REIMAGING AGE-IN LIVING: 
AN EXPLORATION INTO THE SECOND HALF OF LIFE

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THESIS SUBMITTED TO THE FACULTY OF THE VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTERS OF ARCHITECTURE

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REIMAGINING AGE-IN LIVING

AN EXPLORATION INTO THE SECOND HALF OF LIFE.

LOGAN MICHAEL MERRILL
ABSTRACT (ACADEMIC)

THE CONCEPT OF HOME IS ONE THAT HAS EXISTED SINCE HUMANS FIRST SOUGHT A PLACE OF REFUGE AND SHELTER. THESE SPACES HAVE CERTAINLY EVOLVED AND BEEN ADAPTED OVER TIME, HOWEVER, THE LOGIC BEHIND THIS DRIVE TO CREATE SPACES THAT PROTECT AND ENVELOPE IS THE SAME. TO HAVE A HOME IS TO ESTABLISH A SPACE THAT IS ALL YOUR OWN. IN ITS MOST BASIC FORM, IT IS ESSENTIALLY A CONTAINER FOR THE LOVE AND MEMORIES THAT ARE TIED TO HOME LIFE AND THE RELATIONSHIPS FORGED THERE. THE CONCEPT OF AGE-IN LIVING IS ONE THAT CAN AND SHOULD BE ELEVATED TO THE LEVEL OF DWELLING RATHER THAN LIVING OR SIMPLY EXISTING. THIS THESIS ANALYSES THE HOME AT A FUNDAMENTAL LEVEL AND FOSTERS A WAY FORWARD FOR FAMILIES CHOOSING TO REMAIN IN THEIR PERSONAL RESIDENCE AS LONG AS POSSIBLE.
ABSTRACT (GENERAL)

AGE-IN LIVING IS AN AREA OF RESIDENTIAL ARCHITECTURE THAT CURRENTLY HAS NO FORMAL DESIGN OR CONSTRUCTION RELATED GUIDELINES. THE FACT IS, THIS IS AN AREA OF DESIGN THAT HAS RECEIVED LITTLE TO NO FORMAL CONSIDERATION AS A SUBJECT IN ITS ENTIRETY. THE TRADITIONAL SOLUTION TO THIS PROCESS HAS BEEN ASSISTED AND INDEPENDENT LIVING FACILITIES FOR ELDERLY INDIVIDUALS WHO HAVE ENCOUNTERED TROUBLES WHILE LIVING WITHIN THEIR OWN HOMES. IN AN AGE WHERE DESIGN GUIDELINES ADDRESS TOPICS FROM BIOPHILIA, SUSTAINABILITY, AND OVERALL USER WELL-BEING, THIS SAME MINDSET CAN BE APPLIED TO AGE IN LIVING. AFFORDABILITY ALSO BECOME A MAJOR COMPONENT OF RETIREMENT, ESPECIALLY WHEN ASSISTED LIVING INDEPENDENT LIVING, OR MEMORY CARE BECOMES NECESSARY. THIS THESIS SERVES AS A DESIGN EXAMPLE OF THE POTENTIAL WITHIN THE AREA OF AGE-IN LIVING WITHIN THE RESIDENTIAL ENVIRONMENT. WHILE THIS DESIGN GUIDELINE IS INTENDED FOR NEW CONSTRUCTION HOMES, IT CAN BE APPLIED TO RENOVATIONS AS WELL.
TO MY WONDERFUL PARENTS,
MIKE AND KAREN

TWO PEOPLE WHO HAVE
TAUGHT ME EVERYTHING I KNOW
AND HAVE GIVEN ME THE WORLD.

I AM WHO I AM BECAUSE OF YOU.
THANK YOU FOR YOUR BOUNDLESS LOVE
AND UNENDING SUPPORT.
THIS IS FOR YOU.
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VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY
COLLEGE OF ARCHITECTURE AND URBAN STUDIES
MASTERS OF ARCHITECTURE
2019
AGE - IN LIVING
AN EXPLORATION INTO THE SECOND HALF OF LIFE

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VIRGINIA TECH
COLLEGE OF ARCHITECTURE
AND URBAN STUDIES
M. ARCH MASTERS THESIS
2019
TABLE OF CONTENTS
THE START.
Introduction to age-in living research and statistics related to this topic. This section will also introduce the financial aspect of retirement as well as the associated cost and planning of time spent in an assisted living community.

THE HOME.
The concept of home is one that has existed since humans have sought a place of refuge and shelter. These spaces have certainly evolved and been adapted over time. This section will address the home as a place of dwelling and the potential problems associated with aging in place.

ZONES.
As a way of subdividing the home to further analyze how it is used and functions, the home will be divided into four major zones: living room, kitchen, bedroom, and bathroom. These zones will be addressed both individually at the scale of product design to spatial layout within zones.

INTERVENTIONS.
The scale of industrial design is one that is incredibly important to the study of age-in living. Product design and selection are some of the key elements in improving not only the functionality of a space but also improving the overall aesthetic appeal of a home while including ADA standards.

HOME DESIGN.
In this concluding section, the interventions, products, and organizational strategies are implemented in the design of a single family, fully detached residence as an example of what is possible in a new construction project for a family who wishes to remain in their home for an extended period.

REFERENCES.
This section will include reference information for resources used throughout the research process. Much of the material consulted came in the form of written work, however, physical material samples, drawings and other mediums were also consulted.
Age-in living is an area of residential architecture that currently has no formal design or construction related guidelines. The fact is, this is an area of design that has received little to no formal consideration as a subject in its entirety while the vast majority of seniors long to remain in their personal home. The traditional solution to this process has been assisted and independent living facilities for elderly individuals who have encountered troubles while living within their own homes. In an age where design guidelines address topics from biophilia, sustainability, and overall user well-being, this same mindset can be applied to age in living.

As a way of introducing this exploration into the second half of life, the statistics related to age-in living are an excellent place to start. Initial research into this topic reveals that the vast majority of aging individuals wish to remain in their personal residence as they embark on the journey that is aging. From there, the data covers a wide range of topics from renovations to make living at home easier, safer to products used, and the financial burden associated with moving to an senior living facility. This section will delve into the statistics related to each of these areas of study and how they should inform decision making with age-in living design and product selection.
Age-in living is, for the most part, a very new trend in the fields of design and architecture. One of the most striking statistics when performing initial research is that 90% of seniors express their desire to remain in their personal residence as they begin to age. This incredibly high statistic begs the question: why are designers not committing more time and effort to creating environments and spatial organizations that could encourage seniors to remain in their homes as they grow older.
The second statistic that stands out the most is that concerning modifications within the residential environment. When polled, 79% of seniors stated they had expressed interest in acquiring and installing home modification products such as grab bars to facilitate their ability to remain living independently.
Also included in the same polling study, 60% of seniors stated they had already made a financial investment in their current home to make the necessary modifications to better facilitate their lifestyle of living independently or to increase their ability to do so.
The financial component of senior living is one that begins to play a major role in retirement planning. It is often very difficult to budget the appropriate funds to ensure they will last for an extended period of time, especially as community living becomes needed at any point. Currently in the state of Virginia, the average cost to a resident of a senior living community is around $47,400 a year. This figure refers to a single unit for assisted living.

As a comparative study, several additional states have been included in the financial aspect of this research. In the state of Vermont, there is an increase of approximately $11,000 dollars annually for the cost of living as compared to assisted living communities in Virginia.
The third state included in this study is Delaware. The annual rates continue to increase in comparison to both Vermont and Virginia. Delaware has an annual increase of $6,000 from Vermont and $17,000 from Virginia.

Finally, the last area included in this study is the District of Columbia. The average annual cost for one year of housing on an assisted living campus is $80,400. This comes at an increase of $33,000 over that of the cost of living in the state of Virginia.
Even though the cost of assisted living facilities may vary widely from state to state in the US, the overarching fact is senior care facilities are becoming incredibly expensive. The average length of retirement to plan for is 18 years. In the grand scheme, this is a very long period of time which means financial planning becomes a critical component of early stages of life.

In order to begin planning for the season of life that comes during retirement, multipliers have been established to help individuals and families create a budget for their savings as they age. This multiplier is linked to the salary that has been made and the amount of savings that same person should have by the age of 65. This graphic indicates that this individual, making a salary of $75,000 per year, should have 10.5 times their yearly salary in savings bringing their total recommended savings amount to $787,500.
This same logic is applied to higher salaries with an increased multiplier. The increase in multiplier helps to maintain the individual’s lifestyle and spending habits that have been established due to the salary earned. For someone making $100,000 a year, by the age of 65 they should have saved 11.5 times their salary: $1,150,000.

This trend continues with an even higher increase in yearly compensation. An individual earning $150,000 a year would have a savings multiplier of 12.5 times their yearly salary. By the age of 65, this individual should have around $1,875,000 in her/his savings account in preparation for retirement.
A very startling statistic involved with financial planning for seniors is that between the ages of 55 and 65, the average American only has approximately $107,000 in their savings account. When this is stacked up against the ever increasing cost of only one year of assisted living housing, individuals and families could potentially find themselves going through their life savings at an alarming rate.

To put all the numbers in perspective, this equation complies the data from the research previously mentioned. In this scenario, an individual living in Virginia is in need of assisted living facilities throughout the projected 18 years of retirement. This person falls into the average savings category of $107,000 total. The bill for 18 years of care comes out to just over $853,000 creating a budget shortfall of $746,200. It is also very important to keep in mind these cost of living figures apply only to assisted living care. If someone was in need of higher end memory care facility treatment, this figure would increase exponentially from an already unaffordable rate.
**HOME TIMELINE**

**PURCHASE OF HOME**
A husband and wife with one child purchase their forever home with all appropriate age-in living accommodations built into their home. (see page 51)

**AGE 30**

**BIRTH OF 2ND CHILD**
The family grows with the birth of a second child. The spare bedroom becomes the bedroom for the newborn baby.

**AGE 35**

**HOME OFFICE**
The spare bedroom in the 3 bedroom, 3 bathroom house is used for a study or an office space for when one of the parents needs the ability to work from home.

**AGE 60**
COUNTER HEIGHT
In the kitchen and master bathroom of the home, a lower counter height is provided for both the kids to use as well as the adults. The kids can eat at the lower counter top in the kitchen and mom can use the one in the master for getting ready. (see page 71 + 73)

THE LAYOUT
The generous spatial layout of the floor plan of the home provides the family with ample amounts of space for furniture arrangements as well as for large family gatherings. (see page 52)

COLLEGE MOVE-OUT
The oldest child moves out of the home due to their acceptance into college. This space can now be used again as a home office space for working or as a study.
A husband and wife with one child purchase their forever home with all appropriate age-in living accommodations built into their home. (see page 51)

The family grows with the birth of a second child. The spare bedroom becomes the bedroom for the newborn baby.

The spare bedroom in the 3 bedroom, 3 bathroom house is used for a study or an office space for when one of the parents needs the ability to work from home.

The generous spatial layout of the floor plan of the home provides the family with ample amounts of space for furniture arrangements as well as for large family gatherings. (see page 52)

In the kitchen and master bathroom of the home, a lower counter height is provided for both the kids to use as well as the adults. The kids can eat at the lower counter top in the kitchen and mom can use the one in the master for getting ready. (see page 71 + 73)

As the oldest child moves out of the home due to their acceptance into college. This space can now be used again as a home office space for working or as a study.

As the second half of life presents itself, travel distances between major program in the home becomes very important. Minimizing travel distances helps to reduce the risk of injury due to potential falls.

Joint deterioration and grip strength begin to alter the day to day tasks of the home owner. Design interventions such as minimizing wall mounted storage, lever door handles, integrated grab bars in the bathrooms all start to facilitate these issues. The second child also moves out to begin their college studies. (see page 88 + 89)

The mother has to have her knee replaced and is wheelchair bound for a period of time as recovery takes longer than expected. The integrated grab bars in the bathroom as well as the roll under counters help to accommodate her temporary disability.

When laundry baskets become too heavy to carry, the homeowners can take advantage of multiple interventions built into their laundry space. The washer and dryer are both elevated to prevent them from bending over to load and unload clothes. An opening in the wall between the master closet and laundry room is provided as a laundry basket pass through to prevent the homeowners from carrying heavy loads. (see page 82 + 83)

As the couple gets older their ability to take care of themselves begins to decline. They elect to hire a live-in care specialist to assist them in their day to day lives. The spare bedroom suite is able to accommodate the caregivers needs without overlapping with the family's personal space. (see page 51)

Due to natural causes, the husband passes away. One of the couple's children and their spouse moves into the master bedroom of the house to take care of their mother so she stays in the home. The mother moves to the caregivers suite and the entire cycle of the forever home begins again.

TRAVEL DISTANCES
As the second half of life presents itself, travel distances between major programs in the home becomes very important. Minimizing travel distances helps to reduce the risk of injury due to potential falls.

LAUNDRY USAGE
When laundry baskets become too heavy to carry, the homeowners can take advantage of multiple interventions built into their laundry space. The washer and dryer are both elevated to prevent them from bending over to load and unload clothes. An opening in the wall between the master closet and laundry room is provided as a laundry basket pass through to prevent the homeowners from carrying heavy loads. (see page 82 + 83)
KNEE REPLACEMENT
The mother has to have her knee replaced and is wheelchair bound for a period of time as recovery takes longer than expected. The integrated grab bars in the bathroom as well as the roll under counters help to accommodate her temporary disability.

LIVE-IN CARE
As the couple gets older their ability to take care of themselves begins to decline. They elect to hire a live-in care specialist to assist them in their day to day lives. The spare bedroom suite is able to accommodate the caregivers needs without overlapping with the family’s personal space. (see page 51)

FULL CIRCLE
Due to natural causes, the husband passes away. One of the couple's children and their spouse moves into the master bedroom of the house to take care of their mother so she stay in the home. The mother moves to the caregivers suite and the entire cycle of the forever home begins again.
01 THE HOME
THE HOME.

The concept of home is one that has existed since humans first sought a place of refuge and shelter. These spaces have certainly evolved and been adapted over time, however, the logic behind this drive to create spaces that protect and envelope is the same. To have a home is to establish a space that is all your own. In its most basic form, it is essentially a container for the love and memories that are tied to home life and the relationships forged there. The concept of age-in living is one that can and should be elevated to the level of dwelling rather than living or simply existing.

To live in a space can be equated to simply making it personal and to existing there. Residents personalize finishes and select furniture and to a certain extent, the personalization ends there. What if this process was taken a step farther? What if the bar was set a bit higher? As humans age, the process of living is one that changes as physical abilities change and ultimately become more limited. Dwelling on the other hand means to live well within a space or environment. Through this exploration into the second half of life, I am to elevate age-in living to the level of age-in dwelling. This section will address the home as a place of dwelling and the potential obstacles associated with aging in place.
The initial portion of section 01 begins with a floor plan study that analyzes the home as a whole. This study helps to better understand spatial adjacencies and how the floor plan functions as a system of residential dwelling. Also revealed in this study are potential problems that may arise with individuals that want to remain in their personal residence as they age.
Pros
• Spatial separation from guest bedrooms to master bedroom + master bedroom
• Large attached garage

Cons
• Master bedroom close to entry
• Strange layout for the kitchen
• No ADA transfer space for toilets

Pros
• Large pantry
• Generous storage
• Large kitchen and dining space

Cons
• No ADA transfer space for toilets
• Awkward entry sequence
• Limited outdoor spaces
Plan_03

Pros
- Large kitchen space
- Master bedroom has a protected entry sequence from the living room
- Functional footprint

Cons
- No outdoor spaces
- No transition from exterior to interior space of the living room
- Kitchen/dining closed off from the living room

Plan_04

Pros
- Attached garage
- Spatial separation from guest bedrooms to master bedroom + master bedroom

Cons
- Confined entry sequence
- Master bedroom located directly next to front door entry way
- Strange bathroom layout in hall
**PLAN_05**

**Pros**
- Large amount of outdoor space
- Covered front porch
- Attached garage
- Generous amounts of storage

**Cons**
- Stairs to the basement
- No spatial separation from master bedroom from the other bedrooms

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**PLAN_06**

**Pros**
- Very small master bathroom
- Has 2 spare bedrooms
- Generous amount of storage

**Cons**
- No attached garage
- Very small master bathroom
- Limited outdoor spaces
- No spatial separation from master bedroom from the other bedrooms
**PLAN_07**

**Pros**
- Large outdoor spaces
- Large living space is centrally located
- Attached garage
- Large master bathroom

**Cons**
- Stairs to both the second level and to the basement level
- Small master bedroom

**PLAN_08**

**Pros**
- Large living room
- Generously sized bedrooms
- Good amount of storage

**Cons**
- No transition space from exterior to interior living areas
- Very small bathrooms, no ADA transfer space
AREA:
THE HOME _01

• Minimal to no steps throughout the entire home. This gesture greatly reduce the risk for falls and injury of seniors while continuing to live independently in their own home.
• Minimize material transitions throughout. This quality greatly facilitates those residents that are wheelchair bound when thresholds do not present a potential barrier or trip hazard to those that maintain personal mobility.
• Crank-out casement windows to make the process of opening and closing a window very easy.
• Lever door handles on all doors throughout the home.
• All door sizes are 3’ wide or larger to accommodative those residents in a wheelchair or using a walker.
• Easy to use, easy to grasp pull hardware on all cabinet doors and drawers in the kitchen, bedroom, and bathroom.
• Durable flooring and wall covering finish materials are recommended throughout the home to minimize maintenance and maximize the life span of the home.
• Durable exterior materials such as board and batten siding, vinyl siding, and standing seam metal roofing are also encouraged to increase the lifespan of the home.
• In general, spatial layouts from major zones of the home (living room, kitchen, bedrooms, and bathrooms) should aim to minimize the travel distance to and from major areas of use throughout the home.
02 ZONES
Section 03 will begin a conversation concerning the spatial layout and organization of the four major zones of the home in relation to one another. The process of subdividing the home into four zones helps to tackle the complexity of these spaces and how they function. When studying a residential dwelling, zones of inhabitation can be broken down into four major areas: kitchen, living, bedroom, and bathroom. Within this section, each zone will be explained in terms of potential existing issues and solutions to remedy them.

As these zones come together, they begin to overlap and interact with one another. They begin to inform the placement of major areas of use within the home from the public to the private. This section will also include a set of specifications and product cut sheets to assist architects and designers with recommending age-in-appropriate products throughout the residential design process. The specifications for these zones will range from specific dimensions for arranging cabinets/storage to custom details for integrated grab bars throughout the bathroom. These organizational relationships will begin to inform the home design in section 04.
The initial portion of section 02 provides a floor plan study that was aimed at analyzing eight example floor plans to draw out spatial relationship between the four zones previously mentioned. This study lists the positives and negative of each residential floor plan. The size, organization, and orientation of these eight homes varies from project to project.
**PLAN_01**

Pros
- Short travel distance from the kitchen to the dining space
- Open concept from the living room to the kitchen and dining

Cons
- Laundry room is a long travel distance from both the master and spare bedrooms

**PLAN_02**

Pros
- Open concept from the living room to the kitchen and dining
- Short travel distance from the garage to the master bedroom
- Master bedroom and bathroom are located in

Cons
- Laundry room is located very far from the master bedroom
- Long travel distance from garage to pantry for unloading groceries
**PLAN_03**

**Pros**
- Garage is located very close to master bedroom to minimize travel distance
- Master bedroom and bathroom are located in adjacent spaces

**Cons**
- No laundry space
- Closed concept layout from living room to kitchen space

**PLAN_04**

**Pros**
- Master bedroom and bathroom are located in adjacent spaces
- Garage is located very close to master bedroom to minimize travel distance
- Kitchen adjacent to dining space to minimize travel distance with food

**Cons**
- Travel distance from master bedroom to laundry room could be shorter
- Cinema room increase distance from master to main living spaces
### PLAN_05

**Pros**
- Living room is located central to the plan of the home
- Short travel distance from the kitchen to the dining space
- Master bedroom and bathroom are located in adjacent spaces

**Cons**
- Long travel distance from the garage to the master bedroom
- Long travel distance from the laundry room to the master bedroom

### PLAN_06

**Pros**
- Very large master bedroom
- Large central living space
- Kitchen and dining located in adjacent space

**Cons**
- Small kitchen space with no pantry
- Very small master bathroom
- Long travel distance from master bedroom to laundry
**PLAN_07**

**Pros**
- Kitchen located between dining room and breakfast area
- Living room located centrally

**Cons**
- Long travel distance between laundry room and master bedroom/closet
- Long travel distance between the garage and the master bedroom

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**PLAN_08**

**Pros**
- Open concept between the living room, kitchen and dining spaces
- Large master bedroom

**Cons**
- Long travel distance between laundry/utility room and master bedroom/closet
- No attached garage for ease of entry
ZONE QUALITIES

ZONE: LIVING ROOM_01

- Open concept from kitchen area into kitchen and dining.
- Storage built into the entry foyer for convenient access.
- Large open space to accommodate wheelchair clearance.
- Tall ceiling height.
- Consistent floor materials throughout the space to minimize threshold transitions. Consistent flooring materials also makes cleaning and maintenance easier for the residents.
- Under counter built-in cabinets for accessible storage.
- Travertine counter top for easy cleaning and maintenance.
- Minimal travel distance from living space to master bedroom to prevent the risk of falls that accompany extended paths of travel.

ZONE: KITCHEN_02

- ADA clearances on cabinets for a pass-through kitchen.
- Pot faucet built into back splash behind the stove to prevent residents from lifting heavy pots of water while cooking.
- Minimal wall mounted cabinets to reduce need to reach high shelves over counter. Open shelving also incorporated to minimize the need for reaching high level storage.
- Roll out under counter drawers for easy storage.
- -Spacious pantry provided adjacent to the kitchen to make unloading groceries and accessing ingredients easier.
- Lower level window for visual access for residents that are wheelchair bound.
- Open concept dining to the kitchen and living room.
- Roll-under counter height at kitchen island.

ZONE: BEDROOM_03

- Protected recessed entry from main living space.
- Large walk-in closet.
- Pass through access through wall between closet and laundry room prevent residents from carrying heavy laundry baskets.
  - Raised washer/dryer unit to reduce the need to bend over while washing and drying clothes.
  - Utility sink provided in laundry room to minimize travel distance to a water source while doing laundry.
- Spacious bedroom footprint for complete wheelchair access around furniture and other personal belongings.
- 9’ ceiling to provide a more comfortable space in comparison to the tall ceilings throughout the living space.
- Consistent flooring material from living space to bedroom.

ZONE: BATH ROOM_04

- Roll under counter height for seating area as well as wheelchair access for those residents that need this function.
- Transfer space in every bathroom throughout the home to allow for an easier transition from wheelchair to toilet space.
- Integrated grab bars built into the wall of the shower as well as the dividing partition between the toilet and shower to accommodate the need for mobility assistance in a discreet way.
- Spa shower enclosure for tub and shower to provide easy roll-in access for residents with any type of physical restriction.
- Consistent flooring material from main bathroom space to shower.
- Adjustable, mechanized toilet to accommodate residents of all ages.
SECTION 03
INTERVENTIONS
In the previous section, age-in living was discussed from the scale of the home as a whole and the potential issues that should come into consideration as an individual or family ages into a space. This section will focus in to the scale of the design of products and specific interventions to ensure day to day life and tasks do not become belabored or even impossible.

For the purposes of this exploration, the term intervention is being used to define a design solution for specific areas of concern that appear to potentially present difficulty to homeowners. These interventions vary widely in application and areas of focus throughout the home. From the kitchen to the bathroom, these design interventions address the process of aging and in the process, if implemented early on in life and used, can help to slow the process of aging in terms of joint deterioration and mobility. To take this a step further, if these design interventions are used on a daily basis, muscle memory is developed and established in the event that corrective surgeries or unexpected injuries may occur.
One of the initial contacts made with a residential environment is the door knob. The design of these very simple but very important components comes into play even more throughout the process of aging. A person's ability to grip a door knob becomes very important and in some extreme cases debilitating. These changes begin to inform design decisions made concerning products and material the user will come into contact with. Lever door handles become very helpful and far easier to operate as grip strength weakens.
Logan Merrill     |     Reimagining Age-In Living

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![Diagram of lever and dimensions with questions]

- Are lever-handled door knobs easier to use for senior citizens?
- Are lever-handled door knobs more suitable for people with low hand dexterity?
- What is the ideal distance from the mounting of hardware to the center of the door lever?
- Which material is best for door lever?
This photography study was done while analyzing smaller scale moments throughout multiple residential spaces. Small moments such as an interaction with a specific type of door handle or cabinet pull hardware can become dramatically important as a person ages. Room thresholds, material changes, light switches, can also dramatically effect a person’s day to day life and interaction with their home.
When studying age-in living, the Americans with Disabilities Act is a great reference to start with. This document sets forth requirements to allow and facilitate equal access to all public and private spaces.

The diagrams included in this section are taken from the ADA manual published in 2010. They provide contractors, architects, and other designers with ample examples of the requirements set forth. The examples included are more specific to the residential environment such as door width and swing, sizing and spacing of bathroom fixtures and equipment, kitchen layouts and reach requirements for specific disabilities.

Many designers view ADA requirements as a burden to include in their design that has the potential to alter their design intentions. If this guideline is included from the start of a project, it has the potential to become a beautiful integrated component in any project.

ADA provides a great starting point when designing a forever home with interventions built in to accommodate residents of all ages, especially senior residents.
Figure 308.3.2 Obstructed High Side Reach

(a) 34 max
(b) 48 max

Figure 308.2.2 Obstructed High Forward Reach

(a) 20 max
(b) >20-25 max

Figure 404.2.4.2 Maneuvering Clearances at Doorways without Doors. Sliding Doors, Gates, and Folding Doors

(a) front approach
(b) side approach
(c) pocket or hinge approach
(d) stop or latch approach

Figure 404.2.2 U-Shaped Kitchens

(a) 60 min
(b) 60 min

Figure 404.2.1 Pass Through Kitchens

40 min
Laundry Concept Sketches

As men age they begin to need, their ability to bend becomes very limited. One of the essentials to a washer/dryer is the height of the washer and dryer.

Toilet Concept Sketches

As men age their bladder becomes an issue. It may make going to the bathroom more difficult. Most often, the toilet will be too low to comfortably stand up. Building a men's restroom into the set of the show allows for a comfortable height over time as needed.
Section 04 will consist of a single family, fully detached residential home design that will employ and be an example of the design guidelines established throughout sections 01-03. It will include floor plans, sections, interior and exterior renderings, and detail drawings where specified to fully explain and demonstrate the guidelines.

This home design will also be wheelchair accessible and possess all the necessary clearances required to accommodate this lifestyle change if needed. The process of aging can, to a certain extent, be predictable and therefore designs can be implemented to prepare for them. However, life is always changing and unpredictable. The need for wheelchair accessibility is not something most home-owners take into consideration when purchasing a home but having this quality built into the layout and organization can serve them well if the need should arise.
Initial exterior form study
Final concept sketch
SINGLE FAMILY, FULLY DETACHED RESIDENCE

FINISHED SQ FT: 2383
GARAGE SQ FT: 473

3 BEDROOMS
3 BATHROOMS
EAT-IN KITCHEN
SPACIOUS PANTRY
OPEN CONCEPT LIVING
LARGE FRONT AND REAR PORCH
2 CAR GARAGE

CONCRETE FOUNDATION AND FOOTINGS
MID CORD BEARING FLOOR TRUSSES
2x6 EXTERIOR WALL FRAMING
BOARD & BATTEN SIDING
3' CRAWL SPACE
2x4 INTERIOR WALL FRAMING
GWB FINISH
SHIPLAP FINISH
LVT FLOORING THROUGHOUT
CERAMIC TILE IN BATHROOMS
SUBWAY TILE SURROUND
2x6 ROOF TRUSSES
STANDING SEAM METAL
EXTERIOR MATERIALS

- Standing Seam Metal Roof
- Wood Accent Siding
- Window + Door Trim
- Wood Siding
- Stacked Stone
- Sidewalk Pavers
The living room is one of the most social spaces of the home. In this layout, it serves as a transition space from the outside to the open concept foyer. The living room is also open concept into the kitchen and dining spaces. This spatial organization allows for more engagement among users as well as minimizing barriers for seniors that may have impaired mobility. The living room is very spacious providing for ample amounts of room for residents to maneuver around and in between the furniture placed throughout the room.
Second only to the living room, the kitchen provides a very social and engaging space for residents and guests to gather together for a shared meal or to cook together. The kitchen's layout meets ADA's standard for pass through kitchens in terms of cabinet to cabinet clearances. This kitchen minimizes the use of wall mounted cabinets to reduce one's need to make hard reaches to the top shelves. The center island incorporates a roll under height counter top to encourage residents that may be wheelchair bound to join the conversation happening in the kitchen. A pot faucet is also placed above the range to prevent residents from carrying heavy pots full of water while cooking.
Section A - Dining Window View Range

Section B - Kitchen Island Height Access
One of the most private spaces within one’s home is that of the bedroom. The bedroom is often a place of refuge and relaxation for the residents. It provides a safe space for users to decompress from the outside world. The entrances to this master bedroom is recessed to provide privacy and protection for the space inside. The footprint of the master is quite generous to allow for ample circulation space. The master bedroom also provides an alcove that allows for a place of rest and reading. Large windows are places along the exterior wall to maximize natural lighting.
Included in the master bedroom is a large walk-in closet that residents can use for storing clothes and other personal items. The unique aspect of this walk-in closet is that it contains an opening in the wall into the laundry room which functions as a pass-through for the laundry basket. This design element prevents residents, especially in their senior years, from having to carry large, heavy laundry baskets. The basket can simply be pushed through the opening in the wall and can be retrieved on the other side under the sink.

Also included in this laundry room is a raised washer/dryer system. This prevents the resident from having to excessively having to bend over to do laundry. It also provides a place for storage.
Included in the master bedroom in this house is an attached master bathroom space. This bathroom is very spacious to provide room for two people to comfortably get ready at any given time. The vanity contains a roll under height seating area. The toilet is installed on a mechanical lift system that allow it to be adjusted to accommodate a child or a senior in need of an ADA height toilet. Ample transfer space is provided as well as integrated grab bars that are recessed into the side wall adjacent to the toilet. The spa shower contains a large door for easy entry, a large soaking tub, and recessed grab bars to assist users while bathing. The ceramic tile is continuous throughout the bathroom to minimize tripping hazards.
Master Bathroom Render

Master Bathroom Render
COST

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MATE
<table>
<thead>
<tr>
<th>Item</th>
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**Total Home Cost:** $352,450
The total cost estimate for this home is listed here. In comparison to the budget shortfall for assisted living, this home becomes very financially manageable.
REFERENCES.
This section of Reimagining Age-In Living is included to provide appropriate credit for the resources used and the experts consulted throughout the research and design process. This section can and should be used as a way of furthering the personal application of this information. These resources can be consulted in to provide additional information and points of contact for those in need of age-in living design guidance.
The Average Retirement Savings by Age

Comfort Living: Why It Is Okay To Age At Home
https://www.aginginplace.org/comfort-living-why-it-is-okay-to-age-at-home/

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Here's how much families have in retirement savings—and how much they actually need

Here's the Average Length of Retirement. Will Your Money Last That Long?

How Much Does Assisted Living and Home Care Cost in the US?
https://www.seniorliving.org/assisted-living/costs/

Ready to Retire? You still need a budget
https://www.fidelity.com/viewpoints/retirement/budgeting-in-retirement

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Gentle Architecture by Malcolm Wells

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In Detail: Housing for People of All Ages by Christian Schittich (Ed.)

Information Design Source Book by Institute for Information Design Japan

New Approaches to Housing for the Second Half of Life by Andreas Huber

Practicing Universal Design: An Interpretation of the ADA by Wm. L. Wilkoff and Laura W. Abed

Universal Design Handbook by Wolfgang F. E. Preiser and Korydon H. Smith
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