GIB® Fire Rated Systems Supplement

Document

Supplement	ISSUE DATE
ComFlor® composite floor deck flooring system	Oct 2018
Additional GIB® Fire Rated System	Apr 2019
Stahlton Rib and In-Fill Flooring Detail	May 2019
Double Tee Floor Detail	May 2019
Additional wall to floor/ceiling junction details	Feb 2020
Fire rated wall systems subjected to simultaneous two-sided fire exposure	July 2021
Service penetrations and construction sequencing	Sep 2021
Penetration and linear gap seals using GIB Fire Soundseal®	Dec 2022
Structural timber and steel penetration protection	Dec 2022
Services penetrating a top plate	Dec 2022
Fire rated boxes or bulkheads	Feb 2023
Mass timber encapsulation systems	June 2023

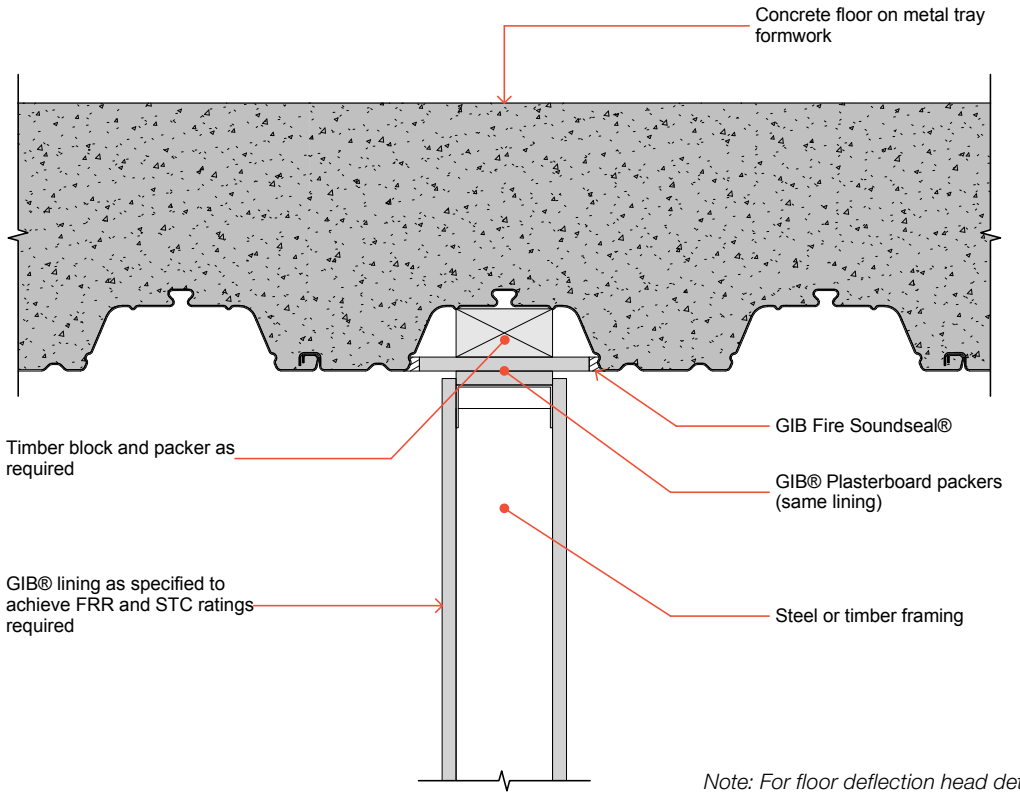
GIB® ComFlor® Detail

Issue Date October 2018

ComFlor® composite floor deck flooring system is commonly used in a wide variety of commercial and residential applications. Winstone Wallboards often receive enquiries about how to detail and construct the junction between GIB® performance partition systems and ComFlor®.

Figures 1 to 4 below show a number of options for the partitions running along and across the ComFlor® profile. The idea is to simply build a flat platform and construct conventional partition head detail or deflection head detail if the floor deflection has to be accommodated. Refer to page 95 of 'GIB® Fire Rated Systems, 2018' for more details.

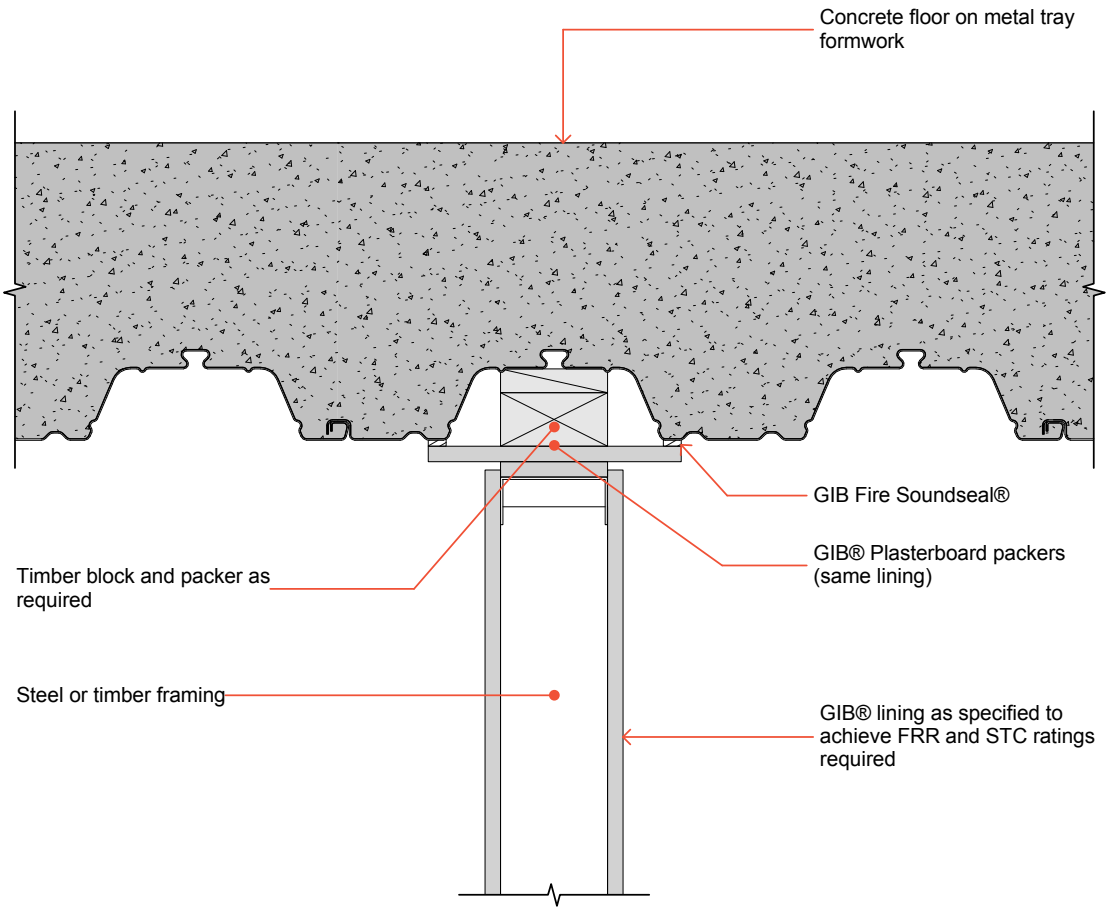
Figure 1: ComFlor® detail for wall with profile – Option 1



GFS 400

Note: For floor deflection head details refer to page 95 of 'GIB® Fire Rated Systems, 2018'.

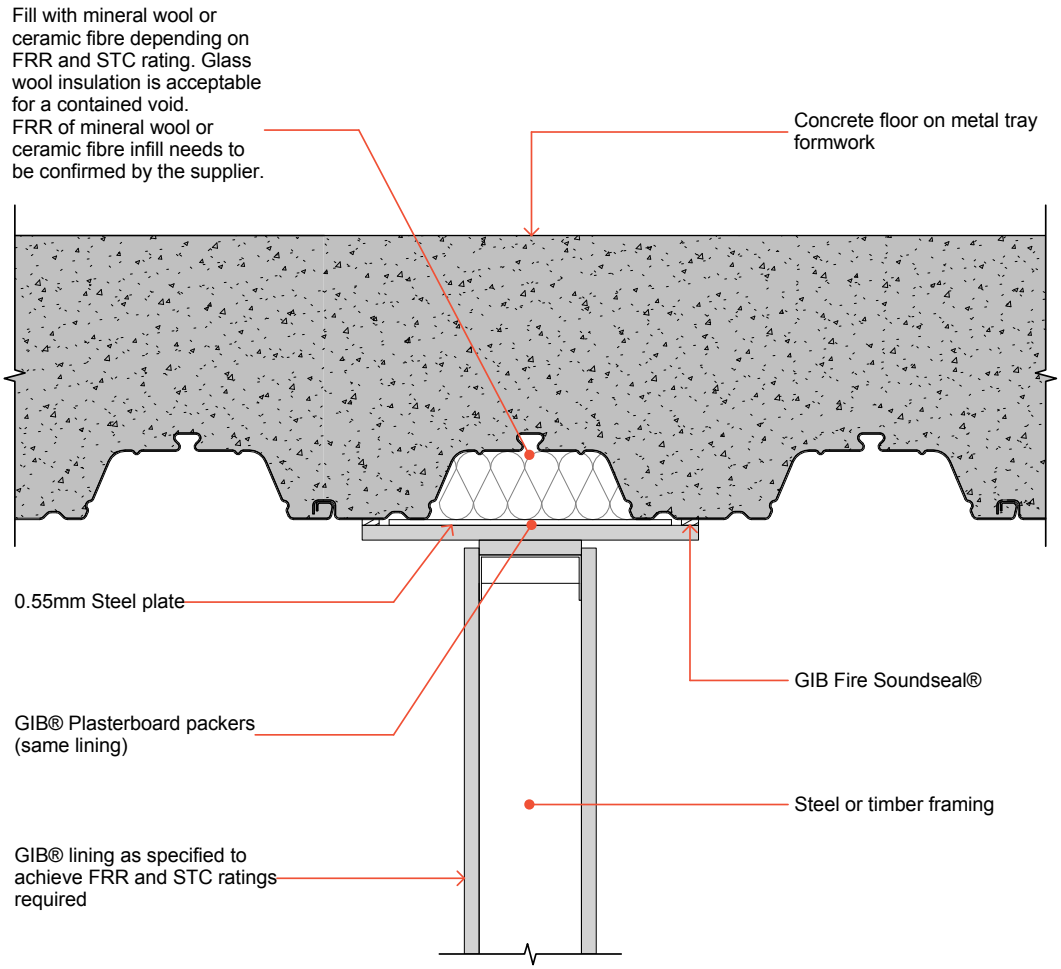
Figure 2: ComFlor® detail for wall with profile – Option 2



GFS 401

Note: For floor deflection head details refer to page 95 of 'GIB® Fire Rated Systems, 2018'.

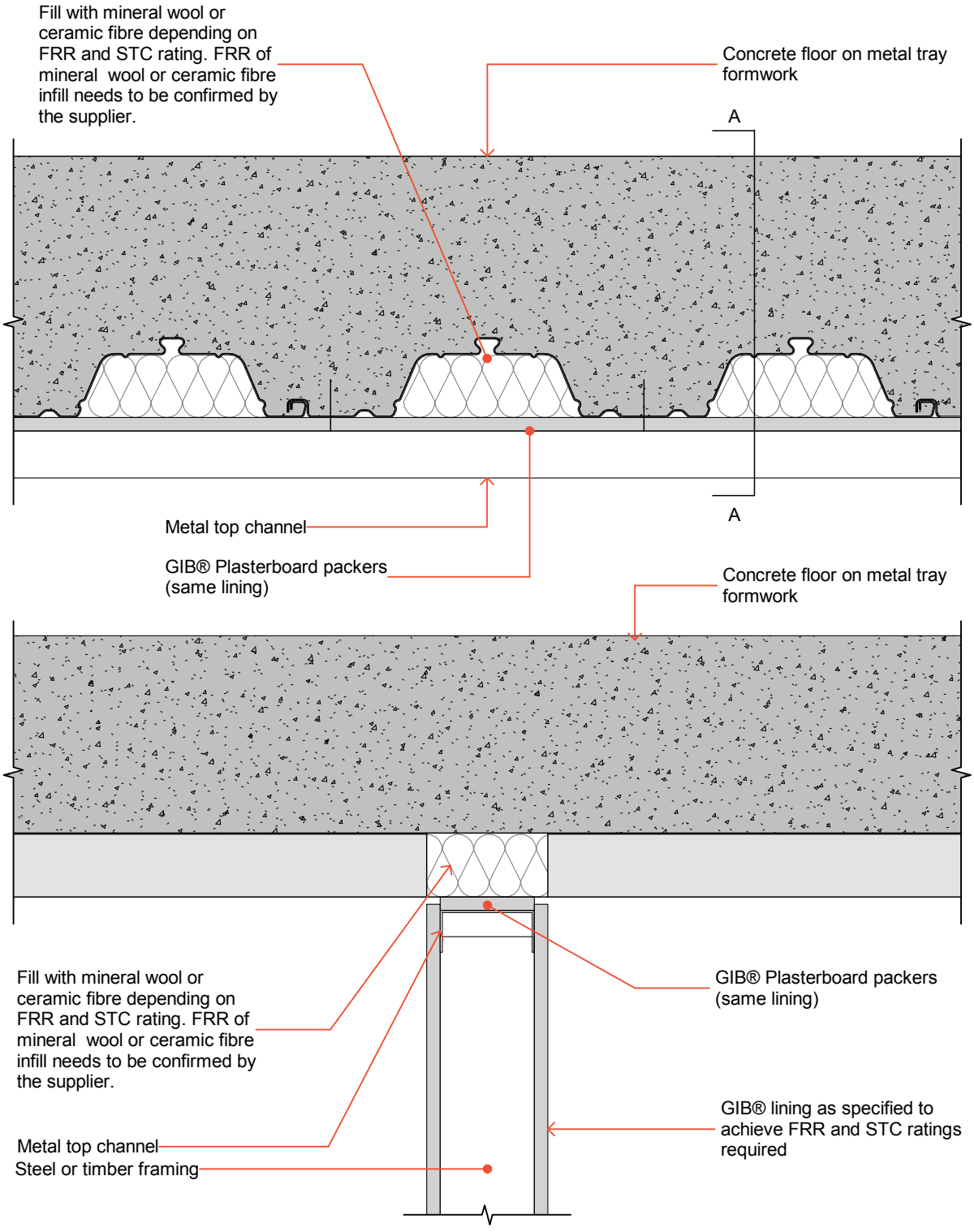
Figure 3: ComFlor® detail for wall with profile – Option 3



GFS 402

Note: For floor deflection head details refer to page 95 of 'GIB® Fire Rated Systems, 2018'.

Figure 4: ComFlor® detail for wall across or diagonal to profile



GFS 403

Note: For floor deflection head details refer to page 95 of 'GIB® Fire Rated Systems, 2018'.

For any further information, please contact the GIB® Helpline on 0800 100 442.

Additional GIB® Fire Rated System

April 2019

In addition to the range of fire rated systems available in the GIB® Fire Rated Systems literature, Winstone Wallboards has recently completed testing on a non-load bearing steel frame system which will be released as an alternative two-way -/90/90 FRR system.

This pre-release serves to advise customers of the high level details required for specification in advance of the next publication of the literature. This release includes the non-load bearing steel frame system which achieves a two way 90 minutes FRR.

The system is called GBS 90a. It requires minimum steel stud dimensions to be 92 x 34 x 0.75mm nominal with a 6mm return and is lined with a single 13mm GIB Fyreline® on one side and double 13mm GIB Fyreline® on the other side.

For any further information, please contact the GIB® Helpline on 0800 100 442.

Two way FRR — steel frame

Specification number	Performance		Specifications	
GBS 90a	**FRR**	–/90/90	**Lining**	1 layer 13mm GIB Fyreline® one side 2 layers 13mm GIB Fyreline® other side
	STC	44 (47*)		
	Rw	43 (48*)	**LB/NLB**	Non load bearing

**With one layer Pink® Batts® BIB R1.8 (75mm) glass wool insulation.*

FRAMING AND WALL HEIGHT

Minimum steel stud dimensions to be 92 x 34 x 0.75mm nominal with a 6mm return.

Minimum steel channel dimensions to be 92 x 30 x 0.75mm nominal for the bottom channel and 92 x 50 x 0.75mm nominal for the top channel.

Top and bottom channels are fixed to the floor and ceiling in true alignment.

Stud spacing at 600mm centres maximum.

Place studs to allow the nominated expansion gap at the top of the frame.

The studs are held in place by the "grip" of the channels.

Recommended maximum wall height

Note that maximum wall heights for fire-rated systems can be lower than what can be achieved with non-fire-rated construction.

Nominal stud dimension (mm)	BMT (mm)	Stud centres (mm)	Max wall height (mm)	Expansion at top of studs (mm)
92 x 34	0.75	600	3000	15
		400	3400	15
150 x 34	0.75	600	4400	20**
		400	5000	25**
	1.15	600	5000	25**
		400	5700	30**

***Use a minimum 50mm-deep head channel.*

LINING

1 layer of 13mm GIB Fyreline® one side and 2 layers of 13mm GIB Fyreline® on the other side.

Vertical fixing only permitted. Full height sheets shall be used where possible.

When sheet end butt joints are unavoidable, they shall be formed over nogs and staggered.

Offset joints between sheets and on opposite side of frame.

Sheets shall be touch fitted.

All sheet joints must be formed over framing.

Linings are installed hard to floor.

FASTENING THE LINING

Fasteners

Inner and single layer: 25mm x 6g GIB® Grabber® Self Tapping Drywall Screws.

Outer layer: 41mm x 6g GIB® Grabber® Self Tapping Drywall Screws.

Fastener Centres

300mm centres up each stud.

Place fasteners 12mm from longitudinal sheet edges and 50mm from sheet ends.

Place fasteners at 200mm centres along sheet end butt joints.

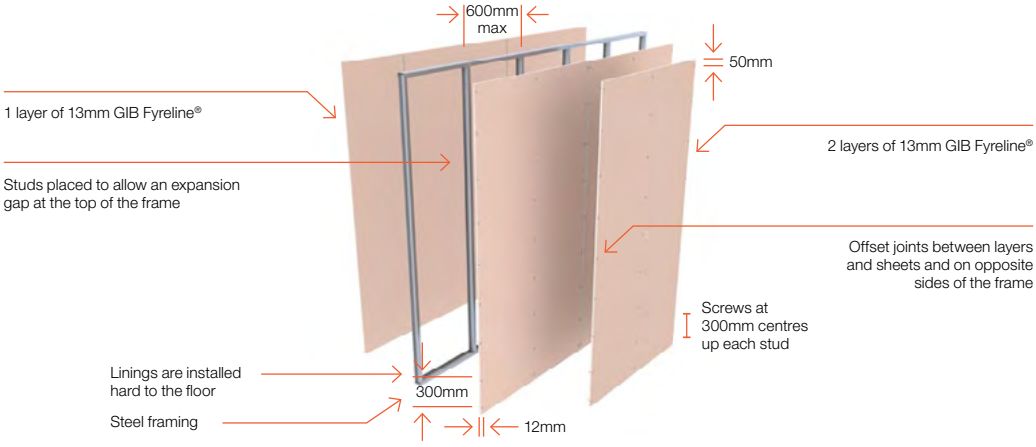
Fastening the linings at 18mm from sheet ends to top and bottom channels is permitted as long as the fasteners do not connect the studs and channels. Do not fix linings to the top channel when floor deflection has to be accommodated.

SERVICES

Holes may be drilled or pre-punched in the metal studs to allow installation of electrical service lines and plumbing supply pipes.

JOINTING

All screw heads stopped and all sheet joints tape reinforced and stopped in accordance with the publication entitled 'GIB Site Guide®'. Inner layer can be left unstopped.



Stahlton Rib and In-fill floor Details

Issue Date May 2019

Stahlton Rib and In-fill flooring is commonly used in a wide variety of commercial and residential applications. The system incorporates pre-stressed concrete ribs, permanent timber infill and an in situ concrete topping. Winstone Wallboards often receive enquiries about how to detail and construct the junction between GIB® performance partition systems and Stahlton Rib and In-fill flooring systems.

Figures 1 to 7 below show a number of options for partitions running along and across the Stahlton Ribs.

Where the partition abuts the underside of the timber infill additional protection as per the table below is required between the Stahlton Ribs to minimise timber char and cover possible shrinkage gaps between the timber planks which can permit sound transmission as well as the passage of flame and hot gases.

Required FRR	Minimum timber infill protection
30 min	1 layer of 13mm GIB® Standard
60 min	1 layer of 13mm GIB Fyreline® or 2 layers of 10mm GIB Fyreline®
90 min	1 layer of 16mm GIB Fyreline® or 2 layers of 13mm GIB Fyreline®
120 min	1 layer of 19mm GIB Fyreline® or 2 layers of 13mm GIB Fyreline®

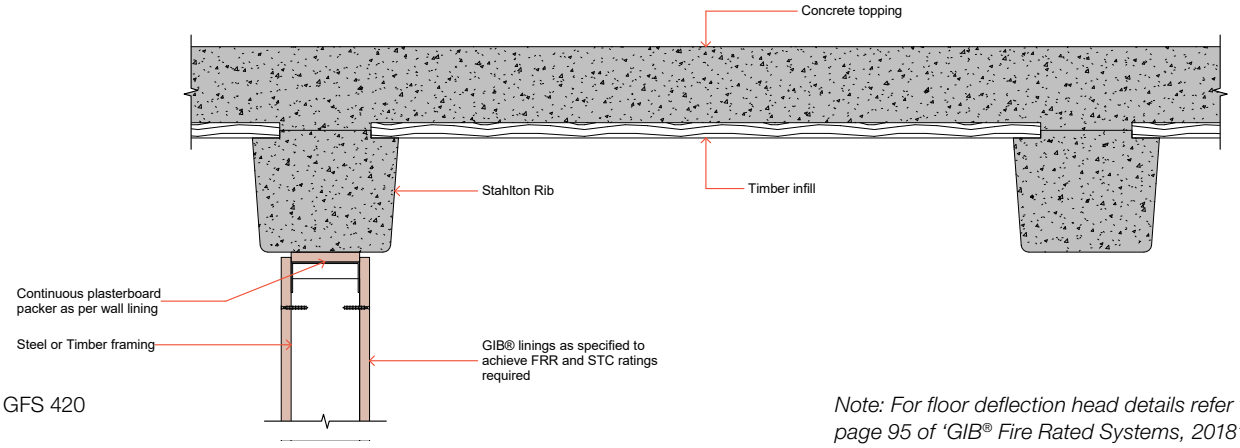
Alternatively, a design engineer may assist with assessing char of the timber infill for the required time of the FRR. This is often acceptable as there is a substantial depth of timber infill and the concrete slab provides a heat sink. However, shrinkage gaps between the timber planks must still be addressed.

Note that timber shrinkage occurs over time and that gaps between the timber planks may not reach their full width until the building has been in service for some time.

Alternatively cut the timber infill partially and extend the partition to the underside of the concrete topping, provided the Stahlton supplier verifies this method.

Note that the partition head must be revised to align with generic deflection head details if floor deflection has to be accommodated. Refer to page 95 of ‘GIB® Fire Rated Systems, 2018’ for more details.

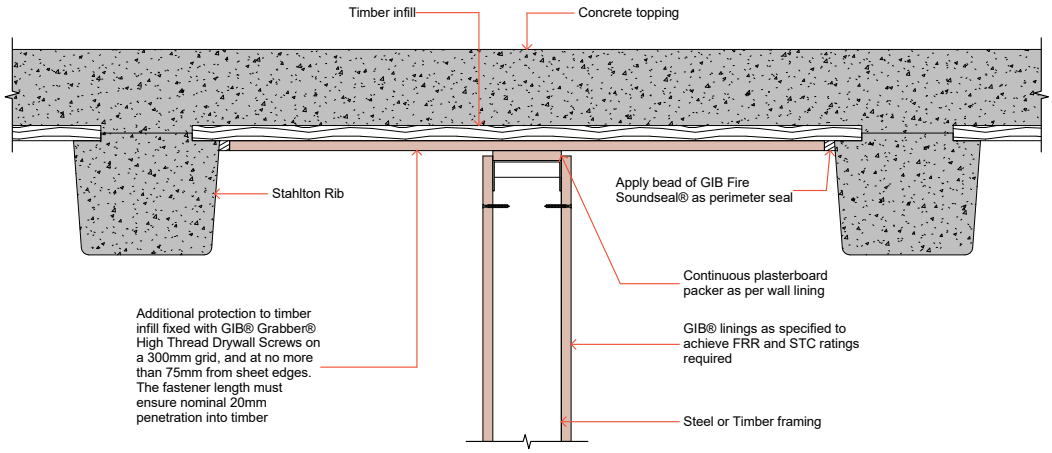
Figure 1: Junction to the underside of Stahlton Rib



GFS 420

Note: For floor deflection head details refer to page 95 of 'GIB® Fire Rated Systems, 2018'.

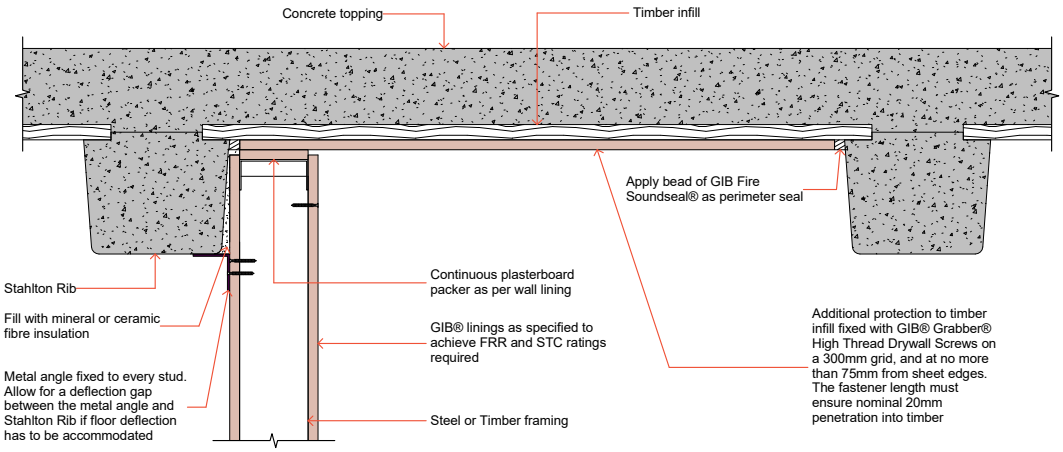
Figure 2: Junction to the underside of timber infill



GFS 421

Note: For floor deflection head details refer to page 95 of 'GIB® Fire Rated Systems, 2018'.

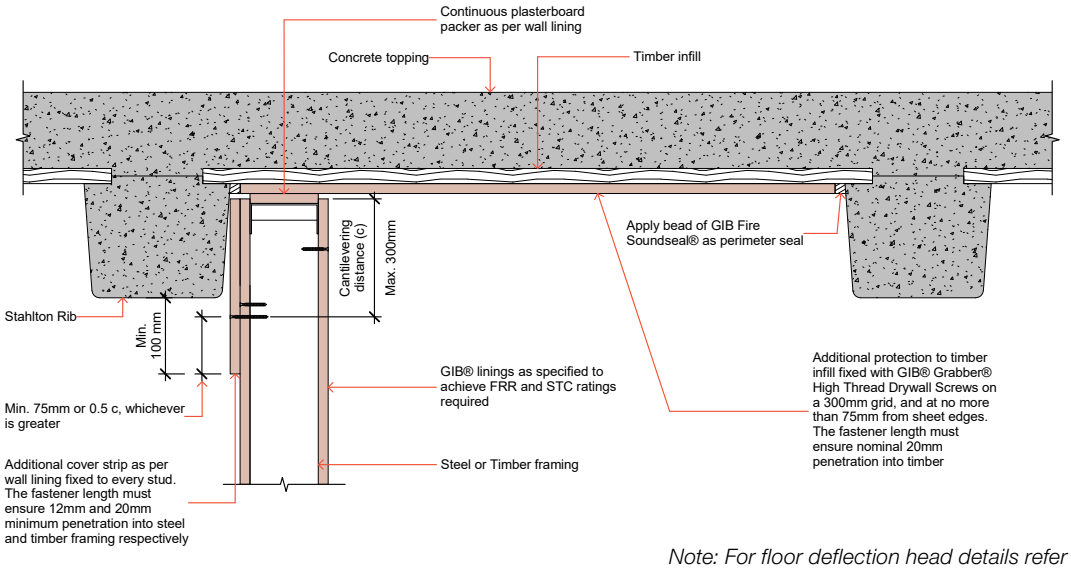
Figure 3: Limited access for the highest fixing – Option 1



GFS 422

Note: For floor deflection head details refer to page 95 of 'GIB® Fire Rated Systems, 2018'.

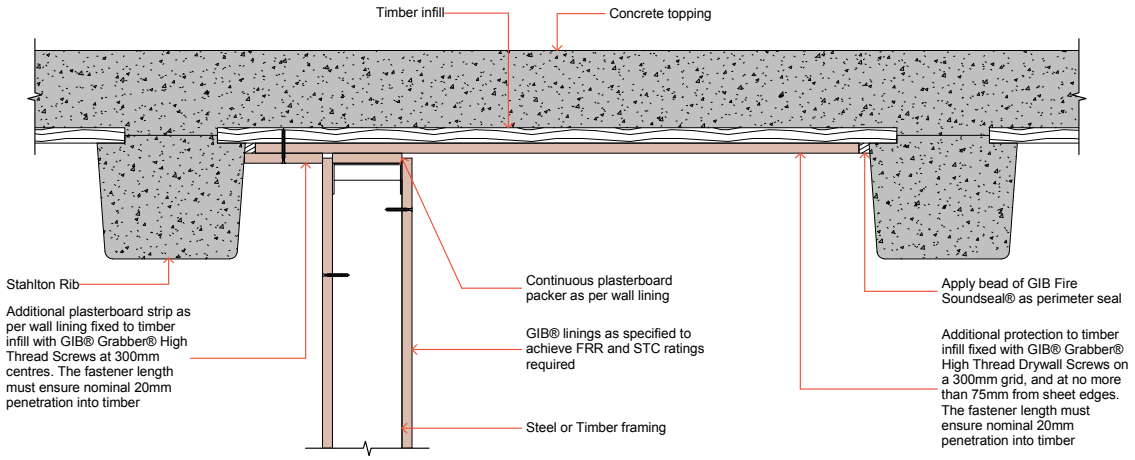
Figure 4: Limited access for the highest fixing – Option 2



GFS 423

Note: For floor deflection head details refer to page 95 of 'GIB® Fire Rated Systems, 2018'.

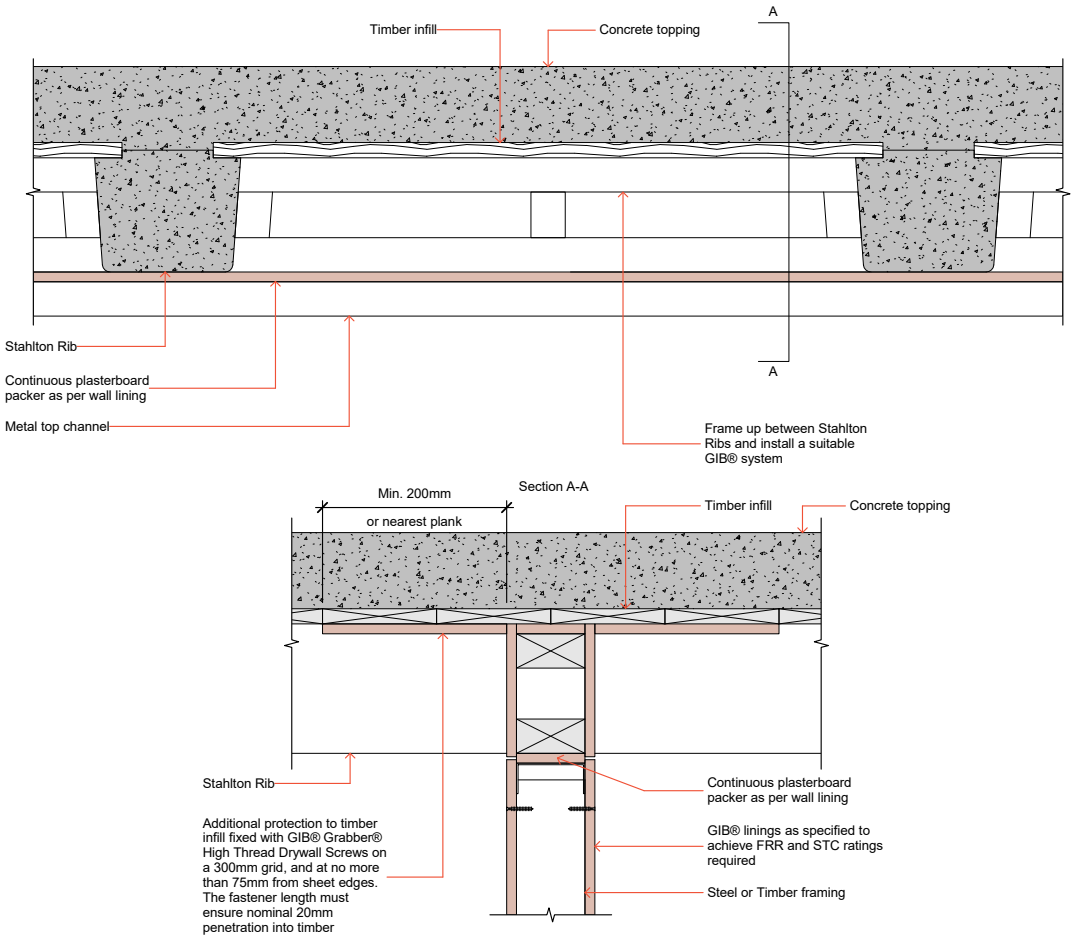
Figure 5: Limited access for the highest fixing – Option 3



GFS 424

Note: For floor deflection head details refer to page 95 of 'GIB® Fire Rated Systems, 2018'.

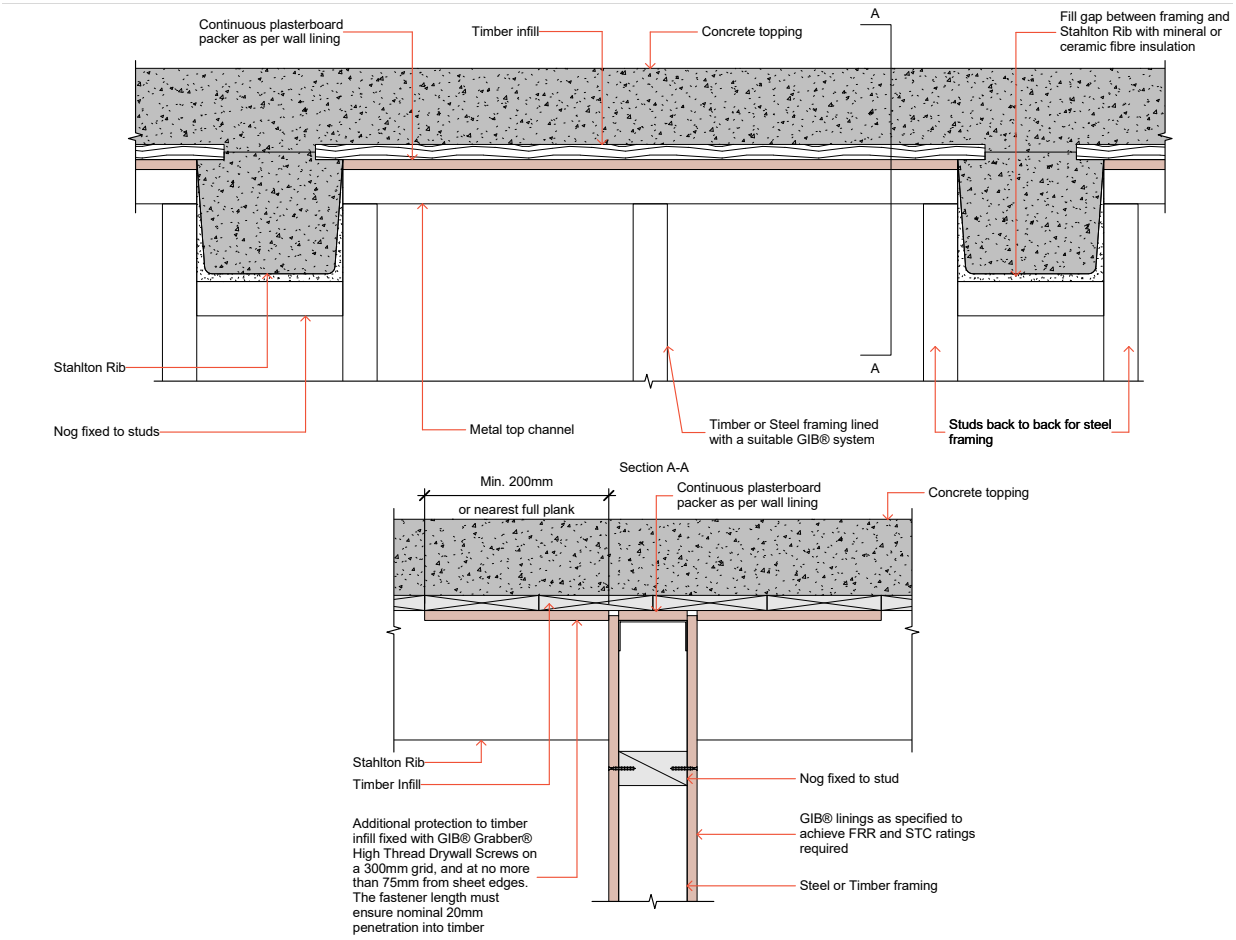
Figure 6: Detail for wall across Stahlton Rib - Option 1



GFS 425

Note: For floor deflection head details refer to page 95 of 'GIB® Fire Rated Systems, 2018'.

Figure 7: Detail for wall across Stahlton Rib - Option 2



GFS 426

Note: For floor deflection head details refer to page 95 of 'GIB® Fire Rated Systems, 2018'.

For any further information, please contact the GIB® Helpline on 0800 100 442.

Double Tee Floor Details

May 2019

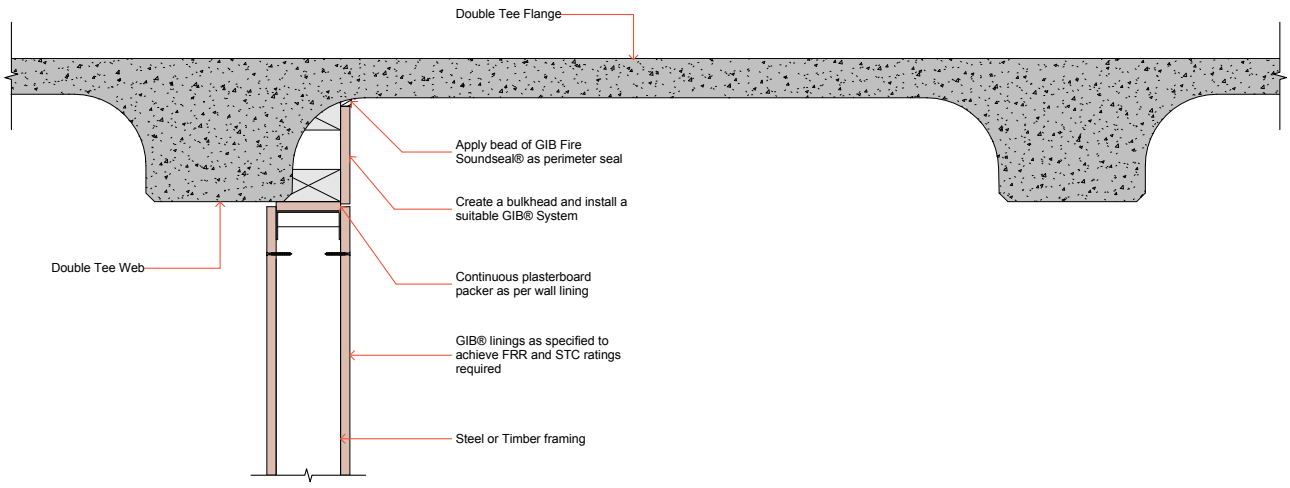
Double Tee floor systems incorporate large, prestressed precast concrete units, and are commonly used in most types of commercial buildings. Winstone Wallboards often receive enquiries about how to detail and construct the junction between GIB® performance partition systems and Double Tee floor systems.

Figures 1 to 6 below show a number of options for partitions running along and across the Double Tee webs.

Prior to any works being carried out it is important to liaise with the Double Tee supplier and check where framing fasteners can be installed.

Note that the partition head must be revised to align with generic deflection head details if floor deflection has to be accommodated. Refer to page 95 of 'GIB® Fire Rated Systems, 2018' for more details.

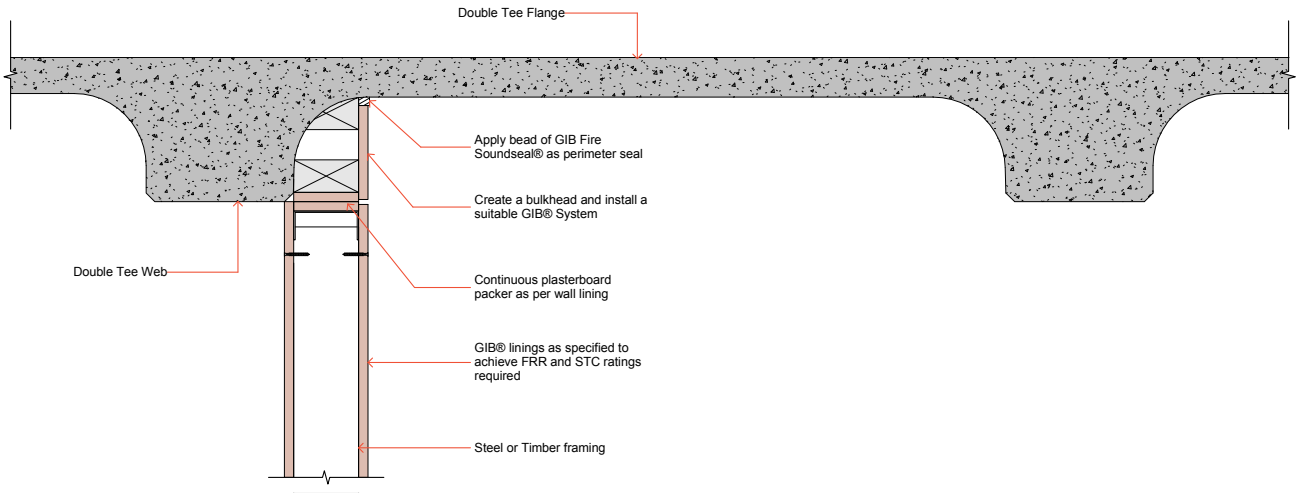
Figure 1: Junction to the underside of both Double Tee flange and web



GFS 440

Note: For floor deflection head details refer to page 95 of 'GIB® Fire Rated Systems, 2018'.

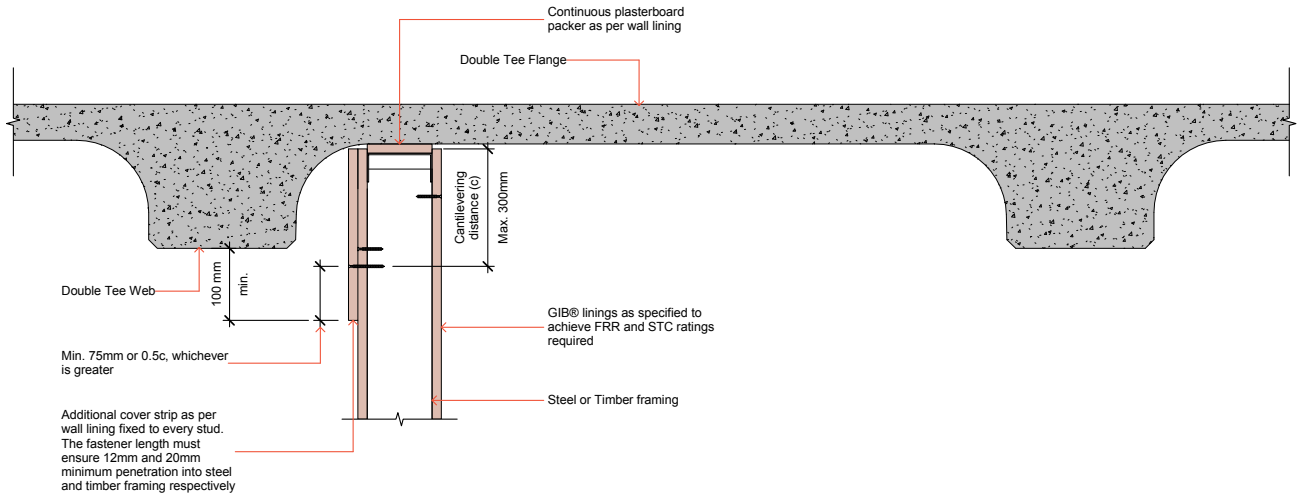
Figure 2: Junction to the underside of the Double Tee flange



GFS 441

Note: For floor deflection head details refer to page 95 of 'GIB® Fire Rated Systems, 2018'.

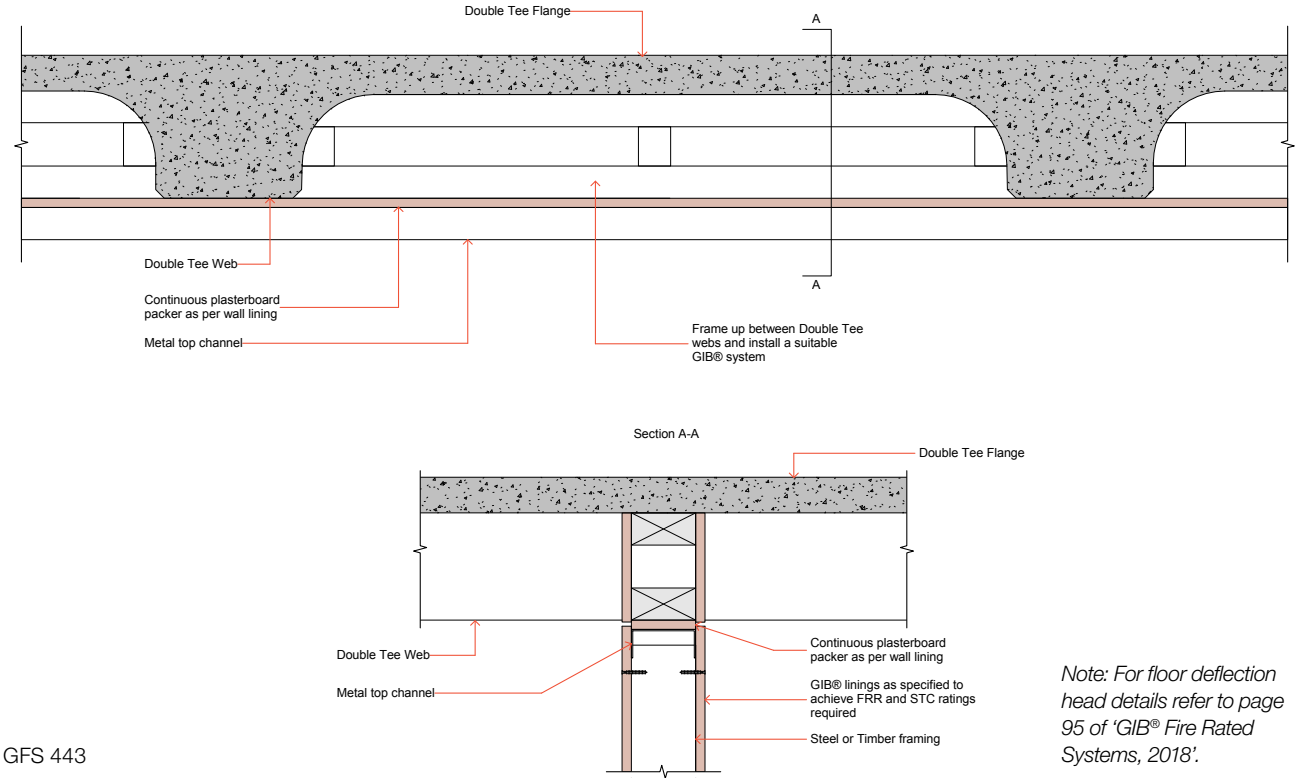
Figure 3: Junction to the underside of the Double Tee flange, where access is limited for the highest fixing



GFS 442

Note: For floor deflection head details refer to page 95 of 'GIB® Fire Rated Systems, 2018'.

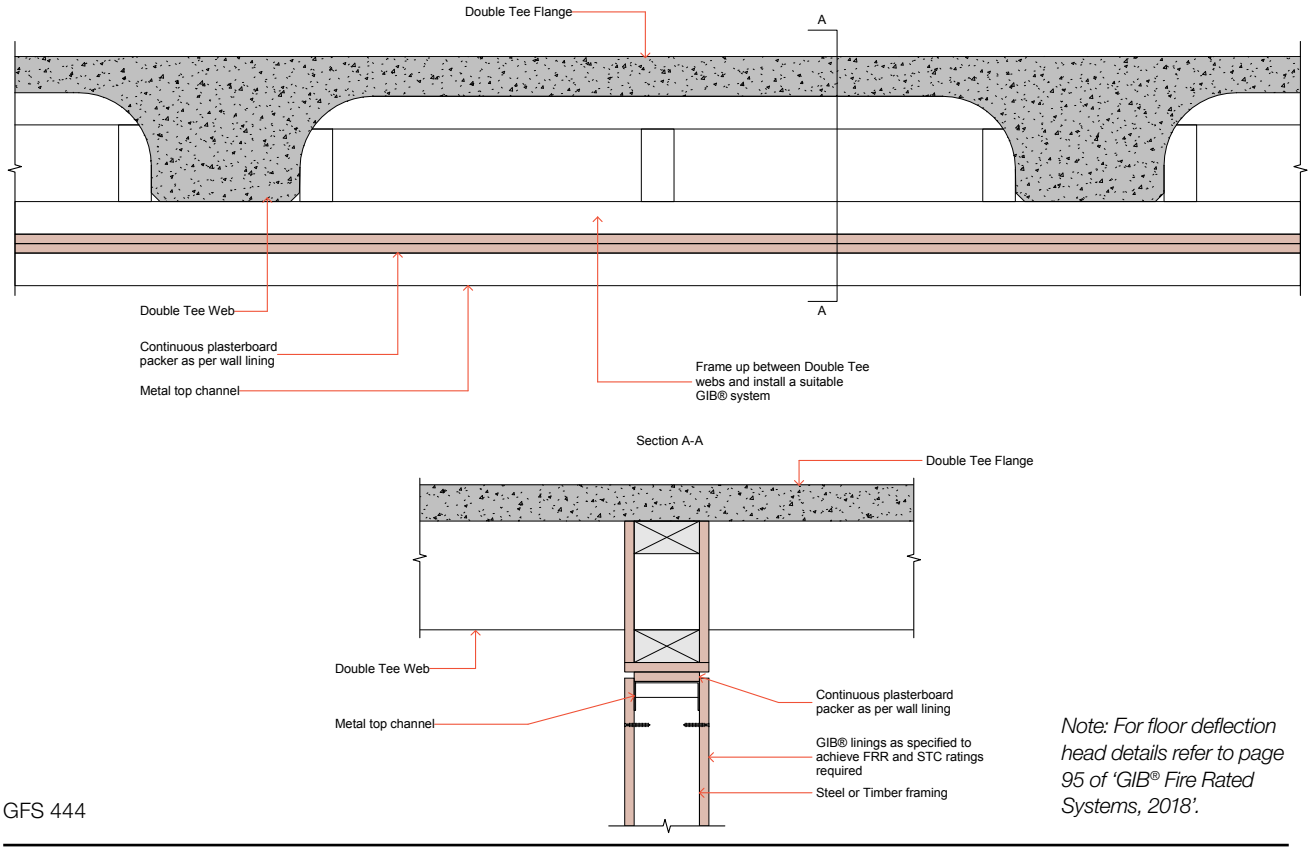
Figure 4: Detail for wall across Double Tee Web - Option 1



GFS 443

Note: For floor deflection head details refer to page 95 of 'GIB® Fire Rated Systems, 2018'.

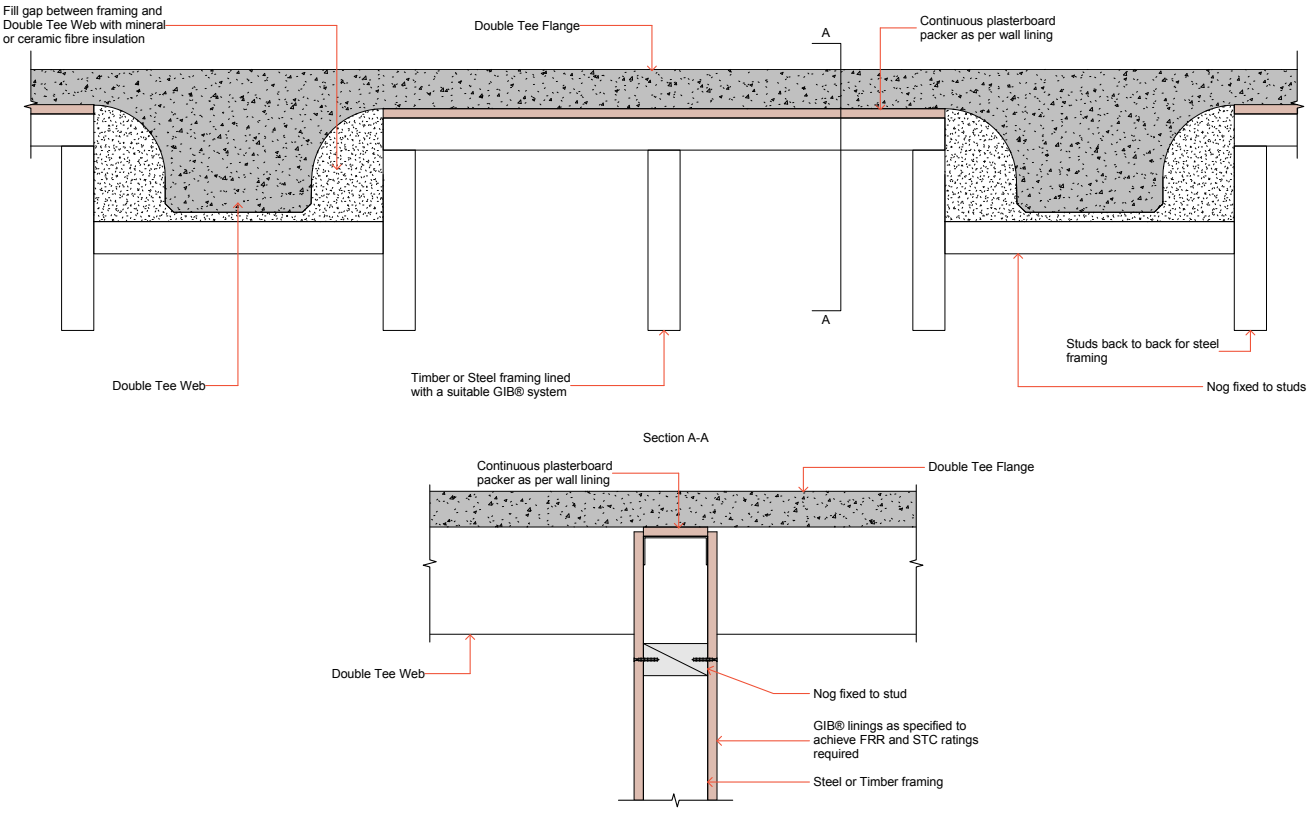
Figure 5: Detail for wall across Double Tee Web - Option 2



GFS 444

Note: For floor deflection head details refer to page 95 of 'GIB® Fire Rated Systems, 2018'.

Figure 6: Detail for wall across Double Tee Web - Option 3



GFS 445

Note: For floor deflection head details refer to page 95 of 'GIB® Fire Rated Systems, 2018'.

For any further information, please contact the GIB® Helpline on 0800 100 442.

Additional wall to floor/ceiling junction details

February 2020

All building sites are different and have their own challenges, and therefore generic wall-to-floor/ceiling junction details for fire and smoke separations presented in GIB® Fire Rated Systems, 2018 manual often have to be modified to align with common practices.

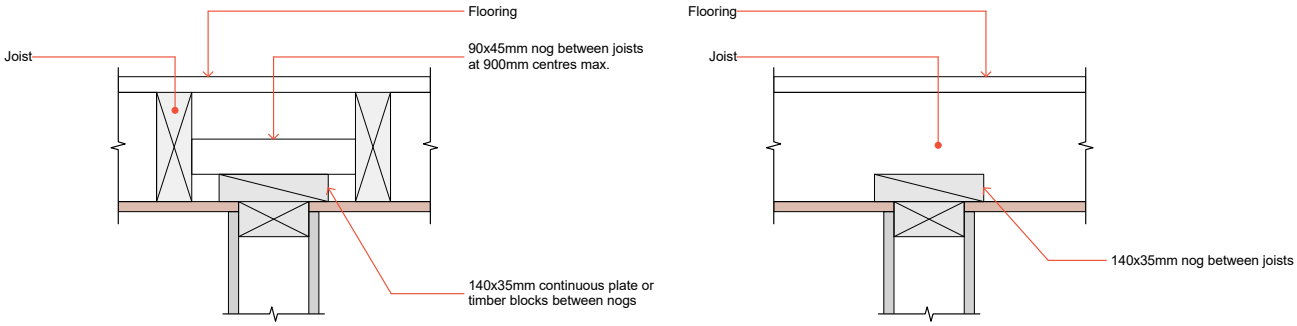
Figures 1 to 6 show a number of wall-to-floor/ ceiling junction details with and without GIB® Rondo® Metal Batten Systems where an FRR of the floor/ceiling is continuous.

Each figure includes two details, one showing the wall running along the joist, and the other showing the wall running across the joist.

Solid connections such as timber blocking, as illustrated in Figures 1 to 4, can reduce the published STC and IIC noise control performances of intertenancy floor/ceiling systems. It is suggested to consider Figures 5 and 6 to retain the published noise control ratings of the floor/ceiling systems.

For any further information, please contact the GIB® Helpline on 0800 100 442.

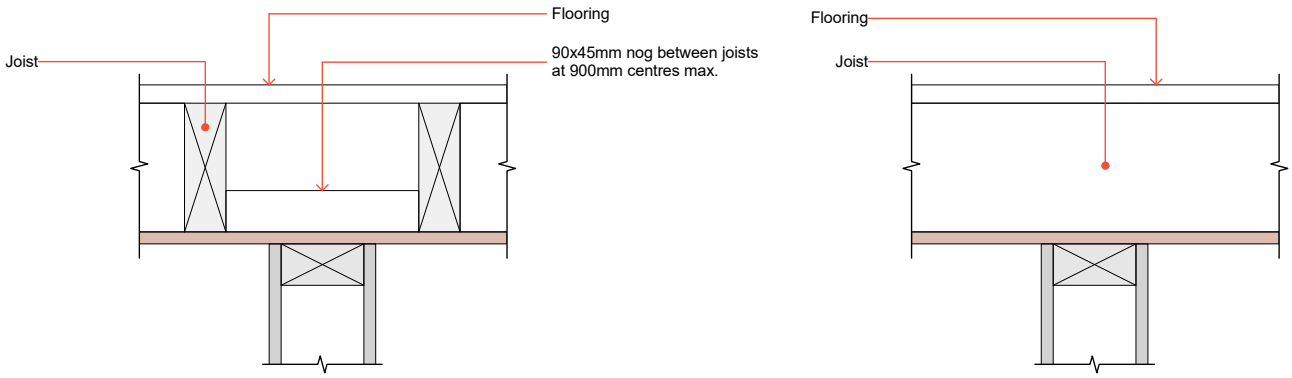
Figure 1: Direct fixed ceiling lining to timber joists (Section view) - Option 1



GFS 105

- The FRR of the floor/ceiling is more than that of the wall, and
- The difference in FRR is no more than 30 minutes, and
- The wall is non-loadbearing

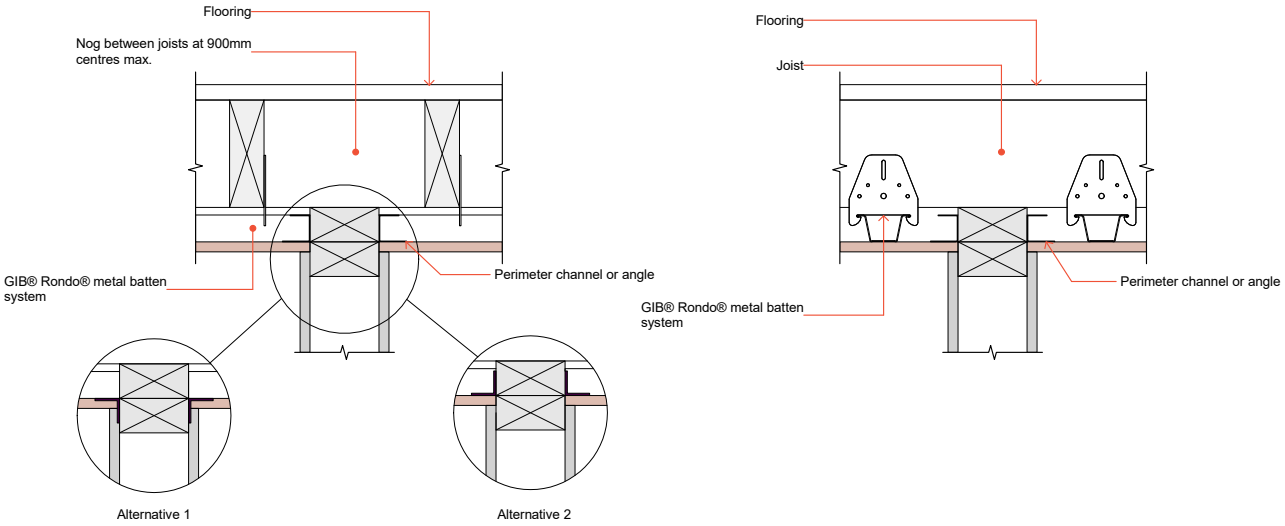
Figure 2: Direct fixed ceiling lining to timber joists (Section view) - Option 2



GFS 106

- The FRR of the floor/ceiling is more than that of the wall, and
- The wall is non-loadbearing

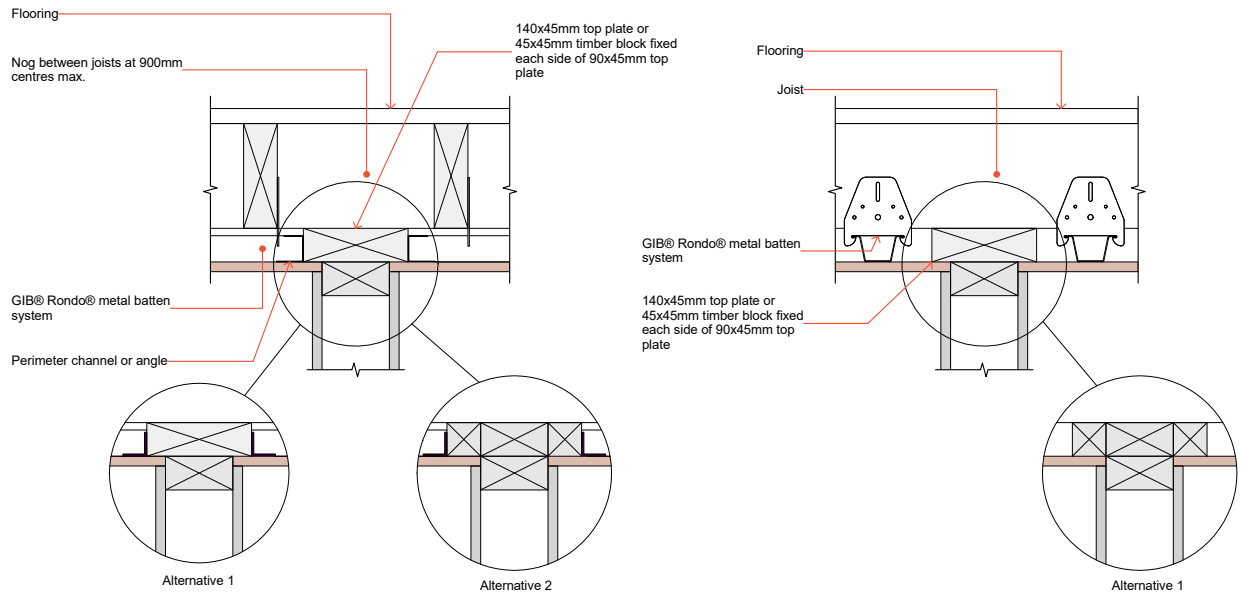
Figure 3: GIB® Rondo® Metal Batten Systems (Section view) - Option 1



GFS 107

- The FRR of the floor/ceiling is more than that of the wall, and
- The difference in FRR is no more than 30 minutes, and
- The wall is non-loadbearing

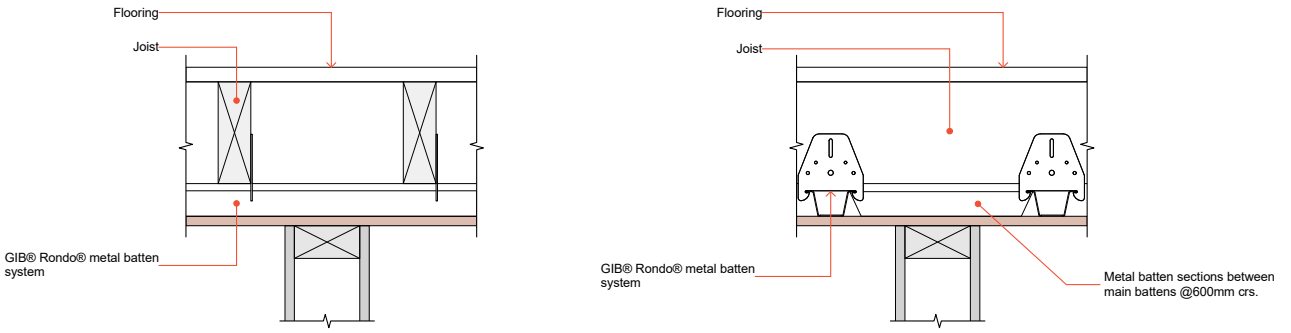
Figure 4: GIB® Rondo® Metal Batten Systems (Section view) - Option 2



GFS 108

- The FRR of the floor/ceiling is more than that of the wall, and
- The difference in FRR is no more than 30 minutes, and
- The wall is non-loadbearing

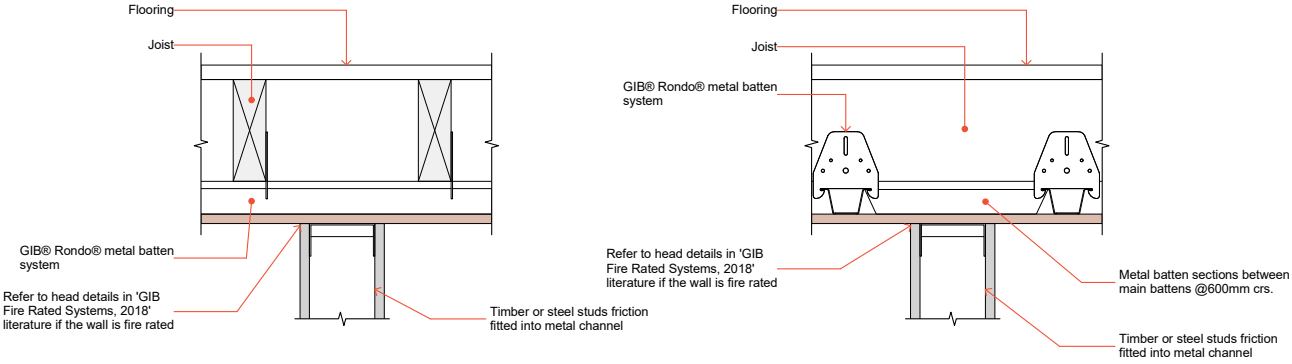
Figure 5: GIB® Rondo® Metal Batten Systems (Section view) - Option 3



GFS 109

- The FRR of the floor/ceiling is more than that of the wall, and
- The wall is non-loadbearing

Figure 6: GIB® Rondo® Metal Batten Systems (Section view) - Option 4



GFS 110

- The FRR of the floor/ceiling is more than that of the wall, and
- The wall is non-loadbearing

Fire rated wall systems subjected to simultaneous two-sided fire exposure

July 2021

The standard furnace test for fire-resistance represents the scenario where a fire-rated wall, acting as a separating element, is exposed to fire from one side. However, like a column or beam located within a fire compartment, walls required to perform a structural function are not always fire separations and can be exposed to fire on both sides simultaneously.

A conventional fire resistance rating (FRR) for a wall system applies from either direction and is expressed in minutes representing *structural adequacy/integrity/insulation* where the exposed and unexposed linings contribute, particularly as it relates to the unexposed face temperature rise (the *insulation* criterion).

Structural adequacy represents the ability of a wall to resist applied gravity loads under standard fire exposure conditions. Due to increased stud char, the *structural adequacy* of a timber-framed wall tested from one side cannot be applied when exposure is from both sides simultaneously.

Research at the University of Canterbury (Kang, 2021) suggests a predictive method to assess the *structural adequacy* of timber-framed load-bearing plasterboard-lined walls subjected to simultaneous fire exposure from both sides. Abaqus/CAE finite element modelling was developed and validated by comparing predictions with experimental results. Three full-scale fire resistance tests, designed to expose the specimen on both sides simultaneously, were conducted as part of the research.

Figure 1: Full-scale fire-resistance test designed for two-sided fire exposure

(a) Extended furnace beyond the specimen

(b) Shortened load-bearing specimen with wall openings at each end

(c) Residual timber-framed wall

Winstone Wallboards literature 'GIB® Fire Rated Systems, 2018' recommends that one-way 'GBUW' FRR specifications can be installed both sides of a wall to limit cavity temperature rise by approximately 300 °C, such that timber char is negligible at the published time of FRR. To achieve *structural adequacy* under two-sided simultaneous exposure this requires specification GBUW 30a (1/16 mm GIB Fyreline® each side) or GBUW 30b (2/10 mm GIB Fyreline® each side) for 30 minutes, and GBUW 60 (2/13 mm GIB Fyreline® each side) for 60 minutes.

The recent research shows that the *structural adequacy* of conventional fire-rated load-bearing timber-framed walls exposed from two-sides simultaneously can be predicted using the equation below. This simplified method offers benefits at 30-minute exposure but has greater conservatism for higher FRRs.

$$t_2 = 0.44 \cdot t_{FRR} + 9.5 \text{ where,}$$

— t_2 = Predicted *structural adequacy* under two-sided fire exposure (min)
— t_{FRR} = Published two way FRR (min)

Combining the approaches in 'GIB® Fire Rated Systems, 2018' and the simplified method from recent research shows that *structural adequacy* under simultaneous two-sided exposure is achieved with GBTL 60 for 30 minutes, and GBUW 60 each side for 60 minutes. On this basis, the following two specifications have been developed to make it easy to specify and install. Refer to attached specification sheets for complete details.

— 30 minutes - GBTL 30 2S (1/13 mm GIB Fyreline® each side)
— 60 minutes - GBTL 60 2S (2/13 mm GIB Fyreline® each side)

Project specific predictions can be made using an advanced design method which was also developed as part of the research. This method also considers other parameters that influence *structural adequacy*, such as load ratio, thickness of plasterboard and timber stud dimensions.

The full thesis is accessible online from the University of Canterbury Research Repository.

For any further information go to gib.co.nz or contact the GIB® Helpline on 0800 100 442.

Reference: Kang, H. (2021). The Performance of Timber-framed Load-bearing Gypsum Plasterboard Walls Subjected to Two-sided Fire Exposure. University of Canterbury, Christchurch, New Zealand.

Simultanious two sided fire exposure — timber frame

Specification number	Performance		Specifications	
GBTL 30 2S	**FRR**	30/-/-	**Lining**	1 layer of 13mm GIB Fyreline® each side
	STC	36	**LB/NLB**	Load bearing
	Rw	36		

FRAMING

Framing to comply with:

— NZBC B1 — Structure: AS1 Clause 3 — Timber (NZS 3604) or VM1 Clause 6 — Timber (NZS 3603)
— NZBC B2 — Durability: AS1 Clause 3.2 — Timber (NZS 3602)
— Minimum 90 x 45mm studs at 600mm centres maximum
— Nogs at 1000mm centres maximum

WALL HEIGHTS AND FRAMING DIMENSIONS

Loadbearing — Framing dimensions and height as determined by NZS 3604 stud and top plate tables for loadbearing walls.

LINING

1 layer of 13mm GIB Fyreline® each side of the frame.

Vertical or horizontal fixing permitted. All sheet joints must be formed over solid timber framing. Sheets shall be touch fitted.

Vertical fixing — Stagger longitudinal sheet joints on opposite sides of the wall. When sheet end butt joints are unavoidable, they shall be formed over nogs and offset on opposite sides of the frame.

Horizontal fixing — Horizontal joints on opposite sides of the wall can be formed over the same row of nogs. Sheet end butt joints shall be formed over studs and offset on opposite sides of the frame.

FASTENING THE LINING

Fasteners

41mm x 6g GIB® Grabber® High Thread Drywall Screws.

Fastener centres

Place fasteners at 300mm centres to perimeter framing and intermediate studs.

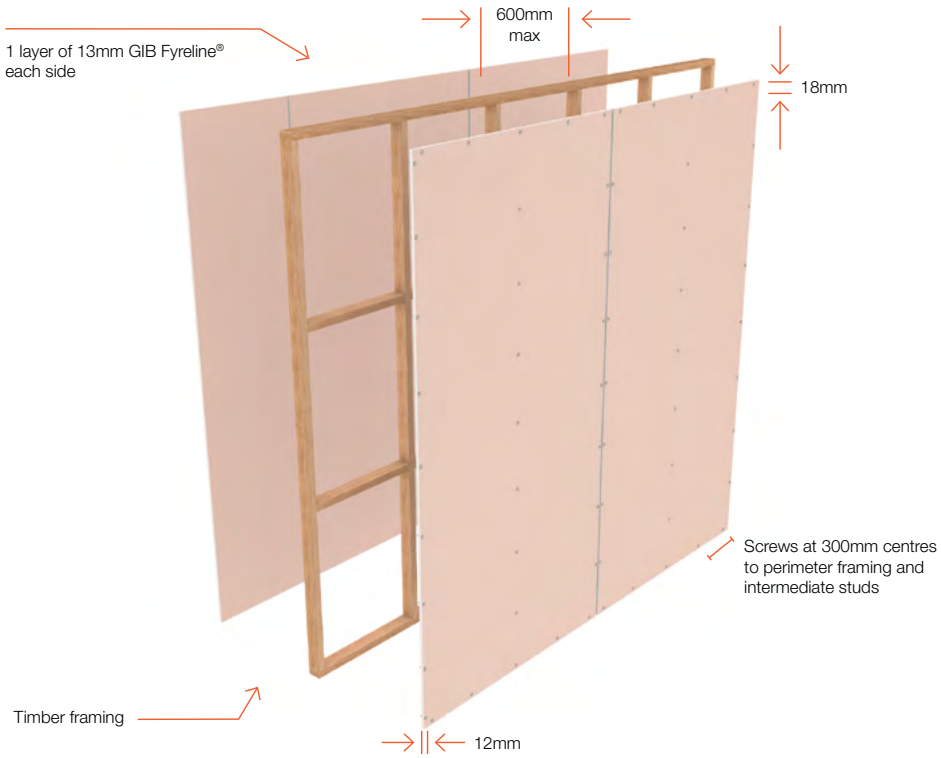
Place fasteners 50mm from sheet corners along plates. At wall corners place an additional fastener 50–60mm vertically, no closer than 10mm from plate-to-stud joints.

Place fasteners 12mm from longitudinal sheet edges and 18mm from sheet ends.

Place fasteners at 200mm centres along sheet end butt joints.

JOINTING

All fastener heads stopped and all sheet joints tape reinforced and stopped in accordance with the publication entitled “GIB® Site Guide”.



Simultanious two sided fire exposure — timber frame

Specification number	Performance		Specifications	
GBTL 60 2S	**FRR**	60/-/-	**Lining**	2 layers of 13mm GIB Fyreline® each side
	STC	46	**LB/NLB**	Load bearing
	Rw	45		

FRAMING

Framing to comply with:

— NZBC B1 — Structure: AS1 Clause 3 — Timber (NZS 3604) or VM1 Clause 6 — Timber (NZS 3603)
— NZBC B2 — Durability: AS1 Clause 3.2 — Timber (NZS 3602)
— Minimum 90 x 45mm studs at 600mm centres maximum
— Nogs at 1000mm centres maximum

WALL HEIGHTS AND FRAMING DIMENSIONS

Loadbearing — Framing dimensions and height as determined by NZS 3604 stud and top plate tables for loadbearing walls.

LINING

2 layers of 13mm GIB Fyreline® each side of the frame.

Vertical or horizontal fixing permitted. For vertical fixing, full height sheets shall be used where possible. Sheets shall be touch fitted.

All sheet joints must be formed over solid timber framing, except for longitudinal joints when the outer layer is fixed horizontally

Stagger longitudinal sheet joints between layers and on opposite sides of the frame. When sheet end butt joints are unavoidable, they shall be formed over nogs, staggered between layers and staggered on opposite sides of the wall.

FASTENING THE LINING

Fasteners

Inner layer: 32mm x 6g GIB® Grabber® High Thread Drywall Screws.

Outer layer: 51mm x 7g GIB® Grabber® High Thread Drywall Screws.

Fastener centres

Inner layer: 600mm centres up each stud.

Outer layer: 300mm centres up each stud.

Place fasteners 50mm from sheet corners along plates. At wall corners place an additional fastener 50–60mm vertically, no closer than 10mm from plate-to-stud joints.

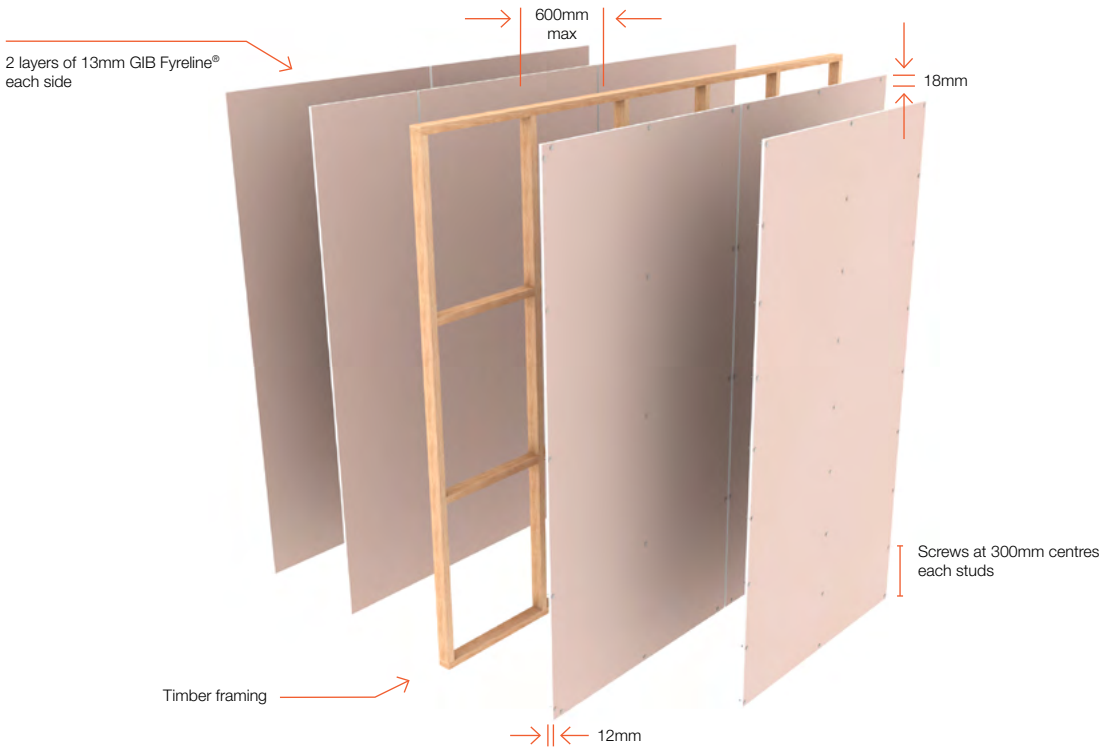
Place fasteners 12mm from longitudinal sheet edges and 18mm from sheet ends.

Place fasteners at 200mm centres along sheet end butt joints.

JOINTING

Inner layer: Unstopped.

Outer layer: All fastener heads stopped and all sheet joints tape reinforced and stopped in accordance with the publication entitled “GIB® Site Guide”.



Service penetrations and construction sequencing

September 2021

It is always recommended to resolve and specify fire stopping of service penetrations in the design office rather than on-site. Combine services as much as possible in 'services highways' or shafts which can themselves be fire rated, eliminating the need for many different and individual penetrations, and carefully consider construction sequencing.

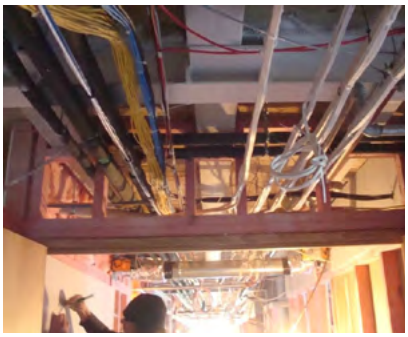
Deciding when to line affects how proprietary penetration seals can be installed around building services. Construction sequencing is important to ensure that both GIB® fire rated systems and penetration seals perform as tested. So, should fire separations be constructed first or should they be erected around building services?

Most fire resistance tests by penetration seal suppliers are conducted by constructing a fire rated system first, drilling neat holes through the plasterboard, before installing the services and penetration seals as shown in Figure 1. However, in practice building services are often already in place when linings are installed. This results in the need to cut plasterboard around services which often means sheet joints and edges end up 'floating' as shown in Figure 2. This sequence of construction makes the installation of linings and tested penetration seals either very difficult or impossible as shown in Figure 3. Inevitable questions will arise relating to the performance of the fire-stopping and expensive rework may be required.

Figure 1

Figure 2

Figure 3



Better construction sequencing

Coordination and planning are key to ensuring construction work is carried out in the most efficient way, and good communication between all relevant parties is essential to ensure fire separations and penetration seals are installed as tested. The ideal construction sequencing depends on whether services are in place before or after construction of the fire separations. Consider and select service penetration seals at design stage rather than during construction, so that compliant penetration seals can be installed correctly at the right time.

Services installed before fire separations

In commercial projects, building services are commonly installed before internal partitions. This means that fire separations need to be constructed around installed services. It is important to separate services so that available and tested penetrations seals can be installed. In other words, make sure cable trays, cable bundles, plastic pipes, metal pipes, etc. run with sufficient distance between them.

— Identify and separate service penetrations that can be fire-stopped individually or as a group
— Erect studs and nogs making sure lining joints can be formed over framing around service penetrations as shown in Figure 4a
— Ensure studs and nogs are positioned to provide support for the penetration seal product (e.g. a collar) and do not leave plasterboard unsupported for more than 75 mm
— Install plasterboard linings making sure penetration seal requirements are complied with
— Install the tested penetration seal and label accordingly

Fire separations installed before services

Given how penetration seals are commonly tested, this is a preferred but less common scenario. However, with adequate planning, discrete sections of framing can be erected and lined before services are installed.

— Consult with the service contractor and identify where services will be running
— Create discrete framed and lined sections where multiple penetrations can be accommodated by installation of a full patch as shown in Figure 5
— Separate service penetrations that can be fire-stopped individually or as a group
— Consult with penetration seal suppliers and installers and prepare service openings ensuring required spacing requirements
— Run services, install the tested penetration seals and label accordingly

Services tested in heavier linings

Sometimes penetration seals are tested in linings heavier than the linings they will be installed in. For example, this could apply to pipe collars tested direct fixed to the plasterboard, or cable penetrations. A simple solution is to locally increase the lining thickness by application of a patch as shown in Figure 4b. Where multiple penetrations need to be accommodated, and some require additional lining thickness, an additional full patch is often preferred as illustrated in Figure 5.

Patches will also assist when linings need to be installed around existing services and local reinforcing is required. Note that patches must be supported by framing and must extend at least 75 mm beyond the service opening.

Figure 4a

Figure 4b

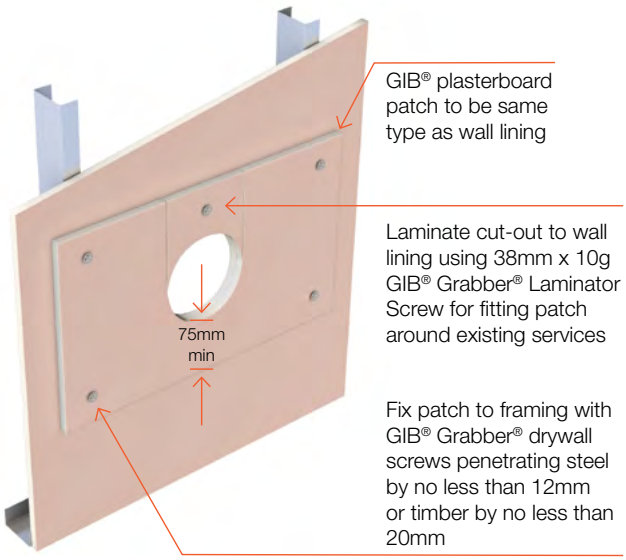
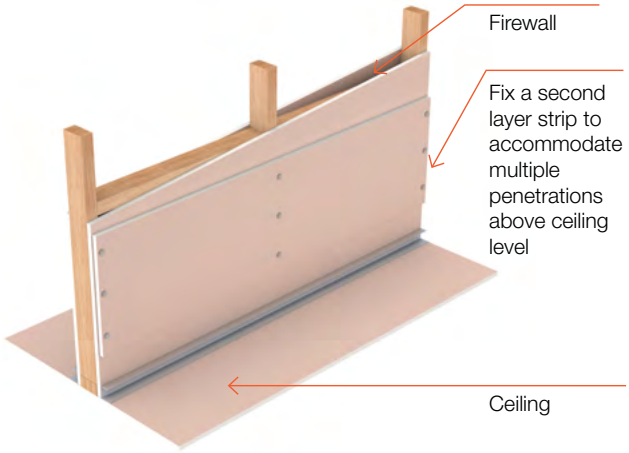


Figure 5



For any further information go to gib.co.nz or contact the GIB® Helpline on 0800 100 442.

Penetration and linear gap seals using GIB Fire Soundseal®

December 2022

Penetrations in fire rated construction can allow premature spread of fire and smoke if not correctly tested, specified or installed. Failure of penetrations can compromise the FRR and in turn the safety of building occupants.

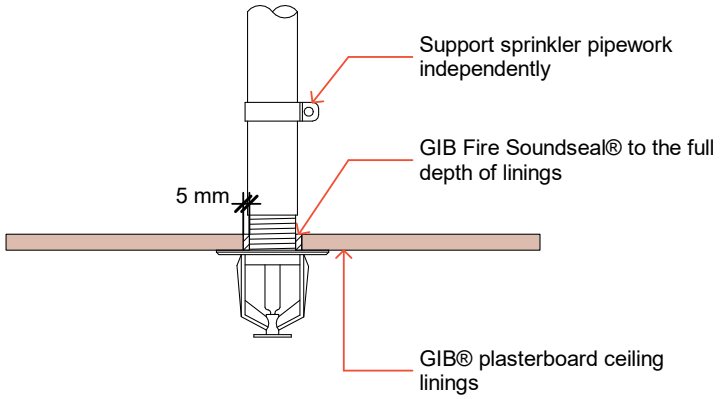
ONE-SIDED SERVICE PENETRATIONS

Figures 1 to 3 show the installation of simple one-sided service penetrations through the linings of GIB® Fire Rated Systems sealed with GIB Fire Soundseal®. They include a sprinkler penetration, and single and looped cable penetrations for surface-mounted electrical fixtures. The penetration details shown are suitable for application in GIB® Fire Rated Systems having an FRR up to and including 120 minutes.

Accurately mark the location of the penetration prior to installation of the sheet linings. At this location drill a hole through the sheet at the diameter shown. Install the sheet and apply GIB Fire Soundseal® around the penetrating item to the full depth of the linings.

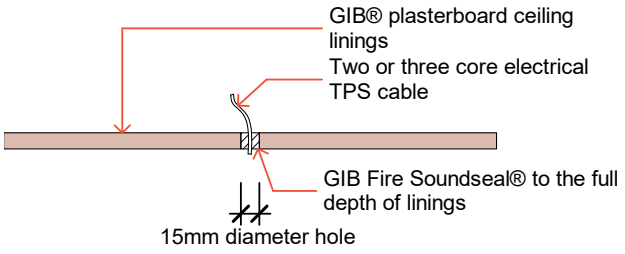
Alternatively, the one-sided service penetration details that rely on plasterboard baffles can be considered. Refer to 'GIB® Fire Rated Systems, 2018' for more details.

Figure 1: Sprinkler pipe penetration (ceiling)

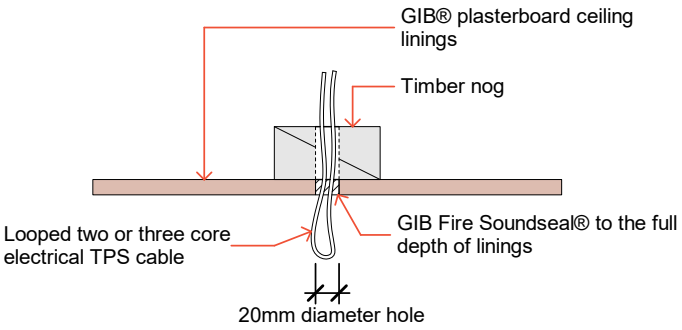


GFS 242

Figure 2: Single and looped cable penetrations (ceiling)

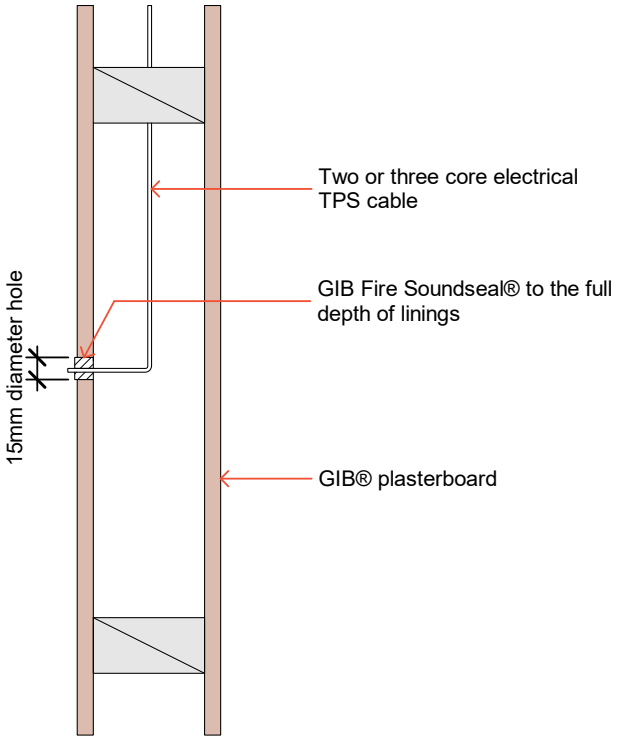


GFS 240

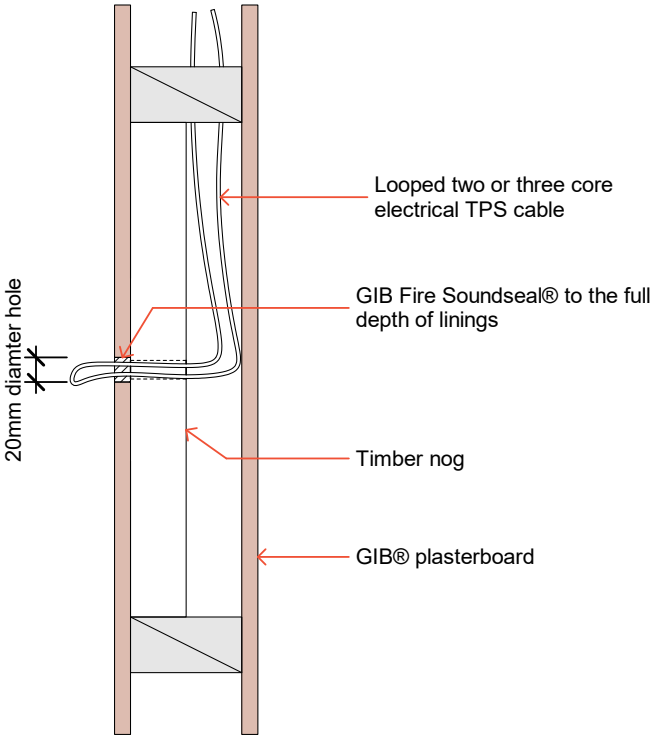


GFS 243

Figure 3: Single and looped cable penetrations (wall)



GFS 241



GFS 244

LINEAR GAP SEALS

Linear gaps between the linings which are backed by the wall framing can be filled with GIB Fire Soundseal®. The linear gaps can be nominally half the lining thickness but are limited to a maximum width of 10 mm. The full depth of the lining is filled with GIB Fire Soundseal® at a width-to-depth ratio between 1:1 and 1:2. This application is suitable for maintaining the fire resistance of wall systems with an FRR up to and including 120 minutes.

When using double layer systems, install the first layer of GIB® plasterboard and seal the linear gap, then repeat for the second layer.

For any further information go to gib.co.nz or contact the GIB® Helpline on 0800 100 442.

Structural timber and steel penetration protection

December 2022

Structural members penetrating a fire rated wall system must be treated the same as any other service penetration and must be adequately sealed to retain the fire resistance rating of the wall system.

TIMBER PENETRATION PROTECTION

Figures 1 and 2 show how to seal nominally 90 x 45mm or larger timber member penetrations through wall systems having a 30-minute FRR, and wall systems with an FRR of 60 minutes or higher. These details are suitable for application in GIB® Fire Rated Systems, GIB Noise Control® Systems, and GIB Weatherline® Rigid Air Barrier Systems having an FRR up to and including 120 minutes.

For wall systems having a 30-minute FRR, solid timber blocking is required around the timber member penetration to support plasterboard edges. Then, a bead of GIB Fire Soundseal® is applied around the timber penetration as shown in Figure 1.

For wall systems having an FRR equal to or more than 60 minutes, the timber penetration needs to be protected with plasterboard of the same type and thickness as the wall lining for at least 300 mm from the wall, as shown in Figure 2. These plasterboard strips are fixed with GIB® Grabber® High Thread Drywall Screws (or GIB® Grabber® Ceramic Coated High Thread Screws for GIB Weatherline®) at 300 mm centres max. and 18 mm from any cut edge. The fastener length must ensure a minimum 20 mm penetration into the timber member.

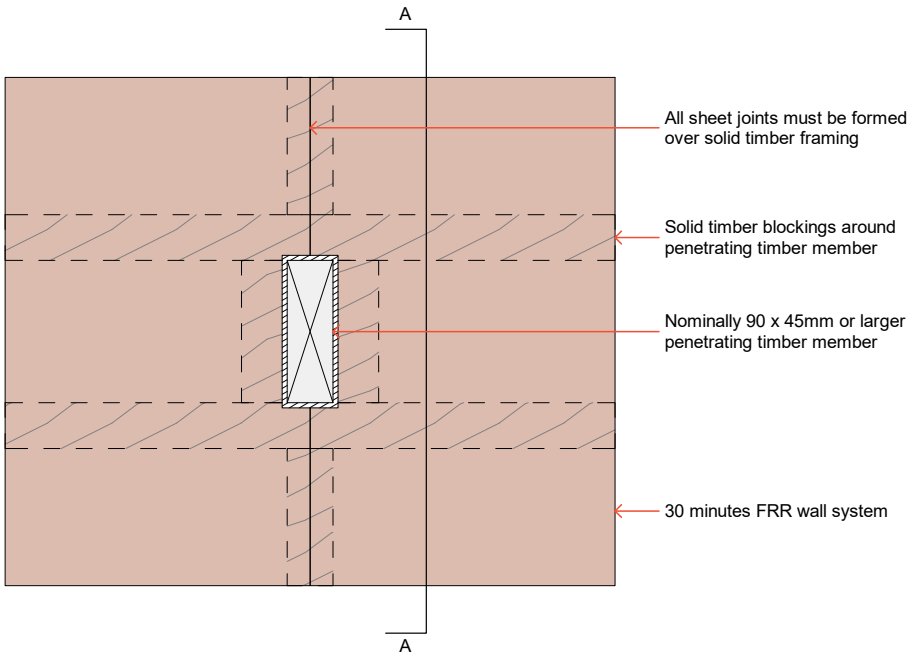
STEEL PENETRATION PROTECTION

Figures 3 to 4 show how to seal nominally 64 x 34 x 0.5 mm or larger steel member penetrations through fire rated timber and steel framed walls. Steel penetrations are protected with plasterboard of the same type and thickness as the wall lining for at least 300 mm from a two-way wall with an FRR up to a maximum of 120 minutes, or 600 mm from a one-way wall with an FRR up to a maximum of 60 minutes. Figure 5 shows how a steel member penetration through a minimum 90 mm thick concrete/masonry wall with an inherent FRR up to 120 minutes is protected. The plasterboard strips are fixed with specified fasteners at 300 mm centres max. and 18 mm from any cut edge. The fastener length must ensure a minimum 12 mm penetration.

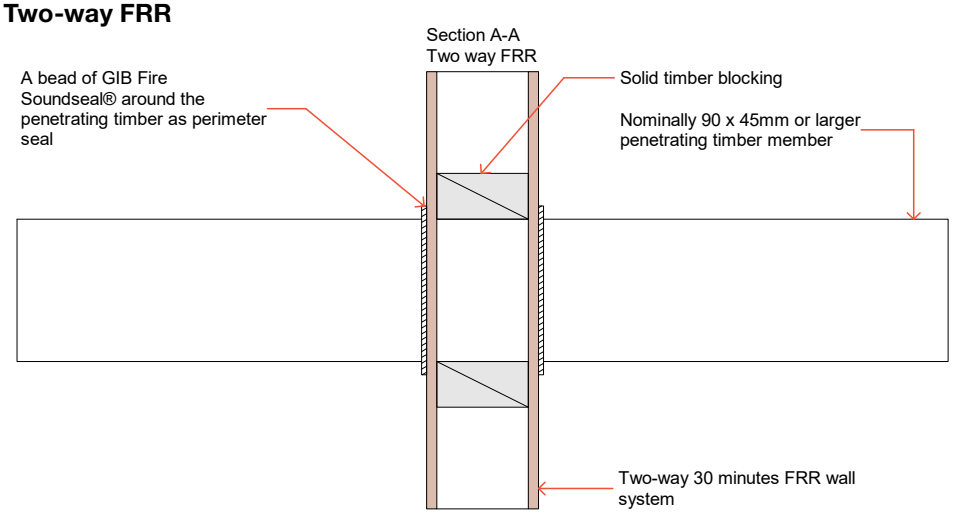
The maximum steel member thickness shall not exceed 20 mm for an FRR up to and including 60 minutes, and 10 mm for FRRs of 90 and 120 minutes. This solution does not apply to hollow sections with a continuous void that cannot be filled (e.g., RHS). The penetration design must ensure that the beam does not transfer fire-induced loads onto the wall system.

An example of construction steps for a hot-rolled Universal Beam penetrating a two-way FRR timber frame wall is shown in Figure 6.

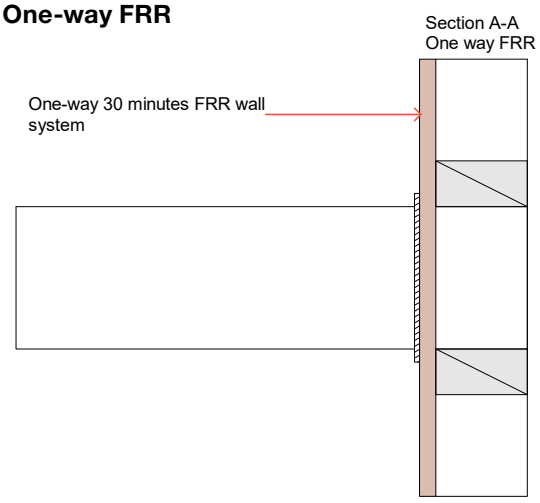
Figure 1: 30 minutes FRR wall systems timber penetration details



Section A-A – Two-way FRR

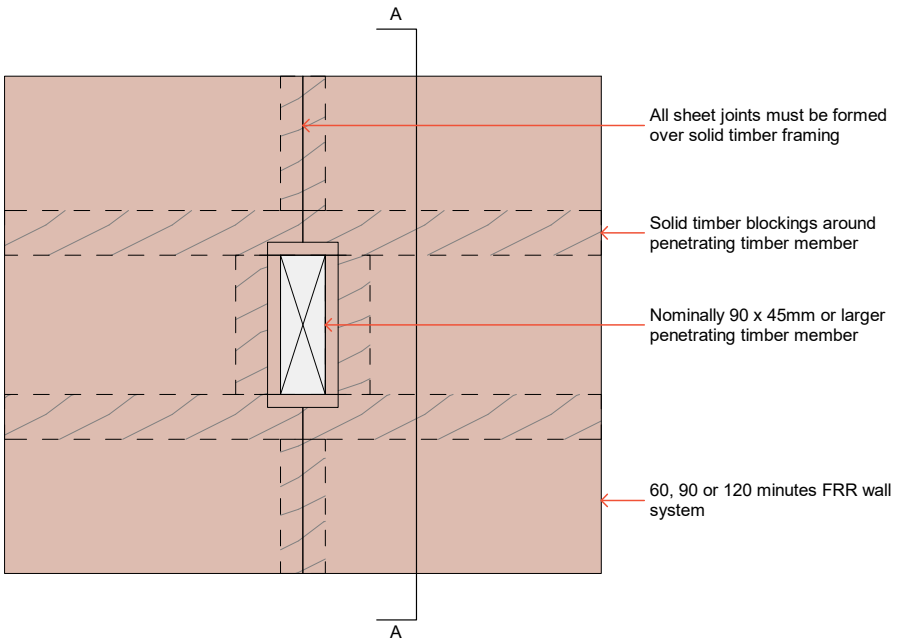


Section A-A – One-way FRR

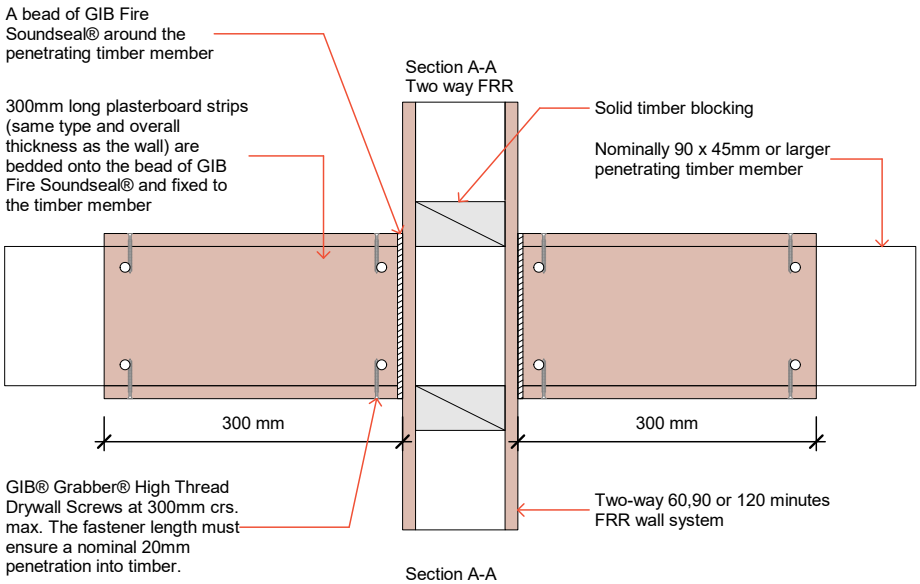


GFS 500

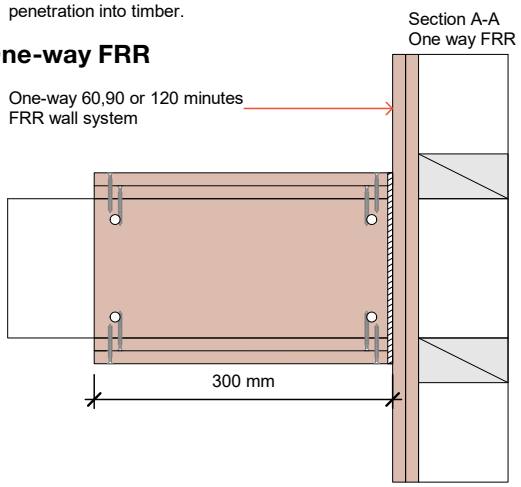
Figure 2: 60 minutes or higher FRR wall systems timber penetration details



Section A-A – Two-way FRR

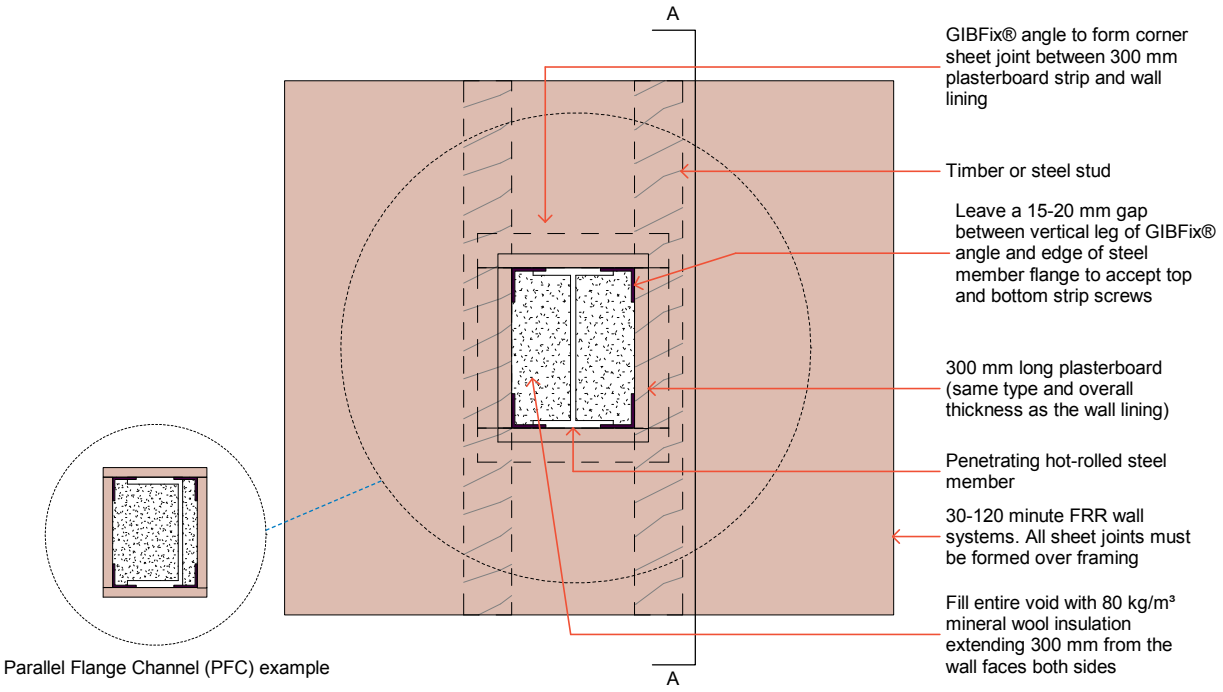


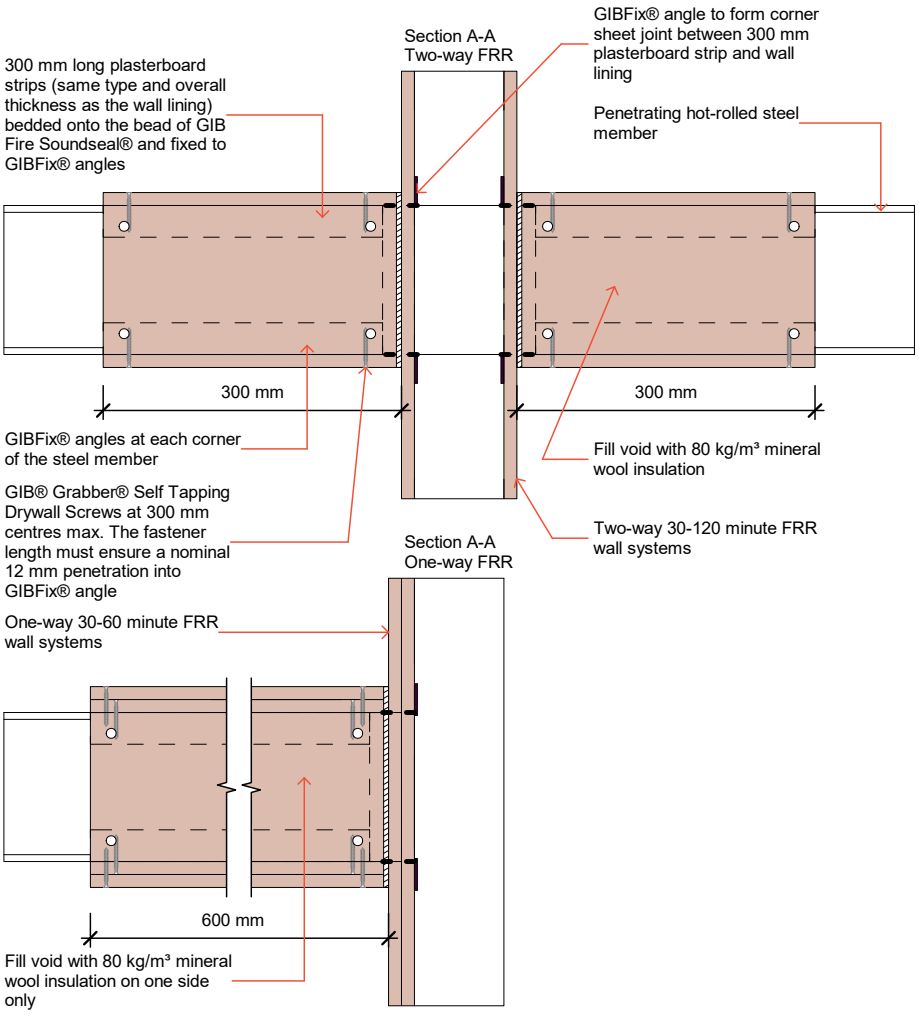
Section A-A – One-way FRR



GFS 501

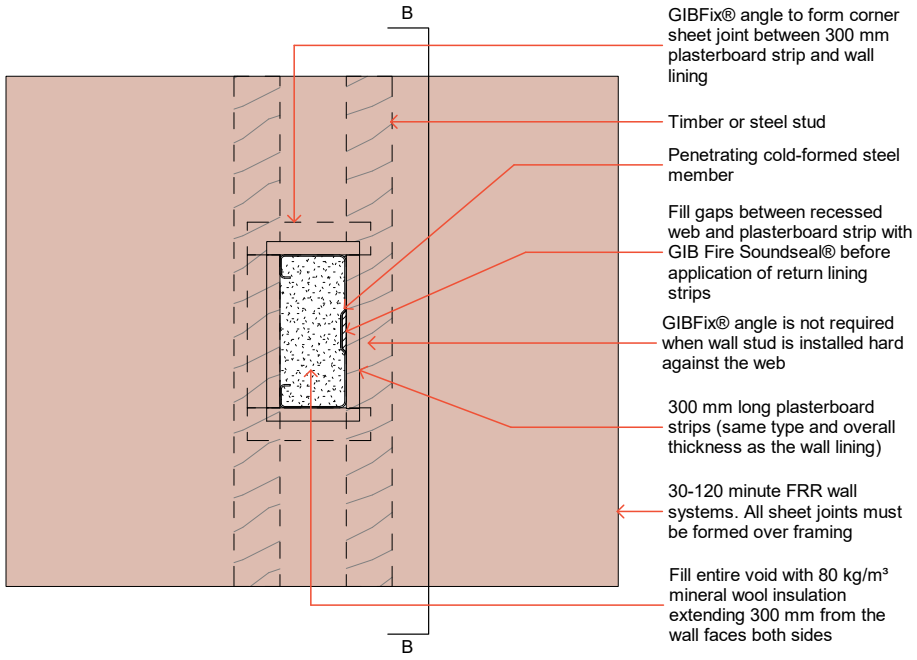
Figure 3: Hot-rolled structural steel penetrating 30 - 120-minute FRR timber/steel frame wall systems

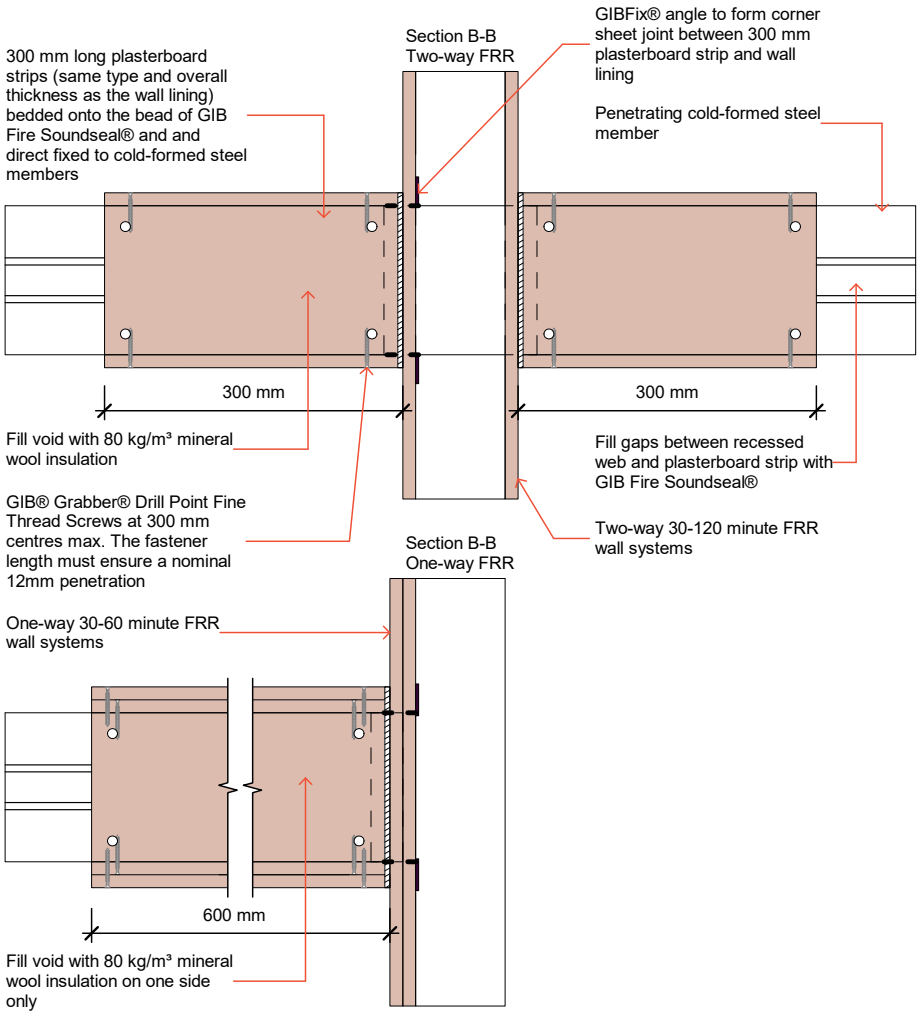




GFS 502

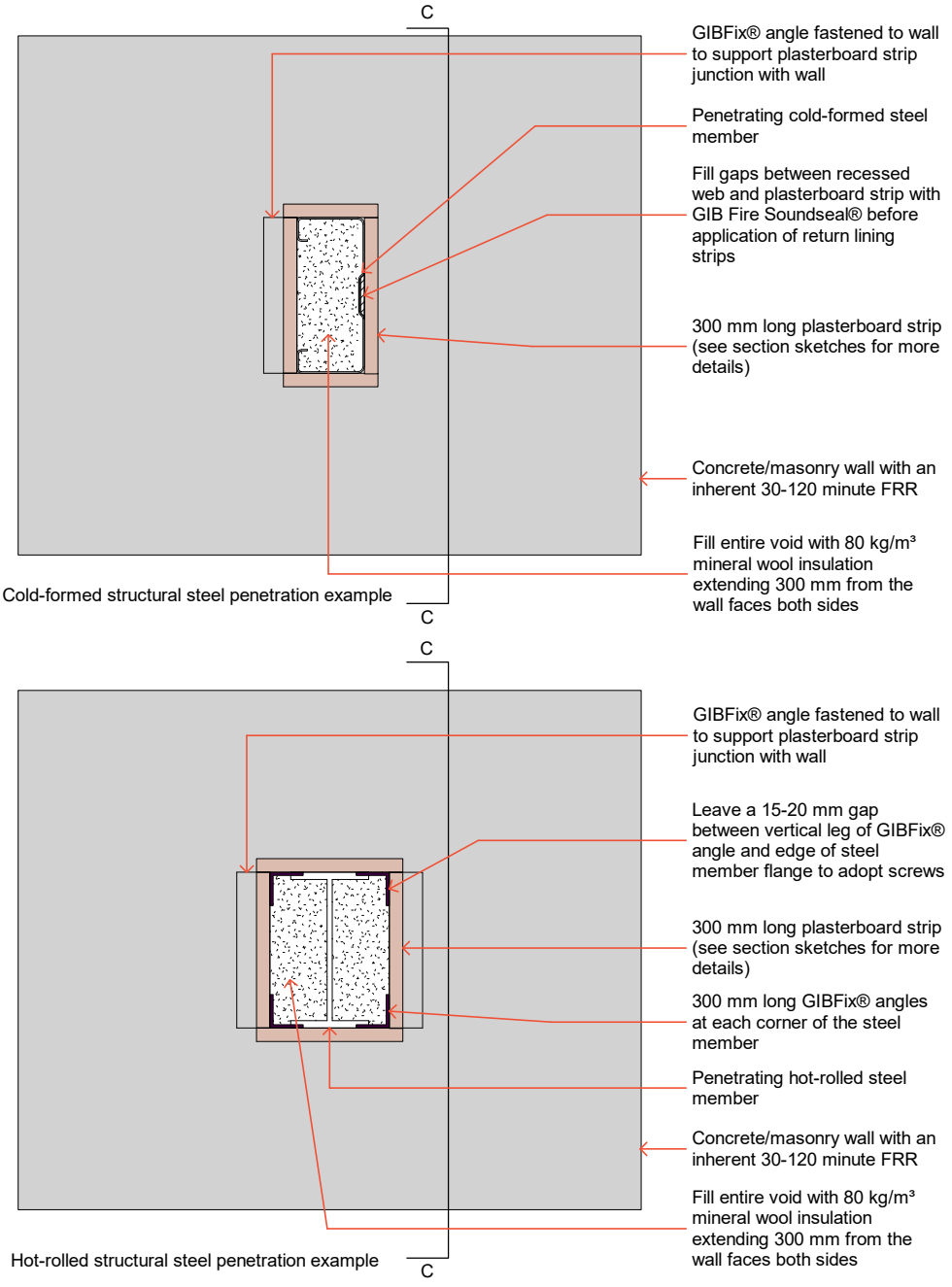
Figure 4: Cold-formed structural steel penetrating 30 - 120-minute FRR timber/steel frame wall systems



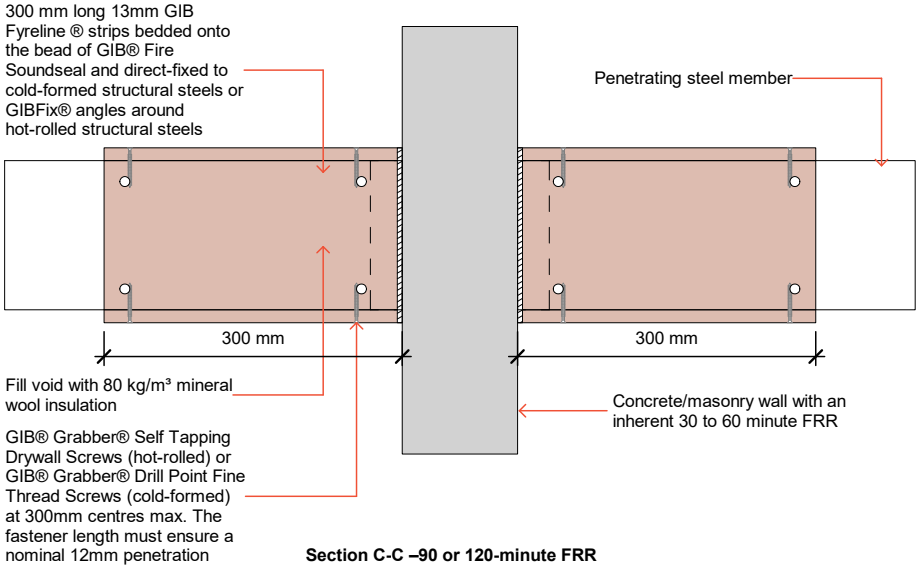


GFS 503

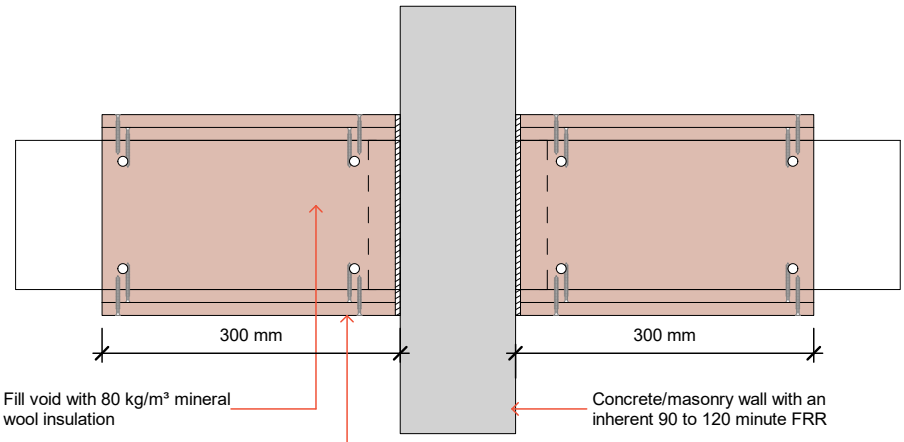
Figure 5: Hot-rolled or cold-formed structural steel penetrating concrete/masonry wall with an inherent 30 to 120-minute FRR



Section C-C –30 or 60-minute FRR



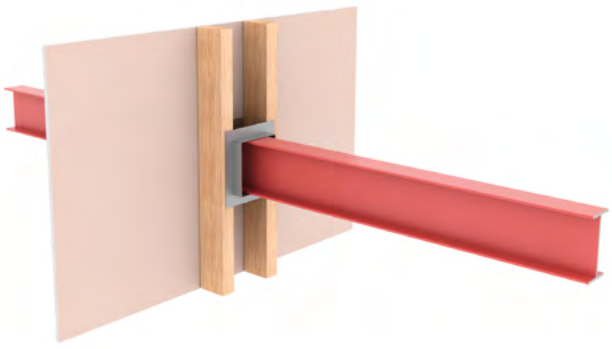
Section C-C –90 or 120-minute FRR



GFS 504

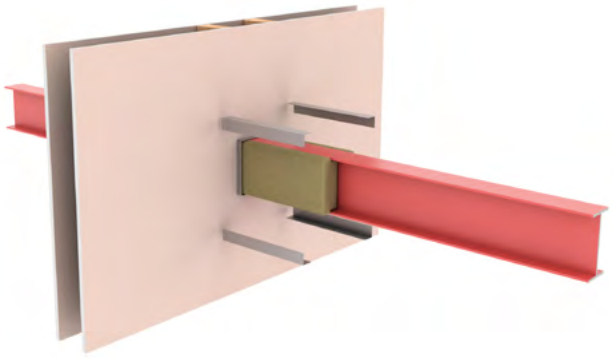
Figure 6: Example of construction steps for UB penetrating two-way FRR timber frame wall

Step 1



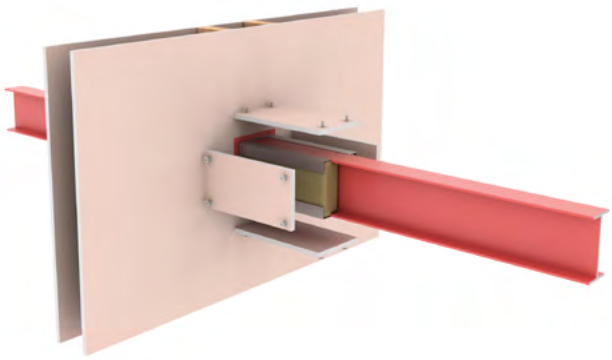
— Install GIBFix® angles around the steel to form corner sheet joints between plasterboard strip and wall lining
— Leave a 15 – 20 mm gap between the steel and GIBFix® angles on two sides

Step 2



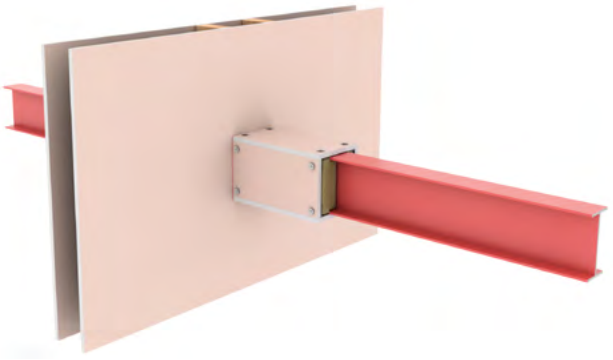
— Line the wall with all sheet joints formed over framing
— Fill entire void with mineral wool insulation extending 300 mm from the wall faces both sides
— Install GIBFix® angles at each corner of the steel

Step 3



— Leave a 15 – 20 mm gap between vertical leg of GIBFix® angle and edge of steel member flange to accept top and bottom strip screws
— 300 mm long plasterboard strips bedded onto the bead of GIB Fire Soundseal® applied to the wall surface, and then fixed to GIBFix® angles

Step 4



— Fix plasterboard strips to GIBFix® angles using GIB® Grabber® Self Tapping Drywall Screws at 300 mm centres max. The fastener length must ensure a nominal 12 mm penetration
— Apply a bead of GIB Fire Soundseal® to board edges before joining strips

Services penetrating a top plate

December 2022

A service hole is often drilled through a top plate to allow services such as cables and pipes to pass through.

NON-LOADBEARING WALLS

Non-loadbearing partitions, although not designed to support gravity loads, often penetrate ceiling linings of fire-rated floor/ceiling system. Although not a desirable practice, this might be detailed to achieve lateral bracing resistance. In this case, the partition FRR cannot be more than 30 minutes less than the floor/ceiling FRR as shown in details GFS 105, 107 and 108 in this document.

Figures 1 and 2 show partition to fire rated floor/ ceiling junctions with services passing through the top plate. Penetration seals can be installed where services pass through the top plate, provided they achieve the same FRR as the floor/ceiling and are installed as per the penetration seal supplier's instructions. Service holes are drilled centrally through the top plate leaving a minimum 20 mm of timber each side.

Unless fire-stopped to the same FRR as the partition, no wall lining service penetrations are permitted above the highest nog. Below this level, wall lining penetrations do not need to be fire-stopped.

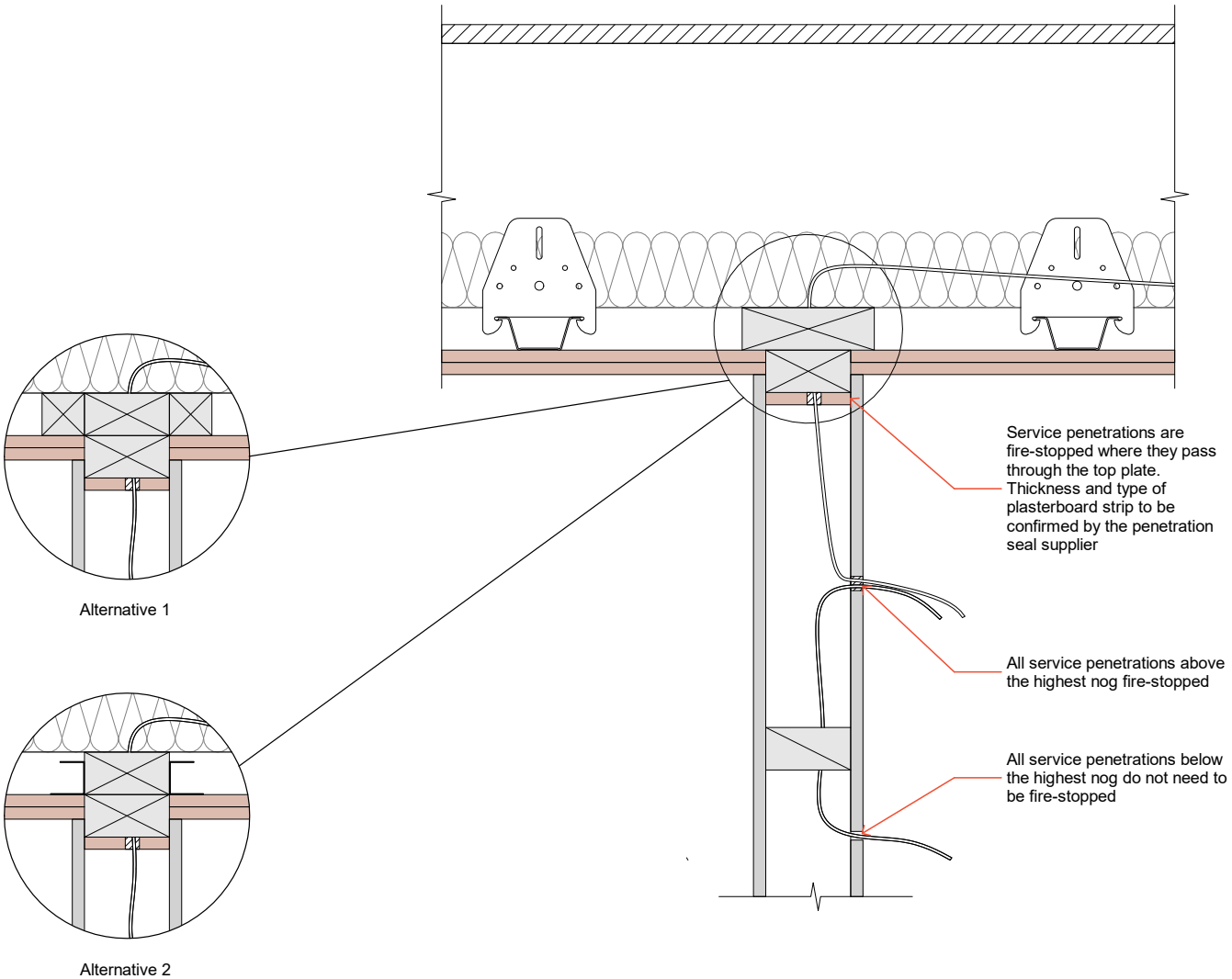
LOADBEARING WALLS

Loadbearing walls providing support to the fire-rated floor/ceiling must be protected with appropriate linings that provide the same FRR as the floor/ceiling system to ensure that structural adequacy is maintained. In this case, service penetrations are fire-stopped where they pass through the wall linings as shown in Figure 3.

Figure 1: Services within partition passing through the top plate at ceiling level

1
2

Unit layout



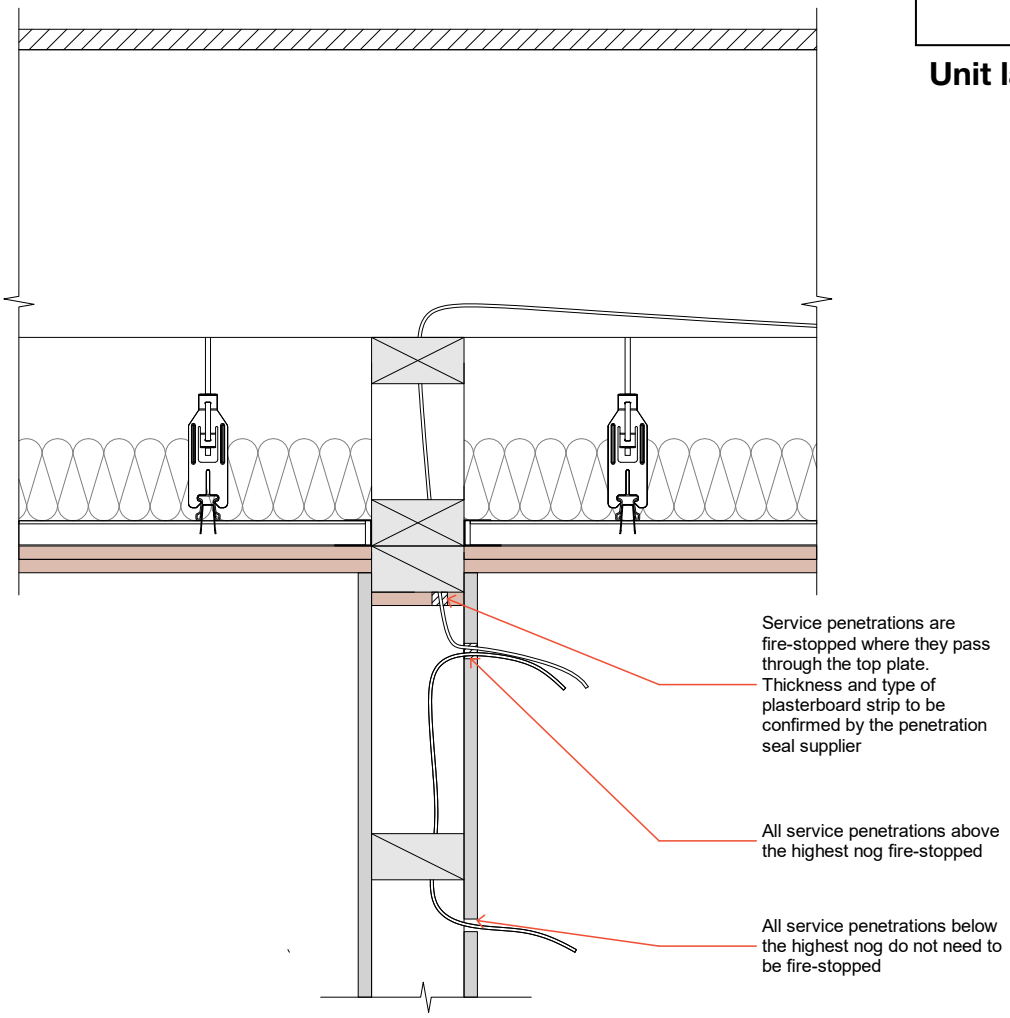
— The FRR of the floor/ceiling is no more than 60 minutes, and
— The FRR of the partition is no less than 30 minutes, and
— The wall is non-loadbearing

GFS 520

Figure 2: Services within partition passing through the top plate at lowered ceiling level

1
2

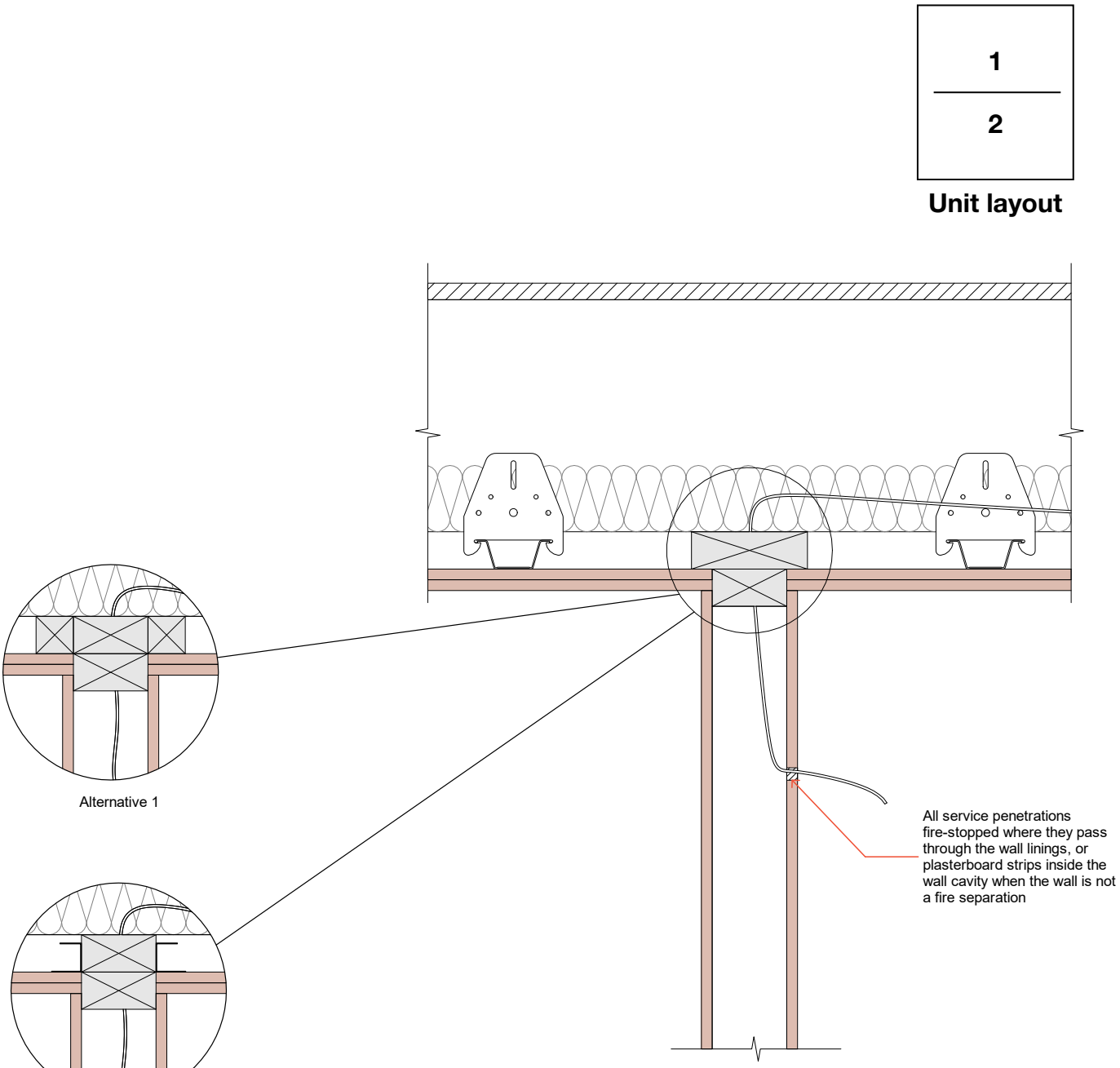
Unit layout



— The FRR of the floor/ceiling is no more than 60 minutes, and
— The FRR of the partition is no less than 30 minutes, and
— The wall is non-loadbearing

GFS 521

Figure 3: Services within loadbearing wall passing through the top plate at ceiling level



— The FRR of the floor/ceiling and wall are the same, and
— The wall is loadbearing
— If the wall is subjected to simultaneous two-sided fire exposure, GBTL 30 2S, GBTL 60 2S, or GBUW one-way protection to both sides can be specified unless structural adequacy is determined by specific design

GFS 522

Fire rated boxes or bulkheads

February 2023

Fire rated plasterboard boxes and/or bulkheads are often specified to accommodate service penetrations below concrete slabs. However, design and construction methods are not well understood. Risky assumptions, and a poorly designed and constructed box or bulkhead, can lead to premature failure. It is important to get the detailing and installation right.

Winstone Wallboards recommends ‘universal’ lining systems such as GBUW and GBUC specifications for wall and ceiling applications respectively. These linings must be applied to a structurally adequate box or bulkhead frame. ‘Universal’ lining systems are designed to limit cavity temperature rise to approx. 300 degree C, to protect timber framing from char and light gauge steel from substantial strength loss.

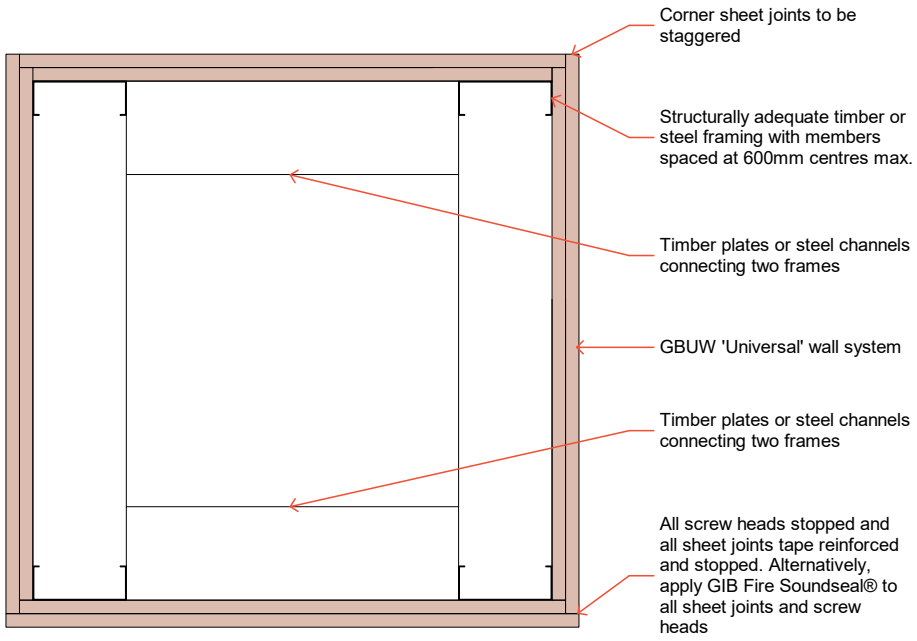
Specifications GBUW 15 to 180, and GBUC 15 to 120 ensure the specified FRR of a well-constructed box or bulkhead can be achieved. Figures 1 and 2 show the principles of constructing a fire rated box or bulkhead based on ‘universal’ specifications and GIB Fyreline® linings. Specific box or bulkhead framing layout can vary on-site depending on required dimensions.

It is important to ensure all sheet joints and edges are formed over the framing. The box or bulkhead framing must be structurally adequate to accept the weight of the linings under ambient conditions, and meet framing requirements outlined in the relevant ‘universal’ system specification. At the junction with the structural floor, the wall linings are installed hard against it with GIB Fire Soundseal® applied as perimeter seal.

Given how proprietary penetrations seals are commonly tested, the fire rated box or bulkhead is ideally constructed before building services are installed. However, services are often in place and linings need to be constructed around them. Figure 3 shows an installation method using plasterboard ‘cut-outs’. Work with the proprietary supplier to ensure all their requirements are met, before installing and labelling the tested penetration seal.

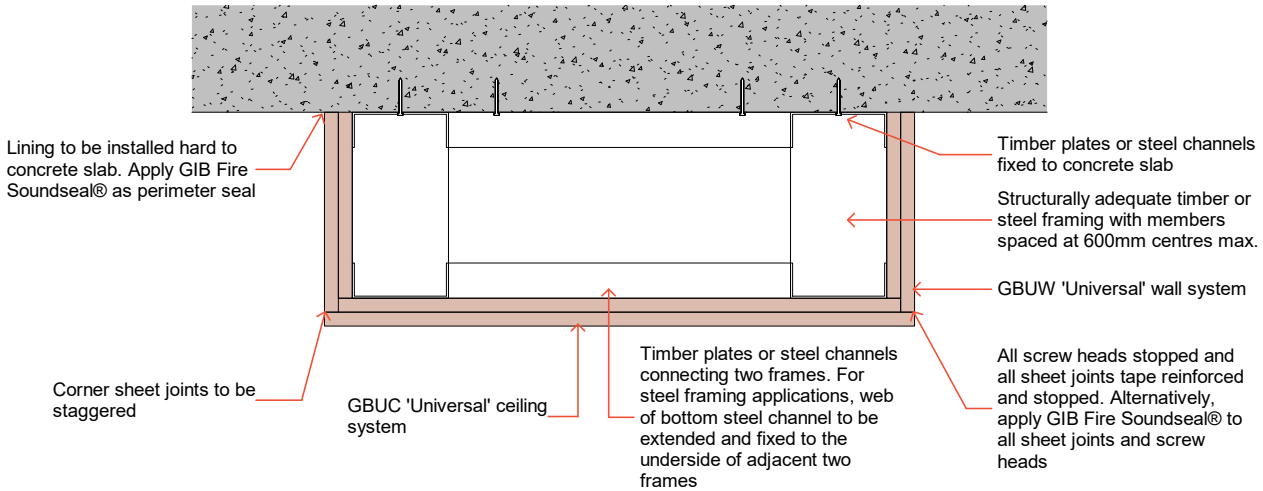
An example of the fire rated plasterboard box construction steps is shown in Figure 4.

Figure 1: Fire rated box or bulkhead (plan view)



GFS 030

Figure 2: Fire rated box or bulkhead (section view)

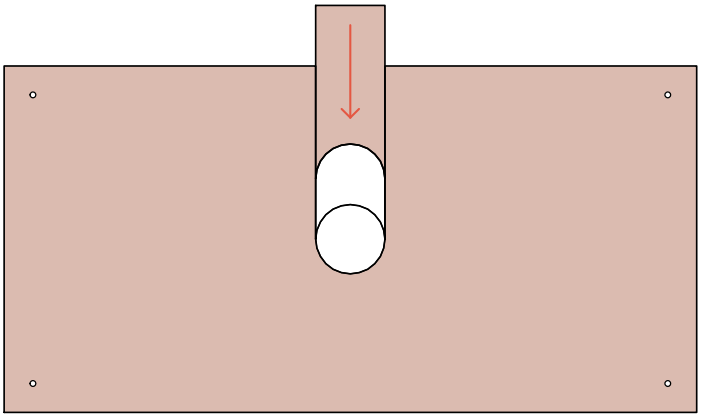


GFS 031

Figure 3: GBUW wall system installation around building services

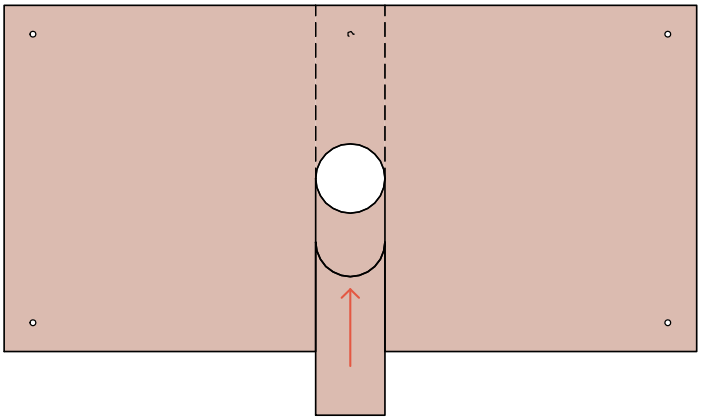
Step 1 - Inner or single layer

Inner or single layer fixed to framing as per GBUW wall system. Plasterboard 'cut-out' fixed to top timber plate or steel channel once fitted around building service



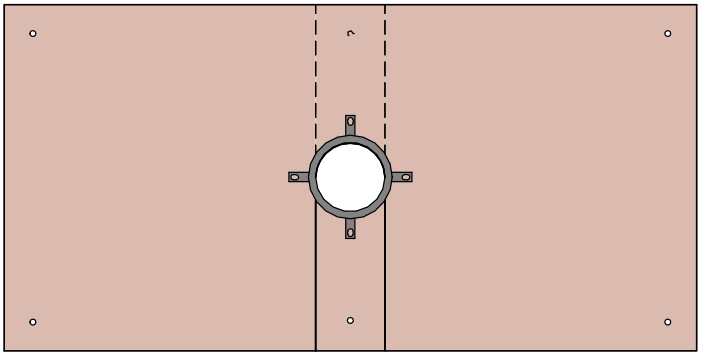
Step 2 - Outer layer

Outer layer fixed to framing as per GBUW wall system. Plasterboard 'cut-out' fixed to bottom timber plate or steel channel once fitted around building service



Step 3 - Penetration seal installation

A suitable penetration seal installed as per manufacturer's instructions



GFS 283

Figure 4: Example of the fire rated plasterboard box construction steps

Step 1

Install the structurally adequate framing that can accept the weight of the linings under ambient conditions, and meets framing requirements outlined in the relevant ‘universal’ system specification.

Step 2

Install the relevant ‘universal’ lining systems. Ensure all sheet joints and edges are formed over the framing, and corner sheet joints are staggered. Refer to Figure 3 for ‘universal’ lining system installation around building services.

Step 3

Install the linings hard against the floor system and apply GIB Fire Soundseal® as perimeter seal. Install suitable penetration seals as per manufacturer’s instructions. All screw heads to be stopped and all sheet joints to be tape reinforced and stopped in accordance with the publication entitled “GIB Site Guide”. Alternatively, apply GIB Fire Soundseal® to all sheet joints and screw heads.

Mass timber encapsulation systems

June 2023

Mass timber construction is becoming more common due to its environmental benefit and as an aesthetic design choice. However, mass timber also poses some fire safety challenges as the exposed timber contributes to the fuel load inside the compartment.

Current New Zealand Building Code C/VM Verification Method and C/AS Acceptable Solution documents do not adequately address the additional fuel load contributed by the exposed mass timber. One way to mitigate this risk and avoid the need for separate fire severity calculation is to encapsulate mass timber with plasterboard.

Winstone Wallboards recommends 'universal' lining systems such as GBUW and GBUC specifications for mass timber wall and floor applications respectively. 'Universal' lining systems are designed to limit back of lining temperature and protect mass timber from char, and are suitable for mass timber encapsulation. Recent fire resistance testing has also shown that additional encapsulation systems are possible with an open or insulated cavity, and some systems are allowed to have limited unsealed service penetrations through battened wall linings or suspended ceiling linings. All outer layer fastener heads stopped and sheet joints tape reinforced in accordance with the publication entitled "GIB® Site Guide". Inner layer can be left unstopped.

Table 1 summarises mass timber GIB® encapsulation systems for mass timber walls and floors.

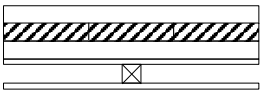
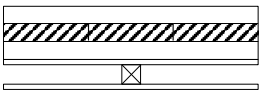
Figures 1 to 8 provide generic construction details for intertenancy mass timber walls and floors obtained from the following documents:

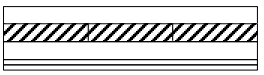
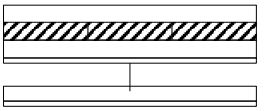
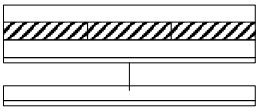
— NZ Wood Design Guides, Chapter 13.5: Acoustics, May 2020

— Red Stag CLT Design Guide, V1.3, Sep 2022

Encapsulation times for each construction detail are given based on mass timber GIB® encapsulation systems in Table 1.

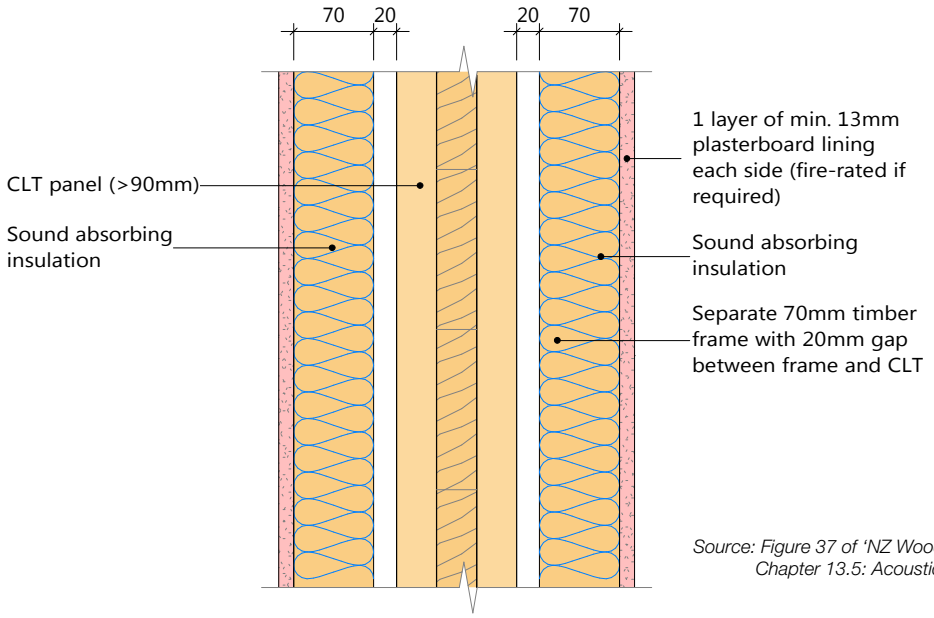
Table 1: Mass timber GIB® encapsulation systems summary table

	Encapsulation time	Lining requirements	Installation guide	Detail
Wall	**Direct fixed or battened**			
	30 minutes	1 layer 16mm GIB Fyreline®	GBUW 30a	
	30 minutes	2 layers 10mm GIB Fyreline®	GBUW 30b	
	60 minutes	2 layers 13mm GIB Fyreline®	GBUW 60	
	Battened			
	30 minutes	1 layer 13mm GIB Fyreline® on minimum 45mm open or insulated cavity	GBTL 60 (or GBS 60)	
	Direct fixed and battened			
	30 minutes	1 layer 13mm GIB Fyreline® and 1 layer 13mm GIB® Standard on minimum 45mm open or insulated cavity (unsealed penetrations through battened lining)*	GBTL 60 and GBTL 30b (or GBS 30)	
	60 minutes	1 layer 13mm GIB Fyreline® and 1 layer of 13mm GIB Fyreline® on minimum 45mm open or insulated cavity (unsealed penetrations through battened lining)*	GBTL 60 and GBTL 60 (or GBS 60)	

	Encapsulation time	Lining requirements	Installation guide	Detail
Floor	**Direct fixed or suspended ceiling**			
	30 minutes	1 layer 16mm GIB Fyreline®	GBUC 30	
	60 minutes	2 layers 13mm GIB Fyreline®	GBUC 60	
	Suspended ceiling			
	30 minutes	1 layer 13mm GIB Fyreline® on minimum 90mm open or insulated cavity	GBSC 30	
	Direct fixed and suspended ceiling			
	30 minutes	1 layer 13mm GIB Fyreline® and 1 layer 13mm GIB® Standard on minimum 90mm open or insulated cavity (unsealed penetrations through suspended lining)*	GBFC 30 and GBSC 30	
	60 minutes	1 layer 13mm GIB Fyreline® and 1 layer 13mm GIB Fyreline® on minimum 90mm open or insulated cavity (unsealed penetrations through suspended lining)*	GBFC 30 and GBSC 30	

** No more than 4 evenly distributed unsealed penetrations per m^2, each not exceeding 100 mm in diameter or equivalent area*

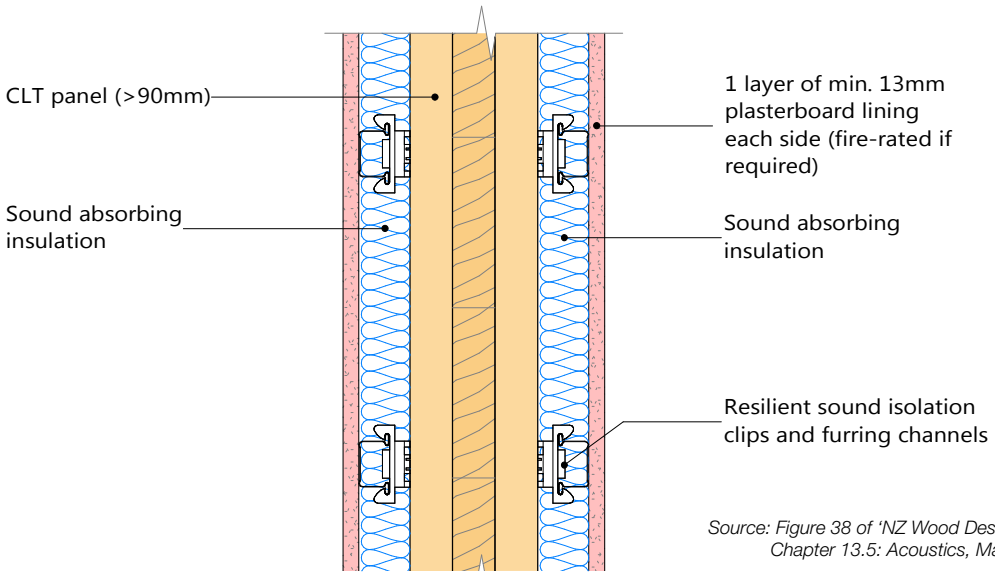
Figure 1: Mass timber wall panel with fire rated wall linings mounted on separate timber frames



Source: Figure 37 of 'NZ Wood Design Guides, Chapter 13.5: Acoustics, May 2020'

— 30-minutes Encapsulation is achieved when 13mm GIB Fyreline® is installed in accordance with GBTL 60

Figure 2: Mass timber wall panel with fire rated wall linings mounted on resilient acoustic clips and furring channels

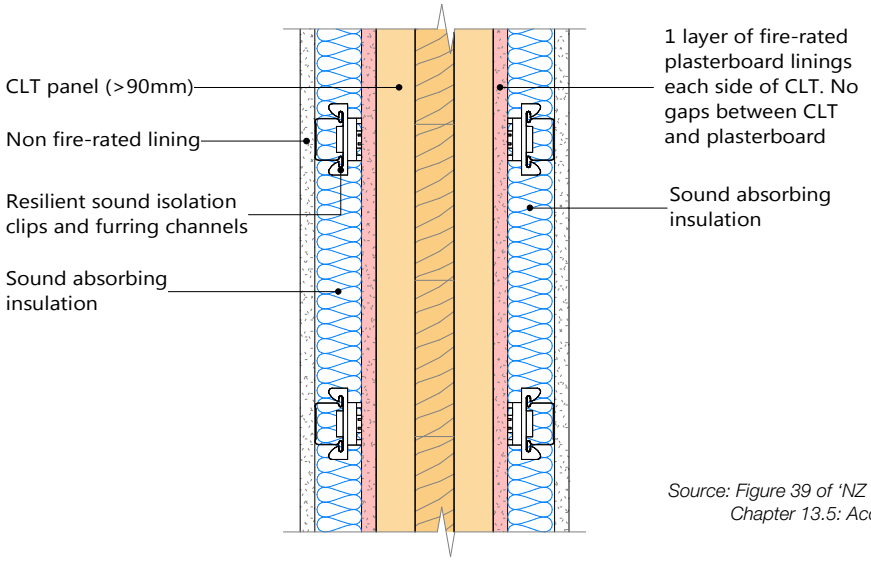


Source: Figure 38 of 'NZ Wood Design Guides, Chapter 13.5: Acoustics, May 2020'

— 30-minutes Encapsulation is achieved when 13mm GIB Fyreline® is installed in accordance with GBS 60

— Sheet orientation and furring channels run vertically with all sheet joints over framing

Figure 3: Mass timber wall panel with fire rated wall linings mounted directly on mass timber. Standard wall lining mounted on resilient acoustic clips and furring channels



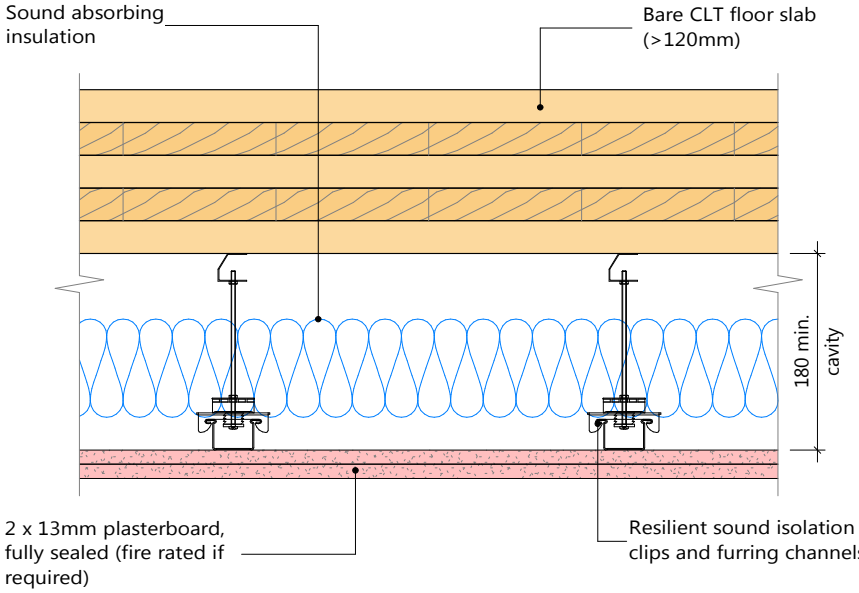
Source: Figure 39 of 'NZ Wood Design Guides, Chapter 13.5: Acoustics, May 2020'

— 30-minutes Encapsulation is achieved when 13mm GIB Fyreline® is direct fixed in accordance with GBTL 60 and 13mm GIB® Standard is fixed in accordance with GBS 30 with sheet orientation and furring channels running vertically in accordance with Figure 2

— 60-minutes Encapsulation is achieved when 13mm GIB Fyreline® is fixed in accordance with GBS 60 with sheet orientation and furring channels running vertically in accordance with Figure 2

— Unsealed service penetrations through the outer lining on the furring channels are permitted within limitations Refer to Table 1

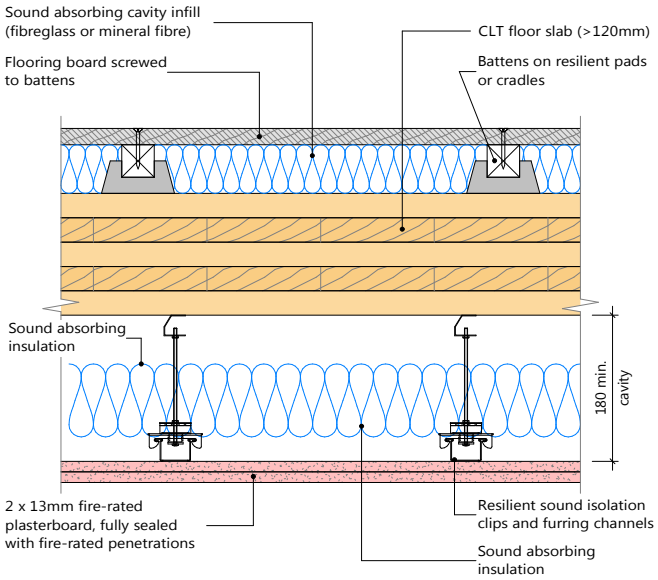
Figure 4: Mass timber floor with resiliently attached suspended ceiling



Source: Figure 41 of 'NZ Wood Design Guides, Chapter 13.5: Acoustics, May 2020'

— 60-minutes Encapsulation is achieved when 2 layers of 13mm GIB Fyreline® are installed in accordance with GBUC 60

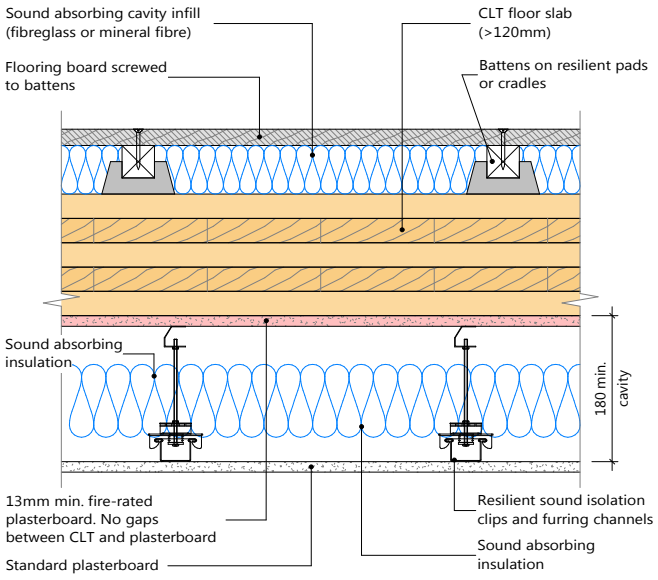
Figure 5: Mass timber floor with a generic lightweight floating floor system – Option 1



Source: Figure 42 of 'NZ Wood Design Guides, Chapter 13.5: Acoustics, May 2020'

— 60-minutes Encapsulation is achieved when 2 layers of 13mm GIB Fyreline® are installed in accordance with GBUC 60

Figure 6: Mass timber floor with a generic lightweight floating floor system – Option 2



Source: Figure 43 of 'NZ Wood Design Guides, Chapter 13.5: Acoustics, May 2020'

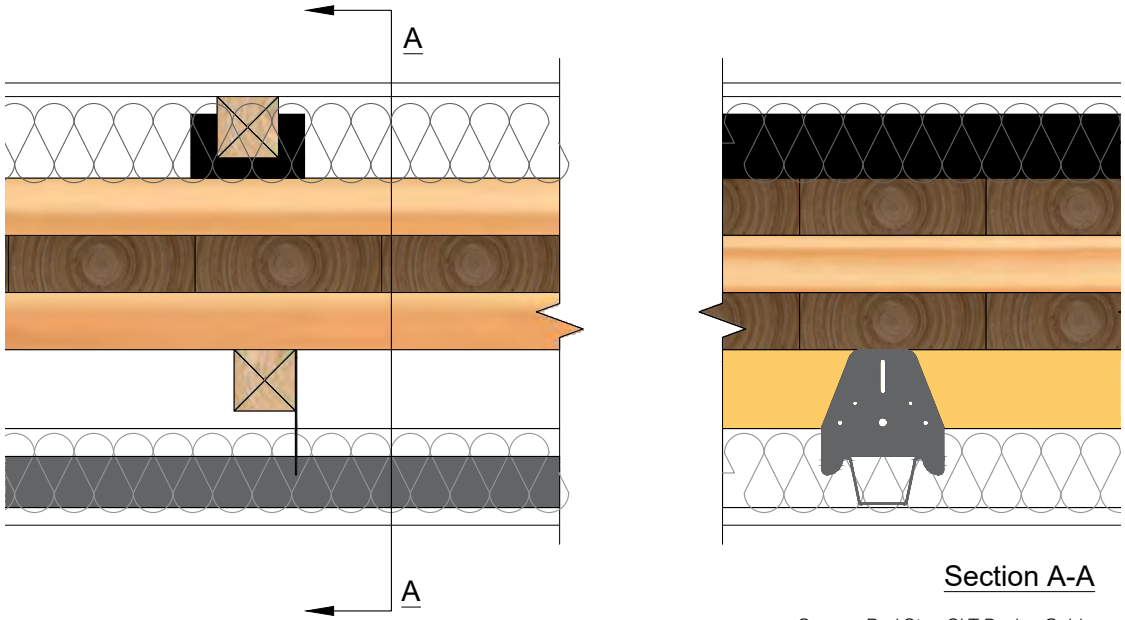
— 13mm GIB Fyreline® is direct fixed in accordance with GBFC 30

— 30-minutes Encapsulation is achieved with a suspended 13mm GIB® Standard ceiling (fixed in accordance with GBSC 30)

— 60-minutes Encapsulation is achieved with a suspended 13mm GIB Fyreline® ceiling (fixed in accordance with GBSC 30)

— Unsealed service penetrations through the suspended ceiling linings are permitted within limitations. Refer to Table 1

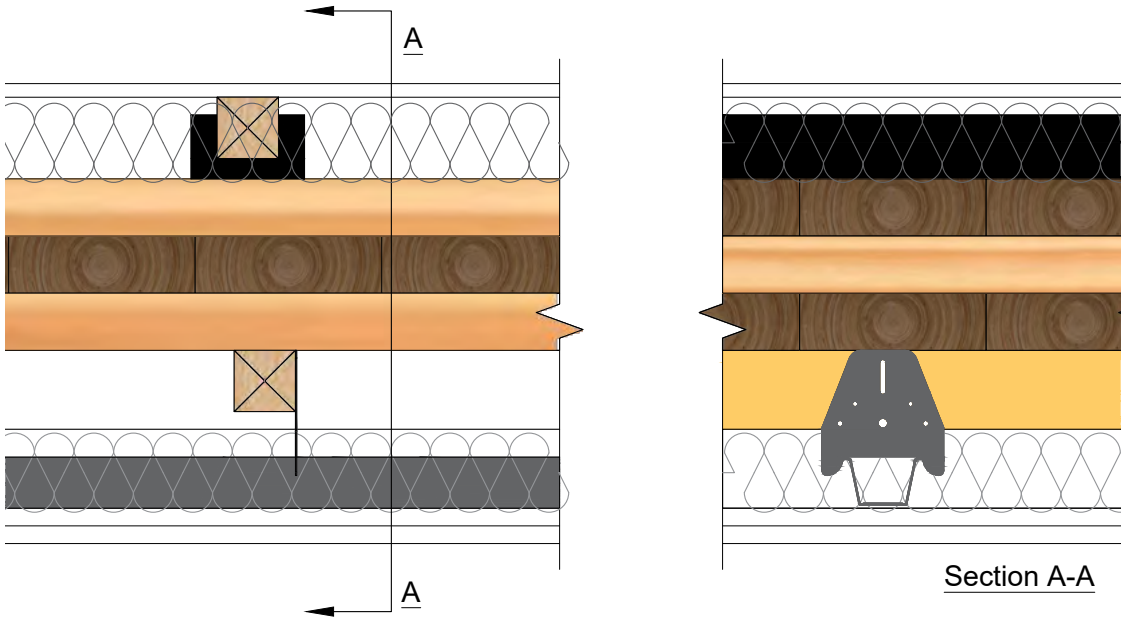
Figure 7: Mass timber floor with a single layer of suspended ceiling lining mounted on timber, resilient acoustic clips and furring channels



Source: Red Stag CLT Design Guide (Website: https://redstag.co.nz/)

— 30-minutes Encapsulation is achieved when 13mm GIB Fyreline® is installed in accordance with GBSC 30

Figure 8: Mass timber floor with two layers of suspended ceiling lining mounted on timber, resilient acoustic clips and furring channels



Source: Red Stag CLT Design Guide (Website: https://redstag.co.nz/)

— 60-minutes Encapsulation is achieved when 2 layers of 13mm GIB Fyreline® are installed in accordance with GBUC 60