# REPORT

Issued by an Accredited Testing Laboratory

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Göteborgs stad Lokalförvaltningen
Box 5163
402 26 GÖTEBORG

# Fire resistance test of load-bearing wall

(4 appendices)

## Test

This report details the method of construction, the test conditions and the results obtained when the specific element of construction described herein was tested following the procedure outlined in the accredited test methods:

• EN 1365-1:2012/AC:2013

• EN 1363-1:2020

Any significant deviation with respect to size, constructional details, loads, stresses, edge or end conditions other than those allowed under the field of direct application in the relevant test method is not covered by this report.

## Product

Load-bearing wall made of wood studs and insulation.

## Product designation

Träregelvägg med lerskiva

## Sponsor/owner of the report

Göteborgs stad Lokalförvaltningen
Box 5163
402 26 GÖTEBORG
SWEDEN

## Reference number

O100402-1101398-2





Accred. No. 1002
Testing
ISO/IEC 17025

# 1 The purpose of the test

The purpose of the test was to determine the fire resistance of the test specimen described in chapter 2.

# 2 Test specimen and test setup

## 2.1 General information

The test specimen consisted of one load-bearing wall made of wood studs and insulation.

The manufacturer was Göteborgs Stad, Lokalförvaltningen.

The construction of the test specimen can be seen in the sponsor's drawings and specifications in Appendix 1 and in the description in chapter 2.3 below.

## 2.2 Selection and delivery of the test specimen

Materials and components for assembling and mounting the test specimen were selected and delivered to RISE by the sponsor of the test. The sponsor delivered more materials and components than needed for the test specimen. RISE randomly sampled materials and components for the test specimen from what has been delivered.

The material for the test specimen arrived at RISE on February 11, April 29 and Maj 11, 2022.

### 2.2.1 Specific sampling and delivery of components in the test specimen

The wood studs were selected and marked by RISE at Norrby Trä and delivered to RISE. The sampling was performed on February 10 and April 28 2022.

## 2.3 Description of the construction

The test specimen was built up by two parallel frameworks of wood profiles with a distance of 30 mm between them. The framework was insulated with wood fibre insulation and covered with wood panels, clay boards and clay mortar on each side.
The outer dimensions of the framworks were (width x height) 3000 x 3000 mm and 3000 x 2900 mm.

*Framework*

Two frameworks were built of wooden studs of class C24, 45x120 mm. Two studs were nailed together and were mounted vertically and placed at the maximum centre distance of 600 mm. Each stud was fixed with three wooden nails per end. Noggings were mounted at one-third and two-thirds of the height of the framework. The outer studs were cut, 30 mm each 300 mm, to ensure they were not load-bearing in accordance with EGOLF RECOMMENDATION EGR80:2014. The framework can be seen in Appendix 1.

*Panels*

Wooden panels 20 x 540 x 3000 (thickness x height x width) mm were mounted before the clay boards.

*Boards*

The clay boards were designated Claytech. The boards were cut in different sizes (see appendix 1) with a nominal thickness of 22 mm and a nominal density of 1450 kg/m$^3$.

*Insulation*

The empty space within the frameworks was insulated with wood fibre insulation with a nominal thickness of 120 mm each and a nominal density of 50 kg/m$^3$. The insulation boards were mounted with compression between the studs.

*Clay plaster*

Two layers of clay plaster with a fibreglass net in between each layer that was 3 mm were applied on the clay boards. Before the first layer of clay plaster was applied, the clay boards were slightly moistened. When the first layer of clay plaster had dried, it was slightly moistened before the second layer of clay plaster. The Clay plaster was designated Målarkalk Lerbruk Fin.

*Details*

The clay boards were attached to the framework with screws. Screws were mounted on the maximum centre distance of 200 mm.

Information about the major components of the test specimen is tabulated below.

*Table: Included components*

| Component | Product designation | Manufacturer/Supplier |
|---|---|---|
| Studs | Wood, C24 45 x 120 | Norrby Trä |
| Panels | Deromeluckan standard C14, (20 x 540 x 3000) mm | Derome |
| Clay boards | Claytec Lemix, see appendix 1 for dimensions | Claytec |
| Insulation | Hunton Nativo Wood Fibre insulation boards, 120 mm, 50 kg/m$^3$ | Hunton Fiber AB |
| Clay plaster | Målarkalk Lerbruk Fin | Hyllingegårdens lerprodukter |
| Nail for studs | Stomspik, D-Huvud, kamgängad, varmförzinkad 3.1 x 90 | Gunnebo Fastening |
| Nail for panels | MFT Spiker on, 28 x 75 mm | MFT |
| Screws for clay boards (studs) | Lemix Lehmplattenschraube 5.0 x 60 mm | Claytec Lemix |
| Screws for clay boards (panels) | Montageskruv 4.2 x 38 Vit | V/S/B |

The information regarding the test specimen and its detailed components given in the sponsor's drawings and specifications, e.g. dimensions, quantities, and physical properties, are nominal values provided by the sponsor. In case of the sponsor's drawings do not correspond with the construction of the test specimen, RISE has crossed details or altered the drawings.

## 2.4 Number of test specimens and test direction

The test specimen was symmetrical with one face being mirror-inverted in relation to the other face. The impact of fire exposure on the test specimen is independent of whichever side the fire is exposed to.

Due to the symmetry of the test specimen, the test specimen was tested from one side only.

The result of the test is valid from both directions.

## 2.5 Test setup

The test setup can be seen in Appendix 2.

## 2.6 Supporting construction

The test specimen was mounted in RISE´s concrete frame for fire tests of load-bearing constructions with an opening dimension (width x height) of 3060 x 3000 mm.

A plinth was mounted on the bottom of the concrete frame. The plinth was used to secure enough possibility of movement of the steel load beam during deformation and to avoid fire exposure of the load steel beam during deformation of the test specimen. The plinth was 100 mm high which meant that the height of the opening was 2900 mm. The plinth consists of aerated concrete blocks with a nominal density of 550 kg/m$^3$ and a nominal thickness of 400 mm.

To provide a Free edge, a seal without restricting freedom of movement, a 30 mm thick board of resilient non-combustible mineral fibre was mounted on both sides of the concrete frame.

The structure of the supporting construction is described in the test setup in Appendix 2.

## 2.7 Mounting of the test specimen

The test specimen was assembled and mounted at RISE. The mounting of the test specimen was overseen by RISE.

The test specimen was placed in the supporting construction after the mounting.

Both the right and left side of the test specimen was kept unrestrained to ensure free movement.

The mounting was performed between Maj 2 and 13, 2022 at RISE by the sponsor.

## 2.8 Conditioning

### 2.8.1 Climate conditions

The test specimen was stored in RISE's furnace hall before the test. During this time the temperature in the furnace hall was on average 22 °C and the relative humidity was on average 47 %.

## 2.9 Verification

### 2.9.1 Verification of the construction of the test specimen

The verification that the test specimen was in accordance with the sponsor's drawings and specifications was carried out by RISE in conjunction with the assembling and mounting of the test specimen, see chapter “Sampling Selection and delivery of the test specimen”. Samples of materials from the same batch of materials used for assembling the test specimen were picked out by RISE for verification of included materials.

*Table: Control of materials*

| Material | Thickness [mm] | Density [kg/m$^3$] | Moisture ratio[1] [%] | Moisture ratio[2] [%] | Loss on ignition[3] [%] |
|---|---|---|---|---|---|
| Stud (45 x120) | 44 | 537 | - | 10.7 | - |
| Wood panel | 19 | 548 | - | 8.9 | - |
| Clay board | 24 | 1348 | - | 1.2 | - |
| Insulation | 80 | 51 | 4.2 | 4.4 | |
| Clay mortar | 12.3 | 1641 | - | 0.8 | - |

*1) Moisture ratio calculated from weight loss after being heated at 52.5 °C.*
*2) Moisture ratio calculated from weight loss after being heated at 105 °C.*
*3) Loss on ignition calculated from weight loss after being heated at 500 °C.*
The verification was performed on Maj 19, 2022.

The purpose of the control is to verify and/or determine material data and dimensions of materials and components included in the test specimen. The extent of performed measurements and applied methodology can deviate from standardized methods. The results shall therefore not be considered formal material data.

### 2.9.2 Strength grading of load-bearing studs

The strength of the studs was determined by visual grading prior to the construction of the test specimen. The studs were classified C24 but not C30 according to SS 23 01 20, issue 1, April 3, 1998. The grading was made by RISE.

## 2.10 Placing of test specimen on the furnace

After the mounting of the test specimen in the supporting construction, the concrete frame with the supporting construction and test specimen was placed on RISE's vertical furnace.

# 3 Test procedure and results

## 3.1 General information

The test was performed on Maj 25, 2022. The test lasted for 114.5 minutes.

The test was performed on RISE's vertical furnace for fire resistance test. The maximum fire-exposed area of the furnace is (width x height) 3000 x 3000 mm and the depth of the furnace is 1800 mm. The heat exposure comes from 6 propane-driven burners.

## 3.2 Witness of test

The test was witnessed by Mrs Angelica Karlsson, Mrs Elin Thundal and Mr Ulf Henningsson from Göteborgs Stad, Lokalförvaltningen.

## 3.3 Fire test procedure

The fire test means in principle that the test specimen is subjected to exposure from one side (fire-exposed side) and measurements and visual judgments are performed on the opposite side (unexposed side). The test specimen is also subjected to an external load from above during the test. The extent of the measurements and assessments depends on the sponsor's requested use of the results from the test.

## 3.4 Loading with external force

The test specimen was loaded with an external force during the fire test to evaluate load-bearing capacity during the fire.

### 3.4.1 Loading equipment

The load was applied to the test specimen by hydraulic pistons and by dead weight. The load from each piston was measured during the test with load cells. The load from the load cells was continuously controlled to maintain the same load independent on the deflection of the test specimen.

The dead weight comes from the equipment used to transfer the load from the hydraulic system to the test specimen and the rod. The dead weight was constant during the test.

The loading equipment is shown in Appendix 2.

### 3.4.2 Load arrangement

The load was applied vertically on the upper edge of the test specimen through a rigid steel beam.

At the top of the test specimen was a 15 mm steel rod mounted on a bedding plate axially mounted on to the upper wood beam.

The load arrangement was in accordance with figure 1b in EN 1365-1:2012.

The loading arrangement is shown in Appendix 2.

### 3.4.3 Load level

The load level which was evaluated during the test was 15.0 kN/stud.

To achieve the requested loading level (5 load-bearing studs 15.0 kN load/stud) total applied 75.0 kN on the test specimen. The deadweight from the equipment and rod was 4.8 kN. The remaining load came from the hydraulic system.

The load level was prescribed by the sponsor.

The applied load during the test is shown in a graph in Appendix 3.

### 3.4.4 Performance criteria - Loadbearing capacity

The load-bearing capacity is evaluated according to the criteria in EN 1363-1:2020 chapter 11.1b. Maximum allowed vertical contraction (negative elongation): $C_{limit}$ = h/100 Maximum allowed vertical rate of deflection: $(dC/dt)_{limit}$ = 3h/1000 Where h is the height of the test specimen.

The load-bearing criteria for actual test specimen are: $C_{limit}$ = 30.0 mm $(dC/dt)_{limit}$ = 9.0 mm/min

Measured deflection and calculated rate of vertical contraction during the test are reported in chapter ”Deflection”.

## 3.5 Test conditions

The furnace was controlled in accordance with EN 1363-1:2020.

### 3.5.1 Temperatures

The furnace temperature was measured with 6 plate thermocouples (PT1 - PT6). The plate thermocouples were positioned approximately 100 mm from the fire-exposed surface of the test specimen at the commencement of the test. The position of the thermocouples can be seen in Appendix 3.

The average temperature in the furnace (average of PT1 - PT6) in relation to the standard time-temperature curve is shown in Appendix 3.

The temperature of each plate thermometer (PT1 - PT6) in relation to the standard time-temperature curve and permitted deviation are shown in Appendix 3.

The deviation in per cent of the area under the average furnace time-temperature curve from the area under the standard time-temperature curve and permitted deviation, is shown in Appendix 3.

### 3.5.2 Pressure

The furnace pressure was controlled so that a pressure of 20 Pa was maintained at the level of the top edge of the test specimen. With a pressure gradient of 8.5 Pa/m, the neutral pressure plane was by calculation adjusted to be established at a level of 550 mm above the lower edge of the test specimen (the notional floor level).

The furnace pressure was controlled at the position 520 mm above the lower edge of the test specimen. Using a pressure gradient of 8.5 Pa/m the control pressure was calculated to be -0.23 Pa in order to establish a pressure of 20 Pa at a level of the top edge of the test specimen.

The calculated furnace pressure on the top edge of the test specimen and permitted deviation are shown in Appendix 3.

The equipment for pressure measurements fulfils the EGOLF recommendation 024Rev1-2018. The measured pressure is presented in the graph as a moving average over a period of one minute.

## 3.6 Ambient temperature

The ambient air temperature was measured with one thermocouple. The ambient air temperature during the test is shown in Appendix 3. The ambient air temperature at the beginning of the test was 20 °C.

The ambient temperature was measured with a thermocouple located close to the furnace.

## 3.7 Measurements on the test specimen

During the test, the properties needed for the requested classification by the sponsor were measured and the behaviour of the test specimen was evaluated during the heat exposure.

### 3.7.1 Temperatures

The temperature rise on the unexposed side of the test specimen was measured with 11 thermocouples (C1 – C11). The position of the thermocouples is shown in Appendix 4.

The measured temperature and the average temperature rise on the unexposed surface of the test specimen (average of thermocouples C1 – C5) on the test specimen are shown in Appendix 4.

The average temperature of all thermocouples (C1-C11) at the start of the test was 20.3 °C.

### 3.7.2 Heat radiation

No measurements were made.

### 3.7.3 Deflection

The horizontal and vertical deflections of the test specimen during the test were measured with electronic deflection transducers (linear potentiometers).

The points for measuring vertical deflections (Dy1 - Dy2) were located on the steel beam, vertically above the upper right and left corners of the test specimen. The points for measuring horizontal deflections (Dz1 - Dz3) were located at the centre of the test specimen and 50 mm in from the free vertical edges, at mid-height of the test specimen. See also Appendix 2.

Measured horizontal deflections of the test specimen are shown in Appendix 4.

Measured vertical deflections of the steel beam are shown in a graph in Appendix 4. Calculated vertical deflection speed is shown in a graph in Appendix 4.

### 3.7.4 Measurements for extended field of application evaluations

No additional measurements for extended field of application were made.

### 3.7.5 Additional optional measurements

The temperature inside the test specimen was measured with thermocouples. The thermocouples were placed in cross-section sections (A, B, C, and D). The thermocouples were positioned as shown in Appendix 4.

The additional optional temperatures are shown in Appendix 4.

## 3.8 Observations

### 3.8.1 Photographs from the test

Photographs taken in connection with the test are shown in Appendix 4.

### 3.8.2 Observations during the test

*Table: Observations*

| Time [min:s] | Observations (refer to the unexposed side if nothing else is stated) |
|---|---|
| -29:00 | The measurements start. |
| -28:00 | The loading of the test specimen starts. |
| -26:00 | Full load on the test specimen. |
| 00:00 | The fire test starts. |
| 11:30 | Fire exposed side: Crack on 3/4$^{th}$ and half of the height of the test specimen, clay mortar has charred on the edges of the test specimen. |
| 19:10 | Smoke from the top edge of the test specimen. |
| 34:00 | Fire exposed side: Clay mortar has bent outwards. |
| 53:00 | Smoke from the bottom of the test specimen. |
| 59:50 | Temperature measurement on the lower part of the test specimen with the roving thermocouple, 53 °C. |
| 68:00 | Moisture stains at the bottom of the test specimen. |
| 73:10 | Temperature measurement on the lower part of the test specimen with the roving thermocouple, 63 °C. |
| 99:00 | Fire exposed side: The wood panels have fallen, and the studs are exposed to fire. |
| 114:30 | The test terminates due to the safety of personnel and equipment. |

• *Integrity tests with cotton wool pads were not performed during the test since no leakage of hot gases was observed.*

• *Integrity tests with gap gauges were not performed during the test since any through gaps were observed.*

## 3.9 Post-test measurements and observations

After the test following tests, measurements, evaluations and observations were made.

### 3.9.1 Observations after the test

*Unexposed side*

Dark spots on the bottom edge of the test specimen.

*Fire-exposed side*

Clay mortar, clay boards and wood panels are burnt away. Most of the studs are broken in the weak direction. Studs and the insulation on the non-loadbearing wall are slightly charred.

# 4 Summary

The test specimen, a load-bearing wall made of wood and insulation has been tested according to the accredited test methods:

• EN 1365-1:2012/AC:2013

• EN 1363-1:2020

## 4.1 Fire test

The test lasted for 114 minutes.

The test specimen was tested with 3 mm clay towards the furnace.

For information regarding the validity of the result in different directions see the chapter "Number of test specimens and test direction".

### Summary of results

*Table: Summary of integrity measurements*

| Integrity | Result |
|---|---|
| • Sustained flaming exceeding 10 seconds | 114 minutes, no failure* |
| • Gap gauges diameter 6 mm and 25 mm | 114 minutes, no failure* |
| • Cotton wool pad test | 114 minutes, no failure* |

*Table: Summary temperature measurements*

| Insulation | Result |
|---|---|
| • Average temperature rise, 140 °C | 114 minutes, no failure* |
| • Maximum temperature rise, 180 °C | 114 minutes, no failure* |

*Table: Summary deflection measurement*

| Deflection | Result |
|---|---|
| • Maximum deflection during the test | 5.1 mm (out from the furnace), after 114 minutes |

*Table: Summary loadbearing capacity vertical loaded elements*

| Loadbearing capacity | Result |
|---|---|
| • Maximum deflection $C_{limit}$ 30.0 mm | 114 minutes |
| • Maximum rate of deflection $(dC/dt)_{limit}$ 9.0 mm/min | 114 minutes |

*The test is terminated due to the safety of personnel and equipment.*

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.

# 5 Field of direct application of test results

The direct application of the test results to constructions similar to the constructions described in this report is described in EN 1365-1:2012 in chapter 13.

**RISE Research Institutes of Sweden AB**
**Fire and safety - Fire Resistance Management**

Performed by

Pär Johansson

Examined by

Malin Mollsjö

## Appendices

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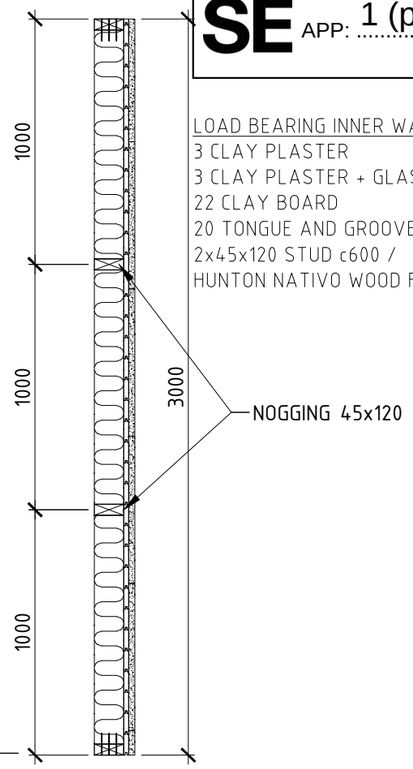
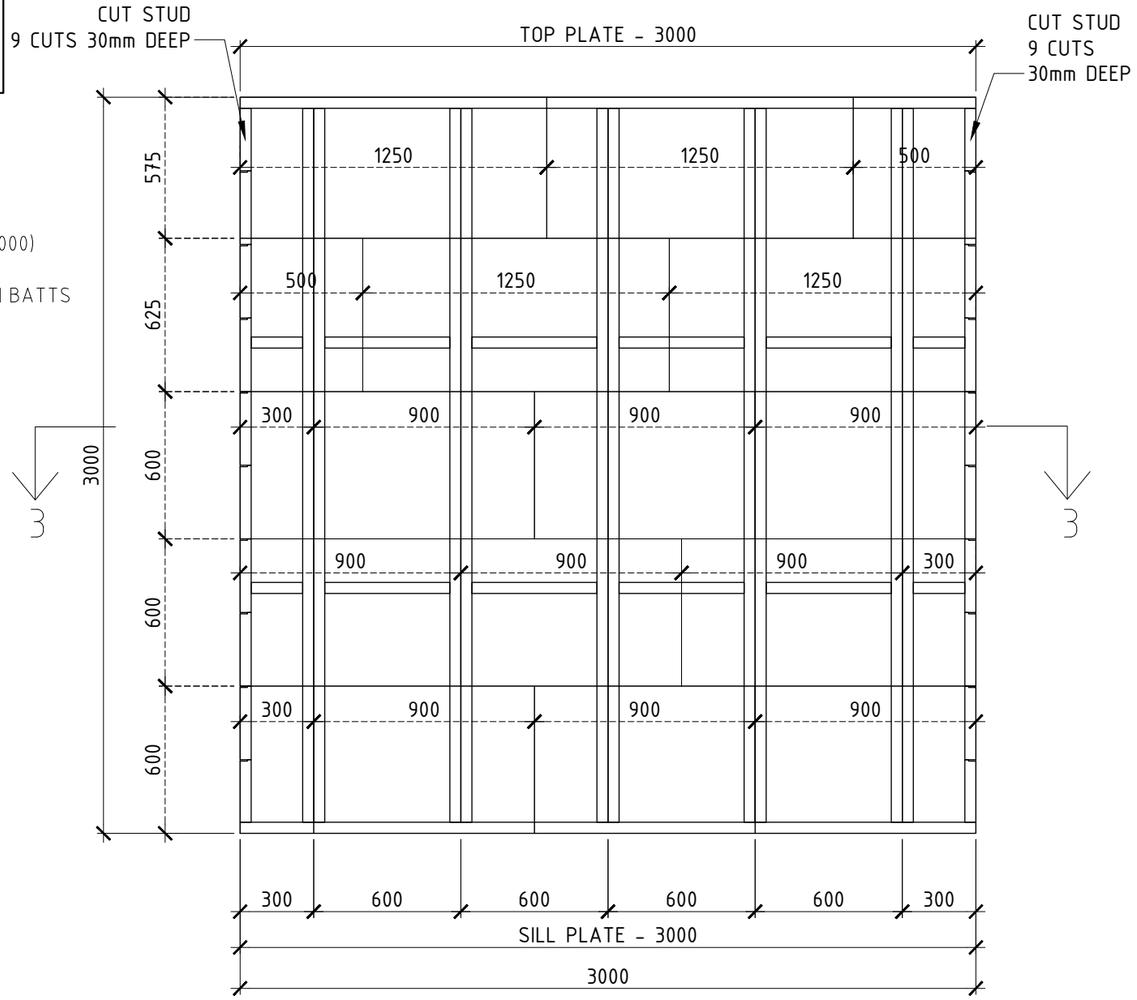
APP: 1 (page 1-3)

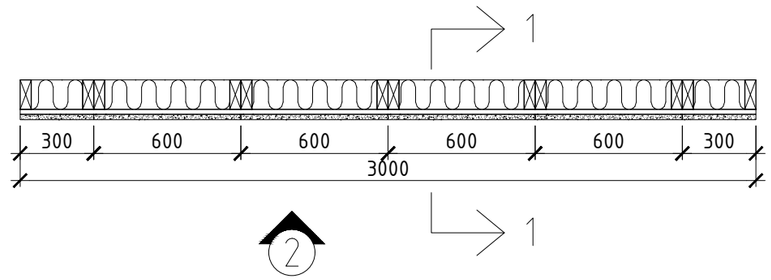



LOAD BEARING INNER WALL
3 CLAY PLASTER
3 CLAY PLASTER + GLASS FIBRE MESH
22 CLAY BOARD
20 TONGUE AND GROOVE BOARDS (540x3000)
2x45x120 STUD c600 /
HUNTON NATIVO WOOD FIBRE INSULATION BATTS

## 1 SECTION
1:25




## 2 ELEVATION




## 3 HORIZONTAL DETAIL / PLAN

## REGULATIONS & INSTRUCTIONS

INSULATION OF TYPE HUNTON NATIVO WOOD FIBRE BATTS 120x565x1220. DENSITY 50 kg/m³. INSULATION BATTS SHOULD BE OVERSIZED 5-40mm TO KEEP THEM IN PLACE BETWEEN THE STUDS. INSULATION BATTENS SHOULD BE MOUNTED AS A WHOLE BATTEN IN EACH COMPARTMENT.

STUDS OF CONSTRUCTION LUMBER 45x120 C24.
STUDS ARE NAILED TO TOP PLATE / SILL PLATE WITH 3 NAILS PER STUD. DUAL STUDS ARE JOINTED WITH 2 NAILS c300 ALONG THE LENGTH OF THE STUD. NOGGINGS ARE NAILED TO THE STUDS WITH 3 NAILS EACH END. NAILS SHOULD BE RING-SHANK NAILS 90x3.1.

TONGUE AND GOROOVE BOARDS 20x540x3000) ARE MOUNTED HORIZONTAL. THE BOARDS ARE NAIL TO THE STUDS WITH 1 NAIL PER BOARD AND STUD(c600). NAILS SHOULD BE RING-SHANK NAILS 75x2.8.
BOARD MANUFACTURER: DEROMELUCKAN STANDARD C14

CLAY BOARDS OF TYPE CLAYTEC LEMIX SCHWER 22mm, DENSITY 1450 kg/m³. BOARDS ARE MOUNTED HORIZONTAL WITH THE MESH SIDE TOWARDS THE STUDS.
CLAY BOARDS ARE FASTENED WITH CLAYTEC LEMIX SCREWS 5x60, c200mm TO THE STUDS, AND c200 TO THE HEAD PLATE/SILL PLATE. THE LONG SIDE OF THE CLAY BOARDS ARE SCREWED c200 WITH FLAT HEAD SCREWS 4.2x38.
CLAY BOARDS SHOULD BE STAGGERED SO THAT NO CROSS-JOINTS APPEAR.

CRACKS LARGER THAN 1mm SHOULD BE REPAIRED WITH CLAY PLASTER.
CLAY BOARDS ARE PLASTERED WITH A FIRST LAYER OF CLAY PLASTER, THICKNESS 3mm, AND REINFORCED WITH GLASS FIBRE MESH. AFTER THE FIRST LAYER HAS DRIED, A SECOND LAYER OF 3mm CLAY PLASTER I APPLIED.
BEFORE APPLYING PLASTER, THE SURFACE SHOULD BE SLIGHTLY MOISTENED, APPLIES TO BOTH LAYERS
CLAY PLASTER SHOULD BE OF TYPE MÅLARKALK LERBRUK FIN.
GLASS FIBRE MESH SHOULD BE OF TYPE CLAYTEC GLASS MESH 112 (112 g/m²)

# TEST SETUP DRAWING

LOKALFÖRVALTNINGEN
Fire test of load beraing wall with clay boards
LOADED WALL PART, EXPOSED TO FIRE

| UPPDRAG NUMMER | KONSTRUERAD AV | HANDLÄGGARE |
|---|---|---|
| - | L.A | L.A |

| DATUM | ANSVARIG | SKALA | NUMMER | BET |
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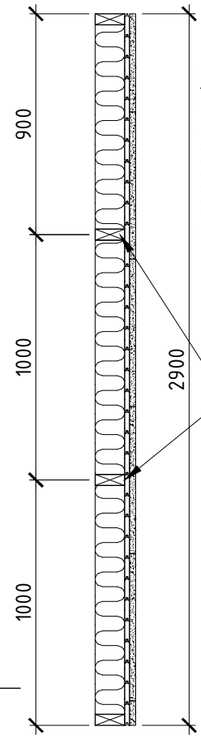
APP: 1 (page 1-3)




INNER WALL
3 CLAY PLASTER
3 CLAY PLASTER + GLASS FIBRE MESH
22 CLAY BOARD
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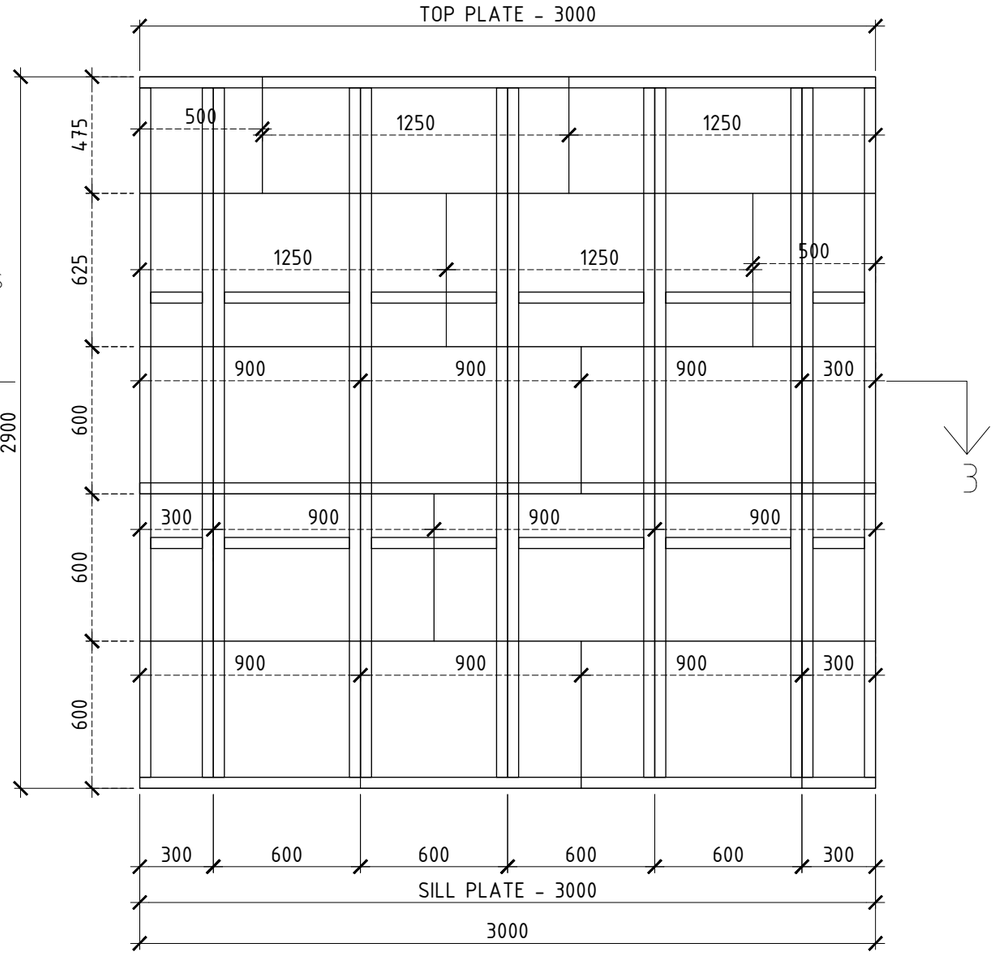
2x45x120 STUD c600 /
HUNTON NATIVO WOOD FIBRE INSULATION BATTS

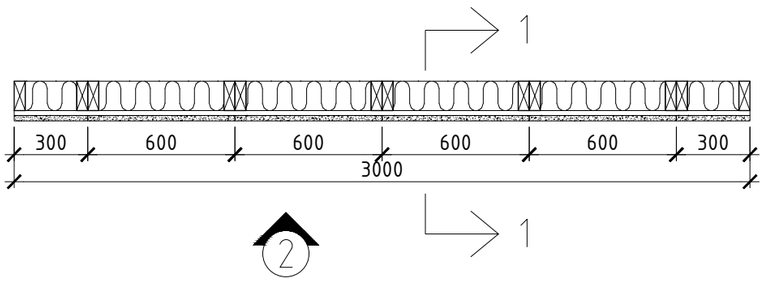
NOGGINGS 45x120

## 1 SECTION

1:25




## 2 ELEVATION




## 3 HORIZONTAL DETAIL / PLAN

1:25

# REGULATIONS & INSTRUCTIONS

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STUDS ARE NAILED TO TOP PLATE / SILL PLATE WITH 3 NAILS PER STUD. DUAL STUDS ARE JOINTED WITH 2 NAILS c300 ALONG THE LENGTH OF THE STUD. NOGGINGS ARE NAILED TO THE STUDS WITH 3 NAILS EACH END. NAILS SHOULD BE RING-SHANK NAILS 90x3.1.

TONGUE AND GOROOVE BOARDS 20x540x3000) ARE MOUNTED HORIZONTAL. THE BOARDS ARE NAIL TO THE STUDS WITH 1 NAIL PER BOARD AND STUD(c600). NAILS SHOULD BE RING-SHANK NAILS 75x2.8.
BOARD MANUFACTURER: DEROMELUCKAN STANDARD C14

CLAY BOARDS OF TYPE CLAYTEC LEMIX SCHWER 22mm, DENSITY 1450 kg/m³. BOARDS ARE MOUNTED HORIZONTAL WITH THE MESH SIDE TOWARDS THE STUDS.
CLAY BOARDS ARE FASTENED WITH CLAYTEC LEMIX SCREWS 5x60, c200mm TO THE STUDS, AND c200 TO THE HEAD PLATE/SILL PLATE. THE LONG SIDE OF THE CLAY BOARDS ARE SCREWED c200 WITH FLAT HEAD SCREWS 4.2x38.
CLAY BOARDS SHOULD BE STAGGERED SO THAT NO CROSS-JOINTS APPEAR.

CRACKS LARGER THAN 1mm SHOULD BE REPAIRED WITH CLAY PLASTER.
CLAY BOARDS ARE PLASTERED WITH A FIRST LAYER OF CLAY PLASTER, THICKNESS 3mm, AND REINFORCED WITH GLASS FIBRE MESH. AFTER THE FIRST LAYER HAS DRIED, A SECOND LAYER OF 3mm CLAY PLASTER I APPLIED.
BEFORE APPLYING PLASTER, THE SURFACE SHOULD BE SLIGHTLY MOISTENED, APPLIES TO BOTH LAYERS
CLAY PLASTER SHOULD BE OF TYPE MÅLARKALK LERBRUK FIN.
GLASS FIBRE MESH SHOULD BE OF TYPE CLAYTEC GLASS MESH 112 (112 g/m²)

# TEST SETUP DRAWING

LOKALFÖRVALTNINGEN
Fire test of load beraing wall with clay boards
UNLOADED WALL PART

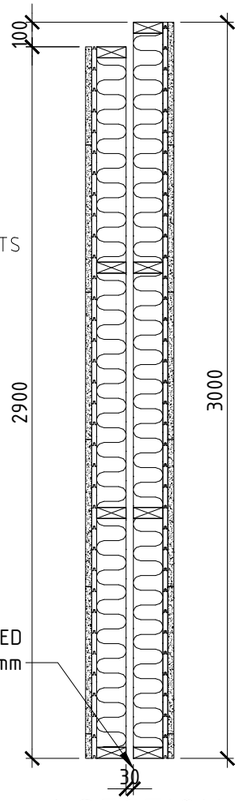
| UPPDRAG NUMMER | KONSTRUERAD AV | HANDLÄGGARE |
|---|---|---|
| - | L.A | L.A |

DATUM 2022-08-25
ANSVARIG L. ABRAHAMSSON
SKALA 1:25 @A3
NUMMER K-20-4-102 | BET

FILE: C:\USERS\LINUS\ONEDRIVE\OLD DOCUMENTS\TEMP\TEMP ONEDRIVE DHP\LERSKIVOR BRANDTEST\BRANDTEST LERSKIVOR.DWG
PLOTTED: 2022-08-25 17:26 BY USER: LINUS

RI. SE REF: O100402-1101398-2
APP: 1 (page 1-3)

INNER WALL
3 CLAY PLASTER
3 CLAY PLASTER + GLASS FIBRE MESH
22 CLAY BOARD
20 TONGUE AND GROOVE BOARDS (540x3000)
2x45x120 STUD c600 /
HUNTON NATIVO WOOD FIBRE INSULATION BATTS




LOAD BEARING INNER WALL
3 CLAY PLASTER
3 CLAY PLASTER + GLASS FIBRE MESH
22 CLAY BOARD
20 TONGUE AND GROOVE BOARDS (540x3000)
2x45x120 STUD c600 /
HUNTON NATIVO WOOD FIBRE INSULATION BATTS

## 1 SECTION TEST SETUP

1:25

# REGULATIONS & INSTRUCTIONS

INSULATION OF TYPE HUNTON NATIVO WOOD FIBRE BATTS 120x565x1220. DENSITY 50 kg/m$^3$. INSULATION BATTS SHOULD BE OVERSIZED 5-40mm TO KEEP THEM IN PLACE BETWEEN THE STUDS. INSULATION BATTENS SHOULD BE MOUNTED AS A WHOLE BATTEN IN EACH COMPARTMENT.

STUDS OF CONSTRUCTION LUMBER 45x120 C24.
STUDS ARE NAILED TO TOP PLATE / SILL PLATE WITH 3 NAILS PER STUD. DUAL STUDS ARE JOINTED WITH 2 NAILS c300 ALONG THE LENGTH OF THE STUD. NOGGINGS ARE NAILED TO THE STUDS WITH 3 NAILS EACH END. NAILS SHOULD BE RING-SHANK NAILS 90x3.1.

TONGUE AND GOROOVE BOARDS 20x540x3000) ARE MOUNTED HORIZONTAL. THE BOARDS ARE NAIL TO THE STUDS WITH 1 NAIL PER BOARD AND STUD(c600). NAILS SHOULD BE RING-SHANK NAILS 75x2.8.
BOARD MANUFACTURER: DEROMELUCKAN STANDARD C14

CLAY BOARDS OF TYPE CLAYTEC LEMIX SCHWER 22mm, DENSITY 1450 kg/m$^3$. BOARDS ARE MOUNTED HORIZONTAL WITH THE MESH SIDE TOWARDS THE STUDS.
CLAY BOARDS ARE FASTENED WITH CLAYTEC LEMIX SCREWS 5x60, c200mm TO THE STUDS, AND c200 TO THE HEAD PLATE/SILL PLATE. THE LONG SIDE OF THE CLAY BOARDS ARE SCREWED c200 WITH FLAT HEAD SCREWS 4.2x38.
CLAY BOARDS SHOULD BE STAGGERED SO THAT NO CROSS-JOINTS APPEAR.

CRACKS LARGER THAN 1mm SHOULD BE REPAIRED WITH CLAY PLASTER.
CLAY BOARDS ARE PLASTERED WITH A FIRST LAYER OF CLAY PLASTER, THICKNESS 3mm, AND REINFORCED WITH GLASS FIBRE MESH. AFTER THE FIRST LAYER HAS DRIED, A SECOND LAYER OF 3mm CLAY PLASTER I APPLIED.
BEFORE APPLYING PLASTER, THE SURFACE SHOULD BE SLIGHTLY MOISTENED, APPLIES TO BOTH LAYERS
CLAY PLASTER SHOULD BE OF TYPE MÅLARKALK LERBRUK FIN.
GLASS FIBRE MESH SHOULD BE OF TYPE CLAYTEC GLASS MESH 112 (112 g/m²)

| TEST SETUP DRAWING | | | DATUM 2022-08-25 |
|---|---|---|---|
| LOKALFÖRVALTNINGEN<br>Fire test of load beraing wall with clay boards<br>TEST SETUP | | | ANSVARIG L. ABRAHAMSSON<br>SKALA 1:25 @A3 |
| UPPDRAG NUMMER<br>- | KONSTRUERAD AV<br>L.A | HANDLÄGGARE<br>L.A | NUMMER K-20-4-103 \| BET |

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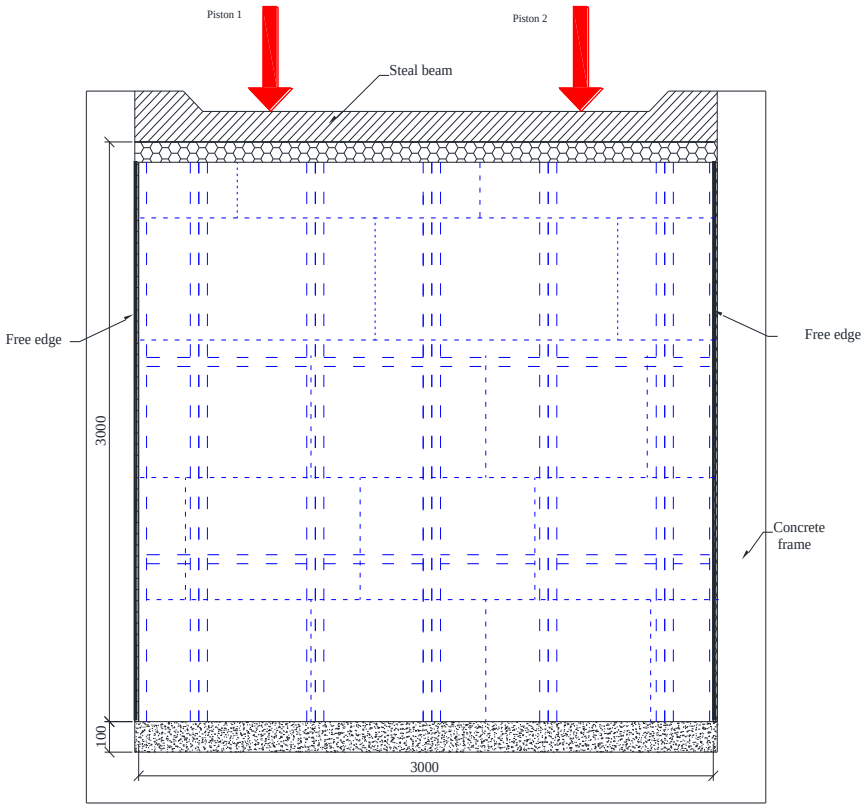
PLOTTED: 2022-08-25 17:26 BY USER: LINUS

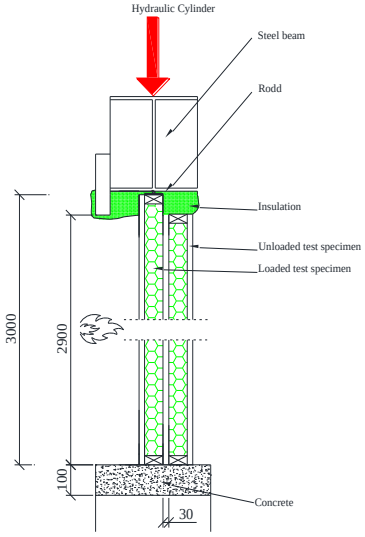
Appendix 2

# Test setup



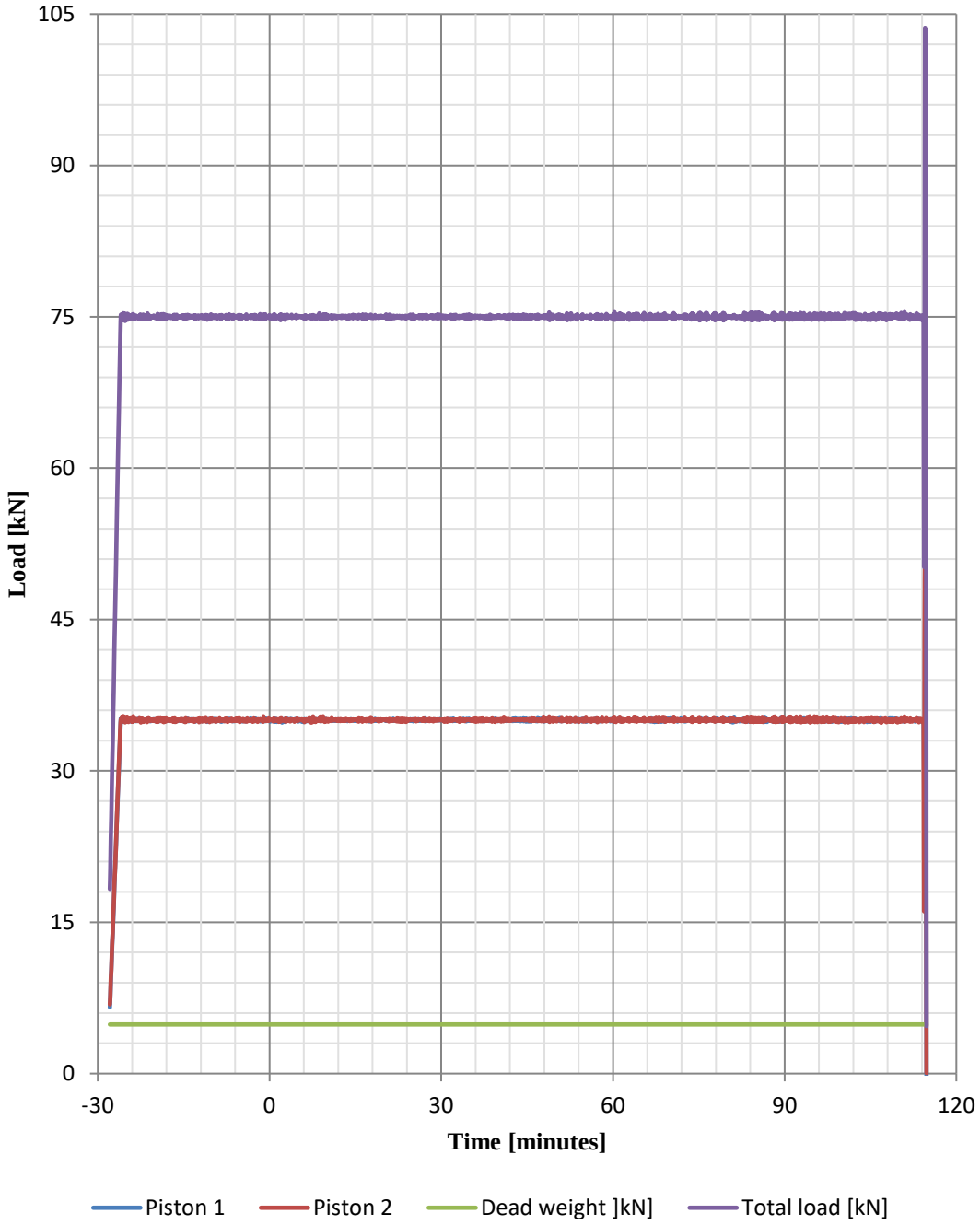

– – – – Studs

····· Clay boards



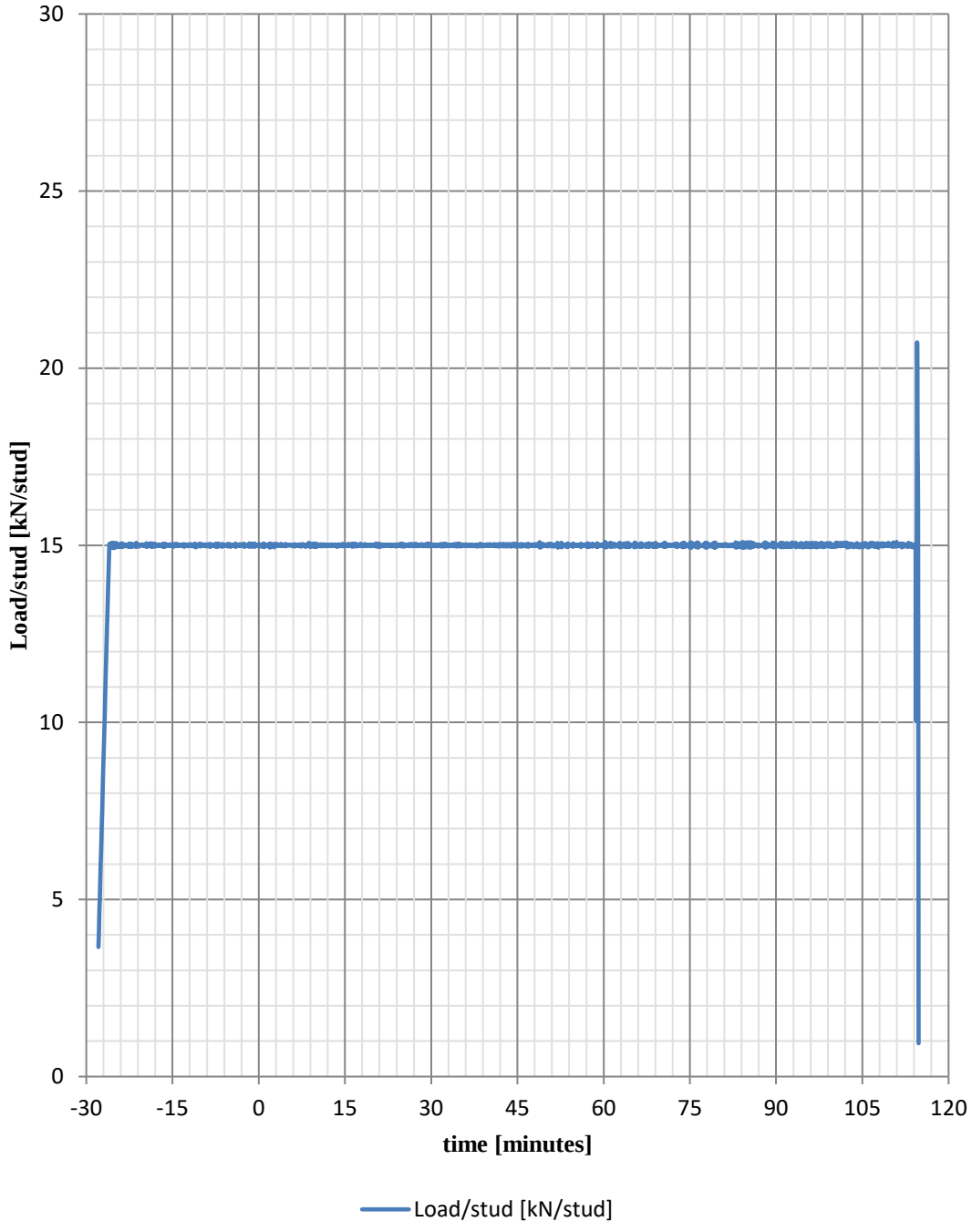
Appendix 3

# Load level: Total load



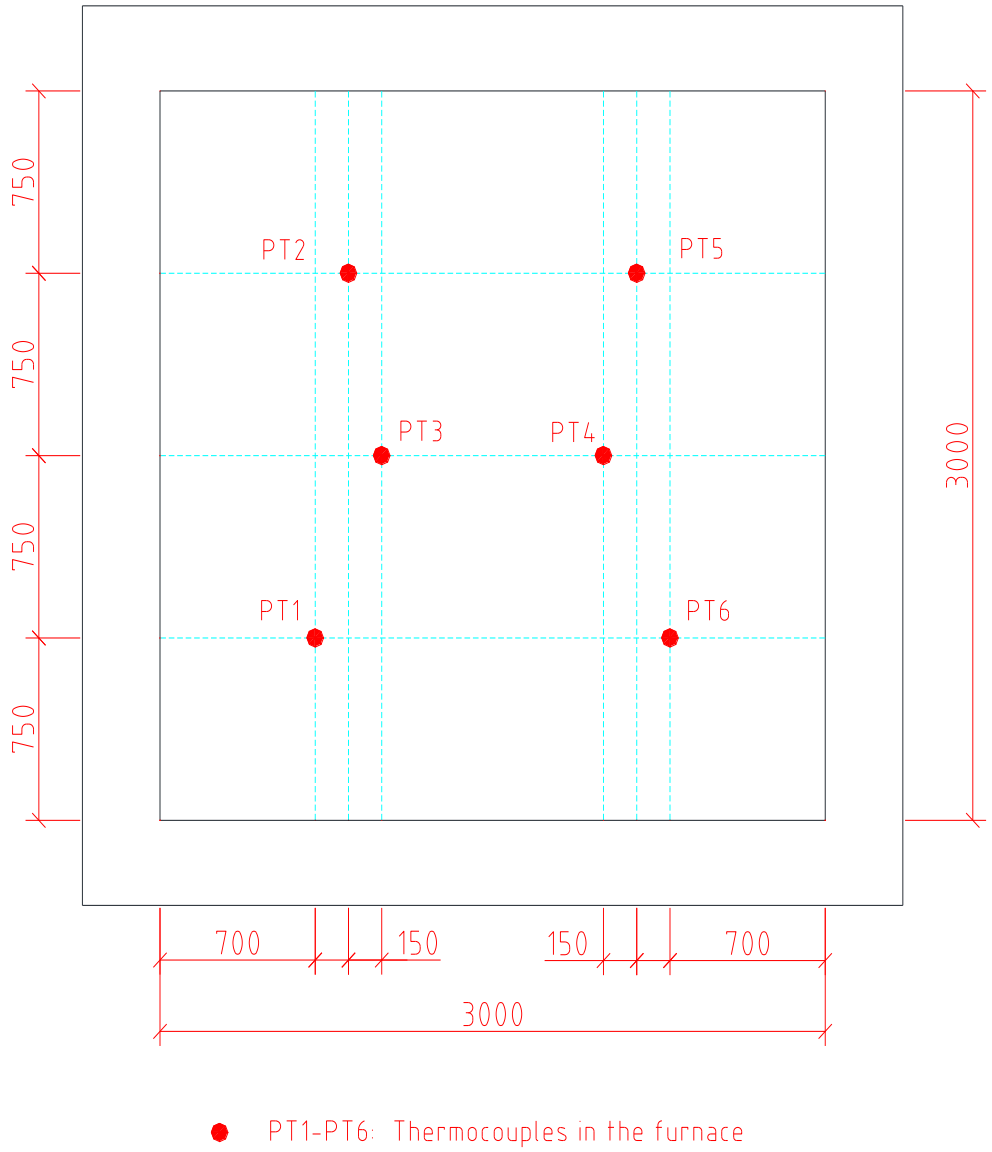
Appendix 3

# Load level: Load per stud



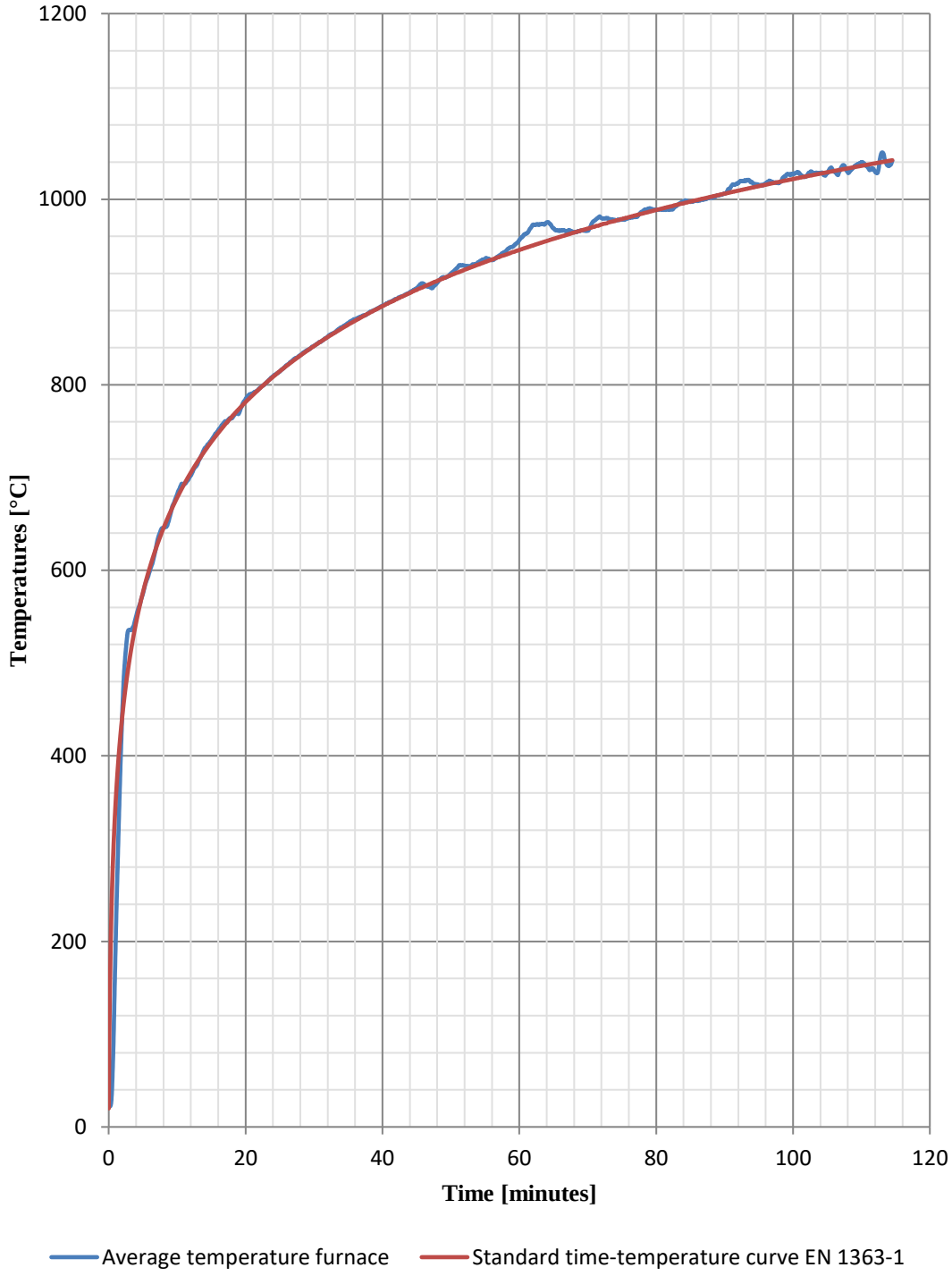
Appendix 3

# Position of the thermometers in the furnace



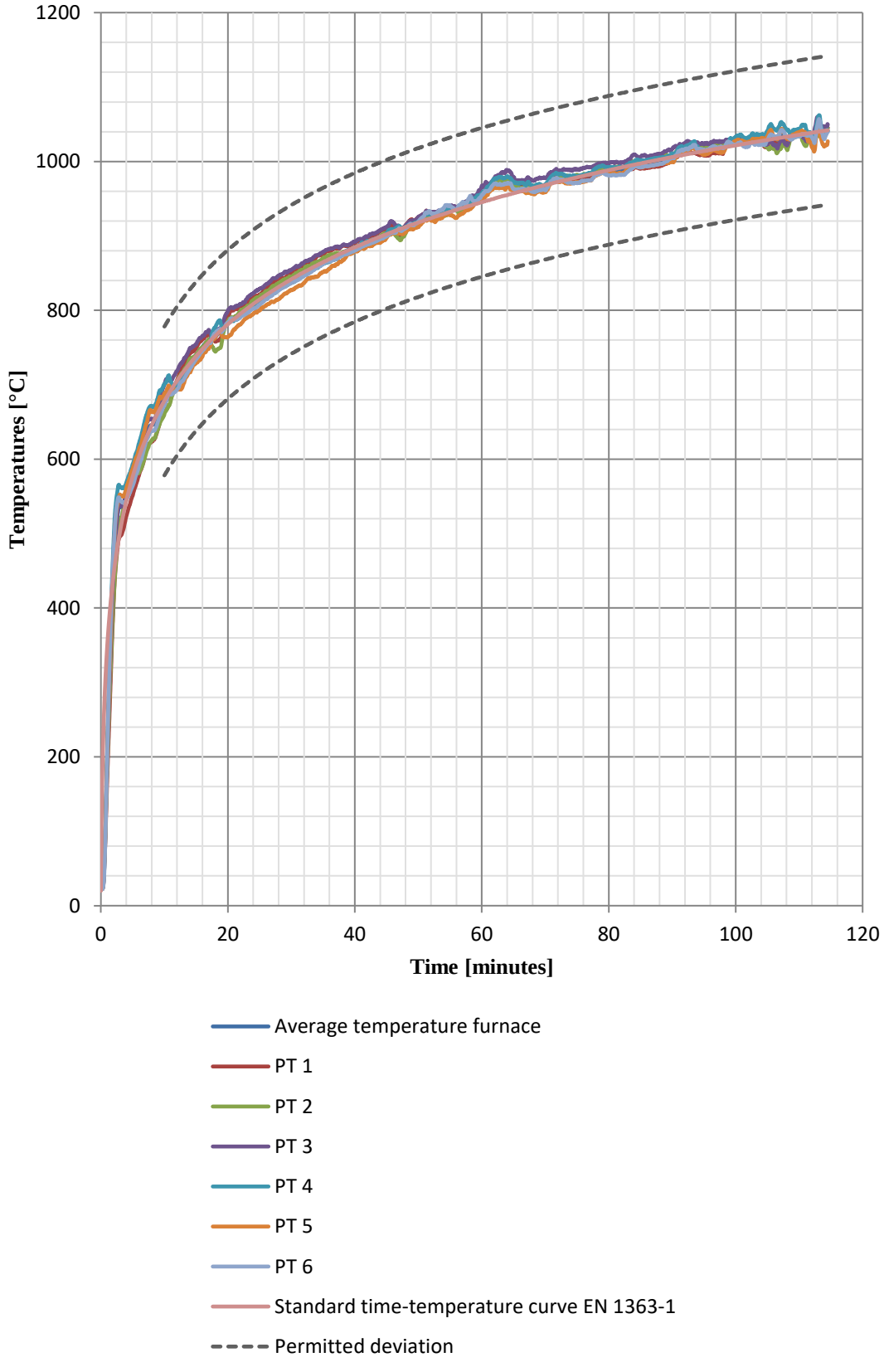
Appendix 3

# Test condition: The average temperature in the furnace



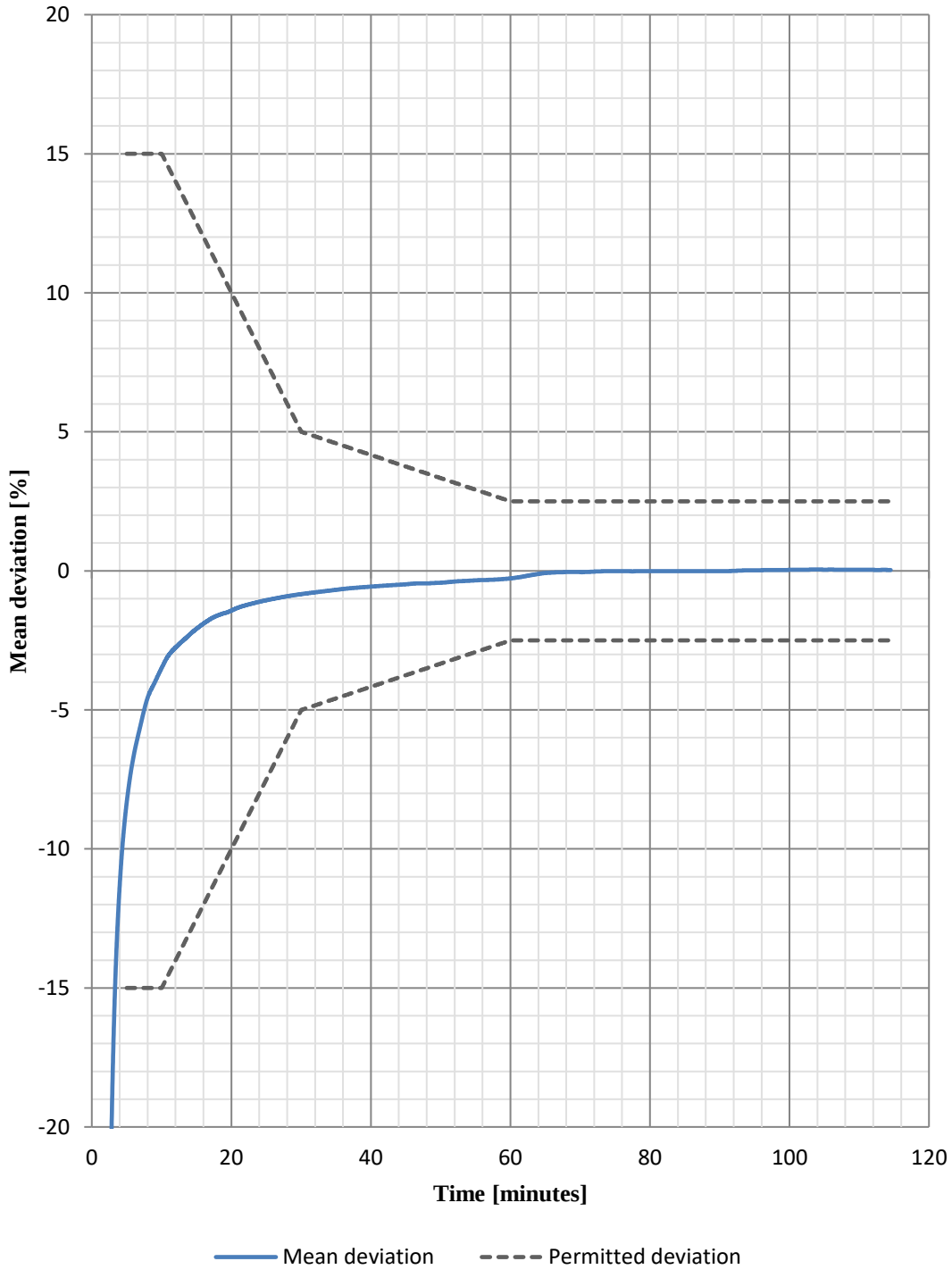
Appendix 3

# Test condition: The temperature of each thermometer



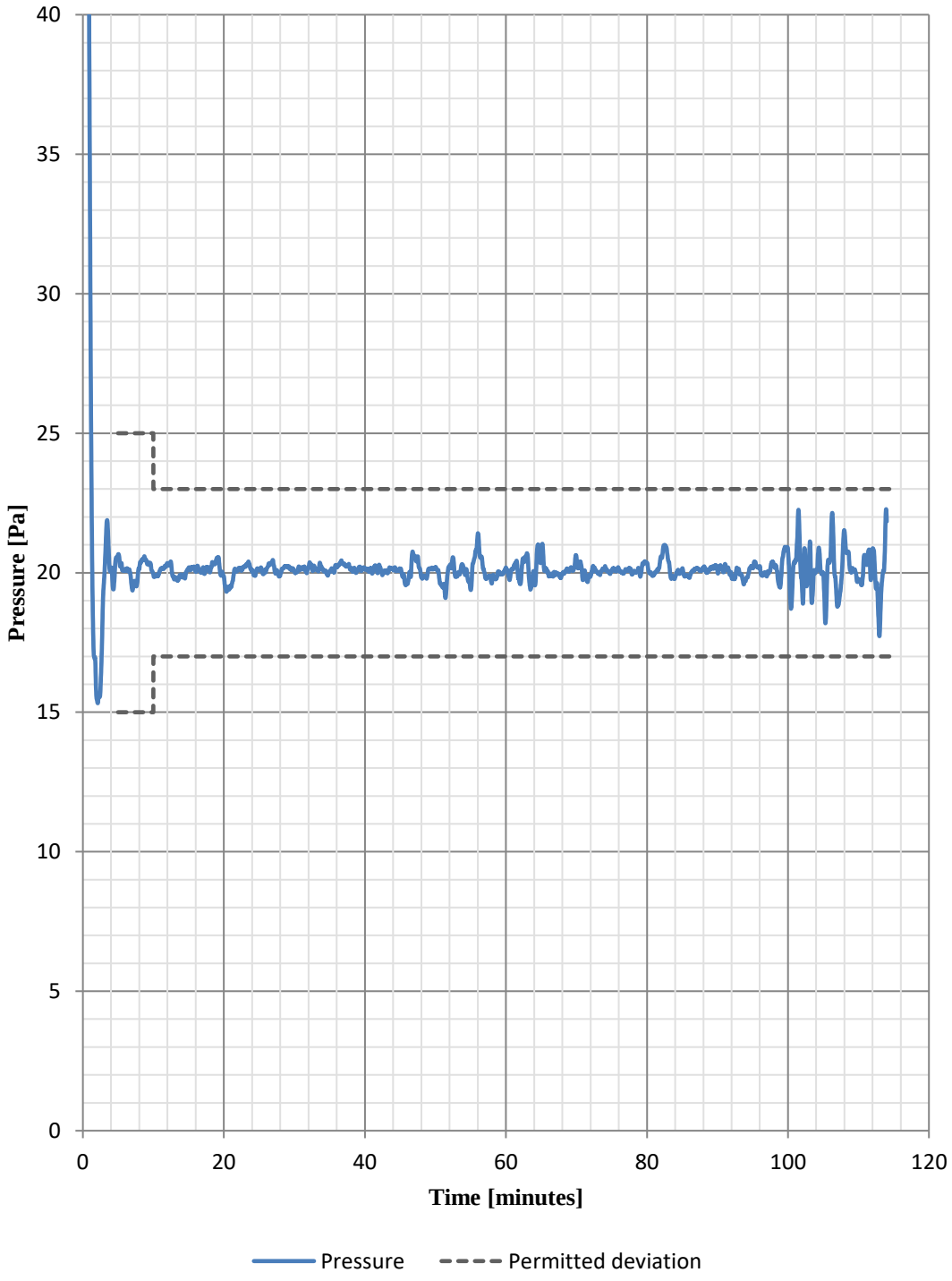
Appendix 3

# Test condition: The deviation in per cent of the furnace time-temperature



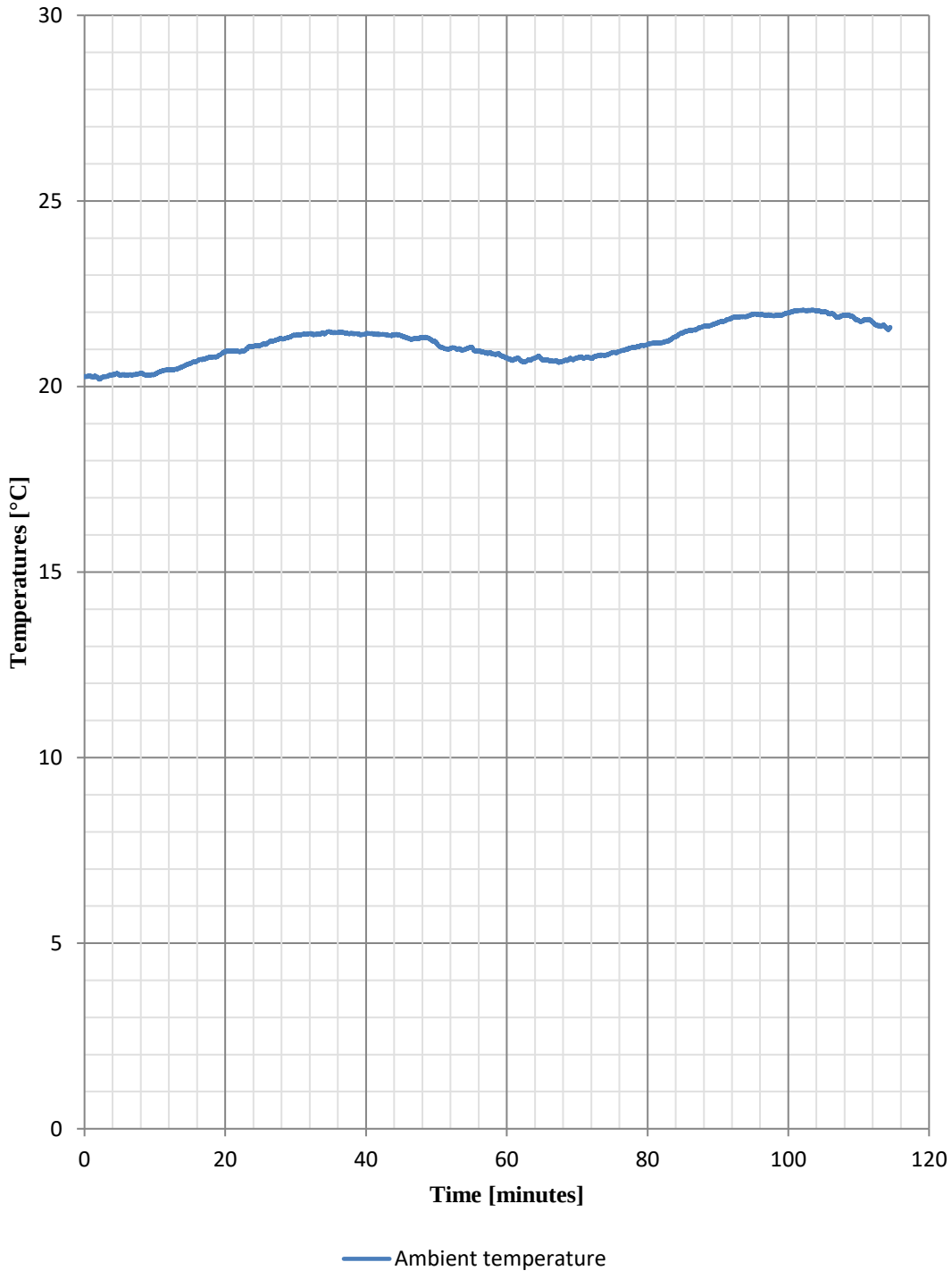
Appendix 3

# Test condition: The calculated furnace pressure on the height of the level of requirement



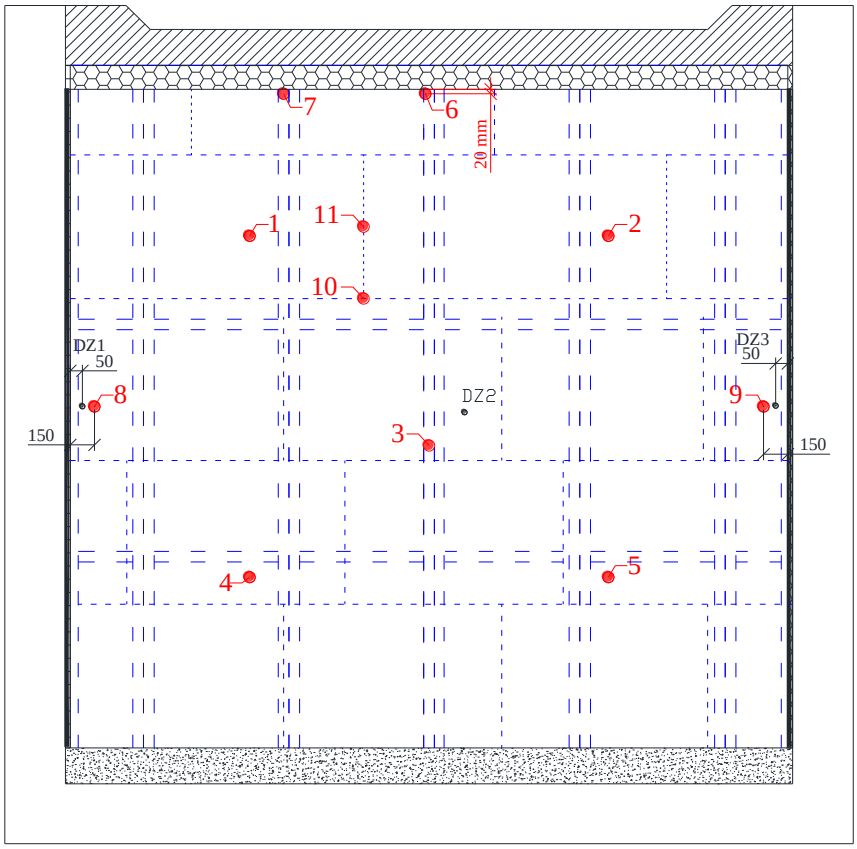
Appendix 3

# Test condition: The ambient air temperature during the test



Appendix 4

# Instrumentation of test specimen




Measuremnts

- Temperature

1-5 Average temperature (SS-EN 1365-1 9.1.2.2)
6 At the head of the specimen at mid-width (SS-EN 1365-1 9.1.2.3 a)
7 At the head of the specimen in line with a stud (SS-EN 1365-1 9.1.2.3 b)
8-9 At mid height of the free edge (SS-EN 1365-1 9.1.2.3 d)
10-11 Locations where higher temperatures are expected to occur (SS-EN 1363-1 9.1.2.3)

Deflection
Dy1 Measuring point of vertical deflection

- Dy2 Measuring point of vertical deflection

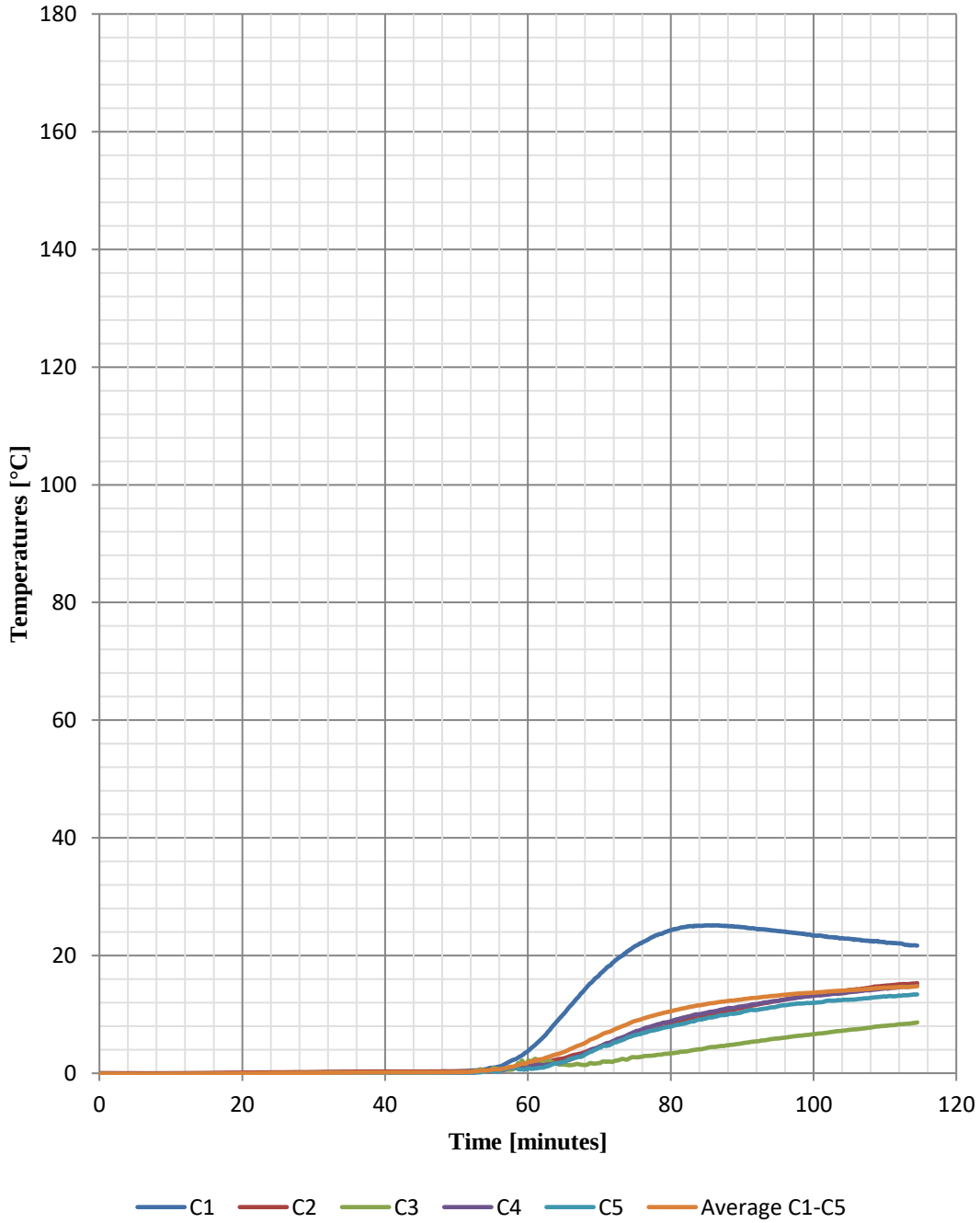
Dz1 Measuring point of horizontal deflection close to the free edge
Dz2 Measuring point of horizontal deflection in the center
Dz3 Measuring point of horizontal deflection close to the free edge

– – – – – Studs

- - - - - - - - - - - - Clay boards

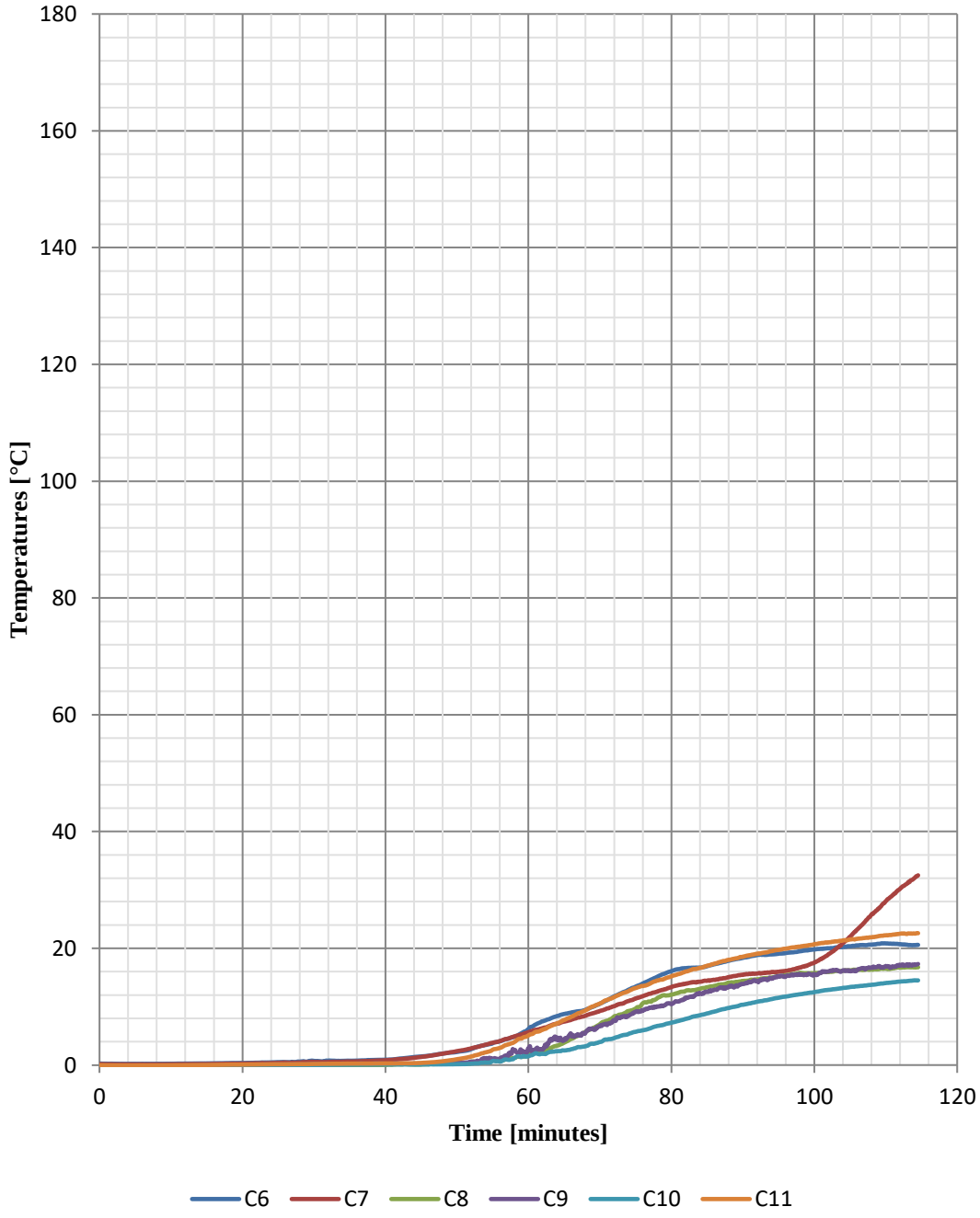
Appendix 4

# Temperatures on test specimen: Graph



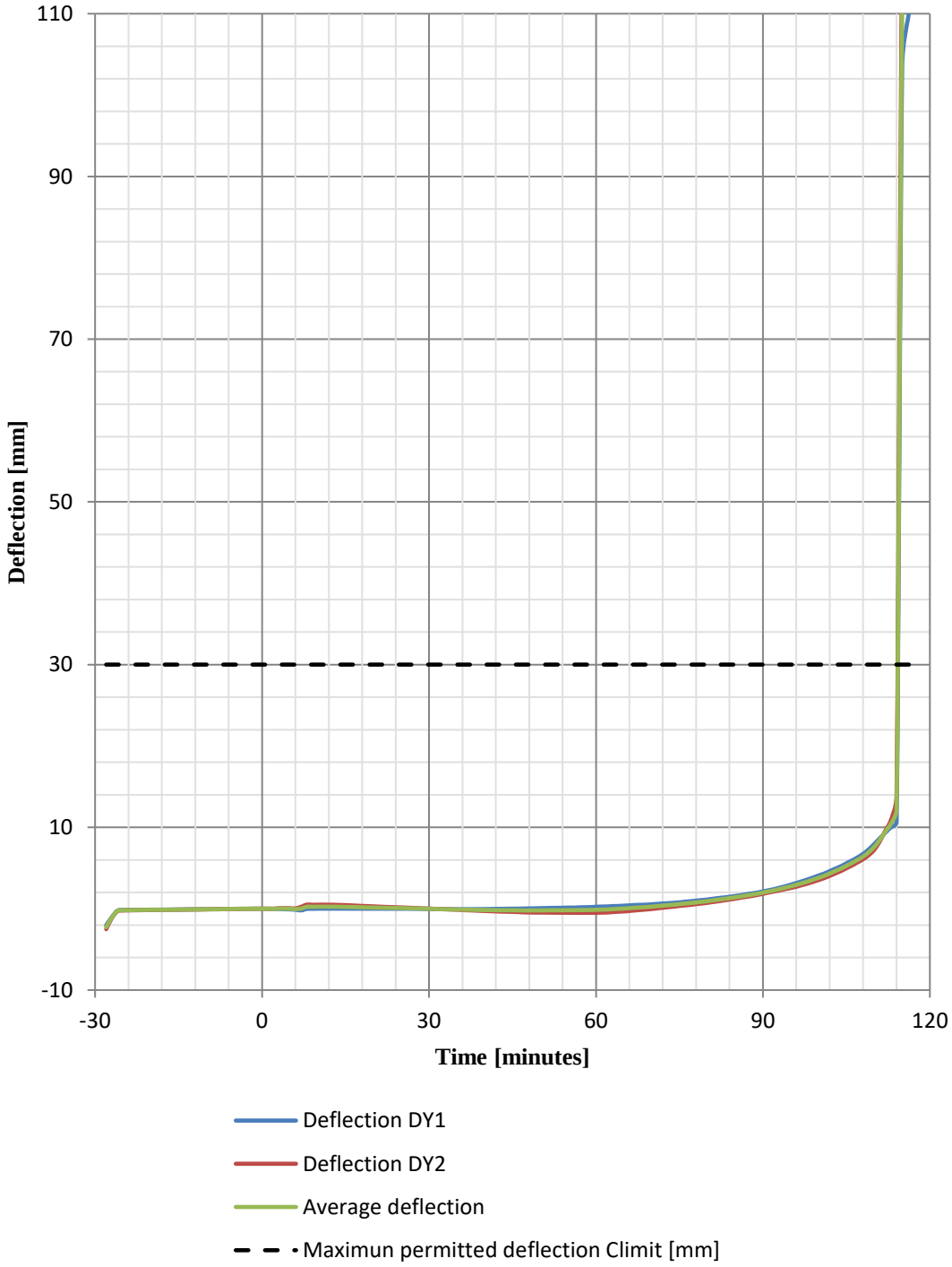
Appendix 4

# Temperatures on test specimen: Graph



Appendix 4

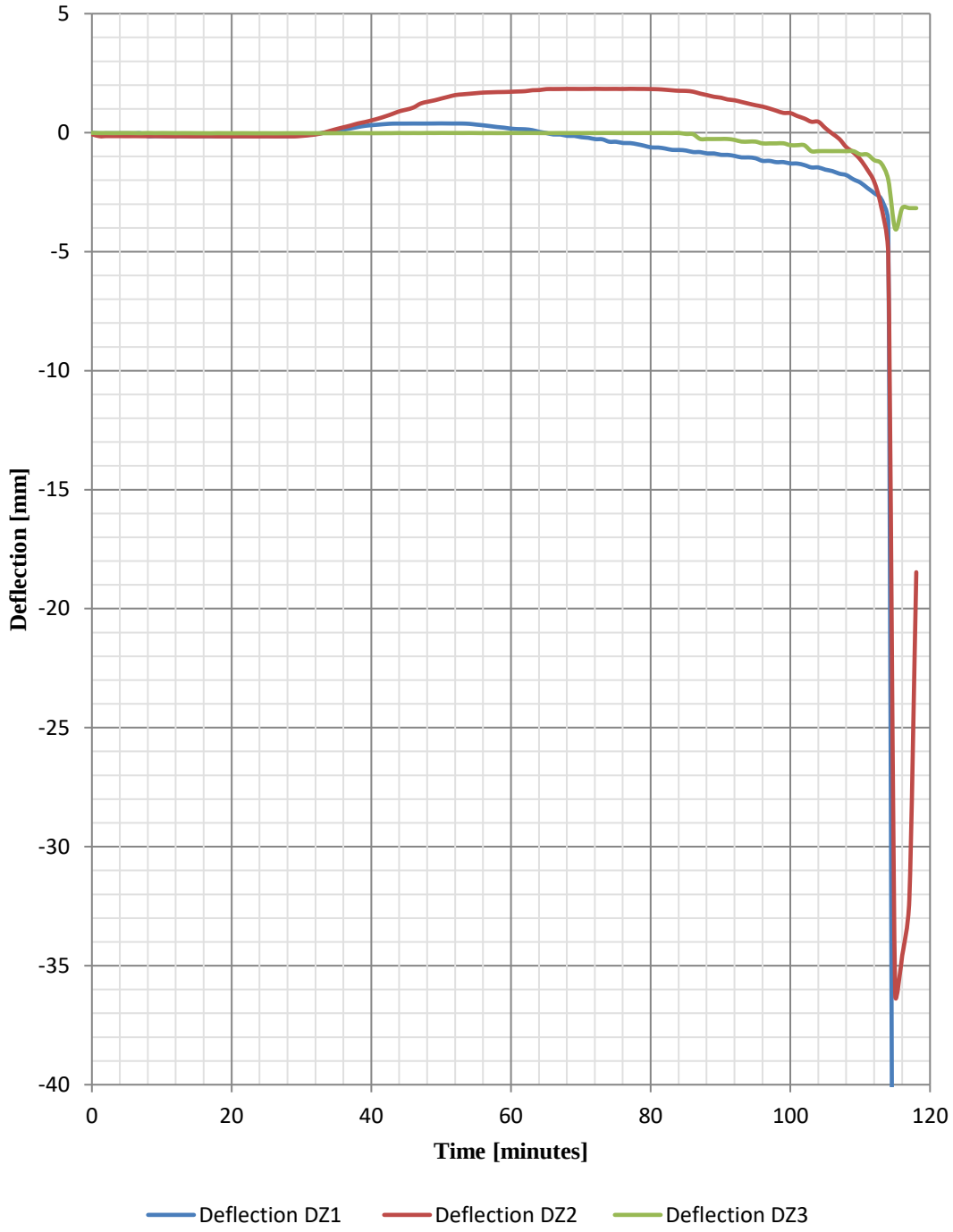
# Deflection




Positive values are deformation downwards.

Appendix 4

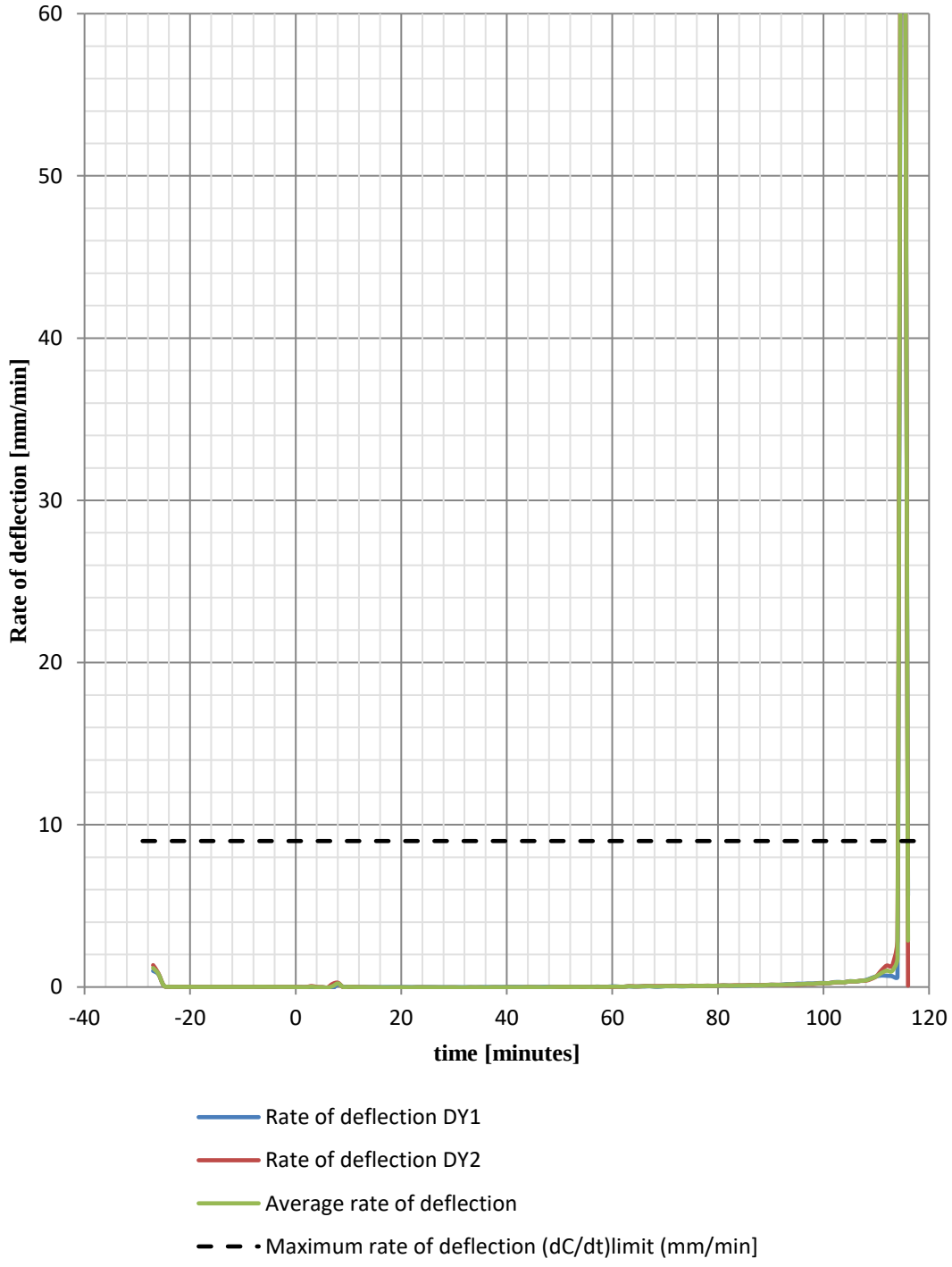
# Deflection




Positive values are deformation towards the furnace.

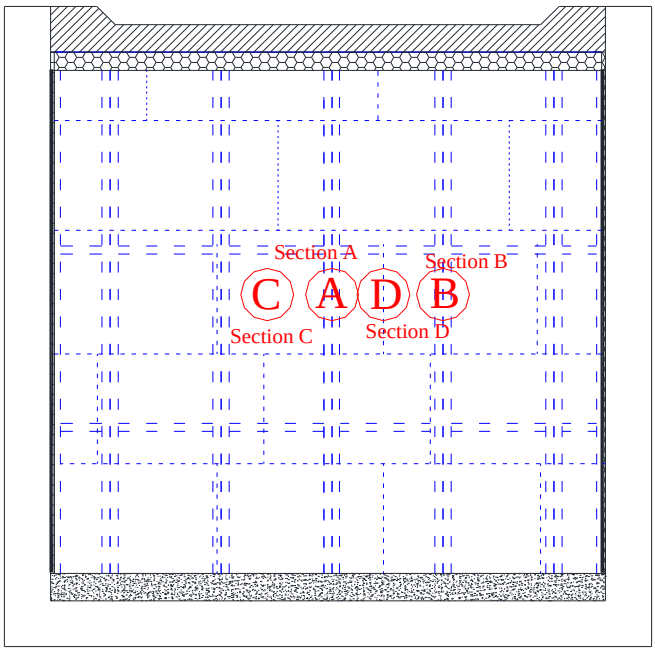
Appendix 4

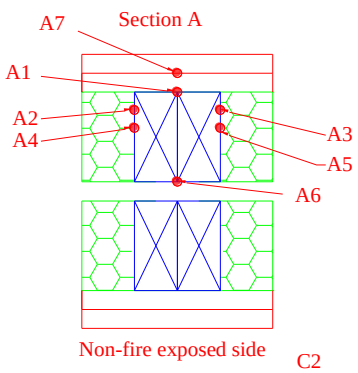
# Calculated rate of deflection

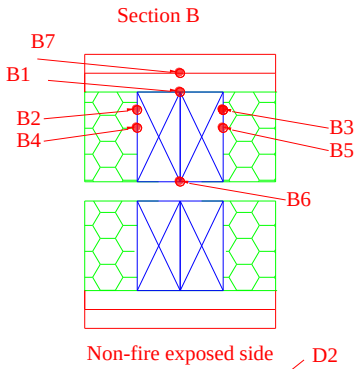


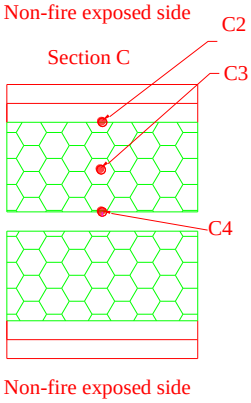
Appendix 4

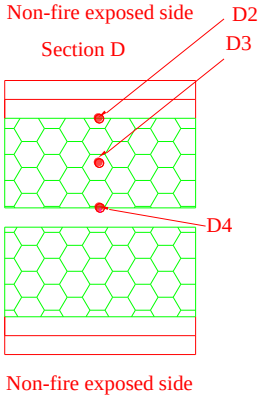
# Additional optional measurements: Instrumentation



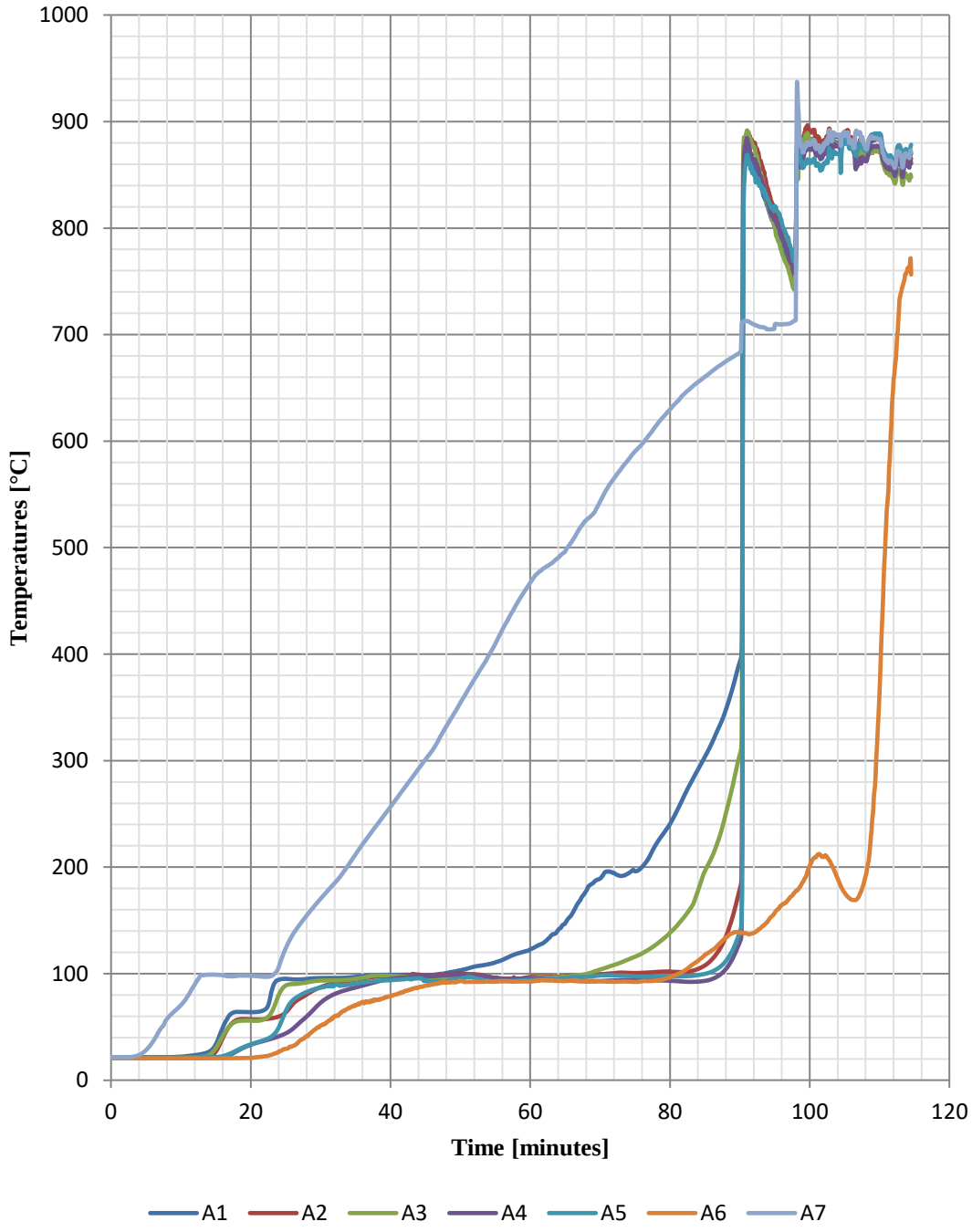



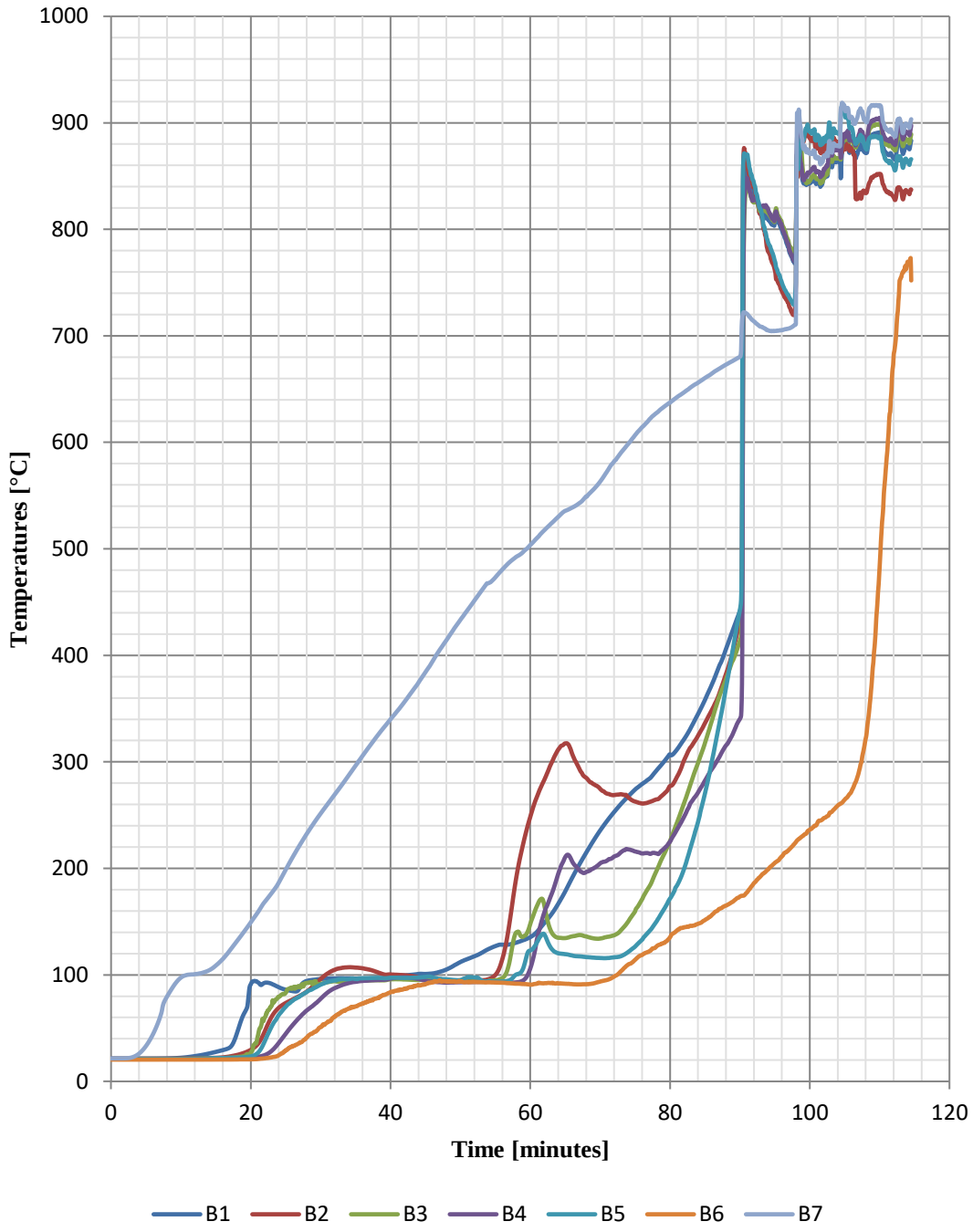
Appendix 4

# Additional optional measurements: Temperatures inside the test specimen section A



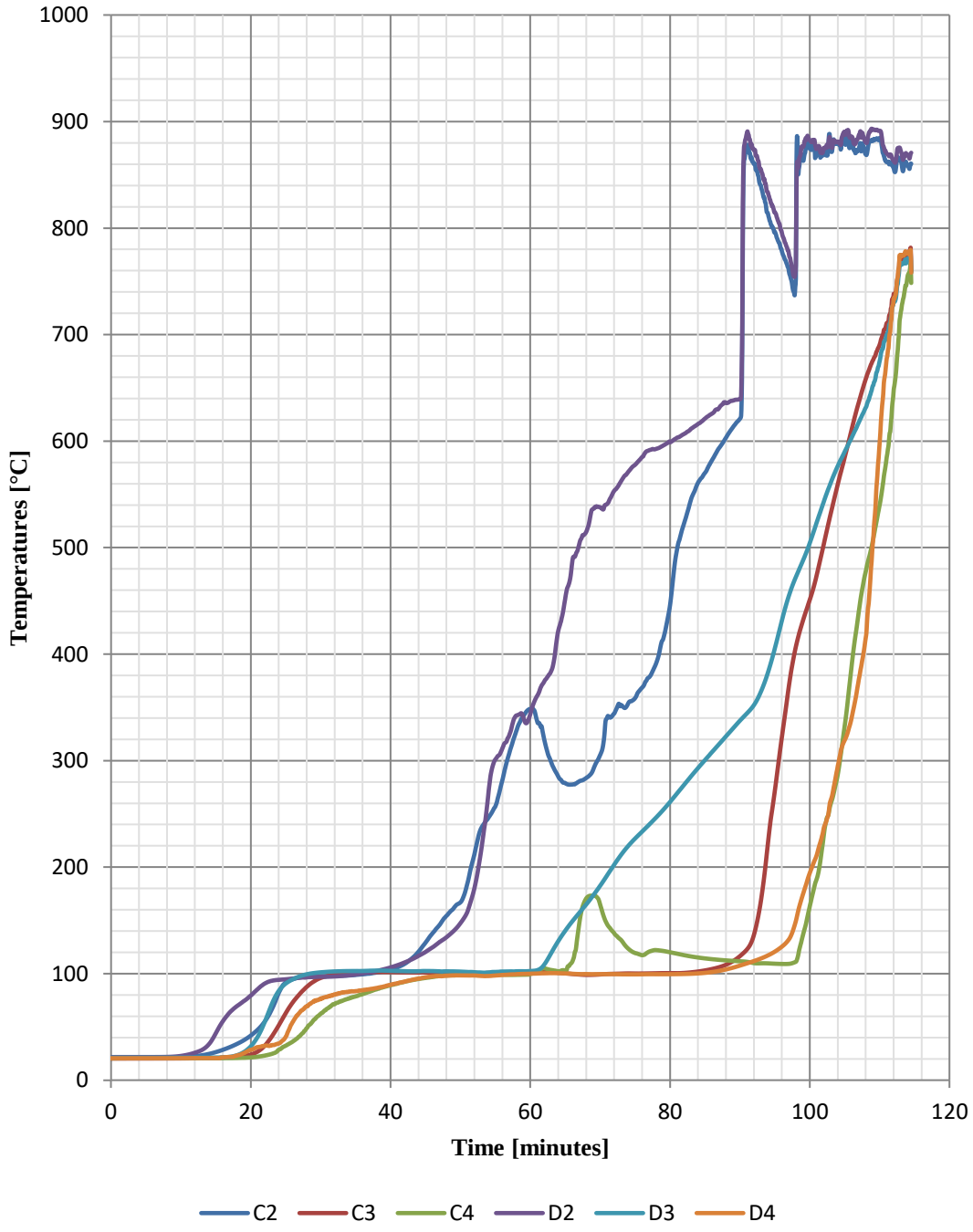
Appendix 4

# Additional optional measurements: Temperatures inside the test specimen section B



Appendix 4

# Additional optional measurements: Temperatures inside the test specimen sections C and D



Appendix 4

# Photographs from the test


*The test specimen at the beginning of the test.*


*The test specimen after 90 minutes.*

Appendix 4

# Photographs from the test


*The test specimen before the crack.*

*Fire exposed side after the test.*

# Verifikat

Transaktion 09222115557476971947

## Dokument

1101398-2 (Göteborgs stad Lokalförvaltningen) LERSKIVA
Huvuddokument
36 sidor
*Startades 2022-09-12 11:52:32 CEST (+0200) av Ali Reza Heravi (ARH)*
*Färdigställt 2022-09-12 13:45:04 CEST (+0200)*

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