

# Indicative fire test on a pilot-scale timber framed floor/ceiling system lined with plywood coated and coated with intumescent paint

## Test Report

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**Report number:** FSP 1890  
**Date:** 1 November 2018

**Client:** Tech Coatings (NZ)

Commercial-in-confidence




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# Indicative fire test on a pilot scale timber framed floor/ceiling system lined with plywood coated and coated with intumescent paint

## Sponsored Investigation No. FSP 1890

### 1 Introduction

#### 1.1 Identification of specimen

The sponsor identified the specimen as a 1200-mm long x 1200-mm wide x 222-mm thick, timber framed midfloor/ceiling system with 19-mm thick CCA structural ply flooring board, lined on the exposed face with a single layer of 12-mm Ecoply BD Plywood coated on the underside with 1076- $\mu\text{m}$  of FBL-100 intumescent paint.

#### 1.2 Purpose of the test

To establish the likely performance of the pilot scale floor system using intumescent paint when exposed to the heating conditions specified in AS 1530.4-2014.

#### 1.3 Sponsor

Tech Coatings NZ Limited  
12 Tokomaru Street  
Welbourn 4312  
New Zealand

#### 1.4 Manufacturer

International Coatings Group  
757 SE 17th Street, Suite 846,  
Fort Lauderdale, FL33316  
United States of America

## 1.5 Test standard

Australian Standard 1530, Methods for fire tests on building materials, components and structures, Part 4-2014, Fire-resistance tests of elements of construction, Section 4 – Floors, Roofs and Ceilings horizontal separating elements.

## 1.6 Departure from the standard

The pilot size of the specimen did not meet the size requirements as specified in Clause 2.9.2 of AS 1530.4-2014.

The indicative test was heated unloaded.

## 1.7 Test number

CSIRO Reference test number: FS 4742/4213

## 1.8 Test date

The fire test was conducted on 13 March 2018.

# 2 Description of specimen

## 2.1 General

The specimen comprised a 1200-mm long x 1200-mm wide x 222-mm thick timber framed floor/ceiling system. The floor system comprised 190-mm high x 45-mm wide MSG (Machine Stress Graded), H3 treated Radiata pine joists spaced at 600-mm centres with one joist located in the centre of the frame. The floor consisted of a layer of 19-mm thick CCA Structural Plywood. The underside of the floor framing was lined with a single layer of 12-mm Ecoply BD Plywood and coated with 1076- $\mu$ m dry film thickness of FBL 100 intumescent paint.

## 2.2 Dimensions

The overall dimension of the floor system was 1200-mm x 1200-mm x 222-mm thick, to suit the opening in the specimen containing frame. An area measuring 1000-mm x 1000-mm was exposed to the heating conditions of AS 1530.3-2014.

## 2.3 Orientation

The floor system was placed horizontally on top of the furnace chamber, and subjected to fire exposure from the underside.

## 2.4 Conditioning

The specimen floor was constructed on 6 March 2018 and was stored under laboratory conditions until the day of the test.

## 2.5 Selection, construction and installation of the specimen and the supporting construction

Floor construction of the specimen frame was organised by CSIRO, the painting of the plasterboard was organised by the test sponsor. CSIRO was not involved in the selection of the materials.

# 3 Documentation

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

- Drawing TC 0007, MID FLOOR PLAN 12mm ECOPLY PLYWOOD CEILING, Dated 08/02/2018, by Tech Coatings.
- CSIRO Test Specification TC 0007 Mid-floor 12mm Ecoply BD Plywood, Dated 30/1/2018, by Tech Coatings.

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

# 4 Equipment

## 4.1 Furnace

The furnace had a nominal opening of 1000-mm x 1000-mm for attachment of vertical or horizontal specimens.

The furnace was lined with refractory bricks and materials with the thermal properties as specified in AS 1530.4-2014 and was heated by combustion of a mixture of natural gas and air.

## 4.2 Temperature

The temperature in the furnace chamber was measured by four type K, 3-mm diameter, and 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.

Location of the thermocouples on the unexposed face of the specimen and internally are described in Appendix A.

### 4.3 Measurement system

The primary measurement system comprised a multiple-channel data logger, scanning at one minute intervals during the test.

## 5 Ambient temperature

The temperature of the test area was 20°C at the commencement of the test.

## 6 Termination of test

The test was terminated at 44 minutes by the agreement with the sponsor.

## 7 Test results

### 7.1 Critical observations

The following observations were made during the indicative fire test:

<b>Time</b>	<b>Observation</b>
41 minutes -	Furnace temperature dropped.
43 minutes -	Ash emitted from furnace exhaust.
44 minutes -	Test terminated.

### 7.2 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.

### 7.3 Furnace severity

Figure 2 shows the curve of furnace severity versus time during the heating period.



## 7.4 Specimen temperature

Figure 3 shows the curve of temperature versus time on the unexposed face.

Figure 4 shows the curve of temperature versus time of the internal thermocouples.

Figure 5 shows the curve of temperature versus time of the paint / Plywood interface.

## 8 Tested by

A handwritten signature in blue ink, appearing to read "Peter Gordon".

Peter Gordon  
Testing Officer

# Appendices

## Appendix A – Measurement location

Measurement Location		
Specimen	T/C Position	T/C designation
Internal Joist	12-mm Plywood ceiling / Joist Interface 250-mm off centre	S1
	250-mm off centre 10-mm up from bottom in centre of joist	S2
	250-mm off centre 20-mm up from bottom in centre of joist	S3
	250-mm off centre 95-mm up from bottom on joist side	S4
	250-mm off centre 95-mm up from bottom 10-mm inside joist	S5
	12-mm Plywood ceiling / Joist Interface 250-mm off centre	S6
	250-mm off centre 10-mm up from bottom in centre of joist	S7
	250-mm off centre 20-mm up from bottom in centre of joist	S8
	250-mm off centre 95-mm up from bottom on joist	S9
	250-mm off centre 95-mm up from bottom 10-mm inside joist	S10
Interface with Intumescent paint / 12-mm Ecoply Plywood	Quarter points	S11
	Quarter points	S12
	Quarter points	S13
	Quarter points	S14
Unexposed face	Quarter points on 19-mm Plywood floor S/W	S15
	Quarter points on 19-mm Plywood floor N/W	S16
	Quarter points on 19-mm Plywood floor S/E	S17
	Quarter points on 19-mm Plywood N/E	S18
Rover		S19
Ambient		S20

Appendix B – Photographs



**PHOTOGRAPH 1 – EXPOSED FACE OF SPECIMEN PRIOR TO TESTING**



**PHOTOGRAPH 2 – UNEXPOSED FACE OF SPECIMEN PRIOR TO TESTING**



**PHOTOGRAPH 3 – SPECIMEN AFTER 30 MINUTES OF TESTING**



**PHOTOGRAPH 4 – SPECIMEN AFTER 45 MINUTES OF TESTING**



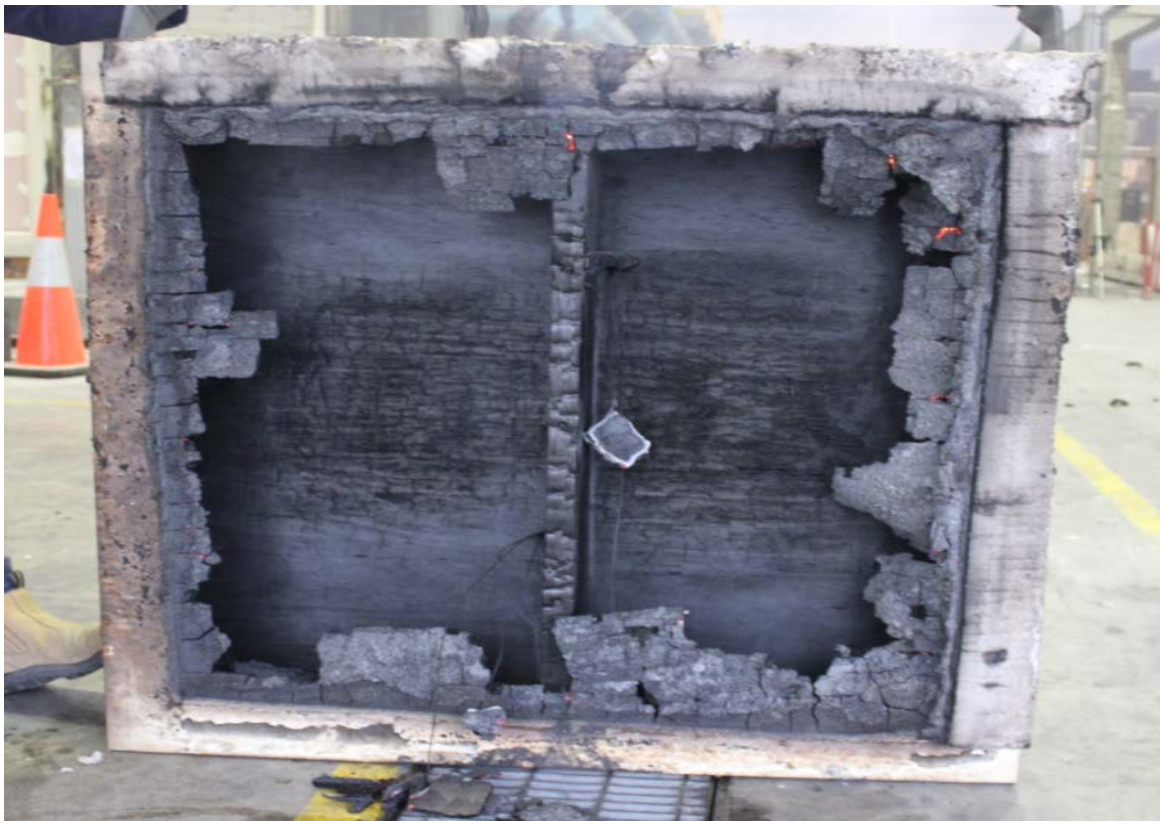
**PHOTOGRAPH 5 – UNEXPOSED FACE OF SPECIMEN AT THE CONCLUSION OF TESTING**



**PHOTOGRAPH 6 – UNEXPOSED FACE OF SPECIMEN AT THE CONCLUSION OF TESTING**



**PHOTOGRAPH 7 – EXPOSED FACE OF SPECIMEN AT THE CONCLUSION OF TESTING**



**PHOTOGRAPH 8 – EXPOSED FACE OF SPECIMEN AT THE CONCLUSION OF TESTING**

## Appendix C – Furnace Temperature

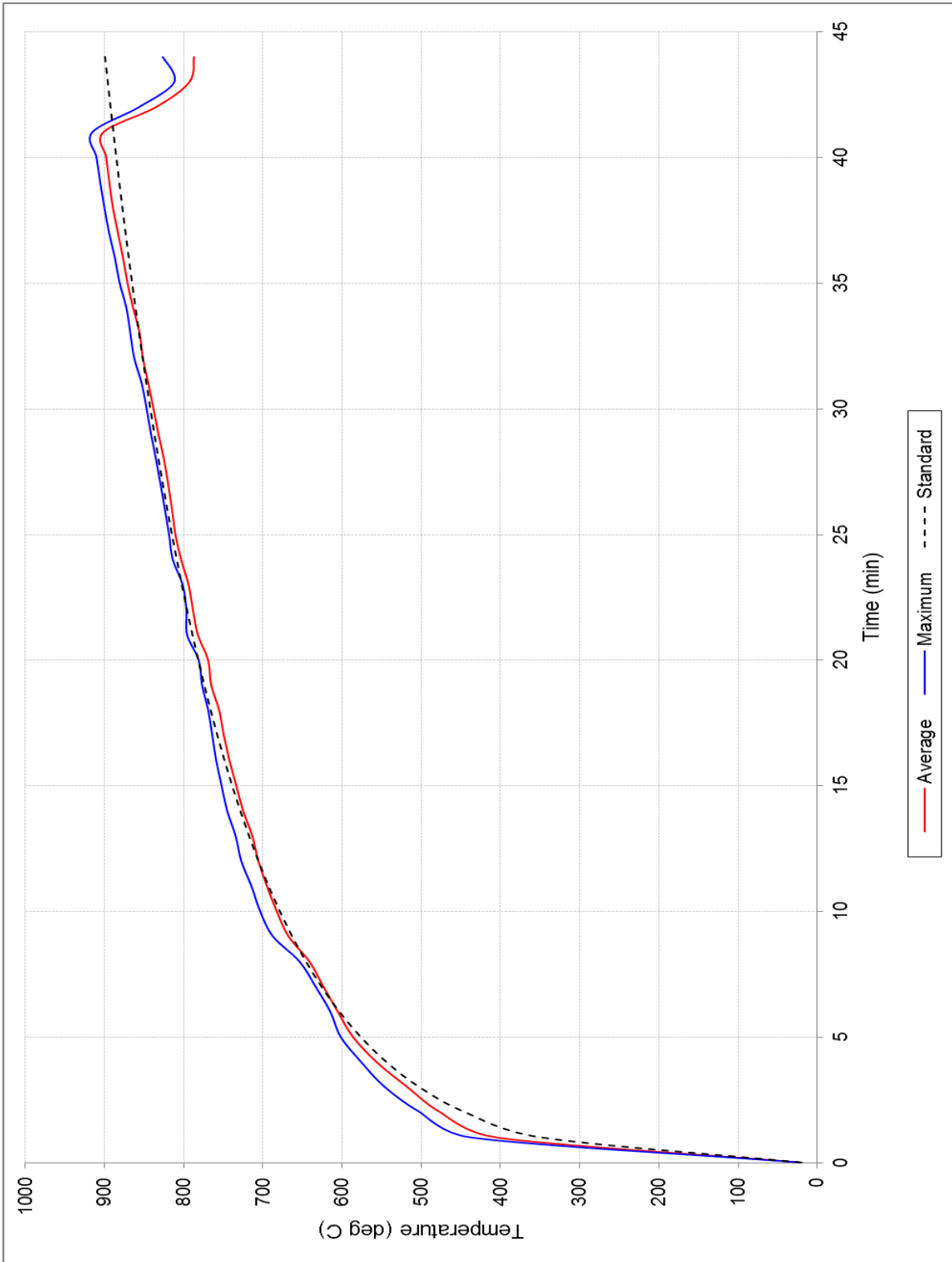


FIGURE 1 – FURNACE TEMPERATURE

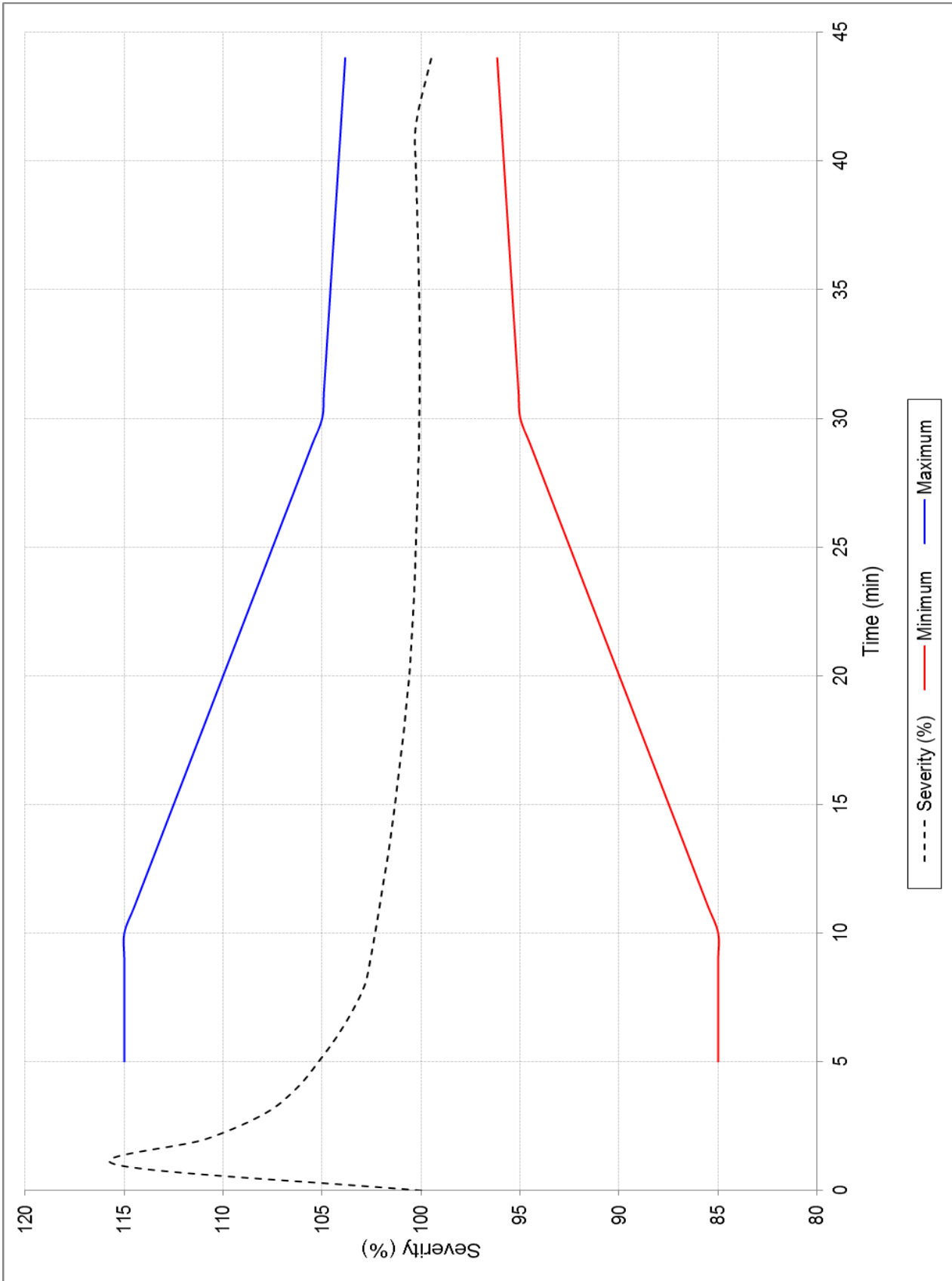
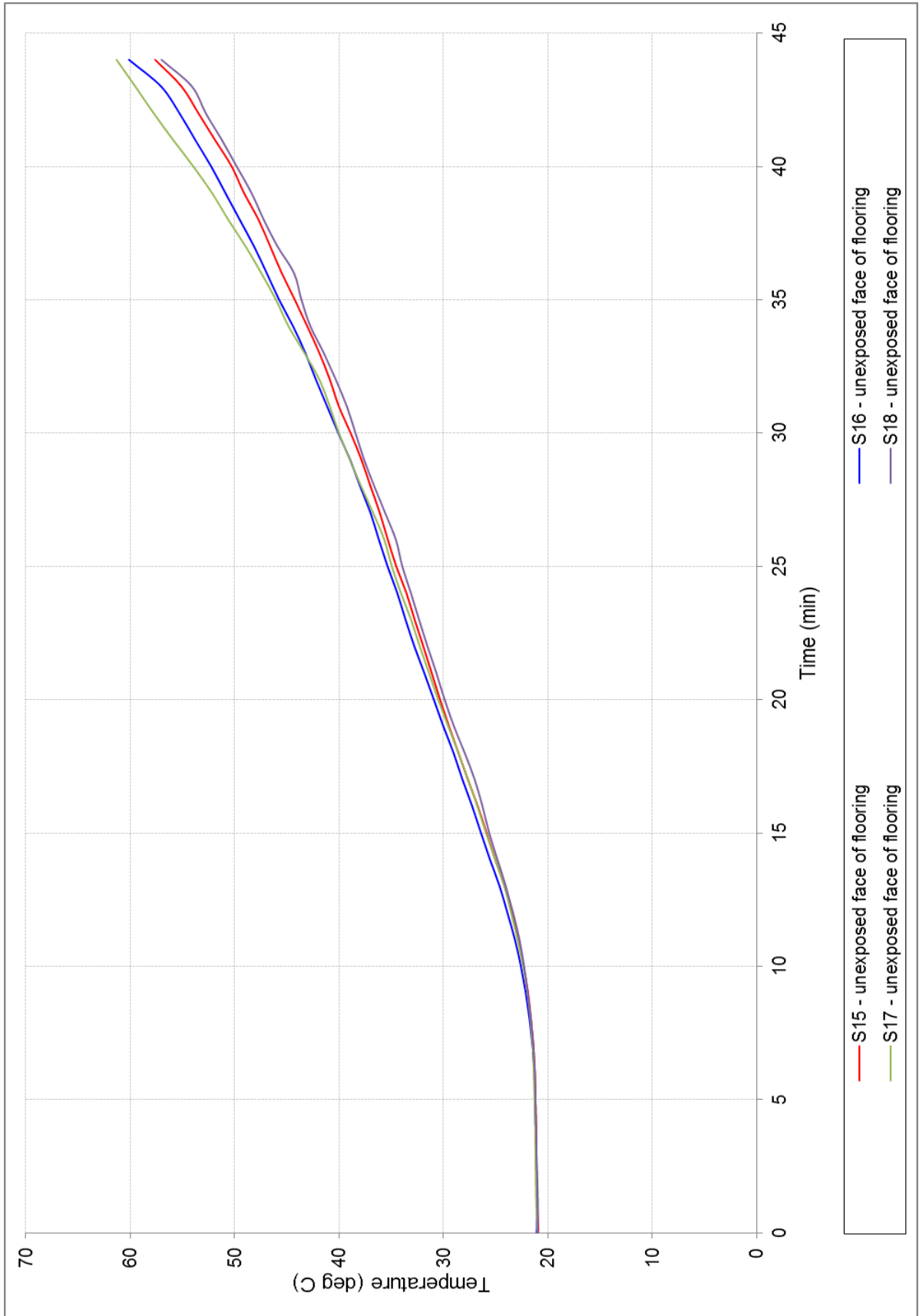


FIGURE 2 – FURNACE SEVERITY





**FIGURE 3 – SPECIMEN TEMPERATURE – UNEXPOSED FACE**

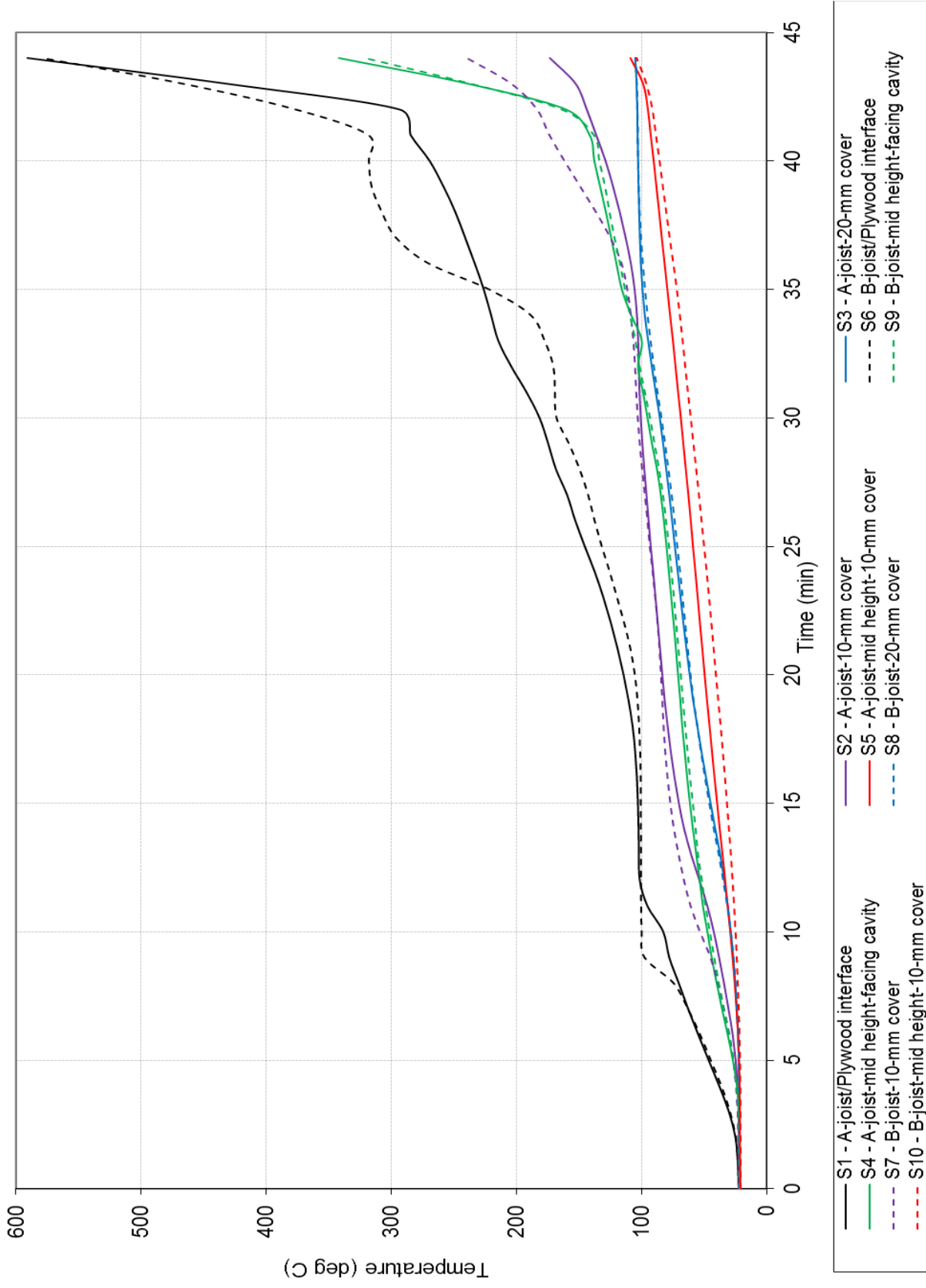


FIGURE 4 – SPECIMEN TEMPERATURE – INTERNAL

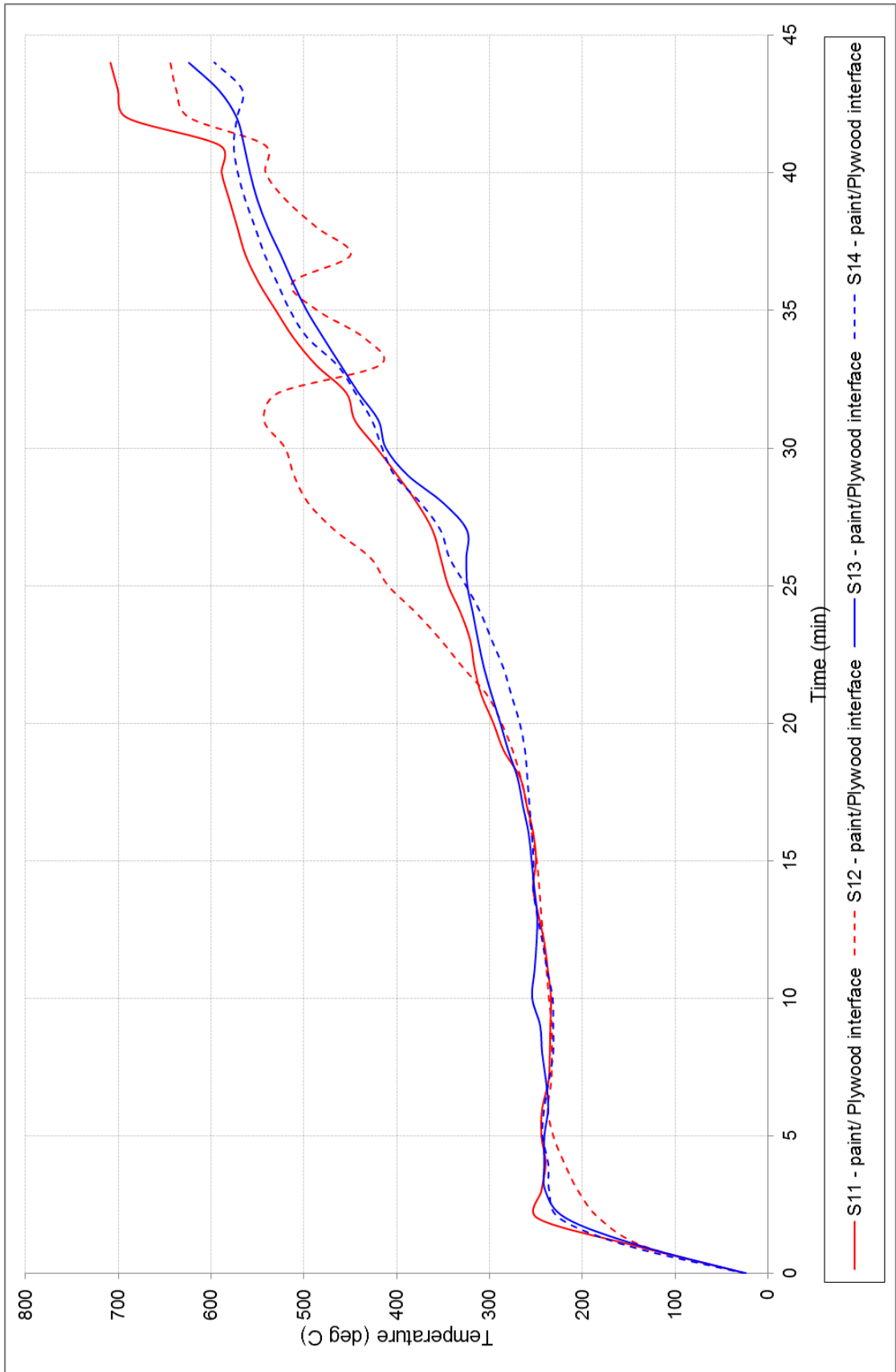
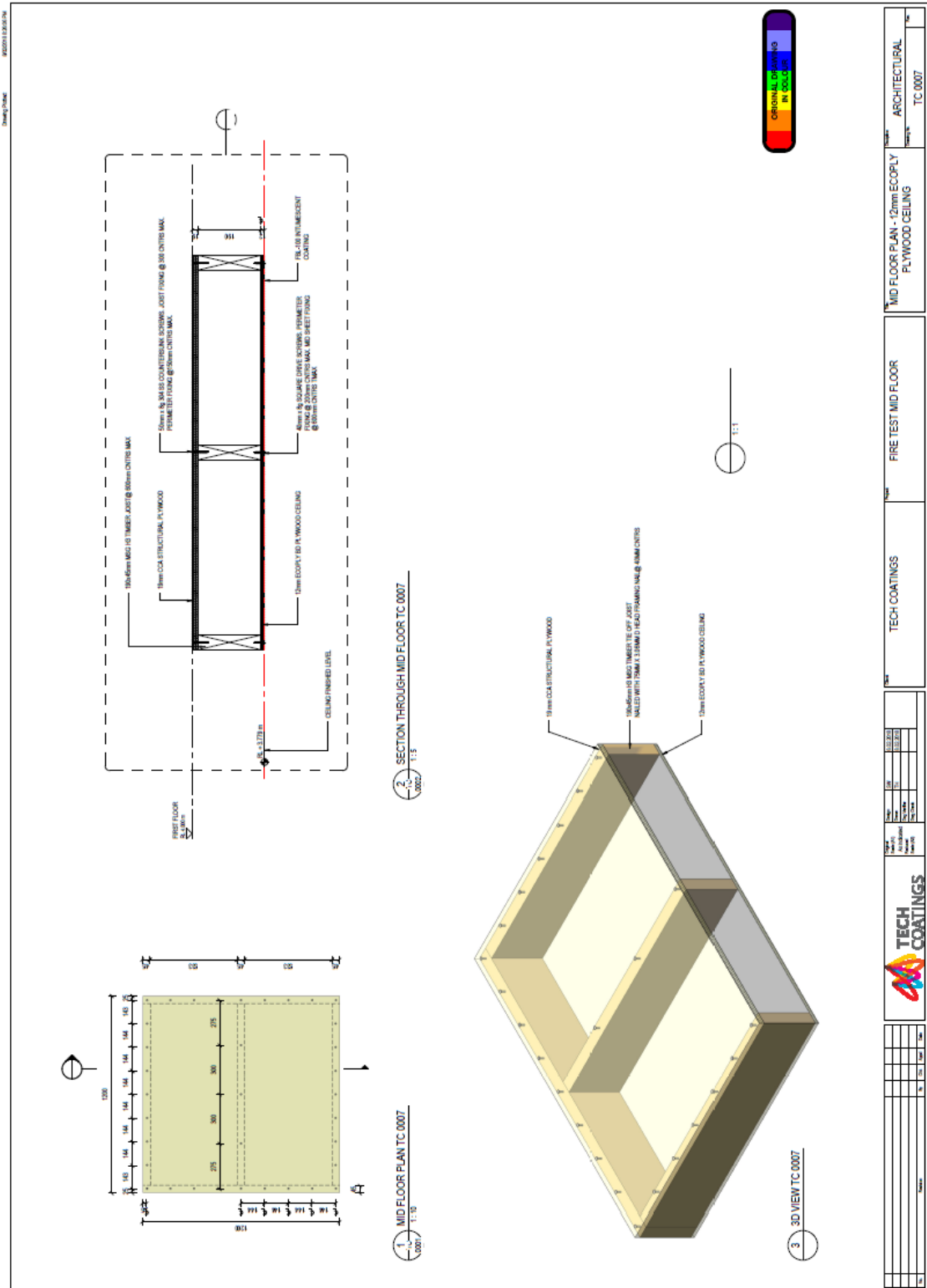


FIGURE 5 – SPECIMEN TEMPERATURE AT THE PAINT / ECOPLY PLYWOOD INTERFACE

# Appendix D – Drawings and Specification Sheets



DRAWING NO. TC 0007, MID FLOOR PLAN 12-MM ECOPLY PLYWOOD CEILING, DATED 8/02/2018, BY TECH COATINGS PTY LTD



30/01/2018

# CSIRO Test Specification

Test number: TC\_0007

Shane Wyatt  
TECH COATINGS NZ Limited

TC\_0007 – Mid-floor 12mm EcoPLY BD Plywood

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## Scope of Work

- The test specimen is 1200mm long x 1200mm wide x 222mm thick, timber framed mid-floor/ceiling system drawn & constructed as per NZS 3603:1993, refer to [TC\\_0007\\_SP4213\\_Pilot\\_12mm\\_Plywood\\_Ceiling\\_Drawing.pdf](#)
- The floor system is comprised of 190mm x 45mm MSG H3 treated joists at 600mm centres, tie off joists are 190mm x 45mm MSG H3 treated timber joists, the floor lining is 19mm CCA structural plywood and the underside of the mid-floor/ceiling is lined with a single layer of 12mm Ecoply BD plywood, protected with a 1000µ coat of FBL-100 intumescent paint.

## Schedule of Materials

- 19mm CCA Structural Plywood
- 190mm x 45mm MSG, H3 Treated Timber Joist
- 50mm x 8g, 304 S/S countersunk screws
- 12mm Ecoply BD Plywood
- 40mm x 8g, Square drive screws
- FBL-100, Intumescent Coating

## Construction

The floor/ceiling will be constructed with the following elements working from the floor down to the ceiling:

- **Flooring** – Will be 19mm CCA Structural Plywood to be fixed using 50mm x 8g 304 S/S countersunk screws. Perimeter fixing @150mm centres max. Mid sheet fixing @ 300mm centres max.
- **Flooring Joists** – 190mm x 45mm MSG, H3 Treated Timber Joists spaced at 600mm centres max.
- **Tie off Joists** – These will be 190x45mm MSG, H3 Treated timber joist fixed with 75mm X 3.06MM D Head framing nails.
- **Ceiling** – The ceiling will be lined with 12mm Ecoply BD plywood  
Perimeter fixing 40mmx 8g square drive screws @ 200mm cntrs.  
Mid Sheet Fixing, 40mm x 8g square drive screws @ 600mm cntrs.

## Paint Specification

### Intumescent Coat

The surface must be prepared as per AS/NZS 2311:2017, section 3

The ceiling will be coated with ICG FBL 100 Intumescent paint. Please refer to the Product Data Sheet.

The DFT required is 1000 $\mu$  to be achieved with the application of 4 x 400 $\mu$  WFT coats. A WFT gauge is to be used to check the consistency of application. DFT readings are to be taken between coats. Final DFT will be determined by using a Defelsko Positector 200b Ultrasonic probe.

If you have any questions please contact

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# References

The following informative documents are referred to in this Report:

AS 1530.4-2014      Methods for fire tests on building materials, components and structures Part 4:  
Fire-resistance tests of elements of building construction.



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