Timber Roof Frames and Trusses

This training package provides information on four types of timber roof systems (including associated rafters, underpurlins, trusses, roof battens and purlins) for village infrastructure and houses common in South-east Asia and the South Pacific region. These are:

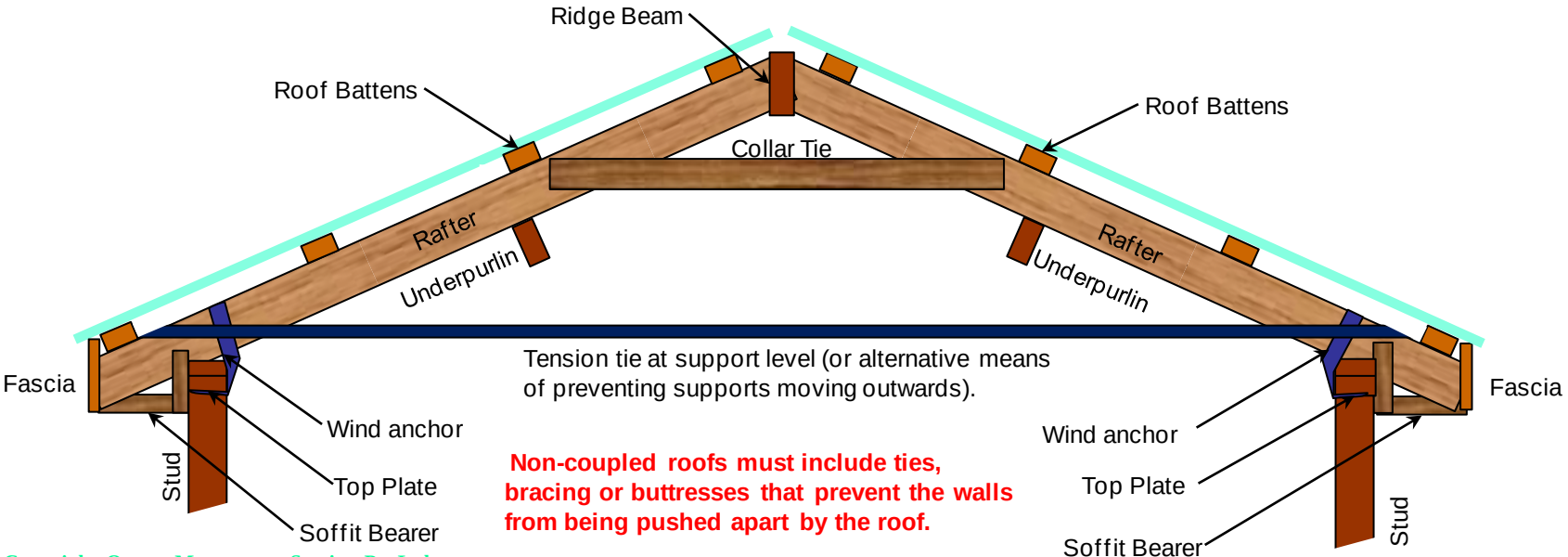
- Non-coupled roof framing (e.g. cathedral roofs)
- Coupled roof framing
- Truss roof
- Direct Anchorage truss roof.

The roof system must also include a suitable diagonal bracing system to prevent movement and collapse.

Non-coupled Roof

- Non-coupled roofs include cathedral roofs and the like, with or without a ceiling.
- Non-coupled roofs must include cross walls, ties, bracing or buttresses at the support level to prevent the walls from being pushed apart by the roof. A collar tie will also assist and should be used where possible.
- This difficulty increases the cost of construction and reduces the resistance to high wind loads.
- Non-coupled roofs should only be used if a qualified and experienced structural engineer designs a suitable collar tie and bracing system.

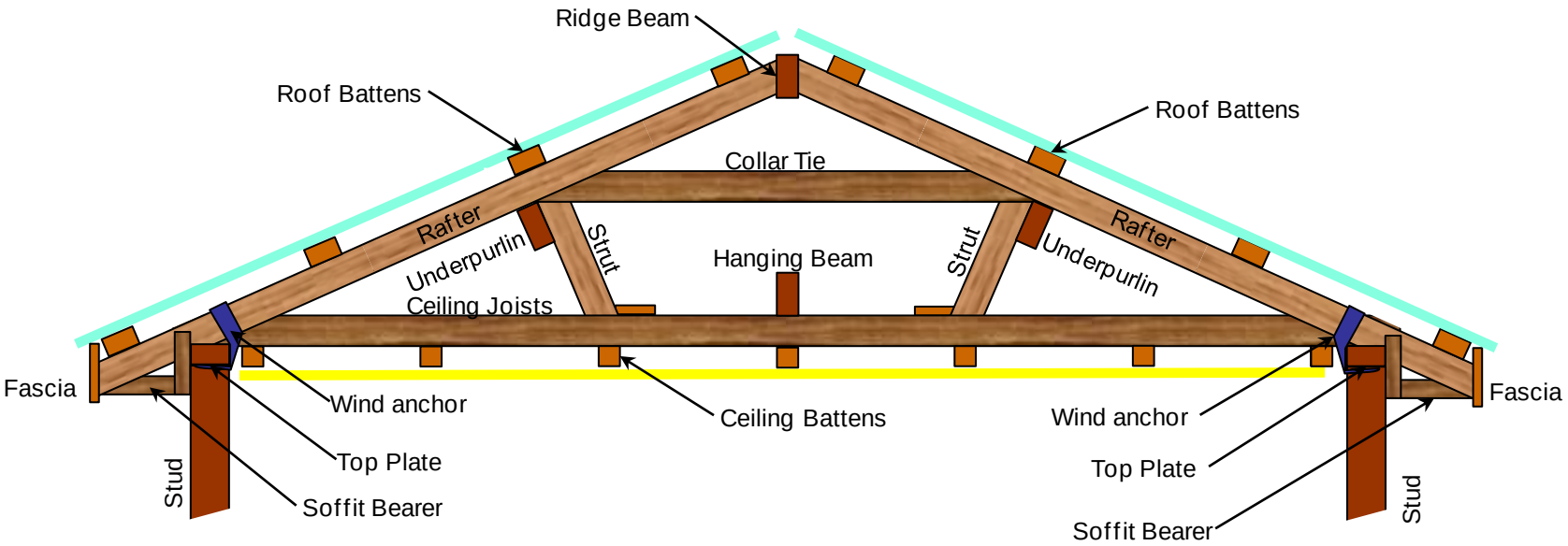
Refer to AS 1680 for the details, member sizes, fixings and corresponding capacities for non-coupled roofs..



Coupled Roof

- Coupled roofs include collar ties and ceiling joists, which prevent the roof from pushing the walls apart.
- While a coupled roof is more efficient than a non-coupled roof, it is not as efficient as a truss roof.

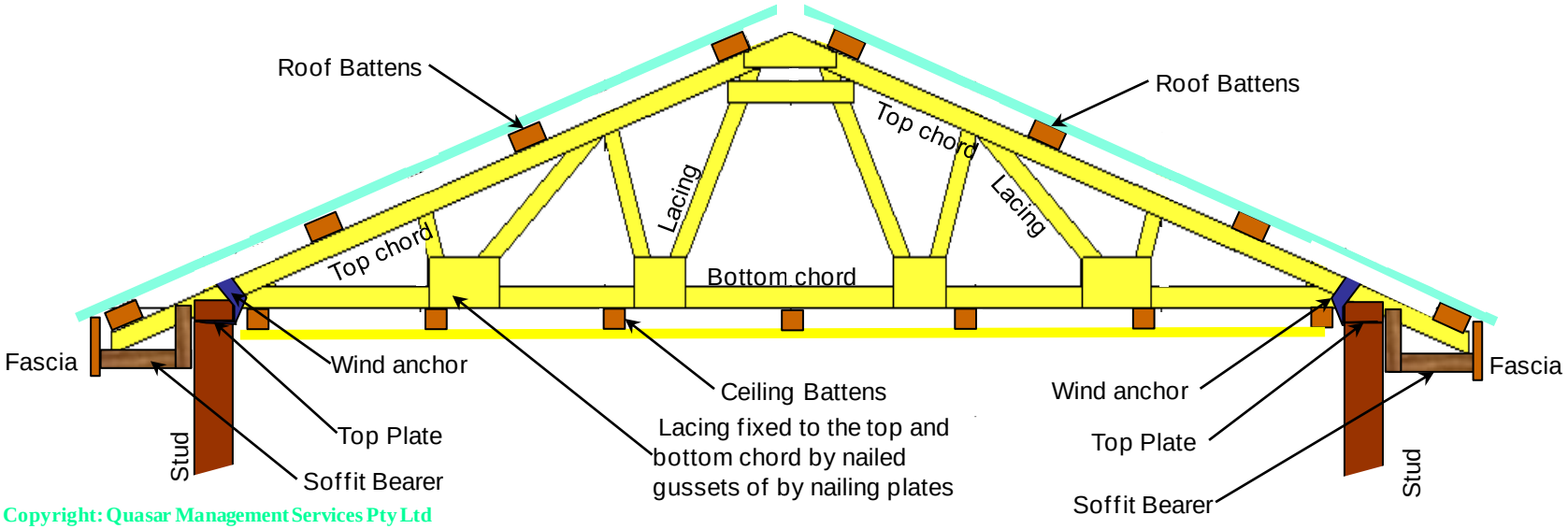
Refer to AS 1680 for the details, member sizes, fixings and corresponding capacities for coupled roofs.



Truss Roof

- Roof trusses are generally prefabricated and delivered to site in one or two sections, depending on the total span.
- They consist of a timber top chord and a timber bottom chord, connected by timber lacing. The configuration of the lacing may be varied depending on whether the main loads are wind uplift or downwards gravity loads.
- The lacing must be securely fixed to the chords. This may be achieved using steel nailing plates or nailed timber gussets (shown here).

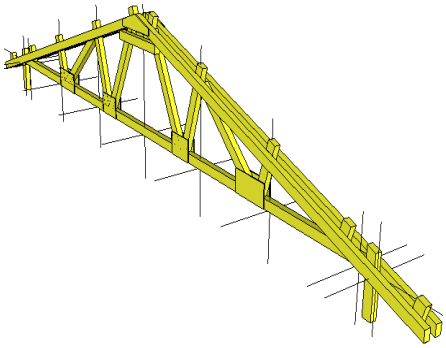
The design of a truss roof is normally carried out be a structural engineer, on behalf of a specialist truss supplier. Standard design are not commonly available, although AS 1720.1 and AS 1720.5 provide the design requirements.

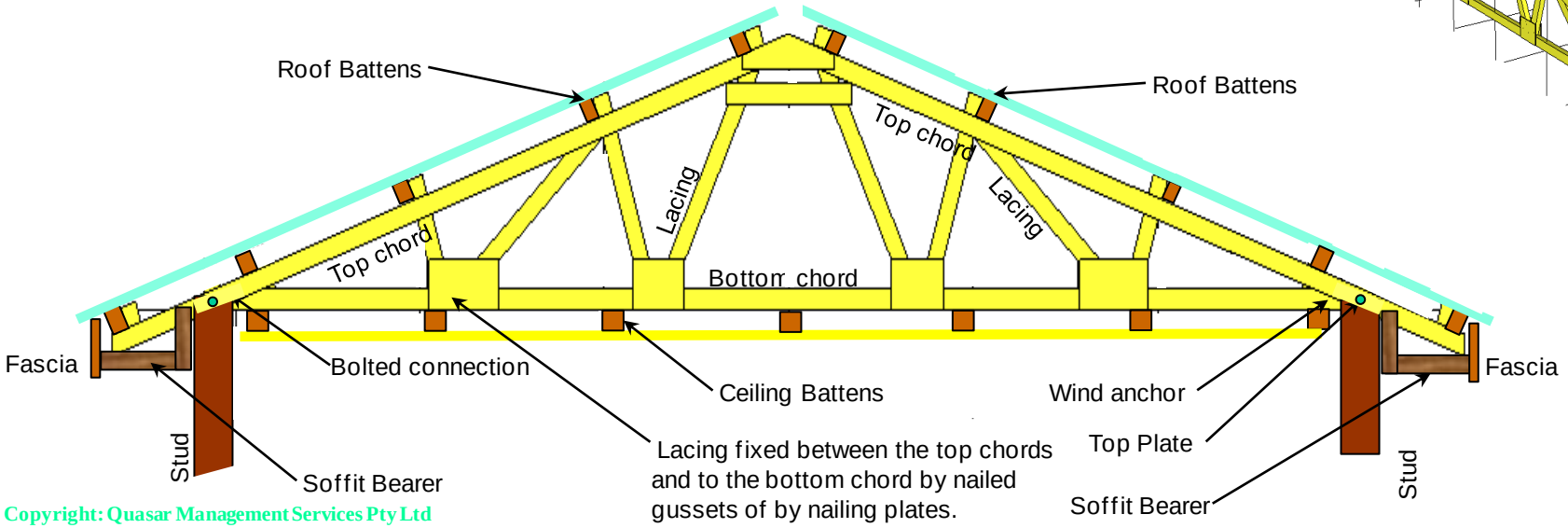


Direct Anchorage Roof

The roof trusses used for a Direct Anchorage System are similar to conventional trusses, but with some very important improvements to provide additional resistance to cyclonic and non-cyclonic wind uplift. They are generally prefabricated and delivered to site in one or two sections, depending on the total span.

- Timber roof purlins on edge (e.g. 100 or 75 deep x 50 mm wide) span 900 mm at 900 mm centres. This 900 x 900 grid is specifically designed to support commonly available corrugated steel roof sheeting in high wind applications. These purlins are fixed horizontally directly into the timber truss lacing.
- Direct Anchorage roof trusses are spaced at 900 mm centres and consist of single timber bottom chords and double top chords (enabling the lacing, bottom chord and the anchorage studs to pass between).
- The timber lacing is securely nailed between the two top chords and is fixed to the bottom chord using steel nailing plates or nailed timber gussets.
- The trusses are bolted to timber anchorage studs between the pairs of top chords.



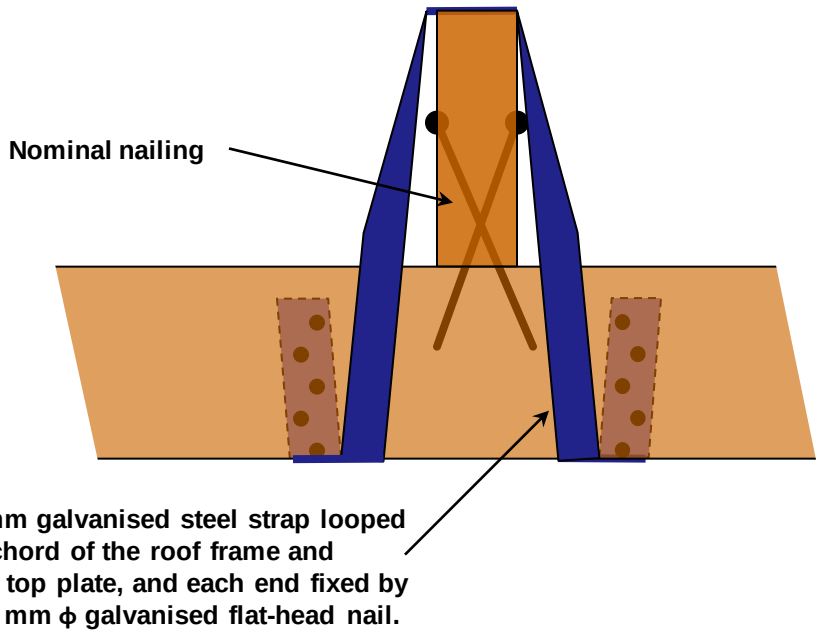


Roof Framing Fixings

Strong wind can suck the roof framing off the timber wall framing if there is an insufficient number of appropriate ties, or if the ties are not correctly fixed to the wall framing.

Following are a couple of example of fixings and their capacities, which are used in the engineering design of roofs. It is important that the specified numbers and dimensions of fixings be used.

Capacity 13.0 kN
Based on AS 1684.3 Table 9.17



Refer to AS 1680 for other details of fixings and corresponding capacities.

Pro-forma Inspection Schedules

The close control of construction is critical to the correct function of a building structure.

The following slides provide a sample Inspection Schedule to indicate the type of inspection that may be warranted. These can be adapted to assist in the site control function.

The details of any Inspection Schedule should be developed by the designer to suit the particular requirements of the application.

Design and Construction Checklist

Site

Activity Timber Roof Framing

Item or Product	Required		Acceptance	Hold Witness	Date, Inspector, Comment
Truss Top Chord (Rafter)					
Top chord type	USHWD F11				
Top chord depth	75	mm			
Top chord width	50	mm			
No top chord components in each	2				
Top chord fixing	1/M12x165 galv bolts, double shear, parallel to grain				
Truss Bottom Chord (Ceiling Joist)					
Bottom chord type	USHWD F11				
Bottom chord depth	75	mm			
Bottom chord width	50	mm			
No bottom chord components in ea	1				
Bottom chord fixing	1/M12x165 galv bolts, double shear, parallel to grain				
Truss Ridge Tie					
Ridge tie type	USHWD F11				
Ridge tie depth	75	mm			
Ridge tie width	50	mm			
No of ridge tie components per trus	2				
Ridge tie fixing	6/90x3.15φ galv nails, shear, side grain				
Truss Lacing (Strut)					
Strut type	USHWD F11				
Strut depth	75	mm			
Strut width	50	mm			
No of components per member	1				
Strut fixing at top	6/90x3.15φ galv nails, shear, side grain				
Strut fixing at bottom	6/60x2.8φ galv nails, shear, side grain				

Roof Purlin					
Roof purlin span (rafter crs	0.900	m			
Roof purlin spacing	0.900	m			
Roof purlin type	USHWD F11				
Roof purlin depth	75	mm			
Roof purlin width	50	mm			
No of components per member	1				
Roof purlin fixing	3/90x3.15φ galv nails, shear, side grain				
Roof Bracing					
Roof bracing type	USHWD F11				
Roof bracing depth	75	mm			
Roof bracing width	50	mm			
No of components per member	1				
Roof bracing fixing	2/90x3.15φ galv nails, shear, side grain				
Roof bracing arrangement	Pairs of diagonals				

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This training package covers broad engineering principles and building practices, with particular emphasis on affordable housing and associated village infrastructure in the Asia-Pacific region. These broad principles and practices must be translated into specific requirements for particular projects by professional architects, engineers or builders with the requisite qualifications and experience. Associated sample specifications and drawings are available in electronic format, with the express intention that architects, engineers and builders will edit them to suit the particular requirements of specific projects. The design, construction and costing of structures must be carried out by qualified and experienced architects, engineers and builders, who must make themselves aware of any changes to the applicable standards, building regulations and other relevant regulations. The authors, publishers and distributors of these documents, specifications and associated drawings do not accept any responsibility for incorrect, inappropriate or incomplete use of this information.

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