GANG-NAIL® Roof Truss Systems are available only through Accredited MiTek® Frame and Truss Fabricators

Refer to the MiTek® New Zealand website for up to date GANG-NAIL® Roof Truss System information and for MiTek® Accredited Fabricators.
# INTRODUCTION
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- Where MiTek® fits in
- Advantages of GANG-NAIL® Roof and Floor Trusses
- GANG-NAIL® Connectors

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## GLOSSARY
The GANG-NAIL® Timber Connector System was introduced into New Zealand in the 1960’s.

The system revolutionised house construction by prefabricating roof trusses, eliminating the need for expensive on-site “stick construction”. Light, efficient timber trusses are factory manufactured using the GANG-NAIL® toothed metal plate connector, enabling quicker construction schedules, better quality control and reduced construction cost.

Wall frames, portal frames, floor trusses (the Posi-STRUT™ system) structural GANGLAM beams and FLITCH Beams are also prefabricated using the GANG-NAIL® System.

The GANG-NAIL® System allows the principles of structural engineering to be applied to house building. The science of timber engineering came of age on the introduction of the GANG-NAIL® System.

The GANG-NAIL® Truss System is based on the GANG-NAIL® Timber Connector, which is a steel plate with multiple spikes or teeth projecting from one face. The connectors are pressed into the timber using hydraulic, pneumatic or roller presses, causing the teeth to embed in the timber. Timber elements can be joined together with ease to make trusses and other structural timber components.

The ease of installation and effectiveness as a timber connector make GANG-NAIL® Connectors ideal for the prefabrication industry where speed and reliability are paramount. The name “GANG-NAIL Truss” has now become synonymous with quality prefabricated timber roof trusses.

GANG-NAIL is a registered trade name of MiTek New Zealand Ltd.
MiTek New Zealand Ltd is the ‘Home of GANG-NAIL® Building Systems’ but does not manufacture trusses. We manufacture the steel connector plates and ancillary items that are supplied to a select national network of licensed truss fabricators. Each of these companies has been appointed as an accredited GANG-NAIL® Fabricator because of their high standards of manufacture and for their professionalism within the building components industry.

The supply of connectors is only a small part of MiTek’s activities. It is the technical support provided to accredited GANG-NAIL® Fabricators, which is the true strength of the GANG-NAIL® System.

Technical support starts with supply of engineered and tested connector plate design and includes MiTek’s commitment to research and development both within New Zealand and internationally.

MiTek has further revolutionised the industry with the MiTek 20/20™ software. This leading edge software has been developed by MiTek and is used by GANG-NAIL® Fabricators to design, detail and cost truss and wall frame systems. The truss and wall frame programs minimise detailing errors and enable cutting information to be directly downloaded to computer controlled saws. Timber members are then cut to the correct angle and to within a millimetre.

Further support is provided by the MiTek Design Office. Architects, builders and fabricators utilise the engineering expertise for technical advice, feasibility studies, preliminary designs, and fully certified designs. Today it is this innovative and extensive technical support which maintains MiTek’s leadership in roof truss and associated building component manufacture.

Training for detailers on MiTek 20/20™ and Sapphire™ software is carried out by MiTek personnel with certificates of competency awarded after rigorous examinations.

**ADVANTAGES OF GANG-NAIL ROOF AND FLOOR TRUSSES**

Prefabricated timber roof and floor truss systems offer greater design freedom, guaranteed strength and improved project cost control.

Almost any shape of truss is practicable and economical. Intricate roof surfaces and ceiling profiles can be achieved, and trusses can be designed for a variety of roof loadings – ranging from cyclonic winds to snow loads – with spans up to 30 metres. Visually, the bold patterns of exposed structural truss elements can be used to architectural advantage.

GANG-NAIL® Trusses meet the New Zealand Standards for Timber Structures, wind loads, live loads and dead loads. The timber specified for each truss element is described by both size and stress grade. GANG-NAIL® Connector Plate sizes specified for each truss joint are determined by the forces being transmitted and the tooth-holding capacity of the type of timber in the truss.

Prefabricated trusses are cost-effective as they use the inherent strength of timber efficiently and factory automation brings the economies of scale to even the shortest production run. Site labour and supervision are greatly reduced and the effects of the weather on construction timelines are minimised.
The GANG-NAIL Connector Plate is a steel plate with a collection of spikes or teeth projecting from the face (see photo). When pressed into timber members a strong joint is formed. The same size plate is used on both faces of the joint.

**GANG-NAIL TRADE NAME**

“GANG-NAIL” is a registered trade name of MiTek New Zealand Ltd. This is written with capitals, and used as follows: “GANG-NAIL Connectors”, “GANG-NAIL Components”, “GANG-NAIL Trusses” and the “GANG-NAIL System”. They are not referred to as “Gang-Nails”. This is to comply with N.Z. Trademark law.

### Connector Types

MiTek has developed three ranges of connector plates. These are:

1. **GNQ** for general residential applications. It is manufactured from 1.0mm thick, G300 grade steel, (galv. spec Z275) steel strip.
2. **GN16** for heavy duty applications. Manufactured from 1.6mm, G300 grade steel, (galv. spec Z275) steel strip.
3. **GS12** stainless steel for high corrosive environments. Manufactured from 1.2mm 445M2 grade stainless steel.

**DURABILITY OF CONNECTORS**

Consult MiTek New Zealand Ltd for advice.

### Timber Specification

GANG-NAIL Trusses may be fabricated from Radiata Pine, Douglas Fir, or equivalent strength species. The minimum timber grade of top and bottom chords is MSG/VSG 8. The maximum moisture content is 16% at time of manufacture. A higher grade timber may be specified in the design, with provisions for LVL members.

Timber treatment is as specified in the New Zealand Building Code, Clause B2. Note that H3 treatment and higher may affect the durability of the connector plates. Consult MiTek New Zealand Ltd for advice.

### Manufacturing

GANG-NAIL Trusses are manufactured by accredited GANG-NAIL Fabricators. The fabricator generally designs the trusses using MiTek 20/20™ and Sapphire™ proprietary truss design software supplied by MiTek New Zealand Ltd. The MiTek Design Office is on hand to assist architects, builders and fabricators with engineering.

### Quality Control

The GANG-NAIL Fabricator is responsible for the supply of the timber, proper use of the software to design the trusses, and manufacture of the trusses. Roof trusses are subject to specific engineering design and are outside NZS 3604.

### Camber

Camber is built into the trusses to allow for the normal deflection in the loaded condition.

### Truss Bracing

The correct bracing of GANG-NAIL Trusses is essential. In most residential applications the bracing is to NZS 3604. In other cases refer to the truss designer, or request the LUMBERLOK® Roof Bracing Specification brochure.
The purpose of this section is to enable house designers to draw truss layouts and to choose truss sizes for preliminary designs. It is the responsibility of Accredited MiTek Fabricators to provide a final ‘Buildable’ layout design and Producer Statement for the truss system with the use of MTtek proprietary truss design software and selection charts.

MiTek New Zealand Ltd manufactures and distributes connector plates and fixing systems to accredited MiTek Fabricators throughout New Zealand (See the Accredited Fabricator listing at www.miteknz.co.nz).

MiTek support service is provided by MiTek New Zealand Ltd in the form of truss designs, computer systems, engineering and fabricator equipment.

<table>
<thead>
<tr>
<th>Timber</th>
<th>Radiata Pine OR Douglas Fir</th>
<th>SG 8, or higher - Top and bottom chords</th>
</tr>
</thead>
<tbody>
<tr>
<td>OR</td>
<td>Equivalent Grade of other species – refer MiTek New Zealand Ltd.</td>
<td></td>
</tr>
<tr>
<td>Moisture Content</td>
<td>Dry – MiTek New Zealand Ltd recommend moisture content of 16% or less at time of fabrication.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Design Loads</th>
<th>Dead Loads</th>
<th>Design Loads</th>
</tr>
</thead>
<tbody>
<tr>
<td>Live Loads (Qr)</td>
<td>Refer NZS 3604 and AS / NZS 1170</td>
<td></td>
</tr>
<tr>
<td>Floor Loads (Qf)</td>
<td>Light roof - 0.25kPa (e.g. Coloursteel)</td>
<td></td>
</tr>
<tr>
<td>Wind Loads (W)</td>
<td>Medium Roof - 0.40kPa (e.g. Plywood)</td>
<td></td>
</tr>
<tr>
<td>Snow Loads (S)</td>
<td>Heavy Roof - 0.65kPa (e.g Concrete tile)</td>
<td></td>
</tr>
<tr>
<td>Ceiling - 0.20kPa (e.g 10mm Gib® Board)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.25kPa for roof</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5kPa to Attic truss bottom chords</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low to Extra High Wind Zones (NZS 3604)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AS/ NZS 1170</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| References | NZS 3603 |
| References | NZS 3604 |
| References | AS/NZS 1170 |

| Truss Joints | The GANG-NAIL Connector Plates are pressed into both sides at each joint. The standard connectors (GNQ and GN16) are manufactured from galvanised steel. For high corrosion environments connectors are available in 445M2 grade stainless steel (GS12). |

MiTek New Zealand Ltd manufactures and distributes connector plates and fixing systems to accredited MiTek Fabricators throughout New Zealand (See the Accredited Fabricator listing at www.miteknz.co.nz).

MiTek support service is provided by MiTek New Zealand Ltd in the form of truss designs, computer systems, engineering and fabricator equipment.
The GANG-NAIL Truss System allows for a wide range of roof shapes. Some of the more popular standard shapes are:

→ Gable Roof
→ Hip Roof
→ Dutch Hip Roof
→ T Shape Roof
→ T Shape Roof with Radial Hip End
→ L Shape Roof
→ Boomerang Roof

GABLE ROOF
A Gable Roof is a roof shape with equal roof pitches meeting at a ridge point that is located in the middle of the building.

HIP ROOF
A Hip Roof runs from each corner of the roof to the ridge point.

DUTCH HIP ROOF (OR SEMI GABLE)
A Dutch Hip Roof is similar to a Hip Roof except that there is a small gable section located at the top of the hip roof.
GANG-NAIL® RESIDENTIAL

TERMINOLOGY

T SHAPE ROOF

T SHAPE ROOF WITH RADIAL HIP END

L SHAPE ROOF

BOOMERANG ROOF
RAFTER TRUSS (T)
Truss support roofing battens or purlins in conventional construction.

GIRDER TRUSS (G)
Truss designed to support one or more other trusses.

TRUNCATED RAFTER TRUSS (TR)
Standard Rafter Truss with top cut short and apex removed.

TRUNCATED GIRDER TRUSS (TG)
Standard Girder Truss with top cut short and apex removed. Supports hip end jack trusses.

MONO PITCHED TRUSS (T)
Low pitched roof (see note on page 12.)
GABLE END TRUSS (GE)
Standard triangular shaped truss for the end of a gable roof. Truss is usually non-structural, being supported by the end wall and has vertical webs to suit the cladding.

JACK TRUSS (J)
Truss supported by Girder Truss.

TRUNCATED JACK TRUSS (TJ)
Standard Jack Truss with top cut short and apex removed.

HALF TRUSS (H)
Long span trusses designed in two halves supported by internal load bearing wall or parallel chord truss.

SADDLE OR VALLEY TRUSS (V)
Trusses at the intersection of two roof surfaces over an internal corner of a building

FLAT TRUSS (PARALLEL CHORD TRUSS)
Truss with top and bottom chords parallel.
**CAMBER**

Camber is a slight curve in the fabricated shape of a truss such that when it deflects it will end up producing a flat ceiling and a straight roof. Some deflection occurs as the truss is loaded, more deflection will occur over a period of time due to the "creep".

As the chords are subjected to a distributed load, they will deflect in between panel points, in addition to the whole truss as a unit deflecting downwards. This local deflection of the chords is called "panel deflection" and is compensated for by keeping the deflection within acceptable limits.

**OVERHANG**

Overhangs are currently designed with a live load of 1.1 kN at 300mm from end.

This allows for a person to stand at the end of the overhang to fix the last purlin or to attach the fascia and gutter. It also allows for the continued maintenance after construction, e.g. cleaning out the gutter etc.

The table below is a guide to the maximum overhang lengths attainable using SG8 timber based on an 8000 mm span truss and 20° roof pitch.

<table>
<thead>
<tr>
<th>Timber Size</th>
<th>Max Overhang</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Light Roof</td>
<td>Heavy Roof</td>
<td></td>
</tr>
<tr>
<td>90 x 45 SG8</td>
<td>750mm</td>
<td>650mm</td>
<td></td>
</tr>
<tr>
<td>140 x 45 SG8</td>
<td>1250mm</td>
<td>1150mm</td>
<td></td>
</tr>
</tbody>
</table>

Overhangs can be increased by using higher grade timber, or doubling up (Scabbing) the top chord. Ensure that the scab member laps the existing top chord as far back as the first top chord panel point.

Too much camber in a truss can cause problems lining the ceiling. To avoid this, the camber can be limited through using stiffer trusses or load bearing internal walls.

**Note:** Trusses should not be supported on internal walls that have not been designed as load bearing. Supporting trusses where a support has not been designed can cause over-stressing of the truss bottom chord and rippled ceilings.
HEEL HEIGHT

Heel height is the distance from the top of the load bearing wall to the top edge of the top chord.

The heel height can be calculated using the following:

\[
\text{Heel Height} = \left( \frac{d}{\cos \theta} \right) - \text{Birdsmouth}
\]

BIRDSMOUTH

The net depth of the rafter at the notch (or birdsmouth) shall not be less than 80% of the actual depth of the rafter, nor less than 65mm as per NZS 3604:2011.

SPAN

The truss span is the horizontal distance between the outside faces of the external load bearing walls; or from external wall to an internal support.

LOW PITCH TRUSSES

Heel height is the distance from the top of the load bearing wall to the top edge of the top chord.

There is an increasing number of low pitch trusses being specified where a truss can be designed, but the camber is impossible to apply. The trusses are usually straight when fabricated and hence will deflect more than anticipated when roofing and ceiling loads are applied.

The Span to Heel Height check is intended to prevent excessive deflection for low pitch roof trusses. Use Chart 1 to determine if the minimum heel height should be checked, and use Charts 2 & 3 to determine the minimum heel height.
LOW PITCH TRUSSES

Chart 2: For Trusses at 900 centres

<table>
<thead>
<tr>
<th>Span (mm)</th>
<th>Minimum Heel Height (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Span Check 1</td>
</tr>
<tr>
<td>Up to 2100</td>
<td>90</td>
</tr>
<tr>
<td>Up to 3400</td>
<td>140</td>
</tr>
<tr>
<td>Up to 4300</td>
<td>190</td>
</tr>
<tr>
<td>Up to 4600</td>
<td>240</td>
</tr>
<tr>
<td>4601 to 5600</td>
<td>10+ Span/20</td>
</tr>
<tr>
<td>Above 5600</td>
<td>10+ Span/20</td>
</tr>
</tbody>
</table>

3: For Trusses at 450 centres and 2-Ply Trusses at 900 centres

<table>
<thead>
<tr>
<th>Span (mm)</th>
<th>Minimum Heel Height (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All Low Pitch Roof Types</td>
</tr>
<tr>
<td>Up to 2600</td>
<td>90</td>
</tr>
<tr>
<td>Up to 3900</td>
<td>140</td>
</tr>
<tr>
<td>Up to 5200</td>
<td>190</td>
</tr>
<tr>
<td>Up to 6400</td>
<td>240</td>
</tr>
<tr>
<td>Above 6400</td>
<td>Span/26.7</td>
</tr>
</tbody>
</table>

EXAMPLES:

1. 8000mm span truss at 9° roof pitch for light roof with trusses at 900mm centres. Therefore minimum required heel height = 8000/40 = 200mm. (Span Check 2)
2. Similar to Example 1 but with 3° roof pitch. Therefore minimum required heel height = (8000/20) + 10 = 410mm. (Span Check 1)
3. Similar to Example 2 but with trusses at 450mm centres. Therefore minimum required heel height = 8000/26.7 = 300mm. (Chart 3)
Over height trusses can be split into two separate trusses, i.e. top hatting the truss. A top hatted truss is a lower truncated truss with a smaller truss sitting on top, the top hat. It is also known as a piggy back truss. The lower truss is designed to carry the load, with the upper truss forming the roof shape, see Fig 1.

**FIGURE 1** - A Top Hatted Truss
The trusses need to be joined together as shown in Fig 2.

Restraining Truss Chords

In Fig 1 runners are shown fixed between the trusses. These are essential to ensure that the chords are restrained. Under gravity loading the top chord of a truss is in compression so unless it is restrained it has a tendency to buckle. On a standard truss, the top chord is restrained by purlins. For a top hat truss runners are required for this purpose.

**FIGURE 2** - Two Options for Fixing Top Hat Truss to Lower Truss

**REQUIREMENTS FOR ATTIC TRUSSES**

For Top Hatted Attic Trusses please contact MiTek for Specific Engineering Design (SED)
The cove dimensions can be calculated by using one of the following:

- **Cove Length** = \( \frac{\text{Cove Rise}}{\tan \theta} \) + Wall Width
- **Cove Rise** = \( (\text{Cove Length} - \text{Wall Width}) \times \tan \theta \)
- **Heel Height** = \( \frac{\text{Cove Member Size}}{\cos \theta} \) – \( \text{Wall Width} \times \tan \theta \)

The nominal cove length is the cove length using the standard top chord size (usually 90 x 45). Typically the roof plane is fixed and the cove length increases as the cove member size increases.

<table>
<thead>
<tr>
<th>Truss Span</th>
<th>Member Sizes</th>
<th>Maximum Cove Length</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Light Roof</td>
</tr>
<tr>
<td><strong>3 - 5m</strong></td>
<td>90x45</td>
<td>150mm</td>
</tr>
<tr>
<td></td>
<td>140x45</td>
<td>400mm</td>
</tr>
<tr>
<td></td>
<td>190x45</td>
<td>1100mm</td>
</tr>
<tr>
<td></td>
<td>240x45</td>
<td>1100mm</td>
</tr>
<tr>
<td></td>
<td>290x45</td>
<td>1200mm</td>
</tr>
<tr>
<td><strong>5 - 8m</strong></td>
<td>90x45</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>140x45</td>
<td>300mm</td>
</tr>
<tr>
<td></td>
<td>190x45</td>
<td>650mm</td>
</tr>
<tr>
<td></td>
<td>240x45</td>
<td>900mm</td>
</tr>
<tr>
<td></td>
<td>290x45</td>
<td>1100mm</td>
</tr>
<tr>
<td><strong>8 - 12m</strong></td>
<td>90x45</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>140x45</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>190x45</td>
<td>350mm</td>
</tr>
<tr>
<td></td>
<td>240x45</td>
<td>650mm</td>
</tr>
<tr>
<td></td>
<td>290x45</td>
<td>800mm</td>
</tr>
</tbody>
</table>

**NOTES:**
- Chart applies to roof pitch between 15° and 30°
- Truss spacing 900mm centres
### HIP END SELECTION CHART

<table>
<thead>
<tr>
<th>Truss Layout</th>
<th>Light Roof</th>
<th>Heavy Roof</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girder Truss At Apex</td>
<td>Up to 7.4m</td>
<td>Up to 6m</td>
</tr>
<tr>
<td>![Girder Truss Diagram]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One Truncated Truss Hip System</td>
<td>6 to 9m</td>
<td>5 to 8m</td>
</tr>
<tr>
<td>![One Truncated Truss Diagram]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two Truncated Truss Hip System</td>
<td>8 to 11m</td>
<td>7 to 10m</td>
</tr>
<tr>
<td>![Two Truncated Truss Diagram]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Three Truncated Truss Hip System</td>
<td>10 to 13m</td>
<td>9 to 12m</td>
</tr>
<tr>
<td>![Three Truncated Truss Diagram]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**KEY**

- T Rafter Truss
- G Girder Truss
- TR Truncated Rafter Truss
- TG Truncated Girder Truss
- J Jack Truss
- TJ Truncated Jack Truss
- R Rafter
- H Hip Board

**NOTE:**
Chart applies to roof pitch between 15° and 45°
Truss spacing at 900mm crs.
The purpose of drawing a truss layout is to:
1. Check that the spans, pitches and roof loading are feasible for trusses.
2. Find the load paths so that the lintels, wall framing and foundations can be designed.
3. Supply a truss layout to the territorial authority for building consent.
   (see www.miteknz.co.nz for a list of Accredited MiTek Fabricators)

1. Draw the rafter trusses. Check that the top chord size is 90 x 45, otherwise the heel height for the job will be affected.

2. Select and draw trusses at hip ends. See page 16 for Hip End Selection Chart. The number of truncated trusses required depends on the span and type of roof.
ATTIC TRUSS CODING

AT 20 / 25

Attic Nom. Top Chord Size Nom Bottom Chord Size

DESIGN CRITERIA

→ Typical roof pitch 45°

→ Truss spacing at 900mm centres normally. Max spacing is 1200mm. (Requires specific design by MiTek® Accredited Fabricator or MiTek® Design Engineers).

→ Maximum floor spans determined by allowable span of intermediate floor joists as per NZS 3604:2011

→ Bottom Chord size similar to intermediate floor joist size.

OVERHANGS

An overhang may be added to the Attic truss by attaching a supplementary member on to the side as shown in the figure below. The truss may also be stop-ended if required, usually to give a higher wall height to rooms.

MODIFICATIONS FOR STAIRS

The bottom chord of standard Attic trusses and Intermediate trusses (not Girder Attic trusses) may be trimmed to accommodate a stair opening.

If stairs are inline with Attic trusses, trimming bottom chords may be avoided. This requires specific design from MiTek New Zealand Ltd.
### FLOOR DETAILS - 1.5kPa Live Load

<table>
<thead>
<tr>
<th>Number of Supports</th>
<th>Max. Floor Span</th>
<th>Floor Joist Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>3400mm</td>
<td>190x45</td>
</tr>
<tr>
<td>2</td>
<td>4300mm</td>
<td>240x45</td>
</tr>
<tr>
<td>2</td>
<td>5000mm</td>
<td>290x45</td>
</tr>
</tbody>
</table>

#### DEFINITION

- Attic Truss @ 900 crs. (generally)
- Trimmer joists, fixed as shown below
- Intermediate floor joists, fixed as shown below

Attic Trusses - To be fixed to Top Plate with a minimum of 2 Wire Dogs each end.

#### FLOOR JOISTS

- Intermediate floor joist size as per NZS 3604:2011.
- Attic Truss Bottom chord similar to intermediate joist size.
- Trimmer joist size to match the intermediate floor joist size.
- Fix trimmer and intermediate floor joists with LUMBERLOK® Joist Hangers, size and fixing as per LUMBERLOK® Joist Hanger selection and Nailing / Screw Fixing brochure.
# Attic Truss selection Table for 45° Roof Pitch

<table>
<thead>
<tr>
<th>Floor Span</th>
<th>Truss Centres</th>
<th>Truss Type</th>
<th>Range of Truss Spans Light Roof &amp; Heavy Roof</th>
</tr>
</thead>
<tbody>
<tr>
<td>3450mm</td>
<td>900mm</td>
<td>2 AT 20/20</td>
<td>7100 - 8600</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 AT 25/20</td>
<td>6000 - 8600</td>
</tr>
<tr>
<td>4300mm</td>
<td>900mm</td>
<td>2 AT 20/25</td>
<td>8600 - 9600</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 AT 25/25</td>
<td>7800 - 9600</td>
</tr>
<tr>
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<td>2 AT 30/25</td>
<td>6000 - 9600</td>
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NOTE: The above selection table is for Attic trusses at 45° roof pitch. Attic trusses at lower roof pitch will require specific engineering design by an Accredited MiTek® Fabricator or MiTek® Design Engineers.
DORMERS

Dormers can be added to most Attic truss roofs but special care must be taken to ensure all vertical and horizontal loads (Wind, Dead and Live loads) have been taken care of. All Dormer designs must be certified by MiTek New Zealand Ltd.

TWO COMMON TYPES OF DOOMER

Flat Doomer

Pitched Doomer

TYPICAL DOOMER FLOOR PLAN

Girder Attic Truss (typically 2 ply)

Intermediate framing or truss

Floor beam to support intermediate joists and trusses

Standard Attic Truss

1800 max. for 2 bays

Girder Attic Truss (typically 2 ply)
3. Recognise blocks and fill in trusses. Blocks are areas that have the same roof details and hence the same truss layouts. In this case the hip end is nearly the same as the other end of the building, just slightly modified.

Note: The main Girder Truss normally spans across the shorter span.

4. Add Saddle or Valley Trusses as necessary to form the roofline. These trusses are non-structural, so do not require design.
The purpose of this document is to provide guidance on both the design and detailing of scissor trusses, so they don’t cause any surprises on site.

Scissor trusses by virtue of their geometry will perform very differently compared to a conventional truss. As the bottom chord is pitched at an angle, when a scissor truss is loaded it will result in a horizontal thrust or force that will push horizontally on a wall frame. If the thrust is not limited or mitigated, it may cause problems in the walls bowing and cracks in joints of ceiling and wall plasterboard.

There are a lot of variables that affect a scissor truss performance including geometry, roof materials, truss span, wall stiffness etc. However, MiTek have put together some recommendations for designers, detailers, and engineers to help mitigate the performance issues.

**Message to the Designers:**
When considering scissor trusses as part of the design at concept stage, there are a few simple recommendations that need to be followed:

- A minimum angle between the top and bottom chords of 15°. If 15° cannot be achieved, Specific Engineering Design is required i.e. contact MiTek or a suitably qualified engineer.

- Avoid scissor trusses with large spans. Large spans will result in the centre of the truss to deflect more, which in turn will cause a large horizontal thrust to the external walls.

- If scissor trusses are used in large open areas, look to introduce return walls at right angles (spaced at a maximum of 6m centres) and detail good connections between the intersecting top plates.

- If return walls are not feasible consider using a centre parallel chord truss (along ridge line), with half trusses on either side. Speak to your local MiTek Truss Fabricator/Detailer for guidance.

- Prevent discontinuous top plates; for example, avoid the detail of lintels that protrude above the top plate of walls.

- Consider thicker walls (eg. 140mm) which will allow for larger and stronger top plates.

- Be aware that if return walls are only on one side, then the opposite wall will move out twice as much.

- Also, patio areas with beams and posts do not provide any restraint to top of wall.
Message to Fabricators / Timber Structure Detailers:

If roof pitch is 45° a 5mm deflection at mid-span will cause each wall to move outwards by 5mm. If one wall is restrained (by other return walls), then the opposite wall will move outwards 10mm. This horizontal movement is resisted by wall top plate and ceiling packer (if any). Under NZS 3604:2011 Clause 5.4.6 “Bracing lines in any storey shall be at not more than 6m centres in each direction...” So, if this is the case a continuous 6m long top plate and ceiling packer may reduce this horizontal movement and there may be no issue. However in practice, rooms with scissor trusses are usually open plan and can be 10 to 12m long.

→ Check scissor trusses have a minimum of 15° angle between top and bottom chords.
→ Design scissor truss for a maximum mid-span deflection / camber of 5mm.
→ Increase number of panels so diagonal webs are about 15° to bottom chord.
→ Double end cut diagonal webs to improve angle.
→ Increase plate sizes at all joints (especially at heels and mid-span) to minimise joint slippage during handling and installation.
→ Use continuous top and bottom chords.

Message to Engineers

→ Use a continuous LVL very top plate or ceiling packer where possible. Please note max. stock length of SG timber is 6m and LVL is 7.2m; longer LVL (up to 13m) is only available by special order.

→ Otherwise stagger joints of top plates and strengthen with Nailon plate 320 x 150 x 2mm or a pair of Floor Joist Stiffener (FJS) for 140mm member and Rafter Splice 2mm x 80 x 400mm for 90mm member.
Standard Truss

Doomer wall frame fixed over 2 ply Girder Truss

Mid floor beam at max. joist span if required

Intermediate joist to match truss bottom chords. Max. span as per NZS 3604:2011

Ceiling strapping to restrain inside of Attic Truss. (partially removed for clarity)

20mm flooring (partially removed for clarity)

End wall framing inside Attic Truss as per NZS 3604:2011 (partially removed for clarity)

Framing between trusses for wall cladding (partially removed for clarity)

Lower level ceiling strapping to retrain Attic Truss bottom chords

Floor beam to support Jack Trusses and intermediate joists

Jack Truss with extended top chord to form Attic

2 Ply Girder Attic Truss

Standard Attic Truss

Jack Truss to form flat ceiling

Parallel Chord Truss or Ridge Beam

2 Ply Girder Attic Truss
APEX
The highest point on a truss.

ATTIC TRUSS
A truss with an attic room space within the truss. The bottom chord doubles as the floor joist and the top chord as the rafter.

BARGE
Trim along the edge of roofing at a gable end. Slopes at roof pitch. It is fixed to ends of battens, purlins or verge rafters.

BATTEN
Roof battens or ceiling battens. Usually timber members fixed to the truss chords to support roof tiles or ceiling material. Also provides lateral restraint to the truss.

BEARING / SUPPORT POINT
Point at which the truss is supported. A truss must have two or more supports located at truss panel points.

BOTTOM CHORD
Truss member forming bottom edge of truss.

BUTT JOINT SPLICE
End-to-end joint between two pieces of timber.

CAMBER
Vertical displacement built into a truss to compensate for the downward movement expected when truss is fully loaded.

CANTILEVER
That part of a truss that projects beyond an external main support, not including top chord extensions or overhangs.

CHORD
The truss members forming the top and bottom edges of the truss.

CONCENTRATED LOAD
A point load applied at a specific position e.g. load applied by an intersecting truss.

CONNECTOR
Light gauge steel plates with teeth projecting form one face. When pressed into intersecting timber members the plate connects the members in a rigid joint.

COVE
A truss supported on an extended top or bottom chord.

CREEP
Movement resulting from long-term application of load to a timber member.

DEAD LOAD
Permanent load due to the weight of materials and truss self-weight.

DEFLECTION
Movement in a truss due to the applied loads.

Design Loads
The various loads that a truss is designed to support.

DISTRIBUTED LOAD
Loads spread evenly along truss member.

FASCIA
Trim along the edge of the eaves.

GABLE TRUSS
Standard triangular shaped truss.

GIRDER TRUSS
Truss designed to support one or more trusses.

HEEL JOINT
The joint on a truss where the top and bottom chords meet.

HEEL POINT
The position on a truss where the bottom edge of the bottom chord meets the top chord.

HIP
Intersection of two roof surfaces over an external corner of a building.

HIP ROOF
Roof constructed with rafters or trusses pitched over all perimeter walls.

JACK TRUSS
Half truss and part of family of trusses that makes a hipset.

JOINT STRENGTH GROUP
Classification of timber according to its ability to perform with fasteners such as bolts, nails and GANG-NAIL® Connectors. The grouping depends on timber species and moisture content.

KING POST
Vertical web at the centre of a gable truss, or the vertical web at the end of a half gable truss.
LATERAL BRACE
Bracing restraint applied at right angles to web or chord to prevent buckling.

LONGITUDINAL TIE
Bracing restraint applied at right angles to web or chord to prevent buckling.

LIVE LOAD
Load as a result of occupancy or use of the building.

OVERHANG
Extension of top chord beyond support. Provision of eaves on gable trusses.

PANEL-POINT
The point where several truss members meet to form a joint.

PANEL-POINT SPLICE
Splice joint in a chord coinciding with web intersection.

PITCH
Angular slope of truss chord measured in degrees.

PURLIN
Roof purlins. Usually timber members fixed at right angles to the truss chords to support roof sheeting. Also provides lateral restraint to truss. Similar to battens except more widely spaced.

RAFTER
A roof member supporting roof battens or purlins in conventional construction. Rafters employ only the bending strength of the timber. A roof truss may also be called a trussed rafter.

RIDGE
The highest point on a gable roof.

SETBACK
The position of a truss measured from the outside face of the end wall. Usually used to describe the position of Truncated Girder and Standard trusses in a Hip End.

SPAN
The horizontal distance between the outer edges of the truss supports.

SPAN CARRIED
The span of standard trusses that are supported by a girder truss.

STOP END
Description of a truss based on standard shape but which is cut-off short of its full span.

TOP CHORD
Truss member forming top edge of truss.

TRUSS
A framework of members forming a light, strong, rigid structure. Usually a triangulated structure.

VALLEY
Intersection of two roof surfaces over an internal corner of a building.

VALLEY TRUSS OR SADDLE TRUSS
Part of a set of non-structural trusses to form valleys.

VERGE
Roof overhang at a gable-end.

VERGE RAFTER
Rafter projecting from gable end to support verge.

WEB
The internal members of a truss. Usually only subject to axial loads due to truss action.

WIND LOAD
Load applied to the roof by the wind.