



Fire resistance test report

Test standard: [Sections 2 and 10 of AS 1530.4:2014](#)

Test sponsor: [HB Fuller Aust Co P/L](#)




Job number: [FRT200323](#)

Test date: [21 June 2021](#) Revision: [R1.1](#)

Warringtonfire: accredited for compliance with ISO/IEC 17025 – Testing



Quality management

| Revision | Date | Information about the report | | | |
|----------|--------------|------------------------------|---|--|---|
| R1.0 | 22 June 2021 | Description | Initial issue | | |
| | | Name | Prepared by Kai Loh | Reviewed by Mandeep Kamal | Authorised by Mandeep Kamal |
| R1.1 | 24 June 2021 | Description | Typographical amendment in Table 2, Table 5, and Table 9. | | |
| | | Name | Prepared by Kai Loh | Reviewed by Mandeep Kamal | Authorised by Mandeep Kamal |
| | | Signature |  |  |  |

Executive summary

This report documents the findings of the fire resistance test of six control joints in accordance with sections 2 and 10 of AS 1530.4:2014. The testing was done on 21 June 2021.

Warringtonfire performed the test at the request of HB Fuller Aust Co P/L.

Table 1 provides details of the test assembly, and Table 2 provides a summary of the test specimen. A summary of the results is provided in Table 3.

Table 1 Test assembly

| Item | Detail | |
|---------------------------------|-----------------------------------|---------|
| Separating element | 150 mm thick concrete floor slabs | |
| Nominal separating element size | Width | 1980 mm |
| | Height | 1720 mm |
| | Thickness | 150 mm |
| Number of control joints | Six | |
| Restraint conditions | Restrained on all edges | |

Table 2 Test specimen

| Control joint | Aperture size | Local fire-stopping protection | First layer backing rod depth | First layer sealant thickness | Second layer backing rod depth | Second layer sealant thickness |
|---------------|--|---|-------------------------------|-------------------------------|--------------------------------|--------------------------------|
| A | 35 mm wide x 1720 mm long x 150 mm thick | <ul style="list-style-type: none"> HB Fuller Firesound™ Open cell backing rod | 95 mm from the exposed side | 30 mm | 20 mm from the exposed side | 20 mm |
| B | 25 mm / 20 mm wide (exposed / unexposed) x 1720 mm long x 150 mm thick | <ul style="list-style-type: none"> HB Fuller Firesound™ Open cell backing rod | 60 mm from the exposed side | 25 mm | 15 mm from the exposed side | 15 mm |
| C | 10 mm wide x 1720 mm long x 150 mm thick | <ul style="list-style-type: none"> HB Fuller Firesound™ Open cell backing rod | 35 mm from the exposed side | 10 mm | 10 mm from the exposed side | 10 mm |
| D | 10 mm wide x 1720 mm long x 150 mm thick | <ul style="list-style-type: none"> HB Fuller Firesound™ Open cell backing rod | 10 mm from the exposed side | 10 mm | - | - |
| E | 20 mm wide x 1720 mm long x 150 mm thick | <ul style="list-style-type: none"> HB Fuller Firesound™ Open cell backing rod | 15 mm from the exposed side | 15 mm | - | - |
| F | 35 mm wide x 1720 mm long x 150 mm thick | <ul style="list-style-type: none"> HB Fuller Firesound™ Open cell backing rod | 25 mm from the exposed side | 25 mm | - | - |

Table 3 Test results

| Control joint | Criteria | Results | Fire resistance level (FRL) |
|---------------|---------------------|---------------------------|-----------------------------|
| A | Structural adequacy | Not applicable | -/240/240 |
| | Integrity | No failure at 241 minutes | |
| | Insulation | No failure at 241 minutes | |
| B | Structural adequacy | Not applicable | -/240/90 |
| | Integrity | No failure at 241 minutes | |
| | Insulation | Failure at 115 minutes | |
| C | Structural adequacy | Not applicable | -/240/240 |
| | Integrity | No failure at 241 minutes | |
| | Insulation | No failure at 241 minutes | |
| D | Structural adequacy | Not applicable | -/240/240 |
| | Integrity | No failure at 241 minutes | |
| | Insulation | No failure at 241 minutes | |
| E | Structural adequacy | Not applicable | -/240/30 |
| | Integrity | No failure at 241 minutes | |
| | Insulation | Failure at 42 minutes | |
| F | Structural adequacy | Not applicable | -/240/60 |
| | Integrity | No failure at 241 minutes | |
| | Insulation | Failure at 65 minutes | |

Note: The FRLs for the specimens only apply to the tested orientation. As the FRL was only determined for one direction, an FRL cannot be assigned for the other direction.

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1. Introduction

This report documents the findings of the fire resistance test of six control joints in accordance with sections 2 and 10 of AS 1530.4:2014. The testing was done on 21 June 2021.

Warringtonfire performed the test at the request of the test sponsor listed in Table 4.

Table 4 Test sponsor details

| Test sponsor | Address |
|-----------------------|---|
| HB Fuller Aust Co P/L | 16-22 Redgum Drive Dandenong South VIC 3175 Australia |

2. Test specimen

2.1 Schedule of components

Table 5 describes the test specimen and lists the schedule of components. These were provided by the test sponsor and surveyed by Warringtonfire.

All measurements were done by Warringtonfire – unless indicated otherwise.

Detailed drawings of the test specimen are provided in Appendix A.

Table 5 Schedule of components

| Item | Description | |
|---------------------------|----------------------|---|
| Separating element (SE) | | |
| 1. | Item name | Concrete slab |
| | Product description | 150 mm thick concrete monolith slabs |
| | Material | 40 MPa, 14 mm aggregate concrete |
| SE | Overall size | 1980 mm wide × 1720 mm long × 150 mm thick |
| | Restraint conditions | Restrained on all edges |
| | Installation | The concrete slabs were cast on 21 January 2021, stored at Warringtonfire Australia, and then cut to 200 mm wide monoliths. The monoliths were spaced out according to the varying control joint sizes. They were supported on the northern and southern edges with parallel flange channels (PFC) and masonry anchors. |
| | | |
| Fire-stopping protections | | |
| Sealant | | |
| 2. | Item name | Sealant |
| | Product name | HB Fuller Firesound™ |
| | Density | 1900 kg/m ³ (26 days of curing) |
| Backing rod | | |
| 3. | Item name | Open cell backing rod |
| | Material | Polyurethane |
| | | |

| Item | Description | |
|-----------------|--------------------------------|--|
| Control joint A | | |
| A | Aperture size | 35 mm wide × 1720 mm long × 150 mm thick |
| | Local fire-stopping protection | |
| | Protection | <p>A strip of open cell backing rod (item 3) was inserted into the aperture of the separating element to a depth of 95 mm from the exposed side. Sealant (item 2) was then applied onto the backing rod to a thickness of 30 mm from the backing rod on 13 April 2021.</p> <p>Another strip of open cell backing rod was inserted into the aperture to a depth of 20 mm from the exposed side on 28 April 2021. Sealant was then applied onto the additional backing rod, finishing flush with the exposed side of the separating element – 20 mm thick.</p> |
| | First layer backing rod depth | 95 mm from the exposed side |
| | First layer sealant thickness | 30 mm |
| | Second layer backing rod depth | 20 mm from the exposed side |
| | Second layer sealant thickness | 20 mm |
| Sealant width | Full width of the aperture | |
| | | |
| Control joint B | | |
| B | Aperture size | 25 mm / 20 mm wide (exposed / unexposed) × 1720 mm long × 150 mm thick |
| | Local fire-stopping protection | |
| | Protection | <p>A strip of open cell backing rod (item 3) was inserted into the aperture of the separating element to a depth of 60 mm from the exposed side. Sealant (item 2) was then applied onto the backing rod to a thickness of 25 mm from the backing rod on 13 April 2021.</p> <p>Another strip of open cell backing rod was inserted into the aperture to a depth of 15 mm from the exposed side on 28 April 2021. Sealant was then applied onto the additional backing rod, finishing flush with the exposed side of the separating element – 15 mm thick.</p> |
| | First layer backing rod depth | 60 mm from the exposed side |
| | First layer sealant thickness | 25 mm |
| | Second layer backing rod depth | 15 mm from the exposed side |
| | Second layer sealant thickness | 15 mm |
| Sealant width | Full width of the aperture | |

| Item | Description | | |
|-----------------|--------------------------------|---|--|
| Control joint C | | | |
| C | Aperture size | 10 mm wide × 1720 mm long × 150 mm thick | |
| | Local fire-stopping protection | | |
| | Protection | A strip of open cell backing rod (item 3) was inserted into the aperture of the separating element to a depth of 35 mm from the exposed side. Sealant (item 2) was then applied onto the backing rod to a thickness of 10 mm from the backing rod on 13 April 2021. Another strip of open cell backing rod was inserted into the aperture to a depth of 10 mm from the exposed side on 28 April 2021. Sealant was then applied onto the additional backing rod, finishing flush with the exposed side of the separating element – 10 mm thick. | |
| | First layer backing rod depth | 35 mm from the exposed side | |
| | First layer sealant thickness | 10 mm | |
| | Second layer backing rod depth | 10 mm from the exposed side | |
| | Second layer sealant thickness | 10 mm | |
| Sealant width | Full width of the aperture | | |
| | | | |
| Control joint D | | | |
| D | Aperture size | 10 mm wide × 1720 mm long × 150 mm thick | |
| | Local fire-stopping protection | | |
| | Protection | A strip of open cell backing rod (item 3) was inserted into the aperture of the separating element to a depth of 10 mm from the exposed side. Sealant (item 2) was then applied onto the backing rod, finishing flush with the exposed side of the separating element – 10 mm thick – on 13 April 2021. | |
| | Backing rod depth | 10 mm from the exposed side | |
| | Sealant thickness | 10 mm | |
| Sealant width | Full width of the aperture | | |
| | | | |
| Control joint E | | | |
| E | Aperture size | 20 mm wide × 1720 mm long × 150 mm thick | |
| | Local fire-stopping protection | | |
| | Protection | A strip of open cell backing rod (item 3) was inserted into the aperture of the separating element to a depth of 15 mm from the exposed side. Sealant (item 2) was then applied onto the backing rod, finishing flush with the exposed side of the separating element – 15 mm thick – on 13 April 2021. | |
| | Backing rod depth | 15 mm from the exposed side | |
| | Sealant thickness | 15 mm | |
| Sealant width | Full width of the aperture | | |

| Item | Description | | |
|-----------------|--------------------------------|---|--|
| Control joint F | | | |
| F | Aperture size | 35 mm wide × 1720 mm long × 150 mm thick | |
| | Local fire-stopping protection | | |
| | Protection | A strip of open cell backing rod (item 3) was inserted into the aperture of the separating element to a depth of 25 mm from the exposed side. Sealant (item 2) was then applied onto the backing rod, finishing flush with the exposed side of the separating element – 25 mm thick – on 13 April 2021. | |
| | Backing rod depth | 25 mm from the exposed side | |
| | Sealant thickness | 25 mm | |
| | Sealant width | Full width of the aperture | |

2.2 Installation details

Table 6 lists the installation details for the test specimen.

Table 6 Installation details

| Item | Detail |
|--|--|
| Start date for construction of separating element | 21 January 2021 |
| Start date for installation of fire-stopping protection for the control joints | 13 April 2021 |
| Completion date for constructing and installing the test specimen | 28 April 2021 |
| Separating element constructed by | Representatives of Warringtonfire |
| Fire-stopping protection for control joints installed by | Representatives of the test sponsor |
| Symmetry | Asymmetrical: <ul style="list-style-type: none"> The sealant and backing rod were installed from the exposed side only. |

3. Test procedure

Table 7 details the test procedure for this fire resistance test.

Table 7 Test procedure

| Item | Detail | |
|--------------------------------|--|-------|
| Statement of compliance | The test was performed in accordance with the requirements of sections 2 and 10 of AS 1530.4:2014 for control joints. | |
| Variations | None | |
| Pre-test conditioning | The construction and installation of the test specimen was completed on 28 April 2021. The test specimen was subjected to normal laboratory temperatures and conditions between the completion of construction of the test specimen and the start of the test. | |
| Sampling / specimen selection | The laboratory was not involved in sampling or selecting the test specimen for the fire resistance test. The results obtained during the test only apply to the test samples as received and tested by Warringtonfire. | |
| Ambient laboratory temperature | Start of the test | 12 °C |
| | Minimum temperature | 12 °C |
| | Maximum temperature | 21 °C |

| Item | Detail |
|-------------------------------|--|
| Test duration | 241 minutes |
| Instrumentation and equipment | <p>The instrumentation was provided in accordance with AS 1530.4:2014 as follows:</p> <ul style="list-style-type: none"> The furnace temperature was measured by four mineral insulated metal sheathed (MIMS) Type K thermocouples – with wire diameters not greater than 1 mm, an overall diameter of 3 mm, and the measuring junction insulated from the sheath. The thermocouples protruded a minimum of 25 mm from steel supporting tubes. The unexposed side specimen temperatures were measured by Type K thermocouples with wire diameters less than 0.5 mm soldered to 12 mm diameter x 0.2 mm thick copper discs covered by 30 mm x 30 mm x 2.0 mm thick inorganic insulating pads. The thermocouple positions are shown in Table 10 and in Figure 3 in Appendix D. Cotton pads were available during the test to assess the performance of the specimen under the criteria of integrity. A roving thermocouple was available to measure temperatures at positions that appeared hotter than the positions monitored by the fixed thermocouples. The furnace pressure was measured at approximately 250 mm below the underside of the slab and corrected to 100 mm below the underside of the slab. |

4. Test measurements and results

Table 8 summarises the results the specimen achieved against the performance criteria listed in sections 2 and 10 of AS 1530.4:2014.

Appendix E includes details of the measurements taken during the test.

Table 9 in Appendix B includes observations of any significant behaviour of the specimen and details of the occurrence of the various performance criteria specified in AS 1530.4:2014.

Photographs of the specimen are included in Appendix F.

Table 8 Test results

| Control joint | Criteria | Results | Fire resistance level (FRL) |
|---------------|---------------------|---------------------------|-----------------------------|
| A | Structural adequacy | Not applicable | - /240/240 |
| | Integrity | No failure at 241 minutes | |
| | Insulation | No failure at 241 minutes | |
| B | Structural adequacy | Not applicable | - /240/90 |
| | Integrity | No failure at 241 minutes | |
| | Insulation | Failure at 115 minutes | |
| C | Structural adequacy | Not applicable | - /240/240 |
| | Integrity | No failure at 241 minutes | |
| | Insulation | No failure at 241 minutes | |
| D | Structural adequacy | Not applicable | - /240/240 |
| | Integrity | No failure at 241 minutes | |
| | Insulation | No failure at 241 minutes | |

| Control joint | Criteria | Results | Fire resistance level (FRL) |
|---------------|---------------------|---------------------------|-----------------------------|
| E | Structural adequacy | Not applicable | -/240/30 |
| | Integrity | No failure at 241 minutes | |
| | Insulation | Failure at 42 minutes | |
| F | Structural adequacy | Not applicable | -/240/60 |
| | Integrity | No failure at 241 minutes | |
| | Insulation | Failure at 65 minutes | |

Note: The FRLs for the specimens only apply to the tested orientation. As the FRL was only determined for one direction, an FRL cannot be assigned for the other direction.

5. Application of test results

5.1 Test limitations

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

These results only relate to the behaviour of the specimen of the element of construction under the particular conditions of the test. They are not intended to be the sole criteria for assessing the potential fire performance of the element in use, and they do not necessarily reflect the actual behaviour in fires.

5.2 Variations from the tested specimen

This report details methods of construction, the test conditions and the results obtained when the specific element of construction described here was tested following the procedure outlined in AS 1530.4:2014. Any significant variation with respect to size, construction 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.

It is recommended that any proposed variation to the tested configuration – other than as permitted under the field of direct application specified in Appendix C – should be referred to the test sponsor. They should then obtain appropriate documentary evidence of compliance from Warringtonfire or another accredited testing authority.

5.3 Uncertainty of measurements

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 for the result.

Appendix A Drawings of test assembly

The leaders in the drawings represent the items listed in section 2.1. All measurements – unless indicated – are in millimetres.

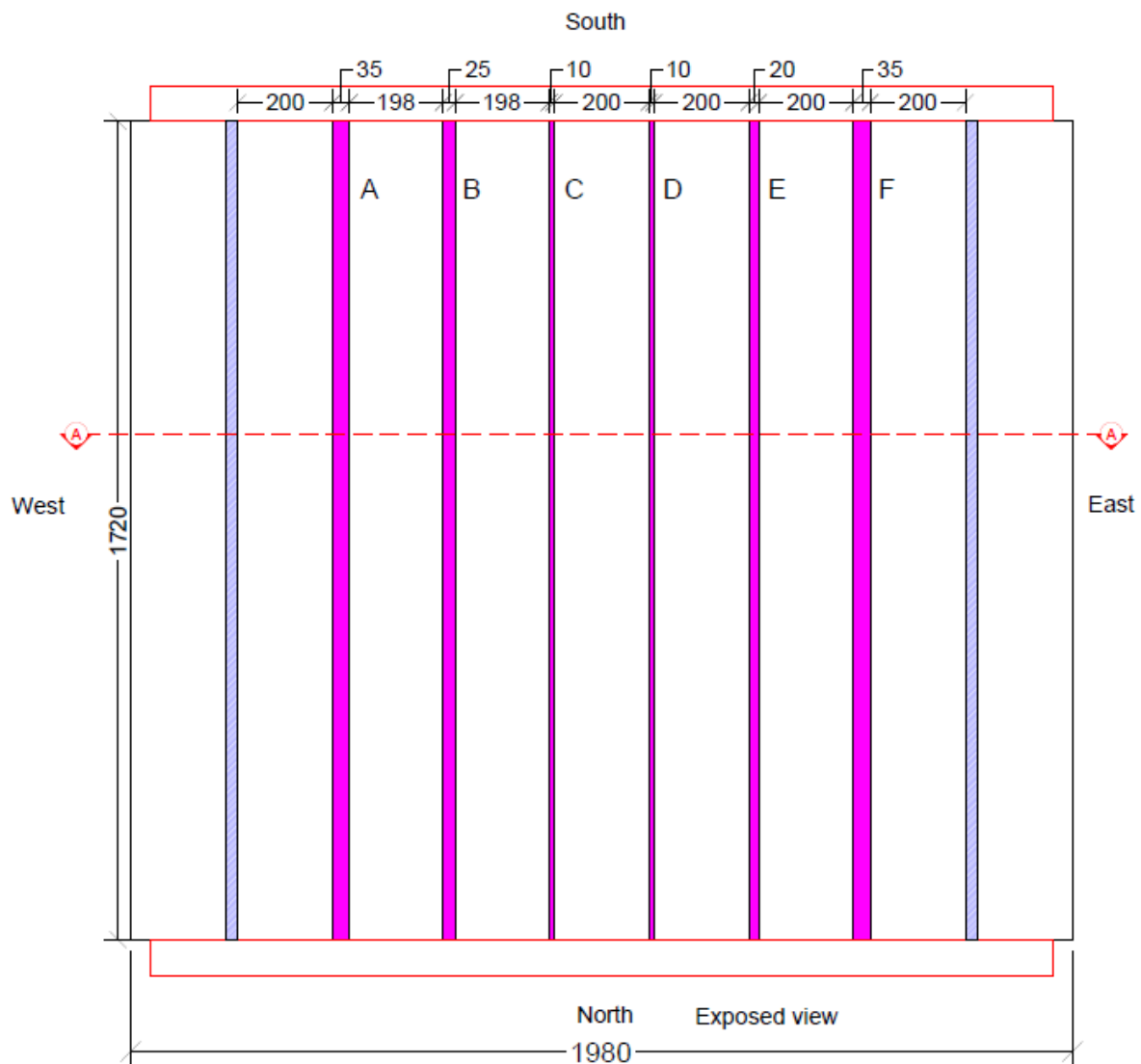


Figure 1 Plan view of test specimen (exposed side)

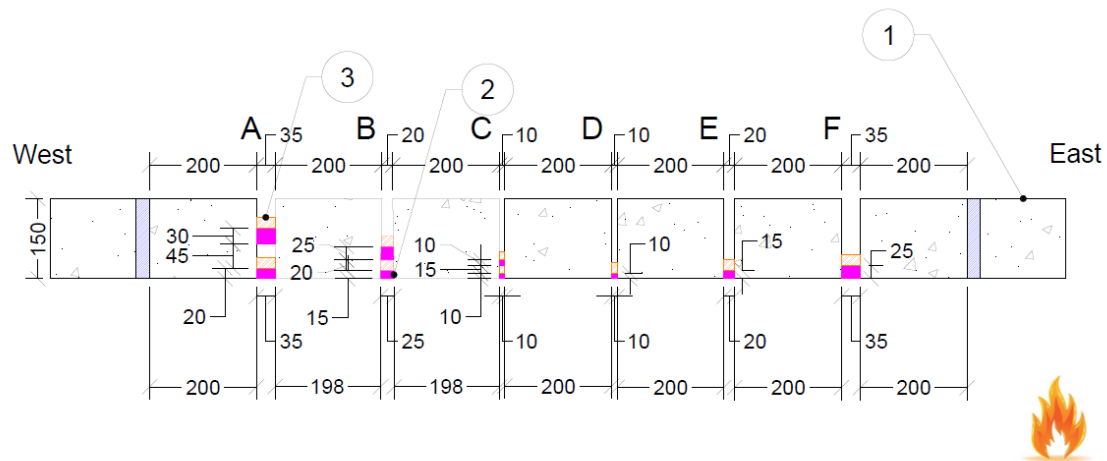


Figure 2 Cross section A-A

Appendix B Test observations

Table 9 shows the observations of any significant behaviour of the specimen during the test.

Table 9 Test observations

| Time | | Observation |
|------------------------|-----|---|
| Min | Sec | |
| Control joint A | | |
| 0 | 00 | The fire resistance test started. The initial temperature of the test specimen was approximately 11 °C. |
| 15 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 30 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 45 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 60 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 90 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 120 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 180 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 206 | 00 | The backing rod had discoloured. |
| 234 | 00 | The backing rod had started to burn off. |
| 240 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 241 | 00 | Test stopped. |
| Control joint B | | |
| 0 | 00 | The fire resistance test started. The initial temperature of the test specimen was approximately 10 °C. |
| 15 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 30 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 45 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 60 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 90 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 106 | 00 | The backing rod had discoloured. |
| 115 | 05 | TC011, on the control joint, at the centre recorded a temperature of 190 °C. Failure of insulation in accordance with clause 2.13.3(b) of AS 1530.4:2014, where the maximum temperature of thermocouple TC011 exceeded the initial temperature by more than 180 K. |
| 120 | 00 | The test specimen continued to maintain integrity in accordance with AS 1530.4:2014. |

| Time | | Observation |
|------------------------|-----|---|
| Min | Sec | |
| 156 | 00 | The backing rod had completely burnt off. |
| 180 | 00 | The test specimen continued to maintain integrity in accordance with AS 1530.4:2014. |
| 240 | 00 | The test specimen continued to maintain integrity in accordance with AS 1530.4:2014. |
| 241 | 00 | Test stopped. |
| Control joint C | | |
| 0 | 00 | The fire resistance test started. The initial temperature of the test specimen was approximately 10 °C. |
| 15 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 15 | 30 | Smoke emitting from the centre of the control joint. |
| 19 | 40 | Liquid substance boiling on top of the backing rod. |
| 30 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 45 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 60 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 90 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 106 | 00 | The backing rod had completely burnt off. |
| 120 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 180 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 240 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 241 | 00 | Test stopped. |
| Control joint D | | |
| 0 | 00 | The fire resistance test started. The initial temperature of the test specimen was approximately 10 °C. |
| 9 | 30 | Smoke emitting from the centre of the control joint. |
| 15 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 19 | 40 | Liquid substance boiling on top of the backing rod. |
| 30 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 43 | 00 | The backing rod had burnt off. |
| 45 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 60 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 73 | 00 | A glow can be seen from the control joint. |

| Time | | Observation |
|------------------------|-----|---|
| Min | Sec | |
| 90 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 120 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 180 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 240 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 241 | 00 | Test stopped. |
| Control joint E | | |
| 0 | 00 | The fire resistance test started. The initial temperature of the test specimen was approximately 10 °C. |
| 9 | 30 | Smoke emitting from the centre of the control joint. |
| 15 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 30 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 43 | 00 | TC031, on the control joint, 250 mm down from the centre recorded a temperature of 190 °C. Failure of insulation in accordance with clause 2.13.3(b) of AS 1530.4:2014, where the maximum temperature of thermocouple TC031 exceeded the initial temperature by more than 180 K. |
| 43 | 00 | The backing rod had discoloured and burnt off. |
| 45 | 00 | The test specimen continued to maintain integrity in accordance with AS 1530.4:2014. |
| 60 | 00 | The test specimen continued to maintain integrity in accordance with AS 1530.4:2014. |
| 90 | 00 | The test specimen continued to maintain integrity in accordance with AS 1530.4:2014. |
| 120 | 00 | The test specimen continued to maintain integrity in accordance with AS 1530.4:2014. |
| 156 | 00 | A glow can be seen from the control joint. |
| 180 | 00 | The test specimen continued to maintain integrity in accordance with AS 1530.4:2014. |
| 240 | 00 | The test specimen continued to maintain integrity in accordance with AS 1530.4:2014. |
| 241 | 00 | Test stopped. |
| Control joint F | | |
| 0 | 00 | The fire resistance test started. The initial temperature of the test specimen was approximately 10 °C. |
| 13 | 00 | Smoke emitting from the centre of the control joint. |
| 15 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 30 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 45 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 56 | 45 | The backing rod had discoloured and had started to burn off. |

| Time | | Observation |
|------|-----|--|
| Min | Sec | |
| 60 | 00 | The test specimen continued to maintain integrity and insulation in accordance with AS 1530.4:2014. |
| 65 | 40 | <p>TC038, on the control joint, 250 mm down from the centre recorded a temperature of 191 °C.</p> <p>Failure of insulation in accordance with clause 2.13.3(b) of AS 1530.4:2014, where the maximum temperature of thermocouple TC038 exceeded the initial temperature by more than 180 K.</p> |
| 83 | 00 | The backing rod had completely burnt off. |
| 90 | 00 | The test specimen continued to maintain integrity in accordance with AS 1530.4:2014. |
| 120 | 00 | The test specimen continued to maintain integrity in accordance with AS 1530.4:2014. |
| 180 | 00 | The test specimen continued to maintain integrity in accordance with AS 1530.4:2014. |
| 240 | 00 | The test specimen continued to maintain integrity in accordance with AS 1530.4:2014. |
| 241 | 00 | Test stopped. |

Appendix C Direct field of application

The text, figures and tables in this appendix have been taken from section 10 of AS 1530.4:2014.

C.1 General

The results of the fire test contained in the test report are directly applicable without reference to the testing authority to similar constructions where one or more of the changes set out in clauses 10.12.2 to 10.12.6 of AS 1530.4:2014 have been made.

C.2 Separating elements

Results obtained for sealing systems in various types of masonry and concrete construction may be applied as follows:

- For elements manufactured from similar types of concrete or masonry, the results of the prototype test may be applied to materials of density within $\pm 15\%$ of the tested specimen. For greater variations, the opinion of a registered testing authority shall be obtained.
- Test results obtained in conjunction with hollow concrete blocks may be used in a solid concrete element of the same overall thickness. The reverse does not apply.
- Results obtained from framed wall systems may be applied to the performance of a system in concrete, masonry or solid gypsum blocks of greater or equal thickness to that of the tested prototype. The reverse does not apply.
- Results obtained from framed wall systems may be applied to similar walls having studs of the same material with sizes greater than the tested prototype.
- Results obtained from a prototype test may be applied to framed wall systems of similar construction but having thicker facings of the same material applied to the studs.

C.3 Control joints

The following variations are permitted:

- Results obtained from single test on a butt joints may be applied to contoured joints, provided the joints have —
 - equal width and equal or greater depth of sealant; and
 - equal or greater thickness of fire-separating element.
 - Note: Examples of butt and contoured control joints are shown in figure 10.12.6 of AS 1530.4:2014.
- Facings may be applied to the surface of the fire-stopping system.

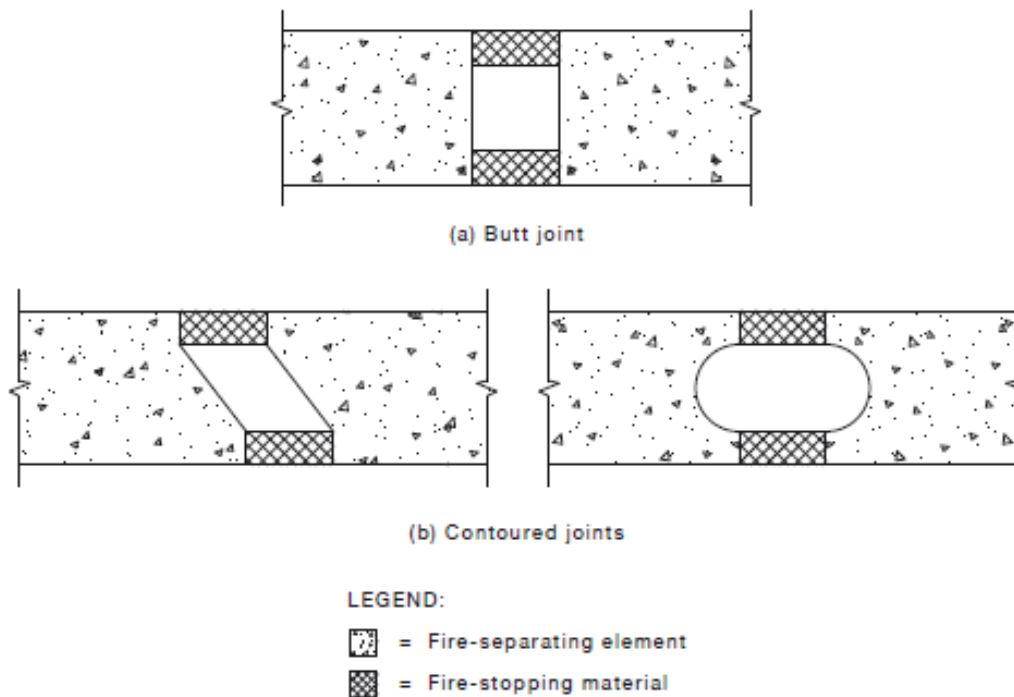


FIGURE 10.12.6 CONTOURED CONTROL JOINTS

Appendix D Instrumentation locations

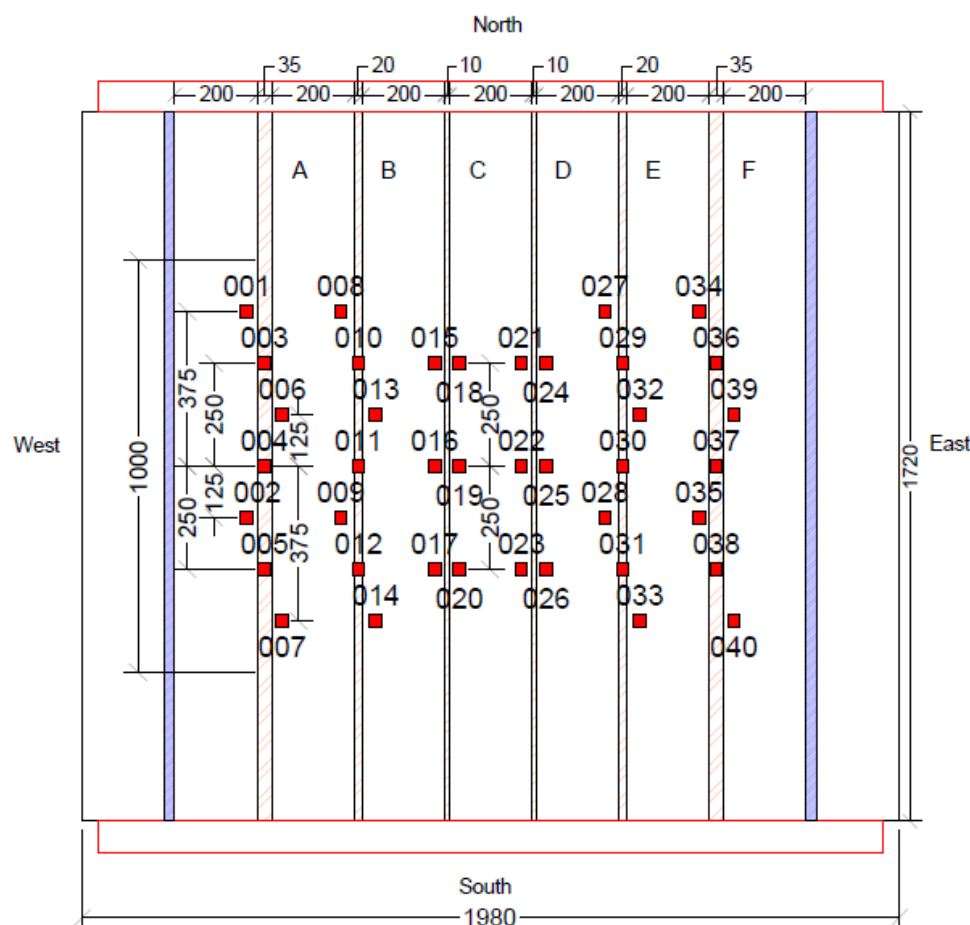


Figure 3 Instrumentation locations

Table 10 Thermocouple locations

| Control joint | T/C # | Description |
|---------------|-------|---|
| A | 001 | 25 mm from the control joint, 375 mm north from the centre. |
| | 002 | 25 mm from the control joint, 125 mm south from the centre. |
| | 003 | On the control joint, 250 mm up from the centre. |
| | 004 | On the control joint, at the centre. |
| | 005 | On the control joint, 250 mm down from the centre. |
| | 006 | 25 mm from the control joint, 125 mm north from the centre. |
| | 007 | 25 mm from the control joint, 375 mm south from the centre. |
| B | 008 | 25 mm from the control joint, 375 mm north from the centre. |
| | 009 | 25 mm from the control joint, 125 mm south from the centre. |
| | 010 | On the control joint, 250 mm up from the centre. |
| | 011 | On the control joint, at the centre. |

| Control joint | T/C # | Description |
|---------------|-------|---|
| | 012 | On the control joint, 250 mm down from the centre. |
| | 013 | 25 mm from the control joint, 125 mm north from the centre. |
| | 014 | 25 mm from the control joint, 375 mm south from the centre. |
| C | 015 | 25 mm from the control joint, 250 mm north from the centre. |
| | 016 | 25 mm from the control joint, at the centre. |
| | 017 | 25 mm from the control joint, 205 mm south from the centre. |
| | 018 | 25 mm from the control joint, 250 mm north from the centre. |
| | 019 | 25 mm from the control joint, at the centre. |
| | 020 | 25 mm from the control joint, 205 mm south from the centre. |
| D | 021 | 25 mm from the control joint, 250 mm north from the centre. |
| | 022 | 25 mm from the control joint, at the centre. |
| | 023 | 25 mm from the control joint, 205 mm south from the centre. |
| | 024 | 25 mm from the control joint, 250 mm north from the centre. |
| | 025 | 25 mm from the control joint, at the centre. |
| | 026 | 25 mm from the control joint, 205 mm south from the centre. |
| E | 027 | 25 mm from the control joint, 375 mm north from the centre. |
| | 028 | 25 mm from the control joint, 125 mm south from the centre. |
| | 029 | On the control joint, 250 mm up from the centre. |
| | 030 | On the control joint, at the centre. |
| | 031 | On the control joint, 250 mm down from the centre. |
| | 032 | 25 mm from the control joint, 125 mm north from the centre. |
| | 033 | 25 mm from the control joint, 375 mm south from the centre. |
| F | 034 | 25 mm from the control joint, 375 mm north from the centre. |
| | 035 | 25 mm from the control joint, 125 mm south from the centre. |
| | 036 | On the control joint, 250 mm up from the centre. |
| | 037 | On the control joint, at the centre. |
| | 038 | On the control joint, 250 mm down from the centre. |
| | 039 | 25 mm from the control joint, 125 mm north from the centre. |
| | 040 | 25 mm from the control joint, 375 mm south from the centre. |

Appendix E Test data

E.1 Furnace temperature and severity

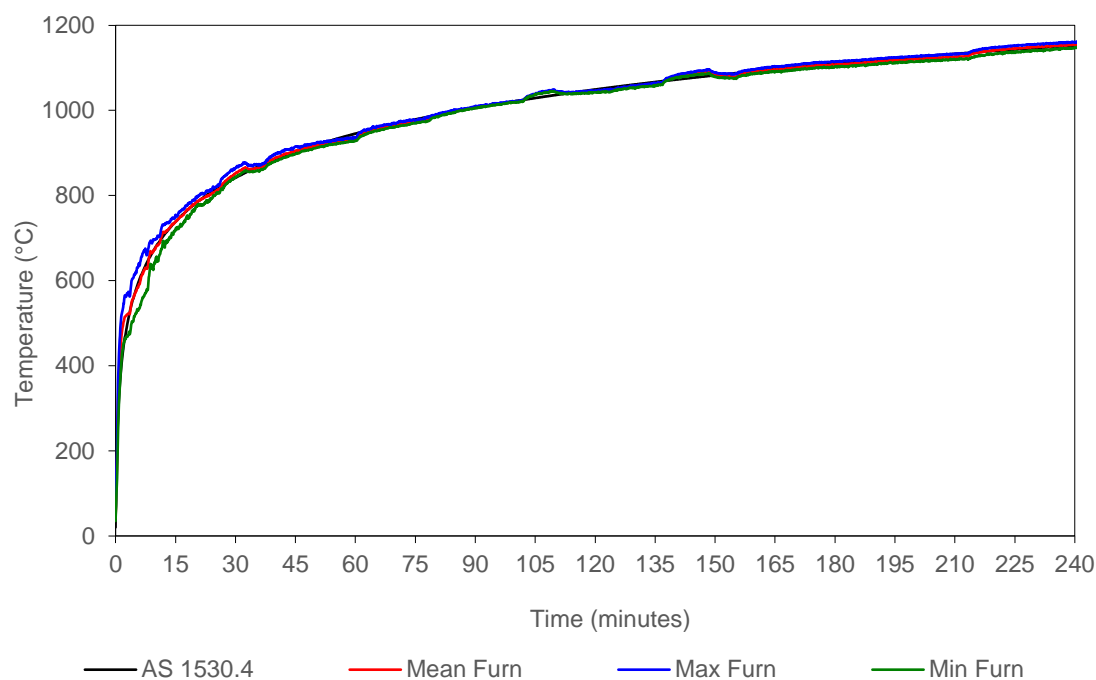


Figure 4 Furnace thermocouple temperature vs time

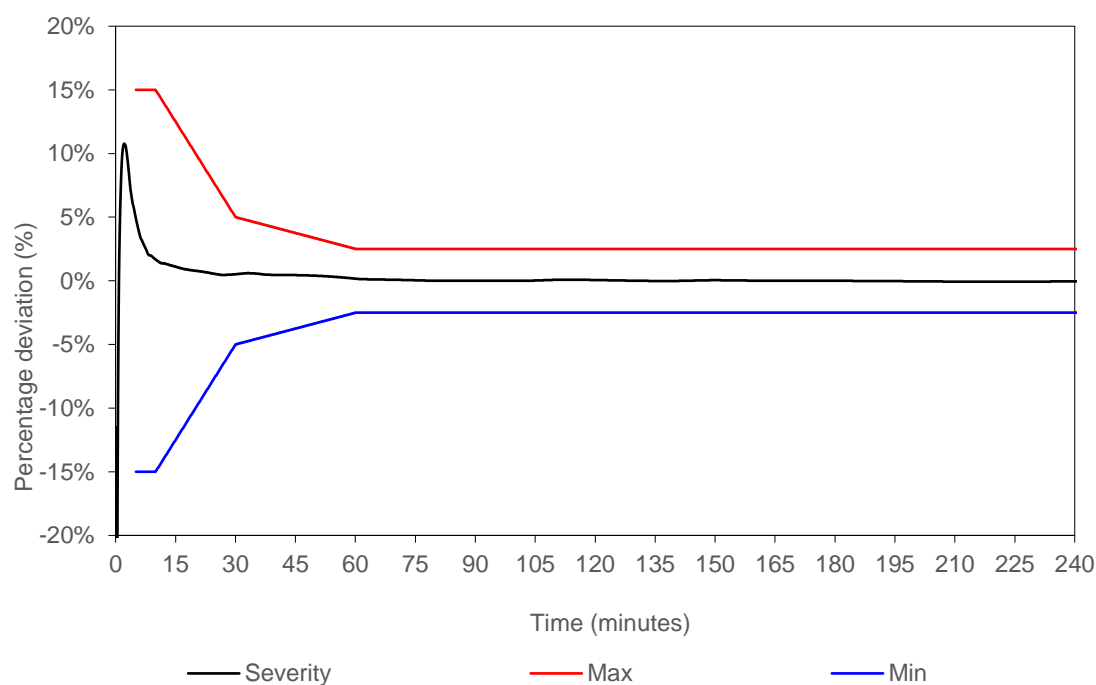


Figure 5 Percentage deviation of exposure severity vs time

E.2 Furnace pressure

The furnace pressure was measured at approximately 250 mm below the underside of the slab and corrected to 100 mm below the underside of the slab.

Table 11 Furnace pressure

| Time (minutes) | Average pressure (Pa) | Time (minutes) | Average pressure (Pa) | Time (minutes) | Average pressure (Pa) |
|----------------|-----------------------|----------------|-----------------------|----------------|-----------------------|
| 5-10 | 21 | 85-90 | 20 | 165-170 | 22 |
| 10-15 | 18 | 90-95 | 21 | 170-175 | 19 |
| 15-20 | 18 | 95-100 | 22 | 175-180 | 21 |
| 20-25 | 19 | 100-105 | 20 | 180-185 | 23 |
| 25-30 | 21 | 105-110 | 20 | 185-190 | 22 |
| 30-35 | 20 | 110-115 | 20 | 190-195 | 20 |
| 35-40 | 21 | 115-120 | 21 | 195-200 | 21 |
| 40-45 | 23 | 120-125 | 22 | 200-205 | 21 |
| 45-50 | 21 | 125-130 | 22 | 205-210 | 21 |
| 50-55 | 22 | 130-135 | 21 | 210-215 | 21 |
| 55-60 | 22 | 135-140 | 21 | 215-220 | 21 |
| 60-65 | 21 | 140-145 | 20 | 220-225 | 21 |
| 65-70 | 22 | 145-150 | 19 | 225-230 | 22 |
| 70-75 | 21 | 150-155 | 18 | 230-235 | 22 |
| 75-80 | 22 | 155-160 | 22 | 235-240 | 22 |
| 80-85 | 22 | 160-165 | 22 | | |

E.3 Specimen temperatures

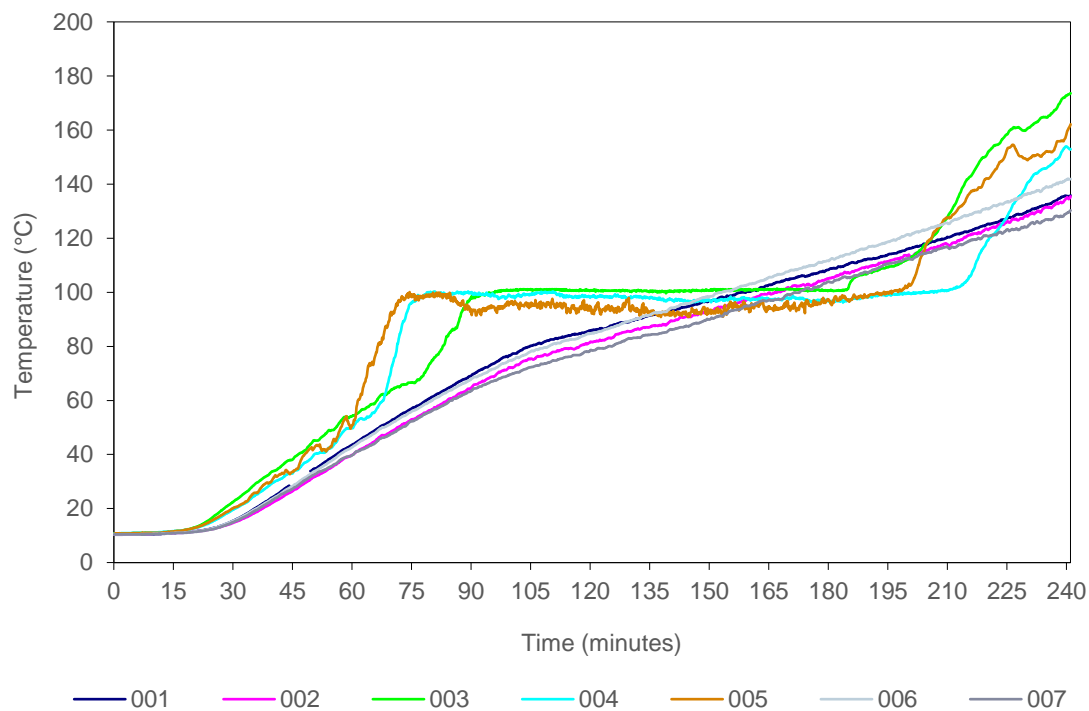


Figure 6 Control joint A – temperature vs time

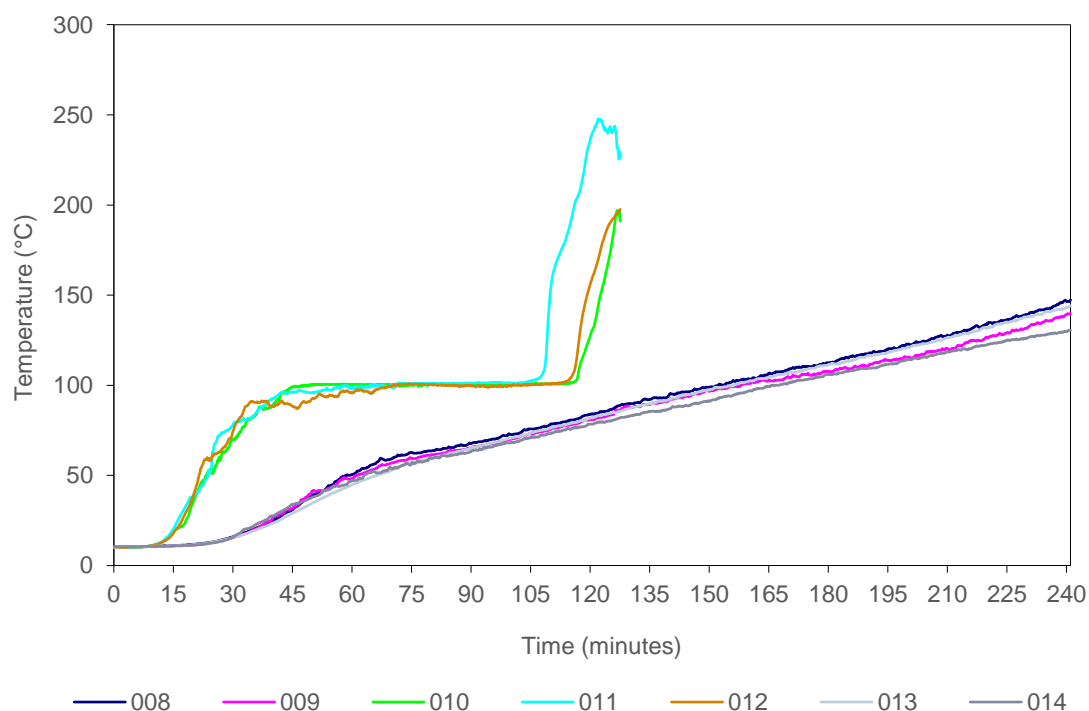


Figure 7 Control joint B – temperature vs time

Note: TC010 to 012 detached from the specimen at 127 minutes of the test period.

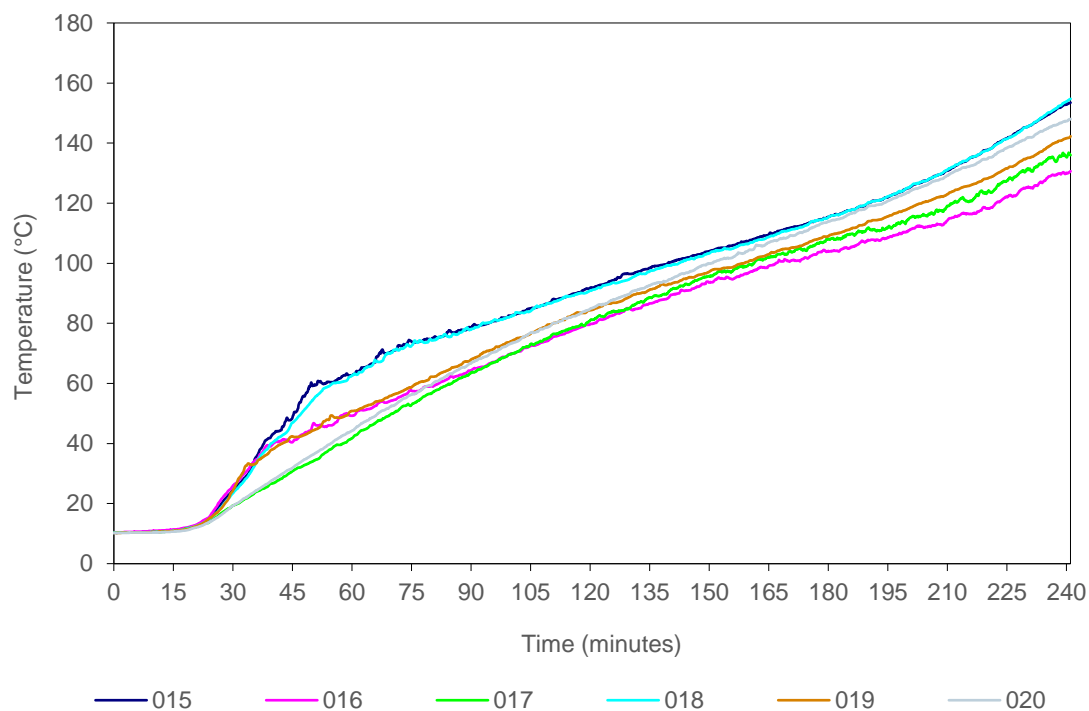


Figure 8 Control joint C – temperature vs time

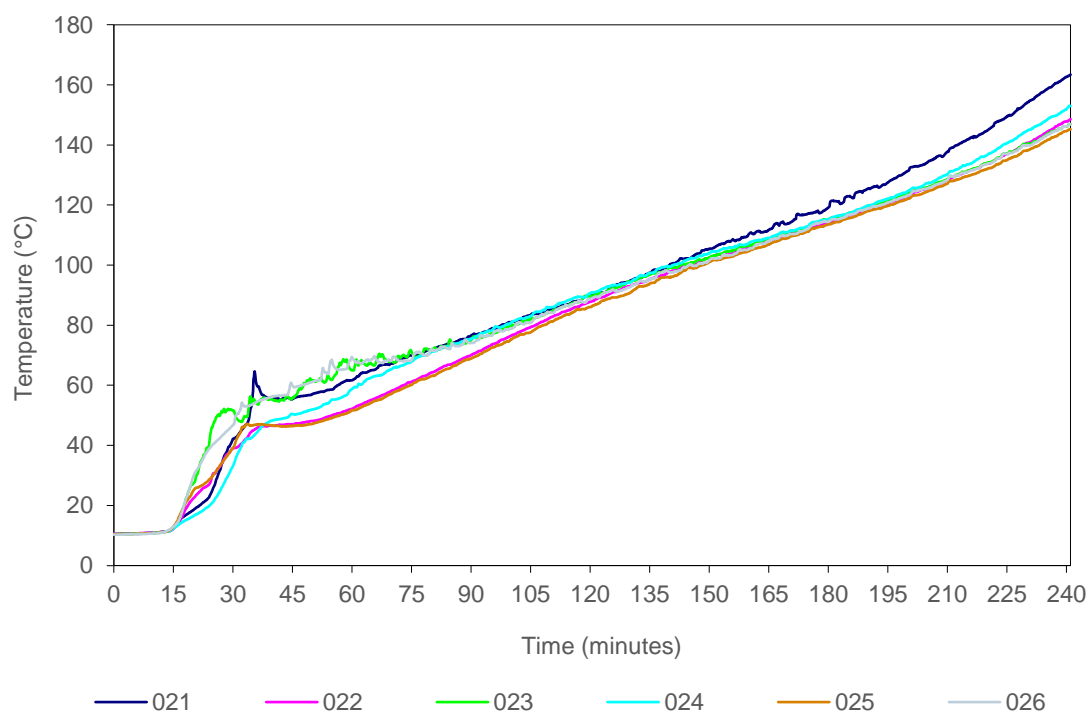


Figure 9 Control joint D – temperature vs time

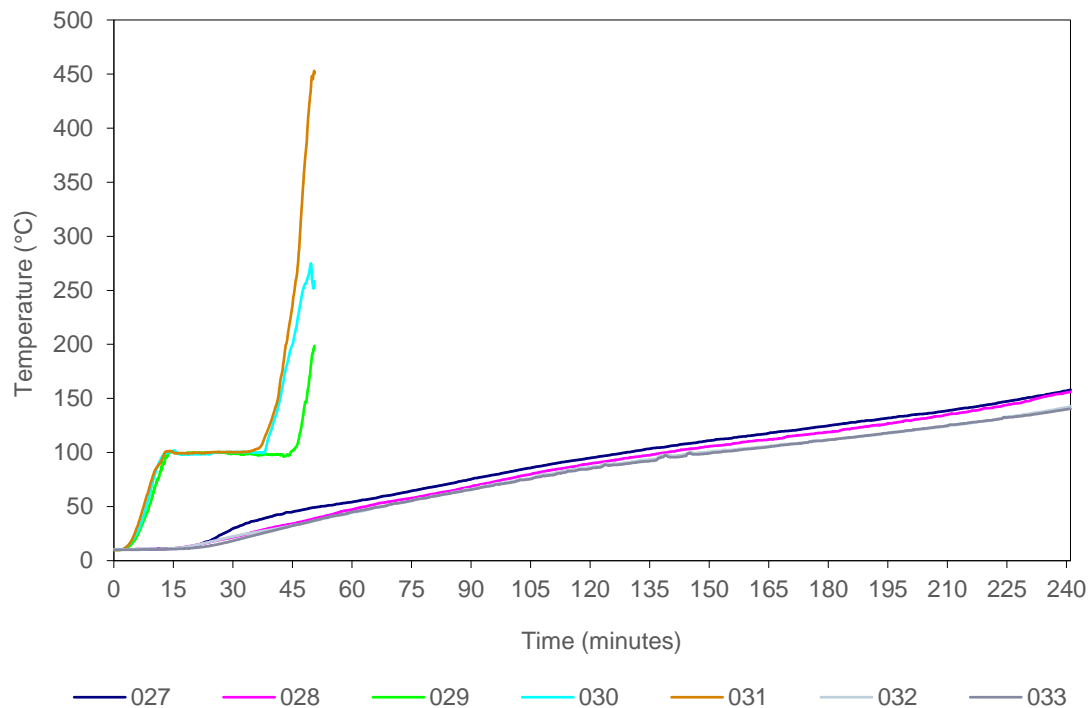


Figure 10 Control joint E – temperature vs time

Note: TC029 to 031 detached from the specimen at 55 minutes of the test period.

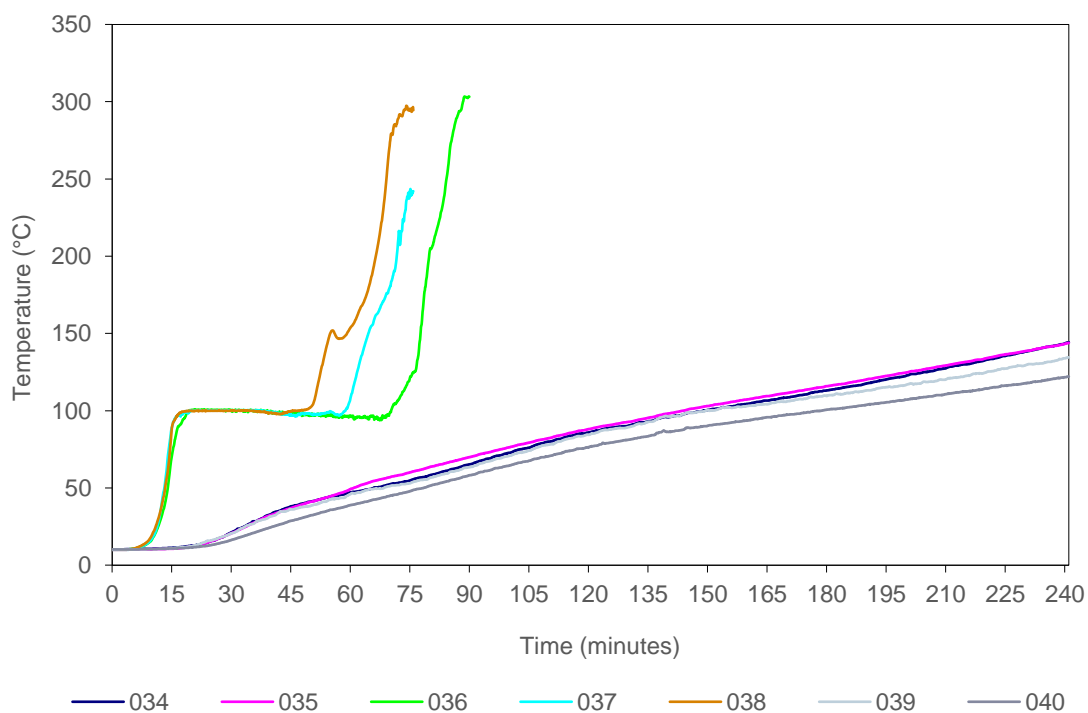


Figure 11 Control joint F – temperature vs time

Note:

- TC036 detached from the specimen at 90 minutes of the test period.
- TC037 to 038 detached from the specimen at 75 minutes of the test period.

Table 12 Test specimen temperatures

| Control joint | T/C # | Description ¹ | Temp (°C) at t (minutes) | | | | | Limit ² (minutes) |
|---------------|-------|-------------------------------|--------------------------|------|-------|-------|-------|------------------------------|
| | | | t=0 | t=60 | t=120 | t=180 | t=240 | |
| A | 001 | 25 mm from the control joint. | 10 | 44 | 86 | 108 | 136 | - |
| | 002 | 25 mm from the control joint. | 10 | 40 | 82 | 105 | 135 | - |
| | 003 | On the control joint. | 11 | 54 | 101 | 101 | 173 | - |
| | 004 | On the control joint. | 11 | 50 | 98 | 97 | 154 | - |
| | 005 | On the control joint. | 11 | 51 | 95 | 97 | 159 | - |
| | 006 | 25 mm from the control joint. | 10 | 43 | 85 | 112 | 142 | - |
| | 007 | 25 mm from the control joint. | 10 | 40 | 79 | 104 | 129 | - |
| B | 008 | 25 mm from the control joint. | 10 | 50 | 84 | 112 | 147 | - |
| | 009 | 25 mm from the control joint. | 10 | 48 | 81 | 108 | 139 | - |
| | 010 | On the control joint. | 10 | 100 | 127 | # | # | 126 |
| | 011 | On the control joint. | 10 | 99 | 236 | # | # | 115 |
| | 012 | On the control joint. | 10 | 96 | 156 | # | # | 125 |
| | 013 | 25 mm from the control joint. | 10 | 45 | 82 | 112 | 143 | - |
| | 014 | 25 mm from the control joint. | 10 | 47 | 79 | 106 | 130 | - |
| C | 015 | 25 mm from the control joint. | 10 | 63 | 92 | 115 | 153 | - |
| | 016 | 25 mm from the control joint. | 11 | 49 | 80 | 104 | 130 | - |
| | 017 | 25 mm from the control joint. | 10 | 42 | 81 | 108 | 135 | - |
| | 018 | 25 mm from the control joint. | 10 | 63 | 91 | 115 | 154 | - |
| | 019 | 25 mm from the control joint. | 10 | 51 | 84 | 109 | 142 | - |
| | 020 | 25 mm from the control joint. | 10 | 44 | 85 | 114 | 147 | - |
| D | 021 | 25 mm from the control joint. | 11 | 62 | 90 | 119 | 163 | - |
| | 022 | 25 mm from the control joint. | 11 | 52 | 88 | 114 | 148 | - |
| | 023 | 25 mm from the control joint. | 10 | 65 | 90 | 115 | 146 | - |
| | 024 | 25 mm from the control joint. | 10 | 59 | 91 | 115 | 152 | - |
| | 025 | 25 mm from the control joint. | 10 | 52 | 86 | 114 | 145 | - |
| | 026 | 25 mm from the control joint. | 10 | 69 | 89 | 115 | 146 | - |
| E | 027 | 25 mm from the control joint. | 10 | 54 | 95 | 125 | 157 | - |
| | 028 | 25 mm from the control joint. | 10 | 47 | 90 | 119 | 155 | - |
| | 029 | On the control joint. | 10 | 317 | # | # | # | 49 |
| | 030 | On the control joint. | 10 | 319 | # | # | # | 44 |
| | 031 | On the control joint. | 10 | 370 | # | # | # | 42 |
| | 032 | 25 mm from the control joint. | 10 | 45 | 87 | 112 | 142 | - |
| | 033 | 25 mm from the control joint. | 10 | 45 | 85 | 112 | 140 | - |
| F | 034 | 25 mm from the control joint. | 10 | 47 | 86 | 113 | 144 | - |
| | 035 | 25 mm from the control joint. | 10 | 49 | 88 | 116 | 143 | - |
| | 036 | On the control joint. | 10 | 96 | # | # | # | 79 |
| | 037 | On the control joint. | 10 | 107 | # | # | # | 70 |
| | 038 | On the control joint. | 10 | 154 | # | # | # | 65 |

| Control joint | T/C # | Description ¹ | Temp (°C) at t (minutes) | | | | | Limit ² (minutes) |
|---------------|-------|-------------------------------|--------------------------|------|-------|-------|-------|------------------------------|
| | | | t=0 | t=60 | t=120 | t=180 | t=240 | |
| | 039 | 25 mm from the control joint. | 10 | 46 | 85 | 110 | 134 | - |
| | 040 | 25 mm from the control joint. | 10 | 39 | 77 | 101 | 122 | - |

- Note:**
- ¹ Refer to Table 10 for the locations of thermocouples as only a generic description is included in the table.
 - ² Limit time is the time to the nearest whole minute, rounded down to the nearest minute, at which the temperature recorded by the thermocouple does not rise by more than 180 K above the initial temperature.
- # Thermocouple detached.
- Under limit column indicates the temperature limit was not exceeded during the test period or up until the time of integrity failure if a failure occurred.

Appendix F Photographs



Figure 12 Unexposed face of the specimen before the start of the test



Figure 13 Exposed face of the specimen before the start of the test

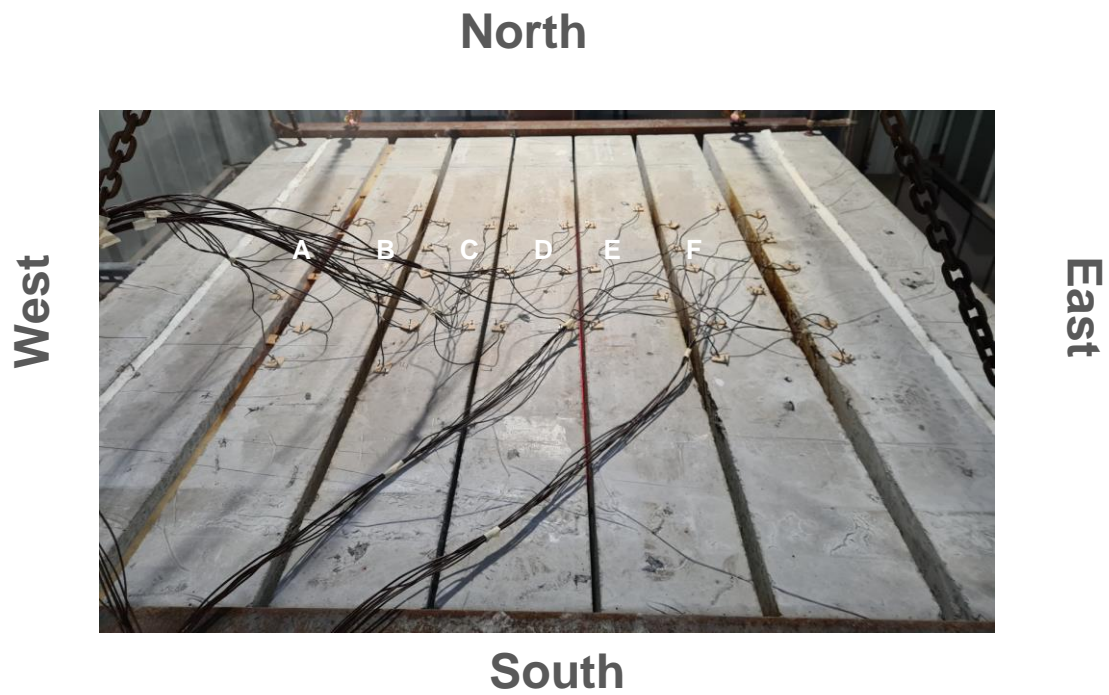


Figure 14 Unexposed face of the specimen at the end of the test

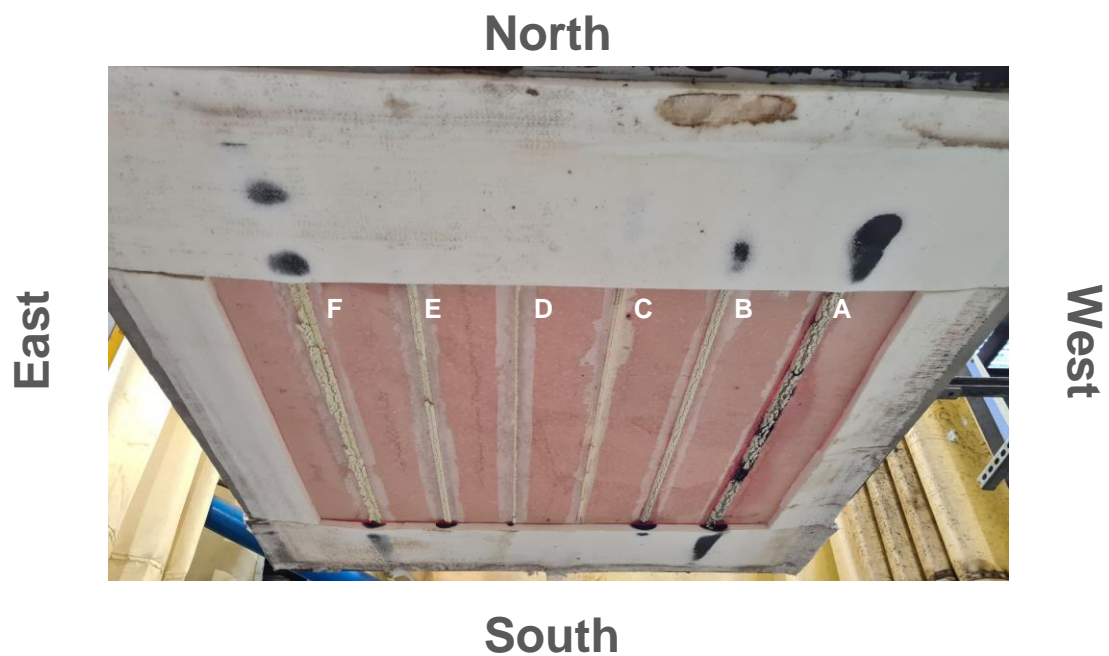


Figure 15 Exposed face of the specimen at the end of the test

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