

ISLAMIC GEOMETRIC PATTERNS – MASHRABIYA

A mashrabiya, also known as either shanshūl or rūshān, is an architectural element, essential to the traditional architecture of the Islamic world. They serve as highly decorated enclosed balconies, representing cultural heritage and successfully harmonize artistic and architectural philosophy. Used since the middle ages, its approach in form draws from oriel windows – or bay windows – which protrude from the main wall of a building, without touching the ground. Responding to the cultural and geographical aspects of daily life within the ancient Islamic world, mashrabiya strongly differ in their design from their European counterparts.

Integral to the Arab lifestyle, mashrabiya were generally installed within domestic dwellings and royal residences – situated on the upper floors (from the first, upwards), and sometimes in open-air structures. They're commonly employed externally, on the street side, however they can also be positioned internally, on the sahn side, facing an inner courtyard. Where they hang over onto public streets, Islamic laws require that the design and build ensure the safety of those below. The projecting component of the mashrabiya is designed such that, under no circumstance, is it to cause any damage to either neighbors, nor the occupants of the street beneath.

The construction of a mashrabiya involves a series of cylindrical wooden pieces, known as bars, which range in size from 10cm to 1m depending on both the scale and level of detail required. Creating the mashrabiya's form, these bars are spaced out at regular distances and interconnected with larger pieces – cylindrical or cubic in shape. When completed, the joining of these elements, creates precise and decorative geometric shapes which make up the design. The horizontal bars

are attached to these interconnected points using mortise and tenon joints, a strong and durable wood-joining technique, which has been used for thousands of years.

In using this technique, traditional craftsmen could assemble these screens without the need to use tools or fasteners, like nails. Using techniques like this, passed down through generations, the overall structure is able to maintain its shape, adjusting itself, as necessary, to withstand both compression and expansion in varying climates. Modern made mashrabiya often use more high-tech methods of joinery, sometimes straying from the graceful form of the traditional façade.

In order to increase structural integrity, bars were also positioned within the framework to aid in the distribution of loads throughout the lattice. Structurally the lattice is formed of two primary sections – the upper and the lower. The upper consists of a tight lattice, made up of fine narrow bars, whereas, the lower is in more of an open grid format with broader bars.

Traditional craftsmen of mashrabiya also, through experience, are able to adapt their methods according to the wood type employed – understanding the behavioral traits of each.

Designs for mashrabiya are created by architectural designers and craftsmen alike. Wood carvings and inscriptions act as decorative elements, working alongside the geometric patterns formed from the structure of bars. Varying designs in this latticework were a result of regional aesthetics. Most mashrabiya were sealed. This was done through the fixing of stained glass, which could be coloured, adding to the aesthetic. Alternatively, for those that weren't, they were left open.

Aside from its decorative function, the mashrabiya's long-established cultural value can be credited to its role in

responding to both the needs of the user/ occupant, and the environmental conditions of the location.

One of the primary advantages of the mashrabiya is its protection against the high heat and intense sunlight of middle eastern climates. Due to its dry desert climate, featuring high temperature and humidity levels, methods of cooling are vital in ensuring a degree of comfort within homes. For this reason, it's no wonder that the mashrabiya, which offers a passive cooling system, as well as shade, has been used in the region for many centuries. Traditionally it was used to capture and passively cool the wind. Jars and basins of water would be placed within it, which naturally caused evaporative cooling. These containers stored drinking water which cooled over time. When open, the mashrabiya allows for cool air to pass through the façade, promoting a constant air flow, cooling the interior space.

Due to the significant role they play in cooling, in response to the sun, when designing a mashrabiya, architects and or artisanal designers had to consider its orientation and situation in relation to the sun's path. In positions where they are more exposed to sunlight, spacing between bands are typically narrower. From the outside, the mashrabiya presents a beautiful and enigmatic front. In the light of day the patterns present on the surface are reflected internally, creating ethereal patterns amongst the shadows. The soft diffusion of light, darkening the interior relieves occupants from what would otherwise be uncomfortably bright.

There are other advantages of the mashrabiya which concern the users' needs. For one, the mashrabiya enables occupants from within to retain contact with the outside world, through its lattice structure (forming perforated wooden screens), all the while preserving their privacy. This privacy is emphasized due to the high luminous intensity outside and the fine dark screen of shade on the inside.

Another advantage it gives rise to relates to its surrounding architectural context. Within Islamic urban communities, the spacing relationship between buildings can be quite irregular i.e. following the contours of small winding roads. This can, at times, for homeowners or their neighbours, result in dead spaces and unconventional shapes, which can be an asset or a liability, depending upon the circumstances. This is where the mashrabiya plays another important role. Its projecting form effectively reacts to these varied shaped land plots and the spaces that lie between buildings. This can allow rooms on the upper floors to be expanded, through the space which the mashrabiya hosts, thereby expanding usable space, without having to alter the plot's dimensions.

Finally, mashrabiya not only aids users inside; it also impacts the ground floor and the space into which it protrudes. Creating a covered area off the road, they cause large buildings, in an urban context, to feel more grounded – particularly to those outside. In addition they cast shadows and could block rain for pedestrians as well.

Overall, the ancient mashrabiya successfully merges cultural values of heritage, traditional geometric visuals and ancient technical aspects, into something beautiful that has truly stood the test of time.

