Case Study - Applying the Details - Mockup and Reality

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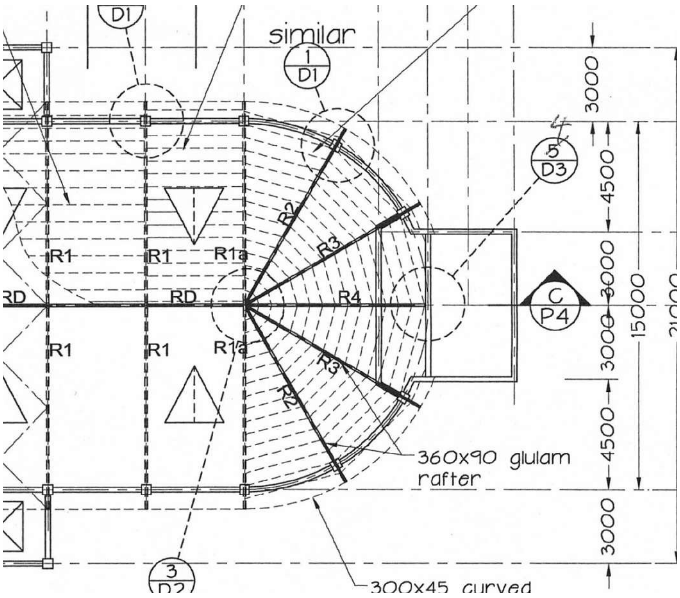
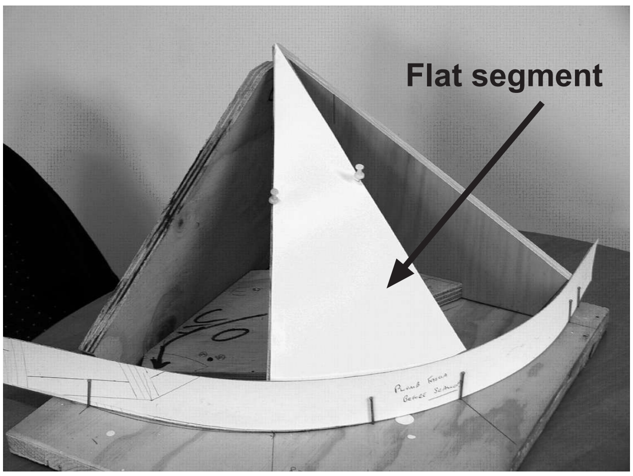
Segmented Domes & Radiused Eaves

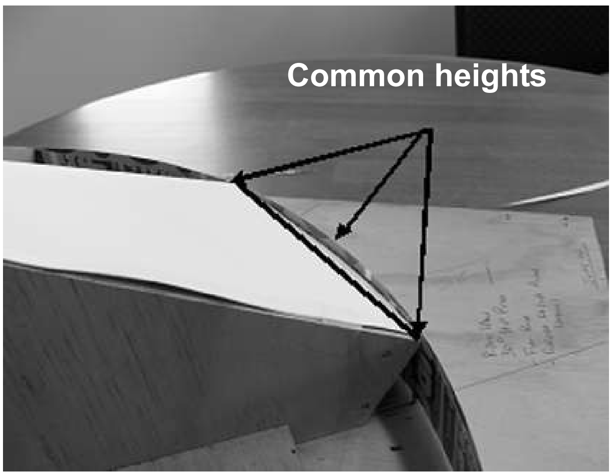
Developing three dimensional frames from two dimensional srawings can lead to installation problems especially where curves are involved and angles are not 90 degrees. Successful construction requires careful attention to detail. With a couple of case studies this note illustrates how some challenges in making the details work can be overcome.

1. Domes with segmented ends and radiused eaves.

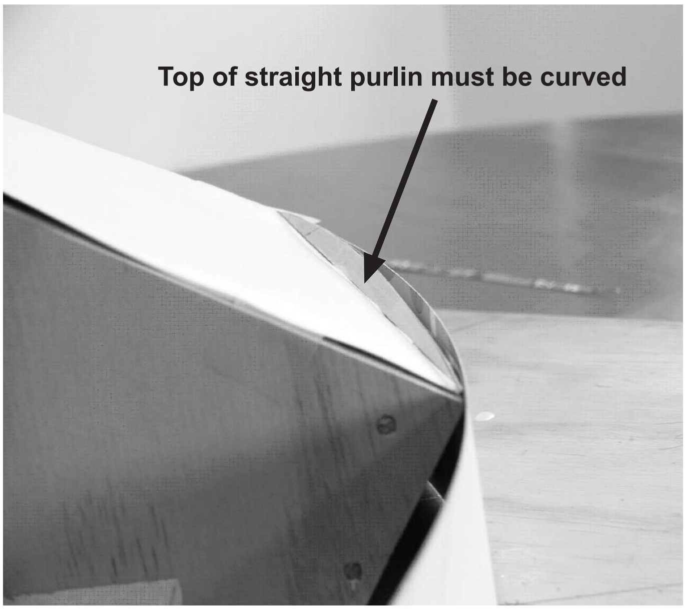


Construction Drawing

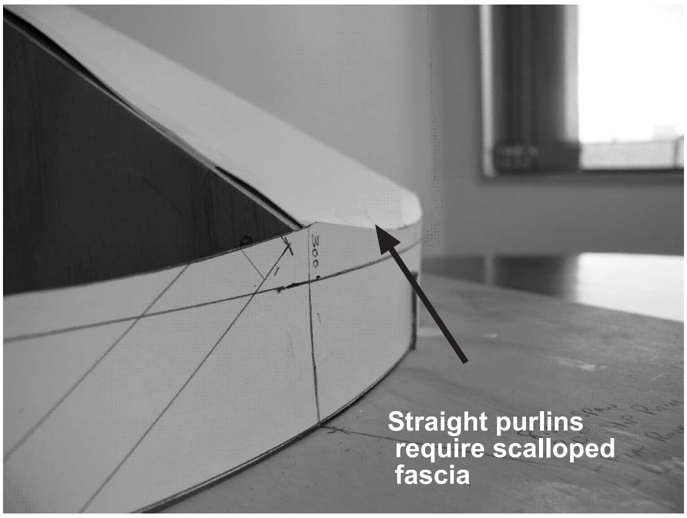




This model shows the challenge. When standard, straight parallel purlins are used, the last purlin connecting the ends of the rafters forms a straight segment. Because the eave or fascia is horizontal and curved in plan, the roof plane will extend further down from the last purlin at the mid point between the rafters. This means that the line of the edge of the segment will be lower in the middle than at the ends.



In order to achieve a common plane between the roof shape formed by the purlins, and the horizontal line of the fascia, the top of the purlins must be cut to a curved shape.

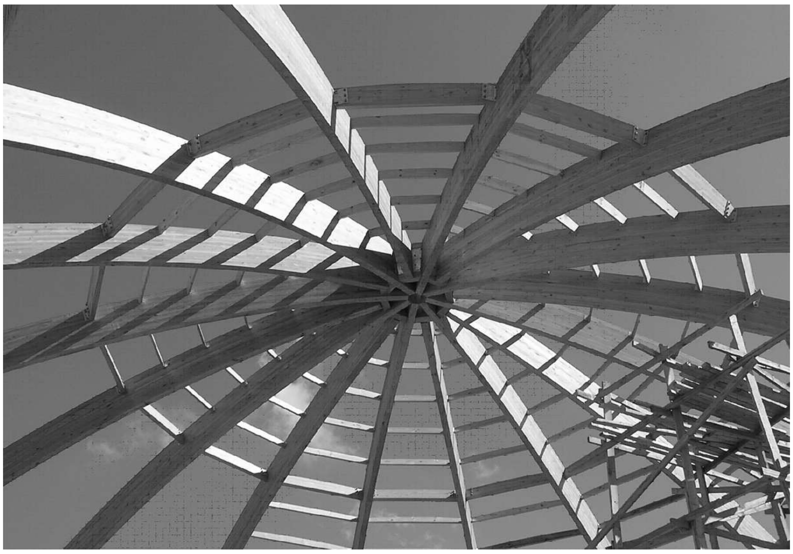


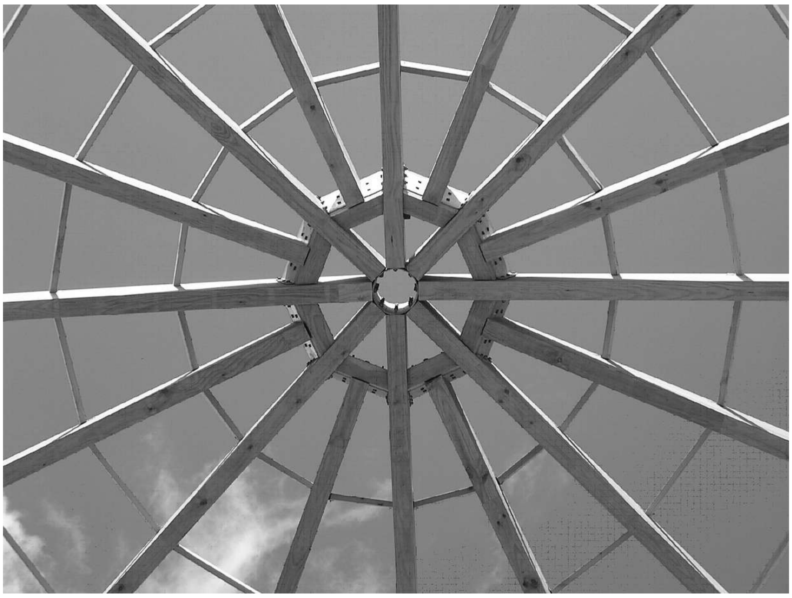
The fashion for domes with curved eaves strikes a snag when the option is made to use straight purlins. The straight plane between the curved arches means that when the flat segment is extended out to meet the radial eave beam the mid point of the segment is lower than the intersection point of the arches with the eave beam. This produces an unwanted scalloped eave line i.e. the vertical fascia will have a scalloped elevation.

For this pitched roof example with 7.5m radius and three segments, a fascia with a depth of 300mm could be reduced to a depth of 130mm at the mid point.

The most effective solution is to cut a curve to the top of the straight purlins to maintain even heights in a horizontal line.

2. Detailing the junction of 16 radial arches at a central apex can prove challenging. A further detail illustrated in this case study is the compression apex fitting. With 16 rib members all fitting at the crown, this can become over crowded and clumsy.





So in this case this has been simplified at the introduction of blocking bridges reducing the central junction to 8 members. They fit into a steel compression ring using studs prefitted into the ends of the Glulam ribs.This creates a secondary bridging ring and in this project produced an attractive central focus feature for the structure.

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