
Accessibility of Commercial Buildings for Persons with Physical Difficulties in Addis Ababa

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Abstract: Building accessibility requires creating spaces that are accessible to everyone, including people who use wheelchairs, canes, and mobility scooters, as well as people with vision and hearing impairments. Due to architectural and functional issues, commercial buildings in Ethiopia's capital, Addis Ababa, do not provide fair accessibility for peoples with physical difficulties. Stairs at the main entrances, the height and number of series of steps and stair risers, insufficient signage or color/texture identification, secured ramp access, and other activities that hinder disabled people's movement are all factors that contribute to their absence. This study was conducted to assess the accessibility of commercial buildings in Addis Ababa in order to make it easier for peoples with physical difficulties to move around, to identify challenges, and to propose architectural solutions to ameliorate the situation. The study covers everything from recognizing accessibility issues to assessing and forwarding theoretical recommendations. Finally, design recommendations for the selected commercial building were made in order to improve accessibility for people with physical difficulties. Key informants were selected by random sampling technique. Observation, questionnaire, case study and focus group discussions were implemented for data collection. Tables were used to explain the data for easy comprehension. To address the lack of fair accessibility, facilitative measures such as the use of new technologies, planning and building accessible systems in accordance with local and international standards, monitoring and supervising the construction of building accessibility systems, and collaboration of relevant stakeholders were suggested. To summarize, the research looked into how to deal with issues arising from current commercial building structures, as well as how to make buildings more accessible to peoples with physical difficulties giving particular attention to wheelchair users.

Keywords: Building Accessibility, Physical Difficulties, Commercial Buildings

1. Introduction

Architecture is about the creating environment for the user, for them to experience it and good building accessibility means creating spaces that are designed to be user-friendly for everyone, including people who use wheelchairs, canes and mobility scooters, and those with vision and hearing impairments [1, 13]. This research focuses on people with physical disabilities, with a particular focus on wheelchair users.

A physical disability is a limitation on a person's physical functioning, mobility, dexterity or stamina [8, 14]. According to the World Report on Disability, 15% of the world's population or 1 billion people are affected by disability [7]. Due to cognitive, developmental, intellectual, mental, physical, and/or sensory differences, disabled people are

“unnecessarily isolated and excluded from full participation in society” [4-6]. 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 [10, 15].

In Ethiopia most of the buildings are not accessible for peoples with physical difficulties because, in most of the buildings especially in the main entrance of the buildings the material selected for the ramps are slipping and the slope is higher which is not cool for users because they perform manually. In addition, the steps risers are higher for people with limited walking abilities or cane (crunch) users. So, this make difficult to use the building for peoples with physical difficulties.

Modern commercial buildings in Addis Ababa can give services for large number of peoples every day but there is a question on the society's equal utility. As a result, comprehending the obstacles faced by persons with physical difficulties a lot of measures are required in Addis Abeba to increase physical accessibility in all types of structures.

2. Description of Study Area

This research is focused on commercial buildings in Addis Ababa. Addis Ababa was chosen because it is Ethiopia's current capital city and the primary area for the building construction industry. The criteria's for the selection of this commercial buildings are;-

- A. Commercial building in Addis Ababa; - because Addis Ababa is Ethiopia's main business district, with a rapidly growing commercial building construction industry.
- B. Buildings location; - Buildings in Addis Ababa's business center regions were chosen. From Bole sub-city Shekinah building, Yeka sub-city Metebaber and 3M City mall buildings, and Lideta sub-city Aymen building were selected.
- C. Buildings having at least one floor; - because the research's primary goal is to investigate the vertical circulation of commercial structures.
- D. Buildings with a large number of visitors on a daily basis; - for example, the Metebaber building is one of the busiest commercial buildings in the city.
- E. Notable with new building combinations; - to comprehend the changes in building accessibility between old and new structures.

2.1. Measurements Tool

A measuring tape is an equipment that is used to get a numerical measurement of a physical feature (character). The researcher used an instrument based on a checklist to observe all four (4) commercial buildings that were chosen. The numerical measurements were then recorded in the notebook, together with other data captured by the camera.



Figure 1. Measuring instruments, diy.com.

2.2. Method of Data Collection

The aim of the study is to look into the accessibility of building structures, hence both qualitative and quantitative methodologies were utilized to do so. The majority of the data was gathered using qualitative methods in accordance with the study's objective/ aim.

Surveys, observations, and questionnaires are used to

collect quantitative data for statistical analysis. For instance, consider a physical characteristic. Height and width, as well as the number of circulations (stair, lift, and ramps) are all noted recorded [2].

Qualitative research enables the researcher to gather in-depth insights on topics that are not well understood [9, 12]. Physical characteristics such as material and texture are noted, as well as design quality such as integration with the building, aesthetics and quality of circulations, signage, and so on. Then the acquired data was summarized, analyzed, and interpreted using a mixed method approach.

2.3. Parameter Used for Analysis

Both functional and physical aspects are researched in order to understand how the current building structures circulation system works for physically challenged people and to obtain clear information about the systems (stairs and ramps) [3, 11]. The primary reason for studying physical and functional qualities is briefly addressed below.

Physical characteristics

- A. Stair type; - the stair type affects the users' comfort, hence it's one of the researchers' study parameters.
- B. Number of stair steps; - The number of steps was investigated by comparing stair risers since the room height makes it difficult for those with physical difficulties.
- C. Stair riser and tread width: -This characteristic is well covered in the following chapter since it provides information on building accessibility issues involving physically challenged people who use canes.
- D. Ramp width and slope; - This parameter provides useful information for the design and construction of a wheelchair ramp.
- E. Material and texture: - Material consideration is especially crucial for wheelchair users because they pose a significant risk to the users when sliding (slipping).
- F. Color: - For the users, they make the circulation system clear and visible.

Functional characteristics

- A. Orientation: -the investigation is done whether the stairwells, ramps, or other circulation systems are in the proper place.
- B. Safety and security: -whether the circulations are safe and secure for physically challenged people are observed.
- C. Signage: - the issue related to a clear signage that directs users to the building's main entrance checked.

3. Results and Presentation

In the sub headings below, the data acquired using the methodologies is explained in terms of how it can be utilized for data analysis and interpretation.

i. Metebaber Building

Metebaber building is a notable commercial structure in Megenagna, Addis Ababa, Ethiopia, in the country's main

business center. It is flanked by other notable commercial buildings such as Zef Mesh, Betelhem plaza, and others.

It's a Basement+G+8-story commercial structure in the heart of the business center. The building features a large central circulation room with ceramic tile flooring. As part of the building circulation system, there is one (1) ramp, two (2) main stair cases, and two (2) supplementary supported staircases, as well as one (1) elevator at the main entrance. From the central space, two corridors lead straight forward from the main entrance and to the left side of the building, where the shops are located.



Figure 2. Metebaber building view.

Physical characteristics

Stair type

The main two stair types on this building are U-shaped staircases. Two parallel flights of straight stairs are connected by a landing, resulting in a 180-degree turn in the walk line. The main stair has a width of 3.3 meters and a landing area of 1.5 meters, while the second main stair has a width of 2.9 meters and a landing area of 1.1 meters.

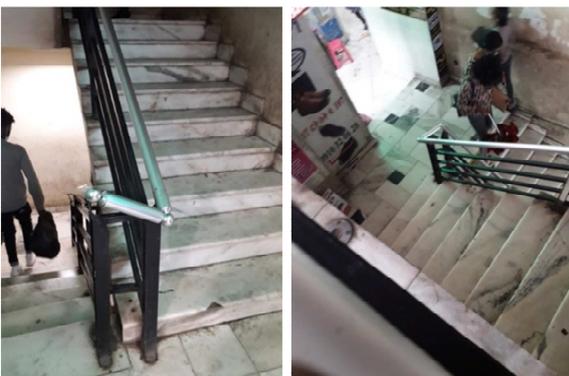


Figure 3. Metebaber building main stair cases view.

Straight stair types are employed for the other two types of supported stairs. Straight stairs can be made more transparent than other types of stairs by selecting thinner treads, open risers, and thin metal stringers, allowing less obstruction to the view beyond. This is a sturdy staircase that was built with a distinct color scheme in mind having 1m width without any flights.



Figure 4. Metebaber building supportive stair case view.

Number of stair steps (risers): Stair 1 (Main stair) has 16 steps each flights which makes the users tired because the room height is 5.4m and stair 2 (main stair 2) has 9 steps each flights which was more or less comfortable for normal persons which doesn't have physical disability (3.06m room height). The other additional supportive stair cases (stair case 3 & 4) have 15 steps with one flight having higher riser height.



Figure 5. Stair case steps view.

Stair Riser and Tread width: The step of stair 1 (Main stair1) and stair 2 (main stair 2) has 17x32 cm rise & tread width respectively and the other additional supportive stair cases (stair case 3 & 4) have 20.4x15 cm rise & tread width respectively.

Ramp width and slope: Metebaber building has only 1 ramp at the main entrance. The ramp type used was like threshold ramps which has 1.5cm height rise with a good slope. These ramps are simple, cost-effective solutions for people using a wheelchair and canes. Also there is 1 elevator in the building used to simplify difficulties related to vertical circulation.



Figure 6. Metebaber building Ramp.

Material and texture: The material used for the ramp is concrete which is good material for wheelchair users because it's not slippery and for the stair 1 & 2 marble floor material and steel + Aluminum rail used and for the rest of the 2 additional supportive stair cases timber floor material and timber + steel rail used.

Color: Color coding is a way to convey information quickly, which facilitates visual search. On this building the color selection is not that much considered its white marble floor + white wall + ceiling. So lacks emphasis to improve object recognition and speedy recognition except the supportive stair cases.

Functional characteristics

Orientation and Safety

Safe, convenient, rapid circulation is essential for all buildings under both normal and emergency conditions. Such circulation may be channeled through any of several different types of passageways, such as lobbies, corridors horizontally and stair, elevators etc... vertically so, equal distribution of vertical circulations, visibility and its safety from any obstructions are needed. In this building structure the orientation of stair cases and elevator are fair except the ramp access.



Figure 7. Metebaber building exterior steps.

Signage: In buildings structures signage's which instruct users to behave in certain way needed. This building lack a good signage which convey the necessary information or instructions clearly and as simply as possible, and should be located where they are easily visible.

ii. 3M City Mall

3M City Mall is a Basement+G+13 story newly constructed commercial building which is located at

Megenagna, Addis Ababa, Ethiopia and it's found near to Betelhem plaza, Zef Mesh grand mall and Metebaber Notable buildings. The building has wide central circulation area which is covered by ceramic tile floor finish. Two (2) ramps one for car and 1 for wheelchair users, two (2) main stair cases, two (2) elevators and two (2) steps at the main entrance used to access the building.



Figure 8. 3M City Mall view.

Physical characteristics

Stair type: The main stair cases have 3m width with 1.5m landing area. Starting from the ground floor up to the 3rd floor the building room height is 3.91m then it becomes 3.4m when we go above.

A wide supportive steps are constructed which connect the site level to the building ground floor (which is elevated 1.36m).



Figure 9. 3M City Mall stair case view.

Number of stair steps (risers)

Both stair cases has 11 steps in one flight and 12 steps in the next flight from basement floor to G+3 story then both flights becomes 10 steps in each flights. The building has 3.91m room height starting from ground up to 3rd floor then the room height become 3m when we go to the upper floors. Both steps which lead from site road to the ground floor main entrance and the site road to the basement floor have 8 steps.



Figure 10. 3M City Mall exterior steps and stair steps view.

Stair Riser and Tread width

The step of both stair cases and front entrance steps have 17x32 cm rise & tread width respectively and the riser height makes tough to use for peoples with limited physical disability.

Ramp width and slope

The preferred slope for a building access ramp is 1:12 or 1 inch of rise per 12 inches of horizontal run - that's roughly an 8% slope. 3M City Mall building has 1 ramp which is constructed for wheelchair users which leads to the basement floor then the users get access of the two elevators. It's a simple ramp design which has 1.36m height rise, 90cm width with a one turn 8m run this means it have a steeper slope estimated to 17% slope without handrails on both sides.

Material and texture: The material used for the ramp is ceramic tile which is more or less good material for wheelchair users because it helps them to move easily and for both stairs & steps marble floor material + Aluminum rail used.



Figure 11. 3M City Mall ramp view.

Color

On this 3M City Mall building a good attention is given for color coding to convey information quickly, which facilitates visual search. For example, the vertical circulations (stair, ramp and elevators) can be differentiated because of their good color combination this creates easy access on the building structure.



Figure 12. 3M City Mall interior view.

Functional characteristics

Orientation and Safety

On this building structure there is equal distribution of vertical circulations (Stair, ramp and elevators), this makes safe movement without any obstructions and adds visibility of circulation areas. Also horizontal circulations (lobbies and corridors) are wide and comfortable.

Because of lack of handrails the ramp is slippery (it is not safe) but the others are stable and slip-resistant.

Signage: This building lack detail signage or description about the building information but the building shape and lighting systems guide users of the building. Especially, for wheelchair users which use in the basement floor signage's which instruct how to be use needed.

iii. SHEKINAH building

Shekinah building is a Basement+G+7 story one of the newly constructed commercial buildings which are located at Bole Medhanealem, Addis Ababa, Ethiopia and it's found next to Bank of Abyssinia Tele Medhanealem branch on the road to embassy of Ukraine or near to Bole Medhanealem roundabout. The building has wide central circulation area which is covered by ceramic tile floor finish. Two (2) ramps one for car and 1 for wheelchair users, one (1) stair case, one (1) elevator and two (2) steps at the main entrance used to access the building.



Figure 13. Shekinah building view.

Physical characteristics

Stair type: The main stair case with elevator has 4.24m width with 1.24m stair landing area. A wide supportive steps are constructed which connect the site level to the building ground floor (which is elevated 1.12m and 69cm).



Figure 14. Shekinah building staircase views.

Number of stair steps (risers): The stair case has 8 steps in one flight and 7 steps in the next flight. The building has 2.5m room height. The 1st step has 7 steps and the 2nd steps which lead to the main entrance have 6 steps.



Figure 15. Shekinah building exterior steps view.

Stair Riser and Tread width: The building stair case has 16x32 cm rise & tread width and both front entrance steps has 17x32 cm rise & tread width respectively. The steps riser height makes tough to use for peoples with limited physical disability.



Figure 16. Shekinah building ramp view.

Ramp width and slope

Shekinah building has 1 ramp constructed for wheelchair users which leads to the ground floor then the users get access of the elevator in the central part of the building. It's a ramp which has 1.4m height rise, 1.4cm width with a one flight 5m run this means it have a steeper slope estimated to 28% slope with one side handrail. This means there is a big difference with the preferred slope for a building access ramp (8%).

Material and texture: The material used for the ramp is marble finish which helps them to move easily and for both steps & stair marble floor material used without handrail.

Color: Shekinah building was built on a small space so, all the activities are gathered in one place. They give more attention for the exterior color selection than the interior because the building doesn't create confusion (The stair and elevator are located in the center of the building).



Figure 17. Shekinah building interior and exterior view.

Functional characteristics

Orientation and Safety: There is a well-organized distribution of vertical circulations, but the landing of the stair is narrow also the combination of the stair and elevator creates clash by blocking peoples view. In addition, the ramp is not safe to use and the step lack rails.

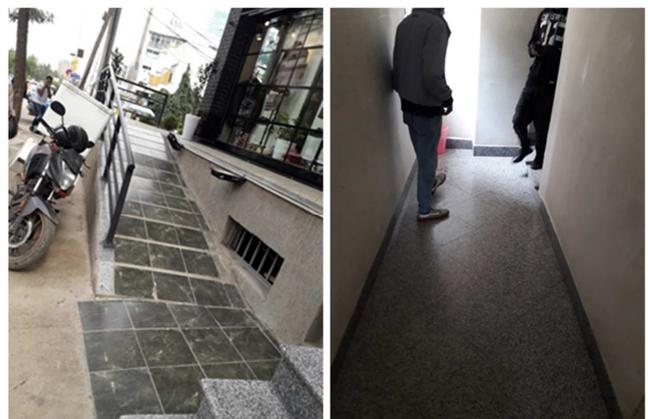


Figure 18. Shekinah building ramp and stair lading views.

Signage: The use of signs on this building is not so important that's why this building lack detail signage or description about the building uses.

iv. AYMEN Commercial center

AYMEN commercial center building is a G+9story newly constructed commercial building which is located at Mexico, Addis Ababa, Ethiopia and it's found next to K-Kare building on the road to Land Mark Hospital. The building has wide circulation area which is covered by ceramic tile floor finish. One (1) ramp for wheelchair users, one (1) stair case, one elevator and front entrance step used to access the building.



Figure 19. Aymen commercial center view.

Physical characteristics

Stair type: AYMEN commercial center building has one (1) main stair case & steps on the main entrance. On this building U-shaped stair used (fit with the building an architectural plan well and landing offer a palace of rest but its narrow). The main stair case has 3m width including 0.93m x 3m stair landing area. Wider steps are constructed to connect the site level to the building ground floor (the elevated height is 30 to 40cm).



Figure 20. Aymen commercial center stair case view.

Number of stair steps (risers)

The ground floor stair case has 11 steps in each flight and starting from the 1st floor the steps become 10 for each flight. The ground floor has 3.52m room height and the other floors have 3.2m room height. The main entrance step has 7 steps and the ground floor step has 3 steps.



Figure 21. Aymen commercial center interior space and steps view.

Stair Riser and Tread width: The building stair case and steps has 16x32 cm rise & tread width respectively and the riser height makes tough to use for peoples with physical limitation.

Ramp width and slope: AYMEN has a ramp which has 1.12m height rise, 90cm width with a one flight 4.48m run this means it have a steeper slope estimated to 25% slope with one side handrail. This means there is a big difference with the preferred slope for a building access ramp.



Figure 22. Aymen commercial center ramp views.

Material and texture: The material used for the ramp is combination of Terrazzo with marble floor finishing which is more or less good material for wheelchair users because its texture is not slippery also helps to move easily. For the steps and stair case marble floor material + Aluminum and steel rail used.

Color: This commercial building uses normal color types only for the beauty purpose of the building but the color of elevator and stair easily differentiated from the other.

Functional characteristics

Orientation and Safety: The distribution of vertical circulations (Stair and elevator) are good but additional activities on the lobbies creates obstacles. The ramp slope and lack of handrails on both sides make the ramp slippery also the existing ramp has broken finish.



Figure 23. Aymen commercial center additional activities and corridor steps views.

Signage: AYMEN building has no signs which instruct users how to get access and reach each service in this building. So, it lacks equal accessibility especially for wheelchair users.

3.1. A summary of the Provision for Accessibility Methods

Different vertical circulation systems used for the building structure. The most common types are stair, ramp, elevator and escalator. According to the data collected, there are three types of vertical circulation systems used in the selected four (4) commercial buildings. Those systems are presented and discussed above using different methods focusing on their physical and functional (design) characteristics.

3.2. An Overview of the Findings

People with limited mobility and wheelchair users have accessibility challenges in commercial building structures. The summaries of the issues are presented below.

Some of the buildings' stair cases have more continuous steps, tiring people out, and steps at their major entrances, and the height of the steps and stair riser makes it difficult to use. The majority of buildings lack secure ramp access, rational material selection, and a suitable color scheme, which is important for the rapid recognition. Also there is lack of fair distribution of ramps and wheelchair users are also discouraged from using ramp access on building structures since most buildings lack adequate signage or color/texture identification. Access for people with impairments is obstructed by additional activity in corridors. Likewise, wheelchair users are unable to access services such as bathrooms and lack the skills to use those that are provided.

4. Conclusions

Accessibility of commercial buildings for persons with physical difficulties explored by assessing four different commercial buildings in Addis Ababa. The study aims to assess the challenges they face on such kind of commercial buildings so, data was collected using various methods, and a comprehensive study was conducted to assess the factors that affect physical impaired people's access to commercial buildings and to make them accessible to them. Most

buildings provide elevators and ramps to create good accessibility but, this does not make their commercial building accessible because there are several factors that contribute to the absence of fair accessibility in commercial buildings which is discussed briefly in the above sections.

In general, the absence of fair accessibility in Addis Ababa's commercial structures is frequently attributed to standards-related problems, a lack of consideration by concerned bodies for the issue of accessibility and facility provision wherever necessary, a problem with design and construction quality, and Since it takes a large space to provide a vertical circulation system like a ramp, there's a space issue.

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