APPLICATION OF UNIVERSAL DESIGN IN HOME FOR THE AGED:

A case study of Thogoto Home for The Aged, Kikuyu

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A Research Project Paper submitted in partial fulfillment of the requirements for the Bachelor of Arts in Design Degree submitted to the School of the Arts and Design (StAD), College of Architecture and Engineering (C.A.E), The University of Nairobi

Submitted on 8th February 2013
DECLARATION
I, Kennedy Anjehele, declare that this is my original work and also affirm that to the best of my knowledge, this project has not been presented in this or any other University for examination or any other purpose.

Signed: ……………………………

Date: ……………………………

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A Research Project submitted in partial fulfillment of the requirements for the award of the degree of Bachelor of Arts (Design) at the University of Nairobi.

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DEDICATION
To my beloved mother, you brought me up well in the way of the Lord and taught me how to work hard. You encouraged me to never give up in life. Blessed are you among many women. And to my uncle Christiaan Adika, you’ve been there not only to mentor me but you’ve also championed for my academic achievement. Thank you and God bless.
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ABSTRACT
This research investigates on interior design for the aged in Nairobi, Kenya. It’s well-known that the ageing process brings into play many factors that can potentially restrict one’s life (the ageing) and lifestyle. As a result of the diverse needs of the aged, the environment they live in must be well suited to support them in their daily lives. Universal design can be used to change these environments and make them habitable for the aged. Universal Design is recommended for creating these assisted living environments because it is an approach to the design of all products and environments to be used by everyone regardless of age, ability, situation or experience (American Society of Interior Design, 2012).

Using qualitative data collection tools like focus groups, guided interviews and questionnaires, the researcher investigated the current facilities at Thogoto home for the aged and their conditions. In addition, the researcher has profiled the residents citing their daily lifestyles, medical conditions and their other special needs in life. The data analysis done established that Thogoto home for the aged, located in Kikuyu, Nairobi had not adequately applied Universal design principles and guidelines in designing the interiors, furniture, landscape, exhibition and display. The investigative research carried out at the site established that Universal design principles have not been applied so as to create an assisted living environment for the aged.

The data analyzed by the researcher has been presented in form of detailed reports of the findings, tables and photographs as data collection methods. In conclusion of this research, the researcher recommends the preferred and the most applicable design solutions using Universal design principles for the interior architecture, furniture design, landscaping design, exhibition and display at Thogoto home for the aged.
CHAPTER ONE

1. INTRODUCTION TO THE STUDY

1.1 OVERVIEW
This chapter provides detailed background information about the aged population in Kenya. In this chapter objectives of the research are outlined and the research questions to be answered. In addition, it provides a justification for the type of investigative research that the researcher will embark on as well as outlining the significance of such a study. This research paper will be concentrating on gerontology social design as well which is the study of the social, psychological and biological aspects of aging (Gerontology, 2012). In this research gerontology will be employed in studying physical, mental, and social changes in people as they age where their interior design environment will be the main interest.

The issue at hand is the development of Universal Design in the society today especially in Kenya. This philosophy of design is slowly gaining popularity in the whole universe because its aim has now evolved to creating an accessible universally designed environment for all from the beginning rather than focus on adapting things for individuals for a later time thus causing inconvenience. Universal design has been applied in enacting laws on building codes to improve accessibility to public spaces. Design is a problem solving activity where problems like the use of spaces concerning the interior spaces of any environment are put into consideration when solving the problem: Interior design is an art in which creativity and technology works together to accumulate a well-defined interior environment.

In Nairobi, there are buildings which have considered Universal design principles in their interior designs. Universal design as a design philosophy has been embraced to solve certain kinds of design problems both locally (for instance the Mall in west lands, Kenya has been designed with ramps instead of stairs so that everyone can access the top floors of the Mall) and internationally like the Ed Roberts Campus. Today, the principles of Universal design are currently being applied in modern day designs mostly in design of public spaces and homes especially homes for the aged. Universal design intends to design all products and the built environment to be aesthetic pleasing and usable to the greatest extent possible by everyone, regardless of their age, ability, or status in life (Rosemarie, 2009). Universal design ensures that all products will enhance usability.
to the customers. During design, one should consider ease of movement for the disabled with wheelchairs or crutches (Goldsmith 2000).

In the vision 2030 by the Government of Kenya, the aged have been given considerations and the government intends to provide their needs. This does not include the social life only but as well as their living environments (Kenya, 2007).

The principles of Universal design have been well employed in the design of the Tanzanian parliament by Architect Kimathi of the K&K Archplans where he puts these principles into consideration and this is shown by the presence of ramps for people on wheelchairs, stair case and expanded landings where people on wheelchair can easily access the building. The parliament is designed in a way that it is sunken, making it easily accessible by people in wheelchairs since the path from the gate is flat and leads straight to the doorstep with no uphill movements making a smooth movement of people in wheelchair. When the Universal Design principles are put into consideration, design problems are well solved. In designing the new Chiromo Morgue, Architect Abonyo, of the Tecta Consultants put Universal design into consideration in the interiors of the morgue. The presence of ramps, rails and wide doorways show that everyone despite their physical challenges, can easily access the morgue because of enough space within the morgue.

1.2 BACKGROUND TO THE PROBLEM
In a research compiled by Indexmundi on Kenyan Demographics in the year 2012, there were 1,102,420 aged people in Kenya; this formed about 2.7% of the total population. In Kenya, most of the aged people are taken care of by their families (Kenya Demographics Profile 2012, 2012). A few numbers of them do stay alone. In some cases, some do not have families and it is for this reason that the government of Kenya through special programs ministry and other well-wishers set up homes for them and provide care and food for them. One such home is Thogoto home for the aged that is located in Kikuyu, Nairobi.

1.3 STATEMENT OF THE PROBLEM
Universal design principles have not been adequately considered in designing the interiors at Thogoto home for the aged. The researcher conducted an investigative research where the key problem areas of investigation were landscaping, interior architecture, furniture design, exhibition and display.
1.4 OBJECTIVES OF THE STUDY
To investigate how Universal design principles have been employed in designing Thogoto home for the aged.

1.4.1 The Specific objectives:
1. To establish how Universal design can be used in creation of more space in the interiors at Thogoto home for the aged.
2. To demonstrate how universal design principles can be applied to the facilities and environment at Thogoto home for the aged to create an assisted living environment for the aged.
3. To establish how universal design can be used to enhance circulation and movement of human traffic at Thogoto home for the aged.

1.5 RESEARCH QUESTIONS
How can Universal Interior Design be used to improve the living environment for the aged at Thogoto home for the aged?

1.5.1 Other Research Questions:
1. Has Universal design been put into consideration in designing the Thogoto home for the aged interiors?
2. How has Universal design principles been applied to create an assisted living environment for the aged at Thogoto home for the aged?
3. Has Universal design been employed in enhancing circulation & movement of human traffic at Thogoto home for the aged?

1.6 RESEARCH PURPOSE
The researcher uses this research to improve on the existing interiors at Thogoto home for the aged. Another purpose of this gerontological social research/study is to describe situations and events of the Thogoto home for the aged by observing and then describing what he will be observing. This study explains the interiors at Thogoto home for the aged where the researcher will explain the general situation of the case study (Crossman, 2012).

1.7 SIGNIFICANCE OF STUDY
The researcher uses this study to learn about the needs and limitations of the aged population and the design requirements needed to be factored and capitalized in creating assisted living
environments for the aged. This study will at large help designers understand the aged society and their needs by comprehensively understanding Universal interior design. This proposed study will generally help students and researchers to have a deeper understanding of the studied Universal interior design whereby they will come up with possible solutions and guidelines on universally designed interiors. For the students who have specialized in interior design, the study will serve as their reference and guide in enhancing and expanding their knowledge and design skills.

Through this study, the government policy makers will be able to learn and understand the needs of the aged and by doing so; they will consider laying laws and regulations to regulate the building procedures and standards which will fever everyone in the whole society. Buildings will have to be universally certified for them to be built. This will also make the government realize how important architecture and design is for inclusion for all people. Both the physically challenged and the normal people will be able to enjoy the interiors of these buildings (universally designed buildings). This research will provide recommendations on the government and relevant bodies to come up with a policy on how Universal design can be applied in future buildings and interior spaces. The study will identify the gaps in the existing literature that talks about universally designed interiors through application of Universal design principles in filling those gaps.

1.8 JUSTIFICATION OF THE STUDY
This research project will contribute at large to the scarce and limited academic resources on design for assisted living environments available in the country to all people in the country interested in designing comfortable interior environments for the aged. The research project will be used as a resource for use by the management of the home in looking for funds for the purpose of improving the facilities so as to create a better assisted living environment for the aged.

1.9 LIMITATION THE STUDY
This study is limited to the four areas of interior design which will constitute the area of study:
1.9.1 Landscaping and Human Environment
1.9.2 Interior Design and Human Development
1.9.3 Trends and Styles in Furniture Design
1.9.4 Exhibition and display Techniques.

These four areas of interior design will be applied to the area of interest which is Universal Design. Each area was tackled separately looking at the principles and elements of design and Universal design in general. In the study limitations of this research paper, there are two variables that were considered which are: Effective Interior Design (being the dependent variable) and Landscaping, interior design, Exhibition and display and furniture (being the independent).

1.10 SCOPE OF THE STUDY

1.10.1 Concept
The study concentrated on application of Universal design in Thogoto home for the aged with reference to furniture design, interior architecture, landscaping and human development and exhibition and display.

1.10.2 Content
This whole study relied mainly on primary sources in collecting data and more information was acquired and got from secondary sources. All these materials, data, ideas and concepts were proposed to be applied in redesign of Thogoto home for the aged.

1.10.3 Geographical
The research was based in Nairobi, Kenya while its case study was Thogoto home for the aged.

1.11 DEFINITION OF TERMS
Universal Design- According to Wikipedia, free online encyclopedia, Universal design is a broad-spectrum of ideas meant to produce buildings, products and environments that are inherently accessible to both people without disabilities and people with disabilities (Universal design, 2012). Universal Design = Useable = Understandable

Environmental psychology- Psychological and social effect of the environment on the residents of a particular place.
Gerontology- Social design which is the study of the social, psychological and biological aspects of aging (Gerontology, 2012).

User-centered design- This is a project approach and a design philosophy that puts the intended users of a site at the center of its design and development. It does this by talking directly to the user at key points in the project to make sure the site will deliver upon their requirements.

Aging in place- Refers to a living place where one has lived for years, not typically in a health care environment or nursing home, using products, services, and conveniences which allow them to remain home as their circumstances change (aging in place, 2012).

Accessible design- Design focused on principles of extending standard design to people with some type of performance limitation to maximize the number of potential customers who can readily use a product, building or service.

Transgenerational design- The practice of making products and environments compatible with those physical and sensory impairments associated with human aging and which limit major activities of daily living (Transgenerational design, 2012).
CHAPTER TWO

2. LITERATURE REVIEW

2.1 Introduction

*Universal design is the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptations or specialized design.”* - Ronald Mace

..The movement, the Universal Design movement is really rolling now. I think it's caught fire and people are seeing the advantage of it and the profit from it and the common sense of it... - Ronald L. Mace, FAIA

In *Residential Remodeling and Universal design* (1996) Universal design is defined as a developing approach to creating live able, marketable environments for everyone as common practice in design. It is inclusionary design that applies to spaces, features, and products to maximize the number of people who can function independently in a particular environment. Universal design considers human needs and abilities throughout the lifespan; it is elaborated that Universal design attempts to meet the needs of people of all ages, sizes, and abilities. In general this concept includes the older, more narrowly focused concepts of barrier free and accessible design, but eliminates the stigma and special appearance to ensure marketability. It is often called life-span design, inclusive design, or Pans-generational design (U.S. Department of Housing and Urban Development: Office of Policy Development and Research, 1996).

According to Lidwell, ET la (2010), the principle of accessibility asserts that designs should be usable by people of diverse abilities, without special adaptation or modification. They add that there are four characteristics of accessible designs; **Perceptibility**; Achieved when everyone can perceive the design, regardless of sensory abilities which is done by presenting information using redundant coding methods (for example textual, iconic, and tactile), provide compatibility with assistive sensory technologies, **Operability**; Everyone can use the design, regardless of physical abilities through; minimizing repetitive actions and the need for sustained physical effort, facilitating use of controls, provide compatibility with assistive physical technologies (for example wheelchair access) and position controls and information to be easily accessed, **Simplicity**; Everyone can easily understand and use the design, regardless of experience, literacy, or concentration level; remove unnecessary complexity, clearly and consistently code and label controls and modes of operation, use progressive disclosure to present only relevant information.
and controls, provide clear prompting and feedback for all actions; and ensure that reading levels accommodate a wide range of literacy. **Forgiveness**: Designs should minimize the occurrence and consequences of errors; use good affordances and constraints (for example controls that can only be used the correct way), use confirmations and warnings to reduce the occurrence of errors and include reversible actions and safety nets to minimize the consequence of errors (for example the ability to undo an action).

The Center for Universal Design, an initiative of the College of Design, states the principles of Universal design as; *Equitable Use*: The design is useful and marketable to people with diverse abilities that is for people with and without disabilities and has the following characters; *Flexibility in Use*: where the design accommodates a wide range of individual preferences and abilities. For instance, a pair of scissors is designed in a way that can be used by both left and right handed people, *Simple and Intuitive Use*: easy to understand, regardless of the user’s experience, knowledge, language skills, or education level, *Perceptible Information*: the design communicates necessary information effectively to the user, *Tolerance for Error*: design minimizes hazards and the adverse consequences of accidental or unintended actions, *Low Physical Effort*: the design can be used efficiently and comfortably and with a minimum of fatigue, *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. (New “Principles of Universal Design” Posters available, 2011)

Universal design as a design philosophy has been embraced to solve certain kinds of interior design problems. Today, the principles of Universal design are currently being applied in modern day designs mostly in designing public spaces. Universal design intends to design all products and the built environment to be aesthetic and usable to the greatest extent possible by everyone, regardless of their age, ability, or status in life (Rosemarie, 2009). Universal design ensures that all products will enhance usability to the customers. During design, one should consider ease of movement for the disabled with wheelchairs or crutches (Goldsmith 2000).

### 2.2 Universal Design

Universal design is about access and inclusion as well as an added margin of safety. This is why Universal and aging-in-place design is so closely matched. Universal design is the legacy of the
late Ron Mace, FAIA, and founder of The Center for Universal Design at North Carolina State University (aginginplace, 2012).

According to a report by Valenziano of The Casino Reinvestment Development Authority in 2012, Universal design is a philosophy of design that recognizes, and attempts to accommodate the broadest possible spectrum of human ability in the design of all products and environments. It requires sensitivity to, and knowledge about people of all ages and abilities. Sometimes referred to as “lifespan design” or “transgenerational design,” it encompasses and goes beyond the accessible, adaptable, and barrier-free design concepts of the past (Valenziano, 2012).

A report done by Centre for Universal Design in 2012 suggests that there should be adequate space provided outside all entrance doors to enable people to maneuver, understand, access, and use any intercom or entry system. When leaving a building, people often pause outside an entrance to button a coat or open an umbrella; there should be sufficient space to do this without obstructing other people who are entering or leaving the same building. Where entrances are located at the top or bottom of a ramp or a flight of steps, or at the end of a long passage, it is essential that sufficient space is provided for wheelchair users; parents with strollers; people with visual difficulties; guide dog users; and those with walking aids to maneuver and turn safely. The recommended clear area for a landing or turning space immediately outside an entrance is 2400mm x 2400mm (Centre for Excellence in Universal Design, 2012).

According to a 2003 American Association of Retired Persons (AARP) study, more than three quarters of respondents said it’s important to have non-slip floor surfaces and bathroom aids such as grab bars or a bathing stool. Accessible bathtubs take into account the needs of the aged in addition to aesthetics. An accessible bathtub needs more than just a few grab bars. These tubs usually incorporate a deeper soaking tub style, built-in seat and walk-in door. This way, the bather doesn’t need to risk losing balance by stepping over the high bathtub wall. The typical walk-in bath has a hinged door that can easily be latched and unlatched. A new alternative is a rising wall bathtub, in which the entire outer wall of the bathtub raises and lowers easily. The extra-wide door opening allows a person to lift legs in and out of the bath and transition from a wheelchair (Gurney, 2012).

Michael Leite, P.E. of the Centre for Universal design suggests that a Universal design should be more than universal and can be of User-centered Design. He suggests that the design must
accommodate the specific needs and disabilities of the intended occupant rather than meeting the needs of the general population. In this way the impact on the existing structure is minimized and the project is more affordable. (Michael Leite, 2012)

Universal design for home for the aged design focuses on entrances and site designs (landscape), doors and doorways, bathrooms, exterior living spaces such as decks and gazebos and interior living spaces. Universal Design will highly be applicable in designing Thogoto home for the aged interiors because of the different categories of people found there on daily bases: the residents (beneficiaries), who are the elderly, the members of staff who are the casual workers and a wide range of visitors who visit to donate food and know the needs of the old. To be able to design a space, Universal design follows seven principle guidelines which when considered in designing home for the aged will be of great benefits to the aged and their assisted living environments (New “Principles of Universal Design” Posters available, 2011).

2.2.1 Equitability in use
According to Bettye Rose Connell, all designs should be useful and marketable to people with diverse abilities. The design aims to provide the same means of use for all users. She argues that the designer should avoid segregating or stigmatizing any users. He/she should ensure provisions for privacy, security, and safety should be equally available to all users and more so, he should make the design appealing to all users.

A report done in 2008 by Centre for Universal Design Environments, describes Bathroom doors as wide enough to allow comfortable passage. In order to accommodate a wheelchair, (a standard wheelchair is 24-27” wide), doorways should be a minimum of 32” wide and if the doorway is located in the typical hallway and requires turning a wheelchair, one needs a 36” door for easy rotation, when it is open in a 90° position to provide wheelchair access. A narrower width may possibly be adequate, particularly when a bathroom door location allows a straight wheelchair approach. Also, in order to increase accessibility, easy-to-grasp lever door handles should be installed on all doors (Centre for Universal Design, 2012).

Universal design is brilliant in that a well-done Universal design functions well for everyone, and in many cases it’s accessible to everyone without looking institutional. Examples of this inside the home would be showers that look like any other high-end bathroom but can accommodate a wheelchair, or grab bars that match the home’s decor. In the figure 1 below, grab bars have been
installed to allow for accessibility whereas the washroom facility can be used by everyone. There is a grip which is rail or post to hold onto provides balance and stability for those who may be unsteady on their feet. There is enough space in the washroom which creates enough accessibility to every component of the bathroom, the space provided at the lavatory and shower area helps one help themselves without any shortcomings (Marciniak, 2012).

Figure 1: Aged Care Bathrooms

Figure 2: Bathroom


The grab bars are a wonderful feature in any bathroom, and make the room safer and more convenient for anyone to use. These grab bars should be installed next to the toilet and in bathing areas as seen in the figure 1 above. They should be 2.5cm -3cm in diameters. Also, the space between the grab bar and wall should be 2.5cm to 4cm. These grab bars help the older people who find bathing very difficult if they cannot bend over easily to hold onto them and bend easily and reach certain body parts. The grab bars are also important in that they provide balance and safety (towel racks are not strong enough) and grab bars assist the aged to get up from the toilet and get in and out of the shower. There must be grab bars in the shower enclosure, and along the bathroom wall of the walk-in route. If a walk in bathtub is installed, there must be grab bars installed on the bathtub length wall. There must be grab bars along the toilet wall. Left or right, as the case may be (Bathroom safety: How to make the bathroom safe for showering, 2011).

Ramps are the most familiar residential and commercial accessibility modification which can be easily used by everyone despite their physical challenges. Some residents are concerned that
ramps label the occupant as vulnerable and make them more susceptible to break-ins (Accessibility for the Disabled - A Design Manual for a Barrier Free Environment, 2003).

On the other hand in addition, high toilet seats are ideal for ambulatory bathroom users who have difficulty getting to their feet from a sitting position on their wheelchairs. An accessible toilet with a high seat is 7-12cm higher than standard seats and this reduces the need for lowering and lifting oneself on and off the seat. Elevated toilet seats are 43cm to 48cm above the finished, compared to standard seats at 35cm or 38cm. Flush controls are placed on the open side of the toilet with the most clear floor space and mounted no higher than 111cm above the finished floor. If the toilet is not accessible enough, an extra toilet sit is added to allow for accessibility. This is a result of the seat having to be deeper to accommodate the extra seat width and the weight of a larger person. A bariatric toilet seat is prevented from moving, slipping, or sliding by the use of rubber bumpers that hold it in place against the toilet pan. These seats are manufactured from a strong lightweight, durable and easy clean plastic. They have a long lifespan and they can be fitted to most regular toilet pans, both round and oval. (Difference between a regular toilet seat and a bariatric version). Figure 3 below elaborates this feature. Many aged people suffer from osteoporosis, arthritis, or temporary injuries and find it hard to stand up from a normal height toilet–a higher toilet (or toilet chair that fits over the existing toilet) helps fix this challenge. (aginginplace, 2012)

**Figure 3:** Extra-large seats

![Extra-large seats](http://www.healthandmobilitystore.com)

**Source:** http://www.healthandmobilitystore.com
2.2.2 **Flexibility in use**

Connell states in the book *The Principles of Universal Design and their application* that every design should accommodate a wide range of individual preferences and abilities. It should provide choice in methods of use and should accommodate right- or left-handed access and use. In the figure 4 below, the stairs have been improvised where new metal rails have been put so that people on wheel chair can access this area and figure 5 shows a curved ramp installed with hand rails. Furthermore, there is a vertical rail put to help the wheelchair users to pull themselves up in case they don’t have someone to push them up. This rail separates the two sections of the stairs. According to this principle, a Universal design should also facilitate the user’s accuracy and precision. All designs should however facilitate adaptability to the user’s pace (THE PRINCIPLES OF UNIVERSAL DESIGN, 1997).

The importance of the use of handrails for the ‘varying needs of users’ is explained with details by Sawyer and Bright in The Access Manual: People with impaired vision often rely heavily on handrails to orientate themselves on staircases, to determine when they have reached the top or bottom of a flight of stairs or steps or in establishing a change of direction. All people will need a handrail that is easy to grip if they trip or fall on the stairs. Therefore, it is important that a handrail is visible, reachable, is strong enough to provide physical support if needed and offers good tactile information about the stair to the user, both when ascending and descending the stairs (Sawyer and Bright, 2007). Older people with walking difficulties or health problems may struggle with long flights of steps; therefore the maximum number of risers (steps) in a single flight should be 12 with resting places between successive flights. The minimum number of steps to be provided in a flight should be 3. All steps should have the same dimensions and should be surfaced with a slip resistant material (Bright, 2004).
According to Inclusive Mobility (2002), most people can manage a riser (step) height of 100 mm minimum and a maximum riser height of 170mm, the ideal riser height being 150mm. The ‘goings’ (step length) should be 300mm deep and no less than 200mm and the nose (edge) of the step should have a rounded radius of 6mm avoiding any overhanging that may catch a foot and cause a person to trip. In addition, step noses in a contrasting color with a depth of 55mm need to be provided across the full width on both the tread and riser to help visually impaired people. Also, appropriate hazard warning surfaces should be provided at the top and bottom of each flight of the stairs (Sawyer A., 2007). Keeping paths as level or as gently inclined as possible is one way of making them accessible to as many people as possible. We can also make these surfaces Americans with Disabilities Act of 1990 compliant, allowing wheelchairs to easily roll across them. Asphalt is good, gravel is bad.

According to a report by Centre for Universal design, a reception area or entrance foyer may comprise an open-plan hub at the center of a large, busy building, connecting circulation routes on the entrance-level floor and to and from other floors. All circulation routes should be clear and unobstructed and provide an obvious route of both exit and entrance. The reception desk should be placed conspicuously so that it is obvious to everybody where it is located. The route to it from the entrance should be direct and unobstructed. The desk should be usable from both sides at a height of 950 to 1100mm for people standing and 760mm for people sitting down or using a wheelchair. The Centre also recommends that a powered, height-adjustable desk may be
considered in some applications for instance in the figure 6 below, the reception desk meets the required dimensions above hence everyone can use it (Centre for Universal Design, 2012).

**Figure 6:** A reception desk with two levels.

![Reception Desk](image)

**Source:** www.universaldesign.ie

**Landscape Accessibility:** The ability to move confidently through the landscape or garden is the key to enjoyment. Regardless of vision, dexterity, balance, endurance or mobility, it should be easy to find your way around (or your way back). One of the key principles of Universal Design is to keep the design unobtrusive so that it blends with the existing landscape/new landscape which is part of accessibility especially for the aged. In the figure 7 below, the landscaping has been design in a way that’s open and one can easily access the landscape all round: because of the circular pathway. The aged people feel more comfortable in an open landscape will less structure to ease their movement (lowes, 2012).

**Figure 7:** Accessible Traditional Landscape Design

![Landscape Design](image)

**Source:** http://www.houzz.com
Any physical limitations such as reduced ability to bend, kneel, lift, reach or grip must be considered when building or adapting the garden in landscaping. Raised Beds - Bringing the garden to the gardener is the idea behind using raised beds. The traditional raised bed (18” tall, more or less) is used here and additional 6” wide boards can be added to increase the height of the bed making it more accessible. Beds up to 3’ tall allow the gardener to stand while working. These can be made from brick or block and stained for a more natural look. A shorter raised bed with a built-in bench added would allow the gardener to sit while working and allow wheelchair access. Bench - A comfortable bench to rest on is a welcome addition to any garden. If necessary, find one that allows easy transfer from a wheelchair. Containers - Whiskey barrels, hanging baskets, and large pots (on the ground or on platforms with casters) can make plants accessible without excessive bending or banging knees (Lowes, 2012).

For gaining access to, and getting around the garden, there should be smooth paving with turning places, raised edgings especially on corners, handrails and gentle gradual slopes in place of steps are essential for wheelchair gardening. Pathway lighting and spotlights around the raised beds and borders will help to keep on gardening as the nights draw in. Well thought out lighting can also add interest to a garden and if you are going down the wildlife friendly route, good lighting makes spotting the wildlife visitors to your garden easier at night. In garden design for wheelchair gardeners, good well thought out garden design for wheelchair access, will make gardening easier if you’re using a wheelchair or have a disability that stops you bending and I have covered layout on the disabled garden layout page. Raised beds (flower beds), reachable borders, hanging baskets and accessible arbors and trellises all make gardening easier without having to bend down to reach your plants. Some hanging baskets even come with their own pulley system so they can be raised and lowered from your wheelchair (Flowerpotman landscape gardeners, 2012).

The aged and wheelchair users need larger bathrooms spaces to allow for maneuvering in the bathroom. The more space that’s left for maneuvering around a bathroom in a wheelchair (or with a walker) the easier and safer it is going to be to the user. Wheelchair handicapped accessible bathroom dimensions require at least 5 feet (60”) in diameter to make a 180 degree turn. To conserve space, a T-shaped turning space with aisles 36” wide allowing a three-point turn is also acceptable. A portion of the diameter or T-shaped turning space may be located under fixtures as long as the required knee and toe clearance is provided. The space can be positioned for a forward or parallel approach to equipment. The bathroom doors should be wide enough to allow
comfortable passage of people on wheelchairs and the aged who normally need big space to operate. In order to accommodate a wheelchair, (a standard wheelchair is 24-27” wide), doorways should be a minimum of 32” wide. If the doorway is located in the typical hallway and requires turning a wheelchair, one needs a 36” door, when it is open in a 90° position to provide wheelchair access. A narrower width may possibly be adequate, particularly when a bathroom door location allows a straight wheelchair approach.

Tool Base Services, a housing industry resource, says to have at least one, first floor accessible bathroom allowing for a 60-inch turning radius or acceptable T-turn space of 60-by-60-inches square. Walk-in showers with little or no threshold offer the easiest accessibility. Bathtub retrofits with hand-held showerheads or walk-in bathtubs are other options. Furthermore install higher, 17- to 19-inch, comfort height toilets instead of the standard 14-inch toilets, to make it easier for the elderly to stand up. Wall-hung sinks accommodate wheelchairs. Use lever-style faucets and door handles that are easier to grasp. Toilet paper holders that can be changed with one hand should be installed to consider those with one hand. (Certified Aging in Home specialist Jamie Goldberg)

2.2.3 Simple and Intuitive
Connell explains that every design should be easy to understand, regardless of the user’s experience, knowledge, language skills or current concentration level. One should aim at excluding unnecessary complication. One should also be consistent with user expectations and intuition. The design should accommodate a wide range of literacy and language skills. It should arrange information consistent with its importance and after completion should provide effective prompting and feedback. Also, in order to increase accessibility, easy-to-grasp lever door handles should be installed on all doors.

Here, Universal design promotes understanding by making methods of operation and use intuitive, clear, and unambiguous (Steinfeld, 2012). Curb cuts intuitively became “universal” as they accommodated baby strollers, delivery workers, and roller blade users, skate-boarders, and cyclists, travelers with roller bags, blind people, and middle-aged runners. In the figure 8 below, a blind person uses a carb cart which has a special effect (texture): this texture helps the blind and visual impaired to know that they’ve reached a certain point to stop, turn or even sit (aginginplace, 2012).
2.2.4 Perceptible information

Connell explains that one should ensure that the design communicates necessary information effectively to the user, regardless of ambient conditions or the user’s sensory abilities. One can do this by use of different modes which are pictorial, verbal or tactile for redundant presentation of essential information. It should provide adequate contrast between essential information and its surroundings. The designer should maximize "legibility" of essential information and should differentiate elements in ways that can be described (i.e. make it easy to give instructions or directions). The design should provide have compatibility with a variety of techniques or devices used by people with sensory limitations. This principle of Universal design is employed in detailed and visible signage system around the Tanzanian parliament building which are used to direct people to different parts of the building. (Kerongo, 2009) These signage is justified by research conducted by Roger Whitehouse for his way finding and signage systems at the Lighthouse Inc. headquarters in New York City found that painting doors and/or their frames a color that contrasts strongly with the wall in which the door is located, provides a visual cue that helps everyone find the right door. Roger affirms that by painting the door a color that contrasts with the adjoining walls, all customers know which door to use at a particular time (PROBLEM: How do you make important doors clearly perceivable by everyone, including people with low vision, 2012). In landscaping guides are vital components where large areas can prove more than physically tiring. Being lost is not an enjoyable experience. Simple arrow markers or signs can

Source: http://aginginplace.com
assist those with restricted eyesight or reduced memory (Iowes, 2012). Universal design provides awareness by ensuring that critical information for use is easily perceived (Steinfeld, 2012).

According to Centre of Universal design, Horizontal circulation in a building may comprise access routes through open-plan areas, walkways, corridors and lobbies. The overall arrangement of access routes should be logical, understandable, useable, and as direct as possible in terms of providing access to key facilities. Travel distances should be minimized, although this of course will depend on the nature and size of the building. A well-designed building layout, with clear circulation routes that are easy to follow will benefit everybody. Changes of level within a storey should be avoided if at all possible. Where this is not possible in an existing building, the installation of a ramp, passenger lift or platform lift may need to be considered and designed to be accessible.

2.2.5 Tolerance for Error
Each design should minimize hazards and the adverse consequences of accidental or unintended actions. Elements should be arranged in a way to minimize hazards and errors: most used elements, most accessible; hazardous elements eliminated, isolated, or shielded. The designer should provide warnings of hazards and errors. More so, he should provide fail-safe features and discourage unconscious action in tasks that require vigilance. Avoid abrupt or extreme drop-offs and pavement edges which may cause discomfort. Paths need to be 36" wide for a wheelchair, five feet wide for two people to walk side by side. A five-foot turnaround area is required for wheelchairs (Centre for Universal Design, 2012).

2.2.6 Low physical effort
The design should be of appropriate size and space is provided for approach, reach, manipulation, and use regardless of user’s body size, posture, or mobility (Centre for Universal Design, 2012). The Tanzanian parliament is designed in a way that it is sunken, makes it easily accessible by people in wheelchairs since the path from the gate is flat and leads straight to the doorstep with no uphill movements making a smooth movement of people on wheelchair. At the door steps of the parliament, there are ramps and rails (for support for the blind and people on single crutches) which enable the wheelchair user to ride downhill on a ramp easily. In the figure 9 below, the door can be easily opened by an elbow because the person is carrying lots of things she can’t use her hands to open the door. There is low physical effort used to open the door.
In landscaping replacing steps with long ramps to ease on accessibility thus low effort is needed for movement, slopes should be flat or gentle to make easy flow of wheelchair. Pathways are firm, wide, flat; level, well-drained and maneuverable pathway is a must. Paving or brick is best. Paving, however, is expensive and retains heat making it unsustainable and it’s not good for the aged. Loose material (such as crushed stone) must be firmly packed for stability and easy movement. In universal design, it’s recommended that there should be lever handles on doors and plumbing fixtures: Hand strength can be an issue with all ages–using a simple lever eliminates the struggle with operating doorknobs and faucets. The aged prefer long handles which makes it easier to open the doors. (aginginplace, 2012)

According to a report by the Centre for Universal Design Environments, when modifying an existing entrance, options to create a step less entrance include ramps, vertical platform lifts and landscaping. Each is appropriate for a particular combination of resources, heights, and site conditions. The advantages and disadvantages for each option must be carefully considered. The construction of step less entrance favors the aged because they do not use a lot of effort to get into the building.

The handrails in the bathing area, sliding doors with long horizontal handles, kitchen base cabinets on easy-to-roll castors, and clear and ample space in the entry, kitchen, and bathing area all contribute to ease of use. Loop handles and hardware minimize twisting of the wrist or
grasping. All electrical and other operating controls (including window operators) require little effort from the user. Other features are either within the reach range of children and others of short stature as well as standing or seated users or can be brought within that range with minimal effort. For example, the second floor can be reached via the elevator. The floor surfaces are smooth and the raised thresholds and abrupt changes in level are eliminated (General Features of "Life-long Housing", 2012).

2.2.7 Size and space for approach and use

Appropriate size and space is provided for approach, reach, manipulation and use regardless of user’s body. It provides a clear line of sight to important elements for any seated or standing user. Connell explains that the design should make reach to all components comfortable for any seated or standing user. It should provide adequate space for the use of assistive devices or personal assistance and accommodate variations in hand and grip size for instance in figure 10 below the ramp is wide enough to accommodate any size of a wheelchair. Current ramp access standards allow 1:12 for a slope on a ramp, which makes it easier and comfortable to move on the ramp. Universal Design can be applied in several aspects during design of an interior environment.

The aged with mobility issues and those with physical disabilities need bathrooms that are designed especially for their maneuvering and navigating needs. By making designs that accommodate creative adjustments and installations of specialist items, bathrooms for the elderly are being fashioned with safety, ease of use, comfort and easy accessibility in mind. With the elderly, there are quite a few movable items and danger zones to avoid, and the bath tub is the greatest culprit. The bath tub is a common element that has been the cause of many nasty bathroom accidents. In the figure 11 below the washroom has been designed with grab bar next to the lavatory helping the user stand up comfortably. The grab bar is designed in a stretched ‘L’ shape which favors users of different heights to use the lavatory.
Figure 10: Wide ramp installed

Figure 11: Bathrooms for the aged

Source: http://www.rollaramp.co.uk

Source: http://suite101.com/interiordecorating

Looking at research which was conducted by Roger Whitehouse for his way finding and signage systems at the Lighthouse Inc. headquarters in New York City found that painting doors and/or their frames a color that contrasts strongly with the wall in which the door is located, provides a visual cue that helps everyone find the right door. This is evident in Chevron gas stations which have employed this concept for years in the design of their restroom doors which promotes design for all. Roger affirms that by painting the door a color that contrasts with the adjoining walls, all customers know which door to use at a particular time (PROBLEM: How do you make important doors clearly perceivable by everyone, including people with low vision, 2012).

Rosemarie Rossetti, Ph.D. developed ten myths about universal design which she believes that there are many misconceptions about universal design. One of the myths is: A home using universal design looks ugly, institutional and stereotypes the home so people know it was designed for a person with a disability. The reality is that: Professionally designed homes with universal design features and products enhance the beauty of a home while making it functional for people with disabilities, as well as convenient for people without disabilities and the aged. Universal design is for everyone, not just people with disabilities. The second myth is: Universal design costs more due to the building design and products with universal design features, such as windows, appliances and plumbing fixtures. Her experience building her own home, the Universal Design Living Laboratory (www.udll.com), national demonstration home in Columbus, Ohio, has shown that there are many choices when it comes to selecting products for the home.
Those with universal design features are not more expensive as a general rule. In fact by adding design features and products that support universal design, the home will have more value to the occupants because it will be more usable for a lifetime. Third myth: Universal design takes more square footage. Space planning is critical in home design especially when the homeowner uses a wheelchair or aged. As a person who uses a wheelchair, she is very cognizant of where extra space is needed and how to be conservative with space planning when creating a floor plan. By creating an open plan with fewer hallways, square footage can be conserved. By putting adequate space in the kitchen and bathrooms, there will be a lot more accessibility, comfort, and convenience. A universal design home need not have additional square footage, but rather have adequate room for a person to navigate the home from a wheelchair. The fourth myth: The resale value of the home will be less due to limiting the number of buyers who would be interested in these universal design features. Universal design is for people of all ages and abilities. Many are opting to renovate their homes, and others are choosing additions to help them to age in place. Universal design features provide for safety and add value to a home. The fifth Myth: Universal design homes have ramps at the front door causing the home to be labeled as a home for a person with a disability. The reality is that in order to create a no step entrance, there are some instances where a ramp at the front door is the only solution. However, by modifying the grade around the home, there are many properties that can be designed with a no step entrance. If ramping is needed elsewhere, such as in the garage, side door, or rear door, the ramp is not visible from the street. The sixth Myth: Only a small number of people with disabilities and the elderly will benefit from universal design. Universal design is human-centered design. The inclusive design of spaces and products will benefit people of all ages, with or without physical or mental limitations. No one can predict when a short term or long term disability will be a part of our lives. It is far better to plan for homes to accommodate us as we age rather than to be forced out of our homes when circumstances change (Ten Myths about Universal Design, 2005-2011).

As a Universal design exemplar, The Sekisui House, Ltd. developed a house (General Features of "Life-long Housing “design) with a base level of access that could be modified with little additional construction, should additional environmental supports be necessary or desirable. The houses have many expected features such as wide doors with long, vertical handles and kitchen and bathing areas with adequate clear floor space to allow someone using a mobility aid, wheelchair, walker, cane, or crutches to comfortably and safely maneuver and approach all
fixtures and appliances. Included also are sufficient amounts of clear floor space for someone using a mobility aid to maneuver or for someone to assist another person in their self-care. Additional considerations include aligning rooms so a person could, via an overhead track lift, go from their bed directly to the toilet and then into the bathing area. In instances where a person might need continual care, the floor plans of homes are designed to allow the addition of a suite customized for a family member or for a caregiver (General Features of "Life-long Housing", 2012).

At the entrances of these houses there is a change in level, generally a single step, is traditionally found just inside the primary or front entrance of most Japanese homes. The step has been maintained and the needs of someone who walks with difficulty or cannot walk are accommodated in some "Life-long Housing" by placing a lift in the entryway. The lift is designed so it recesses into the floor and is invisible when not in use. Another successful design is found in some two-story homes with an attached garage. An elevator is located just inside the house between the house and the garage and doubles as the passageway between the two. The elevator has two doors, one on the house side and the other into the garage. As someone leaves the garage they may enter the elevator to travel to the second floor or pass through the elevator cab on the first floor, using it as a hallway. If the garage must be below the house level, the elevator may take a person up to the main house level, bypassing the step at the front door.

According to a report by Centre for Universal Design, the design of an entrance/reception has a significant influence on both the appearance and functionality of the building. Entrances signify the point of access to a building; provide a focal point for staff, residents and visitors; and serve to welcome people into the building. They may also characterize in a visual and practical way the ethos of the building or organization and its approach to universal design. A clearly visible and accessible entrance is likely to create a positive impression for all building users and make them feel welcome. If an entrance is hard to find or if it is difficult to access due to heavy doors or narrow door width, it creates a poor first impression and may make some people feel less welcome or even excluded (Centre for Universal Design, 2012). The design of reception and waiting areas, and the ease in which people are able to move independently around a building, have a similar influence on overall accessibility. A well-designed building layout with clear access routes and doors that are sufficiently wide and easy to operate will demonstrate a commitment to universal design throughout (Centre for Excellence in Universal Design, 2012).
In the kitchens of these houses there are provisions of continuous knee space beneath the countertop, the cooktop, and the sink as seen in figure 12 below. To maintain flexibility and retain base cabinet storage, the kitchen is equipped with movable base cabinets that may be positioned where desired. All exposed plumbing is protected with removable covers. Controls are located near the front edge of the fixture or appliance or on the apron (narrow appearance and support panel), within easy reach. Kitchens are designed to support both sitting and standing users. Pedestal tables with a recessed base provide knee space for diners or meals (figure 13). The traditional Japanese style of dining, seated on a cushion on tatami mats was carefully examined to create a dining area that combines the cultural needs with the functional needs of a person in a wheelchair. A table with uneven legs is one solution. The end of the table with the shorter legs (approximately 12 inches long) rests on a 17-inch high platform with tatami mats. The end with the longer legs rests on the floor level used by a person sitting in a wheelchair or a Western style dining chair, placing the table height at about 29 inches—within a good range for most seated people (General Features of "Life-long Housing", 2012).

**Figure 12:** Universal Kitchen  
**Figure 13:** Pedestal tables

Doorway widths and clear floor area at doors allow unrestricted maneuvering and rooms are planned with sufficient floor space to allow easy access by a person who may use a mobility aid permanently or intermittently. Electrical outlets, switches, window operators, appliance controls, and faucet controls all can be approached and operated by standing or seated users. Knee space adds to space for approach and use of sink and cooktop by seated users, including a person who wishes to rest on a stool while performing tasks. Spaces are designed minimizing the number of sharp and tight turns that must be made if a person is using a wheelchair.
American Association of Retired Persons (AARP) indicates that the kitchen is the single place where universal design can have the most impact. Counter tops should be at an easily accessible height. Side by side refrigerators are easier to negotiate than those with freezers either above or below. Storage should allow easy access to contents via pull out drawers or lazy-Susan-type devices. Faucets are easiest to control with a single lever instead of multiple knobs for hot and cold (LoveBeingRetired, 2010).

2.3 Assisted living
In designing for the aged, the major design factors that are looked into are the indoors environment (where they sleep, where they have their meals and washrooms), the outdoors (this the general landscape of their residents), furniture fittings and equipment and other general issues like flooring and lighting.

2.3.1 Design for Indoors
The bathrooms for the aged are recommended that they should be well illuminated with both artificial lighting and natural daylight. A casement window is generally the easiest to use and a skylight is another way of bringing daylight into the bathroom. Shower interiors are often dark when the curtains are closed, so a waterproof light fixture is recommended inside stalls and above tub/shower enclosures which allows light in.

The Sekisui House, Ltd. developed a house (General Features of "Life-long Housing ‘design) and in the bathrooms there are trench drain installed that runs in front of the door, eliminating any step or raised threshold making it accessible for the aged on wheelchairs. There is sufficient maneuvering space for someone to enter using a mobility aid or for someone to assist. The controls for the shower and the tub are in close proximity and near the center of the shower area, within easy reach of a seated person. Sometimes the bathing and soaking areas share a movable faucet and a single set of controls. Bathing fixtures are equipped with antiscald valves. Tub controls are mounted on the outside edge of the tub, minimizing reaching, stooping and bending. The showerhead has two wall clips, one high and one low, or a slide bar for greater choice in showerhead position. The long vertical handrail at the foot of the tub offers a secure grasping surface, anywhere along its length, for people lowering themselves or standing up, and is especially helpful for someone who is unsteady on their feet. The large translucent window adds natural light (General Features of "Life-long Housing", 2012).
2.3.2 Design for Outdoors

Design for outdoors is generally landscaping, lawn, trees and park bench. Walking outside is extremely important for older people to remain mobile and independent for longer. However, older people have different walking distance and speed abilities and for some of them with limited functions and mobility difficulties, walking may only be possible with the help of walking aids. In all cases, the change in level on footways and footpaths becomes an important factor that influences older people’s ability to walk which in turn affects the quality of their walking experience and interaction with the external environment. Outdoor environments provide opportunities for physical activity, contact with nature and social interaction. In a study carried out by OPEN space Research Centre Edinburgh College of Art, concludes that older people living in an environment that makes it easy and enjoyable to go outdoors were more likely to be physically active, healthier and more satisfied with life.

According to a report by the Centre for Universal Design Environments, when modifying an existing entrance, options to create a step less entrance include ramps, vertical platform lifts and landscaping. Each is appropriate for a particular combination of resources, heights, and site conditions. The advantages and disadvantages for each option must be carefully considered.

Burton and Mitchell (2006), attempts to explain how accessibility affects older users of the outdoor environment while walking along unimpeded: They explain that any level change can create barriers for people who are frail, have an unsteady gait of a visual impairment. People who find it difficult to lift their feet, such as those with arthritis, and people with visual impairments who struggle to see steps, find ramps easier to use and those who suffer from these problems are mainly the old and aged. Other people, such as those with unsteady balance and use crutches and walking sticks, tend to find steps easier and safer than ramps, including a participant with dementia who said that “ramps, especially zigzags, are very difficult to come down. They are tiring and unbalancing. Going down is harder than going up”. However, both steps and ramps can be challenging for people with mobility problems of low stamina. (Burton and Mitchell, 2006)

Accessible paths traverse the grounds, allowing complete access to living, work and natural areas. On-grade entrances facilitate moving between indoors and outdoors. Changes in surface materials signal changes while enrooted and from paths to natural areas. Paths are made of imbedded solid
materials for stability and low-maintenance. Outdoor areas feature places to bring work into more natural surroundings (General Features of "Life-long Housing", 2012).

2.3.3 Furniture
In Simona Rusnakova’s (of home line furniture) 2012 report, she finds out that when looking into the living room furniture for the aged, one should get that there are some things to make sure the furniture has. For instance:

- **Firm furniture.** Most people will look to buy soft sofa for comfort but these can be hard for the elderly to get out of. If you have a problem finding firm seats in a normal store then you should try office furniture stores.

- **Chairs with armrests.** When you buy chairs make sure that they have sturdy armrests. The armrest will allow the elderly person to get out of the seat better. It is important that the armrests are not soft and are strong enough to handle the weight of the person.

- **Chairs with electric mechanisms.** There are many chairs out there that look similar to a recliner but in fact tilt forward. This is ideal for older people as the chair does most of the work of getting them out and standing. Of course you want to get one that is good quality and one that will not stop working after a short time.

- **Fabric upholstery.** While this may not be a problem for all elderly people there are some who occasionally slip down the sofa without meaning to. This can be prevented by having sofas with fabric upholstery instead of polished leather.

- **Non-slip legs.** The bottom of the legs of furniture should be non-slip so that the item does not move when the elderly are trying to get out of it.

She affirms that while it may be fine to simply keep all the things you should get in mind you should know about the things that need to be avoided as well:

- **Low furniture.** Some people make the mistake of thinking that low furniture would be better for elderly people but this is not true. High tables and chairs are better as people can get in and out of them easily. The lower the furniture the more energy the elderly have to expend getting out of them.

- **Flimsy furniture.** There are certain items of furniture that look better when less but you need to have sturdy furniture. The furniture should not be flimsy enough to tip too far or collapse.

She says that when one is looking for furniture that is suitable for the aged one should keep key facts in mind. These facts will include the need for armrest, the sturdiness of the furniture and the height of the furniture. It is only by remembering this that you will get furniture that the elderly can easily get in and out of by themselves. (Furniture and the Elderly, 2012.)
In Myrland Stables’ report on Assisted Living Furnishings the author asserts that, the aged people unlike young and energetic people are not always strong enough to lift their bodies out of furniture. Certain considerations need to be observed when designing furniture for the aged. Furniture for an aged person needs to be firm so that she/he does not sink into the furniture making it difficult for them to get up from the furniture. Also, furniture that comes in easy to clean upholstery is most ideal. Furthermore, furniture for an aged person can’t be low to the ground or the elder will not be able to get up. The aged need furniture that is high enough to allow the person to sit and stand easily without constrains. Also, furniture for elderly people must have arms/armrests so they have something to hold while they get up (for stability). Last but not least, the elderly need good, sturdy furniture so there is no danger of the furniture tipping over or collapsing.

2.3.4 Flooring
Bathroom floors can be very slippery, especially when wet. Use non-slip flooring and bathing surfaces. Many accessible showers and bathtubs come with anti-slip surfaces. Sheet vinyl flooring is also a good choice, since it is smooth and easy to clean. If using ceramic tile, select large, smooth tiles to minimize grout lines and surface irregularities, and look for a non-slip surface texture. Bathrooms designed for the elderly should ideally have shower seats for them to sit on while taking a bath. This is because though bathtubs are most ideal they are cumbersome to get use especially for wheelchair users. Shower seats can either be inbuilt or be stools made of waterproof material (Scott, 2008).

2.3.5 Lighting
Bathrooms should be well illuminated with artificial lighting enhanced by natural daylight hence supporting sustainability especially during the day. A casement window is generally the easiest to use and a skylight is another way of bringing daylight into the bathroom. Shower interiors are often dark when the curtains are closed, so a waterproof light fixture is recommended inside stalls and above tub/shower enclosures. Individuals with low vision require special task lighting in addition to quality general illumination. A thorough analysis determines both the amount of light and the best color qualities of the light source. Each individual is different with respect to the optimum light source, the necessary light levels and the effect of veiling luminance or glare (Michael Leite, 2012).
2.4 Exemplars of Universal Design

Rex Pace

Rex Pace elaborates that the kitchen contains the most concentrated number of Universal design features in any part of the house. Rex Pace (Universal Design Consultant), one of the Universal design Principles experts shows off a few of these Universal design features to consider in designing a kitchen that can meet the Universal design principles. He designs a dish washer drawer stand unit that pulls out unlike the normal dish washer which has a door at the bottom making the user to bend over. This drawer unit produces a sound/beep as it opens to send a signal to those that are blind implying that the drawer is open. This drawer is designed in a way that one can reach in and pull their staff out easily without an extra effort (Low physical effort-Principle number 6) without necessarily bending over to pick your staff. It makes it easy for both grownups and children.

The other feature Rex designs in the kitchen is lowering the wall cabinets a little bit making it easy to open the cabinet despite someone’s height. This makes items a little closer to the user making it easy to access. The other feature Rex installs in the kitchen is a pantry which has shelves/stalls that are designed to come to the user unlike the traditional shelves which the user goes for the shelves. This pantry actually stores more unlike the traditional pantry. The kitchen space maintains a clear 48 inches of clear floor space so that there is enough space for mobility movement devices such as wheelchairs and baby’s walker (Universal design is for all- principle number 1)This shows that anyone younger or older can use this space easily and efficiently. There is a built in wall oven with an easy side grasp handle along with a rollout extended shelf underneath helps with safely transferring dishes in and out of the oven. Another feature is a manually adjusted counter that enables one to operate even when seated. A motorized adjustable height sink counter as seen in the figure 14 below which accommodates children, a person with back injuries or one who is very tall. The handles on the cabinets in the kitchen makes it easy for grasp ability to all people.
The Ed Roberts Campus is a universally designed Campus built in California, U.S.A. It was designed to be a memorial to life of Ed Roberts who was early leader of Independent Living Movement. This building’s interiors brings together disability services and creates a center that is a resource for everybody in the community and it’s an example of how form and function can work together. The interior design of this building expresses the idea that good design is fundamentally social for justice issues. The interiors are universally designed making architecture and design important and are for inclusion for all people; the presence of a two storey spiral designed ramp going up instead of stairs makes it possible for everyone to access the top floors of this building. Furthermore the building has some sustainable feature; the roofing at the middle of the building has been designed with clear glass trapping in enough natural light from the sun hence reducing on the electricity used for lighting.

This building considers all the conflicting needs of the people using it; how do people with different disabilities use it and how they have different conflicting needs. Dmitri Belser, the President of Ed Roberts Campus, says “sometimes the solution for one person creates a barrier for another.” The Ed Roberts building has a wide space inside making human traffic controllable.

In front of this building, there are different textured concretes making it useful for the people who are blind to find the front door and not becoming a barrier to the people who are wheelchair users. The concrete is also different colors providing enough information to the users. This building combines universal design with aesthetics making it un-cold and un-institutional. This building
has become an icon for the disabled community worldwide making it adaptable for the people who are going to use it. At the entrance of the reception, there is a sensor at the door which when triggered the door opens making it easy for people on wheelchairs to access the building. At the reception, the reception desk has been designed with two levels; one lower that favors those on wheelchairs. The lift buttons of the lifts have been lowered and are big making it functional; the button can be pressed by shoes.
CHAPTER THREE

3. RESEARCH DESIGN AND METHODOLOGY

3.1 Overview
The researcher investigated ways in which Universal Design, can be applied in the redesigning of interior spaces used by The Aged Society, he analyzed how this philosophy has been brought out through design, determine how Universal Design has been currently applied in the interior design and to propose other ways in which modern design can be incorporated in Universal Design.

3.2 Sources of data
The researcher collected data from three main sources starting with Secondary sources: research from former students, books, journals, newspaper research, videos and e-books and tertiary sources: internet research, then followed by Primary sources: interviews, questionnaires, observation and experimentation. The primary data was derived from the answers the respondents gave in the questionnaire prepared by the researcher. More so, the information that was obtained from the interviews provided primary research data that supported the study. The secondary data on the other hand, was derived from the findings that was stated in published documents and literatures related to the research problem.

3.3 RESEARCH DESIGN
According to Hussey, ET la (pg. 54: 1997) research design is the overall approach to research process, from the theoretical underpinning to the collection and analysis of the data. The researcher employed Yin’s (pg. 6: 1994) statement that states that researchers may adopt several strategies to approach their research (see diagram 1 below):

Diagram 1: Research strategies and their application

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Form of research question</th>
<th>Requires control over event</th>
<th>Focus on contemporary events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case study</td>
<td>How, Why</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Source: Yin 1994:6
The researcher employed Qualitative research design which according to Marczyk, et al: *Essentials of Research Design and Methodology* (2005, pg. 32) qualitative research involves studies that do not attempt to quantify their results through statistical summary or analysis and that qualitative studies typically involve interviews and observations without formal measurement. It’s expounded that qualitative research is often used as a source of hypotheses for later testing in quantitative research (Geoffrey Marczyk, 2005). Qualitative inquiry employs different knowledge claims, strategies of inquiry, and methods of data collection and analysis. Qualitative methods are designed to explore the human factor and cause-and-effect nuances. Although the processes are similar, qualitative procedures rely on text and image data, have unique steps in data analysis, and draw on diverse strategies of inquiry (Creswell).

The researcher employed one purpose the qualitative research follows which is evolutional. According to Leedy and Ormrod (2005), evaluation is a qualitative purpose which provides a means through which the researcher can judge the effectiveness of particular policies, practices, or innovations (Leedy, 2005).

### 3.4 POPULATION AND SAMPLE

The researcher used random sampling. The population of the study was the aged beneficiaries of Thogoto home for the aged, visitors, the managers and workers, in total the researchers sample correspondents were 25 people including all the mentioned above. Sampling enabled him to cut down the population of persons who stay and work at the area of study.

The diagram 2 below shows the summary of the population sample to be used by the researcher.

**Diagram 2: Population sample**

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beneficiaries</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td>Managers</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Workers</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>25</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

**Source:** Author
3.5 MODES OF DATA COLLECTION

The researcher employed different modes of data collection which include:

3.5.1 Participation and Observation

Observation, as a method of data collection was employed as stated by Leedy (2005, pg. 144) to get full information, the researcher participated in the daily activities at the area of study. The researcher used direct observation and ensured that he stroked the right rapport with the members at the area of study which later yield to detailed information leading to a proper understanding of how the area operates.

The researcher employed a non-controlled observational system which allows maximum flexibility (Chava and Nachmias, pg. 279-301. 1996). Participant observation was used where by the researcher attempted to obtain some kind of membership or close attachment to the group/population sample that he will be studying. This entailed learning the language, habits, work patterns, leisure activities and other aspects of their daily lives. Along this, the researcher used participant-as-observer system too. This system helped the researcher gain deeper appreciation of the group (Thogoto home for the aged beneficiaries) and its way of life and also gain different levels of insight by participating and not just observing (Nachmias, 1996). Observations were recorded by the researcher by writing notes.

Observation is a continuous data collection tool that was used by the observer/researcher at the site. Through direct observation by the trained eye, the researcher keenly looked at how people relate to the environment, ergonomic standards of the fixtures and equipment and Universal Design considerations to the facilities.

3.5.2 Informal and formal interviews

Interviews yielded a great deal of useful information where the researcher asked questions related to: Facts, people’s beliefs, feelings, and motives present and past behaviors, standard for behavior. The interview was open ended and semi structured. The researcher also interviewed a focus group of a defined group to discuss particular issues for 1 hour with the aid of a moderator/translator (Leedy 2005 pg. 146). Informal interviews will be conducted informally i.e. on a one on one basis, while formal interviews were conducted by use of interview guides provided at the end of the paper.
3.5.3 Questionnaires
The researcher administered structured and open ended questionnaires to the sampled population which were used to ask questions that elicit ideas and behaviors, preferences, traits, attitudes and facts about Thogoto home for aged. The questionnaires were administered in a face-to-face mode and paper-and-pencil mode. Paper-pencil-questionnaires were sent to the beneficiaries of Thogoto home for the aged, the management and workers. People are more truthful while responding to the questionnaires regarding controversial issues in particular due to the fact that their responses are anonymous (Leedy and Ormrod, 2001). Questionnaires often make use of Checklist and rating scales. These devices help simplify and quantify people's behaviors and attitudes (Leedy and Ormrod, 2001).

3.5.4 Photography
The researcher took photographs of the site as a way of collecting data, analyzed them and reported his findings. The photography constituted the interiors, exhibition and display, landscaping and furniture of Thogoto home for the aged. Photography was used to capture diverse facets of the living and working environment at Thogoto home for the aged to present a real time visual illustration of the data. Photography also serves as a recording tool of the current situation of the area of study.

3.5.5 Focus Groups
Since the residents at Thogoto home for the aged are the aged, having informal discussions in groups with the correspondents was an ideal way to gather relevant data about the facilities they enjoy and what could be improved. Recordings of these discussions were an ideal way of gathering the data that was later analyzed by the researcher.

3.6 Table of Tools/Instruments
Diagram 3: Table of Tools/Instruments

<table>
<thead>
<tr>
<th>Tool</th>
<th>Use/Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interview guide</td>
<td>Collecting data that involves presentation of oral-verbal stimuli and reply in terms of oral-verbal responses. This method is used through personal interviews and/or telephone interview. (Kothari, 2004)</td>
</tr>
</tbody>
</table>
Interview guides comprised of interviews which were used to explore the views, experiences, beliefs and motivations of individual participants/correspondents being interviewed

<table>
<thead>
<tr>
<th>Questionnaire</th>
<th>Consists of a number of questions printed or typed in a definite order on a form or set of forms and were administered to the residents, social workers and management (Kothari, 2004).</th>
</tr>
</thead>
</table>
| Focus group   | Consists of a cluster/group of correspondents who are involved in discussion with the researcher and respond to questions and discussion being carried out.  
Focus group was used by the researcher because it employs group dynamics to that will be an aid in generating qualitative data. |

Source: Author

3.7 DATA ANALYSIS
Before presenting the data collected, the researcher analyzed the data to understand it better and explain it further. The researcher analyzed data collected which was basically dissecting the field notes whereby regularities and/or patterns that will emerge from numerous observations made during fieldwork stage (Nachmias, 1996).

3.7.1 Participation and Observation
The data collected through participation and observation (direct observation) was analyzed by the researcher reading and reviewing his data, he then wrote notes as he reviews his field notes. These notes were made in the margins and highlight key passages (Hall, 2012).

3.7.2 Informal and formal interviews
The researcher coded his data collected through interviews. This coding included identifying themes within the interview notes that relate to the research questions in his study. These themes were the common ideas that will be repeatedly read in the data he collected (Hall, 2012).
3.7.3 Questionnaires
The questionnaires administered to the correspondents by the researcher were analyzed by comparing the responses and considering alternative explanations by looking for differences in responses in the questionnaires (Hall, 2012).

3.7.4 Photography
Photographs taken during the data collection by researcher were analyzed by explaining its contents in line with the objectives of the study (Hall, 2012). The researcher analyzed the photographs taken to depict the real time situation at the site.

3.8 DATA PRESENTATION
Most of the data collected by the researcher was represented through narration. The information collected from the sample population is presented in form of a written research report by the researcher, complete with plans of the site including the site analysis. The video recordings and voice recordings is analyzed by transcribing. Data is presented through written paper complete with the key issues that the researcher was handling his findings and a set of recommendations. The researcher wrote a soft copy of the paper on a Compact Disc.

3.9 EXPECTED LIMITATION
Limitations that the researcher encountered were, time constraints - The researcher realized that time was a deciding factor to be considered and managed well as he went along his study in the final year of the four year course. Secondly, little or no material written about the site of study – This restricted the researcher only to primary sources of information. Language barrier was a limiting factor - The researcher experienced language barrier especially when he was conducting group discussion and interviews with the correspondents only communicated in their mother tongue. The researcher also faced some financial constraints while conducting the research.

4 DESIGN PROCES
For a design to be good, both functions and aesthetics being considered there should be a good and a well-organized design process. It involves the planning of routine steps of a process aside from the expected result like the end product of a design it is treated as a product of design and not the method of design (Design, 2012). Having studied the works (interior design) the researcher employed these processes to design the proposal he proposes in redesigning the
Thogoto Home for the aged. The stages are carried out in an iterative fashion, with the cycle being repeated until the project's usability objectives have been attained. This makes it critical that the participant who is/are the designers in these methods accurately reflect the profile of their actual users being their clients. Universal design is about achieving good design so that people can access, use, and understand the environment to the greatest extent and in the most independent and natural manner possible, without the need for adaptations or specialized solutions (Building for Everyone: A Universal Design Approach, 2012).

The process of Universal Design requires a macro view of the application being considered as well as a micro view of subparts of the application taking into consideration the recipient of the end product. Universal Design can be applied to a variety of applications (Sheryl Burgstahler, Universal Design: Process, Principles, and Applications, 2012). The following steps will be employed by the researcher to carry out the design of his proposal.

4.1 Identify the application/problem
Fast of all, one needs to specify the product or environment to which they wish to apply universal design. Here, the designer identifies needs or goals of the client which includes identifying the need or Purpose in a given situation/problem. This involves requirements gathering where the designer creates an understanding and specifying the context of use. A designer needs to know is who the client(s) are, how they live, and what they really desire for their living space. This involves fact findings where the problems are identified and defined, gathering and analyzing the pertinent data (Sheryl Burgstahler, Universal Design: Process, Principles, and Applications, 2012).

4.2 Define universe
At this stage one (designer), has to describe the overall population (for example, users of service), and then he/she needs to describe the diverse characteristics of potential members of the population for which the application is to be designed for (for example, students, faculty, and staff with diverse characteristics with respect to gender; age; size; ethnicity and race; native language; learning style; and abilities to see, hear, manipulate objects, read, and communicate). This helps the designer understand clearly what she/he will be tackling and hence coming up with the best design to the client.
At this stage the ideas are found, produced and developed because the design can now easily identify with him the target audience/clients he is designing for (Sheryl Burgstahler, Universal Design: Process, Principles, and Applications, 2012).

4.3 Involve consumers
At stage three, the designer needs to involve consumers/client. He/she should consider and involve people with diverse characteristics (as identified in Step 2 above) in all phases of the development, implementation, and evaluation of the application. Also gain perspectives through diversity programs, such as the campus disability services office. By doing this, the client feels appreciated because she/he is involved and is part of decision making and designing in general. The designer will also understand what the client wants, needs and expects. The client’s comments help’s the designer visually understand what they will be designing.

4.4 Adopt guidelines/standards
For a designer to design a universal interior design, he should adopt guidelines/standards guiding the Universal Design. He/she needs to create and select existing universal design guidelines/standards for instance equitability in use which is the first universal design principle. Integrating the Universal Design principles other best practices within the field of the specific application will help solve a design problem. These guidelines are requirements specification which Specify the user and organizational requirements (Sheryl Burgstahler, Universal Design: Process, Principles, and Applications, 2012).

4.5 Apply guidelines/standards
Apply universal design in concert with best practices within the field, as identified in Step 4 above, to the overall design of the application, all subcomponents of the application, and all ongoing operations (for example, procurement processes, staff training) to maximize the benefit of the application to individuals with the wide variety of characteristics identified in Step 2 (Sheryl Burgstahler, Universal Design: Process, Principles, and Applications, 2012).

4.6 Plan for Accommodation
The designer at this stage should develop the processes to address accommodation requests (for example, purchase of assistive technology, arrangement for sign language interpreters) from individuals for whom the design of the application does not automatically provide access (Sheryl Burgstahler, Universal Design: Process, Principles, and Applications, 2012).
4.7 Train and support
When the design is in process the designer needs to tailor and deliver ongoing training and support to clients (for example, instructors, computer support staff, procurement officers, volunteers) so that they should understand the product and know how to use them. This is according to principle number 2 (Flexibility in use). One should also share institutional goals with respect to diversity and inclusion and practices for ensuring welcoming, accessible, and inclusive experiences for everyone to use the design (Flexibility in use) (Sheryl Burgstahler, Universal Design: Process, Principles, and Applications, 2012).

4.8 Evaluate
At this moment, the design should be evaluated to see if it meets the needed standards and if it is fit for use by the client. This is done by including universal design measures in periodic evaluations of the application, evaluate the application with a diverse group of users, and make modifications based on feedback. Provide ways to collect input from users for example, through online and printed instruments and communications with staff (Sheryl Burgstahler, Universal Design: Process, Principles, and Applications, 2012).

4.9 Execution
When the design proposal has been approved and all standards met, the project will start. This will involve producing designs and prototypes to be presented to the client(s) who will visualize the final product (Sheryl Burgstahler, Universal Design: Process, Principles, and Applications, 2012).
CHAPTER FOUR

5. FINDINGS

5.1 Historical background information
Thogoto Home for the Aged is one of the many projects of Presbyterian Church of East Africa (P.C.E.A.) which is managed and run by the Woman’s Guild, Kikuyu Presbyterial. The home is within the Presbyterian Church of East Africa’s Historical area of the first missionaries where they started in 1967 by the then South Kiambu Woman’s Guild Presbyterial Council after they realized the problems which were being faced by the old men and women who had no shelter and very needy after the emergency of 1952 in Kenya.

Objectives

The Main objectives of the home are to:

- Make the aged feel needed and appreciated by the society.
- Care for the aged regardless of their color, faith or tribe
- Feed the aged with nutritious food
- Counsel them as often as possible

Vision

Accommodate 200-300 men and women from all over Kenya as land is available for the growth of the Home.

Activities

The home caters for men and women of between seventy (60) and ninety (90) years of age, who are either abandoned by relatives or don’t have families. In some cases relatives request the Guild to accommodate their relative(s) if they don’t have someone to take care of them.

The home has five workers who care for the aged in:

- Feeding them
- Washing their clothes
- Cleaning the compound etc.

The social worker takes care of their health and daily running of the home while the Chaplain looks after their spiritual welfare.
5.2 Site analysis

5.2.1 Location
Thogoto Home for the Aged is located in Kikuyu division in Kiambu District fifteen miles from Nairobi City Centre. The home is situated around other famous institutions like schools, Thogoto Teachers College and University of Nairobi (Kikuyu Campus). It’s near Nairobi/Kiambu boundary next to Dagoretti Children Centre.

**Figure 15:** Thogoto location

Source: http://maps.google.co.ke

Appendix 4 shows the site inventory of Thogoto Home for Aged.

5.2.2 Facilities
**Figure 16:** Pit latrine  **Figure 17:** Kitchen  **Figure 18:** Landscape

Source: Author  Source: Author  Source: Author
5.3 Residents Profile

The diagram 4 below represents the age distribution of the residents both female and male at Thogoto Home for the Aged. It is categorized into two groups represented by two different colors. The brown colored bars represent the total number of women beneficiaries while the orange one represents male.

Currently, the home has a population of 38 aged persons, 18 males and 20 females. Most of them are boarders (stay in the home) at the facility while a few are day scholars who come from their respective homes for the purpose of the care and company. Most of them come from the neighboring Thogoto village.

Diagram 4: Age distribution

The orange color represents the male residents while the brown color represents the female residents.
Source: Author

5.4 Issues cited by residents

The researcher used Focus group discussions to familiarize himself with the daily challenges that the residents encounter on daily basis. The residents were divided into small groups where the focus groups were carried out separately in a sample population of 10 female and 10 male residents with the aim of finding out the design problems in the built environment. Furthermore the researcher used questionnaires which were administered to the correspondence so as to get
each individual opinion. The researcher used one of the workers to translate some of the words to the residents due to language barrier.

5.4.1 Report from Male Residents

Positive Issues

- Some of the male residents cited that they liked the shared rooms since they promoted companionship among them.
- Some residents also said that they enjoyed having a central entertainment room since they could raise issues and solve them more as a whole other than male having their own entertainment room and the female too.
- A number of the male residents are satisfied that they have company from their fellow age mates other than if they could be at home alone.

Negative Issues

- The male residents complained about the absence of rails along the hostels where they can get support as they walked to the hostel.
- They also requested for additional bathrooms and toilets citing that the ones available were not enough. In addition they complained that lack of an efficient piping system to the washrooms resulted to lack of water thereby resulting to a foul and unbearable smell from the toilets. They also claimed that they find it hard to access the washrooms due to their poor design.
- For those in wheelchairs, they proposed for the cubicles in their hostels and the corridors to be expanded so that they could have adequate space for movement. In addition, they requested that the land be flattened and more space created too, so that they could easily access the outdoors and the landscape.
- The male residents also recommended that the current ceiling be replaced in their hostel because of the poor condition of the present ceiling.
- The residents suggested that additional lighting be installed in the hostel since some areas like the washrooms are dark during the night so as they can access them during the night.
• Some of the residents also complained that their beds are too low resulting to some of them having to struggle to get on them because of the acute angle to bend over and sleep.

• Some of the male residents complained about the tables at the multipurpose hall where they all assemble to eat. Mr. Waweru Kamau who is 60 years old and partially blind complained that the tables are too high for them.

• Mr. Bernard Ikua who is 76 years old complained about the storage facilities which are too low and made of metal which makes it hard for them to operate with an ease due to difficulty in bending over.

5.4.2 Report from female residents

Positive Issues

• The female residents said that they liked the fact that the female hostel had been built with a ramp leading to its entrance.

Negative Issues

• They complained that the storage provided was not enough for their clothes and their personal effects. In addition, they complained that some of the shelves erected were too high for their reach. They proposed wardrobes for storage of clothes as opposed to metal boxes.

• Some of the female residents complained for lack of mirrors in their rooms so as to see themselves as they groom themselves.

• The residents also complained about the raised part at the entrance of the female hostel because these made them to trip over and end up falling and injuring themselves.

• The residents complained about the floor finish which is rugged. These floors they complain that causes those in wheelchairs find it hard to maneuver easily.

• The residents suggested that additional lighting be installed in the hostel since some areas like the washrooms are dark during the night so as they can access them during the night.

• Some of the residents also complained that their beds are too low resulting to some of them having to struggle to get on them because of the acute angle to bend over and sleep.
- Mama Wairimu who is 63 years old and partially blind complained that the tables are too high for them and that the path to the washrooms are too narrow for her because she uses tripod to walk.

All these citations made by the residents/correspondence come from both the focus group sessions and the questionnaires administered by the researcher. Due to these citations, the researcher confidently concluded that Universal Design was inadequately employed in designing Thogoto home for the aged. It is because of these reasons that the researcher recommends the application of Universal Design principles in designing Thogoto home for the aged. The researcher believes that if Universal design is employed, the residents will enjoy their stay and have positive attitude about the home.

5.5 Analysis and Evaluation
After an investigative research it can clearly be said that Thogoto home for the aged has not adequately applied Universal design principles in order to create an assisted and a smooth living environment to the premises. The key problem areas of investigation were landscaping, interior architecture, furniture design, exhibition and display.

5.5.1 Interior Architecture

Male hostel
The Male Hostel accommodates 14 residents. It is divided into two separate rooms which are shared by 7 residents each. Also, adjacent to it are washrooms. In addition, there are benches just right outside the hostel where the residents rest and bask during the day. The floors in the hostel are cemented and plastered in Red Oxide but are rugged, while the walls are cream in color. In the rooms, beds are arranged side by side both on each side of the room. There is hanging ceilings in two rooms and are colored in white. The lighting in the hostel is fluorescent lighting.

The ruggedness in the rooms makes it difficult for residents on wheelchairs to move smoothly and they sometimes need support to move. There is poor display and exhibition in the hostels. There are storage boxes allover in an unorganized manner. This makes it difficult for the residents to locate exactly where their properties are.
There are 3 bathrooms and 3 toilets adjacent to the male hostels. The toilets do not have railings which provide support for wheelchair users. Also, the toilets are not wide enough for comfortable wheelchair access. This is because they are 160 cm by 80 cm. Ideally, according to universal design principles, toilets should be accessed comfortably by wheelchair users should be 180 cm by 100 cm.

In the case of the bathrooms, curbs have been installed to prevent water spillage to the rooms. However, these curbs act as hindrances to accessibility by wheelchair users. Also, the bathrooms are not wide enough for comfortable wheelchair access. This is because they are 160 cm by 80 cm. Bathrooms ideally for comfortable wheelchair access should be 180 cm by 100 cm.
Female hostel

The female Hostel accommodates 18 residents. It is divided into two separate rooms which are shared by 9 residents each. Washrooms are next to it and a lawn in the front. In addition, there are benches just right outside the hostel where the residents rest and bask during the day. The floors in the hostel are cemented and plastered in Red Oxide but are rugged, while the walls are blue and cream in color. In the rooms, beds are arranged side by side both on each side of the room. There is hanging ceilings in two rooms and are colored in white. The lighting in the hostel is fluorescent lighting.

Figure 23: Female hostel

Figure 24: Female hostel

Source: Author

Multipurpose room

There is a room next to the kitchen and the hostels which is used for many purpose: It’s where they meet for prayers, eat, have discussions and where they watch television (entertainment). It is full of sofas, wooden chairs, weaved chairs, tables and a television cabinet.

Figure 25: Multipurpose room

Figure 26: Multipurpose room (ceiling)

Source: Author

Source: Author
**Kitchen**
The kitchen is located right next to the multipurpose hall and next to the hedge. It is an old kitchen complete with local traditional stoves (locally made), large sinks and food preparation tables. Cooking is done using local stoves that use firewood as fuel. As a result of poor ventilation in the kitchen, the ceiling is full of soot. This smoke is also poses a health hazard to the chefs and those working in the kitchen.

**Figure 27: Kitchen**

![Kitchen](image1)

**Figure 28: Kitchen (traditional stoves)**

![Kitchen](image2)

**Source:** Author

**Laundry**
As seen in the figure 23 below, the laundry is a small cemented patch adjacent to the reception area. Laundry space is not enough for the residents and it’s not designed according to universal design principles (space provided for maneuvering is not enough and the shelves are high). Also, the drainage is poor.

**Figure 29: Laundry room**

![Laundry room](image3)

**Figure 30: Laundry shelve**

![Laundry shelve](image4)

**Source:** author

**source:** author
Corridors
There is a corridor at the halls of residents which serves as a resting place during the day as this is where they spend most of their time basking. The corridor has a ramp which helps those on wheelchairs access the washrooms. The corridor does not have a rail to help the aged walk comfortably on the corridor.

Figure 31: The corridor

Figure 32: The corridor

Source: Author

5.5.2 Furniture Design

Furniture at male hostels
The storage for clothes and personal effects is in the wooden lockers and metal boxes. The beds used are the wooden ones. Firmness is ideal especially for the aged. However, some beds are too high for the residents to climb on and so they have to step on their metal boxes to get on their beds. The researcher observed that the beds are too low making it difficult for the male residents to get on them. Those using walking sticks and crutches find it difficult to bend over and sleep because of the back ailments. Some of the storage facilities like metal boxes in figure 33 below have to be lowered for one to access what is in the box making it hard for the old people to carry them since they’re heavy.
Furniture at female hostels
Ergonomic considerations have not been put into consideration especially in designing the beds. Some of the racks are too high and as a result, they are not utilized. Also, there is lack of adequate storage facilities in the rooms and so the metal boxes that serve as storage spaces for the residents are kept on top of the beds during the day and kept on the floor at night. Also, the beds are too high and the residents have to step on their metal boxes to climb on to their beds. Just like in the male hostel, they use the wooden beds.

Furniture at Resting Shed
There are chairs and benches outside where the aged sit and bask during the day. These sits are not ergonomically fit for the aged people hence they do not make them feel comfortable as they sit on them.
5.5.3 Landscaping

Site layout
The land at Thogoto home for the aged is generally flat. Although, the land is 8 acres large, a big portion of it is mostly used for farming. The site has poor space planning and landscaping design. As a result, though the land is expansive, it has been underutilized due to poor placement of structures. Most structures are placed near the main entrance. Large trees are grown within the landscape, there is an ever green fence and the compound is dotted with shrubs and flowers.

Accessibility
In some areas at Thogoto home for the aged, accessibility has been greatly hampered (poor site grading); at the female hostel where the land has a steep slope. Most of the residents cannot enjoy the outdoors.
At Thogoto home for the aged, there are indigenous as well as exotic trees and shrubs, since the soils are fertile red volcanic soils. These soils also have good drainage.

Little has been done at Thogoto home for the aged in terms of landscaping (especially universally designed) on site except the growing of bushes, trees and shrubs in an unorganized manner. Although the land is big enough, and it is fertile in a cool climate, the full benefits of landscaping have not been utilized to the maximum. Due to this, the residents, staff and visitors do not enjoy the outdoors to the fullest as most of them prefer staying indoors. Currently, there is a big empty patch of land near at the back of the halls of residents (hostels) full of thicket, shrubs and grass.
Furthermore, in addition, there is a big patch of bare land right in front of the whole compound at the entrance which has underutilized.

### 5.5.4 Exhibition and Display
Signage has been poorly done especially at the entrance where there is a small and tiny sign post showing the area. However some signs are like the sign writing on the gate is well but needs a little renovation for a good and clear vision.
There is more signage inside the facilities which shows some of the well-wishers who built hostels for the aged. As an extra activity, there are livestock kept at Thogoto home for the aged and these places have been labeled though the labels are not legible enough. Inside the multipurpose room, there is poor exhibition and display especially the TV unit; there are old calendars and poor furniture arrangement.
Office Block and Reception

The office block/reception comprises of the manager’s office and a reception. The reception has been poorly designed according to universal design standards. Ideally, the reception should be a place where visitors are received and also a place that has information displayed about the home like photos and more so it should depict the life that the residents live. This will serve in giving the visitors and interested parties an orientation on the facility, for example, achievements, awards and historical background.

The display and exhibition of the reception is wanting. There are old calendars and the furniture arrangement is poorly done. The reception desk is high and a person on a wheelchair can’t access it with an ease.

Figure 55: Reception office

Source: author
At the washrooms there is some sign writing on the wall as seen in the figure 50 below. The doors are also numbered and labeled.

**Figure 56:** Sign writing in washroom

**Figure 57:** Door numbering

**Source:** author
CHAPTER FIVE

7. RECOMMENDATIONS
It is with this in mind that the researcher proposes the following design solutions for Thogoto home for the aged using interior design as his tool of trade.

7.1 Interior Architecture
Through interior architecture, buildings both commercial and residential are designed with all aspects of human needs and uses of the structural spaces in mind and the elements considered in interior architecture are lighting, floor finishes, wall coverings/wallpaper, colors used both interior and exterior and ventilations. According to Wikipedia, the free online encyclopedia, generally interior architecture refers to the spatial art of environmental design, form and practice, interior architecture is the process through which the interiors of buildings are designed, concerned with all aspects of the human uses of structural spaces (Interior architecture, 2012).

7.1.1 Universal Design Consideration in the Washrooms
“Universal design features aren’t just for the elderly or disabled — the term “universal design” simply means common-sense design that accommodates all users. If you’re adding a new bathroom, incorporating universal features ensures that your bath is comfortable, safe, and will adapt to any lifestyle changes.” - Karin Beuerlein

In both the male and female hostels at Thogoto home for the aged have bathrooms which are small hence hindering wheelchair accessibility and use. It is for this reason that some of the residents prefer to sponge bath in their rooms. Due to this reason, the researcher proposes that the dimensions of the bathrooms be the recommended which is 100cm by 180cm. In addition, the bathrooms should have grab bars. The elements of universal bathroom design are: Lighting, Flooring materials, Switches and controls, Doors, Vanities, drawers and storage, Grab bars, Toilets, Showers and Bathtubs (Accessible Housing by Design — Bathrooms, 2012).

Having addressed the issue of mobility in the bathrooms, we now turn to the selection of fixtures and controls. The installation of a comfort height toilet with an integral bidet function can facilitate personal hygiene. The shower and bath tub should have controls that are accessibly placed and control all of the functions. Other fixtures, like the sinks, should allow residents to move about freely. Fitted shower seats are recommended, due to age, they need to sit down
comfortably to enable them bathe with ease. Grab bars should be installed in bathrooms for the aged. There must be grab bars in the shower enclosure, and along the bathroom wall of the walk-in route. If a walk in bathtub is installed, there must be grab bars installed on the bathtub length wall. There must be grab bars along the toilet wall. Left or right, as the case may be. Non slip flooring for the tub, shower, and bathroom floor: This must be fitted or placed in bathrooms for the aged. This prevents falls, skids of slips. Slip proof coating on bathroom floors: This is a recommended finishing coat, applied to floors to prevent slips or bad falls. No step, easy access entrance with no door. Access into the bathroom must be unhindered. If possible, remove the bathroom door and replace with a simple curtain. However, if added privacy is needed, only a sliding door feature must be installed (Michael Leite, 2012).

A 30- or 32-inch-wide interior door is considered standard, but universal access requires 32 inches of clear space when the door is open, which usually means specifying a 36-inch-wide door. Wheelchair-accessible bathroom dimensions require clear space of at least 5 feet (60 inches) in diameter to allow a 180-degree turn. If space is at a premium, consider keeping the room open rather than compartmentalizing the toilet so that a wheelchair’s turning radius can be accommodated (Beuerlein, 2010).

Bawden recommends a curbless shower. These showers have no lip at the floor and can be accessed by those using a wheelchair or other mobility device. The floor slopes down toward the drain; a swing-out door or a shower curtain keeps water contained. From a design standpoint, the minimalist lines fit seamlessly into a contemporary spa-style bathroom. A curbless shower requires that the shower pan or drain be slightly lower than the surrounding flooring (Beuerlein, 2010). The researcher recommends the installation of electrical switches on a lower level. For easy and unaided reach, elderly bathrooms must have light switches fixed at a lower level than is standard. This will help them, especially those in a wheelchair, reach switches easily. Secondly, in the washrooms there should be elevated toilet seats with special add-ons which seats must be raised above the standard height to avoid unwanted strain on the backbone.

Mobility needs to be considered. This involves the selection of flooring that allows the aged to move about easily without tripping and falling. Walk-in showers: Much safer, easier to access and comfortable to use. This is highly recommended by the researcher for elderly people's bathrooms. The modern designs of glass shower panels are good for the elderly who require wheelchair
access. And with a good wide space for easy maneuvering, walk-in-showers allow easy bathing and washing. Floating sinks with space for wheelchairs are recommended for the aged that move around with the aid of a wheelchair. The wheelchair can be 'parked' under the floating sink (Michael Leite, 2012).

**Figure 58:** Universal-design-shower  **Figure 59:** Raised toilet seat

![Universal-design-shower](http://www.hgtv.com) ![Raised toilet seat](http://solmobility.com)

The researcher proposes the adoption and use of the higher type of water closets which instead of being the normal 38cm high are 48cm high. This facilitates the ease of use by wheelchair users as they are able to get off the wheelchair and onto the toilet easily. These raised features come in different sizes which favors everyone.

**Figure 60:** Toilet Safety Grab Bar

![Toilet Safety Grab Bar](http://www.google.co.ke)
The researcher recommends the following General Bathroom Features

Grab bars match décor colors to enhance a homelike feel. Adequate maneuvering space: 60” diameter turning space in each room and 30” x 48” clear floor spaces at each fixture. Clear space (3’) in front of toilets allows for easy maneuvering. Each toilet is centered 18” from a side wall so that grab bars can be within easy reach. Broad blocking in walls around toilet, tub, and shower allows for future placement and relocation of grab bars, while assuring adequate load-bearing and eliminates the need to open up walls to add blocking later. Knee space under lavatory allows seated use of lavatory. Several methods are used to provide knee space, including open knee space without a vanity cabinet, or adaptable solutions such as fold-back or self-storing doors. Pipe protection is provided to prevent contact with hot or sharp surfaces. Mirrors are placed to allow appropriate viewing from any height.

7.1.2 Ambience of the Residence

Color Scheme
Without a doubt, there is a psychology of color which has a great impact in our entire life. Color impacts our mood, our appetite, our energy level. Years of color response research have shown that certain colors elicit specific—and often strong response (Color Moods - The Impact of Paint, 2012). According to Rudolph Steiner, a pioneering educationalist, becoming old can bring loneliness and fear so decorating with the elderly in mind needs to address warmth, security and harmony. Variety in colors in the immediate environment can boost interest in the world and keep cognitive function alive. Older people can be drawn to soft pastels but they may not have the vitality of hue needed to stimulate the mind and mood. Eyesight problems can also impair how the color is seen and what is seen (Colors for children and elderly, 2012). The researcher recommends soft mid-toned colors which encompass softer shades of red and oranges which can help with energy circulation and levels. Soft blues, lavender, mauves and violets are also recommended which aid in connecting to the spiritual or reflective mood.

Space layout and arrangement of the hostels
In both the male and female hostels, the researcher recommends that there should be partitioning to create personal space and at least create privacy which is not appreciated currently in the two hostels. Secondly, the researcher also recommends the arrangement of furniture in such a way that leaves central activity space for accessibility and movement. In addition, in the arrangement
and layout the researcher recommends that no furniture be placed on sides of the beds or on walkways which might cause inconvenience in movement. Furniture at the bedsides can cause unnecessary accidents in the case of residents who may get epileptic fits.

**Ceiling**
In both the male and female hostels there is white acoustic suspended ceiling which are in a bad condition. Sections of the ceiling have turned color due to stain from rain water which is as a result or leakage from the roofing and it thus loses the residential ambience as a result. The researcher proposes the installation of a ceiling in this hostel. It will serve in creating the residential scale of measurement to the space. In addition, the residents will be kept warm at night and make them feel more secure.

**Finishes**
Giving the interiors of Thogoto home for the aged the look of a residential environment is greatly dependent on the finished decoration. Interior decoration is wide and in terms of floor and wall coverings/wallpaper, the researcher recommends the use of materials that evoke the feeling of warmth and comfort, use of carpets and floor rugs would bring out warmth in the hostels. On the other hand, for the windows, the researcher recommends that curtain boxes be installed and the curtains to be put to bear homely patterns and textures this should march with the beddings of the aged. Wallpaper (paintings) that blend well with the color scheme will give that extra interesting and homely look in an inexpensive way. In the male hostel, the researcher recommends the introduction of curtains at the entrance to promote privacy in the cubicles/partitions incase the resident may be dressing or needing some time alone.

**The corridor**
Currently, the dominant feature on the corridor in the hostel is the column/pillars. The researcher proposes the use of these pillars as art pieces to create an inviting ambience for the residents and visitors. The researcher recommends installation of mosaics, collages on the walls in the corridor – these artworks should be made from recycled/reused glass especially those made at Kitengela Glass Firm. In addition, usable as well as aesthetic outdoor furniture must be incorporated in this space since this is where the residents spend most of their day either chatting or helping in household chores. Furthermore the researcher recommends the installation of rails on the walls at heights favoring the aged, to sum up on that, the wall finish should be painted not like what is present which is rough-cast. This will help reduce injuries caused by the roughcast in case of a
fall or accidents. An introduction of plant life in the corridor will be helpful which can be planted in pots, hanging baskets or wall vases. In addition, chimes can be installed to create a therapeutic environment since wind blows gently towards the direction of this hostel. The researcher also recommends that corridors in buildings accessed by members of the public should have a clear width of 2000mm to enable people to move in both directions and pass each other with ease.

**Lighting**
People with low vision like the aged require special task lighting in addition to quality general illumination. A thorough analysis determines both the amount of light and the best color qualities of the light source. Each individual is different with respect to the optimum light source, the necessary light levels and the effect of veiling luminance or glare (Michael Leite, 2012). Currently the lighting used in the rooms is fluorescent lighting for the ceiling lamps. The researcher recommends and proposes colored incandescent lighting in the hostel as this creates a homely and warmer ambience. Also, soft indirect lighting will be most ideal. The researcher proposes the installation of wall lighting as opposed to ceiling lighting so as to create individuality in the partitions/rooms.

**Windows**
A number of the residents are bedridden and thus they stay indoors most of the day. Since nature is a great healer and comforter, they should be able to have a clear view of the outdoors while they are still indoors. An ideal way of doing this would be to have windows that are lower than the beds and these windows should be dominated by clear glass panels (this helps to connect the interiors to the exteriors/landscape of the home). The windows should also be large so that as much natural light is able to get in to the rooms. Moreover the windows should be installed in such a way that they have large window sills so as to accommodate window seats. In addition, currently the windows in both hostels are louvers which obstruct the viewing of nature. The researcher proposes change of these windows to French windows which provide clear view of the outdoors as they have large panels.

**Flooring**
In creation of a warm and homely look in the hostels, the researcher recommends wood flooring. However, cost of installation and maintenance is relatively high. In this light, the researcher recommends vinyl planks for flooring. These are polyvinyl chloride (PVC) tiles that look like real wood flooring, but without the hassle of frequent polishing. They are economical since they are
half the cost of solid wood flooring and at least twice as durable. Moreover, previous falling accidents on the cemented floors in the home have resulted to fracturing of the limbs to some of the residents. These floors will go a long way in reducing the number of falls since they are slip resistant. Also floors should avoid strong patterns or changing color as these could be misconceived as change in level thereby creating a potential tripping hazard.

7.2 Exhibition and Display
Merging aesthetic with anthropometric is often difficult. Despite this, the researcher recommends the following key suggestions in order to maintain residential character and imagery of Thogoto home for the aged.

Signage
The researcher recommends large door numbers (bold numbers) and directional signs because they bring out something appealing without appearing condescending. According to Centre for Universal design, Signage should be provided within the reception area to highlight key facilities such as lifts, stairs, toilets, telephones, and the main building functions. The provision of clear signage that is easy for everyone to understand benefits all building users and increases independence. Some people who experience communication difficulties may prefer not to have to ask for directions or assistance, so the provision of effective signage is paramount.

Reception/waiting area
According to Centre for Universal design, every building entrance should be easy to locate and clearly distinguishable from the rest of the building. The position of an entrance may be highlighted with architectural features such as a canopy or a door recess. A change in surface texture of the pavement or forecourt may help to signal the location of an entrance, particularly for people with visual difficulties. Adequate space should be provided outside all entrance doors to enable people to maneuver, understand, access, and use any intercom or entry system. When leaving a building, people often pause outside an entrance to button a coat or open an umbrella; there should be sufficient space to do this without obstructing other people who are entering or leaving. Where entrances are located at the top or bottom of a ramp or a flight of steps, or at the end of a long passage, it is essential that sufficient space is provided for wheelchair users; parents with strollers; people with visual difficulties; guide dog users; and those with walking aids to maneuver and turn safely. The researcher recommends that the recommended clear area for a landing or turning space immediately outside an entrance is 2400mm x 2400mm.
The researcher recommends that the reception desk should be placed conspicuously so that it is obvious to everybody where it is located. The route to it from the entrance should be direct and unobstructed. The desk should be usable from both sides at a height of 950 to 1100mm for people standing and 760mm for people sitting down or using a wheelchair. The researcher also suggests that a powered, height-adjustable desk may be considered in some applications. Figure 61 below shows an example of recommended reception desk. Lighting, whether natural or artificial, should be controllable within a reception and waiting area, in order to provide appropriate levels of light at all times. The researcher recommends that light fittings and windows should be located so as to avoid glare and to give a uniform spread of light. The provision of blinds, dimmer switches and computer-controlled lighting systems should be considered.

The researcher recommends that floor finishes should be firm, even and slip-resistant. Contrasting color can be used to define circulation routes, such as the route between the entrance door and reception desk. Where there is a potential for water to be carried into the reception area on the soles of shoes and on wheels, the floor finish should be carefully selected so as to maintain slip resistance when wet. Secondary matting may be required beyond any entrance lobby area for this purpose, particularly if the general floor finish is a non-porous surface.

Figure 61: Reception desk with two levels.  Figure 62: Alternative view

Source: http://www.universaldesign.ie  Source: http://www.universaldesign.ie

Room display
The researcher recommends that pictures, paintings and any other type of wall hanging be hanged and displayed in the resident’s hostels. This will help break the monotony of the plain walls as
well as serve the therapeutic needs of the residents because of the soothing effects of the paintings.

**The public spaces**
A resting shed/gazebo is one of the public spaces that the researcher recommends to be built which will be used by residents, staff and visitors. To create an ideal ambience for these different groups of people, the researcher recommends the display of wall hangings and artifacts with themes that spark conversations or stimulate positive emotions in the sheds.

**7.3 Landscaping and human development**
The core factor to be considered in designing landscape for the aged is creating an environment which challenges residents to renew their lost abilities or build new competencies. Exterior landscapes have the potential to provide spaces for contemplation and retreat as well as places for exercise and sensory stimulation.

To design a good landscape environment, the researcher recommends *Healing Gardens* which contain plants with sweet or savory aromas which stimulate senses in a way that is pleasant and memory provoking. Also, plants with bright color and scents so as to attract birds and butterflies as this provides places to watch these mind stimulating activities which shows life and continuity. Furthermore, those plants that whether leaves and fruits during the dry season that could pose potentially slipping hazards should be avoided. Also, in order to accommodate residents that are on wheelchairs sweet smelling flowers and herbs can be grown on planter boxes for them to touch, smell.

The researcher recommends more outdoor structures to be constructed so that the residents can enjoy the landscaping. There are different types of outdoor structures that can be incorporated into the landscape for example a gazebo; this is a pavilion structure that is constructed in parks or gardens. It’s a freestanding or attached to a garden wall, roofed and it is open on all sides. It provides shade, shelter, ornamental features in a landscape and a place to rest and also used to break the monotony of staying indoors. Secondly, the researcher recommends a pergola; is a garden feature forming a shaded walk or a passageway of pillars that support cross-beams and a sturdy open lattice upon which woody vines are trained. Freestanding pergolas offer a sitting area that allows for breeze and sunlight but offers protection from the harsh glare of direct sunlight. They also give climbing plants a structure to grow on.
On the bare space at the back of the hostels the researcher recommends there be a well-manicured lawn dotted with trees for shade and flower gardens. This is because this space forms the center piece for the home since the resting shed is erected here and it’s a big open space. The researcher also recommends hedges which can be incorporated on site since they create partitions and mark boundaries thus defining open spaces with different functions.

The researcher also recommends the construction of wide pathways within the compound. These pathways will enable the residents to walk comfortably without causing inconvenience to others. At present time, the pathways are rugged and narrow making it hard for two people to bypass each other forcing one person to wait for the other to pass first. Those using walking sticks, crutches, tripods and walking frames find it difficult to walk at moderate speed due to narrowness of the pathways. The researcher recommends that the path surfaces must be firm, and provide traction to allow for easy movement of wheelchairs, gurneys and poles. Furthermore, landmarks should be provided to help orient the users of the space. This can be done with elements such as sculpture, a profusion of flowers, or a water feature. Paving with deep grooves can be an obstacle. Asphalt absorbs and radiates heat which can be hot in the summer. Provision of landmarks or reference points to assist in orientation is also recommended. Examples of landmarks are: scented or tactile plants, ornaments and furniture, sound elements such as wind chimes or running water, or path materials such as gravel or bark. He recommends the use of vivid colors and bold materials as reference points for people with partial sight. Color contrast is also recommended because they can be used for containers, pathways, fences, gate latches, and steps. Ornaments and seating should be recessed from pathways. Newer rubberized paving materials are firm enough for wheelchairs and also cushion falls. Avoid materials that produce glare. Light concrete can be especially troubling to older people. Use tinted concrete if possible. Along these pathways, the researcher recommends lights to be installed which will provide illumination during the night if someone wants to enjoy the night’s cool breeze and enjoy the scent from flowers.
Figure 63: Example of accessible path width and design

Source: http://www.sustland.umn.edu

The researcher recommends a provision of five-foot minimum width at paths for one-way traffic to accommodate the turning radius of a wheelchair. For two-way wheelchair traffic, provide seven-foot minimum width. See figure 63 above. At the edges of the pathways, there should be provision of different texture. This texture provides perceptible information to the wheelchair user which tells them that that is the edge of the pathway and that they should change direction and also to people with low vision to recognize when they are off the path. The researcher recommends that there should be a limited grade changes in most highly used outdoor areas especially the pathways. The slope of a walk must not exceed 5% or 1 foot of rise for 20 of feet length. Cross slope must not exceed 2% or 1 foot of rise for 50 feet of length. See figures 64 and 65 below.

Figure 64: Maximum slope

Source: http://www.sustland.umn.edu

Figure 65: Cross slope

Source: http://www.sustland.umn.edu
On the plants and flowers to be grown at Thogoto home for the aged, the researcher recommends plants that engage all the senses. He recommends the use of a variety of textures, scents, colors, as well as plants that make pleasant sounds as wind rustles their leaves. Providing seasonal interest allows people to connect with the cycle of nature.

The researcher recommends that thorny or toxic plants should be avoided, especially in gardens used by children or people with certain psychological disorders and the aged like in this case. He recommends choosing insect- and disease-resistant varieties which can be used to eliminate pesticide use. Plant higher maintenance plants such as vegetables, herbs and cut flowers in easy-to-reach or raised beds. Because of the visually impaired residence, the researcher recommends that the garden can be laid out with straight edges and right angles and that curves and intricate patterns should be avoided.

The researcher recommends the use of warm, highly saturated hues (red, orange, yellow) that are easier for the elderly to see than cooler hues (blue, purple, green). Providing handrails in the landscape will encourage less able residents to participate in outside activities. The pathways along the landscape should contrast with planting areas to help define the boundary between path and plantings for residents with reduced depth perception. Furthermore, the researcher recommends that the color of chairs and tables should contrast with floor material so they are distinguishable by people with sight impairments in the garden. These seats should be with back support and arm rests because at an age of 60 and above one can’t sit comfortably in fancy garden benches. The researcher recommends that plants should be situated in a way as to provide views from windows looking out onto the garden for the aged who are unable to go outside.

The researcher also recommends a landscape with a meditation gardens which will aid in relaxation and provide a focus for concentration and therefore enhance the healing experience especially for the aged people. Garden layout should be as simple and uncluttered as possible. Some possible layouts are a circle which represents the cycle of life, a square representing universal order, or symbols such as a Celtic knot which represents a journey. By so doing, there should be a provision of an area of lawn or some type of seating suitable for sitting for long periods of time. Provide a focal point within view of the seating area. Choose cool colors (violet, blue, green) in the plantings.
The diagram 5 below shows a palette of the plants that the researcher recommends to be planted at Thogoto home aged.

**Diagram 5: Plant Palette**

<table>
<thead>
<tr>
<th>ORNAMENTAL TREES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ornamental plants are plants that are grown for decorative purposes in gardens and landscape design projects, as houseplants, for cut flowers and specimen display (Ornamental plant, 2012). The researcher recommends these types of plants because they are aesthetically appealing due to their shape and the colors of their leaves and flowers. Thogoto home for the aged is located in a cool climate and has a fertile soil; the researcher proposes the following ornamental trees.</td>
</tr>
</tbody>
</table>

**Figure 66:** Cassia Bicapsularis  
**Figure 67:** Bottle Brush  
**Figure 68:** Yaupon Holly

Source:  
www.mccabesnursery.com  
www.win.hostgator.com  
www.win.hostgator.com
### TREES FOR SHADE

The researcher proposes trees that provide shade. The residents should interact with the outdoors as much as possible and these trees will provide them an environment that will be of help. The following are some of the trees recommended by the researcher which will be of great importance to the Thogoto home for the aged residents and visitors too.

<table>
<thead>
<tr>
<th>Figure 69: Jacaranda</th>
<th>Figure 70: Frangipani Tree</th>
<th>Figure 71: Conifer</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="http://www.google.co.ke" alt="Jacaranda" /></td>
<td><img src="http://hawaiidermatology.com" alt="Frangipani Tree" /></td>
<td><img src="http://www.midwales-trees.co.uk" alt="Conifer" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Figure 72: Bauhinia purpurea</th>
<th>Figure 73: Plumeria alba</th>
<th>Figure 74: Callistemon lanceolatus</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="http://www.jardinsdepapounet.fr" alt="Bauhinia purpurea" /></td>
<td><img src="http://www.lepidoptera.com" alt="Plumeria alba" /></td>
<td><img src="http://www.mgonline.com" alt="Callistemon lanceolatus" /></td>
</tr>
</tbody>
</table>
The researcher recommends shrubs which shall be used to create hedges that assist the resident to navigate the site easily because they show barriers and boundaries. Pyrostegia are creepers which can be used in trellis and pagodas to make them more attractive and aesthetically appealing. Some of the flowers attract insects like butterflies and these small organisms go a long way in adding the value of the therapeutic gardens. Some of the flowers and shrubs to be grown at Thogoto home for the aged are shown below.
**SCENTED SHRUBS**

At Thogoto home for the aged, there are partial blind and/or blind residents; the researcher proposes scented shrubs like lavender and rosemary which emit sweet fragrances when the wind blows. This makes the landscape more habitable.

**GROUND COVERS AND GRASS**

In addition to having grass on the lawns, the researcher recommends ground covers will be used to introduce the much needed variety of colors, texture and sweet scents to the environment for the aged. The researcher recommends the groundcovers below for the site. The grass to be used at the site should have a carpet and tender look in order to be accessible by the residents on wheelchairs so that they can also enjoy the outdoors. In addition, it should also be
easy to maintain. For this reason, the researcher proposes the following types of grasses to be used on site. The purpose of the grass lawn is; *It has a charming effect, breaks the monotony and brings the integrity of garden components, cushiony layer for players who are engaged in sport activities, checks the pollution and increase the monetary value of land.*

**Figure 87**: Kikuyu grass

**Figure 88**: Peplum

**Figure 89**: Fountain Grass

Source: http://turfgrass.cas.psu.edu  
Source: http://www.tropicalforages.info  
Source: http://www.georgeweigel.net

**Figure 90**: Gazania

**Figure 91**: Spathiphyllum

**Figure 92**: Spider Plant

Source: http://www.aycicekcilik.com  
Source: http://www.google.co.ke  
Source: http://www.instructables.com
Climbers

Climbers such as Allamanda cathartica, Asparagus densiflorus, Bougainvillea sp, Clitorea ternatea, Ipomoea palmate, Quisqualis indica add a lot of beauty to the general outdoor landscape. The researcher recommends these climbers because they can be grown on the edges of the gazebo where the residents can relax during the day. The figures below show some of these climbers:

**Figure 93:** Allamanda cathartica  **Figure 94:** Bougainvillea  **Figure 95:** Quisqualis indica

Source: Author

The researcher recommends these plants and layout because they are easy to maintain: twice a week.

### 7.4 Furniture

The researcher recommends that seats should be of a color that contrasts with the surrounding area. Seats should be in the range of 450mm to 475mm high and a recommended width of 500mm with firmly padded seats incorporating rounded front edges. Chairs with stiff backrests and armrests are easier for many people to get in and out of the chair. A proportion of the chairs should be without armrests for people who require more space. Seats should be moveable with adequate space in the seating layout to accommodate wheelchair users; parents with strollers; people with visual difficulties; guide dog users; and those with walking aids.

Due to the inadequate storage space and facilities in the hostels, the researcher proposes the expansion of storage space in ways that still meet the Universal design considerations. Minimalist design principles are to be followed so as to maximize the small space in the rooms but still meet
all storage needs. In addition, the researcher recommends application of Universal design in the storage design so it requires low physical effort in using as well as having ergonomic dimensions.

Furthermore in landscaping, permanent outdoor furniture/seats is a major component. This furniture must be carefully selected because of extreme weather conditions at Thogoto which is majorly cold especially during the night. The researcher recommends furniture that is rot resistant so as to increase its self-life. In addition, the material used should be one that age gracefully under the sun. Some of the materials that the researcher recommends are stainless steel metal, wood or plastic. The researcher recommends park benches and garden swing chair which will help the aged improve their physical being.

The researcher recommends safety bed rails, a trapeze, or a pivot transfer super bar near the bed which will provide the necessary support to help the aged to get in and out of bed. Some bed rails for elderly can swing out for added convenience (Products For Elderly People, 2012).

See figure 96and 97 below

**Figure 96:** bed rail  
**Figure 97:** Super Bar Pivot Transfer

Source: http://store.yourspecialneedssolutions.com  
Source: http://store.yourspecialneedssolutions.com

7.5 The fourth consideration is the kitchen

Appliances must be selected to facilitate their use by individuals with physical limitations. This includes both the major appliances (stove, refrigerator and dishwasher) and the portable
appliances (can opener, coffee maker and garbage can). The design must consider the work-flow in the kitchen as well as personal safety. (Guild, 1989)

8. Conclusion
After an intensive research both in secondary and primary sources, the researcher learnt a lot about the principles of Universal Design especially designing the interiors for the aged in our society. Today, the issue at hand is the development of Universal Design in the society especially in Kenya. This philosophy of design is slowly gaining popularity in the whole universe because its aim has now evolved to creating an accessible universally designed environment for all (hence the name universal) from the beginning rather than focus on adapting things for individuals for a later time thus causing inconvenience. Universal design has been applied in enacting laws on building codes to improve accessibility to public spaces. Design is a problem solving activity where problems like the use of spaces concerning the interior spaces of any environment are put into consideration when solving the problem: Interior design is an art in which creativity and technology works together to accumulate a well-defined interior environment.

It is because of this qualitative research that the researcher recommends the above recommendations and solutions that can be applied at Thogoto Home for Aged to provide a universal living environment to the residents. Furthermore having looked at works by Rex Pace who practices Universal design especially in kitchen and the Ed Roberts Campus which is fully Universal it gave the researcher a clear vision of what Universal interior Design entails and hence understand what the needs of the aged are.
9. References

http://www.ncsu.edu/www/ncsu/design/sod5/cud/about_ud/udprinciplestext.htm


http://www.udll.com/media-room/articles/ten-myths-about-universal-design/index.cfm


http://www.idgo.ac.uk/design_guidance/factsheets/levels.htm


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*Transgenerational design*. (n.d.).


**DOCUMENTARIES**

1. Objectified
2. Grand Design
3. Design Star Competition

**HOME EXPOS**

1. Nairobi Home Expo 2012
2. Kenya Homes Expo 2012
APPENDICES

1. QUESTIONNAIRE TO THE MANAGEMENT OF THOGOTO HOME FOR THE AGED

Thank you for taking time to fill in this questionnaire. This Questionnaire is basically for a research purpose which is being carried out by a Fourth year Design student at the University of Nairobi, College of Architecture and Engineering (C.A.E), School of the Arts and Design (S.t.A.D). The information given will be used by the researcher carrying out the study for academic purposes only.

1. Please give a brief history of Thogoto home for the aged indicating when it started, who was the founder and what was their motivation in beginning the home?

2. Who is currently managing Thogoto home for the aged? Also, who are the major stakeholders and donors?

3. Who are the beneficiaries of Thogoto home for the aged?

4. Please give a brief description of the residents at the home (their number, gender, ages, previous occupations and their hobbies)
5. What are the current facilities available at the home and what function do they serve? Do they provide enough help to the residents?

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6. What are some of the suggestions that you can give to improve the welfare of the residents at Thogoto home for the aged?

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7. Please give a brief description of the staff at Thogoto home for the aged (Their number, gender and job description)

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8. Please give a brief description of the program of activities at the home on a daily basis.

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9. Do you think Thogoto home for the aged has sufficient space to house all the beneficiaries? Do they feel comfortable in their hostels?

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10. What do you think about the current landscaping design at Thogoto home for the aged?

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Thank you for taking time to fill in the questionnaire
2. **QUESTIONNAIRE TO THE WORKERS AT THOGOTO HOME FOR THE AGED**

*Thank you for taking time to fill in this questionnaire. This Questionnaire is basically for a research purpose which is being carried out by a Fourth year Design student at the University of Nairobi, College of Architecture and Engineering (C.A.E), School of the Arts and Design (S.t.A.D). The information given will be used by the researcher carrying out the study for academic purposes only.*

1. Please give a brief description of the residents’ daily needs.

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2. How many residents are using wheelchairs and needs specialized attention? What form of specialized attention do they need?

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3. How many residents are suffering from a disability? What type of disability?

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4. Is the living environment at Thogoto home for the aged ideal for residents with disabilities or those with chronic medical conditions?

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5. If the answer to the above question is no, what improvements do you think can be made to the home to improve it?

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6. Do the residents enjoy the current facilities provided by Thogoto home for the aged?

7. Do the residents have difficulties in accessing their beds in the hostels?

Thank you for taking time to fill in the questionnaire
3. GUIDED INTERVIEW TO THE RESIDENTS AT THOGOTO HOME FOR THE AGED

Name: .................................................................

Age: .................................................................

Date: .................................................................

1. What was your previous occupation before coming here? What are your hobbies?
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2. What challenges do you normally face in the built environment at Thogoto home for the aged?
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3. Do you face any difficulties in accessing the facilities provided at Thogoto home for the aged? Are there some areas that you find it difficult to access?
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4. Do you think the current furniture is in good condition? Do you feel comfortable sitting on them?
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5. How much time do you spend outdoors? Is the landscaping comfortable enough to enjoy sitting outside?
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6. What improvements and changes would you like to see made in the built environment at Thogoto home for the aged to make it more comfortable and accessible for you?
   ……………………………………………………………………………………………………………………………………………………………

Thank you for taking time to fill in the questionnaire
4. Site Inventory

Source: Author