Figure 4–5.
The Solar Card is an easy-to-use, low-cost solar evaluation tool. It can also be used to determine how much sun strikes a potential garden spot or where to plant to let summer shade and winter sun fall on the house.

for solar heating your house.) This is because the amount of sunshine during winter is only a small portion of the year-round potential sunshine.

If you are uncertain about the amount of shading on your collector or want a more exact sighting of the sun's path, you can construct a *solar siting mask*. This device lets you see the winter, fall, and spring sun paths. Because the summer sun is so high in the sky, almost overhead, this siting mask cannot project the sun's path in summer. You will have to approximate the summer sun's path in order to determine any summer shading. Instructions for constructing a solar siting mask are given at the end of this section.

Commercially constructed siting devices are available from:

Solar Card, Design Works, Inc., P.O. Box 489, North Amherst, MA. 01059 ($12.95 postpaid);

Solar Site Selector, 105 Rockwood Drive, Grass Valley, CA 95945 ($89.50 + $4 shipping);

Solar Pathways, Inc., 3710 Highway 82, Glenwood Springs, CO 81601 ($144.00).

The amount of shading varies as you move around your site. Shading from nearby obstructions such as bushes, a chimney, a roof overhang, or a protruding part of your house changes considerably if you move several feet sideways, or up or down.

In new construction, shading from your neighbor's house or trees can cause you to position your building to the north side of your site. When there is no space left to go north, raising the collector a few feet is sometimes as good as moving the building north by twice the distance.

In retrofitting, where you usually have a lot less flexibility, pruning and tree cutting have often been solutions. But, please do not cut down a 100-year-old tree to decrease your shading by a few percentage points.

There is always some frustration after you have decided to go solar— and are faced with the sometimes unwilling site. When building on a compromised solar site, you can sometimes overcome obstacles by using reflectors, or you may simply have to rely on other renewable energy sources and strong water conservation measures.

Sites without any shading on the collector area and optimum orientation are rare. Since there are few perfect solar sites, you must work to integrate the collector with the best qualities of your site.

SOLAR SITING MASK

A solar siting mask is an excellent tool for performing a thorough shading analysis and is especially helpful for evaluating questionable solar sites. The mask can be constructed in several hours with material costs of about $5. When you are finished with your site analysis, the mask is a great gift for a friend.

Construction

Materials

1. 14 1/2'' long, 1'' x 8'' (actual measurement 3/4'' x 7 1/4'') pine board
2. 12'' long, 1/2'' diameter wood dowel
3. 23'' x 16'', .005-mm (or thicker) clear acetate or 1/16'' plexiglass sheet
4. twelve 1/2'' pan head wood screws with 1/2'' washers
5. 23'' x 2'' piece of cardboard

Tools

1. drill and 1/16'', 1/4'', and 1/2'' drill bits
2. sabre saw or keyhole saw
3. black marking pen
4. screwdriver
5. ruler
6. string (for drawing 14 1/2'' diameter circle)
7. glue
8. Six 8 1/2'' x 11'' sheets of 1/8'' graph paper
9. Sun Path Chart (page 77) and Magnetic Variation Map (page 68)

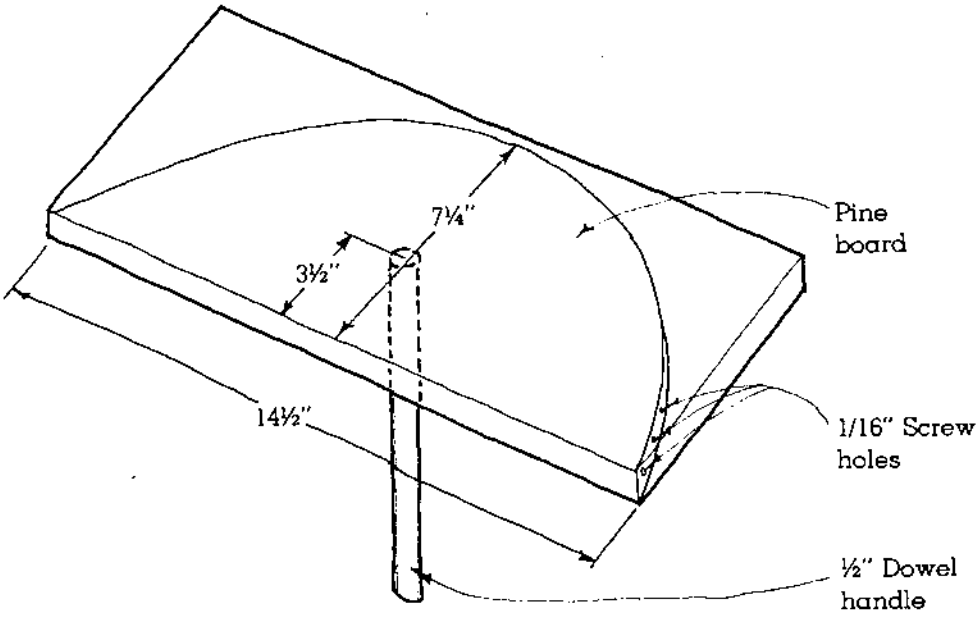


Figure 4–6.
Solar siting mask base and handle.

Constructing the Base and Handle

1. Using a pencil tied to a string, draw a 14 1/2'' diameter semicircle on the 1'' x 8'' x 14 1/2'' board.
2. Mark the point 3 1/2'' from the edge and equidistant from the sides.
3. Cut the board to form a semicircle.
4. Drill a 1/2'' hole at the center point of the board, and glue the end of the 1/2'' dowel into this hole to make the handle.
5. Drill 1/16'' holes every 2'' along the curved edge of the semicircle as shown.

Drawing the Sun Paths

1. Join six 8 1/2'' x 11'' sheets of graph paper to make one 22'' x 24'' sheet. The 24'' side should be held horizontally.
2. Find the Sun Path Chart for the latitude nearest yours. You can determine your latitude from the Magnetic Variation Map.
3. Using a ruler, draw the Solar Altitude/Solar Azimuth Graph according to the dimensions in figure 4–7. Solar altitude is the height of the sun above the horizon. Solar azimuth is the east-to-west position of the sun. Note that the solar altitude spacing varies for each 10° interval. This is because when the sun's circular and overhead paths are projected and drawn onto a flat surface, such as the shading mask, the paths are distorted.
4. Draw the Sun Path Chart for your latitude onto the 22'' x 24'' graph paper. The easiest way to do this is to mark a dot on the graph paper on each solar azimuth

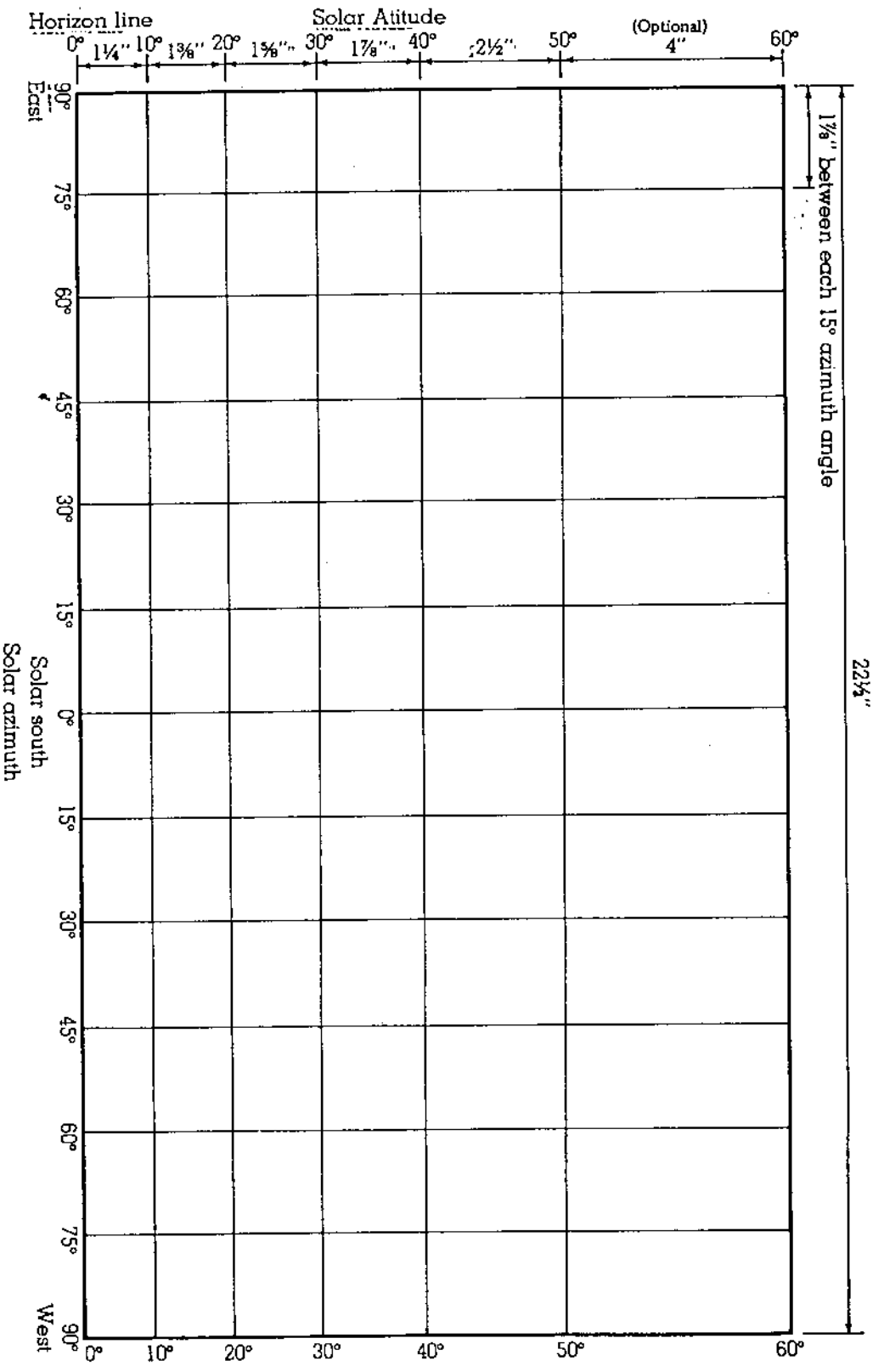
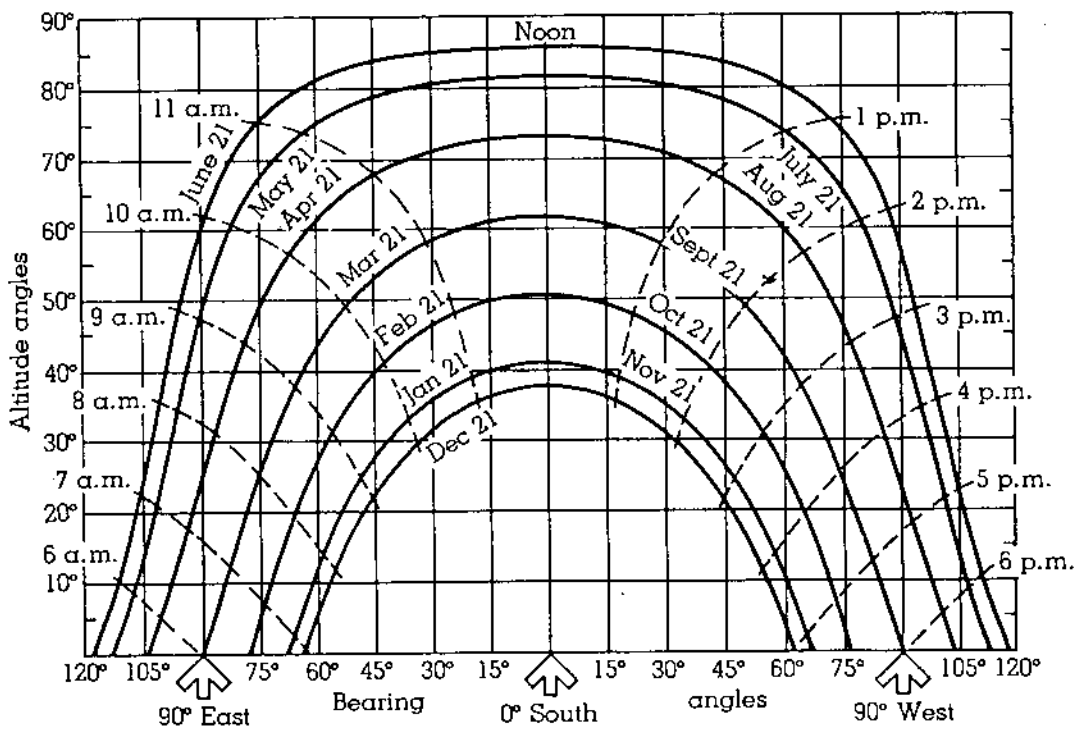


Figure 4–7.
Solar Altitude/Solar Azimuth Graph

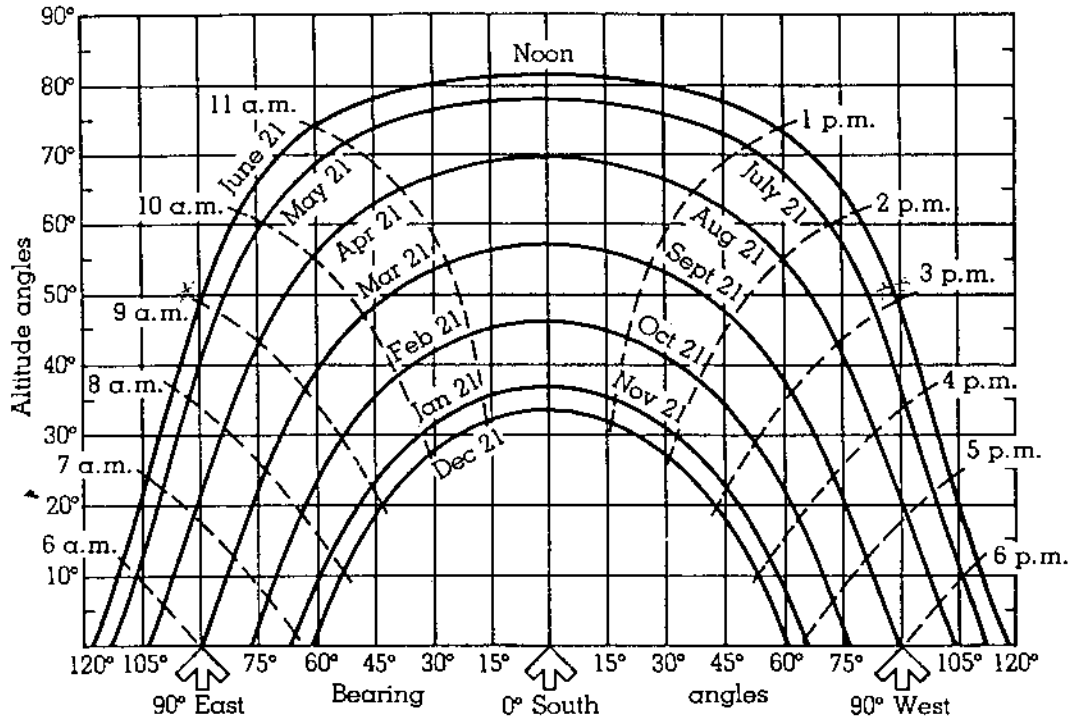
line where the curve of the sun paths cross that azimuth. Then, simply connect the dots to form the correct curves. Next, add the time of day lines. Only the portions of the sun's paths between 90° east and 90° west, and up to 60° solar altitude, can be drawn on this shading mask. The sections of the sun's paths not on the mask, mostly those in summer, can easily be imagined to determine if shading is a problem.

5. Find your location on the magnetic Variation Map. Read the number of degrees variation and the direction—east or west. Remember that if you are east of the zero variation line, your magnetic south line is *left* of the solar south line; if you are west of the zero variation line, your magnetic south line is *right* of the solar south line. Draw a dotted vertical line crossing the horizon line representing magnetic south for your location.
6. Trace the sun's paths, solar and magnetic south lines, time of day lines, and horizon line on to the acetate from the prepared graph paper. Leave 2 1/4'' between the bottom of the acetate sheet and the horizon line. Label each of the sun's paths by month, solar and magnetic south, time of day line, horizon line, and east and west.

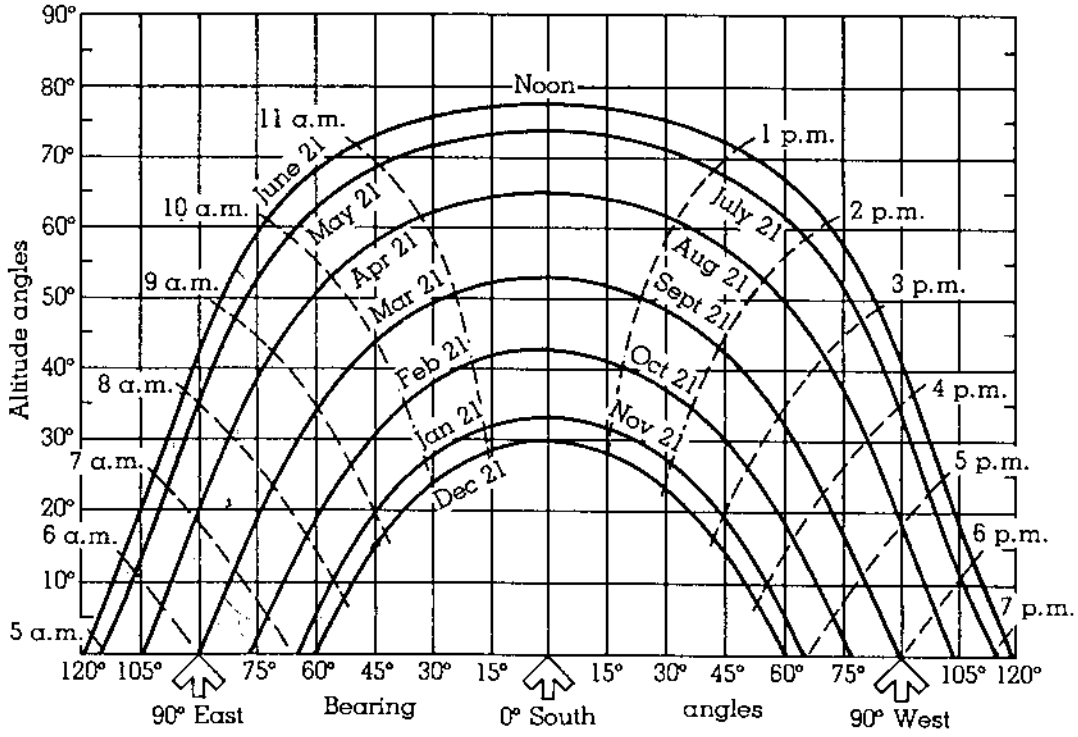
Figures 4–8 (a-g). Sun paths for northern latitudes



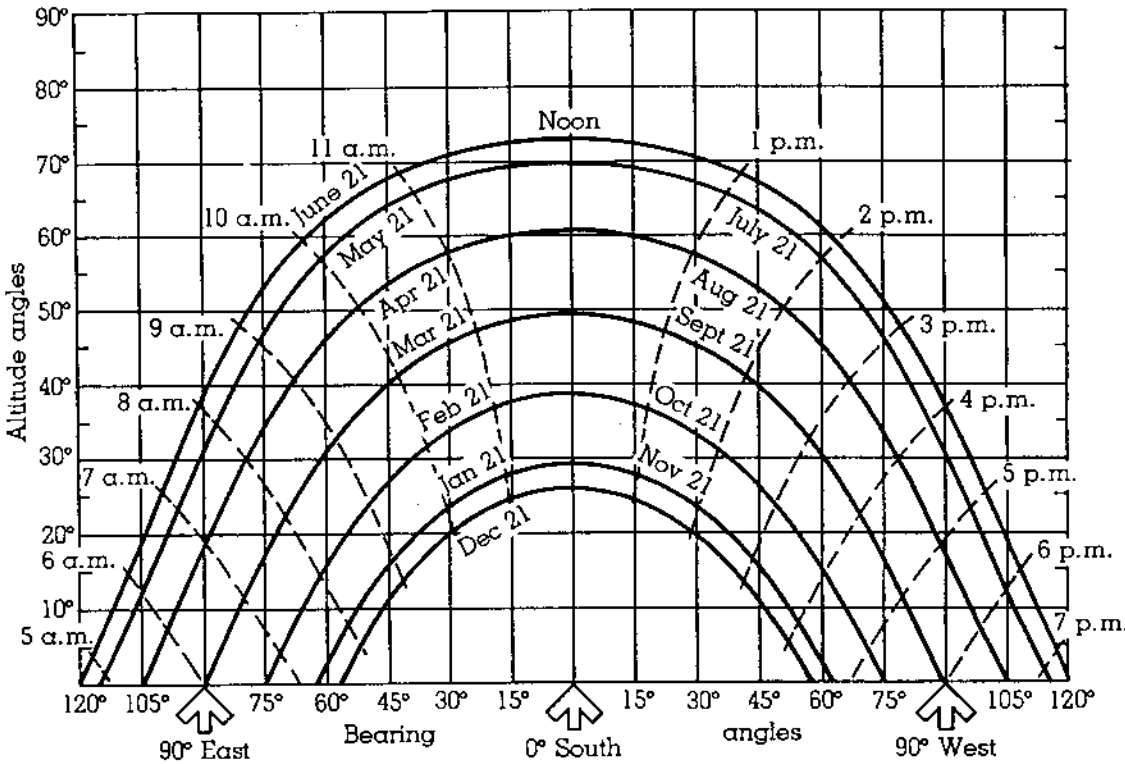
(a) 28° north latitude



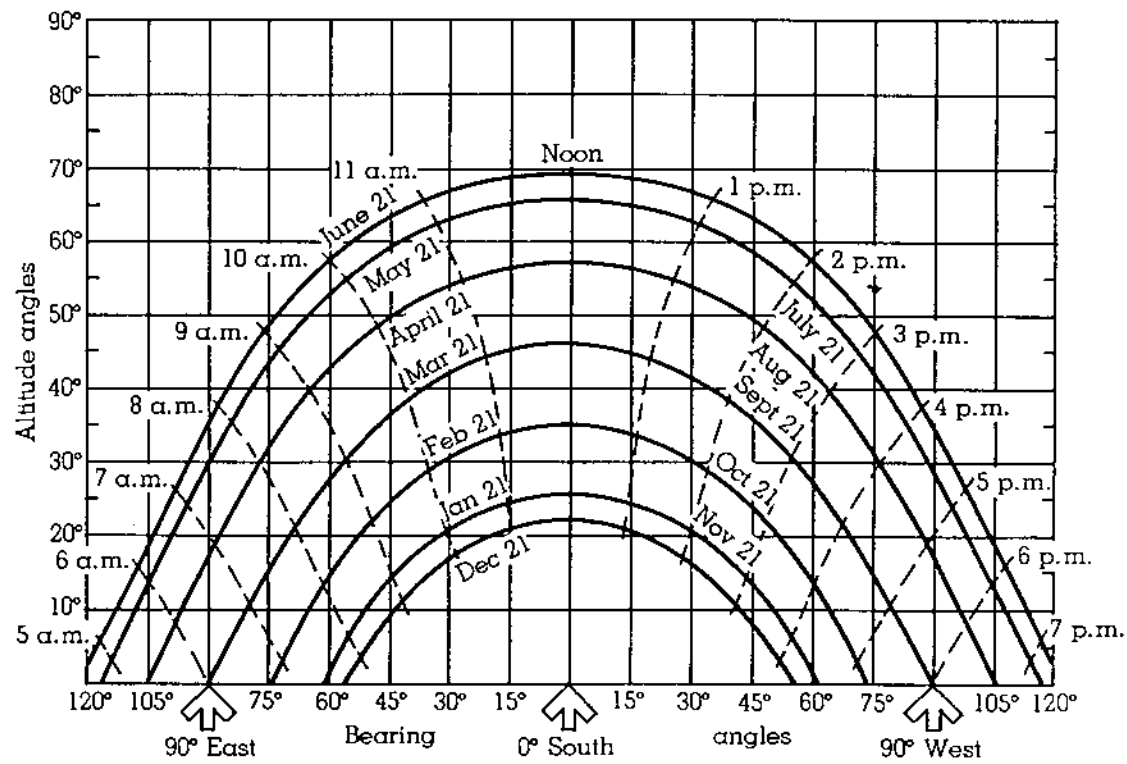
(b) 32° north latitude



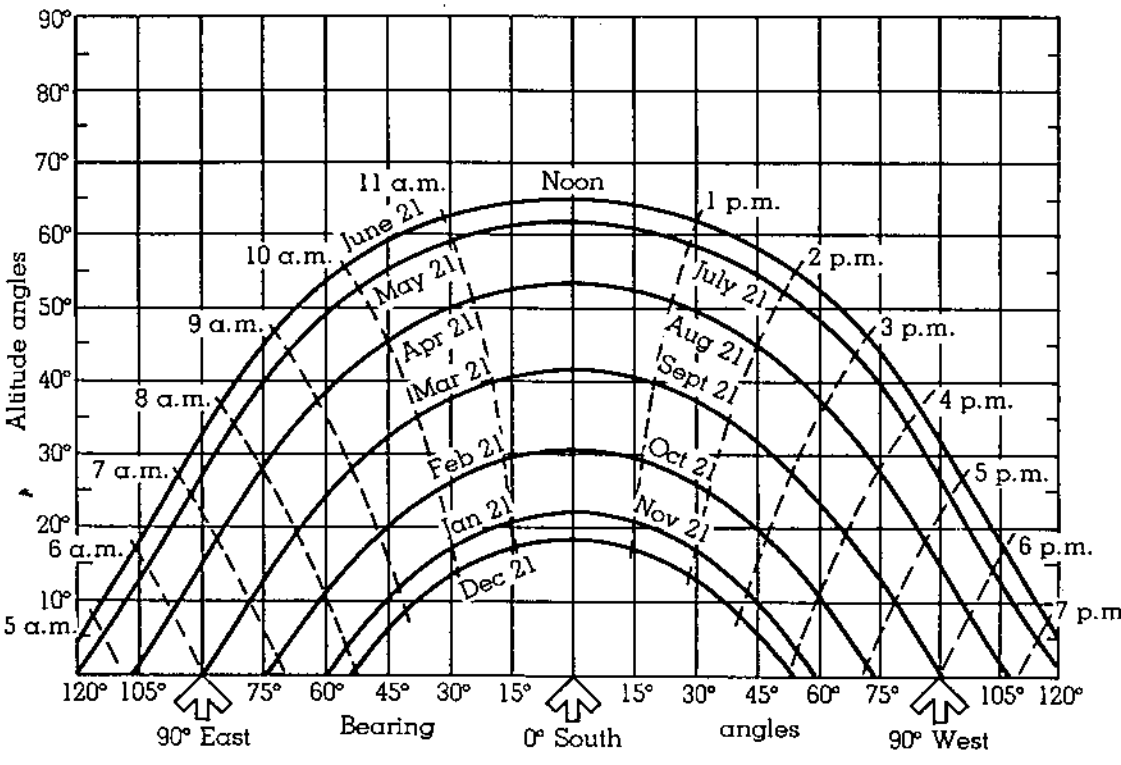
(c) 36° north latitude



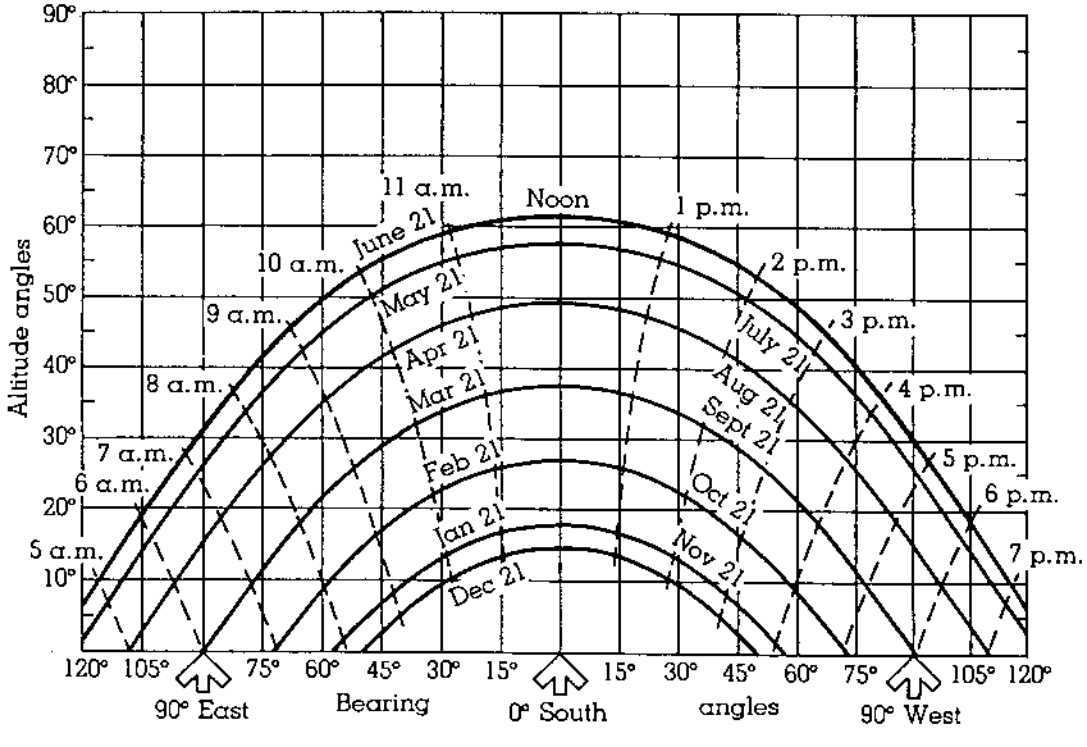
(d) 40° north latitude



(e) 44° north latitude



(f) 48° north latitude



(g) 52° north latitude

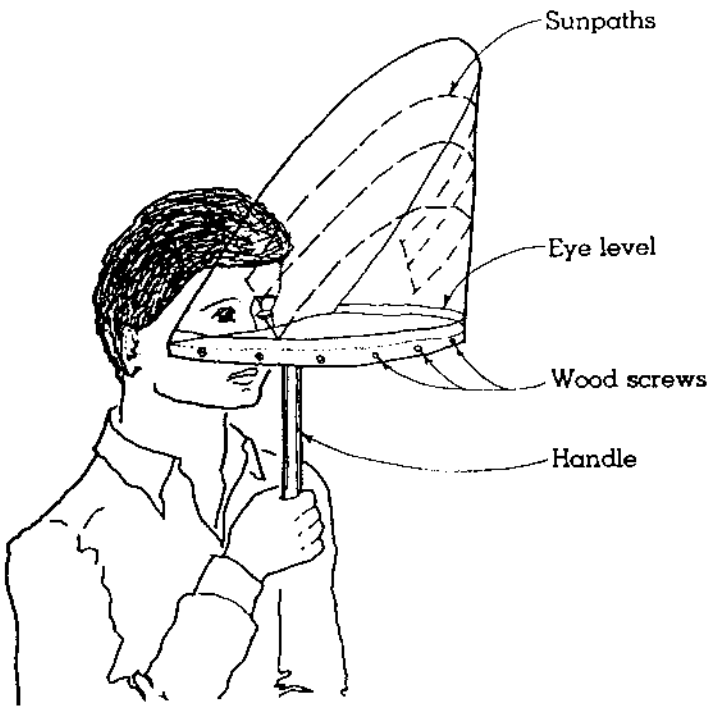


Figure 4–9.
Looking through a solar siting mask.

7. Use the screws, washers, and cardboard to attach the finished acetate sheet to the base. Drill 1/4'' holes through the acetate or Plexiglas sheet, so that the screws do not crack it. Place the cardboard under the washers to add rigidity to the acetate. The horizon line should be 1 1/2'' above the top of the base.
8. Cut away excess acetate about 1/2'' above the highest sun path to add stiffness.

Using the Solar Siting Mask

To determine the amount of shading, stand with your back in line with the potential collector installation. Use a compass to locate magnetic south. Hold the siting mask so that your eye is at the center of the semicircle and level with the horizon line on the mask. Close the other eye. Now aim the magnetic south line on the mask toward magnetic south. Make certain you are holding the base of the mask level. Remember that even small amounts of metal near a compass can disturb its reading, so be sure to check the direction of magnetic south from several positions.

View the sun's path for each month and see when the sun will be shaded. Move to several potential collector sites and compare the amount of shading. Remember that shading of up to 20% of the sun between 9:00 A.M. and 3:00 P.M. is common and acceptable. For further study, sketch the view through the mask on your sun path chart and think about it later.