Domestar V3 3/8 KRUSCHKE: Assembly guide

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Domestar FAQ

3V Kruschke geodesic dome assembly video 3/8

Welcome to the assembly instructions for the geodesic dome using DOMESTAR Frequency 3 3/8 KRUSCHKE connectors. If you have any questions, click on Contact to get in touch with me: I'll be happy to help you.

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Materials required

- Set of 46 KRUSCHKE DOMESTAR Fréquence 3 3/8 connectors
- 120 wooden uprights (joists) in 4 sizes (see size calculation table below)
- 240 bolts: screws and nuts. I strongly recommend TRCC bolts (round head, square neck): one blow from a hammer and they'll stay locked in the wood and won't turn when you tighten them
- For the finish, use between 120 and 240 wood screws, size 5×50 or 5×40

What is "Kruschke"?

Kruschke in "Dome 3V 3/8 Kruschke" means a dome with a flat base. The classic model does not have a flat base, but the Kruschke model does. The 2 models require the same number of connectors and uprights, but the Kruschke model needs 4 different lengths of uprights whereas the classic model only needs 3.

The difficulty of construction is similar. On the other hand, the Kruschke model has 6A connectors where you really mustn't go the wrong way (I'll talk about this later, so be careful!)

Tools required

- something to cut the uprights: ideally a radial saw, otherwise a circular saw or jigsaw
- a drill a drill bit the thickness of the screws
- a spanner or ratchet to tighten the bolts, or an impact screwdriver (note: an impact screwdriver is NOT a percussion drill. With an impact screwdriver, you can screw or bolt much more strongly and quickly) or a simple screwdriver
- a hammer to drive in your TRCC bolts.
- depending on the height of your geodesic dome bench or

ladder

Size of your screws and bolts

The bolts must pass completely through the thickest side of the upright and the connector. I therefore advise you to choose a bolt length around 20 mm longer than the thickest part of your wood.

If your bolts are less than 10mm longer, assembly will be much more complicated.
FOR EXAMPLE, if your wood is 40x70mm, you will need to drill through 70mm. So use an 80mm or 90mm bolt.
For thickness, I recommend 8mm bolts (=M8)

I recommend using bolts rather than screws. The assembly is much more solid, as the bolts go through. But above all, dome assembly will be easier.

Choosing the size of your dome

Kruschke's Domestar 3V (=frequency 3) geodesic dome connectors allow you to mount a "frequency 3" 3/8 geodesic dome with a flat base that uses 4 different sizes/lengths of upright. You will need:

- 10 very large X-poles (colour code Yellow)
- 50 large A-pillars (colour coded Blue)
- 30 medium B-pillars (colour coded Green)
- 30 small C-pillars (colour code red)

The size of the uprights will determine the size of the dome. Height, radius and diameter are therefore determined by the length of the uprights.

Explanations:

For a geodesic dome of 3m radius (6m diameter) I must therefore cut:

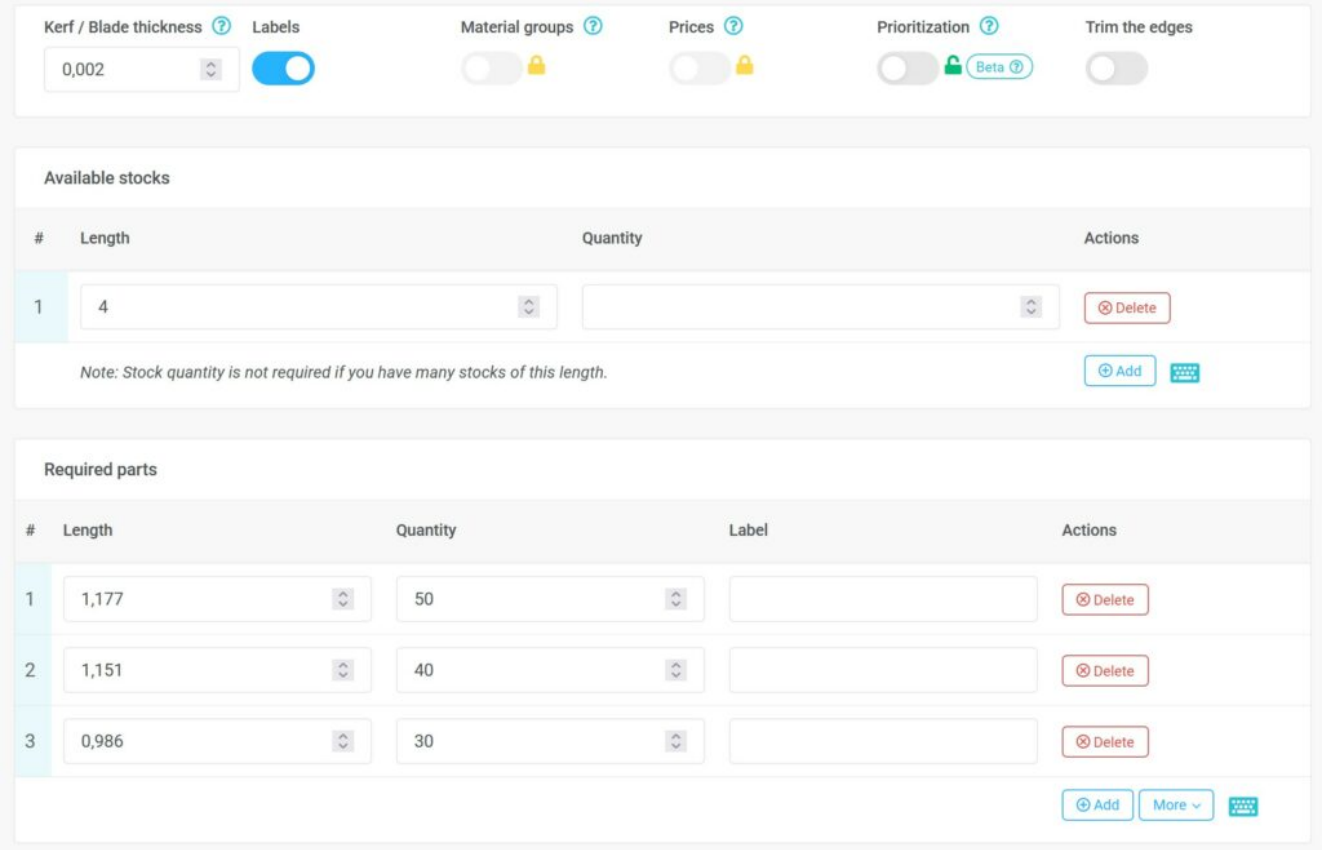
- 10 very large X-pillars of 1.263m
- 50 A-pillars (large) measuring 1.204m
- 30 B-pillars (medium) measuring 1.087m
- 30 C-pillars (small) measuring 0.929m

NB: If you use another geodesic dome calculator, remember that these calculators often give you the measurements from “hole to hole”, i.e. the centre of the connector. However, there is 3 cm between the centre of the connector and the start of the connector leg. This is why the 2 “hole to hole” columns are 6cm longer.

Optimising your wood cuts and purchases

I recommend this free internet application to help you optimise your choice of wood to buy and cut: Optimcutter

Here are the parameters, for example, for a 6m diameter dome (3V 3/8 NON Kruschke), a 2mm board and 4m joists:



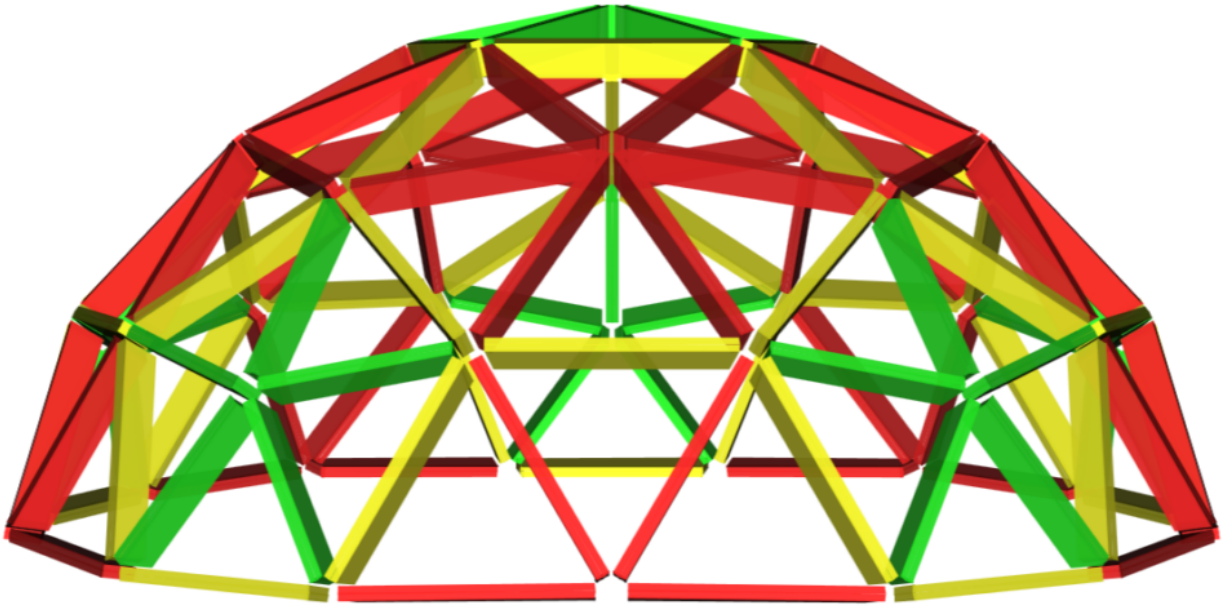
What does the 3/8 in 3 3/8 frequency mean?

Frequency 3 geodesic domes come in 2 formats: 3/8 and 5/8 (sometimes also called 4/9 and 5/9 or even 5/12 and 7/12: it's just a habit! The domes 3/8, 4/9 and 5/12 are all exactly the same).

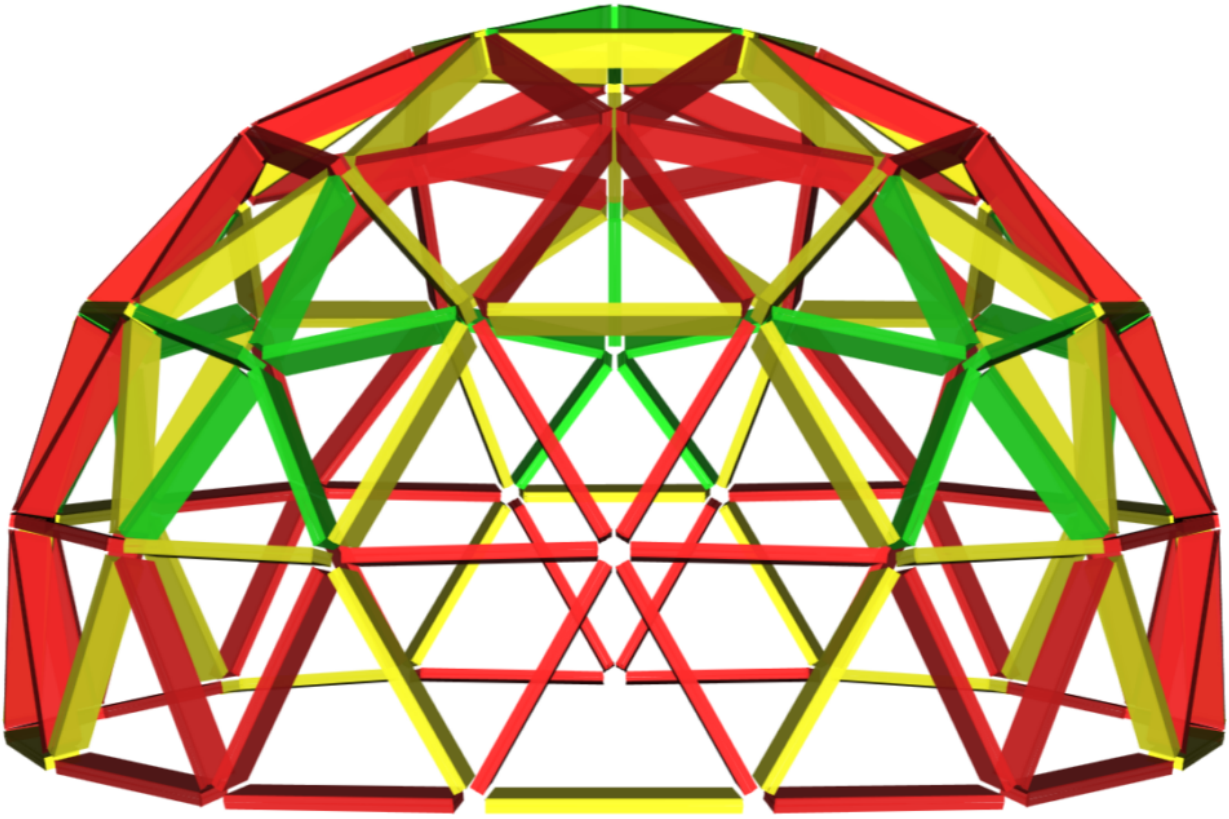
This is the division of the sphere:

- 3/8: a little less than half the sphere
- 5/8: a little more than half the sphere. These domes are one level higher than the 3/8 domes: they are therefore taller.

Here is an example of a 3V 3/8 dome:



And the 3V 5/8 dome:



Which wood should be used for

geodesic dome uprights?

I recommend using construction or decking timber that offers good strength at a fair price.
The MINIMUM length and width of the uprights should be 30mm to ensure the stability of the structure.
Decking joists are very attractive, with dimensions of around 62x38mm or 70x45mm. The joists are also often treated to class 3 or class 4, giving this wood very good resistance to rain.
Construction rafters / half-rafters (on the websites of major building retailers, type in “construction timber”) are often even cheaper and thicker with dimensions of 75×50, but their treatment and rain resistance is often inferior (generally class 2 – this is yellow-coloured wood)

TIP: choose your own wood from the big building stores. Check that the wood is not twisted or warped. Twisted joists will make assembling your geodesic dome much more difficult!

TIP: If you plan to treat the wood, I advise you to do so after cutting the wood but before assembling it: it will be easier to paint/spray the wood flat than once the geodesic dome has been assembled.

TIP: buy a few extra large uprights: they will be needed to support the high levels of the dome during construction.

ATTENTION: if you choose uprights with widths greater than 38mm you may need to bevel some of the uprights: do a test on a 6-point connector with your uprights to see if the ends are not touching. If they do, then bevel them a little.

My experience of fitting the domestar V3

A frequency 3 dome is more difficult to assemble than my domestar V1 and domestar V2: there are many more parts to

assemble and more uprights are levered and therefore require supports during assembly. Here are my recommendations:

- Leave the triangles that do not yet have a support for as short a time as possible: as soon as you have assembled 2 triangles connect them with the belt and continue to add the belt when you add triangles
- 1st floor: absolutely provide a support as long as the belt has not been fitted
- 2nd floor and above to be done by 2 people. Provide supports
- From the 2nd floor onwards, the connectors start to bend under the strain of assembly. But don’t worry: once everything is assembled, the connectors will return to “normal”
- Mark the letters on the uprights CAREFULLY (X; A; B and C): it’s very easy to get the wrong upright. Take the time to check regularly.
- At the end of construction, add wood screws to the small holes in the Domestar connectors. The minimum is 3 screws/connector, but ideally you should fill all the holes to ensure maximum stability. Do not screw in the wood screws until you have completely finished the dome to give the dome room to self-correct during assembly.

Preparing to build the geodesic dome

During this preparation phase we will:

- Cut out the uprights
- Drill all the uprights
- Insert all the screws

Prepare the location for the geodesic

dome

Once you have determined the diameter of the geodesic dome using the table above, make sure that you have enough space for your dome and that this space is flat enough.

Cut out the uprights

You are going to cut:

- 10 very large X uprights (colour code Yellow)
- 50 large A uprights (colour coded Blue)
- 30 medium B-pillars (colour coded Green)
- 30 small C-pillars (colour code red)

Start by cutting out the first upright and checking that its length is exactly what you wanted.
Use this first upright as a template: trace the cutting line on the wood to be cut using this upright. Remember to cut just after the cutting line, not on top of it, to allow for the thickness of the blade.

Bevel some joists if necessary

Depending on the thickness of your joists, it may be necessary to bevel some of them before assembly to prevent them from touching each other on the connector.



More information on bevelling and joist bracing.

Drilling the studs

Now it’s time to drill the studs to accommodate the bolts. Here again, great precision will help you with the installation.

The bolt hole should be 40mm from the end of the upright.

You need to drill through the LONG side of the upright to ensure maximum stability for the dome.

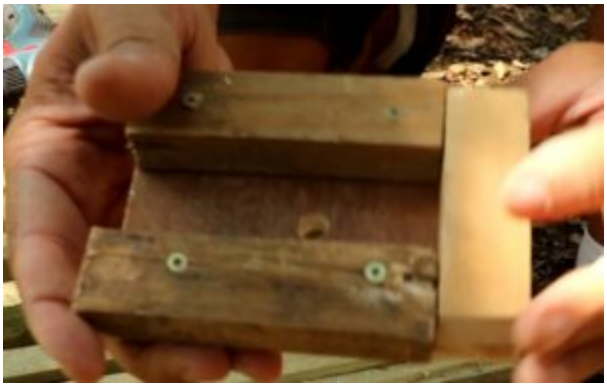
Create a drilling pattern for greater precision

I strongly recommend that you create a drilling template.



Make your first hole very precisely on one side of the first stud.
Mark the side from which your drill bit entered: as you risk not drilling straight through, only the side where you started drilling is accurate. The exit side is likely to be off. This isn’t serious, but to be accurate you need to base yourself on the entry side.
Now turn the upright over and place a small piece of wood underneath. Screw shims tightly against the jamb around this

wooden plate.
Finally, drill the wooden plate through the jamb, entering the drill bit through the EXIT hole.



That’s it, your pattern is ready.



Now finish the holes in the uprights, using your template and trying to drill as straight as possible.

Mark the side where you put the drill bit in: this is the side that will be placed against the connectors, as it is the most accurate side.

Insert the bolts into the holes. Pay close attention to the direction of insertion: insert the bolts through the OUTPUT of your drill bit. This way, the end of the bolt is on the same side as the entrance to your drill bit and this is the side that will be against the connector.
Use the hammer to ensure that the square part of the TRCC bolts penetrates the wood.



Tip: if the hammer isn’t enough, you can use a screw and washer and tighten the bolt so that it goes into the wood.

Presentation of connectors

In your Domestar pack you’ll find 4, 5 and 6-leg connectors.

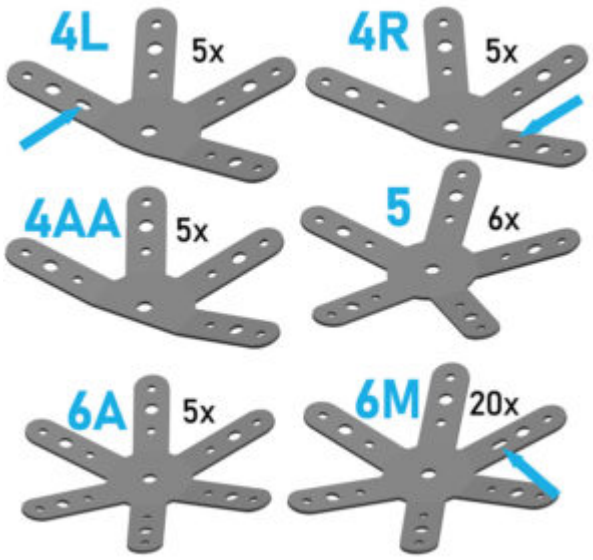
I advise you to start by sorting your connectors:



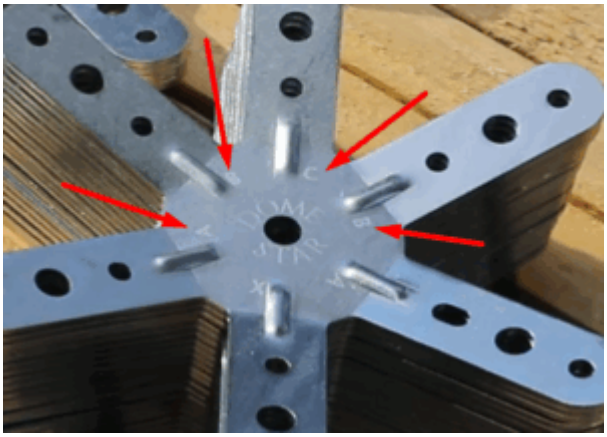
WARNING: there are:

- 3 different types of 4-leg connectors
- 2 different types of 6-leg connectors

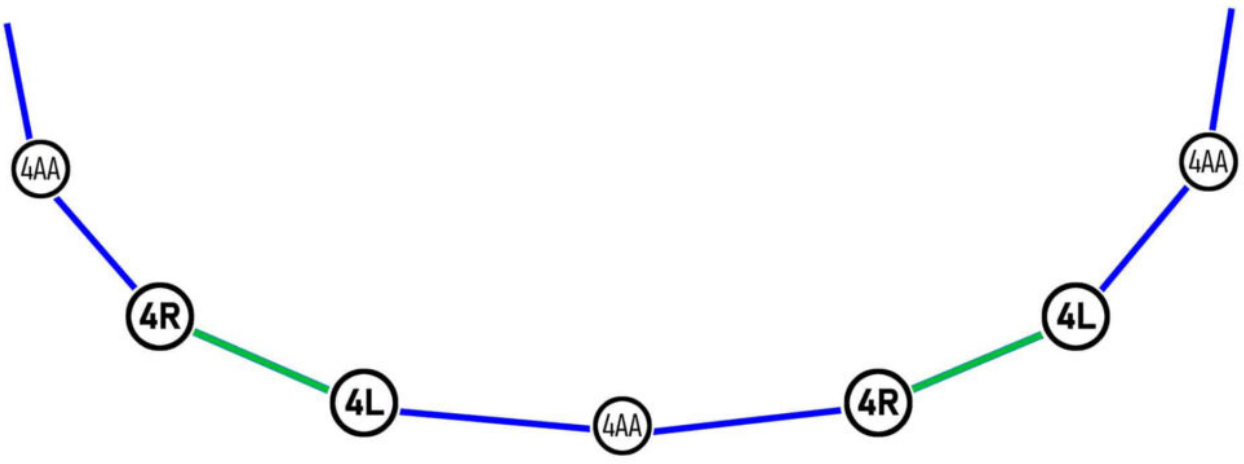
The drawing above shows the distinguishing marks that allow you to tell the difference between the connectors.



Also, each leg has a letter engraved on it so you know whether you need to fit an X, A, B or C strut:



Step 1: the base



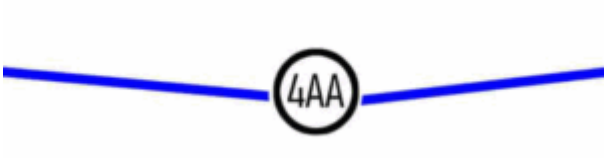
The colour of the lines indicates which amount to use:

- blue: large amount A
- green: medium amount B
- red: small amount C (not used at this stage)
- yellow: very large amount X (not used at this stage)

Parts required:

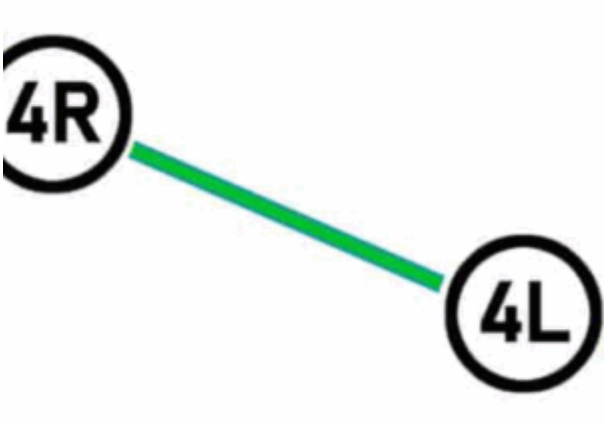
- All 15 4-pin connectors
- 10 A-pillars / blue / large
- 5 green / medium B-pillars

Assemble 5x A-posts / blue / large on either side of the 4AA connectors





Assemble the 4R and 4L 5x on either side of the B / green / medium uprights.

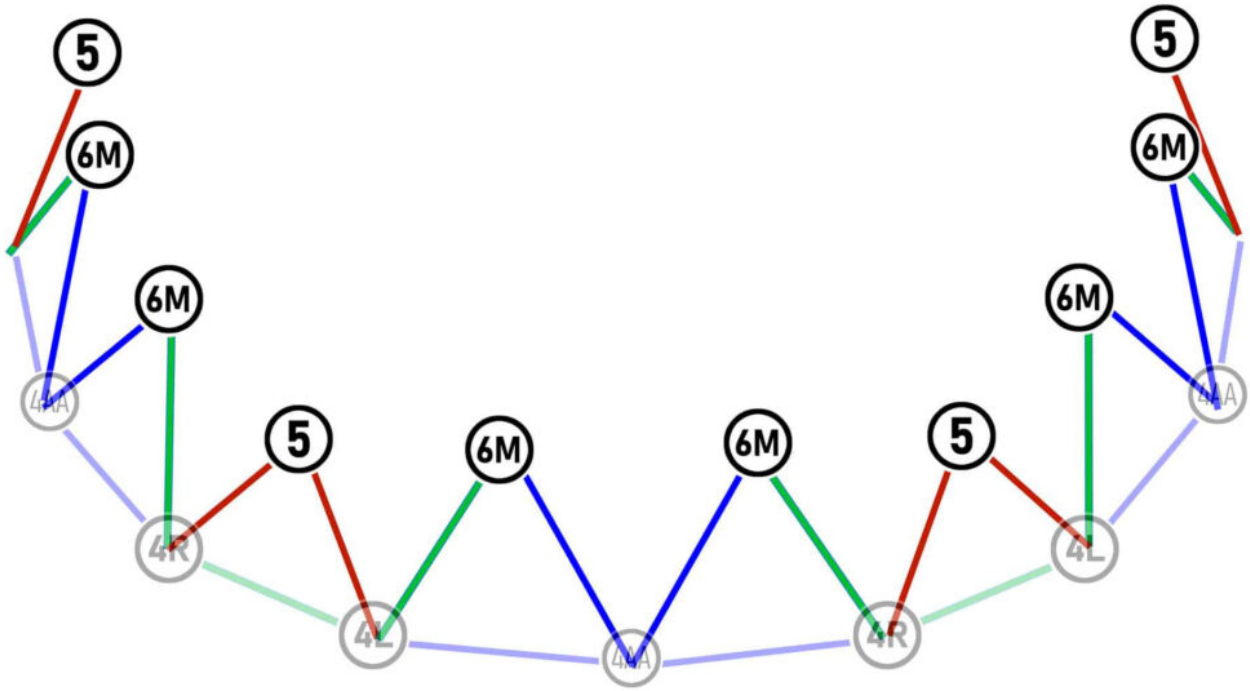




Finally, assemble and screw the base to the floor, alternating our two types of uprights.



Step 2: First level



Parts required:

- 5 x 5-pin connectors
- 10 6M connectors
- 10 A-pillars / large / blue
- 10 B-pillars / green / medium
- 10 C-pillars / red / small

Take 10 small C-pillars and 5 5-pin connectors. Screw 2 uprights to each of these connectors on adjacent branches:



Assemble 5 pairs of uprights with the 6Ms with A on your right and B on your left. The letter X on the 6M connector will be on your right.



Now assemble the last 5 pairs with the 6Ms, but this time with B on your right and A on your left. The letter X on the 6M connector will be on your left.



Preparing the triangles on the base

I’m going to prepare everything on the ground before starting to assemble the first level, so that assembly will go very quickly and I’ll leave the triangles unsupported for as little time as possible.

Place the 5 CC triangles opposite the 4R / 4L connectors (or the B / green / medium uprights) with the connectors facing the ground.



Place the other triangles on the floor, making sure that the uprights coincide with the correct letters: take your time to check that everything is right!



Preparing the first belt on the floor

Still with a view to leaving the triangles unsupported for as short a time as possible, we're going to prepare the first belt on the floor. To do this I'll need:

- 10 C-pillars / small / red

- 5 X-pillars / very large / yellow

Place the C / small / red uprights 2 by 2 on top of the CC triangles: they’re easy to recognise: they’re the triangles with the 5-point connectors and they’re the smallest triangles:



Get into the habit of checking that the letters on your connectors correspond to the uprights you’re going to screw on!

Finally, fit the X-pillars between the 6M connectors:



Screwing on the first level and the first belt

Start with any triangle and turn around the base. As soon as you have made the first 2 triangles, immediately attach the belt upright. Keep going by screwing on 1 triangle, then immediately the belt upright above it.



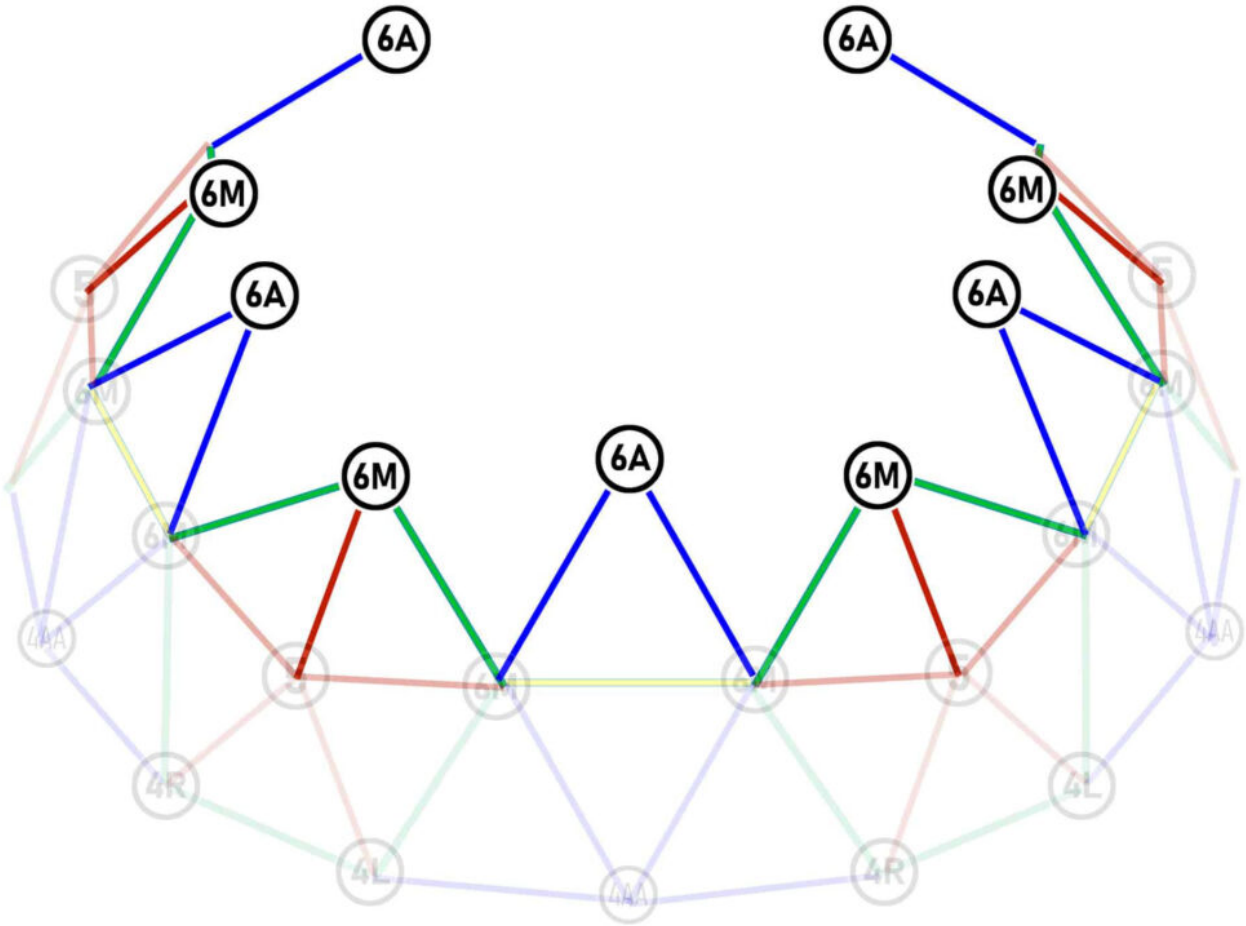




I’d also advise you to support the belt with temporary uprights until you’ve finished the whole belt.



Second level



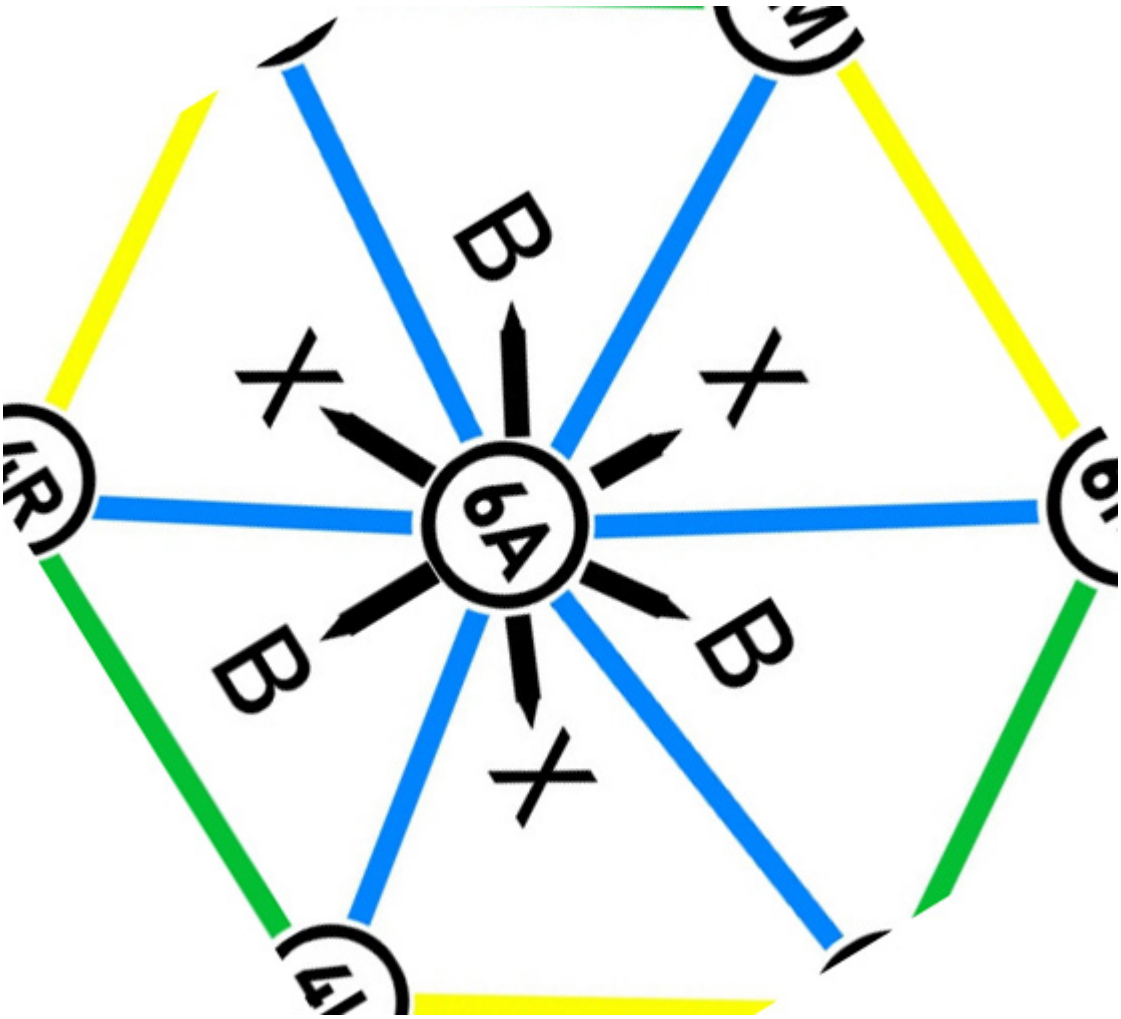
Materials required:

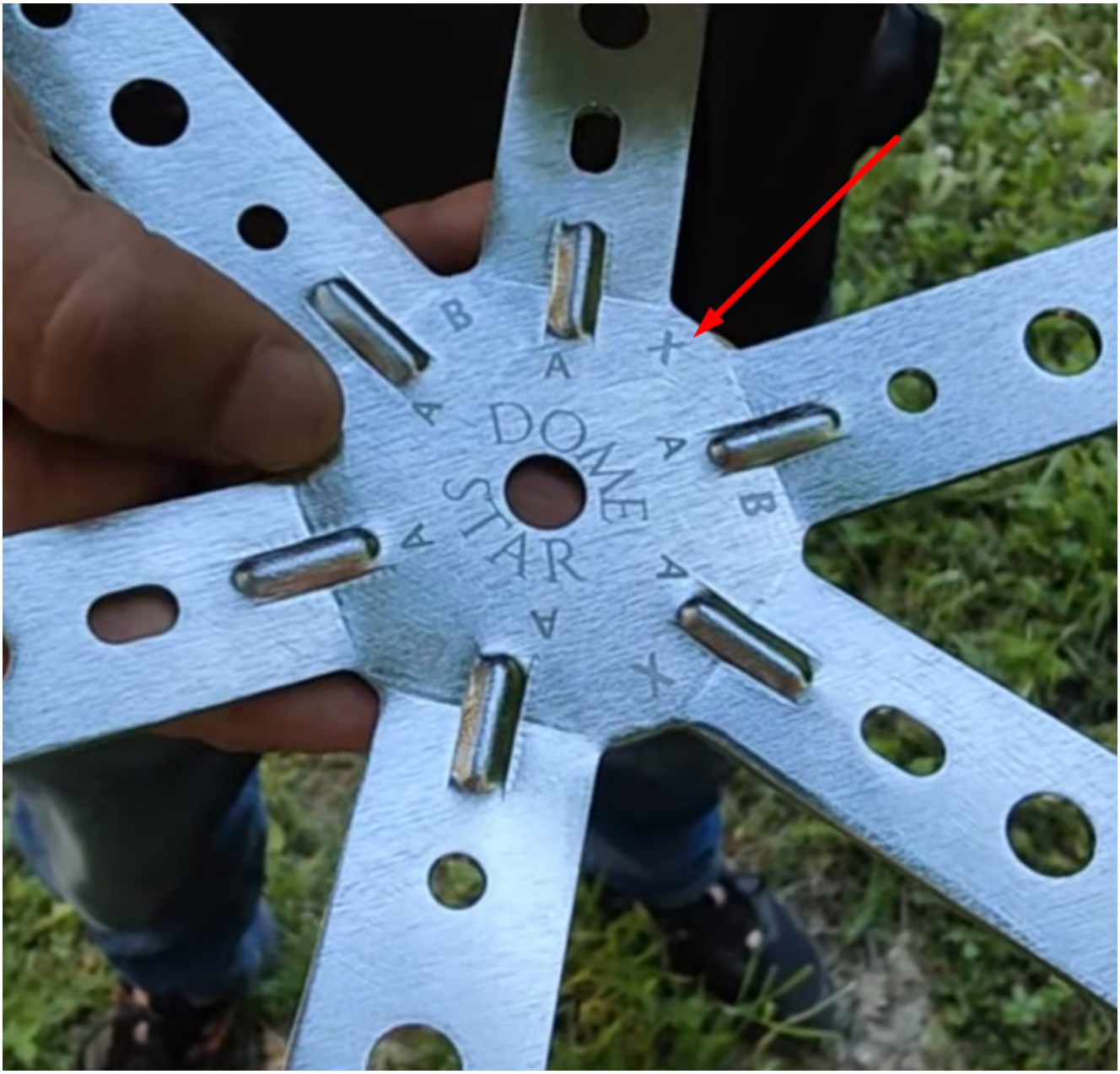
- 10x A (Large),
- 10x B (Medium)
- 5x C (Small)
- 5x 6A Connectors
- 5x 6M Connectors

Start by assembling 5 triangles, each with 2 A-pillars and a 6A connector.

WARNING: VERY VERY IMPORTANT! The 6A connectors have a meaning, even if they have 6 identical A legs. Don’t make any mistakes!

In addition to the letters A on the connector legs, 6A connectors also have intermediate letters. Make sure you orientate these letters towards the right uprights. Here, we have the X / yellow / very large uprights towards the bottom of the connector when looking at the assembly drawing. The letter X on the connector should therefore be pointing downwards!


B
X
X
6A
B
B
X


DOME
STAR



6M triangles

Screw the B-pillars (2 B-pillars/connector) and C-pillars (1 C-pillar/connector) onto each of the 5 6M connectors:



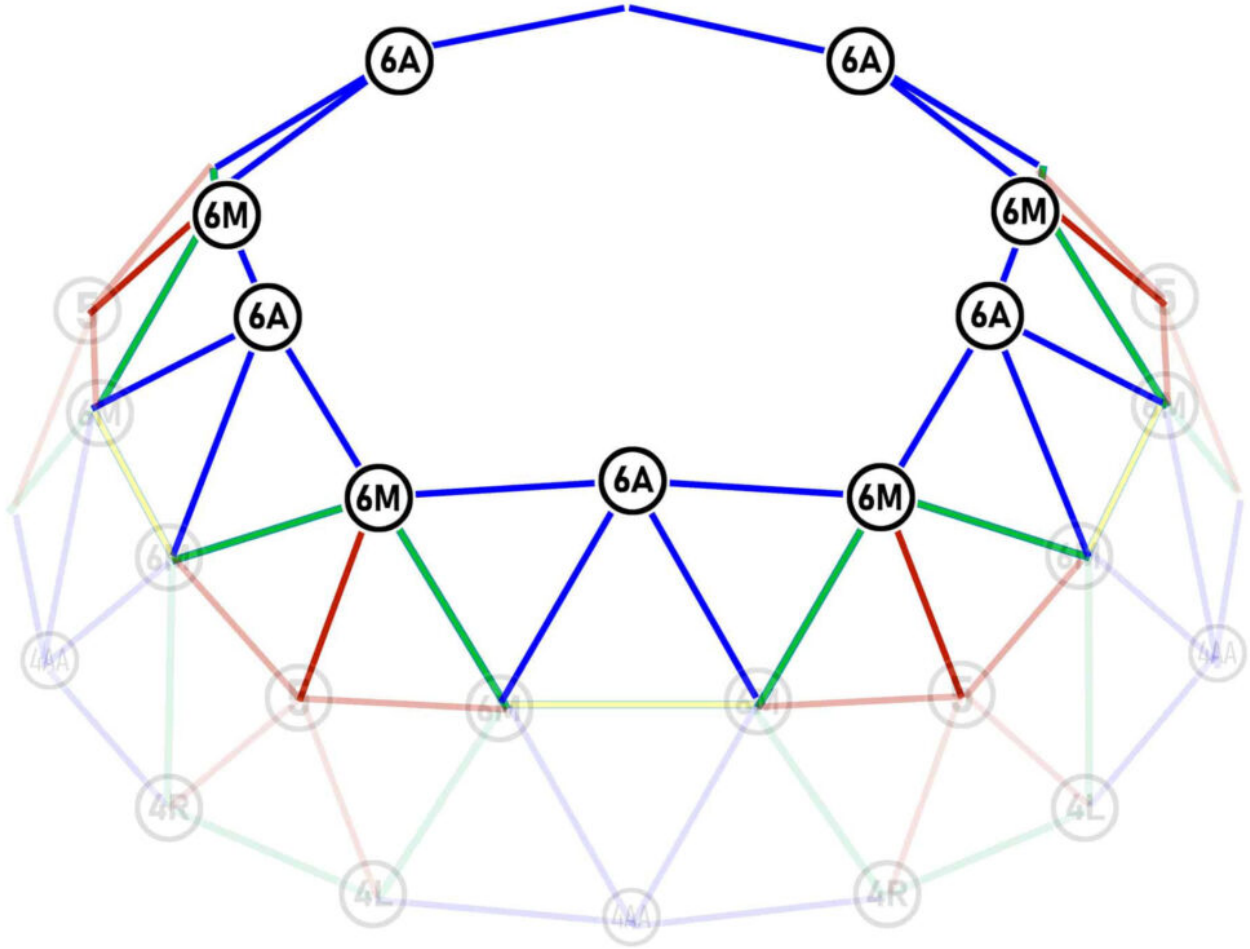
Prepare the triangles on the floor

I place each 6M connector opposite the 5-leg connector, with the C-pillar connecting to the 5-leg connector.

The 6A triangles are placed in the remaining space, facing the very large X-pillars.



Prepare the second belt on the floor

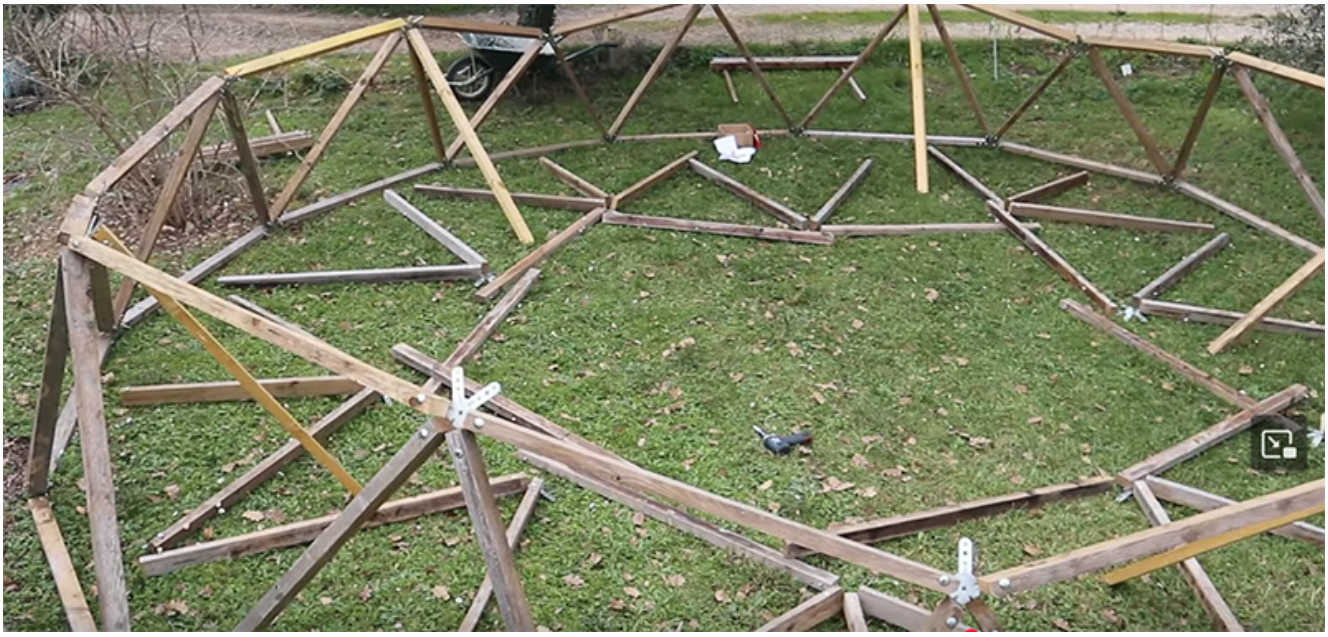


As with the first level, I’m going to prepare the second belt on the floor to leave the triangles unsupported for as little time as possible.

I’ll need:

- 10 A-pillars / blue / large

Place them on the floor between the triangles already on the floor.



Assembling the second level

ATTENTION: 2 people are strongly recommended for these steps. I also recommend using supports for these triangles until the second belt is installed. Things get complicated here, so start this stage in good shape

Assembling the second level is exactly the same as the first level in principle:

- start by screwing on a 6M triangle



- screw on the neighbouring triangle



- immediately attach the belt strut connecting the first 2 triangles



- Support this first assembly with a temporary upright
- continue with the neighbouring triangle: screw it on, then screw on the belt connecting it to the previous triangle

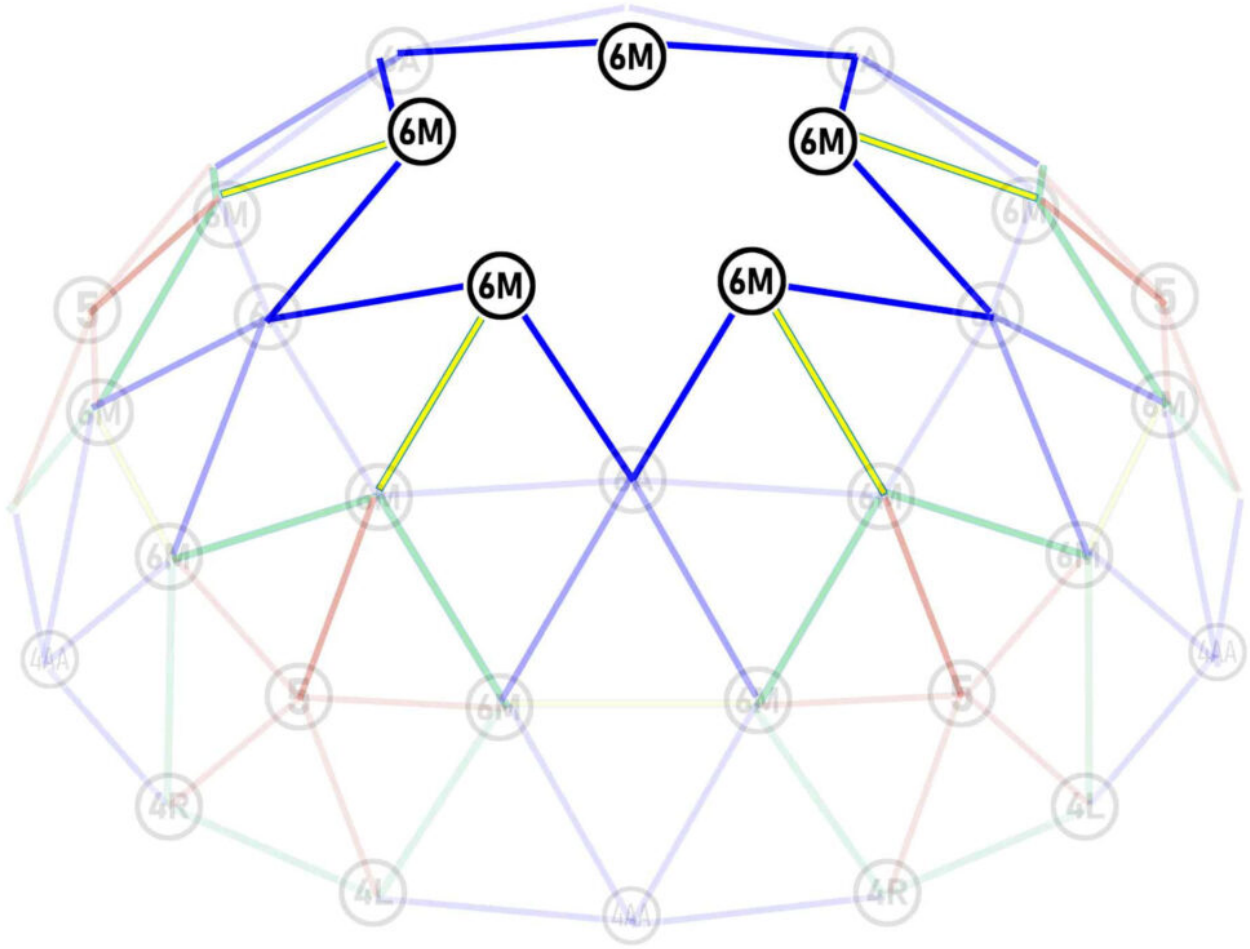




- continue in this way until you have gone all the way round

But as this level is higher and the uprights are more inclined, the support is even more important. I really recommend working with 2 people here: it’ll go much better!

Third level: the 6M triangles



Materials required:

- 10x A (large)
- 5x X (very large)
- 5x 6M connectors

Now you know what to do just by looking at the diagram above! On each of the 6M connectors, screw 2 A-pillars and an X-pillar between the A-pillars:





Prepare the 6M triangles on the ground

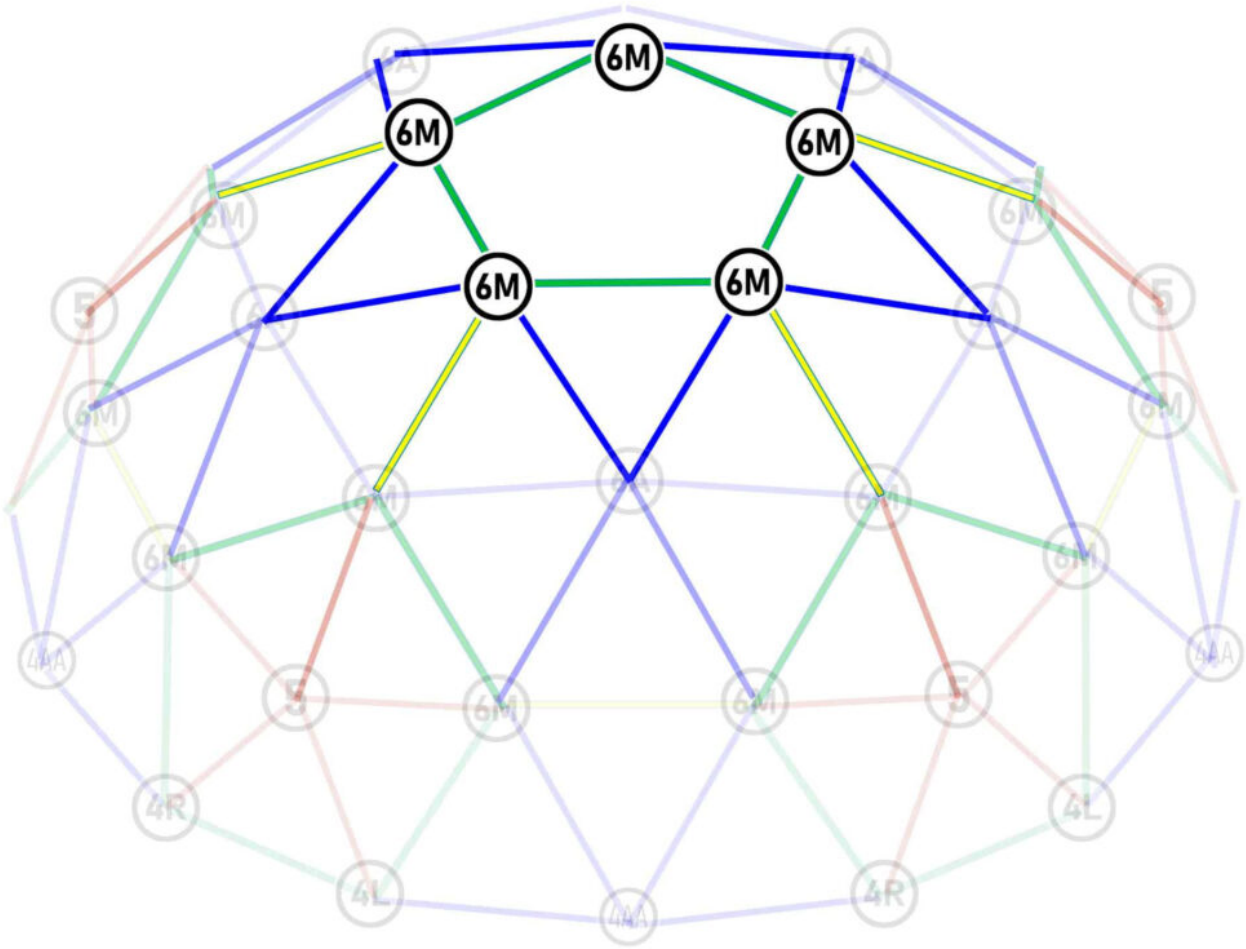
The very large X-pillar that you screwed into the centre of the 6M triangles will screw into the 6M connectors on the dome: they are easy to recognise, they are the only ones on

the dome that have a single free leg (you also marked X on the free leg of the connector!)



Place them on the ground waiting for the belt.

Prepare the third belt on the ground



As usual, we start by screwing on 2 neighbouring triangles:





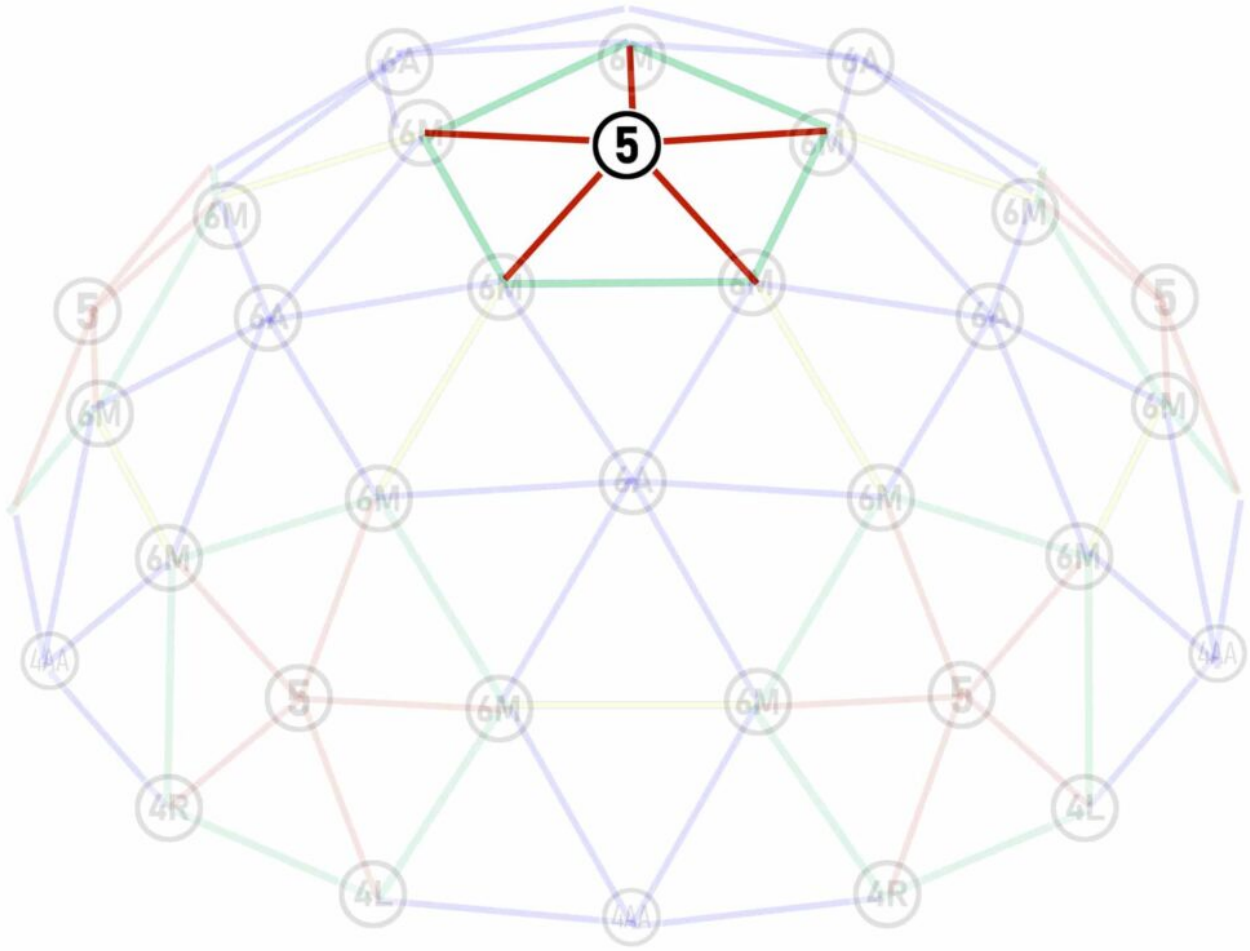
and screw the belt between these 2 triangles:



… and I continue to go round.

Last pentagon

I’m almost at the end!



All I need for this final stage is:

- 1 5-pin connector
- 5 C-pillars / small / red

I screw the 5-pin connector onto a C-pillar



I screw this upright onto the dome. It needs to be supported while the other connectors are installed.





I install the 4 missing connectors by screwing them on.



Your dome is finished!

Finishes

Wood screws to prevent slipping

Your bolts are held in place by compression and over time they can unscrew and the connectors will start to turn. To prevent this undesirable rotation, I advise you to add at least 3 wood screws per connector, as follows:

Where can I buy the materials I need?

If you have any advice to share about buying equipment, drop me a line and I'll post the best tips here!

Wood

When it comes to wood in France, you can find decent prices without having to negotiate in the big building stores: Castorama, Leroy Merlin, Brico Depot… I find that the professionals are sometimes much more expensive than the building superstores unless you have an account and negotiate for a long time.

Bolts

For bolts I found the best prices in Europe at **auprotec**(website) with fast delivery and reasonable prices.

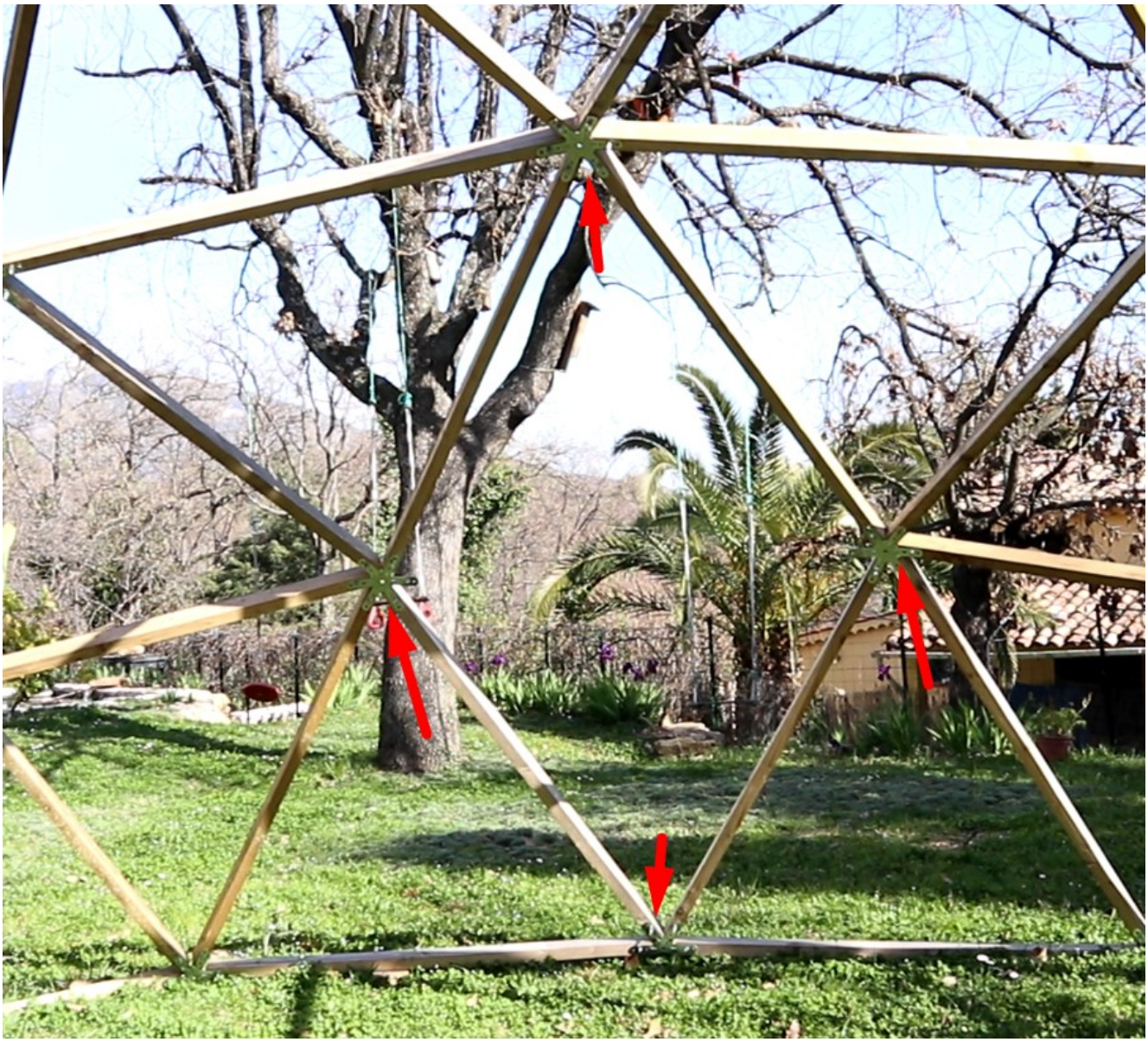
TIP: it is often worth buying 100 bolts rather than 50 because of their policy of reduced prices according to quantity.

Direct link to TRCC bolts

How do I fit a door into a geodesic dome?

I don’t have any experience of dome doors, but I’m sharing on this page my ideas on how I would go about inserting a door into my domes.

However, it’s easy to remove 1 upright from the first belt to leave an easy passage:



In these cases, I advise you to reinforce the structure by

adding wood screws in each free hole of the 4 connectors around your new opening.

Remove this amount at the end of construction: not during construction.