

A picture painted by the sun. Light and shadow complement each other rather than being mutually exclusive – similar to the way lightness of design can also meet the guidelines for earthquake safety, as recently proven in May this year.

The 'hole' story

Terminal 2 at Mexico City Airport.

Text: Prof. Susanne Brenninkmeijer
Photos: Pedro Hiriart, Jaime Navarero, Joachim Ritter

To allow daylight into a building it makes sense to create openings in the facade. In conventional buildings these openings generally take the form of windows. The approach taken by Serrano Architects for the unique facade and ceiling design they developed for the new Terminal 2 building at Mexico City Airport is a different story altogether.



In spite of its size, the Terminal also looks remarkably light from the outside. In the case of the entrance section, the ceiling comes across as being more solid than the supporting walls. The original idea was to glaze the supports, but left as they are and illuminated from below they actually look even lighter.



In a country such as Mexico, located as it is at 20 degrees of latitude, one of the prime goals when designing public buildings is to ensure the climate inside the structure is comfortable for the users. With an average of eight hours of sunshine per day throughout most of the year, and temperatures of almost 30 degrees in the shade every day over the warm summer months, room climate literally becomes key to survival. Given that Mexico City, the country's capital, is located 2,200 metres above sea level, the situation here is somewhat different. The sky is often overcast, which is not true of most of the rest of the country. The new Terminal 2 even looks beautiful under cloudy skies, but comes into its own when sunlight comes into play.

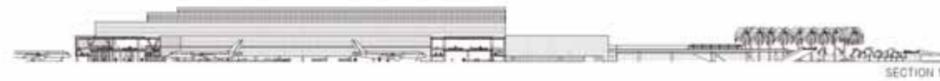
The obvious design task, and indeed challenge, was how to change the openings or windows to ensure there is sufficient incident daylight, while at the same time not over-illuminating the interiors and maintaining a low thermal load. Serrano applied the principle of a sieve to reduce the amount of incident daylight without creating an impression of darkness.

The architects consistently designed and applied a perforated facade structure for practically all the outer walls of the new airport terminal in the mega city. These allow daylight to penetrate the building with an interesting spin-off in the form of a play of light and shadow over the interior walls and floor. When viewed from the outside after dark the different sections of the building become glowing, almost floating boxes of light.

The Terminal 2 building differs radically from many other public buildings in Mexico, most of which aim to

keep sunlight strictly outside. Solar protection is usually realised in the form of solid walls, which keep the interiors cool and relatively dark. Keeping daylight at bay in this way often means that you feel you are plunged into darkness when you enter buildings because of the drastic contrast in luminance levels. This is definitely not the case in the new airport building. The structure, which was completed in 2007, includes daylight as an integral part of the architectural design.

The outer walls are designed so that daylight can penetrate the building from all sides, reaching the smallest corner of any of the building sections. Unlike the glass architecture you might find in Europe, where light remains shadowless, the light is distributed diffusely –



sometimes in the form of bright dots of light dispersed against the contrasting dark background generated by the shadow cast by the solid sections of the walls. This stark contrast between light and dark is relativized given the large number of dots of light and the regular pattern they create. Users no longer feel this is disturbing. On the contrary, it is perceived as a structured backdrop which, when taken as the overall impression, is understood as an evenly lit space. Inside the building it is often hard to determine whether one is perceiving the light openings in the facades, their reflection in glass, or the projection of patches of sunlight onto a separate surface.

Architects J. Francisco Serrano, Susana García Fuertes and Pablo Serrano Orozco were very aware of the effects their façade design would generate.

They saw themselves as designing a true daylight building and designed the proportions of the holes so that when viewed within the building from a variety of perspectives the effect would be one of uniformity and harmony. The resolving capacity of the eye kicks in as soon as the viewer makes a conscious effort to differentiate between the patterns or actually approaches one of the perforated walls, at which point he will perceive round openings, like windows. These have a diameter of 30 centimetres and resemble portholes. That is to say, when you go up to them as you would do to a window you can actually look out. The regular layout of the round openings – they are spaced at 75 centimetres – combines a series of perspectives that together render an impression of the outside world. In spite of the solid quality of the pre-fabricated concrete elements and the fact that they are 20 centimetres thick and measure 1.5 by 15 metres, the perforations make the walls look light and airy. Expressed in per cent, very few perforations are needed to rob the walls of their heavy material quality. The white colouring of the concrete reinforces this impression.

The only section of the building that is not affected by the translucent quality of the perforated walls is the 'patio', which forms the entrance to the airport building and provides access to other sections of the building. The outside view shows perforated facade cladding, which looks light during daylight hours and is practically dematerialized when illuminated using electric light. When entering or driving into this space, it soon becomes clear that this is a huge building element with a large round central light opening. This feature underlines the fact that the entrance situation is indeed a pivotal point leading off into four different directions: from outside to inside, to the seven-storey car park, to the hotel currently being built on the roof, and into the Terminal itself. From a lighting point of view, the patio is the first indication one has of an interior space, albeit only with a solid ceiling in part and where daylight can enter unfiltered through the large opening in the ceiling. It is in effect a semi-outdoor space in which users are definitely aware of the weather conditions, including wind and rain.

This impression changes the moment you enter the three-storey, completely closed main hall. Two shed roofs with vertical glazing run the entire length of the building, providing ample amounts of primarily indirect light from the north-west. Although there are no windows that allow a direct view of the outside world, the hall is nevertheless light and friendly. On the upper level, which houses the Departures Hall, the perforated walls and ceiling make for a naturally lit atmosphere. The interplay of light and shadow is especially interesting at peak times when the overall space is filled with dots of light and the equivalent number of waiting passengers' heads!

The principle behind the design concept for the electric lighting is very obvious in the upper Departures area, the goal being to provide a substitute for daylight and create as near as possible the same atmosphere with electric light. In the hours after dark, the electric light therefore aims to imitate the play of natural light over the surfaces, and the direction from which it emanates. Luminaires are focussed to provide a uniform spread of light over the closed surfaces of the shed roofs, for example, to replace the even wash of natural light during the daytime, thus underscoring the height and light quality of the hall's structure. All electric light sources are concealed behind upturn beams or, when visible, are not recognizable as light fixtures, since a direct view into the light source is not possible. The majority of fixtures are equipped with warm white metal halide lamps. Asym-



metrical, wide-beam reflectors are used in the main for the indirect illumination of surfaces to come as close as possible to the homogeneous quality of daylight.

In the rear two-storey section of the brightly lit hall passengers are divided into Arrivals on the ground floor and Departures on the upper level, before they are guided along the two "fingers" to the gates.

The Departures area on the upper floor features the perforated ceiling, which blends seamlessly, so to speak, with the perforated wall surfaces. Again, the concept for the electric lighting is based on daylight effects. Custom designed luminaires equipped with metal halide lamps are mounted, irregularly spaced, in all perforated ceiling sections on the upper floors. These downlights provide

the necessary ambient lighting. The fixtures consist of polished metal spheres which allow invisible mounting in the openings in the ceiling without blocking them or generating shadows in the daytime.

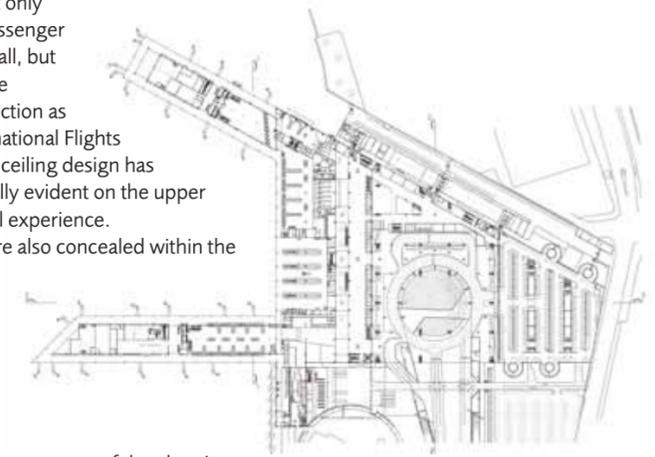
To put light to the ceiling itself, which occurs naturally during daylight hours through the perforated walls, the ceiling surface is illuminated from below. This is achieved by mounting fixtures at regular intervals on the air-conditioning units, thus producing relatively uniform indirect lighting over the ceiling surface.

This lighting scheme is not only applied in the area where passenger handling takes place in the hall, but also along the "fingers". In the northern Domestic Flights section as well as in the southern International Flights section the uniform wall and ceiling design has been applied. This is especially evident on the upper level, and is key to the spatial experience.

The spherical luminaires are also concealed within the openings in this part of the building. Asymmetrical wall washers mounted along the edge of the gallery in the two-storey facade area put uniform light to the walls.

The only areas where users are aware of the electric light are the ground floor levels, which have solid ceilings and therefore receive little natural light. In these areas the lighting designers did not attempt to create something artificial which is not in evidence. They have purposefully applied a variety of linear lighting elements to create a deliberate contrast to the "perforated" sections.

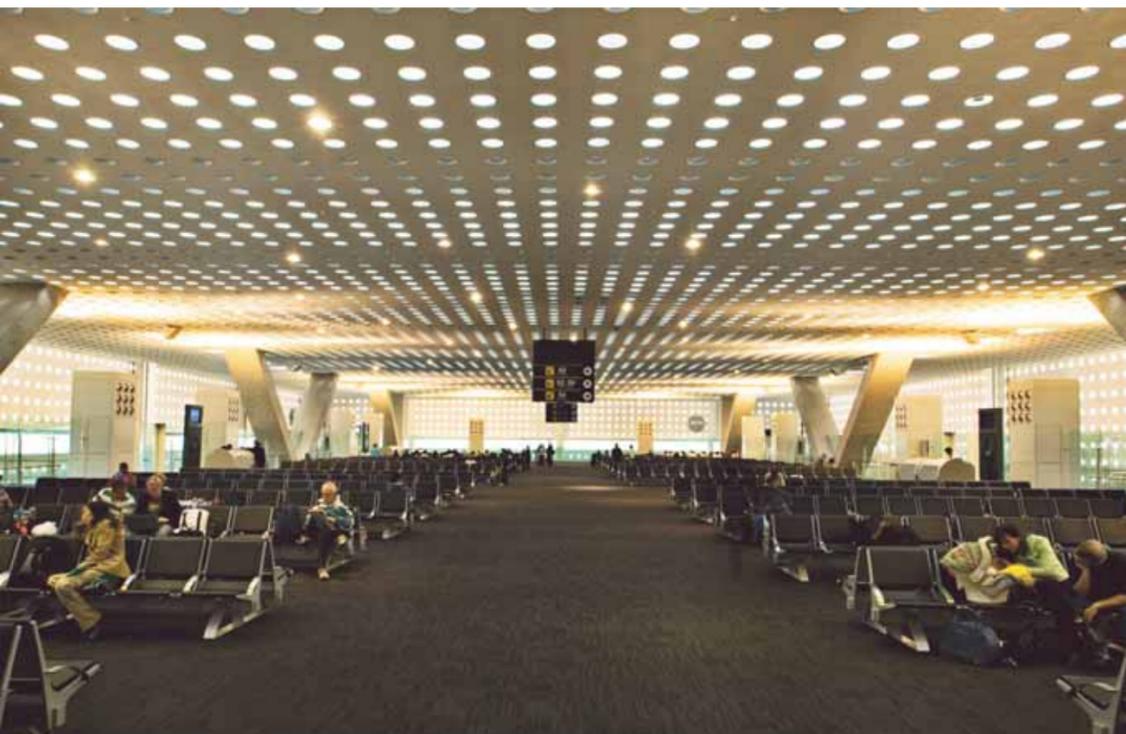
If you have been one of the twelve million passengers using this vast 240,000 square metre Terminal every year, either coming through Arrivals or leaving through Departures, what you will remember about the airport are the perforated walls, or rather the glowing openings that are reiterated throughout the building and are indeed its main feature. It is not the electric light that we remember. This is, of course, due to the dominant nature of the daylight. But you are not actually aware of the electric lighting scheme even if you are using the airport at night. This goes to show that the lighting designers from Starco, Francisco Caridad and Gilberto Vásquez del Mercado, were successful in achieving their second important goal. Consistent with the daylight design developed by the architects, they wanted the luminaires to remain out of sight and only the lighting effect to be visible – similar to rays of sunlight inside a building. Daylight and electric go hand in hand. When you look at this project, it makes you wonder why electric light is used so seldom to substitute daylight so unobtrusively in so few public buildings. And of course why daylight design does not enjoy more importance everywhere in the



The adjacent multi-storey car park, the 'patio' and the traffic circulation areas are spacious and have received a modern lighting scheme. The surfaces are white as far as possible to enhance the brightness. The result is an exciting, inviting space, especially thanks to the interplay of daylight and electric light.



Light and yet shady and cool. It is this contradiction in terms that makes the project so fascinating: the almost artistic perforated grid and the association that has with a leafy canopy and the kind of play of light and shadows that generates, in contrast with the heavy, solid feel of the building material and the way it is dissolved via the perforations.



The use of indirect and direct electric light does not enhance the quality of the space. It is, in fact, disturbing. The patches of light on the ceiling undermine the otherwise calming uniform effect of the daylight concept, and leave the impression of a failed attempt to layer light. The use of warm white light does not help either. It is daylight that determines the quality of the space.



The visual layering of deliberately different structures with the perforated pattern in part gives rise to a moiré effect.

world. Conventional punctuated facades are, after all, nothing more than perforated walls. In this project it is the scale to which this has been done and the consistency of the design throughout the entire building that makes for the special effect.

There is nothing simpler than making holes in a building to let light in. But used to this extent the idea becomes unique.

Project team:

Architecture and daylight design: Serrano Architects, Mexico D.F.
Lighting design and daylight consultants: Francisco Caridad and Gilberto Vásquez del Mercado for Starco, Mexico D.F.

Products applied:

"Light package" custom luminaire designed by Starco
"Slot" linear fixtures, Zumtobel
Custom spherical luminaires designed by Starco using Zumtobel optics

Right and below: the only non-daylight lighting elements are the luminous panels in the "passenger sorting" part of the hall, which links the hall with the long finger sections where the gates are. Even here, the spaces are lit indirectly by daylight from above.

