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A Flexible Home Design For A Comfortable Lifestyle: A Case Study of the Effect of Universal Design

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THE CARL AND WINIFRED LEE HONORS COLLEGE
CERTIFICATE OF ORAL DEFENSE OF HONORS THESIS

Meghann Balmer, having been admitted to the Carl and Winifred Lee Honors College in the fall of 2010, successfully completed the Lee Honors College Thesis on April 18, 2012.

The title of the thesis is:

A Flexible Home Design For A Comfortable Lifestyle: A Case Study of the Effect of Universal Design

A handwritten signature in cursive script, reading "Carla A. Chase", written over a horizontal line.

Dr. Carla A. Chase, Occupational Therapy

A handwritten signature in cursive script, reading "Thomas D. Balmer", written over a horizontal line.

Mr. Thomas D. Balmer

A handwritten signature in cursive script, reading "Diane Bright", written over a horizontal line. To the right of the signature, the text "OTML MSC 10" is written in a smaller, less formal script.

Diane Bright, Occupational Therapy

A FLEXIBLE HOME DESIGN FOR A COMFORTABLE LIFESTYLE

**A CASE STUDY OF THE EFFECTIVENESS OF UNIVERSAL
DESIGN.**

**Meghann
Balmer, OTS
Western
Michigan
University
LHC Bachelors
Thesis
2012**

OVERVIEW OF PROJECT

- **Inspiration:**
 - OT Education at WMU
 - Parents- Baby Boomer Generation

- **Project Process**
 - Researched Universal Design and OT theory
 - Used available resources for additional information
 - Combined information to make recommendation for case study clients

- **Content**
 - What the facts and statistics say
 - Normal aging and what it means for home design
 - What is Universal Design and how does it relate to OT
 - Theory behind the project
 - The floor plan
 - Summary of room features
 - Design Elements and Barriers

DOES YOUR HOME...

- Save you energy when doing chores?
- Have ergonomic features to promote health and productivity?
- Make your daily activities easier and faster to accomplish?
- Accommodate visitors with an array of disabilities?
- Have the versatility to allow for you to operate within it if you were to sustain a disabling condition?

WHAT IF YOUR HOME COULD BE ALL THESE THINGS...

- Efficient
- Ergonomic
- Inviting
- Safe
- Universal

- Sustainable...

FACTS AND STATISTICS

- **Population changes^[12]**
 - From 1950 to 2000 the population of 65 years and older grew from 12 to 35 million.
 - The population of 75 years and older grew from 4 to 17 million.
 - By 2020, an estimated 54 million people in the U.S. will be aged 65 and older. ^[11]
 - By 2040, the population of 75 years and older will EXCEED the population of 65-74.

FACTS AND STATISTICS

- **Realities of current housing options:**
 - Nursing homes can cost \$30,000-\$60,000 a year and 50% of it is paid by the individual.
 - Medicare pays only 2% of the national total cost of LTC.
 - Most private housing lacks features that support the performance of individuals with disabilities^[7]
 - Fewer than 10% of the 100million existing private homes in the U.S. contain such modifications.
 - Current housing stock is often not accessible, and it is not designed for people to “age in place”. ^[11]

FACTS AND STATISTICS

- **The majority of older adults continue to reside in a home rather than in institutions.** ^[11]
 - According to an AARP survey: 89% of people 50 and older want to continue to live in their own homes and communities for as long as possible. ^[9]
- **Enhancing functional performance of older adults can have economic, social, and personal benefits for these individuals, their families, and society as a whole.** ^[12]

NORMAL AGING

- “Variation in human ability is ordinary, not special, and affects most of us for some part of our lives.” – Institute for Human Centered Design
- Genetic predisposition^[12]
- Vision:^[12]
 - Cataracts, glaucoma and macular degeneration
 - Presbyopia
 - Reduced tear secretion and loss of strength and tone in the eye
- Hearing: ^[12]
 - Difficulty:
 - hearing high frequency sounds
 - distinguishing consonants during conversation
 - filtering background noise

NORMAL AGING

- **Taste and Smell** ^[12]
 - Thresholds increase
 - Inability to detect aromas
 - Inability to detect harmful odors (gas, spoiled food, smoke)
- **Proprioceptive and kinesthetic changes**
 - Decreases ability to move throughout the home safely and effectively.

NORMAL AGING

- **Vestibular function**^[12]
 - Increased risk of falling
 - Loss of vision
 - Decreased righting response

- **Central Nervous System**^[12]
 - Cerebrum atrophies and cerebrospinal fluid space increases
 - Neurons lost or atrophy

NORMAL AGING

■ Musculoskeletal System^[12]

- Muscles
- Joints
- Bones

■ Cardiovascular^[12]

- Decreased efficiency
- Diaphragm becomes barrel shaped and less compliant

■ Cognitive^[12]

- Decreased problem solving
- Difficulty coding large amounts of information at once
- Decreased ability to word find

“AGING IN PLACE”

- “Boomer” women were asked (5 years ago): what aging in place meant to them – someone was going to KEEP them in place – they rather hear “welcoming” terms. (D. Bright, personal communication, April 2, 2012)
- Many of those that retire between the age of 55-65 will spend another 30 years in their home. ^[16]
 - To do this: they need to be supported rather than defeated by the structure of their home environment.
 - Often, people will not make changes until a crisis occurs* ^[11]
 - Therefore they are living in a space that no longer meets their needs.
- Using space ^[6]:
 - Being in place involves patterns of activity in using space.
 - We transverse the physical environment and trace regular pathways of everyday activity that overtime become habitual.

UNIVERSAL DESIGN

- “Variation in human ability is ordinary, not special, and affects most of us for some part of our lives.” – Institute for Human Centered Design

+lack of current housing to meet our needs=

- UD:^[10]
 - The design of products and environments to be used by all people, to the greatest extent possible, without the need for adaptation or specialized design. ^[11]
 - New construction with accessibility features costs less than retro fitting existing structures. ^[11]
- Design team typically includes: ^[16]
 - Architect, engineer, interior designer, urban planner, environmental psychologist, gerontologist, OT, contractor, builder
- Accessible – Adaptable – Aesthetically Pleasing – Cost Effective^[11]

HOW CAN OT HELP?

- **Scope of Practice**
 - OT services are provided for the purpose of **promoting health and wellness** and to those who have or are at risk for developing an illness, injury, disease, disorder, condition, impairment, disability, activity limitation, or participation restriction. ^[13]
- **What can an OT do?** ^[11]
 - Analyze the physical environment as it relates to human performance.
 - Determine specific functional and environmental problems.
 - Negotiate intervention options in collaboration with the client and their support network.
 - **PROBLEM SOLVE:** to “bridge the gap” between the environment and the person’s tasks.
- **To be client-centered:**
 - Determine what roles and occupations they want and expect to do. ^[10]
 - The AOTA Code of Ethics (2005) specifically mandates that practitioners respect their clients’ rights to influence decisions that affect them. ^[4]

HOW CAN OT HELP?

- Relate UD to the client in their terms:^[2]
 - Don't think of universal design to loss of function – instead link it to quality of life.
 - In order for the client's to relate to universal design features in their homes, they must connect universal design features with quality of life benefits.
 - 76 million people born post WWII (1946-1964) – but there is no demand for universal design – is this because of the association of universal design and disability?
 - **U.S. consumers do not want home design features to imply impending loss of function.**

ENVIRONMENTS AND OCCUPATIONS

- The environment influences human behavior and provides the context within which all roles are performed. ^[10]
- Several theories and models address the issue of environmental influence on occupational functioning. ^[10]
 - They all emphasize that environmental supports promote optimal occupational performance.
 - Including (but not limited to):
 - Environmental Press Theory
 - PEOP Model (Person Environment Occupation Performance)
 - Ecology of Human Performance
 - Rehabilitation

ENVIRONMENTS AND OCCUPATIONS

- The influence of the environment on performance:^[7]

Medical Model	Social Model
Attribute disability to functional limitations caused by impairments	Disability is a construct imposed by circumstances, and consequently , the environment plays a role in performance
Blind=disabled – due to loss of vision	Lack of Braille or audible cues=disability (with adequate environmental support, this person is “able”)

- When environmental demands exceed a person’s abilities: excess disability results. This greatly limits participation in activities at home, workplace, or community. ^[11]

WHAT'S NEXT?: CONTENT RECAP

■ Content

- ~~What the facts and statistics say~~
- ~~Normal aging and what it means for home design~~
- ~~What is Universal Design and how does it relate to OT~~
- ~~Theory behind the project~~

■ **The floor plan**

■ **Summary of room features**

■ **Design Elements and Barriers**

WHO ARE THE CLIENTS?

■ Thomas (64) and Cheryl (63)

■ Work history

- Salesman – Carpenter
- Educator

■ Hobbies

- Golf – reading – socializing – family

■ What do they want?:

- Location: suburb/golf course community
- Lot size and landscaping: 1acre – woods/low maintenance
- Inside the home: 1,800sq. Feet – 1 level – open concept – great room with a fireplace – 2 bedrooms – breakfast nook – basement – good size laundry
- Flexible, attractive home
- Room for entertaining family and friends
- Live in the home and not have to move

■ What are their priorities?:

- Remain independent
- A home that is the right fit for their wants and needs
- Comfort without compromising attractiveness

HOME

What does home mean to you?

- Sanctuary
- Comfort
- Relaxation
- Familiarity
- Security

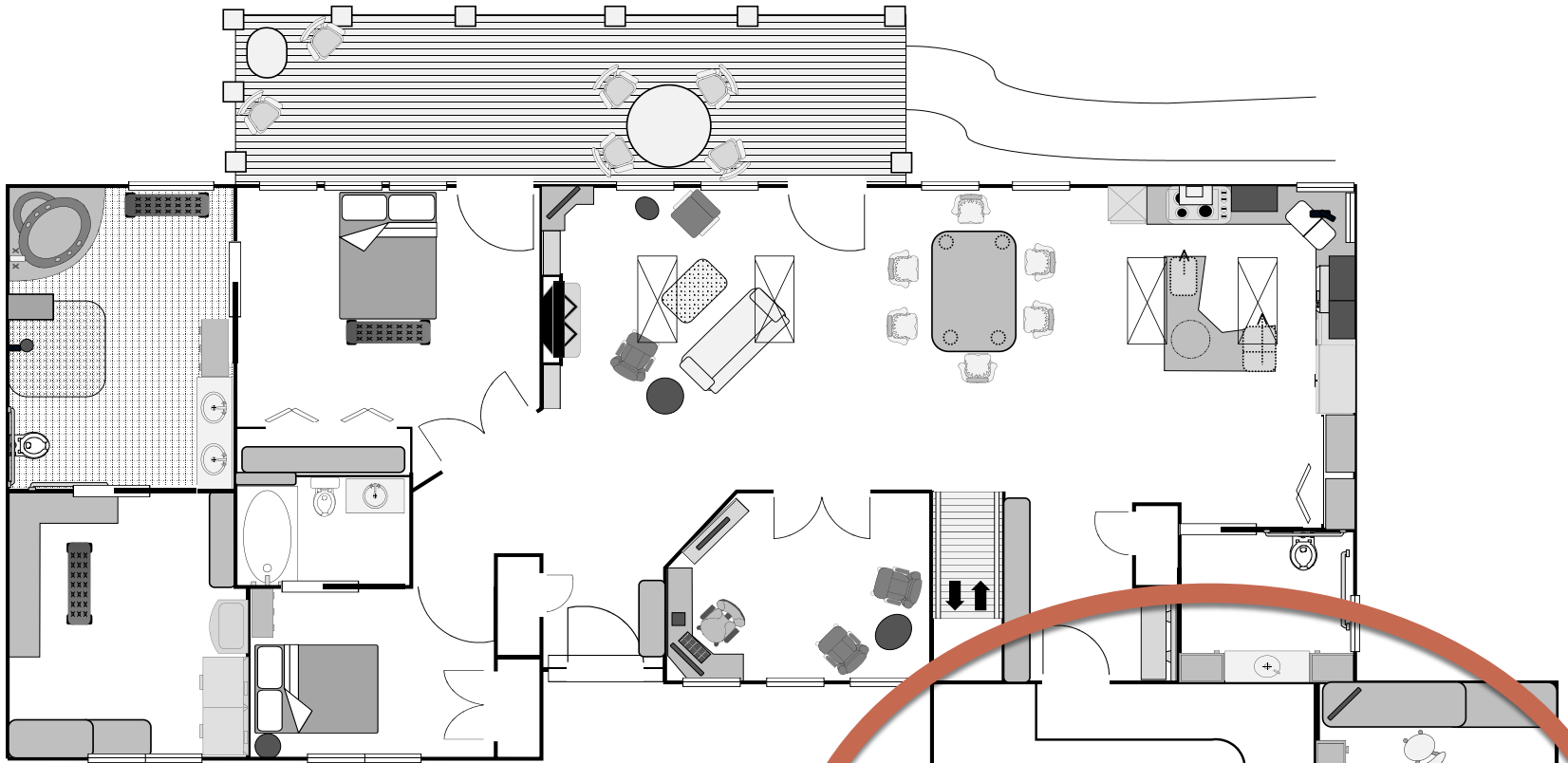
What do you do around your home?

- Relax
- Read
- Entertain
- Clean
- Sleep

RECOMMENDED FEATURES OF THE HOME

- Flexible
- Efficient
- Attractive
- Welcoming
- Secure

- ADJUSTABLE
 - Should permit changes in room use to eventually allow for accessibility for a variety of methods to transverse the space.
 - Accessible for any limitation: vision, hearing, mobility, bathing ^[5] ^[14] .

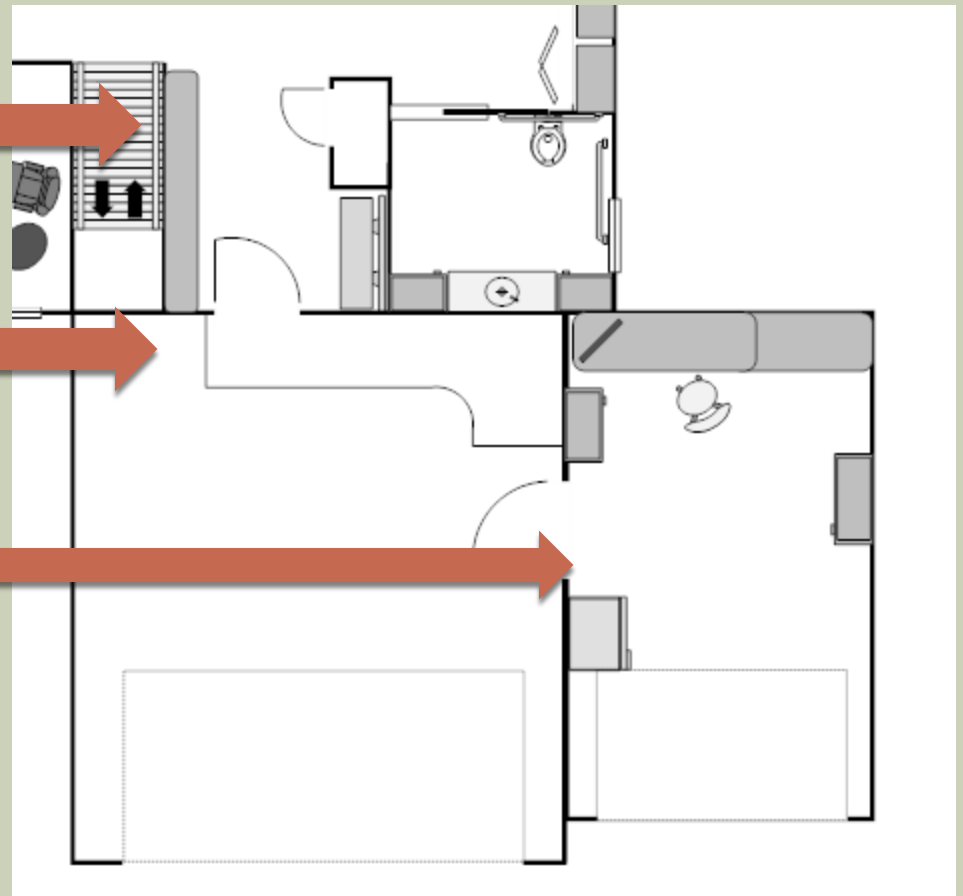


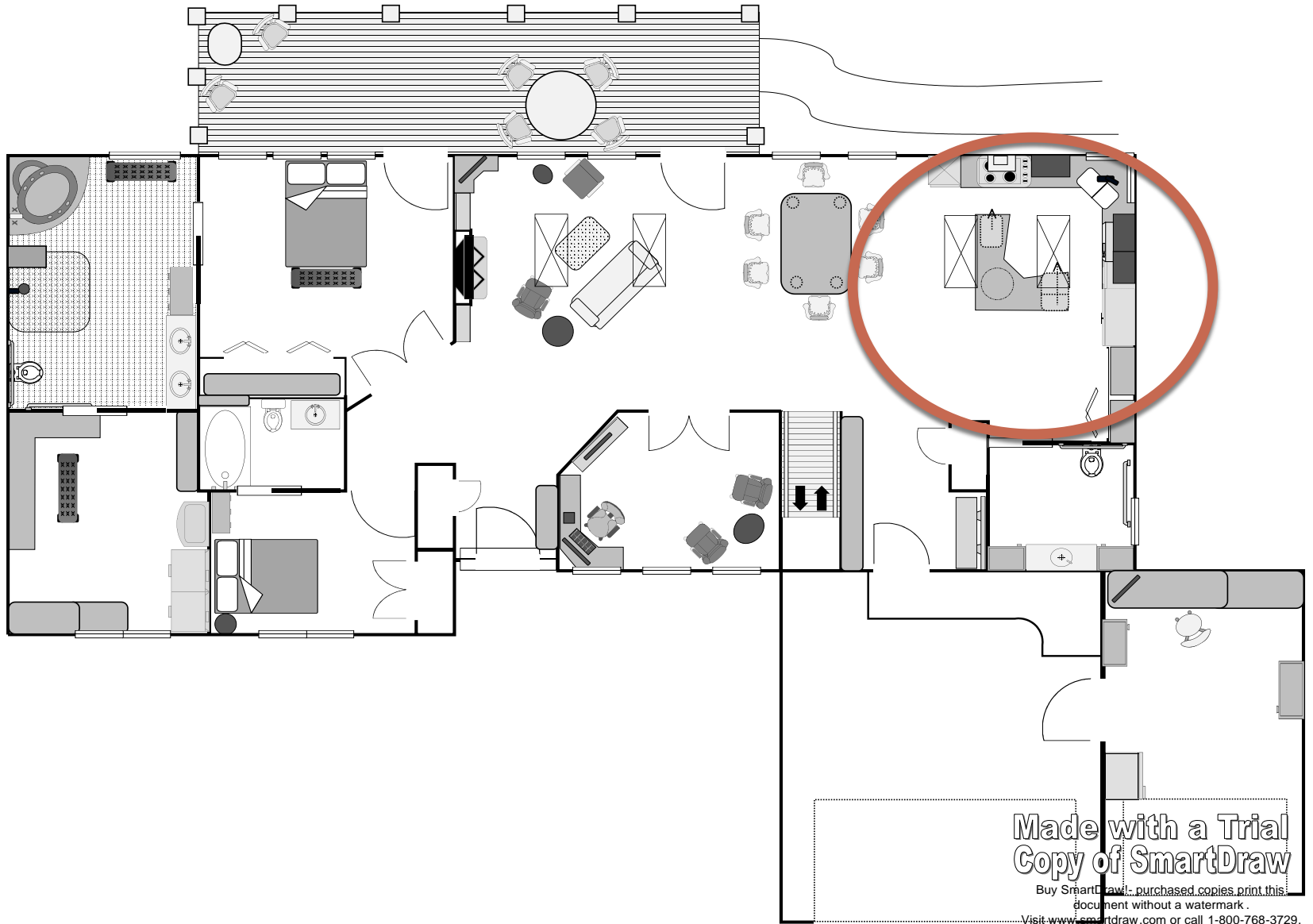
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GARAGE/BACK ENTRY

- Shelf for groceries
- Ramp: 1:12 for no step entry
 - Also: Cascading steps: shorter and deeper
- Workshop for Thomas



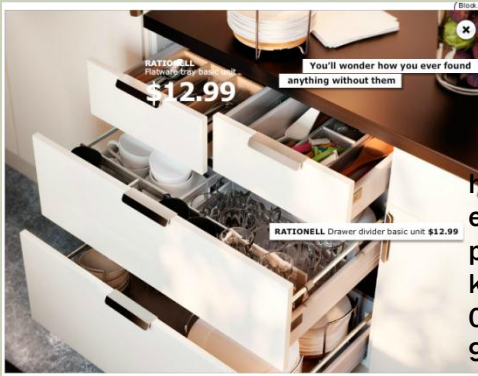


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KITCHEN

■ Drawers in base cabinets

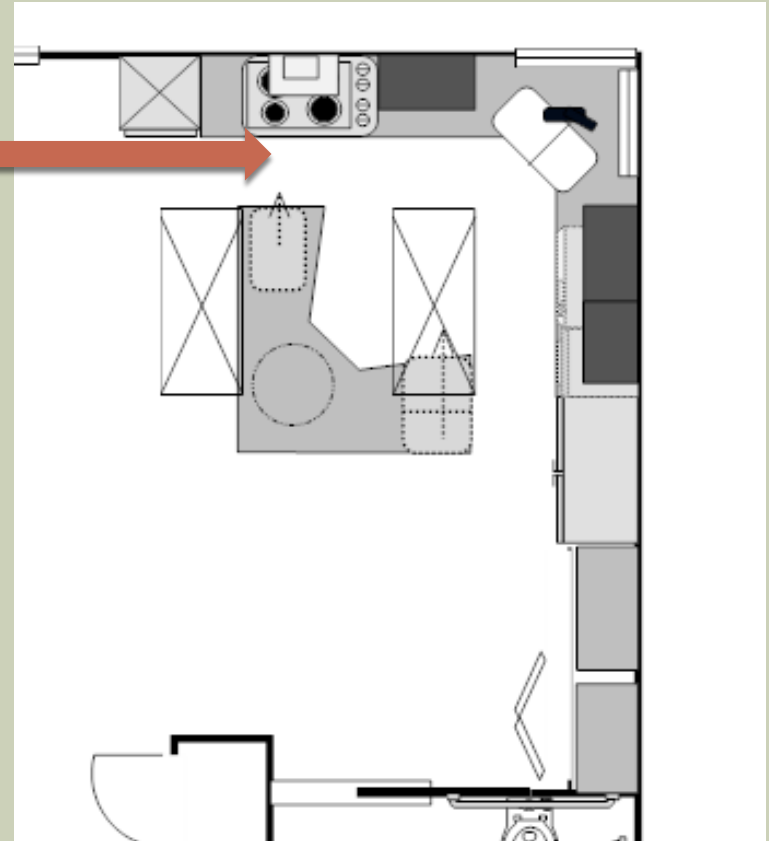


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■ Appliance lift



http://www.google.com/search?q=appliance+lift&hl=en&client=firefox-a&hs=ZXK&rls=org.mozilla:en-US:official&prmd=imvns&source=lnms&tbm=isch&ei=AvWBT42sFJSI8QT1s8XB Bw&sa=X&oi=mode_link&ct=mode&cd=2&ved=0CGMQ_AUoAQ&biw=1600&bih=727



KITCHEN

- Mobile island on caster wheels to allow for flexibility of the space.
 - Pull out garbage and recyclable cans

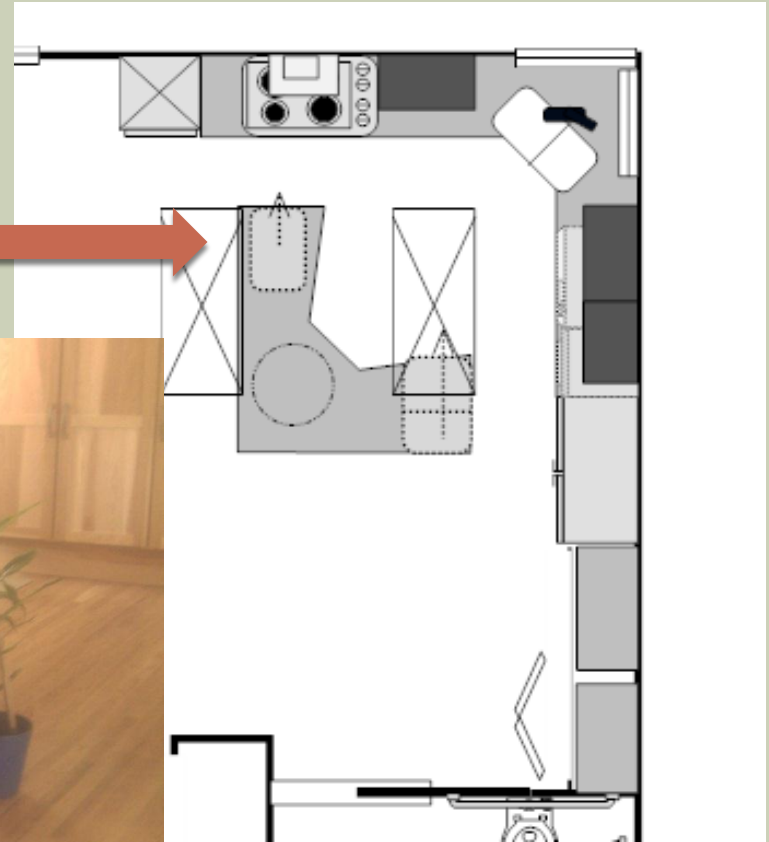
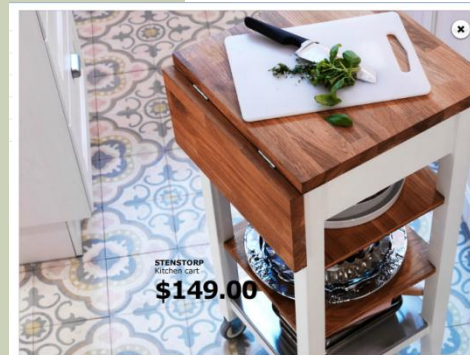
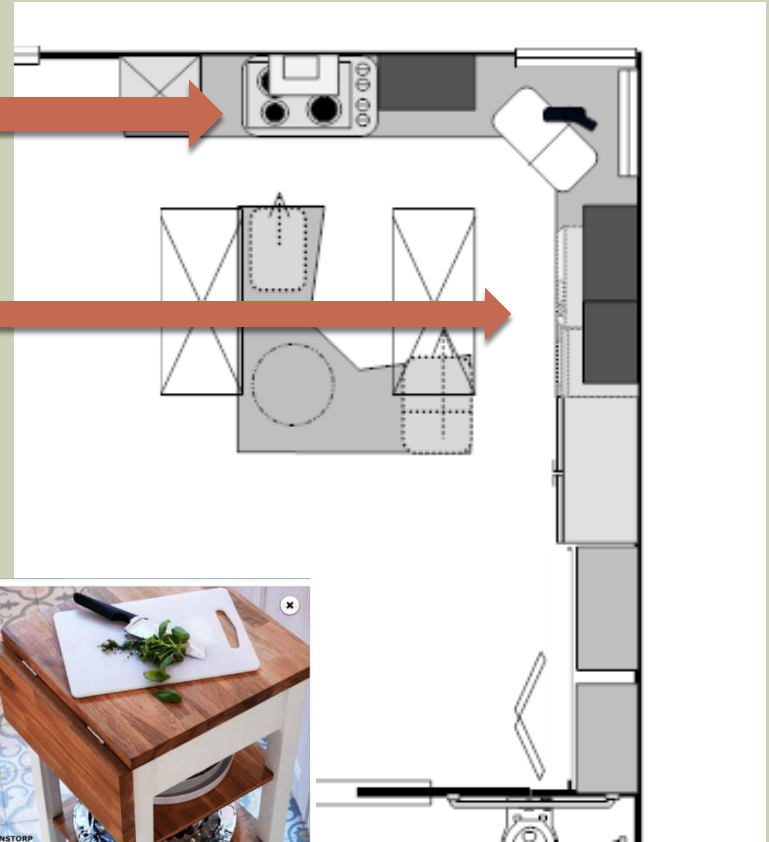


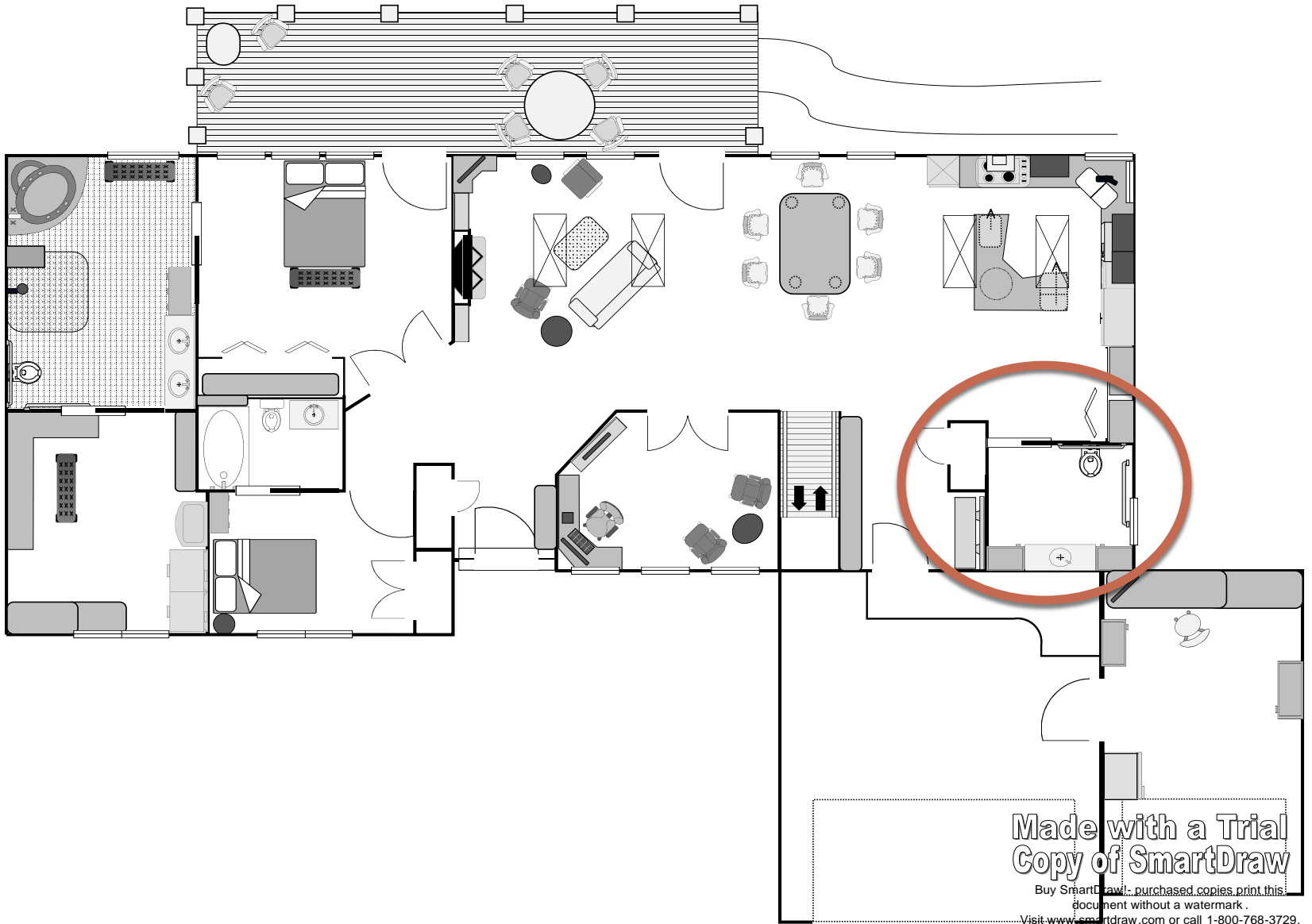
Photo courtesy of: Diane Bright, OTRL, MSc ID

KITCHEN

- Stove top with staggered burners (controls on side) and open underneath (with cabinet doors)
- Toe kicks are raised to 3-4" off of the ground to allow for space for a w/c to turn (D. Bright, personal communication, April 2, 2012)
- Wheeled cart under stovetop with cooking tools



http://www.ikea.com/us/en/catalog/categories/departments/kitchen/tools/kitchen_rooms_ideas/#/20123_kirs04b_01/713887

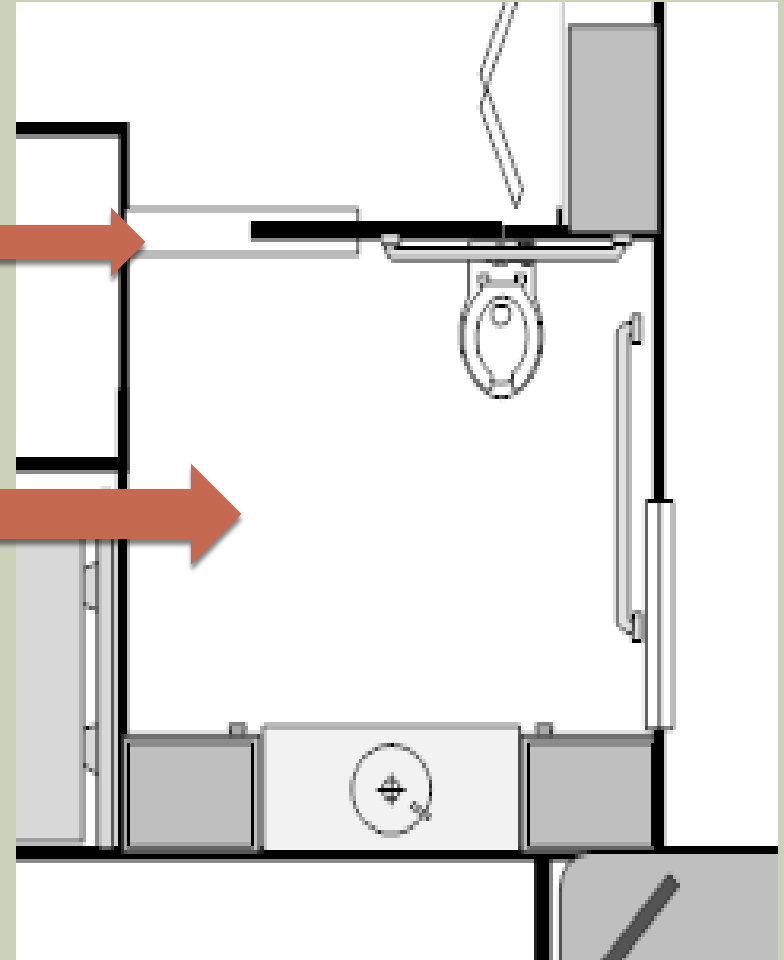


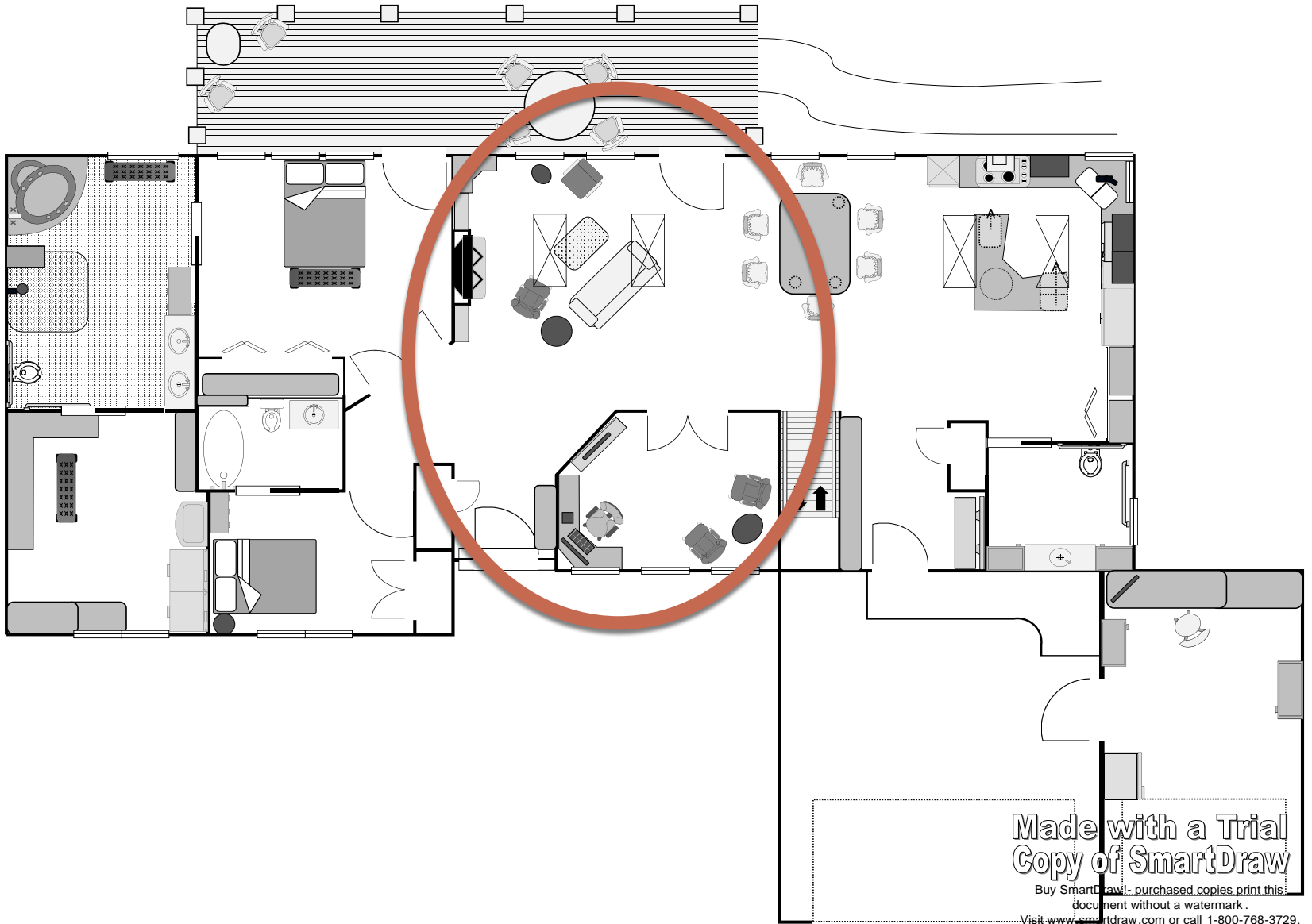
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HALF BATH

- Custom pocket door with lever handle
 - Can be operated with a closed fist
 - Safety lock feature
- Accessible
 - For visitors with different needs.
 - Additional storage and space.





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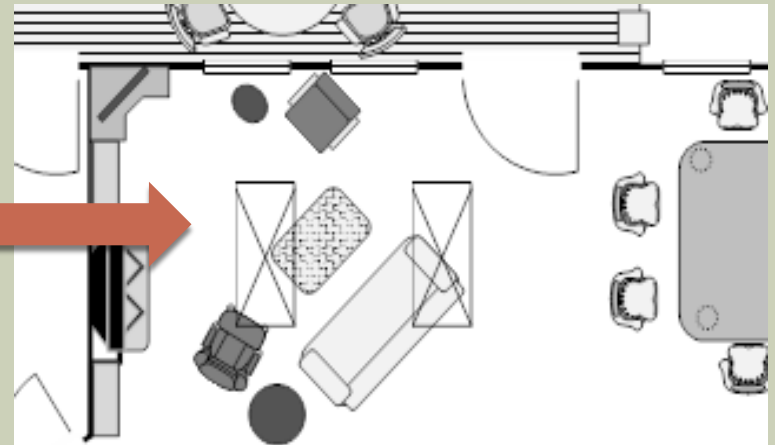
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LIVING ROOM/STUDY

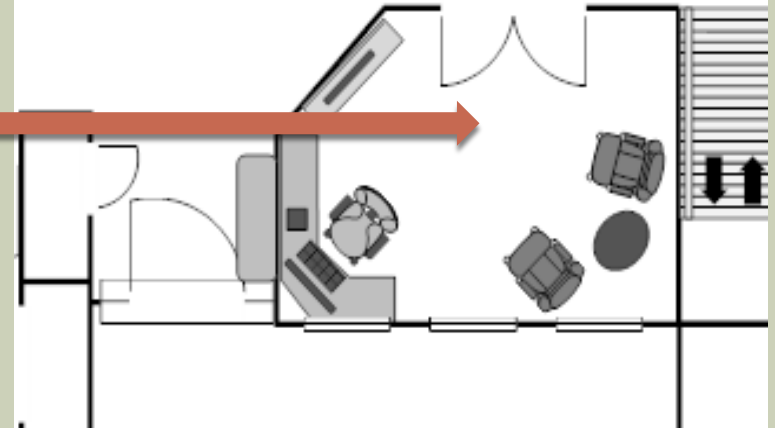
- Skylights operable with electric motor that has a rain sensor that automatically closes when window is dampened^[5]

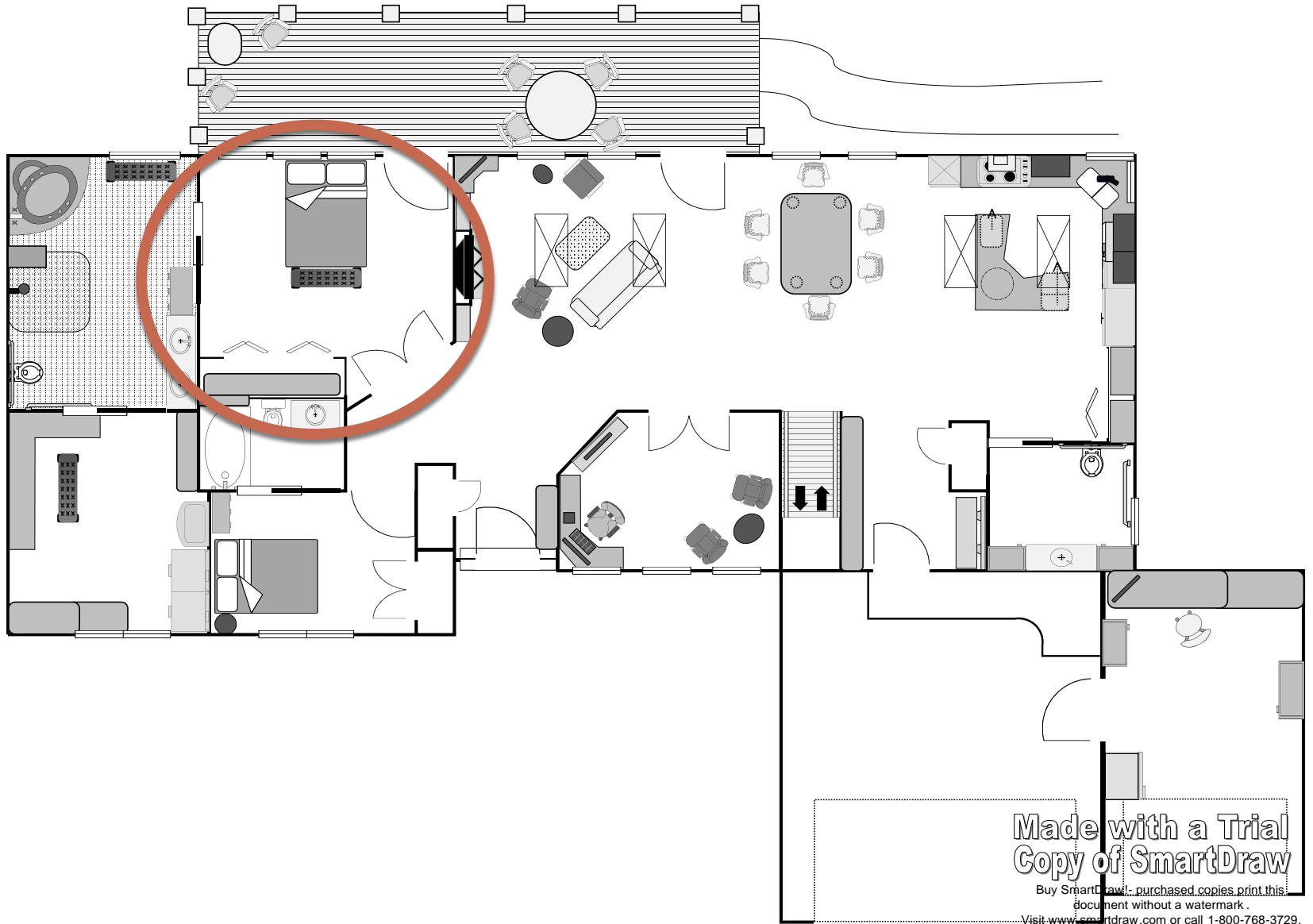
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- Low ply-commercial grade carpet for durability and ease of cleaning.

- Outlets:
 - Electrical outlets 27" above floor





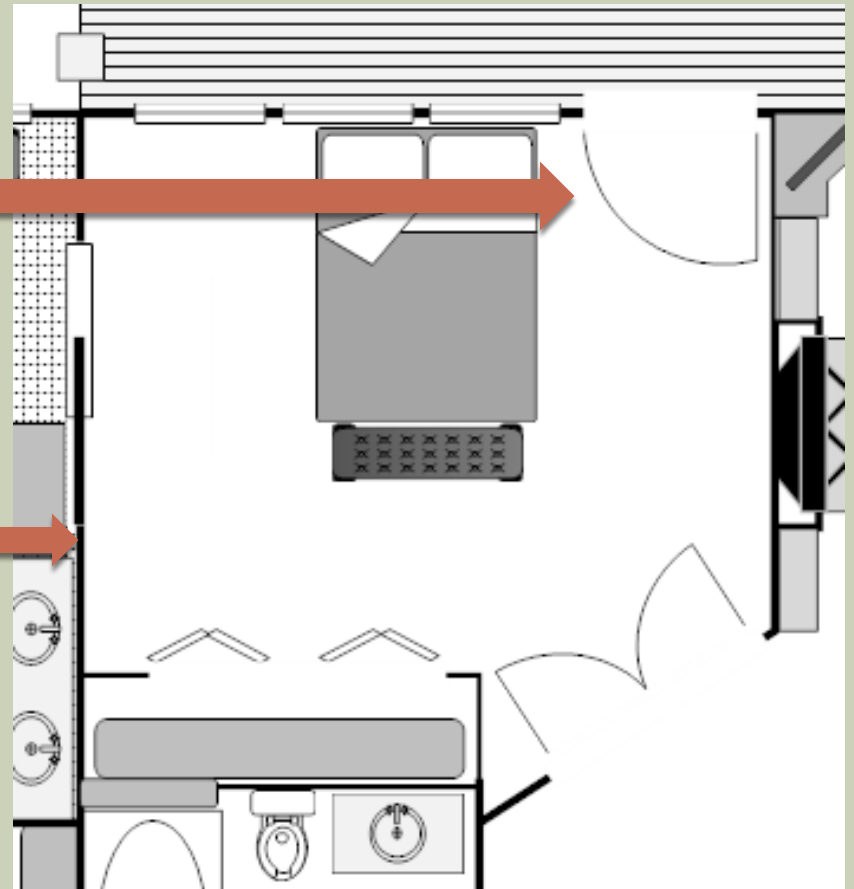
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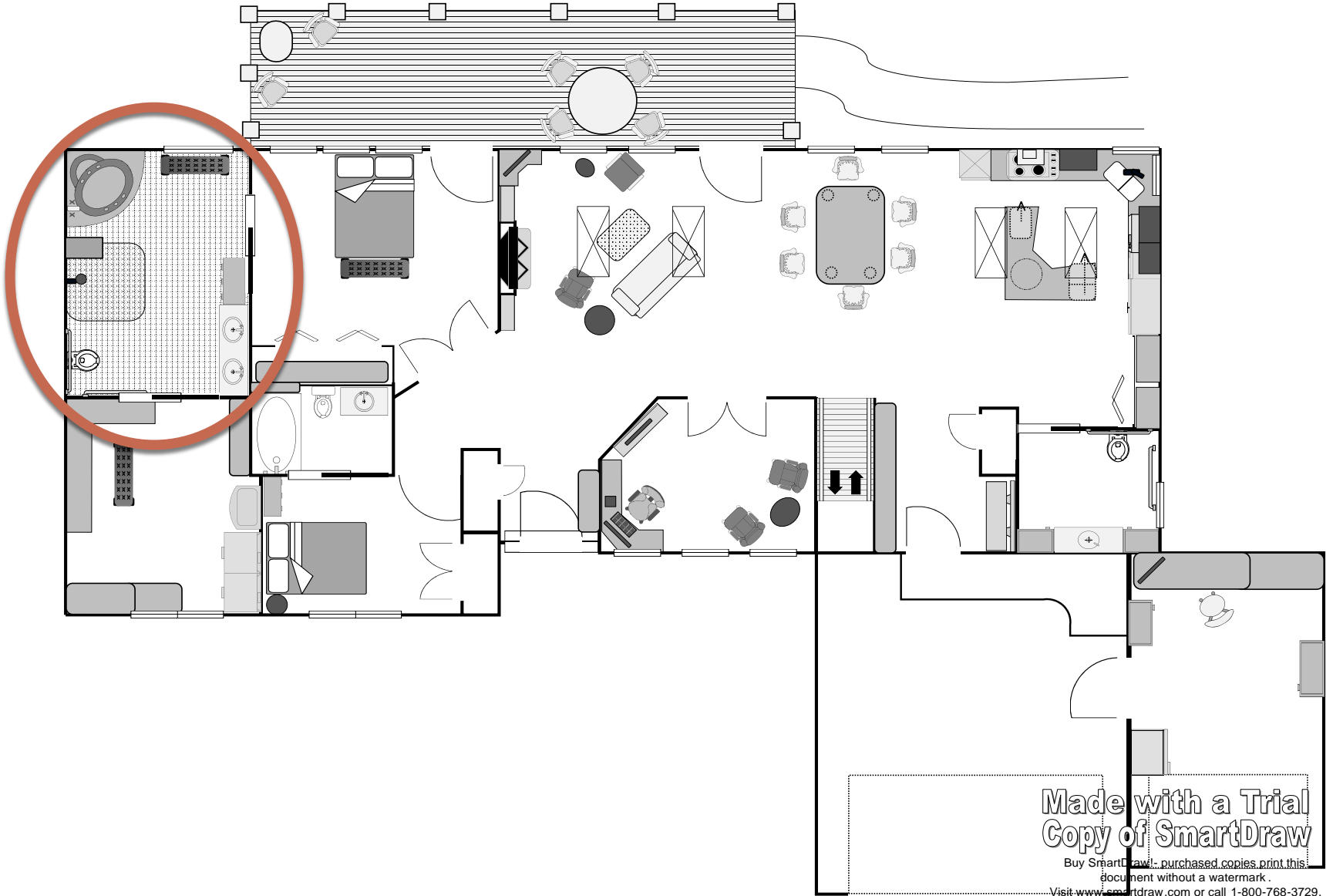
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MASTER SUITE: BEDROOM

- Access to the porch.
- Motion censored and time-able lighting on the baseboards. (D. Bright, personal communication, April 2, 2012)
- Ceiling reinforced between bed and bath for a lift if needed^[5]



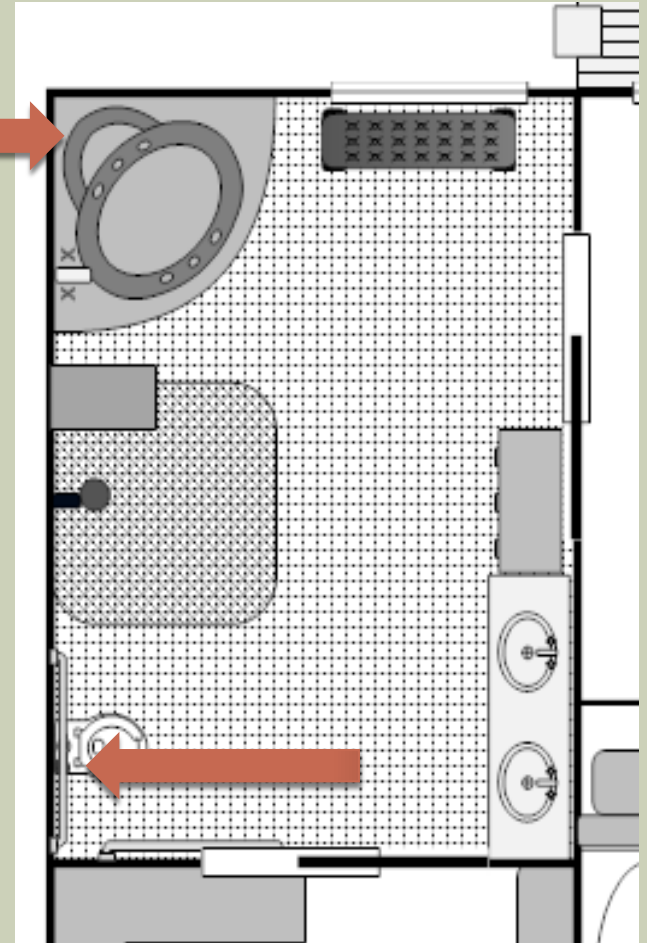


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MASTER SUITE: BATHROOM

- Whirlpool bath with bench seat option
- Handheld shower head on adjustable height track
- Blocking between 32 and 54" from floor to enable future installation of anchored grab bars



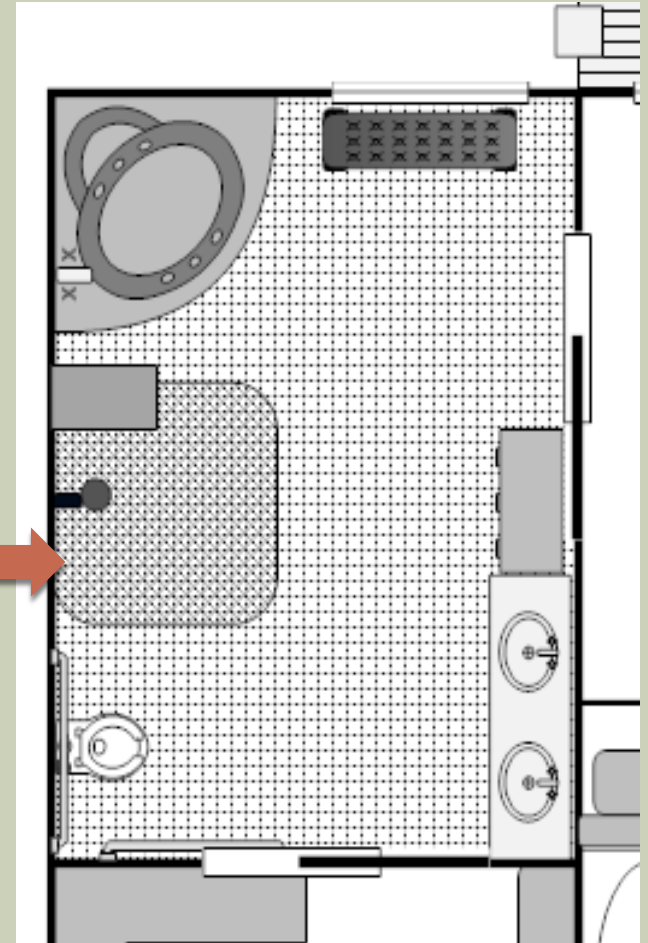
MASTER SUITE: BATHROOM

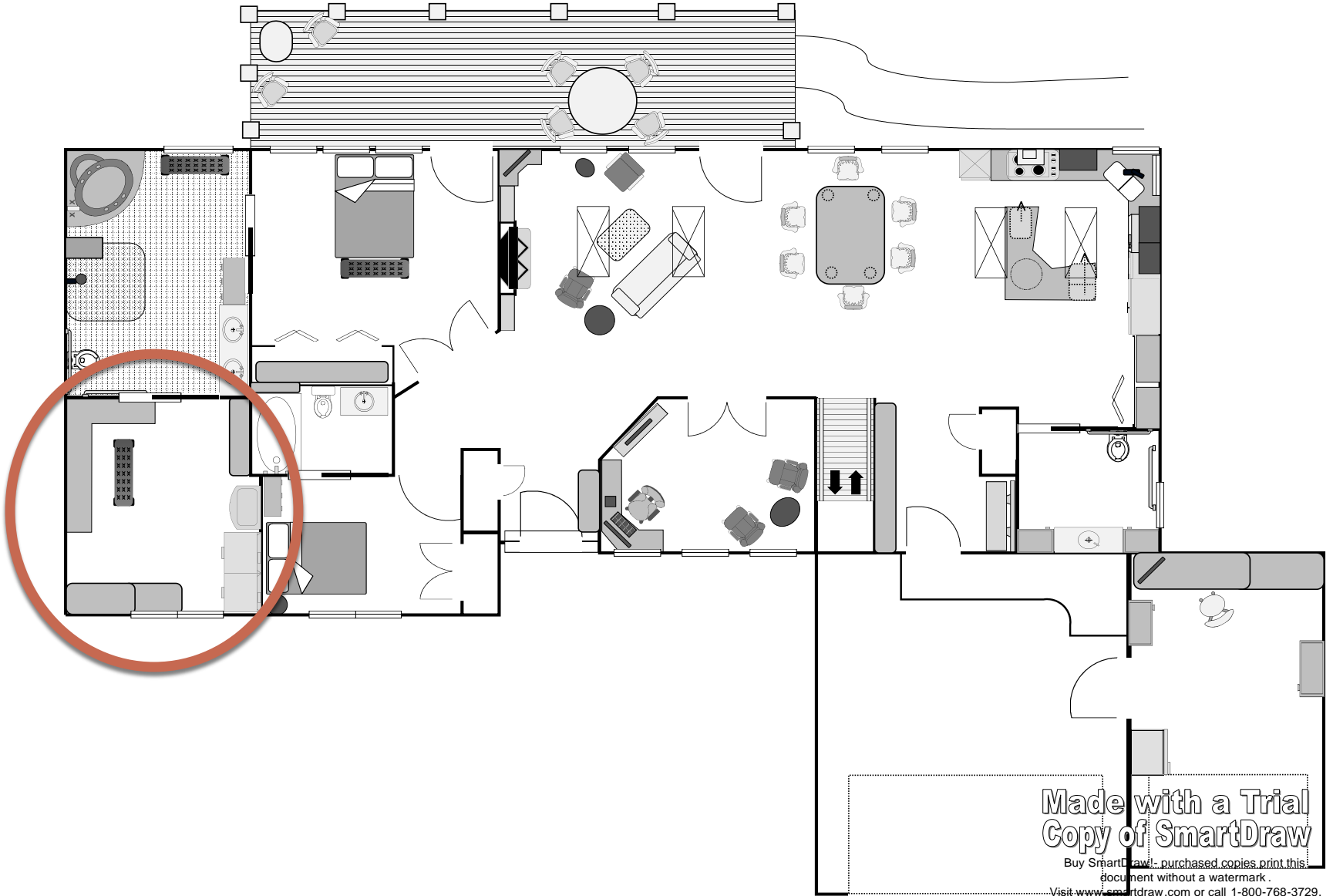


E, BALDWIN HOME

Photo courtesy of: Diane Bright, OTRL, MSc ID

- Spa shower with built in fold-down shower bench





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MASTER SUITE: CLOSET/LAUNDRY

■ IKEA closet:

- Pull down hanger
- Wire baskets
- Pull out shoes

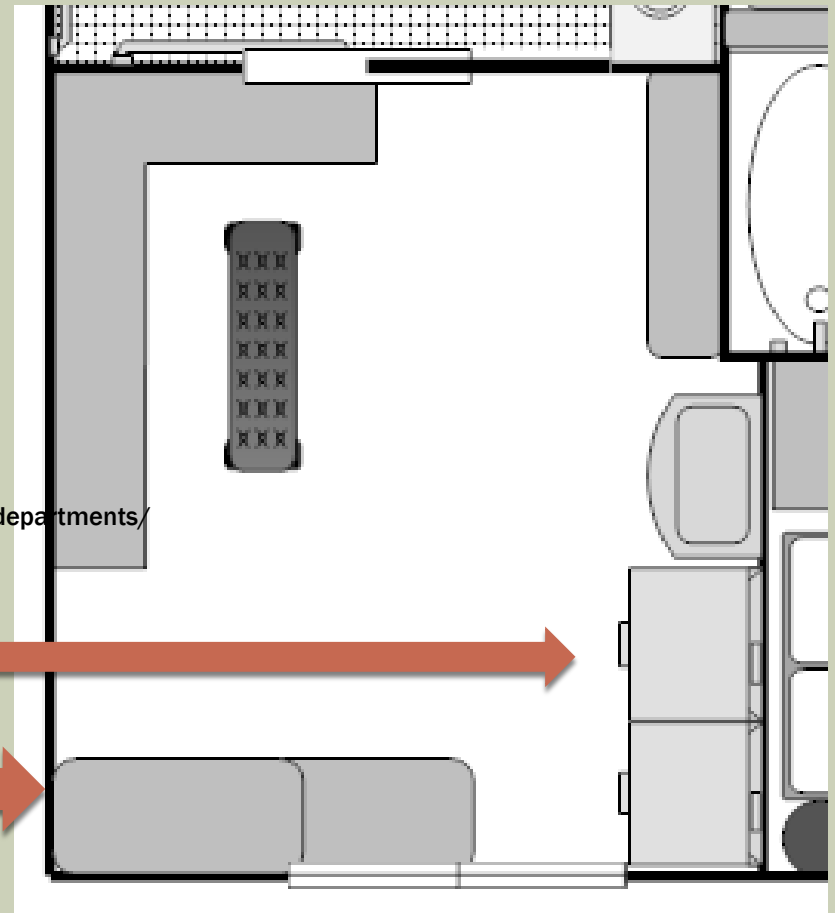


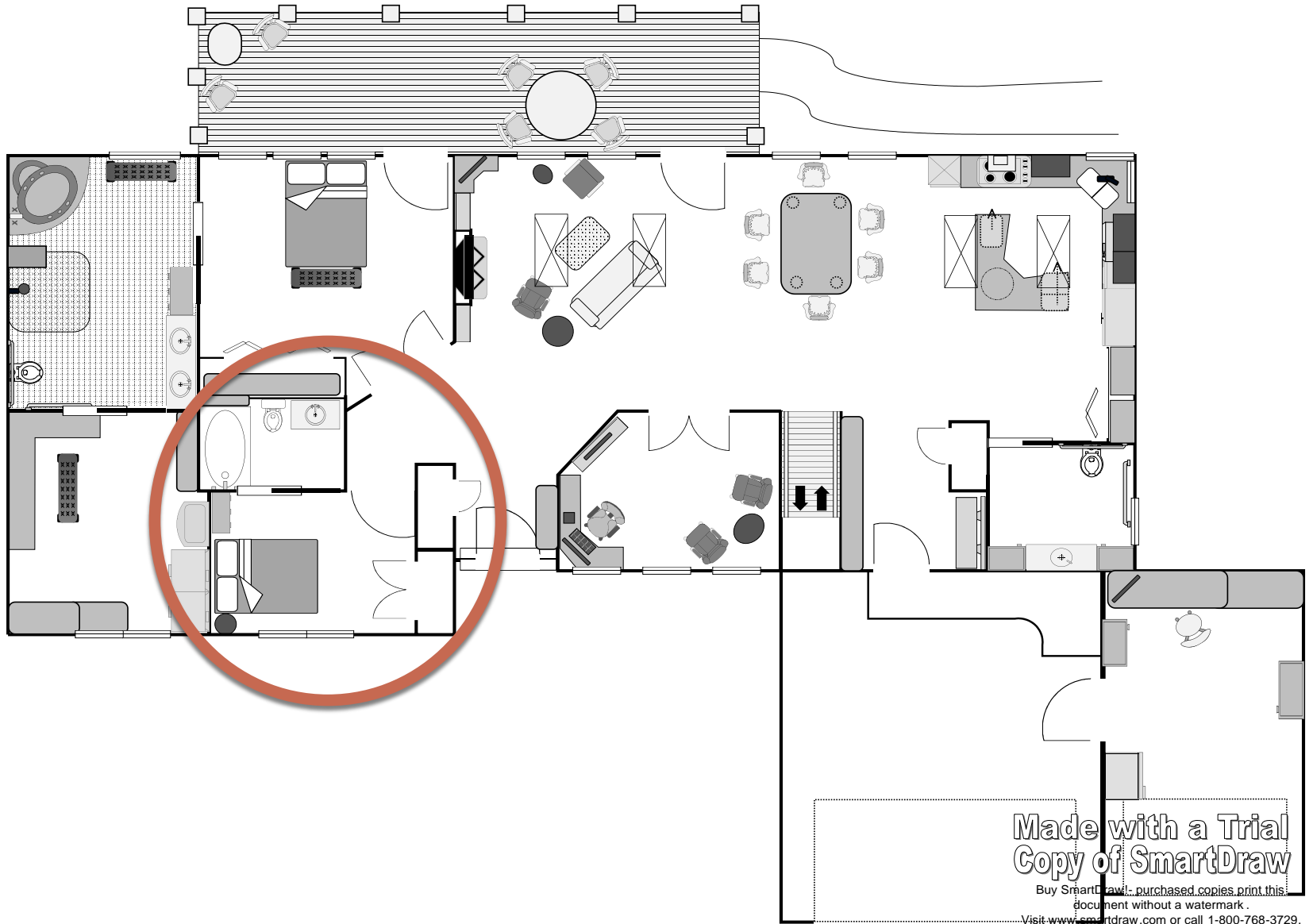
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■ Laundry

- Front loading washer and dryer
- Multi level work surfaces for folding^[1]



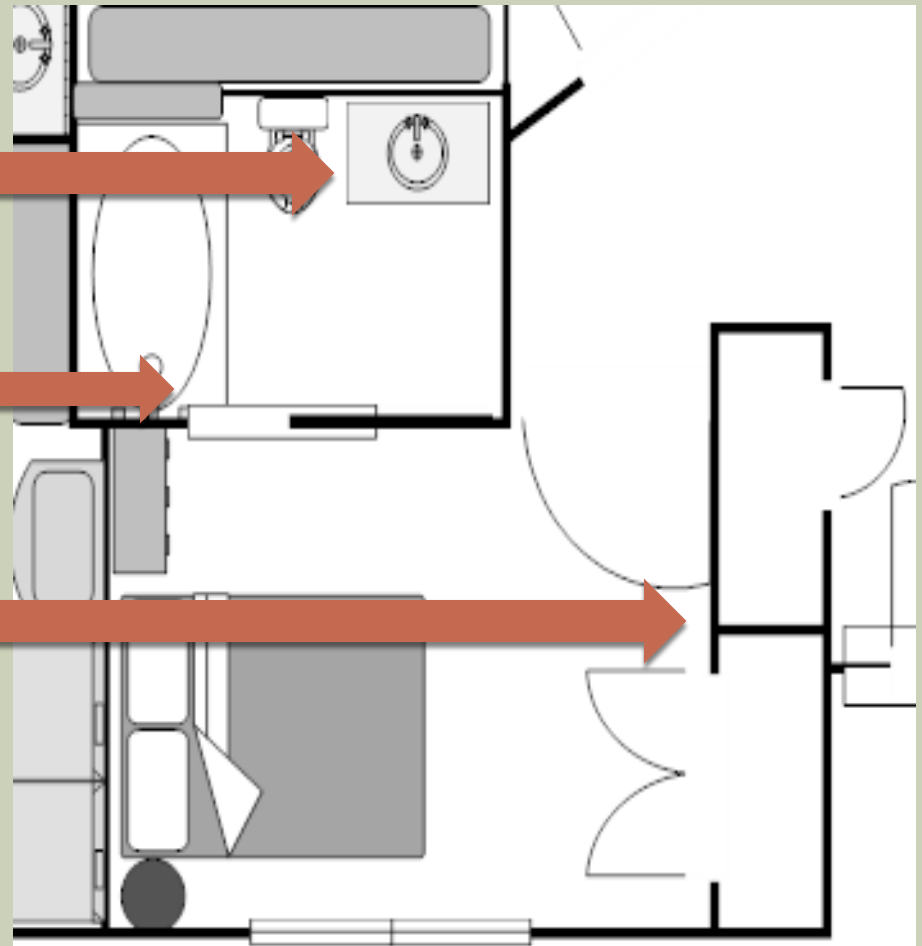


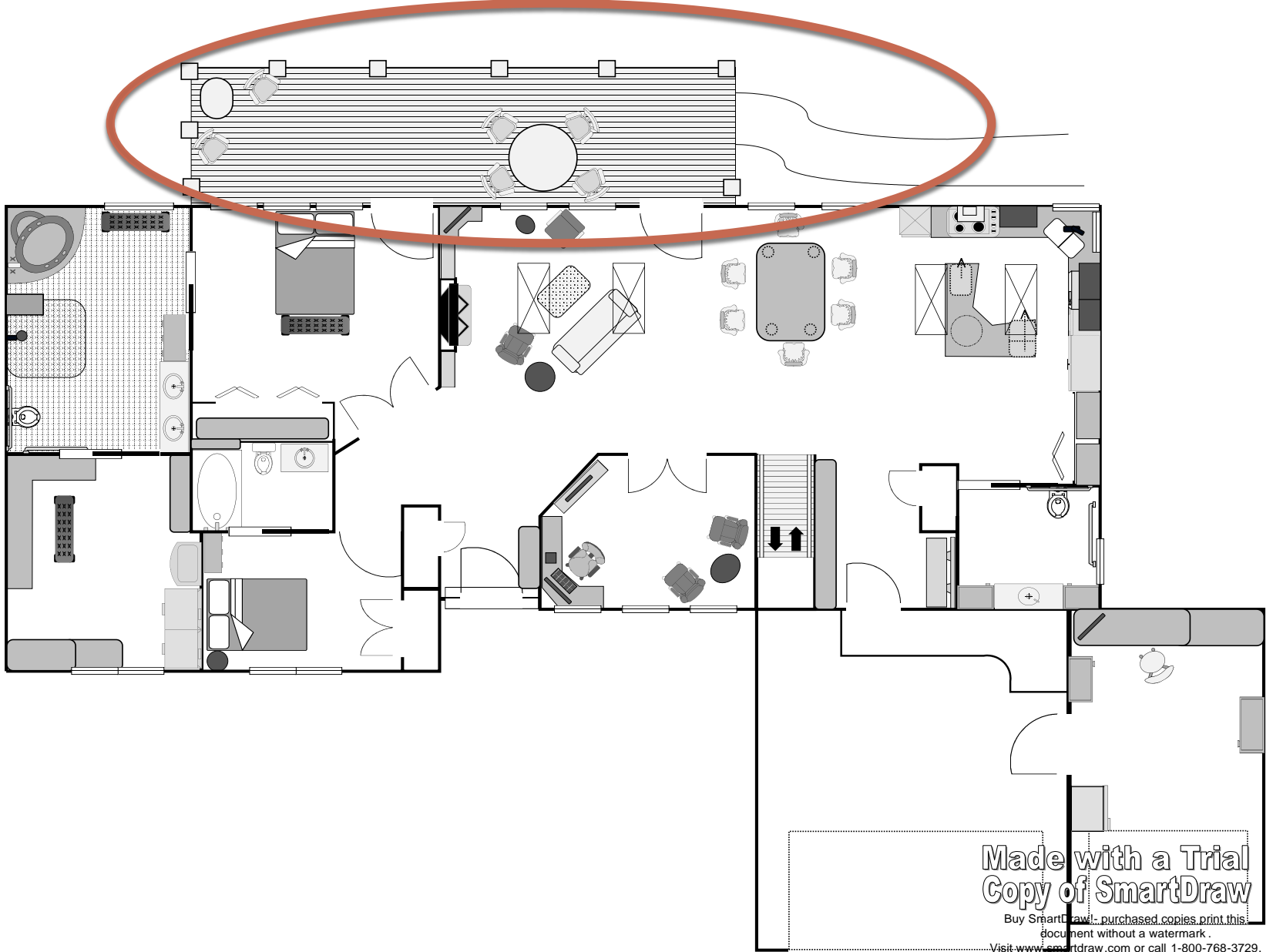
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GUEST SUITE

- Open bottom sink
- Custom pocket door
- Motion censored and time-able lighting on the baseboards. (D. Bright, personal communication, April 2, 2012)

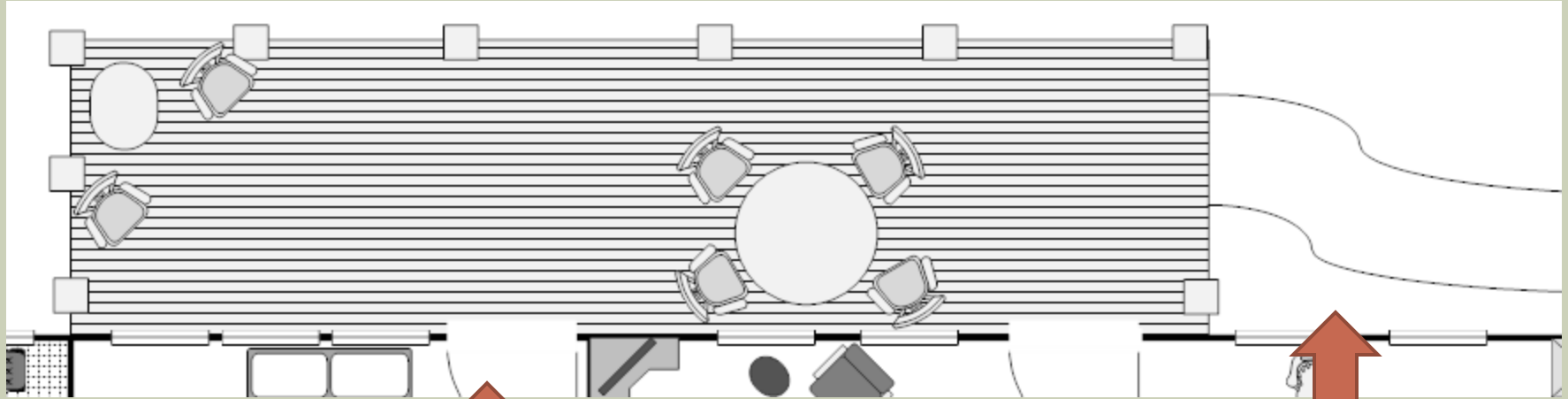




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BACK PORCH



■ Accessible from master

■ Side graded garden pathway

■ Welcoming for entertaining family and friends

■ Ceiling fan

DESIGN CONSIDERATIONS TO AVOID BARRIERS

- What is done in the room, by who, and how? *
- Barriers to consider (specific to the person in the home):^[16]
 - Physical barriers:
 - Anything that impinges on the actual performance of a task.
 - Doors and hallways too narrow for wheel chair or ambulatory devices
 - Toilet seat too high or low
 - Uneven surfaces
 - Difficult to manipulate door handles and locks
 - Sensory barriers:
 - Conditions that impair the ability to see, hear, and taste or to discriminate by touch and smell.
 - Poor lighting or glare on reflective surfaces
 - External noise from traffic
 - Internal noise from lack of proper sound barriers
 - Uncontrolled water heater thermostats, unmonitored natural gas emissions, auditory only fire and smoke alarms, stove top heating elements that do not give visual cues to temperature

DESIGN CONSIDERATIONS TO AVOID BARRIERS

- **Barriers to consider (specific to spaces in the home):** [7]
 - **Entrances and Doorways:**
 - Steps
 - Narrow doorways
 - Heavy doors
 - Hardware that is difficult to manipulate
 - **Bathrooms**
 - Height of tub
 - Lack of grab bars (toilet and tub)
 - Height of toilet
 - Lack of space for ambulatory devices or wheel chairs
 - **General Circulation:**
 - Slippery floors
 - Uneven surfaces
 - Loose carpeting
 - Poorly lit areas
 - Lack of color contrast on edges of counters and doorways

GENERAL DESIGN ELEMENTS

- Attractive and functional
 - Personality of homeowners is of utmost importance
- Paint colors^[8]
 - Watch for reflections in paint and flooring
 - High gloss=glare=errors in judgment > leads to falls
- Flooring
 - No threshold but contrasts from laminate hardwoods to carpet
 - Low ply on carpet
 - Durable and easy to maintain
- Furniture and Accessories:
 - Lighter furniture, drapery, and lamp shades^[8]

GENERAL DESIGN ELEMENTS

■ Lighting^[8]

- Should support functional outcomes and prevent falls.
- Petrofsky and Cuneo study:
 - Examined correlation between gait, balance, and age during standing and walking in: normal, subdued, and no-light conditions.
 - Results: a difference was seen in age in low-light conditions.
- Amount of light needed is determined by activity.
 - Reading vs. watching T.V.
- Often, task lighting is more effective, efficient, and economical than overall room lighting.
- Use natural lighting as much as possible

FEDERAL ACTS

- ** These **do not** directly **apply** to private, residential housing (unless it is a multi family home)...but they influenced decisions made for this project**
- Americans with Disabilities Act (ADA) 1990^[10]
 - Designed to increase the integration and successful community living of people with disabilities in American society.
 - Architectural Board Act (Titles II and III of ADA)
 - Gives building standard specifications for most aspects of the built environment (criteria for positioning, slopes, ramps, widths, etc.)
- The Fair Housing Act Accessibility Guidelines (FHAAG) ^[11]
 - Equal housing for those with disabilities
- Architectural and Transportation Barriers Compliance Board (ATBCB) ^[11]
- Uniform Federal Accessibility Standards (UFAS) ^[11]

MY RECOMMENDATIONS SUMMARY

- **Security^[5]**
 - Home automation system which enables total environment to be controlled from one spot and from a wheelchair – home will be equipped for this if it is needed in the future,
 - **ECUs^[3]:**
 - Now called EADLs
 - Remote control of TV, music, exiting house, regulating lights and temperature and more
 - Open and close windows, turn lights on/off, communicate with lifeline systems: fire, police
 - Thermostatically controlled hot water unit
- **Ranch style-no-step entrance^[11]**
 - Any steps will be cascading

MY RECOMMENDATIONS SUMMARY

- **Comfortable:**^[15]
 - Switches and thermostat placed 48" above floor
 - Electrical outlets 27" above floor
 - Lights along hallways
 - Floors:
 - Slip-resistant and well lighted floors
 - Insulated floors
 - Skid-proof pads under rugs
 - Heavy weight-high density-short pile level carpet to permit easier movement
 - Hallways:
 - 42" wide^[1]
 - Texture on wall to reduce glare

- **Welcoming Versatility**^[11]
 - R and L handed access and use
 - Easy to understand use of objects within the home
 - Large knobs and handles with non-slip surface
 - Visual signal devices (fire and security alarms)
 - D shaped handles on EVERYTHING
 - Toe kicks are raised to 3-4" off of the ground to allow for space for a w/c to turn (D. Bright, personal communication, April 2, 2012)

MY RECOMMENDATIONS SUMMARY

- Flexibility while cooking:^[11]
 - Wall oven
 - Microwave at efficient height in drawer.
 - Stove top with staggered burners (controls on side)
 - Automatic off switches on stove^[2]
 - Mobile island on caster wheels to allow for flexibility of the space.
 - Lazy susan in island
 - Pull out pan rack
 - Pull out garbage and recyclable cans
 - Sink^[11]:
 - Double sided with controlled temperature
 - Spray attachments and levered faucet handles
 - Garbage disposal
 - Stool with front legs cut shorter than the back to encourage anterior pelvic tilt underneath sink.

MY RECOMMENDATIONS SUMMARY

■ Efficient Storage

- Pantry with gliding-shallow shelving with entire contents visible at a glance^[5]
- Drawers in base cabinets
- Magnetic racks for knives and utensils
- Appliance lift

■ Accessible Bathroom^{[11] [15] [16]}:

- Custom pocket door
- Nonskid flooring – NO tile
- Wheel-in shower 4'X4' with built in fold-down shower bench
- Handheld shower head on adjustable height track
- Whirlpool bath with bench seat option
- Toilet: 17 to 19 inches height
- Blocking between 32 and 54" from floor to enable future installation of anchored grab bars
- Open bottom sink
- Levered sink handles
- Anti-scald faucet

MY RECOMMENDATIONS SUMMARY

- Garage^[15]:
 - Automatic opener
 - Ramp: 1:12 for no step entry
 - Also: Cascading step: fit full shorter and deeper
 - Shelf for groceries
 - Levered handles with single lock/electronic key
- Back entry:
 - Contrasting colors to define objects and spaces^[11]
 - Clear and level
 - Bright lighting^[1]
 - Wide doors with lever handles^[1]
 - Peephole with easy open locks^[1]

MY RECOMMENDATIONS SUMMARY

- Spaces for Entertaining:
 - Deck with graded garden pathway and that is accessible from main living space and the master suite.
- Low Maintenance Features of the Outside:
 - Automatic snow melting system in driveway
 - Low maintenance siding
 - Automatic sprinkling and raised gardens
 - Covered entry

RESOURCES

■ For clients:

- Aarp.org/ud: CAPS and OT created 7 steps to hiring a contractor^[1]
 - Certified Aging in Place Specialist: a CAPS certified professional that has been trained on the unique needs of seniors, modifying homes so someone can live there longer as they age and addressing the most common barriers in a home.
[14]
 - <http://ageinplace.com/aging-in-place-professionals/certified-aging-in-place-specialists-caps/>
- Concrete Change: <http://concretechange.org/>

■ For therapists/ designers:

- Home lighting survey
 - Inform OT of the best lamp, light fixtures, and modifications to support OT goals.
 - Incorporated as part of routine home care assessment
 - Review of existing equipment and how it is used
 - Safety and independence are the desired outcome
- Concrete Change: <http://concretechange.org/>
- Center for Universal Design: <http://www.ncsu.edu/project/design-projects/udi/>
- IDeA: Center for Inclusive Design and Environmental Access
<http://www.ap.buffalo.edu/idea/home/>

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