

Development Warrants for Pedestrian Facilities

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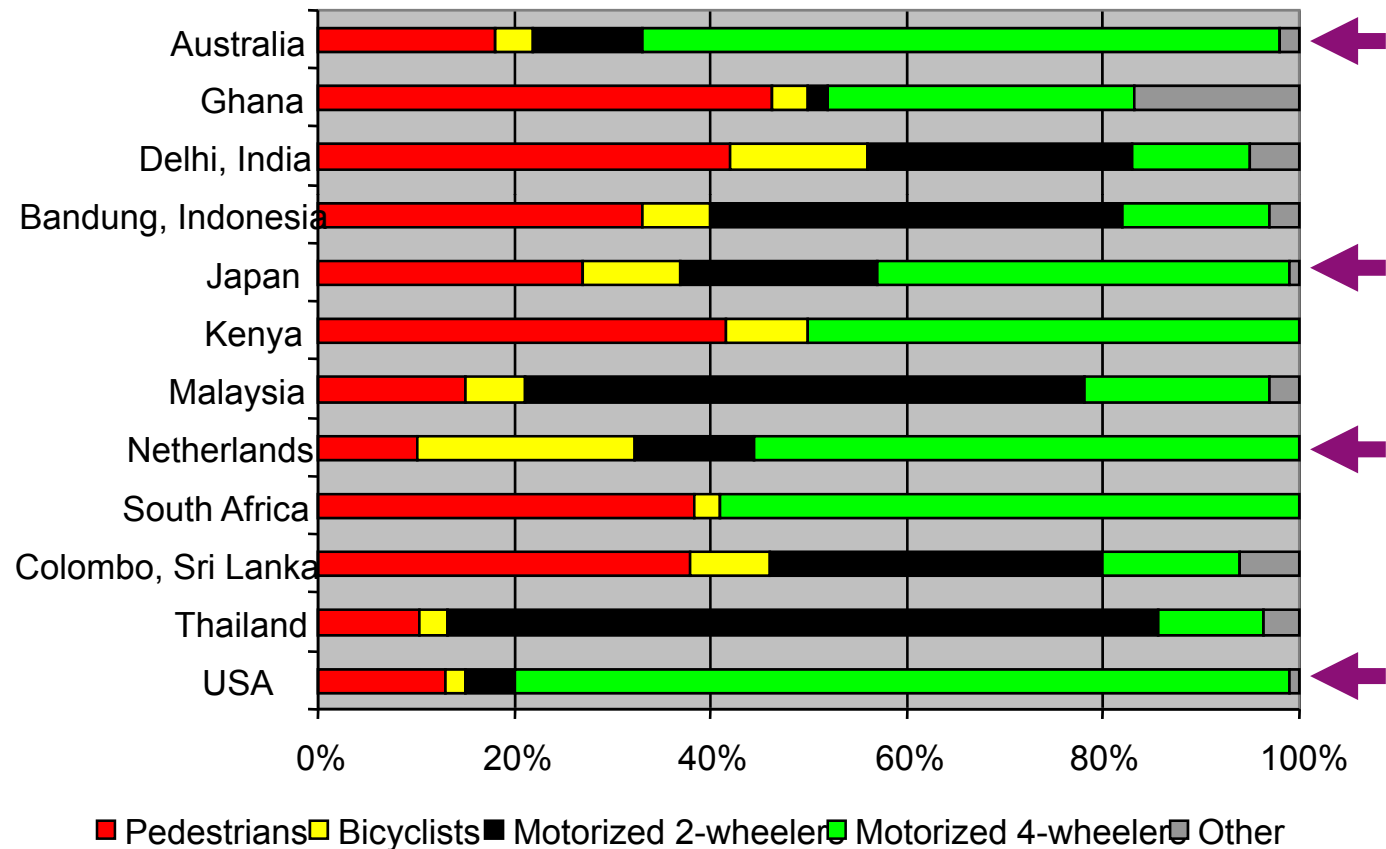


Transportation Research and Injury Prevention Programme (TRIPP)
Indian Institute of Technology (IIT), Delhi



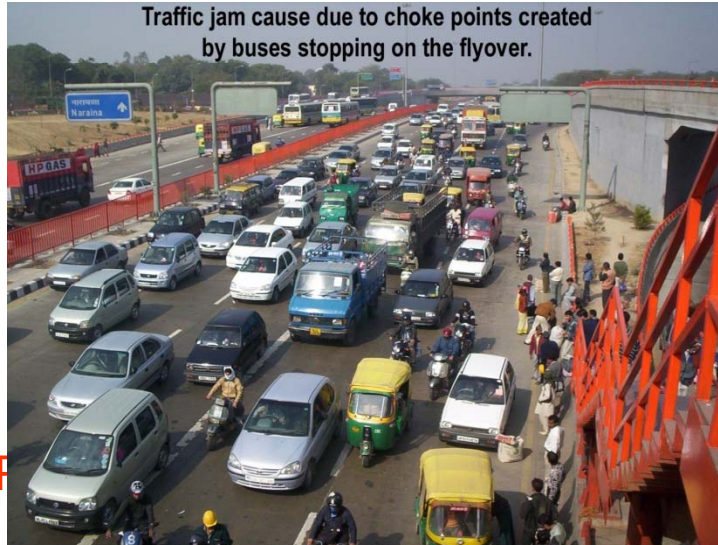
VRUs are RTC victims in all countries, higher proportion in low income countries; NMVs, PT dominant modes

- “success” ~ more people travel by car
- Netherlands: high bicycle use and RTC victims
- Thailand & Malaysia: High MTW and RTC victims



Source: Various WHO collab

VRUs & Urban Transport Infrastructure



Bus commuters on signal free junction and bus stop



Pedestrians at intersection and midblock

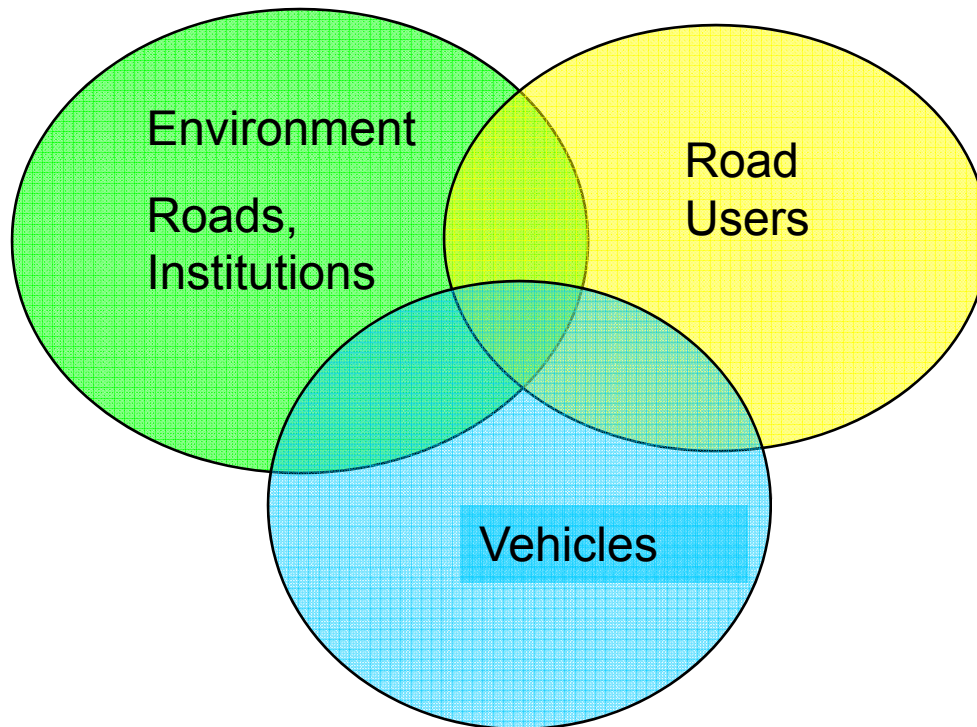
Pedestrians on grade separated junctions



Bus commuters running across the foot of the flyover.

Traffic Safety Science (Public health/systems approach)

- Accident is a failure in a subsystem, or the system as a whole that damages one or more unit



Road Traffic Crash is a complex phenomenon

- **Counterintuitive results:** Traffic education for children(Sandels 1974) may increase injury rates
- Stricter penalties may reduce enforcement and crash reporting
- LIC peds vs HIC peds: findings about red light observance, gap acceptance, crossing behaviour
- Education and culture vs ease of implementation and effectiveness

Traffic Safety Science in its infancy

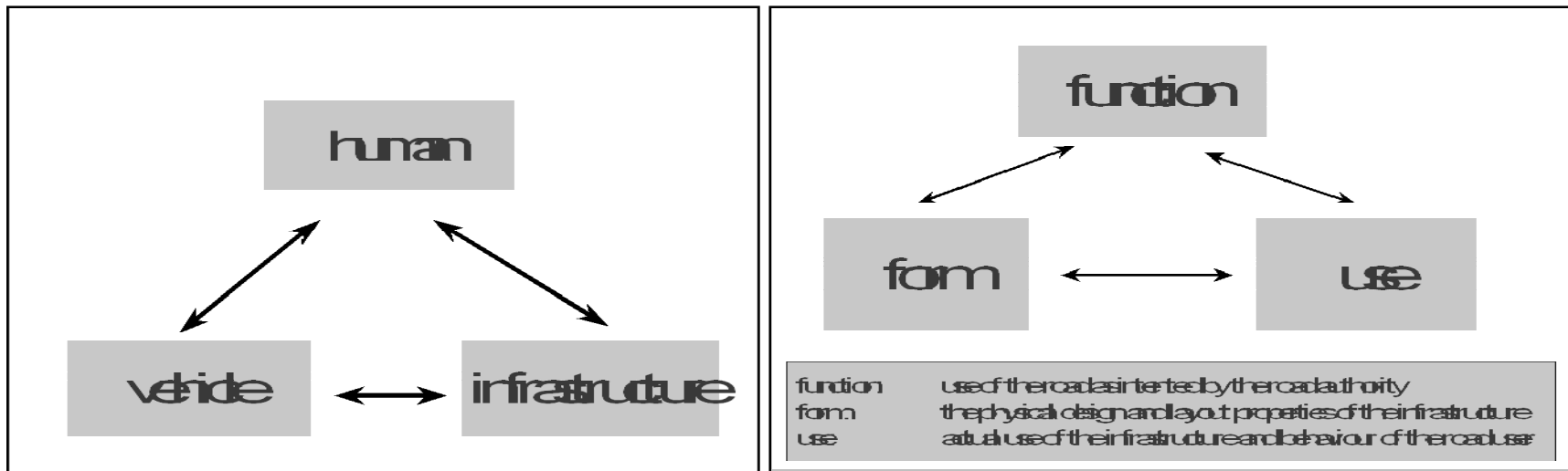
- **Counterintuitive results:** marked pedestrian crossings increased fatalities by 20% compared to unmarked, raised crossings decreased fatalities by 40% (Hyden et al)
- Drivers speed increase near a zebra crossing (varhelyi, A, 1999)
- Poor understanding of city structures and pedestrian behaviour: pedestrian exposure
- **Pedestrian safety requires safe cities**, *safe traffic system is a subset*

Pedestrian safety

- The most influential factor ..in making a decision to cross at a designated crossing location is the distance of the crosswalk to desired destinations of pedestrians. (Handy, 1996; Shriver, 1997)
- Also it is evident that pedestrian safety can be affected by changes in the signal settings at signalized crosswalks(peds delay< 40 sec) (Garter, 1989).

sustainable safe traffic system

- a road environment with an infrastructure adapted to the limitations of the road user;
- vehicles equipped with technology to simplify the driving task and provided with features that protect vulnerable and other road users; and
- road users that are well informed and adequately educated.



Retrofitting cities: Traffic Calming, roundabouts



Basic Components

- Geometric standards (street width, pavement height)
- Operational guidelines(delay at signalized junctions)
- Accessibility guidelines(directness, shorter distance)



Pedestrian Planning Guidelines

- UTTIPEC draft guidelines
- IRC 103: Guidelines for Inclusive Pedestrian Facilities(revised draft report, August 2009)
- Service Level Benchmarks, MUD, 2009

Walking Population

Walking for work, education and services.....

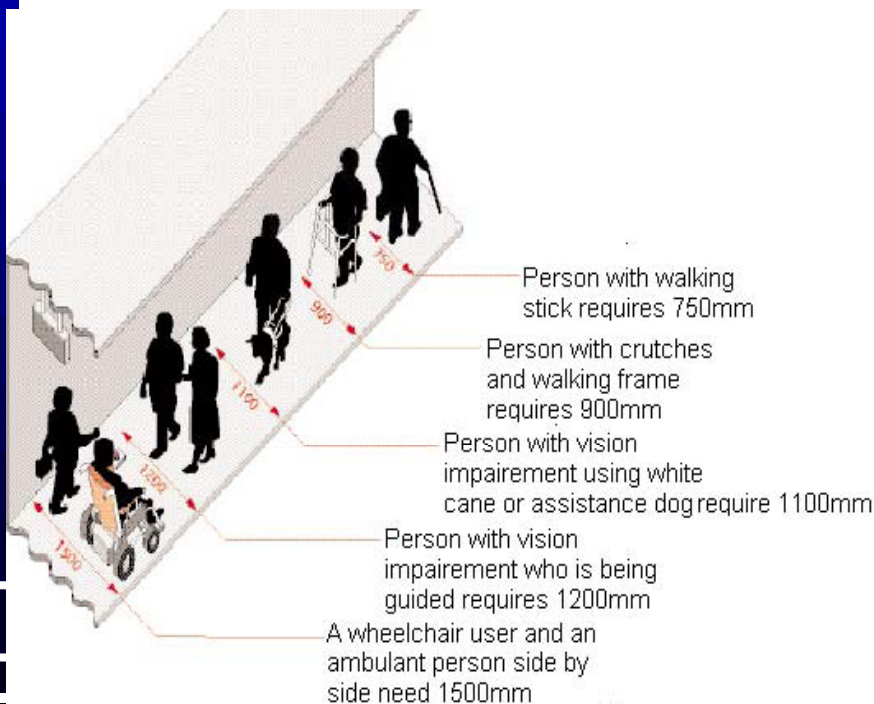
- Of all education trips – 58% walk trips
- Service and business trips – 31% walk trips (RITES 2001)

Walking and urban poor.....

- About 60% of people live in low income localities. An earlier estimate shows 22% of people with less than Rs 2000/month income walk in Delhi.

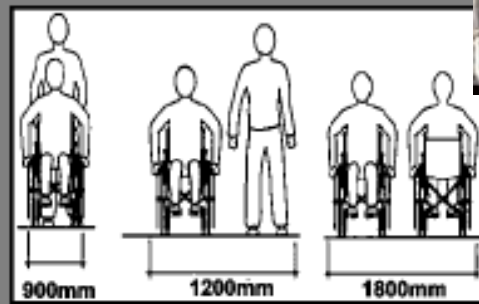
Disability and walking.....

- Samarthyam survey: 58% of the disabled found steps, ramps, difficult to negotiate; 45% of elderly found steps and ramps daunting; 20% found uneven, narrow sidewalks difficult.



GOAL 1

- MOBILITY AND ACCESSIBILITY – Universal Access
- All road users to have safe access and mobility
- Children, women and persons with disability



GOAL 2

- SAFETY AND COMFORT – Make streets safe



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 misbehaviour, shady corners, peeing, etc.)

Require commercial facades to have minimum 30% transparency.

Provide adequate Street Lighting for pedestrians and bicycles.

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)

Essential street components



Pedestrian sidewalks & crossings



Non motorized vehicles



Utilities



Physically challenged



Motorized private vehicles



Public Toilets



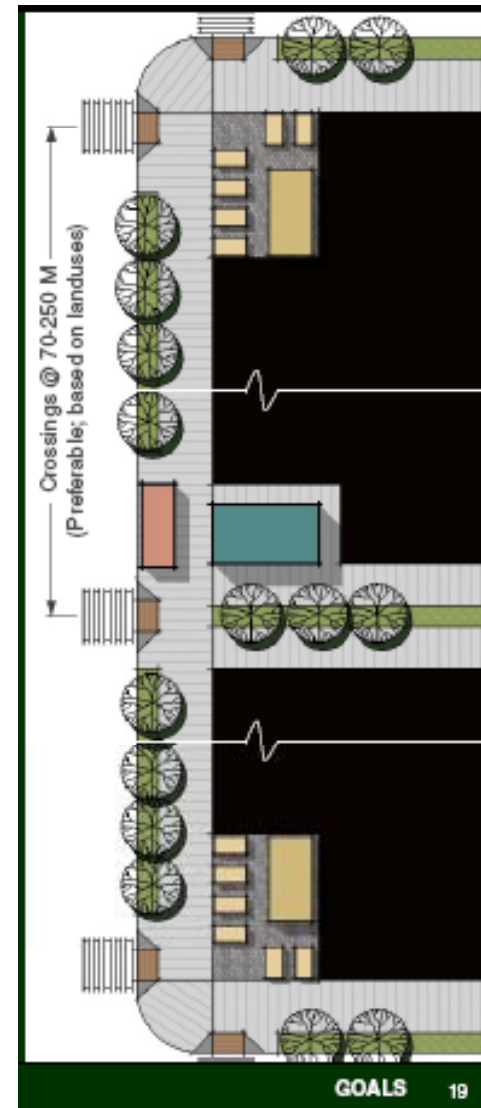
Trees



Rainwater harvesting



Shaded Bus stops



Masterplan-2021 Road Hierarchy: Possible Categorization*

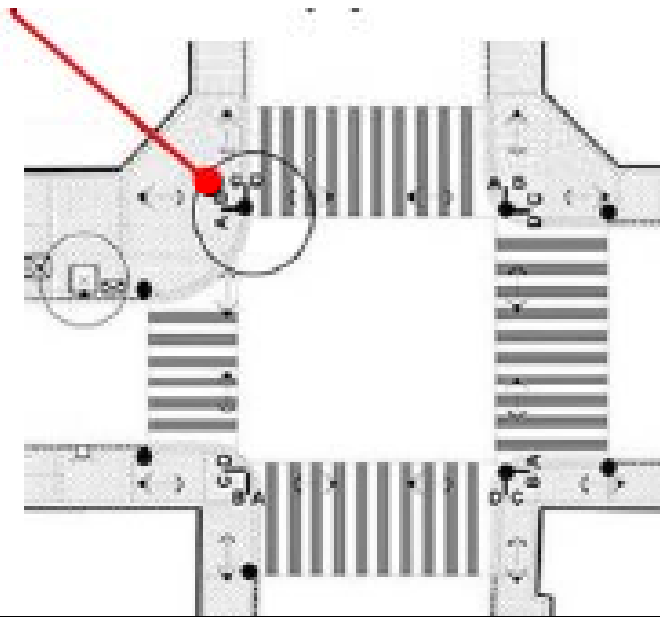
Primary Arterial	Other Primary Arterial	Primary Collector	Secondary Collector	Local Streets
60-80 M	45-60 M	30-40 M	18-24 M	12-20 M
50 km/hr.	50 km/hr.	30km/hr	20 km/hr	20 km/hr
Enforcement required	Enforcement required	Traffic calming required	Traffic calming required	Traffic calming required
Segregated bus and HOV lanes required	Segregated bus and HOV lanes required	Segregated bus and HOV lanes required	Segregated bus and HOV lane optional.	No segregated bus lanes or bus operations required.
2 to 4 vehicular lanes, 3.1m wide (min. 3.3 for buses)	2 to 4 vehicular lanes, 3.1m wide (min. 3.3 for buses)	2 nos., 2.75m lanes per dir. (min. 3.1 for buses)	2 nos., 2.75m lanes per dir. (min. 3.1 for buses)	1 no., 2.75m wide lane per direction
Segregated cycle tracks required	Segregated cycle tracks required	Cycle lanes can work, segregated tracks required where friction & encroachment expected	Cycle lanes can work, segregated tracks required where friction & encroachment expected	No special feature for cyclists
Service lane required	Service lane may or may not be required	No service lane required	No service lane required	No service lane required
Continuous median – all intersections controlled (signalized or roundabout, no grade separators within city)	Continuous median – all intersections controlled (signalized or roundabout, no grade separators within city)	Intermittent or no median - opening accompanied by traffic calming. Roundabout or traffic calmed crossing.	Intermittent or no median - opening accompanied by traffic calming. Roundabout or traffic calmed crossing.	No medians, traffic calmed crossings, or mini roundabouts

* Guidelines prepared by UTTIPEC, DDA In consultation with TRIPP, IIT Delhi and ICE and DIMTS, Nov 2009

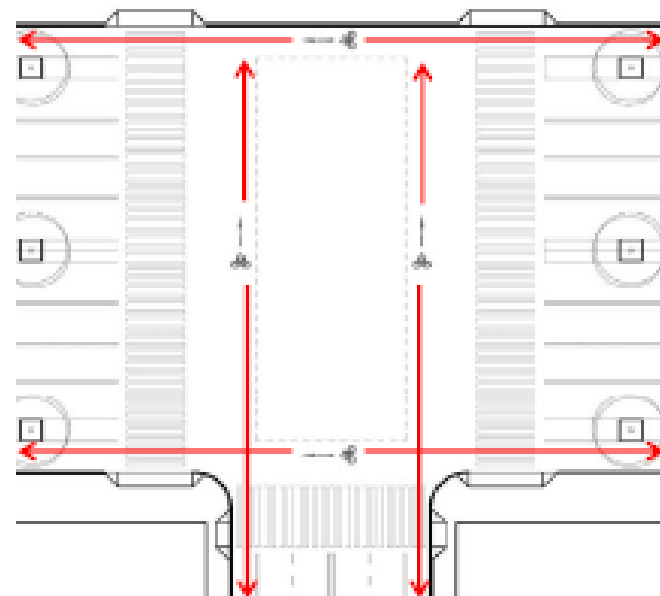
Components

- Footpath:
- Paving:
- Road Markings:
- Road Signs:
- Audible Signals

Crossings



Pedestrian Design Guidelines © UTTPEC, DDA 2009



NMV lanes must be given clear crossing paths at junctions.

Pedestrian Design Guidelines © UTTPEC, DDA 2009

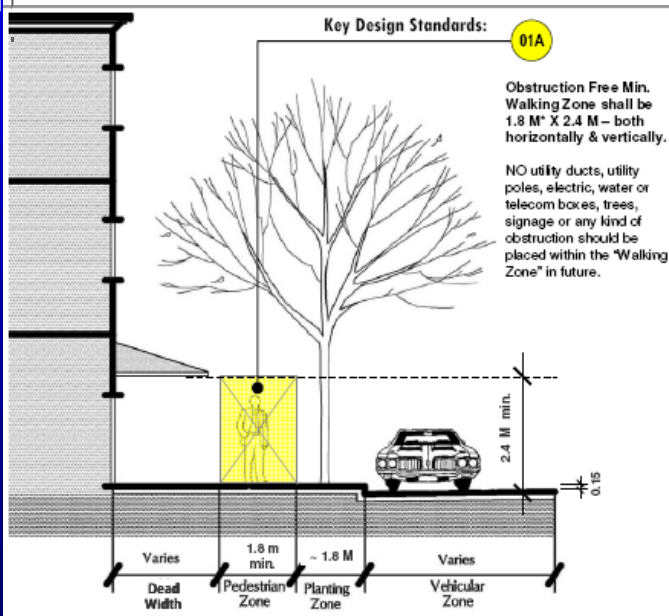


Driver's view of crossing markings. Source: ITE Professional Development Complete Streets Webinar, 2009

*Source: San Francisco Better Streets Plan

- Separating NMT and MV from pedestrians
- Visibility of pedestrians
- Clarity to pedestrians

Old city and case specific areas

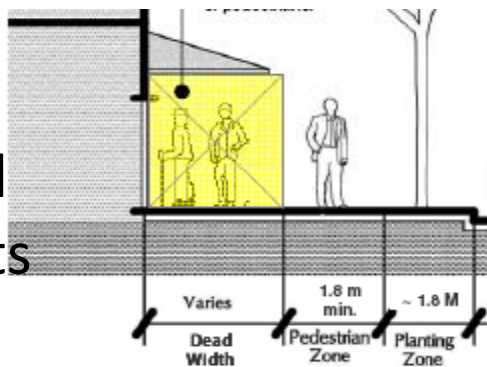


*In lower order residential streets (below 12 M) a footpath of minimum 1.2M could be considered in exceptional circumstances and local constraints

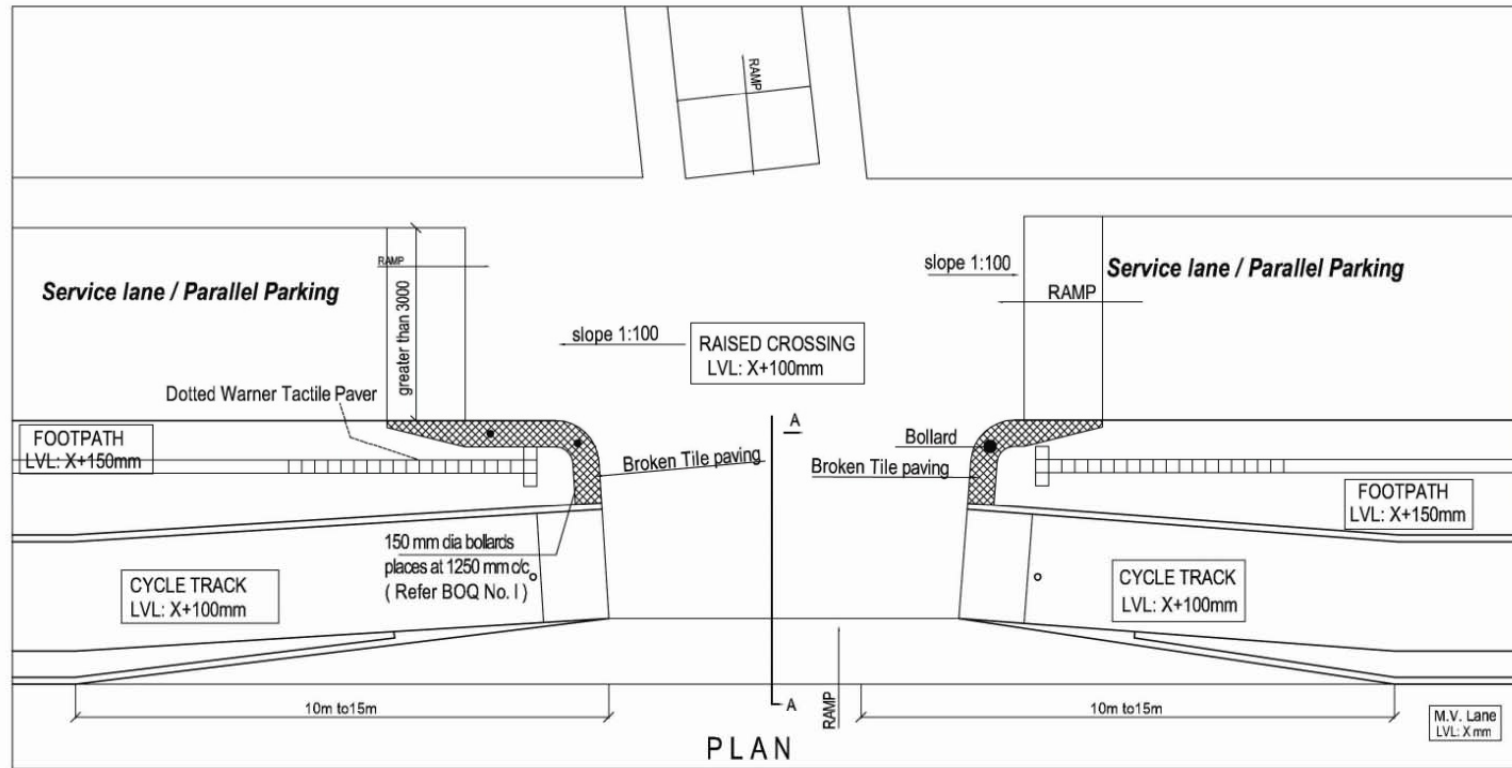


Drawings prepared by UTTIPEC, DDA In consultation with TRIPP, IIT Delhi, SG Architects, ICE and DIMTS, Nov 2009

Dead zone and walk zone should be clearly highlighted in commercial and mixed land use zones / streets



Raised Crossings for Pedestrian Safety



Mid-way Crossings

To be provided at regular intervals based on land use

Pedestrians impatient, if long waiting times

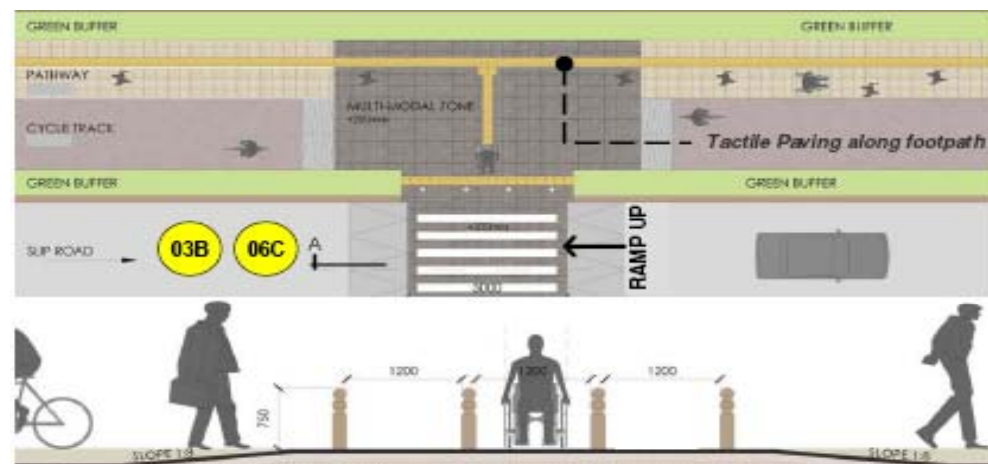
Barrier free crossings enabling disabled / VRU to cross



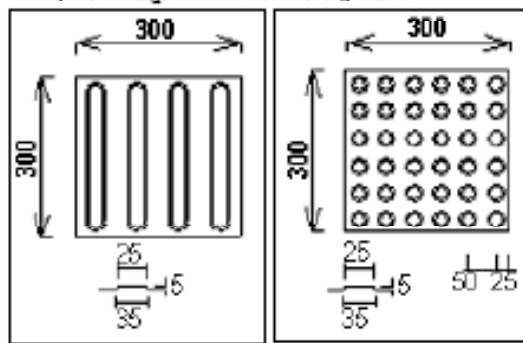
Audible signals which beep when light is green (BRT Corridor, Delhi)



Accessible Bus Stop, Delhi



Sample Drawings Source: Oasis Designs Inc.



Guiding Tile

Warning Tile



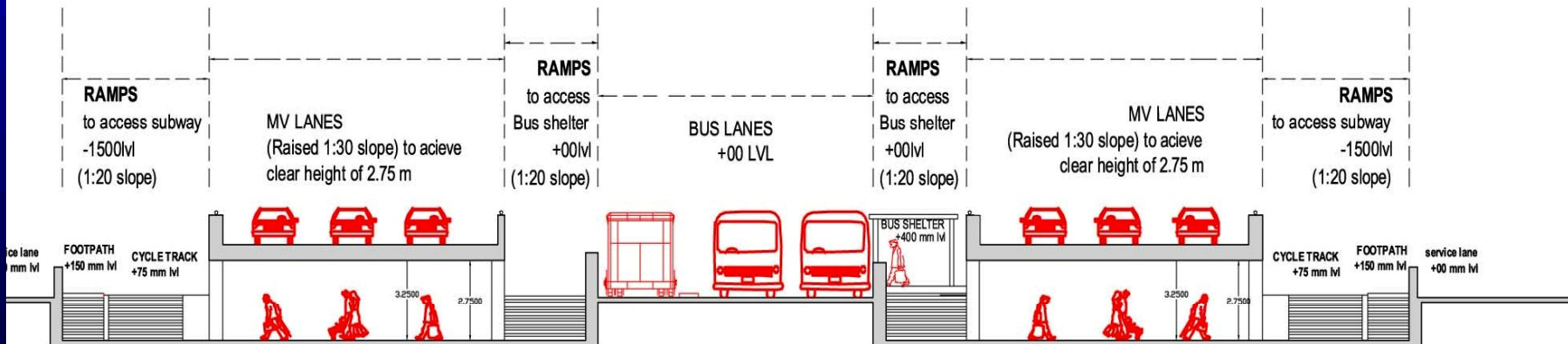
Engineering configuration of floor tactile tiles



The over bridge is 6.50 m above road level. This is similar to climbing stairs to reach the second floor in a building.

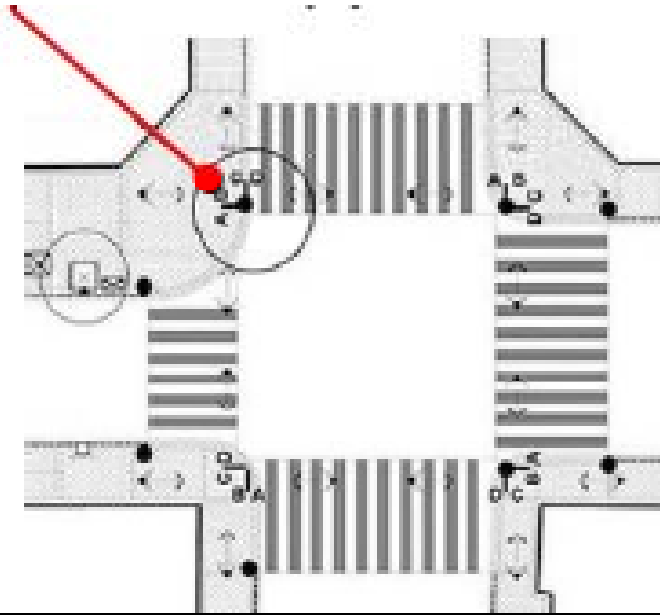
Mid-way Crossings

- High volume of traffic and not efficient to use a signal to stop the traffic flow
- Pedestrians need to access the bus shelters
- Negative -pedestrians are required to walk more

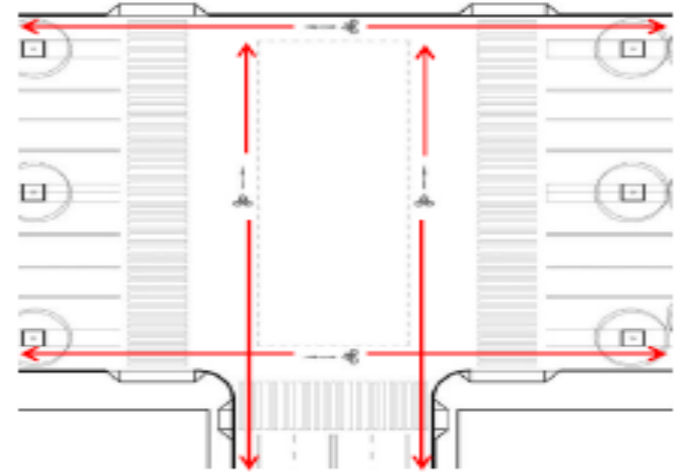


In a compromising situation , this is better then pedestrian foot-over bridges

Junction Crossings



Pedestrian Design Guidelines © UTTPEC, DDA 2009



NMV lanes must be given clear crossing paths at junctions.

Pedestrian Design Guidelines © UTTPEC, DDA 2009

- Separating NMT and MV from pedestrians
- Visibility of pedestrians
- Clarity to pedestrians



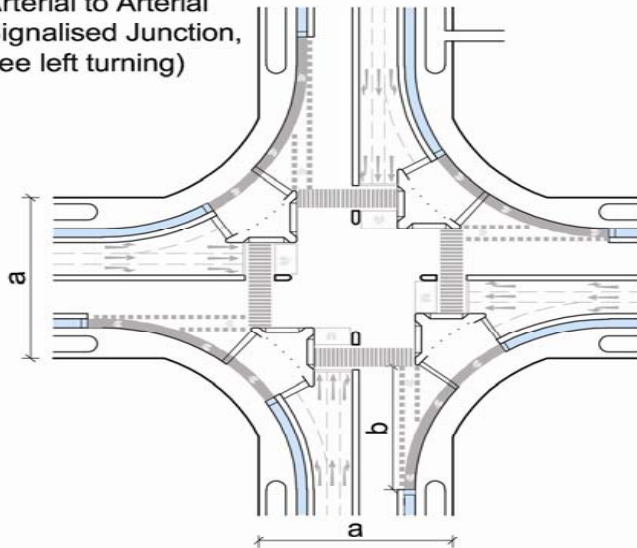
Driver's view of crossing markings. Source: ITE Professional Development Complete Streets Webinar, 2009

*Source: San Francisco Better Streets Plan

Footpaths

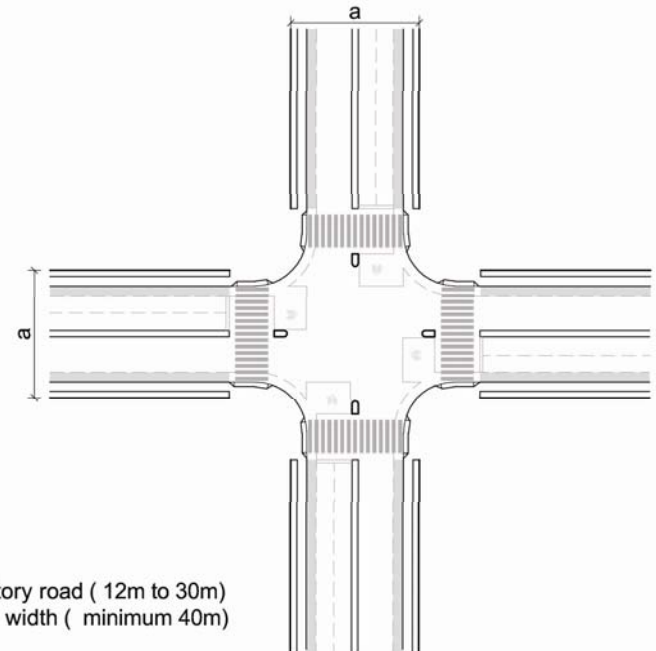
- Minimum clear width should be 1.5m
- Minimum width is 2.0m to accommodate wheelchair users
- Footpath surface should be even and without any irregularities.
- The use of guiding and warning blocks should be used along the footpath paving

Junction Type : Arterial to Arterial
(Signalised Junction, free left turning)



a : arterial road (24m to 60m)
b : length of cycle lane leading upto cycle track (minimum 30m)

Junction Type : Distributory to Distributory
(Signalised Junction, no free left turning)



a : distributory road (12m to 30m)
b : junction width (minimum 40m)

Medians and Refuge Islands



A median is the portion of the roadway separating opposing directions of the traveled way, or local lanes from through travel lanes. At a pedestrian crossing, the median acts as a 'pedestrian refuge island'.

Marking and Signage

To warn motorists of the Pedestrian facility, these marks / signs are put 10-15mts before the crossings, and at regular intervals on facilities.

Road Markings: Essential to designate areas in parking lots to make it comply with accessibility standards.

Road Signs: All signs should be visible, clear and consistent.

- All accessible places should be clearly identified by the International Accessibility Symbol.
- They should be in contrasting colours.



Signals

- Countdown times tends to be more unsafe for pedestrian.

Source: Owen Keegan and Margaret O'Mahony (2003)

- Audible Signals: The use of audible signals or auditory signals for visually impaired to cross a road.
- Pedestrian access system, mountable onto signal poles at crossings with push button system.
- It also gives audible alert signal to Vehicle Users About Pedestrian Crossings.



Lighting

- Lighting at human scale
- Social security
- Living landscapes
- Heritage conservation in older areas

A variety of Full Cutoff light fixtures can meet required site-specific standards:

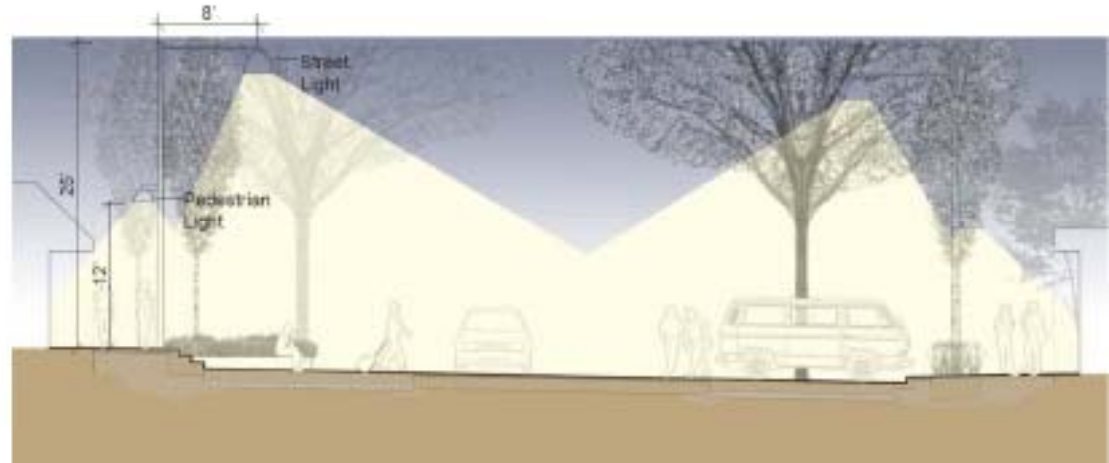
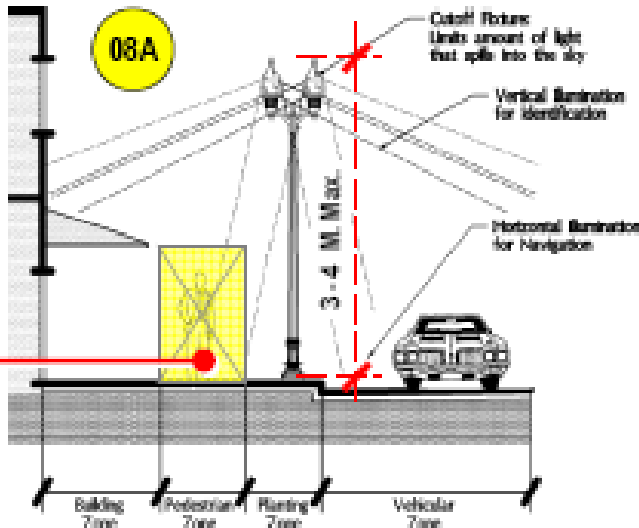
08B

Solar LED lights



•For Wide Streets with high pedestrian/ commercial activity, Mid-Mast lighting may be combined with Pedestrian Scale lighting to create adequate sense of security and comfort.

08A



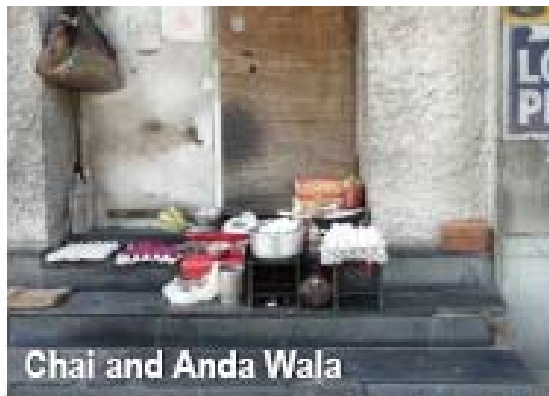
Graphic Source:

www.wnslowwaysreelscape.org/WnslowWayReelscape/Final_Design_files/Lighting_FinalDesign.pdf

Pedestrian Design Guidelines © UTTIPEC, DDA 2009

Streetscape

- Bus stops
- Auto / cycle rickshaw stands
- Hawkers
- Signage
- Public utilities
- Public toilets
- Dustbins





Conclusions

- Pedestrian as the most basic unit / component for street and public space design
- Pedestrian includes vulnerable road users – elderly, disabled, children, people with luggage etc.
- Safety of pedestrians to be on top priority (to be never compromised by design / policy)
- Effective integration of technical innovations, policies, institutional mechanisms for pedestrian safety.