**Summary of provisions for on-street parking**

* + - 1. **Executive summary**

This study reviews the selection criteria and design practices for on-street parking sites according to guidelines and design handbooks issued by governmental (e.g., Indian Roads Congress (IRC)) and non-governmental agencies (e.g., Institute for Transportation and Development Policy (ITDP)). The summarized guidelines and design principles have been arranged in a top-down approach as selection of streets, exclusion of locations based on street features, design of site and design of spot. Quantifiable design and classification criteria have been highlighted throughout each section. Section specific criteria have been tabulated. Various gaps in the current codal provisions have been identified based on lack of quantifiability, specificity of guidelines, applicability, and verifiability. Finally, please note that these codal provisions have not been evaluated for the consistency of recommendations with findings with the academic literature, which will be reviewed as part of the next steps.

* + - 1. **Definitions**

In this study, we shall review the guidelines pertaining to parking activity on Indian streets as per publications from IRC (and ITDP).

The various terms used in this study are defined as follows:

* **Parking activity:** Parking is an act of stopping and disengaging a vehicle and leaving it unoccupied. (IRC: SP:12-2015 2.1)
* **OSP: On-street Parking:** Parking on road/street generally in Urban Local
* Bodies limits.
* **CW: Carriageway width:** Space on the road available for the traffic to traverse.
* **ULB: Urban Local Body:** The governmental body which is the local decision-making body for the specific city or town. E.g. Mahanagar Nigam, Nagar Palika and so on.

Moreover, we shall use the terms ‘restricted’ in the manner that *X* is restricted if;

* *X* is generally not permitted to occur in situation *Y*.
* In certain clearly defined sub-cases of *Y, X* is allowed to occur.
  + - 1. **Classification of roads/streets used:**

For this study, the expressways, and streets for non-motorized transport (NMT), such as cycle lanes, have been excluded due to their relevance to the jurisdictions of interest within the Kanpur Smart City study. With that, let us define and characterize the permissibility of OSPs on the 4 categories of roads.

*Arterial Road:*

* A general term denoting a road/street primarily for through traffic, usually on a continuous route,
* facilitating mobility across the city.
* It typically connects to long distance destinations within/outside the city and provides safe NMT facilities.
* Features: (IRC:86-2018 table 4.1)
* Land width of 45-60 m for plain terrain.
* Design speed limits of 60 kmph (plain terrain).
* Parking activities are restricted, except in case of the presence of a suitable service lane. [2, 4, 5]
* OSP is restricted if carriageway width is less than 7.25 m.
* For example, for a 4-lane road, the total carriageway may not be less than 14.5 m for OSP to be permitted [3]. (>14 m as recommended by IRC:86).
  + 1. *Sub-Arterial Road:*
* offers a somewhat lower level of traffic mobility than the arterial road.
* These are larger ‘collector streets’ meant for movement through neighborhoods and to connect to arterial roads.
* Features:
* Land width of 30-45 m (plain terrain).
* Design speed limits of 60 kmph.
* OSP is restricted if CW is less than 7.5 m. [3]
* Hence for a 4-lane road, A total CW of 15 m will be required for OSP to be permitted. (>14 as per IRC:86)
  + 1. *Collector Street:*
* A street for collecting and distributing traffic from and to local streets and also for providing access to arterial/sub arterial roads.
* Features:
* Land width of 15-30 m (plain terrain).
* Design speed limits of 40 kmph.
* OSP can be provided [4, 5] requiring that CW exceeds 5.5 m. [3]
* Hence for a four-lane collector street, total required CW shall be 11 m (<14 m design CW). Hence OSP is generally permissible.
  + 1. *Local Street:*
* A street primarily for access to residence, business, or other abutting property.
* Its primary function shall be for local activities and access to properties and not through movement of traffic.
* Features:

- Land width of 10-15 m (plain terrain).

- Design speed limits of 30 kmph.

* OSP can be provided [4, 5] preferably in a staggered manner [2].
* OSP may be provided on one side when the CW exceeds 5.5 m and may be provided on both sides if CW exceeds 10.5 m. [3]
* Hence, considering a total land-width of 15 m, and a 2-lane local street, since required CW is 5.5 m (<7 m, design CW), A leeway of 3.5 m shall exist for OSP for single side, and CW has been designed to be 10.5 or greater (widened lanes), OSP can be provided on both sides, with a width of 2.25 m.

In summary, the features of the road categories are provided for brevity.

**Table 1** Classification and restrictions for the presence of OSPs on street functional classes.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Type of street** | **Design Speed (Plains)** | **Land-**  **width (m)** | **Required CW (as calculated for 4-lane) (m)** | **Design CWs (as for 4-lane road)** | **Presence of OSP** |
| **Arterial** | **60** | 45-60 | 14.5 | 14 | **Restricted** |
| **Sub-arterial** | **60** | 30-45 | 15 | 14 | **Restricted** |
| **Collector** | **40** | 15-30 | 11 | 14 | **Allowed** |
| **Local** | **30** | 10-15 | (See details) | (See details) | **Allowed** |

In conclusion, OSPs are generally restricted on streets that feature high speed and high-volume traffic.

1. **Other restrictions for placing OSPs**

In addition to this, presence of certain features on the street can also make the presence of OSPs prohibited for that specific section of the street. Such features are:

1. Intersections:

* Prohibit parking for a distance of about 50 m [3]/ 75 m [1] on the approaches to a major intersection.
* Parking should not be provided within 50m from the intersection on collector streets and 10m from the intersection on local streets. [4]

1. Bus stops: No parking within at least 10 m in either direction [1], or within 5m [2].
2. Pedestrian crossing - No parking within 6m in either direction [1], within 5m [2] or within 8m from it. [3]
3. In front of the entrance of a building, entrance driveways [2, 3].
4. On, within or under bridges, tunnels, and underpasses [2, 3].
5. Narrow Streets: prohibit parking on two-way streets with less than 5.75 m width & one-way streets less than 4 m width.
6. Designated roads during peak hours [3]

Furthermore, there are certain street features that are prone to illegal and/or unmanaged parking activity. These are:

* Sidewalks
* Roads designated as non-motorized transport-only zones, and greenways [2]
* Roads widened for increasing capacity by acquiring land & structures [3]

The ULB should strictly enforce the rules and regulations with regard to parking policy to curb such activity to increase mobility and as well as make designated parking spaces the sole sites for parking activity.

1. **Site-specific design considerations**

Once ULB decides a site for OSP based on the demand considerations and restrictions in conjunction with the traffic police, the next set of considerations are based on the design aspects of the parking site itself. A parking site can be of two types: On street and off street. For this review, we have restricted our discussion to the on-street parking mode.

An on-street parking site is also called a parking bay. A parking bay consists of parking spots that can be arranged in different ways based on the design requirements of the site. The type of parking bays can be broadly classified based on positioning of the vehicles in the bay:

* *Parallel parking***:** Parking the vehicle in line with other vehicles parallel to the curb, front bumper to rear bumper.
* *Perpendicular parking:* Parking the vehicle side by side, perpendicular to the curb.
* *Angle parking:* Angle parking is similar to perpendicular parking, except the vehicles are aligned in an angle.

There is additional design suggestions put forth that significantly increase mobility, safety, and user comfort like:

* *Discontinuous design* to avoid through driving, interruptions by bulb-outs, tree pits/other street amenities are preferred [2, 4]
* Parking bays should be located along the curb so as to protect cycle tracks from high-speed vehicular traffic. In such cases, a buffer of 0.5 m must be provided between cycle tracks and the parking to ensure vehicular overhangs do not affect movement. [2, 5]
* Parking bays should not have guard rails or other features that might prevent direct access to footpaths from parking slots or the street. [2]
* Furthermore, a parking spot must be clearly defined through physical signage/barriers etc. i.e. curbs, paving and road markings to avoid haphazard parking. [2. 4]
* Appropriate parking signages, perpendicular to direction of travel of vehicles for visibility [5], giving information on timings, vehicle type parking and price should be provided. [4]
* It is recommended space be allocated for pedestrians, cyclists, trees, and street vending before parking is allocated. [2]
* Parking for cycles is generally provided as an integrated feature of the sidewalk or along designated NMT lanes. Moreover, given the goal of increasing non-motorized traffic, cycle parking is not monitored and monetized.
* The area allotted for parking should have a clean and leveled surface, free from water logging with proper drain facilities. [5]

**Table 2** Summary of spot design

|  |  |  |
| --- | --- | --- |
| **Vehicle** | **Spot size/dimensions (m^2)** | **Preferred orientation** |
| **Car/taxis** | 5x2.5 [1], 2x6 [4], 2x5 [5] | Parallel |
| **Two-wheelers** | 1x2.5 [1], 2x1 [4, 5] | Perpendicular  [4] On narrow streets, angular orientation may be preferred. |
| **Auto rickshaw, e-rickshaw, and cycle rickshaw** | 1.5x3 [4] | - |

1. **Gaps in codal provisions**
2. Quantifiable location considerations (such as traffic, adjoining land use, estimated peak demand, parking spot turnover, monetizability, among others) haven’t been described satisfactorily.
3. Pricing practices: To the extent of the referenced documents, pricing has been acknowledged as a tool to influence parking demand, there are no quantifiable policies put forth/ backed by data.
4. Monitoring practices are not covered within the codal provisions discussed in the literature.

To address the gaps identified above, the academic literature as well as other best practices in on-street parking deployment will be reviewed.

1. **Clarifications requested from KSCL**

* Are there any specific guidelines and procedures that KSCL follows when identifying and designing on-street parking spots?

1. **References**

[1]: On-street parking handout, ITDP India

[2]: Guidelines on regulation and control of mixed traffic in urban areas (first edition), IRC 2017

[3]: Guidelines for parking facilities in urban areas (IRC\_SP\_12-2015), IRC 2015

[4]: IRC:103 - Guidelines for Pedestrian Facilities (Draft), IRC

[5]: Complete Street Design workbook, ITDP India, MoHUa, Smart city Initiative India.