

A parti-wall shall be a barrier wall in compliance with the guidelines of Part 4 to ensure fire safety of the adjoining property. Other requirements of fire safety, structural design, building services and plumbing services shall be as specified in this Code.

PART III

Appendix F

Road Hierarchy, On-Street and Off-Street Parking

F.1 Introduction

Road is an integral part of a settlement and its land-use planning. For public safety in any new development the hierarchy of road network with measures for gradual traffic calming and adequate safe parking, both on-street and off-street, are of vital importance. Road width and road components, junctions, features of controlling vehicles' speed and turning, forward visibility and visibility splay at junctions are important tools of traffic and speed control.

With increased density and parking demand, on-street parking shall be an important tool to increase overall parking capacity as well as accommodation for service vehicles (e.g. garbage collection vehicle, maintenance vehicles etc.). This measure is also expected to keep the pedestrian walkways free from unauthorized vehicular parking.

F.2 DEFINITIONS

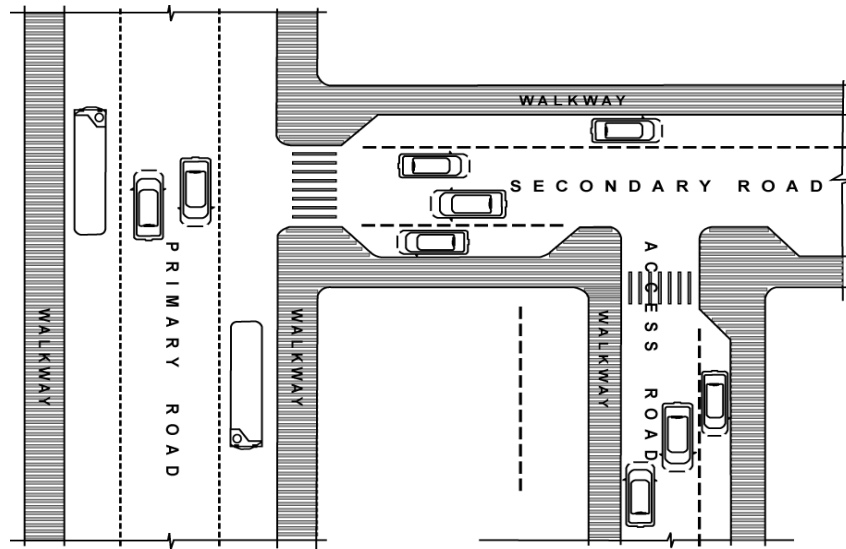
CARRIAGEWAY	Refers to driveway that provides access to the parking place. They do not have parking stalls adjacent to them.
CARRIAGEWAY RAMPS	Refers to inclined floors that provide access between two levels.
INSIDE LANE	Refers to the innermost lane of a curve ramp, which is nearest to the center point of curve.
INSIDE RADIUS OF LANE	Refers to curved carriageway and driveway is the distance measured from the inside curve edge to the center point of the curve.
MAXIMUM GRADIENT	Refers to the steepest gradient of ramp measured along the center line of the ramp. Gradient refers to the ratio of the inclination of the ramp (height length).
OUTSIDE LANE OF CURVED CARRIAGEWAY	Refers to any lane positioned after the innermost lane.
PARKING AISLE	Refers to an access lane or driveway with adjacent parking

	stalls.
PARKING ANGLE	Refers to the angle measured between the longer side of the parking stall and the line of traffic flow of the aisle.
PARKING STALL	Refers to the space required for parking of one vehicle. The space of the stall shall be rectangular. The area of each stall shall be flat and free from curbs and other obstructions.
SINGLE-LANE	Refers to a lane where only one vehicle can pass through at any given time.
TRAFFIC FLOW	Refers to the direction of vehicle movement.

F.3 Road Hierarchy Guidelines For New Development

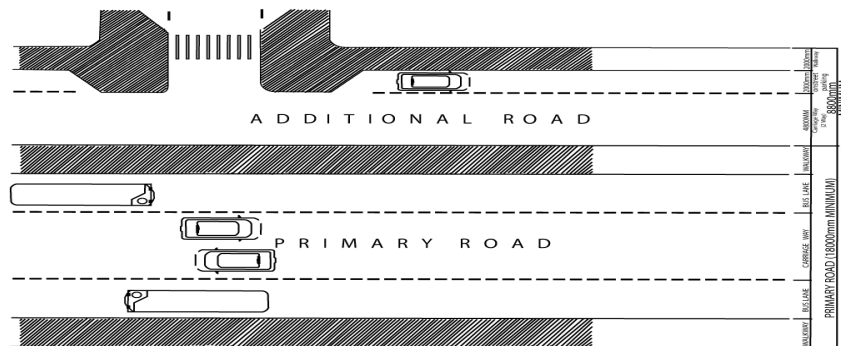
For any new development, at least three hierarchically interlinked road patterns should be followed (Figure 3.F.1): a. primary road, b. secondary road and c. internal/ access/ residential road. Though it is not mandatory to provide wider than regulation pedestrian walkways (with provisions for street furniture), bicycle lane and plantation zones parallel to walkways, it is strongly recommended that such provisions should be made, especially at primary and secondary road level, as much as possible.

Primary Road: This refers to a Public way or portion thereof, on which vehicular traffic is given preferential right-of-way, and at the entrance to which from intersecting public ways is required to be in obedience to a traffic signal, stop sign, or yield sign as per traffic code. Primary roads connect settlements/ zones/ sectors with rest of the city, which are capable of and usually are serviced by public transport facility (e.g. Bus service, Tram service etc.). These roads define the edge of the settlement and shall be capable of hosting traffic interchange (e.g. changing from one mode of transport to another). No individual plot should be accessed directly from a primary road (Figure 3.F.2). The right of way of a primary road shall not be less than 18 meter (Table 3.F.1 and Figure 3.F.3).



Secondary Road: A secondary Road is a collector road or distributor road of low to moderate-capacity, which serve to move traffic from internal/local streets to primary/arterial road. The flow of a collector road usually consists of a mixture of signaled intersections or traffic circles with primary arterial roads or other collector roads and un-signalized intersection with local/internal/residential roads.

Internal/access/residential road: At the bottom of the hierarchy are local/Internal/ access streets and roads. These roads have the lowest speed limit, carry low volumes of traffic and often have pedestrian priority. The minimum width of such road will depend on the density of the adjacent plots (Table 3.F.1, Figure 3.F.5).



2500 mm	3500 mm	6000 mm	3500 mm	2500 mm
sidewalk	bus lane	carriage way	bus lane	sidewalk

Figure 3.F.3 Minimum dimensions for primary road

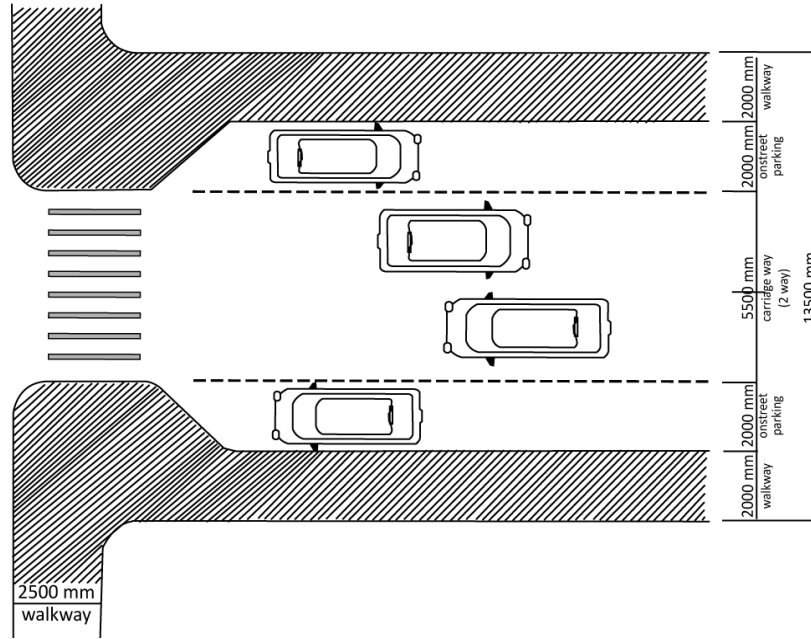


Figure 3.F.4 Minimum dimensions for secondary road

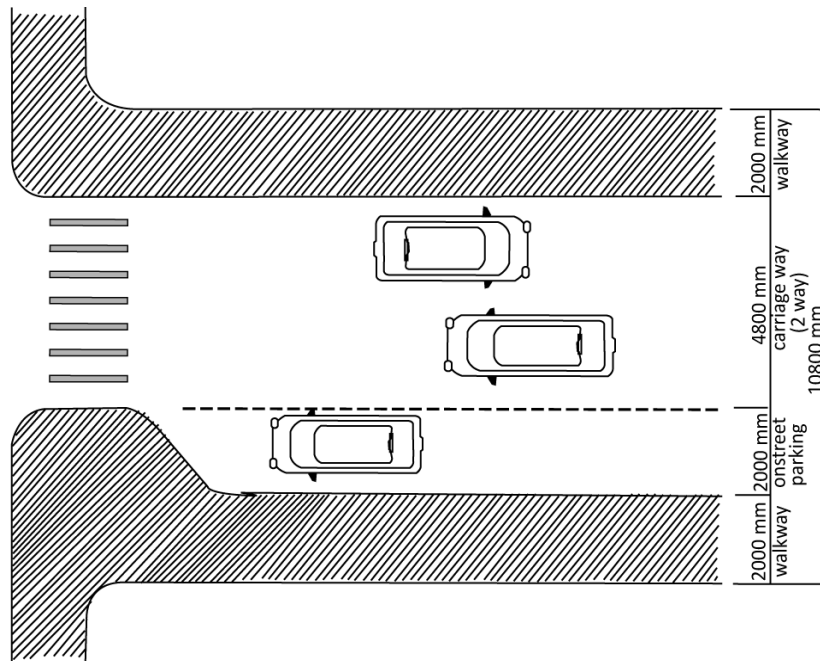


Figure 3.F.5 Minimum dimensions for Internal/access/local/residential road

F.4 Guidelines For Pedestrian Walkway

F.4.1 Any pedestrian path should be part of a pedestrian network connecting building users to different facilities and part of a city or a settlement and should enhance pedestrian friendly environment.

F.4.2 Pedestrian path or walkways should be separated and protected from vehicular driveways and any conflict between vehicular and pedestrian crossing shall be designed to ensure pedestrian safety.

Table 3.F.1: Minimum Widths of Public Means of Access to Residential Plots of new development

	2-way vehicular road width	On-street Parking/ Emergency Vehicle	Pedestrian walkway	Bus Lane / Bus Stop	Minimum right of way/ ROW Option-A*	Minimum right of way/ ROW Option-B**	Minimum right of way/ ROW Option-C***	Minimum right of way/ ROW Option D****
	V (m)	P (m)	W (m)	B (m)	V+W (m)	V+2W (m)	V+P+2W (m)	
Main/ primary road (V+2W X 1.25+2B)	6	Nil	2	3.5	Nil	Nil	Nil	18.00
Secondary road (V+2P+2W)	5.5	2	2	Nil	Nil	Nil	Nil	13.5
Internal/ access road	4.8	2	2	Nil	6.8	8.8	10.8	Nil

Note:

* For serving residential occupancy A1 and A2, the minimum right of way shall be option A

** For serving residential occupancy of A3 within walkup range the minimum right of way shall be option B

*** For serving residential occupancy of A3 above walkup range , the minimum right of way shall be option C

**** For serving residential occupancy of A3 in mixed use , the minimum right of way shall be option D

- F.4.3** The minimum width of a pedestrian walkway which is not enclosed by adjacent walls on both sides shall be 1 m; otherwise the minimum width shall be 1.25 m. However, depending upon the frequency of pedestrian users the recommended minimum width for footpath or walkway shown in Table 3.F.2 may be followed.
- F.4.4** All public transport terminal and stoppages shall have dedicated planning for pedestrian users to and from the facilities showing connection to the public pedestrian and vehicular network adjacent to the site. Pedestrian walkways or footpaths in all such facilities shall be of sufficient width to cater the pedestrian need of the facility.

Table 3.F.2: Recommended minimum width of pedestrian walkway based on frequency of use

Peak pedestrian frequency	Width of walkway	Width for street furniture and plantation	Total recommended width
(pedestrian user per minute)	(m)	(m)	(m)
Up to 60	2.5	1.5	4
Above 60- 80	3.25	1.5	4.75
Above 80- 100	4.0	1.5	5.5
Above 100	5.0	1.5	6.5

F.5 Guidelines For On-Street Parking

For on-street car parking in any new settlement, the guidelines of Table 3.F.1 shall be the minimum requirement depending upon the type of road and expected traffic density.

F.5.1 Parking along Primary Road

For primary roads, fast moving uninterrupted traffic flow needs to be ensured. Therefore such roads shall not serve for on-street parking. If, parking besides such primary roads becomes necessary, then an additional carriageway with on-street parking and an additional pedestrian walkway as shown in Figure 3.F.6 may be planned, keeping the main traffic flow uninterrupted.

F.5.2 Parking along Non-Primary Roads

On-street parking should normally only be considered on local distributors and roads lower in the hierarchy. On such roads, on-street parking spaces may be provided where off-street facilities are inadequate to meet demand and where provision would not adversely affect the flow of traffic. On-street spaces should generally cater for short term parking needs and parking meters may be installed to encourage such usage.

F.5.3 Parking for Service Vehicles

In most situations, it will not be necessary to provide parking spaces specifically for service vehicles, such as delivery vans, which are normally stationary for a relatively short time. If such parking bays are considered necessary, other vehicles may need to be prevented from using the spaces by regulation and enforcement.

F.5.4 Omission and Conversion of Existing Parking

Omission and conversion of existing parking spaces shall not be permitted if it results in parking deficiency for the occupancy type. That is, after omission and conversion, the remaining number of parking spaces must be sufficient to meet the minimum requirement of the existing, proposed and approved development.

F.5.5 Parking Design Considerations

Any parking space design will consider the following two factors :

- Minimum parking requirement ascertained for each type of occupancy
- Parking layout for the required number of parking (Figures 3.5.7 to 3.F.13)

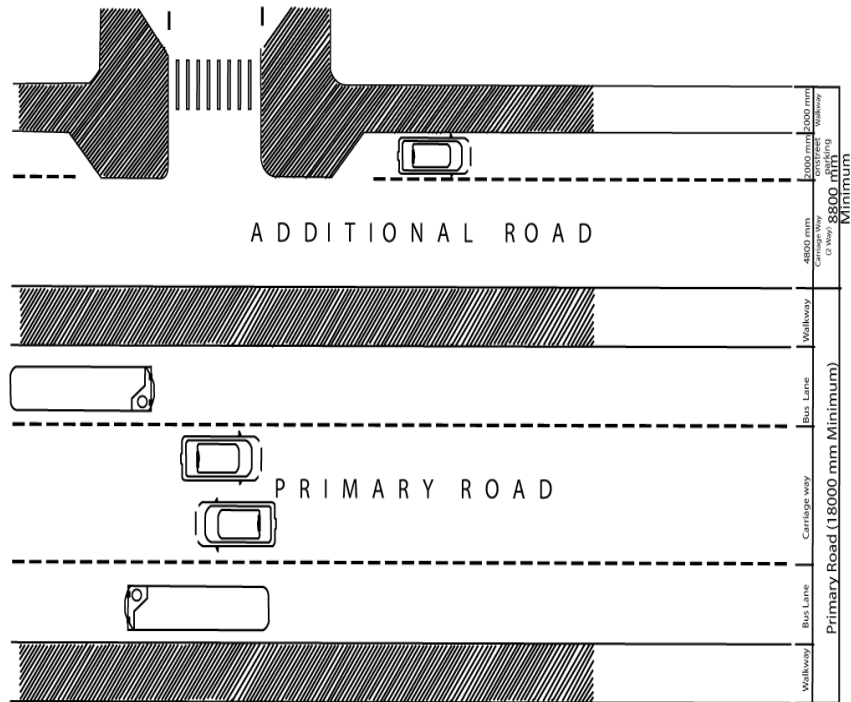


Figure 3.F.6 Provision for on-street parking beside primary road

F.6 Minimum Requirement For off-Street Parking

The number of minimum parking spaces required shall be based on the total floor area of the building and shall depend on its occupancy type and number of users. The following tables (Table 3.F.3) shall form the basis for computation of minimum parking requirement:

Table 3.F.3: Off-street parking requirements for different occupancies

Occupancy type/use		Minimum off-street parking requirements
Residential (occupancy type-A)	Residential (occupancy type-A)	
	Small private dwellings/ row house with plot size not more than 134 m ²	1 car parking
	Small private dwellings/ row house with plot size 134-268 m ²	2 car parking
	Multi-family housing with flats/ apartments with gross area more than 200 m ²	1 car parking/unit+5% guest parking
	Flats/ apartments with gross area more than 140 m ² to 200 m ²	2 car parking per 3 units
	Flats/ apartments with gross area more than 90 m ² to 140 m ²	1 car parking per 2 units
	Flats/ apartments with gross area more than 60 m ² to 90 m ²	1 car parking per 4 units
	Flats/ apartments with gross area up to 60 m ²	1 car parking per 8 units
	Flats/ apartments with gross area up to 90 m ² (in addition to required car parking)	1 motorcycle parking per 5 units
	Hotels (star category)	1 car parking per 5 guest rooms
	Hotels (other category)	1 car parking per 200 m ² gross area
	Others	1 car parking per 300 m ² gross area
	The minimum parking requirements for all residential occupancies within 500 m radius of MRT or BRT stations shall be 25 percent of the calculated requirement from above.	
Occupancy type-B	Educational (Occupancy type-B)	1 car parking per 200 m ² gross area

Occupancy type/use		Minimum off-street parking requirements
	Kindergarten, primary schools, high schools, colleges, tertiary educational institution, training centers, universities and other educational institutions.	For plots with 25 m or more frontages, an uninterrupted dropping bay of at least 25 m length and 4.25 m width shall be given at ground level within the school premises. For plots with less than 25 m frontage, an uninterrupted dropping bay with length equal to total frontage of the plot and 4.25 m width shall be given at ground level within the school premises. At primary and secondary schools there should be a minimum of 3 lay-bys for school buses within the school boundary.
Institutional and Health care Type (Occupancy type-C and D)	Institutional Type (Occupancy type-C)	1 car parking per 200 m ² gross area
	Hospitals, clinics (Occupancy type-D)	1 car parking per 5 beds
	Medical diagnostic centers	1 car parking per 100 m ² gross area
	Others (outdoor treatment facilities, collective practice of physicians etc.)	1 car parking per 200 m ² gross area
Business and Mercantile (Occupancy type-E and F)	Mercantile (Occupancy type-F) Shops, department store	1 car parking per 200 m ² gross area 1 loading/ unloading bay of heavy goods vehicle per 2000 m ² gross area or portion thereof
	Restaurants	1 car parking per 100 m ² gross area
	Business (Occupancy type E) and Offices	1 car parking per 200 m ² gross area
	Others	1 car parking per 200 m ² gross area
Industrial (Occupancy type-G) and Storage (Occupancy type-H)	Industries (Occupancy type-G)	For all such installations, at least 1 truck parking along with loading unloading bay and at least 1 car parking. For administrative or sales centers within these installations, 1 car parking per 200 m² for such parts only are required.
	Storage (Occupancy type-H)	

Occupancy type/use			Minimum off-street parking requirements
Assembly (Occupancy type-I)	Assembly (Occupancy type- I) Cinema		1 car parking per 40 seats
	Theatre, auditorium		1 car parking per 20 seats
	Sports facilities		1 car parking per 200 seats
	Transportation terminals, airports, railway stations, etc. (Occupancy I or MIXED)		1 car parking per 50 m ² gross area
	Wedding/ party center (Occupancy I or MIXED)		1 car parking per 25 m ² gross area. For plots with 25 m or more frontage, an uninterrupted dropping bay of at least 25 m length and 4.25 m width shall be given at ground level within the school premises.
	Religious structure	Up to 300 m ²	At least 1 car parking
		More than 300 m ²	1 car parking per 50 m ² gross area
	Others		1 car parking per 200 m ² gross area
Hazardous (Occupancy type-J)	Hazardous (J1 and J2)		For all such installations, at least 1 truck parking along with loading unloading bay and at least 1 car parking. For administrative purpose within these installations, 1 car parking per 200 m ² for such parts only are required.

Note:

For mixed-use situation, parking requirement shall be calculated by adding up the individual parking requirements of each types based on their use area per floor and respective parking ratio for each type.

For different types of flats/apartments within the same complex, parking requirements shall be determined by determining requirement for each type separately and then adding them together.

Fractional results in parking calculation shall be considered as 1 (one) full parking space.

With recommendation from the permitting authority parking requirement for low income residential areas may be reduced.

For flats with area less than 90 m², parking requirement of 1/3rd requirement of cars can be calculated by combining cars and motorcycles in the ratio of 1 car to 2 motorcycles.

For any building type, at least 1 (one) car parking shall be required.

F.7 Car Parking Layout Guidelines

F.7.1 Parking Stalls

Parking stall is a rectangular space with defined length and width, where the length is subject to variation depending on its relationship with the aisle, Figure 3.F.7.

For perpendicular or angular parking, the minimum dimensions required of a car parking stall shall be:

Stall width: 2400 mm

Stall length: 4800 mm

For parallel parking minimum dimensions required of a car parking stall shall be:

Stall width: 2000 mm

Stall length: 6000 mm

For parallel parking, where cars cannot be parked by reversing, minimum stall length shall be 7200 mm; the floor of each stall shall be flat and free from curbs and other interferences.

Where parallel parking stalls have frontal obstruction or perpendicular parking stalls have side obstruction, the stall sizes will vary in accordance with guidelines of Figure 3.F.8.

F.7.2 Minimum Width of Driveway

The minimum width of parking aisle or driveway shall follow the requirements of Table 3.F.4.

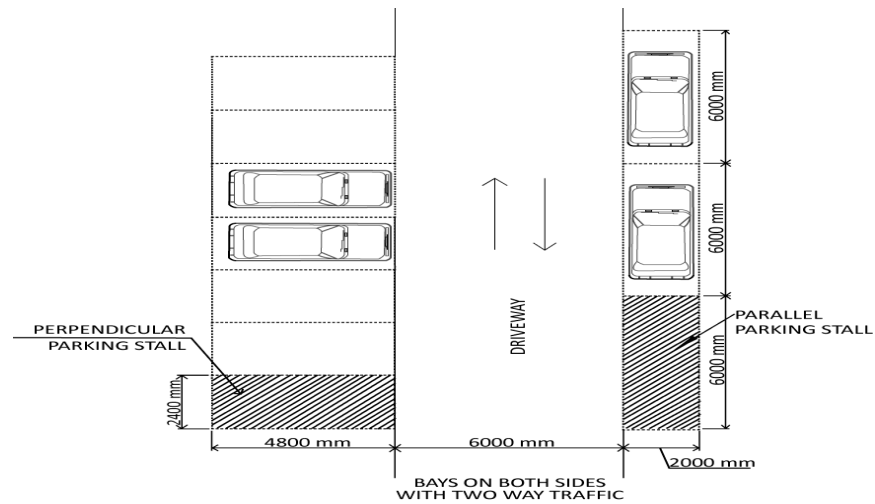


Figure 3.F.5 Parking stall requirements

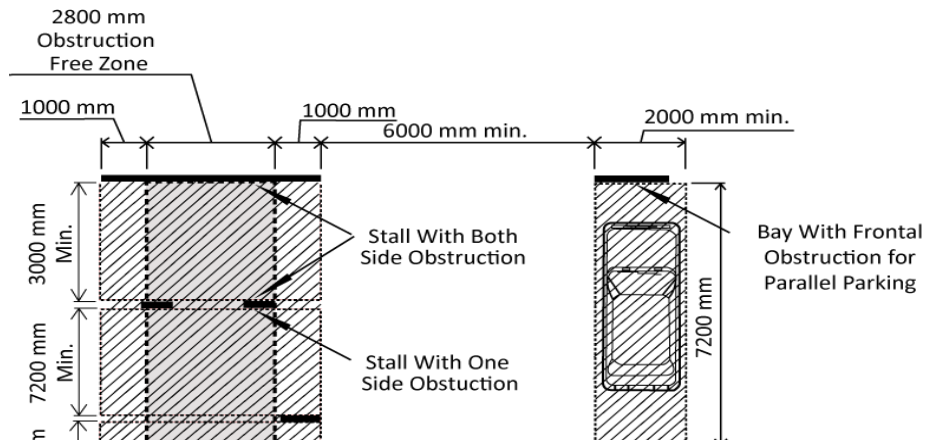


Figure 3.F.8 Parking stall size variation due to obstructions

Table 3.F.4: Minimum width of Parking Aisle/Driveway

Parking Angle to Aisle	One Way Traffic		Two Way Traffic
	Bay on One Side	Bays on Both Side	Bays on One or Both Side
0° (parallel)	3600	3600	6000
30°	3600	4200	
45°	4200	4800	
60°	4800	4800	
90° (perpendicular)	6000	6000	

F.7.3 Minimum Dimension for Carriageway Ramps

Carriageway ramps are sloped driveway connecting and providing access between two levels for vehicles. For safe maneuvering of vehicle on carriageway ramp guidelines of the subsections as under shall be followed.

F.7.3.1 Width of carriageway ramp

The width of a carriageway ramp shall comply with the guidelines of Table 3.F.5 and Figure 3.F.9.

Table 3.F.5: Minimum width of Carriageway Ramps

Type of Carriageway	Single	Dual Lane
---------------------	--------	-----------

Ramp	Lane	
(a) Width of straight carriageway ramp	3600 mm	6000 mm (3000 mm/lane)
(b) Width of lane of curved carriageway ramp	4200 mm	3600 mm for inside lane 3300 mm for outside lane
(c) Inside radius of curved carriageway ramp	4500 mm	

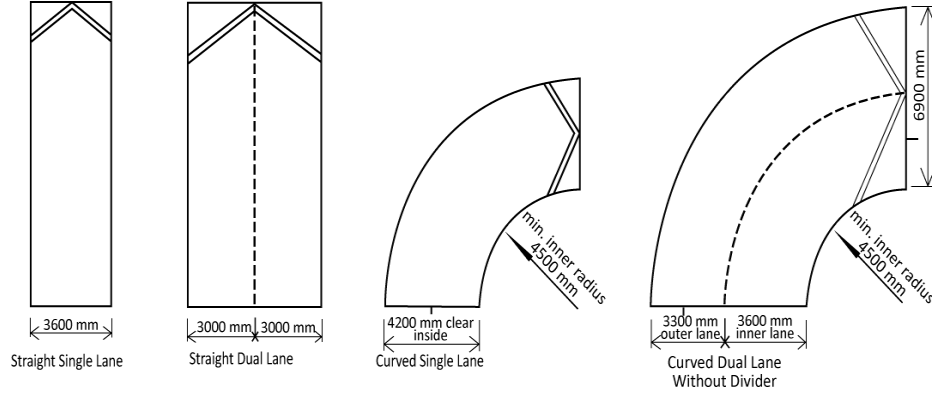


Figure 3.F.9 Carriageway ramp width

F.7.3.2 Carriageway ramp gradient

Ramp gradient specify the slope of a ramp expressed either in percentage or in ratio and calculated as follows:

$$\text{Ramp gradient (slope)\%} = \frac{\text{Floor-to-floor height} \times 100}{\text{Ramp length along the horizontal plane}}$$

For same gradient on ramps, as shown in Figure 3.F.10 (a), the maximum slope shall be 12.5 percent (or 1 : 8). Ramp gradient shall be measured along the center line of the ramp.

For change of gradient on ramp, as shown in Figure 3.F.10 (b), this slope may be increased up to maximum 20 percent, with transition slopes on both end that are sloped at half of the slope of the main ramp.

F.7.3.3 Parking ramp

When sloped parking stalls are directly approached from a same sloped ramp it is known as parking ramp and the maximum gradient of such ramps shall be 5 percent (or 1 : 20).

F.7.4 Minimum Headroom

The height clearance from parking level floor to the bottom of the ceiling above shall be 2400 mm minimum. However, for downward projection from overhead ceiling (e.g. beams, direction signs, sprinkler heads, electrical fittings etc.) the clearance shall be minimum 2200 mm. Figure 3.F.11 shows the variable gradient of ramps used for calculating changing gradients.

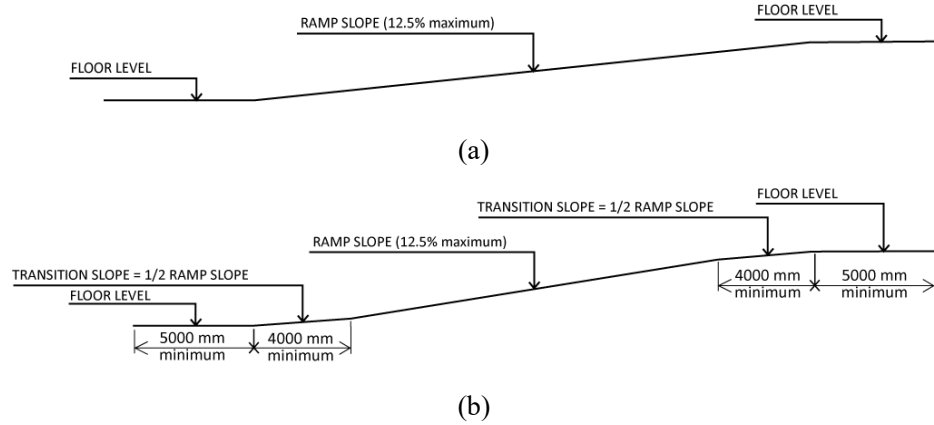


Figure 3.F.10 Ramps with (a) Same gradient; (b) Change in gradient

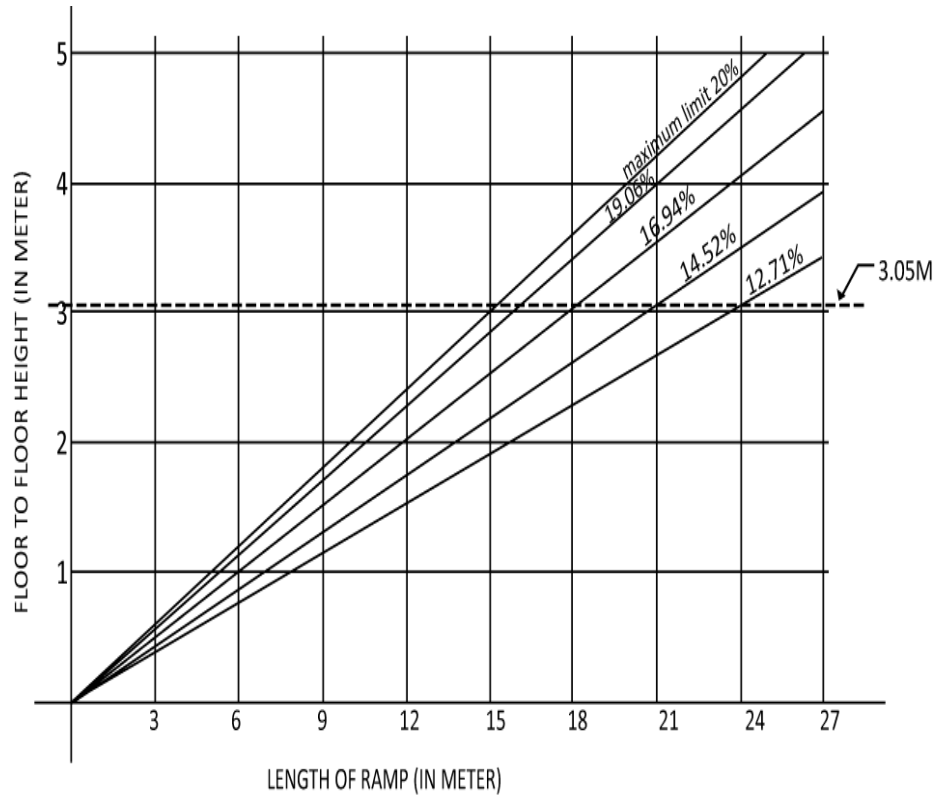


Figure 3.F.11 Relationship between floor-to-floor height, ramp gradient and ramp length

F.8 Motorcycle Parking Provisions

F.8.1 Motorcycle Parking Stall Dimensions

The minimum stall length and stall width of motorcycle parking shall be 2400 mm and 1000 mm respectively.

F.8.2 Stall Location

Motorcycle parking stalls can be provided at corners or any available space within the parking area provided that they do not obstruct movement of other vehicles and pedestrians.

F.9 Provisions For Large Vehicles

For other vehicles the minimum dimension of parking stall, headroom clearance, carriageway width and turning radius shall be in compliance with Table 3.F.6.

Table 3.F.6: Minimum Requirements for Large Vehicle Parking and Maneuvering

Type of Vehicle	Stall Length	Stall Width	Headroom clearance	Minimum carriageway width	Inside turning radius	Maximum ramp gradient ratio
Light goods vehicles e.g. pickup, vans etc.	7 m	3.5 m	3.6 m	4.5 m (single straight lane) 5.5 m (single curve lane) 7.4 m (dual straight lane)	6.0 m	1:12
Mini buses	8 m	3.0 m	3.3 m	4.5 m (single straight lane) 7.5 m (single curve lane) 7.4 m (dual straight lane)		
Buses	12 m	3.5 m	3.8 m			
Heavy goods vehicle e.g. trucks	11 m	3.5 m	4.7 m			1:15
Articulated vehicles e.g. container carriers, trailers etc.	16 m	3.5 m	4.7 m	4.5 m (single straight lane) 9.0 m (single curve lane) 7.4 m (dual straight lane)		

F.10 Provisions For Car Lift and Mechanized Parking

F.10.1 General

To connect between different levels with vehicular access, car lifts can be used instead of a carriageway ramps. However, where a site is so constrained that it is not technically feasible to place a conventional ramp to connect between levels, mechanized parking may be installed. All such parking shall require queuing space as per provisions of this Code.

F.10.2 Guidelines for car lifts in a parking

A car lift shall have two openings, allowing entry of a car from one direction and exit of the car to the opposite direction. After entry to a facility or a building having car lifts, a minimum queuing space for at least 15 percent of the total parking shall be provided within the site. On departure from site, at least one holding bay having equal space of a parking stall shall be provided within the site (Figures 3.F.12 and 3.F.13).

The internal dimension of all such lifts shall not be less than 2600 mm x 6200 mm with a minimum discharge capacity of 30 vehicles per hour. For every 50 vehicles 1 car lift shall be installed. To reduce queue at least two lifts shall be installed in a facility or a building. Maximum number of parking using car lifts shall not exceed 200.

F.10.3 Guidelines for Mechanized Parking

A mechanized parking may involve stacking system or lateral displacement system or a combination of both. The approach driveway width for a mechanized parking shall be at least 3.6 meter for one-way traffic and 6.0 meter for two-way traffic. After entry to a facility or a building having mechanized parking, a minimum queuing space for at least 5 percent of the total parking shall be provided within the site.

Mechanized parking varies widely in type and specification; and shall be installed according to its manufacturer's specifications. In doing so and during its operation it shall not compromise the safety of the building or the users in any way.

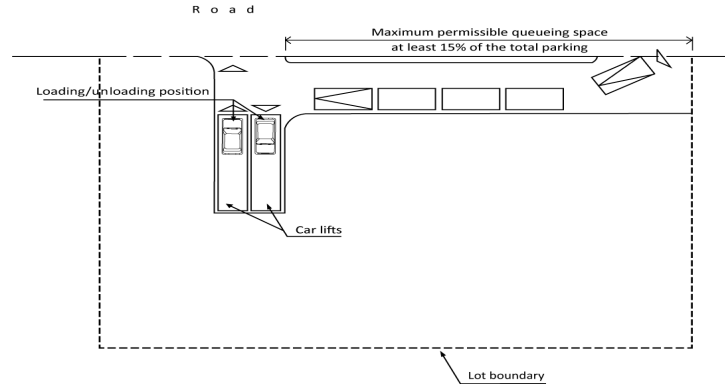


Figure 3.F.12 Queuing space and loading from and unloading to same road

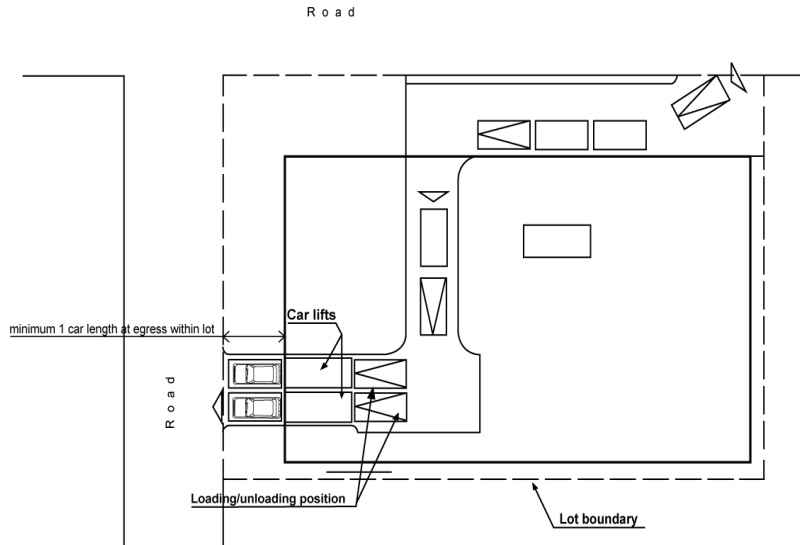


Figure 3.F.13 Queuing space and loading from and unloading to different roads

PART IV
Chapter 1
General Provisions

1.1 Scope

This Part of the Code prescribes regulations for safeguarding life and property in the use or occupancy of buildings or premises from the hazards of smoke and fire, and explosions. The provisions of this Part include general requirements of fire protection, precautionary requirements, means of egress, equipment and in-built facilities standard installations required for firefighting, and firefighting arrangements required for all occupancy groups.

1.2 Terminology

This Section provides an alphabetical list of the terms used in and applicable to this Part of the Code. In case of any conflict or contradiction between a definition given in this Section and that in Part 1, the meaning specified in this Part shall govern for interpretation of the provisions of this Part.

ALARM CONTROL UNIT	It consists of a circuit, controls, relays, switches and associated system which receive signals from alarm initiating devices and transmit to alarm signaling devices.
ALARM INITIATING DEVICE	An equipment operated manually or automatically which, when activated, initiates an alarm through an alarm signaling device.
ALARM SIGNAL	Signals of audible or visual in nature, indicating the existence of a fire and/or smoke condition. Audible devices may be bells, horns, chimes, speakers or similar devices. Visual Alarms is a strobe light emitting bright white light with approved intensity.
ALARM SIGNAL DEVICE	The equipment that produces the alarm signal.
ALARM SYSTEM	It is a combination of compatible devices, which when activated with necessary electrical energy can produce an alarm in the event of fire.
ALARM ZONE	It describes a defined area of the building or buildings for alarm initiating locations.