

THERAPEUTIC STRATEGIES IN ARCHITECTURE FOR SENIOR
CARE AND REHABILITATION

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Dedication page

Besides my personal experiences challenging my longevity, my Grandfather's retirement has shown me a lot about mobility loss. My sister called me shortly after I moved to Hawaii and informed me that my grandfather was no longer walking; she thought this was 'it'. I wasn't super close to my grandfather at that point, and didn't live near him either. But since it sounded like my family needed help and I wasn't too settled yet, I flew to the east coast where my aunt lived and thus, my grandfather lived in his last years. The level of care he required was too much for my aunt at that point because he kept falling down, so he was staying in a 'home' nearby. The 'home' had immaculate landscaping and Georgian red brick solidness and uniformity everywhere. The place was huge, but sprawled on one level with the feel of a golf course around the grounds. His room was all white, with no color or personal touches, except for a few get well cards and a wide screen TV protruding from the corner. When I got there his kidneys and colon were giving him trouble. He was not getting out of bed or walking. He was reading newspapers, watching TV, and eating very little, all from his bed. To ameliorate his kidney and colon condition, he had to stay hydrated. But he wasn't, the catheter he was using showed that he far from being hydrated. When I requested some water for him, and was saw how hard it was to get good quality water, I realized an intervention plan was needed. So, my father and I took him to the beach and got a small place where the three of us lived for a short while. After a month and a half of balance training, ankle therapy, stretching, soaking and massage, and living in a small community where he *could* walk, he was walking with just a cane. Two years later, I saw with my own eyes, my grandfather riding a bike on the beach.

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ABSTRACT

My research is in developing a new building typology for the elderly retirement population. Retirement funds are often eaten up by poor planning and hasty decisions which can jeopardize their health. Hawaii has a large elderly population and I see a great need to address this problem now, as the largest demographic group is now retiring. Hypothesis: Retirement hangs as the preverbal carrot for most people in our rapidly paced society. The reward for life of hard work too often becomes a sedentary activity that encourages the degeneration of our physical body. Architecture for retirees often facilitates this and designs for a lethargic lifestyle.

The consistent pattern for elderly is a 'fall', which then leads to a back-and-forth to the hospital. Most of the time, the fall occurs within a 'designed' space. The research goal is to develop design strategies, design components, and awareness of the problems. Just as ADA (American's with Disabilities Act) is the product of awareness and energy to a neglected demographic, the elderly should have strong design influences. The desired outcome for the project is to prepare for a design that addresses the needs for this elderly age group . Gaining an understanding of the demographic, the needs, hazards, and opportunities will prepare me for the design process.

Specific solutions ranging from therapeutic spaces to technical solutions for improved mobility and independence will be investigated. In urban or suburban places, our mobility is based on options presented to us. These are intentional designs and understanding how 'designed circulation' develops certain muscles while others are lost, helps me design spaces that become therapeutic and incorporate the muscles that are lost. Case studies will be investigated to gain parameters on cost, and design solutions. Emerging theories in senior health care incorporate more activity throughout the day compared to a periodic 'exercise' time. Architecture can facilitate this approach of a steady flow of stimulus and activity.

Preface - Project Motivation

My personal experiences of physical therapy from injuries gives me only a small insight into the topic of elderly mobility impairment. I've broken both my femurs, each one on a separate occasion. The first time, my leg was wrapped in a plaster cast from toe to hip. When it came out of the cast, about 6-8 weeks later, it was immobilized for a couple more. I diligently went to physical therapy and painfully worked just to mobilize my leg. Strengthening and conditioning of the leg occurred much later.

Comparing this first experience to the second time I broke my femur, (completely different situation, leg, climate, and strategy) shines light on part of my inspiration. The second time I broke my femur, I had a titanium rod surgically placed in my leg to stabilize the bone. No cast, just a brace. I was told to not put weight on it and to keep the joint moving as much as possible. My physical therapy started one day after surgery.

On both occasions I was given a variety of different medications and was bedridden for multiple days. Whenever I got up, I would feel all the blood rush to my head and the room would start to spin. I've seen and felt that same look in others and know that it's nice to have friends or at least friendly voices around, when you feel gravity pulling from all angles. Impaired mobility shows you a lot about yourself and others. The first time I broke my femur, I was placed in a wheelchair for a little while and then in crutches. The second time I broke my femur, I just used crutches. My doctor explained to me was that immobility is the most dangerous part of my rehabilitation. Bones fuse, but joints can stiffen and muscles will be forgotten and atrophy. As such, I had to have electrical pulses sent into my leg to physically activate muscles that were going to sleep forever. I've seen this happen to people that don't go to or do physical therapy; my friend began limping to compensate for an injury he didn't rehabilitate properly. He still walks with the same limp today, ten years later. Maybe breaking my femur on both sides balanced things out. My injuries have never limited me, but my knee and ankle that were placed in the plaster cast have never been quite right ever

since. My feeling is that not only do joints stiffen when they don't move, but maybe they don't come back. When you add in the muscle atrophy and blood circulation issues of being sedentary, its quick to see that too much rest and recuperation can lead to degeneration.

Fred Creager was one of the most supportive faculty members I had at the School of Architecture building. I always looked forward to our talks and exchange of ideas. His attitude and outlook was a priceless and healthy perspective for me; it was obvious with Fred that he was there because he loved it and wanted to help the kids. I hadn't seen Fred for a while and one day, I saw him in his office and Fred was not the same. The look in his eyes had changed. He told me about having an accident where he fell down outside his apartment building. He said the wind had funneled between two buildings and the gust knocked him down. This began an in and out at the hospital and in less than a year, my friend from school passed away.

What part did architectural design play in Fred's accident? How much did his lack of mobility put him at risk of falling? Was it actually the new, vibrant environment that caused my grandfather to get better? I don't know. The thing I do know, is that immobility leads to muscle loss and joint stiffening. Further, elderly retirement homes are like junior high school in that no one has a comfort zone, your best friend is your neighbor (due to alphabetical order), and your body goes through changes that make life really awkward. A lot of these 'homes', to me, feel like storage closets where we store our old people. Like luggage or Christmas lights, we drag them out for the holidays and want them to perk up for the holiday mingle.

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Introduction

When a conquering nation occupies and conquers another culture they remove the history (composition of what they are and what they do) from the people. With no history, language, personal ceremony, and unity, their



Fig. 1 <http://www.alternative-hawaii.com/hacul/food.htm>

self-worth is challenged and the culture is defeated. This may have been a military strategy in history but much of the identity loss described above is common in how we unintentionally design for people entering elderly or senior care. Perhaps too much focus is on the safety and service, service from the efficiency perspective of a worker. Often an injury precipitates the move to a home. Could a design empower someone in the midst of a crisis? Does the present model? Does the present model add to the stress?

I can only imagine retirement. Many people look forward to it, but is it a good thing? I can't go on vacation for two weeks and do nothing, since my mind gets restless. So, I'm not sure I would be able to quietly transition from an established career that I've spent decades building, to just stopping completely one day.

My poor judgment and resulting accidents have shown me what challenged mobility is like, but in those instances, I knew I would get better so I had enormous optimism to help recovery. There is a deep sadness in the thought that I will all lose my ability to do the things I love the most, and that day will eventually come for all of us, and its hard to imagine grace, dignity, and optimism are relevant then. Hopefully, in the future, there will be something almost as fun to take its place, but with current practices and technology, we can look forward to the day the family drives you to a 'nice place' where 'nice people' will take care of us and the family will come to visit 'all the time'.

This will probably be the way it is for most of us, if we are lucky. If somehow we are able to catch up with the existing demand for senior care and maintain the incredible growth in the industry. This is also contingent on your health, family, and financial security. To reach beyond ‘putting out the existing fire’ of the problem and to a new solution that addresses more of the stakeholders’ issues may be timely.

The average of care of long term care in *nursing homes in the US averages \$6,235/month. This average is \$10,403/month in Hawaii, that's \$125,556 a year and five years turns into \$627,780. The average cost of *assisted living in Hawaii is \$4,000/month and adult day care in Hawaii averages \$69/day, or \$2,070/month¹ (*see Appendix for definitions).

It is essential to generate memory recognition of life’s past to stimulate a person’s self-worth and belonging, but it’s equally important to continue making more memories. A foreign environment with little stimulus makes for a boring existence. It’s when society segregates out the elderly and isolates them, that they lose stimulus, and begin to lose an understanding of where they’ve been and where they are going.

¹"Hawaii Skilled Nursing Home Facilities." *Hawaii Skilled Nursing Home Facilities*. Skilled Nursing Facilities .org, n.d. Web. 6 Jan. 2016.

Part 1: Data

The Problem

Perhaps its human ego of self preservation that buffers us from the reminders of our mortality. The stability of our whole nation relies on the belief in and compliance of the productivity of our population. The 'homeless problem' is a problem only to some as a social aesthetic. It frightens people when they see someone displaced or die. The elderly represent a far off dilemma we all must face but choose to ignore at present, because of the discomfort of the realization we will all face problems like these.

The physical condition of the elderly that causes the vulnerability is both a physiological degeneration and a gradual condition developed (or undeveloped) from the spaces they occupy. Architects, engineers and planners generally create spaces that are uniformly flat level and linear. These spaces are generally successful at facilitating mobility for elderly but provide no training or preparation for spaces that don't have these uniform qualities. As the human body forgets how to navigate through varied terrain, the muscles and coordination needed to stay upright are lost and the individual becomes more vulnerable to injury from the world around them. You either use it or lose it and architecture too often facilitates this loss.

The lateral stability needed to stay upright should be training that is as integral as the day in and out activities of brushing your teeth. Brushing teeth is a lifelong activity of maintenance that needs no justification or reminder. This sort of balance and muscle training too often becomes a periodic exercise rather than a consistent regiment like brushing teeth.

Sedentary Behavior

Since Americans spend 90% of their time/life indoors, it's safe to say that at least 75% of time is spent in a couch, chair, or bed. When sitting in a chair, the hip joint is held in a constant right angle and most doctors will agree, immobility is the worst thing for a joint. There are many factors that contribute to the breaking down of a joint,

especially the hip. Poor digestion alone can alter the performance of the hip joint, but long periods of immobility of the joint doesn't help it with overall health. Despite the complexity of both the ankle and the knee compared to the large, less complex structure of the hip, hip replacements are more common in the elderly world and fractured hips due to falling are even more common. Is there something inherently wrong with sitting for long periods of time (5 hrs +)? If so, as architects, do we not facilitate this through our design? When we walk into a museum or gallery we walk and explore, when we walk into a house or office we immediately search for a place to sit as though we need to. The design tells us to. As a society we avoid walking as a utilitarian process, but we drive to the beach to walk back and forth. The beach is a unique special environment that has permeated into our culture as fun, family-oriented space, that is impossible to replicate, but as designers we can bring some of the elements that stimulate (and motivate) us home as a therapeutic strategy for emotional, physical and social well-being in retirement design for the tropics/subtropics. "Our results strengthen the developing position that too much sitting is detrimental to cardiovascular health, independent of regular physical activity"-Deborah Rohm Young, *researcher at Kaiser Permanente*. In addition to the setbacks of joint immobilization resulting from hours of sitting, studies in Cleveland, Ohio by Kaiser found excessive sitting can contribute to heart disease which is a prominent problem for men. The study found that despite regular physical activity, long hours of sitting compromise blood circulation and that those who exhibit sedentary behavior are more than twice as likely to have heart failure. The men who had long hours of sitting but regular exercise were still at 1.2 times higher a risk than those who sat less. The study followed over 82,000 men over the age of 45 for the course of ten years and answered questions regarding their activity levels outside of work. The study did not account for the amount of activity at work. The authors don't make claims to fully understand the connection between the heart health and inactivity, but the theory is that "not using the muscles enough can lead to abnormal blood fat profiles through the suppression of an enzyme called lipoprotein lipase, which can convert "bad" cholesterol into good, among other functions. The leading author,

Deborah Rohm Young of the study concluded that: "The message is when you can walk instead of stand, walk," Young said. "When you can stand instead of sit, stand"²

Demand in Hawaii

The lack of long-term health care in Hawaii has fueled the excessive use of acute care services in the state's hospitals. The inappropriate use of acute care, due to the shortages, accounts for an estimated \$62.7 million each year. The climb in wait-listed patients increased by 11% from 2006 to 2011. Peter Sybinsky, president of the Hawaii Information Corporation, formulated the report and said, "What we found ishospitals bear the cost of wait-listed patients." "These wait-listed patients are people who need care but not the acute level the hospital is designed for. However, hospitals are the only option for these patients due to the shortage of lower level care" (referring to a longer monitoring and rehabilitation facility).

The Healthcare Association of Hawaii's George Green claims this problem is for 'most hospitals, if not all' in Hawaii. The need for 'higher level staff', equipment costs, community support for dementia patients, medicine costs, and complex patient needs all need to be addressed in order to solve the problem. The statistics are :

- 2006 - annual loss of \$55.4 million
- 2011 - annual loss of \$64 million
- The average age of the patients was 70 years old.³

The 2007 operating losses for the state of Hawaii's hospitals was \$150 million. The losses were claimed mainly come from the Medicare and State Quest reimbursements covering only a portion of the bill. Medicare and Quest payments make up for 1/3 of the hospitals revenue, but they have only been receiving about 70% of the

² Zeltner, Brie. "Too Much Sitting Is a Risk Factor for Heart Failure, Kaiser Research Shows." Cleveland.com. N.p., 27 Jan. 2014. Web. 1 May 2014.

³ "Waitlist Patients Burden Hawaii Hospitals." *Hawaii Reporter*. N.p., 12 Mar. 2014. Web. 15 Jan. 2015.

bill. The state is reported to have operating losses for its hospitals as a whole, for eight years.⁴

The largest employer in central Oahu Wahiawa General Hospital is in risk of closing if it doesn't find funding. Not to mention the needed medical resource in the region, the hospital supports over 600 jobs. The hospital has been losing over 9 million dollars of the last three years. Approximately 85% of the patients admitted are Medicaid and Medicare.⁵

Baby Boomers (in Hawaii)

The significance of 'baby boomers' is that they are the largest population age group in history and they've started retiring around 2010, and will continue to do so until 2030. Approximately 25% of our population in 2016 is over 60, or one in four people is a 'boomer'. Since they control most of the wealth and they really like Hawaii, we are destined to become the Florida of the Pacific.

The characteristics of baby boomers were evaluated and can be described

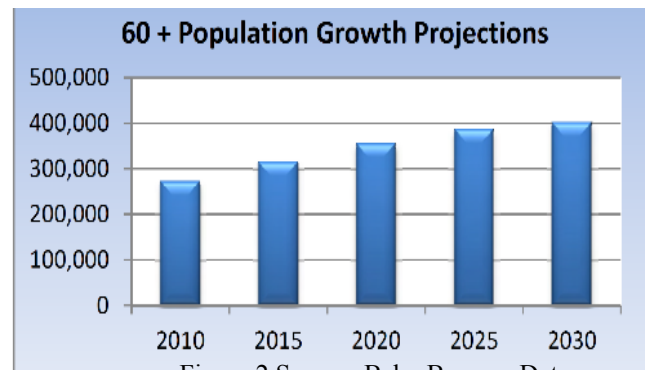


Figure 2 Source: Baby Boomer Data

as:

- High degrees of education,
- Waited until they were older to marry,
- End marriage frequently
- Have fewer children
- Increase in non traditional family structures and living arrangements,
- Generally better off financially than parents'

⁴ "Hospitals in Hawaii Report \$150 Million in '07 Losses." *Hospitals in Hawaii Report \$150 Million in '07 Losses*. The Maui News, 28 Oct. 2008. Web. 7 Feb. 2016.

⁵ Namata, Brigitte. "Wahiawa General Hospital in Danger of Closing." *KHON2*. KHON, 20 Mar. 2016. Web. 21 Mar. 2016.

- Regarded as 'spenders' not 'savers',
- Very mobile, distrustful of institutions, and regarded as 'self-centered' ,
- Current on health and lifestyle regarding longevity and open to alternative medicine

Unsatisfied with current services and demand for higher quality.

From the 2000 Report on Aging in the state of Hawaii by the Office on Aging, 2011 was the year when the first baby boomers reached 65 (retirement for many). The year 2030 represents when all the baby boomers have retired. The problems we have in the elderly spaces are about to rapidly increase.

- Baby boomers were born between 1946 and 1964.
- 83 million in US.
- 25% will be over 65. That's one out of every four people in Hawaii.
- 43% of Hawaii residents over 65 were married in 1990.

In 1990, Hawaii had 89% of its baby boomers living in urban areas, compared to the 76% of the US. In 1990, 25% of the boomers were living in non-family households (alone or with un related others. About three times as many older women live alone than men.

From the 1990 survey to now, the general trend towards healthier lifestyles exists, despite the larger increases in alcoholism and obesity. From the 1990 survey of Hawaii boomers, 80% reported to being active. In Hawaii, men have been found to have a higher risk of heart problems than women, but women have a higher tendency to have cancer or diabetes.

Baby Boomer data 2000 "Limitation of usual activities is one of the measures of health status.....When the baby boomers enter 'old age' the number of disabled adults will increase..... The percent of older adults in nursing homes may notif we expand our home and community care options".

- In the 1990's, 10% of the US boomers had either a work disability, mobility limitations, or self-care.

- Disabilities in older adults is projected to increase from 25% to 30% in Hawaii.
- In the US, the projected number of adults 65+ with 'activity limitations' will rise from 11.8 million (in 1994) to the estimated 27 million in 2030.
- In the US, the number of residents in nursing homes is projected to increase from 1.3 million to 3.3 million by 2030.

Home health care is projected to increase to \$68 billion by 2005. Some of the factors driving these predictions are:

- Almost 40% of the healthcare budget of \$832 billion (1994) was paid by Medicaid. Up to 70 % of the of the long-term care costs were nursing homes.

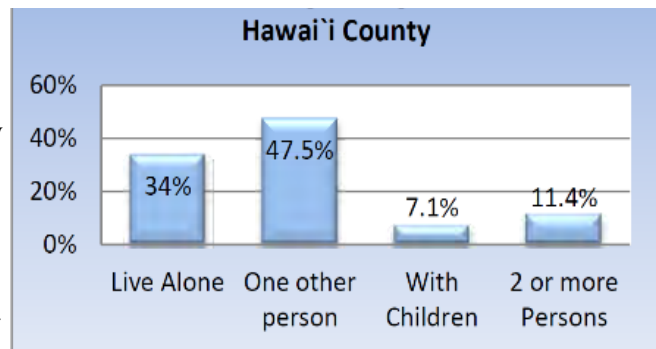


Figure 3 Source: Baby Boomer Data

- The average cost for nursing home care in 2000 was \$40,000 a year and the projected cost for 2020 is \$204,000.
- The majority of payments were from Medicaid and out of pocket.
- In Hawaii long-term care costs including nursing and home care services are expected to increase from the 1991 value of \$181 million to \$250 million by 2020.
- The state of Hawaii's share of expenses in Medicaid for Hawaii is forecasted to increase to \$495 million by 2020. (EOA 1991) p.38
- Its estimated that in the US as much as one-third of long-term care is provided by an adult daughter.
- In Hawaii, family care makes up one-half of the care for the disabled elderly. (1991)
- Informal caregivers provide assistance with 'activities of daily living' (ADL's) such as bathing, dressing, and eating. The other demands lie in the

'instrumental activities of daily living' (IADL) like cooking, cleaning, providing transportation, and taking care of finances).

- A 1991 survey for the Hawaii Government employees in 1990 showed that 24% of all state employee households provide assistance to older adults 60+. The state employee caregiver was spending 8-9 hours a week assisting with ADLs and IADLs in 1990.
- The overall data suggest that there will be a shortage of available human resources like nurses, social workers, and para professionals to provide the level of care and support for the independent elderly.
- The formal support available in Hawaii in 1998 was:
 - 45 long term care facilities
 - 508 adult residential care facilities
 - 6 adult day health/day hospitals
 - 16 adult day care centers
- The elderly expected to need formal paid community services is expected to increase from 9500 (in 1991) to 20,700 (2020) users. p.41⁶

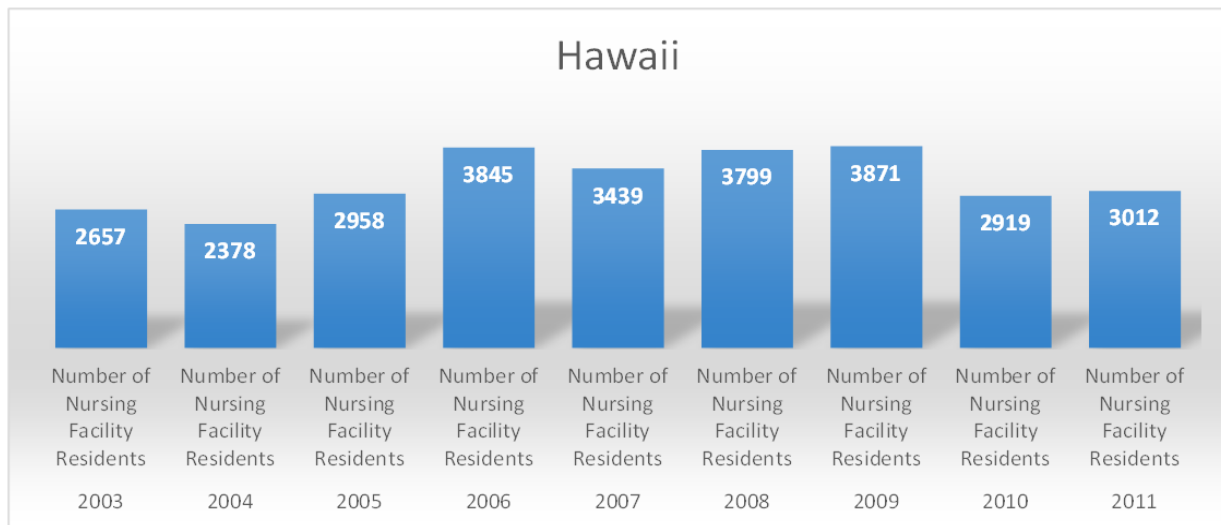


Fig. 4 Source : <http://kp.kaiserpermanente.org/>

⁶ Karel, Harumi S., Kathryn Braun, and Virginia M. Tanji. *Baby Boomer Data: Hawaii»i 2000*. Honolulu, HI: Executive Office on Aging, 2000. Print.

The average life expectancy is at 81 in Hawaii, according to The Kaiser Family Foundation's data collection. The collected data and graphs below represent data collected on the service providers in the state. The numbers for facilities, population in care facilities, time invested for care and need for modification all have fluctuations over the long-term but show general increasing trends. The survey data was collected in 2011. 2011 marks only the first year of the massive influx of baby boomer retirees. Another note of interest is that more baby boomers are postponing retirement due to the economic losses in the investment world and real estate world in recent years. Hawaii has a diverse culture and the 'baby boomer' demographic is broad in their family structures. Some seniors remain alone and independent and some remain the center of the family until death, which is largely culturally influenced. Either way, the need for more housing options for elderly that are safe and cost effective in Hawaii seems apparent, and the existing housing options need revisions.

A Medicaid sponsored 2011 survey on existing facilities examined the status of elderly care homes in the U.S.. The rating metric and its definition are listed below:

- The definition of deficiency is: Given to nursing facilities for ‘problems which can result in a negative impact on the health and safety of residents.’
- Actual harm is a ‘deficiency that results in a negative outcome that has negatively affected the resident's ability to achieve the individual's highest functional status.’

Immediate jeopardy is a ‘deficiency that has cause (or likely to cause) serious injury, harm, impairment or death to a resident receiving care in the nursing home.’

Hawaii is average in state ranking of facilities with deficiencies. California ranks slightly better and West Virginia is close behind with Washington DC having some of the worst rankings (sometimes twice as bad as Hawaii. Most of the nursing facilities in the United States are privately owned. Hawaii falls just under the national average on private ownership of elderly facilities.

Texas and Oklahoma are tied for the states with the most privately owned facilities. North Dakota is, by far, the state with the most non-profit facilities at 93 and

with only 5 privately owned. Wyoming had the most government owned facilities at 42. As all these numbers are proportional to each other, Hawaii's figures lean more toward the country's average with more government owned facilities than most states and less privately owned facilities than most states.⁷

The most expensive aspect of operating costs lie in the licensed nurse hours, which represents a third of the needed nurse hours. By looking at the hours of the nurse's duties, and finding other resources in the community to offset the time demand of the non-specialized jobs, the specialized skills can be spread wider over a larger population. Potential resources for this research are found in uniting the groups of society that have been left out of the common suburban design: plants, animals and children. The integration of children into elderly care varies largely on appropriateness. Any entity that stimulates a nurturing desire in the resident satisfies the goal of 'motivation beyond self interest'. Depression is a common reaction to the shift into the anonymity of the large retirement facilities. To combat depression, the 'motivation beyond self interest is essential'.⁸

Falls among the geriatric community are common precipitator to reduced functions, mortality, and early nursing home admissions. The 'fall' may be an first indicator of a deeper health problem or connected to 'normal' aging issues like fading vision. Most falls are the product of multiple contributing factors such as health and environment. David Geffen of the School of Medicine at UCLA compiled an overview of the most recent studies in falls for the geriatric population. Some of his findings regarding falls were:

- One out of three people over 65 (living in the subject group community) has a 'fall'.

⁷ "Nursing Facilities, Staffing, Residents and Facility Deficiencies, 2009 Through 2014." Nursing Facilities, Staffing, Residents and Facility Deficiencies, 2009 Through 2014. Kaiser Permanente, n.d. Web. 15 Jan. 2016.

⁸ "Total Number of Residents in Certified Nursing Facilities." *Total Number of Residents in Certified Nursing Facilities*. N.p., n.d. Web. 15 Mar. 2014.

- This number increases with age and shows a higher percentage of falls in institutional living settings.
- The 1% of people that have a hip fracture due to a fall have a 20-30% mortality rate within a year of the break.

The 'postfall anxiety' (fear of falling again) is found in a range of 30% to 70% and often leads to long-term care in an institutional facility. The decreased mobility and independence leads to further feelings of depression. Up to 25% to 40% of the falls were triggered by environmental hazards. These are directly connected to the subject's susceptibility as balance, muscle control, and strength all affect how the environmental obstacle is met. Leg weakness was recognized as the greatest risk factor in falls for elderly, at 400% more likely to have a fall. In the study leg weakness was found in 57% of intermediate care and 80% of the residents in a nursing home. The weakness was described as the result of de-conditioning and limited physical activity. Impaired balance and abnormal gait was described as a 300% increase in falling, as it is can be related to leg weakness. Impaired mobility or function was found in 96% of the long term care residents. Depression adds a 200% increase in chances of falling, but the range of contributing factors makes for a difficult direct correlation. One theory is that depression leads to more risky behavior that increases the hazard potential. The Albert Einstein College of Medicine conducted gait analysis was studies at 49 nursing homes found that people who had a history of falling had a slower gait speed. Difficulty in lateral control also was shown to be a large contributing factor to falls. The preventive strategies found to be most effective were: the implementation of risk assessment, environmental assessment and modification, and exercise programs. Although the author does not go into diet as a preventive strategy, there is reference to five studies that concluded that vitamin D supplements showing a decrease in falls up to 20%.⁹

⁹Rubenstein, Laurence Z., and Karen R. Josephson. "Falls and Their Prevention in Elderly People: What Does the Evidence Show?" *Medical Clinics of North America* 90.5 (2006): 807-24. Web.

Gait

To understand the vulnerabilities of elderly - there needs to be an understanding of abnormal gait development and how to reduce it. The anatomy of the ankle and foot are essential to understanding the support system for the body. The foot is the shock absorber to the ground and propulsion mechanism. These functions demand that the foot be rigid at certain times and pliable at others. The basic anatomy of the foot can be divided into three parts: the forefoot, the midfoot, and the rearfoot.

- Forefoot- This has all the metatarsals and phalanges
- Midfoot- This has the navicular, cuneiforms, and cuboid
- Rearfoot- This has the talus and the calcaneus

The collection of bones are connected and woven with ligaments, muscles, bursas and fat pads. The ankle joint, in general is comprised of the talocrural and subtalar, which both connect to the talus bone. The talocrural joint connects the tibia, talus, and fibula. These joints have an 'oblique' axis, that is the which is why things like rolling the ankle to the outside, called supination is common. The rolling to the inside is called pronation. The directional movements of these joints can be described in the terms dorsiflexion, planarflexion, eversion, inversion, abduction, adduction and plantarflexion.

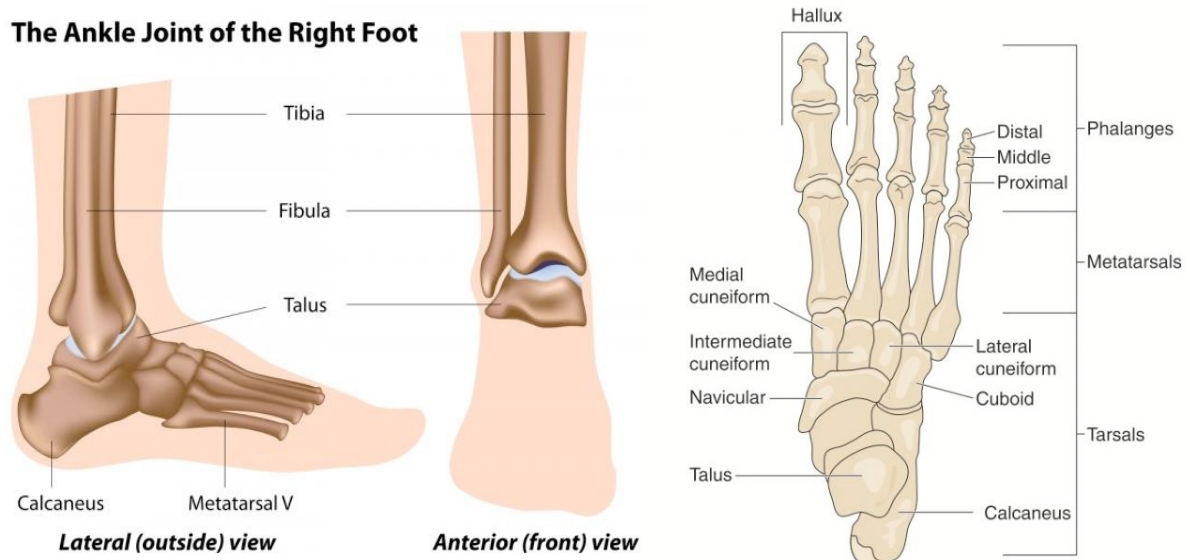


Fig 5 source:<http://breakingmuscle.com/coaches/lindsey-mathews>

The motion of the talus is both a rolls and slides under the tibia. Plantar flexion (pointing of the foot) is this talus rolling backwards and sliding forward. In dorsiflexion, the pulling of the toes in the direction of the shins, the talus rolls forward and slides backwards. When the Achilles tendon and calf muscle are pulled under tension binging the top of the foot upward, that is referred to as dorsiflexion. This translates to the fact that people with calf or Achilles issues will have a talus that is ‘fixed anteriorly’ and the foot stays at 90 degrees to calf with impaired ability to perform plantar-flexion or dorsiflexion.

A chiropractor specialist in musculoskeletal balance and therapy, Lindsey Matthews, recommends exercise specifically in soft sand. She recommends this for activating all the intrinsic musculatures in the foot. As a therapist she emphasizes flexibility and strength training ankle lifts through dorsi and plantar flexion on foam cushion.¹⁰

The pointing of the toe in plantar flexion is a crucial motion for walking down stairs. Explained above is the complex arrangement of many the bones, muscles and joints that keep people mobile. As designers we strive to make spaces that require the least amount of effort to navigate. We have designed plenty of spaces that remove any need to use all these muscles. Now a quarter of the population whose balance and muscle strength, needed to not be a liability for themselves, has left them. This is evident in the forward shuffle of feet, forward lean of the body and walking down stairs sideways.

The pointing of the toe in plantar flexion is a crucial motion for walking down stairs. The forefoot has to support a large portion of the body’s weight before the rest of the foot gets contact with the stair. Going up stairs has more of a correlation to physical therapy, as there are stair machines and a variety leg strengthening device like stair machines, but the strength in the ankle, specifically plantar flexion, is most essential to navigate down steps and is often neglected. In addition to activities that encourage

¹⁰ "Lindsey Mathews." *Breaking Muscle*. <http://breakingmuscle.com/coaches/lindsey-mathews>>., n.d. Web. 15 Dec. 2014.

plantar flexion motion strengthening, lateral muscles for balance can benefit from the soft variable surfaces like sand and foam cushion mentioned above.

To address the idea of abnormal gait or normal gait in this research, abnormal gait is: normal walking that has been modified to compensate for impaired or damaged functions. Distinguishing between gait abnormalities due to healing injuries or degenerative conditions that needs therapy can be awkward in data collection and can be misleading. Certain conditions like osteoporosis and kyphosis create a forward lean, whereas previous falls create a forward lean to watch the ground.

In general elderly people walk with a 5 degree 'toe out'. This creates a wider swing path and greater chance of catching on something. The other tendency is to reduce the length of the step. Often this is due to weaker calf muscles for plantar flexion. The gait cycle is made up of swing phases and stance. There are different stages of swing and stance, but the critical aspect is that due to reduced plantar flexion power for forward movement there is a longer moment of instability in the lateral directions. The center of mass is more difficult to control as one foot supports the body momentarily. Sensor networks that study and evaluate gait anomalies need to accommodate variations to the natural transitions of aging like a joint motion. Algorithms needed that adjust for certain health conditions could extract the data for relevant indicators of health and compensating mechanisms.¹¹

It's also important to note that this age group is the fastest growing age group and should have the highest rate for disability, but studies show a decline in severe disability in the US, Italy, and Netherlands. The overall statistics show that women have more disability issues than men. Reasoning or causes are unclear but women are shown to live longer than men, despite the higher occurrence of disability. Environmental factors are also large contributors to the effects of disability on the elderly beyond quality of life. The elements of pollution that can contribute to complications and should be of concern in design are are:

¹¹"Abnormal Gait. Gait Abnormality. Abnormal Gait Info. Patient | Patient." Patient. © EMIS Group Plc, n.d. Web. 15 Jan. 2014.

- Air, water and soil (both chemical and biological),
- Ultraviolet and ionizing radiation,
- Built environment,
- Noise,
- Occupational risks,
- Electromagnetic fields,
- Agricultural techniques,
- Irrigation methods,
- Anthropogenic climate changes,
- Ecosystem/environmental degradation, and
- Poor sanitation (individual or environment).

The overall integration of accessible design and element that support independent living and mobility is essential for proper elderly care. The assumption is that anyone can benefit from recognizing these threats and reducing or eliminating them, but the elderly with disabilities have a lower threshold to these negative impacts.

'Aging in place' generally refers to older adults remaining in their home as long as possible. The prohibitive elements are best described by *Age Related Disabilities - Aging and Quality of Life*, "successful aging-in-place may be compromised by environmental hazards or barriers, common in the homes of older adults... two or more hazards in 59% of bathrooms and in 23%-42% of other rooms".

To show the problem in proportion a European project 'ENABLE-AGE' (Enabling Autonomy, Participation and Well- being in Old Age) collected European data from surveys and research, that shows 37 'barriers' in the UK and 66 in Germany. From the European report the barriers were described as dim lights, shadow, glare, elements that increase a 'tripping hazard'. The European report goes on to point out sitting workspaces in the kitchen and sinks that also can accept a chair, and should be incorporated into accessible design.

One dilemma is that cross cultural, international collaboration or standardization is difficult due to the wide variations in both lifestyle and terminology. One person's

definition of safe can be radically different from another within the same culture or country, not to mention outside those boundaries. There is a strong need for a uniform metric of evaluation. The success of modifications to the home environment have been documented in some European work, but the purpose of the research was to validate the misconceptions of true hazards for the elderly and the need for unified definitions and objectives.¹²

Hazards

In 1988, a study group in Miami, Florida made a concentrated effort to standardize the definitions for proper study and evaluation on hazards leading to falls in the home environment. Half of the falls of older people are attributed to hazards in the home. The researchers looked at the reliability of a 'standardized instrument' as a tool to help training and policy advancement. The study chose 176 observations for each hazard ranging from throw rugs and bathroom surfaces to light switches. The Home

Table 1:
Causes of falls in older persons: summary of 12 large studies

Cause	Mean (%) ^a	Range ^b
Accident and environment related	31	1–53
Gait and balance disorders or weakness	17	4–39
Dizziness and vertigo	13	0–30
Drop attack	9	0–52
Confusion	5	0–14
Postural hypotension	3	0–24
Visual disorder	2	0–5
Syncope	0.3	0–3
Other specified causes ^c	15	2–39
Unknown	5	0–21

Summary of 12 studies [11,26–36].

^a Mean percent calculated from the 3628 reported falls.

^b Ranges indicate the percentage reported in each of the 12 studies.

^c This category includes arthritis, acute illness, drugs, alcohol, pain, epilepsy, and falling from bed.

¹² Chappell NL, Cooke HA. 2010. *Age Related Disabilities - Aging and Quality of Life*. In: JH Stone, M Blouin, editors. *International Encyclopedia of Rehabilitation*. Available online: <http://cirrie.buffalo.edu/encyclopedia/en/article/189>

Environment Survey (HES) was developed through this investigation as a tool for quantitative assessment of environmental hazards of the home.

In search of consistent and reliable identification of hazards, a glossary of consistent definitions are needed, so the team circulated the survey to architects and environmental designers to evaluate the professional perspective on what is considered hazardous.

This problem is evident also in the wide range of terms and policies found in international collaboration. Much of the terminology comes from insurance companies, that may use different wording. Many of the terms defined in that investigation were generated into a glossary of terms .¹³ (see Appendix)

The chances of compromised mobility increase as people age. The incidence of disease or injuries that require rehabilitation also increase also with age. Temporary immobility often leads to longer periods of, if not permanent, compromised mobility, and this trend has led to an increase in time for rehabilitation facilities and home physical therapy. Mobility is also compromised from loss of muscle mass, less strength, function, joint stiffness and changes in gait (affecting balance). Activities of daily living are often compromised by these events. The general goals for the nursing are to "maintain functional ability, prevent additional impairment of physical activity, and ensure a safe environment."¹⁴

The costs for nurses and medical attention creates a triage approach to planning. The lack of income establishes this sentiment that all funds are 'emergency' funds and need to be stretched as far as possible. How does overall well being and long term returns on spending fare in this mindset? An overall substandard goal is the result of this 'survival' thinking. In addition to reducing the economic demands of retirement, one goal

¹³ Rodriguez, Juan G., "A Standardized Instrument to Assess Hazards for Falls in the Home of Older Persons." *A Standardized Instrument to Assess Hazards for Falls in the Home of Older Persons*. Elsevier B.V., 1995. Web. 15 Jan. 2014.

¹⁴ "Impaired Physical Mobility - Mynurse." *Impaired Physical Mobility - Mynurse*. N.p., n.d. Web. Mar.-Apr. 2014.

of this study is to integrate a higher quality of life into a commonly stale and stagnant lifestyle.

It is estimated that the basic household tasks (*ADLs and IADLs) consume 1/3 of the day for an elderly person whose mobility may be challenged. It is also important to note the individual may spend as much as 82% of the waking hours (if not more) indoors.

As much as 43% of the home fatalities for 65 and over are home accidents relating to the activities of cooking and cleaning. The most common causes of accidental injury for the elderly are:

- Falls on floors, stairways and bathtubs,
- Burns, scalds from cooking, hot water/fires, and
- Poisoning from gases and vapors.

The study points out that the elderly tend to occupy older homes and the need for repairs tend to be greater. The "age related changes in functional abilities" combined with the aging house, increases the vulnerability for this age group.

By evaluating the activities, time required/ spent on the activity, and the factors that limited the design of the space involved in the program, the value of risk vs. reward can be quantified in the design. This chart is also valuable for budgeting time within the program.¹⁵

Could there be a correlation to the fact that most people spend most of their time watching TV, and two of the most difficult activities for many elderly is getting up, moving around and remembering things? If immobilizing the body and reducing the mental stimulus is the outcome of daily life, is it any surprise that dementia and lack of muscle strength for basic mobility are some of the largest problems among the elderly? Where is this finger pointing? The designer. The designer is the one that created a living room with the objective to sit and stare a TV. The 'coffee table' should be called a

¹⁵ "Read "Human Factors Research Needs for an Aging Population" at NAP.edu." *2. Human Factors Problems Associated with Aging*. The National Academies Press, n.d. Web. 15 Mar. 2014.

'remote table' as it serves that tool more than it supports coffee drinking. Most of the furniture in an average house is oriented to the TV.

Are we really that tired? We burn so few calories in comparison to our ancestors, yet we need to rest more than any other generation. Most people spend their workday in a chair, then commute to and from the house in a car sitting, and when we reach any destination we scan the area for a place to sit. Two things make people need to rest: being tired from exertion and being sick. This sickness can manifest itself in physical illness, depression, and physical deformation that steals our energy and leaves us operating at less than our potential. Obviously this touches on the broad issues of nutrition, exercise, genetics, environment and more, but the power of design can be a positive or negative influence. The architecture for someone who spends 90% of their time indoors is far more than a shelter from the elements and a visual aesthetic.

Nancy Wells and Gary Evans, from the Cornell Cooperative Extension, published a Home Safety Guidelines for older Adults that serves as an excellent checklist for evaluating home safety for elders. Much of the data was collected from the US Consumer Products Safety Commission (CPSC), which annually publishes injury rates related to products and architectural features.

Through the annual report from the CPSC, surveys showed the perspective of the elderly and designers compared to historical data. The reports showed that both groups underestimate the risk in most products and features. Certain items like stairs, bathtubs/showers were deemed as the most risky. Doors and toilets were underestimated. Porches, balconies and windows were underestimated as well as sinks. The items of overestimation were hot water, stools, stoves and swimming pools. Floors and flooring were shown to be among the most risky products. Often the flooring material encourages the fall and the architectural feature then becomes a dangerous obstacle on the way to the ground. The most common places for falls to occur is in bedrooms, kitchens, bathrooms and stairs.

Flooring materials account for over 250,000 injuries a year in the U.S.. Whether it's a loose throw rug or uneven surface, height transitions or low level lighting can hide

variations in flooring. As such, safe flooring surfaces are crucial to ensure safety throughout.¹⁶

Hawaii County Policies and Statistics

The Hawaii County Office of Aging (HCOA) is the designated Area Agency on Aging for Hawaii County. The purpose of the agency is to facilitate the needs of the elderly and caregivers in the county. They assess the needs, monitor the provision of services for the needs, and determine the efficiency and effectiveness of the of the delivered service. The planning focuses on how the county plans to meet the demands of the elderly population through the Aging Services Network.

The 2011-2015 HCOA Area Plan on Aging directly addresses the increase in resources for elderly: housing, transportation, recreation, education, health, and nutrition services. The Older Americans Act amended in 2006 recognized older individuals as one of the largest economic and social needs. The amendment places interest in elderly with limited English proficiency, Alzheimer's Disease, and seniors 'at risk

of institutional placement'.

The Area Agency on Aging (AAA) compiled the 2011-2015 Area Plan on Aging, a comprehensive plan submitted to

Table 3: Time Spent Performing Within-Home Activities Among a Sample of Elderly People

Behavior	Percentage who Engaged in Behavior	Median Hours Spent by All Engaged
Eating, cooking	99	2.5
Personal care	97	1.0
Television	70	3.0
Housework	67	2.0
Reading	61	1.0
Napping, idleness	56	2.0
Radio, records	17	1.5
Handiwork	15	2.0
Entertaining	9	2.5
Writing	8	1.5
Crafts, collection	1	2.0

Source: Beyer and Woods (1963) as cited in Lawton (1977).

¹⁶ "Home Safety Guidelines for Older Adults." *SpringerReference* (n.d.): n. pag. Cornell Univerisity. Web. Feb.-Mar. 14.

the Hawaii Executive Office on Aging requesting grants and contracts for implementation. The population group 45 to 64 years old grew over 31% between 2000 and 2010. This was largely due to the aging of baby boomers, but the age group in second with 15% was the 65 and over. The 65 and over age group is expected to grow at a rate of 75% by 2030. There are projected increases for the most vulnerable groups, i.e elderly living alone, older women, elderly minorities living alone, and elderly with no family). Living alone and the high risk of hazard is found most in the 85 and older age group. The surveys also showed that half of the retirees (from 50-70) were interested in work that improved the 'quality of life' in their community. As much as 41% own their own home and are often caregivers to their parents.

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Table 3: Percentage of 65+ Population with Activity Limitations

Activity	Have Difficulty Performing Activity	Receive Help with Activity
Self-Care Activities (a)		
Eating	1.8	1.1
Using toilet	4.3	2.2
Dressing	6.2	4.3
Transferring	8.0	2.8
Getting outside	9.6	5.3
Bathing	9.8	6.0
Walking	18.7	4.7
One or more activities	22.7	9.6
Some Management Activities (a)		
Using telephone	4.8	3.0
Managing money	5.1	4.8
Preparing meals	7.1	6.0
Doing light housework	7.1	6.2
Shopping	11.1	10.5
Doing heavy housework	23.8	19.3
One or more activities	26.9	22.2
Work-Related Activities (b)		
Walking up 10 steps	18.9	
Standing 2 hours	27.8	
Sitting 2 hours	10.1	
Stooping, crouching, kneeling	33.9	
Reaching up over head	13.6	
Reaching out to shake hands	1.9	
Grasping with fingers	9.1	
Lifting or carrying 25 pounds	28.0	
Lifting or carrying 10 pounds	9.2	

Sources: (a) Dawson, Hendershot, and Fulton (1987:Tables 1-7).
 (b) Kovar and LaCroix (1987:Table 1).

The US Census Bureau predicts over 400,000 elderly (over 60) in the state by 2030. The 48% growth prediction has its largest growth between 2010 and 2020. The five years from 2010 to 2015 predicts a 16% increase and the period from 2015 to 2020 predicts a 31% increase. The overall prediction for the state through 2030 (for 60 years +) is a 50% population increase. Hawaii county's growth for the 55+ age group increased over 63%, the 60+ group increased by 54%, 65 and the 65+ had an increase of 33%. The 75+ group shows half the population of the 65+ group but also had an increase of 28%. The 85+ group had the smallest population but the highest growth at 69%.

Part 2 : Strategies

Animal Assisted Therapy

The element of loneliness is more than just human interaction and being nurtured. It involves nurturing. The patterns show that elderly people are interested in helping youth. This youth are not always humans, they comprise of growing plants and raising animals. The integration of diverse age groups is the ideal, but partnering with animal rescue efforts creates opportunity to develop service animals whose companionship also serves as a tool for assisting in ADL's and increased mobility.

Researchers from the Veterans Affairs Medical Center in St Louis, Missouri coordinated a questionnaire to establish scientific data regarding Animal Assisted Therapy (ATT). The group surveyed 45 residents to get a reading on Demographic and Pet History of three long-term care facilities in southern Mississippi. Each facility had between 75 and 100 beds and from that, 15 people per building were selected. The results of the survey showed strong desires from the residents to have animals integrated into the facility. (see Appendix)

Spaces that don't accommodate animals are spaces that have been designed that way. As designers we need to address the needs of animals in design to simplify the

'owners' life. Most evidence points to design and training being the shortcomings of AAT in long-term care facilities.¹⁷

“AAT may ameliorate... [behavioral and psychological symptoms of dementia], but the duration of the beneficial effect has not been explored. The relative benefits of “resident” versus “visiting” pet dogs are unclear and are confounded by the positive effect of pet interaction on staff or caregivers. Further research on the potential benefits of AAT is recommended.”¹⁸

Pet visitation programs have been reported to be beneficial—commonly among the long-term care population. The most commonly studied dependent variable, when pet visitation programs have been tested, is increased social interaction among elderly nursing home residents (references omitted). This variable is of considerable importance to this population as social isolation is a major problem in the nursing home setting.”¹⁹

Regulatory Issues for Animal Assisted Therapy

Federal regulations do not specifically address animals in nursing homes. Thirty-two (32) states do not have specific statutes and regulations with respect to animals in nursing homes. Eighteen (18) states have statutes and regulations dealing specifically with animals in nursing homes. One state (Washington) provides that residents must have reasonable opportunity to have regular contact with animals as desired. Four states (Alabama, New York, Pennsylvania, and South Carolina) and District of Columbia, explicitly authorize pet therapy programs.

¹⁷ Banks, Marian R., and William A. Banks. The Effects of Animal-Assisted Therapy on Loneliness in an Elderly Population in Long-Term Care Facilities 57.7a (2002): n. pag. Pawspeople.org. St. Louis School of Medicine. Web.

¹⁸ Filan, Susan L., and Robert H. Llewellyn-Jones. "Animal-assisted Therapy for Dementia: A Review of the Literature." *International Psychogeriatrics* (2006): 597-611. Print.

¹⁹ Johnson, Robert A, JS Odendaal, and RA Meadows. "Animal-assisted Interventions Research: Issues and Answers." *National Center for Biotechnology Information*. U.S. National Library of Medicine, n.d. Web. 17 Aug. 2014.

Three states (Arizona, Colorado, and New Jersey) require that animals visiting or residing in nursing homes be licensed. Two states (Pennsylvania and Washington) limit the number of animals in the facility. Seven states (Idaho, Montana, New Jersey, Oregon, Pennsylvania, Washington, and Wyoming) limit the types of animals allowed in facilities.

Twelve states (Alabama, Arizona, Arkansas, Colorado, Idaho, New Jersey, New York, Oklahoma, Oregon, South Carolina, Washington, and Wyoming) require vaccination of animals visiting or residing in the facility. Nine states (Alabama, Idaho, New Jersey, New York, Oklahoma, Oregon, South Carolina, Washington, and Wyoming) provide that animals visiting or residing in nursing homes must have veterinarian examinations and/or be free of disease. Thirteen states (Arizona, Arkansas, Idaho, Montana, New Mexico, New York, North Carolina, New Jersey, Oklahoma, Oregon, Pennsylvania, Washington, and Wyoming) prohibit animals in certain areas of the nursing home, such as kitchens and dining rooms, because of sanitation concerns. States that require Vet. Exams in Some Type of 'home':

- Alabama
- Idaho
- New Jersey
- New York
- Oklahoma
- Oregon
- South Carolina
- Washington
- Wyoming

States that restrict areas for animals in Some Type of 'home':

- Arizona
- Arkansas
- Idaho Montana
- New Mexico

- New York
- North Carolina
- New Jersey
- Oklahoma
- Oregon
- Pennsylvania
- Washington
- Wyoming²⁰

Technology: Sensor Networks for Monitoring and Forecasting

According to Professor John A. Stankovic, Computer Science Professor at the University of Virginia, future medical technology will integrate wireless networks, integrated with the built infrastructure, augmenting data collection, and real-time data collection. The biggest gain in these areas are in smart nursing homes, in-home assistance, and clinical trial and research. In-home networks are able to assist elderly in memory enhancement, home appliance controls, emergency communication, and medical information access. One of the challenges of the communication devices is their interoperability since certain devices may occupy the same bands and different protocols must be used. (To avoid interference, biomedical devices may use the Wireless Medical Telemetry Services) WMTS band at 608 MHz. Real-time data analysis and acquisition is very intensive and the efficient processing and communication is essential to be of value. Some of the necessary tasks are time-stamping, event ordering, synchronization, and ability to have quick responses despite the large volumes of data. The reliability is essential in building confidence and credibility for the healthcare and medical world. As we integrate a variety of sensor types, back channel long haul networks, and RFID tags, new modular node architecture may be needed to help this expansion.

²⁰ Law, College Of. "CULTURE CHANGE FOR THE AGING AND COMPANION ANIMALS IN NURSING HOMES: BENEFITS, RISKS, BARRIERS AND BEST PRACTICES." (n.d.): n. pag. Aipp.afmc.org. University of Iowa. Web. 5 Apr. 15.

Patient tracking handled three different ways:

- Symbolic- the place or zone the patient is.
- Geographic- Specific GPS coordinates of a patient at a community.

Relational/Associational- Tracking a resident/patient in reference to who the patient is with. This becomes complex when the patient resident is with someone outside the tracking protocol like a family member or leaves the network zone.

Wireless communications inside buildings have a multitude of obstructions to reduce connectivity. Potential liabilities of unwanted emission, or glitching, are of major concern regarding 'life-critical' medical equipment. The limited radio and computational have 'collaborative' algorithms with energy aware communication.

Data will be mined at levels from on-body filtering to history compression in the network storage. Issues over who owns the data exist. Data must be available but in many cases still remain private. The idea of filtering out the inaccurate data or "privacy contaminated" as if a patient walked into the wrong room, the data should be segregated and private with the ability for encryption.

Information may have 'role-based' access like doctors or nurses, with DRM-like issues like "read only" or "do not copy". As the technology get smaller, the 'unobtrusive factor' gets wider. For in-home care, the invisible sensors are both more socially acceptable and dignified, but the potential for unwanted surveillance or tagging the liability continues to grow. Professor Stankovic describes the 'roadmap' for the "Next generation of Smart Homecare". The wireless sensor network (WSN) architecture should have:

- Real-Time remote monitoring
- Miniature sensors that can be worn
- Assistance to the chronic patients and elderly

The objective is to extend healthcare from the hospitals or facility setting to the patient's home. With telecare the patient can connect with doctors at home without the prohibitive costs of in house visits or treatment. In the traditional system, patients visit

doctors at regular intervals, self-reporting symptoms, or any issues. In smart homecare, the data is gathered according to a physician's needs, removing some of the burden from the patient (who may have age-related memory issues) and updating a continuous record to for diagnosis. In-home tasks are also made easier, for example, remote device control, medicine reminders, object location, and emergency communication to family and doctor.

Among the many benefits of a Smart Homecare are:

- Automatic monitoring- reduces labor costs,
- Wearable sensors- provide a more consistent and thorough monitoring of vitals,
- Faster response times,
- Easier compiling for long term comprehensive health record,
- Potential for assisted diagnosis,
- Faster diagnosis = faster treatment,
- Increased privacy of In-home treatment,
- More opportunity for family involved care, and
- Memory aids can help with safety and independence²¹.

Forecasting Elderly Behavior Patterns

Researchers out of New Zealand ran tests to develop a prototype for a data driven intelligent system sensor network to be applied to existing homes called the Smart Home Monitoring System. The approach helps to address defraying the costs of elderly healthcare while facilitating the desire to live at home. If wellness of the elderly resident is the goal, then having an index to the degree of wellness is necessary. From the study, a system was developed based on the data synthesis of the behavior detection system.

²¹ Stankovic, Q. Cao, T. Doan, L. Fang, Z. He, R. Kiran, S. Lin, S. Son, R. Stoleru, A. Wood JA, Q. Cao, and T. Doan. "Wireless Sensor Networks for In-Home Healthcare: Potential and Challenges." *Wireless Sensor Networks for In-Home Healthcare: Potential and Challenges* (n.d.): n. pag. *Cs.virginia .edu*. Web. 28 Mar. 14.

The data was used to forecast behavior and forecast the 'wellness' of the resident. Daily usages of appliances in a time series analysis was evaluated at a selection of homes. A minimal amount of sensors were chosen to reduce cost and time to market. The appliances and furniture chosen to be monitored were the : a) Room heater, b) toaster, c) microwave, d) TV, e) bed, f) chair (shown below). The sensors used were simple flex sensors and electrical sensors relatively easy to find and configure.

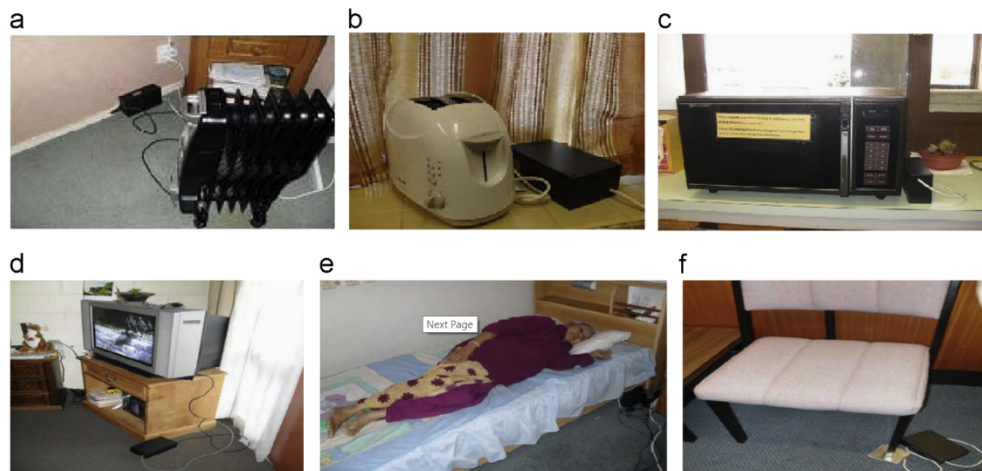


Figure 6 Source: Survadevara,

One means of evaluating the overall condition of an elderly person is their ability to perform all of their ADL's within a 'regular' interval of time. This thinking leads to the development of the wellness index by which the data is evaluated. The activities like food preparation, showering, walking, sleeping, reading, or watching TV can be evaluated in performance based on observed trends. The variations or change in patterns can tell caregivers if intervention is necessary.

Sensor networks have been developed that monitor elderly movement and employ behavior prediction techniques that produce a variation 'alarm', but the challenges have been the accuracy of collection and not generating false alarms.

The sensors collect the data relating to daily activities and environmental changes and sends them wirelessly for discrete and versatile monitoring. The analysis determines a behavior pattern for different times. This pattern is then matched to predict future

behavior or activity. This all follows the medical philosophy that the best way to find a small health problem is to find changes in everyday ADL's (activities of daily living).²²

iHealthHome

The iHealthHome® system is of hardware and software solutions for in home

monitoring. A year-long home, health monitoring and care coordination pilot which enrolled 78 high-cost, high-risk patients across the island of Hawaii has already seen good

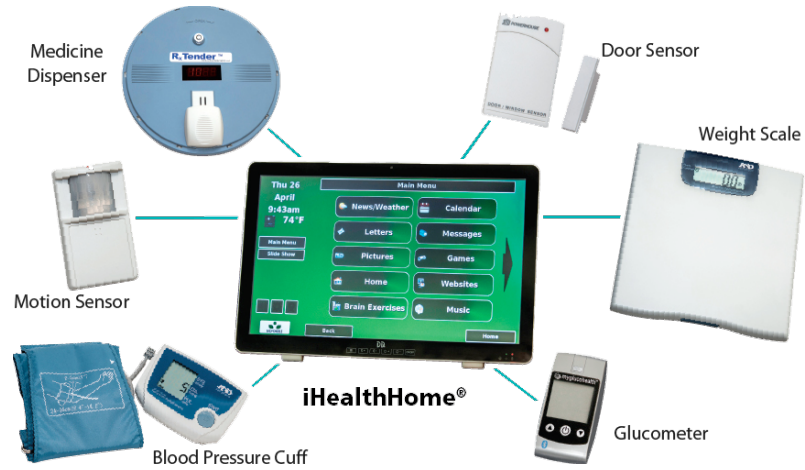


Fig. 3 source: <http://ihealthhome.net/our-system/>

results. The patients had complex care needs due to chronic diseases, such as diabetes, high cholesterol and were frequently admitted to the ER. The patients got assistance from a care coordinator, registered nurse, and a health coach for a full year. Forty-two of the 78 patients also received in-home, the health monitoring system for that time.

The RN worked with each patient to create a service plan to improve his or her health, pilot officials said. They helped with education on complex conditions, helped patients get access to specialists, and helped track prescriptions and doctor appointments.

Officials say the health coach helps to make lifestyle changes, and the home health monitoring helps patients take biometric readings at home such as blood pressure, blood sugar and weight. They can submit the data electronically to the RN then track

²² Suryadevara, NK, SC Mukhopadhyay, and RA Wang. "Forecasting the Behavior of an Elderly Using Wireless Sensors Data in a Smart Home." *Forecasting the Behavior of an Elderly Using Wireless Sensors Data in a Smart Home*. Sciencedirect.com, n.d. Web. 17 Feb. 2014.

their own progress. They are able to log food intake and exercise. The patient essentially always has access to a RN via video calls. Data showed a significant impact during the pilot's 12-month timeframe, including:

- 36 percent improvement in HbA1c blood sugar,
- 37 percent improvement in triglycerides,
- 29 percent reduction in inpatient hospital admissions, and
- 25 percent reduction in emergency room visits.

More studies need to be done to prove these tests as conclusive despite the beneficial results of the pilot. "These results show that care coordination is highly effective, even in a short amount of time," said Susan B. Hunt, project director and CEO for Hawaii Island Beacon Community, which supported HICCS, in a Sept. 18 news release.

"It was inspiring to watch people's lives change," added Dew-Anne Langaon, co-founder of HICCS, in a news release. "People who were homebound overwhelmed and in declining health... gained confidence in knowing how to manage their health together with their primary care physician, and by the end of the study, most felt empowered to take control of their own plan for wellness." The monitoring system components used to collect the data are : medicine dispenser, door sensor, weight scale, motion sensor, blood pressure cuff, glucometer, and a touchscreen. The touchscreen interface helps the client manage their information and connect with provider. The resident senior (client) is able to do all their wellness monitoring, watch the news, play games, and have a video chat. ²³

Integrating both the strategies of forecasting and automated health data collection into senior care design are essential in offsetting the large labor shortage to care for the boomer population. The integration of gait analysis is vital in the floor systems as well as therapeutic conditioning (soft variable surface) from the surface is also a demand.

²³ <http://ihealthhome.net/our-system/>

Water Therapy

The Journal of Physical Therapy Science published an article Effects of Aqua Aerobic Therapy Exercise for Older Adults on Muscular Strength, Agility and Balance to Prevent Falling during Gait which addresses the strategies of using water as a therapeutic medium for balance and strengthening. The 15 subjects of the study were divided into two groups, one control and one variable. Their biomechanical performance was measured before and after. The study created a short 10 cm drop through a series of random trap doors. The control and recovery were measured and used as the overall metric for evaluation for the group.

The aqua therapy was done 3 times a week for an hour at a time. The participants had a warm up of walking, then concentrated on breathing techniques, floating, and posture. The third part was a 'cool down' time with stretching and relaxation. In addition to the loss of body weight the subjects engaged in the aqua aerobic therapy showed an increase in the joint movement and increased the ability to recover balance in the trials. The results show this as an effective exercise to reduce the falling risk in older adults whereas the control group had no gained benefits. The article goes on to point out that the U.S. and other developed countries have high risk of fall related injuries. Fall related injuries are the second largest source of unintentional fatalities and number one source for the non-fatal injuries. The authors describe the magnitude of the problem in 2005, as 80% of elderly in the hospital are admitted because of falls and as much as half of these people died within one year of injury. The article pointed out that Tai Chi, as fall prevention exercise had a remarkable 47% reduction in falls. One of the largest concerns with this approach of therapy or any therapy is to ensure the workout doesn't provoke a 'condition' or cause a regression to overly aggressive regiment.²⁴

There are a variety of facilities integrating Tai Chi into their program, but the problem is the same for physical therapy, which is getting steady attendance. As effective as it is, there still needs to be a stronger motivation beyond themselves to do

²⁴ O'Sullivan, David, and Suk Bum Kim. "Effects of Aqua Aerobic Therapy Exercise for Older Adults on Muscular Strength, Agility and Balance to Prevent Falling during Gait." Research Gate, 2013. Web.

the therapy and the if the therapy feels like work the attendance will not be consistent. Thai Chi represents a lifestyle routine that offers therapeutic while removing some of the rigidity and discipline of physical therapy.

Aroma

Familiar aromas of the past can transform a foreign place into a comfortable, relaxing space. Scent gardens have become more popular in landscapes for elderly and many architects recognize the benefit of fragrant landscapes for the interior, but there are few desirable aromas from today's buildings or homes. Both the landscape and the residence should have a fragrance that relates to its origin. The more the architecture explains its story, the better the chance of the resident feeling connected. A strong fragrance that connects us to the past can almost be an out-of-body experience in the mind's ability to travel to a time and place with detailed clarity of the visual, physical, and audible events relating to it. No other sense can organize and categorize our memories with linked associations as strongly. There are most likely exceptions to this rule, but the concept is to use familiar fragrances of architecture and the home to link other memories. This research does not attempt to address the complex issues and solutions for dementia in elderly, but memory recognition is beneficial for all.

The types of stress related to moving to a 'home' are the types that lead to depression. Removed from the reminders of a previous life with family, career, hobbies, or accomplishments can make some residents question their usefulness. Moving into homes often leaves residents with too much time on their hands. Their lack of independence and struggle to assimilate into a life with strangers leads to a large portion of residents at risk of depression and suicide. p17

Smell and taste are chemical senses and differ from vision and hearing in those regards. The 10 million receptors which recognize the odor molecules are able to recognize over 10,000 differing smells. Unfortunately some of this system wears with

age and loses some of its strength. Architecture has embraced the fragrance of the built world for centuries. Some of the distinct fragrances of architecture include :

- igloo's lamps and animal skins,
- Teepees with wood smoke and animal skins,
- Yurts covered in wool,
- Indian temples built strictly of sandalwood, and
- Mosques that mixed rosewater, musk, cinnamon, and myrrh into its mortar.

One of architecture's most influential designers Richard Neutra (1892-1970) summarizes the shortcomings of fragrance in modern design, " One can can achieve a differentiation richer, more pleasant ...than when a design is merely concerned with visual perception and ignores all other potential aims" (Neutra, 1949). —"Abstract odorlessness or antiseptic absence of smell is one factor that makes nursing homes feel more like hospitals than homes."

We seem to have less descriptive words in English to adequately describe smells. We have colors and adjectives to describe visual and physical sensations. There seems to be a wide array of descriptive words for our sounds, but smell is elusive. It also has some of the most powerful memory recognition. The concept of a building and its program elements having aromas that both trigger memories and help establish new ones can be a useful tool for elderly residences. (See appendix for a list of plants and shrubs for scent gardens.)²⁵

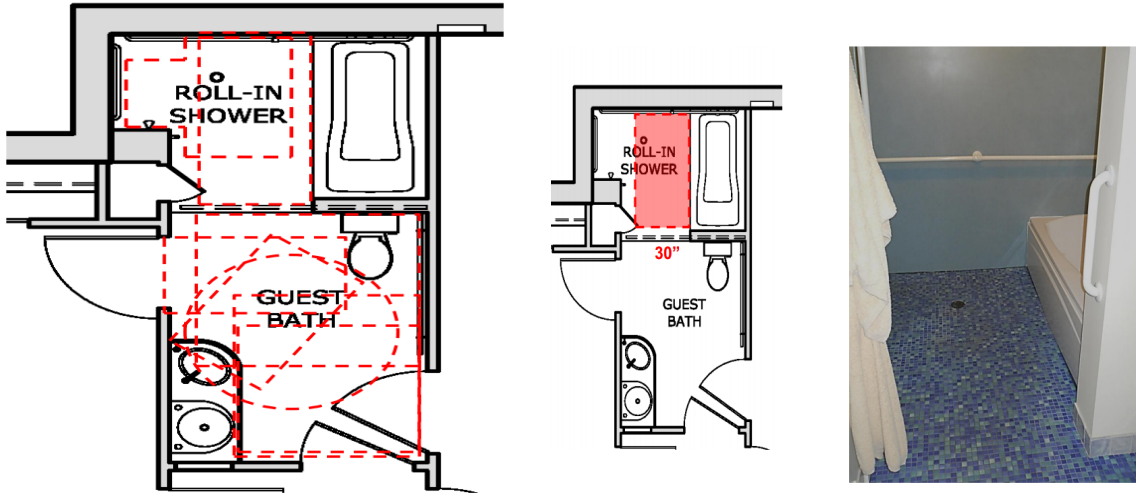
Universal Design


Universal Design's 7 Guiding Principals:


- Equitable in use-
- Flexible in use
- Simple and intuitive in use
- Perceptible information

²⁵, Meyer, Wendy. "PERSISTENCE OF MEMORY: SCENT GARDENS FOR REMINISCENCE THERAPY IN COMMUNITIES FOR THE ELDERLY." (2007): n. pag. *Healinglandsdscapes*. University of Texas at Arlington. Web.

- Tolerance for error
- Low physical effort
- Size and space for approach and use



Site  **UNIVERSAL DESIGN.COM**

 www.UniversalDesign.com Fig. 4 Source: <http://www.udlcenter.org>

A safety checklist was prepared by published by the North Carolina Cooperative Extension Service housing specialist Sarah Kirby. Below are some of the major design considerations to be aware of but relate to the Universal Design approach are:

- In Regards to Overall safety in design, phones and communication is provided in each room.
- All door handles and locks are easy operation.
- Lever action handles for doors instead of door knobs.
- Doorway thresholds are beveled, low or none.
- Windows are easy operation from interior
- Windows are secure from the outside
- Rugs have non-skid backing
- Adequate lighting at kitchen counters and range.
- Flooring is non glare/non-slip.
- Increased visibility on leading edge of nose on stair tread.
- Stairs and hallways are well lit and have railings on both sides.
- Nights-lights in all walkways.
- The bathroom has grab bars by the tub and toilet
- Single lever mixing faucet
- Matte finish 'text tile' flooring or low pile carpet
- The bathroom door opens outward.
- The bathrooms have supplemental heat.
- The exterior walkways have good lighting and railings ²⁶

Age in Place vs. New Home Construction

This study was constructed to evaluate if new home construction was more or less cost effective with Universal Design or without. The test was done with three variables:

- A new home without Universal Design features
- A new home with Universal Design features

²⁶ Kirby, Sarah D. "A Housing Safety Checklist for Older People." North Carolina Cooperative Extension Service,2001 .

- An existing home with 'Universal Design' type retro fits added.

Through their research they found many individuals prefer to live in their own homes but feel the house may not be suited for them anymore. The sentiment is that the community and neighbors are familiar and older Americans would prefer this 'aging in place'.

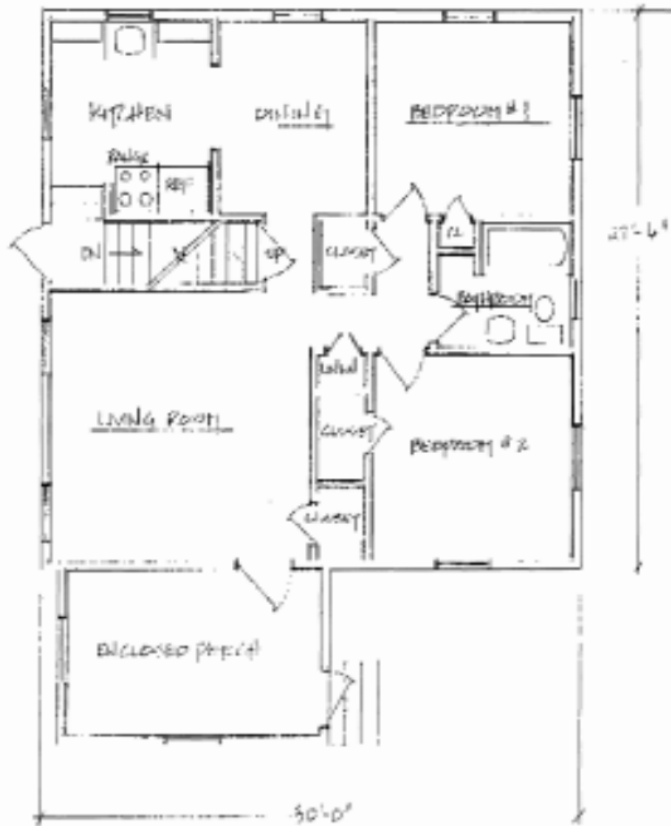


Figure 1. Existing Floor Space

An American Association of Retired Persons (AARP) study (May 2000) showed that elderly Americans preferred: 82% would prefer to stay in their own homes, 9% would prefer to move to a nursing facility, and 4% wanted to move into a relative's home. (Benedict, 2001)

A survey from the American Geriatrics Society claims 30% would rather die than move into a nursing home.

The AARP has put this list together as a guide:

- Shelves should be lowered three inches off standard height or pull down shelving for kitchen and all storage areas.
- Side by side refrigerators allows maximum reach
- Side swing ovens
- Hand held shower heads mounted vertically with a sliding bar
- Peepholes at appropriate height at front door

- Adjustable height rods for shelving
- Incorporate more 'pull-out' drawers and bins for closets and kitchens
- Electrical outlets get raised to 27 inches above floor
- Bath and shower seats
- Raised toilet
- Easy operate levers and handles

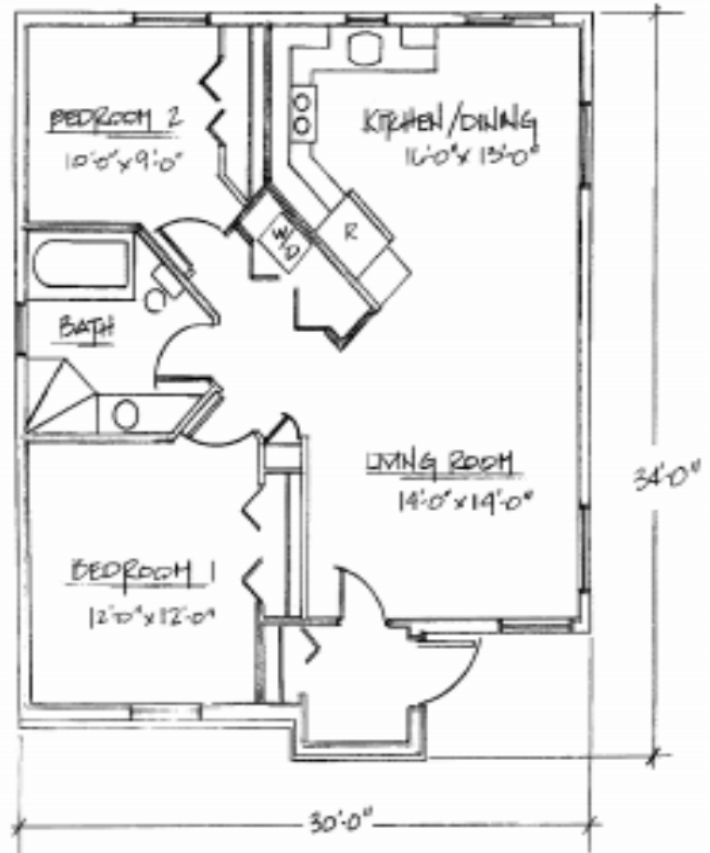


Figure 3. Newly Constructed, Fully Accessible Floor Plan

- Install a package shelf at front door to assist with carrying packages
- Rocker light switches are easier to operate than standard
- Widen doorways to 35 inches
- Lower door thresholds to half inch or less. Transition wedges may be implemented if greater.
- Give driveway a smooth texture but avoid creating slippery spots
- Make sidewalks with moderate texture for traction
- Install handrails on both sides of all stairs
- Ensure the depth of tread is adequate for a whole foot
- Build access ramp with railings on both sides
- Ensure proper lighting standards
- Use appliances with clear markings and buttons

- Install lights in closets
- Place outdoor lighting at walkways, stairs and front entrance

Buildings with devices that monitor or assist the resident are emerging more.

These 'smart houses' are gaining more interest from the studies on people with dementia and the ability to help track both items and people. The study incorporated some of these strategies in both of its retro-fit plan and the new construction plan. The floor plan was evaluated and a new design was generated to accommodate the same space with new construction. The floor plan, entryways and circulation were evaluated in regard to its accessibility. The 'existing house' was a two bedroom and one bath house located in Bloomington, Illinois. The study used a local contractor to establish estimates for the retro fit, new build with Universal Design strategies, and the one without. The floor plan is described as not providing easy access. The front and rear entrances both had stairs which could limit mobility. The bathroom also needed modifications. A list of modifications to the existing building is listed:

- A new sink cabinet that allows for wheelchairs,
- A wall hung toilet,
- A roll in shower and transfer seat for wheelchair access,
- A non-slip flooring for the bathroom,
- Medicine cabinet added,
- Remove bathroom window,
- Add ceiling exhaust fan with light,
- The hallway needed widening,
- Closets and shelves transformed to bins and adjustable shelving,
- Doors/ doorway for both bedrooms needs widening,
- The lower kitchen cabinets get replaced by shelves,
- Installation of shelves for transitioning from stove/oven to counter top,
- New cabinet handles,
- New stove with easy to read and operate controls,
- Non-slip flooring for kitchen,

- Under counter lighting (under cabinet?) for kitchen work surfaces,
- All doorknobs get replaced,
- Low pile carpeting through the whole house,
- A new ramp with railing,
- A new enclosed front porch with lighting,
- The overall bathroom size gets expanded, and
- The kitchen gets 'remodeled'.

The resulting estimate came in the range of \$50,000 to \$66,000, depending largely on the cost of the cabinets to be replaced. The study goes on to point out how this cost could be prohibitive. The study does not indicate if the same contractor was used for the new construction bids (but assuming so). The new construction would have the same standard as the retro fit. The full set of plans could show the equality of the product, but data was unavailable.

The new house with no modifications was estimated at \$99,142. The new house with the modifications built in from design was only \$102,842. The price difference of \$3,700 is minimal to the \$50,000+ price of later retrofit, which seems to be the intent for the study. In regard to retro-fitting and this study, the degree of the remodel could go into debate. Each house will have its own design challenges and price tag attached.²⁷ Gobtop S, Memken J: Housing the Elderly: Investigating Solutions to Help Seniors Age in Place. Journal of the Housing, Education and Research Association 2005; 32,1: 71-83.

According to the estimates -- If someone paid \$5,000/month in a home the \$60,000 will last 12 months. *Most of the living situations are all inclusive arrangements, whereas the conversion remodel only covers the living space. The important fact is that cost of care homes increases over time, the value of the house/land appreciates, and generally retirees are no longer making money. For this reason the conversion costs stand potential to be reduced due to large increase of demand, and the

²⁷ Gobtop S, Memken J: Housing the Elderly: Investigating Solutions to Help Seniors Age in Place. Journal of the Housing, Education and Research Association 2005; 32,1: 71-83.

implementation of these strategies should become the standard to avoid deferring the design short comings to a vulnerable demographic.

Case Studies:

Green Mountain Ranch

Location: Livermore, Colorado

Building Type: Single Family

Residential

Cynthia Liebrock is the owner of the Green Mountain Ranch in Livermore, Colorado and is a Universal Design consultant.



Source: <http://www.agingbeautifully.org/1024x768.html>

The ranch and house are

designed to age gracefully with

them. Features such as countertops that have adjustable heights addresses the need for variable heights as people age.

A list of features of the house are:

Entrances:

- Exterior entrances are well lit, covered for weather protection, and use slip resistant slate flooring.
- The house includes a step-free entrance through the garage.
- An automatic door opener can be operated by remote.
- A fold-down seat at the back entry provides a place for changing shoes without reducing access.

Circulation:

- An accessible route connects the kitchen, garage, patio, two bedrooms, three baths, living room, and library. Routes to other areas of the house are adaptable so that they can become wheelchair accessible in the future if needed.

- The step down into the dining room is removable so that the space can be used to accommodate a wheelchair lift when necessary.
- Narrow level floor joints are provided throughout the house.
- Since rugs can create tripping hazards, the door mats are recessed into the floor.
- Stairs include LED strips for increased safety, and handrails include extensions at the top and bottom where possible.

Furniture and Appliances:

- The front loading washer and dryer have been raised off the floor to reduce the need for bending. While the washer and drier are not currently in a wheelchair accessible location, if needed, a closet on a different floor can be converted in order to house the machines.
- The dining room gas fireplace is remote controlled. For safety, CO2 detectors are located wherever gas is used in the house.
- custom dining room table is wheelchair accessible and can expand to seat up to 14 guests.
- The living room's wood-burning fireplace has been raised for easy access.
- High visual contrast is provided between the seating, flooring, and walls. High contrast rocker switches stand out against the walls.
- The Proliphix thermostat can be operated remotely, providing accessibility and allowing users to adjust the temperature even when they aren't home.
- An iPhone video intercom system allows for communication throughout the house and can be coordinated with the security system to record visitors who come to the door while the residents are out.
- The den includes a murphy bed, allowing it to be used as a guest room when needed. Additionally the space is large enough for a hospital bed, so that the room can support someone who requires a caregiver.

Kitchen:

- The kitchen flooring is a non-slip Quartzite tile.

- An induction cooktop remains cool to the touch, and a pot filler located nearby eliminates the need to carry heavy, water-filled pots.
- The refrigerator was chosen for its back lighting and shallow shelves, which make it easy to see and reach everything. Additionally, the refrigerator's column design means that a portion of both the fridge and the freezer fall within accessible reach range.
- A steamer built in the counter makes it easy to cook healthful meals, and the planters located behind the steamer can be used to grow herbs. A hot water dispenser easily provides hot water for disinfecting dishes or making hot beverages.
- The oven has a side hinged door and the pullout shelf beneath provides a place to rest food when transferring into or out of the oven.
- The sink's fascia-mounted drain controls allow all users to empty sinks with the push of an easy to reach button. Other controls, switches, and outlets are also located in accessible reach range.
- Kitchen storage includes a variety of pull-out solutions that bring objects out of cabinets for easy access. The interiors of drawers and cabinets are painted white to increase visibility.
- The kitchen counters are wall mounted at 42" above the floor in order to accommodate Leibrock and her husband's tall stature. However, the counters can be modified at a later date by removing the lowest drawers and lowering the whole cabinet to a height of 32".

Bathrooms:

- The bathroom adjacent to the den includes a dividing wall that can swing away to provide wider access to the bathroom.
- The bathroom's wet room construction provides two roll-in shower areas. A hand held sprayer is included near the toilet, while the multiple heads of the body shower provide water at varying heights.

- The vanity cabinet's floor has been removed and the doors have been mounted with piano hinges that allow them to fold back within the cabinet to provide knee clearance at the sink.



Source: <http://www.agingbeautifully.org/1024x768.html>

- The sink's folded "j" trap lies flush against the wall and out of the way of seated users.
- Preset temperature valves with hot water surge control provide protection in all of the bathrooms.
- Another bathroom includes a steam shower with a low threshold, built-in bench, and vertical grab bar to assist in standing.
- The comfort height toilet can be outfitted with sheltering grab bars on either side. Tiles at either side of the toilet are held in place by magnets, and can be removed in order to expose the fixtures on which to attach the grab bars.
- A ceiling lift can provide access to the tub and toilet.
- The wall hung lavatory cabinets can be lowered in the future if needed.
- All bathrooms have reinforced walls so that grab bars can be added.²⁸

²⁸ Source: <http://www.agingbeautifully.org/1024x768.html>

Case Studies:

Sun City Takatsuki

Location:

Osaka-Fu, Kyoto Prefecture,
Japan

Client:

Half Century More, Co., Ltd.

Size

220-bed facility

17,00 sq ft

24 assisted living

91 independent living

apartments

68 special nursing/Dementia rooms

Architect

Perkins Eastman Architects



Source: http://www.perkinseastman.com/project_2400253_half_century_more_sun_city_takatsuki

The organic landscape design compliments the modern architecture and supports the surrounding mountain scenery of the town edge. Located between Osaka and Kyoto, in Osaka-Fu, the facility sits on a wooded knoll looking out to the mountains. The area is primarily suburban with bus route out front door that can link to train. The project steers away from the traditional realm of design for assisted living. The programs within the facility combine the Western with Japanese culture and setting. In plan the design uses a cluster of small neighborhoods leading up to a main promenade to public spaces. The central four story atrium features a bold wood and wrought iron stairway and light well in the main lobby that views the garden courtyard.

The public spaces include:

- Japanese tea room,
- Two large 'menu style' dining rooms
- Private dining room,
- Barber/ beauty salon
- Library,
- 'Double height' entertainment salon,
- Private social spaces,
- Large family kitchens,
- Garden terraces, private courtyards and gardens,
- Resident gardens, and
- Traditional Japanese Ofuros.



Source: http://www.perkinseastman.com/project_2400253_half_century_more_sun_city_takatsuki

AWARDS

- The facility has won six awards for excellence, including the AIA Design for Aging Review

AIA Pittsburgh, Honor Award for Architecture (2005)

- Center for Innovation in Health Facilities,

Top Ten Innovative Facilities in Healthcare

- Hospitality Design, Gold Award Key (2002)
- Contract Magazine, Healthcare Environment Awards ²⁹

²⁹ Source: http://www.perkinseastman.com/project_2400253_half_century_more_sun_city_takatsuki

Case Studies:

Burbank Senior Artists Colony

Burbank, California The somewhat modern design is just one aspect of the Burbank Senior Artists Colony that sets them apart from the average assisted living community. The facility offers 30% of its units to low income (defined as earning less than half the median income) through funds from a low-income housing tax credits. The project houses 141 units of 1 and 2 bedroom apartments, which are mostly used by residents averaging in age of 70 years old. The popularity of the facility, program and community have since attracted non elderly, especially to participate in the art. The original goal was to get from 30-50% resident participation in the programs. The programs reported 80% of the residents engaging in the art programs at the facility.



Dates: Opened in 2005

LOCATION:

Just two blocks south of downtown Burbank (Inner Suburban)SITE SIZE:

1.49 acres/0.6 hectare

141 units

LAND USES:

Elderly/Seniors' Housing, Multifamily Rental Housing, Affordable Housing,

FEATURES:

- Mixed-Income Housing
- Infill Development of existing infrastructure

ADDRESS:

240 East Verdugo Ave

Burbank, California

ARCHITECT / PLANNER:

Scheurer Architects

LANDSCAPE ARCHITECT:

The Collaborative West

DEVELOPER:

Meta Housing Corporation

LANDSCAPE ARCHITECT:

The Collaborative West

DESCRIPTION:

The average units range in size from 619-square-foot (57.5-square-meter)

one-bedrooms to 867-square-foot (80.5-square-meter) two-bedrooms. There are a total of forty-three apartments for affordable housing.

THE SITE AND SURROUNDINGS:

The site is pedestrian friendly and offers commercial options one block to the north. Ten miles north of downtown LA at the base of the San Gabriel Mountains.

The surrounding area has been part of a redevelopment effort and is a mixed use of commercial and light industrial. Along with the redevelopment the city has help fund the artist colony, other project and the boulevard as part of the revival. The immediate vicinity has a church, a liquor store, and a Mexican restaurant/ deli.

DESIGN:

The building was designed to encourage residents to become involved in the facilities activities. The residences are mixed around the common areas hosting the : two studios, library, club room, an exercise room, billiards room, a theater, and three courtyards.

The other features/ facilities:

- Computer Room,
- Beauty shop,
- Video editing room,
- Management offices,



- Lobby with seating,
- Lower level parking, and
- Performance theater seating for 40.

AWARDS:

- The National Endowment for the Arts
- The National Association of Home Builders, and the Building Industry Association of Southern California.³⁰

Case Studies:

New Haven Convalescent Center

Most Animal Assisted Therapies⁷ were implemented on a visit basis vs. a live-in facility. The New Haven facility is one of the few homes with a variety of animals living at the



residence. My interests lay in the emotional investment of the resident and the animal. When the resident knows the animal will be there and needs something (even attention) they shift from a receiver to a giver. This mental shift away from the self is a strong tool to combat depression. When the animal's name and ongoing relationship are established, a much stronger bond is made and a sense of family is (re)established.

The New Haven Convalescent Center in New Haven, Connecticut has taken Animal Assisted Therapy to the next level. In the mid-80's, the center incorporated this strategy into daily living. The center has resident dogs, cats, birds, and fish as residents and periodic visits from one of the nurse's pigs.

The response has been positive all around and health care administrators claim the residents are "happier and more productive". As the animal may bring more work for the

³⁰ <<http://casestudies.uli.org/CaseStudies/C037022.htm>>

nurses in some ways, the work was said to be easier due to the improved attitude of everyone with the animal presence. The staff is biased towards animal appreciation and with the resident's ample time, the animals fare pretty good also.

The executive vice president of Connecticut Association of Health Care Facilities, Louis Halpryn, was quoted saying the animal's presence was "... nothing but a positive response." and the "pets have not presented any real problems." He did mention the pets do get overfed by the patients "constantly feeding them" and mentions of the occasions where the "dog who has gotten too rambunctious and knocked over a tray".

Trudy Paquin takes a dog with her when she recruits nurses. Ms. Paquin also is the owner of Blossom, a brown Yucatan miniature pig. The pig is hypoallergenic and has with many bonded of the residents. One resident, Julia DeCapua, said, "she has a very therapeutic effect on the elderly."

Dr. Susan Sandell, the facility administrator, describes one residents turnaround with the introduction of Lucy, a midsize brown and black mutt. Ken Whitehouse, a 75 year old resident, used to "hibernate" in his own room. "when Lucy came to the center 3 years ago, Mr. Whitehouse said he'd do us a favor and take care of her. Now he gets dressed, makes a bed for Lucy in his room every night, and his physical health has stabilized."

The drawbacks described by the Dr. were the extra work required for the animals, an excited animal running out the door, or an 'accident' on the floor. The staff has to segregate the animals from the residents with allergies or fear of the animals. The (Connecticut) Health Code states that pets by law must not be in the food preparation or service areas and must be treated by a veterinarian. It was mentioned also that if the pets are taken care of well and the "staff has a plan" how the patient-animal interaction happens, it works well.

Wendy Wheat is the director of therapeutic recreation at Courtland Gardens Nursing Home in Stamford. She cautioned that temperament is essential in selecting a animal as well as cleanliness. Leashes were also recognized as potential hazards. One

problem both facilities share is jealousy among the residents striving for the animals attention.

At the Courtland Gardens Home , Barbara Hokenson, 87, was quoted as saying, "When I'm around the animals I'm not thinking of myself, I'm busy watching the dogs and it changes me inside". The article goes on to

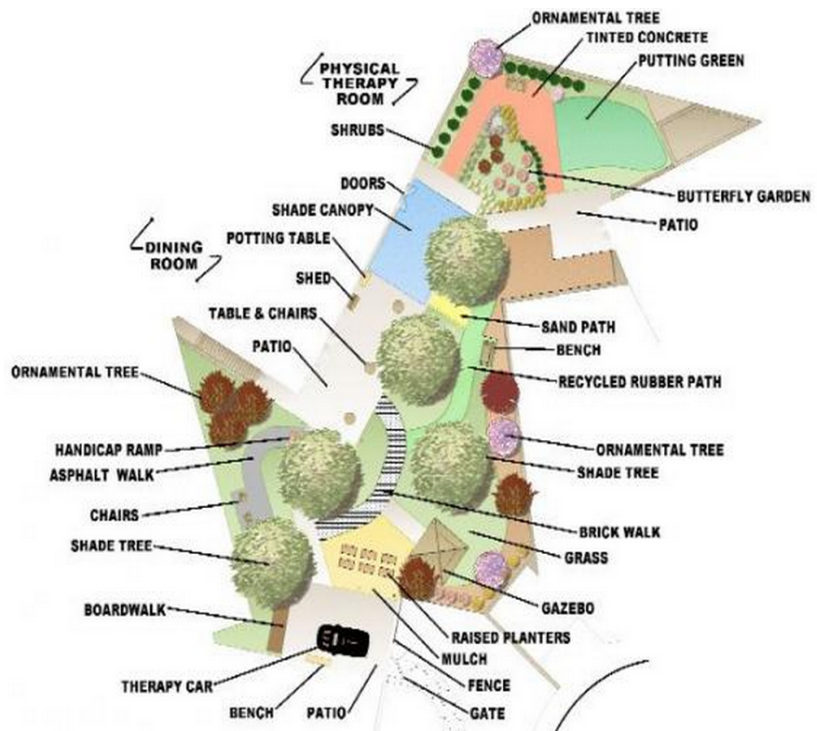


say at Brookview, one golden retriever caused a man to trip. The man was uninjured but the dog broke his leg. Another facility is mentioned as having a dog that was too active and like to run and roam too much. The facility also offers dog training classes to the community as both a resource and a social connection to the home.³¹

Case Studies:

Merwick Care and Rehab.

The Merwick Care and Rehabilitation center in Plainsboro, New Jersey has taken a different approach to physical therapy. Vendome Healthcare Media hosts a Landscape Architecture



³¹ Bass, Sharon L. "NURSING-HOME PETS A BOON TO RESIDENTS." *The New York Times*. The New York Times, 31 May 1986. Web. 17 Jan. 2015.

Competition and gave its 'Senior Living in therapy and landscape design' title to the Merwick Care and Rehabilitation Center. The unique 7,000 sq. ft. design incorporates mental inspiration and the environmental challenges from real life.

The garden is designed to be accessible to all the residents as the designs weaves in and out of the collective building spaces. There's an abundance of benches and social areas, but the emphasis is about a workout for elderly rehabilitation. The paths are lined with flowers and vegetation but the path itself becomes more of a skills course.



To build the mobility skills on varied terrain the landscape incorporates grass, gravel, rubber, sand, bark mulch, concrete, and asphalt. These areas are designed to emulate the hazards of the real world with trained professional support on hand. There is an area with intentional grading and curbs to practice the use of walkers and their legs on varied terrain like sloped concrete. The idea was that too much therapy is done in smooth flat surfaces that are not representative of the real world.

The design came from Joshua and Michael Jacobs, who consistently encourage the residents of the family-owned facility to 'get outdoors'. In addition to the garden and skills training, the facility offers things like a potting station at wheel chair height for increasing hand dexterity and strength. The gazebo is an open comfortable outdoor space with a door intentionally placed to build skills in operation. The garden has, at one end, a parked therapy car that helps patients

with shoulder and hip problems practice one of the most common but difficult maneuvers - getting in and out of a car.

The cost to build the garden was approximately \$150,000 but



they claim the concept can be implemented at a smaller scale. Joshua Jacobs says, “It’s about a philosophy to being committed to spaces that are designed for multiuse, and to promote positive outdoor activity, and to make those areas easily accessible from many different spaces.”³²

Case Studies:

LIFEhouse

Newport Cove, Ill.

In Newport Cove, Illinois two sisters developed a concept house as part of a planned community.

Susanne Tauke owns New American Homes and the Newport Cove development. Her sister, Beth Tauke is a professor of

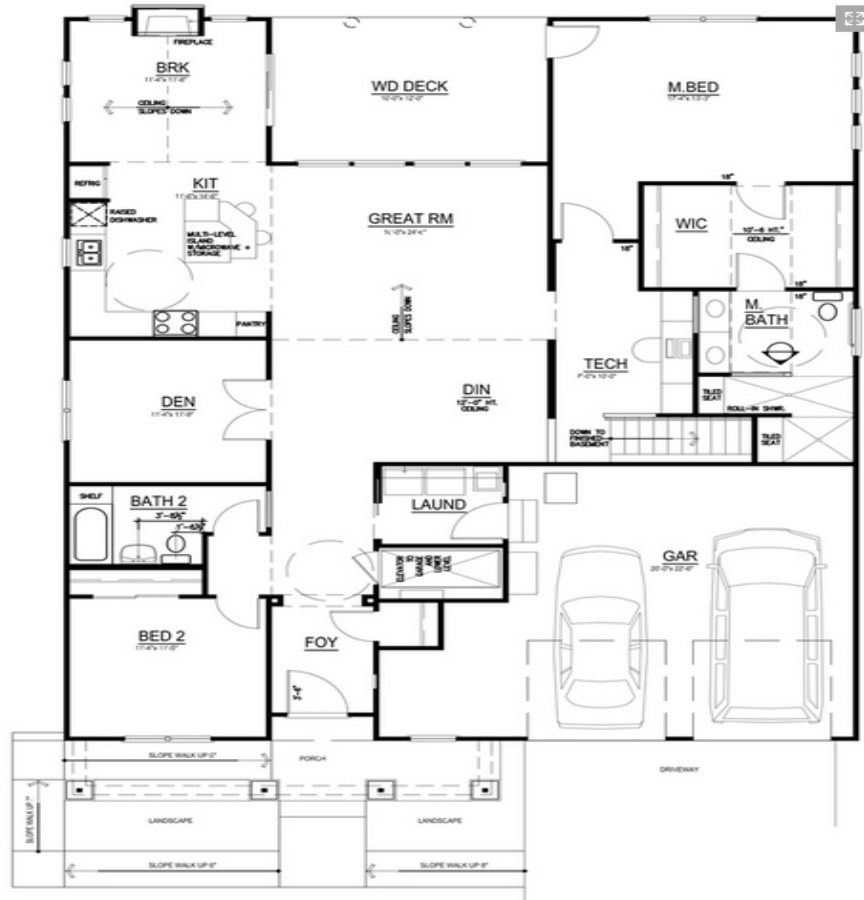


Architecture and Planning at the SUNY Buffalo's School of Architecture and Planning. Beth's collaboration with the school's Center for Inclusive Design and Environmental Access (IDeA Center) developed the LIFEhouse concept from grant funding. The house is designed within the Universal Design principals and is described as having 'multisensory perception'. The 1,192 sq. ft. single family residence is not ADA compliant but can be 'easily' modified.

The house features:

- Memory niches by exits for stashing the common 'misplaced items' such as mail, keys, and phones.
- A bench at entry/exit for garment changes etc.
- Larger toggle type light switches
- Improved task and spot lighting, including closets

³² From <<http://www.ltimagazine.com/article/senior-landscape-architecture>>



- Easy to operate hand crank windows
- U-shaped pull drawers hardware
- Door lever handles
- Open floor plan
- Elevator to access garage and basement.
- Carpeting has alternating color pattern to avoid visual blending
- LED rope lights under handrails to illuminate stairway.
- The front bathroom has a transfer bench for accessing the tub
- Full length mirror in master bath w/ easy access medicine cabinet
- Multi- level vanities
- Roll in showers with seating
- Showers have features such as hands- free adjustable shower head with adjustable spray, heat lamps and safety sensors for temperature

- Comfort height toilets with bidets and heated toilet seats
- Multi height counter tops in kitchen
- All kitchen appliances are easy to view and operate and are at accessible level

The LIFEhouse has won the 2012 Best 50=50 Housing Award from the National Association of Home Builders (NAHB). The community design for the development offers a community marina with UD grilling facility, gazebo, and picnic area.³³

Mom and Pop Stores

With such high concentrations of elderly in suburbia and the future increase of elderly in Hawaii, there are multiple benefits of fostering the local economy at a neighborhood scale. The two demographics left out of the suburban design are the pre-driving adolescents and the elderly. Once the elderly lose their driver's license due to issues such as degenerative vision, they become dependent on other resources to survive in that design. The suburban design dictates the use of automobiles to obtain all services. As food production is one necessary element for sustenance and therapy, the logistics of services should not be a complex process for any demographic.

By placing small variety stores within the neighborhood, the need for traffic transit is reduced and the liability for all involved is also reduced. The complexity of life for the elderly should not become more complex and dangerous. The latter portion of a person's life should be the refinement of a lifestyle and systems. This complexity often directly translates into inflated retirement budgets or large family home care expenses. Many of Hawaii's suburban neighborhoods don't offer sidewalks that are safe for those with impaired mobility, much less ADA. This situation also contributes to the isolation of our senior and adolescent community.

By incorporating in home patient-doctor telecommunication with bio sensors to do minor checkups, we can reduce office visits and resulting costs. The constant monitoring and forecasting model is far more effective than the regular checkup

³³ Source: <http://www.universaldesign.com/general-content/case-studies/1187-lifehouse.html>

philosophy. By employing more consistent data collection, the amount of doctor visits can be reduced.

Hanging the Carrot

The physical interventions to reduce hazards have been shown to only help moderately, and the most effective efforts to prevent falling is physical engagement. This appears to have two strong components to it. One is the desire to be mentally engaged in the world around you. This means being emotionally involved in your immediate environment. This stimulus leads to action, which is the second component. The individual needs to be engaged in some action that comes from their free will. Physical therapy is an example of physical action not truly based on free will. The therapist provides the will and often helps with the physical. Physical therapy is essential for many types of elderly facilities, but the distinction needs to be clear that this is a base standard of mobility and is only one aspect of the needed mobility for more elderly independence.

Our society as a whole completely separates exercise from work, work from living, and living from exercise. In the 'modern world', we have specialized and segregated everything for analysis and quantification. Our desire to be a culture of specialized workers who are loyalty to our careers overshadows the family, the community, and the self. Daycare and 'old folks homes' are examples of the family overshadowing. The disappearance of the 'mom and pop' stores and our intense car culture overshadows the community. The dependence on community which gave it strength is now replaced with big box stores and access to go anywhere, so we do. We go anywhere and everywhere except next door or down the street. The self has also been lost in the factory schedule we adopted. We go to the gym to 'work out' after 'work', because we have removed all engagement from work. We are trained to do one thing and we have to go to the gym to balance our lives. The chair has become the tool to contain the less desirable half of the career driven individual. By pacifying the body, the mind can be used at its fullest. The new factory worker of today is not used for physical work,

but an extraction of the mental abilities not yet exploited by computers. There is an obvious separation happening between the physical body and the mental one. One side effect of this is a body that becomes molded to that form and begins to instinctively search to connect with that form and further reduce work or muscle development outside the gym.

We slowly teach this separation to children because we too often see the mixing of physical learning and 'programmed learning', the standardized education system, and this is not efficient for the factory. Elderly people retire and continue with the separation of body and mind. I believe a more holistic approach is necessary to ensure the 'free will action' is accompanied by physical action (at whatever level is possible). When free will is behind the 'physical activity', the recognition of activity as work or physical therapy (also viewed as work) is reduced. The idea of an active lifestyle is more complex for seniors than it sounds.

How does someone develop patterns in life, and stability in those patterns, and stop at a scheduled time called retirement? How does someone stop doing what they've done as a career and do nothing. Nothing is only nothing in the factory perspective, which is equally hard to abandon. If our self-worth is defined by our wealth and occupation, what does that do to someone who goes from having a career and making money to now just eating up their savings? How much can be eaten and how fast becomes the new pastime. This is not an activity that promotes the self-worth, if that is still their value system.

The free will action is one of the focal points of this research. How do you create a sliding scale obstacle between the free will desire and the action. The sliding scale aspect is designed to adjust the obstacle to the level of mobility. An obstacle for one is a complete roadblock for another. This is one of the design challenges. An example of free will action with an obstacle is going out to see the family despite mobility issues. In the individuals eyes, the risk versus reward is worth it or more aptly, the 'work versus reward'. The design challenge again is how to reduce or remove the associated risks to

the action plan. This type of strategy in observation and planning is helpful to site selection and design.

Reflection of people/culture

This is an aesthetic generated from the culture and the people and less from a stereotypical image. The 'look' of a building should not express cost effectiveness to the resident. The building should not be displayed as a senseless piece of art nor efficient packaging for the 'less desirables'. The population that's retiring now has more custom homes and world travel to be satisfied with the stereotypical Victorian-style, stale design of current elderly homes. Not that Victorian-style is stale, but the retirees of today are fashionable and current. The designs need to reflect these traits with sophistication, as many 'homes' can be condescending in both building and program. The analogy that we return to children as we age has some truth, but just because people need help physically doesn't mean need they need help mentally and vice versa. This is a common area of frustration for residents already struggling with self worth issues.

Lessons/ Strategies

1 Green Mountain- Universal design doesn't have to look like orthopedic shoes, hospital or a nursing home.

2 Sun City- A 'senior home' doesn't have to look like orthopedic shoes, Victorian dollhouse, or an institution.

3 Burbank - A home (or retirement) should be an exploration into the desires of the resident that were previously not profitable for the factory worker life. Typical example is the exploration into the arts and projects. Taking the 'hobby' more seriously. One strategy is creating more of a professional environment for residents to practice/perform.

4 New Haven- By integrated animals into the facility more residents become active in the program. (Lots of 'homes' have various programs but the difficulty is in resident participation.

5 Merwick- By making the pleasant spaces also therapeutic, physical therapy becomes part of daily living. Strongly encourage outdoors.

6 LIFEhouse- This is an example of a small house that incorporates Universal Design in a very middle America appeal. The design makes the Universal design aspect hard to distinguish.

iHomeHealth represents how the beginning of a building infrastructure begins. As the population demographic with money and size shift our priorities to address inclusive design. Electricity, indoor plumbing, and everything else started as luxuries for the elite few. The world of inanimate objects gain intelligence and the home is a natural progression to a smart home. Just as we have all met people with lots of useless information, our sensor networks can also fall victim to this tendency. iHomeHealth connects the sensor data and manually inputted data into one patient record. It seems the amount of variables involved ranging from the home and individual to outside elements, like pets and guest allows for excess data pooling. If the large network could link to the immediate link to the community (if the immediate community is 'community'), then the individual not only has freedom in the house but also in the community as a whole. The idea would be to extend the network and design of inclusive design into the whole neighborhood.

The Burbank Senior Artists Colony is a great example of removing the age stigma from the development. If the program works and the place is 'cool' the distinction of age gets blurry. Not only did they remove the institutional aesthetic but they used government funds to do so. If people evolve over the course of their lives then the arts, humanities, and science should be what older people do. The site is very pedestrian friendly and I applaud the placement of the home into a light industrial/commercial neighborhood. There is probably more inspiration found there than in a typical residential neighborhood. The concept of niche assisted living makes sense. We travel to places to be around a culture we enjoy, we hopefully move to a neighborhood because we like it. Why would an assisted living facility think that homogenizing everything into an 'old Victorian version of middle america' is gonna cut it for the most active, traveled

and worldly group of retirees. Whether its sports, fishing, gardening, art, music, or whatever passion we have stifled into a hobby, it should be able to come alive.

Sun City Takatsuki is like so many things in Japan, a cleaner, slicker version of what we commonly see over here. Perkins/Eastman did the architecture for the project, but it still has a simple, pure cleanliness that give the style a timeliness. The whole operation looks more like a chic hotel than an assisted living facility. The Google Earth images shot in the winter give it a stark feeling and not as much of the anti-institution feeling was working. I like the “no nurse Rachett” or “mothball feeling”. I think the Burbank Senior Artist colony did a better job of breaking up the large mass visually.

Design Strategies:

Soft variable surfaces

Soft variable

- Sand
- Foam
- Grass
- Pea gravel
- Crushed glass(sand) - beach glass

Softened

Beach glass is a way of triggering



beach memories while adding color and texture to a surface. Adding color and texture to a uniform, sand surface counters the visual blending potential. This beach glass along with the sand is derived from a diversion of post-consumer glass here in Hawaii that struggles for a (\$) return. Another source of sand is crushed lava rock. The dark/black sand also gives contrast to the more common light/white sand. Although the Hawaiian islands are loaded with white sandy beaches, white sand is still a commodity. The amount of imported sand to Hawaii is -----. The cost for white sand is-----. By using the glass and lava as resources for 'elderly therapeutic design', Hawaii can create jobs and stimulate small industry. In theory there are more elderly people than children or dogs in Hawaii. Why aren't there parks for elderly therapy. There are proven, positive

results from the implementation of therapeutic gardens for the elderly. If this is true then why would the same techniques not be applied to the built world, the architecture? If we spend 90% of our time indoors, this seems like the good target for application. Needless to say, the built world here in Hawaii needs also to apply the strategies of the natural world such as natural ventilation, *sunshine- direct or filtered (not to be confused with daylighting), ionized, oxygen rich, clean air (not to be confused with filtered recycled air found in sealed or airplanes, and the overall flux of temperature, humidity and light.

Program Strategies:

The first strategy is a follow-up from the text above to compliment the 'age in place' approach. Below are some of the integrated strategies to a retro fit:

1.....Shrinking the house

Pony wall by the bed. Multifunctional wall that serves as a subtle rail to the bath.

1 Media connection

2 Sensor network

3 Night light

2.....Therapy in daily life- Balance and strength in legs ankle

3.....Technology- both monitoring and forecasting

4...Animal friendly design.

Diagonal stairs - Stairs designs to facilitate some lateral direction in the climb.

Sand filter/shower pea gravel bath outdoor association.

Economics- Strategies to own 'home' /build equity as income

*Dehumidification cycles and natural ventilation

Location- planning location for accessibility

Nurturing to and from

*Incentive to 'get out of bed'

Incentive to go outside

Economic Strategies

Half of the homeowners over 65 own their home with no debt (US census).

If someone chooses to sell their home they can get the tax break if they reinvest the profits into a new residence (does this apply to nursing homes?). By retaining the property they are able to continue to build equity. If there

are plans to sell the home, it is important to have residences there otherwise the capital gains tax is 30%. If the retiree moves off the property then sells, they lose resident status. The occupancy must have lived there for at least two years. This gives way to the strategy to stay on the property in either a retro-fit option for the main house or move to an 'ohana option. The tax break is up to \$250,000 for single persons, and couples get up

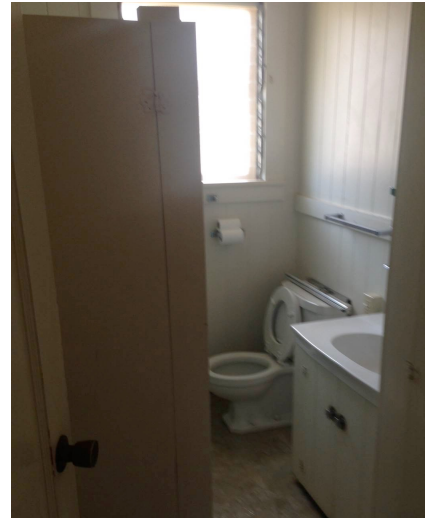


Example House:

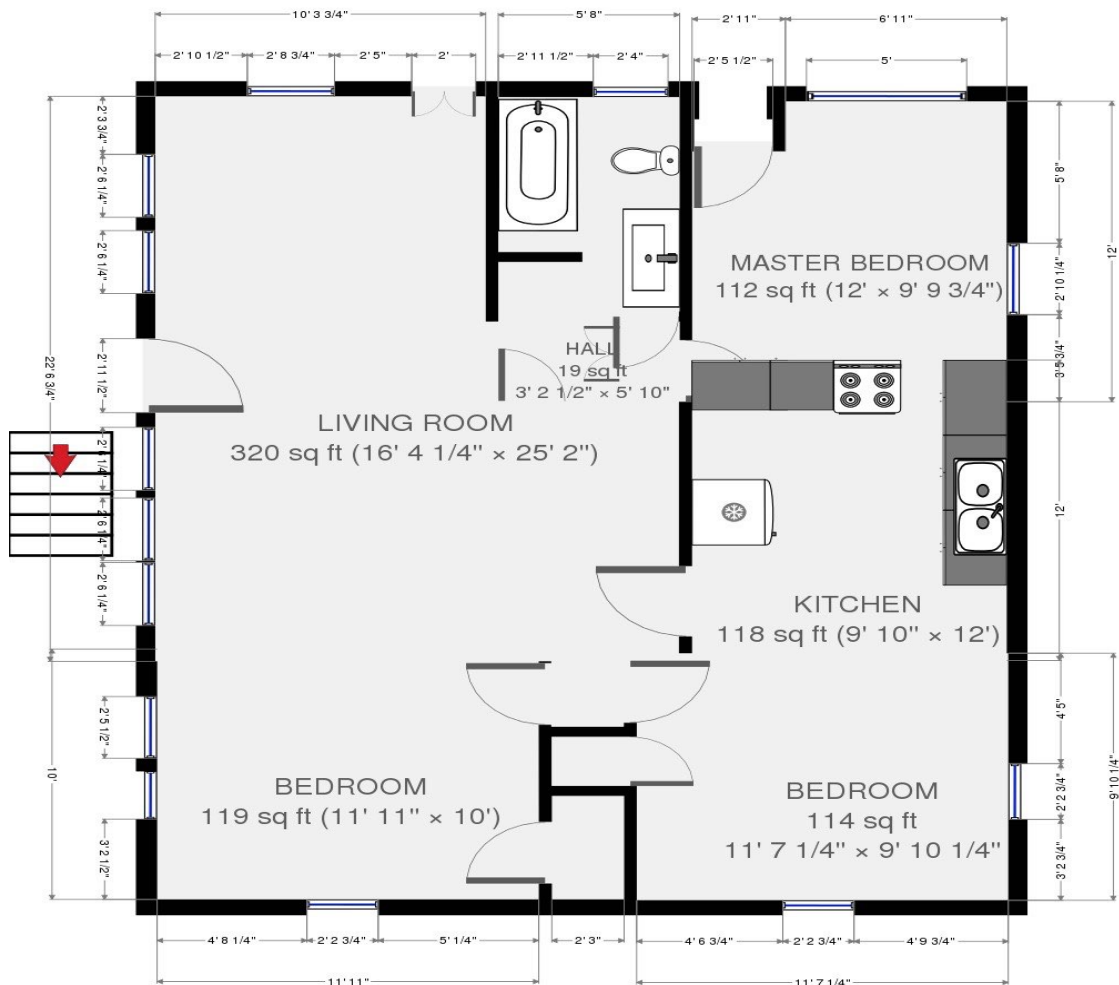
By selecting a typical suburban 3 bedroom house, a better idea of some of the existing challenges and at what scale would the retro fits take place.

1. Additional railings to stairs and or ramp
2. The bathroom layout is both awkward and a liability. Soft variable surfaces can be implemented for traction drainage, and softer contact.
3. The Living Room would have a better connection to the front yard and serve as communal space.
4. The Kitchen needs alot of modifications and is also a communal space.





to \$500,000. Do widowers get only the 250,000? Can two widowers take advantage of the couples tax break? Could two widowers combine their resources into one residence?



- Using temporary walls to define a new purpose for the house
- 'Shrining the house' to a manageable scale
- Providing income and encouraging socializing

Each unit has bathroom and kitchenette. The communal space is the conduit for engaging with the therapeutic aspects of the program.



*Kitchen and Living Room serve as communal space

- unit 1** Needs access modification, kitchenette, bathroom modification
- unit 2** Needs access modification, kitchenette, and new bathroom

If it cost \$7-10,000 a month for a care facility and a RN needs \$50,000/yr.

A RN is overqualified for all the duties and is only 'needed' for 1.75 hrs per patient. A 'less' qualified worker could supplement the workload at a lower cost and provide the other work. Interpreting this as a part time job the estimated cost is approx. \$30,000 for the RN and approx \$30,000 for the full time caretaker- the est. total bill may still be

under \$75,000/yr. for two residents where a 'home' is at least that for a year and the amount of resident space (bedroom) is approximately a third the size. This also doesn't take into account the renovation costs or the built equity -which is one of the strengths of this plan. It also doesn't account for the increase in quality of life and self esteem associated with ownership. The quality of life is assumed to be higher with a higher level of care being only divided by two.

PART 3: Solutions

Gypsy 'Ohana

This concept is probably more analogous to what the original 'Ohana' house was intended to be. The logic to it is that the whole house doesn't have to be retro-fit. Just as schools benefit from lower student to teacher ratios, assisted living also thrives in lower ratios. The personal attention and less institutional translation to the resident, the more the resident feels like they are part of a home. Being part of something is critical in creating a sense of duty or the 'carrot' part of the action plan. The Gypsy 'Ohana allows for a personal space to be developed in an 'age in place' setting with the ability to transition to an acute or long term setting.

'Grandpa' was an independent guy, built his business, owned his home which he was always working on. He loved working in the yard with his dogs. Grandma said he twisted his ankle one day and hasn't been with the dogs as much and the yard has gotten a bit unruly in his absence. She is worried he now will hurt himself trying to catch back up, especially since his ankle isn't 100% healed.

As the above paragraph is an amalgamation of people I know with some member of the family 70 or over struggling with these types of mobility issues. It illustrates how minor impairment can escalate into major life changing injuries like pelvic fracture or any of the bones in the leg. Changes occur for most people (in their 70's) physically that begin to impair mobility. Most people don't change their living situations to accommodate the gradual impairments, they wait for the hospital visit.

Often times this 'hospital visit' is the beginning of radical changes. These changes can lead to the immediate need for supervision, and separation from family, pets, home and life before 'the fall'. Sometimes these events can bring a family together, as caregivers are often family members, but even then the logistics can be awkward. Few houses are designed for ADA or Universal Design and making long term remodel investments are challenging for any size family. The average house doesn't have great wheelchair access, a bariatric lift, railings for bathroom and throughout the

house. Needless to say most homes don't have the physical therapeutic or sensor networks to help understand the patterns of behavior before there is a problem. If specialist and family supervision demand a transient lifestyle that requires lots of moving, the flexibility must be built into the design. By sheer numbers alone, the elderly population needs to adapt to and flex to the younger caregiving generation. Our younger generations, under the baby boomers, are out-numbered by definition of the term baby boomer and the solutions must be somewhat broad stroke as we don't have the human resources to customize the overarching solutions. Customization has a stronger potential in this design in its adaptability and personalization through hosting more elements representing home-like space for plants and animals. As 'home' is often a specific place, the elements of 'home' are often more important than the structure. Sometime the elements of home are more the activities that the space hosts like gardening or sharing meals with friends and family.

My personal experience is that there is a noticeable change in a person the day they realize they no longer have control over where they go and where they stay. It's like watching an animal get 'broken'. Raising the level of autonomy and simplify the process of connecting with the family. As mentioned before this is often a time period of reconnecting with family and the ability to integrate with family's lifestyle is essential.

Gypsy 'Ohana Approach:

By addressing the needs of both Hawaii and the elderly target group discussed the four major concepts to follow for the design are:

1. Shrinking the average living space and responsibilities associated for reduced liability and increased quality of life.
2. Supervision and caregiving is made easier for family and medical professionals by accommodating space and sensor data collection. Design sensors systems to collect data and predict behavior patterns.
3. The ability to relocate is very easy to accommodate health needs or family.



4. The architecture itself is part of daily physical therapy.

- Using the side yard (seen above on right) for aquaponic gardening and safe space for animals, a constant 'lure' to engage in activities outside of a chair or bed. The gardening and animals can provide therapeutic qualities beyond quantification in a traditional therapy programs.
- Creating comfortable space for family makes for longer visits.



From <<http://www.newlifestyles.com/>>



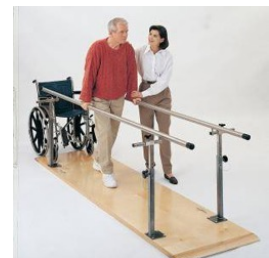
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- The bariatric lift as well as the railing off the tub assist in the soaking and aquatic agility training.

- Intelligent toilets are emerging on to the market. Toto's 'intelli-toilet' does an analysis of the urine to provide feedback of levels of hydration, blood pressure, sugar levels, body temperature, weight, and body mass index. This data is recorded to track trends and use a predictive approach to problems.



The floor follows the variable surface philosophy of beach glass layered in on a gel mat that allows for a uniform variable surface to stimulate a wider range of foot muscles for balance training.

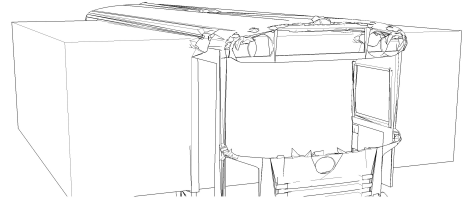


- Parallel bars are a common physical therapy tool. During the assigned times the therapist helps with the function of walking.
- Parallel bars can pull out of existing furniture to provide greater continued therapy and stability.
- Converting a school bus as the module, takes advantage of many neglected resources, as many buses come with wheel chair lifts standard issue, a bariatric lift is



incorporated from the wheelchair lift to the front section bathroom.

Legally the bus conversion would be defined as a ‘House trailer’ and would be registered with the DMV and fall under their jurisdiction. §291C-1 Definitions.

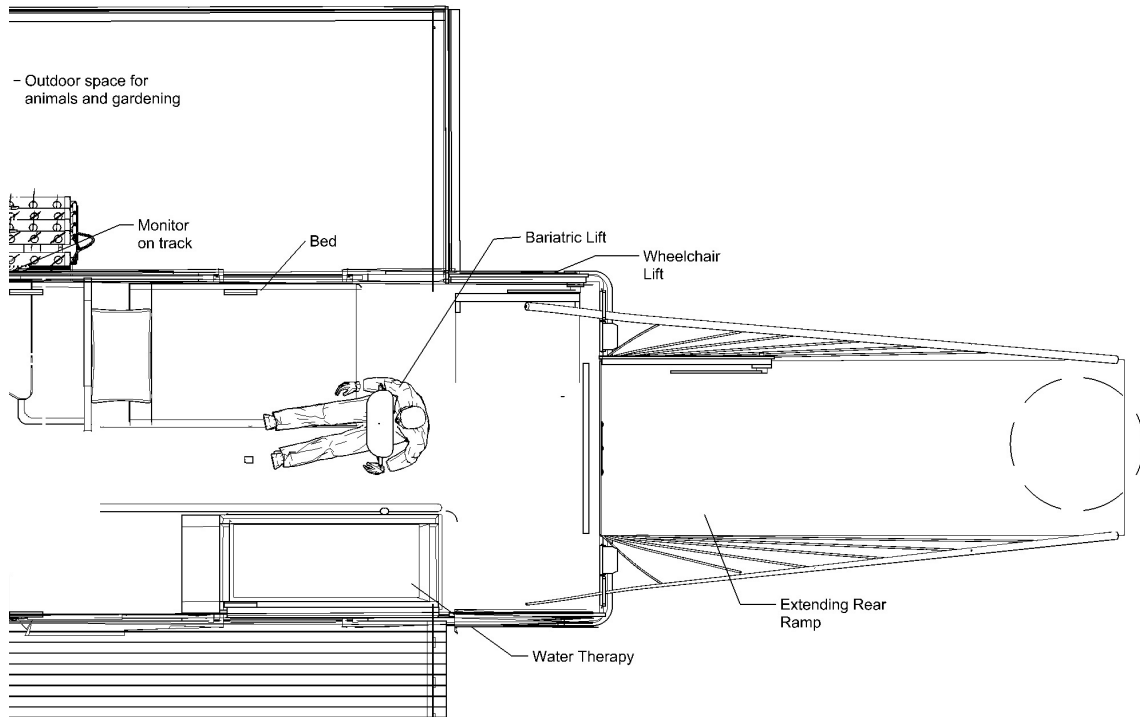
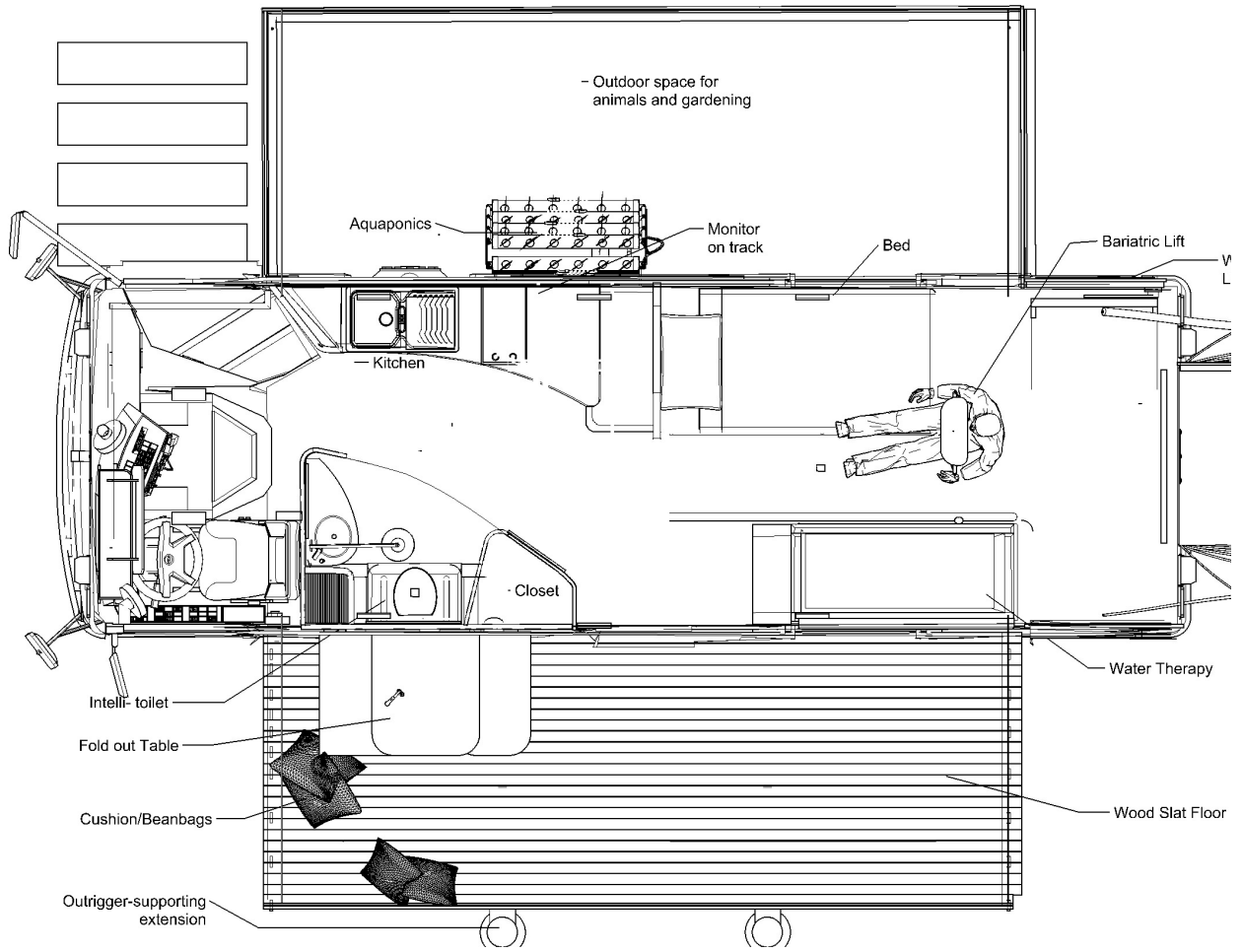


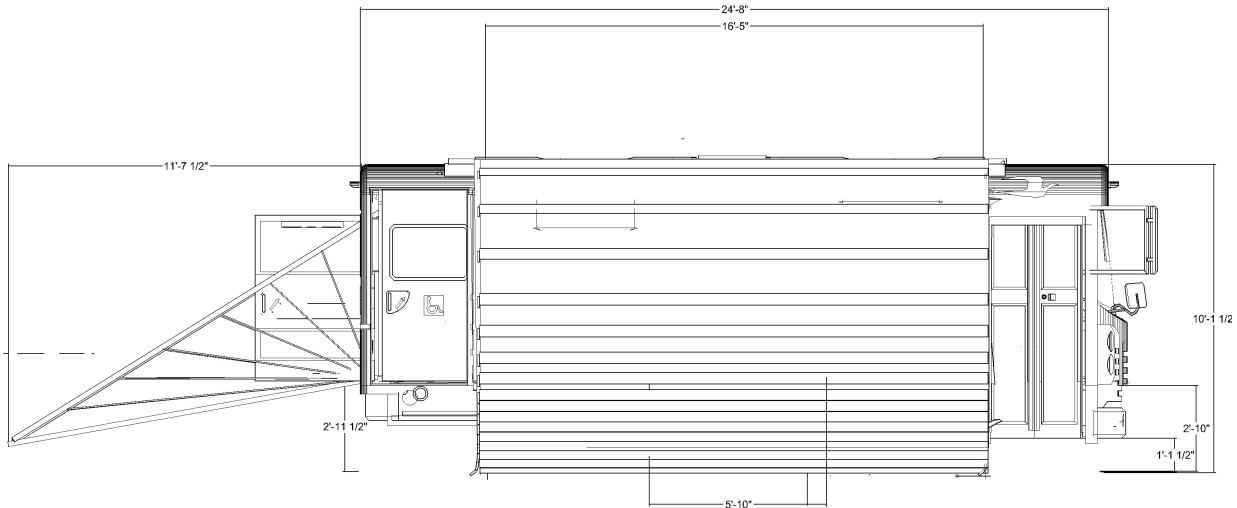
“House trailer” means:

- (1) A trailer or semitrailer which is designed, constructed, and equipped as a dwelling place, living abode, or sleeping place (either permanently or temporarily) and is equipped for use as a conveyance on streets and highways; or
- (2) A trailer or a semitrailer whose chassis and exterior shell is designed and constructed for use as a house trailer, as defined in paragraph (1), but which is used instead



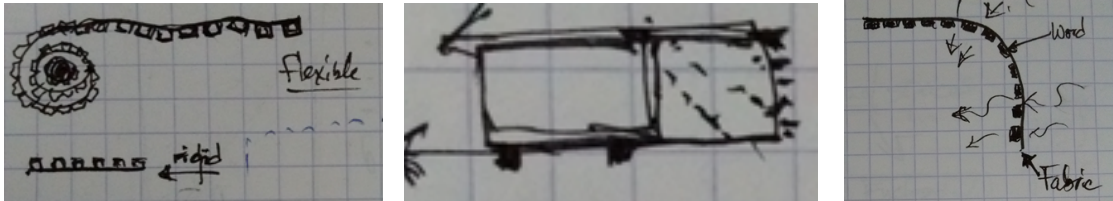
permanently or temporarily for the advertising, sales, display, or promotion of merchandise or services, or for any other commercial purpose except the transportation





of property for hire or the transportation of property for distribution by a private carrier. [note: permission to live inside a “house trailer” on private property with permission of the property owner is authorized by this state vehicle code.³⁴ The design needs to work into everyday life.

The concept behind the extensions on the side was to open up the walls and blur the

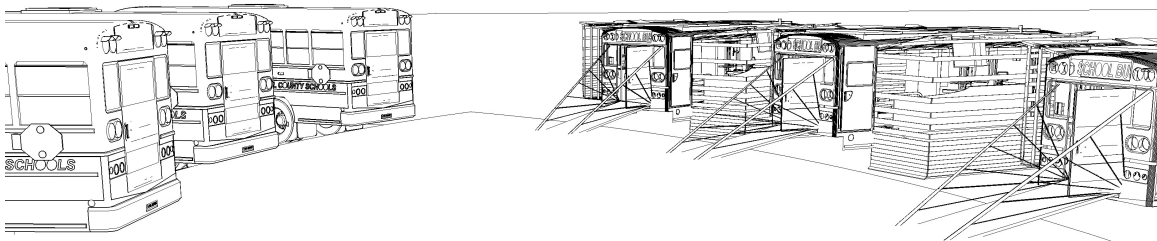


lines between the outdoors and

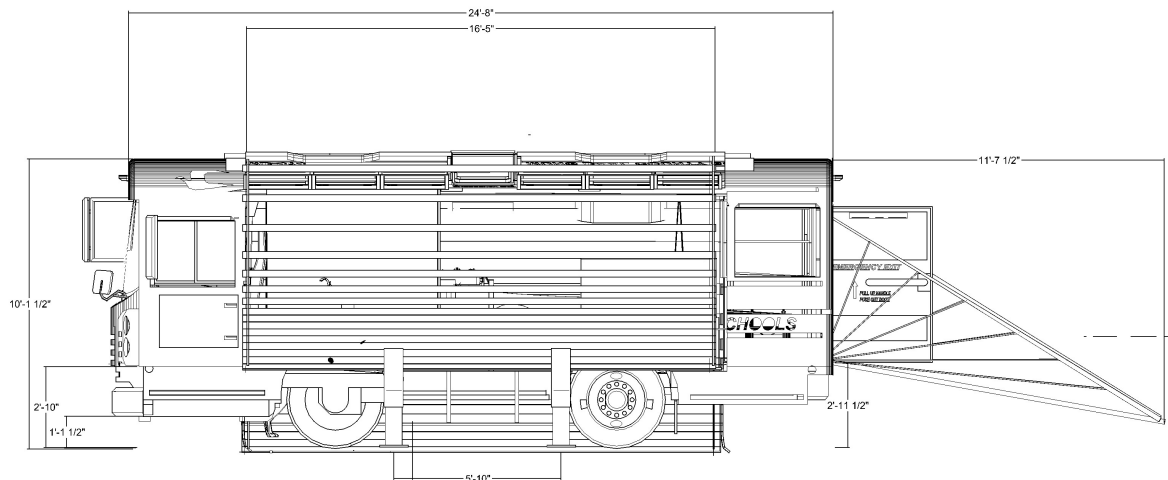
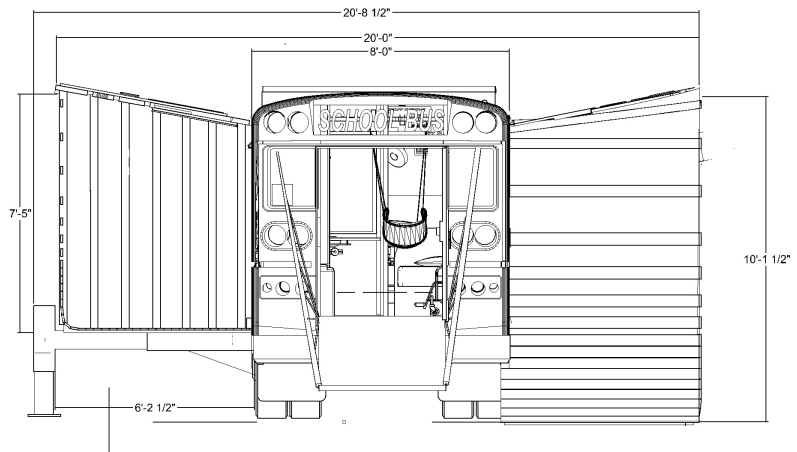
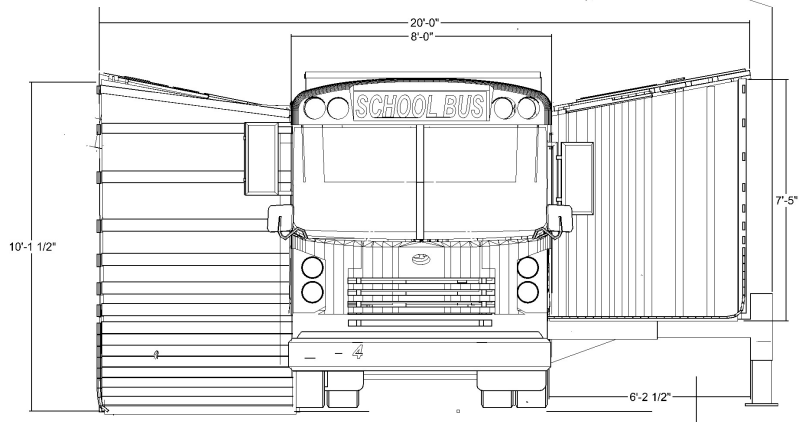
in. The wall have to be flexible, both spatially and physically for safety and logistics. The strategy has to incorporate natural ventilation options that don’t inhibit privacy.

The design modular for large scale solution as mentioned above, but variations on finishes, color, and fabrics would be available. Finishes, colors and fabrics are not intended to mimic a previous home as much as break the institutional barrier that splits the intention from a ‘visitor’ to a guest visiting your home. These two intentions are completely different in their effect on the ‘resident’. Design should continually strive to boost the self worth of the people that reside, because when the self worth is gone,

³⁴ <http://www.erikeverywhere.com/tiny-houses-defined-house-trailers-hawaii/>



depression will sabotage all healing, support and physical therapy. Do we connect 'institutional care' with pity? Could we change what institutional care feels like and what the personal expressions are within that space? We are all affected by this problem through



either family, taxes and infrastructure strain, and the baby boomers are a huge portion of our population that hold most of the money. The higher we raise the standard for the awkward process called 'retirement' and the group we call elderly, the higher the standard will be when its your turn.

Appendix

Types of Housing/Care	Search	Definitions
Adult Day Health Care	Adult Day Care	Adult Day Health Care involves an organized day program of therapeutic, social, and health services. These services are provided to adults with physical or mental impairments, or both, which require nursing overnight care for the purpose of restoring or maintaining, to the fullest extent possible, their capacity for remaining in the community.
Adult Residential Care Homes	Residential	Adult Residential Care Homes are facilities that provide twenty-four hour living accommodations, for a fee, to adults unrelated to the family, who require at least minimal assistance in the activities of daily living, but who do not need the 24 hour services of an intermediate care facility. This does not include facilities operated by the federal government. There are two types of Adult Residential Care Homes: -Type I homes for five or less residents -Type II homes for six or more residents
Assisted Living Facilities	Assisted Living	Assisted Living Facilities provide a combination of housing, meal services, health care services, and personalized supportive services designed to respond to seniors' individual needs.
Expanded Adult Residential Care Homes	Residential	An Expanded Adult Residential Care Home is an adult or senior residential facility licensed to admit individuals who require a Nursing Home level of care.
Home Health Agency	Home Care	A Home Health Agency is a public or proprietary agency, a private nonprofit organization, or a subdivision of such agency or organization which is primarily engaged in providing direct or indirect skilled nursing services and other therapeutic services under a physician's direction to homebound patients on a part-time or intermittent basis (in a place used as the individual's home).
Hospice	Hospice	Hospice Care is a program focusing on providing terminally ill patients and their families with palliative care and social, spiritual, and counseling services.
Skilled Nursing Facilities	Nursing	Skilled Nursing Facilities provide skilled nursing and related services to elderly or disabled patients whose primary need is for twenty-four hours of skilled nursing care on an extended basis and regular rehabilitation services.

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