



What is a Fresnel Lens?

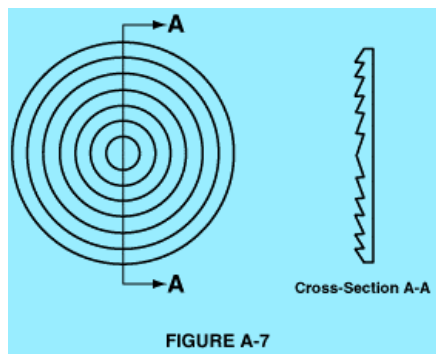
If you have ever looked at the lens of a magnifying glass, you know that it is thick in the middle and tapers down to nothing at the edges. In other words, it is shaped like a lentil, which is where the word *lens* comes from. It would not be very easy to make a big magnifying glass lens for your monitor or TFT screen because it would be thick, heavy and hard to mount.

A Fresnel lens overcomes this problem. It is flat on one side and ridged on the other. Fresnel lenses were first used in the 1800s as the lens that focuses the beam in lighthouse lamps. Plastic Fresnel lenses are used as magnifiers when a thin, light lens is needed. The basic idea behind a Fresnel lens is simple. Imagine taking a plastic magnifying glass lens and slicing it into a hundred concentric rings (like the rings of a tree). Each ring is slightly thinner than the next and focuses the light toward the center. Now take each ring, modify it so that it's flat on one side, and make it the same thickness as the others. To retain the rings' ability to focus the light toward the center, the angle of each ring's angled face will be different. Now if you stack all the rings back together, you have a Fresnel lens. You can make the lens extremely large if you like. Large Fresnel lenses are often used as solar concentrators.

Fresnel

Augustin Jean Fresnel developed the first Fresnel lens in the early nineteenth century. Today, his invention can be found in optical systems where design criteria call for light weight or small size.

Unlike traditional lenses, Fresnel lenses do not employ smooth-surface contours to focus rays of light. Instead, the surface of a Fresnel lens is molded into many circular, concentric ridges. The symmetry of these concentric ridges is similar to that of a dart board.



A Fresnel lens looks like a dart board when viewed straight on, but it has a zigzag cross-section.

These circular ridges give the Fresnel lens a zigzag or sawtooth cross-section. Each sawtooth creates a tiny prism. By choosing appropriate powers for these prisms, designers can define the focal length and control image quality.

Fresnel lenses are molded from precision optical-grade acrylic. Typical applications are projection TV's, microfiche readers and overhead projectors.

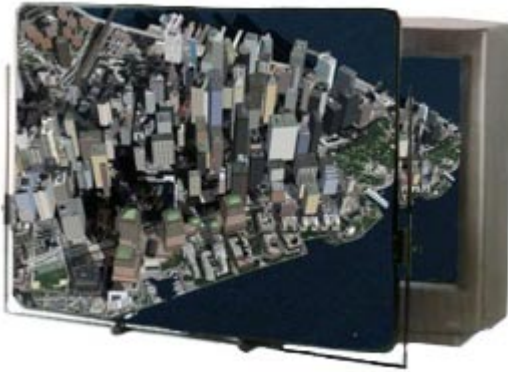
The application for Fresnel lenses in microfilm and microfiche readers are to amplify the available light. Microfilm and microfiche readers often are built to fit on a desk or tabletop. Fresnel lenses help to minimize the size of the illumination system.

Overhead projectors incorporate a Fresnel lens as part of their illumination systems. Usually the Fresnel lens is visible just below the glass platen onto which the transparencies are placed. In order to illuminate evenly the image of the transparency on the screen, the condensing system must direct light through all parts of the transparency into the projection lens, which is mounted on the arm above the platen. A more conventional lens could be used for the task, but its weight and expense would be prohibitive if it were made with the requisite 8 1/2 by 11-inch aperture.



Another application for a Fresnel lens can be found in the design of large-format view cameras. A view camera contains a large ground-glass focusing screen. In order to improve

uniformity of brightness across the entire screen, a Fresnel lens can be placed against the ground glass on the side facing the camera's lens. There, the Fresnel element functions as a field lens by intercepting light already focused at the screen and refracts it toward the viewer's eye. Rays that would be lost because of their large angles of incidence near the edge of the focusing screen are thus captured and contribute to image brightness.



Other applications include TV projection, LCD projection units, 3 dimensional photography, solar energy systems, infrared alarms and detection systems, point of sale scanners, etc.

SimKits offers several different types of Fresnel lenses. They are defined on our website as:

- 76 cm (30)
- 104 cm. (41")

The lens allows you to view your monitor screen with your eyes focused out nearer to infinity instead of two feet in front of your face. The image is also enlarged over 2 times depending on the positioning of the lens in front of your monitor or TFT screen. However, the main benefit is that the image seems to be far away. A "fresnel" lens (pronounced frayNELL or fruhNELL) is a flat lens which takes the curve of a lens and reduces it to a flat shape by sectioning the lens into concentric rings. In the science of simulation, this is called a "collimated display". Collimated means that the light rays are coming out parallel instead of radiating out in the normal way.

Some professional simulators use curved mirrors to provide the collimation and some use fresnel lenses that cost tens of thousands of dollars, but SimKits now offers a Fresnel lens including stand that is affordable.

A Fresnel lens is also used in large projection TV's, produced by Philips, Sony, JVC and many others.

The lens is simply placed in front of your monitor, TFT screen or LCD Monitor via the included stands. By adjusting the distance, you also adjust the magnification size. The size is measured diagonally.

www.simkits.com
www.therealcockpit.com

Support: support@simkits.com

SimKits is a product line of
TRC Development b.v.
Stationsweg 39
4241 XH ARKEL
THE NETHERLANDS
phone +31 183 562 522
fax +31 183 564 268

Mailing address:
P.O.BOX 544
4200 AM GORINCHEM
THE NETHERLANDS