



CITY LEVEL PROJECTS

Design Manual for

# Street Elements And Amenities

in Delhi





## **Delhi Urban Art Commission**

The Delhi Urban Art Commission was set up by an Act of Parliament in 1973 to “advise the Government of India in the matter of preserving, developing and maintaining the aesthetic quality of urban and environmental design within Delhi and to provide advice and guidance to any local body in respect of any project of building operations or engineering operations or any development proposal which affects or is likely to affect the skyline or the aesthetic quality of the surroundings or any public amenity provided therein”.



सत्यमेव जयते

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### Organisations / Others

Ministry of Urban Development  
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East Delhi Municipal Corporation  
South Delhi Municipal Corporation  
New Delhi Municipal Council  
Geospatial Delhi Limited  
Delhi Metro Rail Corporation  
Delhi Urban Shelter Improvement Board  
BSES Rajdhani Power Limited  
BSES Yamuna Power Limited  
RWA's and Area Councillors  
Google Earth

## Preface



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The city of Delhi, capital of this vast land of diversities, is a city laden with layers of history, a place where civilizations have lived, prospered and perished over centuries. The modern city today, built over and around a rich tapestry of heritage, presents an opportunity at every turn, to allow for co-existence of the past, present and the future. In order to understand this multidimensional urban spectrum and attempt to plan the future, various city level studies have been initiated by the DUAC. I hope that these studies will help the planners of modern day Delhi to carefully articulate urban space, structure, form and environment and sensitively address future requirements.

I convey my thanks to all the Consultants and Members of the Commission who have tirelessly worked on this research project to bring out this document. I also take this opportunity to place on record my sincere appreciation of the efforts of Secretary and other staff of DUAC for providing the necessary administrative support to make this happen.

I fondly hope that the authorities of the local, state and national government take these studies seriously and implement, in right earnest, the suggestions given herein.

December, 2020

**Prof. Dr. P.S.N. Rao**  
Chairman  
Delhi Urban Art Commission

## Foreword



The Design Manual for Street Elements and Amenities has been prepared in response to the recommendations of the Master Plan of Delhi-2021 concerning various aspects of mobility on the streets of Delhi and making streets inclusive for all sections of users.

It is based upon selected data that is specific to street elements and amenities from a diverse set of Indian and International street design standards.

The manual includes a comprehensive list of 26 street elements and amenities categorised broadly under six sections, along with suggested design variations suitable to the local context.

The formulation of this manual involves documenting current practices including those of Indian Standards for Street Design from UTTIPEC, Indian Road Congress, ITDP, BIS etc. It highlights the best practices from around the world.

The document would serve as guide to various organisations including the municipalities and planners/designers to design the streets as 'Complete streets' and not a piecemeal attempt with little co-ordination between various agencies. Also, the maintenance of the designed amenities plays a significant role as the upkeep of the public amenities decides the quality of our streets.

December, 2020

**Samir Mathur**  
Member, DUAC

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2. Garbage Bins	22	7. Transit-Shelter	32	10. Displays	38
3. Cycle Rack	24	8. Sound Barrier	34		
4. Street Lights	26				
5. Water ATM	28				

<b>Regulative</b>	<b>40</b>	<b>Landscape</b>	<b>51</b>	<b>Services</b>	<b>59</b>
11. Guardrail	41	17. Horticulture	52	22. Manhole Cover	60
12. Traffic Signal	42	18. Paving	54	23. Drain Grate	61
13. Crosswalk	44	19. Tree Grate	56	24. Electrical Services	61
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## PART A

### 1 Introduction

1.1	Vision
1.2	Objectives
1.3	Methodology
1.4	Existing Standards

## 1.1 Vision - 'Complete Streets for All'

A comprehensive guide containing design specifications for all street elements and amenities that contribute in the design of 'Complete Streets'. It will provide the minimum standards necessary for the installation of street furniture along with a palette of suitable possibilities, that can be referred while designing streets in Delhi.

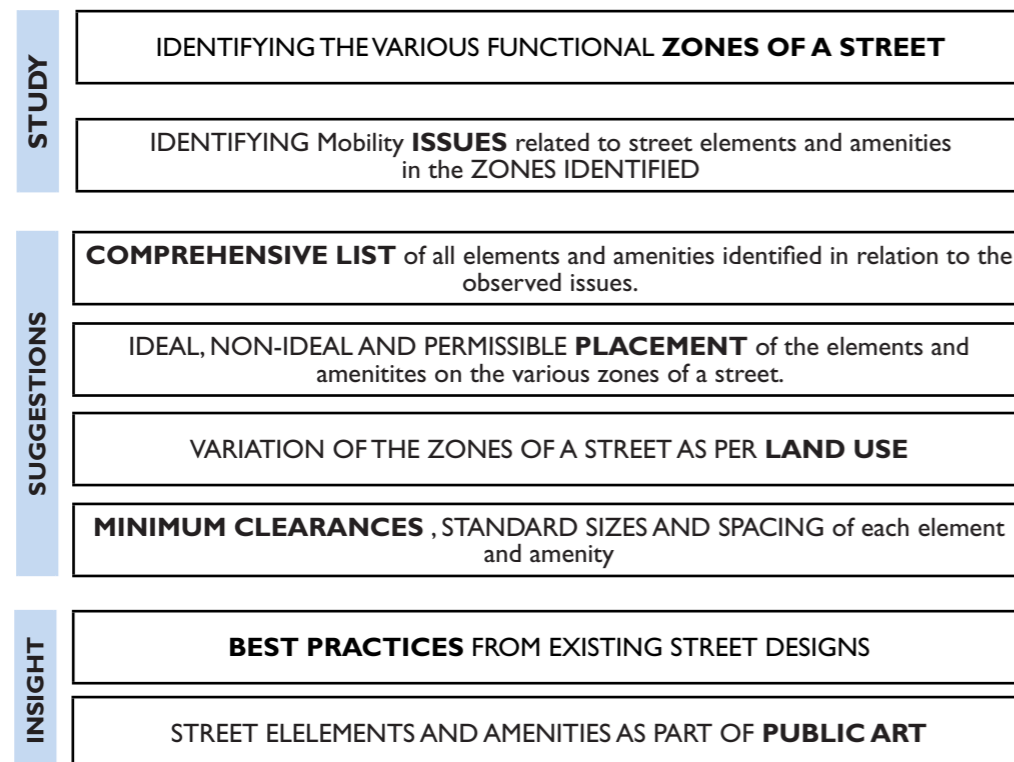
This document is a collation of data from various relevant sources to formulate a manual for the design of 'Complete Streets'.

## 1.2 Objectives - Elevate the on-street user experience

- i. Elevate the on-street user experience in Delhi.
- ii. To aid the design of streets of Delhi to ensure :



## 1.3 Methodology



## 1.4 Existing Norms and Standards

### MASTER PLAN OF DELHI 2021

#### 3.3.2 Policy for Redevelopment Schemes

- vii The standards of housing density, minimum width of roads and community facilities can be relaxed, wherever justified, by planning considerations (e.g. pedestrianization of the area).
- xi The circulation pattern should include segregation of pedestrian and vehicular traffic, entry control, access of emergency vehicles to every block, provision of adequate parking etc.

#### 11. Urban Design

- iv) Policy on unhindered access movement, parking and pedestrian realm.
- vii) Policy for design of pedestrian realm.

#### 11.6.1 Street Furniture & Signage

Street furniture and signage should be designed sensitively considering the land use, intensity of activity and other identified design districts. Their design must also reflect respect to pedestrians and differently abled persons.

#### 11.6.2 Road Signage & Safety

- i. Provision of adequate pedestrian facilities.
- ii. Removal of encroachments from footpaths.
- iii. Improvement in accident handling and reporting.

#### 11.7 Pedestrian Friendly City

Major work centres, where large number of pedestrian networks emerge and culminate, should have enhanced facilities for the pedestrians. This will lead to more sensitive and intricate design of street furniture, making major image able components part of daily urban experience.

#### 12.4.2 Transit Oriented Development Principles

- i. Pedestrian & Non-Motorized Transport (NMT) Friendly Environment
- iii. Multi-Modal Interchange  
Prioritize pedestrians, public transport, IPT and NMT modes over private modes in design and management of urban spaces.

### INDIAN ROAD CONGRESS

#### IRC 103- 2012 Guidelines For Pedestrian Facilities

5.2 Pedestrian Level of Service indicates the environmental qualities of a pedestrian's space and serves as a guide for development of standards for pedestrian facilities. Within the pedestrian LOS definition, 6 levels of service can be expressed.

LOS A	<b>Ideal</b> - minimal discomfort
LOS B	<b>Acceptable</b> - reasonable comfort
LOS C	<b>Basic</b> - safety and comfort
LOS D	<b>Poor</b>
LOS E	<b>Unsuitable</b>
LOS F	<b>Restricted</b>

#### Annexure I

Table 1.2 Pedestrian LOS at Road Crossing

LOS	Wait time in seconds
A	<3
B	>3 and 13≤
C	>13 and 38≤
D	>38 and 64≤
E	>64 and 90≤
F	≥90

### NATIONAL BUILDING CODE

#### 4. Means of Access

Table 3 : Requirement of Footpath as per Land Use

Description	Width (m)
Minimum free walkway width and residential/mixed use areas	1.8
Commercial / Mixed Use areas	2.5
Shopping Frontages	3.5 to 4.5
Bus Stops	3
High Intensity commercial areas	4

Table 2 : Capacity of Footpath & Design

Walkway Width (m)	Design flow in number of persons/hour in both directions	
	LOS B	LOS C
1.8	1350	1890
2	1800	2520
2.5	2250	3150
3	2700	3780
3.5	3150	4410
4.0	3600	5040

## 2.1 To read the Manual

**1 IDENTIFY** the street element/amenity (e/a) that is absent or dysfunctional, in the comprehensive list of street elements and amenities provided in Section 2.2

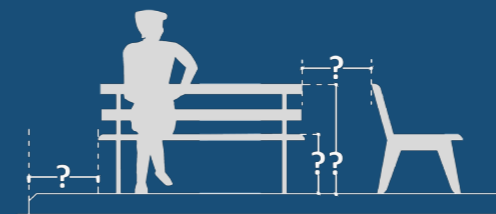
**2 LOCATE** the appropriate zone for the particular e/a in Section 3.1 & 3.2

Place the e/a in the ideal or alternate location (incase of space constraints) as per the placement matrix provided in Section 4.1

Furniture / Element		Legend	
ZONES OF A STREET	Frontage	☞	<b>Preferred</b> Ideal Location
	Pedestrian Throughway	☐	
	MUZ / Furnishing	○	<b>Conditional</b> Alternate location if adequate space is unavailable.
	Edge	☐	
	NMV	☐	
	Treepit / Divider	☞	<b>Not Preferred</b> Not to be placed
	Vehicular Throughway	☞	
	Median	☐	
	Traffic Islands	☐	

**3 SELECT** the appropriate design of the e/a as per suitability

Section 4.2



Design specifications for each element/amenity has been collated in the given format.

1	Placement
2	Minimum Clearances
3	Applicability
4	Design Variation
5	Best Practices
6	Public Art

**Note :**

- i. Public Art and Design Variation has been eliminated where inapplicable
- ii. Design Variation and Functional variation is not restricted to the number options enlisted.

### PART B

## 2 Elements and Amenities

- 2.1 How to read this Manual
- 2.2 List of all Street Elements and Amenities
- 2.3 Categorisation of list of street elements and amenities based on function

## 2.2 COMPREHENSIVE LIST OF STREET ELEMENT/AMENITIES

Following is the list of all objects that occur on the streets of Delhi. These element have been broadly categories under 6 sections based on the function of the individual element/amenity.

1. Seating
2. Garbage Bin
3. Street Lights
4. Cycle Rack
5. Water ATM
6. Public Toilet
7. Transit Shelter
8. Noise Barrier
9. Signage
10. Display
11. Guardrail
12. Traffic Signal
13. Crosswalk
14. Bollard
15. Road Indicator
16. Kerb
17. Horticulture
18. Paving
19. Tree Grate
20. Tree Guard
21. Bio-Swales
22. Manhole Cover
23. Drain Grate
24. Dhalaos
25. Electrical Services
26. Smart Pole

**Limitation :**

The list is limited to elements and amenities that occur on-grade and above grade on the streets. Utilities / services that occur below ground have been excluded in this manual.



## 2.3 Categorisation of Street Amenities / Elements

**FURNISHING** : Objects not requiring additional services to function



Seating



Water ATM



Garbage Bin



Cycle Rack



Street Light

**BUILT** : Facilities that are constructed on the site as per availability of space and suitable material



Public Toilet



Transit Shelter



Noise Barrier

**INFORMATIVE** : Objects that convey messages / warnings / notices / distances / directions / maps etc.



Advertisement



Wayfinding



Directive

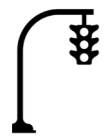


Communicative



Warning

**REGULATIVE** : Objects to control / calm / direct pedestrian and motorised traffic



Traffic Signal



Crosswalk



Kerb



Guardrail



Road Indicator



Bollard

**LANDSCAPE** : Vegetation ; Hard and soft landscaping



Tree



Bio-Swale



Shrubs



Groundcover



Paving

**SERVICES** : Elements that are part of the service/ utility network that occur on the streets



Electrical Poles



Drain Grate



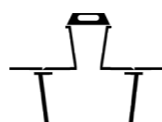
Manhole Cover



Feeder Pillar



Smart Pole



Dhalao (underground)

PART B

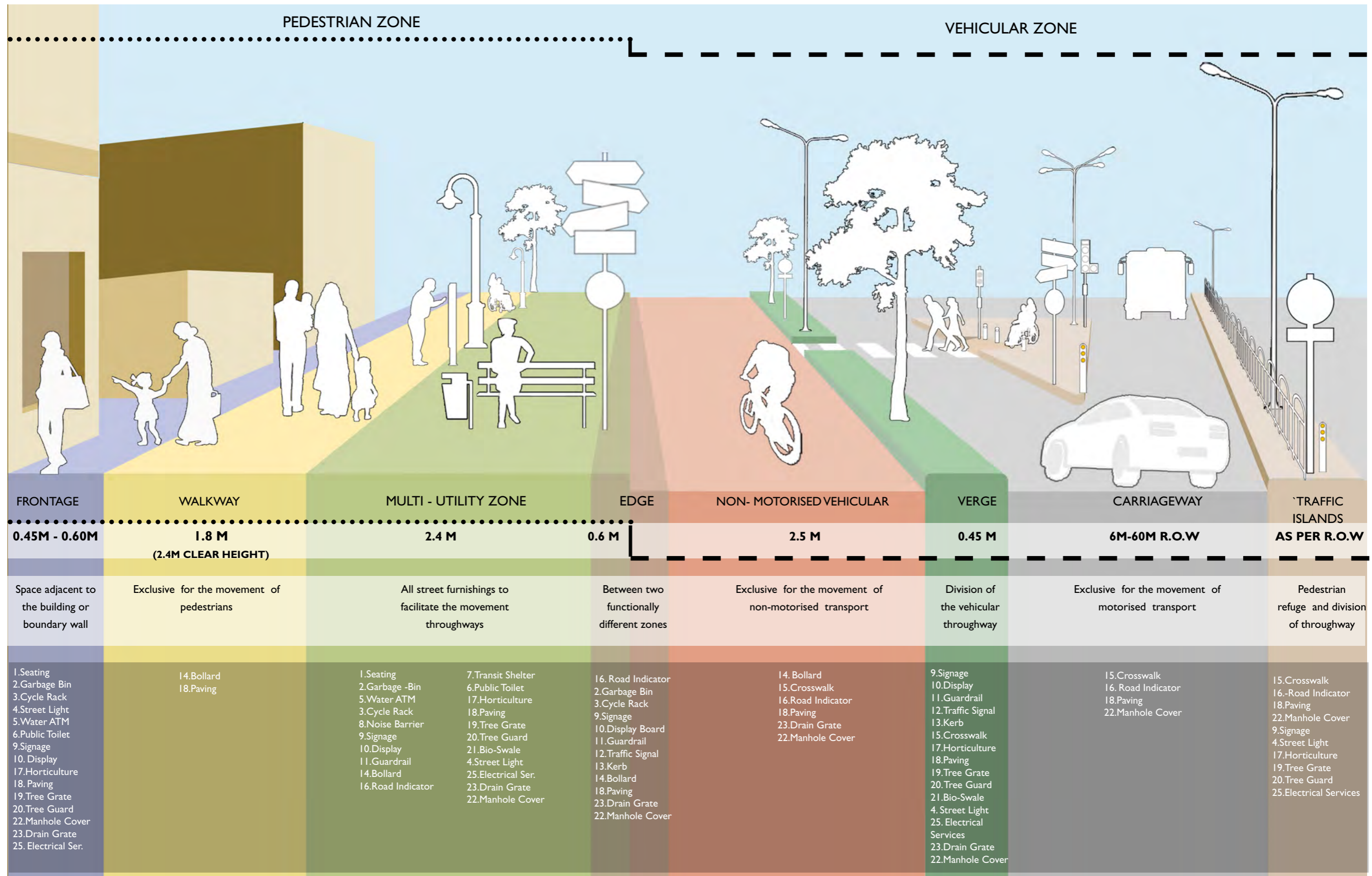
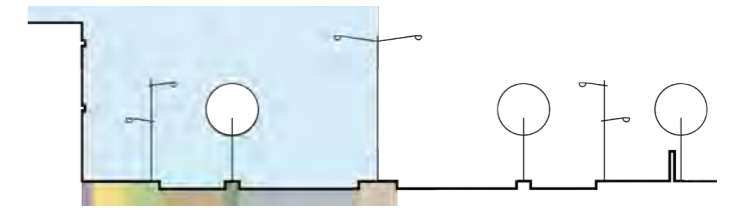
### 3 Zones of A Street

3.1 Typical Street Section : Definition & Standards

3.2 Variation as per land use

3.3 Current practices / issues

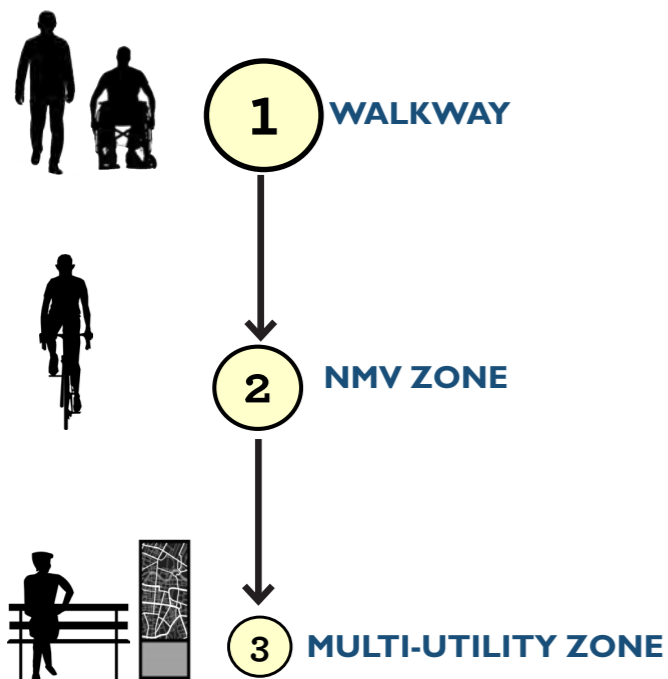
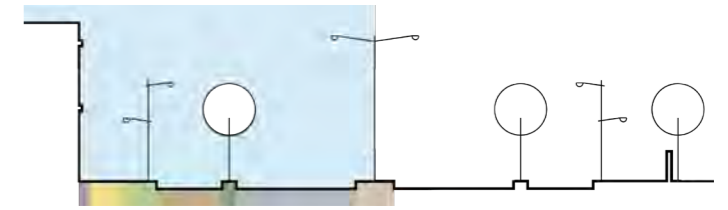
### 3.1 Typical Street Section : Definition and Standards



### 3.1.1 Prioritising the PEDESTRIAN ZONES

The convenience & safety of the pedestrian is of paramount importance while designing complete streets. The Pedestrian walkway width of minimum 1.8m should be maintained before accomodating any other zone. In case of space constraints for a Multi-Utility zone, some of the amenities can be accomodated in the Frontage which is a non-active i.e adjacent to a boundary wall.

**Amenities or facilities should not obstruct or reduce the pedestrian walkway below 1.8m**



The pedestrian walkway is the prime requirement for complete streets. Minimum width of **1.8M** should be maintained on streets with any landuse & R.O.W.

2.5M wide NMV lane is second in priority to the pedestrian throughway.

ONLY IF the walkway of minimum 1.8m has been accomodated in the street section a Multi-Utility Zone of minimum 1.8m should be provided to accomodate Signage, Benches, Street Lights and other amenities



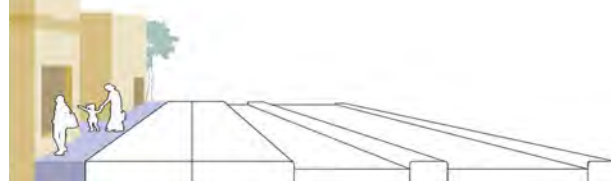
In order to reduce pedestrian vehicular conflicts and encourage a sustainable approach to street design it is important to identify the zones of movement.

Pedestrianization of high-intensity commercial areas is a preferred solution to accomodate all the aspects of safe commute in the urban realm.

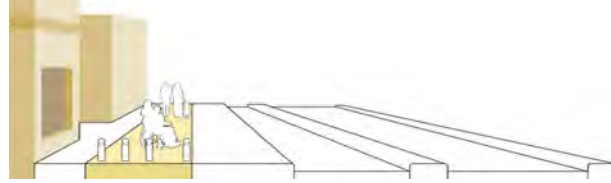
View of Chandni Chowk

### 3.2 Variation as per Land Use

#### FRONTAGE : Adjacent to the property line



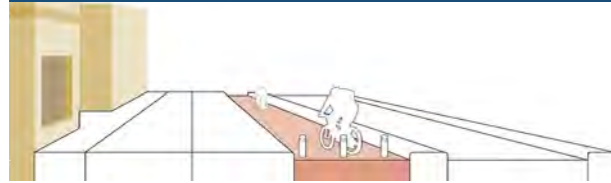
#### WALKWAY: Exclusive for people on foot



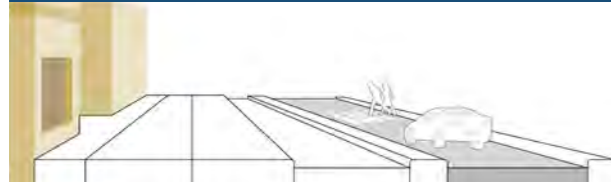
#### MULTI-UTILITY ZONE: Furnishing and Facilities



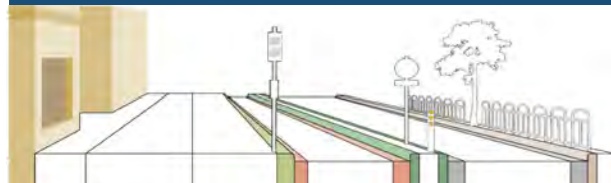
#### NMV ZONE : Exclusive for Non Motorised Vehicles



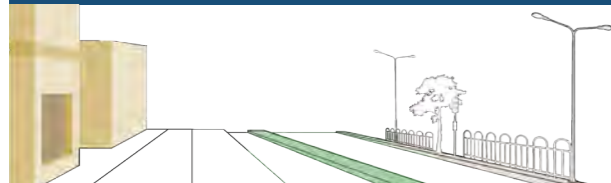
#### CARRIAGEWAY: Exclusive for motorists



#### EDGE : Between two different zones



#### VERGE & MEDIAN : Divides vehicular throughway



#### TRAFFIC ISLAND : Pedestrians refuge



<b>Width</b>	Minimum: <b>0.6M</b>	Optimum: <b>1.0M</b>
<b>Essential</b>	Seating, Vegetation, Display	
As per the Land Use (emphasis on)		
Seating ; Vegetation ; Gar- bage Bins	Displays ; Awnings ; Entrances ; Vending zones ;	Seating ; Vegetation ; Signage ; Vending zones

<b>Width</b>	Minimum: <b>1.8M</b>	Optimum: <b>2.0M</b>
<b>Essential</b>	Unobstructed throughway ; Anti Skid Paving ; Street Light	
As per the Land Use		
Anti-Skid Paving ; Tactile Paving ; Bollards, Lighting, Guardrails - Should not obstruct movement		
<b>NOTE : 2.4m Clear height should be maintained on all pedestrian walkway</b>		

<b>Width</b>	Minimum : <b>1.0M</b>	Optimum : <b>2M</b>
<b>Essential</b>	All street elements and amenities (except crosswalks)	
As per the Land Use		
Public Toilets Shaded Seating Bus Shelters Garbage bins	Public Toilets, Vending Zones, Garbage bins, Bus shelters	Public Toilets Shaded Seating Garbage bins

<b>Width</b>	Minimum : <b>2.5M</b>	Optimum : <b>3M</b>
<b>Essential</b>	Bollards ; Reflectors ; Kerbs ; Lighting	
As per the Land Use		
Crosswalks Paving Bollards	Crosswalks Paving Bollards	Wider throughway Paving Bollards

<b>Width</b>	Minimum : <b>6.0M</b>	<b>As per ROW.</b>
<b>Essential</b>	Crosswalks ; Street Light ; Reflectors ; Road Markings ; Paving	
As per the Land Use		
Crosswalks Paving, Bollards Reflectors, Kerb	Crosswalks Paving, Bollards Reflectors, Kerb	Crosswalks Paving, Bollards Reflectors, Kerb

<b>Width</b>	Minimum : <b>0.3M</b>	Optimum : <b>0.9M</b>
<b>Essential</b>	Kerb ; Reflectors	
As per the Land Use		
Kerb, Reflectors, Guardrails, Street Lights, Signage, Vegetation	Kerb, Reflectors, Guardrails, Street Lights, Signage	Kerb, Reflectors, Guardrails, Street Lights, Signage, Vegetation

<b>Median Width</b>	Minimum : <b>1.2M*</b>	Optimum : <b>1.5M</b>
<b>Verge Width</b>	Minimum : <b>0.3M</b>	Optimum : <b>1.0M</b>
<b>Essential</b>	Barrier Kerb ; Reflectors ; Vegetation ; Street Light	
As per the Land Use		
Kerb, Reflectors, Vegetation, Street Light, Guardrails, Traffic & Pedestrian signals, Paving. <b>NOTE :</b> Minimum Median width for 45M to 90M ROW* ; Raised Median is not necessary in <40M ROW (UTTIIPEC) ; Verge/Tree pit is not mandatory		

<b>Width</b>	Minimum <b>1.8</b>	Optimum : <b>Varies</b>
<b>Essential</b>	Barrier & Mountable Kerb ; Reflectors ; Paving	
As per the Land Use		
Barrier & Mountable Kerb ; Reflectors ; Paving ; Street Light ; Traffic Light ; Guardrails		
<b>NOTE :</b> Minimum refuge on median with staggered crossing 2M ROW* Traffic islands must include minimum 1.8 walkway.		

### 3.2 Activities in the various zones of a street



1 Non-active Frontage zones with street trees/vegetation



2 Frontage for commercial areas



3 Frontage used Public Toilets



4 Booths facing walkway, can stagnate pedestrians thus obstruct



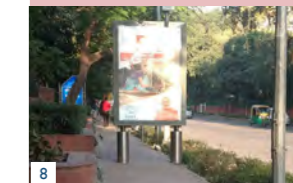
5 Pedestrian zone with secure walkway



6 Amenities facilitating the walkway



7 Shaded walkway; street trees on the MUZ.



8 Walkway obstructed by Advertisement



9 Multi-Utility zone with pedestrian amenities



10 Facilities on the MUZ along the pedestrian walkway



11 Shaded MUZ encourage social activities



12 Absence of a dedicated MUZ



13 Segregated NMV zone for circulation without conflicts



14 NMV segregate the slow and fast vehicles for convenience of both



15 Reflective bollards segregate the NMV on the carriageway



16 Encroachment of the NMV zones by motorists



17 Shaded carriageway with clear road markings.



18 Signage, guardrails, lighting etc. facilitating the carriageway



19 Pedestrian and vehicular network intersection at Transit shelters



20 Absence of guardrails allowing pedestrians to cross unsafe.



21 Vegetation on street edges can provide character and shade



22 Amenities facilitating the carriageway



23 Bollards provide barrier and character to a street



24 Absence of barriers on edges allowing encroachment



25 Medians with refuge space at crosswalks



26 Verge/ Tree pits for divisions and space for installing amenities



27 Guardrail, indicators on kerbs over medians regulate movement.



28 Inefficient guardrails allowing pedestrians to cross-over



29 Traffic islands besides directing traffic act as pedestrian refuge



30 Traffic islands can be converted to vegetated cover/bio-swales



31 Edges of traffic islands allow the installation of street amenities



32 Absence of kerb ramps

### 3.3 Issues/ Current practices related to street elements

In order to ensure a convenient commute for both pedestrians and motorists, it is important that the elements of the street are placed in the appropriate zones without hampering the movement and functioning of other elements. Absence of specific street furniture elements can also lead to pedestrian-vehicular conflicts and make public spaces unsafe space for movement.

#### 1. WALKWAYS LESS THAN 1.8M WIDTH



1 Lack of sufficient footpath



2 Seating obstructing the footpath



3 Pedestrian and Vehicular conflicts

#### 2. INAPPROPRIATE PLACEMENT



4 Signage placed on walkway



5 Dustbins placed on walkway throughway



6 Advertisement boards protruding onto the pedestrian throughway



7 Feeder Pillar obstructing walkway



8 Bollards placed with no provision for wheelchair users



9 Booths obstructing pedestrian movement

#### 3. NON-FUNCTIONAL STREET



10 Discontiguous guardrails allowing people to detour onto the carriageway



11 Kerb height less than 150mm allow vehicles to encroach onto the walkway



12 Misaligned crosswalks



13 Inaccessible wayfinding map not visible



14 Tree guards not accommodating the tree girth.



15 Inappropriate kerb heights for the wheelchair user



16 Visual chaos generated by disordered placing of signage



17 Tactile paving obstructed my manholes cover



18 Community bins placed on the carriageway

#### 4. ABSENCE OF STREET FURNITURE



19 Absence of Kerb ramps



20 Absence of Cycle racks



21 Absence of guardrails



22 Absence of Dhalaos



23 Absence of Transit Shelter



24 Absence of effective barriers to prevent encroachment of pedestrian walkways

#### 5. ENCROACHMENTS



22 Shop extensions compel pedestrians to walk on the vehicular zone.



23 Parking on the footpaths reduce the minimum necessary width of footpaths.



24 Temporary stalls/ hawkers obstructing the pedestrian throughway

## 4.1 Placement Matrix

ZONING OF STREET ELEMENTS & AMENITIES										
S.NO.	ELEMENTS / AMENITIES	ZONES								
		PEDESTRIAN				VEHICULAR				
		FRONTAGE	WALKWAY	MULTI - UTILITY ZONE	EDGE	NMV ZONE	VERGE	CARRIAGEWAY	TRAFFIC ISLANDS	
								MEDIAN	REFUGE (Pedestrian)	
<b>FURNISHING</b>										
1	Seating	○	×	✓	×	×	×	×	×	×
2	Garbage Bin	○	×	✓	○	×	×	×	×	×
3	Cycle Rack	○	×	✓	○	×	×	×	×	×
4	Street Light	○	×	✓	✓	×	○	×	✓	○
5	Water ATM	○	×	✓	×	×	×	×	×	×
<b>BUILT</b>										
6	Public Toilet	○	×	✓	×	×	×	×	×	×
7	Bus/Transit-Shelter	×	×	✓	○	×	×	×	○	×
8	Noise Barrier	×	×	×	✓	×	×	×	×	×
<b>INFORMATIVE</b>										
9	Signage	○	×	✓	✓	×	○	×	✓	○
10	Common Display									
	Advertisement Board	○	×	✓	○	×	○	×	○	○
	Message/ Poster Kiosk	○	×	✓	○	×	×	×	×	×
	Wayfinding Map	○	×	✓	×	×	×	×	×	×
<b>REGULATIVE</b>										
11	Guardrail	×	×	○	✓	×	○	×	✓	○
12	Traffic Signal	×	×	×	✓	×	○	×	✓	○
13	Cross-Walk	×	×	×	×	○	○	✓	×	✓
14	Bollard	×	✓	○	✓	✓	×	×	×	✓
15	Road Indicators	×	×	○	✓	×	✓	×	✓	✓
	Road stud	×	×	×	✓	✓	×	✓	✓	✓
16	Kerb	×	×	×	✓	×	✓	×	✓	✓
<b>LANDSCAPE</b>										
17	Horticulture (Soft)	✓	×	✓	○	×	✓	×	✓	○
18	Paving (Hard)	✓	✓	✓	✓	✓	○	✓	○	✓
	Tactile Tile	○	✓	✓	✓	×	×	×	×	✓
19	Tree Grate (Hard)	✓	×	✓	○	×	✓	×	○	○
20	Plant/Tree Guard (Hard)	○	×	✓	○	×	✓	×	○	○
21	Bio-Swales (Soft)	×	×	○	✓	×	✓	×	○	○
<b>SERVICES</b>										
22	Manhole cover	○	○	○	✓	○	○	○	○	○
23	Drain Grate	○	×	○	✓	○	○	×	○	○
24	Other Electrical Services									
	Electric Pole	○	×	✓	○	×	○	×	○	×
	Feeder Pillar	✓	×	✓	×	×	○	×	×	×
	Speed Radar/CCTV Camera	×	×	○	✓	×	✓	×	✓	○
25	Smart Poles	○	×	✓	○	×	×	×	×	○
26	Dhalao	✓	×	×	×	×	×	×	×	×

✓ Preferred (Ideal Location)  
 ○ Maybe (Alternate location)  
 × Not Preferred (Not to be placed)

### PART B

## 4 Suggestive Design Specifications

### 4.1 Placement Matrix

#### 4.2 Specifications of Individual Street Elements

#### 4.3 Typical plan showing application of suggested specifications on ideal zones

**PART B**

**4 Suggestive Design Specifications**

4.1 Placement Matrix

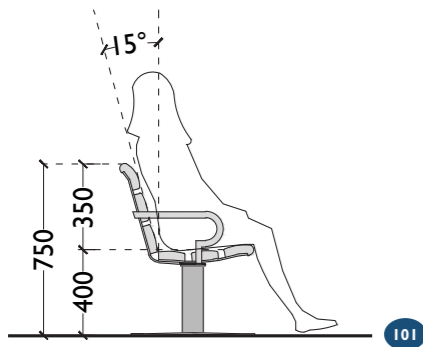
**4.2 Specifications of Individual Street Elements and Amenities**

4.3 Typical plan showing application of suggested specifications on ideal zones

**PART B**

**4.2 Specifications of Individual Street Elements and Amenities**

**FURNISHINGS**



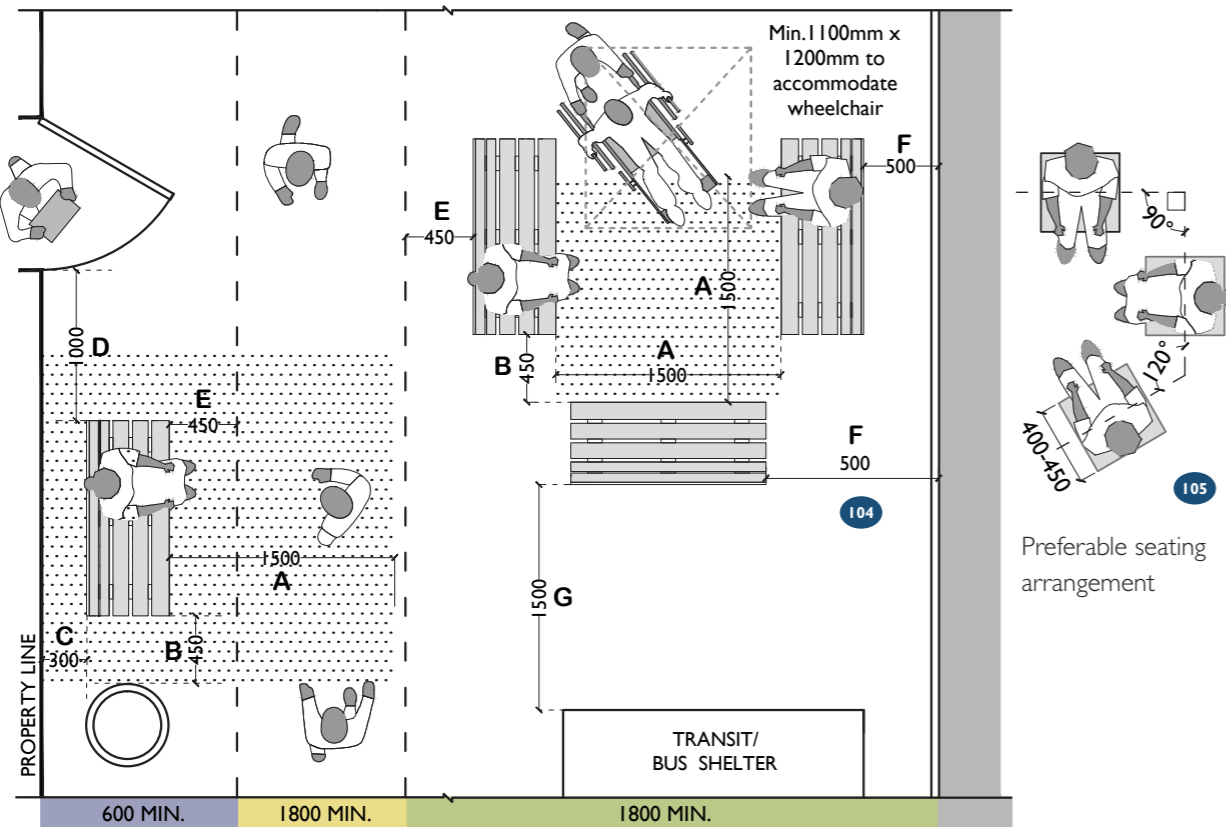
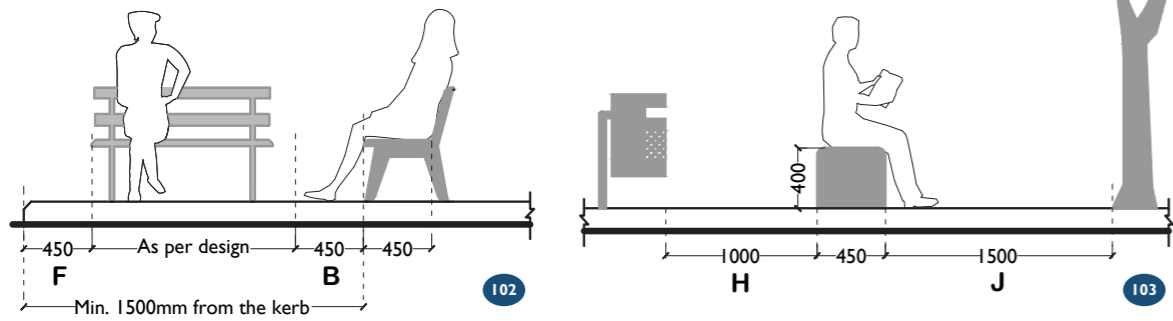
Seating on streets provide for brief halts to rest, encourage social activities and thus contributes in making the public realm lively, active and safe.

The quantity, type and arrangement of seating will differ as per landuse and activities.

### 1.1 PLACEMENT

ZONES OF A STREET	PLACEMENT
FRONTAGE	○
WALKWAY	◻
MUZ	◻
EDGE	◻
NMV	◻
VERGE	◻
CARRIAGEWAY	◻
MEDIAN	◻
REFUGE ISLAND	◻

### 1.2 STANDARDS / MINIMUM CLEARANCES



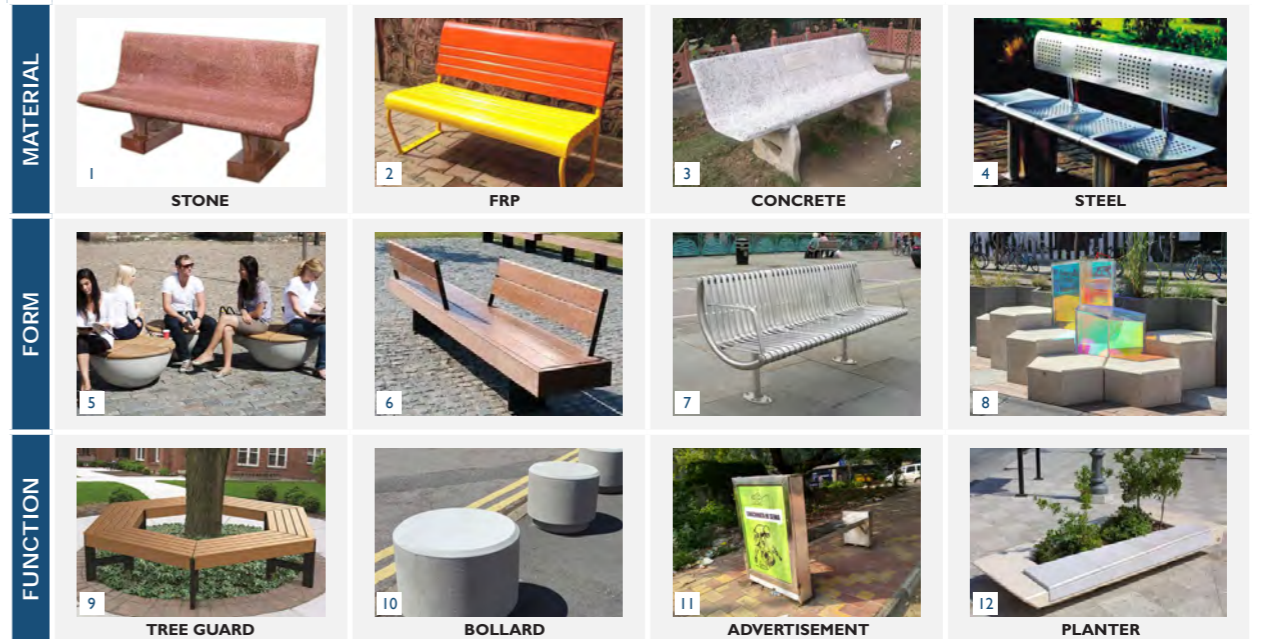
Preferable seating arrangement

References	Minimum Clearances	Legend : Zone Placement
UTTIPEC	A : For access	Preferred (Ideal location) ◻
IRC 103 : 2012 Guidelines for Pedestrian Facilities	B : From other furniture	Conditional (As per available space or landuse) ○
Guide to the San Francisco : Better Streets	C : From property line	Not Preferred ◻
City of Hamilton Co-ordinated Street Furniture Guidelines	D : From door openings	
Smithsonian Institution Accessibility Guidelines	E : From pedestrian zone	
	F : From the Kerb	
	G : From transit shelter	
	H : From garbage bins	
	J : From tree edge	
	K : From edge of paving	

### 1.3 SUITABILITY

	BENCHES	INDIVIDUAL SEATS	SEAT WALLS	PLANTER LEDGES
DESCRIPTION	 1.3A Must accommodate minimum 3 people at a time	 1.3B Detached seats in linear arrangement	 1.3D Extension of the boundary wall onto the frontage zone	 1.3E Planter ledges extended to seats
SUITABILITY	<ul style="list-style-type: none"> <li>1.3A Residential / Institutional</li> <li>1.3B Commercial / Industrial</li> </ul>	<ul style="list-style-type: none"> <li>High Intensity Commercial</li> <li>Multi-Modal Transit areas</li> </ul>	<ul style="list-style-type: none"> <li>Non-active frontage zones</li> <li>Institutional</li> <li>Gated Residential,</li> <li>Long boundary walls aligning streets</li> </ul>	<ul style="list-style-type: none"> <li>Multi-utility zones;</li> <li>Alternative to benches</li> </ul>

### 1.4 DESIGN VARIATION



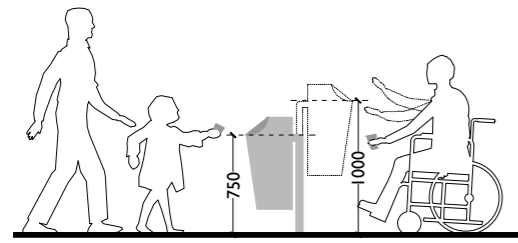
### 1.5 BEST PRACTICES



### 1.6 PUBLIC ART







201

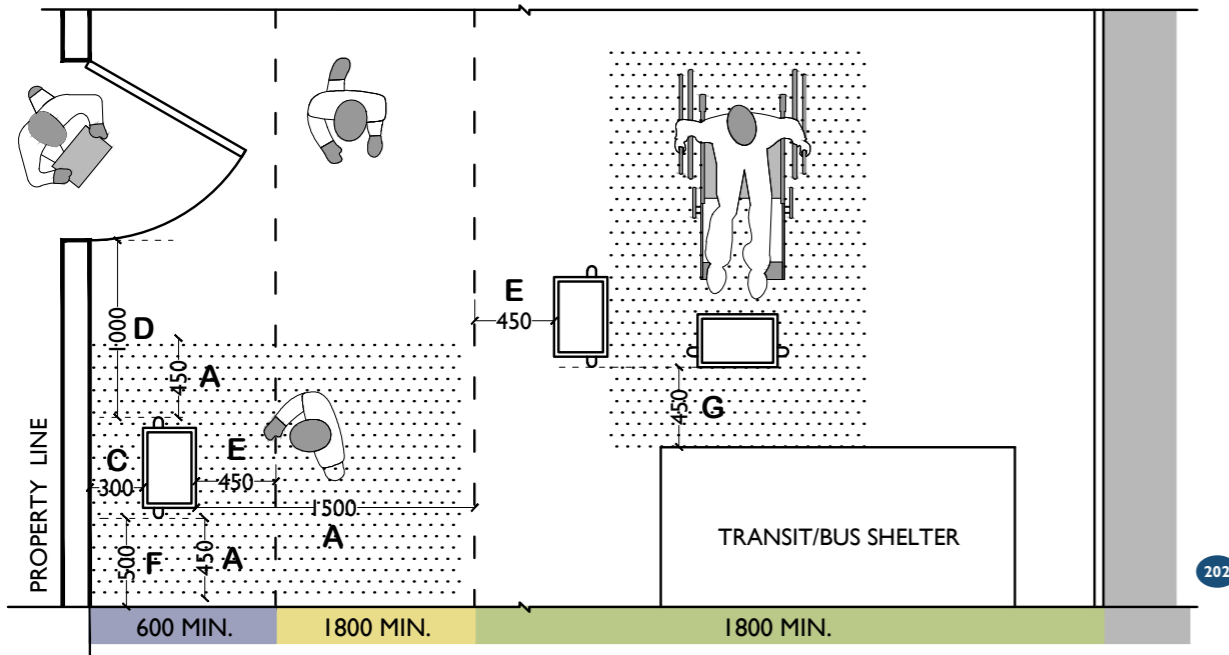
Solid waste disposal systems are an integral part of street furniture. Proper disposal of the generated waste ensures less maintenance and cleaner walkable zones.

Garbage bins should be installed along the pedestrian throughway in intervals upto 200m.

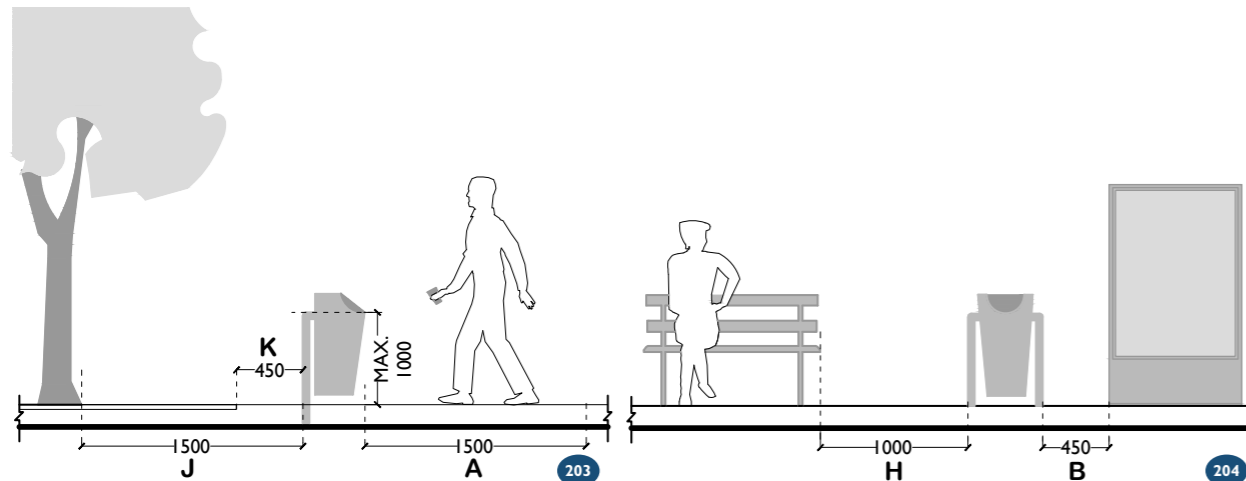
2.1 PLACEMENT

ZONES OF A STREET	Placement
Frontage	□
Pedestrian	⤴
MUZ / Furnishing	□
Edge	○
NMV	⤴
Treepit / Verge	⤴
Vehicular Throughway	⤴
Median	⤴
Refuge Islands	○

2.2 STANDARDS / MINIMUM CLEARANCES



202



203

204

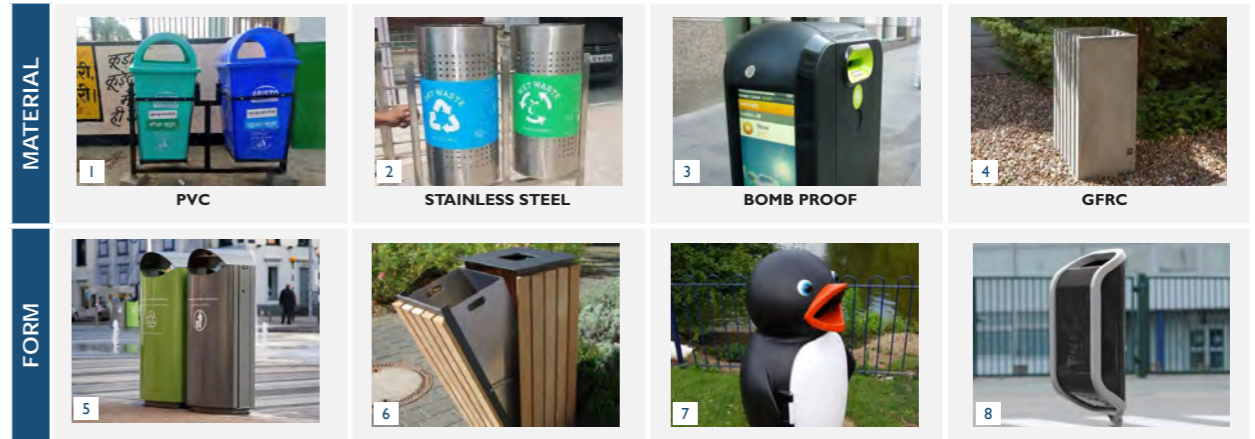
References	Minimum Clearances	Legend : Zone Placement
City of Hamilton Co-ordinated Street Furniture Guidelines	A : For access	Preferred (Ideal location) □
Pune Street Design Guidelines	B : From other furniture	Conditional (As per available space or landuse) ○
ITDP	C : From property line	Not Preferred ⤴
CPWD Guidelines and Space Standards for Barrier Free Built Environment for Disabled and Elderly Persons	D : From door openings	
	E : From pedestrian zone	
	F : From the Kerb	
	G : From transit shelter	
	H : From garbage bins	
	J : From tree edge	
	K : From edge of paving	

NOTE: All dimensions are in mm

2.3 SUITABILITY

DESCRIPTION	FIXED			MOVEABLE	
	OPEN TRASHCANS	SEMI-CLOSED	PLASTIC DISP. KIOSKS	TRASHCANS	DUMPSTERS
SUITABILITY	<ul style="list-style-type: none"> <li>On streets in the frontage</li> <li>MUZ at regular intervals</li> </ul>	<ul style="list-style-type: none"> <li>Commercial areas</li> <li>Store frontages</li> </ul>	<ul style="list-style-type: none"> <li>Places that generate high plastic waste</li> <li>Eating joints</li> </ul>	<ul style="list-style-type: none"> <li>Areas that require cleaning within short intervals</li> <li>Commercial/ institutional</li> </ul>	<ul style="list-style-type: none"> <li>Inside plots dedicated for waste collection/ treatment.</li> </ul>

2.4 DESIGN VARIATION

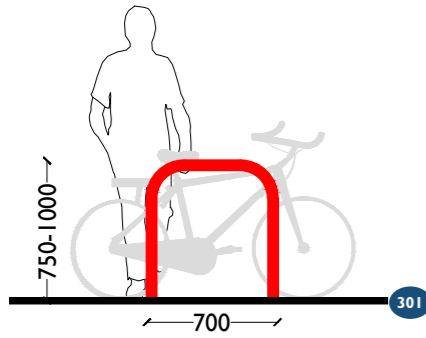


2.5 BEST PRACTICES



2.6 PUBLIC ART





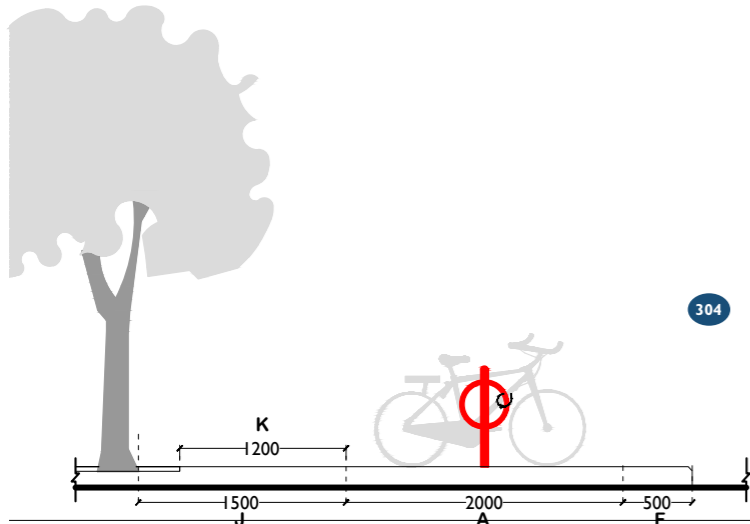
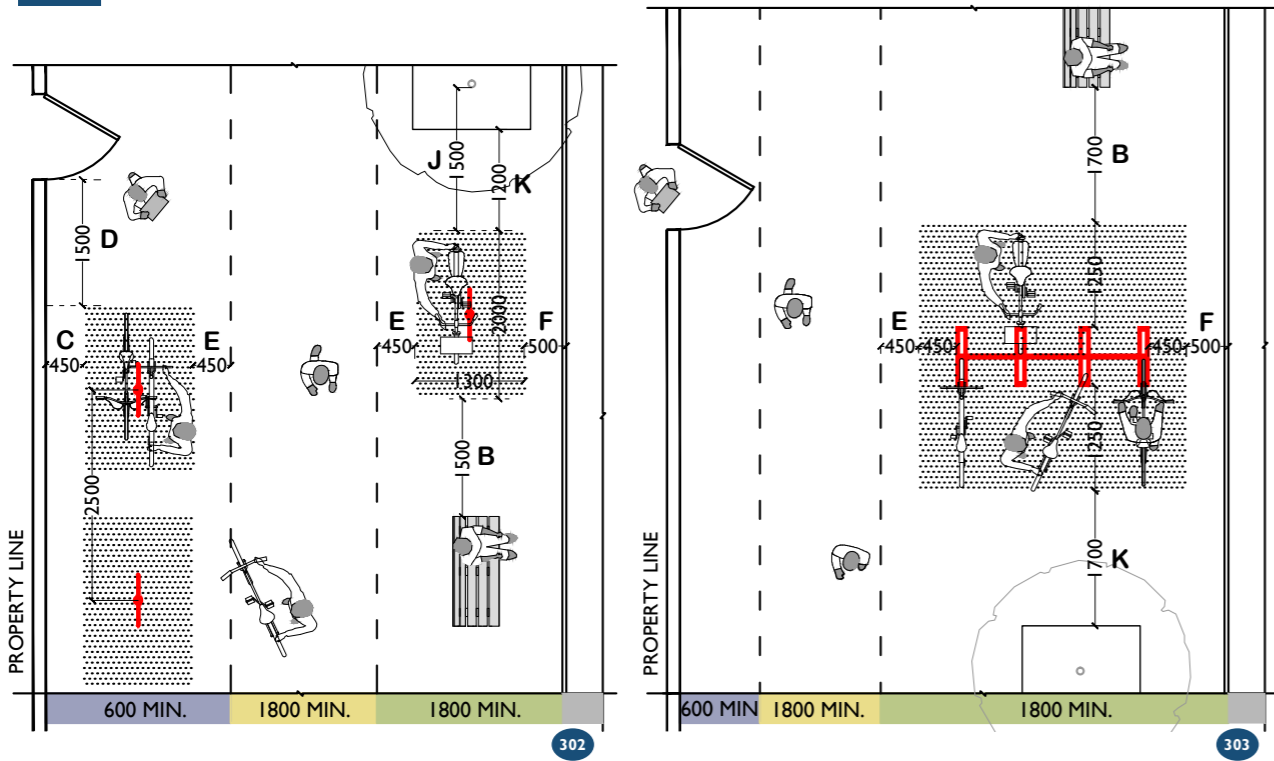
Cycle racks are fixtures on streets as a parking provision for the cyclists. These are usually modules that are permanently fixed and accessible from the NMV zones for the convenience of the commuters.

These are appropriate for all transit hubs or multi-modal interchanges to encourage sustainable mobility options.

### 3.1 PLACEMENT

ZONES OF A STREET	Frontage	○
	Pedestrian	Ⓜ
	MUZ / Furnishing	□
	Edge	○
	NMV	Ⓜ
	Treepit / Divider	Ⓜ
	Vehicular Throughway	Ⓜ
	Median	Ⓜ
	Refuge Islands	Ⓜ

### 3.2 STANDARDS / MINIMUM CLEARANCES



Floor mounted cycle-racks require more space on ground due to the additional space requirement for access and maneuvering. The non-active frontages of streets can be utilised for wall mounted cycle racks that allow vertical cycle parking on the wall or along the wall.

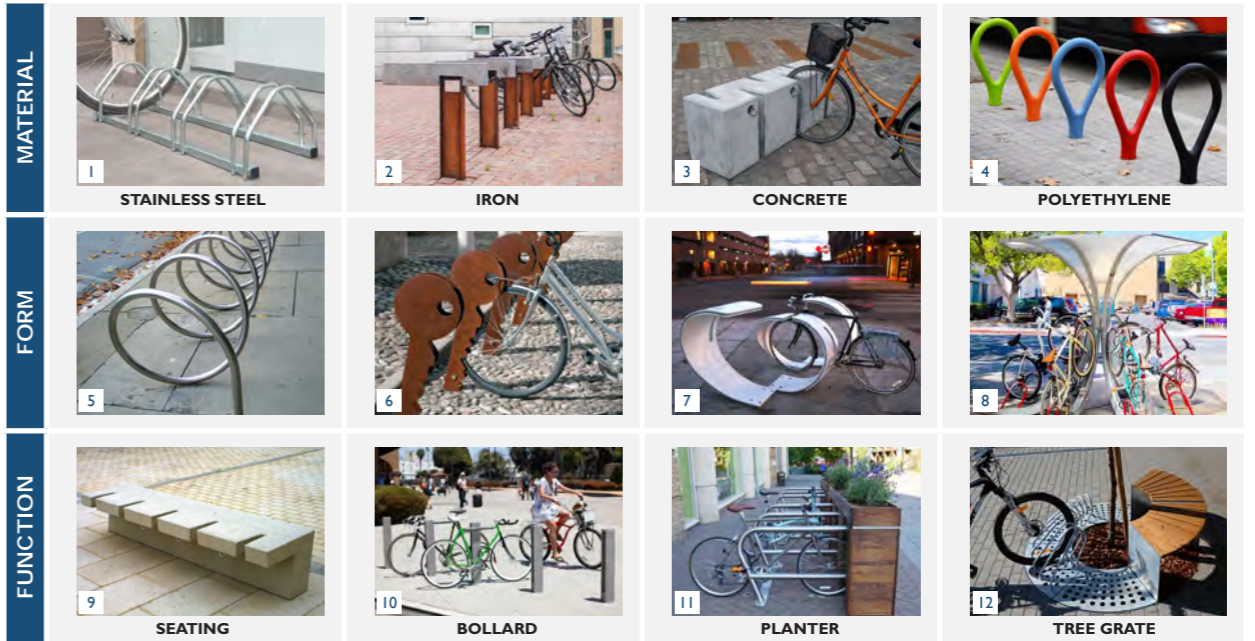
Cycle racks are also the furnishings that can be designed as part of public art to enhance the character of the public realm.

References	Minimum Clearances	Legend : Zone Placement
City of Hamilton Co-ordinated Street Furniture Guidelines	A : For access B : From other furniture C : From property line D : From door openings E : From pedestrian zone	F : From the Kerb G : From transit shelter H : From garbage bins J : From tree edge K : From edge of paving
		Preferred (Ideal location) □ Conditional (As per available space or landuse) ○ Not Preferred Ⓜ

### 3.3 SUITABILITY

DESCRIPTION	FIXED				MOVEABLE
	EMBEDDED	SURFACE MOUNTED			
		POST	RAIL MOUNTED	WALL MOUNTED	
3.3A	3.3B	3.3C	3.3D	3.3E	
SUITABILITY	• Applicable to all areas	• Less number of racks are required	• Institutional areas (with greater requirement)	• Where space is a limitation	• Where position of the cycle parking needs to be shifted occasionally

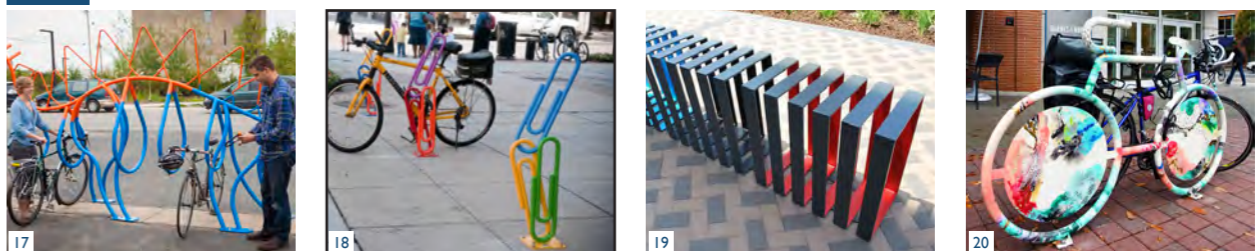
### 3.4 DESIGN VARIATION

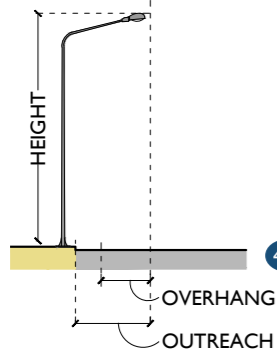


### 3.5 BEST PRACTICES



### 3.6 PUBLIC ART





Street lighting is one of the over ground services that forms an important parameter to analyse the safety aspect of a street.

Street lights cater to both vehicular and pedestrian traffic. They are of varying heights depending on the purpose and area to be lit.

Full cut-off lighting fixtures are preferred to avoid light pollution.

### 4.1 PLACEMENT

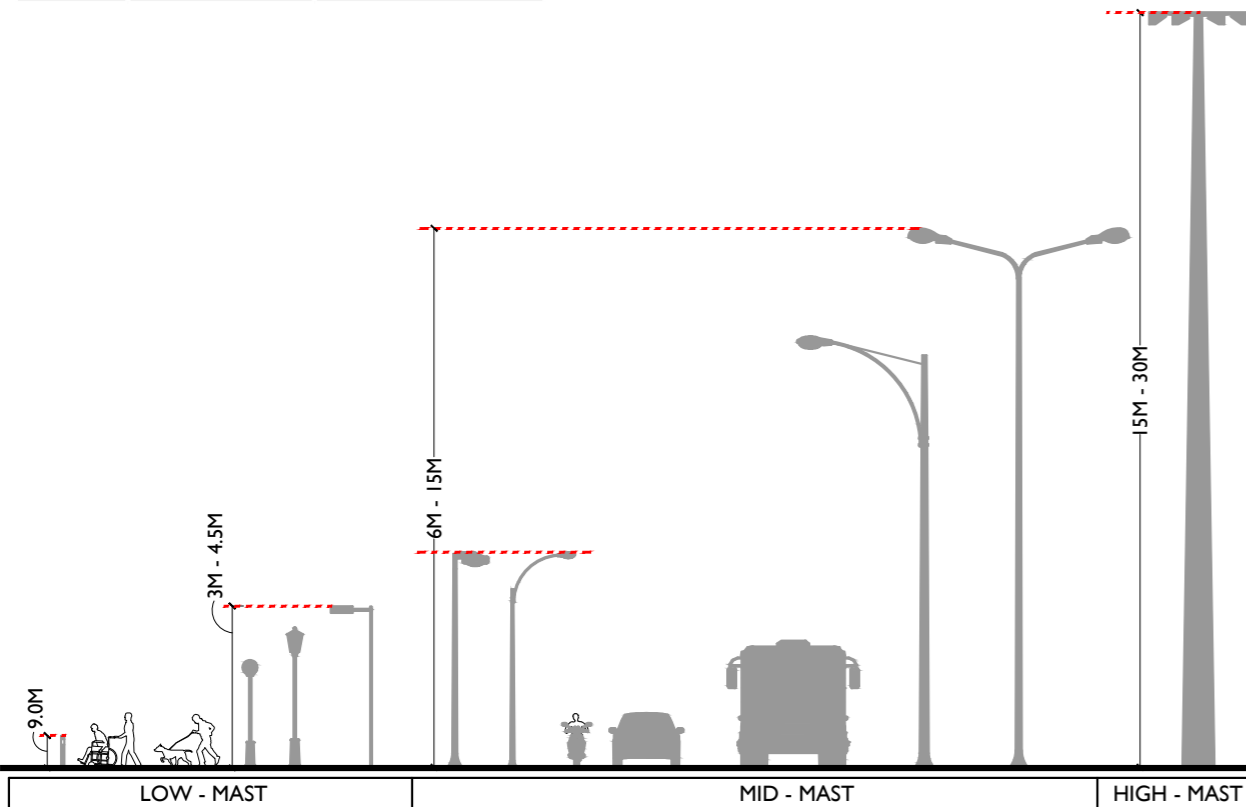
ZONES OF A STREET	Frontage	○
	Pedestrian	⊞
	MUZ / Furnishing	□
	Edge	□
	NMV	⊞
	Treepit / Divider	○
	Vehicular Throughway	⊞
	Median	□
	Refuge Islands	○

### 4.2 STANDARDS / MINIMUM CLEARANCES

Road classification	Carriageway	Individual carriageway width (Rw)	Placement	Spacing	Pole height (H)
A1	Dual	10m - 16m	Central Verge	40m	12
	Single	12m - 30m	Opposite	35m for (12 to 14.5 Rw) 40m for (16 to 30.0 Rw)	
A2	Single	7 - 10	Single Sided	30m	11
A3		7		20m	8
Pedestrian pathway		3 - 6		20m-25m	7.5

Classification	Type Road	Width of Carriageway
A1	Dual/Single Carriageway	>10.5,12,14,16,18,20,30
A2	Single Carriageway	>7m to 10m
A3	Single Carriageway	>7m Colony Roads

Standards for Integrated Street Lighting for Delhi

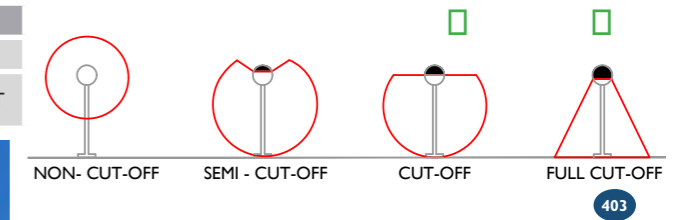


402

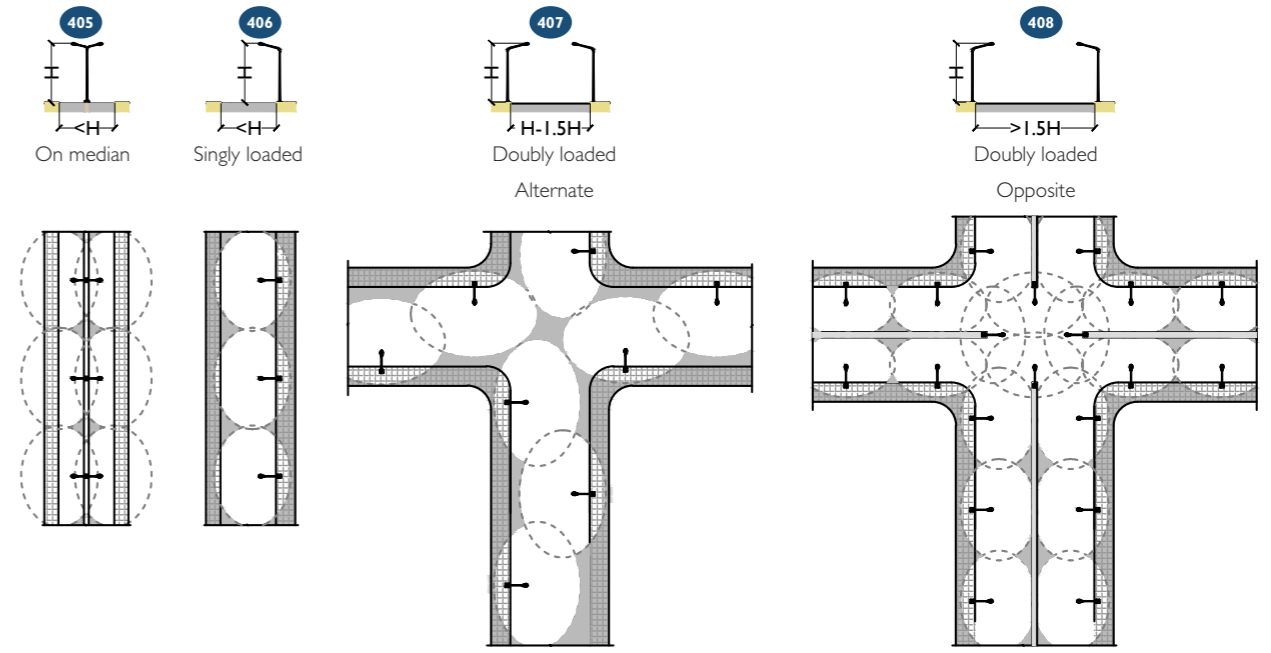
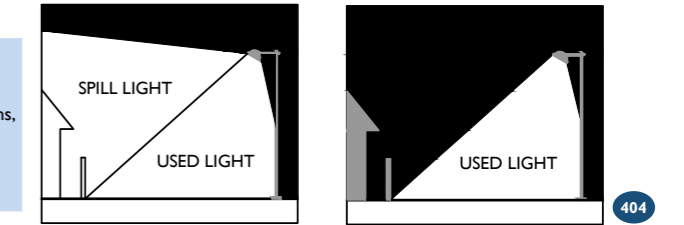
References	Minimum Clearances	Legend : Zone Placement
Time-Saver Standards for Landscape Architecture	A : For access	Preferred (Ideal location) □
Energy Efficient Street Lighting Guidelines USAID India	B : From other furniture	Conditional (As per available space or landuse) ○
IS 1944- 1 and 2 (BIS 1981)	C : From property line	Not Preferred ⊞
Standards for Integrated Street Lighting for Delhi - Relevant Document 5A	D : From door openings	
	E : From pedestrian zone	
	F : From the Kerb	
	G : From transit shelter	
	H : From garbage bins	
	J : From tree edge	
	K : From edge of paving	

### 4.3 SUITABILITY

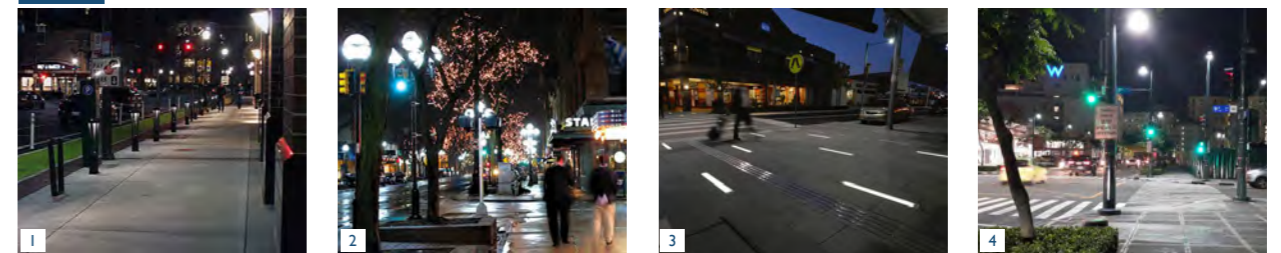
	USER			
	PEDESTRIAN		MOTORIST	
	LOW HEIGHT	LOW MAST	MID MAST	HIGH MAST
DESCRIPTION				
SUITABILITY	<ul style="list-style-type: none"> <li>Pedestrian thoroughways</li> <li>Foot-over bridges</li> <li>Skywalks</li> </ul>	<ul style="list-style-type: none"> <li>Vehicular thoroughways</li> <li>Parking lots</li> </ul>	<ul style="list-style-type: none"> <li>Parking lots</li> <li>Transit stations,</li> <li>Recreational area</li> </ul>	



Light spillage must be avoided to avoid Light pollution. The appropriate type of fixture must be selected for the same.

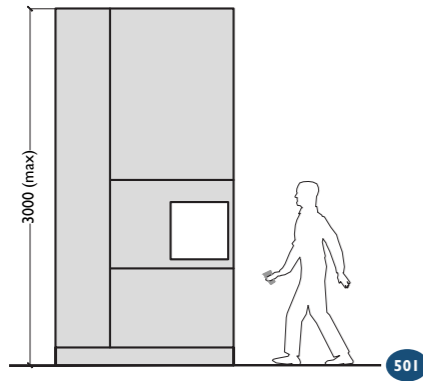


### 4.5 BEST PRACTICES



### 4.6 PUBLIC ART





Water ATMs are automated (paid) water dispensing units that can be installed along the pedestrian throughways

These are modular units with a water tank and a filtration system. Unlike the conventional drinking fountains they do not require a plumbing network to function.

5.1 PLACEMENT

ZONES OF A STREET	Placement
Frontage	○
Pedestrian	Ⓜ
MUZ / Furnishing	□
Edge	Ⓜ
NMV	Ⓜ
Treepit / Divider	Ⓜ
Vehicular Throughway	Ⓜ
Median	Ⓜ
Refuge Islands	Ⓜ

5.2 STANDARDS / MINIMUM CLEARANCES

The modular units of Water ATMs may vary in capacity and materials are limited to steel and concrete. Since they are automated, the power is supplied by solar panels that make this unit a sustainable option for providing potable water on the streets.

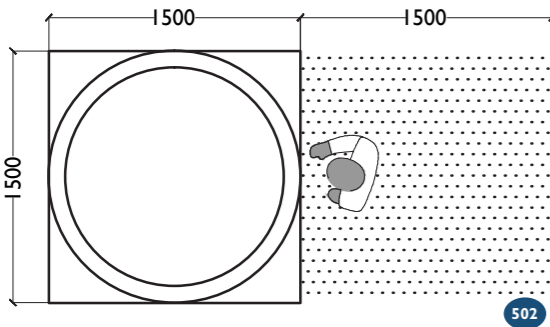
**MINIMUM CLEARANCE** 1.5m to be left for access. These units are easy to maintain, refill and install.

Maximum 4 Sqm space is required and machines can provide purified chilled water at the rate of 500 Ltr per hour.

Water ATMs must not be placed in the MUZ such that it becomes a visual obstructions to the signage.

5.3 SUITABILITY

	FIXED	MOBILE
DESCRIPTION		
SUITABILITY	<ul style="list-style-type: none"> <li>• Heavy pedestrian activity</li> <li>• Traffic junctions</li> </ul>	<ul style="list-style-type: none"> <li>• Less - Moderate pedestrian activity areas</li> </ul>



The water ATMs must not obstruct the pedestrian walkway or be accessible from the carriageway leading to stagnant traffic. It should be placed on the MUZ, if absent on the frontage

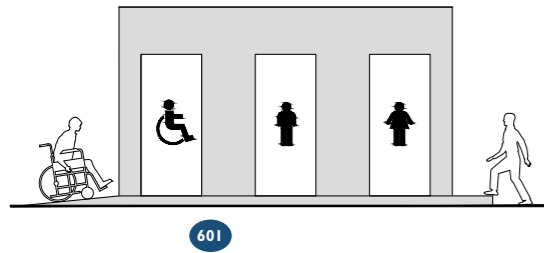
NOTE: All dimensions are in mm

References	Minimum Clearances	Legend : Zone Placement
<a href="http://www.pi-lo.in">http://www.pi-lo.in</a>	A : For access B : From other furniture C : From property line D : From door openings E : From pedestrian zone	Preferred (Ideal location) □ Conditional (As per available space or landuse) ○ Not Preferred Ⓜ
	F : From the Kerb G : From transit shelter H : From garbage bins J : From tree edge K : From edge of paving	

PART B

4.2 Specifications of Individual Street Elements and Amenities

BUILT

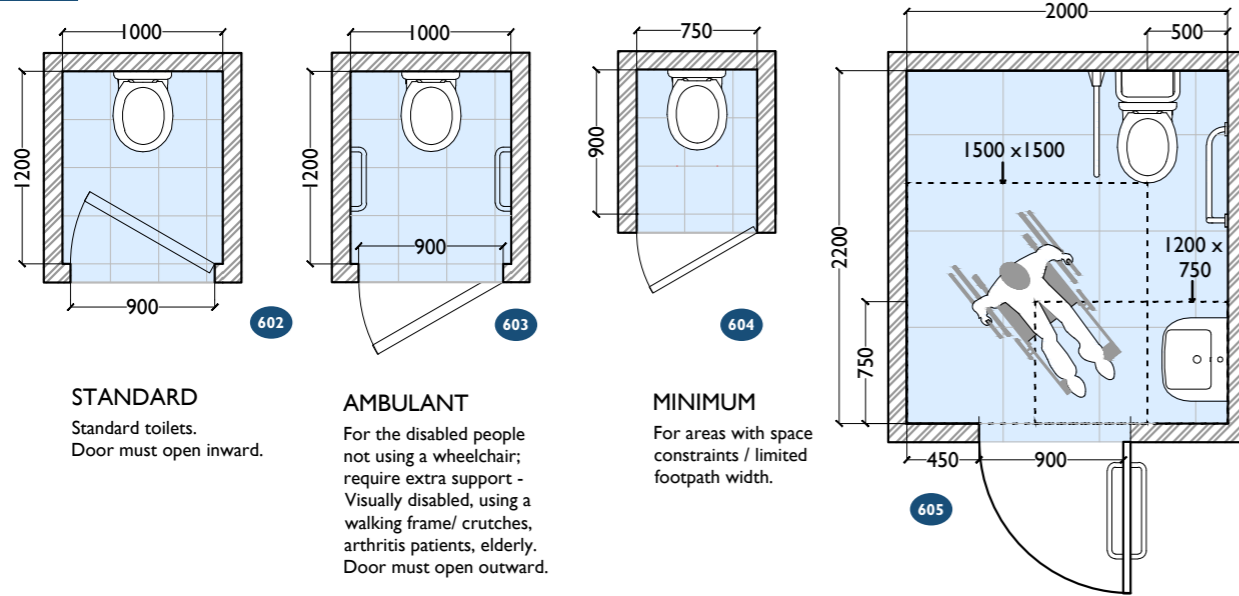


Public toilets are an integral part of on-street pedestrian amenities. They should be installed at every 500-800m intervals. The size of the public toilet will depend on the land-use and frequency of usage of the area. A toilet block should be provided at every 1.5km on mobility corridors, near transit stations and parking areas.

6.1 PLACEMENT

ZONES OF A STREET	Placement
Frontage	○
Pedestrian	Ⓜ
MUZ / Furnishing	□
Edge	Ⓜ
NMV	Ⓜ
Treepit / Divider	Ⓜ
Vehicular Throughway	Ⓜ
Median	Ⓜ
Refuge Islands	Ⓜ

6.2 STANDARDS / MINIMUM CLEARANCES

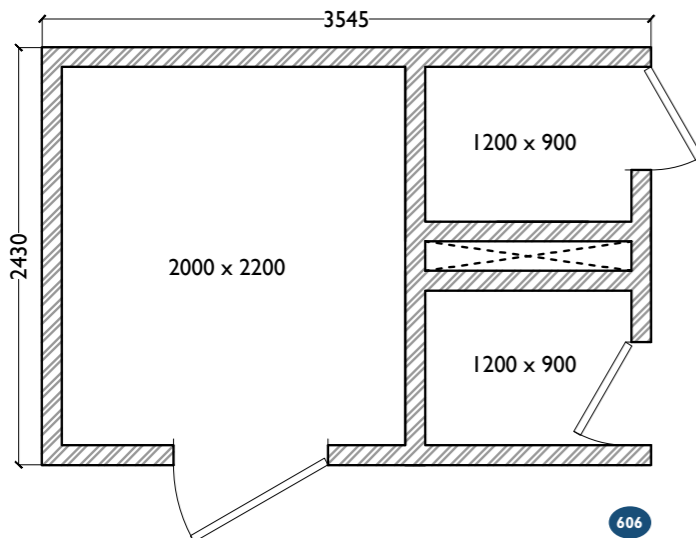


**STANDARD**  
Standard toilets. Door must open inward.

**AMBULANT**  
For the disabled people not using a wheelchair; require extra support - Visually disabled, using a walking frame/ crutches, arthritis patients, elderly. Door must open outward.

**MINIMUM**  
For areas with space constraints / limited footpath width.

**ACCESSIBLE**  
1500 x 1500 space for the circulation of the wheelchair user.  
-Door must open outwards with rail for support  
-Washbasin should be wall mounted to allow leg space of the seated user



Minimum Requirements:  
One accessible toilet and one standard cubicle having ambulant features.  
The toilet block must include a ramp with a slope of 1:12 ratio in case of a level difference.

- Public toilets should be placed within the MUZ wherever provided. In the absence of the MUZ it should be placed in the frontage.
- In case of space constraint, the accessible type of toilet should be provided that will cater to the needs of the abled and the disabled.

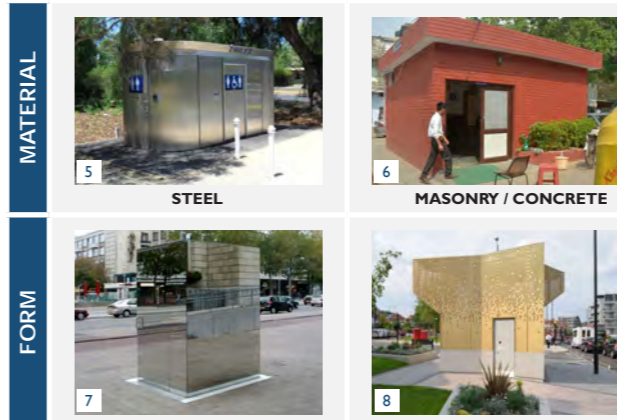
NOTE: All dimensions are in mm

References	Minimum Clearances	Legend : Zone Placement
Guidelines for Public and Community Toilet Management by Cities in Andhra Pradesh	A : For access	Preferred (Ideal location) □
Pune Street Design Guidelines	B : From other furniture	Conditional (As per available space or landuse) ○
CPWD Guidelines and Space Standards for Barrier Free Built Environment for Disabled and Elderly Persons	C : From property line	Not Preferred Ⓜ
Government of India Guidelines for Swachh Bharat Mission	D : From door openings	
	E : From pedestrian zone	
	F : From the Kerb	
	G : From transit shelter	
	H : From garbage bins	
	J : From tree edge	
	K : From edge of paving	

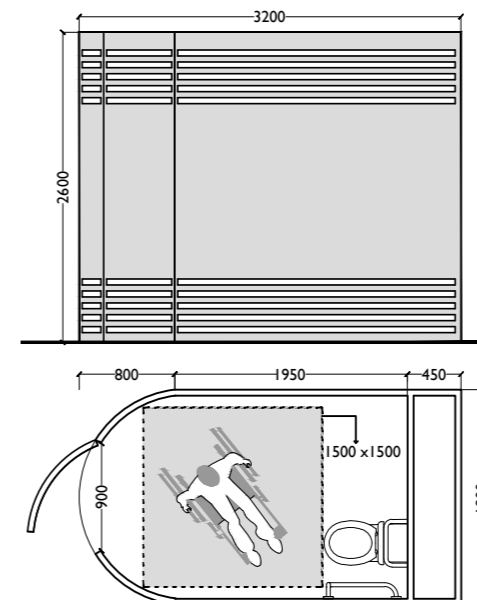
6.3 SUITABILITY

	BUILT IN-SITU	PRE-FABRICATED
DESCRIPTION	6.3A	6.3B 6.3C 6.3D
SUITABILITY	<ul style="list-style-type: none"> <li>MUZ or frontage zone with sufficient widths without obstructing pedestrian throughway</li> </ul>	<ul style="list-style-type: none"> <li>Places with heavy or fluctuating pedestrian footfall</li> <li>All types of streets</li> </ul>

6.4 DESIGN VARIATION

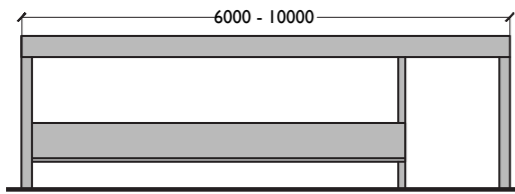


6.5 BEST PRACTICES



**Portland Loo** - Portland's famous stand-alone bathroom. The sleek and modern kiosk discourages crime with graffiti-proof wall panels and open grating. The Portland Loo has proven to be a durable and inexpensive solution to keep your city clean and crime-free.



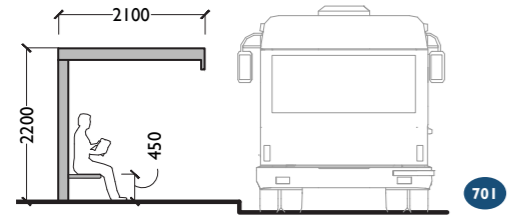


Transit-Shelters are points for commuters to take refuge while waiting for public transport. These elements act as indicators for bus-stoppages.

**A transit-shelter should be placed at walkable intervals of 0.8km-1.0km.**

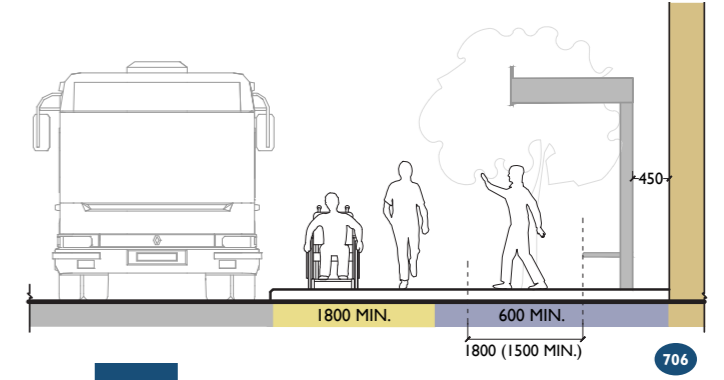
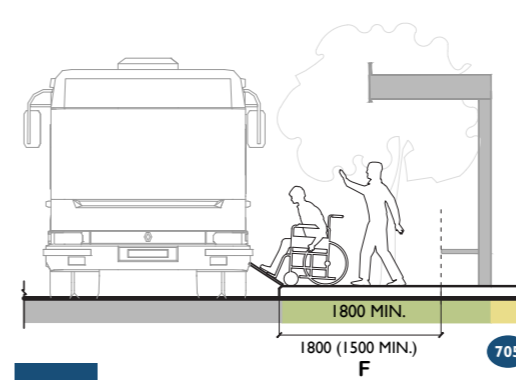
Provisions for the disabled must include :

- space to accommodate wheelchairs
- tactile tiles to mark entry points
- ramps to modulate level differences

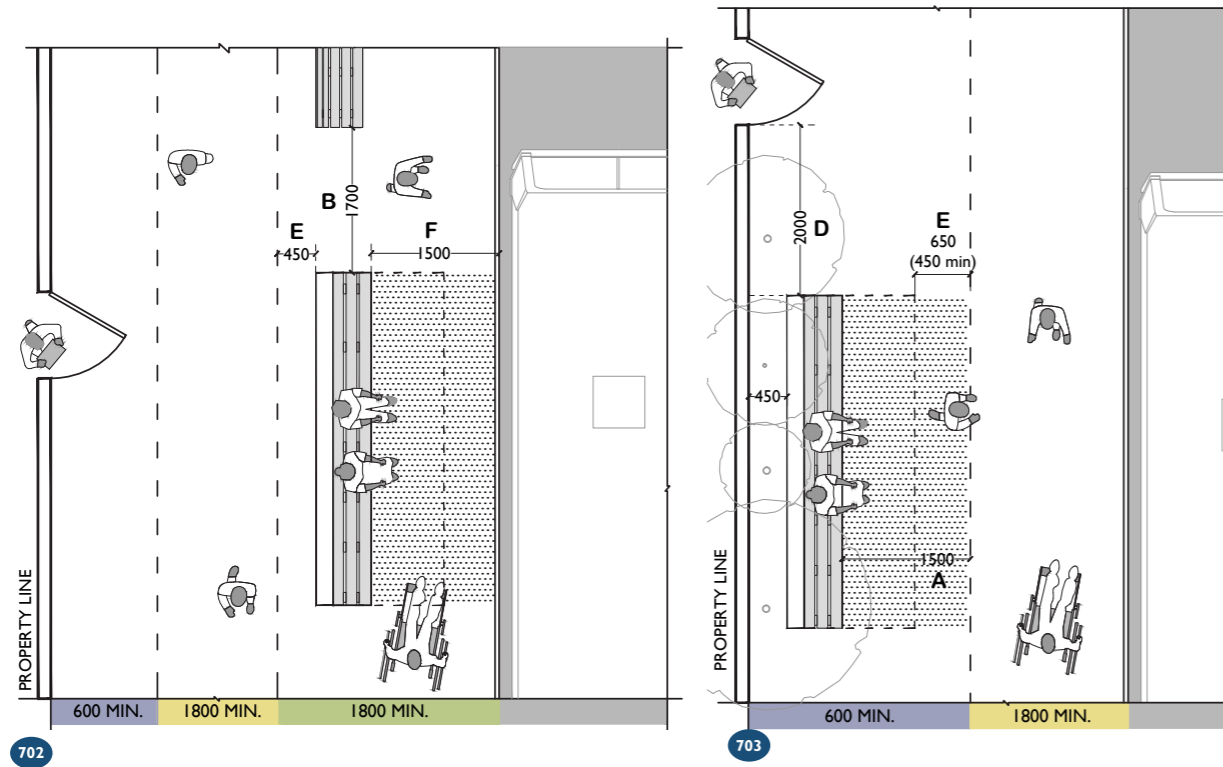


7.1 PLACEMENT

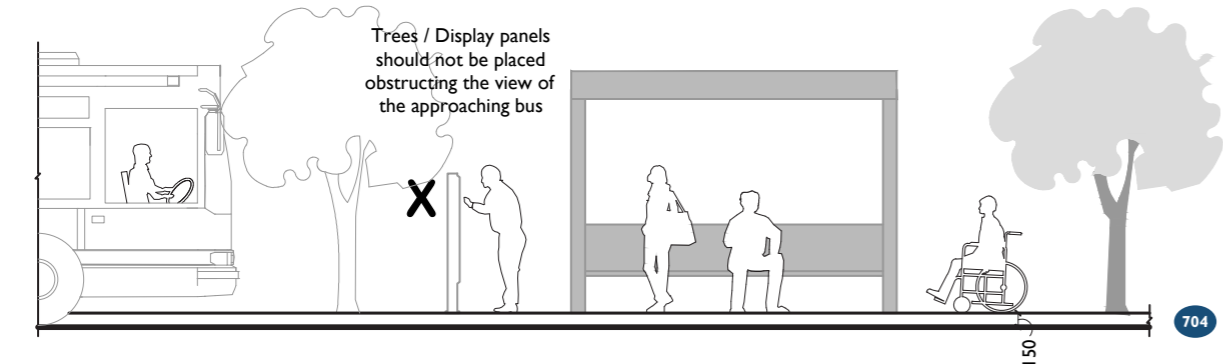
ZONES OF A STREET	Placement
Frontage	Ⓡ
Pedestrian	Ⓡ
MUZ / Furnishing	□
Edge	○
NMV	Ⓡ
Treepit / Divider	Ⓡ
Vehicular Throughway	Ⓡ
Median	○
Refuge Islands	Ⓡ



7.2 STANDARDS / MINIMUM CLEARANCES



Incase kerb heights are at grade with bus floor height (400mm) approach ramps with 1:8 slope should be provided from the footpaths on either ends with 150mm standard kerb height.



References	Minimum Clearances	Legend : Zone Placement
City of Hamilton Co-ordinated Street Furniture Guidelines	A : For access B : From other furniture C : From property line D : From door openings E : From pedestrian zone	Preferred (Ideal location) □ Conditional (As per available space or landuse) ○ Not Preferred Ⓡ
	F : From the Kerb G : From transit shelter H : From garbage bins J : From tree edge K : From edge of paving	

7.3 SUITABILITY

	IN-LANE	MEDIAN
DESCRIPTION	7.3A	7.3B
APPLICABILITY	<ul style="list-style-type: none"> <li>• All areas</li> <li>• MUZ / Frontage zone</li> </ul>	<ul style="list-style-type: none"> <li>• Where buses/ public transport have designated lanes/corridors on the carriageway</li> </ul>

7.4 DESIGN VARIATION

	MATERIAL	FORM	FUNCTION
1	RCC		
2	STAINLESS STEEL		
3			
4			
5			
6			

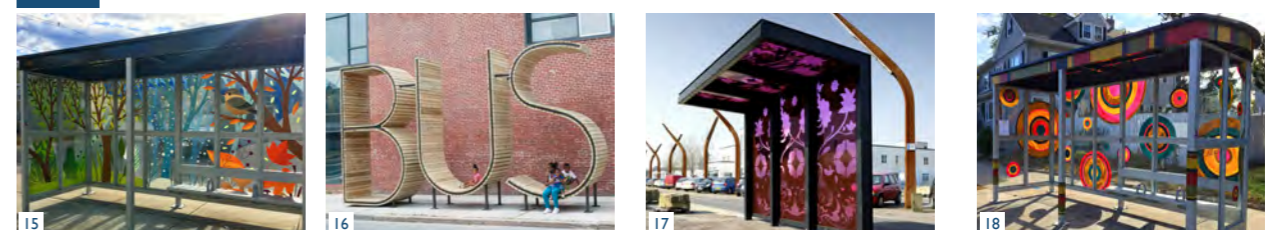
7.5 BEST PRACTICES

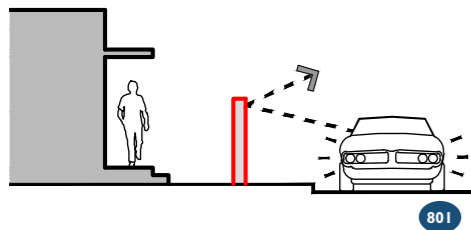


7.5.1 ACCESSIBILITY FOR THE DISABLED AND ELDERLY



7.6 PUBLIC ART





801

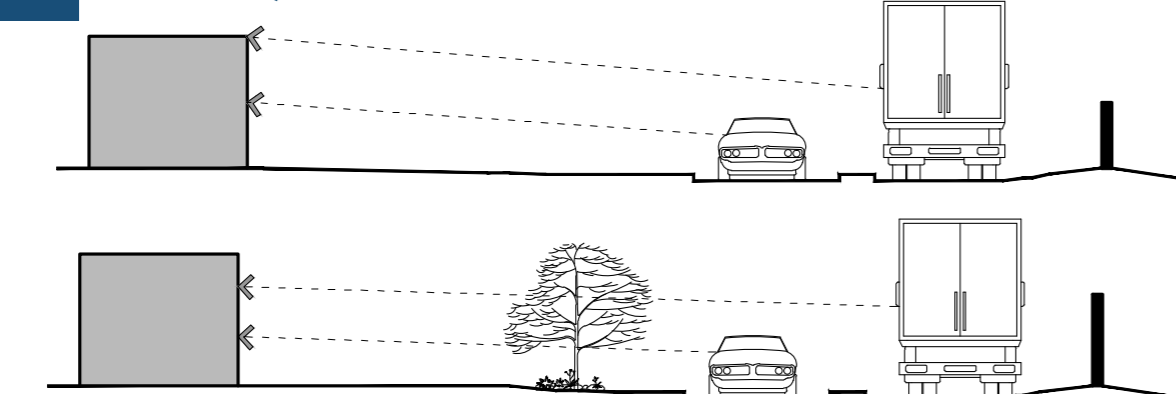
Noise barriers are elements that occupy the edges of a property adjacent to the street. These barriers are buffers that absorb or reflect sound produced on streets due heavy traffic.

Noise barriers can be designed for streets with 45m ROW or more.

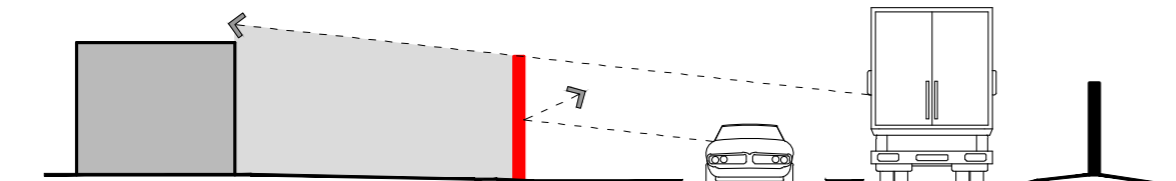
### 8.1 PLACEMENT

ZONES OF A STREET	
Frontage	Ⓜ
Pedestrian	Ⓜ
MUZ / Furnishing	Ⓜ
Edge	Ⓜ
NMV	Ⓜ
Treepit / Divider	Ⓜ
Vehicular Throughway	Ⓜ
Median	Ⓜ
Refuge Islands	Ⓜ

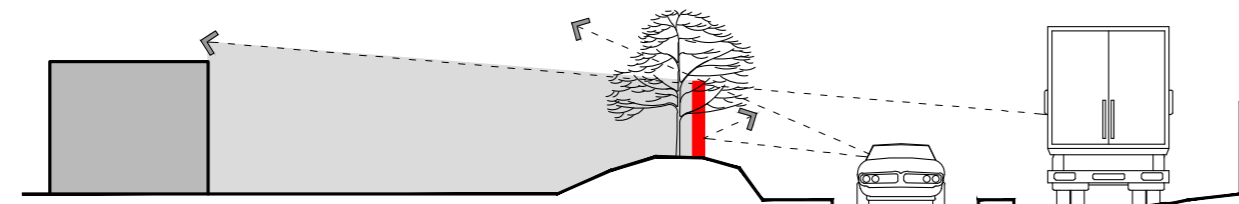
### 8.2 STANDARDS / MINIMUM CLEARANCES



802 Conditions requiring noise abatement



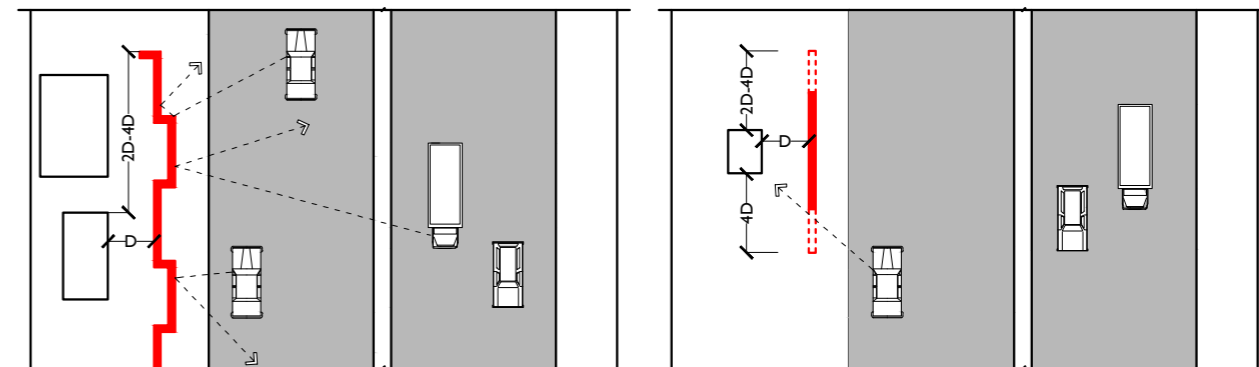
803 Height of Barrier - To obstruct the path of sound between the source and the receiver



804 Earth berm and noise barrier for noise cancellation

NOTE: All dimensions are in mm

References	Minimum Clearances	Legend : Zone Placement
Time-Saver Standards for Landscape Architecture by Charles W. Harris & Nicolas T. Dines	A : For access F : From the Kerb	Preferred (Ideal location) <span style="color: green;">Ⓜ</span>
Journal of Scientific and Industrial Research :Vol 71 March 2012 - Passive Noise Control Measures for Traffic Noise abatement in Delhi, India	B : From other furniture G : From transit shelter	Conditional (As per available space or landuse) <span style="color: black;">○</span>
	C : From property line H : From garbage bins	Not Preferred <span style="color: red;">Ⓜ</span>
	D : From door openings J : From tree edge	
	E : From pedestrian zone K : From edge of paving	



805

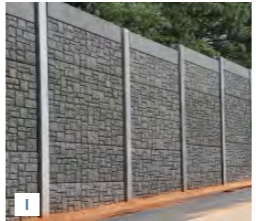



Barrier Design Morphology			
Requirements	Types	Material Aspects	Design considerations
Effectiveness	Reflective	Steel	Minimum height such that the line of sight between the source and the receiver is obstructed
Structural Integrity	Absorptive	Aluminium	1.5dB (A) additional noise reduction for each 1m increase in height after line of sight is intercepted
Compatibility with Environment	Earth Berms/ Bio Barriers	Polycarbonate/Acrylic	Proximity to source or receiver
Maintenance	Mixed	Concrete/Brick/Masonry/GRC	Should extend 4 times in each direction as distance from receiver to barrier
Safety & Durability	Multiple edges	Earth Berms	Extra defracting edge
Easy Installation	Random Edges	Proprietary made Acoustic Panels	T-profile barriers with absorptive material are most effective
Corrosion resistant	Reactive	Glass, Wood, Composites	
Economic Considerations	Dispersive (Zig-Zag)	Recycled materials	
Lighting and Drainage issues	Helium Filled		
	Enclosure, Inclined, Cantilever		

A suitable noise barrier compatible for a particular road network depends upon :

- Acoustic Attenuation
- Economical Constraints
- Structural Constraints
- Aesthetical Constraints
- Ease of Installation
- Compatibility with the environment,
- Maintenance
- Safety aspects.

- Barriers with contoured surfaces i.e zig-zag ; wavy ; castellated scatter sound waves prevent unwanted reflections
- Effectiveness of a thin barrier can be improved by bringing the diffractive edge nearer to the noise source.
- Transparent barriers, tilted and dispersive barriers and multiple edge design prove to be fruitful options for road traffic noise abatement.

### 8.3 SUITABILITY

	PRECAST CONCRETE	MASONRY	PLASTIC	METALS
DESCRIPTION				

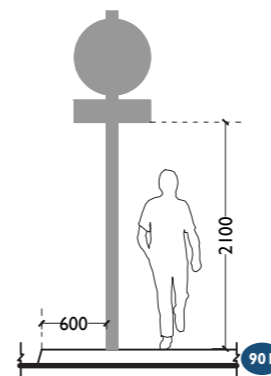
Suitability of Noise barriers will depend on the scale of the street and the adjoining plots. The desired installation should be durable and require least maintenance. Stone & Plastic mounted on stone are the most preferred varieties.

PART B

4.2 Specifications of Individual Street Elements and Amenities

INFORMATIVE

9 SIGNAGE



Signage are the physical indicators of rules, warnings and general information on the streets.

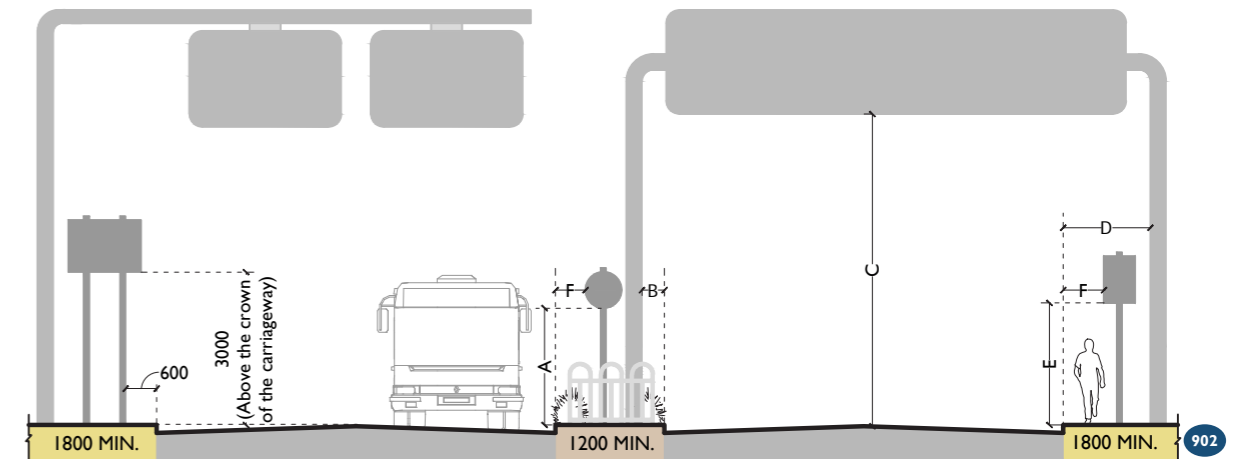
They may be of textual or graphical nature meant for communicating to the commuters on the streets about their whereabouts and provide guidance for safe movement in a multi-modal urban spaces.

The design, colours and fonts on the signages should be in accordance with IRC 67 - 2010.

9.1 PLACEMENT

ZONES OF A STREET	
Frontage	○
Pedestrian	Ⓜ
MUZ / Furnishing	□
Edge	□
NMV	Ⓜ
Treepit / Divider	○
Vehicular Throughway	Ⓜ
Median	□
Refuge Islands	○

9.2 STANDARDS/MINIMUM CLEARANCES



Multilane Carriageway Double Support for Signage with Area >0.9m<sup>2</sup>

Dual Lane Carriageway Single post support for Area upto 0.9m<sup>2</sup>

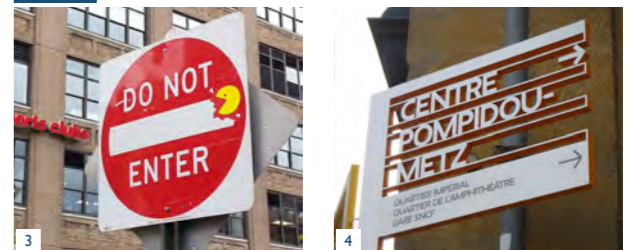
9.3 SUITABILITY

	REGULATORY	CAUTIONARY	INFORMATORY
DESCRIPTION			
SUITABILITY	<ul style="list-style-type: none"> <li>Edges</li> <li>MUZ</li> <li>Median</li> </ul>	<ul style="list-style-type: none"> <li>Edges</li> <li>Medians</li> </ul>	<ul style="list-style-type: none"> <li>Frontage</li> <li>Entrances</li> <li>Edges</li> <li>Medians</li> </ul>

9.5 BEST PRACTICES



9.6 PUBLIC ART

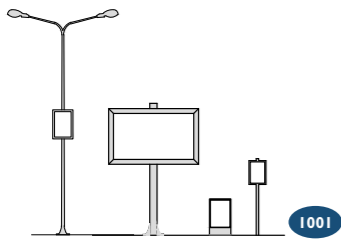


Legend: Frontage (grey), Pedestrian (yellow), Multi-Utility Zones (green), Non-Motorised Vehicle (orange), Verge/Treepit (light green), Carriageway (dark grey), Median (light grey)

References	Height and Clearance required for Sign Placement			Legend - Zone Placement
	Minimum	Desirable	Maximum	
IRC 67 : 2012 Code of Practice for Road Signs	A	2000	2000	Preferred (Ideal location) □
	B	1800	2500	Conditional (As per available space or landuse) ○
	C	5500	6500	
	D	5000	7000	Not Preferred Ⓜ
	E	2100	2500	
	F	300	1000	

NOTE: All dimensions are in mm





Display boards occupy the high visibility areas of the street like junctions and crossings.

These are meant for conveying information and promoting events and advertisement.

**Advertisement Boards**

- Not accessible to the public.
- May be installed over other street furniture that have the necessary provision.
- They are meant for pedestrians and motorists

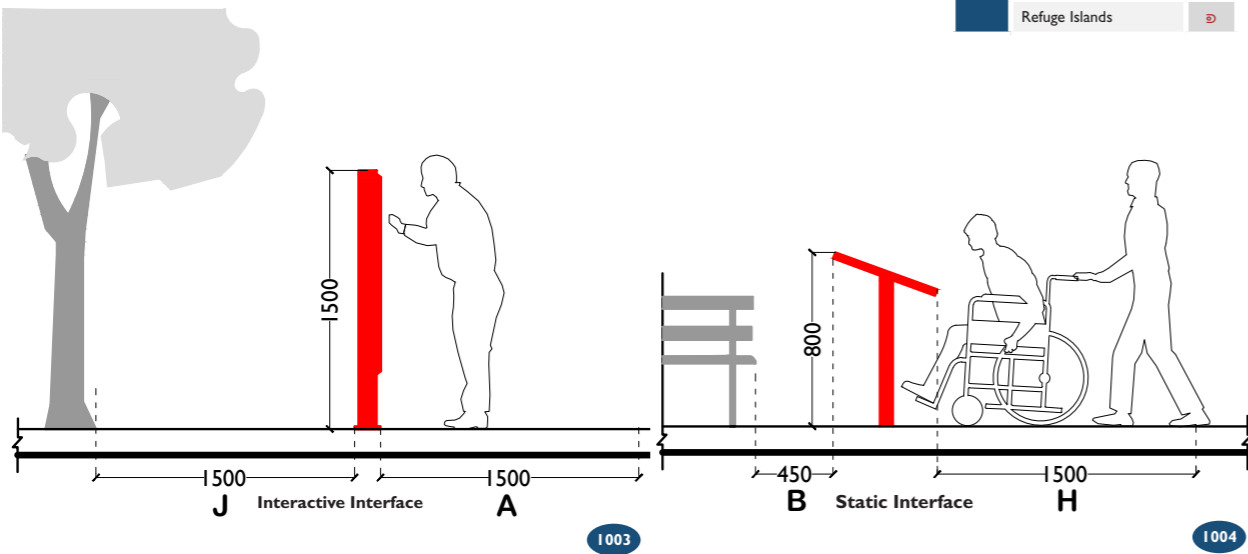
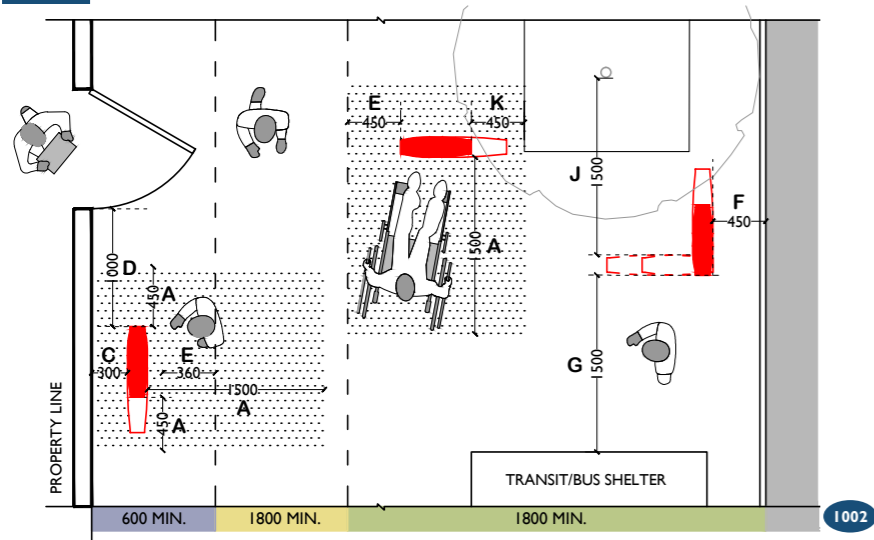
**Wayfinding Maps**

- Accessible to pedestrians.
- Static or interactive display
- Provide directions within a defined area.
- Must be designed for the disabled.

**Message boards or Poster Kiosks**

- Accessible to pedestrians.
- These ensure that other furniture such as signages are not covered with pamphlets/ads, thus help reduce visual chaos.

**10.2 STANDARDS/ MINIMUM CLEARANCES**



Frontage Pedestrian Multi- Utility Zones Non-Motorised Vehicle Verge/Treepit Carriageway Median

References	Minimum Clearances	Legend : Zone Placement
City of Hamilton Co-ordinated Street Furniture Guidelines	A : For access	Preferred (Ideal location)
Pune Street Design Guidelines	B : From other furniture	Conditional (As per available space or landuse)
Sky Sign PMC Jahirat Niyamavali 2010	C : From property line	Not Preferred
Delhi Outdoor Advertising Policy 2017: Balancing safety, aesthetics and revenues for public good Environment Pollution (Prevention & Control) Authority for the National Capital Region	D : From door openings	
	E : From pedestrian zone	
	F : From the Kerb	
	G : From transit shelter	
	H : From garbage bins	
	J : From tree edge	
	K : From edge of paving	

**10.1 PLACEMENT**

**10.1a ADVERTISEMENT BOARD**

ZONES OF A STREET	Placement
Frontage	○
Pedestrian	Ⓜ
MUZ / Furnishing	□
Edge	○
NMV	Ⓜ
Treepit / Divider	○
Vehicular Throughway	Ⓜ
Median	○
Refuge Islands	○

**10.1b MESSAGE/POSTER KIOSKS**

ZONES OF A STREET	Placement
Frontage	○
Pedestrian	Ⓜ
MUZ / Furnishing	□
Edge	○
NMV	Ⓜ
Treepit / Divider	Ⓜ
Vehicular Throughway	Ⓜ
Median	Ⓜ
Refuge Islands	Ⓜ

**10.1c WAYFINDING MAPS**

ZONES OF A STREET	Placement
Frontage	○
Pedestrian	Ⓜ
MUZ / Furnishing	□
Edge	Ⓜ
NMV	Ⓜ
Treepit / Divider	Ⓜ
Vehicular Throughway	Ⓜ
Median	Ⓜ
Refuge Islands	Ⓜ

**10.3 APPLICABILITY**

DESCRIPTION	INTERFACE		FUNCTION			MOUNTING	
	STATIC	INTERACTIVE	WAYFINDING	ADVERTISEMENT	POSTER KIOSKS	ON GRADE	ABOVE GRADE
10.3A, 10.3B, 10.3C, 10.3D, 10.3E, 10.3F, 10.3G							
SUITABILITY	<ul style="list-style-type: none"> <li>• High intensity pedestrian traffic</li> </ul>		All areas with significant pedestrian movement			<ul style="list-style-type: none"> <li>• Streets with wide MUZs that can accommodate stagnant pedestrians</li> </ul>	<ul style="list-style-type: none"> <li>• Areas that receive heavy pedestrian traffic and cannot allow halts</li> </ul>

As per the Delhi Outdoor Advertising Policy, 2017 (Draft) the advertisement devices have been categorized into 4 categories of which Category 1 & 2 can be considered relevant :

Category 1	Category 2												
Large-format advertisements, mainly fixed on billboards/ unipoles/ bi-poles/Variable Message advertising device such as LED, LCD Screens etc./and bridge / flyover panels etc;	Advertisements mounted on public amenities, like public toilets, garbage collection points/Flag Signs etc.;												
<table border="1"> <thead> <tr> <th>Placement</th> <th>Not permitted in</th> </tr> </thead> <tbody> <tr> <td>Lateral placement</td> <td>Medians ; Footpath ; Traffic islands and where carriageways diverge ; Outdoor advertising device shall not be permitted within 3 metres from the edge of existing carriageway.</td> </tr> <tr> <td>Longitudinal Placement</td> <td>within 75m of any traffic red-light erected for the regulation of traffic. Obstructing the path of pedestrians. If interfering with the visibility of approaching, merging or intersecting traffic. A round-about of outer diameter less than 100m. Distance between two advertisement displays on flyover panel/railway bridge/FOB must not be less than 75 m to avoid visual clutter.</td> </tr> </tbody> </table>	Placement	Not permitted in	Lateral placement	Medians ; Footpath ; Traffic islands and where carriageways diverge ; Outdoor advertising device shall not be permitted within 3 metres from the edge of existing carriageway.	Longitudinal Placement	within 75m of any traffic red-light erected for the regulation of traffic. Obstructing the path of pedestrians. If interfering with the visibility of approaching, merging or intersecting traffic. A round-about of outer diameter less than 100m. Distance between two advertisement displays on flyover panel/railway bridge/FOB must not be less than 75 m to avoid visual clutter.	<table border="1"> <thead> <tr> <th>Placement</th> <th>Not permitted in</th> </tr> </thead> <tbody> <tr> <td>Lateral placement</td> <td>A minimum gap of 2m must be maintained between amenity and site features like pavement curbs, trees, electrical poles, boundary walls etc. Medians excluding Pole Kiosks. Traffic islands and where carriageways diverge so much that oncoming traffic is not visible Pedestrian footpath</td> </tr> <tr> <td>Longitudinal Placement</td> <td>Unless specified, the principle of lateral and longitudinal placement will be applicable to Category 1 device only.</td> </tr> </tbody> </table>	Placement	Not permitted in	Lateral placement	A minimum gap of 2m must be maintained between amenity and site features like pavement curbs, trees, electrical poles, boundary walls etc. Medians excluding Pole Kiosks. Traffic islands and where carriageways diverge so much that oncoming traffic is not visible Pedestrian footpath	Longitudinal Placement	Unless specified, the principle of lateral and longitudinal placement will be applicable to Category 1 device only.
Placement	Not permitted in												
Lateral placement	Medians ; Footpath ; Traffic islands and where carriageways diverge ; Outdoor advertising device shall not be permitted within 3 metres from the edge of existing carriageway.												
Longitudinal Placement	within 75m of any traffic red-light erected for the regulation of traffic. Obstructing the path of pedestrians. If interfering with the visibility of approaching, merging or intersecting traffic. A round-about of outer diameter less than 100m. Distance between two advertisement displays on flyover panel/railway bridge/FOB must not be less than 75 m to avoid visual clutter.												
Placement	Not permitted in												
Lateral placement	A minimum gap of 2m must be maintained between amenity and site features like pavement curbs, trees, electrical poles, boundary walls etc. Medians excluding Pole Kiosks. Traffic islands and where carriageways diverge so much that oncoming traffic is not visible Pedestrian footpath												
Longitudinal Placement	Unless specified, the principle of lateral and longitudinal placement will be applicable to Category 1 device only.												

**10.4 DESIGN VARIATION**

The design of Display Boards will vary with the size and purpose of the display.

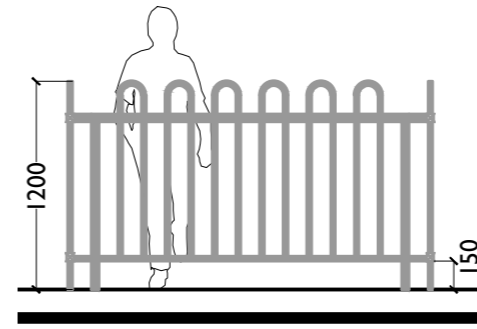
**10.5 BEST PRACTICES**



Device mounted on	Specifications
Garbage and toilet facilities	Up to 23 sqm per single unit Should not obstruct pedestrian path or visibility
Drinking water, kiosk outside colony to facilitate payment of bills	Panels upto 3mx3m <70 % of the visible area to Public.
Road side kiosks, Tea/Cold Drink Kiosk/Fruit juice, Snack bar, Florist, Paan, etc.	< 2.25 Sqm
information displays for public city maps, colony maps etc.	< 2.25sqm
Police Booths/ Tourist Kiosks	< 2.25sqm
Street Benches, Clock towers, dustbin etc.	<2sqm Min. 5m between two parallel ads Not permitted on median <1.2m.
Pole Kiosk:	Area <0.91 sqm Min. 1.2m ground clearance Min. 2 m below any light fixture No displays on the first three street lamp poles from any intersection or traffic light.

# 11

## GUARDRAIL

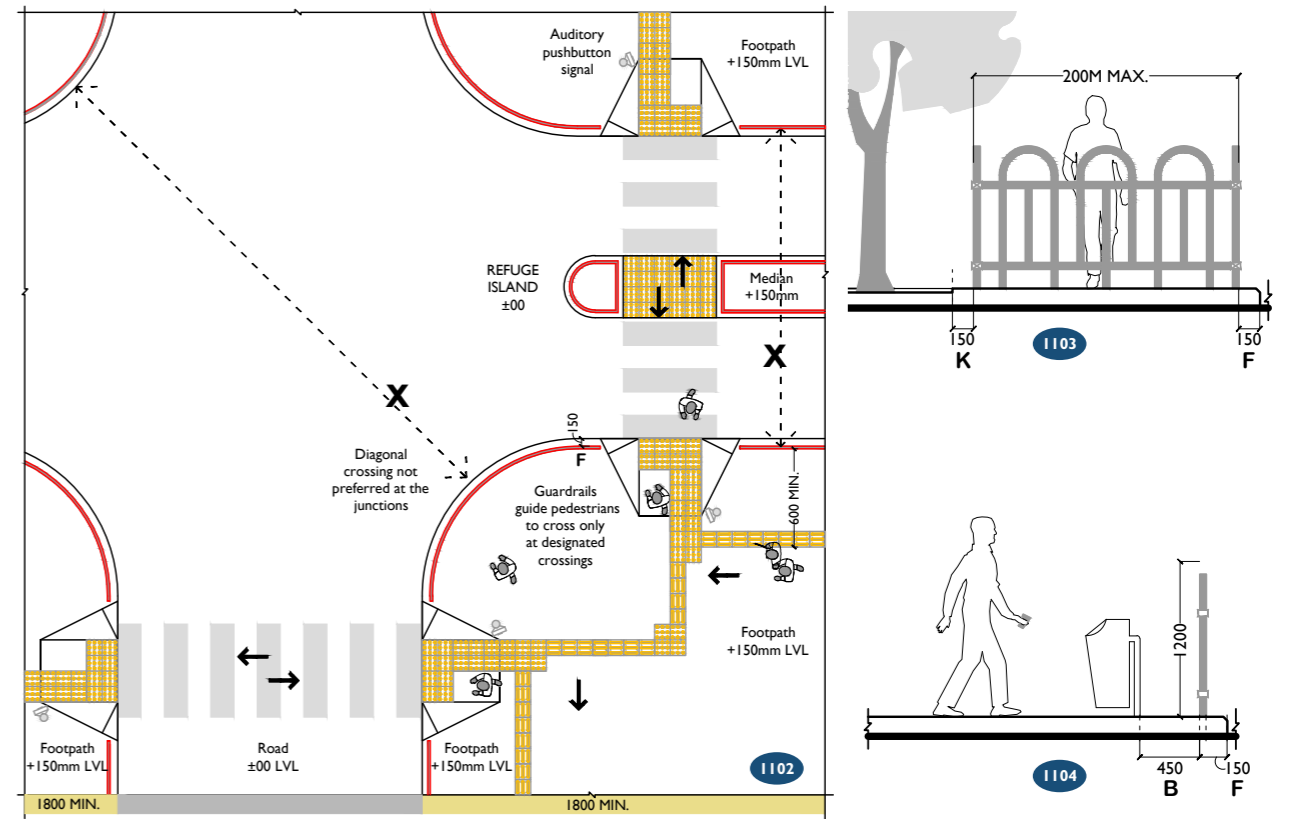


Guardrails are barriers installed along the direction of movement intended to reduce conflicts between pedestrian & vehicles. They also act as crash barriers (accident handling elements) that help contain the impact of the vehicle in case the vehicles go out of control during accidents.

### 11.1 PLACEMENT

ZONES OFA STREET	Placement
Frontage	Ⓡ
Pedestrian	Ⓡ
MUZ / Furnishing	⓪
Edge	□
NMV	Ⓡ
Treepit / Divider	⓪
Vehicular Throughway	Ⓡ
Median	□
Refuge Islands	⓪

### 11.2 STANDARDS / MINIMUM CLEARANCES



### PART B

## 4.2 Specifications of Individual Street Elements and Amenities

### REGULATIVE

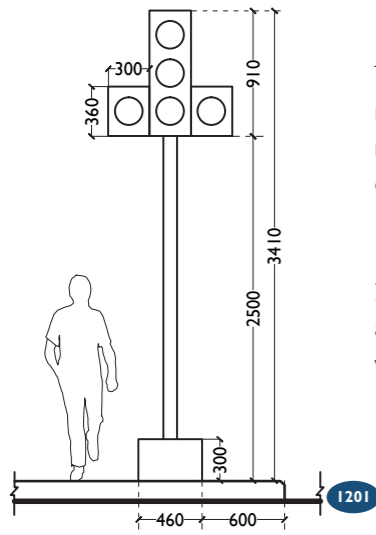
### 11.5 BEST PRACTICES



### 11.6 PUBLIC ART



References	Minimum Clearances	Legend : Zone Placement
DDA, UTTIPEC : Guidelines and Design Specifications For Crash Barriers, Pedestrian Railings and Dividers	A : For access B : From other furniture C : From property line D : From door openings E : From pedestrian zone	Preferred (Ideal location) □ Conditional (As per available space or landuse) ○ Not Preferred Ⓡ
IRC 93-1985 : Guidelines on Design and Installation of Road Traffic Signals	F : From the Kerb G : From transit shelter H : From garbage bins J : From tree edge K : From edge of paving	



Traffic Signals are light indicators, that regulate motorised vehicles in a systematic manner. These lights cater to all commuters on the road, pedestrians and motorists.

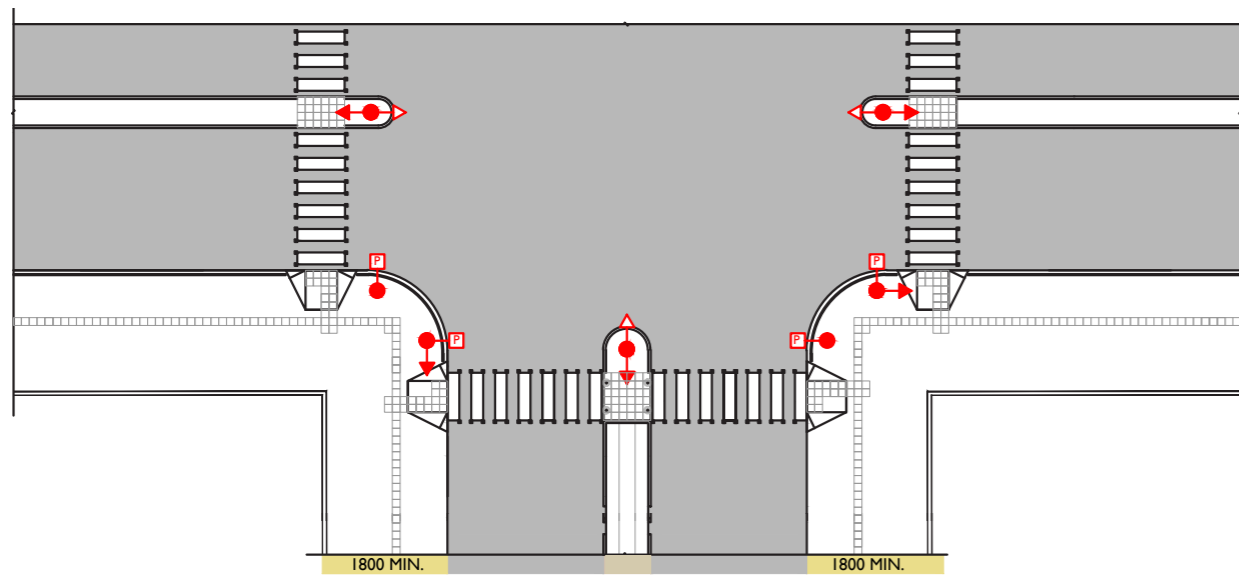
**Minimum Requirements :**

2m from all edge of the equipment, to afford easy access and use of ladders/elevated work platforms, when service doors are fully opened.

**12.1 PLACEMENT**

ZONES OF A STREET	
Frontage	Ⓧ
Pedestrian	Ⓧ
MUZ / Furnishing	Ⓧ
Edge	□
NMV	Ⓧ
Treepit / Divider	○
Vehicular Throughway	Ⓧ
Median	□
Refuge Islands	○

**12.2 STANDARDS / MINIMUM CLEARANCES**



**Primary Signal**

The signal face nearest to and facing the incoming traffic.

**Secondary Signal :**

A signal face showing the same indications as on a primary signal, away from the incoming traffic and on its off-side.

**Pedestrian Signal**

Two faces- one facing the pedestrians on the same side and Signal facing the

**Auxiliary Signs**

- Auxiliary signs used with traffic signals such as restrictions of turning movements, etc. shall be located adjacent to the signal face to which they apply.
- When used in conjunctions with traffic signals, illuminated signs shall be designed and mounted in such a manner so as to avoid glare and reflections that detract from the signal indications.
- The traffic signal control shall be given dominant position and brightness to assure its target priority in the overall display.

References	Minimum Clearances	Legend : Zone Placement
Specification & Guidelines for the Design, Installation and Maintenance of Traffic Signals in Somerset	A : For access B : From other furniture C : From property line D : From door openings E : From pedestrian zone	F : From the Kerb G : From transit shelter H : From garbage bins J : From tree edge K : From edge of paving
		Preferred (Ideal location) □ Conditional (As per available space or landuse) ○ Not Preferred Ⓧ

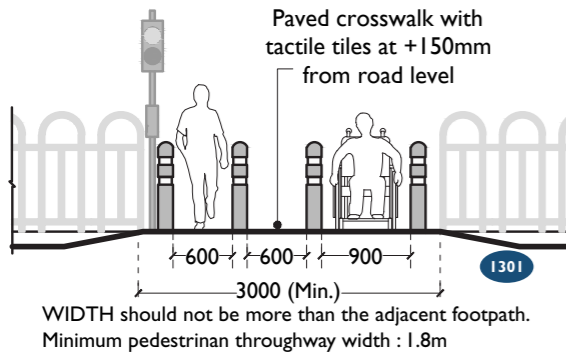
**12.3 APPLICABILITY**

DESCRIPTION	USABILITY		CONTROL	
	VISUAL	AUDITORY	INTEGRATED	PEDESTRIAN
 Traffic signals with color and symbols to regulate traffic	 The signal beeps to signal the visually impaired to cross safely	 Standard traffic control system with a set pattern/algorithm	 Pedestrians can control the signals	
SUITABILITY	<ul style="list-style-type: none"> <li>All crosswalks / junctions</li> </ul>			<ul style="list-style-type: none"> <li>Slow pedestrian traffic like schools, hospitals, old age homes, transit hubs</li> </ul>

DESCRIPTION	MOUNT				TARGET			
	VERTICAL POLES	HORIZONTAL POLES	WIRED GANTRY	WIRE SUSPENDED	MOTORIST	CYCLIST	PEDESTRIAN	EQUESTRIAN
 12.3E	 12.3F	 12.3G	 12.3H	 12.3J	 12.3K	 12.3L	 12.3M	
SUITABILITY	<ul style="list-style-type: none"> <li>All types of streets</li> </ul>	<ul style="list-style-type: none"> <li>Carriageways with width of 18m and more</li> </ul>	<ul style="list-style-type: none"> <li>Streets that accommodate heavy traffic</li> <li>Streets lined with dense vegetation</li> </ul>	<ul style="list-style-type: none"> <li>Junctions</li> <li>Railway crossings,</li> <li>Slow pedestrian traffic like schools, hospitals, old age homes</li> </ul>	<ul style="list-style-type: none"> <li>NMV zones and traffic junctions</li> </ul>	<ul style="list-style-type: none"> <li>All junctions and crosswalks</li> </ul>	<ul style="list-style-type: none"> <li>Areas where cavalry is maintained</li> </ul>	

**12.5 BEST PRACTICES**





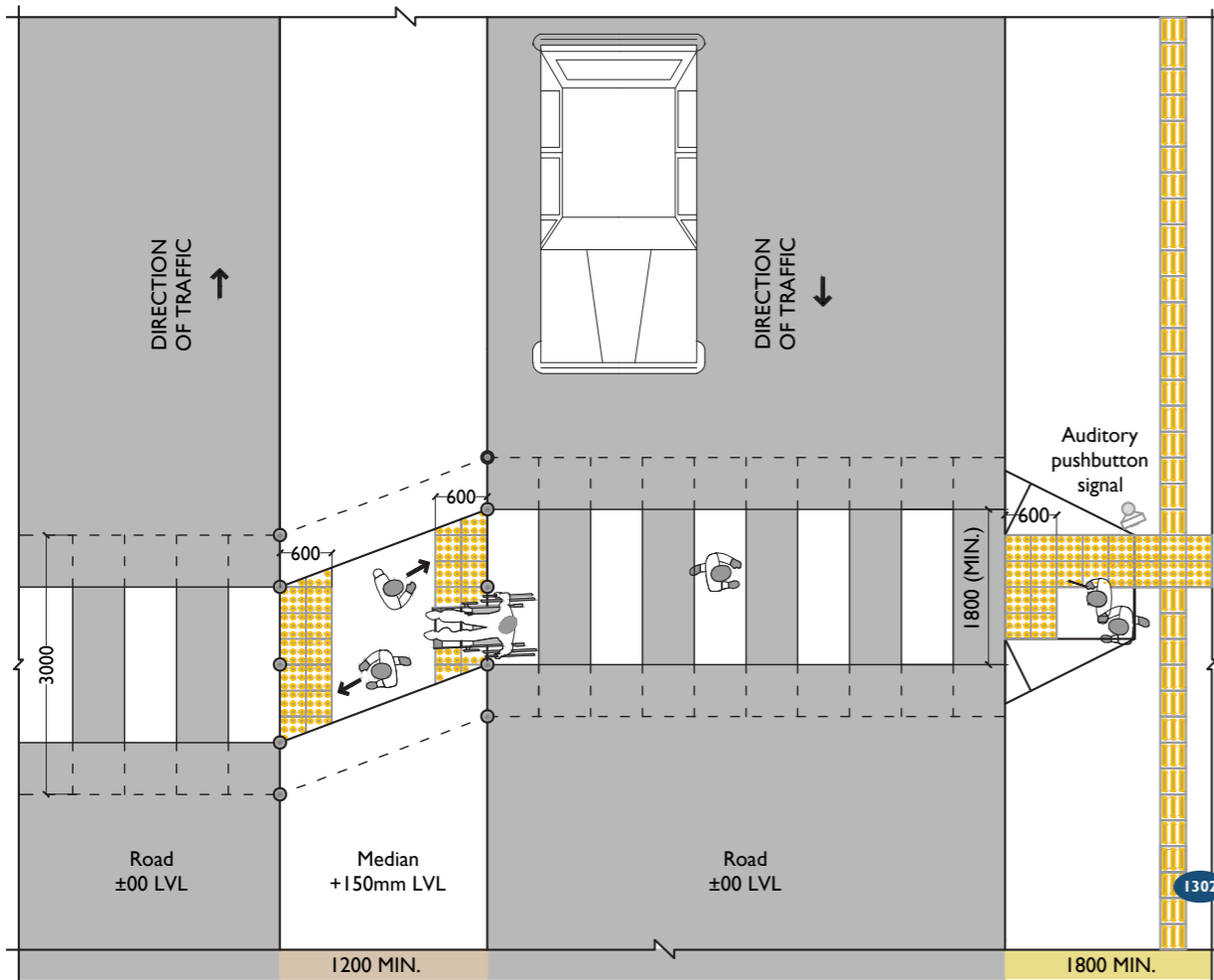
Crosswalks or Pedestrian Crossings are demarcated zones across the NMV lanes and vehicular throughways for safe crossing of pedestrians.

Intervals :  
**Residential Areas :** 80 - 250m  
**Commercial / Mixed Use Areas :** 80 - 150m

13.1 PLACEMENT

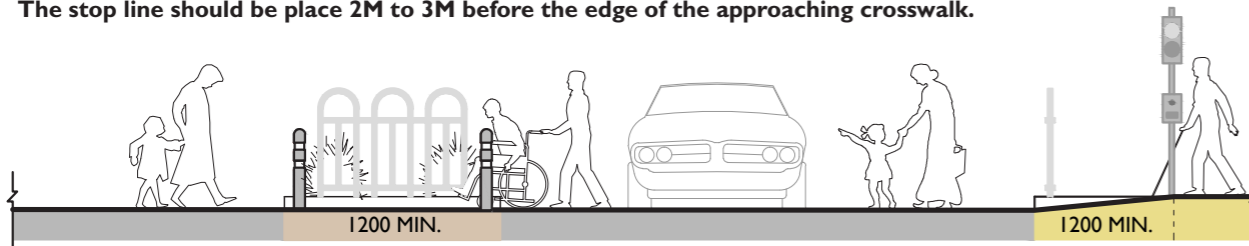
ZONES OF A STREET	
Frontage	Ⓡ
Pedestrian	Ⓡ
MUZ / Furnishing	Ⓡ
Edge	Ⓡ
NMV	□
Treepit / Divider	Ⓡ
Vehicular Throughway	□
Median	Ⓡ
Refuge Islands	□

13.2 STANDARDS / MINIMUM CLEARANCES



All crosswalks should be facilitated with amenities for the disabled.

The stop line should be place 2M to 3M before the edge of the approaching crosswalk.



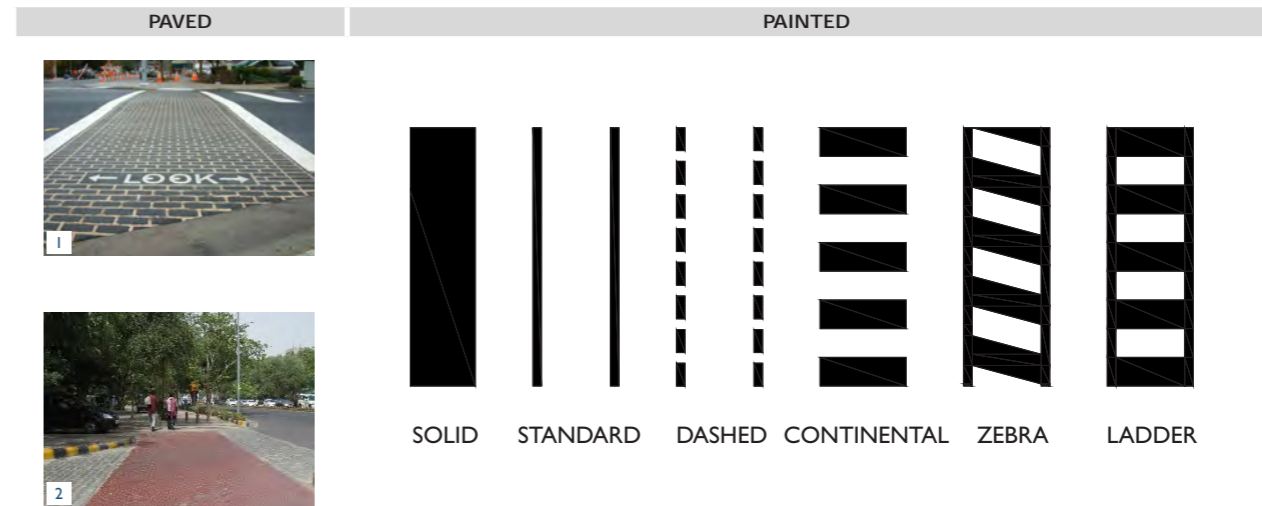
Crosswalk at Grade - Zebra / Standard / Dashed / Crossings

References	Minimum Clearances	Legend : Zone Placement
UTTIPEC	A : For access	Preferred (Ideal location) □
IRC 103 : 2012 Guidelines for Pedestrian Facilities	B : From other furniture	Conditional (As per available space or landuse) ○
IRC 35 : 1997 Code of Practice for Road Markings	C : From property line	Not Preferred Ⓡ
Guide to the San Francisco Better Streets Plan	D : From door openings	
	E : From pedestrian zone	
	F : From the Kerb	
	G : From transit shelter	
	H : From garbage bins	
	I : From tree edge	
	J : From edge of paving	
	K : From edge of paving	

13.3 SUITABILITY

DESCRIPTION	BASED ON LOCATION		BASED ON LEVEL		BASED ON CONTROL		
	JUNCTION	MID-BLOCK WITH REFUGE	AT GRADE	RAISED	GRADE SEPARATED	TRAFFIC SIGNALLED	
13.3A Demarcated zones prior to stop line	13.3B Demarcated zones between two junctions	13.3C Crosswalk level is same as the carriageway	13.3D Crosswalk level same as the footpath	13.3E Foot-over bridges and Sub-ways	13.3F TRAFFIC SIGNALLED	13.3G PELICAN/PUFFIN	
SUITABILITY	• All typical intersections and T-junctions	• Between two junctions at every 80-150m	• All typical road junctions	• Mid-block crossings near schools, hospitals etc. • Non-Signalised junctions	• Heavy traffic corridors with heavy pedestrian traffic	• Areas requiring high visibility	• Junctions close to buidings like schools, hospitals where pedestrian traffic may be slow

13.4 DESIGN VARIATION

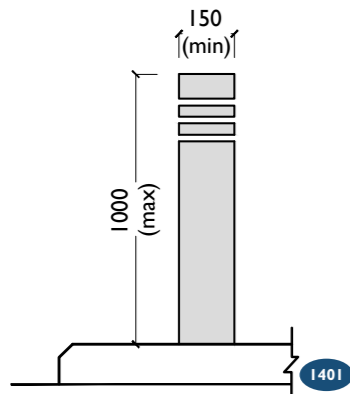


13.5 BEST PRACTICES



13.6 PUBLIC ART





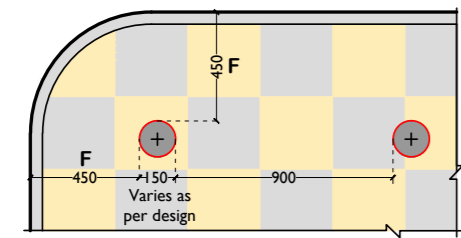
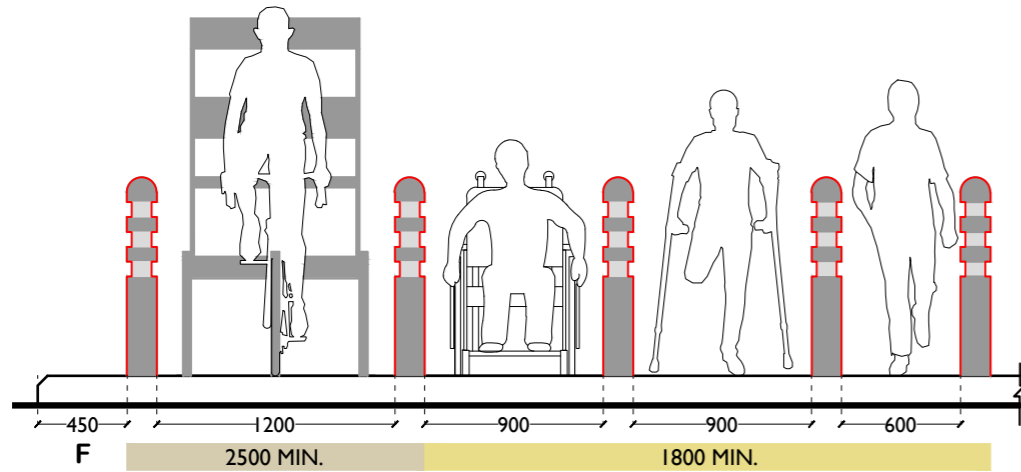
Bollards are barriers that help define an edge and regulate vehicular traffic to prevent encroachment of the zones designated with exclusive pedestrian / NMV usage.

They add character to the urban public realm. They can be multifunctional that help reduce the number of objects on the street.

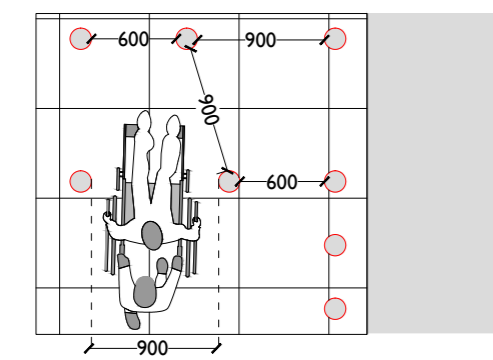
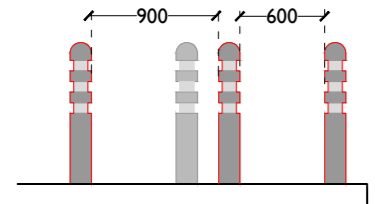
14.1 PLACEMENT

ZONES OF A STREET	Frontage	Ⓡ
	Pedestrian	□
	MUZ / Furnishing	○
	Edge	□
	NMV	□
	Treepit / Divider	Ⓡ
	Vehicular Throughway	Ⓡ
	Median	Ⓡ
	Refuge Islands	□

14.2 STANDARDS/ MINIMUM CLEARANCES



USER	WIDTH
A single person	<700 mm
Single person with walking stick	750 mm
Single Person with two sticks, crutches, walking frame; Single wheelchair user	900 mm
Blind person using a cane	1100 mm
Blind person with a guide	1200 mm



**Issues related to placing of bollards**  
The spacing between Bollards for a wheelchair (900mm) often allows the two-wheelers to encroach the pedestrian through-way. Solutions have to include designing of bollards that can create optical illusion or staggered placement.

References	Minimum Clearances	Legend : Zone Placement
Inclusive Mobility Standards, UK	A : For access	Preferred (Ideal location) □
UTTIPEC	B : From other furniture	Conditional (As per available space or landuse) ○
MPD	C : From property line	Not Preferred Ⓡ
CPWD Guidelines and Space Standards for Barrier Free Built Environment for Disabled and Elderly Persons	D : From door openings	
	E : From pedestrian zone	
	F : From the Kerb	
	G : From transit shelter	
	H : From garbage bins	
	J : From tree edge	
	K : From edge of paving	

14.3 SUITABILITY

DESCRIPTION	FIXED		FLEXIBLE		
	EMBEDDED	SURFACE MOUNTED	REMOVABLE	REBOUNDING	RETRACTABLE
14.3A	14.3B	14.3C	14.3D	14.3E	
SUITABILITY	• Places that witness heavy pedestrian traffic	• Visual barrier • Light pedestrian traffic	• Temporary barriers • Traffic re-direction and re-routing	• Parking lots • Drop-offs • Sharp turns • U-turns	• Gates • Traffic re-routing

14.4 DESIGN VARIATION

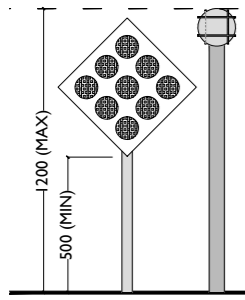
MATERIAL	FORM	FUNCTION
1 CONCRETE	5	9 REFLECTOR
2 PLASTIC	6	10 PLANTER
3 POLYURETHENE	7	11 LIGHTING
4 STAINLESS STEEL	8	12 BOLLARD

14.5 BEST PRACTICES



14.6 PUBLIC ART





1501

Reflectors are objects attached with retroreflective material that act as indicators of dead ends, road edges and change of alignment on the roads under poor light conditions. When a ray of light enters a retroreflective material, the light is reflected back to the emitting source.

These objects act as guides for the motorists and thus prevent collisions with footpath edges.

15.1 PLACEMENT

15.1a

Post / Board / Chevron

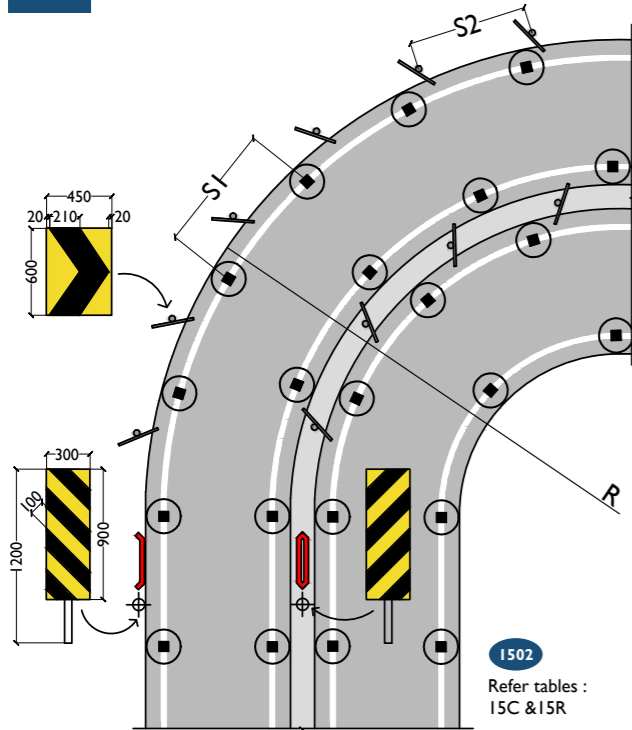
ZONES OF A STREET	Placement
Frontage	Ⓧ
Pedestrian	Ⓧ
MUZ / Furnishing	○
Edge	□
NMV	Ⓧ
Treepit / Divider	□
Vehicular Throughway	Ⓧ
Median	□
Refuge Islands	□

15.1b

Studs

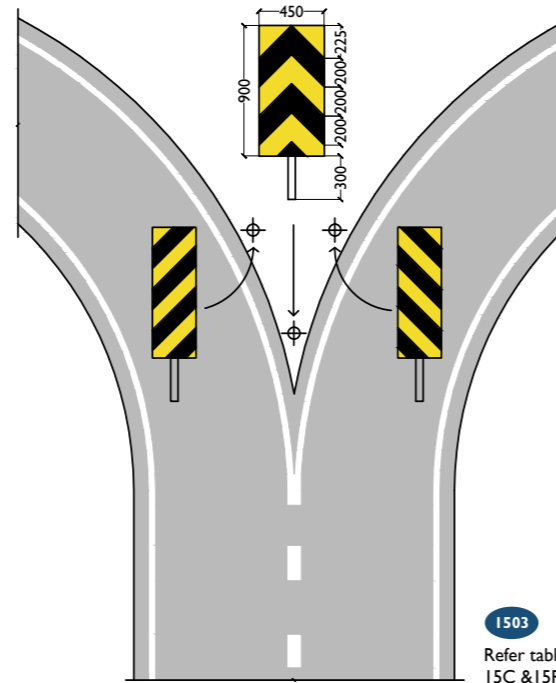
ZONES OF A STREET	Placement
Frontage	Ⓧ
Pedestrian	Ⓧ
MUZ / Furnishing	Ⓧ
Edge	□
NMV	□
Treepit / Divider	Ⓧ
Vehicular Throughway	□
Median	□
Refuge Islands	□

15.2 STANDARDS /MINIMUM CLEARANCES



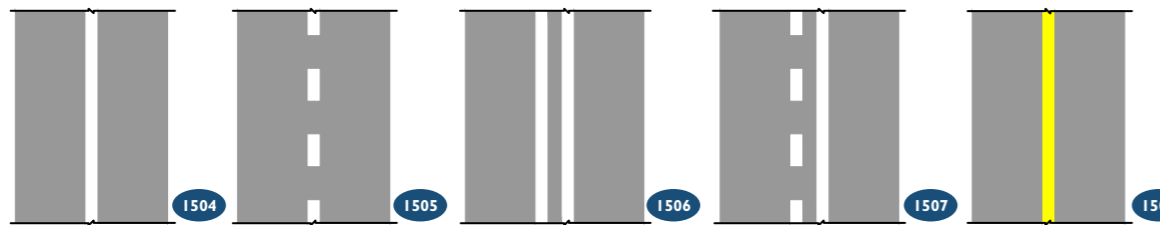
1502

Refer tables : 15C & 15R



1503

Refer tables : 15C & 15R



1504 SOLID, 1505 BROKEN, 1506 DOUBLE SOLID, 1507 SOLID+BROKEN, 1508 YELLOW LINES:

- 1504 SOLID:** Restrictive ; Do not permit crossing, except in case of entry/ exit from a premises or to avoid an obstruction.
- 1505 BROKEN:** Permissive ; May be crossed if traffic permits.
- 1506 DOUBLE SOLID:** Maximum restrictions ; Not to be crossed except in emergencies.
- 1507 SOLID+BROKEN:** May be crossed at discretion if on the side of the broken line. Vehicles on the opposite side are not allowed to cross the solid line.
- 1508 YELLOW LINES:**
  - Lines indicating Parking restrictions
  - Obstruction approach markings
  - No overtaking zone markings
  - Center line - optionally

NOTE: All dimensions are in mm

References	Minimum Clearances	Legend : Zone Placement
IRC SP:84-2014 Manual of Specifications & Standards for Four Lining of Highways through Public-Private Partnership	A : For access	Preferred (Ideal location) □
IRC 35:1997 Code of Practice for Road Markings	B : From other furniture	Conditional (As per available space or landuse) ○
IRC 79:1981 Recommended Practice for Road Delineators	C : From property line	Not Preferred Ⓧ
	D : From door openings	
	E : From pedestrian zone	
	F : From the Kerb	
	G : From transit shelter	
	H : From garbage bins	
	J : From tree edge	
	K : From edge of paving	

15.3 SUITABILITY

	STRIPS	POSTS	STUDS	SIGNS
DESCRIPTION				
SUITABILITY	<ul style="list-style-type: none"> <li>Useful for marking trees, rocks, edges</li> </ul>	<ul style="list-style-type: none"> <li>Median</li> <li>Dividers</li> </ul>	<ul style="list-style-type: none"> <li>Used as delineators along edges and kerbs</li> </ul>	<ul style="list-style-type: none"> <li>Edges of roads and Medians</li> </ul>

15.4 DESIGN VARIATION



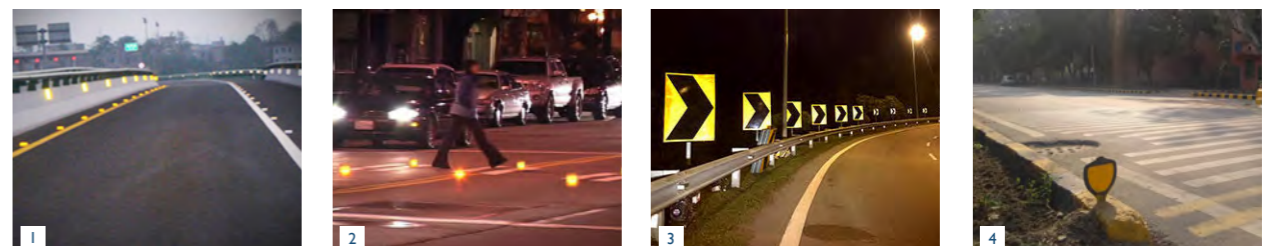
15C - Chevrons		
Turning radius R	Spacing S2 (m)	
	At the turn	Before the turn
50	15	30
100	20	40
200	30	60
300	45	90
400	60	120
500	70	140
> 500	80	150

15D - Delineators	
Turning radius : R	Spacing (m)
30	6
50	8
100	12
200	20
300	25
400	30
500	35
600	38
700	42
800	45
900	48
1000	50

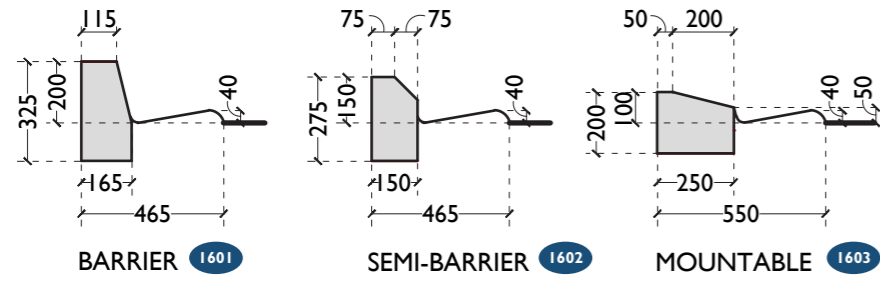
15M - Markers /Road Studs			
Description of Section	Length	Spacing S1	Location and Colour
All Major/ Minor Bridges, Road Over Bridges and all structures (Interchange/ Flyover/ Vehicular Underpass)	Structure portion and adjoining 180M on either side	9M	Shoulder side : RED Median : AMBER
	Approach length including acceleration/ deceleration length if any and 180M adjoining on either side	18M	
Built-up areas	Length of built-up from the start to end	18M	Shoulder side : RED Median : AMBER
All entry/ exit slip roads/ ramps and its acceleration/ deceleration lanes	Length of both side/ edge lines of slip roads/ ramp+ edge line of acceleration/ deceleration lane	9M	
	Chevron/ diagonal markings on gorge	6M	RED
	For lane changing of entry/ exit slip roads	8M	GREEN
All junctions and median openings	Length of shoulder and median edge lines	18M	Shoulder side : RED Median : AMBER
	Chevron/ diagonal markings	6M	RED
	At the start of acceleration lane	3 rows at 1M apart	GREEN
Pedestrian crossings	All four corners of all blocks of pedestrian crossing markings	2 rows at 0.5M spacing	AMBER

The size and type of road reflectors vary as per use. They can be attached to posts, guardrails, crash barriers, kerbs, edges of the carriage way and crosswalks. They can also be installed over immovable protrusions on throughways like trees, boundary walls, electrical poles etc. for the convenience and safety of the commuters.

15.5 BEST PRACTICES



Kerb is the edge of any raised pavement on the street. It helps protect the pedestrian zones from forceful impact of the vehicles and prevents encroachment by the vehicles.



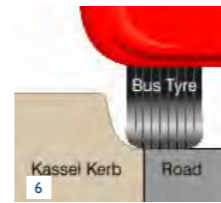
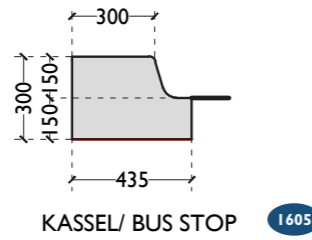
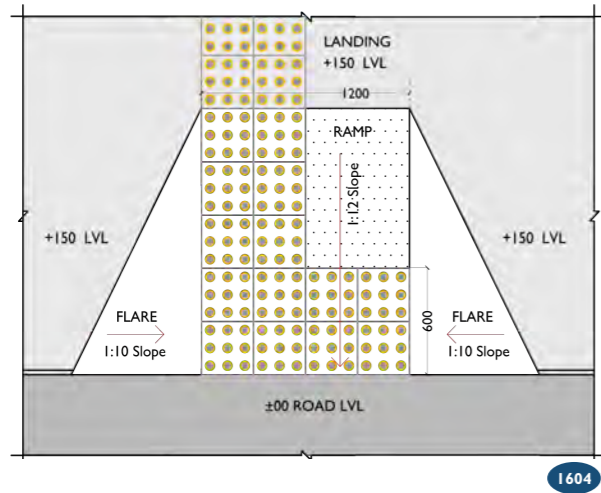
16.1 PLACEMENT

ZONES OF A STREET	
Frontage	Ⓧ
Pedestrian	Ⓧ
MUZ / Furnishing	Ⓧ
Edge	□
NMV	Ⓧ
Treepit / Divider	□
Vehicular Throughway	Ⓧ
Median	□
Refuge Islands	□

16.2 STANDARDS / MINIMUM CLEARANCES

Maximum height : 150mm

Kerbs may allow mounting or function as a barrier as per the location and use of the area. Other types of barriers such as bollards, guardrails and plantations are often required to facilitate the kerbs to function efficiently.



Refer Minimum Clearances\* for distances from the individual furniture in the respective specifications for different amenities/elements.

16.3 SUITABILITY

DESCRIPTION	BARRIER		MOUNTABLE		
	VERTICAL	SLOPE	KASSEL	CHANNEL	RAMP
SUITABILITY	<ul style="list-style-type: none"> <li>Heavy pedestrian/ vehicular traffic</li> </ul>		<ul style="list-style-type: none"> <li>Bus stops</li> <li>Parking bays</li> </ul>		<ul style="list-style-type: none"> <li>Parking lots, property entrances, junctions, medians</li> </ul>

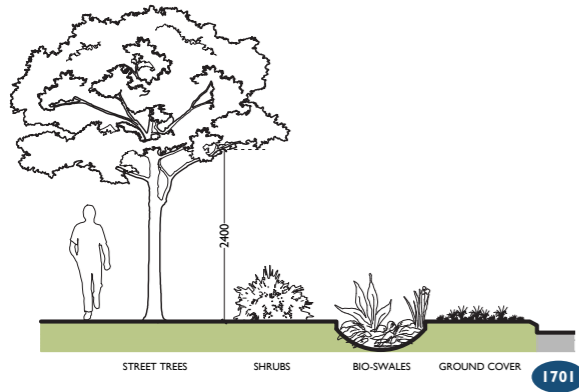
NOTE: All dimensions are in mm

References	Minimum Clearances*	Legend : Zone Placement
IRC 103 : 2012 Guidelines for Pedestrian Facilities	A : For access	F : From the Kerb
IRC 86 : 1983 Geometric Design Standards for Urban Roads in Plains	B : From other furniture	G : From transit shelter
Time-Saver Standards for Landscape Architecture	C : From property line	H : From garbage bins
	D : From door openings	J : From tree edge
	E : From pedestrian zone	K : From edge of paving
		Preferred (Ideal location) □
		Conditional (As per available space or landuse) ○
		Not Preferred Ⓧ

PART B

4.2 Specifications of Individual Street Elements and Amenities

LANDSCAPE



**Vegetation on streets :**

- Provide shade; encourage social activities
- Act as Noise buffer
- Add character; improve appearance
- Act as physical barrier to prevent encroachment.
- Aid in sustainable storm water management.

**17.1 PLACEMENT**

ZONES OF A STREET	Placement
Frontage	□
Pedestrian	Ⓜ
MUZ / Furnishing	□
Edge	○
NMV	Ⓜ
Treepit / Divider	□
Vehicular Throughway	Ⓜ
Median	□
Refuge Islands	○

**17.2 STANDARDS / MINIMUM CLEARANCES**

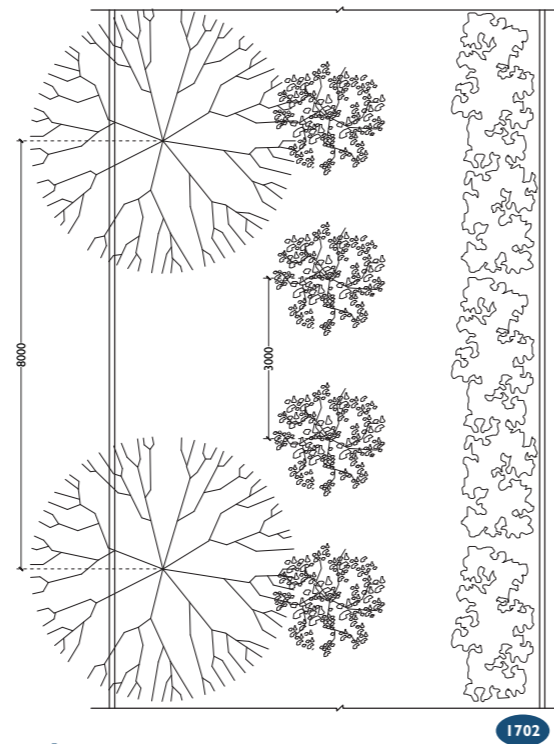
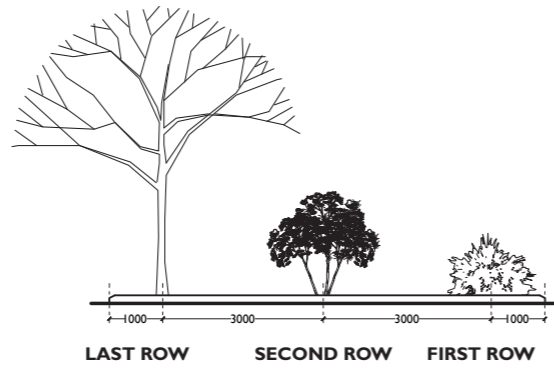
**Plantation on MUZ / Edge / Frontage**

**Last Row - Shade Trees**

Distance from preceding row	3m
Spacing between 2 plants	8 - 12m
Size of the pits	1.2m x 1.2m x 1.2m
No of plants per km	84 (167 at 6m spacing)

**First & Second Row - Ornamental Plants**

Distance from toe of carriageway	1m
Distance from preceding row	3m
Spacing between 2 plants (min)	3m
Size of the pits	0.6m x 0.6m x 0.6m
No of plants per km	84 (167 at 6m spacing)



**No Plantation Zone**

- Within 1.5m from the toe of the carriageway
- 5m blank space at median cut and grade separator
- No long rooted plants on the median

**Plantation on Median**

The shrubs to be planted in the median should be of low or medium height for prevention of the headlight glare. One to two rows of flowering shrubs will be provided according to the varying width of the median in different sections.

Type	Median Width
Turf	Less than 1.5m
Single row of Shrubs	Upto 3m
Two rows of shrubs at 1.5m from the inner edge	4.5-5m

**Selection of Plant variety**

- Aim and objective of plantation
- Shape (spread of the tree) and size
- Texture and colour of foliage/ flower/ fruits in different seasons and stages of growth
- Adaptability and suitability
- Growth rate - maturity and replacement cycle
- Maintainance
- Economic and other social/ recreational benefits

**NOTE:** All dimensions are in mm

References	Minimum Clearances	Legend : Zone Placement
IRC SP-021-2009 - Guidelines on Landscaping and Tree Plantation	A : For access F : From the Kerb	Preferred (Ideal location) □
CPWD - A Handbook of Landscape - Guide	B : From other furniture G : From transit shelter	Conditional (As per available space or landuse) ○
	C : From property line H : From garbage bins	Not Preferred Ⓜ
	D : From door openings J : From tree edge	
	E : From pedestrian zone K : From edge of paving	

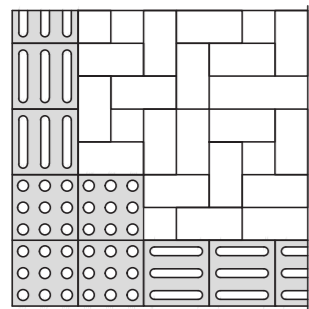
**17.3 SUITABILITY**

	GROUND COVER	HEDGES	STREET TREES	PLANTERS ON POLES
<b>DESCRIPTION</b>	17.3A	17.3B	17.3C	17.3D
<b>SUITABILITY</b>	<ul style="list-style-type: none"> <li>• As part of bio -swales, on median-cuts and tree pits;</li> <li>• Preferable in areas with less pedestrian movement</li> </ul>	<ul style="list-style-type: none"> <li>• On edges as barriers between two zones</li> </ul>	<ul style="list-style-type: none"> <li>• Areas with high pedestrian movement to create shaded pedestrian thoroughway</li> </ul>	<ul style="list-style-type: none"> <li>• Suitable on medians for ornamentation</li> </ul>

**17.5 BEST PRACTICES**





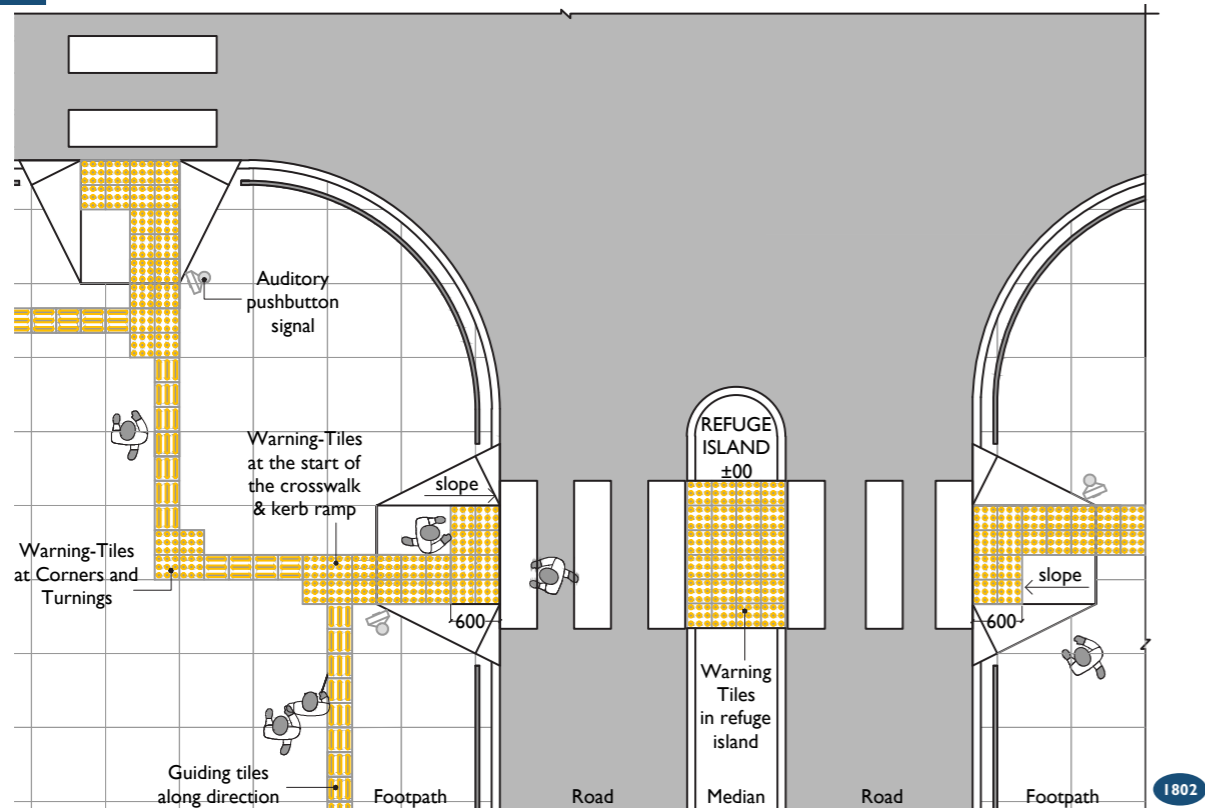


Paving on the street depends on the zone of the street. Both vehicular and pedestrian routes require anti-skid type of paving.

Durability and maintenance are essential components when selecting the type of paving.

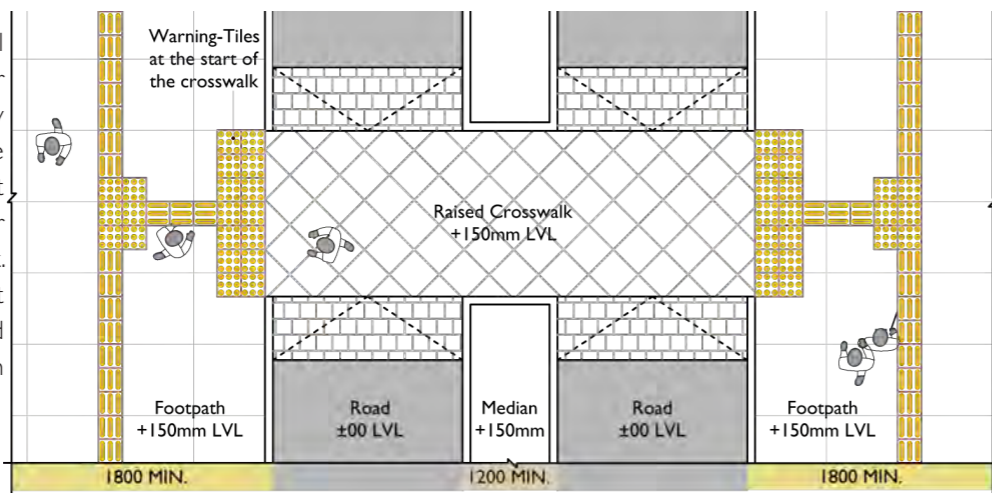
1801

18.2 STANDARDS FOR MINIMUM CLEARANCES



1802

Anti-skid paving material must be chosen for pedestrian throughway zones. The appearance of the paving must complement other elements of the street. Materials chosen must be durable and should require minimum maintenance.



AT MID - BLOCKS

1803

Frontage Pedestrian Multi-Utility Zones Non-Motorised Vehicle Verge/Treepit Carriageway Median

NOTE: All dimensions are in mm

References	Minimum Clearances	Legend : Zone Placement
Department of the Environment, Transport and the Regions Guidance on the Use of Tactile Paving Surfaces	A : For access	Preferred (Ideal location)
CPWD Guidelines and Space Standards for Barrier Free Built Environment for Disabled and Elderly Persons	B : From other furniture	Conditional (As per available space or landuse)
Disability and Discrimination Act (DDA), 2005	C : From property line	Not Preferred
	D : From door openings	
	E : From pedestrian zone	
	F : From the Kerb	
	G : From transit shelter	
	H : From garbage bins	
	J : From tree edge	
	K : From edge of paving	

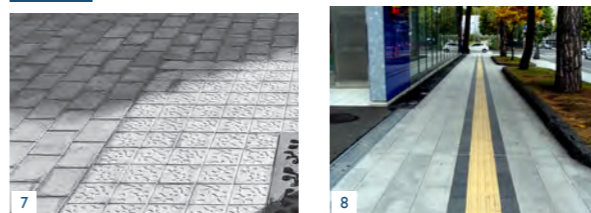
18.1 PLACEMENT

ZONES OF A STREET	Placement
Frontage	□
Pedestrian	□
MUZ / Furnishing	□
Edge	□
NMV	□
Treepit / Divider	○
Vehicular Throughway	□
Median	○
Refuge Islands	□

18.3 SUITABILITY

DESCRIPTION	VEHICULAR			PEDESTRIAN		
	ASPHALT	CONCRETE	STONE	GRASS PAVERS	TACTILE TILES	
18.3A	18.3B	18.3C	18.3D	18.3E	18.3F	
SUITABILITY	<ul style="list-style-type: none"> <li>Vehicular throughways</li> <li>Parking lots</li> </ul>	<ul style="list-style-type: none"> <li>Pedestrian throughways</li> <li>Foot-over bridges</li> <li>Skywalks</li> </ul>	<ul style="list-style-type: none"> <li>Parking lots</li> <li>Transit stations</li> <li>Recreational areas</li> </ul>	<ul style="list-style-type: none"> <li>Multi-utility zones; places with less footfall</li> </ul>	<ul style="list-style-type: none"> <li>Crossings</li> <li>Edges</li> <li>Pedestrian throughway</li> <li>Transit shelter</li> <li>Pick-up/ drop-offs in all areas</li> </ul>	

18.5 BEST PRACTICES

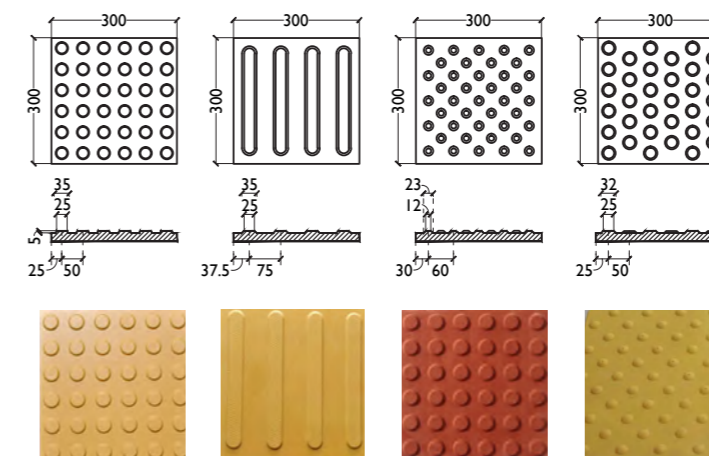


18.6 PUBLIC ART



18A TACTILE PAVING

Tactile paving for the visually disabled is mandatory on all pedestrian zones. These are of "Guiding" & "Warning" types. While the guiding tiles are aligned along the direction of movement. The warning tiles are used to indicate the point to halt, turn and at edges for safety.



1804

18A.1 PLACEMENT

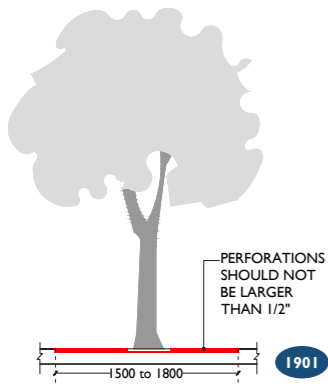
ZONES OF A STREET	Placement
Frontage	○
Pedestrian	□
MUZ / Furnishing	□
Edge	□
NMV	⊘
Treepit / Divider	⊘
Vehicular Throughway	⊘
Median	⊘
Refuge Islands	□

Yellow : On footpaths ; for the partially Blind

Red : On the crosswalks and refuge on medians as a warning for the motorists.

18A.5 BEST PRACTICES





Tree grates function as an extension to the paved pedestrian zone over the soft ground around the trees.

This is done to ensure that the soil around the roots of the trees remains porous and allows water percolation while avoiding a level difference with the paved surface.

19.1 PLACEMENT

ZONES OF A STREET	Placement
Frontage	□
Pedestrian	Ⓜ
MUZ / Furnishing	□
Edge	○
NMV	Ⓜ
Treepit / Divider	□
Vehicular Throughway	Ⓜ
Median	○
Refuge Islands	○

19.2 STANDARDS / MINIMUM CLEARANCES

Refer Minimum Clearances\* for distances from the individual furniture in the respective specifications for different amenities/elements.

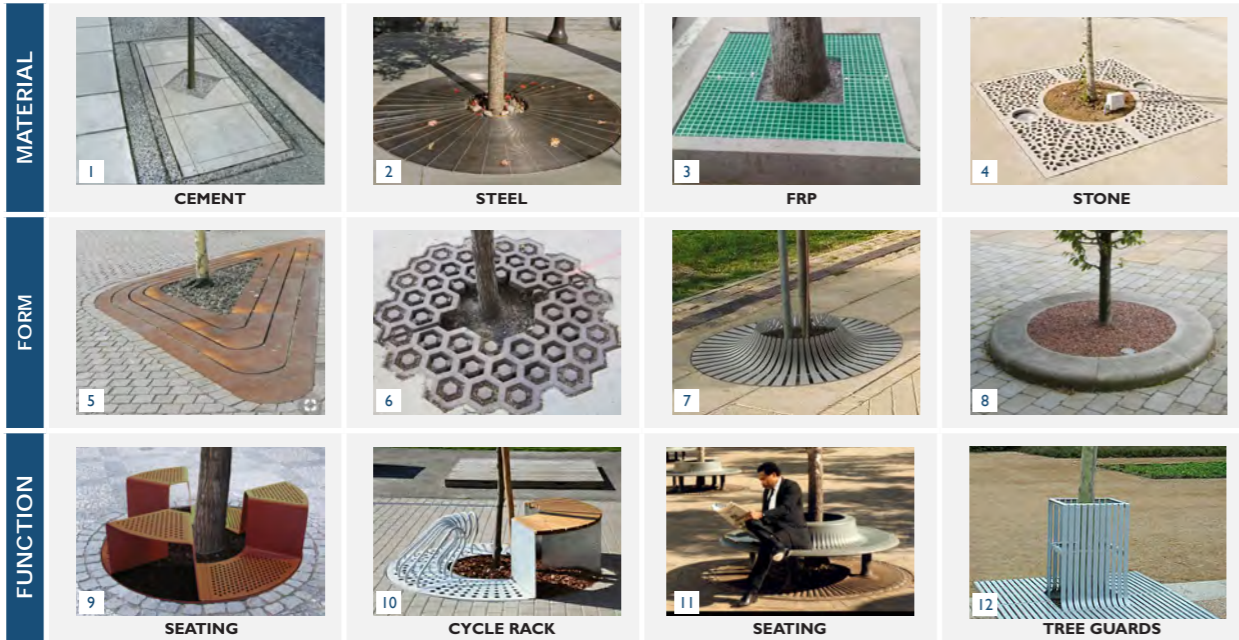
19.3 SUITABILITY

Suitability will depend on the size of the Tree trunk

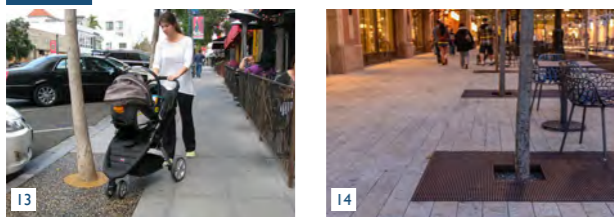
Min. size of Tree Grate (M)	Diameter of Tree Trunk (M)
0.6 x 0.6	Upto 0.15
0.75 x 0.75	Upto 0.3
1.5 x 1.5	Upto 0.9
2 x 2	Upto 1.2

(ITDP)

19.4 DESIGN VARIATION



19.5 BEST PRACTICES

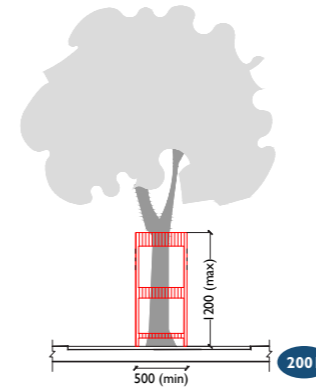


19.6 PUBLIC ART



NOTE: All dimensions are in mm

References	Minimum Clearances*	Legend : Zone Placement
5.2 Plantation - Pune Urban Street Guidelines , PMC , ITDP	A : For access B : From other furniture C : From property line D : From door openings E : From pedestrian zone	F : From the Kerb G : From transit shelter H : From garbage bins J : From tree edge K : From edge of paving
Landscape and Streetscape Design Standards - City of Oakland Park		Preferred (Ideal location) Conditional (As per available space or landuse) Not Preferred



Tree guards are protective frames around the trunks of trees.

Tree guards should not protrude onto any of the throughways and should have rounded edges to avoid injury.

They must have a minimum height of 1.2m, upto 1.8m.

20.1 PLACEMENT

ZONES OF A STREET	Placement
Frontage	○
Pedestrian	Ⓜ
MUZ / Furnishing	□
Edge	○
NMV	Ⓜ
Treepit / Divider	□
Vehicular Throughway	Ⓜ
Median	○
Refuge Islands	○

20.2 STANDARDS / MINIMUM CLEARANCES

Refer Minimum Clearances\* for distances from the individual furniture in the respective specifications for different amenities/elements.

20.3 SUITABILITY

Tree Guard options can be decided based on the pedestrian traffic and available space. Where space is a constraint, guards with additional function are preferable to reduce the number of objects on the streets while serving dual functions.

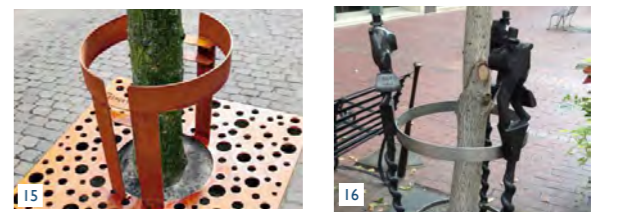
20.4 DESIGN VARIATION



20.5 BEST PRACTICES

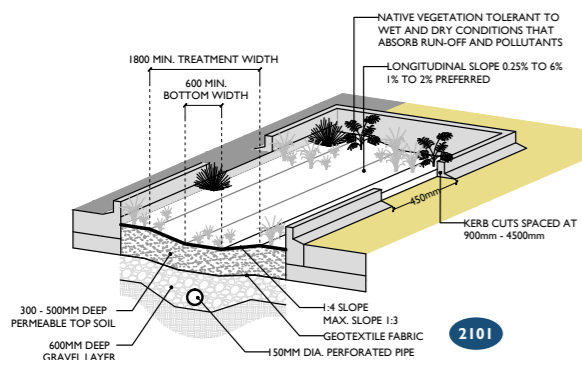


20.6 PUBLIC ART



NOTE: All dimensions are in mm

References	Minimum Clearances*	Legend : Zone Placement
IRC:SP:21-2009 Guidelines on Landscaping and Tree Plantation	A : For access B : From other furniture C : From property line D : From door openings E : From pedestrian zone	F : From the Kerb G : From transit shelter H : From garbage bins J : From tree edge K : From edge of paving
		Preferred (Ideal location) Conditional (As per available space or landuse) Not Preferred



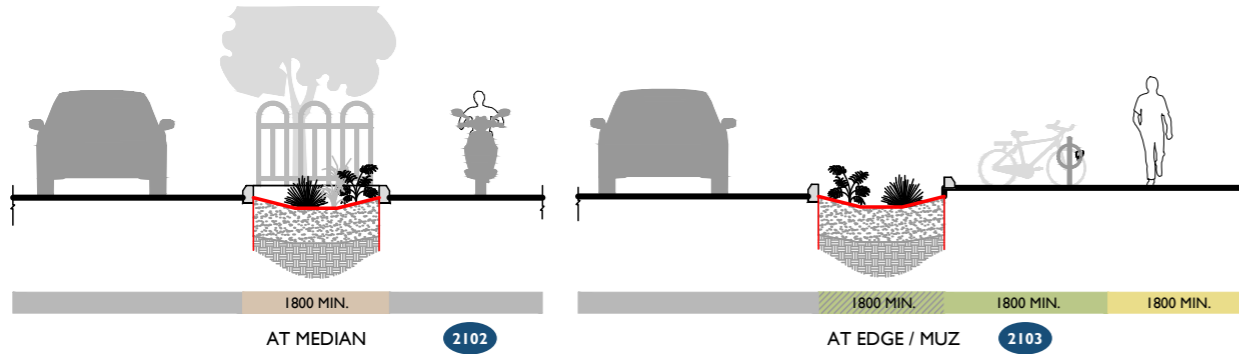
Swales are shallow vegetated channels engineered to divert and manage surface run-off. They are planted with local species that aid in natural infiltration of rainwater into the soil.

Bio-swales are directly connected to stormwater pipes for disposal of excess run-off, helping to lower local flood risks.

21.1 PLACEMENT

ZONES OF A STREET	Placement
Frontage	Ⓧ
Pedestrian	Ⓧ
MUZ / Furnishing	○
Edge	□
NMV	Ⓧ
Treepit / Divider	□
Vehicular Throughway	Ⓧ
Median	○
Refuge Islands	○

21.2 MINIMUM CLEARANCES / STANDARDS



21.3 SUITABILITY

DESCRIPTION	VEGETATION		WATER ABSORPTION	
	GRASSED	PLANTED	DRY	WET
<p>21.3A</p>	<p>21.3B</p>	<p>21.3C</p>	<p>21.3D</p>	
SUITABILITY	<ul style="list-style-type: none"> <li>Low maintenance zones</li> <li>Long Medians</li> </ul>	<ul style="list-style-type: none"> <li>Aesthetic Upgradation</li> </ul>	<ul style="list-style-type: none"> <li>Areas with heavy rainfall</li> <li>Low lying areas that act as catchment.</li> </ul>	<ul style="list-style-type: none"> <li>Preferred in dry zones</li> <li>Areas with smaller catchments</li> </ul>

21.5 BEST PRACTICES



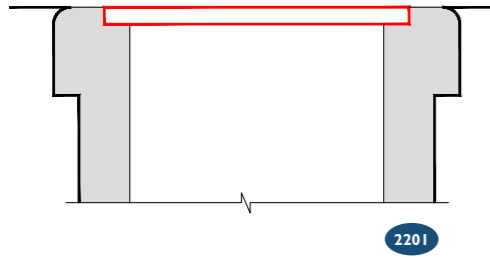
5 Frontage 6 Pedestrian 7 Multi- Utility Zones 8 Non-Motorised Vehicle 9 Verge/Treepit 10 Carriageway 11 Median **NOTE:** All dimensions are in mm

References	Minimum Clearances	Legend : Zone Placement
UTTIPEC	A : For access	Preferred (Ideal location) □
Guide to the San Francisco Better Streets Plan	B : From other furniture	Conditional (As per available space or landuse) ○
Low Impact Development Approaches 2016 - Clean Water Services	C : From property line	Not Preferred Ⓧ
	D : From door openings	
	E : From pedestrian zone	
	F : From the Kerb	
	G : From transit shelter	
	H : From garbage bins	
	J : From tree edge	
	K : From edge of paving	

PART B

4.2 Specifications of Individual Street Elements and Amenities

SERVICES



Manhole-covers are entities of the street that occur on the ground plain.

Though not readily visible, the design of the manhole covers can add to the aesthetic value of the area.

Manhole covers should be flushed with the adjacent paving

22.1 PLACEMENT

Frontage	○
Pedestrian	Ⓧ
MUZ / Furnishing	○
Edge	□
NMV	○
Treepit / Divider	○
Vehicular Throughway	○
Median	○
Refuge Islands	○

ZONES OF A STREET

22.2 STANDARDS / MINIMUM CLEARANCES

Refer Minimum Clearances\* for distances from the individual furniture in the respective specifications for different amenities/elements.

22.3 SUITABILITY

	LIGHT DUTY	MEDIUM DUTY	HEAVY DUTY	EXTRA HEAVY
Pre- Cast Concrete Manhole Cover				
SUITABILITY	22.3A • Residential / Institutional • Area with pedestrians & light vehicular traffic	22.3B • Service Lane • Pavements • Car Parking Lots	22.3C • Institutional • Commercial Areas • Carriageways • Bus terminals • Truck and bus parking • Weight b/w 50-100kN	22.3D • Commercial • Industrial • Port Areas • Warehouse • Godowns • Areas with trucks and trailers. Weight upto 115 kN

22.4 DESIGN VARIATION



22.5 BEST PRACTICES

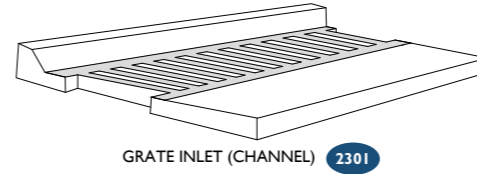


22.6 PUBLIC ART

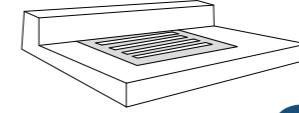


NOTE: All dimensions are in mm

References	Minimum Clearances*	Legend : Zone Placement
<a href="http://www.pavingexpert.com/drain05.htm">http://www.pavingexpert.com/drain05.htm</a>	A : For access B : From other furniture C : From property line D : From door openings E : From pedestrian zone	Preferred (Ideal location) □ Conditional (As per available space or landuse) ○ Not Preferred Ⓧ
IRC SP-50-2013 Guidelines on Urban Drainage	F : From the Kerb G : From transit shelter H : From garbage bins J : From tree edge K : From edge of paving	
IRC SP 042: Guidelines on Road Drainage		



GRATE INLET (CHANNEL) 2301



GRATE INLET (BASIN) 2302

Drain grate or latticed covers over drains occur on the ground plane and are not readily visible. Drain grate installation largely depends on the catchment. Vertical drain grates on the kerb must be avoided as to maintain the kerb height of 150mm

Perforation size must not exceed 1.2mm.

23.1 PLACEMENT

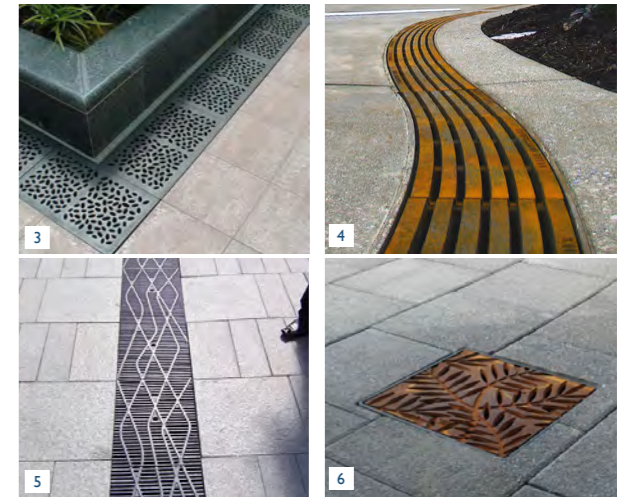
Frontage	○
Pedestrian	Ⓧ
MUZ / Furnishing	○
Edge	□
NMV	○
Treepit / Divider	○
Vehicular Throughway	Ⓧ
Median	○
Refuge Islands	○

ZONES OF A STREET

23.3 SUITABILITY

	CHAIN/TRENCH	BASIN
DESCRIPTION	23.3A Grates over the drain channel	23.3B Grates over drainage basins
SUITABILITY	• Edges and frontage zones	• On all zones that may or may not interfere with the pedestrian throughway

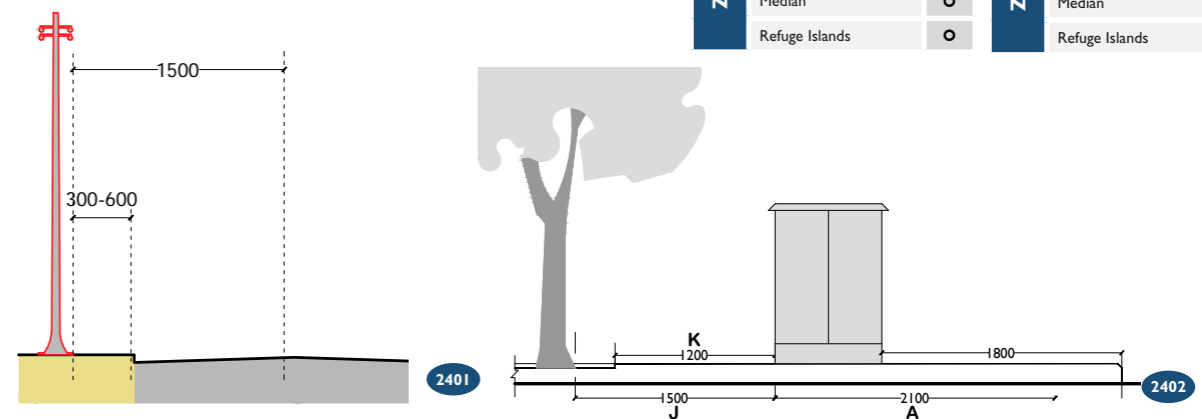
23.5 BEST PRACTICES



Electrical service networks include components that often occur above ground and occupy the space that is primarily designated for pedestrian movement.

In order to ensure safety, the electrical services must follow their respective clearances or safe distances.

24.2 MINIMUM CLEARANCES



References  
<http://www.pavingexpert.com/drain05.htm>  
IRC SP-50-2013 Guidelines on Urban Drainage

24.1 PLACEMENT

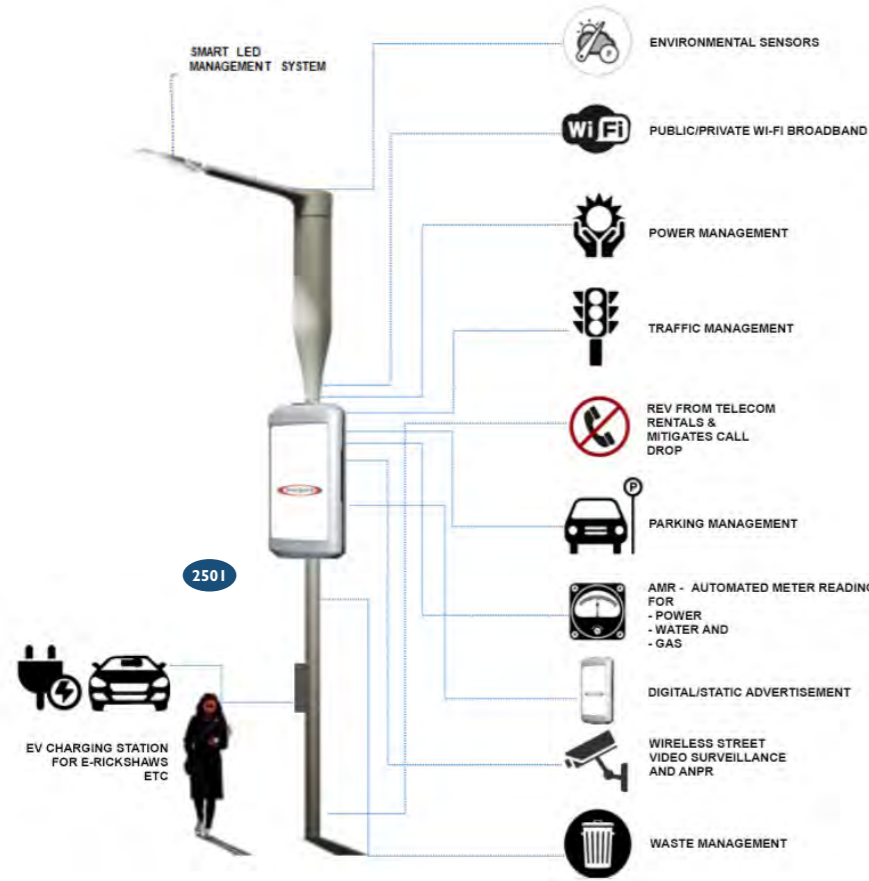
24.1a FEEDER PILLAR

Frontage	○
Pedestrian	Ⓧ
MUZ / Furnishing	□
Edge	○
NMV	Ⓧ
Treepit / Divider	○
Vehicular Throughway	Ⓧ
Median	○
Refuge Islands	○

24.1b ELECTRICAL POLE

Frontage	○
Pedestrian	Ⓧ
MUZ / Furnishing	□
Edge	○
NMV	Ⓧ
Treepit / Divider	Ⓧ
Vehicular Throughway	Ⓧ
Median	Ⓧ
Refuge Islands	Ⓧ

ZONES OF A STREET



25.2 STANDARDS / MINIMUM CLEARANCES

Height and Spacing :

The spacing of smart poles may vary as per 4G and Wifi signal. The height of the pole has to be constant except in junctions where the lighting is required to be from a greater height.

In order to remove the number of objects/amenities on the street Smart poles should be installed. The primary function of the smart poles is to provide :

- Street lighting
- Mobile broadband infrastructure
- Wi-Fi hotspot services
- Active Geo location transponder
- Surveillance camera.
- Charging Stations
- Air quality sensors



These facilities are connected to the central command and can be monitored and managed.

25.1 PLACEMENT

ZONES OF A STREET	Placement
Frontage	Ⓛ
Pedestrian	Ⓛ
MUZ / Furnishing	□
Edge	□
NMV	Ⓛ
Treepit / Divider	Ⓛ
Vehicular Throughway	Ⓛ
Median	Ⓛ
Refuge Islands	Ⓛ



These are underground enclosures for garbage collection with over ground receptacles. These can function as garbage collection points at a community level and garbage bins along the length of the road.

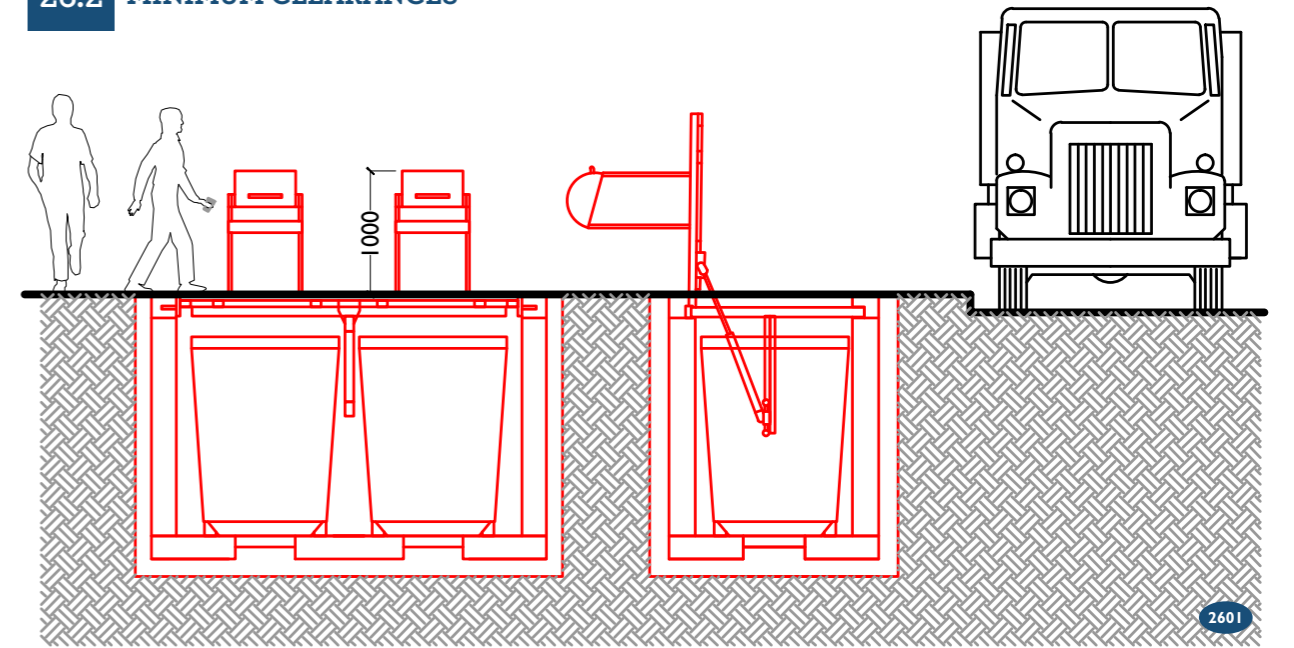
These modules are flushed with the paving surface and can be accessed from the road by the collecting/ depositing vehicles without obstructing the pedestrian throughway



26.1 PLACEMENT

ZONES OF A STREET	Placement
Frontage	Ⓛ
Pedestrian	Ⓛ
MUZ / Furnishing	□
Edge	□
NMV	Ⓛ
Treepit / Divider	Ⓛ
Vehicular Throughway	Ⓛ
Median	Ⓛ
Refuge Islands	Ⓛ

26.2 MINIMUM CLEARANCES



26.5 BEST PRACTICES



ADVANTAGES

- Higher capacity
- Longer emptying intervals
- Improved hygiene
- Avoids flies, mosquitoes, and animal menace
- More convenient
- Space saving about ground profile
- Heavy usage design

References

<http://ecogarbin/smart-bin.html>  
<https://timesofindia.indiatimes.com/india/surats-underground-garbage-system-shows-way-to-delhi/articleshow/64819665.cms>

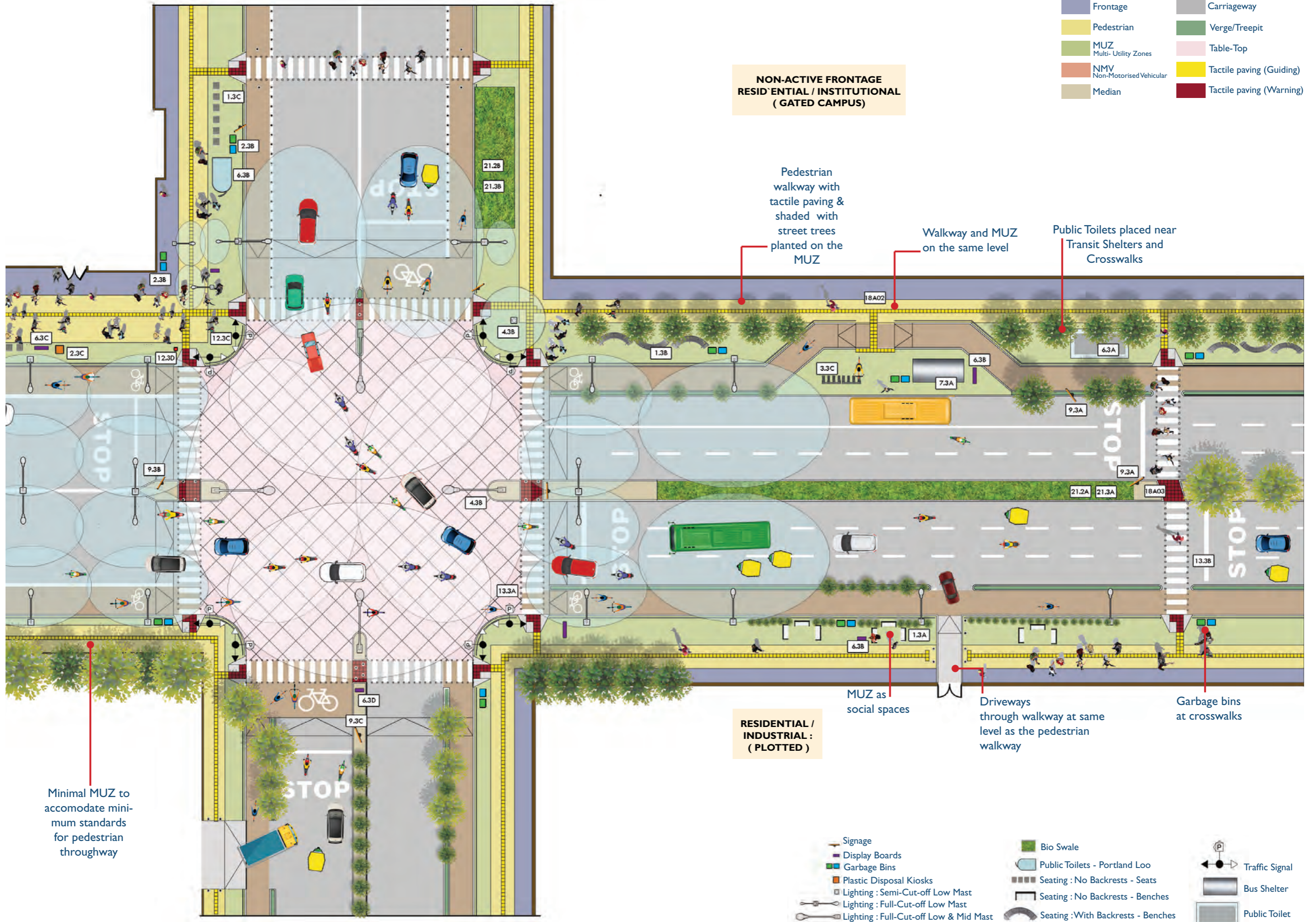


References	Minimum Clearances	Legend : Zone Placement
NDMC- <a href="http://smartcity.ndmc.gov.in/">http://smartcity.ndmc.gov.in/</a>	A : For access	F : From the Kerb
Bhopal Smart City	B : From other furniture	G : From transit shelter
Indore Smart City Development Limited, Indore	C : From property line	H : From garbage bins
Energasia - <a href="http://energasia.in/smart-poles/">http://energasia.in/smart-poles/</a>	D : From door openings	J : From tree edge
	E : 15 m pedestrian zone	K : From edge of pavir 16
		Preferred (Ideal location) □
		Conditional (As per available space or landuse) ○
		Not Preferred Ⓛ

NOTE: All dimensions are in mm

PART B

4.3 **Typical plan showing application of suggested specifications of street elements and amenities on their ideal zones**



PART B

## 5 Maintenance & Quality Control



All street elements will require guidelines for periodic maintenance and guidelines to ensure optimum quality based performance criteria for individual elements.

### 1.7 SEATING

Maintenance	Quality Control
- Periodic checks (preferable every 6 months) for defunct, vandalised or weathered installations.	Structure : Rough/sharp edges and brittle material must be avoided
- Vegetation around seating should be pruned timely for efficient usage of the amenities provided on the streets.	Only permissible after reserving a minimum 1.8m space for walkway
- Any reflectors placed on the benches must be kept clean especially for benches placed on the Multi-Utility Zone that occur on the edge of the footpath.	Benches should reflect the character and aesthetics of the surroundings. Heritage zones should have seating variants that complement the character of the precinct.
	Seating arrangements must accommodate wheelchairs along side. Benches must be spaced appropriately along the roads taking consideration of the elderly and children.

### 2.7 GARBAGE BIN

Maintenance	Quality Control
- Regular cleaning/emptying of bins based on the usage.	- Garbage bins installed must be of accessible height.
- Periodic checks (preferable every 6 months) for defunct, vandalised or weathered bins.	- The bins should be in visible and active areas to prevent misuse.
	- Open-type (Vandalism-proof) bins should be installed in high intensity pedestrian areas

### 3.7 CYCLE RACK

Maintenance	Quality Control
- Periodic checks (preferable every 6 months) for defunct, vandalised or weathered installations.	- Steel and Stone are the preferred material for permanent and large stands.
- Checking of fixtures for surface mounted and wall mounted racks.	- Sharp corners should not be included in the design.
- Periodic cleaning and repainting of racks once a year.	
- Checking retroreflective fixtures for racks placed on the edges.	

### 4.7 STREET LIGHT

Maintenance	Quality Control
- Periodic checks as per life of fixtures, durability of material.	- Light pollution to be avoided by the use of cut-off and full cut-off fixtures
- Regular checks for connections.	- Quality of lighting should depend on the function of the space
- Any loose wiring/connectors must be kept covered, to avoid accidents.	- Specific lighting standards must be adhered to, for spacing and type of street lights.

### 5.7 WATER ATM

Maintenance	Quality Control
- The filters and machine parts must be checked and maintained as per the working requirement of the machine.	- The flooring of the spaces around the water atm must have anti-skid paving and tactile paving.
- Spaces around the Water ATM must be cleaned regularly.	- The equipment must be placed such that it does not interfere with the movement corridors in the pedestrian zone.

### 6.7 PUBLIC TOILET

Maintenance	Quality Control
- Daily cleaning.	- Fixtures installed must be of durable make and sustain long-term usage.
- Periodic checks of plumbing and electrical services.	- Toilet designs must prevent vandalism and repel anti-social activities.
- Pest control measures must be taken (preferably every 6months, once during/ after monsoons)	- Temporary toilet cabins must be secured well to prevent theft.
- Odour control measures must be taken at the time of installation - e.g.Toilet units with proper ventilation ; orientation of exhausts (if any) ;Regular cleaning during usage and leakage checks - to discourage open defecation.	- Anti-stain fixtures must be installed for prolonged durability and encourage use of Public Toilets.

### 7.7 TRANSIT SHELTER

Maintenance	Quality Control
- Daily cleaning of Transit Shelter premise	Light and durable structures like stainless steel, should be opted for the main structure
- Periodic cleaning of seating in the transit shelter	All shelters must have tactile paving tiles to guide the visually impaired

- Periodic inspection of electric connections route updates (if any).	Transit shelters must not be higher than the kerb height from the road level.
- Facilities for the disabled i.e ramps, handrails,tactile tiles must be checked regularly, damages to be fixed immediately.	Transit shelters must not be placed obstructing the pedestrian walkway.
- Electrical/Meter boxes must not be left open.	Garbage bins and well-lit signage must be installed along side transit-shelters for the convenience of the users.

### 8.7 NOISE BARRIER

Maintenance	Quality Control
Noise barriers will require maintenance as per the maintenance schedule of the installations specific to the material and the type of mount.	Stone and Plastic mounted on stone are preferred material that require least maintenance. Planters as part of the structural design of the barrier is encouraged.

### 9.7 SIGNAGE

Maintenance	Quality Control
Signage must be cleaned every 6months and once during the monsoon season. (IRC67-2012)	Signage on streets meant for traffic regulation must adhere to the standards in terms of signage size, material and text sizes.
Replacement of signages will be based on the life of the retroreflective material.	Signage must be spaced adequately and not hide other signage.
Defunct/ Old signages must be checked and replaced in regular intervals.	

### 10.7 DISPLAYS

Maintenance	Quality Control
Damage checks and electrical services must be done at regular intervals.	Displays should not interfere with the circulation of the traffic
	Displays over hanging on the roads must not be distracting or strongly lit.
	Spacing of Displays should not obstruct other services and facilities like traffic signals, electric poles.
	Electric displays must be placed at safe distances from other electrical services

### 11.7 GUARDRAIL

Maintenance	Quality Control
Should have a life of 25-50 years	Materials prone to rust / discoloration will be preferred less
The mount and fixing of guard rails must be checked periodically	The length of guardrails must be moderated and should not give an effect of confinement.
Damaged or dismantled guardrails must be replaced immediately.	Sharp edges must be avoided to prevent injuries

### 12.7 TRAFFIC SIGNALS

Maintenance	Quality Control
Connections and Timers must be periodically checked and set accurately.	Fixtures / Symbols selected as part of the design must be legible and comply with the existing standards,
The alignment of signs and LED beacons should be maintained as specified, in the respective manual.They should always target the road at driver eye height near the advance detectors.	The type of mounting must be selected as per the width of the carriageway
	Plantations, Display boards, Signages should not be placed to obstruct the line of sight.
	Signs and beacons can rotate due to high winds and lose the orientation if they are not tightened properly.
Source : Signal Technician's Installation and Maintenance Manual For Advance Warning of END-OF-GREEN PHASE at High Speed Traffic Signals, Texas Transportation institute.	

### 13.7 CROSSWALK

Maintenance	Quality Control
At grade crosswalks should be re-painted and maintained in effective condition	On-Grade crosswalks are preferred
Kerb-cuts at appropriate distances must be provided for continuity of pedestrian movement	Table-top crosswalks must have similar paving material as of the pedestrian thoroughway for ease of navigation and way-finding.
Before repainting traces and remnants of old and obsolete markings which are sufficiently visible to cause confusion shall be removed.	Green/Sustainable paver blocks should be used for the Table top pavings.
Drains near crosswalks should be unclogged to avoid water collection at the table top edges.	Crosswalks must be supplemented with bollards to prevent encroachment
Table-top edges should be checked for cracked edges or damaged slopes.	Crosswalks must always be preceded by STOP lines to make them safer
Source : PWD Manual	Crosswalks must be supplemented with pedestrian signals.
	3D /illusional crosswalks can be opted for non-signalled crosswalks.

## 14.7 BOLLARD

Maintenance	Quality Control
To maximise life expectancy the products should be visually inspected on a regular basis for any signs of damage, reduction in performance (telescopic products), vandalism, breakdown of surface finish, build-up of salt, dirt or atmospheric residue, and loose fixings.	Appropriate type should be selected as per the area and the function of the bollard.
Regular Cleaning regime may include : Urban and Rural areas - Every 3 months Industrial / coastal areas - Weekly/Monthly or as necessary	Designs should complement the surroundings. Heritage areas should have bollards reflecting the character of the area.
Operation and Maintenance manual of the installation should be followed for details.	Sharp corners or edges must be avoided in the designs.
(Source : Broxap Streetcene Street Furniture )	

## 15.7 ROAD INDICATORS

Maintenance	Quality Control
Reflector units shall be scrubbed and cleaned periodically specially after the rains.	Road indicators posts must not protrude on the throughways
Replacement of indicators as per the life/durability of the retroreflective materials.	The retroreflective material selected should be of durable make
Electric/LED road studs should be checked periodically.	Plantations must be controlled around reflectors
The ground around delineators should be kept clear of wild growth. At least once every 3 months and at least once in a month during rainy season.	

## 16.7 KERB

Maintenance	Quality Control
Regular checks and replacement of chipped, broken or displaced kerbs.	Kerb heights must not be higher than 150mm
	Should be of durable make, capable of taking vehicular impact, preferably of concrete
	For the convenience of commuters in low light, kerbs must be painted in contrasting alternate colours and be supplemented with reflective posts or studs.

## 17.7 HORTICULTURE

Maintenance	Quality Control
Atleast one annual inspection of all roadside trees	Height of plants/ shrubs on the median must not exceed a height of 1-1.5m
Routine maintenance shall include removal of dead and decaying trees	Street trees should not be placed within 1.5m from the toe of the carriageway
Periodic trimming and irrigation as per the maintenance schedule of the concerned local body	3m-5m space without any plantation at median cut should be maintained
Trimming of hedges and trees that over grow on traffic signals, signages and reflectors.	No long rooted plant species are not preferred

## 18.7 PAVING

Maintenance	Quality Control
Paving should be laid with slope towards the drain	Permeable paving should be opted , especially for NMV lanes.
Should have an operation period of 10-15 years	Sustainable/ Green materials such as fly-ash bricks and recycled rubber pavers can be used.
Tactile paving must be maintained in effective conditions at all times. Damaged/ missing tiles should be replaced at the earliest.	Anti-skid and Tactile tiles must be used on pedestrian throughways and transit Shelters

## 19.7 TREE GRATE

Maintenance	Quality Control
Regular cleaning and un-clogging for efficient percolation of rain water into the tree pits.	Rust free material such as Concrete/ PVC must be opted.
Steel tree grates should be painted regularly to avoid rust.	Edges of the grates should be flushed with the paving for the safety of the pedestrians.
	Size of the perforations must follow standard norms for efficient water percolation

## 20.7 TREE GUARD

Maintenance	Quality Control
Steel tree guards should be painted regularly to avoid rust.	Circular Tree guards are preferred ; sharp corners are to be avoided
	If placed on the edges or medians, reflective strips or studs must be installed near/on the base of the Tree Guards for better visibilty at night
	FRP/Concrete types should be preferred for durability and low maintenance.

## 21.7 BIO-SWALES

Maintenance	Quality Control																		
Kerb cuts must be kept clear of garbage for efficient functioning of the Bio-Swales.	Appropriate variety of plant species, soil types and layers must be chosen as per the climatic region																		
Dedicated pretreatment can simplify maintenance activities and help to focus inspections. For example, a grass filter strip can be used to catch sediment and other particulates that may enter a bioretention area.	<table border="1"> <thead> <tr> <th>Inspection Checklist</th> <th>Y/N</th> <th>If yes, perform the following maintenance</th> </tr> </thead> <tbody> <tr> <td>Are weeds/invasive plants present?</td> <td></td> <td>Pull weeds and invasive plants out by the roots to prevent them from returning. Spot treat perennial weeds with appropriate herbicide, if necessary.</td> </tr> <tr> <td>Are trash, excessive leaves, grass clipping or other debris present?</td> <td></td> <td>Remove any debris present</td> </tr> <tr> <td>Is anything blocking or clogging inlets or outlets</td> <td></td> <td>Remove any debris or sediment that may be preventing the water from flowing into or out of the bioretention basin</td> </tr> <tr> <td>Are there areas of bare soil or erosion ?</td> <td></td> <td>Add mulch whereit has been depleted and additional plants where necessary. Use appropriate erosion control methods for more serious cases of erosion</td> </tr> <tr> <td>If underdrain is present, is there standing water for 48 hrs or more after a rainfall?</td> <td></td> <td>Remove any trapped sediment present. If sediment does not appear to be blocking flow, this may be an indication that your underdrain is not functioning as designed and will require further study and action</td> </tr> </tbody> </table>	Inspection Checklist	Y/N	If yes, perform the following maintenance	Are weeds/invasive plants present?		Pull weeds and invasive plants out by the roots to prevent them from returning. Spot treat perennial weeds with appropriate herbicide, if necessary.	Are trash, excessive leaves, grass clipping or other debris present?		Remove any debris present	Is anything blocking or clogging inlets or outlets		Remove any debris or sediment that may be preventing the water from flowing into or out of the bioretention basin	Are there areas of bare soil or erosion ?		Add mulch whereit has been depleted and additional plants where necessary. Use appropriate erosion control methods for more serious cases of erosion	If underdrain is present, is there standing water for 48 hrs or more after a rainfall?		Remove any trapped sediment present. If sediment does not appear to be blocking flow, this may be an indication that your underdrain is not functioning as designed and will require further study and action
Inspection Checklist	Y/N	If yes, perform the following maintenance																	
Are weeds/invasive plants present?		Pull weeds and invasive plants out by the roots to prevent them from returning. Spot treat perennial weeds with appropriate herbicide, if necessary.																	
Are trash, excessive leaves, grass clipping or other debris present?		Remove any debris present																	
Is anything blocking or clogging inlets or outlets		Remove any debris or sediment that may be preventing the water from flowing into or out of the bioretention basin																	
Are there areas of bare soil or erosion ?		Add mulch whereit has been depleted and additional plants where necessary. Use appropriate erosion control methods for more serious cases of erosion																	
If underdrain is present, is there standing water for 48 hrs or more after a rainfall?		Remove any trapped sediment present. If sediment does not appear to be blocking flow, this may be an indication that your underdrain is not functioning as designed and will require further study and action																	
(Source : Operation and Maintenance of Green Infrastructure Receiving Runoff from Roads and Parking Lots - US Environment Protection Agency)																			

## 22.7 DHALAO

Maintenance	Quality Control
Cleaning once in 2 days or as per the capacity of the Dhalaos.	Under ground Dhalaos are preferable.
	Efficient garbage segregation system should be implemented for sustainable waste management.

## 23.7 DRAIN GRATE

Maintenance	Quality Control
Regular unclogging of drain grates as per the cleaning schedule of the concerned local bodies.	Vertical drain grates on the kerbs should be avoided to maintain maximum kerb heights at 150mm.
	Standard perforation sizes should be maintained for unobstructed flow of storm-water.

## 24.7 MANHOLE COVER

Maintenance	Quality Control
Manmade covers should be replaced when damaged.	No rough/protruding edges should be avoided.
	Manhole covers should be flushed with the paving.
	They may be designed to reflect the character of the area or add to the aesthetics of a place.

## 25.7 ELECTRICAL SERVICES

Maintenance	Quality Control	
As per the operation and maintenance schedule of the competent local authority.	All electric service equipments must be provided with adequate service space.	
Tightening of cable connections in poles/feeder pillars	1 month	All electric equipments must be supplemented with cautionary signage.
Cleaning of feeder pillars and poles :	3 months	The electric equipments must be accompanied with reflective strips or posts.
Cleaning of electrical fittings	3 months	Vegetation patches can be used to create buffer between electric equipments and pedestrian access.
Washing and Tightening of nuts & bolts of poles	6months	
Checking insulation and earthing resistance	1 year	
Source : PWD		

## 26.7 SMART POLES

Maintenance	Quality Control
Periodic maintenance of ducts/Joint Closures (JC)/MH/HH shall be carried out to ensure the upkeep of the buried asset at all times.	Efficient usage and installation as per the guidelines by the manufacturers.
Should be free of maintenance for minimum 2 years post installation	There should be provision to have separate connection for light as well for telecom and other secondary equipment for maintenance purpose.
Periodic maintenance of ducts/Joint Closures (JC)/MH/HH shall be carried out to ensure the upkeep of the buried asset at all times.	The fixture shall be designed so as to have lumen maintenance of at least 70% at the end of 50,000 hours.
Provision of lifting of underground equipment box(at suitable working height) from maintenance perspective should be available as option up to equipment weight of 200Kgs	
Fault repair teams and patrollers shall be deployed at every 30-40kms of the route length on round the clock basis.	
( Source : Indore Smart City Development Ltd. - Proposal Tender Volume I )	

## PART C

<b>6</b>	<b>General Notes</b>
<b>7</b>	<b>Image Sources</b>
<b>8</b>	<b>List of Figures</b>
<b>9</b>	<b>Glossary</b>

## 6.0 GENERAL NOTES

### Limitations of the report

- The standards have been collated considering ROW upto 60m only.
- Elements/amenities that are above grade have been considered.
- The guidelines may not apply for streets in mountaineous / hilly terrain.

### Objects excluded from the list

- Post boxes ; Fire Hydrant Pillars ;
- The use of public Post Boxes has diminished over time. However in the condition where they are required to be installed, they must be placed in the Multi-Utility Zone, and in the Frontage incase the MUZ is not available.

### Objects that should not be part of the street :

- **Taxi Stand Booths** : Should be part of the plot designated to the property owner and not occupy space on the street
- **Milk Booths** to have a designated space adjacent to the street but not obstruct the thoroughfare.
- **Dhalaos**: Large enclosures should be taken off the streets. Waste compaction stations must be built within a dedicated plot to collect, segregate and dispose solid waste. There should be a provision for collecting trucks/vehicles to station inside the plot and not occupy the street edges or obstruct the pedestrian throughways with their activities.

### Objects that should follow their respective manufacturing standards :

- **Drain grates** : Design specification may vary as per the slope / catchment of the drain
- **Feeder Pillar** : 1.5m clearance for front access and service is ideal. However incase of space constraints such as when placed on Median, standard clearances related to the equipment should be followed for safety.
- **Electrical Services** - Placing of these objects should not obstruct the pedestrian OR vehicular routes.
- **Signage Font Sizes** - Should be specific to viewing angle and distances must be followed.

- **Street Light Fixtures** - Based on the height and spacing ratio of the street light poles, the light intensity (lumens) for the lighting fixtures must be chosen such that no intermediate dark zones are left between two street lights.
- **Road Indicators** : The retroreflective index of the road indicators must follow the specific instructions for the particular road indicator type for efficient functioning.

### Design Variation

- Design Variation and Functional variation is not restricted to the number options enlisted.
- Elements for which the design variation is not mentioned are to follow the manufacturing specifications of the element/amenity.
- Design variation occurring in part \*.4 of the individual specifications has been eliminated for the elements where the types and applicability include the same data.





## 8.0 List of Figures

The diagrams figures have been prepared taking reference from various existing standards and documents (Indian & International) that are suitable to the local context.

S.No.	Description	Page No.
<b>SEATING</b>		
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**NOTE :** Please note that the carriageway widths are not to scale and are only for representation.

## 9.0 Glossary

### A

**Abatement** : Reduce or contain

**Access**: Being able to get near/inside/onto a place or space.

**Acoustic** : Relating to sound / hearing

**Advertisement Board** : Display stands for promoting businesses or events

**Aesthetic** : Pleasant/beautiful in appearance

**Amenity** :An object/facility that provides convenience or comfort.

### B

**Bench**:A long seat that accommodates several people to sit together at a time.

**Bollard**: Barrier that help define an edge and regulate vehicular traffic such that it does not encroach into the zones designated with exclusive pedestrian / NMV usage.

**Buffer** :An object placed acts as a barrier / protection between two functionally separate zones.

**Bus/Transit-Shelter** : Shelter that have seating/ resting provisions and refuge from harsh weather for the convenience of waiting commuters, usually located at points designated for boarding/de-boarding of public transport.

### C

**Carriageway**: Portion of the street that is reserved only for the movement of vehicular traffic.

**Castellated**: Furnished with regularly spaced tower-like structures in the style of a castle.

**Catchment**: The area from which rain water flows/gets collected into a depression

**Channel**: A linear/ tubular passage for water

**Chevron**: Strips in a V-shaped arrangement, in the context of the signage- reflector boards with such arrangement of strips.

**Clearance**: Clear distance or empty space with any obstruction or protrusion by any object.

**Collate**: Collection/combination of text, data, and information.

**Comfort**: The state of contentment or providing relief/relaxation.

**Complete Street**: Street that is inclusively designed in order to facilitate safe movement and access for all users, including pedestrians, bicyclists, motorists of all age groups and abilities.

**Commuter**: Person who takes the same route to travel daily between the same origin and destination

**Convenience**:The quality of being suitable for a particular purpose/need; adequate to provide comfort.

**Constraint**: Limitation

**Critical**:The minimum value(size/ length/distance) beyond which the zone becomes dysfunctional.

**Cross-Walk**: A paved or marked zone that guides the safe movement of pedestrian traffic across the vehicular throughway zone.

**Cycle Rack**: Stands/ segregated spaces with fixed support, designated for parking/securing bicycles on the street.

### D

**Delineators**: Objects mounted on the road surface/along the edge of a street to channelize traffic

**Detour** :A route taken to avoid an obstacle for ease

**Diffractive** : Property of a material or a surface with the ability to bend waves in this case, sound waves

**Dispersive** :The property of a material/surface to spread/scatter sound

**Dhalao**: Permanent structures that are constructed to function as garbage collection point for neighboring areas.

**Diverge** :To move in different directions from a common point

**Drain Grate**: Latticed plates made of metal/ stone/concrete for partially covering an opening on the ground

**Drinking Water Spout**: Water fountains for providing potable water for the convenience of the on-street commuter.

**Dysfunctional** : Failing to as operate as per the assigned function.

### E

**Edge** :The portion of the street that is shared by two functionally different zones.

**Edge marker/ Road stud** : Objects fitted with reflective surfaces to improve visibility of objects on the street under poor light conditions.

**Elements** : Components that constitute an efficiently functioning street.

### F

**Feeder Pillar**:A cabinet placed on the street which accommodate the equipment for electrical supply to neighboring areas and streets.

**Flushed** : Forming a continuous/unbroken surface.

**Frontage** :The zone adjacent to the building or property that provides additional space for door openings, steps, architectural elements, utilities, window shopping, signs, displays, vegetation, public

toilets, booths etc.

### G

**Guardrails**: A continuous barrier along a median or the edge of a walkway to prevent encroachment and ensure safety.

**Interval** : Space between two modules or units

### K

**Kerb**:A concrete or stone edging of a raised footpath/platform on the road to prevent it from damage.

### L

**Latticed**:A cross work of metal/stone/wood to form a pattern of voids between strips

### M

**Median**:The element that divides a two-way/ multi-directional vehicular throughway into equal sections.

**Multi-modal** : Involving two or more modes of transport Road, Rail.

**Manhole cover**:Temporary covers over the inspection point of underground utilities and services.

**Message board**: Objects/Stand for putting up notices, information, flyers mostly accessible by the pedestrian

**Modules** : Standardized units

**Multi-Utility Zones** : Zones or parts of the street that are dedicated for accommodating furniture and facilities/services to prevent them from encroaching the space for movement.

### N

**Non-Motorized Vehicle Zone** :The zone designated to non-motorized transport like cycles, cycle-rickshaws, carts etc.

### O

**Optimum** : Most favorable

### P

**Palette** : a range or variety of options

**Perforation** : Series of holes

**Porous** : the quality of allowing materials to pass through

**Poster Kiosk**: Objects/Stand for putting up notices, information, flyers accessible by pedestrians.

**Potable Water** : Safe drinking water

### R

**Receptacle** :A container

**Retroreflective** :A surface that reflects light back to the source with minimum scattering

### S

**Staggered** : Irregular arrangement

### V

**Vandalism** : Causing Intentional damage

**Verge** :The strip/or zone that runs along the edge of the carriageway.

### W

**Wayfinding** : Following a route with respect to one's current position



Secretary

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