 500mm (nominal) centres. Timber studs were nailed to the floor and ceiling plates at 600mm centres and four rows of timber dwangs (noggin)s were placed in equally spaced rows over the 4000mm height. The frame was nailed using 100mm x 4mm steel jolt headed nails.

2.2.2 Cladding

The cladding sheets were of 19mm (nominal) "Fyrwall Plasterglass (1979)" manufactured by a member of the sponsoring association to the specification supplied to BRANZ. The sheets were fixed to the timber frame as follows:

- (i) joints between sheets were staggered on opposite sides of the partition;
- (ii) on both sides of the partition a horizontally and vertically wadded joint, and a vertically nailed joint was included;
- (iii) the size of nails used for fixing the cladding were 50mm x 2.5mm flat head galvanised nails and these were set just below the surface of the sheet;
- (iv) the sheets were only nailed to the studs. On all the vertical edges of sheets coinciding with studs and on the top and bottom plates, nails were placed at 150mm centres. At other places in the body of the sheets, nails were placed at 300mm centres.


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2.2.3 Jointing materials

Joints between sheets, angles around the perimeter of the specimen holder frame, and nail heads were caulked with stopping plaster. The joints and angles were first taped with a 40mm wide open weave fibre-glass bandage. The wadded joints were reinforced with 375mm (nominal) long fibreglass rovings.

2.2.4 Plans and Specifications

The wall specimen was built according to Drawing No B2 dated 28 November 1978, supplied by the sponsor, as well as a written description dated 4 April 1979.

3. TEST PROCEDURE

3.1 The specimen was tested in the presence of members of the sponsoring association on 19 April 1979. The test was terminated at 151 minutes.

3.2 The specimen-containing frame was sealed to the 4m x 3m furnace and the temperature and pressure conditions controlled as near as possible in accordance with ISO 834-1975(E) sections 4.1 and 4.2.

3.3 Temperature Measurement

3.3.1 Temperature measurement within the furnace was made using 12 - 0.8 chromel-alumel thermocouples uniformly distributed in a vertical plane approximately 100mm from the exposed face of the specimen.

3.3.2 The temperature of the unexposed surface of the specimen was measured using chromel-alumel thermocouples on copper disks, according to ISO 834, section 4.1.4. Eight thermocouples were placed on the specimen, one at the centre, one at the centre of each quarter section, and one each on a horizontally nailed joint, a horizontally wadded joint, and a vertically wadded joint.

3.3.3 The thermocouples were attached to potentiometric recorders to record furnace and specimen temperatures. The furnace temperatures were scanned once every 75 seconds, the specimen temperatures every 55 seconds.

3.3.4 In addition to the fixed recording thermocouples, spot checks of unexposed surface temperatures were made using a portable direct-reading thermocouple probe.


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3.4 Deflection Measurements

Deflections were measured at the quarter, half and three-quarter points on the vertical centre line of the specimen. These deflections were determined by taking distances (to the nearest mm) offset from horizontal wires tensioned across the unexposed face of the specimen frame. Measurements were taken at 15 minute intervals.

4. OBSERVATIONS

4.1 Figure 1 shows the standard time-temperature curve from ISO 834-1975(E) in relation to the actual furnace temperatures. The percentage ratio of the area under the measured curve to that under the standard curve for the first 150 minutes of the test was 100.8%.

4.2 Specimen Behaviour

4.2.1 Loss of Integrity

During the course of the test, no cracks, holes or other openings appeared on the non-exposed face of the specimen and also no flaming was observed on this face. Hence, during the test, the full integrity of the specimen was maintained as defined by the test standard.

4.2.2 Insulation

4.2.2.1 Average unexposed face temperature

An average temperature rise of 140°C above the initial temperature was noted at 150 minutes by the fixed thermocouples on the unexposed face of the specimen. Figure 1 shows the maximum and average temperatures recorded by the fixed thermocouples.

4.2.2.2 Maximum unexposed face temperature

A temperature rise of 180°C above the initial temperature was noted by one of the fixed thermocouples at 143 minutes.

4.2.3 Deflections

The maximum deflection of the specimen was 57mm away from the furnace at the centre point of the specimen recorded at 120 minutes.



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5. SUMMARY

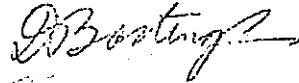
The fire resistance, in minutes, achieved by the non load-bearing plaster board lined timber frame construction was -

Insulation: The criteria for the maximum temperature rise at any point on the specimen was exceeded at 143 minutes.

Integrity: The partition maintained its full integrity throughout the test up to 151 minutes.



H.L. Baber
CHEMIST - FIRE DIVISION



D. Bastings
HEAD - FIRE DIVISION

FIG. 1 BRANZ TEST FR.422

