

CHAPTER 19

The use of glass for a sun dial

This chapter covers the following topics...

THE USE OF OPAQUE GLASS

as in reflected light dials

THE USE OF TRANSPARENT GLASS

where light and shadow are transmitted through the glass

This is not intended to be a treatise on stained glass, but rather a few pointers to consider when constructing a dial using glass.

Glass may provide for a matte surface such that the shadow is seen by reflection, as with any common sundial made of other opaque materials. While horizontal dials produce few challenges, a vertical reflective glass dial indoors requires consideration in placement, and may prove impractical since the dial must be on the other side of the observer compared to the sun.

Glass allows transparency and thus may allow a shadow to be seen through the glass, such as is seen in stained glass windows. This would tend not to be practical for horizontal dials but produces splendid results for the vertical dial which would be between the observer and the sun. Doing so, however, introduces some things to think about.

First, the dial plate would be drawn using a mirror image template.

Second, the gnomon needs rigidity which may take extra thought for declining dials.

Third, the techniques for marking a vertical dial plate may use more advanced skills for the glazier, such as tracing and other fine detail work.

Fourth, the nodus linear height is to the frosted surface upon which it typically resides, and not to the front or non weather side of the glass dial.

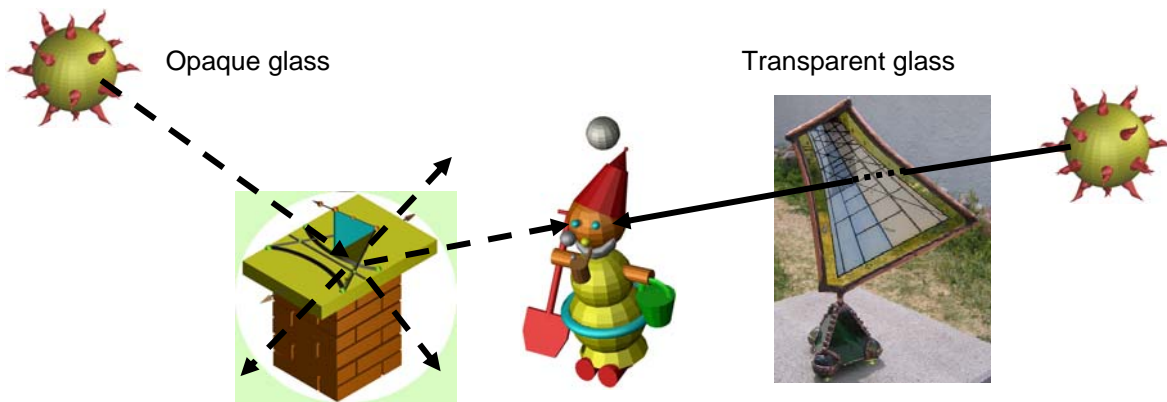
This chapter expands on these topics.

GLASS DIALS

Sun dials may be made in almost any media, and glass has been one of them used down through the centuries.

Historically, glass sun dials were of the painted and stained variety, both of which are processes requiring kiln firing. And they used the property of the light coming through the glass as opposed to being reflected by it.

However, the non transparent and more opaque of the glasses may be used on a dial plate where the observer looks at the gnomon's shadows on that glass which are then reflected towards the observer as on the left side of the pictorial below.



A reflective dial where light and shadow are reflected by the dial plate, it would reside outside or away from the window if it were a vertical dial.

A translucent dial where light and shadow are seen through the glass, it would reside at the window itself.

Reflecting dial plates need little explanation since most dials are of that type. The question becomes what is different with glass dials where the glass dial is transparent, as on the right side of the pictorial above.

A transparent dial such as a vertical meridian dial pictured above would reside in a window, and receive the sun some of the morning (if facing east) or some of the afternoon (if facing west). If a glass reflecting meridian dial were used, then it would have to reflect light which means it could not be in the window itself, but rather on the wall receiving light from the window with the observer in between. And that lighted area will move dramatically making the indoor reflecting dial less practical. Thus for indoor use of vertical transparent glass is much more effective than a reflective dial of an opaque glass. The same would apply to a vertical south facing dial.

For indoor use transparent glass serves best. But how does one see a shadow on transparent glass? The shadow is hard to see on all but the opaque glasses and in a weak light no shadow would be seen. The solution uses a clear glass with a frosted surface, either by an etching cream or a sand blasted process both of which have safety considerations.

The markings may be painted, and there are modern methods not requiring a kiln, however the author prefers a tracing black and brown matte such as were used in the 13th centuries, and fired around 750 degrees Celsius. The pigments are mixed with a flux, each of which has differing benefits. While water may be used, the paint or matte will easily flake. Oil of cloves, anise, and other mediums make a very firm bonding with the glass.

The tracing black is used for the hour lines, calendar lines, and numerals indicating the time. Traditionally they are drawn on the non weather side of the glass which makes writing much simpler. For true meridian and true south dials the process is simple, but for a declining dial care must be used in making the template which will be held below the glass, and above which the dial plate will be drawn in. Care is needed because the hour lines are no longer symmetrical. The template used should thus be a mirror image print of the declining dial because we will be looking south through the glass and not be looking north from a southerly position.

The firing is done and the glass cooled, and for texture a matte may be added with texturing from a brush. That would be a second firing. If the fluxes used for the first firing were effective, then the matte could be applied before that second firing, and thus both would be fired in one step.

The lines and indications need to stand out, and this may use the same technique that is used to make the gnomon's shadow stand out, or they may be marked on a dark matte as in a negative. The weather side of the glass traditionally holds stains and frosting. The tradition goes back to the fact that silver stains (producing the wonderful golden yellow textures of the 14th century, weather well and last hundreds of years, whereas the paints and mattes have a much shorter life when exposed to the elements.

If an etching cream is used then all safety precautions must be observed. While the author has had some success with this, more success has come from a silicon carbide grit in a sand blasting box under the pressure of a compressor. Here again safety must be paramount.

At this point we have lines on the room side of the glass, and a frosted texture on the weather side. In between the paint firing and the frosting may come a stain firing, the wonderful golden yellow stain is derived from silver compounds, fired around 1250 Fahrenheit for a longer period of time. This stain process is on the weather side of the glass, and by doing it before the frosting process, any stain found in unwanted areas may be rectified.

The gnomon must be rigid, and to ensure that, it is best if it lies on a lead or foil line. Simple for the meridian dial and the south facing dial, but some creative thinking may be needed for a decliner.

The author uses 1/4 inch copper pipe commonly used for refrigerator ice making lines as the frame. If the dial is to hang then stress must be considered to avoid glass separation from the frame, as in any hanging window or panel.

If the panel is to stand on a surface such as shown on the prior page, then a stand must be able to sustain jarring forces. The author uses pyramids with large glass marbles touching the surface. Three marbles create stability. The glass pyramid has three panels of 45 or more degrees at the bases. By not beveling the edges, a very sturdy solder line is formed that is structurally sound, and for decoration, solder buttons are applied.

The entire panel is cleaned, then brushed with copper sulphate, a caustic material with safety considerations. Then washed and dried.

SUMMARY

The templates used are mirror image of a template that would be used for a reflective dial, especially important for declining dials. Chemical and other safety considerations exist. However the end result is a wonderful delight to behold. A resource for stained glass dials is: www.stainedglassundials.com