

FSV 1082

**FIRE-RESISTANCE TEST ON A
TIMBER-FRAMED EXTERIOR WALL SYSTEM**

In confidence to

EIFS AUSTRALASIA PTY LTD

30 SEPTEMBER 2004



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CSIRO - Manufacturing and Infrastructure Technology
14 Julius Avenue, Riverside Corporate Park, North Ryde NSW 2113
Ph: 02 9490 5444 Fax: 02 9490 5528

**FIRE-RESISTANCE TEST ON A
TIMBER FRAMED EXTERIOR WALL SYSTEM**

SPONSORED INVESTIGATION No. FSV 1082

**IDENTIFICATION
OF SPECIMEN:**

The sponsor identified the specimen as timber-framed exterior wall system.

SPONSOR:

EIFS Australasia Pty Ltd
423 Bradman Road
ACACIA RIDGE QLD 6249

MANUFACTURER:

EIFS Australasia Pty Ltd
423 Bradman Road
ACACIA RIDGE QLD 6249

TEST STANDARD:

Australian Standard 1530, Methods for fire tests on building materials, components and structures, Part 4-1997, Fire-resistance tests of elements of building construction.

TEST NUMBER:

FS 3685/2695

TESTED:

The fire-resistance test was conducted on 27 August 2004.

**DESCRIPTION
OF SPECIMEN:**

GENERAL

The specimen consisted of a timber-framed exterior wall of overall nominal dimensions 3000-mm high x 3000-mm wide, clad on the exposed side with rendered panels, and the unexposed side with standard grade plasterboard. The wall consisted of a timber stud frame lined on one side with plasterboard, the other side was lined with sarking fixed to the studs with timber battens. QT insulation wall panels made from a blend of polystyrene bead materials and modified concrete, were then fixed to the battens and rendered, to form the external face of the wall system.

The wall incorporated a timber stud frame made from 90-mm x 35-mm MGP12 timber studs installed in accordance with AS 1684. The studs and noggings were connected together using 3.06-mm x 75-mm long gun nails, and spaced at centres detailed in drawing numbered FT-1.2.

On the external side, the timber frame was lined horizontally with Insulco 599 breathable sarking, stapled to the studs temporarily until permanently fixed with timber battens. The timber battens used to fix the sarking onto the frame were 25-mm x 45-mm H3 treated timber fixed to the studs with 3.06-mm x 75-mm long gun nails.



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The external face of the wall was completed by lining the timber battens with QT insulation wall panels, made from a blend of polystyrene bead materials and modified concrete. The 50-mm thick wall panels were fixed horizontally onto the timber battens with 3.75-mm x 75-mm long Class 3 flat head nails and circular plastic buttons. All joints between the panels were glued with expandable polyurethane foam "Powers Trigger Foam". The panels were then coated with nominally 5-8-mm thick polymer modified cement render "SupaCoat PM660" with 160 g/m² alkali resistant fibreglass mesh (4-mm x 4-mm aperture) embedded into the surface of the wet render.

The internal face of the wall frame was lined horizontally with standard grade 10-mm thick plasterboard, fixed to the frame using adhesive and 6-18-mm x 28-mm long bulge head plasterboard screws. All the plasterboard joints formed in both external faces of the wall were then set using perforated paper tape and plaster. Any gaps along the perimeter were sealed using fire-caulk sealant "Bostik FireBan" and finished flush with the face.

DIMENSIONS

The wall specimen was nominally 3000-mm wide x 3000-mm high x 185-mm thick. All dimensions are nominal.

RESTRAINT

The specimen was unrestrained along one of the vertical edges.

ORIENTATION

The system was tested with the rendered side exposed to the furnace.

DOCUMENTATION: The following documents were supplied by the sponsor as a complete description of the specimen and should be read in conjunction with this report:

Specification titled "CSIRO Full Scale Fire Test Wall – Construction Method" (10 pages), dated 6 September 2004, by Quik'nTuff Wall Systems Pty Ltd.

Drawings detail numbers FT-1.1 and FT1.2, both dated 10 September 2004, by Quik'nTuff Wall Systems Pty Ltd.

Confidential information about the test specimen has been submitted and is retained at CSIRO Manufacturing and Infrastructure Technology.

EQUIPMENT: FURNACE

The furnace has a nominal opening of 3000-mm x 3000-mm for attachment of vertical specimens.

The furnace was lined with refractory bricks and materials with the thermal properties as specified in AS 1530.4-1997 and was heated by combustion of a mixture of natural gas and air.



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TEMPERATURE

The temperature in the furnace chamber was measured by nine type K, 3-mm diameter, 310 stainless steel Mineral Insulated Metal Sheathed (MIMS) thermocouples. Each thermocouple was housed in high-nickel steel tubes opened at the exposed end.

The temperatures of the specimen were measured by glass-fibre insulated and sheathed K-type thermocouples with a wire diameter of 0.5-mm.

PRESSURE

The furnace pressure was measured by a differential low-pressure transducer with a range of ± 50 Pa.

DEFLECTION

Deflections of the element were measured by observing the linear displacement against a reference datum established prior to the commencement of the test using a graduated staff and theodolite.

MEASUREMENT SYSTEM

The primary measurement system comprised a multiple-channel data loggers, scanning at one minute intervals during the test. After each scan the information was stored on magnetic disc by the computer controller.

AMBIENT

TEMPERATURE: The temperature of the test area was 27°C at the commencement of the test.

DEPARTURE FROM

TEST STANDARD: There were no departures from the requirements of AS 1530.4-1997.

TERMINATION

OF TEST: The test was terminated at 115 minutes by the agreement with the sponsor.

TEST RESULTS:**CRITICAL OBSERVATIONS**

The following observations were made during the fire-resistance test:

- 20 minutes - The top sheets of the plasterboard on the unexposed side are starting to deflect away from the furnace, pulling through the screw heads.
- 22 minutes - Smoke is being emitted through the screw holes noted at 20 minutes.
- 26 minutes - Render on the exposed side of the specimen appears to be still in place.
- 48 minutes - Discolouring is evident on the top plasterboard sheet on the unexposed face of the specimen. Joint in the panels is visible on the exposed side of the specimen.



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- 70 minutes - Joint noted at 48 minutes appears to be widening.
 - 88 minutes - Render is starting to fall off the exposed face of the specimen.
 - 109 minutes - Screw holes located along the top of the wall specimen have opened up to form four large holes on the unexposed face (photograph 4).
 - 112 minutes - Charring is visible on the top plasterboard sheet on the unexposed face of the specimen.
 - 113 minutes - Integrity Failure – sustained flaming along the top of the unexposed face of the specimen (photograph 5).
 - 115 minutes - Insulation Failure – average and maximum temperature rise limits of 160 K and 180 K respectively are exceeded on the unexposed face of the specimen.
- Test terminated.

FURNACE TEMPERATURE

Figure 1 shows the standard curves of temperature versus time for heating the furnace chamber and the actual curves of average and maximum temperature versus time recorded during the heating period.

SPECIMEN TEMPERATURE

Figure 2 shows the curves of average and maximum temperature versus time recorded on the unexposed face of the wall.

Figure 3 shows the curve of maximum temperature versus time recorded on the plasterboard joints.

SPECIMEN TEMPERATURE

Figure 4 shows the curve of maximum deflection versus time recorded at the centre of the wall.

PERFORMANCE

Performance observed in respect of the following AS 1530.4-1997 criteria:

Structural adequacy	-	not applicable
Integrity	-	113 minutes
Insulation	-	115 minutes

FIRE-RESISTANCE

LEVEL (FRL):

For the purpose of building regulations in Australia, the FRL of the test specimen was -/90/90.

The fire-resistance level of the specimen is applicable when the system is exposed to fire from same direction as tested.



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For the purposes of AS 1530.4-1997 the results of these fire tests may be used to directly assess fire hazard, but it should be noted that a single test method will not provide a full assessment of fire hazard under all fire conditions.

APPENDICES:

APPENDIX 1

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APPENDIX 2

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APPENDIX 3

Drawing, detail number FT-1.1, dated 10 September 2004, by Quik'nTuff Wall Systems Pty Ltd	Page 14
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Drawing, detail number FT-1.2, dated 10 September 2004, by Quik'nTuff Wall Systems Pty Ltd	Page 15
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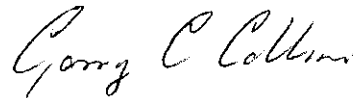
APPENDIX 5

A copy of Certificate of Test No. 1818.....	Page 16
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TESTED BY:



Chris Wojcik
Testing Officer



Garry E Collins
Manager, Fire Testing and Assessments

30 SEPTEMBER 2004

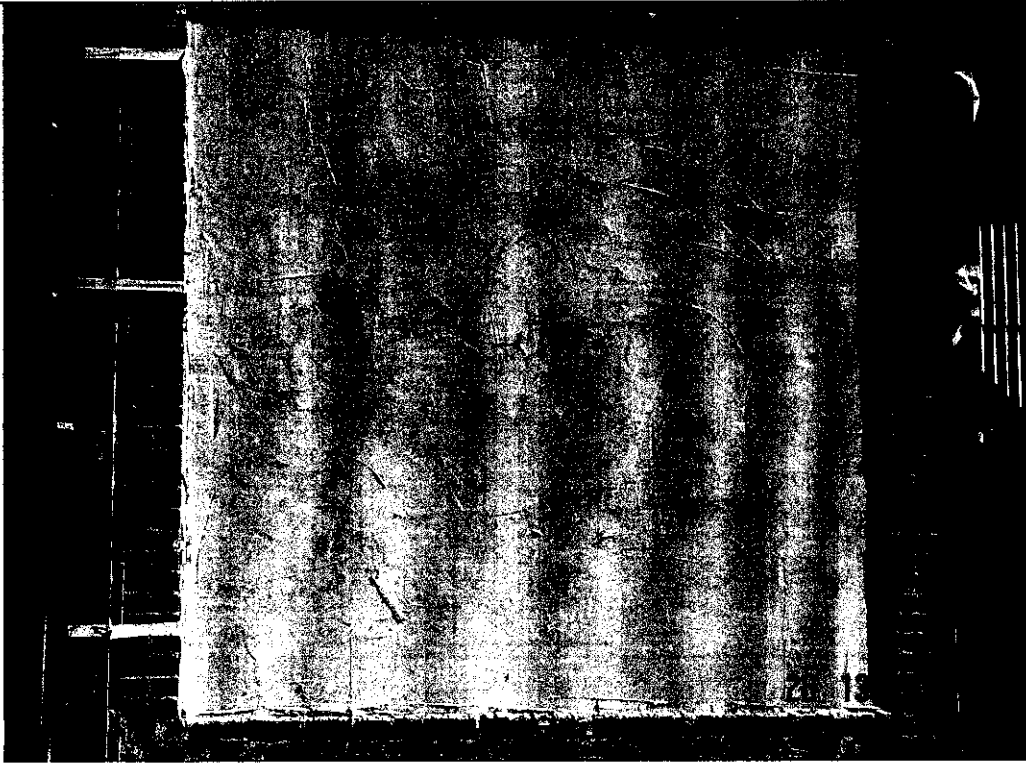


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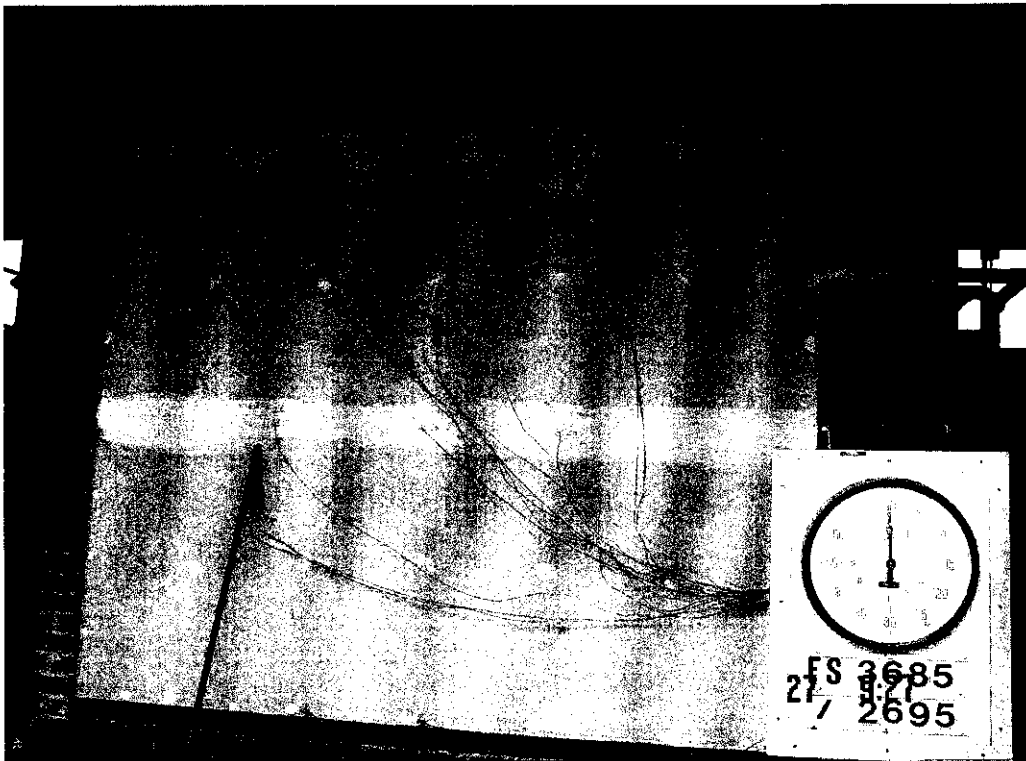
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Photograph 1 – Specimen (exposed face) prior to testing.



Photograph 2 – Specimen (unexposed face) prior to testing.

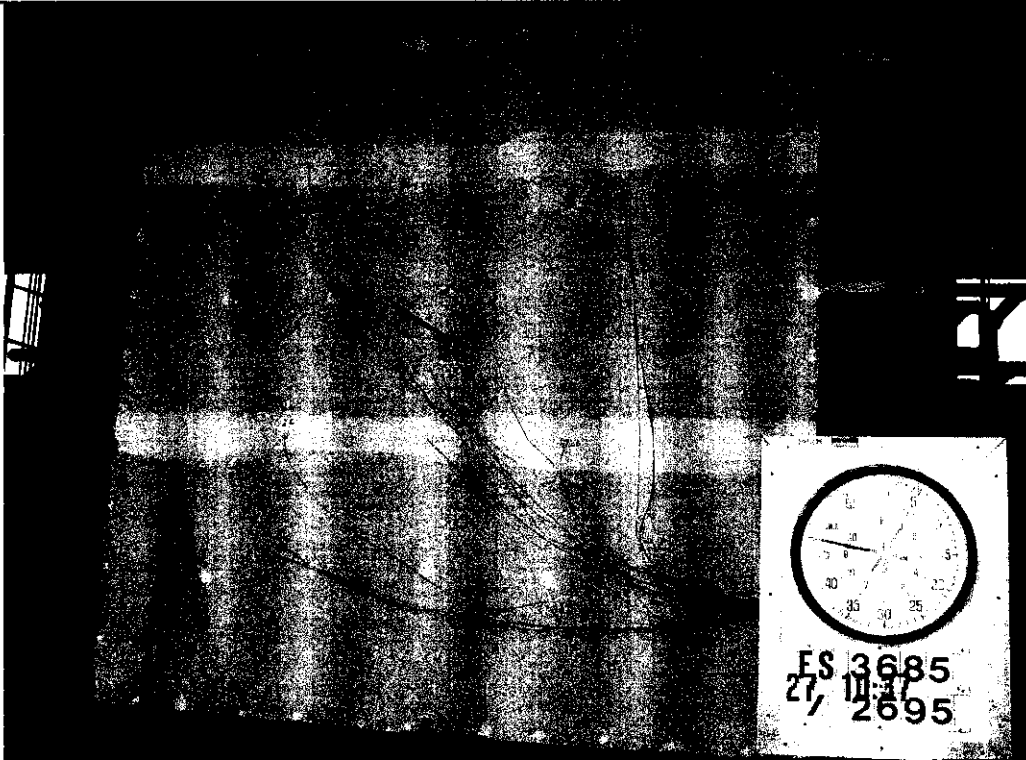


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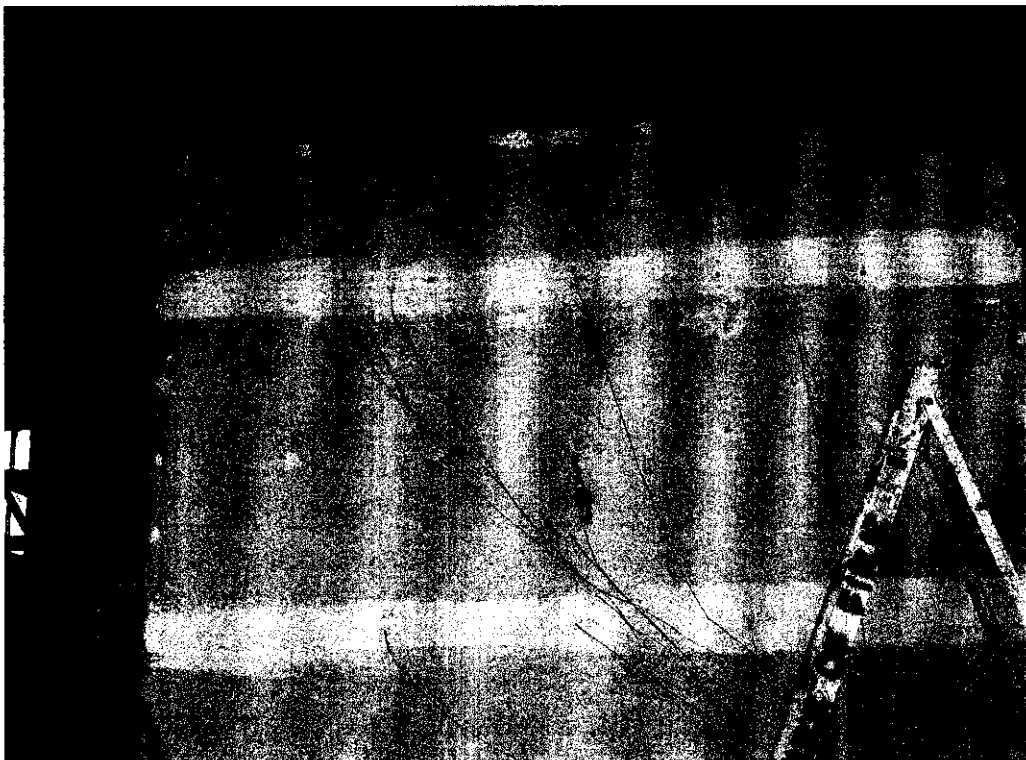
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Photograph 3 – Specimen at 60 minutes into the test.



Photograph 4 – Specimen at 110 minutes into the test.



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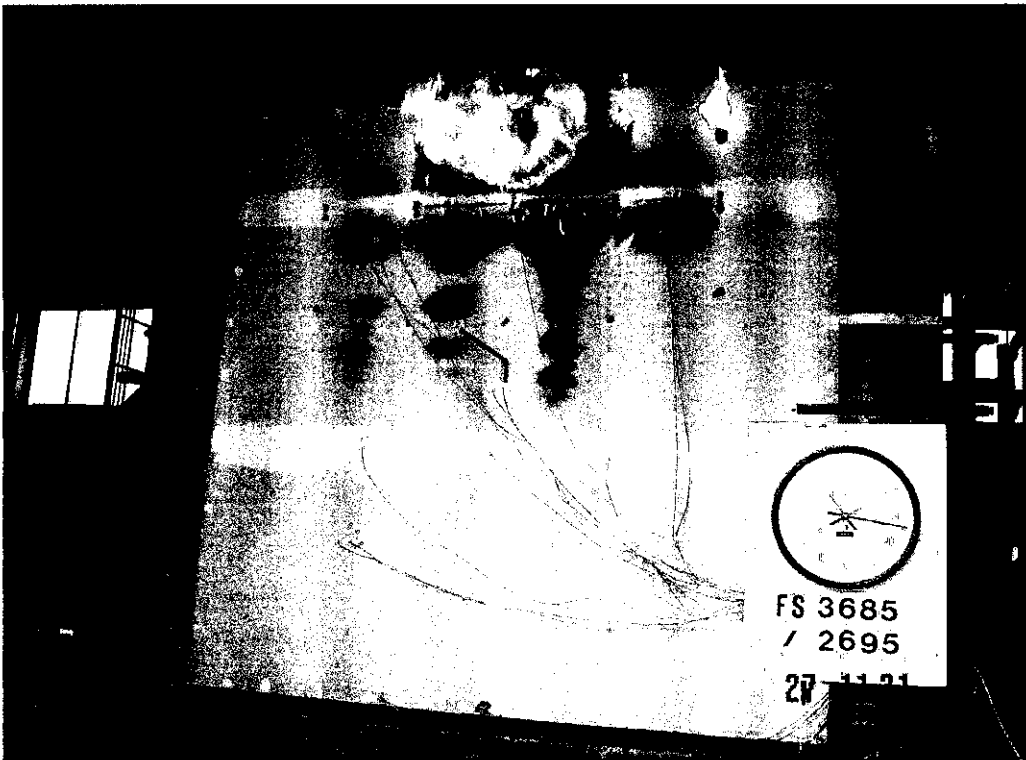
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Photograph 5 – Specimen at 114 minutes into the test.



Photograph 6 – Specimen at the termination of the test.



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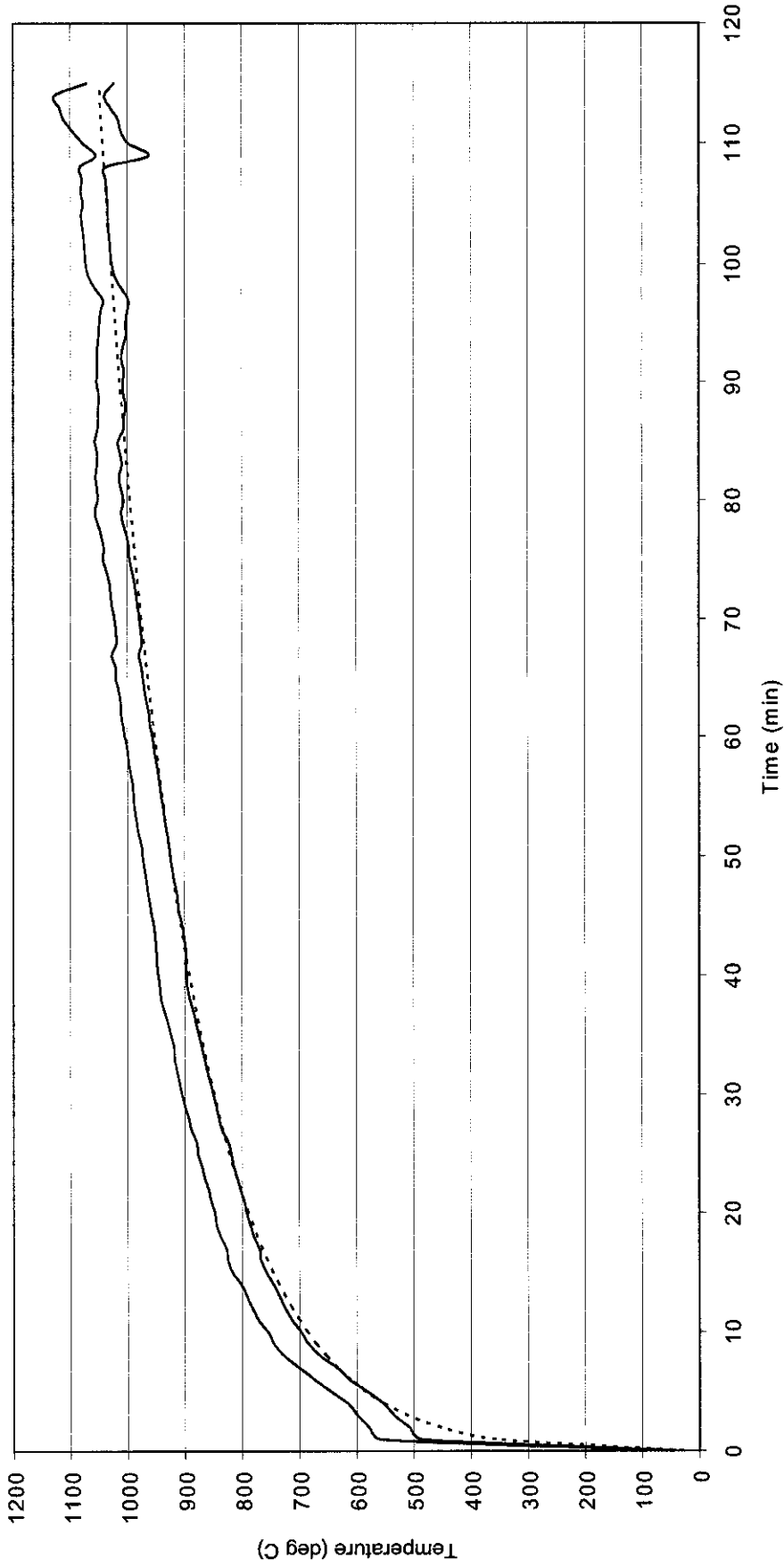


Fig. 1 – FURNACE TEMPERATURE



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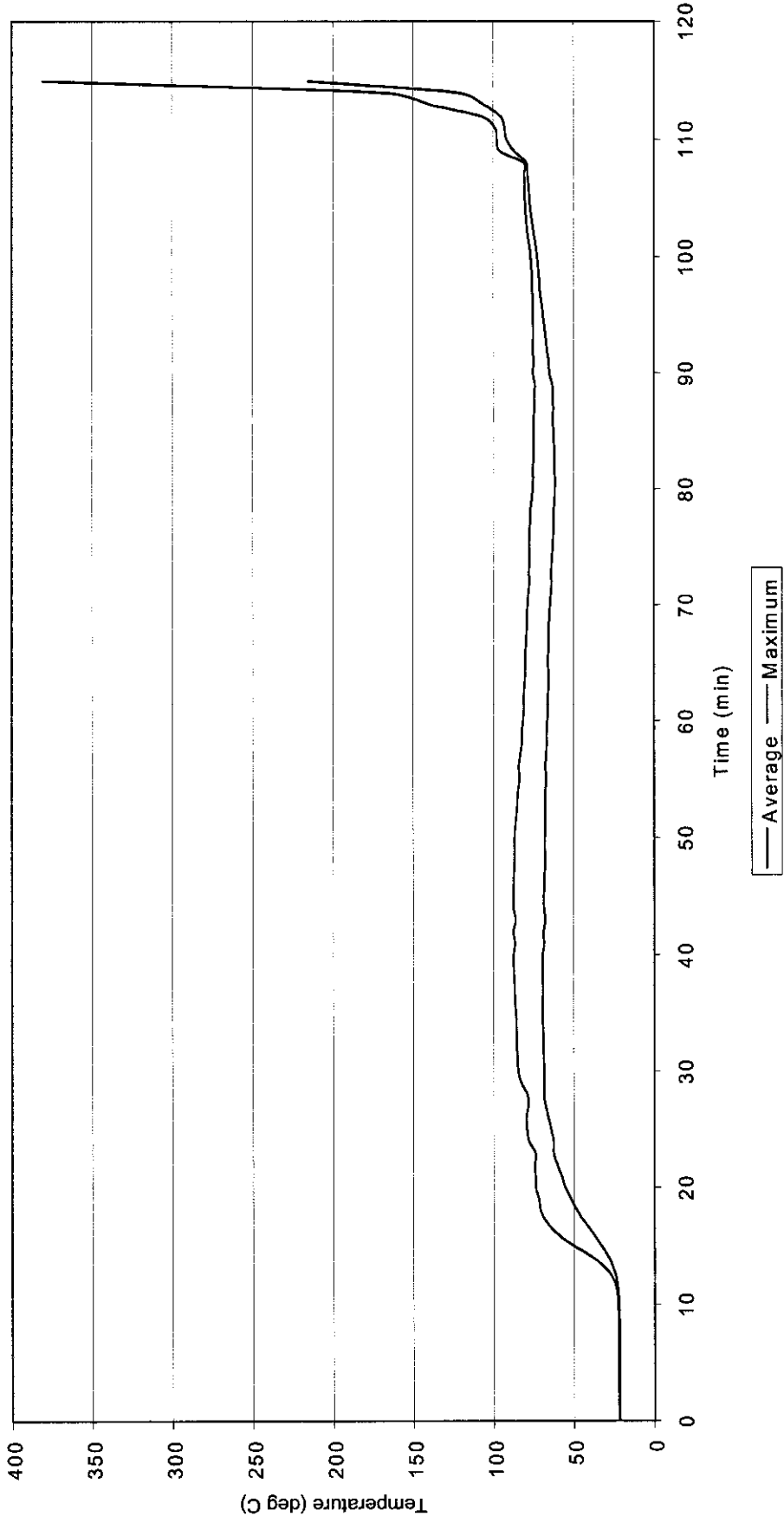


Fig. 2 – SPECIMEN TEMPERATURE
Unexposed face of the wall



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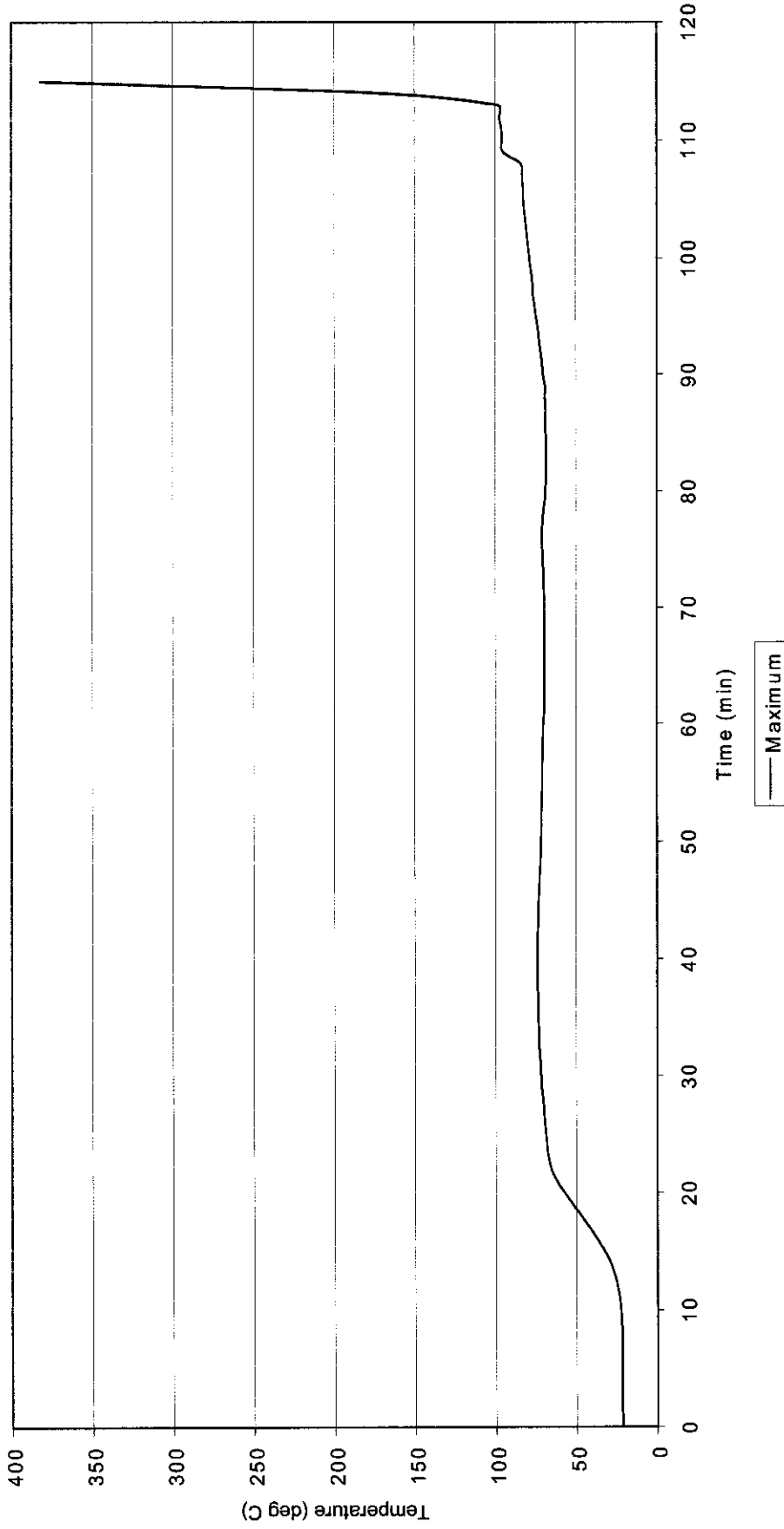


Fig. 3 – SPECIMEN TEMPERATURE
On plasterboard joints.



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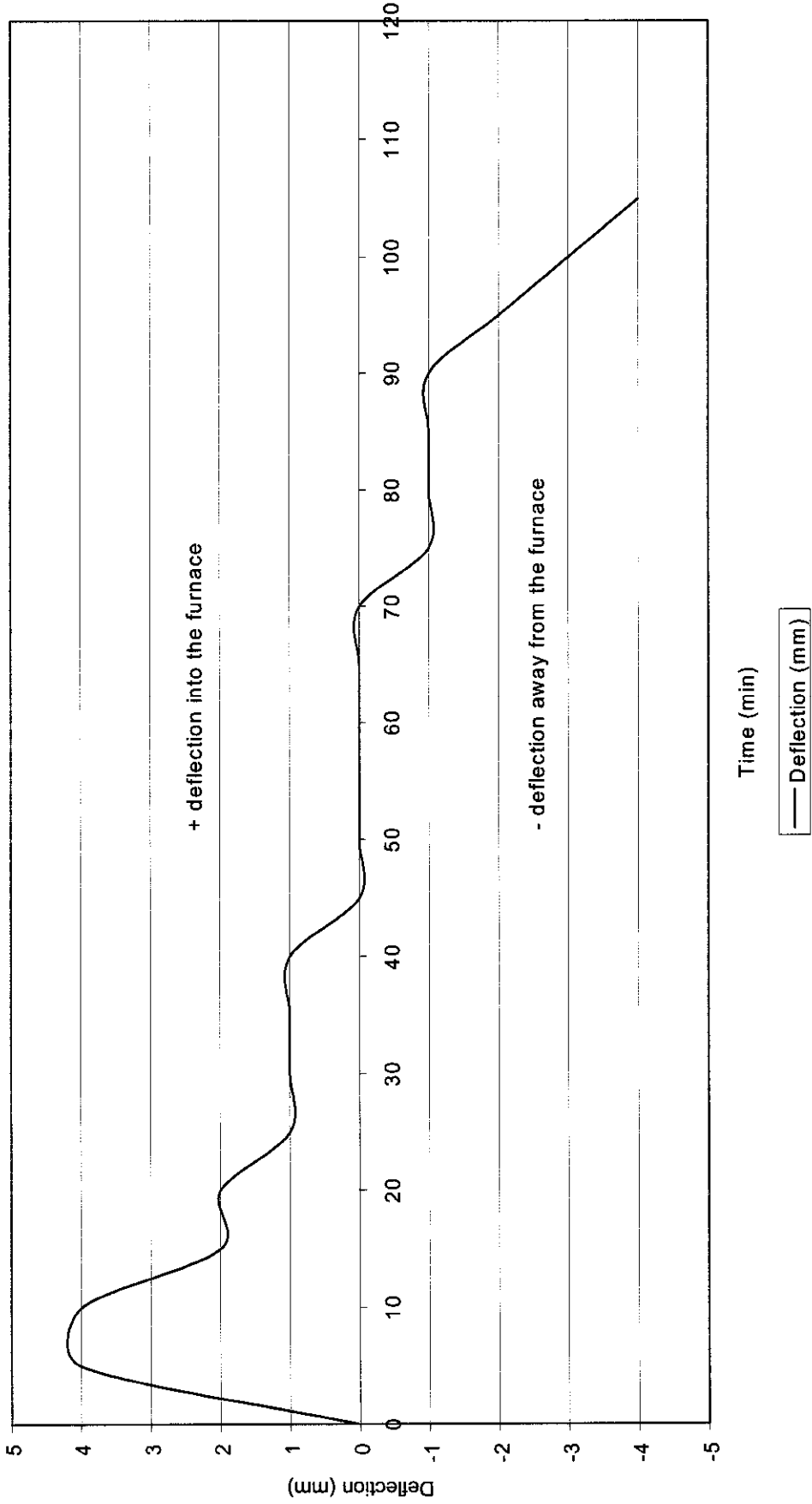


Fig. 4 – SPECIMEN DEFLECTION



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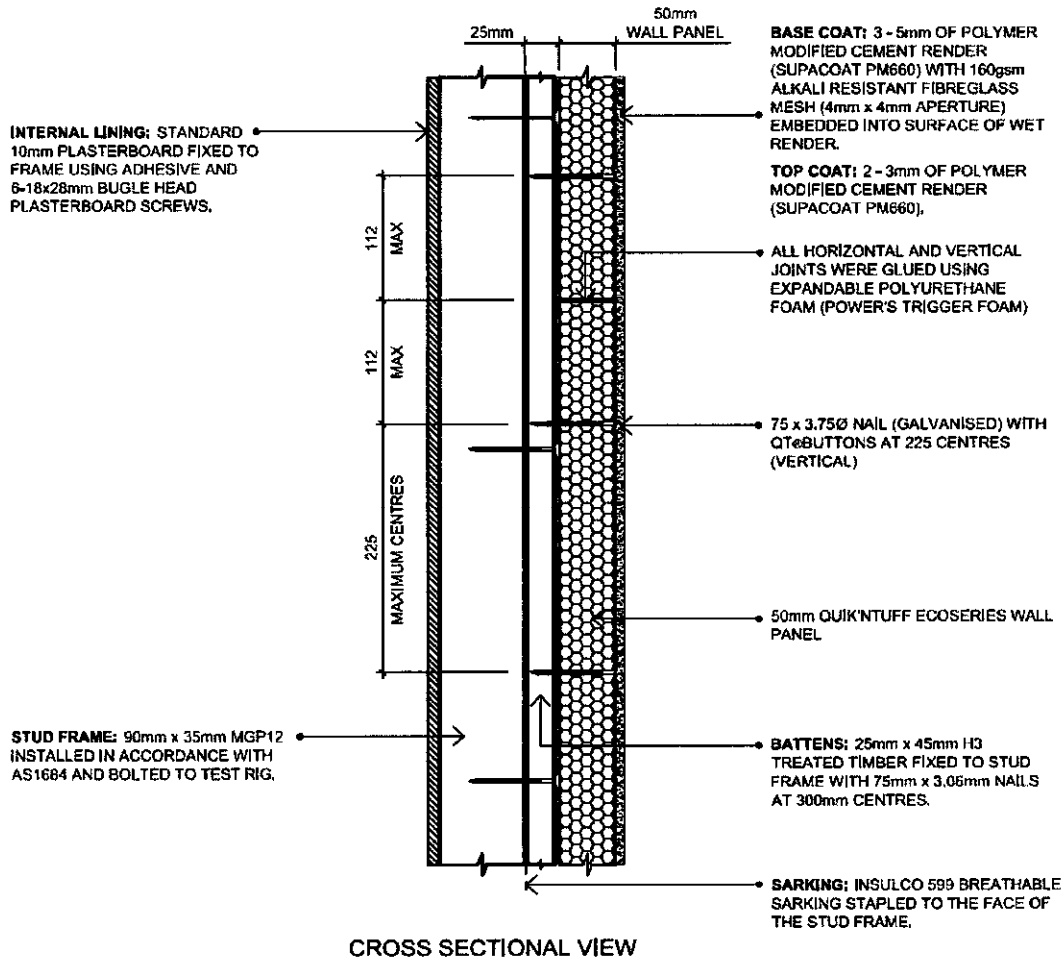
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**Exterior
Wall System**



CROSS SECTIONAL VIEW

**FIRE TEST - FS3685-2695
SPECIMEN - TYPICAL CROSS SECTION**

SCALE: A4=1:5



**EcoSeries
Wall Panel**

REF No.	QTFT-001
REV:	A
DATE:	10/9/04
DETAIL No.	FT-1.1



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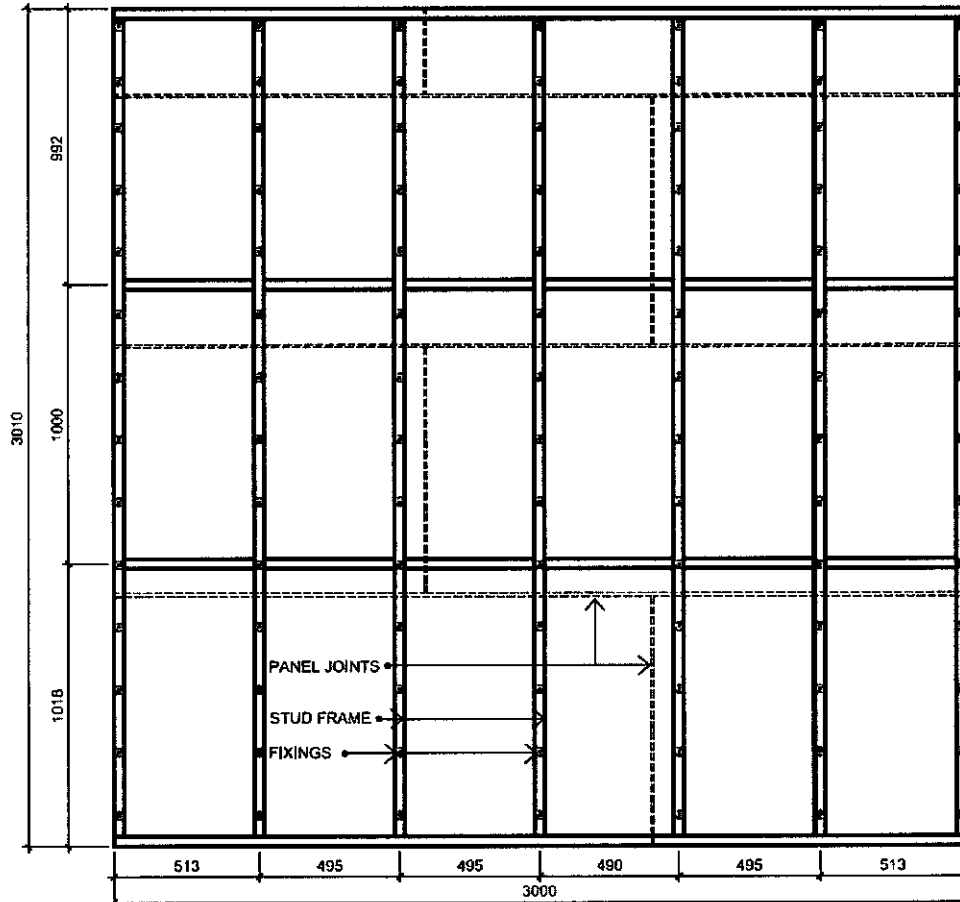
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**Exterior
Wall System**



TEST SPECIMEN - WALL COMPOSITION DESCRIPTION:

1. **INTERNAL LINING:** STANDARD 10mm PLASTERBOARD FIXED TO FRAME USING ADHESIVE AND 6-18x28mm BUGLE HEAD PLASTERBOARD SCREWS. BOSTIK FIREBAN WAS CAULKED BETWEEN THE TEST RIG AND THE OUTSIDE OF THE PLASTERBOARD.
2. **STUD FRAME:** 90mm x 35mm MGP12 - INSTALLED IN ACCORDANCE WITH AS1684 (FRAME SETOUT ABOVE) AND BOLTED TO TEST RIG.
3. **SARKING:** INSULCO 599 BREATHABLE SARKING STAPLED TO THE FACE OF THE STUD FRAME.
4. **BATTENS:** 25mm x 45mm H3 TREATED TIMBER FIXED TO STUD FRAME WITH 75mm x 3.06mm NAILS AT 300mm CENTRES.
5. **PANEL:** 50mm QUIK'NTUFF ECOSERIES WALL PANEL FIXED TO BATTENS WITH 75mm x 3.75mm CLASS 3 FLAT HEAD NAILS AND CIRCULAR PLASTIC BUTTONS. ALL HORIZONTAL AND VERTICAL JOINTS WERE GLUED USING EXPANDABLE POLYURETHANE FOAM (POWER'S TRIGGER FOAM). BOSTIK FIREBAN WAS CAULKED BETWEEN THE TEST RIG AND OUTSIDE OF THE QUIK'NTUFF ECOSERIES WALL PANEL.
6. **BASE COAT:** 3 - 5mm OF POLYMER MODIFIED CEMENT RENDER (SUPACOAT PM660) WITH 160gsm ALKALI RESISTANT FIBREGLASS MESH (4mm x 4mm APERTURE) EMBEDDED INTO SURFACE OF WET RENDER.
7. **TOP COAT:** 2 - 3mm OF POLYMER MODIFIED CEMENT RENDER (SUPACOAT PM660).



**FIRE TEST - FS3685-2695
SPECIMEN - ELEVATION**

SCALE: A4=1:20

REF No.	QTF-001
REV:	A
DATE:	10/9/04
DETAIL No.	FT-1.2



BUILDING, CONSTRUCTION AND ENGINEERING

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Certificate of Test

No. 1818

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This is to certify that the element of construction described below was tested by CSIRO Manufacturing and Infrastructure Technology in accordance with Australian Standard 1530, Methods for fire tests on building materials, components and structures, Part 4-1997 on behalf of:

EIFS Australasia Pty Ltd
423 Bradman Road
ACACIA RIDGE QLD 6249

A full description of the test specimen and the complete test results are detailed in CSIRO Manufacturing and Infrastructure Technology's sponsored investigation report numbered FSV 1082.

Product Name: Quik'nTuff timber-framed exterior wall system.

Description: The specimen consisted of a timber-framed exterior wall of overall nominal dimensions 3000-mm high x 3000-mm wide, clad on the exposed side with rendered panels, and the unexposed side with standard grade plasterboard. The wall consisted of a timber stud frame lined on one side with plasterboard, the other side was lined with sarking fixed to the studs with timber battens. QT insulation wall panels made from a blend of polystyrene bead materials and modified concrete, were then fixed to the battens and rendered, to form the external face of the wall system. The wall incorporated a timber stud frame made from 90-mm x 35-mm MGP12 timber studs installed in accordance with AS1684. On the external side, the timber frame was lined horizontally with Insulco 599 breathable sarking, stapled to the studs temporarily until permanently fixed with timber battens. The timber battens used to fix the sarking onto the frame, were 25-mm x 45-mm H3 treated timber, fixed to the studs with 3.06-mm x 75-mm long gun nails. The external face of the wall was completed by lining the timber battens with QT insulation wall panels, made from a blend of polystyrene bead materials and modified concrete. The panels were then coated with nominally 5-8-mm thick polymer modified cement render 'SupaCoat PM660' with 160 g/m² alkali resistant fibreglass mesh (4-mm x 4-mm aperture) embedded into the surface of the wet render. The internal face of the wall frame was lined horizontally with standard grade 10-mm thick plasterboard, fixed to the frame using adhesive and 6-18-mm x 28-mm long bulge head plasterboard screws. Construction is detailed in drawings, detail numbers FT-1.1 and FT1.2, both dated 10 September 2004, by Quik'nTuff Wall Systems Pty Ltd.

The element of construction described above satisfied the following criteria for fire-resistance for the period stated.

Structural Adequacy	-	Not applicable
Integrity	-	113 minutes
Insulation	-	115 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/90/90. The FRL is applicable for exposure to fire from the same side as tested.

Testing Officer: Chris Wojcik Date of Test: 27 August 2004

Issued on the 30th day of September 2004 without alterations or additions.

Garry E Collins
Garry E Collins
Manager, Fire Testing and Assessments



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