Constructing a Geodesic Shade House

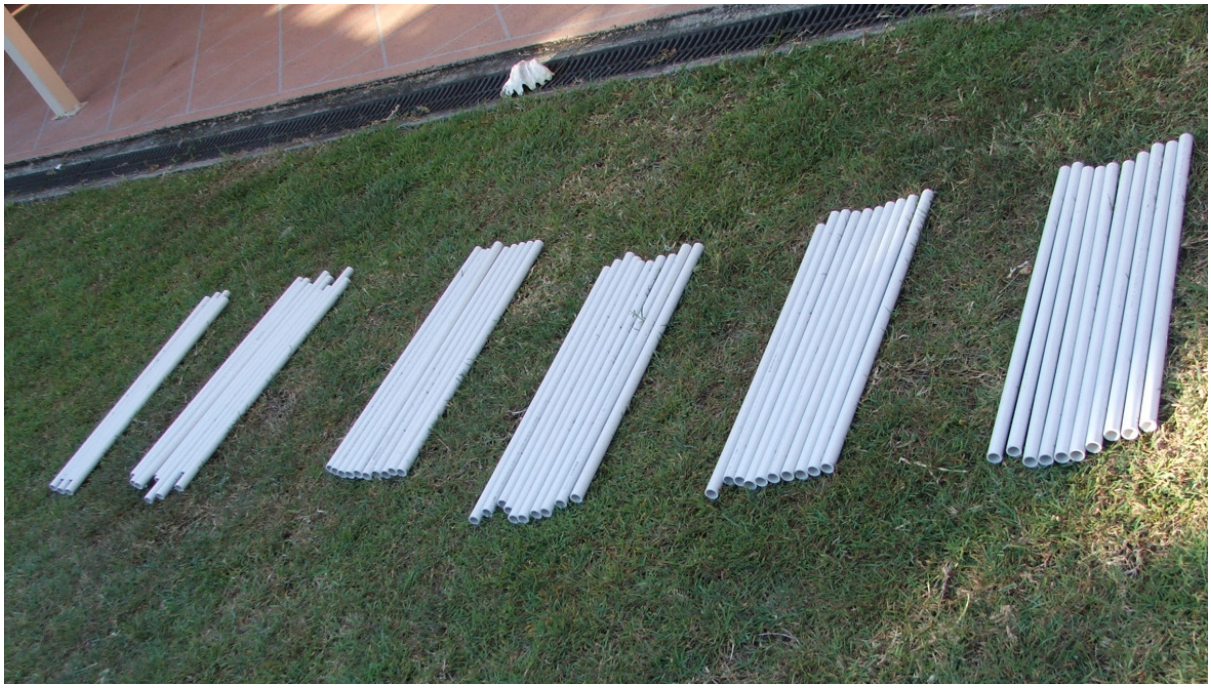
We had need of a shade house to protect our orchard collection. After a bit of research on the web, we decided to opt for a geodesic construction because it was light weight, durable and strong. It was also portable if required.

Many thanks to Tara Landry of http://www.desertdomes.com/domecalc.html for providing the dome calculator and making construction much easier.

We decided on a 3V, 3 meter diameter, 5/8 sphere for our shade house. This would be lifted by a few rows of concrete blocks to give us the walk in height we required. As it would be a damp environment, so we required durable and water resistance construction material. We selected 20mm grey PVC electrical conduit for the struts and 6mm stainless steel bolts for the fasteners. Larger structures could be built using this method, but pipe diameters would have to increase in proportion.

Pic1 – Raw material before starting.

The desert domes calculator provides the fixing to fixing length of each strut. This is the distance between joining bolts. Each strut was cut 30mm longer than the calculated value to allow 15mm on each end for a bolting surface.



Pic 2 - All struts cut to length.

In order to join the pipes neatly, it was necessary to flatten the ends. A flattening jig was built from some scrap metal and a hinge. This made the process quicker and gave each end a consistent look.

Pic 3 – End flattening jig.

A second small holding jig was built to make sure that both ends were in line

Pic 4 – Ensuring both flattened ends are parallel to each other.

To soften ends before flattening, a few methods were tried. The simplest proved to be placing the ends in boiling water.

Pic 5 – Softening the conduit ends before flattening in the jig.

Dome construction relies on the centre distances on the struts being accurate. This can be achieved by many careful measurements, or by making a drilling jig to speed up the overall process.

Pic 6 – First end drill jig.

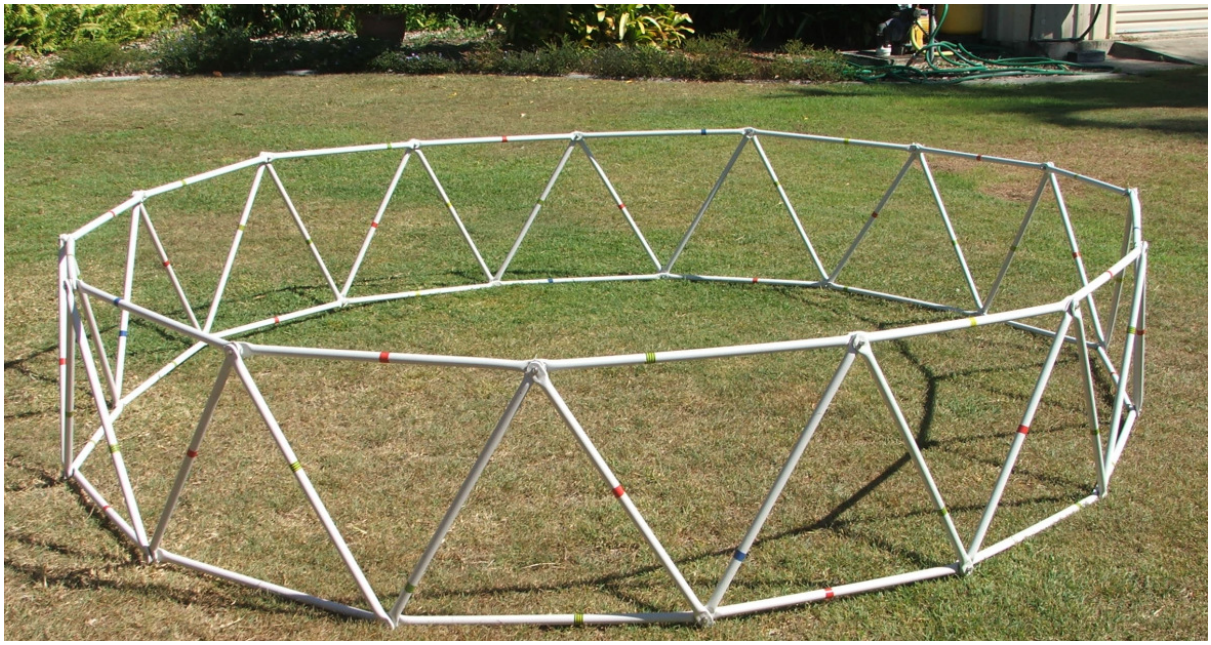
Pic 7 – Drilling all one end of the struts.

Note that different coloured electrical tape was used to differentiate each of the three lengths of strut.

Because continuous accurate measurements are tedious, a second end length jig was set up for each of the strut types. This kept up the accuracy and improved construction speed.

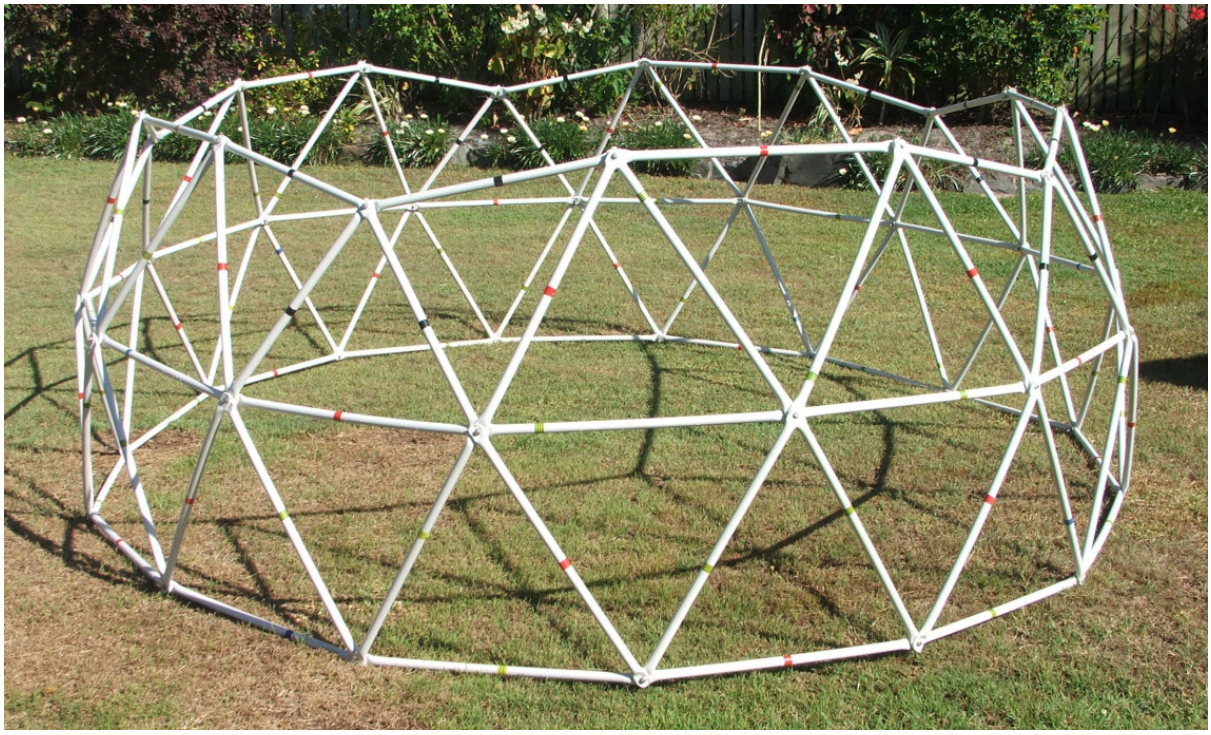
Pic 8 – Second hole length jig for accuracy and speed of manufacture.

With all of the struts built it became a simple job to bolt them all together. Note each of the different strut lengths are colour coded.

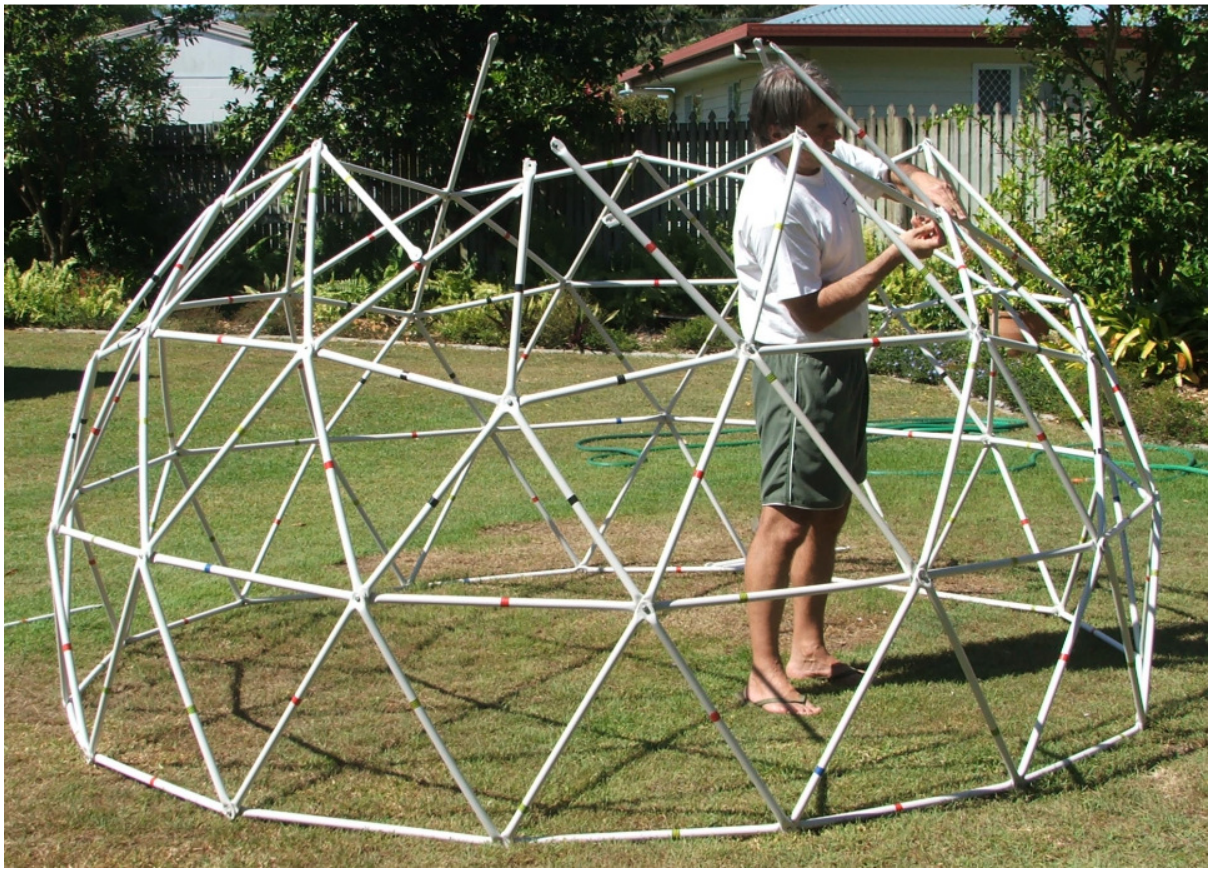


Pic 9 – Bottom row of the 5/8 dome.

Note that at this stage the structure is quite flexible. It does not achieve stiffness until all of the struts are in place.



Pic 10 – Second row in place.



Pic 11 – Just keep adding struts.

Pic 12 – Structure complete and rigid

Pic 13 - Cutting shade cloth into triangles. Sown using sail cloth thread on a home sewing machine.

Pic 14 – Shaded dome with a few struts modified for an entrance.

Pic 15 – Block wall base for dome to sit on.

Pic 16 – Content orchids.