Green Car Parks – An Oxymoron?

BY CRISTINA LYNN

This is the first of two parts on green car parks by Ms. Lynn.

I ONCE HEARD CAR PARKS DEFINED AS "the ashtray of the motor industry." Whilst the imagery this analogy invokes cannot be ignored, there is much that can be done to keep that "ashtray" as clean as possible without actually having to throw it away. After all, while cars are parked in a car park, they are not in the streets of our cities adding to the congestion on the roads and the deterioration of the environment!

Cars are here to stay, and that is a fact that cannot be disputed. Australia-wide, by far the most preferred method of traveling to and from work is the motor car, with around 80% of trips being by car.

Therefore, the general attitude by regulators to call for the elimination or significant reduction in the supply of parking cannot be the only way to resolve the issues of congestion, which in turn lead to degradation in the quality of air we breathe and the energy we consume as a community.

The Green Council of Australia does not address the issue of car parking per se, but it does award points to developments seeking a green star rating for such things as:

- Reducing parking supply compared with the ratios allowed by the relevant codes
- Providing for a certain percentage of small-car bays
- Providing for a certain number of bicycle spaces and ancillary services (showers, lockers, etc.)

However, these requirements strictly address issues of restricting supply, in all cases requiring developments to self-impose decisions that may affect the viability or the value of the property. The fact that a car park may comprise, say, 50 small-car spaces does not necessarily mean there will actually be a demand for such spaces (which obviously would need to be leased at a discount from a "normal size" bay).

Indeed, normal-size vehicles may end up using those spaces, with the possible consequence of these cars actually taking up more than the amount of space line-marked and therefore negatively affecting the efficient use of the car park. Therefore, owners and developers should be considering initiatives which would result in "greener" car parks, whilst maintaining a high level of efficiency, customer service and, ultimately, revenue.

There are a multitude of aspects in the design, presentation, technological solutions and operations of car parks that would achieve all those objectives. The purpose of this article is to address some of these practical aspects.

Design and layout

The less time a vehicle spends circulating inside a car park looking for an available space and then getting to the exit, the less carbon monoxide it produces. It therefore makes sense to consider multi-storey car park layouts that render the traffic circulation as efficient as possible. This would include express ramps and, where possible, intertwined ramping systems, which facilitate vehicles circulating a full turn every two levels and do not require cars to drive past numerous parking spaces on their way in and out of the car park (as happens in traditional designs).

Other issues that can be considered during the construction of a new car park are the use of sustainable building products such as supplementary cementitious materials (SCM), which provide high-performance stronger concrete whilst being more workable during placement and finishing.

It is estimated that an efficient mechanical solution could result in up to 30% higher space efficiency on a horizontal level and up to 50% on a vertical level.

A multilevel above-ground parking structure allows for the installation of solar panels on the roof of the car park, which can provide zero emission power generation and reduce utility costs. At the same time, the structure provides shade for vehicles parked on roof tops (improved customer service) and reduces further emissions from vehicle air conditioners. These systems also can be designed to harvest rain water, which can be recycled for irrigation or other uses.

A car park in San Diego shaded its rooftop spaces with a structure which incorporated special solar modules. In combination with internally housed cabling, it addresses the principles of the natural concepts of photosynthesis, water filtration and shade to tackle the issues of energy generation, storm water run-off and light pollution. The system also provides ambient lighting – enhancing security, while minimising lighting pollution.

By generating solar power in the car park, building owners may be able to offset some of their energy costs in the adjacent buildings and/or surrounding pedestrian walkways, as the excess power will be fed back into the grid. We are not aware of this marriage of solar and parking environment having been dealt with anywhere in Australia, as yet.

Mechanical parking

Mechanical parking solutions, in the right context, can significantly affect the green footprint of a car park. They normally provide much higher space efficiency than traditional car parks because the vehicles are parked by machinery and not by human beings. Therefore, bay sizes are much smaller, and no space needs to be allocated to aisles, ramps, pedestrian accessways, etc. It is estimated that an efficient mechanical solution could result in up to 30% higher space efficiency on a horizontal level and up to 50% on a vertical level. The cost savings in terms of reduced excavation and internal finishes can be easily appreciated.

Further benefits of these car parks from a "green" point of view would relate to reduced illumination, ventilation, painting and surveillance costs within the car parking structure in addition to the previously mentioned finishing costs.

Dynamic signage

Signage is an essential element that is guaranteed to reduce unnecessary circulation within car parks. A multistorey car park designed with a system of express ramps, for example, would be greatly enhanced by the use of dynamic signage indicating to drivers on which levels parking is available. Large-area car parks also can be divided into smaller, less daunting sections, by the clever location of ramps complemented by static and dynamic signage.

The latest development in signage is the use of individual space indicators, which use a green/red light placed above each space (activated by sensors) to show patrons where those elusive available spaces are "hiding". Subject to the layout of the car park, this system not only acts as an excellent customer service tool, but it also results in the maximization of space usage (and therefore in revenues) for the owner. In fact, the use of this system will also allow, in certain circumstances, for the creation of dead-end aisles (normally not permitted by the Australian Standard) and thus maximise the space efficiency and consequently revenues.

Envision Solar's Solar Grove parking structure at the San Diego headquarters of Kyocera International features Solar Trees, columns that contain solar panels, inspired by the photosynthesis process of real trees.

Catch the second part of this article in the next edition of **Parking World**.

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Green Car Parks – An Oxymoron? Part 2

BY CRISTINA LYNN

The first part of this article was published in the September edition of ***Parking World****. In it, Cristina Lynn asked whether car parks could be "greener," and suggested options with design and layout, the use of mechanical parking, and dynamic signage.*

Lighting – Types of lighting

The following table (presented at the International Parking Institute conference on Green Parking in Dallas) summarises the pros and cons of the various types of traditional lighting options for car parks:

	Fluorescent Lighting (FL)	High-Pressure Sodium (HPS)	Metal Halide (MH)
Pros	• Energy efficient • White light • High colour rendition (CRI = 80-90)	• Luminous glow • Higher energy efficiency	• White light • Medium CRI (60-70) • High lumen output
Cons	• Requires more bulbs (3xHID) • Cold climate sensitive • Instant burnout (life span of 30,000 hrs)	• Low brightness perception • Low CRI (20-30) • Instant burnout (life span of 28,000 hrs)	• Highest operating and maintenance costs • Instant burnout (life span of 15,000 hrs)

New technology in terms of LED lighting is in the process of being developed. According to manufacturers of this product, the benefits of installing LEDs in car parks are both economic and qualitative.

Economic benefits:

• Replacing a 175 watt MH fixture with an equivalent LED fixture can provide energy savings of greater than 40%.

• LED fixtures can last five to six times longer than MH and three to four times longer than FL and HPS.

• No cost for material replacement and labour, as there are no bulbs to replace.

• Life of fixture: Due to the speed in technology development, it is difficult to know for sure; however, current LEDs last for about 50,000 hours before depreciating to 70% of original levels.

• LED lighting is mercury free.

Qualitative benefits:

• Quality of lighting provides greater perceived safety and security; lighting provides uniform white light of surveillance-video quality.

• No moving parts, filaments or fragile glass to break (reduced risk of damage during installation).

• LEDs slowly dim over time and therefore are not subject to sudden failure or instant burnout.

However, on the "minus" side of the equation ...

• Higher initial lamp costs –two to two-and-a-half times the cost of MH lighting.

• Difficult to provide up-lighting, which is relatively simple to do with the other traditional lights.

Dimming

In most car parks, the lights are often on even during daylight and off-peak hours. Given that electricity costs represent one of the largest elements in operating expenses, it is worthwhile considering a system that allows for lights to be dimmed during these periods without affecting customer service and safety issues.

The benefits of dimming in existing car parks are that normally there are no modifications required to existing light fixtures; can be quickly installed; are controlled by timers, motion sensors or photocells; and, according to certain manufacturers, could reduce electricity costs by as much as 50%!

Perimeter lights (in aboveground multistorey car parks) would be put on a separate circuit so that they could be dimmed during daylight hours (normally referred to as daylight "harvesting").

Similarly, parking levels can be dimmed after-hours when usage is reduced, with the proviso that a system of sensors would automatically increase the lighting level when movements are detected on the floor.

Painting the ceilings of car parks white, although expensive as an initial cost, will significantly assist in improving the illumination by effectively reducing the intensity of lighting required and therefore result in lower ongoing utility costs. The difference between a well-painted car park and a "bare" concrete shell is enormous, particularly in the perceived level of customer safety and well-being.

Payment options

Historically, car parks have been operated by the use of pay-on-lane systems, being those where a customer, at the end of their stay in the car park, proceeds to the exit where payment is made to a cashier (either via cash or credit card).

These have been effectively replaced in many instances by pay-on-foot systems where a customer proceeds to an automatic payment station and presents the ticket for payment, again by cash or credit card.

Exit from the car park occurs when the customer inserts the paid ticket into an exit machine, which then lifts the boom gate. Many car parks now offer the option for a customer to go directly to the exit and process the transaction there by use of a valid credit card.

The impact on CO2 emissions by changing a car park operation from pay-on-lane to pay-on-foot is significant if one considers the greater speed at which a vehicle would leave the car park if payment has taken place at the automatic pay station, as opposed to having to queue at the exit, idling, while payment is being processed by a cashier.

The use of credit cards at entry and exit would eliminate (or greatly reduce) the need for paper tickets. Other means of reducing the use of paper at car parks are stored value cards for multiple entries, recyclable tickets (cards, tokens, etc.) and electronic tags.

Conclusion

Many other green parking initiatives are available to car park owners and operators, just to mention a few:

• Consider the possibility of introducing pervious paving or vegetated roofs, minimizing paved areas.

• Reuse storm water (collected via retention basins) for irrigation of landscaping around the car park.

• Introduce on-site treatment of wastewater to remove oil, grease and hydraulic fluids.

• Maximise recycling of glass, plastic, aluminum and paper from the premises.

• Maximise use of recycled products for construction.

• Strictly enforce a non-smoking environment.

• Maximise usage of low-emitting materials (adhesives and sealants, paints and coatings, elevator and lobby treatments),

• Maximise access of natural daylight into above ground structures; achieve a direct line of sight to the outdoor environment.

• Maximise use of shared parking.

• Consider pricing strategies to regulate parking demand (e.g., free/subsidized public transport for staff; reduced pricing for car poolers; cash and prizes for people who do not park; unbundle the cost of parking from property sale prices or lease/rental agreements to ensure a user-pays approach).

Finally, it is most important to conduct the necessary due diligence to ensure that the right number of spaces are built to satisfy the demand for parking from the development and therefore maximise efficiency in your development.

And remember that the greenest parking space is the one that is not built!

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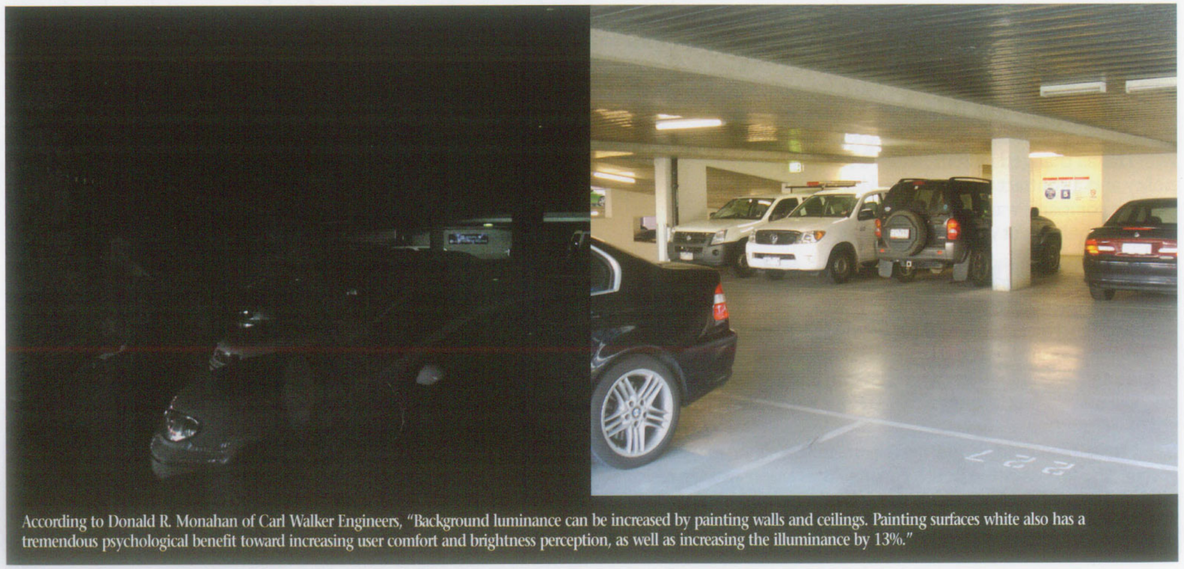

According to Donald R. Monahan of Carl Walker Engineers, "Background luminance can be increased by painting walls and ceilings. Painting surfaces white also has a tremendous psychological benefit toward increasing user comfort and brightness perception, as well as increasing the illuminance by 13%."