IRC:SP:12-2015

GUIDELINES FOR PARKING FACILITIES IN URBAN AREAS

(First Revision)

INDIAN ROADS CONGRESS
2015

CONTENTS

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(As on 12th January, 2015)

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ABBREVIATIONS

ADB	Asian Development Bank
BRTS	Bus Rapid Transport System
CBD	Central Business District
DAP	Differently Able People
ECS	Equivalent Car Space
FAR/FSI	Floor Area Ratio /Floor Service Index
IPT	Intermediate Public Transport Vehicle
MLRB	Multi Level Residential Buildings
MLP	Multi Level Parking
MP	Mechanical Parking
MRTS	Metro Rail Transport Service
MUV	Multi Utility Vehicle
NBC	National Building Code
NUT	National Urban Transport
NMT	Non Motorized Transport
PBD	Parking Benefit District
PPP	Public Private Partnership
PRTS	Personalised Road Transport System
ROW	Right of Way
SUV	Sports Utility Vehicle
TTMC	Traffic & Transport Management Centre
TOD	Transit Oriented Development
ULB	Urban Local Body
UTTIPC	Unified Traffic and Transportation Infrastructure (Planning & Engineering) Centre
VMS	Variable Message Sign

DEFINITIONS

1.	Concessionaire	Private investor in execution of parking facilities/ under public private partnership
2.	Floor Area	The relevant covered area. For instance, in the case of residential flats, it will include the area of corridors, bathrooms etc.
3.	Five Four Three - Or Two – Star Hotels.	Classified as such by the Department of Tourism or other authority.
4.	Multiplex	Cinema theatres in a single building like shopping malls.
5.	Surface Parking	Parking at ground level designated for the purpose.
6.	On Street Parking	Parking on road/street generally in Urban Local Bodies limits.
7.	Off Street Parking	Parking other than on roads / streets like underground, multi-Level, mechanical/automated.

GUIDELINES FOR PARKING FACILITIES IN URBAN AREAS

1 INTRODUCTION

The Guidelines for Parking Facilities in Urban Areas was first published in 1973. With the change in urban infrastructural concepts, introduction of multimode of transportation, growth in urban population, use of vehicles and vehicles of many wheels, many families needing/ using more vehicles/cars. The Urban Roads, Streets and Transport Committee (H-8) felt the need of revising the Guidelines to meet the challenges of present day parking and the challenges of future. A Sub Committee comprising of Dr. P.K. Sarkar, Shri R. Jai Prasad, Dr. B.P. Bagish and Shri R.K. Jaigopal prepared the draft revision of IRC:SP:12 "Guidelines for Parking Facilities in Urban Areas". The H-8 Committee deliberated on the draft revision in a series of meetings and approved the same in its meeting held on 15th November, 2014 for placing before the Highways Specifications and Standards Committee (HSS).

The composition of the H-8 Committee is as given below:

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Sarkar, Dr. P.K.	--------	Co-Convenor
Joshi, Dr. G.J.	-------	Member-Secretary

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Honorary Treasurer, Indian Roads Congress	(Das, S.N.), Director General, (Road Development) & Special Secretary to Govt. of India, Ministry of Road Transport & Highways
Secretary General, Indian Roads Congress	Nahar, Sajjan Singh

The HSS Committee approved the draft revision in its meeting held on 12th January, 2015. The Executive Committee in its meeting held on 18th January, 2015 approved the draft revision for placing it before the Council. The Council in its 204th meeting held at Bhubaneswar, Odisha on 19th January, 2015 approved the draft IRC:SP:12-2015 "Guidelines for Parking Facilities in Urban Areas" *(First Revision)* for publishing.

1.1 Annual urban population growth rate in last two decades has been above national average growth by more than 1%. Urban population constitutes more than 30% of total population out of which 41% resides in metropolitan cities. In Metropolitan Cities two to three decades earlier, the percentage of two wheelers was as high as 75%, whereas four wheelers (cars) were 2% - 3%. The situation has changed and now two wheelers are 60% and four wheelers (cars) are 15% - 20% requiring more parking area. Against decadal rise of 3 to 9% in number of two wheelers, rise in four wheelers is 10 to 12% in Metropolitan & in class One Cities. Statistics of population, numbers of registered vehicles of top twenty cities of the country are in **Annexure I.** This has happened due to rise in economic level of individuals and liberal policy of financial institutions and preference to safety of persons in comparison to two wheelers. Many families have more than one car and need to be encouraged to go for carpooling. The statistics of a Metropolitan City in the Country indicates that 30% of cars are parked on roads (local to arterial) and a city with 8 Lakh cars with parallel parking requires about 2000 km of road network.

1.2 The provisions of parking spaces need to be evolved periodically due to fast pace of urbanization and rapid motorization, which is making the cities denser and congested. Timely planning and implementation will remove the bottlenecks which may be observed due to future high density development in future associated with high land cost in urban areas.

1.3 When dealt positively, parking can form a valuable economic asset for the local community. With proper parking management under well founded parking policies, the parking facilities can generate economic opportunities and good revenue, apart from improving the liveability of any town, while also supporting sustainable transport and the parking business itself. In urban situations, meeting parking demands turns out to be difficult and can transfer into a problem. Yet when managed properly and under well founded parking policy, parking will be an asset.

1.4 Provision of inadequate parking in the cities in the absence of mass transit facilities bears a significant effect leading to high degree of traffic congestion and high level of noise and air pollution in the cities. Even the incidence of road rage has become a common feature due to scarcity of parking supply in a city of Delhi.

1.5 In general, a vehicle remains in parking for 8360 hours out of 8760 hours in a year (5% of the time in a day). It is a well-established fact that there is a need to ensure availability of parking space at least for nearly 22 hours in day where only vehicle is seen in operation for two hours out of 24 hours in a day. It means whenever a new vehicle is added to the street, it means that additional demand for parking facility is added in the city.

1.6 The generation of traffic demand is not uniform in all activity zones and varies according to type and intensity of land uses. For example, the requirement of parking supply would be different for residential areas than that of commercial areas. In industrial areas, the generation of traffic is totally different in nature primarily characterized by a large scale of goods traffic. Therefore the requirement of parking supply would be to accommodate goods vehicles based on the intensity of industrial activities.

1.7 The question is to what extent parking supply should be provided for different types of land use. What would the rationale to work out a balance between parking demand and supply? What kind of parking policy need to be advocated to ensure sustainable growth of traffic where parking of vehicles in the city with proper planning and design can be accommodated efficiently and safely.

1.8 Keeping this in view, it is of utmost importance to develop guidelines for parking facilities in urban areas for all types of vehicles including passenger and goods vehicles under the categories of motorized and non-motorized vehicles.

2 SCOPE

2.1 Parking is an act of stopping and disengaging a vehicle and leaving it unoccupied. Proper provision of parking plays a pivotal role in transportation, building design, quality of life and environmental issues. The provision of off-street or separated on-street parking spaces in urban areas benefits a city by way of removal of obstacles from the carriageways, thus improving the steady flow of traffic and the carriageway capacity. This contributes to a city's economic activities by ensuring a turnaround of different vehicles rather than long stay of the vehicles in commercial areas. It also satisfies the social objectives in terms of supplying adequate parking spaces at certain locations for specific social groups like persons with special mobility.

2.2 The purpose of this guidelines is for the reference of vehicle owners, drivers, pedestrian, ULB's, Government and Concessionaries of PPP projects for parking. Document highlights the need for addressing issues of parking in cities consequent to the accelerated urban growth and rise in vehicle ownership in last two decades. Provision of parking space in different type of buildings/land uses are outlined according to the city size as well as policy measures of restrictions for parking are also given for maintaining efficiency of urban transport system in general and safety of the road users in particular. Guidelines also describe various types of parking systems with their suitability and measures for their efficient usage and management policies.

2.3 The guidelines are elaborating on innovative approaches for addressing the issue of parking in areas like CBD and dense commercial activity areas for all types of vehicles. The main objective of the parking provisions in the standards is to concentrate on different category of urban roads. The parking provisions for residential, commercial, industrial and other types of buildings are regulated by urban local bodies and local governments. Actual demand for parking shall be estimated according to the specific local situation in a city.

3 PARKING POLICY OBJECTIVES AND GUIDING PRINCIPLES

3.1 Parking demand is gregarious, aggressive, and insatiable. Therefore parking provision should aim for parking restraint so as to reduce the growth and usage of car. The main principle of a parking policy is to provide parking with a view to not to increase more parking demand but manage and restrain its provision to discourage people from using personal vehicles. 60% of all trips made in Delhi are short trips which can easily be made on the alternate modes of public transport.

3.2 Objectives of Parking Policy

Broad objectives of the policy for parking in cities are as under:

1. To provide relief of congestion for improved environment
2. To reduce parking demand through increased parking cost
3. To promote public transport for comprehensive mobility

3.3 The general principles of any parking policy for parking system facility are presented as under:

1. To achieve optimum utilization of available parking spaces
2. Turnover of each available space must be increased
3. To discourage long term parking
4. To carry out rationalization of available parking spaces
5. Long term parking shall be accommodated on off street lots
6. Quality of the parking facility should be considered as important as quantity, including aesthetics, security, and accessibility and user information.
7. High parking fee should be charged in order to make the use of public transport attractive.
8. The parking fee should reflect the value of the land that is occupied.
9. Public transport vehicles and non-motorized modes of transport shall be given preference in the parking space allocation. This along with easier access of work places to and from such parking spaces can encourage the use of sustainable transport systems.
10. Park and ride facilities for bicycle users with convenient interchange are a useful measure.

11. Effective management of parking space through use of ITS technologies

12. To free the public carriageway from parked vehicles impeding the smooth flow of traffic in residential areas also by changing the byelaws.

13. Parking is a consumer commodity, not a legal right. No subsidized parking is to be provided in public spaces. User must pay full cost of parking facility based on land opportunity cost, capital cost, O&M costs and temporal demand.

14. To ensure accessibility to maximum number of people, parking for para-transport/ feeder modes is to be prioritized and subsidized. In areas designated for private parking, short term parkers must be prioritized over long-term parkers, in order to maximize turnover and enable economic vibrancy.

15. Spaces already designated for parking must be utilized to highest efficiency and financial viability.

16. Parking management is to be used as a demand management tool – to decrease use of private vehicles and thus reduce overall demand of parking, and shift travel to public transport, para-transport & non-motorized modes.

17. Private vehicle must be parked on 'a fully-paid rented or owned' private space.

3.4 Multilevel parking complexes should be made a mandatory requirement in city centres that have several high-rise commercial buildings. The investments in such parking facility can be made viable through user charges. Commercial complexes with state of art parking facilities can come up through public-private partnerships. These would be encouraged to go in for electronic metering so that there is better recovery of the cost of using valuable urban space in the parking of personal motor vehicles.

3.5 Graded scale of parking fee shall be adopted for recovering the economic cost of the land used in such parking with the objective of persuading people to use public transport to reach city centres.

3.6 The parking policy lays emphasize on adoption of information and communication technology in parking to inform the vehicle users about the availability of parking place (slot) in the respective area as they approach the space which will prevent searching for parking slots and also disturbance to the traffic on the main carriageway. Signage with variable message in some of the cities are provided informing the congestion in certain roads, safety measures like seat belts, dark glasses, drunken driving etc. In addition parking details can also be displayed along with the nearest & the next parking area & distance. **Photos -3.1 and 3.2.**

Latest technology of swipe card **(Photo - 3.3)** mobile applications and also centralized information system about availability of parking space with display on different roads is suggested along with adoption of surveillance cameras etc.

Photo 3.1 Sign Showing Available Occupancy

Photo 3.2 Variable Message Sign

Photo 3.3 Entry Barrier operated by Swipe card

3.7 Parking Management

3.7.1 ULBs shall identify roads, areas where, on-street parking is allowed in consultation with Traffic Police who control the movement of traffic. While identifying the roads, due publicity shall be given with display boards, type of parking, whether parallel, angle, perpendicular, carriageway width and marking. Parking on alternative days (odd and even days) on each side of the road is suggested for adoption so that the riding surface wears evenly and facilitates cleaning of road.

3.7.2 In commercial and CBD areas near markets, adequate space shall be provided for vehicles especially HUV, mini goods vehicles like mini trucks, covered three wheelers. **(Photo 3.4)**

Photo 3.4 Parking of Mini Trucks in front of market yards

3.8 Parking Restrictions

3.8.1 A few parking management strategies, which have demonstrated significant benefit in different cities in the world with considerable reduction of parking demand, are given below in **Table 3.1.**

Table 3.1 Parking Management Strategies

PARKING MANAGEMENT STRATEGIES	
Based on Design	Improve parking facility design and operations to help solve problems and support parking management
Prices based	Parking fees can be done according to zone, peak hour demand, weekdays and weekends, etc. by charging higher rates during peak hour with progressive increase in rates per hour
TOD based	Substantially replace ECS with cycle, Para-transport and HOV parking in high PTAL zones
Unbundle Parking	Provide parking facilities separately from building space
Improve User Information and Marketing	Convenient and accurate information should be provided on parking availability and price
Parking Pricing	Motorists must be directly and efficiently charged for using parking facilities
Mobility Management	More efficient travel patterns, like changes in mode, destination, timing, and trip frequency must be encouraged
Smart Growth	More compact, multi-modal development must be encouraged to allow more parking development

Walking and Cycling Improvements	Walking and cycling conditions must be improved
Improve Pricing Methods	To make pricing more convenient and cost effective use improved techniques
Parking Regulations	Parking Regulations must be properly designed and strictly enforced
Increase Capacity of Existing Facilities	Parking supply can be increased by using, otherwise wasted space
Financial Incentives	In order to shift mode, provide financial incentives
Improved Enforcement	Ensure that the regulations are strictly enforced
Member controlled associations	Establish organizations that provide transport and parking management services
Parking Tax Reform	Develop tax policies in support of parking management objectives.
Overflow Parking Plans	Proper plans must be developed to manage peak parking demands.
Address Spillover Problems	In order to address spillover problems use management, enforcement and pricing
More Accurate and Flexible Standards	Parking standards must accurately reflect demand in a particular situation

3.8.2 Specifications prescribing permissible level of parking on different categories of urban roads in IRC:103 are as under:

- **Arterial: -** A general term denoting street primarily for through traffic usually on continuous route. It is along with expressways where they exist. It serves the principal network for through traffic flows. Parking, loading and unloading activities are usually restricted**.**
- **Sub-Arterial:-** It is the street primarily for through traffic usually on a continuous route but offering somewhat lower level traffic mobility than the arterial. Their spacing may vary from 0.5 km in central business district to 3-5 km in sub-urban fringes.
- **Collector Street:-** A street for collecting and distributing the traffic from and to local streets and also for providing access to arterial streets. The function of collector street is to collect traffic from local streets and distribute the traffic to arterial and sub-arterial streets or vice-versa. Full access is allowed on these

streets from abutting land uses.

- **Local Street:-** It is the street primarily for access to residence, business or other abutting land uses. Local streets are intended to serve the function of accessibility and normally do not carry large volume of traffic. Local streets may be residential, commercial and industrial depending on the predominant use of the adjoining land.

In addition to this, it is desirable to prohibit parking at certain locations and for a specified period to ensure safety & convenience. Such locations are:

a) Near Intersections: the capacity of an intersection is greatly reduced if vehicles are allowed to park on the approaches. Visibility is also adversely affected & safety is reduced. It is the general practice to prohibit parking for a distance of about 50 m on the approaches to a major intersection.

b) Narrow Streets: Narrow streets with heavy traffic require that all possible measures should be taken to remove obstacles to traffic flow. Prohibition of parking can have a salutary effect on traffic flow & congestion. In busy street of the central area, it is generally desirable to prohibit parking on two-way streets with less than 5.75 m width & one-way streets less than 4 m width.

c) Pedestrian Crossings: Desirable to prohibit parking within about 8.0 m from the pedestrian crossings.

d) Structures: Structures such as bridges, tunnels and underpasses generally have a road way width less than the highway and for this reason it is desirable to prohibit parking on them.

e) Entrance Driveways: Vehicles should be prohibited from parking in front of entrance to building.

f) Desirable to prohibit parking on roads widened for increasing capacity by acquiring land & structures **(Photos 3.5 and 3.6)**

g) Prohibit parking on designated roads during peak hours

h) No parking on arterial roads where available carriageway width is less than 7.25 m (individually in 4 lanes). No parking on sub-arterial roads where available carriageway width is less than 7.5 m. No parking on collector streets where available carriageway width is less than 5.5 m. Parking on one side on local streets where available carriageway is not less than 5.5 m and both sides where carriageway is more than 10.5 m. **(Photos 3.7 and 3.8)**

Photos 3.5 and 3.6 Parking on roads widened for increasing the capacity

Photo 3.7 Parking on 3 lane arterial road

Photo 3.8 parking on intermediate lane on local street

3.9 Parking Facility Construction

This is generally the duty of ULBs who identify Government and ULB lands for construction of multilevel/basement car parking in CBD areas. This can also be on land reserved for conservancy purpose or vacant land. Construction of Basement/Multi Level Car Parking (MLCP) can be taken up out of own funds or through PPP. Owners of vacant sites can be permitted to use their land as parking areas. Space underneath HT overhead lines, where constructions are banned can be considered for parking. Some of the ULB lands can be developed as parking-cum-shopping malls/multiplex under PPP model as parking alone will not be profitable for the Concessionaire.

3.10 In a few of the large cities, planning management defines types of areas namely A, B & C as identified as below:

A: Where public transport is easily available

B: Where public transport is moderately available

C: Where public transport is scarcely available

Core area which has intensive vehicle movement (high density traffic areas), parking is

similarly classified. Core area map **(Fig. 3.1)** is also prepared and circulated to the public.

(i) Premier parking

(ii) Business parking

(iii) Ordinary parking

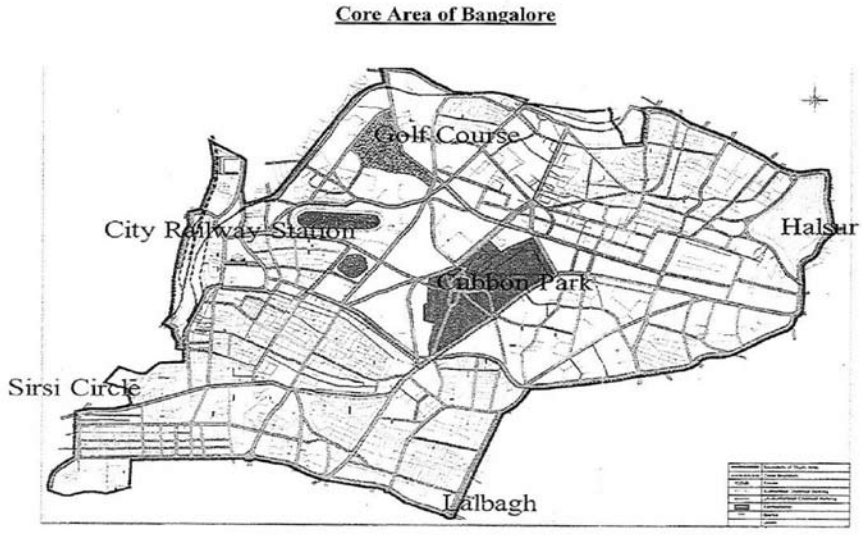


Fig. 3.1 Parking Zones in Core Area

The parking fee scales down from A to C depending on the land value. Annual revision of parking fee based on wholesale price index is adopted. In addition, higher fee during weekends and peak hours is also recommended.

3.11 For operating & maintaining on designated streets, Concession Agreement under PPP model for parking management can also be proposed wherein Concession period will be for five years or as decided by and investment on surveillance cameras, marking, parking meters, automatic collection & other requirements will be made by Concessionaire on revenue sharing arrangement.

3.12 Parking in city residential areas with increased affluence & densification is increasing day by day due to misuse of basement/garages. Due to this, the parking in residential area has largely been on the streets especially local streets. This inconveniences the residents from pulling out their vehicles at times especially during emergency. This needs to be discouraged by enforcing provision of city building bylaw & also parking vehicles within the premises.

3.13 In order to develop proper guidelines for parking facilities, it becomes imperative to revisit some Asian cities to appreciate the provision of parking facilities emerging from adoption of transport policies primarily concerned with restraint approach both from the point of traffic congestion and parking. The policies adopted successfully in Asian cities of Singapore, Hong Kong, Tokyo and Seoul are given in **Annexure II.**

4 PARKING STRATEGIES FOR DIFFERENT MODES OF TRANSPORT

4.1 Parking Strategies with Respect to Category of Vehicle

Cars

- Parking revenue for the Urban Local Bodies shall be generated from pricing of parking facilities and no conversion changes or one time parking fee or in-lieu parking charges shall be levied for private parking facilities.
- Localized variable scale of parking fee based on time, location and use depending on the local demand and congestion level shall be implemented.
- Spill over parking from high-priced areas must be minimized through pricing and enforcement, as it may cause excessive congestion within neighbourhood streets. Market rate parking pricing shall be applied to entire zone, not just a few streets. The entire area shall be implemented as a parking benefit district.

Buses

- Multi-use of large public parking facilities can be permitted for use in off-peak hours for parking buses and commercial vehicles on chargeable basis.
- Underside of flyovers, overpasses and underpasses should not be permitted for parking of any type of transport vehicle to avoid fire hazard.

Trucks

- Parking facility shall be provided for Heavy Transport Vehicles for the purpose of loading and unloading only at respective commercial locations like designated markets, godowns, industrial areas etc. On road parking of such vehicles shall be prohibited in urban limits.

Intermediate Public Transport

- Priority and subsidized parking should be provided for intermediate public transport like taxis, auto-rickshaw, feeder van's etc. at;
  - ➢ All bus terminals and stops
  - ➢ All metro/mono railway stations
  - ➢ Near all important buildings either private, public etc.
  - ➢ Non-Motorized Transport (NMT) like cycle rickshaw's cycle rental, cycles, vendor carts, cycle carts etc. shall be treated in par with IPT for parking facilities.

- ➢ Parking of Intermediate Public Transport (IPT) like parking of taxis, auto-rikshaws, feeder vans and similar vehicles.

Emergency Vehicles

All types of emergency vehicles such as ambulances, fire engines, police vehicles could be parked on all categories of roads at designated and appropriate locations without encroaching carriageway, footpath, and cycle track and side shoulders. They can be demarcated on ground with proper signage.

The dimension of non-motorized vehicles with figure & motorized vehicles are given in **Annexure III**

4.2. Priority, subsidized and designated parking shall be provided for intermediate public transport like, taxis, auto-rickshaws, and feeder vans. While waiting for the passengers at;

a. All bus terminals and stops

b. All intercity and intracity railway stations

c. Near Metro Rail Stations

d. Near all important buildings either private or public

e. Within shopping and commercial areas, near entertainment and recreational places

4.3 These parking facilities should not be used for long term parking. Non Motorized Transport (NMT) like cycle rickshaws, cycle rental, cycles, vendor carts, cycle carts etc. shall be treated on par with Intermediate Public Transport Vehicles (IPT) for parking facilities.

4.3.1 *Parking private vehicles*

This category of parking shall be carefully dealt with so that present situation of bursting and serious lack of parking facilities shall be converted with time, into positive form of revenue generating mechanism, which shall be a valuable economic asset to the ULB. This shall serve citizenry, for effective and efficient parking system so that, they carry on with their normal chores. A synchronized on-street, off-street and multilevel parking system with proper enforcement will be a key to its success. Parking management strategy for private vehicles' shall be;

4.3.2. In-house/In-office/In-society parking should be carried out at parking spaces duly regulated by building and land enforcement agencies of the area.

4.3.3. Parking revenue for the ULB's shall be generated from pricing of parking facilities and no conversion charges or one time parking fee or in-lieu parking charges shall be levied for private parking facilities.

4.3.4. Localized variable scale of parking fee based on time, location and congestion level shall be implemented.

4.3.5. Spillover parking from high-priced areas must be minimized through pricing and enforcement, as it may cause excessive congestion within neighborhood streets. Market rate parking pricing shall be applied to entire zone, not just a few streets. The entire area shall be implemented as a parking benefit district.

4.3.6. In case of heavy activity areas, private parking should be regulated by way of time restrictions either by using fee tags, discs, or installing parking meters.

4.3.7. Parking of vehicles near schools is hindering free flow of traffic and on the road **(Photo 4.1)** should be regulated in accordance with local bye laws. Dedicated and marked parking should be provided by the institution either within premises or at the entrance, and shall not spill over to connected public roads. The alternative that is being attempted by some cities is termed “Safe Way to School” wherein school children are ferried by Govt. Undertaking Buses and use of individual vehicles by parents for Drop & Pickup is discouraged.

Photo 4.1 Pickup vans for schools parked on the road

5 PARKING BENEFIT DISTRICTS

5.1 Urban local bodies shall identify specific urban wards or part of wards or combination of wards to identify congested roads, areas, networks where parking supply appears to be deficient and/or high levels of encroachment of roads, footpaths, public spaces etc. by private vehicle persists. Such wards or part of wards or combination of urban wards shall be declared as "*parking benefit districts".*

Parking benefit districts are to be planned to improve availability of on-street and off-street parking and promote public transport, cycling and walking spaces. A parking benefit district provides more net available parking space in an area by increasing parking turnover through good design, management and pricing of spaces. A parking benefit district provides comprehensive facility provisions for all modes including pedestrians, non motorised transport, cycle tracks, IPT parking, vending zones, bus stops, public amenities etc. in addition to on-street or/and off-street parking for private vehicles.

5.2 ULBs in consultation with planning bodies, local stakeholders shall develop detailed parking benefit district plans with physical design and demarcation of spaces on ground and not the least, a rigid and strict enforcement.

5.3 PBDs are to be planned to improve availability of on-street and off-street parking and promote public transport, cycling and walking spaces. A Parking Benefit District provides more net available parking space in an area by increasing parking turnover through good design, management and pricing of spaces. A PBD provides comprehensive facility provisions for all modes, including pedestrians, non motorized transport, cycle tracks, intermediate public transport vehicles parking, vending zones, bus stops, public amenities etc. in addition to on-street or/and off-street parking for private vehicles.

5.4 Establishment of parking benefit districts can serve as a financing tool to support improvements in old areas, while also addressing traffic congestion and parking constrains. Within a parking benefit district, public parking spaces i.e. both on and off street parking are charged on hourly rate designed to keep approximately 15% of the parking spaces vacant. Funds collected from parking charges are poured directly into improvements that make the PBD more attractive, such as sidewalks, landscaping and other amenities or aesthetic improvements. In addition, traffic congestion in the PBD will be reduced by around 30% because downtown shoppers and employees will no longer need to circle, block-after-block in search of vacant parking spaces. New parking meter technologies have improved customer convenience like customers can pay remotely by credit card or through cell phone. Increased pricing flexibility like, rates that can be charged in real time based on location, time of day, day of week or level of occupancy and also reduce street space occupancy and reduce operating costs.

5.5 Implementing agencies

Generally ULB's are the implementing agencies. A proposal for parking benefit district can be initiated by community groups such as respective area merchants association or urban neighborhoods whose streets fill up daily with spillover parking by employees and shoppers, or it can be solely implemented by respective Urban Local Body.

5.6 Key to Success

5.6.1. *Education and involvement of local businesses*

Local businesses may initially resist the idea of parking benefits district, as they think that free on-street parking is essential for them to compete with suburban shopping centers. Addressing these concerns involves a two-part discussion. First local area businesses must understand and promote the unique qualities, that make their location a more pleasant and attractive place for strolling, shopping and dining than shopping malls surrounded by a sea of asphalt. Second they shall be closely involved in developing plans for the use of funds generated by the parking meters. All of these are dedicated solely towards improving the attractiveness and accessibility of the PBD. If ULB initiates all such activities, then said activities shall be co-actively managed by local community and ULB.

5.7 Planning, Administration and Documenting

5.7.1 A PBD requires staff support from local administration, planning, public works and economic development agencies. Once all in place, the revenue collection process should be fairly easy, but it is important to allocate some staff resources to make sure that the community knows how the funds are being utilized.

5.8 Getting Started

5.8.1 The essential first step to establish PBD is early outreach to businesses and neighborhoods. Business community in particular to be convinced of the benefits of charging for parking both in terms of higher turnover and increased parking availability for their customers, and ability to reinvest parking revenues to improve local area. The boundaries, pricing level and other parking policies must be considered. New or amended parking rules may be passed in ULB or by a state ordinance for implementation of the PBD. While it may be politically preferable to start small in terms of district size and pricing, care must be taken to ensure that the continued presence of convenient free parking near a proposed district does not undermine the long term viability of the PBD. Once the first parking district is implemented, staff will be responsible for managing the operations and allocating revenues towards desired improvement projects.

6 TYPES OF PARKING SPACES AND LAYOUTS

6.1 The urban parking facilities can be divided into three main categories namely:

- On-Street Parking Facility
- Off-Street Parking Facility
- Special Parking Facilities

As regards operation, there are two main types: i. Free parking and ii. Paid Parking:

6.1.1 *Free parking*

These facilities mainly comprise of company or public administrations for car parks. Parking spaces in car parks or commercial garages may belong to, or rented by private companies or public administrations that provide free parking to their employees during work time, to visitors for business trips, or for commercial vehicles.

6.1.2 *Paid parking*

Parking spaces may be made available by private companies or public authorities on payment of parking fees. Car parks can be available in open-air or located in buildings. For short or medium-duration parking, users pay by the hour, the price being decided upon by the operator of the car park. Pricing can be strategic to encourage short term and medium-term parking, progressive to dissuade it, free for first hour to encourage short term parking, involve reimbursement of parking fee by shop owners to encourage purchases and finally, vary in accordance with the purpose of parking in the given area. As regards long-term parking connected with work or residence, the car park operators let spaces or propose subscriptions. In the case of car parks with concessions, users can, avail if they wish, buy a place with guarantee of use for the duration of concession.

6.2 On-Street Parking Facility

On-street parking facility is usually at the curb side at the edge of the carriageway, on the lateral strips parallel to the road way, or on particular road areas such as squares, or other surface, forming part of the publically owned road space. This facility is found in shopping areas at the door step of shopping units where turnover is high and rapid access to the customer. Based on operational and regulatory system there are three types of on-street parking facilities.

- Free parking of long duration
- Free parking of limited duration with strict enforcement
- Parking system involving payment of fee

Following are a few types of On-street parking based upon the layout design:

- **Parallel parking:** Parking the vehicle in line with other vehicles parallel to the kerb, front bumper to rear bumper.
- **Perpendicular parking:** Parking the vehicle side by side, perpendicular to kerb.
- **Angle parking:** Angle parking is similar to perpendicular parking, except the vehicles are aligned in an angle.
- **Pay and display parking:** Pay and displays means that the person who parked the vehicle has to walk to the nearest parking machine and buy a ticket. The ticket is placed on the dashboard of the vehicle and enforcement officers audit by looking in vehicles for receipts. These pay and display systems can be used both on and off-street.
- **Disk parking:** On some places where parking time limit is set which it is monitored using parking disks. The owner of the car uses this disk to indicate the time when he parked the vehicle; he places a disk on the dash board. This is controlling aspect for revenues.
- **On Kerb parking:** This may be allowed in residential and less congested commercial areas. Kerb in such areas/cases will be mountable to road side to give easy access in parking.

6.3 Off-Street Parking

These are surface parking lots and car park structures either underground or elevated. Underground parking or roof top parking could be used to provide 100% usage of the land. Access to these facilities can be made for either public or private use. They can be managed by the municipality or by private or semi-public enterprises.

Off-street is the parking of vehicles at places other than the on-the-streets

Types of Off-street parking commonly considered are:

a. Surface car parking

b. Underground parking

c. Multi – level car parking

d. Roof parking

e. Mechanical parking

6.3.1. *Surface car parking*

Usually these are provided at the surface and at some distance from the activity area to be catered. These are known as 'surface lots'. Arrangements are made for the systematic entry and exit of the vehicles. Stalls are designated by vehicle types and proper circulation area is designed for speedier movements of the parking or un-parking vehicles. Safety provisions need to be considered for the drivers and passengers near parking spaces and in circulation areas. These can be developed on private or public land and the investment is minimum. This is the first option depending on the availability and size of vacant land. Private land owners can also be permitted for creating parking facility in vacant lands till permanent structure of their own is put-up. Concessions could be extended to the land owners to encourage usage of their vacant land for public parking **(Fig. -6.1 a to g)** High mast lights can be provided for illumination.

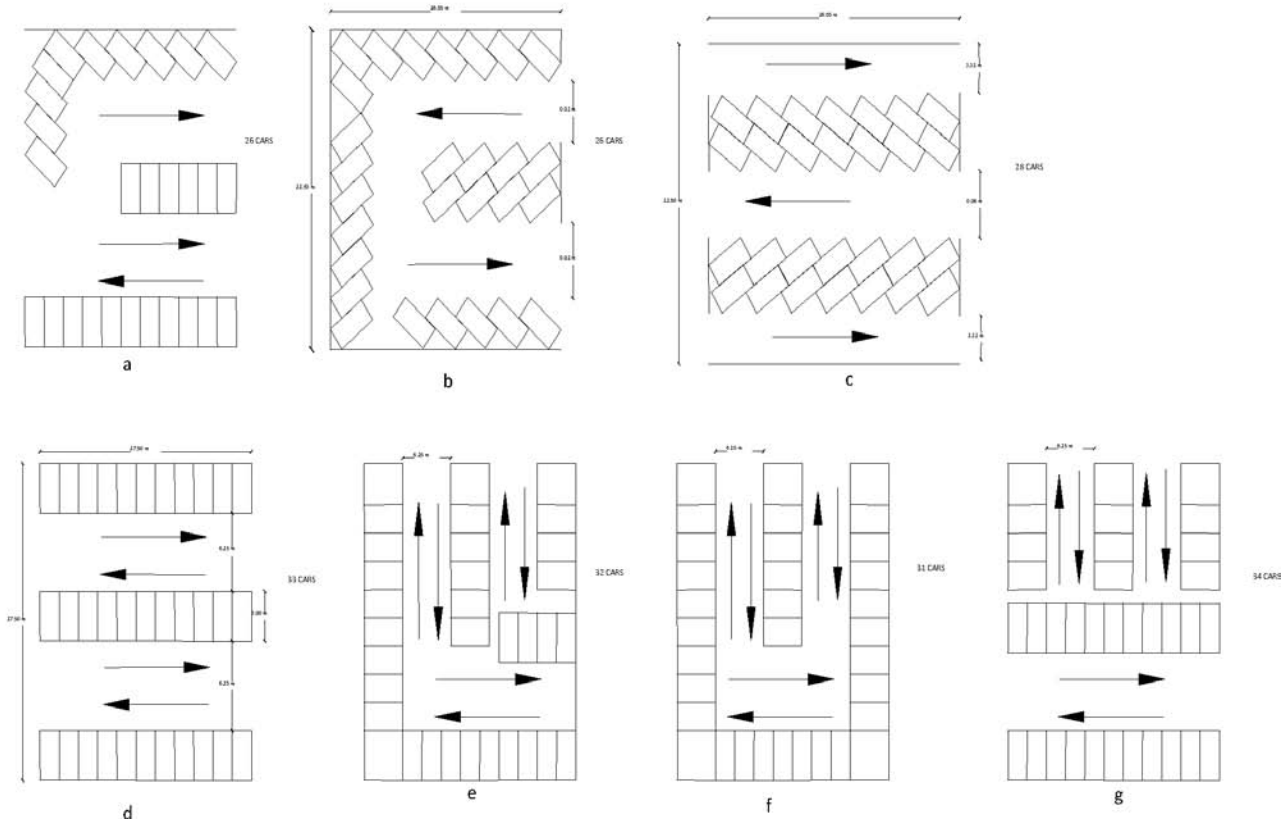


Fig. 6.1 a, b, c, d, e, f & g : Surface Car Parking Lots

6.3.2 *Underground parking*

It is also known as basement parking. Underground parking spaces are mostly located in city centers or below play grounds or at similar locations, where there is not much space available to build a parking facility, but there is an immediate need to build one. This can be provided

underneath apartments and also commercial buildings to provide parking facility to inmates & also for public, visiting the commercial building **(Photos 6.1, 6.2, 6.3 & 6.4).** The norms for entry and exit of ramps width as well as gradient are similar to the one recommended for MLCP. Underground parking involves large quantities of excavation, construction of retaining walls, ventilation and lighting. These can also be single level or multilevel depending on the need and based on type of soil, presence of water table. However the underground parking involves considerable investment.

Photo 6.1 Underground Parking

Photo 6.2 Two Level Underground Parking

Photos 6.3 and 6.4 Lighting of Underground Parking

Underground parking requires proper illumination during all hours. Minimum illumination of 50-75 lux shall be provided through proper lighting systems.

Drainage problem in underground parking can be addressed by providing perforated pipes at floor level or covered drain network and connected to sump of adequate capacity depending on area of parking and water table with automatic pumping. Whenever water table raises or filled by smaller drains along and across the basement the water starts collecting in the sump which gets automatically pumped out to the nearby drain.

Provisions of staircase in underground parking shall be made considering safety during fire or any other untoward incidences or emergencies.

Where the basement is inadequate ground level parking shall be provided as additional parking facility as per norms of the building bylaws of the city. Such provisions are also known as stilt parking. In addition, two level parking can be adopted in parking area to create additional parking **(Photo 6.5)**

Photo 6.5 Two Level parking

6.3.3 *Multi-level parking*

Parking comprising of more than two levels should be provided in respect of Apartments & Commercial Establishments including Malls, Multiplex for parking of cars. This requires considerable investment and also availability of land and investment by urban local body and/or private participation. In a few instances, where urban local bodies have invested, they are unable to get returns due to reluctance of the vehicle owners not preferring parking in multi-level car parking.

Within developed urban areas, multi-level parking should be developed as mixed use projects with the following norms:

- A maximum of 70% of gross/FAR may be utilized as commercial office space, with the remaining accommodating residential uses like hostels, service apartments, budget hotels, etc.
- Bus parking sites can have 100% ground coverage to optimized use of land. Maximum height shall be as per local constrains like flight paths, heritage zones etc.
- There will be no restriction on the number of levels of basement subject to structural safety.
- For comprehensive schemes, development controls shall be as per approved scheme.
- A comprehensive parking benefit district shall be formed to have overall parking control.

This could be successful with joint venture by ULB's owning land with private investors under PPP model with construction of Mall, Multiplex with parking for both commercial and additional parking for outsiders **(Photos – 6.6 & 6.7).**

Photos 6.6 and 6.7 Commercial Construction with Additional Parking (MLP) under PPP Model

Following strategies are recommended for successful operation of MLP:

i) A 1000 m (10 minute walking) radius around the multi-level facility shall be designated a strict 'no-parking' zone for all streets. Road space within this zone may be reclaimed for Intermediate Public Transport Vehicles/Non Motorized Transport parking and pedestrians.

ii) In case it is essential to provide on-street parking within the 1000 m zone, it should be priced exponentially (minimum 3-20 times higher than the off-street parking) so that the multi-level facility has more demand, thus making it viable for the parking provider to cross-subsidies the facility.

iii) On-street parking is the premium, most convenient parking space having maximum demand. Low-pricing of on-street parking will lead to the failure of off-street multi-level parking facilities.

iv) Public multi-level parking facilities' **(Photos 6.8 and 6.9)** cost can never be recovered through simple pricing. It should be recovered through cross subsidy from on-street pricing within the PBD.

v) The cost of multi-level parking is too high to recover by simple user pays principle. The only way revenue can be generated for the service provider is, if the surrounding area is managed by the same agency and returns on parking are generated from the steeply priced short-term on-street parking. For this reason, multi-level parking projects in a PBD must only be implemented as comprehensive PBD projects managed eventually by a single public/private entity.

Photo 6.8 Interior of MLCP

Photo 6.9 View of MLCP

Some of the desirable standards for designing of the multi-story car parks are:

(i) Gradient of the ramp : 1 in 10 generally & 1 in 8 for very short ramps

(ii) Clear height between floors : 2.1 m Parking stall dimensions 2.5 m X 5 m **(Photos 6.19 and 6.20)**

(iii) Inside radius of curves : 7 m

(iv) Width of traffic lane on ramps & entrance : 3.75 m

(v) Gradient of sloping floors : Not steeper than 1 in 20 **(Photos 6.10 and 6.11)**

Additional width of at least single lane width to be provided in front of MLCP for entry and exit to exit without disturbing the traffic on main carriageway, however it is preferable to provide entry and exit ramps at the rear of MLCP or to the road with less traffic. However each city has its own building bylaws.

Photos 6.10 and 6.11 Ramps to MLCP

6.3.4 *Roof parking*

It is a popular method of solving the parking problems adopted in many cities is to park the vehicles on roof tops. Access ramps or mechanical lifts provide the necessary access to the roofs. **(Photos 6.12 and 6.13)**

Photos 6.12 and 6.13 Roof Parking

6.4 Special Parking Facilities

6.4.1 *Automated parking systems*

After placing the vehicle on a platform, the automated parking system will move the vehicle to available parking space somewhere in the structure. The vehicles can be moved horizontally and vertically in the system. Parking spaces in this system will be smaller, because no one needs to get in or out of the vehicle and people do not park it themselves. It is entirely automatic and does not require any staff. Automated parking systems are also sometimes called:

- Mechanical parking system
- Robotic parking system
- Rotary parking system
- Automatic parking
- Stacker parking

6.4.2 *Semi-automated parking system*

A semi-automated parking system uses a mechanical system to move vehicles to their parking space, only it needs a human action to work, either by the driver or by an attendant.

6.4.3 Vehicles are moved in different way from ground level either under the ground or above and carried by lifts to different levels of MLCP instead of conventional manually driving on ramps. The different types are:

(1) Stack Parking

(2) Puzzle Parking

(3) Tower Parking

(4) Rotary Parking

(1) Stack Parking

In this system, two vehicles are parked one above the other and are adopted both under the ground and above, in order to provide more parking slots. This system is electrically and mechanically driven. **(Photo 6.14)**

Photo 6.14 Stack Parking

(2) Puzzle Parking

This is fully automated and there will be one or two slots in the parking to move the vehicle to the vacant space. This moves both horizontally and vertically. This is jointly multi-level and above the ground. **(Photos 6.15 and 6.16)**

Photos 6.15 and 6.16 Puzzle Parking

(3) Tower Parking

This is fully automated and multi-level. Cars are parked in position using lift and there will be two spaces per floor. (**Photo 6.17)**

Photo 6.17 Tower Parking

(4) Rotary Parking

This is mechanical parking with turn-table for narrow space. The vehicles are driven on the turn-table and aligned in position. Vehicles are then driven in to the vacant slot which positions at the ground level. **(Photo 6.18)**

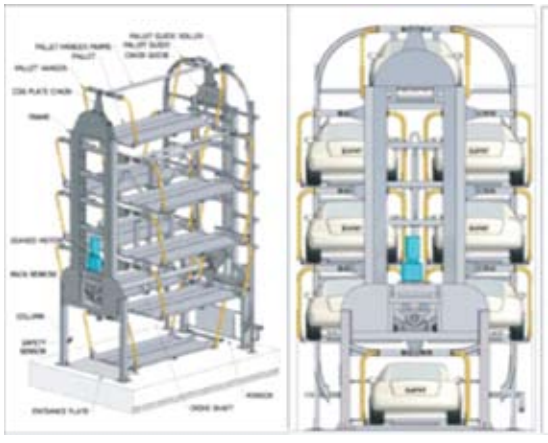


Photo 6.18 Rotary Parking

A few of the parking projects taken up in the country are in **Annexure - II**

6.5 Parking Space Requirements for Different Vehicles

Space required for different types of vehicles shall be as given in **Table 6.1:**

Table 6.1 Parking Space Requirement

Vehicle	Space Required (in m^2)
Car	20-36 sq. m.
Buses	55-60 sq. m
Trucks	55-60 sq. m
Three Wheelers	10-15 sq. m

As parking norms are generally prescribed in terms of ECS, following factors shall be used to convert other vehicles into equivalent car units **Table 6.2:**

Table 6.2 Equivalent Car Spaces (ECS)

Vehicle Type	ECS
Car/taxi	1.00
Two Wheeler	0.25
Auto Rickshaw	0.50
Bicycle	0.10
Two wheelers	0.25
Trucks/Buses	2.50
Emergency Vehicles	2.50
Rickshaw	0.8

Source: URDPFI Guidelines, MoUD 2014.

6.6. Parking Design Layout for Different Types of Vehicles

In order to accommodate parking facilities for different types of motorized and non-motorized vehicles, the following design standards for different types of vehicles for off-street facilities are as under : The design included are given in **Figs 6.2 and 6.6.**

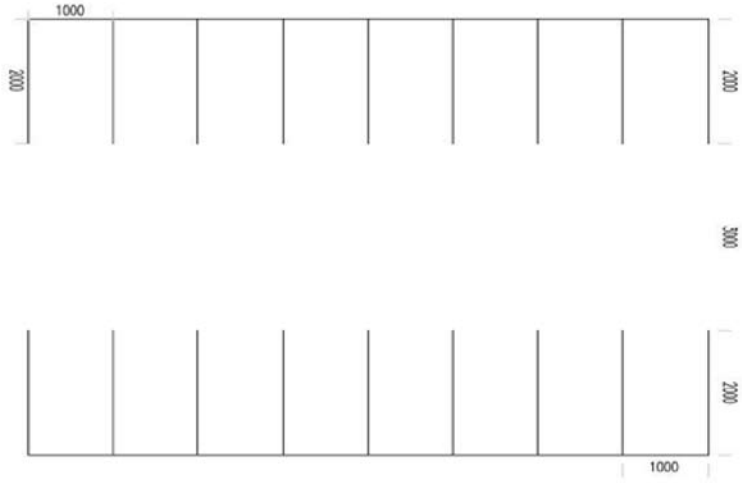


Fig. 6.2 Parking Layout Design for Two Wheelers

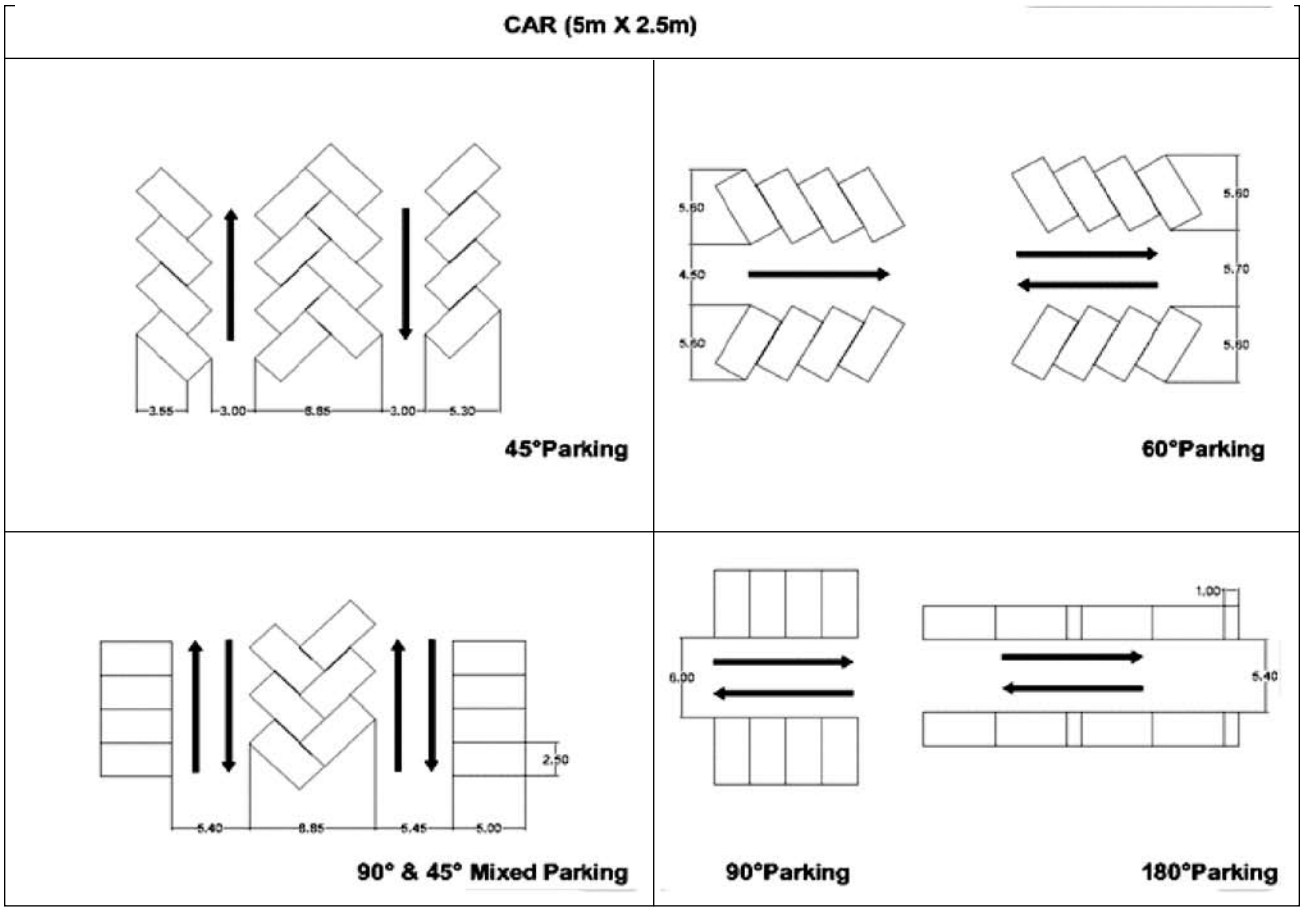


Fig. 6.3 Parking Layout Design for Cars

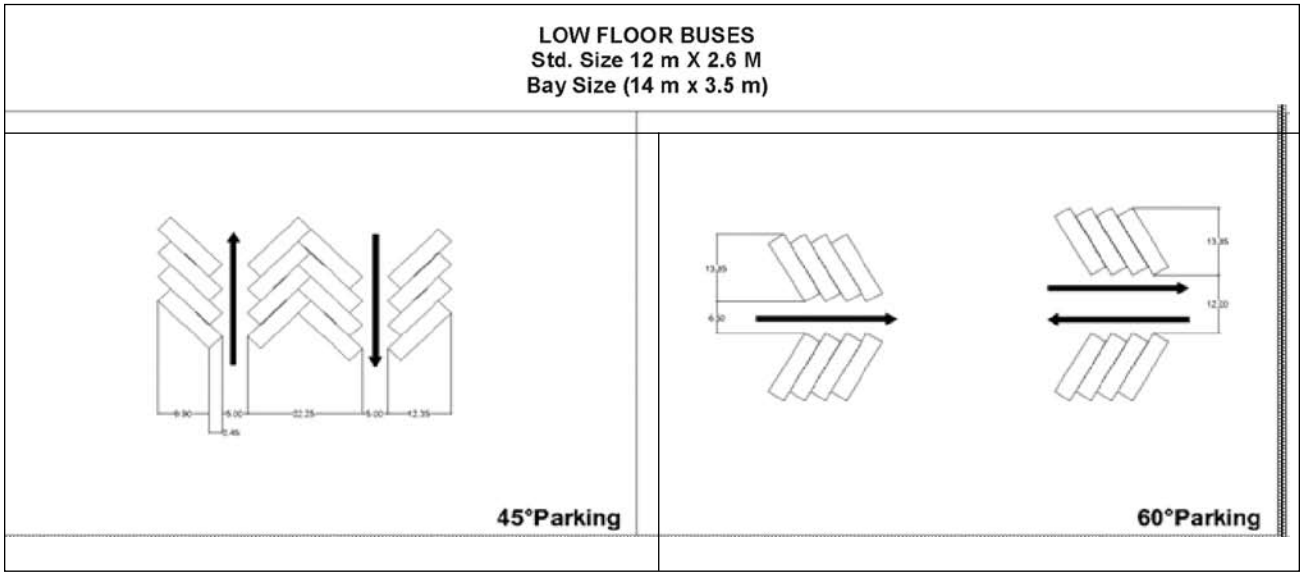


Fig. 6.4 Parking Layout Design for Low Floor Buses

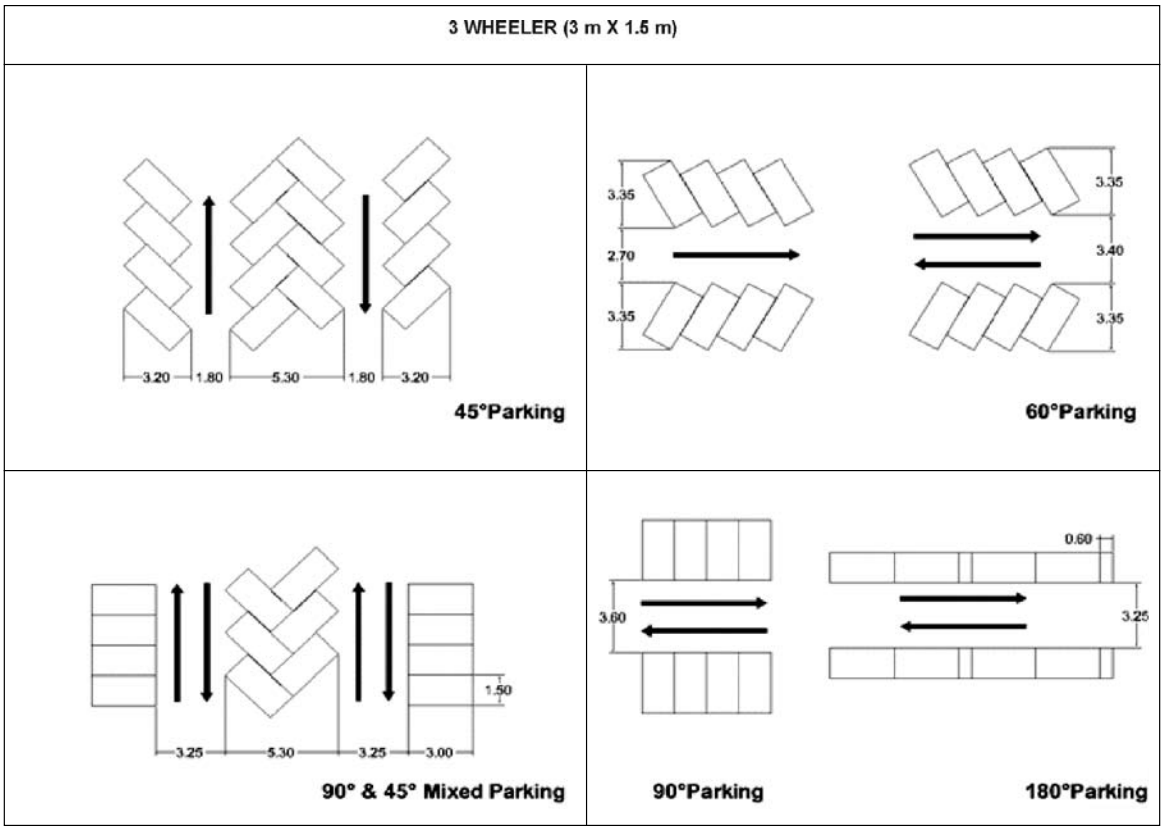


Fig. 6.5 Parking Layout Design for Three Wheelers

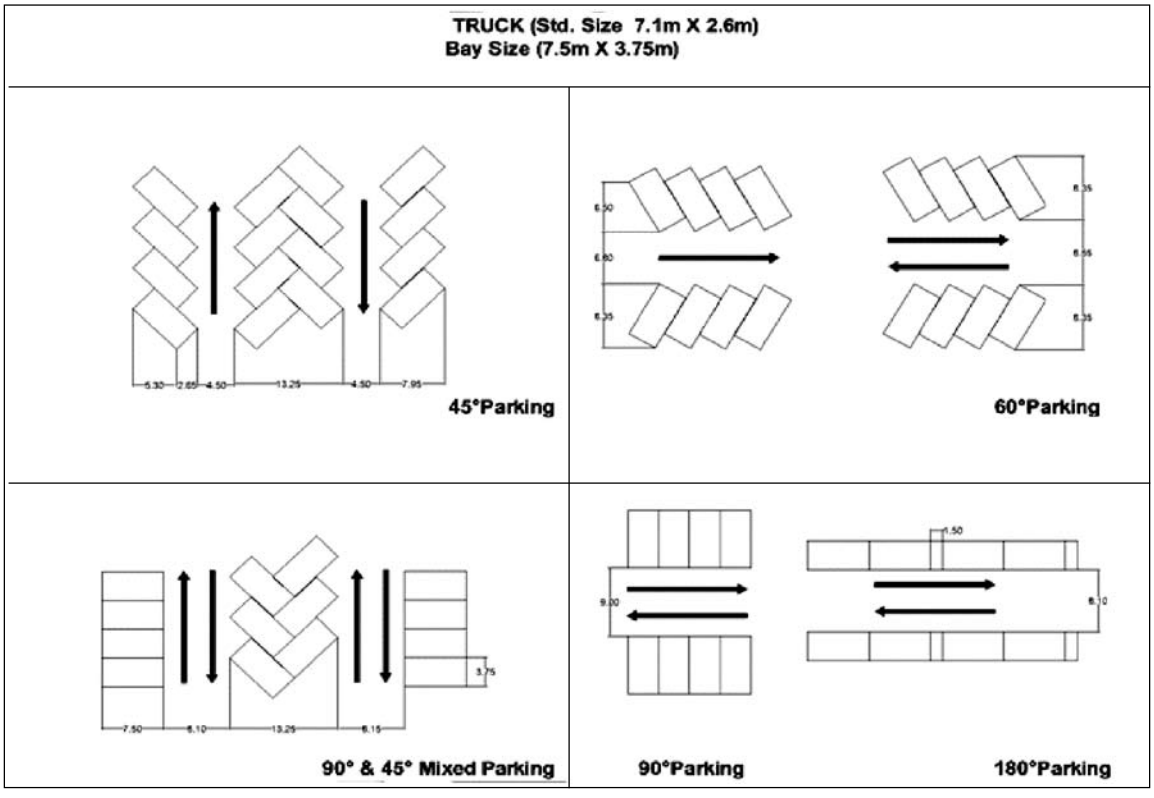


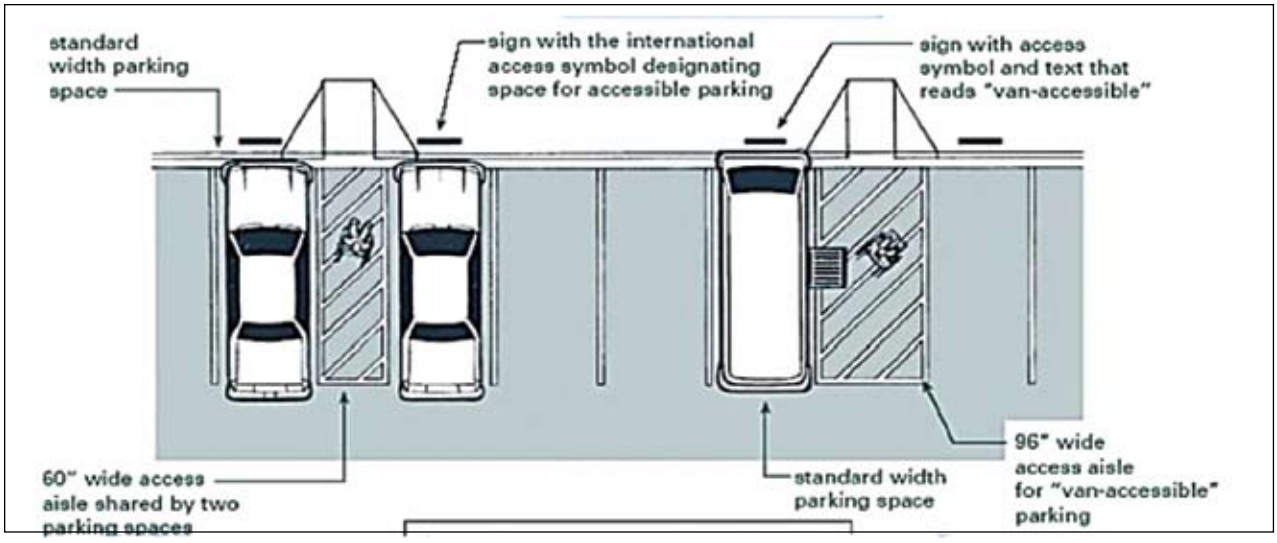
Fig. 6.6 Parking Layout Design for Trucks

6.7. Parking Design for Differently Able People

In order to ensure universal accessibility, it is essential to provide appropriate parking facilities for persons with disabilities and reduced mobility. Following guidelines will be adopted while designing parking for people with disabilities:

- Sign with the international symbol of accessibility mounted high enough so it can be seen while a vehicle is parked in the space.
- If the accessible route is located in front of the space, install wheel stops to keep vehicles from reducing width below 90 cms.
- Boundary of the access aisle must be marked. The end may be a squared or curved shape.
- Two parking spaces may share an access aisle.
- For parking facilities of less than 50 cars, at least one accessible parking space should be provided in every parking facility.
- For parking facilities of a maximum number of 400 spaces, accessible parking spaces should at least be provided in the ratio of 1:50.
- For parking facilities of more than 400 spaces, at least 8 accessible parking spaces should be provided plus 1 space for each additional increment of 100 cars over 400.

Fig. 6.7 shows detailed layout of parking for Differently Able People (DAP).



Source: The Center for Universal Design, College of Design, NC State University, North Carolina.

Fig. 6.7 Design of Parking Layout for DAPs

Dimensions for parking shall be as prescribed here below. The minimum width of parking space shall be 3.60 m. However, recommended width is 3.90 m .

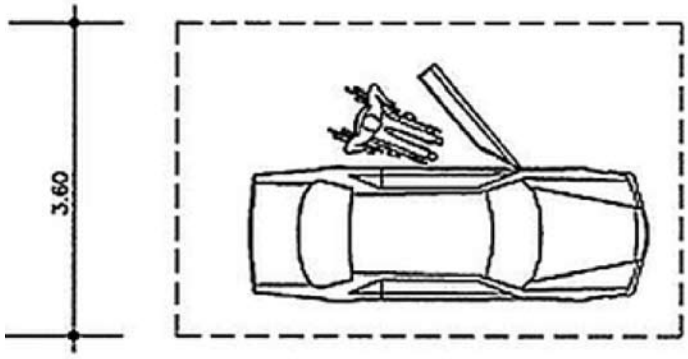


Fig. 6.8 Width of Accessible Parking

- Access aisle 1.20 m wide located between two ordinary parking spaces.
- In case of indoor parking, the minimum height clearance is 2.40 m.
- For angled parking spaces, the extra space at the end of a row can be used as a parking aisle for disabled persons.
- If a curb exists, curb ramps should be provided to link accessible parking spaces to accessible pathways.

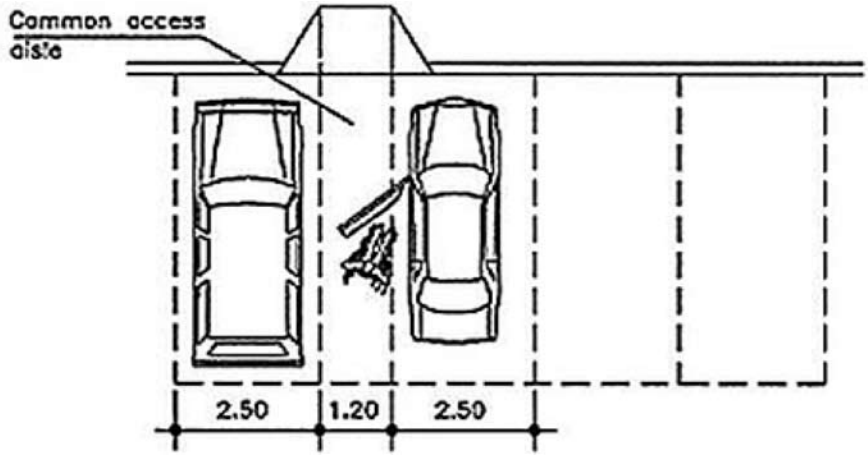


Fig. 6.9 Common Access Aisle

If no curb exists, textured surface at least 0.60 m wide must separate the pathway from the vehicular area; or else bollards should be used. Pre-cast wheelstops can be used to create a passage of at least 0.90 m wide.

6.8 Multi Use or Shared Parking

(i) At least 50% and preferably 100% of the total parking facilities based on

equivalent car space should be provided for any new/redevelopment/retrofit project. Plot area shall be provided as a Shared Parking facility. Such facilities can be shared between different neighbouring uses which have different peak hours of demand. Every car shall have free access to exit units.

(ii) Shared parking locations should be integrated with the Parking Benefit District and be universally accessible by walk, Non Motorised Transport or Intermediate Public Transport Vehicles facilities.

(iii) Shared parking facilities may be identified as part of comprehensive redevelopment schemes prepared by the Govt. or private party.

(iv) 'Unbundling' of parking cost – The conventional method of including the price of parking in an overall lease increases the cost of housing/commercial properties, irrespective of whether the tenant/buyer owns a car. In new projects, shared parking provisions would require that parking spaces are provided and leased/ sold separately ("unbundled") from the rent or sale price of a property.

The cost of investment for different types of parking excluding land cost is estimated as below:

- Conventional parking (Multilevel) : 32 m^2/ECS : Rs. 4 – 6 lakh / ECS
- Stack parking : 16 m^2/Car/Rs. 1.5 lakh /ECS
- Fully automated : 16 m^2/ECS : Rs. 8 – 10 lakh/ECS

The rates for parking must be based on land value and investment. Further the rates for surface & multilevel parking must be different.

6.9 One of the major issues of parking of commercial vehicles due to restriction of their entry into the city limits resulting in parking of these vehicles within the Right of way of National and State highways **(Photo 6.19).** This can be approached by converting government land away from highway with approaches to and fro and parking vehicles in bye lay. The vehicles will be there till such time they are permitted their entry in city limits. Alternatively the goods can be shuttled to the cities in mini commercial vehicles.

Photo - 6.19 Commercial vehicles waiting for entry into city parked along Highways

6.10 Signages

Signages for all type of vehicles including ambulances and emergency vehicles shall be located with sufficient eye catching visibility to help the drivers and vehicle owners to park the vehicles at correct and earmarked locations. Parking signages are published by IRC:67. Parking signages usually adopted are in **Figs. 6.10-6.21** and **Photo 6.20** shows exclusive Parking slot for DAP in a basement (with Wheel Chair).

Fig. 6.10 No parking

Fig. 6.11 Parking not Allowed on Footpath

Fig. 6.12 Parking not Allowed on Half of Footpath

Fig. 6.13 Parking

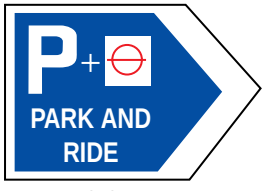
Fig. 6.14 Car Parking

Fig. 6.15 Two Wheelers Parking

Fig. 6.16 Auto Rickshaw Parking

Fig. 6.17 Cycle Parking

Fig. 6.18 Cycle Rickshaw Parking



(a)

(b)

Fig. 6.19 (a & b) - Park and Ride

Photo 6.20 Parking Slot for DAP in a Basement (with Wheel Chair)

(a) (b) (c)

Fig. 6.20 (a, b & c) Parking Restriction Signs for Traffic Management

(a) Parking Information (b) Parking Areas

Fig. 6.21 (a & b) Signs for Differently Able People

6.11 Park and Ride

6.11.1 Creating parking spaces in CBD limits of Metropolitan or Class-I cities has reached the optimum. Putting up Underground Parking(UGD)/Multilevel Cars Parking (MLCP) by authorities or Private along with other constructions like shopping, multiplex, has its limits based on return.

6.11.2 CBD is choked with new constructions and hardly there are lands for development except stray cases of pulling down old buildings and putting up new construction.

Roads are choked in CBD areas and On Street Parking is hardly available. Widening roads for parking is ruled out as the acquisition of land and structures is expensive with protests / litigations from land owners.

Apart from providing park and ride facilities with reference to integration between the road and Metro rail/ rail transport systems, such facilities would also need to be provided to reduce the problem of parking on main arterial roads in the context of identified work and activity centers which may not be directly connected by the MRTS and to encourage use of public transport.

1. Park and ride facilities for private modes are to be provided only at terminal MRTS stations or major multimodal interchanges, not at other stations.

Photo-6.21 Metro Stations Under Construction with Facility for MLCP above the Station

2. Park and ride facilities for bicycle users with convenient interchange at all Metro Rail Transport Service (MRTS) stations are a mandatory requirement at all stations. **(Photo 6.21)**

3. Park and ride facilities should be provided at border locations abutting highways and terminal MRTS/Bus Rapid Transport System (BRTS)/Public Rapid Transport System (PRTS) stations, coupled with excellent public transport linkages to the city centre and various work centres. All will have unhindered exit and entry.

4. For special city level events, mandate ‘park-n-ride’ based parking management strategy can be adopted. Decentralized parking locations can be allocated for the event and mandate event-organizer to arrange for shuttle services from the nearest off-street parking facilities and Metro stations.

5. Department of City Transport undertakings of State Government have developed Traffic and Transport Management Centres (TTMC) with bus stations, shopping malls and MLCP in Metropolitan areas as satellite bus stands. **(Photo 6.13 and 6.14)**

Photo 6.22 and 6.23 Traffic and Transport Management Centres/Satellite Bus Stations with MLCP

6.12 Drop and Ride

Drop and Ride is a designated area identified by sign board for parents picking up or dropping their children by circulation of vehicles, as well as people dropped at metro stations, malls and hospitals. The area is separate from the bus embarking/disembarking locations so that there is no conflict between two types of operations. In order to function this activity efficiently, following procedures need to be followed:

a. A safety supervisor or a designated staff from school shall provide supervision.

b. Children embark and disembark from the passenger side of the vehicle only, so that they will not have to cross the driveway in front of traffic.

c. Drivers shall remain in the vehicle. The safety supervisor and safety patrols will assist with the vehicle door.

d. Vehicles stay in a single file line as they move to and from the Drop and Ride.

7. PARKING NORMS AND STANDARDS

Number of parking spaces required for different type of vehicles depends on the type of land use and socio-economic characteristics of the population. Many cities have evolved norms for parking spaces to be provided in different type of buildings and made it mandatory through their bye laws. Table 7.1 shows recommended area requirements for parking in different type of cities.

Table 7.1 Recommended Area Requirements for Parking in Different Types of Cities

Area requirements for parking in different types of cities									
Sl. No.	Occupancy	One Car Parking Space for every						One Car Parking Space for every	
	Population	Less than 50,000	50,000 to 2,00,000	2,00,000 to 10,00,000	10,00,000 to 50,00,000	50,00,000 and above		More than Population 50,00,000	
i	Ii	iii	iv	v	vi	vii		viii	
1) (a)	Residential	-	-	2 tenements havingf built up area 101 to 200 sq.m	1 tenements of 100 sq.m built up area	1 tenements of 75 sq.m built up area		50 sq.m built up area	2 ECS / 100 sq.m
(b)	Lodging establishments tourist homes and hotels with lodging accommodation	12 guest room	8 guest room	4 guest room	3 guest room	2 guest room		2 guest room (Avg. room size 15sq.m)	3ECS / 100sq.m
2)	Educational	-	-	70 sq.m area or fraction thereof the administrative office area and public service area	50 sq.m area or fraction thereof the administrative office area and public service area	35 sq.m area or fraction thereof the administrative office area and public service area		50 sq.m built up area	2 ECS/100 sq.m
3)	Institutional (Medical)	20 beds (private) 30 beds (public)	25 beds (private) 25 beds (public)	10 beds (private) 15 beds (public)	5 beds (private) 10 beds (private)	2 beds (private) 5 beds (private)		50 sq.m built up area	2 ECS/100 sq.m
4) (a)	Assembly halls, cinema theatres	120 seats	80 seats	25 seats	15 seats	10 seats		50 sq.m built up area	2 ECS/100 sq.m
(b)	Restaurants	60 seats	40 seats	20 seats	10 seats	5 seats		33 sq.m built up area	3ECS / 100sq.m
(c)	Marriage halls, Community Halls	600 sqm. Plot area	400 sqm. Plot area	200 sqm. Plot area	50 sqm. Plot area	25 sqm. Plot area		33 sq.m built up area	3ECS / 100sq.m

(d)	Stadiums and exhibition centre	240 seats	160 seats	50 seats	30 seats	20 seats		50 sq.m built up area	2 ECS/100 sq.m
5) (a)	Business offices and firms for private Business	300 sqm. Area or fraction thereof	200 sqm. Area or fraction thereof	100 sqm. Area or fraction thereof	50 sqm. Area or fraction thereof	25 sqm. Area or fraction thereof		33 sq.m built up area	3ECS / 100sq.m
(b)	Public or Semi Public Offices	500 sqm. Area or fraction thereof	300 sqm. Area or fraction thereof	200 sqm. Area or fraction thereof	100 sqm. Area or fraction thereof	50 sqm. Area or fraction thereof		50 sq.m built up area	2 ECS/100 sq.m
6)	Mercantile	300 sqm. Area or fraction thereof	200 sqm. Area or fraction thereof	100 sqm. Area or fraction thereof	50 sqm. Area or fraction thereof	25 sqm. Area or fraction thereof		33 sq.m built up area	3ECS / 100sq.m
7)	Industrial	400 sqm. Area or fraction thereof	300 sqm. Area or fraction thereof	200 sqm. Area or fraction thereof	100 sqm. Area or fraction thereof	50 sqm. Area or fraction thereof		50 sq.m built up area	2 ECS/100 sq.m
8)	Storage	-	-	500 sqm. Area or fraction thereof	250 sqm. Area or fraction thereof	125 sqm. Area or fraction thereof		-	-
SOURCE: National Building Code of INDIA, 2005 Master Plan Of Delhi, 2021									

8 ENFORCEMENT

On Street Enforcement of parking regulations is primarily the responsibility of Police. As parking of vehicles is the sole responsibility of ULB'S, the enforcement responsibility can vest with respective ULB's. They can do it themselves or outsource to the appropriate agency. However, checking of on-street parking offences is tied with local police.

The services of traffic hosts and traffic wardens can be effectively utilized for orderly on-street parking. Traffic hosts are the people who had the task of addressing car-drivers who were looking for a parking space or intended to or parked illegally and to guide them to an available parking place, provide them with information if needed and in doing so prevent illegal parking and non-compliance to paid parking. This can prevent towing of vehicles parked in unauthorised manner resulting in waste of time and traffic snarls. Some cities have formed traffic Advisory Committee of representative of stakeholders and citizens to address traffic issues including parking.

Photo 8.1. Towing of Vehicles Parked Unauthorised

Suggested options to mitigate the parking problem are:

(i) Reduction in number of registered vehicles where family has already a car

(ii) Disposing off old one or paying premium rate for new one (additional)

(iii) Certification of availability of parking space inside their premises

(iv) Entry and exit to CBD area with premium rate (toll or monthly permits) to discourage use of private vehicles in CBD Area.

(v) Planning for the commercial site for improving the access through improvement in public transport and capping parking supply. Capping can be done through actual physical restriction on further expansion of parking and also by pricing the parking high.

(vi) Increase in the penalty for illegal/wrong parking through Amendment Motor Vehicles Act 1988.

(vii) Introduction of electronics fines, so that enforcement can be improved and also the system of compounded offences can be introduced.

ANNEXURE I

(Refer Para 1.1)

POPULATION & REGISTERED VEHICLES - TOP 20 CITIES

Rank	UA	State/Territory	Population (2011)	Population (2001)	Registered Vehicles as on March 2012
1	Mumbai	Maharashtra	18,394,912	16,434,386	17030000
2	Delhi	Delhi	16,787,941	13,850,507	7350120
3	Kolkata	West Bengal	14,057,991	13,205,697	3668220
4	Chennai	Tamil Nadu	8,653,521	6,560,242	3767294
5	Bangalore	Karnataka	8,520,435	5,701,446	4156132
6	Hyderabad	Andhra Pradesh	7,667,018	5,742,036	3386575
7	Ahmedabad	Gujarat	6,357,693	4,525,013	1682111
8	Pune	Maharashtra	5,057,709	3,760,636	2267123
9	Surat	Gujarat	4,591,246	2,811,614	1145492
10	Jaipur	Rajasthan	3,046,163	2,322,575	1871049
11	Kanpur	Uttar Pradesh	2,920,496	2,715,555	1067440
12	Lucknow	Uttar Pradesh	2,902,920	2,245,509	1314705
13	Nagpur	Maharashtra	2,497,870	2,129,500	1237099
14	Ghaziabad	Uttar Pradesh	2,375,820	968,256	524971
15	Indore	Madhya Pradesh	2,170,295	1,506,062	1337956
16	Coimbatore	Tamil Nadu	2,136,916	1,355,972	480388
17	Kochi	Kerala	2,119,724	1,355,972	480388
18	Patna	Bihar	2,049,156	1,697,976	742889
19	Gwalior	Madhya Pradesh	1,901,981	1,053,505	489516
20	Bhopal	Madhya Pradesh	1,886,100	1,458,416	828569

ANNEXURE II

(Refer Para 3.13)

BEST PRACTICES OF PARKING POLICIES IN SOME ASIAN CITIES

1. Singapore

1.1. Vehicle-Related Taxes

The restraining vehicle ownership was first initiated in Singapore in October 1972, when the initial registration of a new car, was hiked from 15 to 25 percent of the open market value of the car. At the same time the import duty was also increased from 30 to 45 percent and annual road taxes were raised slightly for cars larger than 1000 cc and a sliding scale applied with higher road tax rates for larger cars. Over the next 18 years until 1990, the Annual Registration Fee (ARF) and the road taxes were increased at regular intervals.

1.2. Area Licensing

Vehicles are charged a fee to enter the CBD of the city. This was started in 1975 and there was modification for a number of times since then. It had resulted in decrease in private car travel to the city centre. Parking policies were also directed towards the restraining private vehicle access to congested central locations. In 1975 a parking space surcharge tax was considered at a rate of S$20 per month per space within the CBD and S$10 in the close by areas beyond the CBD.

1.3. Vehicle Quota Scheme (in Singapore)

In 1990 the introduction of the Vehicle Quota Scheme brought a major change in the method of restraining private vehicle ownership growth. Under this scheme, the issuance of Certificates of Entitlement (COEs) is made each month and bids are made for the limited number in each category of vehicles. The philosophy is that the vehicle fleet is allowed to increase only as fast as the road network, at approximately 3 percent per year.

The effect of restraint measures on the affordability of car ownership in Singapore over the years has been quite significant.

2. Hong Kong

2.1. First Registration Tax (FRT) & Annual Vehicle License Fees (ALF)

First Registration Tax (FRT), which is a purchase tax on the value of the vehicle, was hiked to 15 percent of the cost-insurance-freight value of cars and motorcycles. Apart from this, Annual Vehicle License Fees (ALF) were approximately made four times. These changes had brought the desired effect.

2.2. Electronic Road Pricing (ERP)

The trial for ERP started from 1983 to 1985 and brought a great success, demonstrating a very high benefit-cost ratio. However, political concerns about personal privacy and the suspicion that this was simply a revenue-raising device prevented the implementation of the scheme.

3. Tokyo

3.1. Credit and Land-Market Policies

In Japan a number of government policies (especially credit and land-market policies) in the post-war era, resulted in restraint in private spending on both cars and urban sprawl. In the post-war era, the primary underlying reason for private vehicle restraint policies was concerned with Japan's post-war national economic strategy. Under the set of policies known as the *"Maruyu"* system, the primary goal was to bring down the private consumption in order to maximise savings, investment and exports. Some policies include as under:

- High levels of car-related taxes
- Charges and duties in Japan
- Toll charges
- Parking costs

3.2. Proof of Ownership of an Off-Street Car Parking Place

In Tokyo, proof of ownership of an off-street car parking place is needed before a car can get registered (with the exception of very small cars of 550 cc or lower engine capacity).

3.3. High Parking Cost (in Tokyo)

High parking costs are partly related with extremely high property values in Tokyo and also due to the inherent shortage of parking space in the large inner area and even many suburban areas that were built up in the pre-car era.

3.4. Tolls (in Tokyo)

Tolls are expensive on Japan's expressway system, including Tokyo's expressways, the "Shutoko".

4. Seoul

4.1. No-Drive Days (in Seoul)

Seoul made an experimentation with no-drive days, which in Seoul has been called the "10th day holiday" ("sibbuje") system, whereby each vehicle will be off the roads for one

weekday out of ten according to license plate number. This was first experimented during the Seoul Olympics.

4.2. Parking Restraint Policy

Seoul did not have official parking restraint policy. At present the City Government demarcates Seoul into three zones and sets different prices for public parking lots. Most expensive are the old CBD and six other major employment centres. In 1991, an increase in 100 per cent parking price in CBD resulted in the reduction of the demand for CBD parking by 20-30 per cent.

4.3. Employer-Based Transport Demand Management Programs

Employer-Based Transport Demand Management Programs such as eliminating free employee parking, flexible work-hours, public transport incentives and car-pooling matching services have been attempted. Enterprises enjoy in receiving an incentive to participate through a rebate on their Traffic Impact Fee (which is levied on all building owners of over 1,000 square metres of floor space.

4.4. Congestion Toll

Seoul in November 1996 initiated a congestion toll on two tunnels beneath the Namsan Mountain (which is just to the south of the old CBD) in conjunction with new exclusive bus-lanes. This has resulted in a reduction of traffic by 26%, with increase in average car speed in the tunnels, and an increase in the use of public transport. The number of passengers uses car pools of more than 3 persons, during rush hours, increased by 76%.

4.5. Other Restraint Policies in Seoul

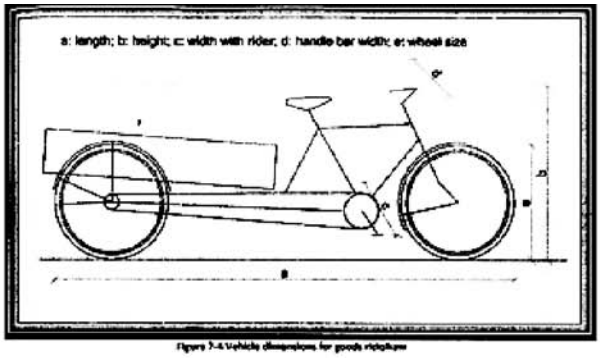
Other restraint policies include acquisition taxes, high yearly ownership taxes, and subway Construction Bonds.

In pursuit to the policy of public transport, Seoul, Singapore and Hong Kong have also developed substantial mass transit systems which create a conducive environment for competing with private vehicles. They did this before motorization in each city had crossed 150 private vehicles per 1000 persons. Kuala Lumpur and Bangkok are in the transition of building mass transit systems. It is expected that both Kuala Lumpur and Bangkok, motorization will have attained high levels by the time that substantial mass transit systems are likely to be in existence.

ANNEXURE III

(Refer para 4.1)

VEHICLE DIMENSIONS



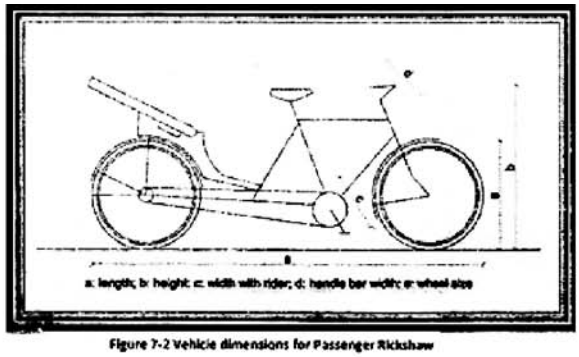


Figure 7-2 Vehicle dimensions for Passenger Rickshaw

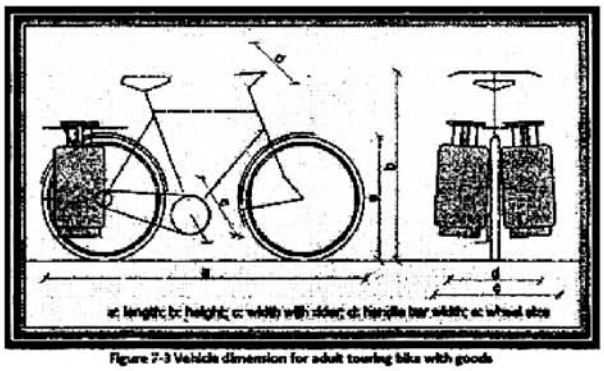
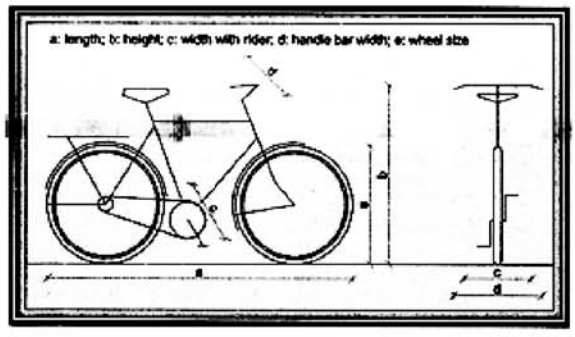
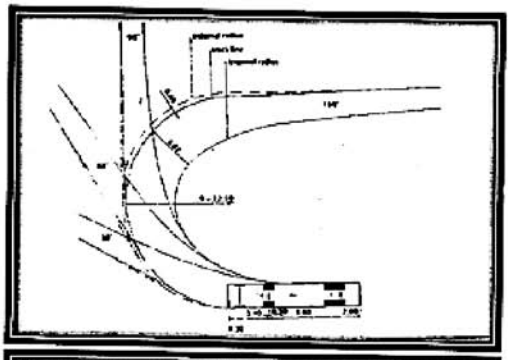
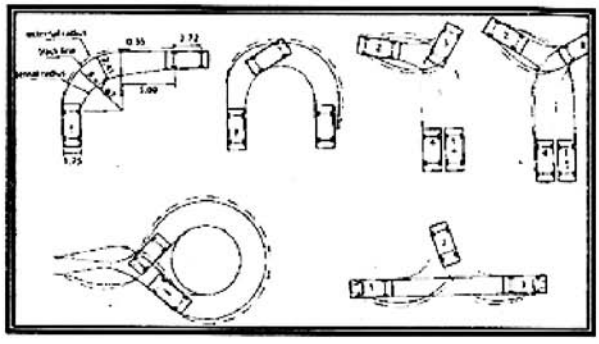


Figure 7-3 Vehicle dimension for adult touring bike with goods







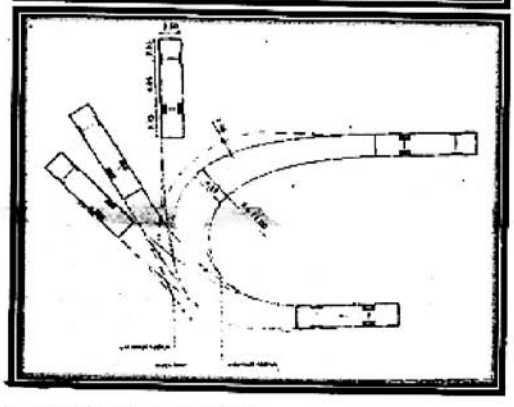
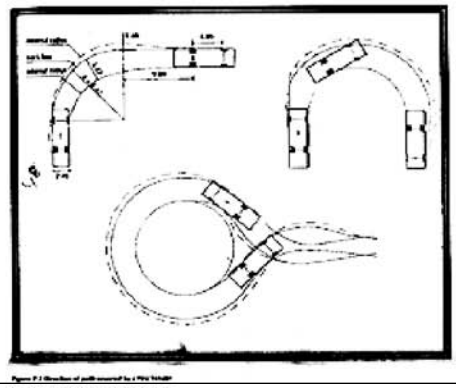


Figure 7-8 Direction of path covered by Goods Vehicle



NMV Vehicle Dimensions

	Length (mm)	Height (mm)	Width with rider (mm)	Handle bar width (mm)	Wheel size (dia in mm)
Adult Touring Bike	1800-1950	990-1200	750	500-600	560-710
Adult touring bike with goods (milk cans or gas cylinders)	1800-1950	990-1200	850-950	500-600	560-710
Passenger Rikshaw	2000-2200	990-1200	900-1000	500-600	560-710
Goods Rikshaw	2200-2400	990-1200	1000-1220	500-600	560-710
Goods Rikshaw	2400-2600	990-1200	1200-1400	500-600	560-710

Characteristics Cycle

	Mean	Min	Max
Length	2	1.25	2
Width	0.6	0.2	0.6
Max. desired speed	10	5	20
Max. acceptance	1.5	2.5	1.5
Normal declaration	2.5	2.5	4
Max. declaration	6	6	6
Speed acceptance	1	1	1
Min. distance vehicle	1	1	1
Give way time	5	5	5
Guidance acceptance	1	1	1

Motorized Vehicle – two wheeler

	Mean	Min	Max
Length	2	2	2
Width	0.7	0.7	0.7
Max. desired speed	40	30	50
Max. acceptance	1.5	1	2.5
Normal declaration	2.5	2.5	5
Max. declaration	5	5	5
Speed acceptance	1	1	1
Min. distance vehicle	1	1	1
Give way time	30	30	30
Guidance acceptance	1	1	1

Three wheeled Scooter Rikshaw (TSR) Gopods Vehicles :These are the motorized rikshaw commonly used as feeder transport in big cities and also an Intermediate Para Transit (IPT) along with many modes of NMV for small sized cities.

Characteristics – 3 Wheelers

	Mean	Min	Max
Length	1.7	1.7	1.7
Width	1.5	1	2
Max. desired speed	30	20	40
Max. acceptance	1.5	1.5	2
Normal declaration	2.5	2	2.5
Max. declaration	5	5	6
Speed acceptance	1	1	1
Min. distance vehicle	1	1	1
Give way time	30	30	30
Guidance acceptance	1	1	1

Characteristics – Cars

	Mean	Min	Max
Length	4	3	4.75
Width	2	1.4	2
Max. desired speed	45	40	50
Max. acceptance	3	3	3
Normal declaration	4	4	4
Max. declaration	6	6	6
Speed acceptance	1	1	1
Min. distance vehicle	1	1	1
Give way time	30	30	30
Guidance acceptance	1	1	1

Characteristics – Buses

	DTC Bus			Blue Line Bus			Mini Bus		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Length	7.5	7.3	10	7.5	7.3	10	4	4	4
Width	2.2	2.2	2.5	2.2	2.2	2.5	2	2	2
Max. desired speed	45	30	70	40	30	70	40	30	70
Max. acceptance	3	3	3	3	3	3	3	3	3
Normal declaration	6	2	6	6	2	6	4	4	4
Max. declaration	6	6	6	6	6	6	6	6	6
Speed acceptance	1	1	1	1	1	1	1	1	1
Min. distance vehicle	1	1	1	1	1	1	1	1	1
Give way time	90	30	90	90	30	90	30	30	30
Guidance acceptance	1	1	1	1	1	1	1	1	1

Characteristics – High Capacity Bus – HCB

	Mean	Min	Max
Length	10.5	10.5	10.8
Width	2.5	2.4	2.5
Max. desired speed	60	40	80
Max. acceptance	3	3	3
Normal declaration	6	4	6
Max. declaration	6	6	6
Speed acceptance	1	1	1
Min. distance	1	1	1
Give way time	30	30	30
Guidance acceptance	1	1	1

References

1. Application of Intelligent Transport System (ITS) for Parking Management; Presented at 1st Indo - US Symposium at IIT Guwahati, by Dr. S. Velmurugan, CRRI, on 12-15, Feb, 2008

2. Asian Development Bank, 2011, *" Parking policies in Asian Cities",* pp. 1-98.

3. Chicago Metropolitan Agency of Planning, 2012, *"Parking Strategies to Support Liveable Communities"*, CMAP, April-2012, pp. 1-49.

4. Code of Practice on *"Vehicle Parking Provision In Development Proposals"*, 2011, Edition UK

5. Delhi Development Authority, 2010, *"Parking Policy as a Travel Demand Management Strategy"*, UTTIPEC, pp. 1-7

6. Department of Economic and Social Affairs, *"Accessibility for the Disabled - A Design Manual for a Barrier Free Environment"*, United Nations, PHOS, pp. 1-52.

7. Development, Community, and Environment Division, 2006, *"Parking Spaces / Community Places Finding the Balance through Smart Growth Solution"*, U.S. Environmental Protection Agency, January 2006 pp 1-70

8. Donald Shoup, 2013, *"On-Street Parking Management v/s Off-Street Parking Requirements"*, The Access Almanac, pp. 38-40.

9. Federal Highway Administration, U.S, 2007, *"Advanced Parking Management System: A Cross Cutting Study"*, FHA, U.S. pp. 1-60.

10. GIS Based Parking Management System (Office of Parking Management, Denver, USA), GAEA Systems Pvt. Ltd. pp. 1-9.

11. Hertsmere Borough Council, 2011, "*Parking Management Strategy"*, November 2011, pp. 1-27.

12. Infrastructure Development Department, 2009, *" Development of MLCPs in Major Cities of Karnataka on PPP Basis"*, KSIIDC-IL&FS (Final Pre-feasibility Report), 2009. pp 1-96.

13. Institute for Transportation & Development Policy (ITDP), 2010, *"U.S. Parking Policies: An Overview of Management Strategies"*, ITDP, USA.

14. Institute of Highways and Transportation U.K, 2005, *"Parking Strategies and Management"*, 2005, pp. 1-188.

15. Institute of Urban Transport (IUT), Ministry of Urban Development, 2012, *"Design of*

Urban Roads - Code of Practice, Part-I: Urban Road Cross Section Design", pp. 1-78

16. IRC: 103-2012, *"Guidelines for Pedestrian Facilities" (First Revision)*
17. IRC: 3-1983, *"Dimensions & Weights of Road Design Vehicles" (First Revision)*
18. IRC: 69–1977, *"Space Standards for Roads in Urban Areas"*.
19. Kadiyali L.R., 2001, *"Principles & Practice of Highway Engineering"*, Khanna Publishers, 2001.
20. Moreland City Council, 2011, *"Parking Management Policy- Moreland City"*, 2011, pp. 1-23
21. National Building Code of India, (SP 7:2005) *"Approach To Sustainability, Part-11*, Bureau of Indian Standards, pp. 1-153.
22. Parking Management Strategy City of Yarra, 2013, Access on 26-Nov, 2014. http://www.yarracity.vic.gov.au/Parking-roads-and-transport/Improving-Parking/parking-guidelines.
23. Parking policy in India: Getting the principles right, Centre For Science And Environment", pp.1-11
24. Parking Regulations and Land-Use in Portland Metropolitan Region, 1996
25. Report of Stakeholder Workshop on *"Land Use and Transportation Integration (India)"*, December, 2013. (Revision)
26. Sanjeev Kumar Lohia, *"Urban Transport In India"*, Ministry of Urban Development.
27. Shaheen, S. A., Rodier, C. J. and Eaken A. M., 2004, *"Applying integrated ITS technologies to parking management systems: a transit-based case study in the San Francisco Bay Area"* Transportation Sustainability Research Centre, Berkeley, California, pp. 1-10.
28. Todd Litman, 2013, *"Parking Management Strategies, Evaluation and Planning"*, Victoria Transport Policy Institute, pp. 1-31.
29. Torbay Parking Policy, 2013, Access on 26-Nov, 2014. http://www.torbay.gov.uk/index/yourservices/parking