SERRAGLAZE - How Serraglaze works

Serraglaze is consists of two very thin sheets of acrylic ("PMMA" or polymethylmethacrylate) incorporating microreplicated prisms bonded together to create microscopic air pockets (“lamellae”) that act as light shelves set perpendicular to the faces of the sheet.

The lamellae act like reflecting mirrors when light beams passing through the PMMA strike the surface of the lamellae at an angle greater than the critical angle. This is a result of the change of the refractive index from the figure of about 1.49 for PMMA to the figure of about 1.0003 for air. The critical angle for these two materials (PMMA and air) is about 42 deg. This phenomenon is known as Total Internal Reflection (TIR) and the general behaviour of Serraglaze is that of a beamsplitter, the split ratio of which varies with incidence angle, as illustrated in Figure 1.

At higher incidence angles than those shown in the figure, the ratio of redirected light to unredirected light becomes larger until, at an incidence angle of around 55°, virtually all the light is redirected and none is transmitted unredirected. At greater incidence angles than this a small proportion of the light undergoes reflections at both flanks of the lamellae while at still greater incidence angles an even smaller proportion is totally internally reflected at the ‘exit’ face and fails to emerge from the device. These more complex behaviour patterns are relatively unimportant in most window applications because only a small proportion of the total incident light arrives at high incidence angles.

The ability of Serraglaze to prevent high incidence sky light from passing directly down to the floor, where the occupants of a room are located, makes it very beneficial as a glare reducing medium and sunshade. Serraglaze also offers a very important bonus for the occupants of the room, because it treats solar radiation in much the same way as it treats visible light, thereby acting as a brise-soleil and shading the occupants from the direct heat of the sun as well as from its light.

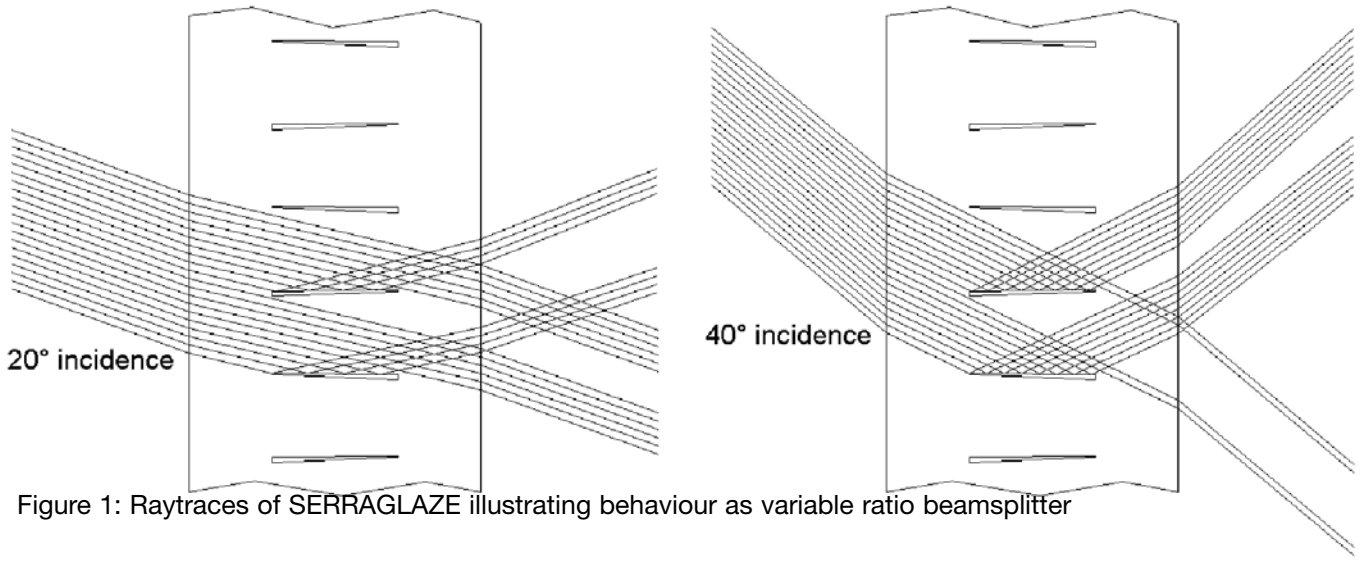

Figure 1: Raytraces of SERRAGLAZE illustrating behaviour as variable ratio beamsplitter

45 Bedford Row
London WC1R 4LN

t: +44 (0) 20 7092 1760
f: +44 (0) 20 7092 1769
e: sales@bendinglight.co.uk
w: www.bendinglight.co.uk

How Serraglaze works continued...

TIR produces an impact on the direction of light penetration both for daylight (which is a diffused source) and sunlight (which comprises single direction moving beams). Serraglaze can thus operate to serve a variety of functions from the increase in daylight in a room to solar shading. The variable functions can be put into effect by varying the angle at which the Serraglaze is set into the building façade or other element of construction.

Where Serraglaze is set in the plane of an external wall, daylight penetration is increased by the upward redirection of all light from the sky impinging at the PMMA/air surface at less than 48 deg ie 90 deg less 42 deg. In most Serraglaze installations, the panes are laminated to glass which means that light beams are bent as they enter the glass from the air. The refractive index of glass is about 1.52.

Computer modelling, using both Radiance and Genelux, has confirmed the performance of Serraglaze, which varies with the level of the window concerned in relation to surrounding buildings, and thus how much the window can "see" of the sky. Computer modelling has demonstrated that significant increases in illumination of the interior are provided by Serraglaze as the angle of the obstruction created by the building opposite increases. Dramatic increases of two to three times the internal illumination level can be obtained if the Serraglaze is used in either a canopy or an angled window.

SERRAGLAZE AS A PRODUCT

A Serraglaze panel is thin, about 1mm thick, and it is usually laminated between two sheets of glass using optical index matched adhesive and the edges sealed. This provides the necessary protection of the Serraglaze material against damage, dust and moisture. It is made on a bespoke basis using proprietary microreplication techniques by our licensed manufacturer in Germany. Serraglaze is manufactured in 250mm x 250mm panels and smaller panels can be supplied ready cut. To achieve the requisite size, a rectilinear mosaic of Serraglaze panels is made between layers of laminating adhesive that are in turn sandwiched between sheets of glass. The whole assembly is cured in an autoclave in the normal way.

APPLICATIONS

In an overshadowed building, the rooms facing north and east have limited daylight, giving a gloomy aspect. Serraglaze as a daylighting production will provide an enhanced daylight solution. Lower ground floor and sub-basement rooms will also benefit from the light collecting properties of Serraglaze. Options include full glazing, clerestory glazing and canopies for maximum impact. Serraglaze applications are highly suitable for new build and refurbishment opportunities.

45 Bedford Row
London WC1R 4LN

t: +44 (0) 20 7092 1760
f: +44 (0) 20 7092 1769
e: sales@bendinglight.co.uk
w: www.bendinglight.co.uk