

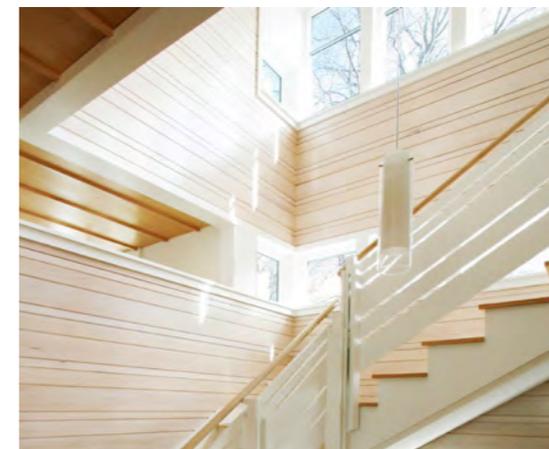
# Small, Green, Aging-Friendly Home Design

Imagine a home that accepts the transition of later life conditions for changes in: vision, strength, range of motion, mobility, in-home care, and income.

A home that just lives better - no matter your age.

# Jason Hart, AIA, LEED AP

- Architect: 15 yrs experience working in U.S., Europe, and Japan on public and private buildings. Extensive experience in multi-family housing and accessibility.
- Education from Univ. of FL & MIT
- Teach: NC State Univ.
- Co-founder: CUBE design + research, Chapel Hill, Boston
- Focus: residential, small commercial, green and universal design
- Wife: Occupational Therapist
- JW@CUBEdesignResearch.com, 919 371 0721



# OBJECTIVES

- Gain awareness of accessibility & universal design
- Learn strategies to plan or remodel a home using accessibility & universal design
- Gain awareness of how design and space affect mental and physical health
- Learn design strategies for planning or remodeling a small home that lives big
- Gain awareness of green design principles
- Learn green design strategies to lower your utility bills and general maintenance costs

# Homes and buildings affect our:

BODY



MIND



WALLET



# ACCESSIBILITY

- Americans with Disabilities Act (ADA) is a civil rights law enacted in 1990 to protect against discrimination of persons with physical or mental disabilities as well as those who assist and aide them.
- Title III governs MINIMUM requirements for all public and commercial facilities (restaurants to housing). Does NOT apply to single-family homes.

# UNIVERSAL DESIGN

- The design of products and environments to be usable by ALL people, to the greatest extent possible, without the need for specialized design.
- MAXIMUM approach for all needs of all ages (baby strollers to walkers).

# STRATEGIES FOR MOBILITY

- FRONT DOOR - no steps or curbs



# STRATEGIES FOR MOBILITY

- RAMPS - integrate and bring to same destination as steps

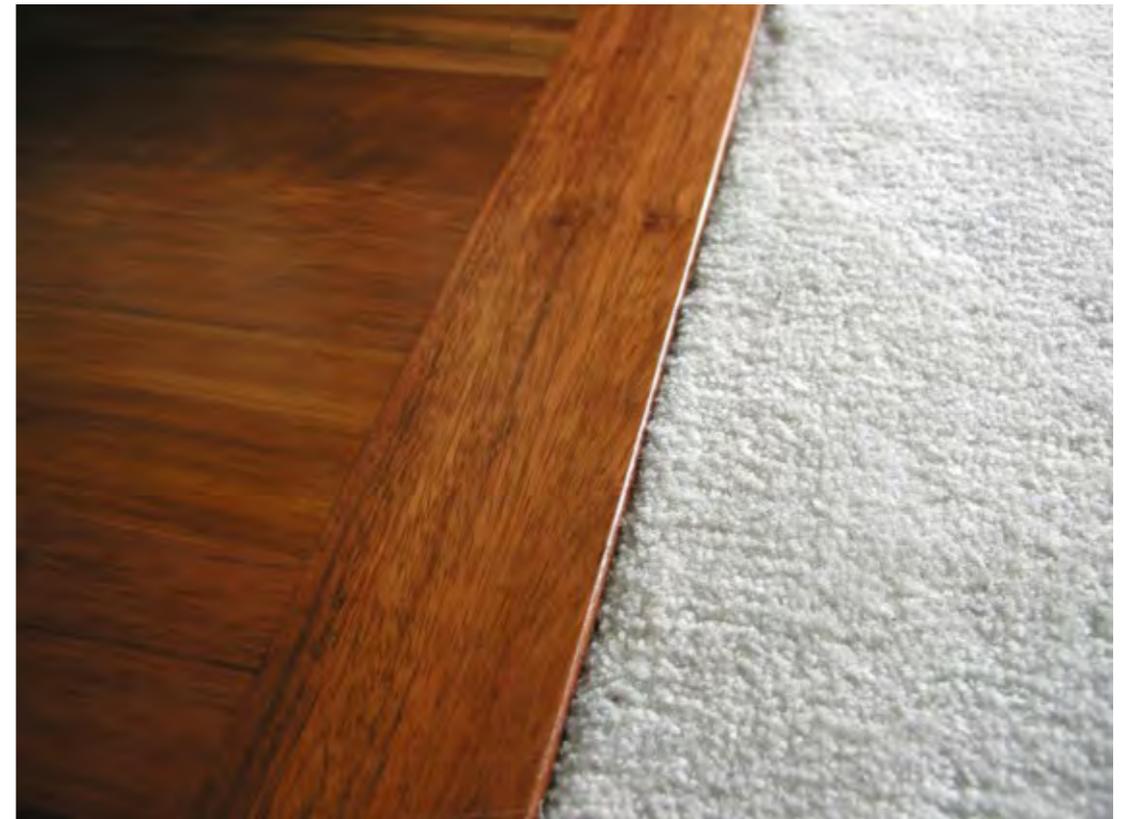


# STRATEGIES FOR MOBILITY

- FLUSH THRESHOLDS & TRANSITIONS ease access and reduce falls



Interior Doors



Flush Carpets  
- Tape down perimeter of rugs w/  
carpet tape

# STRATEGIES FOR MOBILITY

- FLUSH THRESHOLDS & TRANSITIONS ease access and reduce falls

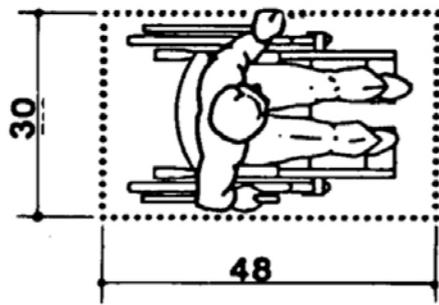


Flush Shower

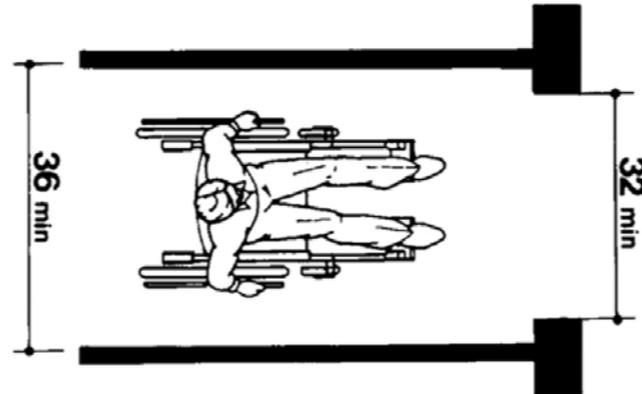


Flush Exterior Doors  
and Surfaces

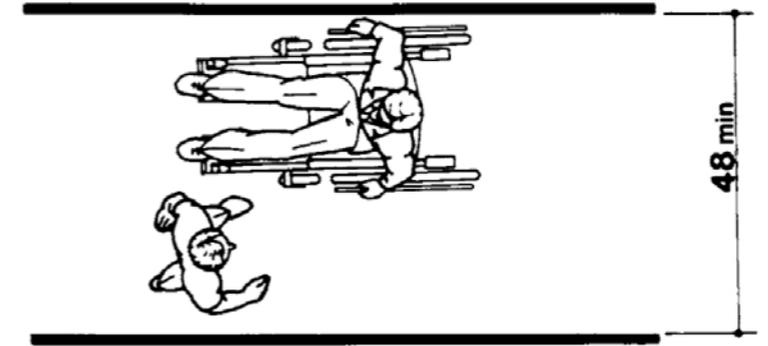
# WHEELCHAIR SPACE



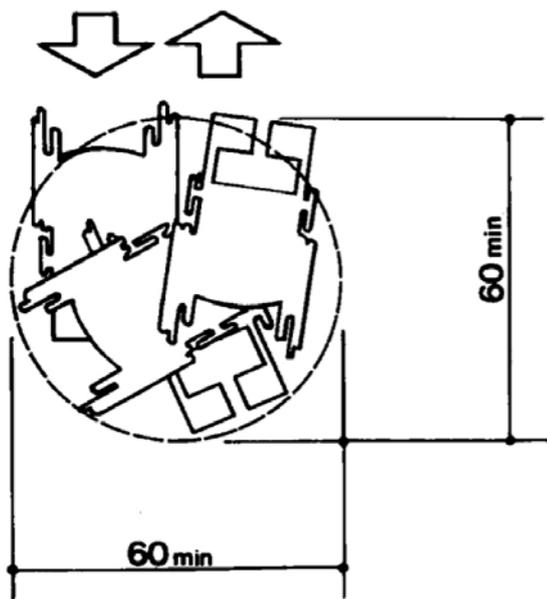
MIN. CLEAR FLOOR SPACE 48 INCHES X 30 INCHES  
**30"x54"** (2015 min.)



MIN. 36 INCHES HALLWAY  
 MIN. 32 INCHES CLEAR DOORWAY  
 (REQUIRES 2 FEET - 10 INCH DOOR MIN.,  
 3 FOOT DOOR IS BEST)

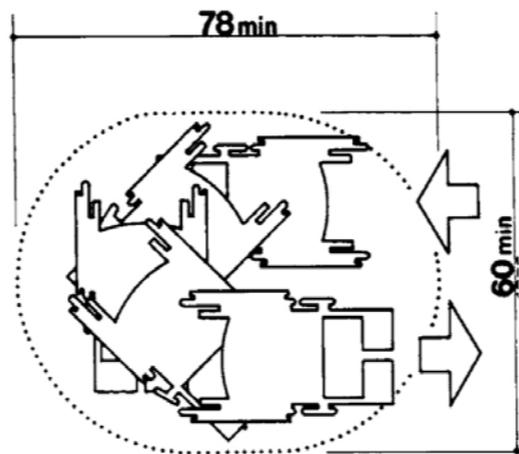


MIN. 48 INCHES HALLWAY FOR PASSAGE

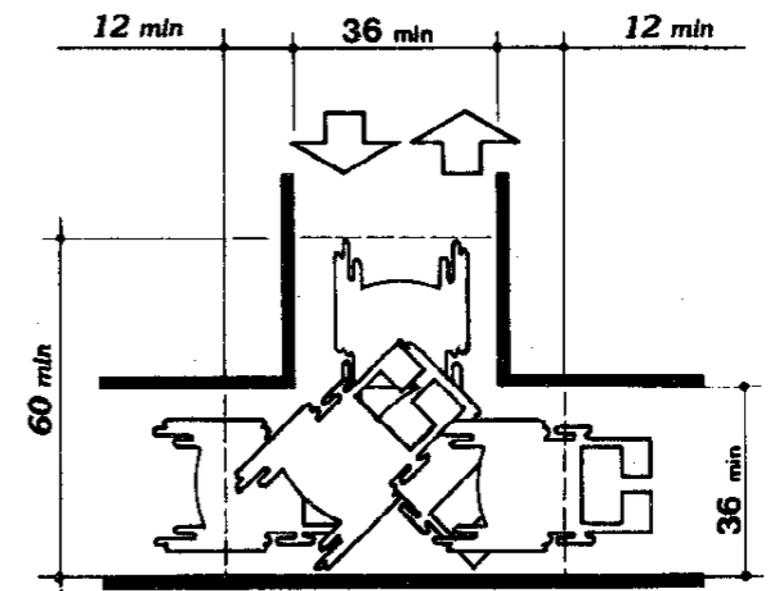


MIN. 60 INCHES (5 FEET) DIAMETER  
 TURNING SPACE

**67"** (2015 min.)



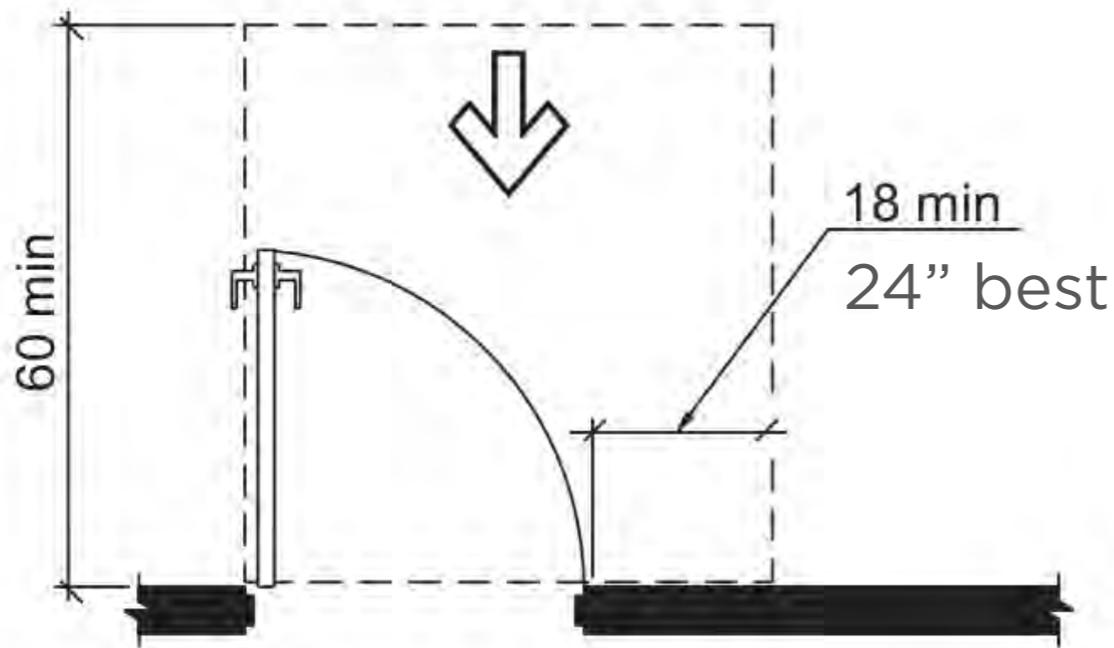
LARGER SPACE NEEDED FOR SMOOTH / COMFORTABLE  
 TURNING OF WHEELCHAIR (NOT AN ADA REQUIREMENT)



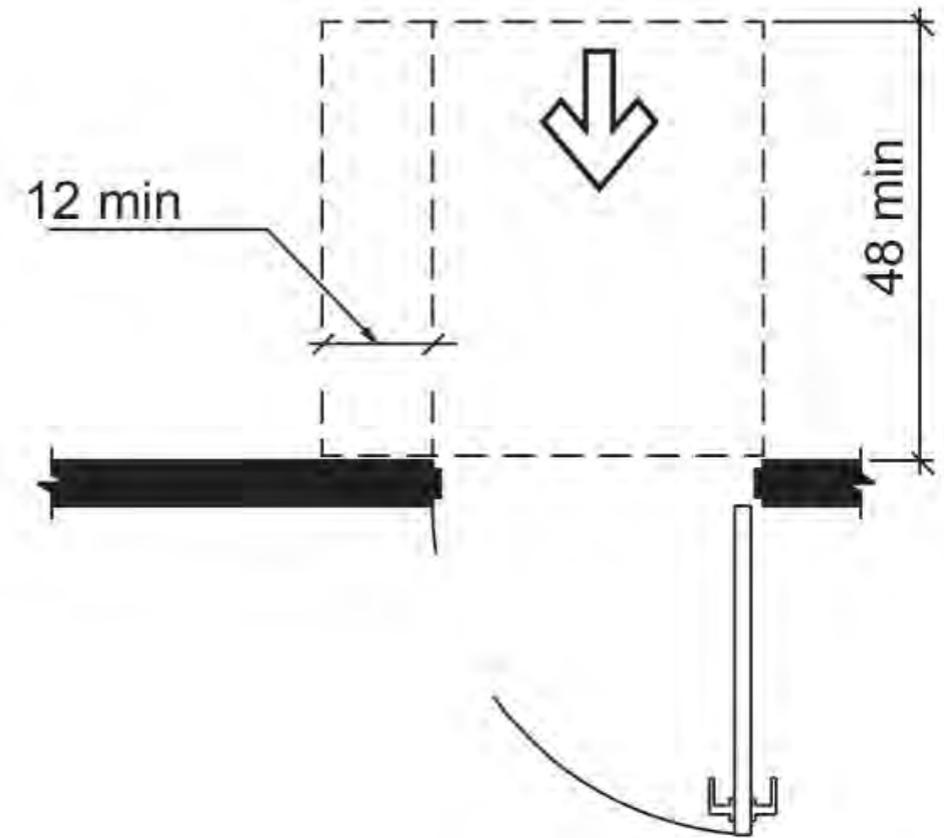
**36" min., 48" best**

# WHEELCHAIRS & DOORWAYS

- DOORS: 2;-10" min., 3'-0" best



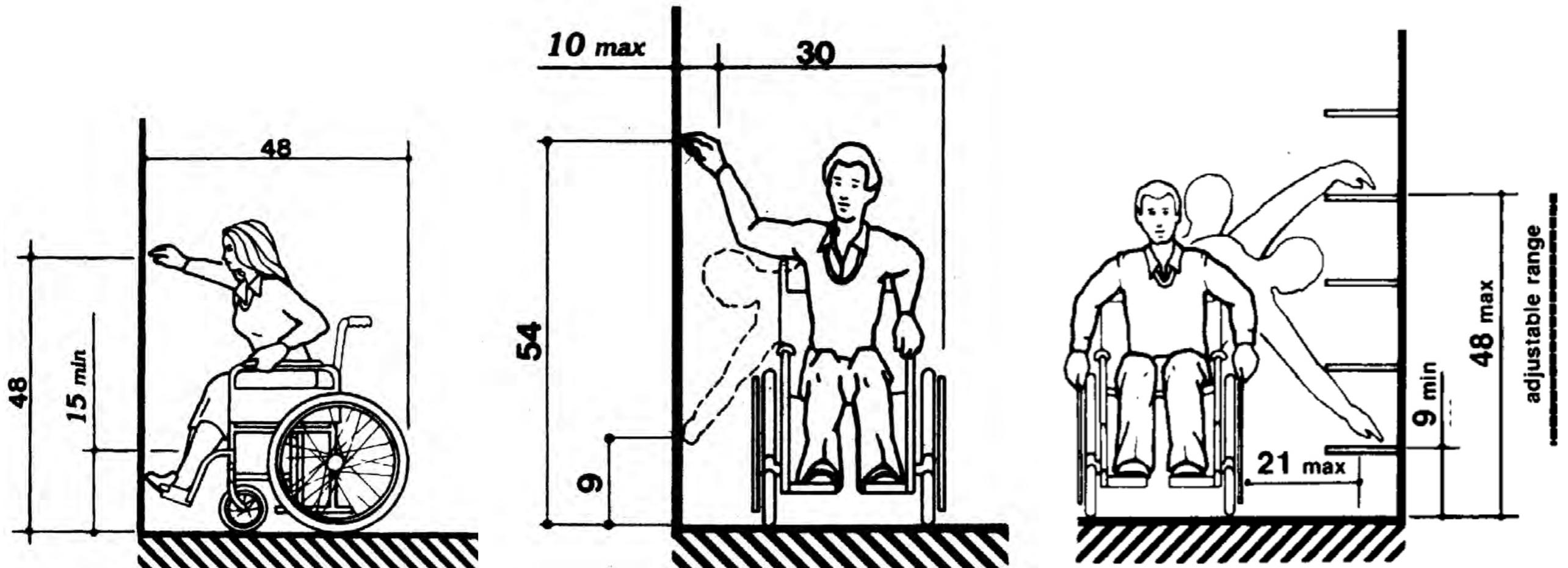
**(a) Front Approach, Pull Side**



**(b) Front Approach, Push Side**

# WHEELCHAIR RANGE OF MOTION

- Light switches max. 48" high, Wall Plugs min. 24" high



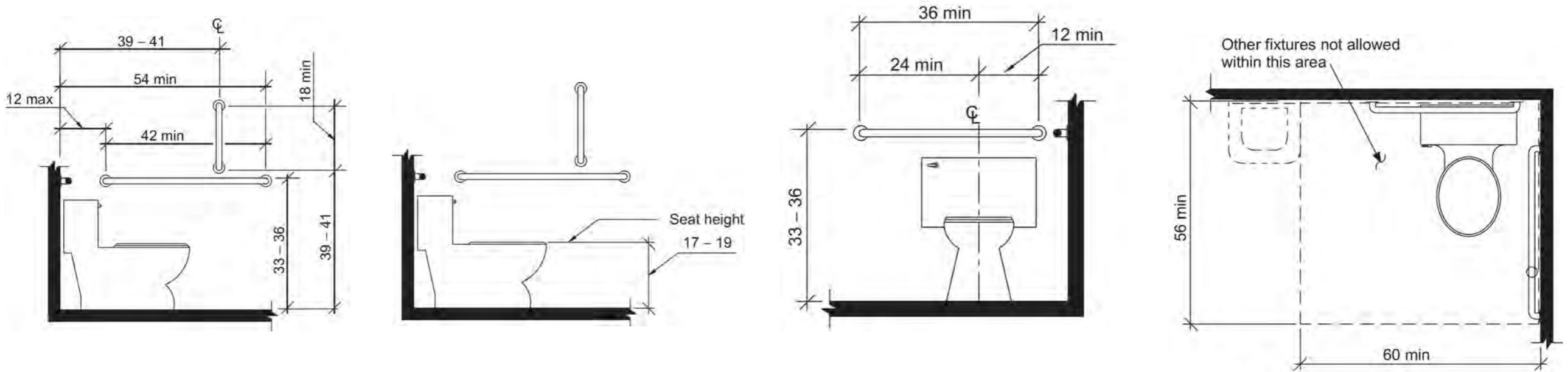
# STRATEGIES FOR BATHROOMS

- CLEARANCES & WALL REINFORCEMENT (wood blocking between studs)



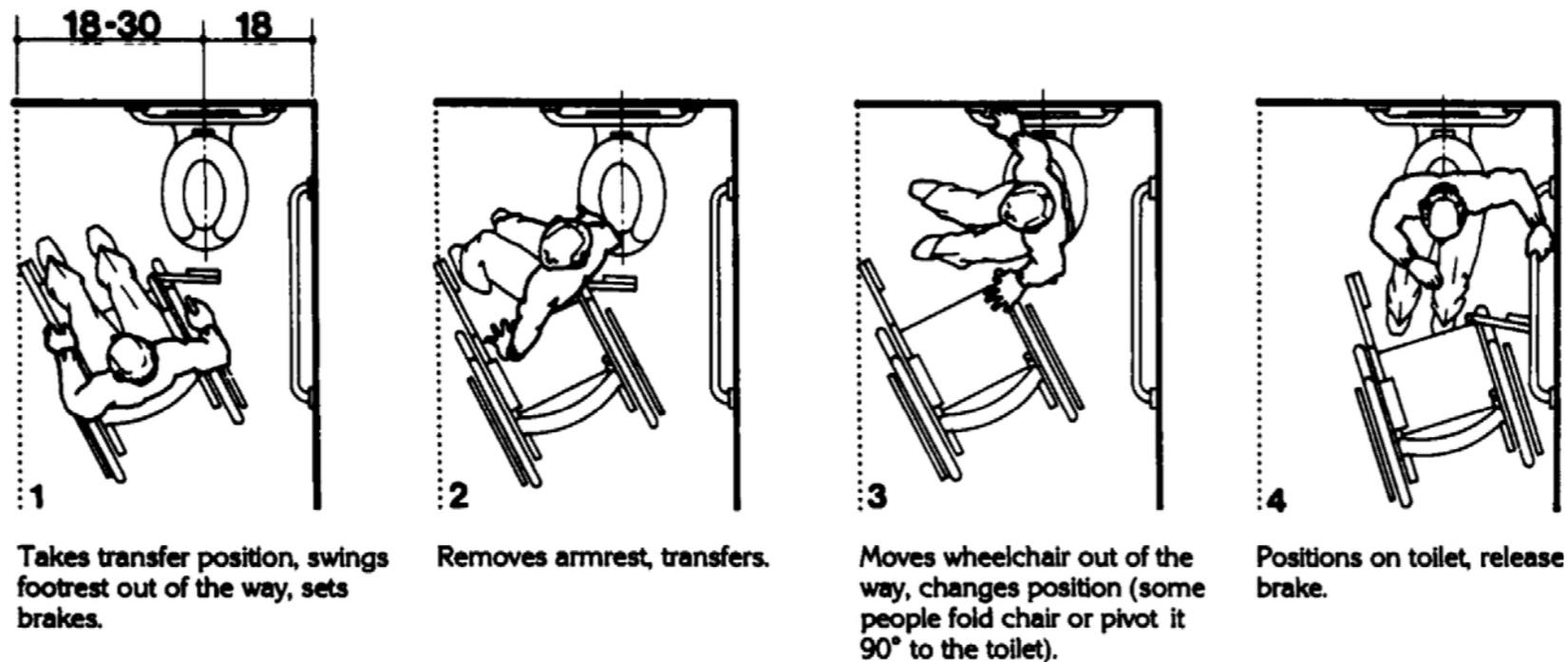
# STRATEGIES FOR BATHROOMS

- Toilet Grab Bar Locations

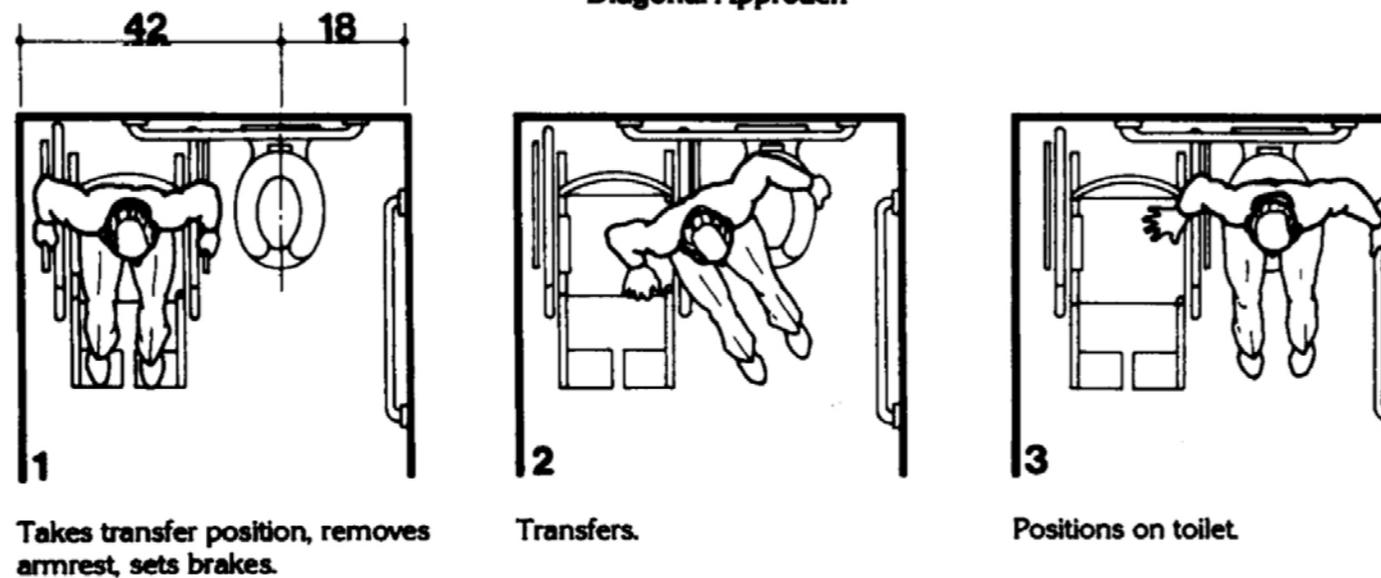


# STRATEGIES FOR BATHROOMS

- Toilet Transfers



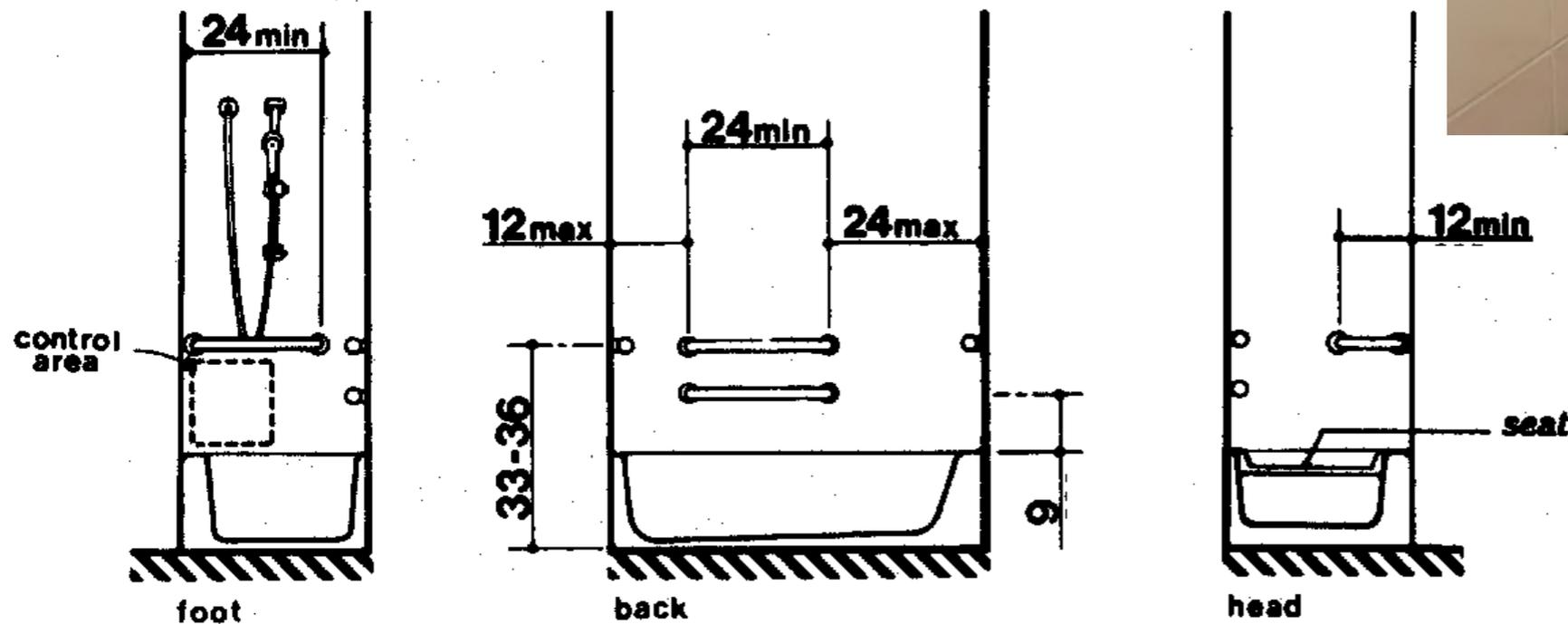
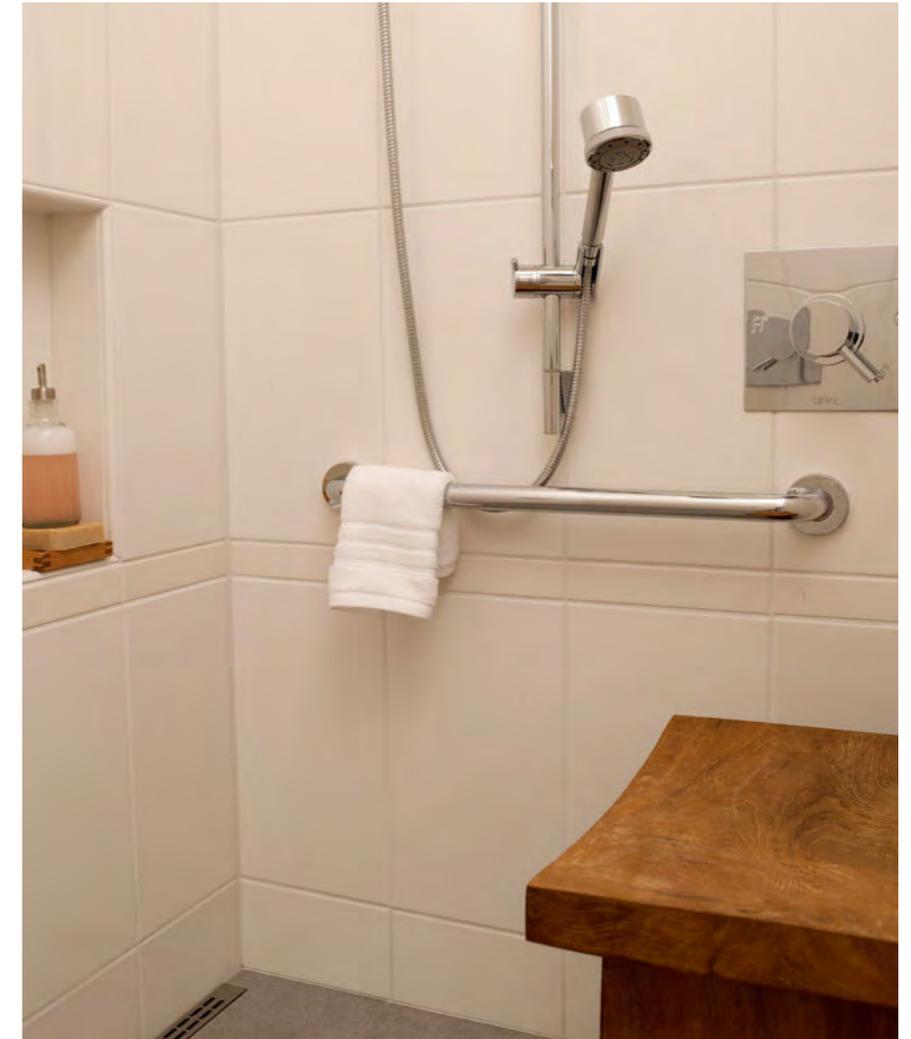
(a)  
Diagonal Approach



(b)  
Side Approach

# STRATEGIES FOR BATHROOMS

- TUBS & SHOWERS
- WWW.ADA.GOV
- WORK W/PROFESSIONAL



# STRATEGIES FOR REDUCED STRENGTH

- LEVERS & CRANKS reduce arthritic hand movements



# STRATEGIES FOR KITCHENS

- Clear space or removeable cabinets under sinks and cooktops
- Lift bottom cabinet shelves to min. 9" above floor
- Lowered or pullout work surfaces
- Lowered appliances
- 4' wide aisle best



# PASSIVE MONITORING TECHNOLOGIES

- SENSORS that monitor physiology and safety
- Some medical equipment may require increases in home ELECTRICAL SERVICE, backup battery, or a generator

## Physiological monitoring

Sensor-based tools that passively measure vital signs. Example: Bed sensor that measures respiration, restlessness at night, sleep interruptions.



## Wearable sensors

Wrist-worn sensors can measure the wearer's normal patterns of life. They require an automated monitoring service that analyses the patterns and alerts carers when something is wrong.



## Safety monitoring and assistance

Stove sensors (combining heat and motion sensors) to detect and distinguish between meal preparation and having left the stove on for too long.



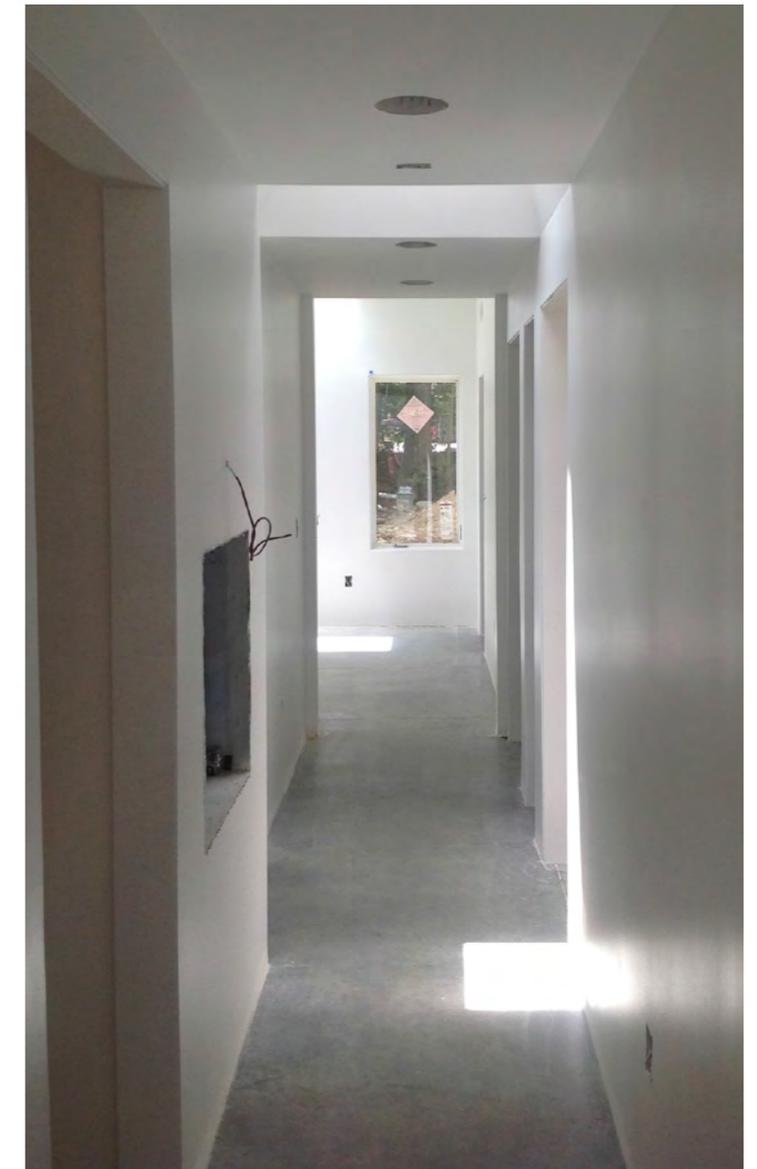
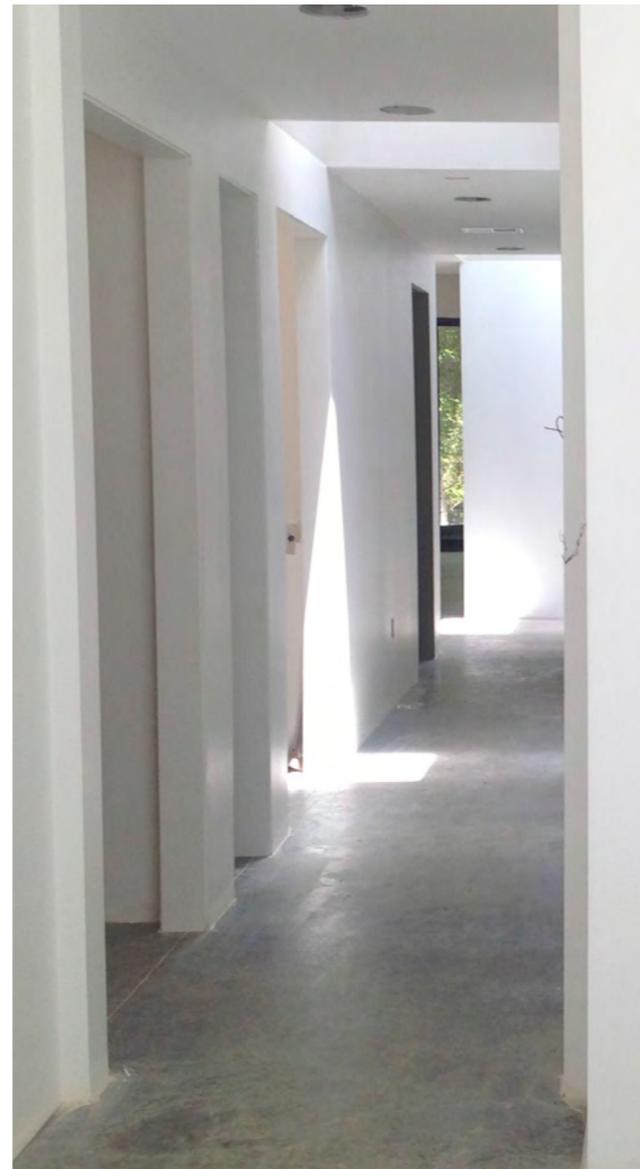
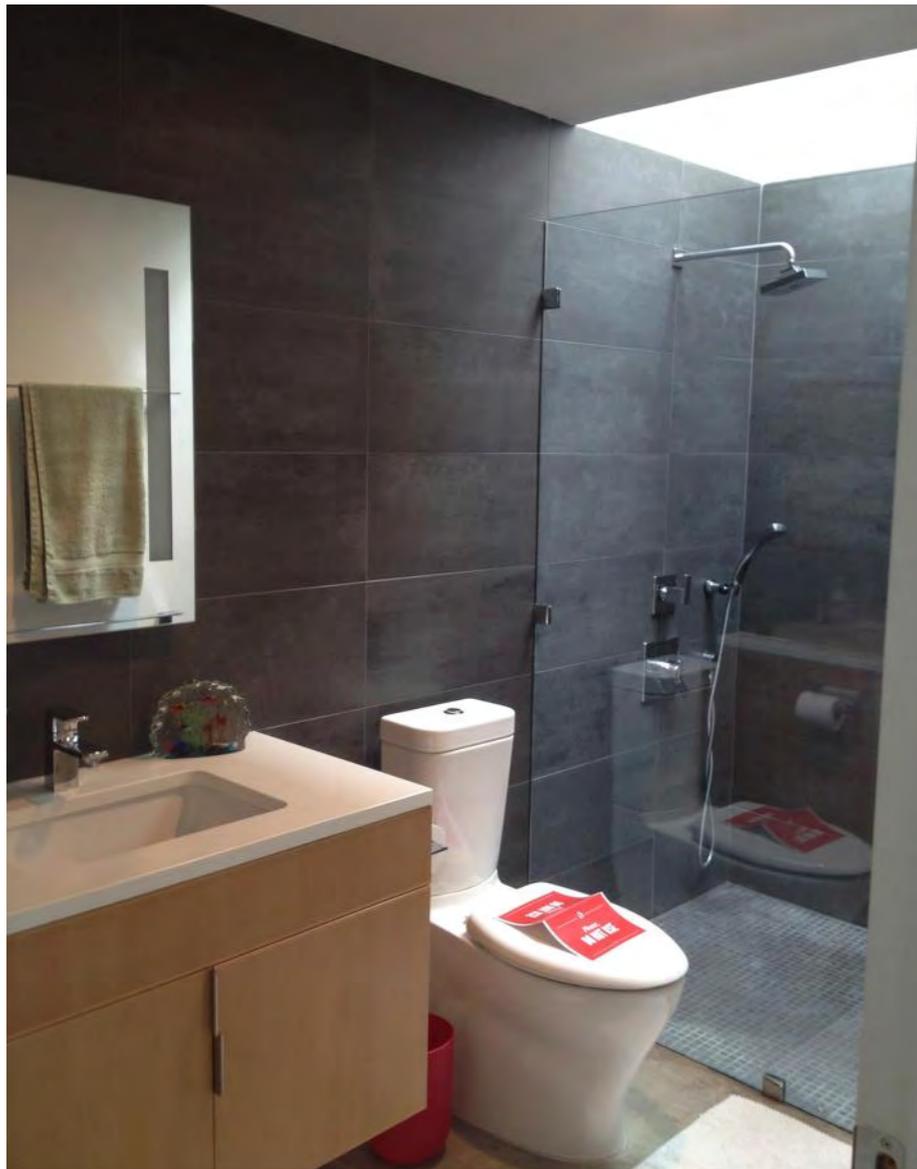
# DESIGN & MIND

- Views of nature, and in particular distant views, have a calming affect and help to lower blood pressure



# DESIGN & MIND

- Natural day light has a calming affect and helps reduce eye strain
- Even light levels from room to room help eyes adjust and reduce falls



# SMALL HOME DESIGN STRATEGIES

- Carefully placed windows can preserve privacy while allowing views and natural light throughout



# SMALL HOME DESIGN STRATEGIES

- Choosing your views with carefully placed windows can preserve privacy while allowing natural light throughout



# SMALL HOME DESIGN STRATEGIES

- FOR TWO STORY HOMES
  - Master bedroom and accessible bathroom on GROUND floor
  - OR a stacked 6'x6' closet for a future residential elevator (\$25K+)
  - Consider accessible half bath for friends in wheelchairs
- ALL HOMES
  - Omit rooms you rarely use
  - Open floor plans for living, kitchen, and dining allow flexible furniture arrangements for changing needs
  - Small bedrooms with good natural light
  - Simple bathrooms, one with shower, one with tub, single sinks
  - Minimize hallway area for efficient plan
  - Reduce molding and dust traps to reduce cleaning
  - Reduce lawns, use native plants that don't require irrigation
  - Use lasting materials to reduce maintenance (metal roofs, fiber cement siding, brick, metal, concrete, etc.)

# SMALL HOME DESIGN STRATEGIES

- Small bedrooms with good natural light feel bigger
- Window shades that can rise from bottom up help preserve privacy and allow light and view



# SMALL HOME DESIGN STRATEGIES

- Small interior spaces feel bigger when floors, walls, and ceilings extend to the outside as patios, decks, and overhangs



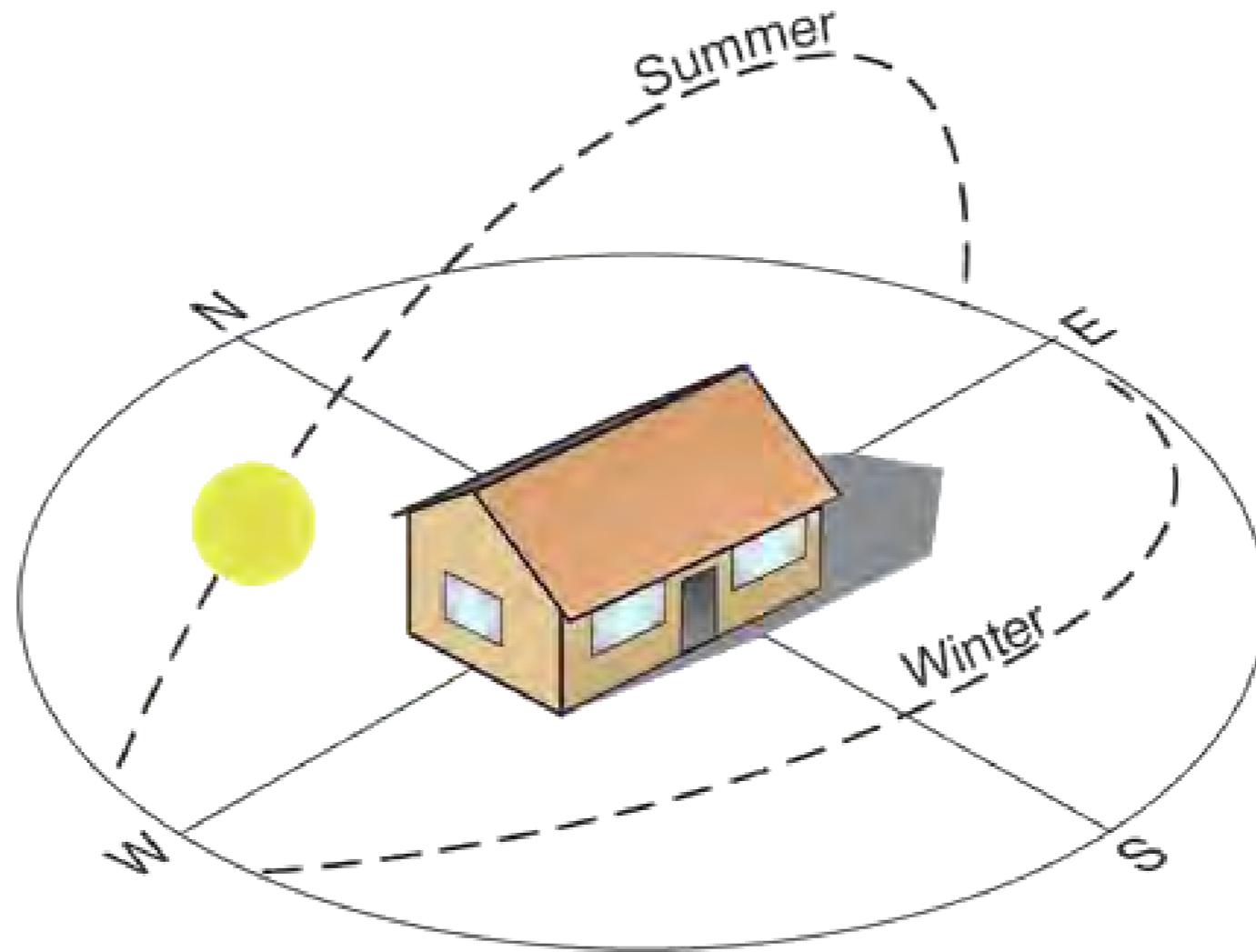
# SMALL HOME DESIGN STRATEGIES

- Consider where the people are - your SOCIAL ENVIRONMENT - sensing the presence of people around you and allowing chance interactions helps reduce loneliness
  - Home accommodations for family and friends
  - Being able to see people in the next room
  - Porches and places for people watching along neighborhood sidewalks



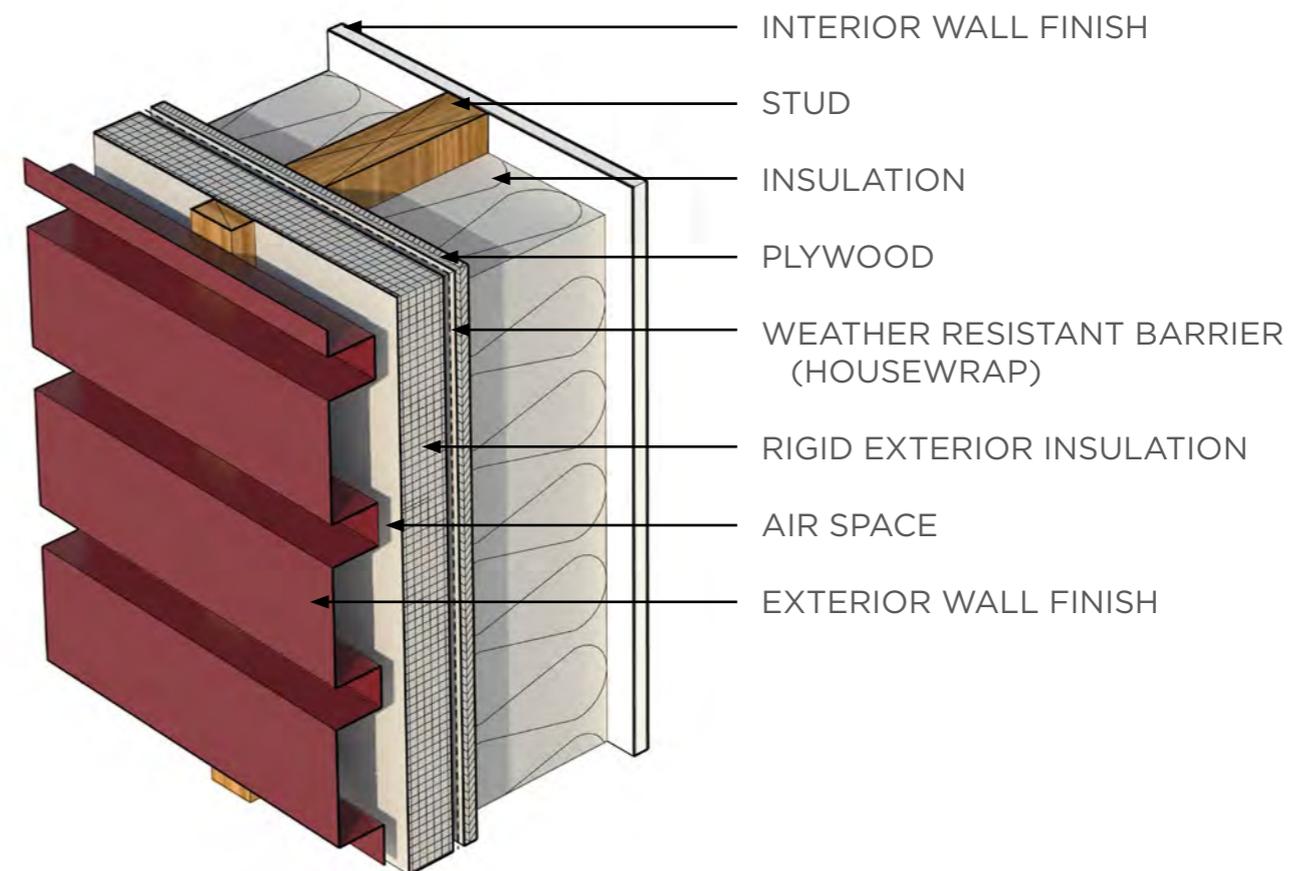
# GREEN DESIGN PRINCIPLES

- PASSIVE SOLAR design with sun



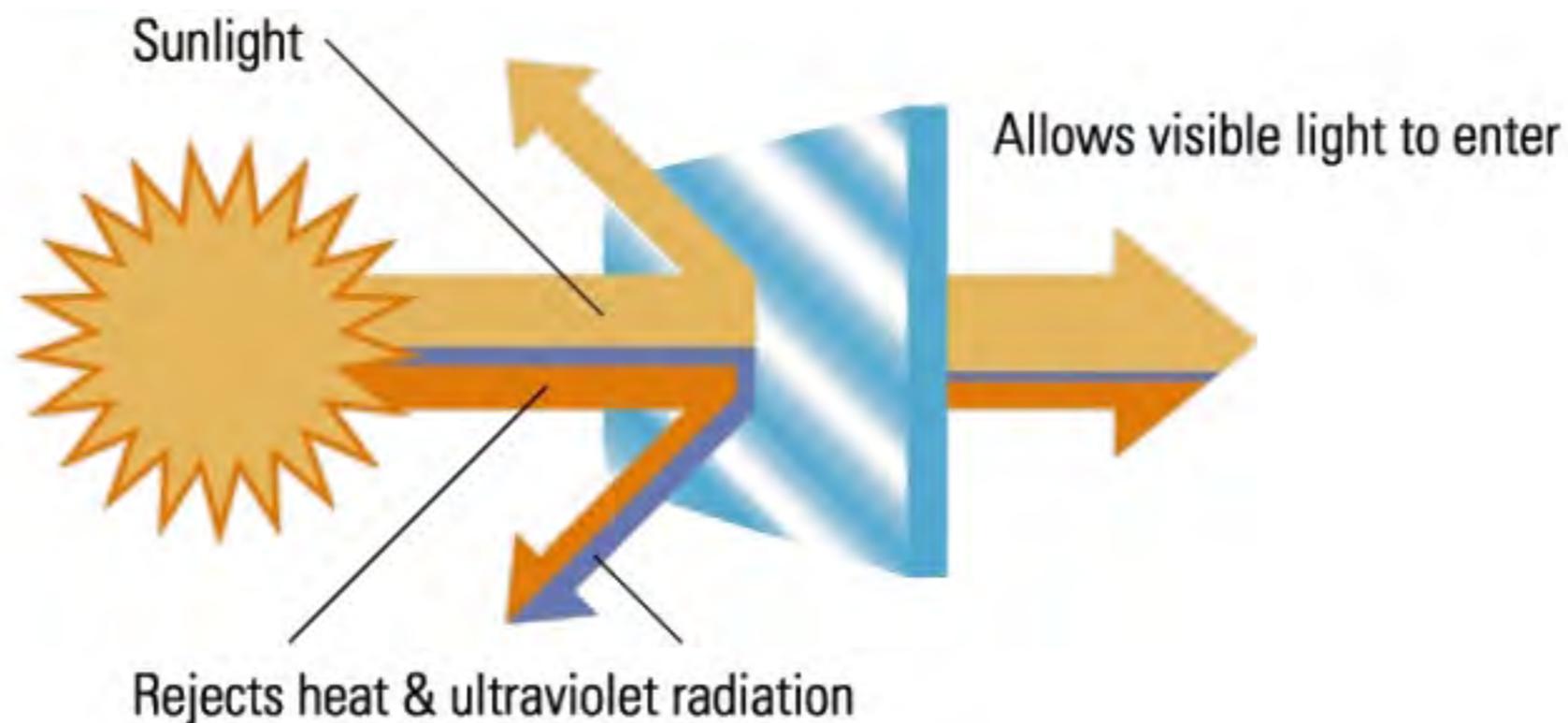
# GREEN DESIGN PRINCIPLES

- REDUCE amount of fossil fuel energy and water used = low utility bills
- METHOD: build home like a cooler and understand local climate



# GREEN DESIGN STRATEGIES

- 1) Efficient WINDOWS: double-pane w/Argon gas in between, Low-E 366 coating (microscope layers of metal that reflect suns infrared wavelengths - radiant energy - but not visible light)
- 2) SEAL around windows and doors: caulking, spray foam, weatherstripping



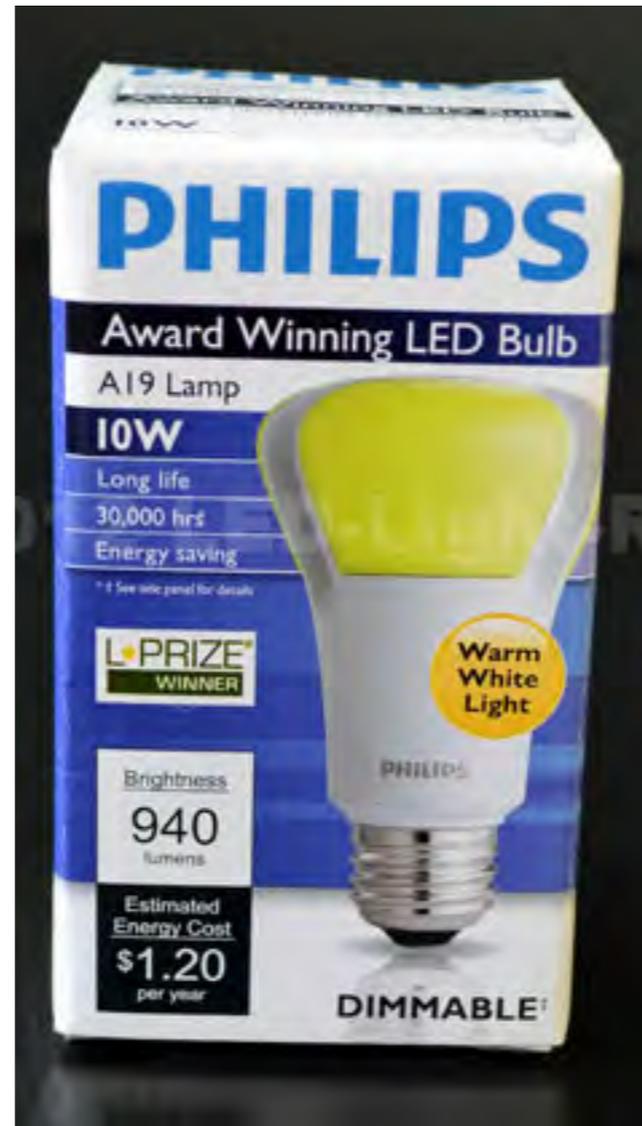
# GREEN DESIGN STRATEGIES

## 3) Increase INSULATION



# GREEN DESIGN STRATEGIES

4) Install LED light bulbs: LOWER KELVIN, 2700K, equals warmer color light like old incandescent; HIGHER LUMENS equals brighter light (850LM = old 60Watts)



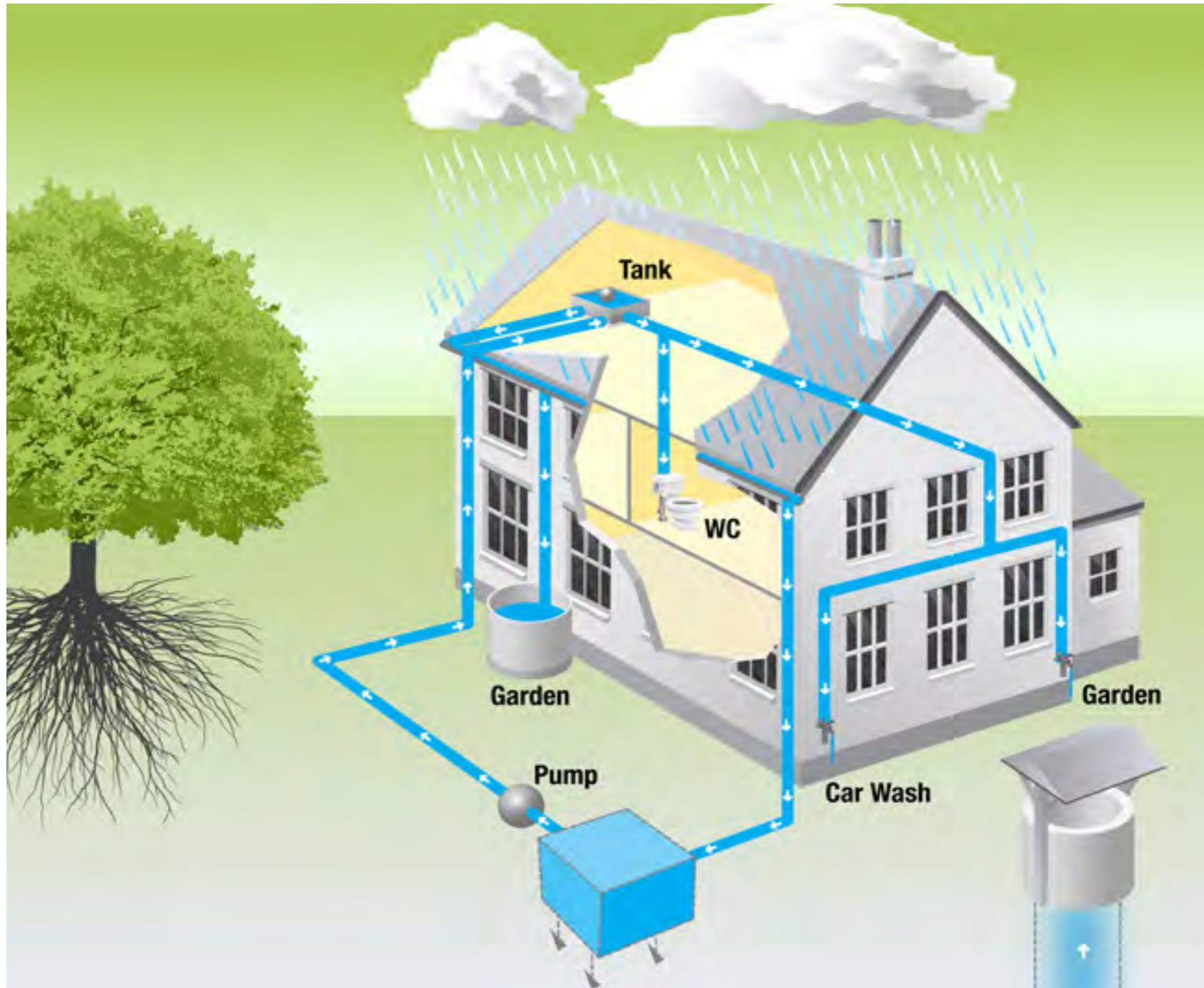
# GREEN DESIGN STRATEGIES

5) Install LOW-FLOW faucets and shower heads and DUAL-FLUSH toilets



# GREEN DESIGN STRATEGIES

6) Use RAINWATER for hoses and toilet flushing (if new home)



# GREEN DESIGN STRATEGIES

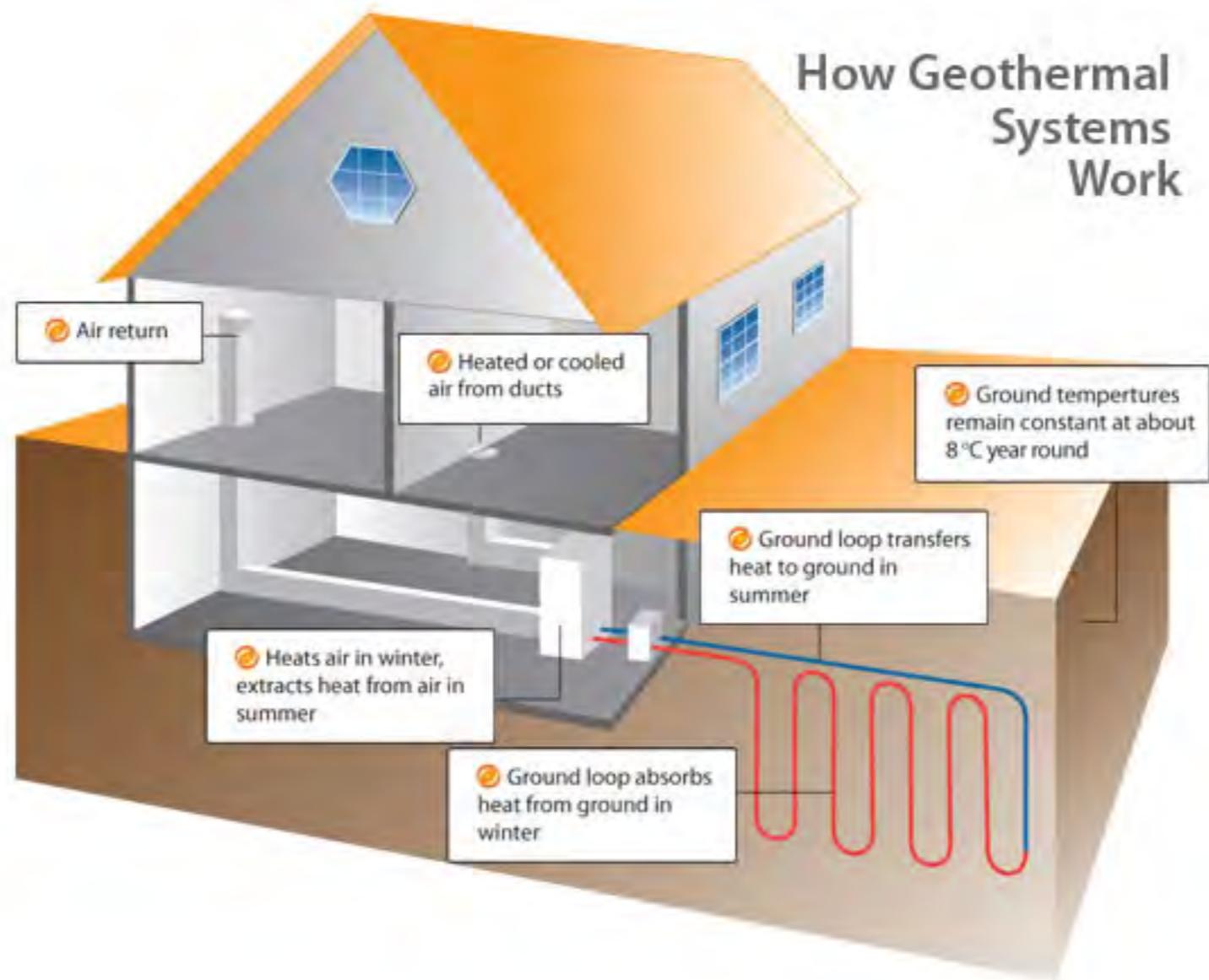
7) Install SOLAR panels for house (Southern Energy Management offers free evaluation and quote) - 65% of installation cost currently eligible for tax credits (30% Fed., 35% State) [www.energystar.gov](http://www.energystar.gov)

- SOLARIZE ORANGE COUNTY: [www.solarizenc.org](http://www.solarizenc.org) - group discounts

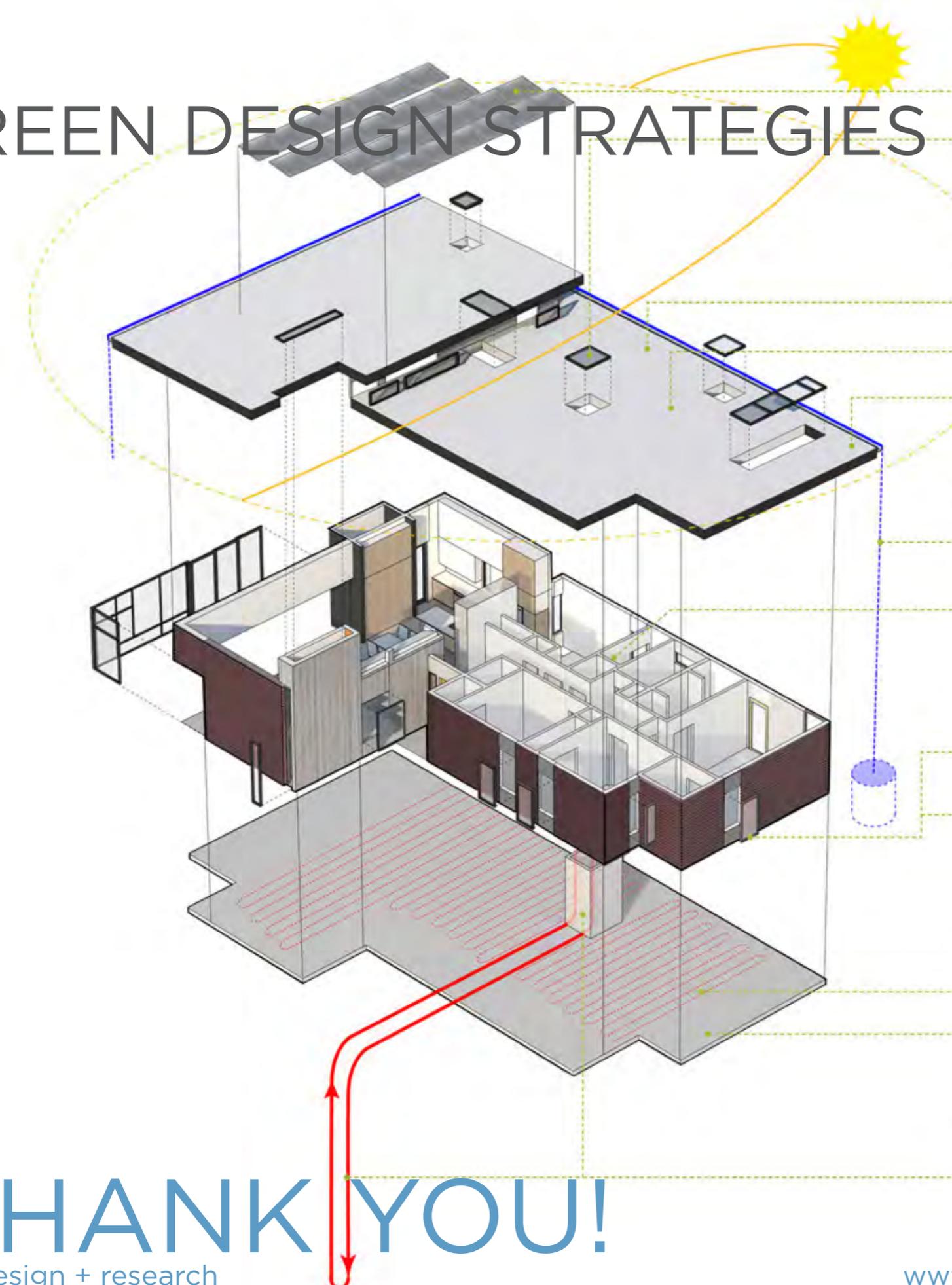


# GREEN DESIGN STRATEGIES

8) Install GEOTHERMAL system for heating and cooling, uses HALF the energy of a traditional air system. Eligible for 65% tax credit.



# GREEN DESIGN STRATEGIES



## SOLAR COLLECTION

5kW SOLAR PHOTOVOLTAIC PANELS

SKYLIGHTS Natural daylighting with solar powered interior shades

## ROOF \_ R-54

SUPER-INSULATED R-54 (SPF + Cellulose)

COOL ROOF White color reduces heat absorption

DEEP OVERHANGS Reduces solar heat gain

## WATER

RAINWATER HARVESTING & 500 gal. CISTERN  
Used for toilet water and irrigation

TANKLESS ELECTRIC WATER HEATERS

## WINDOWS \_ U-Factor 0.29

FIBERGLASS-CLAD WOOD WINDOWS  
High thermal performance (0.29U) & low maintenance

INSULATED GLASS Argon gas filled with Low-E 366 coating maximum year-round efficiency  
All operable in direction of local prevailing winds

## FLOOR

RADIANT HEATING

CONCRETE SLAB Contributes to thermal mass

## ENERGY

GEOTHERMAL Vertical well connected to floor heating and forced-air cooling systems

# THANK YOU!