

## TPDM Volume 7 Chapter 1 – Introduction

### 1.1 References

- 1 GOVERNMENT OF THE HKSAR; WILBUR SMITH AND ASSOCIATES. “Third Comprehensive Transport Study Technical Report, October 1999”
- 2 HONG KONG GOVERNMENT. “White Paper on Internal Transport, 1979”
- 3 HONG KONG GOVERNMENT. “White Paper on Transport Policy in Hong Kong, January 1990”
- 4 HONG KONG GOVERNMENT; OVE ARUP & PARTNERS. “Parking Demand Study”
- 5 HONG KONG GOVERNMENT; SCOTT WILSON KIRKPATRICK AND PARTNERS. “Freight Transport Study”
- 6 PLANNING DEPARTMENT. “Hong Kong Planning Standards and Guidelines, Chapter 8 - Internal Transport Facilities”
- 7 TAC Discussion Paper No. 38/99. “Report on Parking Demand and Supply and Progress of Improvement Measures”
- 8 WELLS, G.R. “Comprehensive Transport Planning”

## **1.2 Background**

### **1.2.1 General**

- 1.2.1.1 Traffic forms the lifeblood of the modern city. Vehicles that need to move along the city streets should be provided the facility to do so without impediment. Similarly, vehicles that have completed a journey and need a place to remain stationary should be provided a suitable parking facility. Having regard to the important socio-economical significance of adequate parking spaces needed for the sustained growth of the Territory, the White Paper on Transport Policy in Hong Kong calls for a comprehensive and coordinated plan for parking provisions.
- 1.2.1.2 As far as possible, all parking should preferably be provided off-street. However, the provision of some on-street parking may be necessary and could be considered at locations where it will not impede moving traffic nor prevent access to developments. That requirement of on-street parking occurs, where off-street parking, boarding/alighting or L/UL facilities are often not available especially in old built up areas.
- 1.2.1.3 Private cars and GV form the majority of licensed vehicles in the Territory. In general, these vehicles require two parking spaces, one where the vehicle is normally parked when not in use and a second where the vehicle remains temporarily stationary until the activity for which the trip is performed is completed.
- 1.2.1.4 The former space, usually at the home end, is for the use of a particular vehicle and is left vacant when the vehicle is in use. The latter space, which is at the attraction end, is generally used by more than one vehicle. Its utilization is dependent on its location, the average parking duration and turnover.
- 1.2.1.5 However, in some commercial, community or industrial developments a parking space at the attraction end could be designated for the use of a particular vehicle. In that case the space would not be available for the use of other vehicles attracted to the particular land use and turnover will be low.
- 1.2.1.6 The size of a car parking space ranges from about 2.4 m<sup>2</sup> for motorcycle, 12.5 m<sup>2</sup> for private car and up to 56 m<sup>2</sup> for container vehicle. In view of the ever-growing vehicle fleet size, there is an increasing demand for land, a scarce resource, for their parking. Because of this and other factors relating to traffic congestion, parking forms an important aspect of the planning process and the provision of transport infrastructure within the Territory.

### **1.2.2 Purpose**

- 1.2.2.1 It is the purpose of Volume 7 of this manual to explore all parking and L/UL related issues and provide guidance for the use of planners, engineers and others involved in transportation matters in the Territory.
- 1.2.2.2 The criteria contained in this Volume should not be interpreted as a rigid set of rules but as forming a flexible approach to resolving problems relating to parking and L/UL in an efficient, economic and practical manner.

### **1.2.3 Structure of Volume 7**

- 1.2.3.1 The remainder of Chapter 1 includes a definition of terminology used in Volume 7, an exploration of aspects of parking policy and the need for a parking plan including the concept of park-and-ride.
- 1.2.3.2 Chapter 2 discusses the legislative provisions for parking and highlights the specific provisions pertinent to parking in the various Ordinances and Regulations.
- 1.2.3.3 As an essential tool for quantifying the adequacy or inadequacy of parking provision, the various aspects of a parking inventory are addressed in Chapter 3.
- 1.2.3.4 Chapter 4 deals with various aspects of on-street parking and Chapter 5 deals with GV parking in particular because of the more demanding requirements characterized by the larger size of vehicles involved. Where on-street parking is permissible, preference should be given to GV, particularly in areas of high GV activity.
- 1.2.3.5 Chapter 6 addresses parking provisions in new developments/redevelopments as required in the HKPSG..
- 1.2.3.6 Chapter 7 covers the layout and circulation arrangements in surface and multi-storey car parks.

## 1.3

### Definitions

1.3.1 A short glossary of terms used in this Volume is included in this Chapter in alphabetical order.

Accumulation : The total number of vehicles parked at a specific location or in an area at a given time.

Deficiency : The extent by which parking demand exceeds the number of available spaces.

Commissioner : The Commissioner for Transport of the HKSAR.

Demand : The number of motorists desiring to park in a given area during a specified time period.

Duration : The length of time a given vehicle remains in a specific parking space.

Fee : An amount charged for parking for a specific period of time.

Inventory : The number of parking spaces available in a given area categorized by on-street or off-street spaces, public or private use, or by other classifications.

Meter : An apparatus constructed and designed to receive and indicate payment for the use of a parking space.

Occupancy : The portion of time a vehicle is parked in a given space during an average day.

Parking : The standing of a vehicle, whether occupied or not, except when standing temporarily for the purpose of and while actually engaged in L/UL or boarding/alighting passengers or when prevented from proceeding by breakdown or other circumstances beyond the driver's control, and all reasonable steps are taken to minimize any obstruction and effect the removal of the vehicle as soon as possible.

Parking Place : A place designated by the Commissioner in accordance with Regulation 5 of the Road Traffic (Parking) Regulations as a place where vehicles may be parked.

Parking Plan : An implementation plan to provide parking spaces to realize the strategic directives/objectives/courses of actions in the Parking Policy.

Parking Policy : Strategic directives/objectives/courses of actions formulated by the Administration to balance all the vested interests in dealing with parking-related and L/UL issues.

Parking Space : A space in a parking place indicated by lines or other marks for the accommodation of one vehicle.

Space-hour : A single parking space occupied by a vehicle for one hour.

Supply : The number of legal parking spaces available in a given area. If the spaces are available for use by the general public either with or without a charge, they are termed 'public'. Otherwise, they are termed 'private'.

Turnover : The number of different vehicles parking in a given space during an average day.

## **1.4 A Parking Policy and Plan**

### **1.4.1 A Parking Shortfall Problem**

- 1.4.1.1 At the end of 1999 there were about 210,000 public parking spaces on-street and in public and privately owned off-street facilities. In addition, there were an estimated 394,000 private off-street parking spaces. They served a population of about 500,000 licensed vehicles.
- 1.4.1.2 In the Third Comprehensive Transport Study (CTS-3), it was estimated that by year 2011, the private vehicle fleet size (including private cars and motorcycles) and GV fleet size would increase to 560,000 and 167,000 respectively in the Medium Growth Scenario.
- 1.4.1.3 Though there is a growing trend to rely more on railways, local shortfall in parking spaces for some classes of vehicles, notably light goods vehicles and container vehicles, is expected to be an area requiring continuous attention.
- 1.4.1.4 For lessening parking shortfall and the resultant congestion, positive measures are needed to narrow the imbalance between parking demand and supply. Of equal importance is the need to correctly locate and properly control public parking facilities to ensure their utilization is optimized.
- 1.4.1.5 The growth in vehicle ownership will continue over the years to come though probably at a rate lower than in the previous years. Hence there will be a continuing demand for the provision of additional parking facilities. To contain the shortfall within a manageable scale, any imbalance between parking demand and supply should be kept under constant review. For this purpose a well-constituted parking plan needs to be prepared and regularly monitored.

### **1.4.2 The Present Practice**

- 1.4.2.1 At present, the provision and control of parking on public roads falls within the jurisdiction of the Commissioner. Those on-street spaces are available for use by the public.
- 1.4.2.2 On-street parking is usually not provided within the core CBD area. Metered parking is provided in commercial, industrial and mixed development areas where traffic conditions and other kerbside activity permits.
- 1.4.2.3 Under the existing policy, convenient but short-term on-street parking facilities are provided only where local traffic conditions permit. For longer term parking, users are encouraged to make use of off-street parking facilities.
- 1.4.2.4 In high demand areas, parking meters should be provided to ration the demand and promote a turnover of vehicles. The present maximum 2-hour parking period at metered parking spaces is specified in Schedule 2 of the Road Traffic (Parking) Regulations. However, in remote areas where nearby off-street car parks are not provided, consideration may be given to revising the operation regime in the light of the local traffic circumstances. Such measures may include de-metering wholly / a proportion of the parking spaces, or revising the operating hours for meters depending on the utilization rate.
- 1.4.2.5 Meter charges are fixed in the expectation that, at any time, 15% of the parking spaces within a specific area would be vacant.

- 1.4.2.6 In the older residential areas non-metered parking spaces are designated on-street where demand exists and such provision would not obstruct traffic movement. The newer residential developments are required to provide adequate off-street parking facilities and are encouraged to do so even in the Metropolitan Zone 1 areas. In those areas where adequate off-street parking is available, the provision of on-street parking spaces would not be necessary.
- 1.4.2.7 Off-street parking and L/UL requirements of private developments are regulated by the Building Authority on the advice of the Transport Department. Such advice is normally based on the provisions in the HKPSG and known traffic conditions on the adjacent road network.
- 1.4.2.8 The overall intention of the HKPSG is to ensure that, except in special circumstances, future residential developments should have sufficient parking provision to match the current and anticipated car ownership of residents.
- 1.4.2.9 In community and commercial developments, parking provision is limited to that required for operational purposes. In industrial developments sufficient parking and L/UL provision is required according to the GFA of the proposed development. The facilities provided are for the use of the occupants of the particular development and are inventorised as 'private'. They are not available for the general use of the public unless so provided.
- 1.4.2.10 According to the White Paper on Transport Policy in Hong Kong, it is the Government policy to continue encouraging the private sector, through the land sales programme (or lease modifications), to develop and operate public car parks in areas of demand and where the surrounding roads are capable of handling the additional traffic generated.
- 1.4.2.11 The agencies entrusted with the management of Transport Department parking facilities cannot set the parking fees. Transport Department determines the fees in consultation with parties concerned. Fees at privately owned public car parks are decided by the owner or operator.
- 1.4.2.12 Most of the privately owned and operated public car parks set a minimum charge that is the equivalent of two or three hours parking. Such practice is undesirable as it discourages the short term parker using such facilities.
- 1.4.2.13 Also, the use of monthly parking tickets favors the regular commuter, who should in effect be discouraged from using a private car for the journey to work, particularly where an alternative mode of public transport is available.

### **1.4.3 Basic Principles**

- 1.4.3.1 The objective of a parking plan should be clearly defined. It should, in broad principle, be aimed at :-
- i) maintaining a free flow of traffic on roads allocated for traffic;
  - ii) controlling street parking and L/UL so as to minimize interference with the free movement of traffic;
  - iii) providing free and safe movement for pedestrians unobstructed by the storage or movement of goods along footpaths;
  - iv) providing off-street parking to accommodate demand and be in balance with the capacity of the adjacent road system;
  - v) ensuring efficient utilization of all available public parking facilities;

- vi) controlling the utilization of metered on-street parking facilities to ensure that short term parkers, particularly in the CBD and commercial areas, are given preference over long-term parkers;
- vii) providing off-street L/UL facilities so as to minimize any on-street requirement for such service;
- viii) ensuring that the management of all parking facilities is conducted in an efficient, viable and economic manner; and
- ix) ensuring that a parking policy and plan complements the overall transport policy and infrastructure development.

#### **1.4.4 Regulatory Measures for Parking**

- 1.4.4.1 The Government assumes responsibility to ensure satisfactory mobility of persons and goods. Improved mobility is essential to sustain the economic dynamism of the Territory and maintain a relatively high standard of living aspired by the community.
- 1.4.4.2 With moving traffic, the discipline of driving on the left side of the road or controlling movement by the use of one-way streets, signal controls, road signs and markings is usually determined by Government. Those measures are exercised for the benefit of road users to permit traffic to flow more smoothly and in greater safety.
- 1.4.4.3 Similar unified regulatory measures by Government, of the design standard and distribution of parking facility for the stationary vehicle is desirable for the same purpose. Such measures should include control/guidance on the nature, size and location of parking facility to be provided.
- 1.4.4.4 The provision of a generous supply of parking spaces to meet demand fully is not practicable in view of other competing demands for the limited land available. Also, the problem of congestion that could occur on city streets during peak periods when parking facilities attract or discharge large numbers of vehicles could be unmanageable.
- 1.4.4.5 If the parking problem is to be addressed in a logical manner, it must be examined as part of the land use/transport planning process. Furthermore, parking policy should be formulated in concert with the overall transport policy.
- 1.4.4.6 A comprehensive parking plan that would satisfy the objectives of an established parking policy should be formulated and regularly updated. It should evolve from an estimation of future travel demand and traffic flow on roads leading to centres of demand, as derived from the standard transport demand modeling process.
- 1.4.4.7 A fundamental requirement in formulating a parking plan is to quantify the estimated parking demand and supply for the years. A knowledge of the demand and available inventory would enable the extent of parking deficiency to be quantified by class of vehicle (car, GV etc.) and nature of parking (private or public). An implementation programme could thereafter be formulated and the desired extent of private sector participation determined.
- 1.4.4.8 Non-residential parking, particularly in the CBD area and in commercial areas, should preferably be for public use. Otherwise, it would be extremely difficult to control parking and vehicular movement into those areas. The provision of public parking enables the use of a pricing mechanism more effectively to discourage commuting by private car and to provide more parking opportunity for the short term parker making a business, shopping or recreational trip.

- 1.4.4.9 As pricing would have been included in the demand estimation process, general guidance would be available for establishing the level of charges that should be imposed on an area basis.
- 1.4.4.10 The comprehensive parking plan should be reviewed periodically and adjusted to accord with changes in travel demand estimated in future years.
- 1.4.4.11 Unified regulating of parking within the Territory should be exercised by the Commissioner who may delegate authority as appropriate. He is directly responsible for supervising the management of Government multi-storey car parks by the carpark contractor and the provision of metered and non-metered on-street parking spaces.
- 1.4.4.12 The Commissioner would advise the Planning Department of the extent and preferred location of public off-street parking facilities to enable their inclusion in Outline Zoning and Development Plans. In the event that these facilities are to be built by the private sector, the Commissioner would advise the Land Authority on the parking provisions that should be incorporated in lease conditions or other documentation.
- 1.4.4.13 The Commissioner would advise developers on the extent and preferred location of public off-street parking facilities in all developments.
- 1.4.4.14 The Commissioner would advise the Land Authority in formulating conditions of sales/grants for private developments/re-developments on aspects pertinent to parking requirements.
- 1.4.4.15 The Commissioner would advise the Land Authority on whether or not it would be appropriate to lease sites to the private sector on short-term tenancies for use as parking sites for different types of vehicles.

#### **1.4.5 Park-And-Ride**

- 1.4.5.1 The development of new towns and market towns in the New Territories took place in the seventies. The objective was to spread a rapidly growing population over a wider area so as to prevent already high urban population densities becoming unmanageable.
- 1.4.5.2 The new towns and market towns are linked to the older urban area by rail and road public transport corridors.
- 1.4.5.3 The majority population in the newly developed towns comprise households resident principally in public housing developments. They are captive public transport passengers.
- 1.4.5.4 The higher income households that moved away from a crowded environment in the metropolitan area, live on the outskirts of the new towns and towards the hinterland. They occupy isolated single family residences or live in small cluster developments. They are car-owning households, positive candidates for commuting by private car.
- 1.4.5.5 However, peak period congestion along the road corridors, the high cost of and the difficulty in securing a parking space at the destination in the urban area and improved facilities along the rail corridors indicates that park-and-ride could be a possible alternative for the private car commuter from the New Territories.
- 1.4.5.6 Park-and-ride is a combination of travel modes whereby a commuter drives his/her car from home to a convenient point where the vehicle is parked. He/She then transfers to a public transport mode to complete the journey to the work place in the congested urban area. The process is reversed on the return journey home.



1.4.5.7 The effective operation of a park-and-ride service depends on several considerations, namely :-

- i) adequate and secure parking facilities must be available at the interchange at low or no charge to the user;
- ii) the waiting time for the public transport connection must be minimal;
- iii) covered waiting facilities should be available;
- iv) there should be an adequate market i.e. a large catchment of car-owning households;
- v) the overall commuting time should be comparable to that by car;
- vi) the overall commuting travel cost should preferably be less than that by car; and
- vii) the provision of convenient and direct interchange for public transport.

1.4.5.8 The overall commuting time and cost are usually associated with the actual length of journey involved. A short overall journey will probably not be appropriate for the operation of a park-and-ride system, because of the increased relative importance of delay at the interchange location.

1.4.5.9 Also of significance is the difference in cost between parking at the interchange and parking at the destination (work place). Other important factors would be the average household income and the car demand ratio, i.e. the number of driving licenses in a household divided by the number of cars in the household.

1.4.5.10 As a related issue, by providing appropriate pick up/set down areas, in the kiss-and-ride system, at major public transport interchanges, commuters would be encouraged to be dropped off at the fringe of busy urban areas and continue their journey by public transport, thereby reducing the demand for parking spaces in busy urban areas.

## TPDM Volume 7 Chapter 2 – Legislation

### 2.1 References

- 1 GOVERNMENT OF THE HKSAR. “Road Traffic Ordinance, Cap. 374”
- 2 GOVERNMENT OF THE HKSAR. “Road Traffic (Parking) Regulations”
- 3 GOVERNMENT OF THE HKSAR. “Road Traffic (Public Service Vehicles) Regulations”
- 4 GOVERNMENT OF THE HKSAR. “Fixed Penalty (Traffic Contraventions) Ordinance, Cap. 237”
- 5 GOVERNMENT OF THE HKSAR. “Housing Ordinance, Cap. 283”
- 6 GOVERNMENT OF THE HKSAR. “Housing (Traffic) By-laws”
- 7 GOVERNMENT OF THE HKSAR. “Public Bus Services Ordinance, Cap. 230”
- 8 HONG KONG GOVERNMENT. “Road Traffic (Amendment) (No. 2) Ordinance 1988”
- 9 HONG KONG GOVERNMENT. “Road Traffic (Parking on Private Roads) Regulations 1989”
- 10 HONG KONG GOVERNMENT. “Report of the Working Party on Revision of the Road Traffic Regulations”
- 11 PLANNING DEPARTMENT. “Hong Kong Planning Standards and Guidelines”

## 2.2

### Purpose

2.2.1 Legislation concerning the provision and control of parking in the Territory is as follows :-

- i) Road Traffic Ordinance, Cap. 374
- ii) Road Traffic (Parking) Regulations
- iii) Road Traffic (Public Service Vehicles) Regulations
- iv) Road Traffic (Parking on Private Roads) Regulations 1989
- v) Fixed Penalty (Traffic Contraventions) Ordinance, Cap. 237
- vi) Housing Ordinance, Cap. 283
- vii) Housing (Traffic) By-laws
- viii) Public Bus Services Ordinance, Cap. 230
- ix) Road Traffic (Amendment) (No. 2) Ordinance 1988

2.2.2 The purpose of this Chapter is to spotlight certain provisions pertinent to parking supply and control within the above documents. For a more detailed elaboration of the legislative provisions, reference should be made to the relevant enactments.

## 2.3 General Provisions

- 2.3.1 The Road Traffic Ordinance Chapter 374 has been instituted to provide for the regulation of road traffic, the use of vehicles and roads, and for other purposes connected therewith. The regulation relating to parking of vehicles is derived from Section 12 and is cited as the Road Traffic (Parking) Regulations.
- 2.3.2 Section 12 permits the Chief Executive in Council to make regulations to provide for :-
- (a) the prohibition and restriction of parking and L/UL of vehicles and the designation of zones within which parking or L/UL are restricted;
  - (b) the designation by C for T of parking places and places set aside for the L/UL of vehicles and the traffic signs and road markings pertaining thereto;
  - (c) the erection of traffic signs and the use of road markings for the control of parking;
  - (d) the designation by C for T of car parks for the use of vehicles of any description or of any particular type or class;
  - (e) the management of car parks and the delegation of power to manage car parks and control their use;
  - (f) controlling the use of car parks and parking places;
  - (g) the fees payable for the use of car parks and parking places;
  - (h) controlling or prohibiting the repair of vehicles in public places, and the liability of vehicle owners and persons carrying out such repairs;
  - (i) the erection and operation of parking meters and other apparatus designed to indicate payment for the use of parking space and the time that a vehicle may be parked;
  - (j) controlling or prohibiting the possession of articles used or intended for use in interfering with parking meters, and controlling or prohibiting conduct that obstructs the use of parking meters; and
  - (k) generally carrying into effect the provisions of this Ordinance relating to the regulation of parking.
- 2.3.3 The Road Traffic (Parking) Regulations do not apply to private roads, which are regulated by the provisions in the Road Traffic (Parking on Private Roads) Regulations. It does not apply to housing estate restricted roads where parking control is exercised by the Housing Authority under provisions in the Housing (Traffic) By-laws.
- 2.3.4 Parking prohibition on roads other than private or housing estate restricted roads is contained in Regulation 4 of the Road Traffic (Parking) Regulations. However, it should be noted that paragraphs (1), (3) and (4) of Regulation 4 apply to all vehicles other than motor vehicles. The relevant regulations that apply to motor vehicles are contained in the Fixed Penalty (Traffic Contraventions) Ordinance, Cap. 237 Section 7(1), 9 and 7(2) respectively.

- 2.3.5 Regulation 4(1) of the Road Traffic (Parking) Regulations and Section 7(1) of the Fixed Penalty (Traffic Contraventions) Ordinance specifically prohibit parking on any public road, other than at a designated place, where there is a system of street lighting furnished by means of lamps not more than 200 metres apart.
- 2.3.6 In the metropolitan area it is generally not necessary to erect "No Parking" signs, unless their use would improve observance, assist enforcement and would not result in a proliferation of signs. As the use of the sign on some sections of urban streets and not on others could possibly cause confusion in the minds of motorists and, perhaps negate the intended objective, caution should be exercised in deciding its use.
- 2.3.7 A side street should not be regarded as having a system of street lighting if there are no street lighting units erected along the side street beyond the building line of the major street. A lighting unit located at the junction of two streets as shown in Diagram 2.3.1 would be considered as part of the major street lighting system and not part of the side street.
- 2.3.8 Where a system of street lighting as mentioned above is not available, the erection of appropriate signs, road markings or both as indicated in the First Schedule to the Road Traffic (Parking) Regulations are required so as to inform motorists of the parking prohibition and to facilitate enforcement. In the metropolitan area the installation of street lights is preferred, as it would eliminate the need for "No Parking" signs and appropriate road markings.
- 2.3.9 Regulation 4(4) of the Road Traffic (Parking) Regulations and Section 7(2) of the Fixed Penalty (Traffic Contraventions) Ordinance prohibit the parking of vehicles :-
- i) on a pavement, pedestrian way, central reservation, verge, hard shoulder or traffic island;
  - ii) that would obstruct vehicular access to or from premises adjacent to the carriageway;
  - iii) that would obstruct access to a fire hydrant from the carriageway.
- 2.3.10 C for T is the Authority to designate any place on a road or any place to which vehicles have access other than on private or housing estate restricted roads as a parking place. He also has the authority to amend, suspend or cancel any parking space so designated. The authority is derived from regulation 5 of the Road Traffic (Parking) Regulations.
- 2.3.11 C for T may exercise such authority by erecting appropriate traffic signs in accordance with those shown in the First Schedule to the Road Traffic (Parking) Regulations, by covering them or having them removed as each situation warrants.
- 2.3.12 Regulation 6 of the Road Traffic (Parking) Regulations conveys similar authority to the Commissioner of Police for the temporary provision, amendment or suspension of parking spaces for a period not exceeding 72 hours.
- 2.3.13 Regulation 11 of the Road Traffic (Parking) Regulations authorises C for T to cause parking meters to be erected on any Government land or at any public parking place for the purpose of charging for the parking of motor vehicles. The Second Schedule sets forth the fee for the use of a parking space by a particular class of vehicle for a specified time period.
- 2.3.14 C for T is the Authority for designating a place as an off-street car park. The authority is derived from regulation 14 of the Road Traffic (Parking) Regulations and is effected by notice published in the Gazette.

- 2.3.15 The notice may restrict the use of the car park or parts thereof to a particular class or type of vehicle. The time period during which any particular class or type of motor vehicle may enter or use the car park may be limited.
- 2.3.16 C for T may, by notice published in the Gazette, revoke or amend any previous designation or temporarily close any car park or any part thereof.
- 2.3.17 The authority derived by C for T through the Road Traffic (Parking) Regulations does not include those privately owned car parks that are open to the general public as required in the 'Conditions of Sale' of a property. Such car parks usually form part of a commercial, industrial or mixed development. They fall within the definition of a private road and are regulated by provisions in the Road Traffic (Parking on Private Roads) Regulations.
- 2.3.18 Car parks located within a housing estate as defined in the Housing Ordinance are under the authority of the Housing Authority. Those located within the Hong Kong International Airport fall within the control of the Airport Authority, Hong Kong. They are both excluded from the authority of C for T.
- 2.3.19 Unlike the authority derived from regulation 6 of the Road Traffic (Parking) Regulations in respect of the temporary closure of on-street parking spaces, the Commissioner of Police has no authority under the Road Traffic Ordinance for the temporary closure of a car park or part thereof.
- 2.3.20 Following privatisation of the management of car parks, the fees for the use of car parks designated by C for T are now regulated and controlled under the car park management contracts awarded by C for T.
- 2.3.21 The fee for the use of a privately owned car park to which the public has access under the 'Conditions of Sale' is presently not regulated either by the conditions nor by provision in the Road Traffic (Parking on Private Roads) Regulations. Fees are set by the operator probably based on market economics.
- 2.3.22 Parking fees in housing estates as defined in the Housing Ordinance are controlled by the Housing Authority.
- 2.3.23 To be effective, a parking plan, once formulated, should be backed by appropriate legislation that would enable a unified control of parking provision and charges.

## **2.4                    Parking of Public Service Vehicles**

- 2.4.1            The operation of public service vehicles is controlled by the Road Traffic (Public Service Vehicles) Regulations.
- 2.4.2            C for T derives authority from Regulation 29 to designate an area of road as an area within which a public light bus may stand for the purpose of picking up or setting down passengers. The parking of public light buses could be permitted within the designated area during certain periods provided the relevant traffic signs specified in Regulation 34 are erected.
- 2.4.3            Figure No. 8 in the Fourth Schedule to the Road Traffic (Public Service Vehicles) Regulations indicates that parking of a public light bus is permitted within the designated area other than at times shown on the sign. During the time period shown on the sign vehicles are permitted to stand for boarding and alighting passengers, but not to park.
- 2.4.4            The distinction between a scheduled and non-scheduled service parking area is seen from the use of Figure Nos. 5 or 6 respectively in conjunction with Figure No. 8 in the Fourth Schedule.
- 2.4.5            Regulation 30 authorises C for T to designate an area of road as an area within which a taxi may stand or ply for hire. As with public light buses, taxis may be permitted to park within the designated area provided the traffic sign shown in Figure No. 9 in the Fourth Schedule is erected as specified in Regulation 34.
- 2.4.6            Further guidance on the design and use of traffic signs and road markings relating to the Road Traffic (Public Service Vehicles) Regulations is contained in the Transport Planning and Design Manual, Volume 3.

## **2.5            Parking of Franchised Buses**

- 2.5.1            In accordance with Section 19 of the Public Bus Services Ordinance, Chapter 230, the grantee of a franchise to operate a bus service shall provide and maintain such premises as C for T considers necessary for the parking of vehicles that are in the service of the grantee at such times that they are not being operated.
- 2.5.2            The intention is that franchised buses when not in operation would be parked primarily off-street. On-street parking of buses should be tolerated only in extreme circumstances and that too only at locations where they would not create traffic or safety problems.



## **2.6                    Parking within Housing Authority Estates**

- 2.6.1            Under Section 25A of the Housing Ordinance, Chapter 283, the Housing Authority may, with the approval of C for T and the Director of Highways, designate in the prescribed manner any road or length of road to be a restricted road.
- 2.6.2            The control of parking on restricted roads and in car parks within a housing estate as defined in the Housing Ordinance and to which access is restricted, is the responsibility of the Housing Authority. That includes among other things the designation of parking places, the fixing of parking fees and the impounding, removal and storage of vehicles that contravene provisions in the Housing (Traffic) By-laws.
- 2.6.3            Any signs that are erected by the Housing Authority to designate parking spaces on a restricted road should conform to those in the Schedule to the Housing (Traffic) By-laws and have the approval of C for T and the Director of Highways.

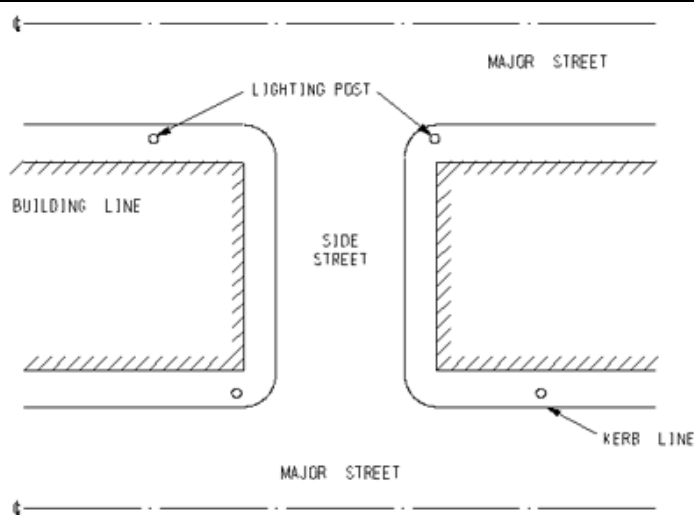
## **2.7                    Parking on Private Roads**

- 2.7.1                    Regulation 7 of the Road Traffic (Parking on Private Roads) Regulations empowers the owner of a private road to erect or place, at every point at which a vehicle may lawfully enter that road from a road within the meaning of Section 2 of the Road Traffic Ordinance, a sign in accordance with Figure No. 1 of the said Regulations.
- 2.7.2                    The control of parking on a private road where such signs have been erected is the responsibility of the owner. He/She has the authority to designate any place on that private road as a restricted parking area by the use of the appropriate traffic signs and road markings in Schedule 1 to the Regulations.
- 2.7.3                    Subject to conditions in Regulations 10, 11 and 12, the owner could impound, remove and dispose of vehicles parked in a restricted parking area.
- 2.7.4                    The Road Traffic (Parking on Private Roads) Regulations do not apply to any private road which is a restricted road within the meaning of the Housing Ordinance (Cap. 283).
- 2.7.5                    Detailed guidance relating to the control of parking on private roads is given in Section 2 of the Code of Practice for Private Roads.

## 2.8 Parking Provision in Private Developments

- 2.8.1 The planning, design and construction of buildings and associated works is regulated by the Buildings Ordinance, Chapter 123. In association with the Building (Planning) Regulations and the Building (Private Streets and Access Roads) Regulations there appears to be reasonable control on the internal streets and access to the public road system.
- 2.8.2 However, with the exception of Building (Planning) Regulation 23(2) that associates parking provision with accountable gross floor area, there is apparently no provision in the Ordinance and Regulations relating to parking requirements.
- 2.8.3 The provision for parking and L/UL in private developments is introduced through inclusion in the 'Conditions of Sale/Grant' of a property. Some difficulty could be experienced in introducing new conditions to conform to the requirements in the HKPSG when property with an unrestricted lease is re-developed.
- 2.8.4 The inclusion of parking and L/UL provision in sale/grant conditions follows the requirements in Chapter 8 of the HKPSG and any advice given to the Lands Department by Transport Department when consulted. It relates to private residential parking and the operational needs of commercial, community and industrial land uses.
- 2.8.5 Enforcement control, to ensure the proper provision and use of parking and L/UL requirements included in lease conditions, is exercised by the Lands Department at stages of building plan approval and building occupancy.
- 2.8.6 Further details relating to parking provision in new developments is contained in Chapter 6 of this Volume.

**DIAGRAM 2.3.1: MAJOR STREET LIGHTING SYSTEM**



## TPDM Volume 7 Chapter 3 – Parking Inventory

### 3.1 References

- 1 ENO FOUNDATION FOR TRANSPORT, INC. “Parking Garage Planning and Operation”, 1978
- 2 GOVERNMENT OF THE HKSAR; WILBUR SMITH AND ASSOCIATES. “Hong Kong Third Comprehensive Transport Study”
- 3 HONG KONG GOVERNMENT; OVE ARUP & PARTNERS. “Parking Demand Study”
- 4 HONG KONG GOVERNMENT; SCOTT WILSON KIRKPATRICK AND PARTNERS. “Freight Transport Study”
- 5 INSTITUTE OF TRANSPORTATION ENGINEERS. “Transportation and Traffic Engineering Handbook”. Second Edition, 1982
- 6 PLANNING DEPARTMENT. “Hong Kong Planning Standards and Guidelines, Chapter 8 - Internal Transport Facilities”. (Revised 1996).
- 7 TAC Discussion Paper No. 38/99. “Report on Parking Demand and Supply and Progress of Improvement Measures”
- 8 TRANSPORT BRANCH. “The White Paper on Transport Policy in Hong Kong”, (January 1990)
- 9 TRANSPORT BUREAU. “Hong Kong Moving Ahead – A Transport Survey For the Future, October 1999”

## **3.2 Background**

- 3.2.1 As a starting point in dealing with parking problems, studies must be conducted to acquire information relating to the capacity and use of existing parking facilities, their location and, the parking characteristics of motorists that use the facilities as well as those that do not do so but park illegally. Studies may be specific to a particular traffic generator, a small district or the whole Territory.
- 3.2.2 The parking inventory is a statistic of the parking supply available at a point in time. It is a measure that enables determining the adequacy or inadequacy of parking provision to meet an estimated demand in a specific area or in the Territory.
- 3.2.3 Following the completion of the Parking Demand Study in 1995, a comprehensive on-street and off-street parking inventory of the whole Territory was established. The inventory contains information of parking and L/UL facilities by vehicle type and location. At present, the updating of the inventory is coordinated by TTSD on a regular basis.

### 3.3 On-Street Parking Spaces

- 3.3.1 On-street parking spaces are those that are provided on a public road and are available for use by the general public. Parking spaces on private roads and restricted roads are not included, as their use is restricted to a particular group of people and not the general public.
- 3.3.2 For the purpose of a parking inventory those spaces on private and restricted roads are classified as private off-street spaces. In fact, the entire restricted area is considered as an off-street facility where parking control is the responsibility of the Housing Authority or, in the case of private roads, the owner.
- 3.3.3 On-street parking spaces may be fee paying or free. Fee paying spaces are currently controlled by the installation of electronic parking devices which are card-operated meters. They are classified for the specific use of GV, private buses or vehicles other than MGV/HGV, buses, MC and pedal cycles.
- 3.3.4 In the light of the recommendations made by the Audit Commission in its Report No. 33 and the changing parking circumstances over the years, it is considered necessary to make more efficient and effective use of on-street parking spaces through metering. The following guidelines should be followed:
- (a) To fulfil the eventual aim of extending metering to all parts of the urban areas and the New Towns where on-street parking (except motorcycle parking spaces) is permitted;
  - (b) To consider installing meters for parking spaces in other areas which have a high (i.e. 85% or above) utilization rate\*;
  - (c) To carry out site inspections for non-metered parking spaces to ascertain the need for metering; and
  - (d) To consider extending meter operations to General Holidays for those parking spaces which have a high utilization rate.
- \*Utilization rate =  $\text{Parking spaces occupied} / \text{Parking spaces surveyed} \times 100\%$   
Normal survey period 10:00 - 17:30
- 3.3.5 For utilization survey of metered parking spaces by TD's parking meter management contract, the utilization rate and survey period are as follows:  
Utilization rate =  $(\text{Total parked hours} / \text{Total of operative hours}) \times 100\%$   
Normal survey period: operative hours of that parking meter
- 3.3.6 Parking spaces where no fee is charged are designated for the use of a particular type or class of vehicle. They are demarcated on the street for use by individual vehicles and are signed using Figure Nos. 1 to 4 in the First Schedule to the Road Traffic (Parking) Regulations, dependent on the type and class of vehicle permitted to park thereat. Hence, they could be accurately recorded in an inventory.
- 3.3.7 Where public service vehicles are permitted under Regulation 34 of the Road Traffic (Public Service Vehicles) Regulations to park at an on-street stand or stopping place, the number of parking spaces is estimated from the length of the demarcated stand. The estimate is based on a module length of 5m for a taxi, 7m for a public light bus and 13m for a bus.

- 3.3.8 Unless the traffic signs specified in Regulation 34 are erected at a public service vehicle stand, parking at the stand is legally not permitted. In such circumstances a parking provision should not be included in the inventory, although vehicles may be parked, albeit illegally.

## 3.4 Off-Street Parking Spaces

- 3.4.1 Off-street parking spaces are classified into those open to the public and those restricted for the private use of individuals and specific groups.
- 3.4.2 Public off-street parking facilities are located in open air ground level car parks or in multi-storey buildings, which may include basements and underground car parks.
- 3.4.3 Off-street open air car parks may be fee paying or free. They often have clearly demarcated parking spaces that are designated for use by a particular type or class of vehicle. They are at times located at off-street termini for public service vehicles, where parking is permitted at times when operations are inactive. It is also a popular form of providing parking for motorcycles.
- 3.4.4 At open air car parks fees are levied through the installation of meters or by the issue of a ticket that records the time of entry and exit. Metered facilities are operated by Transport Department similar to the on-street meter system.
- 3.4.5 Government land which is not needed for immediate permanent development may be let out by Lands Department under short term tenancies for uses including fee paying temporary carpark. These short term tenancies would be terminated when these sites are required for permanent development and there is no guarantee of replacement site. In addition, it is not unusual for private land pending permanent development to be operated as fee paying carpark on a short term tenancy. Though lacking permanency, such arrangements help alleviate parking shortfall as an interim measure, particularly in areas of high GV parking demand.
- 3.4.6 Because of the investment involved, multi-storey car parks are always fee paying. and usually form part of a residential, commercial or mixed development.
- 3.4.7 Off-street parking spaces that are restricted for private use are located in residential, commercial, community and industrial developments, the majority privately owned. Those spaces are for the use of the owners or tenants of such premises and for their visitors and clients as applicable. The spaces are not available for use by the general public. More details for off-street parking provisions in new developments are given in Chapter 6.



### **3.5 Preparation of a Parking Inventory**

- 3.5.1 The preparation of a parking inventory is bound to be a time consuming exercise requiring extensive staff resources. Statistical information are collected from relevant authorities and for other uncovered missing data. Site visits may be required to verify records such as the numbers and types of parking spaces available on all streets and in off-street premises.
- 3.5.2 As a problem-probing tool, a parking inventory is useful to compare parking demand with availability and thereby determine the magnitude of the parking surplus or shortfall. The comparison may be required at a territorial, regional or local level. It is also useful in land use and infrastructure planning and in transport studies.
- 3.5.3 The first parking inventory in the Territory was prepared in 1969. It used the Traffic and Transport Survey Unit zoning system, which has undergone considerable changes in subsequent years. The current parking inventory kept by TTSD was set up in the Parking Demand Study in 1995. It originally adopted the CTS-2 enhanced zoning system, but since 1999, CTS-3 zoning system has been used in the parking inventory.

### 3.6 Updating a Parking Inventory

- 3.6.1 In view of the considerable time and resources implications, a full periodic parking inventory survey should be avoided and the parking inventory should be regularly updated by other means.
- 3.6.2 Basically, parking is classified into two broad categories namely, "on-street" and "off-street". As changes in each category are made through different institutional procedures, updating the inventory could be undertaken separately but coordinated by a single authority, being TTSD at present.
- 3.6.3 The Commissioner for Transport is the authority to designate any place on a road as a parking place and amend, suspend or cancel any designated parking space. That authority for the management and control of on-street non-metered and metered parking provision is delegated by the Commissioner to the Regional Chief Traffic Engineers, and the Chief Transport Operator (Transport Facilities Management Section) respectively.
- 3.6.4 The Commissioner of Police has the authority for the temporary provision or suspension of parking for periods up to a period up to 72 hours. Because of the temporary nature and short duration of such changes, they should be excluded from the inventory.

#### On-street non-metered parking

- 3.6.5 Any change in on-street non-metered parking facilities is initiated by the Regional Traffic Engineer acting on behalf of the Regional Chief Traffic Engineer through the issue of a "Works Order" to his counterpart in Highways Department. On executing the "Works Order", the Highway Engineer conveys the information to the Traffic Engineer, who would amend the parking inventory accordingly.

#### On-street metered parking

- 3.6.6 The management of metered parking has been privatized since 1994. In the complete survey conducted at that time by the company responsible for all metered parking spaces in the Territory, detailed information such as number of parking meters by street, vehicle type, charges and operative hours were collated.
- 3.6.7 Any change in on-street parking facilities is initiated by the Regional Traffic Engineer through the issue of a "Works Order" to the meter management contractor of Transport Department with copies to the Tunnels and Parking Section for monitoring. On executing the "Works Order", the meter management contractor will handle the installation, removal and changes to parking meter heads. Any changes to the meter posts, signs and road markings initiated by the Regional Traffic Engineer are reported to TTSD bi-annually for updating the parking inventory. Any changes to the numbers and locations of metered parking spaces in the territory will be reported to TTSD bi-annually by the Transport Facilities Management Section.
- 3.6.8 When changes are made to the meter heads only, the responsible Transport Officer of the Transport Facilities Management Section will inform the relevant Traffic Engineer in the Regional office, who would in turn amend the parking inventory accordingly.

#### Updating of on-street parking inventory

- 3.6.9 An updated on-street non-metered and metered parking inventory for each Region should always be available in the relevant Traffic Engineering Division. By the end of March and September each year, the inventory should be copied to TTSD, where a consolidated inventory for the entire Territory should be maintained.

#### Updating of off-street parking inventory

- 3.6.10 At present, the parking inventory established in the Parking Demand Study for off-street parking facilities is updated regularly by TTSD, based generally on the recommended procedures laid down in Working Paper No.1 of that study, which are briefly outlined as follows:

##### New buildings/redevelopments

The Monthly Building Digest provides a useful source of information for identifying possible new parking spaces available. Data required for updating the parking inventory can be ascertained through telephone interviews with Authorized Persons followed by checking on site.

##### Demolished buildings

Data required for updating the parking inventory can be obtained from the monthly list provided by the Buildings Department to TTSD.

##### Parking sites under Short Term Tenancies

Data regarding the number of these sites for updating the parking inventory are obtained from the quarterly inputs from Lands Department through the Regional Offices. Besides, useful information for updating the parking inventory such as utilization rates by vehicle types are available from quarterly nighttime parking level surveys conducted by TTSD.

##### Car parks owned/managed by other car park operators/ organizations/schools etc

In the first quarter of each year, letters are sent to car park operators, organizations such as Airport Authority, Hospital Authority, Housing Authority, Housing Society, Mass Transit Railway Corporation Limited, Hong Kong Jockey Club, Government Property Administrator, some Government departments and schools to call for data needed for updating the parking inventory.

- 3.6.11 At present, TTSD updates the parking inventory bi-annually and prepares a consolidated parking inventory as at end March each year for the Territory.

## TPDM Volume 7 Chapter 4 – On-street Parking

### 4.1 References

- 1 GOVERNMENT OF THE HKSAR. “Road Traffic (Parking) Regulations”
- 2 GOVERNMENT OF THE HKSAR. “Road Traffic (Public Service Vehicles) Regulations”
- 3 GOVERNMENT OF THE HKSAR. “Fixed Penalty (Traffic Contraventions) Ordinance, Cap 237”
- 4 INSTITUTION OF HIGHWAYS AND TRANSPORTATION WITH THE DEPARTMENT OF TRANSPORT. “Roads and Traffic in Urban Areas, 1987”
- 5 WOLFGANG S HOMBURGER and JAMES H KELL. “Fundamentals of Traffic Engineering, 9th Edition, University of California, 1977”

## 4.2 General

- 4.2.1 This Chapter deals with on-street parking in general. The practice of parking on-street developed at a time when the vehicle fleet size was small. Also, there was sufficient road capacity to permit on-street parking without causing congestion or inconvenience to other road users.
- 4.2.2 Planning standards at the time, particularly in the high density Zone 1 areas, did not require the provision of parking and L/UL facilities within individual developments. Hence, the majority of parking and L/UL provision had to be located on-street.
- 4.2.3 As traffic volumes increase there are conflicting demands for available road space and priorities must be established. Diagram 4.2.1 schematically illustrates the conflicting demands made for the movement of traffic and access to adjacent property, including on-street parking, at different levels of the road hierarchy.
- 4.2.4 The allocation of space in the kerbside lane should be determined by the relative importance of each demand in terms of the hierarchy of a particular road within the network.
- 4.2.5 At one extreme, where the entire carriageway is needed for traffic movement, parking and stopping are prohibited. This occurs on Expressways, Trunk Roads and Primary Distributor Roads.
- 4.2.6 At the other extreme, where access to adjacent developments is required, it may be in the form of driveways or the occurrence of kerbside parking and boarding/alighting. This occurs primarily on Local Distributor and Feeder Roads. Some provision of access is permissible on other roads, with the exception of Expressways and Trunk Roads.
- 4.2.7 In areas where parking demand is high, off-street parking provision is insufficient to meet demand, and the priority for allocating the kerbside lane for traffic movement is low, consideration should be given to permitting on-street parking. This would occur primarily on Local Distributor Roads.
- 4.2.8 On-street parking should not be permitted on single track access roads. The use of passing places, lay-bys and turnarounds for parking should be prohibited as their use would lead to a significant reduction in the capacity and efficiency of the road. The parking demand along that class of road should be catered for at off-street locations.

### 4.3 Types of On-Street Parking Spaces

- 4.3.1 On-street parking spaces may be either fee paying (metered) or free (designated).
- 4.3.2 Metered parking spaces should be primarily for short term parking involving a high turnover, so that the facility would be available for use by many motorists. Meters permitting half, one or two hour parking should be used.
- 4.3.3 Half-hour meters should be used at private bus parking spaces provided in the proximity of hotels and places of tourist attraction. They are to be used by private buses when boarding/ alighting tour groups visiting a hotel or partaking in a guided tour. They are not meant for the parking of buses awaiting a hire, unless such spaces are located some distance from the core commercial area. In the latter circumstances one or two hour meters may be used instead, dependent on the nature of demand.
- 4.3.4 Metered GV parking spaces should be of one-hour or two-hour duration. One-hour metered spaces should be provided in areas where the demand for the collection/delivery of goods is high and off-street L/UL facilities are inadequate to meet demand. At popular GV hire locations two-hour meters should be used.
- 4.3.5 Metered parking spaces are also provided for the use of motor vehicles other than motor cycles, medium and heavy GV, and buses. They should be of half-hour duration in core commercial areas and two-hour duration at the outskirts.
- 4.3.6 Designated parking spaces should cover similar vehicle classifications but would have no fee-payment requirement. Designated spaces should include motor cycles, refuse collection vehicles and specific government vehicles. Besides, the provision of on-street non-metered overnight GV parking has become a general practice.
- 4.3.7 Parking of taxis and minibuses may be permitted at some on-street stands provided for the use of such vehicles for boarding and alighting passengers. Such facility is permitted only at those stands where traffic sign 325 or 326 has been erected in accordance with the Road Traffic (Public Service Vehicles) Regulation 34. Parking may be permitted only during periods when the stand is not required for boarding or alighting passengers.
- 4.3.8 In order that maximum benefit is gained by the improved mobility for the disabled, on-street parking facilities should be provided for their exclusive use where a need exists and where situation permits. The detailed guidance relating to space dimensions and other features for such provision as contained in TPDM Volume 6, Chapter 8 should be followed.
- 4.3.9 On-street parking for special users should be provided if there is adequate justification showing that the space is required for at least 2 hours every day of a working week, and there is no alternative parking arrangement available. Special users are usually post office vehicles, police vehicles, ambulances, driving test vehicles or similar specific government vehicles. Reference can be made to Tables 4.5.1 and Table 5.3.5.1 to determine the appropriate size of parking spaces required for the vehicles under consideration.

## 4.4 Demand Considerations

- 4.4.1 The entire parking demand in an area should preferably be provided at off-street facilities. However, on roads lower down the hierarchy the use of streets for parking should not be prohibited or restricted until traffic demands warrant such action.
- 4.4.2 In areas where off-street parking provision is inadequate to satisfy demand and traffic conditions permit, on-street parking should be permitted and regulated wherever, and for whatever duration, is equitable with other demands for the use of the kerbside lane.
- 4.4.3 As indicated in Chapter 6 of this Volume, all new residential developments should provide adequate off-street parking facilities in accordance with the probable level of car ownership for the area. That includes new residential developments in Zone 1. Hence, the future need for on-street parking provision in new residential areas, which includes redevelopment in older areas, should be minimal.
- 4.4.4 The older residential developments particularly in Zone 1 areas did not previously require the provision of off-street parking facilities. Hence, in such areas where few off-street private or public parking facilities are available, parking must of necessity take place on-street. In those areas, designated on-street parking spaces should be suitably located taking into consideration other demands for the use of the kerbside lane.
- 4.4.5 Also as stated in Chapter 6 of this Volume, new commercial developments and redevelopments should have adequate off-street parking provision to satisfy their operational needs. Hence, on-street parking provision should be minimal and should be located only where it would not obstruct traffic movement or boarding and alighting activity, particularly that of public transport passengers. In commercial areas and the CBD, the use of the kerbside lane for boarding and alighting should be allocated priority over parking.
- 4.4.6 Should on-street parking be provided in commercial areas, the spaces should be metered so as to make them available to as many motorists as possible. The installation of half hour meters is preferred in core commercial areas, particularly in the proximity of banks and similar institutions that attract trips of short duration. One-hour GV spaces should be selectively located to facilitate the delivery and collection of goods for servicing retail establishments.
- 4.4.7 Because meter feeding is permissible, two-hour metered spaces are likely to attract commuters, who should normally be discouraged from driving to work in areas well served by public transport. If at all necessary, two-hour meters should only be installed at the perimeter of commercial areas where long duration parking may be tolerated.
- 4.4.8 Parking and L/UL requirements in new industrial developments or redevelopments should be provided off-street. However, where the demand for L/UL activity is likely to exceed the off-street capacity, some L/UL provision may be made on secondary access roads. One-hour GV metered parking spaces should be provided for that purpose.
- 4.4.9 To encourage the use of on-street parking spaces in industrial areas for the overnight parking of GV, the period of meter operation should be shortened to 2000 hour instead of the normal 2400 hour termination.

#### 4.4.10

As industrial areas are known to attract GV for overnight parking on-street and, as night time traffic movement on roads in such areas is low, sections of road where daytime parking is not permissible may be selected, in consultation with the Police, for legalized overnight parking during the period 2000 hour to 0700 hour. Selected locations should be designated by the use of appropriate traffic signs but not road markings as the latter could lead to confusion in daytime.



## 4.5 On-Street Parking Layout

- 4.5.1 On-street parking spaces may be laid out parallel to the kerb or at an angle to the kerb as shown in Diagram 4.5.1. Angular spaces are usually at angles of 30, 45, 60 and 90 degrees.
- 4.5.2 Angle parking accommodates more vehicles per unit length of kerb than parallel parking. This advantage increases as the angle increases, and is a maximum when the spaces are perpendicular to the kerb. But as the angle increases, so do requirements of roadway width used for parking and the additional width required for manoeuvring into and out of the spaces.
- 4.5.3 Angle parking simplifies and speeds up the act of parking. The driver can head directly into a parking space with no lost motion and causing minimum interference to moving traffic. Parallel parking involves a backing manoeuvre, which delays moving traffic and is difficult for some drivers to perform without repeated attempts.
- 4.5.4 On the other hand, exiting an angle parking space is more dangerous than exiting a parallel space. Studies elsewhere have shown that angle parking at the kerb is a common factor in accidents and a change to parallel parking had shown an improvement or reduction of accidents.
- 4.5.5 A decision whether to use parallel or angle parking should be based upon the width of street, volume of traffic, type of vehicles and expected turnover.
- 4.5.6 The majority of streets in the Territory are not sufficiently wide to permit angle parking. Hence, parallel parking spaces should normally be provided as they are easier to accommodate within existing road widths without the need for local widening.
- 4.5.7 Parallel parking spaces should normally be arranged in pairs in which two vehicles are parked bumper to bumper, separated from adjacent two vehicle units by a gap of suitable dimension as shown in Table 4.5.1 and Diagram 4.5.1.
- 4.5.8 The size of parking space is not prescribed in the Road Traffic (Parking) Regulations. Standard dimensions have been selected as shown in Tables 4.5.1, 4.5.2 and 5.3.5.1, that would accommodate the majority of vehicles in the Territory of the relevant class. Normally a single vehicle should be parked within a single parking space of the appropriate type. Any overhang will contravene Fixed Penalty (Traffic Contraventions) Ordinance Section 8(2), subject to Section 8(3) which allows a motor vehicle of the permitted class to occupy more than one space.
- 4.5.9 If the parking spaces are metered and Section 8(3) is applicable, an appropriate payment should be made by the parker into the parking meters for each of the parking spaces occupied or partially occupied.
- 4.5.10 On a section of road where localized widening is practicable angle parking may be provided. Parking spaces set at an angle of 45 degrees generally give best results. Steeper angles require more manoeuvring space while flatter angles use as much kerb space as parallel parking.
- 4.5.11 Where angle parking is adopted, the parking spaces could be orientated to facilitate entry in forward or reverse gear. Where GV parking is permitted, orientation to facilitate reversing into the space and exiting in forward gear is preferred. It provides the driver a clearer view of traffic conditions on the road, which is useful when manoeuvring a large vehicle into and out of a parking space. An arrangement similar to that in Diagram 5.3.5.4 could be used.

- 4.5.12 At a cul-de-sac where there is adequate space for manoeuvring and where run-ins are not likely to be obstructed, perpendicular parking could be provided. An arrangement similar to that shown in Diagram 5.3.5.3 should be used. On very wide streets where traffic volumes are low, a one-way arrangement would enable perpendicular parking to be provided to ease a deficient parking situation.
- 4.5.13 Perpendicular parking spaces as shown below should be provided whenever on-street motor cycle parking provision is required. A minimum of five spaces should be provided at any location.
- 4.5.14 Because of the restriction caused by vehicles parking alongside each other in an angle parking layout, the width of the space may need to be increased as shown in Table 4.5.2.
- 4.5.15 When installing on-street parking meters, the horizontal clearance requirements in Volume 2, Section 3.5.2 should be observed. Meter posts should be positioned along the footpath at the line that separates two adjacent parking spaces such that the two meter heads installed thereon will each serve one space.

## 4.6 Siting Considerations

- 4.6.1 The primary attraction of on-street parking is the convenience of accessibility to the trip destination. Hence when on-street parking is provided, the parking spaces should be located within a short walking distance of the destination land use.
- 4.6.2 In commercial, industrial and mixed land use areas where there is likely to be extensive GV activity, preference should be given to the needs of GV when designating areas for on-street parking. One-hour metered GV spaces are most suitable where loading and unloading activity is prevalent.
- 4.6.3 Where loading and unloading activity is permitted from the carriageway of District Distributor, Local Distributor and Industrial Access Roads, the standard carriageway should be widened by a 3m parking strip wherever possible. The additional parking strip will prevent loading activity interrupting traffic movement. The parking strip should be terminated prior to any junctions. If it is not marked for one-hour metered GV parking, an edge of carriageway broken line marking should be used to separate the parking strip from the carriageway. That would permit other vehicles also using the strip for boarding/alighting or L/UL activity.
- 4.6.4 New hotels and places attracting many tourists and visitors should provide adequate off-street parking facilities for private buses or coaches as required in the HKPSG. However, some on-street provision is necessary to meet demand in the proximity of older developments that had not been required to provide off-street parking at the time of development. Half-hour metered bus parking spaces should be provided, as far as practicable, close to the locations of demand.
- 4.6.5 Apart from reducing the effective carriageway width and road capacity, parked vehicles would also reduce visibility for motorists and pedestrians. Hence, on-street parking facilities should preferably not be provided within the visibility area required at run-ins, junctions, roundabouts, pedestrian crossings and similar locations as indicated in TPD Volume 2. Absolute minimum safety requirements for the width of carriageway shall be maintained in proposing any on street parking facilities.
- 4.6.6 The provision of a desirable sight-distance of 70m and an absolute minimum of 50m unobstructed by parked vehicles may not always be practicable. Where on-street parking spaces are required on an interim basis, it is recommended that they should not be located within 30m along the approach to a road junction, roundabout or pedestrian crossing. Nonetheless, a comprehensive safety assessment must be made before implementation.
- 4.6.7 Ideally parking should be prevented throughout the length of the visibility splay at a run-in, but this may be difficult to achieve. However, parking should never be permitted across the actual entrance and preferably for 10m beyond the entrance on both sides.
- 4.6.8 Where a run-in occurs within an on-street parking place, it is recommended that road markings as shown in Diagram 4.6.1 be used to ensure that parked vehicles do not obscure visibility at run-ins. It would also indicate that the parking spaces on each side of the run-in are part of the same parking place.
- 4.6.9 Commercial areas usually attract considerable boarding/alighting, L/UL and parking activity. As mentioned elsewhere such activity should preferably be conducted off-street. The absence of adequate off-street facilities in the older areas makes the ideal difficult to achieve.

- 4.6.10 In those areas, one-way street systems are often introduced for the purpose of improving traffic flow in the area. As boarding/alighting activity is normally high in commercial areas, at least one kerbside lane should be available for such activity. Hence, parking should be permitted only on one side of the street, preferably the offside, that too on minor roads within the system where at least one additional lane is available for the uninterrupted movement of traffic.
- 4.6.11 Where on-street parking is provided, it should be metered preferably for short duration. That would discourage commuters using the on-street parking spaces, which would then be available for use by more motorists on business or shopping trips.

## **4.7 Traffic Signs and Roads Markings**

- 4.7.1 Traffic signs and road markings are required for the purpose of designating places and spaces on a public road where parking is permitted, and identifying the class of vehicle that could be parked thereat. Detailed guidance on the use of regulatory signs and road markings is provided in TPDM Volume 3, Chapters 2 and 5 respectively.
- 4.7.2 Parking spaces that are marked clearly on the carriageway are valuable in promoting orderly parking. Random and indiscriminate parking may sometimes allow more vehicles to crowd into a given length of kerb, but would invariably lead to longer parking and unparking times and irritation to motorists in manoeuvring into and out of a space.
- 4.7.3 Individual parking spaces should be delineated by a continuous white line or the use of road studs. Yellow hatched markings are used to indicate that parking is prohibited. Diagram 4.7.1 indicates the use of signs and road markings to delineate permissible parking spaces.
- 4.7.4 To serve their purpose fully, signs and markings should be visible, properly located, and conform to the Schedules in the Road Traffic (Parking) Regulations and the Road Traffic (Public Service Vehicles) Regulations.

## TPDM Volume 7 Chapter 5 – Goods Vehicle Parking

### 5.1 References

- 1 GOVERNMENT OF HKSAR. "Road Traffic Ordinance, Cap 374"
- 2 GOVERNMENT OF HKSAR. "Road Traffic (Construction and Maintenance of Vehicles) Regulations"
- 3 GOVERNMENT OF HKSAR. "Road Traffic (Traffic Control) Regulations"
- 4 GOVERNMENT OF HKSAR. "Road Traffic (Parking) Regulations"
- 5 PLANNING DEPARTMENT. "Hong Kong Planning Standards and Guidelines, Chapter 9 - Environment"
- 6 TRANSPORT DEPARTMENT. "Transport Planning and Design Manual, Vol 2 - Highway Design Characteristics"
- 7 TRANSPORT DEPARTMENT. "Transport Planning and Design Manual, Vol 3 - Traffic Signs & Road Markings"

## 5.2 Introduction

### 5.2.1 General

- 5.2.1.1 As GVs are the major means of transporting goods in the industrial and commercial spheres within the Territory, their transit of goods from one place to another should be allowed to be achieved as efficiently as possible.
- 5.2.1.2 Attention to the efficiency of GV operations is not only limited to the requirements of GVs in transit but also to their needs for parking and L/UL activities.
- 5.2.1.3 Facilities for parking and/or L/UL operations may be provided either on-street or off-street. In both cases, the principal objective of providing the facilities should be to best serve users without sacrificing the general interests of other road users or the community as a whole.
- 5.2.1.4 This chapter outlines the design standards for on-street and off-street parking and L/UL facilities for GVs to meet the above-mentioned principal objective. Design standards of roadside facilities for refuse collection vehicles have also been included.

## **5.3 On-Street Parking**

### **5.3.1 General**

- 5.3.1.1 On-street parking places are designated on the carriageway of a road by virtue of the Road Traffic (Parking) Regulations.
- 5.3.1.2 Provision of appropriate parking places and L/UL facilities are important to the efficient operations of GV transit. On-street parking places are convenient to GV drivers by allowing the delivery of goods directly from the parked GVs to developments adjoining the road. However, if they are not properly designed and located, the benefits will probably be offset by the obstruction caused by the parking activities to traffic circulation on the road. The term “on-street parking” referred to herein, also include the activities of L/UL as both parking and L/UL activities can take place in same designated parking spaces, though in different periods of a day.

### **5.3.2 Types of On-Street Parking Spaces**

- 5.3.2.1 The following two types of on-street parking places may be used by GVs for parking and L/UL activities:
- (i) Car and LGV parking spaces - They are for vehicles other than MGVs/HGVs, buses, MCs and pedal cycles. LGV may therefore compete with other private motor vehicles for the use of them.
  - (ii) Designated on-street GV parking spaces - They are designated for the exclusive use of GVs only, including LGV, MGV and HGVs.

### **5.3.3 Demand Considerations**

- 5.3.3.1 On-street GV parking places should not be required for new developments as arrangement for parking, and L/UL should have been made within the development.
- 5.3.3.2 On-street GV parking spaces are provided basically to serve existing urban areas on an area-wide basis and mainly for L/UL activities to take place, as parking for unattended vehicles should preferably be located off-street. Demand may be assessed by parking surveys conducted over the area.
- 5.3.3.3 In addition to meeting the demand, on-street GV parking spaces may also be designated on the following grounds:
- (i) Where on-street parking spaces occupied by other vehicles would obstruct GVs from carrying out L/UL activities to the adjacent premises, there is need to reserve parking spaces for GVs to service these premises.
  - (ii) In a "No Stopping" zone where off-street GV parking facilities are lacking, on-street GV parking spaces allow L/UL activities taking place at location within or adjacent to that zone.
  - (iii) Designated on-street GV parking spaces can serve to regulate L/UL activities in a street, particularly if these are metered.



5.3.3.4 For management and control reasons, it is not recommended to provide on-street parking spaces for trailers without their prime movers. Where spaces are designated for overnight GV parking, designers should note that “No Stopping Restriction” may need to be included in order to deter illegal parking during daytime.

#### **5.3.4 Principles of Siting**

5.3.4.1 The siting of on-street GV parking spaces should generally follow the principles outlined below.

5.3.4.2 They should be located in proximity to the source of demand. By the same token, parking spaces serving essentially L/UL activities should where possible be located in the same street block being the major source of the L/UL activity.

5.3.4.3 For on-street parking places serving L/UL activities, particularly in busy urban areas, they should be so located to avoid resulting in a large number of the spaces being occupied for long periods of the day by GVs waiting to be hired, or just parked.

5.3.4.4 Parking spaces should be so located to minimize obstruction to traffic circulation.

5.3.4.5 On-street parking spaces should preferably not be located within 30 m of road junctions or along major thoroughfares, e.g. dual carriageway roads or single carriageway roads which are intended as a major through traffic corridor.

5.3.4.6 Where existing centres of activity abut major thoroughfares, on-street GV parking spaces should be located in the immediate side streets or rear lanes if they are of adequate width to meet the geometric manoeuvring requirements of GVs likely to use the parking spaces.

5.3.4.7 In the planning of new developments, provisions must be made for providing adequate GV parking and L/UL facilities within them. If the demand for GV parking and/or L/UL cannot all be catered for within a development, then a service road of sufficient width off the major thoroughfare should be provided to allow L/UL activities taking place without interfering with the traffic circulation. The desirable carriageway width of a service road to allow one-way flow with standing vehicles on one side is 7.3 m, but a minimum width of 6.5 m is acceptable under restricted site conditions.

5.3.4.8 Where L/UL activities are anticipated to take place at proposed on-street GV parking spaces across the adjacent footway, the impact on pedestrian movements should be examined. Inconvenience and safety hazards to pedestrians should be minimized or avoided, and therefore it is not recommended to designate on-street GVs parking spaces for L/UL adjacent to busy pedestrianways.

5.3.4.9 For safety reasons, on-street GV parking places should not be located:

- i) on bends or crests having visibility less than 50 m;
- ii) on streets where there are heavy pedestrian crossing activities and pedestrians may be masked by parked vehicles; and
- iii) on road sections having gradients of 5% or steeper.

5.3.4.10 It is recommended, on environmental and safety grounds, to avoid locating on-street GV parking spaces in streets within residential areas.

### **5.3.5 On-street Parking Layout**

5.3.5.1 The three basic types of GV on-street parking layouts, namely parallel, angle, and perpendicular parking are shown in Diagram 5.3.5.1.

5.3.5.2 While the Road Traffic (Parking) Regulations does not expressly specify, dimensions for parking spaces can in theory and practice be varied to suit particular circumstances. Nonetheless, normal dimensions of parking spaces for the various classes of GVs, are tabulated in Table 5.3.5.1 as guidance.

#### Parallel parking

5.3.5.3 Parallel parking spaces are normally provided as these can generally be more easily located within existing road widths without the need for local widening, and their uses have less disruption to other traffic. They are also more convenient for alongside L/UL. Their main drawback is the fewer spaces can be provided in comparison with the other two configurations.

#### Perpendicular parking

5.3.5.4 Unless extra space can be made available beyond the normal road reserve and a fully segregated parking area can be created, this type of parking arrangement may lead to unacceptable obstruction to traffic circulation. A typical layout for segregated parking area is shown in Diagram 5.3.5.2.

5.3.5.5 If physical segregation is not possible, a suitable location for a perpendicular parking layout is at the dead end of a cul-de-sac, provided that this does not interfere with the standard turning area, and surplus space is available for the designation of parking spaces. A typical arrangement is shown in Diagram 5.3.5.3.

#### Angle parking

5.3.5.6 Angle parking, being an intermediate layout between parallel parking and perpendicular parking, is normally orientated at 30°, 45° and 60° to the kerb line. Such parking spaces should preferably be so orientated to enable drivers seeing the traffic condition on the road both when reversing into and pulling out of the parking space. Diagram 5.3.5.4 shows this recommended arrangement.

### **5.3.6 Traffic Signs and Road Markings**

5.3.6.1 Detailed information on the traffic signs and road markings to be used can be found in Chapters 2 and 5 of Volume 3, Traffic Signs and Road Markings.

5.3.6.2 For parking places exclusively provided for GVs, traffic sign 281 should be erected at both ends, together with the appropriate plates if the place is to be metered.

5.3.6.3 Individual spaces within a parking lot should be delineated by a continuous white line and studs to indicate that length for the class of GV mainly intended to be served.

5.3.6.4 Each space in a parking lot should abut on adjacent spaces other than at a run-in, or there is a fire hydrant or similar. Where gaps are required, road marking 1043, hatched yellow marking, should be used to indicate that the parking place is continued across the run-in or similar but parking is not permitted thereat.

5.3.6.5 A typical traffic sign and road marking arrangement for parallel, non-metered and metered, on-street GV parking lot, are shown in Diagrams 5.3.6.1 and 5.3.6.2 respectively.

## **5.4 Off-Street Parking**

### **5.4.1 General**

- 5.4.1.1 Off-street parking facilities are provided off the road with access roads connecting the main road to the facilities. Such parking facilities can also be used as a stuffing and de-stuffing area for goods transfer between container vehicles and smaller GVs or vice versa.
- 5.4.1.2 Reference should be made to Chapter 4 "Parking Standards for Private Developments" for details of off-street GV parking facilities provided within industrial developments.

### **5.4.2 Demand Considerations**

- 5.4.2.1 All new developments are required to be provided with adequate off-street GV parking spaces for serving both the parking and L/UL requirements of them. The provision of off-street GV parking facilities not related to particular developments is therefore primarily intended to make up existing shortfalls on an area-wide basis. A parking study is needed for assessing demands in these areas. TTSD can also be consulted for advice on demand/supply forecasts on a district-wide basis.
- 5.4.2.2 Except for other more compelling reasons, it is undesirable to provide on-street parking facilities for articulated vehicles.
- 5.4.2.3 On-street parking places for trailers without their prime movers should not be provided and thus sufficient off-street parking areas for such trailers should be made available particularly for forestalling illegal parking on verges or similar.

### **5.4.3 Principles of Siting**

- 5.4.3.1 The selection of a suitable site for an off-street GV park could often only represent the best compromise attainable having regard to the existing and future circumstances in any given area. The general principles outlined below serve as normal guidelines.
- 5.4.3.2 GV parks should ideally be provided in or close to areas of demands but environmental considerations should be taken account of in the site selection process.
- 5.4.3.3 GV parks should be located close to major road networks to avoid unnecessary penetration by GVs into other areas. Nevertheless, direct frontage access onto Trunk Roads, Expressways and Primary Distributor Roads is not recommended on traffic engineering grounds.

### **5.4.4 Principles of Design Standards**

- 5.4.4.1 Maximum permitted overall dimensions of GVs, extracted from the Road Traffic (Construction and Maintenance of Vehicles) Regulations, are shown in Table 5.4.4.1.
- 5.4.4.2 Given the wide variation of dimensions for GVs, design standards in the subsequent sections have been based on the articulated and rigid vehicles in Table 5.4.4.2.

### **5.4.5 Access Road Standards**

- 5.4.5.1 An access road for the purpose of this Chapter refers to the link between the GV park and the immediate all-purpose road.

- 5.4.5.2 Reference should be made to Volume 2 Chapter 4 "Junctions" for design of junctions of all-purpose roads with access roads.
- 5.4.5.3 The standard width of a two-way access road on straight should be 7.3 m, based on the width of two passing GVs of 2.5 m each, a lateral clearances of 1.3 m between opposing vehicles and a lateral clearance of 0.5 m between each vehicle and the edge of carriageway on either side.
- 5.4.5.4 When the peak hour two-way flow is less than 20 GVs, the carriageway width may be reduced to 6.0 m provided there are no vertical obstructions within 0.5 m of the edges of carriageway.
- 5.4.5.5 If a two-way access road is also serving as a service road, a 10.3 m carriageway width is recommended. However, when the peak hour two-way flow is less than 20 GVs, the carriageway width of the service road may be reduced to 7.3 m.
- 5.4.5.6 Carriageway at a bend must be widened depending on the curvature of the bend, the total angle of turn, the types of vehicles making the turn and details of the layout adopted. The necessary widening at various points in a typical 90° bend with outside curve radius of 15 m, 25 m and 50 m for a two-way access road is shown in Diagram 5.4.5.1. The lateral clearance requirements as for straight road sections are maintained.
- 5.4.5.7 The width of one-way access roads should allow for the situation of the road being blocked by a parked or broken down vehicle. If there is no alternative access, it is advisable to make the carriageway width wide enough (requiring a width of 6 m on a straight road section) for other vehicles to pass through the blockage. Similar width for bends should be obtained by doubling the widths of the outer traffic lane given in Diagram 5.4.5.1 and subtracting 1.3 m

#### **5.4.6 Layout of Loading Bays**

- 5.4.6.1 Most GVs are loaded and unloaded from the rear and most commonly, loading bays are arranged at right angles to a common loading dock as shown in Diagram 5.4.6.1. A 3.5 m wide module allowing a space of 1 m between adjacent vehicles is usually sufficient.
- 5.4.6.2 It is recommended that space of approximately one GV length should be reserved in front of a loading bay as manoeuvring space for the GV to reverse in to the loading bay.
- 5.4.6.3 Where a length of one vehicle cannot be provided in front of a row of bays, it may be necessary to set the bays at an angle, and in this respect the 45° arrangement shown in Diagram 5.4.6.2 is most common.
- 5.4.6.4 Angled bays should be so orientated that GV can reverse anti-clockwise into a bay to allow GV drivers a better visibility during reversing without need for help from others.

#### **5.4.7 Layout of Parking Stalls**

- 5.4.7.1 The dimensions and layout of parking stalls and of loading bays are similar and thus reference can be made to the preceding Sections. However, for parking stalls, the rear of a GV does not need to abut a loading platform and therefore two rows of parking stalls may be located immediately adjacent to each other to maximise the provision of parking spaces.
- 5.4.7.2 From a traffic engineering viewpoint, it is desirable to provide separate ingress and egress points to avoid a concentration of conflicting movements though in practice a combined run-in/run-out normally requires less manpower.

- 5.4.7.3 Some typical layouts of parking stalls for LGV to HGV are shown in Diagrams 5.4.7.1 and 5.4.7.2.
- 5.4.7.4 The parking of articulated vehicles should be so arranged to avoid the need for reversing movements such as through a one way system with vehicles entering and leaving stalls in forward gear from opposite ends. A 45° arrangement as shown in Diagram 5.4.7.3 is generally most appropriate. Table 5.4.7.1 shows a summary of the recommended sizes of parking stalls and the corresponding widths of circulation aisles for various types of GV's.

## **5.4.8 Standards for Turning Areas**

- 5.4.8.1 Depending on the size and configuration of the available space, various type of turning area can be provided to serve rigid and articulated vehicles.

### Roundabout type

- 5.4.8.2 A roundabout type of turning area having a kerb to kerb diameter of 25.6 m is shown in Diagram 5.4.8.1.
- 5.4.8.3 The roundabout type shown in Diagram 5.4.8.1 is relatively easy for articulated vehicles to use, but more difficult for rigid vehicles normally having to utilise the whole area for a three-point turn. For this reason, the 4 m diameter central island should be formed by a flush marking and not be raised or kerbed.
- 5.4.8.4 Where the roundabout turning area is to be used by all vehicles and three point turn manoeuvres are not considered desirable, then the outside diameter will need to be increased to at least 26 m.

### 'Banjo' type

- 5.4.8.5 'Banjo' turning areas are roundabouts flattened on one side to save space but at the expense of a tighter turn.
- 5.4.8.6 A recommended banjo layout is shown in Diagram 5.4.8.2, where the width of the turning area is 20.5 m.
- 5.4.8.7 It is preferable to provide a 4 m diameter island on the carriageway which however should not be raised as rigid vehicles with a turning circle exceeding 20 m between kerbs will need to utilise the whole area to make a three-point turn.

### Full-lock U-turn

- 5.4.8.8 A full-lock U-turn between two parallel walls by the rigid design vehicle is shown in Diagram 5.4.8.3, and requires a width of at least 24 m which may not often be available. However, the same rigid design vehicle could make a three-point turn with only 17 m between walls, as shown in Diagram 5.4.8.3.
- 5.4.8.9 The tightest turn recommended for the articulated design vehicle is shown in Diagram 5.4.8.3 and requires a minimum width between walls of 16 m.

### 'T' turn

- 5.4.8.10 The areas provided for three-point turns usually take the form of T-junctions ('hammer heads'). A T-layout suitable for rigid vehicles is shown in Diagram 5.4.8.4 which is also suitable for articulated vehicles, as in both cases the reversing movement takes place straight across the head of the T.

### Side-road stub turn

- 5.4.8.11 Another common type of turning is usually referred to as a side road turn in which the vehicle is reversed into a side road at a right angle to the access road. The side road may consist of a stub, which has been provided specially for this, or a minor road cul-de-sac, which can be utilised for this purpose. Designs suitable for rigid vehicles and articulated vehicles are shown in Diagram 5.4.8.5.

### Adjustments for wider roads

- 5.4.8.12 The access roads in all the diagrams illustrating three-point turning areas are 6 m wide. Where the carriageway is wider than this, appropriate adjustments can be made to the length of the hammerhead.

## **5.4.9 Other Design Considerations**

- 5.4.9.1 The foregoing sections have dealt in detail with the desirable widths of roads, loading bays and other facilities. Many other aspects of design have to be considered including vertical clearances, horizontal clearances and gradients etc.
- 5.4.9.2 The maximum overall height of a HGV, including any load, permitted under the Road Traffic (Traffic Control) Regulations is 4.6 m. Accordingly, the minimum headroom over any public road should be in accordance with Table 3.5.1.1 of Chapter 3, Volume 2, no less than 5 m at all times.
- 5.4.9.3 In real practice, it is not always possible to provide the clearance required over public roads. Under such circumstances, the minimum clearance should not be less than 4.5 m and will need to be increased as shown in Diagram 5.4.9.1 where there is a sharp gradient change. If working space on top of a loaded vehicle is required, a minimum headroom of 6 m will be required.
- 5.4.9.4 Horizontal clearances are necessary for visibility reasons and for avoiding vehicles or any loads carried being struck by roadside objects. As a general rule, there should be a clearance of at least 0.5 m between vertical objects, such as lighting columns and sign supports, and the carriageways alongside straight sections of access and service roads. The minimum clearances alongside bends and the edges of curved turning areas, such as roundabout should be 0.8 m, and 2 m at the ends of hammerhead arms and side road stubs and round the periphery of parking areas.
- 5.4.9.5 Gradients of ramps should not exceed 1 in 10 when straight and should be less when there is significant horizontal curvature. Elsewhere, sites should be as level as possible, subject to the basic requirement of providing adequate drainage for which a minimum gradient of 1 in 60 is required.
- 5.4.9.6 Gradients should be kept to a minimum, and in no case be steeper than 1 in 40, at and in the vicinity of loading areas.
- 5.4.9.7 Adequate lighting in off-street GV parks should be provided. Where appropriate, the Lighting Division of the Highways Department should be consulted.
- 5.4.9.8 Direction signs should be erected within off-street GV parks to indicate the routes to parking areas, loading and unloading areas, and exits; and arrow marking should be laid in the circulation aisles to indicate the direction to be followed.

#### **5.4.10 Traffic Signs and Road Markings**

- 5.4.10.1 Reference should be made to Volume 3 “Traffic Signs and Road Markings”, Chapters 2, 3 and 5 for detailed information of the appropriate traffic signs and road markings, and only general details of these for off-street GV parking and/or L/UL areas are given in the following paragraphs.
- 5.4.10.2 A direction sign indicating the GV park, or cargo handling area, or GV terminal as the case maybe should be erected at the junction of the all-purpose road with the access road leading to the off-street GV facility to direct GVs to the facility.
- 5.4.10.3 The usual traffic signs and road markings for roads and junctions should be provided in access roads, and at junctions along them. In particular, stopping restriction traffic signs and road markings will be required if it is intended to prevent kerb-side activities from obstructing traffic circulation along the access road.
- 5.4.10.4 Traffic signs "IN/NO EXIT" and "OUT/NO ENTRY" (both back-to-back signs) should be erected at the entry and exit respectively of a GV off-street parking facility if the two are separated, to better regulate the entry and exit movements.
- 5.4.10.5 Inside an off-street GV facility, parking bays and L/UL bays should be clearly demarcated with studs or road markings as appropriate.

## **5.5 Refuse Collection Point**

### **5.5.1 General**

- 5.5.1.1 From a traffic engineering viewpoint, refuse collection points (RCPs) should be located off-street within private residential, commercial or industrial developments.
- 5.5.1.2 Where there is a community need to provide on-street RCPs, these should be designed and sited such that a traffic safety hazard is not created and disruption to traffic is minimised.

### **5.5.2 Location and Size**

- 5.5.2.1 The location of an RCP should be selected so as to be compatible with the environment.
- 5.5.2.2 RCP should not be located on trunk or primary distributor roads, steep roads, or at locations where turning trucks may create traffic problems.
- 5.5.2.3 It is strongly recommended that the design of RCP be such that the refuse collection vehicles (RCV) using the facility can enter and leave in forward gear. The physical dimensions and manoeuvring characteristics of RCV are tabulated in Table 5.5.2.1. Given a generally level site of regular configuration, the minimum RCP area including turning space is in the order of 320 m<sup>2</sup>.

### **5.5.3 Refuse Collection Vehicle On-street Parking Places**

- 5.5.3.1 It may at times be necessary to provide on-street parking places for RCV belonging to FEHD for serving an adjacent RCP or for collecting refuse from adjacent premises without obstructing other traffic. However, these places should not be provided for non-operational reasons such as overnight parking or meal break parking, as facilities for such purposes should be properly provided off-street by FEHD itself.
- 5.5.3.2 On-street parking places for RCV should be marked out by white lines/road studs to indicate individual spaces of a length appropriate to the vehicles using the place. At either end of the parking place, which may consist of one or more spaces, should be erected traffic signs to indicate their exclusive uses by FEHD vehicles. As far as police enforcement is concerned this will only involve whether a FEHD vehicle is parked in the parking place, or any vehicle of any type is parked illegally adjacent to the parking place.



## TPDM Volume 7 Chapter 6 – Parking Provision in New Developments

### 6.1 References

- 1 BRIERLEY, JOHN. “Parking of Motor Vehicles”. (1972)
- 2 ENO FOUNDATION FOR TRANSPORTATION, INC. “Parking Garage Planning and Operation”. (1978)
- 3 HONG KONG GOVERNMENT. OVE ARUP & PARTNERS. “Parking Demand Study”. (1995)
- 4 INSTITUTION OF HIGHWAYS AND TRANSPORTATION AND DEPARTMENT OF TRANSPORT. “Roads and Traffic in Urban Areas”. (1987)
- 5 PLANNING DEPARTMENT. “Hong Kong Planning Standards and Guidelines, Chapter 8 : Internal Transport Facilities”. (2000)

## 6.2

### General

- 6.2.1 In the past, there were not many developments, the majority of parking and L/UL activity was conducted on-street, which had been tolerated when traffic volumes were low. Given the ever-growing demand for road space for the unobstructed movement of large volumes of vehicular traffic, the continued tolerance of parking and even L/UL activity on many streets becomes less defensible. Also, the continuous growth in vehicle fleet sizes requires more parking facilities be provided.
- 6.2.2 The numbers and types of parking spaces provided interact with the volume of traffic that seeks entry into a particular area. Ideally, the parking supply should be about 10 to 15% in excess of demand within an area at peak accumulation. The majority of the supply should be provided off-street in new developments and re-developments. This Chapter deals with the estimation of future parking requirements and also elaborates on provision of off-street parking and L/UL facilities that should be included in new development and re-development. For details of the layout of parking stalls, circulation aisles, ramp configurations etc. for surface and multi-storey parking facilities, reference should be made to Chapter 7 of this Volume.
- 6.2.3 Adequate parking and L/UL requirements should be included in lease conditions for new development and re-development. General guidelines for requirement of parking and L/UL provisions is given in Table 11, Section 7, Chapter 8 of the HKPSG, a current version of which can be found at Planning Department web site at [www.info.gov.hk/planning/](http://www.info.gov.hk/planning/). As a remark, the parking provisions will be reviewed in the PDS-2 and may be subject to change when the findings in it are available.
- 6.2.4 Private off-street parking and L/UL spaces are provided in new development or re-development where applicable, Government can impose new conditions through planning approval and/or lease modification, if appropriate, to meet the standards prescribed in the HKPSG through provisions in the respective lease conditions.
- 6.2.5 For new development and re-development (including housing development), there are 2 stages, namely planning and design stages, during which TD can advise on parking provisions.
- 6.2.6 During planning stage, the normal practice is for TD to stipulate parking provisions according to the HKPSG for the proposed development in the following 3 types of cases:
- (i) When a development is applied for change in land use under S.16 of the Town Planning Ordinance, which is to be considered by the Metro Planning Committee or the Rural and New Town Planning Committee of the Town Planning Board;
  - (ii) When the development parameters for public housing development is circulated, which is to be discussed at the District Planning Conference before submission to the Town Planning Board; and
  - (iii) When a lease is drafted and circulated for land sale/grant or lease modification, which is to be discussed at the District Lands Conference.
- 6.2.7 During design stage when building plans are submitted for comments, the normal practice is for TD to check the building plans based on the lease conditions and/or parking provisions stipulated and Plan D to check the building plans based on the approved parking provision of the respective planning permission for such development, if any. However, for redevelopment under unrestricted lease, no requirements for parking provision are enforceable under the lease conditions.

6.2.8 Pending the outcome and recommendations from the PDS-2, flexible application of the HKPSG along the following lines is emphasized in specifying parking provisions for new developments and re-developments in both the public and private sectors:

- (i) The HKPSG current minimum parking standards should be adhered to as far as possible.
- (ii) In cases that parking provision should be set below the HKPSG standards, developers and their APs should be forewarned when approached by them before submission.
- (iii) In commenting on lease conditions, parking provision above the HKPSG minimum standards should be encouraged where demand is evident and the road network around can cope with the additional traffic so generated.
- (iv) To discourage private car home-work trips, it is more effective to limit parking spaces at work-end than at home-end.
- (v) If a developer submits a parking provision above the HKPSG standards, he should be given a chance to demonstrate the transport need and that the traffic generated by his proposal can be accommodated by adjacent road network. However, it should be noted that in accordance with the current plot ratio control system under the Buildings Ordinance, carpark provisions may be exempted from GFA calculation if the criteria in Building (Planning) Regulation 23(3)(b) are fulfilled. There is no provision under the Buildings Ordinance to grant additional plot ratio as of right or as an incentive for the supply of adequate parking place.
- (vi) District traffic engineers are encouraged to consult their seniors where advice on parking provision is needed.

## 6.3 An Estimation of Parking Requirements

- 6.3.1 For any specific area, the demand for parking and/or L/UL facilities are largely influenced by a number of parameters, notably, vehicle ownership, trip generation/attraction characteristics as well as modal split. These parameters, in turn, are greatly influenced by Government policies on transport and land-use planning. A model capable of forecasting demand for parking and/or loading/unloading facilities must therefore be able to take these key parameters into account.
- 6.3.2 The CTS suite of models have been developed to produce forecasts for travel demand taking account of the afore-mentioned parameters. The strategic Parking Demand Model (PDM) was thus developed in the PDS to accept CTS estimated trip-ends as an input, and translate them for the various vehicle types into demand for parking and/or L/UL facilities. Assessments of demand characteristics for all major vehicle types have been undertaken but major effort has been centered on private cars and GV, given that these 2 types of vehicles constitute the major demand for parking and/or L/UL facilities
- 6.3.3 For more details of the PDM, such as the modeling approach and methodology as well as model application, reference should be made to Working Paper No. 5 of the PDS. For the detailed operation of the PDM, advice can be sought from the TTSD.
- 6.3.4 The supply/demand forecast through the help of the parking inventory maintained by the TTSD and the PDM will help assess parking requirements. Should a shortfall exists or expected, an implementation programme should be introduced expeditiously to remedy the situation.

## 6.4 Provision at Residential Developments

- 6.4.1 In residential developments, the parking provision is predominantly for motor vehicles (ie including taxis). In public rental estates and mixed rental/HOS estates, parking is provided for both LGV and motor vehicles pursuant to the provision under the HKPSG.
- 6.4.2 High income car-owning households normally dwell in Residential Density Zones 2, 3 and 4. Therefore, it is the objective that future residential developments in those zones should have sufficient parking provided to match current and anticipated car ownership of the residents. The stipulation of a minimum requirement in such zones allows a developer greater flexibility to decide what level of parking, above the minimum stated, would be required to meet the needs of prospective residents.
- 6.4.3 Although the standard is open ended at the upper level, the risk of over provision of parking is counterbalanced by the fact that provision in excess of the minimum requirement would be accountable against the permissible gross floor area (GFA) for the development.
- 6.4.4 Some developers wishing to over-provide without losing out on GFA may attempt to convince the relevant government departments, particularly TD, to advise the Authority of a need for parking rates higher than the minimum standards in the HKPSG so as to secure much more GFA-exempted parking areas. This should generally be resisted unless there are very sound transport-related grounds.
- 6.4.5 Although the HKPSG does not set a maximum parking standard for residential developments, except for public housing projects under HA, traffic conditions in an area may dictate a desirability to do so. In such situations, a minimum and maximum parking requirement should be included in the lease conditions. It should be noted that C for T has agreed to allow a flexibility of + 5%, subject to the maximum number of 50 number of spaces, to the parking requirements in future land grants. Such increased parking and L/UL spaces are GFA-exempted.
- 6.4.6 There could be occasions where developers may request to reduce the minimum parking provision required in the HKPSG on grounds of traffic congestion nearby. Where road capacity is inadequate to handle additional traffic generated from new developments, the alternative to maintaining the road capacity would be to reduce the level of development but not the minimum parking provision.
- 6.4.7 Car ownership is more closely related to household income and accessibility than to parking availability. Hence, any reduction in the minimum parking standard would aggravate, rather than resolve, a traffic congested situation and should not be allowed.
- 6.4.8 The objective of providing adequate off-street parking facilities to match current and anticipated car ownership of residents is equally applicable in Zone 1 areas. However, because of the built-up urban environment, the convenient accessibility to high capacity public transport systems, the lower income households resident therein and the higher levels of road congestion usually experienced in such areas, a lower level of parking is provided than in other Zones.
- 6.4.9 Residential developments in Zone 1 areas are either: (a) private developments, or (b) public developments provided by HA or the Housing Society. HA developments are not regulated by lease conditions but by "Development Parameters", usually circulated to government departments for comment at a preparatory stage.

- 6.4.10 Parking standards in public housing developments constructed and managed by the Housing Authority is lower than that required at private developments because residents in the former are of a lower income category and would own less cars. The parking provisions laid down in the HKPSG should be followed for PRH or HOS developments. Subject to the findings of the HKPSG review in PDS-2, an interim parking provisions of one private car space per 9-13 flats may be adopted for BRO or similar, or public housing projects where the housing type has not yet been confirmed. Small flats can be excluded from the calculation of parking spaces provided they are for the elderly. Also, for developments close to MTR and KCRC stations, lower parking provision may be considered.
- 6.4.11 A large proportion of licensed GV in the Territory are under single vehicle ownership. Some conduct their individualized freight transport business from their place of residence and require a lorry parking space within the estate. Others use the vehicle not only for their transport business conducted from a popular central location but also to commute between business and residence. They too need a GV parking space within the estate. To accommodate such demand, parking provision in the HKPSG should generally be followed but applied with suitable flexibility on the merits of individual housing development.
- 6.4.12 Parking layouts in residential developments in Zones 2, 3 and 4 should allow some parking spaces for the use of visitors. Since not every household is likely to own a vehicle, the visitor parking provision in large developments could be included as forming part of the minimum requirement according to the HKPSG. In small developments, a few additional spaces may be provided. The visitor parking spaces should be clearly marked out. They could be used by service vehicles too.
- 6.4.13 In large residential developments, a multi-level parking arrangement may be needed. The parking layout should be suitably designed using standard stall and aisle sizes as shown in Chapter 7.

## 6.5 Provision at Community Facilities

- 6.5.1 For community facilities such as educational, medical institutions, churches, electricity substations and community centers etc, minimum parking provision to satisfy operational needs generally suffices.
- 6.5.2 In hospitals, the parking provision will accommodate some visitor parking determined in consultation with the hospital administration. A proportion of the visitor parking spaces should be allocated for the use of disabled motorists requiring access to hospital facilities. Such spaces should be conveniently located and appropriately designated. A requirement to that effect should be included in the lease conditions at the time when the development is considered. For further details regarding provision of facilities for the disabled, reference should be made to TPDM Volume 6, Chapter 8. If the parking area of the development forms part of the public road system, uses of parking meters, as an effective means of control, should be considered.
- 6.5.3 The parking requirement at educational institutions primarily serves teaching and administrative staff. Although the majority of students use public transport, suitable boarding/alighting facilities must be provided within school premises. This facility is essential, particularly in the Metropolitan Area, if roads adjacent to schools are to be maintained free of obstruction during the times of school commencement and closure.
- 6.5.4 Laybys serving school buses, taxis and private cars should be so located to provide forward ingress and egress and enable a continuous flow of vehicles without tailing back onto public roads. However, at locations where the size and shape of the site would not permit a forward ingress and egress arrangement, a reversing manoeuvre may be allowed. The layout should be such that other vehicles would not be obstructed and no tailback onto the public road would likely occur.
- 6.5.5 Laybys at medical institutions should similarly be located to facilitate a continuous flow of vehicles without tailing back onto public roads. Laybys should not be treated as parking spaces, as they are not intended to accommodate vehicles that are stationary for a long period of time. Besides, they must be easily accessible and should not be sited at an isolated location.

## 6.6 Provision at Commercial Developments

- 6.6.1 For commercial developments such as office buildings, hotels, places of entertainment and shopping complexes, sufficient parking and L/UL facilities should be provided to meet operational demand. If a development site is in an area that is easily accessible by public transport, the parking requirement should be reduced but not totally eliminated. Any reduction should be primarily related to the office space provided, as those commuting to work by car should be discouraged when a site is well served by public transport. Also, a vehicle used to commute to work sits idly all day in a parking space, depriving the use of that space by other motorists requiring short duration parking for a business, shopping or recreational trip. That should be most applicable in CBD and commercial areas.
- 6.6.2 A large commercial development site would usually include a variety of land uses. The peak parking demand for each land use would occur during different periods in the day. Hence, a single parking space could serve the parking requirement of more than one land use. In such a situation, the permissible parking provision for the development could be a fraction of the cumulative parking requirement estimated by the application of the HKPSG standard to each land use. However, prior to deciding what reduction should be permissible, the future demand/supply position within the sector should be quantified.
- 6.6.3 The difference between the future year estimated non-domestic parking demand and the inventory would indicate the parking adequacy or inadequacy in the areas around. If the inventory indicates that the public parking provision is adequate to meet future demand, the permissible parking provision at any new development site in the area should be minimal. Values towards the lower end of the range indicated in the HKPSG should then be used.
- 6.6.4 However, should there be an inadequacy of non-domestic parking within an area, advantage should be taken to provide as much off-street parking as permissible within a new development, so as to increase the inventory and minimize the inadequacy. In that case, the parking requirement included in the lease conditions should lean towards the upper end of the range stated in the HKPSG.
- 6.6.5 The off-street non-domestic parking provision in commercial developments is usually classified 'private', similar to that for residential developments. As the use of private parking spaces is difficult to control, it would seem advantageous from an operational and economic aspect to classify as public the majority, if not all the non-domestic parking provision in CBD and commercial areas. That would provide a means of controlling to a reasonable extent the volume of traffic attracted to the CBD and commercial areas.
- 6.6.6 Where such public parking provision is beneficial, a requirement should be included in the lease conditions that not less than about 80% of the permissible parking spaces will be available for use by the public on an hourly chargeable basis. Space utilization should be effectively controlled through a pricing mechanism based on commercial considerations and parking costs that were used in territorial and regional transport studies to derive present and future year travel and parking demand estimates.
- 6.6.7 Outside the CBD and commercial areas where traffic congestion is not prevalent, non-domestic parking in commercial developments need not be made public. This would however be confirmed subject to the findings in PDS-2.



- 6.6.8 Commercial developments such as restaurants, supermarkets and retail stores, require frequent goods delivery to replenish consumption. These and other commercial developments generate a considerable proportion of daily GV activities in the Territory. To enable such activity to be conducted off-street, the HKPSG stipulates varying L/UL requirements for different commercial land uses.
- 6.6.9 Developers, though willing to provide the parking requirements in the HKPSG and incorporated in the lease conditions, are at times reluctant to provide the associated L/UL requirements, particularly for small developments. However small they are, commercial developments need to be serviced; and as they are usually in the older metropolitan areas where traffic conditions are difficult and kerbside activity undesirable, no relaxation of the L/UL requirement should be agreed if it is likely to result in adverse traffic conditions. Instead, the application for commercial development should be rejected. If the problem is associated with manoeuvrability within the site, the use of a turn table should be considered.
- 6.6.10 For efficient operations, L/UL should be located close to the service area or service lifts. They should not be sited in some isolated location within the site where they would remain unoccupied most of the time or be used for parking and not L/UL.
- 6.6.11 Some commercial land uses require the provision of laybys to facilitate the boarding/ alighting of taxi and private car passengers. Laybys should be located similar to those at community developments described in paragraphs 6.5.4 and 6.5.5.

## **6.7 Provision at Industrial Developments**

- 6.7.1 GV activity is predominant in industrial areas because of the extensive collection and delivery of goods that takes place thereat. Also, more GV are parked during the day and night in industrial areas than elsewhere. In addition to L/UL requirement, the HKPSG stipulates a parking requirement for private cars and GV.
- 6.7.2 The parking provision within individual industrial lots for private cars and light vans could at times be better utilized by having the majority of such area allocated for the use of GV instead. This would however be confirmed subject to the findings in PDS-2. Nonetheless, if such an arrangement is intended, suitably located communal or joint user/composite development multi-storey car parking facilities should be encouraged to cater for the parking requirements of private cars and light vans.
- 6.7.3 In such circumstances the provision for communal or public multi-storey parking facilities should be introduced during the preparation of planning layouts. Their construction should be undertaken at an early stage of the industrial development so that the parking facilities would be available by the time a parking demand is generated.
- 6.7.4 Because of the need to handle bulky and heavy articles, L/UL spaces provided should abut a goods handling platform or area that would facilitate the mechanical movement of goods throughout the building. Also, the circulation arrangement within the perimeter of the development site should be such that large goods and container vehicles could easily manoeuvre within the site, without obstructing or being obstructed by parking and L/UL activity in progress. Furthermore, internal manoeuvring of vehicles should be possible without causing a tail back onto the access road.

## **6.8 Provision at Sites with Mixed Land Uses**

- 6.8.1 It is usual for a single large development complex to provide for a mix of land uses, combining residential and commercial land uses, and even community land uses too.
- 6.8.2 The parking and L/UL requirements in such developments would be a cumulative value of the individual requirements according to the HKPSG. However, if the parking accumulation for different land uses is likely to occur at different times during the day, a lesser parking requirement may be considered. Even so, due consideration would need to be given to the layout of the different land uses and the relative locations of the proposed parking facilities.
- 6.8.3 If the layout is such that the individual land uses are physically separated and located some distance from each other, the individual requirements should be provided at the location of each land use. For example, if the residential blocks are located some distance away from the commercial facilities, the residential parking requirement should be located in the proximity of the residential blocks and not incorporated with the commercial facilities. However, if they are within close proximity of each other, a combined parking facility would enable a smaller parking provision and better utilization of the available spaces.
- 6.8.4 The future parking requirement as estimated from a territorial or regional transportation study should be used as an overall indicator of the adequacy of parking provision in the area inclusive of the proposed development.

## TPDM Volume 7 Chapter 7 – Surface & Multi-storey Car Parks

### 7.1 References

- 1 BRIERLEY, JOHN. "Parking of Motor Vehicles", Second Edition, 1972.
- 2 ELLISON, P.B. "Parking: Dynamic Capacities of Car Parks". RRL Report LR 221. The Road Research Laboratory, 1969.
- 3 ENO FOUNDATION FOR TRANSPORT, INC. "Parking Garage Planning and Operation", 1978.
- 4 HOBBS, F.D. "Traffic Planning and Engineering", 1974.
- 5 INSTITUTION OF STRUCTURAL ENGINEER AND INSTITUTION OF HIGHWAY ENGINEERS. "Design Recommendations for Multi-storey and Underground Car Parks", 1976.
- 6 INSTITUTE OF TRANSPORTATION ENGINEERS. "Transportation and Traffic Engineering Handbook", Second Edition, 1982.
- 7 O'FLAHERTY, C.A. "Highways, Volume 1 : Highways and Traffic", Second Edition, 1974.
- 8 PLANNING DEPARTMENT, HKSAR. "Hong Kong Planning Standards and Guidelines, Chapter 8 : Internal Transport Facilities".

## **7.2**            **Introduction**

### **7.2.1**            **Scope of Chapter**

- 7.2.1.1           This Chapter provides general information and guidelines for the traffic engineering design and geometric layout of surface and multi-storey car parks as well as for the various parking systems.
- 7.2.1.2           This Chapter also includes guidelines for designing ancillary facilities, such as vehicular access arrangements, fee collection arrangements, passenger facilities and traffic aids, and the siting of car parks in respect of adjacent land uses and available road network.

### **7.2.2**            **Definitions of Surface and Multi-storey Car Parks**

- 7.2.2.1           A single level car park is an off-street car park where parking take place on one level or near level plane, which may be at ground or any other floor level.
- 7.2.2.2           A surface car park is a single level car park at ground level, being generally uncovered, though car parks under flyovers would also fall into this category as would those situated on the ground floor of a building.
- 7.2.2.3           A multi-storey car park may have floors above road level as well as underground. Facilities are required to provide vehicular access between floors either by ramps or by mechanical means.
- 7.2.2.4           Multi-storey car parks will normally be built in the central business districts, the centres of New Towns, near Railway Stations in outer urban districts, and near major ferry terminals.

## **7.3 Surface Car Parks**

### **7.3.1 Location and Capacity**

- 7.3.1.1 The choice of location for an off-street car park, and its capacity requirement, will depend on the general land use, and the balance of parking supply and demand in the area under consideration.
- 7.3.1.2 Ideally and theoretically, an off-street car park should be located at the centroid of the destination requirements of those whom the car park is intended to serve. However, whilst this can be achieved in areas to be newly developed, it is often impracticable in already built-up areas.
- 7.3.1.3 An important consideration in choosing a car park location is the walking distance between the car park and likely destinations that the car park will serve. For commuter or long-term parking in urban areas, it is about 500 m. For short-term parking, the walking time to total time parked forms a more significant proportion than for long-term parking. Thus, the acceptable walking distance generally should not be more than 100 m. For rural or recreational areas car parks, even shorter distance will be desirable.
- 7.3.1.4 The capacity of a surface car park largely depends on the shape of the site, the configuration of the parking layout, and the access arrangements. As a rough planning guideline, a figure of 35 to 45 cars per 1,000 m<sup>2</sup> may be used.
- 7.3.1.5 Surface car parks are cheaper than multi-storey ones in respect of construction, operation, and maintenance. However, because of the limited capacity per unit site area, surface car parks are generally unsuitable, though being more appropriate for GV parking, since all land value is at premium, even for “GIC” sites. In general, surface parking, unless being operated on a temporary basis, is considered an inefficient use of land resources in Hong Kong.

### **7.3.2 Vehicle and Parking Stall Dimensions**

- 7.3.2.1 Typical dimensions of various types of vehicles and their turning circles are given in Section 2.2 of Chapter 2, Volume 2, which should be taken into account in the design of car parking layouts.
- 7.3.2.2 Parking stall dimensions shown in Table 7.3.2.1 to be used in layout design are only for guidance and can be varied to suit parking configuration.
- 7.3.2.3 Where the longitudinal side of a parking stall adjoins a wall or fence, the stall width should be increased by an additional 0.3 m. Also a wider stall may be required where parking is provided for the disabled. Section G5 of Chapter 8 of Volume 6 should also be referred to.

### **7.3.3 Parking Layouts**

- 7.3.3.1 The following definitions, as illustrated in Diagram 7.3.3.1, are adopted herein:
- (i) Aisle width means the clear width of the strip of floor area between two parallel rows of parking stalls which gives immediate access to the stalls.
  - (ii) Bin width means the width occupied by a parking aisle plus adjacent stalls on both sides.
  - (iii) Parking angle means the angle between the axis of the parking stall and the aisle.

- 7.3.3.2 Parking angles commonly used are 30 o, 45 o, 60 o, and 90 o. To minimize vehicular conflicts, aisles are normally designed to carry 1-way traffic, except for a parking angle of 90 o where 2-way aisles could be operated. The principal advantage of 2-way aisle systems is reduction in travel distance.
- 7.3.3.3 Table 7.3.3.1 gives standard aisle and bin widths to be provided for various parking angles. Being applicable to private car parking, such widths should be regarded as "desirable minimum".
- 7.3.3.4 Parking layouts should be designed such that a vehicle may be parked in one distinct manoeuvre without reversals of the steering lock. Cars may be parked by reversing into the parking stall or by driving forward.
- 7.3.3.5 With angled parking, i.e. a parking angle of less than 90 o, an interlocking layout may be considered to achieve a more efficient use of floor area through a reduction in bin width. This is shown in Diagram 7.3.3.2 and places the bumpers of vehicles in adjacent stalls next to one another. At a parking angle of 45 o, a "nested" interlocking layout, being illustrated in Diagram 7.3.3.2, places the bumper of one car adjacent to the side of another car. The former arrangement is preferable to the latter for safety reasons.
- 7.3.3.6 Table 7.3.3.2 gives the parking area per car for various parking angles. This is calculated as the area of one parking stall plus half the area of the aisle in front of it. The figure could be regarded as a relative efficiency factor in the usage of space. It can be seen that a parking angle of 90 o provides the most efficient design, and the efficiency decreases as the parking angle decreases. Notwithstanding this, angled parking generally provides greater ease in parking than 90 o parking, and may derive additional advantage in the fact that drivers are able to locate empty stalls more easily.
- 7.3.3.7 Cross aisles providing circulation within car parks but not used for immediate access to parking stalls should be designed to a standard width of 4.0 m for 1-way aisles and 6.75 m for 2-way aisles.
- 7.3.3.8 Standard design dimensions, based on the data in Table 7.3.3.1, for commonly used parking angles are indicated in Diagrams 7.3.3.3 and 7.3.3.4.
- 7.3.3.9 The optimum layout of parking stalls and aisles in a particular car park site depends on such factors as the shape and dimensions of the site, and the location of entrance and exit. The following design guidelines help to achieve greatest parking efficiency :
- (i) There should be a row of parking on each side of an aisle;
  - (ii) Aisles and rows of parking should be placed parallel to the long dimension of the site;
  - (iii) A row of parking should be placed completely around the perimeter of the site.

#### **7.3.4 Parking Under Flyovers**

- 7.3.4.1 "Small car park" is listed as a "Permissible use" in the "Recommended List of Permitted, Tolerated and Prohibited Uses of Land Beneath Flyovers" (endorsed by LDPC in 1978).

7.3.4.2 Similar consideration and standards given for surface car parks in Section 7.3.3 are generally applicable to parking beneath flyovers, but particular attention should be paid to the following :

- (i) Car park entrance/exit should be designed to provide adequate visibility and minimize interference with or obstruction to through traffic. Section 7.5.2 gives further advice on access arrangements.
- (ii) Proper pedestrian facilities must be provided across the roads adjoining the car park.
- (iii) Columns and supports for flyovers must be adequately protected from impacts by vehicles.
- (iv) Pavement must be adequately designed to withstand vehicular loads.

7.3.4.3 In view of their limited sizes, use of areas under flyovers for parking by motor cycles is more efficient than by other vehicles.

7.3.4.4 Adequate headroom clearance should be provided to cater for the vehicles a car park is intended to serve.

### **7.3.5 Miscellaneous Requirements**

7.3.5.1 Surface car parks should be properly surfaced, generally by concrete. But a bituminous surface is often adequate, especially if the car park is a temporary facility.

7.3.5.2 Surface car parks should be well drained by laying it to a fall of 1 in 50 and kept in a clean condition.

7.3.5.3 Surface car parks in night operation should be well lit on safety grounds. The Chief Engineer/Lighting of Highways Department should be consulted on illuminance level and other lighting requirements for public surface car parks.



## **7.4 Multi-Storey Car Parks**

### **7.4.1 Location and Capacity**

- 7.4.1.1 Paragraphs 7.3.1.1 to 7.3.1.3 concerning the location of surface car parks also apply to multi-storey car parks.
- 7.4.1.2 The reservation of sites for multi-storey car parks should form part of any overall planning, having regard to adjacent land uses, existing or likely parking demand, and land availability. Usage of the facility should be supported by effective on-street parking restrictions in the vicinity. Due regard should also be given to the site location for accommodating park and ride facilities.
- 7.4.1.3 Since multi-storey car parks generate substantial volumes of traffic, care should be taken in their location to avoid straining the capacity of adjacent streets. Adequate queuing space should also be provided at the entrance to avoid interference with traffic circulation.
- 7.4.1.4 The capacity of a multi-storey car park depends on the number of storeys of parking, as well as the parking floor area. For the majority of multi-storey car parks having ramp system for interfloor travel, it is desirable to limit the number of floors to about six.
- 7.4.1.5 The above restriction in paragraph 7.4.1.4 does not apply to attendant parking facilities or mechanical car parks, where the controlling factor is car retrieval time, which should be limited to about 5 minutes.
- 7.4.1.6 The number of cars which can be parked in a given floor area of a multi-storey car park depends on such factors as ramp system adopted, configuration of the parking layout, and shape of the building. As a rough planning guideline, a figure of 30 to 40 cars per 1,000 m<sup>2</sup> floor area may be used.
- 7.4.1.7 The width of the car park site is important to parking layout efficiency. In general, a site width less than 40 m greatly impairs design alternatives and space-use efficiency.
- 7.4.1.8 Though being relatively expensive in respect of construction, operation, and maintenance, a multi-storey car park is normally the only solution where land value is at a premium.
- 7.4.1.9 The recommended provision of parking spaces for vehicles driven by the disabled is given in Section 5.2 of Chapter 8, Volume 6.

### **7.4.2 Parking Floor Layouts**

- 7.4.2.1 The location and spacing of columns in a multi-storey car park layout should be so designed to optimise the use of floor areas, and thus clear-span design giving maximum operational efficiency and flexibility is preferred
- 7.4.2.2 Relevant paragraphs should be referred to in Section 7.3.3 regarding parking layout, vehicle and parking stall dimensions.
- 7.4.2.3 Normally a parking angle of 90° is adopted in multi-storey car parks for giving the most economical design.
- 7.4.2.4 Stalls and aisles should be marked out such that any structural columns are set back from the aisles, to avoid hampering parking operations, and in this respect a minimum clearance of 500 mm, and preferably 800mm, between column and aisle should be provided.

7.4.2.5 Where spaces for the disabled are to be provided, extra width stalls may be required. Section 8.5 of Chapter 8, Volume 6 should be referred to.

### **7.4.3 Ramp Systems**

7.4.3.1 Most multi-storey car parks use ramps to provide for interfloor travel.

7.4.3.2 Ramps in a multi-storey car park are generally operated 1-way for safety reasons. If 2-way ramps are needed, it is recommended that opposing traffic be physically separated by a kerb, together with clear signing of the movement direction. For opposing traffic coming around corners on a 2-way ramp, mirrors can be installed at suitable locations to improve safety and visibility of oncoming vehicles.

7.4.3.3 Design standards for straight and helical ramps, being shown in Tables 7.4.3.1 and 7.4.3.2 respectively, apply to private cars parking and should be modified to suit other vehicle types. Where a gradient exceeding 10% cannot be avoided, transitional lengths at half the gradient are recommended at the ends.

7.4.3.4 Clockwise travelling on ramp systems is generally preferred since it places drivers on the inside of turns, enabling better visibility and manoeuvring of the vehicle. In the case of concentric up and down helical ramps, it is recommended that the up ramp be the outer one to have lesser gradient.

7.4.3.5 In terms of circulation, ramp systems may be classified as either "clearway ramps" or "non-clearway ramps". A clearway ramp, sometimes referred to as an express ramp, serves only to give quick access between the parking floor and car park entrance/exit. A non-clearway ramp is part of a circulation route traversing parking aisles and thus also gives access to the parking stalls. If only one clearway ramp is required for making a satisfactory layout, it is usually provided as a departure ramp.

7.4.3.6 Different layouts of ramp are available for consideration, which may be grouped under the following 4 different floor arrangements:

- (i) Level floor arrangement;
- (ii) Split level arrangement;
- (iii) Continuous sloping floor arrangement;
- (iv) Warped slab arrangement.

7.4.3.7 A level floor arrangement is one in which every floor of the car park is flat. Ramp systems which may be used to provide interfloor travel include the following:

- (i) Straight ramp system - Floors are linked by straight clearway ramps being often located externally on the side of the building as shown in Diagram 7.4.3.1. The width of the parking floor should be a minimum of 2 bin widths. An internal ramp arrangement may also be used, in which the up and down ramps are located separately and between rows of stalls, thus requiring at least 3 bin widths. Though straightforward in design, this system necessarily dictates the length of the building since the ramps have to rise the full distance between floor levels, often wasting considerable amount of space.
- (ii) Helical ramp system - Floors are linked by helical clearway ramps. Separate up and down ramps are preferred and these may be arranged at opposite ends of the building as shown in Diagram 7.4.3.1. Space could be saved by adopting an intertwined helical ramp arrangement, as illustrated in Diagram 7.4.3.2, where the entering and exiting traffic streams are confined to their own ramps.

- (iii) Double helix system - Illustrated also in Diagram 7.4.3.2, this is a variation on the helical ramp system. It consists of two interwoven ramps which drop two levels in one complete 360° turn. One ramp then serves the odd-number floors whilst the other serves the even number floors. This design is useful for tall structures, as it reduces the number of turns required in entering or exiting from the upper floors.

#### 7.4.3.8

A split level arrangement, sometimes referred to as the staggered floor arrangement, is one in which the rise between two adjacent parking levels is only half the floor-to-floor height, thus giving the advantage of requiring shorter ramps, which turn through 180° to the next ramp. Several alternative ramp systems are available:

- (i) 2-way ramp system - Illustrated in Diagram 7.4.3.3, it involves 2-way operation of traffic on both ramps and parking aisles. Although relatively simple in design and construction, this system is not recommended as it involves more conflicting vehicular movements and creates potential safety problems.
- (ii) 1-way separate circulation system - As illustrated in Diagram 7.4.3.4, the entering/exiting traffic streams circulate separately on ramps and aisles which operate 1-way. It is generally desirable to position the inner ramps in proximity to the down ramp and away from the up ramp, to provide a long entry route, so that cars searching for parking spaces will pass a high proportion of the stalls, and a short departure route so that cars can exit quickly. Such a design also reduces unnecessary travel and manoeuvres and therefore provides a more efficient operation.
- (iii) 1-way concentric circulation system - Shown in Diagram 7.4.3.4, the entry/exit circulation routes overlap along certain sections of the parking aisles. The ramps and aisles still operate 1-way, but as the up/down traffic movements share the same aisle, there is more moving traffic in the aisles compared to the arrangement at (ii) above. The scissor arrangement of ramps illustrated has a low dynamic capacity since entering/exiting cars merge at the end of ramps where sight distances are short. However, it is possible to avoid this by arranging the down ramps adjacent to each other, giving the additional advantage of a short departure route. In either case the entering route passes all parking stalls.
- (iv) 3-level staggered floor system - Illustrated in Diagram 7.4.3.5, it uses 3 separate floors. The two end floors are at the same level and the centre floor is one half floor height above or below the two end floors. The advantage of this system is that 50% fewer turns are required, but the disadvantage is that the end sections have access to only either an up or down ramp, and therefore each car must be driven up or down one extra half floor on entering or leaving the car park.

#### 7.4.3.9

A continuous sloping floor arrangement is one in which the ramps also form part of the parking floor. For easy parking operations, the gradient of the sloping floor and parking aisle should not exceed about 5%. This arrangement is only suitable for large sites and construction costs tend to be slightly higher. Several alternative systems are available under the sloping floor arrangement, including the following:

- (i) 2-way aisle system - Illustrated in Diagram 7.4.3.6, it involves 2-way operation of traffic on parking aisles. This system is economical in space because separate ramps are not required, the aisles being used for entry and exit as well as access to parking stalls. On entry cars pass the stalls and can take the first one that is vacant. Departure is via the same route to the exit. For cars parked on the upper floors the exit route can be long and tedious. On account of the multi-purpose function of the aisles, the dynamic capacity of this system

is limited and therefore it should only be used where the entering/exiting traffic flows do not have sharp peak periods. From a safety viewpoint this system has a number of conflicting movements and the potential accident risk can therefore be higher than other systems.

- (ii) Clearway exit system - Shown in Diagram 7.4.3.7 a separate clearway helical ramp is provided in this system for exit. Congestion which might occur in the 2-way aisle system is eliminated since the sloping floor aisles only serve incoming traffic a much quicker route with minimum steering effort being available for exiting traffic.
- (iii) Interlocking floor system - Illustrated in Diagram 7.4.3.7, it combines the advantages of the systems described in (i) and (ii) above. Sloping floor aisles carry 1-way traffic but a separate ramp is not required. Each ramped floor ascends or descends the height of two floors. Midway along the length of the floors a cross connection is made between the up and down routes. A disadvantage of this system is that drivers may have difficulty in finding an empty stall in the apparently confusing arrangement because half the stalls are along the up circuit and the other half along the down circuit.

7.4.3.10 Illustrated in Diagram 7.4.3.8, normal ramps are not required in the warped slab arrangement. The floor slabs are horizontal at the external edges thus giving a good elevational appearance. The "buttonhole" arrangement in the middle of the building provides interconnections between parking floors, being achieved by warping or twisting the floor slabs. This design is generally efficient in terms of traffic circulation and usage of space. However the parking stalls near the "buttonhole" are in an area of maximum warp where parking may be unattractive.

7.4.3.11 Described in paras. 7.4.3.7 to 7.4.3.10, the arrangements, being only basic forms of possible layout, may be combined and varied where appropriate. In fact, no single ramp system is the best for all sites and each case should be examined on its own merits with due considerations to the constraints. In all cases, it remains the prime aim to have a satisfactory circulation system with ramp systems of adequate dynamic capacity.

#### **7.4.4 Miscellaneous Requirements**

7.4.4.1 In multi-storey car parks a minimum clear headroom of 2.4 m, measured to the underside of structures and fixtures thereon, should be provided. This normally requires a floor-to-floor height of at least 3.0 m. The headroom should be increased for other vehicle types. However, to discourage the practice of introducing double deckers, maximum headrooms may need to be specified as well. The Building Authority may require the area with excessive high headrooms to be counted for GFA.

7.4.4.2 In designing the junction between the ramp and the parking floor, clearance with the undercarriage of the car should be maintained. A ground clearance of 100 mm and a wheelbase, i.e. the distance between axles, of 3.0 m may be used for design purposes.

7.4.4.3 For drainage purposes, floors should generally be laid to a fall of 1 in 60. The drainage system should be designed so that ramps do not drain on to parking floors. A lip, which should be provided at the top of each ramp at its junction with the parking floor, is to prevent liquids (including water and petrol) flowing from the floor down the ramp.

7.4.4.4 Lighting is important for safety and security reasons in multi-storey car park operations. The standard of lighting should be high enough such that it is unnecessary to switch on headlights but it should not be so high that glare results. Overall consistency of illumination is best achieved by using low-powered units more frequently. At entrances where cars can move suddenly from bright sunlight into the

relatively dark interior of the car park, especially in underground car parks, it may be advisable to consider a speed restriction. If this cannot be done, the lighting installation has to be substantially reinforced in this area.

7.4.4.5 Ventilation has to be provided in multi-storey car parks to avoid the risk of fire and explosion arising from petrol fumes, and to prevent injury to health from exhaust gases. Where buildings are open-sided, natural ventilation may be made use of. However, such ventilation is often not effective in urban areas since the car park is sheltered by adjacent buildings. In these cases and for enclosed and underground car parks, a mechanical extract system should be installed. Detailed guidelines on ventilation design are given in ref. 4.

7.4.4.6 For details of requirements on drainage, lighting, ventilation and fire prevention, the Buildings Ordinance should be referred to and relevant authorities consulted.

7.4.4.7 Access facilities for the disabled should be provided in multi-storey car parks, and guidelines for these are given in Chapter 8 of Volume 6.

#### **7.4.5 Mechanical Car Parks**

7.4.5.1 A mechanical car park is a multi-storey car park in which one or more forms of mechanical devices are employed to deliver the car between the entrance/exit of the car park and the parking stall.

7.4.5.2 Mechanical means may be used to move cars in a vertical direction, in a horizontal direction, or a combination of the two. Different proprietary systems are available some of which are illustrated in Diagram 7.4.5.1.

7.4.5.3 As the simplest form of mechanical device, a car lift takes the place of ramp systems and serves vertical transportation of cars. The number of car lifts to be provided depends on the rate of arrival/departure of cars during the peak period, the number of floors in the car park, and the running speed of the lift. Since cars entering the car park could form a queue at the lift, it is important to estimate the length of the queue and to provide adequate reservoir space so that traffic flow on the main road would not be affected. Each case should be evaluated individually by queuing theory. As a rough guideline, at least 5 queuing spaces should be provided for each car lift. Consideration should also be given to providing back-up facilities at times of maintenance or equipment failure.

7.4.5.4 The horizontal movement of cars entering/exiting a car lift can also be achieved by employing mechanical devices. In a simple example, a car lift serves parking stalls at the back and front of the lift shaft on each floor. An arriving car is left in front of the lift with the brakes released. The attendant, by push-button control, causes a dolly to extend from the lift platform which moves the car onto the latter. On arrival at the selected floor, the dolly moves the car backward or forward into an empty stall.

7.4.5.5 Numerous other mechanical systems have been used worldwide, and devices are available, for example, in which movable plates are electrically operated along access aisles to locate cars in position. Great savings in space are achieved as the aisle widths and parking stall dimensions can be substantially reduced.

7.4.5.6 Mechanical parking, compared to conventional parking, has the obvious advantage of accommodating more car parking spaces per unit site area, which is achievable through the elimination of ramps and, in the case of more complex systems, the elimination of aisles.

7.4.5.7 A main disadvantage of mechanical parking is the need for regular maintenance of the mechanical and electrical plant. There are also obvious troubles during equipment failure.

#### 7.4.5.8

An additional disadvantage of mechanical parking is the rate of handling traffic. It is unable to accept surges of inbound or outbound traffic, thus requiring a large reservoir area at the entrance. It should be noted that the Building Authority may require any excessive area more than needed be counted for GFA. Mechanical car parks generally provide satisfactory service only when the parking demand is relatively uniform throughout the day without sharp peaks.

## **7.5 Other Considerations**

### **7.5.1 Fee Collection Arrangements**

- 7.5.1.1 Apart from the use of monthly parking passes, parking fees are normally levied on an hourly charge basis. Through a variable tariff instead of a fixed charge, control can be exercised on the type of parking catered for, for example, commuter parking can be discouraged by imposing an increasing hourly rate with time.
- 7.5.1.2 One common system of fee collection is to issue a coded entry ticket to the incoming motorist using a ticket machine. A barrier arm is then raised to permit entry. The motorist pays the fee to the cashier before collecting his car. A machine at the exit takes the ticket, causing the barrier arm to be raised to permit exit. Entry/exit lanes controlled in this way have a capacity of about 350 to 500 cars per hour per lane.
- 7.5.1.3 It is possible to replace the entry/exit ticket machines with attendants. However, if there is no separate shroffs office and the parking fee is paid at the exit, the exit capacity would drop to about 175 to 225 cars per hour per lane.
- 7.5.1.4 One fee collection system which eliminates vehicle queues at the entrance/exit and reduces staff requirements is the "pay and display" system. Here, the driver enters the car park, parks the car and pays at a ticket dispensing machine. The ticket is then displayed inside the windscreen for regular inspection by the attendant.
- 7.5.1.5 The lane width at entry/exit control points should be 2.2 m, to be appropriately increased if vehicles other than private cars are to be accommodated. A straight access of at least 6 m in length is recommended on the approach to a ticket machine or payment booth. To reduce braking and starting difficulties at control points, a gradient not exceeding 3% is desirable. The height of ticket machines and window-sill level of the booth should not exceed 1.15 m.
- 7.5.1.6 As a related subject, it is also possible to use manual staff to park cars for customers. Such parking may be divided into two groups :
- (i) Customer parking - It is the most popular form of parking in which the customer operates his car throughout the parking process.
  - (ii) Attendant parking - With this type of parking, the parking/unparking operation is left to attendants.

### **7.5.2 Access Arrangements**

- 7.5.2.1 In general, the entrance/exit of a surface or multi-storey car park should be carefully located in relation to adjacent road networks, such that arriving/departing traffic does not unduly affect traffic flow thereon. Section 3.6 of Volume 2, regarding requirements for run-in location, should be referred to.
- 7.5.2.2 Run-ins to car parks should preferably be located on 1-way lightly trafficked roads. Where this is not possible, consideration should be given to prohibiting right turning movements into/out of them to minimize conflicts. Run-ins should be sited far away from major junctions, so that the ingress/egress traffic flow does not interfere with or be interfered by the junction control. Entrances should be located upstream of exits.

7.5.2.3 Storage space should be provided outside entry barriers, not only for cars waiting for vacancies to arise in a full car park, but also for cars arriving at random. The amount of space required should be evaluated based on factors such as arrival pattern, turnover rate and entry control system. As a rough guideline, a reservoir of at least 2 spaces per entry lane should be provided with a ticket dispenser entry system, and should be increased to 8 spaces per entry lane with manual entry control.

7.5.2.4 The exit from a car park is normally controlled as a priority T-junction with the main road. The capacity of the junction should be assessed using the guidelines given in Section 4.3.6 of Volume 2. A reservoir space of 2 to 3 car lengths is recommended between the exit barrier arm and the main road where cars can wait until suitable gaps appear in the traffic stream. If sufficient space is not provided, the exit gate may not be able to achieve its maximum output stated in paragraphs 7.5.1.2 and 7.5.1.3.

### 7.5.3 Dynamic Capacity Considerations

7.5.3.1 In the design of surface and multi-storey car parks, besides providing an adequate static capacity, i.e. number of parking stalls, it is important to consider the dynamic capacity, i.e. the maximum flow of cars which the facility can accommodate. The dynamic capacity is controlled by various components of the car park. Effects of fee collection and access arrangements are described in Sections 7.5.1. and 7.5.2 respectively. Other factors are dealt with below.

7.5.3.2 The dynamic capacities of a parking aisle with 90° parking are given by the following regression equations :

$$C_m = 55X_1 + 425X_2 + 150X_3 - 10.24X_4 - 849$$

$$C_{out} = 66X_1 + 242X_2 + 52X_3 + 7.7X_4 = 136X_5 - 690$$

Where

$C_{in}$  = inflow capacity (car/hr)

$C_{out}$  = outflow capacity (car/hr)

$X_1$  = aisle width (m)

$X_2$  = parking stall width (m)

$X_3$  = parking stall length (m)

$X_4$  = percentage of cars reversing into stalls

$X_5$  = 0 for 1-way aisle; 1 for cul-de-sac aisle

The above formulae apply when no cars unpark during inflow periods and vice versa. For estimation purposes  $X_4$  may be taken as 35%. Using standard dimensions for  $X_1$ ,  $X_2$  and  $X_3$  of 6.0, 2.5 and 5.0 m respectively, the inflow and outflow capacities of a 1-way aisle work out as 940 and 840 cars/hour respectively.

7.5.3.3 Aisles providing circulation within the car park but not used for immediate access to parking stalls have a capacity of about 1,850 cars/hour. Straight ramps have a similar capacity. The capacity of bends on circulation aisles and helical ramps is given by the formula :

$$C_r = \frac{1850r}{1 + \frac{100}{r^3}}$$

Where  $C_r$  = capacity on bend (car/hr)

$r$  = radius of curvature on centre line (m)

7.5.3.4 For more detailed analysis of dynamic capacity, see ref 5.



## **7.5.4 Pedestrian Facilities**

- 7.5.4.1 In designing surface and multi-storey car parks, consideration must be given to pedestrian movements within the facility for reducing vehicle/pedestrian conflicts. Public safety and security should also be one of the considerations in designing multi-storey car parks in particular those operating round the clock. Open plan layout should be adopted as far as possible.
- 7.5.4.2 Pedestrian walkways, stairs and ramps should be provided with a minimum width of 1.5 m as appropriate and should conform, in other respect, to the standards for ramps/stairs given in Table 3.7.7.2 of Chapter 3, Volume 2. It is desirable to provide independent pedestrian and vehicular ramps. Where they are integral with one another, it is preferable, if the ramp is not a parking ramp, to raise the footway above the level of vehicle ramp and to provide a railing separating pedestrians from vehicles. Where ramps are provided for wheelchair disabled to negotiate steps, a low railing will be needed at least on one side, and the surface of the ramp should have transverse grooves. Details of ramps for the disabled can be found in Section 8.5.2 of Chapter 8, Volume 6.
- 7.5.4.3 Pedestrian lifts should be installed in multi-storey car parks of 3 or more floors. The number of lifts required and the accommodation capacity of each depend on the number of floors and number of parking spaces in the car park as well as the service characteristics, like whether there is a sharp peak period demand. Each case should be evaluated individually by queuing theory. As a general guide, at least two lifts should be provided. Lifts serving the disabled should be in accordance with the requirements in Section 8.5.2 of Chapter 8, Volume 6 and the Design Manual for Barrier Free Access.
- 7.5.4.4 Entrances to stair and lift shafts should be so positioned that approaching/leaving pedestrians have minimum conflict with moving vehicles. In particular, doors of lift lobbies should not open directly onto vehicle circulation paths.

## **7.5.5 Traffic Aids**

- 7.5.5.1 Parking stalls in surface and multi-storey car parks should be demarcated by 100 mm wide white solid line markings. Each stall should be individually numbered. Areas where vehicles should not stand or run over should be clearly marked by a raised kerb or hatched marking. Directional arrow markings should be suitably located. Where vehicular conflicts occur priority should be clearly shown. All markings should be kept clean. Advice on markings where parking for the disabled are provided is given in Section 8.5.2 of Chapter 8, Volume 6. For other markings, Chapter 5 of Volume 3 should be referred to.
- 7.5.5.2 Effective signing/information system should be designed for directing motorists driving/movement. For multi-storey car parks, consideration may be given to painting signs on walls or using internally illuminated signs. To facilitate the search for parking space, it is useful to provide information along the ramp system to indicate whether each parking floor is full or not.
- 7.5.5.3 In multi-storey car parks, signs should be provided to direct pedestrians movements. Floor numbers should be clearly indicated.
- 7.5.5.4 For car parks having 100 or more parking spaces open for public use, consideration should be given to erecting direction signs on roads leading to them. Traffic signs nos. 628, 629 and 630 are appropriate in this respect.