Fire resistance test in accordance with BS. 476 : Part 22 : 1987 on a Drywall Steel Sections Ltd. partition.

Prepared for:

Drywall Steel Sections Ltd.
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This test report is additional to that issued as 229280, dated 29th November 2006. The original test report remains valid and is not replaced by this additional report.

14th April 2008

Additional test report number 244182

0578

Prepared on behalf of BRE Testing by

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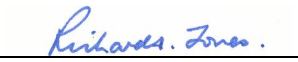
Date 14th April 2008

Signature 

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Contents

SUMMARY

A Drywall Steel Sections Ltd. drywall partition 3m x 3m, was submitted to a fire resistance test in accordance with B.S. 476 : Part 22 : 1987 (Method 5) for a duration of 130 minutes on 23rd November 2006.

The partition was formed from one layer of 15mm-thick Lafarge Firecheck wallboard, each side of a 70mm-deep steel stud frame. There were no horizontal joints in the partition.

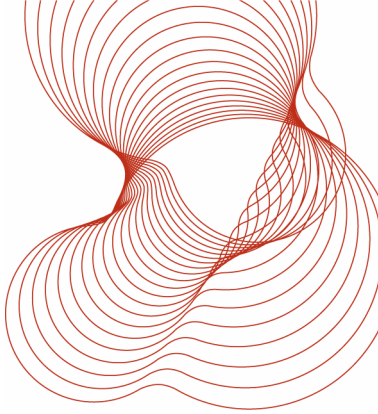
The partition achieved the following fire resistance:

Integrity: 129 minutes

Insulation: 72 minutes

The product has not been retested and this additional report does not involve technical changes or technical reviews of the original test report.

The original and the new name of the products and the company commercially responsible for the products which are the subject of this report, is documented and maintained by BRE laboratory records.



1 OBJECTIVE

To determine the fire resistance of a drywall partition system when tested in accordance with B.S. 476 : Part 22 : 1987[1] (Method 5 for partitions).

2 MATERIALS

2.1 Lafarge Firecheck Wallboard

Lafarge Firecheck Wallboard was supplied to the laboratory in taper-edged sheets nominally 15mm thick x 1200mm wide x 3000mm long. Pink paper covered one face with brown paper facing on the reverse. It was described as a Type 5 plasterboard with a gypsum plaster core containing glass fibres and fillers. The board weight was stated to be nominally 12.0 to 12.8 kg/m^2.

2.2 Top track

The track at the top of the partition was described as Drywall Steel Sections Ltd. Deep Track 72 (code SSDT 72) and was a 50mm x 72mm x 50mm U-shaped channel, formed from 0.7mm-thick galvanised steel.

2.3 Bottom track

The track at the bottom of the partition was described as Drywall Steel Sections Ltd. Track 72 (code SST 72) and was a 25mm x 72mm x 25mm U-shaped channel, formed from 0.55mm-thick galvanised steel.

2.4 Studs

The studs were described as Drywall Steel Sections Ltd. Stud 70 (code SSS 70) and was a 34mm x 72mm x 32mm U-shaped channel, formed from 0.55mm-thick galvanised steel.

3 CONDITIONING

During construction of the specimen, samples of the Firecheck wallboard were taken and placed in an oven at 50^{O}C to determine the free moisture content of the board by weight loss technique. The samples of Firecheck wallboard were found to have a free moisture content of 0.9% by oven dry weight.

4 CONSTRUCTION

Prior to construction of the specimen, the 3040mm height of the test frame opening was reduced to approximately 3m using three strips of 15mm-thick Firecheck Wallboard.

The top channel and stud at one side of the specimen were attached to the test frame using 28mm long screws into Aluminium rawl plugs at nominally 600mm centres. The bottom stud was fixed using 75mm-long screws, to allow them to pass through the wallboard packing along the bottom of the test frame.

Studs were friction fitted between the top and bottom tracks at 600mm centres. The studs were cut to length, so that a nominally 15mm gap existed between the top of the studs and the inside top of the top track.

One layer of Firecheck Wallboard was attached to each face of the partition using 32mm Lafarge Drywall Grabber screws at 300mm centres. Joints between the sheets of wallboard were finished with Lafarge patching tape and Lafarge Readymix joint cement. A 1200mm-wide sheet of wallboard was located against the unrestrained edge on the exposed face, with a 600mm-wide sheet of wallboard against the unrestrained edge on the unexposed face. The resulted in joints between boards being staggered by 600mm between the exposed and unexposed faces.

No sealant was used during the construction of the specimen, and there was no insulation inside the partition.

In accordance with the standard, one edge (the right hand edge as viewed from the unexposed face) was not attached to the test frame. The nominal 50mm gap along this edge was packed with mineral fibre blanket.

Prior to the test, the perimeter of the specimen (with the exception of the unrestrained edge) was sealed against the test frame (by BRE) using a fillet of plaster.

The specimen is shown before the test in Photo's 1 and 2.

5 TEST PROCEDURE

5.1 General

The test was carried out on 23rd November 2006 in accordance with Method 5 of B.S. 476 : Part 22 : 1987[2] and was witnessed by Mr. R. Gupta representing the sponsor. The ambient temperature at the start of the test was 12°C.

The partition was tested from one side only, with the unrestrained on the right hand side, as viewed from the unexposed face.

5.2 Furnace control

The furnace temperature was measured by means of sixteen chromel/alumel thermocouples arranged symmetrically in the furnace in four rows of four with their measuring junctions 100mm from the exposed face of the partition. The furnace was controlled so that the mean of the sixteen readings followed the time/temperature relationship specified in B.S. 476 : Part 20 : 1987[1].

A pressure sensing head 2.4m above the base of the test frame monitored pressure in the furnace. The pressure conditions within the furnace were maintained in accordance with Section 3.2 of B.S. 476 : Part 20 : 1987[1] taking the bottom of the partition as the notional floor level.

5.3 Temperature measurements on the unexposed face

The temperature of the unexposed face of the specimen was measured by eight chromel/alumel (K-type) thermocouples each soldered to a copper disk and covered with an insulating pad. The locations of the thermocouples are given in Table 1. Thermocouples 3, 4, 6, 7 and 8 were used to determine the mean temperature of the unexposed face of the specimen in accordance with the standard[2].

Table 1. Thermocouple locations on unexposed face.

Thermocouple Number	Location of thermocouple
1	At the top of the specimen, over the third stud from the unrestrained edge.
2	Approximately 300mm from the top of the specimen, over the third stud from the unrestrained edge, adjacent to a screw location, and joint in the wallboard on the exposed face.
*3	At the centre of the top left quarter of the specimen.
*4	At the centre of the top right quarter of the specimen.
5	At ¾ height of the specimen, adjacent to the joint between wallboards on the unexposed face (600mm from the unrestrained edge).
*6	In the centre of the specimen.
*7	At the centre of the bottom left quarter of the specimen.
*8	At the centre of the bottom right quarter of the specimen.

* These thermocouples were used to derive the mean temperature of the surface of the specimen, as specified by the standard[2].

5.4 Deflection of specimen

The horizontal deflection at the centre of the specimen was measured throughout the test by means of a transducer connected to the unexposed face via a taut fine steel wire.

6 RESULTS

6.1 Observations

Observations made during the test are given in Table 2 and unless stated are of the unexposed face. Observations of the exposed and unexposed faces are described when viewing the relevant face from the respective side.

Table 2 Observations

Time minutes	Observation
0	Start test.
7	The surface paper has burnt away from the wallboard on the exposed face.
17	The jointing between sheets of wallboard on the exposed face is starting to fall away.
23	Most of the jointing between sheets of wallboard on the exposed face has fallen away.
26	All boards are intact on the exposed face, with no cracks in the boards.
30	Gaps of approximately 1mm have formed between sheets of wallboard on the exposed face.
52	Gaps between sheets of wallboard on the exposed face are now up to a maximum of approximately 1mm to 2mm. All boards on the exposed face are intact, with no visible cracks.
54	The sheet of wallboard on the exposed face, near the centre of the specimen, is bowing away from the partition slightly, and a vertical crack has formed approximately 150mm from the joint between the centre and right hand side sheets of wallboard.
55	Screw locations are darkening slightly as the specimen heats up.
57	A slight crack has formed between the centre and right hand side sheets of wallboardfor the top (approximately) 500mm of the joint.
58	A crack has formed in the centre joint between sheets of wallboard, near mid height of the specimen.

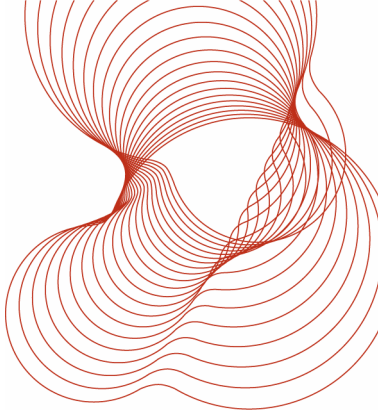
Time minutes	Observation
59	All boards are intact on the exposed face.
62	The crack referred to at 58 minutes is now approximately 1mm wide, and is darkening at its edges. There is no visible glow from this crack.
63	All boards are intact on the exposed face.
71	The crack referred to at 58 minutes is now approximately 3mm wide.
84	The crack referred to at 58 minutes is now approximately 5mm wide. No glow is visible at the crack.
98	All boards on the exposed face are still intact. Gaps between sheets of wallboard on the exposed face are now up to a maximum of approximately 10mm.
108	All boards on the exposed face are still intact. Gaps between sheets of wallboard on the exposed face are now up to a maximum of approximately 15mm.
116	All boards on the exposed face are still intact. Gaps between sheets of wallboard on the exposed face are now up to a maximum of approximately 30mm. A stud is clearly visible near the centre of the partition on the exposed face at this crack. The unexposed face is darkening in colour as it heats up.
124	All boards on the exposed face are still intact.
126	A red glow is visible at the crack near the centre of the partition at mid height. No failure by cotton pad at this location.
128	A large piece of wallboard fell from near the centre of the exposed face.
129	Failure of integrity by cotton pad, flaming and 6mm gap gauge at the joint near the centre of the unexposed face.
130	Test stopped.

The specimen after 120 minutes and after the test is shown in Photos 3 to 5.

6.2 Temperatures recorded

6.2.1 Furnace temperature

The mean furnace temperature recorded is plotted against time in Graph 1 with the specified curve for comparison.



6.2.2 Unexposed face temperatures

The mean and maximum temperatures recorded on the unexposed face of the specimen are plotted against time in Graph 2. Individual surface temperatures are plotted against time in Graphs 3 and 4.

The mean temperature rise for insulation (140^{O}C rise) was exceeded after 72 minutes. The maximum temperature rise for insulation (180^{O}C rise) was exceeded after 74 minutes.

6.3 Deflection

The horizontal deflection recorded at the centre of the partition is plotted against time in Graph 5. The maximum deflection recorded (towards the furnace) was 86mm, recorded at the end of the test.

7 PERFORMANCE CRITERIA

The standards[1,2] state that a partition is regarded as having a fire resistance (expressed in minutes) that is equal to the elapsed time (in completed minutes) between the commencement of heating and the termination of heating, or until failure to meet the integrity or insulation criteria occurs, whichever is the sooner.

Integrity : Failure is deemed to occur:

a) when collapse or sustained flaming for not less than 10 seconds on the unexposed face occurs;

b) when (before the exposed face in the vicinity indicates a temperature of 300°C) cracks, gaps or fissures allow flames or hot gases to cause flaming or glowing of a cotton fibre pad;

c) when (after the cotton pad test is unsuitable) a 6mm-diameter gap gauge can penetrate through a gap into the furnace and be moved in the gap for a distance of at least 150mm;

d) when (after the cotton pad test is unsuitable) a 25mm-diameter gap gauge can penetrate through a gap into the furnace.

Insulation : Failure is deemed to occur:

a) when the mean unexposed face temperature increases by more than 140°C above its initial value;

b) when the temperature recorded at any position on the unexposed face is in excess of 180°C above the initial mean unexposed face temperature;

c) when integrity failure occurs.

The results only relate to the behaviour of the specimen 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.

8 CONCLUSION

A 3m-high x 3m-wide Drywall Steel Sections Ltd. partition, as described in this report was, submitted to a fire resistance test in accordance with B.S. 476 : Part 22 : 1987 (Method 5) for a duration of 130 minutes on 23rd November 2006.

In the orientation tested, the partition achieved the following fire resistance:

Integrity:	129 minutes
Insulation:	72 minutes

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 5 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 a particular test to ensure that they are consistent with current practices, and if required may endorse the test report.

9 REFERENCES

1. Fire tests on building materials and structures. Part 22. Methods for determination of the fire resistance of non-loadbearing elements of construction. British Standard 476 : Part 22 : 1987. British Standards Institution, London, 1987.

2. Fire tests on building materials and structures. Part 20. Method for determination of the fire resistance of elements of construction (general principles). British Standard 476 : Part 20 : 1987. British Standards Institution, London, 1987.

10 FIGURES

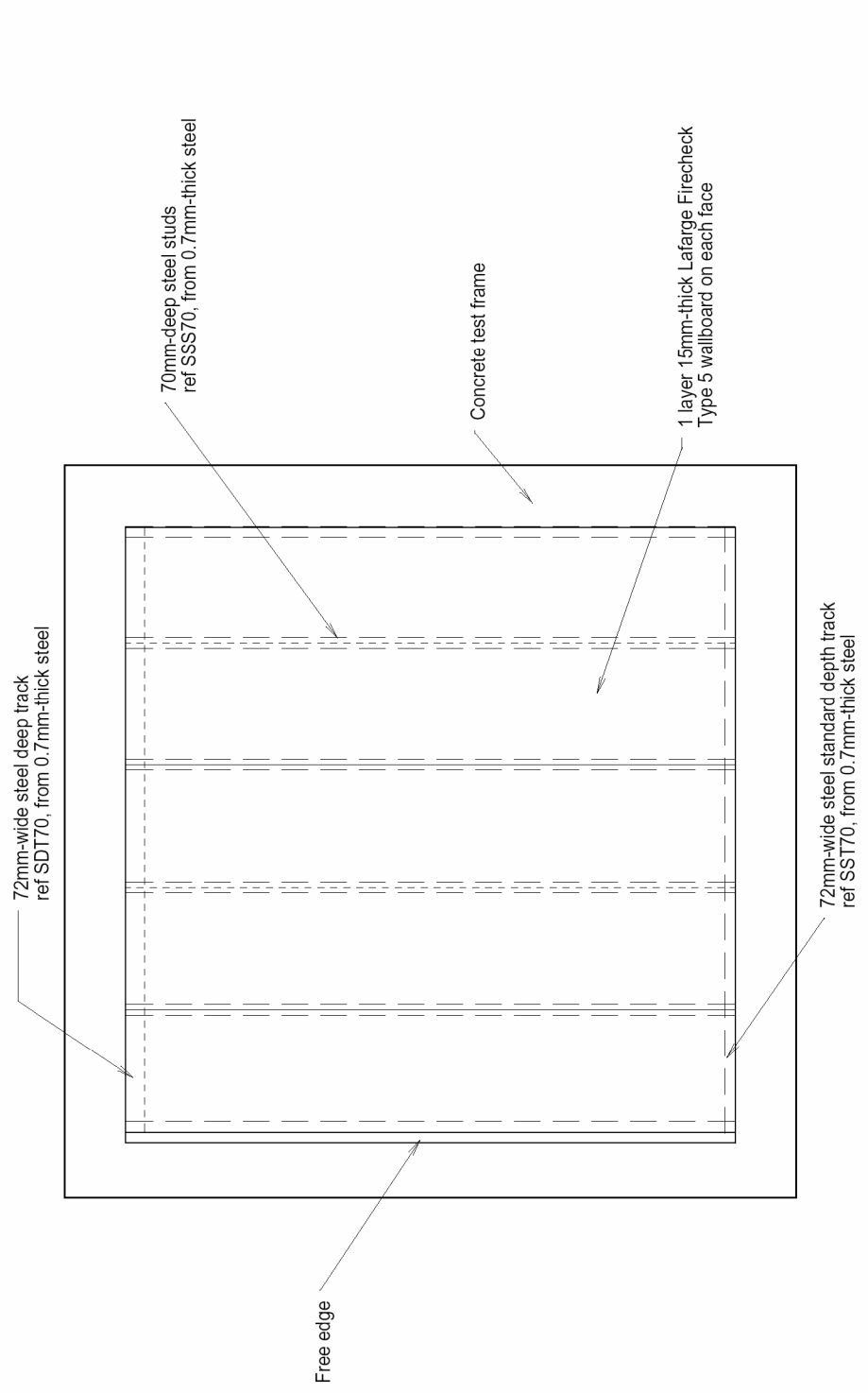


Figure 1 General arrangement of specimen.

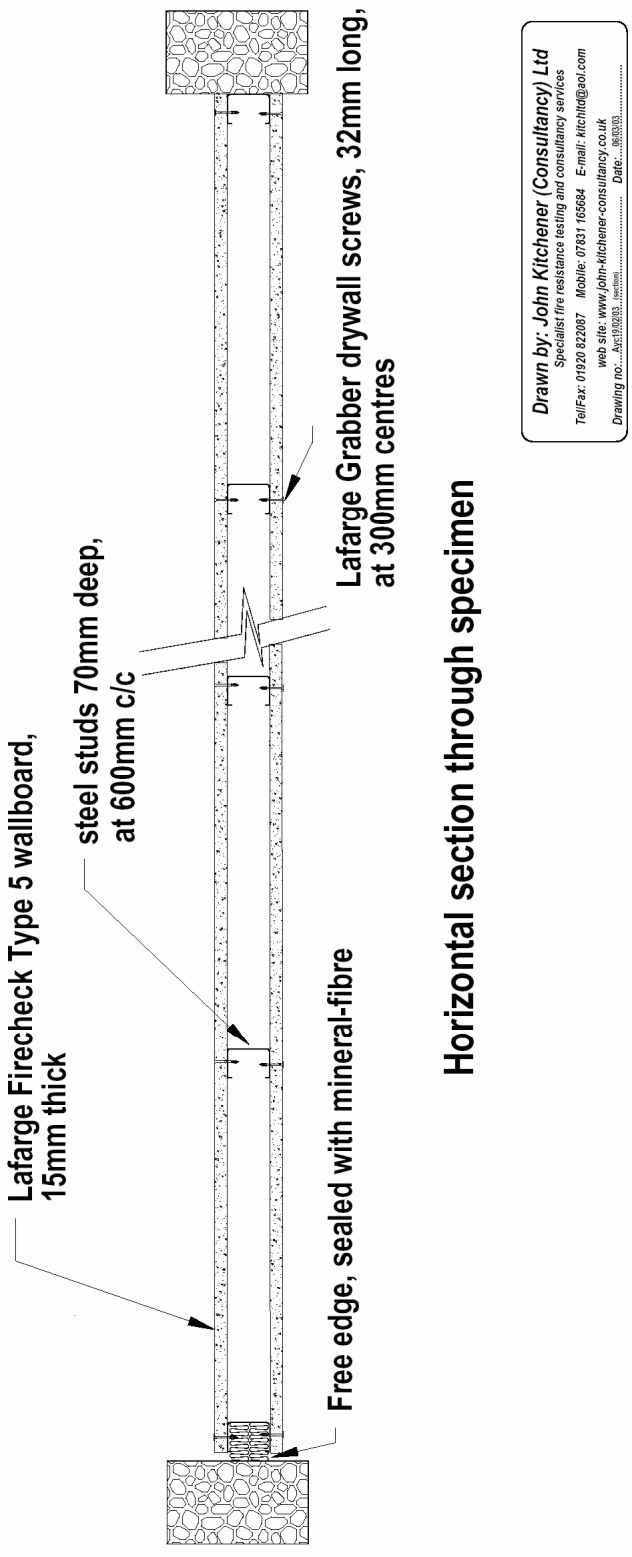
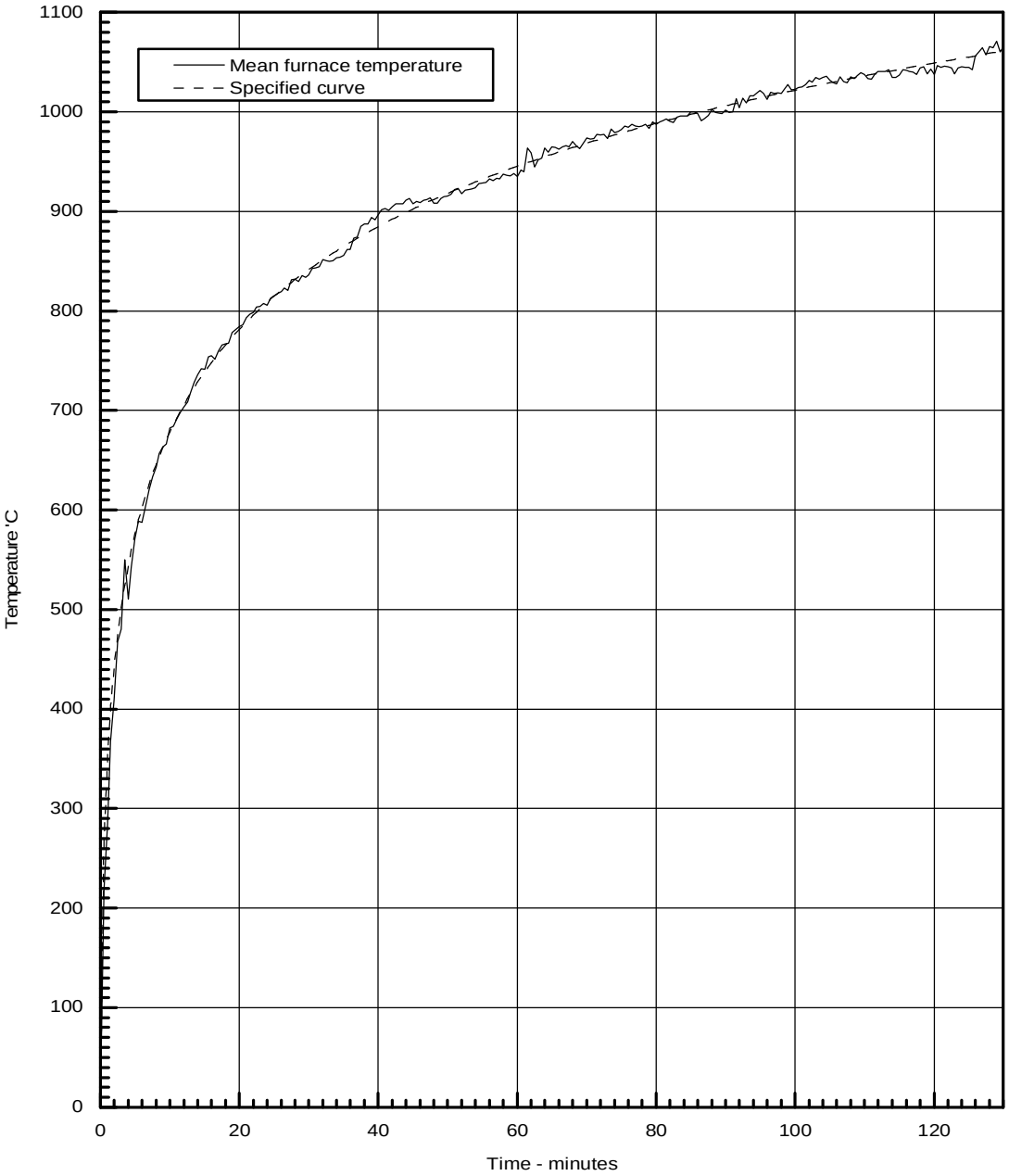
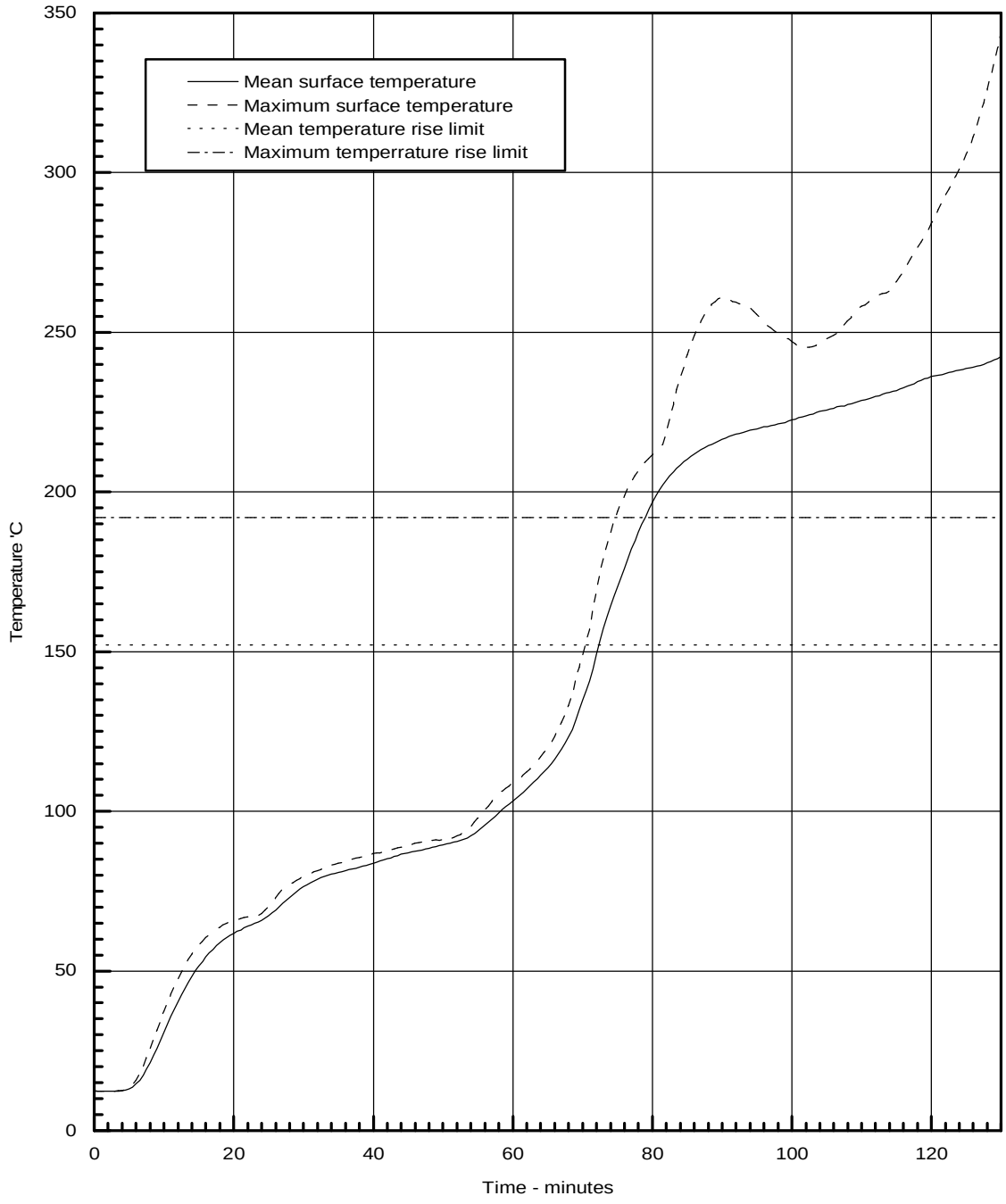


Figure 2 Section view through specimen.

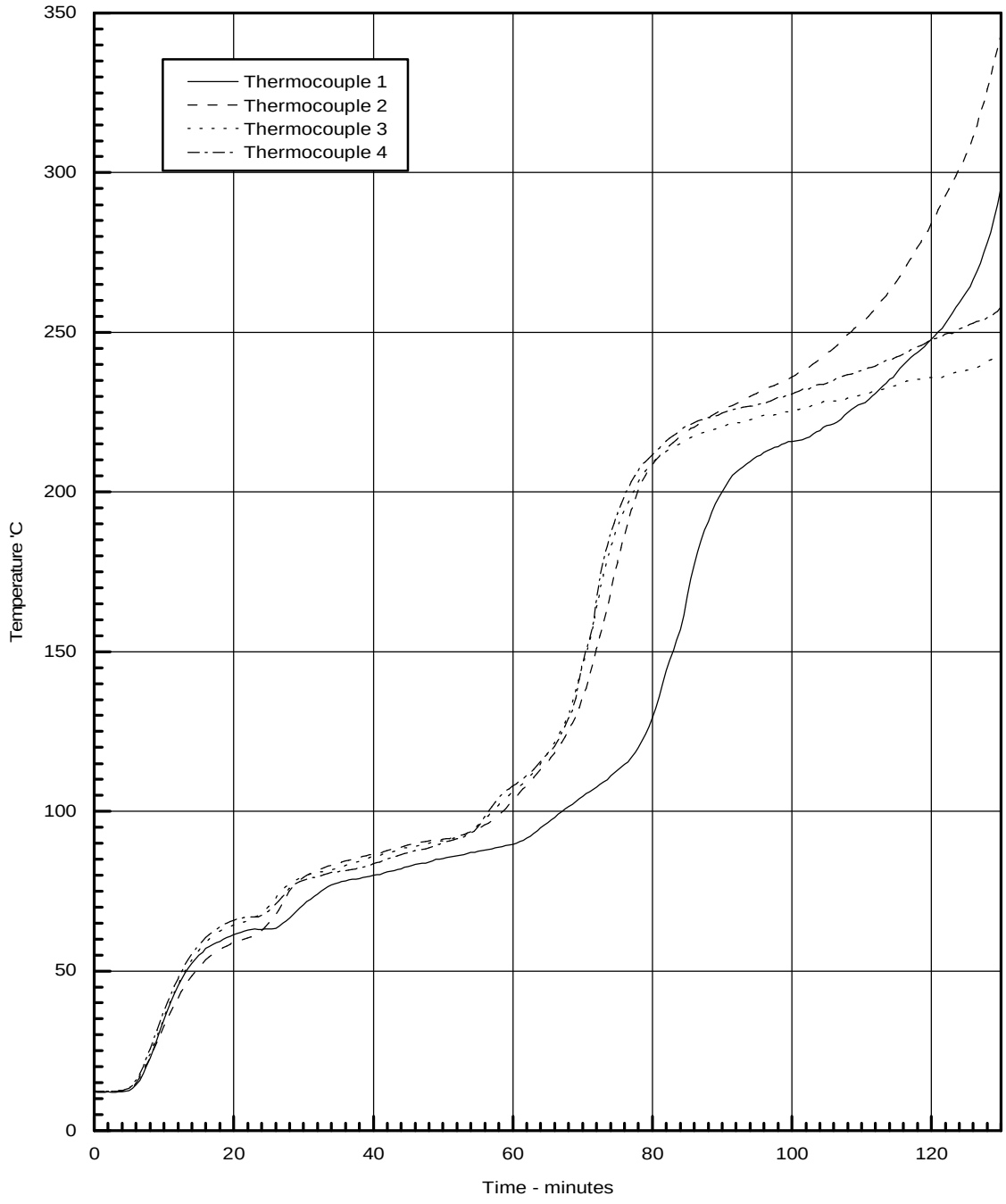
11 GRAPHS



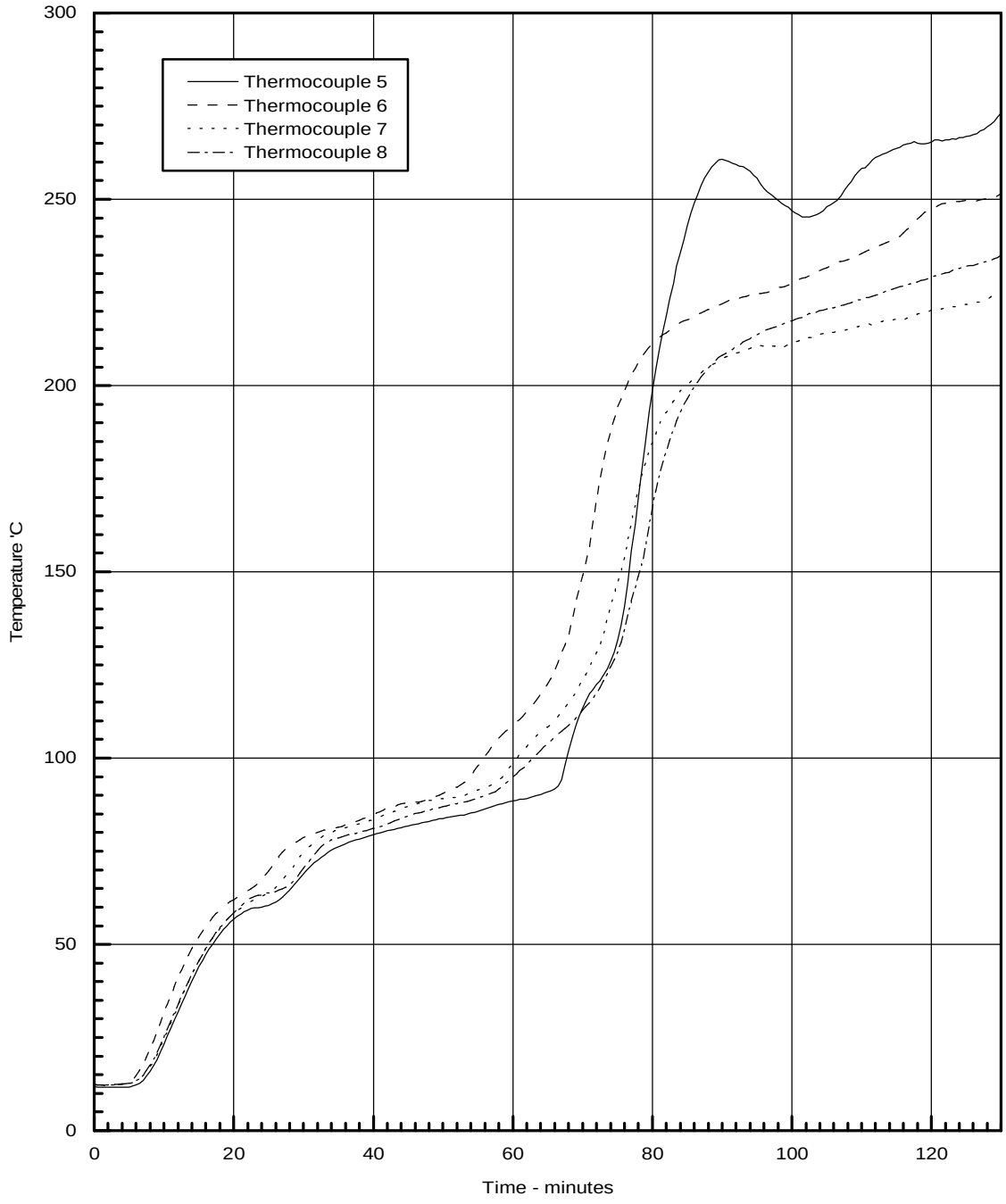
Graph 1 Mean furnace temperature with specified curve for comparison.



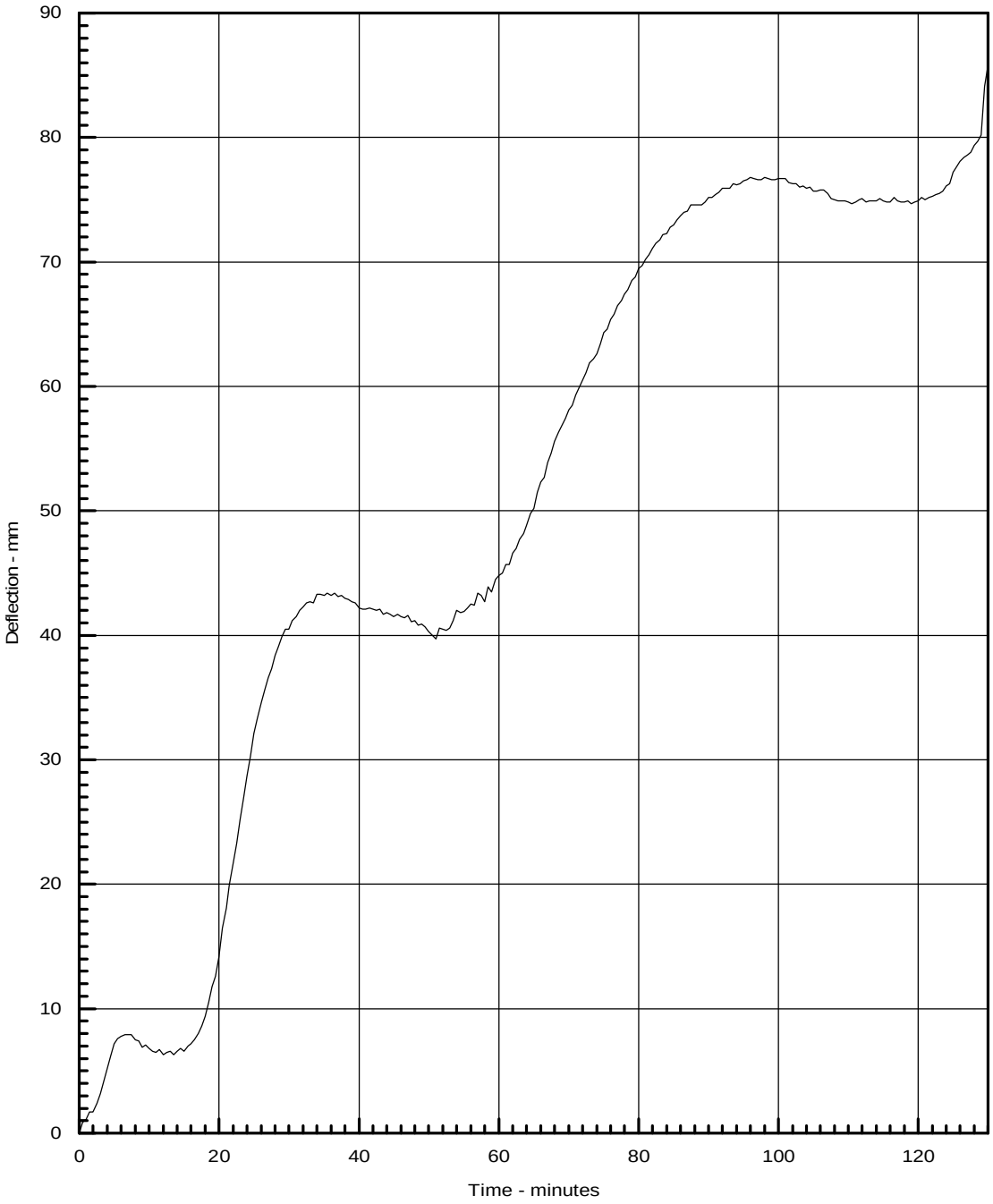
Graph 2 Mean and maximum temperatures recorded on the unexposed face of the specimen.



Graph 3 Temperatures recorded on the unexposed face by thermocouples 1 to 4.



Graph 4 Temperatures recorded on the unexposed face by thermocouples 5 to 8.



Graph 5 Deflection (towards furnace) recorded at the centre of the specimen.

12 PHOTOGRAPHS

Photo 1 Exposed face of specimen before test.

Photo 2 Unexposed face of specimen before test.

Photo 3 Unexposed face after 120 minutes.

Photo 4 Location of integrity failure (129 minutes).

Photo 5 Exposed face of specimen after test.

==========REPORT ENDS==========