

ToR for Urban Street Design for Public and Non-Motorized Transport

1. BACKGROUND

There are many factors that make urban streets different from rural highways such as increased numbers of pedestrians, bicycles, business and residential driveways. Transit, drainage and intersections may also have unique design criteria when they are part of an urban street system. Traffic flow conditions, peak and off-peak speeds and volume variations are also significant and can affect street design. The manual should include schematic drawings and graphics and pictures to illustrate various urban street design practices.

The Manual on Urban Street Design would be intended to create "complete" streets, streets that provide capacity and mobility for motorists, while also being safer and more comfortable for pedestrians, cyclists, and neighbourhood residents.

The proposed Manual need to address a variety of design issues including sight distance assumptions, determination of the functional intersection area, and length of left-turn and right-turns bays. Corner clearance, minimum centerline radii, the rationale for the cross-section of arterials, collectors, and local residential streets and the effectiveness of intersection and median changes to a major urban arterial will also need to be covered.

The Urban Street Design Manual would be intended to ensure that the best aspects of a city's public transportation as well as non-motorized transport network are re-created as the City and its street network continue to evolve. This would mean that the various street design elements must be applied in the right mixes and in the right places. The process for planning and designing streets must also be sensitive to both the land use context and to the needs of the various users of a street.

2. SCOPE OF WORK

The manual should cater to the expectations of different categories of travellers from different locations in a street And should describe methods for applying the guidelines contained in the manual so that any tradeoffs are evaluated fairly for all stakeholders.

As a first step towards designing streets that provide viable transportation options is to understand that different users of the street will likely have different expectations of what makes a "good" street. A street design solution that works well for a motorist, for example, may or may not work well for a pedestrian or a bicyclist.

This is one reason Indian cities need to be more concerned about providing "complete streets." Further, even if every "ideal" design element for all of the travellers on a street were provided, then the resulting street might not satisfy the expectations of the people who live or work along it. These different stakeholders and their expectations for a street can complicate the design process, which is one reason the manual on street design should not treat it as a relatively straightforward

task, with a pre-set menu of auto oriented cross-sections for streets with pre-defined functional classifications. That approach may not work in many cities, for a variety of reasons. One reason is that right-of-way becomes constrained as cities develop, and “standard” cross-sections are less likely to fit within the available right-of-way, particularly for retrofit projects. Another reason is that there is increasing concern about providing facilities that can be used by people other than motorists. In these cases, designing the street has to be treated more as an analytic process - one that considers the various user perspectives and the surrounding land use context, in addition to the street function.

The guidelines in the manual should be intended to ensure a process that clearly, consistently, and comprehensively considers the needs of bus operators, pedestrians, and bicyclists and other Non Motorized Vehicles (NMVs) when planning and designing streets.

All streets would need to be evaluated in terms of how they affect many different groups, including:

- Motorists
- Pedestrians (including transit riders)
- Bus operators
- Bicyclists
- People living, working, or otherwise using the adjacent land uses

Each of these groups has expectations about how a given street should function and, therefore, how it should be designed. Various street users’ perspectives and how they might be addressed in the design process.

2.1 STREET DESIGNS TO CATER TO NEED OF PUBLIC TRANSPORT DRIVERS

When a **Public Transport Driver** expresses a concern or makes a request related to streets, it often stems from congestion or safety concerns.

Public Transport Drivers might expect streets to be:

- Widened and signalized intersections
- Timed to enhance their own travel times, for example, the reduction in number of stop-controlled intersections so that they can maintain free flow.

To meet **Public Transport Drivers’** expectations for safe and efficient travel, perfect conditions over the street network would include:

- minimal travel delays
- minimal conflicts (affecting both delay and safety)
- consistently designed facilities

For the most part, though, urban streets may not be able to provide this combination of conditions except perhaps on freeways or other access-controlled roadways. Even then, travel delay and potential for conflicts with other vehicles will vary by time of

day. Furthermore, consistent design is not only difficult to provide on urban streets, but probably not even desirable for other reasons (it is at odds with the concept of context-sensitive design).

Although providing all of the favourable conditions for **Public Transport Drivers'** described above is difficult, there are ways to achieve some of the **Public Transport Drivers'** preferences, either through construction or operational changes. These approaches may include but not limited to:

- Adding through or turn lanes to increase capacity, which can help reduce delay, at least temporarily
- Making operational changes, such as providing more green signal time to the street with the higher traffic volumes, which can reduce the wait time at signalized
- Intersections for those **Public Transport Drivers** on the higher volume street while increasing the wait time for motorists entering from the lower volume side street
- Constructing grade-separated intersections and roundabouts, rather than signal or stop controlled intersections, which can also limit delay and increase capacity
- Using bus pullouts to separate stopping transit vehicles from the travel lane and, therefore, to help reduce delay

Public Transport Drivers not only want to travel quickly, but they also want to arrive safely. A variety of design features have been used elsewhere to enhance drivers' safety which may include:

- wide travel lanes are generally considered more forgiving to the **Public Transport Drivers** than are narrow travel lanes
- turn lanes separate turning vehicles from the through traffic, potentially reducing rear-end collisions
- medians separate opposing traffic streams
- greater sight distances generally improve a **Public Transport Driver's** ability to "see and be seen", thereby providing greater opportunity to avoid collisions
- street lighting improves overall visibility

In addition to these traditional, auto oriented engineering designs, there are also design features that are desirable for other travellers, but which also have safety benefits for motorists. For example, bike lanes and planting strips, which buffer pedestrians from traffic, also improve **Public Transport Drivers'** safety by increasing sight distance and by reducing the potential for conflicts between autos, bicycles, and pedestrians. Minimizing conflicts provides the **Public Transport Drivers** potential travel time savings and increased safety.

2.2 STREET DESIGNS TO CATER TO THE NEEDS OF PEDESTRIANS

The manual should not be limited only to traditional approach to street design, which defines pedestrian needs as:

- Simply a sidewalk
- The ability to safely cross the street.

These are, indeed, crucial to creating a safe walking environment. However, pedestrians expect and need more than just "walking space" to feel safe and

comfortable. In order to support and encourage walking as an attractive and viable travel mode, the street designs in the proposed manual should reflect that pedestrian expectations that:

- help shorten walking distances
- separate (or buffer) pedestrians from moving traffic
- create aesthetically pleasing surroundings and amenities
- protect pedestrians from the elements
- let them walk as safely as possible

In addition, some special pedestrian populations may have other, specific concerns and their needs must also be considered. For example, safe crossings for blind pedestrians may require a different set of design features than those for pedestrians in general. Many individual design elements can provide for any one of the general categories of pedestrian expectations described above. However, effectively encouraging more pedestrian travel typically requires a combination of several design elements, since the pedestrian is reacting to the overall walking environment.

For walking trips other than for pure recreation, this means that a walk-able environment includes a mix of land uses in close enough proximity to walk comfortably between them. People are much more likely to walk to a given destination if walking distance is minimized or if they perceive that the distances are not too long. Providing the right types of land uses and design characteristics, therefore, can influence perceived distance. Creating direct connections between land uses can also minimize distance.

The Manual may deal with design elements that create better connections these may include:

- short blocks with marked intersections
- safe mid-block crossings on longer blocks
- Continuous walkway systems that connect door fronts with transit stops or other destinations

Buffering pedestrians from passing cars also increases their comfort, even if they already have their own “walking space”. Pedestrians generally find sidewalks with some sort of buffer more attractive than sidewalks built right next to moving traffic. Several design elements can help to create suitable buffers between pedestrians and traffic, including but not limited to:

- planting strips
- bicycle lanes
- landscaping
- On-street parking

These elements may be used alone or in combination. The “correct” combination of these elements will depend on the space available, the various stakeholders’ expectations, the land use context, and the objectives for the street.

Security is also an important consideration, since pedestrians will feel more vulnerable than motorists in many circumstances. A pedestrian's sense of security is improved by:

- Providing street lighting and pedestrian scale lighting, and increasing pedestrian visibility from adjacent land uses (by placing windows/doors/"eyes on the street").

Urban design in the proposed manual should attempt at enhancing a pedestrian's sense of security. The numbers and types of traffic conflicts to which pedestrians are exposed also affect personal safety. It should emphasize reduction of the number of conflicts faced by a pedestrian through:

- Managing driveway access to minimize and control the locations of turning cars
- Providing median or corner pedestrian refuge islands, which help to break up a crossing into more easily manageable parts

The manual may also deal with provisions to minimize overall distance (or time) over which the pedestrian must deal with potential conflicts by:

- reducing the number of travel lanes
- providing curb extensions
- designing smaller curb radii
- Providing sufficient signal timing so that pedestrians do not feel "trapped" in an intersection.

Conflicts between pedestrians and vehicles are not limited to motor vehicles, but also occur with bicycles. Cyclists travelling the wrong way in mixed traffic or on the sidewalk are particularly dangerous, because they are travelling faster than pedestrians, but they are less visible and make less noise than motor vehicles.

The manual may also address the design elements that help provide the space for buses to operate which include:

- wide travel lanes
- wide corner turning radii
- Street signs, utility poles, and on-street parking located to maximize clearance for side mirrors, and Adequate merging distances.

Bus drivers also want to reduce the potential for conflict between buses and other travellers. In addition to minimizing driver fatigue, reducing such conflicts can also help minimize schedule delays, which harm bus operations and performance.

The manual may address steps to minimize conflicts by:

- Selecting safe locations for bus stops
- Providing signal priority for transit vehicles

Bus riders have the same types of interests as do other pedestrians, with some additional, specific expectations. Bus riders also want:

- accessible bus stops
- easy connections
- Personal comfort and security while waiting for the bus

2.3 STREET DESIGN TO CATER TO THE NEEDS OF BICYCLISTS

Bicyclists have different perspectives or expectations related to their trips. Those expectations will vary according to the type of cyclist and the type of trip. Cyclists who are commuting to work will typically take the shortest, most direct route.

Either way, bicyclists of all kinds generally want:

- a well-connected network of bicycling facilities
- safe travel routes
- direct travel routes

The manual may address the development of dedicated bicycle network that connects neighbourhoods, schools, parks, and other activity for bicycling to become a viable travel mode in specific Indian cities. Direct routes may have to be considered through both a continuous network of local streets and through bike lanes on higher-volume streets. Short blocks help to create the dense network necessary for direct routes and lower-volume route options.

On higher-volume, higher-speed streets, provision of a bike lane may be considered for cyclists' safety and comfort. The width of the bike lane should be considered in the manual for:

- the minimum width for a designated bike lane
- Width where the bike lane is next to parked cars or on steep, uphill grades, since the cyclist may need room to avoid opening car doors or to pedal uphill (which can cause "wobbling").

The variety of design elements that may be considered, in the manual, for improving bicyclists' visibility, including, but not limited to:

- designated bike lanes
- pavement markings
- street lighting
- bike boxes and bike signals at intersections
- Buffers from travel lanes and parked cars

The manual may also deal with minimizing of conflicts of cyclists with cars, buses, and pedestrians through reducing driveway frequency in commercial areas and providing bike lanes. also It should address special types of problems faced by bicyclists travelling through intersections, since they must operate their bikes as vehicles, but they are smaller and more vulnerable than the other vehicles. At intersections, it is particularly important that bicyclists be visible to both motorists and pedestrians.

The manual should consider design elements that improve cyclists' visibility at intersections to include but not limited to:

- bike lanes that are located appropriately in relation to the vehicle turn lanes
- lead signal indicators (which provide a head start and allow bicycles to clear the intersection ahead of motor vehicle traffic)
- bicycle stop bars (which provide similar advantages as the lead signal indicators)
- bike boxes, which require a bike lane leading to the intersection never run parallel to the

direction of travel

- pavement markings carefully assessed for potential slickness

2.4 STREET DESIGN TO CATER TO ADJACENT LAND USES

The manual should also consider, in the proposed designs, the interest of other people who have a stake in how streets are designed. These include residents, business owners, property managers, and employees. Either way, these stakeholders will all want to feel safe and secure, to have access to their property, and to enjoy an aesthetically pleasing environment. These will likely see the following design elements as beneficial:

- lighting
- safe and contained travel ways
- driveways (for access to their properties)
- Trees and landscaping

These “stationary” stakeholders’ perspectives are an important consideration when deciding which street design elements should be included:

- traffic calming devices
- low design speeds
- safe and convenient pedestrian
- crossings
- Reduced street widths

In residential and institutional zones, reducing the noise from motor vehicles may also be important.