WARRINGTONFIRE
AUSTRALIA
A Jensen Hughes Company

Fire assessment report

Assessment of A1 COREX board ceiling systems

Sponsor: Trafalgar Group

Report number: FAS220367 Revision: R1.1

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Quality management

Version	Date	Information about the report			
R1.0	Issue: 17 Apr 2023	Reason for issue	Initial issue		
			Prepared by	**Reviewed by**	**Authorised by**
		Name	Edward Kwok	Imran Ahamed	Imran Ahamed
R1.1	Issue: 19 Jul 2024	Reason for issue	Report updated to include: • Rename 'FyreFLOOR' system to 'A1 COREX board ceiling' system. • Updated report format and fixed errors. • Included RISF performance for the ceiling system – section 6. • Allowed FRL and RISF outcome for 'service penetration through pink plasterboard as ceiling lining' to be applied to ceiling system with 'A1 COREX board as ceiling lining' – section 7.		
			Prepared by	**Reviewed by**	**Authorised by**
	Expiry: 30 April 2028	**Name**	Edward Kwok	Omar Saad	Omar Saad
		Signature			

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Executive summary

This report documents the findings of the assessment undertaken to determine the fire resistance level (FRL) of Trafalgar A1 COREX board ceiling systems in accordance with AS 1530.4:2014.

The analysis in section 5 and 6 of this report found that the proposed systems, together with the described variations, are capable of achieving the FRL as shown in Table 1 – in accordance with AS 1530.4:2014.

The variations and outcome of this assessment are subject to the limitations and requirements described in sections 2, 3 and 8 of this report. The results of this report are valid until 30 April 2028.

Table 1 Assessment outcome

A1 COREX board ceiling lining[1]	Floor lining	Referenced figure	RISF performance[2 3]	Fire resistance level (FRL) [4]
2 × 12.5 mm	None	Figure 1, Figure 3, Figure 4, Figure 5, Figure 6	None – no cavity	-/45/45
2 × 15 mm				-/60/60
2 × 25 mm				-/120/120
2 × 12.5 mm	To be designed and confirmed by other parties[5].	Figure 2, Figure 4, Figure 5, Figure 6	45	45/45/45
2 × 15 mm			60	60/60/60
2 × 25 mm			120	120/120/120

Note:

1. The ceiling lining is to be installed and hung from the supporting construction. The ceiling lining is not to carry any load other than the weights (if any) included in the referenced test reports.
2. The cavity, above the ceiling, must be minimum 600 mm deep as per the referenced test report, RTL FT1883.01.
1. RISF measured within the cavity of the separating element.
2. FRL measured from the unexposed side of the A1 COREX board ceiling lining.
3. The FRLs outlined in Table 9 are valid for floor systems designed by others to maintain structural stability throughout the applicable fire period, provided that the design has taken into consideration a minimum cavity temperature rise of 180 °C above ambient, as well as other relevant design factors for the application.

Based on the temperature data comparison presented in sections 7.4.1 and 7.4.2, it is considered that services penetrating through a ceiling system constructed with A1 COREX boards are capable of maintaining the same FRL and RISF performance as services penetrating through a pink plasterboard ceiling system – with the equivalent or higher thickness.

Contents

1. Introduction

This report documents the findings of the assessment undertaken to determine the fire resistance level (FRL) and resistance to incipient spread of fire (RISF) performance of Trafalgar A1 COREX board ceiling systems in accordance with AS 1530.4:2014[1]. In addition, this report also assessed the feasibility of applying 'the FRL and RISF performance of service penetrations in pink plasterboard ceiling' to 'A1 COREX board ceiling system'.

This report may be used as evidence of suitability in accordance with the requirements of the relevant National Construction Code (NCC) to support the use of the material, product, form of construction or design as given within the scope of this assessment report. It also references test evidence for meeting deemed to satisfy (DTS) provisions of the NCC that apply to the assessed systems.

This assessment was carried out at the request of Trafalgar Group. The sponsor details are included in Table 2.

Table 2 Sponsor details

Sponsor	Address
Trafalgar Group	26 Ferndell St, South Granville, NSW 2142, Australia

2. Framework for the assessment

2.1 Assessment approach

An assessment is a professional opinion about the expected performance of a component or element of structure subjected to a fire test.

No specific framework, methodology, standard or guidance documents exists in Australia for undertaking these assessments. We have therefore followed the 'Guide to undertaking technical assessments of the fire performance of construction products based on fire test evidence' prepared by the Passive Fire Protection Forum (PFPF) in the UK in 2021[2].

This guide provides a framework for undertaking assessments in the absence of specific fire test results. Some areas where assessments may be offered are:

- Where a modification is made to a construction which has already been tested
- The interpolation or extrapolation of results of a series of fire resistance tests, or utilisation of a series of fire test results to evaluate a range of variables in a construction design or a product
- Where, for various reasons – eg size or configuration – it is not possible to subject a construction or a product to a fire test.

Assessments can vary from relatively simple judgements on small changes to a product or construction through to detailed and often complex engineering assessments of large or sophisticated constructions.

This assessment uses established empirical methods and our experience of fire testing similar products to extend the scope of application by determining the limits for the design and performance based on the tested constructions and performances obtained. The assessment is

[1] Standards Australia, 2014, Methods for fire tests on building materials, components and structures – Part 4: Fire-resistance tests for elements of construction, AS 1530.4:2014, Standards Australia, NSW.
[2] Passive Fire Protection Forum (PFPF), 2021, Guide to undertaking technical assessments of the fire performance of construction products based on fire test evidence, Passive Fire Protection Forum (PFPF), UK.

an evaluation of the potential fire resistance performance of the elements in accordance with AS 1530.4:2014.

This assessment has been written in accordance with the general principles outlined in EN 15725:2023[3] for extended application on the fire performance of construction products and building elements: Principle of EXAP standards and EXAP reports.

This assessment has been written using appropriate test evidence generated at accredited laboratories to the relevant test standard. The supporting test evidence has been deemed appropriate to support the manufacturer's stated design.

2.2 Compliance with the National Construction Code

This assessment report has been prepared to meet the evidence of suitability requirements of the NCC 2022[4] under A5G3(1)(d). It references test evidence for meeting deemed-to-satisfy (DTS) provisions of the NCC under A5G5 for fire resistance level that apply to the assessed systems based on Specifications 1 and 2 for fire resistance for building elements.

The proposed details and systems (building elements) in this report are confirmed to be assessed, without the aid of an active fire suppression system, based on prototype tests that are equivalent to or more severe than a standard fire test as specified in section 4.4 in accordance with NCC 2022 S1C2(b). It is also confirmed that the differences between the proposed systems and details compared to the tested prototypes are considered minor in accordance with NCC 2022 S1C2(c).

This assessment report may also be used to demonstrate compliance with the requirements for evidence of suitability under the relevant sections of previous versions of the NCC.

2.3 Declaration

The 'Guide to undertaking technical assessments of the fire performance of construction products based on fire test evidence' prepared by the PFPF in the UK requires a declaration from the client. By accepting our fee proposal on 11 January 2023, Trafalgar Group confirmed that:

- To their knowledge, the variations to the component or element of structure, which is the subject of this assessment, have not been subjected to a fire test to the standard against which this assessment is being made.
- They agree to withdraw this assessment from circulation if the component or element of structure is the subject of a fire test by a test authority in accordance with the standard against which this assessment is being made and the results are not in agreement with this assessment.
- They are not aware of any information that could adversely affect the conclusions of this assessment and – if they subsequently become aware of any such information – they agree to ask the assessing authority to withdraw the assessment.

3. Requirements and limitations of this assessment

- The scope of this report is limited to an assessment of the variations to the tested systems described in section 4.3.
- This report details the methods of construction, test conditions and assessed results expected in accordance with AS 1530.4:2014.

[3] European Committee for Standardization, 2023, Extended application on the fire performance of construction products and building elements: Principle of EXAP standards and EXAP reports, EN 15725:2023, European Committee for Standardization, Brussels, Belgium
[4] National Construction Code Volumes One and Two - Building Code of Australia 2022, Australian Building Codes Board, Australia

- This assessment applies to floor/ceiling systems exposed to fire from below in accordance with the requirements of AS 1530.4:2014 where horizontal elements must be exposed to heat from the underside only.
- The floor/ceiling joists must be designed by the project structural engineer to support the system ensuring the joists would not structurally collapse in an event of a fire.
- This report is only valid for the assessed system/s and must not be used for any other purpose. Any changes with respect to size, construction details, loads, stresses, edge or end conditions – other than those identified in this report – may invalidate the findings of this assessment. If there are changes to the system, a reassessment will need to be done by an Accredited Testing Laboratory (ATL) that is accredited to the same nominated standards of this report.
- The documentation that forms the basis for this report is listed in Appendix A and Appendix B.
- This report has been prepared based on information provided by others. Warringtonfire has not verified the accuracy and/or completeness of that information and will not be responsible for any errors or omissions that may be incorporated into this report as a result.
- The FRLs outlined in Table 9 are valid for floor systems designed by others to maintain structural stability throughout the applicable fire period, provided that the design has taken into consideration a minimum cavity temperature rise of 180 °C above ambient, as well as other relevant design factors for the application.
- This assessment is based on the proposed systems being constructed under comprehensive quality control practices and following appropriate industry regulations and Australian Standards on quality of materials, design of structures, guidance on workmanship and expert handling, placing and finishing of the products on site. These variables are beyond the control and consideration of this report

4. Description of the specimen and variations

4.1 Description of assessed systems

The proposed A1 COREX board ceiling systems consist of two layers of Trafalgar A1 COREX boards as ceiling lining, which are supported by different types of frameworks. The types of frameworks include suspended systems, solid timber joists, steel joists and trusses, as shown in Figure 3. For the suspended system, the ceiling linings are fixed to the furring channels connected to the floor or timber/steel joists by hanger bars. For other types of frameworks, the ceiling linings are directly fixed to the ceiling/floor joists. For systems that require a layer of floor lining, the floor lining is to be fixed to the top side of the joists, as shown in Figure 2.

It is also proposed to assess the FRL and RISF performance of the A1 COREX board ceiling systems when the A1 COREX board ceiling linings are hanging off a structurally adequate loadbearing floor – which is designed and confirmed by the others.

In addition to the above, it is also proposed to assess the feasibility of applying assessed outcome of service penetrations in pink plasterboard ceiling lining to A1 COREX board ceiling lining

4.2 Referenced test data

The assessment of the variation to the tested systems and the determination of the expected performance is based on the results of the fire tests documented in the reports summarised in Table 3. Further details of the tested systems are included in Appendix B. The test report sponsor has granted permission to refer their reports in this assessment.

Table 3 Referenced test data

Report number	Test sponsor	Test date	Testing authority
RTL FT 1552.01	Trafalgar Fire Containment Solutions Pty Ltd	13 April 2022	Resolute Testing Laboratories
RFTR22056	DALSAN AICI SAN. VER TIC. A.S.	12 May 2022	Efectis Era Avrasya Test Ve Belgelendirme A.S
RFTR22118		20 July 2022	
RFTR22164		5 October 2022	
RTL FT 1883.01	Trafalgar Fire Containment Solutions Pty Ltd	26 October 2023	Resolute Testing Laboratories

4.3 Variations to the tested systems

The tested systems and variations to those tested systems – together with the referenced standard fire tests – are described in Table 4.

Table 4 Variations to tested systems

No.	Variation	Test standard	Reference test	Evidence of suitability	Governing requirements	Assessment classification
1.	Assessing relevance of EN 1364-2:2018[5] and BS EN 1363-1:2020[6] to AS 1530.4:2014	BS EN 1363-1:2020	RFTR22056, RFTR22118, RFTR22164,	A5G3(1)(d)	A5G5 and S1C2(b)	Fire-resistance of building element
2.	Assessing the FRL and RISF performance of A1 COREX board ceiling systems	BS EN 1363-1:2020	RFTR22056, RFTR22118, RFTR22164 and RTL FT 1883.01	A5G3(1)(d)	A5G5 S1C2(b) and S1C2(c)	Fire-resistance of building element
3.	Applying 'the FRL and RISF performance of service penetrations in pink plasterboard ceiling' to 'A1 COREX board ceiling system'.	AS 1530.4:2014	RTL FT 1552.01 and RTL FT 1883.01	A5G3(1)(d)	A5G5 S1C2(b) and S1C2(c)	Fire-resistance of building element

4.4 NCC referenced fire test standard

AS 1530.4:2014 provides methods for determining the fire resistance of various elements of construction when subjected to standard fire exposure conditions.

Section 4 of the standard sets out the procedures for determining the fire resistance of loadbearing and non-loadbearing horizontal separating element when exposed to heating from the underside. It applies to floors, roofs, ceilings, combinations of floor-ceiling systems, roof-ceiling systems, access panels, and insulated glazed elements when forming part of a horizontal

[5] European Committee for Standardization, 2018, Fire resistance tests for non-loadbearing elements Part 2: Ceilings, BS EN 1364-2:2018, European Committee for Standardization, Brussels, Belgium.
[6] European Committee for Standardization, 2020, Fire resistance tests Part 1 – General requirements, BS EN 1363-1:2020, European Committee for Standardization, Brussels, Belgium.

separating element. Clause 4.9.1 specifies the failure criterion for the resistance to incipient spread of fire.

Section 10 of the standard sets out the procedure for determining the fire resistance of elements of construction penetrated by services such as electrical and plumbing services, pipes, conduits, control joints and air transfer grilles not fitted to ducts.

4.5 Schedule of components

Table 5 outlines the schedule of components for the assessed systems. Figure 1 to Figure 6 show the assessed systems.

Table 5 Schedule of components of assessed systems

Item	Description	
Floor and ceiling lining		
1.	Item name	Ceiling lining
	Product name	Trafalgar A1 COREX board
	Thickness	12.5 mm, 15 mm or 25 mm
	Installation	The ceiling linings are to be fixed the ceiling framework (item 7 and item 8) with self-tapping steel screws. For the system with two layers of 12.5 mm thick ceiling lining, the first (inner) layer must be fixed with 6g × 25 mm long screws (item 12) at 300 mm centres, where the second (outer) layer must be fixed with 6g × 38 mm long screws (item 12) at 150 mm centres. For the system with two layers of 15 mm thick ceiling lining, the first (inner) layer must be fixed with 6g × 38 mm long screws (item 12) at 300 mm centres, where the second (outer) layer must be fixed with 6g × 45 mm long screws (item 12) at 150 mm centres. For the system with two layers of 25 mm thick ceiling lining, the first (inner) layer must be fixed with 6g × 45 mm long screws (item 12) at 300 mm centres, where the second (outer) layer must be fixed with 8g × 70 mm long screws (item 12) at 150 mm centres. The linings should be fixed to the edge framing as shown in Figure 4. The joints of the lining should be installed as shown in Figure 5. The linings should be overlap between layers for minimum of 300 mm – as shown in Figure 6.
2.	Item name	Floor lining
	Description	**For non-loadbearing floor lining** The non-combustible floor lining is to be installed on the top side of the structural joist (item 9). **For loadbearing floor system** The system is to be designed and confirmed by others.
3.	Item name	Resilient tape
	Description	Polyethylene foam sound insulating tape – is used between supporting construction and U-shape profiles for the suspended systems.
4.	Item name	Coating
	Description	Both faces of the ceiling lining must be covered with fiberglass mattress. Unit area weight of the fibreglass mattress on face of the lining must be nominally 205 g/m^2.
5.	Item name	Joint compound
	Description	The joint compounds must be used at the joints of the plasterboard at the second layer.

Item	Description	
6.	Item name	Self-adhesive fibre glass joint table
	Description	Joint tape is applied on the joints of the boards before the joint compound (item 1).
Framework		
7.	Item name	J or U track
	Dimensions	Minimum 28 mm wide × 0.5 mm BMT
	Description	The J or U-Track is fixed to the perimeter fire rated wall with appropriate fixing as shown in Figure 4.
8.	Item name	Furring channel
	Dimensions	38 mm wide × 28 mm high × 0.6 mm thick
	Description	For suspended ceiling systems, furring channels must be used to fix the ceiling linings. These furring channels must be supported by structural joists via hanger at maximum 600 mm centres – as shown in Figure 3. The furring channels must be spaced at maximum 600 mm centres and the ceiling lining must be fixed to these as shown in Figure 5.
9.	Item name	Floor joist
	Dimensions	Designed by the project structural engineer
	Description	Suspended solid timber joist, suspended steel joist, steel joist, solid timber joist and truss are applicable to the proposed floor-ceiling system – as shown in Figure 1 to Figure 3. The floor joists must be spaced at maximum 600 mm centres.
10.	Item name	Hanger bar
	Description	Hanger bars must be used to connect the furring channel and structural joists – as shown in Figure 3.
Sealant		
11.	Item name	Fire rated sealant
	Product	Trafalgar FyreFLEX Sealant
	Depth	Up to 15 mm at full depth of the ceiling linings – as shown in Figure 4.
Fixing		
12.	Item name	Ceiling lining fixing
	Product and size	6g × 25 mm screw 6g × 38 mm screw 6g × 45 mm screw 8g × 70 mm screw

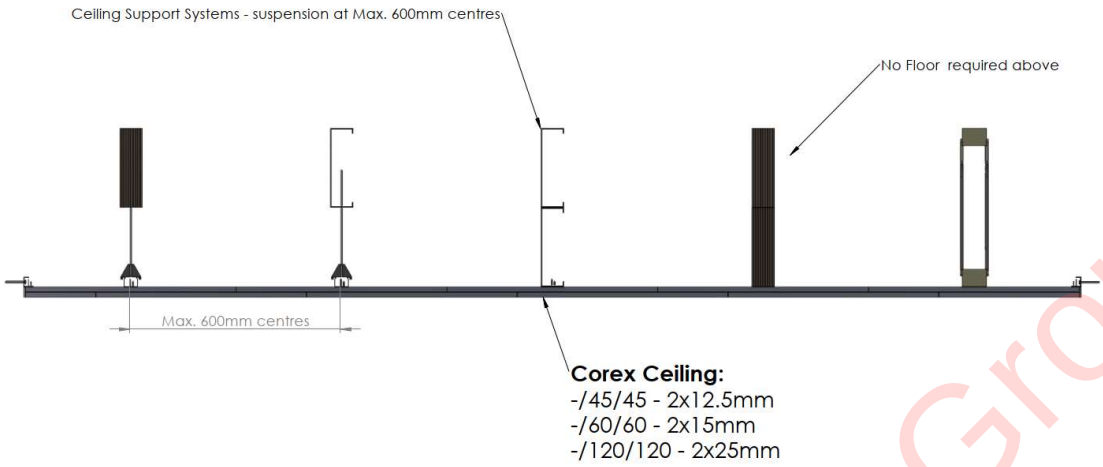

Figure 1 Ceiling systems arrangement

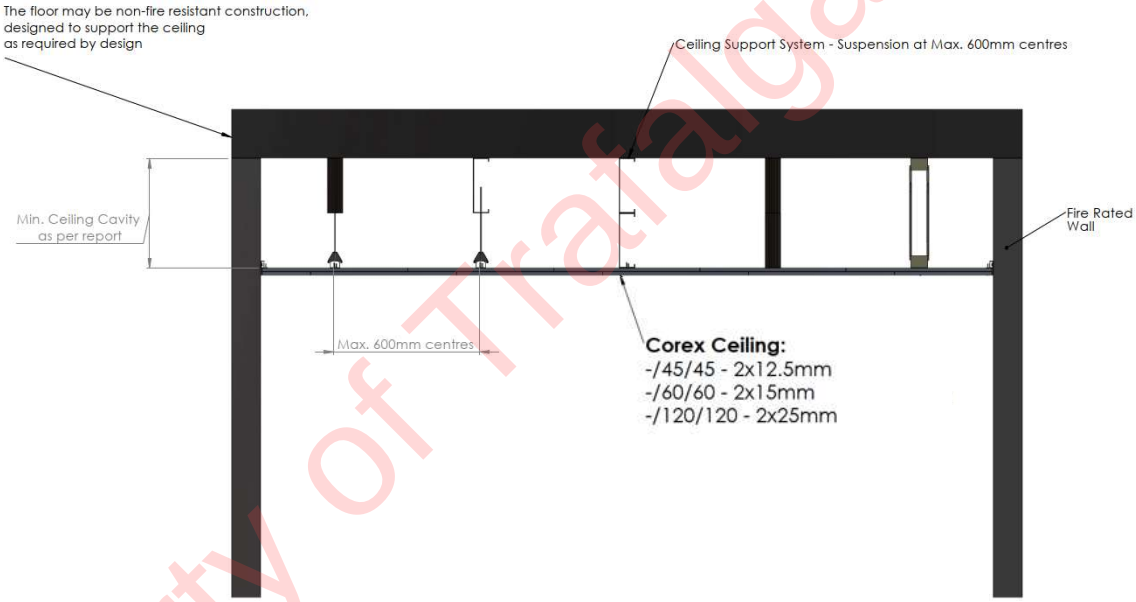

Figure 2 Floor-ceiling systems arrangement

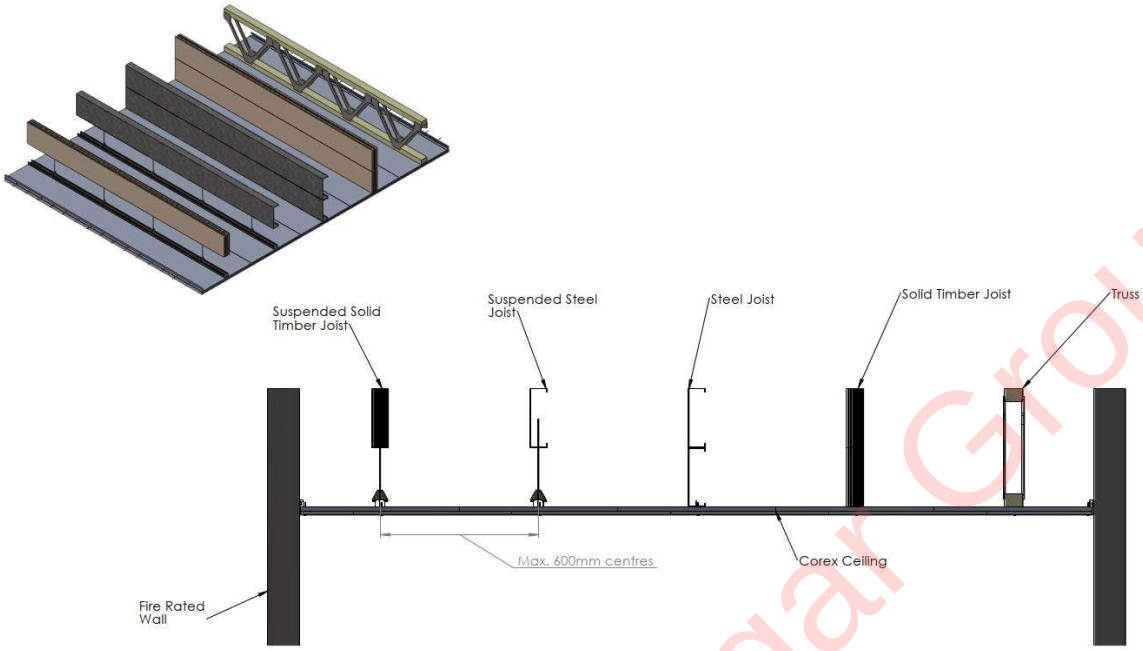

Figure 3 Framing options

Fixing Screws		
Corex Thickness	1st Layer (300mm Centres)	2nd Layer (150mm Centres)
2x12.5mm	6g x 25mm	6g x 38mm
2x15mm	6g x 38mm	6g x 45mm
2x25mm	6g x 45mm	8g x 70mm

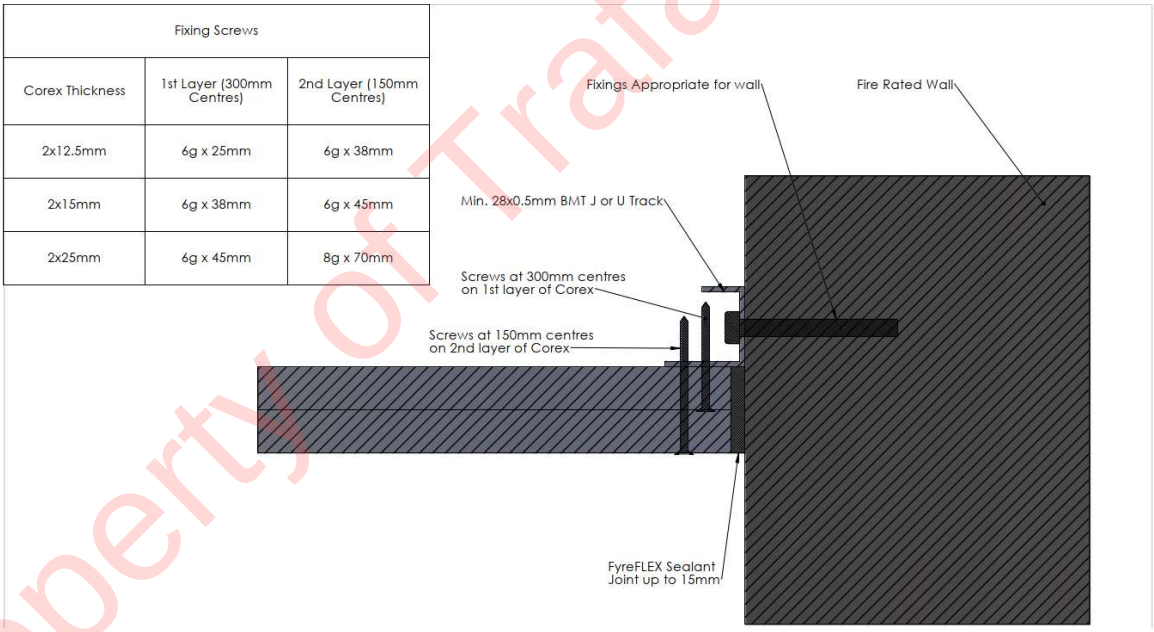

Figure 4 Edge details

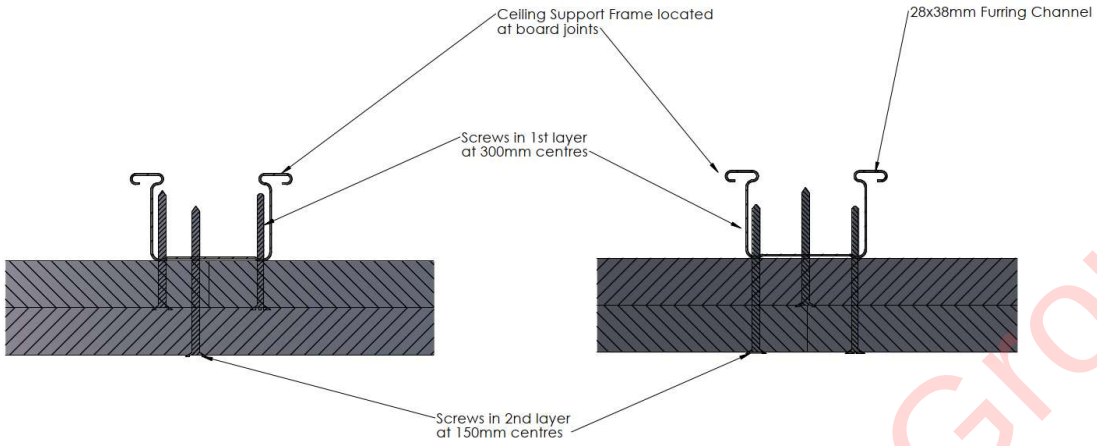

Figure 5 Board joints

Figure 6 Board arrangement

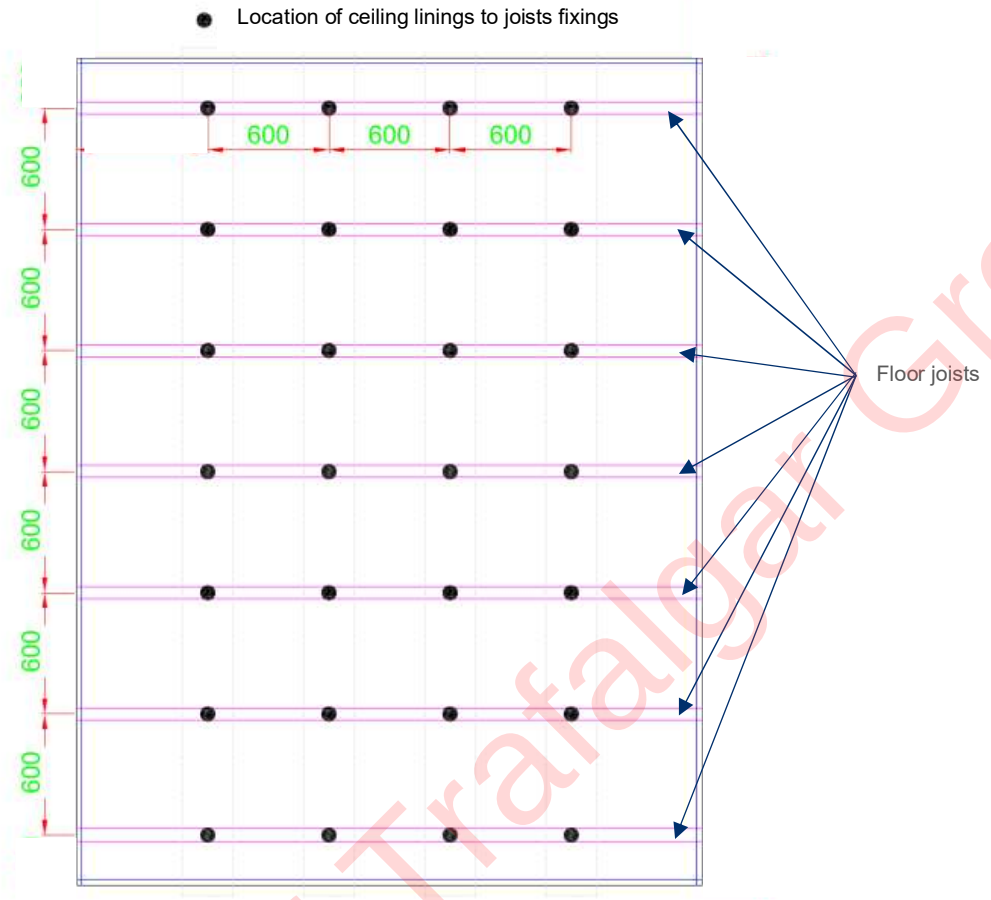

Figure 7 A1 COREX ceiling linings to floor joists fixing locations

5. Assessment 1 – Relevance of EN 1364-2:2018 and BS EN 1363-1:2020 test data with respect with AS 1530.4:2014

5.1 Description of variation

Fire resistance test RFTR22056, RFTR22118 and RFTR22164 were conducted in accordance with EN 1364-2:2018, which differs from AS 1530.4:2014.

EN 1364-2:2018 requires the furnace and test equipment to be setup as specified in EN 1363-1:2012[7]. However, it is known that the EN 1363-1:2012 is withdrawn and replaced by BS EN 1363-1:2020, hence the relevance of EN 1364-2:2018 and BS EN 1363-1:2020 test data with respect to AS 1530.4:2014 is discussed in this section. In addition, the effect that these differences had on the fire resistance performance of test specimens is discussed below.

5.2 Methodology

The method of assessment used is summarised in Table 6.

Table 6 Method of assessment

Assessment method	
Level of complexity	Basic assessment
NCC procedure for determining FRL	Differs in only a minor degree from a tested prototype S1C2(b)
Type of assessment	Qualitative and comparative

5.3 Assessment

5.3.1 Temperature regime

The furnace temperature regime for fire resistance tests conducted in accordance with AS 1530.4:2014 follows the same trend as EN 1363-1:2020.

The parameters outlining the accuracy of control of the furnace temperature in AS 1530.4:2014 and BS EN 1363-1:2020 are not appreciably different.

5.3.2 Furnace thermocouples

The furnace thermocouples specified in AS 1530.4:2014 are type K, mineral insulated metal sheathed (MIMS), with a stainless-steel sheath having a wire diameter of less than 1.0 mm and an overall diameter of 3 mm. The measuring junction protrudes at least 25 mm from the supporting heat resistant tube.

The furnace thermocouples specified in BS EN 1363-1:2020 are required to be plate thermometers comprised of an assembly of a folded nickel alloy plate with a thermocouple fixed to it and insulation material. The folded metal plate shall be constructed from a strip of austenitic nickel based superalloy for high temperature oxidation resistance, (150 ± 1) mm long by (100 ± 1) mm wide by (0.7 ± 0.1) mm, folded to the design. The measuring junction shall consist of nickel chromium/nickel aluminium wire as defined in EN 60584-1, contained within mineral insulation in a heat resisting steel alloy sheath of nominal diameter range of 1 mm to 3 mm, the hot junctions being electrically insulated from the sheath. The thermocouple hot junction shall be fixed to the geometric centre of the plate by a small strip made from the same material as the plate. The strip can be approximately 18 mm × 6 mm if it is spot welded to the plate and nominally 25 mm × 6 mm if it is screwed to the plate. The screw shall be 2 mm in diameter. The assembly of plate and thermocouple shall be fitted with a pad of inorganic insulation material

[7] European Committee for Standardization, 2012, Fire resistance tests Part 1 – General requirements, BS EN 1363-1:2012, European Committee for Standardization, Brussels, Belgium.

nominally (97 ± 1) mm × (97 ± 1) mm by (10 ± 1) mm thick and with a density of (280 ± 30) kg/m^3.

The furnace control thermocouples required by BS EN 1363-1:2020 are less responsive than those specified by AS 1530.4:2014. This variation in sensitivity can produce a potentially more onerous heating condition for specimens tested to EN 1363-1:2020, particularly when the furnace temperature is changing quickly in the early stages of the test.

5.3.3 Furnace pressure

The pressure of the furnace is the same for AS 1530.4:2014 and EN 1363-1:2020. For horizontal elements, both standards required the furnace to be operated such that a pressure of 20 Pa is established at a position 100 mm below the underside of the test specimen above that of the laboratory atmosphere.

The parameters outlining the accuracy of control of the furnace pressure in AS 1530.4:2014 and BS EN 1363-1:2020 are also not appreciably different.

5.3.4 Performance criteria

AS 1530.4:2014 specifies the following performance criteria for building materials and structures:

- structural adequacy (not relevant to this report)
- integrity
- insulation

Integrity

The integrity criteria differ slightly between AS 1530.4:2014 and EN 1363-1:2020.

Both test standards require the framed cotton pad to be applied or placed against the surface of the test specimen until ignition of the cotton pad or for a maximum of 30 seconds, with AS 1530.4:2014 allowing for a ± 2 second margin. The standards state that integrity failure shall be deemed to have occurred upon ignition of the cotton pad, which is defined as glowing or flaming.

Both standards allow for small adjustments in the position of the cotton pad to achieve the maximum effect from the hot gases.

For irregularities in the surface, both standards state clearance shall be maintained between the cotton pad and any part of the test specimen surface during the measurement, with BS EN 1363-1:2020 specifically stating a minimal clearance of 30 mm must be maintained.

The failure criteria in relation to the gap gauges between the two standards are identical.

The failure criteria in relation to flaming between the two standards are slightly different. AS 1530.4:2014 states that sustained flaming on the surface of the unexposed face for 10 seconds or longer shall be deemed an integrity failure, whereas BS EN 1363-1:2020 states that the occurrence and duration of any flaming on the unexposed surface shall be recorded – without mentioning any sustained flaming in terms of time.

Based on the above, it is considered that the general integrity criteria of BS EN 1363-1:2020 is slightly onerous than AS 1530.4:2014. Thus, it is considered the tested system will maintain the fire resistance performance as tested – in accordance with AS 1530.4:2014.

Insulation

The general insulation criteria of AS 1530.4:2014 and BS EN 1363-1:2020 are not appreciably different.

For average unexposed side temperature, AS 1530.4:2014 requires measuring the average temperature rise on the unexposed face of the specimen with five thermocouples evenly distributed over the test specimen to monitor the temperature of the unexposed surface of the

specimen. One thermocouple shall be placed close to the centre and the rest shall be placed close to the centre of each quarter section. BS EN 1363-1:2020 required the thermocouples to be located at or near the centre of the test specimen and at or near the centre of each quarter section. Both standards required the average temperature thermocouple to avoid hotspots such as thermal bridges, joints, junctions, connections and fixings; BS EN 1363-1:2020 specifically stated that the average temperature thermocouple shall be at least 50 mm away from these hotspots.

For maximum temperature in accordance with AS 1530.4:2014, the standard required to have additional thermocouples attached to the specimen to measure the maximum temperature rise at locations that are considered to have a higher heat transfer. The distance of the thermocouples from the joints shall be 15 $\pm$ 2 mm.

For maximum temperature in accordance with EN 1363-1:2020, the standard required the thermocouples to be attached, with a minimum of two thermocouples being applied for each type of joint/feature or location of concern. When positioning a thermocouple near a discontinuity, the centre of the thermocouple disc shall not be placed closer than 20 mm to the discontinuity. Rules for the application of thermocouples for evaluating the maximum unexposed face temperature rise are given in the specific test method. Minor hotspots due to fixings such as screws, nails or staples shall be ignored.

For the internal thermocouples, the requirements from both standards are similar.
AS 1530.4:2014 states that, where possible, the first 25 mm of each thermocouple shall be in the isothermal plane so that the specimen is not damaged. BS EN 1363-1:2020 required the thermocouples to be fixed so that they don't affect the fire performance of the specimen.

Based on the above comparison, it is considered that the temperature measurements recorded in the referenced test reports could be used to assess the fire performance of the proposed construction – if tested in accordance with AS 1530.4:2014.

Restraint

The application of restraint to the test specimen in BS EN 1363-1:2020 and AS 1530.4:2014 is not appreciably different

Active fire suppression

Both BS EN 1363-1:2020 and AS 1530.4:2014 do not incorporate provisions for active fire suppression systems. Consequently, the FRL achieved by the test prototype was attained without the aid of an active fire suppression system.

5.4 Application of test data to AS 1530.4:2014

There is a difference in cotton pad size between standards, however, it is confirmed that the variation does not affect the integrity performance of the tested system in the referenced test for 45, 60 and 120 minutes.

Based on the above discussion and in the absence of any foreseeable integrity and insulation risk, it is considered that the results relating to the performance of the specimens tested in RFTR22056, RFTR22118 and RFTR22164 can be used to assess their performance in accordance with AS 1530.4:2014. Additionally, the test results, specimen, and procedure, in comparison with the outcomes of the test requirements of AS 1530.4:2014, are deemed equivalent.

6. Assessment 2 – FRL and RISF performance of A1 COREX board ceiling systems

6.1 Description of variation

The proposed A1 COREX board ceiling systems consisted of two layers of 12.5 mm thick, 15 mm thick or 25 mm thick A1 COREX ceiling linings supported by different ceiling joists, with or without floor lining. It is proposed to assess the FRL performance for the ceiling system without floor lining, and both FRL and RISF performance for the system with floor lining.

This assessment was done to determine the expected performance of the system in accordance with AS 1530.4:2014.

6.2 Methodology

The method of assessment used is summarised in Table 7.

Table 7 Method of assessment

Assessment method	
Level of complexity	Intermediate assessment
NCC procedure for determining FRL	Differs in only a minor degree from a tested prototype S1C2(b) and (c)
Type of assessment	Qualitative and comparative

6.3 Assessment

6.3.1 Background and evidence from referenced fire tests

Fire test data for system with ceiling linings only

The referenced test reports RFTR22164, RFTR22056 and RFTR22118 consist of ceiling systems with the same ceiling framework and edge details, but with different ceiling lining thicknesses and fixing arrangements. The ceiling frameworks for all three tests were constructed with galvanised steel profiles, ceiling U-tracks and C-studs. The ceiling U-tracks were fixed to the supporting construction with M6 × 45 mm CD6-45 steel dowels, with fixings 50 mm from edge of the supporting construction and at 600 mm centres. The C-shaped galvanised steel studs were fitted inside the U-shaped profiles with a 10 mm gap between the U-track and C-stud. The distance between each ceiling C-stud is 600 mm. The framework of the tested systems was a suspended system. The ceiling linings were fixed to the galvanised quick hangers (furring channels) with 400 mm long hanger bars at 600 mm to 650 mm centres, connected to the structural beams above the suspended ceiling system. The perimeter frame of the tested systems was formed by U-shaped (TU) and C-shaped (TC) galvanised steel profiles. The U-shaped steel profiles were fixed to the supporting construction. The C-shaped steel profiles were fitted inside the U-shape steel profile. The distance between each ceiling C-shape stud is 600 mm. The tested U-tracks had a dimension of 28 mm wide × 27 mm deep × 0.5 mm thick, whereas the tested C-tracks had a dimension of 60 mm wide × 27 mm high × 0.6 mm thick. The ceiling linings of the tested systems were installed hard-up against the supporting wall without any fire rated sealant.

For the ceiling systems with two layers of 12.5 mm thick (RFTR22164) or 15 mm thick (RFTR22056) A1 COREX board, 14 steel hangers were used to support the ceiling linings and supporting joists – spaced at 1200 mm centres; whereas for the two layers of 25 mm thick (RFTR22118) ceiling system, 28 steel hangers were used to connect between the ceiling linings and supporting joists – spaced at 600 mm centres. The hanger bars were 3.8 mm diameter × 400 mm long, and fixed to concrete beams above the testing frame with steel dowels and L steel bars.

The tested plasterboard linings were covered with fiberglass mattress on both faces of the board. The plasterboards were staggered at the bottom face of the suspended ceiling system. FERZTEK joint compound were applied and located at the joints of plasterboards at the second layer. Self-adhesive fibre glass joint tapes were used at the joints of plasterboard at the second layer before the application of the joint compound.

The plasterboard linings were fixed to the framework with self-tapping steel screws. For the two layers of 12.5 mm thick ceiling system (RFTR22164), the first (inner) layer was fixed with 3.5 mm diameter × 38 mm long COREX BV38 at 300 mm between screws, where the second (outer) layer was fixed with 3.5 mm diameter × 45 mm long COREX BV45 at 150 mm between screws. For the two layers of 15 mm thick ceiling system (RFTR22056), the first (inner) layer was fixed with 3.5 mm diameter × 38 mm long COREX BV38 at 300 mm between screws, where the second (outer) layer was fixed with 3.5 mm diameter × 45 mm long COREX BV45 at 150 mm between screws. For the two layers of 25 mm thick ceiling system (RFTR22118), the first (inner) layer was fixed with 3.5 mm diameter × 45 mm long COREX BV45 at 300 mm between screws, where the second (outer) layer was fixed with 4.2 mm diameter × 70 mm long COREX BV70 at 150 mm between screws.

Floor lining was not present for all three tests. Unexposed thermocouples were placed on the unexposed side of the A1 COREX linings.

The two layers of 12.5 mm thick ceiling system (RFTR22164) recorded no integrity failure throughout the 52 minutes test but failed insulation at 52 minutes. The two layers of 15 mm thick ceiling system (RFTR22056) recorded no integrity or insulation failure throughout the 66 minutes test. The two layers of 25 mm thick ceiling system (RFTR22118) recorded no integrity or insulation failure throughout the 132 minutes test.

Figure/photo illustration of the tests are shown in Figure 8 and Figure 9.

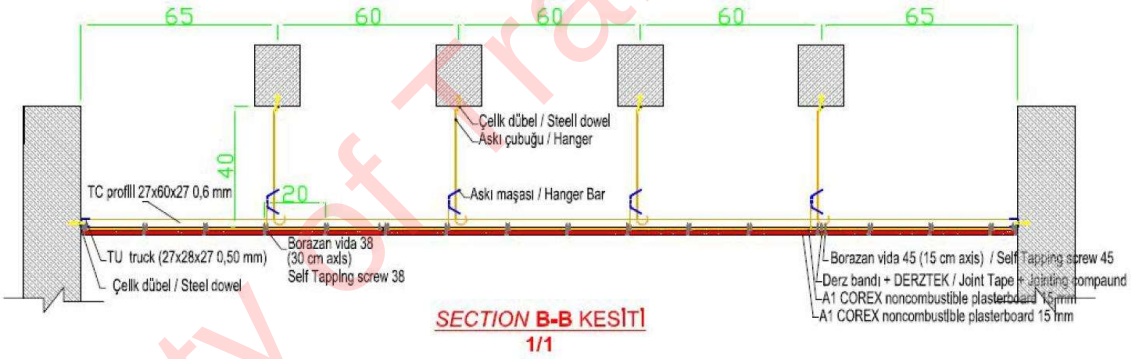

Figure 8 Illustration of tested system – extracted from RFTR22056

Figure 9 Photo illustration of tested system (unexposed side) – extracted from RFTR22056

Fire test data with floor lining

RTL FT1883.01 consisted of a 1600 mm × 1600 mm × 668 mm floor-ceiling system, constructed with two layers of 15 mm thick COREX board ceiling lining, with a 600 mm cavity, and two layers of 19 mm thick INEX flooring board – with various service penetrations – as illustrated in Figure 10.

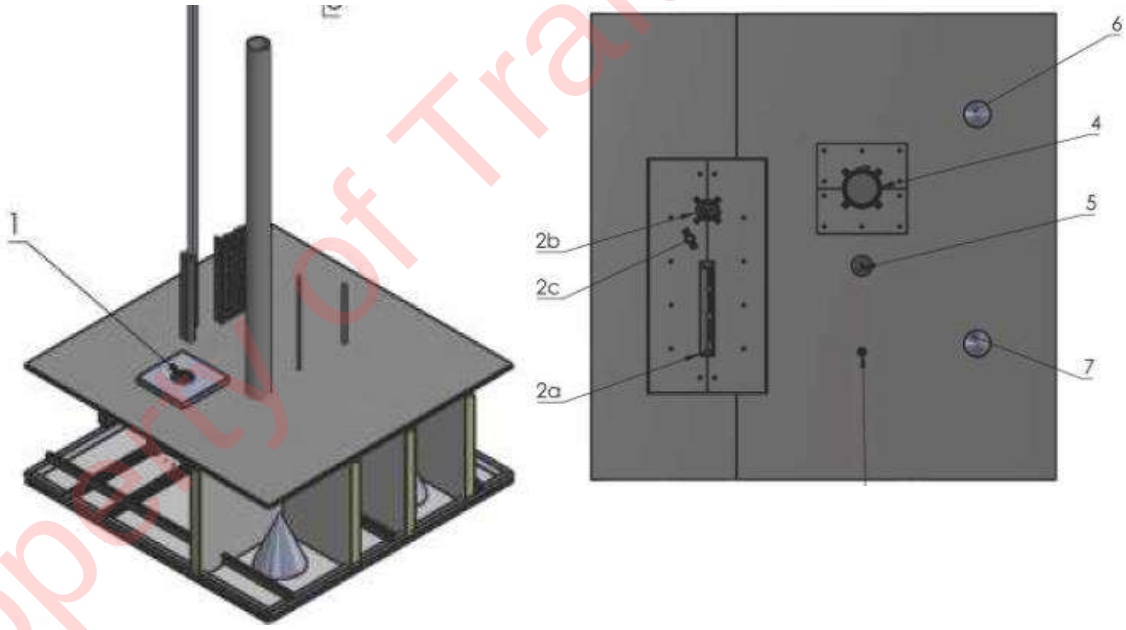

Figure 10 Test specimen illustration – RTL FT1883.01

6.3.2 Assessing the FRL and RISF performance of the proposed ceiling system

It is proposed to assess the FRL and RISF performance of the A1 COREX board ceiling systems in accordance with AS 1530.4:2014. The proposed systems are shown in Figure 1 to Figure 7. Section 5 of this report concluded that the variation in furnace heating regimes, furnace pressure, furnace thermocouples, and the responses of the different thermocouple types to the furnace conditions between the testing standard and AS 1530.4:2014 are not expected to have an overall significant effect on the outcome of the referenced fire resistance test, and thus the referenced

test data from RFTR22056, RFTR22118 and RFTR22164 can be used to support the FRL assessment in accordance with AS 1530.4:2014. The test outcomes are summarised in Table 8.

Table 8 Summary of referenced test report RFTR22056, RFTR22118 and RFTR22164

Referenced test	Ceiling lining	Outcome	Assigned FRL
RFTR22056	2 × 12.5 mm thick A1 COREX board	No integrity failure at 52 minutes, but with insulation failure at 52 minutes	-/45/45
RFTR22118	2 × 15 mm thick A1 COREX board	No integrity or insulation failure at 66 minutes	-/60/60
RFTR22164	2 × 25 mm thick A1 COREX board	No integrity or insulation failure at 132 minutes	-/120/120

FRL without floor lining

As discussed in section 5, it is expected that the tested ceiling systems in RFTR22056, RFTR22118 and RFTR22164 would perform similarly when tested in accordance with AS 1530.4:2014. It is expected that the proposed A1 COREX board ceiling system would perform similarly to the test systems, as long as the variations of the framework, floor joists and edge details do not have an adverse impact on the overall performance.

It is important to note that the boards are expected to perform or act as fire protection for the joists or structural members they are hanging from. As such, the temperatures obtained from the test data can be considered as the material temperatures for the design of these members. As such, then it is expected the FRL as per the test will be met. In addition to the above, this assessment relies on the test outcomes where the ceiling linings remain attached to the ceiling joists. Any additional attachment to ceiling lining that could potentially causes degradation of the fire resistance performance of the system is not considered in this report.

The proposed ceiling systems are supported by various types of joists, as shown in Figure 1 to Figure 3, which involve steel and timber joists. Table 8 shows that the tested two layers of 12.5 mm thick, 15 mm thick and 25 mm thick ceiling system are capable of maintaining an insulation performance for 45 minutes, 60 minutes and 120 minutes, respectively. While the insulation criteria are to prevent an average temperature rise of 140 °C or a maximum temperature rise of 180 °C, it is expected that during the period of the assigned FRL, the temperature of the ceiling joists would be around 200 °C. The professional structural engineer or the qualified party that design the floor joints must take into account the appropriate reduction factors from the relevant design standards.

The structural capacity of a timber element in a fire scenario depends on its residual cross-section area, which is associated with its charring. According to EN 1995-1-2:2004[8] clause 3.4.1, the charring temperature of timber is around 300 °C, meaning that timber elements are not expected to experience any strength loss below this temperature. As discussed previously, the temperature of the joists is expected to be around 200 °C – when protected by the corresponding ceiling lining shown in Table 8. Combining these test outcomes with the charring information provided in EN 1995-1-2:2004, it is expected that the timber joists would not experience any strength loss during a fire scenario. Therefore, it is concluded that the ceiling linings would not structurally collapse during the period of the assigned FRL when supported with timber joists – with the corresponding ceiling lining shown in Table 8.

In the referenced test, the perimeter of the supporting frame was formed by 28 mm wide × 27 mm deep × 0.5 mm thick U tracks, which were fixed to the supporting construction by M6 × 45 mm steel dowel. The ceiling linings were fixed to the frame and positioned hard-up against the supporting construction with no sealant applied. It is proposed to install the A1 COREX board ceiling system as shown in Figure 4, which consisted of minimum 28 × 0.5 mm BMT J or U track

[8] European Committee for Standardization, 2004, Eurocode 5: Design of timber structures – Part 1-2: General – Structural fire design, EN 1995-1-2:2004, European Committee for Standardization, Brussels, Belgium.

as the perimeter frame, with FyreFLEX sealant fully filling the 15 mm gap between the linings and the supporting element.

The variation in the perimeter frame is not expected to degrade the fire resistance performance of the A1 COREX board ceiling system, as the depth and thickness of the framing tracks are similar to the tested system.

FRL with floor lining

As discussed in sections 6.3.1 and 6.3.2, the ceiling systems tested in RFTR22056, RFTR22118 and RFTR22164 were able to maintain integrity and insulation performance for 45, 60 and 120 minutes, respectively, without any floor lining – with the appropriate lining thickness as shown in Table 8. When a non-combustible floor lining is included, the overall thickness of the floor/ceiling system is increased as such the integrity and insulation performance of the system are expected to achieve similar or better performance than tested.

Nevertheless, given that a ceiling cavity is now created, heat is expected to be trapped within the cavity, resulting in structural joists experiencing higher temperatures than the tested systems. Based on the referenced test reports, the average unexposed side temperature of the ceiling lining for the 2 × 12.5 mm, 2 × 15 mm and 2 × 25 mm thick systems was close to or below 100 °C at 45 minutes, 60 minutes and 120 minutes, respectively. While this provides a reasonable safety margin for the structural joists, it is considered that the increase in cavity temperature – caused by the inclusion of floor lining – would not be significant enough to compromise the structural adequacy of the floor joists.

Based on the above, it is concluded that the inclusion of the floor lining – as shown in Figure 2 – would not degrade the fire resistance performance of the A1 COREX board ceiling systems.

RISF performance of the system

RTL FT1883.01 consisted of a 1600 mm × 1600 mm × 668 mm floor-ceiling system, constructed with two layers of 15 mm thick COREX board ceiling lining, with a 600 mm cavity, and two layers of 19 mm thick INEX flooring board – with various service penetrations – as illustrated in Figure 10. The temperature data from this test is used to compare with the RFTR22056 (60 minutes test), which is the two layers 15 mm thick full-scale ceiling lining test.

It is considered that a pilot scale ceiling system would perform better than a full-scale sample, due to the lack of deflection. However, with service penetrations included, the temperature on the ceiling lining or cavity is expected to be higher compared to the test setup with no penetration.

When comparing the temperature data between the two tests (RFTR22056 and RTL FT1883.01 – presented in Figure 11 and Figure 12), the profiles present a very similar trend and temperature at 60 minutes. This shows that the temperature data presented in the pilot-scale test RTL FT1883.01 can be used to determine the RISF performance of the full-scale A1 COREX board ceiling system when cladded with floor lining.

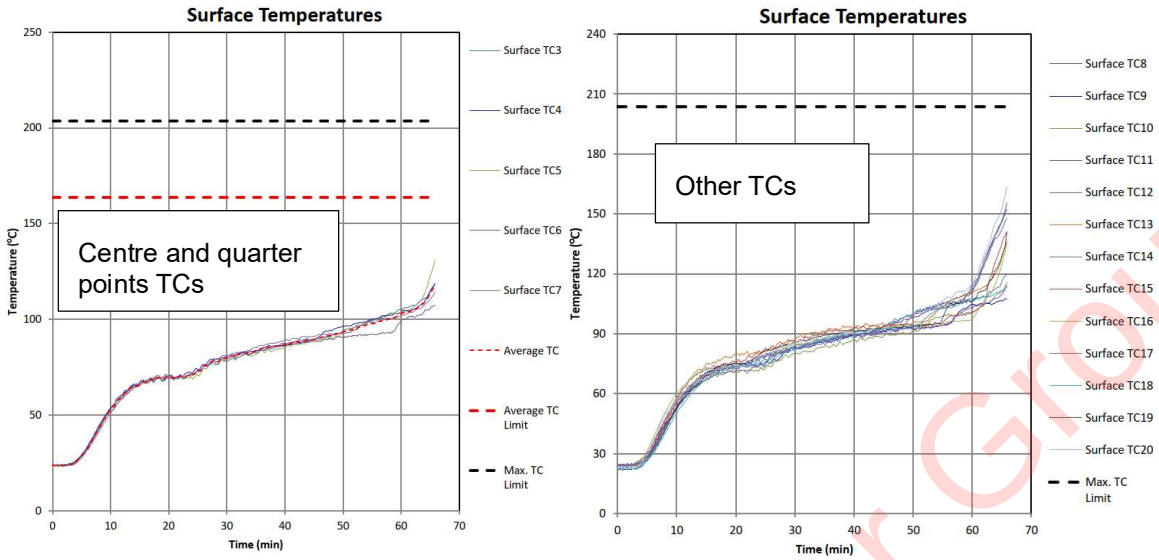

Figure 11 Ceiling lining unexposed side temperature data – extracted from RFTR22056

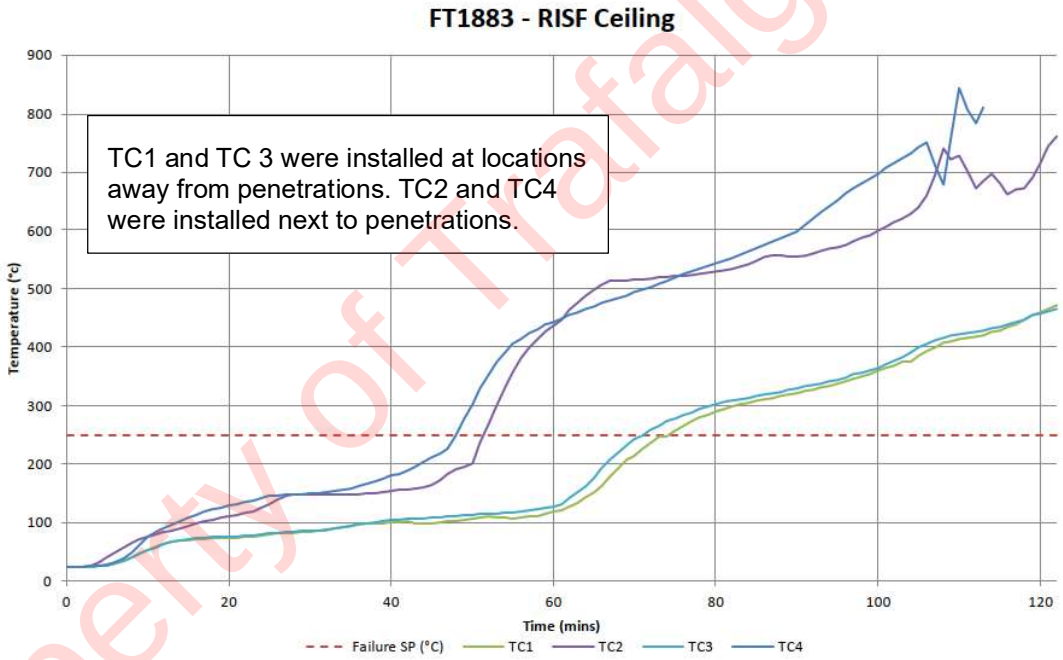

Figure 12 Ceiling lining unexposed side temperature data – extracted from RTL FT1883.01

The temperature data in RTL FT1883.01 show that despite the floor lining trapping the heat inside the cavity, the temperature remained well below the 250 °C RISF failure criteria stated in clause 4.9.1 of AS 1530.4:2014. Therefore, it is considered that the A1 COREX board ceiling system is capable of achieving the RISF performance shown in Table 9 of section 6.4 when cladded with floor lining. Moreover, when the A1 COREX board ceiling system is capped with floor lining or floor system above it, the unexposed side temperature is expected to be even lower than the cavity temperature. Therefore, it is expected that the unexposed side temperature of the whole separating floor would not record a maximum and average temperature rise greater than 180 °C or 140 °C. However, it must be noted that an increase in cavity depth would enable greater area for heat dissipation, hence the cavity depth must not be less than the tested 600 mm in RTL FT1883.01.

6.3.3 Variation to the floor system

As stated previously, the COREX ceiling system would be hanging from the floor system – which is designed by the others to have structural adequacy up to the equivalent assigned time for RISF, integrity and insulation performance – if structural adequacy is required.

With reference to the discussion in section 6.3, that the cavity temperature (or the unexposed side temperature of the ceiling lining) would be less than the 250 °C RISF temperature when the cavity is 600 mm deep. The structural engineer responsible for the design of the floor system is required to confirm the floor system would maintain its structural adequacy performance when exposed to a 180 °C temperature rise for the fire period. If the professional structural engineer requires further temperature data to conduct structural modelling, they are required to extract this information from the referenced test reports.

Providing the professional structural engineer confirming the structural adequacy of the floor system, the A1 COREX board ceiling systems are expected to have a structural adequacy performance.

6.4 Assessment outcome

This assessment demonstrates that the A1 COREX board ceiling systems are expected to achieve the fire resistance performance as shown in Table 9 – in accordance with AS 1530.4:2014.

Table 9 Fire resistance and RISF performance of A1 COREX board ceiling systems

A1 COREX board ceiling lining[1]	Floor lining	Referenced figure	RISF performance[2 3]	Fire resistance level (FRL) [4]
2 × 12.5 mm	None	Figure 1, Figure 3, Figure 4, Figure 5, Figure 6	None – no cavity	-/45/45
2 × 15 mm				-/60/60
2 × 25 mm				-/120/120
2 × 12.5 mm	To be designed and confirmed by other parties[5].	Figure 2, Figure 4, Figure 5, Figure 6	45	45/45/45
2 × 15 mm			60	60/60/60
2 × 25 mm			120	120/120/120

Note:

1. The ceiling lining is to be installed and hung from the supporting construction. The ceiling lining is not to carry any load other than the weights (if any) included in the referenced test reports.
2. The cavity must be minimum 600 mm deep as per the referenced test report, RTL FT1883.01.
3. RISF measured from the unexposed side of the A1 COREX board ceiling lining.
4. FRL measured from the unexposed side of the A1 COREX board ceiling lining.
5. The FRLs outlined in Table 9 are valid for floor systems designed by others to maintain structural stability throughout the applicable fire period, provided that the design has taken into consideration a minimum cavity temperature rise of 180 °C above ambient, as well as other relevant design factors for the application.

7. Assessment 3 – applying 'the FRL and RISF performance of service penetrations in pink plasterboard ceiling' to 'A1 COREX board ceiling system'

7.1 Background and assessment clause

A range of Trafalgar service penetration systems installed in pink plasterboard ceiling system were tested and/or assessed in accordance with AS 1530.4:2014. It is proposed to extend these tested/assessed outcomes to services penetrating through A1 COREX board ceiling system with equivalent or greater thickness.

The relevant clause for this assessment is clause 4.3.1.4 of AS 4072.1:2005, where the standard states:

'Results obtained with a suspended ceiling system using one type of proprietary board may be used to assess the performance of the suspended ceiling system using alternative proprietary boards, provided that a registered testing authority is satisfied that the products behave in a similar manner.'

Warringtonfire Australia, a Jensen Hughes Company is recognised by the National Construction Code (NCC) to be an Accredited Testing Laboratory (ATL). Therefore, the above stated clause can be used for this assessment.

7.2 Methodology

The method of assessment used is summarised in Table 10.

Table 10 Method of assessment

Assessment method	
Level of complexity	Intermediate assessment
NCC procedure for determining FRL	Differs in only a minor degree from a tested prototype S1C2(b) and (c)
Type of assessment	Qualitative and comparative

7.3 Relevant test data

Resolute test report RTL FT 1552.01 and RTL FT 1883.01 were used for this assessment. Figure 13 shows a brief comparison between the two tested specimen.

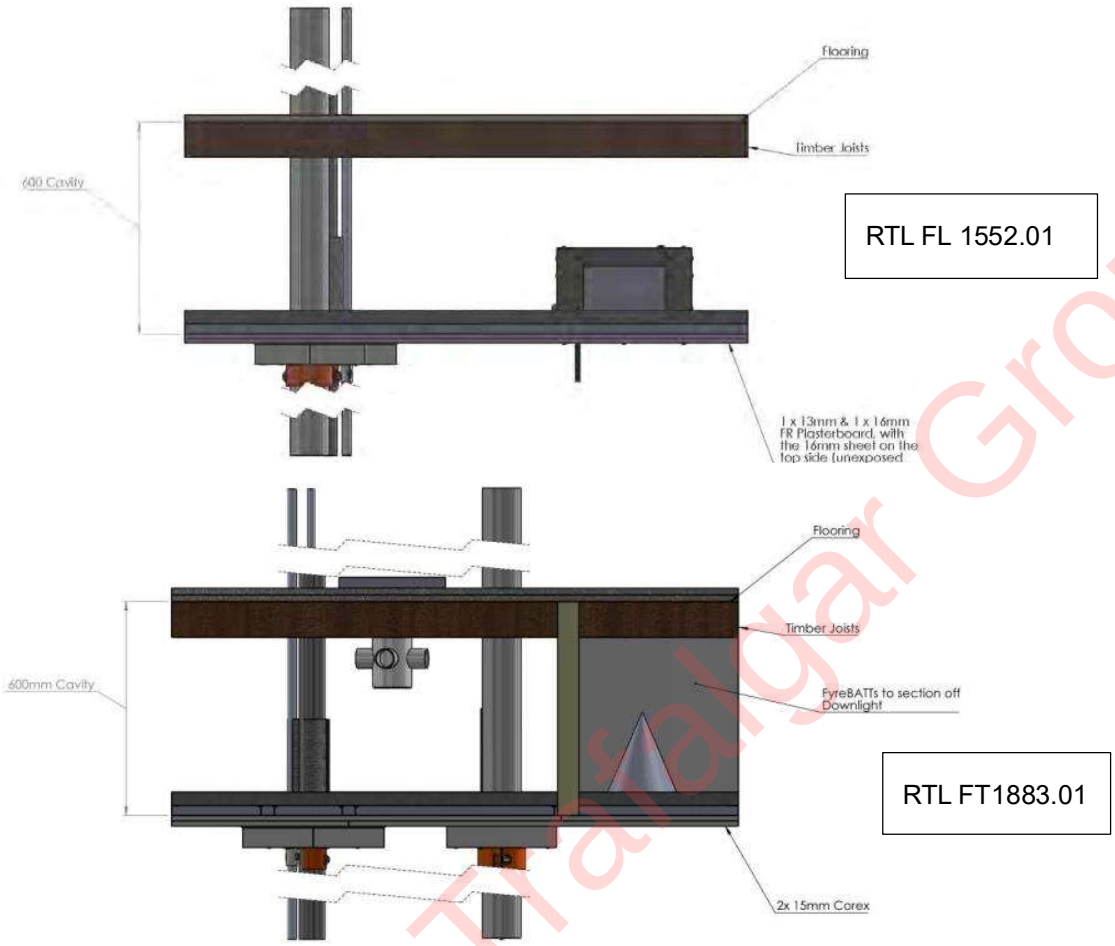

Figure 13 Comparison between RTL FL 1552.01 and RTL FT1883.01

Table 11 Floor/ceiling system comparison

Item	Pink board – RTL FL 1552.01	A1 COREX – RTL FT1883.01
Ceiling lining	1 layer 16 + 1 layer 13 = 29	2 layers 15 = 30
Cavity	600	600
Floor lining	Yellow tongue flooring	2 layers 19 mm thick INEX flooring board

Based on the analyses from Figure 13 and Table 11, and the temperature and pressure conditions of the two tests, it is considered that the two tests can be used for comparing the temperature on the unexposed side of the ceiling linings.

7.4 Assessment

7.4.1 Comparing temperature data of PVC pipe within the cavity

Specimen B of RTL FT1552.01 and specimen 4 of RTL FT1883.01 consisted of a 100 mm diameter PVC pipe protected with a FyreCOLLAR Premium Retrofit collar. Both test specimens were protected with the same local fire protection, with 60 mm thick Maxilite installed locally at the penetration location – on the fire exposed side.

The relevant thermocouples and the relevant installation locations are presented in Figure 14 and Table 12.

Figure 14 Thermocouples locations of the referenced tests

Figure 15 Exposed side view – prior to test

Table 12 Thermocouples locations

Description	RTL FT1552.01 specimen B	RTL FT1883.01 specimen 4
Ceiling lining, 25 mm from the service	11	33
PVC pipe, 25 mm up from the ceiling	12	34
Ceiling lining, 25 mm from the service	13	35
PVC pipe, 25 mm up from the ceiling	14	36

The relevant temperature data is presented in Figure 16 and Figure 17.

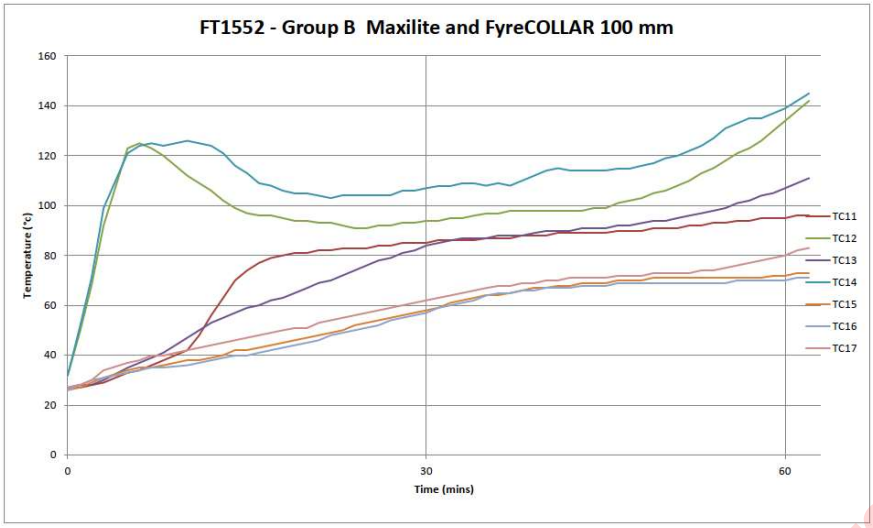

Figure 16 Protected 100 mm diameter PVC pipe through pink plasterboard ceiling – extracted from RTL FT1552.01

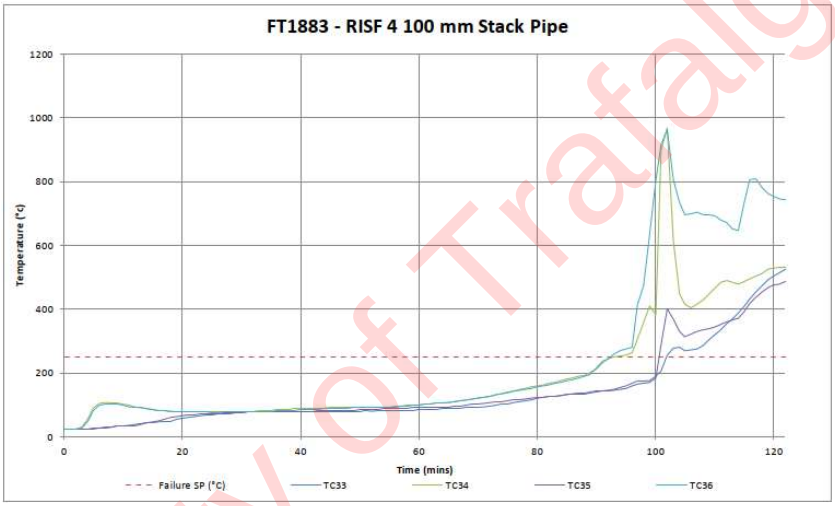

Figure 17 Protected 100 mm diameter PVC pipe through pink plasterboard ceiling – extracted from RTL FT1883.01

As shown in Figure 16 and Figure 17, the temperature of the pink plasterboard ceiling (TC11 and TC13) recorded a maximum temperature of around 100 °C at 60 minutes and started to show an uptrend past 60 minutes. On the other hand, the A1 COREX board ceiling tested in RTL FT1883.01 showed a stable temperature past 60 minutes and started to show a temperature beyond 100 °C at around 70 minutes.

When comparing the temperature data on the PVC service penetrations, after the initial temperature spike, the PVC pipe installed in pink plasterboard ceiling (TC12 and TC14) showed a maximum temperature of 140 °C at 60 minutes, while the PVC pipe installed in A1 COREX board (TC34 and TC36) recorded a maximum temperature of 100 °C at 60 minutes, not reaching under 75 minutes into the test.

Based on the above comparison, when the service penetrations assessed to pink plasterboard ceiling system is installed to the A1 COREX board ceiling system, the services are expected to perform similarly to the assessed systems. It should be noted that the main consideration of this assessment is that changing the board substrate or separating elements does not cause material impact on the expected performance.

7.4.2 Comparing temperature data of cable tray within the cavity

A similar temperature data comparison is conducted for the protected cable tray penetration. Specimen C of RTL FT1552.01 consisted of three services, where one of the services is a locally fire protected 350 mm wide cable tray with 20 × CAT6 communications cables, 10 × 10 mm TBS cables, and 7 × 19 mm OD 3C&E power cables. Specimen 2A of RTL FT1883.01 consisted of 20 × CAT6 communications cables, 10 TBS cables, and 5 × 19 OD 3C+E power cables. It is noted that specimen 2A of RTL FT1883.01 consisted of two less 3C+E power cables. However, combining the temperature comparison conducted for the 100 mm PVC pipe, the two less power cables are not expected to significantly impact the temperature data. The relevant thermocouples are listed in Table 13, Figure 18 and Figure 19.

Table 13 Relevant thermocouples of the tests at 60 minutes

Description	RTL FT1552.01 specimen B	RTL FT1883.01 specimen 4
On cable tray protection within cavity 25 mm from Maxilite board	TC25 – 90 °C	TC8 – 95 °C
On cable tray protection within cavity 25 mm from Maxilite board	TC31 – 90 °C	TC6 – 80 °C
On cable tray within cavity 25 mm from tray protection wrap	TC29 – 110 °C	TC16 – 75 °C

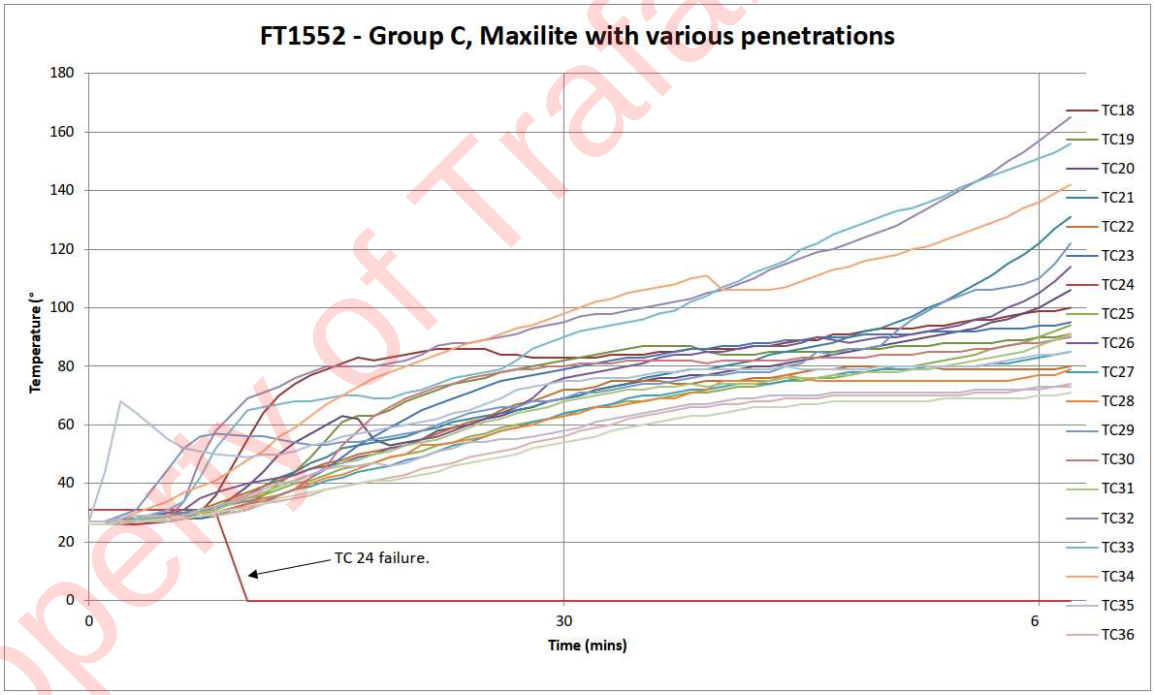

Figure 18 Relevant thermocouples from RTL FT1552.01

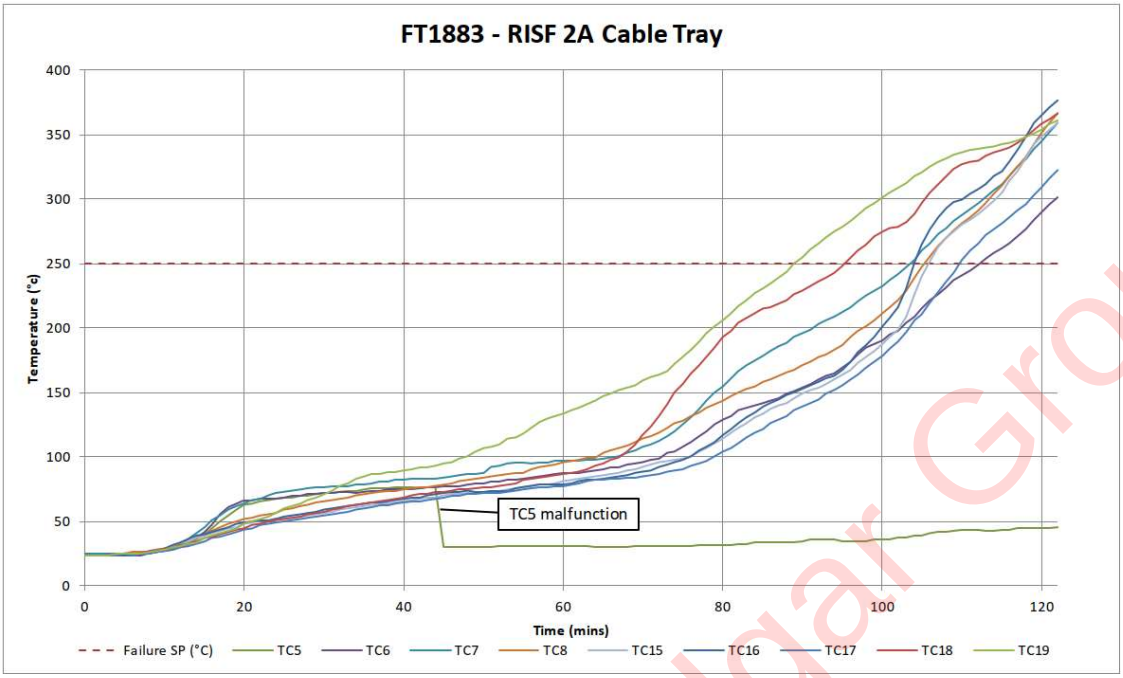

Figure 19 Relevant thermocouples from RTL FT1883.01

As shown in Table 13, Figure 18 and Figure 19, other than one thermocouple that is 5 °C higher than RTL FT1552.01, the other two temperature readings recorded in RTL FT1883.01 on the cable tray are lower.

This further reinforces the statement presented in section 7.4.1, where when service penetrations are installed on A1 COREX board ceiling system, the services are expected to have similar performance to the services assessed to pink plasterboard ceiling system. Similar to the discussion in section 7.4.1, it should be noted that the main consideration of this assessment is that changing the board substrate or separating elements does not cause material impact on the expected performance.

7.5 Assessment outcome

Based on the temperature data comparison presented in section 7.4.1 and 7.4.2, it is considered that services penetrating through a ceiling system constructed with A1 COREX boards are capable of maintaining the same FRL and RISF performance as services penetrating through a pink plasterboard ceiling system – with the equivalent or higher thickness.

8. Validity

Warringtonfire does not endorse the tested or assessed products and systems in any way. The conclusions of this assessment may be used to directly assess fire resistance, but it should be recognised that a single test method will not provide a full assessment of fire resistance under all conditions.

Due to the nature of fire testing and the consequent difficulty in quantifying the uncertainty of measurement, it is not possible to provide a stated degree of accuracy. The inherent variability in test procedures, materials and methods of construction, and installation may lead to variations in performance between elements of similar construction.

This assessment is based on test data, information and experience available at the time of preparation. If contradictory evidence becomes available to the assessing authority, the assessment will be unconditionally withdrawn and the report sponsor will be notified in writing. Similarly, the assessment should be re-evaluated, if the assessed construction is subsequently tested since actual test data is deemed to take precedence.

The sponsor is responsible for formally notifying Warringtonfire of any additional testing performed on their product/system. This obligation applies regardless of where the test was conducted, the results of the test, or whether it was initially considered part of Warringtonfire's ongoing assessment. The primary goal of this notification is to allow Warringtonfire to review the changes and determine whether they require re-evaluation or re-testing to determine whether the changes have affected the product's performance. It is important that the client promptly notify Warringtonfire if any such changes are implemented.

The procedures for the conduct of tests and the assessment of test results are subject to constant review and improvement. The sponsor is therefore recommended that this report be reviewed on, or before, the stated expiry date.

This assessment represents our opinion about the performance of the proposed systems that is expected to be demonstrated when subjected to test conditions in accordance with AS 1530.4:2014, based on the evidence referred to in this report.

This assessment is provided to Trafalgar Group for their own specific purposes. This report may be used as evidence of suitability in accordance with the requirements of the relevant National Construction Code. Building certifiers and other third parties must determine the suitability of the systems described in this report for a specific installation.

Appendix A Drawings and additional information

Table 14 Details of drawings

Figure	Drawing title	Dwg no	Date	Drawn by
Figure 1	Ceiling systems 1a-1c	1	13 December 2022	DP (Trafalgar Group)
Figure 2	Ceiling systems 2a-2c	2		DP (Trafalgar Group), edited by Warringtonfire
Figure 3	Ceiling systems framing options	3		DP (Trafalgar Group)
Figure 4	Ceiling systems edge details	4		
Figure 5	Ceiling systems board joints	5		
Figure 6	Ceiling systems board overlaps	6		
Figure 7	COREX ceiling linings to floor joists fixing locations	-	1 February 2023	Extracted from RFTR22118, edited by Warringtonfire

Appendix B Summary of supporting test data

B.1 Test report – RTL FT 1552.01

Table 15 Information about test report RTL FT 1552.01

Item	Information about test report
Report sponsor	Trafalgar Fire Containment Solution Pty Ltd, 26A Ferndell Street, South Granville, NSW 2142.
Test laboratory	Resolute Testing Laboratories Pty Ltd, Units 18 & 19, 31-79 Paisley Drive, Lawnton, QLD 4501.
Test date	The fire resistance test was done on 13 April 2022.
Test standards	The test was done in accordance with AS 1530.4:2014.
Variation to test standards	None
General description of tested specimen	The test specimen consisted of a floor-ceiling system with four service penetrations. The floor-ceiling system was separated into four individual cavities using 60 mm thick Trafalgar FyreBATTs, with one penetration each individual cavity. The ceiling linings consisted of one layer of 13 mm and 16 mm thick plasterboard. Both layers were suspended by Rondo P129 furring channel and 25 mm trop cross rails, from 125 mm × 50 mm F17 hardwood at 450 mm centres. Yellow tongue floor lining was installed to the topside of the hardwood creating a 600 mm deep cavity. The test was conducted for a period of 62 minutes.
Instrumentation	The test report states that the instrumentation was in accordance with AS 1530.4:2014.

The test specimen achieved the following results – see Table 16.

Table 16 Results summary for this test report RTL FT 1552.01

Specimen	Structural adequacy	Integrity	Insulation	RISF
A	NA	No failure at 62 minutes	No failure at 62 minutes	Failure at 33 minutes
B	NA	No failure at 62 minutes	No failure at 62 minutes	No failure at 62 minutes
C1	NA	No failure at 62 minutes	No failure at 62 minutes	No failure at 62 minutes
C2	NA	No failure at 62 minutes	No failure at 62 minutes	No failure at 62 minutes
C3	NA	No failure at 62 minutes	No failure at 62 minutes	No failure at 62 minutes
D	NA	No failure at 62 minutes	No failure at 62 minutes	Failure at 28 minutes

B.2 Test report – RFTR22056

Table 17 Information about test report RFTR22056

Item	Information about test report
Report sponsor	DALSAN AICI SAN. VE TIC. A.S.
Test laboratory	Efectis Era Avrasya Test Ve Belgelendirme A.S, Dilovasi OSE. 5. Kisim First Cad. No:18, 41455 Dilovasi, Kocaeli, Turkey
Test date	The fire resistance test was done on 12 May 2022.
Test standards	The test was done in accordance with EN 1364-2:2018.
Variation to test standards	None
General description of tested specimen	The test specimen consisted of a ceiling system formed by two layers of 15 mm thick A1 COREX fixed to the bottom of the framework. The panels were 1200 mm wide × 2000 mm long × 15 mm thick. The framework was formed by U-shaped (TU) and C-shaped (TC) galvanised steel profiles, The U-shaped steel tracks were 3100 mm or 4100 mm long × 28 mm wide × 27 mm deep × 0.5 mm thick, fixed to the testing frame with M6 × 45 mm CD6-45 steel dowel. The fixings were 50 mm from edge of the supporting construction and 600 mm centres between steel dowels. The C-shaped galvanised steel tracks were 3080 mm long × 60 mm wide × 27 mm high × 0.6 mm thick, fitted inside the U-shaped profiles with a 10 mm gap between the ceiling U-track and ceiling C-track. The distance between each ceiling C-stud is 600 mm. The framework was suspended by 14 galvanised quick hanger (C type) and hanger bar. The hanger bars were 3.8 mm diameter × 400 mm long, and fixed to concrete beams above the testing frame with steel dowels and L steel bars. Resilient tape – which is polyethylene foam sound insulating tap – was used between supporting construction and U-shape profiles. The tap was 25 mm wide × 3 mm thick with a nominal density of 30 kg/m^3, located between the supporting construction and U-shaped profiles. The plasterboard linings were fixed to the framework with self-tapping steel screws. The first (inner) layer was fixed with 3.5 mm diameter × 38 mm long COREX BV38 at 300 mm between screws, where the second (outer) layer was fixed with 3.5 mm diameter × 45 mm long COREX BV45 at 150 mm between screws. Both faces of the plasterboards were covered with fiberglass mattress, with 205 g/m^2 unit area weight of fiberglass mattress on one face of the plasterboard. The plasterboard layers were staggered at the bottom of the suspended ceiling system. The test was conducted for 66 minutes.
Instrumentation	The test report states that the instrumentation was in accordance with EN 1363-1:2020.

The test specimen achieved the following results – see Table 18.

Table 18 Results summary for this test report RFTR22056

Item	Criteria	Outcome
Integrity	Cotton pad	No failure
	6 mm diameter gap gauges	No failure (not applied)
	25 mm diameter gap gauges	No failure (Not applied)
	Flames longer than 10 seconds	Not observed
Insulation	Average temperature	No failure
	Maximum temperature	No failure

B.3 Test report – RFTR22118

Table 19 Information about test report RFTR22118

Item	Information about test report
Report sponsor	DALSAN AICI SAN. VE TIC. A.S.
Test laboratory	Efectis Era Avrasya Test Ve Belgelendirme A.S, Dilovasi OSE. 5. Kisim First Cad. No:18, 41455 Dilovasi, Kocaeli, Turkey
Test date	The fire resistance test was done on 20 July 2022.
Test standards	The test was done in accordance with EN 1364-2:2018.
Variation to test standards	None
General description of tested specimen	The test specimen consisted of a ceiling system formed by two layers of 25 mm thick A1 COREX fixed to the bottom of the framework. The panels were 1200 mm wide × 2000 mm long × 25 mm thick. The framework was formed by U-shaped (TU) and C-shaped (TC) galvanised steel profiles, The U-shaped steel tracks were 3100 mm or 4100 mm long × 28 mm wide × 27 mm deep × 0.5 mm thick, fixed to the testing frame with M6 × 45 mm CD6-45 steel dowel. The fixings were 50 mm from edge of the supporting construction and 600 mm centres between steel dowels. The C-shaped galvanised steel tracks were 3080 mm long × 60 mm wide × 27 mm high × 0.6 mm thick, fitted inside the U-shaped profiles with a 10 mm gap between the ceiling U-track and ceiling C-track. The distance between each ceiling C-stud is 600 mm. The framework was suspended by 28 galvanised quick hanger (C type) and hanger bar. The hanger bars were 3.8 mm diameter × 400 mm long, and fixed to concrete beams above the testing frame with steel dowels and L steel bars. Resilient tape – which is polyethylene foam sound insulating tap – was used between supporting construction and U-shape profiles. The tap was 25 mm wide × 3 mm thick with a nominal density of 30 kg/m^3, located between the supporting construction and U-shaped profiles. The plasterboard linings were fixed to the framework with self-tapping steel screws. The first (inner) layer was fixed with 3.5 mm diameter × 45 mm long COREX BV45 at 300 mm between screws, where the second (outer) layer was fixed with 4.2 mm diameter × 70 mm long COREX BV70 at 150 mm between screws. Both faces of the plasterboards were covered with fiberglass mattress, with 205 g/m^2 unit area weight of fiberglass mattress on one face of the plasterboard. The plasterboard layers were staggered at the bottom of the suspended ceiling system. The test was conducted for 132 minutes.
Instrumentation	The test report states that the instrumentation was in accordance with EN 1363-1:2020.

The test specimen achieved the following results – see Table 20.

Table 20 Results summary for this test report RFTR22118-

Item	Criteria	Outcome
Integrity	Cotton pad	No failure (not applied)
	6 mm diameter gap gauges	No failure (not applied)
	25 mm diameter gap gauges	No failure (not applied)
	Flames longer than 10 seconds	Not observed
Insulation	Average temperature	No failure
	Maximum temperature	No failure

B.4 Test report – RFTR22164

Table 21 Information about test report RFTR22164

Item	Information about test report
Report sponsor	DALSAN AICI SAN. VE TIC. A.S.
Test laboratory	Efectis Era Avrasya Test Ve Belgelendirme A.S, Dilovasi OSE. 5. Kisim First Cad. No:18, 41455 Dilovasi, Kocaeli, Turkey
Test date	The fire resistance test was done on 5 October 2022.
Test standards	The test was done in accordance with EN 1364-2:2018.
Variation to test standards	None
General description of tested specimen	The test specimen consisted of a ceiling system formed by two layers of 12.5 mm thick A1 COREX fixed to the bottom of the framework. The panels were 1200 mm wide × 2000 mm long × 12.5 mm thick. The framework was formed by U-shaped (TU) and C-shaped (TC) galvanised steel profiles, The U-shaped steel tracks were 3100 mm or 4100 mm long × 28 mm wide × 27 mm deep × 0.5 mm thick, fixed to the testing frame with M6 × 45 mm CD6-45 steel dowel. The fixings were 50 mm from edge of the supporting construction and 600 mm centres between steel dowels. The C-shaped galvanised steel tracks were 3080 mm long × 60 mm wide × 27 mm high × 0.6 mm thick, fitted inside the U-shaped profiles with a 10 mm gap between the ceiling U-track and ceiling C-track. The distance between each ceiling C-stud is 600 mm. The framework was suspended by 14 galvanised quick hanger (C type) and hanger bar. The hanger bars were 3.8 mm diameter × 400 mm long, and fixed to concrete beams above the testing frame with steel dowels and L steel bars. Resilient tape – which is polyethylene foam sound insulating tap – was used between supporting construction and U-shape profiles. The tap was 25 mm wide × 3 mm thick with a nominal density of 30 kg/m^3, located between the supporting construction and U-shaped profiles. The plasterboard linings were fixed to the framework with self-tapping steel screws. The first (inner) layer was fixed with 3.5 mm diameter × 25 mm long COREX BV25 at 300 mm between screws, where the second (outer) layer was fixed with 3.5 mm diameter × 38 mm long COREX BV38 at 150 mm between screws. Both faces of the plasterboards were covered with fiberglass mattress, with 205 g/m^2 unit area weight of fiberglass mattress on one face of the plasterboard. The plasterboard layers were staggered at the bottom of the suspended ceiling system. The test was conducted for 52 minutes.
Instrumentation	The test report states that the instrumentation was in accordance with EN 1363-1:2020.

The test specimen achieved the following results – see Table 22.

Table 22 Results summary for this test report RFTR22164

Item	Criteria	Outcome
Integrity	Cotton pad	No failure (not applied)
	6 mm diameter gap gauges	No failure (not applied)
	25 mm diameter gap gauges	No failure (not applied)
	Flames longer than 10 seconds	Not observed
Insulation	Average temperature	No failure
	Maximum temperature	Failure at 51 minutes

B.5 Test report – RTL FT 1883.01

Table 23 Information about test report RTL FT 1883.01

Item	Information about test report
Report sponsor	Trafalgar Fire Containment Solution Pty Ltd, 26A Ferndell Street, South Granville, NSW 2142.
Test laboratory	Resolute Testing Laboratories Pty Ltd, Units 18 & 19, 31-79 Paisley Drive, Lawnton, QLD 4501.
Test date	The fire resistance test was done on 6 October 2023.
Test standards	The test was done in accordance with AS 1530.4:2014.
Variation to test standards	None
General description of tested specimen	The test specimen consisted of a floor-ceiling system with seven service penetrations. The floor-ceiling system was separated into individual cavities, with one penetration each individual cavity. The ceiling linings consisted of two layers of 15 mm thick A1 COREX Board. Both layers were suspended by Rondo P129 furring channel and 25 mm trop cross rails, from 125 mm × 50 mm F17 hardwood at 485 mm centres. Two layers of 19 mm thick INEX flooring board were installed on the unexposed side of the system, leaving a ceiling cavity of 600 mm. The test was conducted for a period of 122 minutes.
Instrumentation	The test report states that the instrumentation was in accordance with AS 1530.4:2014.

The test specimen achieved the following results – see Table 24.

Table 24 Results summary for this test report RTL FT 1883.01

Specimen	Structural adequacy	Integrity	Insulation	RISF
1	NA	No failure at 122 minutes	Failure at 110 minutes	NA
2	NA	No failure at 122 minutes	No failure at 122 minutes	Failure at 90 minutes
3	NA	No failure at 122 minutes	No failure at 122 minutes	Failure at 48 minutes
4	NA	Failure at 118 minutes	Failure at 114 minutes	Failure at 93 minutes
5	NA	No failure at 122 minutes	No failure at 122 minutes	Failure at 95 minutes
6	NA	No failure at 122 minutes	No failure at 122 minutes	Failure at 12 minutes
7	NA	No failure at 122 minutes	No failure at 122 minutes	Failure at 12 minutes