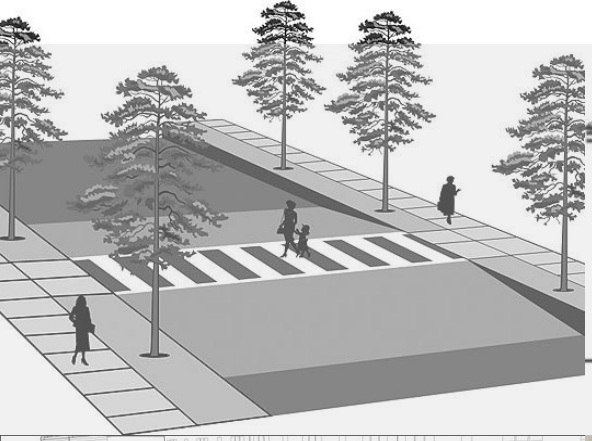
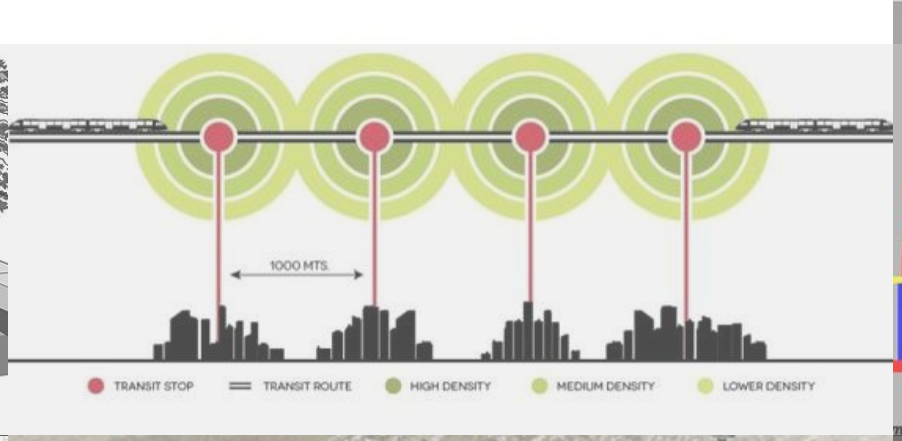
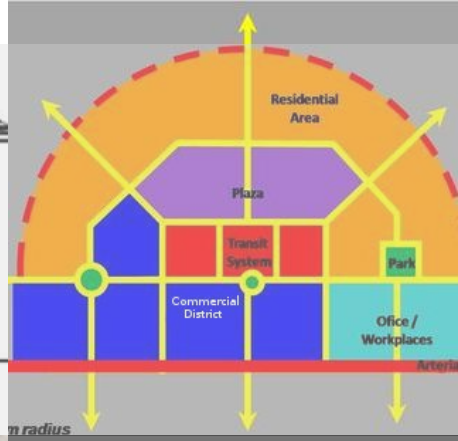
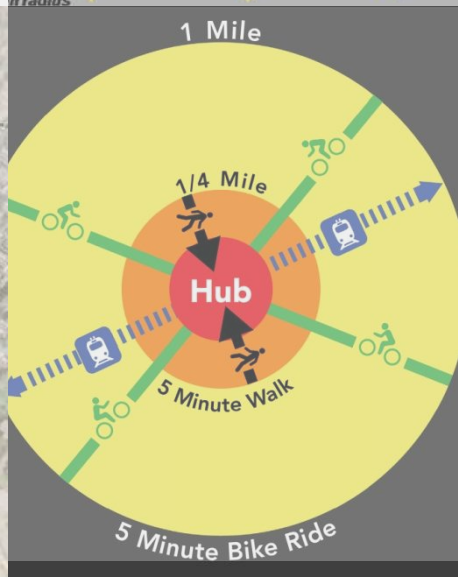








Urban Street Design and Development

Ashok Bhattacharjee, Advisor, Clean Air and Sustainable Mobility, Centre for Science and Environment

CSE Workshop on " Safe Access and Parking"-

Lytton Hotel , Kolkata 16.02.17

Urban Situation

Encroachment on footpath

Hawkers & Bus stops

Public Utilities

Cars & Rickshaws

Need for coordinated infrastructure within road space

Sample Image from Hyderabad

Foot over bridge- Failure due to longer walking

Every 2nd death on road is of a pedestrian

PARKING CHAOS

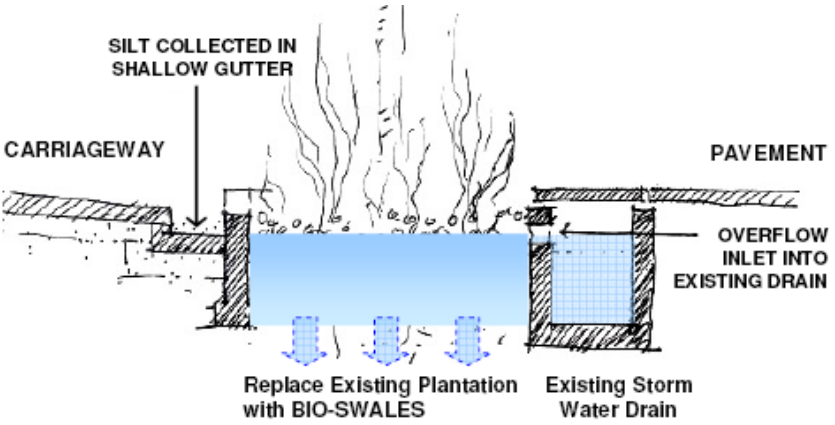
Facts.!

- About 15% of road users (cars) take up 80% of road space.
- Parking of personal vehicles: Inequity in urban land use

"The overarching objective for parking is to progressively reduce the demand for parking and facilitate organized parking for all types of vehicles"

STORM WATER MANAGEMNT

1. BIOSWALES

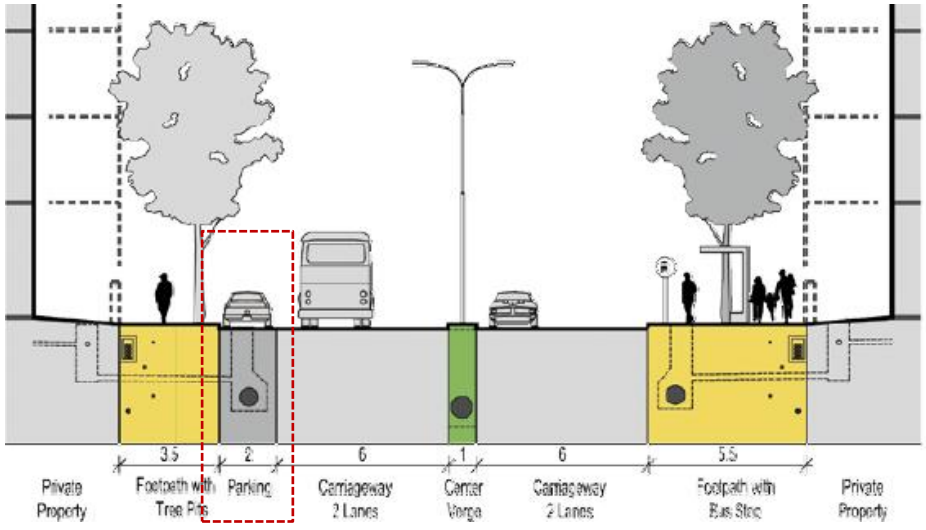


- Bio-swales
- Under utilized area under flyovers can be modified for bio-filtration
- Underground utility ducts

ON- STREET PARKING

On- street parking shall not interfere carriageway.
Shall be in defined lots.

Street space is a scarce resource.
On- street parking shall not be allowed for more than 2 hours.
Short- term parking shall be made expensive.

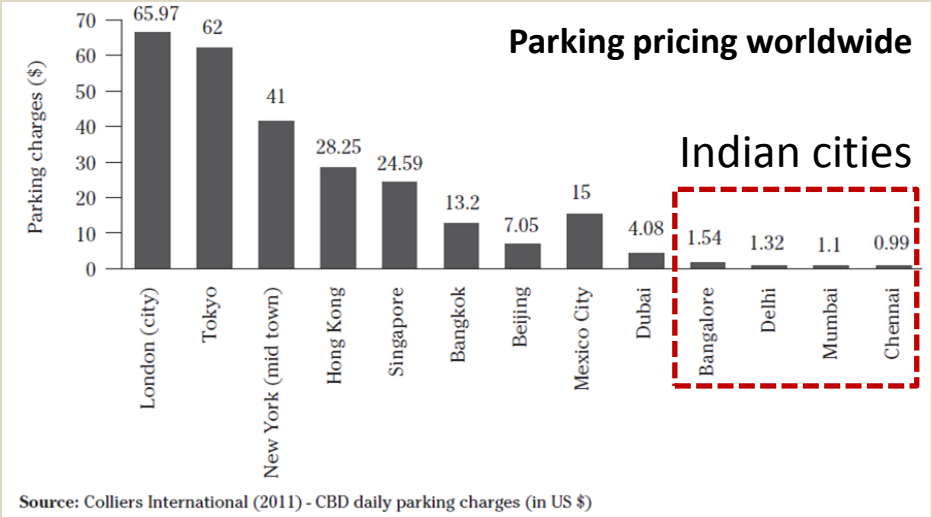


PARKING PRICING AND ENFORCEMENT

Private vehicle Park on a ' fully-paid, rented or owned' space, based on 'user pays' principle

45% CAR USERS SHIFT TO PT IF PARKING PRICING IS INCREASED BY 500%

Willingness to Pay survey by RITES



2. Non-Signalised High Speed Corridors

Average Peak Hour Speed- 5-10Km/Hr

Average Off-Peak Hour Speed- 80Km/Hr

Increased fatality for pedestrians and cyclists

1. Out of scale Infrastructure

Safety of humans, cyclists at risk

Impact and Challenges –Mobility and Safety

Negative impacts - air quality, road safety ,energy use , affordability, universal accessibility ,traffic congestion and demand for precious urban land for parking.

Challenges of urban mobility –

Preoccupation with **mobility enhancement and infra-structure expansion** rather than the **realization of accessibility.**

- **Strengthen and integrate various modes of transport** which are energy efficient, environment friendly, safe and affordable to the people
- **Walking, cycling, non motorised modes, IPT, public transport modes** (Bus, Metro, trains) together act **as a sustainable mobility system**.
- **Buses and IPT as fuel consuming and polluting modes need to opt for cleaner fuel or alternate energy source** with governmental support on fiscal matters with system planning and infrastructure design priorities

Challenges of Urban Streets –

Uncontrolled growth of motor vehicles - main cause of increased congestion during peak hours and high fatal accidents during non peak hours.

- **Universal accessibility -**most important safety aspects under inclusive planning approach.
- **Complete neglect for majority of road users** ie pedestrians (including disabled, children, women and elderly people) and cyclists due to widening of carriageway and construction of flyovers with misconceived notion of removing congestion on urban streets.
- **Highway specific design approach -**Neither congestion nor accidents have reduced in any urban area by following.
- **Segregation of traffic and controlling motorised traffic speed** should tackle both congestion and safety on urban streets.
- **Adoption of specific urban street design norms** along with adoption of specified process of planning and development of complete streets will ensure safe, smooth and regulated traffic movement.

Global experience indicates that urban street design and development -

- **enhance the safety of vulnerable road** users
- **increase mass transit and NMT use** leading to
- **better air quality, low energy use and low congestion on roads** benefitting large section of people with better quality of life

2. National Urban Transport Policy

As per Indian National Transport Policy:

"The Central Government would, encourage measures that allocate road space on a more equitable basis, with people as its focus."

THE PROBLEM

Traffic accident

Traffic Speed

Noise, Vibration and Air Pollution

Appearance, Identity, and Maintenance

Traffic volume and composition

Impact on Land Use and Social Stability

Reduction of Street Activities

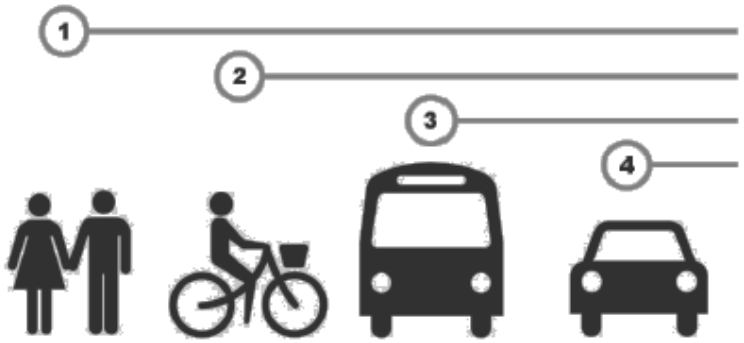
Integrated Planning and Development Approach

Planning, Development, Management and Inspection of urban roads and streets for - New Cities/towns as well as existing cities and towns (Restructuring and retrofitting)

- **Urban Road Network – Close grid network for distribution of traffic over the network**
- **Urban Roads and Streets – Safe streets and equitable distribution of road space**
- **Access Management –inclusive and universal accessibility**
- **Intersections and Interchanges – Pedestrian/NMT friendly**
- **Design of Streets – Complete street with provision of all road elements.**
- **Street Design Process – Preparation, Deliberation and Approval Stages**
- **Implementation and Management – Construction, audit, maintenance and management**

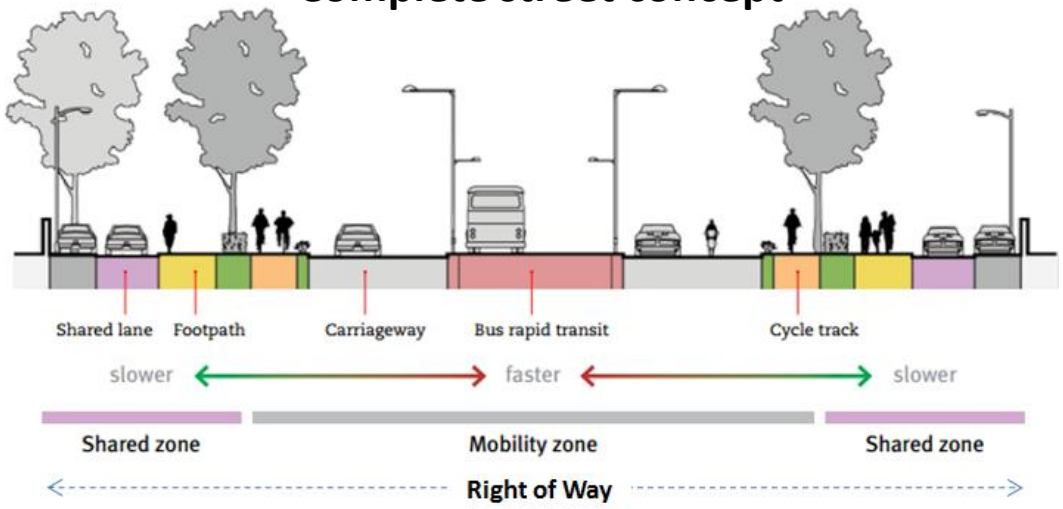
THOUGHTS BEHIND !

- **Pedestrian/NMT friendly streets** : Sustainable street design
- **Road hierarchy**: According to function of road rather than land-use.
- **Reservation of road space** -50% of available RoW is to be reserved for non-motorized uses, while 50% is to be reserved for carriage way.
- **Priority to public transport**: Bus lanes are to be provided in roads up to collector roads.
- **Transport Infrastructure** - Vehicle oriented flyover and traffic interchanges are to be discouraged on all roads except expressways.



Order of priority

Complete street concept



HIGHLIGHTS

Chapter

URBAN ROAD NETWORK

Discussion

Existing Challenges

Macro level planning

TOP DOWN APPROACH:

Vehicle- oriented growth

Urban Sprawl

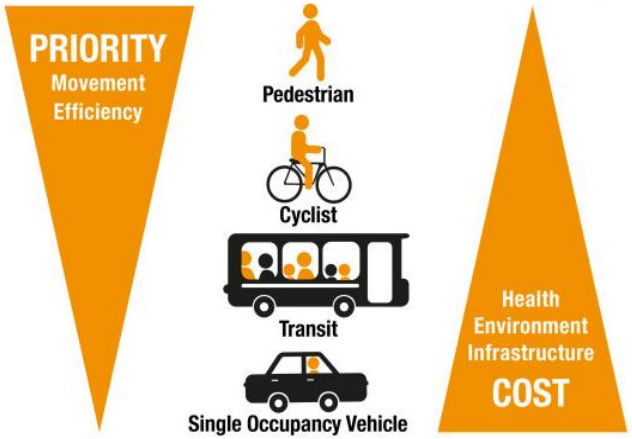
Less priority for neighbourhood Development, pedestrians, NMV or cyclists !

Loosing liveability of cities!

The chapter discusses different urban road /street network patterns with **Network planning principles and strategies** for both new as well as retrofitting developments.

Highlights

BOTTOM UP APPROACH OF PLANNING



Safe mobility for pedestrians, cyclists and NMV users

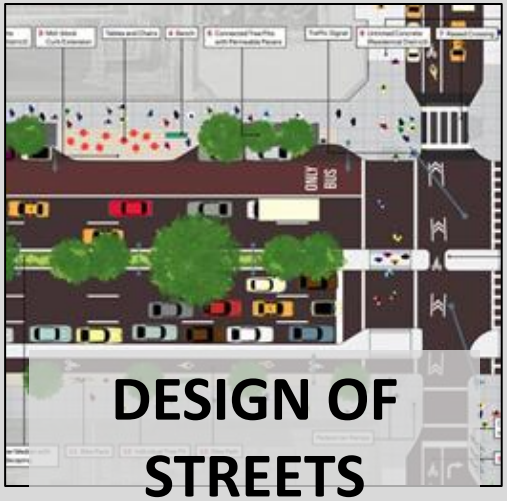
Planning from neighbourhood level

Pedestrian focused streets

Liveable cities !

HIGHLIGHTS

Chapter



DESIGN OF STREETS

Discussion

Street Zoning and Functions

The Pedestrian Zone

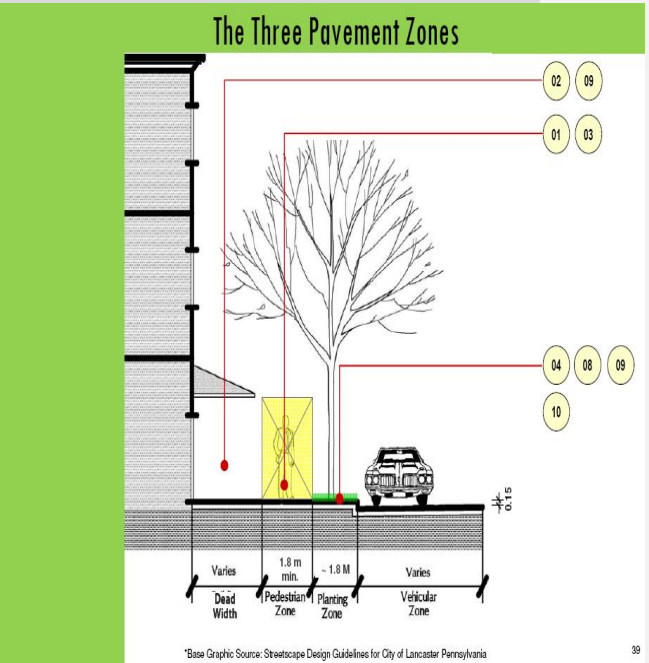
Frontage Zone or Dead Zone

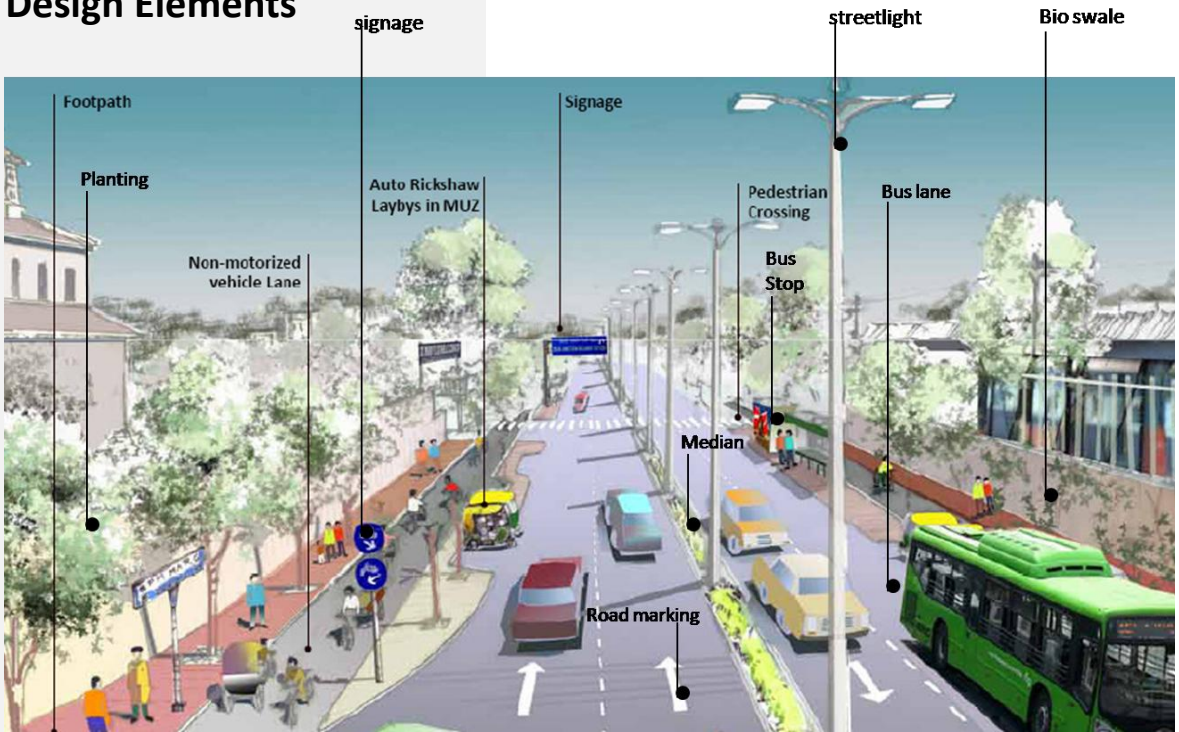
Multi-Functional Zone (MFZ)

Planting Zone

Street Furniture Zone

Street Design Elements



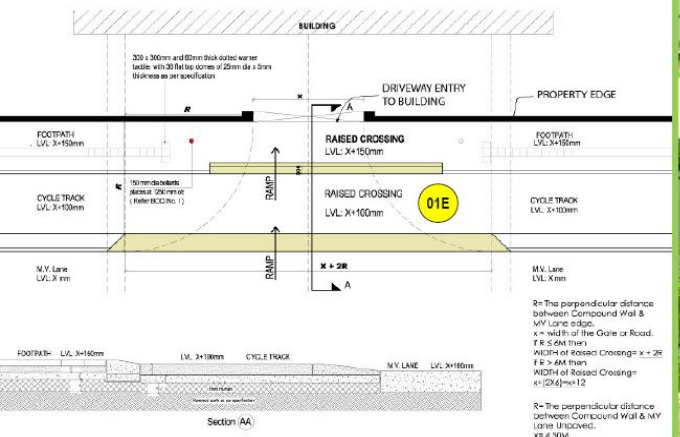


Highlights

All design elements are not elaborated , but mandatory street elements for different hierarchy of roads to make it active streets are provided in consolidated table

01E Continuous Pavement

01E At entry points of properties – introduce "raised driveway" or "table-top" details – where pedestrian and cycle tracks continue at their same level, but the motorized vehicles have to move over a gentle ramp to enter the property.



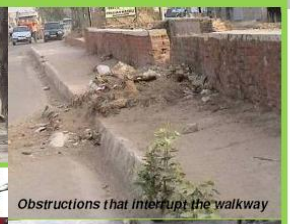
Typical Detail of Raised Driveway at Building Entries.

Source: TRIPP, IIT Delhi, BRT Design Specifications, 2009

Best Practices

BRT Corridor, New Delhi

Not Preferable



Obstructions that interrupt the walkway

Uneven pavement surface due to lack of proper setting in a concrete sub-base.

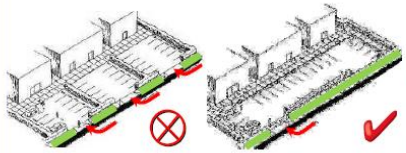
Dramatic changes of elevation

01E Continuous Pavement

Sidewalks and Cycle Lanes should be regarded as a transportation system which is connected and continuous, just like roadways and railways.

Key Design Guidelines:

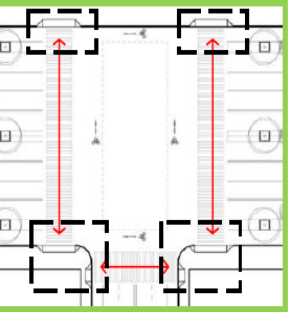
- Avoid sidewalk interruptions by **minimizing kerb cuts** i.e. Minimize the number of driveways that cross the sidewalk – in order to support pedestrian safety and a continuous sidewalk.
- Maintain an **even surface and elevation** of the pavement at 150 MM or less from surrounding road level.
- At entry points of properties – introduce **"raised driveway" or "table-top" details** – where pedestrian and cycle tracks continue at their same level, but the motorized vehicles have to move over a gentle ramp to enter the property.
- Remove all obstructions from the sidewalks.
- **Consistency of design elements, color and texture, help provide visual continuity and calm traffic, even at crossings.**



Source: FHWA Course on Bicycle and Pedestrian Transportation., 2006

03A Kerb Ramps*

Location of Kerb Ramps must align with the Zebra Crossing location and the location of Kerb-ramp on the opposite side.



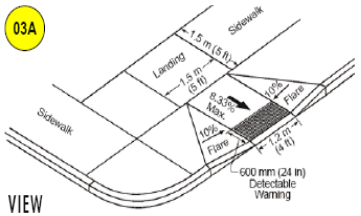
Kerbed Ramp with Tactile Paving

Kerb ramps provide pedestrian access between the sidewalk and roadway for people using wheelchairs, strollers, walkers, crutches, handcarts, bicycles, and pedestrians who have trouble stepping up and down high kerbs. **The absence of kerb ramps prevents any of the above users from crossing streets.**

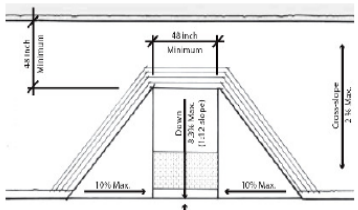
Kerb ramps must be installed at all intersections and mid-block locations where pedestrian crossings exist.

At Signalized Crossings: Use **Kerb Cut- Ramps**

03A



VIEW



PLAN

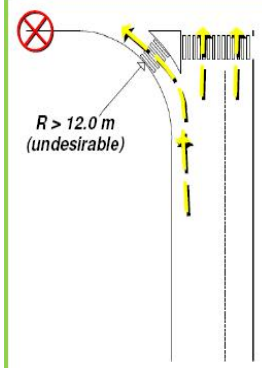
Source:
San Francisco Better Streets Plan

Key Design Guidelines:

- Standard kerb ramps are cut back into the footpath (flush with roadway), at a gradient no greater than 1:12, with flared sides (1:10) providing transition in three directions.
- Width of the kerb ramp should not be less than 1.2 M.
- Tactile warning strip to be provided on the kerb side edge of the slope, so that persons with vision impairment do not accidentally walk onto the road.
- The ramps should be flared smooth into the street surface and checked periodically to make sure large gaps do not develop between the gutter and street surface.
- It is desirable to provide two kerb cuts per corner. Single ramp located in the center of a corner is less desirable. Separate ramps provide greater information to pedestrians with vision impairment in street crossings.
- Mid block crossings accessible for persons with disability should be provided for blocks longer than 250M.

Source: Guidelines for Inclusive Pedestrian Facilities, Report for IRC by Anjlee Agarwal, Samarthyam.org

Not Preferable



Current: Typical Delhi Road Intersection

01D Kerb Radius and Slip Road Treatment

Free left turns/ Signal-free slip roads make traffic turn corners at high speeds, making it unsafe for pedestrians and cyclists to cross.

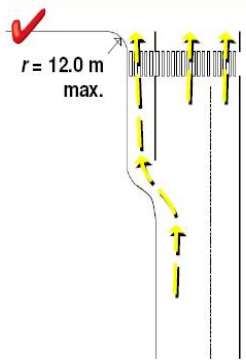
Slip roads may be replaced by Signalized "Left turning pockets" with much smaller corner kerb radii – that ensure Safe, Signalized Pedestrian crossings at junctions.

01D-iii

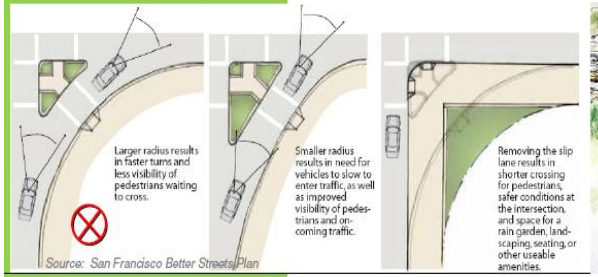
Free left turns/ Signal-free slip roads have large turning radii which allows traffic to turn at high speeds and provide less visibility making it unsafe for pedestrians and cyclists to cross.

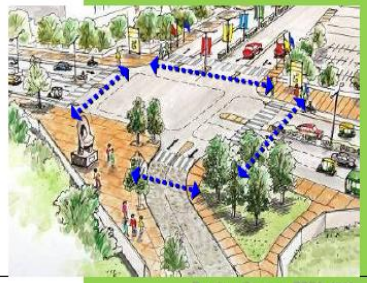
The maximum turning radius "r" allowed in the modified intersection design is 12 m; with recommended 3.0m for most intersections, especially for R/W less than 30m.

Best Practices

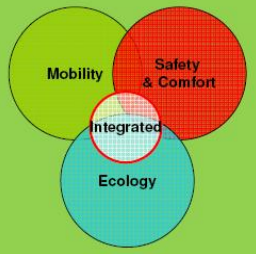


Proposed: Modified Intersection Design





Drawings Courtesy: PSDA, 2009



03 Universal Accessibility

Universal Accessibility is required for all sidewalks, crossings, parks, public spaces and amenities – for people using wheelchairs, strollers, walkers, crutches, handcarts, bicycles, aged people, visually or hearing impaired, and pedestrians with temporary mobility impairment or injury.

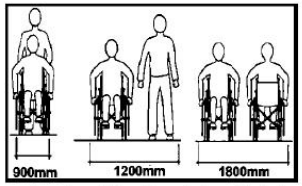


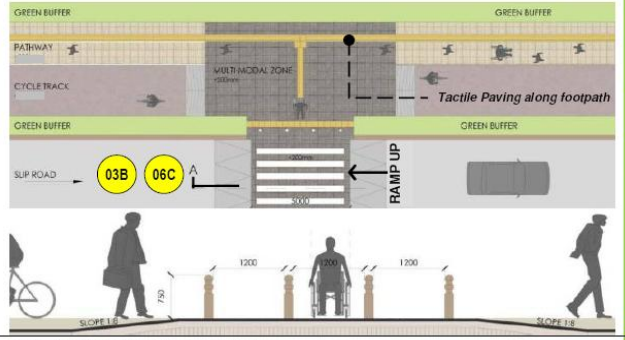
Diagram Source: Samarthyam, National Center for Accessible Environment, Research Report- Road Safety, 2008

03B Raised "Table-top" Crossing (See also 06B)

At Non-Signalized Crossings: **Use Raised "Table-top" Crossings**

Key Design Guidelines:

- Raised crossings bring the level of the roadway to that of the sidewalk, forcing vehicles to slow before passing over the crossing and enhancing the crossing by providing a level pedestrian path of travel from kerb to kerb. Cobble stone are not recommended on the top, but on the slopes.
- Raised Crossings also increase visibility of pedestrians and physically slow down traffic allowing pedestrians to cross safely.
- **Raised crossings should be located at:**
  - At Slip Roads (free left turns)
  - Where high-volume streets intersect with low-volume streets, such as at alley entrances, neighborhood residential streets, and service lanes of multi-way boulevards.
  - At Mid-Block Crossings



Sample Drawings Courtesy: Oasis Designs Inc.

Best Practices

Table-Top Crossing at Intersection, London

Bollard spacing shown here is too less...

Spacing between Bollards on a Kerb Ramp must be minimum of **900 MM** (3 feet).

Table top crossing at Intersection, Bogotá

Best Practices

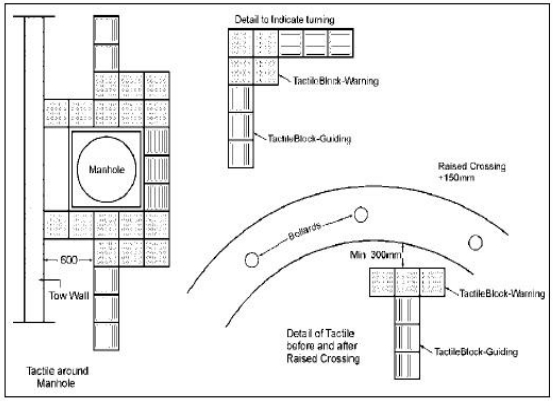
Audible signals which beep when light is green (BRT Corridor, Delhi)

Accessible Bus Stop, Delhi

03D Auditory Signals

Key Design Guidelines:

- **Audible crossing signals (pelican crossings)** help everyone, as well as being essential for persons with vision impairments.
  - Pedestrian traffic lights should be provided with clearly audible signals to facilitate safe and independent crossing of pedestrians with low vision and vision impairment.
  - Acoustic devices should be installed on a pole at the point of origin of crossing and not at the point of destination.
- Tactile paving should be provided in the line of travel **avoiding obstructions such as manholes/ tree guards/lamp posts etc.**



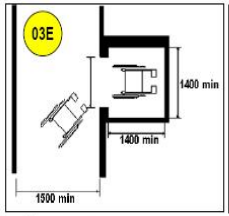
Tactile lay out for manhole and raised crossing

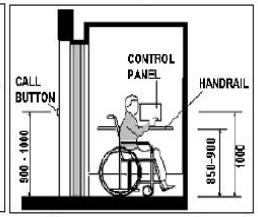
Source: Guidelines for Inclusive Pedestrian Facilities, Report for IRC by Anjlee Agarwal, Samarthyam.org

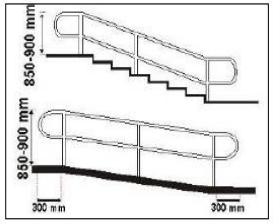
03E Accessible Infrastructure (See also Section 10)

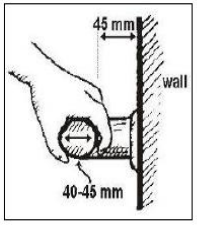
Key Design Guidelines:*

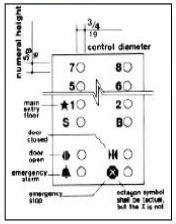
- A slope of 8% (1 in 12) on footbridge ramps, while a slope of 5% (1 in 20) with appropriate resting places/landings is preferable .
- Within the underpass, a handrail set 850mm-900mm (Figure 32 & 33) above the walking surface should be provided.
- To assist visually impaired people, tactile paving/ tiles and a colour contrast should be provided at the top and bottom of the flight of steps and these areas should be well lit.
- Elevator/lift should be provide on both the entrances/exits and should have minimum internal dimensions of 1400mm x 1400mm.
- All Lifts to have Braille buttons and audio announcement systems.





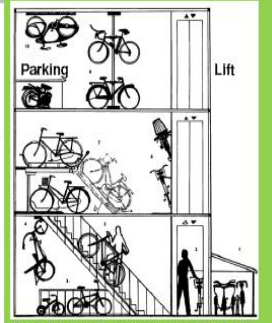




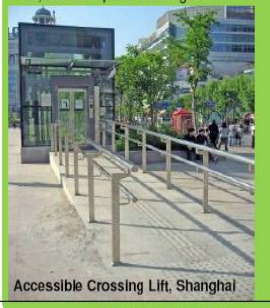


*Source: Access for All, Guidelines for TOT for promotion of Universal Design, 2008, Samarthyam

Best Practices



Cycle Lift must be minimum 2000 x 1400 and provided at every 1 km on a highway FOB, and at all public buildings.

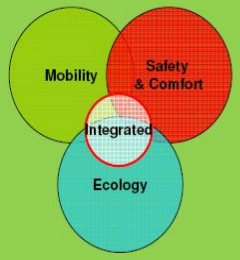


Accessible Crossing Lift, Shanghai

04 Multi-Functional Zone with Planting

- 04A Essential Planting
- 04B Tree Pits and Tree Grates
- 04C Planting with Storm Water Management
- 04D Aesthetic Planting

Multifunctional Planting zones with native Street Trees and Plantation – are Essential on every Delhi pavement to provide shade and climatic comfort. Planting zones can also double as Natural Storm Water catchments and filtration systems - aiding in ground water recharge, preventing seasonal flooding and reducing the pressure on piped stormwater infrastructure.



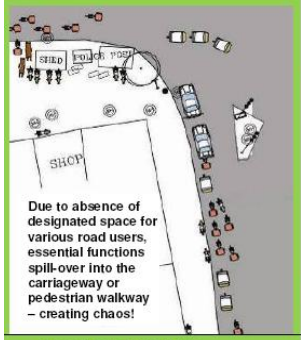
MAIN PRINCIPLES:

Mobility	- Avenue tree plantation is a must on all streets of Delhi in order to provide shade and comfort to pedestrians.
Ecology:	- Integrated Natural Drainage Systems - Native plantation for resistance and water conservation.
Safety/Comfort	- Tree planting zones with native street trees and plantation – are essential for shade, lowering HIE and giving comfort to pedestrians. - Tree planting zone should be CLEAR of the pedestrian walking zone

04

* Multi-Functional Zones on a Street may accommodate all functions described in Section 10, pg. 103, as well as the following:

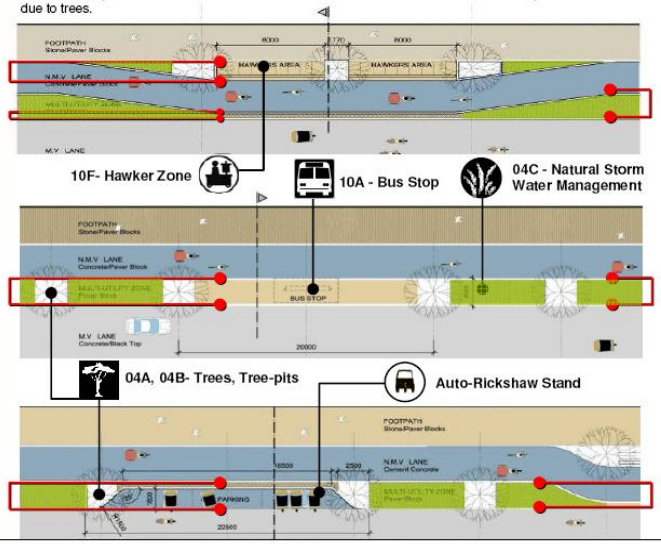
- Tree Planting
- Planting for Storm Water Management
- Auto-rickshaw Stands
- Cycle-rickshaw Stands
- Hawker Zones
- Paid Car Parking
- Street Furniture
- Bus Stops
- Traffic Police Booths, MTNL boxes, fire hydrants, junction boxes, etc.
- Street lights/ pedestrian lights.



Due to absence of designated space for various road users, essential functions spill-over into the carriageway or pedestrian walkway – creating chaos!

04 Multi-Functional Zone (MFZ) with Planting, Etc.

- Multi-Functional Zones on a Street should be a **minimum of 1.8 M Wide**, and may locate multiple functions.
- Provision of MFZ is most critical otherwise the uses/ components of streets (mentioned to the left) would encroach upon pedestrian, NMV or carriageway space.
- Common Utility Ducts and Duct Banks **should not be** located under the MFZ as there may be interference due to trees.



Drawings Courtesy: Pradeep Sachdeva Design Associates, 2009

04 Multi-Functional Zone with Planting

Continuous planting zones are suitable for areas where pedestrian volumes are less and they need to be contained within the walking zone.

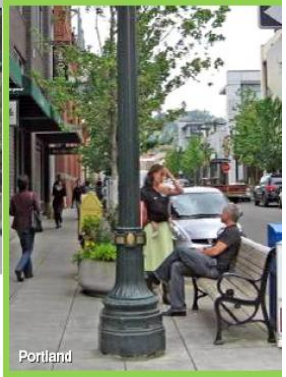
Retail (shopping streets) should have trees in tree-guards (and not continuous planting strips) – to allow more flexibility and space for pedestrian movement.

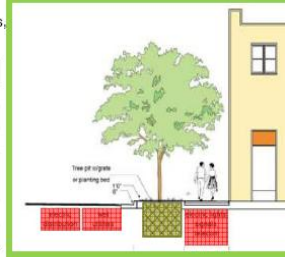
- Pedestrian corridor and Utility Easements must be placed **separately from the Tree Planting Zone.**
- **Ideally Utilities should be placed in ducts or duct banks**, for easy maintenance.
- For the health of trees and preventing their disruption during utility repairs & other pavement activities, street trees must have the **Standard Clearances:**

From	To	Standard Clearance from Tree
Centerline of Tree	Face of kerb	3.5 feet
	Pavement or pavement landing	2 feet
	Driveway (measured from edge of driveway at pavement)	7.5 feet
	Centerline of streetlight poles	20 feet (varies by type of tree)
	Centerline of utility poles	10 feet
	Extension of cross street kerb at an intersection	30 feet
	Underground utility duct, pipe or vault	5 feet

Source: *http://www.seattle.gov/transportation/rowmanual/manual/6_4.asp*

Best Practices





Current Situation

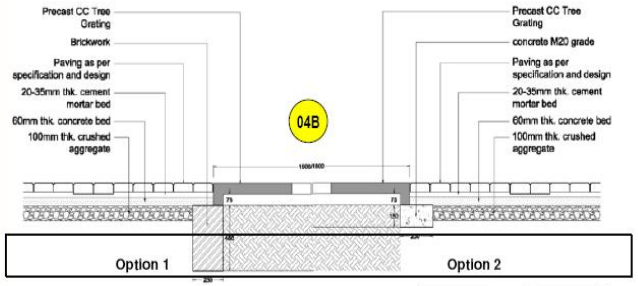
Suffocated Tree pits

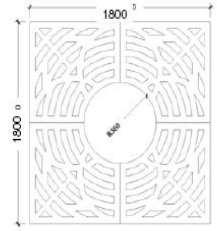
- Delhi High Court, the city government said on 28 Oct 2009 it would ensure "breathing space" for every tree in the Capital — by keeping a circumference of 6 feet around it concrete-free.
- The assurance came in reply to an HC Petitioner who tells HC that concrete pavements are weakening tree roots, cutting off their water supply. This leads to 'slightest of storms' uprooting several trees, leading to

Open Tree pits are acceptable but they are difficult for pedestrians to walk over.

04B Tree Pits and Tree Grates

- **A clear width of 1800 x 1800 M is to be left free of concrete, in order to allow access of nutrients to the roots of trees.**
- **Tree Grates allow pedestrians to walk close to trees, without discomfort to either.**





Sample Detail of Precast Cement Concrete Tree Grating.
Source: Pradeep Sachdeva Design Associates, Nov 2009

08A Pedestrian Scale Street Lighting

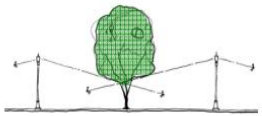
Best Practices

- **Height of Light Pole is a function of Street Width. Narrower the Street Width, lower can be the Lamp Height.**
- Expert advise should be taken from lighting engineer for design calculations including for pole height, type of luminaries, etc. for achieving appropriate lighting levels at all parts of the street.

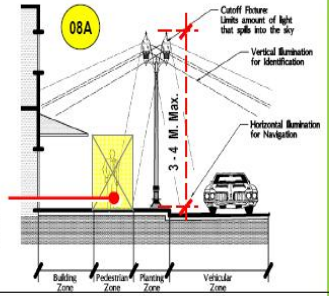
High/ Mid-Mast Lighting may not provide sufficient light at pavement level.

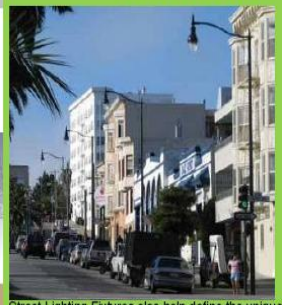
Additional Low-Mast Pedestrian Scale Lighting is advisable on all Streets.

30 M or narrower streets like local access lanes, alleys and pedestrian pathways can possibly be adequately illuminated with Low-mast fixtures alone.



- **Tree planting plan and Lighting plans** (See also 04A) **must be prepared in conjunction** – so that tree canopies do not obstruct lighting for road users.
- Under NO CIRCUMSTANCES should the **Light-pole placement interfere with the clearance of the main pedestrian walkway** of the pavement. Light pole may preferably be located within the tree-planting zone.



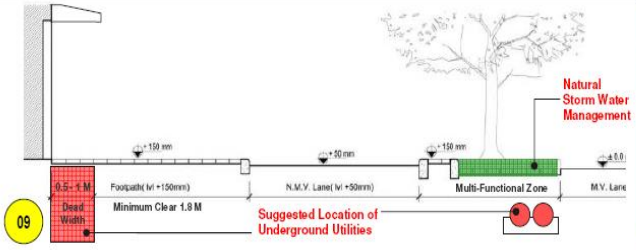


Street Lighting Fixtures also help define the unique character of an area.
Above: A historical neighborhood
Below: A modern area – both in San Francisco

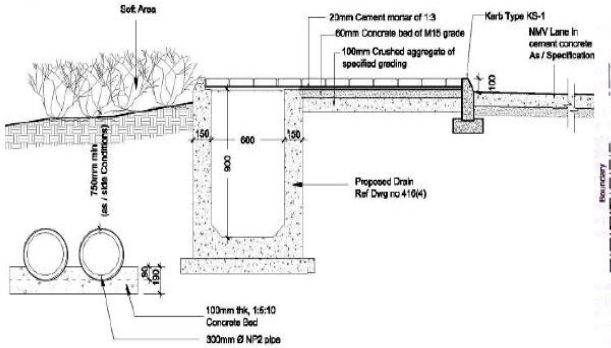
Source: San Francisco Better Streets Plan

09A Underground Utilities

Best Practices

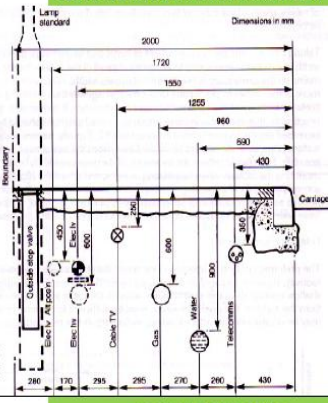


Utilities along the 0.7 M Buffer Zone between Cycle Path and MV Lane, BRT corridor, Delhi.



Sample Underground Cabling Plan

Drawing Courtesy: Pradeep Sachdeva Design Associates



British Services Layout Guideline:

The Kit of Parts:

10 Public Amenities, Hawker Zones, Signage

Designated Hawker Zones (10G) **must be allowed to locate in areas where pedestrians tend to wait or congregate i.e. street intersections and near bus stops or major civic destinations, public offices, etc.**

X. Public Toilets (10A) **should be located near every alternate bus-stop and definitely located at each Rapid Transit Station (Metro/BRT). Frequency of location of toilets should be every ~500 - 800 M.**

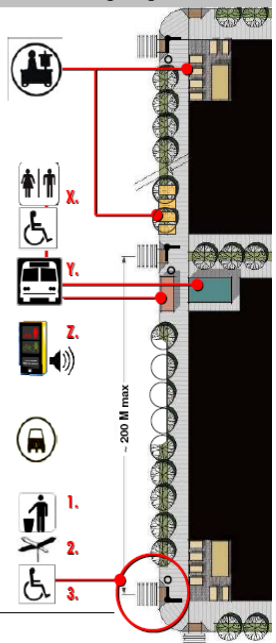
Y. Bus Stops with Route Maps (10B) **must be universally accessible, and located every ~800-1000 M.**

Z. Auditory Pelican signals (10C) **and raised table-top crossings at all mid-block or T-junctions, in absence of a full traffic signal.**

Auto and Cycle-Rickshaw Stands (04) **should be provided near bus-stops, within the Multi-Functional Zone.**

"Set of 3" at every intersection must be provided for Pedestrian Way-finding:

1. - Dustbin with map (10E)
2. - Street directional signage (10D)
3. - Universal accessibility features (03B)



10A Local Bus Stop

Key Principles:

- Dustbins – their frequent provision, cleaning and maintenance are key aspects to the cleanliness of a city.
- **All bus stops must be universally accessible.**
- Bus Stops should preferably be located within the **Multi-Functional Zone** – so that they do not interfere with the **1.8 M clear walking zone** for passing pedestrians at the back.
- **Criteria for Placement of Local Bus Stops:**

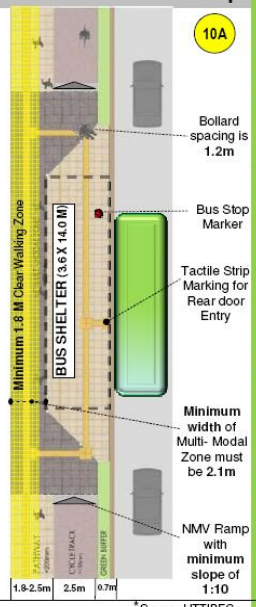
Placement of Stop
- Convenient location to major land uses (pedestrian generators)
- Convenient to transfer movement

Pedestrian Access
- Route to be direct as possible, integrating short-cuts
- Connecting path should be clear of obstructions, firm surface material, well drained
- Consider impact of stops on adjacent properties
- Adjacent, or as close as possible to stop going in the opposite direction
- Accessible stops should have matching adjacent stops
- Convenient for errand running and "trip linking" tasks
- Grade of road should not impede accessibility

Visibility
- Drivers' sightlines should not be obscured by trees, shrubs, poles, buildings
- Where there are bike lanes: locate sufficient distance for cyclists to stop safely
- Buses should not restrict visibility of traffic signals
- Do not place on curves
  - 150 m. sightlines going into zone and coming out of zone
- Ensure clear sightlines on the right side of the bus - no obstructions
- Stop should be well lit

Proximity to Crosswalks
- Intersection stops: if near side is necessary, ensure 4.5 metres distance
- Mid block stops: always locate stop on far side of crosswalk so that pedestrians cross from behind the bus not in front
  - Avoid locating stop close to driveways especially those with high traffic volumes

Driveways
- If impractical, ensure full visibility for vehicles exiting driveways
  - Place on far side of driveway (sight distance for left turning still a problem)
- Consider volumes and turning movements of other vehicles



Source: UTTIPEC

This Bus Stop is accessible, but Clear 1.8M Pedestrian Zone has not been left. Moreover, Space in front of bus stop for waiting passengers is highly inadequate.

This Bus Stop is correctly placed.

A Local Area Map or an entire **Bus-Route Map** should be displayed on the panels of all bus-stops (besides advertising) , to help Wayfinding.

Not Preferable

Lack of adequate clean and frequent public toilets and abundance of unwatched boundary walls makes Delhi's public spaces an open public toilet.

10B Public Toilets

Key Guidelines:

- **Provide public toilets at a distance of every 500 – 800 M** (5-8 minute walk) from each other and from any destination.
- Toilets should be located near **every alternate bus-stop** and **at each Rapid Transit Station** (Metro/BRT)
- Public toilets should be provided as combination of general toilets and accessible toilet, where accessible toilet to be marked as Multi-use toilet to be used by senior citizens, families with young children and disabled persons.
- **Environmental friendly *Sulabh Shauchalayas*** should be built as public toilets as they have the following **advantages:**
  - They do not smell
  - They consume very little water and are easy to clean and maintain (in contrast to conventional toilets that require a minimum of 10 litres.)
  - They have potential to tie up with other community based environmental technologies such as biogas production, etc. for heating, cooking, and generating electricity.
  - They provide new employment opportunities for many.
  - Environmentally balanced wastewater treatment based on a duckweed and fish raising (pisciculture) ecosystem that provides economic opportunities for the urban poor.

(Above) **Sulabh Shauchalayas**

(Right) **A public toilet system that incorporates local treatment and water recycling system – providing much needed water for horticulture.**
Source: Pradeep Sachdeva Design Associates, 2009

Not Preferable

Obscure Street Signage…..

10C Street-Direction Signage

Key Principles:

Signage for Wayfinding and Information of Pedestrians and Cyclists are essential for creating a public transport friendly city.

Signage provides help to pedestrians to navigate the city with ease and safety, and have the following functions:*

- **Orientation – Way finding** (Street Signs)
- **Availability of Public Transit nearby** (Transit Signs)
- **Guiding Street Flow** (Traffic Signs)
- **Announcing about City's specific features or attractions** (Information Signs)
- **Conveniences** (Toilet, dustbin, hawker signs).

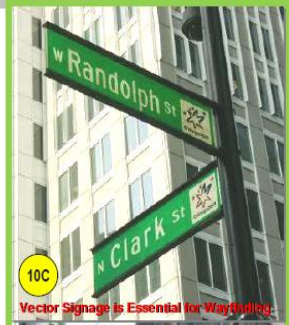
- Signs should reinforce the overall character of the specific district and be consistent throughout the City.
- Posts and poles should be arranged to minimize the number and avoid clutter.

Pleasing Signage Palette above. But Non-Vector Signage is ineffective for Wayfinding.

Visual Signage is preferable for Amenities and General Information

*Source: San Francisco Better Streets Plan

Best Practices



Vector Signage is Essential for Wayfinding

Not Preferable

Littering in Delhi is a perennial problem.
Source: Hindustan Times, Oct 2009

"How to use" Delhi's new 'source separated' dustbins is a mystery to most people in the city.

10E Dustbins

Key Principles:

- Dustbins – their frequent provision, cleaning and maintenance are key aspects to the cleanliness of a city.
- **Dustbins must be provided at each bus-stop and street intersection** in order to discourage people from throwing trash on the road.

Key Concepts:

- On Source Separated Dustbins – **signage for "Trash type" should be made of graphic symbols** – so that even illiterate people can understand how to use them.
- **Private Sector could be involved in manufacturing and maintenance of dustbins** in return for the incentive of getting waste for recycling or tax subsidies for firms if conducted as a CSR initiative.

"Graphically explained" Source Separated Dustbins: Shanghai.

*Graphics Source: Miscellaneous, representative only.

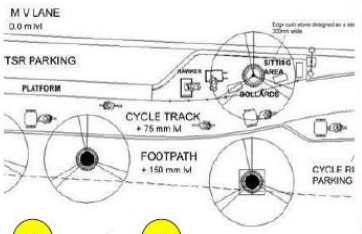
Best Practice

Transparent dustbins can be used in crowded places like Metro Stations, etc.

Opaque Dustbins with Maps - can be use… general Street corners and Intersections.

10F Designated Hawker Zones

Hawker zones at Street Intersections (A) — 1.8 M clearance for moving pedestrians — (B) Hawkers fronting Shops



10F See Also: 04

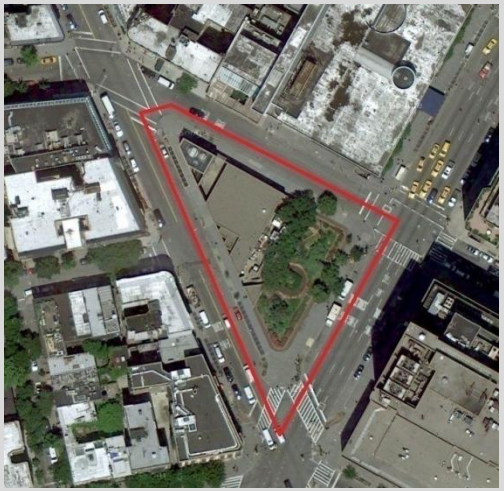
1.8 M CLEAR Walking Zone (C) Hawker zone on pavements

Street Design Guidelines © UTTIPEC, DDA 2009

Best Practices

HIGHLIGHTS

Chapter



STREET DESIGN PROCESS

Vision statement

The approach of Street design process is to make urban streets ready for multi modal transportation networks that can safely accommodate access and travel for all users.

Street Design Process

- **Terms of Reference**
  - **Stage I: Inception Report**
  - **Stage II: Conceptual Design Options**
  - **Stage- III: "Detail Design of Approved Proposal"**

- **Type of Surveys**

Topographic and Landscape surveys, Land-use surveys, Survey of pedestrian facilities, Pedestrian and cyclist movement surveys, Street vending and activity surveys, Parking surveys and Traffic surveys.

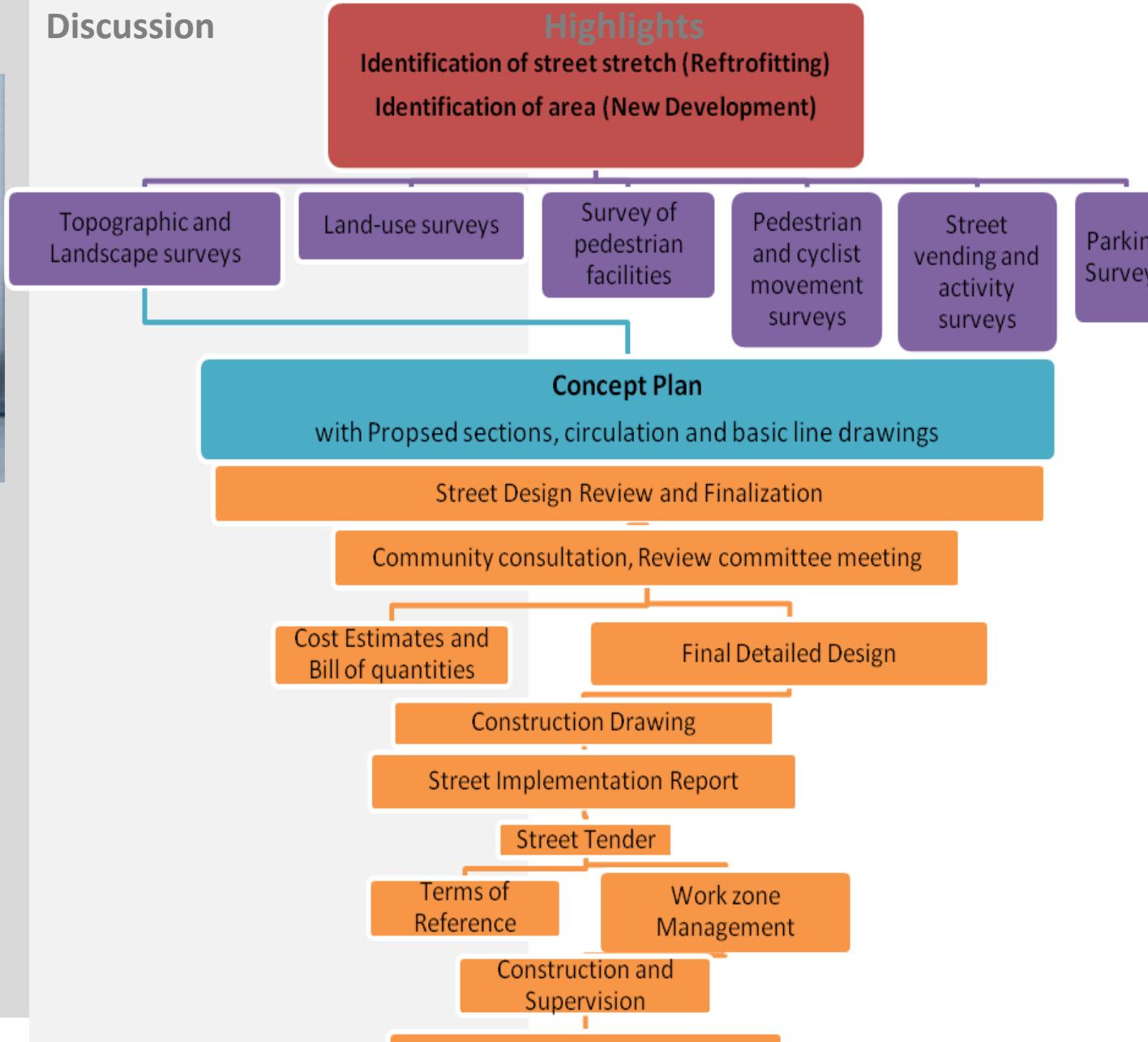
- **Plans Depicting Existing Scenario**
- **Proposed Concept plans**
- **Street Design Review and Finalization**
- **Detailed design**

HIGHLIGHTS

Chapter

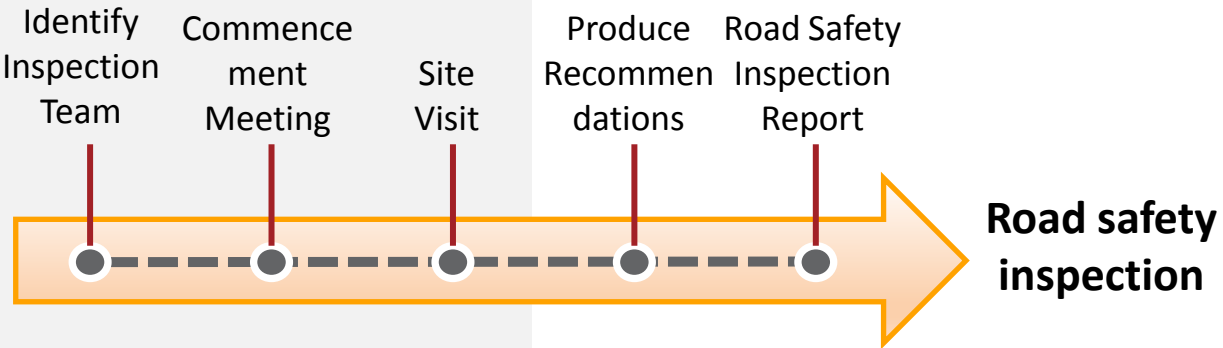
IMPLEMENTATION OF STREET DESIGN

Discussion



HIGHLIGHTS

Chapter	Discussion	Highlights
 **MANAGEMENT OF URBAN STREETS**	Out of various aspects for effective management of streets., the chapter highlighted few major components.	**Street Asset Maintenance and Management** **Street Management Authority** **Enforcement procedure and techniques** **Traffic Management and Enforcement** **Disaster Management** **Capacity Building**
 **ROAD SAFETY AUDITS**	Relevance of doing audits. Its importance in effective street design implementation and management.	❖**Road Safety audit** ❖**Road Accessibility audit** ❖**Road safety inspection**

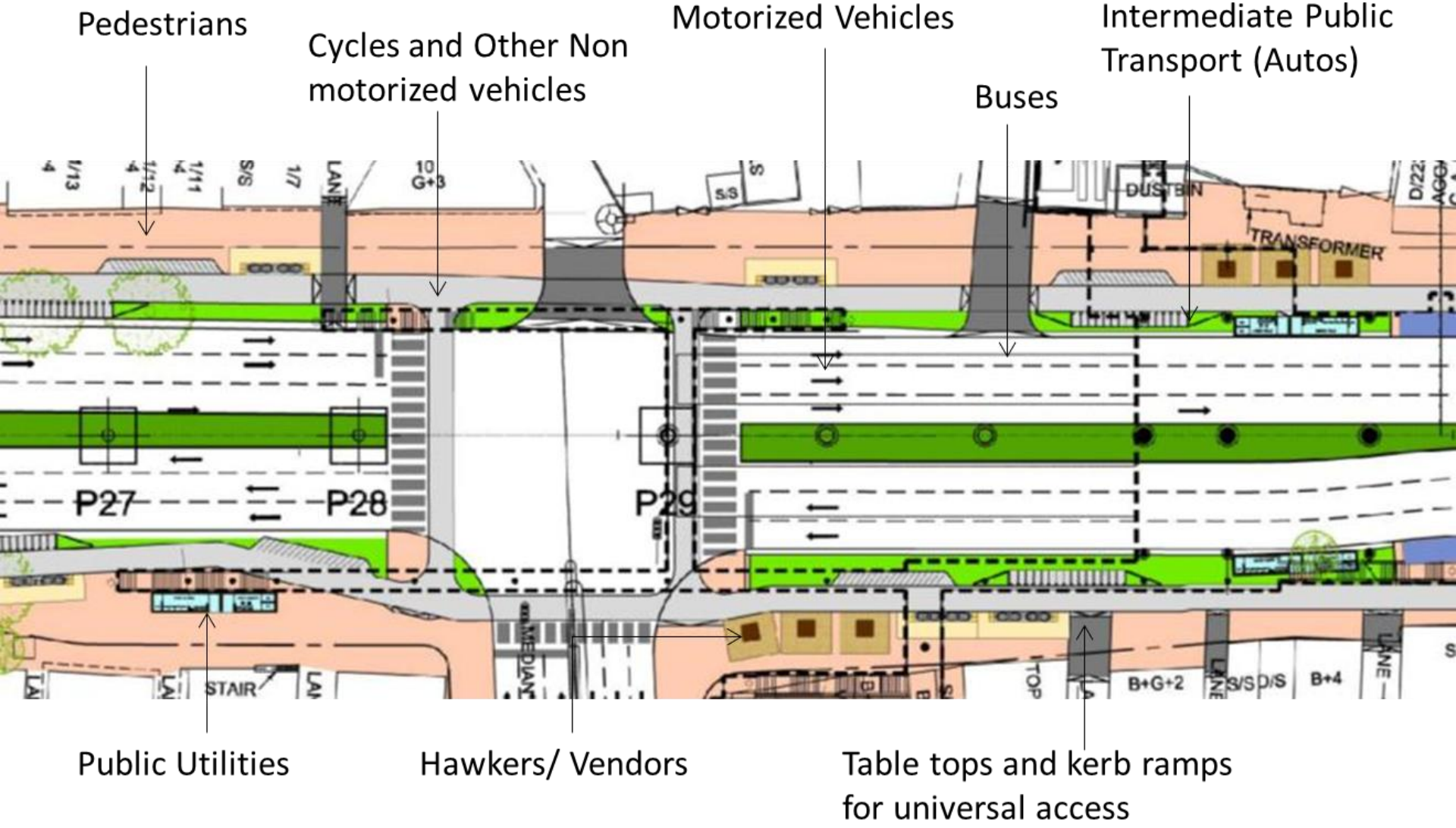


Approach for NMSH

1. Focus on people not vehicles:

Approach for NMSH

2. Increase share of walking and cycling



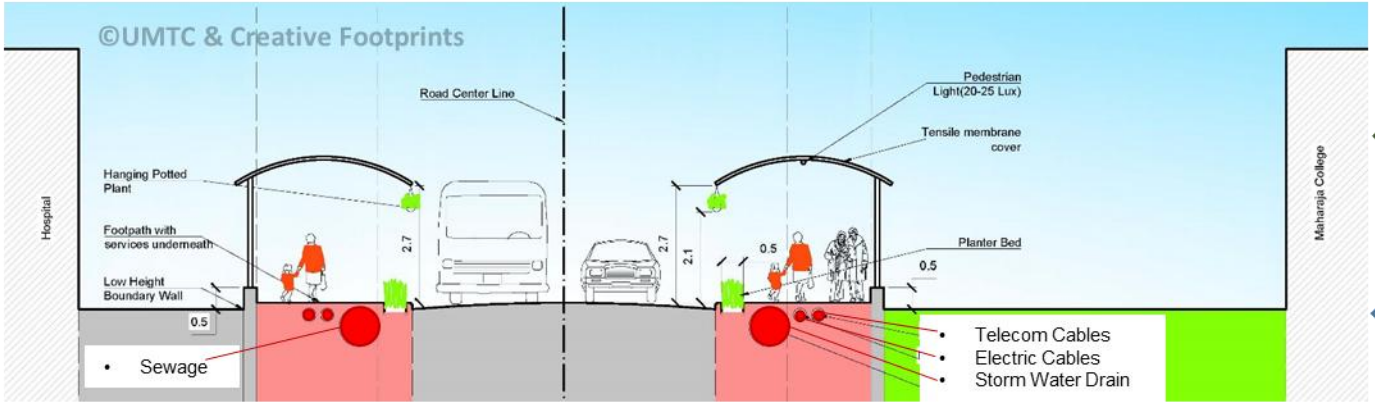
Need for Street Rejuvenation

Panampannly Streetscape-Kochi

Better walking & cycling infrastructure

M.G. Road- Bangaluru

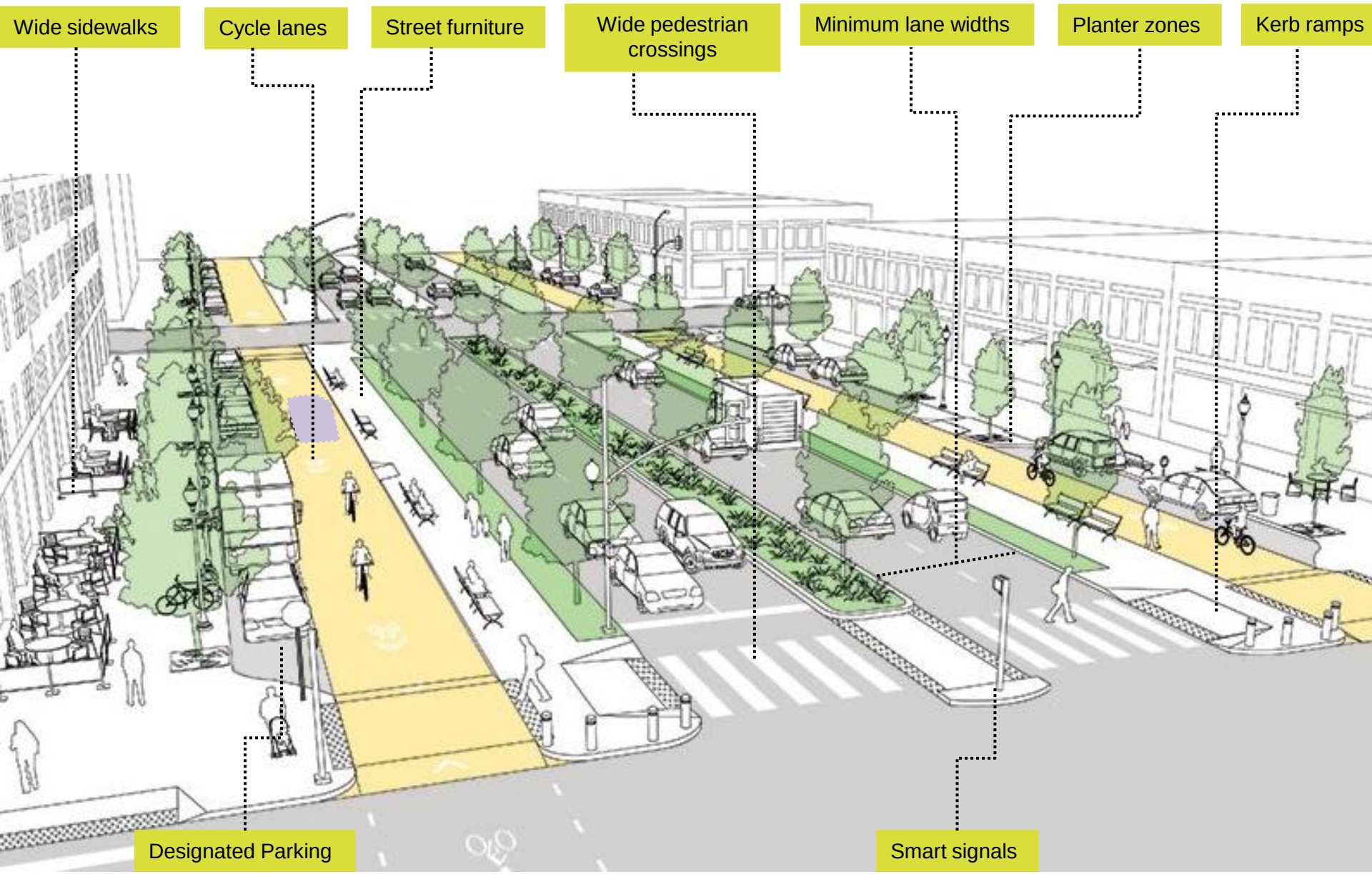
Encouragement in use of Metro & Public Transport



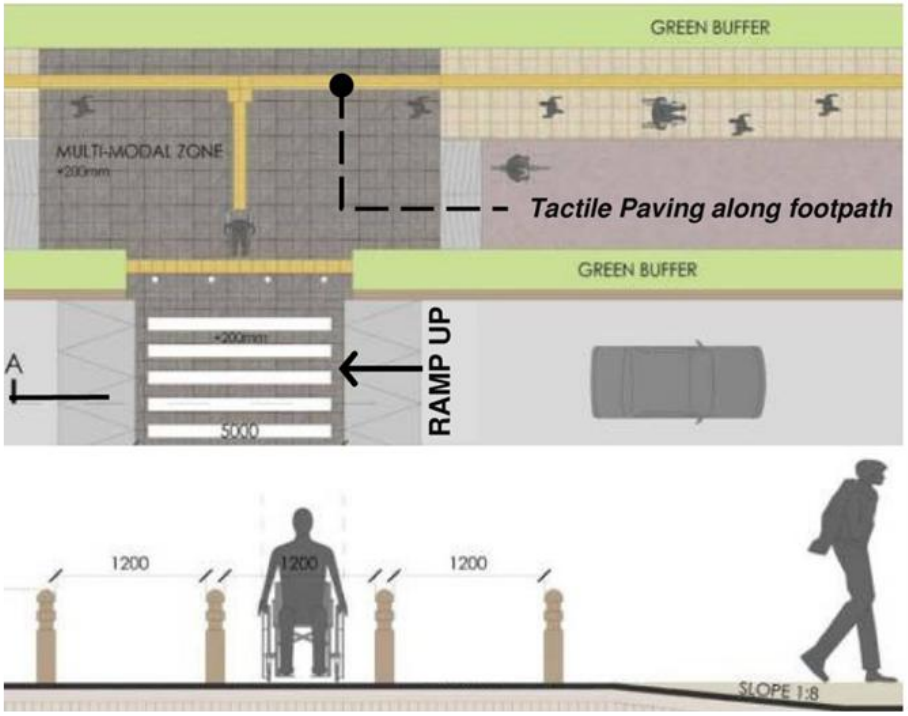
Hospital road streetscape-Kochi

Better quality of public utilities.

Street Components



1.b) Universal accessibility Plan



Source: UTTIPEC Street Design Guidelines

Audible Pelican signal- Delhi BRT

Tac tile paving- Delhi BRT

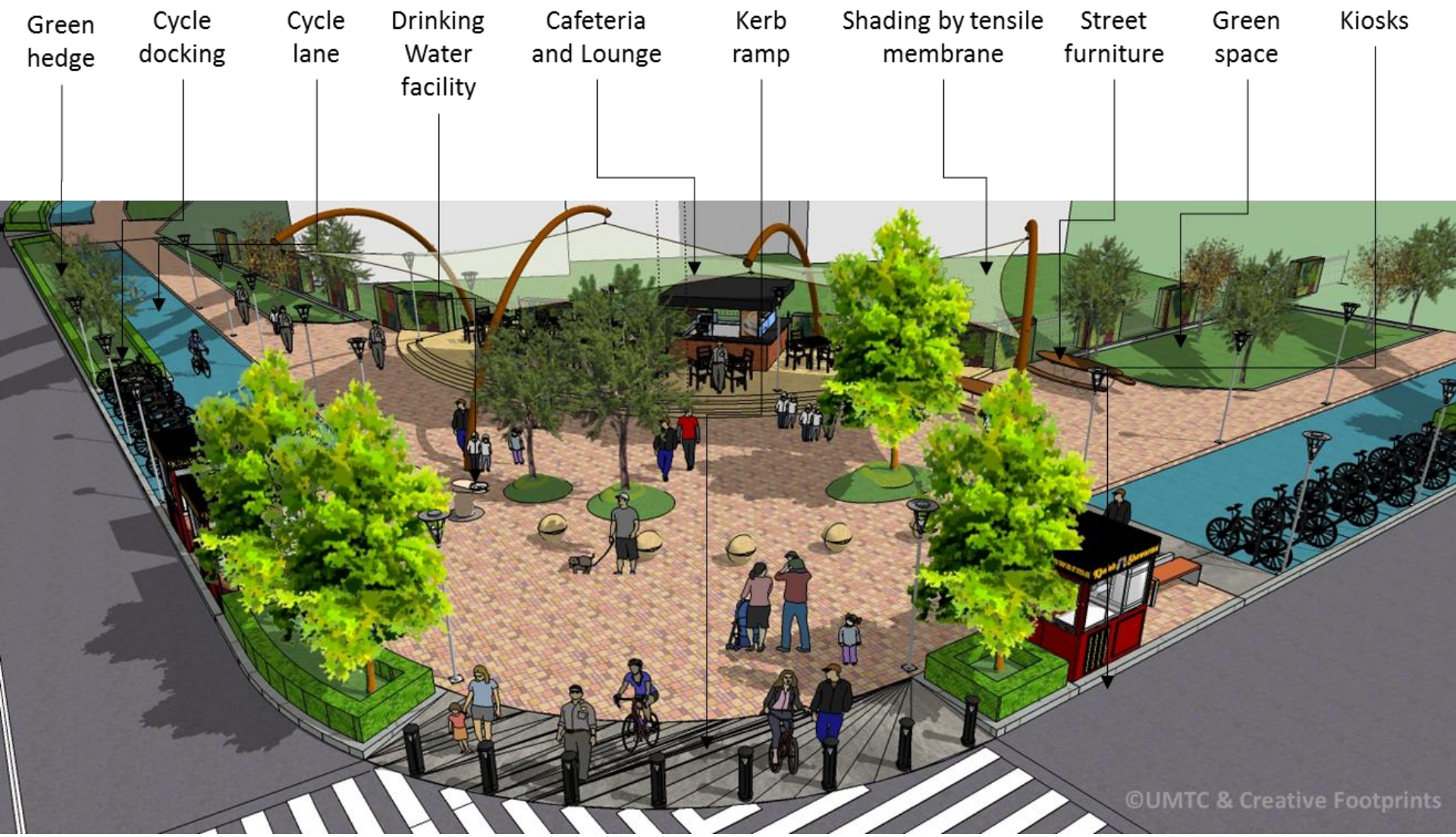
Engineering configuration of floor tactile tiles

Table top crossing-London

Table top crossing-Bogota

Tactile paving on footpath leading to ramp and crossing, BRT Corridor Delhi

2) Landscaping and Place Making Scheme

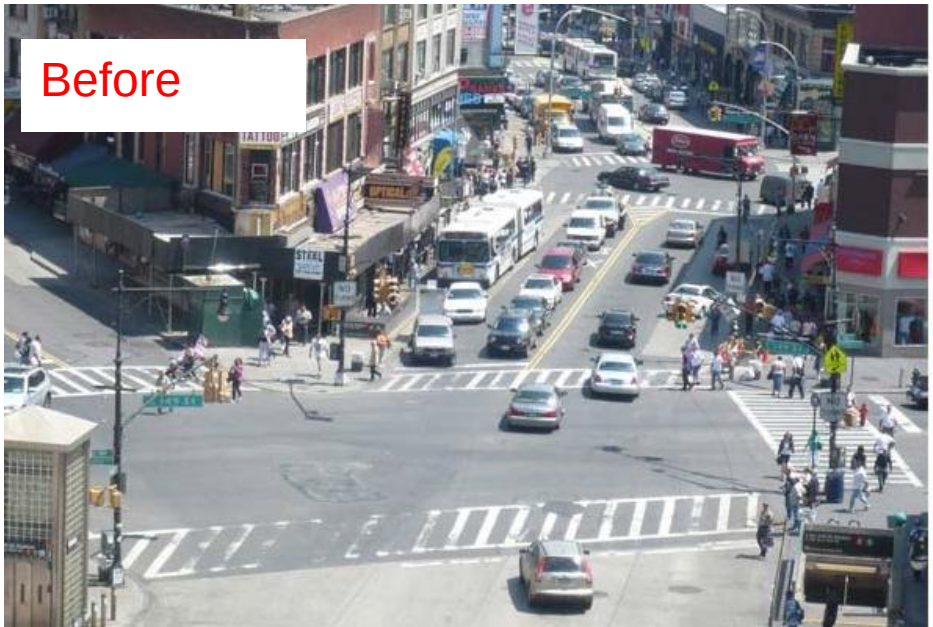


As part of Kochi Metro Project

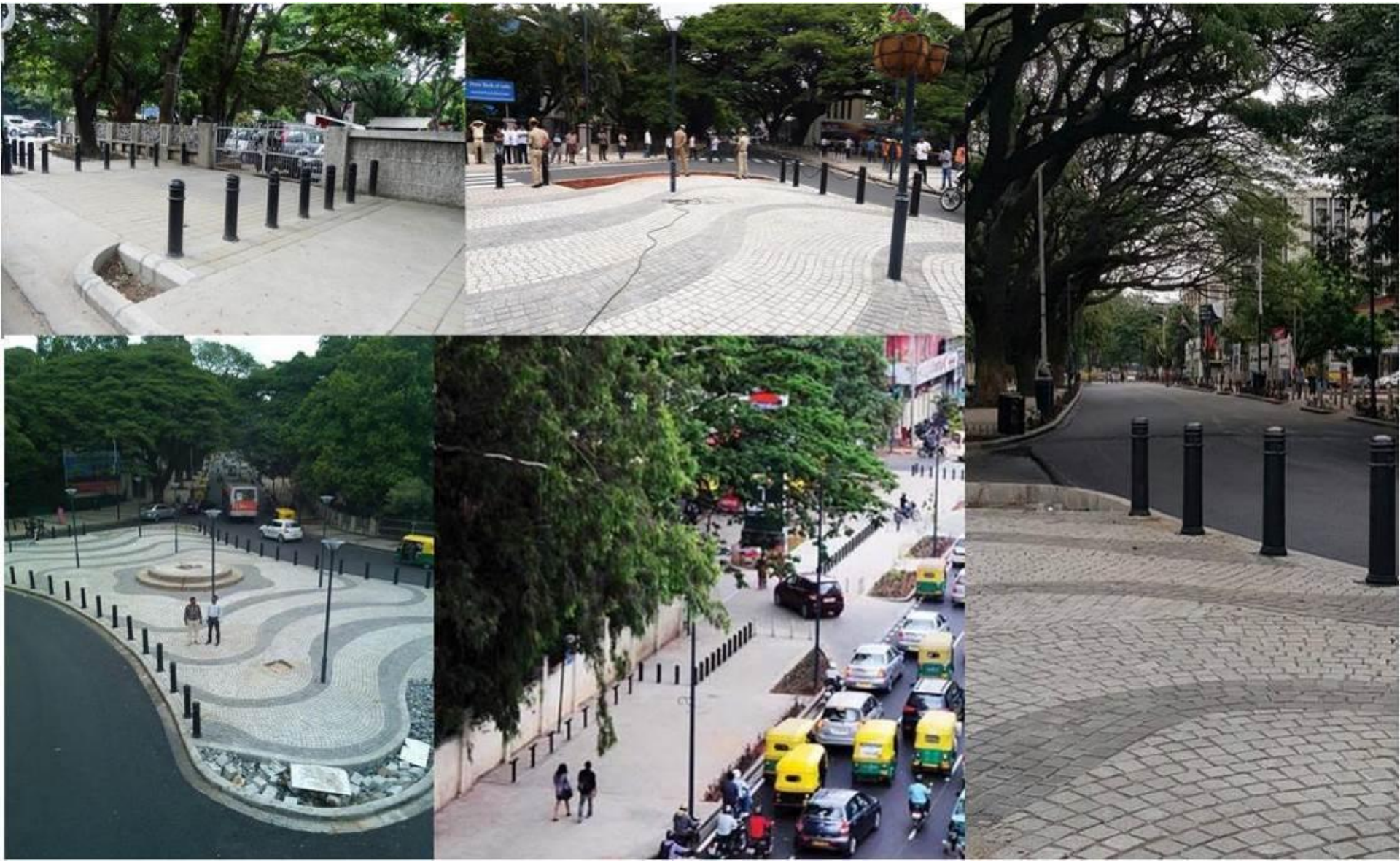
3) Junction Redesign

NACTO Urban Street Design Guide

Sunset strip, West Hollywood

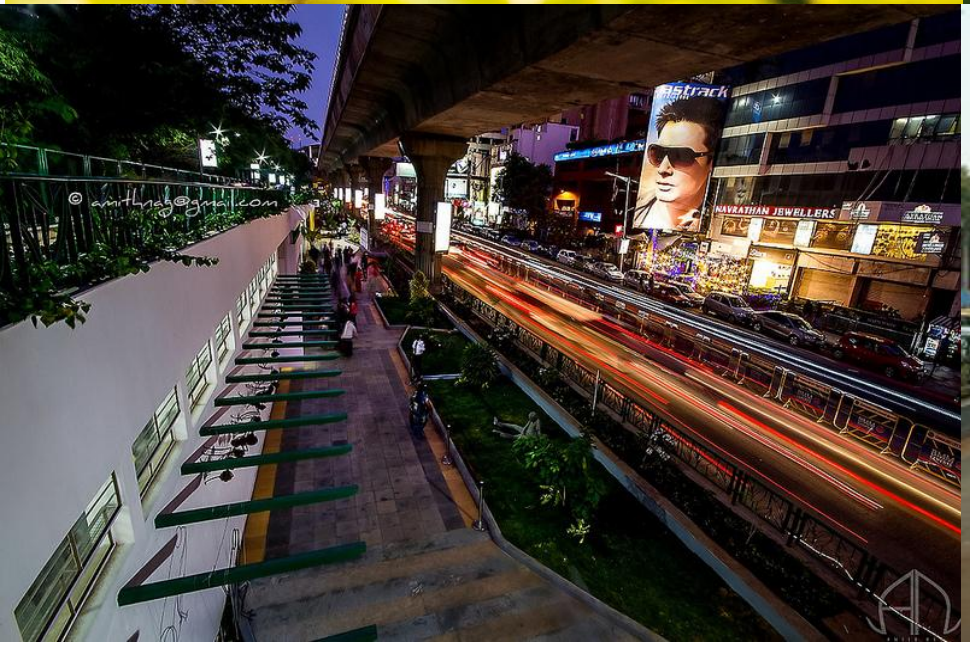


2. Case of Bangalore



Tendersure roads in Bangalore

2. Case of Bangalore



M.G. Road in Bangalore

THANKS