Fire resistance test in accordance with B.S. 476 : Part 22 : 1987 on a double-leaf access panel.

Prepared for:
Fire Proofing services Ltd.,
13 Shilton Road,
Barwell,
Leicestershire,
LE9 8NB

2nd March 2009

Test report number 248908

0578

Protecting People, Property and the Planet

Prepared on behalf of BRE Global by

Name K. D. Fardell

Position Senior Consultant

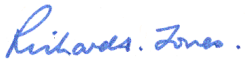
Signature 

Approved on behalf of BRE Global by

Name Richard A Jones

Position Associate Director

Date 2nd March 2009

Signature 

BRE Global
Bucknalls Lane
Watford
Herts
WD25 9XX
T + 44 (0) 1923 664100
F + 44 (0) 1923 664994
E enquiries@breglobal.com
www.breglobal.com

BRE Global is not UKAS accredited to make opinions and interpretation. Any opinions and interpretations included as part of this report are clearly marked as such.

UKAS TESTING
0578

Contents

SUMMARY

A double-leaf steel / plasterboard access panel (mounted in a steel frame) fixed into a steel-stud plasterboard partition, 130mm thick, was subjected to a fire resistance test, in accordance with B.S. 476 : Part 22 : 1987 on 17th December 2008.

The 2490mm-tall x 1790mm-wide access panel was formed from two 895mm-wide leaves, mounted in a steel frame. Both leaves were hung via continuous hinges and locked in the centre using a 2-point locking system on the passive leaf, and a 3-point locking system on the active leaf. Each leaf was formed from 1.2mm-thick Zintec steel (incorporating vertical and horizontal stiffeners) and 12.5mm-thick Megadecco wallboard. A 1.5mm-thick Zintec steel protection plate was screw-fixed to the Megadecco wallboard and the inside of the leaves was filled with 50mm-thick E-Coustiquilt insulation.

The specimen, when tested with the leaves opening away from the furnace, and with the plasterboard on the exposed face was found to have the following fire resistance:

Insulation:	18 minutes
Integrity:	132 minutes.

1 OBJECTIVE

To determine, at the request of Fire proofing Services Ltd., the fire resistance of a double-leaf access panel when installed in a drywall plasterboard partition, and tested in accordance with B.S. 476 : Part 22 : 1987.

2 CONSTRUCTION

2.1 Supporting partition

A steel-stud drywall partition was constructed within the opening (nominally 3m x 3m) of a steel reinforced concrete test frame as follows:

Galvanised steel track, 70mm wide x 30mm deep, was secured to the top and bottom of the test frame using M6 x 75mm “Thunderbolts” at nominally 600mm centres. Vertical galvanised steel studs, 70mm wide x 33mm deep, were located nominally 25mm away from each edge of the test frame, with a further two studs nominally 590mm in from each edge. These studs formed the sides of the specimen opening. Two lengths of track were now fitted between these two studs, one 260mm from the top and one 260mm from the bottom of the test frame to form the top and bottom of the opening for the access panel. Four additional vertical studs were then fitted at between 300mm and 600mm centres between the top and bottom tracks and the horizontal tracks forming the opening, as shown in the photographs section of this report. An additional length of track was fitted between the two vertical studs on either side of the partition, at a height of approximately 600mm. One 4.2mm x 13mm wafer head screw was used at each stud / track location.

Each side of the partition was clad with two layers of 15mm Lafarge GTEC plasterboard. All boards were screwed to the studs at nominally 300mm centres using 32mm-long drywall screws on the inside layer of boards, and 42mm-long Drywall screws on the outer layer. The boards were arranged so that the vertical joints in each layer of board on each face were staggered by a minimum of 600mm, relative to vertical joints in the immediately adjacent plasterboard layer.

The opening for the access panel was finally lined with one layer of 15mm Lafarge GTEC plasterboard.

Both vertical edges of the partition were unrestrained (i.e. not attached to the test frame) and were packed with ceramic fibre insulation prior to the test.

2.2 Access panel

The sponsor provided the description of the specimen. As the door set was supplied complete, only surface details and dimensions were verified by BRE before the test.

The door trays consisted of a 1.0mm thick Zintec steel skin, strengthened with two pre-formed vertical stiffeners and two pre-formed horizontal stiffeners, formed from 1.5mm-thick steel, and welded within the door tray.

The door was hinged via a mild steel continuous hinge welded to the door leaves, and bolted to the frame.

A 12.5mm thick Lafarge Megadeco wallboard was inserted into the recessed door and screw fixed to the door tray using 32mm drywall screws. This wallboard was then covered with a 1.5mm thick Zintec steel rear protection plate, screw-fixed to the door at nominally 200mm centres, the screws locating into the stiffeners inside the door leaves. The space between the Megadeco wallboard and the front of the door leaves was filled with E-Coustiquilt insulation.

The locking device consisted of a 2-point locking system in the passive leaf, and a 3-point locking system in the active leaf, both comprising 8mm-diameter steel rods locating into the frame top and bottom and a central cam locking the door leaves at mid-height. The locking rods engaged approximately 10mm into the frame at the top and bottom of the door leaves.

The frame consisted of a pre-formed 1.2mm-thick Zintec steel section with a 25mm wide front flange. The frame was tightly fitted into the structural opening in the partition, and screwed in position using M5 x 50mm self tapping screws.

The metal doors and frame were polyester powder coated RAL 9010, 20% Gloss.

The gaps between the leaf and frame were observed to be nominally between 2mm and 3mm.

Intumescent and Neoprene seals were used at the door / leaf interfaces, with a Neoprene seal between the leaves, as detailed in the attached figures.

Further details of the specimen construction are shown in the attached figures, and the specimen is shown before the test in the attached photographs.

3 TEST PROCEDURE

3.1 General

The test was carried out on 14th December 2005 and was witnessed by Mr. T. Beasley, Mr. R Stokes and Mr. P Caven representing the sponsor. The ambient temperature at the start of the test was 15^{O}C.

3.2 Furnace control

The furnace temperature was measured by means of fourteen bare-wire chromel/alumel thermocouples arranged symmetrically in the furnace with their measuring junctions 100mm away from the exposed face of the specimen. The furnace was controlled so that the average temperature followed the time temperature relationship specified in B.S. 476 : Part 20 : 1987[1]. After the first 5 minutes of the test, the pressure in the furnace was maintained so that a pressure of 18Pa existed at the top of the access panel.

3.3 Specimen temperature

The temperature on the unexposed face of the specimen was measured using twenty chromel / alumel (K-type) thermocouples each soldered to a copper disc and covered with an insulating pad, 30mm x 30mm x 2mm thick, as described in B.S. 476 : Part 20 : 1987. The location of the thermocouples is given in following table and is shown in the attached photographs.

Thermocouple	Location
1	On the access panel frame, centrally above the left hand side leaf.
2	On the access panel frame, centrally above the right hand side leaf.
3	Near the top left corner of the left hand side leaf.
4	Near the top right corner of the left hand side leaf.
5	Near the top left corner of the right hand side leaf.
6	Near the top right corner of the right hand side leaf.
7*	Near the centre of the top left quarter of the access panel (on the left hand side leaf).
8	Over an internal vertical stiffener, near to the moving edge of the left hand side leaf, approximately 500mm from the top of the access panel.
9	Over an internal vertical stiffener, near to the moving edge of the right hand side leaf, approximately 500mm from the top of the access panel.
10*	Near the centre of the top right quarter of the access panel (on the right hand side leaf).
11	Over the internal horizontal stiffener in the top part of the left hand side leaf, and adjacent to a screw location.
12	Over the internal horizontal stiffener in the top part of the right hand side leaf, and adjacent to a screw location.
13	On the left hand side frame member at mid height.
14	Near the lock mechanism on the left hand side leaf.
15	On the right hand side leaf, over the vertical stiffener near the left hand side, just above mid height.
16*†	Approximately 250 mm away from the moving edge of the right hand side leaf, at mid-height.

Thermocouple	Location
17	On the right hand side frame member at mid height.
18*	Near the centre of the bottom left quarter of the access panel (on the left hand side leaf).
19*	Near the centre of the bottom right quarter of the access panel (on the right hand side leaf).
20	On the supporting partition at mid-height, adjacent to the access panel opening.

* These thermocouples were used to determine the mean surface temperature of the access panel.

† This thermocouple inadvertently coincided with a joint in the insulation inside the door leaf. As such, the temperature at this location was not representative of the mean temperature (as specified in the standard) and so was not used in the determination of mean surface temperature.

3.4 Deflection

A transducer activated by a fine taut wire attached at the centre of the access panel leaves (on the right hand side leaf) was used to continuously monitor deflection throughout the test.

4 RESULTS

4.1 Observations

The observations made during the test are given in the following table and refer to the unexposed face.

Observations.

Time min	Observation.
0	Test started.
7	Some smoke is coming from the top edge of the left hand side leaf, and from the meeting point between the leaves at approximately ¾ height.
12	The doors are bending towards the furnace, causing a gap of approximately 10mm to form between the door leaf and frame members at mid width of both leaves.
13	Slight smoke from the handle location. Some smoke is now coming from the top of the right hand side leaf.

Time min	Observation.
26	The meeting point of the two leaves is darkening as it heats up.
31	Some of the gasket fell from between the leaves at approximately mid height, and hot gases are coming out from this location. The temperature of the surface in the vicinity of this area is in excess of 300^{O}C. However, for information, the cotton pad was applied, and did not glow or flame. A small amount of smoke is coming out from the bottom of the left hand side door leaf / frame interface, approximately 200mm from the left hand side.
36	The active leaf has moved towards the furnace by approximately 18mm relative to the passive leaf at mid-height.
38	An occasional spark was observed form the joint between leaves at mid height.
45	An approximately 400mm length of gasket has now fallen out from between the leaves, above the centre lock location.
61	A red glow is visible down the moving edge of the left hand side leaf.
70	A localised hot area is forming across the leaves at approximately mid height.
98	An approximately 1m length of gasket has now fallen out from between the leaves, above the centre lock location. Both leaves are now darkening as they heat up.
112	Gaps between the door leaves and frame members have filled with intumescent char.
132	Test stopped.

There was no failure of integrity during the test.

4.2 Temperature measurements

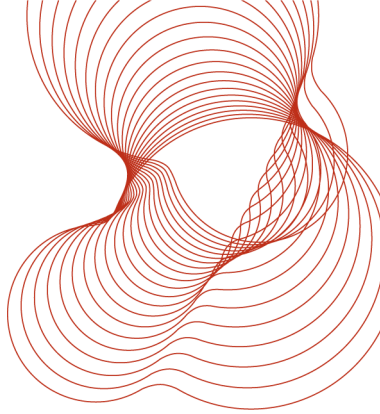
4.2.1 Furnace temperature

The mean furnace temperature, together with the specified curve for comparison is given in the attached graphs.

4.2.2 Unexposed face temperatures

The mean, maximum and individual temperatures recorded on the access panel leaf and frame are plotted against time in the attached graphs. Due to local heating of thermocouple number 16, only thermocouple numbers 7, 10, 18 and 19 were used to determine the mean surface temperature.

The limit for maximum temperature rise (180^{O}C) was first exceeded after 18 minutes by thermocouple number 4 and the limit for mean temperature rise (140^{O}C) was exceeded after 51 minutes.



4.2.3 Deflection

The deflection recorded near the centre of the access panel is shown plotted against time in the attached graphs.

5 PERFORMANCE CRITERIA

The standards[1,3] state that a door / shutter assembly is regarded as having a fire resistance (expressed in minutes) that is equal to the elapsed time (to the nearest completed minute) 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 10s on the unexposed face occurs;

b) when cracks, gaps or fissures allow flames or hot gases to cause flaming or glowing of a cotton fibre pad;

c) a 6mm-diameter gap gauge can penetrate through a gap into the furnace other than at sill level, and be moved in the gap for a distance of at least 150mm;

d) a 25mm-diameter gap gauge can penetrate through a gap into the furnace.

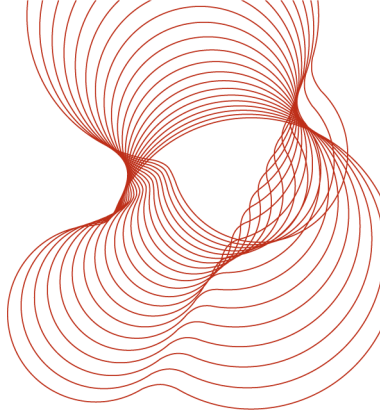
Insulation : Failure is deemed to occur:

a) when the mean unexposed face temperature increases by more than 140^{O}C above its initial value;

b) when the temperature recorded at any positions on the unexposed face is in excess of 180^{O}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.



6 CONCLUSION

A 2490mm-tall x 1790mm-wide double leaf access panel incorporated in a 130mm-thick drywall partition, as described in this report was tested in accordance with B.S. 476 : Part 22 : 1987 and in the orientation tested was found to have the following fire resistance:

Insulation:	18 minutes
Integrity:	132 minutes

Because of the nature of fire resistance testing and the consequent difficulty in quantifying the uncertainty of measurement of fire resistance, it is not possible to provide a stated degree of accuracy of the result.

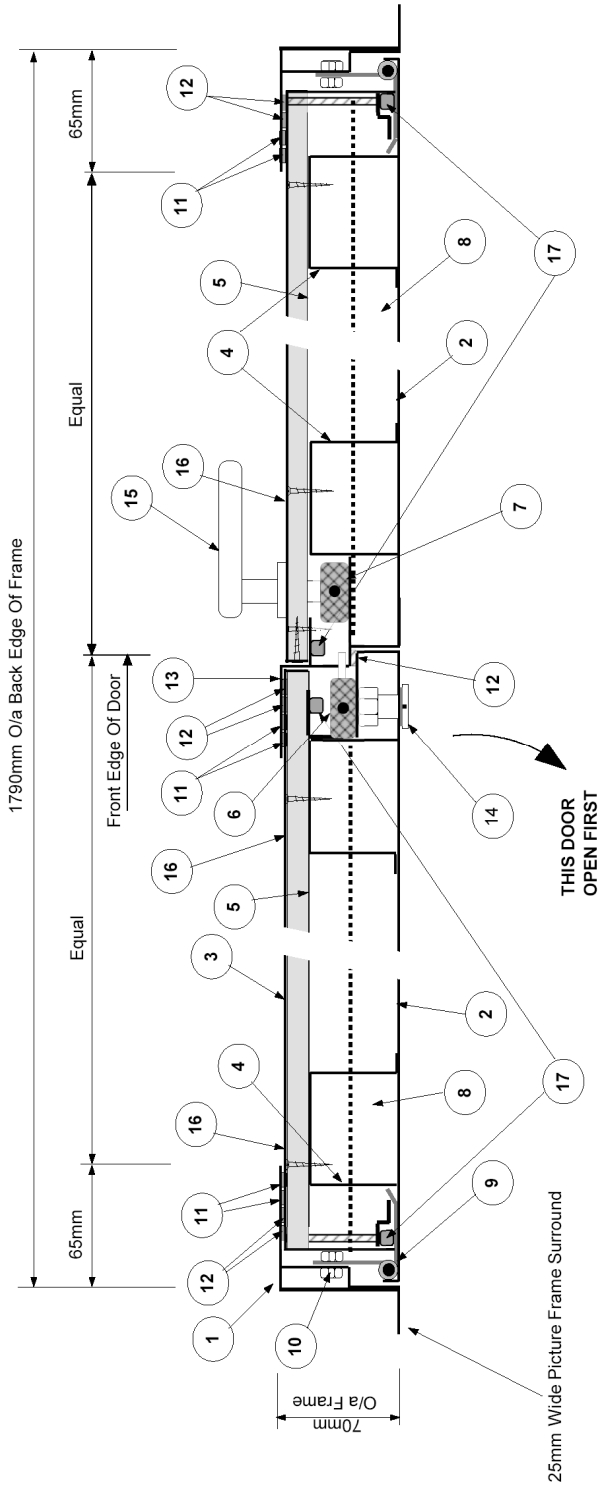
The specification and interpretation of fire test methods is the subject of ongoing development and refinement. Changes in associated legislation may also occur. For these reasons it is recommended that the relevance of test report's over 5 years old should be considered by the user. The laboratory that 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.

7 REFERENCES

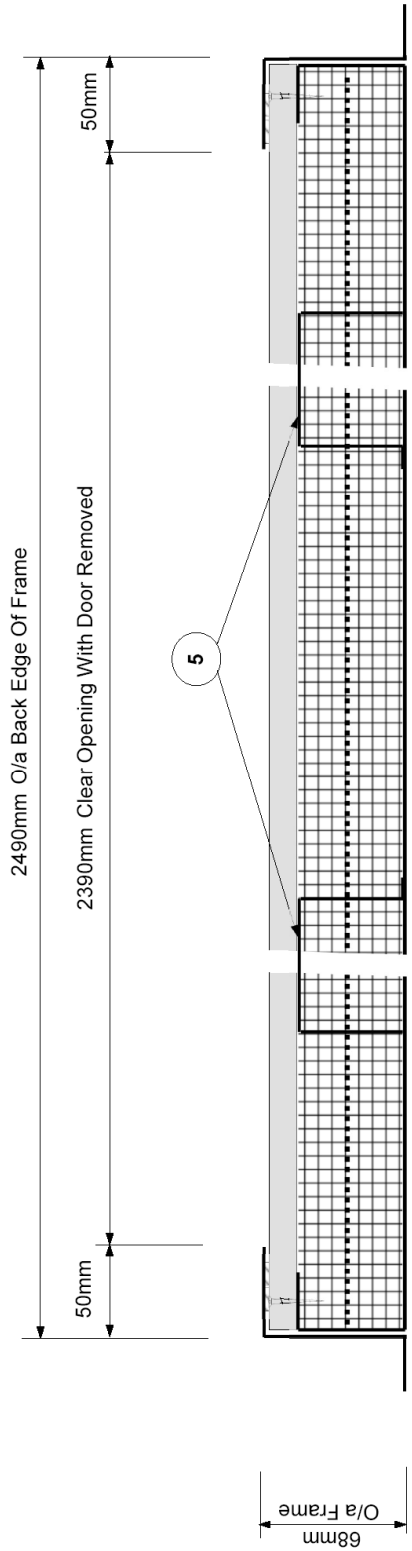
Fire tests on building materials and structures. Part 20. Method for determination of the fire resistance of elements of construction (general principles). British Standard 476 : Part 20 : 1987. British Standards Institution, London, 1987.

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

8 FIGURES



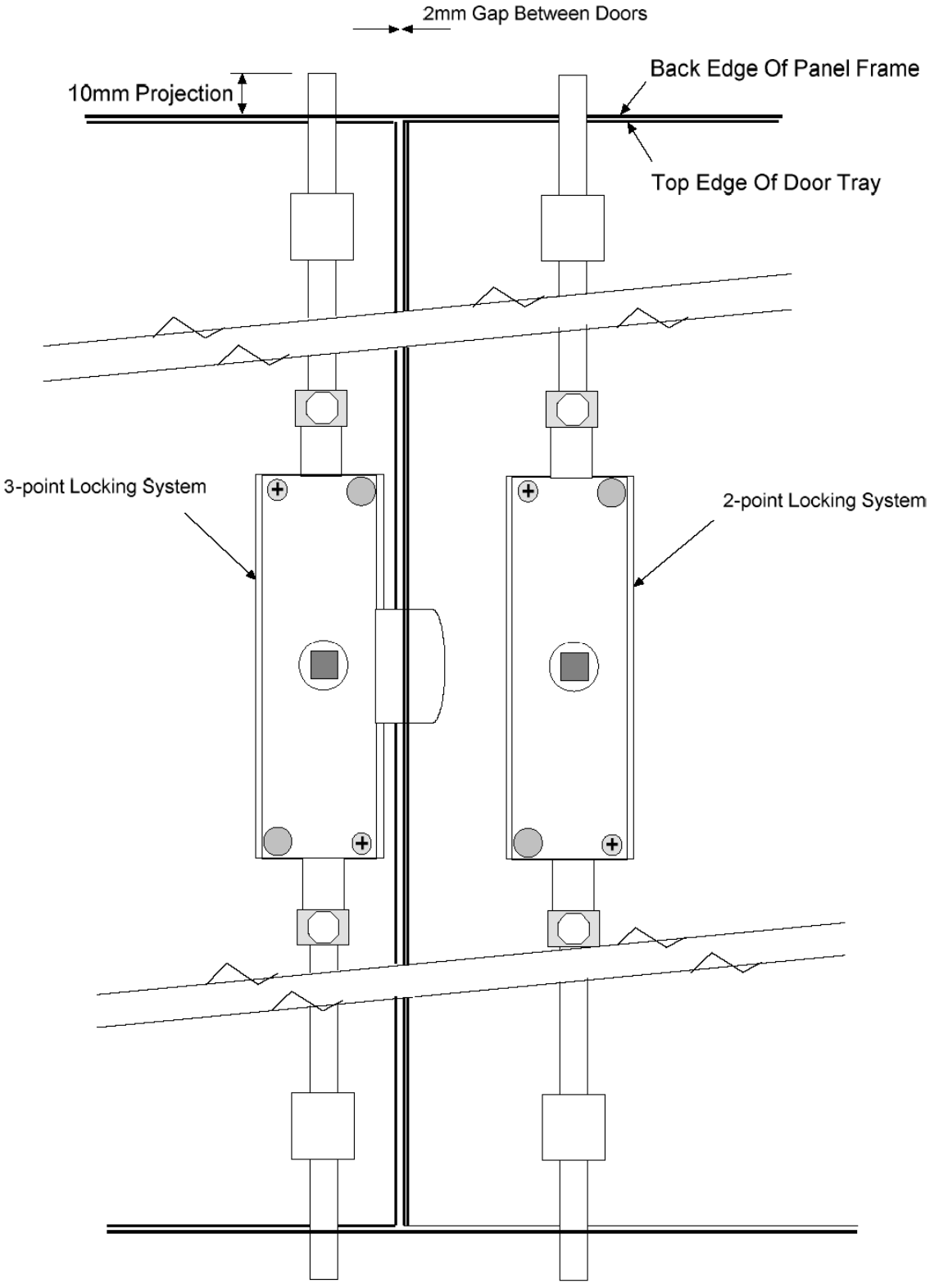
Horizontal section showing details of specimen.



Vertical section of specimen.

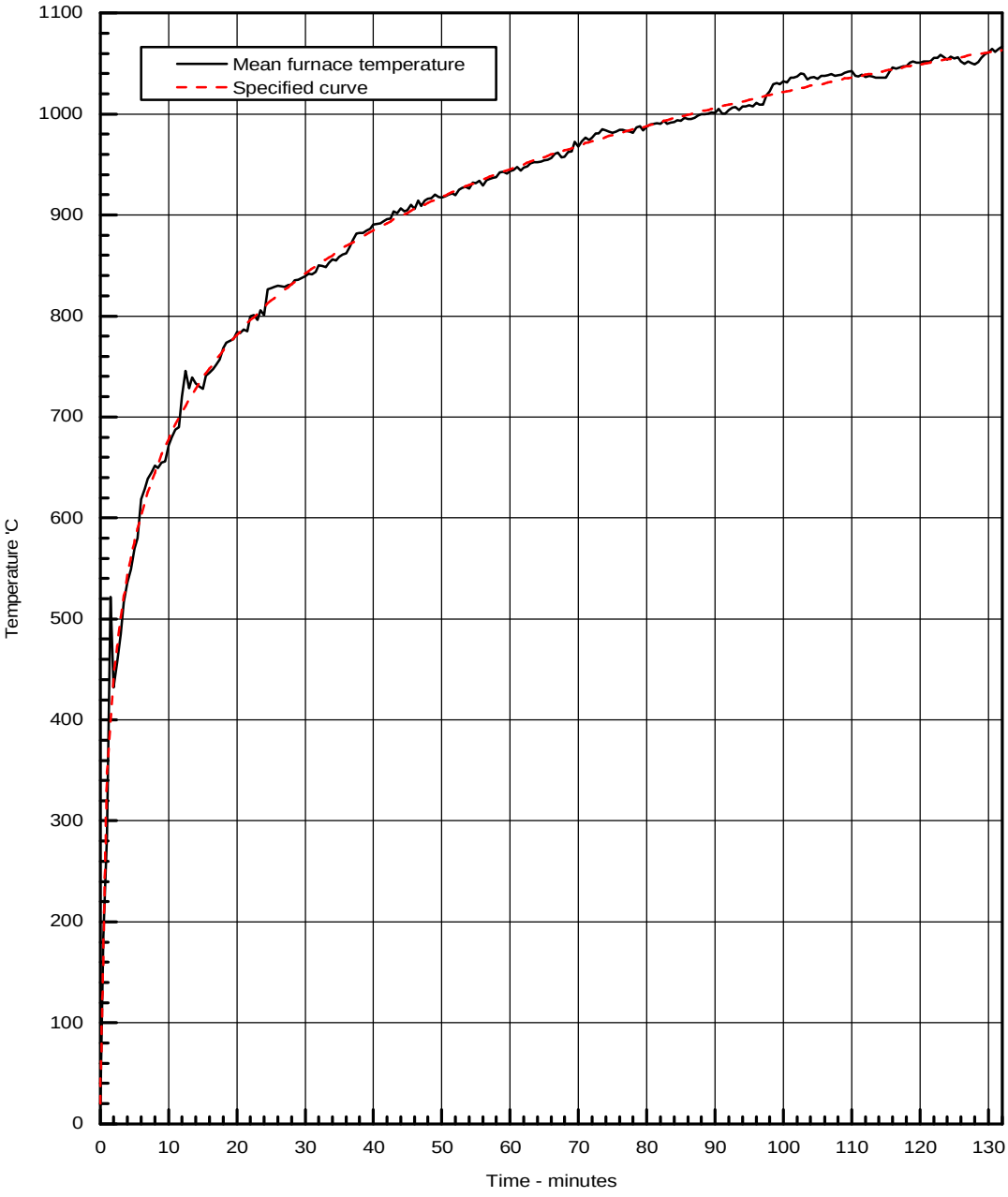
1. Access panel frame manufactured from 1.2mm thick Zintec steel sheet. The 25mm wide picture frame surround was mitred at each corner. All seams were fully welded and sealed.
2. Access panel door tray manufactured from 1.0mm thick Zintec steel sheet, cut and folded to dimensions shown.
3. 12.5mm thick Lafarge Megadeco wallboard factory screw fixed to the rear of the door tray using 32mm drywall screws.
4. 2No. 1.5mm thick Zintec steel stiffeners per door welded vertical at each edge as shown of door tray. Size 48mm x 100mm x 48mm x 20mm.
5. 2No. 1.5mm thick Zintec steel stiffeners per door welded horizontal off centre of the door tray. Size 20mm x 48mm x 100 x 48mm x 20mm.
6. 3-point locking system (see enclosed detail) with central lock operating 8mm diameter rods which lock into frame top and bottom. The rods are secured to the door tray with 4No. lock guides.
7. 2-point locking system (see enclosed detail) with central lock operating 8mm diameter rods which lock into frame top and bottom. The rods are secured to the door tray with 4No. lock guides.
8. 50mm thick E-Coustiquilt matting inserted into cavities between door tray and Megadeco wall board.
9. Mild steel continuous hinge welded to door tray and bolted to frame using M6 bolts and nuts with washer.
10. M6 bolts welded to panel frame at 50mm in from edges and 300mm centres thereafter. Door tray secured to frame using M6 nuts and washers.
11. 4No. 10mm wide x 2mm thick self adhesive intumescent (BS476,part 1) glazing strip (Envirograph Ref: G10/10) fitted around inside edge of frame and rear edge of door tray.
12. 2 No. strips of self-adhesive Lorient Neoprene Seal around inside edge of frame.
13. 1.5mm thick Zintec door angle 65mm wide.
14. 14mm diameter metal screw bung with neoprene washer, covering budget lock hole in door tray.
15. Chrome Handle with 8mm square bar fixed to 2-point locking system, screw fixed to rear of door tray.
16. 1.5mm thick Zintec steel rear protection plate screw -fixed to rear of door.
17. M5 Hankbushes and Screws to Provide Extra Fixing Points For Rear Plates

Key to the first two drawings.

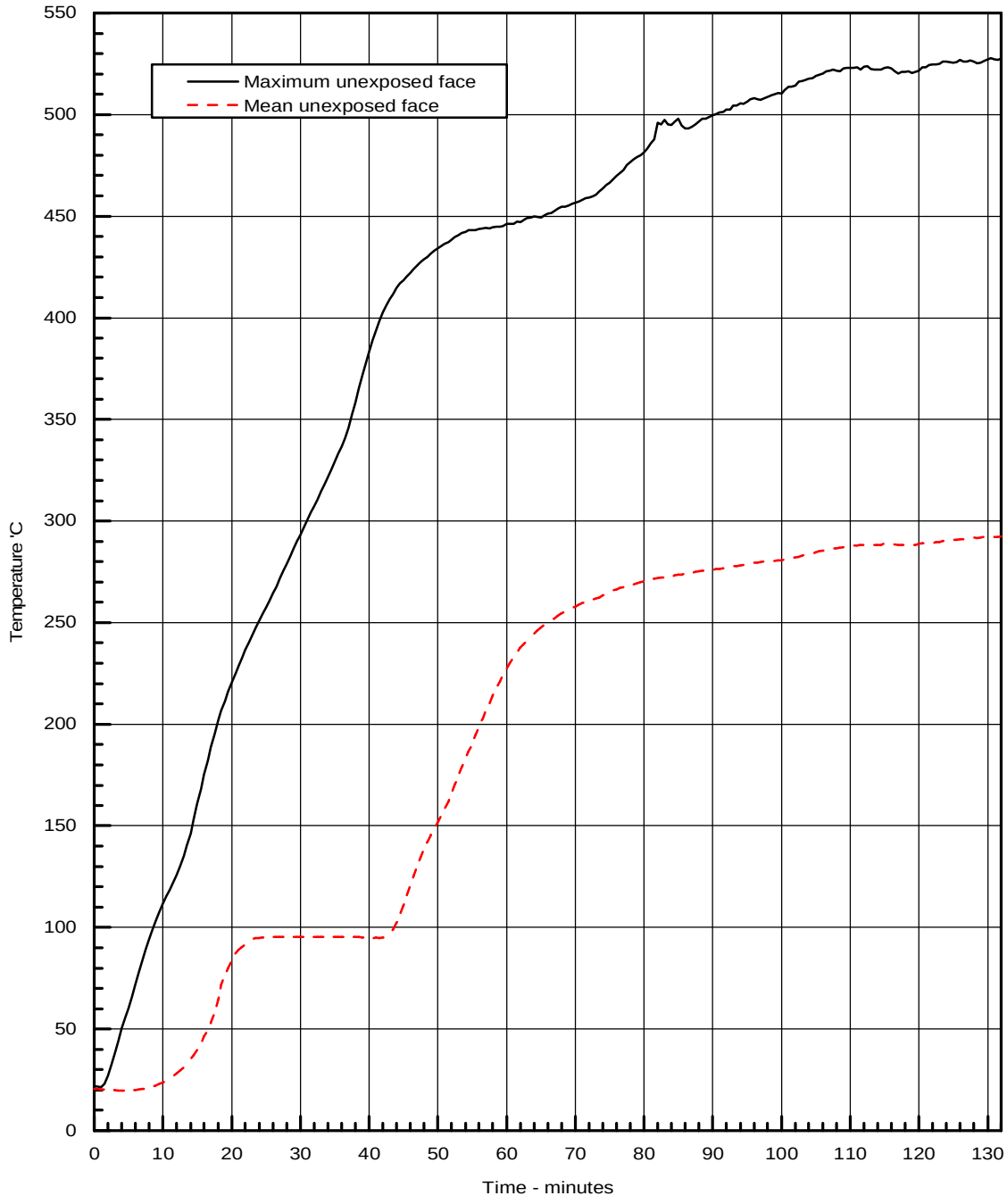


Rear view of access panels showing locking positions.

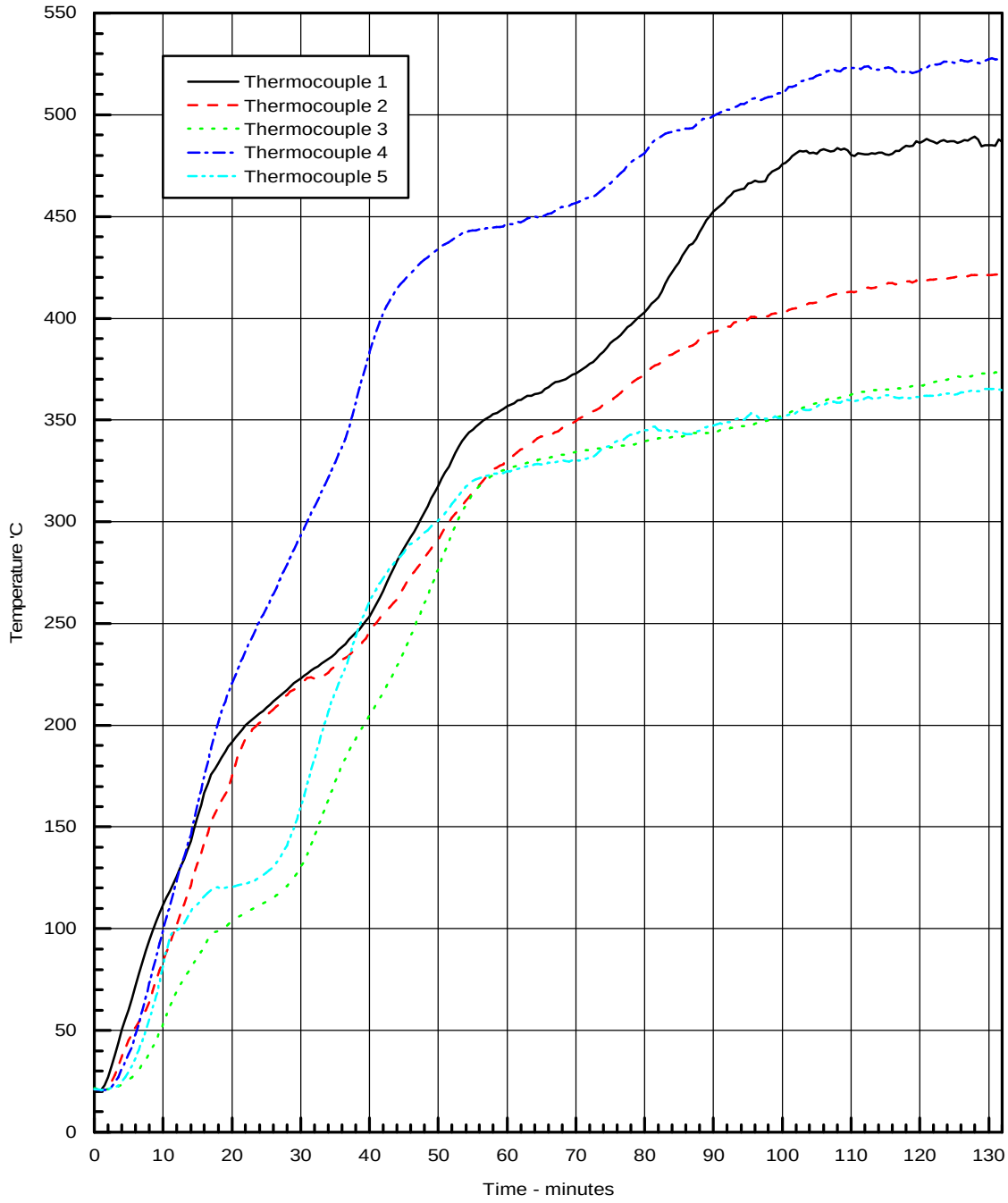
9 GRAPHS



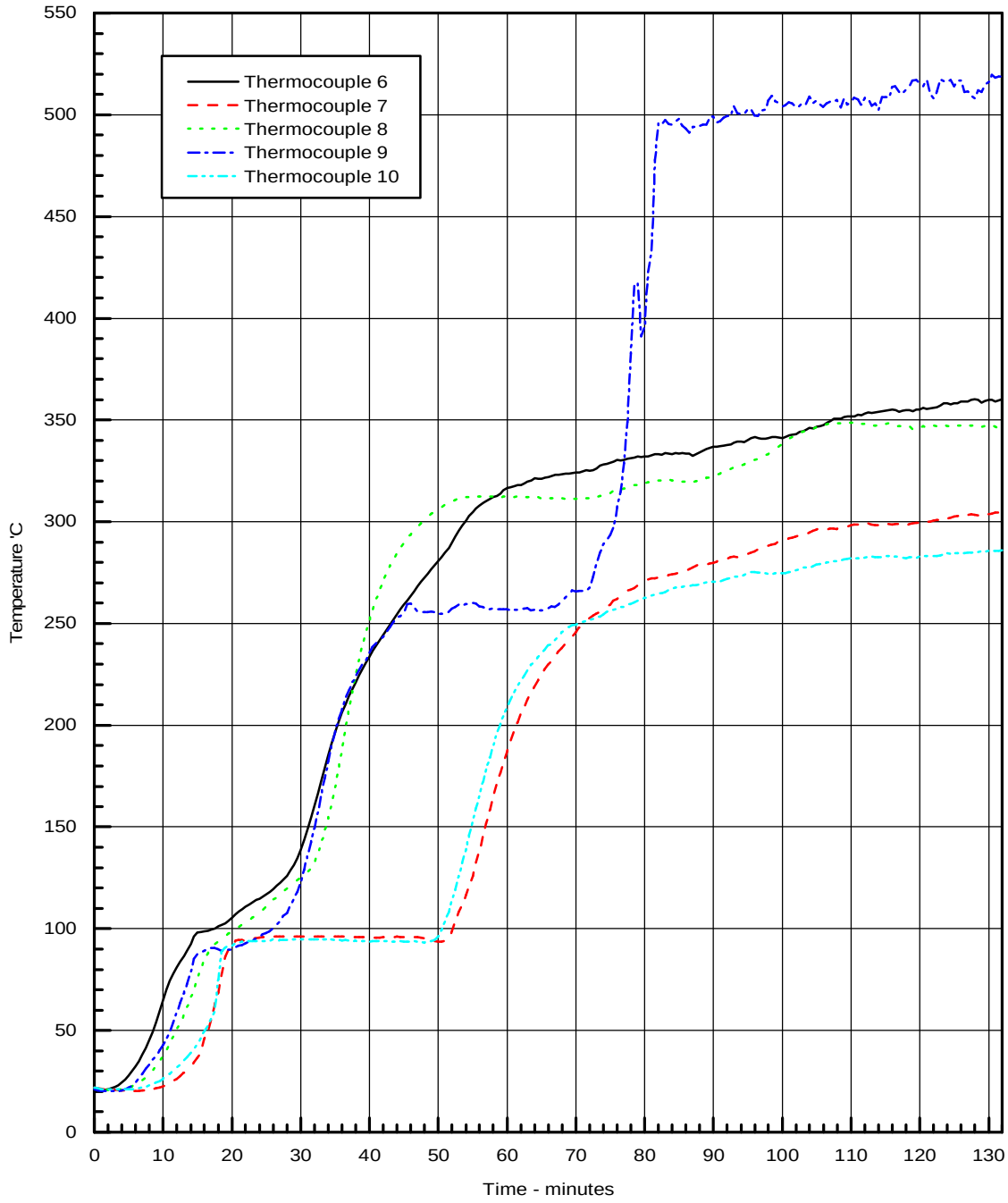
Mean furnace temperature with specified curve for comparison.



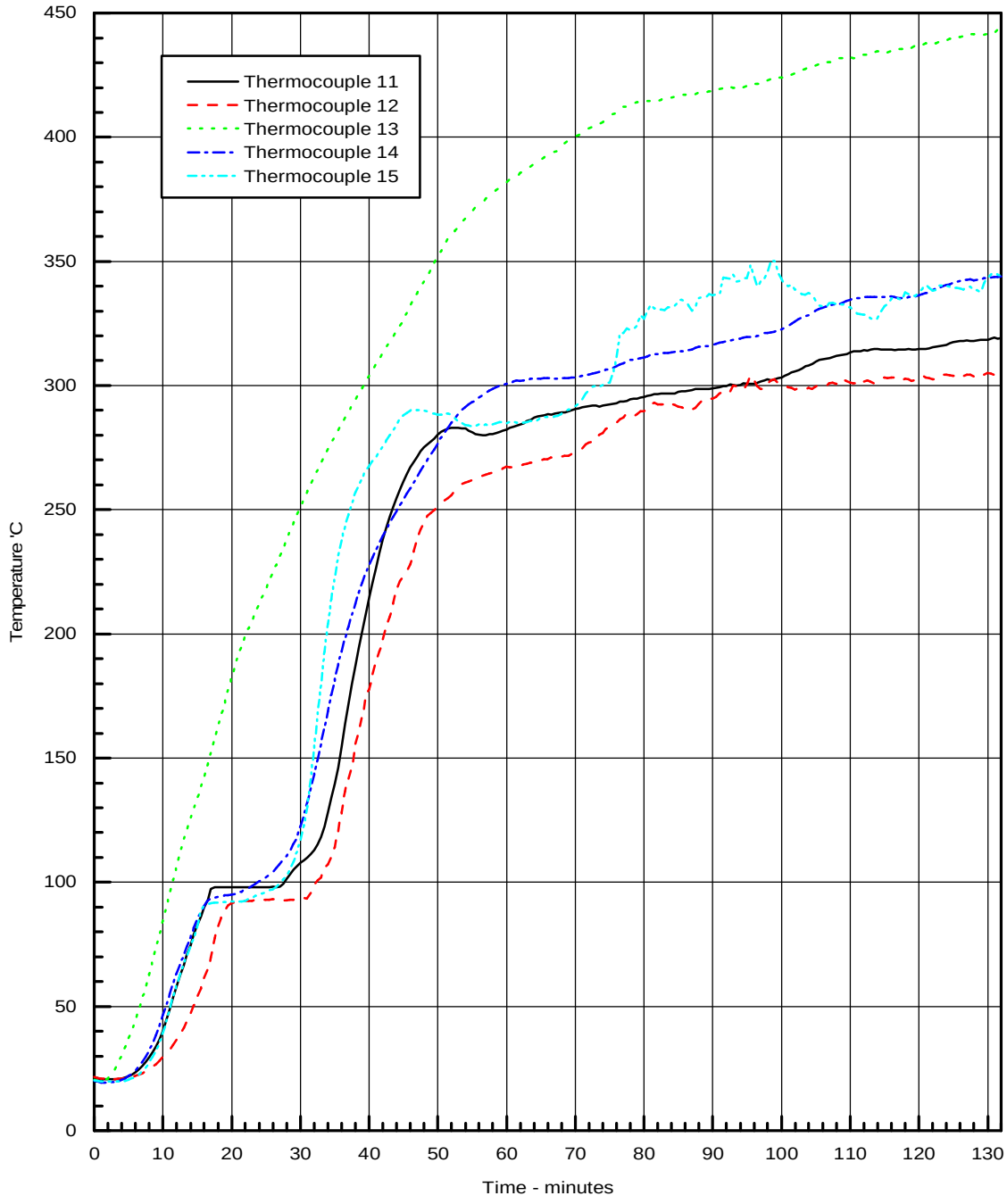
Mean and maximum unexposed face temperatures.



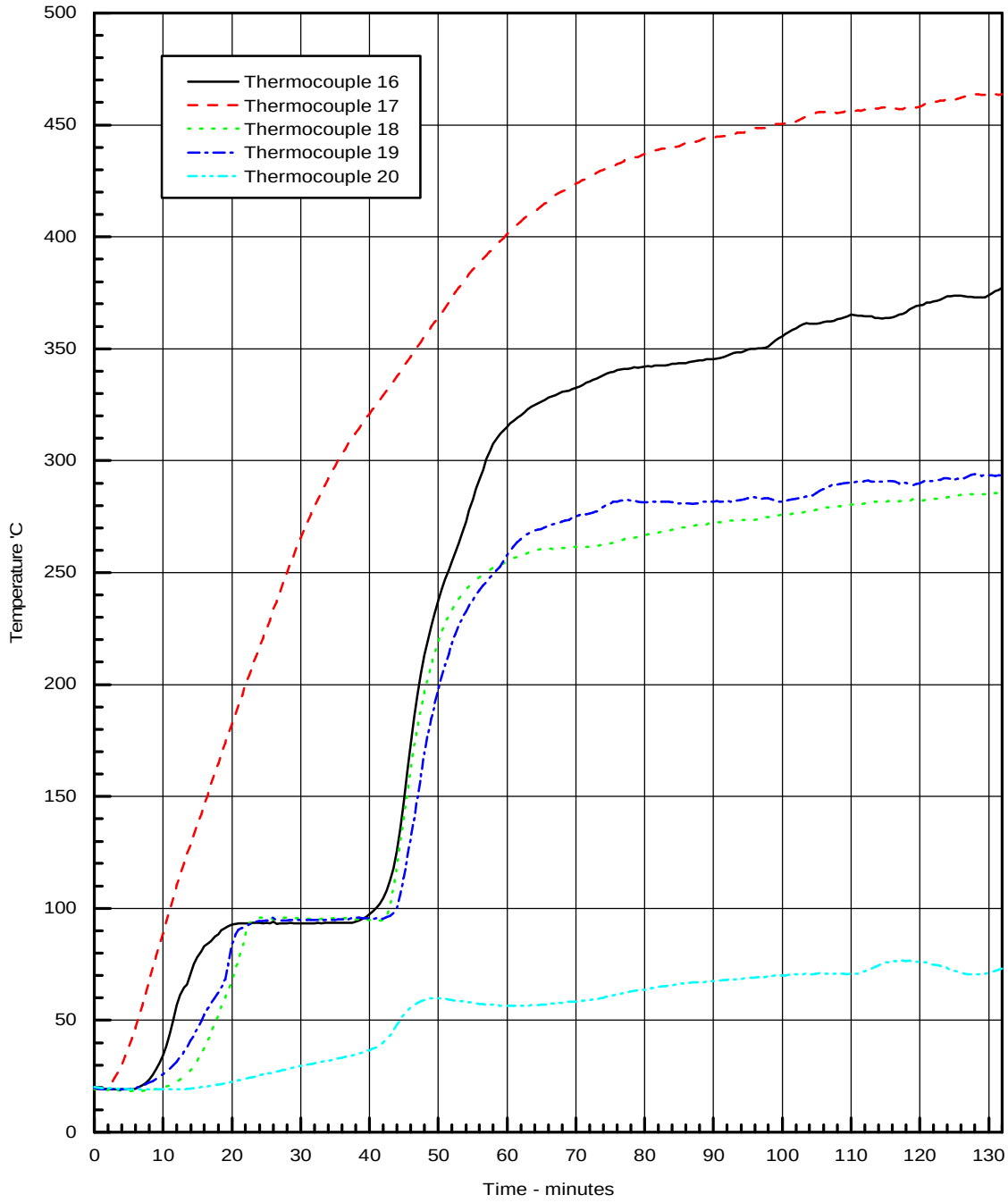
Temperatures recorded on the unexposed face by thermocouples 1 to 5.



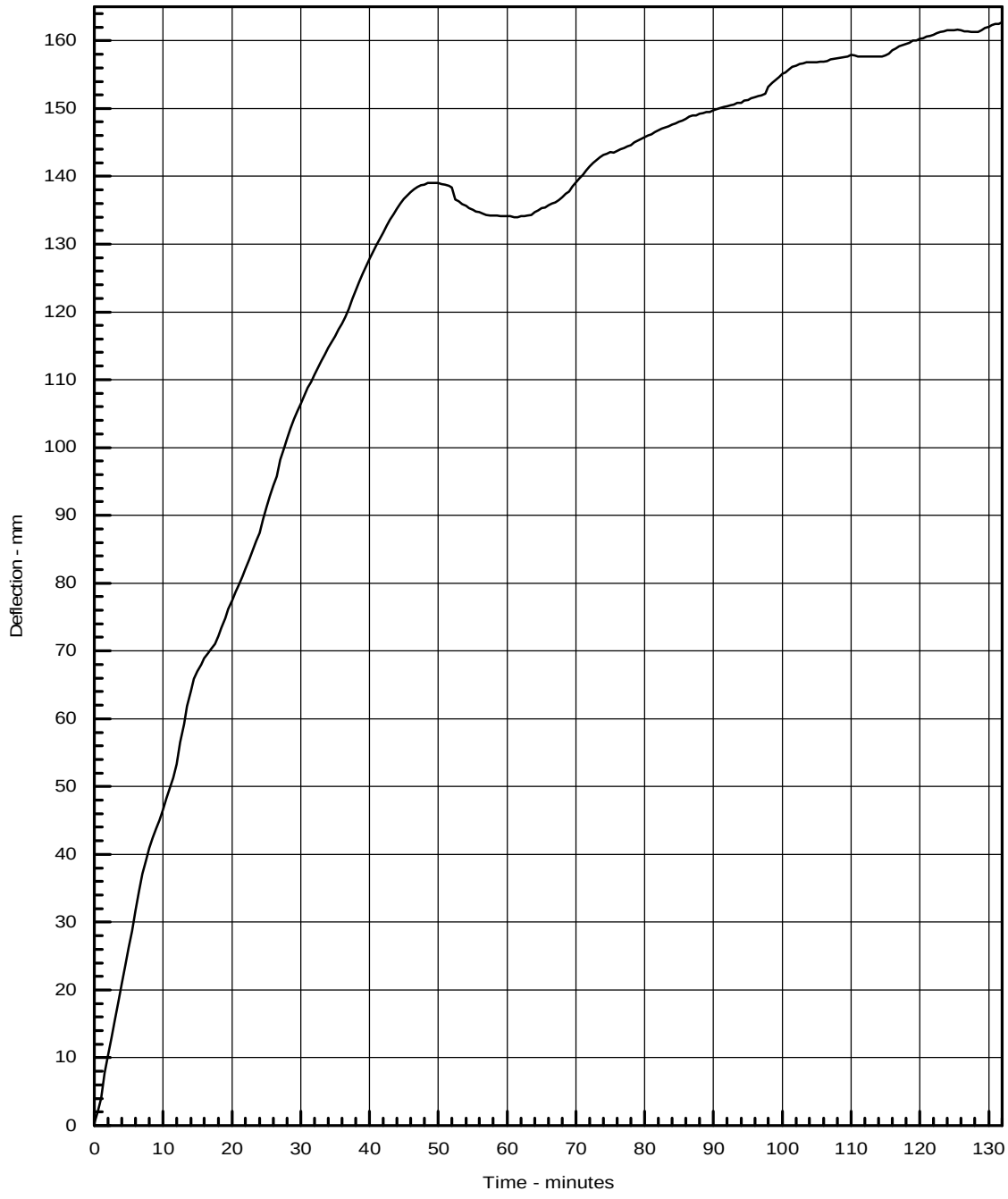
Temperatures recorded on the unexposed face by thermocouples 6 to 10.



Temperatures recorded on the unexposed face by thermocouples 11 to 15.



Temperatures recorded on the unexposed face by thermocouples 16 to 20.



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

10 PHOTOGRAPHS

Partition during construction.

Exposed face of specimen before test.

Unexposed face of specimen before test.

Unexposed face of specimen at end of test.

Exposed face of specimen after test.

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