

**RECOMMENDATIONS
FOR ESSENTIAL AND ADVANCED
UNIVERSAL DESIGN FEATURES
AND PRODUCT CHARACTERISTICS
IN NEW, SINGLE-FAMILY HOUSING IN WASHINGTON**

A Report of the Housing Task Force, Northwest Universal Design Council

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Table of Contents

	Page
Executive Summary	3 – 6
I. Introduction	7
II. Development of the ‘Recommendations’	8 – 10
A. Process	
B. Context	
1. categories	
2. characteristics	
3. considerations	
4. miscellaneous considerations	
a. connectedness to sidewalks, street systems, neighborhood and community	
b. building codes	
III. Design Features and Product Characteristics for Specific Rooms and Spaces	11 – 29
A. Entrances	
B. Exterior and Site Considerations	
C. Garages and Carports	
D. Interior Circulation: Doors, Hallways & Clear Floor Space	
E. Vertical Circulation: Stairs, Residential Elevators and Vertical Platform Lifts	
F. Bathroom’s	
G. Kitchen	
H. Kitchen Appliances	
I. Laundry	
IV. Design Features and Product Characteristics for Whole House	30 – 34
A. Switches and Controls	
B. Storage	
C. Lighting and Color	
D. Windows	
E. Hardware	
F. Home Automation	
V. Next Steps and Discussion	35 – 36
VI. References	37
VII. Appendix	38 – 47
A. Background on Universal Design and Application to Housing	
1. building blocks	
2. principles of universal design and application to housing	
3. benefits of universal design	
B. Universal and Accessible Design and VISIBLE Housing	

Executive Summary

Universal design (UD) is an approach to design that recognizes and accommodates the ordinary changes people experience over their lives, due to aging and life circumstances, by addressing the range of human abilities: physical, cognitive and sensory. UD benefits people through all life stages, including children and adults, older adults experiencing age-related changes, and people of all ages experiencing a temporary or permanent disease or disability. UD supports one of the most important goals of good design, namely, that it should meet the needs of as many users as possible, now and in the future.

In the broader, more holistic, sense, universally designed housing is inclusive, supports social justice and is sustainable. Furthermore, a truly sustainable home supports social, economic and environmental well-being. The ability to live in one's home and neighborhood throughout the lifespan, move about safely, and feel secure and independent reflects social sustainability; the cost-efficiency over time reflects economic sustainability, achieved in part from reducing extensive remodels, expensive retrofitting and delaying moves to care facilities; and the efficient use of resources such as water, waste and energy reflects environmental sustainability.

The Housing Task Force, a sub-committee of the Northwest Universal Design Council, sought to create recommendations for designing and building new, single-family housing that was universally designed. The members of the task force are housing and design professionals representing interior design, architecture, accessibility consulting, local government housing planners and specialists, and real estate. The project spanned the years from 2006 to 2010.

The final report is presented as *Recommendations for Essential and Advanced Universal Design Features and Product Characteristics in New, Single-Family Housing in Washington*.

General considerations for universally designed housing included the following:

- The range of human abilities includes physical, sensory and cognitive abilities
- The seven principles of universal design are incorporated.
- Representation of performance goals and prescriptive standards; which guide the design of the range of housing from speculatively built housing to custom housing.
- The relationship of housing to the neighborhood and community
- Differentiation between universal design and visitable, adaptable and accessible design

Universal design is different from *visitable, adaptable* and *accessible design*. *Visitable design*, visitability or visitable housing, aims to incorporate basic access into all new constructed homes by requiring a few specific features that make the home easier for people

with mobility impairments to visit. These three features define a scope that is currently possible for rapid, broad application in new construction. The features are: one zero-step entrance, at the front, back or side of the house; all main floor doors, including bathrooms, with at least 32 inches of clear passage space; and at least a half bath, preferably a full bath, on the main floor. Visitable design in housing is often achieved through local and/or state ordinances. Thus, a newly designed and built house may be visitable, but not universal; and vice versa.

Universally designed housing contains features that are accessible and adaptable. Deardorff and Beardsong (Introduction to Housing, 2006) define *accessible design* as products and environments that are easy to approach, reach, enter or use. Mandatory requirements for accessible housing vary widely and are found in state and local building codes and in government agency regulations; are often associated with publicly financed housing; and are frequently found in multi-family residences. However, even though the accessible design features are not required, they can be used as guidelines for accessibility in single family, privately produced and/or owned housing. Although accessible design is a major component of universal design, universal design is more comprehensive.

Deardorff and Beardsong (Introduction to Housing, 2006) define adaptable design as design containing flexible features that can be adjusted for the personal needs of specific users in a short time by unskilled labor without involving structural or finish material changes. Universal design incorporates adaptability.

- The whole house is universally designed, thus, the whole house can be lived in. Ideally, universal design is incorporated into the whole house when it is designed and built. Thus, these recommendations apply to a whole house, rather than just part of the house or just one floor of the house. Also, a house would not be considered universally designed if it just contained some universal design features.

Specific considerations for universally designed housing and this project included the following:

- Questions Asked Regarding Design Features

The HTF deliberated on each universal design feature and product characteristic under consideration, asking: 1) what is the feasibility of it being done in the most constraining house design, such as a townhouse (tall, narrow structure) and 2) is the design feature or product characteristic flexible and/or adaptable? could it be installed at a later date with relative ease and low cost? and are the structural elements in place for the design feature either at present or for future adaptation?

- Levels for Design Features and Product Characteristics

The recommended design features and product characteristics are presented at two levels: essential and advanced. The *essential level* represents those design features and product characteristics that are required for house to be universally designed. The *advanced level* represents those design features and product characteristics that would enhance the essential features, but are not required.

Presentation of Report:

The report is presented in seven sections. Sections I – V provide the primary information regarding the report. Section I, the Introduction, introduces the reader to the concept of universal design as it is applied to housing. Section II, Development of the ‘Recommendations’ presents the process by which and the context within which the recommendations were developed. Section III, Design Features and Product Characteristics for Specific Rooms and Spaces, presents the essential and advanced design features and product characteristics in chart format for the following rooms/spaces: entrances; exterior and site; garages and carports; interior circulation (doors, hallways and clear floor place); vertical circulation (stairs, residential elevators and vertical platform lifts); bathroom’s; kitchen; kitchen appliances; and the laundry.

Section IV, Design Features and Product Characteristics for Whole House, addresses design features and product characteristics, in chart format, that would be applied to the whole house, including: switches and controls; storage; lighting and color; windows; hardware; and home automation. And finally, Section V, presents the Next Steps and Discussion.

Section VI presents the references and Section VII is an appendix.

Use of report/recommendations:

The development of the ‘Recommendations’ was the first step in creating guidelines or a standard for the design and build of universally designed houses in Washington state. It is a working document and feedback from its use will be necessary for evaluation and revision.

The ‘Recommendations’ are a primary data source that could be used, as is, in the design and build of housing or could be further developed into other types of resources that would be used by residential designers and builders.

It is important to note that the presence of universal design features and product characteristics are determined during the planning, selection of materials and products, and during construction. Therefore, it is important to evaluate for the presence of universal design features and

product characteristics in plan, elevation, section and detail views; in product selection; and during construction. It is also important to evaluate the quality of implementation once the project is complete.

Two goals for universal design are to 1) accelerate the adoption of universal design features in residential design and building and to 2) transform the market to one in which universal design features are the standard for design and construction, rather than the exception

Universally designed housing is good design that benefits people of all ages and abilities. It supports the design and build of housing that is holistically sustainable, which includes environmental, social and economic sustainability.

Universal design is the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design.

Center for Universal Design, 1997, p.1

I. Introduction

Existing housing is neither designed nor built to provide for users across a range of ages and abilities. And, it tends to not be adaptable or sustainable. In contrast, universal design (UD) is an approach to design that recognizes and accommodates the ordinary changes people experience over their lives due to aging and life circumstances. As such, universal design benefits people through all life stages, including children and adults, older adults experiencing age-related changes, and people of all ages experiencing a temporary or permanent disease or disability. UD is a concept that reestablishes one of the most important goals of good design, namely, that it should meet the needs of as many users as possible, now and in the future.

Although universal design applies to all products and environments, this report focuses specifically on new, single-family housing. Few, if any, existing programs promote universal design in single-family housing, specifically in the private sector. In addition, a large percentage of new construction is speculatively built and sold, thus, not individualized to custom standards. Universal design is not a particular house type or style. The UD approach to designing and building houses uses a range of attitudinal, design and construction refinements to create living spaces that benefit everyone now, yet are flexible enough to be adapted to meet the needs as people's lives change over time and with circumstance. From the outside, a universally designed house will look similar to a traditionally designed house, and on the inside, most of the design features and product characteristics will be virtually invisible.

Incorporating universal design features and product characteristics during the design and construction phase of housing results in housing that is: functional (easy to use, safe and convenient), attractive (a well-integrated design), cost effective and emotionally supportive – supporting independence for people of all ages and abilities.

In the broader, more holistic, sense universally designed housing is inclusive, supports social justice and is sustainable. A truly sustainable home supports both human and environmental health. By evolving with the needs of the users over time, it decreases the need to extensively remodel, retrofit or move, thus, decreasing the enormous amounts of waste and the depletion of natural resources that are associated with traditional design and build of houses.

This report presents recommendations for designing and building new, single-family housing that is universal in its entirety, rather than designing and building housing that contains some universal design features, that is accessible, or that is visitable. Brief descriptions of those terms are provided in the appendix.

II. Development of the Recommendations

A. Process

The Housing Task Force (HTF), a sub-committee of the Northwest Universal Design Council, began meeting in May of 2006 to discuss a process for determining the universal design features and product characteristics to be included as standards or guidelines *for new single-family universally designed housing* to be designed and built in our community (city, county, state). The main source of information used was the research findings reported in *Universal Design Features and Product Characteristics for New Residential Construction* (Hartje, 2006). The areas identified in the findings (such as entrances, kitchens, bathrooms, laundry, etc.) were divided among the small groups who were then assigned to evaluate the application of the findings to our goals for universal design in housing. The groups were also directed to add any components that were not included in the report, as appropriate, and to return to future task force meetings with their evaluations and recommendations.

Over the course of the next three years, HTF members met in two-hour sessions for at least 18 additional meetings to discuss the evaluations and recommendations. Correspondence via email and telephone occurred between meetings.

The report that follows is the result of the many hours of work by HTF members and numerous revisions of the document, which is itself a work in progress. Prior to the presentation of the recommendations for design features and product characteristics, general information will be presented to provide the context within which the recommendations were made.

B. Context

Two goals commonly associated with universal design and housing are: 1) to accelerate the incorporation of universal design in housing and, 2) to transform the market to one in which universal design is the standard for design and construction, rather than the exception. One day, hopefully sooner rather than later, universal design will be accepted for what it is – good design for all, or at least for a broader range of users.

To assist in reaching those goals, the HTF sought to develop a standardized list of universal design features and product characteristics. This list will facilitate the thoughtful and intentional design and build of housing that is useable now for a broader range of users and that can be adapted over time as the users needs change. The result is this document, hereafter referred to as the ‘Recommendations’. The purpose of the Recommendations is to provide a standardized list to be used to identify (describe, explain, etc.) those design features and product characteristics that would make a house, particularly new construction, universally designed – in it’s entirety, rather than a house which contains some universal design features or a house that is accessible. This basic information will need to be developed into a resource to be used by housing consumers or housing professionals.

The context for universal design in housing is presented in four sections: categories of universal design, characteristics of the recommendations, considerations for each design feature and product characteristic, and miscellaneous consideration, such as building codes and connectedness to streets, neighborhood and community.

1. Categories of Universal Design

To design and build a house that is universally designed, design features and product characteristics are divided into two categories (or levels) – essential (level 1) and advanced (level 2), as follows:

- Level 1: *essential* – feature must be present for house to be considered universally designed; these are basic and necessary – without the design feature, the house cannot be considered universally designed.
- Level 2: *advanced* – these features are in addition to the essential features; they are recommended, but not required. They will enhance universal design. Consideration is being given to having two levels of achievement of the advanced category.

If a newly built house contains the essential features, it could be marketed as being ‘universally designed’. If the same newly built house contained just some of the design features, it would be marketed as ‘containing universal design features’. Furthermore, features could be identified as accessible if they fit those requirements.

Also, in the use of the charts that follow, some features are determined in the development of the plan, while others are part of product selection and/or actually determined during the construction process. Therefore, determining the presence of universal design features and product characteristics will take place while evaluating

plan, elevation, section and detail views; during product selection (features, materials, finishes, etc.) and during construction (for example, height of outlets and switches). A final evaluation should be conducted when the project is complete to determine the presence of universal design features and the quality of implementation.

2. Characteristics of the Recommendations

The Recommendations were developed by a group of housing and related professionals, as listed before the Table of Contents. The Recommendations are a standard that:

1) applies to new construction, 2) applies to single family housing (housing with 1 – 4 units), both single- and multi-story; 3) will be used within our community (cities, counties and state); and 4) will be implemented voluntarily by housing professionals. A similar document for multi-family housing may be prepared at a later date.

3. Considerations for the Design Features and Product Characteristics

As the HTF deliberated on each universal design feature and product characteristic, the following questions were asked: 1) what is the feasibility of it being done in the most constraining house design, such as a townhouse (tall, narrow structure) and 2) is the design feature or product characteristic flexible and/or adaptable? could it be installed at a later date with relative ease and low cost? And are the structural elements in place for the design feature either at present or for future adaptation?

4. Miscellaneous Considerations

Two considerations emerged in the discussion that are important, but perhaps beyond the scope of this report.

a. Connectedness to sidewalks, street systems, neighborhood and community

Housing doesn't exist in a vacuum. Residents want and need to be able to connect to their neighborhood and community. Therefore, sidewalks, street systems, neighborhood design and community development must all be considered.

b. Building codes

This is a reminder to designers, builders and developers to always check their local building codes for the most current requirements. Codes establish minimum regulations.

III. Design Features and Product Characteristics for Specific Rooms and Spaces in New, Single Family Housing

A. Entrances

1. Essential Features	Yes	No	NA	Comments
a. General				
▪ At least one stepless entrance that is not through the garage or from a raised patio or deck				
▪ 3' – 0" minimum exterior door width				
▪ maximum ½" rise at all entrance thresholds, beveled to ¼"				
▪ minimum 5' x 5' level clear space inside and outside of the entry door(s)				
▪ covered exterior entrance				
▪ clear floor space (18" – 24") beside door on pull side at latch jamb				
▪ general illumination inside and outside the entry door				
▪ house numbers large, high contrast, and located in a prominent place (visible from street)				
▪ lighted doorbell installed at reachable height of 40" – 44" AFF				
▪ wide angle peep hole viewers in door, at two levels; <i>or</i> full-length sidelights or glass panel in door				
▪ exterior sliding doors: drop frame and threshold into sub-floor to reduce height of track				
b. Door lockset and handle				
▪ 4" – 5" lever handle				
▪ large thumb dead-bolt lever				
▪ mortise style integral latch and lock				

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Report of the Housing Task Force, Northwest Universal Design Council by Sandra C. Hartje, Ph.D.; Seattle Pacific University; Sept. 2010.

2. Advanced Features	Yes	No	NA	Comments
a. General				
▪ all entrances are stepless				
▪ focused light on lockset outside entry doors				
▪ exterior built-in shelf, bench or table with knee space below located adjacent to the door				
▪ motion detector light controls to operate entry locks and provide security				
▪ porch, awnings, long roof overhangs and/or carports extending beyond covered entrance, including pathways from vehicles to primary entrance				
b. Door lockset and handle – no advanced features				

B. Exterior and Site Considerations

The preference is to design primary pathways that are flat or minimally sloped, incorporating the general features as given below.

1. Essential Features	Yes	No	NA	Comments
a. General				
▪ maximum ½” rise at all entrance thresholds, beveled to ¼”				
▪ 36 – 48” clear width minimum for primary pathways				
▪ surfaces of paths are firm, stable and slip resistant				
▪ cross slope maximum of 2% on paths				
▪ decks built at same level as house floor with board spacing a maximum of ½” apart				
▪ drive way and garage elevated to house floor level so vehicles do the climbing				
▪ mailbox, garbage and recycling reachable on an accessible route of travel				
▪ use of retaining walls, bermed earth, elevated walkways and/or ramps to create smooth transitions between areas of different elevations				
▪ ½” maximum width of openings in grates perpendicular to travel, if present				
▪ design primary pathways to minimize use of ramps; however, ramps are preferable to stairs. The design of pathways is related to slope, as follows:				
1. Sloped pathway (slope less than 1:20)				
- resting intervals on top and bottom (interval where length = width of pathway and slope is a maximum of 2% or 1:50)				
- if pathway longer than 10’, then provide resting interval				
2. Ramp (with slope 1:12 to 1:20)				
- resting intervals on top and bottom				
- design of ramp is well integrated into overall design of house and site (unobtrusive – aesthetically pleasing)				
- minimum handrail on one side according to local residential code				
3. Slope greater than 1:12 and ramp not an option				
- if there is another accessible entrance, it is okay to use steps; however, incorporate plans for the future installation of a vertical platform lift				

2. Advanced Features	Yes	No	NA	Comments
a. General				
▪ 44 – 48” clear width minimum for primary pathways				
▪ 2” – 4” edge protection along paths (such as wood, bricks, concrete, etc.)				
▪ railing or other grab points along pathways				
▪ seating such as seat wall or bench with arms (height to be determined)				
▪ landscaping planted at varying heights to take advantage of different ground levels, utilizing planters and raised beds where appropriate				
▪ raised garden bed 24” high with consideration given to horizontal reach range				
▪ planters accessible from more than one side				
▪ outdoor living area that includes choice of experiencing sun or shade, exposure or seclusion				
▪ outdoor living area accessible from interior spaces				
▪ primary pathway from front to back of house				

Note: Consult the local residential building code for railing heights.

C. Garages and Carports (if provided)

1. Essential Features	Yes	No	NA	Comments
a. General				
<ul style="list-style-type: none"> ▪ 13' minimum interior width for garage or carport 				
<ul style="list-style-type: none"> ▪ 8' – 0" minimum door height or alternate on-site parking for tall vehicles. If on-site parking is the alternative, it must be covered and have a clear path of travel to the accessible entrance 				
<ul style="list-style-type: none"> ▪ remote control operated overhead doors, when doors are provided; with wall switch for garage door opener installed with controls at 40 – 44" AFF; and with 30 x 48" clear floor space in front for approach 				
<ul style="list-style-type: none"> ▪ entrance from garage/carport into house is stepless unless accessed by vertical platform lift (VPL) or elevator 				
<ul style="list-style-type: none"> ▪ When a stepless entrance is not provided, extra length and width inside garage around cars must be provided. The recommendation is 8' – 0" adjacent to the side of one car with direct access to step-less garage entry door into home, such as a ramp to the interior entrance. The 8' – 0" is the combined van ramp lift length and clearance to disembark from the lift. Clearance for circulation behind and/or in front of vehicles 3' – 0" minimum. 				
b. Other elements often located in garage				
<ul style="list-style-type: none"> ▪ furnace, hot water tank, water shut-off, electrical panel, machine room for elevator or lift, mechanical equipment, etc. are accessible 				
<ul style="list-style-type: none"> ▪ adequate lighting provided for path of travel and safe operation of appliances 				

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2. Advanced Features	Yes	No	NA	Comments
a. General				
▪ 16' minimum interior width for garage or carport				
▪ 8' – 6" garage door height				
▪ stepped entrance with ramp from garage/carport to house or sloping garage floor. This would be on a case-by-case basis and/or if a code requirement				
▪ a single, overhead double-door for a two-car garage door				
▪ battery back-up for garage door				
▪ keypad entry for automatic garage door in an accessible location				
b. Other elements often located in garage				
▪ provide window and side door (specific requirements for size, shape, location, operation and approach to be determined)				
▪ curbless floor basin with hot and cold controls				

D. Interior Circulation: Doors, Hallways and Clear Floor Space

1. Essential Features	Yes	No	NA	Comments
a. General				
▪ clear width door opening (cwo) a minimum of 32", with flush thresholds, for all interior doors				
▪ clear floor space (18" – 24") beside door on pull side at latch jamb				
▪ 5 pounds maximum force to open doors				
▪ circulation route 42" width minimum				
▪ minimum 5' – 0" diameter maneuvering space in all rooms				
▪ interior pocket doors – when fully opened should extend 1 ½" – 2" maximum outside door jamb and be equipped with open looped handles; maintain a minimum of 34" clear width opening				
▪ bi-pass closet doors with a minimum 32" clear width opening or bi-fold doors. Where feasible, pocket style doors could be used				
▪ floor finishes that minimize glare and are slip resistant. Stain resistant and low maintenance are also recommended				
▪ maximum change in floor surfaces ½" with ¼" bevel				
▪ exterior sliding doors: drop frame and threshold into sub-floor to reduce height of track				
b. Door lockset and handle features				
▪ 4" – 5" lever handle				
2. Advanced Features – no advanced features				

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E. Vertical Circulation: Stairs, Elevators and Vertical Platform Lifts

Stairs				
1. Essential Features	Yes	No	NA	Comments
a. General				
▪ minimum stair width 48" (wall to wall)				
▪ handrails on both sides of stairs, with returns				
▪ stair handrails extend horizontally beyond top and bottom risers, as feasible				
▪ all stairs to have minimum space (30" x 48") at the top and bottom for possible future installation of a chair lift OR at least one set of stacked closets, pantries, or storage spaces with knock-out floor for <i>future installation</i> of an elevator or vertical platform lift (VPL), providing a minimum footprint size of 5' x 5'				
▪ electrical outlet at bottom or top of stair for future installation of chair lift and/or vacuuming				
2. Advanced Features	Yes	No	NA	Comments
a. General				
▪ stair handrails color contrast with wall color (recommended a minimum of 3 units on the 10 unit grey scale)				

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Elevator (also refer to current, local elevator code)				
1. Essential Features (preparation for future installation)				
a. General				
▪ at least one set of stacked closets, pantries, or storage spaces with knock-out floor for future installation of an elevator or vertical platform lift (VPL)				
▪ minimum footprint size of 5' x 5' clear floor area or interior floor space or maximum allowed by code for future elevator; a recessed 'pit' may need to be poured in the concrete floor with the same dimensions as the shaft x 12" deep with a level bottom (no sloping and no drains) of 4" thick reinforced concrete that is waterproofed and provides adequate headroom in upper landing shaft way				
▪ structural support in wall to support rail				
▪ electrical preparation for dedicated circuit				
▪ consideration for machine and/or controller location				
▪ plan future elevator location to access public spaces of home rather than opening into private spaces				
▪				
2. Advanced Features (installation at time of construction)				
a. General				
▪ a minimum of 5'-0" x 5'-0" clear floor area or interior floor space or maximum allowed by code				
b. Controls				
▪ Can be used with low effort and with minimum dexterity				
▪ Top of controls no higher than 44" AFF				
▪ Raised, cupped or otherwise detectable by touch				

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Vertical Platform Lift (VPL)

1. Essential Features (preparation for future installation)				
<ul style="list-style-type: none"> ▪ minimum footprint size of 4' – 6" x 4' – 6" clear floor area or interior floor space or maximum allowed by code for future VPL; a recessed “pit” may need to be poured in the concrete floor with the same dimensions as the shaft x 4" deep with a level bottom (no sloping and no drains) of 4" thick reinforced concrete that is waterproofed. 				
<ul style="list-style-type: none"> ▪ plan future VPL location to access public spaces of houses rather than opening into private spaces 				
2. Advanced Features (installation at time of construction)				

Note: Generally, the above apply; however, consult the local building code and elevator code for current practice.

F. Bathrooms

1. Essential Features	Yes	No	NA	Comments
All bathrooms:				
a. General				
<ul style="list-style-type: none"> ▪ ¾" plywood blocking installed on walls around toilet, tub and shower for future grab bar and shower/tub seat anchoring 				
<ul style="list-style-type: none"> ▪ 30" x 48" clear floor space in front of each fixture (lavatory, commode, etc). 				
<ul style="list-style-type: none"> ▪ 32" – 34" lavatory counter height with provision in base cabinet for 27" – 29" knee clearance; minimum width of base cabinet is 42" 				
<ul style="list-style-type: none"> ▪ slip-resistant walking surfaces (≥ .7 coefficient of friction factor wet and dry; static) 				
<ul style="list-style-type: none"> ▪ lighting in or near the tub/shower 				
At least one bathroom on each floor shall fully contain the following features:				
a. General				
<ul style="list-style-type: none"> ▪ 5' minimum diameter maneuvering space, this can overlap the 30" x 48" clear floor space at each fixture and can include the knee/toe space under the lavatory and countertop. Provide 30" x 48" clear floor space in room free of door swing. 				
b. Lavatory/Sink and Faucet				
<ul style="list-style-type: none"> ▪ lavatory/sink design allows knee clearance or simple adaptation to achieve knee and toe clearance underneath the sink for a minimum of 30" width. Knee and toe clearance allows someone to pull a wheelchair up close enough to use the sink directly in front of them, as follows: <ul style="list-style-type: none"> - knees should be able to extend a minimum of 8" deep and 27" high under the sink - toes should be able to extend another 6" deep and 9" high 				
<ul style="list-style-type: none"> ▪ if cabinet is provided, provide minimum 36" clear width to allow for future knee clearance if the cabinet doors are removed 				
<ul style="list-style-type: none"> ▪ sink design allows the drain pipes to be outside the knee clearance area described above 				

- ideas to consider: install plumbing from wall rather than the floor, sink has a rear drain, and sink depth is a maximum of 6 ½"				
▪ waste pipe and supply line protection provided under sink if pipes are exposed or when cabinetry is removed				
▪ counter space and/or shelving is within users reach if provided; provide variety				
▪ controls can be operated with a closed fist, preferably lever control				
▪ controls have easily distinguishable hot/cold labeling with letters or color temperature display. Hot/cold controls are consistent throughout the house				
c. Commode/Toilet				
▪ elongated bowl style (to accommodate male and female users)				
▪ centered 16" – 18" from any side wall, cabinet or tub (preferably in corner to accommodate grab bar)				
▪ seat height 17" – 19" AFF				
▪ 30" x 48" clear space in front of and to one side of toilet				
▪ flush control on open side, or side opposite wall				
d. Grab bar(s) – see advanced features below				
▪ ¾" plywood blocking installed on walls around toilet, tub and shower for future grab bar and shower/tub seat anchoring				
e. Mirror				
▪ mirrors placed over a counter to have the bottom or the reflective surface 36" – 40" AFF and the top a minimum of 76" AFF				
f. Shower(s) and Tub(s)				
▪ if there is only one full bathroom, provide a curbless shower with accessible shower unit and controls				
▪ if there are two (2) full bathrooms, one bathroom shall have a bathtub with accessible shower unit and controls and one bathroom shall have a curbless shower (with minimum dimension of 3' – 6" x 5' – 0") with accessible shower unit and controls				
▪ hand held shower unit, minimum 69" long flexible hose attached to an adjustable glide bar that is a minimum of 36" long				
▪ controls can be operated with a closed fist, preferably lever controls				

<ul style="list-style-type: none"> ▪ controls have easily distinguishable hot/cold labeling with letters or color temperature display. Hot/cold controls are consistent throughout the house 				
<ul style="list-style-type: none"> ▪ non-slip surfaces on bottom of tubs and showers 				
<ul style="list-style-type: none"> ▪ controls have pressure balance anti scald or temperature safe feature 				

At least one bathroom on each floor shall fully contain the following features (continued):				
2. Advanced Features	Yes	No	NA	Comments
a. General – no advanced features				
b. Lavatory/Sink and Faucet				
<ul style="list-style-type: none"> ▪ Sink color contrast with counter ▪ Motion sensor controls 				
c. Commode/toilet				
<ul style="list-style-type: none"> ▪ Outlet placed near the base of the commode/toilet (roughly 12” AFF and 12” from center line of toilet, on open side, for future plug in) ▪ ¼ turn shut off valves for toilet and sink plumbing ▪ Motion sensor controls 				
d. Grab bars				
<ul style="list-style-type: none"> ▪ Install grab bars ▪ Color of grab bar(s) contrasts with wall color ▪ 1 ¼” – 2” diameter cross section ▪ no more than 1 ½” clearance from the wall ▪ grab bars can be installed horizontally, vertically or diagonally depending on the needs of each person. Consider upper body strength, type of mobility assistance equipment, etc. 				
e. Mirror				
<ul style="list-style-type: none"> ▪ adjustable mirror, with ability to adjust the angle 				

Recommendations for Essential and Advanced Universal Design Features and Product Characteristics in New, Single-Family Housing; Report of the Housing Task Force, Northwest Universal Design Council by Sandra C. Hartje, Ph.D.; Seattle Pacific University; Sept. 2010.

G. Kitchens (including sink and faucet)

The primary work areas in the kitchen are the sink, cooktop/oven and refrigerator. The following lists provide the design features for those areas, rather than the placement of the primary work areas.

1. Essential Features	Yes	No	NA	Comments
a. General				
▪ loop or touch latch hardware				
▪ space between face of cabinets and opposite cabinets and/or walls a minimum of 48"				
▪ adjustable height shelves in wall cabinets				
▪ full-extension, pull-out drawers, shelves, and/or racks in all base cabinets				
▪ continuous countertops at standard height (36" AFF) between primary work areas (sink, cooktop/oven and refrigerator) so items can be slid from one area to another safely				
▪ multiple height work surfaces between primary work areas (sink, cooktop/oven and refrigerator) at 32" – 34" AFF, which can be created with pull-out surfaces, such as cutting boards. - cutting boards are available in standards widths of 18", 24", 36", etc.; can be used in multiples; are placed horizontally between drawers; have a minimum knee clearance of 29"; and have hardware for easy push/pull.				
▪ lazy susans or comparable slide-out shelves in corner cabinets				
▪ space between countertop and upper cabinet 14" – 16"				
▪ task lighting on all work surfaces (from under cabinet lighting or ceiling lighting placed over work surface)				
▪ for microwave – counter space closes to microwave to set items on				
b. Kitchen sink, cabinetry, and plumbing				
▪ 42" minimum width of base cabinet for sink, to provide 36" clear width and structural support on both sides of sink				
▪ standard countertop height (36") with provision in base cabinet for 27" – 29" knee clearance				
▪ sink design allows the drain pipes to be outside the knee clearance area described above. Ideas to consider – install plumbing from the wall rather than the floor, sink				

has a rear drain, and sink depth is a maximum of 6 ½”.				
▪ color of sink contrasts with counter for increased visibility				
▪ flooring continuous under sink				
▪ sinks not placed in corners				
c. Faucet				
▪ single lever or lever controls with a maximum distance of 17” between lever and front edge of counter				
▪ easy to control flow rate and easy to adjust temperature can be controlled with a closed fist				
▪ controls have easily distinguishable hot/cold labeling with letters or color temperature display. Hot/cold controls are consistent throughout the house				
▪ hand held sprayer integral with faucet				
2. Advanced Features	Yes	No	NA	Comments
a. General				
▪ contrasting color between countertop and floor				
▪ multiple work areas of varying heights (that are not between primary work areas)				
▪ adjustable height work surface (28” – 42”), may be electronically or mechanically adjustable				
▪ pantry storage with easy access pull-out and/or adjustable height shelves				
▪ high kick space (9” x 6”)				
b. Kitchen sink, cabinetry, and plumbing				
▪ two-basin sink, with one side shallow depth				
▪ at least one sink with shallow depth of 6 ½” – 7 ½”				
▪ if garbage disposal provided, disposal control within reach range (from seated position) and sink with rear drain				
▪ kitchen sink cabinet with retractable doors				
▪ adjustable height kitchen sink				
▪ pull down/up specialty shelving				
c. Faucet – no advanced features				

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H. Kitchen Appliances

ALL Kitchen Appliances	Yes	No	Comments
1. Essential Product Characteristics			
a. Controls			
▪ can be used with low effort and minimum dexterity			
▪ clearly related to function			
▪ raised, cupped, or otherwise detectable by touch			
b. Display/Label			
▪ Large size lettering (1/4" high)			
▪ High contrast lettering (for example, white on black)			
▪ With redundant signals, visual and audible alarms, and the option to reduce redundancy			
SPECIFIC Kitchen Appliances	Yes	No	Comments
Range and/or Cooktop			
1. Essential Product Characteristics			
▪ Staggered burners and front or side mounted controls			
▪ If drop in range used, at standard countertop height (36" AFF)			
▪ Raised, cupped or otherwise detectable by touch			
2. Advanced Product Characteristics			
▪ Display/label color contrasts with counter			
▪ Lights in cooktop indicate when surface is hot			
▪ Induction cooktop			

Recommendations for Essential and Advanced Universal Design Features and Product Characteristics in New, Single-Family Housing; Report of the Housing Task Force, Northwest Universal Design Council by Sandra C. Hartje, Ph.D.; Seattle Pacific University; Sept. 2010.

Wall Oven			
1. Essential Product Characteristics			
▪ Side-hinged door (with consideration given to the side the hinge is on)			
▪ Built-in oven set for one pull-out oven rack at the same height as adjacent countertop or pull-out cutting board			
2. Advanced Product Characteristics - none			
Microwave			
1. Essential Product Characteristics			
▪ Minimal programming required, with common functions (heating, defrosting, popcorn, etc.); simple and straightforward			
▪ Install with controls at a maximum operational height of 48" AFF			
2. Advanced Product Characteristics - none			
Refrigerator			
1. Essential Product Characteristics			
▪ Door handles are full length and can be used with low effort and minimum dexterity			
▪ Counter space provided on opening side of refrigerator door(s)			
▪ Pull out shelves and/or drawers			
▪ Adjustable interior shelves			
▪ At least 180 degree opening doors			
2. Advanced Characteristics			
▪ Easy to access interior controls (located within 24"-48" AFF)			
▪ Water and ice controls on outside			
▪ Remote cooling drawer			

Dishwasher			
1. Essential Product Characteristics			
▪ Minimal programming required			
2. Advanced Product Characteristics			
▪ Drawer style unit			

I. Laundry

1. Essential Features	Yes	No	NA	Comments
a. General				
▪ 34” counter height				
▪ sink mounted at 34” AFF, when sink provided				
▪ washer and dryer placed side-by-side; clear floor space in front of washer and dryer - the width of the washer and dryer plus enough floor space on outside of washer and dryer (approximately 18” on each side) for doors to open fully (180 degrees)				
▪ front loading washer (clothes and detergent)				
▪ front loading dryer (clothes and lint screen)				
▪ washer and dryer with side hinged doors, with door swing of 180 degrees				
▪ washer and dryer oriented so doors on each unit open away from each other				
▪ 36” wide counter space over washer and dryer				
b. Washer and Dryer				
▪ Controls				
- Front mounted				
- Can be used with low effort and with minimum dexterity				
- The relationship between the controls, what they operate, and how they function is clear and intuitive				
- Raised, cupped or otherwise detectable by touch				
▪ Display/label				
- Large size lettering (1/4” high)				
- High contrast graphics (for example, white on black)				
- Redundant signals, visual and audible alarms; with option to disable				
2. Advanced Features	Yes	No	NA	Comments
a. General				
▪ Clear knee space of 29” below sink				
▪ Counter space with 29” height knee clearance below and minimum width of 36”				
▪ Consider a combined full-sized washer and dryer if space is limited				

IV. Design Features and Product Characteristics for the Whole House

A. Switches and Controls

1. Essential Features	Yes	No	NA	Comments
▪ Operational height of electrical outlets 18” – 24” AFF (measured at bottom of lower outlet)				
▪ Operational height of light switches and thermostats 42”-48” AFF (measured at top of highest control)				
▪ Control switches operable with a closed fist or reaching device (for example, rocker style)				
▪ 30” x 48” clear floor space centered in front of all switches, controls and electrical panel				
▪ Electrical panel located inside the home or in an accessible garage				
▪ Electrical panel with highest switch no more than 48” AFF, and with 30” x 48” clear floor space in front				
▪ Electrical panel with circuits clearly labeled				
▪ Water heater, furnace controls, and gas and main water shut off readily accessible and operating instructions clearly indicated				
▪ Additional electrical outlets on bed wall				
▪ Thermostat(s) are easy to read and adjust				
2. Advanced Features	Yes	No	NA	Comments
▪ Illuminated light switches				
▪ Light switches located within arm’s reach, or ~ 6”, from latch side of door and placement consistent throughout house.				
▪ Light switches color contrast with walls				
▪ Electrical panel located inside the house				
▪ One four-plex electrical box in each bedroom on the bed wall, preferably not centered behind bed				
▪ Additional electrical outlets at desk locations for computer and electronic equipment (four-plex boxes) and personal use equipment				
▪ 20 amp circuit in bedroom(s) to meet future electrical needs; additional electrical outlets on bed wall (4 plex) preferable				

B. Storage (Other than Kitchen)

1. Essential Features	Yes	No	NA	Comments
a. General				
▪ Storage accessible and reachable for items used regularly (i.e. daily or weekly)				
▪ Minimum of 30" x 48" clear floor space in front of closets/storage				
b. Closets				
▪ Illuminated; with interior illumination in walk-in closets				
▪ Shelving at multiple heights				
▪ Adjustable height closet rods with one rod mounted at a maximum height of 48" AFF				
▪ Minimum 32" cwo for closet doors; with door style to maximize access (bi-fold, by-pass or swing)				
▪ Accessible closets in all bedrooms ('walk-in' closets, where provided, are accessible or auxiliary accessible closet provided)				
2. Advanced Features	Yes	No	NA	Comments
a. General				
▪ Motorized cabinets that raise and lower closet rods				
b. Closets				
▪ Recessed floor track (if used)				
▪ Lighted interior				
▪ Adjustable height closet shelves				

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C. Lighting and Color

There are three functions of lighting – general (ambient), task and accent. This section addresses fixed general and task lighting. Additional recommendations for lighting are also given for specific rooms and spaces.

1. Essential Features	Yes	No	NA	Comments
▪ Lighting and switching for lighting provided at top and bottom of stairs				
▪ Overhead lighting is dimmable in kitchen and dining rooms				
▪ Increased lighting provided in task areas with direct light on work surfaces (i.e. kitchen counters; bathroom sink; laundry room, etc.)				
▪ A minimum of one hardwired fixture per room to provide general lighting at a light level (footcandle or lumen) appropriate for the space. For light levels, follow the guidelines set by the Illuminating Engineering Society (IES).				
▪ A minimum of one switched outlet per room, with switch located near doorway				
▪ Provide transitional lighting between bright and dark spaces to allow eyes to adjust				
▪ Avoid glossy surfaces (i.e. high gloss granite)				
2. Advanced Features	Yes	No	NA	Comments
▪ Color contrast between floor surfaces and counter tops of three units on grey scale				
▪ Color contrast difference between treads and risers on stairs				
▪ Motion sensor light switches				
▪ All interior overhead lighting is dimmable				
▪ One dimmable switch in each interior room				
▪ Lighting control system				

Recommendations for Essential and Advanced Universal Design Features and Product Characteristics in New, Single-Family Housing; Report of the Housing Task Force, Northwest Universal Design Council by Sandra C. Hartje, Ph.D.; Seattle Pacific University; Sept. 2010.

D. Windows

1. Essential Features	Yes	No	NA	Comments
▪ Windows with desirable views, including egress windows, with a 36” maximum sill height				
▪ Locks, latches and cranks at maximum height of 44” AFF				
▪ Recommended styles, for ease of use, include horizontal sliders, casement, crank operated and awning				
2. Advanced Features	Yes	No	NA	Comments
▪ Locks, latches and cranks operable with a closed fist				
▪ Power operated or remote control whenever possible				

E. Hardware

A. Essential Features	Yes	No	NA	Comments
▪ Lever style door handles on doors				
▪ Loop style pulls on all drawers and cabinet doors				
B. Advanced features – No advanced features				

F. Home Automation

The technology for home automation changes rapidly and it is not possible to create an exhaustive list of features for physical, visual and audible access for the house.

1. Essential Features	Yes	No	NA	Comments
a. General				
<ul style="list-style-type: none"> ▪ Rough in wiring for audible and/or visual alarms for doorbell, smoke detectors, security system, computer, television, telephone, etc. 				
b. Controls				
<ul style="list-style-type: none"> ▪ Easily programmed and controlled ▪ Intuitive input controls 				
c. Display/Label				
<ul style="list-style-type: none"> ▪ Large size lettering (1/4" high) ▪ High color contrast graphics (for example, white on black) ▪ Redundant signals, such as visual and audible alarms, for multi-sensory communication; with the option to eliminate redundancy 				
2. Advanced Features	Yes	No	NA	Comments
a. General features				
<ul style="list-style-type: none"> ▪ Hand held controls for heating and cooling, with auxiliary controls by room and/or floor level ▪ Remote controls, with large buttons for selected lights, overhead fans and security ▪ Doorbell intercoms that connect to portable telephones ▪ Motion detector light switches in garages, utility spaces, entrances, basements, decks and yards ▪ Fire suppression interior sprinkler system 				
b. Controls				
<ul style="list-style-type: none"> ▪ Remote control ▪ Large button hand held unit 				

V. Next Steps and Discussion

The development of the ‘Recommendations’ was the first step in creating a standard for the design and build of universally designed houses in Washington state. It is a working document and feedback from its use will be necessary for evaluation and revision.

The ‘Recommendations’ are the primary source of data and provide the basis for the next steps, as follows:

1. Resource Development – Questions, Publication and Distribution

- Questions
 - Determine who will use the resource – who is the target audience? Will it be for consumers, designers/architects/builders, or other?
- Determine how the resource will be used. What is the purpose of the resource? Is it a stand-alone resource or will it be part of another resource? Is it part of a program for:
 - Education
 - Self- or agency certification
 - If the purpose is certification, who will be the committee, agency, company, organization and/or association who implements and oversees the process: evaluating housing plans that are submitted, inspecting the projects that are completed, and awarding a certificate for those houses that meet the universal design criteria?
 - for the advanced design features, how many would need to be included for the house to be considered an advanced universally designed house? Or if a house was designed and built with advanced UD features, would it be marketed as meeting the essential requirements and containing some advanced UD features?
 - Is there a relationship to green and/or sustainable design programs?
- Based on the target audience and the purpose of the resource, determine what will be most helpful to supplement the written descriptions:
 - visual images (drawings, photographs, etc.)
 - technical information/guidelines – explains how to design and/or install the features
- Funding the resource. Where will the funds come from for resource development, production and distribution?

2. Relationship to Original Goal of Developing an Incentive Program for Universal Design in New, Single-Family Housing.

Developing the ‘Recommendations’ was one step in the process to develop an incentive program to facilitate the two goals for universal design in single-family housing, as previously stated. The five steps were presented in an article titled ‘Developing an Incentive Program for Universal Design in New, Single-Family Housing’ which was published in a 2004 edition of the Journal of Housing and Society. According to that article, additional steps include:

- Designing a positive marketing campaign for the incentive program that educates the mainstream consumer housing market – consumers and producers. Provide examples of universally designed housing for the general public to observe. Publicize housing that has received certificates for being universally designed. In developing the marketing program, consider the existing challenges to promoting universal design: lack of awareness of universal design, perceived costs, availability of products, unconventional building practices, etc.’ and
- Evaluating the effectiveness of the incentive program, including each of the components previously identified. Assessment may include quality and quantity of universally design homes built, consumer and producer responses to the program, clarity of the requirements, ability of coalition or organization to keep up with demand, need for trained housing professionals to implement universal design in housing, etc.

The article also stated that each step will require further research and thorough development. Some steps can be worked on simultaneously. Development of an incentive program for universal design in new, single-family housing will span many years. Once developed, the program will be a work in progress, evaluated and revised as necessary.

VI. References

Hartje, S. (2006). Universal Design Features and Product Characteristics for New Residential Construction – Report with Findings and Discussion. A report submitted to the Advisory Committee on Aging and Disability Services, City of Seattle. Seattle, WA.

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Hartje, S., Tremblay, K and Birdsong, C. (2006). Chapter 8 - Universal design in housing. In Merrill, J., Crull, S., Tremblay, K., Tyler, L., & Carswell, A. (Eds.), *Introduction to housing* (pp. 191-224). New York: Prentice Hall.

VII. Appendix

The information presented in the appendix supports the previous sections of this report.

A. Background on Universal Design and Application to Housing

1. Building blocks of universal design

Building blocks are basic parameters upon which design recommendations are based. With the goal to design and build housing for a broader range of human ability, consideration must be given to three categories of human abilities that are used in daily living: physical, sensory and cognitive. Physical abilities are influenced by size, strength, range of motion, manual dexterity and mobility. Sensory abilities used to monitor the home are vision, hearing, smell and touch. Cognitive abilities involve the brainwork needed to function within the home, such as understanding and remembering.

For physical abilities, anthropometrics are often considered – the relationship between the human body and design. As a result, specific dimensions for people using mobility equipment are often considered as mobility equipment has the largest impact architecturally on residential design. Universal design considers the three categories of human abilities over the life span.

Terms and building blocks for universal design considered for this report include those presented below, presented in alphabetical and/or numerical order:

- accessible route of travel
- clear space or clear width opening (CWO)
- closed fist principle
- coefficient of friction factor
- color contrast
- minimum dexterity
- operational height – the highest point above finished floor (AFF) that one has to reach to operate a control
- optimal reach zone (ORZ) or reach range
 - the ideal target area for locating controls, shelving or other components and items that a person needs to reach. The ORZ is within a comfortable reach for tall people, short people and most people in wheelchairs. In the vertical direction, it is between 20” – 44” above the finished floor (AFF). In the horizontal direction, it is 20”. Source: Building for a Lifetime.
- 30” x 48” rectangle (wheelchair footprint)
- 5’ turning diameter (the minimum for a wheelchair, and often insufficient)

2. Principles of Universal Design

This section on the Principles of Universal Design and their application to housing was taken directly from pages 202 – 205 in Chapter 8 Principles of Universal Design Applied to Housing in the Introduction to Housing textbook, published by Pearson/Prentice Hall in 2006.

In the mid-1990s, the Center for Universal Design, in collaboration with a consortium of universal design researchers and practitioners from across the U.S., developed the Principles of Universal Design. The set of seven principles of universal design were created to guide a wide range of design disciplines. These seven principles may be applied to evaluate existing designs, guide the design process, and educate both designers and consumers about the characteristics of more usable products and environments. According to the center, the Principles of Universal Design address only universally usable design, while the practice of design involves more than consideration for usability. Designers must also incorporate other considerations such as economic, engineering, cultural, gender, and environmental concerns in their design processes. These principles offer designers guidance to better integrate features that meet the needs of as many users as possible.

The Principles of Universal Design, presented in Figure 1, give the name of the principle as a concise and easily remembered statement of the key concept of the principle and a definition of the principle as a brief description of the principle's primary directive for design.

Figure 1. Principles of Universal Design

Principle One: Equitable Use

The design is useful and marketable to people with diverse abilities.

Principle Two: Flexibility in Use

The design accommodates a wide range of individual preferences and abilities.

Principle Three: Simple and Intuitive Use

Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.

Principle Four: Perceptible Information

The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

Principle Five: Tolerance for Error

The design minimizes hazards and the adverse consequences of accidental or unintended actions.

Principle Six: Low Physical Effort

The design can be used efficiently and comfortably and with a minimum of fatigue.

Principle Seven: Size and Space for Approach and Use

Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, or mobility.

Source: North Carolina State University, The Center for Universal Design, Version 2.0 - 4/1/97

3. Principles of Universal Design Applied to Housing

The principles of universal design apply to the design of products and environments, including housing. Examples of how the Principles of Universal Design are applied to housing design features and products are provided below. Many of the examples represent more than one principle.

Principle One: Equitable Use

The design is useful and marketable to any group of users. The design provides the same means of use for all users, avoids segregating or stigmatizing any users, and makes the design appealing to all users. Multiple height countertops, cutting boards, and wider interior doorways are examples of this principle in housing.

Principle Two: Flexibility in Use

A flexible approach to design means it will be more desirable to a wider range of consumers. The design accommodates a wide range of individual preferences and abilities. The design provides choice in methods of use, accommodates right-or left-handed access and use, facilitates the user's accuracy and precision, and is adaptable to the user's pace. Pull-out pantries and drawers, railings down both sides of the stairs, and a curbless shower are examples of this principle in housing. An excellent example is an adjustable height, moveable hand-held shower head or 60" - 72" flexible hose that allows easy use by people of all heights. The shower head can be adjusted to the height of the user, helps avoid getting hair, bandages and casts wet, and can be used for back massage and rinsing hair.

Principle Three: Simple and Intuitive Use

Use of the design is easy to understand regardless of the user's experience, knowledge, language skills, or current concentration level. The design eliminates unnecessary complexity, is consistent with user expectations and intuition, and accommodates a wide range of literacy and language skills. Features in housing design that promote safety include stepless entrance and offset water controls in shower and tub. Offset controls allow for easy access from outside the tub/shower, which reduces reaching and bending, without inconvenience when inside.

Principle Four: Perceptible information

The design communicates necessary information effectively to the user regardless of ambient conditions or the user's sensory abilities. An example of this principle seen in *housing would be the use of a large dial on a thermostat or telephone.*

Principle Five: Tolerance for Error

The design minimizes hazards and the adverse consequences of accidental or unintended actions. This means that the design arranges elements to minimize hazards and errors, provides warnings of hazards and errors, and provides fail-safe features. An example seen in housing would be a crank or power operated counter system. Lever handles can also be texturized to communicate to those with low vision that the door should not be opened.

Principle Six: Low Physical Effort

The design can be used efficiently and comfortably and with a minimum of fatigue. This means that the design allows users to maintain a neutral body position, uses reasonable operating forces, minimizes repetitive actions, and minimizes sustained physical effort.

Features in housing design that support comfort include:

- Lever door handles or loop handle pulls on drawers and cabinets makes it easier to operate with elbow or knee if hands are full and requires little or no strength or twisting.
- Light switches at 44” - 48” high, and thermostats 48” above the floor make it easier to reach with hands full (for example with an elbow) and are more accessible to children.
- Electrical outlets placed at 18” minimum height make it easier to reach without bending and from a seated position. Also, users are less likely to unplug appliances by pulling on the cord.
- Removable cabinet fronts at sink with insulated pipes.
- Varied height counters.
- Front loading washer and dryer with front controls reduce the need to bend, stoop, or lean over to reach clothes.

Principle Seven: Size and Space for Approach and Use

The appropriate size and space are provided for approach, reach, manipulation, and use regardless of the user’s body size, posture, or mobility. This means that a clear line of sight is provided to important elements, the reach to all components is comfortable for any user, the design accommodates variations in hand and grip size, and adequate space is provided. Examples of this principle include entry door of 36” minimum width, interior doors of 32” clearance, and hallway width of a minimum 42”.

4. Benefits of Universal Design in Housing

The charts in this section on the Benefits of Universal Design in housing were taken directly from pages 208 – 210 in Chapter 8 Principles of Universal Design Applied to Housing in the Introduction to Housing textbook, published by Pearson/Prentice Hall in 2006.

A more comprehensive list of the benefits of universal design features in housing is available in the publication *Universal Design in Housing*, published by the Center for Universal Design and revised in January of 2006.

Figure 2. Universal Design Features at Entrances

<i>FEATURE</i>	<u>S</u> <u>OR</u> <i>NS*</i>	<i>BENEFIT(S)</i>
1. Stepless entrances from exterior to interior <ul style="list-style-type: none"> ▪ It is best to make all entrances stepless. More than one stepless entrance is preferred. At least one stepless entrance is essential; if only one, not through a garage or from a patio or raised deck. 	S	Easier to move furniture and appliances in and out, to bring in groceries and packages, and to clear snow, ice, and leaves. Great for baby strollers and bicycles. Safer in wet or icy conditions. Easier than steps to repair and maintain.
2. Other entrance features: <ul style="list-style-type: none"> ▪ One-half inch maximum rise at entrance thresholds. ▪ Minimum 5' x 5' level clear space inside and outside entry door. ▪ Weather protection such as a porch, stoop with a roof, awning, long roof overhand, and/or carport. ▪ Built-in shelf, bench, or table with knee space below located outside the door. ▪ Full-length sidelights, windows in doors, and/or windows nearby. ▪ Lighted doorbell at reachable height, intercom with portable telephone link, and/or hardwired intercom. ▪ Light outside entry door and motion detector controlled lights. ▪ House numbers should be large, high contrast, located in a prominent place. 	S S S NS S NS NS NS	Reduces tripping hazards. Dollies and hand-trucks move over easily. Allows for maneuvering while opening or closing door. Provides sheltered space for people while unlocking the door, waiting for a carpool, making deliveries, etc. Provides a place to put packages while opening doors. Allows all residents, including children and people using wheelchairs to see who is at the door before opening it. Allows visitors to communicate with residents. Provides view of approaching visitors. Adds general illumination and sense of security. Illuminates lockset. Eliminates dark approaches to the home. Easy for friends and emergency personnel to locate residence.
* S = Structural NS = Non-Structural		

Source: Center for Universal Design, Raleigh, NC

Figure 3. Universal Design Features for Circulation

<i>FEATURE</i>	<u>S</u> <u>OR</u> <u>NS*</u>	<i>BENEFIT(S)</i>
<p><i>Interior Circulation</i></p> <ul style="list-style-type: none"> ▪ An open floor plan design. ▪ At least one bedroom and accessible bathroom located on an accessible ground floor entry level (same level as kitchen, living room, etc.) ▪ Clear door opening width (32” minimum, 34” – 36” wide doors), for all doorways. ▪ Flush thresholds at all doorways. ▪ Clear floor place (18” minimum) beside door at pull side at latch jamb. ▪ Circulation route 42” minimum width. ▪ Turning space in all rooms (5’ diameter) 	<p>S</p> <p>S</p> <p>S</p> <p>S</p> <p>S</p> <p>S</p> <p>S</p>	<p>Minimizes hallways and doorways and maximizes sight lines.</p> <p>Improves circulation, especially with many visitors, such as at parties. Also reduces damage to door jambs when moving large furniture or appliances, equipment, and ladders.</p> <p>Provides space to move out of the way of the door swing when pulling it open.</p> <p>Provides maneuvering room in the hallways and archways.</p>
<p><i>Vertical Circulation</i></p> <ul style="list-style-type: none"> ▪ All stairs should be appropriate width and have space at the bottom for later installation of a platform lift, if needed. <p><i>If a two-story dwelling:</i></p> <ul style="list-style-type: none"> ▪ At least one set of stacked closets, pantries, or storage spaces with knock-out floor. <p><i>Or</i></p> <ul style="list-style-type: none"> ▪ A residential elevator with minimum 3’ x 4’ clear floor area installed at the time of initial construction. ▪ Stair handrails to extend horizontally beyond top and bottom risers. 	<p>S</p> <p>S</p> <p>S</p> <p>S</p>	<p>Easy access between floors.</p> <p>Becomes shaft for later elevator installation – at a great cost savings.</p> <p>Steady users at top and bottom or stairs</p>

Source: Center for Universal Design, Raleigh, NC

Figure 4. Universal Design Features for Kitchens

<i>FEATURE</i>	<u>S</u> <u>OR</u> <i>NS*</i>	<i>BENEFIT(S)</i>
<p><i>Interior Circulation</i></p> <ul style="list-style-type: none"> ▪ Space between face of cabinets and cabinets and walls should be 48” minimum. ▪ Clear knee space (minimum 29” high) under sink (must have pipe protection), counters, and cook tops. May be open knee space or achieved by means of removable base cabinets or fold-back or self-storing doors. ▪ Variable height (28” – 42”) work surfaces such as countertops, sinks, and/or cooktops. May be mechanically adjustable in 2” increments or be electrically powered, through a continuous range. ▪ Contrasting color border treatment on countertops. ▪ Stretches of continuous countertops particularly between refrigerator, sink, and stove top. ▪ Adjustable height shelves in wall cabinets. ▪ Full-extension, pull-out drawers, shelves and racks in base cabinets. ▪ Full height pantry storage with easy access pull-out and/or adjustable height shelves. ▪ Front-mounted controls on all appliances. ▪ Single-lever water controls at all plumbing fixtures and faucets. 	<p>S</p> <p>NS</p> <p>S</p> <p>NS</p> <p>S</p> <p>NS</p> <p>NS</p> <p>S</p> <p>NS</p> <p>NS</p>	<p>Provides pen storage space for serving cart, trash can, recycle bins, etc. Permits sitting in a stool to work at the sink or cooktop.</p> <p>Allows tall people to work without excessive bending by bringing work closer to user. More usable to children and shorter adults, so the whole family can help with meal preparation. Allows person to work while seated. Provides built-in desk in kitchen.</p> <p>Makes it easier to detect the edge of counters and reduces likelihood of spills. Makes it easier to repair damaged edges without matching entire countertop.</p> <p>Allows sliding of heavy items and easy, one-level food flow.</p> <p>Easy reach to all storage space. Easier to maneuver large items in and out of cabinets.</p> <p>Makes storage at all heights reachable. Provides maximum storage capacity.</p> <p>Facilitates easy reach. Eliminates dangerous reaching over hot burners, reducing the chance of burns and spills.</p> <p>Easy to adjust water temperature and volume. Can operate with a single hand or elbow. Single-lever controls with fewer parts are less costly to repair, maintain, and clean.</p>

Source: Center for Universal Design, Raleigh, NC

B. Universal and Accessible Design and Visitable Housing

Universal, accessible and visitable are all terms used to refer to housing designed to meet the needs of a broader range of people for a longer period of time than does traditional housing design. Each has a different meaning, purpose and use. Universal design, the broadest of the design concepts, has been defined and explained in this report. Universal design targets people of all ages, sizes and abilities, and is applied to all buildings, including housing. Universal design goes beyond accessible design; it includes or encompasses it, but is not limited to it. Applying the principles of universal design to housing, principles #6 (lower countertops, switches and outlets in easily reachable locations, etc.) and principle #7 (wider doors, sufficient clear floor space for wheelchairs, etc.) address access. Often, accessible features are permanently fixed in place and very apparent. Generally, the requirements for accessible features do not apply to single family housing, particularly in the private housing market.

- **Accessible design**

The Center for Universal Design fact sheet entitled ‘DEFINITIONS: Accessible, Adaptable, and Universal’ states:

Accessible generally means that the dwelling meets prescribed requirements for accessible housing. Mandatory requirements for accessible housing vary widely and are found in state, local, and model building codes, in agency regulation such as in the Department of Housing and Urban Development’s program 202 and 811, section 504, and the Fair Housing Amendments Act requirements. They are also found in standards such as the American National Standards Institute’s A117.1 and the Uniform Federal Accessibility Standards (UFAS).

Universal design goes beyond the minimum requirements and limitations of accessibility law. In addition to universal and accessible, additional terms were defined on page 221 in Chapter 8 Principles of Universal Design Applied to Housing in the Introduction to Housing textbook, published by Pearson/Prentice Hall in 2006.

Figure 5. Terms, New and Existing Definitions Resulting from the Study, and Sources

Term	Proposed (or Existing) Definition	Source
Universal design	Design of products and environments to be useable by all people, to the greatest extent possible, without the need for adaptation or specialized design.	Center for Universal Design, 1997
Accessible design	Products and environments that are easy to approach, reach, enter, or use.	Deardorff & Birdsong, 2003
Adaptable design	Flexible features that can be adjusted for the personal needs of specific users in a short time by unskilled labor without involving structural or finish material changes.	Loureiro, 1997 Mace, 1990 Story, 1998
Barrier-free design	Eliminating obstacles in a space or product thereby accommodating persons with disabilities.	Wilkoff & Abed, 1994
Lifespan design	Products and environments that consider the needs of children through older persons.	Deardorff & Birdsong, 2003

- **Visitable housing**

The concept of visitability originated with Concrete Change (www.concretechange.org) in 1990. It is a movement to change home construction practices so that virtually all new homes – not merely those custom-built for occupants who currently have disabilities – offer a few specific features that make the home easier for people who develop mobility impairments to live in and visit. These three features define a scope that is currently possible for rapid, broad application of Visitability. The three essentials include: one zero-step entrance, at the front, back or side of the house; all main floor doors, including bathrooms, with at least 32 inches of clear passage space; and at least a half bath, preferably a full bath, on the main floor.

According to the website, the spirit of visitability says it’s not just unwise, but unacceptable that new homes continue to be built with gross barriers – unacceptable, given how easy it is to build basic access in the great majority of new homes, and given the harsh effects that major barriers have on so many people’s lives. These easily-avoided barriers cause daily drudgery; unsafe living conditions; social isolation, and forced institutionalization.

The visitability movement has had some success due to its extreme simplicity of content, rigorous prioritization, and insistence on application not just cogitation, speculative home not special homes.