Cassie the puppy
INCLUSIVENESS

UNIVERSAL DESIGN
ACCESSIBILITY

AND

THE AMERICANS
WITH DISABILITIES ACT
How owners see accessibility: ADA standards & mobility

PERCEPTION is the core problem
How the community sees accessibility
How the community sees accessibility
How architects see accessibility

• code compliance
How architects see accessibility

- code compliance
- focussed on wheelchairs
How architects see accessibility

- code compliance
- focused on wheelchairs
- emphasis on toilet rooms
How architects see accessibility

- code compliance
- focussed on wheelchairs
- emphasis on toilet rooms
- minimum = maximum
How architects see accessibility

How does that fit into their world?
How architects see accessibility: minimum = maximum
How architects see accessibility: minimum = maximum?
School Mobility Case

inaccessible routes
barriers
School Mobility Case

accessible routes
inaccessible routes
barriers
School Mobility Case

but does this work?

accessible routes
inaccessible routes
barriers
School Mobility Case: Legal yet not effective

Social isolation: if you had to use the blue routes?

Practicality?

accessible routes
inaccessible routes
barriers

Parking & Entrance
Statistics: percentages of US population with a disability (2011)

Prevalence of disability among non-institutionalized people ages 65 to 74 in the United States in 2011

Prevalence Rates: Age 65 to 74 years (%)

- Any Disability: 25.6%
- Visual: 4.1%
- Hearing: 9.1%
- Ambulatory: 16.0%
- Cognitive: 5.5%
- Self-Care: 4.7%
- Independent Living: 8.3%
25% of population has a disability by age 74

(www.disabilitystatistics.org 2011 report)

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Statistics: percentages of US population with a disability (2011)

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1.5% of population uses a wheelchair (2005)
(www.census.gov/prod/2008pubs/p70-117.pdf)

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How architects see accessibility vs. reality of disability statistics

• code compliance

• focussed on wheelchairs
Universal Design: meeting broader challenges

Where now? Going beyond the standards...
Seven Principles of Universal Design

1. **Equitable Use:**
The design is useful and marketable to people with diverse abilities.

2. **Flexibility in Use:**
The design accommodates a wide range of individual preferences and abilities.

3. **Simple and Intuitive:**
Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level.

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

5. **Tolerance for Error:**
The design minimizes hazards and the adverse consequences of accidental or unintended actions.

6. **Low Physical Effort:**
The design can be used efficiently and comfortably and with a minimum of fatigue.

7. **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.

(from http://www.design.ncsu.edu/cud/univ_design/princ_overview.htm and other sources)
4. Perceptible Information:
The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.

Importance of redundant information: visual and aural, for example, as with transit information which is presented on the PA system as well as on the reader board.
Bear in mind the range of expression of each disability:

full hearing    hard of hearing    deafness
Bear in mind the range of expression of each disability:

- full hearing
- hard of hearing
- deafness

- full vision
- limited vision
- blindness
Bear in mind the range of expression of each disability:

**full hearing**      **hard of hearing**      **deafness**

**full vision**      **limited vision**      **blindness**

**mobility aids:**
  none      handrails      canes      crutches      walkers      wheelchairs
Bear in mind the range of expression of each disability:

full hearing  hard of hearing  deafness

full vision  limited vision  blindness

mobility aids:
none  handrails  canes  crutches  walkers  wheelchairs

Universal Design is a richer subject than white canes and wheelchairs.
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(From http://www.design.ncsu.edu/cud/univ_design/princ_overview.htm and other sources)

These don’t always apply well in design fields. Perhaps follow them up...
Universal Design: Four Questions to Test a Design

- **Is it universal?**
  - Is it designed for a wide range of abilities and needs?

- **Is it effective?**
  - Does it actually work for the specific needs?
  - Has it been tested or at least reviewed by representatives of a wide range of users?
  - Is it supported by research, design standards, or other sources?

- **Is it welcoming and inclusive?**
  - Does it feel natural and comfortable for all users?
  - Does it discriminate unnecessarily on the basis of ability?
  - Does it give the impression of disability-based discrimination?

- **Will the design solution be durable over time?**
  - Can it accommodate change through flexibility, adaptability, or adjustability?
• Welcoming?
• Is it too “special”?
• Does it make a spectacle of those who use it?
• Is it socially isolating?
• Is it architecturally delightful? Beauty as a characteristic of Universal Design
309 Operable Parts

309.1 General. Operable parts shall comply with 309.

309.2 Clear Floor Space. A clear floor or ground space complying with 305 shall be provided.

309.3 Height. Operable parts shall be placed within one or more of the reach ranges specified in 308.

309.4 Operation. Operable parts shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate operable parts shall be 5 pounds (22.2 N) maximum.

EXCEPTION: Gas pump nozzles shall not be required to provide operable parts that have an activating force of 5 pounds (22.2 N) maximum.
Pattern:

Can the control be operated with a closed fist?

Many standard plumbing, electrical, and hardware controls can be. However, others can't, in particular door knobs, thumb latch locks, faucets that require grip, and so forth.
Integrated Design to solve multiple problems simultaneously through an integrated team

Who: Integrated design team
Owner: professional staff
End users

Design team
architect
engineers and other consultants

Contractor

Ed Roberts campus, Berkeley, CA
Universal Design: Hearing

PATTERNS:

Protection from Fire
Provide visual alarms as part of the main fire alarm system. Provide bed shakers in sleeping areas.

Assistive Listening Systems
Provide personal amplification systems in all assembly areas and all areas with amplification systems.

Excellent Communication Acoustics
Design the room acoustics to maximize sound quality for all. In rooms designed for discussion, design for two-way acoustics. In rooms limited to presentation, maximize for presenter-receiver acoustics. In office environments, control ambient noise.

Line of Sight
Seeing is doubly important for people with hearing impairments. With diminished sound, communications, safety, and much else depends of visual connection.
Universal Design: Hearing & Safety

HEARING PATTERNS
- Fire Protection
- Assistive Listening
- Communication Acoustics
- Line of Sight
Universal Design: Hearing - Why some rooms sound better than others?
Universal Design: Hearing
Universal Design: Hearing

HEARING PATTERNS
Fire Protection
Assistive Listening
Communication Acoustics
Line of Sight
Universal Design: Hearing

HEARING PATTERNS
Fire Protection
Assistive Listening
Communication Acoustics
Line of Sight
Universal Design: Hearing

HEARING PATTERNS
Fire Protection
Assistive Listening
Communication Acoustics
Line of Sight
Example: acoustics

- Social isolation of deafness
- Importance of acoustics to hard-of-hearing (most of us at some point in our lives)
- Importance of excellent communication acoustics in learning environments (as well as line of sight)
- Importance of acoustics for people who are blind, who use echo-location (hearing echoes, as does sonar)
- Universal appreciation of acoustical delight
Universal Design: Hearing

Which letters carry meaning in words?

Vowels? Consonants?

Evidence:
Universal Design: Hearing

Which letters carry meaning in words?

Vowels?    Consonants?

Evidence:

![Image of a license plate with the text "DBLTRBL"]
What do we Hear?

We have already defined sound as any pressure variation which can be heard by a human ear. This means a range of frequencies from 20 Hz to 20 kHz for a young, healthy human ear. In terms of sound pressure level, audible sounds range from the threshold of hearing at 0 dB to the threshold of pain which can be over 130 dB.

Although an increase of 6 dB represents a doubling of the sound pressure, an increase of about 10 dB is required before the sound subjectively appears to be twice as loud. (The smallest change we can hear is about 3 dB).

The subjective or perceived loudness of a sound is determined by several complex factors. One such factor is that the human ear is not equally sensitive at all frequencies. It is most sensitive to sounds between 2 kHz and 5 kHz, and less sensitive at higher and lower frequencies.

Sound Volume in dB

![Diagram of sound volume and frequency range](hdhearing.com-Speech Intelligibility.pdf)
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Universal Design: Hearing

![Diagram of sound frequency and volume]

- **Sound Volume in dB**
- **Frequency (low to high sounds)**
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Universal Design: Hearing

Sound Volume in dB

Frequency (low to high sounds)
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Universal Design: Hearing and Typical Classroom Performance

- All vowels
- Most consonants
- Carpet
- Cheap ceiling
Universal Design: Hearing and Typical Classroom Performance

inexpensive mineral ceiling tile
Universal Design: Hearing and Typical Classroom Performance

- Inexpensive mineral ceiling tile
- Glue-down carpet or composition tile
Universal Design: Hearing and Typical Classroom Performance

- inexpensive mineral ceiling tile
- concrete masonry walls
- glue-down carpet or composition tile
What do we Hear?

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The subjective or perceived loudness of a sound is determined by several complex factors. One such factor is that the human ear is not equally sensitive at all frequencies. It is most sensitive to sounds between 2 kHz and 5 kHz, and less sensitive at higher and lower frequencies.

Universal Design: Hearing and Good Classroom Performance

[Diagram showing relationship between sound volume in dB and frequency (20-20,000 Hz).]

- All vowels
- Most consonants
- Carpet
- Cheap ceiling
- Good ceiling

Frequency (low to high sounds)
Classroom materials of high sound absorption placed at ceiling/wall intersections, combined with carpet to reduce noise at the source, have the maximum effect on reinforcing speech in a classroom or seminar room. This approach works for the primary presenter and also for enhancing discussions.

Diagrams above from www.nonoise.org for use in teaching at the University of Oregon.
Full acoustic design is much more complex:
• placement of absorptive material
• shaping of the room to increase beneficial reflections
• specific performance of each material
• HVAC noise
• control of noise transfer through walls, floor, and ceilings
Universal Design: Mobility
Compliance: ramps

Standard solution to grade change:
Pick a ramp from the building code or from the ADA Standards.

Results are seldom beautiful and sometimes don't work well for almost anyone. And if you try to build it at the maximum slope (1:12), it will almost invariably end up too steep.
**Standard solution** to grade change:
Pick a ramp from the building code or from the ADA Standards.

Results are seldom beautiful and sometimes don't work well for almost anyone. And if you try to build it at the maximum slope (1:12), it will almost invariably end up too steep.

Why can’t a ramp be
- beautiful to look at?
- a delight to travel on?
- effective for all who use it?
Universal Design: Mobility - We all use ramps
Universal Design: Mobility - We all use ramps
Universal Design: Site Mobility Patterns

### Integrated Path

Make sure that accessible routes are a meaningful main route used by all to prevent social isolation and to enhance wayfinding.

### Low Slopes / Short Ramps

Keep slopes at 5 percent or less except for short ramps (up to 12 - 15 feet long).

### Shortest Path

Make accessible routes a direct and as short as possible (within the context of Low Slopes / Short Ramps). This suggests integrating grade changes into the direction of desired travel and avoiding back-and-forth ramps.

### Easy Climbs

Total vertical ascents of more than about four feet can be very tiring for many people. Avoid them or provide alternative means (such as an elevator).
Universal Design Case: Mobility, Cascade Courtyard
Universal Design Case: Mobility, Cascade Courtyard

- Columbia Hall
- Pacific Hall
- Courtyard
- Volcanology
- Cascade Hall
- Fountain
- Upper terrace (accessible by elevator)
- 1:12 slope up
Universal Design Case: Mobility, Cascade Courtyard

MOBILITY PATTERNS
Integrated Path
Low Slope/Short Ramps
Shortest Path
Easy Climbs

Universal? Welcoming? Effective? Durable?
Is it possible to use 5% slopes to create walks that connect levels without making people loop back and forth?

MOBILITY PATTERNS
Integrated Path
Low Slope/Short Ramps
Shortest Path
Easy Climbs
Universal Design Case: Design Integration at HEDCO Restrooms

courtyard

cafe

entrance

lobby

elev

learning commons
Universal Design Case: Design Integration at HEDCO Restrooms
Universal Design Case: Design Integration at HEDCO Restrooms

courtyard
cafe
entrance
lobby
elev
learning commons
Universal Design Case: Design Integration at HEDCO Restrooms
Mobility: No-door (airport-style) toilet rooms have no entry barriers

Vision: Auditory cue of water sounds guides users to the restrooms
**Problem:**
Poor acoustical design puts too much toilet noise into the entrance lobby.
**Result:** Doors are retro-fitted, making access more difficult.
Universal Design Case: Mobility, Johnson Hall entrance

MOBILITY PATTERNS
Integrated Path
Low Slope/Short Ramps
Shortest Path
Easy Climbs
Universal Design Case: Mobility, Johnson Hall entrance

MOBILITY PATTERNS
Integrated Path
Low Slope/Short Ramps
Shortest Path
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Universal Design Case: Mobility, Johnson Hall entrance

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Easy Climbs
Universal Design Case: Mobility, Johnson Hall entrance

MOBILITY PATTERNS
- Integrated Path
- Low Slope/Short Ramps
- Shortest Path
- Easy Climbs
Universal Design Case: Mobility, Johnson Hall entrance

Solution: Create a new entrance to lower level. 18” drop, straight 5% slope, closest entrance to parking

Universal? Welcoming? Effective? Durable?

MOBILITY PATTERNS
Integrated Path
Low Slope/Short Ramps
Shortest Path
Easy Climbs
Universal Design Case: Mobility & Wayfinding, Lawrence Hall
Universal Design Case: Mobility & Wayfinding, Lawrence Hall
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Universal Design Case: Mobility, Lawrence Hall
### Universal Design Case: Mobility, Lawrence Hall

#### Social Isolation:
If this is your only route to studio, how would you feel?

<table>
<thead>
<tr>
<th>Universal?</th>
<th>Welcoming?</th>
<th>Effective?</th>
<th>Durable?</th>
</tr>
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<tr>
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#### MOBILITY PATTERNS
- Integrated Path
- Low Slope/Short Ramps
- Shortest Path
- Easy Climbs
Universal Design Case: Mobility & Wayfinding, Lawrence Hall
Universal Design Case: Mobility, Lawrence Hall

- Universal?
- Welcoming?
- Effective?
- Durable?

MOBILITY PATTERNS
Integrated Path
Low Slope/Short Ramps
Shortest Path
Easy Climbs

keyed lock
Universal Design: Vision

PATTERNS:

No Protrusion Hazards
Avoid items that protrude more than 4" above 24" (ADA Standards = 27”) so that blind and low vision users are safe

Safe Crossings
Design vehicular areas with clear separation from pedestrian areas, either
- curbs at 1:12 slope, or
- 3' band of tactile pavement, or
- bollards with 3' maximum gaps

Effective Shorelines
Provide consistent edges to guide cane users and others
- vertical edges such as walls and curbs, or
- textural contrasts such as pavement to planting, or concrete to gravel, or paving type, and
- provide visual contrast along shorelines as appropriate

90 Degree Corners, No Curves
Provide clear circulation to enhance imageability
Avoid curves and angles, use a rectilinear organization for circulation

Visual Contrast
Use light/dark contrast to emphasize stair hazards, shorelines, etc.
No Protrusion Hazards
Avoid items that protrude more than 4" above 24" (ADA Standards = 27") and below 80” so that blind and low vision users are safe.
Universal Design: Safe Crossings

- Orthogonal (90 degree) elements for straight paths
- Sound cues
Universal Design: Curb Ramps - Mobility vs. Vision?

VISION PATTERNS
- No Protrusion Hazards
- Safe Crossings
- Effective Shorelines
- 90 Degree Corners
- Visual Contrast
Also, enhancement of auditory cues with pavement textures
Universal Design: Vision on Broadway

VISION PATTERNS
No Protrusion Hazards
Safe Crossings
Effective Shorelines
90 Degree Corners
Visual Contrast
Shorelines

VISION PATTERNS
No Protrusion Hazards
Safe Crossings
Effective Shorelines
90 Degree Corners
Visual Contrast
Universal Design: Vision on Broadway

Shorelines

VISION PATTERNS
No Protrusion Hazards
Safe Crossings
Effective Shorelines
90 Degree Corners
Visual Contrast
Universal Design: Vision on Broadway at Willamette

VISION PATTERNS
No Protrusion Hazards
Safe Crossings
Effective Shorelines
90 Degree Corners
Visual Contrast
Test for high reflectance contract by photographing in black and white

full vision     limited vision     blindness

VISION PATTERNS
No Protrusion Hazards
Safe Crossings
Effective Shorelines
90 Degree Corners
Visual Contrast
Universal Design: Vision - Lane Transit Station

VISION PATTERNS
No Protrusion Hazards
Safe Crossings
Effective Shorelines
90 Degree Corners
Visual Contrast
Universal Design: Vision - Lane Transit Station

VISION PATTERNS
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Visual Contrast
VISION PATTERNS
No Protrusion Hazards
Safe Crossings
Effective Shorelines
90 Degree Corners
Visual Contrast
Nice building!
Universal Design: Vision at the Health Center

VISION PATTERNS
No Protrusion Hazards
Safe Crossings
Effective Shorelines
90 Degree Corners
Visual Contrast
Universal Design: Vision at the Health Center

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Universal Design: Vision at the Health Center

VISION PATTERNS
No Protrusion Hazards
Safe Crossings
Effective Shorelines
90 Degree Corners
Visual Contrast
Universal Design: Vision at building entrances

**VISION PATTERNS**
- No Protrusion Hazards
- Safe Crossings
- Effective Shorelines
- 90 Degree Corners
- Visual Contrast
Universal Design: Vision at the Health Center

VISION PATTERNS
No Protrusion Hazards
Safe Crossings
Effective Shorelines
90 Degree Corners
Visual Contrast
Universal Design: Vision at Knight Law Center

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Universal Design: Vision at Knight Law Center

VISION PATTERNS
No Protrusion Hazards
Safe Crossings
Effective Shorelines
90 Degree Corners
Visual Contrast
HILYARD COMMUNITY CENTER was designed with particularly effective input from the disability community.
Universal Design: Autism

HEDCO Building
College of Education
University of Oregon
Universal Design: Autism

HEDCO Building
College of Education
University of Oregon

AUTISM PATTERNS
Controls & Adjustments
Soft Light & Colors
Subdued Prints
User Testing
Universal Design: Four or Five Concepts to Test a Design

• **Is it universal?**
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• **Will the design solution be durable over time?**
  - Can it accommodate change through flexibility, adaptability, or adjustability?

and...
DON'T BE STUPID!

N.B: This is in no way a comment on any person, present or past, who has every worked as or for the Dean of the School of Architecture and Allied Arts at the University of Oregon. This image has been placed here to demonstrate to architecture students the importance providing vertical transport, in the form of elevators, at or near the main entrance of a building. In the example in the AAA Dean's Office shown above, what appears to be a round white column is in fact the hydraulic piston of an elevator added in the 1990's. It was designed at the right horizontal location but it only served upper floors, which is (to be blunt) stupid. If you still don't get it, send me a note and we'll talk about it sometime.
Fred Tepfer
Olivia Asuncion
Molly Rogers

http://pages.uoregon.edu/ftepfer/access/