

APPLYING THE PRINCIPLES OF UNIVERSAL DESIGN IN DEVELOPING INFRASTRUCTURE

By:

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What is Universal Design

- The design of products and the environment to be usable to the greatest extent possible by people of all ages with varying abilities.
- Universal Design respects human diversity (since every individual is unique) and promotes the inclusion of all people in all activities of life.

Why Universal Design?

- Where products and the environment are designed to suit a broad range of users, including children, older adults, people with disabilities, people of different shape and sizes, people who ill or temporarily injured.

How did we get here?

- People with disabilities voicing their need for access and independence.
- Overcoming barriers with adaptation
- Barrier-Free Access (built access features)
- Access for All – that everyone benefits from access features
- Concept of Universal Design

Understanding Human Abilities

- Each of us is unique in size, abilities, talents and preferences
- Application of the Principles of UD requires an understanding of how abilities vary with age, disability, environment or circumstances

- Human Abilities can be grouped into the following categories:
 - Cognition
 - Vision
 - Hearing & speech
 - Body, arm & hand functions
 - Mobility

Universal Design and Cognition

- Considering the variety of human abilities in receiving, comprehending, interpreting, remembering, or acting on information. Includes:
 - Initiating tasks without prompting
 - Response time taken to react to a situation
 - Ability to concentrate
 - Comprehending visual and audio information
 - Sequencing & keeping things organised
 - Remembering things
 - Problem solving & decision making
 - Learning new things
- Cognition can vary according to age, disability, the environment, or a particular situation.
 - Very young children with limited grammar, vocabulary and reasoning skills
 - Individuals with limited literacy
 - Individuals in foreign lands
 - Older persons with memory deficiencies
 - Adults with diminished memory or reasoning skills
 - Individuals who are fatigue or distracted

Universal Design and Vision

- Considering the variety of human abilities in perceiving visual stimuli. Includes:
 - Perceiving visual detail clearly
 - Focusing on objects up close and far away
 - Separating objects from the background
 - Perceiving contrast in colour and brightness
 - Adapting to high and low lighting levels
 - Tracking moving objects
 - Judging distances
- Vision can vary according to age, disability, the environment, or a particular situation. Includes:
 - Individuals distracted by a “busy” visual environment
 - Individuals fatigue from excessive visual tasks
 - Individuals functioning under coloured lighting or very high or very low lighting conditions
 - Individual functioning in adverse weather conditions
 - Those with blindness or partial vision lost

Universal Design and Hearing & Speech

- Considering the variety of human abilities in perceiving auditory stimuli. Includes:
 - Localising the source of sound
 - Separating auditory information from background sounds
 - Perceiving both high and low pitched sounds
 - Carrying on a conversation
- Hearing and speech can vary according to age, disability, the environment, or a particular situation. Includes:
 - Individuals whose attention is divided among several auditory sources
 - Individuals functioning in noisy environments
 - Individuals using headphones
 - Individuals with deafness or loss of hearing

Universal Design and Body Functions

- Considering the variety of human abilities in performing common tasks. Includes:
 - Physical exertion
 - Achieving, maintaining and changing position
 - Maintaining equilibrium
 - Breathing
- Body function can vary according to age, disability, the environment, or in a particular situation. Includes:
 - Young children with limited physical development
 - Older adults with diminished stamina or balance
 - Women in later stages of pregnancy, whose balance is affected by the weight of the baby
 - Individuals who are fatigue, in pain or have limited range of motion due to temporary or minor illness
 - Individuals under adverse environmental conditions
 - Individuals with limitations

Universal Design and Arm Functions

- Considering the variety of human abilities in upper extremity range of motion, coordination and strength. Includes:
 - Reaching up, down forward or behind
 - Pushing and pulling
 - Lifting and lowering
 - Carrying
- Arm function can vary according to age, disability, the environment, or a particular situation. Includes:
 - Young children with limited physical development
 - Older adults with diminished joint range, motion or strength
 - Individuals who are fatigue, in pain or have limited range of motion due to temporary or minor illness
 - Individuals with one or no free arm due to carrying things or performing another tasks
 - Individuals wearing thick clothing
 - Individuals with limitations

Universal Design and Hand Functions

- Considering the variety of human abilities required to perform common tasks. Includes:
 - Grasping
 - Squeezing
 - Rotating
 - Pinching
 - Pushing
 - Pulling
- Hand function can vary according to age, disability, the environment, or a particular situation. Includes:
 - Young children with small hand and weak fingers
 - Older adults with diminished joint range, motion or strength
 - Individuals who are fatigue, in pain or have limited range of motion due to temporary or minor illness
 - Individuals whose hands are fatigue with repetitive tasks
 - Individuals wearing gloves, or with wet or oily hands
 - Individuals with only one hand free due to simultaneous performing of another task
 - Individuals with limitations

Universal Design and Mobility

- Considering the variety of human abilities required in performing common tasks. Includes:
 - Rising from a seated position
 - Standing upright
 - Walking & running
 - Jumping & climbing
 - Kneeling
 - Balancing on one foot
 - Operating foot controls

- Mobility can vary according to age, disability, the environment, or a particular situation. Includes:
 - Young children with limited physical development
 - Older adults with diminished strength, stamina, balance, range of motion in the spine and lower extremities
 - Individuals who are fatigue, in pain or have limited range of motion due to temporary or minor illness
 - Individuals of extreme body size or weight
 - Individuals under adverse environmental conditions (uneven or unstable terrain)
 - Individuals with limitations

Principles of Universal Design

1. Equitable Use
2. Flexibility in Use
3. Simple and Intuitive Use
4. Perceptible Information
5. Tolerance for Error
6. Low Physical Effort
7. Size and Space Approach and Use

1. Equitable Use

The product/environment is useful and marketable to people with diverse abilities

1A: Provide the same means of use for all users; identical where possible; equivalent when not.

1B: Avoid segregating or stigmatising any users

1C : Make provisions for privacy, security and safety equally available to all users.

1D: Make the design appealing to all users

2. Flexibility in Use

The product/environment accommodates a wide range of individual preferences and abilities

- 2A: Provide choice in methods of use
- 2B: Accommodate left- or right- handed access use
- 2C: Facilitate the user's accuracy and precision
- 2D: Provide adaptability to the user's pace

3. Simple and Intuitive Use

The use of the product/environment design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.

- 3A: Eliminate unnecessary complexity
- 3B: Be consistent with user expectations and intuition
- 3C: Accommodate a wide range of literacy and language skills
- 3D: Arrange information consistent with its importance
- 3E: Provide effective prompting and feedback during and after task completion

4. Perceptible Information

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

- 4A: Use different modes (pictorial, verbal, tactile) for redundant presentation of essential information.
- 4B: Maximise "legibility" of essential information
- 4C: Differentiate elements in ways that can be described (i.e. make it easy to give instructions or directions).
- 4D: Provide compatibility with a variety of techniques or devices used by people with sensory limitations

5. Tolerance for Error

The product/environment minimises hazards and the adverse consequences of accidental or unintended actions.

- 5A: Arrange elements to minimise hazards and errors
- 5B: Provide warnings of hazards or errors
- 5C: Provide fail-safe features
- 5D: Discourage unconscious action in task that requires vigilance

6. Low Physical Effort

The product/environment can be used efficiently and comfortably with a minimum of fatigue

6A: Allow user to maintain a neutral body position

6B: Use reasonable operating forces

6C: Minimise repetitive actions

6D: Minimise sustained physical effort

7. Size and Space Approach and Use

The product/environment provides appropriate size and space for approach, reach, manipulation and use, regardless of the user's body size, posture or mobility.

7A: Provide a clear line of sight to important elements for any seated or standing user

7B: Make reach to all components comfortable for any seated or standing user

7C: Accommodate variations in hand and grip sizes

7D: Provide adequate space for the use of assistive devices or personal assistance

Conclusion

Our biggest challenge is to create the awareness among design professionals, manufacturers and consumers. Design should adapt to people, not the other way around. As the industries respond to the aging of the population and new legal structures, "better for everyone" and "planning ahead for your family's needs" will begin to replace "handicapped" and "elderly" as marketing approaches

Designers can influence their clients to appreciate the relatively small cost and large benefit associated with improved usability for all. However, as comfort, safety, and flexibility become more important key words in advertising, emerging technologies will continue to respond to the needs of people of all ages, abilities and sizes. Designers will be faced with a choice: reluctant compliance with minimum accessibility standards, or a positive, sensitive offering of universal design services.

Manufacturers can realize higher sales to a wider market through the production of products that are more suitable and comfortable for more people to use.

Finally, the consumers will benefit from the environment and product that impose a lesser demand on their physical, sensory and cognitive abilities.