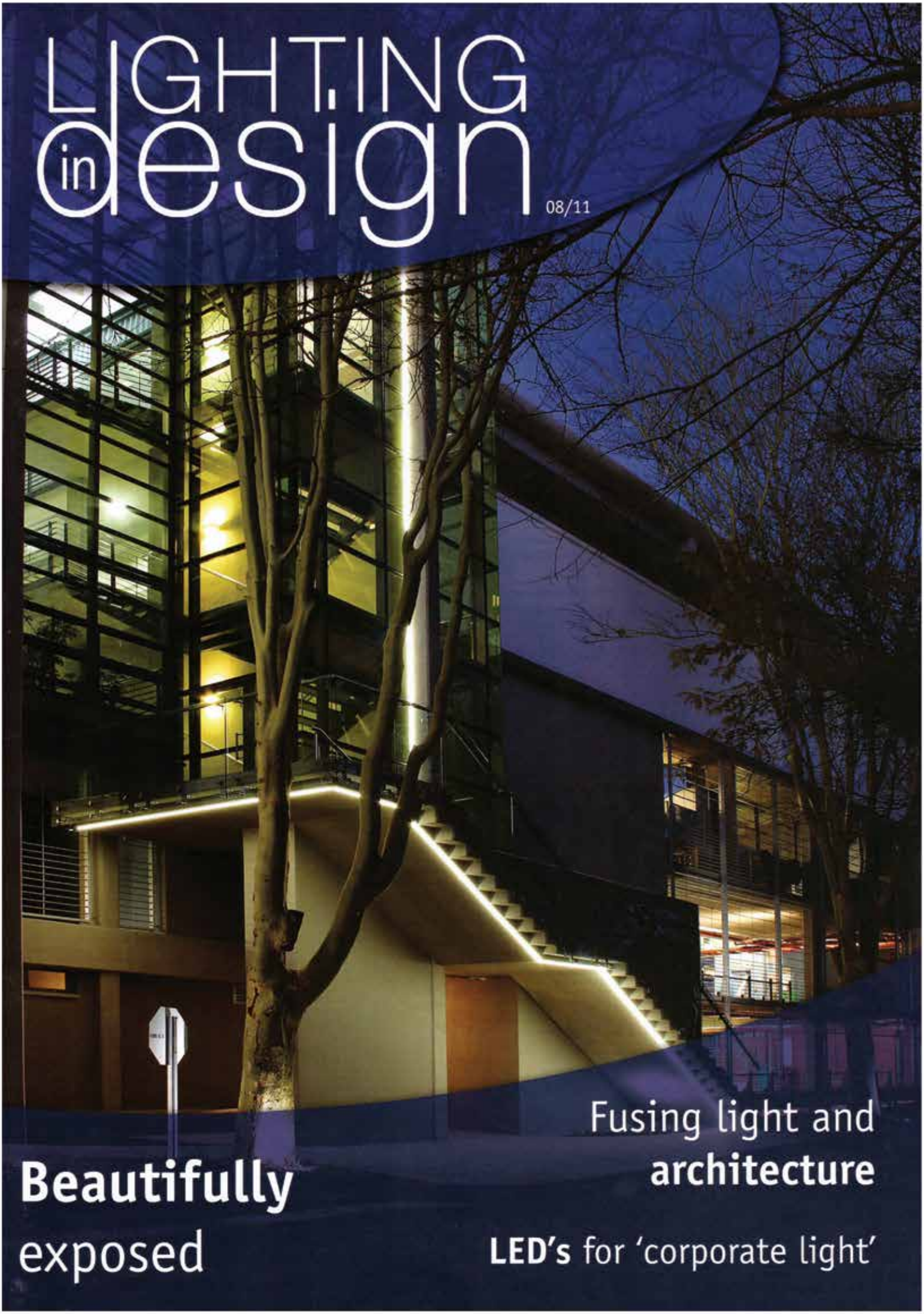
LIGHTING in design 08/11



Beautifully exposed

Fusing light and **architecture**

LED's for 'corporate light'

All photographs by Dudley Bunn.

Engineering light for students

The University of Pretoria's Hatfield campus has a striking new engineering facility and parkade building. Built to address two crucial, though divergent, issues—the nation's need for more engineers and the perennial problem of student parking—this multi-functional, environmentally friendly facility offers the School of Engineering 1 000 added parking bays, six additional lecture rooms with a total seating capacity of 1 800; a drawing hall (seating 450); and extensive teaching and research laboratory space.

Engineering 3 and Parkade, as the facility is known, is situated between the campus's Aula auditorium, the Musaion building and the Engineering 2 building. Limited space and consideration of various infrastructure requirements meant that the urban landscape had to be layered with the main concourse of the new structure joined to the Aula auditorium through link bridges.

The combined structure—with parking on four levels, two of these subterranean, and two upper-level storeys for engineering—is situated on the location of what was an existing parking area. Its footprint was therefore pre-determined and, according to Madi van Wyk of ARC Architects, presented a number of challenges.

"The parkade below dictated the shape of the building upwards and this in turn informed the lighting design of the office space," says van Wyk. "Normally, we would design an office building that is between 12.5 and 17 metres deep, allowing us to use natural light to maximum benefit. In this instance, however, we had an office section that was 30m deep and although we would have preferred more natural light, here we had to imitate this in the design to achieve correct lighting and ventilation levels throughout the offices and labs".

According to Jonathan Johnson of Claasen Auret Inc, electrical consulting engineer on the project, van Wyk required that three general principles be applied to the overall lighting scheme. First, the lighting installation had to be sustainable, with low operational maintenance costs; second, the brief required warm lighting in public areas and cool lighting with higher lighting levels in work spaces and on the external facade; and third, the emphasis throughout was to be on light, rather than luminaires.

To satisfy requirements for the Green Star rating, energy-saving lighting in the form of CFLs and LEDs is used wherever possible throughout the building. Natural light has been introduced at every opportunity via full-height fenestration, clear-storey windows to the atria and laboratories and protected, large-scale curtain walling to focal points. All artificial lighting is linked to motion sensors to ensure that the lights automatically switch off once students and staff have vacated the premises. To allow for safety and general emergencies, fifty percent of the lighting in the building and twenty five percent of lighting in the parkade areas is linked to a UPS to accommodate power outages and ensure that exit routes and stairways remain clearly marked at all times.

Walk right in

The building can be accessed from University Road on the western side of the campus. An oval-shaped entrance, with a water feature to one side of it, offers vehicular access and a paved walkway for pedestrians. The sixteen custom-designed streetlights, curved above the road on either side of the entrance to match the radius of the oval, create a striking first impression. Pedestrians on the walkway are guided by 35W metal halide bollards and 11W LED in-ground uplighters while along the retaining walls of the roads leading into and out of the parkade, recessed strip LEDs glow out of the U-shaped niches to make an attractive feature and offer directional guidance.

The western facade of the Engineering 3 building receives direct sun to a particularly low azimuth and, in addition to glazing; the architects had to supply a variety of shading measures in the form of horizontal louvres, metallic vertical mesh screens, framed concrete deep-set facades and planted sun screens. During daylight hours, the shading devices on the facade serve to protect users inside the building against sunlight, but at night they play an aesthetic role in its image. When the effect lighting comes into play, the vertical and horizontal elements of this façade are illuminated to create an interesting and effective composition.

LED, supplied by Giantlight, has been used extensively in this project. Ribbon-in-channel (16x16) outlines the underneath of the staircases, providing effect lighting as well as spill light onto the ground

below. The vertical and horizontal elements, including the deep-set concrete frames, along the west, north and south facades are illuminated by LED which follows the geometric form of the building. The greenery on the western façade is illuminated by 250W metal halide floodlights that are angled to light the underneath of the canopy and bounce spill light onto the footpaths around the building. Surrounding walkways and roads are lit by metal halide tower lights and in-ground LEDs, which are also used to uplight trees in the gardens.

Still outside, mounted up/downlighters accent the columns in the corridor between the Engineering Building and the Musaion and the effect is heightened by light from the in-ground LEDs that bounces off the overhead canopy onto the ground.

Throughout, the parking facilities make use of 2x54W T5 fluorescent lamps with electronic control gear to provide uniform illumination of sufficiently high lux for security cameras. On the outer perimeter of the parking levels, which are open at the sides, metal halide spotlights mounted about 300mm from the soffit illuminate the soffit to allow adequate lighting around the vehicles without visible fluorescent fittings. This enhances the night time lighting effect and spills light onto the pathways. Warm, welcoming 'porte cochere' lighting leads students from the parking garage to the engineering faculty.

A 10m-wide concourse runs through the centre of the building. On one side are the lecture halls and, on the other, two levels of offices and labs, which become the Engineering 3 building. Walkways at each level and across the concourse give students access to the various facilities. Full-height fenestration at either end of the concourse and skylights in the corridors off the concourse ensure that during daylight hours, much of the light in the public spaces is natural.

According to van Wyk, the lighting in the concourse was designed to support a 'human scale' in what is a very high-ceilinged space and this was done by highlighting specific architectural and design elements, such as the curved ceiling outside one of the lecture halls, the lift lobbies and the

planters. Indirect lighting is used along the curved length of the concourse to create floating effects and lines. In addition, the general light of the surface mounted 2x26W CFLs is supplemented by 3W in-ground LED uplighters; and recessed LED 40x40 strips, set at different heights along the concourse walls, are elegantly applied to enhance illumination, emphasise subtle design elements and aid orientation. Up/down light underscores the existence of the columns. Mounted on the roof of the concourse, 400W metal halides boost light levels on the floor.

The low energy solution developed for the lecture halls employs T5 linear fluorescent and 1x42W surfaced mounted CFLs with recessed LED strips along the length of the staircases to provide a decorative safety feature. Johnson explains that the lighting inside the lecture halls is DALI-controlled with a range of pre-set scene selections that allow lecturers to alter the lighting in line with the requirements of the lecture. Ultimately the lighting will be controlled by the motion sensors on the ceilings of the lecture halls. To maximise daylight harvesting, lux level sensors are employed in those laboratories that have a natural light and louvred blinds on the windows allow students to adjust the shading manually. Additional light is functional and supplied by 1200 by 600 direct/indirect fluorescent luminaires from Lighting Innovations, suspended across the ceiling to maintain the lighting at the specified level of 500 lux.

To encourage communication between students, particularly the post grads in this instance, the architects created a number of social spaces, or pause areas, along the length of the concourse, the walkways and the external balconies. Informal seating set close to IT and electrical points allows students to interact and converse with each other; simply sit quietly in a naturally lit public space; or work close to windows that afford views in and out of the building.

Daylight has been used in the Engineering 3 and Parkade building, not only as a function of energy efficiency, but also as a design element to good effect, with the result that the overall impression of the lighting scheme is that of a stylish, aesthetically pleasing installation.