New York Looks Ahead with LED Street Light

When New York City ran a design competition for a new street light, few expected the chosen design to use LEDs. Carl Gardner reports on the innovative, winning solution, designed by Jean M Sundin and Enrique Peiniger of the Office for Visual Interaction

In 2004, the City of New York, represented by the New York City's Department of Design and Construction, in partnership with the Department of Transportation, launched an international design competition for a new signature street light. The current city luminaire, introduced almost 50 years ago, consists of variations of a fabricated steel pole and 'Cobra Head' lantern luminaire.

The Brief

The design challenge facing the competitors was to create an imaginative, cost-effective, and enduring design with the capability, over time, to become the city's pre-eminent and most widely used street light. The winning design had to be innovative and state-of-the-art; it had to be able to respond to the unique diversity of the city's architecture and urban landscape; and finally it had to meet strict technical performance standards. The winning design, and its variations, had to be flexible enough to light streets, sidewalks and parks within the city's five boroughs.

The new streetlight had to allow a one-for-one replacement with the existing and/or outdated streetlights. Strict structural and lighting requirements needed to be met – and the new design had to help reduce the visual clutter of the current street lights and their associated signage and components. In addition, the design utilises the lighting technology of the future, while providing the distribution and light levels required by the city.

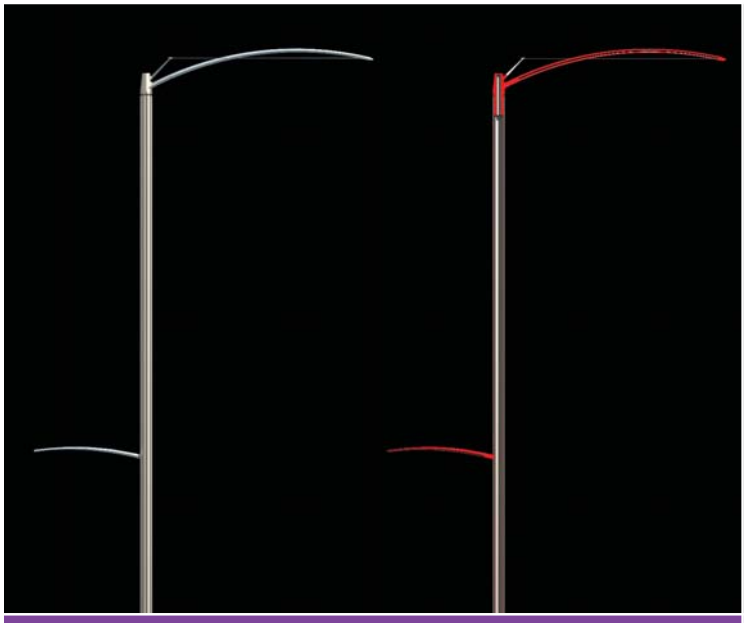

Photo rendering: dBox

Side profile of the new street lights

The Competition

Stage 1 of the competition was open to the entire global design community, including architects, artists, engineers, landscape architects, planners, urban designers, lighting designers, product and industrial designers, and manufacturers. Recognising that the apparent simplicity of a street light belies its technical complexity, the sponsor encouraged multi-disciplinary teams to participate.

In the event, over 250 concept entries from 23 different countries were entered in Stage 1 of the international competition. These were all judged anonymously – and three finalist teams were selected to develop their designs for a final jury selection in Stage 2. The winning luminaire design was designed by New York-based lighting designers, Office for Visual Interaction (OVI) who recently designed the interior and exterior lighting for the new Scottish Parliament building in Edinburgh – and their chosen light source was the LED.

Design Evolution

So how did the design team approach the design of their new luminaire?

There were a number of fundamental starting points for the design. Future interchangeability with existing poles meant that the base anchorage to the foundation had to be achieved with four bolts in a pre-defined location, while also maintaining the central conduit connection. The design team took the decision to locate the pole asymmetrically at the base. This off-centre design allows optimal access to the mounting bolts and cable conduits, via a hinged access door, while all the components are concealed within a slim rectangular profile, which acts as the base for the luminaire.

Specific attention was given to the method of fixing signage and other components to the pole. The pole will be constructed of lightweight structured material with a 'fluted/slotted' pole design, in which a slide-in signage system can be easily incorporated. The slots work like a track, and allow components to be slid into place or 'snapped in' at any location along its length, with 360-degree adjustability. This offers a much cleaner appearance than the typical strap/banding currently used. In addition, the fluted design enhances the system's appearance while minimising the surface area for vandalism.

Enter the LED

The final element of the street light is the LED luminaire component. LEDs were chosen for a number of reasons. The current life of LEDs exceeds 50,000 hours (thus reducing local authority maintenance costs and toxic waste disposal). In fact, they contain no mercury and produce no harmful ultra-violet light. They also offer better colour rendition than SON and have low wattage consumption, with very precise light distribution. Finally, LEDs are robust,

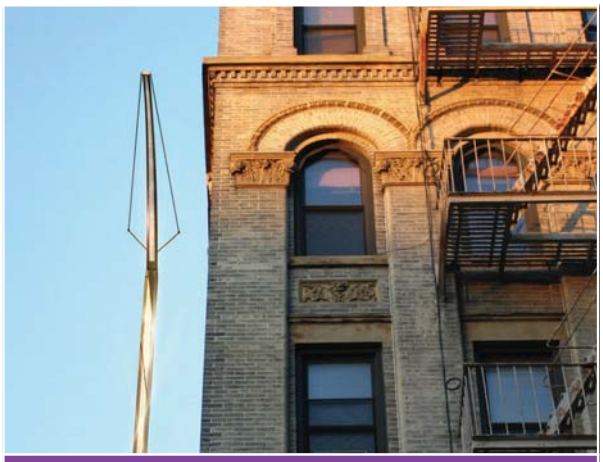

Photo rendering: dBox

Prototype column in a typical New York location

require no 're-strike' tune and not susceptible to vibrations inherent in roadway applications. For all these reasons, LEDs have recently gained increasing importance as an exterior lighting instrument in such things as traffic lights, signage boards, street signs, etc. Several automobile manufacturers, such as Audi and Mercedes Benz, have also announced that LED technology will be standard for daytime running headlights in 2006 models.

In design terms, one major advantage of LEDs is their small size and low weight, which offers a range of design possibilities. For the New York street light, the LED light source was an integral element which shaped the design. The use of high-output LEDs, with state-of-the-art lens optics, allowed considerable design flexibility and the ability to make the luminaire small and compact – the result is a long, slender lighting 'blade' rather than a traditional lantern form. The LEDs are arranged in a linear formation, unlike, say, the Philips LED road light, where the LEDs are grouped into a rectangular formation. Also, an oval profile was preferred for the LED 'blade' body, to maximize its surface area and act as a heat sink for the LEDs.

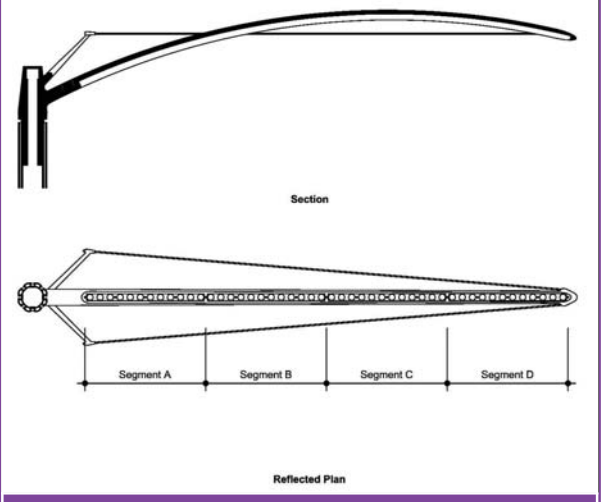

Diagram: OVI

Diagram of the LED luminaire seen from the side and below

New Orientation

At the ELDA conference in Birmingham in February, I asked Peiniger why, when road lighting requires a linear light distribution along the road's axis, they did not mount the lighting 'blade' in the same orientation, rather than at right angles to the road. Enrique explained that the main reason was aesthetic – 'It looked odd and people weren't ready for it'. In fact, as the individual LEDs are focused in segments on different areas of the road (rather than relying on a single, fixed reflector, as in conventional road lights) the orientation of the linear array is virtually insignificant, in terms of light distribution on the road surface. Segmented light distribution also avoids a 'hot spot' below the column.

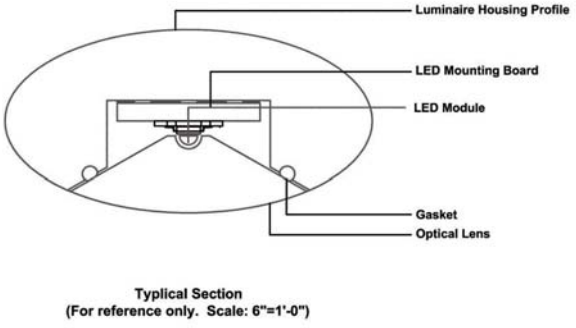

Diagram: OVI

Oval cross-section of the LED 'blade'.

The linear array of LEDs is grouped into four segments. Each segment has a macro lens using light-shaping film diffuser technology, to achieve the required light distribution pattern. This modular design strategy of components allows interchangeability between the various street light configurations (e.g. long and short arm versions, as well as the park/pedestrian light configuration) which the City required. All the LED drivers are mounted within a compartment at the base of the pole (unlike most discharge ballasts, which are located within the lantern) – once again this offers considerable time, cost and maintenance savings to hard-pressed engineers.

Nevertheless, the use of LED technology was a challenging task, because this technology is only just becoming usable for the street lighting market. LED efficiency and output is accelerating over very short timeframes – currently lm/W output doubles every 18-24 months. For the 2004 competition entry, OVI worked with the Philips Luxeon III LED source – but will re-assess the best option as the luminaire goes into production.

In fact, as Enrique Peiniger mentioned during the February LED conference, OVI had designed the street light on the assumption that by the time it was manufactured, new generation LED sources would have improved its performance even more. OVI's segmented, modular luminaire design is inherently interchangeable, so the next generation of higher wattage LEDs can be easily retro-fitted into each segment. Rather than outdating itself in 10-20

LED Street Lighting

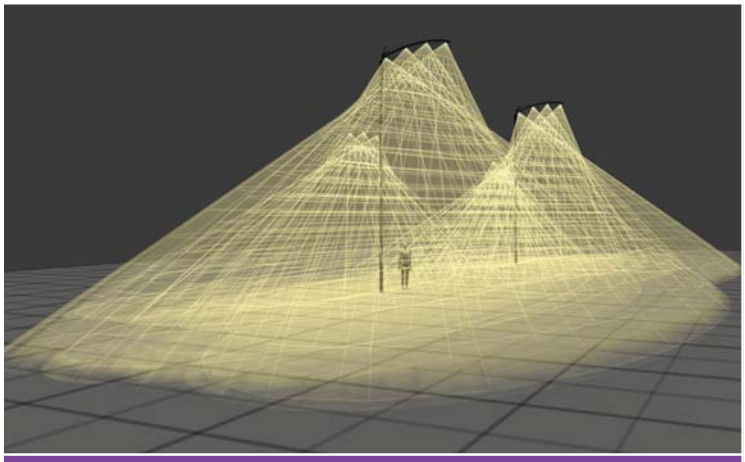

Diagram: OVI

Ray trace diagram of the double column's light distribution. Note the absence of 'hot spots'.

years, the proposed LED solution will be able to evolve with current technology and improve with age, becoming less costly and consuming less energy over time. As we went to press, the project is just moving into the pre-production development and specification phase, prior to finding a suitable manufacturer. So watch this space – and the 'Big Apple's streets – for this innovative arrival on the public lighting scene.

Credit List	**City Lights Competition – New York**
Client	The City of New York represented by New York City's Department of Design and Construction in partnership with the Department of Transportation
Lighting Consultant	Office for Visual Interaction, Inc. (OVI) Jean M. Sundin, Enrique Peiniger
Architect	Thomas Phifer and Partners
Structural Engineer	Werner Sobek New York

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Photo rendering: dBox