TECHNICAL SOURCE GUIDE

CREATING THE ELLIPSE – PART 2

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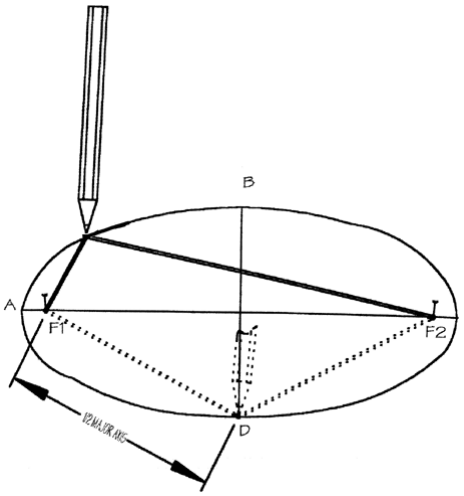
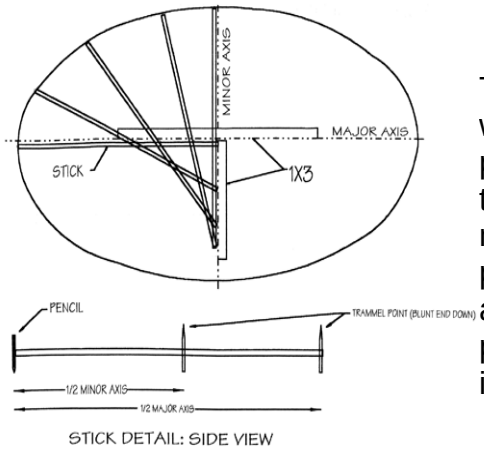
Perhaps the best-known method for drawing ellipses, and the one featured in most drafting texts, is the string method (Figure 5). First, establish the major and minor axes. set a compass to one-half the length of the major axis. Place the compass point on one end of the minor axis and strike an arc across each side of the major axis; the points where the major axis and the arcs intersect are the foci of the ellipse



(F1 and F2). Tie a cord to one of the foci, and set the point of a sharp pencil on one end of the minor axis.. Take the free end of the cord around the outside of the pencil and wrap it a couple of times around the other focus point. Pull the cord until all the slack is removed and hold it there. Keep the pencil pressed against the cord and move it to each end of the major axis. It will describe half an ellipse. Repeat for the other side. (Note: It is not necessary to tie a complete loop around the foci and the pencil. Attempts to get the circumference just right can be frustrating and the knot just gets in the way.)

When laying out large ellipses, stretching the string can affect accuracy. One must keep the same tension on the cord and the same angle on the pencil throughout the process and this is not always easy to do. Nevertheless, set-up and execution is quick and requires few tools.

The Two-Boards-and-a-Stick Method



This method uses three standard trammel points: one with a pencil instead of the point and two with the points inverted. Attach the pencil to the end of a stick that is at least as long as one-half the length of the major- axis from the pencil. Attach the other trammel point to the stick at a distance of one-half the minor-axis from the pencil. (Nails can work in lieu of trammel points.) Place a board along the minor axis, as shown in Figure 6.

The length of the minor-axis board is not critical, but it should be at least as long as the distance between the two trammel points. Leave a gap between the end of the board and the major axis for the end of one of the trammel points to pass through.

Place a board along the major axis as shown. The length of the major-axis board is not critical, but it should be at least twice as long as the other board.

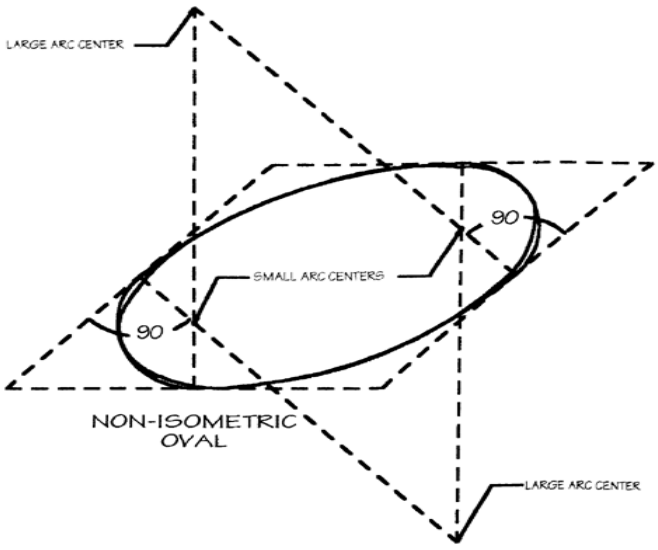
Slide the trammel point furthest from the pencil along the minor-axis board and the other trammel point along the major-axis board as shown. (Hence the blunt end of the trammel points down.) The pencil will describe half of a perfect ellipse of the desired size. Move the minor-axis board to the other side to finish the ellipse if necessary. (For very large ellipses it helps to have a person at each point and at the pencil to assure proper travel.)

This method is more accurate than using a string and two foci, is nearly as quick to set up, and uses common items found in most scene shops. And, a router can replace the pencil if one wants to directly cut out the ellipse.

Other Methods to Consider:

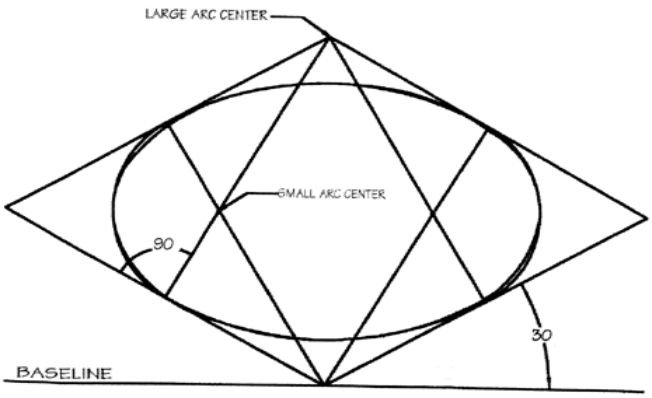
1) When CAD is available and the ellipse is larger than the plotter can handy one may simply laser-print or plot a scale version of the ellipse to acetate, then project the image with an overhead or opaque projector on a suitable surface and trace. In this case, the ellipse should be printed With as fine a line as possible, since the line will thicken with enlargement. For greatest accuracy, one should mark points along the edge of the projected line and then use a spine to connect the pants

2) If a simple oval is all that is necessary, rather than a true ellipse, then a method adapted from isometric drawing may be used (Figure 7). This method requires that a rhombus (equilateral parallelogram) be constructed that we contain the oval, but that is often necessary when trying to position an ellipse with respect to other objects in the drawing anyway. Establish the rhombus where the oval is to be drawn. From the center of each side and perpendicular to the side, extend a line until it crosses similar lines from both adjacent sides.



The four points where the four lines cross are the centers for the four circular arcs that form the oval. The radii of each arc is the distance from the arc center to the center of the original side. To complete the oval, simply draw the arcs with a compass.

If the rhombus is truly isometric—that is, the sides are drawn thirty degrees to horizontal—then the large arc centers will be located at the corresponding comers of the rhombus (Figure 8). Therefore in the interest of time and simplicity, this method is preferred over true ellipses for isometric drawings. The dotted line shows a true ellipse and the differences are minor.



ISOMETRIC OVAL

3.) The scenic artist’s' technique for laying out irregular shapes with grids may be used for ellipses. In this case the scale drawing of the ellipse is overlaid with a regularly spaced grid. A proportionally larger grid is laid over the final drawing and the image transferred square by square. This method is cumbersome and slow and should only be considered if other aspects of the image required a grid anyway.

4) A close approximation of an ellipse, which may be acceptable in many cases, can be drawn free- hand using a folded sheet of paper. Cut the paper into a rectangle so that its length and width are the same as the desired ellipse. fold the paper into quarters and draw on a quadrant of the ellipse free-hand, using the folds as the axes. cut the paper along the line and unfold the paper. Voila! A perfect ellipse! OK, so it wasn't perfect Merely re-fold the paper and trim a bit until the unfolded ellipse is acceptable.

Personal preference will dictate which method is used, but my experience is that once a draftsperson or technician is introduced to either of the trammel methods, he or she seldom uses the others. The trammel methods do not clutter the drawing with extraneous lines and the necessary materials a scrap of paper or a couple of boards—are commonly found in the design studio or scene shop.

Thank you for taking time to read this “classic” Technical Source Guide! Because it has been published a relatively long time ago, addresses (physical & web) and any phone numbers, might not be current!