Car park designers' handbook

Jim Hill

With contributions from

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This book is dedicated to the memory of
John Charles Cannon

MA (Cantab), CEng, MICE, FIStructE

1931–2005

An outstanding engineer who, for 50 years, fought the
effects of poliomyelitis with courage and determination.

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In 1967 Jim founded the Hill Cannon Partnership (HCP) with John Cannon and has been involved in car park design since 1969. In 1970, they developed the Tricon structural system and in 1993 Jim patented the Vertical Circulation Module system (VCM). He is a past President of the British Parking Association and a regional Chairman of the Concrete Society. He is now a consultant to the practice, having retired in 1992, since when he has concentrated on the further development of VCM, designing appropriate circulation layouts for many projects and researching this book. He is currently writing a similar handbook on 'good practice' parking in the USA.

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Glynn is a senior partner of the HCP and has been involved in the design of 30 multi-storey car parks since 1986, two of which have been voted *Best New Build* car parks at the annual British Parking Awards. He also received the Ernest Davies Award for the best article published in *Parking News* entitled '*Current Trends in the Design of Car Parks*'. He has provided design advice for large underground car parking facilities in Manila, Kuala Lumpur (Petronas Towers), Zagreb and Dubai. Recent projects include the Jubilee car park in Harrogate (precast with 450 spaces), Merryhill Shopping Centre, West Midlands (precast with 1600 spaces) and Manchester Royal Infirmary (precast with 1600 spaces).

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Foreword

Jim Hill has spent the last 35 years in the development of car park design and this experience has given him a unique insight into the reasons why some buildings operate successfully and others, of a similar size and activity, do not. The choice of the correct circulation layout is a subject that he considers to be of prime importance in the creation of an efficient parking building.

Both as a consumer of parking services and a former parking manager, it always intrigues me why some parking layouts are easily navigated and yet others test one's patience? As an engineer, I think logically and admire the 'art of parking' created by my fellow colleagues; as a consumer I want to be able to park my car as quickly and as effectively as I can and get on with the business in hand, be it work or play; this is especially true if I have children with me.

My experience has taught me that parking is a means to an end; it is the first and last impression of my 'destination'; it needs to be good if I'm to contemplate returning there again and again. This is especially true in the retail and commercial world where (hopefully) my custom is valued. It is equally true when I visit an unfamiliar town or city, park at a rail station, or simply spend a day at leisure someplace.

Equally important is the need to feel intuitively safe and welcome wherever I choose to park. Complex layouts, frustration with queues and conflict with others who are manoeuvring about in or out of parking spaces, or sometimes in what seems like a never-ending set of twists and turns to get in or out of the car park in the first place, only serve to increase my sense of 'uncared for' by the owner or operator.

This book, describes and illustrates some 60+ variations on the many 'layout themes', no doubt there are others. Their advantages and disadvantages are discussed, recommendations made for their practical application and suggestions made for other layouts that should also be considered.

More than just discussing layouts, the author has shown how ramps can be prevented from projecting excessively into traffic aisles, how to assess dynamic capacity and efficiency, and the many other considerations that go to make up the design process. The matters dealt with in Chapters 8 to 20 such as the current requirements for people with mobility impairments, pedestrian access, security, ventilation, etc. have been written with the help of his partners, all parking experts in their own right.

In the author's opinion, effective design is based upon common sense, a little crystal ball gazing and experience: it is not a precise art. He suggests that, provided drivers will want to frequent the car park and clients are willing to pay for it, little else matters. I wouldn't want to disagree with him, but my comments about being 'welcome' at any parking facility are the key to its success. If the operator wants to do business, good customer service is vital; to do that needs good design.

This book addresses the subject of car park design, especially the design of circulation layouts, in a practical manner and can be easily

understood by anyone with an interest in the subject. It will help to identify examples of best practice in making our parking facilities more accessible to all. The book is also a useful reference for those considering the Park Mark[®] Safer Parking Scheme.

Kelvin Reynolds

Kelvin is Director of Technical Services at the British Parking Association and Head of the Safer Parking Scheme.

Preface

Information on the design of vehicle circulation systems in car parks is hard to find: had it not been so this book, probably, would not have been written. To my knowledge, special features and relative efficiencies of car parks have never before been discussed in any great detail. Many designers are unaware of the advantages of using a particular layout system over another and it is a major purpose of this book to redress that imbalance.

In 1968, John Cannon and I first became involved in car park structures when we were retained to design the foundations and non-standard elements for a proprietary precast concrete system. A local car park incorporating this system had become the subject of adverse comment by many who used it, convincing us that we could do better ourselves. Our first effort was to develop a clear-span structure that was efficient, economical, aesthetically pleasing and capable of being constructed using structural steel as well as precast and cast *in situ* concrete: this was a successful venture and after more than 35 years it is still being used in many car park designs. In time, however, it became clear that no matter how efficient the structural solution was and how attractive the architectural appearance, if it was wrapped around a poor choice of circulation layout the result was yet another unpopular car park. In many under-used car parks, the reason for their unpopularity is not that they have been allowed to become dirty and/or dingy (conditions that by themselves would not normally put off most motorists), but rather that they suffered from a poor choice of internal layout. Of the many buildings inspected, the most unpopular have, invariably, incorporated inappropriate circulation designs. Rather than giving these car parks an expensive cosmetic 'make-over', the money would have been better spent on improving the layout, even at the cost of losing, possibly, a few parking stalls.

Over the years, as we became more experienced, so our awareness of the number of different layouts available increased. Fifteen years ago I decided to list them and recommend when and where they could be put to best use. This endeavour was interrupted in 1992 by the development and promotion of the vertical circulation module (VCM) circulation system. It was just as well, as the number of different layouts has risen even further since then. Some have been rejected as being impractical or just plain whimsical, but those that are featured in this book are practical and have been constructed somewhere but not always in the UK. With more than 6000 car parks in the UK, 30 000 in the USA and many thousands more in the rest of the world, it is unlikely that all of the possible variations will have been covered, and if any reader is aware of a practical circulation layout substantially different from those featured and lets me know, if it is included in a future edition they will be acknowledged as the source.

Finally, I would like to thank my wife Rosalie who not only accompanied me on my travels around the car parks of several countries without complaint, but was also of invaluable assistance in suggesting improvements to the text and correcting my grammatical errors: any that remain are entirely my own fault.

Glossary of terms

Access-way or crossway

A traffic lane without adjoining stalls laid flat or to a slope not exceeding 5%, also capable of being used by pedestrians.

Aisle

A traffic lane with adjoining stalls on one or more sides.

Bin

Used to denote the dimension across an aisle and its adjacent stalls. (A half bin has stalls only on one side.)

Circulation efficiency

A method of comparing the travel distance required to search the stalls, in any particular car park, with the minimum travel distance. (Given as a percentage.)

Congestion

Applies to traffic that is unable to flow freely.

Cross-ramp

An inclined traffic lane connecting the aisles in adjacent bins, laid to a slope greater than 5%.

Deck

A single floor that extends over the plan area of a parking building.

Des Recs

A shortened form of words describing the *Design Recommendations for Multi-storey and Underground Car Parks*, 3rd edition, published in June 2002 by the Institution of Structural Engineers.

Dynamic capacity

A measure of the rate that traffic can pass a given location within a car park. (Given in vehicles per hour.)

Dynamic efficiency

A measure of the ability of a car park to process vehicles under normal operating conditions.

Excluded

Applies to an inflow route that is separated from an outflow route.

Extended

Applies to any traffic route that is not rapid.

Included

A flow route that is located within the circulation pattern of another.

Inflow

Applies to the search path for traffic within a car park.

Manoeuvring envelope (ME)

The boundaries established by the minimum turning circle when entering a crossway or ramp, outside of which a vehicle is unable to manoeuvre without reversing.

MPV

The initials for a multi-purpose vehicle.

MSCP

The initials for a multi-storey car park.

One-way-flow

Traffic flowing in a single direction on an aisle.

Outflow

Applies to traffic exiting from a car park.

Ramp

Any traffic lane, without adjoining stalls, that provides access to or from parking at different levels.

Rapid

Applies to a short route for inflow or outflow traffic.

Stall

The parking area allotted to a single vehicle, exclusive of any other adjoining area.

Stall pitch

The spacing for stalls, normal to an aisle, for a particular angle of parking.

Static capacity

The total number of stalls contained within a designated area or complete car park.

Static efficiency

The area of the parking decks divided by the static capacity and given as an area per stall.

SUV

The initials for a sports utility vehicle.

Swept path

The width on plan established by a vehicle for any given radius of turn.

Two-way-flow

Traffic flowing in both directions on an aisle, ramp or crossway.

Vph

Vehicles per hour.

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