

## **Test report # PF23030**

**Test Numbers 23030-1, 23030-2**

**Client: BOSS Products (Australia) Pty Ltd**

**Fire resistance test for penetrations through  
vertical separating element**

**Test method: AS 1530.4:2014**

Report Date 09/01/2024

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## 1.1 Document revision schedule

| Revision # | Date       | Description                     |
|------------|------------|---------------------------------|
| 1          | 19/09/2023 | Initial Issue for Client review |
| 2          | 16/11/2023 | Issued with Client comments     |
| 3          | 09/01/2024 | Issued to Client                |

## 1.2 Signatories

| Report         | Name                                  | Signature                                                                           | Date       |
|----------------|---------------------------------------|-------------------------------------------------------------------------------------|------------|
| Prepared by:   | Alexey Kokorin                        |   | 09/01/2024 |
| Authorized by: | Andrew Bain<br>(Authorized signatory) |  | 09/01/2024 |



All tests reported herein  
have been performed in  
accordance with the  
laboratory's scope of  
accreditation

## 2. Contact details

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### 2.1 Accredited Testing Authority

Fire TS Lab - Passive Fire Inspection and Test Services Ltd

Accreditation Number - 1335

1/113 Pavilion Drive, Mangere, Auckland, 2022

New Zealand

Contact e-mail: [tests@firelab.co.nz](mailto:tests@firelab.co.nz)

### 2.2 Client/Applicant

BOSS Products (Australia) Pty Ltd

Unit 1, 16 Atkinson Rd, Taren Point NSW 2229

Australia

Contact e-mail: [mark.prior@bossfire.com.au](mailto:mark.prior@bossfire.com.au)

### 2.3 Manufacturer

Same as Client/Applicant

## 3. Test Results

### 3.1 Test 23030-1

| Specimen # | Service                                                        | Actual Integrity (min) | Actual insulation (min) | FRL*    |
|------------|----------------------------------------------------------------|------------------------|-------------------------|---------|
| 1          | 25mm PEX Pipe                                                  | 58                     | 35                      | -/45/30 |
| 2          | 25mm PEX AL Pipe                                               | 91 NF                  | 80                      | -/60/60 |
| 3          | 25mm PEX Pipe                                                  | 91 NF                  | 75                      | -/60/60 |
| 4          | 25mm PEX AL Pipe                                               | 91 NF                  | 49                      | -/60/45 |
| 6**        | TPS Cable Bundle - 4 x TPS Power Cable 2C+E 2.5mm <sup>2</sup> | 91 NF                  | 91 NF                   | -/60/60 |
| 8**        | Comms Cable Bundle - 2 x CAT6, 2 x COAX x 1 Security           | 91 NF                  | 82                      | -/60/60 |
| 9          | 40mm CPVC Pipe                                                 | 90                     | 63                      | -/60/60 |
| 11**       | 20mm PEX Pipe                                                  | 91 NF                  | 68                      | -/60/60 |

NF – No failure during the test

\* FRL is limited to published performance of the wall.

\*\* Specimens 6, 8, 11 – Specimens are asymmetrical, results apply if exposed to fire as tested

### 3.2 Test 23030-2

| Specimen # | Service                                                                    | Actual Integrity (min) | Actual insulation (min) | FRL*    |
|------------|----------------------------------------------------------------------------|------------------------|-------------------------|---------|
| 5*         | Four 2C×2.5mm <sup>2</sup> +E 2.5mm <sup>2</sup> czbles - TPS cable bundle | 91 NF                  | 91 minutes              | -/60/60 |

|     |                                                                |       |            |         |
|-----|----------------------------------------------------------------|-------|------------|---------|
| 7*  | Bundle of 2×COAX cables, 2×CAT5E cables and 1×fire alarm cable | 91 NF | 87 minutes | -/60/60 |
| 10* | 20mm Pex Pipe                                                  | 91 NF | 89 minutes | -/60/60 |

**NF – No failure during the test**

\* FRL is limited to published performance of the wall.

\*\* Specimens 5, 7, 10 – Specimens are asymmetrical, results apply if exposed to fire as tested

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The test results relate to the specimens of the product in the form in which they were tested. Differences in the composition or thickness of the product may significantly affect the performance during the test and may therefore invalidate the test results. Care should be taken to ensure that any product, which is supplied or used, is fully represented by the specimens, which were tested.

The specimens were supplied by the sponsor and the Laboratory was not involved in any of selection or sampling procedures.

The results of these fire tests may be used to directly assess fire hazard, but it should be recognized that a single test method will not provide a full assessment of fire hazard under all fire conditions.

## 4. Test Overview

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### Test Specification Fire Resistance:

Failure shall be deemed to have occurred when one of the following occurs:

- a) the temperature at any location on the unexposed face of the test specimen exceeds the initial temperature by more than 180 °C
- b) Integrity failure shall be deemed to have occurred upon ignition of the cotton pad when glowing or flaming occurs or for a period of 30 seconds.
- c) Flaming to the unexposed face for 10 seconds or longer shall be deemed to be an Integrity failure.

### Testing scope:

AS 1530-2014 Part 4 Section 10 Service penetrations and control joints

AS 4072.1-2005 (r. 2016) Components for the protection of openings in fire-resistant separating elements. Part 1: Service penetrations and control joints

### Documentation:

Testing products were verified and tested based on the Client description, refer to the Specimen description below. Documents provided by the Client:

- PF23030-1.pdf
- PF23030-2.pdf
- PF23030-3.pdf
- PF23030-4.pdf
- PF23030-5.pdf
- PF23030-6.pdf
- PF23030-7.pdf
- PF23030-8.pdf
- PF23030-9.pdf
- PF23030-10.pdf
- PF23030-11.pdf

**Testing date (PF23030-1):**

06/09/2023

**Installation completion date (PF23030-1):**

01/06/2023

**Testing date (PF23030-2):**

02/11/2023

**Installation completion date (PF23030-2):**

02/10/2023

**Specimens preparation and conditioning:**

The separating element construction was performed by the Laboratory, using client-provided specifications. Specimen installation was performed by the Laboratory. Client installed fire stopping materials. Laboratory was not involved in sampling and selection of the materials. Laboratory checked materials during construction of the specimen.

**Termination of The Test (for both tests):**

The test was discontinued at 91 minutes.

**Use of Reports:**

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This report details the methods of construction, test conditions and the results obtained when the specific element of construction described herein was tested following the procedure outlined in AS 1530.4. Any significant variation with respect to size, constructional details, loads, stresses, edge or end conditions, other than that allowed under the field of direct application in the relevant test method, is not covered by this report.

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. Equipment

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### **Furnace:**

1200X1200 Indicative Furnace designed to operate to AS1530.4:2014

### **Temperature:**

Furnace Temperature measurements were controlled with four 3mm Type K MIMS thermocouples set within 50-100 mm from the face of the specimens in line with AS1530.4-2014. All thermocouples are calibrated by ISO/IEC 17025 accredited laboratory - a signatory to the International Laboratory Accreditation Corporation (ILAC) through their Mutual Recognition Agreement (MRA) to the accuracy required by AS 1530.4-2014.

### **Pressure measurement:**

Kepware Siemens Data logging system including multi-channel recording data at 5 second intervals. Calibrated by ISO/IEC 17025 accredited laboratory - a signatory to the International Laboratory Accreditation Corporation (ILAC) through their Mutual Recognition Agreement (MRA) to the accuracy required by AS 1530.4-2014.

### **Ambient Temperature:**

Ambient temperature was recorded 15 minutes before the test was commenced, at the start of the test and monitored during the test. All thermocouples are calibrated by ISO/IEC 17025 accredited laboratory - a signatory to the International Laboratory Accreditation Corporation (ILAC) through their Mutual Recognition Agreement (MRA) to the accuracy required by AS 1530.4-2014.

### **Specimen thermocouples:**

Specimen thermocouples were installed to the unexposed face. Type K copper disk thermocouples fixed within the required locations referenced from AS1530.4-2014. Thermocouples are calibrated by ISO/IEC 17025 accredited laboratory - a signatory to the International Laboratory Accreditation Corporation (ILAC) through their Mutual Recognition Agreement (MRA) to the accuracy required by AS 1530.4-2014.

### **Dimensional measurements:**

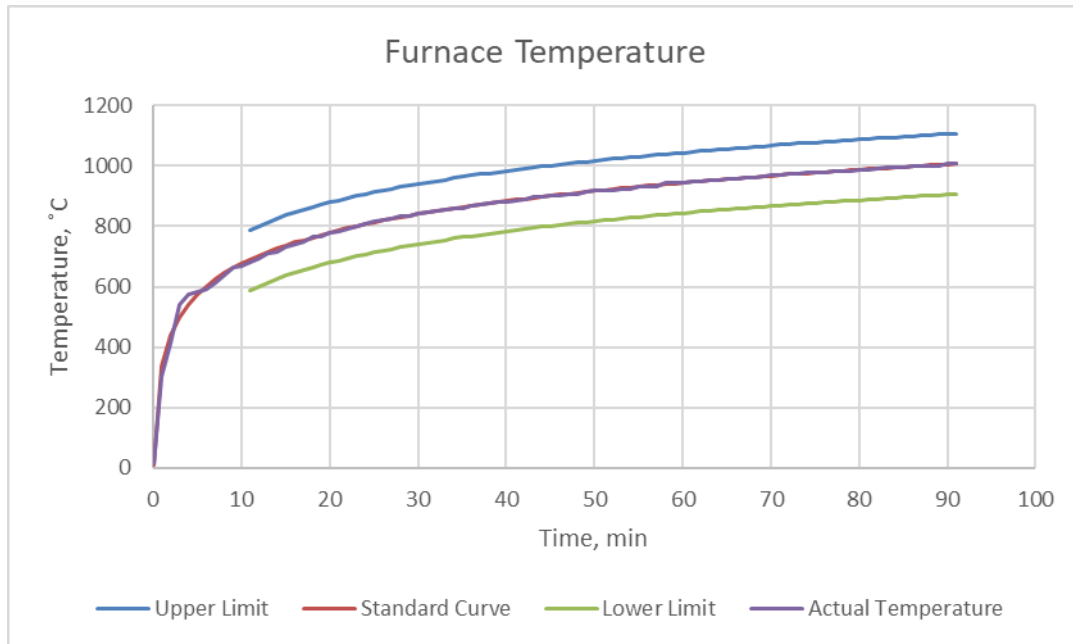
All linear measurements are made with equipment calibrated by ISO/IEC 17025 accredited laboratory - a signatory to the International Laboratory Accreditation Corporation (ILAC) through their Mutual Recognition Agreement (MRA) to the accuracy required by AS 1530.4-2014.

## 6. Test Conditions – Test 23030-1

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### 6.1 Furnace Temperature

The furnace was controlled to follow the temperature/time relationship specified in AS 1530.4-2014.



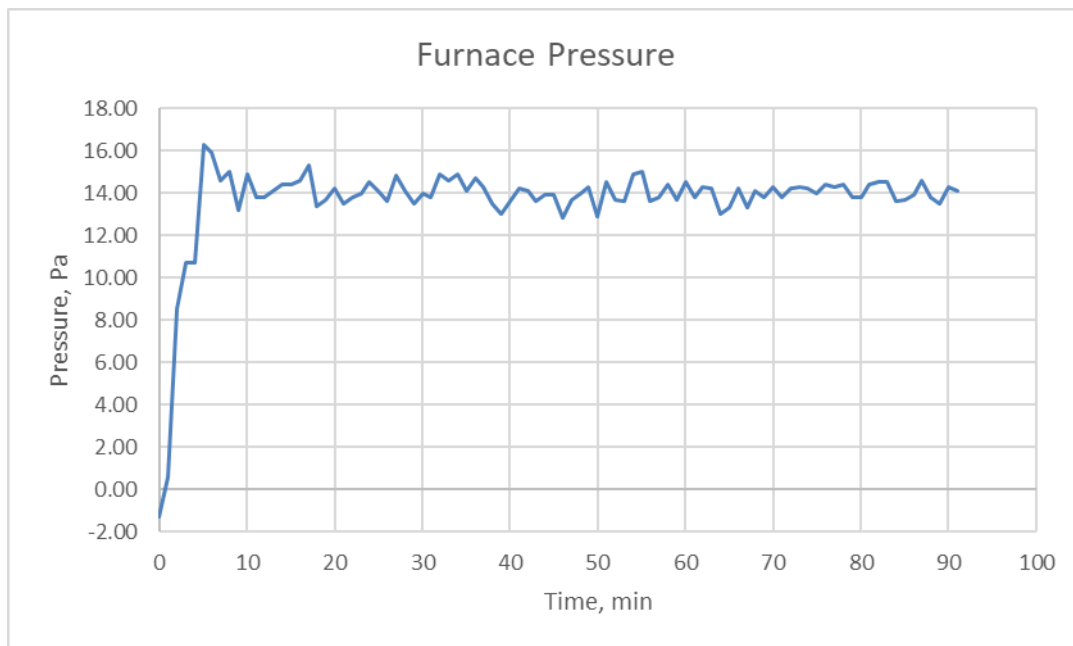
**Figure 1 – Furnace Temperature during the test**

### 6.2 Ambient Temperature

The ambient temperature of the test area 15 minutes before the test and at the commencement of the test was 17°C.

## 6.3 Pressure Readings

After the first 5 minutes of the test, the furnace pressure was maintained at  $14 \pm 3$  Pa with respect to atmosphere. The probe was located 500mm above the furnace floor.

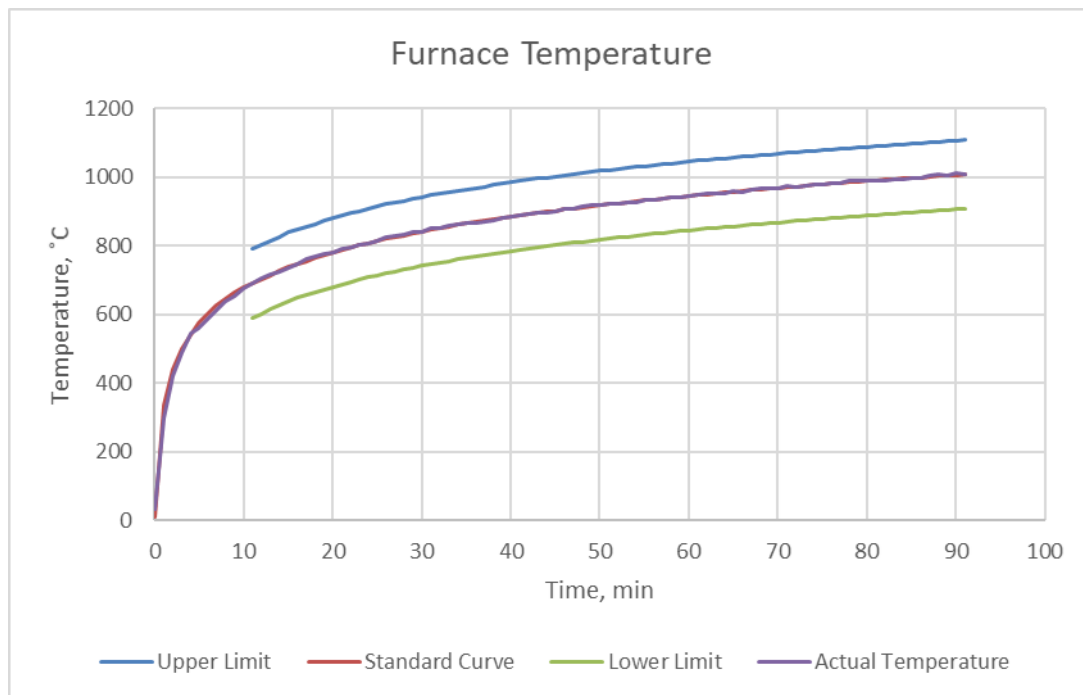


**Figure 2– Furnace Pressure during the test**

## 7. Test Conditions – Test 23030-2

### 7.1 Furnace Temperature

The furnace was controlled to follow the temperature/time relationship specified in AS 1530.4-2014.



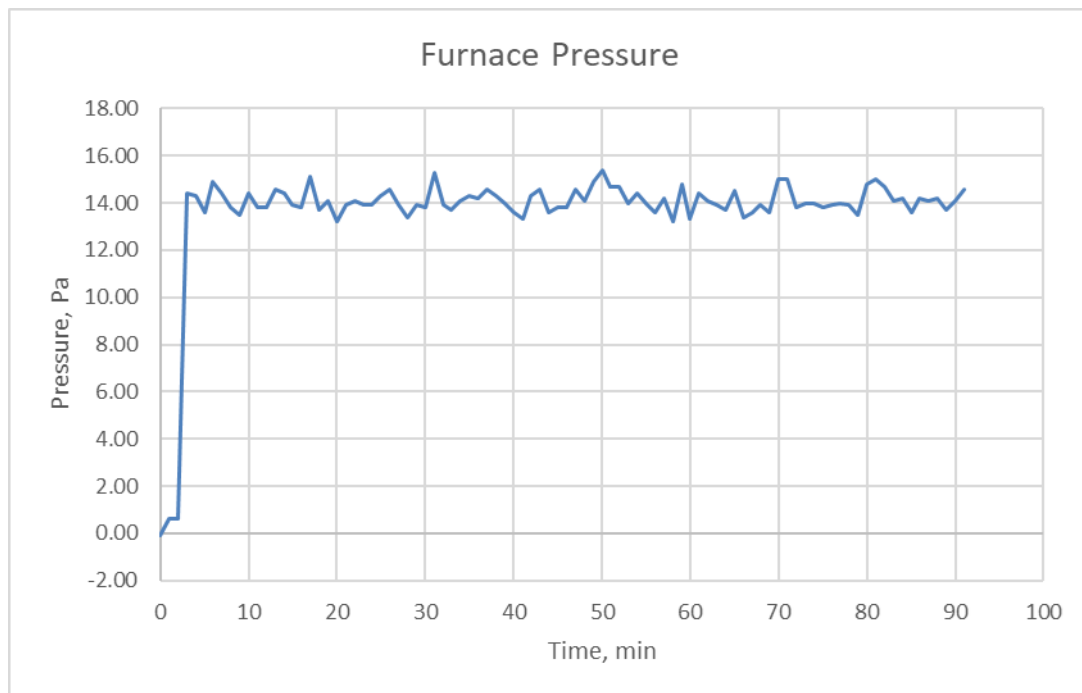
**Figure 3 – Furnace Temperature during the test**

### 7.2 Ambient Temperature

The ambient temperature of the test area 15 minutes before the test and at the commencement of the test was 20°C.

## 7.3 Pressure Readings

After the first 5 minutes of the test, the furnace pressure was maintained at  $14 \pm 3$  Pa with respect to atmosphere. The probe was located 500mm above the furnace floor.



**Figure 4 – Furnace Pressure during the test**

## 8. Schedule of Materials – Test 23030-1

| Separating Element |                     |                                       |
|--------------------|---------------------|---------------------------------------|
| 1.1                | Item / Product Name | Steel Track                           |
|                    | Dimensions          | Width / Height (W/H): 2mm × 50mm      |
|                    |                     | Thickness (T): 0.75 BMT               |
|                    | Additional Info     | Used to construct separating element  |
| 1.2                | Item / Product Name | Steel Stud                            |
|                    | Dimensions          | Width / Height (W/H): 92mm × 32mm     |
|                    |                     | Thickness (T): 0.75 BMT               |
|                    | Additional Info     | Used to construct separating element  |
| 1.3                | Item / Product Name | Boss Batts                            |
|                    | Dimensions          | Thickness (T): 50mm                   |
|                    | Additional info     | Used to construct separating element  |
| 1.4                | Item / Product Name | GIB Fyreline Plasterboard             |
|                    | Dimensions          | Width / Height (W/H): 1200mm × 1200mm |
|                    | Measurements        | Thickness (T): 13mm                   |
|                    | Additional Info     | Used to construct separating element  |
| 1.5                | Item / Product Name | PinkBatt insulation                   |
|                    | Dimensions          | R1.8 90mm thick glasswool insulation  |
|                    | Additional Info     | Wall insulation                       |

| Services |                     |                                                    |
|----------|---------------------|----------------------------------------------------|
| 2.1      | Item / Product Name | AUSPEX 25mm PEX pipe                               |
|          | Measurements        | Thickness (T): 3.5mm                               |
|          |                     | Inner Diameter (ID): 19mm                          |
|          |                     | Outer Diameter (OD): 25mm                          |
|          | Additional Info     | Specimen 1, 3                                      |
| 2.2      | Item / Product Name | Duopex PEX AL Gas Pipe 26mm                        |
|          | Measurements        | Thickness (T): 3mm                                 |
|          |                     | Inner Diameter (ID): 19.5mm                        |
|          |                     | Outer Diameter (OD): 26mm                          |
|          | Additional Info     | Specimen 2, 4                                      |
| 2.3      | Item / Product Name | Nexans OLEX TPS Cable                              |
|          | Measurements        | Width / Height (W/H): 11.5mm×5.5                   |
|          | Additional Info     | Specimen 6 – 4 × cables installed through aperture |
| 2.4      | Item / Product Name | CAT6 Cable                                         |
|          | Measurements        | Outer Diameter (OD): 18mm                          |
|          | Additional Info     | Specimen 8 – 2 × cables installed through aperture |
| 2.5      | Item / Product Name | COAX Cable                                         |
|          | Measurements        | Outer Diameter (OD): 7mm                           |
|          | Additional Info     | Specimen 8 – 2 × cables installed through aperture |
| 2.6      | Item / Product Name | Security Cable                                     |
|          | Measurements        | Outer Diameter (OD): 3.5mm                         |

|     |                     |                                                      |
|-----|---------------------|------------------------------------------------------|
|     | Additional Info     | Specimen G, H – 1 × cable installed through aperture |
| 2.7 | Item / Product Name | 40mm CPVC Sprinkler                                  |
|     | Measurements        | Thickness (T): 6mm                                   |
|     |                     | Inner Diameter (ID): 37mm                            |
|     |                     | Outer Diameter (OD): 48.5mm                          |
|     | Additional Info     | Specimen 9                                           |
| 2.8 | Item / Product Name | AUSPEX 20mm PEX pipe                                 |
|     | Measurements        | Thickness (T): 3mm                                   |
|     |                     | Inner Diameter (ID): 14.5mm                          |
|     |                     | Outer Diameter (OD): 20.5mm                          |
|     | Additional Info     | Specimen 11                                          |

| Sealants |                     |                                                                   |
|----------|---------------------|-------------------------------------------------------------------|
| 3.1      | Item / Product Name | FireMastic-HPE                                                    |
|          | Measurements        | Thickness (T): 13mm                                               |
|          | Installation        | Specimen 1, 2, 3, 4, 6, 8, 9, 11 – Installed around penetrations. |

| Fixings |                     |                                         |
|---------|---------------------|-----------------------------------------|
| 4.1     | Item / Product Name | KG Koala Wafer Head Self tapping screws |
|         | Measurements        | 16mm × 10g                              |
|         | Installation        | Used to fix steel stud frame            |
| 4.2     | Item / Product Name | GIB Grabber Self Tapping Screw          |
|         | Measurements        | 32mm                                    |
|         | Installation        | Used to fix plasterboard to steel frame |

| Fire Collar |                       |                                                        |
|-------------|-----------------------|--------------------------------------------------------|
| 5.1         | Item / Product Name   | BOSS 32mm MaxiCollar                                   |
|             | Collar Shell Material | Outer Diameter (OD): 47mm                              |
|             |                       | Inner Diameter (ID): 35mm                              |
|             |                       | Height (H): 30mm                                       |
|             | Intumescent Details   | Number of Layers: 5                                    |
|             |                       | Depth (D): 29mm                                        |
|             |                       | Thickness (T): 2mm                                     |
|             | Installation          | Specimen 3, 4– fixed to separating element with screws |

## 9. Schedule of Materials – Test 23030-2

| Supporting Construction |                     |                                                                                          |
|-------------------------|---------------------|------------------------------------------------------------------------------------------|
| 1.1                     | Item / Product Name | 92mm Steel Stud & Track Wall Framing with one layer of 13mm FR plasterboard on each side |
|                         | Dimensions          | Width / Height (W/H): 1200mm × 1200mm                                                    |
|                         |                     | Thickness (T): 118mm                                                                     |
| 1.2                     | Item / Product Name | Rondo Steel Track                                                                        |
|                         | Dimensions          | Width / Height (W/H): 92mm × 45mm                                                        |
|                         |                     | Thickness (T): 0.75 BMT                                                                  |
|                         | Additional Info     | Installed to top and bottom of refractory frame                                          |
| 1.3                     | Item / Product Name | Rondo Steel Stud                                                                         |
|                         | Dimensions          | Width / Height (W/H): 92mm × 32mm                                                        |
|                         |                     | Thickness (T): 0.75 BMT                                                                  |
|                         | Additional Info     | Installed between top and bottom tracks                                                  |
| 1.4                     | Item / Product Name | Boss Fire Batt                                                                           |
|                         | Thickness           | 50mm                                                                                     |
|                         | Installation        | Installed to steel studs, between specimens                                              |
| 1.5                     | Item / Product Name | PinkBatt insulation                                                                      |
|                         | Dimensions          | R1.8 90mm thick glasswool insulation                                                     |
|                         | Additional Info     | Wall insulation                                                                          |
| 1.6                     | Item / Product Name | GIB Fyrelite Plasterboard                                                                |
|                         | Dimensions          | Width / Height (W/H): 1200mm × 1200mm                                                    |
|                         |                     | Thickness (T): 13mm                                                                      |
|                         | Additional Info     | 1 x layer installed to each face of steel stud frame                                     |
| 1.7                     | Item / Product Name | 25mm GIB Grabber Self-Tapping Screw                                                      |
|                         | Dimensions          | 6 × 25mm                                                                                 |
|                         | Installation        | Used to fix steel stud frame                                                             |
| 1.8                     | Item / Product Name | 41mm GIB Grabber Self Tapping Screw                                                      |
|                         | Dimensions          | 6 × 41mm                                                                                 |
|                         | Installation        | Used to fix plasterboard to steel stud frame                                             |

| Services |                     |                                                    |
|----------|---------------------|----------------------------------------------------|
| 2.1      | Item / Product Name | NEXANS OLEX 2.5mm <sup>2</sup> 2C+E Flat TPS Cable |
|          | Dimensions          | Width / Height (W/H): 12mm × 5mm                   |
|          | Insulation          | 450/750V V-90 insulated                            |
|          | Sheath              | 90°C PVC sheathed                                  |
| 2.2      | Item / Product Name | BELDEN Broadband Coax RG6 Cable 1829A-C            |
|          | Dimensions          | Outer Diameter (OD): 7mm                           |
|          | Insulation          | PE - Polyethylene (Foam)                           |
|          | Sheath              | PVC - Polyvinyl Chloride                           |
| 2.3      | Item / Product Name | DYNAMIX Cat5e Blue UTP SOLID Cable                 |
|          | Dimensions          | Outer Diameter (OD): 5mm                           |
|          | Insulation          | HDPE                                               |

|     |                     |                                                                    |
|-----|---------------------|--------------------------------------------------------------------|
|     | Sheath              | PVC CM UL Rated Jacket                                             |
| 2.4 | Item / Product Name | TYCAB 2 x 1.25mm <sup>2</sup> Screened Fire Alarm Cable DMAC216032 |
|     | Dimensions          | Outer Diameter (OD): 7.5mm                                         |
|     | Insulation          | V90 PVC                                                            |
|     | Sheath              | 5V90 PVC                                                           |
| 2.5 | Item / Product Name | 20mm Pex Pipe                                                      |
|     | Dimensions          | Inner Diameter (ID): 14.5mm                                        |
|     |                     | Outer Diameter (OD): 20mm                                          |
|     |                     | Thickness (T): 2.5mm                                               |

| Sealants |                     |                                                  |
|----------|---------------------|--------------------------------------------------|
| 3.1      | Item / Product Name | FireMastic-HPE                                   |
|          | Dimensions          | Thickness (T) 13mm                               |
|          | Installation        | Installed to specimen 5, 7, 10, in annular space |

## 11. Testing Specimens Details – Test 23030-1

### 11.1 Thermocouple Positions Table

| SPECIMEN | TC# | THERMOCOUPLE LOCATION DESCRIPTION                                        |
|----------|-----|--------------------------------------------------------------------------|
| 1        | 201 | Separating element, 25mm above sealant cone                              |
| 1        | 202 | Separating element, 25mm right of sealant cone                           |
| 1        | 203 | PEX Pipe, top side of specimen, 25mm from sealant cone                   |
| 1        | 204 | PEX Pipe, bottom side of specimen, 25mm from sealant cone                |
| 2        | 205 | Separating element, 25mm above sealant                                   |
| 2        | 206 | Separating element, 25mm right of sealant                                |
| 2        | 207 | PEX-AL Pipe, top side of specimen, 25mm from separating element          |
| 2        | 208 | PEX-AL Pipe, bottom side of specimen, 25mm from separating element       |
| 3        | 209 | Separating element, 25mm above fire collar                               |
| 3        | 210 | Separating element, bottom right of specimen, 25mm from fire collar      |
| 3        | 211 | Fire collar, top right side of fire collar, 25mm from separating element |
| 3        | 212 | Fire collar, bottom side of fire collar, 25mm from separating element    |
| 3        | 213 | PEX Pipe, top side of specimen, 25mm from fire collar                    |
| 3        | 214 | PEX Pipe, bottom side of specimen, 25mm from fire collar                 |
| 4        | 215 | Separating element, top right of specimen, 25mm from fire collar         |
| 4        | 216 | Separating element, bottom right of specimen, 25mm from fire collar      |
| 4        | 217 | Fire collar, top right side of fire collar, 25mm from separating element |
| 4        | 218 | Fire collar, bottom side of fire collar, 25mm from separating element    |
| 4        | 219 | PEX Pipe, top side of specimen, 25mm from fire collar                    |
| 4        | 220 | PEX Pipe, bottom side of specimen, 25mm from fire collar                 |
| 6        | 221 | Separating element, 25mm above sealant                                   |
| 6        | 222 | Separating element, 25mm right of sealant                                |
| 6        | 223 | Cable bundle, top side of specimen, 25mm from separating element         |
| 6        | 224 | Cable bundle, bottom side of specimen, 25mm from separating element      |
| 8        | 225 | Separating element, 25mm above sealant                                   |
| 8        | 226 | Separating element, 25mm below sealant                                   |
| 8        | 227 | Cable bundle, top side of specimen, 25mm from separating element         |
| 8        | 228 | Cable bundle, bottom side of specimen, 25mm from separating element      |
| 9        | 229 | Separating element, 25mm above sealant cone                              |
| 9        | 230 | Separating element, 25mm right of sealant cone                           |
| 9        | 231 | Sealant cone, top side of specimen, 25mm from separating element         |
| 9        | 232 | Sealant cone, right side of specimen, 25mm from separating element       |
| 9        | 233 | CPVC Pipe, top side of specimen, 25mm from sealant cone                  |
| 9        | 234 | CPVC Pipe, right side of specimen, 25mm from sealant cone                |

|    |     |                                                                 |
|----|-----|-----------------------------------------------------------------|
| 11 | 235 | Separating element, 25mm above sealant                          |
| 11 | 236 | Separating element, 25mm right of sealant                       |
| 11 | 237 | PEX Pipe, top side of specimen, 25mm from separating element    |
| 11 | 238 | PEX Pipe, bottom side of specimen, 25mm from separating element |

## 11.2 Observations during the test

| TIME<br>Mins | TEST<br>FACE | SP#        | OBSERVATIONS/REMARKS                                                                           |
|--------------|--------------|------------|------------------------------------------------------------------------------------------------|
| 1            | E            | 1, 2, 3, 4 | Specimens discolouring and combusting                                                          |
| 1            | E            | 1, 3, 4    | Pipes discolouring and deforming                                                               |
| 1            | E            | 9          | Pipe discolouring                                                                              |
| 5            | E            | 1          | Pipe not visible                                                                               |
| 5            | E            | 1, 2, 3    | Expansion of sealant                                                                           |
| 10           | E            | 3, 9       | Pipe not visible                                                                               |
| 10           | E            | ALL        | Expansion of sealant                                                                           |
| 10           | U            | 1          | Deformation of pipe, 100mm from separating element and fissuring of sealant around pipe        |
| 14           | U            | 1          | Further deformation of pipe and fissuring of sealant                                           |
| 20           | U            | 3          | Smoke from fire collar and discolouring of separating element on the right side of fire collar |
| 22           | U            | 9          | Deformation of pipe                                                                            |
| 23           | U            | 1          | Fissuring of sealant around pipe expanded to 3mm                                               |
| 25           | E            | 2, 4       | Pipe extending from exposed face not visible                                                   |
| 31           | U            | 9          | Further deformation of pipe, pipe expanding                                                    |
| 35           | U            | 9          | Smoke from left side of sealant cone                                                           |
| 36           | U            | 1          | Sealant on the top right of pipe detached from sealant cone                                    |
| 42           | U            | 1          | Crack between sealant cone and the outer diameter of pipe                                      |
| 45           | U            | 1          | Crack between sealant cone and separating element                                              |
| 45           | E            | SE         | Cracking of plasterboard on both sides of specimen 9                                           |
| 46           | U            | 4          | Intumescent in fire collar expanding, coming out of collar                                     |
| 50           | U            | 2          | Gap between sealant and the top side of pipe                                                   |
| 54           | U            | 2          | Gap expanding towards bottom side of pipe                                                      |
| 55           | U            | 1          | Smoke from the crack on the top side of sealant cone                                           |
| 57           | U            | 1          | Sealant falling off from top side of sealant cone                                              |
| 58           | U            | SE         | Discolouring of separating element between specimen 9 and 11                                   |
| 58           | U            | 1          | Pipe break off from sealant cone and move up, aperture exposed with visible glow in aperture   |
| 58           | U            | 1          | Cotton pad test for 30 seconds – FAIL                                                          |
| 60           | U            | 2          | Sealant expanding and detaching from pipe                                                      |
| 60           | U            | 4          | Further expansion of sealant, sealant falling off from specimen                                |

|    |   |    |                                                                                                                |
|----|---|----|----------------------------------------------------------------------------------------------------------------|
| 62 | U | 9  | Crack on the top side of sealant cone, next to the pipe, with smoke from the crack                             |
| 63 | U | SE | Discolouring of separating element, right of specimen 9                                                        |
| 68 | U | SE | discolouring of separating element, right of specimen 1 sealant cone                                           |
| 69 | U | 2  | Smoke from specimen                                                                                            |
| 70 | U | SE | Discolouring of separating element above specimen 8 and between specimen 1 and 9                               |
| 71 | U | 9  | Sealant cone detached from separating element with smoke from the crack between sealant and separating element |
| 75 | U | 3  | Deformation of pipe                                                                                            |
| 77 | U | SE | Discolouring of separating element below specimen 8                                                            |
| 82 | U | SE | Separating element at the bottom right of specimen 9 cracking                                                  |
| 84 | U | 2  | Discolouring of pipe next to expanded sealant                                                                  |
| 84 | U | 11 | Expansion of sealant and deformation of pipe                                                                   |
| 85 | U | 8  | Expansion of sealant, melting of cables next to sealant                                                        |
| 85 | U | SE | Discolouring of separating element on the right side of specimen 8 and on the left side of specimen 11         |
| 90 | U | SE | Discolouring of separating element, right of specimen 6                                                        |
| 90 | U | 9  | Cotton pad test for 30 seconds – FAIL                                                                          |
| 91 |   |    | Test discontinued                                                                                              |

NOTE: E – Exposed Face (inside furnace)  
U – Unexposed Face (outside furnace)  
SE – Separating element



## 12. Testing Specimens Details – Test 23030-2

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### 12.1 Thermocouple Positions Table

| SPECIMEN | TC# | THERMOCOUPLE LOCATION DESCRIPTION                                                      |
|----------|-----|----------------------------------------------------------------------------------------|
| 5        | 1   | Separating element, mid-width of specimen, 25mm above the aperture on exposed face     |
| 5        | 2   | Separating element, mid-height of specimen, 25mm left of the aperture on exposed face  |
| 5        | 3   | Separating element, mid-width and mid-height of specimen                               |
| 7        | 4   | Separating element, mid-width of specimen, 25mm above the aperture on exposed face     |
| 7        | 5   | Separating element, mid-height of specimen, 25mm left of the aperture on exposed face  |
| 7        | 6   | Separating element, mid-width and mid-height of specimen                               |
| 10       | 7   | Separating element, mid-width of specimen, 25mm above the aperture on exposed face     |
| 10       | 8   | Separating element, mid-height of specimen, 25mm right of the aperture on exposed face |
| 10       | 9   | Separating element, mid-width and mid-height of specimen                               |

## 12.2 Observations during the test

| TIME | TEST  | SP# | OBSERVATIONS/REMARKS                                   |
|------|-------|-----|--------------------------------------------------------|
| Mins | FACE  |     |                                                        |
| 3    | E     | ALL | Cables and pipe combusting                             |
| 7    | E     | ALL | Expansion of sealant                                   |
| 7    | E     | 10  | Pipe combusted, not visible from exposed face          |
| 15   | E & U | ALL | No Notable Change                                      |
| 30   | E & U | ALL | No Notable Change                                      |
| 45   | U     | ALL | No Notable Change                                      |
| 45   | E     | 10  | Sealant in annular space not visible from exposed face |
| 60   | U     | ALL | No Notable Change                                      |
| 60   | E     | 7   | Sealant in annular space not visible from exposed face |
| 75   | E & U | ALL | No Notable Change                                      |
| 80   | U     | SE  | Discolouration between specimen 5 & 7                  |
| 84   | U     | SE  | Discolouration between specimens 7 & 10                |
| 88   | U     | SE  | Further Discolouration around specimen 7               |
| 91   |       |     | Test Discontinued                                      |

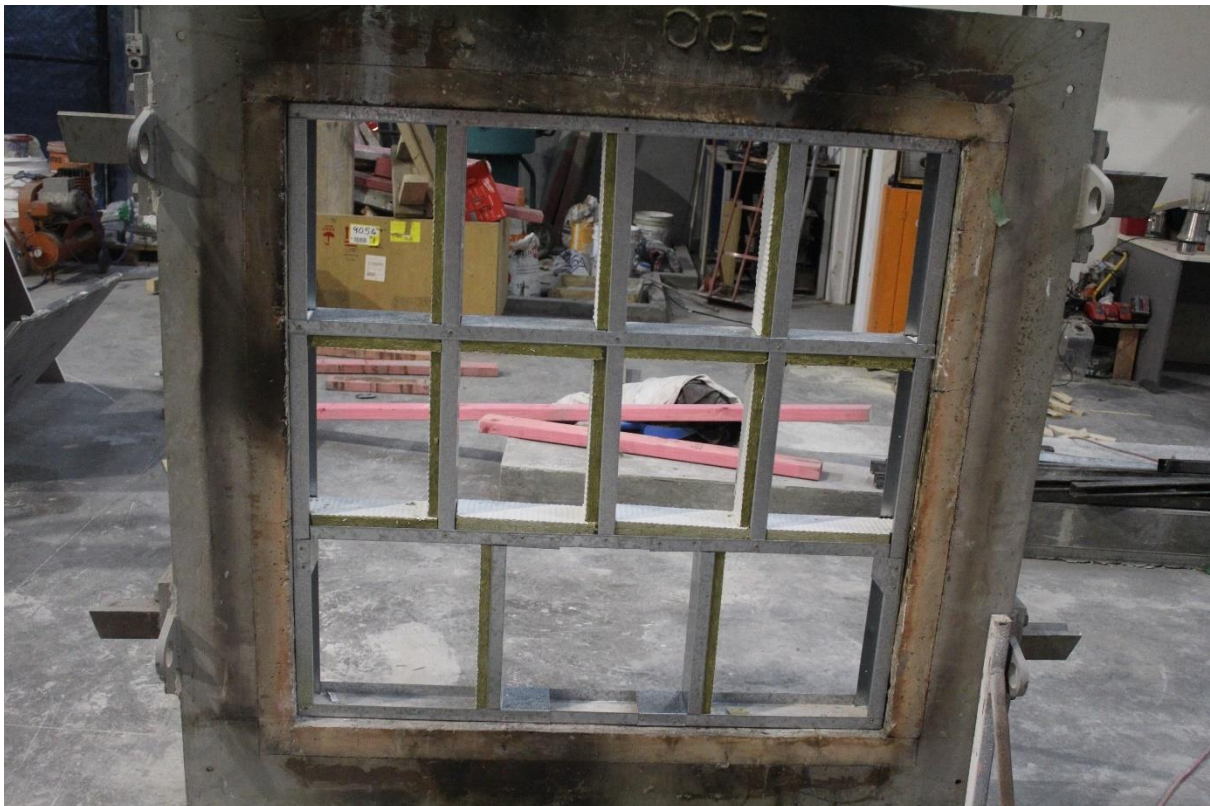
NOTE: E – Exposed Face (inside furnace)  
 U – Unexposed Face (outside furnace)  
 SE – Separating element

## 13. Separating Element Construction – Test 23030-1

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The separating element was constructed by the laboratory. Documentation of the construction process was recorded by the laboratory during and after construction.

The separating element was constructed in line with the general requirements of the GBS60 system of GIB Fire Rated Systems – Specification and installation manual (Oct 2018) with modification to the studs and nogs in terms of spacing and introduction of mineral wool inserts. Separating element consisted of 92x36mm 0.75mm BMT steel framing. Cavities were isolated from each other with 50mm thick Boss Fire batt. The wall was insulated with R1.8 90mm thick glasswool insulation.



**Figure 5 – Separating element framing**

One layer of 13mm fire rated plasterboard was fixed on both sides of the framing. The plasterboard was screw fixed to each face of the separating element. Apertures were cut to size, refer to specimens' description.

## 14. Separating Element Construction – Test 23030-2

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The separating element was constructed by the laboratory. Documentation of the construction process was recorded by the laboratory during and after construction.

The separating element was constructed in line with the general requirements of the GBS60 system of GIB Fire Rated Systems – Specification and installation manual (Oct 2018) with modification to the studs and nogs in terms of spacing and introduction of mineral wool inserts. Separating element consisted of 92x36mm 0.75mm BMT steel framing. Cavities were isolated from each other with 50mm thick Boss Fire batt. The wall was insulated with R1.8 90mm thick glasswool insulation.



**Figure 6 – Separating element framing**

One layer of 13mm fire rated plasterboard was fixed on both sides of the framing. The plasterboard was screw fixed to each face of the separating element. Apertures were cut to size, refer to specimens' description.

## 15. Test Results – Test 23030-1

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**Figure 7 – Unexposed Face of Specimens**



**Figure 8 – Exposed Face of Specimens**

## 15.1 Specimen 1

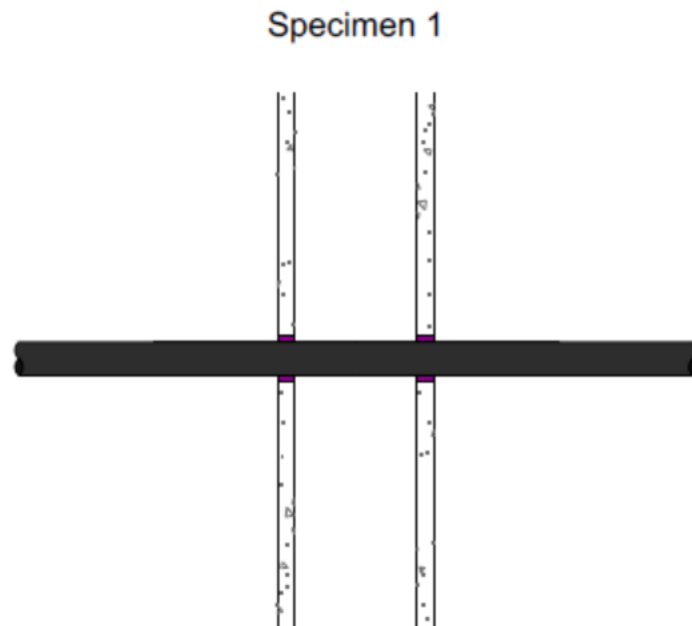
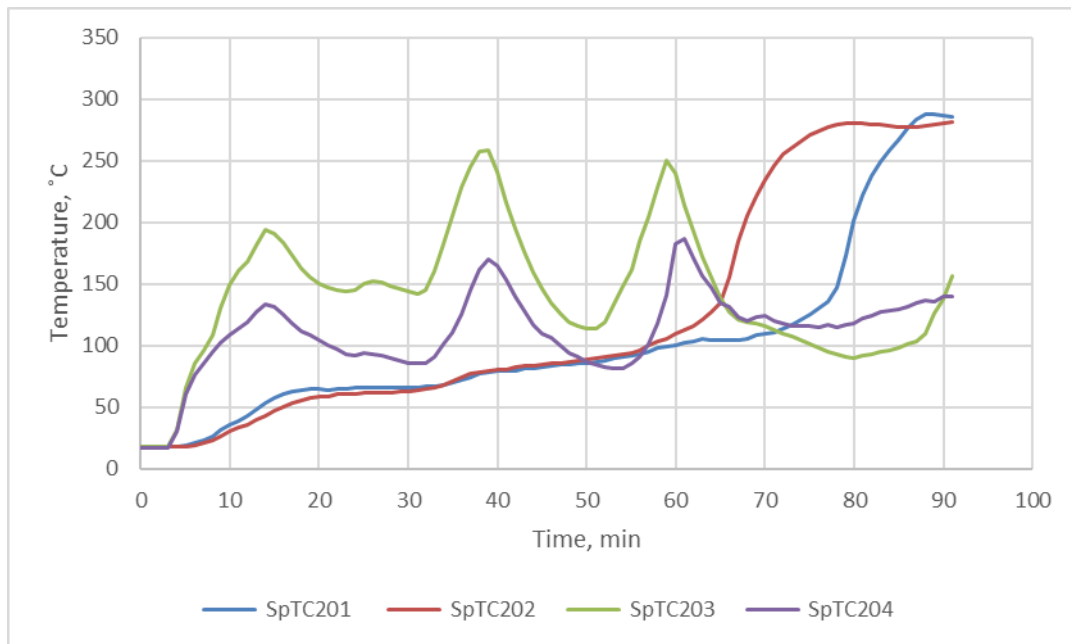


Figure 9 – Specimen 1

| Penetration System |                                       |                                                                                                                                                                                                                                                  |
|--------------------|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                  | Service                               | 25mm PEX Pipe                                                                                                                                                                                                                                    |
|                    | Service Details                       | Pipe (2.1), Sealant (3.1)                                                                                                                                                                                                                        |
|                    | Service Support                       | Unistrut structure at 410mm and 1450mm                                                                                                                                                                                                           |
|                    | Aperture Size                         | 36mm core hole                                                                                                                                                                                                                                   |
|                    | Annular Spacing                       | Min: 4.5mm, Max: 5.5mm                                                                                                                                                                                                                           |
|                    | Configuration                         | Capped from fire side only                                                                                                                                                                                                                       |
|                    | <b>Local Fire stopping Protection</b> |                                                                                                                                                                                                                                                  |
|                    | Fire Stop application                 | Symmetrical                                                                                                                                                                                                                                      |
|                    | Protection Used                       | Aperture was cut into the separating element. The pipe (2.1) was placed through aperture, extending 500mm from the exposed face. Sealant was installed in the annular gap, flush with the plasterboard, resulting in a 13mm (nominal) deep seal. |

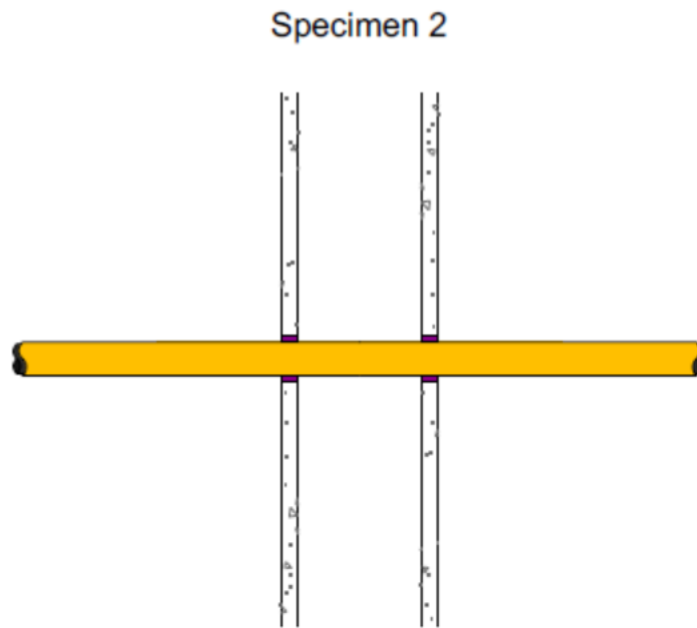
### Test results

|                     |                |
|---------------------|----------------|
| Structural adequacy | Not Applicable |
| Integrity           | 58 minutes     |
| Insulation          | 35 minutes     |



**Figure 10 – Specimen 1 thermocouples readings**

## 15.2 Specimen 2

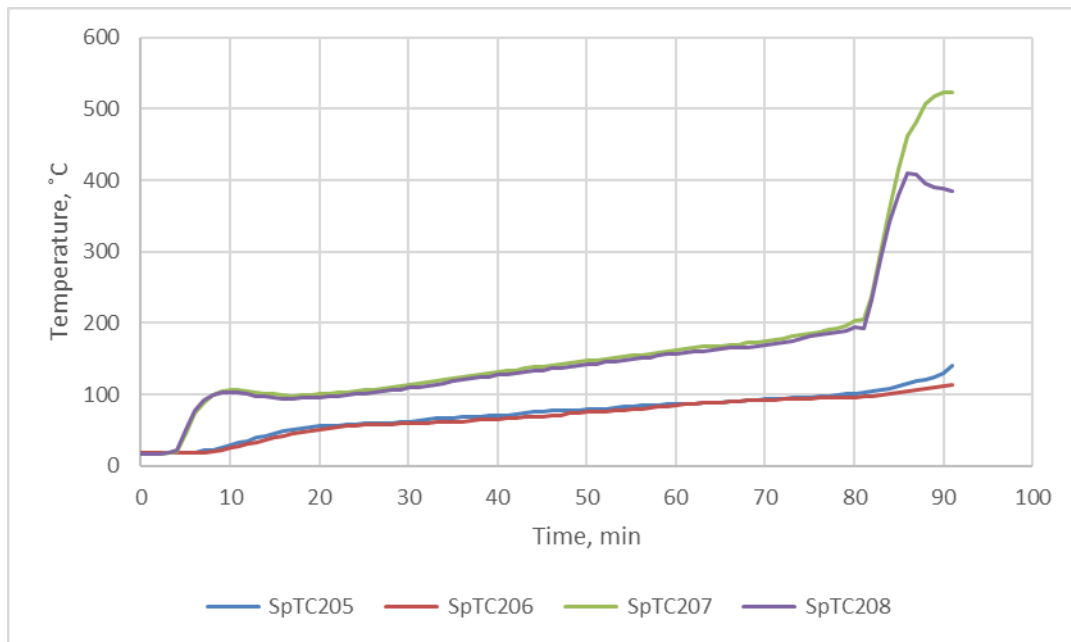


**Figure 11 – Specimen 2**

| Penetration System |                                       |                                                                                                                                                                                                                                                  |
|--------------------|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2                  | Service                               | 25mm PEX-AL-PEX Pipe                                                                                                                                                                                                                             |
|                    | Service Details                       | Pipe (2.2), Sealant (3.1)                                                                                                                                                                                                                        |
|                    | Service Support                       | Unistrut structure at 410mm and 1450mm                                                                                                                                                                                                           |
|                    | Aperture Size                         | 36mm core hole                                                                                                                                                                                                                                   |
|                    | Annular Spacing                       | Min: 5mm, Max: 5.5mm                                                                                                                                                                                                                             |
|                    | Configuration                         | Capped from fire side only                                                                                                                                                                                                                       |
|                    | <b>Local Fire stopping Protection</b> |                                                                                                                                                                                                                                                  |
|                    | Fire Stop application                 | Symmetrical                                                                                                                                                                                                                                      |
|                    | Protection Used                       | Aperture was cut into the separating element. The pipe (2.2) was placed through aperture, extending 500mm from the exposed face. Sealant was installed in the annular gap, flush with the plasterboard, resulting in a 13mm (nominal) deep seal. |

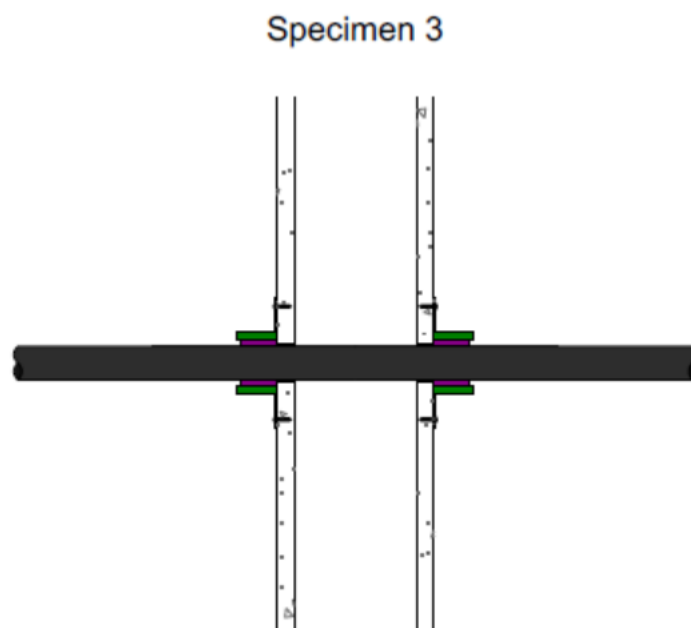
### Test results

|                     |                          |
|---------------------|--------------------------|
| Structural adequacy | Not Applicable           |
| Integrity           | No failure at 91 minutes |
| Insulation          | 80 minutes               |



**Figure 12 – Specimen 2 thermocouples readings**

## 15.3 Specimen 3

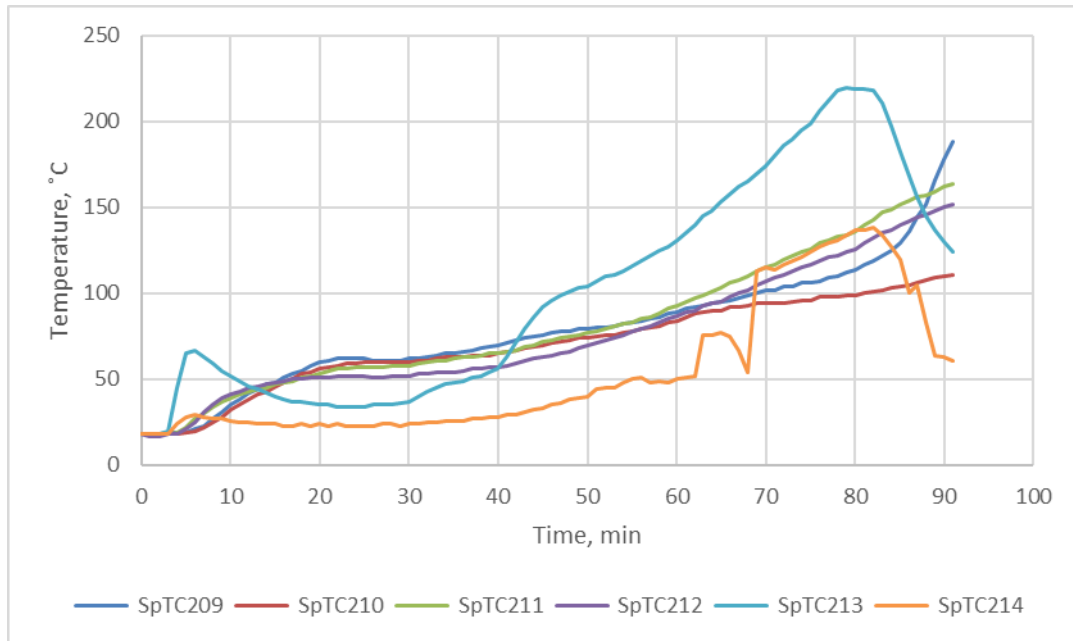


**Figure 13 – Specimen 3**

| Penetration System |                                       |                                                                                                                                                                                                                                                                                                                           |
|--------------------|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3                  | Service                               | 25mm PEX Pipe                                                                                                                                                                                                                                                                                                             |
|                    | Service Details                       | Pipe (2.1), Sealant (3.1), Fire Collar (5.1)                                                                                                                                                                                                                                                                              |
|                    | Service Support                       | Unistrut structure at 410mm and 1450mm                                                                                                                                                                                                                                                                                    |
|                    | Aperture Size                         | 32mm core hole                                                                                                                                                                                                                                                                                                            |
|                    | Annular Spacing                       | Min: 3mm, Max: 4.5mm                                                                                                                                                                                                                                                                                                      |
|                    | Configuration                         | Capped from fire side only                                                                                                                                                                                                                                                                                                |
|                    | <b>Local Fire stopping Protection</b> |                                                                                                                                                                                                                                                                                                                           |
|                    | Fire Stop application                 | Symmetrical                                                                                                                                                                                                                                                                                                               |
|                    | Protection Used                       | Aperture was cut into the separating element. The pipe (2.1) was placed through aperture, extending 500mm from the exposed face. Sealant was installed in the annular gap, flush with the plasterboard, resulting in a 13mm (nominal) deep seal. Fire Collar was fixed to the plasterboard, around the pipe, with screws. |

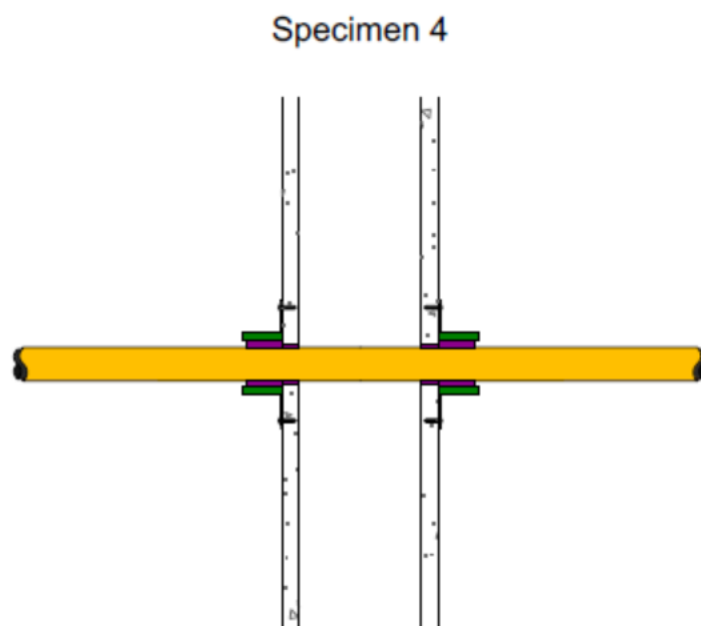
### Test results

|                     |                          |
|---------------------|--------------------------|
| Structural adequacy | Not Applicable           |
| Integrity           | No failure at 91 minutes |
| Insulation          | 75 minutes               |



**Figure 14 – Specimen 3 thermocouples readings**

## 15.4 Specimen 4

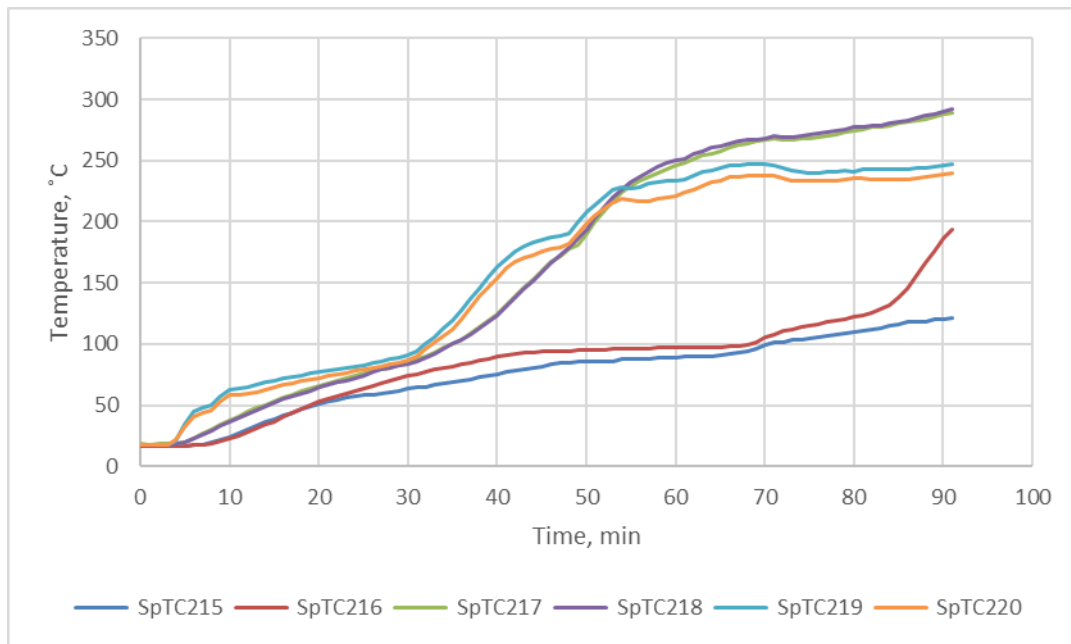


**Figure 15 – Specimen 4**

| Penetration System |                                       |                                                                                                                                                                                                                                                                                                                           |
|--------------------|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4                  | Service                               | 25mm PEX-AL-PEX Pipe                                                                                                                                                                                                                                                                                                      |
|                    | Service Details                       | Pipe (2.2), Sealant (3.1), Fire Collar (5.1)                                                                                                                                                                                                                                                                              |
|                    | Service Support                       | Unistrut structure at 410mm and 1450mm                                                                                                                                                                                                                                                                                    |
|                    | Aperture Size                         | 32mm core hole                                                                                                                                                                                                                                                                                                            |
|                    | Annular Spacing                       | Min: 3mm, Max: 4mm                                                                                                                                                                                                                                                                                                        |
|                    | Configuration                         | Capped from fire side only                                                                                                                                                                                                                                                                                                |
|                    | <b>Local Fire stopping Protection</b> |                                                                                                                                                                                                                                                                                                                           |
|                    | Fire Stop application                 | Symmetrical                                                                                                                                                                                                                                                                                                               |
|                    | Protection Used                       | Aperture was cut into the separating element. The pipe (2.2) was placed through aperture, extending 500mm from the exposed face. Sealant was installed in the annular gap, flush with the plasterboard, resulting in a 13mm (nominal) deep seal. Fire Collar was fixed to the plasterboard, around the pipe, with screws. |

### Test results

|                     |                          |
|---------------------|--------------------------|
| Structural adequacy | Not Applicable           |
| Integrity           | No failure at 91 minutes |
| Insulation          | 49 minutes               |



**Figure 16 – Specimen 4 thermocouples readings**

## 15.5 Specimen 6

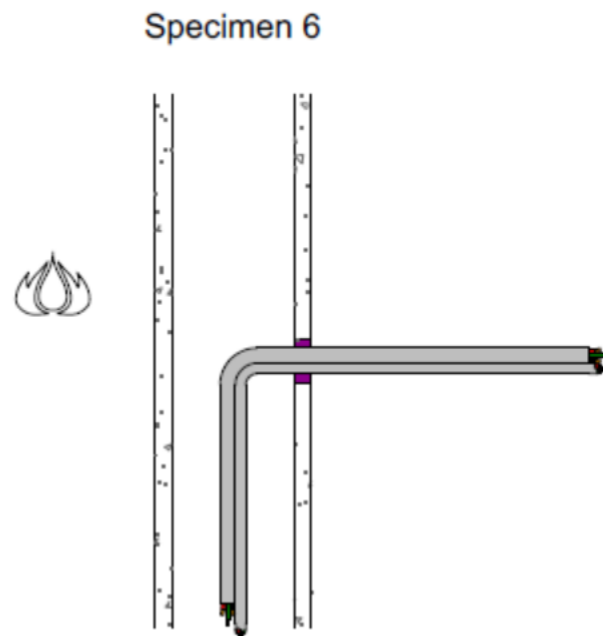
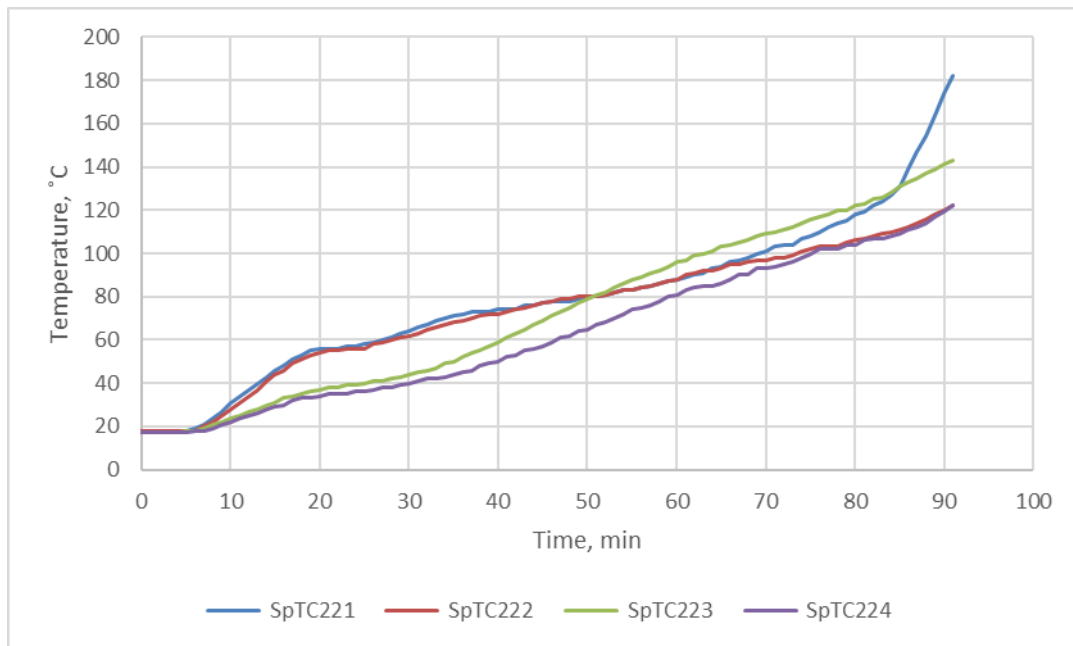


Figure 17 – Specimen 6

| Penetration System |                                       |                                                                                                                                                                                                                                                                                                                         |
|--------------------|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 6                  | Service                               | TPS Cable Bundle - 4 x TPS Power Cable 2C+E 2.5mm <sup>2</sup>                                                                                                                                                                                                                                                          |
|                    | Service Details                       | 4×Cable (2.3), Sealant (3.1)                                                                                                                                                                                                                                                                                            |
|                    | Service Support                       | Unistrut structure at 370mm                                                                                                                                                                                                                                                                                             |
|                    | Aperture Size                         | 32mm core hole                                                                                                                                                                                                                                                                                                          |
|                    | Annular Spacing                       | Min: 3.5mm, Max: 4mm                                                                                                                                                                                                                                                                                                    |
|                    | Configuration                         | Penetrates non-fire side only                                                                                                                                                                                                                                                                                           |
|                    | <b>Local Fire stopping Protection</b> |                                                                                                                                                                                                                                                                                                                         |
|                    | Fire Stop application                 | Asymmetrical                                                                                                                                                                                                                                                                                                            |
|                    | Protection Used                       | Aperture was cut into the plasterboard on the unexposed face. 4 cables (2.3) were bundled together (20mm nominal bundle OD), then passed through the aperture, extending 500mm from the unexposed face. Sealant was installed in the annular gap, flush with the plasterboard, resulting in a 13mm (nominal) deep seal. |

### Test results

|                     |                          |
|---------------------|--------------------------|
| Structural adequacy | Not Applicable           |
| Integrity           | No failure at 91 minutes |
| Insulation          | No failure at 91 minutes |



**Figure 18 – Specimen 6 thermocouples readings**

## 15.6 Specimen 8

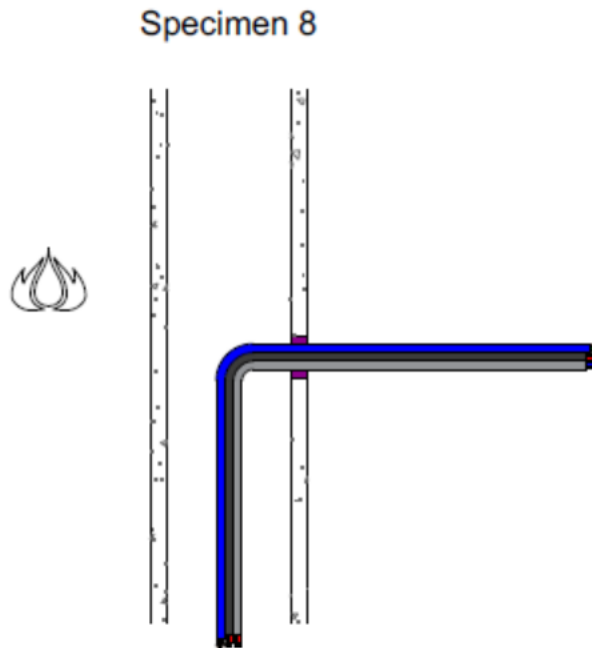
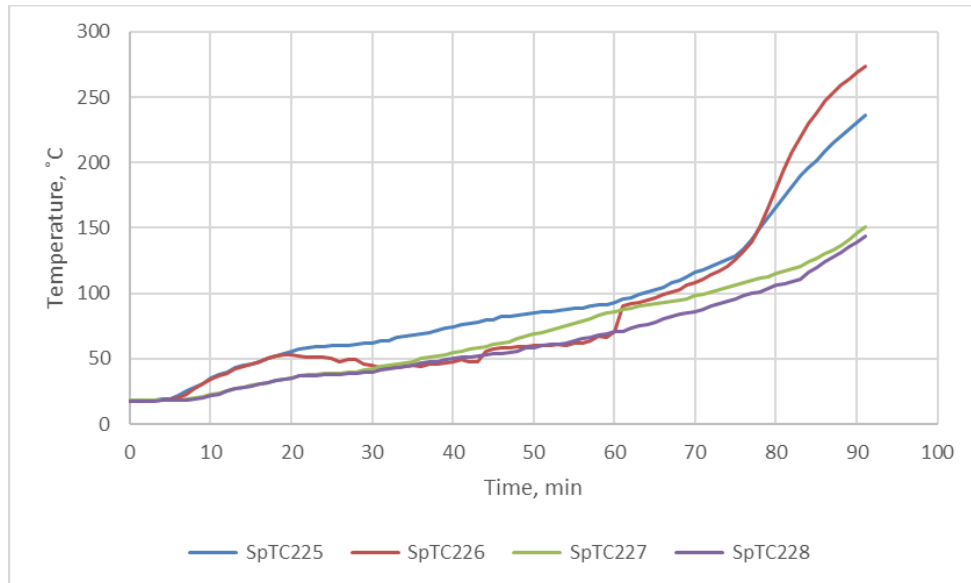


Figure 19 – Specimen 8

| Penetration System |                                       |                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8                  | Service                               | Comunication Cable Bundle - 2 x CAT6, 2 x COAX x 1 Security                                                                                                                                                                                                                                                                                                                  |
|                    | Service Details                       | 2×CAT6 Cable (2.4), 2×COAX Cable (2.5), Security Cable (2.6), Sealant (3.1)                                                                                                                                                                                                                                                                                                  |
|                    | Service Support                       | Unistrut structure at 370mm                                                                                                                                                                                                                                                                                                                                                  |
|                    | Aperture Size                         | 32mm core hole                                                                                                                                                                                                                                                                                                                                                               |
|                    | Annular Spacing                       | Min: 6.5mm, Max: 7.5mm                                                                                                                                                                                                                                                                                                                                                       |
|                    | Configuration                         | Penetrates non-fire side only                                                                                                                                                                                                                                                                                                                                                |
|                    | <b>Local Fire stopping Protection</b> |                                                                                                                                                                                                                                                                                                                                                                              |
|                    | Fire Stop application                 | Asymmetrical                                                                                                                                                                                                                                                                                                                                                                 |
|                    | Protection Used                       | Aperture was cut into the plasterboard on the unexposed face. Two CAT6 cables (2.4), two COAX cables (2.5) and one security cable (2.6) were bundled together (18mm nominal bundle OD), then passed through the aperture, extending 500mm from the unexposed face. Sealant was installed in the annular space, flush with the plasterboard, resulting a 13mm (nominal) seal. |

## Test results

|                     |                          |
|---------------------|--------------------------|
| Structural adequacy | Not Applicable           |
| Integrity           | No failure at 91 minutes |
| Insulation          | 82 minutes               |



**Figure 20 – Specimen 8a thermocouples readings**

## 15.7 Specimen 9

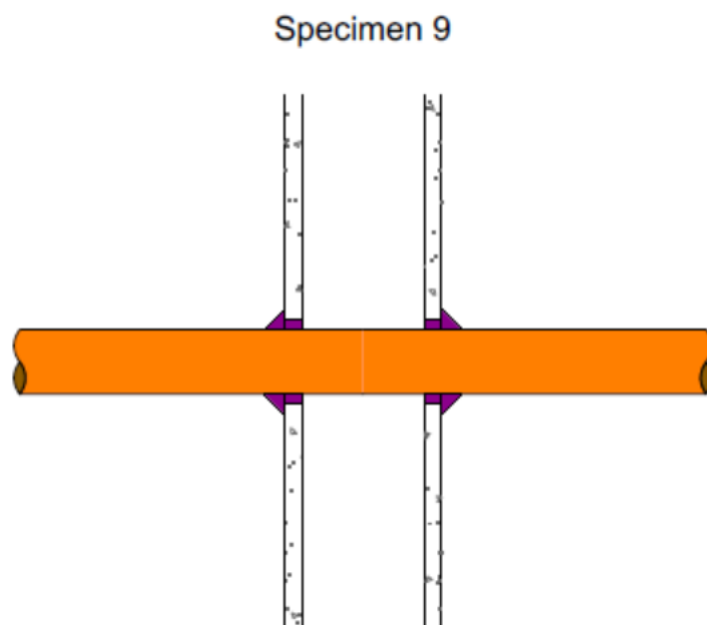
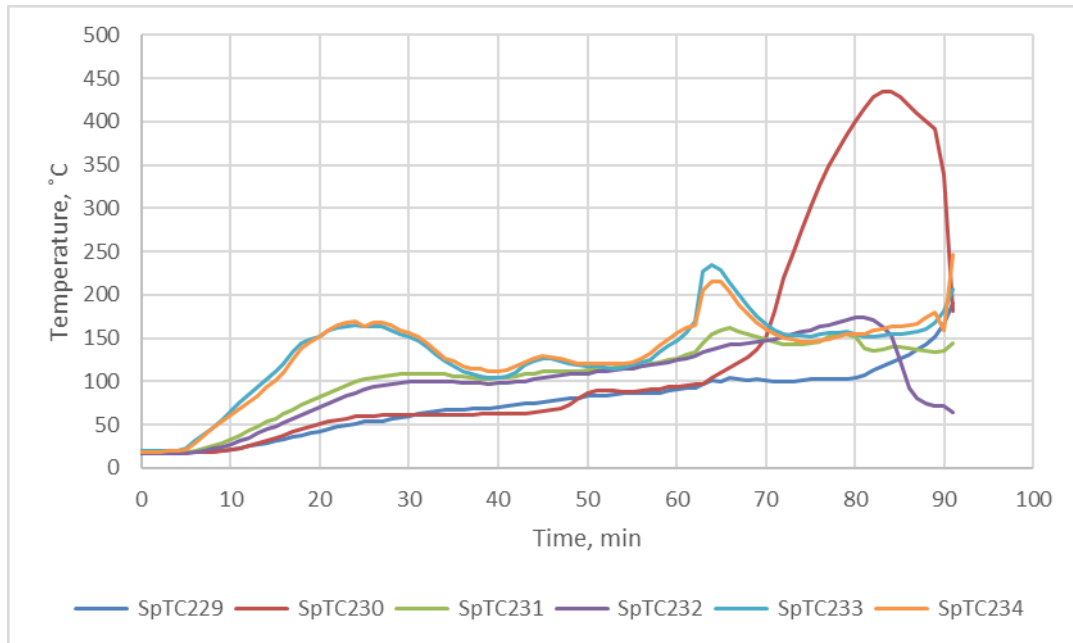


Figure 21 – Specimen 9

| Penetration System |                                       |                                                                                                                                                                                                                                                                                                                                                 |
|--------------------|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9                  | Service                               | 40mm CPVC Pipe                                                                                                                                                                                                                                                                                                                                  |
|                    | Service Details                       | Pipe (2.7), Sealant (3.1)                                                                                                                                                                                                                                                                                                                       |
|                    | Service Support                       | Unistrut structure at 400mm and 1460mm                                                                                                                                                                                                                                                                                                          |
|                    | Aperture Size                         | 64mm core hole                                                                                                                                                                                                                                                                                                                                  |
|                    | Annular Spacing                       | Min: 6mm, Max: 7mm                                                                                                                                                                                                                                                                                                                              |
|                    | Configuration                         | Capped on fire side only                                                                                                                                                                                                                                                                                                                        |
|                    | <b>Local Fire stopping Protection</b> |                                                                                                                                                                                                                                                                                                                                                 |
|                    | Fire Stop application                 | Symmetrical                                                                                                                                                                                                                                                                                                                                     |
|                    | Protection Used                       | Aperture was cut into the separating element. The pipe (2.7) was placed through aperture, extending 500mm from the exposed face. Sealant was installed in the annular gap, flush with the plasterboard, resulting in a 13mm (nominal) deep seal. An additional 15mm × 15mm cone of sealant was applied between the pipe and separating element. |

### Test results

|                     |                |
|---------------------|----------------|
| Structural adequacy | Not Applicable |
| Integrity           | 90 minutes     |
| Insulation          | 63 minutes     |



**Figure 22 – Specimen 9 thermocouples readings**

## 15.8 Specimen 11

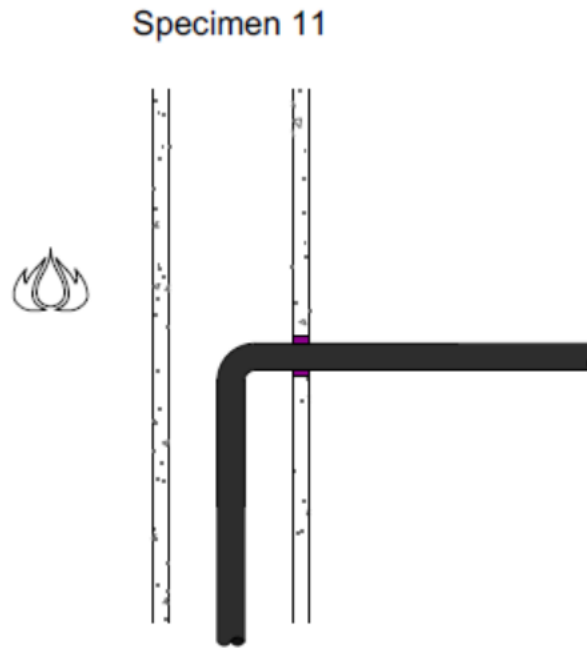
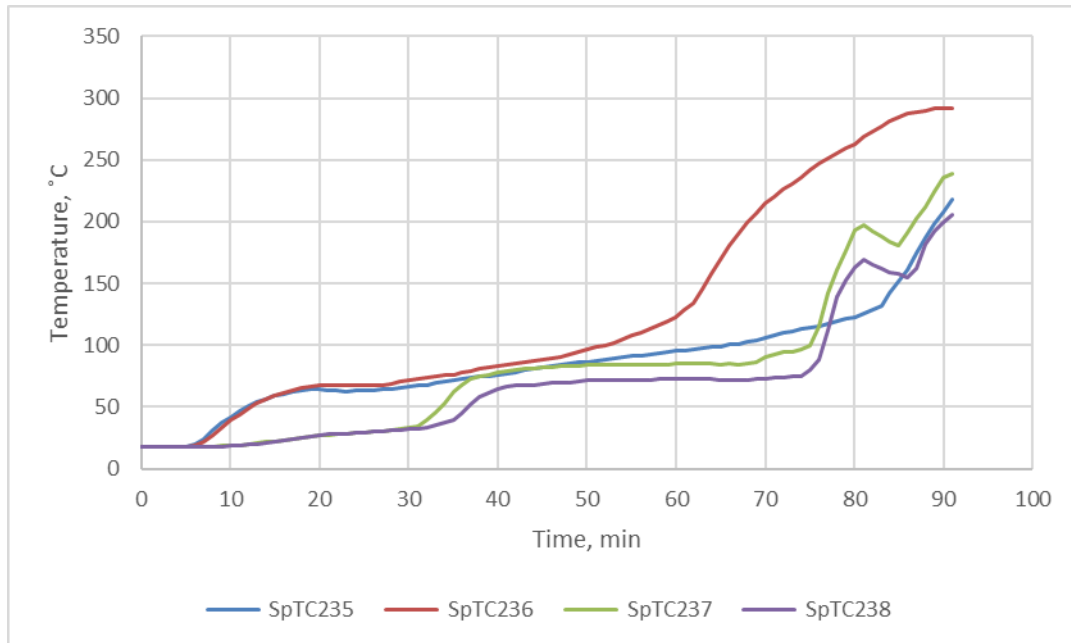


Figure 23 – Specimen 11

| Penetration System |                                       |                                                                                                                                                                                                                                                                     |
|--------------------|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11                 | Service                               | 20mm PEX Pipe                                                                                                                                                                                                                                                       |
|                    | Service Details                       | Pipe (2.8), Sealant (3.1)                                                                                                                                                                                                                                           |
|                    | Service Support                       | Unistrut structure at 400mm and 1460mm                                                                                                                                                                                                                              |
|                    | Aperture Size                         | 30mm core hole                                                                                                                                                                                                                                                      |
|                    | Annular Spacing                       | Min: 4.5mm, Max: 5mm                                                                                                                                                                                                                                                |
|                    | Configuration                         | Penetrates non-fire side only, capped inside the cavity                                                                                                                                                                                                             |
|                    | <b>Local Fire stopping Protection</b> |                                                                                                                                                                                                                                                                     |
|                    | Fire Stop application                 | Asymmetrical                                                                                                                                                                                                                                                        |
|                    | Protection Used                       | Aperture was cut into the plasterboard on the unexposed face. The pipe (2.8) was placed through aperture, extending 2000mm from the unexposed face. Sealant was installed in the annular gap, flush with the plasterboard, resulting in a 13mm (nominal) deep seal. |

### Test results

|                     |                          |
|---------------------|--------------------------|
| Structural adequacy | Not Applicable           |
| Integrity           | No failure at 91 minutes |
| Insulation          | 68 minutes               |



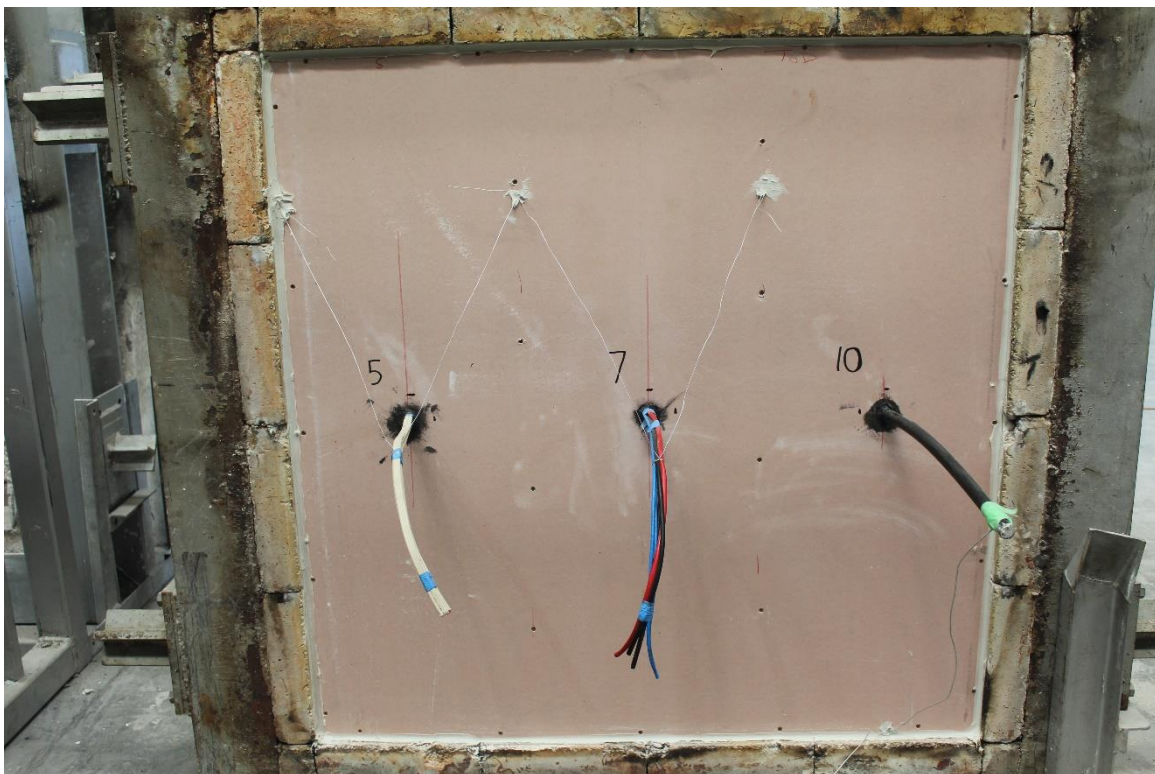
**Figure 24 – Specimen 11 thermocouples readings**

## 16. Test Results – Test 23030-2

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**Figure 25 – Unexposed Face of Specimens**



**Figure 26 – Exposed Face of Specimens**

## 16.1 Specimen 5

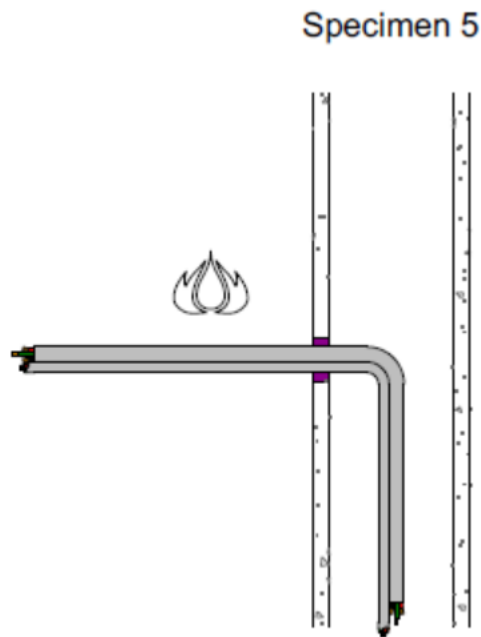
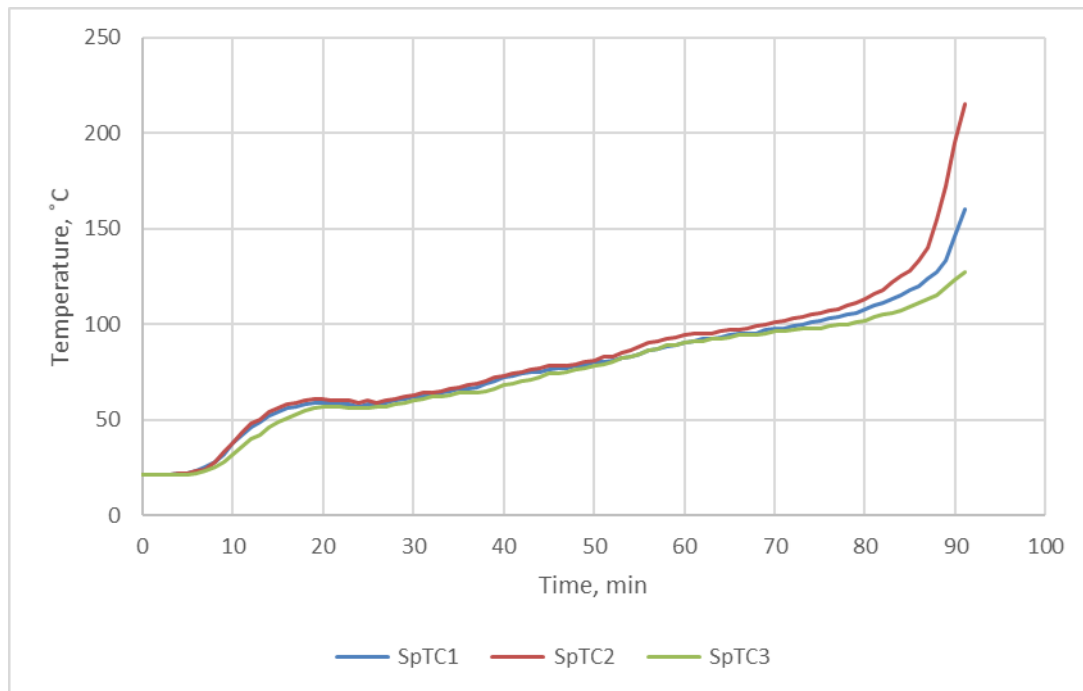


Figure 27 – Specimen 5

| Penetration System |                                       |                                                                    |
|--------------------|---------------------------------------|--------------------------------------------------------------------|
| 5                  | Service                               | TPS Cable Bundle – 4×TPS Power Cable 2C+E 2.5mm <sup>2</sup>       |
|                    | Service Details                       | 4×Cable (2.1), Sealant (3.1)                                       |
|                    | Aperture Diameter                     | Min: 34mm, Max: 35mm                                               |
|                    | Annular Spacing                       | Min: 5.5mm, Max: 11.5mm                                            |
|                    | Configuration                         | Penetrates fire side only                                          |
|                    | <b>Local Fire-stopping Protection</b> |                                                                    |
|                    | Fire Stop application                 | Asymmetrical                                                       |
|                    | Protection Used                       | 13mm (nominal) deep seal in annular space, flush with plasterboard |

### Test results

|                     |                          |
|---------------------|--------------------------|
| Structural adequacy | Not Applicable           |
| Integrity           | No failure at 91 minutes |
| Insulation          | 91 minutes               |



**Figure 28 – Specimen 5 thermocouples readings**

## 16.2 Specimen 7

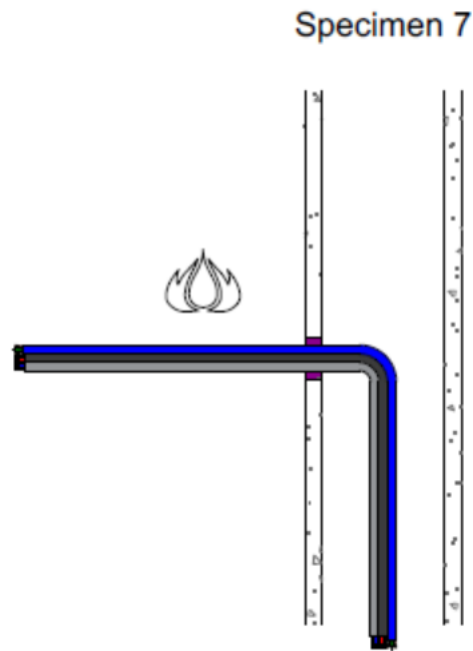
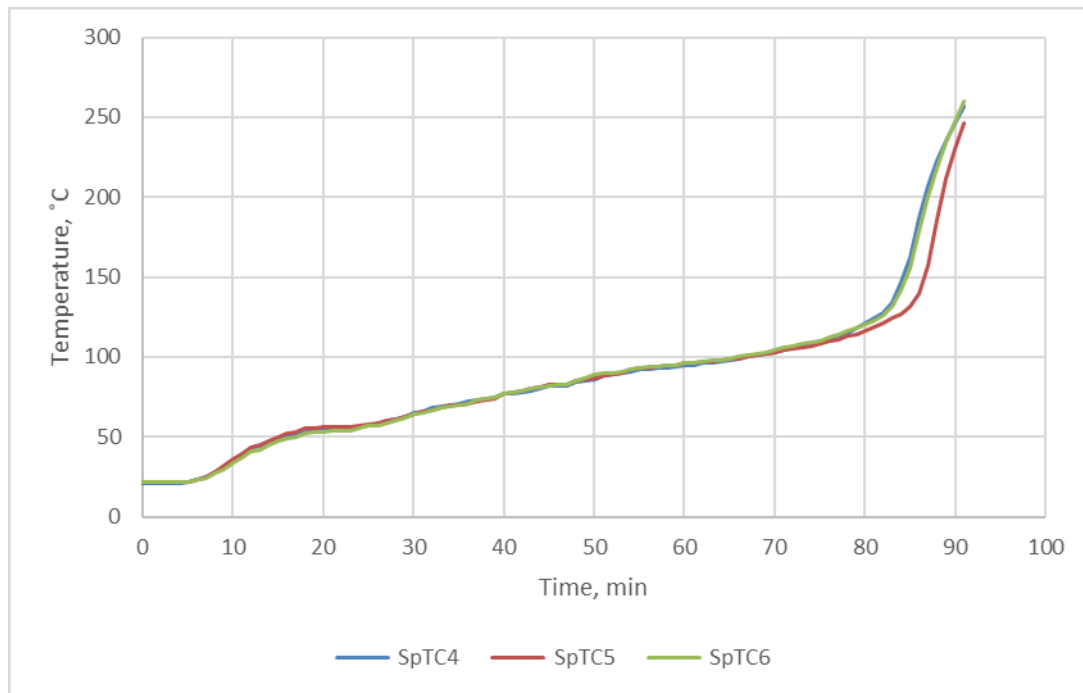


Figure 29 – Specimen 7

| Penetration System |                                       |                                                                    |
|--------------------|---------------------------------------|--------------------------------------------------------------------|
| 7                  | Service                               | Comms Cable Bundle – 2×COAX, 2×CAT5E, 1×fire alarm cable           |
|                    | Service Details                       | 2×Cable (2.2), 2×Cable (2.3), 1×Cable (2.4), Sealant (3.1)         |
|                    | Aperture Diameter                     | Min: 34mm, Max: 34.5mm                                             |
|                    | Annular Spacing                       | Min: 8mm, Max: 9.5mm                                               |
|                    | Configuration                         | Penetrates fire side only                                          |
|                    | <b>Local Fire-stopping Protection</b> |                                                                    |
|                    | Fire Stop application                 | Asymmetrical                                                       |
|                    | Protection Used                       | 13mm (nominal) deep seal in annular space, flush with plasterboard |

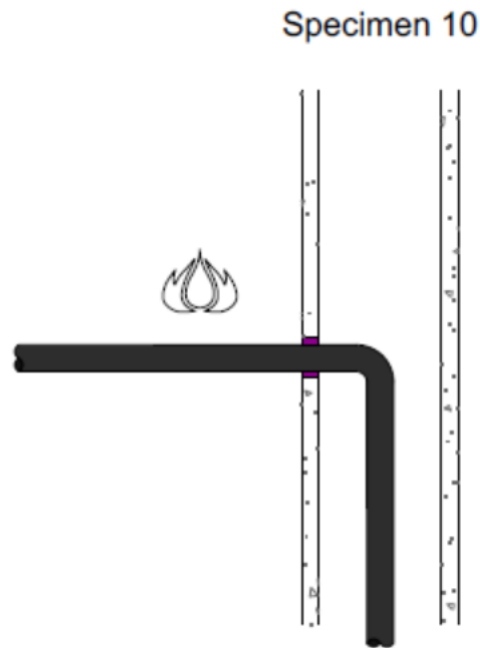
### Test results

|                     |                          |
|---------------------|--------------------------|
| Structural adequacy | Not Applicable           |
| Integrity           | No failure at 91 minutes |
| Insulation          | 87 minutes               |



**Figure 30 – Specimen 7 thermocouples readings**

## 16.3 Specimen 10

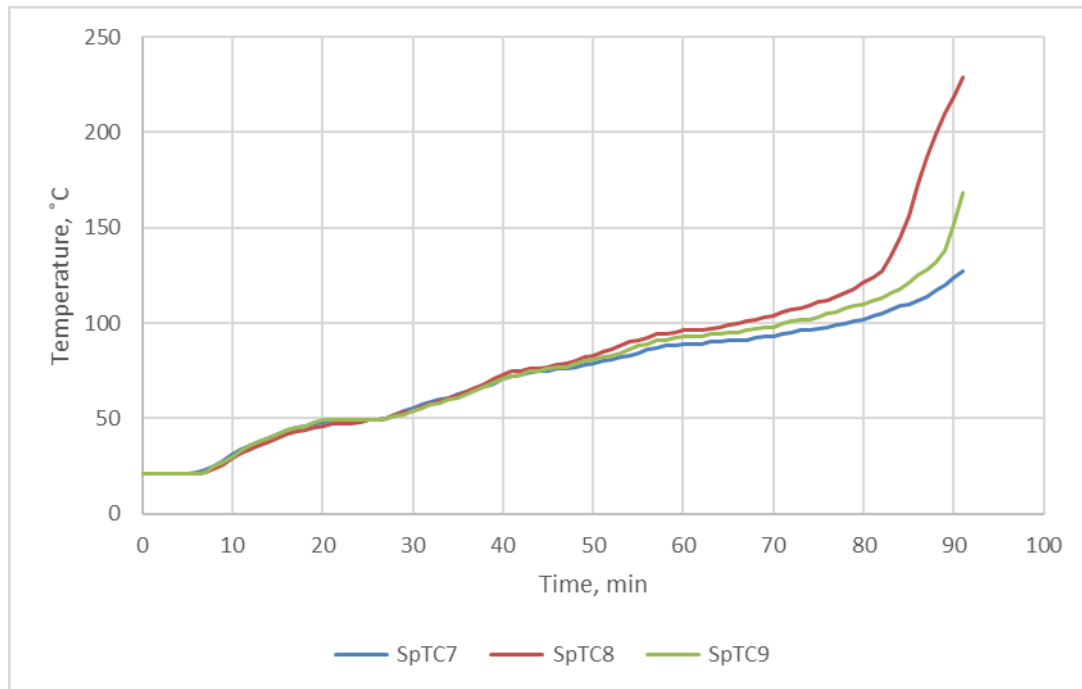


**Figure 31 – Specimen 10**

| Penetration System |                                       |                                                                    |
|--------------------|---------------------------------------|--------------------------------------------------------------------|
| 10                 | Service                               | 20mm Pex Pipe                                                      |
|                    | Service Details                       | Pipe (2.5), Sealant (3.1)                                          |
|                    | Aperture Diameter                     | Min: 30mm, Max: 31mm                                               |
|                    | Annular Spacing                       | Min: 5mm, Max: 6mm                                                 |
|                    | Configuration                         | Penetrates fire side only, capped on fire side only                |
|                    | <b>Local Fire-stopping Protection</b> |                                                                    |
|                    | Fire Stop application                 | Asymmetrical                                                       |
|                    | Protection Used                       | 13mm (nominal) deep seal in annular space, flush with plasterboard |

### Test results

|                     |                          |
|---------------------|--------------------------|
| Structural adequacy | Not Applicable           |
| Integrity           | No failure at 91 minutes |
| Insulation          | 89 minutes               |

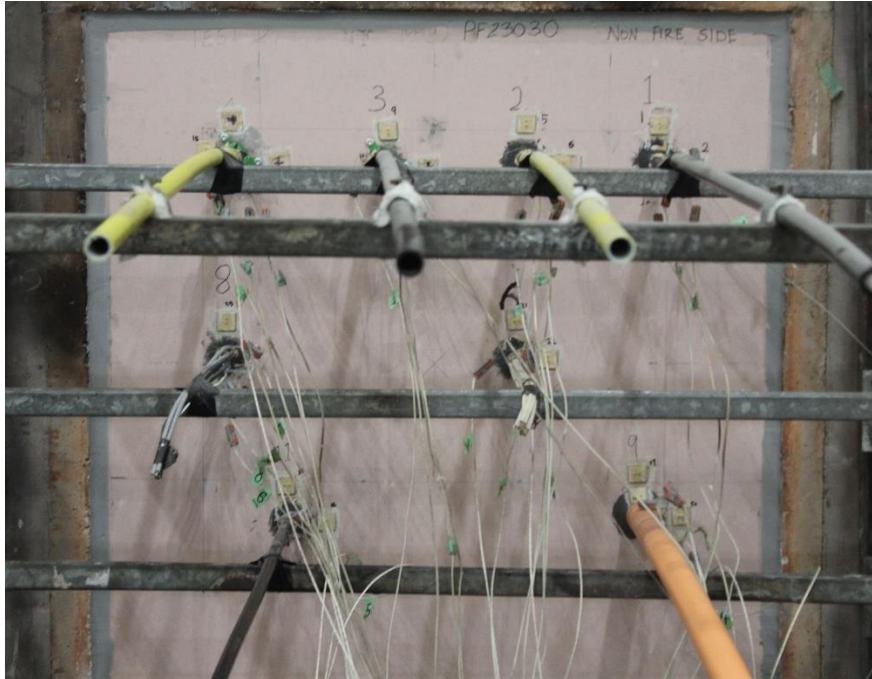


**Figure 32 – Specimen 10 thermocouples readings**

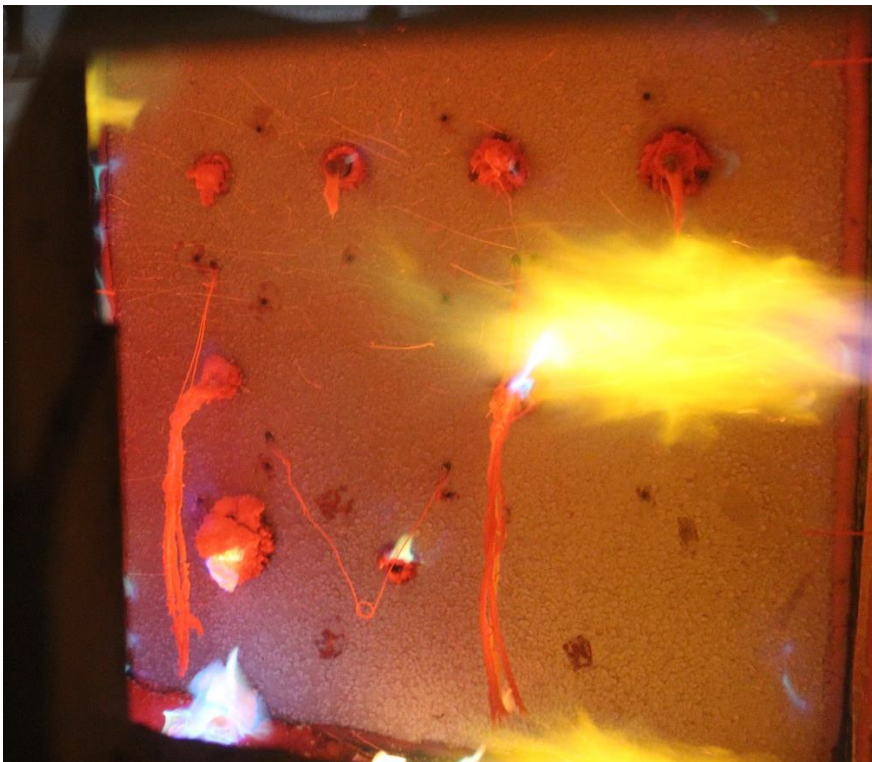
## 17. Additional Photographs – Test 23030-1

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### 17.1 During and after the test



**Figure 33 – Unexposed face at 15 minutes**



**Figure 34– Exposed face at 15 minutes**



Figure 35 – Unexposed face at 30 minutes

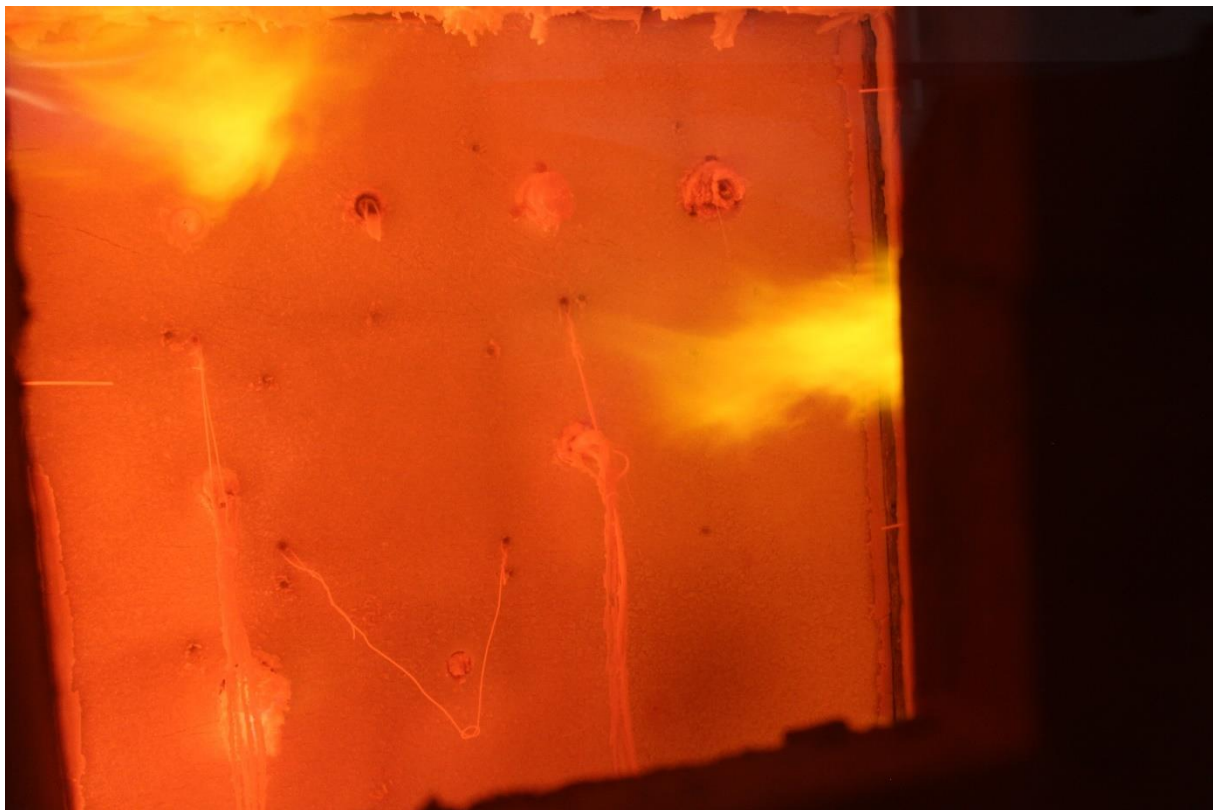


Figure 36 – Exposed face at 30 minutes

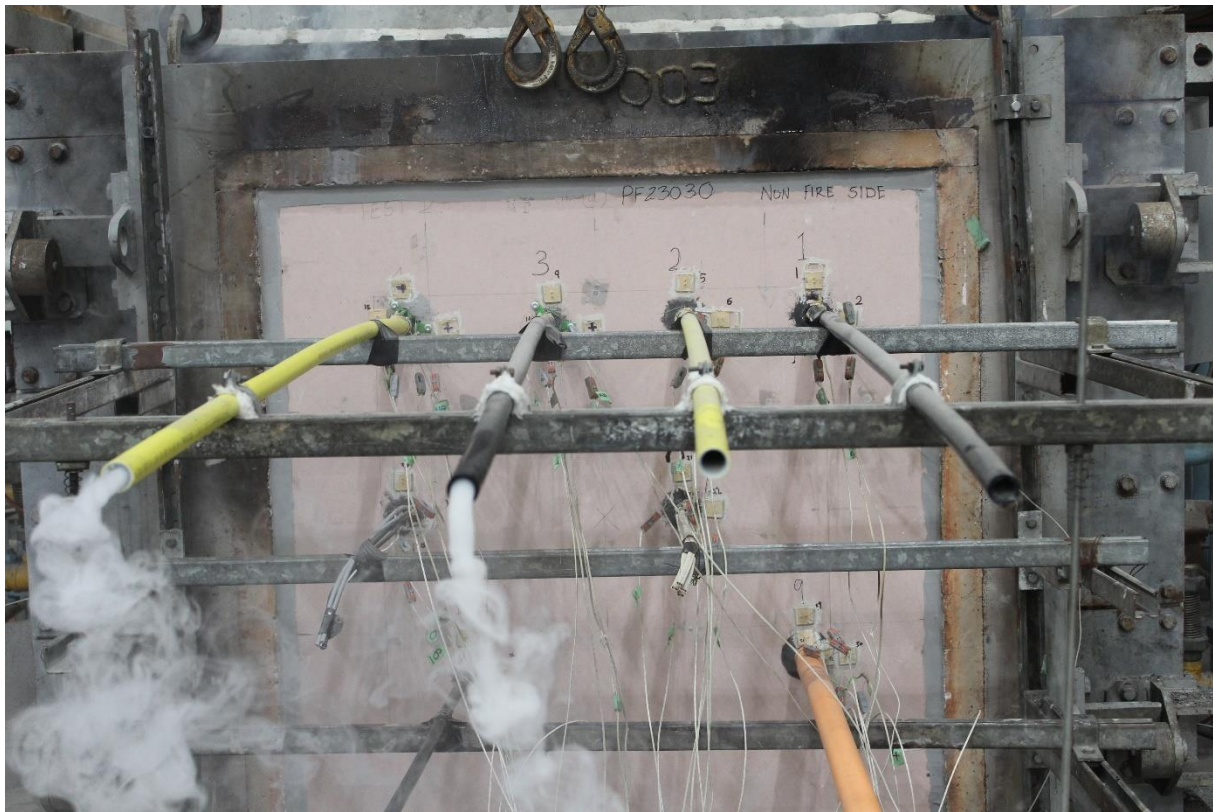


Figure 37 – Unexposed face at 45 minutes

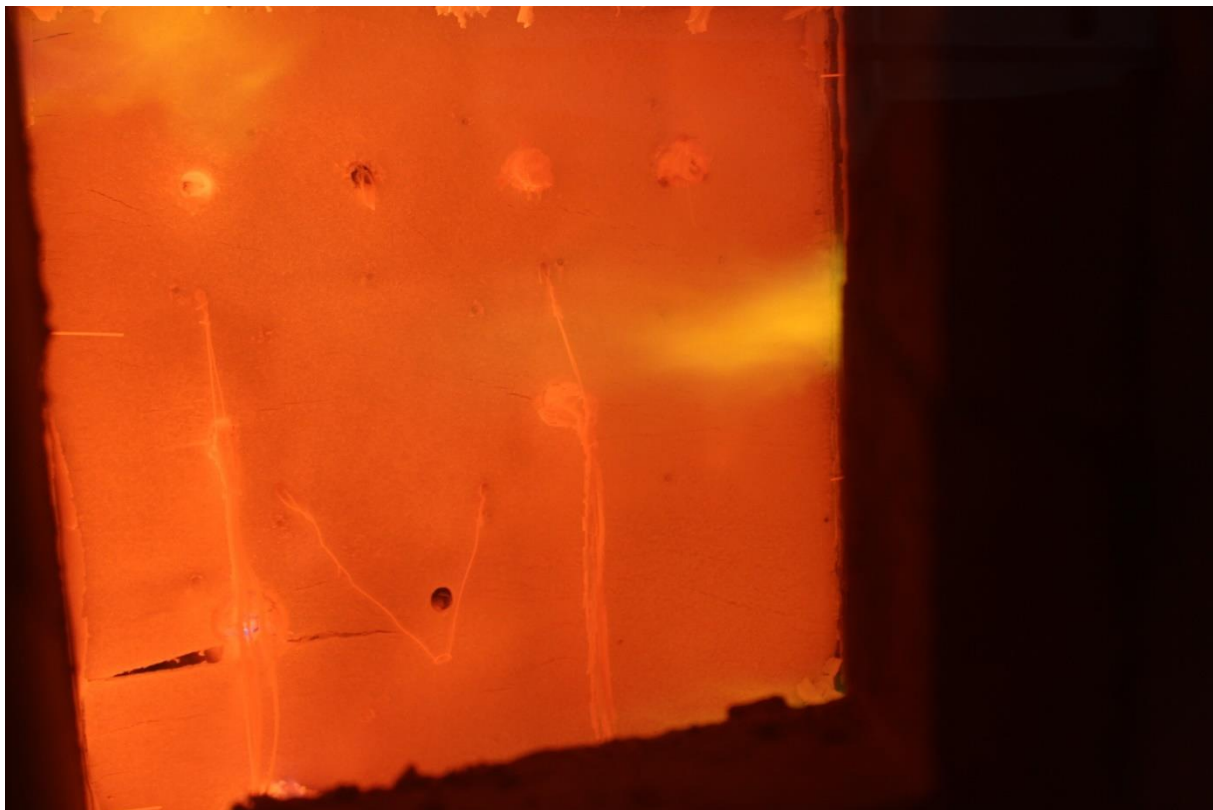


Figure 38 – Exposed face at 45 minutes

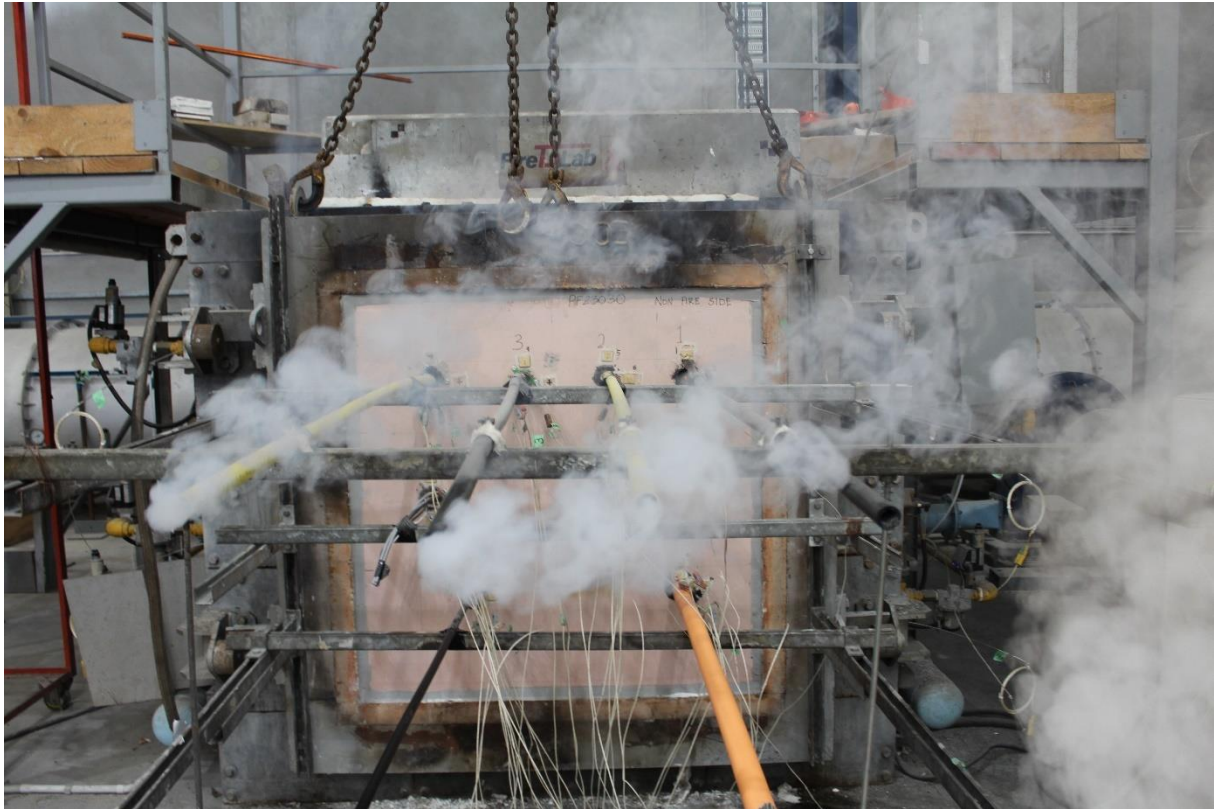


Figure 39 – Unexposed face at 60 minutes

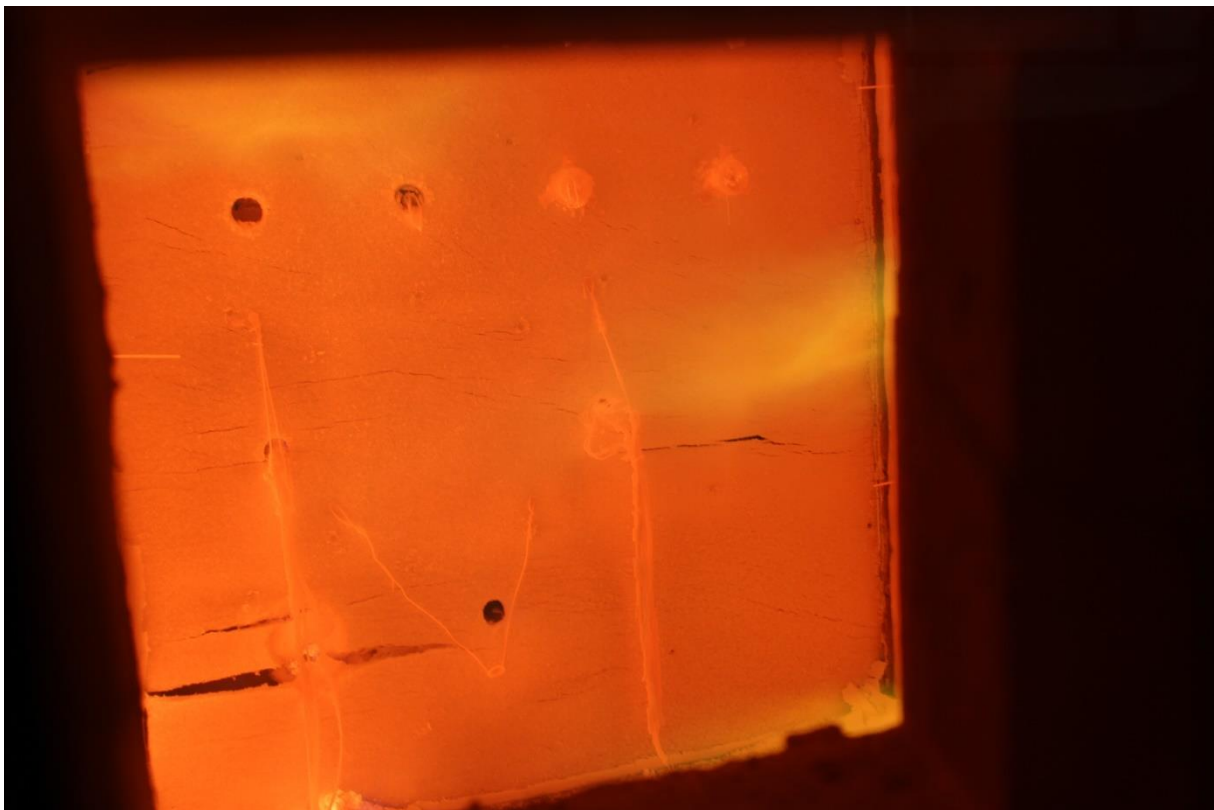


Figure 40 – Exposed face at 60 minutes

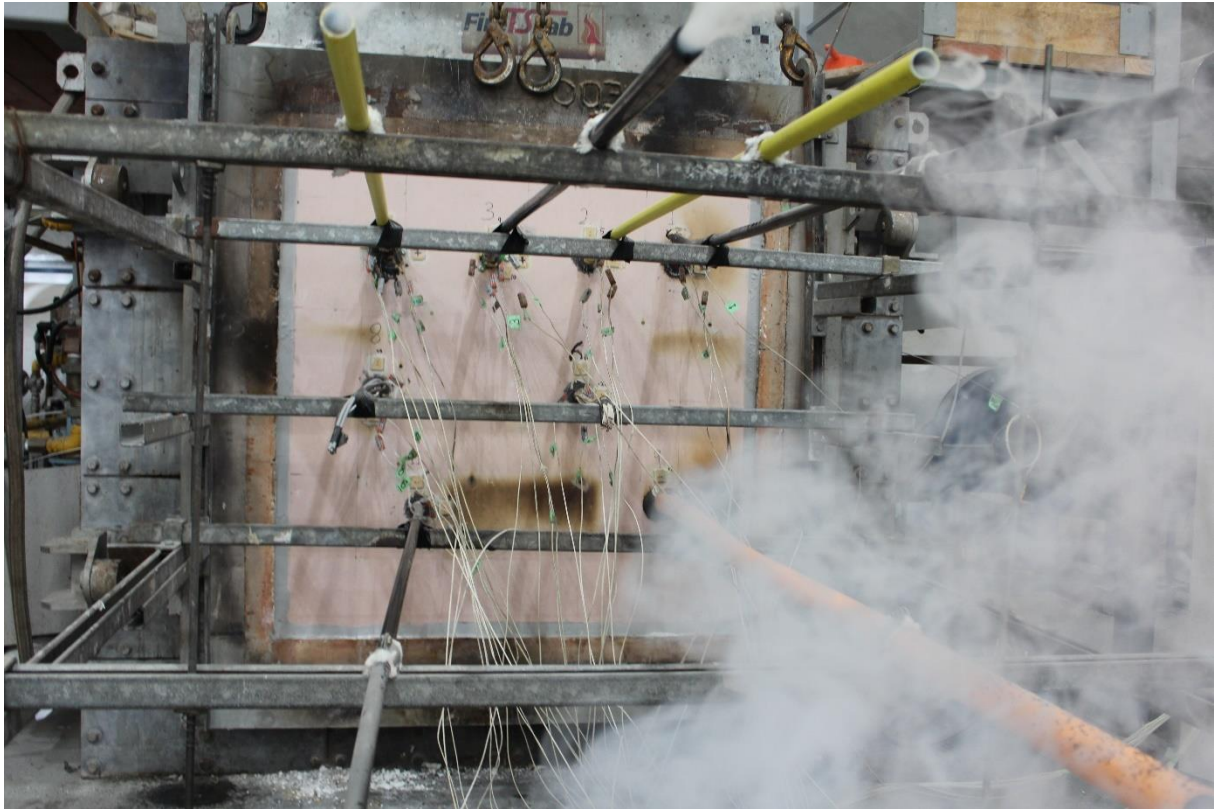


Figure 41 – Unexposed face at 75 minutes



Figure 42 – Exposed face at 75 minutes



Figure 43 – Unexposed face at 90 minutes

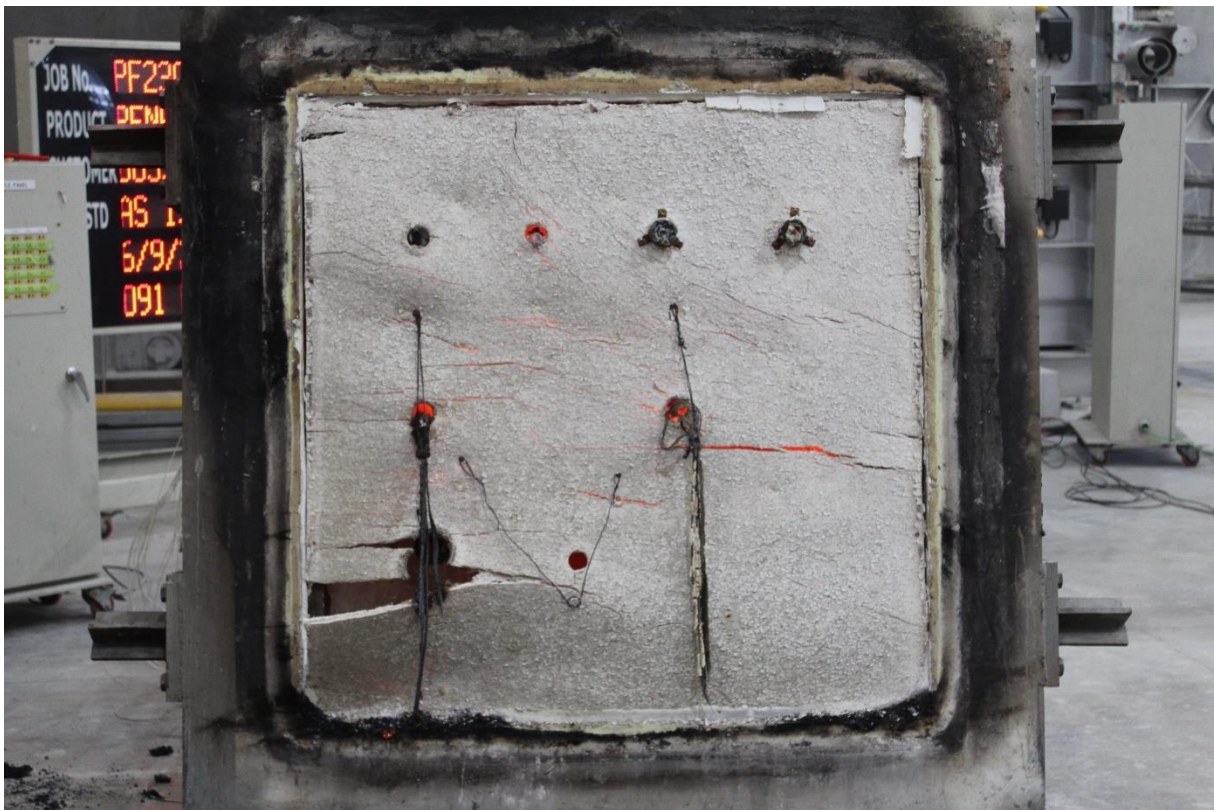
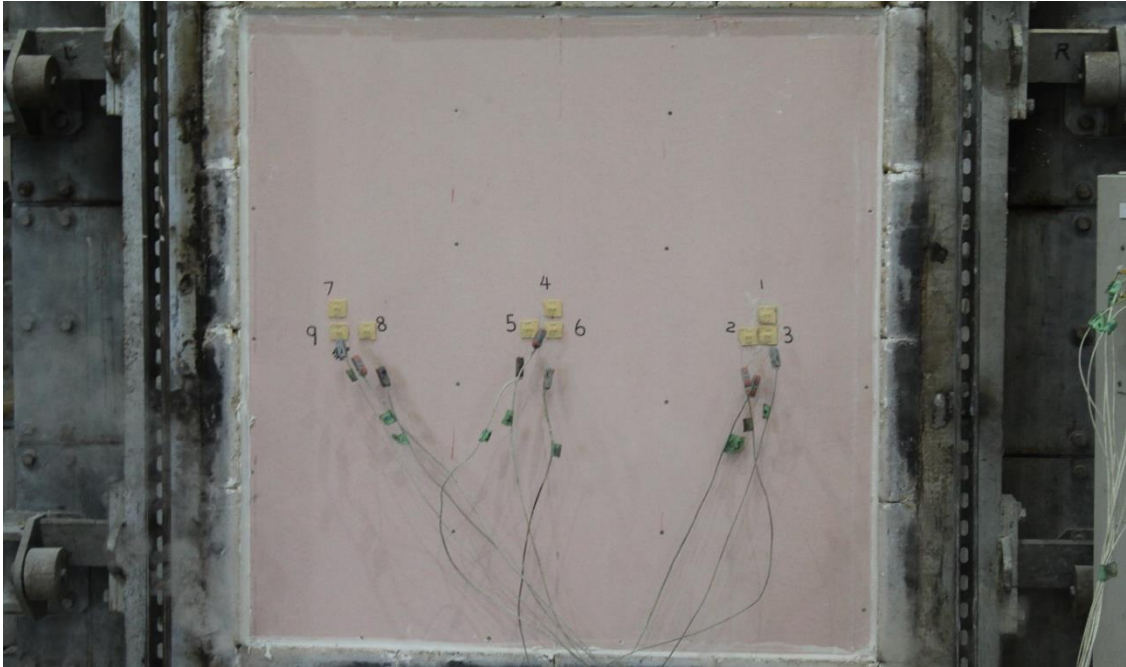


Figure 44 – Exposed face after the test

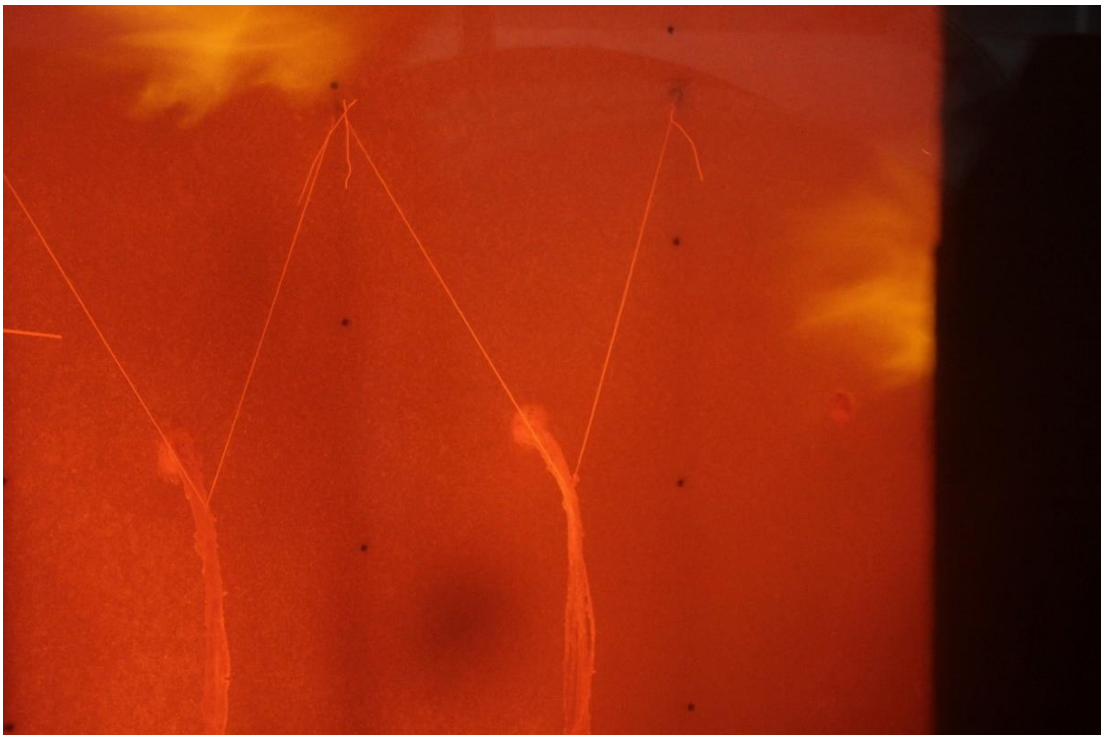
## 18. Additional Photographs – Test 23030-2

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### 18.1 During and after the test



**Figure 45 – Unexposed face at 30 minutes**



**Figure 46 – Exposed face at 30 minutes**



Figure 47 – Unexposed face at 60 minutes

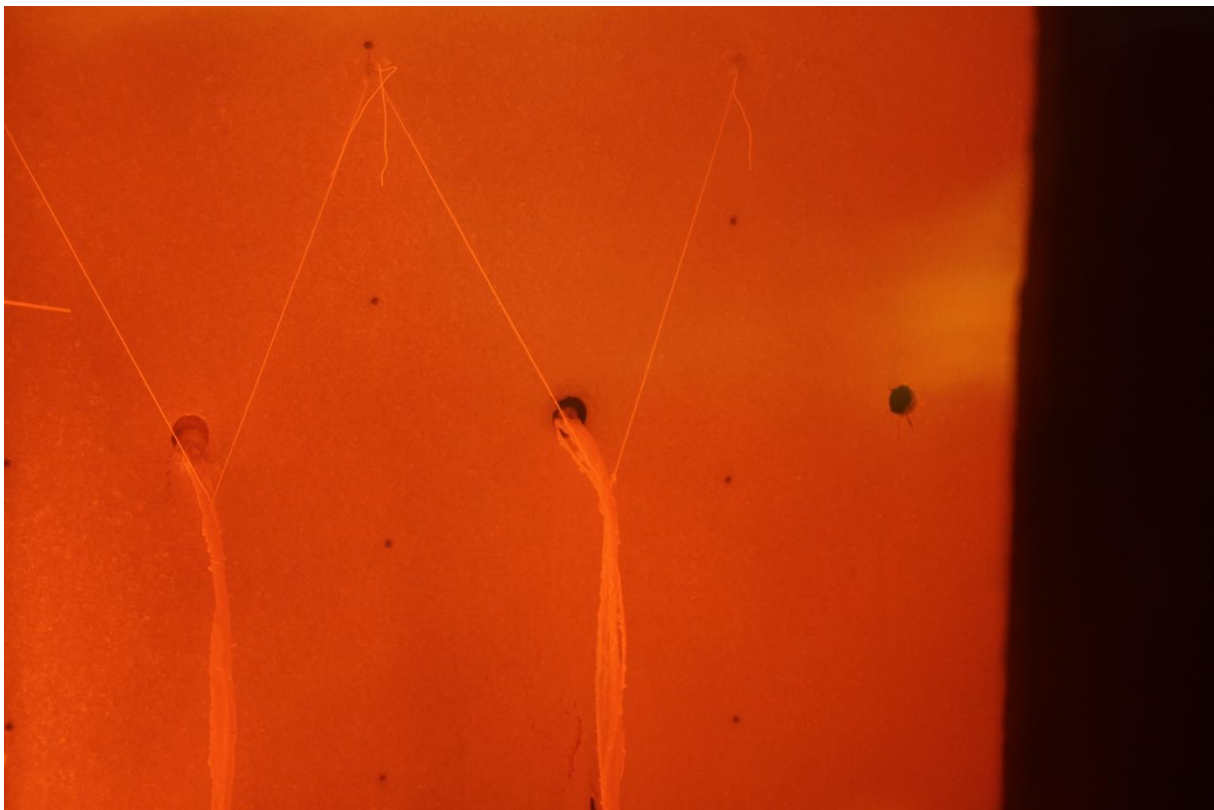


Figure 48 – Exposed face at 60 minutes



Figure 49 – Unexposed face at 90 minutes



Figure 50 – Exposed face after the test