

Designing Sustainable Homes that Make Life Easier

American Society of Interior Designers
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Words to Better Communicate About the Concept of Universal Design

- Ease of living
- Comfortable
- Sustainable
- Safer
- Easier to access
- More ergonomic
- Adaptable
- Inclusive
- Flexible

Sustainability: Environmental, Economical, Social

- Not just a “green” concept
- Homes can be lived in throughout a lifetime
- Visitable by all
- If it isn’t accessible, it isn’t sustainable

Universal Design in the Entries, Kitchen and Bathrooms

The following list of Universal Design features can be easily incorporated into any new home from production development to luxury. It is important to note that almost none of the features are prohibitively high in cost and that a builder does not have to do this all or nothing. Adapting any of these features would be a step in the right direction.

The Entries

- Level thresholds at any door, no higher than ½”
- 36” wide doors with lever handles
- Lighting for safety and access
- Mail drop for easy access
- Porch shielded from the weather
- High visibility house address numbers
- 5' x 5' level maneuvering space (turning circle) on both sides of door
- Stepless, level grade at the entrance
- Sloped garage floor to the house entry with level threshold
- Use sloping walks, earth berms, retaining walls, bridges, or porches instead of obtrusive front ramps
- Package shelf or bench outside the door
- Full-length sidelight(s) at entry or window in door to see visitors

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The Kitchen

- Sufficient clear floor space for work/traffic flow
- Circulation routes 40" wide at a minimum at entryways to the kitchen
- No thresholds at any door
- 36" wide doors with lever handles
- Easy to roll on hard surface flooring
- Strategically placed visual barriers to kitchen mess
- Point of use storage
- Open/visible storage; flexible pantry storage
- Flexible base storage allowing for use as knee space
- Roll-out carts for storage of cook ware
- Single lever faucets, mounted on the side of a low profile sink
- Pot filler at cooktop if sink is not close by
- Garbage disposer mounted in the rear of the sink allowing for knee space under the sink
- C or D-shaped handles rather than knobs on cabinets and drawers
- Counter tops at a variety of common heights: 30", 34", 36", and 42"
- Roll-out full extension shelves and drawers in lower cabinets
- Pull down articulated hardware to lower shelf contents stored in wall cabinets
- Toe kick area at the base of lower cabinets: 9-10" high by 6" deep
- Glass doors or open shelves in upper cabinets
- Vertical (pantry style) cabinets with pull out shelving for most used items
- Waste and recycling container on pull-out drawers in lower cabinets
- Side by side refrigerator/freezer (prefer 24" deep) w/ full extension shelves
- Safety shut-offs and dual cueing (where available) on appliances
- Pull-out step stool
- Contrasting edge on counter and flooring to define spaces, transitions and edges
- Rounded corners on counter tops
- Built-in desk
- Side hinged doors on oven and microwave at counter height or lower
- Dishwasher elevated 8" above the floor
- Front-mounted controls on all appliances (Ex. cooktop, oven), with easy to read print
- Knee space under sink and cooktop
- 5' turning radius in working areas
- Pull out spice and towel racks
- Electrical wall outlets 18" above the floor
- Electrical outlets and controls within reach Ex. Garbage disposer, range hood ventilation
- Varied light sources (mix of compact fluorescent, LED, incandescent or halogen with similar color temperatures)
- Under cabinet lighting: linear T5 fluorescent, low profile so as not to protrude below cabinet trim, well shielded (diffuse lens), good color (choose bulbs with a high color rendering index, good distribution, located at front of cabinet with lens facing towards the backsplash
- Adjustable lighting controls with dimmer switches
- Light switches should have rocker switch, and be located within easy reach of user, (not on the back wall!) 42-48" off the floor

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- Preset lighting control system option – allows you to set varying light levels according to the room or task
- Important to note – California’s Title 24 requires that 50% of wattage in kitchen must be high efficiency, i.e. fluorescent; all other hardwired fixtures that are not fluorescent throughout the house must be either dimmable or on a manual on occupancy sensor

The Bathrooms

- No threshold entries
- 36” wide swinging doors with lever handles and/or pocket doors as a space saving alternative
- Circulation routes 40” wide at a minimum, to get to the bathroom
- Sufficient clear floor space for functional passage
- 5’ turning radius in key areas
- Point of use, easily accessed storage
- Multiple-height vanities with flexible knee space under the sink
- Toe kick area at the base of lower cabinets: 9-10” high by 6” deep
- Increased use of support rails and grab bars in the toileting, shower and tub areas that compliment the aesthetics
- Walls reinforced with ¾” plywood or wood blocking behind wallboards where grab bars will be installed
- Optional heat in the floor and towel warmers
- Anti-scald fittings on tub and shower
- Non-slip flooring
- Controls for windows, lighting and fixtures that are easy to operate
- Full length mirror
- Vanity mirror at height for a seated person or able to tilt to adjust
- Flush threshold shower
- Curbless shower designed for transfer (36” wide by 36” deep minimum) or roll in (36” wide by 48” deep minimum) depending on entry
- Shower chair or bench – built in or free standing made with non-slip surface products
- Easy maintenance, i.e. showerheads and whirlpool tubs with self-cleaning features
- Towel bars at various heights for access by people who sit and those who stand
- Hand-held shower spray on a sliding vertical bar, with 60” long hose
- Water controls within reach of person seated in the shower
- Tub deck with 15” extension for easier entry
- Tub with non-slip bottom
- Tub with built in grab bars
- Comfort-height toilets 17-19” from the floor
- Toilet centered 18” from a side wall so grab bars can be within easy reach
- If toilet is compartmentalized, provide an option to open it up for wheelchair access
- Increased lighting from varied sources with adjustable controls
- Provide sufficient, well shielded lighting along either side of vanity mirror to eliminate shadows while grooming
- Provide moderate light level for wayfinding and orientation from bed to bathroom during the night
- Electrical outlets and controls within reach
- Light switches should have rocker switch, and be located within easy reach of user, (not on the back wall!) 42-48” off the floor
- Electrical wall outlets 18” above the floor

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Fundamental Components of a Green and Healthy Home

Lot Preparation and Design - Use of Land

- Erosion control during construction
- Limit turf
- No invasive plants
- Design permeable site
- Design and install permanent erosion controls

Resource Efficiency - Use of Materials

- Low waste when building the structure

Energy Efficiency - Use of Energy

- Passive solar house design and orientation of the home to the sun
- Plentiful energy efficient windows, clearstory, skylights and glass block to let in natural lighting
- Solar energy panels for exterior and landscape lighting
- 6' overhangs on roof to shield windows from the sun
- High efficiency insulation throughout all walls, ceiling, and attic
- Spray foam insulation made from soybeans for selected areas
- Tankless water heater
- Radiant heat floors in bathroom
- Structured insulated panels on exterior walls
- Pre-cast concrete, Styrofoam insulated foundation walls
- LED and halogen lighting
- Energy Star appliances that use less energy
- Dividing the house into multiple zones to control air temperatures
- Integration of a heat pump with the energy efficient HVAC system
- Thermostats on timers to reduce energy use
- High performance vented fireplace
- Trees and shrubs utilized to shade the home

Water Conservation - Use of Water

- Energy Star appliances that use less water – dishwasher, clothes washing machine
- Low water use toilets
- Low flow sink and shower faucets
- Native landscape materials
- Rainwater collection from the roof for landscape irrigation
- Mulch on landscape trees, shrubs and flowers
- Drought tolerant plants

Occupancy Comfort and Enhanced Indoor Air Quality

- Foundation moisture control
- Air sealing and advanced insulation techniques
- High performance windows
- Energy efficient, sealed combustion heating systems
- High efficiency air filtration
- Whole house ventilation

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- Carefully selected construction products, adhesives, plywood, solvents, wall covering, synthetic fabrics, interior finishes and paints with low or no volatile organic compounds (VOC)
- Carbon monoxide detection and alarms
- Precautions taken to eliminate radon gas in the basement during construction
- Microban incorporated in countertop and shower wall quartz surfaces
- Specialized wall boards that inhibit mold growth
- All hard surface flooring to reduce dust and dust mite populations
- Seal off ducts during construction

The Principles of Universal Design

Definition of Universal Design: 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.

Ron Mace

The authors, a working group of architects, product designers, engineers and environmental design researchers, collaborated to establish the following Principles of Universal Design to guide a wide range of design disciplines including environments, products, and communications. 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.

The Principles of Universal Design are presented here, in the following format: name of the principle, intended to be a concise and easily remembered statement of the key concept embodied in the principle; definition of the principle, a brief description of the principle's primary directive for design; and guidelines, a list of the key elements that should be present in a design which adheres to the principle. (Note: all guidelines may not be relevant to all designs.)

PRINCIPLE ONE: Equitable Use

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

- Provide the same means of use for all users: identical whenever possible; equivalent when not.
- Avoid segregating or stigmatizing any users.
- Provisions for privacy, security, and safety should be equally available to all users.
- Make the design appealing to all users.

PRINCIPLE TWO: Flexibility in Use

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

- Provide choice in methods of use.
- Accommodate right- or left-handed access and use.
- Facilitate the user's accuracy and precision.
- Provide adaptability to the user's pace.

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.

- Eliminate unnecessary complexity.
- Be consistent with user expectations and intuition.
- Accommodate a wide range of literacy and language skills.

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- Arrange information consistent with its importance. Provide effective prompting and feedback during and after task completion.

PRINCIPLE FOUR: Perceptible Information

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

- Use different modes (pictorial, verbal, tactile) for redundant presentation of essential information.
- Provide adequate contrast between essential information and its surroundings. Maximize "legibility" of essential information.
- Differentiate elements in ways that can be described (i.e., make it easy to give instructions or directions).
- Provide compatibility with a variety of techniques or devices used by people with sensory limitations.

PRINCIPLE FIVE: Tolerance for Error

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

- Arrange elements to minimize hazards and errors: most used elements, most accessible; hazardous elements eliminated, isolated, or shielded.
- Provide warnings of hazards and errors.
- Provide fail safe features.
- Discourage unconscious action in tasks that require vigilance.

PRINCIPLE SIX: Low Physical Effort

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

- Allow user to maintain a neutral body position
- Use reasonable operating forces.
- Minimize repetitive actions.
- Minimize sustained physical effort.

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.

- Provide a clear line of sight to important elements for any seated or standing user. Make reach to all components comfortable for any seated or standing user.
- Accommodate variations in hand and grip size.
- Provide adequate space for the use of assistive devices or personal assistance.

Please note that 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. *Compiled by advocates of universal design, listed in alphabetical order:*

Bettye Rose Connell, Mike Jones, Ron Mace, Jim Mueller, Abir Mullick, Elaine Ostroff, Jon Sanford, Ed Steinfeld, Molly Story, and Gregg Vanderheiden. Copyright 1997 NC State University, The Center for Universal Design

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Universal Design – Related Resources

Associations, Organizations, Corporations, Agencies

Abledata
800-227-0216
www.abledata.com

Access One
www.beyondbarriers.com

Adaptive Environments
617- 695-1225
www.adaptenv.org

AARP
www.aarp.org

Alzheimer's Association
800-272-3900
www.alz.org

Alzheimer's Disease Education & Referral Center
800-438-4380
www.alzheimers.org/

American Foundation for the Blind
AARP
888-687-2277
www.aarp.org

800-AFB-LINE
www.afb.org

American Heart Association National Center
800-AHA-USA-1
www.americanheart.org

American National Standards Institute
212-642-4900
www.ansi.org

American Occupational Therapy Association
www.aota.org

Center for Inclusive Design and Environmental Access (IDEA Center), University of Buffalo
716- 829-3485 Ext. 329
<http://www.ap.buffalo.edu/idea/Home/index.asp>

Center for Universal Design North Carolina State University
800-647-6777
www.design.ncsu.edu/cud

Charles Schwab Architects
309-792-4599
www.universaldesignonline.com

Concrete Change
In support of visitable homes
404-378-7455
www.concretechange.org

Council for Exceptional Children
888-CEC-SPED
www.cec.sped.org

Cystic Fibrosis Foundation
800-344-4823
www.cff.org

Disabled American Veterans
202-554-3501
www.dav.org

Disability Rights Education Defense Fund
202-986-0375
www.dredf.org

Draware (Ireland)
<http://www.ucd.ie/avc/DraWare/default.htm>

Easter Seal Society
312-726-6200
www.easter-seals.org

EasyLiving Home
www.easylivinghome.org

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American Stroke Association National Center

888-4-STROKE
www.strokeassociation.org

Area Agencies on Aging

www.aog.dhhs.gov/agingsites/state.html

Amputee Coalition of America

888-AMP-KNOW
www.amputee-coalition.org/

Arthritis Foundation

800-283-7800
www.arthritis.org

CAST

www.cast.org

Home Modification List Serve

Homemodification-list@listserv.acsu.buffalo.edu

Independent Living Research Utilization Project

713-520-0232
www.ilru.org

Institute on Independent Living (Sweden)

www.independentliving.org

Lifease

www.lifease.com

Lighthouse International

800-829-0500; 212-821-9713 TTY
www.lighthouse.org

Muscular Dystrophy Association

800-572-1717
www.mdaua.org

National Association of the Deaf

301-587-1788; 301-587-1789 TTY
www.nad.org

National Center for Accessible Media

www.ncam.wgbh.org

National Council on Independent Living

703-525-3406; 703-525-4153 TTY
www.ncil.org

Eldercare Locator

800-677-1116
www.eldercare.gov

European Concept for Accessibility

(Luxembourg)
www.eca.lu

European Institute for Design and Disability

www.design-for-all.org

Harris Communications, Inc.

www.harriscomm.com

National Resource Center on Supportive Housing and Home Modifications

**Andrus Gerontology Center,
University of Southern California**
213-740-1364
www.homemods.org

National Rehabilitation Information Center

800-346-2742
www.naric.com

Paralyzed Veterans of America

800-424-8200
www.pva.org

ProMatura

www.promatura.com

Regional ADA technical assistance

800-949-4232
www.adata.org

Rehabilitation Engineering and Assistive Technology Society of North America

(RESNA)
703-524-6686
www.resna.org

**Trace Research and Development Center
University of Wisconsin**

www.trace.wisc.edu

Universal Design Alliance

770-667-4593
www.universaldesign.org

Universal Design Education Online

<http://www.udeducation.org/>

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National Institute on Aging

301-496-1752
www.nia.nih.gov/

**National Institute on Deafness and Other
Communication Disorders**

National Institute of Health
301-496-0252
www.nidcd.nih.gov

**National Institute on Disability and
Rehabilitation Research**

US Department of Education
202-205-8134; 202-205-4475 TYY
www.ed.gov

National Endowment for the Arts

www.arts.endow.gov

National Kitchen & Bath Association

908-843-6522
www.nkba.org

Universal Designers & Consultants

301-270-2470
www.universaldesign.com

United Spinal Association

718- 803-3782
www.unitedspinal.org

U.S. Access Board

800-872-2253; 800-993-2822 TTY
www.access-board.gov

**U.S. Dept. of Housing and Urban Dev.
Tech. assist. on Section 504 &
Fair Housing**

800-827-5005
Publications Center: 800-767-7468
www.hud.gov/fhe/fheo.html

**U.S. Dept. of Justice
Technical Assistance on ADA**

800-514-0304, 800-514-0383 TTY
www.usdoj.gov/crt/ada/adahom1.htm

**U.S. Dept. of Veterans Affairs
Home Loan Guaranty Services**

www.homeloans.va.gov/

Visitability List Serve

visitability-list@ACSU.buffalo.edu

Volunteers for Medical Engineering

2201 Argonne Drive
Baltimore, MD 21218
<http://www.toad.net/~vme/>

**Checklists, related resources and universal design resources compiled with the
assistance of Mary Jo Peterson, www.mjpdesign.com.**

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Universal Design Resources – Books and Printed Materials

“Universal Design for the Home: Great-Looking, Great-Living Design for All Ages, Abilities, and Circumstances”, Wendy A. Jordan, Quarry Books, 2008

“Universal Design and Visitability: From Accessibility to Zoning”, Jack Nasar & Jennifer Evans-Cowley, The John Glenn School of Public Affairs, 2007

“Universal Design Ideas for Style, Comfort & Safety”, RSMMeans and Lexicon Consulting Inc., 2007

“Universal and Accessible Design for Products, Services, and Processes”, Robert F. Erlandson, CRC Press, 2007

“Accessible Home Design: Architectural Solutions for the Wheelchair User” Second Edition, Thomas D. Davies and Carol Peredo Lopez, Paralyzed Veterans of America Distribution Center, 2006

“Remodeling for Easy Access Living”, Rick Peters, Popular Mechanics, 2006

“Universal Design “Smart” Homes for the 21st Century: 102 Home Plans You Can Order and Build”, Charles Schwab, Schwab Publishers, 2005

“The Right Space: A Wheelchair Accessibility Guide for Single-Family Homes”, Albert Ayala, Debold-Marquez Books, LLC, 2005

“Directory of Accessible Building Products”, NAHB Research Center, 2005

“Using Your Home to Stay at Home”, National Council on Aging, 2004

“We the People: Aging in the United States”, Census 2000 Special Reports, Issued December 2004

“AARP Beyond 50.03”, A Report to the Nation on Independence and Disability, AARP, 2003

“The Accessible Home: Updating Your Home for Changing Physical Needs”, Creative Publishing International, 2003

“High Access Home: Design and Decoration for Barrier-Free Living”, Charles A. Iii Riley, Rizzoli Universe Promotional Books, 2003

“Living Independently in Your Later Years”, A special report of the Harvard Medical School, Harvard Health Publications, 2002

“Aging in Place- Solutions to a Crisis in Housing and Care”, Neighborhood Reinvestment Corporation, August 2002

“A Quiet Crisis in America”, The Report to Congress by the Commission on Affordable Housing and Health Facility Needs for Seniors in the 21st Century, June 30, 2002

“Universal Design”, Selwyn Goldsmith, Architectural Press, 2001

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“A Basic Guide to Fair Housing Accessibility: Everything Architects and Builders Need to Know About the Fair Housing Act Accessibility Guidelines”, Steven Winter Associates, Inc., John Wiley & Sons, 2001

“Universal Design Handbook”, Wolfgang Preiser and Elaine Ostroff, editors; McGraw-Hill, 2001

“Aging in Place, Coordinating Housing and Health Care Provision for America’s Growing Elderly Population “, The Harvard University Joint Center on Housing Studies in conjunction with the Neighborhood Reinvestment Corporation report entitled, October 2001

“Aging in Place – Aging and the Impact of Interior Design”, American Society of Interior Designers, 2001

“Products and Plans for Universal Homes”, Home Planners, LLC, 2000

“Fixing to Stay”, A National Survey of Housing and Home Modification Issues, AARP, May 2000

“High-Access Home: Design and Decoration for Barrier-Free Living”, Charles A. Riley II, Ph.D., Rizzoli, 1999

“Universal Interiors by Design: Gracious Spaces”, Mary Jo Peterson and Irma Dobkin, McGraw-Hill, 1999

“Beautiful Universal Design: A Visual Guide”, Cynthia Leibrock, James Terry, James Evan Terry, Wiley John & Sons, 1999

“The Universal Design File: Designing for People of All Ages and Abilities”, Molly Story, James Mueller, Ronald Mace, The Center for Universal Design, 1998

“Universal Kitchen and Bathroom Planning: Design That Adapts to People”, Mary Jo Peterson, McGraw-Hill Professional Publishing, 1998

“Universal Design: Creative Solutions for ADA Compliance”, Roberta L. Null, Professional Publications Inc, 1998

“Fair Housing Act Design Manual”, Barrier Free Environments, Inc., 1998

“Accessible Housing by Design: Universal Design Principles in Practice”, Steven Winter Associates, McGraw-Hill, 1997

“Elder Design: Designing and Furnishing a Home for Your Later Years”, Rosemary Bakker, Penguin Group, 1997

“Residential Remodeling and Universal Design: Making Homes More Comfortable and Accessible”, U. S. Department of Housing and Urban Development, 1996

“Accessible Housing”, Leon A. Frechette, McGraw-Hill, 1996

“Building for a Lifetime: The Design and Construction of Fully Accessible Homes”, Margaret Wylde, Adrian Baron-Robbins and Sam Clark, Taunton Press, 1994

“Enabling Garden: Creating Barrier-free Gardens”, Gene Rothert, Taylor Publishing Co., 1994

“The Accessible Housing Design File”, Barrier Free Environments, Inc., John Wiley & Sons, 1991

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