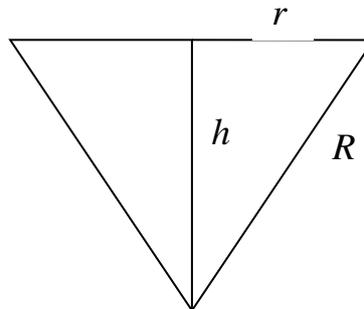# A conical cooker for solar cooking

Design considerations

The dimensions of the cone and the position of the pan are chosen such that as many sun rays as possible reach and heat the pan.
Important parameters are the radius r of the cone, its vertical height h, and the outer length of the cone R, see the figure.

The radius r determines the area of the top surface of the cone and thus the solar power that it catches. The height h is best chosen as 1.5 times the radius r. Then R equals 1.80 x r.
A convenient choice is $r = 40$ cm and hence $h = 60$ cm and $R = 72$ cm [1]. For such a cone the bottom of the (truncated) cone should be at 36 cm vertically from the top (or 43,2 cm from the top as measured along the outside of the cone). It is a circle with a radius of 16 cm.
The pan should have a diameter of about 24 cm and a height of 12 -18 cm.
The pan sits on a black plate. There should be a space of about 2 cm between this plate and the bottom of the cone in order to isolate the plate and pan from the cone itself. Therefore the plate rests on three or four wooden blocks, fixed to the cone (see later).
The cone must be supported by a circular metal ring with 'legs'. For good stability the ring should be positioned at about 20 cm from the top, measured along the side of the cone.
The ring should have three or four legs, pointing enough outwards that the cone does not topple easily, for instance in strong winds.

---
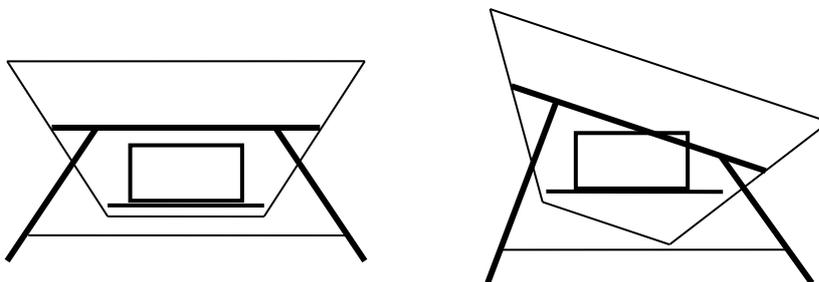
[1] For cooking for larger groups a conical cooker with r = 55 cm can be made. All dimensions should then be 11/8 times as large. E.g., the pan should be something like 32 cm diameter and 20 - 25 cm height.

How to manufacture the conical cooker

The cone is made from a sheet of gauge 30 (0.32 mm) iron, from which a sector, as shown in the figure, is cut [2].
NB. At the left side cut out along the dashed line, so as to have some material for the felled seaming.
It is strongly advised to first make a model of the sheet as shown in the figure. This can then be copied onto the actual sheets of which a cone is made.)
The angle φ equals 200° and the length of the circumference between points P and Q thus equals $2\pi r$.
The circle in the middle indicates the part that should be cut off for attaching the bottom.
If this part is cut off first, the bottom of the cone can be made out of it.
(In principle the bottom is a circle with a radius of 16 cm, but a little larger may be needed in view of the felled seaming.)
After folding the sector into a cone, the sides are connected by using felled seaming. Then the bottom is connected also through felled seaming. See the photo's at the end.

---
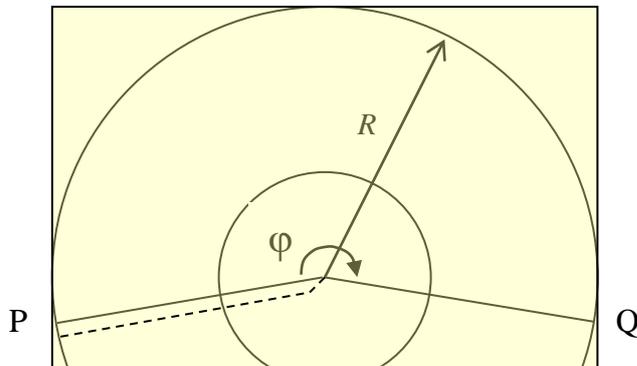
[2] A plate of 150 cm x 100 cm is sufficient for making a cone with $r = 40$ cm $(R = 72$ cm$)$.
   A cone with $r = 55$ cm $(R = 99$ cm$)$ can be made from a plate of 200 cm x 120 cm.

The cone itself is the same for the vertical and the tilted version, but the bottom plates are different. For the vertical version it is a circle with a diameter of 35 cm, while for the tilted version (which is tilted over 20 degrees) it is an ellipse with a short axis of 40 cm and a long axis of 44 cm.
The bottom plate is made from about 1 mm thick iron and then blackened.
It can be supported by fixing four wooden blocks with screws to the cone, see the figure.
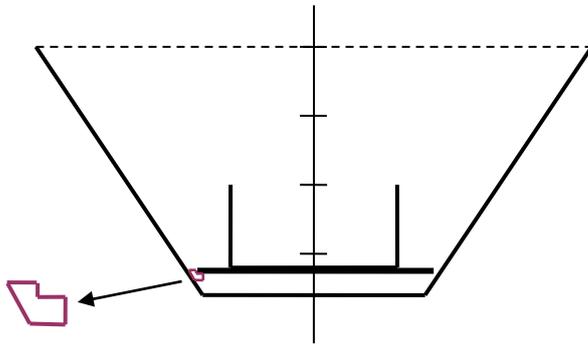
For the tilted cone the angle of the inclined part of the support block will depend on the position of the block (left, right or middle).

The model used to cut the cone (see the figure on the previous page) can also be used to cut the aluminized foil. The part of the sector between the two circles is for the sides of the cone, the circular part for the bottom can be cut from another part of the foil (it depends on the width of the foil how to cut it most economically, so as to use least of the foil).
The foil should be glued to the cone.

Some photo's of making the cone.