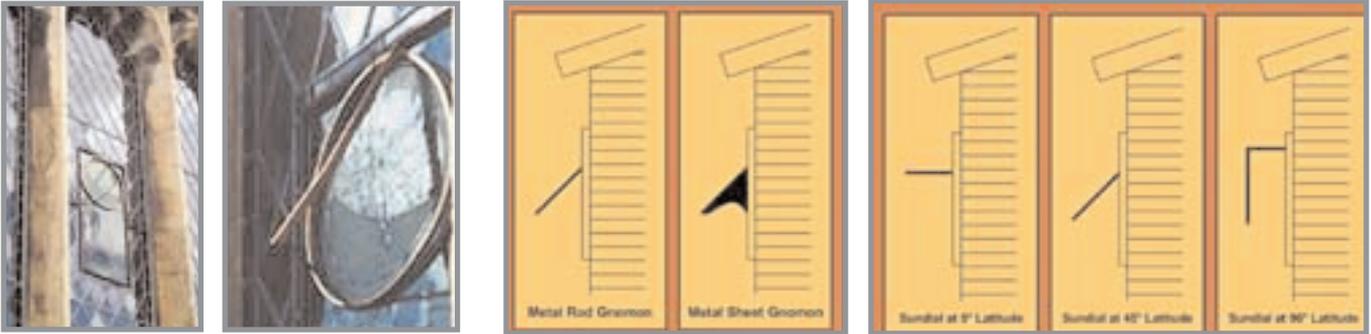


LOOKING AT: Stained Glass Sundials - Part II by John L. Carmichael



WINDOW LOCATION: Any window that receives sunlight can be used for a sundial, but the best location for a stained glass window sundial is a vertical wall that faces due south in the Northern Hemisphere or due north in the Southern Hemisphere. Obviously, it should receive full or filtered sunlight for most of the day. Another good place is on a horizontal flat roof (like a skylight). Both of these locations are good because the sun shines on the window for most of the daylight hours so they tell time and are functional for the maximum amount of time. On the other hand, you can have a sundial window on an east, west or even a north wall, but these sundials will only work for part of the day. In the tropics, vertical sundial windows will only work for about six months of the year if they are near the equator because the sun is behind the building and doesn't shine on the window.

In theory, one can design a sundial for any surface that receives sunlight, even angled, tilted and curved surfaces. But these odd sundials' calculation, construction and installation, particularly the tricky placement of the gnomon (the shadow caster), are more difficult. South wall and flat ceiling sundials are definitely the easiest to design, construct and install. If you want a window for a wall that doesn't face south or that is not vertical, to avoid errors, I suggest that you work closely with a sundial designer in your local area who would be willing to personally visit the building, take wall measurements and help you with the window and gnomon installation.

GNOMON ATTACHMENT: There are several ways you can attach the gnomon (the shadow casting metal rod or triangular sheet) to the sundial. I suppose you could solder, weld or use an adhesive, but these methods are rarely used because they are problematic in one way or another.

The traditional way is to make threads on the end of the metal rod gnomon and bend it in a vice to the exact angle specified in the design plans. Place it through a slightly larger hole cut in the glass or metal structure of the window. If the hole is through glass, to protect the glass, you should use padded washers between the glass and flat metal washers. You might even put a thin padded sleeve around the gnomon so that it is not in contact with the glass at all. Tighten this 'sandwich' with nuts on both sides, making sure that the gnomon is pointing in the right direction. Of course, if the glass is too thin, the gnomon could crack the glass, so the other methods of attachment would be

(left) Sundial by Chris Daniel, made by York Glaziers Trust, late 1900s, on Merchant Adventurers' Hall, York, with detail of gnomon welded to a metal ring and support; (centre) two types of gnomon; (right) gnomon angles at different latitudes preferable. But if the glass is at least 3 mm (1/8") thick, it should be ok to bolt the gnomon directly to it if it isn't too heavy.

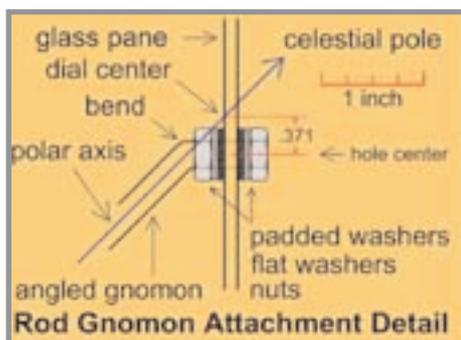
Note that if the gnomon is angled downward, the hole in the glass is slightly below the centre of the sundial where the hour lines converge. (See Rod Gnomon Attachment Detail drawing.) The distance between the hole and the dial centre is variable depending on angle of the gnomon and its thickness. In this example, a 45°, 1/4" thick gnomon makes the distance between the hole and the dial centre equal to 0.371". This distance increases if the gnomon's width increases or if the gnomon is bent more. Therefore, at higher latitudes, the distance from the hole to the dial centre increases.

Sometimes, metal support stays are soldered to the outside frame of the window and to the gnomon to give it added support. Also, you can attach the gnomon to the wall of the building directly above the window if it is practical. Your sundial designer will surely help you with the design and placement of the all-important gnomon.

All polar axis gnomons, properly positioned on any sundial, will be parallel to the Earth's axis, and will point to both the North and South Celestial Poles. The North Celestial Pole is located very near the North Star. So, on South wall windows in the Northern Hemisphere, the gnomon will extend outwards and from the dial face and will be angled downwards to the South at mid-latitudes. At the Equator it would extend horizontally at a right angle to the window face, and at either Pole it would be parallel to the window, vertical, and spaced away from it.

Most stained glass sundials use the rod gnomons instead of the triangular sheet gnomons because they cast a smaller shadow on the stained glass and don't affect the light and colours passing through the glass as much. They're also easier to make and install. Another type of gnomon not pictured here is a post gnomon. It usually meets the dial face at a 90° angle and may have a small sphere or a point at the end. You read the time where the shadow of the post's tip falls on the dial hour lines. Post gnomons can also be used to tell the date on some sundials.

For those who are adventurous, other exotic types of gnomons are possible. The sky's the limit! In this photograph of a horizontal skylight sundial by Claude Hartman USA, the gnomon is simply a gap in a shade cloth placed above the sundial. Note how it uses a bright slash of sunlight to mark the hour.



SUNDIAL DESIGNS: Designing a stained glass sundial window requires collaboration between the client, the glass artisan and the sundial designer. Today's stained glass craftsmen can build a sundial window almost as easily as a typical stained glass window if they have a little technical help with their sundial drawings. Astronomical laws demand that every sundial has a different design depending on its location. Window sundials will function as accurate timepieces only if a qualified sundial designer who understands the math involved provides the artisan with a custom-made design based on the window's specific location using its latitude and longitude. Most sundial designers now use special computer programs to calculate and draw ultra-precise sundial designs that are available in printed or digital form. Using this sundial design, the glass artisan can make a window that is just a sundial or he can embellish the sundial design with extra artwork. By looking at photos of existing glass sundials, and using your imagination, you can visualize that many different stained glass sundial designs from traditional to modern are possible.

The glass artisan will have to discuss with the sundial designer details such as the sundial's location, size, shape, time notation (Standard Time or Daylight Saving Time), gnomon type and general design so that the latter can come up with a drawing that you can work into your window design. You will need drawings of the sundial face and the gnomon. The artisan should have no trouble transforming a drawing of a simple vertical south wall or horizontal sundial into a working sundial window.

If you'd like to find a professional sundial designer to help you with your design, you can locate one via the following websites:

North American Sundial Society Artisans Link: [http://sundials.org/links/Sundials on the Internet/Sundial Makers:](http://sundials.org/links/Sundials_on_the_Internet/Sundial_Makers)
<http://www.sundials.co.uk/sunfair.htm>



EDUCATION AND PUBLICITY: In order to get more of these wonderful things built, it's simply a matter of education and getting the word out. It requires informing the public and the stained glass community that glass sundials are indeed possible, and showing them beautiful existing examples to get them inspired. Therefore, we're publicizing the idea on the internet and in several stained glass publications.

With the help of my colleagues in the sundial community, we developed a new educational non-profit website that is a wonderful collection of the only available photographs known to exist of stained and etched glass sundial windows. We are using the website to promote and facilitate communication between stained glass customers, glass artisans and sundial designers. It has links to lists and websites of both sundial designers and stained glass artisans from around the world and it tells the reader how to go about commissioning a sundial window. It's called: Stained Glass Sundials of the World:

http://advanceassociates.com/Sundials/Stained_Glass

If you make a new glass sundial or find a one that isn't already in the Stained Glass Sundials of the World website photo collection, we'd be happy to include your photos and any information about them you wish to share (building, city, designer, maker, date). Please, if you have any questions email or call me. I'm here to help and serve!

(Sundial Sculptures, 925 E. Foothills Dr., Tucson AZ 85718 USA; email: johncarmichael@mindspring.com; tel.: 520-696-1709; website: <http://www.sundialsculptures.com>. The author would like to thank all the people who sent in information and photographs. The author and publisher grant permission to copy this document in its entirety and without changes.)
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(below left) An etched stained glass sundial; (below centre) the Spectra sundial: a tabletop etched sundial (Artisan Industrials Corp ©2002); (below) a recent sundial by John Hayward, at Toller Porcorum church, Dorset

