

**ADDIS ABABA UNIVERSITY**  
**SCHOOL OF GRADUATE STUDIES**



**ADDIS ABABA INSTITUTE OF TECHNOLOGY SCHOOL OF CIVIL  
AND ENVIRONMENTAL ENGINEERING**

**Assessing the Efficiency and Challenges with Implementing Accessible  
Building Facilities for Persons with Disabilities in Public Building of Addis**

**Ababa**

**By**

**Betelhem Derese**

**Advisor**

**Prof. (Dr. - Ing.) Abebe Dinku**

**A Thesis Submitted to School of Graduate Studies in Partial fulfillment of the  
requirements for the Degree of Master of Science in Civil Engineering (Construction  
Technology and Management Engineering)**

**July, 2020**

**Addis Ababa, Ethiopia**



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**EXAMINER'S APPROVAL SHEET**

	<b>Name</b>	<b>Signature</b>
<b>ADVISOR</b>	<b>Prof. (Dr. – Ing.) Abebe Dinku</b>	_____
<b>EXAMINER</b>	_____	_____
<b>EXAMINER</b>	_____	_____
<b>CHAIRPERSON</b>	_____	_____

## **Declaration**

I declare that this thesis entitled “Assessing the efficiency and challenges on implementing accessible building facilities for persons with disabilities in critical public building of Addis Ababa” is my original work. This thesis has not been presented for any other university and is not concurrently submitted in candidature of any other degree, and that all sources of material used for the thesis have been duly acknowledged.

Candidate:

Name:     Betelhem Derese

Signature: \_\_\_\_\_

Place:     Addis Ababa University

Addis Ababa Institute of Technology

School of Civil and Environmental Engineering

Date of submission: July, 2020

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## ABSTRACT

People pass through being elderly, pregnant women, children and with a temporary sickness or injury and will be in need of help from others to maneuver in built environments. Thus, public buildings should be accessible and barrier-free to both able and disabled people. Disabled people find it difficult to gain access into and operate freely without assistance in many public buildings in Addis Ababa.

The aim of this descriptive research was to examine the extent to which the persons with Disability facilities have been incorporated in the designs and construction of public buildings of Addis Ababa, to identify the challenges with the implementation of accessible Building Facilities, challenges faced by of PWDs and to assess possible improvement solutions. To achieve the study's objectives, a comprehensive literature review, a questionnaires survey and observation were carried out. The total population of grade one consultant (44) from federal construction minister of Addis Ababa in the year 2019 was taken to respond on the questionnaires. The study also sought to find out major challenges that person with disability are facing by purposively selected 6 organizations, which are working on disability and 30 PWDs were given the questionnaires based on their disability type. In addition the study took inventory of facilities available for disabled people in purposively selected ten critical public buildings. The inventory covered the identification and ascertaining the functional state of the facilities.

Findings from the research shows that almost half of the respondents who were responsible for taking decision on the design of built environment has got little or fair knowledge about the inclusive, accessible, universal buildings and disability concerning laws. Therefore most the building being provided are not disability-friendly. Even, if there are consideration of the disability in design the frequently considered is mobility. And some of the challenging factors for implementing accessible buildings are ranked as follow; lack of enforcement of the law, lack of public awareness about the law and weakness in the provisions of the law. Public education, review of the disability law and active involvement of disability groups in decision making were some of the recommendations made.

Keywords: Disability-friendly; Facilities; Public Buildings

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### LIST OF ABBREVIATIONS

ADA	American Disability Authority
ANSI	American National Standard for Accessible
CABE	Commission for Architecture and the Built Environment
CAE-1	Consulting Architects and Engineers Grade 1
CRPD	Convention on the Rights of Persons with Disabilities (United Nations)
CSA	Canadian Standard Association
DQI	Design quality indicator
ECDD	Ethiopian center for disability and development
ILO	International Labor Organization
ISO	International Organization for Standardization
MoFED	Ministry of Finance and economic development
PWDs	Person with disabilities
SPSS	Scientific Package for Social Science
WHO	World Health Organization

## 1 INTRODUCTION

### 1.1 Background

Infrastructure is critical to social functioning with direct impact on social wellbeing, earnings, education and health. When infrastructure is inaccessible to any social group, that group is at risk of social exclusion, being able to participate in and contribute to society. One of the Infrastructure which is critical is Building, since it is the means by which other services are accessed including health, education, employment, living etc.[1]. In architecture, construction, engineering, real estate development and building technology, the word building refers to any human-made structure used or intended for supporting or sheltering any occupant. Buildings fulfill several needs of society-primarily as shelter from weather and as a general living space, for privacy, for keeping belongings and for comfortably living and working. According to Anjlee Agarwal and Andre Steele urban environments without a universally accessible building system will exclude people living with disabilities, marginalizing them and breaching their human rights[1].

A study by WHO shows that across the world there are more than one billion people with disabilities who on a daily basis experience built environment barriers, that prevents them from participating in their communities, getting public services, getting a quality education, finding decent work, using safe mode of transport and the like. In consequence, inaccessible built environments create disability by being creating barriers from greater independence, equal participation and social inclusion [2].

As universal design approach states, that people of diverse disabilities should be able to use buildings and places comfortably and safely, as far as possible without special assistance. And also people should be able to find their way easily, understand how to use building facilities such as intercoms or lifts, ramps, stairs, toilets, and know what is a pedestrian facility, and know where they may encounter traffic[3]. However, there is a vast scope for improving performance through knowledge in the construction industry where men, materials, machinery, money and

management work together to build construction industry which gives an inclusive facility service to the society.

In Ethiopia, the construction industry plays an essential role in socio-economic development of the country. It is also believed that most of the capital budget goes to the construction of infrastructures because it is the development of infrastructure that could be the back bone for the economic growth of the nation. According to MOFED the contribution of the construction industry accounted for 5.6 % of the economy of Ethiopia. Therefore Construction organizations are operating continually to create a rapid change in the sector. However, successful construction project performance is achieved when stakeholders meet their requirements, individually and collectively. Construction projects potentially can have different sets of stakeholders as: clients, consultants, contractors, suppliers, end-users and the community[3]. Therefore the successfulness of building construction projects depends on satisfying the need of end-users including person with disability.

In Addis Ababa most of the infrastructure roads, residential areas, business centers, schools, health centers and work places, the transport system to mention among others, is full of barriers in which persons with disabilities continue to face difficulty while using these facilities to move freely and to get the services thereof[4]. In such a city, it is hardly possible for persons with disabilities to live independently, to obtain an education, to get a job, to move wherever they choose, to contribute in political, religious, social and recreational activities. The main cause with this problem is the lack of awareness in the community including the government in which some see the issue of accessibility as a charity question while others consider it as luxury and still others see it as a source of additional costs.

According to baris and Uslu (2009), the desires of the disabled persons are as important as the desires of the physically-able majority. People with diverse disabilities, sizes, and ages should be able to fully participate with the built environment independently as they all have opportunities and obligations in all aspects of society. Therefore, planning and designing for the majority should consider the requirement of PWDs (people with disabilities). Mostly nine out of ten

individuals may be architecturally disabled in some way or other at some time in their lives. This shows that people can be disabled on one time of their lives. For example, a child, a pregnant woman, an elderly person, an injured person, a parent with a pram, etc., are all disabled in one way or the other. There are very few people who remain able-bodied and healthy all their lives. It is, therefore, important that the built environment, which includes public buildings that needs to be made barrier-free by suitable designing, constructing and maintaining them to meet the needs of all users equally [4].

Public buildings are regarded as barrier free buildings or sustainable buildings. In most cases, people find it difficult to get access into these buildings basically because of their physical disability. The barriers could be in the form of limited access narrow doorways, steps and staircases etc.[2]. Accessibility should be provided for people with diverse disabilities, including mobility, mental, and sensory (hearing and vision loss), and various user groups of children, families, and the elderly. When designing buildings and environments, various users require different needs. It is vital to consider everyone since some people depend on other abilities for creating awareness of their surroundings. The availability of accessible facilities in the public buildings is very significant. This has a double significance: it helps physical access to use those public spaces and also supports a public presence that leads society to a greater understanding of 'disability', 'disabled people' and their 'needs'.

In many cases, disabled people, especially those with mobility impairments, find themselves trapped within their homes. Frequently, this is because of the challenges PWDs face while using spaces outside to their houses. The causes of their struggles range starts from mobility requirements like cracked pavements, obstacle-ridden thoroughfares, the absence of ramps for wheelchair users, inaccessible transport. These barriers exclude people with impairments from mainstream social life. Furthermore, these physical barriers in public places effectively reinforce the social view that disabled people are a minority and a burden on their families. To a certain extent, this attitude binds disabled people in 'their place' and circumscribes their opportunities of fighting for accessible public spaces and for redeveloping existing and emerging needs in order to design for the future.

In Addis Ababa city currently there are many critical public buildings which are giving different service for the society. And its efficiency, usability or accessibility of building facility meant to be provided for everyone is in equation. Therefore, this research work will try to find out mainly how efficient and usable the existing building facilities are, the major challenges faced by designer (architects, engineers, etc.) making them not to perform as the industry standard and what improvement strategies should be followed to make these public building convenient for all.

## **1.2 Statement of the problem**

Starting from the time Addis Ababa was chosen to be the diplomatic capital city of Africa, people have been flowing from different countries for the sake of attending global conferences and also to visit the capital of the African continent. It should be recognized that some of these guests have different disabilities [5]. It should also be noted here that Ethiopia is among the first countries who accepted the United Nations Convention on the Rights of Persons with Disabilities (CRPD), which promises to make the built environment accessible for people with disabilities, resulting in isolation from jobs, housing, health care, and education. Therefore as per the internationally signed convention and Ethiopia standard, any built environment in the city needs to be accessible, inclusive and also comfortable for foreign and local PWDs which showcasing our city's infrastructure development as well as its integrity.

It's hard to show the exact numbers of PWDs in Ethiopia, based on the World Report on Disability jointly issued by the World Bank and World Health Organization[6]. There are an estimated 15 million children, adults and elderly PWDs in Ethiopia, representing 17.6 per cent of the population[7]. Inaccessibility of built environment and transportation have been major challenges for persons with disabilities by making them to stay at home, being denied of exercising their rights, like accessing education center, accessing health care services, employment opportunities, and other services as equal as all citizens[6]. Instead PWDs are facing exclusion from experience everyday life activities.

The construction industry in Ethiopia should also focus on accessibility and usability of infrastructures like buildings because it is sign of development as a country when buildings are

problem solving to the disabled society and not the problem themselves. Since it provides to the society it should be for all, not in favor of the majority. There are lots of private and public buildings in Addis Ababa which are not either accessible or usable for persons with disabilities[5]. Therefore, it is the entire society, including the elderly, pregnant women, people with temporarily reduced mobility, children and the like who benefits from improved accessibility to the built environments [7].

Addis Ababa roads, resident areas, business establishments, schools, health centers, work places, the transport system to mention among others, most of them are full of barriers in which persons with disabilities continue to face difficulty to move freely and to get the services thereof. In such a city, it is hardly possible for persons with disabilities to live independently, to receive an education, to find a job, to travel wherever they choose, to participate in political, religious, social and recreational activities. The main cause with this problem is the lack of awareness in the community including the government in which some see the issue of accessibility as a charity question while others consider it as luxury and still others see it as a source of additional costs[8].

In most cases, people find it difficult to gain access into public buildings simply because of their physical disability. The barriers could be in form of restricted access and narrow doorways, steps and staircases [2]. Therefore, disabled people become frustrated and handicapped only by the way in which their environment emphasizes their disability. Architectural and urban barriers have prevented people with disabilities to partake in social activities and this equally has negative effect on the society at large [9].

These are some identified challenging factors which are responsible for being failure to implement inclusive building by the World Report on Disability include: Inadequate policies and standards, Policy design does not always take into account the needs of people with disabilities, or existing policies and standards are not enforced, Negative attitudes, complexity and cost, Beliefs and prejudices constitute barriers, lack of budget allocation and involvement of PWDs in decision making [10]. Much research has not being done in the effect of these challenging factors to accessibility of buildings in construction industry of Ethiopia.

The above facts shows that notwithstanding the existence of a legal framework (i.e. the disability) backing the needs of PWDs, the built environment at educational institutions, city centers, banks, hospitals etc. still pose various degrees of restrictions to PWDs access. The current study therefore aims at finding out how the building facilities designed do not still meet the requirements for PWDs access and efficiency of critical public building facilities, the causes that failed architects and engineers with implementing accessible building facility for the Disabled while designing and constructing and also the challenges of PWD while using public buildings.

In addition much research has not been done in Assessing the Efficiency and Challenges of Implementing Accessible Building Facilities for Persons with Disabilities on public building of Addis Ababa. Therefore the interest of the study is to Assessing the current Efficiency and Challenges with Implementing Accessible Building Facilities for Persons with Disabilities on public building of Addis Ababa. So that this research will serve as a resource to researchers interested in carrying out further research in this field

### **1.3 Research questions**

The following research questions needs to be addressed

1. Is there disability consideration in design and constructions of public buildings projects in Addis Ababa?
2. What are the challenging factors of implementing accessible Building Facilities for Persons with Disabilities in Addis Ababa?
3. What are the challenges that person with disability face while using public building of Addis Ababa?
4. What are possible improvement solutions that should be addressed for the public buildings to be usable and accessible to person with disability?

### **1.4 Objectives of the research**

#### **1.4.1 General objective**

To assess the efficiency and challenges with the implementation of accessible building facilities for persons with disabilities on public buildings of Addis Ababa

### 1.4.2 Specific objectives

This main objective would be supported by these sub objectives:

- To identify whether Disability facilities are factored into the design and constructed on public buildings of Addis Ababa.
- To identify the challenges with the implementation of accessible Building Facilities for Persons with Disabilities in Addis Ababa.
- To study the major challenges and problem that person with disability face while using public building of Addis Ababa.
- To asses possible improvement solutions that should be addressed for the public buildings to be usable and accessible to person with disability.

## 1.5 Scope and Limitation of the Study

The research is assessing the Efficiency and Challenges of Implementing Accessible Building Facilities for Persons with Disabilities on selected public buildings of Addis Ababa. The scope of the study has been limited to public and critical public buildings based on service they provide and exposure to the society. The disability type targeted in this research are wheelchair users, people with limited walking ability, people with limited use of hands or arm, visually impaired and with hearing impaired. The scope of this study is investigating the efficiency and challenge of implementing accessible building facilities from experience of designers (architects, engineers) and PWDs to providing convent facility for disables on critical public building of Addis Ababa.

The data collection were limited to primary data i.e. observation and questionnaires mainly for the public buildings. The data were collected from consulting office and PWDs. Since the study mainly concerns consultants and PWDs. Contractor were not asked for data because consultant is responsible for the design and supervision of building projects and there being constructed accordingly. There were also difficulties to find relevant written and organized documents in sector where building efficiency and their implementation challenge. It was difficult to find even primary data though observation & questionnair since the companies weren't willing to give data. Especially banks were not willing to allow taking picture and a few questioners were not filled properly.

## 1.6 Significance of the study

The findings from this study will create awareness on the existing challenges that the disabled person are facing because of building facilities not being inclusive of them, the causes that failed architects and engineers with implementing accessible building facility for the disabled and its effective implementation will offer suggestions on how they can be improved. Thus, this study is considered significant for the following reasons.

- This study will be important to building professionals and the general public because it will create awareness on how inaccessibility and non-inclusiveness of building can adversely affect project and society.
- Also it will initiate to review the existing practices, codes (law), methods of work and management system to improve the usability of public buildings in Addis Ababa.
- This study will also help contractors, clients, consultants and all parties involved in construction projects about ways of improving their current method of design and construction.
- To know PWDs challenges so that one can know where to focus on to overcome the challenges and to improve existing practice.
- This research will serve as a resource to researchers interested in carrying out further research in this field

## 1.7 Organization of the study

This paper is organized into five chapters. Chapter one incorporates the introduction (preliminary) parts of the study: the background of the study, the statement of the problem, objectives, significance, scope and limitation of the study. The second chapter is Literature review.

The third chapter gives detailed account of the study area; the research design including the selection of sample; the data that are collected and analyzed. Chapter four discusses the presentation, analysis and discussion of findings. Finally, chapter five presents the general summary of the findings, conclusion as well as recommendation.

## 2 LITERATURE REVIEW

### 2.1 General overview

The construction industry is vital for the development of any nation. The pace of the economic growth of any country can be measured by the development of physical infrastructures, such as buildings, roads, rail ways, hydropower stations and bridges. Construction project development involves numerous parties, various processes, different phases and stages of work and a great deal of input from both the public and private sectors, with the major aim being to bring the project to a successful conclusion. The level of success in carrying out construction project development activities will depend heavily on the quality of the managerial, financial, technical , organizational performance of the respective parties and the satisfaction of users, while taking into consideration the associated risk management, the business environment, and economic and political stability.

According to World Report on Disability jointly issued by the World Bank and World Health Organization, there are an estimated 15 million children, adults and elderly PWDs in Ethiopia, representing 17.6 per cent of the population [7].Despite this fact, according to experience and the survey conducted by ECDD (Ethiopian center for disability and development) on existing buildings and transportation in Addis Ababa it was found out that most of buildings and transportations are not accessible for persons with disabilities. The researcher believes it's meaningless to have accessible transport if the buildings are not accessible and there are no points of having accessible education center, health center etc. if the transportation is inaccessible. Therefore, it's a must to work on both construction of buildings and transportation ways to improve the life of persons with disabilities fully. ECDD believes that without being able to access the facilities and services provided in the community, persons with disabilities by no means is fully included. In most societies, however, there are innumerable obstacles and barriers that hamper persons with disabilities from accessing public services available in their community. These include such things as stairs, lack of information in accessible formats such as Braille and sign language, and community services provided in a form which persons with

disabilities are not able to understand. Although some of the more costly accessibility provisions can be implemented progressively, there are a number of low-cost, low-tech accessibility solutions that would have immediate benefits[5].

A society that believes in equity should be influential in providing accessible environment for its citizens with freedom and the means to pursue an active social and economic life. Where there is a setting in which the citizens have free access to buildings, premises and other facilities without the help of others, it can be said that an individual has enjoyed his /her rights as a citizen: an accessible environment means that a person will be able to seek employment, receive education and training, and pursue an active social and economic life [11].

To have an equal access for the built environment, designers of the environment should consider different requirements that can be of the highest level of flexibility and that assures barrier free environment for all users [4]. Often accessibility is thought of as a separate issue to be addressed after the planning and development process of a project is complete but accessibility is a fundamental prerequisite for building an inclusive society where everyone including persons with disabilities, has the opportunity to participate fully in all aspects of society[12]. In addition the conformability and accessibility of citizens have been traded for cost-effectiveness of infrastructure systems, besides meeting the necessity of physical access to the built environment [13]. A person's mental and physical well-being is related to many circumstances, not the least of which is the quality of their dwelling and home environment. An important part of such quality is physical design and layout, and how far it enables the ease of people's mobility and movement around the dwelling and the use of different rooms and their facilities[14].

## **2.2 Definitions of basic terms and concepts Definitions**

### **2.2.1 Disability, Impairment and Handicap:**

The terms “**Impairment**”, “**Disability**”, and “**Handicap**” are used interchangeably. They all have different meanings. The most common definition is provided by the WHO (World Health Organization) which distinguishes difference between the three terms i.e. disability, impairment and handicap[15].

- **Impairment** – It is defined as any injure or weakening of physiological, psychological and anatomical functions or structure.
- **Disability** – it is defined as any limitation or inability to perform an activity due to mental or physical disability.
- **Handicap** – A handicap is a drawback for an individual which results from a disability or impairment and precludes an individual from being normal.

Generally disability is a state in which functional limitation and/or impairments are causative factors of the existing difficulties in performing one or more activities which, (in accordance with the subject’s age, sex and normative social roles,) are generally accepted as essential, basic components of daily living, Such as self-care, social relations and economic activity.”[16].

### 2.2.2 Public Buildings:

Public buildings are referred as buildings without obstructions. It must be accessible to both physically able and disabled people. In most cases, public buildings are regarded as barrier free buildings or sustainable buildings. Building types that are listed as public buildings are among others: office buildings, commercial buildings, assembly halls, hospitals and health facilities, libraries, sports buildings, public transit buildings, religious buildings, government administrative buildings, educational buildings, religious buildings, banks etc.[15].

### 2.2.3 Critical public building

Critical public building facilities are those buildings that are basic to the continuing function of essential services following a significant affair such as Education centers, Health care center, police stations, government buildings, Community retail center and Banks etc. [17].

### 2.2.4 Barrier

Barrier as defined as anything that prevents a person with a disability from fully participating in all aspects of society because of his or her disability, including a physical barrier, an architectural barrier, an information or communications barrier, an attitudinal barrier, technological barrier, a policy or practice.

### 2.2.5 Accessibility

The root of the word accessibility is derived from access which means “the possibility to go into, to enter a place etc.” which implies freedom of movement. An accessible environment is an

environment which allows for the freedom of movement and use in total safety, regardless of age, gender, or impairments, of a space or product which can be used by all, with no obstacles, with dignity and the highest possible levels of independence[18].

### **2.2.6 Usability**

Usability refers to the perceived fit between human beings and architecture and built environment. It is perceivable through an intellectual and qualitative analysis of the architectural space that takes into account the adjustable level in architecture and built environment with respect to cognitive impairments and functional disabilities. Characteristics of the built environment which can be used by everybody in convenience, safety and about product quality in relation to users are usability [19].

### **2.2.7 Inclusive design**

Definition of inclusive design has been adopted in the area of design education: Principally, it should be acknowledged that “inclusive design” is not a fixed set of design criteria, but a constantly evolving philosophy. The goal of creating beautiful and functional environments that can be used equally by everyone, irrespective of age, gender or disability requires that the design process must be constantly expanding to accommodate a diverse range of users, as we develop greater understanding of their requirements, desires and expectations[2].

### **2.2.8 Universal design**

The universal design definition is “the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design” [2].

Universal Design is a relatively recent paradigm that emerged from ‘barrier-free’ or ‘accessible design’ and ‘assistive’ technology. It is a frame work for the design of places, things, information, communication and policy to be usable by the widest range of people operating in the widest range of situations without special or separate design. Universal design refers to a broad spectrum solution that produces buildings, products, transportations and environments that are usable and effective for everyone, not just people with disabilities [4].

### 2.3 Common types of disability

According to WHO, disability is an umbrella term, covering impairments, activity limitations, and participation restrictions. Impairment is a problem in body function or structure; an activity limitation is a difficulty encountered by an individual in executing a task or action; while a participation restriction is a problem experienced by an individual in involvement in life situations. A disability may be physical, cognitive, sensory, emotional and developmental or some combination of these. Therefore designers need to consider every disability type before and after construction building which give service to the society. Table 2.1 is presented to demonstrate the types of disability which are considered for design and installment of mobility aiding features [20].

Table: 2.1:-Basic type of disabilities considered for access aiding features [adapted from[21]]

Types of disability	Description
<b>Non-Ambulatory</b>	<ul style="list-style-type: none"> <li>- Impairments that, regardless of cause or manifestation, for all practical purposes, confine individuals to Wheel Chairs</li> <li>- Person not able to walk or exit to safety without the physical assistance of another individual</li> </ul>
<b>Semi-Ambulatory</b>	<ul style="list-style-type: none"> <li>- Impairments that cause individuals to walk with difficulty or insecurity.</li> <li>- Individuals using braces or crutches, amputees, arthritis, spastics, ladies with advanced pregnancy and those with pulmonary and cardiac ills may be semi-ambulatory</li> </ul>
<b>Sight</b>	<ul style="list-style-type: none"> <li>- Person with Sight Impairments, Blind person</li> <li>- Total blindness or partial impairments affecting sight to the extent that the individual functioning in public areas is insecure</li> </ul>
<b>Hearing</b>	<ul style="list-style-type: none"> <li>- Person with Hearing impairments, Deaf person</li> <li>- Deafness or hearing handicaps that might make an individual insecure in public because he is unable to communicate or hear warning signals</li> </ul>

In addition to the above categories, designers also need to be concerned about a building user who has got disability on mental functioning, senses, Internal body regulation, Motor impairment, cannot feel temperature or pressure and cannot speak.

## 2.4 Challenges on disability and implementation of accessible buildings

### 2.4.1 Challenges faced by people with disability

The challenge that PWDs face forced them to stay in a confine environment and not to practice their basic rights. Even if the concept of accessibility has being accepted in Ethiopia earlier it's not being practiced as expected yet. People with disability face many obstacles in their physical environment that prevent them from fully exercising their rights and participating in social, cultural and professional life on an equal basis with others. This includes access to education and health services, the opportunity to earn a living and the right to participate in family, community and political life. A barrier-free environment is the key to social inclusion of people with disability[22]. Improved accessibility also benefits society as a whole. The International Disability and Development Consortium, in its statement on CRPD Article 9 accessibility, noted that people with disability are largely overlooked in development policies and programs.

Architects traditionally design buildings for an idealized "average" user who might be characterized as a "large, healthy, adult male in his late teens or early 20's"[11]. An alternative to traditional building design is barrier free design which permits a wide range of able-bodied and disabled people to freely use the built environment. This requires an inspection of the range of abilities of expected users and the design criteria necessary to accommodate them. The goal of accessible design cannot be approached by putting a "young healthy adult male" in a wheelchair and designing for his perceived needs. Accessible designs must be approachable to the different needs of people and sometimes multiple disabilities[11]. Considering disabilities and accessibility issue the following features can be considered as challenging areas of accessibility in built environment[20]:

- **Inside building:**-Entrance, Doors, Elevators, Stair, Corridor or walking passage, Indoor parking etc...

- **Outside building:**-parking place, Sidewalk or footpath, transportation vehicles, Road crossing, Roundabout, Grade separated facilities e.g. underpass over pass, Bus stop and Railway station etc...

The table 2.2 below shows some of challenges and solutions with the type of impairment or disability in the built environments.

Table:2.2:-Challenges and solutions according to the type of impairment: [adapted from[4]]

<b>Type of impairment</b>	<b>Examples of difficulties faced</b>	<b>Accessibility required</b>	<b>Possible actions</b>
<b>Visual</b> :Person with sight impairments, blind person	<ul style="list-style-type: none"> <li>- Spatial awareness and orientation</li> <li>- Seeing obstructions within the path of travel</li> <li>- Finding Handrails</li> <li>- Recognizing emergency situations</li> <li>- Reading small writing or complicated texts</li> <li>- Maneuvering in elevators etc...</li> </ul>	<ul style="list-style-type: none"> <li>- Improvement of visual perception</li> <li>- Mobilization of the other senses</li> </ul>	<ul style="list-style-type: none"> <li>- Installation of pedotactile strips on the ground as a guide and warning device,</li> <li>- Adapted signposting</li> <li>- Obstacle-free routes</li> <li>- Availability of audio or Braille formats</li> </ul>
<b>Auditory</b> : Person with Hearing impairments, Deaf person	<ul style="list-style-type: none"> <li>- Hearing audio information</li> <li>- Absences of sign for direction</li> <li>- Absence of building map at the entrance get</li> <li>- accessing rest room identified by a sign etc...</li> </ul>	<ul style="list-style-type: none"> <li>- Transfer of information from audio to visual formats</li> </ul>	<ul style="list-style-type: none"> <li>- Signposting,</li> <li>- Quality of lighting and acoustics</li> </ul>

<p><b>Physical :</b> Person with difficulties in mobility, Person using walking aids and wheelchairs</p>	<ul style="list-style-type: none"> <li>- Moving around on loose, slippery or uneven ground</li> <li>- Passing obstacles or differences in level (steps, slopes)</li> <li>- Maneuvering in rest rooms</li> <li>- Passing narrow passages</li> <li>- Reaching certain heights</li> <li>- Grasping, using objects</li> <li>- Seeing at certain heights</li> <li>- Covering long distances with no rest etc...</li> </ul>	<ul style="list-style-type: none"> <li>- Removal of all obstacles on outdoor (roads and pavements) and indoor (entrance, exit, mobility inside buildings, facilities) routes and create the best possible conditions for using walking aids</li> </ul>	<ul style="list-style-type: none"> <li>- Different types of surfaces, access ramps and stairs, obstacle</li> <li>- Free routes, adaptation of facilities and commands</li> </ul>
<p><b>Mental / intellectual</b></p>	<ul style="list-style-type: none"> <li>- Learning difficulties and problems with orientation</li> <li>- Understanding signs</li> <li>- Memorizing an itinerary</li> <li>- Spatial awareness etc..</li> </ul>	<ul style="list-style-type: none"> <li>- Any modifications or adaptations which improve understanding</li> </ul>	<ul style="list-style-type: none"> <li>- Signposting using images</li> <li>- Simple plans</li> <li>- Simple commands Clearly visible entrances to buildings</li> </ul>

**2.4.2 Challenges with implementation of accessible buildings**

In spite of the numerous efforts in terms of legislations and the passage of national building codes, the built environment of many nations is still remain inaccessible[23]. To work, universal design and construction one needs to consider regulatory, structural, human behavior and operational practices. These all play an important role in planning and implementation. The following factors have been reported by the world report on disability and being responsible for the failure to implement inclusive buildings:

**2.4.2.1 Weaknesses in the provisions of law/policy:**

Implementation of local policy, legislation and enforcement rules are required for universal design principles to work. Lack of appropriate regulation, enforcement and maintenance can change built areas from being accessible, secure and safe area to being areas of danger and

concern[22]. Imrie explained the national and legal provisions regulating the construction of barrier-free structures are weak or non-existent in many countries. It was observed that, in developed countries for instance United Kingdom, the building codes which guide designers and developers in providing accessible buildings and structure for the disabled were weak and ineffective[23]. Moreover, the provisions apply to only new buildings and key renovations. This weakness in the building code has consequently affected the effort of the country to remove the barriers PWDs face in accessing the built environment. Thus, as long as the law is not amended, the chase for an all-inclusive built environment is a delusion.

#### **2.4.2.2 Inadequate policies and standards**

Similar to the issue discussed above, usually the design of national policies neglect the requests of the disabled. Even where the policies consider the PWDs, the policies or standards are hardly enforced[23]. In the case of Ethiopia, the accessibility policy is there to serve as the legal support to ensuring the accesses of PWDs to the built environment; however, the enforcement and its adequacy is the issue of concern.

This policy phase involves researching, analyzing and consulting. The aim is to clear the direction of an assist in adequate policies and standards. With universal design, it is important to[22]:

- Identify and understand an associate country's legislative frameworks as a starting point. Some developing countries have legislative frameworks and policies on disability inclusion.
- Identify the in-country Disabled People's Organizations and other points of support.
- Document lessons learned from all country projects that include disability

#### **2.4.2.3 Complexity and high cost of designs which incorporate the needs of PWDs**

Imrie and Hall noted that the design of the built environment cannot be completely all-inclusive due to the following reasons[24]:

- i. Low require from the disabled to necessitate the provision of an accessible built environment for them.
- ii. It is highly expensive to provide an environment that is completely accessible, meaning supplementary fixtures and devices add up to the complexity of projects which fully

considers the needs of the disabled. Therefore, the more complex the design, the more expensive it becomes.

Vandebelt, argue that the statement by Imrie and Hall can be disproved if one considers the following: Firstly being smaller in number (PWDs) in using of a given facility as compared to able bodied persons is not enough justification to prevent them from enjoying their right. As long as they are allowed to such benefits, they should not be limited to use facilities[25]. Moreover, a person can become impaired at any time, so designers should not only consider the current statistics in taking decisions. Secondly, on the cost issue Vandebelt admitted designing for all may cost more than traditional designs however, still can design an all-inclusive structure which is financially beneficial, by integrating the principles of universal design[25].

#### **2.4.2.4 Ignorance**

The study by Wijk, shows that architectural disability“ was attributed to the ignorance, inflexibility and beliefs of the designers [23]. Salmen’s study also asserts that engineers, architects, planners and professionals of the built environment usually do not give attention on the expected changes needed to the society. Therefore they fail to come out with inclusive design solutions. It is recommended that, the ignorance of the designers can be addressed through public educations and introducing them to creative examples. Moreover, their attitude can be changed through professional training programs. As well, the current way of training should also be revised [26].

#### **2.4.2.5 Ineffectiveness of Disability Groups**

Ojok noted that the ineffectiveness of disability group is somewhat responsible for the suffering of PWDs. He explained that, Disability community is responsible to defend the cause of the disabled exclusion. They are responsible to promoter for passage and implementation of disability laws and policies. Thus where this body is silent or ineffective the disabled suffer[27].

#### **2.4.2.6 Negative attitudes towards PWDs**

Traditional and cultural beliefs sometimes generate barriers to education, employment, health care and social participation. The bad concepts some designers have about the disabled sometimes influence their decisions, when it comes to incorporating the needs of PWDs to the built environment[27].

#### **2.4.2.7 Lack of budget allocation for implementation**

For instance, in developed countries, it is anticipated that about 20% to 40% of the disabled does not meet their needs in terms of assistance devices. Moreover, in most developing economies the governments cannot offer satisfactory services for the disabled. One of the reasons is the budget allocation to create inclusive environment. Money held for the construction of infrastructures are often found to be insufficient, in terms of its ability to finance the project given that all the requirements for PWDs access are fully incorporated [27].

#### **2.4.2.8 Lack of consultation and involvement in decision making**

Most disabled persons are excluded from decision-making processes even on issues that directly concern them and have direct impact on their life. This problem is a key issue that most countries face [27]. The disability groups stand for the mouth piece of the PWDs in every country. They expose various complains such as the difficulties they face in using a particular facility.

Thus it is considered very important that, either the disability associations or the disabled themselves are periodically invited and their opinion solicited on the challenges they face in using the built environment. This will provide vital information to the designers and policy maker to design and construct an all-inclusive environment which can meet the needs of the users. On the contrary Ojok, noted that designers usually sit at the offices, consult books and produce designs which at the end of the day are sometimes unable to meet the needs of the users [27].

#### **2.4.2.9 Lack of coordination between departments**

The study of Ojok found that difficulty in the coordination of the roles of other ministries, lower government structures and private entities responsible for the implementation of the law/ policy is one of the major challenges associated with the implementation of the requirement of Disability[27]. Therefore to change the existing condition our country needs to establish early collaboration between government representatives, infrastructure designers and Disabled People's Organizations.

#### **2.4.3 Tips for promoting universal design [22]**

1. Identify and understand a neighbor country's legislative framework and building standards and codes.

2. Establish early teamwork between government representatives, infrastructure designers and Disabled People's Organizations.
3. Consult with a representative range of disability groups as equal participants throughout the project cycle and after the project is complete, to assess the effectiveness of the design and to collect lessons learned.
4. Learn how local people with disability and their families adapt their environments to make them more accessible.
5. Include people with disability on general planning committees to ensure a better understanding of the barriers faced by people with disability.
6. Include costs for inclusive design as part of overall construction costs and not refer it as add on.
7. Ensure that contractors and consultants consider employing people with disability in design, construction and administration
8. Raise the importance of universal design with other development partners, using Accessibility Design Guide as a reference tool.
9. Advocate for universal design principles to be reflected in local laws and policies.
10. Capture lessons learned to ensure that they are incorporated into planning of future aid funded.

## **2.5 Approaches and design concepts**

This day's meeting the needs of users has become an important goal on the political agenda and there is an increasing recognition of elderly people and people with disabilities by giving attention for their requirements in the society. The increasing awareness of these groups and their needs have attracted the interest of developers and designers to enable them to obtain an increased independence in terms of societal help and support for performing everyday tasks. Even if the interest for designing for people with some form of disability was there already, the shifting of basic values to the society is very important [2]. The following are short description of some of the design approaches or groups of design thinking that, have played an important role and inspired many in the area of designing for accessibility.

### 2.5.1 Barrier-free design

In 1950 was the year where changing process of public policies and design practices started in United States. Due to a number of people returning to the US with injuries after the Vietnam War, the US President's Committee on Employment of the Handicapped, the Veterans Administration and others worked on national standards for "barrier-free" buildings, targeted at making buildings accessible by handicapped soldiers and others with similar conditions. The objective was to give education and employment opportunities, as an alternative to institutionalized health care.

Barrier Free design is mainly a disability-focused movement and uses building codes, regulations and guidelines to achieve designs and features that are usable by persons with disabilities.

### 2.5.2 Accessibility

The term accessible design was derived from the ADA (American Disability Act) standard for accessible design. Its general message is that "No individual shall be discriminated against on the basis of disability in the full and equal enjoyment of the goods, services, facilities, privileges, advantages, or accommodations of any place of public accommodation by any private entity who owns, leases (or leases to), or operates a place of public accommodation"[28]. In other words Accessibility means that a program, activity, meeting, hearing, or other event or process is readily usable by an individual, regardless of his or her abilities. When used in reference to a building or facility, it means that a facility can be approached, entered and used by any individual, regardless of his or her abilities.

According to ISO's guide 71 accessible design is defined as "design focused on principles of extending standard design to persons with some type of performance limitation to maximize the number of potential customers who can readily use a product, building or service, which may be achieved by[29]:-

- Designing products, services and environments that are readily usable by most users without any modification,
  - Sign posting in public buildings or towns
  - Sign language for the deaf
  - Documents in Braille

- Making products or services adaptable to different users (adapting user interfaces) and
- Having standardized interfaces to be compatible with special products for persons with disabilities.’’

Urbanization is currently one of the most important global trends of the 21st century. Urbanization has a great potential to be a great engineer to achieve sustainable and inclusive development for all. About 6.25 billion people, 15 per cent of them with disabilities, are predicted to be living in urban centers by 2050. Urban environments, infrastructures, facilities and services, depending how they are planned and built, can impede or enable access, participation and inclusion of members of society[30].

In Universal Design Index, there are six aspects to rate accessibility i.e. connectivity (15%), accessibility (25%), usability (20%), safety (20%), integrated design (10%) and operation and maintenance (10%) where the passing score is 65%.The Ethiopia building proclamation has stated that public buildings should be made accessible for PWDs as per standards. It says “Any public building shall have a means of access suitable for use by physically impaired persons, including those who are obliged to use wheelchairs and those who are able to walk but unable to negotiate steps”. Based on the proclamation, the Council of Ministers and Ministry of Urban Development and Constructing issued a regulation and directive respectively. The building regulation provides in article 28 (2) that design of category “C” buildings shall have suitable access to staircases, parking lots, and lavatories accessible for people with disabilities. Article 33 (3) of the regulation also provides that lifts shall be suitable for all users including PWDs. Article 34 of the same regulation has set out essential facilities that a public building should have for PWDs [31].

### **2.5.3 Usability**

Usability refers to the amount of supplementary adjustments, besides accessibility adjustments, with which the architectural space has to be equipped with – assistive technology, permanent staffing or random assistance from other people present in this space – so that it will be usable for a person with disability issues.

According to the pyramid of needs (Figure 2.1) below developed by Maria Benktzon and Goldsmith, it divides users by their varying degrees of impairment from fully capable at the bottom to people with disabilities who rely on assistance at the top of the pyramid [32].

When checking to see if a building is convenient for all its users, fig.2.1 shows that architect should begin with:

- Row 1 at the bottom of the pyramid represents fit and active people who can perform different activities.
- Row 2 represents normal adults who, whilst not being fit, can still move freely in the environment. No supplementary considerations need to be applied when designing for these group users. The straight line A represents the satisfaction of these people's requirements by unselfconscious design.
- Row3 also represents active people, but in this case they happen to be women, who Goldsmith points out are subject to architecture discrimination whenever they use public buildings because they need to queue for the toilet ,as women are not provided with enough facilities.
- Row4 represents older people, who probably would not consider themselves as disabled even though they may be less active and possibly use a walking aid and adults with children in pushchairs. Both groups experience difficulty using a normal WC compartment in public buildings because of in adequate space.
- Row5 represents ambulant disabled people. Goldsmith argues that none of rows3-5 inclusive would be in convenience; the squiggly line B represents this extension.
- Row6 people are independent wheelchair users. Line C represents the satisfaction of wheelchair users and hints that the people in the tiers below could be accommodated if 'disabled' toilet provision were to be extended to their groups.
- Rows 7and8 are users whose needs are not covered by current legislation. The individuals in row 7 are wheelchair users who need assistance to go to the toilet, and scooter users. People in row 8 need two care givers. Many people in these tiers could access public buildings if these were designed inclusively, as line D indicates

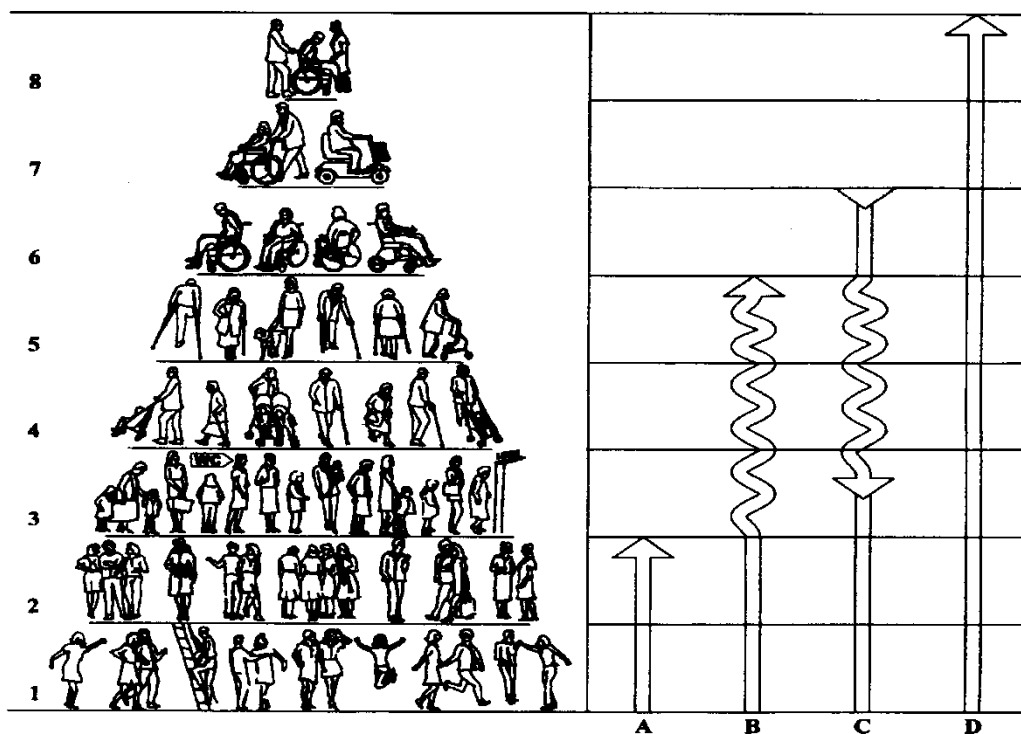


Figure: 2-1:- The pyramid of needs [adapted from[32]]

Furthermore, there will always be 5% of the people who are not capable to access buildings and environments. A single design solution cannot accommodate everyone because it cannot meet diverse needs. Therefore, the aim of usable ID is to design for the average with accommodations by considering choices and flexibility[32].

#### 2.5.4 Inclusive design

This term is used mostly in the UK and described in the British Standard on Managing Inclusive Design [2]. “Inclusive design seeks to prioritize building users’ views and values and to challenge the social and institutional, as well as technical, relations of design and building processes. Inclusive design requires designers to adopt a certain type of design approach that sets out to include as many people as possible, without denying the need for design solutions to meet the needs of specific types of impairments. It is an equity and quality (of life) issue for everyone. “Inclusive design bears similarities to universal design and design for all[2]. The table below shows ID principles is based on Commission for Architecture and the Built Environment (CABE’s) principles.

Table:2.3:- Principles of inclusive design [adapted from[33]]

<b>Principle</b>	<b>Information</b>
Places people at the heart of the design process	Inclusive design seen as an essential component of sustainable communities.
Acknowledges diversity and difference	Recognizes the wide diversity of different needs including wheelchair users, but also sensory impairments, learning difficulties, mental ill health, hidden impairments and the needs of children and parents.
Offers choice for users in acknowledgement that a single solution that fits all users is not possible.	Accommodating for all people regardless of their age, gender, mobility, ethnicity or circumstances.
Flexibility in use	Link to sustainable principles by acknowledgement of the need for adaptability in design to meet different needs at different stages.
Convenient and enjoyable places for everyone.	Well-connected buildings and streets  Understandable so that everyone knows where they are and can locate their destination.

The argument advanced by CAGE is that the principles lead to a development that is [33]:

- Inclusive: so everyone can use it safely, easily and with dignity
- Responsive: takes into account what people say they need and want
- Flexible: so different people can use the buildings and places in different ways
- Convenient: so everyone can use it without too much effort or separation
- Accommodating: for all people regardless of their age, gender, mobility, ethnicity or circumstances
- Welcoming: with no disabling barriers that might exclude some people
- Realistic: offering more than one solution to help balance everyone’s needs and recognizing that one solution may not work for all
- Understandable: everyone knows where they are and can locate their destination

### **2.5.5 Adaptable Design:**

Adaptable features refer to those which are either adjustable or capable of been easily added or removed to meet individual needs or preferences. An adaptable building has all the necessities of accessible features but it has provisions for some items to be omitted or concealed until needed. The adaptation could be carried out without involving any structural or finished material changes. Accessible features, such as knee spaces under sinks, counters and grab bars in bathrooms, are some of the standard features that could help project what an accessible building would be like. However, these features would not necessarily favor those who don't need them.

A building which is adaptable has wide doors, no steps, knee spaces, control and switch locations clear, grab bar reinforcing and other access features provisioned as standard. Grab bars however, can be installed and removed when needed. As the essential requirement is already provided, the bars can be easily installed when needed without harming the existing walls. Knee space can be concealed by installing a removable base cabinet that can simply be unscrewed from adjacent cabinets and slipped out when needed or by installing self-storing cabinet doors that fold and slide back. Counter tops and closet rods can be placed on adjustable supports rather than fixed at lower heights as required for some wheelchair users[5].

### **2.5.6 Universal design**

Universal design is a design term which was coined by Ronald L. Mace, a highly influential architect, product designer and educator. He stated the term universal design as a concept of designing products and environments for the needs of people, regardless of their age, ability or status in life [34]. The concept of universal design emerged primarily with people with disability in mind; universal design helps everyone with maintains and assistance needs including the elderly, pregnant women, children and people with a temporary illness or injury. Thus the benefits of implementing universal design are wide.

According to more recent research, the term Universal design can be used interchangeable with the term design for all, Barrier-free design and accessible design concepts[35]. One of the most frequently cited explanations of the concept of universal design is the seven principles that are used to further elaborate on the concept [2]. These seven principles may be applied to evaluate

existing designs, guide the design process and educate both designers and consumers about the characteristics of more usable products and environments.

The Principles of Universal Design are presented below; applying the seven universal design principles will support practitioners to better meet the needs of as many users as possible. When working in developing countries, Designers must also incorporate other considerations such as economic, engineering, cultural, gender, and environmental concerns in their design processes. These Principles offer designers guidance to better integrate features that meet the needs of as many users as possible [15].

**Principle 1: Equitable Use:**

The design is useful and marketable to people with diverse abilities.

**Guidelines:**

- a. Provide the same means of use for all users: identical whenever possible
- b. Avoid segregating or stigmatizing any users.
- c. Provisions for privacy, security, and safety should be equally available to all users.
- d. Make the design attractive to all users.

**Principle 2: Flexibility in Use:**

The design accommodates a wide range of individual preferences and abilities.

**Guidelines:**

- a. Provide option in methods of use.
- b. Have room for right or left handed access and use.
- c. Facilitate the user's accuracy and precision.
- d. Provide adaptability to the user's pace.

**Principle 3: Simple and Intuitive Use**

The design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.

**Guidelines:**

- a. Eliminate unnecessary complexity.
- b. Be consistent with user expectations and intuition.
- c. Accommodate a wide range of literacy and language skills.

- d. Arrange information consistent with its importance.
- e. Provide effective prompting and feedback during and after task completion.

#### **Principle 4: Perceptible Information**

The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

##### **Guidelines:**

- a. Use different modes (pictorial, verbal, tactile) for redundant presentation of essential information.
- b. Provide adequate contrast between essential information and its surroundings.
- c. Maximize "legibility" of essential information.
- d. Differentiate elements in ways that can be described (i.e., make it easy to give instructions or directions).
- e. Provide compatibility with a variety of techniques or devices used by people with sensory limitations.

#### **Principle 5: Tolerance for Error**

The design minimizes hazards and the adverse consequences of accidental or unintended actions.

##### **Guidelines:**

- a. Arrange elements to minimize hazards and errors: most used elements, most accessible; hazardous elements eliminated, isolated, or shielded.
- b. Provide warnings of hazards and errors.
- c. Provide fail safe features.
- d. Discourage unconscious action in tasks that require vigilance.

#### **Principle 6: Low Physical Effort**

The design can be used efficiently and comfortably and with a minimum of fatigue.

##### **Guidelines:**

- a. Allow user to maintain a neutral body position.
- b. Use reasonable operating forces.
- c. Minimize repetitive actions.
- d. Minimize sustained physical effort.

## **Principle 7: Size and Space for Approach and Use**

Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.

### **Guidelines:**

- a. Provide a clear line of sight to important elements for any seated or standing user.
- b. Make reach to all components comfortable for any seated or standing user.
- c. Accommodate variations in hand and grip size.
- d. Provide adequate space for the use of assistive devices or personal assistance.

### **2.5.7 Design for all**

Design for all is design for human diversity, social inclusion and equality. This holistic and innovative approach constitutes a creative and ethical challenge for all planners, designers, entrepreneurs, administrators and political leaders. Design for all aims to allow all people to have equal opportunities to participate in every aspect of society. The practice of design for all makes conscious use of the analysis of human needs and aspirations and requires the involvement of end users at every stage in the design process [2].

## **2.6 Sustainable Public Buildings**

It is obvious that many public buildings are not accessible for the old, the very young and persons with disabilities due to poor design and performance [9]. Based on the World Report on Disability jointly issued by the World Bank and World Health Organization, there are an estimated 15 million children, adults and elderly persons with disabilities in Ethiopia, representing 17.6 per cent of the population [5]. Therefore, there is urgent request for planned approach in handling the problem of accessibility for the disabled people in public buildings [9].

Planning can help break down unnecessary physical barriers and exclusions caused by the poor design of buildings and places. In some countries a higher level of technical specifications has been achieved due to their long history in developing accessible building standards and regulations. International standard provides building users, architects, engineers, designers, builders, building owners and managers, manufacturers, policy makers and legislators with requirements and recommendations to create a sustainable built environment which is accessible. The function of this International Standard is to label how the built environment should be

designed, constructed and managed to allow people to move toward, enter, use, and way out from and evacuate a building without help, in an equitable and dignified manner and to the greatest extent possible [19]. Good design can help to create buildings and places that are for everyone which is inclusive.

A sustainable building need to have inclusive design, so as to acknowledges diversity and difference and it's more likely to be achieved when it is considered at every stage of the development process, from inception to completion. However it is often wrongly seen as a Building Regulations issue, to be addressed once planning permission has been granted, not at the planning application stage. Thinking at the beginning of the design stage about how the completed building appear and managed can overcome many barriers experienced by some users[36].

### **2.6.1 Standard features of accessibility design** [[22], [37]]

The followings are some of the standard features of accessibility design reviewed adapted from different guidelines and case studies:

#### **2.6.1.1 Parking spaces**

Parking includes parking spaces and drop-off zones. Parking problems faced by people with disability include, no or too few spaces, spaces that are not wide enough and/or spaces located too far from a main building entrance. Drop-off zone problems include no specified zones or poorly located zones.

- locate disability-reserved parking spaces no more than 50 m from a main building entrance
- Parallel parking space with outside limits aligned with the outside edge of the adjacent standard size parking space
- Design parking spaces for people with disability that are a minimum width of 3.2 m (preferably 3.6 m) with an adjacent minimum 2.4 m wide shared space for wheelchair transfers

### 2.6.1.2 Entrances

Entrance areas should be accessible, easy to find, well lit and supported with clear and consistent signage.

- make at least one entrance, preferably the main one, accessible by people using wheelchairs
- Accessible entrances should be clearly identified using the international symbol of accessibility including alternate locations of accessible entrances
- Accentuated doors for identification & personalization
- Short route to entrance and covered or protected with any ramps or steps carefully detailed
- Avoidance of change in levels as possible

### 2.6.1.3 Stairs

Stairs should provide safe access into buildings and between levels within buildings for all users. This is particularly important for those with low vision and blindness, as well as those with mobility disability. Poor staircase design is a common problem in many buildings in developing countries and it can lead to injuries.

- All steps in one flight should be uniform
- Steps should be 150 mm to 180 mm high and not less than 280 mm deep.
- Open risers are not recommended
- The length of the landing should be at least 1.20 m extending along the full width Of the stairs
- Clear width of stairways should be at least 1 m, preferably 1.5 m allowing for easy two-way traffic.
- Sharp edges and overhanging nosing should not be used for treads
- Angled risers are preferred to nosing, but if nosing are used they should be rounded and not project more than 40 mm.
- Stair covering should be slip-resistant, firmly fixed and easy to maintain.
- Nosing should be flush or rounded and should not project more than 40 mm

#### **2.6.1.4 Ramps**

Ramps can provide barrier-free access into buildings and between floor levels. Compared with the option of installing a lift, internal and external ramps between floors can be inexpensive. Lifts to upper floors should only be considered where maintenance funding and technical capacity are available.

- provide ramps when stairs obstruct the free passage of pedestrians and people with disability
- provide at least one accessible entrance to a public building, preferably the principal entrance
- locate ramps immediately adjacent to entrances, lobbies and stairs
- calculate sufficient space for ramps and landings to provide appropriate slope and include rest and passing areas
- The landing should have a minimum length of 1.20 m and a minimum width equal to that of the ramp
- The minimum width should be 0.90 m. and the maximum recommended slope of ramps is 1:20
- for existing buildings where re-design or refurbishment is proposed, provide reasonable access to all ground floor services and facilities
- For designs of new single and multi-level buildings, access to all services and facilities should be addressed and incorporated into any design, which could include upper floor access by way of a ramp.

#### **2.6.1.5 Railings and Handrails**

Handrails and railings need to be properly configured and installed at an accessible height.

- provide handrails around all accessible balconies, galleries, hazardous areas, platforms, ramps, roofs and stairs for safety, assistance and rest opportunities
- install handrails at a minimum height of between 800 mm and 1 m
- Check that installation arrangements are in line with safety and accessibility guidelines.

- A protective handrail at least 0.40 m high must be placed along the full length of ramps
- A ramp with drop off that has a vertical change in elevation 2” or greater or a slope greater than 2 in 12 shall require a handrail

#### **2.6.1.6 Edge Treatment and Thresholds**

- Thresholds as near levels as practicable, with a maximum overall height of 15mm and with tapered good section
- Changes in level one-quarter of an inch or less do not require edge treatment
- Changes in level greater than half an inch require ramped surface with a 1:12 maximum slope

#### **2.6.1.7 Doors and Doorways**

Accessible doors include doors a person can operate in a single motion with little effort. They should not:

- Be too narrow, have incorrect hinging, be heavy and hard to operate and have an incorrect door swing direction.
- Wide, passable doorways that provide at least a 32-inch clear opening
- Accessible doors requiring minimal effort to close or open and requiring 30N maximum of opening pressure
- The use of toggle, knurled, roughened or carborundum-epoxy coated round doors knobs are however acceptable for use in restricted or hazardous areas
- The edges of a glass door should be apparent when the door is open
- Added second handle or pulling device

#### **2.6.1.8 Windows**

- An accessible window with a minimum space of about 2’- 6”× 4’- 0” available at each window for maneuvering
- Window sills positioning between 18” (46cm) and 36” (91cm) above the floor so that a seated person can easily open or close the handle

- Windows to be used as fire exits, with at least 30” (76cm), wide enough to permit a person to go through in an emergency

#### **2.6.1.9 Light and Gadget Controls**

- Light switches, thermostats, electrical receptacles, faucets, and other controls should be mounted between 9 inches and 48 to 54 inches above the floor (depending on the direction of approach) and operable with one hand
- The use of lever type or push-button faucets for especially people with limited use of hands and arms

#### **2.6.1.10 Elevator**

The best way to provide people who have limited mobility with access to upper floors in a multi-story building is with an accessible standard lift. However lifts are expensive, require a reliable electricity supply, regular and relatively high-cost maintenance and can be a safety hazard when electricity is available.

- ensure dimension of lift enables easy access by a person in a wheelchair
- install a handrail on at least two sides
- position the control panel so it is easily accessible and can be easily viewed
- install door re-opening activators, audio-visual signals and floor audio announcements
- install a non-skid floor
- select a door color that contrasts with the color of the walls, floor and the landing area in front of lift doors
- provide minimum lift floor space of 1.4 m x 1.6 m
- provide controls positioned 850 mm to 1.2 m high
- Install Braille and tactile signage at the appropriate height

### **2.6.1.11 Restroom**

Bathrooms and toilets include those in any form of accommodation, places of employment and public buildings.

- Restroom should have slip resistant flooring; flush detailing of drainage and junctions between surfaces and spaces, easily reachable positions of controls and fittings as well as adequate space for maneuvering
- 3 x 3 foot size with a seat to allow transfer, or a roll-in shower that can accommodate a person in a wheelchair
- provide an accessible bathroom and/or toilet on each floor
- provide at least one toilet cubicle designed for wheelchair access in school ablution blocks
- provide sufficient space for people using wheelchairs or other assistive devices
- install doors that are a minimum 850 mm clear width and preferably open out or slide
- install adequate handrails and grab bars to assist people to and from a wheelchair and assist those with reduced strength

### **2.6.1.12 Floor Finishes**

- The use of flooring materials like solid hardwood, ceramic tiles, vinyl, linoleum, brick and stone
- Carpets should be avoided in places where wheelchairs will be used
- Non-slippery flooring surfaces

### **2.6.2 What makes a good client?**

It is a difficult task to commissioning and managing the building of a public sector project. Drawing on its proficiency and experience of working with both government and built environment professionals, CABA [33] has set out 10 clear principles that clients must follow if they want to achieve the best in public building projects [38].

1. Understand the role of design –there is clear confirmation that good design has a great influence in improving quality of life and reducing negative environmental impacts.

2. Recognize the barriers to design – knowing the common barriers means you can work to reduce them, and make sure you put the measures in place to get a better result.
3. Insist on the significance of design from brief to on-site construction – a commitment to design needs to be there from the start
4. Consider whole-life value – good design can improve efficiency and reduce running costs
5. Look at the shortlisted entries Better Public Building Award – ask yourself: is the design you are considering a credible competitor?
6. Consult your design champion –Use their knowledge and contacts to help guide your project.
7. Get design advice –clients should always look to hire relevant expertise.
8. Use the design quality indicator
9. Think about civic value – good design should lift people’s spirits.
10. Go and see examples –could help provide benchmarks to check how well you are doing with your own project.

### **2.6.3 Achieving excellence in construction**

Importantly, the chief aim of achieving excellence in construction is to secure delivery of best value for money, not in the sense of lowest cost, but as the best balance of quality and whole-life cost to meet user requirements. The National Audit Office has said that this is the approach that public bodies must take [38].

### **2.6.4 Specify materials and finishes**

Interior materials and finishes have an effect on the quality of life for users, contributing to health, safety, psychological, and well-being. One of the most common types of accidents in building interiors, mainly affecting people with physical disabilities and older adults are because of Interior materials and finishes [35].

There are four important elements that need to be considered for interior finishes including floor covering, wall finishes, ceiling finishes, and textiles. Issues with flooring are slipping and tripping. Slipping refers to surfaces exposed to moisture and tripping refers to abrupt changes in floor surface heights between rooms. A small difference in height can cause accidents. Some floor coverings also cause hazards for people with poor vision. Thus, floor covering should be

slip, trip, and fall-resistant, and avoid heavy carpeting to benefit everyone. Walls can either be painted or finished with wall covering, which are highly durable. Wall covering ranges in patterns and color humanizing interior environments. They transform institutional interiors to create more familiar settings [35]. Ceiling finishes gives sound quality within interior spaces. An acoustical ceiling absorbs sound reverberation and is considered the best way to control noise [37]. When selecting ceiling finishes, it is important to consider fire safety codes, prevent growth of mold and bacteria, and does not absorb moisture. Ceilings should always be white for higher reflectance qualities. It is important to select suitable fabrics by considering low maintenance, up-to-date fabrics, flammability requirements, breathability, moisture barrier, abrasive level, and infection control [35].

Overall, there are many type of floor covering, wall finishes, ceiling finishes, and textiles to choose from. However, they are being selected based on aesthetics while meeting functional needs of people with diverse ages and abilities is the essential thing to consider in order creating inclusive environments [35].

## **2.7 Policy Frameworks**

### **2.7.1 International policy frameworks**

The current international policy framework guiding disability-inclusive urban development is largely based on a number of instruments concerning persons with disabilities. The World Program of Action Concerning Disabled Persons (1982) (A/RES/37/52) views accessibility as an essential means to further its goals of “full participation” and “equality”.

The Standard Rules on the Equalization of Opportunity for Persons with Disabilities (A/RES/48/96) identifies “accessibility” of the physical environment and of information and communication as two “target areas” to ensure equalization of opportunities. The Convention on the Rights of Persons with Disabilities further strengthened the international normative framework for the advancement of the rights and socio-economic development of persons with disabilities. Accessibility is established in the Convention as a cross-cutting issue that enables persons with disabilities to live independently and participate fully in all aspects of life. The Convention has a standalone article (Article 9) and a number of other provisions, including

article 19 (living independently and being included in the community), article 20 (personal mobility) and article 21 (freedom of expression and access to information), that provides detailed guidance on measures that States shall take in terms of advancing accessibility [39].

In 2013, the United Nations High-level Meeting on Disability and Development and its action-oriented Outcome Document<sup>88</sup> stressed on the importance of ensuring accessibility for and inclusion of persons with disabilities in all aspects of development and giving due consideration to all persons with disabilities in the 2030 Agenda for Sustainable Development. The Outcome Document further called for actions to ensure accessibility, following the universal design approach, by removing barriers to the physical environment, transportation, employment, education, health, services, information and assistive devices, such as ICTs, including in remote or rural areas, to achieve the fullest potential throughout the whole life cycle of persons with disabilities [39]. The commitment of the international community to advance accessibility and the mainstreaming of disability in development was further strengthened and reflected in the recently adopted 2030 Agenda for Sustainable Development. Disability is specifically mentioned 11 times in target areas in the 2030 Agenda, and is specifically mentioned in the target relating to accessible and inclusive habitat and human settlements [40].

### **2.7.2 Laws and Policies adopted in Ethiopia**

The 1995 Federal Democratic Republic of Ethiopia (herein after FDRE) Constitution guarantees to fulfill the fundamental rights of all Ethiopians to social justice, economic development, enjoying rights and opportunities and access to clean and safe water, health, accessibility and decent shelter amongst others. Despite the legal recognition of the right to accessible public building, millions of Ethiopians in general and People with Disabilities (herein after PWDs) in particular suffer from a terrible inaccessible environment

Many people with disabilities do not have equal access to health care, education, and employment opportunities, do not receive the disability-related services that they require, and experience exclusion from everyday life activities. Following the entry into force of the United Nations Convention on the Rights of Persons with Disabilities (CRPD), disability is increasingly understood as a human rights issue. Despite the magnitude of the issue, both awareness of and scientific information on disability issues are lacking.

The CRPD promises of equal opportunity in accessible public buildings for people with disabilities, resulting in isolation from jobs, housing, health care, and education. Policymakers when discuss such important issues as how best to rebuild and repair our public buildings and public environment, and where and how to prioritize investments in public transportation it is also vital that they take into consideration the needs of people with disabilities. Although people with disabilities live in every community so that accessibility policy has undermined them.

The Government of Ethiopia has adopted and implemented a number of laws, policies and standards pertaining to people with accessibility of disabilities, including their right to productive and decent work. The main ones are [5]:

- Constitution of the Federal Democratic Republic of Ethiopia article 9
- Constitution of the Federal Democratic Republic of Ethiopia, adopted in 1995. Article 41(5) of the Constitution sets out the State's responsibility for the provision of necessary rehabilitation and support services for people with disabilities
- Building Proclamation, No. 624/2009, provides for accessibility in the design and construction of any building to ensure suitability for physically impaired persons.
- The Federal Civil Servant Proclamation No. 515/2007
- Proclamation on Definition of Powers of Duties of the Executive Organs of the Federal Democratic Republic of Ethiopia, No. 691/2010
- Proclamation No. 676/2010 on the Ratification of the "UN Convention on the Rights of persons with Disabilities" (UN CRPD) by Ethiopia.
- United Nations Convention on the Rights of Persons with Disabilities (2006) and Optional Protocol. Status: ratified, 7 July 2010.
- National Plan of Action of Persons with Disabilities (2012-2021)

The above reviewed legal provisions are in sufficient to address the whole issues of accessibility in public buildings at Addis Ababa level. In such a case, the federal building laws can be applied to fill the gap though it fails to consider the issue comprehensively. Further, in the absence of directives or guidelines to guide designers, building officers and professionals, it is difficult to make sure their responsibilities are being done accordingly to the standard concerning the

accessibility of facilities. In addition, there will not be a reliable means to check or monitor the inclusion of accessibility standards in the ongoing construction sector. Therefore, it is unlikely to expect changes to such buildings in the absence of actual plans supported by sufficient resources and detailed implementation strategies [8].

## **2.8 Previous research reviewed**

The study by Hans Persson and Alexander Arvei Yngling shows that designing for all, universal access and inclusive design are all different names of approaches that largely focus on increasing the accessibility of the interactive system for the widest possible range of use. The aims of the study was to investigate the various concepts used for accessibility, Based on their discussion, the authors argue for a much more thorough definitions of the concepts and discuss what effects it may have on measurability, conformance with standards and the overall usability for the widest possible range of target users [2].

Research by Amare Sisay intends to inspect the issue of accessibility right to the built environments in Ethiopia with a special reference to Addis Ababa. The study realized that the problem of accessibility is more prevailing in Addis Ababa where the creation of haphazardly built environments takes place. The research puts the reason for this was largely due to the existence of inadequate laws, insufficient monitoring institutions, ineffective enforcement mechanisms and failure to publish the CRPD in the Negarit Gazette. Additionally, reasons forwarded on the problem of accessibility were attributed to the low level of understanding and awareness in the community including the government and persons with disabilities themselves. The study concluded that the city is in need of determined action to develop horizontal accessibility laws, policies and guidelines which are backed by adequate budget and effective monitoring institutions. And also the city should continue efforts to raise the awareness of all stakeholders on the significance of accessibility to alleviate the existing built environment barriers that are adversely affecting the daily free movement of persons with disabilities [8].

Hong-Li Wong's study was in Canada, the studies shows that there are changing demographics increasing in the population, the disability rate, and the aging population. This significantly impacts people and their interactions within the built environment. Thus, integrating Inclusive

Design (ID) allows for full participation within society. Therefore this prevents discrimination and stigmatization. The research approach was to incorporate three design strategies, including visual, non-visual and social aspects enhancing the concept of ID. They were accessible experience while traversing in architecture as communication, responsive and adaptable environment through multi-sensory experience, and secure architecture for social interaction. As a result, an inclusive environment is created addressing equity and equality, which benefit everyone enhancing self-dignity, independence, and well-being [35].

Research by Benjamin Kyei-Dompim Widely supported the concepts universal design which is brought for the social inclusion of the disabled. The research saw some accessibility conflicts resulting from the use of accessibility features and products by two or more groups within the disability circle which has the likelihood of affecting the mobility impaired person. The research focused at some of the problem-solving approaches to issues of disability. Lesson drawn from the studies helped in developing the concept and philosophy towards the design of a technical-vocational institute for the mobility impaired. The design which is described in details were intended to serve as a positive architectural model that reinforces the need of accessible environments which can serve the need of a wider group of persons in any mobility impairment domain [37].

Julienne paper examines the reasons why the design of urban public space in the UK has failed to provide easy access to the city center for older people and people with disabilities. After tracing the impact of medical, social, and bio-social models of disability on professional attitudes and values, the account goes on to consider ‘architectural disability’ that is produced by the design of the built environment. The distinctions between general needs, special needs and inclusive design are examined, and the impact of these different approaches is considered in respect of built environment legislation and architectural practice. Access to the city center is conceptualized in terms of the ‘transport chain’ and public toilets are identified as a missing link in that chain. The paper concludes by speculating about the part that chartered surveyors could play in implementing a more inclusive approach to design

### **3 METHODOLOGY**

This chapter discusses the methodological framework within which the study was undertaken. It gives details on research design, research techniques and procedures that were used for the collection of data. It also included general information about the places of field work and the methods adopted on data collection.

#### **3.1 Research Methodology**

Research methodology is a way to systematically solve the research problem. It may be stated as a science of studying how research is done scientifically. As data and methodology are highly interdependent, the methodology to be used for a particular research problem must always take into consideration the nature of the data that will be collected to resolve the research problem [41].

The goal of the research is to assess the efficiency and challenges of implementing accessible building facilities for persons with disabilities on public building of Addis Ababa city. It is anticipated, the study may create awareness on disability consideration in design and construction, the challenging factors of designers on implementation of public buildings as per the standard, challenges that PWDs face, how inaccessibility and non-inclusiveness of building can adversely affects project and society, buildings efficiency, promote and facilitate inclusive development and initiate to review the existing practices, methods of work and management system to improve the usability of public buildings in Addis Ababa etc. This chapter presents the methodology adopted and identifies the tools and techniques employed in conducting this study.

#### **3.2 Study Subject**

In this research, different volunteer participants were included as the study is intended to assess the efficiency and challenges of implementing accessible building facilities for persons with disabilities on public building of Addis Ababa. The participants included in this research are professionals in the consulting companies more specifically architects, resident engineers, office engineers and person with disability.

### 3.3 Study area

This study is undertaken at Addis Ababa which is the capital city of Ethiopia. It is located at the geographical center of the country and spans from 2200 to 3200 m above mean sea level in altitude. Its topography ranges from rolling to hilly areas with relative steep gradients. From its lowest point, around bole international airport, at 2,325m above sea level in the southern periphery, Addis Ababa raises to over 3,000m in the Entoto mountains to the north. The Entoto massive in the north surrounds the city. The upper parts of the city is characterized by steep slopes with high mountains, flat topped plateau while the lower part is less steeper. The municipality expands over 540 square kilometers, 10 sub-cities, and 116 “Woredas”. It has 220 square kilometers allocated for green area and a vegetation cover of 80km<sup>2</sup>[42].

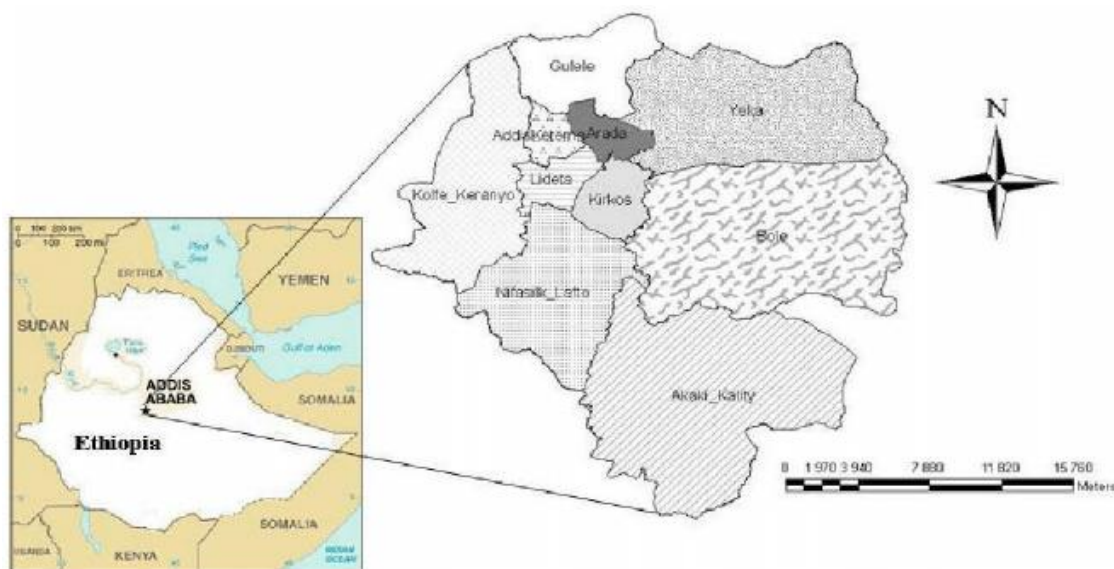


Figure:3-1:- Map of Addis Ababa[adapted from[43]]

### 3.4 Study design

There are two types of researches i.e. qualitative and quantitative researches where the division bases on the way in which the research objectives can be questioned. A qualitative research is a “subjective” assessment of a problem and takes the form of an opinion, view, perception or attitude towards objects (that are referred to as an attribute, variable, factor or question). Quantitative research, on the other hand, is an objective measurement of the problem that

investigates facts and tries to establish relationships using statistical tools. This research is basically of a mixed research type where both qualitative and quantitative methods are employed [44].

The mixed methods approach tries to combine the benefits of both quantitative and qualitative approaches. It integrates the two approaches for the purpose of gaining better insight into a social phenomenon it is further argued that the mixed methods approach is better than either method alone because it provides not only more information but also better quality of information. The use of mixed methods approach for this research was intended to drive the benefits of both quantitative and qualitative approaches.

The quantitative features in this case enabled the researcher to generate data from the sample size about different variables then to generalize the results to the population, whereas, the qualitative features will allow the researcher to explore the current Efficiency and Challenges with Implementing Accessible Building Facilities for Persons with Disabilities on public building of the city. Mainly primary data were used in this study. More specifically, the researcher used structured questionnaire survey in the gathering of data. In addition observation was used in order to substantiate results obtained from different data sources and types. Photos were taken during the site visit to support the data collection.

Research design is the arrangement of conditions for collection and analysis of data in a manner that aims to combine to the research purpose with economy in procedure. The types of study design used in this research are mainly descriptive. A descriptive research tries to explore and explain a problem while providing additional information. It tries to describe what is happening in more detail, filling in the missing parts and expanding our understanding on a problem. It is considered as a suitable and available research design for the purpose of description about the Efficiency and Challenges with Implementing Accessible Building Facilities for Persons with Disabilities on public building of Addis Ababa.

### **3.5 Data Sources**

Concerning study issues data can be gathered in various ways by making references to documents, interviewing, observation, questioners or combination of the two or more methods.

The study was based on a qualitative and quantitative approach. For the purpose of this study, data were collected from both primary and secondary sources, so as to answer the basic questions of this research. Primary sources are first hand materials, such as interviews, diaries, maps, graphs, statistics, charts, and other original documents. The vital element to be considered about primary sources is that they are not explanations or analyses of a subject matter; rather, they are raw data, direct personal observations or records. Secondary sources are writings about primary sources, or about information extracted from them. It was believed that the combination of both primary and secondary information obtained from different groups of respondents and topic related documents gave clear picture of the existing situation about the efficiency and challenges of implementing accessible building facilities for PWDs on public building of Addis Ababa. To get first hand and original information from the main sources, the study focused on those who have contacted with the issue to be studied. The data from Primary sources were collected by using close ended and open ended questions in the questionnaires.

### **3.6 Sampling Methods and Procedures**

The sample is defined as a part of total population that represents the population. In this particular study, two different target groups were selected to fill out the questionnaires according to the objective. The targeted groups were PWDs and consulting architects and engineers CAE-1 office. As of the federal ministry of construction bureau data there were 44 CAE-1 offices in Addis Ababa in 2019. The researcher took the entire population of grade one consulting architects and engineers (CAE-1) to distribute the first questionnaires. With the aim of getting verity of professional views two questionnaire papers were given to each CAE-1 office which means the first sample size is equal to 88. The second population was questionnaire for PWDs, Sample size for the second questionnaire were selected by using purposive sampling technique. Six different organizations were selected which works with disability concerning issues and have got employees of PWDs and 5 questionnaires were distributed for each organization so as to address the targeted group which means the second sample size is equal to 30.

For any scientific study considering reasonable amount sample size and appropriate sample technique is essential. In this research paper the study in addition to questionnaire method of data collection used observation. The observation focused on purposively selected ten critical public

building in Addis Ababa to be observed. The critical Public buildings were selected based on the reviewed literature, the buildings service and the exposure to the society on their daily basis. Under the observation, researchers observed the facilities within and around the selected buildings. The population of this study consists of ten critical public buildings in Addis Ababa. The most known critical public buildings are Education centers, Health care center, Police stations, Government buildings, Community retail center and Banks. For this study the buildings taken as critical building were Education centers, Government building and Bank buildings. From the selected critical buildings, Educational center - two universities buildings their Main Library (ML) and Lecture class block, Banks - four headquarter and Government building - three sub-cities building were observed in this research.

A purposive sampling approach was employed to select these three critical public buildings in accordance with the service of the building and importance of functions being provided for the society. The targeted disability groups in this research were wheelchair users, people with limited walking ability, people with limited use of hands or arm, the visually impaired and the hearing impaired.

The research adopted triangulation approach in the process of collecting and analyzing the data. The triangulation approach in this research consists of two methods of data collection and analysis: questionnaire survey and observation. Using different research methodological approaches lead to greater validity and reliability than a single methodological approach. The questionnaire was designed in line with the aim and objectives of the research to ascertain whether disabled facilities are factored in designs of Public buildings of Addis Ababa and also to find out the public building efficiency and expected improvements. Therefore to meet the major objective of the study, original data were collected from selected study areas. In this case, it was advantageous to gather information regarding the efficiency and challenges of implementing accessible building facilities for persons with disabilities from persons with disability and class 1 consulting office (designers, engineers). The questionnaires were delivered personally by the researcher. This was to ensure that targeted persons received the questionnaires and it was much easier to collect the questionnaires back for analysis.

Table: 3.1:- Summary on research questionnaire respondents

<b>Category</b>	<b>Number Of Questionnaire Distributed</b>	<b>Number Of Questionnaire Returned</b>
<b>Consultant</b>	88	80
<b>PWDs</b>	30	27
<b>Total</b>	118	107

### 3.7 Data Quality

To assure the quality of the data and its appropriateness some tasks were done, like pre testing and modification of questioner, close supervision and cross checking of responses obtained has been done.

### 3.8 Data Collection

The data collection approach adopted for conducting this research includes both primary and secondary sources. Questionnaire and observation provide the primary data for this study while the secondary data include reviewing related sources like relevant journals, books, internet sources, on the current efficiency and challenges of implementing accessible building facilities for disable persons. These different methods of data collection have been used in order make the data obtained from one source can be supplemented by the other sources, whereby the collected data are multiple evidences.

#### 3.8.1 Questionnaire

Questionnaire provides immediate information for the subject matter of a research as it is focused on issues which further serves as a survey to understand the main concerns and attitudes of respondents towards the problems [44].

The questionnaire survey was also adapted to get opinion on views of respondents towards the efficiency and challenges of implementing accessible building facilities for persons with disabilities on public buildings of Addis Ababa. Two different questionnaires were prepared targeting for PWD and CAE-1. The questionnaire was a series of questions asked to persons to

obtain statistically helpful information about a given topic. When properly constructed and reliably administered, questionnaires become a very important instrument by which statements can be made about specific groups or people or entire populations. In designing the questionnaire, the objectives of the study were first established. This was done to help in determining what questions to ask and how to ask them. Again, very short and brief questions were field as questions that are long and wordy may be confusing to respondents. All these were done in order to ensure that the responses received would be reliable.

### **3.8.2 Observation**

Observation was made through check list on purposively selected critical public buildings which is used in this research to supplement responses found through questionnaire. The check list was designed based upon literature to obtain information on the facilities for physically disabled people in critical public buildings and their functional requirements. The check list covers facilities such as ramps, elevators/lifts, restrooms, signage, entrances, stairs, parking area etc. Functional requirements of the facilities were also drawn up for the purpose of the study. A total of 10 public buildings were observed. The study covered critical public buildings such as education center, banks and sub city buildings.

## **3.9 Data Processing and Analyzing**

Through data analysis, a researcher addresses the research question depending on the evidence collected. Data analysis “consists of examining, categorizing, tabulating, testing otherwise recombining both qualitative and quantitative evidences to address the initial proposition of the study.” [44].

The study employed both qualitative and quantitative data collection instruments. The bulk data were collected through in-depth key informant questioners. Combining all the information that is gathered using the data collecting instruments reinforced the reliability of the research output. The statistical method used to analyze the quantitative data was percentage, ranges and comparison of the data. The data obtained by using questionnaires were analyzed using the Scientific Package for Social Science (SPSS). Tables and graphs are used to present the data

more elaborately in accordance with their importance. Therefore, information that were obtained through the data gathering tools were effective enough to address each research question.

### **3.9.1 Pilot study**

The professionals participated in this research were consultants (CAE-1) and PWDs. The piloting was done to check whether the questionnaire was understandable, clear and simple for respondent to understand and respond to. Pilot study of the questionnaire was conducted by investigating sample questionnaires. Four (4) questionnaires were distributed to construction professionals such as architect, resident engineers and office engineer who have a strong practical experience in the industry. Their adequate experiences are a suitable suggestion for pilot study. From the given four questionnaires all of the questionnaires were returned. The following are summary of the main results obtained from pilot study:

- a. Some factors and sentences should be modified or represented with more details.
- b. Some factors were repeated more than one time with the same meaning. So, it should be eliminated.
- c. Some factors and sentences should be modified in order to give more clear meaning and understanding.
- d. There were some parts of questionnaire required to be written again because they were not clear.
- e. Some factors should be rearranged in order to give more suitable and consistent meaning.
- f. There are some questions which are not practical or realistic with respect to local situations of building construction projects. Such questions should be removed or modified to be realistic and fit to practical situations.

Based on the comments obtained from the pilot study, the questionnaire was then modified and corrected and as a result the final questionnaire have been made more clearer by replacing ambiguous words with simple and understandable ones.

### 3.9.2 Reliability and Validity of Data Collection Instrument

Sound measurement must meet the tests of reliability and validity. In fact, these are the two major considerations one should use in evaluating a measurement tool. In the widest definition, reliability can be described as clearness degree of measurement results from random errors [45].

Up to today, lots of reliability coefficients have been recommended for estimating reliability of measurement tools. Alpha coefficient developed by Cronbach [46], is generally used in acquiring reliability in terms of internal consistency regarding a single test especially in combined measurements. This coefficient is also known as Cronbach's alpha coefficients.

The classification performed by Cohen et al., (2007) was used while interpreting the significance of influence quantities in the study. According to this classification, influence quantities are classified as,

1. Weak between 0.00 and  $\pm 0.10$
2. Small between  $\pm 0.10$  and 0.30
3. Moderate between  $\pm 0.30$  and 0.50
4. Strong between  $\pm 0.50$  and 0.80
5. Very strong over  $\pm 0.80$

In this study Cronbach's alpha coefficients was used to check the reliability of the data collection tool and the internal consistency was indicated according to Cohenet classification [45].

Table: 3.2:-Cronbach Alpha Coefficient Test Result on efficiency and implementation challenges of accessible building for PWD

Respondent	Cronbach Alpha Coefficient
Consultant	0.66
PWDs	0.73

Validity means how fairly you can generalize your findings to other groups or other situations. Also it can refer to the most critical criterion and indicates the degree to which an instrument measures what it is supposed to measure. But the question arises: how can one determine validity without direct confirming knowledge? The answer may be that we seek other relevant evidence that confirms the answers we have found with our measuring tool[47].

In this study, the researcher applied the following validity strategies to make the study reliable and precise. First pilot study was done to test whether the questionnaire was understandable, clear and simple for respondent to get the concept and respond accordingly. Pilot study of the questionnaire was conducted by investigating sample questionnaires. Second was observation of critical public buildings. In this way, the researcher get a deep understanding on efficiency and implementation challenges of accessible building for PWDs. Third triangulation of data was made; by doing this data was collected through different source (i.e. questionnaire survey, observation/site visit and document analysis).

### **3.10 Ethical Consideration**

This study was conducted according to the ethical guidelines of research requirements. For this purpose, before going to conduct the site observation and taking relevant pictures for the study permission were asked and the objectives of the study were clearly described. In addition, oral consent was obtained before the questionnaire was given to the respondent and promised them not discloses their photograph and their name without their consent. Participants were also assured that their response will remain strictly confidential and personal details will be kept anonymous.

### **3.11 Expected Output**

The findings from this study will create awareness on how inaccessibility and non-inclusiveness of building can adversely affects project and society. And will clearly show and offer suggestion how they can be avoided. In addition to initiate to review the existing practices, methods of work and management system to improve the usability of public buildings and also to promote and facilitate inclusive development. This study will be important to professionals involved in the

construction industry by showing the existing situation and what needs to be done in order to achieve inclusive development in providing building facilities for all society including PWDs.

## **4 ANALYSIS OF FINDINGS AND DISCUSSION**

### **4.1 Introduction**

This chapter deals with the analysis of gathered data and presents discussion from the result of analysis on the major issues by analyzing with literature review. The data collection was carried out through questionnaire and observation. The questionnaire were given to the whole population of CAE-1 and purposively selected critical public buildings were observed.

This chapter contains result and discussion of the study and the chapter has been organized under three main parts with each dealing with the views of the various group of respondents selected for the study. The first part presents the views of designers (i.e. architects and engineer) and it has got four sections. Section one deals with personal information about sample respondents. Second section deals with Disability consideration in design and construction of public buildings. The third section deals with the findings of the questions directed towards identifying the key problems or challenging factor for implementing accessible buildings and the results were discussed. The forth section focuses on studying possible improvement solutions that should be addressed for the public buildings to be usable and accessible to person with disability and presents the results of the questions directed towards this.

The second part presents the views of the disability groups and addresses the challenges of PWDs while using public buildings and presents observation that has been done to ten purposively selected critical public buildings according to prepared check list.

### **4.2 Response Rate**

Of the total eighty-eight (88) questionnaires distributed for consulting office 80 questionnaires were collected and analyzed. And the rest 8 questionnaires were discarded, since they were not fully filled or returned. Thus, the response rate of the questionnaires is 80(90.9%). and out of thirty (30) questionnaires distributed for disability groups 27 were collected and analyzed and the rest three questionnaires were discarded as well since they were not fully filled or returned.

Table: 4.1:-Summary of questionnaire distributed and responded

Category	Number of questionnaire distributed		Number of questionnaire returned	
	Number	percentage	Number	Percentage
<b>Consultant</b>	88	100%	80	90.9%
<b>PWDs</b>	30	100%	27	90%
<b>Total</b>	118	100%	107	90.67%

Two questionnaires paper were delivered for each class one consulting offices (44) that are performing design and supervision activities on different construction projects. 80(90.9%) of the questionnaires were returned (N = 88). and 30 questionnaires were delivered to PWDs. 27(90%) of the questionnaires were returned. The data gathered from the survey were then analyzed using the SPSS software package.

On the other hand, ten critical public buildings which were engaged in giving service for the society their building facilities were observed in through check list and the findings from the observation is accompanied in the analysis of data found from questionnaire.

### 4.3 Personal Information of Respondents

In this section personal information of respondents like: classification of organization, the position of respondents at the site, respondent gender, their educational background and work experience of respondents in the construction industry are discussed below.

Regarding respondents' position office and site, 36(45%) were architects, followed by 19(23.8%) office engineers, 14(17.4%) site supervising engineer, 11(13.8%) resident engineer and no quantity surveyor. Thus, we can infer most of the respondents were architects and office engineers.

Concerning respondent gender, 67(83.8%) were males and 13(16.2%) were females. Therefore, it can be said most of the respondent were male.

The educational background, 61(76.2%) were degree holders, followed by 19(23.8%) masters and no diploma holder. Thus, we can infer the majority of the respondents were degree holders.

With regard to the working experience of respondents, it was revealed that 31(38.8%) had 6 to 10 years' experience, followed by 24(30%) 1 to 5 years, 15(18.8%) 11 to 15 years, 6(7.4%) had 16 to 20 years and 4(5%) had >20 years of experience. Thus, we can conclude that the majority of the respondents had more than 5 years of experience.

Table: 4.2:-Personal information of respondents

Profile		Consultant	
		Frequency	Percent (%)
<b>Position</b>	Resident engineer	11	13.8
	architect	36	45.0
	Site Engineer	14	17.4
	Office Engineer	19	23.8
	Quantity Surveyor	0	0
<b>Gender</b>	Female	13	16.2
	Male	67	83.8
<b>Educational background</b>	Masters	19	23.8
	Degree	61	76.2
	Diploma	0	0
<b>Years of experience</b>	1-5 Years	24	30.0
	6-10 Years	31	38.8
	11-15 Years	15	18.8
	16-20 Years	6	7.4
	>20 Years	4	5.0

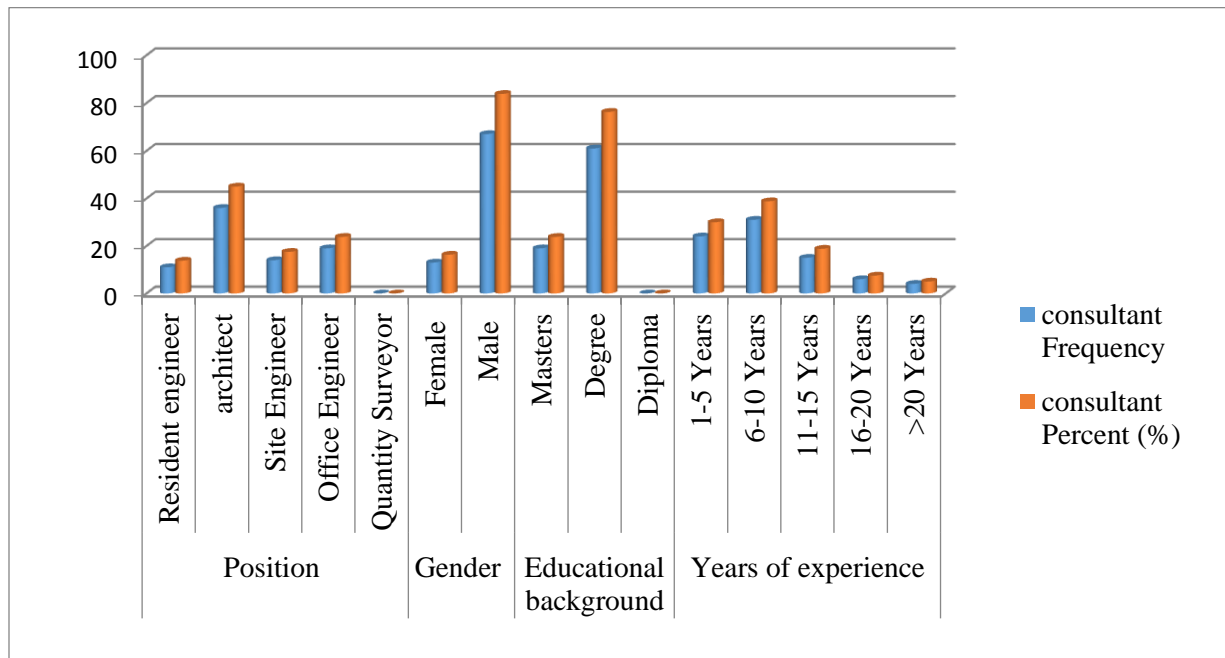


Figure: 4-1:-Personal information of respondent

#### 4.3.1 Position of respondent

Regarding respondent’s gender as shown in Fig 4.2, (45%) Architects who formed the majority followed by office Engineers (23.8%), site supervising engineer (17.4%) and resident engineer (13.8%). Thus, we can infer most of the respondents were architects and office engineers.

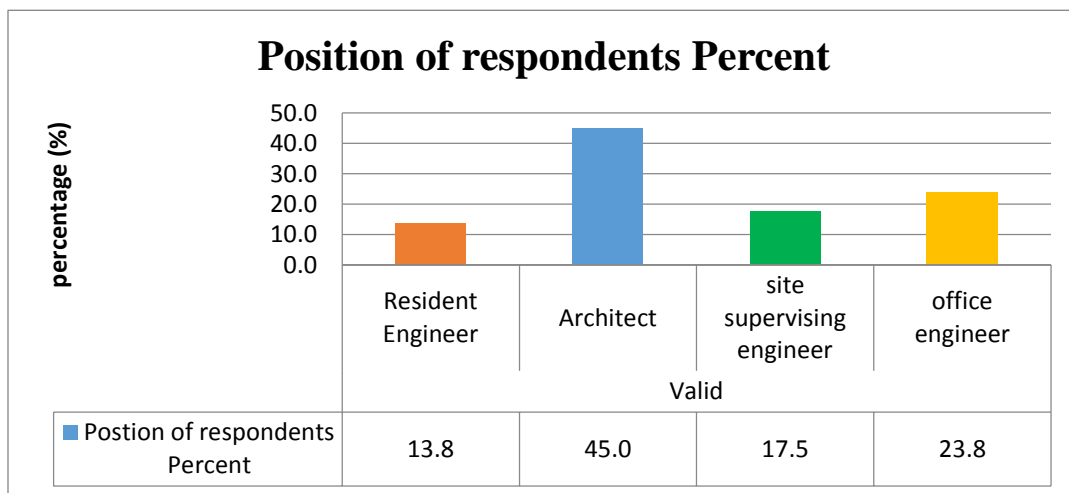


Figure: 4-2:-Position of respondents

### 4.3.2 Gender

Regarding respondent's position as shown in Fig 4.3, 67(83.8%) were male who formed the majority and 13(16.2%) were female. Thus, we can say most of the respondents were males.

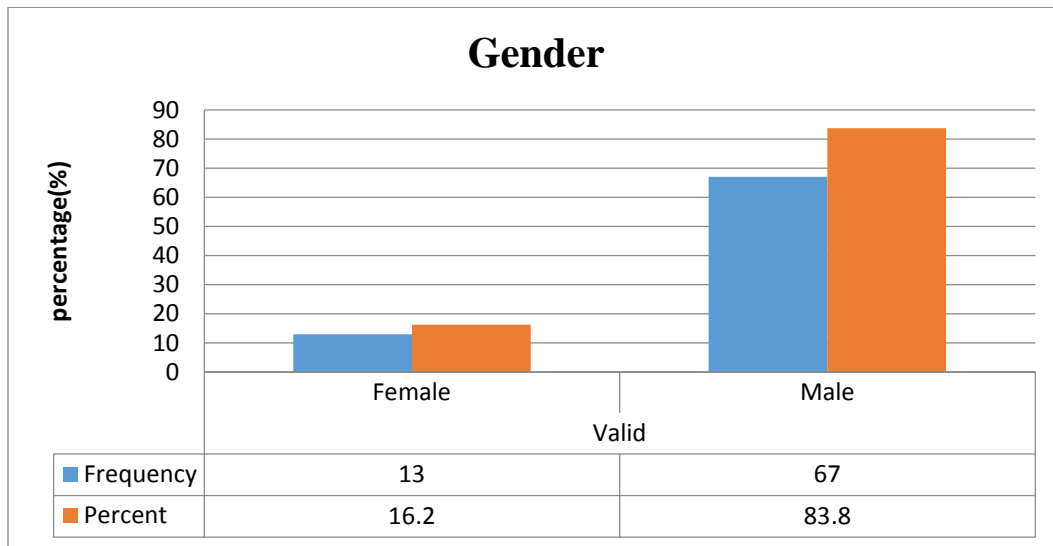


Figure: 4-3:-Gender of respondents

### 4.3.3 Work experience

Respondent's years of working experience as shown in Fig 4.4, 31(38.8%) has got 6-10 year experience, 24(30%) has got 1-5 years of experience, 15(18.8%) has got 11-15 years of experience, 6(7.4%) has got 16-20 years of experience and 4(5%) has got more than twenty years of experience. Thus, we can say most of the respondents (i.e. 70%) had at least 5 years of working experience. This put them in top position to provide in detail information about the problem the study arises. In line with the above, the credibility of the information is also assured

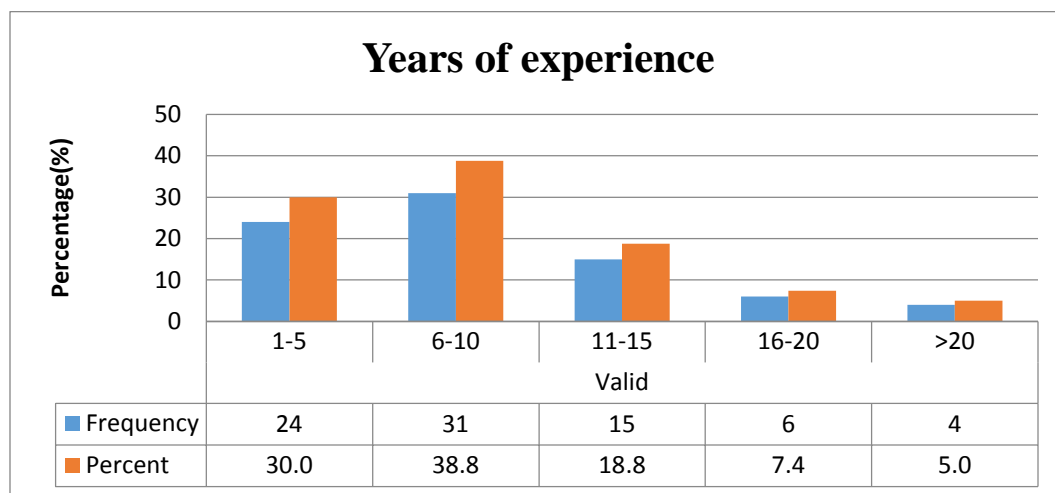


Figure: 4-4:-Years of working experience

#### 4.4 Disability consideration in design and construction

An inclusive building is one in which all users, no matter what their disability are able to carry out their day to day activities conveniently, effectively and safely without being limited by the poor design, maintenance or management of the building. A solution outcome for inclusive design should therefore be to both improve environmental pressure and architectural disability, and also to achieve a greater measure of social equity and justice.

In terms of provision of facilities for disabled people the study went on to get the level of awareness of universal design, the type of disability and facility considerations while designing stage, making sure that projects under construction are being constructed by incorporating needs of the disable and the practice of the law which states about accessibility of buildings and also to recommend some of improvement solution for future projects.

##### 4.4.1 Disability consideration in design

Regarding the presence of awareness on building facility for disabled person and extent of practice of the law in the design of facilities is shown in the table4.4.1 below. Even though 100% (n=80) respondents indicated that they have some level of knowledge about universal /inclusive design, it was 48.8% (n=39) that had fair knowledge, 35% (n=28) had high knowledge and 16.2% (n=13) had very high knowledge. The above findings raises an issue for great concern if almost half of the people who are responsible for taking decision on the design of our built

environment have little or fair knowledge about the universality of building, how are they going to implement it?

Concerning the provision of inclusive design to clients, 58.8% (n=47) of the respondent indicated that they do not incorporate the needs PWD in their designs and 41.2% (n=33) of the respondents responded that they provide inclusive design for their clients. Therefore, this indicates that most of the time universal/inclusive design is not being provided.

About disability types that are considered during design, 42.5% (n=34) responded that mobility type of disability considered, 36.2% (n=29) replied that both eyesight and mobility type of disability considered, 21.3% (n=17) responded that all type of disability which are Eyesight, Mobility, Hearing and Cognitive are considered. From this finding the disability which is frequently considered in design is mobility.

For the question whether building facilities such as ramps and visually impaired like tactile warning markings, using contrasting colors, handrails and curbs etc. features added to the design initially, 53.8% (n=43) replied that building facilities mentioned above are not add initially to design and 46.2% (n=37) responded that building facilities like ramps and for visually impaired disabilities are provided initially. Therefore, can be summaries as building facilities like ramps, tactile, warning markings, using contrasting colors and handrails are not added initially in the design.

Table: 4.3:-Disability consideration in design

No.	Item	Frequency	Percentage
		n	(%)
1.	Do you know about universal /inclusive design?		
	Yes	80	100
	No	0	0
2.	What is your level of knowledge about universal/inclusive design?		
	Fair	39	48.8
	High	28	35
	Very high	13	16.2
3.	Does your company provide universal design to its clients?		
	Yes	33	41.2
	No	47	58.8
4.	Which of the following disability types are considered during design?		
	Eyesight	0	0
	Mobility	34	42.5
	Hearing	0	0
	Cognitive	0	0
	Eyesight and mobility	29	36.2
	All	17	21.3
5.	Do ramps and visually impaired features added on the design initially?		
	Yes	37	46.2
	No	43	53.8

#### 4.4.2 Disability consideration in construction

Concerning in making sure buildings that are being constructed whether it's usable or accessible for PWDs while supervising different sites shown in the table 4.4 below , 53.8% (n=43)replied that they follow the accessibility of building while supervising their site and 46.2% (n=37) responded that it's not being given much attention while supervising site. Therefore, can be said even if the response shows that designer (engineers) follow the usability of building while supervising their working site (53.8%) it's not enough. it's a little bit higher than half percent rather its needs to be greater to future to make sure its accessibility to all including PWDs.

The difficulties while constructing accessible building facilities for PWDs, 68.8% (n=55) responded that it doesn't have any difficulties to construct accessible building and 31.2 % (n=25) responded that it has got difficulties to construct. From this finding accessible building facilities are not difficult to construct.

In deciding that accessible building facility whether it's finishing work, structural member and both structural and finishing work, 66.3% (n=53) replied that it is both structural and finishing work, 27.4% (n=22) replied that it is structural member and 6.3% (n=5) replied that it is finishing work. Therefore, from this finding accessible building facilities are both structural member and finishing work as well.

Table: 4.4:-Disability consideration in construction

No.	Item	Frequency	Percentage
		(n)	(%)
1.	Does your company make sure that buildings are usable while supervising site?		
	Yes	43	53.8
	No	37	46.2
2.	Accessible building facility, does it have any difficulties while constructing it?		
	Yes	25	31.2
	No	55	68.8

3.	Is it a finishing work or structural member?		
	Finishing work	5	6.3
	Structural member	22	27.4
	Both	53	66.3

**4.4.3 Awareness of Laws in accessible building facilities for PWDs**

About the enforcement of the law which directs for the inclusiveness of public building, 86.2% (n=69) respondents indicated that there is enforcing law which dictate for the inclusiveness of public buildings and 13.8% (n=11) responded that there is no enforcing law as shown in the table4.5 below. Therefore, this indicates that most of respondent have the awareness of the enforcing law which guides designers to follow to create inclusive environment.

Concerning incorporation of the provisions of the code in the design and construction of public buildings, 66.2% (n=53) of the respondent indicated that they do incorporation of the provisions of the code in their design and construction procedure and 33.8% (n=27) of the respondents responded that they don't. From this finding it can be summarized as majority of respondent's incorporation the provisions of the code which considers the accessibility for disabled in their design and construction procedure of public buildings.

For the question which states that the law on design permits stage of designs being universal/inclusive is being practiced properly, 61.2% (n=49) responded that it's being practice properly and 38.8% (n=31) replied that it's not being practiced accordingly. Thus it is concluded that the majority of the respondents agreed that there is a better follow up or enforcement of the law to make designs inclusive at design permit stage. But looking at respondents who responded no it can be said that still now it's not enough.

Regarding to the law which states about accessibility of building to permit for use after construction is being practiced properly, 8.8% (n=7) responded that it's not being practice properly and 91.2% (n=73) replied that it's being practiced properly. From these can be summarized that there is gap between design permit stage and building use permit stage. Thus,

we can infer that the majority of respondents responded that the law is not being practiced accordingly in the stage of construction.

In addition the controlling units who monitors universality of building is maintained, 62.5% (n=50) agreed that there are controlling units who monitor universality of buildings and 37.5% (n=30) responded that there are no monitoring units. According to this finding the majority of the respondents consider that there are controlling units concerning to the universality of buildings is maintained.

Table: 4.5:-Awareness of laws in accessible building facilities for PWDs

No.	Item	Frequency	Percentage
		(n)	(%)
1.	Is there an enforcing law which dictates for the inclusiveness of building?		
	Yes	69	86.2
	No	11	13.8
2.	Do you incorporate the provisions of the code in the design and construction?		
	Yes	53	66.2
	No	27	33.8
3.	Do you think the law on design permit stage of designs being universal/ inclusive is being practiced properly?		
	Yes	49	61.2
	No	31	38.8
4.	Do you think the law concerning accessibility of buildings to use permit after construction is being practiced properly?		
	Yes	7	8.8

	No	73	91.2
5.	Is there a controlling unit who monitors universality of building maintained?		
	Yes	30	37.5
	No	50	62.5

**4.4.4 Is there any change now a day in inclusiveness of public building?**

Whether there is a change these days in inclusiveness of public buildings, 77.5% (n=62) replied that there is change and 22.5% (n=18) responded that there is no change on accessibility of public buildings. Therefore, it can be summarized as there are changes these days on the accessibility of public building of Addis Ababa city.

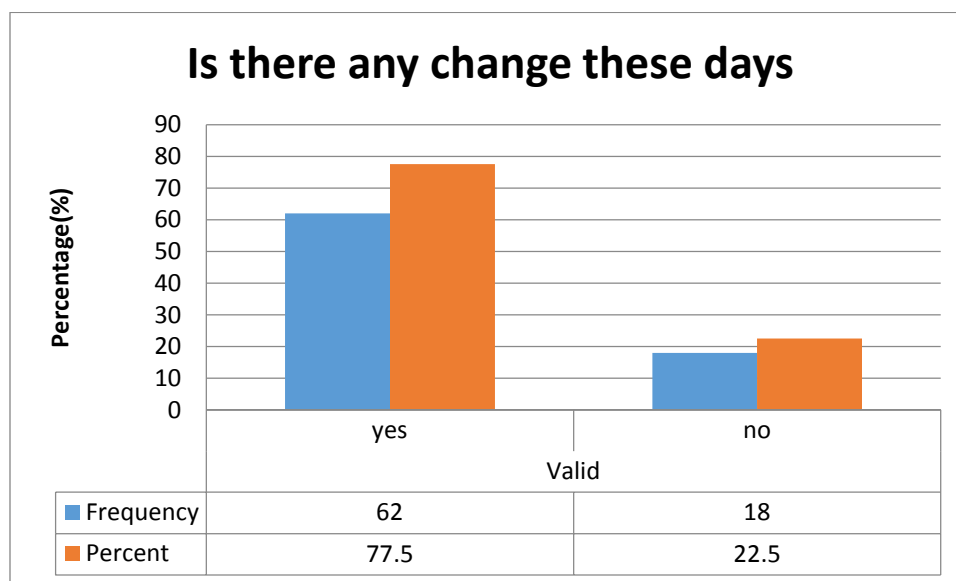


Figure: 4-5:-Is there any change these days in inclusiveness of public building

**4.5 Challenges with the implementation of accessible public buildings (Views of designers)**

The study wanted to represent information from the respondents on why the city is still weakening to incorporate the need of PWDs in the design of public facilities despite the provision has been made in the law and codes. From literature some of the challenges other

countries face with the implementation of the inclusive or accessible buildings for PWDs were gathered and given to the respondent to indicate how significant each of the factors contribute to the failure to implement our disability considering law as well standards.

Table 4.6 shows the results of the analysis of the responses. The results revealed that all the factors identified from literature contribute in some way to explain the problem of the city is facing. A breakdown of the challenges is as follows:

#### **4.5.1 Lack of enforcement of the law to compel designers**

The first factor that respondents collectively voted as the key challenge impeding the implementation of inclusive building facility for the disable is the lack of enforcement of the law with mean score 4.40. It must be known that the law and its enforcement (implementation) are two different things. Some of the respondents explained that, they are obliged or compelled to follow the law mostly in the design permit stage whereas there is a gap in the enforcement of the law in the use permit after the construction.

The above findings are not different the study by Caesar Julius Nathan (2015) on the implementation of the Disability Act in Ghana where lack of enforcement was found to be one of the key implementation challenges. Thus, the findings of the current study show that there is a gap/weakness in the provisions and enforcement of law which incorporate accessibility of public buildings in Addis Ababa. The law/code has included a clause which states about accessibility of building but it failed to compel all designs/drawings being sent for permit/approval to be scrutinized and checked to guarantee that all the necessary requirements regarding accessibility of PWDs are incorporated before the permit is granted in both design stage and construction stage.

#### **4.5.2 Lack of public awareness about the law**

As discussed, earlier stage of the study, some of the designers and top management members who are responsible for decision making are ignorant about the Accessibility of Building Facilities for PWDs codes. Moreover, some of the respondents has confirmed that they have knowledge about the law/code which states about accessibility of building facility but those who claim to have knowledge about it are reluctant to implement it. In this study, the respondents ranked this factor as the 2ndmost significant challenge with mean score of 4.24. The report by

Caesar Julius Nathan is therefore being confirmed by the current study. Salmen advised to change the attitude of these professional's public education and training programs need be used. This will help them to identify the needs of society and as a result come out with actions to address them.

#### **4.5.3 Weakness in the provisions of the law/code**

In the current study, the respondents ranked this factor as the 3rd most significant challenge with mean score of 4.18. From the literature, Imrie explained the national and legal provisions regulating the construction of barrier-free structures are weak or non-existent in many countries. He observed that, in the United Kingdom for instance, the building codes, which guides designers and developers in providing accessible buildings and structure for the disabled, is weak and ineffective, such that developers are only required to make 'reasonable provisions' in the design of their buildings for the disabled. Moreover, the provisions apply to only new buildings and key renovations. This weakness in the code has consequently affected the effort of the country to remove the barriers PWDs face in accessing the built environment. Thus, developers and designers the built environment has not been adequately "pinned down" by the building regulations.

#### **4.5.4 Lack of coordination between departments**

The other problem found by respondents is the lack of efficient coordination between departments such as disability groups, consultants, contractors, clients and the local authorities who are responsible for overall inclusiveness of building/built environment. According to respondents this challenging factor is ranked 4<sup>th</sup> with mean score of 4.09. And also respondents suggested that if designers and local authorities/municipalities work together with Co-ordination and Interaction, there will be a better change which will result in making barrier free built environment.

#### **4.5.5 Complexity and High Cost of designs which incorporate the needs of the Disabled**

Imrie and Hall argued that there are four reasons that prevent the built environment from being all-inclusive. One of them is the high cost that comes with designing fully accessible built environment. The respondents seem to agree with Imrie and Hall [24]. They generally agreed that designs which incorporate the needs of PWDs are comparatively complex and expensive. Of

the respondents two of them explained that “for example in situation like entrances you have to provide ramps the get of building together with steps. The construction of the ramp is additional cost. Moreover, areas in restroom needs be wide enough to ensure that wheelchair users can maneuver inside them. As well fittings and fixtures in buildings needs to be specially designed to address for the disable. All these things and others add up to the cost of construction”. Thus, the fear of the increase in cost of construction put some of the designers and clients off especially when there are few disabled people who will use the facility.

#### **4.5.6 Inadequate policies and standards**

Developed countries like England, USA, and Canada etc. There is a specially designed standard/code on accessibility of PWDs to the built environment. The codes provide detail guidelines on how the built environment should be design and construct to make them barrier free. However, in this country there is no detail standard. Even though there are different codes which refer to accessibility of buildings, it is not placed in detail to be used as a guideline. The Disability law does not have any design guidelines. Therefore, only few people who are familiar with foreign design standards are able to consider and use them in their designs. The above report shows that this factor is insufficiency to ensure a barrier free or all-inclusive built environment in the country. The factor was ranked 6th with mean score of 3.94.

#### **4.5.7 Lack of consultation and involvement of PWDs in decision making**

The disabled or their associations are almost not included in any decision-making process of built environments. In fact, some of the respondent’s further discuss by admitting that they don’t invite the disabled or their association at their board meetings even though the issues which were being discussed concerned the PWDs. Some of them explained why their decision don’t involve the disabled on their meetings is because they believe they lack the knowledge about the design of the built environment hence it was not important to invite them. This reason may sound somewhat logical; but the views of the PWDs and their Associations is an important source for development of an inclusive environment therefore it cannot be left out.

#### **4.5.8 Ineffectiveness of disability groups**

According to Tessema Eseta the ineffectiveness/no inclusiveness of disability group is somewhat to blame for the suffering of PWDs in Ethiopia. He explained that, Disability community is supposed to expose and defend the cause of challenges that PWDs are facing. They are also responsible to advocate for the passage and implementation of disability laws. Where the disability group is quiet or ineffective the disabled suffer with different challenges on their daily basis. In the current study, the respondents articulated similar worry that the disabled societies are to a certain extent responsible for failure to implement disability laws. This challenging factor is ranked 10th place according to respondents. If the associations are vibrant, the rights of the disabled to have equal access in the use of the public buildings as well all built environment will be respected.

#### **4.5.9 Few numbers of disabled in the country**

One of the four assumptions which were put forward by Imrie and Hall as a key challenge which will not make it possible for the built-environment to be designed to eliminate architectural disability is the number of disabled users being smaller for the provided facility. They argue that in some cases if you compare the number of disabled persons who are likely to use a facility to that of the capable person, you will notice that there is a huge difference. Consequently, the designer does not see the need to put in so much resource in the design and construction of a facility only to satisfy the need of just few disabled persons.

Table: 4.6:-Challenges with the implementation of disability law on accessibility disabled to public buildings (Views of designers or consultant)

No.	Challenges	Rating					Total	Mean	Rank
		1	2	3	4	5			
1.	Lack of enforcement of the law/policy to compel designers	1	9	5	7	58	80	4.40	1st
2.	Lack of public awareness about law/policy	1	10	3	21	45	80	4.24	2nd
3.	Weakness in the provisions of the law/code	2	6	7	26	39	80	4.18	3rd
4.	Lack of coordination between departments	1	8	14	17	40	80	4.09	4th
5.	High Cost of designs which incorporate the needs of PWDs	8	3	4	35	30	80	3.95	5th
6.	Inadequate policies and standards	1	6	19	25	29	80	3.94	6th
7.	Lack of consultation and involvement of PWDs in decision making	1	2	30	20	27	80	3.88	7th
8.	Complexity of designs which incorporate the requirements of PWDs	14	5	10	29	22	80	3.50	8th
9.	Lack of budget allocation for implementation	0	23	11	33	13	80	3.45	9th
10.	Ineffectiveness of Disability Groups	16	5	22	10	27	80	3.34	10th
11.	Few numbers of disabled persons in the country	17	18	25	11	9	80	2.71	11th
12.	Negative attitudes towards the disabled	40	7	8	14	11	80	2.36	12th

**4.5.10 Level of commitment of client in the provision of access for the disabled**

As of the level of commitment of client in the provision of access for the disabled during requesting for design, 75% (n=60) responded that the interest of clients in provision of access for disabled is low, 25% (n=20) replied that its medium and none of the respondents answered that the level of commitment of clients in the provision of access for the disabled was high. Therefore, from this finding level of commitment of clients in provision of access to the disable is low.

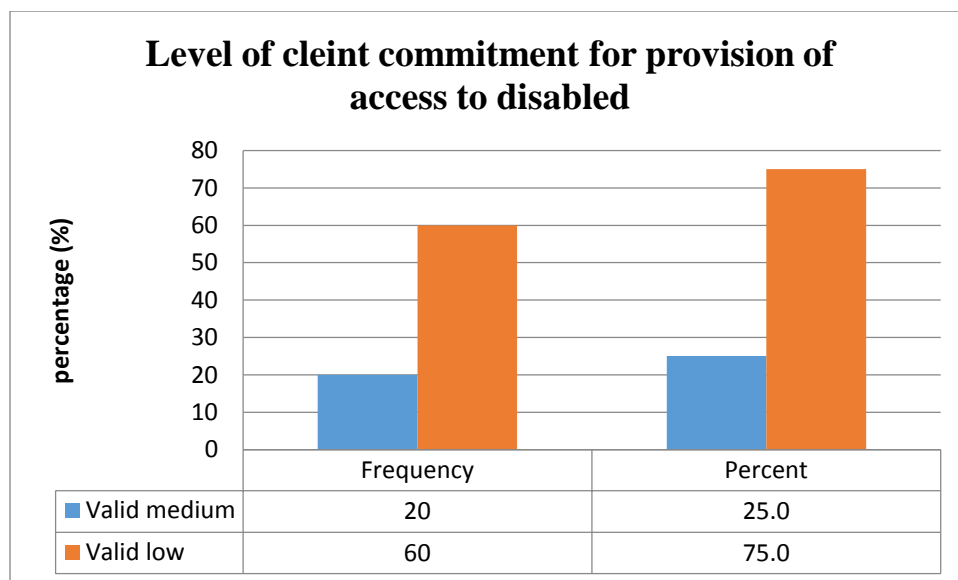


Figure: 4-6:-Level of commitment of client in the provision of access for the disabled

**4.5.11 Inclusive design does it change in the overall cost of projects**

Concerning Inclusive design whether it has got any change in the overall cost of projects, 60% (n=48) replied that it has got a change in the overall cost of the project and 40% (n=32) responded that there is no change in the overall cost of the project if one needs to use inclusive design. Therefore, can be summaries as inclusive design changes the overall cost of the project.

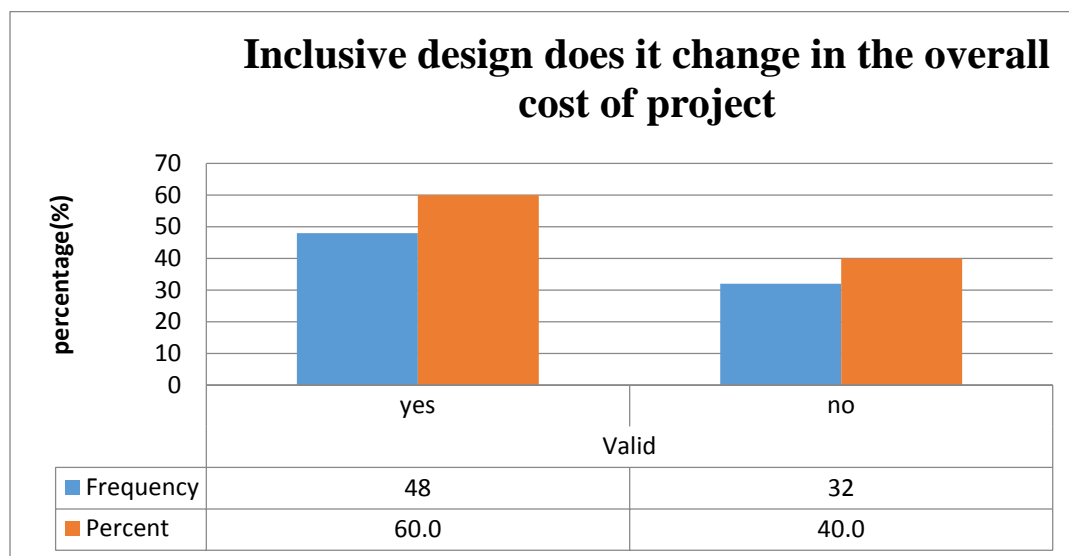


Figure: 4-7:-Inclusive design does it change the overall cost of projects

**4.5.12 Whom do you blame for the failure to incorporate the requirements of PWDs in the designs?**

Regarding the blame for the failure to incorporate the requirements of PWDs in the designs of public buildings, there were five choices for the respondent where the blame goes to like Government, Designers, Clients, Disability Groups and finally all and 98.8% (n=79) responded that all were to be blamed which are government, designers, clients, disability group and 1.2% (n=1) replied that designers are to be blamed. Therefore, this finding lead to totally conclude for the failure to incorporate the requirement of PWDs in design of public building were the government, designers, clients, PWDs and all who are concerned with this issue.

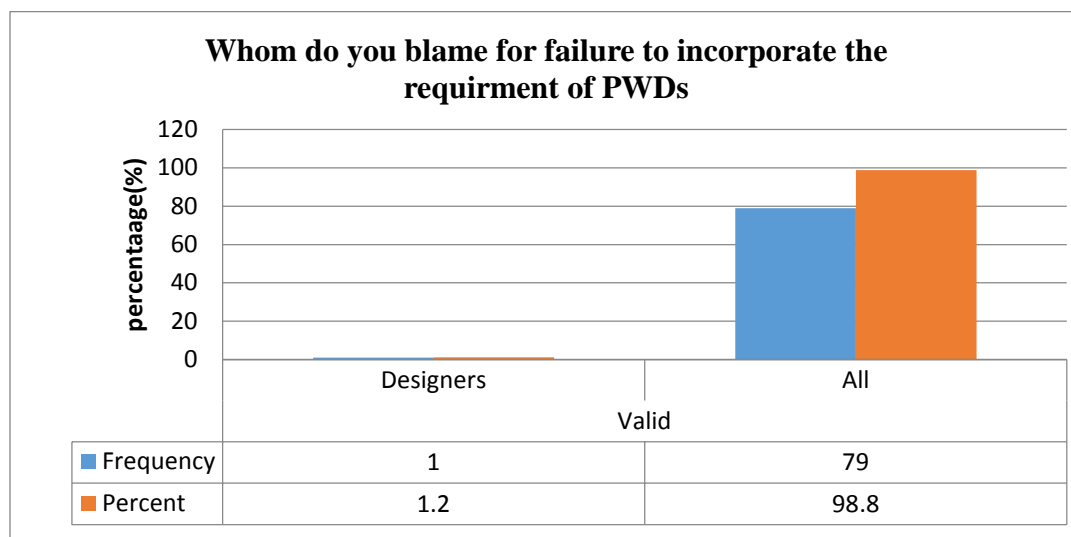


Figure: 4-8:-Whom do you blame for the failure to incorporate the requirements of PWDs in the designs

#### 4.6 Building facility functionality improvements

Survey respondents were asked to give their opinion by ranking in level of agreement (1 “strongly disagree”, 2 “Disagree”, 3 “Neutral”, 4 “Agree” and 5 “strongly agree”) a series of statements regarding building facilities that they believe improves accessibility for persons with disabilities in their community. Tables 4.7 below show the overall building facilities that need to be addressed in public buildings of the city. And respondents responded their level of agreement/disagreement as it relates to their experiences in designing and construction which was most important; they believe to improve accessibility for persons with disabilities.

##### 4.6.1 Parking

The table 4.7 below shows parking area facilities which need improvement for providing accessible parking to the society including PWDs from the views of designer’s, among the key improvements that building facility need: Indicating signs needs to be easy to read and understand was indicated as the first building facility functionality improvement with the mean score of 4.83, Accessible parking on building area needs to be adequate was ranked as the second with mean score of 4.65, Curb cuts on building area need to be adequate was ranked as the third with mean score of 4.58, Sidewalks on building area needs to be adequate was ranked as the fourth with mean score of 4.54 and Curb cuts should be located where they are needed as the

fifth building facility improvement with the mean score of 4.48. The results obtained confirmed with the reviewed literatures.

Table: 4.7:-Building facility functionality improvement rating for parking

No.	Building facility improvement:	Rating					Total	Mean	Rank
		1	2	3	4	5			
<b>1. Parking</b>									
1.	Indicating signs needs to be easy to read and understand.	0	0	2	10	68	80	4.83	1st
2.	Accessible parking on building area needs to be adequate.	1	20	2	0	57	80	4.65	2nd
3.	Curb cuts on building area need to be adequate.	0	0	2	30	48	80	4.58	3rd
4.	Sidewalks on building area need to be adequate.	0	0	9	19	52	80	4.54	4th
5.	Curb cuts should be located where they are needed.	1	2	5	22	50	80	4.48	5th

#### 4.6.2 Entrance

Short route to entrance and covered or protected with any ramps or steps carefully detailed, Avoidance of change in levels as possible [37]. Accessible entrances should be clearly identified using the international symbol of accessibility including alternate locations of accessible entrances are some of key building accessibility guidelines for facility improvement. In the table4.8 below building facility which needs improvement for providing accessible entrance to the PWDs from the views of designer's, among the key functional requirements that building facility need: The primary entrances to buildings need to be accessible was indicated as the first entrance functionality improvement with the mean score of 4.83, Accessible building entrances needs to be easy to identify was ranked as the second with mean score of 4.76, Accessible building entrances should be adequate was ranked as the third with mean score of 4.73, The approach to the entrance free of stairs and steps was ranked as the fourth with mean score of 3.10. The results obtained confirmed with the reviewed literatures.

Table: 4.8:- Building facility functionality improvement rating for entrance

No.	Building facility improvement:	Rating					Total	Mean	Rank
		1	2	3	4	5			
<b>2. Entrances</b>									
1.	The primary entrances to buildings need to be accessible	0	0	1	12	67	80	4.83	1st
2.	Accessible building entrances needs to be easy to identify.	0	0	0	19	61	80	4.76	2nd
3.	Accessible building entrances should be adequate.	0	0	1	20	59	80	4.73	3rd
4.	The approach to the entrance free of stairs and steps	16	15	13	17	19	80	3.10	4th

### 4.6.3 Signage

There are different codes and standards which guides how signage should be provide in built areas some of them reviewed in the literature, these are Signs must be clear, simple and easy to read, color of signs needs be clearly distinguishable, There should be directional signs indicating the location of accessible facilities and Maps, information panels and wall-mounted signs should be placed etc. the table 4.9 below shows accessibility facility which needs improvement for providing signage or indication to the users including PWDs from the views of designer's, among the key improvements that building facility need: Signs must be clear, simple and easy to read was indicated as the first signage improvement with the mean score of 4.76, The color of signs needs be clearly distinguishable was ranked as the second with mean score of 4.75, There should be directional signs indicating the location of accessible facilities was ranked as the third with mean score of 4.71, Maps, information panels and wall-mounted signs should be placed was ranked as the fourth with mean score of 4.26. The results obtained confirmed with the reviewed literatures.

Table: 4.9:- Building facility functionality improvement rating for signage

No.	Building facility improvement:	Rating					Total	Mean	Rank
		1	2	3	4	5			
<b>3. Signage</b>									
1.	Signs must be clear, simple and easy to read	0	0	1	17	62	80	4.76	1st
2.	The color of signs needs be clearly distinguishable	0	1	1	15	63	80	4.75	2nd
3.	There should be directional signs indicating the location of accessible facilities	0	0	2	19	59	80	4.71	3rd
4.	Maps, information panels and wall-mounted signs should be placed	0	0	12	35	33	80	4.26	4th

#### 4.6.4 Pathway

From the table 4.10 below accessible building with its functional requirements of pathway that needs to providing for PWDs from the views of designer's, among the key improvements that accessible building facility need: The pathway needs to be clear of obstructions was indicated as the first signage improvement with the mean score of 4.81, The path of travel needs to be free of steps or stairs was ranked as the second with mean score of 3.24. The results obtained confirmed with the reviewed literatures.

Table: 4.10:- Building facility functionality improvement rating for pathway

No.	Building facility improvement:	Rating					Total	Mean	Rank
		1	2	3	4	5			
<b>4. Pathway</b>									
1.	The pathway needs to be clear of obstructions	0	0	1	13	66	80	4.81	1st
2.	The path of travel needs to be free of steps or stairs	16	14	11	13	26	80	3.24	2nd

#### 4.6.5 Ramps

According to the reviewed literatures ramps functional requirements that needs to be provided are, minimum width should be 0.90 m and the maximum recommended slope of ramps is 1:20, a protective handrail must be placed along the full length of ramps, the ramp surface needs to be clear of obstructions and the surface of ramps needs to be non-slip. In the table 4.11 below accessible building needs functional improvement on providing ramps to the PWDs from the views of designer’s, among the key improvements that building facility need: The ramp surface needs to be clear of obstructions was indicated as the first ramps improvement with the mean score of 4.93, The location of the ramp must be clearly identifiable was ranked as the second with mean score of 4.84, The surface of ramps needs to be non-slip was ranked as the third with mean score of 4.65, There should be a complementary ramped route next to stairs or steps was ranked as the fourth with mean score of 4.18. The results obtained confirmed with the reviewed literatures.

Table: 4.11:- Building facility functionality improvement rating for ramps

No.	Building facility improvement:	Rating					Total	Mean	Rank
		1	2	3	4	5			
<b>5. Ramps</b>									
1.	The ramp surface needs to be clear of obstructions	0	0	1	4	75	80	4.93	1st
2.	The location of the ramp must be clearly identifiable	0	0	1	11	68	80	4.84	2nd
3.	The surface of ramps needs to be non-slip	1	5	0	9	65	80	4.65	3rd
4.	There should be a complementary ramped route next to stairs or steps	1	2	17	22	38	80	4.18	4th

#### 4.6.6 Doors

From different functional requirement of doors in public buildings in the review literature, to have minimal effort to close or open and requiring 30N maximum of opening pressure, adding second handle or pulling device and door handles being in a shape that is easy to grasp with one hand are some of them. The table 4.12 below shows building facility that needs improvement for providing suitable door to PWDs from the views of designer's among the key improvements that accessible building facility need: Doors needs be opened without much effort was indicated as the first doors functionality improvement with the mean score of 4.65, Door handles needs to have a shape that is easy to grasp with one hand was ranked as the second with mean score of 4.63, There should be sufficient space beside the latch side of the door was ranked as the third with mean score of 4.60. The results obtained confirmed with the reviewed literatures.

Table: 4.12:- Building facility functionality improvement rating for doors

No.	Building facility improvement:	Rating					Total	Mean	Rank
		1	2	3	4	5			
<b>6. Doors</b>									
1.	Doors needs be opened without much effort	1	0	1	22	56	80	4.65	1st
2.	Door handles needs to have a shape that is easy to grasp with one hand	0	0	2	26	52	80	4.63	2nd
3.	There should be sufficient space beside the latch side of the door	0	0	3	26	51	80	4.60	3rd

#### 4.6.7 Elevators

The table4.13 below summarizes accessible building facility which needs functional improvement for providing barrier free service to the society including PWDs from the views of designers, among the key functionality improvements that building facility needed: There should be an accessible path leading to the elevator was indicated as the first elevators functionality improvement with the mean score of 4.75,The elevator door easy to identify was ranked as the second with mean score of 4.74,The elevator needs to be provided with audible and visual warning signals indicating arrival at a floor was ranked as the third with mean score of 4.64, was ranked as the fourth with mean score of 4.61, The door opening/closing interval needs to be long enough as the fifth building facility improvement with the mean score of 4.59. The results obtained confirmed with the reviewed literatures.

Table: 4.13:- Building facility functionality improvement rating for elevators

No.	Building facility improvement:	Rating					Total	Mean	Rank
		1	2	3	4	5			
<b>7. Elevators</b>									
1.	There should be an accessible path leading to the elevator	0	0	1	18	61	80	4.75	1st
2.	The elevator door easy to identify	0	0	1	19	60	80	4.74	2nd
3.	The elevator needs to be provided with audible and visual warning signals indicating arrival at a floor	0	0	0	29	51	80	4.64	3rd
4.	The elevator cab needs to provided handrails on three side	0	1	1	26	52	80	4.61	4th
5.	The door opening/closing interval needs to be long enough	0	3	0	24	53	80	4.59	5th

#### 4.6.8 Stairs

The table 4.14 below summarizes building facility which needs improvement for providing accessible stair to the society including PWDs from the views of designers among the key improvements that building facility needed: Treads need to be with a non-slip surface was indicated as the first stair functionality improvement with the mean score of 4.86, width of the stairs needs to be enough and the location of the stairs must be clearly identifiable was ranked as the second with mean score of 4.80. The results obtained confirmed with the reviewed literatures.

Table: 4.14:- Building facility functionality improvement rating for stair

No.	Building facility improvement:	Rating					Total	Mean	Rank
		1	2	3	4	5			
<b>8. Stairs</b>									
1.	Treads need to be with a non-slip surface	0	0	4	3	73	80	4.86	1st
2.	width of the stairs needs to be enough	0	0	2	12	66	80	4.80	2nd
3.	The location of the stairs must be clearly identifiable	0	0	1	14	65	80	4.80	2nd

#### 4.6.9 Railings and Handrails

The table 4.15 below shows accessible building facility which needs to be provided for improving functionally of Railings and Handrails for safe movement while using stairs, ramps and elevators to society including PWDs from the views of designers, among the key improvements that public building facility needed: The railings must be securely attached was indicated as the first Railings and Handrails functionality improvement with the mean score of 4.93, The handrails must be easy to grip was ranked as the second with mean score of 4.85, The handrails must be continuous throughout the full length of ramps and stairs was ranked as the third with mean score of 4.79, Handrails must be easy to identify was ranked as the fourth with mean score of 4.70 and Low positioned windows at landings must be protected by railings as the fifth building facility improvement with the mean score of 4.66. The results obtained confirmed with the reviewed literatures.

Table: 4.15:- Building facility functionality improvement rating for railing and handrails

No.	Building facility improvement:	Rating					Total	Mean	Rank
		1	2	3	4	5			
<b>9. Railings and Handrails</b>									
1.	The railings must be securely attached	0	0	1	4	75	80	4.93	1st
2.	The handrails must be easy to grip	0	0	0	12	68	80	4.85	2nd
3.	The handrails must be continuous throughout the full length of ramps and stairs	0	2	1	9	68	80	4.79	3rd
4.	Handrails must be easy to identify	0	0	1	22	57	80	4.70	4th
5.	Low positioned windows at landings must be protected by railings	0	2	3	15	60	80	4.66	5th

**4.6.10 Toilet**

According to the reviewed literatures toilet or rest room functional requirements are, Restroom should have slip resistant flooring; flush detailing of drainage and junctions between surfaces and spaces, there should be accessible rest room identified by sign easily reachable positions of controls and fittings as well as adequate space for maneuvering [37]. The table4.16 below shows accessible building facility which needs to be improved in restroom for providing safe movement and usage function while using toilet to PWDs from the views of designers, among the key improvements functionality that building facility needed: The flooring material needs to be skid-proof, well drained and waterproofed was indicated as the first washroom improvement with the mean score of 4.91, There should be sufficient space inside the rest room to maneuver a wheelchair was ranked as the second with mean score of 4.84, There should be accessible rest room identified by a sign and There should be helping side rails facilities at the toilets were ranked as the third with mean score of 4.74, The flushing mechanisms needs to be easy to operate was ranked as the fourth with mean score of 4.66. The results obtained confirmed with the reviewed literatures.

Table: 4.16:- Building facility functionality improvement rating for toilet

No.	Building facility improvement:	Rating					Total	Mean	Rank
		1	2	3	4	5			
<b>10. Toilet</b>									
1.	The flooring material needs to be skid-proof, well drained and waterproofed	0	0	1	5	74	80	4.91	1st
2.	There should be sufficient space inside the rest room to maneuver a wheelchair	0	0	1	11	68	80	4.84	2nd
3.	There should be accessible rest room identified by a sign	0	0	7	7	66	80	4.74	3rd
4.	There should be helping side rails facilities at the toilets	0	0	0	21	59	80	4.74	3rd
5.	The flushing mechanisms needs to be easy to operate	0	2	3	15	60	80	4.66	5th

#### 4.7 Challenges faced by Persons with Disability (views of PWDs)

The study cannot be complete without the inclusion of the persons with Disability who are at the center of the problem at hand. The study purposively selected 30 persons with various forms of impairment in the study area and their views solicited. But out of thirty (30) questionnaires distributed for disabled persons 27 were collected and analyzed and the rest 3 questionnaires were discarded since they were not fully filled or returned.

##### 4.7.1 Personal Information of Respondents

In this section personal information of respondents like: respondents' gender, impairment type, cause of impairment, usage of assistive device, type of assistive device use and how much help do they to access public buildings.

### 4.7.2 Gender of respondents

From Fig 4.9, 81.5% (n=22) of them were male while the remaining 18.5% (n=5) were female. Thus, there is no significant gender discrimination in the selection of the respondents even though the number of male respondents was higher than the female.

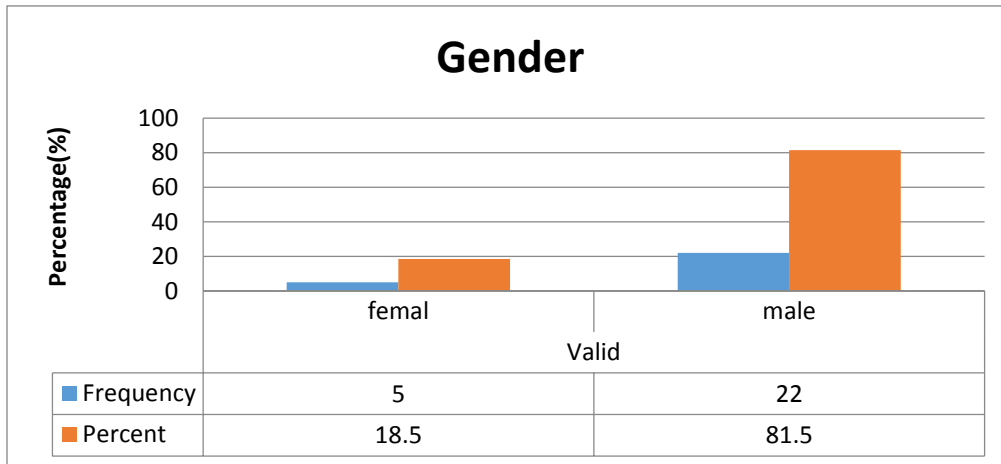


Figure: 4-9:-Gender of respondents

### 4.7.3 Type of disability

As can be seen from Fig 4.10 below, 55.5% (n=15) were physically impaired, 26% (n=7) were with visual impairment and 18.5% (n=5) were with hearing impairment. This shows that physically impaired respondents took the higher place.

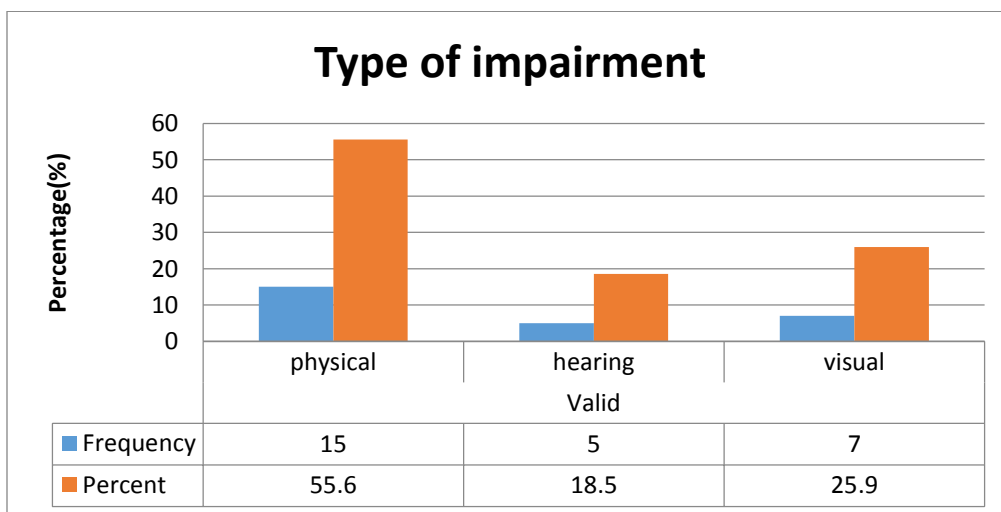


Figure: 4-10:-Type of disability

#### 4.7.4 Cause of disability

As can be seen from Fig 4.11 below, 63% (n=17) of the respondent explained that they acquired their impairment later in life. Whereas the remaining 37% (n=10) had their impairment congenital (i.e. it was present at birth). Therefore, it can be said that most of the respondents got their impairment later in their life because of accidents, ailment etc.

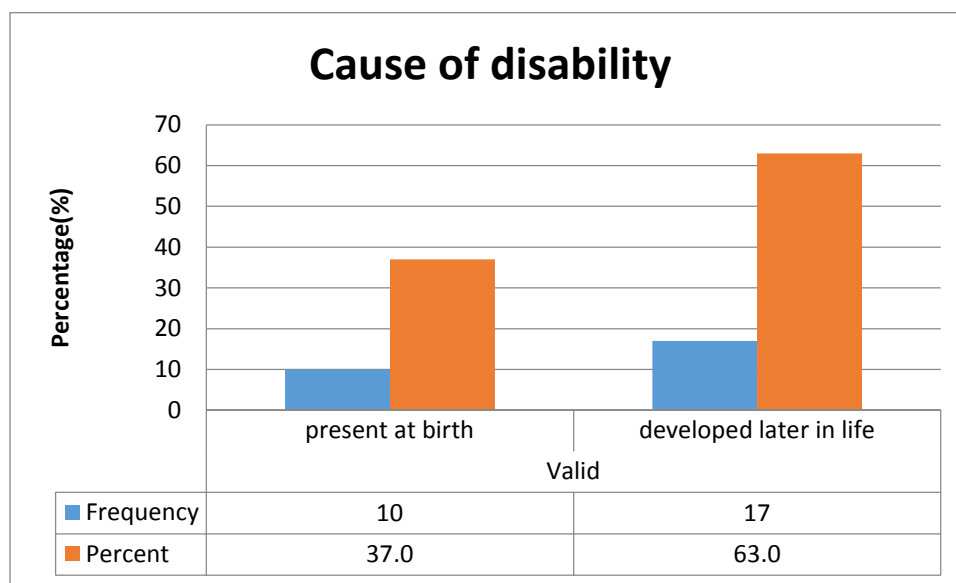


Figure: 4-11:- Cause of disability

#### 4.7.5 Usage of assistive device

The respondents also revealed that, due to the nature of their impairment and the environment, they have to use assistive devices to be able to move and access the built environments. As noted by The Office of Technology Assessment cited in Wisniewski and Sedlak, assistive-device technologies such as wheel chairs, calipers, crouches etc. improve the daily life of PWDs [77]. They rehabilitate/restore the cause of the impairment; they facilitate normalcy and augment the skill of PWDs by providing a higher level of functioning. In the current studyfig4.12, 67.3% (n=18) of the respondent representing said that they use assistive devices to access or to maneuver with in buildings and everywhere and the remaining 33.3% (n=9) responded that they don't need any assistive device. From these it can be said that most of the respondents use assistive device and respondents who don't need assistive device are most of them with impairment on hands and hearing. Out of 67.3% (n=18) respondent who uses assistive device,

22.2% (n=6) uses wheel chair, 18.5% (n=5) uses crutches, 14.8% (n=4) uses white cane, 7.5% (n=2) uses mobile GPS application, 3.7% (n=1) uses cane and the remaining 33.3% (n=9) uses none shown on fig4.13

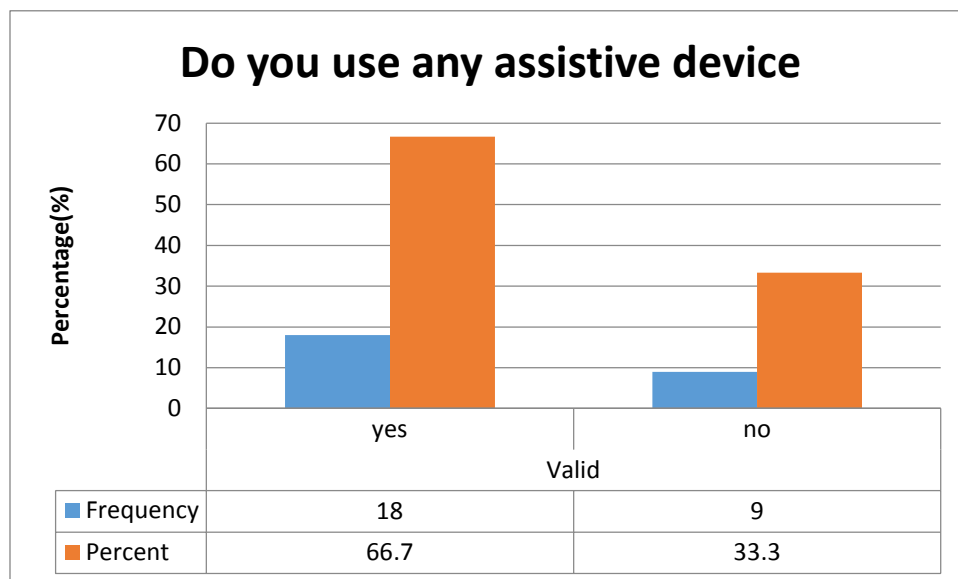


Figure: 4-12:-Assistive device users

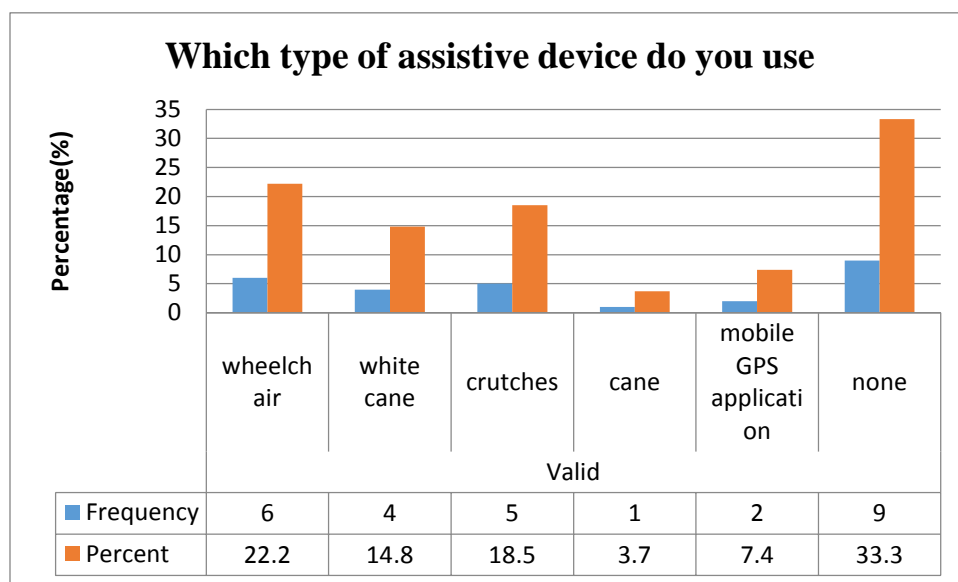


Figure: 4-13:-Type of assistive devices used by PWDs

The study went on to asked if the respondents need any help to access or move around public buildings. The result (Fig 4.14) revealed that 44.4% (n=12) said that they needed considerable

amount of help, 26% (n=7) said they don't need help, 14.8% (n=4) said they needed some help; and 14.8% (n=4) said they needed continuous help. This shows that as high as 74% of the study respondents need varying degrees of help in order to use the public buildings, they use in their day to day activities. This high number raises an issue of concern about the inaccessibility of the built environment in the city as earlier on reported by Danso et al.

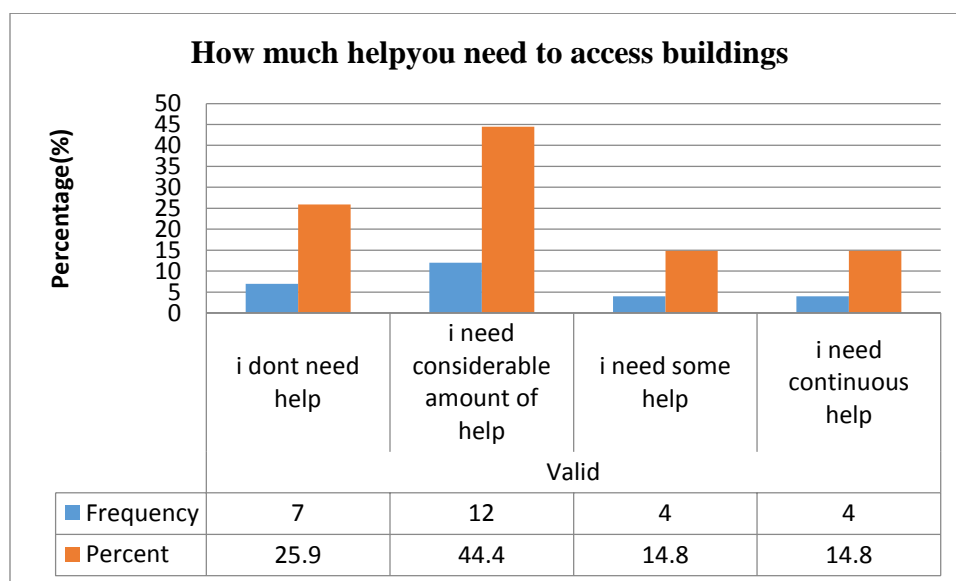


Figure: 4-14:-Degree of help respondents needs to access the public buildings

#### 4.8 Key Challenges faced by PWDs

Many of PWDs lack an equal access to health care, education, job opportunities and other necessary services. One of these challenges that prevent their access to possible independence and their use of public spaces is lack of attention to their physical and mobility needs, resulting in their isolation and deprivation of their human rights. The issue of access to public buildings has received little attention in Ethiopia, leading to the deprivation of a large number of people from enjoying their legal rights on an equal footing with other members of the society. As a result, disability has caused many problems at family and societal levels, because PWDs have been deprived of accessing their human rights such as the rights to health and education and other human rights[48]. The challenges that PWDs face while using these building differs as their disability type and assistive device they use. Below the researcher discussed the disability type and the challenges that are being obstacles for them to use without barrier.

#### 4.8.1 Wheelchair users

In this section the researcher attempted to identify what are the key problems that wheelchair user face on public building and it was found that, the key problems on the functionality of building facility related with using barrier freely wheelchairs by disabled in the study area is indicated below in the table 4.17 according to their level of agreement. From the views of the wheelchair users; among the key problems: facing difficulties at Entrance was indicated as the first key problem with the mean score of 4.67, ramp slop difficulties was ranked as the second with mean score of 4.50, maneuvering in tight spaces and maneuvering in rest rooms were ranked as the third with mean score of 4.33 and Passing through narrow door openings and over high thresholds and Reaching high-mounted controls and objects were ranked as the fourth with mean score of 4.17. The results obtained confirmed with the reviewed literatures.

Table: 4.17:-Challenges of wheelchair user

No.	Challenges faced	Rating					Total	Mean	Rank
		1	2	3	4	5			
<b>4.8.2 Wheelchair users</b>									
1.	Face difficulties at Entrance	0	0	0	2	4	6	4.67	1st
2.	Ramp slop difficulties	0	0	0	3	3	6	4.50	2nd
3.	Maneuvering in tight spaces	0	0	0	4	2	6	4.33	3rd
4.	Maneuvering in rest rooms	0	0	0	4	2	6	4.33	3rd
5.	Passing through narrow door openings and over high thresholds	0	0	0	4	2	6	4.17	4th
6.	Reaching high-mounted controls and objects.	1	0	0	2	3	6	4.17	4th

#### 4.8.3 People with limited walking abilities

As indicated in table 4.18 below, The mean of the opinion of the respondent in item " Overcoming differences in level" and "Climbing stairs and ramps "were " 4.40" with respect to

the others challenges that People with limited walking abilities face while using public building in Overcoming differences in level and Climbing stairs and ramps got the highest mean and took the 1<sup>st</sup> place on the rank. Therefore, it can be said that overcoming differences in levels and Climbing stairs and ramps of buildings area are the first key problem that People with limited walking abilities struggle with. The mean of the opinion of the respondent in item “Maneuvering in situations requiring speed” was “4.20”. The respondents agreed that Maneuvering in situations requiring speed is a challenge that they face while using public building. Therefore, maneuvering in situations requiring speed is challenging factor for People with limited walking abilities to maneuver in situation which requires speed. So, these challenging factors took a place of 2<sup>nd</sup> in rank.

Table: 4.18:- Challenges of people with limited walking abilities

No.	Challenges faced	Rating					Total	Mean	Rank
		1	2	3	4	5			
<b>2. People with limited walking abilities</b>									
1.	Overcoming differences in level	0	0	0	3	2	5	4.40	1st
2.	Climbing stairs and ramps	0	0	0	3	2	5	4.40	1st
3.	Maneuvering in situations requiring speed	0	0	0	4	1	5	4.20	2nd
4.	Maneuvering in rest rooms	0	0	3	1	1	5	3.60	3rd
5.	slippery surfaces	0	0	3	2	0	5	3.40	4th
6.	Passing through narrow door openings and over high thresholds	1	0	2	1	1	5	3.40	4th

#### 4.8.4 People with limited use of hands or arms

The table below summarizes the key challenges that People with limited hands use or arms facing while using public buildings facilities according to their level of agreement; and the result

is shown in Table 4.19. From the views of the People with limited hands use or arms among the key problems of public building facility: Gripping door knobs was indicated as the first key problem with the mean score of 4.25, Opening heavy doors was ranked as the second with mean score of 4.00, Gripping faucets was ranked as the third with mean score of 3.75. The results obtained confirmed with the reviewed literatures.

Table: 4.19:- Challenges of people with limited use of hands or arms

No.	Challenges faced	Rating					Total	Mean	Rank
		1	2	3	4	5			
<b>3. People with limited use of hands or arms</b>									
1.	Gripping door knobs	0	0	0	3	1	4	4.25	1st
2.	Opening heavy doors	0	0	1	2	1	4	4.00	2nd
3.	Gripping faucets	0	0	2	1	1	4	3.75	3rd

#### 4.8.5 Sightless person

In this section the researcher attempted to identify what are the key problems that sightless person face on public building facilities and it was found that, the key problems of building facility related with challenges that sightless person may face in the study area is indicated according to their level of agreement; and the result is shown in Table 4.20. From the views of the sightless people among the key problems of building facility related with sightless person: Identifying obstructions within the path of travel and Locating exit doors and stairs were indicated as the first key problem with the mean score of 4.86, Lack of accessible path leading to the elevator was ranked as the second with mean score of 4.71, Orientation was ranked as the third with mean score of 4.57, Maneuvering in elevators was ranked as the fourth with mean score of 4.43, Lack of helping side rails facilities at the toilets was ranked as the fifth with mean score of 4.29 and Recognizing emergency situations was ranked as the sixth with mean score of 4.26. The results obtained confirmed with the reviewed literatures.

Table: 4.20:- Challenges of people with sight problem

No.	Challenges faced	Rating					Total	Mean	Rank
		1	2	3	4	5			
<b>4. The sightless</b>									
1.	Identifying obstructions within the path of travel	0	0	0	1	6	7	4.86	1st
2.	Locating exit doors and stairs	0	0	0	1	6	7	4.86	1st
3.	Lack of accessible path leading to the elevator	0	0	0	2	5	7	4.71	2nd
4.	Orientation	0	0	0	3	4	7	4.57	3rd
5.	Maneuvering in elevators	0	0	0	4	3	7	4.43	4th
6.	Lack of helping side rails facilities at the toilets	0	0	0	5	2	7	4.29	5th
7.	Recognizing emergency situations	0	0	0	1	6	7	4.26	6th
8.	Finding Handrails	0	0	2	3	2	7	4.00	7th

#### 4.8.6 Person with hearing impairment

In the table below the key challenges that person with hearing impairment face on public building while using them and it was found that, the key problems of building facilities that are related with disability of hearing impaired person may face in the study area is indicated according to their level of agreement; and the result is shown in Table 4.21. From the views of the hearing impaired people among the key problems of building facility related with hearing impairment: Not hearing door, elevator and emergency and Absence of building map at the entrance get were indicated as the first key problem with the mean score of 4.40, Absences of sign for direction and Managing in situations involving the use of speech messages, verbal transmission and interaction were ranked as the second with mean score of 4.20, Accessible rest room identified by a sign was ranked as the third with mean score of 3.20. The results obtained confirmed with the reviewed literatures.

Table: 4.21:- Challenges of people with hearing impaired

No.	Challenges faced	Rating					Total	Mean	Rank
		1	2	3	4	5			
<b>5. The hearing impaired</b>									
1.	Not hearing door, elevator and emergency	1	0	0	2	2	5	4.40	1st
2.	Absence of building map at the entrance get	0	0	0	3	2	5	4.40	1st
3.	Absences of sign for direction	0	0	0	4	1	5	4.20	2nd
4.	Managing in situations involving the use of speech messages, verbal transmission and interaction	0	0	0	4	1	5	4.20	2nd
5.	Accessible rest room identified by a sign	2	0	1	1	1	5	3.20	3rd

#### 4.8.7 Government is doing enough to improve the needs of PWDs

Figure 4.15 below shows concerning whether government is doing enough to improve the needs of PWDs in the built environment, 92.6% (n=25) responded that the government is not doing enough to improve the needs of the disable and 7.4% (n=2) replied that it's doing enough. From these finding it can be said that the government is not performing in accessibility of public building issue as expected.

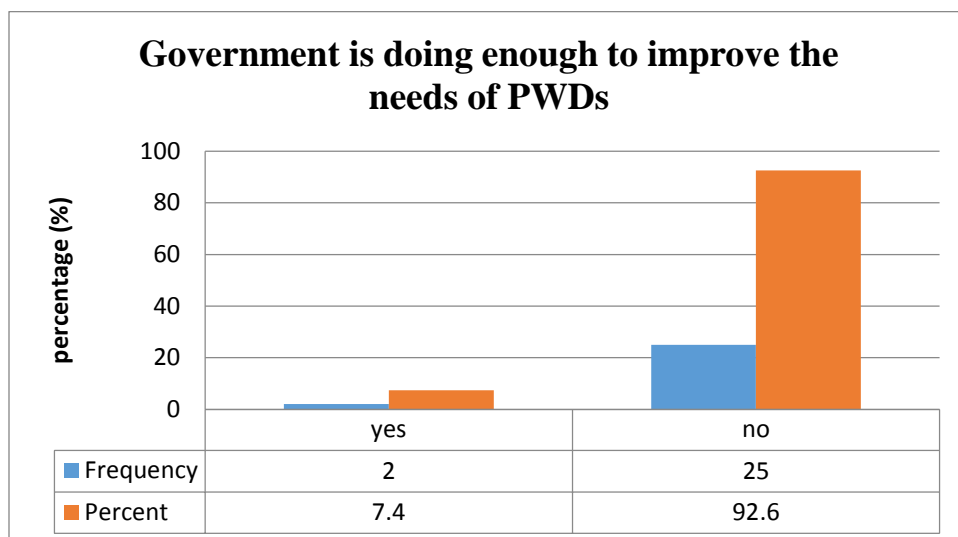


Figure: 4-15:-Government level of contribution in the improvement of needs of PWDs

#### 4.8.8 Designers performance for inclusive design

For the question which requests respondent’s opinion whether Architects, engineers and planners seeks to make their designs all inclusive, figure 4.16 below indicates 63% (n=17) replied that they think designers seeks to make inclusive designs and 37% (n=10) responded that don’t think that designers seek to make inclusive design. Majority of respondents agreed that designers seek to make their design inclusive.

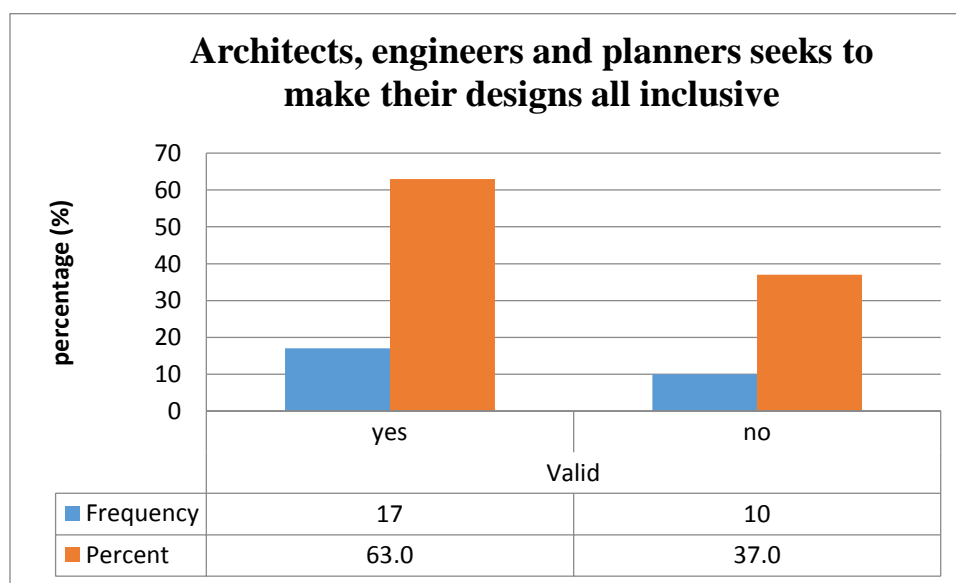


Figure: 4-16:-Designers performance for inclusive design

**4.8.9 The blame for the failure to incorporate the requirement of PWDs in design**

Regarding the blame for the failure to incorporate the requirements of PWDs in the designs of public buildings, there were five choices for the respondent where the blame goes to Government, Designers, Clients, Disability Groups and finally all and figure 4.17 below shows 70.4% (n=19) responded that all were to be blamed which were government, designers, clients, disability group, 22.2% (n=6) replied that government designers was to be blamed and 7.4% (n=2) replied that designers was to be blamed. Therefore, this finding lead to totally say for the failure to incorporate the requirement of PWDs in design of public building were the government, designers, clients, PWDs and all who are concerned with these issues.

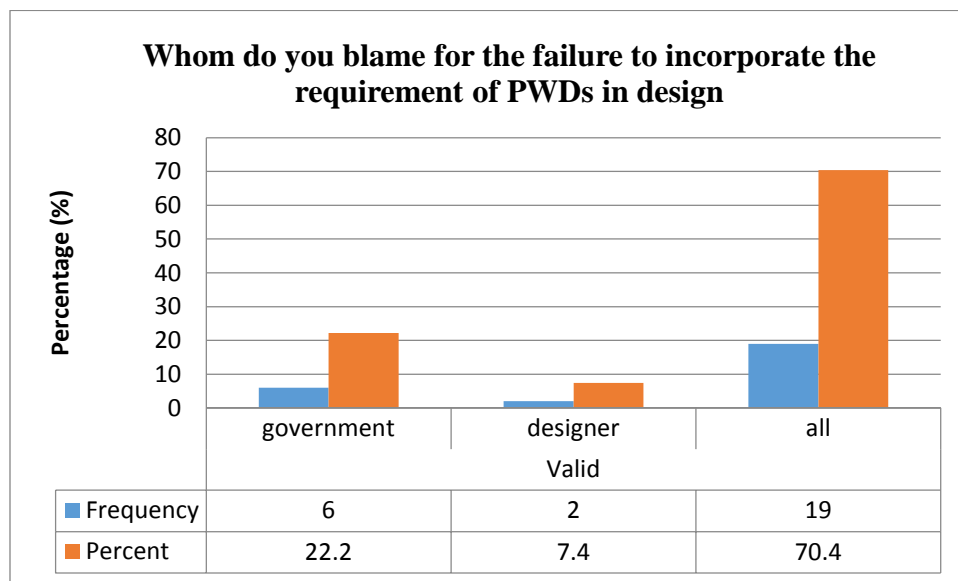


Figure: 4-17:-The blame for the failure to incorporate the requirement of PWDs in design

**4.8.10 Changes these days in inclusiveness of public buildings**

Concerning whether there is a change in the inclusiveness of public building these days, figure 4.18 below shows 55.6% (n=15) replied that there are change in the inclusiveness of public buildings and 44.4% (n=12) responded that there is no change in the inclusiveness of public building in the city. Therefore, can be summaries as there are some changes in the inclusiveness of public buildings

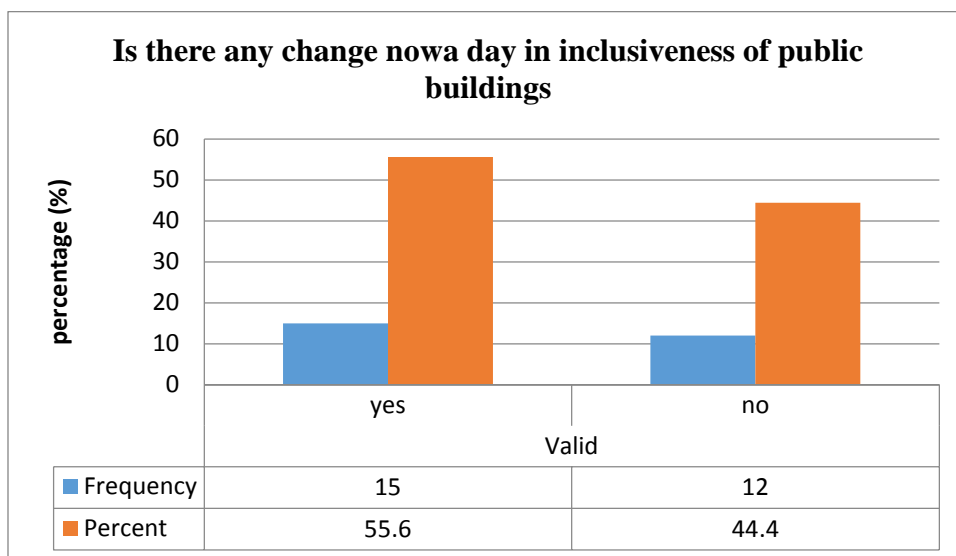


Figure: 4-18:- Frequency and Percentage change in inclusiveness of public buildings

## 4.9 Site Observation

The presentation below shows all the result from the observation that has been done to all the ten purposively selected critical public buildings. Based on the list that has been provided, if the facilities follow all the requirements in the list it was marked with ‘/’ and for the facilities that did not follow the list it was marked with ‘X’, while those facilities were not provided at all was marked with ‘NA’. During the technical visit, all the facilities have been strictly observed to ensure that all the results are valid. This process of information gathering afforded the researcher the opportunity to have first-hand information and actually see and experience what is on the actual efficiency and availability of public building facilities for PWDs.

### 4.9.1 Observations and Findings

The public buildings observed were grouped based on their use and service they provide for the society. All buildings observed were with three floors and above. The summary of types and number of buildings studied are shown in Table 4.22 total of 10 public buildings were observed.

Table: 4.22:-Summary of critical public buildings observed

No.	Building Type	Number of buildings
1	Banks	4
2	Government administrative building (sub-city buildings)	3
3	Educational buildings	3

#### 4.9.2 Staircase

Staircase is one of the facilities that majorly used by the people in public buildings. Hence, the staircase needs to be barrier-free and constructed according to the requirements that provided in Ethiopian Building Code Standard (EBCS-G). Stairs are provided in all of the buildings observed (i.e. for buildings above one floor). The functional state of the stairs is summarized in Table 4.23, 30% (n=3) of the critical public building observed were providing handrail both side, 70% (n=7) of observed were not providing both side handrail. The second functional requirement Continuous handrails provision, of the critical public buildings observed 90% (n=9) has provided continuous handrail. Therefore, the major deficiencies observed are with the Handrail being provided both side of stair and the non-availability of Braille inscription at the handrail at all

Table: 4.23:- Functional requirements of staircase checked on critical public building

Facility	Functional Requirements	Number of buildings that conform with the functional requirement	Number of buildings that do not conform with the functional requirement	Number of buildings that functional requirement not available
<b>STAIRCASE</b>	Handrail provided both side of stair	3	7	0
	Continuous handrails provided	9	1	0
	Braille inscription at the handrail	0	0	10

The figures 4.19 below shows some of the stairs on the visited buildings and their provision of functional requirements (a) shows the provision of handrail both side of stair, (b) shows the provision of handrail both side in the landing area of the stair, (c) shows one side handrail which is not continuous throughout the stair and (d) shows the provision of one sided continuous handrails

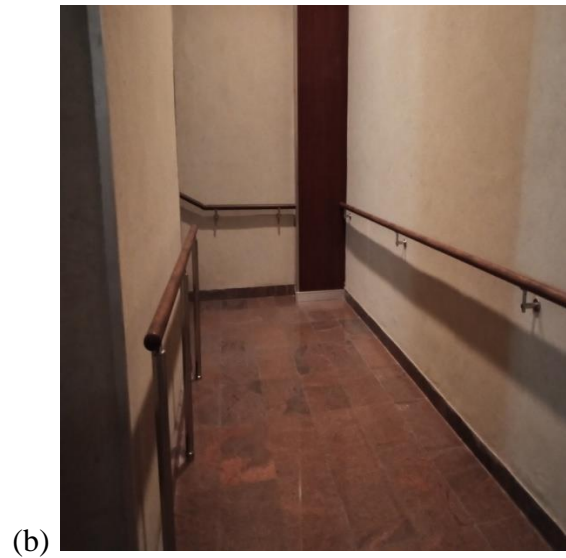


Figure: 4-19:- Sample images of stair cases observed

### 4.9.3 Ramps

Another medium of access that usually will be used by the disabled people is a ramp. Ramp will be used by physically impaired and visually impaired people. It can ease the movement of PWDs especially those on a wheelchair. According to Ethiopian building proclamation it is required on all buildings above four floors to be provided with elevators. 90% (n=9) of buildings observed provided entrance ramps. The table 4.24 shows the functional requirements of ramps that; 70% (n=7) of building observed were confirmed with the functional requirement which ramp needs to be free from any obstructions and anti-slip and also ramp should have gentle gradient and the rest which is 30% (n=3) were observed building which didn't meet the functional requirements.

Table: 4.24:- Functional requirements of ramps checked on critical public building

Facility	Functional Requirements	Number of buildings that conform with the functional requirement	Number of buildings that do not conform with the functional requirement	Number of buildings that functional requirement not available
<b>RAMP</b>	The ramp is free from any obstructions and anti-slip	7	2	1
	The ramp should at least 1200mm wide	5	4	1
	There is handrails provided on both sides	4	5	1
	The ramp should have gentle gradient	7	2	1

The figures 4.20 below shows samples of the ramps observed on the visited buildings and their provision of functional requirements (a) shows the provision of one side handrail, free from any obstructions and anti-slip floor ramp (b) shows the ramp with one side handrail and with gentle gradient. (c) Shows entrance having ramp on one side but without handrails.

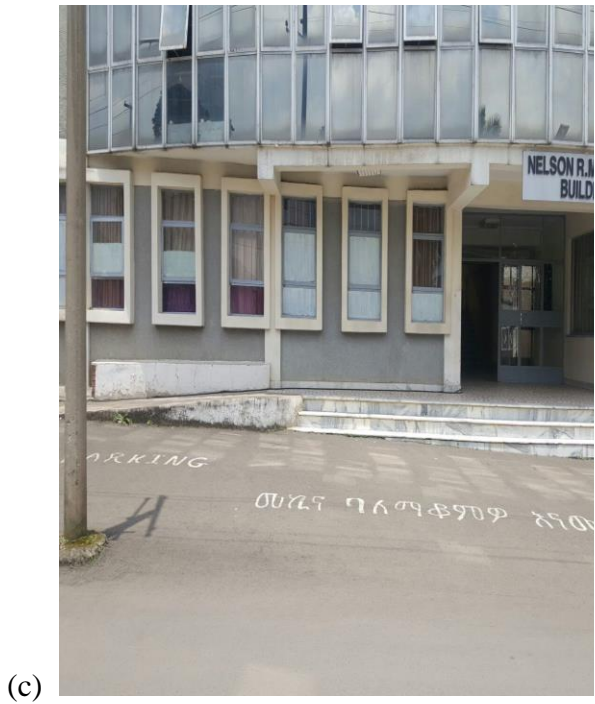


Figure 4-20:- Sample image for ramps observed

#### 4.9.4 Signage

Based on the literature reviewed, all signage on disabled facilities needs to be visible, clear, simple, and easy to read and understand by all people. These requirement features must be fulfilled according to the standard requested by Ethiopian Standard. Besides, the symbol used by all the signage needs to be a universal symbol. Also, needs to be located at the appropriate position and not hidden from the sight. As of this study, more than 80% of the buildings studied (observed) are not providing signage. The deficiencies in the signage available are as follows: lacks of directional signs, available signs are dirty and not readable at night. Can be seen in table 4.25 below

Table: 4.25:- Functional requirements of signage checked on critical public building

Facility	Functional Requirements	Number of buildings that conform with the functional requirement	Number of buildings that do not conform with the functional requirement	Number of buildings that functional requirement not available
SIGNAGE	The signage is clearly seen by all people	2	7	1
	The signage is marked with universal symbol	1	8	1

#### 4.9.5 Entrances

According to Ethiopian standard, the entrance of the building must be free from any obstacles and must be easily accessible by everybody especially disabled people. Based on the observation, all the ten public building followed this requirement. Besides, the entrance also connected with the pathway that leads to the entrance. Also, none of the buildings provide the tactile floor for visually impaired people. The tactile floor is one of the requirements that buildings does not comply with. As there are differences in level between the road surface and pathway level at building entrances. As shown in table 4.26 below, six (6) of the buildings (60%) are with ramps and steps for access to able and disabled people. The remaining 40% are with only steps to cater for able and disabled people. In the observed building's 60% of entrance are

free from any obstructions, accessible with path ways and provided with tactile floor as well ramps for disable. The remaining 40% is lack this functional requirement.

Table: 4.26:- Functional requirements of entrance checked on critical public building

<b>Facility</b>	<b>Functional Requirements</b>	<b>Number of buildings that conform with the functional requirement</b>	<b>Number of buildings that do not conform with the functional requirement</b>	<b>Number of buildings that functional requirement not available</b>
<b>ENTRANCE</b>	The entrance is free from any obstructions	6	4	0
	The entrance accessible with pathways	7	3	0
	The entrance is provided with tactile floor and ramps for disable	6	4	0

The figures 4.21 below shows some of the observed entrance of buildings and their provision of functional requirements (a) shows the provision of separate entrance which is free from any obstructions and anti-slip floor ramp (b) shows entrance having stair with ramp being alternative access to the building (c) & (d) Shows an entrance with stairs only which is not accessible for PWDs observed around the selected buildings



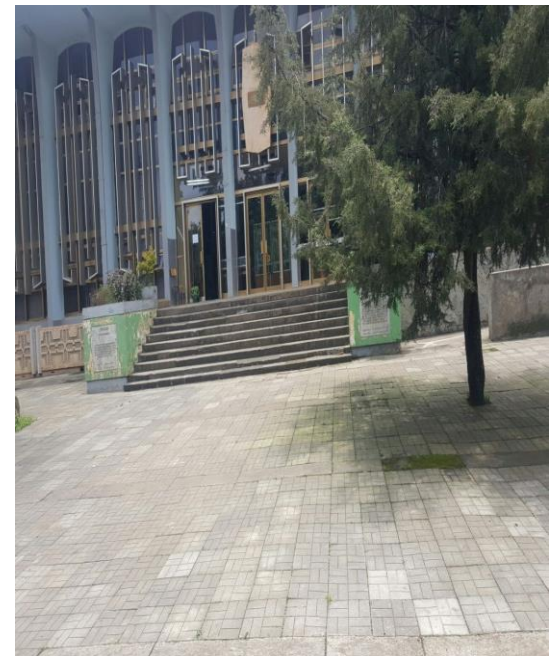
(a)



(c)



(b)



(d)

Figure: 4-21:- Sample images for entrances observed

#### 4.9.6 Parking

It is a requirement to provide parking space for disabled people as stated in the standard requirement that has been used worldwide. This requirement is important as disabled people must have a special privilege to access to the public building. According to Ethiopian standard, American with Disabilities Act 2010, Australian Standard and others, the minimum space for disabled parking should not be less than 3600mm width as space for wheelchair movement. Based on the observation, 90% of the parking area observed was free from any obstructions, 70% of the parking area is not marked with universal symbol, and 70% of the parking space is located near to the entrance. As shown in table 4.27 below

Table: 4.27:- Functional requirements of parking checked on critical public building

Facility	Functional Requirements	Number of buildings that conform with the functional requirement	Number of buildings that do not conform with the functional requirement	Number of buildings that functional requirement not available
<b>PARKING</b>	The parking area is free from any obstructions	9	1	0
	The parking area is marked with universal symbol	3	7	0
	The parking space located near to the entrance	7	3	0

All the building observed has got parking space, the gap is when we see their functionality. The figures 4.22 below shows samples of the parking place on observed buildings and their provision of functional requirements (a) shows the provision of parking area with no marked universal symbol for PWDs (b) shows parking area located near to the entrance.



Figure: 4-22:- Sample images for parking observed

#### 4.9.7 Elevators

All the 7 buildings having more than four floors are provided with elevators. The other 3 building don't have elevator. However, some of them did not fulfill the requirements that come with the elevator. The functional state of the elevators is shown in Table 4.28 Major deficiencies identified are even though there are elevators most of them are not giving function, the elevator which are giving service don't have button with Braille code and voice projection for visually impaired people, the space not being accessible for wheelchair users and handrail not being provided in side of the elevator. From the observed building one buildings elevator was having handrail every side. However according to the standard all public buildings needs fulfils the requirements by providing elevators with expected functionality.

Table: 4.28:- Functional requirements of elevators checked on critical public building

<b>Facility</b>	<b>Functional Requirements</b>	<b>Number of buildings that conform with the functional requirement</b>	<b>Number of buildings that do not conform with the functional requirement</b>	<b>Number of buildings that functional requirement not available</b>
<b>ELEVATOR</b>	The button is accessible for wheelchair user	6	1	3
	Braille code and voice projection for visually impaired people	1	5	4
	The space is accessible for wheelchair user	4	1	5
	Handrails provided in the elevator	4	1	5

The figures 4.23 below shows some of the observed elevators which helps to maneuver vertically and their provision of functional requirements (a) shows an elevator with accessible inside button, handrail provided in all four side, the space good accessible for wheelchair users and voice projection Shows an elevator which is not giving service at all (b) Shows an elevator which has got handrail on one side and inside area inaccessible for wheelchair users.

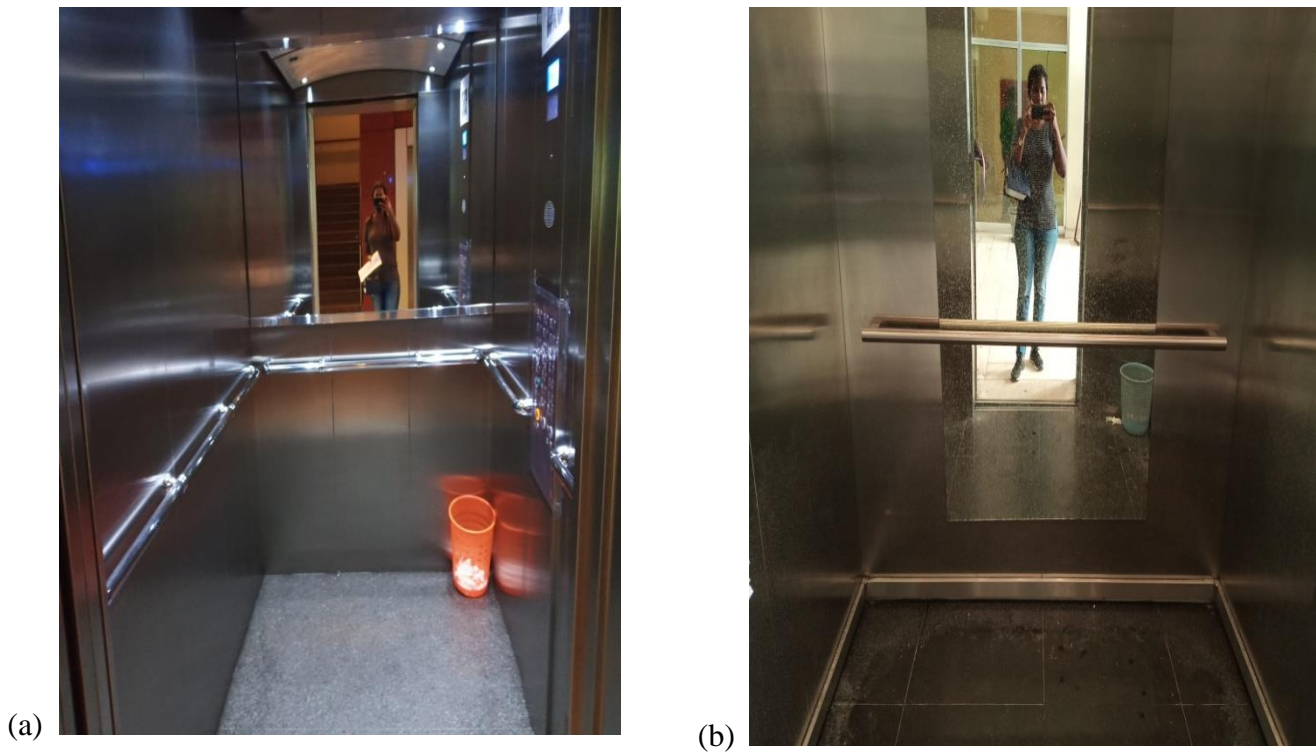


Figure: 4-23:-Sample images for elevators observed

#### 4.9.8 Restrooms

Restrooms are available in all of the public buildings but most of them were locked and not giving service for the public. However, the researcher observed their functionality. There was only one building which got separate rest room for disable, 70% of the toilets floor were not slippery, 80% of the toilet door is accessible for wheelchair user, 40% of the observe public buildings has got the area of the toilet which is enough to fit wheelchair. The deficiencies observed is the absence of indicating sign, handrails inside, the toilet not being on the same block, being lock in need of use, narrow corridors leading to the toilet, cleanness and not being comfortable for PWDs use. As shown in table 4.29below

Table: 4.29:-Functional Requirements of Restrooms checked on critical public building

<b>Facility</b>	<b>Functional Requirements</b>	<b>Number of buildings that conform with the functional requirement</b>	<b>Number of buildings that do not conform with the functional requirement</b>	<b>Number of buildings that functional requirement not available</b>
<b>Restrooms</b>	The toilet is separated for PWDs	1	9	0
	The door is accessible for wheelchair user should not less than 900mm wide	8	2	0
	the area of the toilet is enough to fit the wheelchair	4	6	0
	The floor should not be slippery	7	3	0

The figures 4.24 below shows some of the observed restrooms and their provision of functional requirements (a) shows restroom which is better for PWDs to use and with not slippery floor (b) & (c) Shows restrooms which are not accessible for users with disability, have got challenges like not being enough to fit wheelchair, no handrail to grab on and slippery floor



Figure: 4-24:- Sample images for restrooms observed

## 5 Conclusions and Recommendations

This chapter of the study deals with the conclusions and recommendations which are drawn as a result of findings of the assessment of efficiency and implementation challenges of accessible building facilities in public building of Addis Ababa.

### 5.1 Conclusions

The researcher lay down some conclusion form the finding of the study done on the critical and public buildings of Addis Ababa. Generally, despite the known number of persons with disability 17.6% of the Ethiopian population little has been done on the provision of access for people with disabilities in public buildings of Addis Ababa. Some of the conclusions made are listed below:

1. The consideration of disability in design and constructions of public buildings in Addis Ababa, research result indicate that almost half of the respondents who were responsible for taking decision on the design of built environment has got little or fair knowledge about the inclusive, accessible and universal building.
2. As the result shows most the design being provided were not universal/inclusive designs. Even if, there were provision/consideration of the disabilities in design the frequently considered one was mobility.
3. Building facilities like ramps, tactile, signage, warning markings, using contrasting colors and handrails mostly are not added initially in the design.
4. In construction stage the result shows that accessible building facilities are not difficult to construct, but the designer (engineers) who confirm the accessibility of buildings while supervising construction site were 53.8% of the respondents. This number is not enough to bring a great change in accessibility of buildings. Therefore to create environment which is barrier free for all corporative work is expected between departments like architect and engineer working in office and site as well as the government representative.
5. Majority of the designers (engineers) were aware of the laws considering disability in building design and construction, however, their level of knowledge about discipline that they need to follow is low. Therefore the accepting international proclamations and having a

written legislation and policies alone are not enough. They must be implemented with effectiveness.

6. Most of designers agreed that all the various stakeholders namely the government, designers, building clients, disability groups are all partly responsible for the failure to incorporate the need of the disabled in the design of the built environment.
7. The study identified the factors for challenges associated with the implementation of accessibility public building facilities for PWDs. The results revealed that from the various challenging factors which were identified to have effect against the implementation of accessible building facility. The key one includes the following as the respondents ranked them:
  - Lack of enforcement of the law
  - Lack of public awareness about the law
  - Weakness in the provisions of the law
  - Lack of coordination between departments
  - High Cost of designs which incorporate the needs of PWDs
  - Inadequate policies and standards
  - Lack of consultation and involvement of PWDs in decision making
  - Complexity of designs which incorporate the requirements of PWDs
8. PWDs responded that most public buildings are “closed” to them and that lacks key facilities which greatly restrict their activities. It was clearly identified that, our public buildings lack the designing and the construction of buildings to the disabled as far as accessibility to our built-environment. Among the deficiencies identified with public buildings that are inaccessibility and non-compliance for PWDs are parking, entrance, signage, path ways, ramps, doors, elevator, stair, hand railings and toilets.
9. Most of the respondents accepted the fact that, there is a change these days in newly constructed buildings as well in the enforcement of the law to provided accessible building. But older and currently inaccessible buildings needs improvements to upgrade them to the level which will make them disable friendly. Therefore designers need to come up with upgrading or improving solution for the existing inaccessible buildings and needs to work or

provide and construct accessible public building according to the standards, codes and proclamation for future.

10. The observation results of this research indicate that all the ten buildings surveyed have serious deficiencies as far as accessibility to their built facility functionality is concerned. In terms of provision of facilities for disabled people, recently constructed one bank building which is giving service at this time, was the most modern among others, and had better facilities for PWDs than all the rest.
11. Facilities for PWDs in and around the ten buildings, such as car parks, ramps, directional signs, and hand rails are not adequately provided and should be improved. The greatest levels of deficiency were observed in and around the two older buildings. These buildings will need major retrofitting to make them accessible to PWDs.

## 5.2 Recommendations

The researcher set some recommendations and suggestions which might help the designers, consultants representing the government and PWDs to improve public building and related facilities. This would lead to better lives to the disabled and everyone; finally the study recommended based on the findings of the study

### 5.2.1 Designers (engineers)

- Universal accessibility principles need to be followed through planning, designing and consulting stages of projects.
- Designers need to be addressed through public educations and exposure to exemplary works to decrease ignorance. Moreover, their approach can be changed through professional training programs.
- Different disability types like wheelchair users, people with walking difficulties, and sightless, deaf or hearing impaired people should be consider in design and construction stages and features that supports them should be provided.
- Urgent repair on existing buildings facilities like entrance, slops of ramps, slippery surfaces, stairs with properly design handrails together with ramps, toilet seats and maneuvering space to meet the disabled demands.

- Designers need to come up with improving solution for the existing inaccessible buildings and needs to work or provide and construct accessible public building according to the standards, codes and proclamation for future.
- Make sure that the entire disabled facilities are addressed in the construction stage, since the construction stage ensures that all the facilities are provided accordance with the requirements.
- More barrier-free facilities need to be provided especially in critical public building like education centers, banks and sub-city buildings etc... in order to avoid the limitation that has been occurring to the disabled people.
- Needs to have seminars with PWDs that seeks helping the architect identify the challenges being faced by PWDs.
- Addis Ababa City Government building regulations and building codes needs to be Reviewed so that it includes the necessary discipline that legislates the design requirements for this group of people

### 5.2.2 Government

- According to the Addis Ababa City Government building regulations no. 17/2004, Constructions for public services shall be undertaken in a manner accessible to persons with disabilities. Nonetheless, this regulation is not as such detailed in addressing the issue of accessibility. Rather, the detail has been left to be determined in a directive issued by the government infrastructure development and civil works authority. However, the expected directive no. 1 to address the access needs of PWDs in detail has been issued in 2005 ignorant of the issue as a whole. Thus, both the regulation and directive should be amended in a manner inclusive of all accessibility issues to further enhance the access needs of persons with disabilities.
- Consultant representing government needs to play their role in assuring that all the public building are accessed by the disabled people and the building facilities are disabled friendly.

- To review the Addis Ababa City Government building regulations concerning accessibility of public building for PWDs, so that it can be presented in detail form as a guideline manual for work.
- All designs/drawings sent for approval needs to be well scrutinized to ensure that they comply with the provisions of the law before the permit is given as well as strictly supervision.
- The knowledge and experience of developed countries should be shared in the formation of access legislation, and their enforcement practice.
- Penalizing those who don't perform as the according to the regulation and standard to create accessible environment.

### **5.2.3 PWDs**

- PWDs need to create awareness on the challenges they face in the built environment and that all people are responsible to ensure that all the disabled facilities are in good condition and never been abused.
- Creating awareness among legal practitioners and court officials about the legal rights of PWDs.
- Increase the community awareness about the different concepts of disability.
- Collaborating with the designing and constructing team make representation of their barriers and challenges while using buildings. to town councils and local authorities

### **5.3 Recommendation for future study**

1. Assessing the Efficiency and Challenges of Roads for Persons with Disabilities in Addis Ababa.
2. Assessing the Efficiency and Challenges with Accessibility of Building Facilities for Persons with Disabilities in Hospitals Buildings of Addis Ababa.
3. Assessing the Efficiency and Challenges with Implementing Accessible Building Facilities for Persons with Disabilities in Building of Addis Ababa.

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## **APPENDIXES**

## **QUESTIONNAIRE FOR CLASS I CONSULTANTS IN ADDIS ABABA**

### **Assessing the Efficiency and Challenges of Implementing Accessible Building Facilities for Persons with Disabilities on public buildings of Addis Ababa**

Dear respondent, the aim of this questionnaire is to obtain necessary data for the partial fulfillment of an MSc thesis in Construction Technology and Management at Addis Ababa University. The objective of this thesis is to assess the Efficiency and Challenges of Implementing Accessible Building Facilities for Persons with Disabilities on public buildings of Addis Ababa. Therefore, you are kindly requested to contribute to this research work by completing this questionnaire. The identity of the respondent and that of the company you represent shall remain confidential and all data's found from the survey will only be used for an academic purpose. I would like to extend my gratitude for taking your precious time to respond to this questionnaire. If you have any inquiry please contact through the following addresses.

Betelhem Derese

Post Graduate Student at Addis Ababa University, school of Civil and environmental engineering, Construction technology and management stream

Email: [bettyfikir118@gmail.com](mailto:bettyfikir118@gmail.com)

### General Information

1. Classification of your organization .....
2. Your position  
 Resident Engineer  Architect  Site supervising Engineer   
 Office Engineer  quantity surveyor   
 If other, please specify .....
3. Gender  
 Female  Male
4. Educational Background  
 Masters  Degree   
 Diploma  If other, please specify .....
5. Years of experience in the construction industry  
 1 - 5 years  6 - 10 years   
 11-15 years  16 - 20 years  > 20 year

### Part One: Disability consideration in design and construction

1. Do you know anything about inclusive/ universal design?
  - Yes
  - No
2. What is the level of knowledge about universal/inclusive design?
  - Fair
  - High
  - Very high
3. Does your company provide inclusive (universal) design to its customers (clients) sufficiently?
  - Yes
  - No
4. Which of the following Disability types are considered during designs?
 

Eyesight                       Mobility                       All   
 HearingCognitive                                             mobilityandeyesight   
 Mobility and hearing

(i). Can you list some of the design or construction solution for the disabilities that you provide?

- A. Eyesight -----
- B. Hearing -----
- C. Mobility -----
- D. Others -----

5. Do Ramps and Visually impaired features like tactile warning markings, using contrasting colors, handrails and curbs etc... have been added to the design initial?
  - Yes
  - No
  
6. Does your company make sure that buildings are usable (accessible) for PWDs while supervising construction sites?
  - Yes
  - No
  
7. Accessible building facility, Does it have any difficulties while construction?
  - Yes
  - No
  
8. Is it a finishing work or structural member?
  - finishing work
  - structural member
  - Both
  
9. Is there an enforcing and mandatory law which strictly dictates for the inclusiveness of buildings in Ethiopia?
  - Yes
  - No
  
10. Do you incorporate the provisions of the code in the design and construction of public buildings?
  - Yes
  - No
  
11. Do you think the law on design permit stage of designs being universal/ inclusive is being practiced properly?
  - Yes
  - No
  
12. Do you think the law concerning accessibility of buildings on use permit after construction is being practiced properly?
  - Yes
  - No
  
13. Is there a controlling unit who monitors universality of the building is maintained?
  - Yes
  - No
  
14. Is there any change now a day in inclusiveness of public building designs through time?
  - Yes
  - No

**Part two: Challenging factor for constructing accessible buildings.**

Most public buildings (even newly constructed facilities) remain disability unfriendly. The needs of the disabled are not considered in the design of these building facilities. This is due to different factors; some of them are listed below in the table. Therefore one can show how significant the factors are by making a mark using the numbers.

On a scale of 1 – 5, please indicate your opinion of the challenges which militate against the implementation of accessible building facility for person with disability (PWD) in public buildings.

1 = highly insignificant    2 = insignificant    3 = neutral    4 = significant    5 = highly significant

No.	Challenging factors	Level of Significance				
		1	2	3	4	5
1.	Lack of public awareness about law/policy					
2.	Complexity of designs which incorporate the requirements of PWDs					
3.	High Cost of designs which incorporate the needs of PWDs					
4.	Few number of disabled persons in the country					
5.	Lack of enforcement of the law/policy to compel designers					
6.	Weakness in the provisions of the law/policy					
7.	Inadequate policies and standards					
8.	Ineffectiveness of Disability Groups					
9.	Negative attitudes towards the disabled					
10.	Lack of budget allocation for implementation					
11.	Lack of consultation and involvement of PWDs in decision making					
12.	Lack of coordination between departments					

15. What is the level of commitment of client in the provision of access for the disabled?  
 High  Medium  Low
16. Inclusive design, does it have any change on the overall cost of the project?  
 • Yes   
 • No
17. Whom do you blame for the failure to incorporate the requirements of PWDs in the designs of public buildings?  
 (a) The Government (b) Designers (c) Clients (d) Disability Groups (e) All  
 (f) Others please specify .....

**Part three: key building facilities that needs improvement**

Please read each statement and indicate your level of agreement/disagreement as it relates to your experiences in designing and construction. You are provided a space to describe any statements you strongly disagree with. As a final step please provide mark (√) your level of agreement.

1=Strongly disagree    2 = Disagree    3= Neutral    4= Agree    5= Strongly agree

<b>Building facility improvement:</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>1. Parking</b>						
1.	Accessible parking on building area needs to be adequate.					
2.	Sidewalks on building area needs to be are adequate.					
3.	Indicating signs needs to be easy to read and understand.					
4.	Curb cuts on building area need to be adequate.					
5.	Curb cuts should be located where they are needed.					
please comment on any question that you answered "strongly disagree" in space below						
<b>2. Entrances</b>						
6.	The primary entrances to buildings needs to be accessible					
7.	The approach to the entrance free of stairs and steps					

8.	Accessible building entrances needs to be easy to identify.					
9.	Accessible building entrances should be adequate.					
	please comment on any question that you answered "strongly disagree" in space below					
	<b>3. Signage</b>					
10.	There should be directional signs indicating the location of accessible facilities					
11.	Maps, information panels and wall-mounted signs should be placed					
12.	Signs must be clear, simple and easy to read					
13.	The color of signs needs be clearly distinguishable					
	<b>4. Pathway</b>					
14.	The pathway needs to be clear of obstructions					
15.	The path of travel needs to be free of steps or stairs					
	<b>5. Ramps</b>					
16.	There should be a complementary ramped route next to stairs or steps					
17.	The surface of ramps need to be non-slip					
18.	The ramp surface needs to be clear of obstructions					
19.	The location of the ramp must be clearly identifiable					
	<b>6. Doors</b>					
20.	Doors needs be opened without much effort					
21.	Door handles needs to have a shape that is easy to grasp with one hand					
22.	There should be sufficient space beside the latch side of the door					
	<b>7. Elevators</b>					
23.	There should be an accessible path leading to the elevator					
24.	The elevator cab needs to provided handrails on three side					

25.	The elevator needs to be provided with audible and visual warning signals indicating arrival at a floor					
26.	The elevator door easy to identify					
27.	The door opening/closing interval needs to be long enough					
<b>8. Stairs</b>						
28.	width of the stairs needs to be enough					
29.	Treads need to be with a non-slip surface					
30.	The location of the stairs must be clearly identifiable					
<b>9. RAILINGS AND HANDRAILS</b>						
31.	The handrails must be easy to grip					
32.	The railings must be securely attached					
33.	The handrails must be continuous throughout the full length of ramps and stairs					
34.	Low positioned windows at landings must be protected by railings					
35.	Handrails must be easy to identify					
Please comment any question that you answered "strongly disagree" in the space below						
<b>10. TOILET</b>						
36.	There should be accessible rest room identified by a sign					
37.	There should be sufficient space inside the rest room to maneuver a wheelchair					
38.	There should be helping side rails facilities at the toilets					
39.	The flooring material needs to be skid-proof, well drained and waterproofed					
40.	The flushing mechanisms needs to be easy to operate					
Please comment any question that you answered "strongly disagree" in the space below:						

## QUESTIONNAIRE FOR PERSON WITH DISABILITIES

### **Assessing the Efficiency and Challenges of Implementing Accessible Building Facilities for Persons with Disabilities on public buildings of Addis Ababa**

Dear respondent, the aim of this questionnaire is to obtain necessary data for the partial fulfillment of an MSc thesis in Construction Technology and Management at Addis Ababa University. The objective of this thesis is to assess the Efficiency and Challenges of Implementing Accessible public Building Facilities for Persons with Disabilities in Addis Ababa. Therefore, you are kindly requested to contribute to this research work by completing this questionnaire. The identity of the respondent and that of the company you represent shall remain confidential and all data's found from the survey will only be used for an academic purpose. I would like to extend my gratitude for taking your precious time to respond to this questionnaire. If you have any inquiry please contact through the following addresses.

Betelhem Derese

Post Graduate Student at Addis Ababa University, school of Civil and environmental  
Engineering, Construction technology and management stream

Email: [bettyfkr118@gmail.com](mailto:bettyfkr118@gmail.com)

### General Information

1. Gender?
  - Male
  - Female
2. Group of special need/ impairment?
  - Physical       Hearing     Speech
  - Visual       Mental     Multiple  others (specify).....
3. Cause of impairment?
  - congenital (present at birth)     acquired (developed later in life)
4. Do you use any assistive device?
  - Yes                       No
5. If yes to Q4; which type of assistive device do you use?
  - wheelchair       white cane       crutches
  - cane                       calipers               other (specify).....  None
6. How much help to you need to access the built environment?
  - I don't need help                       I need considerable amount of help
  - I need some help                       I need continuous help

### Part one: disability and problem faced

Please read each statement and indicate your level of agreement/disagreement as it relates to your experiences in different public building. You are provided a space to describe any statements you strongly disagree with. As a final step please provide mark (√) your level of agreement from your related disability.

	<b>Problems faced:</b>	Strongly disagree	Disagree	Neutral	agree	Strongly agree
	<b>1. Wheelchair users</b>					
1	Face difficulties at Entrance					
2.	Ramp slop difficulties					
3.	Passing through narrow door openings and over high thresholds					
4.	Maneuvering in tight spaces					

5.	Maneuvering in rest rooms					
6.	Reaching high-mounted controls and objects.					
	please comment on any question that you answered "strongly disagree" in space below					
	<b>2. People with limited walking abilities</b>					
7.	Overcoming differences in level					
8.	Maneuvering in situations requiring speed					
9.	Climbing stairs and ramps					
10.	slippery surfaces					
11.	Maneuvering in rest rooms					
12.	Passing through narrow door openings and over high thresholds					
	please comment on any question that you answered "strongly disagree" in space below					
	<b>3. People with limited use of hands or arms</b>					
13.	Opening heavy doors					
14.	Gripping door knobs					
15.	Gripping faucets					
	please comment on any question that you answered "strongly disagree" in space below					
	<b>4. The sightless</b>					
16.	Orientation					
17.	Identifying obstructions within the path of travel					
18.	Finding Handrails					
19.	Lack of helping side rails facilities at the					

	toilets					
20.	Maneuvering in elevators					
21.	Lack of accessible path leading to the elevator					
22.	Recognizing emergency situations					
23.	Locating exit doors and stairs					
please comment on any question that you answered "strongly disagree" in space below						
<b>5. The hearing impaired</b>						
24.	Managing in situations involving the use of speech messages, verbal transmission and interaction					
25.	Not hearing door, elevator and emergency					
26.	Absences of sign for direction					
27.	Absence of building map at the entrance get					
28.	accessible rest room identified by a sign					
please comment on any question that you answered "strongly disagree" in space below						

7. What other challenges have you been facing while using public buildings?

- (i).....
- (ii).....
- (iii).....

8. What are your impressions about the accessibility of the disabled to the built environment at public buildings?

- (a) It is normal
- (b) It needs more improvement

9. How would you rank the level of accessibility and safety of using the public building in general?  
(a) Highly inaccessible (b) Inaccessible (c) Accessible (d) High accessible
10. In your opinion do you think the government is doing enough to improve on the needs of the disabled persons especially regarding the access to public facilities?  
[ ] Yes [ ] No
11. Do you also think designers (Architects, Engineers, and Planners etc.) seek to make their designs all inclusive?  
[ ] Yes [ ] No
12. Whom do you blame for the failure to incorporate the requirements of PWDs in the designs of public buildings?  
(a) The Government (b) Designers  
(c) Clients (d). All
13. Is there any change now a day in inclusiveness of public building designs through time?
- Yes
  - No
  - If yes, can you explain? .....

## Observation checklist

### Provision of the disabled facilities in public buildings

If the facilities follow all the requirements in the list it would be marked with ‘√’. Facilities that did not follow the list it will be marked with ‘X’, while those facilities that not provided at all will be marked with ‘NA’ not available.

Table.1. Observation checklist regarding disabled facilities in selected public buildings

	<b>STAIRCASE</b>	√	X	NA
1.	Handrail provided both side of stair			
2.	Continuous handrails provided			
3.	Braille inscription at the handrail			
	<b>RAMP</b>			
4.	The ramp is free from any obstructions and anti-slip			
5.	The ramp should at least 1200mm wide			
6.	There is handrails provided on both sides			
7.	The ramp should be of gentle gradient			
	<b>SIGNAGE</b>			
8.	The signage is clearly seen by all people			
9.	The signage is marked with universal symbol			
	<b>ENTRANCE</b>			
10.	The entrance is free from any obstructions			
11.	The entrance accessible with pathways			
12.	The entrance are provided with tactile floor and ramps for disable			
	<b>PARKING</b>			
13.	The parking area is free from any obstructions			
14.	The parking area is marked with universal symbol			
15.	The parking space located near to the entrance			
	<b>ELEVATORS</b>			
16.	The button is accessible for wheelchair user			
17.	Braille code and voice projection for visually impaired people			
18.	The space is accessible for wheelchair user			
19.	Handrails provided in the elevator			
	<b>Restrooms</b>			
20.	The toilet is separated for PWDs			
21.	The door is accessible for wheelchair user should not less than 900mm wide			
22.	the area of the toilet is enough to fit the wheelchair			
23.	The floor should not be slippery			

Pictures taken while observation

