

Equitable Road Space : Case study Vikas Marg, New Delhi

Laxmi Nagar Chungi to Karkari Mor

Methodology Adopted

STAGE 1 : Understand Equitable Road Space and Design

STAGE 2 : Study of different Guidelines.

STAGE 3 : Identification of Case Study Location and Data Collection

STAGE 4 : Data Analysis

STAGE 5 : Design Considerations

Need for Equitable Road Space

Benefits of Equitable Design



- Increase in comfort of pedestrians
- Comfortable last mile connectivity from MRTS Stations – therefore increased ridership of Buses and Metro.
- Reduced dependency on the car, if shorter trips can be made comfortably by foot.
- Prioritization of public transport and non-motorized private modes in street design.
- Reduced car use leading to reduced congestion and pollution.
- More equity in the provision of comfortable public spaces and amenities to all sections of society.

Guidelines of UTTIPEC for Equitable Road Space

GOALS FOR “INTEGRATED” STREETS FOR DELHI:

GOAL 1:

- **MOBILITY AND ACCESSIBILITY** – Maximum number of people should be able to move fast, safely and conveniently through the city.

GOAL 2:

- **SAFETY AND COMFORT** – Make streets safe clean and walkable, create climate sensitive design.

GOAL 3:

- **ECOLOGY** – Reduce impact on the natural environment; and Reduce pressure on built infrastructure.

Mobility Goals:

To ensure preferable public transport use:

1. To Retrofit Streets for equal or higher priority for Public Transit and Pedestrians.
2. Provide transit-oriented mixed land use patterns and redensify city within 10 minutes walk of MRTS stops.
3. Provide dedicated lanes for HOVs (high occupancy vehicles) and carpool during peak hours.

Safety, Comfort Goals:

4. Create “eyes on the street” – by removing setbacks and boundary walls and building to the edge of the street ROW. This would allow people from inside to look out on to the pavement, thus discouraging misbehavior, shady corners, peeing, etc.)
5. In case enclosure of sites is required, transparent fencing should be used above 300 mm height from ground level.
6. Require commercial facades to have minimum 30% transparency.
7. Provide adequate Street Lighting for pedestrians and bicycles.
8. Create commercial/ hawking zones at regular intervals (10 minute walk from every home in the city) to encourage walkability, increase street activity and provide safety. (e.g. Mumbai, Shanghai)

For climatic comfort: Safety, Comfort Goals:

- 8. Trees are an essential component for all streets – to provide shade to pedestrians and reduce solar gain.
- 9. High albedo (diffuse reflectivity) materials for paving reduces urban heat island effect.
- 10. Built to Pavement edge buildings with overhangs and arcades provide excellent protection to pedestrians.

To ensure universal accessibility and amenities for all street users:

- 11. Provide at-grade crosswalks (and overpasses on highways) at maximum intervals of ~70-250 M, aligning with location of transit stops, type of street / land use activities and neighbouring building entries and destinations.
- 12. Provide Dustbins, post boxes, signage and other public amenities at street corners for high usability.
- 13. Provide Accessible Public Toilets at every 500 -800 M distance – preferably located close to bus stops for easy access by pedestrians and public transport users.
- 14. Follow universal accessibility design standards to make public streets & crosswalks fully navigable by the physically handicapped.

To reduce urban Heat Island Effect and aid natural storm water management:

15. Decrease impervious surfaces through permeable paving, tree planting zones, etc. to increase ground water infiltration & prevent seasonal flooding.
16. Integrate Natural Storm Water filtration and absorption into street design through bio-filtration beds, swales and detention ponds.
17. Decrease Heat Island Effect (HIE) by increasing greenery, planting trees, using reflective paving, etc.

Street Hierarchy of Delhi with Categorization by Function

National Urban Transport Policy 2006 recommends:

- i. Equitable distribution of road space between all road users
- ii. Priority to the use of public transport
- iii. Priority to non-motorized modes

Masterplan of Delhi 2021 specifies:

- i. All roads should be made pedestrian, disabled and bicycle friendly.
- ii. Provision of adequate pedestrian facilities.
- iii. Provision for introducing cycle tracks, pedestrian and disabled friendly features in arterial and sub-arterial roads.
- iv. In urban extension, cycle tracks should be provided at the sub-arterial and local level roads and streets.
- v. On all roads with ROW greater than 30 m exclusive bus lanes will be planned to implement the Bus Rapid Transit System (BRTS) in a phased manner to cover the whole city.

Key Aspects of the Guidelines of Urban and Regional Development Plans Formulation and Implementation (URDPFI)

Sector	Key Aspects
Transportation planning	<ul style="list-style-type: none"><li data-bbox="556 325 1833 603">• The streets, roads, mass rapid transit systems, other public transportation systems provide the back bone Structure for urban and regional development. Transportation including mobility should therefore be given a prime importance.<li data-bbox="556 614 1833 893">• Transportation planning not only to be efficient, but also needs to be designed and integrated into other systems in such a way that it facilitates mobility for all genders, age groups and citizens with disabilities (differently abled citizens).

Design Elements of Street

Sketch indicating various street elements

Figure showing the category of road users

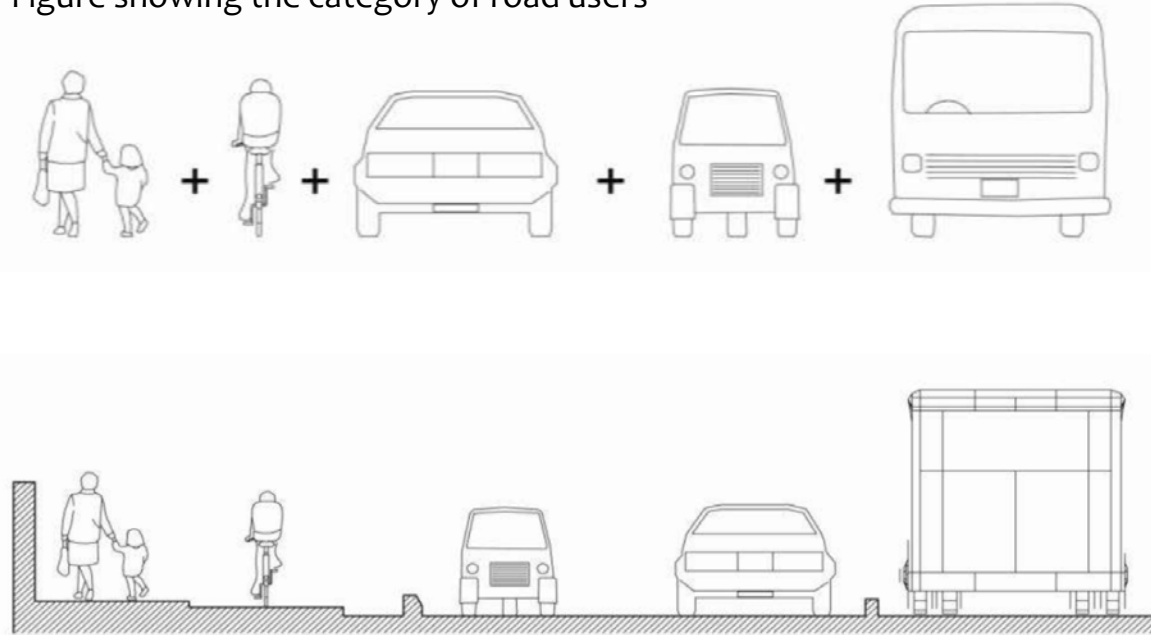
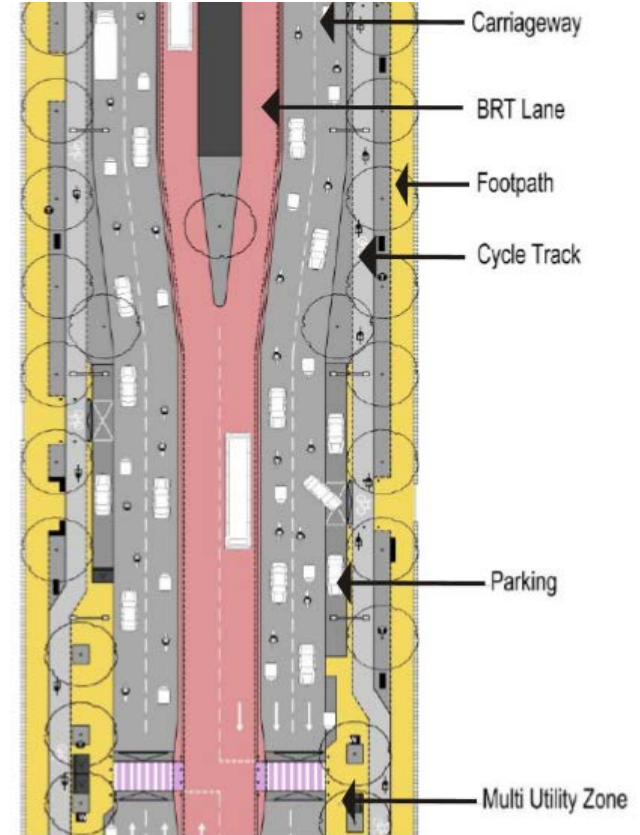


Figure showing different design components of the Road, to be designed for the different Road Users

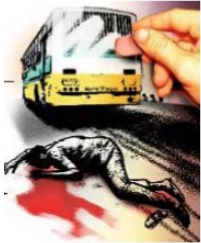


Guidelines

Goal for Integrated Streets for Delhi



**GOAL 1:
MOBILITY AND
ACCESSIBILITY –**
Maximum number of people
should be able to move fast,
safely and conveniently through
the city.



**GOAL 2:
SAFETY AND
COMFORT –**
Make streets safe clean and
walkable, create climate
sensitive design.



**GOAL 3:
ECOLOGY –**
Reduce impact on the natural
environment; and Reduce
pressure on built infrastructure.

Essential Components of Streets



Pedestrian sidewalks & crossings



Non motorized vehicles



Utilities



Physically challenged



Motorized private vehicles



Public Toilets



Trees



Rainwater harvesting



Shaded Bus stops

Guidelines

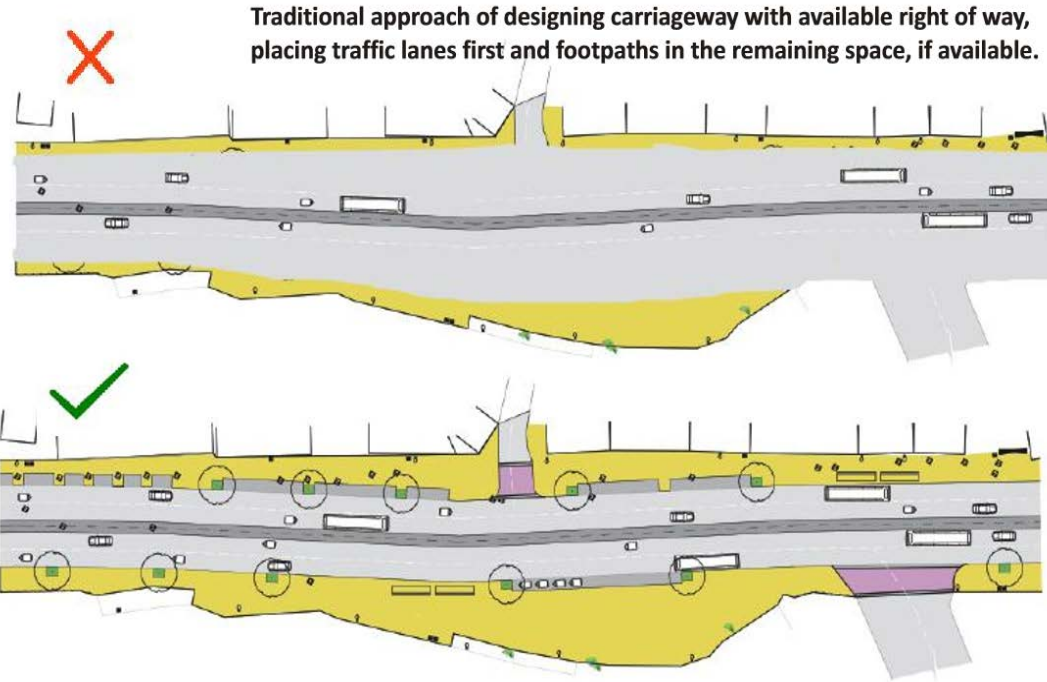
Master Plan 2021 – Road Hierarchy

	Primary Arterial	Other Primary Arterial	Primary Collector	Secondary Collector	Local Streets
RIGHT OF WAY	60-80 M	45-60 M	30-40 M	18-24 M	12-20 M
SPEED RANGE	50 – 70 km/hr	30 - 40 km/hr.	20 - 30 km/hr	10- 20 km/hr	10-20 km/hr
SPEED CONTROL	Enforcement and Traffic Calming required	Enforcement and Traffic Calming required	Enforcement and Traffic calming required.	Traffic calming essential.	Traffic calming required
BUSWAYS FOR BRT	Segregated busways required where BRT proposed	Segregated busways required where BRT proposed	Segregated busways required where BRT proposed, at-grade segregation possible on R/Ws above 36 M	No segregated bus lane; but Road may be designated Bus-NMV only if required	No segregated bus lanes or bus operations required; but Road may be designated Bus-NMV only if required
MOTORIZED LANES	2 to 4 motorized lanes per direction, min. 3.3 m wide (min. 3.5 for BRT busways)	2 to 4 motorized lanes per direction, min. 3.3 m wide (min. 3.3 for BRT busways)	2 to 3 motorized lanes per direction, min. 3.1m wide (min. 3.3 for BRT busways)	No minimum lane width specification.	No minimum lane width specification.
CYCLE/ NMV TRACKS	Segregated cycle tracks required; min. 2.5 m wide for two-way movement.	Segregated cycle tracks required; min. 2.5 m wide for two-way movement.	Traffic Calming essential where segregated Cycle tracks are not provided; Cycle tracks to be min. 2.5 m wide if block lengths are >250m.	Cycle lanes can work, segregated tracks required where friction & encroachment expected	No special feature for cyclists
SERVICE LANES	Service lanes required.	Service lanes required for low-density residential frontages; for commercial / MU frontages, service lanes not required.	No service lane required	No service lane required	No service lane required
MEDIANS	Continuous median; all openings and intersections accompanied by signals and traffic calming. (no grade separators within city)	Continuous median; all openings and intersections accompanied by signals and traffic calming. (no grade separators within city)	Intermittent or No median; openings/ intersections accompanied by signals and traffic calming.	Intermittent or No median required; For roads where need for Median is felt, issue to be brought to UTTIPEC. Crossings to be traffic calmed.	No medians; traffic calmed crossings, or mini roundabouts

NOTE: Lane Widths have been designated based on desired speed of the road category.

Guidelines

Carriageway

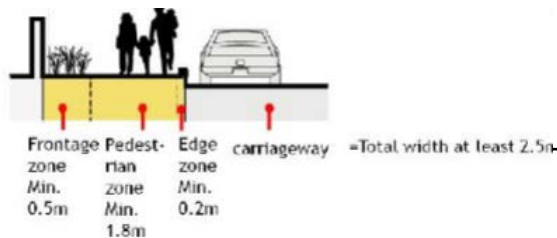


New approach to design carriageway maintaining constant width(after providing the required space to NMT) to avoid bottlenecks and dedicating any extra space available to NMT.

Guidelines

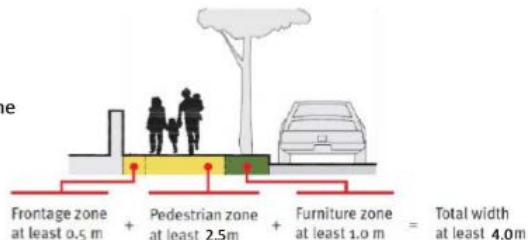
Pedestrian Zone

Residential zone

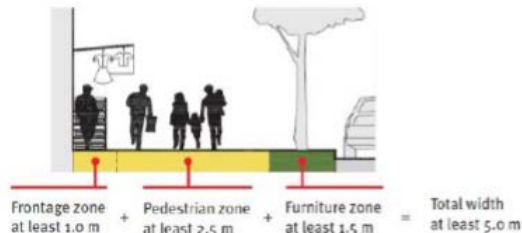


Treatment at Entry / Exit

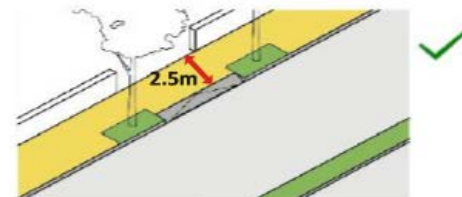
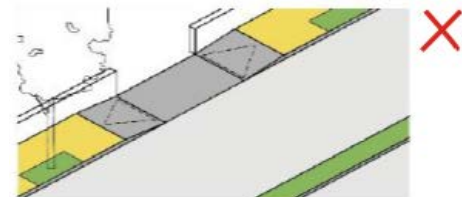
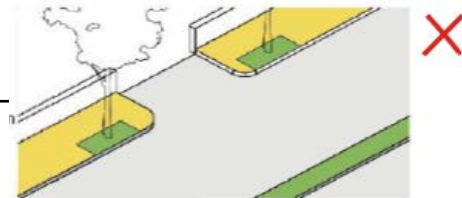
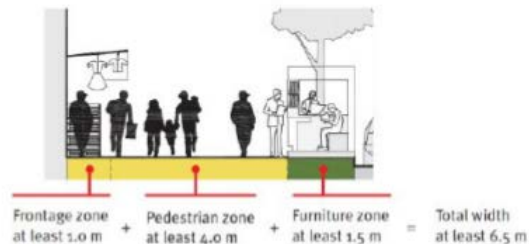
Mixed use zone



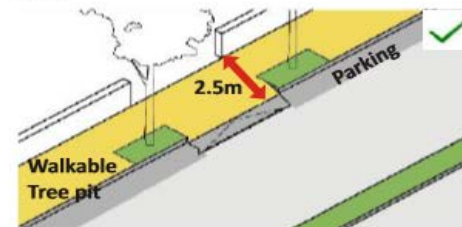
Commercial zone



High-intensity commercial zone



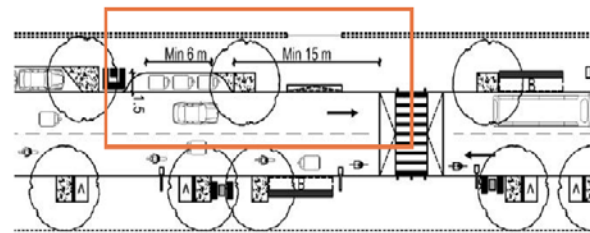
Ramp within footpath at edge only if clear walkway width available at ramp is minimum 2.5m



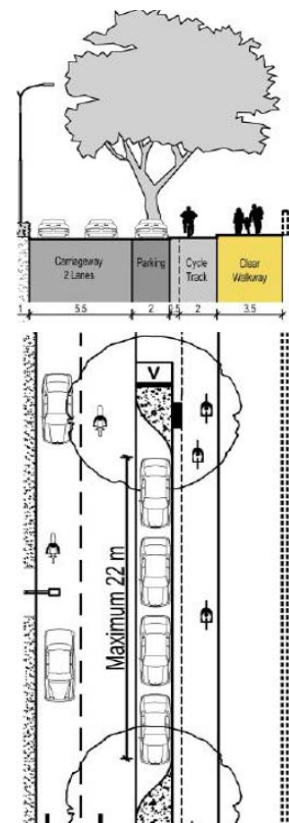
Ramp in parking zone / road side if clear footpath width is 2.5m or less

Guidelines

Bicycle Track

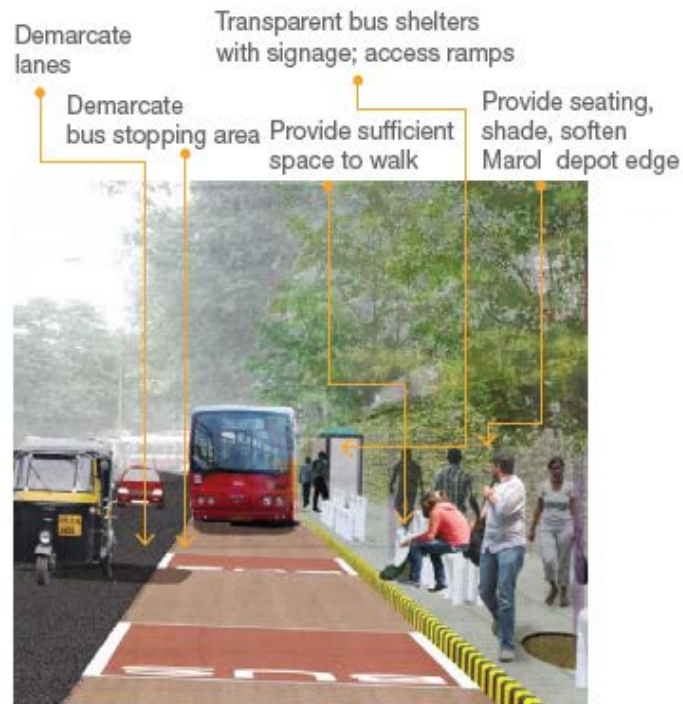


Parking



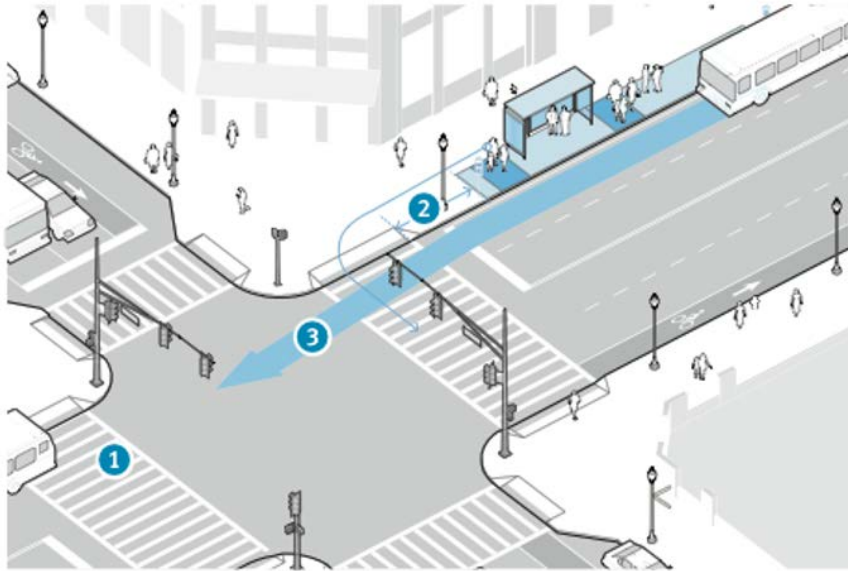
Guidelines

Existing and Redesigned Bus Shelters



Guidelines

Complete Street Design – Near Intersection



Advantages:

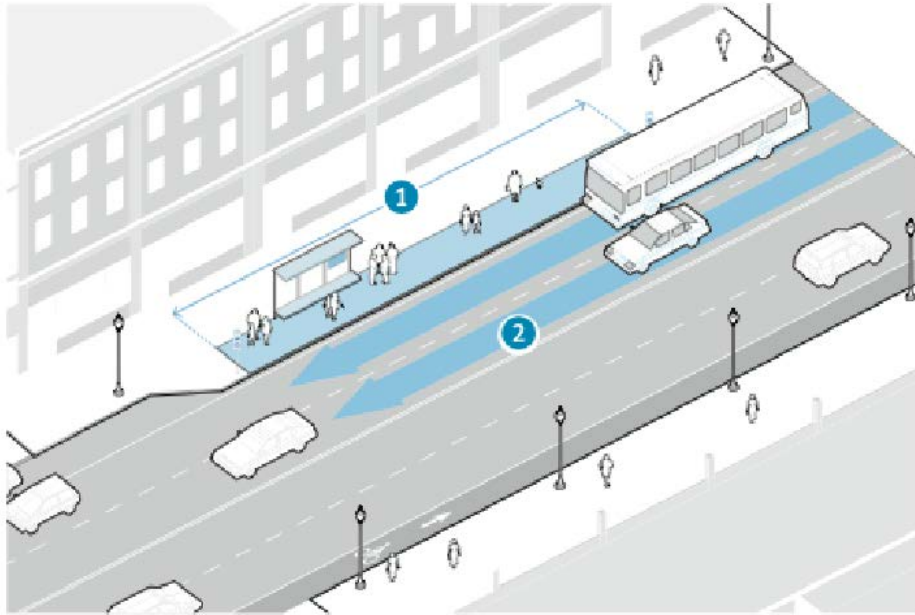
- Minimizes inference when traffic is heavy in the far-side of the intersection (1)
- Allows passengers to board bus closest to crosswalk (2)
- Width of intersection is available for the bus to pull away from curb and re-enter traffic (3)
- Eliminates the potential for double stopping / parking

Disadvantages:

- Increases sight distance problems for crossing pedestrians

Guidelines

Complete Street Design – Mid Block



Advantages:

- Passenger waiting areas experience less pedestrian congestion (1)
- Minimizes sight distances problems for vehicles and pedestrians
- May result in less interference with traffic flow (2)

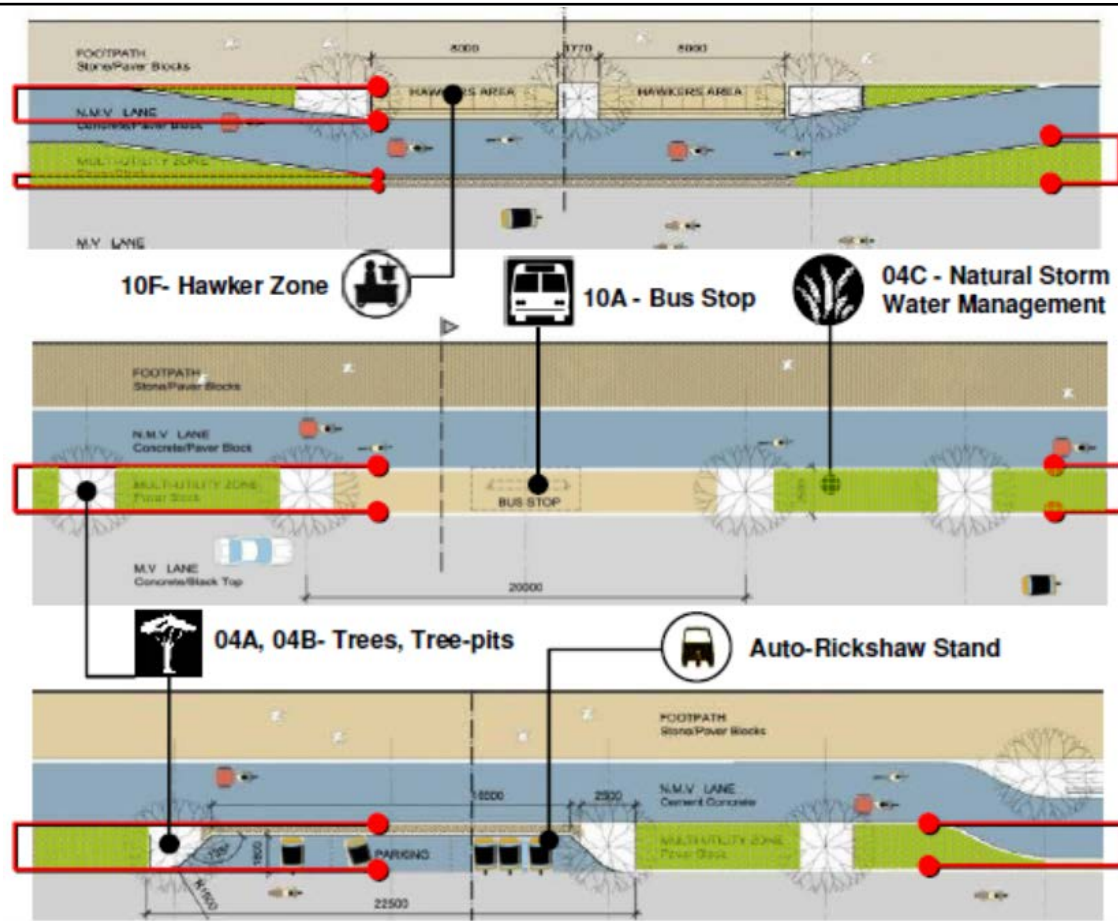
Disadvantages:

- Requires additional curb space for no-parking restriction.
- Encourages passengers to cross street at mid block (jaywalking)

Guidelines

Multi-Functional Zone (MFZ)

- Multi-Functional Zones on a Street should be a **minimum of 1.8 m wide** and may locate multiple functions.
- Provisions of MFZ is most critical otherwise the uses / components of streets 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 inference due to trees.

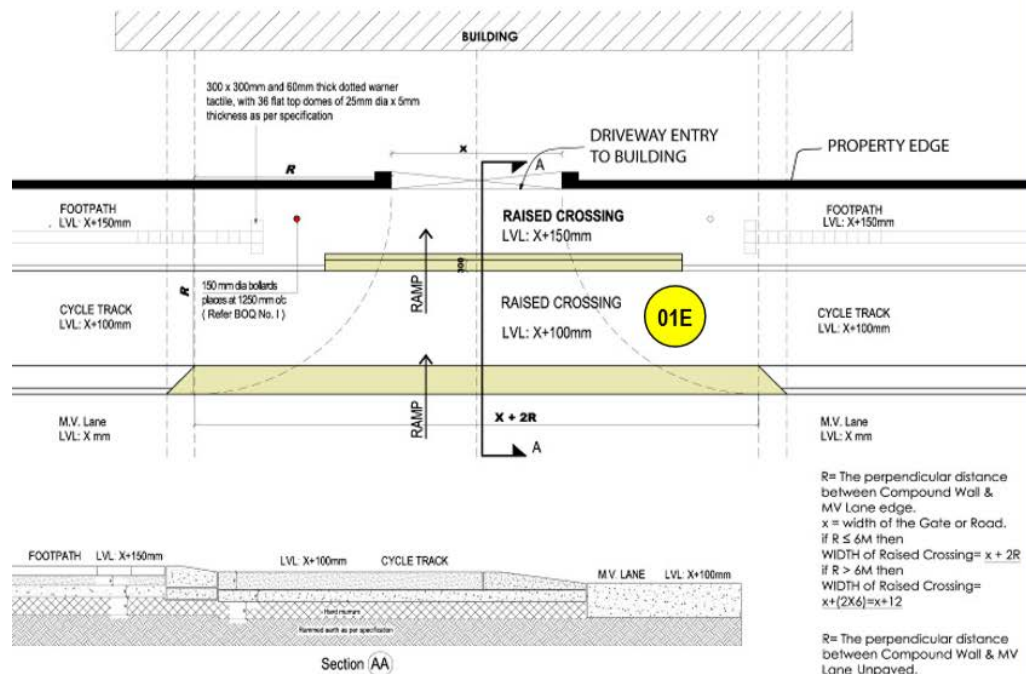


Guidelines

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



R= The perpendicular distance between Compound Wall & M.V Lane edge.
 x = width of the Gate or Road.
 If $R \leq 6M$ then
 WIDTH of Raised Crossing= $x + 2R$
 If $R > 6M$ then
 WIDTH of Raised Crossing= $x + (2 \times 6) = x + 12$

R= The perpendicular distance between Compound Wall & M.V Lane Unpaved.
 x = 4.50M
 R = 5.20M
 WIDTH of Raised Crossing= $x + 2R$
 $= 4.50 + 2 \times 5.20 = 14.90M$

Guidelines

Two Wheeler - Lane Segregation



Segregated Lanes in Taiwan and Malaysia (Source: Hsu et.al., 2003)



Study Trap length with grids superimposed on it : Case Study – Kochi, Kerala

Source: SPA Delhi, 2017

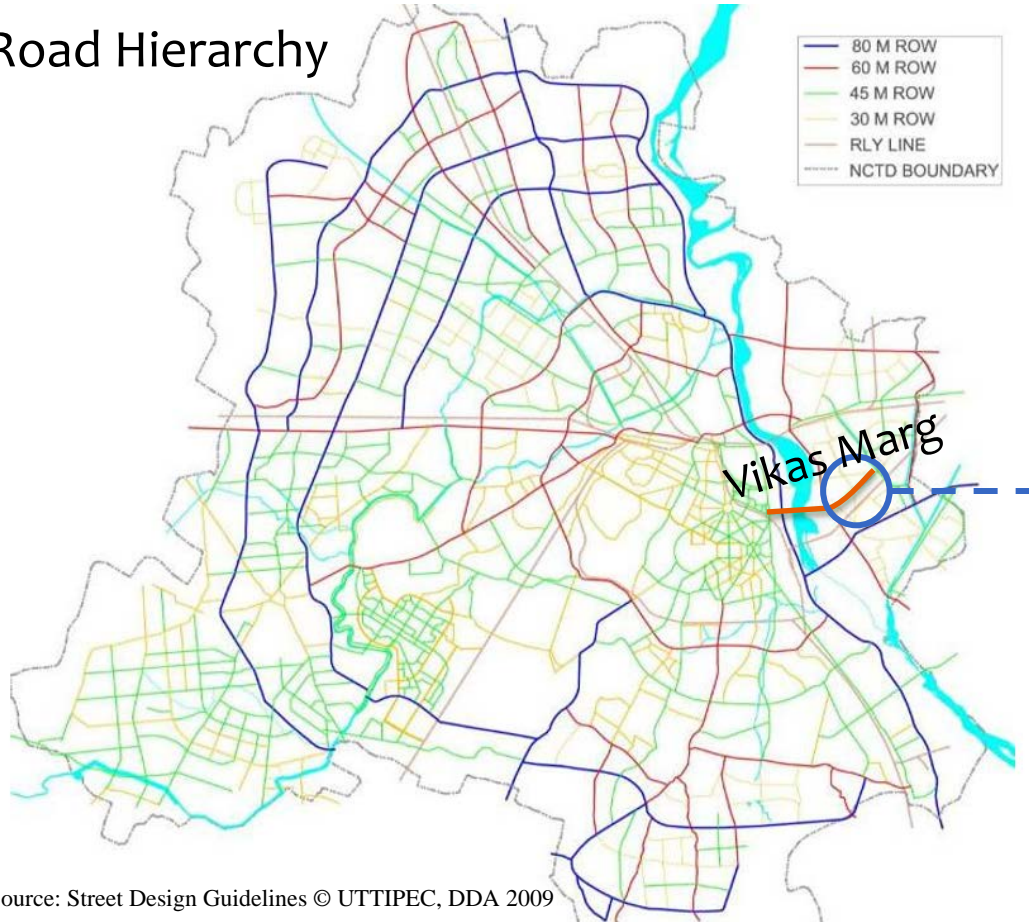
Recommendation from the Study

Composition of TWs, (%)	Flow (TW/hr)	Applicability of TW segregation	Lane width, (m)
> 50	> 1200	Not recommended	-
< 50	> 1200	Yes	2.5
< 50	< 1200	Yes	2

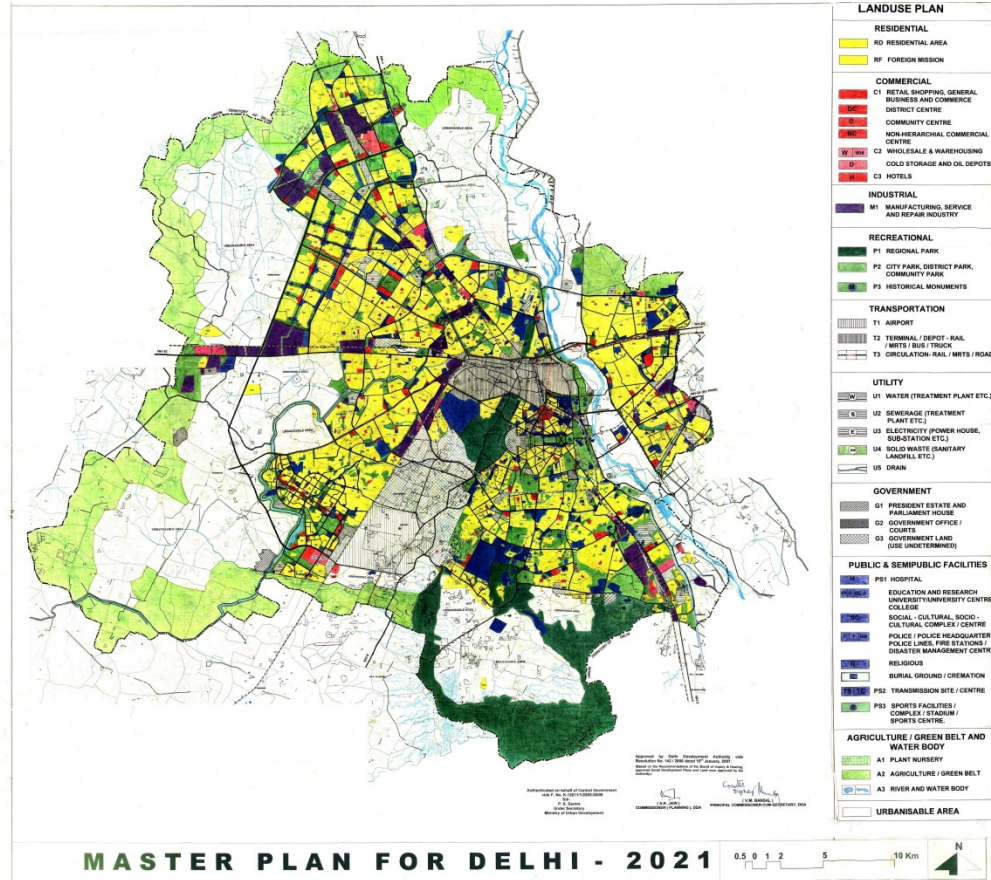
Vehicle Pair	Min observed Lateral Distance(m)	Avg. observed Lateral Distance(m)
TW - TW	0.5	1.2
TW - Car	0.5	1.46
TW- 3W	0.5	1.48
TW- (LCV, Tempos)	1	1.6
TW- (Buses, Trucks)	1	1.81

Case Study Location

Road Hierarchy



Land use of Vikas Marg



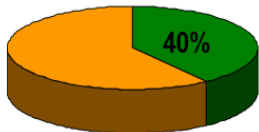
Case Study Location

Modal Share of Delhi

MODE	% of PERSON TRIPS		
	WITH WALK TRIPS (2007-08)		
•CAR/TAXI	9.09	23	Motorized Private Transport
•2W	14.07		
•AUTO RICKSHAW	2.36		
•BUS	27.12	33	Public/ Para-Transport
•METRO	2.66		
•TRAIN (IR)	0.42		
•BICYCLE	4.46	44	Non-motorized Public/ Private Transport
•CYCLE RICKSHAW	5.16		
•WALK	34.67		
TOTAL	100		
TOTAL TRIPS/DAY	219.87 LAKH	100	

Source: Anon 2008, Transport Demand Forecast Study: study and development of an Integrated cum Multi Modal Public Transport Network for NCT of Delhi, RITES, MVA Asia Ltd, TERI, May 2008

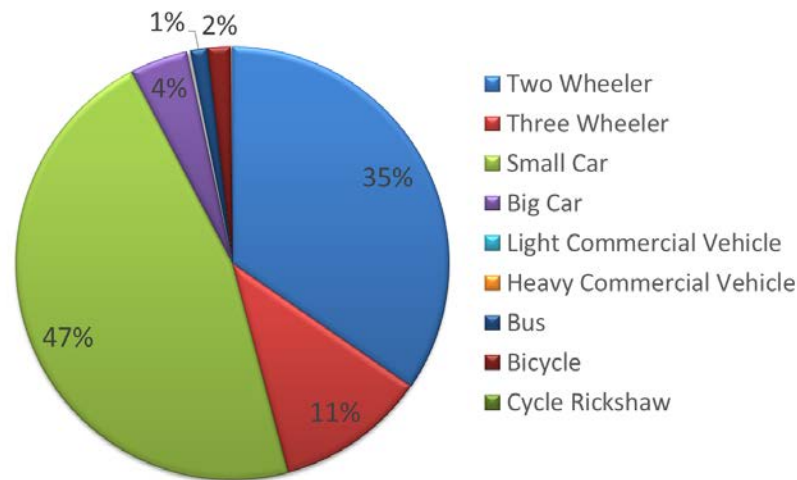
- 34% of the population engages in "Walk-only" trips for their daily travels, needs or errands.
- Only 14% population of Delhi rides private cars.



- 40% of the total Road Length of Delhi has NO Sidewalks! *

And the ones having sidewalks, lack in quality in terms of surface, width and geometrics.*

Vehicular Composition of Vikas Marg



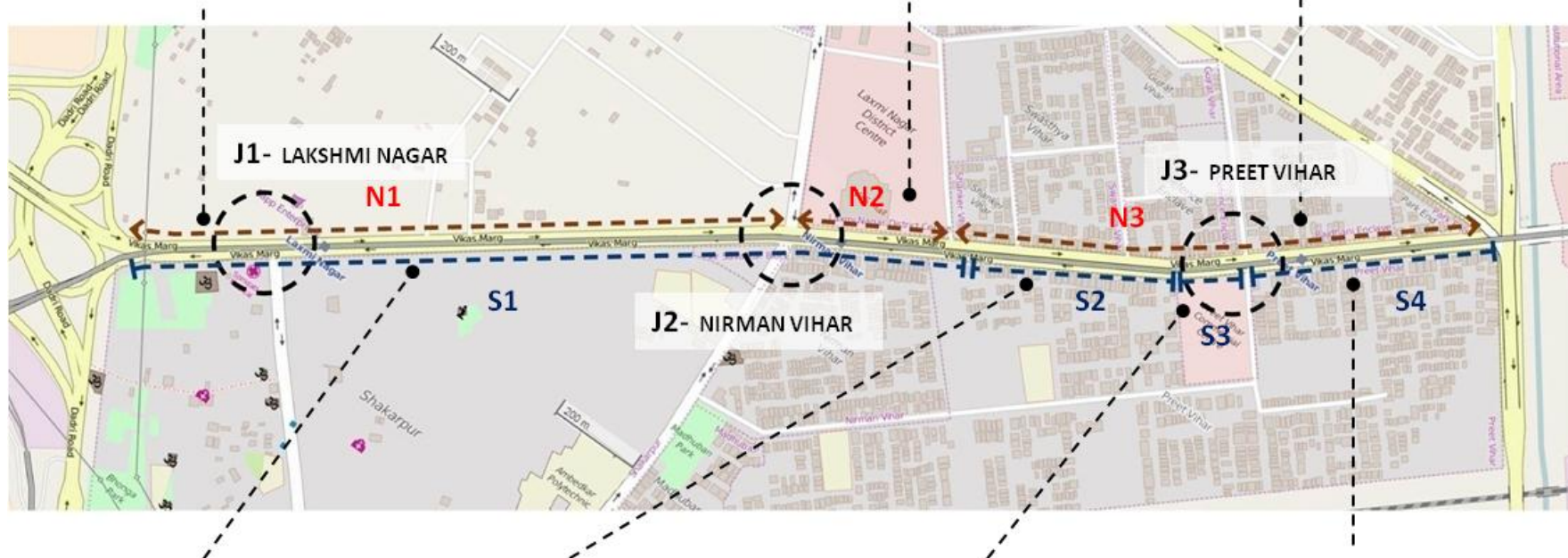
Source: SPA, Delhi, 2016.

Vikas Marg: Overview

N1 – LAKSHMI NAGAR TO PATPARGANJ ROAD
LANDUSE – RESIDENTIAL WITH EDGE COMMERCIAL

N2– PATPARGANJ ROAD TO JAGDISH CHANDRA ARORA MARG
LANDUSE – COMMERCIAL

N3– JAGDISH CHANDRA ARORA MARG TO KARKARI MOR
LANDUSE – RESIDENTIAL



S1 – LAKSHMI NAGAR TO DELHI JAL BOARD OFFICE
LANDUSE- RESIDENTIAL WITH EDGE COMMERCIAL

S2 – JAL BOARD OFFICE TO PREET VIHAR COMMERCIAL CENTRE
LANDUSE- UTILITY AND RESIDENTIAL

S3 – PREET VIHAR COMMERCIAL CENTRE TO ACHARYA NAG RAJ MARG
LANDUSE- COMMERCIAL

S4 –ACHARYA NAG RAJ MARG TO KARKARI MOR
LANDUSE- RESIDENTIAL

Traffic Characteristics

TRAFFIC COUNTS AT LAXMI NAGAR FROM 9AM TO 10AM- TOWARDS ITO

VEHICLE TYPE	COUNTS	PASSENGER CAR EQUIVALENT FACTOR	PCU VALUE
BUS	53	3	159
TRUCK	7	3	21
MINI BUS	21	3	63
CYCLE RICKSHAW	141	1.5	211.5
CYCLES	56	0.5	28
THREE WHEELERS	526	1	526
CARS	1151	1	1151
TWO WHEELERS	1571	0.5	785.5
LCVs	41	1	41
TOTAL	3567		2986

Traffic Characteristics

TRAFFIC COUNTS AT LAXMI NAGAR FROM 9AM TO 10AM- TOWARDS PREET VIHAR

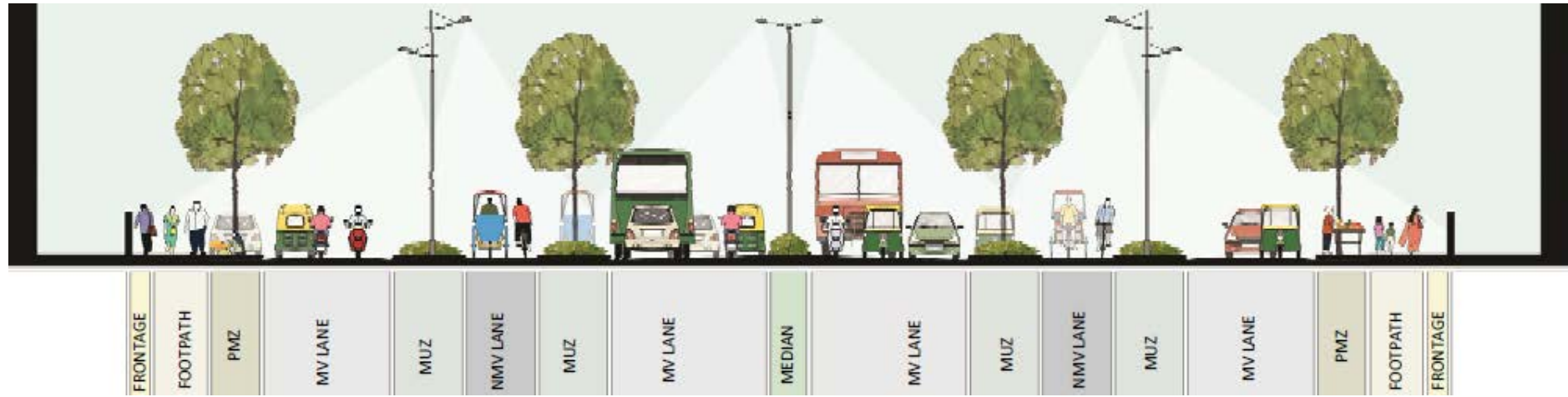
VEHICLE TYPE	COUNTS	PASSENGER CAR EQUIVALENT FACTOR	PCU VALUE
BUS	60	3	180
TRUCK	2	3	6
MINI BUS	16	3	48
CYCLE RICKSHAW	238	1.5	357
CYCLES	56	0.5	28
THREE WHEELERS	503	1	503
CARS	1195	1	1195
TWO WHEELERS	1606	0.5	803
LCVs	47	1	47
TOTAL	3723		2045

Case Study Location

- Vikas Marg is one of the busiest road stretch located in the National Capital.
- Vikas Marg is located in Zone E – Trans Yamuna Zone comprising of 8797 Ha.
- Average vehicular speed during peak hours at Vikas Marg is 8 to 10 km/hr.
- Road section between **Laxmi Nagar Chungi to Karkari Mor (approximately 3 kms)** located at Vikas Marg is considered as the study location.
- This road stretch is occupied with commercial hub on both the sides.
- This street lacks the design guidelines for Public Transport (PT) and the provision for Equitable Street.

Streetscaping: Objectives

- Equitable Allocation & Efficient Use of Space
- Improved Road Geometry
- Safety
- Decongestion of Intersections
- Improved Urban Aesthetics



Streetscaping: Objectives (Contd....)

- Encourage the use of Non-motorised Vehicles, Public Transport & Walking
- Accessible to persons with Disabilities
- User-friendly



SAFE INTERSECTIONS

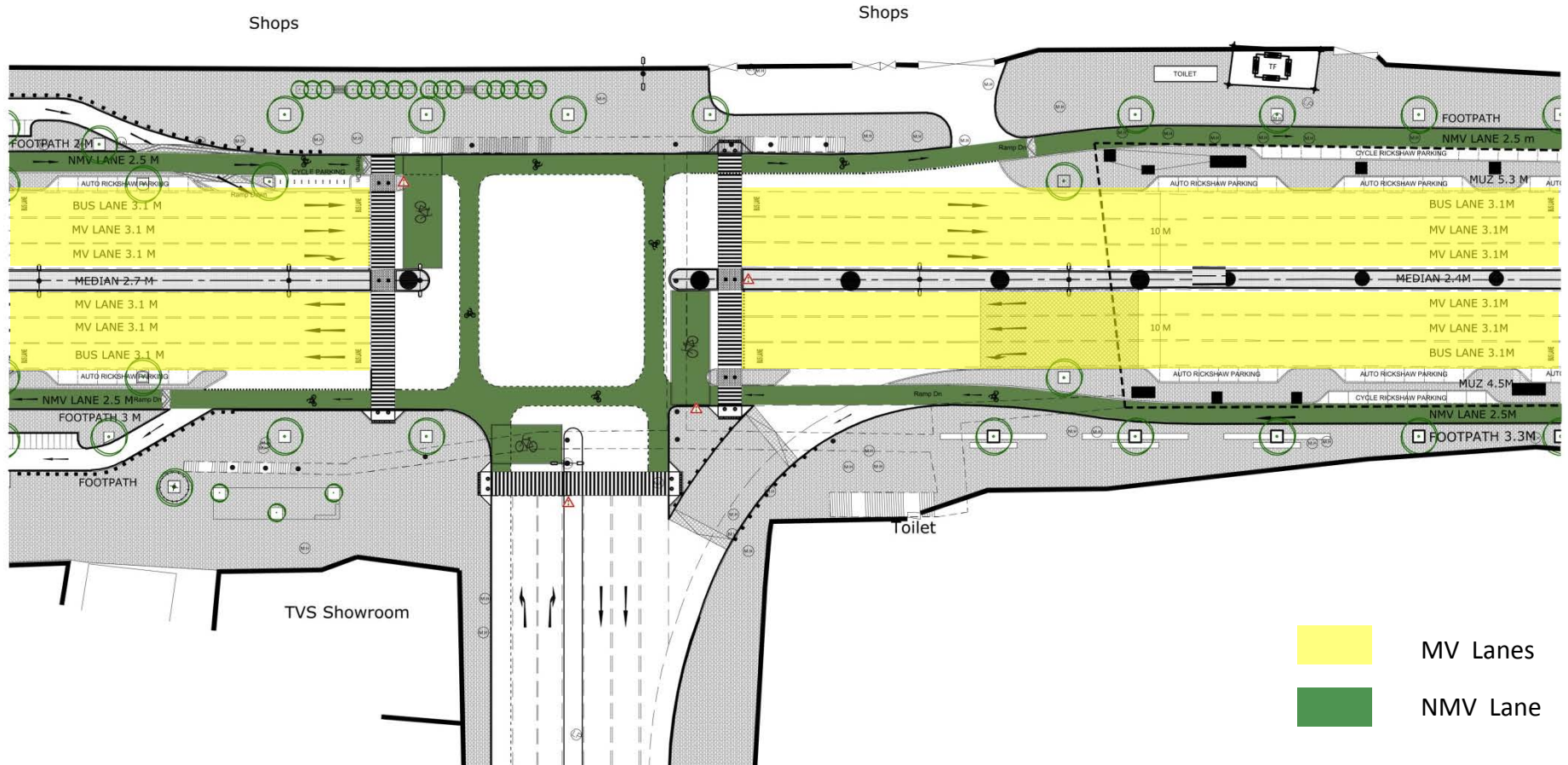
Making Intersections Safe for All Users

Intersections in Delhi: Key Issues

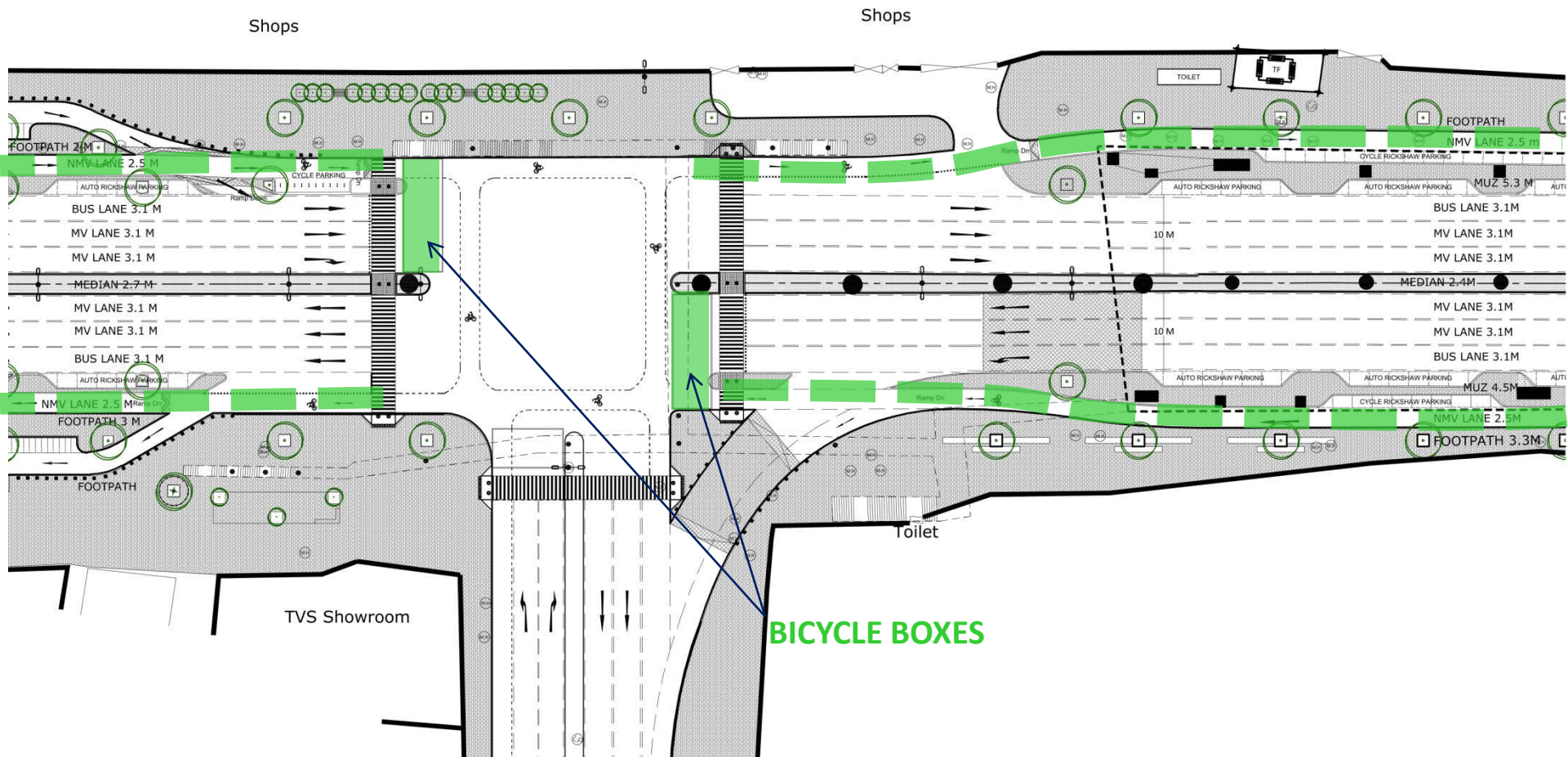
- Lack of Safe Pedestrian Crossings, Footpaths & Refuges
- Missing Road Markings, Signage and Signals
- Poor Road Geometry
- Lack of facilities for Non-motorised Vehicles & Pedestrians
- Termination of Service Lanes at Junctions
- Parking close to intersections hinder movement
- Poor condition of street, kerbs and street furniture
- Barrier-Free Movement not possible



Separation of MV & NMV Traffic



Alignment of Lanes at Junctions



Wide Footpaths & Pedestrian Crossings

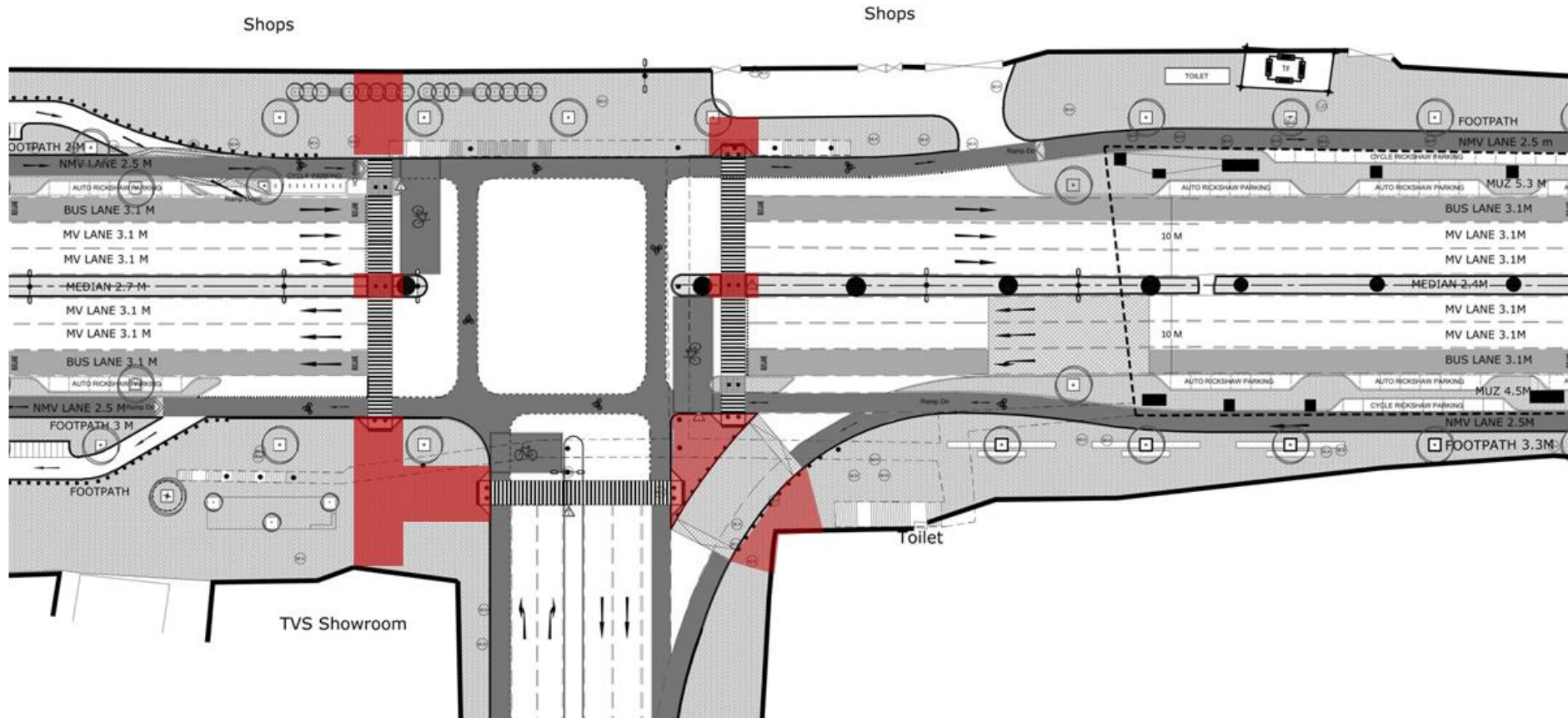
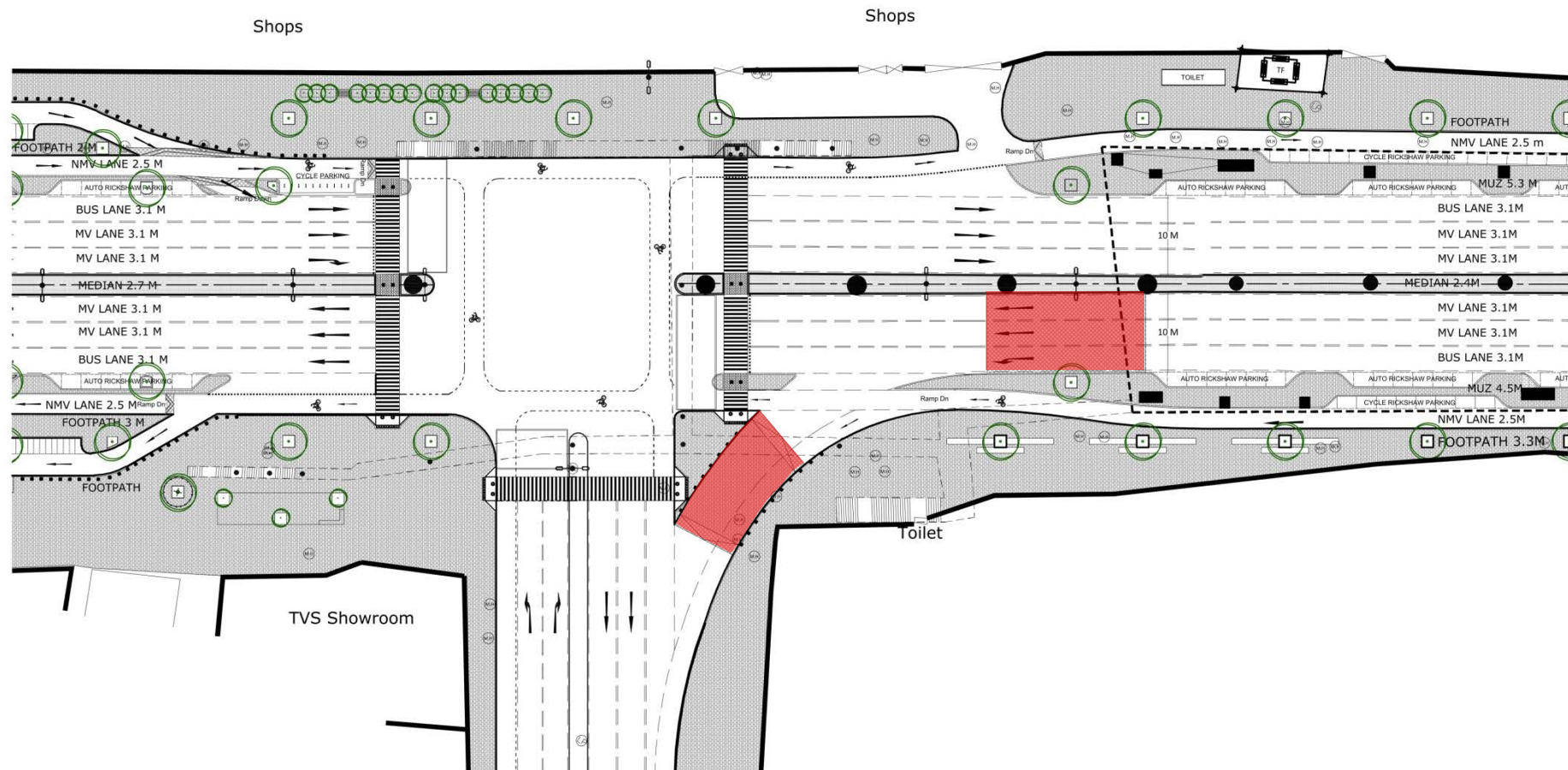


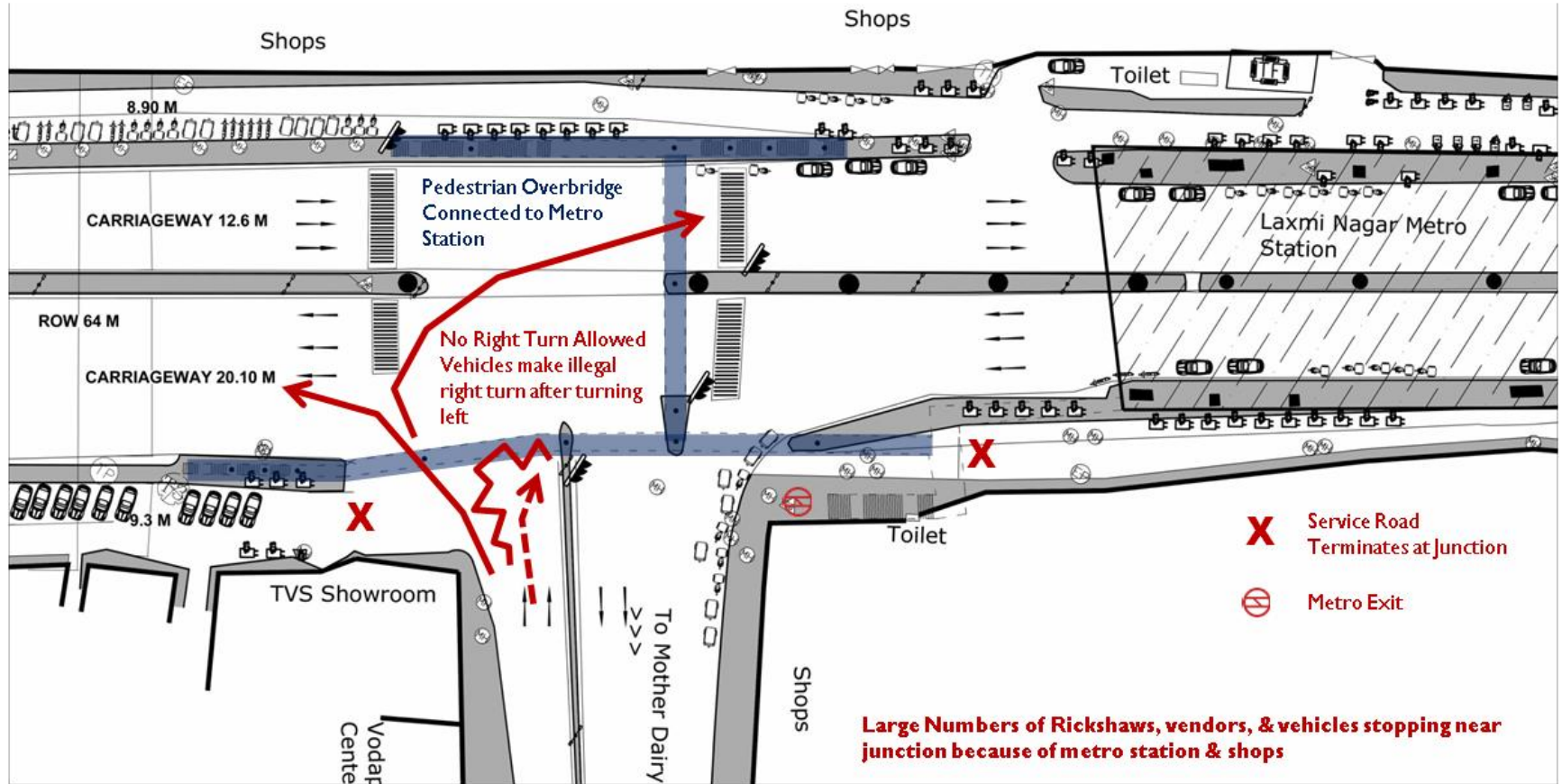
Table Top with Change of Material for Traffic Calming at Free-Left Turns



Raised Pedestrian Crossings/ Traffic Calming



Street Layout: Laxmi Nagar Metro Station (Existing)

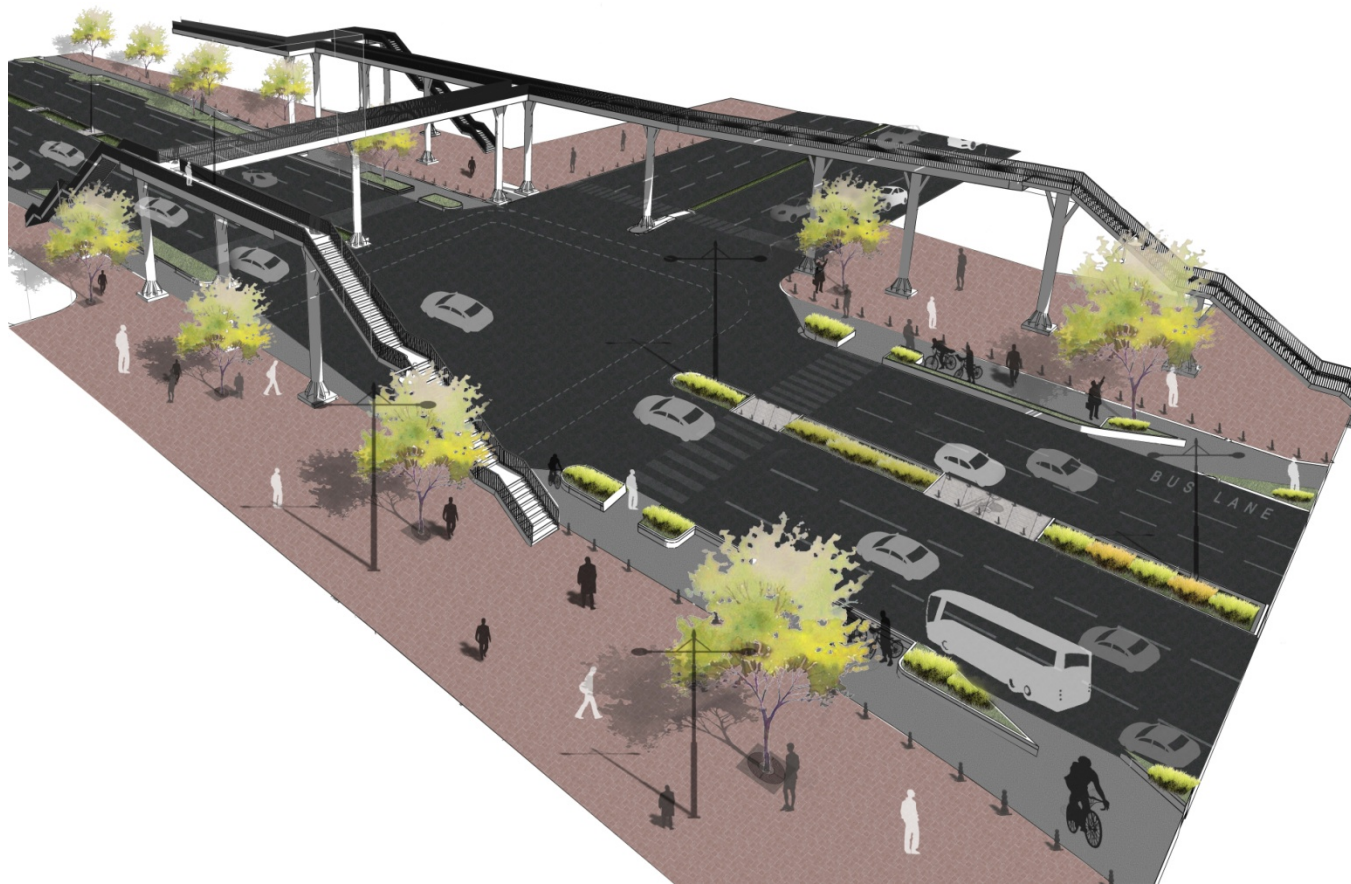


Laxmi Nagar Metro Station (Existing)

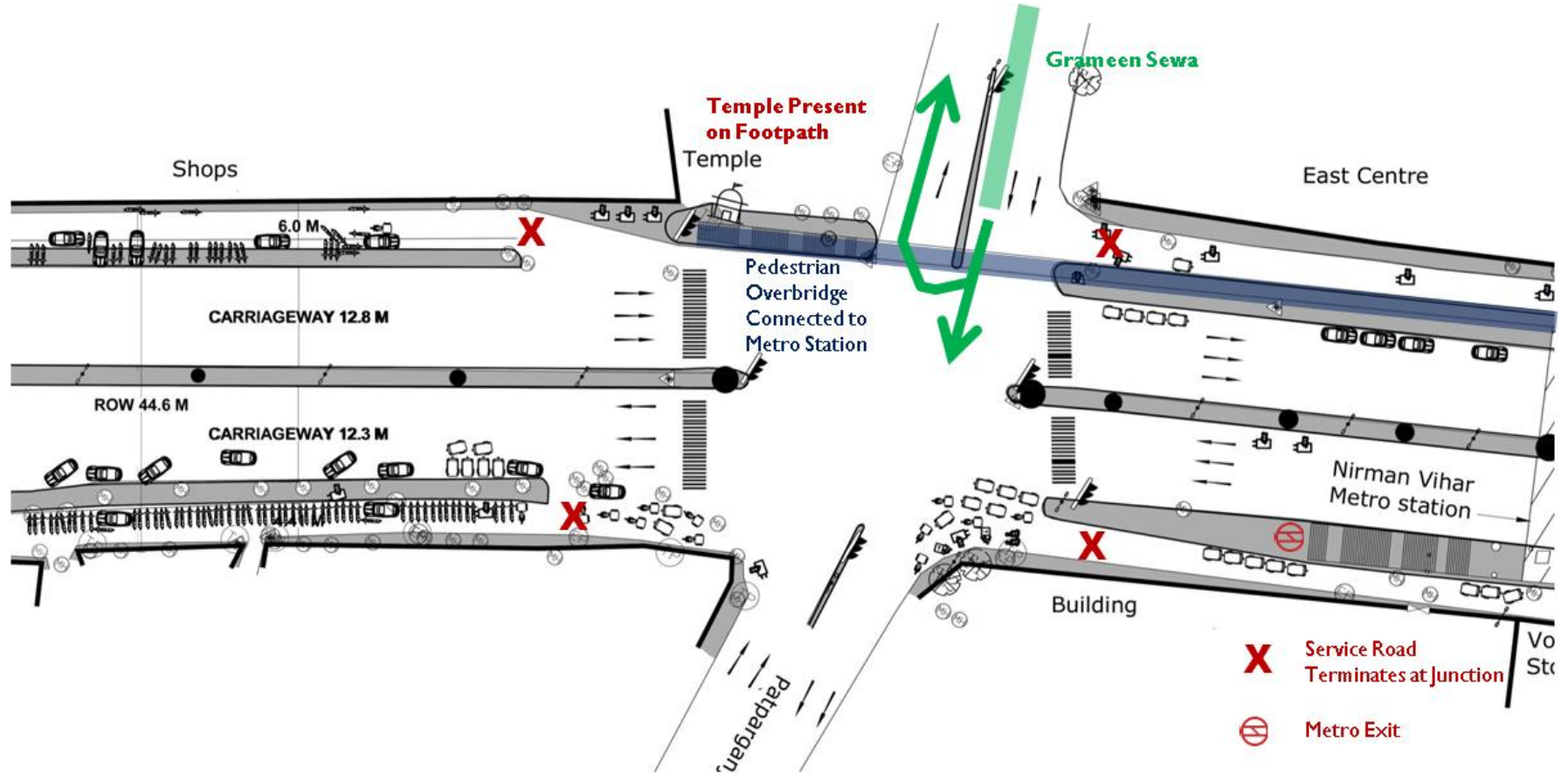


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Laxmi Nagar Metro Station Junction –Proposed



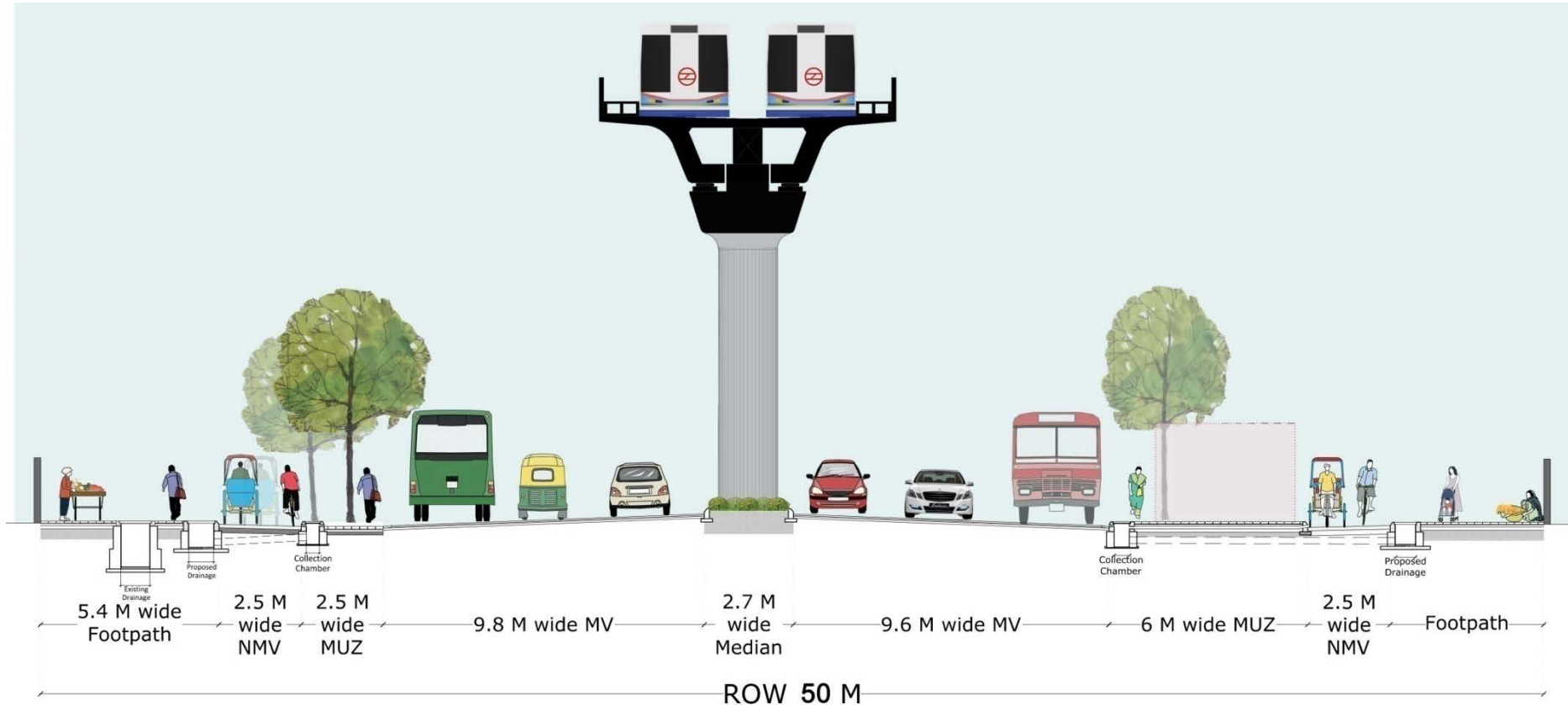
Street Layout : Nirman Vihar Metro Station (Existing)



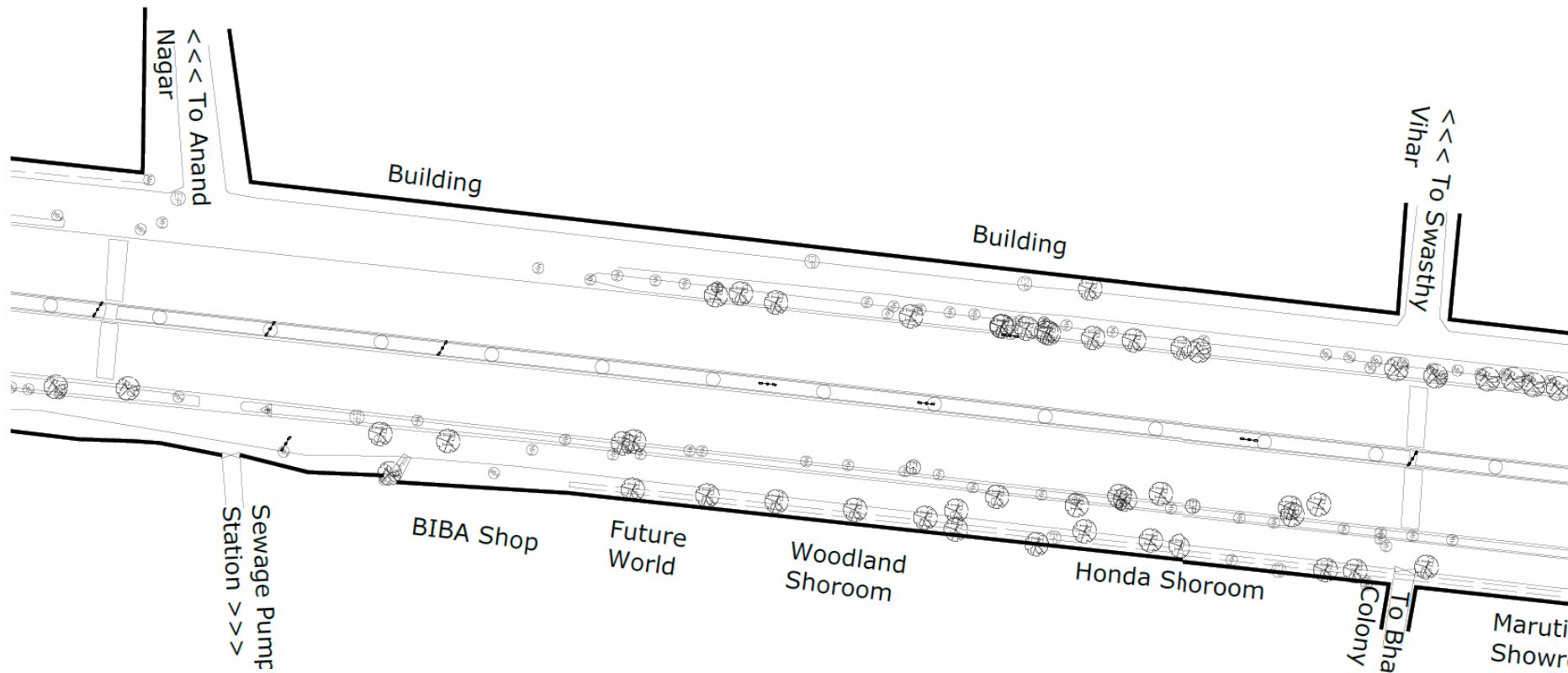
Nirman Vihar Metro Station(Existing)



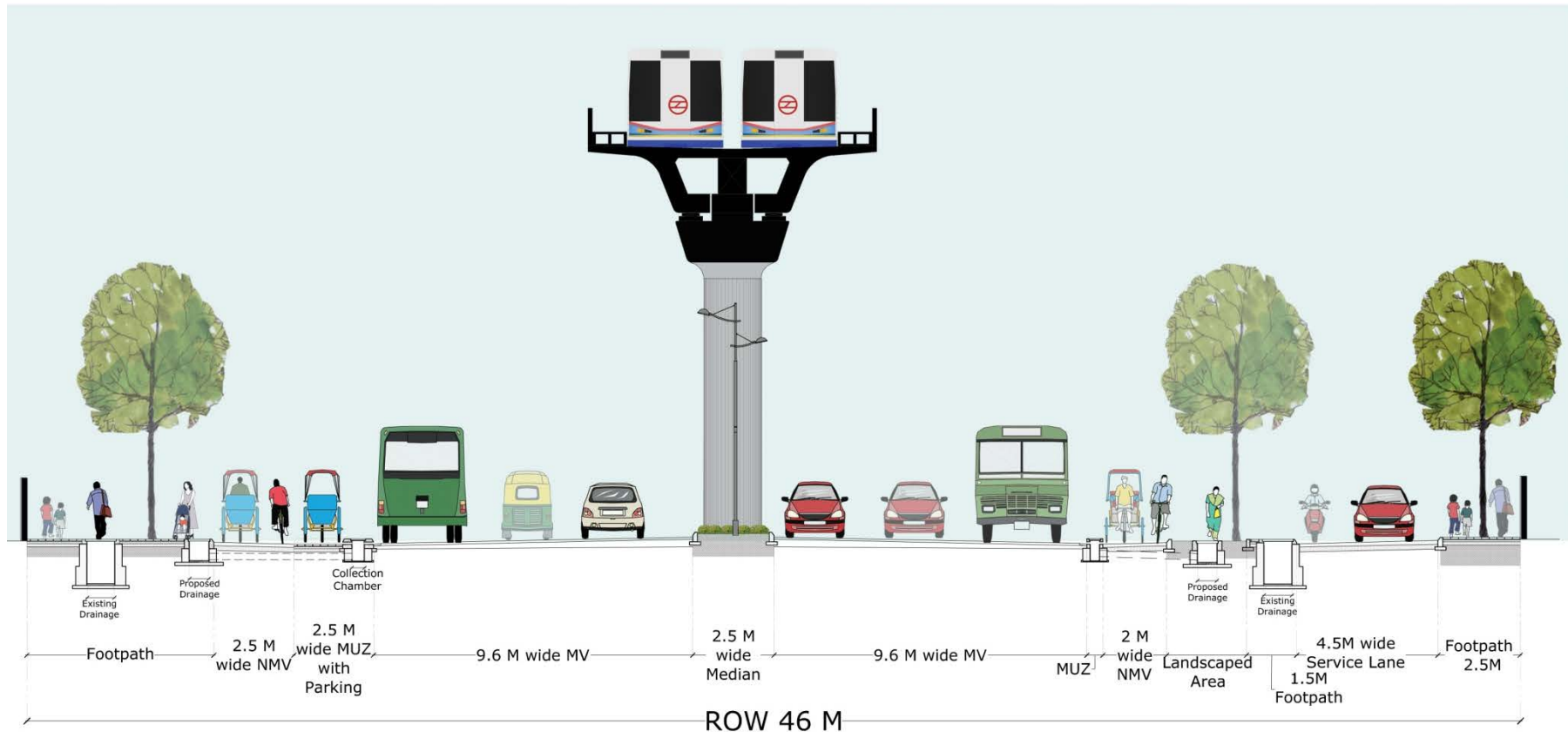
Street Section: Nirman Vihar Metro Station(Proposed)



Street Layout: Between Nirman Vihar & Preet Vihar Metro Station (Existing)

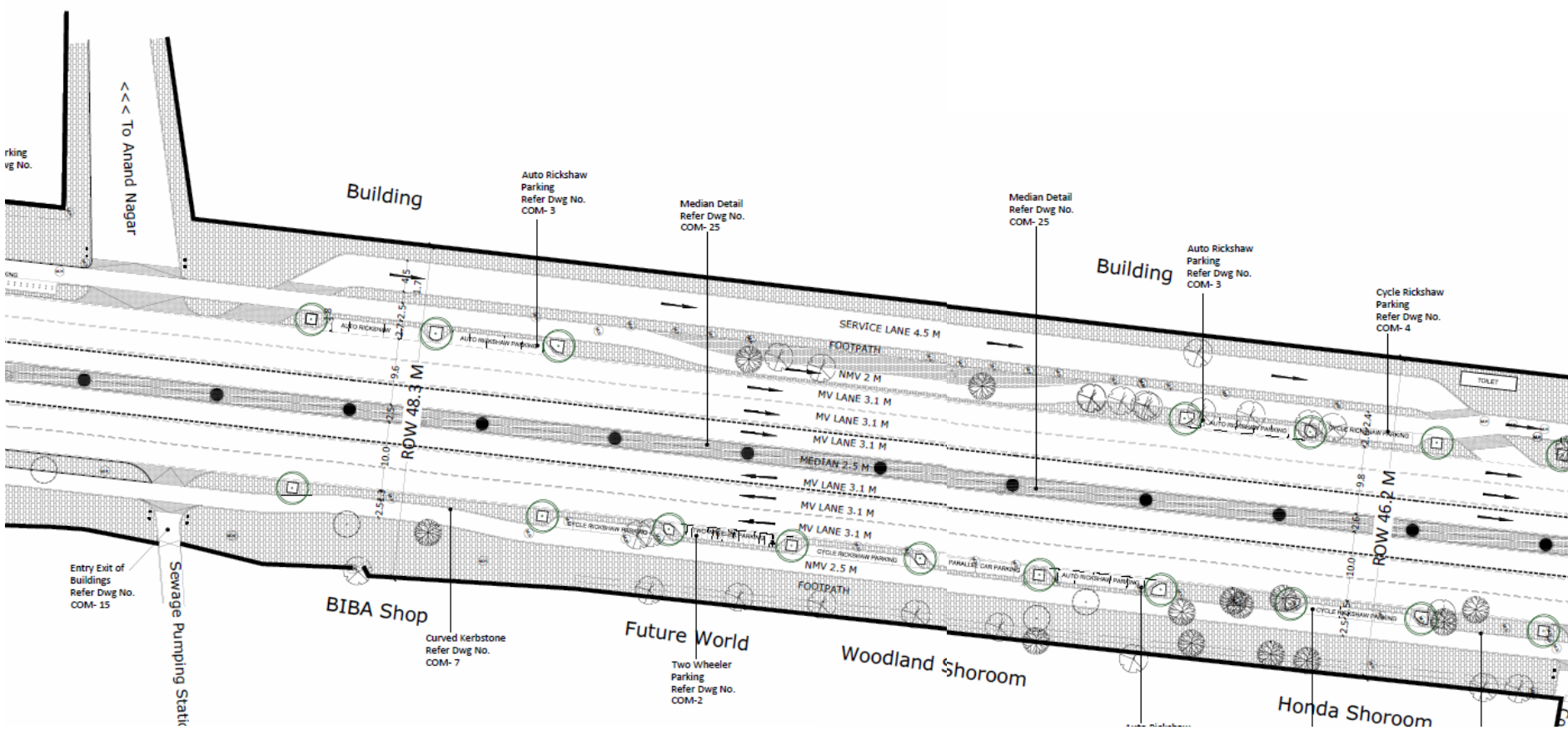


Street Section: Between Nirman Vihar & Preet Vihar Metro Station (Proposed)

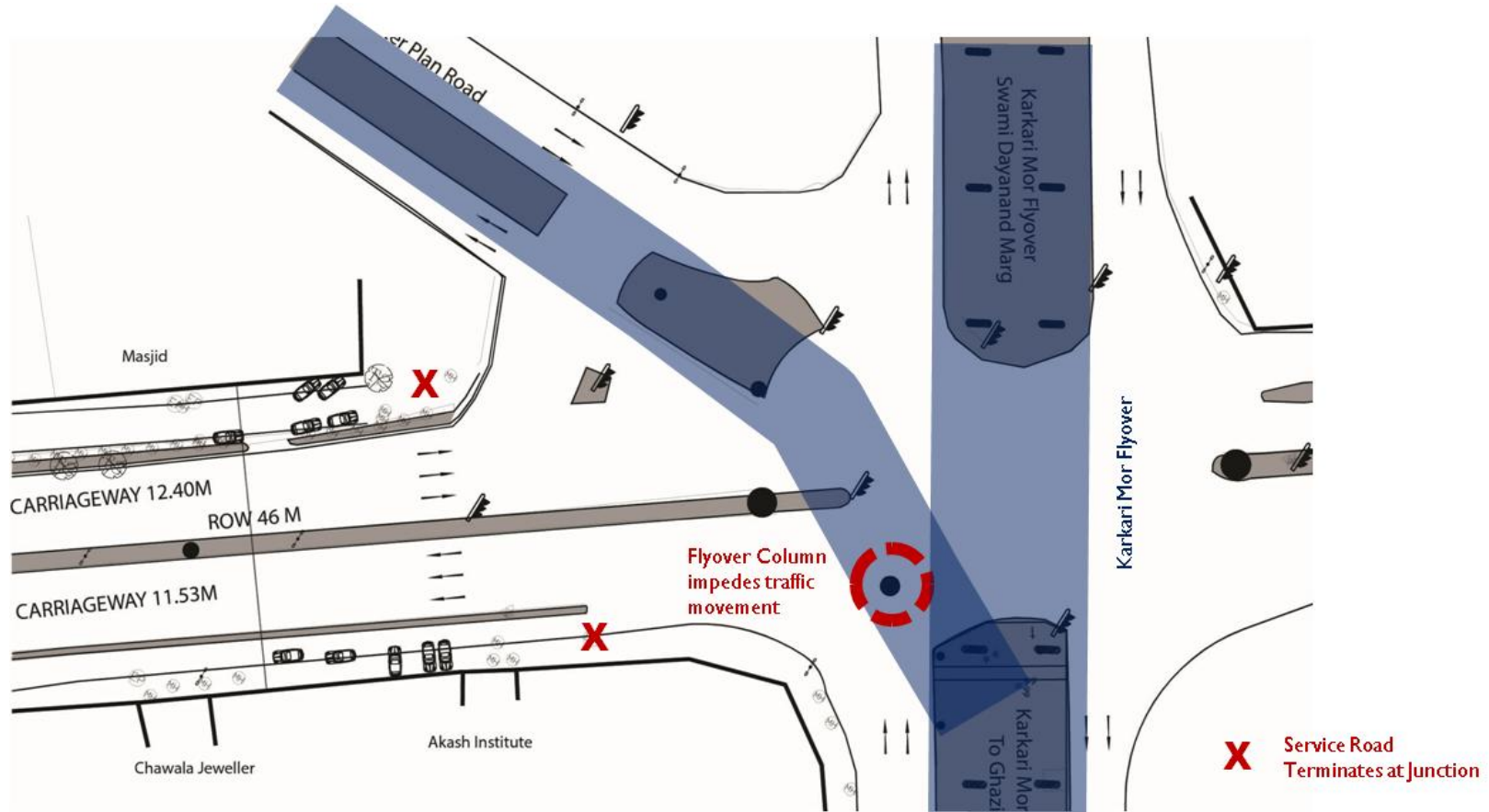


Technical site plan showing road layout, lane widths, and building locations. Key features include:

- Building** (Top Left)
- Auto Rickshaw Parking** (Refer Dwg No. COM-3)
- Median Detail** (Refer Dwg No. COM-25)
- Service Lane 4.5 M**
- Footpath**
- NMV 2 M**
- MV Lane 3.1 M**
- Median 2.5 M**
- Building** (Top Right)
- Auto Rickshaw Parking** (Refer Dwg No. COM-3)
- Cycle Rickshaw Parking** (Refer Dwg No. COM-4)
- TOILET**
- ROW 48.3 M**
- ROW 46.2 M**
- BIBA Shop**
- Future World**
- Woodland Shoroom**
- Honda Shoroom**
- Sewage Pumping Station**
- Entry Exit of Buildings** (Refer Dwg No. COM-15)
- Curved Kerbstone** (Refer Dwg No. COM-7)
- Two Wheeler Parking** (Refer Dwg No. COM-2)



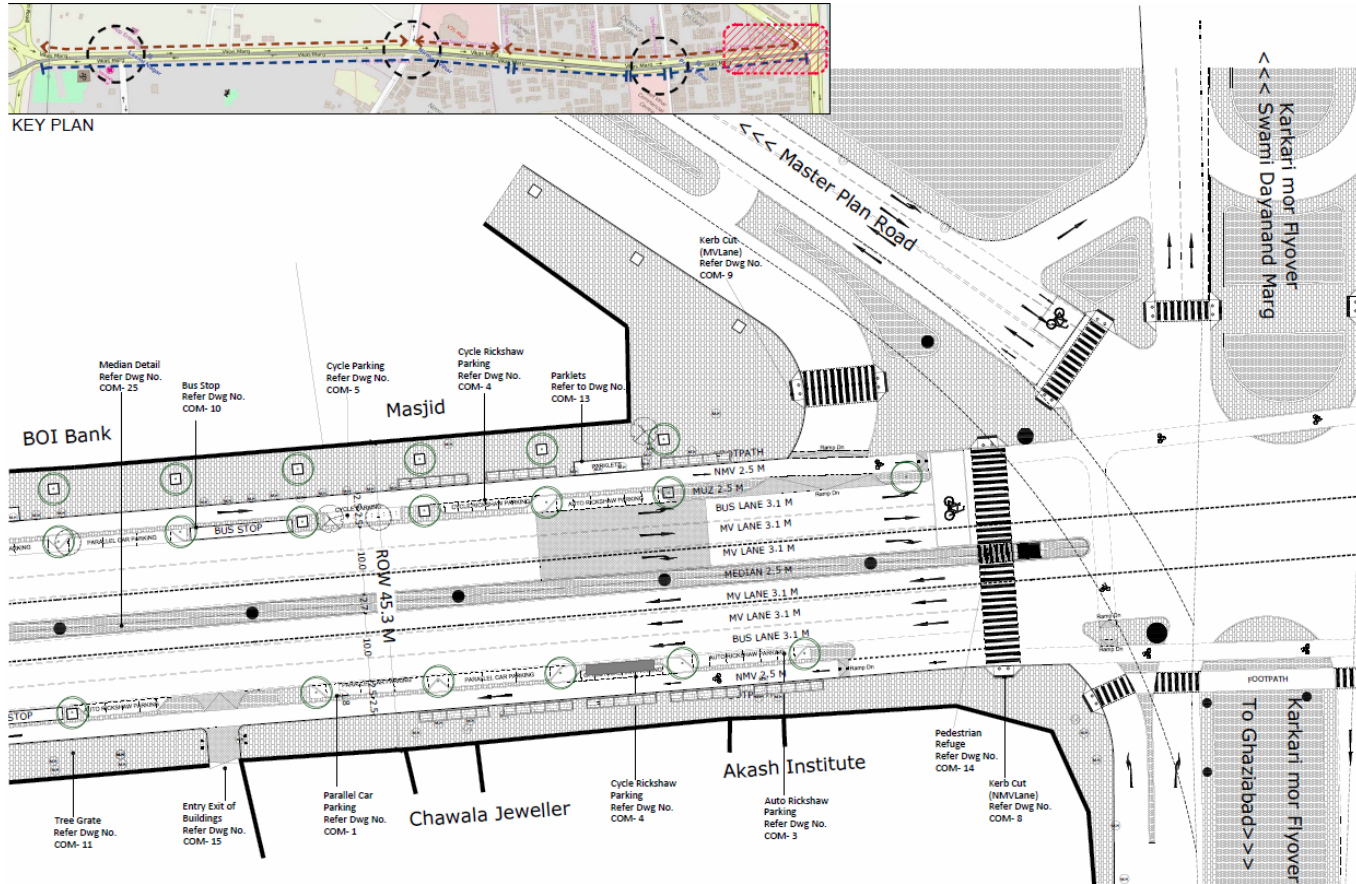
Street Layout: Karkari Mor (Existing)



Karkari Mor (Existing)



Street Layout: Karkari Mor (Proposed)

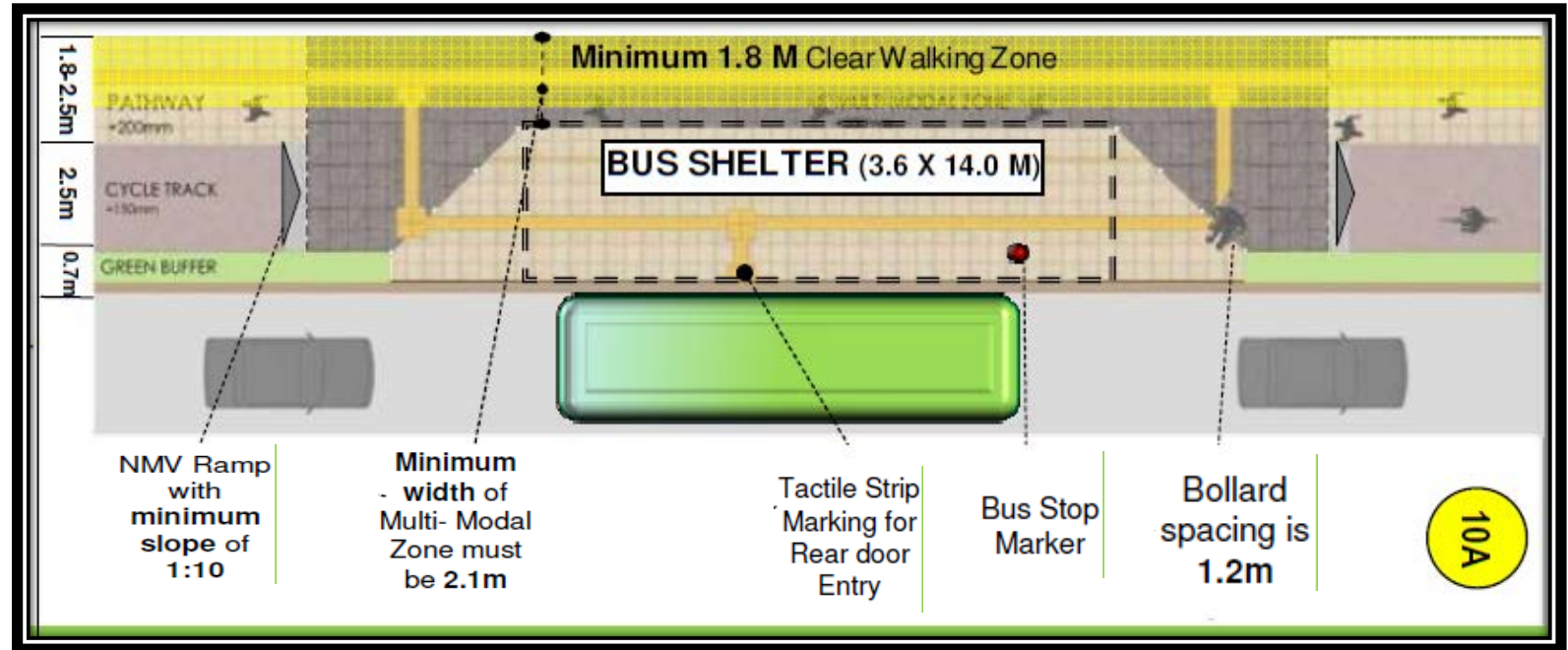


Street Components

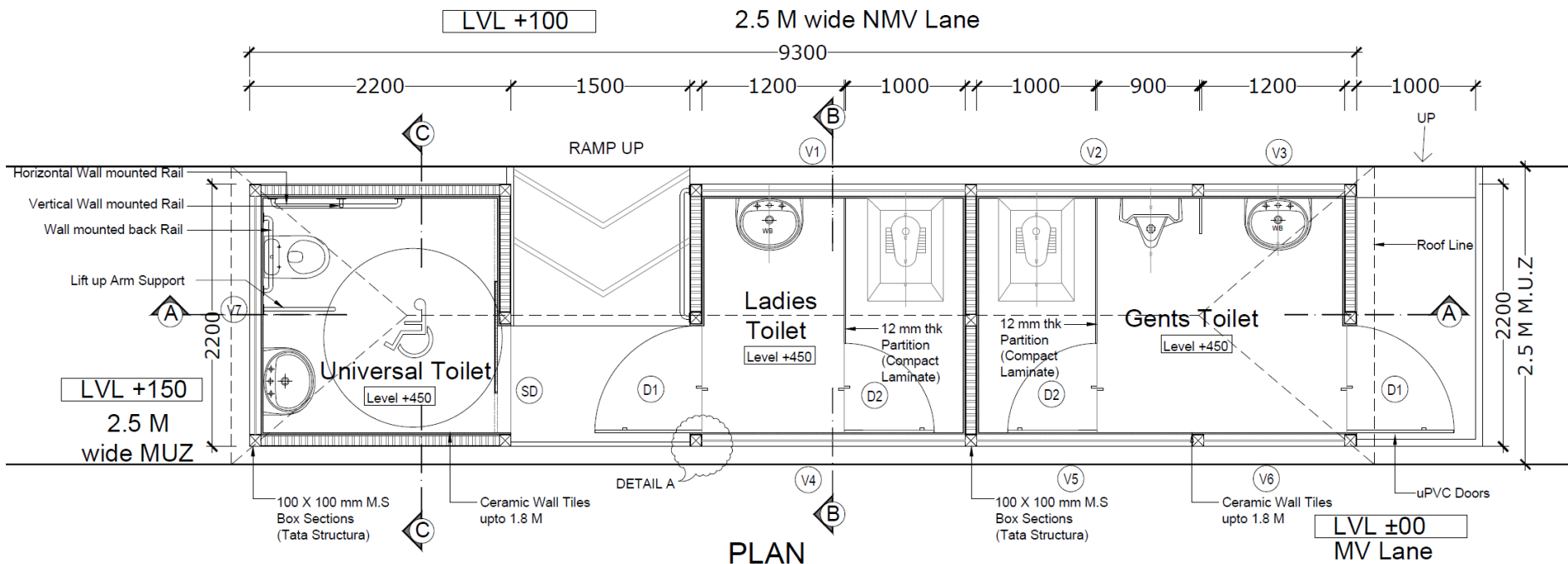
List of Key Street Components/Elements

- | | |
|--|--|
| 1. Bus stops | 15. Security/Police Booths |
| 2. MV Parking (4wheeler) | 16. Mohalla Clinics |
| 3. MV Parking (2wheeler) | 17. Aam Admi Canteens |
| 4. Bicycle Parking | 18. Community Library & Notice Board |
| 5. Auto-rickshaw stand | 19. Trees with Tree Gratings & Tree Guards |
| 6. Cycle-rickshaw stand | 20. Planters |
| 7. E-Rickshaw Stand | 21. Benches & Seating |
| 8. Gramin Sewa/Phat Phat Sewa Stands | 22. Bollards |
| 9. Parking for Police & Emergency Vehicles | 23. Paving Patterns |
| 10. Public Toilets | 24. Kerb cuts & Tactile Paving |
| 11. Drinking Water Points | 25. Refurbishment of Pedestrian Subways & Over-bridges |
| 12. KiosksStreet Vending Zones | 26. Maps & Signage |
| 13. Street Vending Zones | |
| 14. Parklets | |

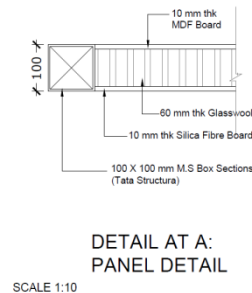
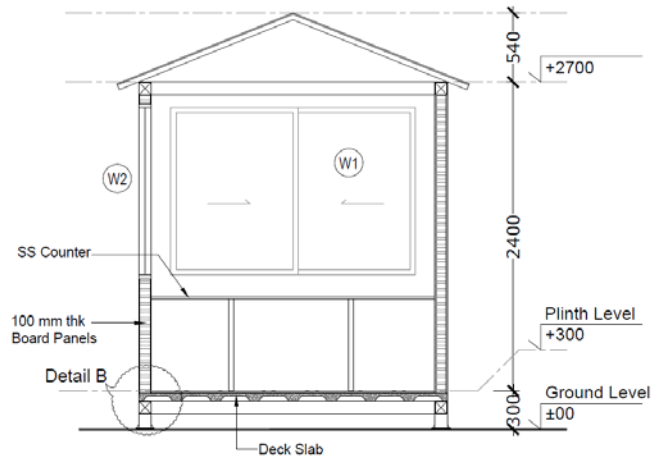
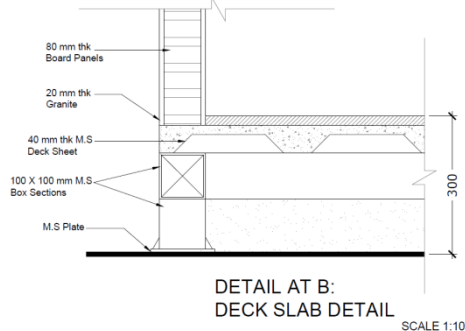
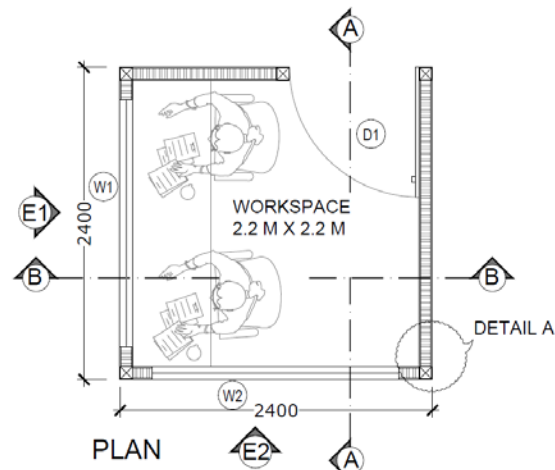
Redesigned Bus Shelters in Vikas Marg



Proposed Public Toilets



Proposed Police Booth



Thanks
