Design Manual for a Barrier Free Environment in Universities/Colleges

For All India Council for Technical Education (AICTE)

Presented by SVAYAM FOUNDATION & CBR NETWORK
Inclusive Accessibility - A Design Manual for a Barrier Free Environment in the universities/colleges

Introduction

We are all physically disabled at some time in our lives. A child, a person with a broken leg, a parent with a pram, an elderly person, etc. are all disabled in one way or another. Those who remain healthy and able-bodied all their lives are few. As far as the built-up environment is concerned, it is important that it should be barrier-free and adapted to fulfill the needs of all people equally. As a matter of fact, the needs of the disabled coincide with the needs of the majority, and all people are at ease with them. As such, planning for the majority implies planning for people with varying abilities and disabilities. This is known as inclusive design or universally accessible design.

Application

The document does not cover all the requirements of disabled people in detail. Most of the recommended measures have been tested in developed and developing countries, and while some have proven to be effective, the outcome of others is still unknown as the local conditions; resources and needs must be taken into account while developing accessible environment. Practical advice from technical, legal, Building By laws, professional and academic institutions as well as individuals with disabilities is also of the utmost importance in shaping the final form of an accessible universities/campus in India.

The purpose of this document study is to integrate disabled people into higher education in order to take an active part in the national development programmes while leading a life with dignity and self-reliance. In order to be achieving this an individual with a disability should be able to commute between home, university/college, work and other destinations. It is also intrinsically important to design the classrooms, library, washrooms, canteen, hostels, and college buses, parking facilities etc to make the movement easy. It is equally important to use the technology to make learning is in accessible formats to meet the diverse needs of students with disabilities studying in the universities/affiliated colleges. This document explores the scientific tested and appropriate usable technologies available today to develop both built and learning environments is disability friendly. All students and faculty can use a majority of designs. There are a few facilities, which may be needed only for the use of persons with a specific type of a special need. The needs of persons with disabilities are not homogenous. The wide range of needs is not based only certain type of disability but could also vary within each category of disability based on intensity of disability and functions affected due to disability.

A majority of the accessible designs compiled in this document is to provide a barrier-free environment for the independence, convenience and safety of all persons including people with disabilities.
Who needs accessible design?

In our universities/college students, faculty, visitors, employee’s man require accessible design.

The target group is composed of 6 major categories:

1. Wheelchair users
2. People with limited walking abilities
3. The sightless and the partially sighted
4. The hearing impaired
5. People with difficulties in learning
6. Those persons who are temporarily disabled due to accidents or illness.

Other categories that may benefit to some extent from the proposed measures include the mentally health problems, people susceptible to physical fits, people with extreme physical proportions, and people with functional disabilities of the arm or hand.

As for the composition and size of the target group in universities there is no dependable statistics currently exist to define the extent of disability in our universities in India.

A good database on disability in the universities is essential for any future development in this field and this could be easily created by introduction ‘Diverse needs/Disability registers” in the universities/colleges as a part of admission systems.

Content

The document deals with the technical considerations and design provisions or measures to be taken into account in the planning of the built environment, transportation and learning environments. This includes issues related to the design of several complementary domains: open spaces and recreational areas, local roads and pathways, the immediate vicinity of buildings, building entrances and the interiors of buildings. For the purposes of this document, all information is divided into 3 sections:

- Urban Design Considerations
- Architectural Design Considerations
- Building Types
I. Urban Design Considerations

This section deals with the design requirements of open spaces, recreational areas and pedestrian routes. It introduces solutions to the principal problems in the design of an accessible outdoor environment.

II. Architectural Design Considerations

This section deals with the design requirements of vertical and horizontal access in both new and existing constructions. It is subdivided into following headings:

- Ramps
- Elevators/Lifts
- Stairs
- Railings And Handrails
- Entrances
- Reception
- Doors
- Corridors
- Restroom/Toilets
- Classroom
- Library
- Conference Hall/Auditorium
- Cafeteria
- Hostel

Others

- Sports Recreational Area
- Evacuation
- Universal Signage and way finding
- Retrofitting and technological solutions
- Dealing with persons with mobility problem and disability

III. Building Types

This section deals briefly with the accessibility requirements of selected building types. To establish building and planning by laws regarding access for disabled people, this section needs to be thoroughly developed by respective universities and colleges, based on the size of the target group, a classification of the various building types and a study of the specific needs of each university/college campus.
1. Ramps

1. Problem Identification
   - Inaccessible building entrances due to difference between indoor and outdoor levels.
   - Inaccessible routes due to differences in level.
   - Lack of or improper design of ramps.
   - Very steep and/or long ramps with no resting landings.

2. Purpose-
   - To provide access to buildings and between different floor levels.

3. Design Considerations

3.1 General
   - An exterior location is preferred for ramps to provide wheelchair access to different floors. Indoor ramps are not recommended because they take up a great deal of space.
   - Ideally, the entrance to a ramp should be immediately adjacent to the stairs.

3.2 Ramp configuration
   - Ramps can have one of the following configurations:
     (a) Straight run
     (b) 90 turn
     (c) Switch back or 180 turn
Illustrations of layout and dimension of an accessible ‘L’ shape ramp

**Slope:**

The preferred slope of ramps in educational institutes is 5% (1:20) and the maximum acceptable slope is not less than 8% (1:12)

**Width:**

Preferred width of ramp should be in between 1:50 to 2:00 m and not less than 0:90 m to 1:00 m

**Landings:**

Each landing should have a minimum length of 1.20 m and a width at least equal to that of the ramp. landings should be provided for resting, maneuvering and avoiding excessive speed

Landing should be provided:
- At least every 10 meters
- At every change in direction & at the tip and bottom of ramp
Handrails-

- Handrails should be mounted at a height between 0.80 m and 1m.
- Handrails should extend a minimum distance of 0.30 m beyond the top and bottom of the ramp.
- To guide sightless people using a long cane on ramps, an extra rail should be mounted at a height between 0.10 m and 0.15m.
- Continuous handrails should be provided on both sides of stairs and ramps (except for doorways) and around landings.

Handrails diameter-

- Handrails of ramp should be tubular or oval in section; sharp edges should be avoided.
- Handrails diameter should be 30 mm to 40 mm and extend 30-40 mm from wall finish.

Tactile marking-

- A colored textural indication of width 0.60 m at the top and bottom of the ramp should be placed to alert sightless people as to the location of the ramp.
- Tactile warning markings have a different texture to the surrounding floor finish and can be detected by people using a long or

Useful suggestions-

- Circular and curved ramp should be avoided.
- Surface of ramp should be hard and non-slip.
- Uneven surface or carpet should be avoided.
2. ELEVATORS/LIFTS

1. PROBLEM IDENTIFICATION

- Inadequate space inside the elevator cab.
- High position of switches, buttons and control panel.
- Narrow entry doors & Low lighting inside the lift
- Insufficient opening time interval

2. Purpose-

- To provide well-dimensioned and convenient lifts to allow free vertical access between different floors

3. DESIGN CONSIDERATIONS

3.1 General

An accessible lift should serve all floors and its location should be clearly indicated and recognizable. The arrival at each floor should be indicated both by optical and acoustic means to alert passengers with visual and hearing impairments.

3.2 Dimensions

<table>
<thead>
<tr>
<th>Internal Dimension of a lift</th>
<th><img src="image" alt="Diagram of Lift Dimensions" /></th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum internal dimensions of 1.30 m x 1.00m allowing access for one person using a wheelchair and turning a full circle, or two people using a wheelchair side by side.</td>
<td></td>
</tr>
<tr>
<td>The clear opening width of the doors should be a minimum of 0.80 m, preferably 0.85 m</td>
<td></td>
</tr>
</tbody>
</table>
Lift Cabin

- Handrails inside lift should be installed mounted 0.80 m to 0.90 m from the floor.
- A mirror placed at a height of 0.40 m up to 1.60 m in opposite of the door provides an important orientation aid for wheelchair users.
- The internal light should provide a level of illumination of minimum 100 lux.

Control Panels

- The control panel should be positioned on the flank wall rather than front wall to facilitate access. In larger lift, control panel option can be placed on both the flank walls.
- Call buttons should be located in between 0.90-1.20 m.
- The numerals should be embossed to be easily identifiable by touch, particularly the alarm button. It is desirable to repeat the legend in Braille.
- The lift hall signal should be located at an approximate height of 1.80 m.
- A clear landing area of minimum 1.50 m x 1.50m in front of the lift doors should be provided.

Useful suggestions-

- The door opening interval should be no less than five seconds. Re-opening activators should be provided.
- The elevator should signal arrival at each floor by means of a bell and a light to alert sightless and hearing-impaired passengers simultaneously.
- The floor of the elevator and the area in front of the elevator on each floor should have a non skid resilient surface or a low-pile fixed carpet.
- The color of the elevator door should contrast with the surrounding surface so as to be easily distinguishable by persons with visual impairments.
3. **STAIRS**

1. **Problem identification**
   - Poorly designed steps that hinder foot movement.
   - Steep staircases without handrails.

2. **Purpose**
   - To provide safe staircases for all users, particularly those with visual impairments, elderly and mobility problems.

3. **Design considerations**
   - The careful design of steps and stairs is particularly important for the safety of people with visual impairments and mobility problems.

**Steps:**
- All steps in one flight should be uniform.
- Steps should be 15 cm to 18 cm high and not less than 28 cm deep.
- At least every 15 steps, landings should be provided to assist people who cannot manage long staircases. The landing should be at least 1.20 m long.
- The nosing should be rounded and shaded with color contrast to orient persons with visual impairment.

**Width of stairs**
- For one way traffic, clear width-1 m
- For two way traffic, clear width-1.50 m

**Handrails of stairs:**
- Handrails should be provided both sides at height of 0.70-0.80 m and 0.90-1.00 m from floor finish.
- The handrails must extend a minimum of 0.30 m beyond the top.
Recommended Accessible Staircase Design
In case of wider stairs of width more than 3 m, intermediate handrails should be provided.

**Tread and Riser of steps/stairs:**

- Riser should be 150 mm-180 mm high and tread should be 280 mm deep.
- Tread nosing should be clearly marked with either a brightly painted non-slip finish or include an integrated non-slip nosing that clearly contrasts in color from the tread.

**Tactile marking/Warning surface:**

- Provision of tactile marking strips should be provided at top and beginning of stairs to orient people with visual disability.
- Color texture tactile marking width should be 0.60 m and color contrast with surroundings.

**Lighting at stairs:**

- Staircases should be well illuminated during the day and night when in use (level of illumination preferably between 150 and 200 lux) to avoid any risk of accident or fall.
- Stairway lighting requires switches at both the top and bottom of the stairs when the stairs have more than three treads.

**Useful suggestions:**

- Avoid visually distracting patterns on the tread.
- Do not place loose rugs on steps, or at the top or bottom of stairways.
- Provide non-slip and rough surfaces at staircase.
4. Entrance

1. Problem identification

- Inadequate space in front of the entrance.
- No distinct accessible entrance.

2. Purpose

- To provide accessible and easy-to-find building entrances.

3. Design considerations

3.1 General

- For new accessible constructions, all main public entrances should be accessible to an ambulant disabled person. At least one entrance per facility should be accessible to a wheelchair user. In new buildings, the accessible entrance(s) should be the main entrance(s) intended for use by the general public.
- Each accessible entrance should be connected by accessible pathways to accessible indoor or outdoor parking areas, local public transit stops and drop-off areas.

**Entrance**

- Accessible entrances provide direct access to persons using wheelchairs or scooters and are also frequently used as waiting areas for persons requiring assistance.

**Waiting space**

- There should be enough waiting space inside the main accessible entrance, either in the foyer or adjacent lobby, for at least two persons using assistive devices. Waiting areas should provide a clear view of the entrance and arrival area for taxis, buses or private vehicles.

**Public Accessible Telephone**

- In colleges and educational institutes/buildings, it is desirable to provide an accessible public telephone near the accessible entrance. This helps in getting assistance of transportation (taxi) or any other services for persons with sensory impairment.
Glaze at Entrance –

- Glazed doors should have glazed panels that extend low enough to allow persons using mobility aids to see what is on the far side of the door (i.e., maximum height from grade 900 mm to lower edge of glazing).

Signage and Information panel at Entrance

- Wall mounting signs such as room no., class room, library, public utilities etc should be place at height of between 1.30 m – 1.60 m from floor finish.
- Overhanging signs indicating signage for staircase, lifts, conference room, laboratories, cafeteria etc should be placed at minimum height of 2.10 m from floor finishes.
- Maps and information panel should be place at a height in between 0.90 m – 1.80 m from floor.
- Signage should be provided at campus and buildings at appropriate locations such as approach to the building, entrance, reception, library, laboratory, cafeteria and public conveniences.
- Directional signage should be readily identifiable and provide a logical sequence from a starting point to a point of destination. The name of destination should be consistent throughout the route.

Adequate placement of overhanging signs, information panels and maps

Signage and facilities showing at entrance/reception area of educational institutes
5. Reception/ Information Desk/Service counters

1. Problem identification

☐ Inadequate leg space for wheelchair at reception corner and inaccessible information desk

2. Purpose

☐ To provide accessible and easy-to-access information

3. Design considerations

a. General Considerations

Counters and reception desks, including information desk should be accessible and understandable to everybody. This includes all visitors or students in a building, as well as personnel who work on the staff side of the counter.

In larger buildings such as colleges/universities and in public offices, service counters and reception desks are likely to be large, with several positions for staff and students. With this type of arrangement, there will be sufficient space to provide counters at different heights.

Reception desk

☐ Reception desks should be located in clear view of the entrance doors, well signed and easy to identify using high contrast color schemes.

☐ To ensure full accessibility of the reception desk for wheelchair users, a section should be at least 0.75 m from floor finish but no higher than 0.90 m (lower edge being at a minimum height of 0.70 m).

☐ Reception desks and service counters should be evenly illuminated to a level of 200 lux.

☐ A hearing enhancement system or induction loop should be provided at all reception desks and service counters
6. Doors

1. Problem identification

☐ Inadequate width for wheelchair at door to enter and utilize the facilities

2. Purpose

☐ To facilitate the easy passage through doors, particularly for wheelchair users and people using other mobility aids.

3. Design considerations

a. General Considerations

   Internal doors should be in designed in such a way to give easy access to persons with limited mobility.

   In general, automatic doors are the best solution for persons with disabilities.
Door dimensions

- For exterior door, minimum width should be 0.90 m -1.00 m
- For interior doors, minimum width should be 0.80-0.85 m
- Clear height of 2.10-2.20 m is recommended for all the doors

Accessible door features

Accessible doors have following features-
- Visible signage
- Kick Plate
- Door Handle
- An extra pull handle

Dimensions are indicated in photographs as suggested-

Door Hardware/Locks/Fixtures

- All doors opening hardware on entrance, vestibule, and room doors should be easy to grasp and use (e.g., of the lever handled type).
- Hardware for closet doors, drawer pulls etc., should be of the simple ‘D’ type (i.e., a continuous and easy to grasp handle), 75 mm – 100 mm long.
- The positioning of lever handles and push / pull handles should be consistent throughout the building
- Lever handles are the preferred type of furniture, as door knobs of spherical, circular, or similar design can be difficult to operate for people with, for instance, arthritis, Cerebral Palsy or a weak grip.
- The door furniture should contrast in color and luminance with the door finish to ensure clear visibility for people suffering from visual impairment.
Clear height of door from floor finish - 2.10 m
m - 2.20 m

Dimensions of door locks and fixtures
Useful suggestions:

- In general, automatic doors are accessible. Automatic doors are of two types- Swinging door and Sliding door. Sliding door should be preferred over Swinging door.
- Revolving doors should not be preferred in any public building type.
- Automatic doors should have an adequate opening interval to allow people with mobility problems easy access

7. Corridor

1. Problem identification

- Inadequate width and obstructed corridor area makes horizontal accessibility inconvenient

2. Purpose

- To facilitate the easy passage through corridors, particularly for wheelchair users and orientation for all users.

3. Design considerations

a. General Considerations

Generally, corridors should be as short as possible to avoid orientation difficulties and if necessary, changes of direction should be at 90 degrees. In all cases, corridors should be left unobstructed.

**Corridors dimensions**

- Width of corridors- Preferable width should be in between 1.50 m-1.80 m to allow easy passage of two wheelchairs without any obstruction. (1.80 m width is appropriate for 180* turn inside corridor)
- In a place where traffic is low, corridors may have width less than 1.50 but not less than 0.90 m
- Water fountain or any other facilities such as fire hoses should be located outside the corridor area and not protrude outside.

Dimension of an accessible corridor
Ageing staff and others with limited strength and endurance may require handrail support and/or resting places in long corridors or paths of travel.

In extended length corridors of 50 m or more, consideration should be given to the provision of a bench or other seating, located at intermediate points along the corridor for elderly staff and others with visual impairment and limited mobility.

The surface of corridor should be slip resistant.

8. Restroom/Toilets

1. Problem identification

- Insufficient space and design of restroom or toilets
- Poor design of fixtures, supporting rails and fittings
- Inappropriate taps which are difficult to grip

2. Purpose

To provide wheelchair accessible toilets and bathrooms with adequate space, fixtures and fittings at a convenient height for people with mobility problems.

3. Design considerations

a. General Considerations

Accessible toilets should be provided with every floors of educational and public building to assist students with limited mobility or ageing staff. If not feasible, at least one toilet should be made accessible in each building.

It is important to provide sufficient space for persons using wheelchair or any other assistive devices. Also, amenities should be installed at convenient height along with provision of grab bars and handrails to assist persons with low muscular strength and limited mobility.
Features of Accessible Toilet-
1. Side grab bar- There is a grab bar on the adjacent side wall that is at least 1.05 m long and from 0.95 m above the floor. Grab bars diameter should be 30 mm to 40 mm
2. Rear grab bars- There is a grab bar behind the toilet that is at least 36 inches long and from 0.95 m above the floor. Grab bars should be firmly fixed since considerable pressure will be placed on the rail.
3. Flush valve- Flush valve is located in reach range and is operable without tight grasping, twisting, or pinching
4. Toilet seat height-Height of toilet seat from floor finish should be 0.45 m
5. Toilet Center line- The toilet bowl needs to be centered 0.45 m from the side wall, so that persons with disabilities can use the side grab bar.
6. Clear floor space- Clear floor space: Adequate space is provided to approach the toilet from a variety of wheelchair transfer positions (i.e. diagonal or side approaches). Generally, the toilet needs to be placed within a 1.5 m wide by 1.5 m deep clear area of the floor.
7. Floor of toilet /washroom should be slip resistant
8. An additional push alarm or emergency alarm should be placed adjacent to call for assistance in emergency.
Two 5’0 x 7’3” room = Total 70 square feet area

Accessible urinal features and design

Features of Unisex Toilet
9. **Classrooms-**

1. **Problem identification**

   - Narrow door of classroom
   - Poor design of fixtures, supporting rails and fittings
   - Inappropriate seat height for wheelchair user

2. **Purpose**

   - To provide wheelchair accessible classrooms with appropriate height of desk along with utilization area for people with mobility problems.

3. **Design considerations**

   a. **General Considerations**

      Accessible classroom should be provided with every floors of educational and public building to assist students with limited mobility or ageing staff. If not feasible, at least two desk heights should be made accessible in each class.

      Minimum 2% to 5% of the seating available in classrooms should be made accessible to accommodate students with limited mobility or persons using wheelchair. Tables must be between 0.7 m and 0.8 m high with at least 0.6 m of knee clearance to accommodate students in wheelchairs. Adjustable tables are recommended.

   1. **Table Height** - Tables must be between 0.7 m and 0.8 m high with at least 0.6 m of knee clearance
   2. **Desk clear floor space**: If provided, desks and writing tables need to have a 0.7 m by 1.2 m clear floor space that extends 0.48 m under the desk and any fixed seat needs to be removable.
   3. **Door width** – Door width should be minimum 0.90 m for convenient entry for persons using wheelchair
   4. Classrooms with one entrance and exit should be limited to 45-50 person capacity.
10. Library

1. Problem identification

- Insufficient space between racks
- Poor illumination inside library

2. Purpose

- To provide wheelchair accessible library with adequate space and utilization area so that persons with disability can move around with convenience.

3. Design considerations

a. General Considerations

   All library areas, including checking areas, book stacks and reading/teaching spaces, should be accessible to ageing staff and persons with varying disabilities.

   - Book stack areas should have aisles preferably 1.65 m wide, or a minimum of 0.9 m wide, to allow easy access and maneuverability by persons using mobility aids.
   - Book return and checking area counters should be designed to be accessible to persons using mobility aids.
   - Lighting should have minimum illumination of 200 lux as a benefit to persons with low vision and ageing staff. Lighting fixtures should be mounted at the height of 0.9 m approx from floor finish.
   - Study tables should be designed to accommodate persons using wheelchair and mobility aids, with clear knee space of at least 0.7 m high.
   - Acoustic quality in library should limit extraneous background noise so that persons with limited hearing abilities can comprehend with ease.

Design of Accessible Library
11. Conference Hall/Meeting room/Auditorium

1. Problem identification

- Inaccessible seating arrangements in the conference hall
- Poor acoustics and absence of emergency signage

2. Purpose

- Assistive device accessible conference room with adequate seating arrangement and emergency evacuation mechanism

3. Design considerations

a. General Considerations

Meeting rooms and Conference hall, whether used by the public at large, by visitors to college/universities should be designed to be accessible to persons with varying disabilities, including persons using mobility aids and persons with sensory limitations.

- Accessible seating should be distributed and integrated throughout seating areas of conference rooms with different vantage points available to all including persons with disability.
- Accessible conference hall/Auditorium area should accommodate persons using various mobility aids.
- Clear exit and emergency area should be marked with appropriate accessibility signage.
- A foldable wooden ramp of 1:12 width ratio should be provided to help persons with limited mobility getting on stage.

<table>
<thead>
<tr>
<th>Number of seats in a seating area</th>
<th>Number of required spaces for wheelchair users</th>
</tr>
</thead>
<tbody>
<tr>
<td>up to 600</td>
<td>6 i.e. 1/100</td>
</tr>
<tr>
<td>up to 1000</td>
<td>6 + 2</td>
</tr>
<tr>
<td>over 1000</td>
<td>8+1 for each additional increment of 1000 seats</td>
</tr>
</tbody>
</table>

Dimension of Auditorium/Conference hall
Induction loop system - For Conference room, sound regulation via induction loops is ensured and clearly marked.

*What is Induction loop system?* : People with hearing impairments find it difficult to grasp mass audio activity. In an enclosed venue, it is possible to enclose a small area with a loop-induction system so that people with hearing impairments within it can hear voices and sounds without ambient noise. A loop-induction system comprises of a microphone, an amplifier and a loop (a conducting wire encircling the enclosure). The sound of music or the voices of actors are converted into electromagnetic signals. The signals are carried to the loop. A pickup coil fitted in a hearing aid picks up the electromagnetic signals and the receiver in the ear converts this into comprehensible speech or music. Since the hearing aid does not pick up actual sound signals, it receives no ambient noise, ensuring good quality of sound.

Inuction loop system and signage
12. Cafeterias/ Dining areas –

1. Problem identification

- Insufficient space inside the cafeteria
- High level of tray rail to access food services from counter

2. Purpose

- Accessible cafeteria /mesh with appropriate design of food counter, passageway and seating arrangement.

3. Design considerations

a. General Considerations

Cafeterias and restaurant areas providing food or beverage services should be accessible to persons with varying disabilities, including persons using mobility aids.

- Passageway spaces between furniture, equipment and other fixed objects inside the cafeteria or mess should be wide enough to allow a person using mobility aids to pass.
- Major passageways should be a minimum of 1065 mm wide. If space is constraint, the narrowest passage should be at least 810 mm wide.
- At least one counter section of cafeteria should be no higher than 915 mm from floor finishes to allow person using wheelchair to access food and beverages.
- Display of menu items should be fixed at eye level- 915 mm from the floor surface.
Dimension of accessible Cafeteria/ Dining area/Hostel Mesh

(Hint- 1 meter = 1000 mm)
13. Hostel –

1. Problem identification

- Inaccessible entrance due to lack of ramps / lifts
- Inappropriate furniture and desk height which makes wheelchair transfer difficult

2. Purpose

- To provide wheelchair accessible hostel with adequate space, desks, furniture, fixtures and fittings at a convenient height for people with mobility problems.

3. Design considerations

   a. General Considerations

Minimum 2% of the rooms available in hostel should be made accessible to accommodate students with limited mobility or persons with disability or any hidden impairment.

**Hostel entrance –**

- Entry to hostel should be accessible by providing ramp. Width of ramp should be minimum 1 m for wheelchair entry.
- Slope of ramp should be minimum 1: 12
- Corridor space should be unobstructed
  - and no any protruding objects should hinder the mobility of persons using assistive devices.

**Bed and furniture**

1. **Table Height** - Tables must be between 0.7 m and 0.8 m high with at least 0.6 m of knee clearance

2. **Desk clear floor space**: If provided, desks and writing tables need to have a 0.7 m by 1.2 m clear floor space that extends 0.48 m under the desk and any fixed seat needs to be removable.
3. **Beds** - Bed height from floor surface should be appropriate for wheelchair transfer. It should be in between 0.45 m -0.50 m from floor surface.

4. **Bed transfer space** - Clear transfer space should be in between 0.75 m -1.2 m from a wheelchair to the bed.

**Others**

**Sports/Recreation area**

Sports fields, outdoor and spectator areas should be accessible to students with varying disabilities.

- Controlled access points/mechanical gate should be designed to accommodate the free movement of wheelchairs. The width of such gate should be minimum 915 mm wide.
- Area inside the field/recreation complex should be obstruction free. Accessible seating should be provided for both spectators and athletes with disabilities.
- Seating height for bench should not be more than 0.45 m from ground.

The maximum distances that people with mobility problems can walk without rest depends on various factors such as the walking surface and the slope. Walking more than 200 m and standing for more than 10 minutes is difficult for persons with mobility problems and therefore seating has to be provided wherever people may have to rest along the circulation path.
Evacuation Plan/ Safety Measures

Ageing staff, Persons with limited mobility and varying disabilities are greater risk during fire and any other emergencies as they may not be able to help themselves autonomously than general people. It is important to ensure that a comprehensive evacuation plan and operational strategies are in place in case of a fire or other emergency.

☐ All university buildings with floors above or below grade should develop a fire-safety and emergency plan, indicating in detail the preferred evacuation area strategies for persons with disabilities (including staff and visitors)

☐ Strategies can include creation of separate areas for exiting to a safe area on the same floor or creation of safe holding area.

☐ For persons with hearing impairment, early warning system in the form of visual flashing lights should be installed. Similarly, Hooter alarm or an alarm with flashes is helpful for persons with varying disabilities.

☐ Emergency signage and way finding should be installed to orient during emergencies for safe evacuations.
Universal Signage and Way finding

Signage and way finding is required in all public buildings such as college, universities, hospitals, government offices to provide direction and information to reach particular destination.

The "International Symbol of Accessibility" should be used to identify special amenities, such as accessible parking, accessible entrances, or accessible washrooms.

☐ The design of signs should allow for contrasting colors, serif-free text, simple an consistent use of symbols and the provision of tactile information, including Braille
☐ Signs need to be carefully located so as to help visitors throughout their journey by providing information at junctions or in long passageways.
☐ The height of the sign should be lower rather than higher as there is no perfect height for all visitors and be tactile/Braille enabled.

Wall mounted Sign-

☐ The height of wall mounted signs should be consistent throughout a space, meeting the placement expectations that are especially important for vision-impaired individuals and those in wheelchairs.
☐ Wall mounted signs indicating room numbers should be in between 1.4-1.5 m (60 inches) from the floor.
☐ Signage should be placed towards latch side of the door

Overhanging Sign-

☐ Overhanging signs should be located at 2.10 m or 80 “from floor finish to allow safe passage of persons with low vision or visual disability.

Fixed Sign-

Fixed sign indicating street names should be mounted at height of 2.50 m from floor surface.
Maps and information sign-

Maps and information at universities or public building should be placed at height of 0.90 m to 1.20 m from floor surface. This is usually the viewing region for persons using wheelchair.

Dimension of accessible signage
(1 inch = 0.025 m)

Pictograms –

- Symbols of accessibility are required to identify text telephones, assisted hearing systems. Colors chosen to be navy blue with white lettering.
- Symbols and border and size to be 200 mm x 200 mm square with 1.25 mm borders.
- Pictograms must be placed in a 6 inch high "field" area, which should be free of raised characters or braille dots.
- When text and braille dots are used with a pictogram, they should be placed directly below the pictogram field.
- Pictograms should have a non-glare finish and contrast with background.
- Accessible pictogram facilities showing individual facilities should be installed at entrance, reception.
**Tactile Indicators**

- Tactile indicators are of two types- Tactile Directional and Tactile Positional.
- Tactile Directional- for providing direction and orientation to persons with visual disability
- Tactile positional - To alert from potential hazards or change in position
- Clear visual and tactile clues are required to facilitate visit of vision impaired or people with low vision, therefore tactile indicators for visually impaired visitors should be provided in a public place by default.
- Tactile paving should not be placed so as to lead the users in to obstructions like pole, trees, potholes etc and should be regularly maintained

Tactile directional indicators | Tactile warning indicators

Different types of tactile indicators
Parking-

Parking should be accessible, easy to use, and should provide sufficient parking spaces within a building environment to meet the needs of all people expected to use them. Wherever car parking facilities are provided, they should consider the needs of all car users, including parents and caretakers with young children; people who need to load and unload goods and shopping; people with visual difficulties; and people who use larger vehicles such as vans with rear hoists that enable wheelchair users to travel while seated in their wheelchair.

Standard car parking spaces are typically 3500mm wide x 5000mm long should be allocated at a convenient place near the office entrance or reception with international symbols of accessibility as shown in the figure.

- The parking spaces reserved for persons with a disability shall be located in proximity and with an accessible route to entrance
- Ensure the route between the car park and the entrance to the building or facility is accessible and easy to understand

Provide clear signage to highlight location of designated parking spaces within the car park.

<table>
<thead>
<tr>
<th>Total no of car parking in a lot</th>
<th>Required no of accessible car parking</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>51-150</td>
<td>2</td>
</tr>
<tr>
<td>151-250</td>
<td>3</td>
</tr>
<tr>
<td>251-350</td>
<td>4</td>
</tr>
</tbody>
</table>
Retrofitting and Technological solutions-

Existing facilities that will remain in use and are not currently accessible must be evaluated for accessibility. Facilities can be inaccessible due to narrower doors, absence of ramp or inappropriate gradients, no provision of lift, small washrooms, absence of hand railings and supportive grab bars and so on.

A careful examination of infrastructure by doing access appraisal is first key step to prioritize accessibility concern. Following are some basic examples of creative retrofitting and technological solutions to improve the accessibility-

<table>
<thead>
<tr>
<th>Problem concern</th>
<th>Retrofitting solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step at entrance- inaccessible for wheelchair user</td>
<td>Step at entrance can be replaced by accessible ramp</td>
</tr>
<tr>
<td>Pathway with step</td>
<td>Pathway after retrofitting solutions</td>
</tr>
</tbody>
</table>

Step at entrance- inaccessible for wheelchair user

Pathway with step

Pathway after retrofitting solutions
<table>
<thead>
<tr>
<th>Corridor without tactile orientation and signage</th>
<th>Corridor design with appropriate tactile orientation and signage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level difference at entrance</td>
<td>Provision of ramp makes entrance accessible</td>
</tr>
<tr>
<td>Toilet without supportive bars</td>
<td>Toilet with supportive bars and mirrors</td>
</tr>
</tbody>
</table>
## Technological Solutions

### Vertical lift-

The innovative design ensures that special emphasis has been placed on the needs of both the lift user and the building owner in facilitating compliance with the current disability legislation.

### Stage lift –

The STAGE lift is a safe, simple and cost effective accessibility solution for low-rise vertical barriers such as stages and podiums. This lift is easy to use and can be wheeled out of sight when wheelchair accessibility is not required.

### Evacuation Trac-

In the event of a fire or earthquake, elevators should not be used for the emergency evacuation of a building. In this situation, people with limited mobility may be trapped or have to wait for a prolonged period of time in an area of refuge. This evacuation trac gives technological solution to transfer from wheelchair to the comfortable place during emergency.

### Portable / vehicle loading Ramp-

This type of portable ramp can be carried to different locations during travel. Mostly used for outdoor activities, persons with wheelchair have easy access to any transport services.
Battery operated accessible cart-

Battery operated accessible cart is mostly used in large campus area to help persons with disability to reach different faculties/departments in universities/institutions.

Dealing with persons with mobility problem and disability-

- Individual who use wheelchairs may require different degrees of assistance. Offer help whenever asked or required. Do not automatically assist the individual without permission. It is ok to offer assistance. However, if the offer is not accepted, respect his/her request! It is recommended to find a place where you can sit down to give the individual a more comfortable discussion or interaction.

- When walking with someone with a visual impairment, offer them your arm for guidance. They will likely keep a half-step behind to anticipate curbs and steps.

- It is recommended to keep conversations clear and find a quiet location to communicate. While interacting with persons with hearing impairments speak directly making sure that your lips are visible.

- Assistive devices such as Wheel Chairs, walking aids, canes are means of freedom to fully engage in life. This can be used by people with temporary ailments, elderly, pregnant woman, joint pains, limb weaknesses, and persons with disability and people with hidden illness such as Asthma, Diabetes, overweight, Osteoporosis. Offer help as and when required if someone have difficulty in accessing various departments.