INFRASTRUCTURE TECHNOLOGIES
www.csiro.au

Fire performance of various timber-framed and massive timber panel systems

Short Form Assessment Report

Author: **Keith Nicholls**

Report number: Short Form FCO 3600

Date: 26/11/2025

Client: Forest and Wood Products Australia Limited

Inquiries should be addressed to:

Fire Testing and Assessments	Author	The Client
NATA Accredited Test Laboratory 14 Julius Avenue North Ryde, NSW 2113	Infrastructure Technologies 14 Julius Avenue North Ryde, NSW 2113 Telephone +61 2 9490 5450	Forest and Wood Products Australia Limited Suite 6.03, Level 6 36 Wellington Street Collingwood VIC 3061 Telephone 0407 874 901

Report Details:

Report CSIRO Reference number: FCO 3600/CO5955

Report Status and Revision History:

VERSION	STATUS	DATE	DISTRIBUTION	ISSUE NUMBER
Initial Issue	Final	26/11/2025	CSIRO/Client	Short Form FCO 3600

Report Authorization:

AUTHOR	REVIEWED BY	AUTHORISED BY
Keith Nicholls	**Jing Xu**	**Keith Nicholls**
		
26/11/2025	26/11/2025	26/11/2025

Copyright and disclaimer

Important disclaimer

CSIRO advises that the information contained in this publication comprises general statements based on scientific research. The reader is advised and needs to be aware that such information may be incomplete or unable to be used in any specific situation. No reliance or actions must, therefore, be made on that information without seeking prior expert professional, scientific and technical advice. To the extent permitted by law, CSIRO (including its employees and consultants) excludes all liability to any person for any consequences, including but not limited to all losses, damages, costs, expenses and any other compensation, arising directly or indirectly from using this publication (in part or in whole) and any information or material contained in it.

Contents

1 Introduction

This short form report refers to an assessment report FCO 3600 titled “fire performance of various timber-framed and massive timber panel systems.”

The National Construction Code (NCC) 2019 and 2022 permits the use of timber structural elements in mid-rise buildings and introduces the concept of fire-protected timber. This report assesses the performance of variations to basic wall and floor ceiling systems that otherwise comply with the requirements for fire-protected timber when elements interface with other forms of construction, have additional coverings applied or are penetrated by services or fire doors.

This assessment expresses the RISF, t250(mins.) and t300 (mins.) performances of the proposed construction based on the NCC Specification C1.13a - Fire protected timber.

In addition this assessment expresses the RISF, t250(mins) and t300 (mins) performance of the proposed construction based on the NCC 2022 S10C2 (b) (i) for fire protected timber and S10C3 (b) (i) for massive timber as shown below.

For fire protected timber joist floor ceiling, RISF is the time when exposed face temperature within the floor ceiling cavity exceeds the 250°C criteria in AS 1530.4-2014 section 4.

For fire protected timber framed wall, t250 (mins.) is defined in this report to mean “the time when exposed face temperature within the wall cavity exceeds 250°C”.

For massive timber walls and floor ceiling, t300 (mins) is defined in this report to mean “the time when the temperature at the interface between the protection system and the timber exceeds 300°C”.

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 reference assessment 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 subject to the requirements, validity and limitations of Sections 7, 8 and 9 of this report.

2 Supporting Data

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

Table 1: Primary test data

Report Reference	Test Standard	Outline of Test Specimen
FSV 187	AS 1530.4-1990	A fire-resistance test on a loadbearing timber-stud plasterboard-lined wall.
FSV 189	AS 1530.4-1990	A fire-resistance test on a loadbearing timber-stud plasterboard-lined wall.
FSH 0204	AS 1530.4-1990	A fire-resistance test on a loadbearing timber-stud plasterboard-lined floor ceiling system.
FSH 0205	AS 1530.4-1990	A fire-resistance test on a loadbearing timber-stud plasterboard-lined floor ceiling system.

Table 2: Supplementary test data

Report Reference	Test Standard	Outline of Test Specimen
BWA 2264907.1	AS 1530.4-2005	A fire-resistance test on a non-loadbearing steel-stud plasterboard-lined wall.
EWFA 32190200.1	AS 1530.4-2005	A fire-resistance test on a loadbearing steel-stud plasterboard-lined wall.
FSV 2239	AS 1530.4-2014	A fire-resistance test on a non-loadbearing steel-stud plasterboard-lined wall.
FSV 2256	AS 1530.4-2014	A fire-resistance test on a non-loadbearing steel-stud plasterboard-lined wall.
FP 15810-01-1	AS 1530.4-2014	A fire-resistance test on a non-loadbearing steel-stud plasterboard-lined wall.
FP 15810-03-1	AS 1530.4-2014	A fire-resistance test on a non-loadbearing steel-stud plasterboard-lined wall.
FSV 2104	AS 1530.4-2014	A fire-resistance test on a non-loadbearing steel-stud plasterboard-lined wall.
FRT 220022	AS 1530.4-2014	A fire-resistance test on a loadbearing steel-stud plasterboard-lined ceiling.
FRT 220023	AS 1530.4-2014	A fire-resistance test on a loadbearing steel-stud plasterboard-lined ceiling.
FRT 220028	AS 1530.4-2014	A fire-resistance test on a loadbearing timber-stud plasterboard-lined floor ceiling system.
FRT 220225	AS 1530.4-2014	A fire-resistance test on a non-loadbearing steel-stud plasterboard-lined shaft wall.

The referenced tests FSV 187, FSV 189, FSH 0204, FSH 0205, FSV 2104, FSV 2239, FSV 2256 were carried out at this testing facility and were sponsored by CSR Building Product Pty Ltd and permission has been obtained from the sponsor of the above reports to reference the data.

The referenced tests FSV 2104 was carried out at this testing facility and was sponsored by Knauf Plasterboard Pty Ltd and permission has been obtained from the sponsor of the above reports to reference the data.

The referenced test BWA 2264907.1 was carried out at Bodycote Warringtonfire, Victoria and was sponsored by Lafarge Plasterboard and permission has been obtained from the sponsor of the above reports to reference the data.

The referenced tests FRT 220022, FRT 220023 and FRT 220225 were carried out at Warringtonfire Australia, Victoria and were sponsored by CSR Building Product Pty Ltd and permission has been obtained from the sponsor of the above reports to reference the data.

The referenced tests FRT 220028, EWFA 32190200.1 were carried out at Warringtonfire Australia, Victoria and were sponsored by Forest and Wood Products Australia Limited.

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 specimens as identified above.

3 Proposed Minor Variations

The proposed construction comprises timber framed walls and floor ceiling systems protected with fire grade plasterboard as tested in FSV 187, FSV 189, FSH 0204 and FSH 0205 with consideraton of the following variations

- Variation to framing, layers of plasterboard and cavity insulation, adjacent wall construction as presented in Sections 3.1 to 3.13 below and Table 3.

Table 3: Schedule of components

<table>
<tr><th>Item No.</th><th>Item name</th><th>Detail</th></tr>
<tr><td>1</td><td>Wall or floor ceiling framing</td><td>Timber framed wall
Shall contain solid timber or engineered timber frames and shall be tested or assessed to achieve the required FRL of at least 90/90/90 or 120/120/120 based on design when protected with fire-protective grade plasterboard (Item 2).

Timber floor ceiling construction
Shall contain solid timber (Item 5), timber trusses with metal plates, timber trusses with metal webs, engineered joists with metal or OSB webs, and shall be tested or assessed to achieve the required FRL of at least 90/90/90 or 120/120/120 based on design when protected with fire-protective grade plasterboard (Item 2). If a cavity is present, it shall be fully filled with Non-combustible cavity insulation (Item 4).</td></tr>
<tr><td>2</td><td>Fire grade plasterboard for fire protected timber</td><td>Material
Fire grade plasterboard
Size
At least the following lining thicknesses depending on the required FRL:
2, 3 or 4 layers of 13mm or 16mm thickness, or
1 x 13mm plus 1 x 16mm in any order
Installation
Linings shall be installed in accordance with the test or assessed system of the product.</td></tr>
<tr><td>3</td><td>Fire grade plasterboard for massive timber</td><td>Material
Fire grade plasterboard
Size<table><tr><th>Lining thicknesses depending on the required FRL</th><th>Possible Application</th></tr><tr><td>1x13mm or greater</td><td>Inside a fire-isolated stairway or lift shaft</td></tr><tr><td>2x13mm or greater</td><td>External walls within 1 m of an allotment boundary or 2 m of a building on the same allotment</td></tr><tr><td>1x16mm or greater</td><td>All other applications</td></tr></table>Installation
Linings shall be installed in accordance with the test or assessed system of the product.</td></tr>
<tr><td>4</td><td>Non-combustible cavity insulation</td><td>Material
Insulation that meets the NCC 2022 requirements for non-combustibility.</td></tr>
</table>

Item No.	Item name	Detail
5	**Massive timber**	**Size** Timber panel not less than 75 mm thickness and formed from chemically bonded laminated timber. This includes: • (a) Cross laminated timber (CLT) • (b) Laminated veneer lumber (LVL) • (c) Glued laminated timber (Glulam)
6	**Masonry wall**	Masonry wall shall be tested or assessed for the required FRL of at least 120/120/120
7	**External cladding**	Non-combustible external cladding comprising non-combustible components
8	**Additional lining**	**Material** Materials for the additional wall and ceiling linings must comply with applicable NCC 2019 and NCC 2022 requirements (e.g. requirements for wall and ceiling lining systems must be satisfied) **Application** Additional wall and ceiling lining systems that are not required to contribute to the fire resistance of the element of construction (e.g. decorative linings which conceals services)
9	**Flooring**	**Installation** Flooring shall be installed in accordance with the test or assessment report for the required FRL.
10	**Fire Protected Timber system**	Fire-protected timber system shall be tested or assessed for the required FRL. If a cavity is present, it shall be fully filled with Non-combustible cavity insulation (Item 4).
11	**Shaftwall construction**	Shaftwall constructions and fixing details shall be tested or assessed for the required FRL
12	**Fire door assembly**	Fire door assembly and fixing details shall be tested or assessed for the required FRL
13	**Solid timber cavity barrier framing**	Minimum 45mm thick non-loadbearing solid timber cavity barrier framing protecting the cavity opening around the door.
14	**Lift landing door assembly**	Lift landing door assembly and fixing details shall be tested or assessed for the required FRL and installed in accordance with the lift door and shaft wall supplier instructions.
15	**Service Penetrations**	Service penetration shall be tested or assessed for the required FRL
16	**Mineral fibre packing**	Non-combustible mineral fibre packing that may be used for fire damper penetration seal or proprietary fire damper penetration seals shall be tested or assessed as a part of a damper installation system for the required FRL
17	**Mechanical fire damper**	Mechanical fire damper shall be tested or assessed for required FRL.
18	**Access panel system**	Proprietary access panel system shall be tested or assessed for the required FRL and not detrimentally affecting the FRL of the element they are installed within. Access panel providing access to ceiling cavities, is required to that it is tested or assessed for an RISF of at least 45minutes. Access panel providing access to providing access to wall cavities, it is required to that it is tested or assessed for a t250(mins.) at least 45 minutes.
19	**Fire rated sealant**	The fire rated sealant filled to full depth of the plasterboard lining protecting pipe or cable service penetrations through plasterboard elements. The protected system shall be tested or assessed for an FRL of at least -/120/- .

3.1 Timber framed fire grade plasterboard walls and floor ceiling system

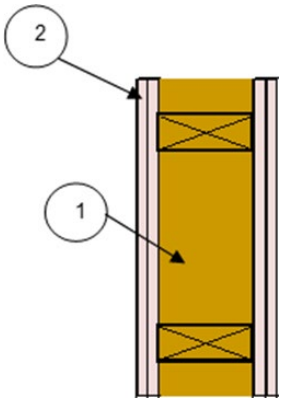

Figure 1 – Timber framed wall system with Single stud – Section view

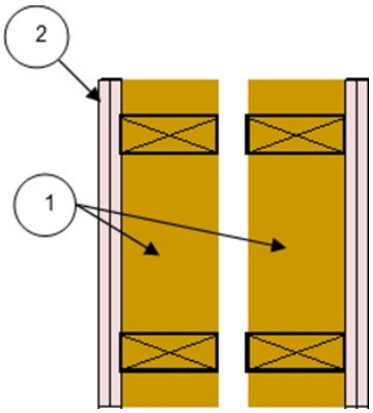

Figure 2 – Timber framed wall system with Double stud – Section view

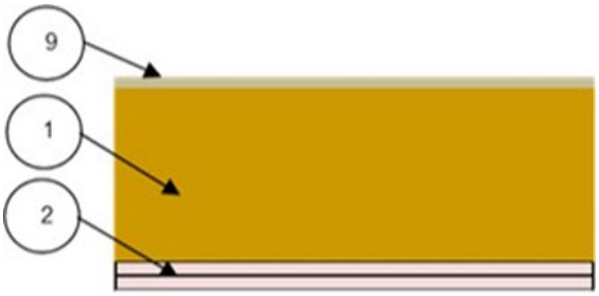

Figure 3 – Timber framed floor ceiling system with fire grade lining fixed directly to the joist – Section view

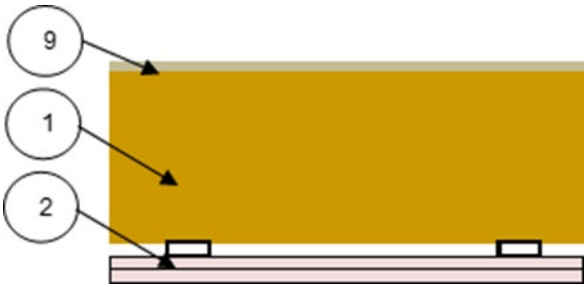

Figure 4 – Timber framed floor ceiling system with fire grade lining fixed to furring channels that are suspended or clip fixed to the joist – Section view

3.2 Massive timber framed fire grade plasterboard walls and floor ceiling system

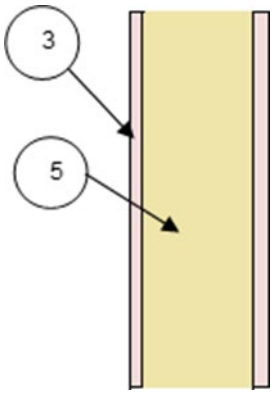

Figure 5 – Massive timber panel with single skin – Section view

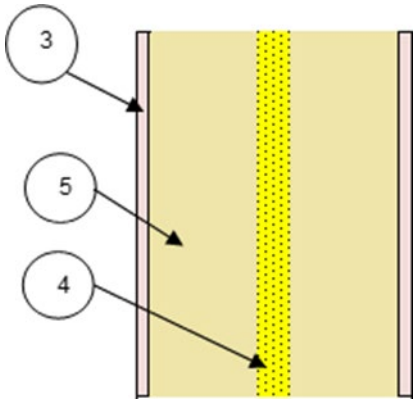

Figure 6 – Massive timber panel with double skin – Section view

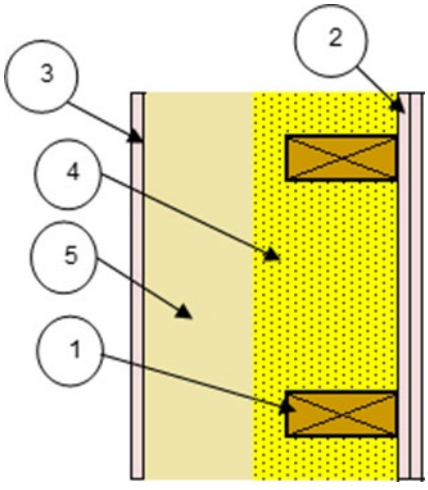

Figure 7 – Combination of massive timber panel and timber framed wall – Section view

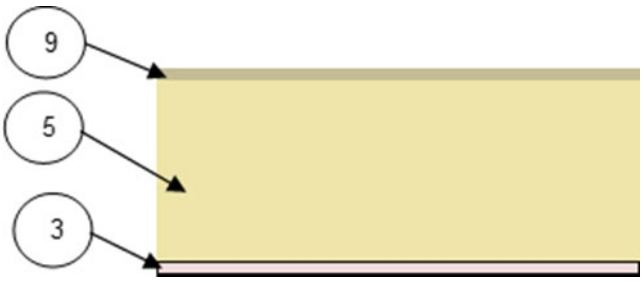

Figure 8 – Massive timber floor ceiling system with fire grade lining fixed directly to the massive timber – Section view

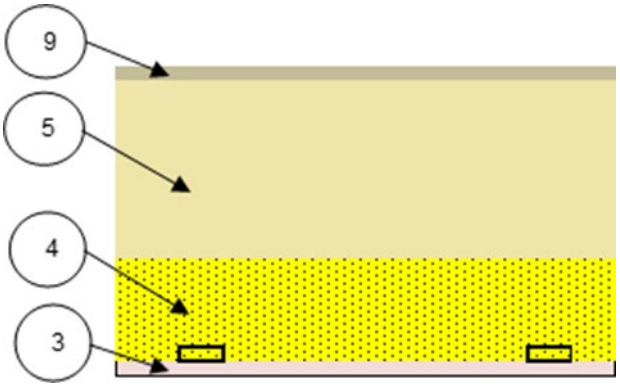

Figure 9 – Massive timber floor ceiling system with fire grade lining fixed to furring channels that are suspended or clip fixed to the massive timber – Section view

3.3 Timber framed fire grade plasterboard walls and floor ceiling system with additional linings

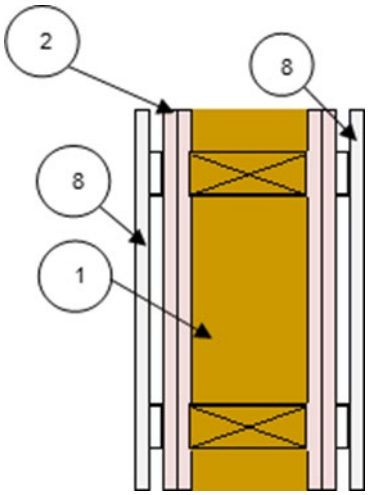

Figure 10 – Timber framed single stud wall with non-fire grade linings – Section view

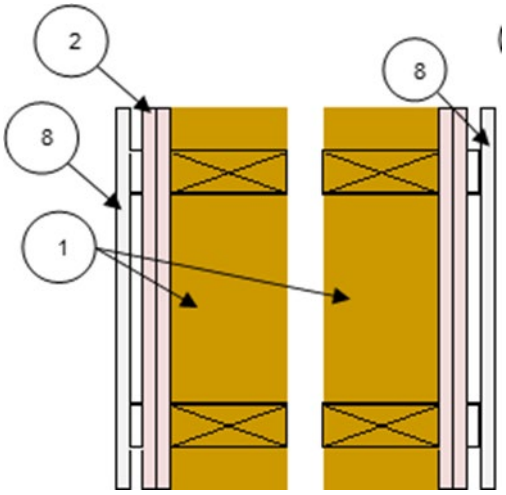

Figure 11 – Timber framed double stud wall with non-fire grade linings – Section view

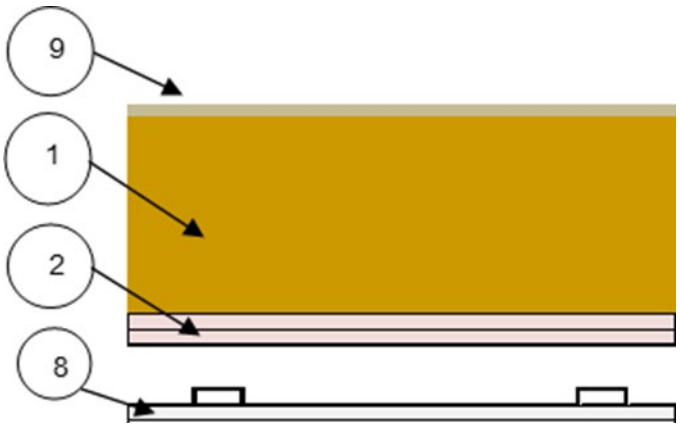

Figure 12 – Timber framed floor ceiling system with fire grade lining directly fixed to the joist and including optional a suspended decorative ceiling – Section view

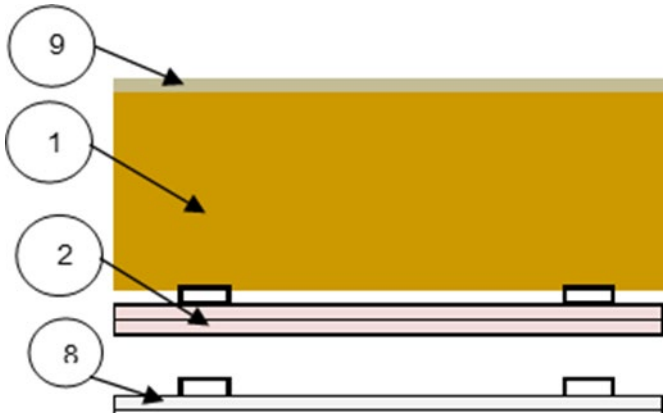

Figure 13 – Timber framed floor ceiling system with fire grade lining fixed to furring channels that are suspended or clip fixed to the joist and including optional suspended decorative ceilings – Section view

3.4 Massive timber framed fire grade plasterboard walls and floor ceiling system with additional plasterboard lining

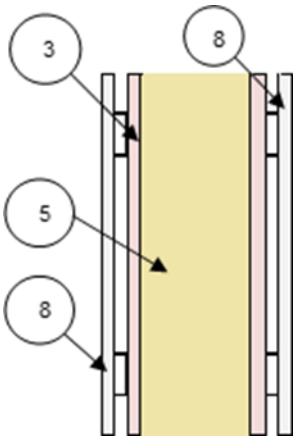

Figure 14 – Massive timber panel with single skin incorporating non-fire grade lining – Section view

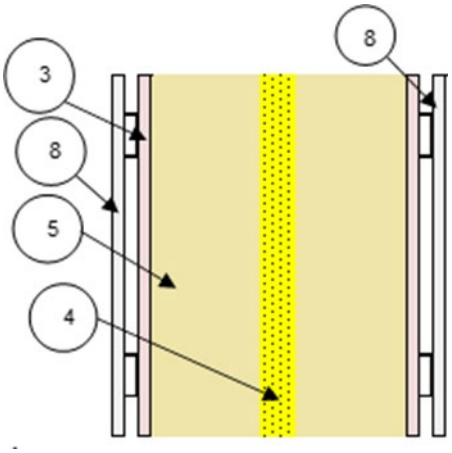

Figure 15 – Massive timber panel with double skin incorporating non-fire grade linings – Section view

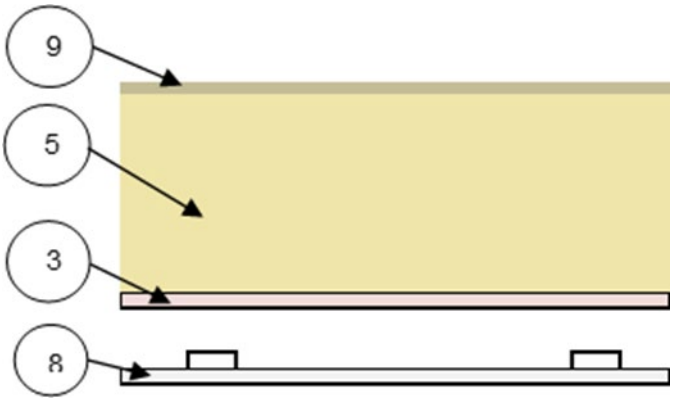

Figure 16 – Massive timber floor ceiling system with fire grade lining directly fixed to the massive timber and including optional a suspended decorative ceiling – Section view

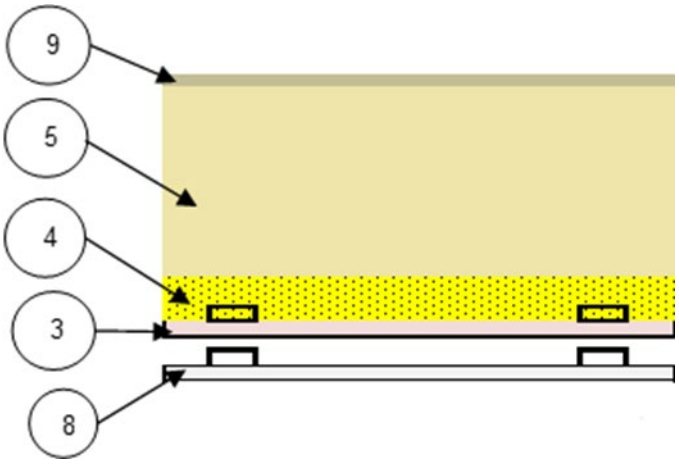

Figure 17 – Massive timber framed floor ceiling system with fire grade lining fixed to furring channels that are suspended or clip fixed to massive timber and including optional suspended decorative ceiling – Section view

3.5 Timber and massive timber framed fire grade plasterboard walls with various external cladding

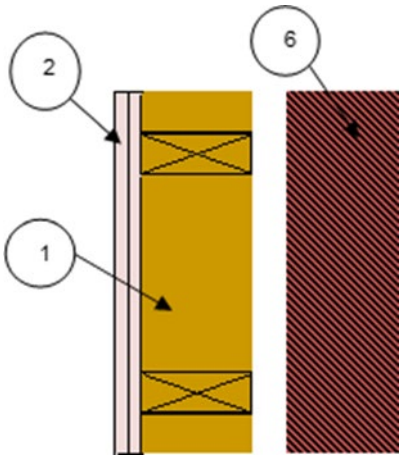

Figure 18 – External brick wall (or equivalent) with timber framed wall – Section view

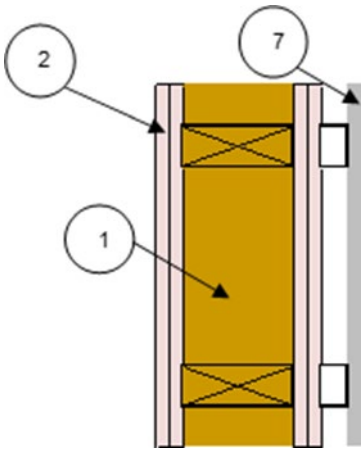

Figure 19 – External timber framed wall with non-fire grade cladding – Section view

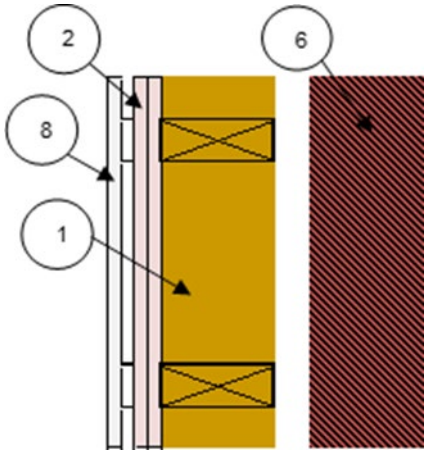

Figure 20 – External brick wall (or equivalent) with timber framed wall incorporating non-fire grade lining and cladding – Section view

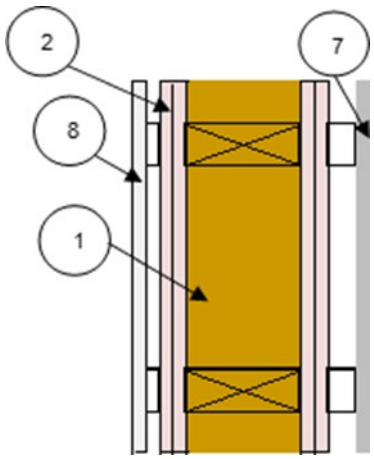

Figure 21 – External timber framed wall with non-fire grade lining and cladding – Section view

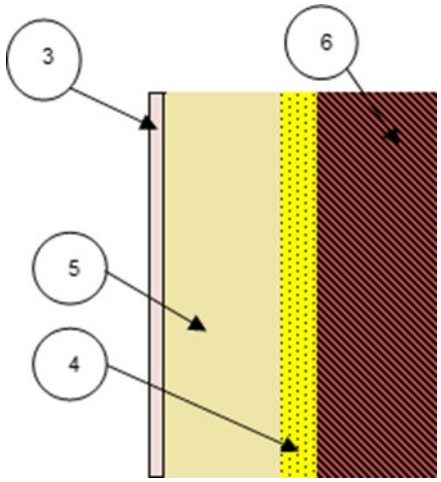

Figure 22 – External brick wall (or equivalent) with massive timber wall system – Section view

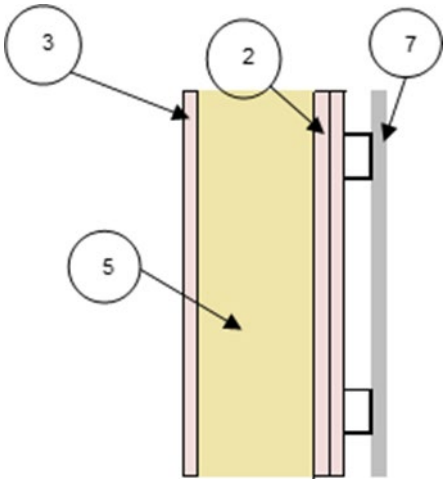

Figure 23 – Massive timber wall system with non-fire grade cladding – Section view

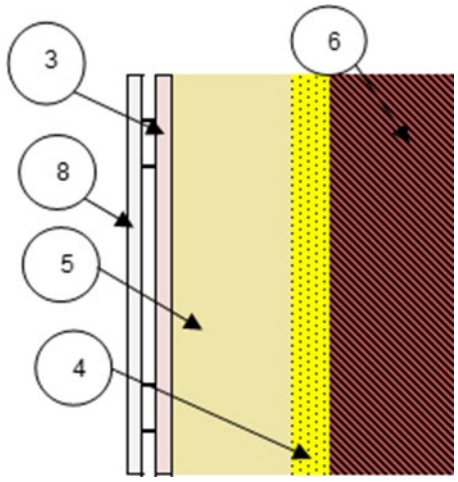

Figure 24 – External brick wall (or equivalent) with massive timber wall system incorporating non-fire grade lining and cladding – Section view

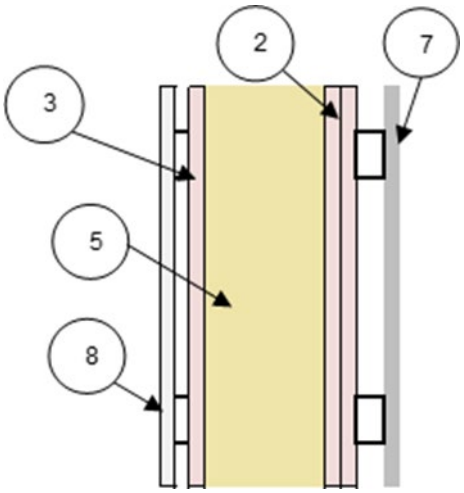

Figure 25 – Massive timber wall system with non-fire grade lining and cladding – Section view

3.6 Timber and massive timber framed fire grade plasterboard walls and floor ceiling system interface with shaftwall

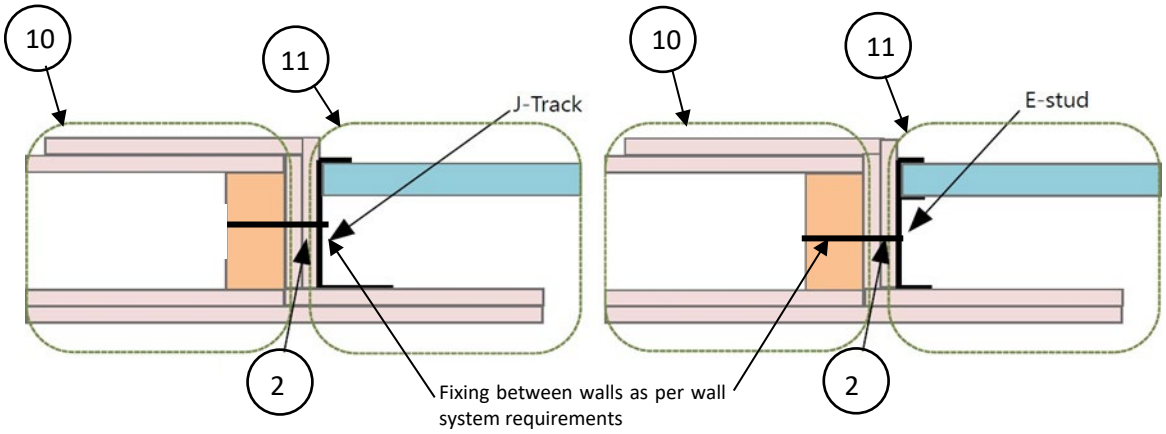

Figure 26 – Steel stud shaft wall in parallel interface with single stud timber partition – Plan view

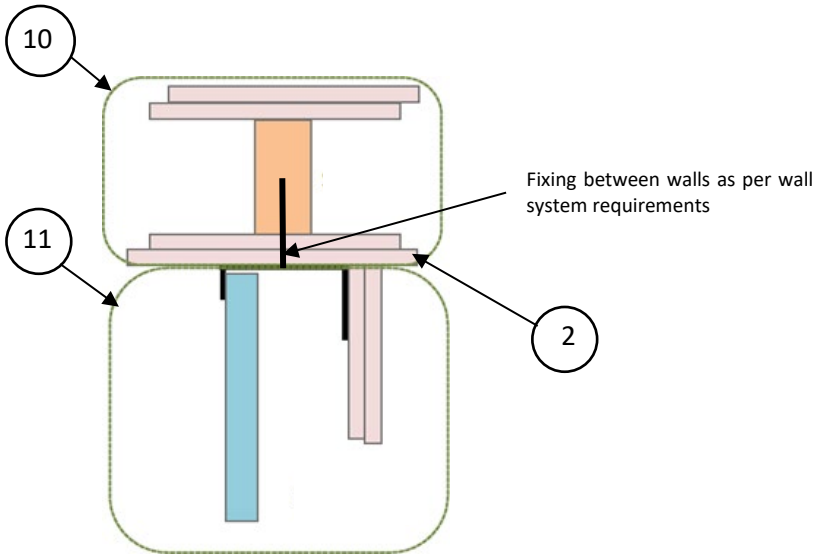

Figure 27 – Steel stud shaft wall perpendicular interface with single stud timber partition – Plan view

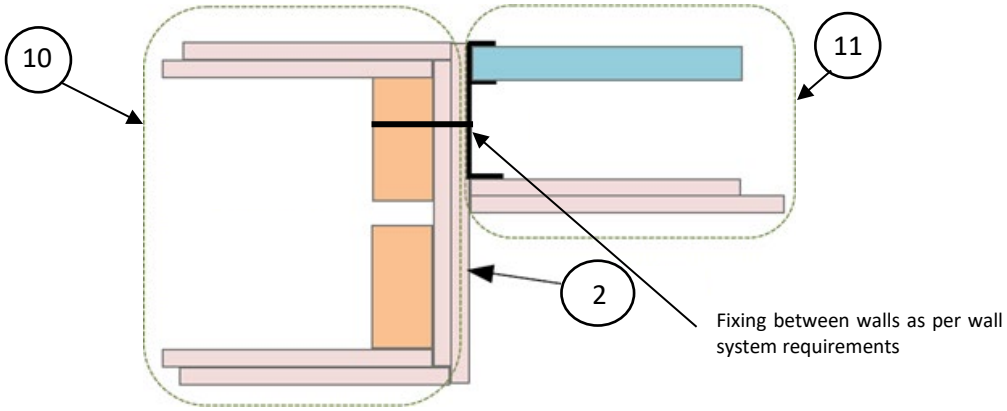

Figure 28 - Steel stud shaft wall parallel interface with double stud timber partition – Plan view

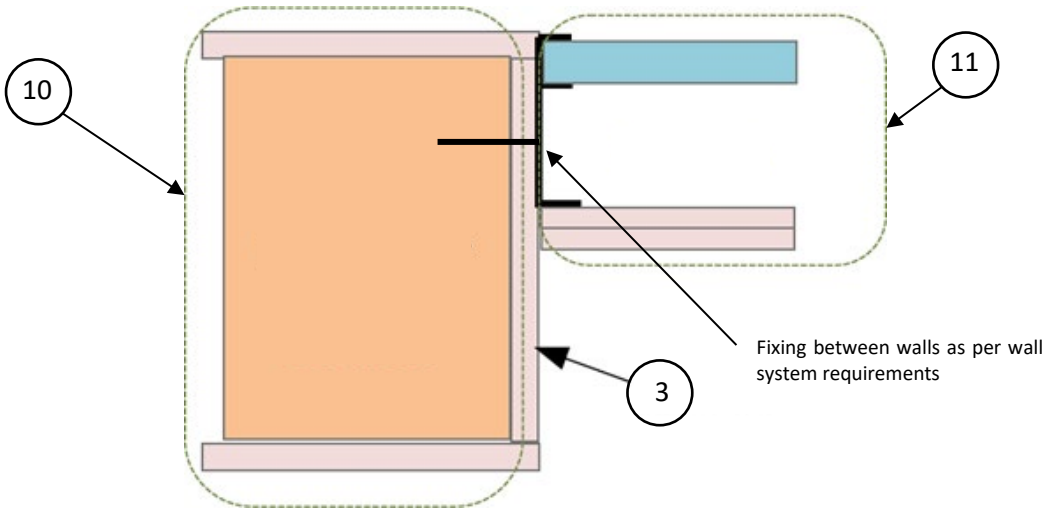

Figure 29 - Steel stud shaft wall parallel interface with massive timber wall – Plan view

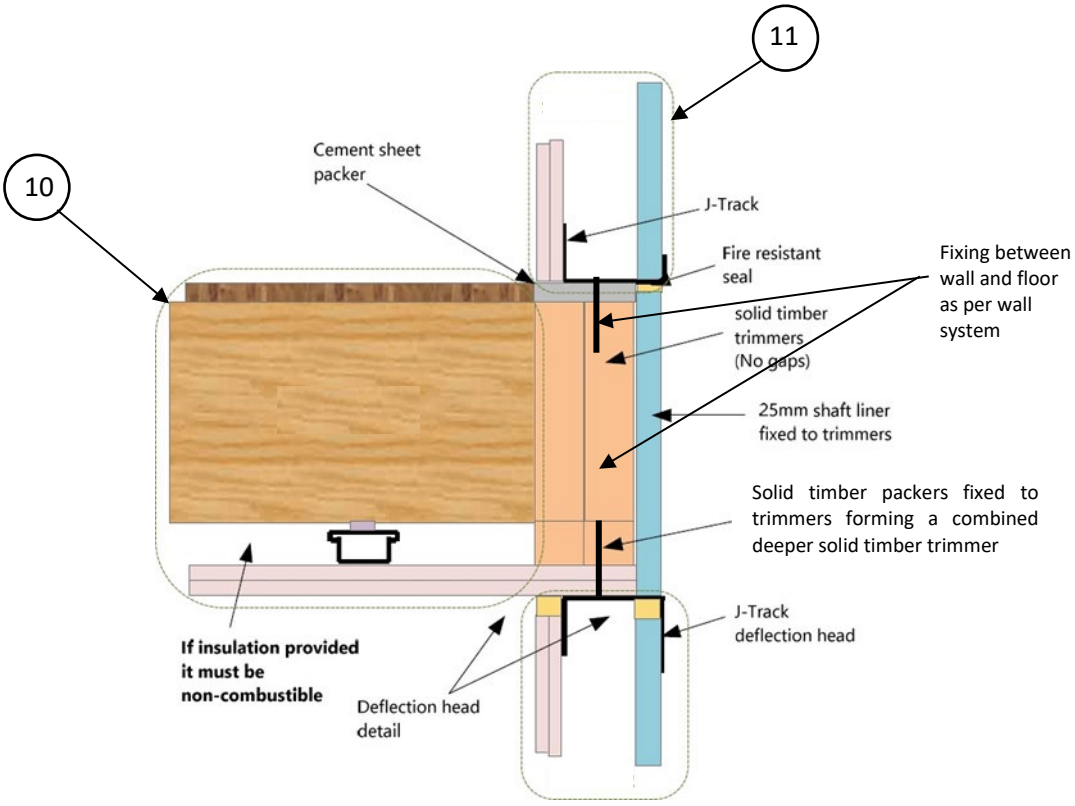

Figure 30 - Steel stud shaft wall interface with timber floors maintaining shaft continuity – Section view

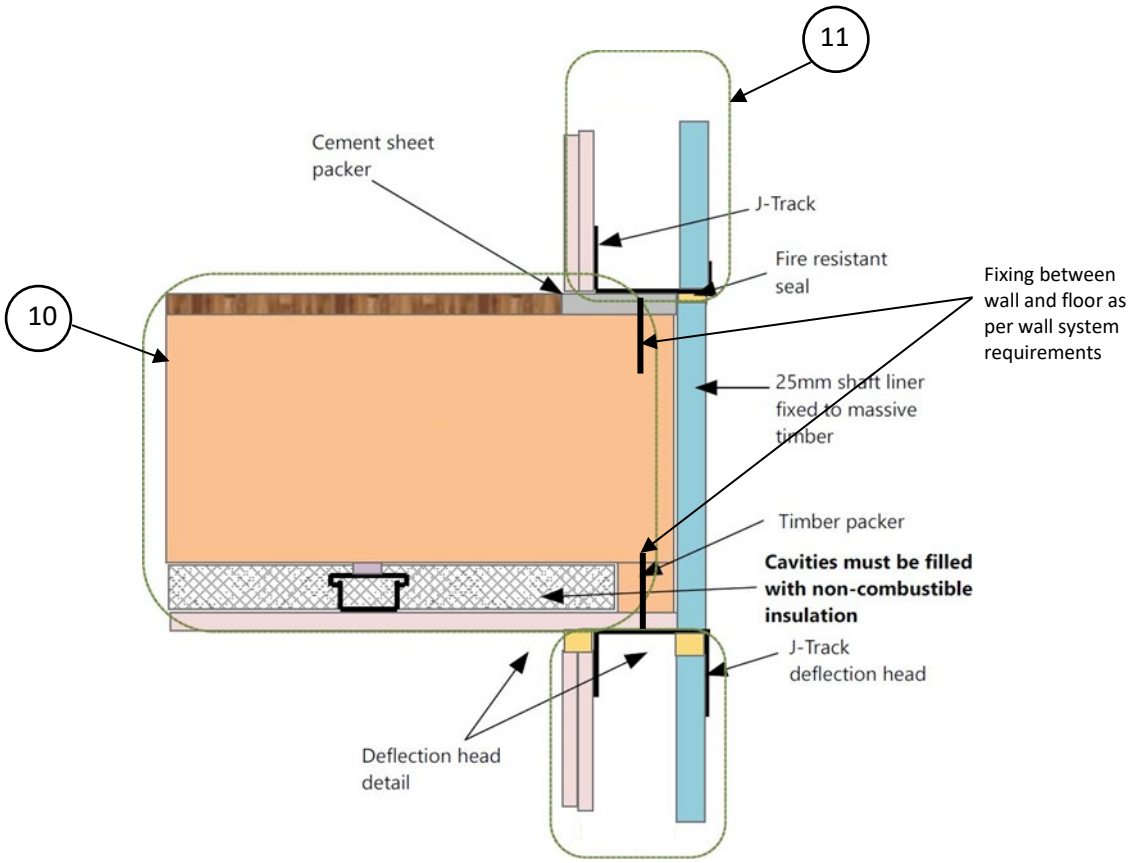

Figure 31 - Steel stud shaft wall interface with massive timber floors maintaining shaft continuity – Section view

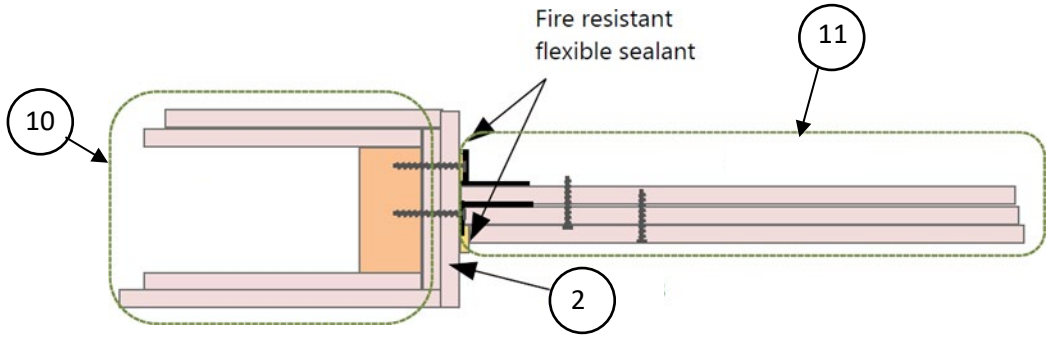

Figure 32 - Laminated shaft wall parallel interface with single stud timber partition – Plan view

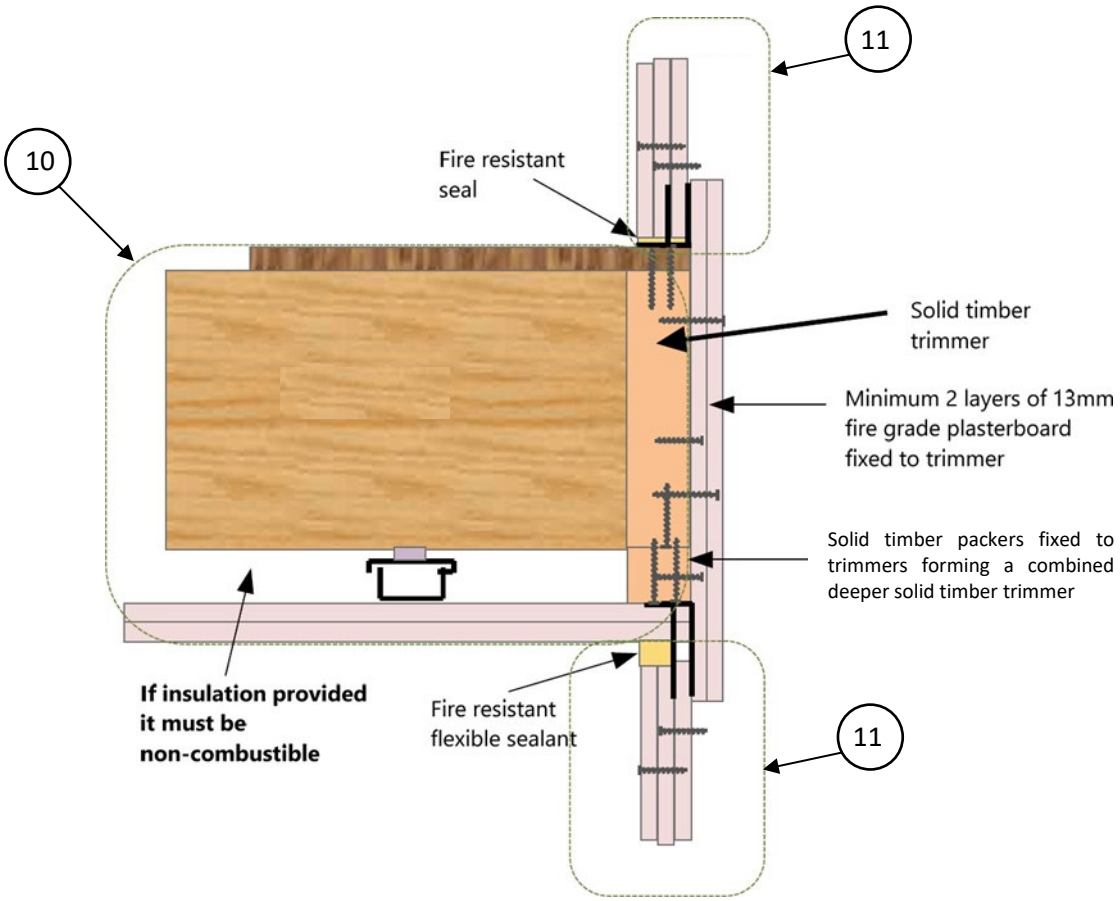

Figure 33 - Solid laminated shaft wall interface with timber floors maintaining shaft continuity – Section view

3.7 Timber and massive timber framed fire grade plasterboard wall system interface with hinged fire door frame

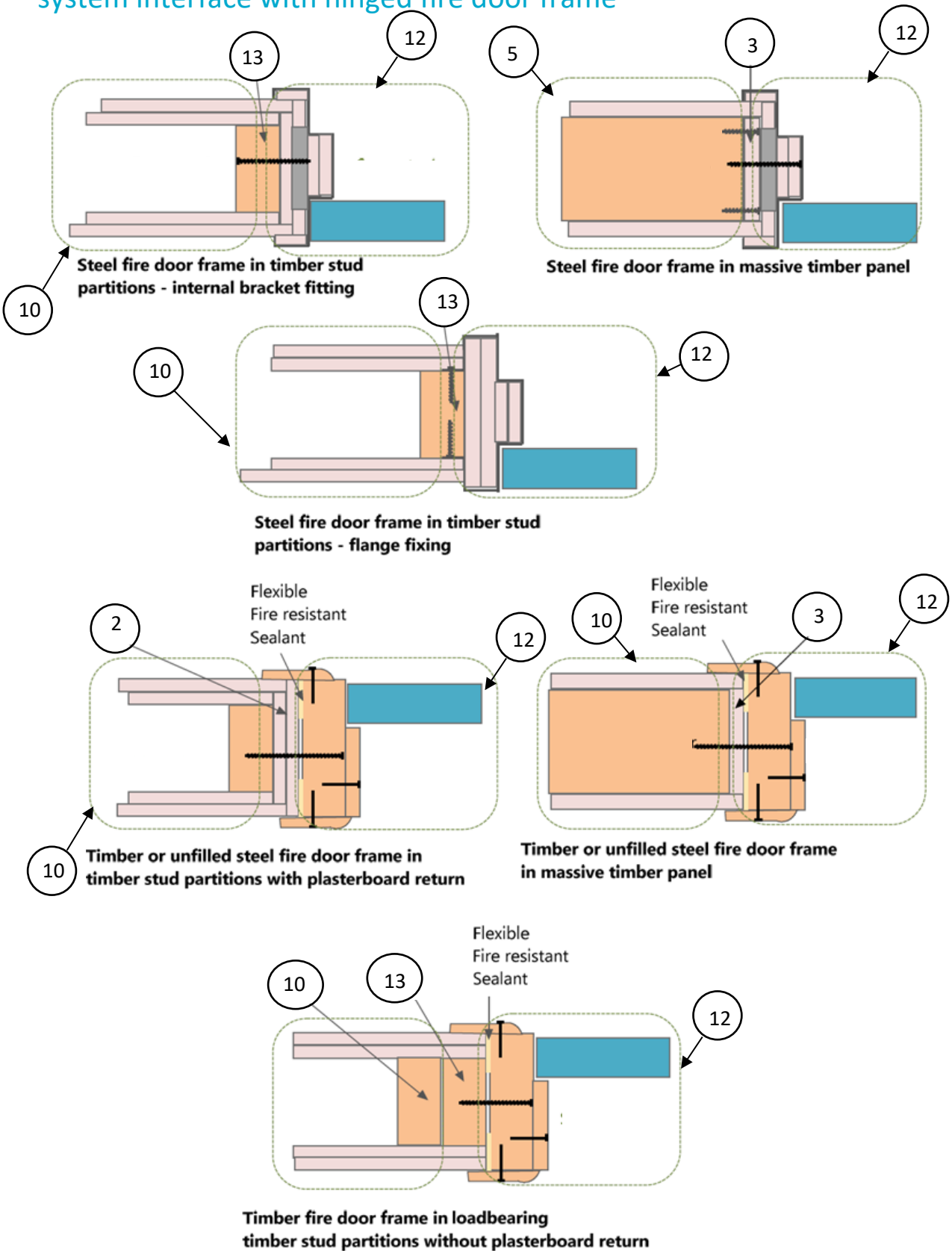

Figure 34 - Hinged fire door installation details – Plan view

3.8 Timber and massive timber framed fire grade plasterboard walls and floor ceiling system interface with lift landing doors

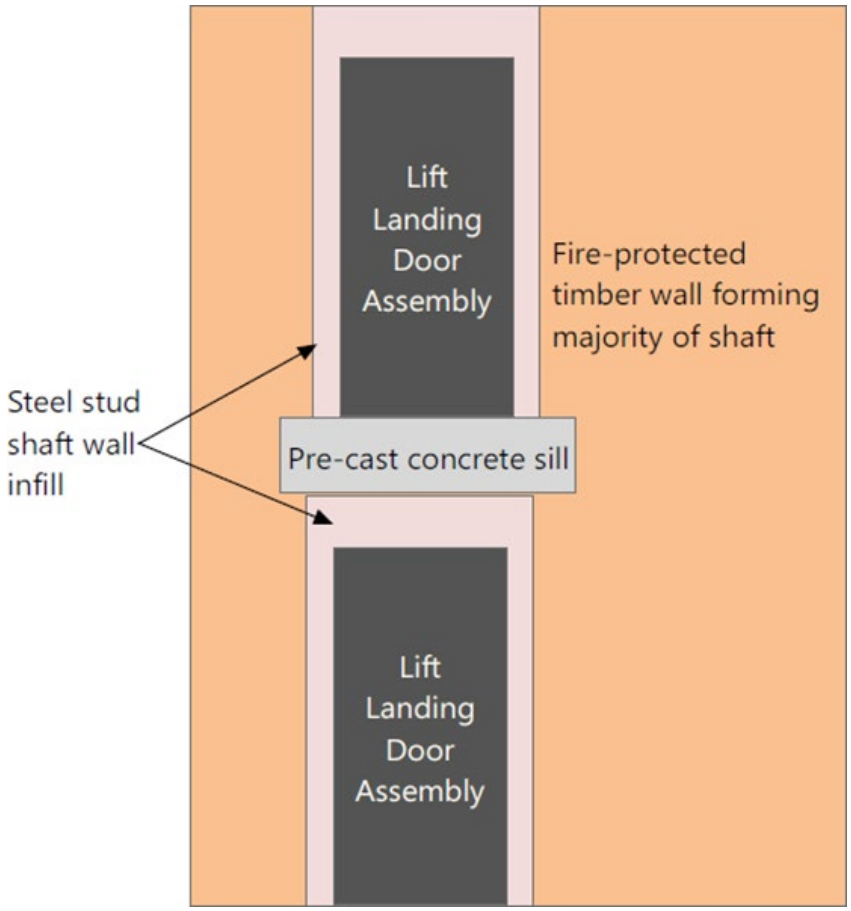

Figure 35 - Fire protected timber wall to lift landing door interface – Elevation section view

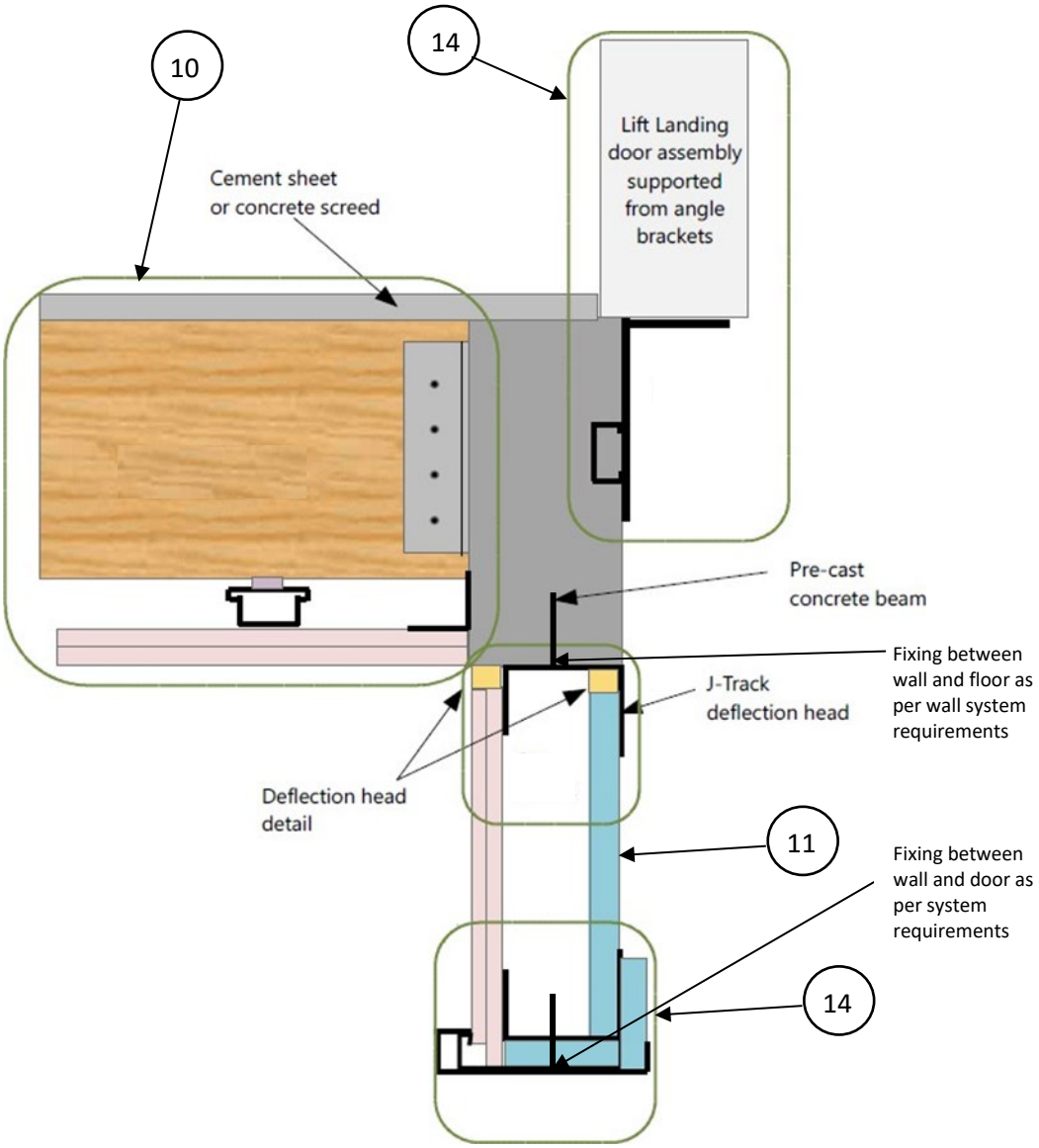

Figure 36 - Head and sill detail for pre-cast concrete and shaft wall interface – Section view

3.9 Timber and massive timber framed fire grade plasterboard walls and floor ceiling system interface with protected penetration system

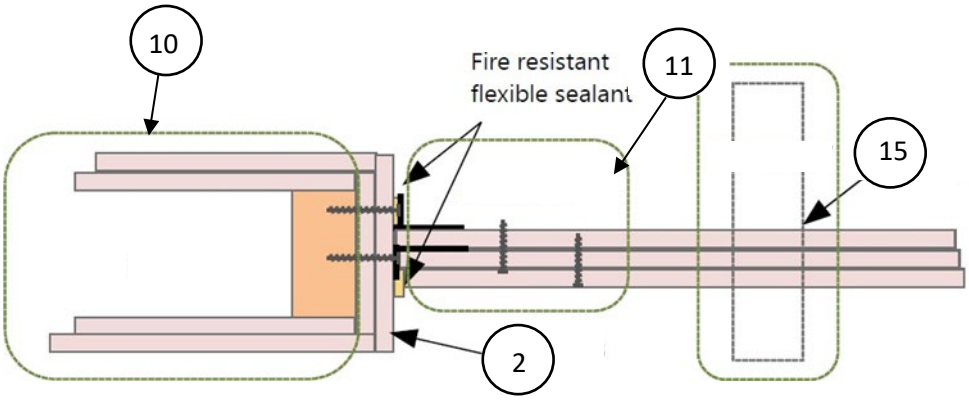

Figure 37 - Fire grade board infill system – Plan view

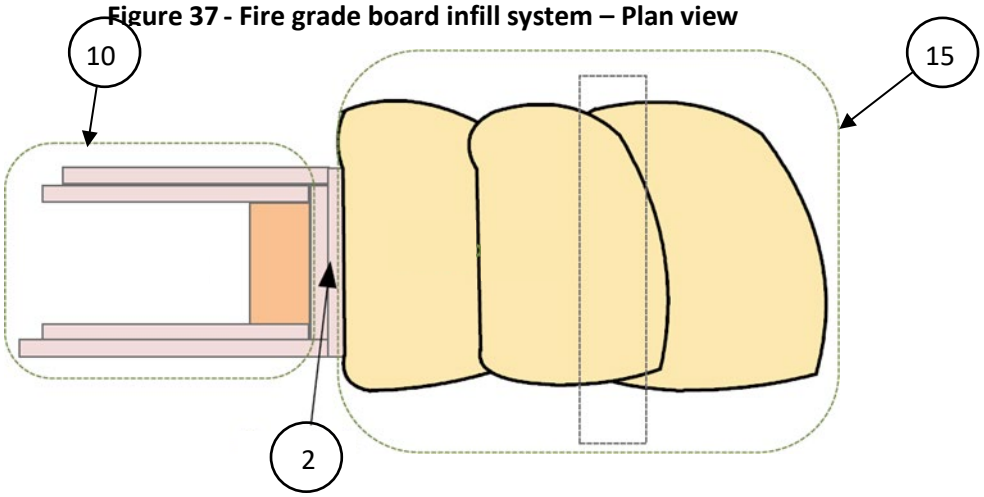

Figure 38 - Pillow system fitted in wall – Plan view

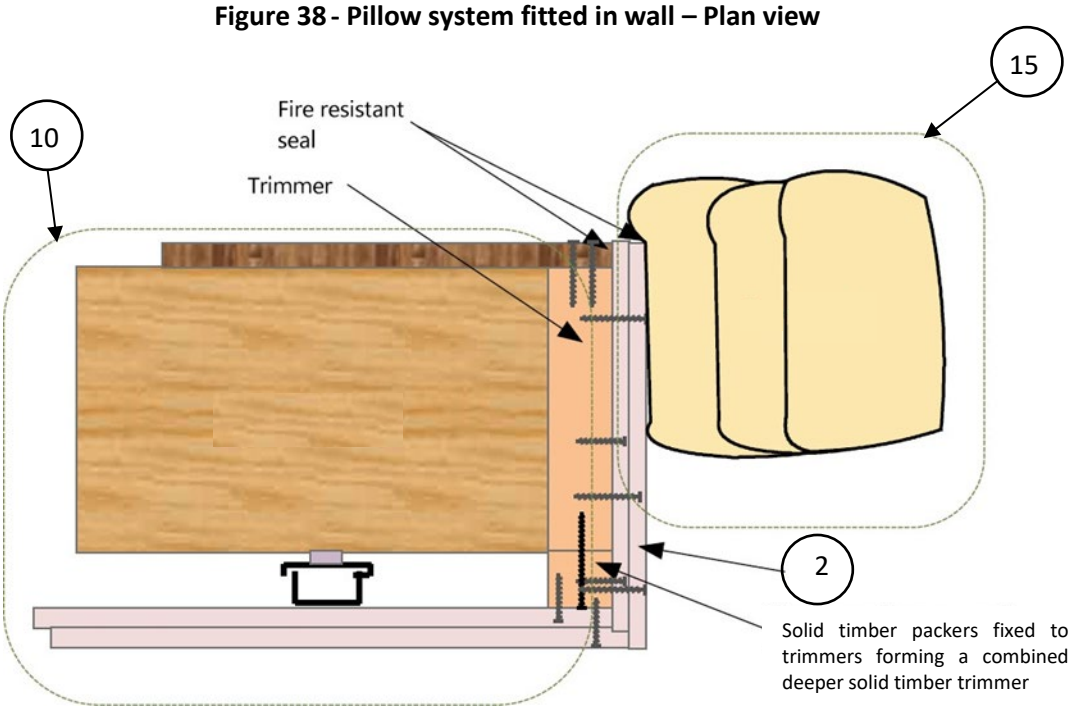

Figure 39 - Pillow system fitted to an opening in a floor – Section view

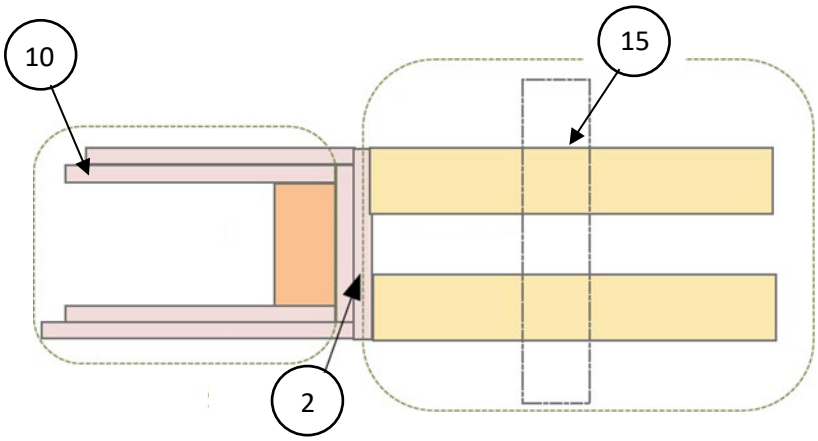

Figure 40 - Batt system fitted to an opening in a wall – Plan view

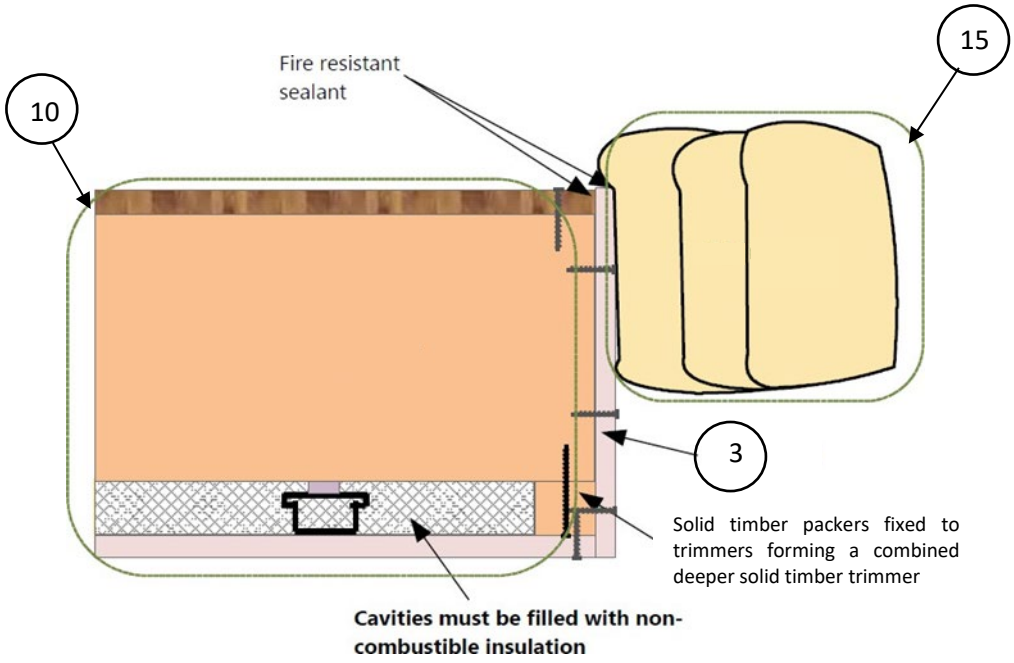

Figure 41 - Pillows fitted to an opening in a massive timber floor – Section view

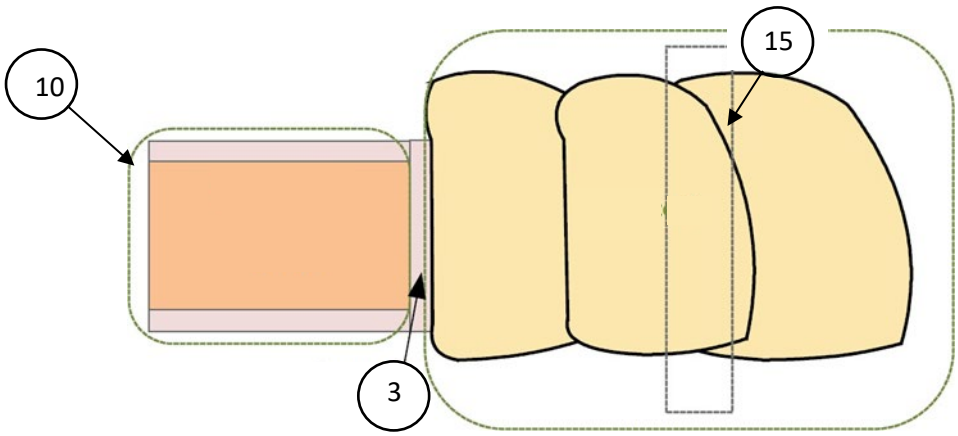

Figure 42 - Pillows fitted to an opening in a massive timber wall – Plan view

3.10 Timber and massive timber framed fire grade plasterboard walls with mechanical damper

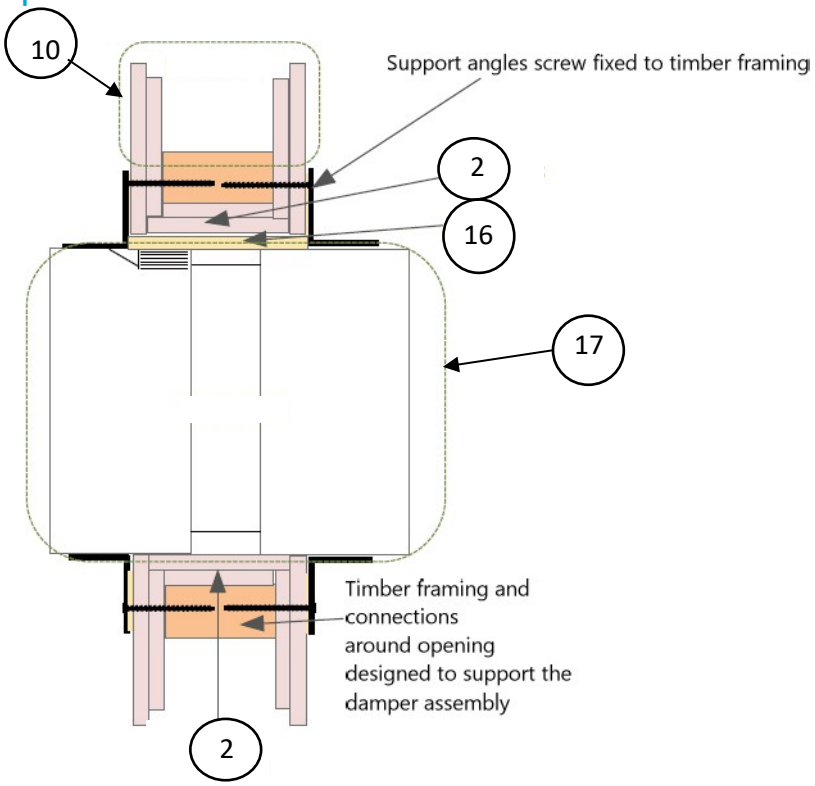

Figure 43 - Typical damper installation detail for timber-framed wall – Section view

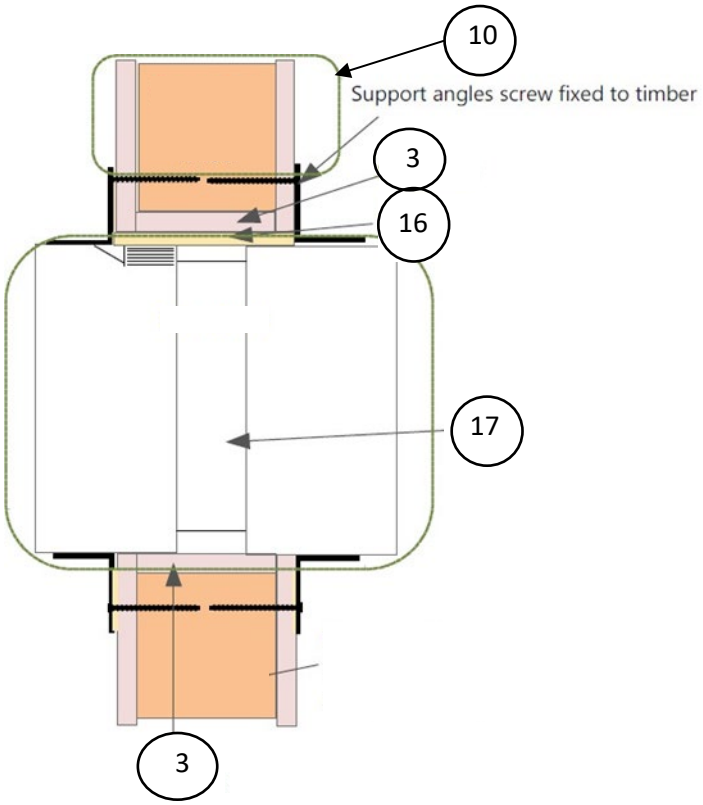

Figure 44 - Typical damper installation detail for massive timber wall– Section view

3.11 Timber and massive timber framed fire grade plasterboard walls with GPO outlets

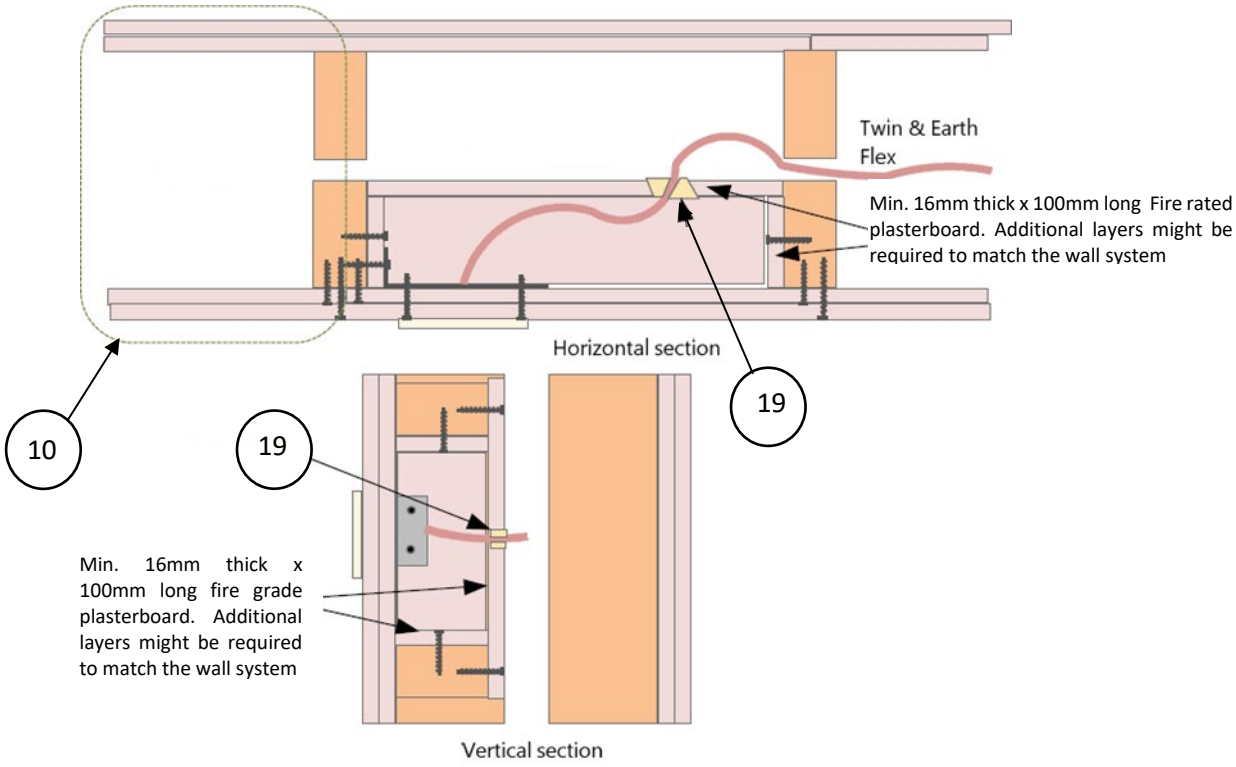

Figure 45 - Framing out of GPOs in double stud timber-framed construction – Plan and section view

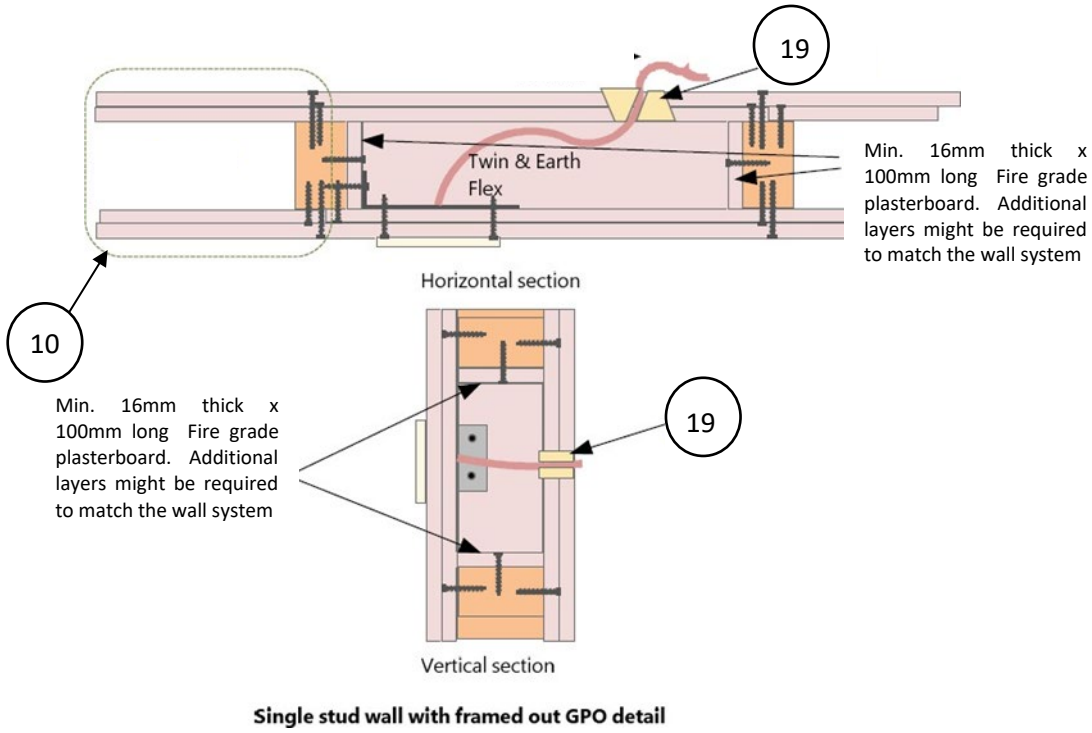

Figure 46 - Framing out of GPOs in single stud timber-framed construction – Plan and section view

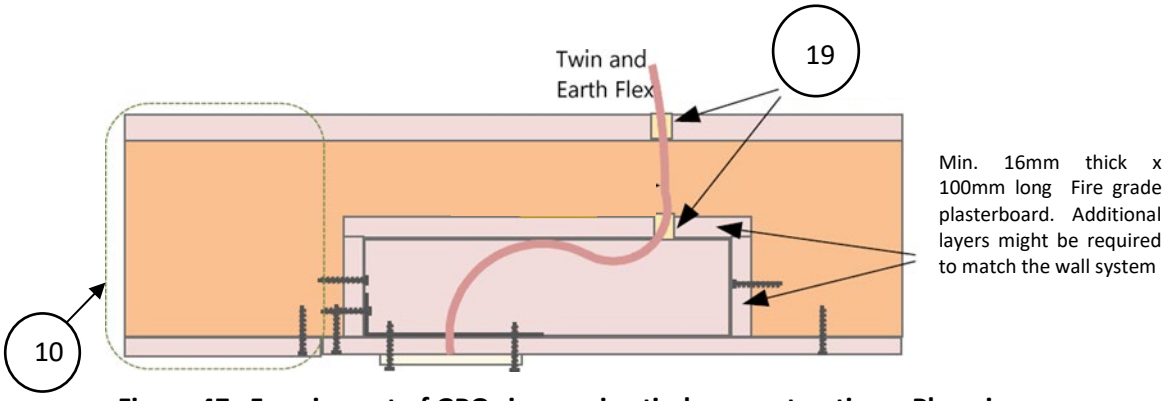

Figure 47 - Framing out of GPOs in massive timber construction – Plan view

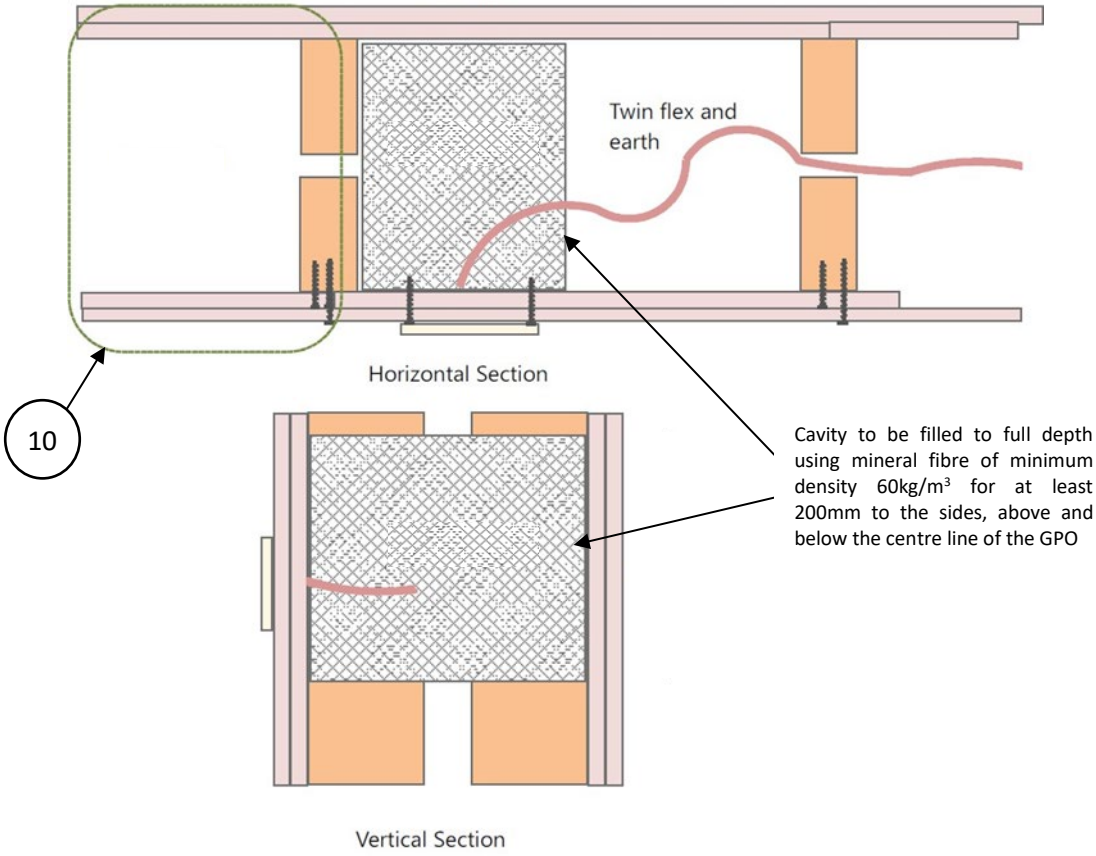

Figure 48 - Protection of GPOs with non-combustible insulation – Plan and section view

3.12 Timber and massive timber framed fire grade plasterboard walls with penetrations protected in cavities

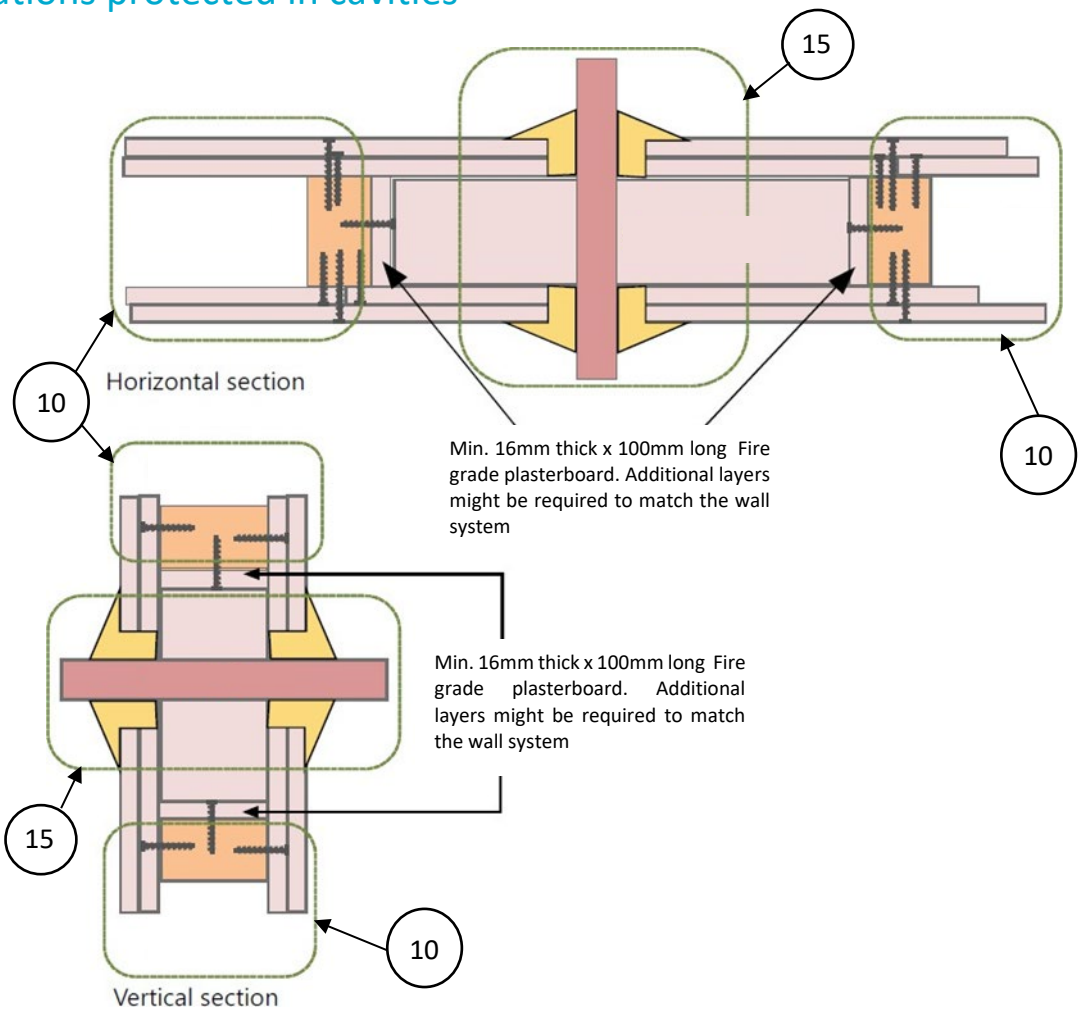

Figure 49 - Framed out service penetration for pipes and cables – Plan and section view

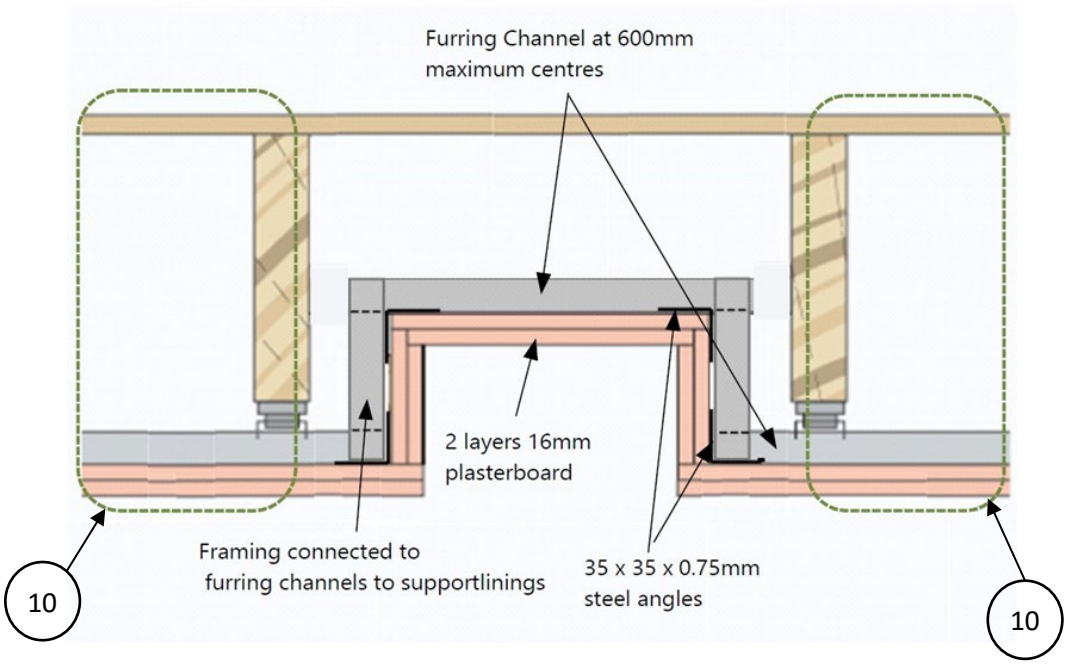

Figure 50 - Framing out detail for large rebated ceiling opening – Plan view

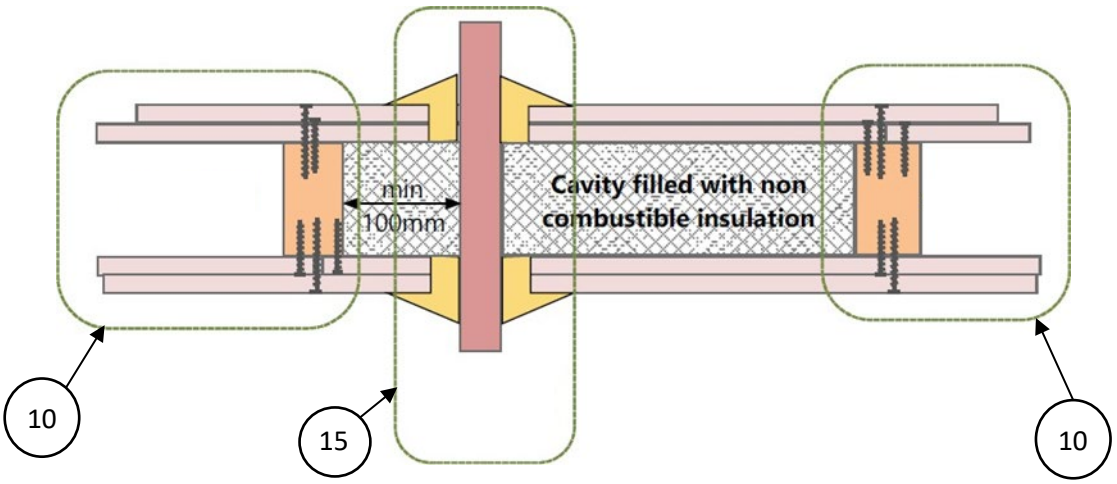

Figure 51 - Insulated cavity service penetration through timber-framed construction – Plan view

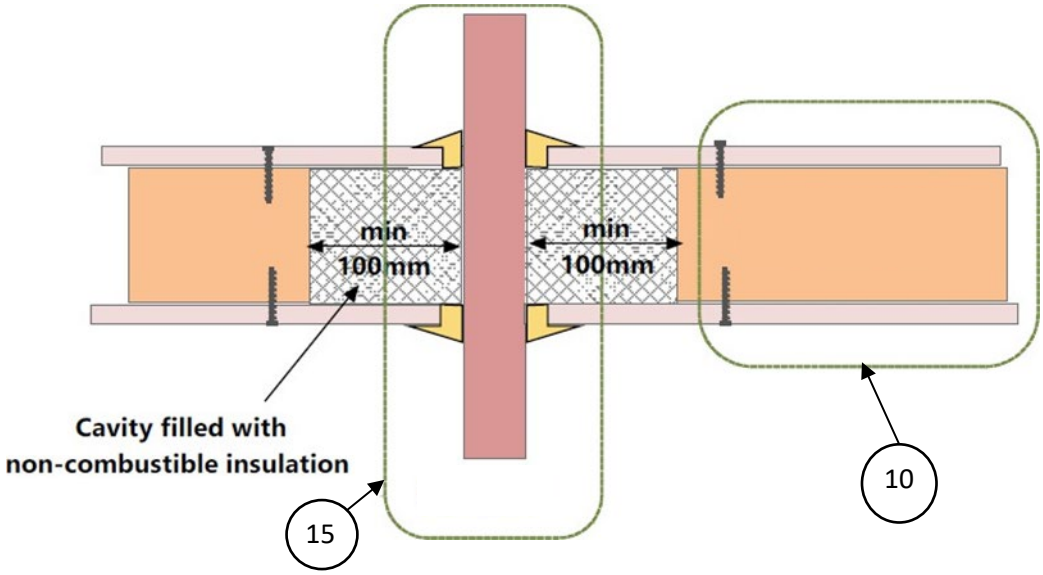

Figure 52-Insulated cavity service penetration through massive timber construction – Plan view

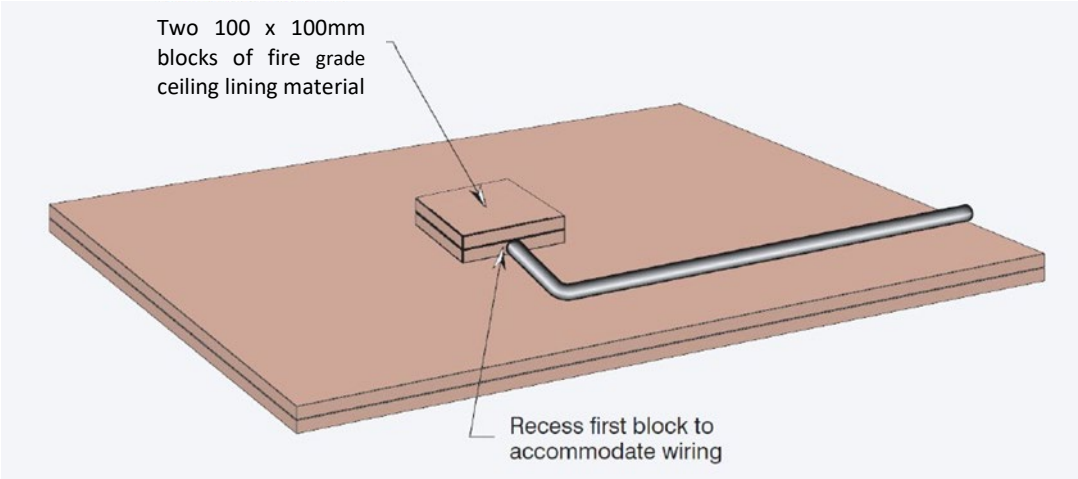

Figure 53 - Back blocking of small cable penetration through a ceiling system

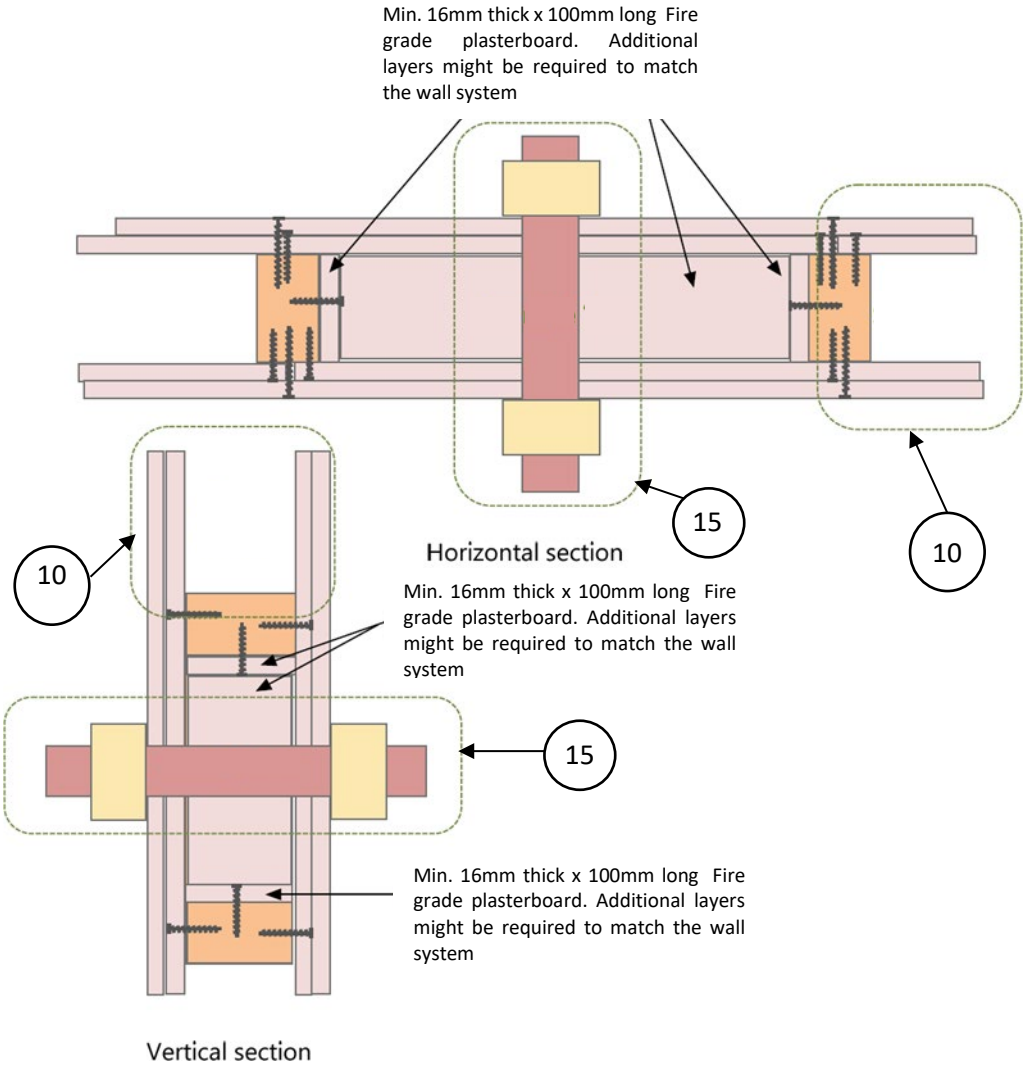

Figure 54 - Proprietary plastic pipe and fire collar protection systems used with frame out detail – Plan and Section view

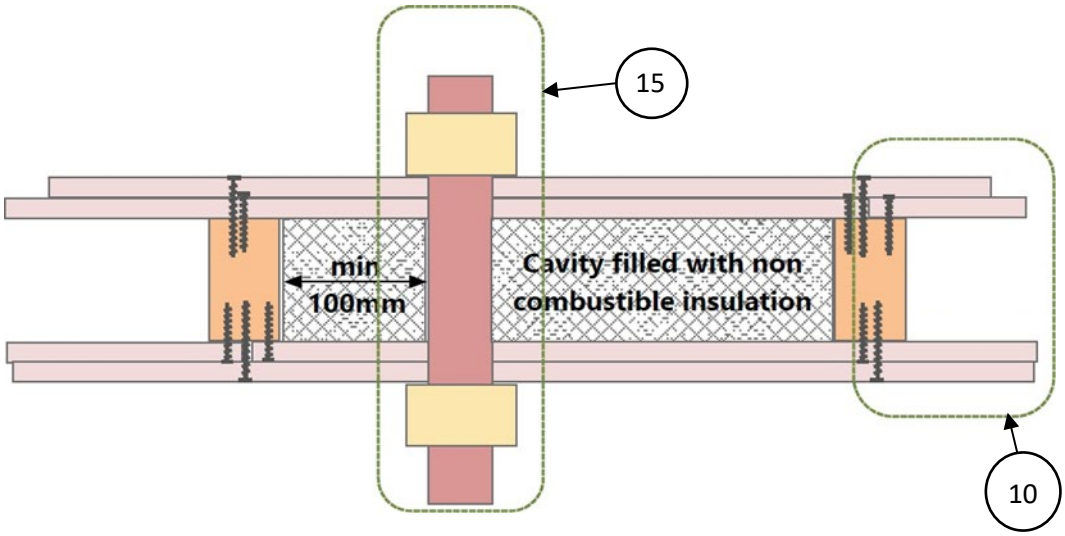

Figure 55 - Proprietary plastic pipe protection systems used with cavity insulation – Plan view

3.13 Timber and massive timber framed fire grade plasterboard walls and floor ceiling system interface Access panel framing

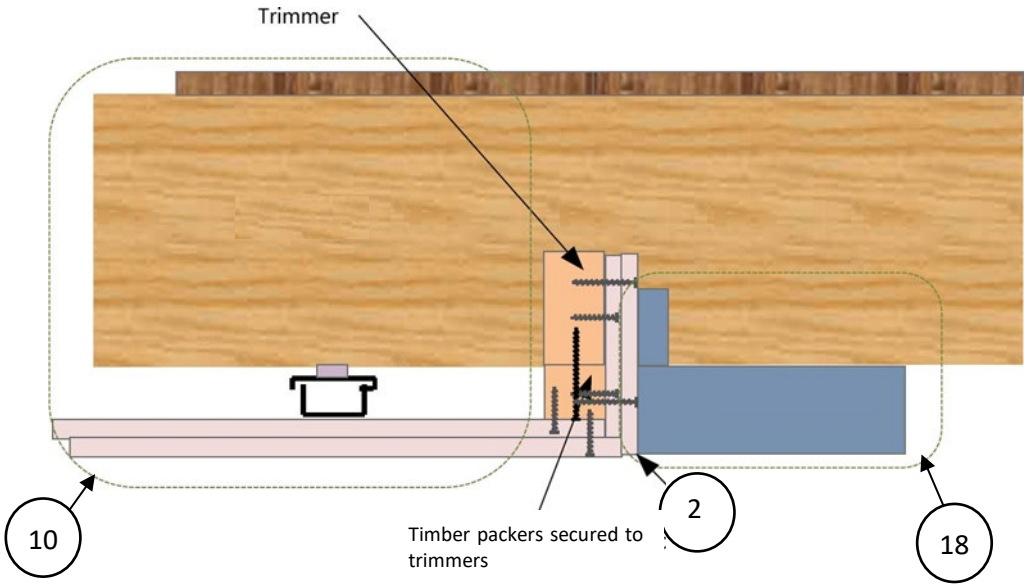

Figure 56 - Framing out opening for access panels in a timber floor assembly – Section view

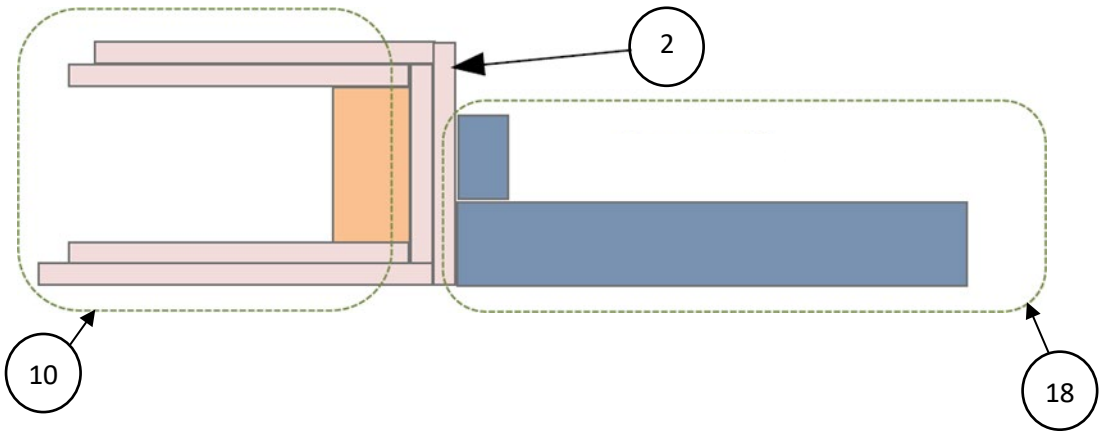

Figure 57 - Framing out opening for access panels in a timber-framed wall assembly – Plan view

4 Referenced Standards

Standards:

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

5 Conclusion

On the basis of the analysis presented in the reference assessment 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 Level (FRL) 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, validity of section 8 and limitation of section 9.

Table 4 – Performance of Fire Protected Timber framed wall and floor ceiling systems

System	Timber framed construction	Fire grade plasterboard protection	Construction Figures and Tables	RISF[1] (mins)	t250[2] (mins)
1	Single stud wall system	Min. 2 layers of 13mm thick on both sides	Table 3 and Figure 1	NA	>45
2	Double stud wall system		Table 3 and Figure 2	NA	>45
3	Floor ceiling system with ceiling fixed directly to timber framing	Min. 2 layers of 13mm thick on under side	Table 3 and Figure 3	>45	NA
4	Floor ceiling system with ceiling system suspended or clip fixed to the timber framing		Table 3 and Figure 4	>45	NA

Notes

1. For fire protected timber joist floor ceiling, RISF is the time when exposed face temperature within the floor ceiling cavity exceeds the 250°C criteria in AS 1530.4-2014 section 4.
2. For fire protected timber framed wall, t250 (mins.) is defined in this report to mean “the time when exposed face temperature within the wall cavity exceeds 250°C”.

Table 5 – Performance of Massive Timber framed wall and floor ceiling systems

System	Timber framed construction	Fire grade plasterboard protection	Construction Figures and Tables	t300[2] (mins)	t250[1] (mins)
1	Single skin massive timber wall system	Min. 1 layer of 13mm thick on both sides	Table 3 and Figure 5	20	NA
		Min. 1 layer of 16mm thick on both sides		30	
2	Double skin massive timber wall system	Min. 2 layers of 13mm thick on both sides	Table 3 and Figure 6	45	
3	Combination of massive timber and single stud wall system	Min. 1 layer of 13mm thick on massive timber side and min. 2 layers of 13mm thick on stud sides	Table 3 and Figure 7	20	45
		Min. 1 layer of 16mm thick on massive timber side and min. 2 layers of 13mm thick on stud sides		30	
		Min. 2 layers of 13mm thick on both sides		45	
4	Floor ceiling system with ceiling fixed directly to timber framing	Min. 1 layer of 13mm thick on exposed side	Table 3 and Figure 8	20	NA
5		Min. 1 layer of 16mm thick on exposed side		30	
6		Min. 2 layers of 13mm thick on exposed side		45	
7	Floor ceiling system with ceiling system suspended or clip fixed to the timber framing	Min. 1 layer of 13mm thick on exposed side	Table 3 and Figure 9	20	NA
8		Min. 1 layer of 16mm thick on exposed side		30	
9		Min. 2 layers of 13mm thick on exposed side		45	

Notes

1. For fire protected timber framed wall, t250 (mins.) is defined in this report to mean “the time when exposed face temperature within the wall cavity exceeds 250°C”.
2. For massive timber walls and floor ceiling, t300 (mins) is defined in this report to mean “the time when the temperature at the interface between the protection system and the timber exceeds 300°C”.

Table 6 – Performance of Fire Protected Timber framed wall and floor ceiling systems with an additional layer of non-fire grade lining or with various external cladding

Timber framed construction	Fire grade plasterboard protection	Construction details for non-fire grade lining	Construction details for various external cladding	Will not detrimentally affect the FRL, RISF[1], t250[2] of the base system in Table 4 for up to 120 minutes
Single stud wall system	Min. 2 layers of 13mm thick on both sides	Table 3, Figures 1 and 10	Table 3, Figures 1 and 19	System 1
Double stud wall system		Table 3, Figures 2 and 11	Table 3, Figures 1 and 21	System 2
Floor ceiling system with ceiling fixed directly to timber framing	Min. 2 layers of 13mm thick on under side	Table 3, Figures 3 and 12	Table 3, Figures 2 and 18	System 3
Floor ceiling system with ceiling system suspended or clip fixed to the timber framing		Table 3, Figures 4 and 13	Table 3, Figures 2 and 20	System 4

Notes

1. For fire protected timber joist floor ceiling, RISF is the time when exposed face temperature within the floor ceiling cavity exceeds the 250°C criteria in AS 1530.4-2014 section 4.
2. For fire protected timber framed wall, t250 (mins.) is defined in this report to mean “the time when exposed face temperature within the wall cavity exceeds 250°C”.

Table 7 – Performance of Massive Timber framed wall and floor ceiling systems with an additional layer of non-fire grade lining or with various external cladding

Timber framed construction	Fire grade plasterboard protection	Construction details for non-fire grade lining	Construction details for various external cladding	Will not detrimentally affect the FRL, t250[1] or t300[2] of the base system in Table 5 for up to 120 minutes
Single skin massive timber wall system	Min. 1 layer of 13mm thick on both sides	Table 3, Figures 5 and 14	Table 3, Figures 6, 22, 23, 24, 25	System 1
	Min. 1 layer of 16mm thick on both sides			
Double skin massive timber wall system	Min. 2 layers of 13mm thick on exposed side	Table 3, Figures 6 and 15		System 2
Floor ceiling system with ceiling fixed directly to massive timber	Min. 1 layer of 13mm thick on exposed side	Table 3, Figures 8 and 16	NA	System 4
	Min. 1 layer of 16mm thick on exposed side			System 5
	Min. 2 layers of 13mm thick on exposed side			System 6
Floor ceiling system with ceiling system suspended or clip fixed to the massive timber	Min. 1 layer of 13mm thick on exposed side	Table 3, Figures 9 and 17		System 7
	Min. 1 layer of 16mm thick on exposed side			System 8
	Min. 2 layers of 13mm thick on exposed side			System 9

Notes

1. For fire protected timber framed wall, t250 (mins.) is defined in this report to mean “the time when exposed face temperature within the wall cavity exceeds 250°C”.
2. For massive timber walls and floor ceiling, t300 (mins) is defined in this report to mean “the time when the temperature at the interface between the protection system and the timber exceeds 300°C”.

Table 8 – Performance of Fire Protected Timber framed and Massive Timber wall system interface with shaft wall system

<table>
<tr><th>Timber framed construction</th><th>Fire grade plasterboard protection</th><th>Construction Figures and Tables</th><th>Performance</th></tr>
<tr><td rowspan="3">Single stud wall</td><td rowspan="3">Min. 2 layers of 13mm thick</td><td>Table 3,
Figures 1 and 26</td><td rowspan="7">Will not detrimentally affect the FRL, RISF[1], t250[2] or t300[3] of the base system for up to the lesser of the FRL of the system or 120 minutes</td></tr>
<tr><td>Table 3,
Figures 1 and 27</td></tr>
<tr><td>Table 3,
Figures 1 and 32</td></tr>
<tr><td>Double stud wall</td><td>Min. 2 layers of 13mm thick</td><td>Table 3,
Figures 2 and 28</td></tr>
<tr><td rowspan="3">Massive timber wall</td><td>Min. 1 layer of 13mm thick</td><td rowspan="3">Table 3,
Figures 5 and 29</td></tr>
<tr><td>Min. 1 layer of 16mm thick</td></tr>
<tr><td>Min. 2 layers of 13mm thick</td></tr>
</table>

Notes

1. For fire protected timber joist floor ceiling, RISF is the time when exposed face temperature within the floor ceiling cavity exceeds the 250°C criteria in AS 1530.4-2014 section 4.
2. For fire protected timber framed wall, t250 (mins.) is defined in this report to mean “the time when exposed face temperature within the wall cavity exceeds 250°C”.
3. For massive timber walls and floor ceiling, t300 (mins) is defined in this report to mean “the time when the temperature at the interface between the protection system and the timber exceeds 300°C”.

Table 9 – Performance of Timber floor and shaft wall interface

Timber framed construction	Fire grade plasterboard protection	Shaft wall construction	Construction Figures and Tables	Performance
Timber framed floor ceiling system	Min. 1 layers of 25mm thick	Steel stud	Table 3, Figure 30	Will not detrimentally affect the FRL, RISF[1], t250[2] or t300[3] of the base system for up to the lesser of the FRL of the system or 120 minutes
	Min. 2 layers of 13mm thick	Laminated	Table 3, Figure 33	
Massive timber floor	Min. 1 layers of 25mm thick	Steel Stud	Table 3, Figure 31	

Notes

1. For fire protected timber joist floor ceiling, RISF is the time when exposed face temperature within the floor ceiling cavity exceeds the 250°C criteria in AS 1530.4-2014 section 4.
2. For fire protected timber framed wall, t250 (mins.) is defined in this report to mean “the time when exposed face temperature within the wall cavity exceeds 250°C”.
3. For massive timber walls and floor ceiling, t300 (mins) is defined in this report to mean “the time when the temperature at the interface between the protection system and the timber exceeds 300°C”.

Table 10 – Performance of Fire Protected Timber framed and Massive Timber wall system interface with fire door and lift door frame construction

<table>
<tr><th>Timber framed construction type</th><th>Fire grade plasterboard protection</th><th>Door Frame Type</th><th>Construction Figures and Tables</th><th>Performance</th></tr>
<tr><td rowspan="2">Single stud</td><td rowspan="2">Min. 2 layers of 13mm on both sides</td><td>Steel fire door frame with Internal bracket fitting or flange fixed</td><td rowspan="5">Table 3, Figure 34</td><td rowspan="10">Will not detrimentally affect the FRL, RISF[1], t250[2] or t300[3] of the base system for up to the lesser of the FRL of the system or 120 minutes</td></tr>
<tr><td>Timber or unfilled steel fire door frame with plasterboard return</td></tr>
<tr><td>Load bearing timber stud</td><td>Min. 2 layers of 13mm on both sides</td><td>Timber fire door frame without plasterboard return</td></tr>
<tr><td rowspan="2">Massive timber</td><td rowspan="2">Min. 2 layers of 13mm thick on timber side</td><td>Steel fire door frame</td></tr>
<tr><td>Timber or unfilled steel fire door frame</td></tr>
<tr><td>Single stud</td><td>Min. 2 layers of 13 mm</td><td rowspan="5">Lift landing door</td><td rowspan="5">Table 3, Figures 35 and 36</td></tr>
<tr><td>Double stud</td><td>Min. 2 layers of 13 mm</td></tr>
<tr><td rowspan="3">Massive Timber</td><td>Min. 1 layer of 13mm thick</td></tr>
<tr><td>Min. 1 layer of 16mm thick</td></tr>
<tr><td>Min. 2 layers of 13mm thick</td></tr>
</table>

Notes

1. For fire protected timber joist floor ceiling, RISF is the time when exposed face temperature within the floor ceiling cavity exceeds the 250°C criteria in AS 1530.4-2014 section 4.
2. For fire protected timber framed wall, t250 (mins.) is defined in this report to mean “the time when exposed face temperature within the wall cavity exceeds 250°C”.
3. For massive timber walls and floor ceiling, t300 (mins) is defined in this report to mean “the time when the temperature at the interface between the protection system and the timber exceeds 300°C”.

Table 11 – Performance of wall and floor ceiling system interface incorporating protected service penetrations

Timber framed construction type	Fire grade plasterboard protection	Penetration protection system	Construction Figures and Tables	Performance
Single Stud wall	Min. 2 layers of 13mm thick on both sides	Board infill	Table 3, Figure 37	Will not detrimentally affect the FRL, RISF[1], t250[2] or t300[3] of the base system for up to the lesser of the FRL of the system or 120 minutes
		Fire rated Pillows	Table 3, Figure 38	
		Batt system	Table 3, Figure 40	
Timber floor ceiling system	Min. 2 layers of 13mm thick	Fire rated Pillows	Table 3, Figure 39	
Massive Timber stud Floor ceiling system	Min. 1 layer of 13mm thick	Fire rated Pillows	Table 3, Figure 41	
	Min. 1 layer of 16mm thick			
	Min. 2 layers of 13mm thick			
Massive Timber stud wall	Min. 1 layer of 13mm thick	Fire rated Pillows	Table 3, Figure 42	
	Min. 1 layer of 16mm thick			
	Min. 2 layers of 13mm thick			

Notes

1. For fire protected timber joist floor ceiling, RISF is the time when exposed face temperature within the floor ceiling cavity exceeds the 250°C criteria in AS 1530.4-2014 section 4.
2. For fire protected timber framed wall, t250 (mins.) is defined in this report to mean “the time when exposed face temperature within the wall cavity exceeds 250°C”.
3. For massive timber walls and floor ceiling, t300 (mins) is defined in this report to mean “the time when the temperature at the interface between the protection system and the timber exceeds 300°C”.

Table 12 – Performance of Fire Protected Timber framed and Massive Timber wall system incorporating mechanical fire damper

Timber framed construction type	Fire grade plasterboard protection	Construction Figures and Tables	Performance
Single Stud wall	Min. 2 layers of 13mm thick on both sides	Table 3, Figure 43	Will not detrimentally affect the FRL, RISF[1], t250[2] or t300[3] of the base system for up to the lesser of the FRL of the system or 120 minutes
Massive Timber stud wall	Min. 1 layer of 13mm thick	Table 3, Figure 44	
	Min. 1 layer of 16mm thick		
	Min. 2 layers of 13mm thick		

Notes

1. For fire protected timber joist floor ceiling, RISF is the time when exposed face temperature within the floor ceiling cavity exceeds the 250°C criteria in AS 1530.4-2014 section 4.
2. For fire protected timber framed wall, t250 (mins.) is defined in this report to mean “the time when exposed face temperature within the wall cavity exceeds 250°C”.
3. For massive timber walls and floor ceiling, t300 (mins) is defined in this report to mean “the time when the temperature at the interface between the protection system and the timber exceeds 300°C”.

Table 13 – Performance of Fire Protected Timber framed and Massive Timber wall system incorporating GPO's

<table>
<tr><th>Timber framed construction type</th><th>Fire grade plasterboard protection</th><th>GPO connection cable penetration protection system</th><th>Construction Figures and Tables</th><th>Performance</th></tr>
<tr><td>Single Stud wall</td><td>Min. 2 layers of 13mm thick on both sides</td><td rowspan="5">Fire rated sealant tested or assessed to achieve the require FRL when protecting cable penetration</td><td>Table 3, Figure 46</td><td rowspan="6">Will not detrimentally affect the FRL, RISF[1], t250[2] or t300[3] of the base system for up to the lesser of the FRL of the system or 120 minutes</td></tr>
<tr><td>Double stud wall</td><td>Min. 2 layers of 13mm thick on both sides</td><td>Table 3, Figure 45</td></tr>
<tr><td rowspan="3">Massive Timber stud wall</td><td>Min. 1 layer of 13mm thick</td><td rowspan="3">Table 3, Figure 47</td></tr>
<tr><td>Min. 1 layer of 16mm thick</td></tr>
<tr><td>Min. 2 layers of 13mm thick</td></tr>
<tr><td>Double stud wall</td><td>Min. 2 layers of 13mm thick on both sides</td><td>Non-combustible insulation tested or assessed to achieve the require FRL when protecting cable penetration</td><td>Table 3, Figure 48</td></tr>
</table>

Notes

1. For fire protected timber joist floor ceiling, RISF is the time when exposed face temperature within the floor ceiling cavity exceeds the 250°C criteria in AS 1530.4-2014 section 4.
2. For fire protected timber framed wall, t250 (mins.) is defined in this report to mean "the time when exposed face temperature within the wall cavity exceeds 250°C".
3. For massive timber walls and floor ceiling, t300 (mins) is defined in this report to mean "the time when the temperature at the interface between the protection system and the timber exceeds 300°C".

Table 14 – Performance of Fire Protected Timber framed and Massive Timber wall system incorporating cable and pipe penetrations protected with fire stopping system

Timber framed construction type	Fire grade plasterboard protection	Insulation details	Construction Figures and Tables	Performance
Single Stud wall	Min. 2 layers of 13mm thick on both sides	No insulation in cavity	Table 3, Figures 49 and 54	Will not detrimentally affect the FRL, RISF[1], t250[2] or t300[3] of the base system for up to the lesser of the FRL of the system or 120 minutes
	Min. 2 layers of 13mm thick on both sides	Cavity filled with non-combustible insulation	Table 3, Figures 51 and 55	
Massive Timber stud wall	Min. 1 layer of 13mm thick	Cavity filled with non-combustible insulation	Table 3, Figure 52	
	Min. 1 layer of 16mm thick			
	Min. 2 layers of 13mm thick			

Notes

1. For fire protected timber joist floor ceiling, RISF is the time when exposed face temperature within the floor ceiling cavity exceeds the 250°C criteria in AS 1530.4-2014 section 4.
2. For fire protected timber framed wall, t250 (mins.) is defined in this report to mean “the time when exposed face temperature within the wall cavity exceeds 250°C”.
3. For massive timber walls and floor ceiling, t300 (mins) is defined in this report to mean “the time when the temperature at the interface between the protection system and the timber exceeds 300°C”.

Table 15 – Performance of Fire Protected Timber framed and Massive Timber wall system with large, rebated opening, small cable penetrations and interface with framing for access panels

Timber framed construction type	Fire grade plasterboard protection	Penetration/Interface details	Construction Figures and Tables	Performance
Ceiling system with furring channels	Min. 2 layers of 16mm thick fixed to the furring channel	Large, rebated opening	Table 3, Figure 50	Will not detrimentally affect the FRL, RISF[1], t250[2] or t300[3] of the base system for up to the lesser of the FRL of the system or 120 minutes
Ceiling system	Tested or assessed to achieve required FRL	Small cable penetration protected with two 100mm x 100mm blocks of fire grade ceiling lining material	Table 3, Figure 53	
Timber Floor ceiling system	Min. 2 layers of 13mm thick	Interface with Access panel framing	Table 3, Figure 56	
Massive Timber floor ceiling system	Min. 1 layer of 13mm thick	Interface with Access panel framing		
	Min. 1 layer of 16mm thick			
	Min. 2 layers of 13mm thick			
Single or double stud wall	Min. 2 layers of 13mm thick	Interface with Access panel framing	Table 3, Figure 57	
Massive timber stud wall	Min. 1 layer of 13mm thick			
	Min. 1 layer of 16mm thick			
	Min. 2 layers of 13mm thick			

Notes

1. For fire protected timber joist floor ceiling, RISF is the time when exposed face temperature within the floor ceiling cavity exceeds the 250°C criteria in AS 1530.4-2014 section 4.
2. For fire protected timber framed wall, t250 (mins.) is defined in this report to mean “the time when exposed face temperature within the wall cavity exceeds 250°C”.
3. For massive timber walls and floor ceiling, t300 (mins) is defined in this report to mean “the time when the temperature at the interface between the protection system and the timber exceeds 300°C”.

6 Direct Field of Application of Results

The application of the results of this assessment is to walls exposed to fire from either side or floor exposed to fire from below.

7 Requirements

It is required the surrounding wall and floor structure be capable of providing effective vertical support to the base of the proposed construction and lateral support to the top of the proposed construction for the required fire-resistance period (FRL).

It is required the proposed wall or floor ceiling systems be tested or assessed in accordance with AS 1530.4 for the required FRL.

It is required the penetration systems be tested or assessed in accordance with AS 1530.4 for the required FRL.

Any further variations with respect to size, constructional details, loads, stresses, edge or end conditions, 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 30th November 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 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 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 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.

CONTACT US

t 1300 363 400
+61 3 9545 2176
e enquiries@csiro.au
w www.csiro.au

YOUR CSIRO

Australia is founding its future in science and innovation. Its national science agency, CSIRO, is a powerhouse of ideas, technologies and skills for building prosperity, growth, health and sustainability. It serves governments, industries, business and communities across the nation.

FOR FURTHER INFORMATION

Infrastructure Technologies
Keith Nicholls
Group Leader, Fire Testing and Assessments
t +61 2 9490 5450
e keith.nicholls@csiro.au
w https://research.csiro.au/infratech/fire-safety/fire-testing/

Infrastructure Technologies
Jing Xu
Senior consultant, Fire Assessments
t +61 2 9490 8041
e jing.xu@csiro.au
w https://research.csiro.au/infratech/fire-safety/fire-testing/