

Healthy Homes Research

Presented by the AIA Residential Knowledge Community

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Healthy Homes Research



Moderator

Kathleen Dorgan, AIA, LEED-AP

Principal, Dorgan Architecture & Planning

dorgan@kdorgan.net

Submit a question to the moderator via the “question” box. They will be answered as time allows.



Speaker

Greg Secord

Director, Resource Development

Mutual Housing Association of Greater Hartford, Inc.

gsecord@MutualHousing.org



Speaker

Sherry Ahrentzen, Ph.D.

Shimberg Professor of Housing Studies

College of Design, Construction & Planning, University of Florida

ahrentzen@dcp.ufl.edu



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Course Description

This is the fifth in a series of web seminars sponsored by the AIA Residential Knowledge Community that will explore the ways that architects use research to enhance the health, safety, social, economic and environmental performance of buildings as well as the experiences of housing residents.

Experts will explore the many connections between the design of homes and the health of residents. They will discuss the impact of indoor air and water quality on health outcomes. The nature and cause of home injuries will also be explored. Participants will learn how to apply research to their practices in order to create healthy homes.

Few factors are as key to healthy aging as a physically active lifestyle. A review of research and post-occupancy evaluation studies highlights residential design factors and strategies that can support physically-, mentally-, and socially-active lifestyles in seniors. There will be an opportunity for questions and discussion.



Learning Objectives

1. Participants will learn to identify various types and methods of research applicable to the design and construction of healthy homes.
2. Participants will learn about current trends in evidence-based design for healthy homes.
3. Participants will gain an understanding of various strategies for applying healthy homes research to their own practices.
4. Participants will gain an understanding of ways in which research related to healthy homes is being conducted in the field and in the academy.



Speaker: Greg Secord



Director,
Resource Development

Mutual Housing Association of
Greater Hartford, Inc.



Healthy Home Rating Tool (HHRT)

An Introduction

Greg Secord



What is “health”?

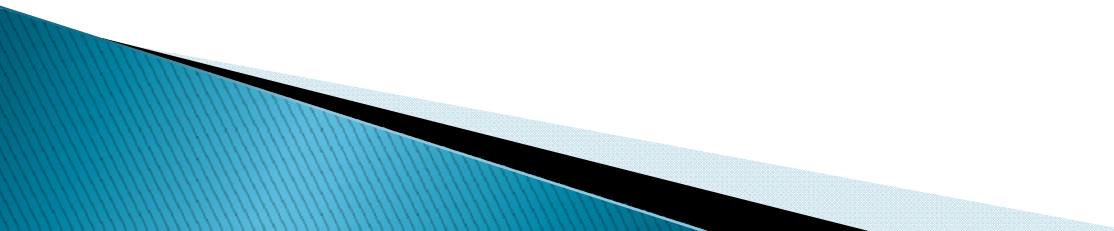
- ▶ “Health is a state of complete physical, mental and social wellbeing, not merely the absence of disease or infirmity.”

The World Health Organization

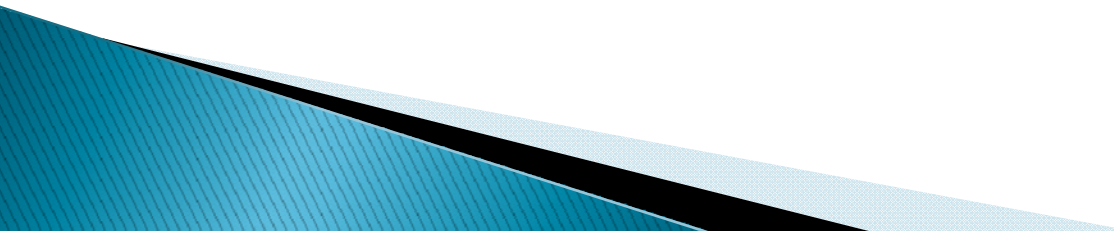
What is a “healthy home”?

- ▶ “a home that is designed, constructed, rehabilitated, and maintained in a manner that promotes the health and well-being of its occupants”

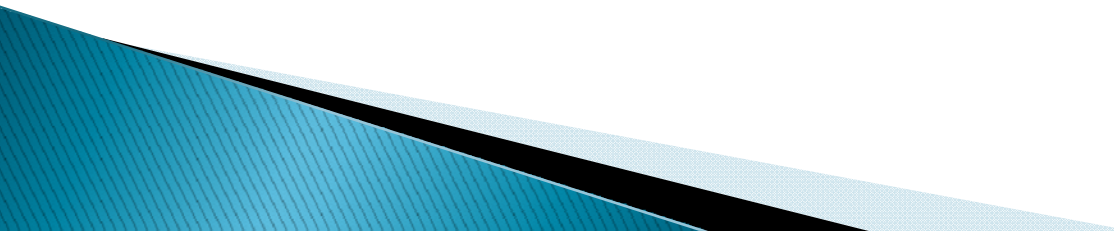
Why do we need a HHRT?

- ▶ US Department of Housing and Urban Development (HUD) estimates that ½ of all existing housing stock in the U.S. has issues that compromise the health of those living or visiting that space.
 - ▶ Falls and fires are the leading cause of death and injury of older adults
 - ▶ An estimated 5.7 million homes in U.S. Are considered substandard but there are no consistent standards to ensure “health” of homes.
 - ▶ No standardized comprehensive tool to assess homes to ensure the health and well being of the occupants.
- 

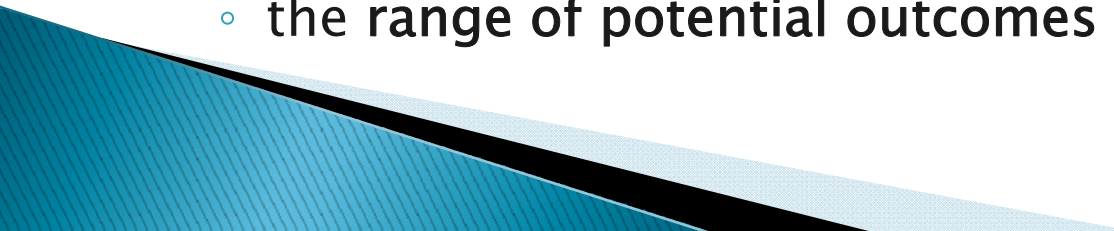
Origins of the Healthy Homes Rating Tool (HHRT)

- ▶ The HHRT follows a risk assessment approach established in the United Kingdom called the Housing Health and Safety Rating System (HHSRS).
 - ▶ The HHRT is concerned with avoiding or, at the very least, minimizing potential hazards to health from conditions in the home.
- 

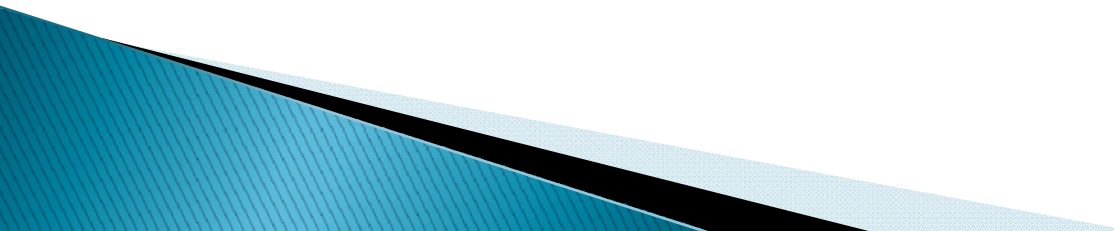
Identifying Hazards

- ▶ The dwelling should not contain any deficiency that might give rise to a hazard that interferes with, or puts at risk, the health or safety, or even the lives, of the occupants.
 - ▶ So, to test whether a deficiency is connected to one or more hazards what is needed are:
 - An understanding of the functions and workings of each element of the unit, and
 - The ability to assess or test whether the deficiency will cause a hazard.
- 

Identifying Hazards

- ▶ The HHRT uses judgments made by the inspector, based on an inspection of the whole dwelling, to generate a numerical score.
 - ▶ The information observed during the inspection should be properly and accurately recorded – the evidence used to justify and support the judgments which form the basis of the numerical Hazard Score.
 - ▶ For each hazard, you must make two judgments:
 - the likelihood, over the next twelve months, of an occurrence that could result in harm to a member of the vulnerable group; and
 - the range of potential outcomes from such an occurrence.
- 

Identifying Hazards

- ▶ This approach ensures that the severity of a threat that is very likely to occur but will result in a minor outcome can be compared with one that is highly unlikely to occur but if it did would have a major outcome.
 - ▶ It also allows differentiation between similar hazards where the likelihood may be the same, but the outcome very different.
- 

About the Hazards

- ▶ There are 29 hazards, arranged in four main categories depending on the kind of threat they pose to health.
- ▶ The HHRT Guidance (being developed now) includes “hazard profiles” that summarize what can be done to help in the assessment of hazards.

Four Categories

In 1938, American Public Health Association (APHA) issued “Basic Principles of Healthful Housing” to promote the “physical, mental and social health” essentials in housing. The Principles fall into four categories:

- ▶ **Fundamental Physiological Needs** (e.g., for illumination, heat, cooling, space, chemical purity, quiet)
- ▶ **Fundamental Psychological Needs** (e.g., for privacy, adequate space, cleanliness, peace-of-mind, normal family and household activity),
- ▶ **Protection Against Contagion** (e.g., from disease, vermin, sewage, contaminated water, over-crowding, food decay); and
 - ▶ **Protection Against Accidents** (e.g., from falls, fire, burns, gas, mechanical injuries, electrical shock, building collapse, traffic).

HHRT Scoring Form

Download as a separate PDF.

HHSRS		SCORING SHEET	
ADDRESS			
Survey date		Surveyor	
DWELLING	House or flat <input type="checkbox"/> HMO <input type="checkbox"/> Non HMO <input type="checkbox"/>	Age of dwelling <input type="checkbox"/> Pre 1920 <input type="checkbox"/> 20-45 <input type="checkbox"/> 46-70 <input type="checkbox"/> 80+	
HAZARDS		HAZARDS	
Physiological		Psychological	
Damp & mould etc <input type="checkbox"/> 01		Crowding & space <input type="checkbox"/> 11	
Excess cold <input type="checkbox"/> 02		Entry by intruders <input type="checkbox"/> 12	
Excess heat <input type="checkbox"/> 03		Lighting <input type="checkbox"/> 13	
Asbestos (& MMFs) <input type="checkbox"/> 04		Noise <input type="checkbox"/> 14	
Biocides <input type="checkbox"/> 05		Infection	
Carbon monoxide etc <input type="checkbox"/> 06		Domestic hygiene etc <input type="checkbox"/> 15	
Lead <input type="checkbox"/> 07		Food safety <input type="checkbox"/> 16	
Radiation <input type="checkbox"/> 08		Personal hygiene etc <input type="checkbox"/> 17	
Uncombusted fuel <input type="checkbox"/> 09		Water supply <input type="checkbox"/> 18	
VOCs <input type="checkbox"/> 10			
		Safety	
		Falls in baths etc <input type="checkbox"/> 19	
		Falling on the level <input type="checkbox"/> 20	
		Falling on stairs etc <input type="checkbox"/> 21	
		Falling between levels <input type="checkbox"/> 22	
		Electrical hazards <input type="checkbox"/> 23	
		Fire hazards <input type="checkbox"/> 24	
		Flames, hot surfaces etc <input type="checkbox"/> 25	
		Collision/entrapment <input type="checkbox"/> 26	
		Position of amenities etc <input type="checkbox"/> 27	
		Explosions <input type="checkbox"/> 28	
		Structural collapse <input type="checkbox"/> 29	
HAZARD & No. <input type="checkbox"/>		Item/s	
LIKELIHOOD			
Justification			
OUTCOMES			
Justification			
RATING		Score (if calculated)	
HAZARD & No. <input type="checkbox"/>		Item/s	
LIKELIHOOD			
Justification			
OUTCOMES			
Justification			
RATING		Score (if calculated)	

Chart

Download as a separate PDF.

1

Damp and Mold growth

Caused by dust mites, mold or fungal growth caused by dampness and/or high humidity. It includes threats to mental health and social wellbeing caused by living with damp, damp staining and/or mold growth.

Most vulnerable:
14 years or less

2

Excess cold

Caused by excessively cold indoor temperatures.



Most vulnerable:
65 years or older

3

Excess heat

Caused by excessively high indoor air temperatures.

Most vulnerable:
65 years or older

4

Asbestos, Silica and other MMF

Caused by excessive levels of silica, asbestos and man-made mineral fibers (MMF).



Most vulnerable:
No Specific Group

5

Biocides

Threats to health from those chemicals used to treat timber and mold growth in dwelling. While biocides include insecticides and rodenticides to control pest infestations (e.g. cockroaches or rats and mice), these are not considered for the purposes of the HHRT.

Most vulnerable:
No Specific Group

6

Carbon monoxide and fuel combustion products

Excess levels of carbon monoxide, nitrogen dioxide, sulphur dioxide and smoke in the dwelling's atmosphere.



Most vulnerable:
For CO - 65 years plus;
For NO2, SO2 & smoke
- no specific group

7

Lead

Ingestion from lead-paint dust, debris or leaded water pipes.

Most vulnerable:
6 years or younger

8

Radiation

This category covers the threats to health from radon gas and its daughters, primarily airborne, but also radon dissolved in water.

Most vulnerable:
All persons aged 60 - 64
with lifelong exposure

9

Uncombusted fuel gas

Fuel gas escaping into the atmosphere within a dwelling.

Most vulnerable:
No Specific Group

10

Volatile Organic Compounds

Volatile organic compounds (VOCs) are a diverse group of organic chemicals which includes formaldehyde, that are gaseous at room temperature, and are found in a wide variety of materials in the home.

Most vulnerable:
No Specific Group

associated with inadequate natural and/or artificial light. It includes the psychological effect associated with the view from the dwelling.



Most vulnerable:
No Specific Group

11

Crowding and Space

This category covers hazards associated with lack of space within the dwelling for living, sleeping and normal family/household life.

Most vulnerable:
No Specific Group

14

Noise

Covers threats to physical and mental health resulting from exposure to noise inside the dwelling or within its curtilage.

Most vulnerable:
No Specific Group

12

Entry by Intruders

Difficulties in keeping a dwelling secure against unauthorized entry and the maintenance of defensible space.



Most vulnerable:
No Specific Group

13

Lighting

This category covers the threats to physical and mental health



Most vulnerable:
No Specific Group

THE EFFECT OF THE DEFECT

Housing Hazards as Identified in the Healthy Home Rating Tool

Chart

Download as a separate PDF.

16

Food Safety

Threats of infection resulting from inadequacies in provision and facilities for the storage, preparation and cooking of food.

Most vulnerable:
No Specific Group

17

Personal Hygiene, Sanitation and Drainage

Threats of infection and threats to mental health associated with personal hygiene, including personal washing and clothes washing facilities, sanitation and drainage. It does not include problems with pests associated with defective drainage facilities.

Most vulnerable:
Children under 5 years

18

Water Supply

Covers the quality and adequacy of the supply of water within the dwelling for drinking and for domestic purposes such as cooking, washing, cleaning and sanitation. As well as the adequacy, it includes threats to health from contamination by bacteria, protozoa, parasites, viruses, and chemical pollutants.

Most vulnerable:
No Specific Group

19

Falls associated with Baths etc

This category includes any fall associated with a bath, shower or similar facility.

Most vulnerable:
60 years or older

20

Falling on Level Surfaces etc

This category covers falling on any level surface such as floors, yards, and paths. It also includes falls associated with trip steps, thresholds, or ramps, where the change in level is less than 12 inches or 300mm.

Most vulnerable:
60 years or older

21

Falling on Stairs etc

This category covers any fall associated with a stairs, steps and ramps where the change in level is greater than 12 inches or 300mm.



Most vulnerable:
60 years or older

22

Falling between Levels

This category covers falls from one level to another, inside or

outside a dwelling, where the difference in levels is more than 12 inches or 300mm. It includes, for example, falls out of windows, falls from balconies or landings, falls from accessible roofs, into basement wells, and over garden retaining walls.

Most vulnerable:
60 years or older

23

Electrical Hazards

This category covers hazards from shock and burns resulting from exposure to electricity, including from lightning strikes. (It does not include risks associated with fire caused by deficiencies to the electrical installations, such as ignition of material by a short-circuit.)



Most vulnerable:
No Specific Group

24

Fire

This category covers threats from exposure to uncontrolled fire and associated smoke at a dwelling.

Most vulnerable:
No Specific Group

25

Flames, Hot Surfaces etc

This category covers threats of burns – injuries caused by contact with a hot flame or fire, and contact with hot objects or hot non-water based liquids; and scalds – injuries caused by contact with hot liquids and vapors. It includes burns caused by clothing catching alight from a controlled fire or flame.

Most vulnerable:
No Specific Group

26

Collision and Entrapment

This category includes risks of physical injury from trapping body parts in architectural features, such as trapping limbs or fingers in doors or windows; and striking (colliding with) objects such as architectural glazing, windows, doors, low ceilings and walls.



Most vulnerable:
No Specific Group

27

Explosions

This category covers the threat from the blast of an explosion, from debris generated by the blast, and from the partial or total collapse

of a building as the result of an explosion.

Most vulnerable:
No Specific Group

28

Position and Operability of Amenities etc

This category covers threats of physical strain associated with functional space and other features at dwellings.



Most vulnerable:
No Specific Group

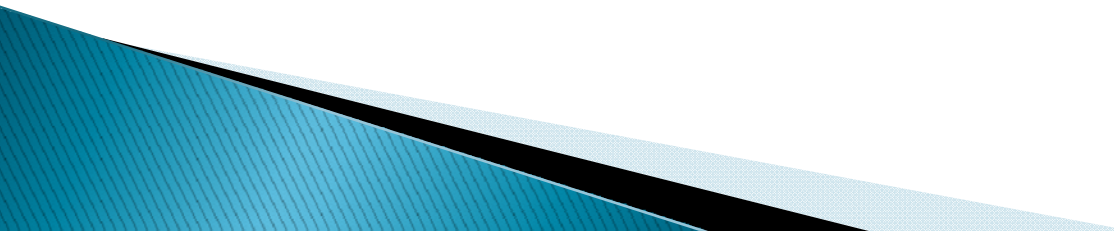
29

Structural Collapse and Falling Elements

Covers the threat of whole dwelling collapse, or of an element or a part of the fabric being displaced or falling because of inadequate fixing, disrepair, or as a result of adverse weather conditions. Structural failure may occur internally or externally within the curtilage threatening occupants, or externally outside the curtilage putting at risk members of the public.

Most vulnerable:
No Specific Group

29 Hazards: Physiological

1. Damp & Mold Growth
 2. Cold
 3. Heat
 4. Asbestos and man-made fibers
 5. Biocides
 6. Carbon Monoxide
 7. Lead
 8. Radiation
 9. Uncombusted fuel
 10. Volatile organic compounds
- 

29 Hazards:

Psychological

11. Crowding and Space

12. Entry by Intruders

13. Lighting

14. Noise

Infection

15. Domestic Hygiene etc.

16. Food Safety

17. Personal Hygiene

18. Water Supply



29 Hazards: Safety

19. Falls in baths etc.

20. Falls on the level

21. Falls on stairs etc.

22. Falls from windows etc.

23. Electrical hazards

24. Fire hazards

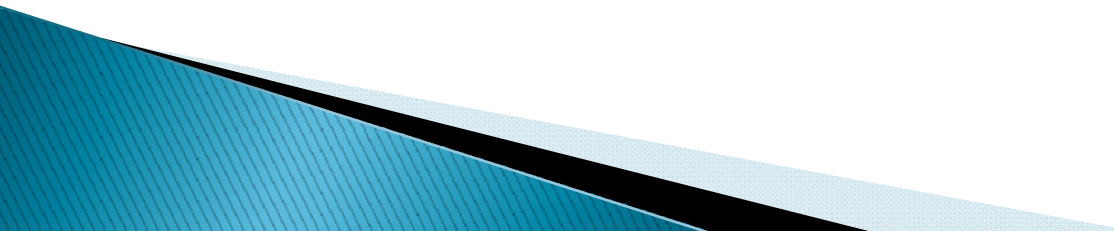
25. Hot surfaces etc.

26. Collision/Entrapment

27. Ergonomics

28. Explosions

29. Structural collapse



29 Hazards

HHSRS		SCORING SHEET	
ADDRESS			
Survey date	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	Surveyor	
DWELLING	House or flat <input type="checkbox"/> hse <input type="checkbox"/> flat	HMO <input type="checkbox"/> Non <input type="checkbox"/> HMO	Age of dwelling <input type="checkbox"/> Pre 1920 <input type="checkbox"/> 20-45 <input type="checkbox"/> 46-79 <input type="checkbox"/> 80+

How it works

$$\text{Likelihood} \times \text{Outcome} = \text{Score}$$



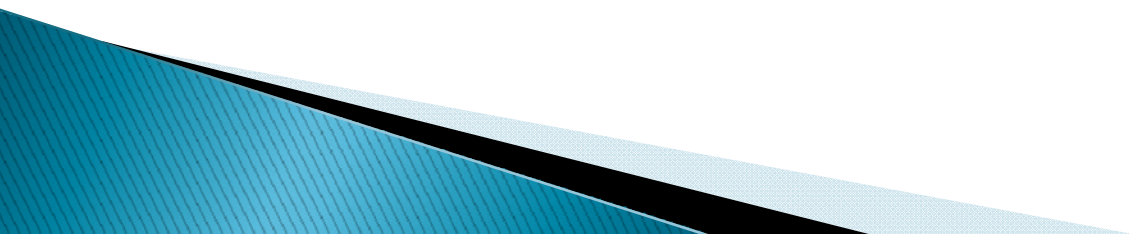
HHRT Scoring Form

Download as a separate PDF.

HHSRS		SCORING SHEET	
ADDRESS <input type="text"/>			
Survey date <input type="text"/>		Surveyor <input type="text"/>	
DWELLING	House or flat <input type="checkbox"/> HMO <input type="checkbox"/>	Age of dwelling	<input type="text"/>
HAZARDS			
Physiological		Psychological	Safety
Damp & mould etc	01	Crowding & space	11
Excess cold	02	Entry by intruders	12
Excess heat	03	Lighting	13
Asbestos (& MMFs)	04	Noise	14
Biohazards	05	Infection	
Carbon monoxide etc	06	Domestic hygiene etc	15
Lead	07	Food safety	16
Radiation	08	Personal hygiene etc	17
Uncombusted fuel	09	Water supply	18
VOCs	10		
HAZARD & No. <input type="text"/> Item/s <input type="text"/>			
LIKELIHOOD <input type="text"/>			
Justification <input type="text"/>			
OUTCOMES			
<input type="text"/>			
<input type="text"/>			
<input type="text"/>			
Justification <input type="text"/>			
RATING <input type="text"/>			
Score (if calculated) <input type="text"/>			
HAZARD & No. <input type="text"/> Item/s <input type="text"/>			
LIKELIHOOD <input type="text"/>			
Justification <input type="text"/>			
OUTCOMES			
<input type="text"/>			
<input type="text"/>			
<input type="text"/>			
Justification <input type="text"/>			
RATING <input type="text"/>			
Score (if calculated) <input type="text"/>			

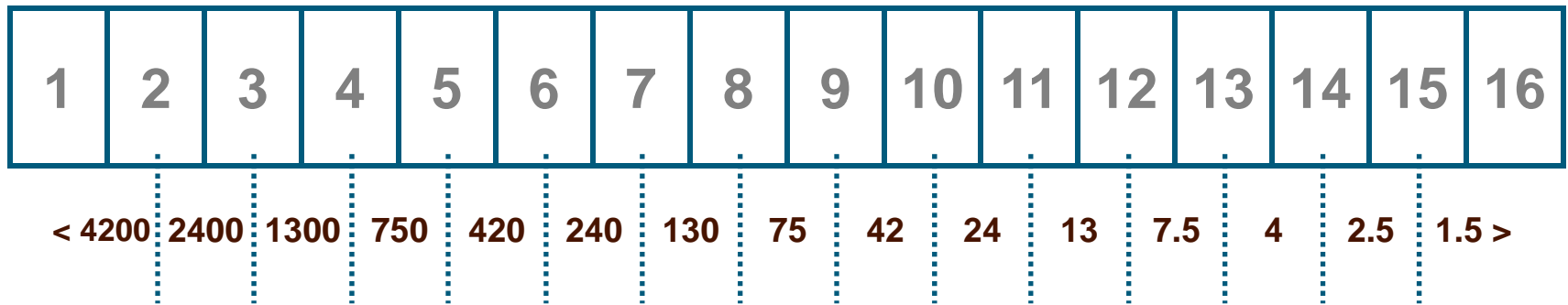
HHRT Scoring Form

HAZARD & No.	<input type="text"/>															Item/s	<input type="text"/>																									
LIKELIHOOD	5600	3200	1800	1000	560	320	180	100	56	32	16	10	6	3	2	1																										
	< 4200	2400	1300	750	420	240	130	75	42	24	13	7.5	4	2.5	1.5	>																										
Justification	<input type="text"/>																																									
OUTCOMES																																										
																<0.05	0.15	0.3	0.7	1.5	3	7	15	26	38	>																
Class I																0	0.1	0.2	0.5	1.0	2.2	4.6	10.0	21.5	31.5	46.4	<input type="text"/>															
Class II																0	0.1	0.2	0.5	1.0	2.2	4.6	10.0	21.5	31.5	46.4	<input type="text"/>															
Class III																0	0.1	0.2	0.5	1.0	2.2	4.6	10.0	21.5	31.5	46.4	<input type="text"/>															
																<0.05	0.15	0.3	0.7	1.5	3	7	15	26	38	>																
Justification	<input type="text"/>																																									
RATING																A	B	C	D	E	F	G	H	I	J																	
																<5000	2000	1000	500	200	100	50	20	10	>																	
																															Score (if calculated)	<input type="text"/>										



Likelihood

How likely is the hazard to result in a harm?

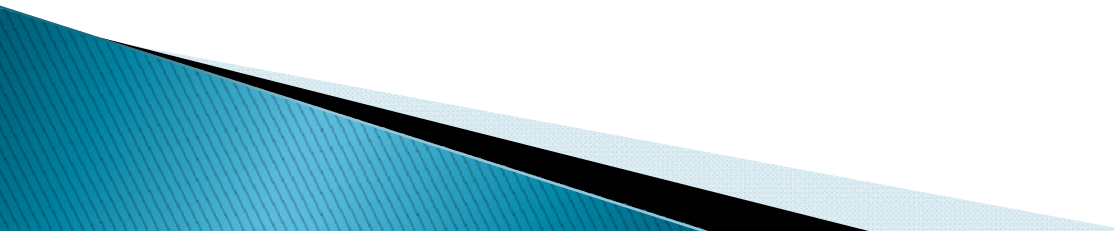


Assessors make a judgment

Outcomes: Class 1

- ▶ This Class covers the most extreme harm outcomes including:
 - Death from any cause; Lung cancer; Mesothelioma and other malignant lung tumors; Permanent paralysis below the neck; Regular severe pneumonia; Permanent loss of consciousness; 80% burn injuries.

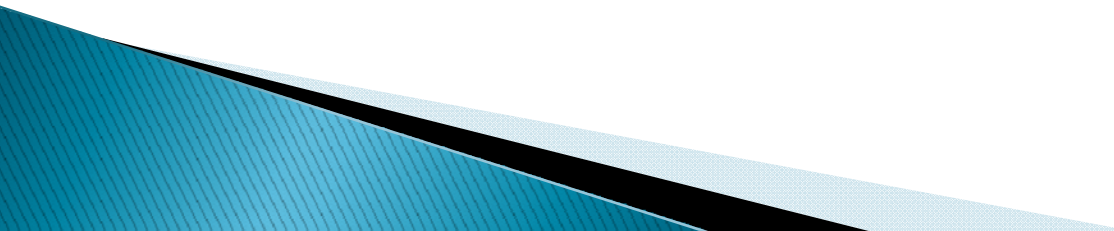
Outcomes: Class 2

- ▶ This Class covers **severe harm outcomes**, including:
 - Cardiorespiratory disease; Asthma; Non-malignant respiratory diseases; Lead poisoning; Anaphylactic shock; Cryptosporidiosis; Legionnaires disease; Myocardial infarction; Mild stroke; Chronic confusion; Regular severe fever; Loss of a hand or foot; Serious fractures; Serious burns; Loss of consciousness for days.
- 

Outcomes: Class 3

- ▶ This Class covers serious harm outcomes, including:
 - Eye disorders; Rhinitis; Hypertension; Sleep disturbance; Neuropsychological impairment; Sick building syndrome; Regular and persistent dermatitis, including contact dermatitis; Allergy; Gastroenteritis; Diarrhea; Vomiting; Chronic severe stress; Mild heart attack; Malignant but treatable skin cancer; Loss of a finger; Fractured skull and severe concussion; Serious puncture wounds to head or body; Severe burns to hands; Serious strain or sprain injuries; Regular and severe migraines.

Outcomes: Class 4

- ▶ This Class includes moderate harm outcomes which are still significant enough to warrant medical attention. Examples are:
 - Pleural plaques; Occasional severe discomfort; Benign tumors; Occasional mild pneumonia; Broken finger; Slight concussion; Moderate cuts to face or body; Severe bruising to body; Regular serious coughs or colds.
- 

Assigning Outcomes

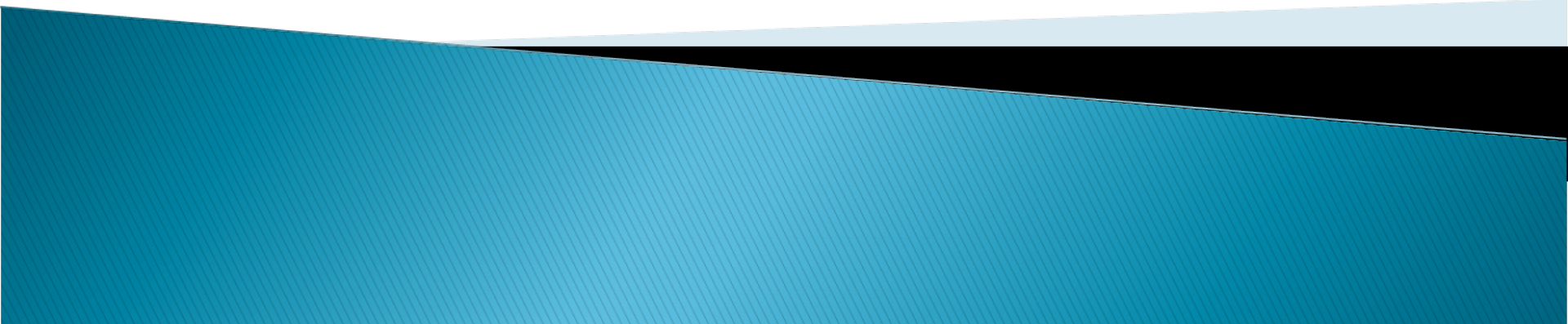
	< 0	0.05	0.15	0.3	0.7	1.5	3	7	15	26	38	>		
Class 1	0.0	0.1	0.2	0.5	1.0	2.2	4.6	10.0	21.5	31.6	46.4			
Class 2	0.0	0.1	0.2	0.5	1.0	2.2	4.6	10.0	21.5	31.6	46.4			Class 4
Class 3	0.0	0.1	0.2	0.5	1.0	2.2	4.6	10.0	21.5	31.6	46.4			100- (I+II+III)

Mix it all together...

- ▶ You get a score...or RATING

A	B	C	D	E	F	G	H	I	J
<5000	2000	1000	500	200	100	50	20	10	>

Sample Hazards

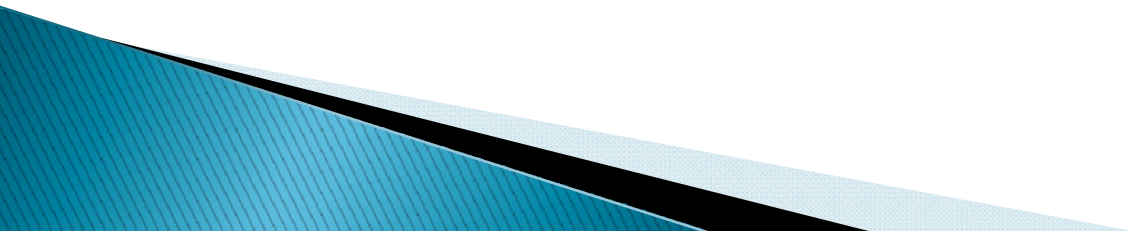


Let's try it out

For each photo identify...

- What hazard is present
 - Are any other hazards associated with the condition?
- What conditions might affect the outcome

Then score the *likelihood* and the range of *outcomes*...it's just an exercise.
Don't panic!







FEB 8 2005

Speaker: Sherry Ahrentzen, Ph.D.



Shimberg Professor of
Housing Studies

College of Design,
Construction & Planning,
University of Florida



AIA Residential Knowledge Community
Healthy Homes Research Webinar
7 November 2011

Healthy Housing for Seniors

Sherry Ahrentzen, PhD

Shimberg Center for Housing Studies, University of Florida



National Center for
Healthy Housing

Housing Interventions and Health: A Review of the Evidence



January 2009
National Center for Healthy Housing



National Center for Healthy Housing

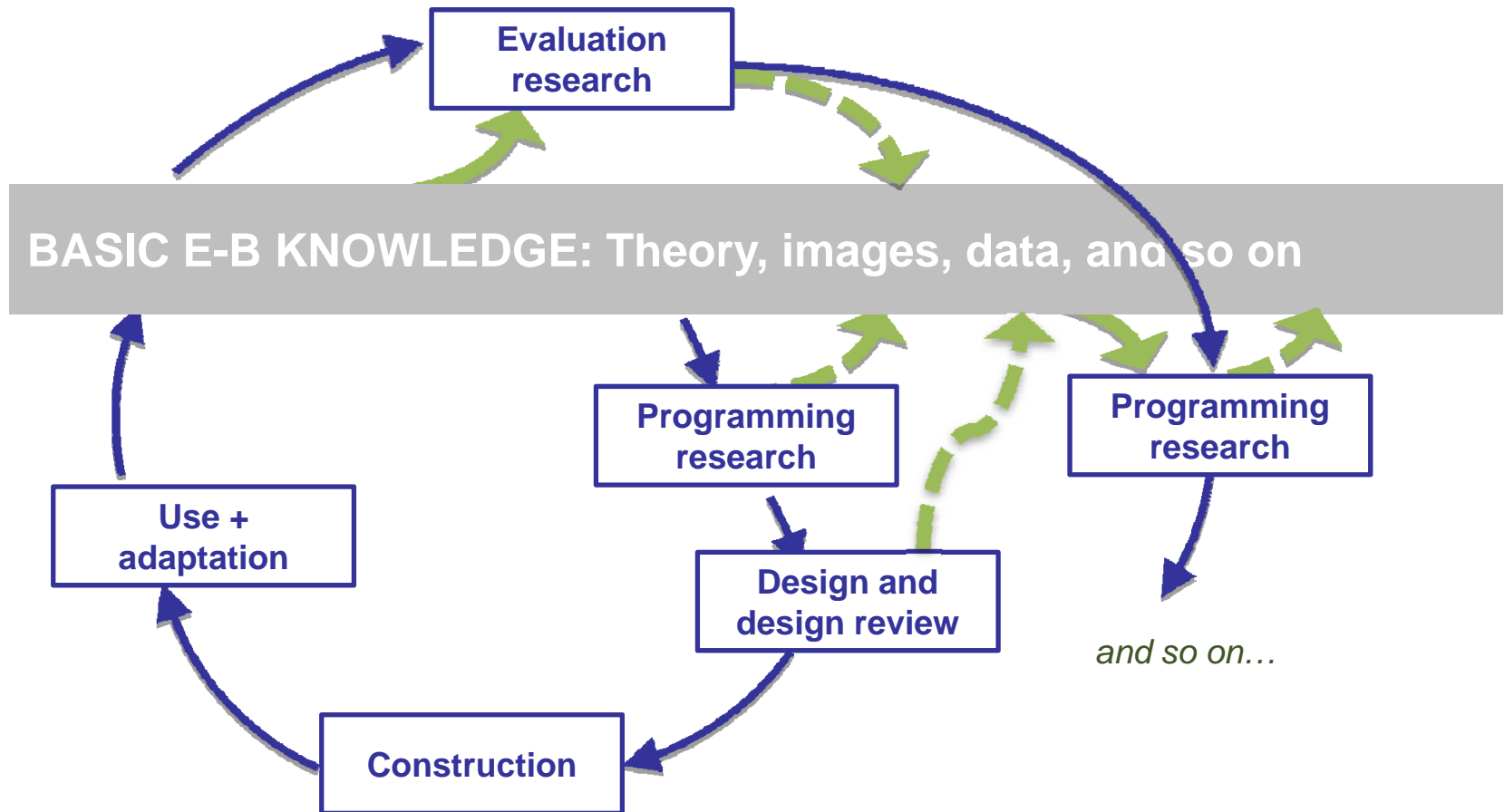
Comparing Green Building Guidelines and Healthy Homes Principles: A Preliminary Investigation



The National Center for Healthy Housing
April 2006

What do we know?

Scientific Research v Design Research



Occasions for research/design cooperation in the design-process cycle.

From: Zeisel, J. (2006). *Inquiry by Design: Environment/Behavior/Neuroscience in Architecture, Interiors, Landscape, and Planning* (p. 36). New York: W. W. Norton & Co.

Aging & Generational Concerns

By 2030, more than 70 million Americans – and 960 million people worldwide – will be 65 years or older

Physiological Changes

- Joints, Bones, Muscles
- Respiratory Systems
- Sensory

Cognitive Changes

- Attention, Reactions
- Memory

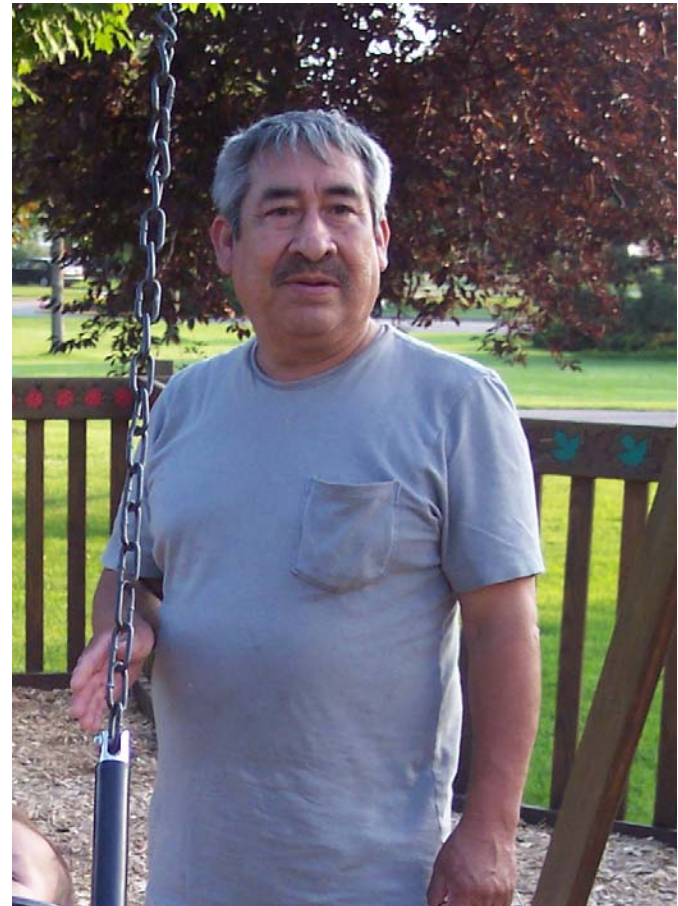
Emotional Challenges

- Depression
- Hormonal

Cultural Norms + Stereotypes

Susceptibility to Housing Conditions

- Spend a great deal of time in the home
- Limited mobility
- 11.2 million of elderly were living alone in 2008
- Different housing needs in communities with limited diverse housing stock
- Seniors with fewer resources and competencies are more affected by their physical environment – both positively and negatively
- An environment that “does it all” for you can be unhealthy as well



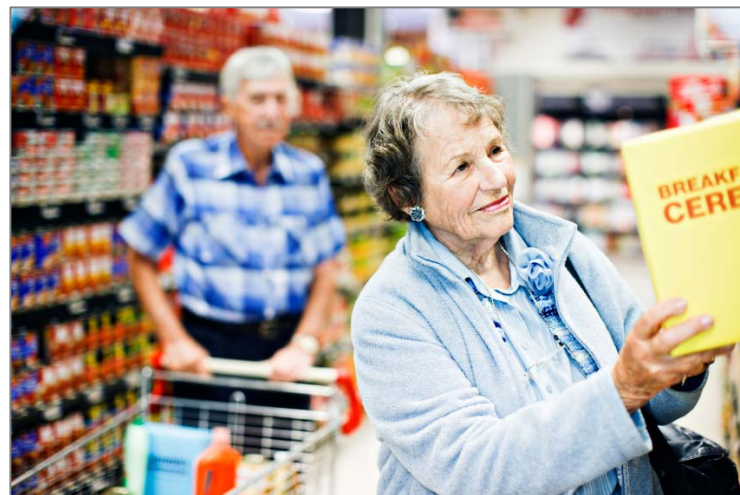
Active Aging

The desire, ability and opportunity for older adults to integrate physical activity into both structured and unstructured daily routines; to be physically engaged in economic or socially productive activities



Research shows that
Active Aging contributes to:

- Emotional + physical health
- Less cognitive decline



3 design strategies that facilitate Active Aging

- Secure Independence
- Engagement in Place
- Accessibility for the Whole Person

Secure Independence

Safety from Falls & the Unfamiliar

- Secure only doors to high-risk areas

- Secure outdoor areas

- Smooth, well-maintained flooring & paths

- Resilient materials

- Lighting and glare

Previewing



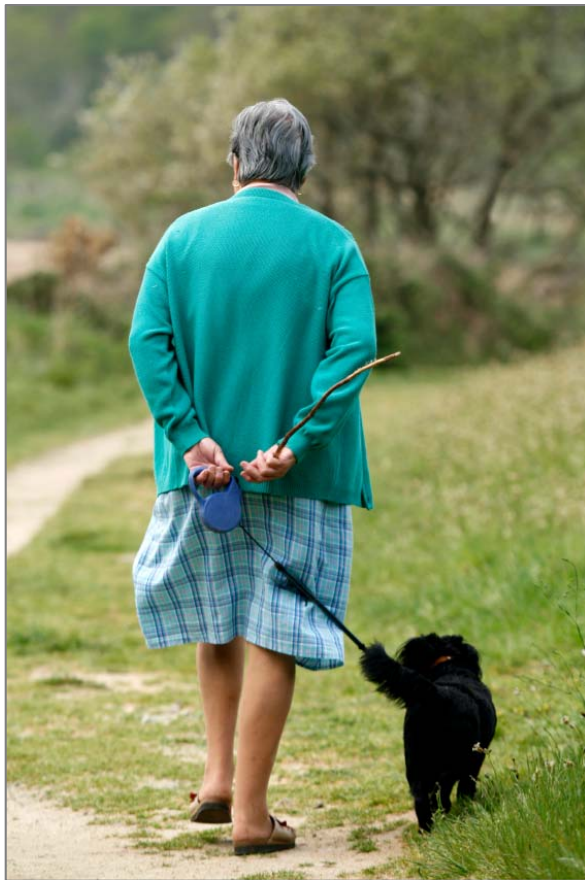
Previewing

Home Use & Activity

- Small and familiar tasks**

- Cultural and generational proclivities**

Secure Independence



Small & familiar tasks

Secure Independence



Engagement in Place

Heighten interest & curiosity

Environmental contrast

Minimize distraction, stress

Auditory privacy

Visual attention



Social gathering places

Places near the heart

Socially stimulating alcoves

Neighborhood amenities

Resting areas and
furnishings

Transit accessibility



Engagement in Place

Heighten interest & curiosity
Environmental contrast

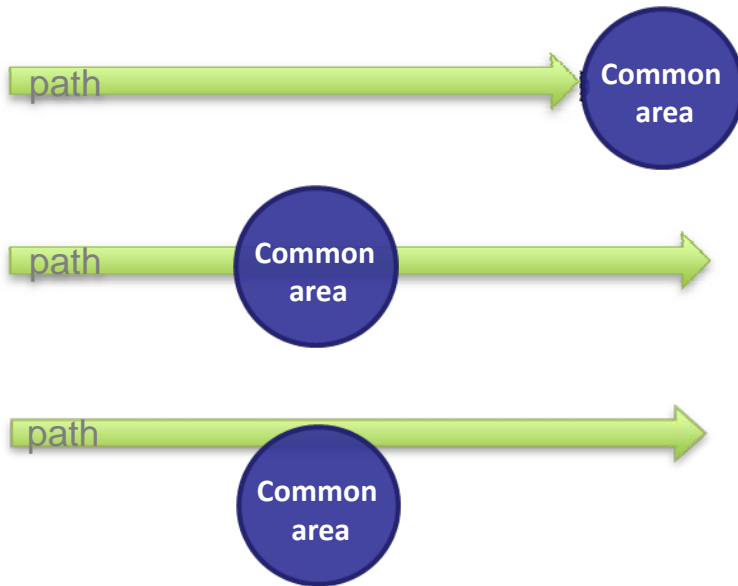
Minimize distraction, stress
Auditory privacy
Visual attention

Social gathering places
Places near the heart
Socially stimulating
alcoves

Neighborhood amenities
Resting areas and
furnishings
Transit accessibility



Engagement in Place



Places near the heart

Adapted from: "Common Areas at the Heart."
Alexander, C. , et al. (1977). *A Pattern Language: Towns, Buildings, Construction*. New York: Oxford University Press.

Accessibility for the Whole Person



Mobility

For wheelchairs & scooters
For walkers and canes

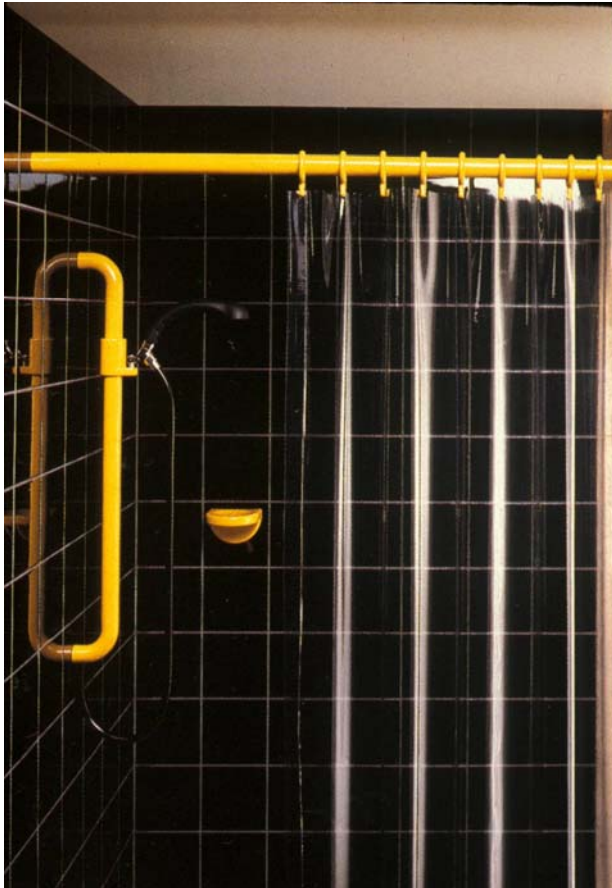
Cognitive

Multiple cues for orientation
Clear floor plan
Control of stimulation

Sensory

Lighting & glare
Auditory
Kinetic & touch

Accessibility for the Whole Person



Color contrast for cueing



Flooring material change as a visual cue

Accessibility for the Whole Person



Enhance touch

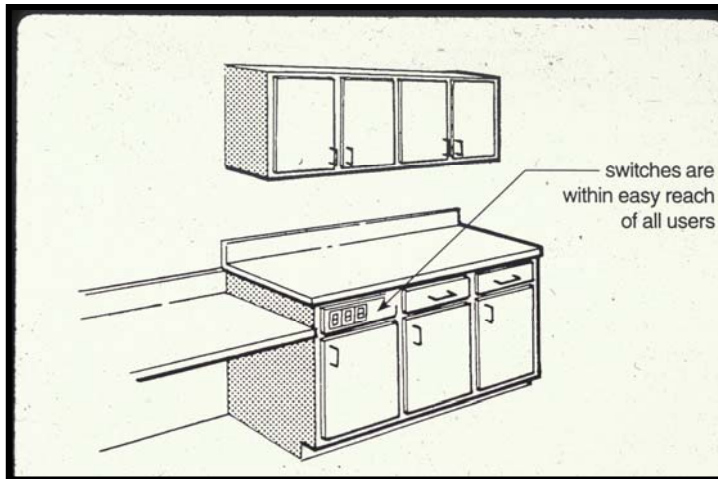


Accessibility for the Whole Person



Minimize squatting

Accessibility for the Whole Person



From Fair Housing Act Design Manual, 1998



John Hockenberry. From Metropolis Magazine



WELLcome Home

Select References for Follow-Up

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Healthy Homes Research



Moderator

Kathleen Dorgan, AIA, LEED-AP

Principal, Dorgan Architecture & Planning

dorgan@kdorgan.net

Submit a question to the moderator via the “question” box. They will be answered as time allows.



Speaker

Greg Secord

Director, Resource Development

Mutual Housing Association of Greater Hartford, Inc.

gsecord@MutualHousing.org



Speaker

Sherry Ahrentzen, Ph.D.

Shimberg Professor of Housing Studies

College of Design, Construction & Planning, University of Florida

ahrentzen@dcp.ufl.edu



Thank you for joining us!

This concludes the AIA/CES Course #R11005.

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