Fully Fixed Flush Suspended Plasterboard Ceilings for Commercial and Residential Applications

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BACKGROUND

The capability of full plasterboard ceilings to transfer seismic forces to supporting perimeter walls is not adequately covered in AS/NZS 2785:2020 'Suspended Ceilings – Design and Installation'. The Standard is substantially based on the performance of grid and tile ceilings where seismic forces are accumulated in grid members and transferred to a single end wall in each direction. This has led to the 'free' edge approach which introduces potential issues with other performance requirements when full plasterboard ceilings are used. AS/NZS 2785:2020 not only deals with structural performance but refers to other Standards for attributes such as noise attenuation, fire-resistance, and hygiene, where conflicts can arise.

Unlike grid and tile ceilings, a suspended ceiling lined with gypsum plasterboard has significant strength and stiffness along the ceiling plane. As a result, seismic forces are transferred to perimeter walls through sheet material connections. These include screw fixings, as well as plaster cove or square stopped ceiling to wall linings.

Therefore, the design of fully fixed suspended plasterboard ceilings is predominantly governed by the in-plane action of the ceiling linings, the strength and stiffness of ceiling-to-wall connections, and the capability of perimeter walls to safely transfer seismic forces to the building structure. Testing on square stopped and coved plasterboard joints shows that the characteristic strength in both shear and tension is significantly higher than the capacity of partition walls typically used in New Zealand commercial and residential construction. As a result, the maximum size of suspended ceilings lined with plasterboard is limited by the maximum load carrying capacity of the perimeter walls.

To simplify the application of suspended ceiling systems for non-specific design, three different wall types typically used in NZ commercial and residential construction are considered.

- Conventional timber framed wall.
- Steel partition with studs connected to the bottom track (Type-A).
- Steel partition with friction fitted studs (Type-B).

SCOPE OF USE

Suspended ceiling systems in this document can be specified without the need for a Specific Engineering Design (SED), provided they are intended for installation within the following scope of use:

1. Installation in IL1 and IL2 buildings.
2. Single layer of 10mm or 13mm GIB® plasterboard ceiling lining.
3. Suspension drop not exceeding 1000mm measured from the supporting structure above to the back of the ceiling lining.
4. Fixture weight not exceeding 1kg with no more than one fixture per m^2. Heavy weight fixtures must be independently supported and braced to the structure above.
5. The ceiling is level, with no height variations along the ceiling plane.
6. Sheet material linings are installed to the suspension system in accordance with the GIB® installation instructions in this technical bulletin or GIB® Site Guide.
7. Perimeter walls are detailed in accordance with this document or GIB Ezybrace® Systems.

Weight scenarios have been considered with and without thermal ceiling insulation.

Outside this scope, SED may be required. Call GIB® Helpline on 0800 100 442 for assistance.

Detailing of GIB® Suspended Ceiling System

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SUSPENSION SYSTEM

- Suspension system designed and installed according to the manufacturer's specification to take the gravity loads.
- Furring channels spaced at maximum centres of 450mm for 10mm GIB® plasterboard or 600mm for 13mm GIB® plasterboard.
- Perimeter channel secured to timber or steel wall studs spaced at 600mm centres maximum.

CEILING LINING

- Single layer of 10mm or 13mm GIB® plasterboard fixed at right angles to the underside of the furring channels.
- All sheet end joints must either occur on furring channels or be back-blocked in accordance with the publication GIB® Site Guide.
- Sheets joints shall be touch fitted.
- Small openings (e.g. down lights) no greater than 90x90mm or 100mm diameter may be placed no closer than 90mm to the edge of the ceiling.
- A large opening is allowed within the middle third of the ceiling, with dimensions in any direction not exceeding 1/3 of the width.

FASTENING THE CEILING LINING

Fasteners

- 25mm x 6g GIB® Grabber® Self Tapping Drywall Screws.

Fastener Centres

- Place fasteners no closer than 12mm from the longitudinal sheet edges and 18mm from the sheet cut edges. This distance may be reduced to 12mm from the sheet ends at butt joints on furring channels.
- Place fasteners at 200mm centres along each intermediate furring channel and where sheet end butt joints occur.
- For large openings, fix GIB® plasterboard lining to opening trimmers at 150mm centres maximum.
- Fix the GIB® plasterboard lining to the perimeter channel at 200mm centres.

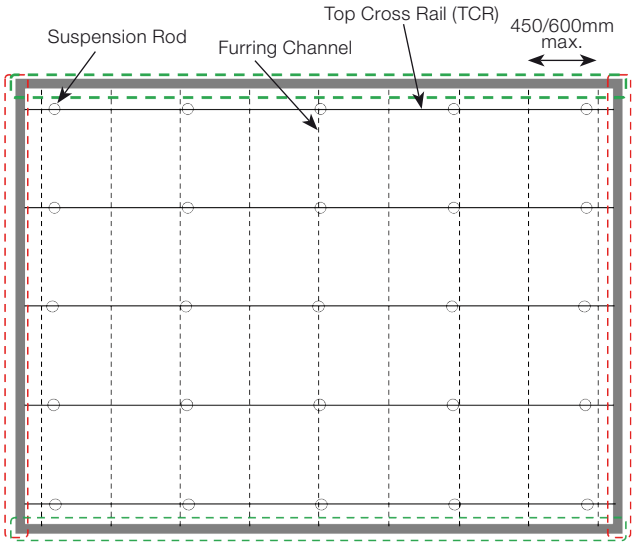
WALL CEILING JUNCTIONS

The internal angle between the ceiling and walls is finished with GIB-Cove® adhered with GIB-Cove® Bond, or boxed corners (square stopped) taped and stopped in accordance with the GIB® Site Guide.

JOINTING

All fastener heads stopped and all sheet joints GIB® Joint Tape reinforced and stopped accordance with the GIB® Site Guide.

DETAILING



Furring Channel to Perimeter Channel Junction (Figure-1)

TCR to Perimeter Channel Junction (Figure-2)

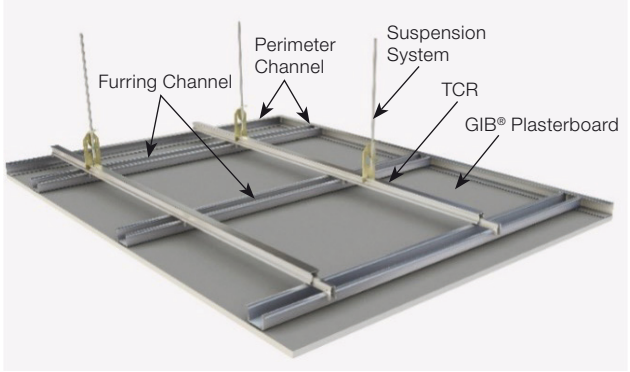


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FIGURE 1: LINING DETAIL WHERE FURRING CHANNEL MEETS PERIMETER CHANNEL

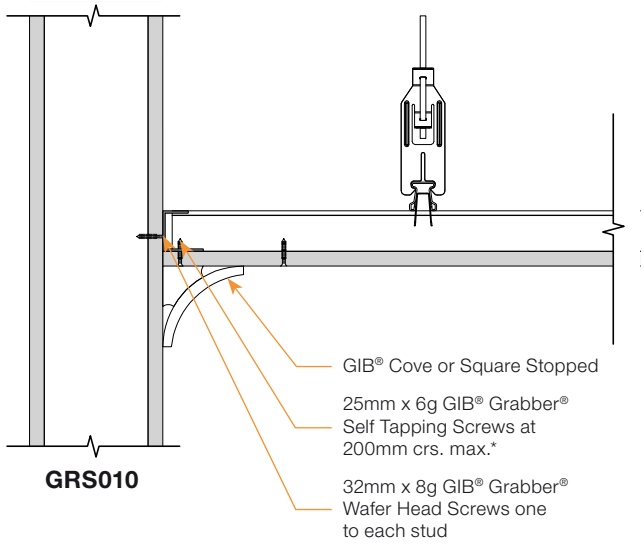
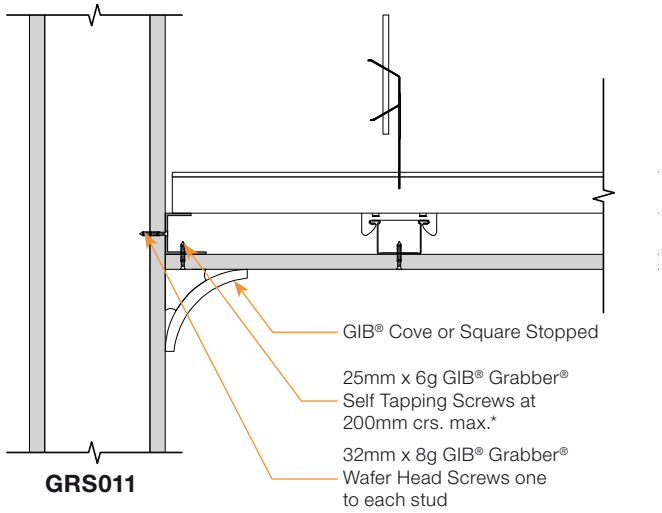


FIGURE 2: LINING DETAIL WHERE TCR MEETS PERIMETER CHANNEL



** GIB® plasterboard to perimeter channel or angle connection. A direct connection between the furring channel and the perimeter channel or angle is not required but is recommended. Follow suspension system manufacturer's specification or call GIB Helpline on 0800 100 442.*

Maximum Ceiling Sizes

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The maximum size of a suspended ceiling in a building situated in a given seismic region is determined by the seismic demand and the capacity of the ceiling and walls to securely transfer seismic loads.

Seismic demand is a function of geographic region, seismic weight, and location of the ceiling with respect to building height. Whereas, the capacity of the ceiling and supporting walls is dependent on wall-ceiling junctions, and the capacity and effective length of supporting walls to transfer applied forces. For example, walls with openings will limit the effective wall length available.

GIB® Suspended Ceiling can be specified without the need for SED, provided that the scope outlined in this document is achieved and the maximum ceiling size in each direction is restricted in accordence with the following tables. They contain three levels of connectivity between the ceiling and walls on each side, set at 40%, 60%, and 80% effective wall length. Outside these parameters SED may be required.

Table 1: Perimeter Wall - Timber Framed Wall, Type-A Steel Framed Wall or GIB EzyBrace® Wall System**

Region	Minimum Wall Support (Each Side)	Maximum Ceilings Size in Each Direction (m) No Insulation				Maximum Ceilings Size in Each Direction (m) Insulation up to 2.1 kg/m²			
		Ceiling Location				Ceiling Location			
		Ground	Level-1	Level-2	Level-3+	Ground	Level-1	Level-2	Level-3+
Auckland (z=0.13)	80%	12	12	12	12	12	12	12	12
	60%	12	12	12	12	12	12	12	10.5
	40%	12	12	9.5	7.5	12	10.5	8.5	7
Christchurch (z=0.3)	80%	12	11	8.5	7.5	12	9	7	6
	60%	11	8	6.5	5.5	9	6.5	5.5	4.5
	40%	6.5	5	4	3.5	6	4.5	3.5	3
Wellington (z=0.4)	80%	11	8	6.5	5.5	9	6.5	5.5	4.5
	60%	8	6	5	4	6.5	5	4	3.5
	40%	5	3.5	3	2.5	4.5	3	2.5	2

Table 2: Perimeter Wall - Type-B Steel Framed Wall**

Region	Minimum Wall Support (Each Side)	Maximum Ceilings Size in Each Direction (m) No Insulation				Maximum Ceilings Size in Each Direction (m) Insulation up to 2.1 kg/m²			
		Ceiling Location				Ceiling Location			
		Ground	Level-1	Level-2	Level-3+	Ground	Level-1	Level-2	Level-3+
Auckland (z=0.13)	80%	12	12	12	12	12	12	12	11
	60%	12	12	12	10.5	12	12	10	8.5
	40%	12	10.5	8.5	7	11	8.5	7	5.5
Christchurch (z=0.3)	80%	12	9	7	6	10	7.5	6	5
	60%	9	7	5.5	4.5	7.5	5.5	4.5	3.5
	40%	6	4.5	3.5	3	5	3.5	3	2.5
Wellington (z=0.4)	80%	9	7	5.5	4.5	7.5	5.5	4.5	3.5
	60%	7	5	4	3.5	5.5	4	3.5	2.5
	40%	4.5	3.5	2.5	2	3.5	2.5	2	2

*** Outside these parameters contact GIB Helpline on 0800 100 442 for assistance.*

Maximum Ceiling Sizes

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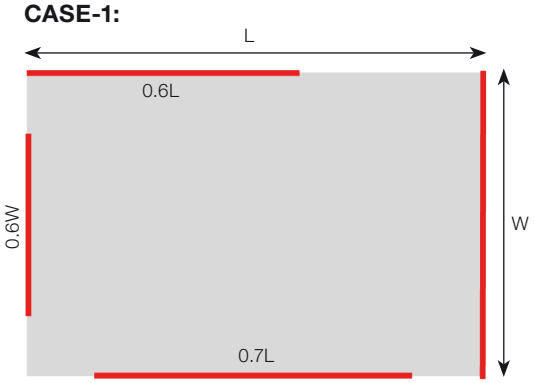
TYPICAL EXAMPLES

CASE-1:

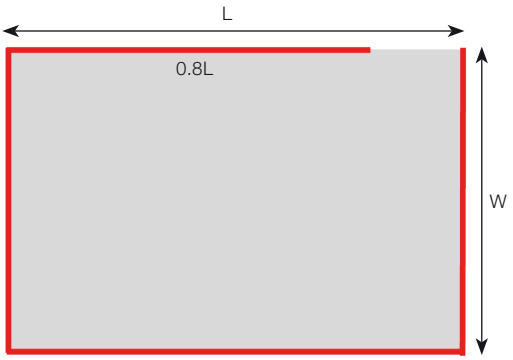


Effective Wall Connectivity = 60%

CASE-2:

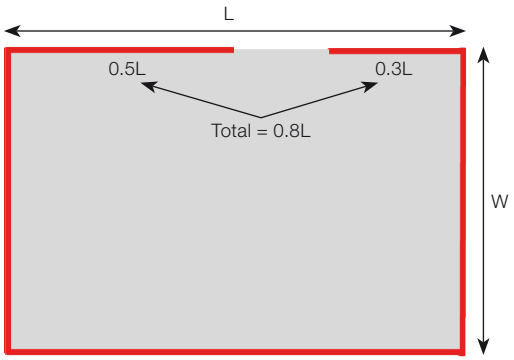
Effective Wall Connectivity = 60%

CASE-3:



Effective Wall Connectivity = 80%

CASE-4:



Effective Wall Connectivity = 80%

Ceiling

Boundary Walls

CORRIDOR CEILINGS

Corridor ceilings with a width not exceeding 2 metres, and a length equal to or less than 12 metres, do not require SED provided a minimum of 80% wall support is available along each longitudinal edge.

Perimeter Wall Detailing

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TIMBER FRAMED WALL

WALL 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).
- Studs at 600mm centres maximum.

WALL HEIGHT AND FRAMING DIMENSIONS

- Maximum wall height of 3000mm.
- Framing dimensions and height as determined by NZS 3604:2011 stud and top plate tables for load bearing and non-load bearing walls.
- Minimum framing dimension 90 x 45mm.

LINING

- Any GIB® plasterboard lining on each side.
- Sheets can be fixed vertically or horizontally.
- Use full length sheets where possible.
- Sheet joints shall be touch fitted.
- All sheet joints must be formed over framing.

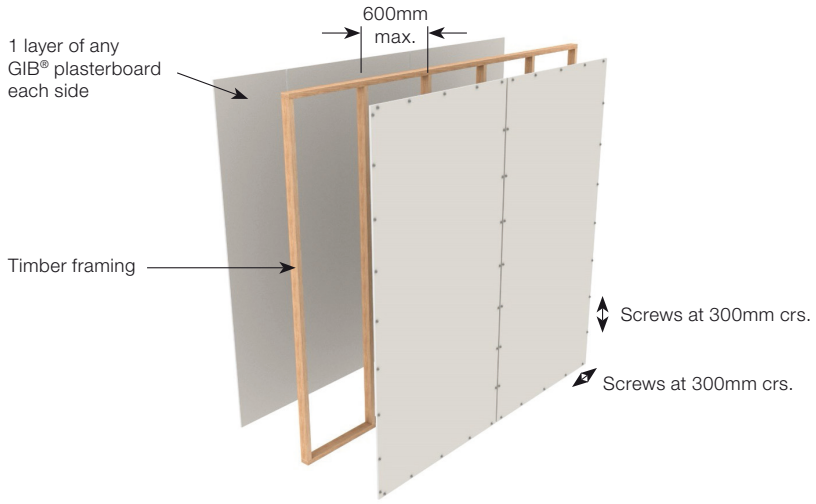
FASTENING THE LINING

Fastener Type and Centres

- 32mm x 6g GIB® Grabber® High Thread or 32mm x 7g Dual Thread Screws for 10 and 13mm GIB® plasterboard.
- Place fasteners no closer than 12mm from the longitudinal sheet edges and 18mm from the sheet cut edges.
- Place fasteners at 300mm centres to perimeter framing.
- It is recommended to use either daubs of GIBFix® adhesive or fasteners at 300mm centres to intermediate studs.
- For alternative lining systems or multi-layered systems, the fastener type, length, and centres shall be in accordance with the relevant GIB® performance system requirements.

Jointing

- All fastener heads stopped and all sheet joints GIB® Joint Tape reinforced and stopped accordance with the GIB® Site Guide.



Perimeter Wall Detailing

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TYPE-A AND TYPE-B STEEL FRAMED PARTITION WALL

WALL FRAMING

Framing to comply with:

- Minimum steel stud dimensions to be 64 x 34 x 0.50mm nominal with a 6mm return.
- Minimum steel channel dimensions to be 64 x 30 x 0.50mm nominal.
- Top and bottom channels are fixed to the floor and ceiling in true alignment.
- Studs at 600mm centres maximum.
- Nominated expansion gap at the top of the frame allowed.
- Type-A wall: Studs are fixed to the bottom track using 13mm x 8g GIB® Grabber® Pancake Head Drill Tip Screws.
- Type-B wall: Studs are held in place by the “grip” of the channels (friction fitted). No further fixings are installed.
- Maximum wall height of 3000mm.

LINING

- Any GIB® plasterboard lining with a minimum thickness of 13mm on each side.
- Sheets can be fixed vertically or horizontally.
- Sheet joints shall be touch fitted.
- All sheet joints must be formed over framing.
- Use full length sheets where possbile.
- Linings are installed hard to the floor.

FASTENING THE LINING

Fastener Type and Centres

- 32mm x 6g GIB® Grabber® Self Tapping Drywall Screws.
- Fix GIB® plasterboard lining at 300mm centres up each stud.
- Fix GIB® plasterboard lining at 300mm centres to the bottom channel.
- Place fasteners no closer than 12mm from the longitudinal sheet edges and 18mm from the sheet cut edge.
- Fastening the linings to the top and bottom channel permitted.
- For alternative lining systems or multi-layered systems, the fastener type, length, and centres shall be in accordance with the relevant GIB® performance system requirements. For Type A specifications, studs are placed down in the track and the stud-to-channel and sheet bottom edge fixings remain.

Jointing

- All fastener heads stopped and all sheet joints GIB® Joint Tape reinforced and stopped accordance with the GIB® Site Guide.