DIY Geodesic Domes Tipsheet 50p

Dome structures are simple to build. All you need is a few tools, some wooden poles and a canvas sheet. This DIY guide shows you how.

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Domes are inspirational and spiritual structures; for many centuries they have been places of worship. The first dome to use modern materials such as lightweight steel and thin shell concrete was built by Doctor Walter Bauseford in 1922, but it was pioneering American designer R Buckminster Fuller who brought the principles of dome building to a wider audience.

Buckminster Fuller envisaged his domes as factory made standardised units available to a mass audience. He saw domes as the building blocks of the universe, believing them to be the purest form of construction; hence, people who lived in domes were more in touch with the universe.

In the 1960s and 70s a number of communities took on Buckminster Fuller's ideas and created homes housing up to thirty people. Contrary to Fuller's vision, however, these structures were makeshift, individualistic responses to their own housing needs. The new wave of domes used a chaotic mélange of materials, including a lot of scrap – old car parts, bamboo, wood, plastic, aluminium, steel. These domes were cheap, quick to construct, and made optimum use of limited space.

What this construction demonstrated was that while domes can be built on a large scale by engineers, they can also be created on a small scale by those with no construction training whatsoever, with plenty of scope for self-expression.

There are probably as many different dome designs as there are dome builders. This is partly because size, geometry, designs and coverings can be modified according to the raw materials available.

The design shown here, though not as grand as the ones developed by Buckminster Fuller, still uses the same basic geometric form. It is simple to build and easy to dismantle. Depending on the type of covering you use, this design is suitable as a temporary or semi-permanent dwelling. This particular dome design should be nearly as portable as a large tent. It is well suited to camping holidays and festivals. Further, there is scope for design modification. The design encourages the use of materials which are either recycled manufactured products or natural materials.

The essentials

To build your own dome home you will need the following:

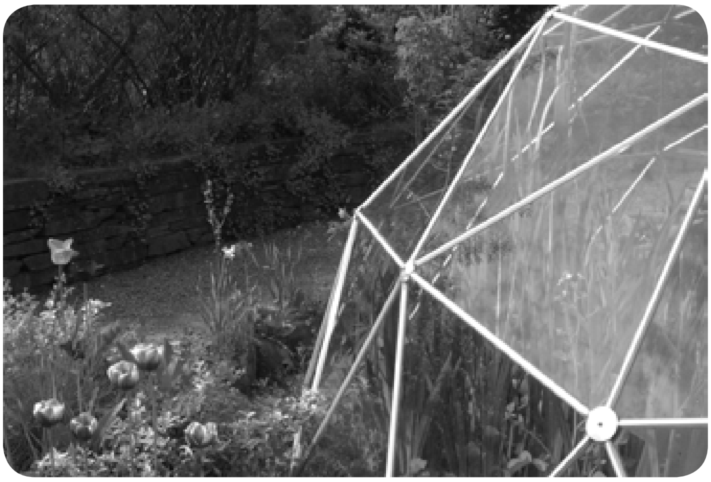
- **Time:** about a day (although it will only take about an hour to put up and less to take down).
- **Equipment:** drill and drill bits, tape measure, protractor, hand saw and a vice (not essential but will make construction more accurate, particularly when drilling the holes).
- **Materials:** hazel poles or broomsticks, about 20mm (¾") in diameter, 1.5m (5') of 130mm (5") alcathene gas pipe and 260 split pins. These make it easy to erect and take down your dome.

Preparation

Step 1. Cut 35 poles to exactly the same length: 1050mm-1200mm (3'6"-4') would give even tall people adequate headroom. Do not cut them shorter than 900mm (3') unless building for children; and 1200mm (4') is probably the optimum length for the strength of materials and joints used in this design.

Step 2. Saw 30 more poles, which must be 11% shorter than the long poles. For example, if you cut the long poles to 1200mm (4') then your shorter poles will be 1070mm (3'6").

Step 3. Cut the alcathene gas pipe into sections 50mm (2") long to make the joints. You will need 26 joints in all.



Now you need to drill holes in the joints to hold the ends of the poles. The holes will need to be fractionally larger than the poles you use. For example, if you use standard household broomsticks which are roughly 20mm (¾") thick, holes will be cut to just less than 25mm (1") in diameter. This will ensure enough 'give' in the joints to create the angles necessary in dome building. You must make precise measurements. Be consistent, regardless of the dimensions you decide upon.

You need ten 6-hole joints, ten 4-hole joints, and six 5-hole joints:

Ten 6-hole joints: use the drill to cut six holes at 60° intervals around the cross section of pipe (see fig. 1).

Figure 1: *6-hole joint from above*

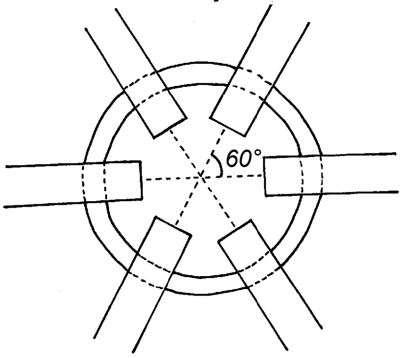
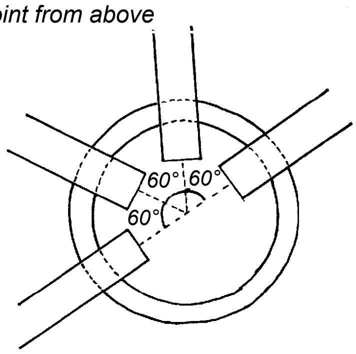
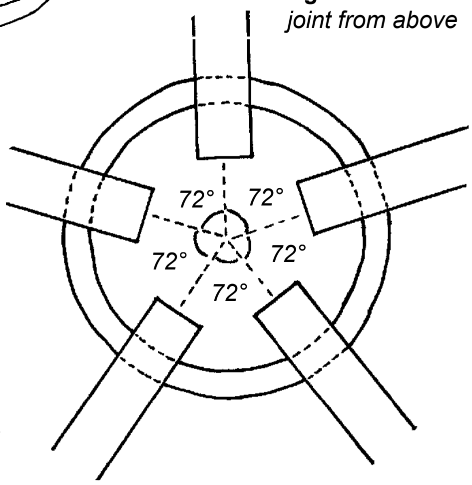


Figure 2: *4-hole joint from above*



Ten 4-hole joints: with holes cut at 60° intervals around half the cross section (see fig. 2).

Figure 3: *5-hole joint from above*



Six 5-hole joints: with holes cut at 72° intervals around the cross section (see fig. 3).

Assembly

Step 1. Assembling a prototype:
Take one 5-hole joint and slot in five of the smaller poles (see fig. 4).

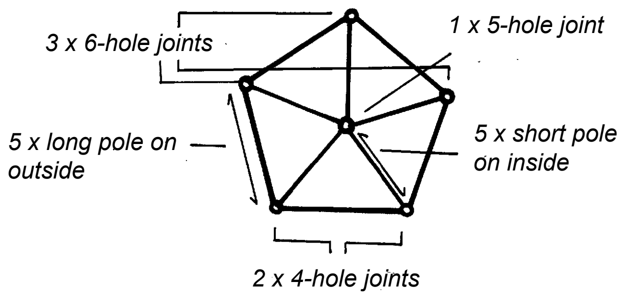
Put two 4-hole joints at the base of the pentagon and slot three 6-hole joints onto the upright poles as shown in fig. 4.

Step 2. At this point, measure where the holes need to be drilled in the poles either side of the pipe. Depending on the thickness of the pipe, this will be about 25mm (1") from the end of each pole and again about 25mm (1") further along the pole.

Once you have marked the poles, dismantle the pentagon. Sort the poles into two piles – long and short. Drill two holes in each end of every pole.

It is vital that each hole is drilled in exactly the same position on every pole.

Figure 4: *Pentagon*



Step 3. Reassemble the pentagon and fasten the joints by inserting the split pins (see fig. 5). Build from the middle outwards following the pattern shown in fig. 6.

Covering

For this particular design, the best cover seems to be a single tarpaulin large enough to cover the complete frame in much the same way as a 'bender'. Experience has shown that covering a dome in individual sections leads to problems with leaks and drafts, unless you can afford to employ a tent maker to weld forty sections of plasticised canvas together – an effective but expensive method of covering.

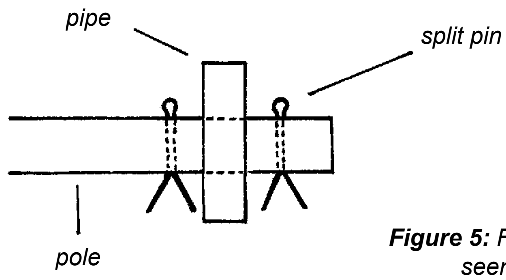


Figure 5: *Fixing for joints seen from the side*

Other covering materials have been used with some success: polythene (much cheaper but more prone to condensation than canvas tarpaulin); glass, perspex, or metal sheets cut to the size of the individual triangles; concrete; wooden tiles; polyurethane; and even vinyl LPs. However, for health and environmental reasons it is best to use a minimal amount of plastics.

Providing low-cost shelter, domes meet basic housing needs. Built using the appropriate materials, they make ideal greenhouses, children's climbing frames, or whatever else your imagination can invent! Much larger and more robust structures can be built using different materials such as scaffold poles flattened at each end and secured together with strong bolts. To build on a grand scale you need more heavy-duty equipment: an industrial drill bench, a large vice, and a forge to melt the metal.

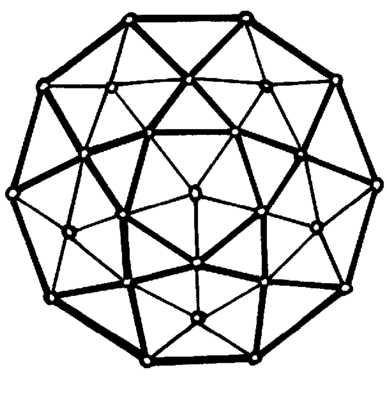


Figure 6: *Geodesic dome from above. Six pentagon design: the thick lines represent long poles, thin lines represent short poles.*

Photos by Allan Shepherd and Chris Ford