

Assessment task 3 – Evaluate structural elements

CPCCB4010B

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Introduction

Purpose of assessment

To research and evaluate structural elements

This Assessment accounts for 20% of total assessment.

Assessment task

Provide substitute designs for alternative structural elements including members, bracing & tie-down for:

- Change of stress grade due to the same type of material (e.g. timber)
- Change of wind classification (provide reference to the BCA)
- Change of stress due to a different material (e.g. timber vs. steel)
- Change of cross-sectional shape

Assessment task 3 – Evaluate structural elements

Provide substitute designs for alternative structural elements including members, bracing and tie-down for:

Reference

Low rise residential buildings utilize many types of structural timbers in base structure, walls and roofs.

AS 1684 Residential timber framed construction – non-cyclonic areas lists the considerations for design. The logical sequence for a building designer/architect is to initially establish the factors of wind and terrain.

Design considerations include the following elements:

1. The wind classification as listed in AS 1170 Structural design actions or AS 4055 Wind loads for housing, or as stated by the relevant authority.
2. The extent and preliminary location of bracing for floor, walls and roof.
3. The sizes and profiles of bracing members.
4. The type of bracing system as designed for the structure.
5. The method of preventing uplift including all connections and tie downs.

Refer to the NCC, Volume Two, Part 3.4.3 Timber framing.

Appropriate performance requirements

Where an alternative timber framing design is proposed as an Alternative Solution to that described in Part 3.4.3, that proposal must comply with:

- performance requirement P2.1
- the relevant performance requirements determined in accordance with 1.0.10.

Acceptable construction manuals

- Part 3.4.3.0
- Performance requirement P2.1 is satisfied for a timber frame if it is designed and constructed in accordance with the following, as appropriate:
 - AS 1684.2 Residential timber framed construction – non-cyclonic areas
 - AS 1684.4 Residential timber framed construction – simplified – non-cyclonic areas

The common practice for factory assembled frames and trusses are to use stress graded timber to AS 1684.2 Residential timber framed construction – non-cyclonic areas, Table 1.2 stress grades. If the frames require pre-fabricated components such as roof trusses, glued and laminated beams and links, any nail plated jointed timbers can be used.

Factory operation ensures the frame is located in jigs and the entire structure is pre-fabricated into modular form, and is ready for transportation to the site.

1. Change of stress grade due to the same type of material (e.g. timber)

When the stress grade of the structural timber changed from a high level to a lower level (hardwood to softer wood), we need to use bigger beam and more columns to support, more roof trusses and nail plated jointed timbers need to be used.

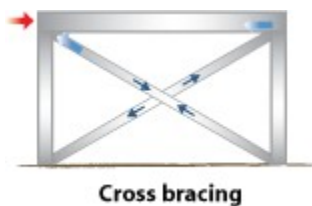
Or we can use MGP timber in place of F graded timber: MGP material could be substituted for F graded material, below are the three main MGP grades and the F grades they can replace.

MGP 10 can replace F5

MGP 12 can replace F8

MGP 15 can replace F11

Bracing: need more bracing since we have more members now.

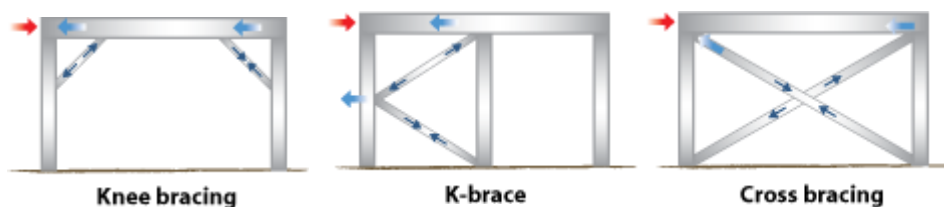


Tie-down: could use the same method.

2. change of wind classification (provide reference to the BCA)

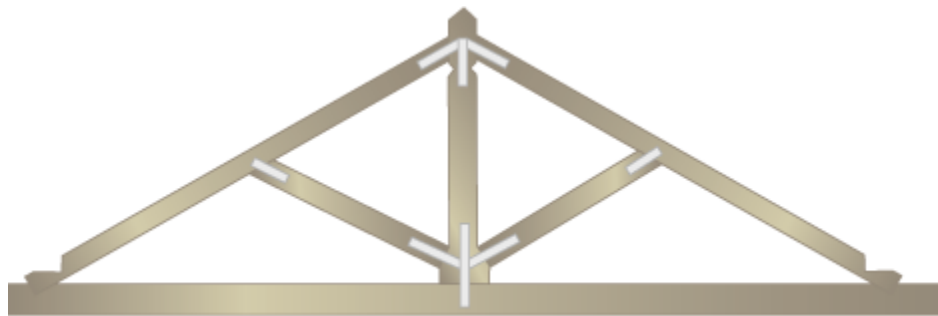
when the wind classification changed, the size of the beams, columns, roof trusses need to be changed. The screen size of the window need be smaller if it is necessary. The brick veneer wall design may change to render wall. And the bearers, floor joists, roof tiles and timbers for a conventional roof frame may need to change as well.

Bracing: need bracing for more areas.

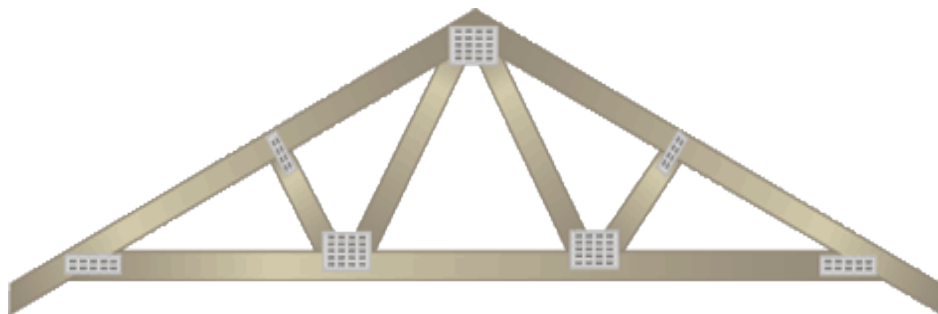


3. Change of stress due to a different material

Different materials have different weight and elasticity. when the material changed, the size of the columns, roof trusses need to be changed. The concrete slab and footing need to re-consider. The bearers, floor joists and timbers for a conventional roof frame may need to change as well. Bracing: need bracing for more areas. When using cable for cross bracing, it is necessary to use two cables to stabilise the structure against lateral forces from both directions. One cable will work effectively in tension while the other would just buckle. If rigid bracing is used, a single brace will stabilise the structure.



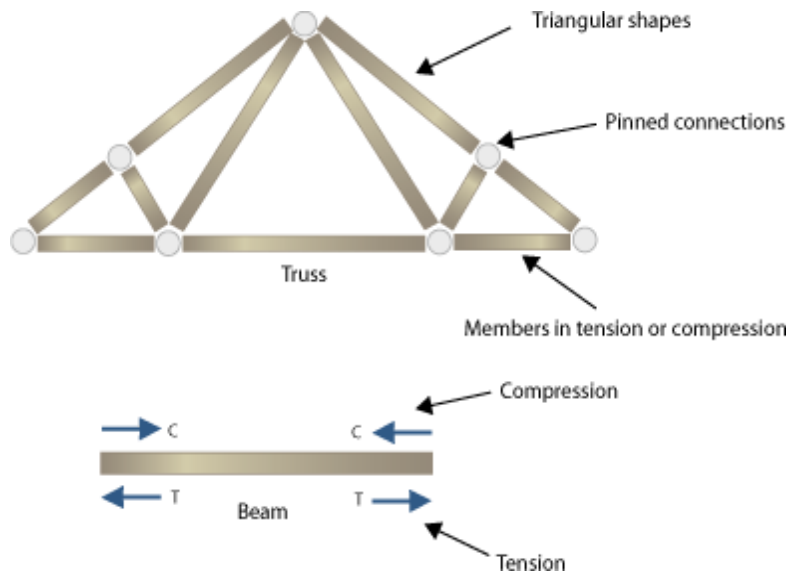
Architectural truss



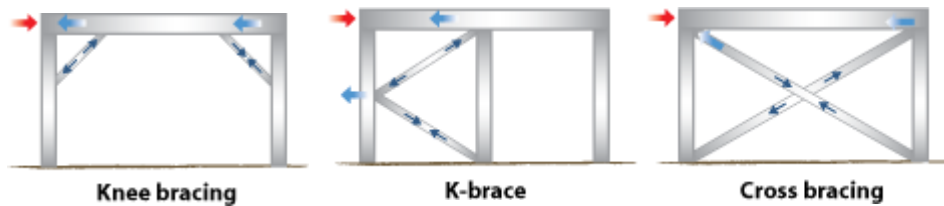
Gang nail truss

4. change of cross-sectional shape

Re-consider the position of the beams, columns, roof trusses.



Bracing: need bracing for more areas.



Conclusion

In conclusion, this assessment demonstrates the result of research and evaluate structural elements

Reference

- <http://vicash.com.au/wp-content/uploads/2017/05/AS-1720.1-2010-Timber-structures.pdf>
- <https://www.qbcc.qld.gov.au/sites/default/files/QBCC%20and%20Timber%20QLD.pdf>
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