Sphere Model 3

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This document is part of GNU 3DLDF, a package for three-dimensional drawing.

The mailing list `info-3dldf@gnu.org` is for sending announcements to users. To subscribe to this mailing list, send an email with "subscribe ⟨email-address⟩" as the subject.

The webpages for GNU 3DLDF are here: `http://www.gnu.org/software/3dldf/LDF.html`

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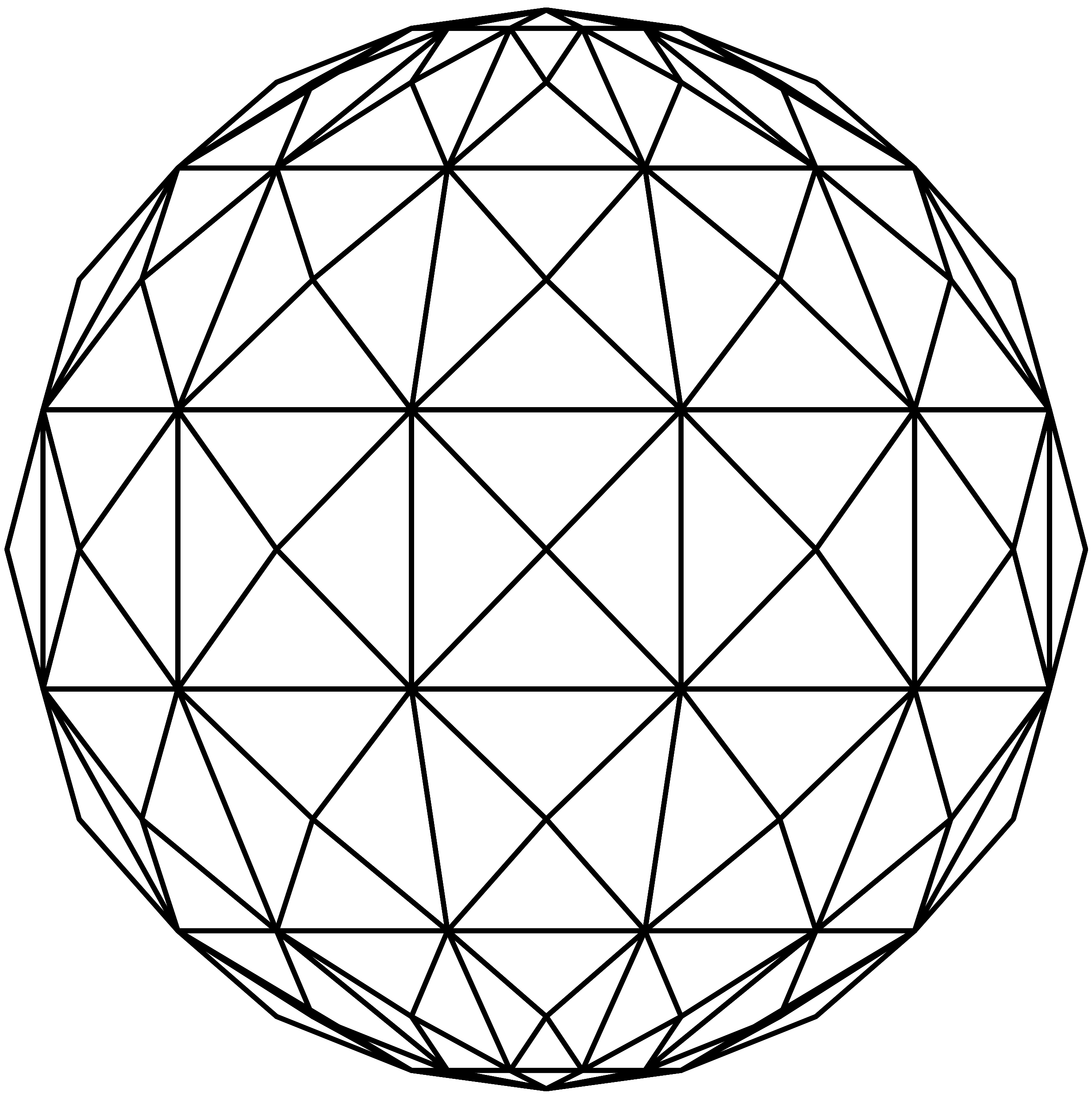


Instructions

PLEASE NOTE! The author has tried to ensure that the following plans are correct, but as of August 6, 2010, he has not tested them yet himself. As mentioned above, this material is distributed **without a warranty**. I recommend that users check it themselves before investing a lot of time and effort into cutting out the paper or cardboard model.

Any corrections or other feedback will be gratefully received by the author. Contact information can be found above.

These plans represent a sphere divided into unlike triangles. The source code can be found in the file `sphrmd03.ldf` which is available from the GNU 3DLDF Sphere and Dome Models webpage:
`http://www.gnu.org/software/3dldf/sphrdmmd.html#Sphere_Models`

The GNU 3DLDF program that generates the plans and other images in this document, i.e., the code in `sphrmd03.ldf`, uses parameters for various values; in particular, the radius of the sphere and the arc angle that separates the points on the sphere that are used to find the points on the triangles. By changing the values of the parameters, variations of these plans can be generated. However, one must be careful, since some values may cause unforeseen problems or unsatisfactory results, or require changes to other parts of the program.

The center of the sphere is located at the origin. The radius of the sphere used here is 5.375cm. It was chosen in order to have (approx.) the largest possible sphere for which the plans would fit onto a single sheet of DIN A3 paper.

The sphere is divided into 5 "bands" plus two pyramids with dodecagonal bases for the poles. The bands, in turn, each consist of 12 sets of 4 triangles. When the model is folded together, each set of 4 triangles becomes a pyramid with a trapezoidal base, whereby the the base of the pyramids belonging to the middle band are rectangular.

The corner points of the trapezoidal or rectangular bases represent line segments that join points on 30° arcs of circles that lie on the surface of the sphere and are parallel to one of the major planes (and perpendicular to the others). Other plans may be created by changing the angle used for the arcs, but this would certainly require modifying other parts of the program. However, it shouldn't be too difficult.

To use these plans, tape, tack or otherwise attach them to a sheet of paper or cardboard. I generally prefer tacking to taping, where possible. Cardboard could be used for this model, since all of the pieces are flat, but heavy paper would probably also result in an adequately stable model.

This model uses "double tabs" for attaching pieces to each other. The triangles on the plans on page 4 have traces of the tabs drawn on them. The tabs themselves are on page 5. The tabs can be used for sewing the model together, either in combination with gluing or alone. The model can be assembled by gluing alone, in which case no holes need to be pricked on the tabs or the triangles. Nor is it necessary in this case for the tabs to match up with the traces when assembling the model.

Sewing, however, will generally lead to better results, especially with regard to the alignment of the pieces. In this case, the crosshairs in black mark the places where holes should be pricked, on both the pieces and the tabs. It may also be advisable to transfer the lines of the traces to the cardboard or paper using graphite paper or in some other way.

Felt mats are available at hobby supply stores. I find they work well for pricking out the holes.

The solid (outer) lines should be cut out, while the dashed (inner) lines should be scored only. I have tried to be careful about drawing dashed and solid lines correctly, but due to the complexity of this model, I can't be sure that I haven't made any mistakes until I've tried it myself. (Even then, mistakes like this can slip past one easily.) Please exercise care when cutting out the model and don't cut through the paper or cardboard if you have any doubts about a solid line being correct! However, in an emergency, an additional tab should fix the problem, if a line is cut through by mistake, and the difference in the finished model will be negligible.

The knife must be sharp as heavy paper or cardboard will dull the blade quickly. I have been using knives with disposable blades. I've been meaning to try sharpening them but haven't done so yet. I therefore can't say whether this will work. It seems a shame to waste so many blades, which is why I have a jar full of them. They must be good for something. I don't think scissors would work well for this model, and I don't recommend scoring with scissors, because this will dull its blade unnecessarily. However, this isn't a hard-and-fast rule, if someone prefers scissors.

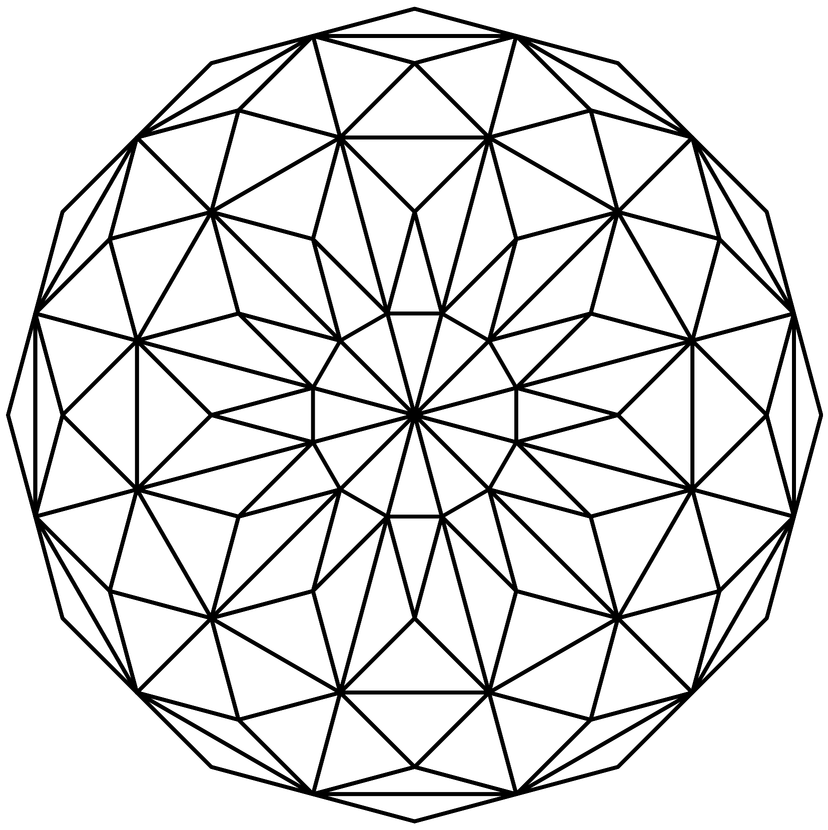
It will be necessary to reattach the plans parts of them are cut out.

Make sure that the plan is attached smoothly or you will introduce inaccuracies. *Do not detach it or let it slip until you are done!* You will never get it back where it's supposed to go.

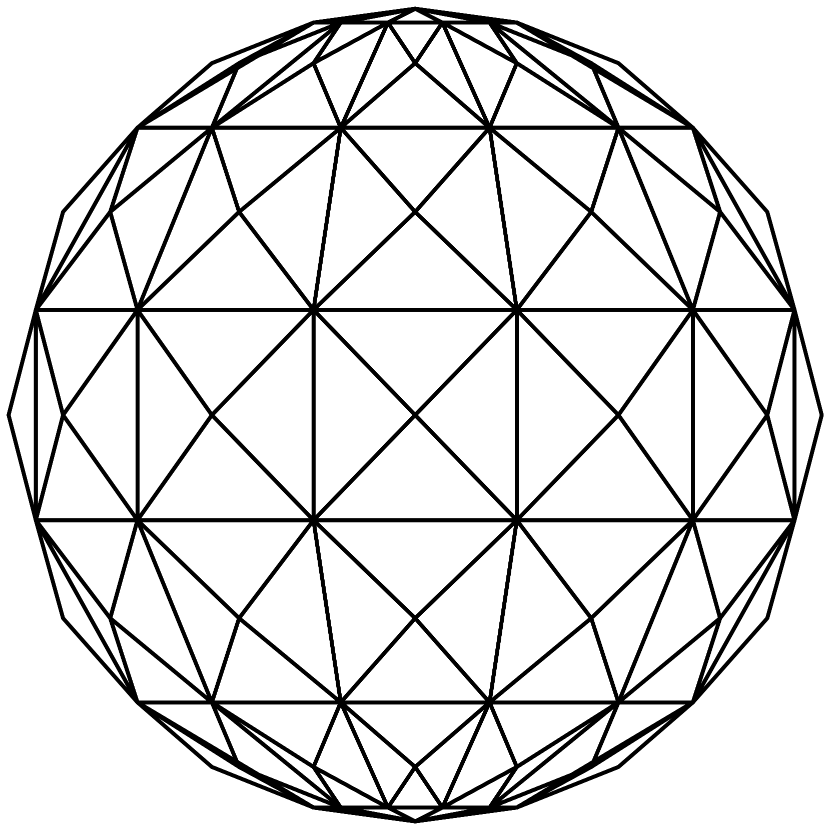
If you use tape, please use the removable kind. Ordinary masking tape will damage the paper when it is removed. Be aware that "removable tape" isn't completely reliable, especially if left too long on the drawing. Sometimes it's possible to reuse pieces of it, which avoids wasting large amounts of it.

Pages 6–7 contain patterns for the various triangles that appear in the plans with dashed lines to make it easier to cut them out. These patterns can used to cut triangles out of better quality paper, such as watercolor paper, which can then be attached to the assembled model. This may improve the appearance of the model, especially if it is to be painted. One might also cut the triangles out of good quality colored paper.

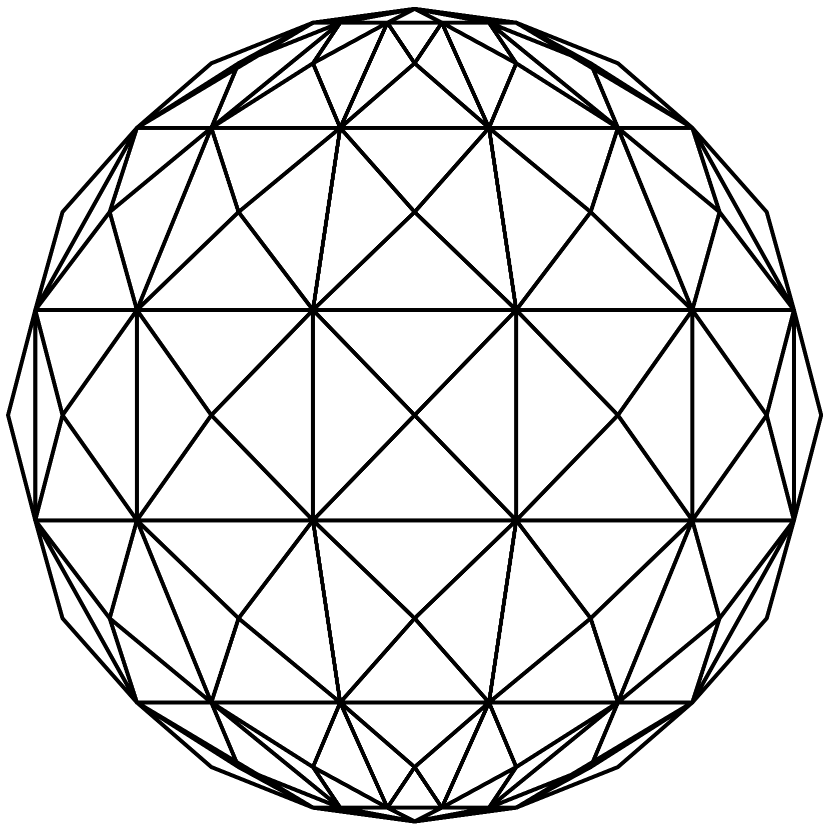
Radius of sphere: 5.375cm
Center at origin



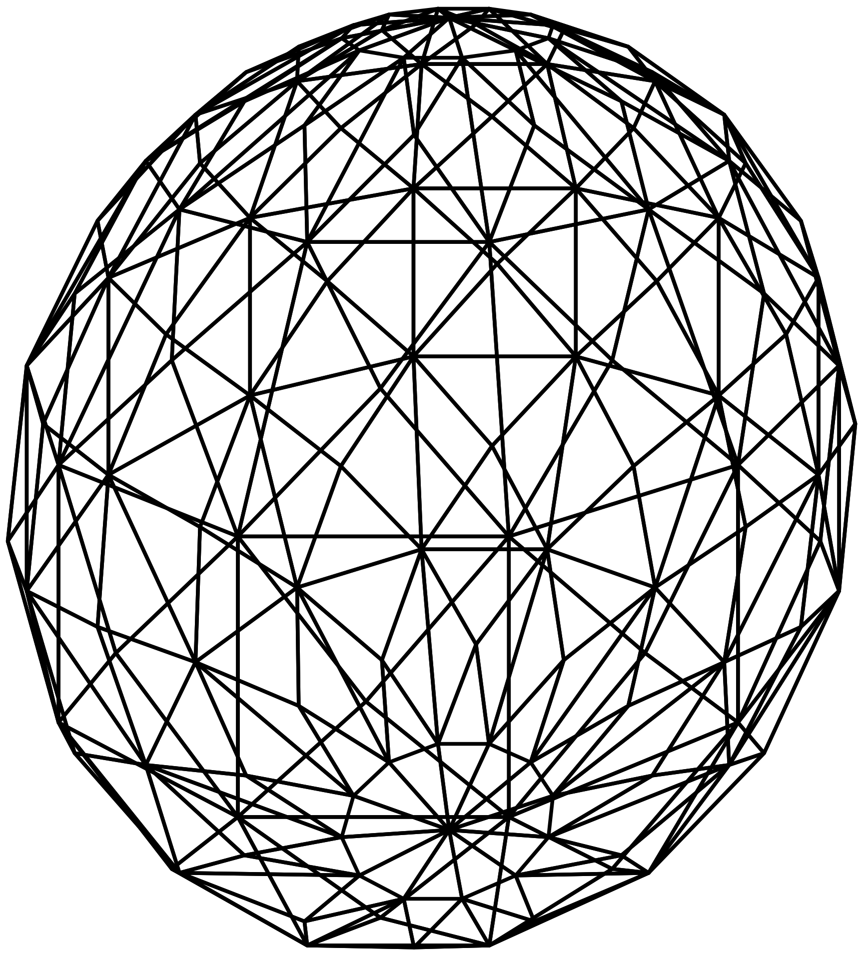
Parallel Projection onto the x-z plane



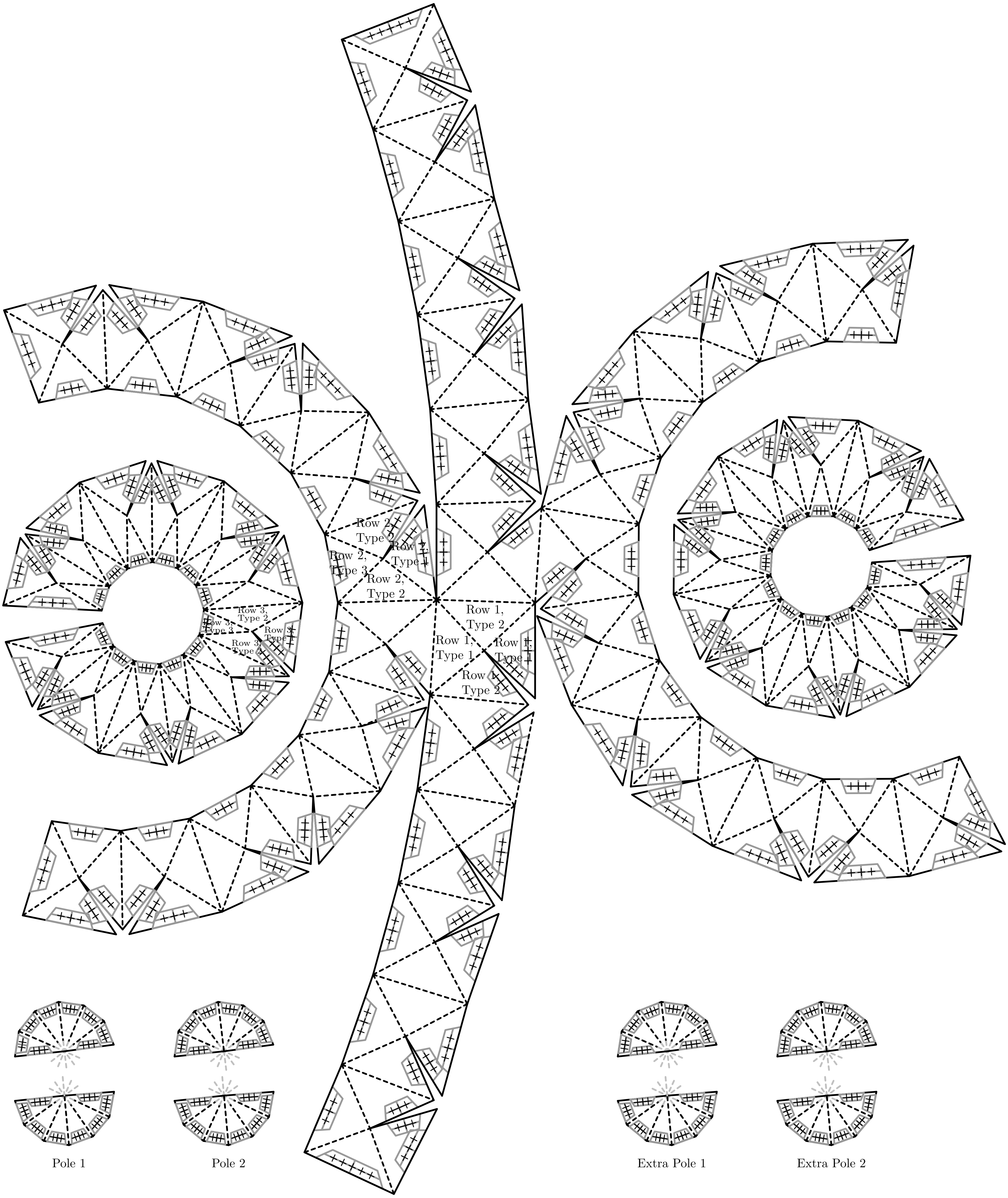
Parallel Projection onto the x-y plane



Parallel Projection onto the z-y plane

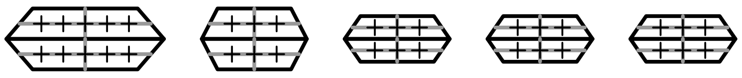


Perspective Projection
Position of focus: (3cm, 10cm, −20cm)
Direction of view: (3cm, 10cm, 10cm)
Distance from plane of projection: 20cm


Row 2, Type 2
Row 2, Type 1
Row 2, Type 3
Row 2, Type 2
Row 3, Type 2
Row 1, Type 2
Row 1, Type 1
Row 1, Type 1
Row 1, Type 2
Pole 1
Pole 2
Extra Pole 1
Extra Pole 2

Model Plans

Tabs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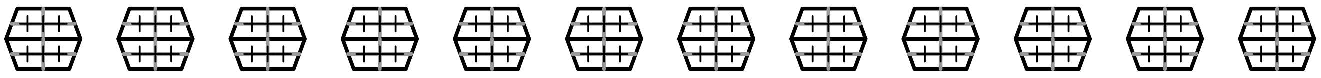
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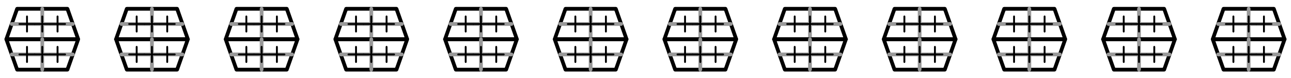
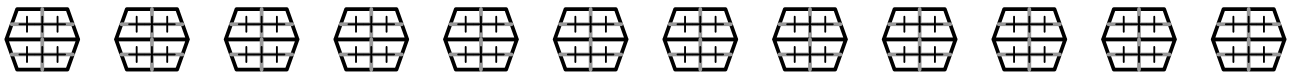

Second row gaps, above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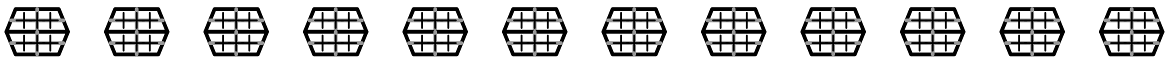
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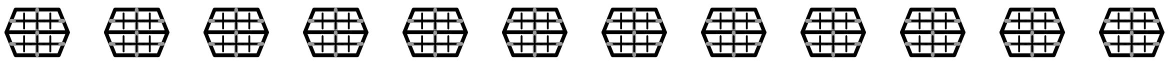
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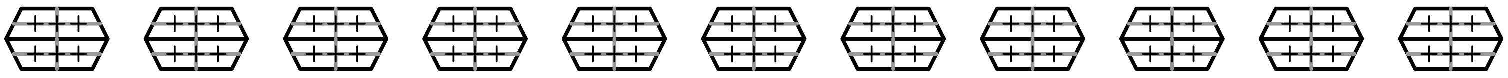
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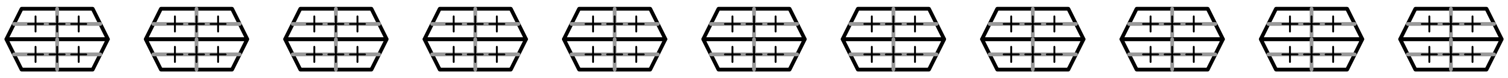
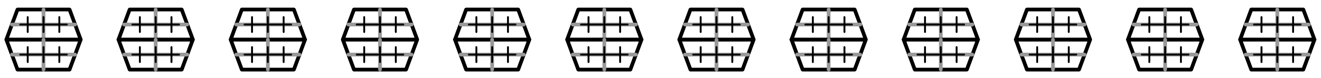
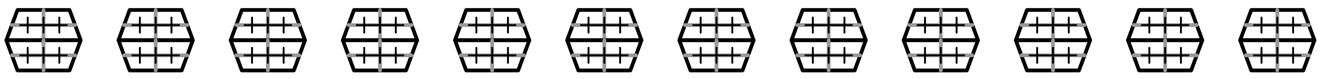
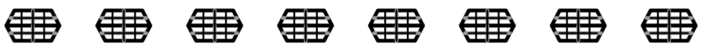
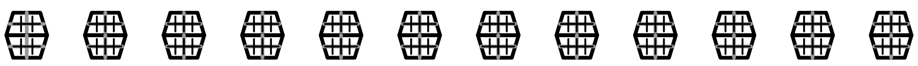
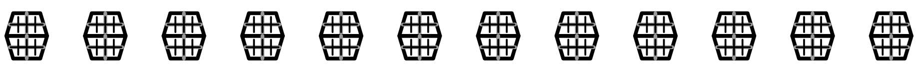

First and second row, bottom


Second and third row, top

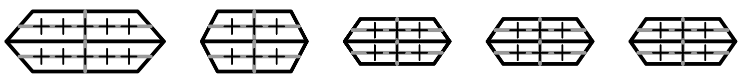

Second and third row, bottom


Pole 1 and Pole 2 (plus extras): Joins


Pole 1 and Row 3, above


Pole 2 and Row 3, below

Extra Tabs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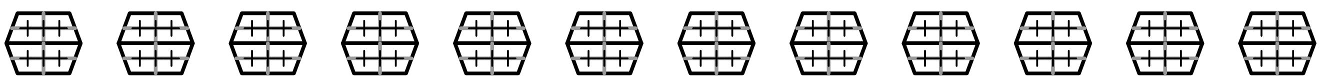
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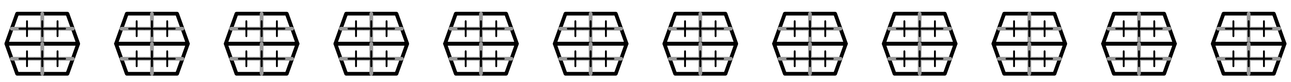
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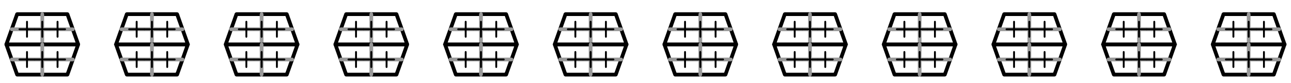
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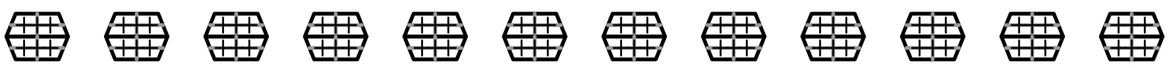
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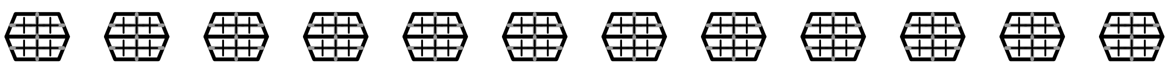
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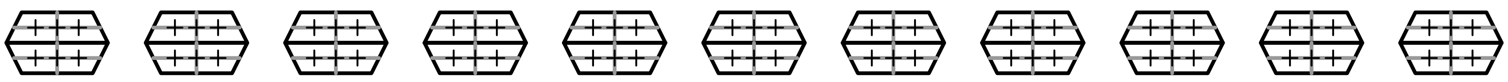
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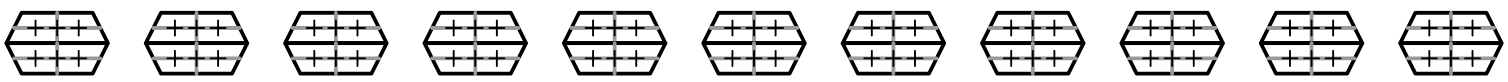
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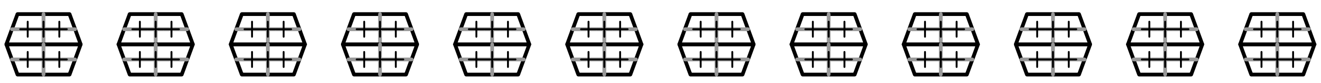
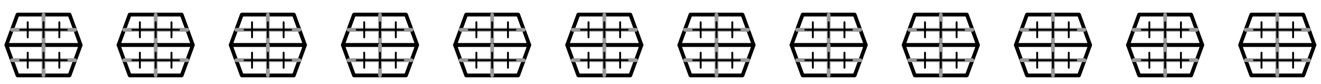
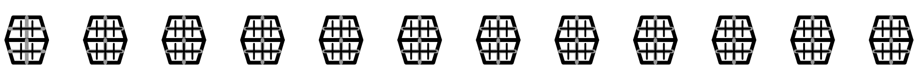
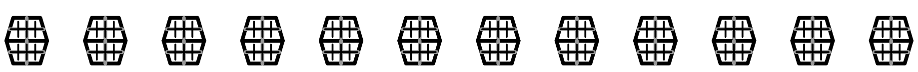

Second and third row, top

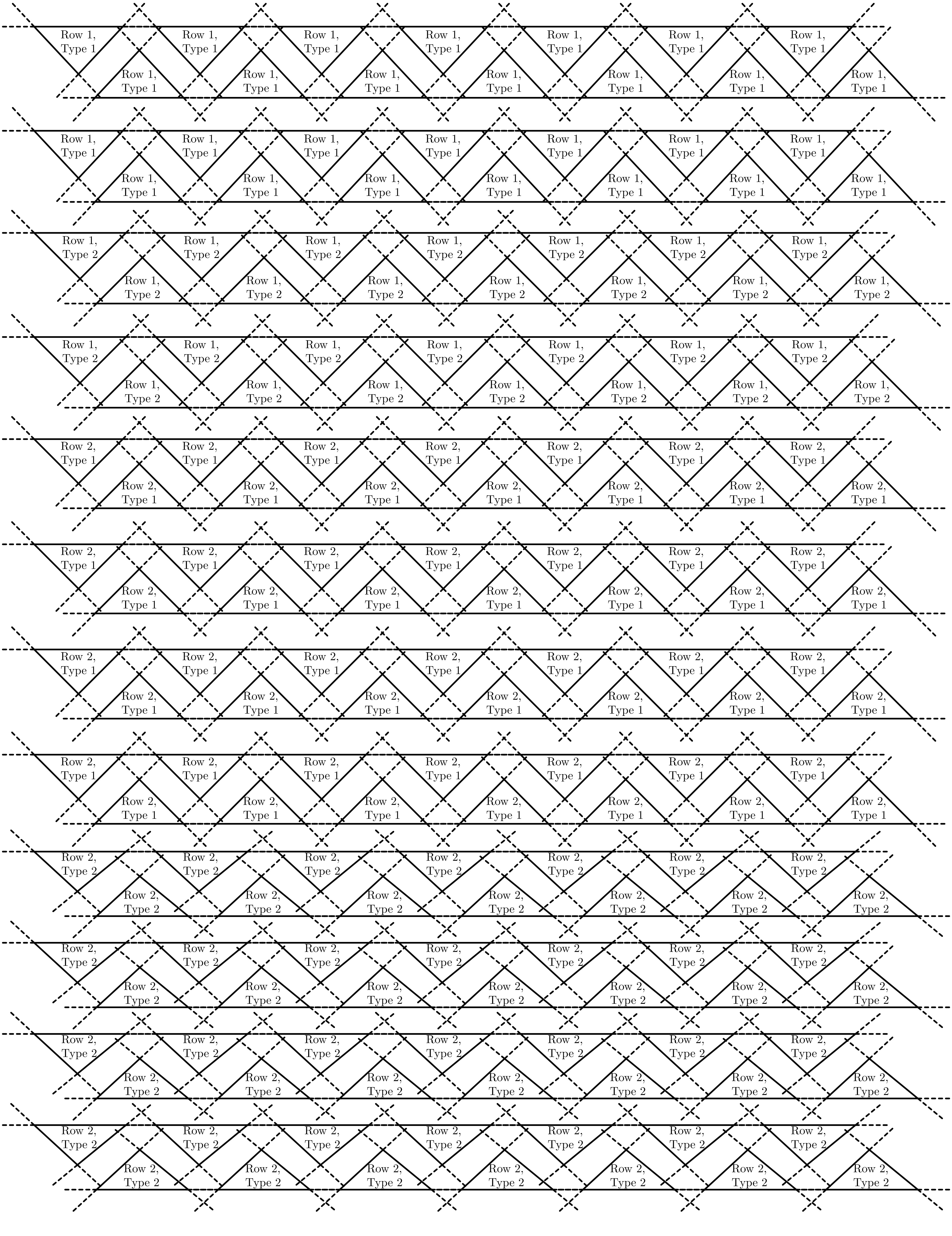

Second and third row, bottom


Pole 1 and Pole 2 (plus extras): Joins


Pole 1 and Row 3, above


Pole 2 and Row 3, below

Triangles for Cutting-Out 1



Triangles for Cutting-Out 2