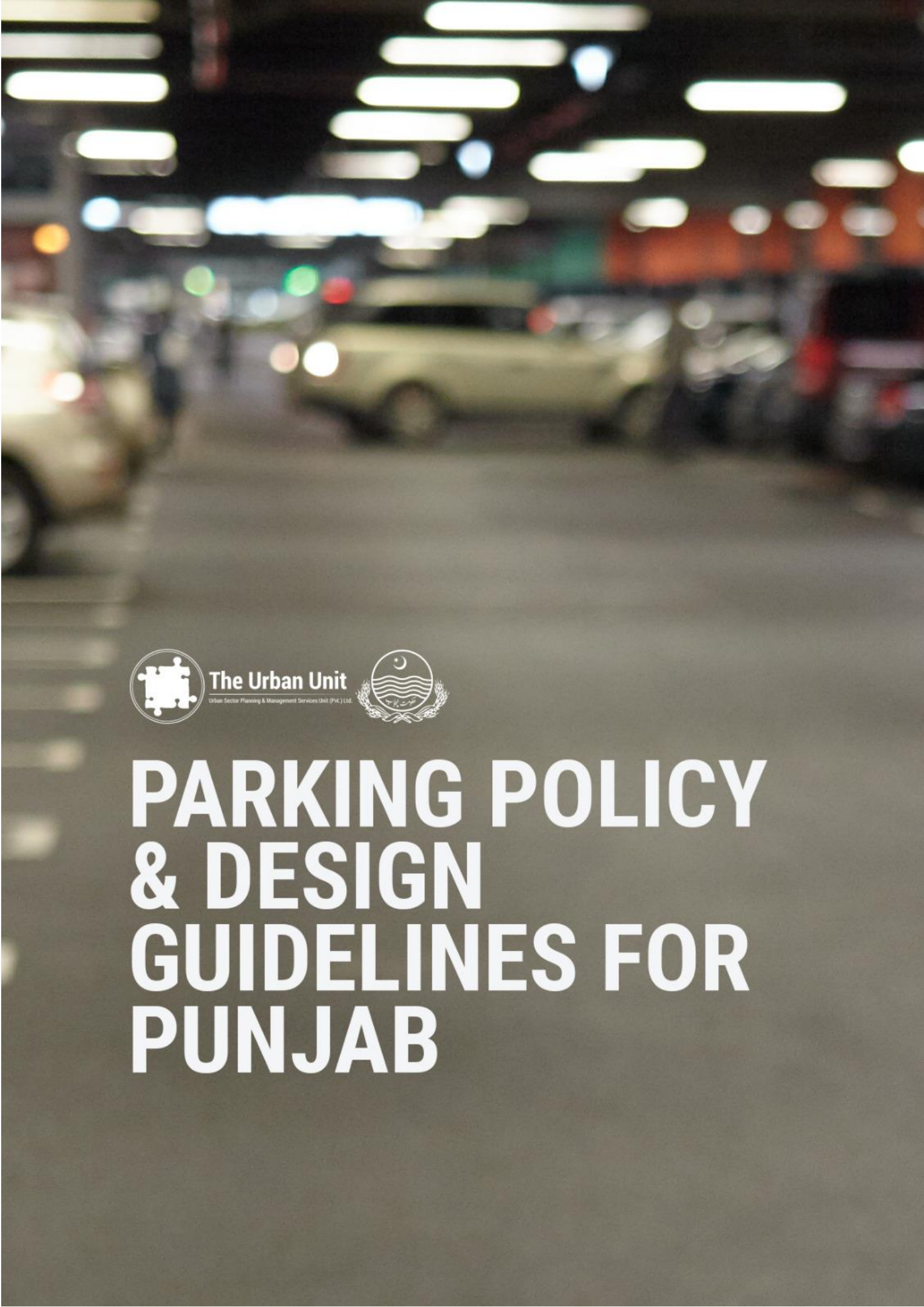


The Urban Unit

Urban Sector Planning & Management Services Unit (Pvt.) Ltd.

PARKING POLICY & DESIGN GUIDELINES FOR PUNJAB

DISCLAIMER

This policy and the mentioned guidelines are meant to serve as a guidance note for Districts / Cities/ Metropolitan/ Municipal Corporations and Transport Authorities in Punjab for the development of Parking infrastructure within their jurisdiction. All legally prevalent procedures shall be followed, and all approvals/ sanctions are to be sought as per law before construction/ implementation.

Maximum care and caution have been observed while developing the policy and guidelines; The Urban Unit shall not be responsible for any flaw/ limitation. Neither, Urban Sector Planning and Management Services Unit (Private) Limited, nor its employees make any representation (expressed or implied) or warranties as to the Comprehensiveness of the information contained here in connection with any existing or future tendering process pertaining or referred to this policy and mentioned guidelines. Urban Sector Planning and Management Services Unit (Private) Limited or its allied entities, and their employees or representatives will not be liable to reimburse or compensate for any costs or expenses incurred by acting upon this policy and corresponding guidelines.

The Urban Sector Planning and Management Services Unit (Private) Limited reserves its right, in its full discretion, to modify this document at any time to the fullest extent and shall not be liable to reimburse or compensate the recipient for any costs or expenses incurred due to such event.

Printed in Pakistan

The Urban Unit
503 – Shaheen Complex, Egerton Road, Lahore
Tel: +42 99205316-22 Fax: +42 99205323
Email: uspmu@punjab.gov.pk Website: www.urbanunit.gov.pk

PREPARED BY:

1. Dr. Syed Murtaza Asghar Bukhari
   Senior Specialist - Transport Planning & Management

2. Mr. Muhammad Bilal
   Senior Research Analyst - Transport Planning & Management

3. M Aniq Gul
   Research Analyst - Transport Planning & Management

4. Engr. Aleem Akram
   Research Officer - Transport Planning & Management

REVIEWED BY:

1. Muhammad Omar Masud
   Chief Executive Officer - The Urban Unit

FOREWARD

Urban transport systems are designed to provide seamless access to goods, services, and activities, enabling individuals to fully participate in civic life. However, unequal access to urban opportunities, whether due to inadequate infrastructure or inefficiency, can exacerbate social exclusion and transport disadvantages. Notably, investments in transport infrastructure often fail to address the mobility challenges faced by disadvantaged, vulnerable, and low-income groups if they do not adequately account for their specific accessibility needs.

The most significant challenge for delivering efficient and sustainable urban transport services lies in the diversity of the urban population and the spatial distribution of social and economic activities. Addressing these diverse mobility needs requires comprehensive transport infrastructure, including parking facilities. Parking is a crucial component of the transport ecosystem, as every motorized journey culminates in parking, serving as the final link to the destination. Insufficient parking facilities contribute to urban congestion, increasing mobility costs for road users. Studies show that deficiencies in parking infrastructure can have wide-reaching consequences on urban land use, as parking plays a pivotal role in integrated land-use planning and travel demand management.

In Punjab, several interventions have been introduced, such as the establishment of parking companies, Park & Ride facilities alongside mass transit services, and revisions to land-use regulations that include parking as a key approval requirement. However, the anticipated benefits have not been fully realized, largely because parking infrastructure has not been effectively integrated with broader transport planning efforts. Moreover, the province lacks a comprehensive parking policy or design guidelines to ensure the consistent and efficient provision of parking facilities.

The underlying Parking Policy and Design Guidelines for Punjab is an effort to address this gap. It underscores the necessity of recognizing parking as an integral part of the urban transport journey and provides a strategic framework to guide the development, management, and integration of parking infrastructure across the province.

EXECUTIVE SUMMARY

Today, Punjab's urban infrastructure faces several infrastructural, institutional, and regulatory challenges, including the absence of a unified parking policy, weak enforcement mechanisms, underutilization of management tools, and significant revenue losses due to ineffective pricing and fee collection. An integrated approach to policy development and enforcement is essential to close these gaps, ensuring that parking regulations are implemented in alignment with broader mobility and environmental objectives.

The underlying Punjab Parking Policy and Design Guidelines tackle the pressing challenges of parking management resulting from rapid urbanization and motorization in the province. Over recent decades, the growing population and vehicle numbers have outpaced existing infrastructure, leading to congestion, environmental degradation, and inefficiencies in the transportation system. This document provides a comprehensive framework and practical solutions to enhance parking management and support urban mobility, safety, and sustainability.

The document identifies key elements of a robust parking policy, focusing on safety, comfort, integration with land use, aesthetics, and maintenance. Safety measures include secure pedestrian circulation, proper lighting, and enhanced security, while comfort ensures accessibility for all users, including people with disabilities. Additionally, it emphasizes climate-responsive parking solutions and the integration of parking facilities into broader urban planning efforts to meet development goals. Aesthetic considerations and regular maintenance are highlighted to improve user experience and system efficiency.

Effective parking facility design requires careful attention to location, orientation, and user accessibility. The guidelines provide specific design standards for various parking types, including off-street, on-street, parallel, perpendicular, and angled parking. Standards for specialized parking areas and various modes including but not limited to motorcycles, and cars, are also detailed, along with accessible parking for individuals with disabilities. These considerations ensure the functionality and user-friendliness of parking facilities across different vehicle types.

Efficient revenue collection and enforcement are vital for sustainable parking management. The policy and its resultant guidelines explore various payment methods, such as parking meters, mobile apps, and toll gates, and advocate for integrating parking data to improve monitoring and compliance. It recommends modern technologies like CCTV cameras, parking sensors, RFID systems, and city cards to enhance surveillance, increase compliance, and improve user convenience. Implementing these systems can boost revenue, reduce congestion, and foster sustainable urban mobility.

The policy concludes with recommendations for advanced innovations, including the installation of parking sensors, pre-booking systems, and RFID technology integration. These forward-looking solutions aim to improve user experience, reduce congestion, and promote environmental sustainability. By adopting these guidelines, Punjab can create a more efficient, equitable, and sustainable urban transportation system.

In summary, this parking policy and design guidelines offer a strategic framework for addressing the challenges of parking management in Punjab, focusing on closing regulatory gaps, enhancing policy components, refining design standards, and adopting modern enforcement and revenue collection techniques. With these parking measures, Punjab can significantly improve its urban mobility infrastructure and support sustainable transport development.

TABLE OF CONTENT

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS

CBD	Central Business District
CM	Centimetre
C&WD	Communications & Works Department
GFA	Ground Floor Area
GoP	Government of Pakistan
GoPb	Government of the Punjab
LOS	Level of Service
P&DD	Planning and Development Department
ROW	Right of Way
Sq. Ft	Square Feet
Sq. m	Square Meter
TD	Transport Department
TOD	Transit-Oriented Development
TMA	Tehsil/ Town Municipal Authority
UU	The Urban Unit, Punjab

UNIT CONVERSION FACTORS

1 Meter	=	3.28084 Foot
1 Foot	=	0.3048 Meter
1 Sq. Meter	=	10.7639 Sq. Foot
1 Sq. Foot	=	0.092903 Sq. Meter
1 Inch	=	2.54 Centimeter
1 Centimeter	=	0.393701 Inch

GLOSSARY

Access Aisle	Access aisles provide the necessary space to allow people with disabilities to get in and out of their vehicles.
Accessible Path	A continuous and unobstructed route that a disabled person (persons with mobility or sensory impairments) can safely follow from an accessible parking space to the entrance of building or facility. Accessible paths should be at least 5 feet wide with smooth surface, proper slope, curb ramps, handrails and well lit.
Accessible Parking	Priority parking spaces for the disabled persons.
Aisle	An aisle is a dedicated space used to provide direct access for vehicles between rows of parking stalls. The aisle width varies based on traffic flow and parking configuration / layout.
Change of Mode	Shift from one mode of transportation to another. In park and ride lot, drivers park their vehicles and continue their remaining trips using public transport or alternate means.
Cross Slope	Cross slope or camber is a geometric element of pavement surfaces and referred as the transverse slope with respect to the horizon. Cross slope is provided for drainage purposes i.e. a gradient which allows surface run off to a drainage system such as a street gutter or ditch.
Foot-Candle	A unit of measure of the intensity of light falling on a surface equal to 1 lumen per square foot. It has been replaced in the International System by the candela (1 lumen per square meter).
Gross Floor Area	Total floor area inside the building envelope, including the external walls, and excluding the roof.
Land Use	Land use involves the management and modification of natural environment such as settlement and semi-natural habitats such as arable fields, pastures and managed woods.
Lux	This is used as a measure of the intensity, as perceived by the human eye, of light that hits or passes through a surface.
Parking Duration	The length of time for which a vehicle remains in one parking space / stall.
Parking	A vehicle is considered parked when it's stationary for a period longer than necessary to load or unload passengers or goods, and not due to traffic conditions or avoiding an obstacle.
Parking Accumulation	The total number of vehicles parked in a specific area (usually segregated by type of parking facility) at a specific time.

Parking Demand	The number of vehicles with drivers desiring to park at a specific location or in a general area.
Parking Space/Stall	An area large enough to accommodate one parked vehicle with unrestricted access (no blockage by another parked vehicle).
Parking Supply	The number of spaces available for use, usually classified by on-street curb (metered and unmetered), lot and garage. Further differentiation of the types of parking is useful, such as those available to the general public, and private spaces earmarked for a specific purpose such as loading.
Parking Volume	The total number of vehicles that park in an area during a specific length of time.
Pedestrian Network	A road/walkways network for the movement of pedestrian linking/ integrating different facilities like commercial areas, parking lots, public transport infrastructure etc.
Stall Length	The longitudinal dimension of the stall.
Stall Width	The width of each parking space as measured crosswise to the vehicle.
Transverse Markings	Pavement markings that are generally placed perpendicular and across the flow of traffic such as shoulder markings, word or symbol markings, stop lines, crosswalk lines, speed measurement markings, parking space markings, etc.
Trip Purpose	The primary reason for the individual's journey to the study area. Typical purposes include shopping, work, education, and recreation.
Turning Radii	The radius of a circle travelled by the design vehicle while completing a turn.
Turnover	The number of different vehicles parked at a specific parking space or facility during the study period. Parking turnover measures parking facility utilization.
Van Accessible	A parking space that is at least 8 feet wide with a minimum access aisle of 5 feet along the right side of the parking space.
Vehicle Overhang	Overhangs are the lengths of a car which extend beyond the wheelbase at the front and rear. They are normally described as front overhang and rear overhang.

1 PREAMBLE

In Punjab, rapid urbanization and rural-to-urban migration, driven by the pursuit of better socio-economic opportunities, have significantly increased the urban population, surpassing the capacity of the existing infrastructure. Between 1998 and 2024, the population of Punjab surged from 73.62 million to 124.69 million, with the urban population doubling from 23.02 million to 47.34 million. This rapid growth has strained the province's infrastructure, particularly in urban areas, where transportation systems are under immense pressure to meet the rising demand.

The transport sector in Punjab has been unable to keep pace with the snowballing demand for mobility. Both the scarcity of new infrastructure and the inefficiency of the existing systems have contributed to worsening congestion. Motorization has exacerbated the negative impacts of unplanned urbanization, consuming acres of fertile land for development and contributing to environmental degradation. As of March 2024, Punjab had 24.05 million registered motor vehicles, with private vehicles—primarily motorcycles and motorcars—making up over 80% of the total vehicle population. Public and commercial transport vehicles account for a mere 0.7% and 0.4%, respectively, reflecting the disparity between the growth in private vehicle ownership and public transport services.

Transport planning and infrastructure development are critical in shaping urban growth and guiding it towards sustainable, desirable outcomes. Today, transport planners emphasize a people-centric approach to mobility rather than focusing solely on vehicles. The rising number of private vehicles in cities impacts both mobility patterns and accessibility, furthering the reliance on motorized travel. Parking availability plays a significant role in travel demand, influencing transport decisions and contributing to the smooth operation of the system.

Despite efforts to promote non-motorized transport, improve public transport fleets, and reduce environmental impacts, Punjab faces a policy dilemma regarding the prioritization of parking facilities. Every year, substantial resources are invested in expanding and maintaining roads, yet parking management reforms—critical to addressing congestion and private vehicle use—are largely overlooked. The focus should shift toward managing and reducing the demand for private motorized travel through effective parking policies.

Unfortunately, the role of parking management in curbing private vehicle use has been underutilized in Punjab's urban centres. Although some cities have introduced parking fees, these are often undervalued compared to the land they occupy. Weak enforcement has led to low compliance, resulting in lost revenue that could otherwise support public transport improvements. Efforts to establish multi-story parking structures have failed due to poorly managed and under-priced on-street parking. Moreover, surface parking lots and multi-story garages in commercial districts encourage private vehicle use, undermining broader mobility, equity, and environmental objectives.

Parking is an essential part of the transportation system, with vehicles typically in use for only an hour each day, spending the remaining 23 hours parked. Most vehicles require multiple parking spaces: at home, at work, and at various recreational destinations. Increasingly, planning professionals advocate for improved parking management, emphasizing the need to rethink traditional approaches and implement new strategies. Effective parking management can reduce the number of parking spaces needed while improving overall urban mobility. This requires a coordinated program of targeted strategies, with careful consideration of their collective impacts.

The success story of Pasadena, California, in the 1970s illustrates how effective parking management can transform urban areas. By implementing a parking meter zone and using the revenue to fund public space improvements, the city revitalized its downtown, attracting new businesses and developments. Similarly, many universities have adopted transportation and parking management strategies, reducing traffic and parking demand by offering subsidized transit, rideshare programs, and enforcing stricter parking regulations.

In 2008, Pune, India, developed a comprehensive mobility plan that used parking management as a tool to regulate demand, freeing space for public and non-motorized transport. The plan integrated parking with public transit terminals and implemented fair pricing, demonstrating the value of strategic parking policies in urban mobility planning.

This document provides a set of practical guidelines and policy tools for authorities in Punjab to enhance current parking practices and develop new strategies to meet the growing demand for mobility. It underscores the importance of parking management

as a critical component of sustainable urban transport planning, helping to reduce congestion, promote equity, and improve the overall efficiency of the transportation system.

2 INSTITUTIONAL AND REGULATORY SHORTCOMINGS

2.1 Lack of Policy Framework

Punjab's urban infrastructure, particularly its parking systems, is facing significant challenges due to rapid urbanization and population growth. A key issue is the absence of a cohesive policy framework that integrates parking management with broader urban development plans. This gap has resulted in fragmented and ineffective parking solutions, making it difficult to manage scarce and inefficient parking facilities and to curb the rising demand for motorized travel in a sustainable manner.

2.2 Inadequate Enforcement Mechanisms

Another significant issue is the weak enforcement of parking regulations by the Traffic Police and municipal authorities. In many cities, either there does not any parking enforcement regime or the applied enforcement mechanism is too weak to curtail ill-parking practices. Parallelly, parking fees are set too low, encouraging widespread disregard for the rules and resulting in considerable lost revenue and congestion. If parking fees were appropriately priced and enforcement strengthened, cities could significantly increase revenue, which could then be reinvested in improving urban infrastructure and public transport systems.

2.3 Insufficient Use of Parking Management Tools

Globally recognized parking management tools, which are essential for regulating travel demand and optimizing parking facilities, are not being effectively utilized in Punjab to manage the growing reliance on private motorized travel. While some cities have introduced parking fees and constructed multi-story parking facilities, these efforts fall short due to the continued on-street parking. A more strategic approach to parking management is required, one that aligns with broader objectives of integrated land use planning such as enhancing mobility, promoting equity, and achieving spatial and environmental sustainability.

2.4 Inadequate Parking Infrastructure Design

The inadequate parking infrastructure design adopted in Punjab is insufficient to keep pace with exacerbating demand due to rapid motorization. Ad-hoc planning has resulted in the provision of insufficient and ill-designed infrastructure that often shortfalls in terms of present and future planning. Moreover, the ill-design further adds to congestion on the road due to poor entry and exit points. This imbalance leads to frequent traffic jams, longer travel times, increased fuel consumption, and higher emissions, further deteriorating air quality.

2.5 Revenue Loss

In Lahore, over 1.4 million vehicles are registered, and according to the 2012 Lahore Urban Transport Master Plan, the city experiences more than 4 million vehicular trips daily. However, the annual revenue collected from parking remains under 200 million PKR, highlighting a significant mismatch between the potential and actual revenue. Several factors contribute to this discrepancy. Firstly, the actual revenue falls far short due to the absence of an effective collection system, weak enforcement, and widespread malpractices. Secondly, the limited revenue that is collected is not being used efficiently for its intended purpose. Low parking fees and significant losses during collection leave minimal funds available for reinvestment in upgrading parking infrastructure. This financial inefficiency further aggravates the existing deficiencies in the city's parking systems.

Addressing these issues is crucial for improving parking and transportation infrastructure and reducing negative effects on urban mobility and the environment.

3 BUILDING BLOCKS OF A PARKING POLICY

3.1 Introduction

Amidst high rates of motorization and rapid urbanization, parking often appears to be a secondary concern, as people do not commute merely to park. However, the growing demand and associated issues with parking have become critical, significantly impacting city functionality. While parking alone may not dictate land use, it plays a crucial role in influencing it. Effective parking management can enhance a city’s economic activities and overall quality of life, making it an integral part of the city's image.

Parking policies should be grounded in a set of core principles derived from parking design and requirements. These principles serve as the foundation for developing robust parking policies and addressing urban challenges effectively. The key principles include:

3.2 Safety

3.2.1 Pedestrian Circulation and Safety

Parking is to allow people to leave their cars for a while and move on their foot, so it naturally requires to kinds of circulation facilities one is vehicular and the second is pedestrian. Where parking areas are designed giving deep deliberation to vehicular circulation, but pedestrian circulation and safety is not given much consideration notwithstanding the purpose and function of parking. Hence for parking pedestrian circulation and safety must be given enough consideration in design and operation.

To enhance safety in parking facilities, it's important to clearly separate pedestrian and vehicle areas. Once people leave their vehicles, pathways to bus stops or restrooms should be obvious and direct. Pedestrians will choose the shortest route to their destination, so maximizing pedestrian crossings in front of moving vehicles is essential. When crossings are needed, especially in safety rest areas, drivers should be warned before reaching pedestrian zones. Clear sightlines are important for police surveillance both on-site and from the street.

Lighting plays a key role in ensuring both pedestrian and vehicle safety. Useful indicators can include signs, painted crosswalks, rumble strips before stopping or

slowing conditions, speed bumps, raised crosswalks, and embedded pavement lights. Parking areas might need more pronounced markings than typical roadways to guide pedestrian paths and vehicle movement. Planting islands can help direct traffic, but in areas where traffic conflicts, such as backing vehicles or opposing directions, choose shrubs and groundcovers that stay under 2 feet tall and keep tree branches trimmed up to 8 feet to ensure clear sightlines for safe traffic flow.

3.2.2 Security

Parking places usually do not include much of activities. People Park and simply leave for their activities and leave for their purpose of commute. This makes this land use quite unhabituated and prone to crimes. Yet if parking is to be efficient this constraint of insecurity should be erased through design and other such measures. Users of a facility should feel safe and not restricted or threatened. For instance, it's better to use lighting, security cameras, emergency phones, and reliable vendors instead of relying solely on fences and on-site security. Regularly removing graffiti, broken glass, and trash is also crucial to maintaining a secure environment. These measures can offer both active and passive security, as the perception of safety is as crucial as actual safety. Clear sightlines are also essential, enabling police to effectively monitor the area both within the site and from the street.

3.2.3 Lighting

Lighting is crucial for the security and safety of both pedestrians and vehicles. An effective illumination plan must consider adjacent land uses. Using trees and tall shrubs to shield the parking facility’s lighting and vehicle activity from nearby residential areas can be beneficial. The scale of lighting fixtures is important, as standard roadway lighting heights may not be suitable for pedestrian areas. Ensure that lighting sufficiently illuminates pedestrian pathways as well as roadways. Maintenance requires space for a lift truck to access and change lights, and replacements should be planned for midday or off-peak hours. Junction boxes and access points at poles must be accessible and not obstructed by vegetation.

Good lighting not only improves user comfort and safety perception but also enhances the visibility and readability of signage, supporting safe movement for both pedestrians

and vehicles. Special attention should be given to lighting for parking area entrances and exits. Light fixtures should provide at least 1-2 foot candles or 10-20 lux. Lighting should be designed to avoid disturbing nearby residential areas. Standards for lighting poles typically range from 6-9 meters tall and should be placed in islands or along the perimeters of parking areas. Poles that are not protected by curbs or other structures should have concrete bases at least 1 meter high or be reinforced with concrete-filled pipes or bollards to ensure visibility for drivers.

3.3 Comfort

The second key aspect is comfort. Ensuring that parking facilities are comfortable is crucial. Comfort here refers to avoiding inconveniences caused by inadequate infrastructure. Beyond meeting basic safety requirements, design features that enhance comfort in a parking area include:

- Access to Pedestrians and Inclusive infrastructural design for the Disabled
- Sustainable and Climate Responsive Parking

3.3.1 Access to Pedestrians and Disabled Inclusivity

Parking areas should be designed to manage traffic volumes and pedestrian flow according to the land use they serve. To separate parking spaces from traffic and pedestrian areas, the use of islands, medians, and curbing is recommended. Handicap stalls must be provided by municipal parking regulations. Access points to parking lots should be limited, except for those serving dwelling units. All off-street and on-street parking areas must include a curb or wheel barrier around their entire perimeter unless there is a designated walkway or border. When adjacent to required setbacks and property lines, wheel barriers or curbs should be positioned two feet from the edge of these areas. Accessible parking spaces should be located as close as possible to key destinations, such as restrooms or bus stops.

Accessible parking spaces must be identified by signs that include the International Symbol of Accessibility. Signs at accessible spaces must be mounted so that the lower edge of the sign is at least five (5) feet above the ground. This helps ensure visibility both for motorists and local enforcement officials.

Similarly, available parking stalls should be identifiable so that drivers don't have to roam about all around the parking area to find one, for this with the help of digital or manual systems drivers are to be facilitated.

3.3.2 Sustainable and Climate Responsive Parking

For the climate of Punjab parking is to be designed considering climatic constraints so that it be more comfortable and viable to users. In this discourse, separate considerations are to be taken for parking structures and for parking lots.

For Parking lots, the basic consideration is to provide shade preferably through natural vegetation if not through shades. Green parking lots use permeable or semi-permeable paving and porous design techniques to decrease stormwater runoff. Besides employing permeable pavement, these lots often minimize or omit curbing and feature extensive landscaping. This landscaping helps manage runoff, enhances the parking lot's appearance, and improves water quality by filtering and removing pollutants from stormwater. Planting trees to mark parking stall Is also a concept to provide shade while making the environment greener and livelier.

Similarly, for parking structures green building concept is to be considered according to which certain design elements are to be focussed while constructing and designing a parking structure. For the hot and arid climate of Punjab, the main points to be considered are: Maximum ventilation is to be provided and free air movement by large openings, for this ventilated double roof could be used; Similarly, maximum shading of direct and diffusing solar radiation particularly on large openings can avoid the heat storage; Use of reflective outer surfaces instead of transparent ones can avoid heat waves entering the building and raising the indoor temperature. Incorporating indoor vegetation can also an overall life and greener and more comfortable environment for the users. Sustainable design features for parking structures include the following:

1) **Sustainable Site Development of Green roofs:** In the wake of the green building concept for off-street parking structures it's preferable to provide green roofs with options like vertical farming or rooftop gardening so that minimum be the environmental footprint of that building. Similarly, for lesser energy consumption renewable energy is to be used. Ideally, solar energy is to be used by installing solar panels. Better lighting technologies like light

emitting diodes (LED) are to be preferred for parking structures. Similarly, computerized lighting controls and voltage reduction technologies are to be used for sustainable energy consumption.

2) **Water Saving:** The landscape of the building is to be water efficient. Rain harvesting is to be used which will help in aquifer recharging.

3) **Materials and Resource Selection:** For structures reuse of existing facades or shell and similarly maximizing recycling of material should be a norm in construction. Similarly, for minimizing energy requirements according to the climate change of material for use is to be considered. For indoor Environmental Quality low VOC products (e.g., paint, sealers, and coatings), CO monitoring and venting should be given enough consideration for Maximum natural ventilation and lighting (e.g., interior light wells).

4) **Innovation in Design**: Multi-modal facilities are to be installed throughout for efficient parking and a system that is suitable to the newest needs of the transportation systems similarly automated parking facilities on smaller site footprints should be given enough consideration.

5) **Design Period**: Innovative designs that can preferably sustain a future 75 – 100 years should be employed otherwise design period must be 50 years.

3.4 Integration of Parking and Land Uses

A key design principle to remember is that parking structures serve people commuting between various land uses. Since different land uses have varying parking requirements in terms of timing, type, and number of spaces, designing with the users in mind will result in a more effective parking structure. Different user types have distinct needs, and some may require physical separation for revenue control or security reasons. Additionally, different users necessitate different pedestrian circulation systems. Parking design should account for traffic volumes and pedestrian flow based on the land use it supports. Incorporating islands, medians, and curbing is recommended to separate parking spaces from traffic and pedestrian areas. Handicap stalls must be provided as required, and access points to parking lots should be restricted, except for those serving dwelling units. Parking space widths and circulation geometry should also be adjusted according to the type of land use.

Table 3-1: Vehicular Circulations and Land Uses

Sr. No	Land Use Type	Vehicular Circulations
1	Residential	Regular users enter and exit two times a day.
2	Education	May have peak loads in and out.
3	Hotel	Overnight guests, maybe event parking too.
4	Office	Low turnover. Regular users enter and exit two times a day.
5	Health Care (Visitors and Staff)	For visitors, wayfinding very important. Need to accommodate elderly drivers and passengers. For staff Shift time overlap and loading. Security issues, particularly at night.
6	Retail	High turnover. Occasional users - wayfinding to and from vehicle. Elderly or Families with Small Children – Wayfinding again important. May need larger spaces and more elevators.

3.5 Aesthetics and Safety

The most appealing parking areas are those that are well-landscaped. Trees, whether planted in curbed islands or along perimeters, are particularly valuable additions. They offer shade, visually break up large expanses of pavement, and help reduce heat gain. When planting trees or undertaking landscaping in parking areas, the following factors should be considered:

- Incorporating appropriately scaled, well-graded planted earth berms on parking area perimeters to screen the parking area from streets and other facilities.
- Minimizing the use of medium to tall shrubs on internally curbed parking islands.
- Integrating regionally native groundcovers and small shrubs at island ends to add interest while maintaining the visibility of pedestrians and vehicles.
- Ensuring separation of parking spaces from trees and shrubs to avoid damage.

- Avoiding trees with messy fruits or berries and large-leafed deciduous trees like some maples that can clog drains and make walking hazardous.

3.6 Maintenance

Regular maintenance is crucial for extending the lifespan and functionality of parking area pavements. The area should be routinely inspected for litter and debris from plant materials. Parking spaces need to be restriped as necessary. Removing debris and litter should be a key consideration for planners and engineers. Elements like islands and curbs can affect the efficiency of these maintenance tasks, so careful attention should be given to their placement during the planning and design stages. Additionally, managing surface water drainage is essential, especially in regions with heavy rainfall. The pavement slopes should be designed to prevent water accumulation and drain gratings must be properly designed to handle surface runoff, prevent vandalism, and avoid clogging.

4 PARKING POLICY FOR PUNJAB

The rapid urbanization and increasing motorization in Punjab have put immense pressure on the existing urban infrastructure, especially parking systems. Efficient parking management is crucial for addressing urban mobility challenges, improving air quality, and enhancing economic activities in cities. This parking policy aims to provide a comprehensive framework, drawing on global best practices, to optimize the use of parking resources, reduce congestion, and support sustainable urban development.

4.1 Vision

To create a sustainable, efficient, and equitable parking system that enhances urban mobility, reduces traffic congestion, supports economic growth, and contributes to environmental sustainability across Punjab.

4.2 Key Objectives

- **Efficient Parking Management:** Ensure optimal use of parking spaces through smart management tools and technologies.
- **Sustainable Mobility:** Encourage the use of public transportation, and non-motorized transport, and reduce reliance on private vehicles.
- **Revenue Generation and Transparency:** Improve revenue collection systems and reinvest earnings in urban transport improvements.
- **Environmental Protection:** Minimize air pollution and traffic congestion through well-planned parking policies.
- **User-Friendly Experience:** Provide accessible and safe parking facilities for all, including pedestrians, cyclists, and disabled individuals.

4.3 Guiding Principles

This parking policy is built on the following key principles derived from global best practices:

- **Equity:** Ensure fair access to parking for all users, including provisions for low-income groups, public transport users, and non-motorized transport.

- **Sustainability:** Focus on reducing private vehicle use and promoting sustainable modes of transport such as public transport, cycling, and walking.
- **Demand-Based Pricing:** Implement dynamic pricing models to regulate demand for parking and encourage efficient use of space.
- **Integration with Land Use Planning:** Align parking policies with broader land use and urban development goals.
- **Technological Innovation:** Leverage smart parking technologies for real-time data collection, enforcement, and monitoring.

4.4 5. Strategic Approach to Parking Management

The parking policy will be implemented through the following strategies:

4.4.1 Demand-Based Parking Pricing

Dynamic Pricing: Introduce variable parking rates based on location, time of day, and demand to manage congestion and encourage short-term parking.

Kerbside Management: Utilize smart meters for on-street parking, with higher fees in high-demand areas to discourage long-term occupancy.

Incentivize Public Transport: Offer discounted or free parking at transit hubs to promote public transport use.

4.4.2 Smart Parking Solutions

Real-Time Parking Information: Use sensors and mobile apps to provide real-time availability of parking spaces, reducing time spent searching for parking.

Automated Payment Systems: Implement contactless payment solutions, including mobile apps and RFID technology, to streamline fee collection.

Integrated Parking Data System: Develop a centralized platform for parking data collection, monitoring, and analysis to improve management and enforcement.

4.4.3 Parking Zoning and Land Use Integration

Parking Zones: Establish designated parking zones based on land use, with differentiated pricing and availability for residential, commercial, and industrial areas.

Parking Requirements for New Developments: Update building codes to include minimum and maximum parking requirements, encouraging developers to create adequate parking while avoiding overprovision.

Transit-Oriented Development (TOD): Integrate parking planning with public transportation corridors, encouraging the use of mass transit over private vehicles.

4.4.4 Enforcement and Regulation

Effective Enforcement: Strengthen enforcement through technology, including CCTV monitoring, parking sensors, and automatic ticketing for violations.

Penalties for Violations: Introduce stricter penalties for parking violations, including illegal parking, non-payment of fees, and overstaying time limits.

Licensing and Registration of Parking Operators: Regulate private parking operators to ensure adherence to standards and transparency in operations.

4.4.5 Revenue Collection and Reinvestment

Efficient Collection Systems: Improve fee collection through automated systems, reducing leakages and increasing transparency.

Reinvestment of Parking Revenue: Allocate a portion of parking revenue for public transport development, parking facility maintenance, and environmental improvements.

Public-Private Partnerships (PPP): Encourage private sector participation in the development and management of parking facilities to leverage expertise and resources.

4.4.6 Special Provisions

Accessibility: Ensure all parking facilities comply with universal design standards, providing accessible spaces for people with disabilities.

Non-Motorized Transport (NMT): Provide dedicated parking spaces for bicycles and other non-motorized vehicles at key locations.

Green Parking Initiatives: Promote the use of eco-friendly parking lots, including green roofs and permeable paving to reduce environmental impact.

4.4.7 Monitoring and Evaluation

Performance Metrics: Establish clear metrics for evaluating the success of parking policies, including revenue generation, reduction in congestion, and improvements in air quality.

Regular Audits: Conduct periodic audits of parking facilities and revenue systems to ensure transparency and efficiency.

Feedback Mechanism: Engage stakeholders, including the public, in providing feedback on parking management practices to inform future improvements.

The aforementioned Parking Policy for Punjab aims to address the growing challenges of urban parking by leveraging global best practices, advanced technologies, and sustainable urban planning principles.

By improving parking management, aligning with land use policies, and promoting sustainable transportation, this policy seeks to create a balanced, efficient, and equitable parking system that supports the province's long-term urban development and environmental goals.

5 PARKING DESIGN CONSIDERATIONS

Parking requirements are generally shaped by several factors: the integration of compatible facilities that share common parking, efforts to reduce personal vehicle use by promoting alternative transportation options, and the provision of safe, attractive bike paths and walkways that encourage non-motorized travel. The primary objective in designing a parking area should be to meet user needs while ensuring the space is both functional and visually appealing.

5.1 Physical Requirements

5.1.1 Parking Space Location

An ideal parking space is one which is located a few steps from the user's home or office. Consequently, it is imperative for the planners to look at a number of factors prior to providing parking areas in any development/ land use. These include:

- Projected road capacity and traffic volumes in both the immediate vicinity and the wider district.
- Parking demand and supply conditions in the vicinity.
- Availability of public transport services in the vicinity.
- Availability of public car parks in the locality.
- Minimizing excessive grading operations and balancing cut and fill.
- Feasibility of providing safe entry/exit points.
- Proximity to and quality of pedestrian access linking public transport interchanges i.e. Bus stops, and stations.
- Integrating adequate parking spaces with surrounding facilities and existing circulation patterns.
- Area and shape of specific site.
- Locating parking areas convenient to building entrances.
- Using topography and trees to mitigate negative visual impacts.

- Preserving sight lines to entries and significant landscape and architectural features.
- Minimizing negative impacts to the natural environment such as unnecessarily removing mature vegetation or degrading soil stability.
- Preserving and integrating existing mature trees in future parking.

5.1.2 Orientation

To ensure parking areas are safe and convenient, it's crucial to consider their orientation and layout early in the planning process. Two key factors to focus on in this context are:

- Aligning rows of parking spaces perpendicular to the facility; thus, minimizing the number of pedestrian aisle crossings.
- Providing access points and crosswalks from parking areas to facility entries.

5.1.3 User Walking Distance

Long-term users, like employees, can generally accommodate longer walking distances from parking areas to their workplaces. In contrast, short-term users, such as customers or visitors, prefer shorter distances. Parking spaces for a specific facility should be no more than 246 feet (75 meters) from the facility entrance.

5.1.4 General Design Guidelines

Common important parking area design guidelines used by the planners while drafting parking layout include:

- Minimization of parking area entrance and exit curb cuts.
- Locating separate visitor and reserved parking at the front entry of the facility.
- Eliminating dead-end parking areas.
- Locating entrances and exits away from busy intersections.

- Locating aisles and rows of parking parallel to the long dimension of the site with parking on each side of an aisle.
- Using rectangular parking areas to minimize land area requirement.
- The aforementioned universal guidelines are used to draft an ideal parking layout; however, the site characteristics govern the design. In case of site limitations, planners tend to define an optimal solution.

5.1.5 Grading and Drainage

Parking areas must be adequately sloped and drained to manage surface runoff effectively. The following minimum standards may be applied, depending on site conditions and approval from the relevant authority:

- Ideal slope for all parking area pavements is 2%.
- Longitudinal pavement slope should be 1% - 5%.
- Pavement cross slope should be 1% - 10%.
- Storm water should be collected on the perimeter of parking areas with a minimum of 2% slope along concrete curb and gutter.

5.1.6 Islands

Curbed or painted non-parking zones within a parking area are known as islands. These islands serve both safety and aesthetic purposes, helping to manage vehicle circulation. Ideally, these islands should be curbed and at least 8.2 feet (2.5 meters) wide if they are to accommodate tree planting. Islands can also be marked using reflective striping or paint on the pavement, though painted islands do not create a physical barrier for vehicles. Importantly, plants should not be placed without the protection of curbed islands.

5.2 Types of Parking Areas

Two types of parking are usually made by the people i.e., either on street or off-street. Both have their own advantages and disadvantages; however, selection of each is governed by following factors;

- Location of the area where parking is to be provided.
- Parking Volume and Turn over
- Available Parking Site Characteristics
- Availability of Public Transport
- Proximity of Services (in case of retail or commercial development).
- Availability of Pedestrian Walkways

5.2.1 Off-Street

Off-street parking is the most commonly used parking method. Often, these areas are designed as large, unified parking spaces, such as expansive parking lots or plazas. This can lead to extensive areas of asphalt with minimal attention to visual appeal. Therefore, when planning off-street parking areas, the following considerations should be considered:

- Minimize extensive grading operations by designing to the topography.
- Ensuring a distance of at least 15 meters is provided from proposed parking area entrances and exits to intersections.
- Minimizing the number of entrances and exits.
- Integrating planted islands to increase aesthetics.

5.2.2 On-Street

When incorporating street parking into the design, parallel parking is generally preferred. However, under certain conditions, angle parking may also be appropriate. The choice of on-street parking type should be based on factors such as the street's function and width, adjacent land use, traffic volumes, and both current and anticipated traffic conditions.

While on-street parking is known to reduce roadway capacity, impede traffic flow, and increase the potential for accidents, it may be necessary if off-street parking facilities are inadequate or impractical. Despite this, on-street parking is often discouraged due to its impact on carriageway width and traffic flow. Many installations, however, use existing streets to meet their parking needs. If on-street parking cannot be avoided, the following considerations should be considered:

5.2.3 Parallel Parking

Parallel parking is a type of city-street parking where a vehicle is positioned close to and parallel with the curb, typically between two other vehicles parked in the same manner. This parking arrangement is useful when suitable off-street parking options are unavailable or impractical. For drivers, parallel parking demands experience, confidence, and patience.

Table 5-1: Advantages & Disadvantages of Parallel Parking

Advantages	Disadvantages
▪ Works well in extremely narrow, linear spaces ▪ Requires minimum pavement area	▪ Difficult maneuvering for most drivers ▪ Less than ideal visibility of adjacent traffic. ▪ Inefficient use of on-street space.

5.2.4 Perpendicular Parking

In perpendicular parking, also referred to as bay parking, vehicles are parked side by side, at a right angle to an aisle, curb, or wall. This arrangement accommodates more cars along a given length of road or curb compared to parallel parking, making it a common choice for parking lots and parking structures.

Table 5-2: Advantages & Disadvantages of Perpendicular Parking

Advantages	Disadvantages
▪ Works well with either one-way or two-way aisles. ▪ Handles the most vehicles per square meter of pavement. ▪ Handles most vehicles per linear foot.	▪ Requires widest area. ▪ Difficult maneuvering for some drivers. ▪ Two-way traffic can create some visibility problems.

5.2.5 Angled Parking

Angle parking resembles perpendicular parking, but vehicles are positioned at an angle to the aisle. This gentler angle facilitates easier and quicker parking, allows for narrower aisles, and supports higher density compared to perpendicular parking. Angled parking typically comes in 30°, 45°, and 60° configurations, depending on site characteristics. A 60° angle is ideal for high turnover rates or predominantly short-term use, though it can lead to inefficient circulation patterns and one-way aisles. The 45° angle offers similar advantages and drawbacks to the 60° configuration.

Table 5-3: Advantages & Disadvantages of 60° Angled Parking

Advantages	Disadvantages
▪ Easy maneuvering in and out of parking spaces. ▪ Good Visibility ▪ Lends itself to either one-way or two-way aisles. ▪ Most common short-term parking configuration.	▪ Requires more pavement per vehicle than perpendicular configuration ▪ Handles fewer vehicles per linear foot.

Table 5-4: Advantages & Disadvantages of 45º Angled Parking

Advantages	Disadvantages
▪ Reduced width requirements for layout. ▪ Easy maneuvering in and out of parking spaces. ▪ Good visibility to the rear.	▪ Doesn't work well with two-way aisles. ▪ Requires more pavement per vehicle than perpendicular parking configuration.

Table 5-5: Advantages & Disadvantages of 30º Angled Parking

Advantages	Disadvantages
▪ Easy Parking ▪ Reduced width requirements for layout.	▪ Requires the most pavement per vehicle. ▪ Doesn't work well with two-way aisles.

5.3 Parking Geometry

Parking areas can be arranged in various configurations, including parallel, perpendicular, or angled (30°, 45°, or 60°) to the driving lane or aisle. A key aspect of these layouts is the size of the parking space. The minimum standard size for an automobile parking space is 20.0 feet in length and 9.0 feet in width. Aisle widths depend on the chosen angle and whether they are one-way or two-way, with two-way aisles requiring a minimum width of 23.0 feet.

The space required for each parking configuration varies, but as a general rule, parking configurations closer to perpendicular allow for more vehicles per linear foot. A summary of the dimensions and attributes for different orientations of on-street parking is shown in Figure 4-1 and Table 4-6. Similarly, Figure 4-2, 4-3 and Table 4-7 describes dimensions and attributes of different bays orientations in off-street parking.

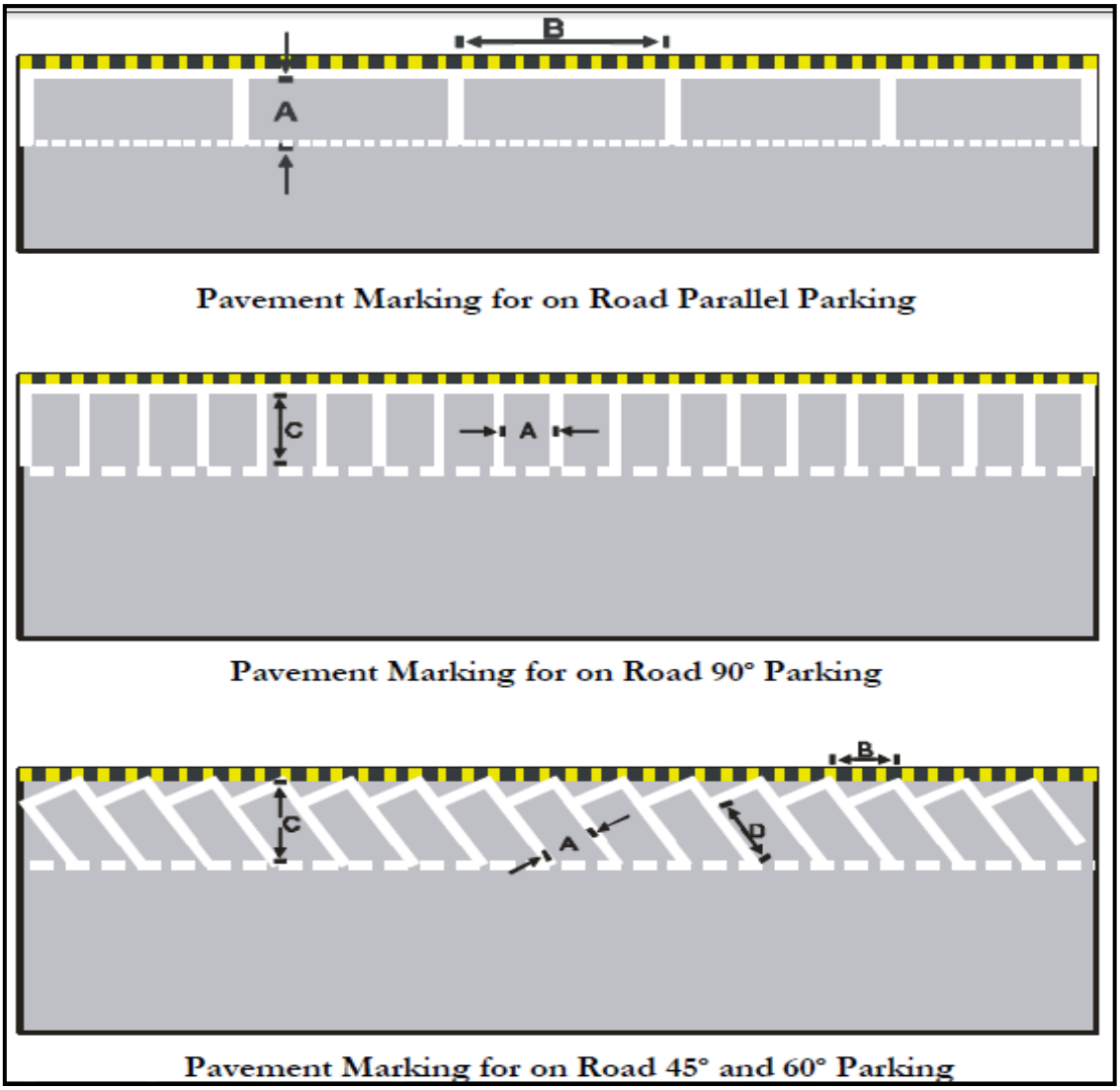


Figure 5-1: On-Street Parking Orientations (PTTM, 2008)

Table 5-6: Dimensions of On-street Parking Bays (PTTM, 2008)

Degree of Angle	Stall Width	Curb Length	Stall Depth	Stall Length
	A	B	C	D
0	8.5	23.0	-	-
45	9.0	13.0	20.0	19.0
60	9.0	10.5	21.0	19.0
90	9.0	9.0	18.0	19.0

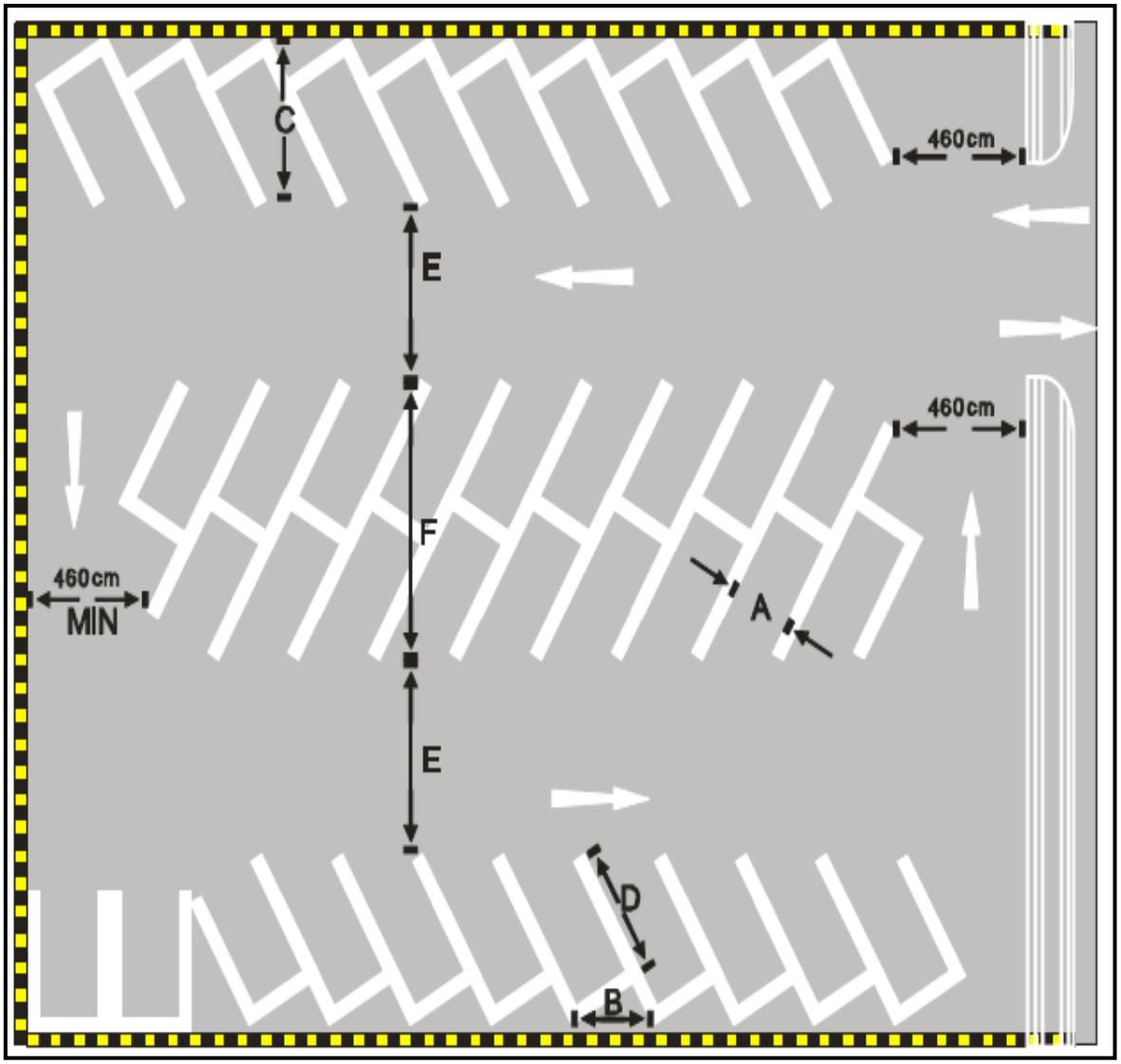


Figure 5-2: Angular Off-street Parking Orientation (PTTM, 2008)

Table 5-7: Dimensions of Off-Street Parking Bays (PTTM, 2008)

Degree of Angle	Stall Width	Curb Length	Stall Depth	Stall Length	Aisle Width		Island Width
					1-Way	2-Way	
	A	B	C	D	E		F
45	9.0	13.0	20.0	19.0	13.0	13.0	33.0
60	9.0	10.0	21.0	19.0	18.0	18.0	37.0
90	9.0	9.0	18.0	18.0	24.0	24.0	36.0

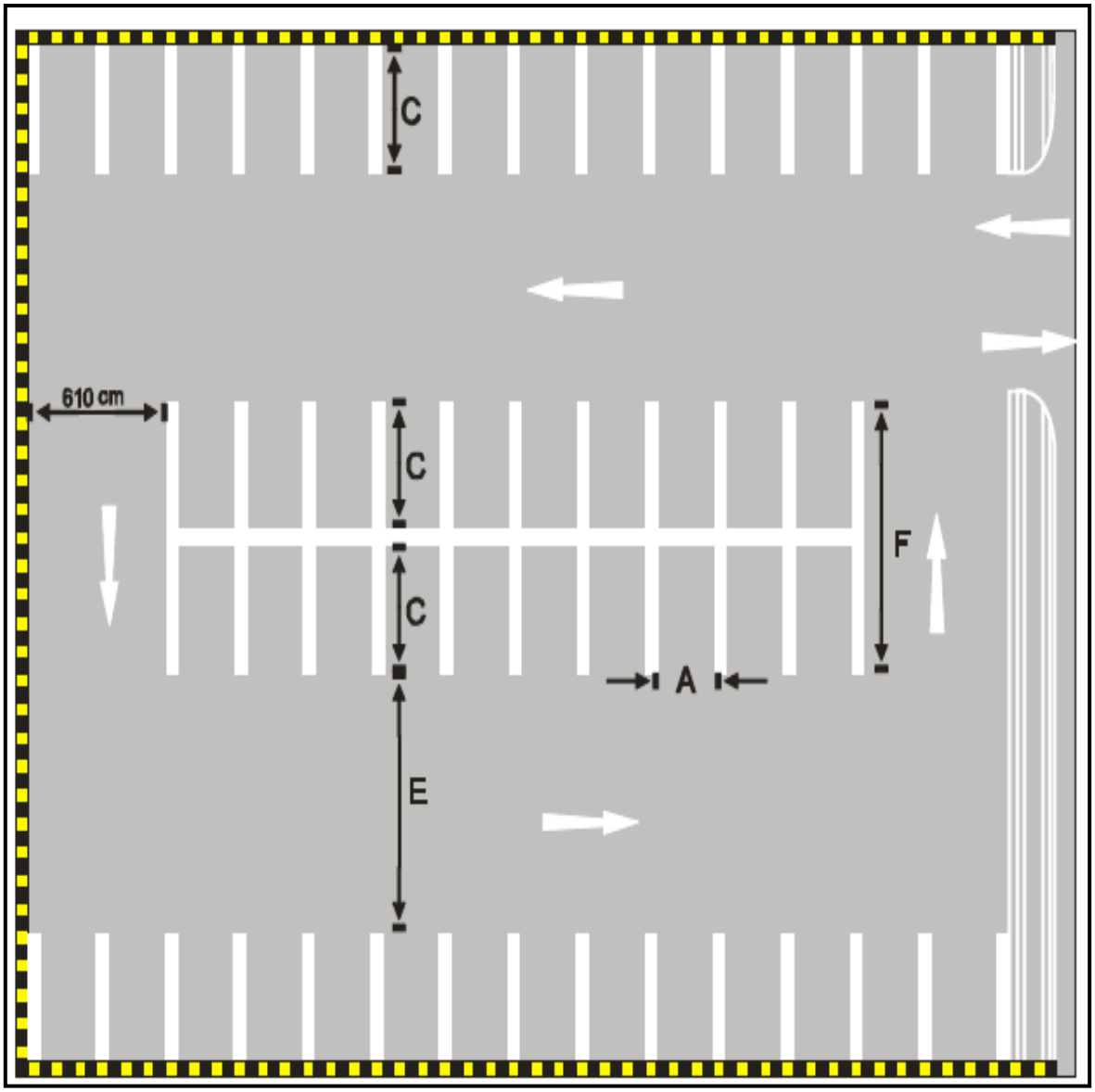


Figure 5-3: Perpendicular Off-Street Parking Orientation (PTTM, 2008)

5.4 Parking Space Standards

The minimum parking spaces required according to the type of building is elaborated in Table 4-8.

Table 5-8: Minimum Parking Spaces

Sr. No.	Type of Building	Minimum Parking Space
1	Apartments	▪ One car space for every 1200 sq. ft. (111.52 sq. m) of covered area subject to a minimum of one car space for every housing unit.

		▪ In an apartment building, if any portion is intended to be used for a purpose other than residential, the parking standards prescribed hereunder shall apply in accordance with the nature of intended use.
2	Offices, Commercial Including Large Stores & Retail Shops, Hospitals & Exhibition Halls	▪ One car space for every 1000 sq. ft. (92.95 sq. m) of floor area.
3	Hotels	▪ One car space for every 6 rooms, provided that in case of family suites, each room will be counted separately as one room for calculation of parking spaces. ▪ One car space for every 800-sq. ft. (75 sq. m) of shopping area. ▪ One car space for every 1000 sq. ft. (92.95 sq. m) of office area.
4	Restaurants, Clubs & Cafes	▪ One car space for every 500-sq. ft. (46.47 sq. m) of floor area.
5	Marriage Halls, Banquet Halls & Community Centres	▪ One car space for every 500-sq. ft. (46.47 sq. m) of floor area.
6	Cinema, Theatres & Concert Hall	▪ One car space for every 5 seats.
7	Post Offices & Police Station	▪ One car space for every 2000 sq. ft. (185.90 sq. m) of floor area.
8	Industrial Buildings and Warehouses	▪ One car space for every 500-sq. ft. (46.47 sq. m) of floor area of the administrative block of the building for the staff. ▪ One car space for every 2000 sq. ft. (185.9 sq. m) of floor area for the workers.
9	Schools, Colleges and Educational Institutions	▪ One car space for every 2000 sq. ft. (185.9 sq. m) of floor area. ▪ 40% of car parking space shall be reserved for motor cycles and buses.

Note: When calculating parking requirements, the gross floor area should exclude the space occupied by mechanical plant rooms, air conditioning units, electric substations, prayer rooms, ducts, service shafts, public restrooms, elevators, escalators, stairs, covered parking areas, and vehicle circulation spaces. Additionally, if corridors and arcades are wider than 10 feet, the extra area of these spaces should also be excluded from the parking requirement calculations.

5.5 Motorcycle Parking

Provision for motorcycle parking is ruled by the demand, because there exist variations with respect to land use. Parking areas are frequently designed and constructed with minimal consideration for motorcycles and their specific requirements. Facilities such as markets, dining establishments, educational institutions, major recreational centres, and offices may experience high demand for motorcycle parking. Therefore, instead of providing motorcycle parking in left over spaces, planners must make provisions for two wheelers parking especially motorcycles in the planning stage i.e. prior to designing the facility. The most appropriate method in this regard is to estimate the number of trips that are executed in the identical facility (in case of new development) or study mobility patterns in built up area during planning stage. Considering the minimum parking space required for motorcycles, 16% of the total car parking area shall be reserved for motor cycle.

Notably, Motorcycles typically use a kickstand for support when parked, so it's important to provide a stable, rigid surface like concrete to ensure stability and prevent pavement damage, especially in warm climates or during summer months. The standard parking dimensions for motorcycles are:

Table 5-9: Dimensions of Motorcycle Parking Bay

Description	Dimensions
Parking Space Width	2.5 Feet
Parking Space Length	6 Feet
Driving Aisle Width (Two Way)	6 Feet
Two Rows Plus Aisle Width	18 Feet
Vehicles Per 100 Linear Feet Double Row	40

5.6 Bicycle Parking

Promoting cycling as a travel option is part of the broader effort to encourage alternatives to private car use and support more sustainable travel methods. Enhancing the provision, safety, convenience, and overall environment for cyclists is crucial, requiring that their needs be fully addressed during the development process. Increasing the number of cycle parking spaces is a widely adopted measure to encourage cycling.

Secure cycle parking should be integrated into land use planning to address the issue of cycle theft, which is a significant concern for many riders globally. Well-designed, secure parking facilities can help alleviate this concern and may also encourage the use of cycle routes. Additionally, providing designated cycle parking areas can reduce the clutter caused by bicycles being haphazardly chained to railings, pipes, and lighting columns, thereby improving pedestrian access and aesthetics.

The exact number of secure cycle parking spaces needed should be determined based on a thorough review of mobility patterns. Typically, fully secure, weather-protected parking is necessary for employee cycles. Similarly, weather protection is often required for cycle parking with ten or more spaces or for medium to long-term parking, such as at public transport interchanges. Overall, cycle parking should be conveniently located near the facility, secure, user-friendly, well-lit, clearly signed, and ideally sheltered.

5.6.1 Design of Bicycle Parking - Rack system

Ideally, a cycle parking facility should enable both the frame and both wheels of the bicycle to be securely locked to the fixture. Cycle stands that only hold the bike by the wheel (such as concrete slots) are not recommended, as they provide limited security and can damage wheel rims. Typically, a rack system is employed for bicycle parking, where the rack element is the component that supports each bicycle. It is important that the rack element should:

- Support the bicycle upright by its frame in two places
- Prevent the wheel of the bicycle from tipping over
- Enable the frame and one or both wheels to be secured
- Support bicycles without a diamond-shaped frame with a horizontal top tube
- Allow front-in parking: a U-lock should be able to lock the front wheel and the down tube of an upright bicycle
- Allow back-in parking: a U-lock should be able to lock the rear wheel and seat tube of the bicycle.

5.6.2 Rack

Ideally, a rack consists of one or more elements attached to a common base or arranged in a regular pattern, securely fastened to a mounting surface. The rack should include a series of frame elements, which may be attached to a single frame or individually mounted close together. Additionally, the rack elements should be designed to prevent them from being easily detached from the rack frame or removed from the mounting surface.

The rack must also be anchored securely to prevent theft of the bicycles when they are attached. Vandalism-resistant fasteners can be used to fix the rack to the ground. Furthermore, the rack should allow for easy, independent access to bicycles. Typically, inverted "U" rack elements are installed with 2.5 feet (30 inches) between centres, arranged in a row. This configuration provides sufficient space for securing two bicycles side by side to each rack element.

5.6.3 Rack Area

A rack area, also known as a "bicycle parking lot," is a space equipped with multiple racks separated by aisles. The aisle width is measured from the outer edges of bike tires across the space between racks, with a minimum separation of 4 feet (48 inches) between aisles. This allows enough room for a person to walk through with a bicycle. In high-traffic areas, such as college campuses, where many users park or retrieve bicycles simultaneously, the recommended minimum aisle width is 6 feet (72 inches). Similarly, each row of parked bicycles should have a depth of 6 feet (72 inches) to accommodate conventional upright bicycles, which are just under 6 feet long.

For large rack areas with high turnover, having multiple entrances is advisable to facilitate the movement of cyclists and pedestrians. Some parking areas may have racks mounted closer to walls, but this arrangement does not affect space dimensions. If possible, the rack area should be sheltered from the elements. An awning can protect racks along building walls, keeping cyclists more comfortable while parking, locking their bikes, and managing cargo, despite exposure to sun, rain, and snow. An awning will also help keep the bicycles dry, particularly the saddle.

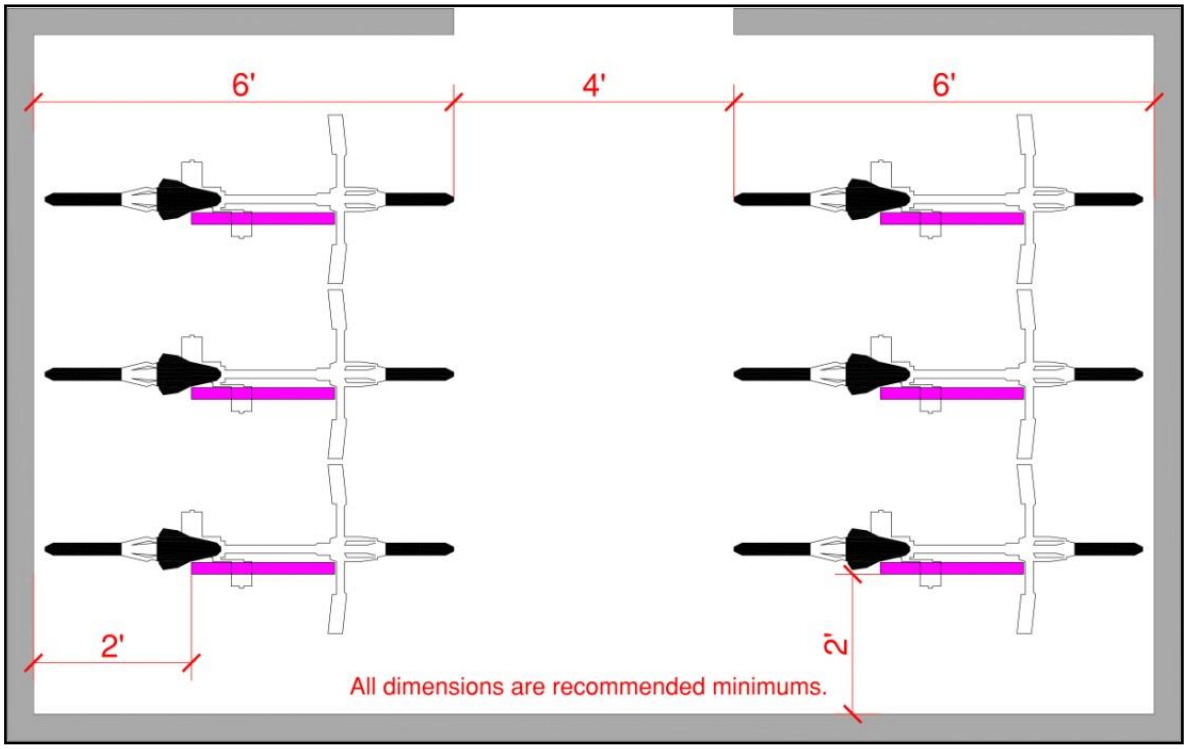


Figure 5-4: Rack Parking Area for Bicycles

5.6.4 Location of Rack Area

The placement of a rack area with the building it serves is crucial. Ideally, the rack area should be situated directly adjacent to the entrance it serves. Racks should be positioned so that they do not obstruct the entrance or impede pedestrian flow into or out of the building. Racks that are far from the entrance, difficult to locate, or perceived as vulnerable to vandalism are less likely to be used by cyclists.

The rack area should be placed along a primary building approach and be easily visible from that approach. It should be no more than a 30-second walk (120 feet) from the entrance it serves, with a preferred distance of within 50 feet. It is not advisable to have a single, distant rack area serving multiple buildings; instead, smaller, more conveniently located rack areas are preferable.

5.6.5 Bicycle Locker

When combined with surveillance, cycle lockers provide a secure parking option that also allows for accessory storage and offers weather protection. Each locker should be at least 2.5 feet wide, 6.2 feet long, and 4 feet high. To ensure easy access, there should be a minimum of about 5 feet of space in front of the locker door.

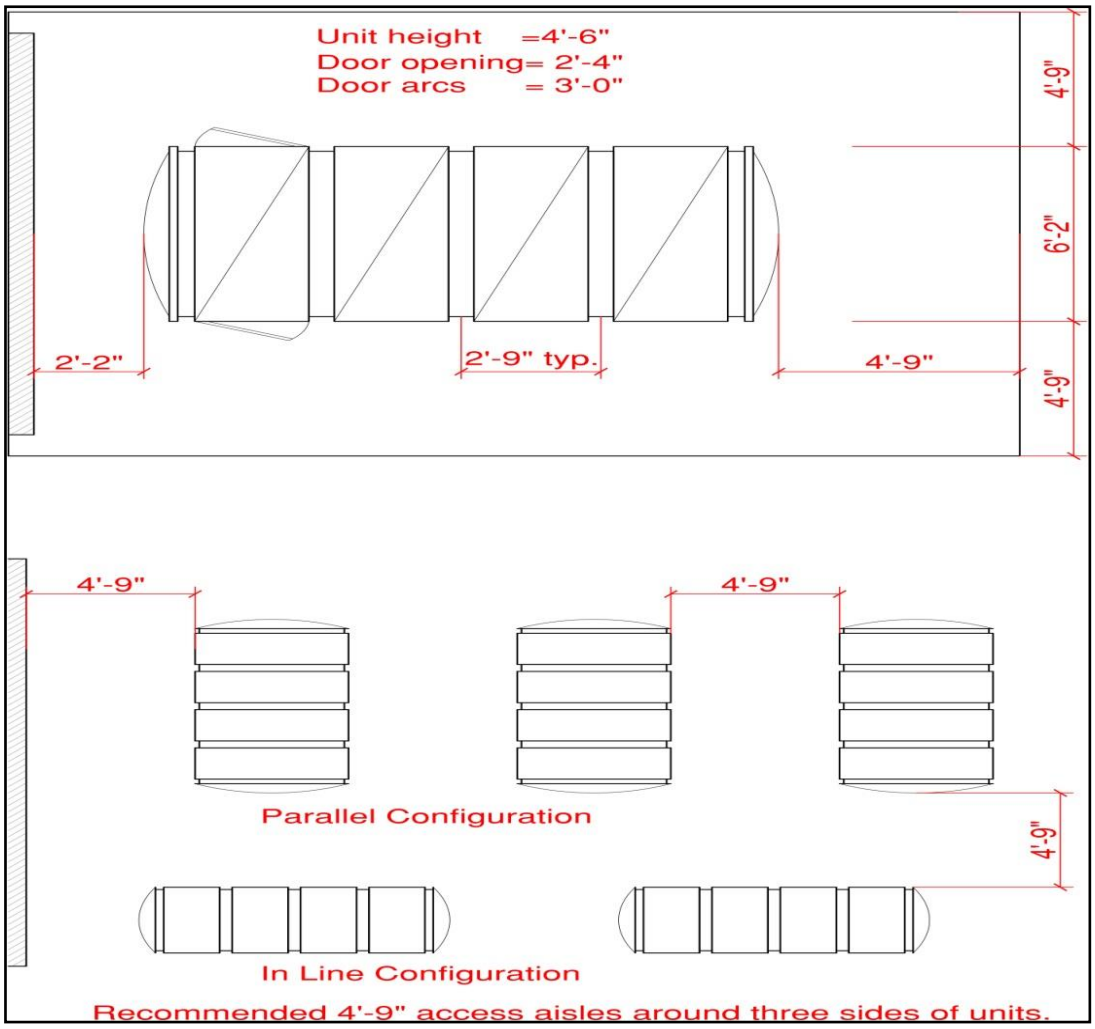


Figure 5-5: Bicycle Locker Parking

Lockers can be operated using coins, tokens, or cycle locks, and may also accept credit cards or smart cards. At public transport interchanges, a reservation system for lockers based on weekly, monthly, or annual tickets might be suitable. The primary drawbacks of cycle lockers are their higher cost compared to rack bicycle parking and their potential to be visually intrusive in environmentally sensitive areas.

5.7 Bus Parking

Public transport plays a crucial role in connecting people to their desired destinations. Therefore, planners must incorporate public transport options into various land uses, such as dormitories, schools, training centres, clubs, dining halls, and major

recreational facilities. Some essential considerations for designing bus parking and circulation areas include:

Table 5-10: Typical dimensions of Bus Parking Bay
(USAF, Landscape Design Guide)

Description	Dimensions
Parking Space Width	10 Feet
Parking Space Length	40 – 50 Feet
Minimum Turning Radius	40 Feet

5.7.1 On-Road Bus Bay at Bus Stops

Following dimensions may be considered for designing bus bay at bus stops.

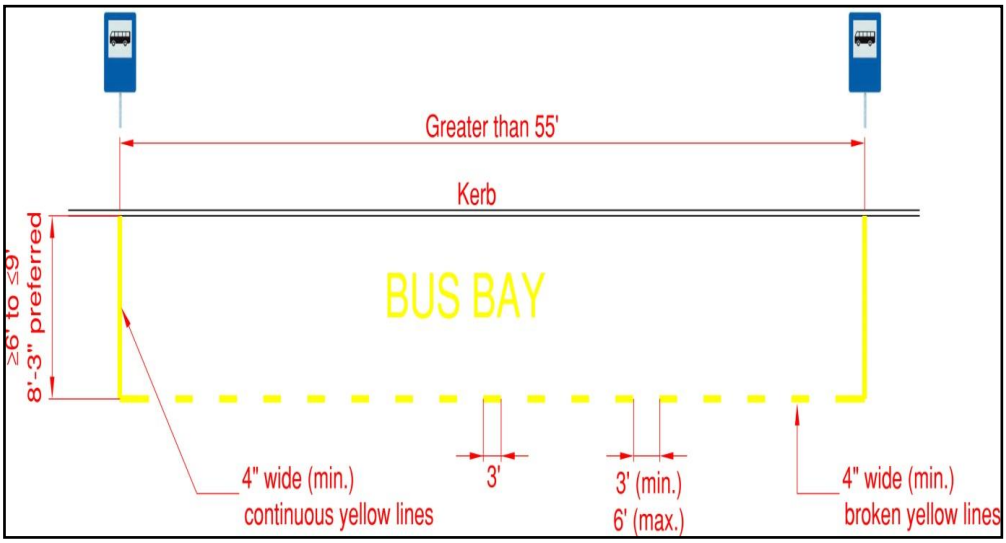


Figure 5-6: On Road Bus Bay at Bus Stops

Table 5-11: Bus Bay dimensions at on road bus stops

Description	Dimensions
Parking Space Width	9 Feet
Parking Space Length	55 Feet

5.8 Garbage Trucks/ Refuse Haulers Parking

Typically, centrally-located dumpsters are used for the disposal and collection of refuse and recyclable materials, with many positioned in parking areas. Specialized vehicles are employed to collect waste from these dumpsters. Garbage Trucks should be placed to ensure user convenience, ease of access for emptying, and aesthetic appeal. In addition to addressing refuse collection needs regarding access and circulation, the following points should also be considered:

- Screening dumpsters with fences, walls, or shrubs
- Coordinating grade requirements within dumpster areas in addition to overall parking area grading
- Providing protection with concrete-filled pipes or bollards for fences and walls from damage caused by vehicle operations

5.9 Tractor Trailers Parking

Large tractor-trailers may require access to parking areas. In such cases, due consideration regarding their parking shall be made because these vehicles have specific requirements. The following minimum dimensions shall be considered when designing for tractor-trailers:

Table 5-12: Tractor Parking Bay Dimensions

Description	Dimensions
Parking Space Width	50 Feet
Parking Space Length	10 Feet
Minimum Outside Turning Radius	60 Feet
Vertical Clearance	15 Feet
Backing & Maneuvering	50 Feet

5.10 Access Area for Pedestrians and Drivers

Effective parking area design ensures that vehicle occupants, including those with physical disabilities, have convenient and safe access to nearby facilities. When designing parking areas, the following factors should be considered:

- Provision of separated pedestrian walkways whenever possible.
- Homogenous integration of planted, curbed islands for guided mobility.
- Provision of walkway for accessibility from all parking spaces to facility entrances.
- Minimizing the number of vehicle circulation aisles that pedestrians must cross to enter adjacent facilities.
- Integration of parking area walkways with existing pedestrian network.

5.11 Parking for Disable People

5.11.1 Location

Parking for individuals with disabilities should be situated near the main accessible building entrance, ideally along the shortest accessible route. For buildings with multiple entrances and adjacent parking, accessible spaces should be distributed and positioned closest to the available entrances. Accessible parking spaces may be grouped in one or more lots if they provide equivalent or better accessibility in terms of distance from the entrance, impact of parking fees, and convenience.

5.11.2 Route

An accessible route must always be provided from the parking areas to the facility entrance. This route should be free of curbs or stairs, with a minimum width of 3 feet and a firm, stable, and slip-resistant surface. The slope of the accessible route should not exceed 1:12 in the direction of travel. Parked vehicle overhangs should not obstruct the clear width of the accessible route.

5.11.3 Layout

Accessible parking spaces should be 8 feet wide, with a 5-foot-wide adjacent access aisle. The first space and one in every six additional spaces must be accessible to vans. For designated van parking, an 11-foot-wide space with a 5-foot-wide adjacent access aisle is preferred. Alternatively, van parking stalls may be 8 feet wide with an 8-foot-wide access aisle. Two accessible parking spaces may share a common access aisle.

5.11.4 Required Accessible Spaces

Parking stalls for individuals with disabilities should be provided in each parking lot as outlined in Table 4-13 (ADA Accessibility Guidelines: Space Requirements):

Table 5-13: Number of Parking Spaces for Disabled Persons

Total Parking Spaces	Required Accessible Spaces
1 – 25	1
26 – 50	2
51 – 75	3
76 – 100	4
101 – 150	5
151 – 200	6
201 – 300	7
301 – 400	8
401 – 500	9
501 – 1000	2% of Total
1001 & above	20, Plus 1 for each 100, or fraction thereof, over 1000

6 LEVEL OF SERVICE CALCULATION OF PARKING SPACES

Level of Service (LOS) standards are benchmarks used to determine the minimum amount of public facilities necessary to meet a community's basic needs and expectations, in line with regulatory and standard guidelines. LOS is typically quantified as a ratio of facility capacity to the number of users.

In transportation planning, LOS is commonly applied to evaluate traffic flow, roadway safety, and parking facilities. From the user's perspective, parking service quality is generally assessed through multiple dimensions, including convenience and cost. Therefore, evaluating the service level of parking involves measuring both individual parking spaces and city-wide parking systems based on two key factors: parking availability and the flow/capacity ratio.

6.1 Need for Level of Service

Level of Service (LOS) standards are utilized to assess whether existing facilities and services adequately meet the needs of citizens, identifying any deficiencies that need addressing. They also act as benchmarks to determine if current capacity can accommodate new developments or if improvements are necessary to prevent overburdening existing infrastructure. As communities expand, LOS ensures that facilities and services grow accordingly. Therefore, LOS serves as a tool for ensuring accountability in urban transport service delivery, by comparing actual performance against established targets or setting new ones. Additionally, service level evaluations can contribute to land use and transport strategy development, assess investment outcomes, and highlight achievements and best practices.

Currently, urban agencies have not institutionalized a system for measuring parking performance and taking subsequent actions. It is crucial to establish a common understanding and use of basic performance benchmarks among all stakeholders. Performance parameters should be tailored to the specific needs of a city to enhance the quality of parking services.

6.2 Calculating LOS for Parking Availability

Level of Service (LOS) is assessed based on the availability of parking spaces. Essentially, it reflects the extent to which parking availability is constrained for all vehicles within a city. The key indicators used to evaluate parking facilities include:

- **Availability of paid public parking spaces (%):** To cover at least 50% of on street public parking spaces under ‘paid parking’
- **Difference in Maximum and Minimum Parking Fee in the City:** To keep maximum and minimum parking fee difference to at least 2:1 (Parking rate to be computed two hourly).
-

6.2.1 Data Requisites for LOS Calculation

Against each level of service data is to be collected. Different kinds of indicators are drawn from each level of service and for those indictors data is to be collected.

6.2.1.1 Availability of Paid Public Parking Spaces (LOS1)

To evaluate the Level of Service (LOS) for the availability of paid public parking spaces, three indicators are analysed, and data is collected accordingly. The indicators and the corresponding data to be gathered are detailed in Table 5-1.

Table 6-1: Data collection for “Availability of Paid Public Parking Space”

Sr. No.	Indicators Data Required for Calculating the indicator	Remarks
1	Total available on street paid Parking spaces in Equivalent Car Spaces (ECS) allotted for all vehicles	Total available on street paid parking spaces = number of parking spaces for (cars x1 + two wheelers x 0.25) All the Arterial, sub arterial roads to be considered including service roads along these roads.
2	Total available on street Parking spaces in (Equivalent Car Spaces) ECS allotted for all vehicles	Total available on street Parking Spaces = number of parking spaces for (cars x1 + two wheelers x 0.25)
3	Availability of paid public parking spaces	Calculate = [Total available on street paid parking spaces / Total available on street Parking Spaces] * 100.

6.2.1.2 Ratio of Maximum and Minimum Parking Fee (LOS 2)

In the city's Central Business District (CBD), land is typically costly, making it challenging to allocate organized parking spaces. To manage parking demand in the CBD, one approach is to implement high parking fees, which discourages the use of private vehicles. Additionally, the parking fees set by private operators may also be considered. Table 5-2 provides details on the units, indicators, and remarks associated with the service level indicator "Ratio of maximum and minimum parking fees in the city."

Table 6-2: Data Collection for "Ratio of Maximum and Minimum Parking Fee in the City"

Sr. No.	Indicators Data required for calculating the indicator	Remarks
1	Maximum parking fee being charged per 2 hours in the city for public parking	A very high premium is being charged for land in CBD
2	Minimum parking fee being charged per 2 hours in the city for public parking	Free parking rates are not to be counted.
3	Ratio of Maximum to Minimum parking fee	Calculate = [Maximum parking fee being charged per 2 hours in the city for public parking / Minimum parking fee being charged per 2 hours in the city for public parking].

6.3 City-Wide Parking LOS

After collecting the data for each Level of Service (LOS), it needs to be analyzed. For parking service level analysis, a cumulative assessment of the constituent service levels is performed by summing them. Table 5-3 presents the indicators and calculation methods for each service level, while Table 5-4 displays the overall LOS, which is determined by comparing the cumulative LOS, the sum of LOS1 and LOS2 from earlier calculations.

Table 6-3: City-wide Level of Service Parking

LOS	Availability of On-street Paid Public Parking Spaces (%)	Ratio of Maximum and Minimum Parking Fee in the City
1	> =75	> 4
2	50 - 75	2 - 4
3	25 - 50	1 - 2
4	< 25	1

Table 6-4: Calculation of LOS for Availability of Parking

Overall LOS	Calculated LOS	Comments
1	2	Paid parking spaces are available in the city and the demand is well managed by incorporating differential parking rates for the CBD.
2	3 - 4	Paid parking spaces are available in the city and the demand is well managed by incorporating differential parking rates for the CBD. However, some improvements may be required
3	5 - 6	Paid parking spaces provided in the city need to be improved upon and to cater to the demand some differential parking rates for the CBD have been adopted. The city authorities need to imitative considerable improvements measures.
4	7 - 8	The city authorities need to initiate immediate actions with respect to providing paid parking spaces and demand management for parking.
Note: The Level of Service 1 depicts the highest efficient parking level where as Level of Service 4 depicts the minimum parking efficiency level.		

6.4 Reliability of LOS

The reliability level for LOS is to be determined that a LOS holds are to be ascertained when using them. The Table 5-5 shows reliability level for the overall LOS calculated previously.

Table 6-5: Reliability measurement of Level of Service of Parking

Reliability Scale	Description of Method
Lowest level (D)	The parking capacities have been estimated as per the information from secondary source
Intermediate level (C)	Parking capacity is based on information from concerned offices only and no survey has been conducted for validation
Intermediate level (B)	Parking capacity is measured from field surveys only and not verified from concerned offices
Highest level (A)	Parking capacity should be measured by proper field surveys, and marked on maps to scale. Latest data from concerned offices of RTO should be collected.

7 PARKING SIGNAGE

7.1 Parking Signs

The Parking Signs may be used where it is desirable to show the direction to a nearby public parking area. It shall carry the word “P” and a directional arrow. The legend and border shall be white on a blue background. Following signs may be used for parking signs.

- Parking Sign
- Parking Sign with Right Directional Arrow
- Parking Sign with Left Directional Arrow
- Handicapped Parking Sign
- HTV / Truck Parking Sign
- Only Motorcycle Parking Sign
- Taxi Stand Parking Sign
- Rickshaw Parking Sign
- Park and Ride Sign

Figure 7-1: Parking Sign

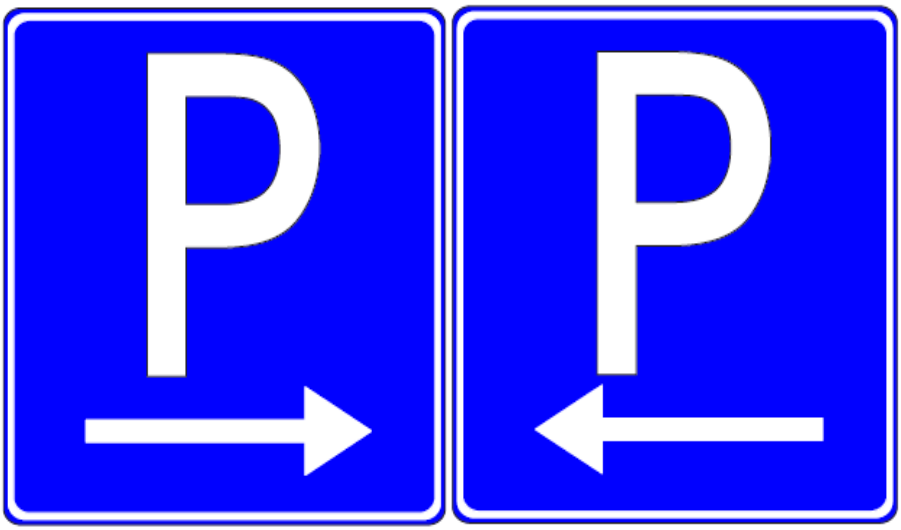


Figure 7-2: Parking Signs with Directional Arrows

Figure 7-3: Handicapped Parking Sing

Figure 7-4: HTV / Truck Parking Sign

Figure 7-5: Only Motorcycle Parking Sign

Figure 7-6: Taxi Stand Parking Sign

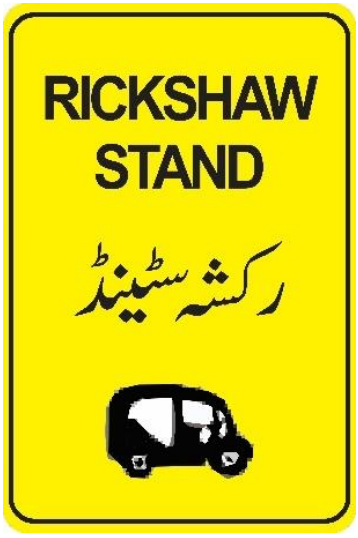


Figure 7-7: Rickshaw Parking Sign

Figure 7-8: Park and Ride Sign

7.2 Parking Prohibition Signs

The Parking Prohibition Sign (PP-1) shall be used to prohibit the parking of vehicles along a given section of the road. A panel shall be mounted below the sign showing an arrow pointing towards the directions to which the sign applies. A single-headed arrow pointing in the direction the regulation is in effect is used if the sign is at the end of a zone, and a double-headed arrow pointing both ways is used if the sign is at an intermediate point in a zone. If the signs are posted facing traffic at an angle of 90 degrees to the curb line they may be included on the sign as an alternate to the arrow. Likewise, a separate plate below the sign may be fixed including legend/ details such as Parking Hours, Parking Time, Parking Days, Emergency Parking Only, etc. Where parking is prohibited during specific hours of the day or permitted with a time limit, two parking signs may be used.

Following Parking Prohibition Signs may be used

- Parking Prohibition Sign
- Direction Specific No Parking Sign
- No Parking in Loading/Unloading Zone
- No Standing Sign
- No Parking near Bus Stop Sign
- Time Specific Parking Prohibition Sign

- Heavy Traffic Vehicle Restriction Sign
- Car Restriction Sign
- Motorcycle Restriction Sign
- Pedestrian Restriction Sign
- Hawkers Stall Restriction Sign
- Hourly Parking Permissions signs

Figure 7-9: Parking Prohibition Sign

Figure 7-10: Direction Specific No Parking in Loading/Unloading Zone

Figure 7-11: No Standing Sign

Figure 7-12: No Parking near Bus Stop Sign

Figure 7-13: Time Specific Parking Prohibition Sign

Figure 7-14: Hourly Parking Permissions signs

Figure 7-15: Heavy Traffic Vehicle Restriction Sign

Figure 7-16: Car Restriction Sign

Figure 7-17: Motorcycle Restriction Sign

Figure 7-18: Pedestrian Restriction Sign

Figure 7-19: Hawkers Stall Restriction Sign

7.3 Disable/Access Parking Sign

The disable/access parking sign may be used to indicate availability of parking space for disable persons. It shall carry the International Symbol of Access (ISA). The legend and border shall be white on a blue background.

Figure 7-20: Disable/Access Parking Sign

7.4 Placement of Parking Signs

Parking signs should be positioned at an angle between 30° and 45° relative to the direction of traffic flow to ensure visibility for approaching drivers. Additionally, suitable panels may be used to clearly indicate that stopping, parking, or leaving any vehicle standing on the paved or travelled portion of the roadway is prohibited.

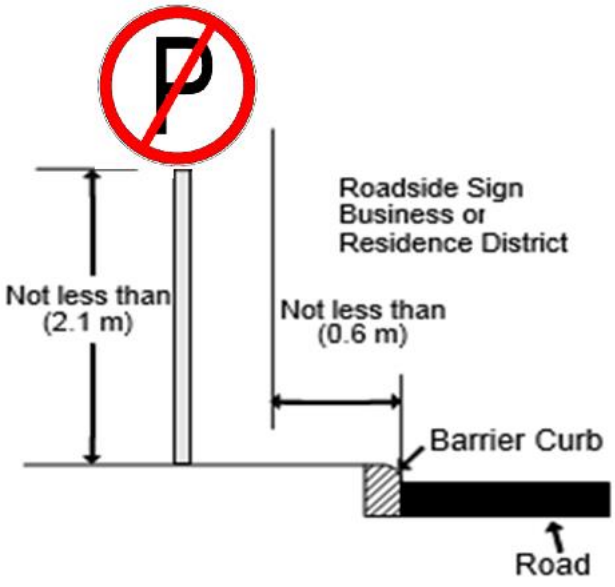


Figure 7-21: Heights and Lateral Locations of Signs for Typical Installations

8 ROAD MARKING FOR PARKING

8.1 Longitudinal Pavement Edge Markings

Longitudinal pavement markings shall conform to the following:

- **White Lines:** used on roadways where there are no parking restrictions.
- **Yellow Lines Delineate:** used on roadways where there are parking restrictions. No vehicle shall be allowed along roads having yellow line markings.
- In case parking is allowed on one side of the carriageway then the left edge line is marked in white color whereas the right edge having parking restrictions is marked with yellow color line.
- A normal longitudinal line shall be 12 cm to 15 cm wide.

Figure 8-1: No Parking Marking

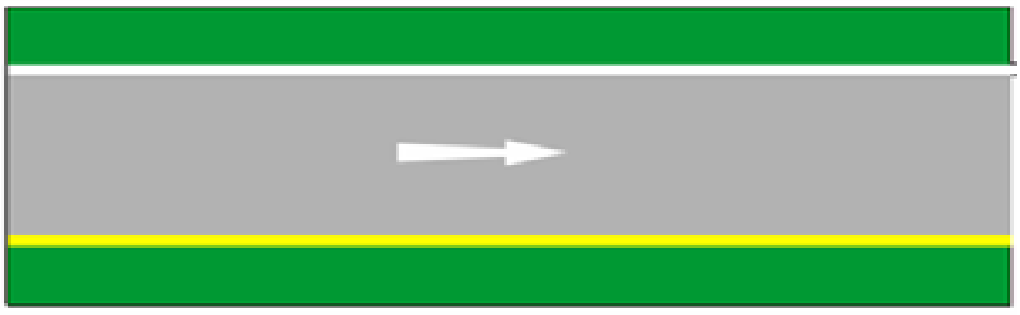


Figure 8-2: Parking Provision Marking

Depending on the maintenance of the edge of the road, a distance of 20 cm shall be maintained between the edges of the pavement to the outer edge of the painted edge line.

8.2 Parking Space Marking

Parking spaces are marked transversely in white colour. The dimensions and areas of parking stalls vary depending on their orientation. Due to the shallow angle at which pavement markings are viewed, transverse lines must be wider than longitudinal lines to prevent distortion at the intersections of symbols or lettering where the two types of lines meet.

9 PAYMENT AND ENFORCEMENT MECHANISM

9.1 Making Payment for Parking

9.1.1 Parking Meter

Parking meters are a straightforward and widely-used method for collecting parking fees. They can be installed on streets or in parking lots, allowing users to make payments for the duration of their parking. These meters can accept online payment bills, and credit or debit cards. Parking meters help ensure that parking spaces are used efficiently and that revenue is collected in a structured manner.

Figure 9.1: Types of Smart Parking Meters

Table 9-1: Typical Specifications of Smart Parking Meter

Specifications	Description
Power Supply	Solar-powered with battery backup, or direct electrical supply
Communication	4G/LTE, Wi-Fi, Bluetooth
Display	High-resolution, weatherproof LCD/LED
Payment Options	Credit/debit cards, contactless payments, mobile payments, cash
Sensors	Vehicle detection sensors
Durability	Weather-resistant, vandal-proof

Software	Remote monitoring, data analytics, and real-time reporting
Operating Temp	-20°C to +70°C
Dimensions	Varies, typically around 40-50 cm wide, 150-200 cm tall
Installation	Surface mount or embedded in-ground
User Interface	Multi-language support, user-friendly touch interface
Integration	Compatible with city parking management systems
Maintenance	Remote diagnostics, easy access for repairs
Security	Encrypted communication, tamper alarms

9.1.2 Payment App

A modern and convenient method for parking payments is through a dedicated mobile app. This app can streamline the payment process, making it easier for users and more efficient for enforcement. With the app, users can locate available parking spaces, make payments, and extend their parking time remotely.

9.1.3 Salient Features of Payment App

9.1.3.1 One Time Log In

Users can log into the app once and stay logged in, reducing the hassle of repeated logins and making the payment process quicker and more user-friendly. This feature enhances user experience by providing a seamless interaction with the app

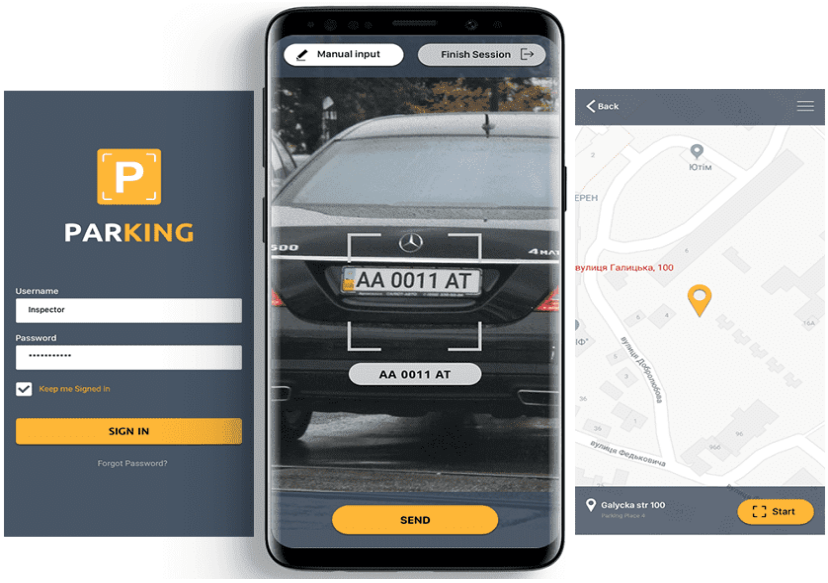


Figure 9-2: App Interface – SignIn/Register

9.1.3.2 Ease of Booking Space

The app allows users to book parking spaces in advance, providing convenience and reducing the time spent searching for parking. This feature is particularly useful in busy urban areas where parking spaces are in high demand.

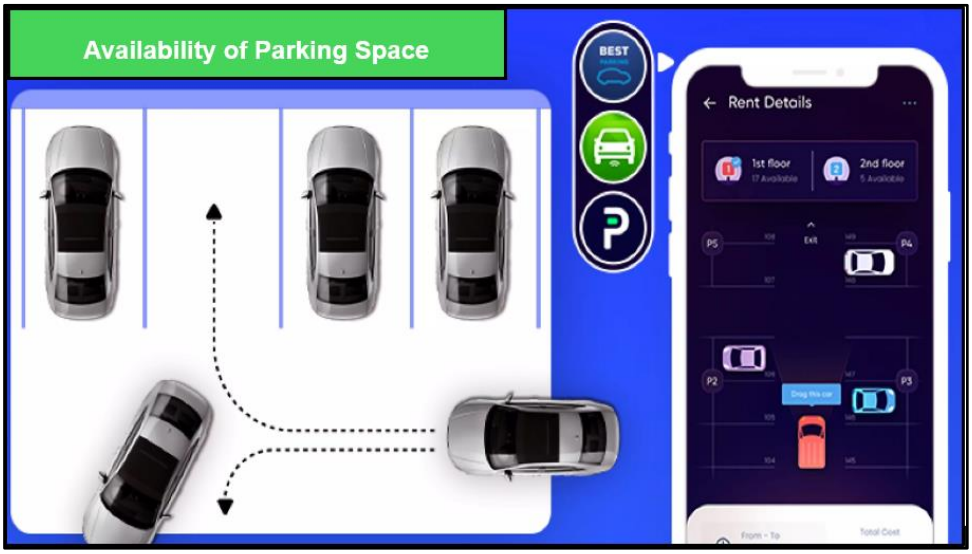


Figure 9-3: App Interface – Locating for Parking Space

9.1.3.3 Multiple Payment Methods

To accommodate different user preferences, the app should support various payment methods, such as credit/debit cards, mobile wallets, and direct bank transfers. Offering

multiple payment options ensures that users can choose the method that is most convenient for them.

Figure 9-4: App Interface – Payment Method

Figure 9-5: Parking Meter – Payment Method

9.1.4 Use of Parking App by Traffic Police

Traffic police can use the parking app to check for compliance, issuing tickets for unpaid parking and ensuring that parking regulations are enforced efficiently. The app can provide real-time data on parked vehicles, helping police quickly identify violators and streamline the enforcement process.

9.1.5 Toll Gates

Toll gates at parking entrances and exits can automatically charge users based on the duration of their stay. These systems can be integrated with payment apps for seamless transactions. Toll gates can help manage traffic flow in and out of parking facilities, ensuring that parking spaces are used effectively and that revenue is collected accurately.

Figure 9-6: Toll Gate Entry Point – Off Street Parking

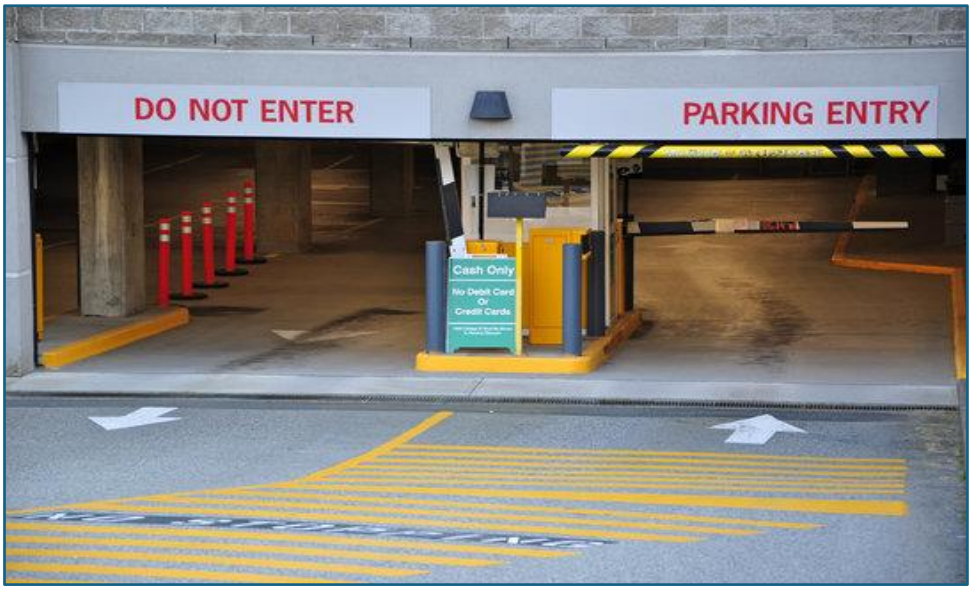


Figure 9-7: Toll Gate Entry and Exit – Underground Parking

9.1.6 Integration of Parking Data

Integrating parking data from various sources, including meters, apps, and toll gates, into a centralized system can enhance monitoring and enforcement. This integration allows for real-time data analysis and better decision-making. By having all parking data in one place, authorities can identify trends, manage demand, and optimize the use of parking resources. Integration also facilitates better communication between different departments involved in parking management.

9.2 Monitoring, Surveillance, and Enforcement

9.2.1 Parking Police

Dedicated parking police can patrol parking areas to ensure compliance with parking regulations, issue fines for violations, and assist with traffic management. Their presence can discourage illegal parking and ensure that parking spaces are used according to the rules.

9.3 CCTV Cameras

Installing CCTV cameras in parking areas can help monitor compliance, violations, and provide evidence for enforcement actions. CCTV footage can be reviewed in case of disputes or to identify repeat offenders. Cameras can also enhance the safety and security of parking areas.

9.3.1 Control Room

A central control room can oversee the entire parking system, using data from parking meters, apps, toll gates, and CCTV cameras to monitor and manage parking in real-time. The control room can coordinate enforcement actions, respond to violations, and ensure that parking resources are used efficiently. It can also provide support to parking police and other personnel in the field.

9.4 Way Forward

9.4.1 Installation of Parking Sensors

Parking sensors can be installed in parking spaces to detect the presence of vehicles. This technology can provide real-time data on parking availability and enhance enforcement by detecting overstays and unauthorized parking. Sensors can help drivers find available spaces quickly, reducing congestion, and enhancing enforcement by detecting overstays and unauthorized parking.

9.4.2 Pre-Booking of Parking Stall

Allowing users to pre-book parking stalls through a mobile app can reduce congestion and improve the efficiency of parking space utilization. Pre-booking ensures that users have a guaranteed parking spot when they arrive, which can be particularly beneficial during peak hours of traffic

9.4.3 Use of RFID Technology

RFID technology can be used for automatic vehicle identification and seamless payment processing at parking facilities, improving the efficiency of revenue collection and enforcement. RFID tags can be placed on vehicles, allowing for quick and accurate identification at entry and exit points.

9.4.4 City Card

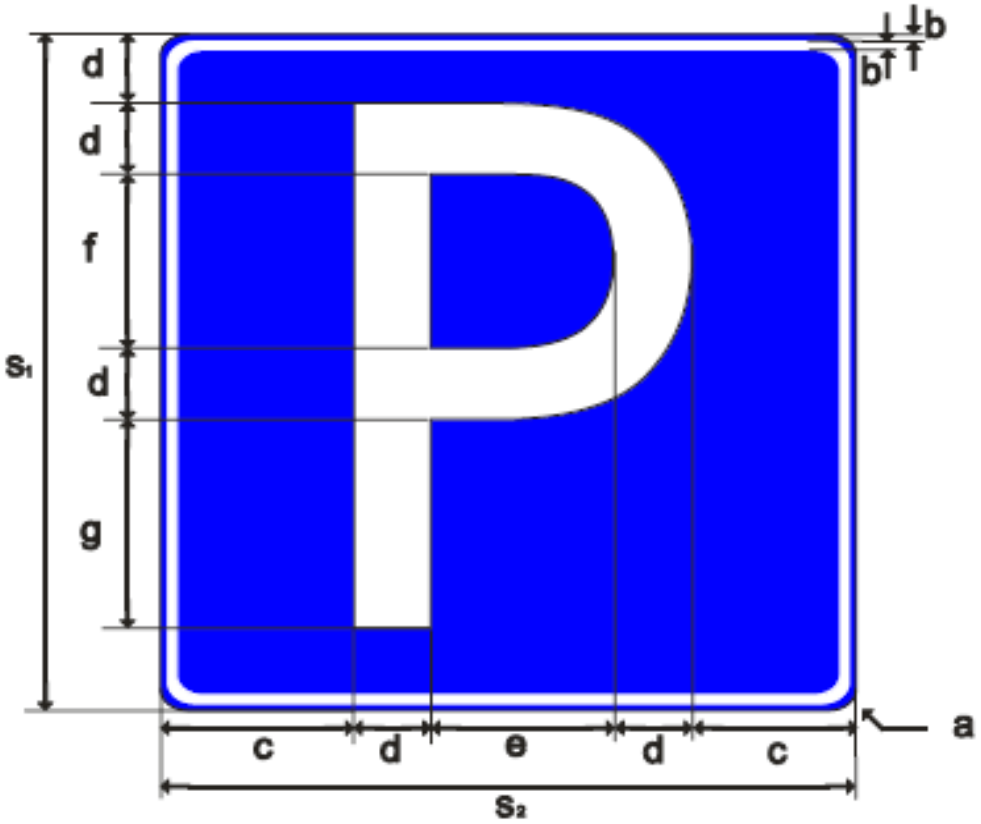
A city card system can be introduced, allowing residents to pay for various services, including parking, using a single card. This integrated approach can simplify payment processes and enhance user convenience. The city card can be linked to a user's account, enabling easy reloads and tracking of expenses. This system can also be used for public transport, making it a versatile tool for urban mobility management

10 BIBLIOGRAPHY

1. Alexander, C. (1987) *A New Theory of Urban Design.* Oxford University Press.
2. Asian Development Bank (2011). “Parking policy in Asian cities.” http://www.adb.org/stes/default/files/parking-policy-asia.pdf
3. Ben Joseph, E. (2012). *Rethinking A Lot: The Design and Culture of Parking.* MIT Press.
4. Bicycle Parking Guidelines, A Set of Recommendations from The Association of Pedestrian And Bicycle Professionals [APBP].
5. Burgess, J. (2008) *A comparative analysis of the Park-and-Ride/transit oriented development tradeoffs.* Massachusetts Institute of Technology – Dept. of Urban Studies and Planning. http://dspace.mit.edu/handle/1721.1/44362
6. Centre for Science and the Environment (2009). “Choc-A-Block: PARKING MEASURES TO ADDRESS MOBILITY CRISIS” Right to Clean Air Campaign.
7. Delhi Development Authority (2013). Parking Policy for Travel Demand Management. www.uttipec.nic.in/writereaddata/linkimages/7460355562.pdf
8. Litman, Todd (2006) *Parking Management Best Practices.* Chicago: American Planning Association.
9. Model Building and Zoning Regulations for Development Authorities in Punjab, July 2007.
10. Parking Areas, Landscape design Guide, USAF.
11. Parking Lot Design Standards, Campus Design Guidelines and Standards (Section 09), University of Houston.
12. Parking Standards, the planning service, An agency within in the department of the environment, United Kingdom.
13. Punjab Geometric Design Manual – The Urban Policy and Management Services Unit Pvt Ltd, 2012
14. Punjab- Traffic and Transport Manual, – The Urban Policy and Management Services Unit Pvt Ltd, 2008.

Appendix

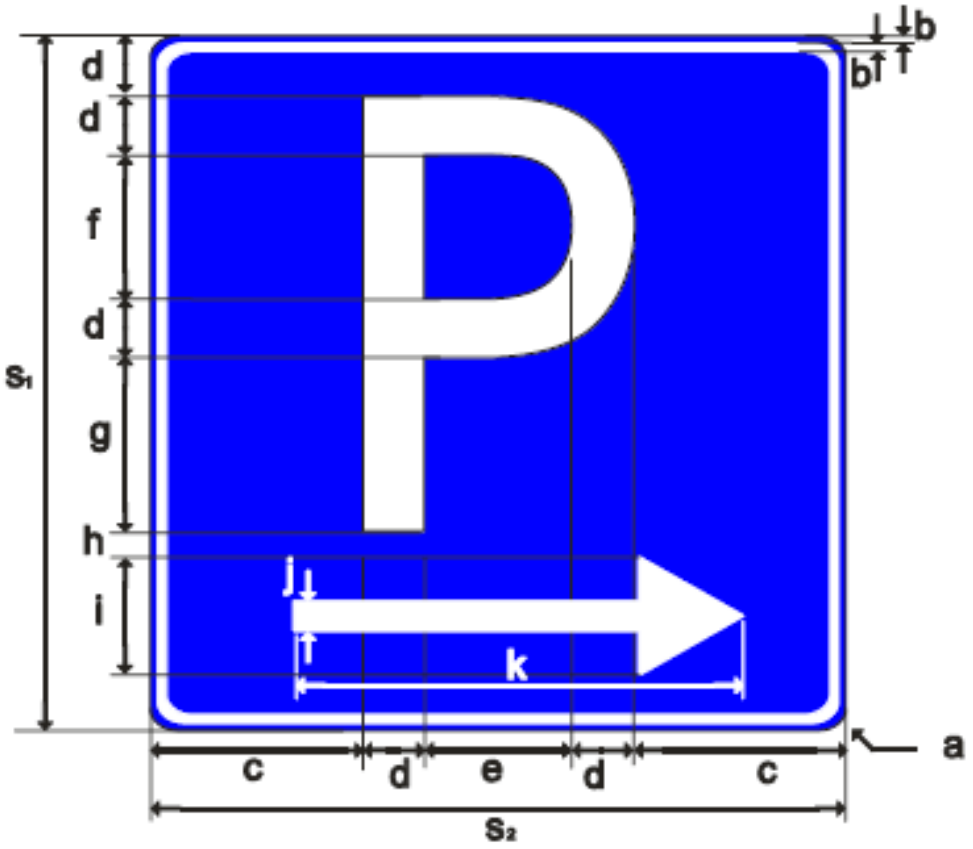
Parking Sign



Legend Dimension (cm)

Parts	Sign Size		
S1 x S2	**60 x 60**	**90 x 90**	**120 x 120**
a	3.0	4.5	6.0
b	1.2	1.8	2.4
c	15.0	22.5	30.0
d	6.5	9.8	13.0
e	17.0	25.5	34.0
f	14.5	21.8	29.0
g	20.0	30.0	40.0

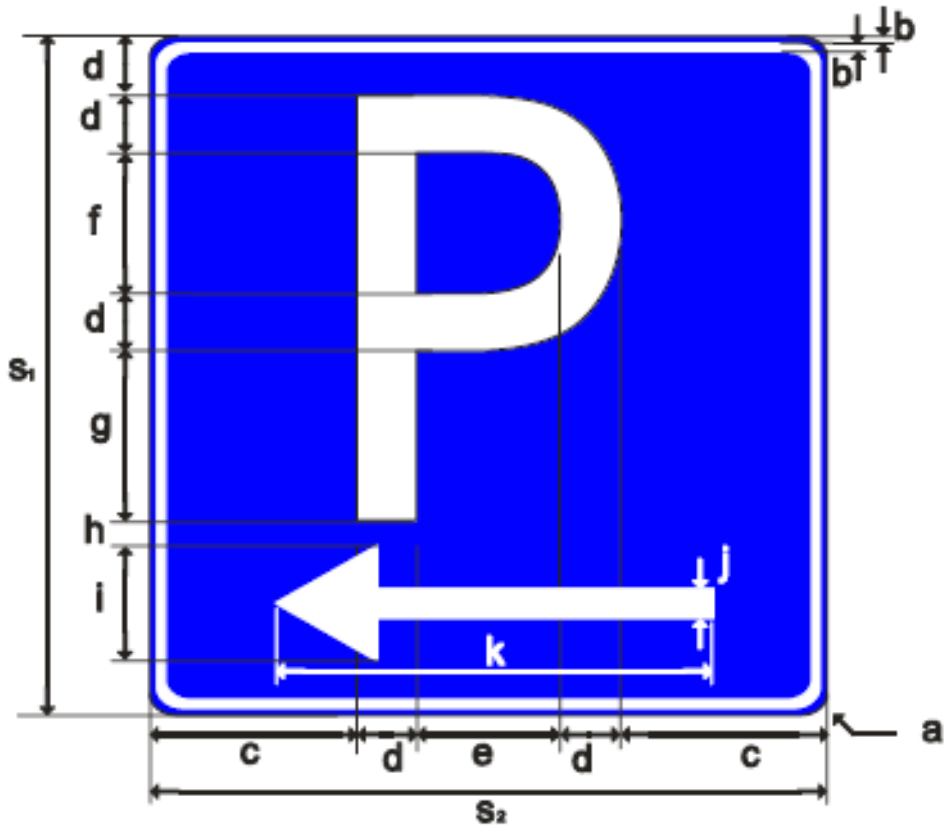
Parking Sign with Right Directional Arrow



Legend Dimension (cm)

Parts	Sign Size		
S1 x S2	**60 x 60**	**90 x 90**	**120 x 120**
a	3.0	4.5	6.0
b	1.2	1.8	2.4
c	18.2	27.4	36.4
d	5.4	8.0	10.8
e	12.7	19.1	25.4
f	12.5	18.7	25.0
g	15.0	22.4	30.0
h	3.4	5.1	6.8
i	10.1	15.2	20.2
j	2.5	3.8	5.0
k	38.4	57.6	76.8

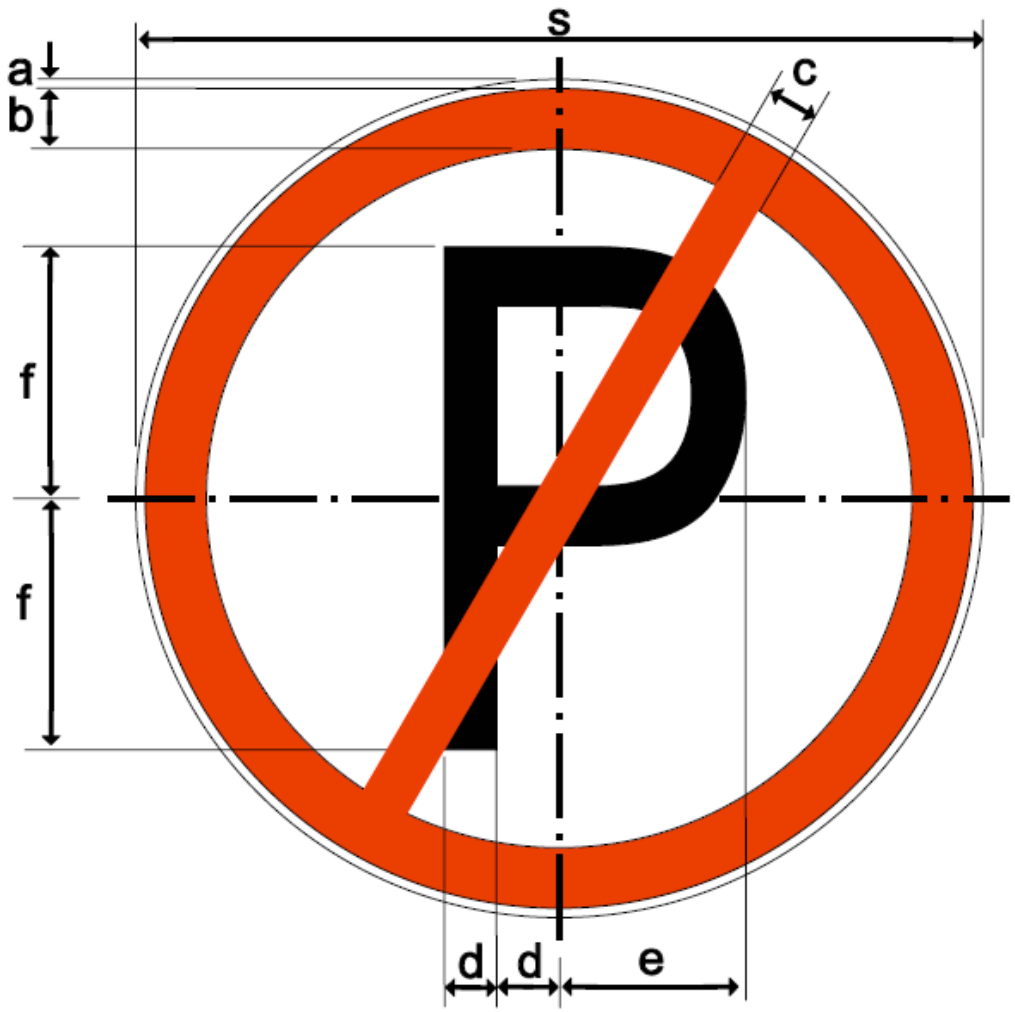
Parking Sign with Left Directional Arrow



Legend Dimension (cm)

Parts	Sign Size		
S1 x S2	**60 x 60**	**90 x 90**	**120 x 120**
a	3.0	4.5	6.0
b	1.2	1.8	2.4
c	18.2	27.4	36.4
d	5.4	8.0	10.8
e	12.7	19.1	25.4
f	12.5	18.7	25.0
g	15.0	22.4	30.0
h	3.4	5.1	6.8
i	10.1	15.2	20.2
j	2.5	3.8	5.0
k	38.4	57.6	76.8

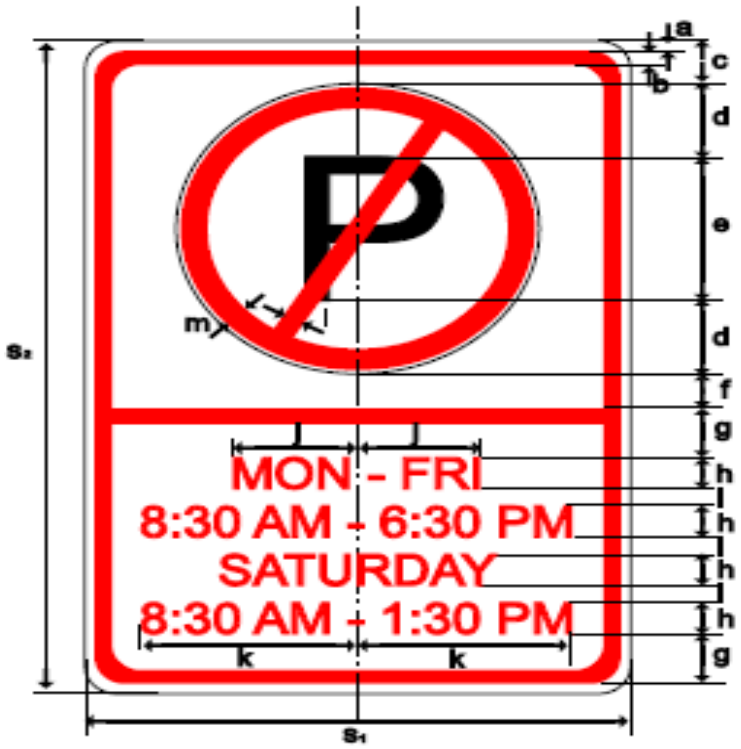
Parking Prohibition Sign



Legend Dimension (cm)

Parts	Sign Size		
S	**70 cm**	**90 cm**	**120 cm**
a	0.8	1.0	1.3
b	5.4	6.5	8.7
c	4.6	5.5	7.3
d	6.7	8.0	10.7
e	13.3	16.0	21.3
f	22.5	27.0	36.0

Time-Specific Parking Prohibition Sign



Legend Dimension (cm)

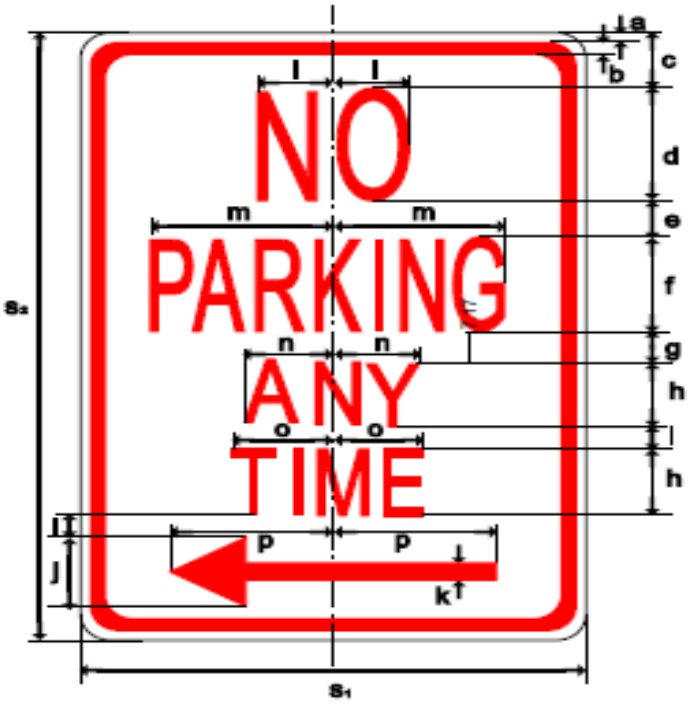
Parts	Sign Size		
S1 X S2	**30 x 45**	**60 x 90**	**90 x 135**
a	0.7	1.4	2.1
b	1.0	2.0	3.0
c	2.9	5.8	8.7
d	5.1	10.2	15.3
e	9.9	19.8	29.6
f	2.4	4.7	7.0
g	3.4	6.8	10.1
h	2.2	4.3	6.5
i	1.2	2.3	3.5
j	6.8	13.7	20.5
k	11.9	23.9	35.8
l	1.2	2.5	3.8
m	1.3	3.0	4.6

Time Specific Parking Prohibition Sign

Legend Dimension (cm)

Parts	Sign Size		
S1 X S2	**30 x 45**	**60 x 90**	**90 x 135**
a	0.7	1.4	2.1
b	1.0	2.0	3.0
c	4.1	8.2	12.2
d	7.1	14.2	20.2
e	2.9	5.8	8.7
f	6.7	13.5	20.3
g	3.2	6.5	9.5
h	4.1	9.3	13.4
i	1.7	3.4	5.1
j	5.1	10.1	15.2
k	1.3	2.5	3.8
l	4.5	8.9	13.4
m	10.8	21.1	32.5
n	7.3	14.7	22.1

Time Specific Parking Prohibition Sign



Legend Dimension (cm)

Parts	Sign Size		
S1 X S2	**30 x 45**	**60 x 90**	**90 x 135**
a	0.7	1.4	2.1
b	1.0	2.0	3.0
c	4.1	8.2	12.2
d	7.1	14.2	20.2
e	2.9	5.8	8.7
f	6.7	13.5	20.3
g	2.4	4.8	7.2
h	5.0	10.0	15.0
i	1.6	3.2	4.8
j	5.1	10.1	15.2
k	1.3	2.5	3.8
l	4.5	8.9	13.4
m	10.8	21.1	32.5
n	5.3	10.5	15.7
o	5.7	11.3	17.9
p	9.6	19.2	28.8