

7. DISABLED FRIENDLY FEATURES

7.1 COVERAGE

The proposed mass transport system should be user-friendly which ensures accessibility to persons with disabilities, people travelling with small children or are carrying luggage, as well as people with temporary mobility problems (e.g. a leg in plaster) and the elderly persons.

Design standards for access to public transport infrastructure including associated facilities, services and information, etc. would benefit people using the system.

The standards provided here are extracted from 'Indian Roads Congress' (IRC) Code, 103:2012, Guidelines for Pedestrian Facilities, Model Building Bye Laws-2011 and National Building Code-2005; Central Public Works Department's (CPWD) "Space Standards for Barrier Free Built Environment for Disabled and Elderly Persons-1998" and 2013 edition (under revision by MoUD), and other international best practices/standards. Further, attempts have been made to standardize boarding & alighting area, approach to station, car parking area, drop-off and pick-up areas, taxi/auto rickshaw stand, bus stand/stop, footpath (sidewalk), kerb ramp, road intersection, median/pedestrian refuge, traffic signals, subway and foot over bridge etc. to achieve a seamless development around metro stations.

7.2 RAIL TRANSPORT SYSTEM

- i. The rail based mass transport system is a highly effective mode of transport may it be elevated, at-grade or underground. The system should have the following features:
 - Station areas and train should have fully accessible coaches including doorway access for wheel-chairs.
 - Staff should be trained in methods of assistance and be at hand on request of the passengers.
 - Staff should be on hand to assist persons with disabilities and elderly to enter or exit through convenient gates.
- ii. Accessible metro rail coaches should have the following features:
 - Metro car doors should be at least 900 mm wide.
 - The gap between the car doors and the platform should preferably be less than 12 mm.

- Identification signage should be provided on the doors of wheelchair accessible coach.
 - If the car door and the platform cannot be at the same level, then at least one car doors should have apparatus such as a hydraulic lift or pull-out ramp installed in the doorway for wheelchair users.
- iii. Wheel Chair space
- Space for a wheel chair should be available at the side of the door
 - The space should be indicated inside and outside the car by using the international symbol of access
 - Wheel stoppers and ring-strap or other appropriate safety grip should be provided for wheel-chair users.
- iv. Seats
- An appropriate number of designated seats for passengers with disabilities and elderly people should be provided near the doors.
- v. Aisles
- Aisles should be at least 900mm wide.

7.3 METRO RAILWAY STATIONS

7.3.1 Level Approach

- Approach route should not have level differences. If the station is not on the same level as the walkway or pathway, it should have a ramp.
- Walkway surfaces should be non-slippery.
- Approach walkway should have tactile pavements for persons with visual impairments.

7.3.2 Station Entrances and Exits

- These should have a minimum width of 1800mm and should be at level or ramped.

7.3.3 Reservation and Information Counters

- Should have clear floor space of at least 900 mm x 1200 mm in front of the counters.

- There should be at least one low counter at a height of 750 mm to 800 mm from the floor with clear knee space of 750 mm high by 900 mm wide by 480 mm deep.
- At least one of the counters should have an induction loop unit to aid people with hearing impairments; and
- The counters should have pictographic maps indicating all the services offered at the counter and at least one of the counter staff should be sign language literate.

7.3.4 Toilet Facilities

- There should be at least one unisex accessible toilet
- Ticket Gates

At least one of the ticket gates should:

- Be minimum 900 mm wide to allow a wheelchair user through
- Have a continuous line of guiding paver for people with visual impairments.

7.3.5 Platforms

The platforms in the station should have following characteristics:

- Have a row of warning paver installed 600mm before the track edge.
- Have non-slip and level flooring.
- Have seating areas for people with ambulatory disabilities.
- Be well illuminated with a level of 35 to 40 lux.
- There should be no gap or difference in level between the train entry door and the platform.
- All platforms should be inter-connected by means of accessible routes or lifts from concourse level and provide accessible level entrance to the train coach.

7.3.6 Way Finding

Way finding features is an important factor in identification of path/routes in the station areas. The characteristics of way finding information are summarized below with signage shown in Figure 7.1.

- Way finding references should be available at decision points.
- Colour can be used to identify routes and provide assistance in locating doors, walls and hazards. Proper colour contrast between different elements greatly improves visibility for all users and is critical for persons with low vision. For example, colour contrasting of door frames can assist in locating doors, and likewise floors should be contrasted with walls. In addition, furniture should contrast with walls and floors so as not to create an obstacle.
- Structural elements such as columns should be colour contrasted or brightly marked so as to be visible to those who may have a visual disability.
- Generally, patterns on flooring should be avoided or else should be minimal and small to avoid visual confusion.
- In addition to identifying hazards or warnings, tactile floor surfaces can also be used to inform that there is a change in area (e.g. leaving a corridor and entering a boarding area).
- Tactile system should be consistent throughout the building. For example, terminals should not have carpeting in some boarding areas and tile in others as this may create confusion for those who rely on tactile surfaces to guide them to their destination.
- Good lighting assists those with a visual disability to see better and allows person with hearing impairment to lip read easier. However, care should be taken to properly direct lighting and to use matte finishes on floors, walls and signage, so as not to create glare which may create difficulties for all travellers.
- Blinds can be used to adjust lighting levels in areas where the natural lighting changes significantly throughout the day.

7.3.7 Signage

Signs must be clear, concise, and consistent. All travellers need clear information about the purpose and layout of stations to maintain a sense of direction and independent use of all facilities. Using internationally and nationally established symbols and pictograms with clear lettering and 'Braille' ensures universal accessibility cutting across regional/cultural and language barriers.

FIGURE 7.1: WAY FINDING SIGNAGE



FIGURE 7.2: INTERNATIONAL SYMBOL OF ACCESS



A cohesive information and signage system can provide visual (e.g. signs, notice boards), audible (e.g. public address and security systems, induction loops, telephones, and infrared devices), and/ or tactile information (e.g. signs with embossed lettering or Braille). The international symbol of accessibility is shown in **FIGURE 7.1** and **FIGURE 7.2**.

7.3.8 Sign Design Specifications

- The sign should be in a prominent position.
- The face of the sign should be well-illuminated by natural or artificial light.
- Letters should be simple such as Arial, Helvetica medium, and san serif or similar and numbers should be Arabic.
- The colour of the text should be in a colour that contrasts with the sign board.
- The sign board should also contrast with the wall on which it is mounted.
- The surface of the sign should not be reflective.
- Some signs such as those adjacent to or on a toilet door may be embossed so that they can be read by touch.
- Illuminated signs should not use red text on a dark background.
- Signs should be supplemented by Braille where possible.

7.3.9 Automated Kiosks

- Automated kiosks should be accessible for wheelchair users.
- These kiosks should be clearly marked with international symbol of accessibility.
- Kiosks should have 'Braille' buttons and audio announcement system for persons with vision impairments.
- Operations should be easy to understand and operate for persons with learning disabilities, intellectual disabilities, and elderly persons.

7.3.10 Public Dealing Counters

- Ticketing, Information, Check-in, Help Desk, Restaurants, Shops, etc. should have public dealing counters.
- Information or help desks should be close to the terminal entrance, and highly visible upon entering the terminal. In addition, they should be clearly identified and accessible to both those who use wheelchairs and those who stand.
- It should provide information in accessible formats, viz. Braille leaflets for persons with vision impairments.
- These desks should have a map of the facility that desk attendants can view with passengers, when providing directions.
- Staff manning the counters should know the sign language.
- Information desk acoustics should be carefully planned and controlled as a high level of background noise is confusing and disorienting to persons with hearing impairment.
- Lighting should be positioned to illuminate the receptionist/person manning the counter and the desk top without creating glare.
- Lighting should not create shadows over the receptionist staff, obscuring facial detail and making lip reading difficult.
- There should be a hearing enhancement system such as a loop induction unit, the availability of which is clearly indicated with a symbol.
- One of the counters should not be more than 800mm from the floor, with a minimum clear knee space of 650mm high and 280mm- 300mm deep.

7.3.11 Audio-Visual Displays

- Terminal maps should be placed so that they are readily visible to persons who are standing and persons who use wheelchairs. They should also be accessible to persons with a visual disability (i.e. tactile maps). Other alternatives include electronic navigation systems or audio maps.
- Enable captioning at all times on all televisions and other audiovisual displays that are capable of displaying captions and that are located in any portion of the terminal.
- The captioning must be in high contrast for all information concerning travel safety, ticketing, check-in, delays or cancellations, schedule changes, boarding information, connections, checking baggage, individuals being paged by bus railway or airlines, vehicle changes that affect the travel of persons with disabilities, and emergencies(e.g. fire, bomb threat etc.)

7.3.12 Rest Areas/Seating

- Seating area / benches should be provided along the circulation path at regular intervals so that passengers do not need to walk more than 50 to 60 metres before being able to sit and rest.
- Where seating is provided, designated seating for passengers with disabilities is to be provided at boarding gates and departure areas within viewing distance of communication boards and/or personnel and identified by the symbol of access.
- Seating should be provided in passenger service areas where there may be long waiting lines or times, including at ticket sales counters, check-in counters, etc.
- Designated seating should be provided for boarding gates and departure areas within viewing distance of communication boards, and within hearing range of audio announcements as well. Such seating areas should be identified by the symbol of accessibility.
- The chains for persons with disabilities chairs should have armrests and backrest.

7.3.13 Tactile Paving- Guiding & Warning

(a) Tactile Guiding Paver (Line-Type)

It is recommended to install a row of tactile guidance paver along the entire length of the proposed accessible route for visual impaired persons. Care must be taken to ensure that there are no obstacles, such as wall, pillar, uneven surfaces, Soffit (underside /open area under the stairs etc. along the route traversed by the guidance paver. Also, there should be clear headroom of at least 2.1 meters height above the tactile guidance paver, free of protruding objects such as overhanging advertisement panel and signage, along the entire length of the walk.

(b) Tactile Warning Paver (Dot-Type)

These paver indicate an approaching potential hazard or a change in direction of the walkway and serve as a warning of the approaching danger to persons with visual impairments, preparing them to tread cautiously and expect obstacles along the travel path, traffic intersections, doorways, stairs, etc. They are used to screen off obstacles, drop-offs or other hazards, to discourage movement in an incorrect direction and to warn of a corner or junction. Two rows of tactile warning paver should be installed across the entire width of the designated accessible passenger pathway at appropriate places such as before intersections, terminal entrances, obstacles such as signage, and each time the walkway changes direction.

7.3.14 Places to Install Warning Paver

- In front of an area where traffic is present.
- In front of an entrance/exit to and from a staircase or multi-level crossing facility.
- Entrances/exits metro stations or boarding areas.
- Guiding & warning tactile paving for metro systems are shown in the **FIGURE 7.3** and **FIGURE 7.4** below.

FIGURE 7.3: GUIDING PAVER

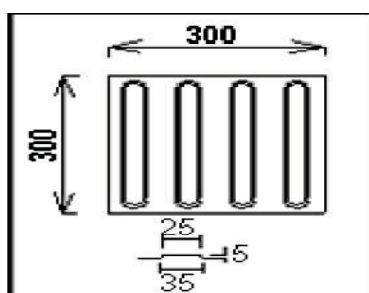
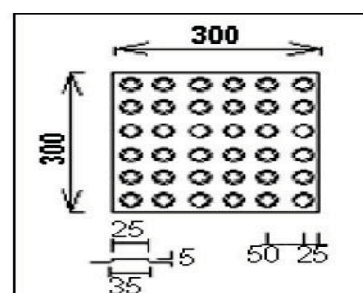


FIGURE 7.4: WARNING PAVER





7.3.15 Doors

The entrance door must be wide enough to accommodate passenger traffic comfortably.

- The recommended minimum clear opening width of an internal door is 900mm minimum.
- Where doors comprise two leaves (i.e. double doors), each leaf should be 900mm minimum wide, so that persons carrying large items and people using wheelchairs do not have to open both leaves.
- Manual doors should incorporate kick plates 300-400mm high to withstand impact of wheel-chair footrest (this is especially important where doors are glazed).
 - Also be fitted with vision panels at least between 900mm and 1500mm from floor level.
 - Be colour contrasted with the surrounding wall and should not be heavier than 22N to open.

- Lever handles and push type mechanisms are recommended. When a sliding door is fully open, handles should be usable from both sides.
- A distance of 400mm should be provided beyond the leading edge of door to enable a wheelchair user to manoeuvre and to reach the handle.
- To ensure maximum clarity for persons with visual impairments, the entrance should be easily distinguishable from its surroundings by the effective use of landscaping, signage, colour (preferably yellow/orange), tonal contrast and tactile surfacing.
- Door hardware should be positioned between 900-1000mm above floor.
- Operable devices such as handles, pulls, latches and locks should:
 - Be operable by one hand
 - Not require fine finger control, tight grasping, pinching or twisting to operate
- Glazed doors and fixed glazed areas should be made visible by use of a clear, colour and tone contrasted warning or decorative feature that is effective from both inside and outside and under any lighting conditions, e.g. a logo, of minimum dimensions 150mm by 150mm (though not necessarily square), set at eye level.

7.3.16 Steps & Stairs

- Steps should be uniform with the tread not less than 300mm and the risers 150mm.
- The risers should not be open.
- The steps should have an unobstructed width of 1200mm minimum.
- All steps should be fitted with a permanent colour and tone contrasting at the step edge, extending the full width of the step, reaching a minimum depth of 50mm on both tread and riser.
- Have continuous handrails on both sides including the wall (if any) at two levels
- Warning paver to be placed 300mm at the beginning and at the end of all stairs.
- Nosing to be avoided.

- The staircase should be adequately and uniformly illuminated during day and night (when in use). The level of illumination should preferably fall between 100-150 lux.
- The rise of a flight between landings must be no more than 1200mm.
- There should be no more than 12 risers in one flight run.
- The stair covering and nosing should be slip-resistant, non-reflective, firmly-fixed and easy to maintain.
- Soffit (underside /open area under the stairs) of the stairs should be enclosed or protected.

7.3.17 Handrails

- Handrails should be circular in section with a diameter of 38-45mm and formed from materials which provide good grip such as timber, nylon or powder coating, matt finish metal finishes.
- The handrail should contrast in colour (preferably yellow/orange) with surrounding surfaces.
- At least 50mm clear of the surface to which they are attached and should be supported on brackets which do not obstruct continuous hand contact with the handrail.
- The handrail should be positioned at two levels- 760mm and 900mm above the pitch line of a flight of stairs.
- Handrail at foot of the flight of stairs should extend 300mm beyond the stairs in the line of travel and returning to the wall or floor or rounded off, with a positive end that does not project into the route of travel.

7.3.18 Ramps

- Ramps gradient should ideally be 1 in 20 and not greater than 1 in 12.
- Width of the ramp should not be less than 1200mm and preferred width is 1800mm.
- The steeper the gradient, the shorter the length of ramp between landings.
- On long ramps, a horizontal resting space should be provided every 6 meters.

- Surface materials should be slip-resistant, non-reflective, firmly-fixed and easily maintained.
- The edge of the ramp should have an edge protection with a minimum height of 100mm.
- Landings every 750 mm of vertical rise.
- A tapping or lower rail should be positioned so that its bottom edge is no higher than 200mm above ground level.
- Handrails on the ramps should be on both sides at two levels: upper at 900mm and lower at 760mm; both ends to be rounded and grouted; extend 300 mm beyond top and bottom of ramp.
- A row of tactile warning paver should be placed 300mm beginning and end of each run.
- Landings should be provided at regular intervals as indicated in **TABLE 7.1**.

TABLE 7.1: SPECIFICATIONS FOR RAMPS

Level difference	Minimum gradient of Ramp	Ramp Width	Handrail on both sides	Comments
≥ 150 mm ≤ 300 mm	1:12	1200 mm	✓	
≥ 300 mm ≤ 750 mm	1:12	1500 mm	✓	Landings every 5 meters of ramp run.
≥ 750 mm ≤ 3000mm	1:15	1800 mm	✓	Landings every 9 meters of ramp run.
≥ 3000 mm	1:20	1800 mm	✓	Landings every 9 meters of ramp run.

7.3.19 Lifts/Elevators

Carefully designed lift makes a huge contribution to the accessibility of a multi-storied station building for persons with disabilities.

- Lift locations should be clearly signposted from the main pedestrian route and recognizable through design and location.
- The colour and tone of the lift doors should contrast with the surrounding wall finish to assist in their location. Lift doors with metallic finishes such as steel grey and silver should be avoided as they are difficult to identify by persons with low vision.

- The lift lobby shall be of an inside measurement of 1800mm X 2000mm or more. A clear landing area in front of the lift doors of minimum dimensions 1500mm x 1500mm should be provided.
- By making the landing area distinguishable by floor surface and contrast, it will aid location and recognition of core areas. This could comprise a change in floor finish from thin carpet to vinyl/PVC, or cement/mosaic floor to carpet.
- Changes in floor finish must be flushed. There should be no level difference between lift door and the floor surface at each level; the gap if unavoidable should not be more than 12mm.
- The floor level/location should be indicated on the wall adjacent to or just above the call buttons, and opposite the lift doors where possible.

7.3.20 Lift Dimensions

- Provisions of at least one lift shall be made for people using wheelchairs with the following car dimensions:
 - Clear internal depth - 1500 mm minimum
 - Clear internal width - 1500 mm minimum
 - Entrance door width - 900 mm minimum

7.3.21 Lift Controls

- The lift call button should be wall-mounted adjacent to the lift and should contrast with wall finish, either by using a contrasting panel, or a contrasting border around the button panel.
- The call buttons should be located within the range 800-1000mm above floor finish.
- Buttons should not be touch sensitive, but should require a light positive pressure and should ideally be large enough to be operable by the palm of the hand if required.
- The control buttons inside the lift should be positioned on the side wall rather than front wall to allow access from the back and front of the lift car, by mobility aid users like wheelchair users.
- The control buttons should contrast with their surroundings and illuminate when pressed and should incorporate highly visible tactile embossed (NOT engraved) characters and in Braille.

- Time of closing of an automatic door should be more than 5 seconds and the closing speed should not exceed 25 meters per second. There should be a provision of sensor enabled closing.
- In larger lifts, controls should be positioned on both side walls, at least 400mm from front wall and between 800-1000mm above floor level.

7.3.22 Car Design

- Internal walls should have a non-reflective, matt finish in a color and tone contrasting with the floor, which should also have a matt, non-slip finish.
- Use of reflective materials such as metal (stainless steel for example) can be problematic in creating sufficient contrast with control buttons, emergency telephone cabinet, etc. for persons with low vision and the use of such materials should be avoided wherever possible.
- A mirror (750mm above floor level) on the rear wall can be useful to persons using wheelchairs and other mobility aids should they need to reverse safely out of the lift carer view the floor numbers.
- Internal lighting should provide a level of illumination of minimum 100 lux (approximately 50-75 lux at floor level), uniformly distributed, avoiding the use of spotlights or down lighters.
- A grab bar should be provided along both sides and the back wall, 900mm above floor level.
- Handrails should be of tubular or oval cross section, in order to be easily gripped and capable of providing support.
- Handrails should be positioned so that there is a clear space behind the handrail to allow it to be grasped i.e. knuckle space should be 50mm.

7.3.23 Information Systems

A map of train routes should be installed. This should be in Braille/raised numbers as well.

- In each car, there should be an announcement and provision of a visual display of the names of stations route. Announcement system should be of 50 decibel.
- Lifts should have both visual and audible floor level indicators

- Audible systems are also usually capable of incorporating additional messages, such as door closing, or, in the case of an emergency, reassurance (with manual over-ride allowing communication with lift occupants).
- This display should be in raised numbers with sharp contrast from the background. The display could be digital or segmented LED, or an appropriate alternative. A yellow or light green on black display is preferred to a red on black display as it is easier to read.

7.3.24 General and Accessible Toilets

a. Signages

- All signage of general toilets should be in bold and contrasting colours.
- For persons with low vision and vision impairments: male pictogram in triangle and female pictogram in circle, marked on plates along with Braille & raised alphabets, to be mounted on wall next to door near the latch side, at a height between 1400mm-1600mm.
- Warning strip/ thin rubber door mat to be provided 300mm before and after the toilet entrance.
- Tactile paver to be provided for urinals, WC and washbasins for persons with vision impairments.

b. Accessible Toilets

- Should have the international symbol of accessibility displayed outside for wheel chair access.
- The toilet door should be an outward opening door or two way opening or a sliding type and should provide a clear opening width of at least 900mm.
- It should have a horizontal pull-bar, at least 600mm long, on the inside of the door, located so that it is 130mm from the hinged side of the door and at a height of 1000mm.

c. WC Compartment Dimensions

- The dimensions of a unisex toilet are critical in ensuring access. The compartment should be at least 2200mm and 2000mm. This will allow use by both manual and motorized wheelchair users.
- Layout of the fixtures in the toilet should be such that a clearing manoeuvring space of 1500mm x 1500mm in front of the WC and washbasin.

d. Water Closet (WC) Fittings

- Top of the WC seat should be 450-480mm above finished floor level, preferably be of wall hung or corbel type as it provides additional space at the toe level.
- An unobstructed space 900mm wide should be provided to one side of the WC for transfer, together with a clear space 1200mm deep in front of the WC.
- WC should be centred 500mm away from the side wall, with the front edge of the pan 750mm away from the back wall. Have a back support. The WC with a back support should not incorporate a lid, since this can hinder transfer.
- L-shape grab bar at the adjacent wall and on the transfer side (open side) swing up grab bar shall be provided.
- The cistern should have a lever flush mechanism, located on the transfer side and not on the wall side and not more than 1000mm from the floor.

e. Grab Bars

- Grab bars should be manufactured from a material which contrasts with the wall finish (or use dark tiles behind light coloured rails), be warm to touch and provide good grip.
- It is essential that all grab rails are adequately fixed, since considerable pressure will be placed on the rail during manoeuvring. Grab bars should sustain weight of 200kg minimum.
- A hinged type moveable grab bar should be installed adjacent to the WC on the transfer side. This rail can incorporate a toilet tissue holder. A distance of 320mm from the centre line of the WC between heights of 200-250mm from the top of the WC seat. It should extend 100-150mm beyond the front of the WC.
- A fixed wall-mounted L-shape grab bar (600mm long horizontal and 700mm long vertical) on the wall side should be provided. It should be placed at a height of 200-250mm above the WC seat level.

f. Washbasins

- Hand washbasins should be fitted on cantilevered brackets fixed to the wall.

- The basin should be fixed no higher than 750mm above the finished floor level.
- Be of dimensions 520mm and 410mm, mounted such that the top edge is between 800-900mm from the floor; have a knee space of at least 760mm wide by 200mm deep by 650-680mm high.
- The position of the basin should not restrict access to the WC i.e. it should be located 900mm away from the WC.
- A lever operated mixer tap fitted on the side of the basin closest to the WC is useful as it allows hot and cold water to be used from a seated position on the WC.
- The hand drying facilities should be located close to the hand washbasin between 1000-1200mm.
- Lever type handles for taps are recommended.
- Mirror's bottom edge to be 1000mm from the floor and may be inclined at an angle.

g. Fixtures and Fittings

- Contrast between fittings and fixtures and wall or floor finishes will assist in their location. For example, using contrasting fittings, or dark tiles behind white hand wash basins and urinals, contrasting soap dispensers and toilet roll holders. Contrast between critical surfaces, e.g. floors, walls and ceilings helps to define the dimensions of the room.
- Towel rails, rings and handrails should be securely fixed to the walls and positioned at 800-1000mm from the floor.
- The mirror should be tilted at an angle of 30° for better visibility by wheelchair users.
- It should have lower edge at 1000mm above floor finish and top edge around 1800mm above floor finish.
- Hooks should be available at both lower-1200mm and standard heights-1400mm, projecting not more than 40mm from the wall.
- Where possible, be equipped with a shelf of dimensions 400mm x 200mm fixed at a height of between 900mm and 1000mm from the floor.

- Light fittings should illuminate the user's face without being visible in the mirror. For this reason, most units which have an integral light are unsatisfactory.
- Large, easy to operate switches are recommended, contrasting with background to assist location, at a maximum height of 1000mm above floor finish.
- All toilet facilities should incorporate visual fire alarms.
- Alarms must be located so that assistance can be summoned both when on the toilet pan i.e. at 900mm height and lying on the floor i.e. at 300mm, from floor surface. Alarms should be located close to the side wall nearest the toilet pan, 750mm away from rear wall and at 900mm and 200mm above floor finish.

h. Signage of Accessible Toilets

- All unisex accessible toilets to have access symbol in contrast colours. A distinct audio sound (beeper/clapper) may be installed above the entrance door for identification of the toilets.

FIGURE 7.5: SIGNAGE FOR ACCESSIBLE WASHROOM



7.3.25 Accessible Urinal

- At least one of the urinals should have grab bars to support ambulant persons with disabilities (for example, people using mobility aids like crutches).
- A stall-type urinal is recommended.
- Urinals shall be stall-type or wall-hung, with an elongated rim at a maximum of 430mm above the finish floor. This is usable by children, short stature persons and wheelchair users.
- Urinal shields (that do not extend beyond the front edge of the urinal rim) should be provided with 735mm clearance between them.

- Grab bars to be installed on each side, and in the front, of the urinal.
- The front bar is to provide chest support; the sidebars are for the user to hold on to while standing.

7.3.26 Drinking Water Units

- Drinking water fountains or water coolers shall have up front spouts and control.
- Drinking water fountains or water coolers shall be hand-operated or hand and foot operated.
- Conventional floor mounted water coolers may be convenient to individuals in wheelchairs if a small fountain is mounted on the side of the cooler 800mm above the floor.
- Fully recessed drinking water fountains are not recommended.
- Leg and knee space to be provided with basin to avoid spilling of water. This allows both front and parallel access to taps for persons using mobility aids like wheel chair, crutches etc.

7.3.27 Visual Contrasts

- Visual contrasts means adequate contrast created by difference of at least 30 LRV (Light Reflectance Value) of the two surfaces/ objects and it helps everyone especially persons with vision impairments.
- Visual contrast should be provided between:
 - Critical Surfaces (walls, ceiling and floor),
 - Signage and background sign frame/ wall,
 - Step edges and risers/ treads on steps,
 - Handrails and background walls,
 - Doors and surrounding walls,
 - Switches/ sockets and background wall,
 - Toilet fixtures and critical surfaces in toilet.
- Barriers and hazards should be highlighted by incorporating colors and luminance contrast.

7.4 EMERGENCY EGRESS/EVACUATION

- Placement (accessibility) and visibility of such devices is very important. The following is to be considered for the installation of such alarm devices; fire alarm boxes, emergency call buttons and lit panels should be installed between heights of 800mm and 1000mm from the furnished floor surface. These should be adequately contrasted from the background wall and should be labelled with raised letters and should also be Braille.
- A pre-recorded message, alerting an emergency to the control room or reception should be installed in the telephone and this should be accessible by a 'hotkey' on the phone keypad. This 'hotkey' should be distinct from the rest of the keypad.

7.4.1 Alerting Systems

- In emergency situations, it is critical that people are quickly alerted to the situation at hand, for persons with disability the following needs to be considered.
- Consider having audible alarms with 'voice instructions' that can help guide them to the nearest emergency exit. As an alternative to the pre-recorded messages, these alarms may be connected to the central control room for on-the-spot broadcasts.
- Non-auditory alarms (visual or sensory) to alert persons with hearing impairments should be installed at visible locations in all areas that the passengers may use (including toilet areas, etc).

Non-auditory alarms include:

- Flashing beacons
- Vibrating pillows and vibrating beds.
- Pagers or mobile phones that give out a vibrating alarm along with a flashing light (these may be issued to persons with vision or hearing impairments at the time of check-in or boarding the vehicle.)

7.4.2 Written Evacuation Procedure

A written evacuation procedure that details the egress plan for people with disability should be installed behind the entrance door in the accessible rest rooms. The evacuation procedure should be detailed in large print letters that contrast strongly against the background. Where possible, it should also incorporate raised letters and

Braille. The evacuation route should be displayed on a high contrast tactile map for benefit of persons with vision impairments.

7.4.3 Emergency Evacuation Route

- Designate routes that are at least 1200mm wide, to ensure that a person using a wheelchair and a non-disabled person are able to pass each other along the route. The route should be free of any steps or sudden changes in level and should be kept free from obstacles such as furniture, coolers, AC units and flower pots.
- Use Exit signage along the route. Orientation and direction signs should be installed frequently along the evacuation route and these should preferably be internally illuminated. The exit door signage should also be internally illuminated.
- A 'way guidance lighting system' consisting of low mounted LED strips to outline the exit route (with frequent illuminated direction indicators along the route) should be installed along the entire length of the evacuation route. Way guidance systems allow persons with vision impairments to walk significantly faster than traditional overhead emergency lighting. Moreover, emergency exit lights in green colour and directional signals mounted near the floor have been found to be useful for all people in cases where a lot of smoke is present.

7.4.4 Way Guidance System

- Luminance on the floor should be 1lux minimum provided on along the centre line of the route and on stairs.
- Install clear illuminated sign above exit and also directional signage along the route.
- The directional exit signs with arrows indicating the way to the escape route should be provided at a height of 500mm from the floor level on the wall and should be internally illuminated by electric light connected to corridor circuits.

7.4.5 Fire Resistant Doors

Fire resistant doors and doors used along the emergency evacuation route are generally heavy and the force required to open these is much higher than 25 Newton, making it difficult for people with disability to negotiate these doors independently. There are, however, magnetic and other types of door holders available that can be

connected to fire alarms so that they will hold the doors open normally but will release the doors when the fire alarm is activated.

7.5 STREET DESIGN

a. Footpath (Sidewalk)

Footpaths should be regarded as a transportation system which is connected and continuous, just like roadways and railways. They should not be sporadically placed where ever convenient, but instead should be provided consistently between all major attractions, trip generators, and other locations where people walk.

Footpath should have the following characteristics:

- Be along the entire length of the road;
- Have height of a standard public step riser i.e. 150 mm maximum;
- Be at least 1800 mm wide;
- Have non-slip surface;
- Have tactile guiding paver for persons with visual impairments;
- Preferably have well defined edges of paths and routes by use of different colours and textures;
- Have no obstacles or projections along the pathway. If this is unavoidable, there should be clear headroom of at least 2200 mm from the floor level;
- The minimum 1.8m (width) x 2.2m (Height) Walking Zone should be clear of all obstructions both horizontally and vertically.
- Have kerb ramps where ever a person is expected to walk into or off the pathway; and
- Have tactile warning paver installed next to all entry and exit points from the footpath.

b. Kerb Ramp

- Kerb should be dropped, to be flush with walk way, at a gradient no greater than 1:10 on both sides of necessary and convenient crossing points. Width should not be less than 1200 mm. If width (X) is less than 1200mm, then slope of the flared side shall not exceed 1:12.

- Floor tactile paving- Guiding & Warning paver shall be provided to guide persons with vision impairment so that a person with vision impairment does not accidentally walk on to the road.
- Finishes shall have non-slip surface with a texture traversable by a wheel chair.

c. Road Intersections

- Pedestrian crossings should be equipped with traffic control signal.
- Traffic islands to reduce the length of the crossing are recommended for the safety of all road users.
- Warning pavers should be provided to indicate the position of pedestrian crossings for the benefit of people with visual impairments.
- Table tops (raised road level to the sidewalk height) are helpful in reducing the speed of traffic approaching the intersection

d. Median/Pedestrian Refuge

Raised islands in crossings should:

- Cut through and level with the street; or
- Have kerb ramps on both the sides and have a level area of not less than 1500 mm long in the middle; and
- A coloured tactile marking strip at least 600 mm wide should mark the beginning and end of a median/ pedestrian refuge to guide pedestrian with visual impairments to its location.

7.5.1 Traffic Signals

- Pedestrian traffic lights should be provided with clearly audible signals for the benefit of pedestrians with visual impairments;
- Acoustic devices should be installed on a pole at the point of origin of crossing and not at the point of destination;
- The installation of two adjacent acoustic devices such as beepers is not recommended in order to avoid disorientation;
- The time interval allowed for crossing should be programmed according to the slowest crossing persons; and

- Acoustical signals encourage safer crossing behaviour among children as well.

7.5.2 Subway and Foot Over Bridge

Subways and foot over bridges should be accessible for people with disabilities. This may be achieved by:

- Provision of signage at strategic location;
- Provision of slope ramps or lifts at both the ends to enable wheelchair accessibility ;
- Ensuring that the walkway is at least 1500 mm wide;
- Provision of tactile guiding and warning paver along the length of the walkway;
- Keeping the walkway; free from any obstructions and projections; and
- Providing for seats for people with ambulatory disabilities at regular intervals along the walkway and at landings.

7.5.3 Alighting and Boarding Areas

All areas and services provided in the Mass Rapid Transit System (Metro/subway), bus terminuses, etc. that are open to the public should be accessible.

7.5.4 Approach

- Passenger walkways, including crossings to the bus stops, taxi stands, terminal/station building, etc. should be accessible to persons with disabilities.
- Uneven surfaces should be repaired and anything that encroaches on corridors or paths of travel should be removed to avoid creating new barriers. Any obstructions or areas requiring maintenance should be white cane detectable.
- Access path from plot entry and surface parking to terminal entrance shall have even surface without any steps.
- Slope, if any, shall not have gradient greater than 5%. The walkway should not have a gradient exceeding 1:20. It also refers to cross slope.
- Texture change in walk ways adjacent to seating by means of tactile warning paver should be provided for persons with vision impairment.

- Avoid gratings in walks.

7.6 PARKING LOTS

a. Signage

- International symbol of accessibility (wheelchair sign) should be displayed at approaches and entrances to indicate the provision of accessible parking lot for persons with disabilities within the vicinity.
- Directional signs shall be displayed at points where there is a change of direction to direct persons with disabilities to the accessible parking lot.
- Where the location of the accessible parking lot is not obvious or is distant from the approach viewpoints, the directional signs shall be placed along the route leading to the accessible parking lot.
- Accessible parking lot should be identifiable by the International Symbol of Accessibility. The signs should not be obscured by a vehicle parked in the designated lot.
- Vertical signs shall be provided, to make it easily visible, the sign should be at a minimum height of 2100 mm.

b. Symbol

International Symbol of Accessibility should be clearly marked on the accessible parking lot for drivers/riders with disabilities only.

- A square with dimensions of at least 1000 mm but not exceeding 1500 mm in length;
- Be located at the centre of the lot; and
- The colour of the symbol should be white on a blue background.

c. Parking Lot Entrance

- Car parking lot entrance should have a height clearance of at least 2400 mm.
- Accessible parking lots that serve a building should be located nearest to an accessible entrance and / or lift lobby within 30 meters. In case the access is through lift, the parking shall be located within 30 meters.
- The accessible route of 1200 mm width is required for wheelchair users to pass behind vehicle that may be backing out.

d. Accessible Parking Lot

The accessible parking lots should have the following characteristics:

- Have minimum dimensions 5000 mm × 3600 mm;
- Have a firm, level surface without aeration slabs;
- Wherever possible, be sheltered;
- Where there are two accessible parking bays adjoining each other, then the 1200 mm side transfer bay may be shared by the two parking bays. The transfer zones, both on the side and the rear should have yellow and white cross-hatch road markings;
- Two accessible parking lots shall be provided for every 25 no of car spaces.

e. Drop Off and Pick Up Areas

- Designated drop-off and pick-up spaces, to be clearly marked with international symbol of accessibility.
- Kerbs wherever provided, should have kerb ramps.