



N° 0296, 0296SI

**The Building Test Centre**  
British Gypsum Limited  
East Leake, Loughborough  
Leicestershire, LE12 6NP  
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## Report Number BTC 5416F

A FIRE RESISTANCE TEST ON FIVE SEPARATE PENETRATION SEALING SYSTEMS, MANUFACTURED BY COMPLETE FIRE PROTECTION LTD, CONDUCTED IN ACCORDANCE WITH BS 476: PART 22: 1987: CLAUSE 5, FOLLOWING THE METHODOLOGY OF prEN 1366-3 (1993).

Test Date: 24 March 1995

Customer:

**Complete Fire Protection Ltd**  
1 Queen Victoria St  
St. Philips  
Bristol  
BS2 0QR



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## CONSTRUCTION DETAILS

The specimen was constructed in a refractory concrete lined restraint frame having an opening of 3000mm x 3000mm.

### Penetration Sealing System 1

The penetration sealing system consisted of two CPT FR (Cable Pass Through - Fire Rated) metal plates and FPC 150 metal canisters one screw fixed to each side of the partition connected with a 150 diameter PVC pipe. The inside of each canister was lined with four layers of 4mm intumescent. The corners of the plates were packed with Rock Fibre loose lay. A canvas smoke sock with draw string each end surrounded the PVC pipe.

### Penetration Sealing System 2

The penetration sealing system consisted of two CPT FR (Cable Pass Through - Fire Rated) metal plates and FPC 150 metal canisters one screw fixed to each side of the partition connected with a 150 diameter PVC pipe. The inside of each canister was lined with three layers of 4mm intumescent. The corners of the plates were packed with Rock Fibre loose lay. A canvas smoke sock with draw string each end surrounded the PVC pipe. Within the PVC pipe was placed a Rock Fibre loose lay FPP 150 pillow.

### Penetration Sealing System 3

The penetration sealing system consisted of two CPT FR (Cable Pass Through - Fire Rated) metal plates and FPC 150 metal canisters one screw fixed to each side of the partition connected with a 150 diameter PVC pipe. The inside of each canister was lined with three layers of 4mm intumescent, and the outer of the canister was lined with a single layer of 4mm intumescent. The corners of the plates were packed with Rock Fibre loose lay. A canvas smoke sock with draw string each end surrounded the PVC pipe.

### Penetration Sealing System 4

The penetration sealing system consisted of two CPT FR (Cable Pass Through - Fire Rated) metal plates screw fixed each side of the partition connected with a 150 diameter PVC pipe. The PVC pipe was surrounded by a FPB 150 intumescent bandage. A canvas smoke sock with draw string each end surrounded the PVC pipe.

### Penetration 5

The penetration sealing system consisted of a C.F.P Ltd (Fireplug Ventilation Grill) FPG 300 x 300) which was constructed from a 30mm thick honeycomb of intumescent, surrounded by a metal retaining frame and finished on the unexposed side with a metal ventilation grid.



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### Associated construction

The sealing systems were located within a 108mm thick partition, which was constructed from Gyproc 48S50 metal studs located at 600mm centres between the 50C50 head and base channel, screw fixed top and bottom, lined both sides with 15mm Gyproc Fireline board and with 25mm Gypglas 1200 within the cavity.

The perimeter joints of the inner layer were sealed using a bead of Intu-plus-intumescent acrylic sealant, manufactured by Trade - Fire Seal Systems Ltd.

The penetrations were formed using Gyproc 50C50 metal channel, and were lined using two layers of 15mm Gyproc Fireline board, with the joints sealed using a bead of Intu-plus-intumescent acrylic sealant.

Identical groups of representative cables were placed through each penetration (except the ventilation grill).

*The descriptions of individual components making up the test specimen were provided by the customer and were checked for accuracy wherever possible.*

### TEST PROCEDURE

The test was conducted fully in accordance with BS 476: Part 22: 1987, clause 5, except the standard five thermocouples were not fixed to the unexposed face of the sample. Where areas of the test specification are ambiguous or open to interpretation the Fire Test Study Group Resolutions 43, 50, 51, 53, 63, 70 & 72 have been followed (where appropriate). These Resolutions provide the basis of common agreements between the fire test laboratories which are members of this group. The test procedure followed was BFTL 476/20/87.

At the request of the sponsor sealing system number 5 was located in a position that is representative of the conditions of use on site. This positioning is not in accordance with prEN 1366-3 as the seal is subject to a negative pressure.

Sealing systems 1,2,3 & 4 were located and tested in accordance with prEN 1366-3.

The furnace pressure was maintained at  $19 \pm 2$  Pa positive with respect to atmosphere, at a point 100mm below the top of the specimen, except during the first 5 minutes of the test, assuming a pressure gradient of 8.5 Pa/m this gives a pressure of  $15 \pm 2$  Pa at the centre of sealing systems 1,2,3 & 4.

The ambient temperature at the start of the test was 15 °C.



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## TEST RESULTS

### Sealing System 1

**Insulation** 110 mins  
**Integrity** 150 mins (Test terminated)

### Sealing System 2

**Insulation** 114 mins  
**Integrity** 150 mins (Test Terminated)

### Sealing System 3

**Insulation** 57 mins  
**Integrity** 150 mins (Test Terminated)

### Sealing System 4

**Insulation** 141 mins  
**Integrity** 150 mins (Test Terminated)

### Sealing system 5

**Insulation** 150 mins (Test Terminated)  
**Integrity** 150 mins (Test Terminated)

The test was terminated after 150 minutes.

Reference should be made to the additional data given in the tables showing temperature rise of the thermocouples fixed to the penetrating cables, at a distance of 25mm from their exit from the penetration seal. This thermocouple position is cloaked by the canvas smoke sock and is deemed to be within the penetration sealing system and is therefore discounted in terms of insulation failure.

## LIMITATIONS

The results only relate to the behaviour of the element of construction under the particular conditions of test; they are not intended to be the sole criteria for assessing the potential fire performance of the element in use nor do they reflect the actual behaviour in fires.

The specification and interpretation of fire test methods are the subject of ongoing development and refinement. Changes in associated legislation may also occur. For these reasons it is recommended that the relevance of test reports over five years old should be considered by the user. The laboratory that issued the report will be able to offer, on behalf of the legal owner, a review of the procedures adopted for the particular test to ensure that they are consistent with current practices, and if required may endorse the test report.



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Report Date:

10 May 1995



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Time		Observations.
hrs.	min	<i>Refer to exposed face (except where otherwise stated)</i>
47		The partition joints (1 <sup>st</sup> layer) had opened to approx 10mm. The canvas smoke socks around penetrations 2, 3 & 4 were flaming. The canvas smock sock on penetration 1 had fallen/burned away.
57		<i>Unexposed face</i> The insulation on the cables through penetration 3 had melted away exposing the copper core. <b>INSULATION FAILURE Penetration 3</b> The temperature rise on exposed copper cores through penetration 3 exceeded 180 °C (roving thermocouple).
1	00	No visible change.
1	12	Horizontal crack opened up in the left hand plasterboard at approx 900mm from the head of the partition. Vertical crack open down the centre of the centre plasterboard.
1	23	The cracks noted at 1 hour 12 minutes now open to approx 5mm.
1	25	<i>Unexposed face</i> <b>Penetration 2</b> The temperature rise on cables through penetration 2 exceeded 180 °C, measured by thermocouple number 27.
1	28	Part of (1 <sup>st</sup> layer) centre plasterboard had fallen. The exposed joint of the second layer open to approx 6mm.  <i>Unexposed face</i> The glow of the furnace was visible through penetration 2.
1	34	<i>Unexposed face</i> Penetration 3 was checked using the cotton pad but failed to ignite.
1	35	<i>Unexposed face</i> The intumescent and the PVC pipe were visible on penetrations 1 & 2. The canvas smoke sock on penetration 4 started to charr and had ripped.
1	38	Part of the left hand plasterboard (1 <sup>st</sup> layer) fell.



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Table with 2 columns: Time (hrs. min) and Observations. Contains test results including crack observations, insulation failure penetrations, and test termination.



FURNACE TEMPERATURE CURVES

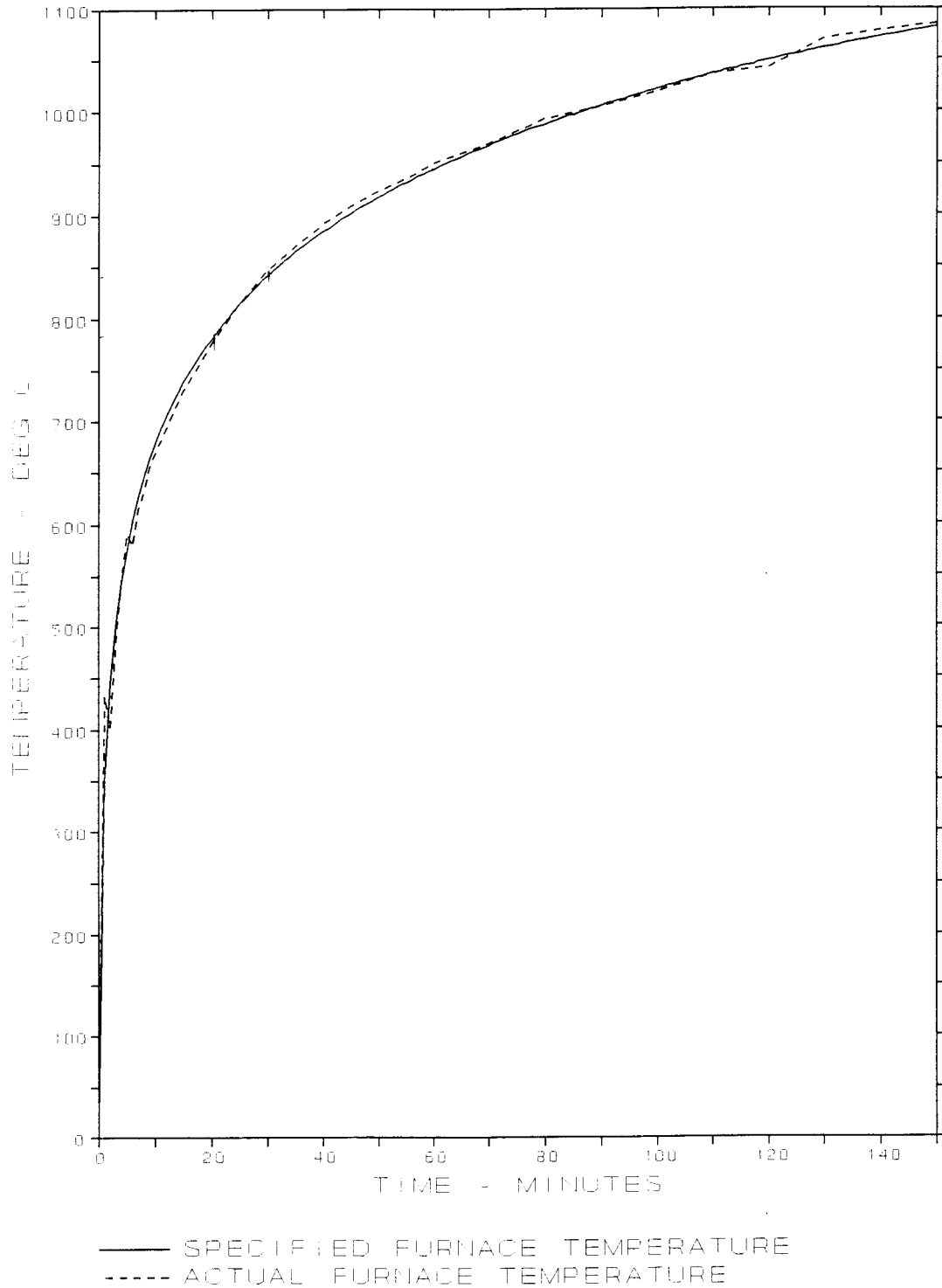
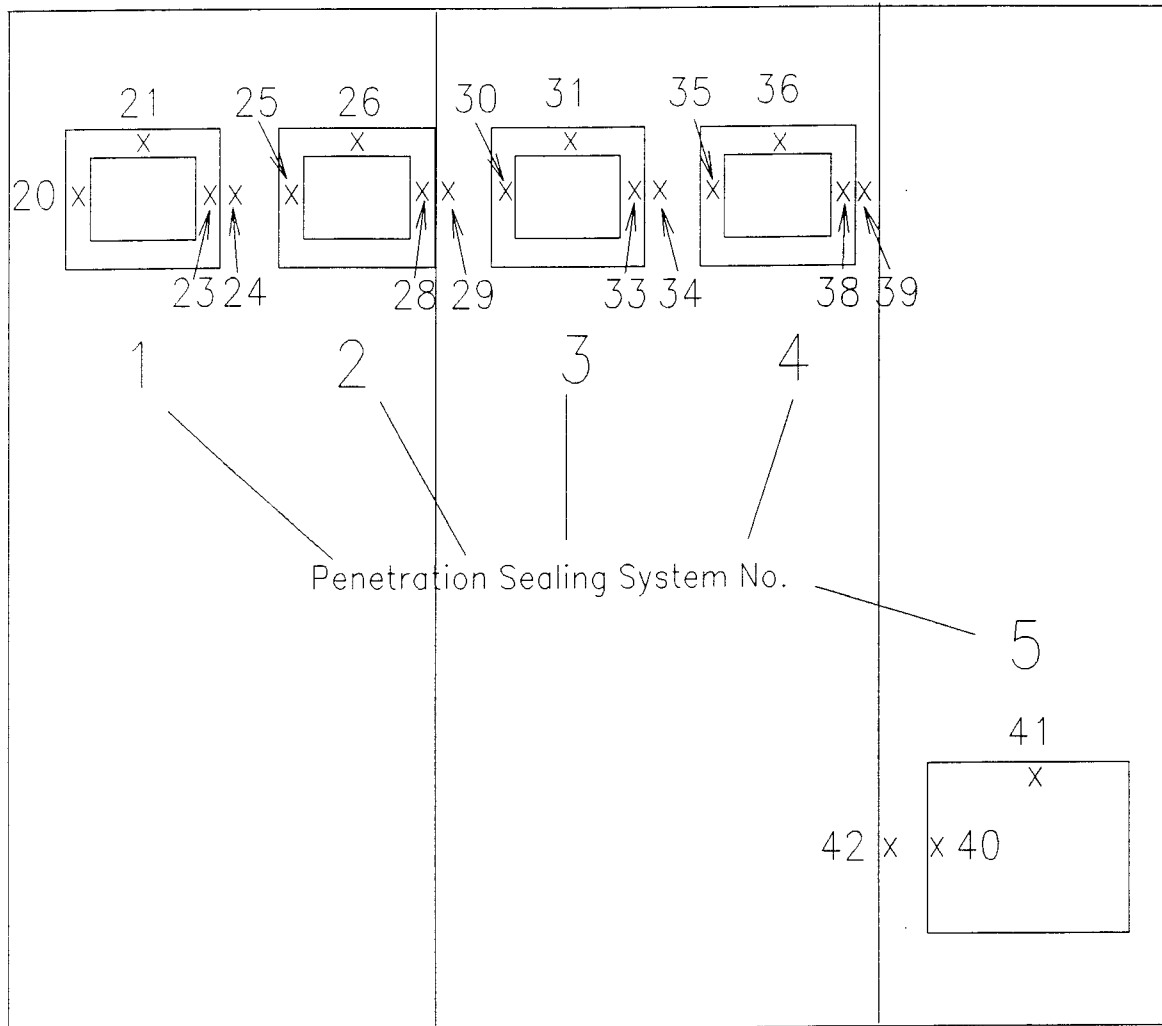


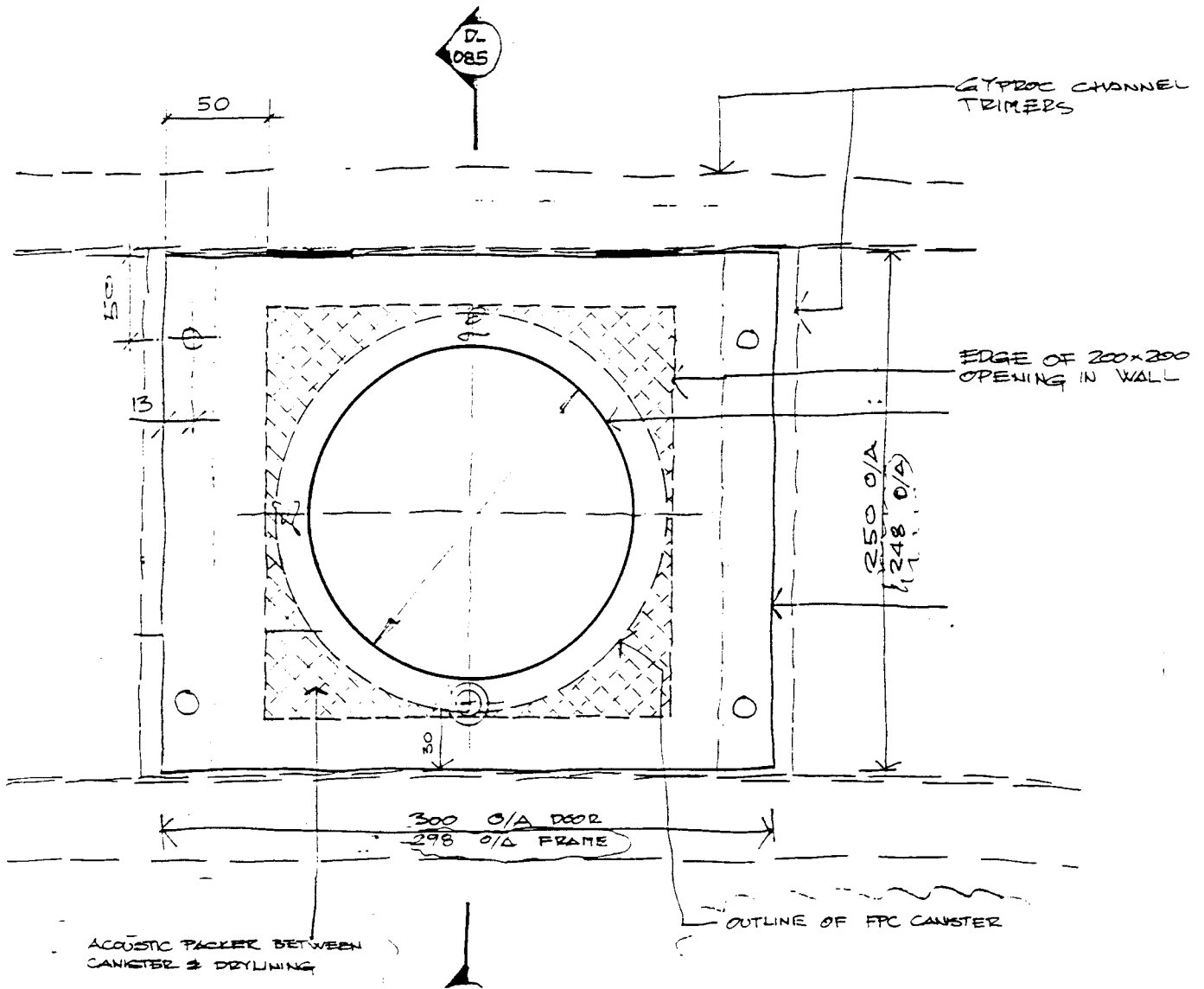
Figure 1 - Furnace temperature curves





**Figure 2** Unexposed face thermocouple layout

Note:- thermocouples 22,27,32 & 37 were located on the penetrating cables of penetration sealing systems 1,2,3 & 4 respectively, approximately 25mm from the exit of the penetrating seal within the smoke sock.



**Figure 3** Schematic diagram showing penetration, plates and canvas smoke sock.

