Accessibility for All through Universal Design

BY: RAMESH GULATEE

D isability impacts all of us. Most Americans will inevitably suffer from impairments during their lifespans. These impairments may be due to issues that are diagnosed, such as obesity, combat injuries, lifestyle and other factors. Additionally, as America grays, the prevalence of sensory (visual, hearing), manipulatory and mobility impairments will increase in duration and magnitude.

It is easy to extrapolate the CDC data below to conclude that aging and obesity alone constitute the majority of the US population. The modeling projections point to higher proportions of Americans in this category during the next 25 years.
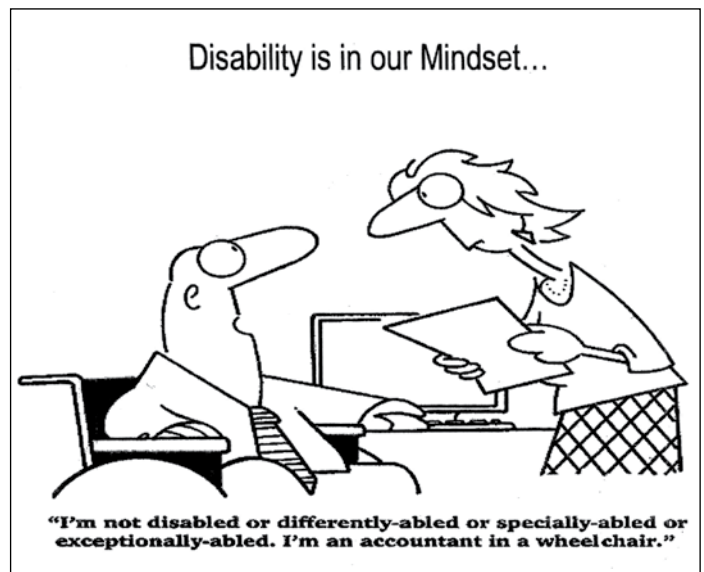
Despite the demographics, there is a perception in the design engineering and real estate industries that the "accessibility ordinances" are excessively cautionary, and amount to mandating designs for **worst-case scenarios**. Barrier-Free Design is in fact designing for the **best situation**, because it accommodates the needs of changing US demographics.

This article will help readers to understand Universal Design (UD) concepts and identify and modify unworkable designs. It will also help them to compare Universal Design vs. non-universal designs and to identify and source Universal Design-based products.

Demographics for U.S. Impairments

If we could fit the entire U.S. population (332 million) into a room of 100 people while maintaining the proportions of Americans suffering from various impairments, the room would have the following demographics:

Impairments	%	Millions
ADA	16	54
Combat Veterans	6	20
Aging Induced	16	54
Obesity	42	139
Lifestyle Situations	8	27 (Live/Learn/Work/Play Mishaps)
Relatively Healthy	12	38

Disability is in our Mindset…

"I'm not disabled or differently-abled or specially-abled or exceptionally-abled. I'm an accountant in a wheelchair."

Accessibility Timeline:

The following legislation and advocacies have been undertaken since 1968:

ABA 1968	The Architectural Barriers Act
RA 1973	The Rehabilitation Act (sec. 508)
ADA 1990	The Americans with Disabilities Act
UD 1997	Development of principles of Universal Design/UD, North Carolina State University
UD 1998	First International Conference on Universal Design, NYC
AIA 2008	Resolution on "integration of Universal Design in the built environment" adopted by AIA, and becoming AIA's policy statement on accessibility.

Definitions: Accessibility

Traditional Design - Designs based on the needs of an able-bodied individual

ADA Design - Compliance to minimal accessibility standards guidelines

Barrier-Free Design - Design that enables access of the built environment for all. Numerous myths and misconceptions exist regarding Universal Design. Some of them are:

  The ADA and other disabilities laws have created equality.

  Universal Design only helps people with disabilities and seniors.

  Universal Design is simply good ergonomic design.

  Advances in healthcare and medical science are reducing incidences of functional limitations.

  Universal Design can't sustain itself because the people who need it most can't afford it.

Universal Design is human-centered design for broad-spectrum use to the greatest extent possible. UD applies to surroundings, objects, products and equipment that humans interface with, such as infrastructure, cities/towns, habitat, landscape, and more.

The purpose of this article is to promote awareness and understanding of barrier-free design to enable access of the built environment to all.

The issues of access to a barrier-free environment were studied at length and developed into a set of guiding principles called **Universal Design** by an esteemed group of designers from North Carolina State University in 1997.

  PRINCIPLE 1: Equitable use
  Right/Left Hand Scissors
  The design is useful and marketable to people with diverse abilities.
  Provide the same means of use for all users i.e., identical when possible or equivalent.
  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 2: Flexibility in use
  Audio/Video/Tactile cues on ATM
  The design accommodates a wide range of user preferences and abilities.
  Provide choice in methods of use.
  Accommodate right/left-handed access and use.
  Facilitate the user's accuracy and precision.
  Provide adaptability to the user's pace.

  PRINCIPLE 3: Simple and intuitive Use
  Smart phones/thermostats/wi-fi security cameras
  Use of the design is easy to understand, regardless of the experience, knowledge, language skills, or concentration levels of the users.

Eliminate unnecessary complexity.
Be consistent with user expectations and intuition.
Accommodate a wide range of literacy and language skills.
Arrange information in a way that is consistent with its importance.
Provide effective prompting and feedback during and after task completion.

PRINCIPLE 4: Perceptible information
Product assembly pictorials (Ikea)
The design communicates necessary information effectively regardless of ambient conditions or the user's abilities.
Use different modes i.e., pictorial/verbal/tactile and others for essential information.
Provide adequate contrast between essential information and its surroundings.
Maximize legibility of essential information.
Differentiate elements in ways to make it easy to give instructions or directions.
Provide varying techniques or devices used by people with sensory limitations.

PRINCIPLE 5: Tolerance for error:
Fuses/Circuit Breakers, Undo/Redo Commands
Minimize design hazards and adverse consequences of accidental/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 6: Low physical effort:
Battery-powered tools with interchangeable bits
The design can be used efficiently, comfortably, and with a minimum fatigue.
Allow user to maintain a neutral body position.
Use reasonable operating force.
Minimize repetitive actions.
Minimize sustained physical effort.

PRINCIPLE 7: Size and space for approach and use:
Adjustable height countertop
Provide appropriate size and space 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.

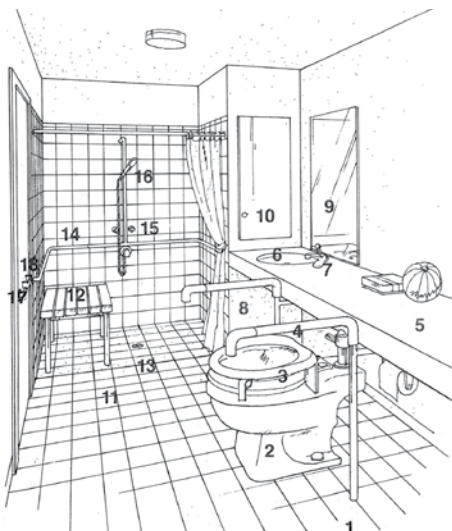## Accessibility thru Design Evolution:

Wheeled Mobility

Universal Design
Wheel Chairs

Trains, Planes, Cars

ADA & UD based Transportation Accessibility
Trains, Planes, Automobiles and Wheelchairs

Universal Design

Kitchen

ADA

1. Wall oven, for easy access, open at counter height
2. Cooktop controls at the front, to avoid burning
3. Cooktop and counter, 30"/76 cm to 33"/84 cm height
4. Knee space under sink counter to allow sitting in the wheelchair at counter
5. High recessed base under cabinets to accommodate wheelchair pedals
6. Pullout work shelf, 30"/76 cm to 33"/84 cm at standard height counters
7. Mixing faucet at sink, lever handle
8. Cove lighting under wall cabinets, bulb replacement within reach range
9. Shallow shelf over sink counter within reach range
10. Wall space within reach over sink counter, used for hanging utensils
11. Front-loading dishwasher
12. Side-by-side refrigerator doors to allow access to refrigerator and freezer
13. Full height storage closet for easy access
14. Cabinet space under wall oven within reach range
15. Drawers under cooktop and counter for easier access
16. Easy grip cabinet door pulls
17. High cabinets (out of reach for the chair-bound) for other user
18. Smooth, nonskid slooring, open spaces for wheelchair passage
19. Round table to avoid corners, legs, or pedestal base with no apron to allow for wheelchair

Universal Design

UD based Kitchen

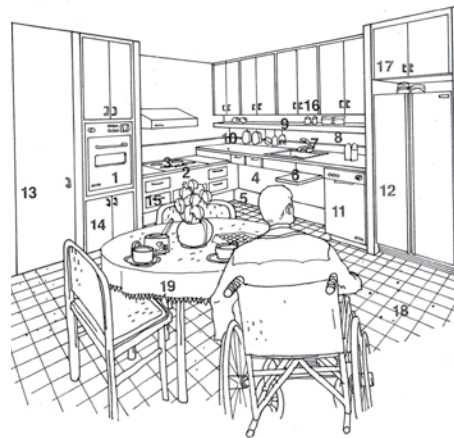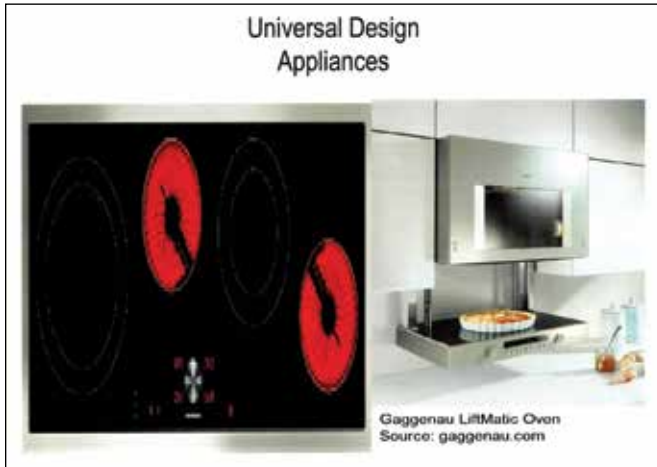adjustable height countertop and overhead cabinets

Bathrooms

ADA

1. Space for a wheelchair either side of toilet
2. Toilet with recessed base
3. Adjustable height toilet seat or seat extender
4. Swing-away grab bars
5. 27"/ 69 cm-deep counter
6. Washbasin within reach of the seated position on the toilet
7. Mixing faucet, lever handle, within reach of the seated position on the toilet
8. Knee space under counter, drain pipe covered or insulated
9. Mirror, lower edge no higher than 36"/91 cm
10. Medicine cabinet within reach
11. Space for transfer to a shower seat
12. Freestanding shower seat, can be placed either end of shower, or removed
13. No curb for shower stall; the chairbound can wheel directly into the shower; shower stall floor slope to center drain
14. Grab bar, three sides of shower stall
15. Controls centered on back wall of shower stall
16. Hand shower
17. Outswinging bathroom door, lever handle
18. Door pull, hinge side of door

Universal Design Appliances

Universal Design Appliances

Gaggenau LiftMatic Oven
Source: gaggenau.com

Conclusions: CDC data show that Americans spend 75-80% of their lives indoors.

In the U.S., built environments incorporate ADA accessibility design guidelines for compliance with regulatory thresholds. This approach results in accommodating the accessibility needs of about 1 in every 6 Americans to the exclusion of the majority of citizens.

The need to develop a more inclusive accessibility policy is recognized in the U.S.

www.section508.gov/blog/infographic-the-case-for-universal-design.

In this regard, organizations such as ADA, the U.S. Access Board, GSA and other governmental bodies have been proactively advocating for greater accessibility of the built environment, as well as digital accessibility, through the application of universal design principles.

Barrier-free accessibility is generally viewed favorably by municipal jurisdictions, leading to expediency in project approvals, and when considered/incorporated at the conceptual stages results in: a) lower life cycle cost,

b) adaptability to changing demographics, and c) greater broad-spectrum usage.

This enhances the asset value towards greater marketability. Barrier-free design, or provisions for it, is undeniably part of good design practice that contributes to the success of the built environment.

Example: Consider the plus value of an ATM machine that offers tactile, audio, and video cues to banking customers vs. an ATM that does not.

Accessibility Resources

Organizations:
ADA - www.ada.gov
US Access board - www.access-board.gov
Federal Communications Commission - www.fcc.gov
Center for Applied Special Technology - www.cast.org
Assistive Technology Industry Association - www.atia.org
International Association of Accessibility Professionals - www.accessibilityassociation.org

Industry:
Household Products - www.oxo.com
Appliances - www.ge.com, www.gaggenau.com
Accessibility-Related Products - www.hafele.com
Bathroom/Kitchen Accessories - www.pressalitcare.com, www.toto.com, www.laufen.com, www.kohler.com

About the Author: Ramesh Gulatee, Architect (Canada/USA) focuses on accessibility in practice and was the sponsor of the resolution on Universal Design/AIA '08, Boston. Ramesh was invited by NCD to participate in the ADA2010 Accessibility Summit, Washington DC. Since 1998, Ramesh has worked as project lead on the McCormick Place Corporate Addition, The Goodman Theatre Center, and Fort Sheridan Housing Development, Illinois. Ramesh currently serves on the ADA Accessibility Illinois steering committee.

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Test Questions

CE Quiz - Continuing Education Test – Accessibility for all through Universal Design

1. What is Universal Design?
   a. Design for All
   b. Design that is based solely on wheelchair access
   c. Design that works without a specific user in mind

2. Name the institution, year and team composition that developed UD principles:
   Write in your answer: _____
   _____

3. Is ADA (ADA Accessibility Guidelines) the same as UD?
   a. True
   b. False

4. Select 5 Myths about Universal Design:
   a. Building codes adequately address all disabilities
   b. Universal Design is simply good ergonomic design
   c. UD is same as ADA compatible design
   d. UD is not necessary since ADA has created equality
   e. Universal Design only helps people with disabilities and older people
   f. Improvements in health sciences/care have reduced disability limitation

5. Select all the UD principles from the list below:
   a. Equitable Use
   b. Evidence-Based Design
   c. Barrier Removal
   d. Flexibility in Use
   e. Low Physical Effort
   f. Simple and Intuitive Use
   g. Perceptible Information
   h. Tolerance for Error
   i. Size and Space for Approach and Use

6. ABA and UD accomplish accessibility for all.
   a. True
   b. False

7. Universal Design, Adaptive Design and Inclusive Design all work on a similar basis?
   a. True
   b. False

8. When is it appropriate to install grab bars?
   a. Make provision(s) if needed
   b. Install to complete

9. Is UD applicable to private residences only?
   a. True
   b. False

10. When is it a good design practice to integrate UD into a project?
    a. Before permit submittal
    b. When negotiating with the builder
    c. During construction
    d. During the design concept stage

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