The Aging Home

How a housing typology can provide increased quality of life through multiple life stages.

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Thesis Statement

To develop a housing typology that addresses concerns of aging in place by introducing a flexible multi-generational design that adapts to users' needs over time.

Abstract

In an age of increasing technology, specifically advancements in medicine, new challenges are presented with how to adjust to the lengthened life-expectancy of American citizens. Given that living thirty years past retirement age is becoming more and more common, a unique opportunity is presented with how to approach architectural design for the aging. The Baby Boomer generation, because of its size and percentage of the population, will require new solutions to this problem. This generation is beginning to reach the age of retirement in large quantities and is set to continue to do so for another two decades.

The change is set to put an enormous amount of pressure on the current infrastructure for housing for the aging, namely nursing homes and assisted living facilities. While these have been viable options throughout history, they are often seen as a last resort and are utilized only when a person is no longer able to take care of themselves at home. Instead of increasing the capacity of these facilities, architectural effort would be better spent on developing systems that allow residents to remain in the comfort of their own homes and give them the opportunity for self-sufficiency.

The thesis aims to identify possibilities for incorporation of design elements during initial construction that can be utilized as the residence ages with the occupants, in addition to developing a system of adaptable functionality to allow for comfortable living throughout multiple life stages, with the option of incorporating multi-generational housing.
Thesis Essay
**Introduction**

The demographics of the aging population in the United States rapidly changes with every passing year as well as the sheer number of citizens over the age of 65. This results in an increased demand for housing solutions for the Baby Boomer generation to allow more freedom for the elderly as well as their children who often end up being the primary caretakers.

The current approach to aging in this country is one that can often separate the elderly from their families and their homes by providing off-site care in the form of nursing homes or assisted living communities. While this has been a viable solution to the issues that come with aging, it is often detrimental to the mental health of the residents. In fact, almost 90 percent of Americans over the age of 65 said they would prefer to remain in their current residence rather than move to a home for care. With this increased demand for remaining in their residence—aging in place—architectural solutions need to be developed to make this feasible for more Americans.

Of course, this is more than just an architectural issue. Even with the best in accessible design, aging results in physical limitations that often cannot be overcome without help. One current solution in place is hiring live-in help to assist with daily activities. While this solves the issue of living alone with physical limitations, this is cost prohibitive for most American families. However, architectural solutions may be available in the form of suites within the home that allow for aging parents to live with their children or grandchildren, creating a mutually beneficial living situation that could actually reduce the cost of living for all of the generations.

1. "A Report to the Nation on Livable Communities: Creating Environments for Successful Aging"
“Old age, believe me, is a good and pleasant thing. It is true you are gently shouldered off the stage, but then you are given such a comfortable front stall as spectator.” - Confucius

Nursing Homes

Arguably the most popular approach to housing solutions for the aging is in the form of nursing homes. These group homes have existed for decades and have often been the only choice for those who are no longer able to live on their own.

There are obvious benefits to nursing homes and assisted living communities. It is an all-in-one solution to the multitude of issues that face an aging population. It provides housing, food services, and support for the residents that includes medical care and physical therapy. Additionally, community events provide a social setting for those that may have lost their spouse and desire a more interactive living experience.

However, issues exist as well because of the institutional nature of these homes. Visiting hours limit when family members can stop by. The group setting can limit privacy and freedom to maintain the quality of life that is provided when living in a house or apartment. There have also been issues with diseases spreading among the residents as well as elder abuse. Studies have been done that show 1 in 6 nursing home residents will be victims of abuse or neglect every year². This is obviously not the situation that children wish to see their parents in, but it is the most popular solution with as many as 40 percent of adults entering a nursing home at some point in their lives³.

Nursing homes have made huge strides in design, distancing themselves from the hospital model and falling into a residential model that more closely resembles an apartment. However, this does not address all of the issues that face an aging population and are still in many cases cost prohibitive to families. While proven effective, they are not the only solution for comfortable living for those advancing in age.

2. “Nursing Home Abuse Guide”
Accessible Housing

An increasingly common approach to housing for the elderly is accessible design. This, more often than not, is achieved by remodeling the home in certain ways to eliminate obstacles that prevent mobility. An example of this would be the installation of a chair lift in multi-story homes to allow for circulation to various floors without having to use the stairs, a common limitation of the elderly. Another common example is the installation of grab bars and handrails throughout the home to provide stability when moving around.

While these modifications are helpful in the mobility of the residents, they can often be unsightly and obtrusive. Additionally, these modifications can be expensive and in certain situations require further remodeling of the home to accommodate these changes.

There are a few examples of homes that have been designed in accordance with the universal design movement, meaning that they are constructed from the beginning to accommodate all levels of limitations, whether that be issues with mobility or even hearing and sight. These examples are designed on a case by case basis and demand a high cost up front. While this is the ideal solution for a good quality of life, it requires a commitment to staying in one home at a relatively young age, which many couples are not able to do. It often seems more reasonable to wait until issues occur and then remodel a home accordingly to fit the exact needs of the occupants.

Finding a balance between remodeling and universal design is something that has not been explored much, but may hold the key to successful design that allows for remaining in one's home without a diminishing quality of life as one ages.

2. "Nursing Home Abuse Guide"
"Combine nursing homes with nursery schools. Bring very old and very young together: they interest one another." - John Cage

Multi-generational Housing

In generations past, living with older relatives in adulthood was a common occurrence. Children growing up with their grandparents was not uncommon and was often the first solution thought of when a relative reached an age when they could no longer live on their own.

Over time, however, this became less and less common. In fact, only 12 percent of American families had more than two generations living under one roof in the 1980s. This statistic is steadily increasing, up to 18 percent in 2012. This has been attributed to a multitude of reasons, such as a loss of jobs, tighter household budgets, and the oldest generation living longer than ever before.

This situation actually provides many solutions to the modern American family especially in terms of a living situation for the elderly. In cases where both parents hold full time jobs, the grandparents are able to care for the grandchildren in their youth, and those children can in turn care for their grandparents as they age. This also provides the most feasible solution in terms of cost among approaches to housing the elderly. Living under one roof allows for shared costs of rent, groceries and accessories.

Of course, issues to this approach exist when analyzing how much space is required to house three generations of family. The lots that can most often accommodate the required space exist in the suburbs, which are often too far removed from infrastructure that would allow for the elderly generation to get around when they can no longer operate a vehicle. However, architectural approaches can be made to increase the density of the multi-generational household to make this a more feasible housing solution.

Multi-generational households often require large floor plans to provide privacy to all of the residents. Susan Fitzgerald

House M-M provides an example of a more compact floor plan that could be develop to exist in a more dense urban fabric. Tuomas Uusheimo

3. "Multi-generational Household Information"
"There is nothing like staying at home for real comfort." - Jane Austen

**Staying Home**

While nursing homes have been the answer to issues that face an aging population, they often leave more to be wanted. Although they provide the convenience and support such as 24-hour care, meals, and activities, they are often a tough decision for the elderly and their families to make. The feeling that leaving your home is the only option is never a good one, and can often have detrimental effects on the mental health of the residents.

Some aspects that are important to maintain are the separation between a private room and social spaces. Even in a much smaller household, public spaces become extremely important, especially when considering the task of housing multiple generations. Each person needs their own private space, but to make the plan flow and work on a social level, these intermediate spaces where everyone can gather might hold the key to the success of the project.

Another issue of nursing homes is cost. However, if proposing alternative solutions, this cost can be used as a benchmark for what is reasonable in terms of outfitting a home with the necessary accessories to provide for comfortable living. Added cost is something to be expected regardless of the solution being used, so it is important to understand how these various approaches compare. The average cost of a private room in a nursing home is close to $7,000 per month. The average length of stay in a nursing home is approximately two and a half years. This equates to $210,000 being spent on a care facility. This money seems to be enough to provide for any changes being made to a home in order to accommodate mobility issues as well as in home care as necessary.

4. "Cost of Care"
5. "40 Must-Know Statistics About Long-Term Care"
Reaction Vs. Anticipation

There are two schools of thought when it comes to outfitting a home with features that help with compromised mobility. One has been used time and again and proven effective but obvious, and the other has yet to be explored in a wide market.

The first approach falls under the reaction category, that is to say bringing in modifications as they are needed to help keep a home comfortable and reasonable to live in. Items such as grab bars, hand rails, shower seats, and chair lifts have been popular in the homes of aging as long as they’ve existed. And while they are useful and have the advantage of being installed as needed, they are more often than not unsightly and can get in the way of someone using the home without mobility issues.

The second approach is becoming more popular as people begin to prepare for living longer and aging in place. This means designing and constructing a home in anticipation of needs that may need to be met later on in life. The advantage here is that these design features can be better integrated and less obtrusive to the unsuspecting visitor. The downside is that it is difficult to know exactly which features will be needed and therefore the architect needs to lean more heavily on over-designing. This results in higher costs and potentially unnecessary elements.

Both are viable approaches to aging in place but both also have clear downsides. There is a trade off between having the freedom to install what you need and having those features fit seamlessly into the home.
"There is nothing like staying at home for real comfort." - Jane Austen

**Under One Roof**

Multi-generational living, typically defined as more than one adult generation in the same residence, has been steadily increasing in popularity since the 1980s. For various reasons, such as job loss, lower incomes, and boomerang children, multi-generational housing has become an unavoidable option for many American families.

This provides a unique opportunity to address issues of aging in place for the elder generation. While it has been shown that in-home care can be extremely expensive, living with grown children that can take care of their aging parents becomes more and more of a reasonable option. In turn, these live-in parents can watch over their grandchildren if the owners of the household both work. This mutually beneficial living situation seems to be a trend that will increase in popularity.

There are some restrictions that occur when dealing with this housing typology, namely space. Including a parent or parents into a household increases the need for living space especially when taking into consideration privacy needs. Often, in-law suites have their own bathroom, bedroom, and sometimes even kitchen and living room. While this provides necessary privacy and division of space, it drastically increases the footprint which may become an issue depending on where the project is sited.

By trying to combine public spaces and orient private spaces to maximize efficiency, this model of multi-generational housing may become a viable option for extended families across the country.
Proposed Solution

While the current approaches to design as it relates to aging are all successful in their own way, they all demand the user give up something, whether it be their home or their ability to function well within their home.

The thesis aims to combine aspects from multiple sources into one project that allows freedom and flexibility for the aging residents. Mobility is of the utmost importance to someone with physical limitations; therefore the design of the structure needs to carefully consider the needs and wishes of someone with limited physical capabilities.

These implementations need to be seamlessly integrated into the design; to function alongside the home without detracting from the general layout. This becomes even more important when pairing this accessible design with a multi-generational housing typology. Because the project intends to serve multiple clientele, all with different needs, the aspects to aid the elderly must not diminish the living conditions of those who do not need the assistance.

Furthermore, the proposal requires the flexibility of use to change and adapt to multiple phases of life. The ability to transform the functionality of a space is important when considering children that leave home for extended periods of time but may return, as well as the ability to accept new residents to the project, whether that be aging parents or a third party with the wish to rent. This flexibility gives more feasibility to the project by allowing it to be multiple projects simultaneously.

This would allow the necessary funds to be used to accomplish the project without forcing a family to deal with one static approach.
Proposed Solution

Combining the typology of multi-generational housing with the accessibility that one with physical limitations needs seems to be a beneficial pairing when taking into consideration cost, utility, and a mutual social dependency. By housing an extended family together, young and old can receive the help and guidance they require without relying on third party organizations that are a potential financial burden.

This combination may prove more cost effective than any solution alone, and will therefore be a more common option for families to choose from if they are faced with circumstances that require action.

As far of the siting of the project is concerned, the proposal should allow for adaptability for multiple situations. However, the most successful possibility would be in a more urban context. Although a suburban setting allows for more space and therefore more freedom of design, and urban site provides more amenities that would be helpful to a multi-generational family. These amenities would include access to public transportation and proximity to urban infrastructure including grocery stores, banks, schools, and pharmacies. The ability to access these locations with ease prove invaluable to families with older and younger members alike.

The thesis aims to provide a viable solution for families that need assistance with elderly family members, simply as another option to consider when compared with existing solutions.
Case Studies
Maison Bordeaux is a residential project in the hills of Bordeaux, France that tackles issues of accessibility in a multi-level house while maintaining privacy for multiple inhabitants. The resident that this project was commissioned for is paralyzed and bound to a wheelchair, but requested that the structure be complex because this was to be a majority of his world. The challenge for the architects was to create a straightforward program that exists in a complex and interesting space, while still providing accessibility to the whole house. Rem Koolhaas, the lead on the project, envisioned three houses stacked on top of one another, each with a unique set of characteristics and spatial condition. The biggest feature in the house is a three-story hydraulic lift that allows wheelchair accessibility to the entirety of the structure that is imperative to the success of this design.
This is an interesting take on a common problem, and offers an approach that is relevant to the thesis topic in multiple ways. First, accessibility is a huge issue when dealing with residents who are advanced in age. Maison Bordeaux presents a unique design that does not stress to visitors that someone living there is impaired in any way. Maintaining that quality of life while being accommodating is an important step in creating a successful, whole-life house. Secondly, the division of space allows for various levels of privacy of the inhabitants which can translate to issues that would present themselves in a multi-generational household. OMA did an excellent job in creating dynamic spaces that are both convenient and comfortable to someone who need handicap accessibility as well as being fit for everyday life of people not suffering from those ailments. When compared to a multi-generational living situation, it would be important to maintain this dichotomy to feel natural to all of the residents.

Diagram Color Key:
- Stairwells
- Hydraulic lift
- Private Areas
- Public Space
Bridge House was specifically designed as a multi-generational house that could blend in with a typical single-family suburban neighborhood. The architect accomplishes this by using the natural landscape to hide the larger volume in the rear and maintain a more modest presentation on the street side. The family that resides here consists of grandparents, their son, daughter-in-law and their children, and their single daughter. By using multiple volumes, the architect is able to house these different life stages all together by carefully dividing spaces and ensuring that the main public spaces of a house such as the kitchen and living room are situated in a way that they become accessible to everyone and encourage a community feeling. However, they also ensure that each person has their own private space that they can retreat to at any time.
The main aspect of Bridge House that relates to the thesis topic is that of privacy. In any multi-generational house, privacy is of the utmost importance because each person or couple needs to feel that they have their own space to live in, while still enjoying the convenience of having those other family members near by. Bridge House accomplishes this by utilizing various volumes that separate bedroom suites and communal spaces. In the image below, which diagrams different spaces on the ground floor, the blue shows the grandparents' suite while the yellow area is all of the public space in the house, containing the kitchen, dining room, living room and utility spaces. In the image above, the second floor is much more private; containing a single master suite and a larger master suite that also houses the grandchildren's bedrooms in a Jack and Jill style, meaning that two separate rooms share a common bathroom. This layout allows for privacy as well as interaction in the public spaces because the only means of circulation pass through the public zone. Another important aspect as it relates to the thesis is how the architect was able to make the public spaces much more accessible to the grandparents by situating them on the same floor. This eliminates any issues that may come up in the future with regards to stairs or general mobility.
House M-M is another multi-generational residential structure that was designed to house the clients, their two children, and their grandmother. This project is unique in that it also houses the clients’ parents, but in a separate structure on the same site. The architects’ approach presents itself in a much more vertical layout that is commonly seen, and therefore takes up a smaller footprint by comparison. The public spaces are located in the middle of the house, with bedrooms above, below, and on the same level as the kitchen, dining and living spaces. The main room also extends out to a large porch, offering more gathering space that takes advantage of the wooded site the project sits on. Large windows on the long edges of the house bring natural light into the project and help to connect the multiple levels.
This project is similar to Bridge House in terms of tackling issues of privacy, but does so in a different way. While Bridge House uses bars of privacy and large open public spaces, House M-M has a more typical bedroom layout stacked vertically along one edge of the house which lets the public spaces share a common vertical core. The unique shape of the roof line creates a third level on one edge that is used for another bedroom, while the outdoor porch on the opposite edge opens up to views of the forest. In regards to the thesis topic, this project does a nice job separating the various bedrooms, but falls short in the area of connecting the family together, where the Bridge House excels. The grandmother has her own private studio apartment on the ground floor which is good for her accessibility in terms of entry and exit from the house, but there is no circulation that connects to the rest of the house. The only way into the main house would be to walk outside and around to the public space on the ground floor, and then use the large stairwell to move up into the main house. With age, these steps can become a problem and might unfortunately cut off access from the rest of the family. Other than that, the public space is successful because of its location in the center of the house both vertically and horizontally. The window system offers natural light that gives this space a sense of openness and connectivity both to the surrounding landscape and internally for the family living there.

The diagrams show the various bedrooms in blue, with the public spaces in yellow. The sectional diagram shows how the private spaces are stacked along one edge while the public spaces connect through a straight run of stairs.
The Laurent House is one of Frank Lloyd Wright's Usonian Houses, specifically in the hemicycle design. The unique feature of this structure is that it is a single story, the first of the hemicycle designs that Wright designed in this way. This was also the only residence that Wright designed for a physically disabled client. The open layout allows for wheelchair access to the entire structure, and the hemicycle design creates long sweeping rooms and corridors that are easier to navigate than having to turn corners. Wright exhibits a very early example of universal design because of his incorporation of furniture into the architecture. In this way, he ensured that both the structure and the furniture would be accommodating for someone in a wheelchair. This makes the Laurent house a successful project for aging in place, as the clients intended.
Roomroom follows the theme of accessibility, but of a different kind. The clients of this project are not impaired in their mobility, but with their hearing. Partial or complete loss of hearing is not unusual among the elderly, and therefore some elements from this project are relevant to the thesis. The architect utilizes sight and touch to allow the clients to interact with their non-deaf children. Using holes in the floor, the parents are able to use sign language with their children while in different rooms. Another feature is the indoor planting which spans multiple levels, so that the children can shake the leaves to get their parents’ attention while on a different floor. This small space is filled with a variety of tactile design elements to allow for ease of communication between someone with a disability and someone without.
Maison De Retraite is a nursing home complex that renovated and connected three previously existing structures that had been built in different periods in time. The architect utilized the horizontal wood facade to connect the structures into one cohesive unit. The main goal was to ensure a departure from the hospital-like nursing homes of the past and instead try to mimic a hotel environment for the residents. Each unit is handicap accessible and has a balcony to encourage the residents to go outside. Clean, modern interior design is used to mask features that help with mobility, such as grab rails in the hallways, and bright colors on certain walls to help with deterioration of sight. The materials used also help with traction while walking, and large open corridors are inviting for anyone in a wheelchair.
The idea behind this project incorporates a lot of relevant features that could be implemented in an accessible as well as multi-generational design. The open floor plan allows for a smooth transition between all spaces of the house, which would be easily navigable by wheelchair. The rotating walls, being the key feature of the project, allow for a transformation in functionality from day to night in the project. During the day the walls fold away to frame the space of the living room and utility spaces. At night, they fold out into the main space of the house, and incorporate beds within to accommodate the family. Because the walls are so heavily programmed, they allow for a seamless transition in activity within the project.
This project employs two rotating walls that are anchored to a column. This allows for a separation of space that originates from a static point. The half wall in the living room can pivot a full 180 degrees into either the kitchen or the living room. This allows the functionality of each space to change depending on the location of the wall. The larger wall in the bedroom pivots 90 degrees to either create two spaces - a bedroom and a study room - or can rotate to connect the two, creating a larger master suit. Each wall is programmed as a book case, and tapers to a point to trick the eye into seeing them as a thin and lightweight element.
Juliana Santana - Wheelchair accessible residence that demonstrates an open floor plan.

Ultimate Home Design - Wheelchair accessible under-counter space that is disguised by false cabinets.

Susan Fitzgerald - Multi-generational home that exhibits one approach to separation of space.

Marc Cramer - Addition to existing home to account for parents that move in with their children.

Juliana Santana - Accessible features that are well integrated into the bathroom design.

Katherine Lu - Multi-generational home showing the extension of space to the outdoors.
General Analysis

All of the case studies chosen aim to demonstrate a variety of approaches both to multi-generational housing and to housing design that is conducive to elderly occupants. These case studies are meant to serve as inspiration rather than examples of what the proposal of the thesis might become.

These case studies exhibit limitations because of the expensive costs that some of them call for. While this is not a model meant to represent a mainstream approach, the freedom of design because of the large budgets exhibit design features that would be worth exploring in a more cost effective manner.

Cutting edge architecture is often expensive and cost prohibitive in its early stages, but provides the opportunity for refinement and further development that may eventually become affordable and available to the masses. The design features outlined in these case study analysis are simply to illustrate the direction in which architecture for the aging should aim to progress.
Program Analysis
Program Analysis

Using the research into housing options for the aging and the case study analysis identifying current solutions to some of the previously mentioned problems, a certain programmatic approach begins to present itself.

Combining certain requirements for housing the aging, specifically an accessible home for those who may have decreased mobility, and a multi-generational setting, may help to provide a familial support system allowing for a comfortable setting and an increase in quality of life for the residents.

This can be a demanding combination programmatically, as a multi-generational household typically demands a large floor plan, and accessible housing requires ease of access to all parts of the home, most easily represented in a one-story design. These design requirements are at odds with each other, especially in regards to the location of the project. By utilizing a clever programmatic layout, however, freedom of site may become a more realistic option, and one that is key to the success of the proposal.

The following three analyses aim to highlight successful design features of multi-generational homes as well as key issues that may arise and must be addressed in the program presented to work with the thesis.
Lennar Next-Gen Homes

Most of the homes in a multi-generational format are from companies that offer standard layout residences. One of the major players in this field is Lennar. Lennar offers stock plans for houses in various price ranges and sizes. Recently, they have been developing their line of Next-Gen homes which incorporates a suite into the home to provide multi-generational living.

One aspect that Lennar does well is seamlessly integrating this suite into the main home, allowing for an easy transition from private separation to part of the home. This feature is important because it allows for the support system to function for the elderly if need be. The family is always there if assistance is required, but gives each person their privacy to maintain quality of life for all parties.

The images to the right show two different layouts of the same plan. Features that are important to consider for the elderly include:

- Single-Story for accessibility
- Separate Entrance
- Self contained kitchenette in suite

By the numbers:

- 4 Bedrooms
  - Including one master and one private
- 3 Bathrooms
- Average of 3,000 square feet
  - 400 square foot private suite
- Option on bottom right includes separate
- One-car garage
- 150 square foot single bedrooms
- 250 square foot master bedroom
Drummond House Plans

Drummond is another company that provides house plans for construction, with various sizes and types. Unlike Lennar, Drummond is less concerned with the seamless incorporation into the main home, and this results in a more private experience for the suite.

Because this plan has a basement suite, accessibility to the suite is a non-issue; however stairs to the main floor could pose future problems for those with limited mobility.

The images to the left show the basement plan with separate suite and living space. The main floor has additional living space, the kitchen and dining rooms, a single bedroom and a master suite. Important features with regards to the elderly include:

- Ground floor entrance
- Kitchenette included in private suite
- Accessibility to the main home could pose an issue

By the numbers:

- 3 Bedrooms
  - Including one master and one private
- 2 Bathrooms
- 2,800 square feet
  - 500 square foot private suite
- 120 square foot single bedrooms
- 250 square foot master bedroom
- One-car garage
- Average cost of $175,000
**Stanton Homes**

Stanton Homes takes a similar approach to Lennar, by incorporating the suite into the home, and providing a second entrance. The difference is that this suite flows into the ground floor where only shared space exists, and the rest of the bedrooms are located on the second floor. This could be a welcome change for a larger family where privacy is an issue.

While this home is large, the circulation is set up in a way to accommodate the foot traffic. A split staircase services the second floor, and both a dining room and breakfast nook abut the kitchen to provide open seating. On the second floor, a playroom is provided that could easily be converted into a third single bedroom.

The images to the right show the floor plans, and represent some features that would be successful to adopt.

- First floor suite for accessibility
- Separate Entrance
- Separation of suite for privacy
- Accessibility features in suite

By the numbers:

- 4 (Potentially 5) Bedrooms
  - Including one master and one private
- 3.5 Bathrooms
- 3,700 square feet
  - 400 square foot private suite
- Two-car garage
- 150 square foot average bedroom size
- 500 square foot master bedroom
- Average cost of $350,000
 Proposed Program

Based on the needs of the elderly as discussed in the essay and precedent research, the vehicle for the thesis is a residence that has the hybrid capability of servicing a multi-generational family and exhibiting accessible features to accommodate those who are advanced in age. The program should also allow for flexibility over time, meaning that as the children grow up and move out of the house, the functionality can change to best service those currently residing in the house, with the option to revert to original use should the opportunity present itself.

One major feature is a self-contained suite, to allow for privacy and independent living within a larger household. This suite will ideally include a small living space, bedroom, bathroom, and kitchenette. The suite should be situated as to seamlessly flow into the main home, providing the fluidity between private and shared space.

As in a typical household, a separate master suite is required as well as two single bedrooms to accommodate the average size of the American family. Keeping with the theme of flexibility, rooms in the home should be able to convert as needed, potentially providing more bedroom space for additional children.

The house should have an open floor plan to provide ease of access to all of the residents and allow for the flexibility required as the needs of the inhabitants change over time. In addition, design features that allow for changes in level of privacy for each living space could increase the plausibility of grown children moving back into the home, potentially with families of their own. This should allow for a sustainable project that can service the same family over multiple generations.
Program Summary

Square footage estimates based on average American household

Private Suite including living space, bedroom, bathroom, and kitchenette: 350 sf

Master Bedroom: 250 sf

(2) Single Bedrooms: 200 sf

Kitchen: 275 sf

Dining: 175 sf

(3) Bathrooms: 70 sf

Living Room: 215 sf

Total: 1,875 NSF

$1.3 for non-usable space

=2,437 GSF
Site Analysis
Site Criteria

The idea of the thesis is to address a common issue across America by creating a program that is prototypical in nature and that can exist in a variety of environments. However, certain limitations exist with regards to the site by aiming to provide a realistic living environment for various generations living under one roof. Some key aspects of the site should include:

- **Access to public transportation**

- **Proximity to urban infrastructure** (grocery store, pharmacy, schools, restaurants, medical care, library, community center, parks.)

- **Low land value**

In addition, some social aspect will be a key contribution to the feasibility of the project. This includes either cities with a high native-born population, as in cities that retain a large population of those that were born there, or cities that attract a high number of those who are of working age that could theoretically relocate their parents.

All of these factors play an important role in determining feasible sites for the project, as well as addressing certain cities where this proposal might not be well received.

On a more specific level, the site needs to be in an area that is zoned for multi-family housing, to provide the flexibility over time should the occupants choose to rent out extra space or if circumstances were to change. This would most likely appear in a more densely populated urban setting rather than a suburban one.
When considering sites for multi-generational housing, a slew of factors have an effect on the potential success of the project. Amelia Josephson, a researcher at smartasset, conducted a study of the most successful cities for multi-generational housing. The list is populated by cities that fit a number of criteria that are seen as good identifying factors for the support of this residential typology. Some of the factors include the percent of housing that contain three or more generations, city unemployment rate, and the percent of multi-generational households living at or above the poverty line.

With all of the aspects compared across the board, Honolulu, Hawaii is at the top of the 100 city list. Identifying a site in Hawaii began with identifying available lots in residential areas, specifically those zoned for one or two-family homes, to ensure that a variety of living situations in the proposal will be acceptable. Proximity to the downtown area was also a top priority as well as a short distance to public transit.

This site is located in an appropriate zoning district, approximately 3.5 miles from the city center. There is a bus stop within 500 feet of the site and an approximated time of 30 min to use public transportation into the urban core. The downside to this site is the cost, at $375,000 for the lot alone. However, in this location, this is significantly cheaper than other available lots in the area, combined with the fact that nearly 75% of multi-generational households live above the poverty line.
Site Two: 6501 Hough Ave.  
Cleveland, Ohio

While Cleveland does not show up on the top 100 for best cities for multi-generational housing, it does provide some potential opportunity for success. Based on the research done, and overwhelming majority of cities are located on the West Coast or Mountain West, with only two East Coast cities appearing in the top 25. Cleveland is poised to encourage a shift for multi-generational housing to the Midwest, especially in Rust Belt cities that are seeing a population bump because of tech startups.

Another reason Cleveland might prove successful for this housing typology is because of its high native-born population. Of the three major cities in Ohio, Cleveland has the highest retention rate of natives at 74.9%. This makes Cleveland feasible for fostering multi-generational families because of the increased occurrence of three or more generations in the same city.

Another positive for Cleveland is the extremely low land value. As opposed to the potentially prohibitive price of the Honolulu site, the Hough Ave. site costs $5,900.9 This allows for a more prototypical proposal that could theoretically be applied in various situations around the country.

As far as fitting the site criteria set out previously, the site is located between two bus stops, the closest being 350 feet away.10 It is located 2.5 miles from downtown with a 20 minute bus ride. There is also a high school and a church with a day care located within two blocks, as well as a community park a little further down the road.

The site is also in the proper zoning area for two-family housing.

9. Zillow  
Large view of Cleveland showing the site's proximity to the urban core. Via Google Maps

Zoomed in view of the site showing surrounding infrastructure. Via Google Maps

Circulation around site with the red circle denoting a bus stop. By Author

Immediate context of site and the surrounding fabric. Via Google Maps

Zoomed out circulation with major routes to areas of amenities including downtown and University Circle. By Author
Site Three: 9800 Chester Ave.
Cleveland, Ohio

This site has the same qualifications as the Hough site, but in a denser, more developed area. The larger site would allow for the expansion of the project, resulting in a larger scale housing development. The site is also located directly across from the Cleveland Clinic main campus, and is within proximity to a bank, pharmacy, and convenient store. This, paired with the adjacent bus line, provide all the necessary infrastructure for the project to be a success.
Vehicle Proposal
Typology Need

The goal of the design proposal is to address a need that is currently unavailable in the United States. The design must accommodate a multi-generational family within an accessible design to allow for comfortable aging in place for the eldest generation. The idea is to alleviate the need for assisted living facilities and nursing homes as the U.S. population over 65 is set to double in the next 40 years.
**Typology Proposal**

The current availability of multi-generational housing in the United States tends to exist in suburban areas, where large plots allow for single story homes, providing accessibility and the space required to accommodate three generations. The downside to these houses is that there are very few amenities in proximity to the project, and would rely on personal transportation, which may become difficult as the occupants age. Instead, this proposal calls for an urban setting, and subsequently an apartment building, with various unit types to support different combinations of residents. The basic idea of the unit types is to provide independent spaces for each generation, with a shared space that improves the overall quality of the unit. This allows for flexibility within each unit in terms of the amount of space that is shared rather than private.
Unit Type A

This unit type is designed for three generations, or for two generations and a live-in aide. Each adult generation has their own master suite, with a third bedroom located off the living room. The kitchen, dining, and living spaces are central, encouraging interaction between the occupants. Moving wall systems allow for the reconfiguration of various spaces on a need basis. One example of this is the wall separating the third bedroom and the living space. As more space is needed, this programmed wall can collapse to create additional room in the living space. The wall also contains furniture that can fold down or away as needed. This includes a bed and a dining table. Another feature is a rotating wall that changes the functionality of the bathrooms. During the evenings, the bathroom is part of the master suite, but when needed by other occupants or guests, the wall exposes the bathroom while still maintaining the privacy of the bedroom.
Unit Type B

This unit type is designed for two generations, in a scenario when the eldest generation is older and the children are no longer living at home. It has some similar features to the previous type, such as the rotating bathroom walls. In this scenario however, the eldest generation would need more assistance due to limited mobility. To address this, their bedroom suite incorporates a wall of the bathroom that rotates away to allow more space for someone to assist with mobility and bathing. The shared living space can also be divided by a wall to accommodate any guests that may be staying over, or a temporary aide.
Unit Type C

This unit type is designed for two generations, in a scenario when the occupants of the two units are not related. Because this thesis is based around multi-generational living, it cannot be assumed that the entire family is living in the same area. Instead, it is possible that two couples looking to downsize could take advantage of this unit type. The larger private suites allow for separation of space, but the entire unit becomes more comfortable with the reconfiguration of the walls to connect the two spaces. Again, the second space could also be used for a live-in aide if need be.
Connected Living Space. By Author

Living Room. By Author

Unit Type C Isometric. By Author
Rotating Wall

To make this design feasible, a rotating wall type must be developed. Currently on the market, not much exist in the way of lightweight, rotating walls, and so a custom system was developed to support the thesis. While slightly more expensive, the custom wall system is lighter than a standard stud framed wall, and becomes affordable when compared with the alternatives, such as assisted living facilities, or renovating the spaces over time. Being lightweight is important for this project, especially when keeping in mind that some of the occupants might have compromised mobility. This is achieved through the use of a plastic honeycomb system, providing shear strength required in a moving wall system.

Graphs Comparing the Cost and Weight of Wall Construction. By Author
Diagrams of Various Wall Types and How They Move. By Author
Wall Construction

The wall construction utilizes a steel column with plates that are bolted to c-channels. The channels are then attached to the plastic honeycomb via Z-clips. On the exterior of the honeycomb, a veneer is applied with adhesive. The bottom of the system is attached to a sound and light lock door seal, which creates contact with the floor surface. A set of casters are placed under the wall to ensure a smooth transition while the system rotates. To avoid any friction with the ceiling, the wall is not full height, but instead meets a bulkhead at each stopping position to complete the seal and ensure a sonic and visual disconnection to the surround spaces.
Annotated Bibliography


Baker devotes an entire chapter to the idea of "aging in place" and does an interesting analysis of the pros and cons on a case by case basis. She uses testimonials from those who have either gone through the process of moving to a nursing home or those who had the opportunity to stay in their own homes. For the most part, the residents in these situations would prefer to stay in their homes because it affords a sense of familiarity that becomes increasingly important as we age. One important point that she makes is that aging in place is often dangerous to the elderly if they do not have a reliable support system in place to make sure they are getting everything they need. This could be a reason to further explore the idea of making homes more accessible to make this a valid option for those who are later on in life.


This is an article from a home remodeling journal that highlights the increasing demand for living in place thanks to the Baby Boomer generation. Faloon discusses how this particular generation has been the driving force behind design changes at every stage of their lives simply because they account for such a high percentage of the population. She claims that this generation will continue to push for advancements in kitchen and bathroom remodeling, as well as customized components to ensure accessibility for everyone living in that space. This can be seen as a counter-argument to the proposed thesis because it is supportive of remodeling and having additions to the home later on to fit the specific needs of the aging. A key point is that it allows for the flexibility of design for specific ailments or health-conditions that could not be foreseen.


Groc takes another stance on the approach to multi-generational housing with the introduction of "granny flats". Her key point is that affordable housing can be hard to come by for multi-generational families, especially because this situation is sometimes used to save costs by condensing into one home. Due to zoning laws however, these homes are often large and cost-prohibitive for many families. The proposed solution is for the introduction of a granny flat, or a separate structure that can be assembled in the backyard of homes to accommodate for grandparents that may move in. The biggest struggle here is to modify city zoning laws to allow for a second structure on any given property. This is another viable approach to the issue of aging in place, but does bring up other issues such as the aforementioned zoning as well as affordability.
Lafferty, Valerie. "Multi-generational Housing: Old School or Powerful Game Changer?"
*Experience: the Magazine of the Senior Lawyers Division.*

Lafferty analyzes the current state of American culture where multi-generational housing is no longer the norm. While it used to be a viable option and in many cases a necessary one, higher divorce rates and a mobile middle class have changed this means of housing to a thing of the past. While Lafferty does call for a movement back to this way of life, she also offers an interesting perspective as to where this housing typology would be the most successful. Rather than having this as a site-less idea, she writes about the importance of having multi-generational housing located in denser urban areas, close to city infrastructure. She also recognizes that the legal system would have to adapt to this by way of changing zoning laws and making different types of contracts with construction companies, among other things, in order for this cultural shift to become a successful choice for housing.

Morley, John E. “Aging in Place”
*Journal of the American Medical Directors Association*, July 2012, Vol.13(6), pp.489-492

Morley compares the benefits of aging in place rather than moving into a nursing home, as well as a third and lesser known options of “green houses” which are small communities of 10-12 residents with shared features but private living spaces. Morley cites many studies that show the benefit of aging in place, as long as certain systems are available to ease the process for the residents. One such system is the Program for All-Inclusive Care (PACE) which provides community services through an adult day care program that offers healthcare as well as a sense of community. This model has proven to be cost-effective and has shown that residents live longer and with a better quality of life. This is potentially something to explore with regards to the thesis in terms of designing multiple structures that make up a small community of those aging in place.

Oswald, Frank; Jopp, Daniela; Rott, Christoph; Wahl, Hans-Werner. “Is Aging in Place a Resource for or Risk to Life Satisfaction?”

Contrary to the other readings, this is a psychological approach to the issue of aging in place. The article looks at varying factors, both within the home and the general community to determine whether or not aging in place has a generally positive or negative affect on the aging. The study breaks down aging further into “young-old” and “old-old” and weighs these groups against a multitude of factors to determine an average solution to this problem. The most applicable conclusion is that environmental characteristics both in the home and in the community need to be addressed to better understand the process of aging in place with respect to people's well-being. While the authors were mainly focused in a psychological approach, their findings can be used as a basis to compare different effects that architectural design may have on the elderly, whether it be positive or negative.
Works Cited


