BUILT ENVIRONMENT FOR THE DISABLED

A DISSERTATION

Submitted in partial fulfilment of the requirements for the award of the degree of

MASTER OF ARCHITECTURE

By

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CANDIDATE'S DECLARATION

I hereby certify that the work which is being presented in thesis entitled, "BUILT ENVIRONMENT FOR THE DISABLED." in partial fulfillment of the requirement for the award of the degree of Master of Architecture, submitted in the department of architecture of the university of roorkee is an authentic record of my own work carried out during a period from July 2000 to January 2001 under the supervision of Prof .Dr Najamuddin.

I have not submitted the matter embodied in this thesis for the award of any other degree.

Mahesh Kr Singh

(MAHESH Kr. SINGH)

This is to certify that the above statement made by the candidate is correct to the best of my knowledge.

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Place: Roorkee
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CONTENTS

Chapter 1.
Introduction

1. INTRODUCTION

1.1 Preamble

In the Indian context, the society is yet to fulfil its responsibility towards one of its large sections comprising the disabled. It has not yet created opportunities for them to participate in the over all process of growth and as a result of this, the society has deprived itself from the potential contributions of this section. GDP or Per Capita Income is a common barometer of progress of a nation as far as materialistic perception is concerned but the sensitivities towards human needs define the holistic attainments. Our society still has a long way to go as far as our responses towards the disabled are concerned. This is inspite of the fact that the Constitution of India guarantees the fundamental rights equalities to all including the disabled. Subsequent enactment of "Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995" necessitates initiation of specific steps to achieve the spirit of fundamental rights enshrined in the India Constitution.

Indian values and ethos respect human rights but, its citizens with disabilities are still being deprived of their rights, which should have been provided to them voluntarily. It is a poor reflection of our modern social value system wherein one finds it difficult to implement even the statutory provisions. People, Politicians, Public servants and Professionals; all need to ponder over this issue as to how to bring about an attitudinal change in the society towards the cause of disabled. And, once we are able to achieve this change in the mindset we will realize our responsibilities and requisite actions shall follow on its own. But, that may not be all. What we further need is a collective community effort as the task ahead is not small. It is necessary and imperative to initiate a thought process from a macro perspective and then the individual groups could identify own relevant targets.

For many city-dwellers, today's modern cities and towns may be convenient and fascinating places for working and living, offering a great variety of opportunities and experiences. But for disabled persons, such built environments are full of uncertainties, anxieties and dangers.

Disabled persons encounter many obstacles that prevent them from moving about freely and safely. For wheelchair users, steps and stairways are obstacles. Blind people are endangered by the absence of directional and safety features that they can hear and touch.

Many disabled persons live in poverty and need education and training, but these are often located in places where access is difficult for them. In

addition, most community centers, parks and places of worship have not been designed to welcome users with disabilities. Public transport systems, too, are not user-friendly to persons with disabilities.

Fortunately, awareness is growing that society is also penalized when an unfriendly environment from realizing their full potential prevents disabled persons. Societies incur hidden costs when their members, including those with disabilities, suffer from stress, fatigue and accidents.

This awareness has recently taken hold among developing countries in Asia and the Pacific.

1.2 National Scenario

The survey covers The Government of India undertakes periodically, a survey, through the National Sample Survey of India (NSSI) of disabled people with visual, hearing, speech and physical disabilities.

According to the 1991 survey, about 16,150,000 people are estimated to have one or the other of the four types of disabilities mentioned above. This figure constitutes 1.9% of the total estimated population in the country. The prevalence of physical disability was 20 per 1000 persons in rural sector and 16 in the urban sector and was prevalent in males than in females. A national survey on blindness conducted from 1986 to 1989 estimated that 3,470,000 persons are blind as against 11,920,000 estimated in 1981.

A study conducted by Indian Council of Medical Research estimated that 6.8% of the people in urban areas and 10.8% of the people in rural areas have significant hearing losses.

Six national institutes set up in this regard are the National Institute for the Visually handicapped, Dehradun; National Institute for the Hearing Handicapped, Mumbai; National Institute for the Orthopaedically Handicapped, Calcutta; National Institute for the Mentally Handicapped, Secunderabad; Institute for the Physically Handicapped, New Delhi; National Institute of Rehabilitation Training and Research, Cuttack.

The Persons with Disabilities Act was enacted in 1995, which treats rehabilitation as a right and aims to eliminate discrimination and create a society which provides opportunities for the development of people with disabilities to their fullest potential. The efforts of the governmental, non-governmental and other agencies in the welfare sector need to be more structured and concerted in approach. There must be optimum utilization of available resources and holistic rehabilitation for people with disability.

1.3 Identification of the Problem

For many city-dwellers, today's modern cities and towns may be convenient and fascinating places for working and living, offering a great variety of opportunities and experiences. But for disabled persons, such built environments are full of uncertainties, anxieties and dangers.

Disabled persons encounter many obstacles that prevent them from moving about freely and safely. For wheelchair users, steps and stairways are obstacles. Blind people are endangered by the absence of directional and safety features that they can hear and touch.

Many disabled persons live in poverty and need education and training, but these are often located in places where access is difficult for them. In addition, most community centers, parks and places of worship have not been designed to welcome users with disabilities. Public transport systems, too, are not user-friendly to persons with disabilities.

1.4 Aims and Objectives

The basic objective of my research work is

- To find out barriers, which hinders the exploitation of full capability of the disabled, and examine the relevant provisions relating to the creation of barrier free built environment.
- To formulate guidelines and architectural considerations in terms of minimum access provision which ultimately governs to promote a barrier free built environment for the disabled, which will act as a reference guide to professionals, researchers, educationalist etc.
- To work out strategies and suitable model for promotion of barrier free built environment and for making the existing buildings and infrastructure barrier free.

1.5 Scope of Dissertation

Good guidelines are necessary tools for the creation of accessible environment. Many existing documents have an uncertain quality and limited scope. An important weakness of most handbooks is that they are restricted to certain disability groups.

The scope of this dissertation is to study the access need of diverse disability groups through literature and case studies. Study about what are the barrios to mobility of various

disability groups. It can be include a broad survey of a particular locality/building. In the last some recommendation will be given in the context of India.

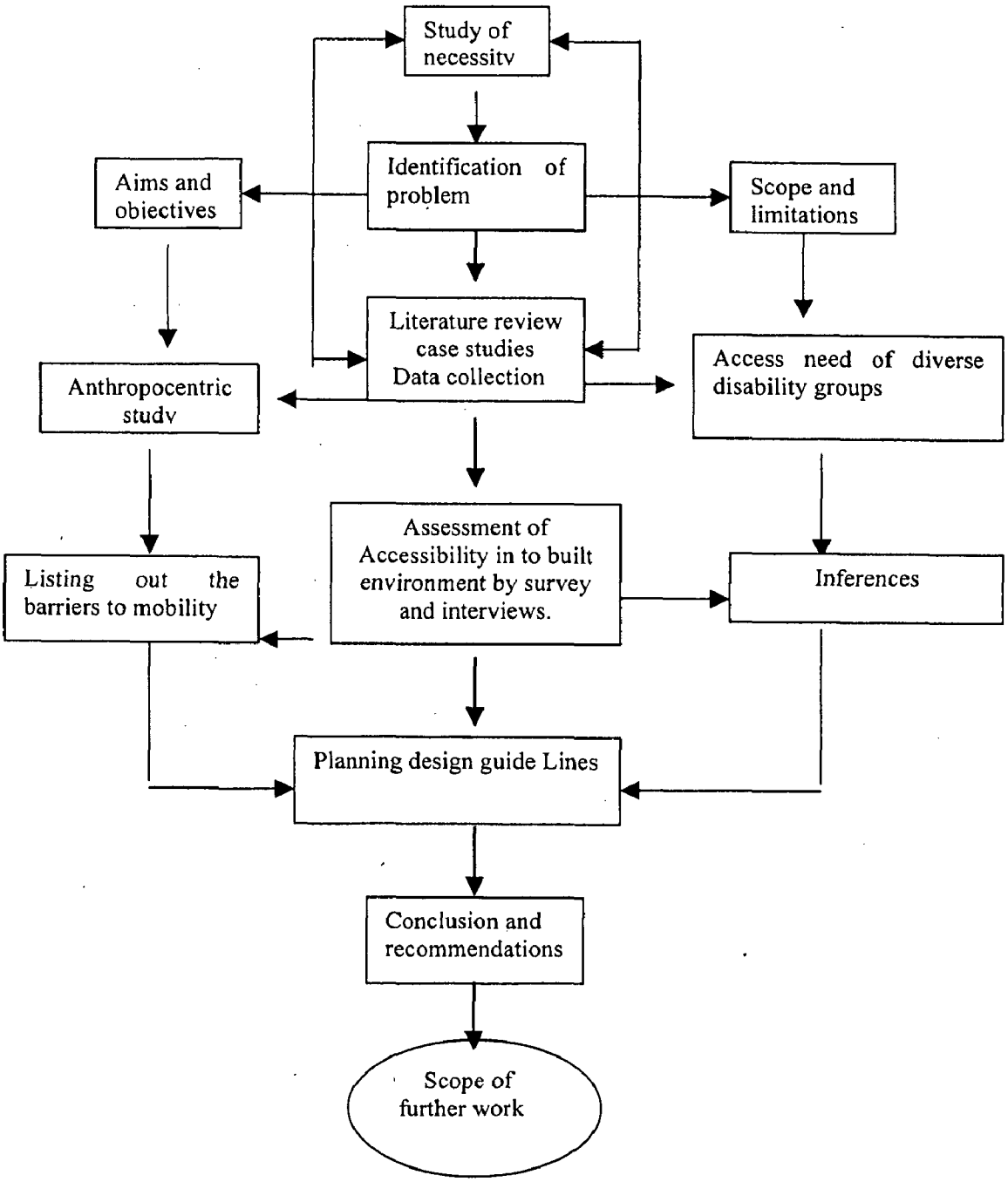
1.6 Limitations

For a study of this magnitude, to obtain first hand information requires sufficient period of time. Therefore, the study is primarily based on literature available. Various disabilities, which have been considered in the study, are broadly classified under four categories.

- Non-ambulant (chair bound)
- Semi ambulant (lower limb impairments)
- Visual, and
- Hearing disabled.

1.7 Methodology

To fulfill the objectives, the study will be carried out in the following stages:



1. Study the current situation regarding access in India and other countries.

2. Study the access need of diverse disability groups through literature/case studies.

3. Identify the barriers, which hinders the full capability of disabled, through some surveys and interviews.

4. Literature survey on accessibility into the built environment.

5. Review of available data and design guidelines and fit them according to Indian conditions.

6. Review of policy guidelines given by ESCAPE, United Nations.

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Chapter 2.

Built Environment.. The issues

2. BUILT ENVIRONMENT - THE ISSUES

2.1 Need of Barrier Free Built Environment

2.1.1 Built Environment : What is Included

The physical environment is, both in theory and practice, a continuity of space. Barrier free design means giving users the possibility to use space in a continuous process – to be able to move around without restriction.

The built environment could be defined as a transformation of the natural environment into a new shape. At the same time, as space is changed physically by human beings, it is normally divided and categorized along new artificial dimensions such as "public", "private" and "functional". The right to use space and the possibility of using space, which is termed accessibility, is restricted, not

only by physical barriers, but also by a complex of cultural, social and economic rules.

When discussing a barrier-free society, this basic consideration of space as a continuity is often forgotten or neglected. The perspective is changed from the point of the user to that of the state, the legislator, the market, or the owner. This way of thinking results in the erection of barriers to full accessibility. Unless those barriers are eliminated, people with disabilities will not be able to participate fully and avail themselves equally of the opportunities that exist in society.

2.1.2 Barrier Free Built Environment

Inaccessibility in thoroughfares of the built environment is, indeed, very frustrating. It enhances the agony of disability in isolation of one's own confines. Getting around with freedom in a city is the first step towards the efforts to make independent living a reality. Ramps located to provide continuity of footpath adjacent to the regular flow of traffic, reserved parking lots for disabled, conveniently positioned public call booths, special toilets, elevators, street furniture, continuity of foot path, public transit vehicles etc. are some of the specific issues which if attended to, can ensure ease of movement within the public spaces.

The responsibilities of achieving a "**Barrier Free Built Environment**" squarely lies over the shoulders of the Architects and Planners, who by way of

their Planning and design could ensure the implementation of such essential functional requirements. By satisfying needs of all the possible users, the provisions for "Barrier Free Built Environment" shall add value to the quality of space created by an Architect.

2.1.3 Access to Facilities and Amenities

The benefits of development must reach all sections of the society. As a result of advancements in various fields, there is an improvement in quality of life in terms of available facilities and amenities. It is therefore desirable that all facilities are accessible to disabled in the same manner as any other normal person. For example, a hotel building may have certain recreational areas, business support facilities, health center, restaurants etc. it is the responsibility of the professionals involved to ensure by way of design that the disabled are not deprived of any facility.

Limited access to facilities on specific demand, due to financial implications and other reasons is unethical. Architects need to educate, sensitize and convince others of such requirements, who may not aware of such a requirement at the first instance. Thus, the building professionals carry a great responsibility in eradicating discrimination against the disabled, by intervention at design level itself.

2.1.4 Avoidance of Exclusion

If a person is offered a treatment same as that of others, there is very low probability that the person would be abused or exploited. Once there is an isolation or treatment in exclusion, abuse or exploitation is almost imminent, especially when the society at large is not desirably sensitive to disabled as yet. Design options for disabled, thus, need to be offered as part of the overall design and not an attachment or merely as matter of legal requirement, placed at scheduled locations. These options must ensure that the movement of disabled and use of facility, within a space, is along with all. Avoidance of exclusion by design may offer an opportunity to non-disabled to understand the needs of disabled and develop sensitivity towards them.

2.1.5 Planning For Equal Opportunities

Architectural program of buildings must have an inherent character of creating opportunities proactively rather than respond to the needs subsequently. Unless the approach is proactive, other interests and conveniences would almost force denial of opportunities. For example, if ramps are planned in the original program itself, they may not be left out in execution but if they are not planned. It will be too difficult to justify their need. Arguments like, number of disabled existing now and likely to come in future etc. are common reasons put-forth. The fact is that by non-proactive approach , an environment of discouraging opportunities and reluctance is created. Disabled, who are already frustrated

due to extra difficulties thy are generally faced with, may not have enough enthusiasm to take initiative. The objective is to provide same opportunities that exist for others and not explore possibilities to accommodate later when an individual has come forward. Architectural design development process can address these issues to also include opportunities for various categories of disabilities so that specific needs can be considered at the initial stages itself. Thus, the architectural inputs can initiate the process of "main-streaming" of disabled.

2.1.6 Emphasis on Social Interaction

Specific emphasis needs to be given to the planning of places of social interactions. Community areas, recreational areas and other public spaces provide such opportunities. As non-disabled interact with disabled persons, it is known to have initiated appreciation, understanding and a sense of responsibility towards the disabled. Sharing of experiences at informal level raises confidence in each other's capabilities. It shall lead to greater contributions from the disabled, thereby, giving them positions in society that they deserve.

2.2 The Current Situation Regarding Access

2.2.1 Buildings

The access requirements of disabled and elderly persons have only been a consideration for town planners, policy makers, architects, and building developers since 1993. Most public and other buildings in India are not accessible.

It is not common in India for residential buildings to have ramps and lifts. Private builders can, of course, install these but they are deterred by the additional expense. The lower and the middle classes are often housed in units under a Group Housing Project. These generally have two to three stories with a staircase. Only more affluent members of society can afford lifts, fire alarms and other modifications. Group Housing Project units are generally too small to incorporate alterations which would improve access.

Public and residential buildings in the rural areas are elevated from the ground for drainage and sewerage purposes. Indian-style toilets are the norm in most lower and middle class dwellings. These are not suitable for access by elderly and disabled persons. Public toilets are typically narrow and inaccessible to wheelchair users.

The most common access feature, which has been added to existing public buildings in urban areas, is a ramp at the entrance point. The majority of multi-story public buildings now have lifts. Multi-story commercial buildings, market areas and shopping centers usually have moving stairs but no ramps or lifts. Urban public buildings usually have toilets accessible to persons with disabilities and elderly persons.

Most industrial buildings have hooters and bells to raise the alarm in case of a fire. These buildings are not equipped with visual emergency signals for hearing-impaired persons.

2.2.2 Public transport

Very few railway stations have ramps and lifts. Visual destination signs are also rare. Large railway stations, bus terminals and airports have public announcement systems, which benefit visually impaired persons. In local buses,

The arrival times are announced through a public address system. There are no Braille information boards in stations and airports.

The Committee on Access has prepared plans for the development of Nizamuddin Railway Station in New Delhi. It will be a model railway station providing all basic access features for disabled and elderly persons. It will provide an example for other similarly busy stations to follow. Similar steps have been taken to improve access in domestic airports. Indian international airports are barrier-free.

Local buses are overcrowded and almost completely inaccessible to a wheelchair user. There are no lifts in buses and usually no ramps at bus stops.

2.2.3 Roads and walkways

Guidelines or standards do not regulate pavement height, footpaths, road dividers and speed breakers. Unauthorized constructions and extensions shrink pavement space. Beggars and homeless persons occupy large areas of walking space.

The covering of gutters, sewers and manholes is mandatory but has not yet been enforced by law. Until enforcement takes place, damages cannot be claimed for accidents.

2.3 Existing regulatory controls relating to the Built environment

2.3.1 Building By-laws

These are formulated and implemented by local authorities for application within their respective limits. Each local authority follows the Municipality Act for its area. Building by-laws are essentially based on the National Building Code. They stipulate administrative procedures to regulate building construction activities. Local government authorities have the power to implement and enforce these procedures.

Special building regulations have not yet been formulated for persons with disabilities. Access requirements are not specifically mentioned in building by-laws.

2.3.2 The Motor Vehicle Act (MVA)

The MVA is a national regulation covering all road traffic. Access issues are not yet included, but the Committee on Access is in the process of suggesting suitable amendments. The amendments under consideration relate to:

i. Specifications for entrance and exit doors, the height of foot boards, the width of space between rows of seats;

ii. Provision for hearing-impaired persons to obtain driving licenses;

iii. Visual and auditory signals throughout the public transport system; and

iv. Training for public transport staff and traffic police officers

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Chapter 3.
Literature and Case Studies

3. LITRATURE & CASE STUDIES

3.1 About The Disabilities

3.1.1 Definitions

The World Program of Action concerning Disabled Persons recognizes that disabled persons do not form a homogenous group. In 1980, the World Health Organization adopted an international classification of "impairment", "disability" and "handicap". There is a clear distinction among these three. Previous terminology to define these terms reflected a medical or diagnostic approach. The new definitions represent a more precise approach.

People with visual, hearing and speech impairments and those with restricted mobility or with so-called "medical disabilities" encounter a variety of barriers. From this perspective of diversity in unity, it is useful to clarify the distinctions among three commonly used terms.

a. **Impairment** is any loss or abnormality of psychological, physiological or anatomical structure or function. Impairment can be temporary or permanent. This includes the existence or occurrence of an anomaly, defect or loss in a limb, organ, tissue or other structure of the body, including the systems of mental function.

b. **A disability** is any restriction, or lack of ability (resulting from impairment), to perform an activity within the range considered normal for a human being. A disability may be temporary or permanent, reversible or irreversible, and progressive or regressive.

c. **A handicap** results from impairment or a disability and limits or prevents the fulfillment of a function that is considered normal for a human being. A handicap is therefore seen in the relationship between disabled persons and their environment. Cultural, physical or social barriers to mobility within the built environment are handicaps.

In India, there are no national or local policies for disabled or elderly persons. The Government of India is currently processing a draft national policy on the basis of the recommendations presented at the 1993 seminar. Draft legislation concerning rights of access for disabled persons is being completed.

3.1.2 Types of disabilities

Various disabilities, which have been considered in the dissertation on barrier free built environment, are broadly classified under four categories.

1. **Non-Ambulatory:**

   Impairments that, regardless of cause or manifestation, for all practical purposes, confine individuals to wheelchairs.

2. **Semi-Ambulatory:**

Impairments that cause individuals to walk with difficulty or insecurity. Individual using braces or crutches, amputees, arthritics, spastics and those with pulmonary and cardiac ills may be semi-ambulatory.

3. **Sight:**

Total blindness or impairments affecting sight to the extent that the individual functioning in public areas is insecure or exposed to danger.

4. **Hearing:**

Deafness or hearing handicaps that might make an individual insecure in public areas because he is unable to communicate or hear warning signals.

3.1.3 Access Needs of Diverse Disability Groups

In order to create fully accessible environments, it is important to understand the nature of the access requirements of diverse disability groups. For the purpose of built-environment design, there are usually four major disability groups:

a. Orthopedic: ambulant and non-ambulant (wheelchair users);

b. Sensory: visual, hearing;

c. Cognitive: mental, developmental, and learning;

d. Multiple: combination of any or all of the above.

(a) Orthopedic

People with orthopedic disabilities are generally those with locomotion disabilities which affect mobility. This can mean impairment of the trunk, the lower limbs, or both of these. People with orthopedic disabilities may also have impairment of the lower limbs and the trunk as well as the upper limbs. People with orthopedic disabilities are divided into two subgroups, namely;

i. *Ambulant disabled persons* are those who are able, either with or without assistance, to walk and who may walk with or without the aid of devices such as crutches, sticks, braces or walking frames.

ii. *People who use wheelchairs* are unable to walk, either with or without assistance, and who, except for the use of mechanized transport, depend solely on a wheelchair for mobility. They may propel themselves independently, or may require be pushing and maneuvering by an assistant. While being unable to walk, the majority of people in this group are able to transfer to and from a wheelchair. The built environment needs to incorporate level access, ramps, lifts/elevators, handrails and grab bars, larger toilet cubicles, clear signs, sufficiently wide paths, doors, entrances, lobbies and corridors. The presence of these features would ensure wheelchair users access to buildings and to the external environment.

(b) Sensory

People with sensory disabilities are those who, as a consequence of visual or hearing impairment may be restricted or inconvenienced in their use of the built environment. They are divided into two sub groups:

i. *Visually-impaired/blind persons,* who rely solely on their sense of hearing, touch and smell. The built environment must therefore incorporate certain aspects of sound, texture and aroma to assist these persons in their surroundings.

ii. *Hearing-impaired persons,* who rely solely on their sense of sight and touch and need signs, colour and texture to be incorporated in the built environment to assist them in moving around their surroundings.

(c) Cognitive

People with cognitive disabilities are generally those with a mental illness, a developmental or a learning disability. To assist them to function in their surroundings, the built environment should incorporate a combination of cues such as those of sight, touch and sound, as well as signs, colors and texture.

(d) Multiple

People with multiple disabilities are generally those with a combination of orthopedic, sensory and/or cognitive disabilities. The built environment therefore must incorporate a combination of visual, tactile and olfactory cues to assist them in their use of their surroundings.

3.2 Case Studies.

Case study 1

3.2.1 THE INSTITUTE FOR PHYSICALLY HANDICAPPED -- New Delhi

The institute aim to serve the orthopaedically handicapped of all age group. The building is three story high with the provision of lift.

Architectural Barriers –

- There are not proper leveling of curbs
- The inclination of the ramp is more thus obstruct unassisted access by all wheel chair users.
- The ramp surface is very slippery.
- The steps and staircase have extra nosing.
- Doors are heavy in weight and require excessive force to open.
- Most of corridors are 5'-0" wide. The space is reduced and obstructed by placing benches and cupboards on the one side.
- Toilet doors are narrow enough for the wheel chair to move through easily.
- Some windowsills are high and do not allow clear vision to the children.
- There is not enough space inside the toilet for the mobility of the wheel chair.

- Urinals are very close to each other thus not allowing two wheel chairs to park side by side.

Conclusion from the case study-

- There should be at least one ramped approach to all the levels/floors of the building.
- Both stairs and ramps should be provided at the entrance.
- Toilet etc should be easily accessible, having enough space inside the toilet for the mobility of wheel chair.
- The slope of ramp should not be more than 1:12
- The ramp surface should be non-slippery with handrail on at least one side, preferably on both.
- The min width of ramp should be 5`-0``
- The gap between the lift and floor should not be greater then 2 cm.
- Nosing should not be provided in the stairs case.
- Handrails should be provided on one or preferably both side of the stairs case for ambulatory disabled.
- All control switches should be within the height of 2`-2`` to 4`-2``.
- The min doorway should be 6`-0``.

3.2.2 NATIONAL INSTITUTE FOR VISUALLY HANDICAPPED – Dehradun.

N.I.V.H.- Dehradun is an educational cum rehabilitation centre for the blinds. Campus is situated in a contoured site, having maximum of two story high buildings.

There are some architectural and environmental barriers, which had been listed out at the time of study-

Architectural and environmental barriers-

- Most of the children face problem in orienting them selves towards the entrance while turning.
- There is no identification or warning for the steps or level differences.
- Lack of contrast colors to identify for the steps or level differences for the partially blinds.
- Lack of contrast colors and fences to identify the unexpected objects
- Turning points are not defined.
- There are low hanging tree limbs in the campus, which are hazardous to blind and partially sighted.

- Traffic signs placed too low and their posts are too close to the sidewalk.
- Walkways have no tactile clues and brail blocks as route finders.

Conclusion from the case study-

- Change of material at approaches to stairs, pedestrian crossings, etc.,
- Handrails at the top and bottom of stairs should continue horizontally for some distance (but must of course not protrude into space),
- Important pedestrian crossings should be provided with acoustic signals.
- Edges of safe wakling areas should be marked by borders which can be felt by tapping with a cane (e.g., in places where the kerb slopes down to the roadway a difference in level of 2 cm should be retained at the edge of the kerb),
- Contrasting colors to increase visibility, e.g. to distinguish door from frame, to distinguish riser and tread on stairs, etc.
- Doorknobs of different material to identify the doors which access to hazardous areas .

Case Study : 3

3.2.3 SCHOOL FOR THE DEAF , Roorkee

This institute is aimed to serve to the blind for educational and training purposes. Campus of school is small having single story buildings.

Architectural Barriers

- Lack of visual signs in the campus, which cause the difficulty for new comers.
- There are no any emergency indication system (flashing light in place of alarm system)
- There is lots of glare in the classrooms while it is important for the people with hearing impairment to avoid glare and good lighting because they focus on facial expression.

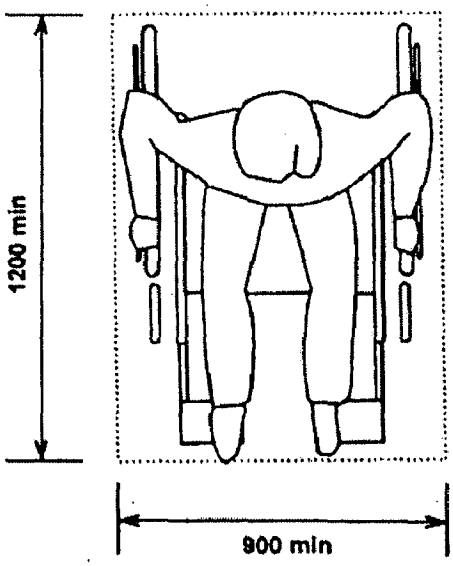
Conclusions from case study

- Hearing impaired persons who rely solely on their sense of sight and touch therefore colour and texture to be incorporated in the built environment to assist them in moving around their surroundings.

- It is most important and widely understood that a person with a hearing impairment reacts a lot more slowly than someone without this difficulty. Therefore there should be flashing light alarm system in case of hazards in public buildings.
- There must be very clear and accurate visual signs.
- Wherever possible (e.g., in foyers, meeting rooms, interview rooms, courts, theatres, training venues, booking offices and cash desks) an induction loop system should be installed for hearing aids.
- It is most important to reduce any background noise both internally and externally in buildings.

3.3 Space standards

3.3.1 Non ambulatory



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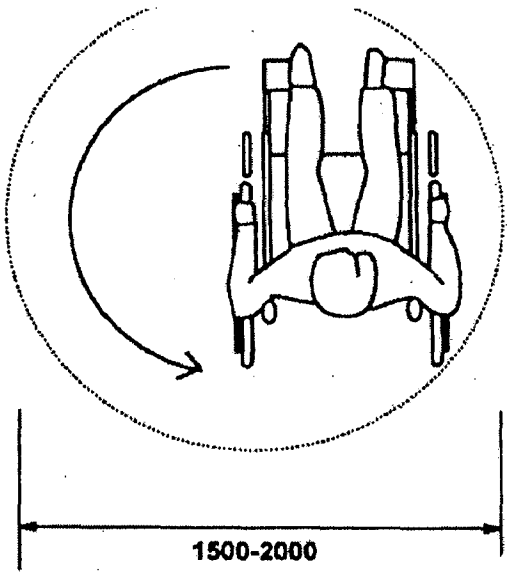

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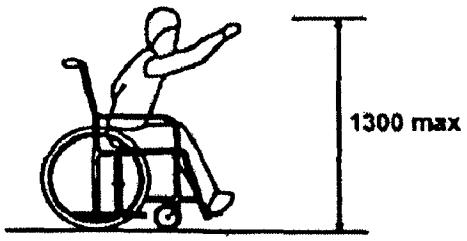
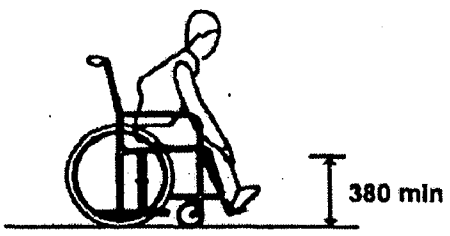
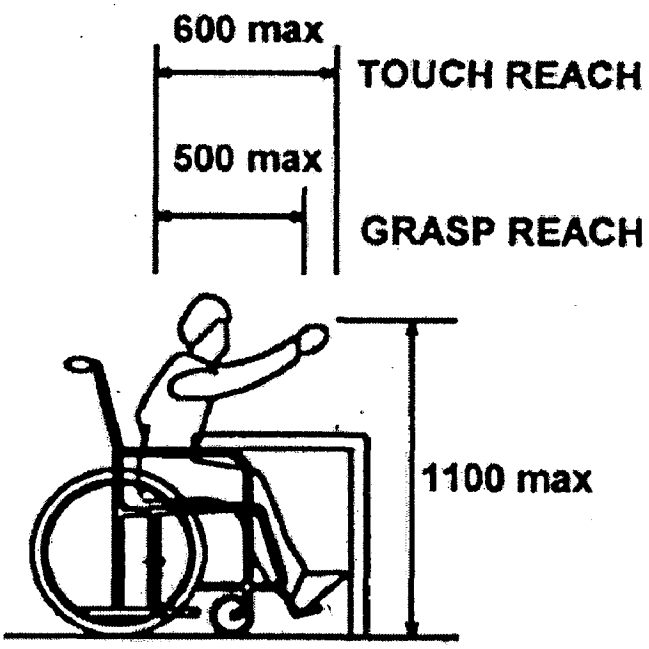
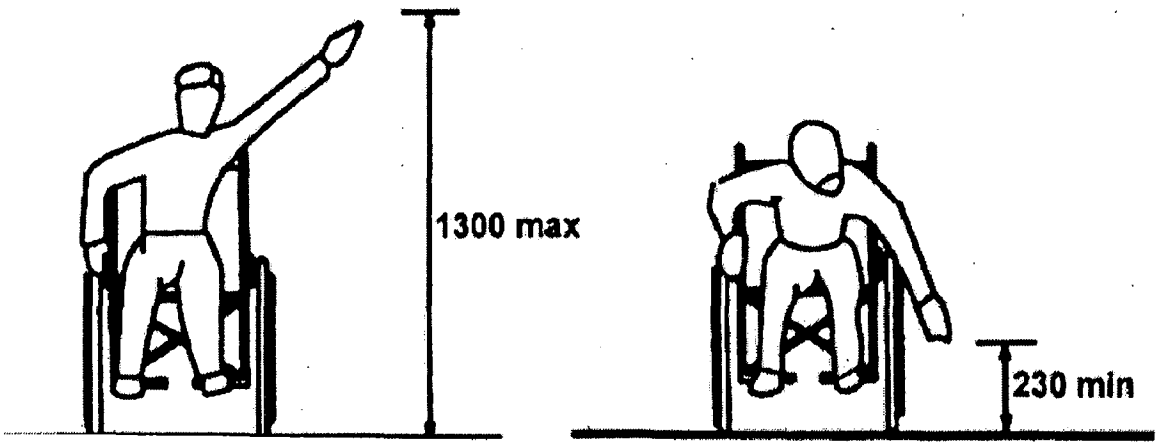




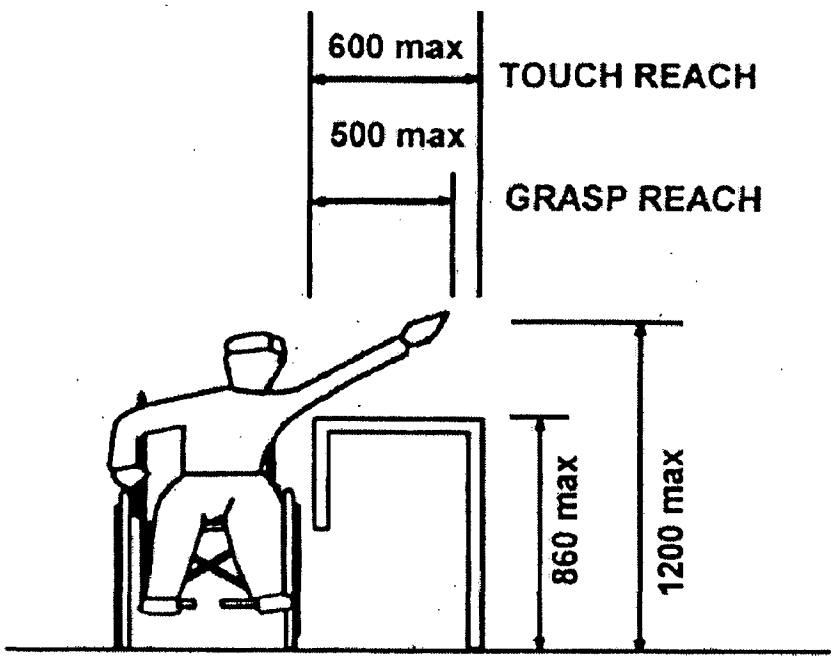
Forward reach without obstruction



Forward reach over obstruction

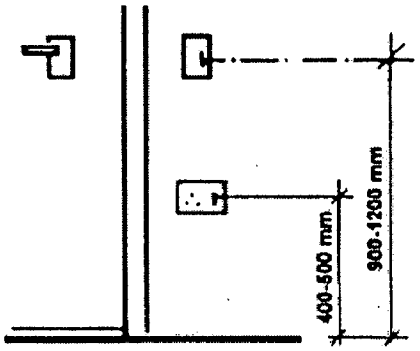


Side reach without obstruction



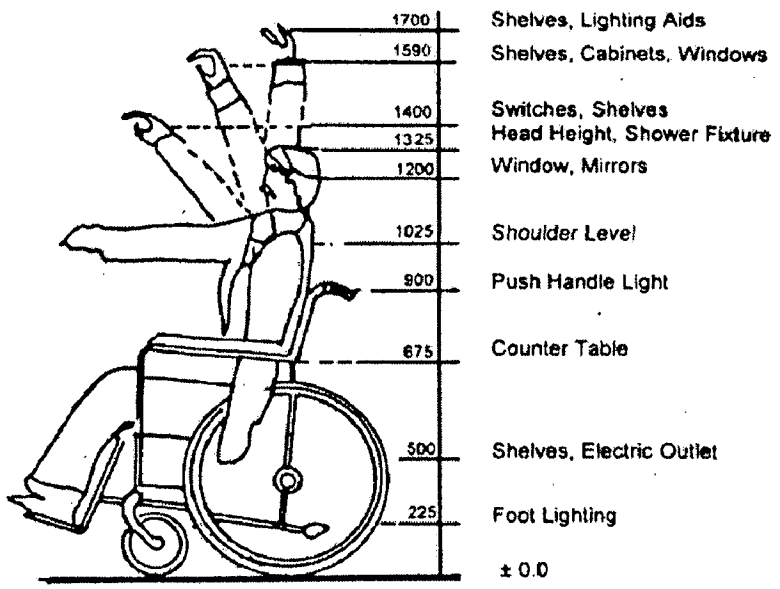
Side reach over obstruction

CONTROLS



Heights For Switches, Doors, Handrails

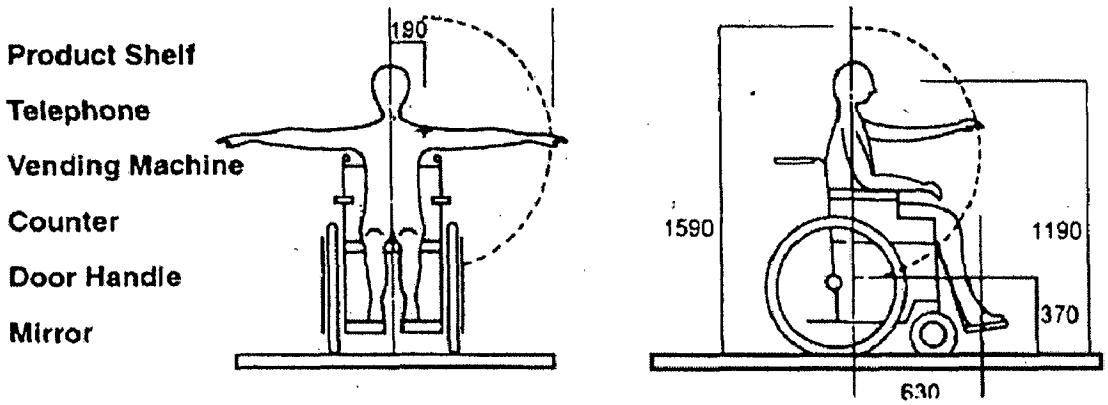
- For locking and opening controls for window and doors should not be more than 1400mm from the finished floor usable by one hand.
- Switches foe electric light and power as well as door handles and other fixtures and fittings should be between 900mm -1200 mm from finished floor.



Typical Dimensions for Essential uses with in easy reach

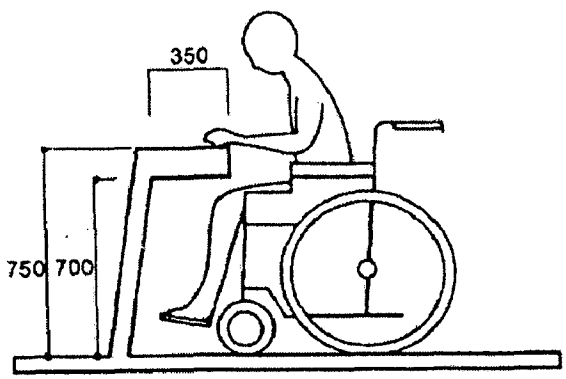
Renge of reach

- a wheelchair user's movement pivots around his /her soulders therefore, the range of reach is limited ,approximately 630 mm for an adult.
- While sitting in a wheelchair, the height of the eyes from the floor becomes about 1190mm.



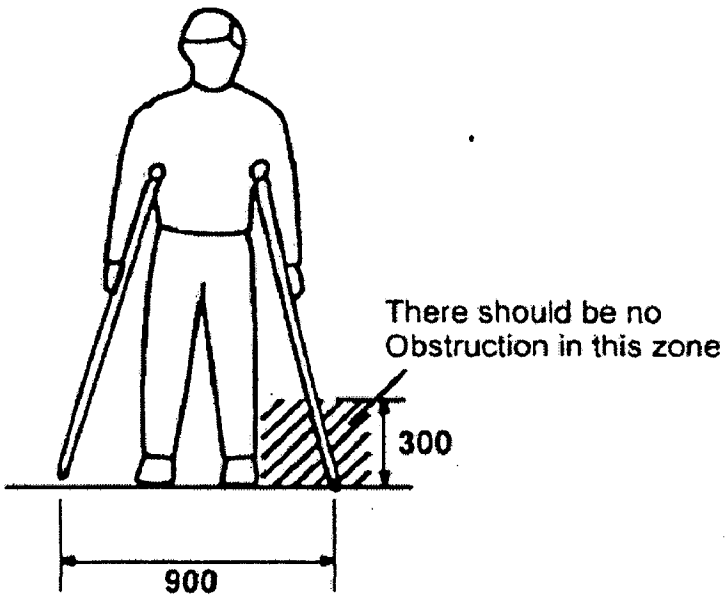
Range of Reach

- A wheel chair has a footplate and legrest attached in front of the seat .the foot plate extends about 350mm in front of the knee.



Space required for wheelchair footplate

3.3.2 Semi ambulatory



Space Allowance

Persons in this category who use walking aids such as crutches or canes, who are amputees, who have chest ailments or heart disease. The persons in this category include those who can not walk without a cane and those who have some trouble in their upper or lower limbs although they can walk unassisted.

- **Width of passage for crutch users (min. 900 mm)**
- **Finishes of floor surface with non slip floor material.**

3.3.3 Visual

Persons in this category are totally blind or with impaired vision. Visually impaired persons make use of other senses such as hearing or touch to compensate for the lack of vision. It is necessary to give instructions accessible through the sense of touch (hands, fingers or legs).

While walking with a white cane to spot their feet the tip of the cane the persons may bump his or her head or shoulder against protruding objects.

- **Use of guiding blocks**
- **Installation of information board in braille.**
- **Installation of audible signage (announcements)**

3.3.4 Hearing

Persons in this category are totally deaf or have difficulty in hearing. They are generally use their sight to gather information in public place.

- **Provision of information board in an easily understandable manner.**
- **Provision of illuminated signages, layout diagrams to help the persons easily reach the desired place.**

References: -

1. ADA (Americans with disability Act) **Accessibility Guide lines for buildings and facilities** (ADAAG), Jan-1998.
2. Promotion of non–handicapping physical environment for disabled persons: Guidelines by United Nations, 1997.
3. Ramsay and Sleeper, **"Architectural graphic standards"** – The American Institute of Architects.
4. Ali Baquer and Anjali sharma , **"Disability: Challenges Vs Responses".**
5. Joseph De Chiara, **"Time saver standards for residential development".**

Chapter 4.

Environmental Accessibility and Barriers

4. ENVIRONMENTAL ACCESSIBILITY AND BARRIERS

4.1 Environmental Accessibility

The built environment shall be designed so that it is accessible for all people, including those with disabilities and elderly persons. For a person with limited mobility, vision or hearing, the physical environment can either facilitate or limit their independence. A barrier free environment will allow a person with disability to live more independently within his or her own home as well as access public buildings and participate in community activities. Barrier free design assists not only those with disabilities, but also the elderly and even parents with children in strollers. Accessibility should be considered in both public and residential buildings.

Buildings and structures should satisfy the following basic requirements of accessibility: When we consider access, we are looking at four main areas:

- **Functionality:**

The mobility-impaired user should be able to enjoy the basic functionality expected of the structure, just as well as a normal person, and with the same degree of comfort or convenience.

- **Autonomy:**

The mobility-impaired person should not be required to seek the help of anybody for using the structure.

- **Safety:**

Usage of the structure by a mobility-impaired person should not compromise on his safety. In general, objects designed for use by the handicapped must provide a much higher level of safety than those designed for use by normal persons only.

To ensure safety, we should identify and eliminate all hazards, which exist, in our building. For instance, we should:

1. Identify and eliminate all unnecessary barriers and obstacles e.g. furniture, partitions, sculptures, screens, potted plants, thresholds, steps etc. Where such obstacles are inevitable, the place should be very well lit, and must be marked prominently or cordoned off.
2. Take special care to see that there are no cables and trailing wires (e.g. Phone Wires) which may get entangled and lead to an accident.

3. Confirm that the flooring surface is non-skid in nature. If you are using carpets or any other form of floor-cladding, make sure that it is made of a non-woven material, to avoid frayed strands getting entangled in a handicapped person's equipment.

4. Ensure that there are no open pits (e.g. open manholes, trapdoors etc.) or no soft or slushy patches on the path of handicapped persons. Such traps should be clearly cordoned off.

5. Ensure that the possible passageways are all cleared of all hazards, to respect the minimum dimensions mentioned in the earlier section and that all-essential device and objects are kept easily reachable.

6. Mark prominently the availability of handicapped accessible facilities using signposts and indicators.

4.2 Disability Simulation Exercise

1. What Is It?

This is an exercise that can be used to give participants an understanding of what it is like to be elderly and disabled. It is most effective if the exercise can span an overnight period, as many normal acts of daily living, such as going to the toilet, walking, eating and dressing, can be experienced.

2. When to use the simulation exercise

It is best used in a workshop situation. It can be used for small groups of five or six people or a large group of up to 30, which is divided into smaller subgroups.

3. Disabilities that can be simulated

Paraplegia, stroke, arthritis, being an amputee, having a broken leg, cataract, tunnel vision, blindness, hearing loss, heart/chest conditions can all be simulated.

4. Equipment and materials required for simulation exercise per group of ten participants

One self-propelled wheelchair, two pairs of adjustable crutches, one adjustable walking frame, one adjustable tripod walker, one camera jacket (with several pockets), sunglasses (lenses smeared thickly with soap), sunglasses (adapted for tunnel vision), one set of industrial protective earmuffs, two sets of shin protective guards, one set of elbow proactive guards, one set of wrist weights (1 kg), one set of wrist weights (2 kg), one set of ankle weights (1.5 kg), one set of ankle weights (2.5 kg), two crepe bandages, cotton wool, one set of thin surgical gloves, safety pins, and talcum powder.

5. Briefing on disability

It is important that a short briefing is given on each disability, its causes, effects and limitations. This will help to improve understanding and involvement in the role-play situation. If blindness is being simulated, then a demonstration of

how to lead a blind person must be given by someone who is familiar with the correct way of doing this.

6. Demonstration on use of devices

A demonstration is given of how to measure the correct height of the walking devices, to adjust them and to ensure their safe use on steps/stairs and outside in negotiating kerbs. It may be useful to have a physiotherapist take part in this exercise.

7. Medical conditions

There are various medical conditions that could be aggravated by simulating some of the disabilities. Advise the whole group about this. Check with the group if anyone has a heart condition, chest condition or arthritis and avoid allocating them a "disability" that may be detrimental to their health.

8. How to simulate different disabilities

There are a number of different physical and sensory impairments that can be simulated in this exercise by using the equipment listed above.

(a) Paraplegia

Use the wheelchair. Check that the person can use the wheelchair correctly knows the procedure for both kerbs and steps and is comfortable. Check that the person can use the walking device correctly knows the procedure for steps/stairs and is comfortable.

Someone with a heart or chest condition or arthritis should not try simulation of paraplegia.

(b) Heart condition/chest condition

Use the camera jacket. Put weights into the various pockets around the jacket. Judge the total weight according to the size of the person. Small woman: 5 kg; large man: 8 kg.

Someone with a heart condition, chest condition or arthritis of the spine should not participate in this simulation exercise.

(c) Cataract

Use sunglasses, the lenses of which have been thickly smeared with soap. As an alternative, the lenses may be covered by semi-opaque plastic. Check that the glasses are comfortable.

(d) Tunnel Vision

Use sunglasses that have had cone-shaped tubes of cardboard attached to the lenses and the sides screened off. Two sections of an egg box could also be used. Ensure that the centres of the cones are aligned. Alternatively, blacked-out spectacles with pinholes to simulate tunnel vision may be used. Check that the glasses are comfortable and that the person is aware of the necessity of turning her/his head from side to side to compensate for the narrow field of vision.

(e) Blindness

Use a crepe bandage tied around the head to cut out all vision. A sleeping mask or sunglasses that have had the side screened off and the lenses blacked out may be used. Check that the blindfold is comfortable.

(f) Deafness

Use a set of industrial ear protectors with cotton wool tightly packed inside them. Have enough cotton wool to replace it for each participant; if someone has an ear or skin infection this will avoid it being passed on. An alternative to the ear protectors is to use wads of cotton wool over the ears, held securely in place by a crepe bandage, but this does not cut out sound as effectively as the ear protectors do.

9. How to conduct the simulation exercise

(a) Pre-preparation

Assemble the various "devices" that will be required in the exercise. Be sure to have enough for the whole group. Work out an itinerary of places and activities for each group, i.e., four or five places could be visited in sequence. Examples could be: a public toilet; a bedroom with attached bathroom; a bus stop; a post office (to buy and post stamps); a lift to go from one floor to another in a building; a shop to price some items on sale; a kitchen to make afternoon tea for the group, and so on.

Each group will encounter various barriers in everyday life. If the workshop is residential then having a meal together can be a good idea. The sequence should be different for each group so they do not all try and visit the same place at the same time.

Decide beforehand the duration of the exercise, e.g., half a day or 24-hour period.

A separate itinerary should be prepared for each group, with a list of the activities that they should undertake in each location.

b) The Simulation Exercise

- Briefly explain what is to happen during the exercise and its duration.
- Give a short briefing on each disability.
- Check with the participants for any contraindicated medical conditions.
- Demonstrate how to measure and adjust the walking devices for correct height, and
- Confirm that this is understood.
- Demonstrate the correct use of the various devices and ask for a return demonstration.
- Demonstrate the correct method of guiding a blind person.
- Outline the itinerary and what is to be done at each location.

Divide the large group into smaller groups and allocate "disabilities", ensuring that no participant in that group already has a medical condition that could be aggravated by the assigned simulated disability. If so, reallocate a "disability" that is safe for the individual. Each group member should have a different "disability".

Advise the group members to change "disabilities" after a specified time depending on the duration of the simulation exercise.

Go over that group's itinerary and check that it is understood. Dress group members up in the simulation devices, adjusting walking devices for each

4.3 SURVEYS

Prior to the formulation of planning and building and building design guidelines, a survey should be conducted. The purpose of survey should be to identify obstacles into the built environment, which used to encounter by the user groups.

To check the accessibility into the public buildings, I have taken "collectorate complex, Haridwar "as a case study.

COLLECTORATE COMPLEX, Hardwar

Collectorate complex is newly constructed by Uttar Pradesh Rajkiya Nirman Nigam , Lucknow .There are three buildings in the complex-

1. **district court**
2. **collectorate**
3. **vikas bhawan**

Location and Access

The Collectorate Complex is located near the Hindustan Aeronautics Limited. It is about 6 km from the railway station of Hardwar.There are two main access road to the complex and each of them cause the same problem because of no crossing or zebra crossing.

Architectural Barriers in the Complex-

- It is impossible for a wheelchair user to gain access in any of the building of complex stepped because of the high steps at the entrances.
- Open drains besides the road without any edge demarcation, which may be hazardous for the sighted and partially sighted persons.
- There is no identification or warning for the steps or level differences.
    - Lack of contrast colors and fences to identify the unexpected objects
    - Turning points are not defined.
    - There are low hanging tree limbs in the campus, which are hazardous to blind and partially sighted.
    - Traffic signs placed too low and their posts are too close to the sidewalk.
    - Walkways have no tactile clues and brail blocks as route finders.
    - Lack of visual signs in the campus, which cause the difficulty for the deaf.
    - No proper leveling of curbs, causes the problem for the wheelchair users.
    - No on-street or of-street parking is provided for the persons with disabilities.
    - Inadequate grating and covers for storm drains and manholes.

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District court building

Court building in the complex is three stories high without having lift. Basement floor is used for the services and upper three floors having offices and courts. Typical design of court building is repeated in Mau and Ferozabad district.

These are the some architectural barriers, which has been listed out at the time of survey.

- No any entrance and exit to the building is suitable for wheelchair users and other disability groups.
- Doors are heavy in weight and require excessive force to open.
- Most of corridors are 5'-0" wide. The space is reduced and obstructed by placing benches and cupboards on the one side.
- No provisions of the toilet for the wheelchair users and toilet doors are narrow enough for the wheel chair to move through easily.
- There are no any emergency indication system (flashing light in place of alarm system)
- There is lots of glare in the courtrooms while it is important for the people with hearing impairment to avoid glare and good lighting because they focus on facial expression.
- No any floor of the building is accessible for the wheelchair users.
- Floor finishes are very slippery.

4.4 ANALYSIS

	Minimum standards	Recommended standards
Entrances & exits	* One exit/entrance in a building should be wide enough for wheelchairs to pass through. • Its width shall be 80 cm or more. • In principle, guide blocks, etc., shall be installed from the entrance/exit to the reception, etc. * At least one doorway to each room shall be constructed so that wheelchair users can pass through it, and its width shall be 80 cm or more.	* Every entrance/exit in a building shall be such that a wheelchair user can use it with ease. • Principal entrances/exits shall have automatic doors, shall be at least 120 cm in width, and other entrances/exits shall have a width of 90 cm or more. • In principle, guide blocks, etc., shall be installed from the entrance/exit to the reception, etc. * Doorways within a building shall be constructed so that a wheelchair user can pass through them, and their width shall be 90 cm or more.

Corridors, etc.	* Corridors, etc., shall have a width of 120 cm or more so that a wheel- chair user can pass through them, and spaces where a wheelchair user can turn his wheelchair around shall be provided at fixed intervals in every passageway. * Where there is a level difference, equipment to eliminate the difference or slopeway shall be installed.	* Corridors, etc., shall have a width of 180 cm or more so that two wheelchair users can meet and pass one another and easily change direction. If spaces where two wheelchair users can meet and pass each other are provided at fixed intervals, corridors, etc., may be 140 cm or more. * Where there is a level difference, equipment to eliminate the difference or slopeway shall be installed.
Stairs	* Handrails shall be installed. * Warning blocks shall be installed at the top of stairs.	* Handrails shall be installed on both sides. * The width shall be 150 cm or more, the rise shall be 16 cm or less, and the tread shall be 30 cm or more. * Warning blocks shall be installed at the top of stairs.

Slopeways	* Handrails shall be installed. * In a case where the height exceeds 75 cm, landings with a length of 150 cm or more shall be provided at intervals of at least 75 cm. * Warning blocks shall be installed at the tops of slopeways.	* Handrails shall be installed on both sides. * The width shall be 150 cm or more and the incline shall be 1/12 or less. * In a case where the height exceeds 75 cm, landings with a length of 150 cm or more shall be provided at intervals of at least 75 cm. * Warning blocks shall be installed at the tops of slopeways.
Lavatories	* Where lavatories are provided in a building, at least one toilet stall for wheelchair users shall be provided in the building. * At least one floor- installed urinal shall be provided in the building.	* When lavatories are provided, they shall conform to the following specifications: • In principle, 2 per cent or more of all toilet stalls on each story of a building shall be toilet stalls for wheelchair users. • In lavatories without toilet stalls for wheelchair users, one or more toilet stalls shall contain a toilet seat and toilet stall with handrails. * One or more floor- installed urinals shall

		be provided in the lavatories on each storey of the building.
Parking areas	* When a parking area is provided, one or more parking spaces for wheelchair users (minimum width: 350 cm) shall be provided. • The designated space shall be close to the entrance/exit of the parking area.	* When a parking area is provided, in principle, 2 per cent or more of the parking spaces shall be parking spaces for wheelchair users (minimum width: 350 cm). • The designated space shall be close to the entrance/exit of the parking area.

References: -

1. Shannon crumb and Kenneth E. Foote – **"Environmental and architectural Barriers"** – A research paper- 1996.
2. John I.Gilderbloon, **"Creating an Accessible city"** – Concept paper.
3. Prof. Irving Kenneth Zola, **"Experience of Inaccessibility into the built Environment, and the Benefits of integration".**
4. View of various professionals and social workers published by Poonam Goel, **Times of India**, Dec 2-1999.

Chapter 5.

Planning and Building Design Guide Lines

5. BUILDING DESIGN GUIDE LINES

5.1 General Considerations

No part of the built environment should be designed in a manner that excludes certain groups of people on the basis of their disability or frailty. No group of people should be deprived of full participation in and enjoyment of the built environment or be made fewer equals than others due to any form or degree of disability. In order to achieve this goal adopted in the dissertation, certain basic guiding principles need to be applied.

a. It should be possible to reach all places of the built environment;

b. It should be possible to enter all places within the built environment;

c. It should be possible to make use of all facilities within the built Environment; and

d. It should be possible to reach, enter and use all facilities in the built environment without being made to feel that one is an object of charity.

These basic guiding principles may serve as general requirements for consideration in physical planning and design. These requirements may be summarized as follows:

i. Accessibility

The built environment shall be designed so that it is accessible for all people, including those with disabilities and elderly persons.

ii. Access or accessibility

This means that people with disabilities can, without assistance, approach, enter, pass to and from, and make use of an area and its facilities without undue difficulties. Constant reference to these basic requirements during the planning and design process of the built environment will help to ensure that the possibilities of creating an accessible environment will be maximized.

iii. Reachability

Provisions shall be adopted and introduced into the built environment so that as all people can reach many places and buildings as possible, including those with disabilities and elderly persons.

iv. Usability

The built environment shall be designed so that all people, including those with disabilities and elderly persons can use and enjoy it.

v. Safety

The built environment shall be so designed that all people, including those with disabilities and elderly persons can move about without undue hazard to life and health.

vi. Workability

The built environment where people work shall be designed to allow people, including those with disabilities, fully to participate in and contribute to the work force.

vii. Barrier-free or non-handicapping

This means unhindered, without obstructions, to enable disabled persons free passage to and from and use of the facilities in the built environment.

5.2 Classification of Buildings

Category 1	**Residential**
Category 2	**Commercial**
Category 3	**Manufacturing**
Category 4	**Public and Semipublic**
Category 5	**Recreational**
Category 6	**Transportation & Communication**
Category 7	**Agriculture**
Category 8	**Special Area**

CATEGORY 1 ***RESIDENTIAL***

Primary Residential Zone

Mixed Residential Zone

Unplanned Informal Residential Zone

CATEGORY 2 ***COMMERICAL***

Retail Shopping Zone

General Business & Commercial

Wholesale, Godowns, Warehousing/Regulated Markets.

CATEGORY 3	***MAN UFACTURING***
	Service and Light Industry
	Extensive and Heavy Industry
	Special Industrial Zone
	Hazardous, Noxious, and chemical.
CATEGORY 4	***PUBLIC AND SEMI-PUBLIC***
	Govt./Semi Govt./Public Offices
	Education and Research, Medical and Health
	Social Cultural and Religious
	Utilities and Services
	Cremation and Burial Grounds
CATEGORY 5	***RECREATIONAL***
	Playground/stadium/sports complex
	Parks & Gardens-Public open spaces
	Special recreational zone-restricted open spaces
	Multi open-space (Maidan)

CATEGORY6	***TRANSPORTATION & COMMUNICATION***
	Roads
	Railways
	Airports
	Seaports and Dockyards
	Bus Depots/Truck Terminals & Freight
	Communication
CATEGORY7	***AGRICULLTURE & WATER BODIES***
	Agriculture
	Forest
	Poultry and Dairy Farming
	Rural Settlements
	Brick Kiln and Extractive Areas
	Water Bodies
CATEGORY 8	***SPECIAL AREA***
	Old Built up (core) Area
	Heritage and Conservation Area
	Scenic value areas
	Village Settlement
	Others uses

5.3 Min Access Provisions Required in Various Types of Buildings

Type of Building	Minimum Provisions
• Single detached, single welling units.	A minimum of 2 per cent of the total number of units to be constructed with barrier-free features. (Adaptable Units)
• Staff housing, multiple dwelling and high rise residential units and tenements	A minimum of 1 unit for every 25, plus 1 additional unit for every 100 units thereafter. Entrances and exists to be accessible.
• Tenement houses, row houses, apartments and town houses.	A minimum of 1 unit for up to 150 units, and a minimum of 1 additional unit for every 100 units thereafter to be accessible.

• Post offices, banks and financial service institutions	A minimum of 1 lowered service counter on the premises.
	A minimum of 1 lowered automatic teller machine (ATM) / cash disbursement point on the premises.
• Shophouses and single-storey shops	Accessible shopping area.
• Places of worship	Entrances and exits and main area of worship to be accessible. Mosques: access to area for ablutions; Churches: access to confessionals, fonts and chapels; Temples: access to shrines and courtyards.
• Food centres	A minimum of 1 table without stools or seats attached to the floor for every 10 tables.

	A minimum of 2 tales without stools or seats attached to the floor for the whole premises. Accessible entrance
• Community centres, village halls, auditoria, concert halls, assembly halls, cinemas, theatres and other places of public assembly.	Accessible entrances, exists, aisles and main community or public gathering areas. Accessible toilet facilities should be nearby. Seating for persons with disabilities to be accessible from main entrances and lobbies. Various seating / viewing choice t be provided for persons in wheel chairs throughout the main seating area. A minimum of 2 wheelchair spaces for seating capacity up to 100 seats. A minimum of 4 wheelchair spaces for seating capacity from over 100 to 400 seats.

5.4 Design elements need to be considered when creating a barrier free built environment

5.4.1 Design elements within the building premises

- **Site Planning**

- Walks and Paths
- Levels and Grooves
- Kerb Ramp

- **Parking**
- **Approach to Plinth Level**

- Ramped Approach
- Stepped Approach

- **Entrance Landing**
- **Corridor**
- **Entrance / Exit Door**
- **Windows**
- **Stair Ways**

- **Lift**
- **Toilet**
- **Signage's**
- **Other Facilities**

- Counter
- Water Fountain
- Telephone

Site Planning

To accommodate the handicapped and elderly people each building and its site should be planned and designed as integral units form the very beginning of the design process.

Walks and Paths

- Walks should be smooth, hard level surface suitable for walking and wheeling. Irregular surfaces as cobblestones, coarsely exposed aggregate concrete, bricks etc. Often cause bumpy rides.
- The minimum walk way width would be 1200 mm and for moderate two way traffic it should be 1650 mm –1800 mm.
- Longitudinal walk gradient should be 3 to 5% (30 mm-50 mm in 1 meter)

- When walks exceed 60 Meter in length it is desirable to provide rest area adjacent to the walk at convenient intervals with space for bench seats. For comfort the seat should be between 350 mm- 425 mm high but not over 450 mm.
- Texture change in walkways adjacent to seating will be desirable for blind persons.
- Avoid grates and manholes in walks. If grates cannot be voided then bearing bar should be perpendicular to the travel path and no opening between bearing bars greater than 12 mm in width.

Levels and Grooves

- The casters on a wheelchair are about 180 mm in diameter. Therefore, a wheelchair can only get over a small level difference.
  It can be difficult to move a wheelchair if a caster is caught in groove.

Difference in level

Shape of level difference

- Use a method that can reduce the height of the level difference, in addition to the methods shown here.

a. It is desirable that there is no difference in level. (If a difference is unavoidable, limit it to 20 mm or less.)

b. Round off or bevel the edge.

c. To prevent a wheelchair from getting its casters caught in a drainage ditch or other cover.

a. Install grating with narrow slots in the direction of movement.

b. Treat the grating with an on-slop finish.

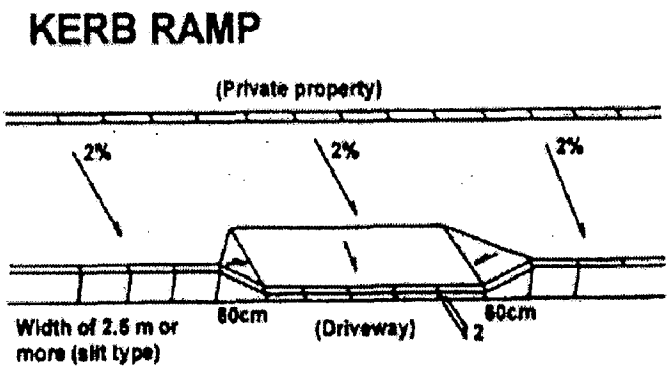
c. Reduce the gap between an elevator floor and the landing.

Kerb Ramp

a. do not require handrails;

b. should not project onto a road surface;

c. shall be located or protected to prevent obstruction by parked vehicles; and

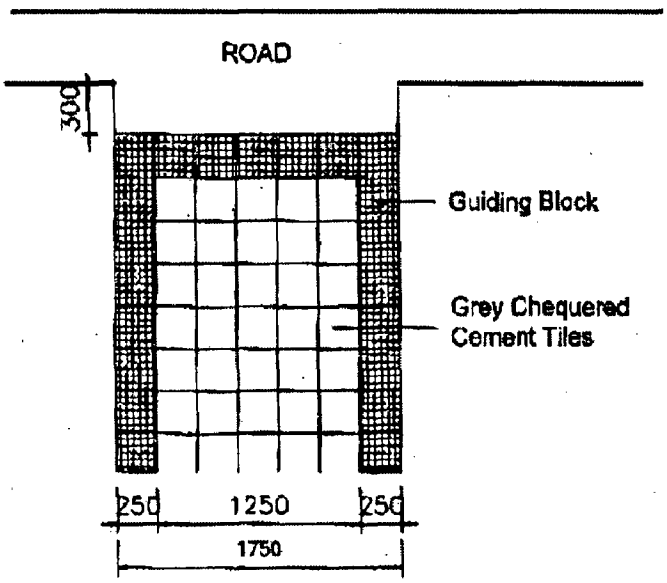


d. Shall be free from any obstruction e.g. signposts, traffic light or other things.

- The width of a kerb ramp shall not be less than 900 mm
- Built-up or extended kerb ramps are not recommended if it projects in a roadway as it is dangerous to users and obstructive to vehicles.

Typical Detail of Walkway

- Walkway should be constructed with a non-slop material and different form rest of the area.
- The walkway should not cross-vehicular traffic.
- The manhole, tree or any other obstructions in the walkway should be avoided.
- Guiding block at the starting of walkway and finishing of the walkway should be provided.

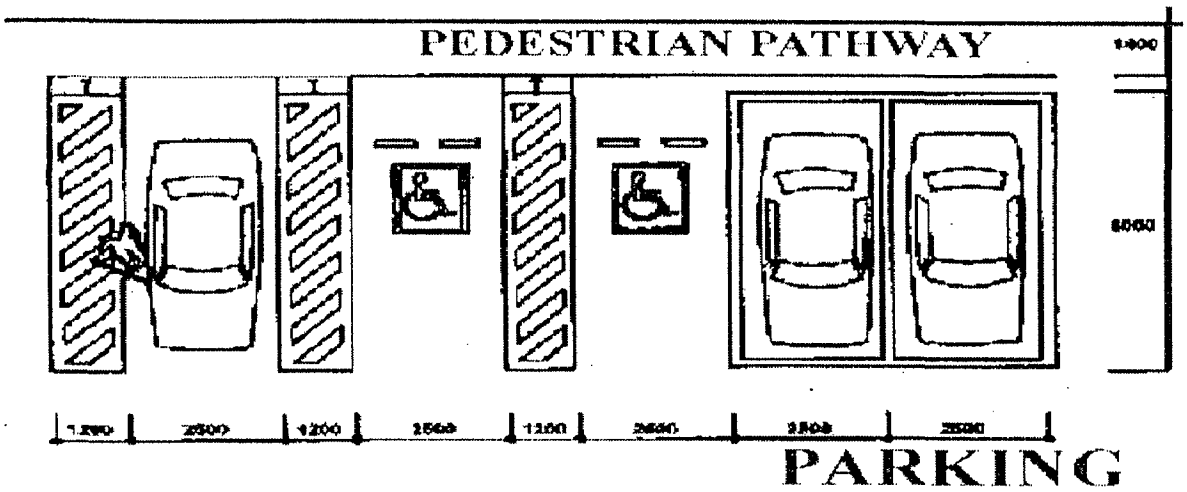


(The Width of the Walkway can vary from 1750 to 1800 Depending on the Tile size i.e. 250mm to 300mm.)

- Guiding block can be of red checkered tile, smooth rubble finish, prima Regina, Naveen tiles or any other material with a different texture as compared to the rest of the area.

Parking

Parking: For parking of vehicles of handicapped people the following provisions shall be made:



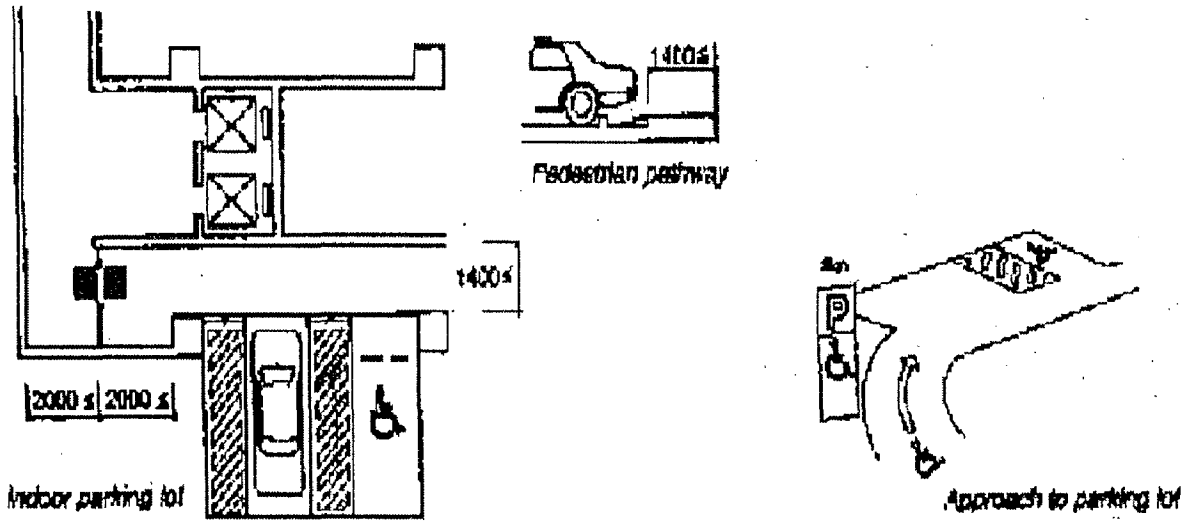
a) Surface parking for two care spaces shall be provided near entrance for the physically handicapped persons with maximum travel distance of 30 M from building entrance.

b) The width of parking bay shall be minimum 3.60 Meter.

c) The information stating that the space is reserved for wheelchair users shall be conspicuously displayed.

d) Guiding floor materials shall be provided or a device which guides visually impaired persons with audible signals or other devise, which serves the same purpose, shall be provided.

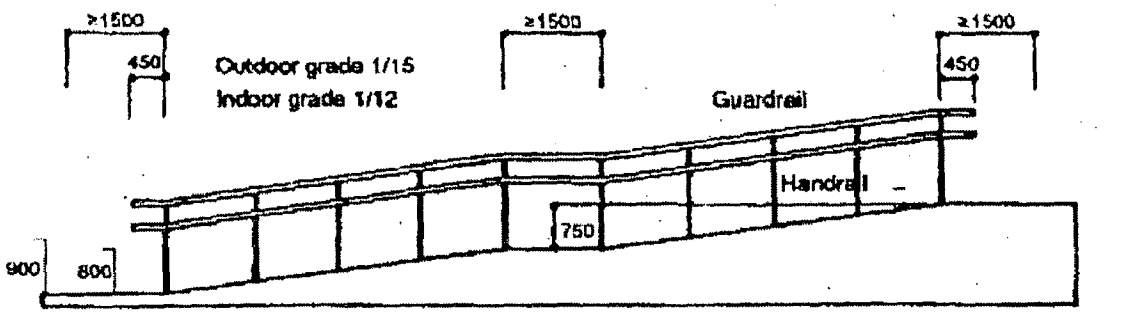
The symbol shall be displayed at approaches and entrances to are parks to indicate the provision of accessible car parking lot (s) for the disabled within the parking vicinity.



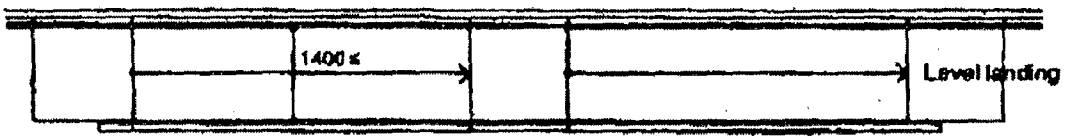
- Directional signs shall be displayed at points where there is a change direction to direct the disabled to the accessible parking lot (s).
- Accessible parking lots that sere a particular building shall be located nearest to an accessible entrance and / or lift lobby.

Approach to Plinth Level

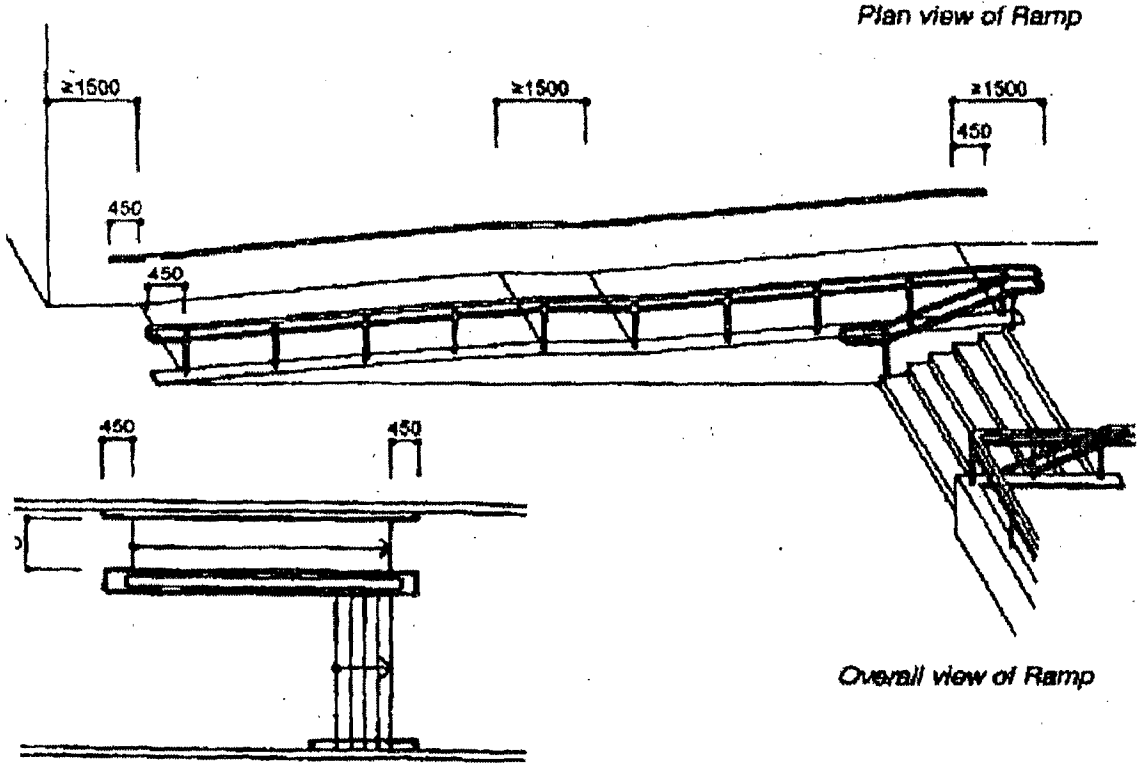
- Every building should have at least one entrance accessible to the handicapped and shall be indicated by proper signage.



Side elevation of Ramp



Plan view of Ramp



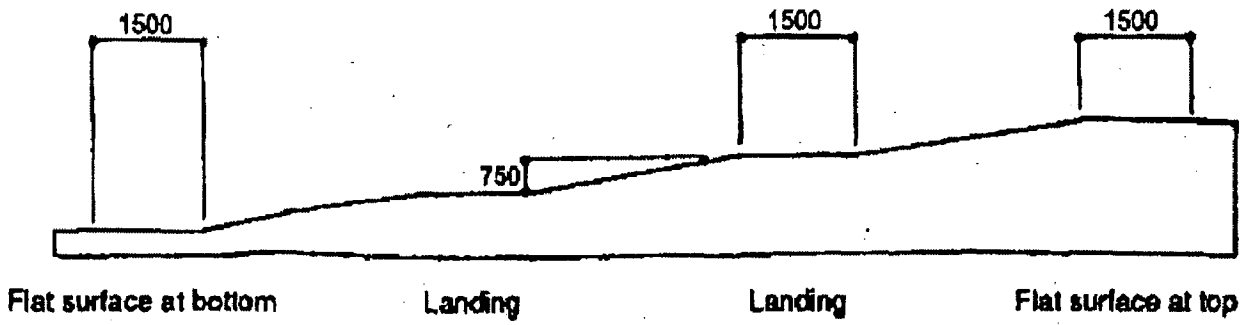
Overall view of Ramp

) combined with staircase

- The entrance shall be approached through a ramp together with the stepped entry.
- The access should preferably be through the main entrance of the building.
- Symbol shall be displayed at all other non-accessible entrances to direct people with disabilities to the accessible entrance.

Ramped Approach:

- Ramp shall be finished with non-slip material to enter the building. Minimum width or ramp shall be 1800 mm.
- With maximum gradient 1:12, length f ram shall not exceed 9.0 M having double handrail at might of 800 and 900 mm on both sides extending 300 m. beyond top and bottom of the ramp.
- Minimum gap from the adjacent wall to the hand rail shall be 50 mm.



Cross Section of ramp

DETAILS OF RAMP

- When climbing a ramp in a wheelchair, the upper limbs must bear the burden of propelling the body up the ramp.
- When descending a ramp in a wheelchair, especially on steep ramps, there is a possibility of the wheelchair running out of control because the user must manually control the speed.
- Prevent the installation of steep ramps.

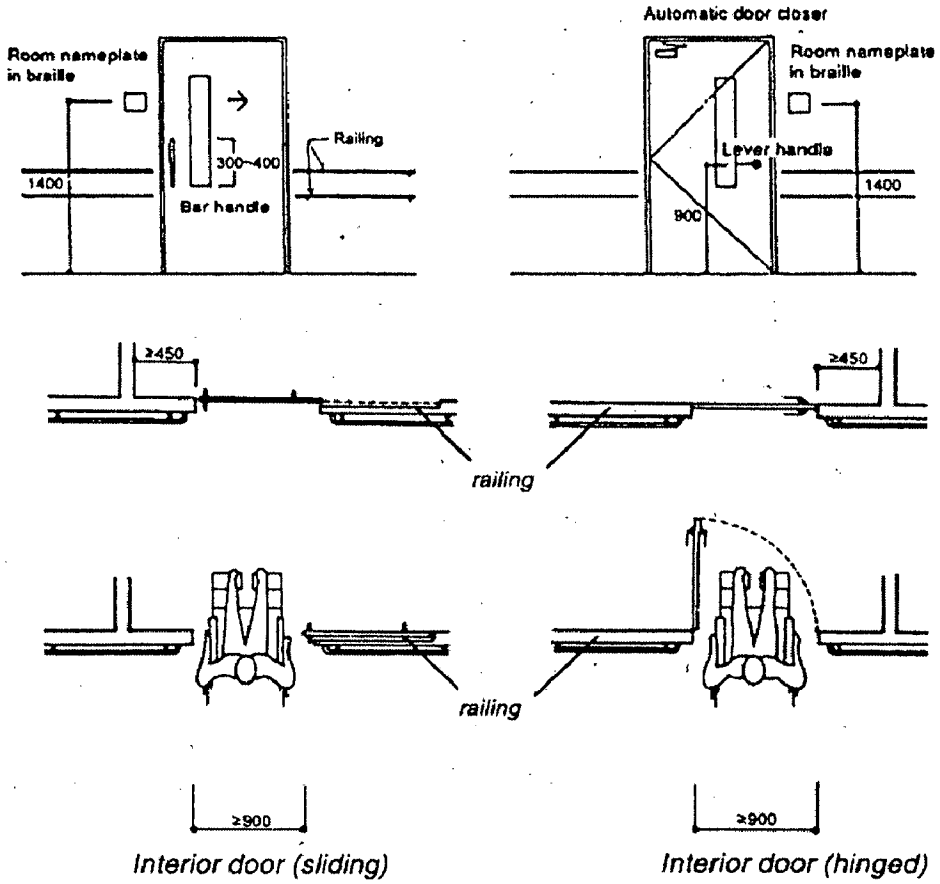
  (a) Make sure the grade of a ramp is a moderate rise of 10 mm to each 120-mm of travel.

  (b) Provide a flat surface 1500-m or more in length at the top and bottom of the ramp for a wheelchair to pause and prevent it from going out of control.

  (See the diagram at the next page)

Exit / Entrance door

- Minimum clear opening of the entrance door shall be 900 m. and it shall not be provided with a step that obstructs the passage of a wheel chair user.



Interior door (sliding) *Interior door (hinged)*

- Threshold shall not be raised more than 12 mm.

- Wherever possible and practicable, automatic door, swing or sliding type should be provided instead of doors, which are manually opened. Heavy or revolving doors should be avoided.
- Bathroom doors should swing out so that the person inside the bathroom does not fall against the door and block it. Consideration should be given to

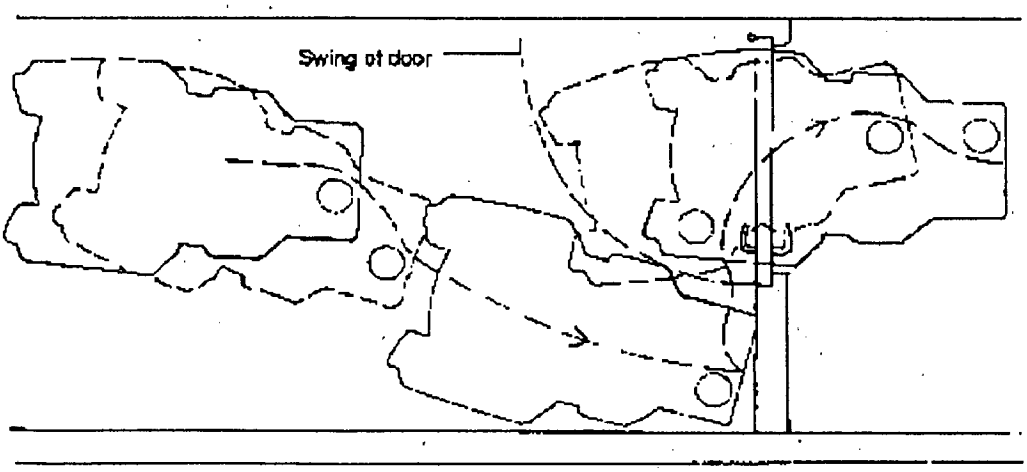
the use of sliding or flooding doors, which are easier to operate and require less wheelchair maneuverings.

Maneuvering space at doors

Wheelchair maneuvering spaces as illustrated shall be free of any obstruction, a be provided on the side where the door handle is located in the following manner:

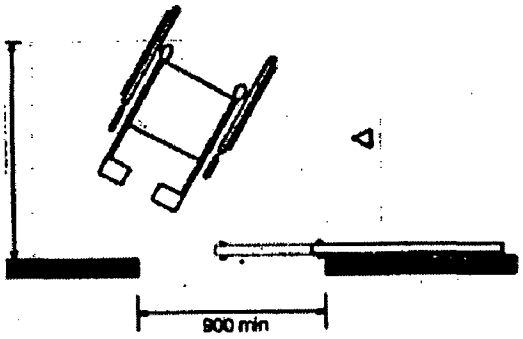
a. on the pull side, a minimum space of 500 mm ;

b. on the push side, a minimum space of 250 mm;

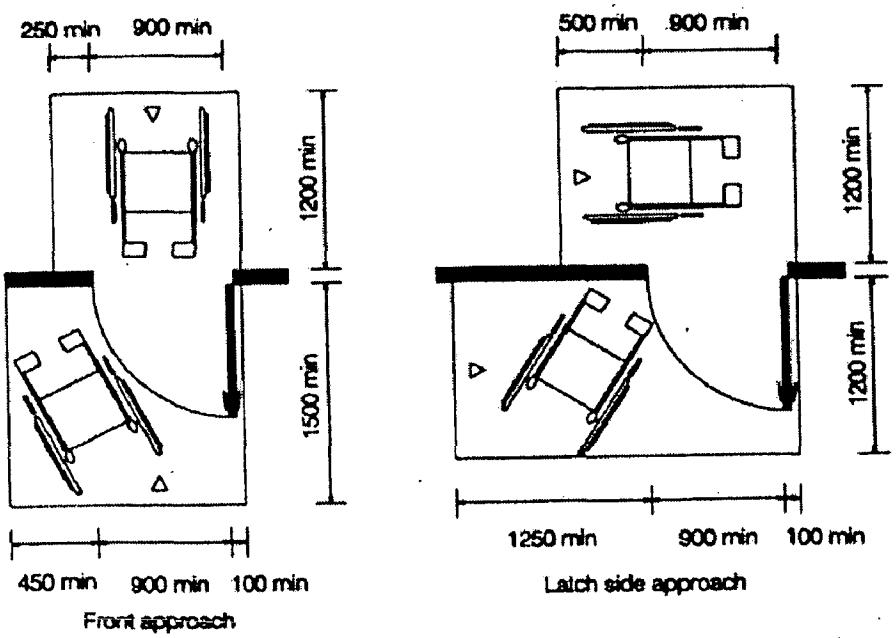


Different position of a wheel chair with the openning of a swing door

Required Clearance Space at the Entrance / Exit door



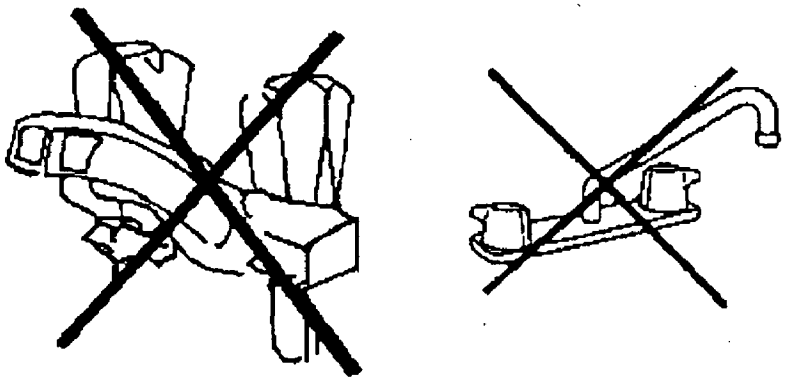
Sliding door



Swing door

Door Hardware

Operating devices such as handles pulls latches and locks shall;

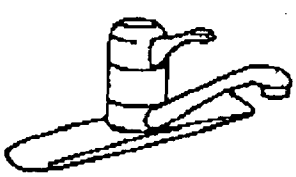


a. be operable by one hand;

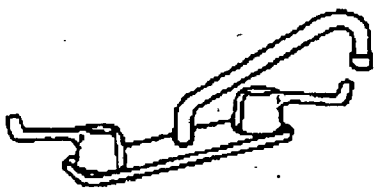
b. not require fine finger control, tight grasping, pinching, or twisting to operate; and

c. Be mounted at a height of 850 m to 1100 mm from the floor.

Door handles, as illustrated with the following characteristics are recommend



Long lever handle



Single lever handle

a. Push-pull mechanisms that do not require grasping

b. Lever handles should be used on latched doors, and

c. U-shaped door handles that reduce the risk of catching on clothing, or injury for the exposed level end.

Sliding / Folding Doors

a. Operating hardware shall be exposed and usable for both sides when sliding / folder doors are fully open.

b. If the door retracts fully into a wall pocket, an accessible handle is required on the exposed edge of the door.

Door Opening Force

The maximum force for pushing or pulling open a door should be

a. 38 N for exterior hinged doors;

b. 22 N for interior hinged doors; and

c. 22 N for sliding or folding doors.

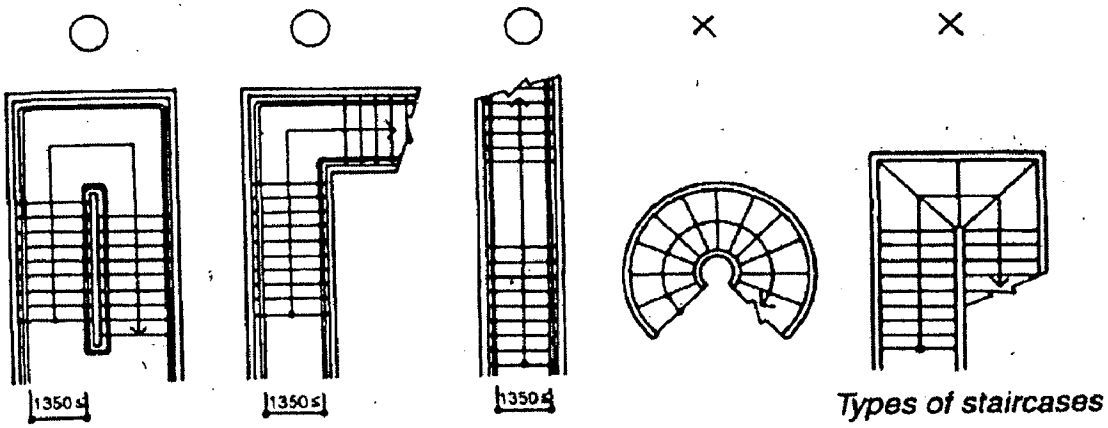
Kickplates

Kickplates of not less than 250 mm high as shown are recommended for doors high-use areas to protect the push side of doors for damage.

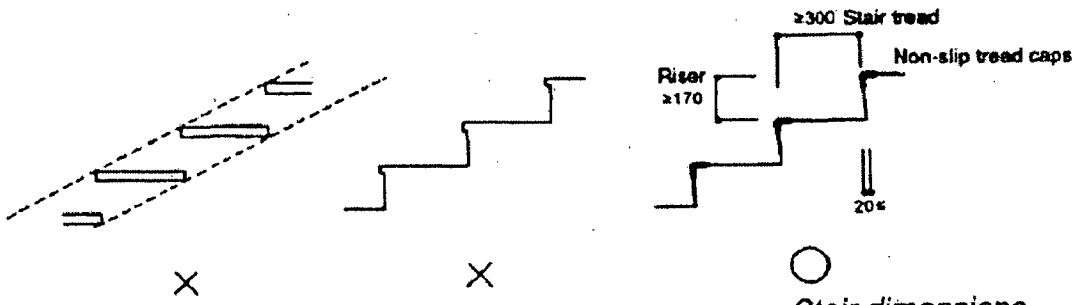
Windows

- A window should have handles / controls at a height that permits use form wheelchairs.
- A window should have an unobstructed viewing zone for wheelchair users.
- Curtain or venetian blind controls / ropes should be accessible for wheelchair users.

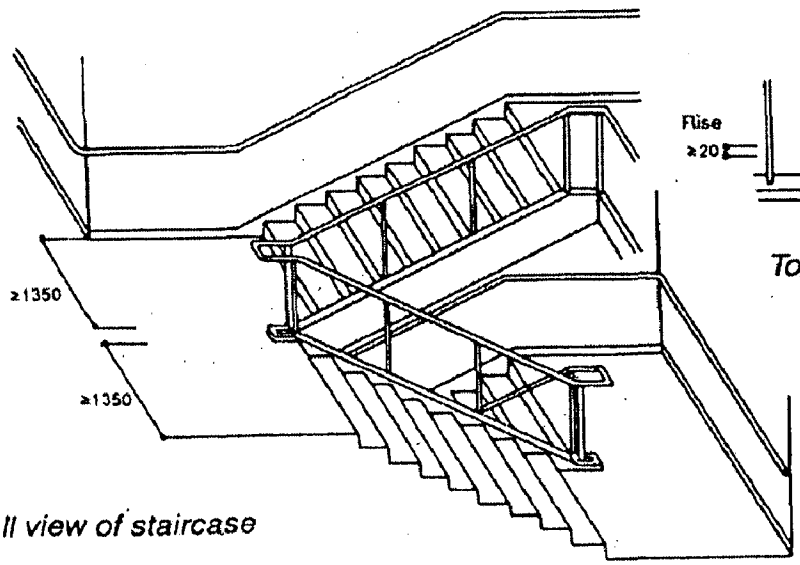
Steps and Stairs



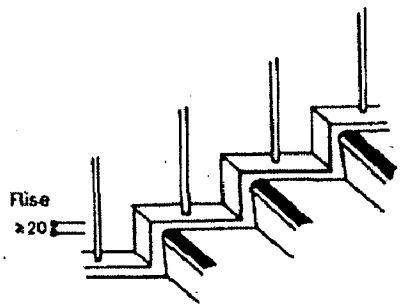
Types of staircases



Stair dimensions

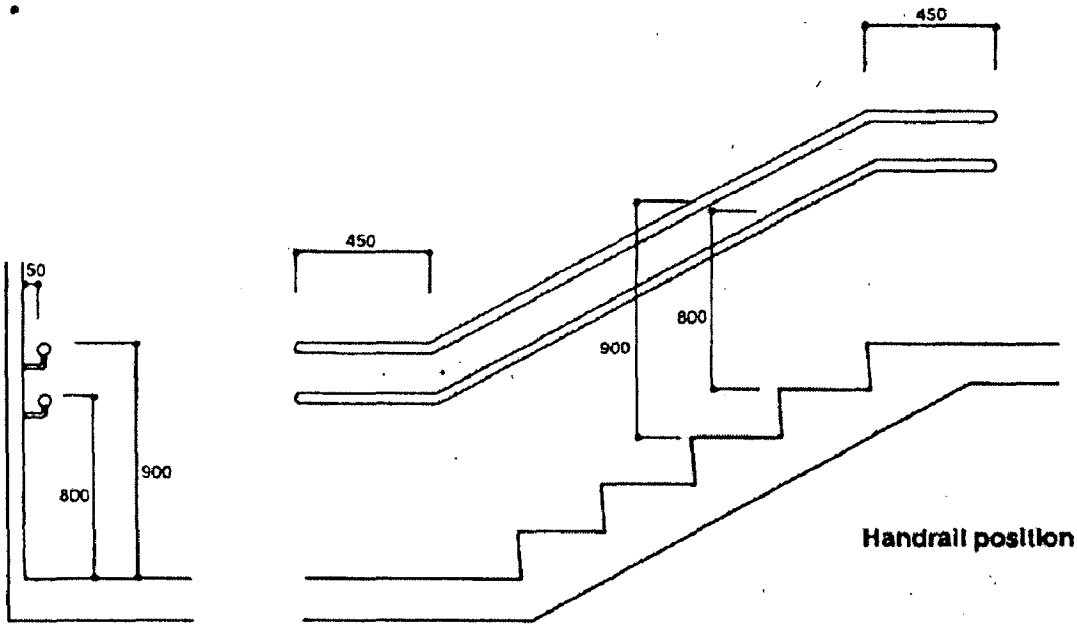


Overall view of staircase

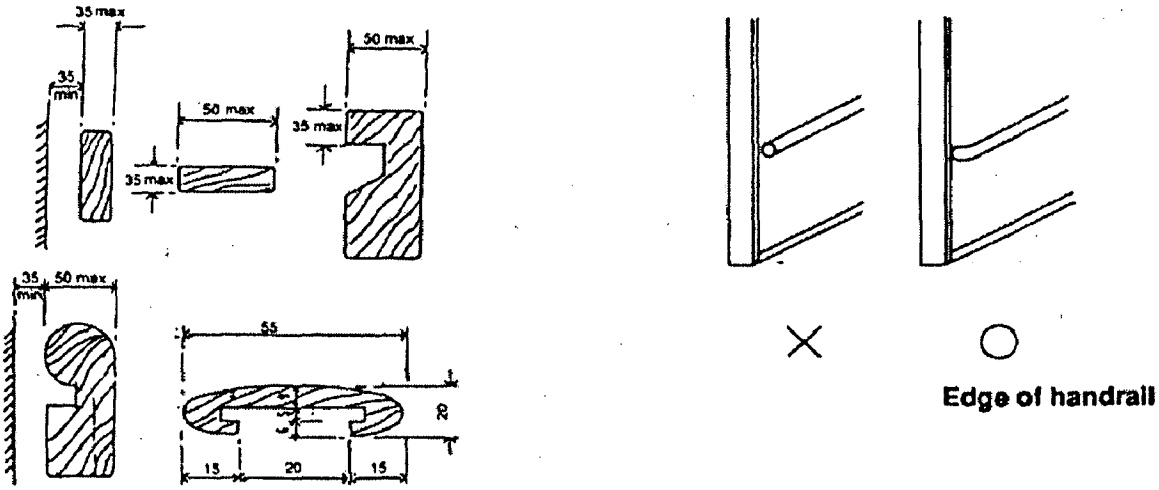


Top and bottom of staircase

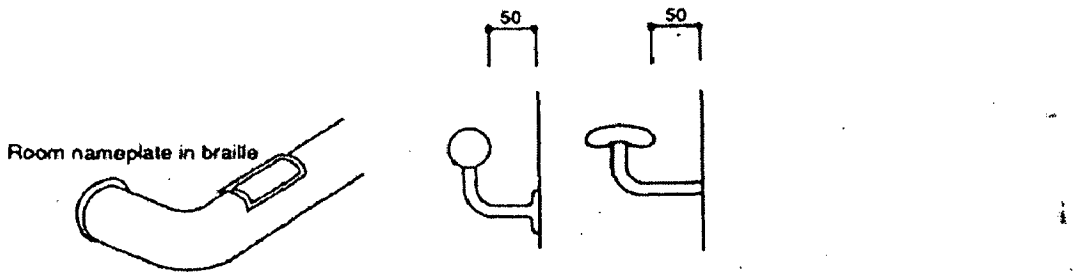
Details of staircase



Handrail position



Edge of handrail

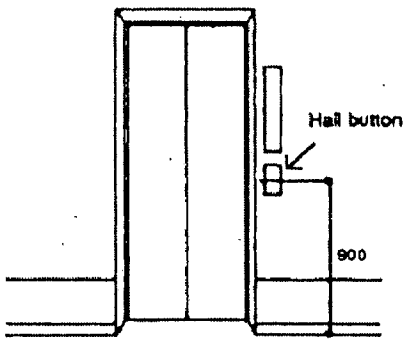


Handrail shape and clearance from wall surface

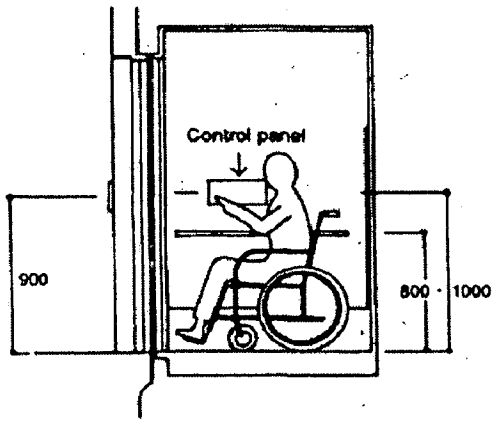
Lifts:

Wherever lift is required as per bye-laws, provision of a least one lift shall be made for the wheel chair user with the following cage dimensions of lift recommended for passenger lift of 13 person's capacity by Bureau of Indian Standards.

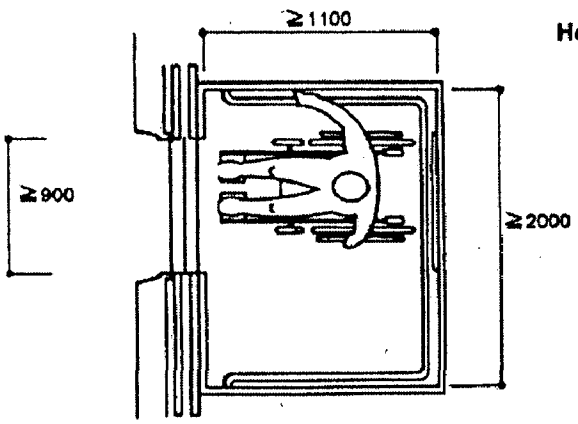
Lift



Elevator entrance



Height of control panel and standard dimensions



Space inside elevator

Clear internal depth	**:**	**1100 mm.**
Clear internal width	**:**	**2000 mm.**
Entrance door width	**:**	**900 mm.**

a) A handrail not less than 600 mm. long at 800-1000 mm. above floor level shall be fixed adjacent to the control panel.

b) The lift lobby shall be of an inside measurement of 1800 x 1800 mm. or more.

c) The time of an automatically closing door should or minimum 5 seconds and the closing speed should not exceed 0.25 M/Sec.

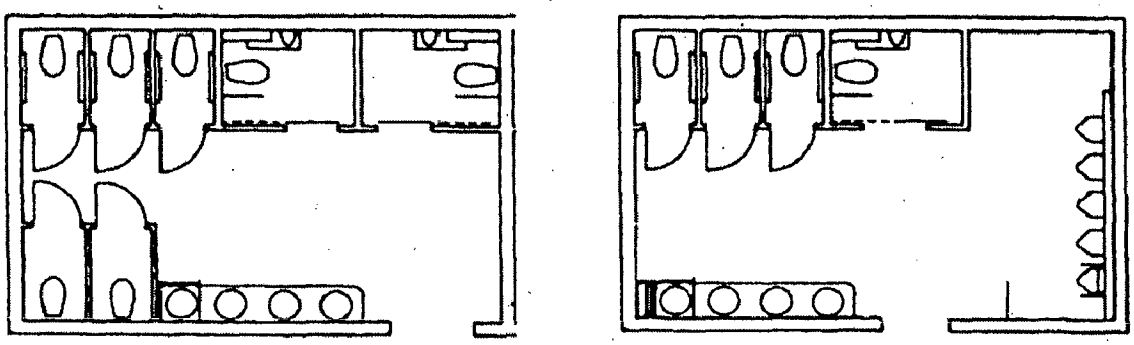
d) The interior of the cage shall be provided with a device that audibly indicates the floor the cage ha reached and indicates that the door or the cage for entrance / exit is either open or closed.

Toilet

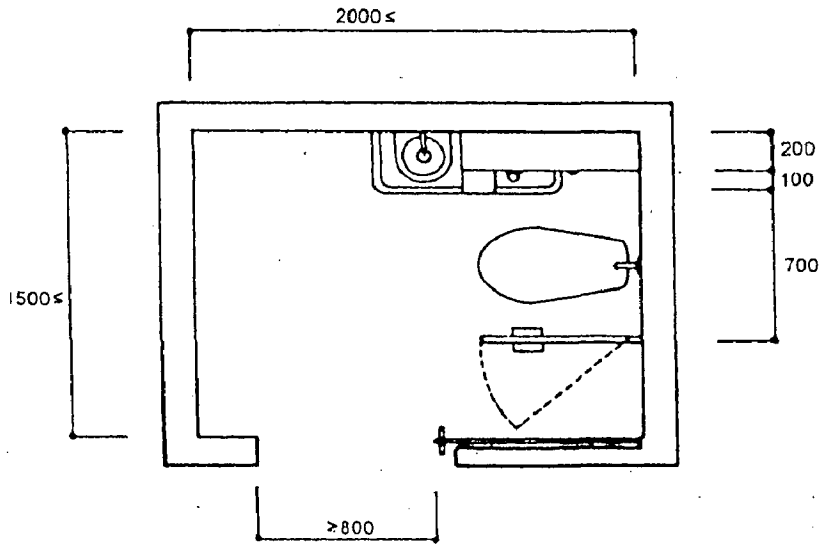
One special W.C. in a set of toilet shall be provided for the use of handicapped with

essential provision of wash basin near the entrance for the handicapped on each floor.

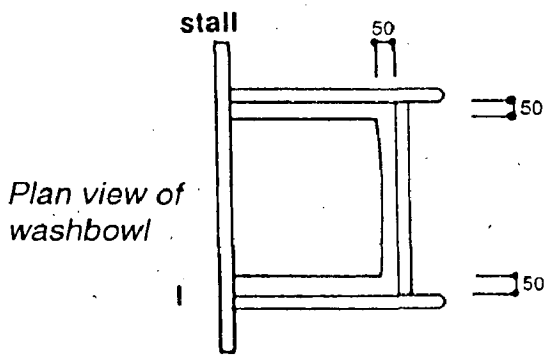
Toilet



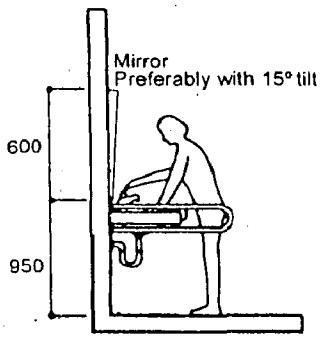
- Mark prominently the availability and location of handicapped accessible toilets using signposts and indicators.
- Wash basins, taps, mirrors, and other devices should be reachable for a



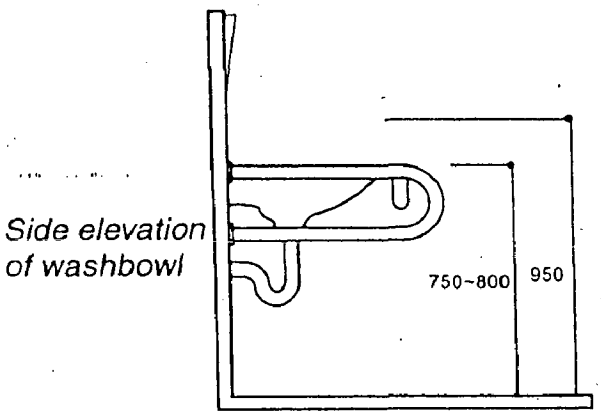
Plan view of toilet stall



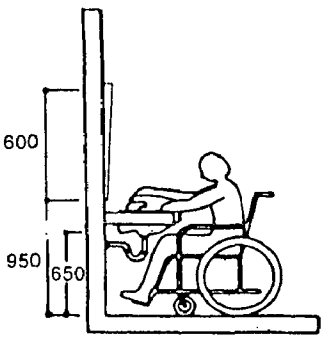
Plan view of washbowl



Use by a cane user



Side elevation of washbowl



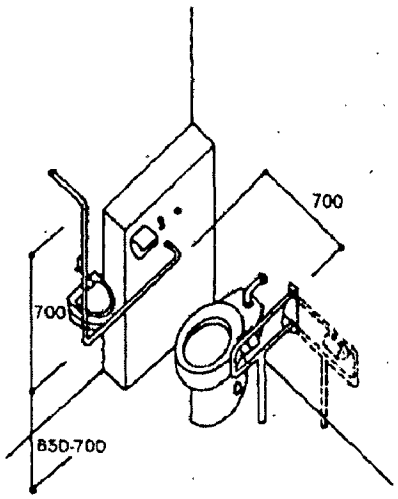
Use by a wheelchair user

wheelchair.

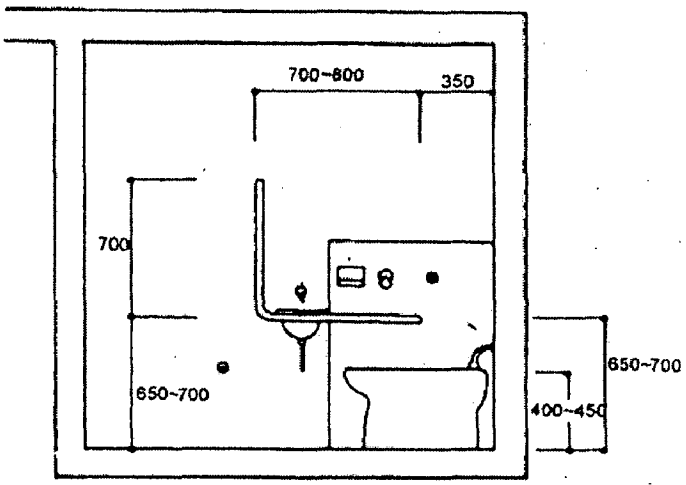
- Make sure that the door lath is reachable forma wheelchair.
- The flooring should be of a non-skid material.
- The minimum size shall be 1500 x 1750 mm.
- Minimum clear opening of the door shall be 900 mm. and toe door shall swing out.
- Suitable arrangement of vertical / horizontal handrails with 50 mm. clearance form wall shall be made in the toilet.
- The W.C. seat shall be 500 mm. form the floor.

Special Toilet

- Toilet floor shall have a non-slop surface without any level difference.



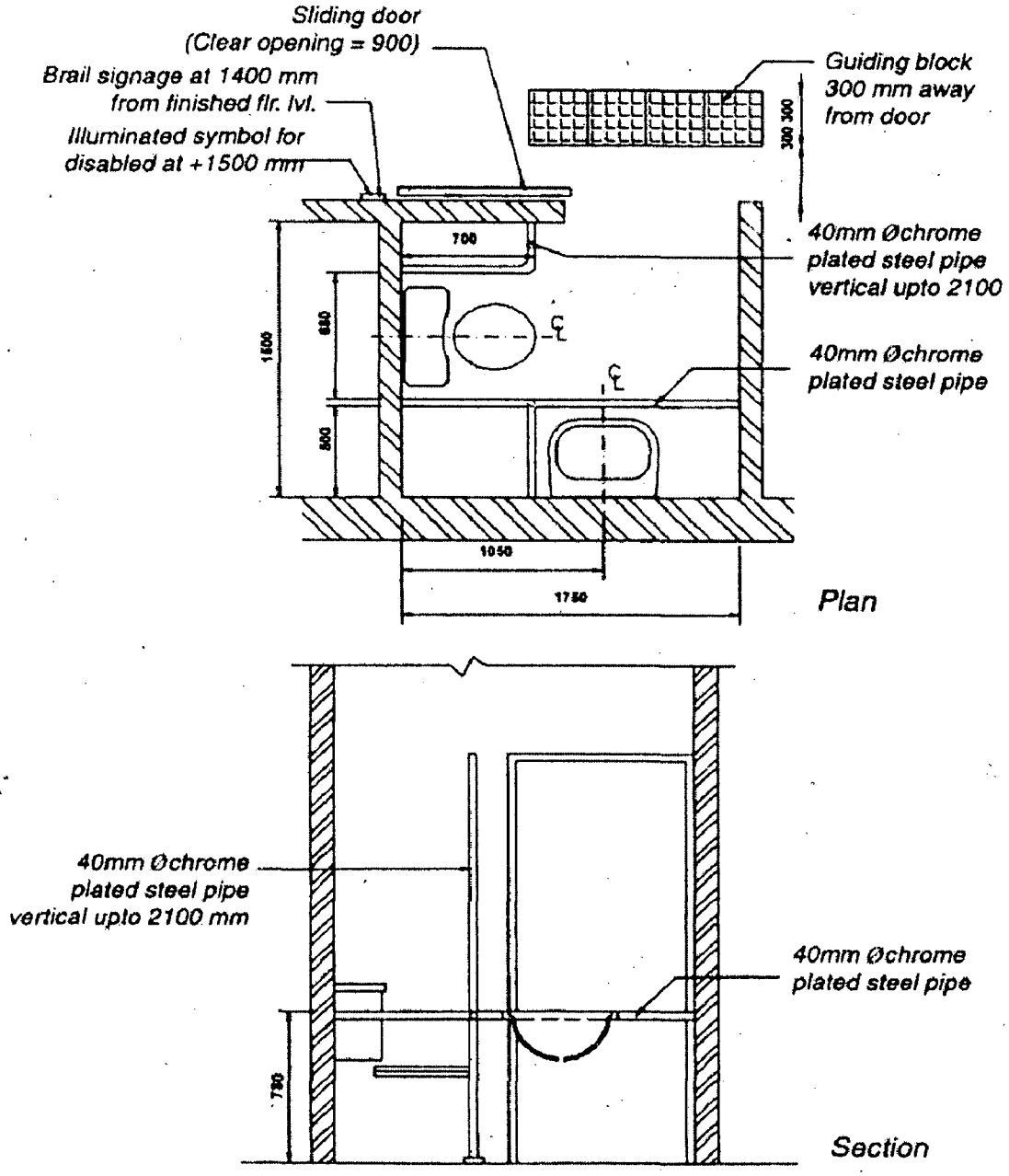
Handrail (Inside stall)



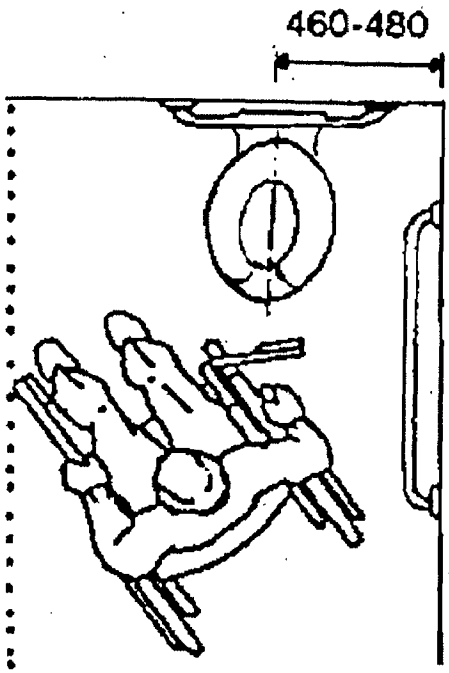
Side elevation of toilet stall

- Guiding block near the entry should have a textural difference, (e.g. Diamond Tiles, Prima Regina Tiles, Undressed Granite)

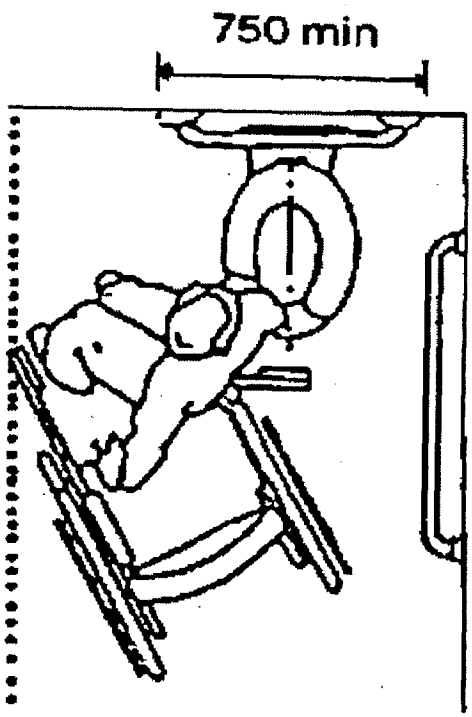
Typical Toilet



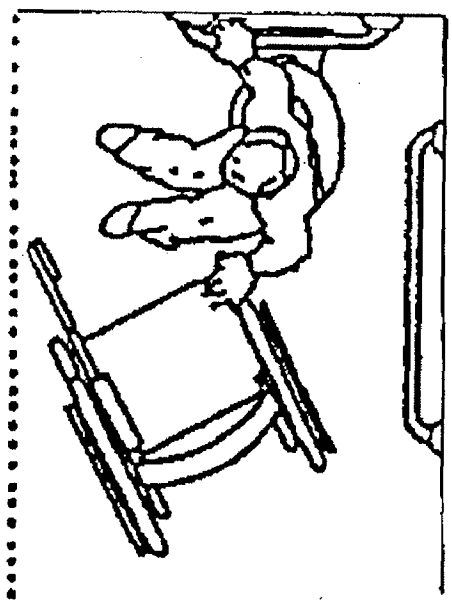
- Light-weight PVC door shutter should be provided as a sliding door



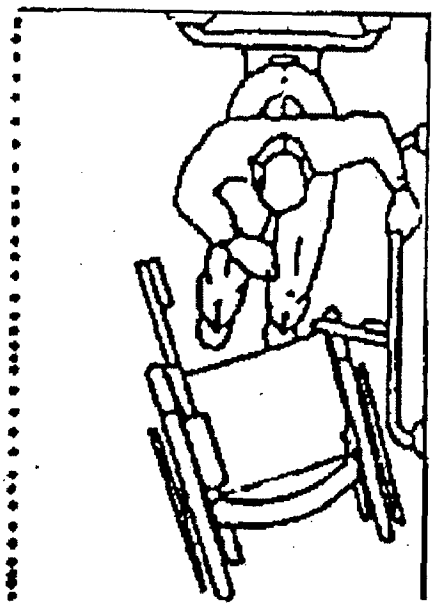
(a)



(b)



(c)

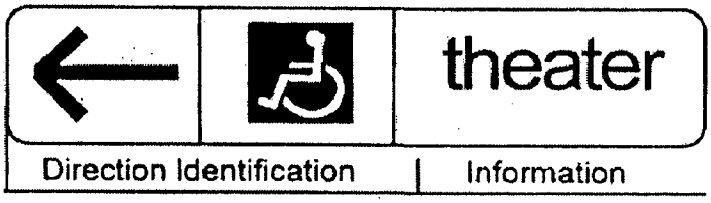


(d)

TOILET USING POSTURES

Signage's

The main purpose of signs should be to provide a clear designation of places, warnings and routing information. A person in a wheel chair is less than1200 mm high. A person who is partially sighted needs contrasting texture along side walkways and audible signs for dangerous areas. Signs should be useful to everyone, easily seen from eye level, readable by moving the fingers and well lighted for nighttime identification.



'HEIGHT' OF LETTER FOR VARYING VIEWING DISTANCE

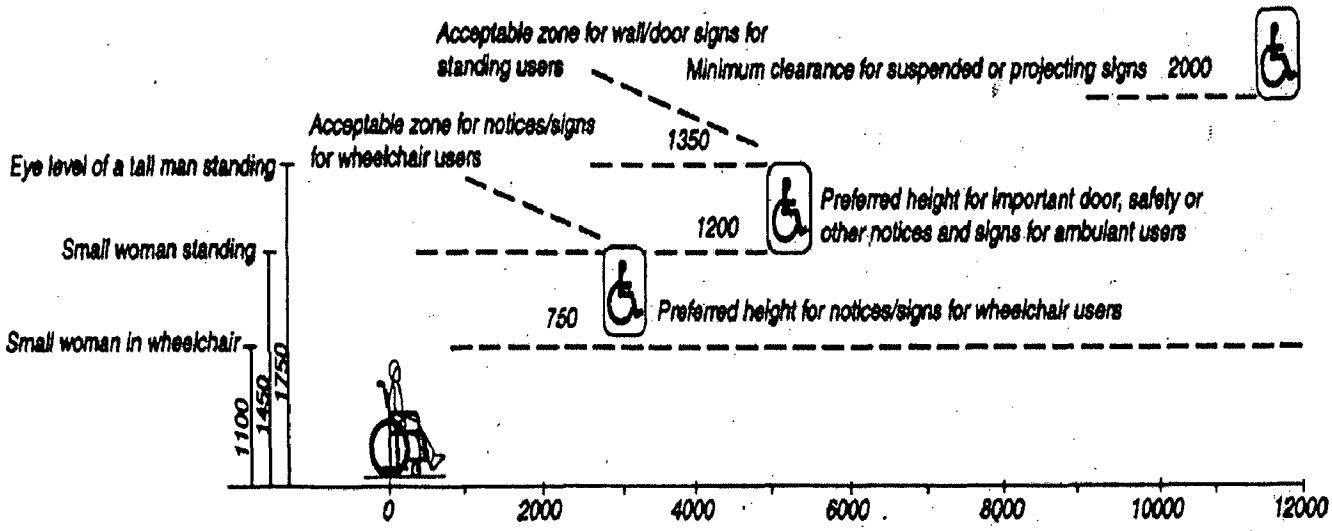
Required viewing distance (M)	Minimum height of letters (MM)
2	6
3	12
6	20
8	25
12	40
15	50
25	80
35	100
40	130
50	150

HEIGHT OF SYMBOL OF ACCESS FOR VARYING VIEWING DISTANCE

Required viewing distance (M)	Minimum size of symbol (MM)
0.7	60 x 60
7.18	110 x 110
18 +	Min. 200 x 200 Max. 450 x 450

- Signs shall indicate the direction and name of the accessible facility and incorporate the symbol of access.
- The size, type and layout of lettering on signs shall be clear and legible.

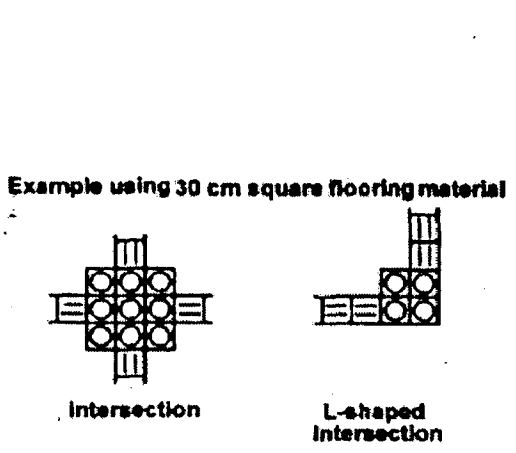
- Signs should be in contrasting colours and preferably be embossed in distinct relief to allow visually impaired person to obtain the information they contain by touching them



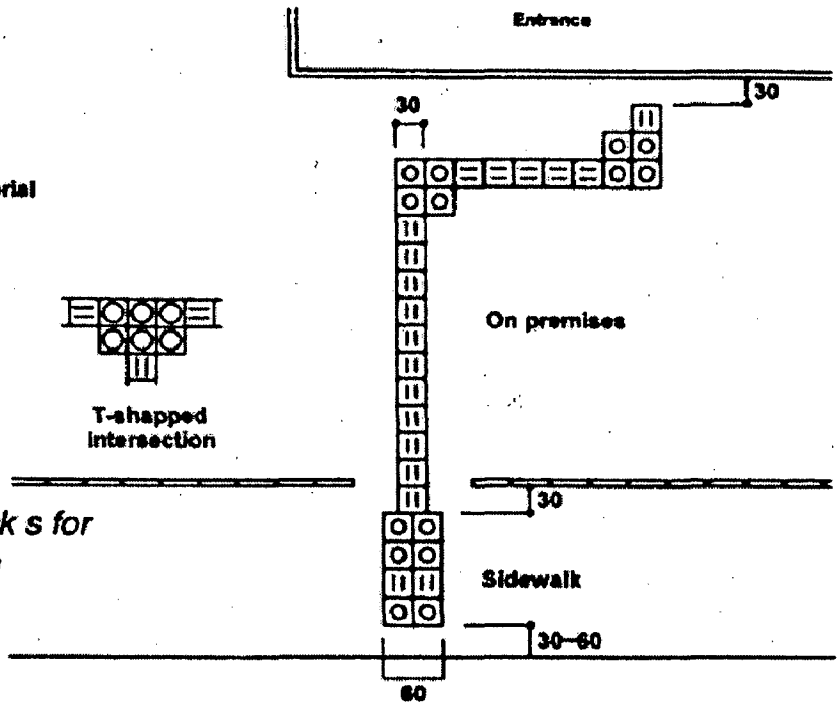
Suitable heights and distances to display the signage

Places to install guiding blocks for persons with impaired vision

1. Immediately in front of a location where there is a vehicular traffic.
2. Immediately in front of an entrance / exit to and form a staircase or multilevel crossing facility.



Arrangement of guiding block s for persons with impaired vision



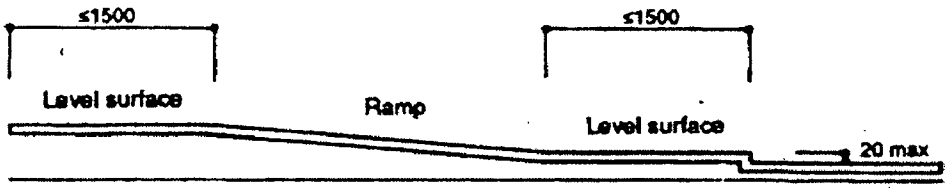
Guiding path and approaching sidewalk to the building

3. Entrance / exit to and form public transportation terminals, or at boarding areas.
4. Sidewalk section of a guiding or approaching road to the building.

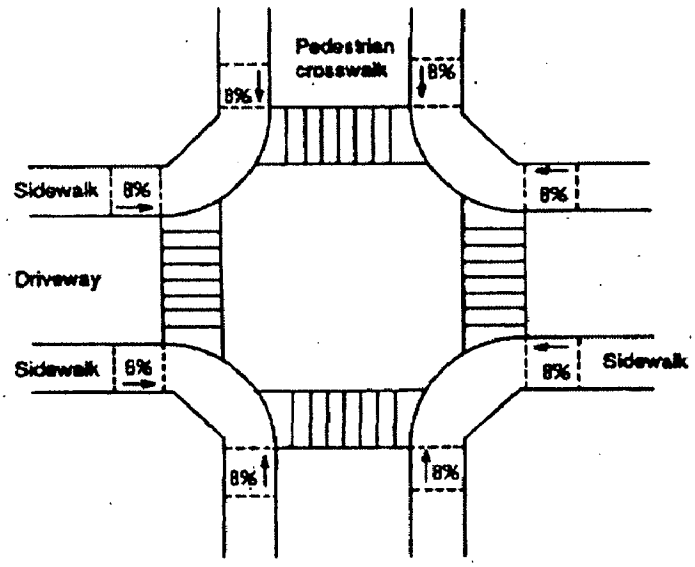
5. Path form a public facility which is frequently visited by persons with impaired vision (e.g. a city hall or library) to the nearest railroad station (to be installed at intervals)

6. Other places where installation of a guiding block for persons with impaired vision is considered effective (e.g. locations abruptly changing in level or ramp).

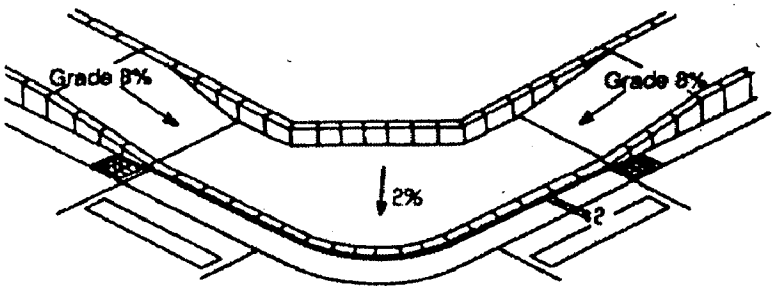
Road Crossing



Cross section of graded level differences



Sidewalk grading (at intersection)



Sidewalk Fences

5.3.2 Design elements outside the building

a. Consideration must be given at all times to how pedestrians are to move around in the urban area. A comprehensive pedestrian system should be created to include the needs of disabled persons and elderly persons.

b. Special attention should be given to the provision of effective pedestrian links between bus and rail terminals.

c. Pedestrian walkways should be as far as possible from vehicular traffic. Wherever possible, walkways should take the shortest and most level route, as ramps may be difficult to use without assistance.

d. At strategic points, walkways should meet the road network so that disabled persons and elderly persons can enter and leave vehicles easily and safely.

e. The following list of facilities should be considered in barrier-free design plans:

- **Kerb at Footpath**
- **Road Crossing and walkways**
- **Public Toilets**
- **Bus Stops / Taxi Stand**
- **Telephone Booth**
- **Signage's and audible traffic signal**
- **Street furniture**
- **On/of-street parking**

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Chapter 6.
Conclusion and Scope of Further Work

6. CONCLUSION AND SCOPE OF FURTHER WORK

Barrier-free built environments would benefit not only people with disabilities, but also the rapidly increasing numbers of elderly persons, as well as children, women and people in less than optimal physical and mental conditions who are not necessarily disabled. Thus life elimination of barriers would mean the shaping of physical environments, which were friendly to all groups in society, particularly the disadvantaged groups who did not as yet have a voice in planning and design, and were invisible to architects. Urban planners transport engineers and local authorities.

In the planning and design of barrier-free environments, it is essential to ensure that suitable access and facilities are provided for people with all the disabilities mentioned above. Identifying and understanding the circumstances, which create barriers for persons with disabilities and elderly people, is a fundamental requirement. A systematic review of layouts, space requirements

and the use of components and component relationships may need to be undertaken to evaluate the adequacy and performance of design proposals.

(a) Mobility-impaired people

In terms of circulation, wheelchair movement is seen as the most critical. The spatial needs of the ambulant disabled and the sensory or cognitive disabled are unlikely to exceed the space needed to maneuver a wheelchair.

Independent wheelchair users require more generous activity space width, while assisted wheelchair movement requires greater length or depth of space and, consequently, larger overall turning space. The built environment should accommodate both independent and assisted wheelchair mobility.

The recommendations in this dissertation are suitable for most standard, manually propelled chairs and electric indoor wheelchairs. Electric outdoor models generally require 10 to 15 per cent more maneuvering space than standard, manually-propelled chairs.

(b) Visually-impaired people

Many blind people, including those who are registered as such, have varying degrees of residual vision. The following recommendations pertain to people who are totally blind and those who have low vision:

i. Dropped kerbs to footpaths:

Interruptions in footpath kerbs and edges are useful cues for partially sighted people. Where interruptions do occur, they should be indicated with tactile paving.

ii. Stairs and ramps:

Handrails should be of a bright colour, contrasting with the surroundings. They should extend a minimum distance of 300 mm beyond the top and bottom of the ramp or stairs to give a blind person a chance to feel them before encountering the hazard. Staircases should have bright contrasting, preferably non-slip nosing. A tactile warning surface should also be incorporated into the floor at the top and bottom of the staircase or ramp.

iii. Walkways:

These should be fitted with visual signs and tactile clues (e.g., Braille blocks) as route finders. It is desirable to define clearly the edges of paths and routes by using different colours and textures. It is also possible to use plants to emphasize pavement edges, but care must be taken in the choice and placement of plants to avoid people tripping over. Large featureless paved areas in front of buildings should be avoided as these can cause glare problems for visually-impaired persons and make it difficult for them to distinguish entrances. Patterns in the paving should be carefully thought out to guide people through routed areas or to entrances. Regular bands of colour at 90 across narrow pathways

should also be avoided as persons with impaired vision can easily mistake these for steps.

iv. Hazards:

Windows and doors opening outwards can be very dangerous. One solution is to recess outward opening doors into a porch. Street furniture, trees, lamp posts, fire hydrants, waste bins, flower tubs, seats and other such items should be located to one side of pathways and roads used by the public. Some of these could be grouped together with a change in paving surface texture and colour to give some warning on approach. The use of contrasting colours can greatly assist visually-impaired persons particularly on street signs or lamp posts. A contrasting band at eye level should be incorporated onto the posts. Overhanging awnings or signs should be positioned well above 2 metres. Low barriers should be placed around temporary road works to enable persons using canes to detect the hazards.

v. Tactile objects:

The sense of touch is vital to people with visual impairments. Objects, which are important in daily life, should be distinctive in shape, texture or size. Coins and bank notes should be so designed that the value of each may easily be identified.

vi. Signs:

These should be in contrasting colours. Raised letters and characters should be used to allow blind persons to feel the signs. Where possible, universally accepted symbols and colours should be used, e.g., green for safety, yellow or amber for risk and red for danger. A clear system of signs should be used throughout a building, with a similar height and format at each change in direction. Signs should be fixed at eye level when mounted on a wall; a suspended sign should be hung between 2 m and 2.4 m above floor level.

vii. Hedges and trees:

Such plants must be maintained to prevent them from encroaching onto footpaths. Low branches hanging over footpaths should be removed.

viii. Doors:

The use of colour to distinguish doors from surrounding walls is very useful. A colour contrast between a door and a door frame, with the door handle in a distinct tone, can be of great benefit to people with visual impairments. Glass doors must have a bright colored band or motif at eye level to avoid partially-sighted persons from walking into them.

ix. Corridors and circulation:

All appliances and fittings should be recessed where possible.

x. Lifts:

Raised numbers with tactile indications on landings should be used to indicate the floor. Buttons in the lift car should be marked with raised numbers and Braille (on control buttons). A voice synthesizer is the most important addition to any lift serving more than two floors and can give to visually-impaired persons important information such as: doors closing/opening; lift going up/down; lift free; and floor level.

Summary recommendations for the visually impaired persons:

a. The use of Braille guide blocks should be promoted and installed in public facilities, including train stations, shopping centres and bus terminals.

b. Glare should be reduced from windows by using net curtains, solar reflective glass, or external/internal blinds.

c. Contrasts should be reduced between the outside and inside of buildings. Windows should not be positioned to cause silhouetting in corridors and circulation areas unless the possibility of glare is reduced by one of the above measures or by other means.

d. Changes in colour and texture should be used to warn of differences in floor level and to indicate door handles, light switches and other fixtures.

e. Green and blue tones being hard to differentiate (for example, green carpets and blue walls can appear as one to a visually-impaired person), they should be avoided. The red colour range causes the least difficulty in this respect.

f. Patterns should be used to indicate direction warning. A contrasting band of colour on walls can be very helpful, e.g., a line of contrasting tiles in a tiled toilet area can help to define walls to visually impaired persons.

(c) Hearing-impaired people

- **Lifts:**

It is important for the emergency call button in lifts to have an acknowledgement light adjoining it. This provides both visual and auditory notification that someone is in trouble in the lift and that someone is dealing with the problems.

- **Fire evacuation:**

It is most important that it is widely understood that a person with a hearing impairment will react a lot more slowly than someone without this difficulty. There fore the flashing light alarm systems should be incorporated with alarm in all public building incase of hazards.

- **Visual signs:**

These must be very clear and accurate. A flashing light unaccompanied by a message can be confusing (e.g., a flashing fire exit sign would be preferable to a flashing red light; it gets the message across much more quickly). Flashing exit signs in public buildings are preferable to permanently lit exit notices in emergency situations. These will be activated only when alarms sound during an emergency. Signs in to facilities frequented by members of the public, including shopping and entertainment areas, should be improved. Electric and flashing information signs to indicate stops should be installed on trains and buses to enable deaf persons to use public transportation independently.

- **Good lighting and prevention of glare:**

These are as important for people with hearing impairment, who focus on facial expression, as for those with visual impairment. Many people lip read. Flat lighting and conditions that remove contouring should be avoided. A flexible installation to suit the context and avoid any flattening effect, with a good combination of general and localized lighting, is better than high overall levels of lighting.

- **Alarm systems:**

Bedrooms used by people with disabilities and elderly persons should be provided with flashing lights activated by alarm systems to alert them in the event of an emergency. Vibrating pillows linked to an alarm clock or an alarm system are a further possibility for awakening hearing-impaired persons.

- **Hearing aids:**

Wherever possible (e.g., in foyers, meeting rooms, interview rooms, courts, theatres, training venues, booking offices and cash desks) an induction loop system should be installed. These can, however, cause problems of "overspill" (when people in adjoining rooms wearing hearing aids can overhear conversations in other rooms). The use of magnetic tape under carpets can reduce this effect. Infrared systems can provide a solution where confidentiality is required, but these have other drawbacks.

- **Background noise:**

It is most important to reduce any background noise both internally and externally, for instance, a magnetic hum can be created by mechanical ventilation systems or by fluorescent lighting. Mechanical and electrical engineers should solve these problems.

- **Acoustics:**

Care should be taken to provide good acoustic conditions in all building interiors. Sound absorbent surfaces should be utilized to minimize reverberation, which could seriously affect the hearing of a hearing-impaired person. In areas where there is fixed seating, such as lecture theatres, the lecturers position should not be in front of a window or the light source which may create glare and cause difficulty in lip reading.

General requirements

The ideals situation that should be aimed for in all buildings is to provide reasonable means of access for all people whatever their specific requirements may be. This applies from the boundary of the site or car park to the main entrance / exit of a building. The purpose of access should be to encourage movement throughout the building with sufficient space for wheelchair maneuvers and convenient ways of moving from one floor to another. An accessible environment should also has provision for building and to use the facilities provided within the building.

Public transport

Buses, trams, taxis, mini-buses and three-wheelers should be designed as far as practicable to include facilities which can accommodate people with disabilities. New vehicles when purchased should comply with accessibility standards to enable all people, including those in wheelchairs, to use the service provided. Equally important, travel routes to bus stops should also be barrier-free to ensure that persons can travel from their homes to their chosen pick-up point. Training should be provided for drivers to help them become aware of the needs of persons with disabilities.

Whether overground or underground, rail travel is a highly effective mode of transport. Every train should contain fully accessible carriages. Staff should be trained in methods of assistance and be at hand on request. Stations for all rail travel should be fully accessible with extra wide turnstiles where possible. Staff should be on hand to assist persons with disabilities to enter or exit through convenient gates. All new railway stations should be designed to be fully accessible. In a situation where full accessibility is not secured at the initial construction stage, it is imperative to design the layout of the station in such a manner that access features can be easily modified at a later stage.

External environment

Public places such as parks, gardens and zoos should be fully accessible to persons with disabilities and infirmities. This is vital if discrimination is to be avoided. The current unbalanced situation needs to be addressed so that persons with disabilities may freely move in the external environment as part of their integration into society. Parking facilities, obstructions on pavements, street furniture, pavements, crossings, changes in level, ramps, steps, plants and landscaping, signs and symbols, gratings and covers all need careful consideration.

Public buildings

All public buildings such as offices, shops, factories, schools, universities, hotels, restaurants, bars, cinemas and theatres should have accessible entrances and exits. Horizontal and vertical circulation and all facilities contained within buildings should also be accessible for persons with disabilities. Wherever possible, an accessible service window should be introduced in a public building to facilitate assistance which may be required.

Housing

Entry to, and movement within buildings must be carefully considered when designing housing. Height and layout of fixtures in each house can be tailored or adapted to suit the needs of the resident. An adaptable housing concept should be promoted, in particular, for homes financed by government housing loans or public housing schemes

Information technology

The use of modern technology should be encouraged among blind, deaf and home-based disabled persons, to facilitate communication from within the home. Communication with others can greatly enhance an individuals self-esteem by opening up new possibilities for developing higher levels of social and other skills, thereby enhancing self-reliance and independence.

Telephones should be installed with push buttons incorporating large numerals and volume controls. Some telephones have a facility for visual display of messages. Various types of induction loop systems are available to allow persons who have impaired hearing to hear public performances, take part in discussions or even to watch television. Visual and audible alarm systems and paging systems can be used within or outside of buildings. Computer aids are available to assist people with disabilities. Many such aids open up employment opportunities for persons with disabilities.

Approaches Towards The Promotion of Barrier Free Built Environment

Initiative approach

This approach focuses on increasing the sensitivity and responsiveness of various sectors of society to the access needs of persons with disabilities and elderly persons, so that these sectors may play an active role in access promotion. The various sectors included individuals, government officials, politicians, and trades unions, private sectors and non-governmental organizations.

Mandatory approach

This approach is based on pressure from legal instruments or administrative decrees. In the case of non-compliance, penalties such as fines or demolition of the building may be imposed.

Economic approach

This approach focuses on increasing the involvement of various sectors of society in the promotion of an accessible built environment for persons with disabilities and elderly people by publicizing the cost effectiveness and other consequential economic benefits of accessible built environments.

Associations of professionals

Architects, engineer, urban planners, landscape designers, transport planners and lawyers together determine the accessibility of the built environment.

Associations of professionals composed of members of these groups need to understand their responsibility for creating barrier-free environments that benefit all users.

The following initiatives are suggested for associations of professionals:

- Generate discussion in professional journals, newsletters and conferences on the development of designs for accessible built environments in a variety of social, economic and political contexts.
- Organize competitions on access design, awards and public recognition of significant contributions to access promotion.
- Provide training opportunities for organizations of people with disabilities and elderly persons to strengthen their technical expertise on accessibility issues.
- Undertake, in collaboration with members, persons with disabilities and elderly persons, demonstration projects to illustrate the advantage of barrier-free design.

Higher education institutions

Many architects, engineers, building designers and town planners lack a conceptual understanding of access issues and technical knowledge of how access features should be incorporated into the built access issues and technical

knowledge of how access features should be incorporated into the built environment.

Education institutions directly influence the development of sense of social responsibility among future professionals. There is an urgent need for these institutions introduce into their curricula conceptual understanding and practical knowledge of access issues.

The following initiatives are suggested for education institutions:

- Organize diverse awareness activities to encourage interest in access issues.
- Provide opportunities for students to meet people with a range of disabilities and the hear and discuss first-hand experiences of mobility problems in the built environment.
- Encourage design projects for students which involve accessibility issues, and invite people with disabilities to participate both in briefings and feedback activities.
- Include disability simulation exercises as an integral part of all courses concerned with the design of the built environment.
- Encourage postgraduate study and research into topics related to accessibility by seeking sponsorship or providing grants.
- Organize competitions or "live projects" on barrier-free design topics to encourage students interest in accessible environments.
- Encourage student unions or councils to address issues concerning those barriers faced by young persons with disabilities to education and to full participation in all aspects of life taken for granted by people without disabilities.

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