AC 2008-2181: MERGING ADA & LEED TO ENHANCE OLDER ADULT LIVING: A CAPSTONE PROJECT

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Abstract
An Interior Design Technology 400 level capstone project set out to develop homes designed to raise the quality of life for seniors. Enhancing the living environment for seniors is shortly becoming a growing issue for the American public and political system. The US Census Bureau 2000 statistics indicate that by the year 2010 the number of older adults (age 65 or older) would have grown to 39.4 million, up from 31.8 million in 1990. The Report also indicates that by the year 2020 this number will balloon to 52.1 million. The "graying of America" is how William Hoyer and Paul Roodin refer to it in their book Adult Development and Aging. With these population stats in mind, housing solutions will need to lend themselves to offer some key components to make them efficient, affordable, and useable. The components looked at in this capstone project which will be discussed in this paper are Universal Design, ADA Compatibility, along with Green Design leading to LEED Certification of the home designs.

Efficiently designed homes can lead to several factors that make them appealing to older adults that deal with such issues as economic restrictions, health concerns, and accessibility obstacles stemming from physical limitations that come along with the aging process. These housing designs undertaken in this capstone project looked at such things like solutions to in-door air quality by studying low VOC paints, non-off-gassing carpet glues as well as the impact of better ventilation with more efficient windows, among many other things that will be discussed in this paper. In addition this project tried to create solutions to lower cost per square foot for energy uses by researching the maximum usage of natural light, housing position in reference to sunrise/sunset, and more energy efficient appliances and utilities, among other things. Lastly, but just as important, this capstone project was set in a 400 Level Interior Design course which means topics such as space planning, ergonomics, anthropometrics, universal design, and accessibility were paramount in the solutions sought after.

This project allowed students of the institution to collaborate with a local design professional that is a Certified Aging-in-Place Specialist. This professional led the students on site visits of a prototype neighborhood, as well as reviewed drawings of all the students involved. With this professional being an architect, it brought a multidisciplinary approach to our Interior Design Project.

Introduction

This paper will examine the results of combining the standard benefits of Leadership in Energy and Environment Design (LEED) Certification qualities and Americans with Disabilities Act ADA guidelines to produce single family living environments where elderly occupants could live comfortably as well as have a more cost effective approach to living.

The premise of this paper is based on the outcome of the Capstone Design Project for the Interior Design Bachelors of Science degree in the Design Communication Technology Program at the _____ School of Engineering & Technology on the _____ campus, focusing on testing the ability of the students preparing to enter the professional world of design. This course

taken concurrently with the thesis course affords the teacher the opportunity to investigate design solutions that prompt a large quantity of research to give merit to the end result. The paper will examine the methods taken in this design approach, as well as chronicle the results with statistical data.

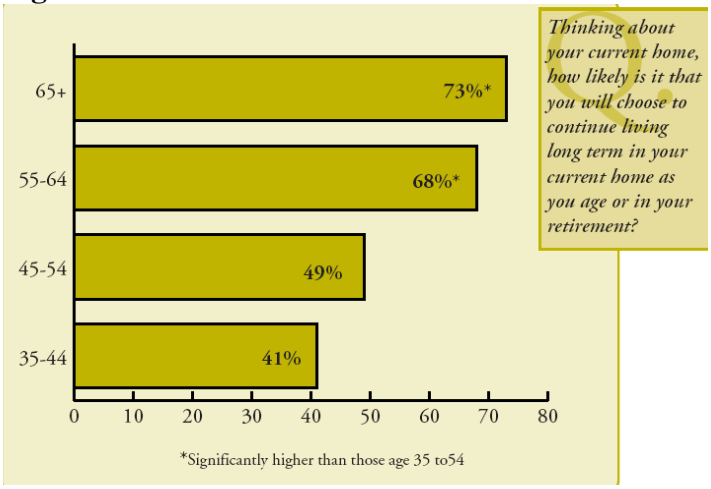
The students were asked to develop their designs in a the same manner that one would do if they were professionally trying to design a LEED Certified project, and with this each design would be evaluated on the amount of points it would get toward the four major certification standards of Certified, Silver, Gold and Platinum as defined by the U.S. Green Building Council. The point breakdown is described in figure 1.1.

Figure 1.1

Performance Level	**Min. # of Points Required**
Certified	30/108
Silver	50/108
Gold	70/108
Platinum	90/108

The project designs were also evaluated on the quality of their environmental friendliness and how those qualities manifest themselves in the lives of the aged community. Students were specifically instructed to focus on two areas, one being cost savings and the other being Aging in Place. From the cost saving standpoint one of the larger topics of the investigative designs was to look at maximizing natural light use, which was an attempt to create dwellings that lower energy cost as well as to minimize the use of artificial light for daily household task. This could have a huge impact on the expenses of seniors who see their discretionary spending decrease due to things like increased medical expenses, transportation expenses, and decreases income due to retirement and transitions to fixed incomes (Moody [1]). The second focus item, and just as important was this issue of creating environments where the occupants could “age in place”. Gerontologist refers to aging in place as the concept of a resident being able to live an independent lifestyle while still maintaining their primary residence. While assisted living facilities and other types of living alternatives are important, a recent ASID study points out how likely it is that those currently living in their own home will continue to live there into their retirement. See figure 1.2

Figure 1.2



Background

"Human error in many cases gets a bad rap as faulty design is the blame for some of life's mishaps". (Norman [2]) "How can I work a multimillion dollar computer installation, but not my home refrigerator". (Norman [2]) These are some of the statements that the design students were challenged to address as they attempted to design residential environments that promote an independent lifestyle for the aged population, or "Aging in Place" as many Gerontologists would describe this type of living scenario. The designs would attempt to address issues of ;

- Accessibility
- Storage
- Circulation
- Open Floor Plan
- Modern Design Feel
- Indoor Air Quality
- ADA Standards (Common dimensions & uncommon dimensions)
- Specific Client Request from Interview

Students were also introduced to the concept of becoming specialist in the field of design that focuses on the elderly population, and in doing so the guidelines for Certified Aging in Place Specialist or CAPS were invoked as an end goal of having each student prepared to sit for this certification exam.

The National Association of Home Builders NAHB defines a CAPS specialist as "a professional (designer, builder, architect, etc.) that has been trained in the unique needs of the older adult population, aging-in-place home modifications, common remodeling projects, and solutions to common barriers." The certification has three primary components that must be completed. 1) Working with and Marketing to Older Adults, 2) Home Modifications, and 3) Introduction to Business Management Focuses. Students used the Home Modifications section as our focus area which has concentrations in three areas;

1. Codes and standards
2. Common barriers and solutions
3. Product ideas and resources

Partnering with an architect in (insert city here) that is already CAPS certified, this project also was well connected to the aged community. (Insert architect name here) is the lead architect for the(insert neighborhood name here)development that is a small subdivision where all the homes are designed to meet the specific needs for the elder population. Each home is custom designed for the original buyer, and upon it's sale can easily be modified to fit the next client.

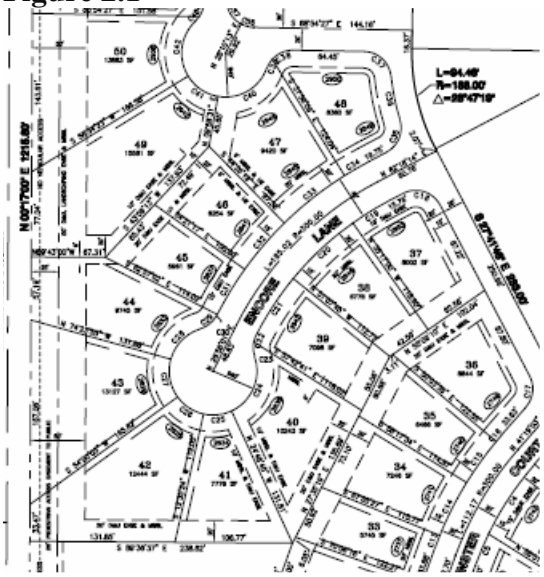
The capstone design students had the opportunity to conduct an in home interview and tour with one of the residents of this neighborhood Mr.(insert interviewee name here), as well as use the site plans to select vacant out-lots to begin their residential design. Some of the Q&A comments from the interview that stood out and had a large impact on the design results were;

Q: What was of the largest adjustments you had to make when moving from your previous residents into this type of living environment?
A: "As many of my neighbors have shared with me we all moved from much larger homes, so storage was a high priority. We all want to hold on to our memories and mementos even if they have to be in storage."

Q: What is one of the obstacles that you wanted addressed that your previous home presented?
A: "Having larger doors in every room, that allow easier access with my wife's walker, and when doing regular task like carrying a laundry basket"

Being able to select their out-lot was seen as a valuable learning tool as this gave students the ability to observe the site and selected one where the natural light would have the best impact on the usability factors. Figure 2.1 shows the site plan used for this particular project.

Figure 2.1



Development

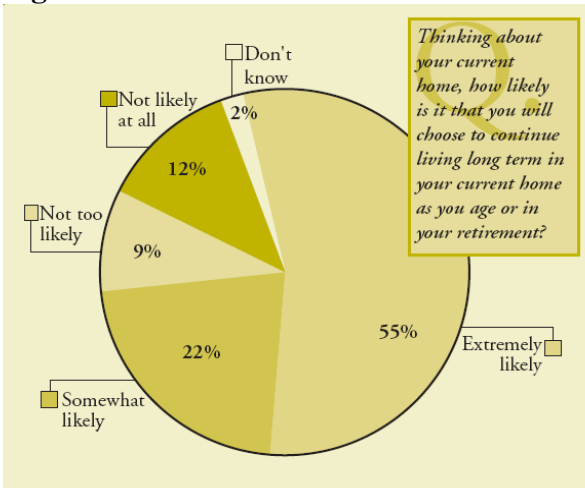
Using a standard sixteen week semester as our project schedule, each student was charged with completing the following task in order:

1. Each student was assigned a research topic related to the design type, where they were to become our content experts. Topics were:
    a. Aging in Place
    b. Assisted Living
    c. Certified Aging in Place Specialist (CAPS)
    d. GREEN Design
    e. Leadership in Energy and Environment Design (LEED)
    f. Residential Building Codes and ADA
    g. National Association of Home Builders (NAHB)
2. Each student was required to select a home site from figure 2.1
3. Each student was asked to submit three floor plan options for their home design, with the only restrictions being that it fit within the boundaries of the chosen lot, and it is a ranch style design.
4. Each student was asked to investigate every possible way to attain LEED Certification points based on their design, and selection of appliances, finishes and architectural elements, using the LEED for Homes Pilot Checklist as the rubric.
5. Each student was required to create marketing posters that include:
    a. Four Exterior Elevations
    b. Kitchen and Bath Elevations
    c. A calculation of how many LEED points they were able to achieve with their design results.
    d. Examples of elements in the home that add to it's environmentally friendliness.

Outcome

This design project addresses the issue of creating housing options for those in need of living options that help promote independence as well as meeting the environmental needs, which in turn may create a healthier living environment as well as a cost savings due to lower energy and resource usage and longer lasting products. The elderly population is growing at an alarming rate, and many of them are and will be homeowners for quite some time. Figure 4.1 shows more results of the ASID study referenced earlier about the likelihood that people will stay in their homes into retirement.

Figure 4.1



One large impact we hoped to have with these designs was to create residences that gained points toward one of the LEED Certification categories. Using the U.S. Green Building Councils LEED for Homes Pilot Project Checklist, we were able to assess how environmentally friendly each home would be and at what certification level it would rank. Using the "How GREEN Is It" checklist shown in Figure 4.2.1the group was able to create a catalog of items and their GREEN qualities to ensure that they met as many qualifications as possible.

Figures 4.2.1 LEED Certification Points total for Home

Appendix A

How Green Is It Rubric

Name: _____
Product: _____
Source (i.e. web site, journal, etc.) _____

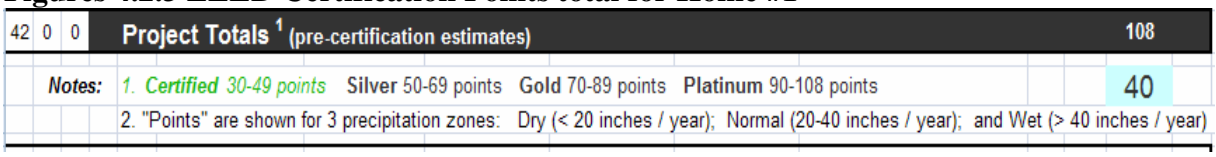
The Product:	Yes	No
1. Is it made from recycled materials?	____	____
2. Is it made from a renewable resource?	____	____
3. Can it be recycled	____	____
4. Does it have a lifespan equal to or greater than most alternatives?	____	____
5. Does it have low levels of VOC emissions?	____	____
6. It contains no formaldehyde or chemical causing toxic fumes?	____	____
7. It can be installed with non-toxic adhesives or fasteners?	____	____
8. Its recommends space be ventilated 24-72 hours after installation prior to occupancy?	____	____
9. Its maintenance uses non-toxic cleaners, or can be maintained with non-toxic cleaners?	____	____
10. Natural pigment or dyes are used?	____	____
11. It is manufactured using processes that reduce waste, emissions, energy, water usage and toxic by-products?	____	____

The 11 question checklist looks at everything from the recycle-ability of the product, to its installation process. The group scored a sizeable number of products selected to use for the interior finishes, as well as windows, doors, and many other items. The results were then displayed in charts like the one displayed in figure 4.2.2. We then looked at adding those points to the LEED Certification for Homes Checklist (see figure 4.2.3) to assess where our homes designs would fall on the grand scale of the points system, with the understanding the homes would have other things that would add points to it as well, like brown field, framing system, site maintenance, etc. The few areas we concentrated our efforts on were able to get a sizeable number of points toward one of the LEED benchmarks, and in some cases met the minimum standards for "Certified" class. Figures 4.3 will indicate some of the GREEN qualities of materials selected as a part of the home designs.

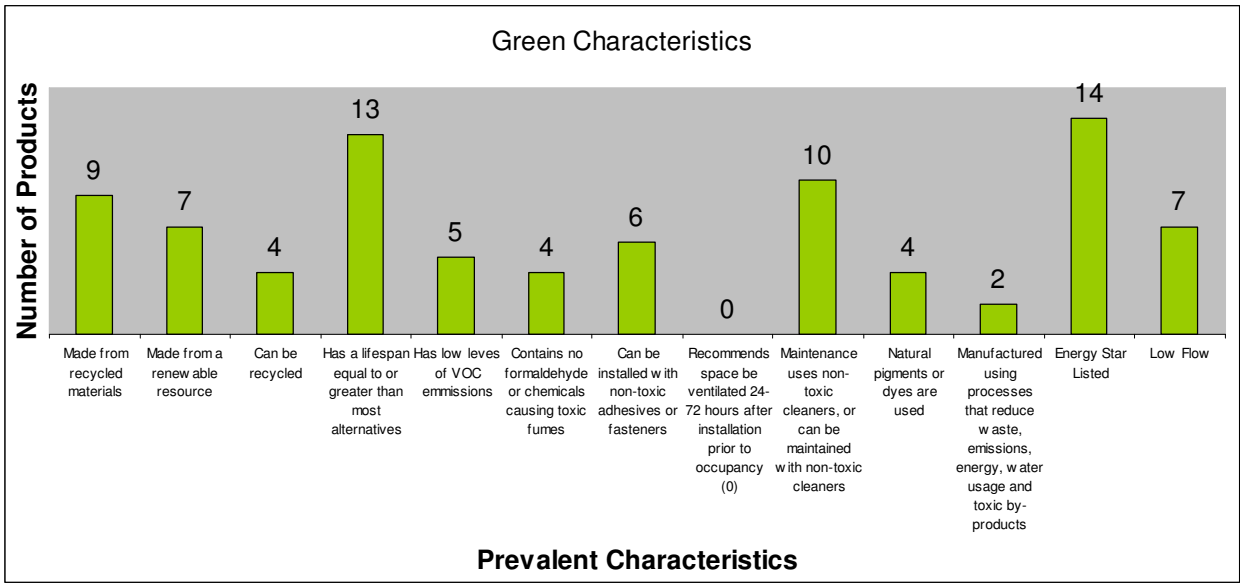
Figures 4.2.2 LEED Certification Points total for Home

LEED Category	Abbreviation	Points
Water Efficiency	WE	4
Energy and Atmosphere	EA	11
Materials and Resources	MR	10
Indoor Environmental Quality	IEQ	1
Location and Linkages	LL	2
Sustainable Sites	SS	2
Homeowner Awareness	HA	1
Innovation and Design	ID	1
Total	**LEED Certified 32 out of possible 108**	**32**

Figures 4.2.3 LEED Certification Points total for Home #1



Figures 4.3. Green Qualities of products used in the designs



Conclusion

In looking back at this capstone project it seems clear that there are advantages in designing environmentally friendly homes that vary from just meeting LEED Certification milestones, or creating energy savings. Contrary to some popular belief, there is an array of beautiful finishes and products on the market that meet the standards of being green, in addition to many products that generate huge cost savings on utilities and resources. See figure 4.4 for a collage of items used on one of the projects, as a demonstration of the aesthetic appeal that environmentally friendly products have. Another major advantage this type of home can have is maximizing the natural elements that come along with a home. As mentioned earlier in the paper, the students looked at location front and back of the home to ensure maximizing the use of natural light, as well as adding skylights, and other elements to enhance this element. Lastly, and certainly no less important was the aspect of efficiency, as we were certain not to forget out target audience. A portion of the elderly population, as evidenced in our surveys and interviews want have a high level of interest in homes that are less on travel time and more on functionality and usability. These designs only touch the surface of how large this area of design will grow in the future as GREEN design continues to grow.

Figures 4.4. Green Qualities of products used in the designs

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