

Placement Guidelines for Bus Queue Shelters in NCT of Delhi

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Definitions

List of Abbreviations

BQS	Bus Queue Shelter
DTIDC	Delhi Transport Infrastructure Development Corporation Limited
IRC	Indian Road Congress
NACTO	National Association of City Transportation Officials
NCT	National Capital Territory
PwD	Persons with Disability
PWD	Public Works Department
RoW	Right of Way
SEPTA	Southeastern Pennsylvania Transportation Authority
UTTIPEC	Unified Traffic and Transportation Infrastructure (Planning & Engineering) Centre

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1. Introduction

The Public Works Department (PWD) in partnership with the Transport Department of NCT of Delhi is constructing 1397 bus queue shelters (BQS) to improve the travel experience of bus commuters in the NCT of Delhi. The BQS design was selected through a design competition conducted by the Delhi Government in 2018. The proposed BQS are classified in two categories based on the number of routes served and scheduled headway, and their dimensions are specified in Table 1.

Table 1: Dimensions of the proposed BQS

BQS	Dimensions (In metres)		
	Length	Depth (Including solar panels)	Height (Minimum)
Low Intensity	7.9	3.0	2.5
Medium-High Intensity	13.5	3.0	2.5

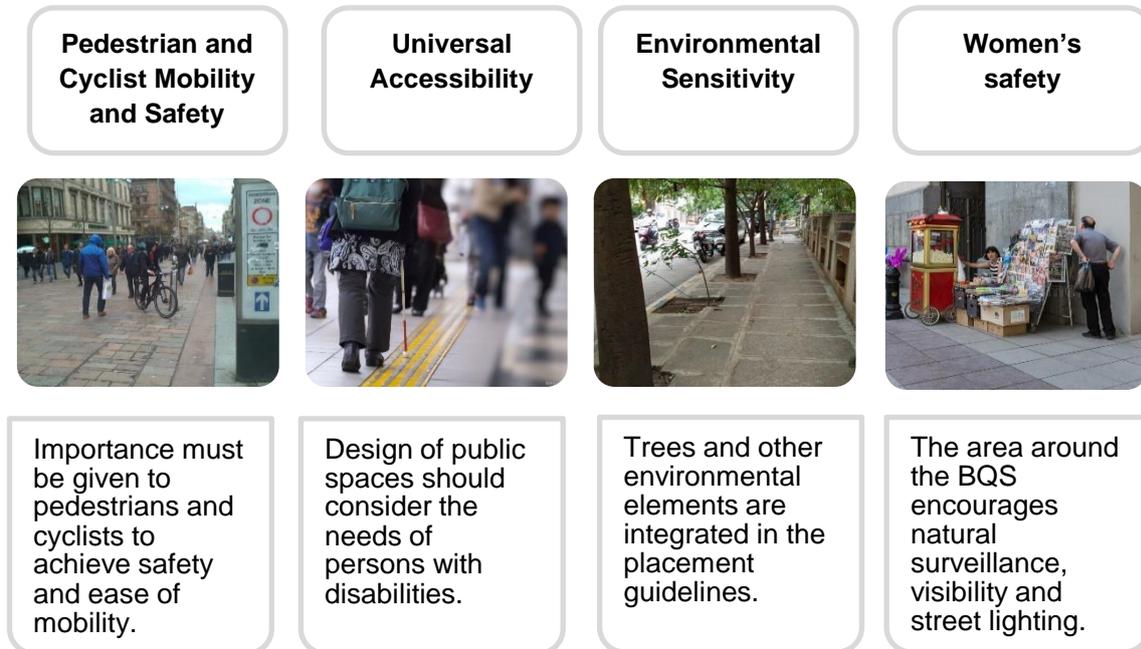
A bus shelter is the first point of contact between the bus service and the passenger. A bus shelter with strong infrastructure to facilitate passengers with ease and convenience is an essential part of any successful urban public-transit system. A good bus shelter is low maintenance and vandal resistant while also allowing visibility, easy access to buses, clear route related information, without causing any obstruction to pedestrians.

Street design guidelines for the NCT of Delhi were created in 2010. Since then, several guidelines such as IRC 103:2012 Guidelines for Pedestrian Facilities and Harmonized Guidelines and Space Standards for Barrier-Free Built Environment for Persons with Disability and Elderly Persons, 2016 have been adopted. Additionally, a review of guidelines in Indian cities revealed that there are limited provisions pertaining to the placement of BQS (Annexure 1)**Error! Reference source not found.** This document fills this gap by creating placement guidelines for 1397 BQS, to ensure that they are integrated with the pedestrian infrastructure, street environment and improve passenger waiting experience.

2. Principles

The placement guidelines adopt the below principles to ensure pedestrian and cyclist mobility and safety, universal accessibility, environmental sensitivity and women's safety.

Figure 1: Principles of placement guidelines for BQS



3. Methodology

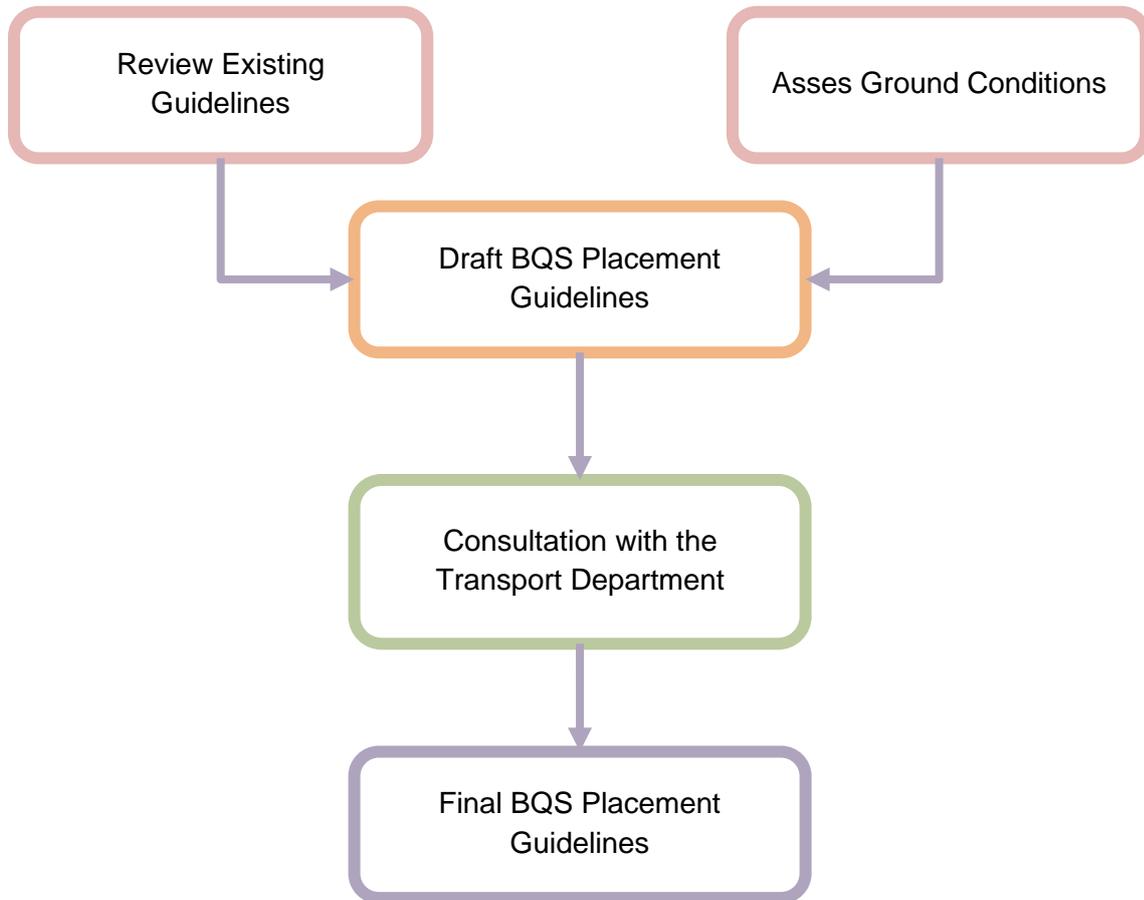
National and international urban street design guidelines were reviewed, which are detailed in Annexure 2. These include

- Street Design Guidelines for the NCT of Delhi (2010)
- IRC:103 Guidelines for Pedestrians
- Harmonized Guidelines and Space Standards for Barrier-Free Built Environment for persons with Disability and Elderly Persons
- Street Design Guidelines for Pune
- Urban Street Design Guide by NACTO
- Bus Stop Design & Accessibility Guidelines for Memphis
- Bus stop Guidelines for Delaware Valley

A ground assessment of 5 BQS in each of the four zones¹ of Delhi was conducted between 19-30 August. The width and condition of the footpaths, service lanes, utilities and the surrounding land-use were recorded and are detailed in Annexure 3. The draft guidelines were created and finalized in consultation with the Transport Department of Delhi.

¹ North, South, East and West.

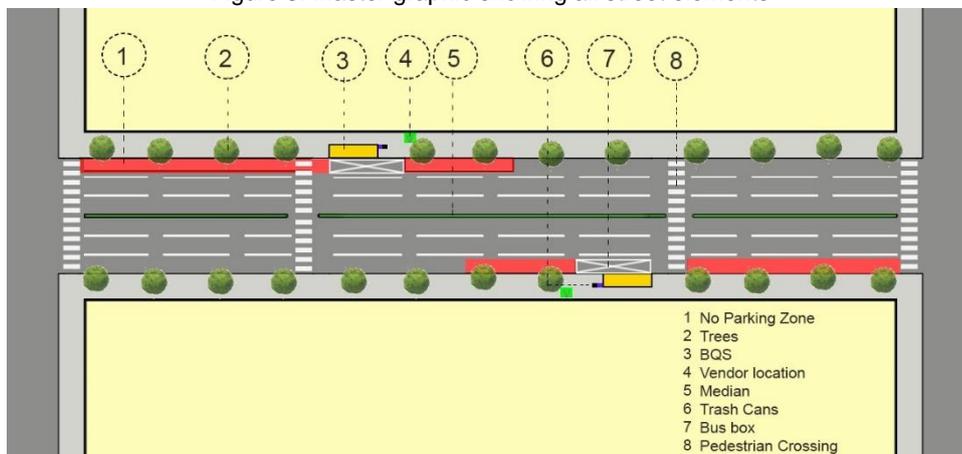
Figure 2: Methodology



3. Street Elements

A BQS and the surrounding environment consists of various elements, such as the footpath, trees, street lighting, pedestrian crossings, on-street parking, street vending. These need to be planned and located in coherence with each other to ensure a pleasant waiting experience for commuters.

Figure 3: Master graphic showing all street elements

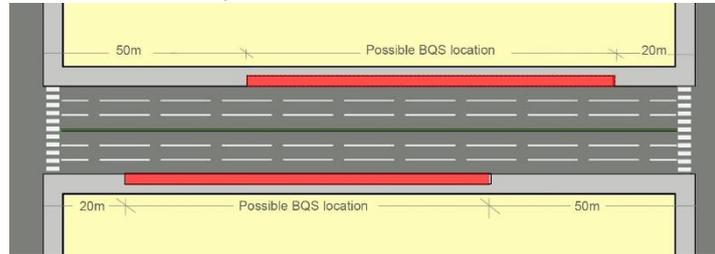


4. Placement Guidelines

4.1 Street Length

- The BQS should be placed at 50m away from the near side of an intersection and at least 20m away from the far side of an intersection.

Figure 4: Possible BQS location



4.2 Footpath

- A footpath should include 3 zones: dead zone, uninterrupted walking zone and a street furniture zone. The width of each zone will vary with the adjoining land use as per
- Table 2. The BQS will be placed in the street furniture zone.
- The footpath will be even, well-maintained, without any debris, grass or weed outgrowth and garbage.

Table 2: Footpath in different land-use zones

Adjoining predominant land-use	Recommended dimensions (Metres)			
	Total footpath width	Dead zone	Walking zone	Street furniture zone
Suburban/ rural areas	3	0.5	2.5	
Residential or low-density areas	4.8	0.5	1.8	2.5
Commercial areas	5.5	0.5	2.5	2.5
High-intensity land-use (markets, universities or colleges, transit nodes such as mass rapid stations, bus terminals)	7.5	1.0	4.0	2.5

Source: Adapted from IRC: 103-2012

Figure 5: Footpath cross-section in a residential area

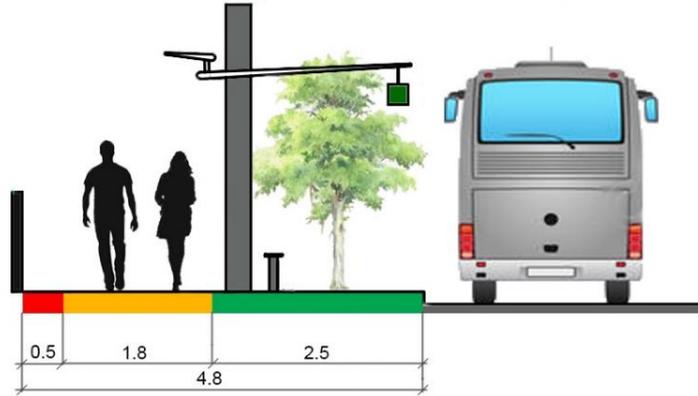


Figure 6: Footpath cross-section in commercial areas

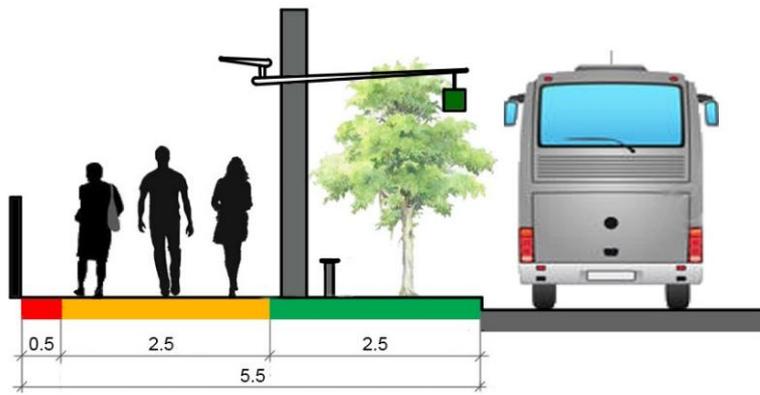
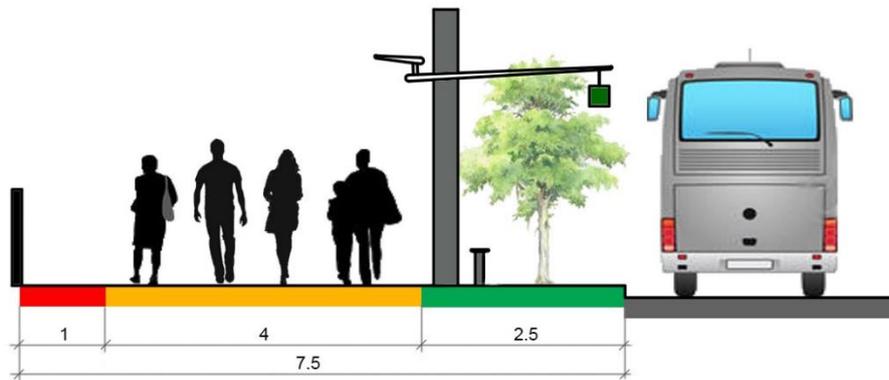


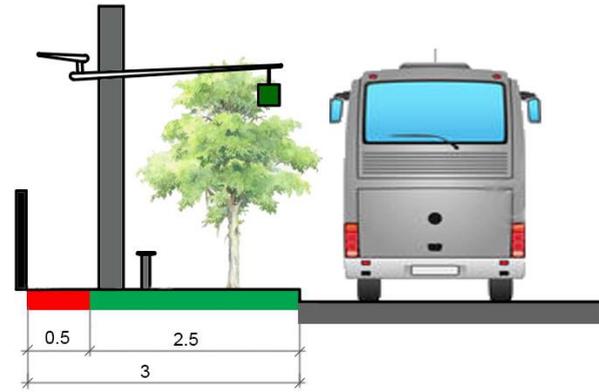
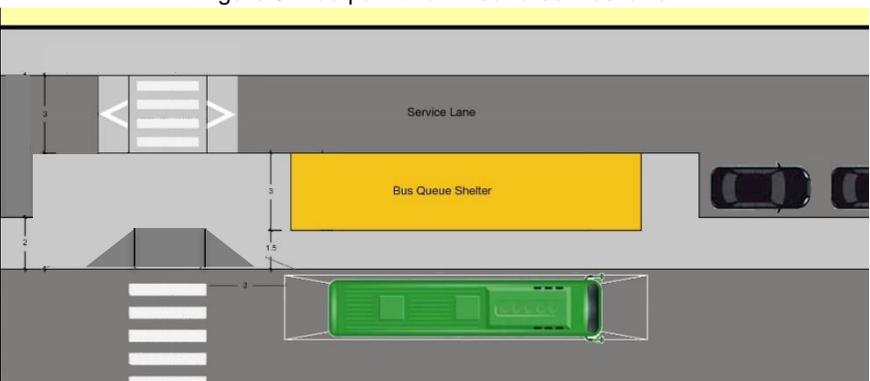
Figure 7: Footpath cross-section in high intensity areas



All dimensions are in metres

- Where no footpaths exist or the width of the footpath is less than 4.8m, the following can be considered:

Table 3: Footpath width

Type of BQS	Placement guideline
Low-intensity BQS	<p>Place the BQS towards the edge of the boundary wall to create a shared waiting and walking area. However, at no point should the minimum width of a footpath be less than 3 m.</p>  <p>All dimensions are in metres</p>
Mid to high-intensity BQS	<ul style="list-style-type: none"> • Increase the footpath width to cover the entire length of the bus box. The adjoining street length can be used for managed on-street parking. • In case the BQS is in a service lane, consider extending the footpath to provide enough space for pedestrians and public transport commuters while maintaining a 3m wide service lane; provide raised crossing across service lane to access the BQS. <p>Figure 8: Footpath width near a service lane</p>  <p>All dimensions are in metres</p>

4.3 Utilities and amenities

- The footpath surface shall have a gradient of 1:100 towards the storm water drain to avoid water logging at the BQS.
- Existing trees should be retained while placing the BQS, and the tree grates flushed with the footpath surface can be considered to ensure an even surface. The tree foliage can be trimmed to ensure clear visibility till a height of 3.0m.
- The length of the bus box must be clear of vending zones and kiosks.
- Ensure pedestrian scale street lighting of 35-40 lux.

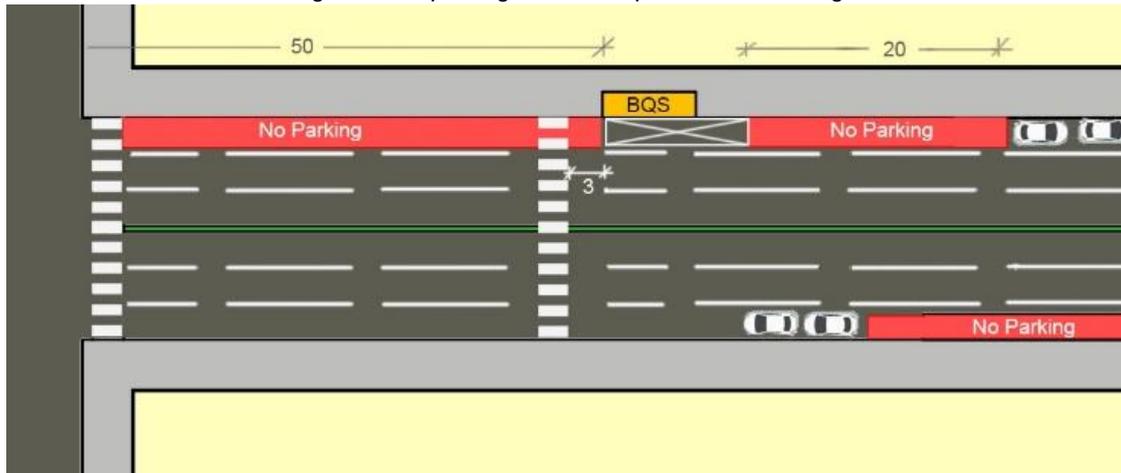
4.4 Parking

- On-street parking should be prohibited 50m before and 20m after the bus box.
- 'No parking' areas are to be defined with signages in the vicinity of bus stops.

4.5 Pedestrian crossings

- Pedestrian crossings, of at least 3m, should be proposed behind the bus box, at a distance of at least 3m, so that oncoming traffic is visible to pedestrians. Signalized crossings should be considered on arterial and sub-arterial roads and raised crossings of 150mm, flushed with the footpath, on collector roads.

Figure 9: No parking zones and pedestrian crossing

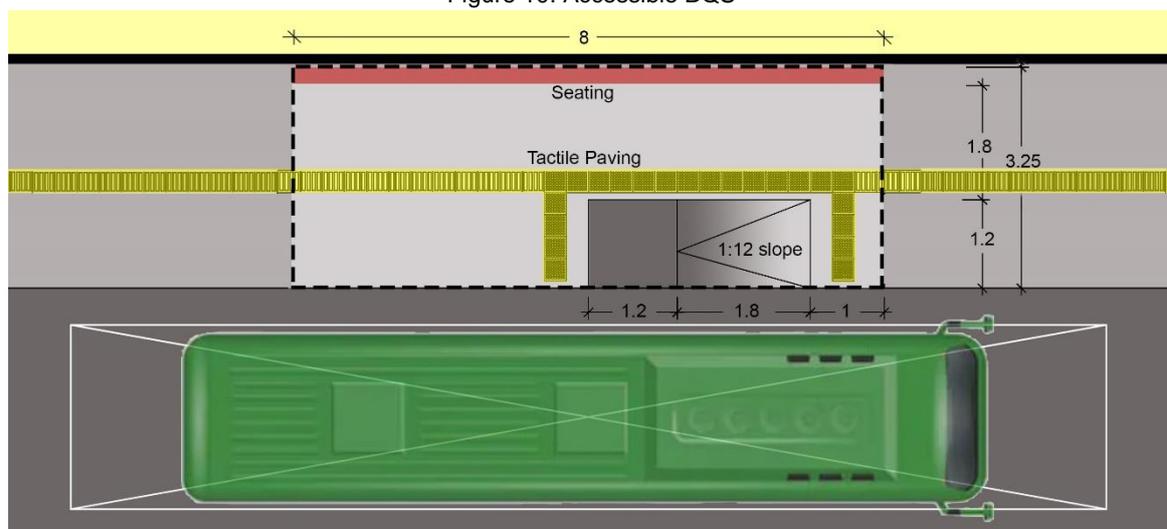


All dimensions are in metres

4.6 Accessibility

- Height of the flooring of the BQS should not be more than 150mm. Where existing footpaths are more than 150mm, access ramps shall reduce the height to 150mm at the BQS. Access ramps at a ratio, not less than of 1:12, shall be provided from the footpath to the carriageway.
- Warning tactile pavers should be provided at the BQS and on the footpath leading to the BQS.

Figure 10: Accessible BQS



All dimensions are in metres

4.7 Lane markings

- Thermoplastic painted lane marking should be done to ensure alignment of buses.

- Bus boxes are to be clearly defined by thermoplastic paint markings and as no stopping zones as per IRC-35: 2015.

4.8 Carriageway and service lane

- In case of insufficient footpath width, unused carriageway width can be used to expand footpath. If a service lane is present, it can be reduced to 3m to increase the footpath width at the BQS. Figure 8).

Annexures

Annexure 1: Review of guidelines

Urban street design guidelines in India and internationally are reviewed to understand recommendations for footpaths, carriageways, universal accessibility, placement of bus shelters and other utilities. These are consolidated in Annexure 1, along with the adopted guidelines.

1.1. Street Design Guidelines for NCT of Delhi, 2010

The Street Design Guidelines aim to enhance mobility, reduce congestion and to promote traffic safety in the National Capital Territory of Delhi. The relevant guidelines are described below:

- Bus stop must be located clear of the 1.8m walking zone of the footpath.
- The multi-function zone should be minimum 1.8m and may locate any or all the following functions within them: Tree planting; planting for stormwater management; auto-rickshaw stands; cycle-rickshaw Stands; hawker Zones; car parking; street furniture; bus stops, streetlights/ pedestrian lights.
- For sidewalks in shopping areas, an extra 1m should be added, as the dead width, to the stipulated 4m width of the footpath.
- In other situations where sidewalks pass next to buildings and fences, a dead width of 0.5m can be added.
- Kerb height for all bus stops as 150mm while only bus shelters for BRT corridors could have kerb height matching the floor of the bus. Tactile pavers should be provided to lead persons with visual impairments to the lifts, crossings, toilets, bus stops, i.e. all public and road facilities.

1.2. Harmonized Guidelines and Space Standards for Barrier-Free Built Environment for persons with Disability and Elderly Persons, 2016

These guidelines were framed to ensure access to persons with disabilities, on an equal basis with others, to the physical environment, transportation, information and communications, including information and communications technologies and systems, and to other facilities and services open or provided to the public, both in urban and in rural areas. Planning and construction of accessible spaces and buildings not only to optimize independent access to Persons with Disabilities (PwD) but also to improve access for all. The guidelines specify that:

- A clear passageway with a minimum width of 1.2m should be provided.
- Seats should be provided at the bus stand for people with ambulatory disabilities.
- Seats should be positioned so as not to impede the movement of wheelchair users.
- Where a bus stand is not on the same level with the walkway or pathway, it should have two separate ramps for boarding and alighting.
- Where there are curbs between the access aisle and the vehicle pick-up space, it should have a kerb ramp.

1.3. IRC 103: 2012, Guidelines for Pedestrian Facilities

The Indian Roads Congress (IRC) has framed guidelines for pedestrian facilities which state that:

- The required width of footpath near bus stop is to be 3m.
- Provision of guard rails alongside walks with suitable openings at bus stops
- Provision of mid-block crossings to be coordinated with bus stop locations.

1.4. Urban Street Guidelines, Pune, 2016

Urban design guidelines for streets in Pune have been formed to prioritize streets for people and not for vehicles. It provides guidelines regarding the designing of a street for appropriate allocation of spaces and general design specifications for various elements of the street. It specifies that:

- Consideration should be given to gradient and raised curbs to drain off water at the bus stops so as to avoid water logging.
- A bus queue shelter should be located at 50 m away from any junction
- Parking should be prohibited in the zone 50m before the bus stop and 20m after bus stop.

1.5. Urban Street Design Guide, NACTO

NACTO is an association of 81 major North American cities and transit agencies formed to exchange transportation ideas, insights, and practices and cooperatively approach national transportation issues. It aims to provide safe, sustainable, accessible and equitable transportation choices. It states that:

- Bus stops must have safe access via sidewalks and appropriate street crossing locations.
- Where possible, pedestrian crossings should be accommodated behind the departing transit vehicle.
- Streets with insufficient queuing space at bus stops should consider the implementation of a bus bulb or dedicated waiting area.

1.6 Bus Stop Design & Accessibility Guidelines, Memphis MPO, 2017

Memphis Urban Agglomeration Metropolitan Planning Organization has laid out guidelines for bus stop design where it states that 2.5m is the minimum width of the footpath in low intensity areas and 3m for high volume areas. It also states that there needs to be a 1.2m wide clear continuous path for pedestrian movement.

1.7 Bus stop Guidelines, SEPTA, 2012

Bus stop design guidelines developed by SEPTA for Delaware Valley states that there needs to be a 3m safety buffer between the pedestrian crossing needs and the bus box.

Annexure 2: Comparison of guidelines
Table 4: Comparison of BQS Guidelines

Parameter	India				International			Adopted guidelines
	Street Design Guidelines for NCT of Delhi, 2010	Urban Street guidelines, Pune, 2016	Guidelines for Pedestrian facilities, Indian Road Congress 103, 2012	Harmonized Guidelines and Space Standards for Barrier-Free Built Environment for persons with Disability and Elderly Persons, 2016	Urban Street Design Guide, NACTO	Bus Stop Design & Accessibility Guidelines, Memphis Metropolitan Planning Organisation	Bus stop Guidelines, SEPTA	Placement Guidelines for Bus Queue Shelters in NCT of Delhi
Street Length	NP	Bus stop to be in the vicinity of the junction but should be located at a distance of 50 m away from any junction.	Mid-block crossings to be coordinated with bus stop locations	NP	NP	A distance of 300m is recommended between bus stops		BQS should be placed at 50m away from the near side of an intersection and at least 20m away from the far side of an intersection.
Footpath Width	Bus stop must be located clear of the 1.8m Walking Zone	NP	The required width of the footpath near bus stop is to be 3m.	A clear passageway with a minimum width of 1.2m should be provided	The required width of footpath near bus stop is to be 3m	Continuous clear width of 1.2m for path of travel through or around the bus stop		Minimum width of the footpath behind the BQS should be 1.8m
	A multi-function zone street should be a minimum of					Minimum sidewalk width is 2.5m for low volume areas and		

								1.8 m Wide, and may locate Bus Stops within it.	3m for high volume areas	
								For sidewalks in shopping areas, an extra 1m should be added to the stipulated 4m width.		For sidewalks in shopping areas, an extra 1m should be added to the stipulated 4m width.
								In situations where sidewalks pass next to buildings and fences, a dead width of 0.5m can be added.		In other situations where sidewalks pass next to buildings and fences, a dead width of 0.5m can be considered.
Pedestrian Crossing	NP	NP	Provision of mid-block crossings to be coordinated with bus stop locations.	NP	Bus stops must have safe access via sidewalks and appropriate street crossing locations. Where possible, pedestrian crossings should be accommodate		Pedestrian crossing to be 3m behind bus box			Pedestrian crossings should be 3m behind the bus box.

					d behind the departing transit vehicle	
Kerb Height	Kerb height for all bus stops as 150mm while only bus shelters for BRT corridors could have kerb height matching the floor of the bus floor.	Height of the flooring of the bus stop should not be more than 150 mm.	NP	Where there are curbs between the access aisle and the vehicle pick-up space, it should have a kerb ramp.	NP	Height of the flooring of the BQS should not be more than 150 mm.
Parking	NP	Parking should be prohibited in the zone 50m before the bus stop and 20m after bus stop.	NP	NP	NP	Parking should be prohibited in the zone 50m before the bus box and 20m after the bus box. 'No parking' areas are to be defined with signages in the vicinity of bus stops.
Universally Accessibility	Tactile pavers should be provided to lead persons with visual impairments to the lifts, crossings, toilets, bus stops, i.e. all public and	NP	Provision of guard rails alongside walks with suitable openings at bus stops	Seats should be provided at the bus stand for people with ambulatory disabilities. Where a bus stand is not on the same level with the walkway or	NP	In low intensity BQS minimum width of BQS should be 3.25m with a 1.2m wide ramp and 1:12 slope for movement of wheelchairs. Tactile paving needs to be provided at bus stops and footpath leading to BQS.

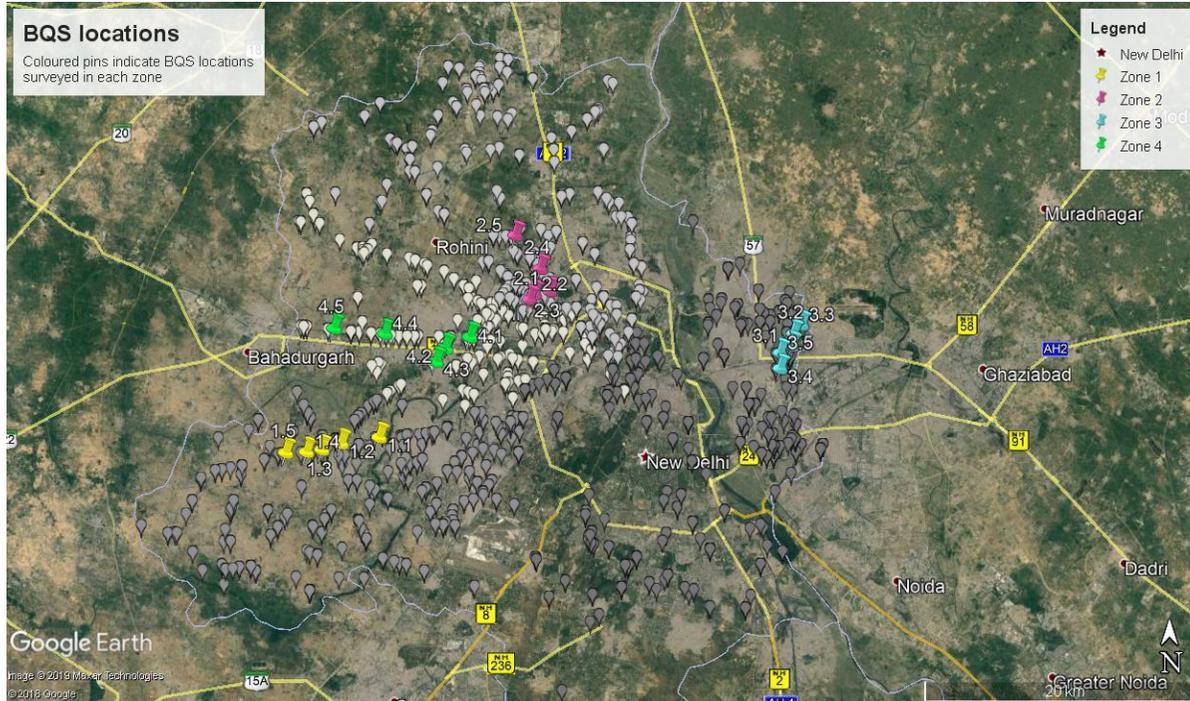
	road facilities.				pathway, it should have two separate ramps for boarding and alighting	
Provision for buses	NP	NP	NP	NP	Streets with insufficient queuing space at bus stops should consider the implementation of a bus bulb or dedicated waiting area.	Bus bulb outs are to be provided to ensure minimum footpath widths, as per IRC:103-2012.
Provision for water logging	NP	Consideration should be given to gradient and raised curbs to drain off water at the bus stops so as to avoid water logging.	NP	NP	NP	The footpath surface shall have a gradient of 1:100 towards the storm water drain to avoid water logging at the BQS.

NP: Not provided

Annexure 3: On-ground assessment

A total of 1397 BQS locations have been identified, out of which 20 locations have been selected (5 in each of the 4 zones. These locations were selected such that different types of land uses were covered in both urban and semi-urban locations.

Figure 11: BQS locations



Zone 1: Janakpuri towards Dwarka and Najafgarh.

Table 5: Site findings in Zone 1

BQS No.	BQS Location	Adjacent Land use	Footpath	Image	Remarks
1.1	Najafgarh Metro Depot	Undeveloped	Absent		2m within the carriage way is used for onstreet vehicle parking, pedestrian use and as waiting area for bus. A bus pole indicates the bus stop.
1.2	Najafgarh Health Centre	Institutional	Footpath was 2.5m wide with 1.2m wide unpaved and unused carriageway which is also being used for pedestrian use. Kerb height is 300mm.		2m of the BQS roof is encroaching on the adjacent property.
1.3	RC Institute of Technology	Institutional/ low intensity commercial	5.5m wide BQS with 2.5m wide footpath behind the BQS. Kerb height 150mm.		No visible lane marking, bus box marking or pedestrian crossing
1.4	Indera Service Station	Low intensity commercial	BQS is located on 2.5m wide unpaved footpath. There is a 2m wide paved footpath for pedestrians.		
1.5	Mitraon Village	Low intensity mixed-use	1.8m wide paved footpath with a 2.5m wide unpaved multi-utility zone. An outdoor bench acts as the waiting area.		There is no marking for a bus stop, bus box, lane marking or pedestrian crossing. No regulated on-street parking or vendor locations

Zone 2: Rohini, Pitampura and surroundings

Table 6: Site findings in Zone 2

BQS No.	BQS Location	Adjacent Land use	Footpath	Image	Remarks
2.1	Nav Durga Mandir	Residential	4m wide footpath with a 1.2m wide BQS. Kerb height is 150mm.		Vendor located immediately behind the BQS.
2.2	Rohini Sector 7,8 Metro	Transit	7.5m wide footpath with 5m pedestrian walkway behind BQS. Kerb height is 150mm.		
2.3	Pitampura RU Block	Commercial	1.8m wide drainage cover acting as a footpath. At BQS location, the footpath is 2.2m.		A 5.5m wide service lane is between the footpath and the 1.2m wide sloped pedestrian footpath in front of the commercial buildings.
2.4	Vidyasagar Marg Crossing	Residential	2.5m wide footpath containing the BQS.		A 5.5m wide service lane is provided between the footpath and the 0.9m wide pedestrian footpath along the boundary wall. The BQS are not staggered which results in the pedestrian crossing in front of the BQS.

2.5	Shahbad Village	Low intensity mixed use	2.5m wide footpath with a 4.5m wide unused and unpaved carriageway acting as a multi-use zone for BQS, trees, vendors, on-street parking, etc.		A bus pole indicates the bus stop.
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Zone 3: East Delhi, near Dilshaad Gardens

Table 7: Site findings in Zone 3

BQS No.	BQS Location	Adjacent Land use	Footpath	Image	Remarks
3.1	Dilshaad Garden metro	Transit	Footpath width 2.5m. Kerb height 300mm		Vendors located take up entire footpath leaving n pedestrian walkway
3.2	Tahir Pur	Residential	Unpaved footpath is 6.5m wide. Kerb height 300mm		Guard railings present at BQS location
3.3	Anand Gram Ashram	Residential/ Utility	2m wide footpath with an open drain adjacent to it. Kerb height 150mm		Mohalla clinic located within 15m where the footpath is 5m wide.
3.4	Surajmal Vihar	Low intensity commercial	3.4m wide footpath with 900mm pedestrian walkway behind BQS. Kerb height 300mm		5.5m service lane behind footpath. Dedicated parking bay 7m behind BQS.

3.5	Jhilmil colony Phase II	Low intensity mixed use	No present BQS. Location marked is adjacent to underpass and was not serviced by buses. Possible BQS location was 100m from given location (50m from underpass exit. Kerb height 300mm		Possible location has 2.5m wide service lane. 3m wide footpath.
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Zone 4: Pashchim Vihar and Mundka.

Table 8: Site findings in Zone 4

BQS No.	BQS Location	Adjacent Land use	Footpath	Image	Remarks
4.1	Jwalapuri	Low intensity commercial	1.2m drain cover acting as footpath. BQS located on unpaved extension of footpath. Kerb height 75mm.		3.6m unpaved, undeveloped area between footpath and 5.5m wide service lane.
4.2	Karmuddin Nagar	Low intensity mixed use	1m wide concrete footpath and a 2m wide covered drain which is paved. No BQS present. Kerb height 300mm		Footpath is broken and not maintained. No indication of a bus stop. Carriageway is blocked by continuous on-street parking.
4.3	Kunwar Singh Nagar	Low intensity commercial	4.5m wide paved footpath which was broken at places and 75mm kerb height.		No indication of a bus stop.

4.4	Swarn Park	Mixed use/ transit	approximately 2m wide drainage cover		Area was not maintained and flooded with drainage water. No place for pedestrian walkway.
4.5	Tikri Hospital	Undeveloped land	2m wide covered drain which is paved.		

Annexure 4: Checklist for Site
Table 9: Checklist for site

Elements	Site conditions		Action to be taken (as per guidelines)
Location			
Distance from near side			
Distance from far side			
Footpath			
Width at BQS			
Width at bus box			
Length of bus box			
Height of footpath			
Footpath surface (Tick all that apply)	No footpath		
	Broken		
	Grass/weed		
	Garbage		
	Uneven		
	Even, well-maintained surface		
	Others (please mention)		
Obstruction/ Element	Parking (within 50m before BQS and 20m after BQS)		
	Vendors/ Kiosks (within bus box length)		
	Functioning pedestrian streetlight		
	Others (please mention)		
Universal Accessibility (yes/no)			
Tactile pavers as per IRC: 103-2012			
Access ramps from footpath to carriageway			
Carriageway			
Width			
Unused carriageway width			
Service lane If yes, width	Y	N	
	Bus box marking		

Road marking and signages (Tick all the apply)	Vehicles parked within bus box		
	Vendors		
	No parking signage		
	No stopping zone marking at bus box for other vehicles		
Images (Cover extent from boundary to median, from either side of BQS)			

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