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Inclusive Design Close to Home: Residential Accessible Dwellings for Aging-in-Place

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INCLUSIVE DESIGN CLOSE TO HOME: RESIDENTIAL ACCESSIBLE DWELLINGS FOR AGING-IN-PLACE

By

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For Robert
Infinity + 1
and
My family especially my twin
I love you one and all
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ABSTRACT

This study addresses the position of design in the creation of universal and transgenerational designed dwellings. The emphasis of this study is the promotion of aging-in-place with or near family members. The objective is to understand and utilize the principals and guidelines of universal design, transgenerational design, barrier free design and place attachment. The goal of the design is to allow the elderly as well as the disabled population the ability to live and age with increased comfort as well as a strong sense of place.

The results of research lead to the development of four proposed dwellings; two of them being detached and two dwellings being attached. The site selected for this study is located in Jacksonville, Florida. The goal of the dwellings is to create four different residential dwelling additions designed to house a variety of elderly and disabled individuals of different characteristics. These four dwellings are designed to strengthen the bonds of the elderly and disabled with their family and friends while allowing them to age with dignity and a strong sense of place. Also created is a fictional showroom named Universal Dwellings. The purpose of the showroom is to illustrate how these dwellings could be marketed to the public. Though these two projects are different both relate to the general purpose of this study.
CHAPTER 1
INTRODUCTION

The obligation of a professional interior designer is to enhance the function and quality of interior spaces for the purpose of improving the quality of life, increasing productivity, and protecting the health, safety, and welfare of the public (Sloan, 2004). Designers are trained to analyze client’s needs and wants. However, it is also the responsibility of the designer to help the client foresee possible future needs as well, and one such future need is the growing incidence of multigenerational residential design.

A baby boomer is defined as someone who is born during a period of increased birth rates or baby boom. (Gillon, 2004) This term is commonly applied to those people born after World War II and before the Vietnam War or between the years 1946-1964 (Gillon, 2004). Research suggests that America is aging and baby boomers are growing older and planning for retirement. Many of them are planning to ‘age-in-place’, which is defined as “to remain in one’s current home rather than relocate to new quarters, a senior community or, if need be, a care facility” (Designers, 2000). By 2025 the baby boomers will compose a quarter of the U.S. population ranging in age from 61 to 79. However, it is not just the baby boomers that designers should be considering, because more families are now consisting of multiple generations under one roof. It is also important to consider the parents of the aging baby boomers. Like their children they are living longer. As they age their needs are changing and many people of this generation need help whether it be full time care or modifications made to their homes. Also important to consider is that more grandparents are raising their grandchildren and more adult children are taking care of their aging parents. (Clay, 2005) As society changes it is becoming more important for homes to function for all ages and abilities (Clay, 2005). It naturally follows that many areas of residential design research might be brought to bear on this complex challenge of designing spaces suitable for all persons.
One way to confront this need is to bring the principals of universal design into the residential environment. Universal design is defined as “a user-friendly approach to design in the living environment where people of any culture, age, size weight, race, gender and ability can experience an environment that promotes their health, safety and welfare today and in the future” (Alliance, 2005). Universal design and its various subcategories of barrier-free design and transgenerational design recognize that implicit in this obligation to protect the health and welfare of the public is the safeguarding of persons in all stages and capability levels of life.

While universal design’s guidelines for physical space are undoubtedly relevant to residential design, so too are aspects of place attachment. Place attachment is a complex and multifaceted concept. Scholars from a multitude of disciplines have proposed frameworks to help in the understanding of place attachment, but it commonly defined as “the emotional connection formed by an individual to a physical location due to the meaning given to the site as a function of its role as a setting for experience. A range of thoughts, beliefs, attitudes and behavior as well as feelings are evoked through attachment to place. Thus, place attachment involves an elaborate interplay of emotion, cognition, and behavior in reference to place” (Ponzetti, 2004).

Protection of the public health also logically extends to include decisions regarding environmental choices in product specifications and indoor air environments. Therefore, it is also appropriate to include sustainable design guidelines and practices to the design of residential spaces. To meet the goal of including sustainable design guidelines the LEED (Leadership in Energy and Environmental Design) rating system will be followed throughout this study. According to the LEED organization, the system was created “to transform the built environment to sustainability by providing the building industry with consistent, credible standards for what constitutes a green building” (Leadership in Energy and Environmental Design, 2007).

**Purpose of the Study**

The purpose of this study is to review research concerning human beings’ elder years and the nature of human disability, and integrate guidelines from the research areas described above into a tangible residential architectural solution that
accommodates transgenerational residential living. Such dwellings may afford occupants the ability to maintain a sense of independence and remain close to family.

Justification of the Study

Everyone ages, and many persons within their lifetime experience a temporary or permanent disability. Review of aging and various related research provides better understanding of how humans grow and adapt. This study’s goal is to better understand these concepts and provide an example to others of how these concepts might be applied within dwelling spaces. In so doing, this case study might help architects and designers create better environments that are more functional and safer for all generations.

Research has shown that people would like to remain in their current residences for as long as possible, but as one ages this goal may not be feasible (Designers, 2000). One solution to this problem is to expand on the idea of ECHO (Elderly Cottage Housing Opportunity) which was introduced by the AARP (American Association of Retired Persons) in the 1980’s (Koebel, Beamish and Danielsen-Lang, 2003). ECHO is a program that was developed to help homeowners negotiate zoning laws that may prohibit them from creating an addition of an in-law suite or garage apartment (as they are commonly called) at their residence. This program works in compliance with these zoning laws allowing the additions to be built. When the need for these dwellings is no longer present, the dwellings are then dismantled and the residence is again returned to a single-family home.

This study’s goal is to utilize the principals of the ECHO program but to move beyond the basic nature of AARP’s design for these units. These extra design considerations will include sustainability, universal design concepts in its various forms, place attachment, and products that utilize the guidelines of transgenerational design. This study will also include a design for a commercial space that markets transgenerational residential dwellings.
Summary Techniques

Information collected for this review of literature includes topics covering aging, aging-in-place, disabilities, adaptable homes, sustainable design, universal design, transgenerational design, and barrier free design as well as place attachment and building practices. This review of literature is organized in the following headings: (1) Aging (including Aging-in-Place), ECHO; (2) Universal Design and its Principles, Transgenerational Design and its Guidelines; and concluding with Barrier Free Design; (3) Place Attachment; (4) Methods of Construction; and, (5) Summary of Important Findings.

Many types of sources were utilized for this literature review. They include textbooks, abstracts, journal articles, research articles, surveys and, when necessary and appropriate, a variety of secondary sources. Various computer websites and search engines were also helpful in locating articles, especially the Informedesign website hosted by the University of Minnesota as well as Ingenta and WebLuis. Many universities in the United States are conducting research on these topics and their findings posted in research articles and on their websites were also very helpful. The American Society of Interior Designers (ASID) website was further very instructive, as it lists many sources and information for universal design as well as studies conducted on aging-in-place. Some keywords that revealed productive search results included: universal design, transgenerational design, intergenerational design, inclusive design, adaptable design, lifespan design, aging-in-place, barrier free and accessible design, place attachment, aging, panel-based building and prefab or modular housing.
CHAPTER 2

REVIEW OF LITERATURE

This chapter will discuss many topics including aging, aging-in-place, the ECHO program, universal, transgenerational and barrier free design. Also discussed will be the concept of place attachment and various methods of construction. These topics are important because they will help give a better understanding of human beings in their elder years and how design can better one’s way of life as they age or live with a disability. The information in this chapter will then be integrated into a residential architectural project within chapters 3 and 4 that may afford occupants the ability to maintain a sense of independence while remaining close to family.

Aging

The minute one is born the aging process begins. This progression, of course, is inevitable, and the term the “graying of America” recognizes that bodies and minds will change (Kausler & Kausler, 1996). The average life expectancy in the U.S. today currently stands at approximately 83 years of age for women and 81 years for men (Services, 2005). These ages are extended when viewed in historic context. In 1790 when the first U.S. census was conducted, for example, it was uncommon for someone to “grow old”. Over half of the population was under the age of sixteen and less than two percent of the four million people who responded were 65 and older. Most adult Americans did not live past 35 to 45 years of age (Dychtwald, 1999). In the 21st century, the increase in life expectancy can be attributed to improvements due to “healthier living, better medicine and vaccines and sanitation that have helped to eliminate many fatal infectious diseases” (Coleman, C. & Sosnowchik, K., 2006).

Because the U.S. population is aging, it is important to discuss this process in this review of literature. Research shows that in America one in every eight members of the population is an older American (Services, 2005). To put this in perspective, since
1900, the percentage of Americans 65 and older has tripled and this number has increased almost 12 times. It is also important to note that the older population itself is getting older. In 2004, the 65-74 age group was over eight times larger than in 1900, but the 75-84 group was 17 times larger than in 1900. The 85 plus group was 39.8 times larger than its size in 1900 (Services, 2005).

Research suggests that the elderly population will only continue to grow, especially as the baby boomers age. The first generation of boomers (those born between 1946 and 1964) turned 60 in 2006. As this generation continues to age the population 65 and over is expected to increase from 35 million in the year 2000 to 40 million people in 2010. By 2020 it is estimated that 55 million people will be 65 and older as shown in figure 1. Overall in 2030 there will be approximately 71.5 million older persons, almost twice their number that existed in 2004 (Services, 2005).

![Figure 1: Number of Persons 65+, 1900 - 2030 (numbers in millions)](image)

*Figure 1. Number of persons 65+ in the years 1900-2030 (Services, 2005).*
In his book *Transgenerational Design: Products for an Aging Population*, James Pirkl writes that “gerontologists perceive human aging as a continuous, complex and dynamic process starting with birth and ending with death” (1994, p. 31). The aging process is vastly different for every person. People cannot expect to age the same exactly the same way. A review of current research resources shows that there are many theories that consider the human body as it ages. While this literature of review cannot discuss all of these, one theory hypothesizes that aging occurs at the biochemical and cellular levels in the human body and that within the human body the “cells might be genetically programmed to age” (Pirkl, 1994, p. 31).

As persons grow and develop they are taught from a young age that through a healthy diet and exercise as well as maintaining a good quality of life that they can often slow the effects of growing old. Often “65 plus” is the age where one is considered elderly. It is important to note that someone’s chronological age may just be a number, physically speaking. “There is not a correlation between chronological age and physical age. A person need not be chronologically old to be physically old. Each individual ages at his or her own pace as do any individual’s abilities. One may be “old” at 75; another may be “old” at 40” (Pirkl, 1994). A person might be able to control the pace at which they age, but it is important to note that throughout an individual’s lifetime their senses will gradually decline. This decline includes taste, touch, sight, smell and hearing. Typically the decline of a person’s senses is gradual and one might not begin to notice a great difference for many years (Pirkl, 1994).

There are many myths associated with aging. Because there is a degree of sensory loss as people age, they are often stereotyped and grouped together. Some commons myths include that the elderly are all senile, disabled or that they have no sexual drive and they become homogenous (alike) as they age (Pirkl, 1994). Many of these stereotypes have developed from how society views aging. Modern western culture is youth driven, but as the senior population continues to increase it seems that many of these myths are being dispelled (Dychtwald, 1999). Because everyone ages, research suggests that it is important to consider where and how people are going to age. Planning for the future might help to eliminate problems that might arise if someone were to become disabled and their home no longer accommodated them.
There are many options available, such as active adult communities, retirement homes or continuing care facilities.

**Aging-in-Place**

Family relationships, particularly marriage, significantly impact living arrangements for the elderly. Figure 2 illustrates the living arrangements of persons 65 years or older in 2004. These data show that almost half of the older women and almost 75% of older men live with their spouses. It is also important to note that 40% of elderly women live alone while only 19% of elder men are living alone.

![Figure 2: Living arrangements of persons age 65 and older (Services, 2005).](image)

The “other” category within the charts in Figure 2 is relatively small in comparison to the previously mentioned categories, but as people age the numbers in the other category will progressively rise (Services, 2005). These statistics also demonstrate that a large percentage of elderly men and women live with their spouses. Findings also suggest that a person can live independently longer if they are living with their spouse (Services, 2005). On the other hand, some couples may choose to leave their residences and move to a home that is more accommodating to them as they age together, or if one of them should pass away before the other (Hand, 2005).

As the population grows older, an increasing percentage of people are finding ways to stay independent and continue to live in their homes with as little assistance as possible (Designers, 2000). With the benefits and growing awareness of universal and transgenerational design (which will be discussed in detail later), it is becoming more
feasible for the elderly to lead a healthy and active lifestyle. As technology advances and new products and innovations are created, the stigma of accessible design is disintegrating, and more people are now seeing environments that are usable by all persons as good design (Clay, 2005). For example, an American Association of Retired Persons (AARP) study concluded that for its respondents age 45 and over, 83% of the respondents reported they would like to remain in their current residences for as long as possible. 63% said that they will always live in their current residence, and 82% said that even if they need help caring for themselves they would prefer to remain at home (Designers, 2000). Many of them also mentioned that they plan to modify their homes to better suit their needs or those of an elderly family member. Studies have also shown that many aging and elderly persons don’t want to just age-in-place; they want to age in luxury.

According to Clay (2005), the older generations of today are better educated and wealthier than the generations past. Many of them have the resources and ability to modify or maintain their homes as they age. The current life expectancy for the average person is approximately 80 years of age. With people living this long, it is the duty of the market to create new and aesthetically pleasing products and services that they can utilize, according to some researchers (Pirkl, 1994). Tenebaum (2005) states that designers who understand the principles of universal and transgenerational design will be able to understand the needs and wants of clients aging-in-place and can help better identify “strategies that provide lasting value, while allowing them to enhance and preserve independence, self respect and dignity as they age” (p. 54).

It is important to note that it is unlikely that everyone is going to be able to age-in-place in his or her home due to financial conditions or infirmity, for example. As time passes one or both members of a couple may develop disabilities that would prevent them from aging-in-place. This happenstance may lead them to seek living arrangements with extended family members.

ECHO

One option for those not able to age-in-place is a program called E.C.H.O., or Elder Cottage Housing Opportunity sponsored by the American Association of Retired Persons (AARP). The ECHO program promotes the use of “accessory units” or
“mother-in-law suites”, terms that refer to a living situation where seniors occupy a second family living unit or apartment with a separate entrance on a single-family lot with another family ("Elder Cottage Housing Oppurtunity (ECHO)", 2005). These dwellings are meant to give an elderly person or couple the opportunity to age close to family when they no longer choose to live in their current residence. For example, these dwellings permit an elderly couple to ‘downsize’ their living situation should one or both of them become sick or disabled. This option offers an opportunity for the elderly couple to remain close to their family rather than go to a retirement or continuing care facility.

The American Association of Retired Persons (AARP) proposed this program in the early 1980’s. It was meant to be a solution that supplies housing for seniors that allowed them to remain close to their families or caretakers. Because zoning ordinances in some cities do not make it possible for homes to have permanent apartments or mother-in-law suites on the property, the ECHO program advocated the dismantling and/or selling of the structures for someone else’s use elsewhere (Koebel, Beamish & Danielsen-Lang, 2003). Consequently, modular building construction was often used, as this construction type can be quickly constructed and or dismantled ("Elder Cottage Housing Oppurtunity (ECHO)", 2005). Once the dwelling was removed, the property was again restored to a single-family residence, thus bringing it into compliance with the community’s zoning restrictions. ("Elder Cottage Housing Oppurtunity (ECHO)", 2005)

Figures 3 through 6 illustrate an addition being added to an existing home that follows the guidelines of the ECHO program. The pictured unit was built for an elderly couple that decided to downsize their current home. This solution was chosen so that they could live close to their daughter and her family in case they needed direct care as they age. The pictured unit utilizes an exterior entrance as the only way to access the addition so that the couple is able to maintain their independence. In the event that one of them needs more direct care, an interior entrance to the main residence can be created.

The benefits of the ECHO program allow the elderly to live close to their families or caretakers while maintaining independence and dignity as they age. The units can
be detached with no entrance into the main house to serve as an entirely independent structure or they can take the form of additions that have entrances from the dominant residence. Because of the many homeowners’ associations and zoning ordinances imposed by different cities, users find it important to consider the different methods of construction available for these additions so as to avoid infringement on local restrictions.

*Figure 3. ECHO addition being set into place (Hand, 2005).*

*Figure 4. Completed ECHO addition (Hand, 2005).*
Though the ECHO program was originally developed with the elderly in mind, this program could also be adapted for those persons living with physical or mental disabilities. Statistics show that an estimated 53 million non-institutionalized Americans (about 1 in 5) have a disability. Within this group, 26 million have a severe disability
(Coleman, C. & Sosnowchik, K., 2006). Studies point out the importance of intergenerational closeness between mothers and fathers who care for their adult children that have mental retardation (Essex, 2002). One study implies that close intergenerational interaction is beneficial to both parents and children, explaining that “affection was identified as an important motivation for intergenerational interaction and aid and strong affective ties with children can have a positive effect on parental well-being” (Essex, 2002). Chapter 3 will discuss the parameters for a dwelling that caters to a disabled young adult living at home with their parents. Hopefully this unit it will exemplify how these dwellings can be adapted for various situations and help to reinforce the bonds between parents and their children. Previously the topic of aging-in-place was discussed and it was mentioned that people want to make modifications and changes to their homes if possible. The ECHO program could also be adapted to fit this want by providing a space for caregivers to live. This would allow for close personal care while letting the residents of the home maintain their independence.

**Universal Design and its Principles**

Universal design is “a user-friendly approach to design in the living environment where people of any culture, age, size, weight, race, gender and ability can experience an environment that promotes their health, safety and welfare today and in the future” (Alliance, 2005). It essentially implies that “universal design is the idea that everyone should have access to everything all the time” (Nieusma, 2004). This definition pertains to more than just the design of interior spaces. It also relates to the appliances and products used in everyday environments such as the internet, phones that the deaf and blind can use, and a can opener with a thicker handle that is easier for an elderly person or child to grip. The phrase universal design is often called an umbrella term due to the breadth of its content. Therefore, universal design subcategories such as transgenerational design will be discussed later in this review of literature.

Because people are living longer and wanting to maintain a better quality of life as they age, many want to remain in their homes for as long as possible (Designers, 2000). As the population evolves, technology is also advancing and changing. Concurrently, marketing forces of industry constantly compel quality improvements and user satisfaction. Because of this, guidelines and principles of universal design have
been developed to help improve technology and products so that they better serve users. This in turn lets people lead an easier, more productive lifestyle. Table 2 provides information regarding these guidelines and principles.

A common misconception is that universal design is meant to meet only the needs of the disabled and elderly. Historically persistent stigma of “institutionalism” has been attached to the look of universal design spaces and products. However, technology has changed. As society has evolved, so has the requirement for beautiful functional solutions that meets the needs of the elderly as well as the rest of the general public (Pirkl, 1994). In a recent survey conducted by the American Institute of Architects, 600 architecture firms reported that the stigma associated with aging-in-place interventions might be fading (Clay, 2005).

Using universal design creates a functional, user friendly atmosphere that anyone from a child to a grandparent could use (Tenebaum, 2005). For example, creating a kitchen with multiple counter heights provides children as well as adults the ability to utilize the space. This chapter’s previous discussion explained that the human body changes as one ages and begins to lose its five senses. Because of this, older generations require better task lighting as well as higher contrast in certain areas. This is because degeneration of eyesight becomes a major factor with advancing age (Staying Put Adapting…, 1997). To help remedy this problem, task lighting can be implemented to help prevent eye strain for the elderly in a space. A bonus benefit of this is the same task lighting could just as easily benefit a child working on his or her homework in that same space (Clay, 2005). Overall, universal design principles and products are meant to be integrated seamlessly, simplistically, and affordably into the daily lives of people (Leibrock & Terry, 1999). By implementing these principles, better design is being created that benefits users of all ages and abilities. Joseph Pirkl explains that “no design will serve 100 percent of the people 100 percent of the time, but we are trying to make sure no one group is excessively penalized by design (Luscombe, 2003, p. 1).
<table>
<thead>
<tr>
<th>Principle</th>
<th>Description</th>
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| 1. Equitable Use | 1a. Provide the same means of use for all users: identical whenever possible; equivalent when not.  
1b. Avoid segregating or stigmatizing any users.  
1c. Make provisions for privacy, security, and safety equally available to all users.  
1d. Make the design appealing to all users. |
| 2. Flexibility in Use | 2a. Provide choice in methods of use.  
2b. Accommodate right-or-left handed access and use.  
2c. Facilitate the user’s accuracy and precisions.  
2d. Provide adaptability to the user’s pace. |
3b. Be consistent with users’ expectations and intuition.  
3c. Accommodate a wide range of literacy and language skills.  
3d. Arrange information consistent with its importance.  
3e. Provide effective prompting and feedback during and after task completion. |
| 4. Perceptible Information | 4a. Use different modes (pictorial, verbal, tactile) for redundant presentation of essential information.  
4b. Maximize "legibility" of essential information.  
4c. Differentiate elements in ways that can be described (i.e. make it easy to give instructions or directions).  
4d. Provide compatibility with a variety of techniques or devices used by people with sensory limitations. |
| 5. Tolerance for Error | 5a. Arrange elements to minimize hazards and errors: most used elements, most accessible; hazardous elements eliminated, isolated, or shielded.  
5b. Provide warnings or hazards and errors.  
5c. Provide fail safe features.  
5d. Discourage unconscious action in tasks that require vigilance. |
| 6. Low Physical Effort | 6a. Allow user to maintain a neutral body position.  
6b. Use reasonable operating forces.  
6c. Minimize repetitive actions.  
6d. Minimize sustained physical effort. |
| 7. Size and Space for Approach and Use | 7a. Provide a clear line of sight to important elements for any seated or standing user.  
7b. Make reach to all components comfortable for any seated or standing user.  
7c. Accommodate variations in hand and grip size.  
7d. Provide adequate space for the use of assistive devices or personal assistance. |
Transgenerational Design

Transgenerational design is often compared to universal design and, in fact, falls underneath the “universal design umbrella”. Many of the guidelines of transgenerational design could be considered subcategories of the universal design principles. Transgenerational design, however, is oriented more toward the mature consumer while still advocating design for all ages and abilities. Specifically, transgenerational design is defined as

“the practice of making products and environments compatible with those physical and sensory impairments associated with human aging and which limit major life activities. It rejects as discriminatory and stigmatizing, specialized products or devices targeted directly at older consumers. Rather, transgenerational design insists that products and environments be designed at the outset to accommodate a “transgenerational” population, which includes the young, the middle-aged, and the elderly – without penalty to any group” (Pirkl, 1994, p. 228).

Transgenerational design is an approach to design that “(1) bridges the physical and sensory changes associated with human aging; (2) responds to the widest range of ages and abilities, without penalty to any group; and, (3) preserves the individual’s sense of dignity and self worth” (Netherlands, 1996, p. 1). Researchers have defined the following guidelines for appropriate transgenerational design:

1. Provide cross-sensory redundant cuing for all alarms, signals and controls (combine and audio signal with a visual indicator).
2. Offer redundant modes of operation utilizing the next larger set of motor movements (finger to hand; hand to arm; arm to foot).
3. Establish consistent display/motion relationships left to right and forward/up to increase, backward, down to decrease.
4. Provide definitive feedback cues (control positions (detents) should “snap” into position).
5. Reduce the complexity of all operations (minimize the number of tasks).
6. Place critical, and frequently used controls within easiest reach (cluster controls on basis of priority).

7. Prevent accidental actuation of critical controls (relocate, recess, or provide a guard).

8. Provide adjustable product/user interfaces (horizontal/incline, vertical/incline, raise/lower, push/pull).

9. Design for use by a variety of populations (male/female, young/old, weak/strong, large/small).

10. Design to facilitate physical and cognitive function (encourage user to practice and improve by making operations easy and enjoyable).

11. Design beyond the basic physical/functional need (enhance the user’s independence, self-respect, and quality of life).

12. Compensate for a range of accommodations levels (provide for some exercise through user interaction/participations).

13. Strive to make task movements simple and understandable (clockwise for “on” or “increase”, counterclockwise for “off” or “decrease”) (Pirkl, 1994, p. 110).

The New Mexico home of James Pirkl (Figures 19 - 26), the self-identified founder of transgenerational design, puts into effect both transgenerational design and universal design principals. The average person might not even realize that the home was designed to be universal. Many details translate these ideas into built form such as the thermostat with bold markings that make temperature easier to read. The home is completely flat without thresholds, making the interior easier for someone to navigate, especially if they are using a wheelchair or walker. Most of the doors in the home are sliding, which saves space and also gives more room for someone that might have to use a wheelchair. Rather than use a traditional closet pantry, the kitchen has pullout doors that give the user the ability to see all of the contents to avoid searching behind other items (Luscombe, 2003). In the bathroom, adjustable height vanities were utilized as well as a wall mounted toilet. By using these products, the bathroom is not only more accessible and easier to navigate in case of a wheelchair, but is also easier to clean. James Pirkl’s first goal while designing his home was “to demonstrate how
transgenerational design can extend independent living for millions of aging people” (Luscombe, 2003, p. 1).

It is important to note that transgenerational products are those that support safety, comfort, convenience, ease of use and bodily fit (Pirkl, 1994). This type of design is notable because it bridges the transitions across the various life stages and is responsive to individual differences and abilities in people. These products also give all people (not just the elderly), a sense of self worth, encourages personal and social interaction, and promote close friendships between non-disabled persons and persons with disabilities (Pirkl, 1994).

*Figure 7. Exterior view of James Pirkl’s home. Note the walkway is flush with the entry, thus enabling easier access of the home (Luscombe, 2003).*
Figure 8. View of James Pirkl’s kitchen. Several features are shown that illustrate transgenerational principles such as pullout storage stools placed for easy access if needed (Luscombe, 2003).

Figure 9. Illustration of pull out ironing board (Luscombe, 2003).
Figure 10. A view of breakfast area. The bookshelf acts as a divider for the space and is easily accessible (Luscombe, 2003).

Figure 11. Tub with grab bars and bench (Luscombe, 2003).
Figure 12. View of the shower illustrates universal design solutions (Luscombe, 2003).

Figure 13. View of adjustable height vanities (Luscombe, 2003).
Figure 14. Wall mounted water closet and vanity. The vanity is height adjustable and wheelchair accessible (Luscombe, 2003).

**Barrier Free Design**

Barrier free design, like transgenerational design, falls under the umbrella of universal design, but specifically addresses accessibility for people with disabilities. In the U.S. there are over 30 million people that are disabled or considered disabled because of functional limitations (Vanderhein, 1990). Barrier free design is meant to create accessible environments with as few barriers or hindrances as possible. Guidelines have been set into law for barrier free design with the 1990 passage of the American with Disabilities civil rights act. The act requires government buildings, contract design facilities, public accommodations, and public transportation systems to provide equal accessibility to all people regardless of disability (Sloan, Jones & Stimpson, 2004). Currently there are no laws stating that barrier free design must be implemented into residences, but taking the initiative and implementing these standards into a residence can afford someone that is elderly or disabled more time in their home rather than having to move because it is not accessible (Leibrock & Terry, 1999).
Figures 15 and 16 illustrate common ADA guidelines that must be followed when designing ADA accessible spaces.

Figure 15. Graphic illustrating the maximum and minimum that a disabled person can side reach side to side. (Bobrick, 2005)

Figure 16. Graphic illustrating design solutions for tub and shower combinations allowing for accessibility (Bobrick, 2001).
Laypersons often perceive that making a building ADA accessible will cause it to look institutional and aesthetically unpleasant. This makes employers and homeowners slow to implement elements of barrier free design into their buildings and homes (Leibrock, Beautiful Barrier Free, 1993). Another common misconception by the public is that complying with the ADA standards is expensive. In reality, many businesses may be eligible for tax breaks and also able to deduct up to $15,000 from of the expenses of complying with the American with Disabilities Act (Leibrock, Beautiful Barrier Free, 1993).

Leibrock notes that good intentioned designers often create spaces that are accessible for their clients in the moment. For example, constructing ramps or installing chair lifts into their clients’ homes provides an immediate solution. However, these solutions are often temporary and may cost more in the long run. Instead, designers should try to anticipate their clients’ future needs as they age or their disability progresses (Leibrock & Terry, 1999). If the solution includes relocation from their current residence, it is important to make the transition as smooth as possible, both physically and psychologically.

**Place Attachment**

Accessibility and barrier-free considerations primarily address physical aspects of residential spaces. There are also psychological considerations in the thoughtful design of the home environment, and place attachment is among these issues. As people age and progress through various life stages they often form attachments to their surroundings and personal possessions. This is commonly referred to as place attachment, which is defined as “a process that provides personal and group identity, fostering security and comfort with one’s immediate surroundings” (Sugihara & Evans, 2000, p. 401). Place attachment is very important to the situation of a new residence for an elderly person because relocation removes a person from what they have known for many years. This change may be detrimental to their “sense of place” and identity. (Sugihara & Evans, 2000) Sense of place, very much like place attachment, is often defined as “those characteristics that make a place special or unique, as well as
those that foster a sense of authentic human attachment and belonging” (Sugihara & Evans, 2000, p. 401).

Research has shown that it is not always the home that people hold such strong attachments to but rather, the possessions that these residences house and the meanings behind them. Many of the possessions that the elderly find important are family histories, diaries, photographs, family heirlooms and childhood possessions. Having these possessions often helps them maintain a sense of identity as well as helping them to connect to their past (Sugihara and Evans, 2000).

It can be very traumatizing to a person if they are separated from their possessions. They may feel a sense of loss and also have trouble making a connection with their new environment. Further, their wellbeing may also be adversely affected. According to Boschetti (1995), human beings form emotional attachments to inanimate objects “not because of what they are, but because they represent pieces of the past” (p. 9).

Designers and students of design who fully embrace the concept of place attachment keep several key concepts in mind: (1) preserve a sense of the past; (2) determine if the design fits the need; and, (3) create a sense of place in the new environment (Xu, 1995). There are many ways of taking a person’s past and incorporating it into their current space. For example, incorporating shelving into a home for the display of personal possessions such as photographs or collections could be a way of allowing someone to remain connected to their personal history. Another way of incorporating place attachment might include incorporating a few family heirlooms such as a family rocking chair or favorite sofa in space for a client. Boschetti (1995) also states that “it is the role of possessions to convey meaning and to transform an anonymous space into a place” (p. 10). An understanding the concept of place attachment may afford designers the ability to better design spaces for all people, and especially the elderly.
Methods of Construction

There are many methods of construction available to a homeowner seeking to enhance or enlarge their residence. These methods include stud construction, concrete block construction and manufactured housing.

**Kit-Style Prefabricated Homes.** Construction for manufactured housing or prefabricated homes can vary widely in size from very small buildings to large homes of over 3,000 square feet or more. Many of them are constructed in manufacturing plants and then transplanted to their location where final assembly is finished (Arieff and Burkhart, 2005).

One company that is utilizing prefab structures is Modular Dwellings. Located in California, the company seeks to combine clean lines with industrial materials. They have many options available with units ranging from as small as 6’ x 8’ in size to a structure called the MD 280 (figures 7-10) that encompasses 280 square feet and has nine foot ceilings ("Modular Dwellings", 2006). The MD 280's floor plan includes a bathroom, kitchen, living room and a bedroom. This unit is constructed offsite and then transported by semi truck. Once there it is lifted by crane to its final location and anchored. Structurally, the dwelling is composed of a welded steel frame with hardwood siding. The unit also includes operable windows with tempered glass ("Modular Dwellings", 2006).

![Figure 17. MD 280 set into place during construction ("Modular Dwellings", 2006).](image)
Figure 18. Exterior view of MD 280 ("Modular Dwellings", 2006).

Figure 19. Exterior view of MD 280 living room ("Modular Dwellings", 2006).
Similarly, Rocio Romero is a company that utilizes prefabricated building component products and is committed to “simplicity in design” ("Rocio Romero", 2004). The goal of their designs is to employ the principles of minimalism and to utilize natural air and light. Like the products offered by Modular Dwellings, Rocio Romero offers a broad range of floor plans ranging in size. Unlike Modular Dwellings, they offer their plans in kit form ("Rocio Romero", 2004).

These kits include the plans, instructions and kit parts that comprise the exterior shell of the home. This includes open wall panels, materials and the exterior siding. The customer orders this kit, and once received, the customer prepares the site, builds the foundation and constructs the floor framing and decking. When this is completed, the kit is then constructed and delivered within thirty days to the home site. Table 1 illustrates the costs incurred by Barry Bless and Jennifer Watson, a couple who purchased the very first LV model offered by Rocio Romero. The LV model includes a floor plan consisting of 1,150 square feet. Throughout the construction process of their home the couple kept detailed accounts of all expenses spent during the construction process. At the time their home was purchased in 2004 the cost for the LV kit was
$29,833, including delivery fees. In three years the cost of the LV kit has since risen to $33,900 ("Rocio Romero", 2004).

The LV model is one of the largest kits available. If something smaller is desired, the company also offers the LVM kit that is 625 square feet in size. The price for the LVM kit starts at $21,000 and rises if upgrades are chosen. The floor plan for the LVM (figures 11 through 13) is configured like a studio space with the bedroom open to the living room. If the buyer chooses, they can have the floor plans reconfigured to meet their needs ("Rocio Romero", 2004).

The Rocio Romero Company further promotes itself as a company committed to sustainable building practices. Their goal is to have as little waste as possible and they pursue this goal by utilizing prefabricated components in their structures and using energy efficient materials. Rocio Romero also states that they have units that are rated to withstand hurricane force winds as high as 150 mph ("Rocio Romero", 2004).

Figure 21. Exterior rendering of LVM model ("Rocio Romero", 2004).
Figure 22. Exterior view of completed LVM model ("Rocio Romero", 2004).

Figure 23. LVM studio floor plan ("Rocio Romero", 2004).
Table 2. Expenses of LV Prefabricated Dwelling Kit ("Rocio Romero", 2004).

<table>
<thead>
<tr>
<th>LV Home Kit</th>
<th>$29,833 (includes $2,100 delivery fee)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Subcontracted work:</strong></td>
<td></td>
</tr>
<tr>
<td>Excavation</td>
<td>$3,808</td>
</tr>
<tr>
<td>Septic</td>
<td>$3,000</td>
</tr>
<tr>
<td>Well</td>
<td>$4,600</td>
</tr>
<tr>
<td>Foundation</td>
<td>$4,016</td>
</tr>
<tr>
<td>Duro-Last roof installation &amp; materials</td>
<td>$8,650</td>
</tr>
<tr>
<td>Windows and exterior sliding doors</td>
<td>$14,300</td>
</tr>
<tr>
<td>Galvalume siding and trim installation</td>
<td>$6,400</td>
</tr>
<tr>
<td>HVAC unit, ductwork and stainless steel registers</td>
<td>$3,846</td>
</tr>
<tr>
<td>Electrical</td>
<td>$3,253</td>
</tr>
<tr>
<td><strong>Landscaping:</strong></td>
<td></td>
</tr>
<tr>
<td>(excavating for parking lot, gravel for parking lot and perimeter of house)</td>
<td>$1,250</td>
</tr>
<tr>
<td><strong>Do-it-yourself work:</strong></td>
<td></td>
</tr>
<tr>
<td>Permits</td>
<td>$372.23</td>
</tr>
<tr>
<td>Floor framing</td>
<td>$3,793</td>
</tr>
<tr>
<td>Labor cost to assemble kit (owner assembled)</td>
<td>$0</td>
</tr>
<tr>
<td>Interior framing</td>
<td>$1,100</td>
</tr>
<tr>
<td>Conditioning crawlspace</td>
<td>$400</td>
</tr>
<tr>
<td>Plumbing</td>
<td>$1,000</td>
</tr>
<tr>
<td>Insulation for walls (exterior and interior) and foundation stem walls</td>
<td>$1,000</td>
</tr>
<tr>
<td>Tyvek wrap and weather stripping for windows/doors/corners</td>
<td>$300</td>
</tr>
<tr>
<td>Sheetrock, finishing and painting</td>
<td>$1,500</td>
</tr>
<tr>
<td>Interior flooring</td>
<td>$1,588</td>
</tr>
<tr>
<td>Custom tiled large, 2 person shower (2/person)</td>
<td>$600</td>
</tr>
<tr>
<td>Polycarbonate ceiling for bathroom</td>
<td>$220</td>
</tr>
<tr>
<td>Kitchen &amp; Bath cabinets/shelves</td>
<td>$1,800</td>
</tr>
<tr>
<td>Interior doors (includes finishing and hardware)</td>
<td>$777</td>
</tr>
<tr>
<td>Appliances</td>
<td>$2,212</td>
</tr>
<tr>
<td><strong>TOTAL:</strong></td>
<td>$99,618.23</td>
</tr>
</tbody>
</table>
**Preassembled Units.** Preassembled units offer another option that differs from kit-style prefabricated homes in that they are completely put together prior to delivery to the site. The use of preassembled units can be cost effective and rapid, but usually require the use of cranes, forklifts and semi-trucks to put in place. Though this is a very efficient way of building, zoning laws can make preassembled units problematic to construct in neighborhoods that are already established ("Elder Cottage Housing Opportunity (ECHO)", 2005).

**Panel Based Units.** Another type of manufactured building is called panel-based building. This method utilizes a product known as structural insulated panels. This type of building is quick and efficient because lightweight panels are constructed offsite and then brought in and installed on location ("SIPA", 2004). Structural insulated panels (SIPs) are unique because they utilize rigid foam that is sandwiched between boards made of strand or composite materials, wood paneling or other materials. The standard size for a panel is four to eight feet wide and up to twenty-four feet long. These panels can be used for walls and structural roof sections, which may take the place of standard stud construction. This type of construction is still relatively new, but research suggests that it is stronger than standard wall construction and is more energy efficient (Maxwell, 2006).

Home Front Homes located in Englewood, Florida utilizes panel-based construction in the residences that they build. The frame of the residence is constructed of steel and the walls and roof are structural insulated panels. Many of the homes built from this method are constructed within three days, not including the interior finishes. The homes also require no cranes or forklifts and are typically built with a four-man crew. Figures 14 through 16 show the progress of construction of a Home Front Home within a three-day time span. Other benefits of the panel based construction system are that it is environmentally friendly as well as economical. The cost of an entry level home from Home Front Homes is $26,500 which includes walls, roof, frame and fasteners. They also utilize no wood materials and there is minimal waste during construction ("HomeFront Panelized Construction System", 2005).
Figure 24. Day one of the construction process of a panel built home ("HomeFront Panelized Construction System", 2005).

Figure 25. Day two of the construction process of a panel built home ("HomeFront Panelized Construction System", 2005).
In the wake of 2005’s hurricane Katrina, Home Front Homes built Katrina Cottage II (Figures 17 and 18), a plan that was designed during a Louisiana charrette ("The Katrina Cottage", 2006). The cottage is constructed of SIPS panels sandwiched between cement fiberboards and rated to withstand at least 140 MPH winds. The cottage contains approximately 600 square feet of living space and can be hosed down inside if flooded. Only the furnishings and the electrical switch plates must be replaced to restore this building to habitable condition ("The Katrina Cottage", 2006). Though this structure was developed for the relief of hurricane victims, its principles might translate to independent dwellings or additions for the elderly while remaining cost effective.

As this section shows, recent advances in technology have resulted in multiple possibilities for small residential dwellings’ construction. Each possesses certain advantages and disadvantages which can influence their choice.
Figure 27. Exterior of Katrina Cottage II ("HomeFront Panelized Construction System", 2005).

Figure 28. Interior view of kitchen in Katrina Cottage II ("HomeFront Panelized Construction System", 2005).
**Sustainable Building.** Sustainable building is defined as “the practice of 1) increasing the efficiency with which buildings and their sites use energy, water, and materials, and, 2) reducing building impacts on human health and the environment, through better siting, design, construction, operation, maintenance, and removal” (U.S. Green Building Council, 2007). In the U.S. alone there are over a 120 million homes and over 2 million new homes are constructed every year. As reported by the U.S. Department of Energy, the sector of residential housing accounts for 22% of the total energy consumed in the U.S. and 74% of water. It is also important to note that indoor air pollutants can be four to five times higher than outdoor levels. (U.S. Green Building Council, 2007) Recently actions have been taken to develop the program LEED for Homes (Leadership in Energy and Environmental Design) by the US Green Building Council. This program is a rating system consisting of eight categories:

1. Innovation and Design Process
2. Location and Linkages
3. Sustainable Sites
4. Water and Efficiency
5. Energy and Atmosphere
6. Materials and Resources
7. Indoor Environmental Quality

Energy conservation, water and efficiency and material resources are common concerns of interior designers that seek to create sustainable environments. For example, selecting water conserving plumbing fixtures for homes can help cut the amount of water consumption a home uses throughout its life cycle. Energy conserving luminaires and fixtures can be chosen, such as fluorescent lighting. As previously noted, indoor air pollutants can be up to five times higher than outdoor levels. Recent studies have shown that “approximately 20% of the US population has allergies to environmental antigens and approximately 6% have asthma. Symptoms of allergies and asthma may be triggered by a number of allergens in indoor air, including dust mites, smoking, or other irritants (Building Design and Construction, 2003). To help combat
indoor air pollutants, precautions can be taken by selecting finishes and materials that have low levels of volatile organic compounds (V.O.C’s).

**Summary of Findings**

This review of literature suggests that society as a whole is aging, social norms are evolving, and multiple generations are now increasingly living and working together. Concurrently, perceptions and actions toward the built environment of our society are changing. Taboos previously held about universal, transgenerational and barrier-free design are being dispelled, and people are increasingly realizing the benefits of incorporating these guidelines and principles into their daily lives (Clay, 2005).

As the population of the elderly has grown, so have their options for housing. Resources are increasing and more companies are offering solutions to modify homes so that they meet the existing needs of those living in them (Clay, 2005). The AARP’s ECHO program is one program that seeks to address aging-in-place in relation to these modified homes. However, all too often within these homes the typical solution for the elderly and disabled may only meet the needs of today and not those of the future. Ideas found within transgenerational design, universal design and place attachment offer potential to further enhance livability of these dwellings as do sustainable building practices.

It is the hope of this author, therefore, that the research gathered for this review of literature and implemented within the project illustrated in chapters three and four may offer a valid alternative to these traditional solutions that further embraces these important concepts. It is anticipated that by creating dwellings that offer the elderly and disabled an opportunity to remain close to their families in an adaptive, psychologically comforting and environmentally sound environment, they will in turn benefit from a stronger sense of place, dignity and wellbeing as they age.
CHAPTER 3

DESIGN PROGRAM

This chapter describes a theoretical project designed for the fictitious company “Universal Dwellings”. Essentially two design projects will be developed:

- A series of four different residential dwelling additions designed to house a variety of elderly and disabled individuals of different characteristics; and,

- A design showroom that markets these dwellings for the Universal Dwellings Company.

Though different from each other in program and intent, they both relate to the general purpose of this study. The dwellings are meant to exemplify and incorporate information collected in the review of literature and translate it into tangible architectural form. The development of the invented company Universal Dwellings is intended to show how these dwellings could be marketed to the general public and demonstrates a practical approach to the physical marketing of these units.

The format of this chapter will first explain the dwellings and their concept and will then conclude with the design showroom information.

The Dwellings

Design Concept

As previously discussed in chapter two’s review of literature, the percentage of the United States population that will soon reach the elder year stage of life is significantly expanding. The average life expectancy for humans is now 83 for women and 81 for men (Services, 2005). Because of this, housing needs are changing as well. In a study conducted by the American Association of Retired Persons, researchers found that 83% of the retired respondents want to remain in their current residences for as long as possible (Designers, 2000). Unfortunately, it is not always possible to age-in-place.
In today’s society many older Americans can modestly modify their homes to meet their changing needs. However, sometimes this solution is only temporary and does not meet their long-term requirements because larger changes are required. In cases like this, various housing options are available to the elderly (assuming funds are available) such as relocating to a retirement community or continuing care facility.

In contrast, this design project intends to address the needs of those who cannot remain in their current homes, cannot live independently (such as a disabled young adult), or are seeking to downsize their current residence and move closer to other members of their family. Four dwellings will be designed that provide a solution for those who have lost the ability to live fully independently, yet still desire to maintain their autonomy as possible. The design solutions will reside in the context of what many in this situation choose—to move closer to their extended families that live in a single family residence.

As the literature review suggests, the characteristics and life circumstances of those seeking to age-in-place can vary greatly in age, ability level and financial status. To accommodate these variations, four different aging-in-place dwellings will be designed that reflect the different needs and priorities of persons who might typically desire to age-in-place.

The dwellings will also vary in their physical proximity to the existing residence:

- **Attached:** Two of the dwellings will be physically connected to the existing residence to maximize ease of care giving and family connection. By keeping the dwelling attached to the existing residence the caregiver does not have to exit their home to enter into the dwelling, thus enabling the caregiver easier access into the dwelling and easier facilitation of care to the dweller. The goal of creating attached units is to help give the residents of the dwellings a sense of independence and separateness from the main home but still allow a closer connection to the home’s family and activities. Essentially the attached unit acts like a mother-in-law suite, giving residents a more private space but still allowing a connection to the main home. The attached units will require some structural changes to
the existing home, but these changes are minimal to ease disruption to the existing residence.

- **Detached**: Two of the dwellings will be freestanding units that will reside next to the existing residence on the property of the existing home emphasizing autonomy with remote, yet available connection to the family. Detached units provide residents of the dwellings a sense of independence and separateness from the main residence. This will permit the families to live their lives separately but allow them to interact together when they so choose. The detached nature of the dwelling will not require any structural changes to the existing home on the property. When the dwelling is no longer occupied it can be adapted to a home office or guest house or be disassembled, thus reclaiming space in the yard.

Thus, when the two variables of user profile and proximity to the existing residence are combined, the following four options result:

**Detached Dwellings**

- **Dwelling Option A**: a retired married couple who wishes to downsize and are currently fully able.
- **Dwelling Option B**: a single elderly person that is still very active and is financially situated to enjoy a higher end lifestyle.

**Attached Dwellings**

- **Dwelling Option C**: a single elderly person with a disability that relies on extended family members for daily care.
- **Dwelling Option D**: a person in their twenties or thirties with a disability.

Each of the four options will describe a different floor plan and include products that accommodate the variations in client requirements. All designs will take into consideration content from the literature review, including information on the aging population and the principals and guidelines of universal, transgenerational and barrier-free design.

As discussed in the review of literature, sense of place is an important factor to consider when designing for anyone, and especially the elderly. Research has shown...
that having these possessions often helps the elderly maintain a sense of identity as well as helping them to connect to their past (Sugihara and Evans, 2000). Therefore, these units will provide opportunities for the display of personal possessions such as family photographs or personal collections. This feature of the units is a distinct goal that sets them apart from others’ aging in place units currently offered in the market.

Also among this design project’s goals are the use of as many sustainable and eco-friendly products and solutions as possible. This includes the selection of structural components as well as interior products and finishes. All products will be chosen with attention to efficiency and quality while still being environmentally responsible. It is also the intent that the exterior finishes will complement the exterior of the existing residence, thus meeting one of ECHO’S goals of blending into the existing surroundings of the home and neighborhood. ("Elder Cottage Housing Opportunity (ECHO)", 2005).

Commonalities to all four dwellings

Each of the four dwelling options will possess features specific to its users’ requirements. However, Tables 3 and 4 illustrate common features that the dwellings will possess:

\[
\text{Table 3. Program analysis showing spatial requirements, furnishings, fixtures and equipment for detached dwellings.}
\]

<table>
<thead>
<tr>
<th>Detached Dwellings</th>
<th>Furniture Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Detached Dwellings</strong>&lt;br&gt;Overall sq. footage: 400-600</td>
<td></td>
</tr>
<tr>
<td>Kitchen</td>
<td>Easily cleaned surface, energy star appliances, pullout storage</td>
</tr>
<tr>
<td>Living Area</td>
<td>Sofa, armchairs, side tables, coffee table, easy lift chair</td>
</tr>
<tr>
<td>Dining Area</td>
<td>Table, chairs (amount may vary per unit)</td>
</tr>
<tr>
<td>Laundry/Utility Area</td>
<td>Washer/Dryer, Storage</td>
</tr>
<tr>
<td>Bedroom</td>
<td>King or queen size bed, night tables, dresser and/or television</td>
</tr>
<tr>
<td>Bathroom</td>
<td>Accessible shower and or tub, storage for toiletry items, grab bars or reinforcement for grab bars, comfort height toilet</td>
</tr>
</tbody>
</table>

Sustainable products will be incorporated

Space for personal possessions and collections will be integrated
Table 4. Program analysis showing spatial requirements, furnishings, fixtures and equipment for attached dwellings.

<table>
<thead>
<tr>
<th>Attached Dwellings</th>
<th>Overall sq. footage: 300-400</th>
<th>Furniture Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kitchen (If Applicable)</td>
<td>Easily cleaned surface, energy star appliances, pullout storage</td>
<td></td>
</tr>
<tr>
<td>Living Area</td>
<td>Sofa, armchairs, side tables, coffee table, easy lift chair</td>
<td></td>
</tr>
<tr>
<td>Dining Area (If Applicable)</td>
<td>Table, chairs (amount may vary per unit)</td>
<td></td>
</tr>
<tr>
<td>Bedroom</td>
<td>King or queen size bed, night tables, dresser and/or television</td>
<td></td>
</tr>
<tr>
<td>Bathroom</td>
<td>Accessible shower and or tub, storage for toiletry items, grab bars or reinforcement for grab bars, comfort height toilet</td>
<td></td>
</tr>
<tr>
<td>Sustainable products will be incorporated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Space for personal possessions and collections will be integrated</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Existing Site Conditions

A real site located in south Jacksonville, Florida will be used for this design project. Actual site conditions offer the opportunity to maintain a realistic approach to the design solution. A brick construction single family ranch style home is currently in place on the quarter acre site. The 2600 square foot home was constructed in 1955 and has a raised foundation. It contains three bedrooms, two bathrooms, living room and eat-in kitchen as well as a formal dining room. A storage shed and a pool are located in the back yard. This area of the property is sufficient in size to create the addition of a detached dwelling. The backyard is not heavily landscaped, so this will not affect the placement of the unit.

The site is located within walking distance of a Publix supermarket, Walgreens pharmacy and various food establishments. A bus route is available in this area as well and a bus stop is located at the end of the road. The home is situated in an established part of town that offers many options for religious worship and entertainment activities.
Figure 29. Exterior photo of existing home.

Figure 30. Rear exterior photo of existing home and deck.
Figure 31. View of existing back yard.

Figure 32. Exterior view of dining room window.
Figure 33. Interior view of dining room looking towards back yard.

Figure 34. View of existing back yard gate in front of dining room.
Dwelling Option A

**User Profile.** The goal of this dwelling is to accommodate an elderly retired married couple that has decided to downsize their home. ASID’s aging in place study found that 23% of the respondents age 45 and over felt that downsizing their home would make it easier to maintain and get around (Designers, 2000). The couple is currently fully active with no disabilities. They require the means to entertain frequent guests during the daytime hours. Complete independence from the main home is desirable. This will allow the couple to come and go as they please without interfering with the residents in the main home. Access to the surrounding yard, pool and parking will be integrated around the dwelling, thus enabling them the opportunity to entertain independently from the main house.

**Analysis of Individual Space Requirements.** Parking will be provided for the dwelling from the existing home’s available carport and driveway. Entrance into the backyard will be provided through a side gate that provides a ramp on the existing deck of the home. From here the residents can access the walkway to their dwelling. An exterior deck will also be added to the side of the dwelling to allow for outdoor entertaining separate from the main residence. A “grocery shelf” will be located on the exterior of the dwelling to the side of the front door to help facilitate entry into the home by allowing the resident to place items on it while they unlock the home, thus lowering the risk of tripping or dropping ones’ keys. Also incorporated into the dwelling will be an exterior patio independent of the existing patio already attached to the current home. This patio will afford another place for the couple to entertain guests if they so choose. The unit will facilitate entertaining two to four guests at a time and will feature a kitchen of sufficient size to accommodate two persons. Universal/barrier free features will include a dishwasher that can be raised twelve inches to decrease the amount of bending and stress on the lower back while loading and unloading. Durable, easy to clean surfaces will be implemented. A dining table with seating for at least four will be integrated into the space. The table’s unique wall-attached track system allows it to move back and forth functioning alternately as a kitchen/dining table or utilized in the laundry area for setting baskets and folding clothes. Furniture requirements for the bedroom include a queen or king size bed and night tables. A sectional sofa and
armchairs will provide sufficient seating in the living space. Storage will also be integrated in closets located near the front door for storage of seasonal items, toys for grandchildren and guest coats.

**Dwelling Option B**

**User Profiles.** Like Dwelling Option A, this dwelling is intended to meet the needs of someone that has downsized their current home in favor of a smaller, more manageable space. The goal of the option B dwelling is to accommodate a single person that is still very active, enjoys his or her own privacy, and is financially situated to enjoy a higher-end lifestyle. The ASID study found that two in five people desire their homes to be more luxurious (2000). It is important to note though that luxury mean different things to different people, such as adding Jacuzzis and updating appliances (Designers, 2000). To meet these desires, specifications for furnishings, finishes and equipment for this space will be made with higher price point allowances in mind.

**Analysis of Individual Space Requirements.** Option B will be universally designed/barrier free while simultaneously including luxury items and features into the unit such as a steam shower and high-end appliances. A television will be placed at the foot of the bed in a cabinet that allows it to be raised up and down by remote control. A smaller living area will be incorporated into the space to allow for a small office area while still providing adequate entertaining space for guests. A deck with spa and seating area will be integrated creating an outdoor extension for the resident and guests. Like Dwelling Option A above, the unit will have a separate entrance and parking area that will allow them to be completely independent of the existing home.

**Dwelling Option C**

**User Profile.** ASID’s Aging-in-Place survey asked the question “How likely do you think it will be that you will have a parent or elderly family member living with you in your home at some point in the future?” In response they found that more than a quarter of the respondents either have or expect to take in an elderly parent or family member while 6% already do so and 16% reported that it is somewhat likely they will have to in the future. (2000) In reaction to these statistics, Dwelling Option C’s plan is designed for a single elderly person that desires to be close to family and relies on these persons for daily care. The space needs to be sufficiently large so that he or she
can enjoy his or her own private environment with an attendant psychological association of independence, but still remain connected to the family.

**Analysis of Individual Space Requirements.** Mobility assistance in this dwelling is important, so greater care will be taken in planning the bathroom. Discreetly placed grab bars will be utilized, as well as an open shower that has no threshold to step over. A small sitting, television viewing and reading area will be provided within the dwelling’s private space. Various sustainable flooring choices such as cork and linoleum will be explored as possible options. A television will also be incorporated into the space and will be viewable from the bedroom or living area. Also incorporated into the dwelling will be a separate entrance from the existing home, thus enabling the resident to come and go as they please and have visiting guests without interfering with family members. No kitchenette or laundry facilities will be incorporated into this dwelling, as it is being designed for someone that needs more individualized care. These tasks will be provided by the caregiver in the existing residence.

**Dwelling Option D**

**User Profile.** The 2000 Florida census reveals that there are 8,746,066 people living with disabilities between the ages of 21 to 64 in the state (US Census Bureau, 2005). Clearly, the elderly are not the only population group that requires proximity to extended family for support. Therefore, Dwelling Option D will be designed to accommodate a younger person in their twenties or thirties with a physical or mental disability. This unit will be designed so that it provides a sense of independence but still affords the family close proximity to monitor their care.

**Analysis of Individual Space Requirements.** Direct access into the dwelling from the main residence will be provided as well as a separate entrance from the parking area into the dwelling. Parking will be provided so that this independent adult may entertain visitors without passage through the main house.

The presence of a kitchenette will help provide a greater sense of separation and independence from the main home. The suite will also incorporate an entertaining area so the user can entertain guests his or her own age independently from the main home. Within the entertaining space a multimedia area will be incorporated that includes a computer station with multi-tasking television capability.
**Type of Construction/Materials: Exterior and Interior**

The dwellings will be steel frame construction and placed on a raised foundation to achieve an elevation identical to the existing residence. Structural insulated panels (SIPs) will comprise the walls and ceiling surfaces. SIPs were chosen because they are economical, energy efficient, and can be rapidly installed. An average home can generally be constructed by a four-person crew in a three day period. The panels are lightweight and do not require special equipment to implement and are offered in sizes that make their transport to the rear of the lot feasible. Structural insulated panels have also been rated to withstand 200 mph hurricane wind code requirements in Florida. These panels are energy efficient and may help to lower energy costs. The roof panels will be six-inch polystyrene insulation. A variety of interior and exterior finishes throughout, including paint, siding and or stucco or brick veneer will be utilized. All interior and exterior finishes including paint will utilize sustainable design solutions. The style of the exterior will respond to the existing home’s exterior appearance.

**Budget**

It is the goal of this project to obtain cost estimations for the construction of each of the two types of dwellings (detached and attached) specifying structural insulated panels (SIPs). The author intends to contact the company Home Front Homes to help in obtaining these cost estimates. Homes Front Homes is a home builder located in Englewood Florida that specializes in panel based building. Currently Home Front Homes offers home models ranging in square footage from 584–2100 square feet with current home prices ranging from $32,877 to $56,445.00. SIP Supply in Eastman, Georgia will also be contacted for their help in this project. Currently Sip Supply offers SIPs panels, as well as SIP ready home plans and SIP home kits. For this project to be economically feasible it is the hope of this author that the cost for constructing the attached and detached dwellings remains within the $30,000 - $60,000 range.
Energy Conservation and Green Design Issues

Every effort will be taken to specify products that are sustainable and eco-friendly for this project where possible. This includes the selection of structural components as well as interior products and finishes. As far as possible, products will be chosen with attention to efficiency and quality while still being environmentally responsible. For example, materials and finishes that have low emission levels of volatile organic compounds (VOC’s) and materials that utilize as little waste as necessary during the construction process (such as structural insulated panels) will be incorporated.

The Showroom

Design Concept and Client Philosophy

In addition to the design of the dwellings described above, this design project will also address the showroom within which these home additions are marketed. It is intended that the fictitious company “Universal Dwellings” will create an open and inviting space that compels guests of all ability levels to feel welcome and invite them to explore the company's services. This will be achieved by creating an environment that implements the principals of universal and barrier-free design. The firm’s name makes clear how they wish to be perceived. Universal Dwellings intends their workplace to reinforce the objective of creating universal spaces that invite everyone to live and work fully without discrimination.

User Profile

The headquarters will house the design showroom which is open to the public as well as the administration offices for the corporation. The site of the fictitious showroom Universal Dwellings is purposely intended to be generic in nature so that it can be used as a general prototype.

Aging baby boomers, the elderly and families are the primary target clients for the corporation. The goal is to attract guests that are interested in creating homes and dwellings that are universally designed for all ages. The primary focus of the company is to offer dwellings for those that need new accommodations because they cannot stay in their existing residence, or are relocating to be closer their families. Universal Dwellings is also proactive in designing homes for families that integrate the principals
of universal and transgenerational design for reasons other than aging (such as disabilities) so that they may better accommodate all users' needs, whether they be adults or children.

**Client Operation and Organizational Structure**

Because Universal Dwellings is a startup company, staff size is limited so that growth can be prudently addressed as demand warrants. Currently the company employs a receptionist, an assistant to the president, a showroom manager and two home sales representatives. Also employed are two designers, two design assistants, and two accounts managers. When demand calls for it, various other employees are used as needed. As the company grows and expands it is their hope that their staff can grow as well.

- **President:** Owns and operates business; is the face of the company and is actively involved in the community.

- **President's Assistant:** Assists President with daily tasks and is responsible for setting appointments as well as greeting and directing guests.

- **Showroom Manager:** Responsible for maintaining design showroom and managing staff. Works directly with the president on day to day business operations.

- **Sales Representatives (2):** Promote and manage sales of homes and dwellings.

- **Designers (2):** Help customers plan and choose residence or dwelling that would best suit their needs and help them plan the interiors of the homes and dwellings.

- **Showroom Assistants (2):** Assist clients and designers with selection of materials for homes and dwellings. They are also responsible for maintaining showrooms and maintaining the currency of the library.

- **Main Receptionist:** Responsible for greeting and directing guests to appropriate place or people.

- **Account Managers:** Responsible for payroll and accounting for company.
Analysis of Individual Space Requirements

*Table 5.* Program analysis showing individual space requirements.

<table>
<thead>
<tr>
<th>First Floor</th>
<th>Sq. Ft.</th>
<th>Furniture Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reception</td>
<td>200</td>
<td>Reception desk w/return, phone, fax, computer, printer, task chair, file storage</td>
</tr>
<tr>
<td>Kitchen Vignettes</td>
<td>450</td>
<td>N/A</td>
</tr>
<tr>
<td>Bathroom Vignettes</td>
<td>400</td>
<td>N/A</td>
</tr>
<tr>
<td>Assistants</td>
<td>350</td>
<td>Desk w/return, phone, fax, computer, printer, task chair, file storage</td>
</tr>
<tr>
<td>Plan Station</td>
<td>200</td>
<td>Storage for plans, (2) Work Tables</td>
</tr>
<tr>
<td>Computer Station</td>
<td>100-150</td>
<td>Task Seating (4), Computers (4)</td>
</tr>
<tr>
<td>Lounge</td>
<td>300</td>
<td>Minimum seating for 8, Lego Table, toy storage, TV, Coffee table</td>
</tr>
<tr>
<td>Restrooms</td>
<td>80-100</td>
<td>N/A</td>
</tr>
<tr>
<td>Break room</td>
<td>150-200</td>
<td>N/A</td>
</tr>
<tr>
<td>Janitors Closet/Water Heater</td>
<td>40-50</td>
<td>N/A</td>
</tr>
<tr>
<td>Store Room</td>
<td>250-300</td>
<td>N/A</td>
</tr>
<tr>
<td>Light Display Area</td>
<td>300-400</td>
<td>N/A</td>
</tr>
<tr>
<td>Flooring Area</td>
<td>400</td>
<td>N/A</td>
</tr>
<tr>
<td>Model Space A</td>
<td>500</td>
<td>N/A</td>
</tr>
<tr>
<td>Model B Display</td>
<td>1000</td>
<td>N/A</td>
</tr>
<tr>
<td>Model C Display</td>
<td>800</td>
<td>N/A</td>
</tr>
</tbody>
</table>
(Table 5 Continued)

<table>
<thead>
<tr>
<th>Second Floor</th>
<th>Sq. Ft.</th>
<th>Furniture Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copy Area</td>
<td>100-150</td>
<td>Storage for paper, etc. copier, fax</td>
</tr>
<tr>
<td>Waiting Area</td>
<td>200</td>
<td>Seating for 6, coffee table</td>
</tr>
<tr>
<td>Restrooms</td>
<td>80-100</td>
<td>N/A</td>
</tr>
<tr>
<td>Janitors Closet</td>
<td>40-50</td>
<td>N/A</td>
</tr>
<tr>
<td>Managers Office</td>
<td>200-250</td>
<td>Desk w/ return, phone, fax, computer, printer, task chair, file storage</td>
</tr>
<tr>
<td>Conference Room</td>
<td>350</td>
<td>Seating for 8, conference table, A.V. Storage, Credenza</td>
</tr>
<tr>
<td>President</td>
<td>300-350</td>
<td>Desk w/ return, phone, fax, computer, printer, task chair, file storage</td>
</tr>
<tr>
<td>Designer’s Space (2)</td>
<td>500-600</td>
<td>Desk w/ return, phone, fax, computer, printer, task chair, file storage</td>
</tr>
<tr>
<td>Sales Agents' Space (2)</td>
<td>500</td>
<td>Desk w/ return, phone, fax, computer, printer, task chair, file storage</td>
</tr>
<tr>
<td>Account Managers</td>
<td>400</td>
<td>Desk w/ return, phone, fax, computer, printer, task chair, file storage</td>
</tr>
<tr>
<td>Materials Library</td>
<td>400</td>
<td>Work Tables (Size and qty. TBD, Seating (qty. TBD)</td>
</tr>
</tbody>
</table>

**Type of Construction Methods/Green and Sustainable Materials**

Universal Dwellings is not only committed to creating universal homes but is also passionate about supporting the natural environment. Echoing the sustainable philosophy evident in the dwellings’ designs, it is similarly a goal of the showroom to implement as many sustainable and eco-friendly products and solutions as possible. Products will be specified with attention to efficiency and quality while still being environmentally responsible where feasible.
Much like the environmental orientation of the dwellings themselves, the showroom's walls and roof will consist of structural insulated panels, an intentional choice to reinforce and market the structural soundness of the dwellings themselves.

Chapter Summary

This chapter discusses the proposed development of two design projects. The first project will consist of two attached and two detached dwellings. Each dwelling will accommodate a different user profile that research suggests represent popular needs and desires of elderly and disabilities user groups. The second project proposes a showroom that markets these dwellings to the general public.

It is the hope of this author that these design projects will represent a progression beyond the traditional methods of housing the elderly and disabled that are currently available. They may afford these populations the ability to live and age with increased comfort as well as a strong sense of place.
This chapter will illustrate the design solutions for four proposed model dwellings as well as the proposed showroom for a fictitious company that markets these dwellings to end users. All drawings have been scaled to fit and include preliminary drawings, floor plans, perspectives and presentation boards.

**Existing Site Conditions**

*Figure 35. Rendering of existing site plan.*
The Detached Dwellings

Figure 36. Proposed site plan showing placement of the detached dwelling

Dwelling Options A and B

The detached units were placed to create separation between the detached dwelling and the existing home, thus creating distinctive spaces for both residences. This placement was also chosen because it maintains open green space in the backyard as well as circulation to and from the existing pool. Directly off the parking
area is a ramp that leads up onto the existing deck of the main home. A new deck extension leads to the dwelling itself.

Figure 37. Detached swellings: parti-diagram illustrating major/minor circulation zones and privacy zones.
The parti diagram shown above illustrates the various zones within the spaces as well major and minor circulation paths that can be utilized by the residents of the detached dwelling. These zones as illustrated by the parti legend are divided by privacy needs of the existing residents as well as the residents of Dwelling options A and B.

The following sections will detail the interior development of all four dwellings. All of the furniture in the dwellings is meant to be used as a place marker or inspiration if this unit were to be built. In reality, furniture from the residents’ previous home could be incorporated into the space, thus providing a link to their past if they so choose.

**Dwelling Option A**
The specific goal for Dwelling A was to create a home for a retired married couple that decided to downsize from their current home. Space planning for this dwelling began with a rectangular footprint and dividing it into quadrants. Since the couple likes to entertain, the largest quadrant was designated the living space. To meet their needs for now and in the future, both large and small details are located throughout the space that infuse universal design and transgenerational design principals throughout the design. (see figures 38 - 40.) For example, a shelf adjacent to the front door allows the user to set groceries down upon entering rather than having to hold them in their hands while trying to open the front door. Once in the space, there is another shelf for setting items down such as keys or a purse.

The entertaining space of the dwelling has purposefully been left open so that it can foster communication between the couple and guests. The kitchen has been designed so that it can accommodate more than one person at a time. The refrigerator is a side by side model so that it is easier to use by someone with a disability. The dishwasher which has been raised 12” off the ground to decrease the amount of bending and stress on the lower back while loading and unloading. Overhead kitchen cabinets are placed at no more than 48” above floor level so they can be accessed by persons of various abilities. The sink is open underneath so a user in a wheelchair can fully participate in kitchen activities. Alternately, the space can house a stool that can be used for sitting while at the sink. The nearby washer and dryer are front loading and have also been raised 12” to help with bending and reaching.
To incorporate the goals of place attachment, shelving has been incorporated into the dwelling which allows the couple to display personal items or collections. Storage and personal display space has also been incorporated into the entertainment center in the living room. Ample wall space is also available to hang artwork or photographs.

The table in the dining space is unique because it is attached to the wall by a track system which allows it to be pushed back and forth. This design feature permits the table to provide more counter space for the kitchen, and in its location at the other end of the track becomes a dining table or a folding table for the laundry area.

The living space incorporates a sectional sofa that provides seating for one to four persons when entertaining. The two end seats of the sofa recline, thus giving the couple a foot rest when needed. Space has been left open to accommodate a wheelchair participant, making them a seamless part of the main group. Should more seating be required when guests are visiting, chairs from the dining room can be pulled into the space. Another important feature of the living area is the transition of flooring materials. To help define the seating area and provide a warmer atmosphere, an area rug has been integrated into the floor so that it is level with the bamboo flooring that has been chosen for the rest of the space. This minimizes tripping or stumbling when transitioning between the two materials. It is important to note that rather than specifying carpet for the area rug, other materials such as cork, forbo and etc. could be implemented.

The bathroom in the space functions for both the residents of the dwelling as well as guests. It has been left open so that it can accommodate a wheelchair if required. The shower is a roll or walk-in style without a threshold and includes a built-in bench. It has an overhead shower head as well as a handheld one that can be utilized while sitting. The water closet is at a comfort height of 17” rather than the average toilet height of 14” to help enable getting up and down. At this point in time grab bars are not needed but the walls will be reinforced in case they need to be installed in the future. Figure 38 shows the location of these grab bars. The vanity is an open counter that enables grooming while still being comfortably seated. The mirror can also be angled to accommodate seated users.
The bedroom has been left as open as possible with three feet on either side of the bed to allow the couple room to get in and out. An armchair has been provided in the space for dressing or reading. The chair is motorized so that it can recline or lift up to help someone with limited mobility get in or out of the chair without assistance. The windows utilized throughout all the spaces are pivoting, as this style is easy for a mobility-impaired person to operate by themselves. For privacy curtains have been represented in all of the drawings. But the windows could be specified so that blinds have been incorporated into the actual window itself, this allows the window to be opened easily and with no hindrances from window treatments such as curtains. The flooring in the bedroom is again carpeting that is flush with the adjacent thresholds to prevent tripping and falling.

Lighting for Dwelling A is intended to give general illumination as well as accommodate specific tasks. Fixtures include both permanent and portable types for variety. Under cabinet lighting has been provided in the kitchen area specifically to provide extra illumination, help prevent accidents and boost contrast for detailed tasks. Wall sconces have been provided in the bedroom in lieu of traditional lighting fixtures on either side of the bed to save space on the night stand. This solution also provides a preventive measure so the lighting fixtures cannot be knocked over if the resident should fumble when trying to turn it on or off. Lighting has also been provided in all closets to help illuminate the space when searching for particular items.

Color has also been taken into consideration which is another important factor when designing for anyone, and especially the aging. In general, color schemes have been selected to enhance contrasts between various surfaces and objects. In advancing age it becomes more difficult to distinguish the subtleties and various shades of color. To help with this problem, all colors are placed to exhibit a large contrast from one surface to neighboring ones. For example, in the living room the carpet is darker in value compared to the rest of the flooring so it can be easily distinguished by someone that is elderly.
Figure 38. Annotated floor plan for Dwelling Option A, designed for a retired married couple.
Figure 39. 3D View of Dwelling Option A, designed for a retired married couple.
Figure 40. Dwelling Option A lighting plan.
Figure 40 continued. Dwelling Option A lighting plan legend.

Dwelling Option B

Dwelling Option B was designed to accommodate an elderly single adult that has decided to downsize from their current residence. Like Dwelling Option A, Dwelling Option B has been designed for someone who wishes to downsize their current home, but is of single status. This person is still very active, enjoys his or her privacy, and is financially situated to enjoy a higher end lifestyle. To meet the needs for now and in the future, universal design and transgenerational design principals were implemented throughout the space (See figures 40 - 43). Like the previous dwelling, a shelf has been created adjacent to the front door to enable placement of items while trying to enter the space, and another shelf allows for display space or for setting keys and personal items inside the door.

The entertaining space of dwelling B is smaller than the previous dwelling, but still accommodates multiple guests for entertaining. Because the main television of the house has been placed in the bedroom, a secondary flip-down television has been attached to the ceiling of the living room. This was designed so if one were entertaining they could watch television from the living room but return it to its closed position when not in use.
The kitchen and dining space is suitably sized for a single cook with occasional guests and features a home office built into the kitchen, providing the user a space to have a computer or pay bills. This kitchen also employs universal and transgenerational design solutions including the raised dishwasher, open sink, side by side refrigerator and front loading washer and dryers.

The issue of place attachment has been considered for this dwelling as well. Wall space is readily available for the placement of photographs or art work. While no permanent display shelving has been incorporated into the space, shelving could be hung if desired.

The bathroom in the space functions for both the resident of the dwelling as well as guests via multiple entrances into the bathroom from living room pocket doors and the bedroom. The bathroom has been left as open as possible so that it can accommodate a user in a wheelchair. The shower is a roll or walk-in steam model which eliminates thresholds with a built in bench and multiple shower heads. The water closet is comfort height to enable getting up and down, and grab bars have been placed in the space. The vanity is an open counter that provides leg room for seated users. The mirror can also be angled if necessary. A makeup vanity has also been added as well as a built in bench so that someone can sit to dress if desired.

As in Dwelling Option A, the bedroom has been left as open as possible with three feet on either side of the bed to allow room to get in and out. An armchair has been provided in the space for dressing or reading. The chair is motorized so that it can recline or lift up to help someone with limited mobility get in or out of the chair without assistance. The windows utilized throughout all the spaces are pivoting, as this style is easy for a mobility-impaired person to operate by themselves. Again, the windows can be specified with blinds built in to the frame thus requiring no window treatments. The flooring in the bedroom is again carpeting that is flush with the adjacent thresholds to prevent tripping and falling. A unique feature within this space is the remote controlled television. The unit is motorized and can be raised or hidden in a cabinet at the foot of the bed. This allows the user to watch television from their bed or to rotate the unit so that it is viewable from the provided armchair.
As described with Dwelling Option A, lighting and color have been taken into consideration in this space. Under cabinet lighting has been implemented in the kitchen and office space to provide specific task lighting. The television in the living room is remote controlled so the user does not actually have to reach up and fold the television down, which could cause someone to lose their balance. Ceiling fans have been utilized and they too are remote controlled. In the bedroom wall sconces have again been specified to save space and allow for task lighting. All color in the dwelling was chosen to provide contrast, making it easier for an elderly resident to easily distinguish between surfaces.

The exterior of the dwelling has also been taken into consideration. A whirlpool Jacuzzi has been recessed into the deck so that it stands approximately 18" high, thus enabling it to be accessible by someone in a wheelchair. A seating area has also been provided on the patio area so that the resident can enjoy his or her own space.

**The Attached Dwellings**

The entrance for the attached units will be from the dining room of the existing home, a community space often utilized by the family. The entrance will be created by the removal of a large picture window which will open up the wall allowing for the addition of the dwelling. Thus, the window’s existing header is used for the new doorway. By placing the dwelling at this location, all family members can access the new residential wing without compromising the existing private spaces of the home. If the attached dwelling’s purpose changes, it could be converted to a second master suite, guest suite, a home office or family room. The dwelling could also be removed with the window being replaced or a door being integrated into the wall creating a new entrance to the backyard.

The parti diagram shown in figure 45 illustrates the various zones within the spaces as well as major and minor circulation paths that can be utilized by the residents of the attached dwelling. Since this dwelling is attached to the existing home, much of the home is considered a community space since the residents of the dwelling will have much more social interaction with the existing family.
Figure 41. Annotated floor plan for Dwelling Option B designed for a single active elderly person.
Figure 42. 3D floor plan for Dwelling Option B designed for a single active elderly person
Figure 43. Detached Dwelling Option B: lighting plan.
Dwelling Option C

Dwelling Option C is designed to provide a single elderly person a sense of independence while still allowing close proximity to the existing family. Because this user will have full access to the main residence’s community space, only a small seating area has been provided so that they may watch television or entertain one to two guests at a time. A unique feature of this space is the wall mounted plasma screen television that can pivot to face the seating area or face the sleeping area. Built into the wall of the unit is shelving to provide display space for personal items and artifacts. Wall mounted shelves near the front entrance have been placed so that items such as keys or personal possessions may be set down. Overhead shelving has been provided for display space.

The bathroom of the space incorporated many of the same features of the previous dwellings. Instead of a walk-in shower, however, Dwelling Option C incorporates a safety tub with a pivoting door and seating so the dweller can take baths or a shower if desired. Showerheads at multiple heights have been provided.
Dwelling Option C utilizes two entrances into the space from both the exterior and the main residence. Space was cordoned off for entertaining as well as a small kitchen area to provide independence from the main residence. The circulation diagram above (figure 45) illustrates the semi-private and community spaces of this attached dwelling.

**Attached Dwelling Options C and D**

*Figure 44. Existing site plan showing placement of the attached dwellings.*
Figure 45. Attached Dwellings: Parti-diagram illustrating major/minor circulation zones and privacy zones.
Figure 46. Annotated plan view of Dwelling Option C for a single elderly person.
Figure 47. 3D floor plan for Dwelling Option C designed for a single elderly person.
Figure 48. Dwelling Option C: lighting plan.
Dwelling Option D

Dwelling Option D is designed for a disabled young adult. Features have been added to help give the user a greater sense of independence from the nearby family. For example, a separate entrance has been provided so that the user can come and go as they please without entering the main residence and a small kitchenette with storage is included.

A seating area for entertaining guests or watching television features a multifunctional computer surface that extends to double as an eating table. The dwelling also includes a media center with wireless keyboard and mouse. The computer monitor is mounted to the wall and can pivot in various directions as well as up or down. The monitor can be controlled via remote and also serves as a television through an electronic switch, thus saving space by having one dual-use unit rather than television and computer. Open storage has been provided by the table for a display area as well as closed storage below for computer and audio visual equipment.
Figure 49. Annotated floor plan for Dwelling Option D, designed for a disabled young adult.
Figure 50. 3D floor plan for Dwelling Option D designed for a disabled young adult.
Figure 51. Dwelling Option D: Lighting plan, extra electrical outlets accommodate the extra power demands of gaming or other devices.
The sleeping area is semi-enclosed, providing privacy from the public areas. Closet hanging space as well as a built in dresser saves space and maximizes storage. Open storage above the dresser can be utilized for displaying personal items. Common to all the dwellings described here, Dwelling Option D provides pivoting windows enabling users to easily control ventilation without assistance.

The bathroom in the unit is accessed through the sleeping area. A roll/walk-in shower has been specified as well as an open sink vanity. The space has been left as open as possible to permit wheelchair access. Grab bars over the toilet have also been implemented to enable transfer to and from the comfort height toilet. Built in linen and toiletry storage has been provided for the resident via cabinetry adjacent to the sink vanity. The mirror in the space is height-adjustable.

**Budget**

As described in chapter 3, various options were explored concerning projected costs for constructing the attached and detached styles of proposed dwellings. Three companies were contacted to help in providing cost estimates. Unfortunately, Home Front Homes was not able to help in providing a cost analysis for this project. In order to provide an in-depth cost estimate, a local Tallahassee, Florida builder was contacted.
in their place. Table 6 illustrates the cost breakdown for the attached dwelling that was provided.

Table 6. Traditional cost analysis for the attached dwelling style.

<table>
<thead>
<tr>
<th>Attached Dwelling</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineer, Permits, Utilities, Demo</td>
<td>$9,066.44</td>
</tr>
<tr>
<td>Foundation</td>
<td>$8,539.90</td>
</tr>
<tr>
<td>Framing, Siding, Roofing</td>
<td>$28,735.65</td>
</tr>
<tr>
<td>Exterior Doors</td>
<td>$1,000.00</td>
</tr>
<tr>
<td>Windows</td>
<td>$1,000.00</td>
</tr>
<tr>
<td>Plumbing</td>
<td>$5,254.00</td>
</tr>
<tr>
<td>Electric</td>
<td>$4,360.47</td>
</tr>
<tr>
<td>Heating &amp; A/C</td>
<td>$4,970.00</td>
</tr>
<tr>
<td>Insulation</td>
<td>$1,237.53</td>
</tr>
<tr>
<td>Drywall &amp; Hardcoat</td>
<td>$3,697.60</td>
</tr>
<tr>
<td>Interior Doors</td>
<td>$639.00</td>
</tr>
<tr>
<td>Interior Trim</td>
<td>$3,184.00</td>
</tr>
<tr>
<td>Cabinets (Installed)</td>
<td>$2,100.00</td>
</tr>
<tr>
<td>Ceramic Tile (Installed)</td>
<td>$750.00</td>
</tr>
<tr>
<td>Painting</td>
<td>$4,268.52</td>
</tr>
<tr>
<td>Lights &amp; Ceiling Fans</td>
<td>$1,200.00</td>
</tr>
<tr>
<td>Closet Shelves (Installed)</td>
<td>$250.00</td>
</tr>
<tr>
<td>Mirrors (Installed)</td>
<td>$115.00</td>
</tr>
<tr>
<td>Bath Accessories (Installed)</td>
<td>$350.00</td>
</tr>
<tr>
<td>Floor Coverings (Installed)</td>
<td>$1,344.00</td>
</tr>
<tr>
<td>Drives, Patios, &amp; Sidewalks</td>
<td>$700.74</td>
</tr>
<tr>
<td>Wood Deck</td>
<td>$2,160.00</td>
</tr>
<tr>
<td>Final Grading &amp; Cleanup</td>
<td>$5,040.00</td>
</tr>
<tr>
<td>Landscaping (Installed)</td>
<td>$1,000.00</td>
</tr>
<tr>
<td>Miscellaneous &amp; Other</td>
<td>$36.17</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$91,000.00</strong></td>
</tr>
</tbody>
</table>

This estimation was provided by a licensed contractor who specified traditional materials and methods of construction. It unfortunately does not meet the aforementioned criteria of sustainable materials and products nor is it within the $30,000-$60,000 price range originally specified in chapter 3. The second company contacted was Sips Supply in Eastman, Georgia. The company supplied a cost estimate for the detached dwelling detailed in table 7.
Table 7. SIPS cost analysis for detached dwelling.

<table>
<thead>
<tr>
<th>Structural Insulated Panels</th>
<th>Quantity</th>
<th>Dimensions</th>
<th>Sq. Ft</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall Panels</td>
<td>24</td>
<td>4’ x 8’ x 4 1/2”</td>
<td>768</td>
<td>$3,840</td>
</tr>
<tr>
<td>Corners</td>
<td>4</td>
<td>2’ x 2’ x 8’</td>
<td>128</td>
<td>$640</td>
</tr>
<tr>
<td>Roof Panels</td>
<td>22</td>
<td>4’ x 12’ x 6 1/2”</td>
<td>1056</td>
<td>$6,864</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>4’ x 6’ x 6 1/2”</td>
<td>192</td>
<td>$1,248</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>2’ x 12’ x 6 1/2”</td>
<td>48</td>
<td>$312</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>2’ x 6’ x 6 1/2”</td>
<td>72</td>
<td>$468</td>
</tr>
</tbody>
</table>

Labor                        |           |             |        | $13,584|
Sub-Total                    |           |             |        | $26,956|
Engineers, Permits, Utilities, Demo |       |             |        | $6,799 |
Excavation                   |           |             |        | $2,856 |
Foundation                   |           |             |        | $3,012 |
Windows and Exterior Doors   |           |             |        | $10,725|
HVAC unit, Ductwork and stainless steel Registers |     |             |        | $2,884 |
Electrical                   |           |             |        | $2,439 |
Permits                      |           |             |        | $300   |
Floor Framing                |           |             |        | $2,884 |
Plumbing                     |           |             |        | $750   |
Tyvek wrap and weather stripping for windows/doors/corners |  |             |        | $225   |
Grand Total                  |           |             |        | $59,830|

SIPS Supply estimated the quantity of SIPS wall, corner and roof panels that would be required to complete the project. It was specified that it would cost $6.00 per square foot for labor to install the aforementioned panels. The roof panels were estimated at $5.00 per square foot of wall and the roof panels were $6.50 per square foot. From this information it was derived that it would cost $26,956.00 for SIPS materials and the labor to install. Unfortunately, this does not take into account the cost of excavation, windows/doors, HVAC, systems, permits and weather-stripping. To complete the cost analysis, this information was interpolated from the data for the Rocio Romero homes detailed in chapter 2. Calculations shown in Table 7 account for the difference in size between these two units.

**Energy Conservation and Green Design Issues**

Selected furnishings, fixtures and equipment have been chosen with care and attention towards sustainability. Energy conservation was similarly a key factor in
appliance and equipment specification. For example, all specified appliances used in the dwellings are energy star rated. Energy Star is a national program sponsored by the U.S. Environmental Protection Agency (U.S. EPA) with a stated goal of instilling “comprehensive whole house approach to improving energy efficiency while helping to protect the environment” (U.S. Environmental Protection Agency, 2007). All plumbing fixtures are water conserving fixtures and the dishwasher and washing machine are both equipped with water conserving settings. The countertops specified for the dwellings are recycled glass or paperstone, a composite surface material made from recycled paper. Flooring options for the dwellings include recycled carpet, cork, bamboo and linoleum.

**The Showroom**

This project thesis also incorporated the design of a showroom that market the dwellings described above to prospective buyers. The goal of the “Universal Dwellings” showroom was to create a space that invites guests of all ability levels to explore the company’s services. This was accomplished by creating a space that is open, interactive and inclusive of all physical ability levels. The bottom floor of the showroom has been designed to invite user exploration of the actual dwelling models. Vignettes of universally designed kitchens and bathrooms have also been placed to help illustrate options available to clients, as well as an interactive area that permits tangible inspection of specific products.

The private spaces are placed in the back of the showroom and on the second level. The second floor of the space is designed for administration and showroom employees and includes the president’s office, manager, designers, accounts managers and real estate agents.

Like the dwellings themselves, the showroom seeks to exude a mood of inclusion, vitality and respect for persons of all abilities. The goal of developing the four model dwellings and the Universal Design’s showroom was to offer a valid design alternative to the traditional methods of housing the elderly and disabled. It is the intention that the design solutions detailed here fulfill these needs and represent a real life solution that facilitates dignity and enduring family connection for aging and disabled populations.
Note: All showroom drawings are not to scale and are drawn in metric including all annotations.

Figure 52. Universal Dwellings Showroom first floor.
Figure 53. Universal Dwellings Showroom first floor lighting plan.
Figure 54. Universal Dwellings Showroom second floor.
Figure 55. Universal Dwellings Showroom second floor lighting plan.
Figure 56. Universal Dwellings Showroom longitudinal cross section.
Chapter Summary

This chapter described solutions for two design projects. Four separate dwellings each accommodated a different user profile that research suggests represent popular needs and desires of elderly and disabilities user groups. Principles of sustainability, place attachment, and the various aspects of universal design were reflected in the solutions. The feasibility of these dwellings was explored through attention to building construction method. The second project proposed a showroom that markets these dwellings to the general public.

It is the hope of this author that these design projects represent an evolution beyond the established methods of housing the elderly and disabled that are currently available. They may allow these populations the ability to live and age with increased comfort as well as a strong sense of place.
CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

The proposed model dwellings and showroom project fulfills the intent of a prototype for residential accessible dwellings that allow people of various life stages and abilities to age-in-place with their families. The overall goal was to orient and design the dwellings so that they promoted social interaction with the residents of the main home while still allowing dwelling users to maintain a sense of separation when desired. This provides them the opportunity to maintain their individual identities while allowing them the freedom to come and go as they please. When or if needed, a more active role can be taken by the residents of the home in the care of their family members. The proposed dwellings’ design springs from the concepts of the AARP’s ECHO program, then seeks to exceed them by incorporating concepts of place attachment, universal design in its various forms, and using a sustainable approach to construction materials.

Limitations

This study included a preliminary investigation of budget and specifications of sustainable materials for the construction of the proposed dwellings. The current cost estimates included here provide only a beginning snapshot of resources required to actually construct the proposed model dwellings based on preliminary building component cost estimates and case studies of like dwellings. Similarly, the incorporation of sustainable materials discussed herein represents only a beginning exploration of these ideas.

It is also important to note that this thesis only discusses one proposed location. In reality each dwelling will require a somewhat different solution depending on the location and placement of the dwelling. This could limit the kinds of materials used during construction as well as access to the site. Further research needs to be conducted to determine alternative methods of construction for the development of the dwellings for such contingencies.

Application of this research

The author’s exploration of this topic has spawned actual interest in the design and construction of an aging-in-place dwelling for an elderly couple. The couple’s profile
is striking in its similarity to the case study profiles described here. Both members are currently active and mobile but are realizing that their abilities are changing. The husband has had a stroke and his mobility is slowing. His wife is currently in good health but it is finding it more difficult to maintain a large house on a daily basis. They are interested in downsizing their current residence and adding a dwelling to their daughter and son-in-law’s home. The author intends to research their needs and desires further and develop a design that meets their specific requirements.

**Recommendations for future research**

Products and materials are ever changing and evolving. More research should be conducted to explore constructing these dwellings in a prefabricated style, thus possibly lowering the cost to build and implement them. For the purpose of this thesis the materials chosen and specified were sustainable in nature. As of February 2007, the U.S. Green Building Council has developed a pilot rating system for residential homes and neighborhoods. When finalized, these concepts should be consulted when designing these dwellings. Similarly, the concepts of universal design and place attachment are constantly in evolution. It is important to note that new avenues of ideas these research areas reveal should also be referenced and applied in the future.

**Conclusion**

Research shows that almost 80% of the population now lives past the age of 65, and by 2020 the Census Bureau estimates that seven to eight million people will be over the age of 85. The Bureau also reports that 214,000 people will be over the age of 100. (Coleman, C. & Sosnowchik, K., 2006) As the population continues to grow and age, more housing options are needed that allow people to age and progress through their lives with comfort and dignity. Statistics show that people want to age-in-place and remain close to their families and loved ones. They also want to maintain a connection to their pasts and memories and dwell in an environment that maximizes their ability to flourish and live independently. This author offers these proposed dwellings as one possible solution to these life challenges.
REFERENCES


BIOGRAPHICAL SKETCH

Theresa Newbill was born and raised in Jacksonville, Florida. She received her Bachelor’s of Science degree from the Department of Interior Design at Florida State University in spring 2005. She continued her education in interior Design to pursue a Master of Fine Arts degree in order to become a practicing Interior Designer and Interior Design Educator in Jacksonville, Florida. It is also her goal to achieve LEED accreditation.