



GIB® Ceiling Diaphragms are stiff and strong horizontal bracing elements which effectively transfer loads to bracing walls. They themselves do not have a Bracing Unit rating but are used to space bracing lines further apart. The basic shape of a ceiling diaphragm is square or rectangular. Protrusions are permitted but cut-outs are not. The length of a ceiling diaphragm shall not exceed twice its width. Dimensions are measured between supporting bracing lines. Supporting bracing lines (all four sides) must contain at least 100 BUs each.

**Limitations for GIB® Standard Plasterboard Ceiling Diaphragms**

- Diaphragms not steeper than 25 degrees to the horizontal shall not exceed 7.5 metres in length.
- 10mm or 13mm GIB® Standard Plasterboard is fastened at 150mm centres to the boundary members around the entire perimeter of the diaphragm. Fasteners – 32mm x 6g GIB® Grabber® Drywall Screws or 30mm x 2.8mm GIB® Nails.

**Limitations for GIB Ultralite® Ceiling Diaphragms**

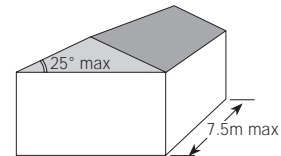
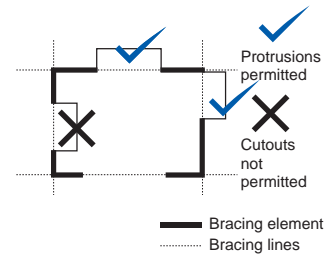
- Diaphragms not steeper than 25 degrees to the horizontal shall not exceed 10 metres in length.
- GIB Ultralite® is fastened at 150mm centres to the boundary members around the entire perimeter of the diaphragm. Fasteners – 32mm x 6g GIB® Grabber® Drywall Screws or 30mm x 2.8mm GIB® Nails.

**GIB Braceline® Ceiling Diaphragms**

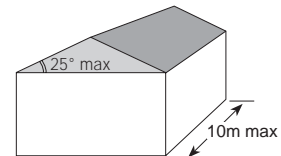
- Diaphragms not steeper than 25 degrees to the horizontal shall not exceed 15 metres in length.
- Diaphragms not steeper than 45 degrees to the horizontal shall not exceed 7.5 metres in length.
- GIB Braceline® is fastened at 150mm centres to the boundary members around the entire perimeter of the diaphragm. Fasteners – 32mm x 7g GIB Braceline® Drywall Screws or 35mm GIB Braceline® Nails (10mm GIB Braceline® only).
- If a metal angle or channel has been installed to the perimeter 25 x 6 GIB® Grabber® self tapping screws can be fitted at 100mm centres to the perimeter of the diaphragm.

**General Fixing Requirements for GIB® Ceiling Diaphragms**

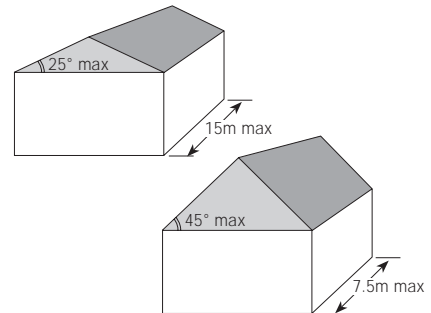
- Linings shall be installed over the entire area of the diaphragm.
- Fastening shall be no less than 12mm from sheet edges and not less than 18mm from sheet end.
- Sheets shall be supported by framing members (e.g., ceiling battens) spaced at no more than 450mm centres for 10mm GIB® Plasterboard and at no more than 600mm centres for 13mm GIB® Plasterboard.
- Sheets within the diaphragm area may be fastened and finished conventionally in accordance with the publication entitled, "GIB® Site Guide". All joints shall be paper tape reinforced and stopped. It is recommended that sheet butt joints are formed off framing and back-blocked (see "GIB® Site Guide").
- Use full width sheets where possible. At least 900mm wide sheets with a length not less than 1800mm shall be used. Sheets less than 900mm wide but no less than 600mm may be used provided all joints with adjacent sheets are back-blocked (see "GIB® Site Guide").
- Openings are allowed within the middle third of the diaphragm's length and width. Fixing of sheet material to opening trimmers shall be at 150mm centres. Neither opening dimension shall exceed a third of the diaphragm width. Larger openings, or openings in other locations, require specific engineering design. Refer "Openings in Bracing Elements" page 18.
- Fasteners are placed at 150mm centres around the ceiling diaphragm starting at 50mm, 100mm and 150mm from the sheet corners.



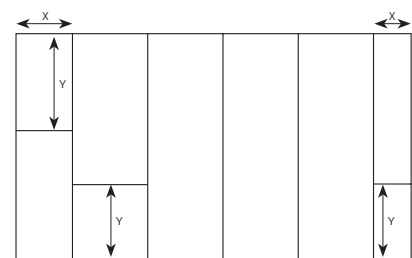
**GIB® Standard Plasterboard Diaphragms**



**GIB Ultralite® Diaphragms**

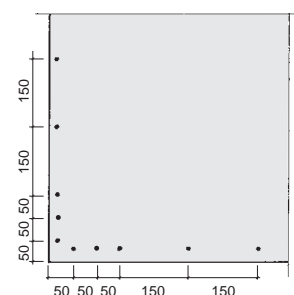


**GIB Braceline® Ceiling Diaphragms**



X = 900mm min or 600-900mm min provided all adjacent joints are back-blocked. Y = 1800mm min sheet lengths at ends of ceiling diaphragms

**Sheet Widths and Lengths in Ceiling Diaphragms**



**Fastening pattern for ceiling diaphragms**



**Battens**

Ceiling diaphragms may be constructed using steel or timber ceiling battens.

Battens shall be spaced at

- 450mm for 10mm GIB® Plasterboard
- 600mm for 13mm GIB® Plasterboard

Timber battens shall be fixed in accordance with the requirements of NZS 3604:1999.

Steel battens shall be GIB® Rondo® battens or similar with a minimum base metal thickness (BMT) of 0.55mm with two external flanges of 8mm to allow direct screw fixing to roof framing.

Steel battens shall be fixed with 2/32mm x 8g GIB® Grabber® wafer head self tapping screws to supporting framing.

Steel battens must be fixed directly to the roof framing. If a clip system has been used, a timber block (min 300mm) or a continuous timber member can be fixed alongside the bottom chord to permit a direct connection to the batten.

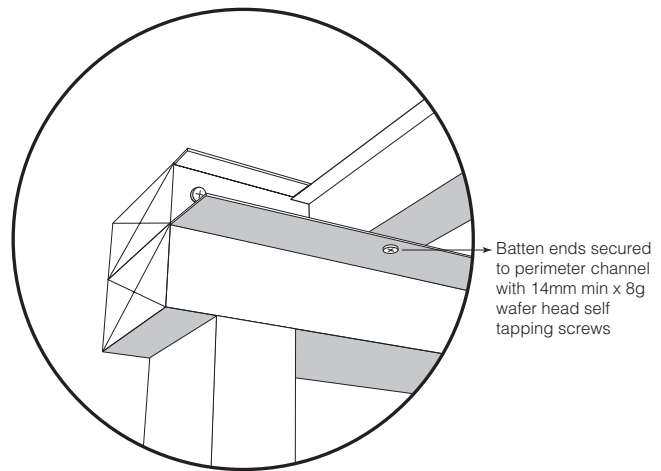
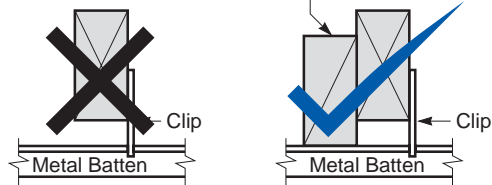
For steel battens a steel channel or metal angle is required at the perimeter of the diaphragm. The perimeter channel shall be fastened to the top plate with 32mm x 8g GIB® Grabber® wafer head self tapping screws at 300mm centres maximum.

The linings are fastened to the perimeter channel at 150mm centres with 25mm x 6g self tapping screws. If GIB® Braceline® has been used for the diaphragm the perimeter shall be fixed to the channel at 100mm centres using 25mm x 6g GIB® Grabber® self tapping screws. Within the diaphragm area sheets may be fastened as described in 'General Fixing Requirements for GIB® Ceiling Diaphragms'.

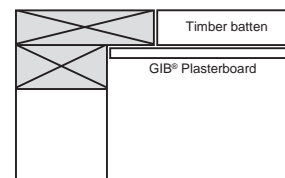
Coved ceiling diaphragms can be achieved by attaching a folded metal angle to the junction. The metal angle shall be;

- min 0.55mm BMT
- fastened at 300mm centres on each edge using 30mm GIB® Nails or 32mm x 8g GIB® Grabber® wafer head self tapping screws or similar to the roof framing.
- linings are fastened to the folded angle as specified for the perimeter channel above.

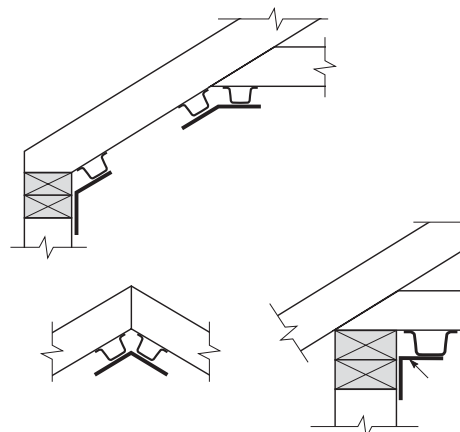
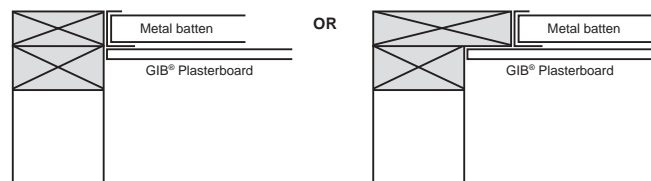
Block or continuous  
Timber member  
min 300mm fixed  
with min 4 x 100mm  
x 3.75mm Nails



Timber battens example



Steel battens with perimeter channel example



Place selected wall bracing systems on the bracing lines. A range of GIB® EzyBrace™ Systems has been tested with the specifications listed on pages 24 to 28 and Bracing Unit ratings listed on pages 6 and 7. GIB® Standard Plasterboard systems often represent the majority of the wall bracing elements. GIB Braceline® systems are used for narrow walls or when high Bracing Unit ratings are required. Note that BU ratings embedded in the GIB® EzyBrace™ FP software are higher than those tabulated on pages 6 and 7.

**GIB® Plasterboard Linings**

When fixing part sheets of GIB® Plasterboard, a minimum width of 300mm applies for bracing elements. Horizontal fixing is recommended. If fixing vertically, full height sheets shall be used where possible. Where sheet end butt joints are unavoidable they must be formed over nogs or over the studs and fastened at 200mm centres. Alternatively, the sheet end butt joints may be back-blocked.

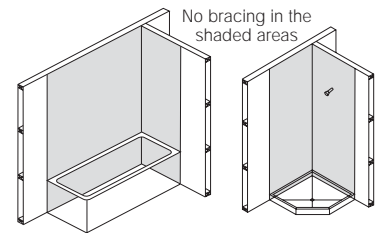
Plasterboard bracing element sheets must be fixed directly to the wall framing, eg bracing must be provided by the inner layer of a multilayer system. When a GIB® bracing element has been designated for a section of wall, BU ratings can not be increased by incorporating additional proprietary bracing elements within that same section of wall.

**Limitations**

GIB® Plasterboard must be stacked flat and protected from the weather. GIB® Plasterboard must be handled as a finishing material. GIB® Plasterboard in use must not be exposed to liquid water or be installed in situations where extended exposure to humidities above 90% RH can reasonably be expected. GIB® EzyBrace™ Systems must not be used in showers or behind baths. It is highly recommended not to install GIB® Plasterboard in any situation where external claddings are not in place or the property is not adequately protected from the elements. If GIB® Plasterboard is installed under these conditions, the risk of surface defects such as joint peaking or cracking is greatly increased.

**GIB® EzyBrace™ Systems in Water-Splash Areas**

When GIB® Plasterboard is installed in locations likely to be frequently exposed to liquid water it must have an impervious finish. Examples are adhesive fixed acrylic shower linings over GIB Aqualine® or ceramic tiles over an approved waterproof membrane over GIB Aqualine®. The NZBC requires 15 years durability in these situations. Bracing elements are required to have a durability of 50 years. Bracing elements are not to be located in shower cubicles or behind baths because of durability requirements, the likelihood of renovation, and practical issues associated with fixing bracing elements to perimeter framing members. Otherwise GIB® EzyBrace™ Systems can be used in water-splash areas as defined by NZBC Clause E3, provided these are maintained impervious for the life of the building.

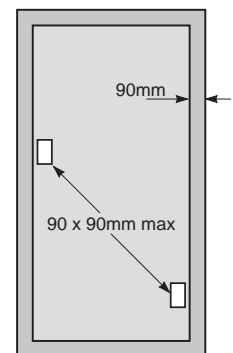
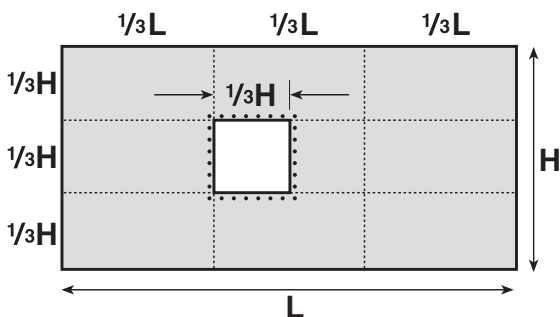


**Renovation**

When relining walls during the process of renovation, ensure that bracing elements are reinstated (check the building plans).

**Openings in Bracing Elements**

Openings are allowed within the middle third of a wall bracing element's length and height. Neither opening dimension shall be more than one third of the element height. Wall linings are fixed to opening trimmers at 150mm centres. Small openings (e.g., power outlets) of 90 x 90mm or less may be placed no closer than 90mm to the edge of the braced element. A block may need to be provided alongside the perimeter stud as shown below.



□ Small opening e.g. switch box



**Framing**

General framing requirements such as grade, spacings and installation shall comply with the provisions of NZS 3604:1999. Winstone Wallboards Ltd recommends the use of kiln-dried machine stress graded framing (KD MSG). To achieve the published bracing performance the minimum actual framing dimensions are 90 x 35mm for external walls and 70 x 35mm for internal walls. Wall bracing tests on GIB® EzyBrace™ Systems were undertaken without nogs. Nogs are not considered to add to the bracing performance of the wall.

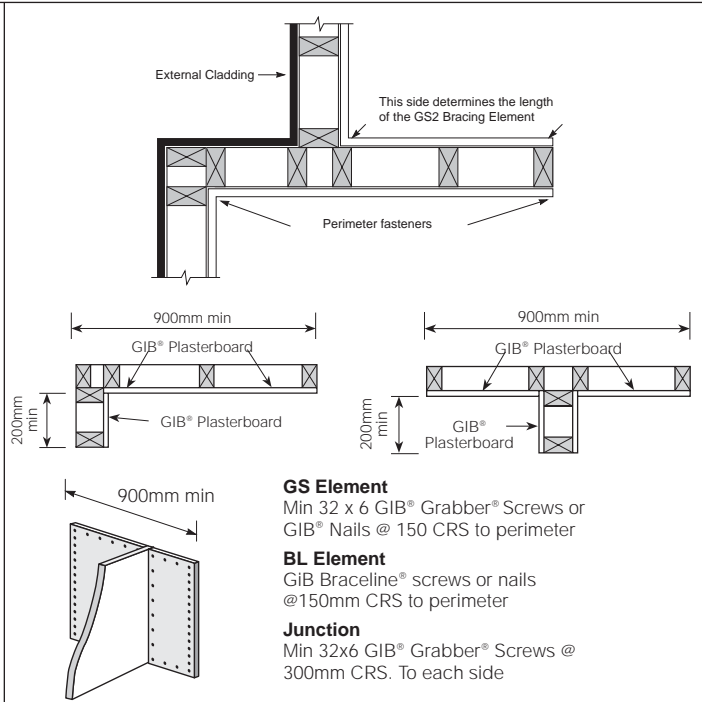
**Guidelines for intersection walls**

Where the lining on a double lined internal GS2 Bracing Element is shorter on one side, the length of the element is taken as the shorter wall length but bracing fasteners can still follow the wall perimeter on both sides.

GIB® Bracing Elements may have intersecting walls with a minimum length of 200mm. Fasteners are required around the perimeter of the bracing element. Vertical joints at T-junctions shall be fixed and jointed as specified for intermediate sheet joints. **The bracing element length must be no less than 900mm.**

Where a Wall Bracing Element is interrupted by a T or L junction the element is deemed to be continuous for the whole length (900mm in the example illustrated).

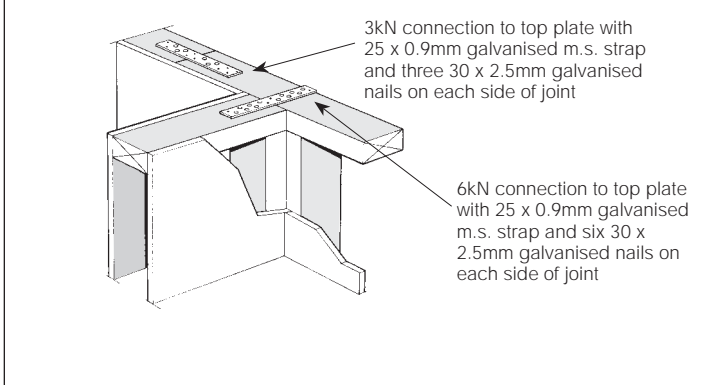
When fixing part sheets of GIB® Plasterboard, a minimum width of 300mm applies for bracing elements.



**Top Plate Connections**

The top plate of a wall that contains one or more wall bracing elements shall be jointed according to the rating of the highest-rated individual wall bracing element as follows:

- (a) Rating not exceeding 100 bracing units: A 3kN connection as shown or by an alternative fixing of 3kN capacity in tension or compression along the plate;
- (b) Rating exceeding 100 bracing units: A 6kN connection as shown or by an alternative fixing of 6kN capacity tension or compression along the plate.



**Parapets and Gable End Walls**

Bracing elements must be fixed from top plate to bottom plate. Fixing to a row of nogs is not acceptable unless either:

A continuous member such as an ex 90x45mm ribbon plate is fixed across the studs just above a row of nogs at the ceiling line.

OR

A minimum 50x50x0.55mm metal angle is installed as shown. The angle is fixed to a row of nogs with 30x2.5mm galv FH nails at 300mm centres.

