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Case Study

Universal Design in Housing

by Steve Hansler, MSW and
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Educational Objectives

1. Show how an aging population increases the need for housing that is accessible and adaptable.
2. Define visitability, universal design, and accessible design.
3. Explain ways to approach universal design including key factors.
4. Illustrate how universal design can be used in both renovation and new construction.

Background

The correlation between aging and disability has been well-documented. The U.S. Census Bureau reports that only 4.1% of Americans aged 0–21 and 11.0% of those aged 21–64 had a severe disability, but the rate soars to 36.9% for those aged 65 and older (US Census Bureau, 2008). Among older adults, disability rates continue to increase with age. A study by the National Aging Information Center (NAIC)

of mobility and self-care limitations shows that people had one or both limitations at a rate of 9.65% for ages 60–64, 13.3% for ages 65–74, 25.8% for ages 75–84, and 49.8% for ages 85 and older (NAIC, 1996).

It is important to consider the implications of these statistics for housing and housing design. Smith, Rayer, & Smith (2008), writing in the *Journal of the American Planning Association*, find that over the course of the lifespan of a new house, there is a 25% chance that it will have a resident who needs full accessibility, a 60% chance it will have a resident who needs an adaptable house, and a 93% chance that the home will require visitability features. A 2005 study by the Brookings Institution, as reported by *The New York Times* columnist David Brooks (January 19, 2006), says that half of the homes in which Americans will live in 2030 have not been built yet. It is also by 2030 that the aging baby boom generation is likely to be experiencing substantial rates of disability. Studies show that the vast majority of people wish to remain in their homes. The use of universal design

in this not-yet-built housing will increase the likelihood that people will be able to remain in their homes longer and function better as they face aging-related disability.

What is Universal Design?

The housing concepts relevant to this discussion are visitability, accessible design, and universal design. All three apply to any type of housing, although visitability focuses primarily on single-family housing. **Visitability** is a newer concept emphasizing three elements required for a person with a mobility disability to visit a home: an accessible, no-step entry on an accessible route; an accessible travel path throughout the main level of the house; and a usable half or full bathroom on the main level. **Accessible design** refers to housing for with people with disabilities and usually assumes that the person uses a wheelchair or other mobility aides; special design features are in place at the time of construction or renovation.

Universal design is on the spectrum of housing concepts between visitability and fully accessible hous-

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ing. Universal design is often misunderstood; many erroneously assume it means that everything has to be made accessible, regardless of difficulty. Adaptive Environments Center, Inc. provides this definition: “Universal design asks from the outset how to make the design work beautifully and seamlessly for as many people as possible. It seeks to consider the breadth of human diversity across the lifespan to create design solutions that work for all users” (Valerie Fletcher, executive director of Adaptive Environments, Inc., 2002). An academic definition of universal design, used by design professionals, includes Seven Principles as developed by the Center for Universal Design at North Carolina State University. They are: Equitable use; Flexible design; Simple and intuitive use; Perceptible information; Tolerance for error; Low physical effort; and Adequate space for approach, reach and comfort.

Universal design makes housing safer and easier for everyone throughout a lifespan, while anticipating and designing for future needs. Any single home may contain various universal design elements; there is neither one universal design home nor a strict set of rules to build for. This flexibility is both an opportunity and a challenge.

Universal Design’s Key Elements

The essential universal design measurements are: Rooms must include a 60-inch (five-foot) turning radius for a wheelchair to turn, as well as a 30 x 48 inch clear space next to items that a person in a chair may need to use, such as appliances. All doorways and openings must be at

least 32 inches wide, 36 inches preferred. The design must account for a reach range of 18 to 54 inches, the low and high points a person using a wheelchair typically can reach. Any slopes, interior or exterior, shall be no greater than one to 12: for one inch of rise, the length of the walkway/ramp needs to be one foot (12 inches) long. This ratio is easiest to remember as “inches to feet,” thus a nine-inch rise requires a ramp at least nine feet long. Slopes greater than one to 20 require handrails. There are many other important measurements in terms of switches and controls, space at doorways, and other items.

When applying universal design to housing, the best approach is “Outside In.” This approach examines the design elements, ensuring the necessary features are in place, beginning from the exterior and continuing into and throughout the housing. Visualization of how a person with a disability would manage each part is often helpful.

Let us begin with the exterior design elements. The site should be as level as possible and avoid any major grade changes. An accessible travel path with no steps must connect to all necessary amenities, including parking, sidewalks, streets, and public facilities like laundry rooms and building offices. Slopes on the accessible route shall be within the limits previously described. The entry to the building itself should be covered and lighted. The level (no-step) entry is one of the most important design elements and is also a part of visitability. There must be adequate room to maneuver at the doorway and a place to set down packages. The

maximum threshold is ½ inch beveled and the entry door should be at least 36 inches wide.



Grading is the best way to achieve an accessible travel path with a minimal slope. If a ramp is necessary, consider incorporating it into a deck. Finally, automatic door openers are preferred for those who have trouble with opening and closing doors. Lifts are an option, but are not preferred for the primary entry.

Next, we move inside to look at the general interior design elements. This refers to the housing itself, not common areas in a multi-family setting. Doors should have lever handles and be at least 36 inches wide. Halls and openings should be at least 36 to 42 inches wide and provide easy travel paths that avoid trip hazards. Transitions should be smooth with no more than ¼ inch beveled. Consider the users both in layout and in materials and products used, e.g., low level carpet may be better for a person who walks with a cane and may slip, while smooth flooring is easier for a person in a wheelchair.

We now get to the most challenging area: the bathroom; it illustrates the distinctions among the three levels of design. Visitability only requires a usable toilet, which necessitates a wide door and adequate space to approach the toilet. Universal design and accessible design require those basics but also a sink with a single-lever handle faucet

and adequate turning spaces. Both design concepts require blocking in the walls for grab bars; however, accessible design would have the grab bars installed at the outset while universal design would have them installed as needed. Similarly, the sink area would be open underneath in accessible design, while universal design would simply make it possible for the sink area to be open underneath with the initial installation of removable doors. Other bathroom design features include a roll-in shower, pressure-balanced anti-scald valves, and an adjustable-height, hand-held showerhead on a 60-inch flexible hose.

Our next challenge is the kitchen. This room must be designed with consideration to multiple users and multiple functions. Key elements include adequate turning spaces at work areas, cabinets, and work surfaces of varying heights, and pull-out shelves and drawers. The kitchen should also include hardware and pulls that are easy to use and good lighting. Movable carts as part of the work space are also helpful. Sinks should have single-lever faucets and be open underneath or be able to be made that way. Appliances should include a side-by-side refrigerator and a range with front controls and smooth cooktop. Good space for a microwave is essential. There is no clear answer on ovens: both wall-mounted and under-counter options have pros and cons. Regardless of the oven choice, there should be shelves for hot foods near cooking areas.

This is not a full listing of all design considerations. Using the “Outside In” approach and consid-

ering all aspects of how a person functions in the housing helps ensure that all elements are included, whether one is a design professional or simply someone wanting housing to meet needs.

Case Study #1

After a year in a rehabilitation facility following a brain injury, 58-year-old Gary had made significant progress and would soon be able to continue his rehab at home. Now using a wheelchair, he needed help with several activities of daily living. His wife, Ann, sought renovations to their condo so that Gary would be able to function in his current condition, improve his functioning, and still allow Ann to be comfortable in their home.

Using the “Outside In” approach, their first challenge was giving Gary access to their two-story condo. The main entry was on the upper level with a full flight of exterior stairs and a large deck shared with three other condos. Weather, especially snow and ice, was a consideration. The best solution was to enter from the underground garage that included a parking space near the basement door that would be protected from the weather. However, there were two barriers: the five-inch threshold at the door and the stairs from the basement to the main level. Ann decided on a six-foot long, portable ramp for the threshold because it minimized expenses and could travel with them as needed. Although there was a clear travel path from the basement door to the foot of the stairs, there was no obvious space for an elevator, which would have also been too costly. The stairwell

was conducive to a stair lift and Gary is able to transfer from his wheelchair to the stair lift.

The main floor presented several challenges. The kitchen is small and, although Gary would not be cooking, he would need to travel through the kitchen to get to the dining area and would need room to be in the kitchen with Ann when she cooked. The doorways at either end of the kitchen were widened, which also removed a sliding door. The appliances and cabinets were not changed. Removing throw rugs and rearranging furniture created accessible travel paths for Gary.

The door to the master bedroom was reversed so it opened out and swing-clear hinges were added to provide additional clearance so Gary could enter the bedroom. A low-loop carpet was installed. The biggest challenge for Ann and Gary was the narrow and inaccessible master bathroom. After considering several options, they agreed to cut a new entryway in the wall separating the master bathroom and bedroom. The plan called for an exterior-mounted sliding door, but they eventually chose to use a simple privacy curtain. The interior of the bathroom was almost completely changed as well: the tub was replaced with a roll-in shower; a higher toilet was installed; fold-down grab bars were installed next to the toilet; the pedestal sink was replaced with a wall-hung sink; and a full-height wall between the sink and toilet was cut down to half-height to make it easier for someone to help Gary at the sink. This bathroom was then usable by both Ann and Gary.

Another modification enabled Gary, with assistance, to go out onto the main deck off of the living room and bedroom. The remodeler improvised a portable metal ramp that fit over the sliding door tracks with a nine-inch bevel on each side. After these renovations were complete, Gary was able to come home and function well. Except for some health setbacks, he has made excellent progress and has much-improved functioning.

Case Study #2

Multi-family housing for people with physical disabilities presents a special challenge, for the specific functioning levels of, and mobility aides used by, future tenants are unknown. The design must work over several years for multiple occupants who may have differing functioning levels and must also work for able-bodied family members. For this case, New Circle Vistas, additional challenges included an urban site with limited square footage and limited construction funds. This case study follows the “Outside In” approach and focuses primarily on design decisions related to the multi-family/multi-disability challenge.

We begin again with designing a fully accessible entry. The challenges include weather, differing modes of transportation, security, and the 24-hour nature of apartment living. Curbless pathways eliminate barriers and are usable for all tenants, regardless of disability. A porte-cochere covers the main entry and allows tenants comfortably to enter and exit vehicles. Automatic door openers on the entry doors remove the need to manually open

and hold open heavy doors. However, security concerns require that the tenants use key cards or fobs to open doors. This also keeps tenants with limited reach or low hand dexterity from having to maneuver keys. Visitors must be let in or be buzzed in via intercoms.

Next we consider the common areas. The lobby is spacious with windows so that tenants, either with or without their caregivers, can comfortably wait for transportation or visit with neighbors and friends. There is a patio area that features accessible picnic tables, grills, and planters that tenants can use. These large areas for tenants to socialize in, including a community room, are important as it is difficult for multiple wheelchairs to fit into an apartment. Hallways are six-feet wide, so that tenants who use wheelchairs can easily turn around or travel together and have a handrail to provide support to tenants who walk. A laundry room on each floor has front-loading machines and is centrally located, as is the trash room on each floor. Two elevators are centrally-located and have a large waiting area on each floor to accommodate multiple tenants and their companions.

Tenants spend the majority of their time in their units. A wide travel path with a five-foot turning radius and no steps or barriers allows tenants to easily maneuver through the unit and utilize each of the rooms, regardless of type of mobility aide used. Flooring is planned to be the most functional for the widest range of users: low-pile carpet in the living room is glued directly to the floor and vinyl composition tile in the kitchen and bedroom minimizes

tripping hazards and is easy for wheelchairs to roll over. Casement windows are only two feet from the ground and have easy-open handles so that tenants can see out their windows as well as open and close them without assistance.

Bathrooms must be designed so that a wheelchair user can function with or without assistance. They are spacious, with an integrated shower area that maximizes the turning radius throughout and leaves room for an aide to help with the shower. The shower has a hand-held adjustable shower head, enabling tenants, regardless of size and ability to stand, to wash themselves, and allows caregivers to assist them. The entire room has a pre-engineered, sloped floor with consistent drain-age and the walls are reinforced so that grab bars can be mounted anywhere needed. The bathroom is the most “institutional” room in the apartment, requiring the most adaptation by able-bodied users.

The kitchens must be very flexible because the tenants use different parts of the kitchen in different ways depending on their disability and who assists them. They are designed so that tenants can use them, from getting a glass of water to cooking a meal to cleaning, with as little assistance as possible. A side-by-side refrigerator allows easy opening and access to parts of both the refrigerator and freezer, as well as the in-door ice/water dispenser. Countertops are 34 inches high, allowing all tenants to use the counter comfortably, and an eight-inch high toe-kick keeps tenants from having to reach down very low to the bottom shelf. Pull-out

shelves and drawers are usable by all. The kitchen has a peninsula with a built-in table that is open underneath and provides additional counter space tenants can use as a table, kitchen work space, or a desk.



The electric range has front controls and a smooth-top that are easy and safe. The sink has a lever handle and is open underneath. All of these design features make a kitchen that both an able-bodied person and a person in a wheelchair can use easily.

The design process for this building included obtaining input from the people who will live in it. This proved to be an invaluable source of insights and design improvements, such as moving a closet wall by six inches and adjusting the bathroom layout. Involving future residents or others with similar disabilities in the design is essential.

Conclusion

By incorporating universal design, we can renovate or build housing that enables people to remain in their homes if they face disabilities, especially those some encounter in growing old. This helps keep communities stable by reducing vacant housing. Furthermore, in an era when governments are trying to reduce expenditures, allowing people to stay out of long-term care facilities should be a priority.

Implementing universal and accessible design is not difficult if one follows the approaches outlined here. However, it does require action now if such housing is to be ready by 2030. The housing industry is demand-driven. Just as people demand items like stainless steel appliances, they can demand universal design.

Study Questions

1. What are the similarities and differences among universal design, visitability, and accessible design?
2. How does using the “Outside In” approach benefit the design process?
3. What are some differences between using universal design for a known individual and for an unknown future resident?
4. How will using universal design in housing now help with aging-in-place two decades from now?

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U.S. Census Bureau. (2008). Americans with Disabilities. Retrieved from: www.census.gov/prod/2008pubs/p70-117.pdf

Resources

Assist Utah. The ASSIST Guidebook to the Accessible Home. Found at: www.assistutah.org/docs/guidebook_v6.pdf

Center for Universal Design at North Carolina State University. Found at: <http://login.npwebsiteservices.com/mil/NCV%20Accessibility%20Features.pdf>

Maximum Accessible Housing of Ohio. Distinctive Accessibility Features of New Circle Vistas. Found at: <http://login.npwebsiteservices.com/mil/NCV%20Accessibility%20Features.pdf>

Visitability Information found at <http://www.concretechange.org/>

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Steve Hansler, M.S.W. from Rutgers University, has been Executive Director of Maximum Accessible Housing of Ohio (MAHO) since 1984. He has developed five fully accessible apartment communities for people with mobility disabilities. He was a member of the State Housing Plan Advisory Board for the State of Ohio.



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