

Fire-resistance of timber-framed floor-ceiling systems in accordance with AS 1530.4-2014

Short Form Assessment Report

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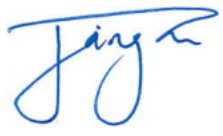
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1 Introduction

This report refers to an assessment report FCO-3591 titled “fire-resistance of timber-framed floor-ceiling systems in accordance with AS 1530.4-2014.”

This report is prepared for the purpose of meeting the requirements of NCC 2022 Volume One Clause S1C2 b) and c) as appropriate for FRL.

This report reviews and confirms the extent to which the reference fire-resistance tests listed in Section 2 meet the requirements of the standard fire test standards listed in Section 4 of the report. The proposed variations to the tested construction presented in Section 3 are subject to an analysis in Appendix B in the referenced report and the conclusions are presented in Section 5 of this report.

The field of applicability of the results of this assessment report is presented in Section 6 and is subject to the requirements, validity and limitations of Sections 7, 8 and 9.

2 Supporting Data

This assessment report refers to various test reports to support the analysis in the referenced report and conclusions of this report. They are listed below;

Report Reference	Test Standard	Description
FSH 204	AS 1530.4 -1990	Fire-resistance test on a 4.56m wide x 3.6mm long timber-framed plasterboard floor-ceiling system.
EWFA 36474400.2	AS 1530.4 -2014	Fire-resistance test of a nominal 2900mm wide x 4290mm long x 335mm thick loadbearing timber-framed plasterboard floor-ceiling system.
TST 180021.2	AS 1530.4 -2014	Fire-resistance test of a nominal 2900mm wide x 4290mm long x 351mm thick loadbearing timber-framed plasterboard floor-ceiling system.

The test reports FSH 204 was carried out at CSIRO North Ryde and was sponsored by Forest and Wood Products Australia.

The test report EWFA 36474400.1 was carried out at Warringtonfire Australia Pty Ltd, Victoria and was sponsored by Forest and Wood Products Australia.

The test report TST 180021.2 was carried out at Warringtonfire Australia Pty Ltd, Victoria and was sponsored by Forest and Wood Products Australia.

The tests identified above are confirmed by this Accredited Testing Laboratory to be equivalent or more severe than a Standard Fire Test in accordance with the test standard specified in Section 4 of this report when applied to the specimen as identified above.

3 Proposed Variations

Section 3.1 – 90 minute application

The proposed floor-ceiling element shall be as tested in EWFA 36474400.2, when subjected to any combination of the following variations:

- The primary structural elements shall be varied to include one or a combination of the following elements in a floor-ceiling system:
 - Solid metal web beams – TecBeam
 - Metal Strut web beams - MiTek PosiTruss (MiTek PosiStrut) and Pryda Span Truss
 - Timber web I-joists - Wesbeam “e-Joist”
 - Floor trusses with nail plate connections - Pryda Longreach floor truss
 - Roof/floor truss configurations (on edge) with nail plate connections
 - Solid timber joists
 - Glue laminated timber and Laminated Veneer Lumber (LVL) joists – (Resorcinol adhesive)
- Depth and span of primary structural element may be increased provided it is designed in accordance with AS 1720.5-2015 or AS 1720.1-2010 by an accredited structural engineer as appropriate.
- Width of the floor can be increased from that tested to unlimited width
- Plasterboard lining options on the underside of primary structural elements
 - The Plasterboard shall be 2 × 16mm Boral USG Firestop or other proprietary fire-resistant plasterboard that has been tested or assessed with two 16mm layers for an FRL of 90/90/90 and Resistance to the Incipient Spread of Fire (RISF) of 60 minutes when protecting a timber floor system with a cavity/plenum depth of 288mm or less.
- The ceiling suspension systems shall be designed to support the loads expected to be applied by the ceiling and any insulation and other fixtures. The framing and support system for the ceiling battens shall include any combination of the following when installed at the maximum 600mm centres;
 - 16mm and 28mm furring channels
 - Fixing systems may include,
 - Direct fixing clips or
 - Resilient mounts or
 - M237R Direct Fix Furring Channel resilient mount (Studco)
 - Furring Channel resilient mount (Rondo)
 - Furring Channel resilient mount (Gyprock)
 - Upgraded resilient mounts
 - Rondo WHI Rubber Hanger Isolator (Green)
 - Rondo WHI Rubber Hanger Isolator (Red)
 - Rondo WHI Rubber Hanger Isolator (White)
 - M50R-BLK Resilient Isolation Hanger (Studco)
 - Suspended ceiling systems with cross rails
- Flooring shall be varied from tested 15mm thick plywood to one of the following:
 - Particleboard with minimum thickness of 18mm
 - Engineered flooring with minimum thickness of 15mm
 - Cement sheet or calcium silicate sheet with minimum thickness of 15mm
 - Plywood with minimum thickness of 15mm
 - Tongue and groove timber flooring with minimum thickness of 15mm
 - AAC panel with minimum thickness of 50mm.

- Concrete or sand / cement screed cast over plywood or particleboard with a minimum thickness of 50mm.
- Flooring may have one of the following additional coverings:
 - Carpet
 - Tile
 - Stone
 - Various acoustic treatments
- The floor cavity shall include the following insulation options:
 - No insulation
 - Non-combustible mineral fibre or glass wool up to maximum cavity depth
- The floor-ceiling systems shall optionally include a non-fire rated decorative false ceiling system
 - The false ceiling system can be supported by ceiling suspension systems (ceiling furring channels/battens) provided they have been designed to support the loads at ambient conditions. The non-fire rated decorative false ceiling system will be supported from the fire-resistant ceiling system and shall be attached as follows
 - Direct fixing clips secured through the fire-resistant board
 - Resilient mount secured through the fire-resistant board
 - Suspended ceiling systems secured through the fire-resistant board
- The proposed construction is as shown in Figures 1, 2 and Table 1

Section 3.2 – 120 minute application

The proposed floor-ceiling element shall be as tested in TST 180021.2, when subjected to any combination of the following variations:

- The primary structural elements shall be varied to include one or a combination of the following elements in a floor-ceiling system:
 - Solid metal web beams – TecBeam
 - Metal Strut web beams - MiTek PosiTruss (MiTek PosiStrut) and Pryda Span Truss
 - Timber web I-joists - Wesbeam “e-Joist”
 - Floor trusses with nail plate connections - Pryda Longreach floor truss
 - Roof/floor truss configurations (on edge) with nail plate connections
 - Solid timber joists
 - Glue laminated timber and Laminated Veneer Lumber (LVL) joists – (Resorcinol adhesive)
- Depth and span of primary structural element may be increased provided it is designed in accordance with AS 1720.5-2015 or AS 1720.1-2010 by an accredited structural engineer as appropriate.
- Width of the floor can be increased from that tested to unlimited width
- Plasterboard lining options on the underside of primary structural elements
 - The Plasterboard shall be 3 × 16mm Boral USG Firestop or other proprietary fire-resistant plasterboard that has been tested or assessed with three 16mm layers for an FRL of 120/120/120 and Resistance to the Incipient Spread of Fire (RISF) of 120 minutes when protecting a timber floor system with a cavity/plenum depth of 288mm or less.
- The ceiling suspension systems shall be designed to support the loads expected to be applied by the ceiling and any insulation and other fixtures. The framing and support system for the ceiling battens shall include any combination of the following when installed at the maximum 600mm centres;
 - 16mm and 28mm furring channels
 - Fixing systems may include,
 - Direct fixing clips or
 - Resilient mounts or

- M237R Direct Fix Furring Channel resilient mount (Studco)
 - Furring Channel resilient mount (Rondo)
 - Furring Channel resilient mount (Gyprock)
- Upgraded resilient mounts
 - Rondo WHI Rubber Hanger Isolator (Green)
 - Rondo WHI Rubber Hanger Isolator (Red)
 - Rondo WHI Rubber Hanger Isolator (White)
 - M50R-BLK Resilient Isolation Hanger (Studco)
- Suspended ceiling systems with cross rails
- Flooring shall be varied from tested 15mm thick plywood to one of the following:
 - Particleboard with minimum thickness of 18mm
 - Engineered flooring with minimum thickness of 15mm
 - Cement sheet or calcium silicate sheet with minimum thickness of 15mm
 - Plywood with minimum thickness of 15mm
 - Tongue and groove timber flooring with minimum thickness of 15mm
 - AAC panel with minimum thickness of 50mm.
 - Concrete or sand / cement screed cast over plywood or particleboard with a minimum thickness of 50mm.
- Flooring may have one of the following additional coverings:
 - Carpet
 - Tile
 - Stone
 - Various acoustic treatments
- The floor cavity shall include the following insulation options:
 - No insulation
 - Non-combustible mineral fibre or glass wool up to maximum cavity depth
- The floor-ceiling systems shall optionally include a non-fire rated decorative false ceiling system
 - The false ceiling system can be supported by ceiling suspension systems (ceiling furring channels/battens) provided they have been designed to support the loads at ambient conditions. The non-fire rated decorative false ceiling system will be supported from the fire-resistant ceiling system and shall be attached as follows
 - Direct fixing clips secured through the fire-resistant board or
 - Resilient mount secured through the fire-resistant board or
 - Suspended ceiling systems secured through the fire-resistant board
 - Refer to Figure 2
 - The false ceiling system can also be supported by the timber floor joists and floor panels via 6mm threaded rods, where the rods penetrate the fire-resistant plasterboard and
 - The gaps between the rod and the boards shall be sealed by HB Fuller Firesound sealant or
 - The gaps between the rod and the boards shall be sealed by HB Fuller Firesound s and
 - A 25mm layer of non-combustible mineral or glass fibre layer is fitted over the ceiling or,
 - Concentric steel sleeves of 25mm high with a nominal 25mm internal diameter are fitted around threaded rods where they penetrate the plasterboard ceiling
 - Refer to Figure 3-6
- The proposed construction is as shown in Figures 1- 6 and Table 1

Table 1 Schedule of components for Sections 3.1 and 3.2

ID	Description	
1	Name	Floor-ceiling system - primary structural elements
	Size	One or a combination of the following elements • Solid metal web beams – TecBeam • Metal Strut web beams - MiTek PosiTruss (MiTek PosiStrut) and Pryda Span Truss • Timber web I-joists - Wesbeam “e-Joist” • Floor trusses with nail plate connections - Pryda Longreach floor truss • Roof/floor truss configurations (on edge) with nail plate connections • Solid timber joists • Glue laminated timber and Laminated Veneer Lumber (LVL) joists – (Resorcinol adhesive)
	Specification	Depth and span of primary structural element may be increased provided it is designed in accordance with AS 1720.5-2015 or AS 1720.1-2010 by an accredited structural engineer as appropriate.
2	Name	Fire resistant plasterboard for 90 minute application
	Size	2 layers of 16mm thick Firestop or other proprietary fire-resistant plasterboard that has been tested or assessed with two 16mm layers for an FRL of 90/90/90 and Resistance to the Incipient Spread of Fire (RISF) of 60 minutes when protecting a timber floor system with a cavity/plenum depth of 288mm or less. The plasterboard lining shall be fixed to the floor joists (Item 1) via a ceiling suspension system (Item 4)
3	Name	Fire resistant plasterboard for 120 minute application
	Size	3 layers of 16mm thick Firestop or other proprietary fire-resistant plasterboard that has been tested or assessed with three 16mm layers for an FRL of 120/120/120 and Resistance to the Incipient Spread of Fire (RISF) of 120 minutes when protecting a timber floor system with a cavity/plenum depth of 288mm or less. The plasterboard lining shall be fixed to the floor joists (Item 1) via a ceiling suspension system (Item 4)
4	Name	Ceiling suspension system
	Details	The ceiling suspension systems shall be designed to support the loads expected to be applied by the ceiling lining (Items 2 or 3) and any insulation and other fixtures. The framing and support system for the ceiling battens shall include any combination of the following when installed at the maximum 600mm centres; • 16mm or 28mm deep × min. 0.55mm thick galvanised steel • Min. 0.94mm thick Galvanised steel fixing system of one of the following ○ Direct fixing clips or ▪ Resilient mounts options ▪ M237R Direct Fix Furring Channel resilient mount (Studco) or ▪ Furring Channel resilient mount (Rondo) or ▪ Furring Channel resilient mount (Gyprock) or ○ Upgraded resilient mounts options ▪ Rondo WHI Rubber Hanger Isolator (Green) or ▪ Rondo WHI Rubber Hanger Isolator (Red) or ▪ Rondo WHI Rubber Hanger Isolator (White) or ▪ M50R-BLK Resilient Isolation Hanger (Studco) • Suspended ceiling systems with cross rails

ID	Description	
5	Name	Insulation for floor-ceiling cavity
	Details	Optional Non-combustible mineral fibre or glass wool up to maximum floor-ceiling cavity depth.
	Installation	It is required that the cavity insulation be friction fitted between the joists and furring channel systems for direct fixed systems and shall be laid over the furring channels for suspended ceiling systems.
6	Name	Flooring
	Size	Flooring on top of the joists (Item 1) shall comprise one of the following: • Particleboard with minimum thickness of 18mm or • Engineered flooring with minimum thickness of 15mm or • Cement sheet or calcium silicate sheet with minimum thickness of 15mm or • Plywood with minimum thickness of 15mm or • Tongue and groove timber flooring with minimum thickness of 15mm or • AAC panel with minimum thickness of 50mm or • Concrete or sand / cement screed cast over plywood or particleboard with a minimum thickness of 50mm. Flooring (Item 1) may have one of the following additional coverings: • Carpet • Tile • Stone Various acoustic treatments
	Installation	Flooring shall have butt joints staggered by 1000mm over the central joists. The flooring is screw fixed to joists using 8g × 40mm long Bugle head, coarse thread screws at nominal 300mm centres. A minimum of 288mm cavity/plenum depth (distance from upper surface of ceiling lining (Items 2 or 3) to underside of plywood flooring) is required.
7	Name	HB Fuller Firesound sealant
	Installation	Location of application • Maximum 10mm gap between ceiling lining (Items 2 or 3) and adjacent fire rated wall to full depth of ceiling lining (Items 2 or 3). • To seal off any area where furring channels/battens supporting false ceiling (item 7) is fixed through the ceiling lining (item 2 or 3). • Where 6mm threaded rods supporting for false ceiling (item 7) penetrates the fire-resistance ceiling lining (Items 2 or 3), the gaps between the rod and the fire-resistance plasterboard shall be sealed by a fire-resistant sealant to full depth of fire-resistance plasterboard.

ID	Description	
8	Name	Non-fire rated decorative false ceiling system
	Installation	A non-fire rated decorative false ceiling system may be optionally below the floor-ceiling systems. The fixing method and support system of the non-fire rated decorative false ceiling are as per the two options below. - The floor-ceiling systems is via the ceiling furring channels/battens (Item 5) and they have been designed to support the loads at ambient conditions. The fixing method and support system of the non-fire rated decorative false ceiling to the floor-ceiling systems shall be one of the following - Direct fixing clips secured through the fire-resistant board (Items 2 or 3) or - Resilient mount secured through the fire-resistant board (Items 2 or 3) or - Suspended ceiling systems secured through the fire-resistant board (Items 2 or 3) - Alternative the fixing method and support system of the non-fire rated decorative false ceiling to the timber trusses and floor panels via 6mm threaded rods, where the rods penetrate the fire-resistant plasterboard and - The gaps between the rod and the boards shall be sealed by a fire-resistant sealant for systems or - The gaps between the rod and the boards shall be sealed by a fire-resistant sealant for systems and - A 25mm layer of non-combustible mineral or glass fibre layer is fitted over the ceiling or - Concentric steel sleeves of 25mm high with a nominal 25mm internal diameter are fitted around threaded rods where they penetrate the plasterboard ceiling Fire rated sealant (item 7) to seal any area where furring channels/battens for false ceiling is fixed through the ceiling lining (item 2 or 3). Refer to Figure 2 Fire rated sealant (item 7) to seal any area where furring channels/battens for false ceiling is fixed through the ceiling lining (item 2 or 3). Refer to Figure 3-6

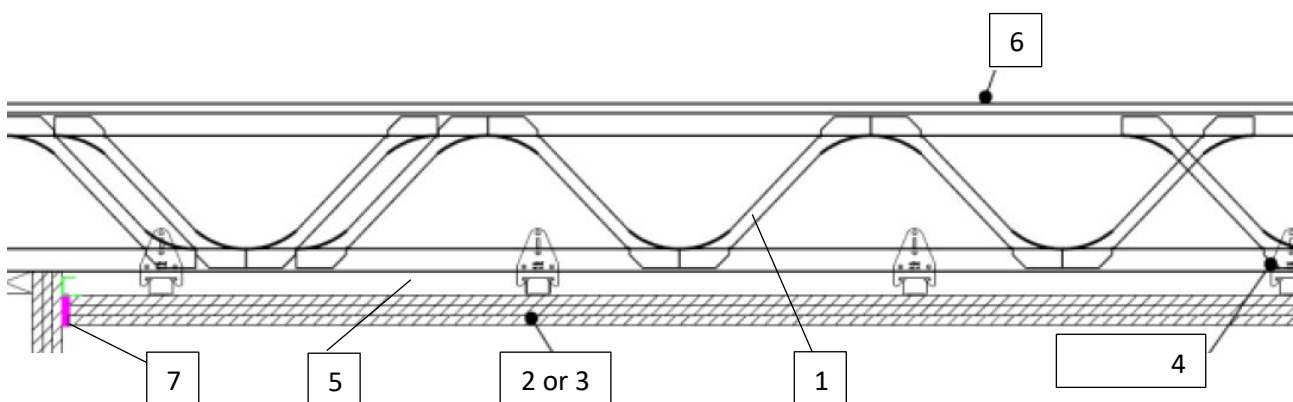


Figure 1: Floor-ceiling system without a false ceiling (Elevation view) showing MiTek Joist, other joist systems as per Table 1 item 1 are similarly arranged

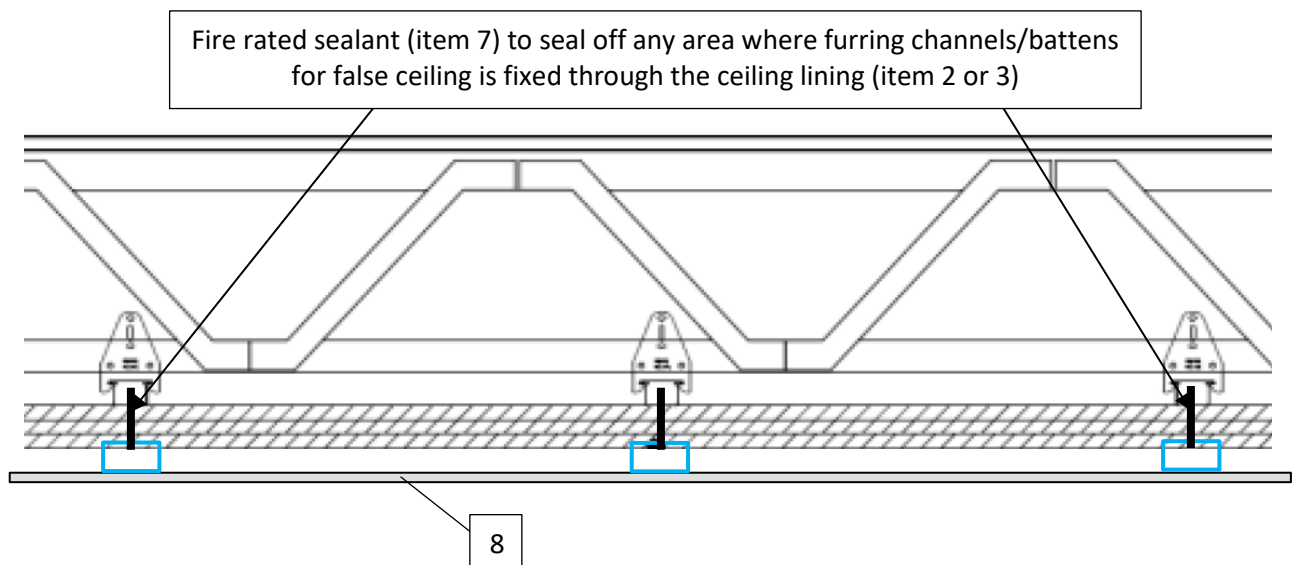


Figure 2: Floor-ceiling system with a false ceiling beneath fixed to Ceiling suspension systems. Refer to Figure 1 for Floor-ceiling system detail.

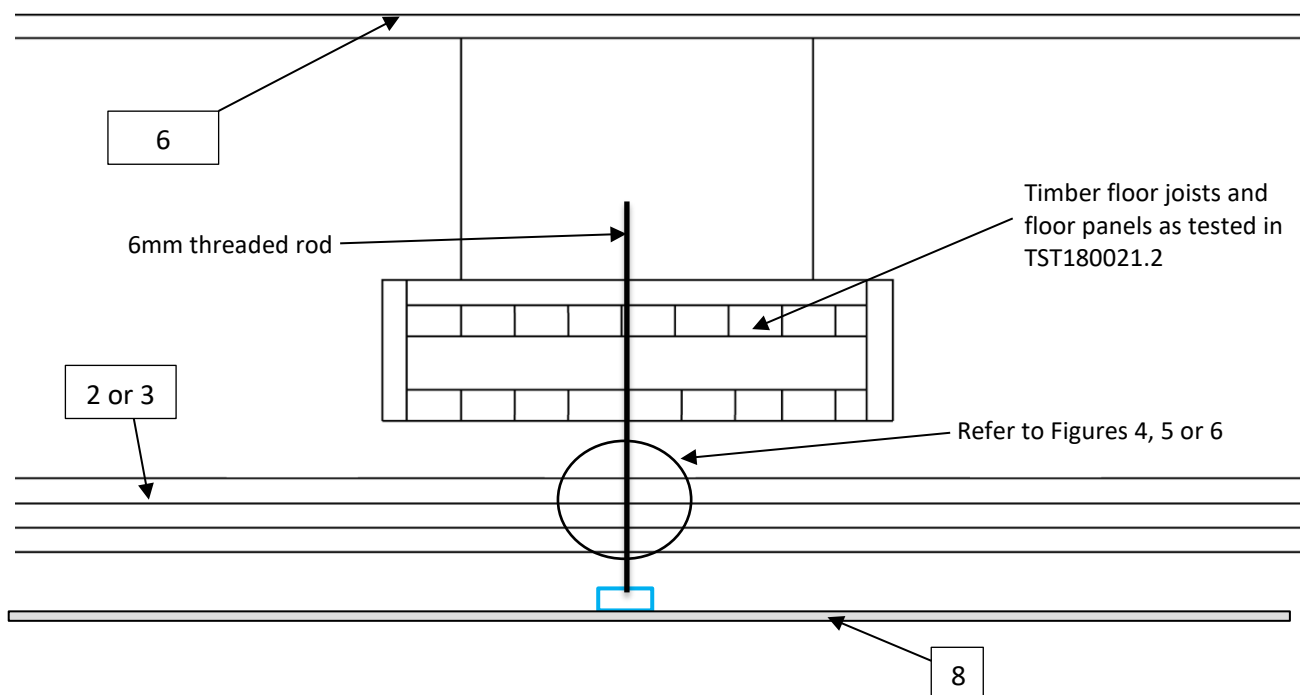


Figure 3: Floor-ceiling system with a false ceiling beneath supported by the timber floor joists and floor panels. Ceiling suspension systems not shown, refer to Figure 1 for Floor-ceiling system detail

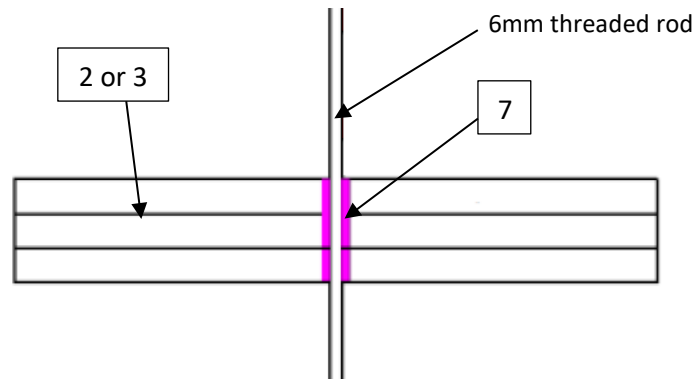


Figure 4: Additional sealant protection for floor-ceiling system with a false ceiling beneath

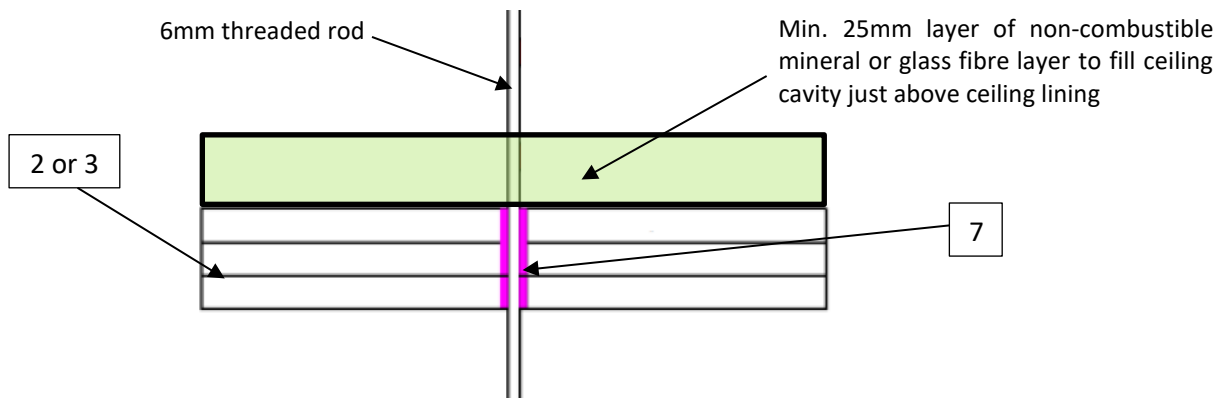


Figure 5: Additional sealant and ceiling insulation protection for floor-ceiling system with a false ceiling beneath

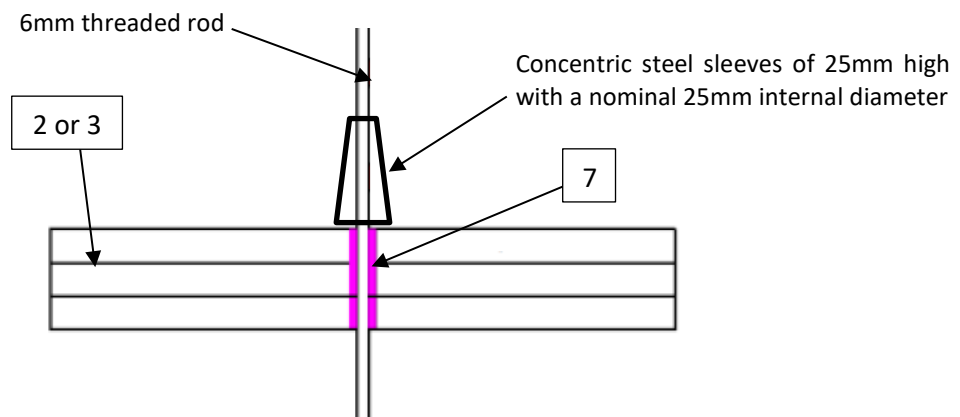


Figure 6: Additional sealant and steel sleeves protection for floor-ceiling system with a false ceiling beneath

4 Referenced Standards

Standards:

AS 1530.4-2014	Methods for fire tests on building materials, components and structures Part 4: Fire-resistance tests of elements of building construction, Section 4.
AS 1720.4-2019	Timber Structures Part 4: Fire-resistance of timber elements
AS 1170.0 - 2002	Structural Design Actions

5 Conclusion

On the basis of the analysis presented in the referenced report, it is the opinion of this Accredited Testing Laboratory that the tested prototypes described in Section 2 when varied as described in Section 3 will achieve the Fire-resistance stated below when submitted to a standard fire test in accordance with the test methods referenced in Section 4 and subject to the requirements of Section 7, the validity of Section 8 and limitation of Section 9.

Table 2: Performance of ceiling systems

Floor-ceiling System	Ceiling plasterboard lining	False ceiling	Construction details	FRL	RISF
1	2 × 16mm Boral USG Firestop or other proprietary fire-resistant plasterboard that has been tested or assessed with two 16mm layers for an FRL of 90/90/90 and Resistance to the Incipient Spread of Fire (RISF) of 60 minutes when protecting a timber floor system.	Nil	Figure 1 Table 1	90/90/90	60 minutes
		Present	Figures 1, 2 Table 1	90/90/90	60 minutes
2	3 × 16mm Boral USG Firestop or other proprietary fire-resistant plasterboard that has been tested or assessed with three 16mm layers for an FRL of 120/120/120 and Resistance to the Incipient Spread of Fire (RISF) of 120 minutes when protecting a timber floor system.	Nil	Figure 1, 2 Table 1	120/120/120	120 minutes
		Present	Figures 1-3, 5, 6 Table 1	120/120/120	120 minutes
			Figures 1-3 and 4 Table 1	120/120/120	90 minutes

6 Direct Field of Application of Results

The results of this assessment are applicable to floor-ceiling construction when exposed to fire from below.

7 Requirements

It is required that the wall supporting construction is tested or assessed or designed to achieve the required FRL in accordance with AS 1530.4 - 2014.

It is required that the flooring and floor joists or floor slab to be designed to support the applied dead and live loads expected to be applied by the flooring.

Any other variations with respect to size, and construction details that are other than those identified in this report, may invalidate the conclusions drawn in this report.

8 Term of Validity

This assessment report will lapse on 31st May 2030. Should you wish us to re-examine this report with a view to the possible extension of its term of validity, would you please apply to us three to four months before the date of expiry. This Division reserves the right at any time to amend or withdraw this assessment in the light of new knowledge.

9 Limitations

The conclusions of this assessment report may be used to directly assess the fire-resistance performance under such conditions, but it should be recognised that a single test method will not provide a full assessment of the fire hazard under all fire conditions.

Because of the nature of fire-resistance 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 report does not provide an endorsement by CSIRO of the actual products supplied to the industry. The referenced assessment can therefore only relate to the actual prototype test specimens, testing conditions and methodology described in the supporting data, and does not imply any performance abilities of constructions of subsequent manufacture.

This assessment is based on information and experience available at the time of preparation. The published procedures for the conduct of tests and the assessment of test results are the subject of constant review and improvement and it is recommended that this report is reviewed on or, before, the stated expiry date.

The information contained in this assessment report shall not be used for the assessment of variations other than those stated in the conclusions above. The assessment is valid provided no modifications are made to the systems detailed in this report. All details of construction should be consistent with the requirements stated in the relevant test reports and all referenced documents.

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