

Truss Solutions for Curved Roofs

David Reid, BE(Civil) M.IPENZ, Dip Bus, Technical Services Manager, Gang-Nail Group Ltd

Introduction

In New Zealand there is a current trend towards designing buildings with curved roofs. There are two methods for forming these roofs in a cost-effective way using timber trusses. For buildings with a curved roof and curved ceiling, **curved Posi-Strut trusses** are used; for a curved roof and a flat ceiling, **“bowstring” trusses** are used.

Curved Posi-Strut Roof Trusses.

A curved parallel chord truss is formed with timber chords bent to the required radius and webbed with Posi-Strut metal webs, effectively locking the curve in place. This forms a smooth clean curved roof and ceiling line. The chords are formed from 100x50 or 75x50 timber for trusses with a radius greater than 12m, and a double 100x25 chord for radii down to a minimum of 5.0m. If the trusses are set out at a maximum of 600 centres, the ceiling can be fixed direct to the bottom chord. The trusses are designed to be stiff enough to minimise horizontal deflections. For this reason curved Posi-Strut trusses can't be selected from the Posi-Strut Selection charts and require special design.

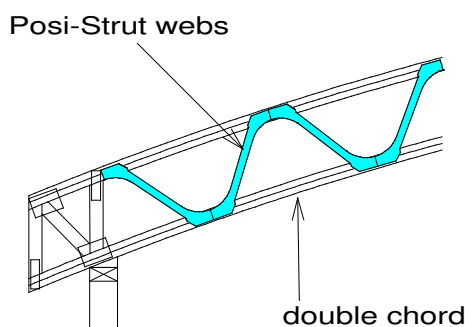


Diagram 1 - Typical curved Posi-Strut detail

Maddren Timber completed this large curved roof for a garage in Kumeu.

The Gang-Nail Design Office designed the roof arch of PS25 Posi-Strut with framing to form north light windows. In order to bend the chords to the 6m radius double 69x22 chords were used.

The builder and owner were rapt with the result. The builder, Ron Hepworth, said that he framed the roof by two men in one day and he found the Posi-Strut simple and lightweight to use.

Similar curved roofs have been constructed from Posi-Strut for other residential and commercial projects.

Photos 1 & 2 – Caption - The curved Posi-Strut forms a smooth clean ceiling line, ideal for fixing the ceiling to.

Bowstring Trusses

Bowstring trusses are formed from a sequence of sloping top chords, adjusted so that when the purlins are fixed, a smooth curve is formed. A flat bottom chord provides a flat ceiling.

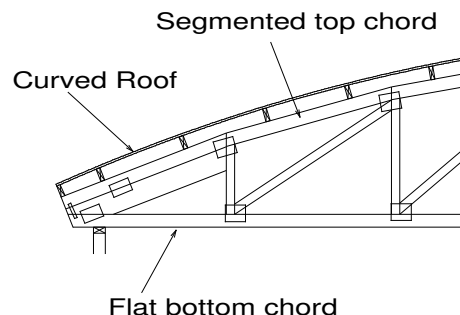


Diagram 2 – Detail of typical bowstring truss.

The architects for the Georgie Pie restaurant chain, Aston Mitchell Architects (now Roberts Mitchell) wanted to create a unique look that resembles the crust of a pie. In order to do this bowstring trusses were used.

The Gang-Nail Design Office was employed to design the trusses, which were designed and detailed on Gang-Nail's proprietary truss design software, MiTek 2000™. The software generates accurate cutting details for each stick of timber. The open web design of the trusses enables services to fit into the roof space and be supported by the trusses.

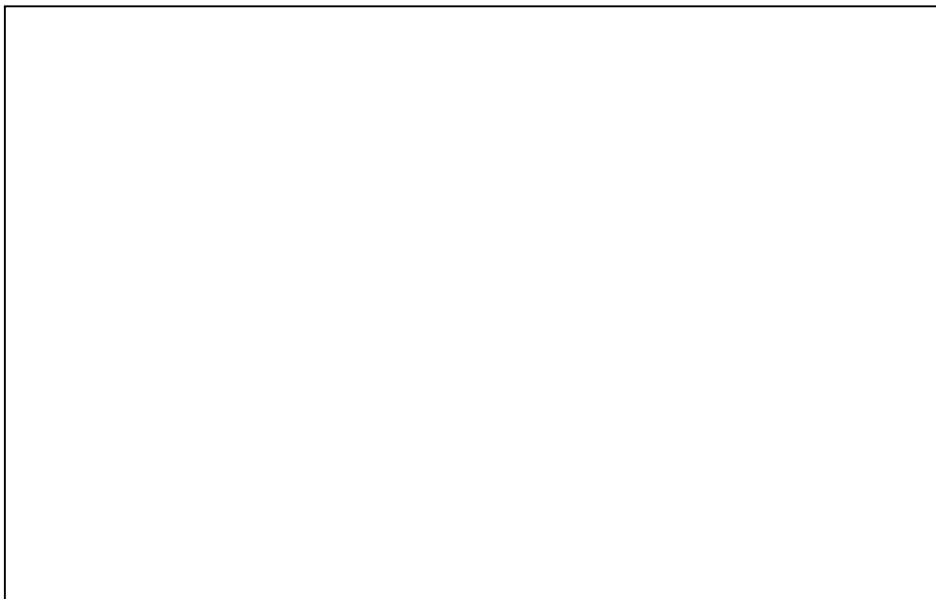
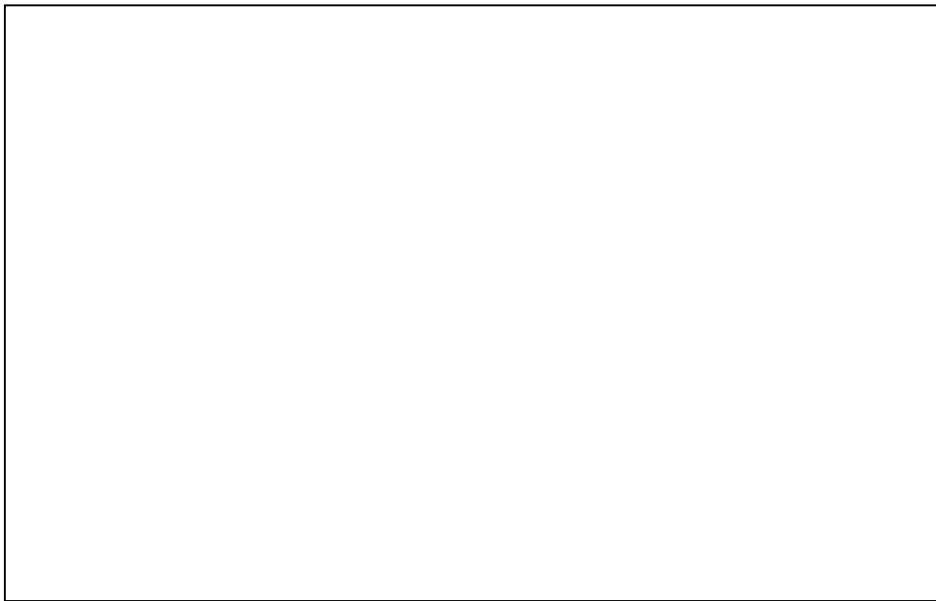
The project pictured is the New Lynn restaurant, which was fabricated by PlaceMakers Manufacturing. Hans Neunzerling, formerly of

PlaceMakers, said that the 15m trusses required a few hours to set up and make on their 40 tonne Gang-Nail lever press, but it is always interesting making something different like this.

Photos 3 & 4 – Caption - Georgie Pie restaurant using bowstring trusses, showing the flat bottom chord and segmented top chord.

Conclusion.

Photographs 1 and 2



Curved Posi-Strut and bowstring trusses provide an effective and economical solution for curved roofs and have been used on both residential and commercial projects. Fabrication is readily available throughout New Zealand through licensed Gang-Nail fabricators.

References

Gang-Nail Designs Ref 5470, 6401
Posi-Strut Truss Selection Manual

Photographs 3 and 4

