

# SIMPLIFYING CURVED ROOF CONSTRUCTION: CUTTING COMPLEXITY & COST



## INTRODUCTION

Introducing a curved element to the roof of a project was once a feature predominantly in coastal style Australian architecture. With popularity of this spreading to inland and regional areas of the country, this can no longer be said.

Historically, in Australian construction, curved roofs are an aesthetic beauty though they can be an engineering undertaking. The curved shape is pleasing to many, and can be altered in many ways, incorporating different concave and convex elements to form differing profiles.

Traditionally, curves have been formed using stone, wood, steel or concrete. In modern times, constructing curved roofs are achieved by either cold rolling structural members, spring-curving over segmented trusses, or LVL joists over a curved top plate, amongst other methods. Some enable curved, vaulted ceilings, others do not. All are complex, time consuming methods to construct a curved roof.

A curved roof will give your design that bespoke, architectural look you may be after, though it is quite important to bear in mind that using time honoured, traditional methods can add complexity, time, and most importantly, cost, to your project.

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## DO MODERN METHODS PROVIDE COST EFFECTIVE ALTERNATIVES?

In short, yes. Improvements and innovation in building product technology are paving the way to allow design flexibility in light weight construction, while providing a highly insulated, cost effective system.

Formally known as Ritek Roof Systems, Arcpanel are at the forefront of curved structural insulated panel systems (SIPs). Their Custom, Ecotek, Aquatek, and Firetek panel can all be made to form single and multi-curve (concave/convex) options, bullnose, elliptical, and straight/curved configurations.

Take their Custom Panel for example. The orb profiled top and bottom sheet of the panel lends itself to forming curved configurations while naturally forming the much-desired vaulted ceiling to create a sense of space.

In most instances, the term SIPs are associated with ply or particle board panel systems. Arcpanel systems incorporate profiled steel and EPS-FR to form lightweight insulated panels that can span and cantilever huge distances, 12.5m spans and 4.5m cantilevers can be achieved. Add to this the ability form complex curved profiles, the Arcpanel Custom Panel can provide near limitless options and design flexibility.

Utilising panel systems such as the Custom Panel can replace the need to introduce cold rolled structural steel elements and the like. The ability of the panel to span in the direction of the curve provides an opportunity to rid the structure of the curved members, the structural design can be simplified as much as a series of level, parallel supporting members or walls perpendicular to the direction of curvature at the same or differing heights as required. This degree of simplification in building methodology can reduce materials, labour, construction time and hence cost. The proposition of introducing a curved element to your design starts to seem not so daunting or costly after all.

The panels used in their unlined state provide a contemporary architectural feature, replacing the roof, rafters, insulation, ceiling, and soffit linings, and provide a prefinished product that requires little maintenance by the end user other than the occasional wash down of surfaces not naturally washed by the natural purging action of rain.

Just like the multitude of straight panel products available today, the curved Arcpanel systems are designed to increase the speed of construction with less trades required onsite. A traditionally framed curved roof, finished and lined requires upwards of 7 different trades and weeks to complete. It's not uncommon for a curved Arcpanel roof to be installed, flashed, and finished in a day or two. Should the orb aesthetic not appeal or suit the brief, a plasterboard ceiling lining is easily introduced. This does add cost (and trades) back into the project however not enough to negate the benefit of enlisting the use of such a system.

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## PLANNING IS KEY IN GETTING IT RIGHT

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Whether a curved roof is constructed using traditional methods, or by using systems such as Arcpanel, planning is the key to success. For either method to be successful, it is critical that the beam and wall heights are correct. With a bit of time spent, a maths whiz with a scientific calculator can work this out. Alternatively, this can be modelled using a CAD or 3D BIM modelling program.

Earlier we spoke about forming a curved roof by attaching a curved panel system on a series of level, parallel supports, at differing heights where required. Just as with conventional methods, getting the support heights correct is critical.

The team at Arcpanel are acutely aware, panels are only as good as the structure they are attached to. If the members are not level and parallel where they need to be then the panels will not fit, or the mistakes in structure are magnified in the cantilevered roof edge. It's for this reason the Arcpanel team work with their client, taking the DWG file or Revit model of the project, panelise the roof and establish the wall and beam heights in accordance with the required RL's. These heights are then refined to work with the plan measurements taken on site by the client once the slab or floor frame is constructed.

Doing this ensures success once the panels arrive onsite and are nervously placed up on the supporting structure for the first time. If the heights are correct and the structure is level, parallel, and perpendicular where needed, once the first panel is placed correctly, subsequent panels are easily fixed in place with the occasional check for parallel to ensure a quality finish.

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“If the supports are level and parallel where they need to be, and the first panel is parallel where you need to end up, it's pretty hard to get it wrong!”

## CONCLUSION

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Time honoured construction methods are by and large proven and industry accepted, but does that mean that we cannot or should not challenge convention? If we look to Arcpanel as an example, the answer to this question is without doubt yes, we *should* challenge the norm.

Utilising **ARCPANEL** curved structural insulated panels reduce or eliminate the need for curved structural members, reduce the amount of overall structure, and provide a prefinished, insulated solution that is quick to install.

**ARCPANEL** systems are rigorously tested by leading testing authorities and are CodeMark certified to provide peace of mind for all project stakeholders. The **ARCPANEL** systems are custom manufactured per project. If you would like to explore the use of their innovative panel systems for your project, they can be contacted on 1300 200 004 or [info@arcpanel.com.au](mailto:info@arcpanel.com.au).



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