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FSH 0150

**FIRE-RESISTANCE TEST ON
A LOADBEARING LIGHTWEIGHT CONCRETE
FLOOR SYSTEM**

IN CONFIDENCE TO
CSR HEBEL AUSTRALIA PTY LTD

OCTOBER 1991



DIVISION OF BUILDING, CONSTRUCTION AND ENGINEERING

**87 DELHI ROAD NORTH RYDE
PO BOX 310 NORTH RYDE NSW 2113
AUSTRALIA**

**FIRE-RESISTANCE TEST ON
A LOADBEARING LIGHTWEIGHT CONCRETE FLOOR SYSTEM**

SPONSORED INVESTIGATION No. FSH 0150

**IDENTIFICATION
OF SPECIMEN:**

The sponsor identified the specimen as a floor system constructed with reinforced autoclaved, aerated concrete precast panels.

SPONSOR:

CSR Hebel Australia Pty Ltd
Unit 4A, 4 Central Avenue
THORNLEIGH NSW

MANUFACTURER:

CSR Hebel Australia Pty Ltd
Unit 4A, 4 Central Avenue
THORNLEIGH NSW

TEST STANDARD:

Australian Standard 1530, Methods for fire tests on building materials, components and structures, Part 4-1990, Fire-resistance tests of elements of building construction.

TEST NUMBER:

NF08SH0378

TESTED:

The fire-resistance test was conducted on 14 November 1990.

**DESCRIPTION
OF SPECIMEN:**

GENERAL

The specimen comprised precast reinforced autoclaved aerated concrete panels of nominal overall dimensions of 4000 mm long x 600 mm wide x 200 mm thick. The panels were butted up against each other and the spaces between were filled with grout from the top which was finished flush at the joint.

LOAD

A uniformly distributed load of 5 kPa was applied to the top surface of the specimen.

DOCUMENTATION: The following documents were supplied by the sponsor as a complete description of the specimen and should be read in conjunction with this report:

Drawings numbered FR-1 and FR-2, dated July 1991, by CSR Hebel Australia Pty Ltd.

Confidential information about the composition of materials and/or manufacturing processes used in the test specimen has been submitted and is retained at the Division of Building, Construction and Engineering.

EQUIPMENT: The furnace has a nominal opening of 4570 mm x 3660 mm for attachment of horizontal specimens.

The furnace is lined with refractory bricks and materials with the thermal properties as specified in AS 1530.4-1990 and is heated by combustion of a mixture of natural gas and air.

TEMPERATURE

The temperature in the furnace chamber was measured by nine K-type thermocouples housed in high-nickel steel tubes substantially sealed at the exposed end. Each wire was 0.8 mm in diameter and electrically insulated with ceramic insulators.

The temperatures of the specimen were measured by glass-fibre insulated and sheathed K-type thermocouples with a wire diameter of 0.5 mm.

PRESSURE

The furnace pressure was measured by a differential low-pressure transducer with a range of ± 50 Pa.

DEFLECTION

Deflections of the elements were measured by observing the linear displacement against a reference datum established prior to the commencement of the test using a graduated staff and theodolite.

MEASUREMENT SYSTEM

The primary measurement system comprised a multiple-channel datalogger scanning at one minutes intervals during the test.

After each scan the information was stored on magnetic disc by the computer controller.

AMBIENT

TEMPERATURE: The temperature of the test area was 24°C at the commencement of the test.

**DEPARTURE FROM
TEST STANDARD:**

There were no departures from the requirements of the standard.

**TERMINATION
OF TEST:**

The test was terminated at 165 minutes by agreement with the sponsor.

TEST RESULTS:**CRITICAL OBSERVATIONS**

The following observations were made during the fire-resistance test.

- 1 minute - Specimen is producing smoke from the unexposed face.
- 22 minutes - Transverse cracks have appeared across the panels on the exposed face.
- 33 minutes - Smoke and steam are still rising off the unexposed face of the specimen but appear to be restricted to cracks which have opened up along the joints.
- 62 minutes - The cracks noted at 22 minutes appear to be widening.
- 150 minutes - A height difference is now apparent between the two central panels on the unexposed face.
- 162 minutes - Integrity failure - It is possible to see into the furnace through a gap between the second panel from the south side and the panel noted at 161 minutes. The second panel is collapsing slowly.
- 164 minutes - Insulation and structural failure - The second panel from the south side collapses into the furnace, a maximum temperature rise of 180 K above the initial temperature is recorded 25 mm from the edge of the joint.

FURNACE TEMPERATURE

Figure 1 shows the standard curve of temperature versus time for heating the furnace chamber and the actual curves of average and maximum temperature versus time recorded during the heating period.

SPECIMEN TEMPERATURE

Figure 2 shows the curves of average and maximum temperature versus time recorded on the unexposed face of the specimen.

Figure 3 shows the curve of maximum temperature versus time recorded over the joints on the unexposed face of the specimen.

Figure 4 shows the curve of maximum temperature versus time recorded 25 mm from the joints on the unexposed face of the specimen.

SPECIMEN DEFLECTION

Maximum recorded downward deflection taken manually was 74 mm at 163 minutes at centre of the specimen. The maximum rate of deflection over the last 12 minutes of the test was 1.5 mm/min.

PERFORMANCE

Performance observed in respect of the following criteria:

Structural adequacy	-	164 minutes.
Integrity	-	162 minutes.
Insulation	-	164 minutes.

FIRE-RESISTANCE**LEVEL:**

For the purpose of building regulations in Australia, the FRL of the test specimen is 120/120/120.

The fire-resistance level is applicable from the direction of test.

For the purposes of AS 1530.4-1990 the results of these fire tests may be used to directly assess fire hazard, but it should be recognised that a single test method will not provide a full assessment of the fire hazard under all fire conditions.

ATTACHMENTS:

Figure 1. - FURNACE TEMPERATURE

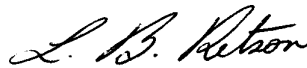
Figure 2. - SPECIMEN TEMPERATURE - On the unexposed face of the specimen.

Figure 3. - SPECIMEN TEMPERATURE - Over the joints.

Figure 4. - SPECIMEN TEMPERATURE - 25 mm from the joints.

Drawings numbered FR-1 and FR-2, dated July 1991, by CSR Hebel Australia Pty Ltd.

A copy of Certificate of Test No. 331.

TESTED BY:

L B Retson
Testing Officer



R J McKenna
Experimental Scientist

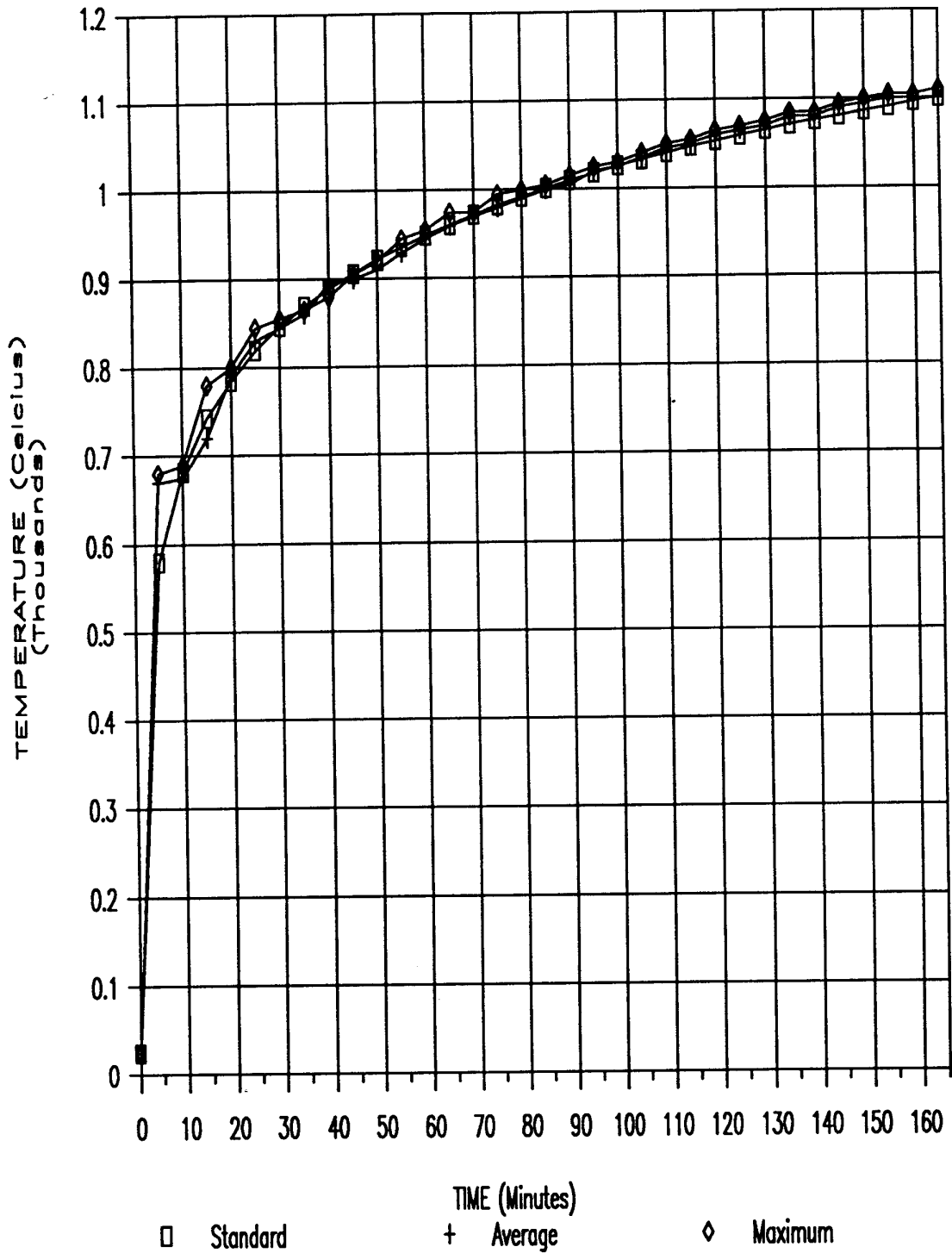


R J Dayeh
Principal Experimental Scientist
for Manager, Fire Technology

OCTOBER 1991

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Fig. 1 - FURNACE TEMPERATURE



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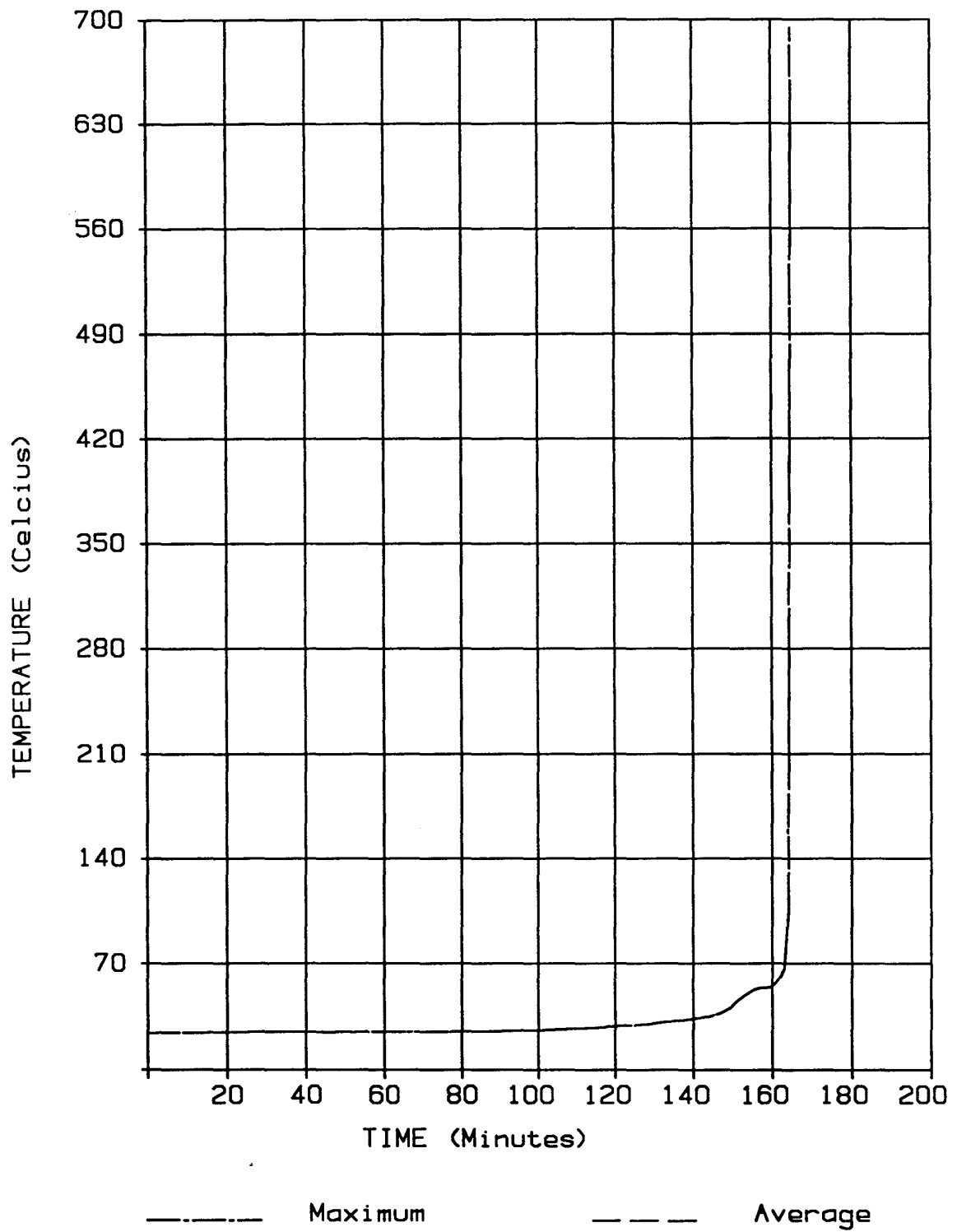


Fig. 2 - SPECIMEN TEMPERATURE
On the unexposed face of the specimen



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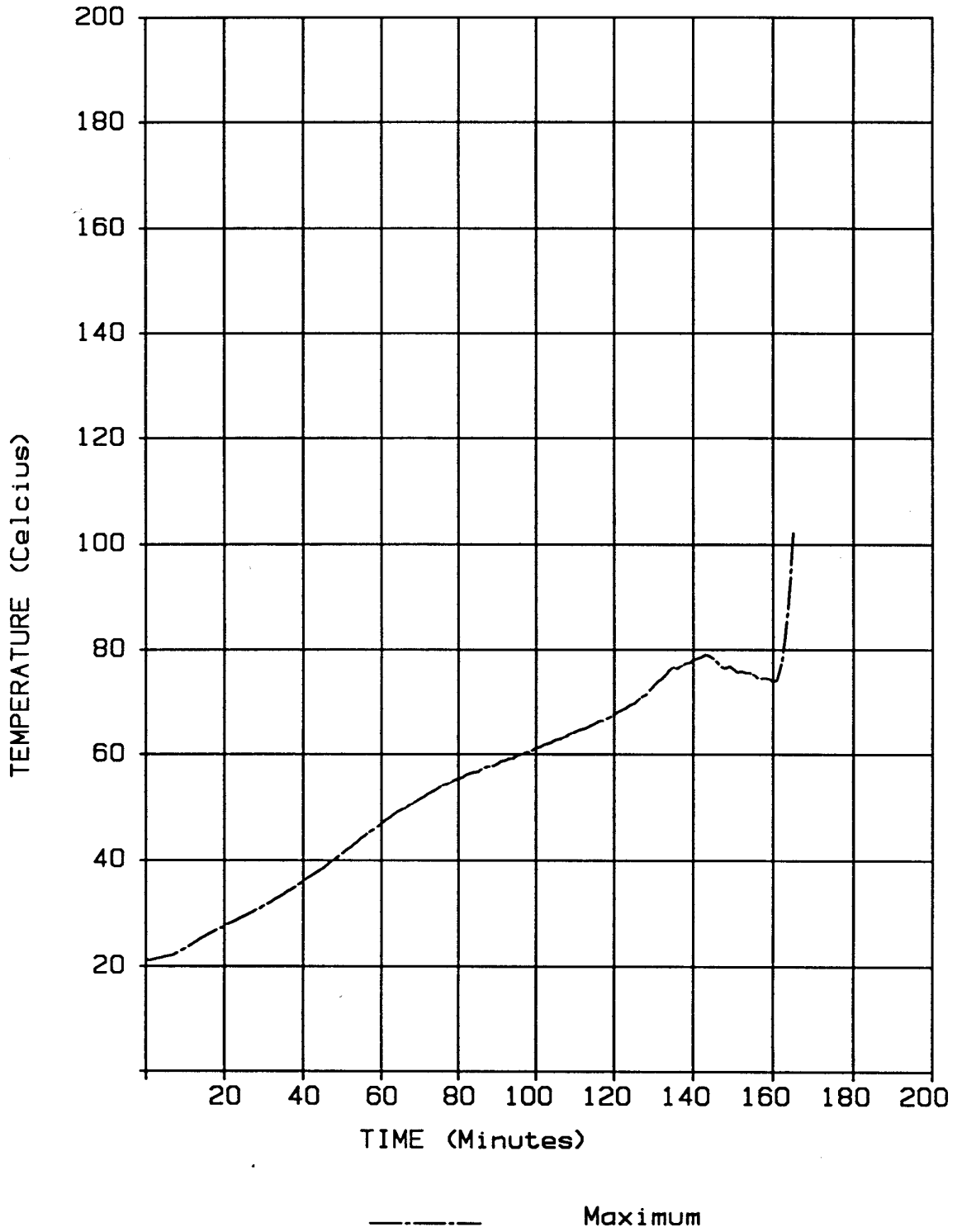


Fig. 3 - SPECIMEN TEMPERATURE
Over the joints



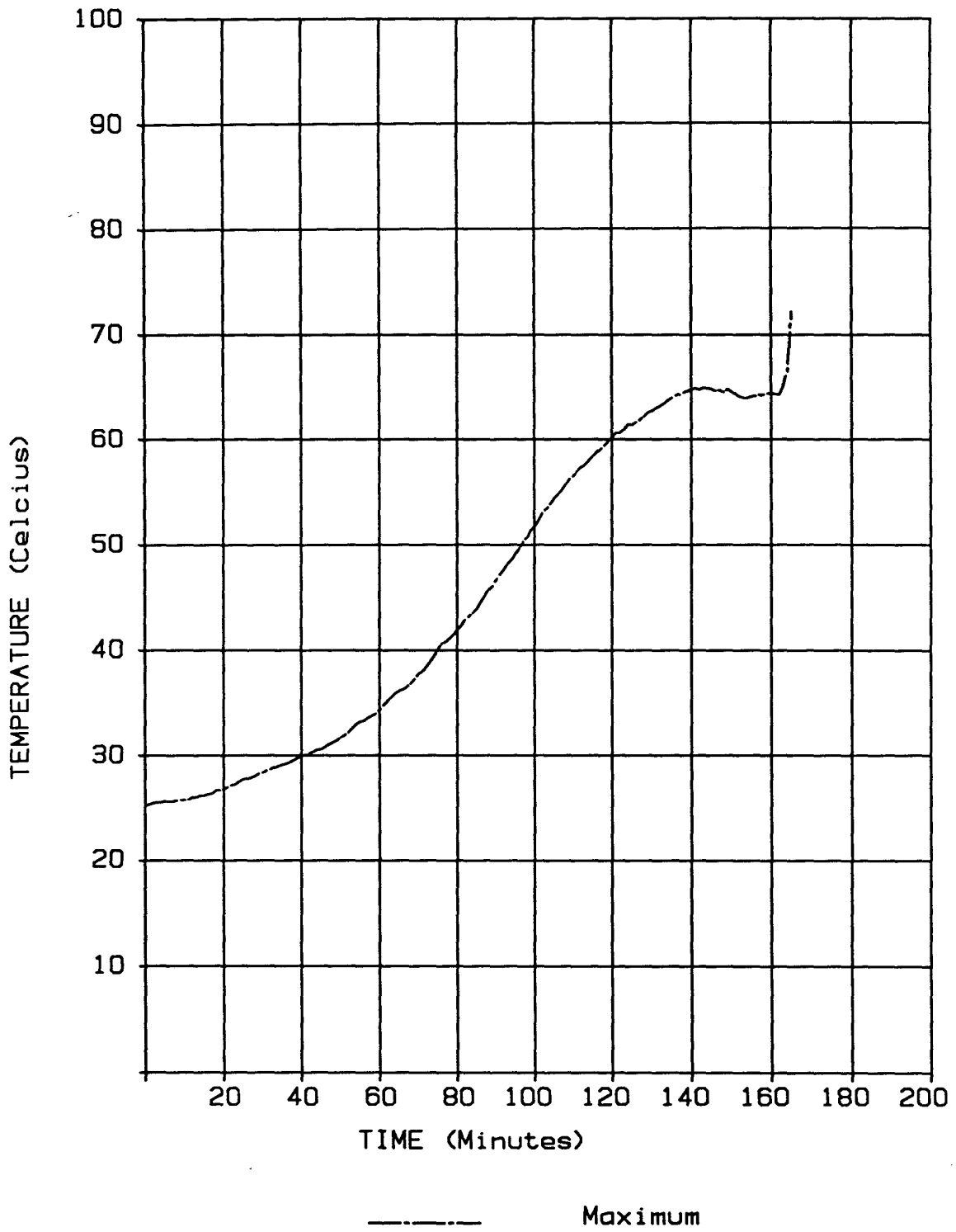


Fig. 4 - SPECIMEN TEMPERATURE
25 mm from the joints



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CLIENT

TITLE

PIRE PANEL SECTION

DATE

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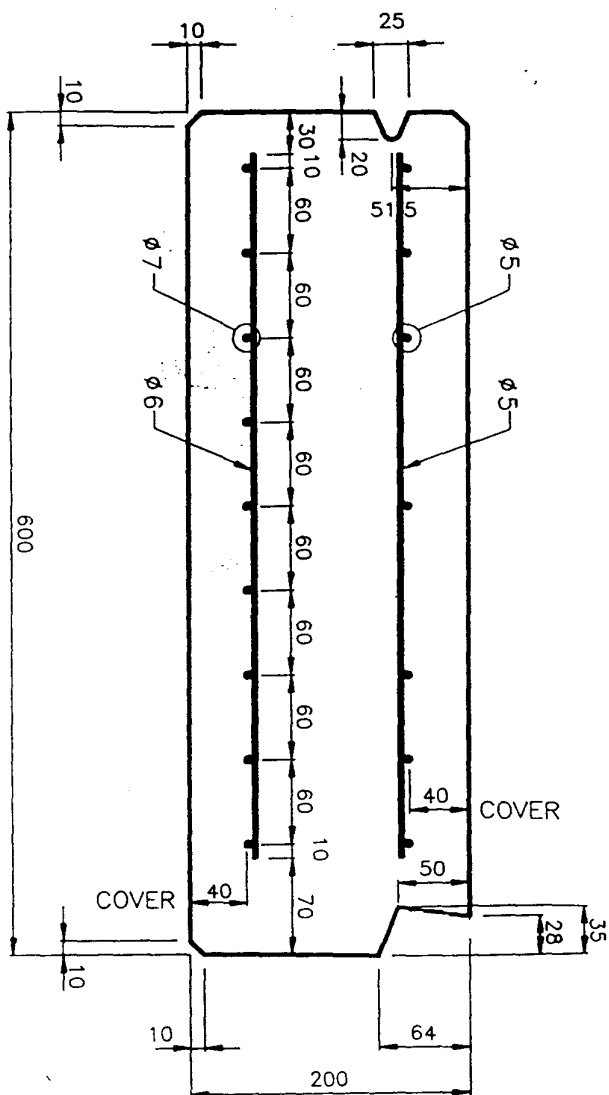
DATE

DIR. No.

FR-1

REV.

1:5





Hebel

200 mm Thick Autoclaved Aerated Concrete Panels
100 mm Thick Autoclaved Aerated Concrete Panels
150 mm Thick Autoclaved Aerated Concrete Panels

CLIENT

TITLE

**FIRE TEST STAND
200 mm FLOOR PANELS**

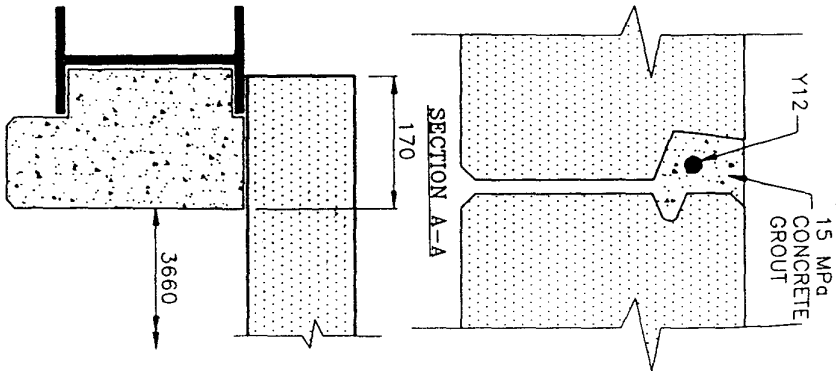
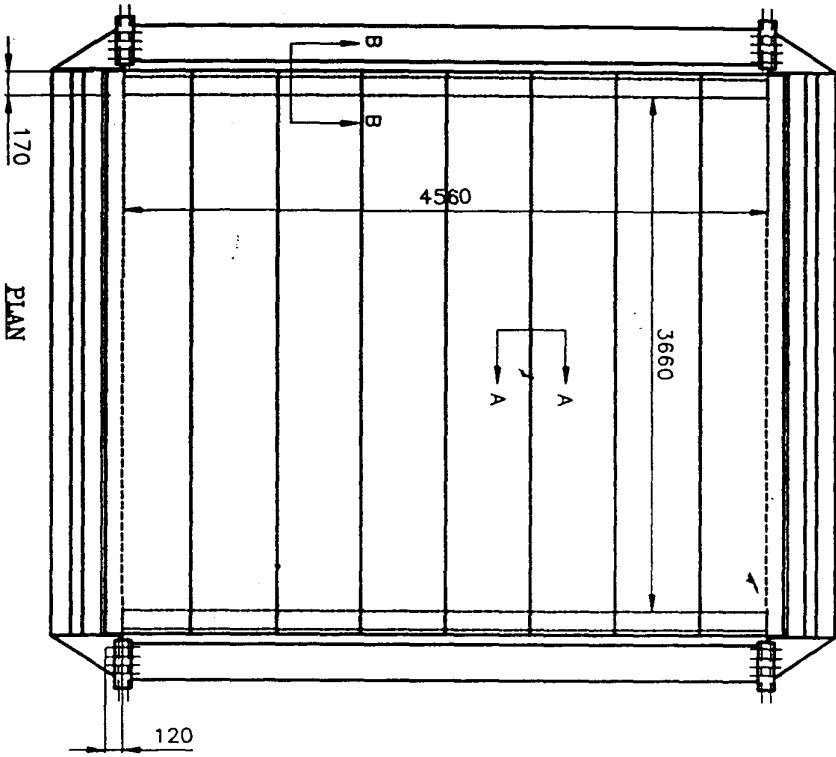
DESIGN DATE	RWF
CHECKED DATE	JULY 81
APPROVED DATE	
SCALE	1:5, 1:10

DRG. No.

FR-2

REV.

This drawing and all measurements shown on the drawing of CSRI Autoclaved Aerated Concrete Panels and used in connection with the design of the fire test stand are the property of CSRI. No part of this drawing may be reproduced or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or by any information storage and retrieval system, without the prior written permission of CSRI.



Certificate of Test

This is to certify that the element of construction described below was tested by the CSIRO Division of Building, Construction and Engineering in accordance with Australian Standard 1530, Methods for fire tests on building materials, components and structures Part 4-1990, Fire-resistance tests of elements of building construction on behalf of

CSR Hebel Australia Pty Ltd
Unit 4A 4 Central Avenue
THORNLEIGH, NSW

A full description of the test specimen and the complete test results are detailed in the Division's report FSH 0150

Product Name: The sponsor identified the specimen as a floor system constructed with reinforced autoclaved, aerated concrete precast panels.

Description: The specimen comprised precast reinforced autoclaved aerated concrete panels of nominal overall dimensions of 4000 mm long x 600 mm wide x 200 mm thick. The panels were butted up against each other and the spaces between were filled with grout from the top which was finished flush at the joint. A uniformly distributed load of 5 kPa was applied to the top surface of the specimen. Construction is detailed in . drawings numbered FR-1 and FR-2, dated July 1991, by CSR Hebel Australia Pty Ltd.

Orientation: The floor panels were tested to model fire on the underside.

The element of construction described above satisfied the following criteria for fire-resistance for the period stated

Structural Adequacy	-	164 minutes
Integrity	-	162 minutes
Insulation	-	164 minutes

and therefore for the purpose of Building Regulations in Australia achieved a FRL of 120/120/120.

The rating applies to elements of the same construction as the specimen and exposed to fire from the same side as in the test

Testing Officer: L B Retson Date of Test: 14 November 1990

Issued on the 4th day of October 1991 without alterations or additions



R J Dayeh
for Manager, Fire Technology.