METRA
PANEL CONSTRUCTION

DESIGN & CONSTRUCTION MANUAL

METRA – Take a closer look.

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BRANZ Appraised
Appraisal No.364 [2015]

Contents

Related Documents

New Zealand Standards

- NZS 3602:2003 Timber and Wood Based Products for Use in Building.
- NZS 3603:1993 Timber Structures Standard.
- NZS 3604:2011 Timber Framed Buildings.
- AS/NZS 1170:2002 Structural Design Actions.
- NZS 4218:2009 Energy Efficiency – Housing and Small Building Envelope
- NZS 4229:2013 Concrete Masonry Building not Requiring Specific Engineering Design.

The METRA system has a BRANZ Appraisal, Certificate No. 364, for use under NZBC B2.3.1 (a) for 50 years durability. BRANZ have confirmed that METRA walls will meet the robustness intent of NZS 3602:2003

The **Building Research Association of New Zealand** (BRANZ) has produced the following test reports:

- BRANZ Appraisal, Certificate No. 364
- MTR 1007 Report on Mechanical Properties.
- MTR 1042 3 Month Weather Testing of 36mm panel.
- MTR 1048 Cyclic Humidity Testing of 36mm panel.
- FR 2453 Fire Resistance of a 36mm Wall.
- BRANZ Technical Opinion on: Durability 36mm Superfine.

Auckland Uniservices Limited conducted a series of panel tests as follows:

- Series 1 - Bending, screw withdrawal, 'T' section nail joint and screw plate joint tests.
- Series 2 - Compression, butt joint bending, nailed shear joint and batten to board nail joint tests.
- Series 3 – In and out of plane compression, in plane shear strength and flooring wall connection tests.

Paragon Consulting conducted formaldehyde tests to verify compliance with World Health Organisation guidelines:

- Formaldehyde – Determining concentration of houses lived in and at various stages of construction.

Foreword

The Metra System of engineered wood panel construction is the prime construction method used by Metrapanel Limited.

Panel based building systems have been developed in the New Zealand market for the past twenty years and the basic principles are similar to that of concrete “Tilt Slab”. Whereas, “Tilt Slab” is generally used for industrial construction, engineered wood panels are ideally suited to residential and light commercial activities.

The engineered wood panel products that form the system are:

- Metra wall panel – 36mm thick, fine surface, moisture resistant particleboard.
- Metra ceiling panel – 25mm thick, fine surface, moisture resistant particleboard.
- Metra lining panel – 18mm thick, fine surface, moisture resistant particleboard.

Metra wall panels

The standard sheet size that wall panels and ceiling panels are cut from is 7350mm x 2440mm

Wall panels are pre-cut to size, with grooves and rebates for ease of assembly, window and door openings marked or cut and pre-primed/sealed at the factory. These panels are then supplied in kitset form, complete with assembly hardware.

Metra panels have been used in the construction of residential houses, school buildings, retirement villages, apartment complexes, detention centres and industrial fit outs. The BRANZ Appraisal covers residential houses.

The Metra System allows for construction to proceed at an exceptionally rapid pace and a typical single storey structure can be easily assembled in one day.

All Metra construction must only be carried out by selected builders or construction companies that have been fully trained in panel construction by Metrapanel Limited.

This manual has been designed to align with NZS 3604:2011 (the current acceptable solution for Structure/Timber of the New Zealand Building Code). A similar index and numbering system has been used and this document should be read in conjunction with that standard.

Compliance

The Metra Panel Construction System has a BRANZ Appraisal, Certificate No. 364, for use under the NZBC.

In the opinion of BRANZ, the Metra Panel Construction System will meet or contribute to meeting the following provisions of the New Zealand Building Code:

- **B1 STRUCTURE:** Performance B1.3.1, B1.3.2 and B1.3.4 for the relevant physical conditions of B1.3.3.
- **B2 DURABILITY**: Performance B2.3.1 (a), the Metra panel wall and ceiling system, not less than 50 years.
- **C1 OUTBREAK OF FIRE:** Performance C1.3.2.
  NZBC Acceptable Solutions C/AS1 requires that foam plastics such as Expanded Polystyrene (EPS), which is an insulating material in the Metra Wall System, must be protected from direct exposure to fire. Metra wall panels, when joined with screw/nail fixed back blocking or metal strips, in accordance with the details in this manual, will satisfy the NZBC Acceptable Solution C/AS1 requirements as a flame barrier.
- **E2 EXTERNAL MOISTURE:** The system requires the addition of a building envelope to meet performance E2.3.2 and E2.3.6.
- **E3 INTERNAL MOISTURE:** Performance E3.3.1, E3.3.4. and E3.3.5.
- **F2 HAZARDOUS BUILDING MATERIALS:** Performance F2.3.1.
  The System will not present a health hazard to people.
- **H1 ENERGY EFFICIENCY:** Performance H1.3.1 and H1.3.2.
- **STRUCTURAL AND DURABILITY TESTING**
  The Metra System and its components have been extensively tested by a range of independent agencies.

1. Scope & Interpretation

1.1 Scope

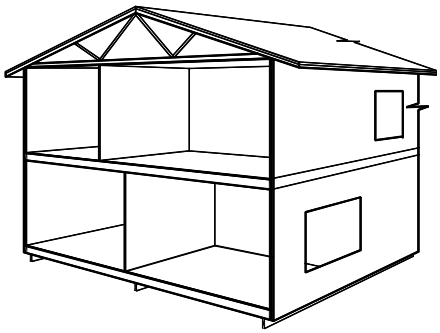
The Metra Construction System has been specifically designed in accordance with AS/NZS 1170 to comply with the appropriate design loadings for domestic buildings.

The components have been designed using structural properties determined by testing and established engineering methods. NZS 3604 and NZS 4229 can be used to specify the foundations and building platform.

Roof construction is conventional and is based on trusses. Trusses must be designed by an engineer experienced in truss design in accordance with the requirements of Clause 10.2.2 of NZS 3604: 2011. Roof claddings must be one of those specified in Paragraph 3.2 of NZBC Acceptable Solution E2/AS1.

All details of the system and components are suitable for timber framed buildings within the scope of NZS 3604:2011, Clause 1.1.2 – with the following departures:

- The floor live load on the upper floor must not exceed 1.5kPa.
- Two storey buildings must be limited to those for which details are included in this manual. Buildings outside these limits shall be specifically designed. Three storey buildings are not included.



- Ceiling diaphragms in accordance with NZS3604 up to 12m long.
- The snow load shall not exceed 1.5 kPa without specific design.

Figure 1.1 and 1.2 in NZS 3604:2011 may be used to determine the scope, but the departures listed above must be applied.

All external claddings from Paragraph 3.3 of NZBC Acceptable Solution E2/AS1 may be used.

Lintels are designed up to Very High Wind Zone for roof pitches 5 to 30.

1.2 Interpretation

Interpretation shall be as detailed in NZS 3604:2011, clause 1.2.

1.3 Definitions

The following definitions are additional to those given in NZS 3604:2011, Clause 1.3.

ANGLED FASTENING – nails are angled when they are driven though a panel or batten into a supporting member.

BEAM – a support member spanning over a room or other space and supporting a load.

BOARD – a sheet of raw, unprocessed uncut 18mm, 25mm or 36mm wood based material used in creating the Metra System.

BOTTOM PLATE (BP1) – a pre-drilled galvanised steel angle 36 x 36mm bottom plate used on concrete floors.

BLOCKING – short pieces of timber or panel the same depth as the joist, spanning from joist to joist. Blocking is spaced at given centres of the joist span between supports to stabilise the joist, to limit differential deflections, and to reduce dynamic response.

CAVITY BATTEN – these are normally H3.1 treated timber battens with a finished size of 45 x 18mm for fixing claddings over a drainage cavity. They are fixed over building wrap to the Metra battens.

CEILING STRAP (CP1) – a galvanised 50 x 1.2mm steel ceiling strap used to connect ceiling panels together.

CEILING CLIP (CPC40) – right angle brackets used to connect ceilings to truss bottom chords.

INTEGRAL LINTEL – the lintel left over at the top when an opening is cut from a solid panel.

LINTEL – a lintel spans over an opening in a wall and carries roof or floor load.

BATTEN SPECIFICATION – all timber battens supplied with the Metra kit-sets are H1.2 SG6 with a moisture content of 18% or less. The purpose of the battens is to stiffen the wall panels. Full height vertical battens are fixed at either 400 or 600mm centres depending on the height of the panels and are fixed to the panels with nails spaced at centres that are determined by the site specific wind zone. Horizontal trimmer battens are fixed around door and window openings. Additional horizontal battens may be fixed between vertical battens for cladding support as required.

NOG – floors – a short piece of timber fixed between floor joists to nail the edges of sheet flooring to.

PANEL – a large piece of board cut to the shape required to form part of a wall or ceiling.

1.3 Definitions continued

SEPARATE LINTEL – a lintel cut separately from the wall panel and fixed to it for support.

SHEET – a sheet of raw, unprocessed uncut 18mm, 25mm or 36mm wood based material used in creating the Metra System.

SKEWED – skew nails are driven at opposite angles to each other through the edge of a panel into another member.

SQUARE DRIVE SCREWS – 18 x 3mm zinc chromate coated screws used in wall and ceiling fixings.

SQUARE PLATE – a galvanised 200 x 200mm x 2mm steel plate to connect Metra ceiling panels to Metra ceiling panels.

STURDI BOND – heavy-duty construction adhesive used in wall to wall and ceiling to ceiling connections.

U-CHANNEL – a 600mm long x 1.2mm thick channel screw fixed across ceiling straps (CP1) when a ceiling joint is between trusses.

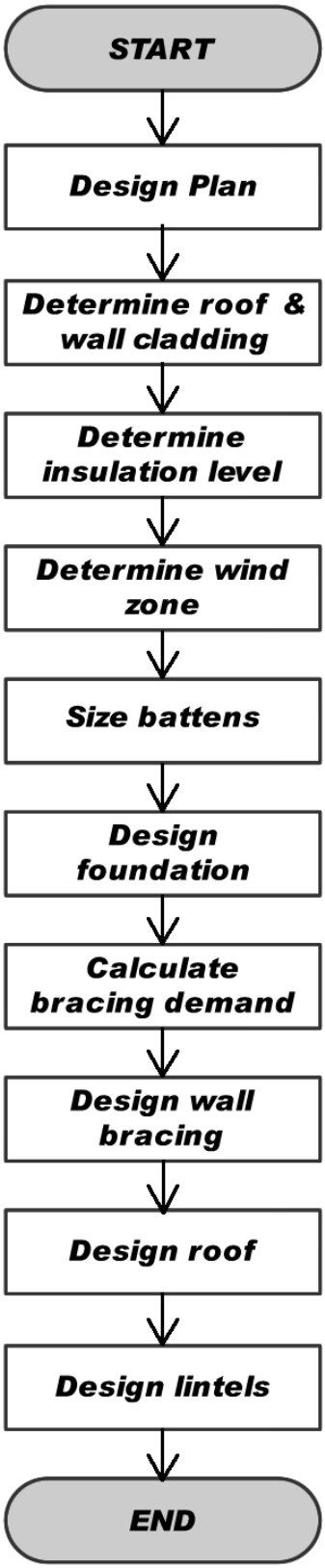
VENT BOXES – used to vent wardrobe and cupboard spaces.

1.4 Design Procedure

When designing a Metra panel structure, the following process is recommended:

- Draw the floor layout plan as desired within the scope of the particular District Scheme.
- Choose the roof and wall cladding systems to be used
- Choose the level of insulation required for the site location.
- Refer to Section 8 Walls to select the batten size and spacing after determining the appropriate Building Wind Zone for the site.
- Design the foundations and the building platform in accordance with NZS 3604, NZS 4229.
- Determine the bracing requirements from NZS 3604:2011 and calculate the bracing values of the panels (refer to Section 5 (Bracing) of this manual). Metrapanel Limited can assist with the preparation of the bracing calculations upon request.
- Design the roof construction and/or trusses to comply with the truss designer's requirements and NZS 3604:2011.
- Select a lintel, with appropriate supports and connections from the tables in Section 8 Walls.

DESIGN FLOW CHART



2. General

2.1 Materials Description

Table 2.1 Metra Wall & Ceiling Panels – Physical Properties

Board	36mm Wall Panels	25mm Ceiling Panels	18mm Ceiling Panels
Board Size	7350 x 2440mm	7350 x 2440mm	7350 x 2440mm
Weight per Board	422 kg	293 kg	216 kg
Weight per m2	23kg	15.9 kg	11.8 kg

2.1.1 WALLS

Metra wall panels are manufactured with a nominal density of 658 kg/m3.

- Full sheets are 7350mm long x 2440mm wide x 36mm thick..
- The standard wall height is 2440mm (h).
- A Factory joined sheet is available for a wall height of 2700mm (h.
- Higher walls may be built with the sheet stood on end and wall joints at 2440mm max.

Table 2.2 Metra Wall Panels – Physical Properties

Property	Unit	Average	95%
Density	Kg/m2	658	623
MOR	MPa	20000	15600
MOE	MPa	2700	2300
IB	kPa	1000	920

2.1.2 CEILINGS

25mm Metra ceiling panels are manufactured with a nominal density of 635 kg/m3.

- Full sheets are 7350mm long x 2440mm wide x 25mm thick.
- Ceiling sheets are generally supplied full size and cut to fit on site.
- Ceiling sheets may be supplied with tongue and groove edges and plastering chamfer for jointing.

2.1.3 PAINT

The primer paint applied to the panel faces and edges will resist water entering the board during the construction period. Any disturbance of this coating, i.e. cuts, nail or screw penetrations, or damaged areas must be re-primed.

NOTE: Primer for sealing edges of cut panel is supplied with the Panel kitset.

2.1.4 HARDWARE & SUNDRY ITEMS

The items used to assemble the structure may be ordered with the kitset. These include:

- Ceiling strap (CP1)
- Bottom plate angle (BP1)
- Ceiling clips (CPC40)
- Ceiling U-channel
- Ceiling square plates
- Adhesive
- Ceiling screws
- Bolts
- Nails
- Timber battens
- Lintels
- Insulation
- Touch-up sealer/primer paint
- Vented soffit sheets
- Vent boxes
- Gib quiet ties
- Fire & acoustic sealant
- Bracing tie-downs
- Wall end capping
- Interior doors
- Truss kit

Metal structural components are manufactured from galvanised steel, are zinc plated, hot dip galvanised, or primer painted to an appropriate standard so as to best resist corrosion. In all cases, fixing components must meet the minimum requirements of Section 4 of NZS 3604:2011.

Cast-in items such as bottom plate anchors, Lumberlok and Bomac cleats are not included in the Metra kitset.

Cast-in items may be required depending on the bracing options selected. Stainless Steel bottom plate anchors shall be used in coastal areas or in areas of high geothermal activity.

All nails shown in the details are to be hot dip galvanised, as follows:

- 60mm x 2.8 dia particleboard flooring nails
- 100mm x 4mm flat head nails
- 100mm x 3.75mm flat head nails

2.1.5 TIMBER

Timber used for battens shall be either dry 45 x 45mm SG8 or greater Radiata Pine or dry 70 x 45mm SG6 or greater Radiata Pine, treated to H 1.2 with a moisture content of 18% or less.

2.2 Weather Exposure

The maximum weather exposure period of panels must not exceed 28 days. Roof cladding should be installed as quickly as possible after the trusses are fixed, preferably within 14 days and within a maximum of 28 days. Longer periods may cause the panel to swell. If exposure is likely to exceed this period, then temporary covering with tarpaulins or similar must be installed.

NOTE: All site cut edges shall be painted with the sealer/primer paint supplied with the kitset.

2.3 Maintenance

To comply with the 50 year durability required by the NZBC, Metra panels must be kept dry after close-in. The external envelope must be maintained to prevent ingress of water and internal water sources such as leaks must be repaired promptly.

If damage due to prolonged wetting does occur, contact Metrapanel Limited for guidance with repair or replacement methods.

The following notice outlining maintenance requirements shall be attached to a suitable place (inside linen cupboard or electrical distribution panel) in every Metra house.

METRA PANEL CONSTRUCTION

To the homeowner/occupier.

This house is constructed using the Metra Construction System. Like all houses it requires regular maintenance. Regular maintenance is required to meet the performance requirements of the New Zealand Building Code and will enhance the serviceable life of the building materials used.

Attention to the following is required:

- Ensure adequate ventilation to wet areas is maintained.
- Ensure internal linings, floor covering and finishing, including joints, openings and the perimeters are maintained to provide protection from internal moisture. Ensure that Metra wall and ceiling surfaces are not exposed to sustained high humidity, liquid water or high temperatures.
- Regularly inspect (at least yearly) the external cladding and roofing systems and repair any damage or deterioration to prevent water ingress.
- Maintain minimum floor clearances: concrete floors – 150mm to permanent paving – 225mm to unprotected ground. Refer to the New Zealand Building Code Acceptable Solution E2/AS1 3rd Edition July 2004 for detail.

Contact Metrapanel Limited, the suppliers of Metra panel, for further detail on the above.

2.4 Workmanship & Tolerances

It is important that floor platforms are of the correct dimension and are flat, straight, parallel, square and set to the exact level.

As a guide recommended tolerances based on NZS 3604 Table 2.1 are shown below:

- Deviation from the position shown on plan – 10mm (15mm in NZS 3604)
- Deviation from vertical within a storey – 8mm per 2.4 m
- Deviation from vertical in total height of building – 20mm
- Relative displacement between load-bearing walls in adjacent storeys intended to be in vertical alignment – 5mm
- Deviation from line in plan
  1 – In any length up to 10 m – 5mm
  2 – In any length over 10 m – 10mm total
- Deviation from horizontal
  1 – In any length up to 10 m – 5mm
  2 – In any length over 10 m – 10mm total

2.5 Edge Distances for Fasteners

Table 2.3 Minimum edge/end distances and spacing for other fasteners

Item	End (mm)	Edge (mm)
Metra ceiling fixings (nail or screws)	50	10
Metra wall fixings (nail or screws)	50	10
3.15mm dia nails in radiata pine	40	18
5mm dia roofing screws in radiata pine	60	25
3mm dia nails driven into concrete	NA	50
12mm dia Dynabolt in concrete	NA	100
3 mm Tapcon screws in 2.5 mm dia holes drilled in concrete	NA	30

SKEW NAILING RULES

Off set skew nails must be centred at not less than 30mm nor more than 40mm from the joint contact surface, and at an angle not less than 30^{o} nor more than 40^{o} to the surface into which they enter.

3. Site Requirements

3.1 Preparation Before Assembly of Panels

1. It is the responsibility of the installing contractor and franchise builder to verify that the floor platform dimensions shown on the consent drawings are correct.
2. Clear crane truck access to a suitable and safe unloading position around the site must be provided so that the wall panels can be landed on the floor platform and the ceiling panels placed on the standing wall panels.
3. The installing contractor must ensure construction site safety signage is in place prior to the crane truck arrival and that all site staff are wearing safety hats and boots during panel unloading.
4. It is the responsibility of the installing contractor and franchise builder to provide a safe and firm ground surface for the crane truck to access and exit the site.
5. A full safety briefing must be undertaken prior to the unloading of any panels.
6. Site installation and construction should always be undertaken with a sufficient number of competent staff. We would suggest this would involve no less than four team members (including the truck driver/crane operator).

7 For foundation and site requirements refer to NZS 3604 or NZS 4229.

NOTE: Refer to the Metra Panel Lifting Procedure for details of:
- *Truck access requirements*
- *Site safety briefing*
- *Panel lifting procedures*

4. Durability

4.1 BRANZ Opinion

As a result of the latest edition of NZS 3602:2003 being adopted as the Acceptable Solution for Durability under the New Zealand Building Code, BRANZ have updated their durability opinion for the Metra wall panels.

“The update addresses the robustness required for exterior and other framing by NZS 3602 for exposure to moisture due to cladding leaks which will allow time for detection and repair. NZS 3602 has been adopted in the amendment to NZBC B2/AS1.

The opinion states that Metra external walls meet the robustness intent of NZS 3602:2003.

5. Bracing Design

5.1 Bracing

Bracing unit requirements for wind and earthquake are determined by using the design criteria from Section 5 of NZS 3604:2011.

The bracing resistance of the building may be calculated by adding the bracing unit values of each panel type. All full height panels, without large openings, and a min. length of 400mm, may be used as bracing elements.

Bracing elements should be evenly distributed throughout the building.

5.2 Bracing Values for Panels

As Metra panels will remain square and are fixed to the floor so that they will not slide, the brace value for each panel is largely dependent on preventing it overturning.

Long panels have much more bracing value than short panels.

The effect of small openings on panels may be ignored. Panels with windows up to 2000mm wide x 1200mm high and with at least 600mm of panel on each side of the opening may be regarded as solid.

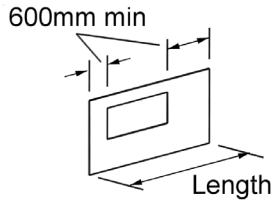


Figure 5.1 Effect of small openings

Walls joined to length using either the exterior or interior joining details shown in Section 8 may be measured as one panel.

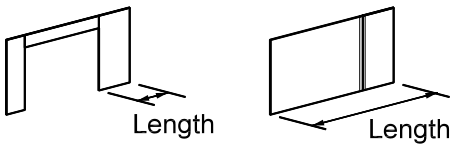


Figure 5.2 Joined Panels

5.2.1 BRACING EXAMPLE

For example the bracing for a 2m long external wall panel fixed to a concrete floor is calculated by adding the LP5 + LP7 + LP10 values. In this example this would be 11 + 9 + 100 = 120 bracing units.

The bracing for a 3m long external wall panel fixed to a timber floor is calculated by adding the LP1 + LP5 + LP7 + LP10 values. In this example this would be 146 + 22 + 21 + 150 = 339 the total value exceeds the sliding limit of 288 bracing units. The rating for the panel is therefore the sliding limit value of 288 bracing units.

Note: No total calculated bracing units can exceed the sliding limit value for that given wall length.

For panel heights other than 2.44m multiply the ratings by (2.44 divided by wall height), except that the factor shall not be greater than 1.25.

For panels with varying height use the average height for the height adjustment factor.

5.3 Panel Ceiling – 25mm

The panel ceiling acts as a diaphragm up to 12m long provided it is fixed to wall panels and trusses in accordance with the details given in Section 13. Ceiling sheets must be fixed together as shown in Section 13. The minimum sheet size within the diaphragm is 2400 x 1200mm.

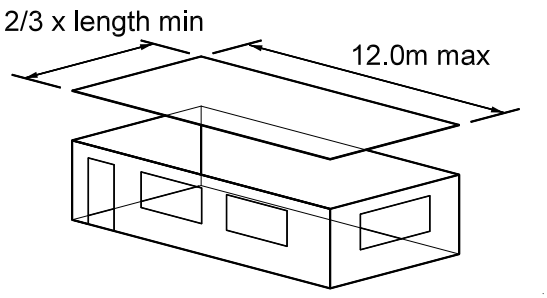
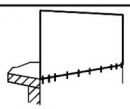
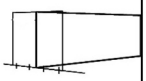
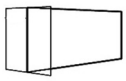
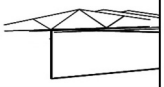
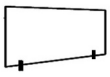
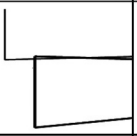
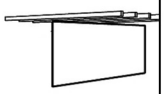


Figure 5.3 Ceiling Diaphragm

Table 5.1 Metra Bracing Values for Wind and Earthquake

Type	Bracing element	Diagram	Panel length (m)									
			0.4	0.6	0.9	2.0	3.0	4.0	5.0	6.0	7.0	8.0
LP1	External panel fixed to timber floor with battens at 600 crs		0	16	27	79	146	231	334	470	548	627
LP2	External panel fixed to concrete floor		0	7	11	34	62	98	142	193	252	319
LP3	Internal panel end held down by 2.0m long external panel fixed at right angles		0	22	33	74	110	147	184	221	258	294
LP4	Internal panel end held down by 2.0m long internal panel fixed at right angles		0	8	12	27	40	53	66	80	93	106
LP5	Panel held down by weight of trusses on panel		0	6	10	11	22	29	36	44	51	58
LP7	Self weight of panel		0	1	2	9	21	37	59	84	115	150
LP10 **	Panel held down by 6kN fixing at end		0	30	45	100	150	200	250	300	350	400
LP11 **	Panel held down by 30kN fixing at end to concrete floor		41	86	171							
LP24	Panel held down by weight of 2.0m long panel at right angle on floor above		0	6	8	19	28	37	47	56	66	75
LP25	Panel held down by weight of 2.0m width of floor above, joists at right angle to panel		0	2	4	19	42	75	117	169	230	300
LP26	Panel held down by weight of 2.0m width of floor above, bearing on wall fixed at right angle to panel		0	10	15	33	50	67	83	100	117	133
Sliding Limit	Maximum total bracing for any wall		41	58	86	192	288	384	480	576	672	768

** These fixings must be specifically detailed on the drawing. All other fixings are standard.

6. Foundation & Subfloor Framing

6.1 Foundation & Subfloor Construction

The foundation and subfloor construction must be as shown in:

- NZS 3604: 2011 (timber & concrete)
- NZS 4229 (concrete masonry and timber floors)
- By specific design in accordance with NZBC B1/VM1

7. Floors

7.1 Floor Construction

Floor platforms or lower floor construction shall be specifically designed or constructed in accordance with NZS 3604:2011 or NZS 4229 as appropriate except where noted. The following additional requirements apply.

7.2 Timber Floors

Load bearing and non load bearing wall panels shall be supported by joists and bearers in accordance with the requirements of NZS 3604:2011. Upper floors are limited to 1.5 kPa loading.

7.2.1 SUPPORTED BOUNDARY JOISTS

Where the boundary joist is directly supported by the bearer, it must be fixed to the joist end as shown in Figure 7.1 and 7.2.

7.2.3 METRAPANEL FLOORING SHEETS

Metrapanel flooring sheets shall be fitted as per NZS 3604/2011 section 7.2.3 and 7.3 for structural floor diaphragms.

Sheet flooring material shall to the greatest possible extent be laid in complete sheets. The standard flooring sheets size is 7350 x 2450 x 25mm. Space floor joists to accommodate full sheets where possible.

Joints in sheet flooring material shall be made over supports. 90mm x 45mm timbers fixed on edge between joists, with their top surfaces set to a common level, shall be provided as necessary for this purpose.

Each sheet shall be fastened along each edge to framing or blocking members and shall also be fastened to every intermediate framing member. Fastenings shall be not less than 10 mm from sheet edges.

Fix sheets with flooring nails 60 x 2.8mm nails at 150mm centres to sheet edges and 300mm centres to intermediate supports as shown in Figure 7.2.3

7.2.4 SEALING FLOORING SHEETS

Metrapanel flooring sheets must be sealed as soon as practical or ordered as pre-sealed sheets. If flooring will be exposed to wet weather during construction it must be ordered as pre-sealed flooring sheets.

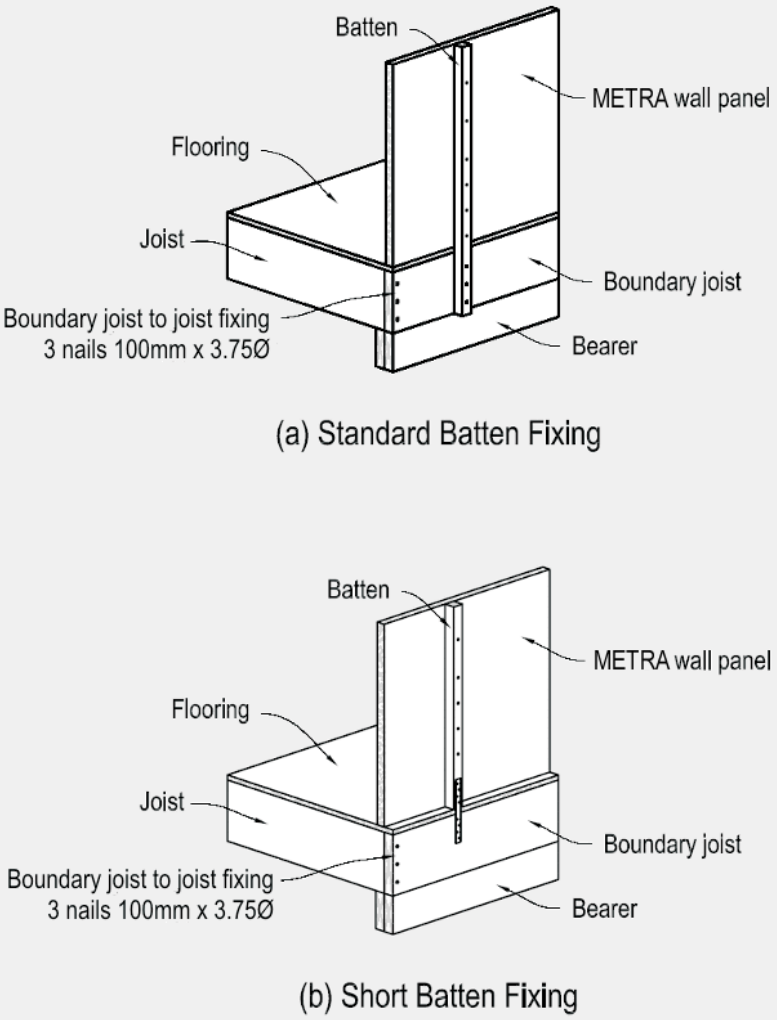


Figure 7.1 Supported Boundary Joist on Timber Bearer

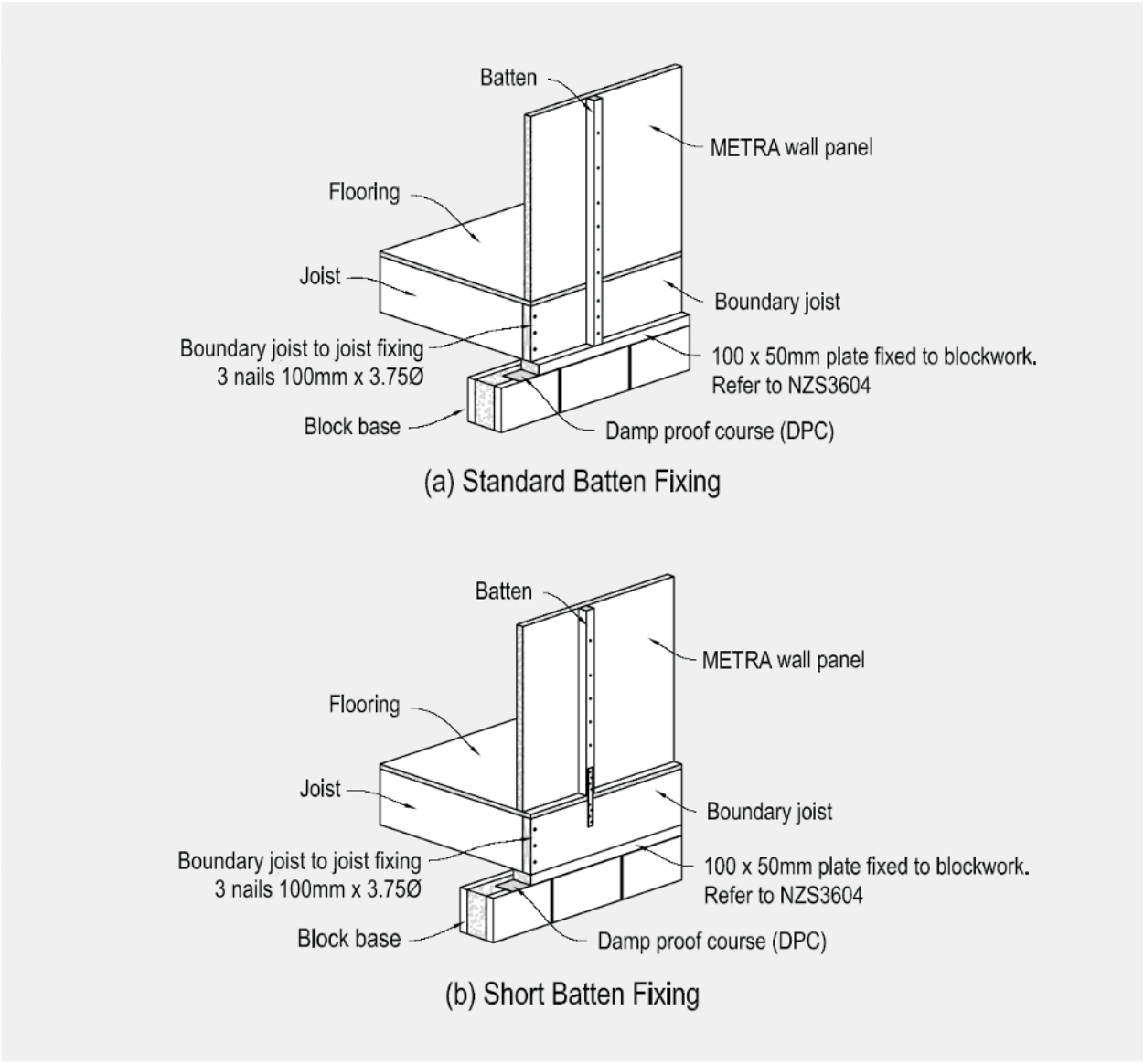


Figure 7.2 Supported Boundary Joist on Block Base

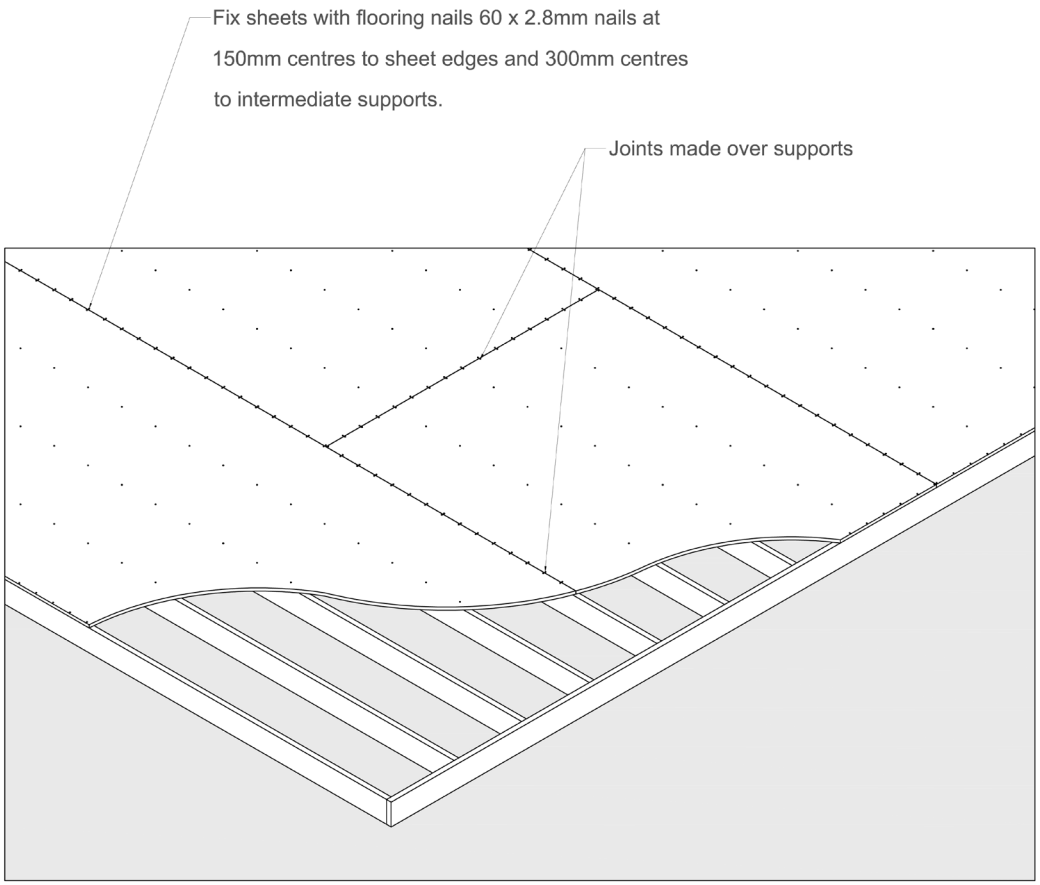
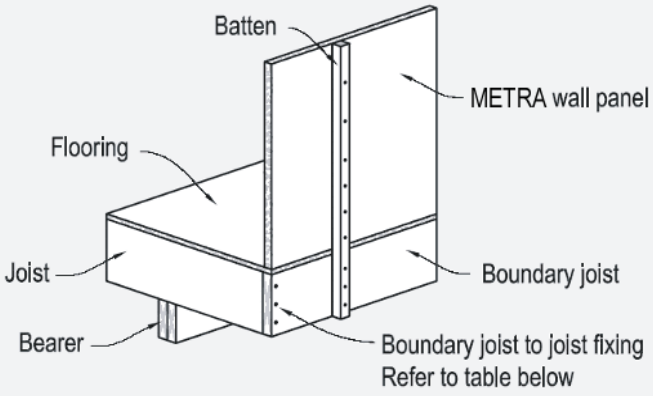


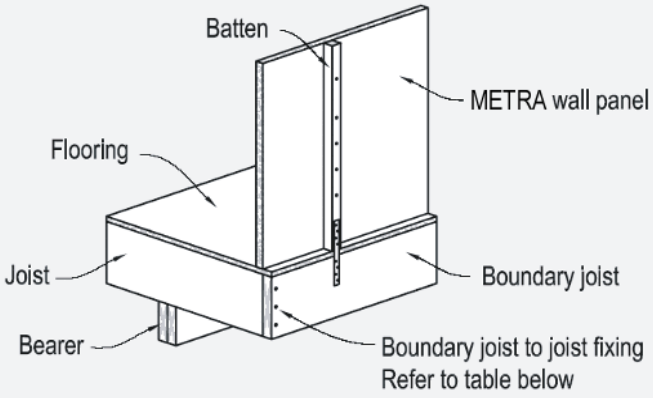
Figure 7.2.3 Metrapanel floor sheets

7.2.2 CANTILEVERED BOUNDARY JOISTS

When the boundary joist is not directly supported by the bearer, it must be fixed to the joist end as per Figure 7.3 and Figure 7.4.



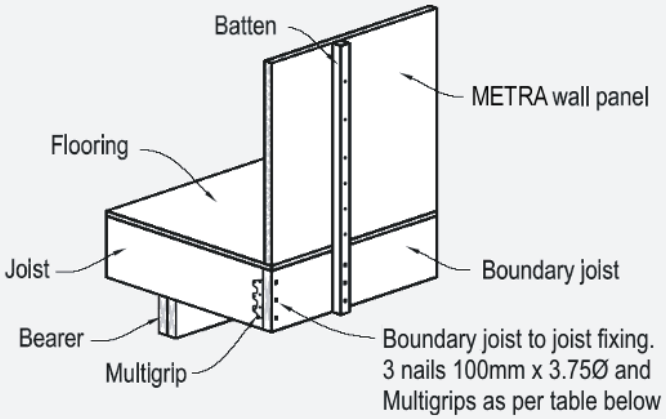
(a) Standard Batten Fixing



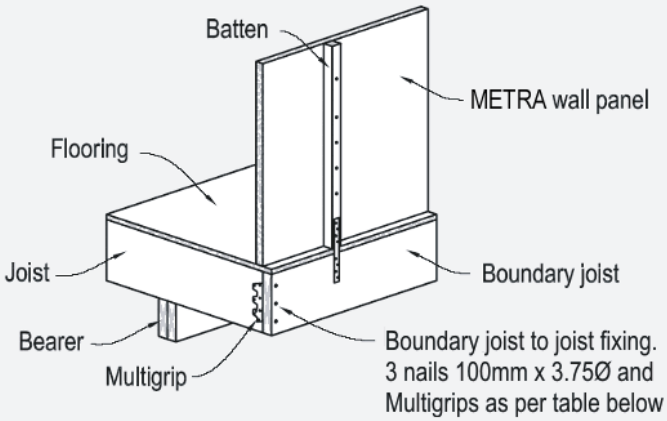
(b) Short Batten Fixing

Boundary joist to joist fixing			
Roof span	8m	10m	12m
Number of nails 100mm x 3.75Ø	3 per joist	3 per joist	4 per joist

Figure 7.3 Cantilever Boundary Joist Fixings – Light Roof



(a) Standard Batten Fixing



(b) Short Batten Fixing

Multigrip	Boundary joist to joist fixing			
	Roof span	8m	10m	12m
	Number of multigrips	1 every 2nd joist	1 per joist	2 per joist

Figure 7.4 Cantilever Boundary Joist Fixings – Heavy Roof

NOTE: Multigrips must be fixed to the boundary joist and the floor joist with 4-30mm x 3.55Ø nails (8 total).

7.3 Concrete Floors

The wall to floor bracing elements used may be determined from table 5.1, typically they will be either cast-in type LP2 bottom plate anchors or epoxy fitted LP6, LP12 or LP30 anchors fitted after the walls have been stood.

Where cast-in bracing is specified, bottom plate anchors are cast in around the perimeter where required by the bracing plan. Refer to Figure 7.5.

The metal angle used to fix panels to the floor forms a moisture barrier and capillary break between the panel and damp concrete.

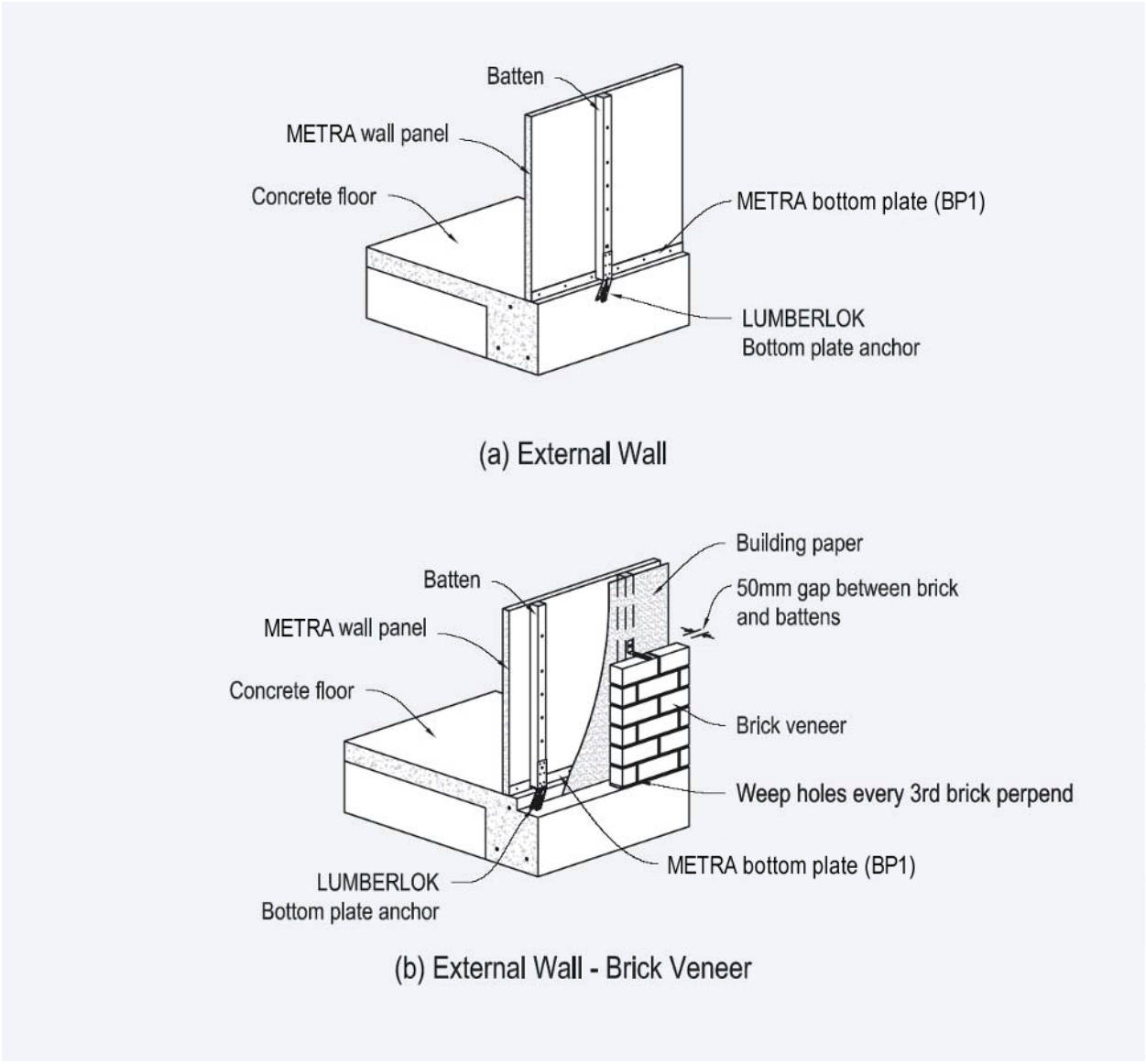


Figure 7.5 Cast-in Concrete Floor Fixings

NOTE: Refer to Section 8 for fixing details.

7.3.1 FLOOR THICKENING

Floors under internal load bearing walls must be thickened in accordance with the requirements of NZS 3604 2011.

In some cases floor slab thickening may not be required under internal load bearing walls. Refer to Table 7.1.

Table 7.1 Slab Thickness

Load bearing internal wall supporting light or heavy roof (single storey)		
Roof span supported (m)	**Slab thickness (mm)**	**Mesh HRC (size)***
6	100	668
8	100	668
10	100	668
12	100	668

* Note: where the concrete pour length is greater than 15m use 665 mesh.

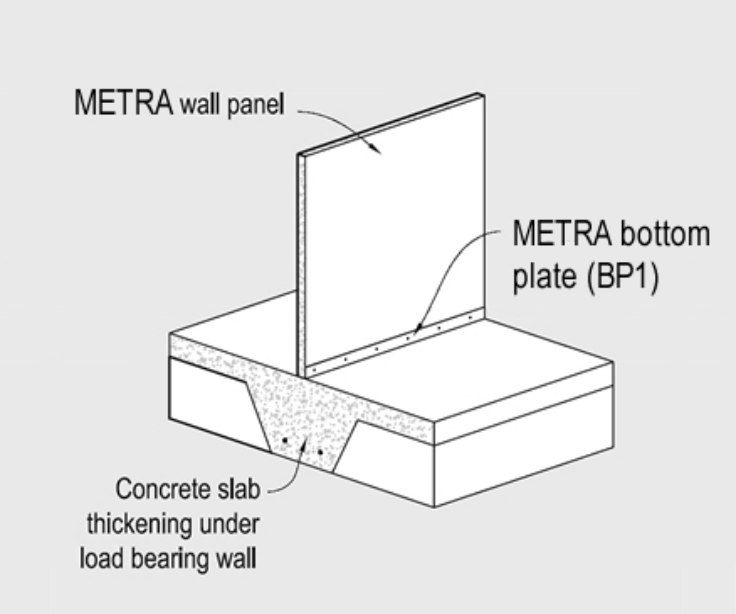


Figure 7.7 Load Bearing Interior Wall – Floor Thickening

8. Walls

8.1 General

All external and internal walls are normally 2440mm high. Factory joined wall panels 2700mm high are available as required.

Walls panels over 2440mm high may be cut from sheets stood “on end”.

8.2 Systems to Resist Vertical Loads

Wall panels and battens must be as shown in the tables in this manual.

Table 8.1 to Table 8.3 give the batten spacings for walls in single and two storey construction.

Traditional paint and wall paper finishes may be used on Metra panels.

Wall linings and finishes to wet areas are to comply with NZBC E3/AS1 Clause 3.1.2 and 3.2.

Table 8.1 External Wall Battening – Single or Top Storey

Wall Height	Roof Span	45 x 45mm Batten Spacing	70 x 45mm Batten Spacing	Number of trimmer battens beside opening width (mm) less than:		
m	**m**	**mm**	**mm**	1801	2401	3001
2.4	12.0	600	600	1	2	2
2.7	12.0	400	600	1	2	2
3.0	12.0	400	600	2	2	3

Single or upper wall of two storey.

For light or heavy roofs.

For low to very high building wind zones.

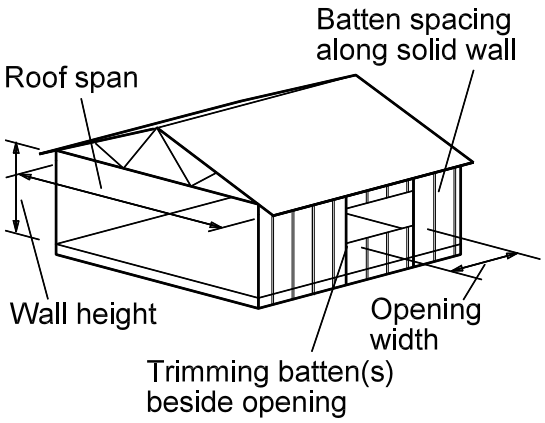


Figure 8.1 External Wall Battening – Single or Top Storey

Batten spacing to all upper storey walls as per table above.

Table 8.2 External Wall Battening – Lower of Two Storey or Subfloor – with internal support wall

Wall Height	Roof Span	45 x 45mm Batten Spacing	70 x 45mm Battens Spacing	Number of trimmer battens beside opening width (mm) less than:		
m	**m**	**mm**	**mm**	1801	2401	3001
2.4	12.0	600	600	1	2	2
2.7	10.0	400	600	1	2	2
2.7	12.0	400	600	1	2	4
3.0	8.0	400	600	1	2	-
3.0	10.0	400	600	2	4	-

Lower of two storeys or subfloor beneath one with internal support wall.

For light or heavy roofs.

For low to very high building wind zones.

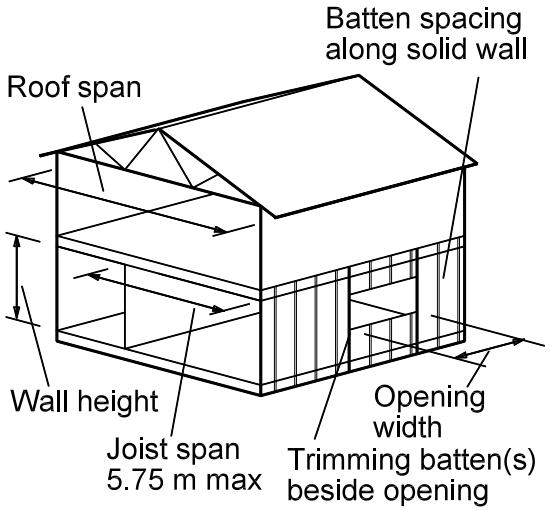


Figure 8.2 External Wall Battening – Lower of Two Storey or Subfloor – with internal support wall

Batten spacing to end walls as per table above.

Table 8.3 External Wall Battening – Lower of Two Storey or Subfloor – joist spanning between external walls

Wall Height	Roof Span	Roof Weight	45 x 45mm Batten Spacing	70 x 45mm Batten Spacing	No. of trimmer battens beside opening width (mm) less than:	
m	**m**		**mm**	**mm**	1801	2401
2.4	8.0	Light	600	600	1	1
2.4	8.0	Heavy	600	600	1	1
2.4	10.0	Light	600	600	2	2
2.4	10.0	Heavy	600	600	2	3
2.4	12.0	Light	600	600	2	3
2.4	12.0	Heavy	600	600	3	5
2.7	8.0	Light	400	600	1	2
2.7	8.0	Heavy	400	600	1	2
2.7	10.0	Light	400	600	2	3
2.7	10.0	Heavy	400	600	3	6

Lower of two storeys or subfloor beneath one with joists spanning between external walls.
For low to very high building wind zones.

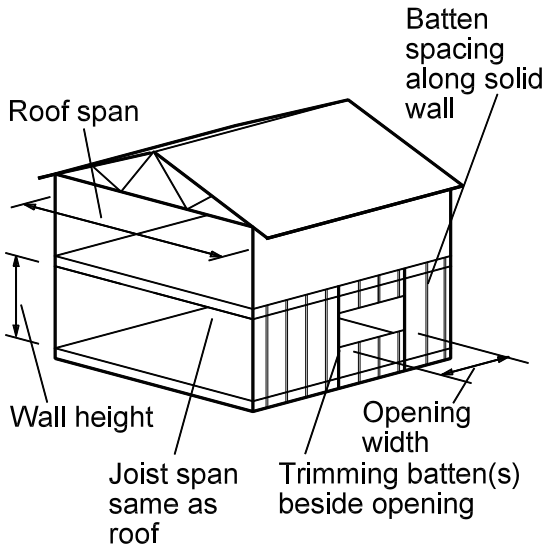


Figure 8.3 External Wall Battening – Lower of Two Storey or Subfloor – joist spanning between external walls

Batten spacing to end walls as per table above.

Table 8.4 Internal Walls – Thickness of panel (no batten) for wall supporting joists

Thickness of panel for Wall Supporting Joists				
Stud Height	Joist Span JS1 + JS2	Continuous Wall	Max 800 Opening Width	Max 1800 Opening Width
m	m	mm	mm	mm
2.4	4.9	36	36	36
	6.9	36	36	2/36
	9.9	36	2/36	2/36
	12.0	2/36	2/36	2/36
2.7	3.6	36	36	36
	5.2	36	36	2/36
	7.6	36	2/36	2/36
	12.0	2/36	2/36	2/36
3.0	2.7	36	36	36
	4.0	36	36	2/36
	6.0	36	2/36	2/36
	12.0	2/36	2/36	2/36

Lower of two storeys or subfloor beneath one

For light or Heavy roofs

For low to very high building wind zones

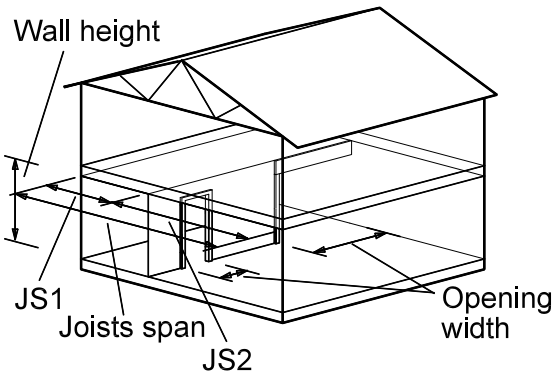


Figure 8.4 Internal Walls – Thickness of panel for wall supporting joists

8.3 Battening

The battening detailed in this section is required for structural purposes. Additional non-structural battens may be required as fixing points for cladding joints, cladding edges or cladding cavity battens. For details refer to Section 11 Building Envelope Wall & Cladding.

NOTE: Use double head & sill trimmers around openings where a double batten is required beside the opening.

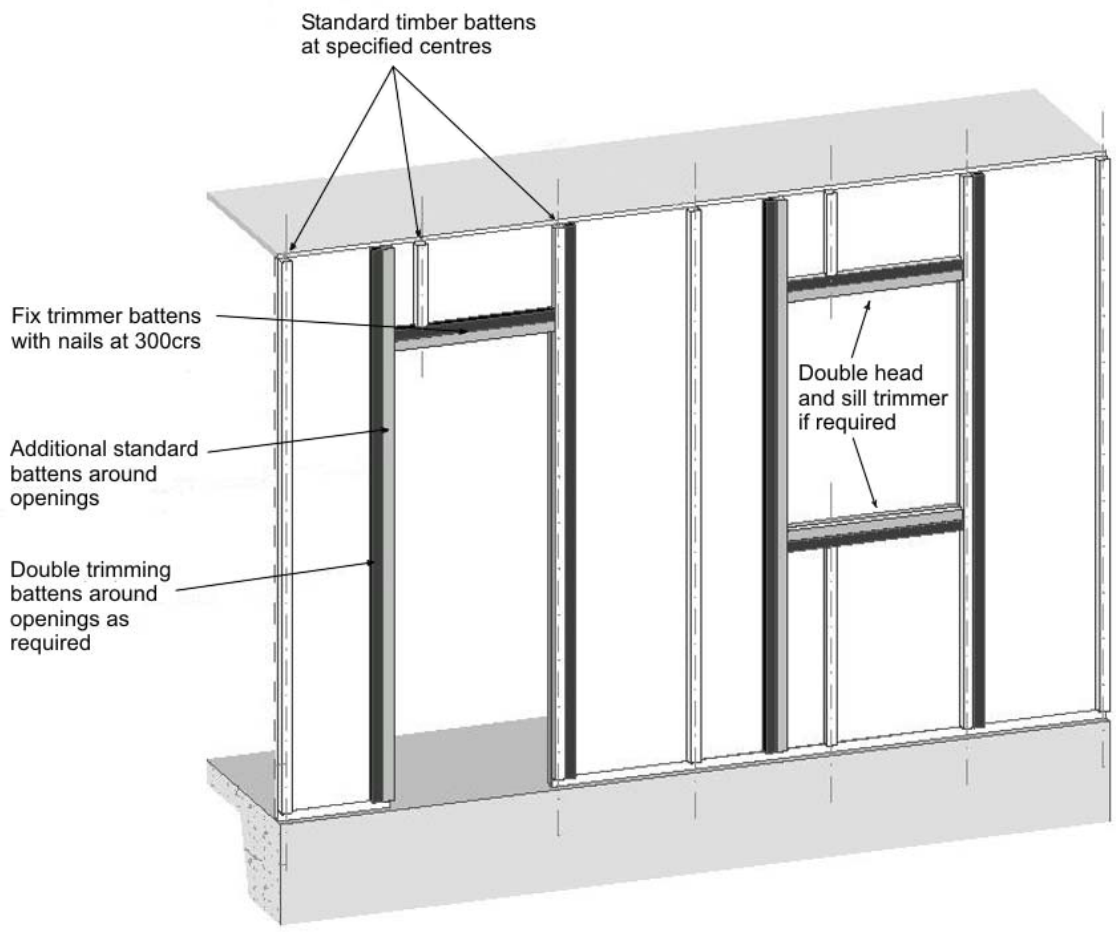


Figure 8.5 Battens around openings

Vertical battens are fixed depending on Wind Zones for the building, refer to Figure 8.6.

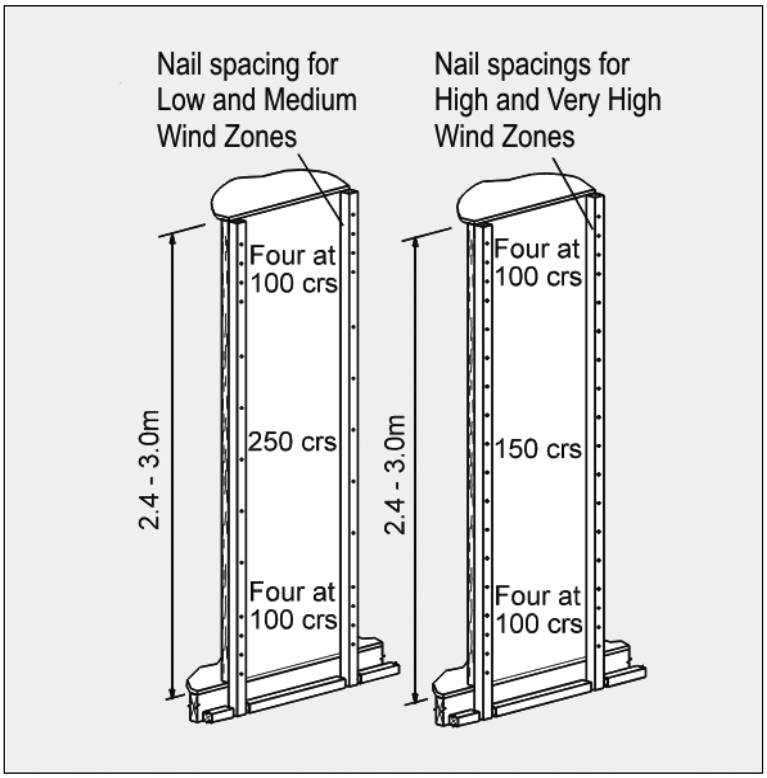


Figure 8.6 Batten Fixings

NOTE: Floor fixings may vary.

8.3.1 BATTEN NAILS

Where SG8 or greater 45 x 45mm battens are used;

- 75 x 3.15mm dia hd galvanised nails angled slightly to prevent dimpling of inside surface.
- On suspended timber framed floors, 3/100mm x 3.75mm dia nails at 40mm crs are also nailed through the batten into the floor joist.

Where SG6 or greater 70 x 45mm battens on edge are used;

- 90 x 3.15mm dia hd galvanised nails punched 5mm below the surface.
- On suspended timber framed floors, 4/90mm x 3.15mm dia nails at 40mm crs skew nailed through the batten into the floor joist.

8.4 Lintels

There are two forms of Metra Lintels – Integral or Separate.

Integral lintels are the lintels that remain when a hole for a window or door is cut from a Metra wall panel. Integral lintels can be stiffened using timber, ganglam, LVL, or steel flitch lintels.

When the lintel requires stiffening, a lintel is fixed to the outside of the existing Metra wall panel. It must be 600mm longer than the opening to give a 300mm overlap
at each end.

Separate lintels are where the lintel is a separate piece of Metra panel that is fixed to the Metra wall panels.

Separate panel lintels are fixed to the support panel via connecting Metra panel cleats of the same depth as the lintel. The cleat is lapped 300mm onto both the wall panel and lintel.

When the lintel requires stiffening specific designed lintels are fixed to the outside of the panel. These are 600mm longer than the width of the opening to give a 300mm overlap at each end.

A flitch beam lintel is a separate lintel that is stiffened using steel. This has been specifically designed to fit in the cavity formed by the battens and to be able to span large openings such as garage doors.

The lintels have been designed for:

- Roof pitches of 5 degrees to 30 degrees.
- Soffits maximum width of 600mm.
- For 1.5kPa snow loads, refer to tables 8.10.3 & 8.10.4
- For high wind zone, refer to tables 8.5, 8.6, 8.7, 8.8, 8.9 &8.10
- For very high wind zone, refer to tables 8.10.1 & 8.10.2

Lintels where the pitches are outside of this range or that are outside the lintel tables covered by this manual, must be specifically designed. Refer to Metrapanel Limited.

8.4.1 PANELS SUPPORTING LINTELS

Panels supporting lintels shall have a width of no less than 300 mm when braced by another panel at right angles, or 1000 mm if unbraced. Where the width is less than shown in Figure 8.7, refer to NZS3604.

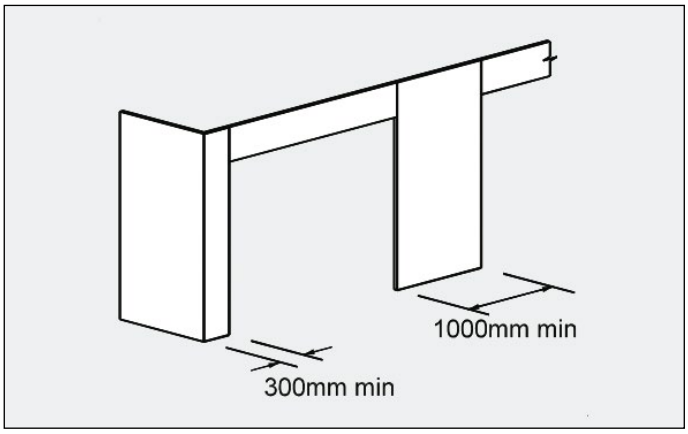


Figure 8.7 Panels Supporting Lintels

For suspended ground floor applications where lintel supporting walls immediately adjacent to the lintel are not directly positioned over a foundation pile refer to Metrapanel Limited.

Table 8.5 Metra Lintels Supporting Roof Only – Light Roof

		Maximum Span for Lintel Sizes listed below (m)			
	Lintel	Loaded dimension of lintel (m)			
		3	4	5	6
	L01	1.8	1.6	1.5	1.4
	L02 190	2.6	2.4	2.3	2.2
290	L03	3.0	2.6	2.4	2.2
Lintel	L04 190	3.4	3.1	2.8	2.6
	L02 290	3.3	3.1	2.9	2.8
	L04 290	3.8	3.6	3.4	3.3
	L01	2.5	2.3	2.1	2.0
	L02 190	3.0	2.8	2.7	2.6
	L02 290	3.5	3.3	3.1	3.0
390	L03	3.8	3.6	3.2	2.9
Lintel	L04 190	4.0	3.8	3.5	3.2
	L02 380	4.1	3.9	3.7	3.5
	L04 290	4.3	4.1	3.9	3.7
	L04 380	4.8	4.5	4.3	4.1
	LF 6 x 300	5.0	4.9	4.8	4.7
Flitch	LF 8 x 300	5.2	5.1	4.9	4.8
	LF 10 x 300	5.4	5.3	5.1	4.9
	LF 12 x 300	5.6	5.4	5.2	5.0
LVL	LVL 360 x 63	5.3	4.9	4.6	4.3

Roof pitch range: 5 degrees minimum to 30 degrees maximum.

Up to high wind zones.

Soffit width 600mm max

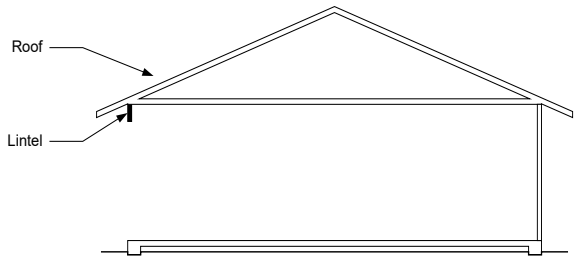


Figure 8.8 Lintels Supporting Roof Only (Refer Table 8.5)

Table 8.6 Metra Lintels Supporting Roof Only – Heavy Roof

		Maximum Span for Lintel Sizes listed below (m)			
	Lintel	Loaded dimension of lintel (m)			
		3	4	5	6
	L01	1.4	1.3	1.2	1.1
	L02 190	2.1	1.9	1.8	1.7
290	L03	2.4	2.1	1.9	1.7
Lintel	L04 190	2.9	2.6	2.3	2.1
	L02 290	2.8	2.6	2.4	2.2
	L04 290	3.3	3.1	2.9	2.7
	L01	2.0	1.8	1.7	1.6
	L02 190	2.6	2.4	2.2	2.1
	L02 290	2.9	2.7	2.6	2.4
390	L03	3.2	2.9	2.6	2.3
Lintel	L04 190	3.5	3.2	2.9	2.6
	L02 380	3.4	3.2	3.0	2.9
	L04 290	3.7	3.5	3.2	3.0
	L04 380	4.1	3.9	3.7	3.6
	LF 6 x 300	4.4	4.2	4.0	3.8
Flitch	LF 8 x 300	4.6	4.4	4.2	4.0
	LF 10 x 300	4.8	4.6	4.4	4.2
	LF 12 x 300	5.0	4.9	4.8	4.8*

Roof pitch range: 5 degrees minimum to 30 degrees maximum.
Up to high wind zones.
Soffit width 600mm max.

* Use 340mm steel flitch

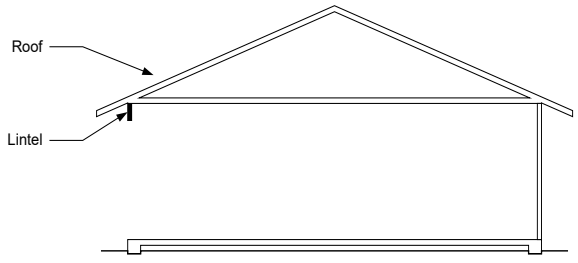


Figure 8.9 Lintels Supporting Roof Only (Refer Table 8.6)

Table 8.7 Metra Lintels Supporting Roof and Wall – Light Roof

		Maximum Span for Lintel Sizes listed below (m)			
	Lintel	Loaded dimension of lintel (m)			
		3	4	5	6
	L01	1.5	1.4	1.3	1.2
	L02 190	2.2	2.1	2.0	1.9
290	L03	1.9	1.8	1.7	1.6
Lintel	L04 190	2.8	2.7	2.6	2.5
	L02 290	2.9	2.7	2.6	2.5
	L04 290	3.4	3.3	3.2	3.1
	L01	2.0	1.9	1.8	1.7
	L02 190	2.6	2.5	2.4	2.3
	L02 290	3.0	2.9	2.8	2.7
390	L03	2.5	2.4	2.3	2.2
Lintel	L04 190	3.3	3.1	2.9	2.8
	L02 380	3.6	3.5	3.4	3.2
	L04 290	3.7	3.6	3.5	3.3
	L04 380	4.3	4.1	4.0	3.9
	LF 6 x 300	4.3	4.1	4.0	3.9
Flitch	LF 8 x 300	4.6	4.5	4.3	4.2
	LF 10 x 300	4.9	4.7	4.5	4.4
	LF 12 x 300	5.1	4.9	4.8	4.7

Roof pitch range: 5 degrees minimum to 30 degrees maximum.

Up to high wind zones.

Soffit width 600mm max.

NOTE: Determine the loaded dimension of the wall above the lintel at the roof level and use this value in the table.

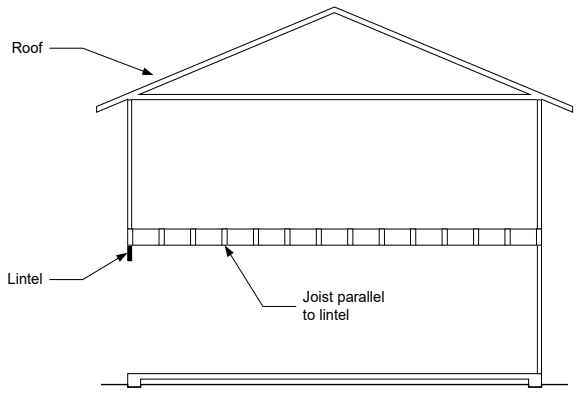


Figure 8.10 Lintels Supporting Roof and Wall (Refer Table 8.7)

Table 8.8 Metra Lintels Supporting Roof and Wall – Heavy Roof

		Maximum Span for Lintel Sizes listed below (m)			
	Lintel	Loaded dimension of lintel (m)			
		3	4	5	6
	L01	1.2	1.1	1.0	0.9
	L02 190	1.9	1.8	1.7	1.6
290	L03	1.6	1.5	1.4	1.3
Lintel	L04 190	2.4	2.3	2.1	2.0
	L02 290	2.4	2.3	2.2	2.1
	L04 290	3.0	2.9	2.8	2.7
	L01	1.7	1.6	1.5	1.4
	L02 190	2.2	2.0	1.8	1.7
	L02 290	2.7	2.5	2.4	2.3
390	L03	2.1	2.0	1.9	1.8
Lintel	L04 190	2.7	2.5	2.3	2.2
	L02 380	3.2	3.1	3.0	2.9
	L04 290	3.3	3.2	3.1	3.0
	L04 380	3.9	3.7	3.5	3.4
	LF 6 x 300	3.9	3.7	3.5	3.3
Flitch	LF 8 x 300	4.1	3.9	3.8	3.6
	LF 10 x 300	4.3	4.1	4.0	3.8
	LF 12 x 300	4.5	4.3	4.1	4.0

Roof pitch range: 5 degrees minimum to 30 degrees maximum.

Up to high wind zones.

Soffit width 600mm max.

NOTE: Determine the loaded dimension of the wall above the lintel at the roof level and use this value in the table.

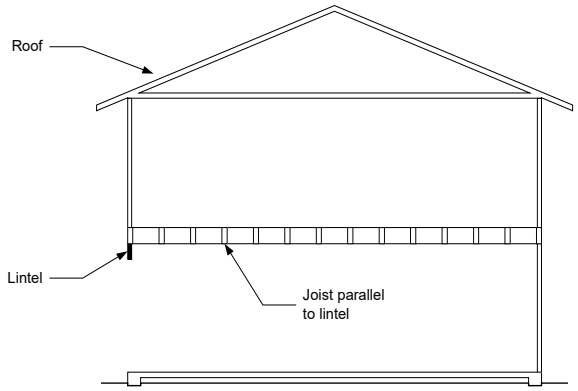


Figure 8.11 Lintels Supporting Roof and Wall (Refer Table 8.8)

Table 8.9 Metra Lintels Supporting Roof, Wall and Floor – Light Roof

		Maximum Span for Lintel Sizes listed below (m)			
	Lintel	Loaded dimension of lintel (m)			
		3	4	5	6
	L01	1.2	1.1	1.0	0.9
	L02 190	1.5	1.3	1.2	1.1
290	L03	1.6	1.5	1.4	1.2
Lintel	L04 190	1.9	1.6	1.4	1.3
	L02 290	2.1	1.8	1.6	1.5
	L04 290	2.6	2.3	2.0	1.9
	L01	1.7	1.5	1.3	1.2
	L02 190	1.7	1.5	1.3	1.2
	L02 290	2.6	2.4	2.2	2.0
390	L03	2.1	1.9	1.7	1.5
Lintel	L04 190	2.1	1.9	1.7	1.5
	L02 380	3.2	3.0	2.8	2.6
	L04 290	2.7	2.4	2.2	2.0
	L04 380	3.5	3.1	2.8	2.6
	LF 6 x 300	3.5	3.1	2.8	2.5
Flitch	LF 8 x 300	4.0	3.6	3.2	2.9
	LF 10 x 300	4.5	4.0	3.6	3.3
	LF 12 x 300	4.7	4.3	4.1	3.8

Roof pitch range: 5 degrees minimum to 30 degrees maximum.

Up to high wind zones.

Soffit width 600mm max.

NOTE: Determine the loaded dimension of the lintel at floor level and the loaded dimension of the wall above the lintel at roof level and use the greater value in this table.

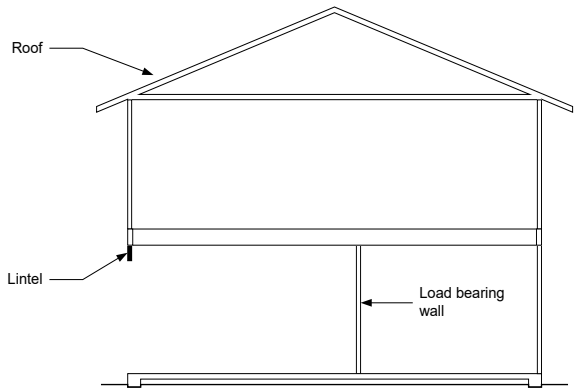


Figure 8.12 Lintels Supporting Roof, Wall and Floor (Refer Table 8.9)

Table 8.10 Metra Lintels Supporting Roof, Wall and Floor – Heavy Roof

		Maximum Span for Lintel Sizes listed below (m)			
	Lintel	Loaded dimension of lintel (m)			
		3	4	5	6
	L01	1.1	1.0	0.9	0.8
	L02 190	1.4	1.2	1.1	1.0
290	L03	1.5	1.3	1.2	1.1
Lintel	L04 190	1.8	1.5	1.3	1.2
	L02 290	1.9	1.7	1.5	1.4
	L04 290	2.4	2.1	1.9	1.7
	L01	1.5	1.4	1.2	1.1
	L02 190	1.5	1.4	1.2	1.1
	L02 290	2.4	2.2	2.0	1.8
390	L03	2.0	1.7	1.5	1.3
Lintel	L04 190	2.0	1.7	1.5	1.3
	L02 380	3.0	2.8	2.6	2.4
	L04 290	2.5	2.2	2.0	1.8
	L04 380	3.3	2.9	2.8	2.4
	LF 6 x 300	3.2	2.8	2.5	2.3
Flitch	LF 8 x 300	3.8	3.3	3.0	2.7
	LF 10 x 300	4.1	3.7	3.4	3.1
	LF 12 x 300	4.3	4.1	3.8	3.5

Roof pitch range: 5 degrees minimum to 30 degrees maximum.

Up to high wind zones.

Soffit width 600mm max.

NOTE: Determine the loaded dimension of the lintel at floor level and the loaded dimension of the wall above the lintel at roof level and use the greater value in this table.

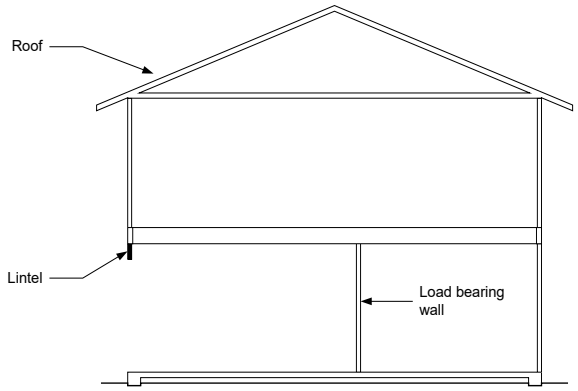


Figure 8.13 Lintels Supporting Roof, Wall and Floor (Refer Table 8.10)

Table 8.10.1 Metra Lintels Supporting Roof, Wall and Floor – Very High Wind Zone - Light Roof

Type	Lintel	Loaded Dimension of Lintel											
		3m	# Studs	# Studs	4m	# Studs	# Studs	5m	# Studs	# Studs	6m	# Studs	# Studs
		max. span	under lintel	full height	max. span	under lintel	full height	max. span	under lintel	full height	max. span	under lintel	full height
L01	290x36 Metra	1600	1	2	1400	1	2	1300	1	2	1200	1	2
L02	290x36 Metra + 290x45 MSG8	3100	1	3	2800	2	2	2600	2	2	2500	2	2
L02	290x36 Metra + 300x45 LVL	3700	2	3	3400	2	3	3200	2	2	3000	2	2
L02	290x36 Metra + 300x63 LVL	4100	2	4	3800	2	3	3500	2	3	3300	3	2
L02	340x36 Metra + 360x63 LVL	5100	2	5	4800	2	5	4500	3	4	4200	3	3
L03	290x36 Metra	2700	1	2	2500	2	2	2300	2	2	2200	2	2
L04	290x36 Metra + 290x45 MSG8	3400	2	2	3000	2	2	2700	2	2	2400	2	2
L04	290x36 Metra + 300x45 LVL	3400	2	2	3000	2	2	2700	2	2	2400	2	2
L01	390x36 Metra	2100	1	2	1900	1	2	1800	1	2	1700	2	2
L02	390x36 Metra + 290x45 MSG8	3300	1	3	3000	2	2	2800	2	2	2700	2	2
L02	390x36 Metra + 300x45 LVL	3900	2	3	3500	2	3	3300	2	2	3100	2	2
L02	390x36 Metra + 300x63 LVL	4300	2	4	3900	2	3	3600	2	3	3400	3	2
L03	390x36 Metra	3700	2	2	3300	2	2	3100	2	2	2900	2	2
L04	390x36 Metra + 290x45 MSG8	4400	2	4	3900	2	3	3500	2	2	3200	2	2
L04	390x36 Metra + 300x45 LVL	4400	2	4	3900	2	3	3500	2	2	3200	2	2
LF6	300x36 Metra + 300x6 Steel flitch + 300x36 Metra	4500	2	4	4100	2	3	3900	3	2	3600	3	2
LF10	300x36 Metra + 300x10 Steel flitch + 300x36 Metra	5300	2	6	4800	3	4	4500	3	4	4300	3	3
LF12	300x36 Metra + 300x12 Steel flitch + 300x36 Metra	5600	2	6	5100	3	4	4800	3	4	4500	3	4

Notes:

a) Dead load deflection limited to 12.5mm. Live load deflection limited to 9mm, and combined G+0.7Q deflection limit of span/300.

b) Flitch beams require special truss connection detail to provide lateral resistance to buckling under uplift conditions.

c) All studs nailed to Metra panel with 3.13 nails at 150mm centres vertically for transfer of forces.

d) Roof pitch range: 5 degrees minimum to 30 degrees maximum.

e) Up to very high wind zones.

f) Soffit width 600mm max.

Lintels Supporting Roof Only

Table 8.10.2 Metra Lintels Supporting Roof, Wall and Floor – Very High Wind Zone - Heavy Roof

		Loaded Dimension of Lintel											
		3m	# Studs	# Studs	4m	# Studs	# Studs	5m	# Studs	# Studs	6m	# Studs	# Studs
Type	Lintel	max. span	under lintel	full height	max. span	under lintel	full height	max. span	under lintel	full height	max. span	under lintel	full height
L01	290x36 Metra	1300	1	2	1200	1	2	1100	1	1	1000	1	2
L02	290x36 Metra + 290x45 MSG8	2700	2	2	2400	2	2	2300	2	1	2100	2	2
L02	290x36 Metra + 300x45 LVL	3200	2	2	2900	2	2	2700	3	1	2600	3	2
L02	290x36 Metra + 300x63 LVL	3600	2	3	3300	2	2	3000	3	1	2800	3	2
L02	340x36 Metra + 360x63 LVL	4500	2	4	4100	3	2	3800	3	2	3600	4	2
L03	290x36 Metra	2300	2	2	2100	2	2	2000	2	1	1800	2	2
L04	290x36 Metra + 290x45 MSG8	2900	2	2	2500	2	2	2200	2	1	2000	2	2
L04	290x36 Metra + 300x45 LVL	2900	2	2	2500	2	2	2200	2	1	2000	2	2
L01	390x36 Metra	1800	1	2	1700	2	2	1500	2	1	1400	2	2
L02	390x36 Metra + 290x45 MSG8	2900	2	2	2600	2	2	2400	2	1	2300	3	2
L02	390x36 Metra + 300x45 LVL	3400	2	2	3100	2	2	2800	3	1	2700	3	2
L02	390x36 Metra + 300x63 LVL	3700	2	3	3400	2	3	3100	3	2	2900	3	2
L03	390x36 Metra	3100	2	2	2900	2	2	2700	3	1	2500	3	2
L04	390x36 Metra + 290x45 MSG8	3900	2	3	3300	2	2	3000	2	1	2700	3	2
L04	390x36 Metra + 300x45 LVL	3900	3	2	3300	3	2	3000	2	1	2700	3	2
LF6	300x36 Metra + 300x6 Steel flitch + 300x36 Metra	3900	2	3	3600	3	2	3300	3	1	3100	3	2
LF10	300x36 Metra + 300x10 Steel flitch + 300x36 Metra	4600	3	3	4200	3	3	3900	3	2	3700	4	2
LF12	300x36 Metra + 300x12 Steel flitch + 300x36 Metra	4800	3	4	4400	3	3	4100	4	2	3900	4	2

Notes:

a) Dead load deflection limited to 12.5mm. Live load deflection limited to 9mm, and combined G+0.7Q deflection limit of span/300.

b) Flitch beams require special truss connection detail to provide lateral resistance to buckling under uplift conditions.

c) All studs nailed to Metra panel with 3.13 nails at 150mm centres vertically for transfer of forces.

d) Roof pitch range: 5 degrees minimum to 30 degrees maximum.

e) Up to very high wind zones.

f) Soffit width 600mm max.

Table 8.10.3 Metra Lintels Supporting Roof, Wall and Floor – 1.5kPa Snow Load Zone - Light Roof

Type	Lintel	Loaded Dimension of Lintel							
		3m	# Studs	4m	# Studs	5m	# Studs	6m	# Studs
		max. span	under lintel	max. span	under lintel	max. span	under lintel	max. span	under lintel
L01	290x36 Metra	1500	2	1300	2	1200	2	1100	2
L02	290x36 Metra + 290x45 MSG8	2900	2	2600	2	2400	2	2200	3
L02	290x36 Metra + 300x45 LVL	3500	2	3200	2	3000	3	2800	3
L02	290x36 Metra + 300x63 LVL	3900	2	3500	3	3300	3	3100	3
L02	340x36 Metra + 360x63 LVL	4600	3	4200	3	3900	4	3700	4
L03	290x36 Metra	2400	2	2200	2	2000	2	1900	2
L04	290x36 Metra + 290x45 MSG8	2700	2	2400	2	2100	2	1900	2
L04	290x36 Metra + 300x45 LVL	2700	2	2400	2	2100	2	1900	2
L01	390x36 Metra	2000	2	1800	2	1700	2	1600	2
L02	390x36 Metra + 290x45 MSG8	3100	2	2800	2	2600	3	2300	3
L02	390x36 Metra + 300x45 LVL	3600	2	3300	3	3100	3	2900	3
L02	390x36 Metra + 300x63 LVL	4000	2	3700	3	3400	3	3200	3
L03	390x36 Metra	3200	2	2900	2	2700	3	2600	3
L04	390x36 Metra + 290x45 MSG8	3600	2	3200	3	2900	3	2600	3
L04	390x36 Metra + 300x45 LVL	3600	2	3200	3	2900	3	2600	3
LF6	300x36 Metra + 300x6 Steel flitch + 300x36 Metra	4300	3	3900	3	3600	3	3400	4
LF10	300x36 Metra + 300x10 Steel flitch + 300x36 Metra	5000	3	4600	3	4200	4	4000	4
LF12	300x36 Metra + 300x12 Steel flitch + 300x36 Metra	5200	4	4800	4	4500	4	4200	4

Notes:

a) Dead load deflection limited to 12.5mm. Live load deflection limited to 9mm, and combined G+0.7Q deflection limit of span/300.

b) Flitch beams require special truss connection detail to provide lateral resistance to buckling under uplift conditions.

c) All studs nailed to Metra panel with 3.13 nails at 150mm centres vertically for transfer of forces.

d) Roof pitch range: 5 degrees minimum to 30 degrees maximum.

e) Up to high wind zones.

f) Soffit width 600mm max.

Lintels Supporting Roof Only

Table 8.10.4 Metra Lintels Supporting Roof, Wall and Floor – 1.5kPa Snow Load Zone - Heavy Roof

Type	Lintel	Loaded Dimension of Lintel							
		3m	# Studs	4m	# Studs	5m	# Studs	6m	# Studs
		max. span	under lintel	max. span	under lintel	max. span	under lintel	max. span	under lintel
L01	290x36 Metra	1300	2	1200	2	1100	2	1000	2
L02	290x36 Metra + 290x45 MSG8	2600	2	2300	2	2100	3	1900	3
L02	290x36 Metra + 300x45 LVL	3100	2	2900	3	2700	3	2500	3
L02	290x36 Metra + 300x63 LVL	3500	3	3200	3	3000	3	2800	4
L02	340x36 Metra + 360x63 LVL	4200	3	3800	3	3500	4	3300	4
L03	290x36 Metra	2400	2	2300	2	2000	2	1900	2
L04	290x36 Metra + 290x45 MSG8	2700	2	2400	2	2100	2	1900	2
L04	290x36 Metra + 300x45 LVL	2700	2	2400	2	2100	2	1900	2
L01	390x36 Metra	1800	2	1600	2	1500	2	1400	2
L02	390x36 Metra + 290x45 MSG8	2800	2	2500	2	2300	3	2100	3
L02	390x36 Metra + 300x45 LVL	3300	3	3000	3	2800	3	2600	4
L02	390x36 Metra + 300x63 LVL	3600	3	3300	3	3000	3	2900	4
L03	390x36 Metra	3200	2	2900	2	2700	3	2600	3
L04	390x36 Metra + 290x45 MSG8	3600	2	3200	3	2900	3	2600	3
L04	390x36 Metra + 300x45 LVL	3600	2	3200	3	2900	3	2600	3
LF6	300x36 Metra + 300x6 Steel flitch + 300x36 Metra	3800	3	3500	3	3300	4	3000	4
LF10	300x36 Metra + 300x10 Steel flitch + 300x36 Metra	4500	3	4100	4	3800	4	3600	5
LF10	300x36 Metra + 300x12 Steel flitch + 300x36 Metra	4700	3	4300	4	4000	5	3800	5
LF12	300x36 Metra + 300x12 Steel flitch + 300x45 LVL	4900	3	4700	4	4100	5	3900	5

Notes:

a) Dead load deflection limited to 12.5mm. Live load deflection limited to 9mm, and combined G+0.7Q deflection limit of span/300.
b) Flitch beams require special truss connection detail to provide lateral resistance to buckling under uplift conditions.
c) All studs nailed to Metra panel with 3.13 nails at 150mm centres vertically for transfer of forces.
d) Roof pitch range: 5 degrees minimum to 30 degrees maximum.
e) Up to high wind zones.
f) Soffit width 600mm max.

Lintels Supporting Roof Only

8.4.1.1 GIRDER TRUSSES

The development in truss design has seen the girder truss as a commonly used structural support. The fact that the girder truss supports a number of other trusses means that it passes a heavy concentrated point load to any lintel that it happens to land on. A loaded dimension multiplier may be used to determine lintel requirements as shown in the following tables 8.10.5 and 8.10.6.

8.4.1.2 LINTELS SUPPORTING A GIRDER TRUSS

Refer to the truss manufacturers schematic truss layout plan to determine the location of girder trusses.

If the roof span is outside that provided in the Metrapanel lintel tables then specific design is required.

These tables only cover girder trusses landing in the middle 1/3 of the lintel.

Lintels supporting a girder truss are:

- For typical lintels supporting roof only; girder from hip end roof
- For girder in the middle 1/3 of the lintel span
- Ground snow load of up to 0.9kPa
- Wind load up to High
- Light roof only

Refer to tables 8.10.5 and 8.10.6 for loaded dimension multiplier

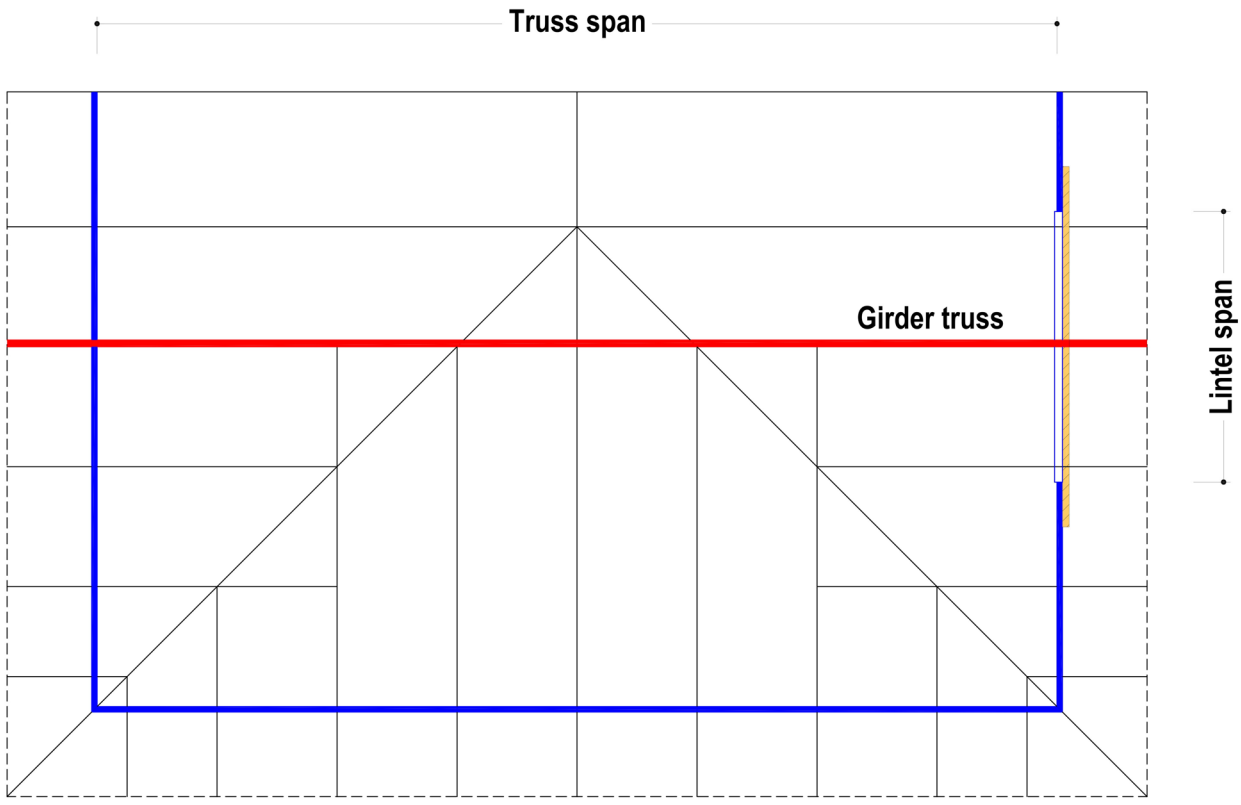


Figure 8.13.1 Girder truss

Table 8.10.5 Metra Lintels for girder truss - lintel span 1000-2500

Metra lintels for girder truss in mid span

This chart must be read in conjunction with the Metrapanel manual and charts for typical lintels supporting roof only; gider from hip end roof

Lintel span	1000	1500	2000	2500
Roof pitch	5 to 30 degrees			
Actual loaded dimesion of lintel	Loaded dimension multiplier			
m				
3	3.0	2.4	2.1	1.9
3.25	3.2	2.5	2.1	1.9
3.5	3.0	2.3	2.0	1.8
3.75	3.1	2.4	2.0	1.8
4	3.2	2.5	2.1	1.9
4.25	2.9	2.2	1.9	1.7
4.5	3.1	2.4	2.0	1.8
4.75	3.4	2.5	2.1	1.9
5	3.5	2.6	2.2	1.9
5.25	3.1	2.4	2.0	1.8
5.5	3.3	2.5	2.1	1.8
5.75	3.4	2.6	2.2	1.9
6	3.6	2.7	2.2	2.0

For girder in middle 1/3rd of lintel span
If roof span is outside that provided in Metra manual, S.E.D required
Ground snow load of 0.9kPa
Wind load up to High
Light Roof Only

To use this table:

Assess position of girder truss; ensure it is inside central third of lintel span
Assess loaded dimension of lintel as for typical Metra lintel supporting roof only
For **lintel spans** listed above, run down chart to loaded dimension (refer truss plan) listed on left-hand side
Figure in cross-referenced cell is the loaded dimension multiplier to assess for lintel sizing in typical Metra lintel tables
Multiply actual loaded dimension by this figure and use the product to determine the correct lintel size from Metrapanel tables

Table 8.10.6 Metra Lintels for girder truss - lintel span 3000-5000

Metra lintels for girder truss in mid span

This chart must be read in conjunction with the Metrapanel manual and charts for typical lintels supporting roof only; gider from hip end roof

Lintel span	3000	3500	4000	4500	5000
Roof pitch	5 to 30 degrees				
Actual loaded dimesion of lintel	Loaded dimension multiplier				
m					
3	1.7	1.6	1.6	1.5	1.5
3.25	1.8	1.7	1.6	1.6	1.5
3.5	1.7	1.6	1.5	1.4	1.4
3.75	1.7	1.6	1.5	1.5	1.4
4	1.7	1.6	1.5	1.5	1.4
4.25	1.6	1.5	1.4	1.4	1.3
4.5	1.6	1.5	1.4	1.4	1.4
4.75	1.7	1.6	1.5	1.5	1.4
5	1.8	1.7	1.6	1.5	1.4
5.25	1.6	1.5	1.4	1.4	1.3
5.5	1.7	1.6	1.5	1.4	1.4
5.75	1.7	1.6	1.5	1.4	1.4
6	1.8	1.6	1.5	1.5	1.4

For girder in middle 1/3rd of lintel span
If roof span is outside that provided in Metra manual, S.E.D required
Ground snow load of 0.9kPa
Wind load up to High
Light Roof Only

To use this table:

Assess position of girder truss; ensure it is inside central third of lintel span
Assess loaded dimension of lintel as for typical Metra lintel supporting roof only
For **lintel spans** listed above, run down chart to loaded dimension (refer truss plan) listed on left-hand side
Figure in cross-referenced cell is the loaded dimension multiplier to assess for lintel sizing in typical Metra lintel tables
Multiply actual loaded dimension by this figure and use the product to determine the correct lintel size from Metrapanel tables

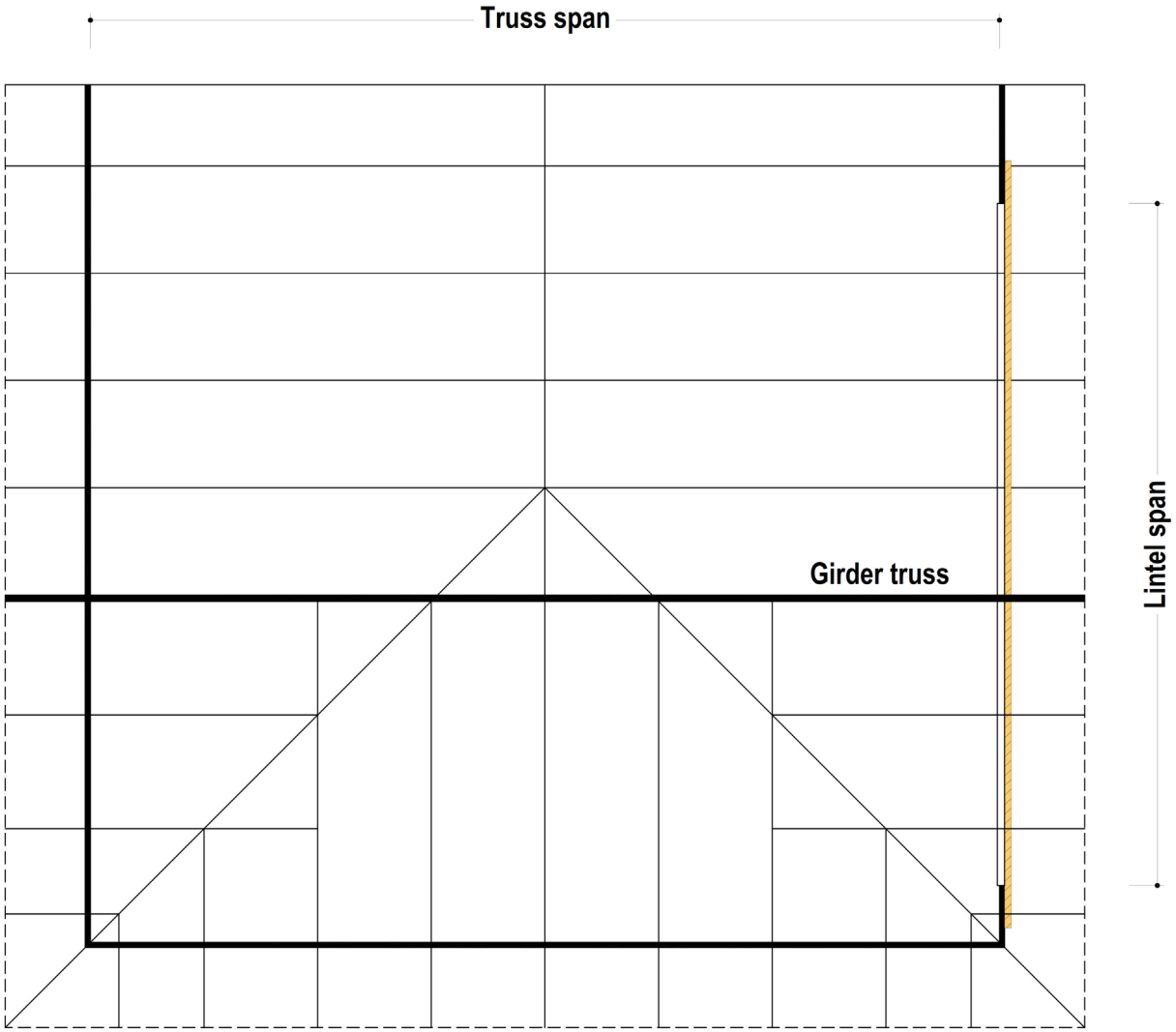


Figure 8.13.2 Girder truss

8.4.1.3 LINTEL SUPPORTING GIRDER TRUSS EXAMPLE 1

Example shown for a typical 6m deep garage with a door opening of 4.8m and a light roof.

Lintel span = 4.8m

Girder truss span = 6m

New loaded dimension = 4.5m (loaded dimension 3m x 1.5 multiplier = 4.5m)

Refer to table 8.5 for standard lintels and use the column for loaded dimension of 4.5 (round up to 5m). A 4.8m lintel span supporting a girder truss can be achieved with an LF 6 x 300mm steel flitch beam.

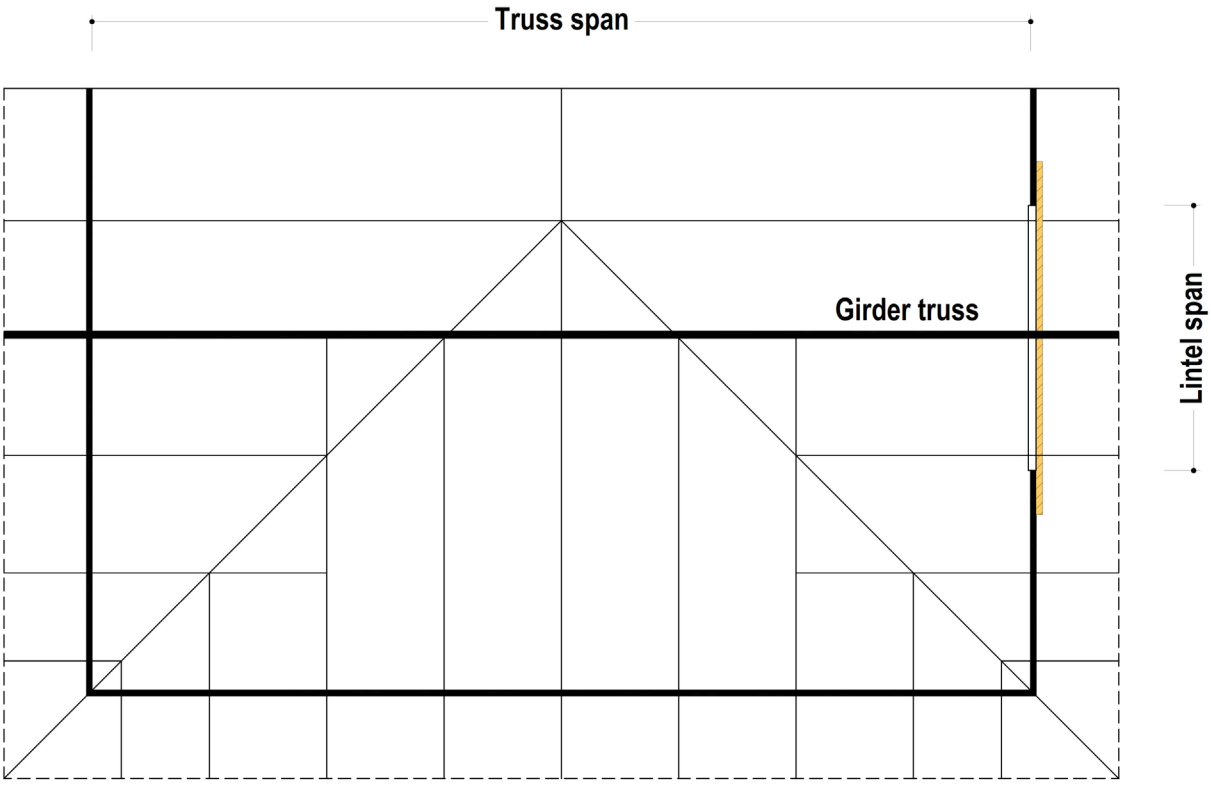


Figure 8.13.3 Girder truss

8.4.1.4 LINTEL SUPPORTING GIRDER TRUSS EXAMPLE 2

Example shown for a typical 6m deep room with a window opening of 2.5m and a light roof.

Lintel span = 2.5m

Girder truss span = 6m

New loaded dimension = 5.7m (loaded dimension 3m x 1.9 multiplier = 5.7m)

Refer to table 8.5 for standard lintels and use the column for loaded dimension of 5.7 (round up to 6m). A 2.5m lintel span supporting a girder truss can be achieved with an integrated L03 Metra lintel.

8.4.2 L01 DETAILS

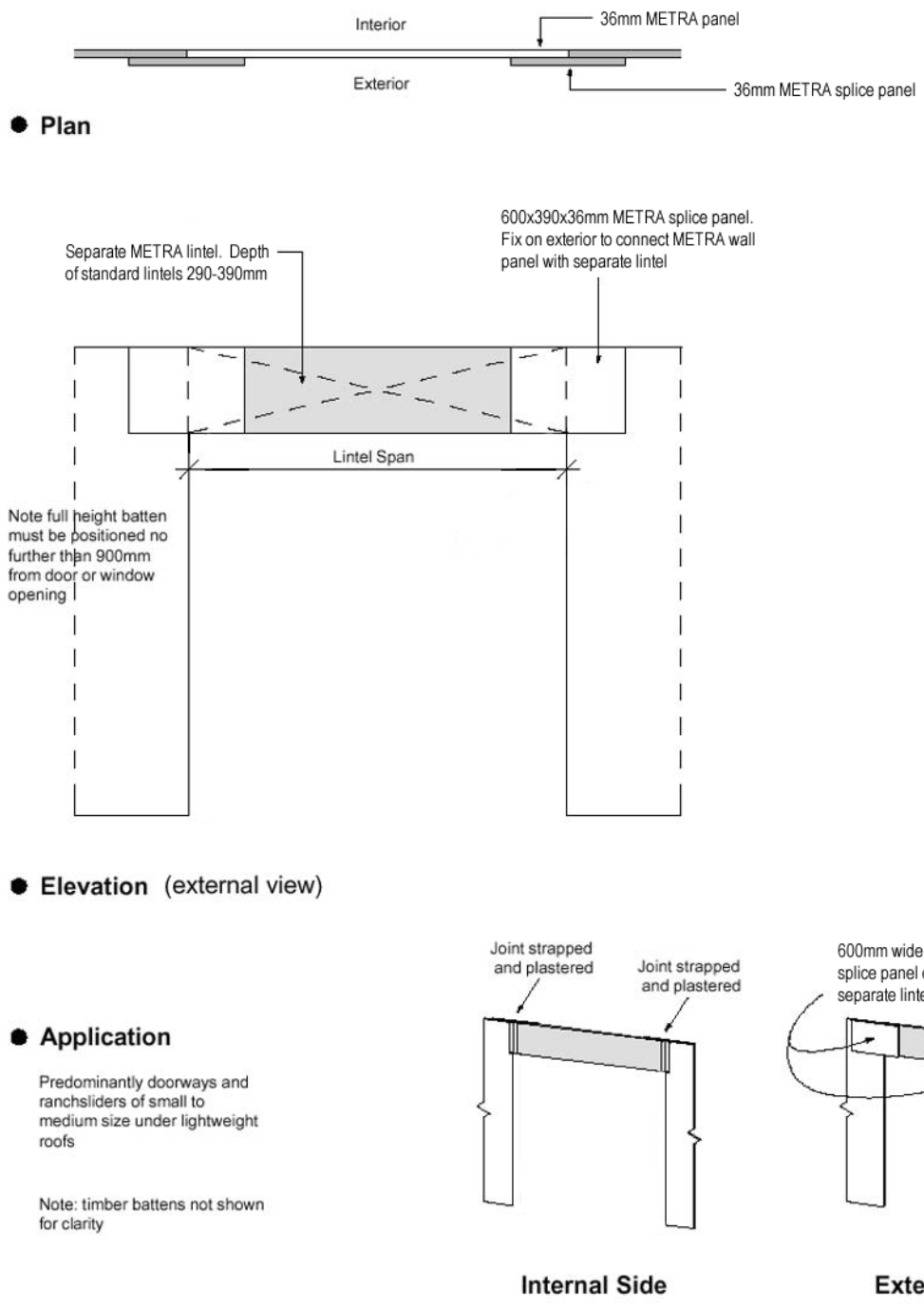


Figure 8.14 L01 Lintel

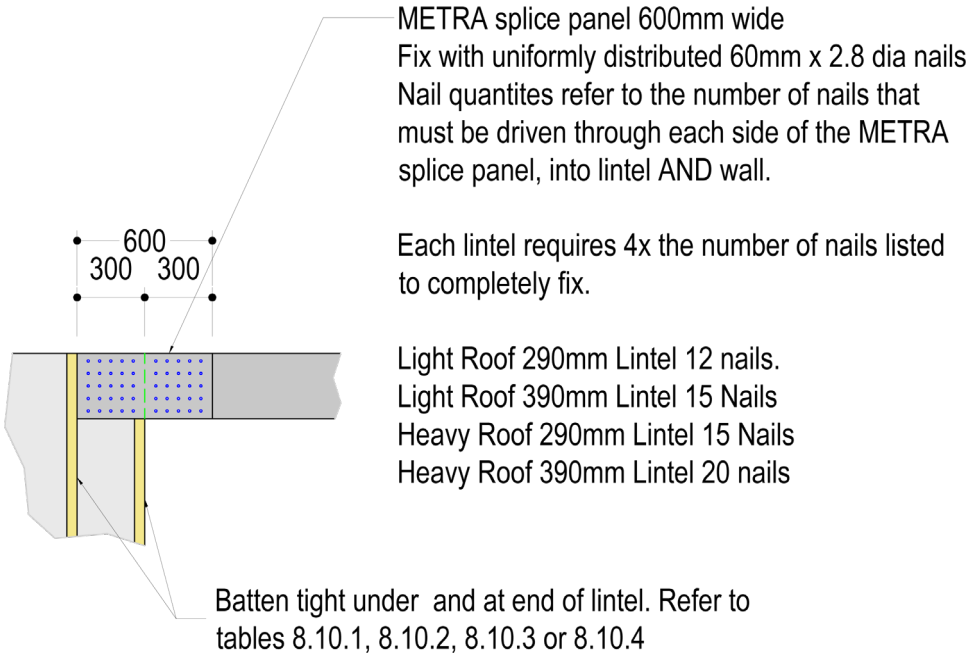
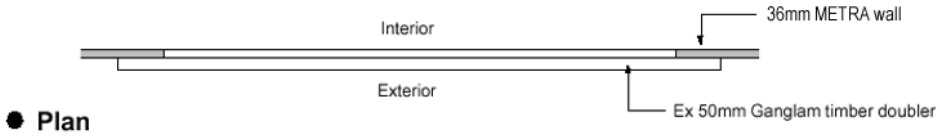
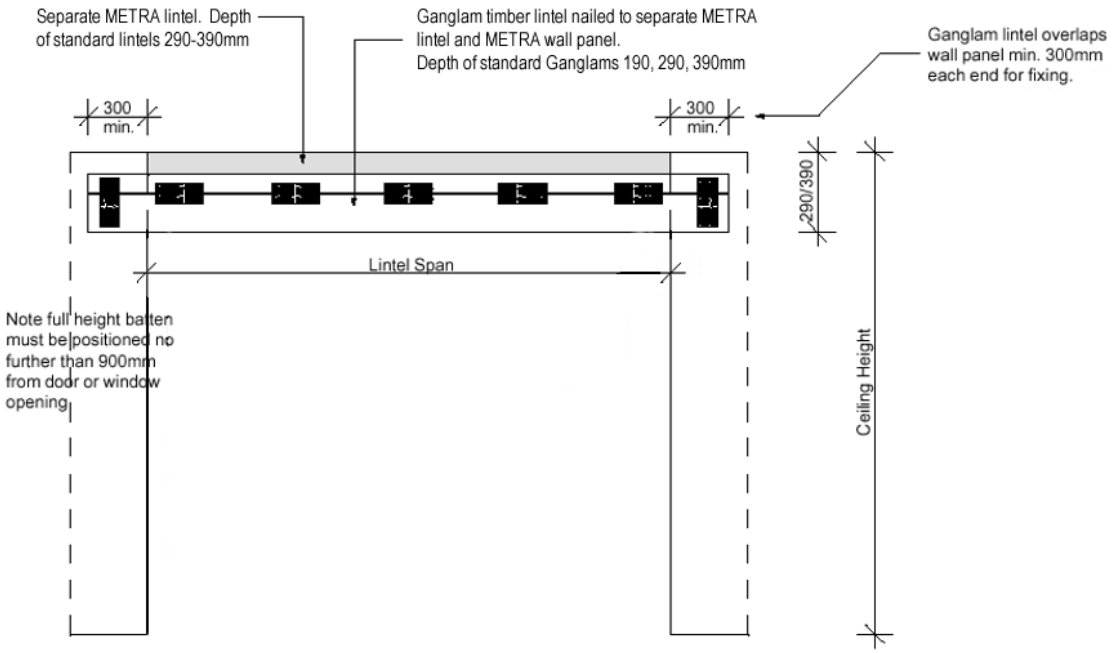


Figure 8.15 L01 Lintel Fixing Details

8.4.3 L02 DETAILS



● **Plan**



● **Elevation** (external view)

● **Application**

Intermediate to wide door openings under heavy roof systems. Timber will be substituted for Ganglams over small openings

Note: timber battens not shown for clarity

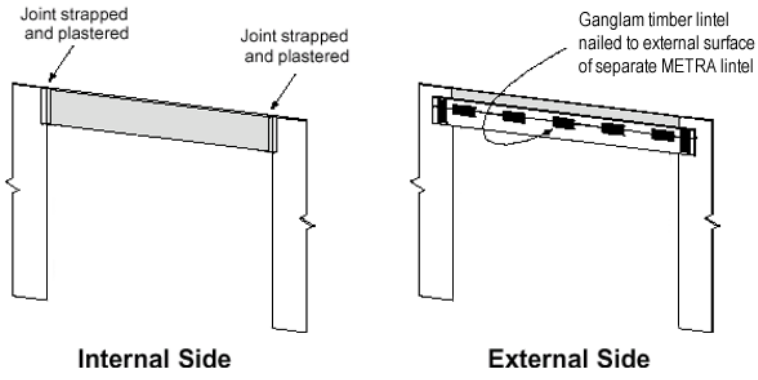


Figure 8.16 L02 Lintel

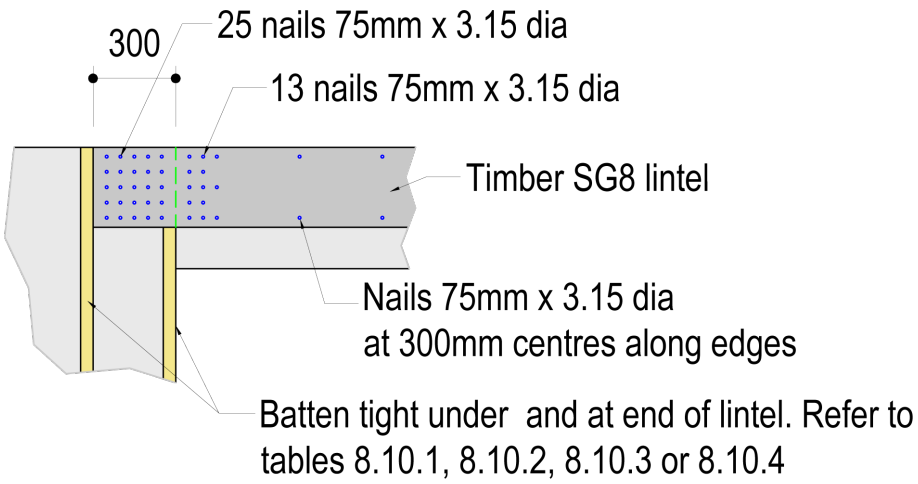


Figure 8.17 L02 Lintel Fixing Details

8.4.4 L03 DETAILS

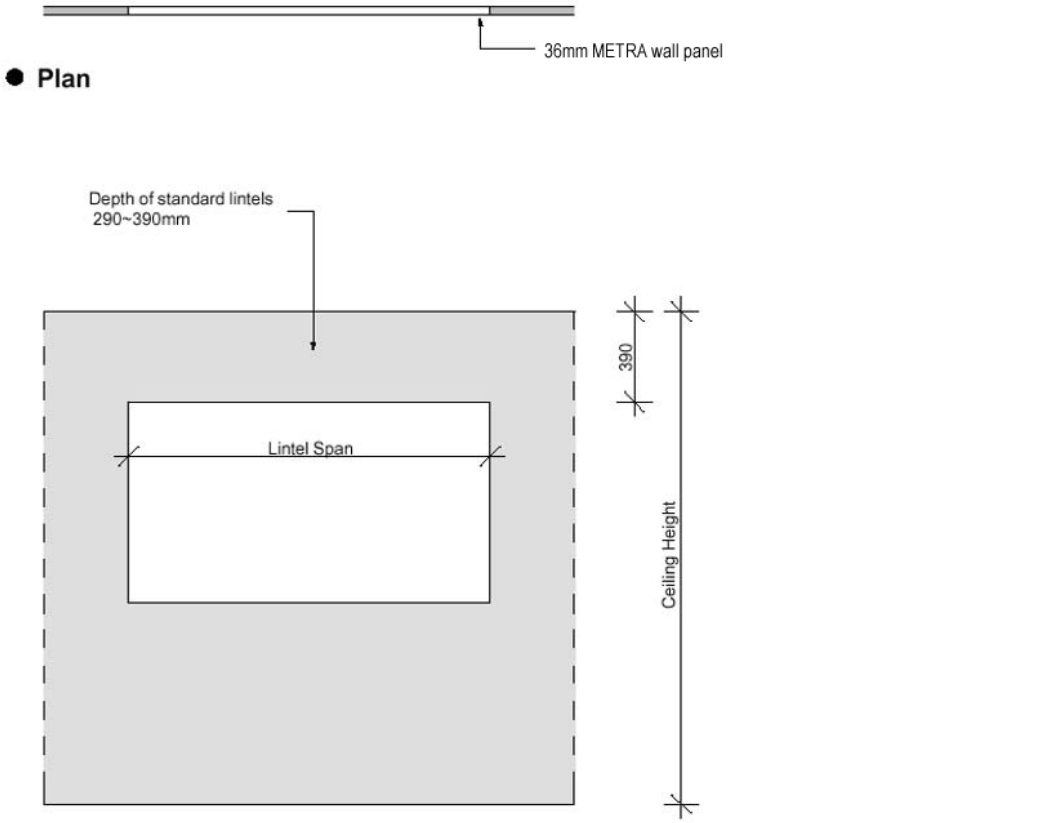


Figure 8.18 L03 Lintel

8.4.5 LO4 DETAILS

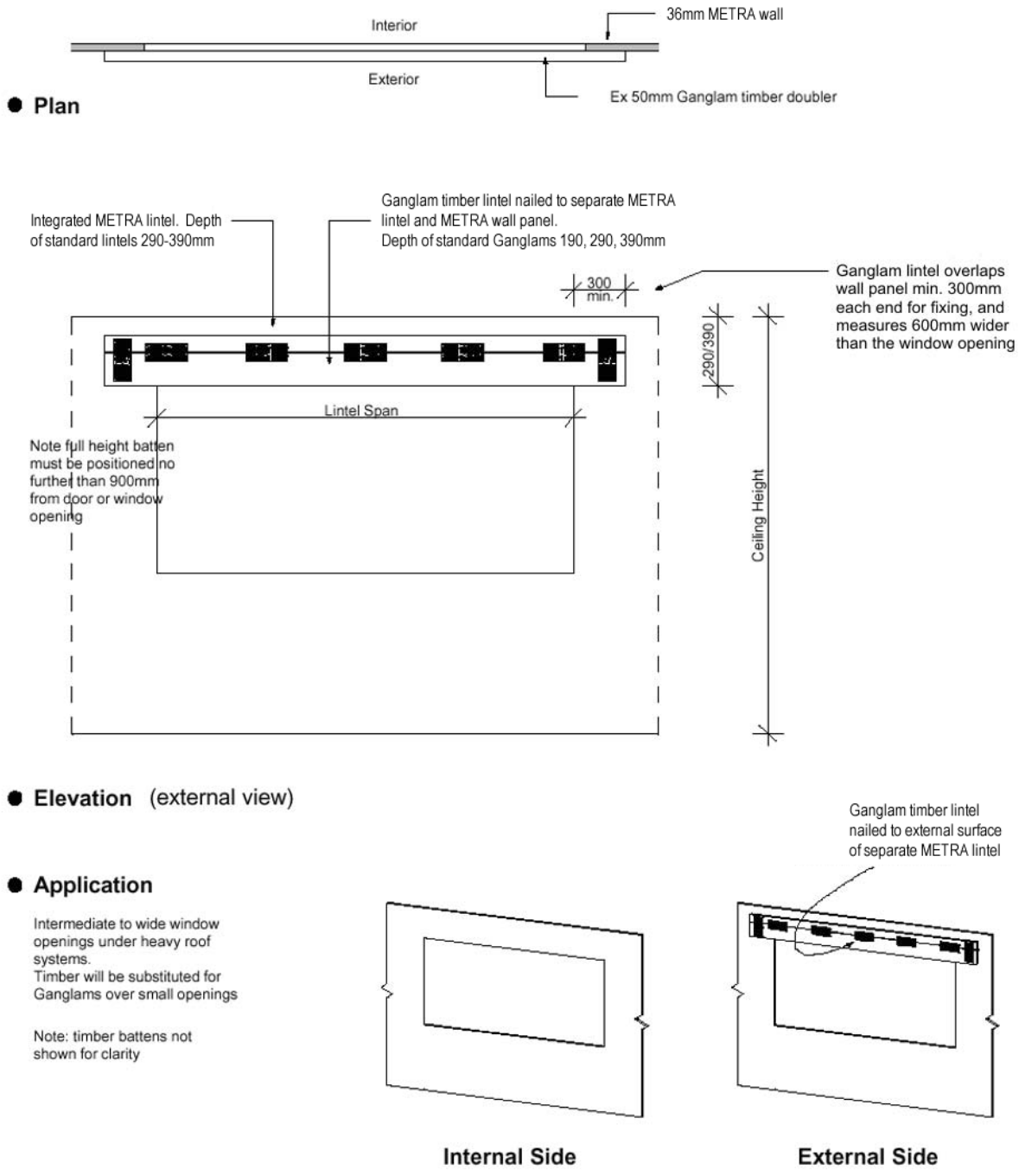


Figure 8.19 L04 Lintel

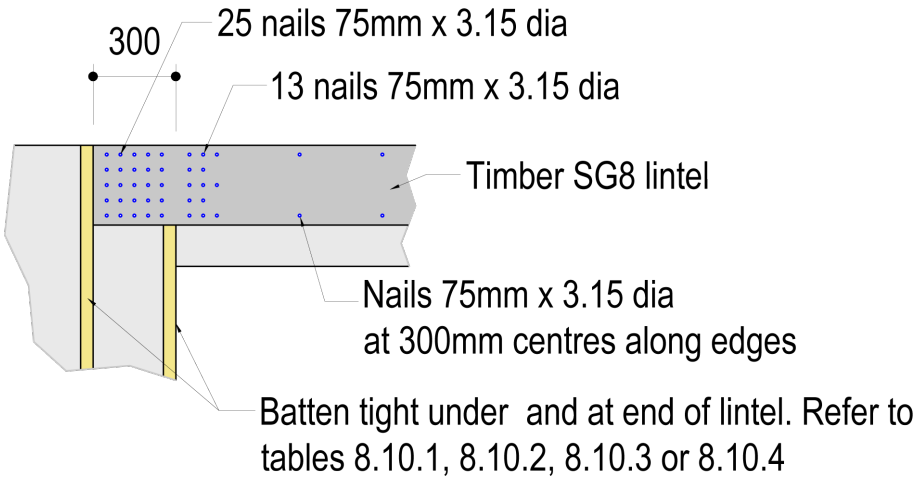


Figure 8.20 L04 Lintel Fixing Details

8.4.6 LF DETAILS

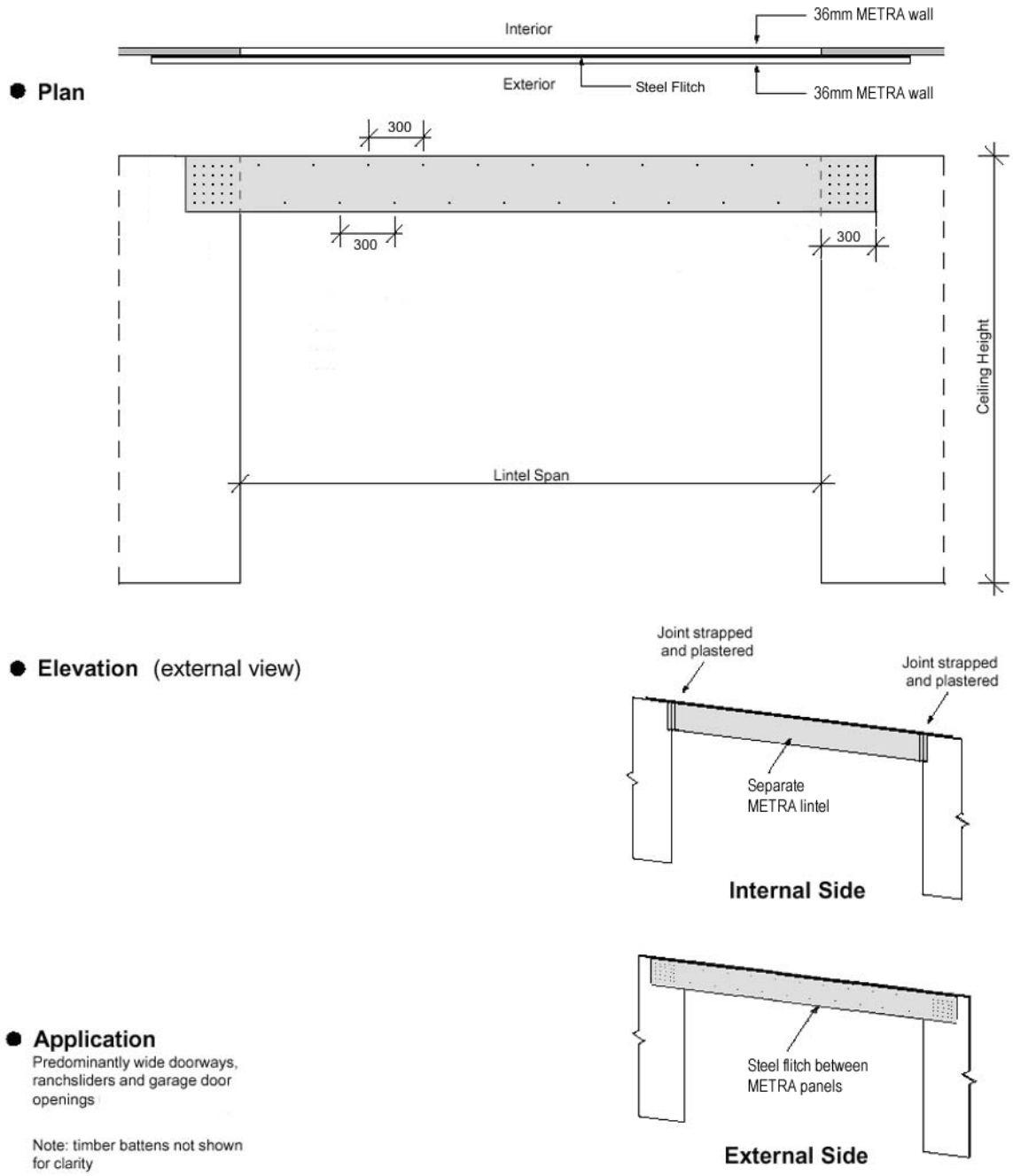


Figure 8.21 LF Lintel

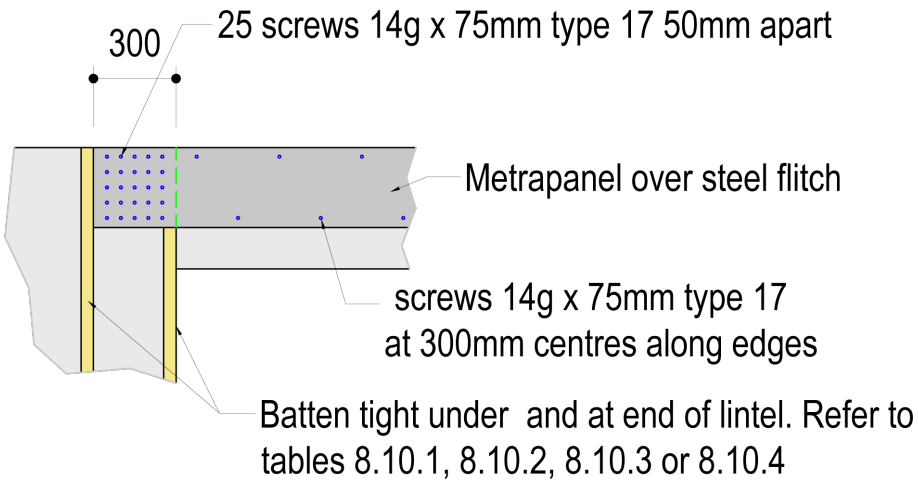


Figure 8.22 LF Lintel Fixing Details

8.4.7 LVL FIXING DETAIL

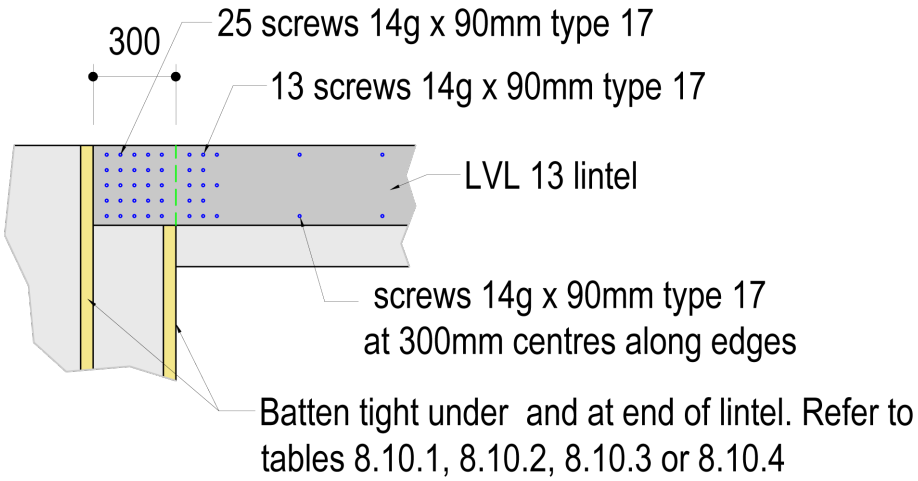


Figure 8.23 LVL Fixing Detail

8.5 Panel Fixings

8.5.1 WALL TO FLOOR FIXINGS – CONCRETE FLOORS

All external and internal wall panels are fixed to concrete floors with METRA bottom plate (BP1) steel angles as shown in Figure 8.24 and Figure 8.25.

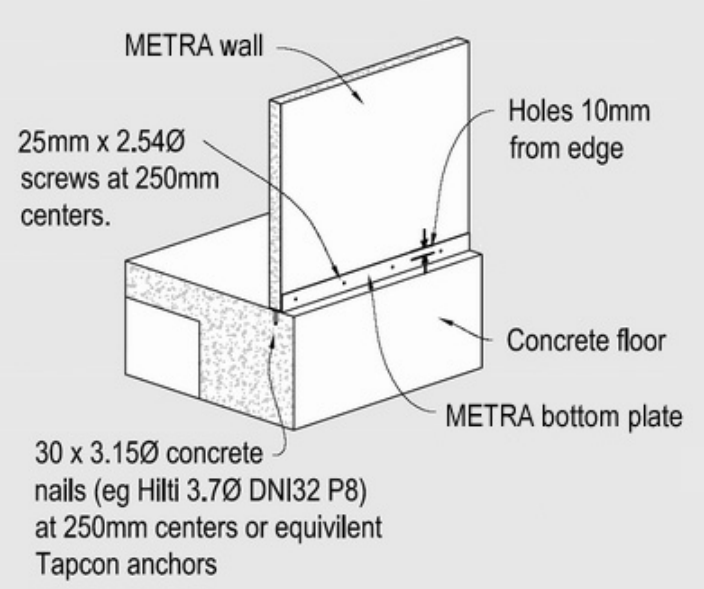


Figure 8.24 External Wall/Floor Fixing – Concrete Floor

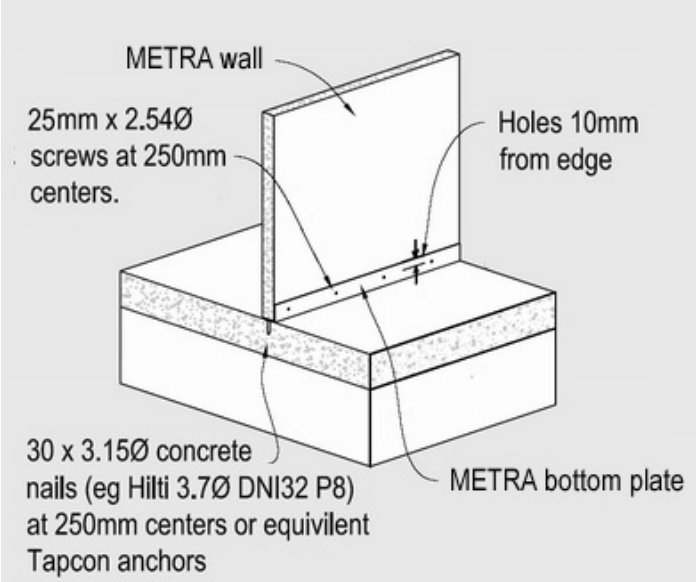


Figure 8.25 Internal Wall/Floor Fixing – Concrete Floor

External wall panels have addition fixing. The spacing of these are shown in Figure 8.26 and the detail is given in Figure 8.27.

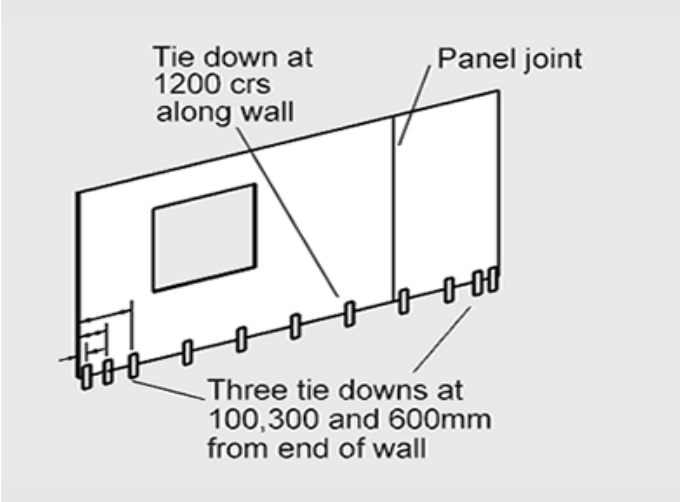


Figure 8.26 External Wall Anchor Tie Down Spacings

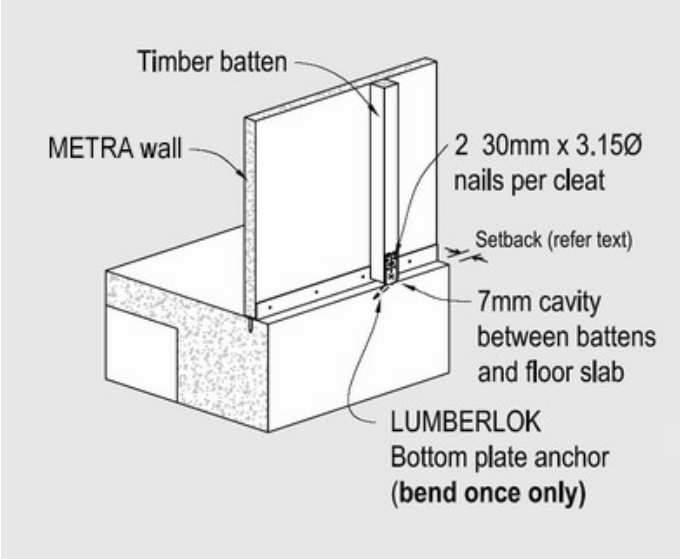


Figure 8.27 External Wall Tie Down Details – Concrete Floor

Setback: Where no cladding cavity is required, the setback is 63mm where standard 70mm battens are used. This creates a 7mm gap between the cladding and the foundation. The gap is required to prevent capillary action between the foundation and cladding.

Where a cladding cavity is required, the cladding cavity creates the gap between the cladding and the foundation. In this case the setback is 70mm where standard 70mm battens are used.

Refer to NZBC Acceptable Solution E2/AS1 to determine if a cladding cavity is required.

When bottom plate anchors are located in the concrete floor and they do not line up with the battens, additional stub battens 600mm long can be fixed to the Metra wall panel. The bottom plate anchors are fixed to these. This is shown in Figure 8.28.

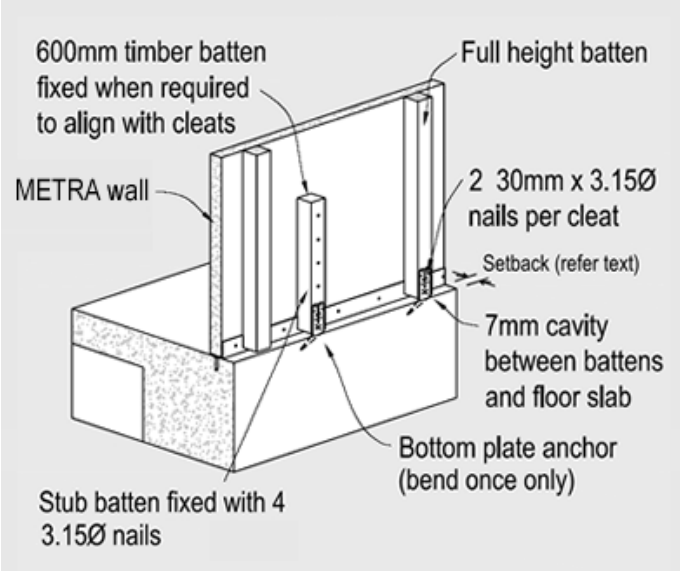


Figure 8.28 External Wall Tie Down Details Non Aligned Battens – Concrete Floor

8.5.2 TIMBER FLOORS

The following details apply to timber floors complying with NZS3604:2011.

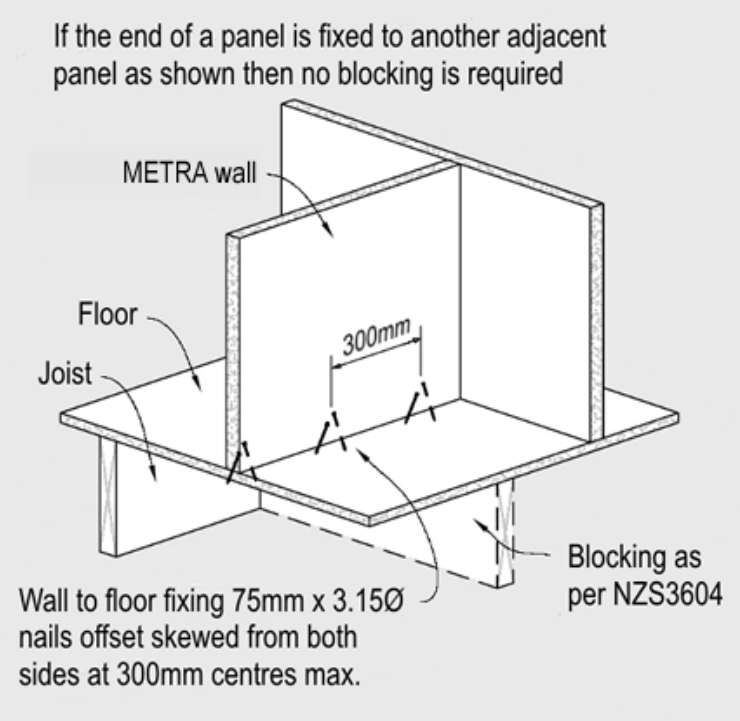


Figure 8.30 External/Internal Wall to Floor Fixing – Timber Floor

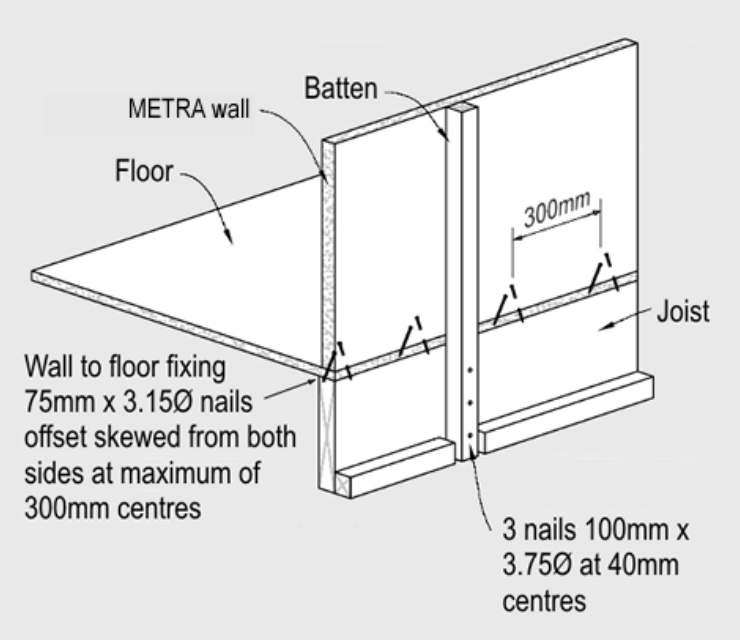


Figure 8.31 External Wall Tie Down Details – Timber Floor

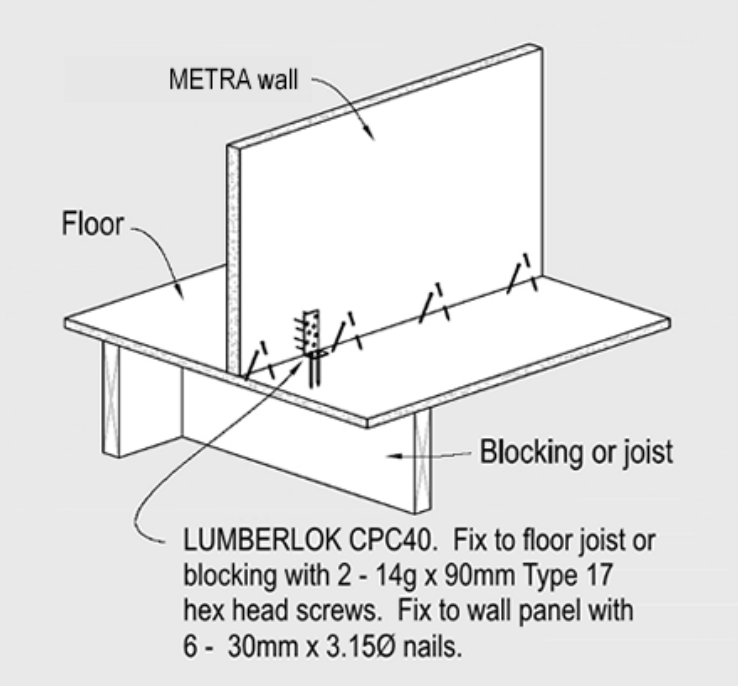


Figure 8.32 Internal Wall 6kN Tie Down Details for Additional Bracing – Timber Floor (refer bracing type LP10)

8.5.3 WALL TO WALL FIXINGS

Wall to Wall fixing details for Internal and External walls are contained Figure 8.33 and Figure 8.34.

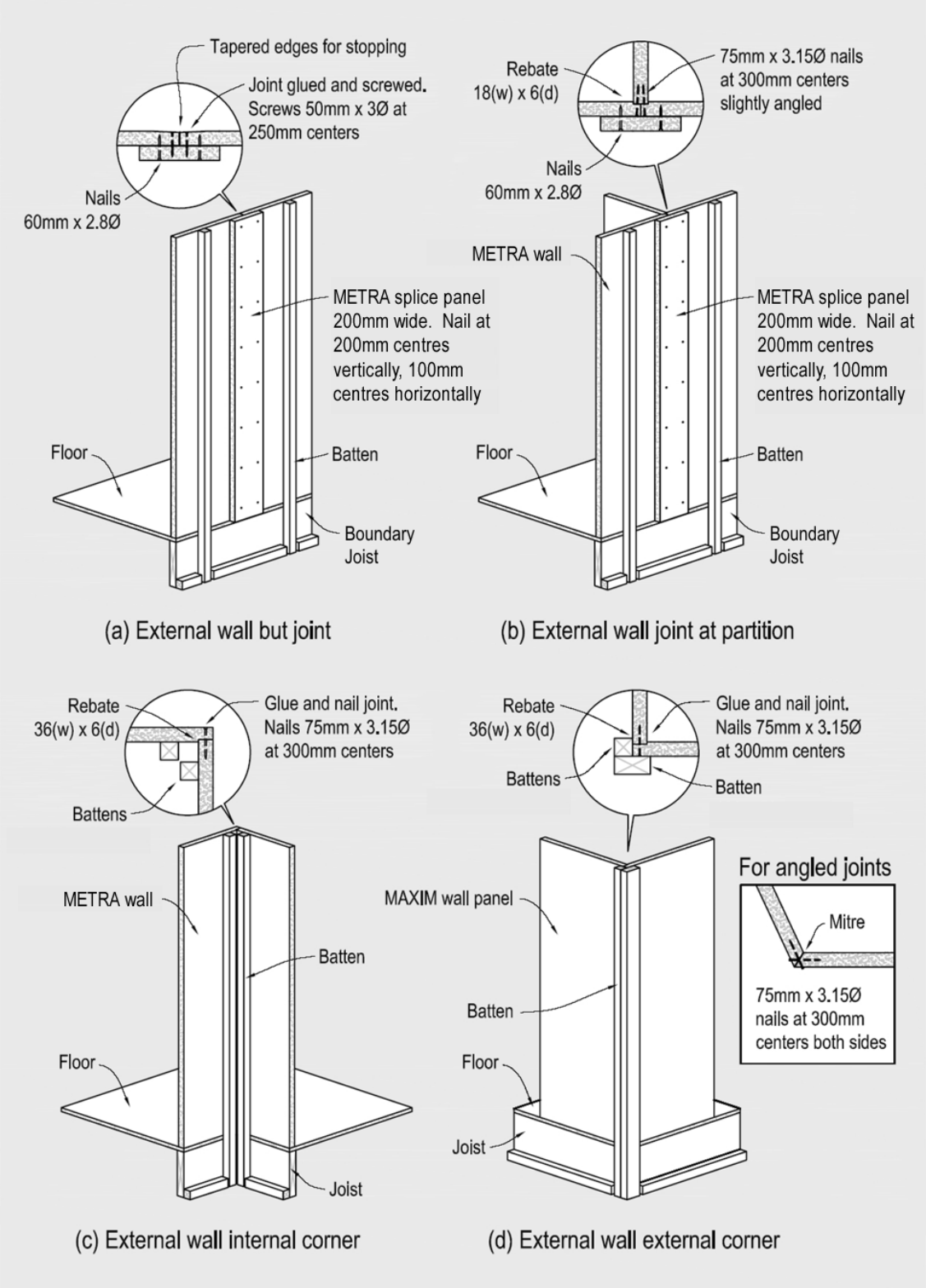


Figure 8.33 External Wall Joint Detail

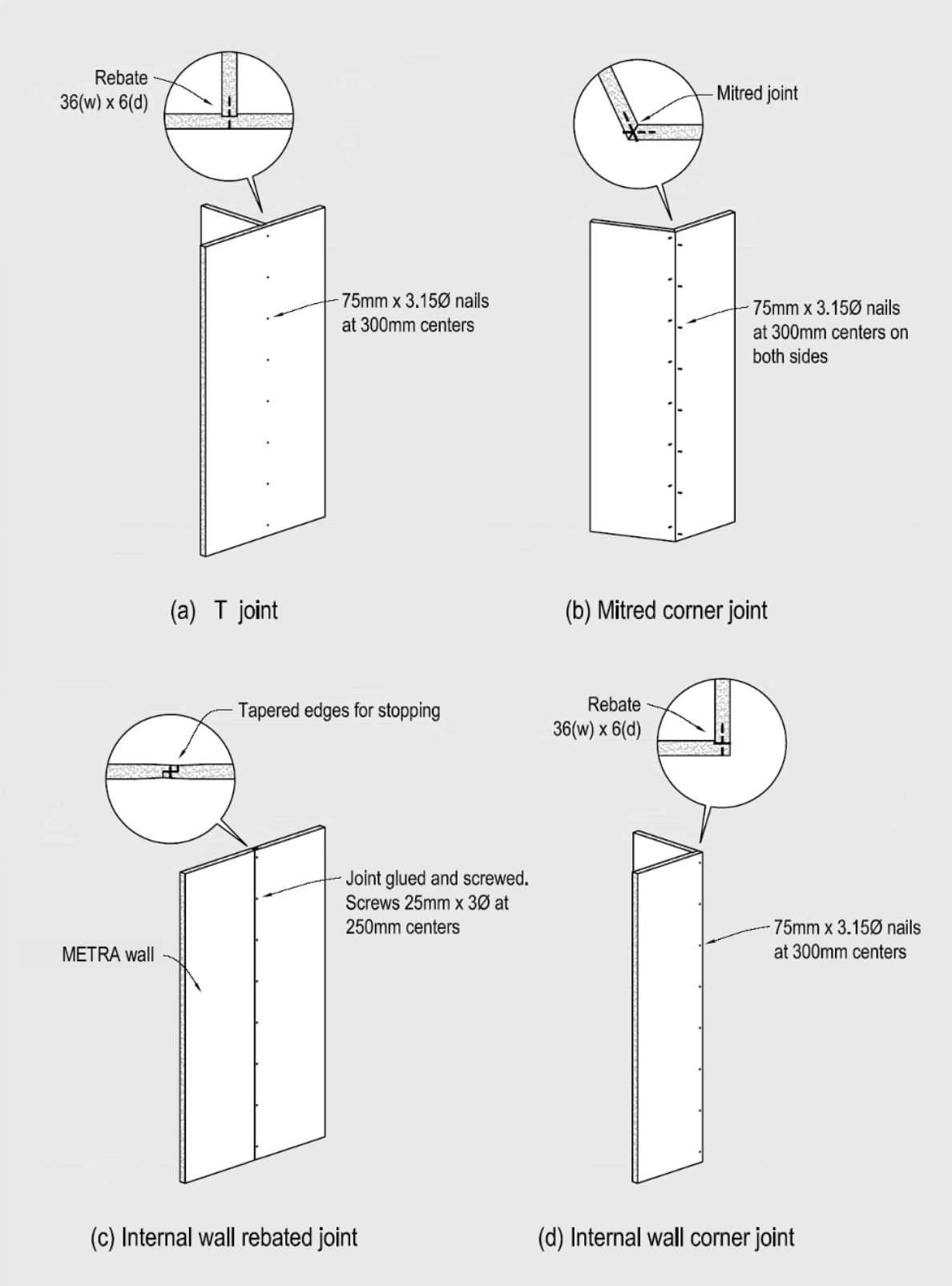


Figure 8.34 Internal Wall Joint Detail

8.5.4 ADDITIONAL TWO STOREY DETAIL

Figure 8.35 and Figure 8.36 contain additional details for two storey buildings.

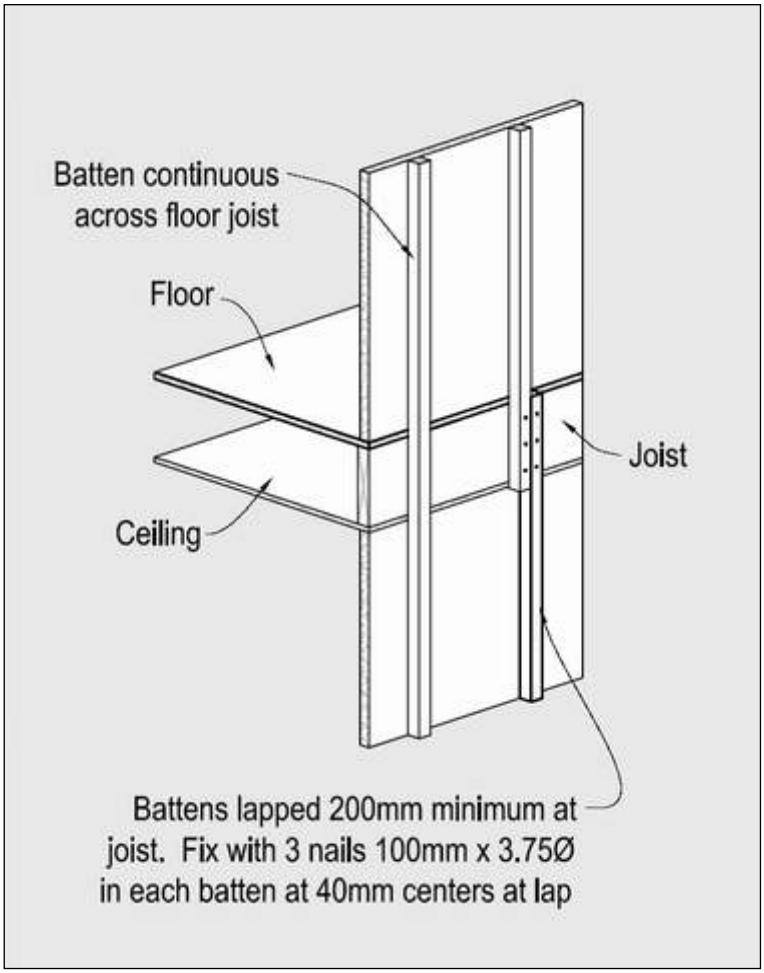


Figure 8.35 Two Storey Wall, Floor & Batten Detail

Figure 8.36 contains details around stairwells. Full height panels may be used around stairwells refer to Metrapanel Limited.

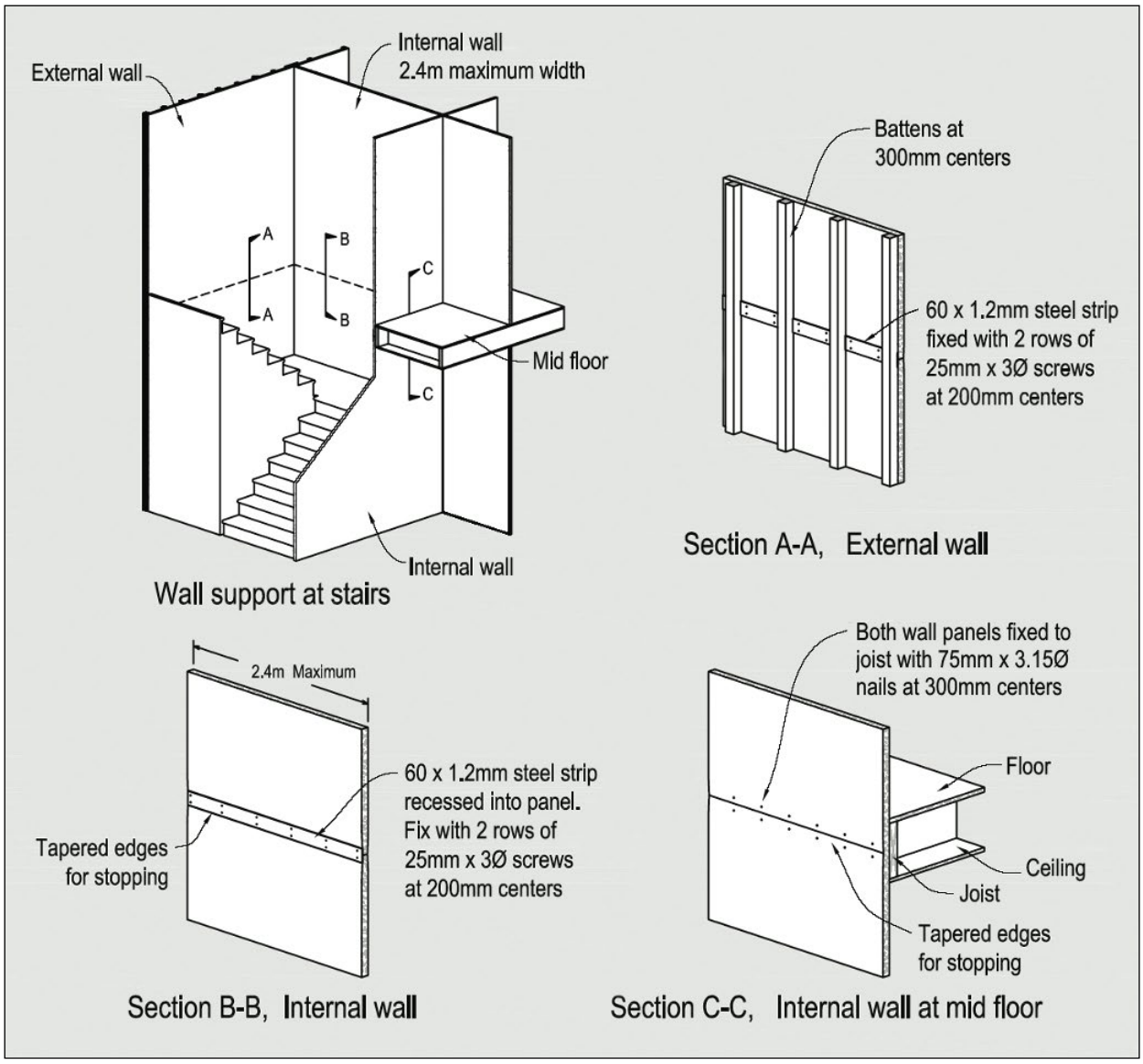


Figure 8.36 Wall Support at Stairs

9. Posts

9.1 General

Refer to NZS 3604:2011, Section 9 for all details and requirements.

10. Roof Framing

10.1 General

The roof construction shall be in accordance with NZS 3604: 2011 Para 10.2.2 Roof Trusses except that:

10.2 Gable Trusses

Gable trusses shall be rafter trusses with the wall battens carried up to the rafter line – Figure 10.1.

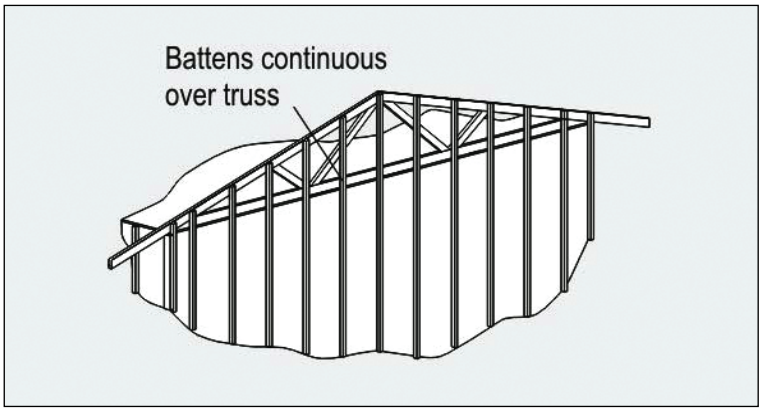


Figure 10.1 Gable End Detail

10.3 Ceiling Braces

The board ceiling acts as a diaphragm and ceiling braces, such as shown in NZS 3604 Fig 10.23 are not required.

10.4 Truss Spacing

Trusses shall be at 900mm maximum centres.

NOTE: It is strongly recommended that installation of the roof is completed as quickly as practicable. Confirmation of roof required should be made a minimum of one month before construction commences, with a follow up acknowledgment the day before wall erection and ceiling installation.

This should help in reducing unnecessary exposure of the panels.

10.5 Anchorage

The fixing of trusses at supports shall be as given by the truss design but not less than that required by the appropriate tables of NZS 3604 Section 10.

Truss wind uplift fixing requirements including capacity are detailed in NZS3604 Section 10 Types E and F.

Figure 10.2 details the fixing equivalent to Type E. Figure 10.3 details the fixing equivalent to Type F.

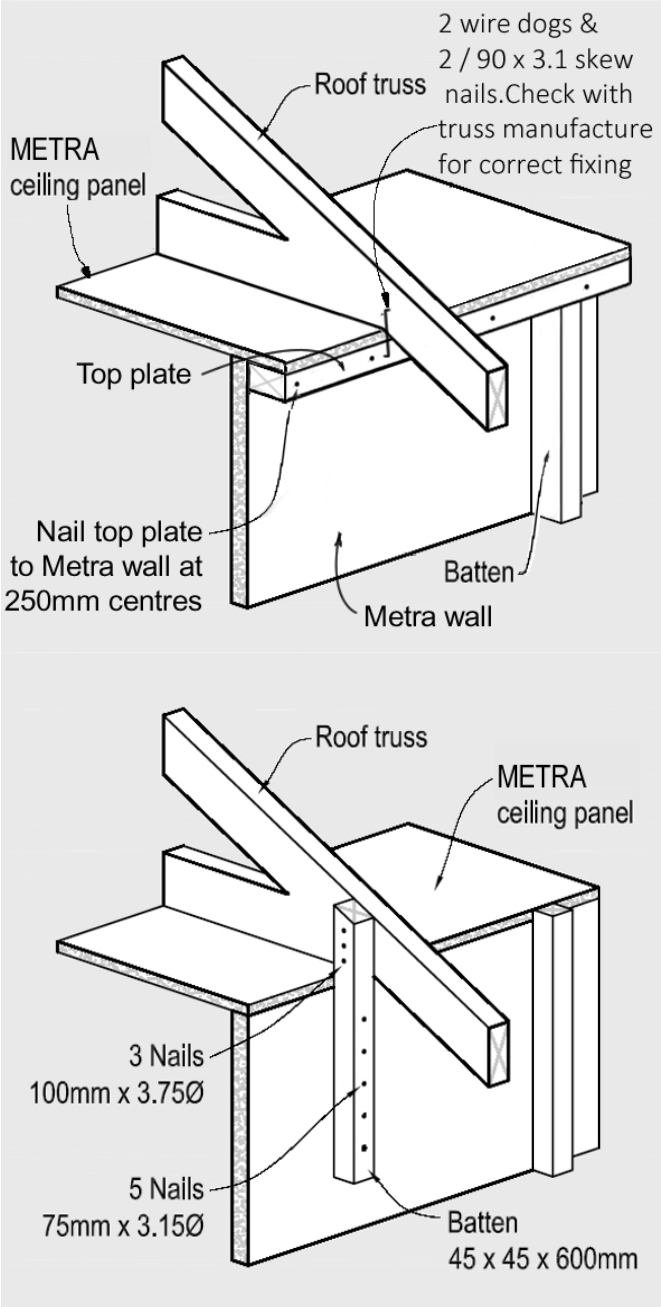


Figure 10.2 Truss Support – Type E Equivalent (NZS3604)

Figure 10.3 example of truss connection, always check with truss manufacture for correct truss hold down fixing.

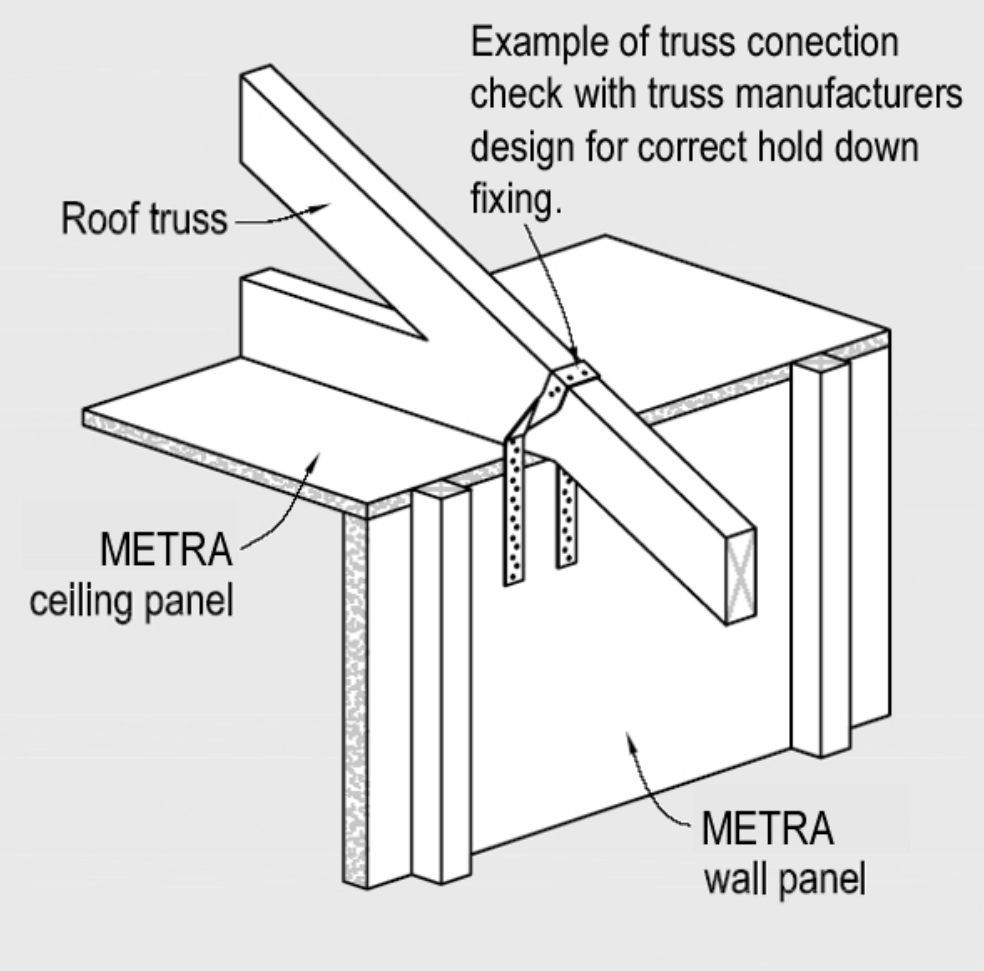


Figure 10.3 Truss Support – Type F Equivalent (NZS3604)

10.6 Roof Plane Bracing

For roof plane bracing requirements, refer to Clauses 10.3.4 and 10.3.5 of NZS 3604:2011.
Roof Space Braces are not required.

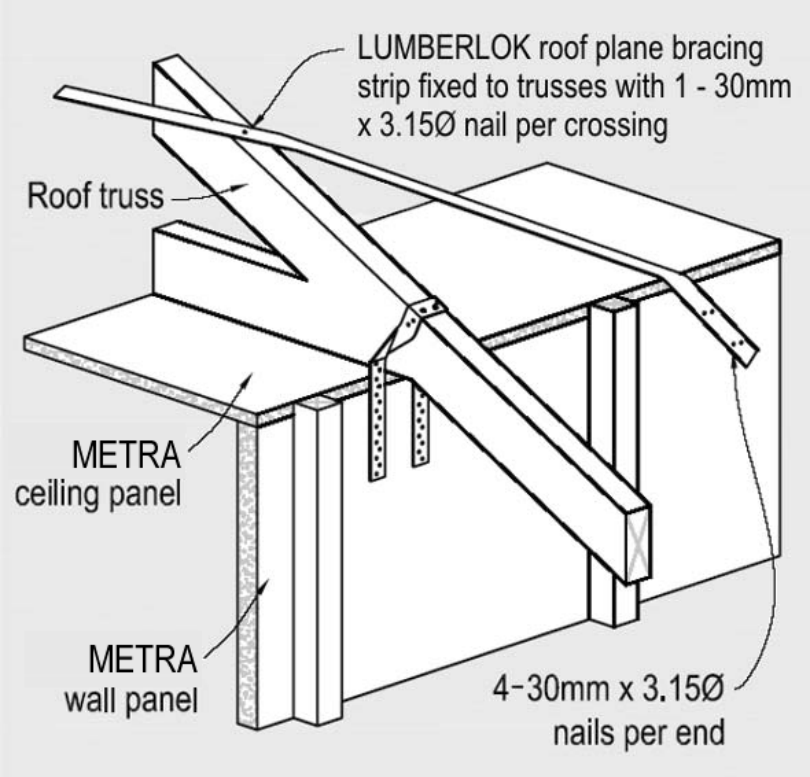


Figure 10.4 Roof Plane Brace Fixing

11. The Building Envelope – Roof & Wall Claddings

11.1 Exterior Wall Claddings

Exterior wall claddings shall be in accordance with NZBC Acceptable Solution E2/AS1, 3rd Edition July 2004. Flashings around openings shall be detailed to ensure the Metra panels are protected from moisture ingress, in accordance with NZBC Acceptable Solution E2/AS1, 3rd Edition July 2004.

11.2 Metra Battening

Section 8 – Walls details the minimum Metra batten requirements for Metra construction. Additional Metra battens may be added. These typically are required to support cladding joints or ends Metra battens may also be required to provide support for cladding cavity spacers, cavity battens or brick veneer ties. Refer to cladding manufacturers for their cavity batten requirements before fitting additional Metra battens.

NOTE: ensure all additional Metra battens are fitted before attaching the building wrap.

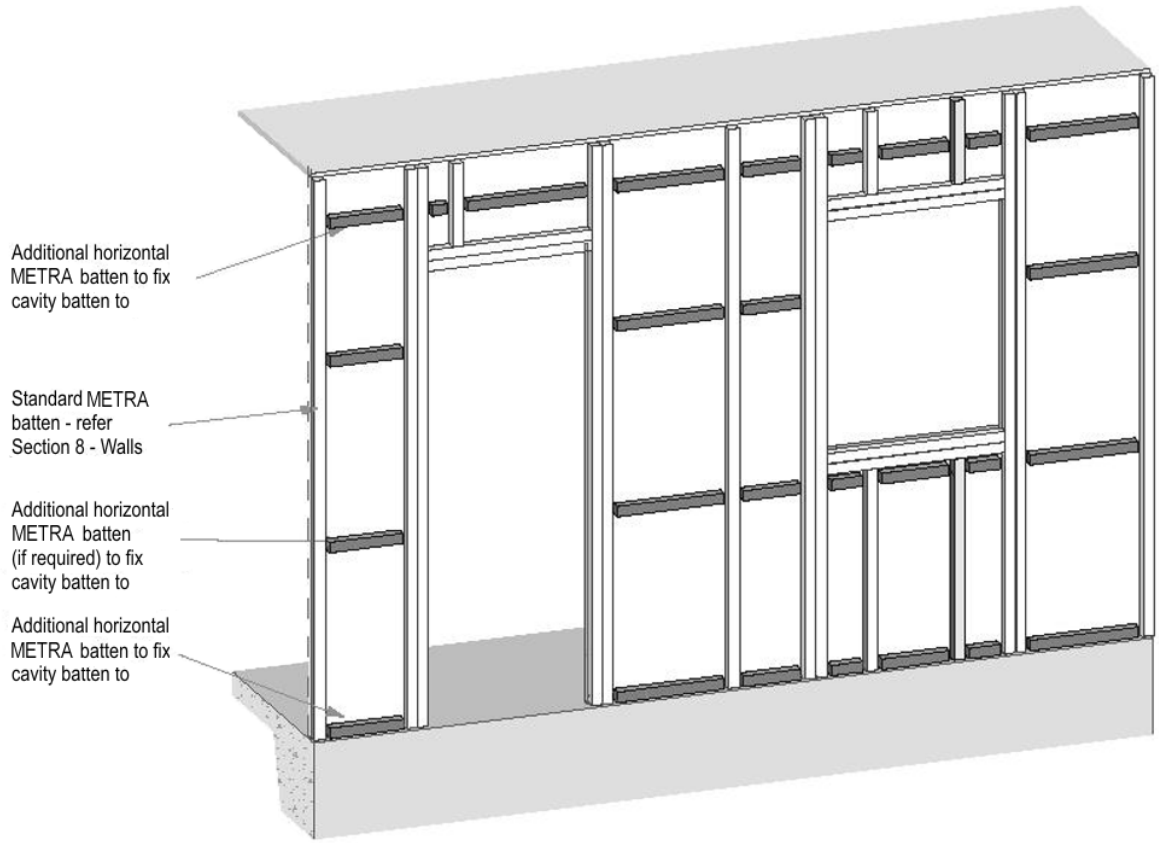


Figure 11.1 Additional battens

11.3 External Joinery

Windows and external doors must be installed in accordance with the window manufacturer's instructions and the correct flashings and scribers used.

Extra care must be taken in the High and Very High Building Wind Zones with detailing to ensure that wind blown water does not penetrate the external envelope

In all cases the requirements of NZBC Acceptable Solution E2/AS1, 3rd Edition July 2004 must be fully met.

11.4 Services

Services are generally accommodated in the cavity formed by the Metra battens in external walls, or in purpose made ducts planned within the design.

11.4.1 PLUMBING

Plumbing and drainage pipe work is normally accommodated in the batten cavities or purpose made cavities and may be run from the floor or the ceiling in both dry and wet service areas.

Hot water cylinders must be restrained. Refer to Figure 11.2 for typical details.

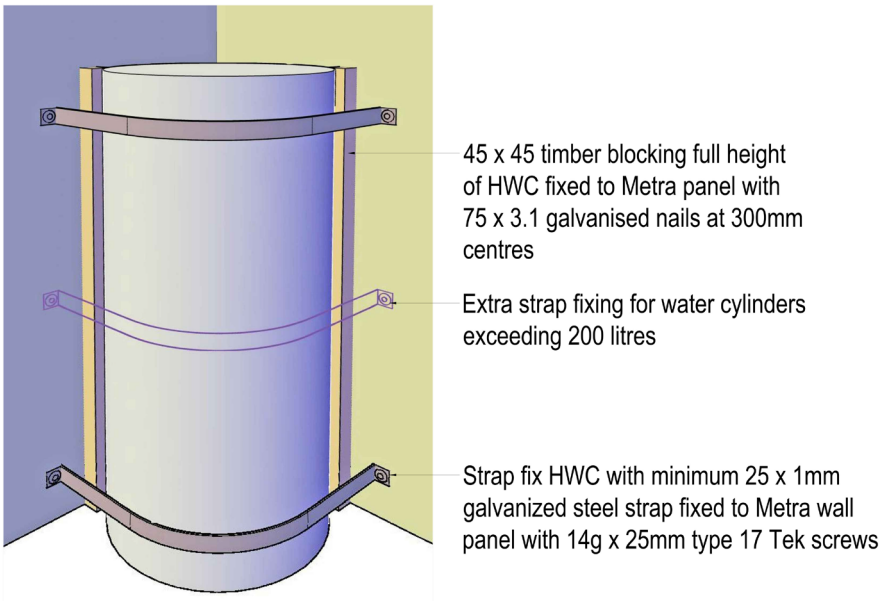


Figure 11.2 Hot water cylinder restraint

11.4.2 ELECTRICAL

All electrical wiring holes drilled through the ceiling sheets must be sealed with a full plug of flexible silicon sealant to prevent moisture ingress. This sealing must occur immediately after wiring has been completed to avoid moisture penetrating down into the panel.

Holes to accommodate electrical wiring are normally drilled into the panel on site. Refer Figure 11.3 for typical details. **AVOID ROUTING GROOVES IN THE SURFACE FOR WIRING WHERE POSSIBLE.**

Halogen or other high temperature lighting is not recommended where temperatures generated by the luminary exceed 65°C above ambient.

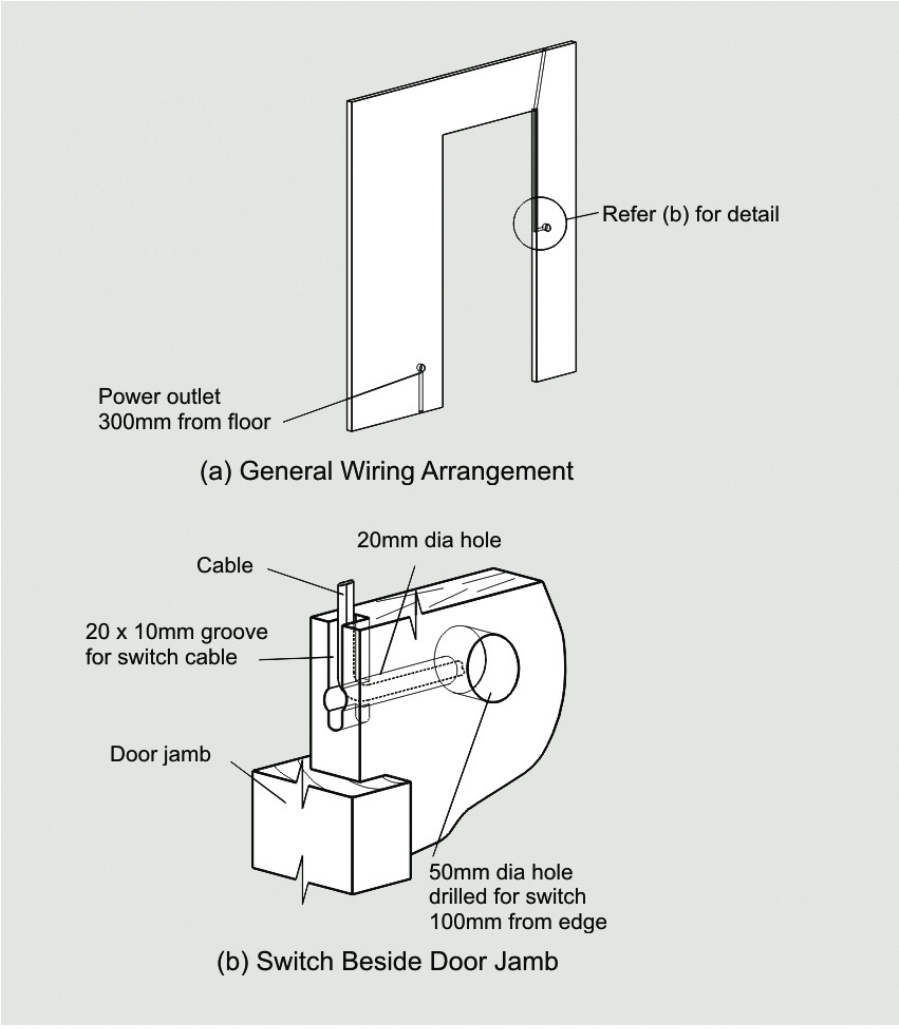


Figure11.3 General Cable Ducting

11.5 Roof Cladding

Roof Cladding including underlay shall meet the requirements of NZBC Acceptable Solution E2/AS1, 3rd Edition July 2004.

11.6 Ventilation

11.61 INTERNAL WET AREAS

Metra structures have a low internal air leakage to the outdoors. In order to reduce the likelihood of excessive internal moisture accumulation from sources such as bathrooms, laundry and shower cubicles etc. Adequate ventilation must be provided such as a mechanical ventilation system or non-closable vent ducts to provide permanent trickle ventilation.

All venting of moisture laden air must be directly to the exterior i.e. ducting as shown Figure 11.4

NOTE: This ventilation is additional to that required by NZBC G4/ASI.

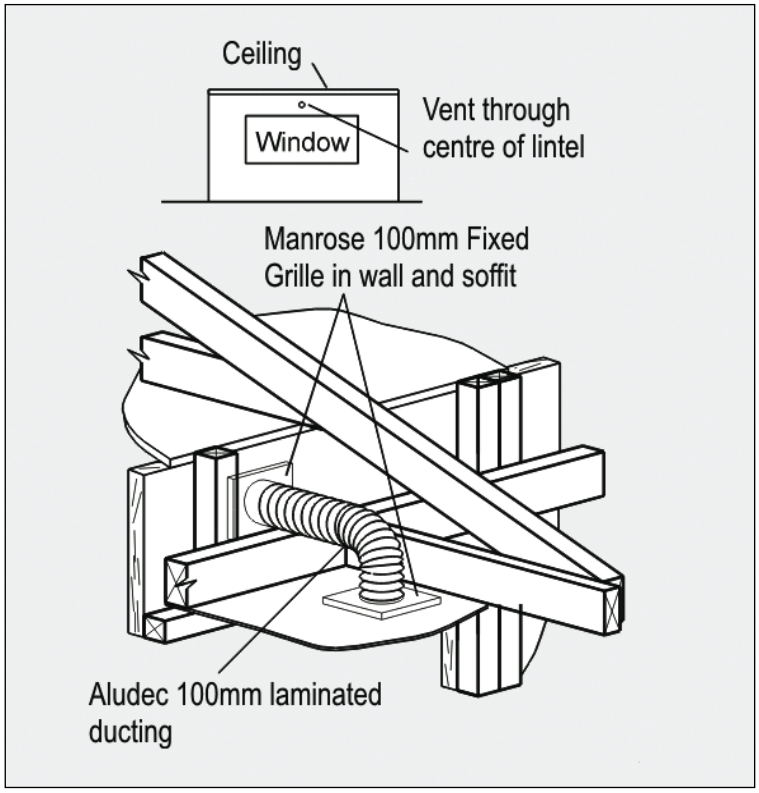


Figure 11.4 Wall Vent to Exterior

11.6.2 CUPBOARD SPACES

Vents are fitted in all closed cupboard spaces to allow air circulation.

Two alternative vents are shown in Figure 11.5.

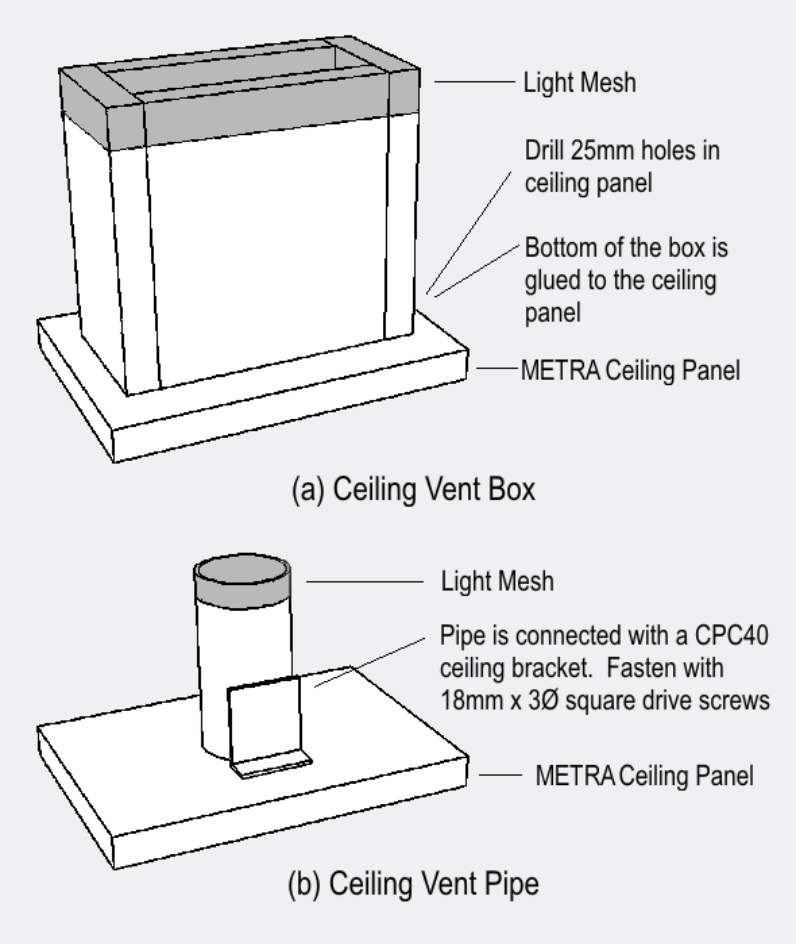


Figure 11.5 Air Circulation Vents

If a mechanical ventilation system such as a DVS or HrV or the like is in the house the vents would not be required.

11.6.3 ROOF SPACES

Elevated temperatures with exceedingly low humidity are prevalent in ceiling roof spaces and plenum areas. As these are immediately adjacent to the ceiling panels, roof space ventilation must be provided.

Efficient cross-flow ventilation must be achieved within the roof spaces to reduce temperature and improve ceiling insulation performance in the summer, and control moisture in the winter. This ventilation, requirement is managed through slotted soffits, roof apex venting or gable end louver venting

12. Interior Linings

12.1 General

In general terms the Metra panel is an inherent internal lining. However, certain areas are highlighted here to ensure compliance with NZBC E3.

12.2 Jointing – Dry Areas

Panels are bevelled as Figure 12.1.

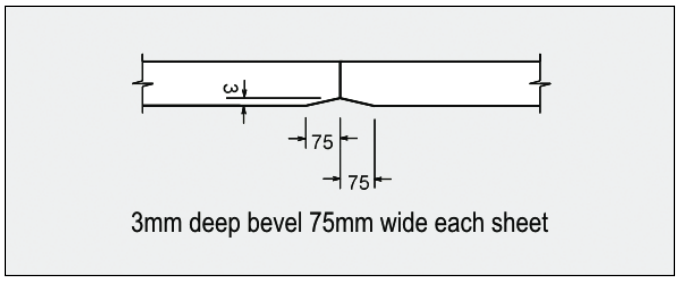


Figure 12.1 Panel Joints for Stopping

12.3 Control Joints to Ceilings

Movement control joints are recommended for buildings requiring more than six ceiling panels, (eg. exceeding 100 m^2 in floor area). Refer to Figure12.2.

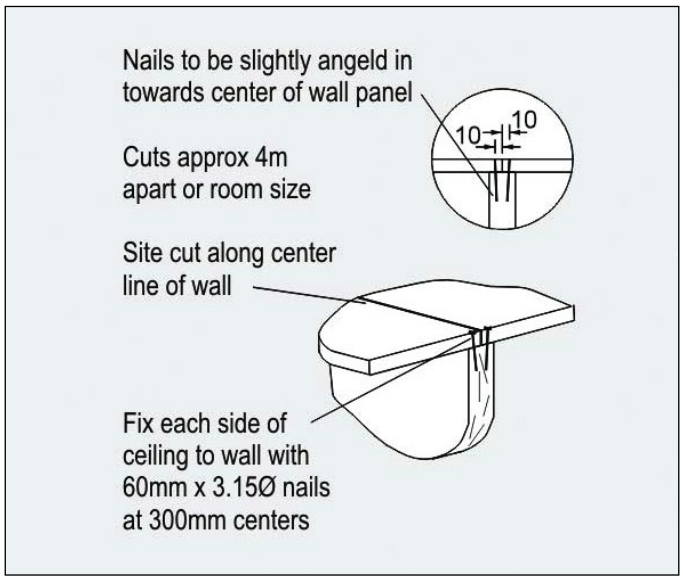


Figure 12.2 Control Joint

12.4 Wet Areas

The long term performance of Metra panels will be adversely affected if exposed to moisture for prolonged periods after building occupation.

In areas where water spillage may occur, it is essential to prevent moisture penetration, by providing suitable protection.

A “Wet Area” is any area within a building supplied with water from a water supply system, eg. Kitchens, Bathrooms, Toilets, Shower Rooms, En Suites, Laundries, etc.

The general wall and ceiling surfaces, of such areas, must be finished with an impervious material complying with NZBC E3/AS1 Clause 3.1.2. If using a semi-gloss or gloss coating complying with f) of this clause, the coating must be waterborne enamel.

The recommended paint finish is two top coats of either Resene SpaceCote 'Kitchen & Bathroom' Low Sheen or for a satin finish use Resene Lustacryl.

12.5 Shower Enclosures

Shower enclosures (including showers over baths) must be constructed in a manner that totally protects the Metra panels from moisture.

Shower linings and trays must be totally impervious and where required shall have in situ membranes.

All installations must comply with NZBC Acceptable Solution E3/AS1 Clause 3.3.

13. Ceilings

13.1 Board Ceilings

Metra ceiling panels are 25mm thick moisture resistant particleboard, 7.35m x 2.45m.

13.2 Installation

Ceiling panels are installed on temporary supports and fixed to the top of walls, prior to the installation of roof trusses.

Non-diaphragm Ceiling

Ceiling to Wall Fixings

- 75 x 3.15Ø ring shank nails or 75 x 8g screws @ 250mm centres into all walls. At ceiling joints on exterior walls nail or screw 4 fixings at approximately 50mm apart at both sides of the joining sheets.

Ceiling Corners on External Walls

- At each ceiling corner nail or screw 4 fixings at approximately 50mm apart.

Internal Walls

- Nail or screw 4 fixings at approximately 50mm apart over ends of internal walls, especially very short walls.

Diaphragm Ceiling

Ceiling to Wall Fixings

- 75 x 3.15Ø ring shank nails @ 150mm centres into all walls. At ceiling joints on exterior walls nail 4 fixings at approximately 50mm apart at both sides of the joining sheets.

Ceiling Corners on External Walls

- At each ceiling corner nail 4 fixings at approximately 50mm apart.

Internal Walls

- Nail 4 fixings at approximately 50mm apart over ends of internal walls, especially very short walls.

NOTE: Where roof truss cambers are more than 10mm the ceiling to truss cleats shall not be fixed to the trusses until all roof framing and cladding has been installed, and the trusses have settled to within 10mm of their final level.

13.3 Ceiling Panel Joints

When panel joints do not coincide with trusses, butt joints are formed supported by a metal strip as detailed in Figure 13.2

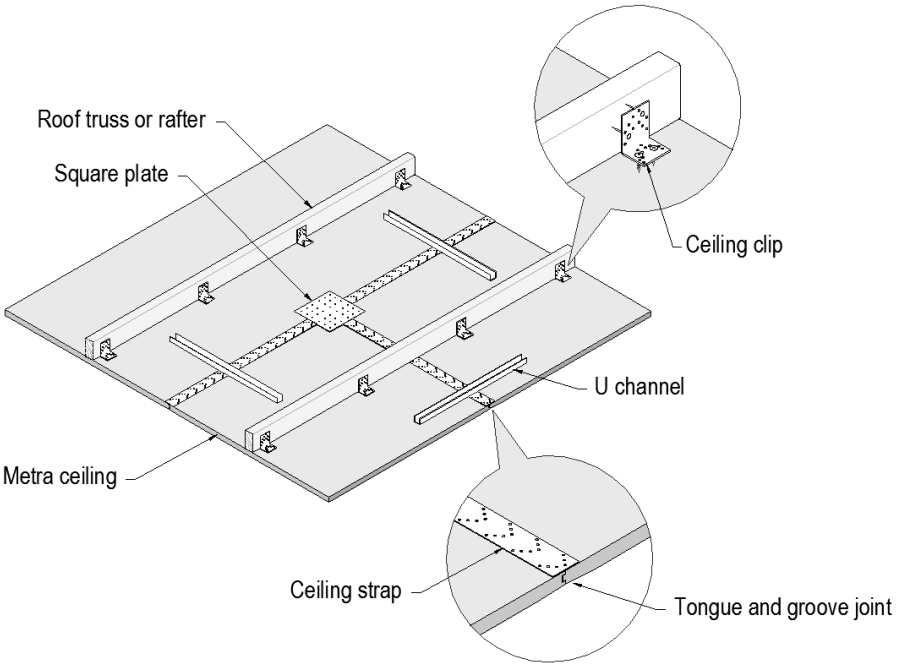


Figure 13.2 Ceiling fixings

Tongue & Grooved Ceiling Joints

- Glue ceiling sheets together with 'Sturdibond'. Glue Metra steel ceiling strap over the **full length** of ceiling joins. **Do not stop short. Steel straps must be fixed to the full length.**
- Ensure ceiling straps are centred over the join and not running off the centre line.
- Fix ceiling straps with 2 rows of 25mm screws at 200mm centres. Paint and seal entire strap to water protect joint.

Ceiling to Truss/Rafter Fixings

- Ceilings are fixed from above the ceiling line with Metra ceiling clips fixed at 600mm centres maximum.
- Lift the ceiling by straightening or wedging ceiling props room by room, until the ceiling is flat with the underside of trusses.
- Fix Metra ceiling clips with 2 x 30mm x 2Ø nails or 3 25mm 8g screws in 2 top holes to truss.
- Fix Metra ceiling clips with 2 x 25mm x 8g screws through bracket down into ceilings.

Ceiling U Channel Joint Stiffener

- Fit 600mm long Metra U channel stiffeners at 1200mm centres when strapped ceiling joints are more than 300mm away from nearest truss bottom chord or rafter.
- Fit 600mm long Metra U channel stiffeners at 'T' joints to stiffen.

Square Plates

- Fit Glue and screw Metra square plates with 25 x 8g screws to support interior corners of ceiling sheets.

13.5 Drop ceiling beam

Where a wall is pushed out under the eaves and requires a lower wall height it is preferable to use a drop ceiling where possible rather than coved ceiling.

The bottom edge of the drop ceiling beam has a double rebate running the full span of the beam. The ceiling panel joining into the beam requires a matching rebate along the edge of the joining ceiling panel. This needs to be wide enough to accommodate a ceiling strap. Primer paint the rebated ceiling, glue the upper rebate of the beam and nailed the ceiling up into the beam rebate at 250 centres with 75 x 3.15Ø nails. The bottom rebate is then glued and the ceiling strap positioned and screwed off at 250mm centres with 25 x 8g screws the length of the lintel. Paint prime the joint and strap before being plaster stopped.

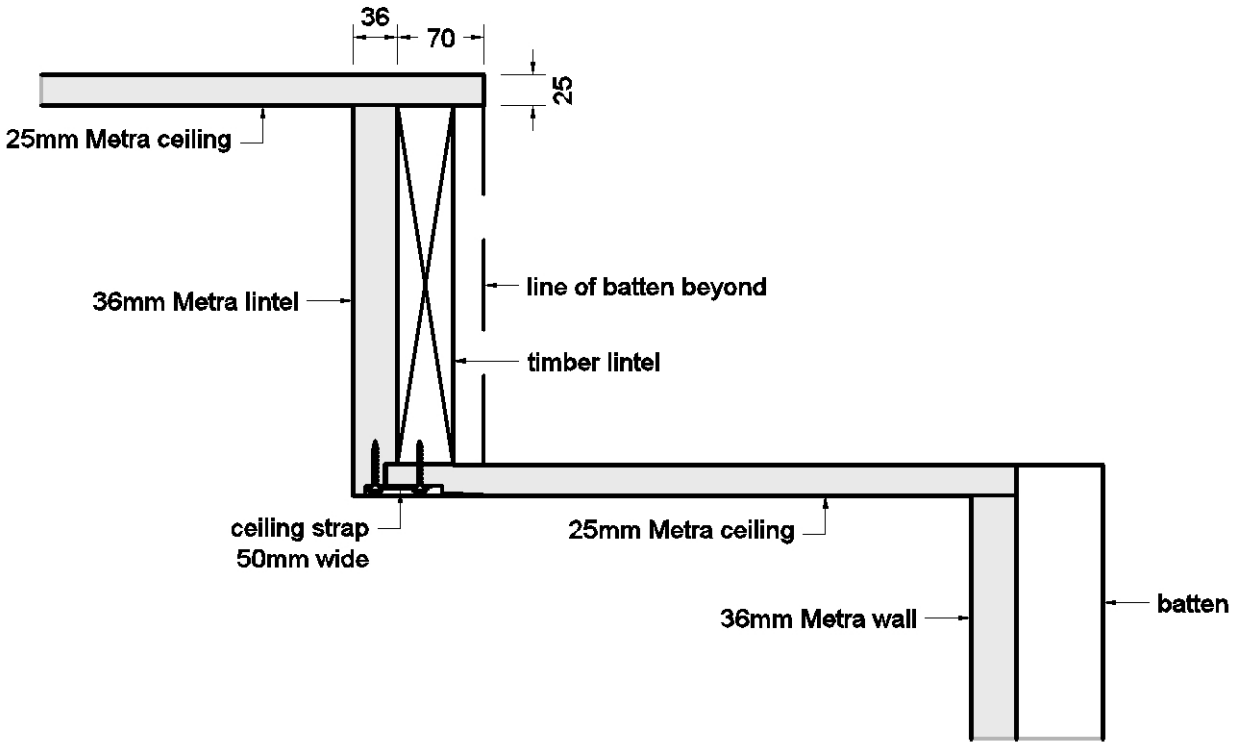


Figure 13.8 Fire rated ceiling typical arrangement

14. Stopping

14.1 Stopping Overview

14.1.1 INTRODUCTION

This section covers the key points for stopping Metra panels. Metra panel can be stopped using standard trade methods, however there some aspects unique to the Metra system.

14.1.2 STOPPING METHODS

There are two methods for stopping, either skimming or taping. The following tables identify where each of these methods shall be used. It is important in each case that the stopping is allowed to dry between coats.

Panel Joints	Method
Manufactured over-height panels	Skim
Horizontal joints	Paper taped
Butt wall joint	Paper taped
Internal exterior corner	Paper taped or Goldline
Mid floor joint	Paper taped
Lintel joint	Paper taped
Dropped ceiling joint	Paper taped
Ceiling to wall tapered joint	Skim

Surface	Method
Dents	Grind, prime and skim
Nails	Punch, grind, prime and skim
Clamp marks	Sand, prime and skim

14.1.3 CAULKED JOINTS

Typically, wall to wall internal corners and wall to ceiling junctions do not require stopping. These junctions and rebates of less than 5mm can be caulked rather than stopped. This may require more than one application. The following table lists joints to be caulked.

Caulked Joints	Method
Internal Corner	Caulked
Ceiling to Wall	Caulked

14.2 Allowing Stopping to Dry

14.2.1 INTRODUCTION

Metra panels have different properties from plasterboard linings. One of these properties, permeability, affects the time stopping compounds take to dry.

14.2.2 ALLOWING STOPPING TO DRY

Allowing the stopping to dry between coats is the single most important aspect which differentiates stopping Metra from plasterboard linings. It can be the difference between doing the job once and having to return to apply further coats. If the stopping has been painted, the cost to remedy the problem will be increased. Drying times will vary with seasonal changes. The time the stopping takes to dry is dependent on temperature and humidity.

Temperature
Do not to attempt to stop joints when the temperature is below 10 degrees Celsius. If the temperature is below 10 degrees Celsius avoid stopping or use electric heaters to raise and maintain the temperature.

Humidity
High humidity will increase drying time. To lower humidity ensure adequate ventilation. If this is not possible, as it may be necessary to lock the building up, dehumidifiers may provide a suitable solution.

Note
The Metra panel system has a low internal air leakage to the outdoors. Concrete floors drying can raise the humidity within the building and increase stopping drying time. Increase ventilation or use dehumidifies as above.

14.2.3 WHY STOPPING TAKES LONGER TO DRY ON METRA PANELS

Stopping is applied to primer coated Metra Panels. The primer coating helps protect the Metra panel from weather exposure during the stand up process. The primer is designed to have a low permeability. This protects the panel from water ingress and damage but also means that stopping applied to the primer must dry out through the surface of the stopping compound rather than drying through the surface and being absorbed into the substrate.

The impact of this is that stopping takes longer to dry on Metra Panels under the same conditions, than plasterboard linings. Satisfactory drying times are achievable though these are dependent on the temperature and humidity.

During dry summer months the stopping dries within hours. During cold winter months stopping can take days to dry. Using electric heaters and/or dehumidifies to control the environment in the building will allow for satisfactory stopping drying times to be achieved all year round.

It is not recommended to use gas heating as these produce H2O.

It is also not recommended to use diesel or kerosene heaters as these will contaminate the surrounding areas.

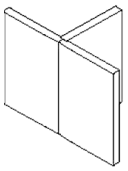
14.3 Stopping Panel Preparation

14.3.1 INTRODUCTION

Before stopping Metra panels it is important that the joints are stable, edges have been rounded off, the moisture of the board is no more than 12% and that primer has been applied to all exposed raw panel. This section details the preparation of Metra panel for stopping.

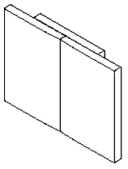
14.3.2 CHECK PANELS

Before plastering check the following:



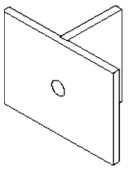
Stability of joints
All joints shall be firmly fixed. If movement is detected on any joint it must be rectified before further finishing work is carried out.

Check
• Panel joints are solid
• There is no deflection or movement in the joints.

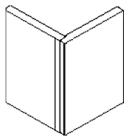


Ceiling and wall panels are supplied with tapered edges. For site cut joins the edges must be re-tapered.

Edges
All sharp edges shall be rounded off.



Edges	Action
Sharp edges	Grind off and prime
Nails	Punched 2mm below the surface
Hammer marks, dents, scratches, clamp marks and punched nails	Grind out and prime
Rebated corners	Grind out and prime for paper tape and stopping compound
Mid floor joint	Paper taped
Lintel joint	Paper taped



14.3.3 MOISTURE CONTENT

The moisture content of the Metra panel at the time of stopping shall be no more than 12%. Do not stop any panels or joints showing signs of moisture. Stopping panels with high moisture will result in concaved ceiling joints and cracked or lifting wall panel joints.

14.3.4 PRIMING

Ensure all surfaces are free of dust etc. before priming. Check that all exposed surfaces are primed before stopping.

14.4 Stopping Compounds

14.4.1 INTRODUCTION

METRA Panel joints are stopped using selected standard trade compounds. When applied correctly and allowed to dry these compounds produce a high quality finish.

14.4.2 STOPPING COMPOUNDS

The following stopping compounds should be used for Metra Panels.

	Panel Joints	Surface
First Coat	Tradeset premium joint compounds Tradeset 90 or direct equivalent with paper tape	Gib ProMix® or Gib Plus4®
Subsequent Coats	Gib ProMix® or Gib Plus4®	Gib ProMix® or Gib Plus4®

Use **ONLY PAPER TAPE** on the Metra panel system.

DO NOT use mesh tape on Metra panel joints. Tradeset 90 is the recommended first coat for joints due to its ability to adhere to painted panels.

IMPORTANT – To ensure a high quality joint finish is achieved first time, ensure that the first bedding compound is rendered dry before additional coats are applied.

14.5 Applying Stopping

14.5.1 INTRODUCTION

This section details the process for stopping Metra Panels.

14.5.2 APPLY STOPPING COMPOUND

Once the panels have been prepared correctly they can be stopped using standard trade practice.

The number of layers of stopping can vary depending on the method of application. A minimum of 3 coats is required. More can be applied if required.

It is important that a high quality finish is achieved as the size and flatness of the panels will highlight imperfections in the stopped joints more than on plasterboard.

It is important that the stopping compounds adhere to the primer and that the joints are allowed to dry sufficiently between coats.

All products must be used as per manufacturers' directions.

14.5.3 STOPPING PROCESS

The process for stopping Metra panels is:

Edges	Action
Panel preparation	Prepare panels. Ensure that: • Joints are secure • Edges rounded off • Panel moisture no more than 12% • Exposed raw panel primed • Primer dry • Panels are clean
Before plastering commences	Check temperature and humidity to determine if extra equipment (heaters or dehumidifiers) are required.
Stopping	• Stop panel using best trade practice • Use only recommended compounds • Ensure the stopping is thoroughly dry between coats

15. Painting

15.1.1 INTRODUCTION

This section covers the key points for painting Metra panels.

METRA panels can be painted using standard trade methods however it is critical that the paint is allowed to dry between coats.

15.1.2 PAINTING METHODS

The following methods have been used successfully to paint Metra panels:

- Spray painting
- Spray painting and back rolling
- Roll painting

The method used is dependant on the operator, their skill and equipment. Excellent results, superior to plasterboard finishes, are achievable using any of the above methods.

In each case it is critical that the paint is allowed to dry between coats.

15.1.3 PRIMER PAINT COATING

Metra panels have primer paint applied.

The product used is Resene True-Prime®, based on medium oil. It is compatible with both acrylic and oil base paint systems.

Every house lot of panel is supplied with a container(s) of primer paint for touch-ups. Additional primer paint is available directly from Metrapanel.

NOTE: Metra panels are reconstituted wood panel products and must be primed with recommended paint systems for particleboard products.

Do not use Acrylic paints on raw or unpainted Metra panel. This may cause grain raise to the surface of the panel. Use an oil base paint.

15.2 Allowing Paint to Dry

15.2.1 INTRODUCTION

Metra Panels have different properties from plasterboard linings. One of these properties, permeability, affects the time paint takes to dry.

15.2.2 ALLOW PAINT TO DRY

Allowing the paint to dry between coats is the single most important aspect, which differentiates painting Metra panels from plasterboard linings. It can be the difference between doing the job once and having to return to site to re-paint the whole job. Paint drying times will vary with seasonal changes. The time the paint takes to dry is dependent on temperature and humidity.

TemperatureNever paint when the temperature is below 10 degrees Celsius. If the temperature is below 10 degrees Celsius avoid painting or use electric heaters to raise and maintain the temperature.

HumidityHigh humidity will also slow paint drying. To lower humidity ensure there is adequate ventilation. If this is not possible, as it may be necessary to lock the building up, dehumidifiers may provide a suitable solution.

NOTE: The Metra panel system has a low internal air leakage to the outdoors. Concrete floors drying can raise the humidity within the building and slow paint drying times. Increase ventilation or use dehumidifiers as above.

15.2.3 WHY PAINT TAKES LONGER TO DRY ON METRA PANELS

In the Metra panel system, finish coats of paint are applied to the primer coated Metra panels. One of the purposes of the primer coating is to protect the Metra panel from weather exposure during the stand up process. The primer is designed to have a low permeability.

This protects the panel from water ingress and damage but also means that paint applied to the primer must dry out through the surface rather than a combination of drying through the surface and being absorbed into the substrate.

The impact of this is that paint takes longer to dry on Metra panels under the same conditions, than plasterboard linings. Satisfactory drying times are achievable though these are dependent on the temperature and humidity.

During dry summer months the paint dries within hours. During cold winter months paint can take days to dry. Using electric heaters and/or dehumidifies to control the environment in the building will allow for satisfactory paint drying times to be achieved all year round.

15.3 Paint Preparation

15.3.1 INTRODUCTION

Before painting Metra panels it is important that no raw board is exposed, all stopping is sealed and all surfaces are clean. This section details the preparation of Metra panels for painting.

15.3.2 PANEL PREPARATION

Achieving a good paint finish is dependent on correct panel preparation.

Prime
Touch up any raw panel or heavily sanded areas with the approved sealer. Allow sufficient time for primer to dry. Refer to Primer section.

Paint Stopping
All plaster stopping must be painted with an oil base pigmented sealer.

Clean
Sand and brush down panels to remove all dirt, stains, contaminations and loose materials.

15.3.3 CAULKING

Selleys No More Gaps is the most compatible gap filler used with the Metra panel system. Gaps should be filled prior to painting.

NOTE: If Selleys No More Gaps is not left long enough to cure before it is painted, this may result in crazing and cracking of the compound. Care must be taken when cleaning or wiping the joints of No More Gaps. If too much of the product is removed or a very thin, feathered membrane is created, this could result in crazing and cracking once it has been painted coated. Refer to the product specifications.

15.3.4 INSULATION

It is recommended that wall and ceiling insulation is installed before commencing painting.
This will help with drying times and maintain a more constant temperature inside the building.

15.4 Paints

The following paints are recommended

Application	Recommended Paints
Level 4 walls & ceilings	• Spot prime joints and filled areas with Resene Broadwall Sealer • Apply two top coats of Resene SpaceCote Low Sheen
Level 5 walls & ceilings	• Apply a full coat of Resene Broadwall Surface Prep & Seal • Apply two top coats of Resene SpaceCote Low Sheen
Wet areas (non splash)	• Apply a full coat of Resene Sureseal • Apply a full coat of Resene Broadwall Surface Prep & Seal • Apply two top coats of either Resene SpaceCote 'Kitchen & Bathroom' Low Sheen or for a satin finish use Resene Lustacryl

15.5 Painting Process

15.5.1 INTRODUCTION

This section details the process for painting Metra panels and includes details for wall papering METRA panels.

15.5.2 PAINTING PROCESS

Process for painting Metra panels:

Step	Description
Panel preparation	Prepare panels. Ensure that: • Raw surfaces are primed • Joints stopped • Stopping sealed • Gaps filled • Panels are clean
Check temperature and humidity	Check temperature and humidity to determine if extra equipment (heaters or dehumidifiers) are required.
Paint	• Paint panels using standard trade methods (spray or roll). • Check that paint is dry between coats. It is better to wait longer for the paint to dry than to apply a second wet coat and compound the problem

15.5.3 WALL PAPER

Prepare the wall as above and apply a full seal coat of Resene Sureseal.Drying times can be improved using the same techniques to improve paint drying times.

NOTE: Air pockets in wallpapering can take longer to disappear than on plasterboard linings.