

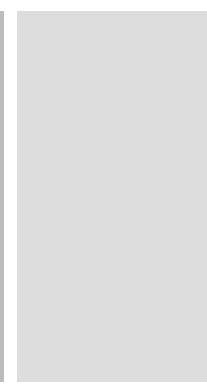
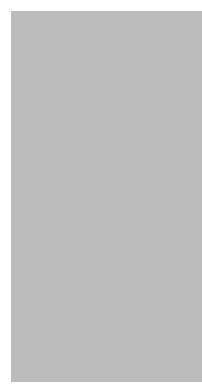
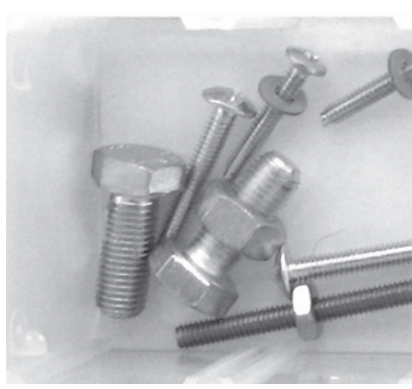
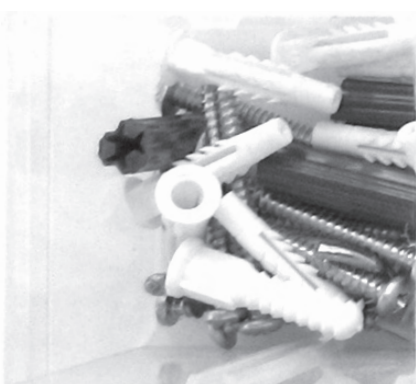
# Residential Rehabilitation, Remodeling and Universal Design



### *Dedication*

The Center for Universal Design dedicates this noteworthy publication to John Dalrymple, who during his decades of work at the Division of Vocational Rehabilitation, North Carolina Department of Health and Human Services, devoted his life to promoting independent living for all North Carolinians. John understood that local recipients of state agency housing rehabilitation funds could benefit from a publication such as this. He also knew if this document could be placed in the hands of the Division of Community Assistance and the North Carolina Housing Finance Agency, as well as owners of single-family housing, significant improvements could be made in housing across the State.

John inspired the Priority Features List contained in this publication. In addition, the unique approach to a commonplace room found in all housing—the bathroom—sets this publication apart from all others. Showing multiple strategies to modify the same small residential bathroom has never been addressed in this manner. The publication offers options for those wishing to make their environment better accommodate their needs, perhaps allowing families to live more safely and comfortably in the home of their choice as long as desired.



# Residential Rehabilitation, Remodeling and Universal Design

## *Produced by*

The Center for Universal Design  
College of Design, NC State University

## *for the*

NC Department of Health and Human Services  
Division of Vocational Rehabilitation  
Independent Living Services

## *Credits*

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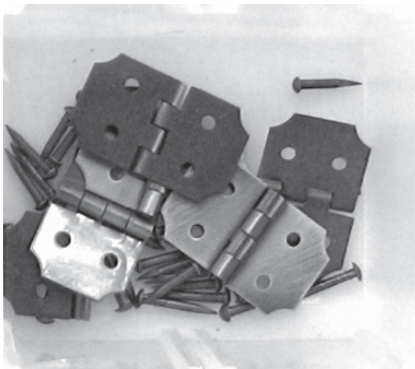
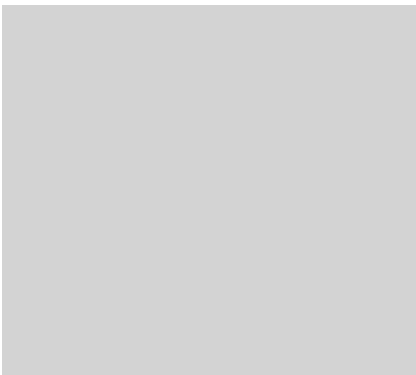
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Illustrations: Rex J. Pace

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# Introduction

In recent years it has become more widely recognized that residential design must address a dynamic range of people and abilities. Housing in this century must be adaptable to accommodate the differing needs and requirements of the users. Individual characteristics such as strength or agility should not prevent a person from safely using and enjoying all features in their home. This design approach, known as UNIVERSAL DESIGN, strives to make day-to-day living and home tasks possible and safer for everyone, allowing a person to remain independent for as long as possible.

These goals are as significant for affordable housing as they are for market rate housing. They may, in fact, be even more critical for households lacking the financial and community resources to effectively deal with dramatic life changes from sickness and injury, effects of aging, or those supporting other family members affected by these issues. For many households, finding decent, affordable housing that also supports their activities is extremely difficult. A family living in a typical home often faces expensive modifications they can not afford such as adding ramps, widening doorways, or creating usable bathrooms.

Little housing today, whether single- or multifamily, adequately responds to the diverse and ever changing needs of the population. The FAIR HOUSING ACT and the NORTH CAROLINA ACCESSIBILITY CODE are altering the multifamily housing industry, but the requirements of these accessibility provisions only offer a limited degree of usability to many people. UNIVERSAL DESIGN incorporates many accessibility code requirements and stresses innovative solutions to facilitate daily living and independence, especially for people who have, are, or will be experiencing changes in their mobility and/or sight and hearing.

In the coming years, several state agencies are rehabilitating targeted older homes owned by people of low income. Significant rehabilitation may occur to address structural, energy, weatherization, and plumbing concerns. In some cases individual homes are already identified for upgrade based on the occupant's needs, i.e., older adults and people with disabilities. When significant construction is underway, what better time to address key issues of usability?

When significant construction is underway, what better time to address key issues of usability?

Entrances and bathrooms are two significant areas where mobility is essential. It is critical to ensure that people are able to get in and out of their home. Usable bathrooms, on the other hand, are essential for surviving in one's home with a temporary or a long-term disabling condition. Safety and independence

within one's home is impacted by bathroom design to such a great extent that it is the primary focus of this document.

This publication introduces key universal features to include when modifying or rehabilitating a single- or multifamily dwelling. The most critical features are provided in a 14-item list with the highest priority assigned a number one (see page 7). In the back of this document is a more comprehensive list of additional features that could be incorporated. Those homeowners with the financial resources to remodel their homes may find helpful the design guidance in the 14-item as well as the expanded list.

Housing designs that support occupants with a disability now and require no expensive modifications later are clearly superior to standard designs. When housing can be safer and more usable by current and future residents allowing them to “age in place”, countless dollars in costly nursing home and Medicaid expenses can be saved. Close family and community relations can be maintained, contributing to an individual's sense of place and helping to maintain community cohesiveness, neighborhood permanence, as well as individual mental and physical health.



# Key Features to Increase Function and Usability

Over the next five years the NC Housing Finance Agency (NCHFA) and the NC Division of Community Assistance (NCDCA), will be working to rehabilitate hundreds of North Carolina homes using HOME Investment Partnership Program and Community Development Block Grant (CDBG) funds. Both agencies presently serve many families with older adults and people with disabilities. Each agency has affirmed its commitment to UNIVERSAL DESIGN where feasible.

The 14-item Priority List on page 7 offers critical key features and elements to include in rehabilitation work when only a limited number of universal features are possible. The numbers in the “Priority” column indicate the importance of the feature. Incorporating as many features as possible in the Priority List is encouraged when significant rehabilitation or modifications are being considered for inaccessible housing currently occupied by an older adult or a person with a disability. Recognizing exact dimensions cannot always be provided, it is recommended a clear usable pathway be created to allow a person using a wheelchair (or someone with any mobility limitation) to safely enter and exit the dwelling and maneuver throughout the living spaces on the ground floor, including the bathroom.

All features in the Priority List are structural and do not include such items as grab bars, easy-to-use lever faucets, and lever door hardware that can be added later at little cost. The goal of this document is to encourage the inclusion of universal features while substantial rehabilitation efforts are underway—changes that would be too costly to make later. A more comprehensive features list, provided at the end of this publication, should be reviewed to determine if additional universal elements could also be incorporated.

Developed by the Center for Universal Design in collaboration with the Division of Vocational Rehabilitation, Independent Living Services, the final Priority List was reviewed and input was provided by potential users, including several North Carolina agencies undertaking rehabilitation. Each agency has its own guidance manual or construction specifications to assist with the applicability of these priorities.

# Selecting a Dwelling Conducive to Accessibility Improvements

Residents with immediate and impending needs will benefit most from a home with the addition of specific features that meet, or can be adapted to meet, their needs. However, when no specific features are required at the time of upgrade, the following design features still should be considered to provide the longest-term accessibility benefit to a home's present and future residents. Many of these homes may, over time, house other families, thus upgrades to include universal features make it easier to accommodate the needs of any new family.

Features to consider include a house with:

1. a **lot** that would allow any of the entrance options as shown on page 9 of this booklet or a dwelling with the floor level no more than 30 inches above grade. A zero-step entrance on an accessible route could be at the front, side or back of the home, or through an attached garage—wherever most feasible for the given terrain.
2. **parking** close to an entrance. It may be possible to move parking closer and install an earth berm with gently sloping walk (shallower slope than a ramp) to an entrance.
3. an entry **porch** or steps that must be replaced anyway. As the porch is replaced, it is possible to integrate a concrete pad and exterior electrical junction box for future installation of a wheelchair platform lift. Such lifts could be owned by an organization or agency and moved to a location when needed.
4. short wide **hallways** or
5. **hallways** that are possible to widen because of other planned renovations.
6. a large **bathroom** that requires some modification or a small bathroom that needs a significant upgrade, provided it can be expanded through feasibly moving or removing walls.

**Priority Features List** on the facing page offers guidance on selecting universal features to include in dwelling units – with a focus on units being *rehabilitated and/or remodeled*. The features should be included whenever technically feasible, even if exact dimensions cannot be provided, especially in housing for older adults or people with disabilities.



## Priority Features List

AREA	PRIORITY	UNIVERSAL HOUSING FEATURE
<i>Entrances</i>	①	1. One entrance without steps and a flat or very low threshold
	①	2. Minimum 60" by 60" level maneuvering space at stepless entrance (roof over entrance offers additional convenience)
<i>General Interior</i>	②	3. Hall widths of 42" (where possible)
	①	4. Passage doors 32" clear (typically provided with 36" door)
	②	5. Maneuvering space at doors—if inswinging door obstructs a bathroom or kitchen fixture or appliance, use offset hinges, swing door out, hinge door on opposite jamb, or widen doorway
	②	6. Increased number of electrical outlets for additional lighting and alarm indicators, especially in bedrooms
<i>Kitchens</i>	①	7. Clear floor space in kitchens; many configurations possible, 60" minimum turning circle recommended
	②	8. Adaptable cabinets to reveal kneespace at sink and under work surface near cooking appliance
<i>Bathrooms</i>	①	9. Clear floor space in room; modest increase in room size beyond 5' X 8'
	②	10. Adaptable cabinets with under sink kneespace
	②	11. Broadly applied bands of blocking (reinforcement) inside walls around toilets and bathing fixtures for future installation of grab bars
	③	12. Offset controls in tub or shower to minimize stooping, bending, and reaching
	②	13. Toilet in a 48" X 56" space with centerline of toilet 18" from sidewall
	②	14. Curbless showers, if installed, at least 36" X 60"

- ① These features are given the highest priority so a person using a wheelchair or other mobility device can safely and independently enter and exit the dwelling and get to and maneuver in the kitchen and bathroom.
- ② These features, when incorporated into the dwelling, offer residents with children, a family member with a disability or an older adult the possibility of being safe and independent for as long as possible.
- ③ Offset controls offer increased safety for all users.

# Entrance Options

When modifying an existing entrance, options to create a stepless entrance include ramps, vertical platform lifts and landscaping. Each is appropriate for a particular combination of resources, heights, and site conditions. The advantages and disadvantages for each option must be carefully considered.

## *Ramps*

Ramps are the most familiar residential accessibility modification. They can be built relatively quickly and inexpensively. Although ramps make a big difference in the lives of those who use them, they do have some drawbacks. Ramps accommodating rises above 30 inches require extensive construction, may be very long, occupy a significant amount of space, and can be quite expensive. Ramps are not maintenance free. Leaf, snow and ice removal, painting, and periodic repairs all take time and resources. Ramps should be thoughtfully planned so they are constructed in a style compatible with the house. Some residents are concerned that ramps label the occupant as vulnerable and make them more susceptible to break-ins.

## *Lifts*

Taking up less than 30 square feet of space, an electrically operated vertical platform wheelchair lift can avoid the space problems of long ramps. Where possible, locate lifts under cover to reduce snow and ice accumulation in the winter. On sites prone to flooding, potential water damage to mechanical components must be considered. The cost of lifts, including a concrete slab, electrical power and related remodeling expenses, ranges between \$5,000-\$15,000.

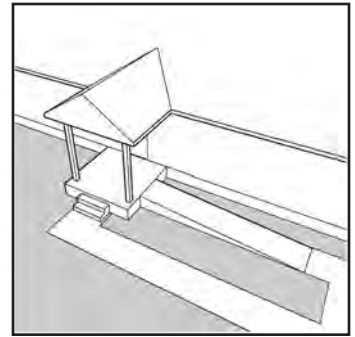
## *Site Grading and Landscaping*

Site conditions can offer an opportunity to use landscaped earth pathways for a more natural and blended solution. This approach may include a retaining wall, an earth berm, and sometimes a bridge to an entrance. A safe path with a gentle slope of 1:20 or less can be built without handrails (unless there are abrupt drop-offs or they are needed by users), thereby avoiding the cost and intrusive appearance of handrails. Landscaped options may be more expensive than an equivalent ramp, but usually have a longer lifespan and require less maintenance. The remodeled entrance shown on page 10 makes use of the “earth berm concept.”

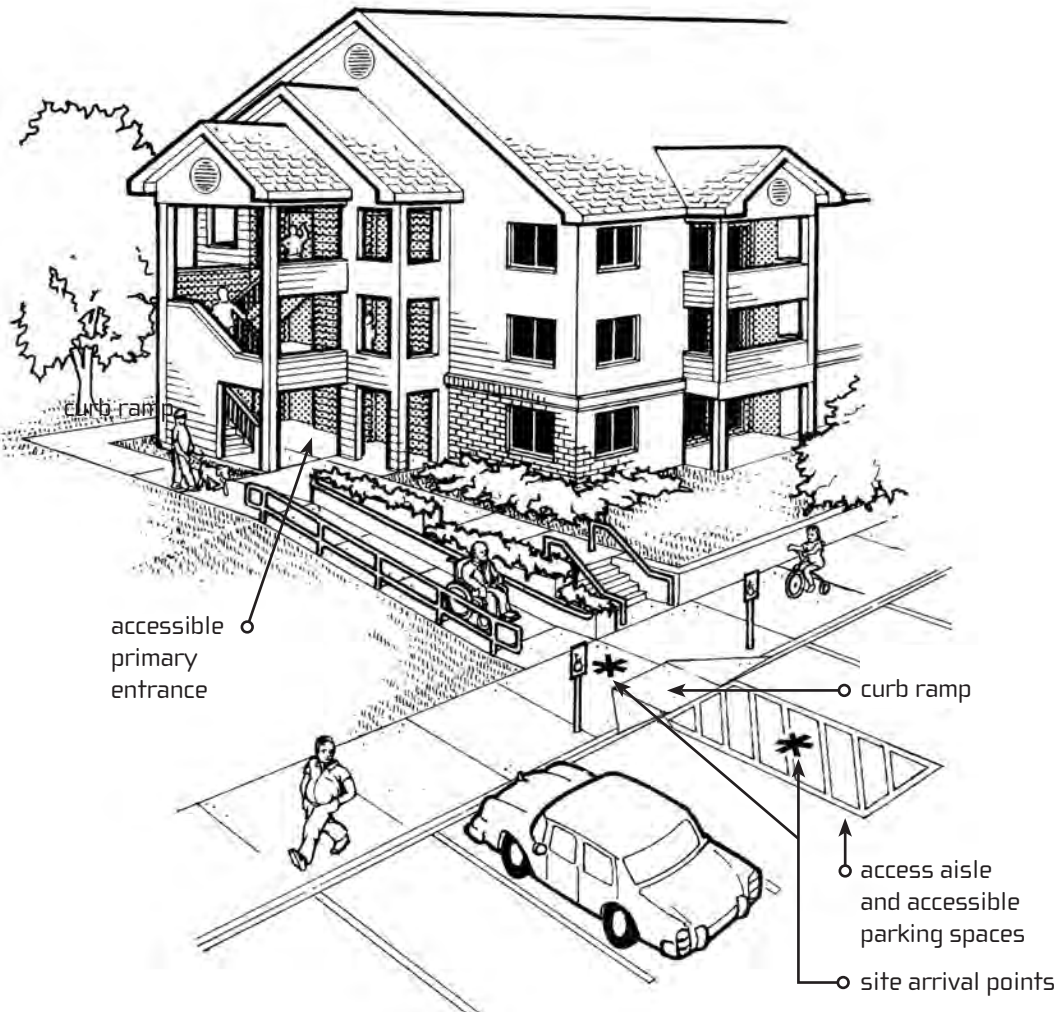


### Single-family House Entrance Upgrade

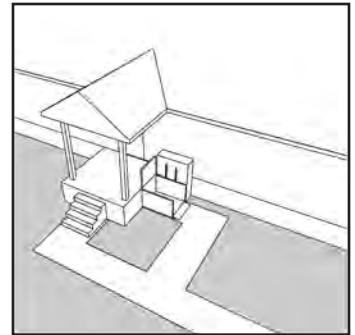
plantings minimize and soften the visual impact of ramps



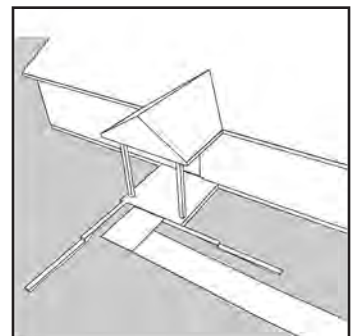
*Ramps*  
work best for heights up to 30"



### Multifamily Housing Entrance Upgrade



*Lifts*  
space-saving option for heights over 30"



*Earth Berms and Regrading*  
depending on site conditions, can work for all heights. See page 10 for a more detailed illustration of an earth berm.

Covered entrance helps control water at low threshold and provides protection during inclement weather

Provide adequate maneuvering space around screen or storm doors

5' x 5' minimum level landing area for maneuvering

Additional lowered peephole for seated or short adults and children

Both entry and screen door provide a min. 32" clear opening – lever handle hardware

Provide good overall lighting plus focused lighting at locksets and house number for nighttime security and ease-of-use

High contrast house numbers, easy to read from a distance

Handrail with integral package shelf

Flush or low profile threshold, 1/2" high max.

New porch landing set at same level as interior house floor, eliminates step at entry door

Original small stoop removed

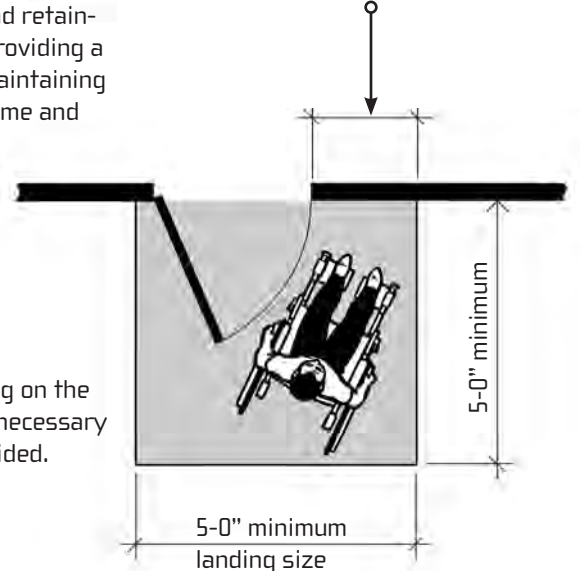
4'-0" wide walkway sloped at 1:20 or less, slopes steeper than 1:20 necessitate handrails

Using a combination of earth berm and retaining walls is an effective method for providing a stepless route to the landing while maintaining an integrated appearance with the home and surrounding site.

18" minimum to pull side of door, 24" preferred

## Remodeled Stepless Entry

5' x 5' clear level area for maneuvering on the landing is recommended and may be necessary when screen or storm doors are provided.



# Bathroom Modifications

Mere inches make the difference between independence and dependence. How can the greatest usability be achieved within very tight constraints? A small bathroom plan with all plumbing fixtures mounted along a common wall is the basis for nine different solutions: from renovations inside existing walls to more extensive construction using a “bump out” or “mini” addition. These modified plans can be considered in a variety of applications from single-family to multifamily housing. Both bathtubs and roll-in or curbless showers are addressed. See the publication *Curbless Showers* for additional information on the unique features of this bathing fixture, available for free download at [centerforuniversaldesign.org](http://centerforuniversaldesign.org).

Additional guidance is provided on each plan page to help select the most appropriate bathroom modification. Each page indicates which plan modification complies with specific NC accessibility requirements. Although not always necessary for bathroom modifications to comply, it gives the contractor a reference point and some awareness of how successful the modified bathroom may be for a specific user. A resident may be able to better articulate personal needs if he or she can use plans to initiate discussion.

The modified plans are shown from least usable/accessible to providing a much higher level of accessibility. (Accessibility codes only provide instructions for minimum levels of accessibility.) The NC Housing Finance Agency QAP “bonus points” bathrooms are much closer to a “universally usable bathroom.”

<b>higher usability</b>	<p><b>QAP</b></p> <p>Meets NCAC Type A and incorporates two additional features: a 5' X 5' clear floor space for the toilet and a curbless (roll-in) shower at least 60" long and 36" deep.</p>	<p>Meets the requirements in the NCAC for “fully accessible” Type A units. Qualified Allocation Plan (QAP) requirements established by the NC Housing Finance Agency allow builders of multifamily housing units funded under the low income tax credit plan to be awarded extra bonus points for units with a 5' X 5' clear floor space at the toilet. Curbless showers at least 36" X 60" (larger recommended) are now required in 5% of all QAP units. These units have some of the highest levels of usability.</p>
<b>moderate usability</b>	<p><b>NCAC Type A</b></p> <p>Type A “fully accessible” unit as specified in the NC Accessibility Code.</p>	<p>Meets State “fully accessible” design requirements. (Note: building codes provide the minimum requirements for compliance).</p>
<b>lower usability</b>	<p><b>NCAC Type B</b></p> <p>Type B “accessible” unit as specified in the NC Accessibility Code.</p>	<p>Meets State “accessible” or Fair Housing design requirements. These requirements are less than for Type A and offer a modest level of accessibility.</p>

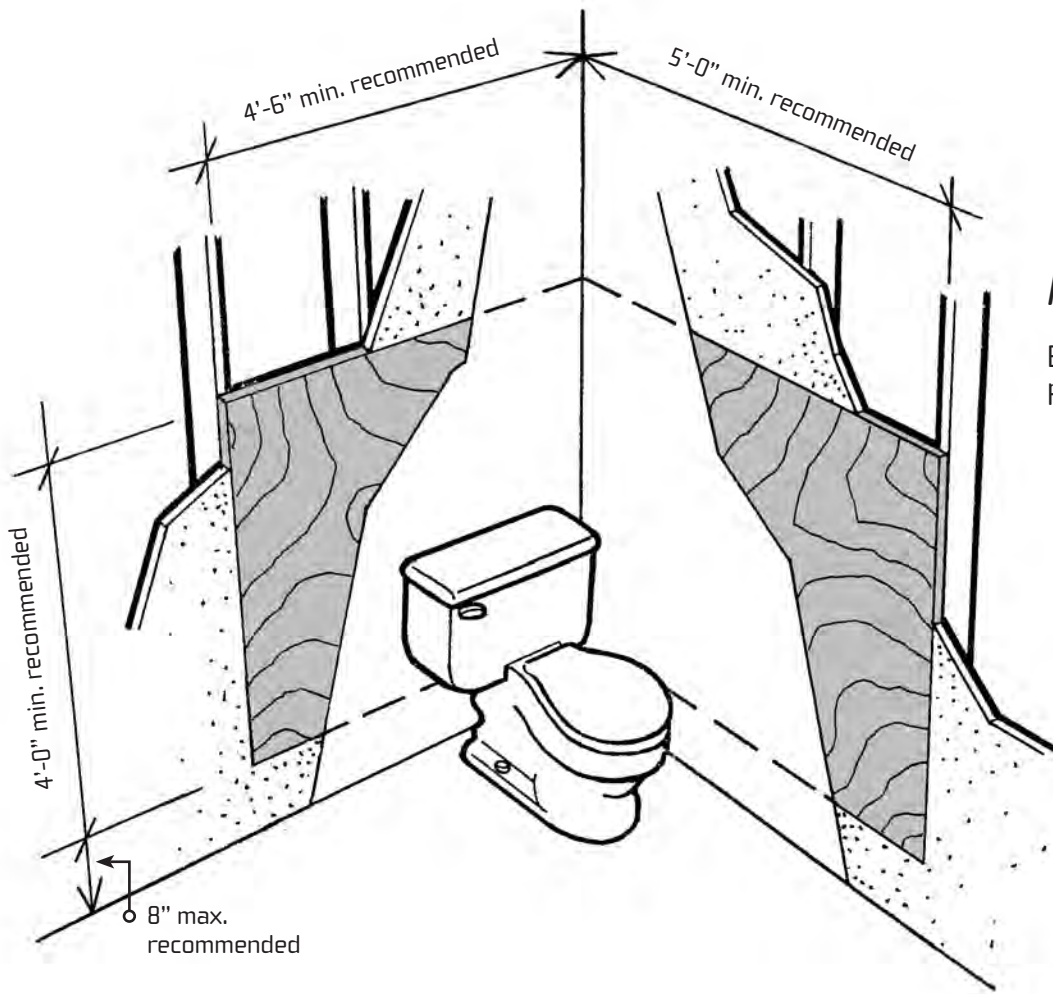
## *Features and Elements Shown in the Plans*

- All modified plans include knee space below lavatories.
- Horizontal and fold-down grab bars are shown in conventional locations.
- Additional space has been allocated beside the toilet to allow safer transfers and assistance if needed.
- Extra maneuvering and clear floor space is provided.
- Pocket doors are shown in some plans.
- Offset controls are shown in bathtubs and showers.
- Clear floor space is shown for approach to fixtures.
- 5-foot diameter turning circle is shown when space is available to execute such a turn.
- All plans show reinforcing around toilet and bathing fixtures.

**Pocket Doors.** Very inexpensive doors may be problematic; however, many pocket doors are available that can successfully be used in these installations. Pocket doors are shown because in small spaces hinged doors, if inswinging, often limit maneuvering space within the room. Outswinging doors have the potential to injure someone approaching the room.

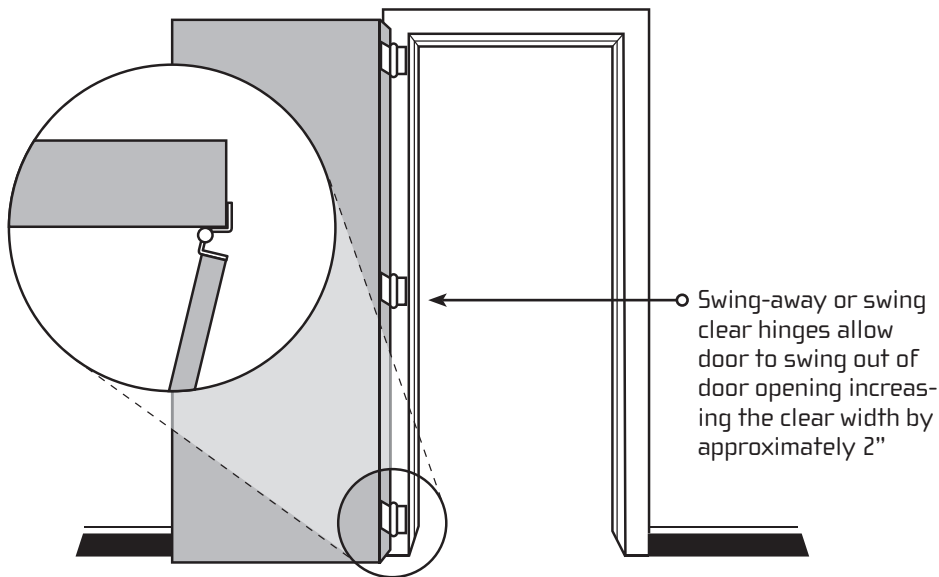
**Grab Bars and Reinforcing.** In certain instances the length of the bar may be shorter than specified in accessibility codes and standards; however, in rehabilitation and remodeling work this is generally not as critical unless compliance is required. Reinforcing a broad band of wall area around bathing fixtures and the toilet is preferred to installing grab bars in the limited locations specified in many accessibility design documents. A single bar location does not work for all users. Other locations are often desirable and needed and can be accommodated if enlarged reinforced areas are provided.

**Offset Controls.** This simple concept assists all users. When installing new faucet controls in the bathtub or shower, locate the controls close to the outside of the enclosure. Controls in this position can be easily operated from outside to set and test the water temperature before entering. This location is easier to reach and requires much less bending and stooping for a standing person and offers easier access from outside the bathing fixture for a person using a wheelchair or scooter.



### Reinforcing

Enlarged Areas of Reinforcing around Toilet



### Doorway Width

Swing-clear Hinges Installed to Widen Interior Doorway



### Controls

Offset Tub and Shower Control

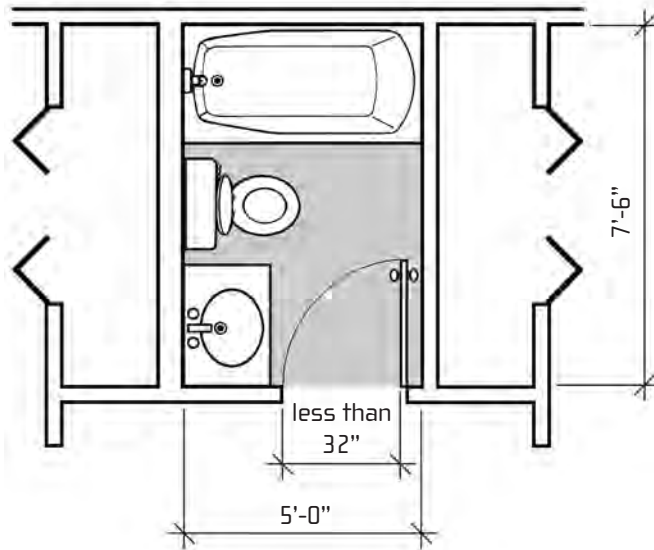
# Bathroom Plans

## Common Problems

- Narrow entry door
- Lack of turning space
- Lack of maneuvering space to side of toilet
- Toilet location obstructs bathing fixture
- No knee space below lavatory
- No reinforcing in walls for grab bars

### Wall Key:

-  existing
-  new



## Inaccessible Plan

Conventional

## Changes

- Remove bathtub and replace entire floor
- New wider outswinging door
- New wall-hung countertop lavatory

## Plan Meets:

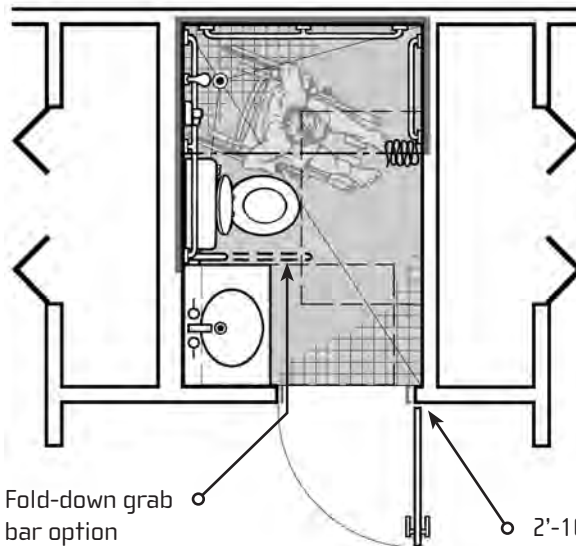
NCAC Type "B" Accessible Requirements

## Plan Does Not Meet

NCAC Type "A" Fully Accessible Requirements

## Advantages and Concerns

- ⊕ Additional space beside toilet
- ⊕ Wet area option utilizes existing plumbing locations
- ⊕ Significantly more space for maneuvering than in inaccessible plan. Floor area lacks full turning space for wheelchair users.
- ⊖ Toilet location requires fold-down grab bar (for many users, less secure than wall-mounted bar).



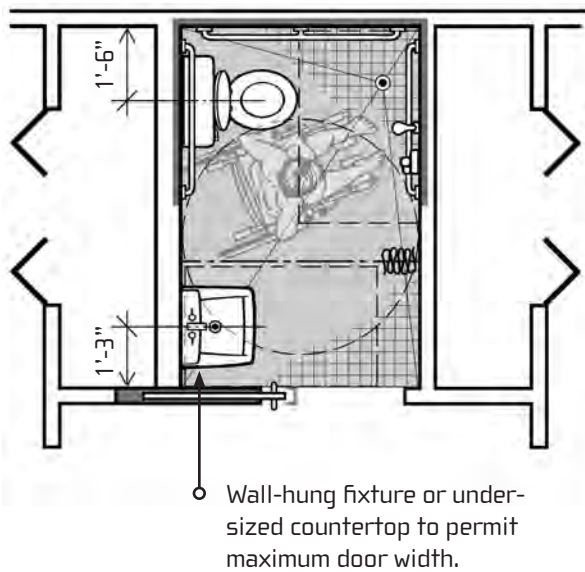
Fold-down grab bar option

2'-10" door with swing-clear hinges and custom trim work, necessary if standard depth lavatory counter used

## Plan 1: "Wet Area" Design

(Changes within existing room only)





**Plan 2: "Wet Area" Design**  
(Changes within existing room only)

**Changes**

- Remove bathtub and replace entire floor
- Wider door (pocket)
- Relocate toilet and shower plumbing
- New wall-hung lavatory

**Plan Meets:**

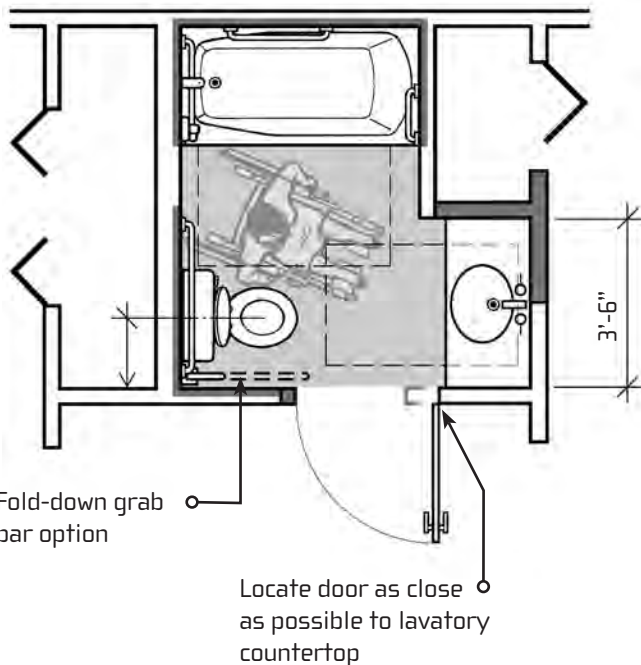
NCAC Type "B" Accessible Requirements

**Plan Does Not Meet:**

NCAC Type "A" Fully Accessible Requirements

**Advantages and Concerns**

- ⊕ Additional space beside toilet
- ⊕ Design dependent on curbless wet area
- ⊖ Turning around possible, but obstructed by lavatory. People using scooters or oversized wheelchairs must make multiple adjustments and turns to maneuver.



**Plan 3: Tub Location Unchanged**  
(Modest Expansion)

**Changes**

- Incorporate 1/2 of right closet
- Relocate toilet and lavatory plumbing
- New wider outswinging door
- Wider wall-hung counter lavatory

**Plan Meets:**

NCAC Type "B" Accessible Requirements

**Plan Does Not Meet:**

NCAC Type "A" Fully Accessible Requirements

**Advantages and Concerns**

- ⊕ Some additional space beside the toilet for wheelchair users
- ⊕ Improved lavatory access
- ⊕ Existing bathtub remains
- ⊕ Recommended installation of offset tub control
- ⊖ Floor area lacks full turning space for wheelchair users
- ⊖ Fold-down grab bar beside toilet may be necessary for some users. Short sidewall, reduced by door, limits grab bar length.

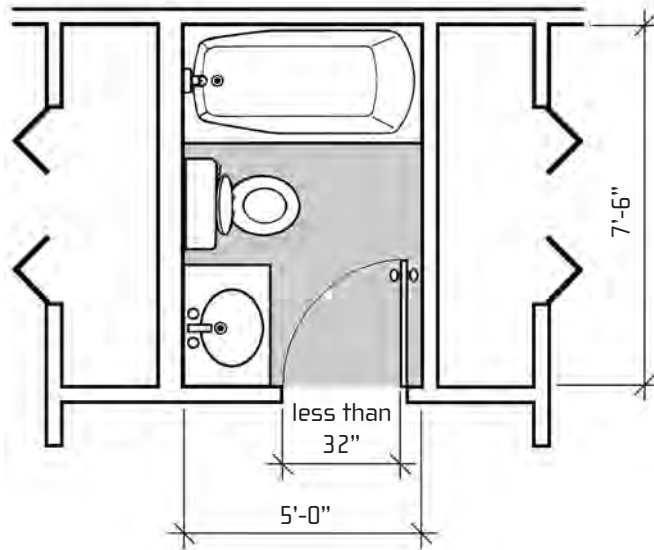
# Bathroom Plans

## Common Problems

- Narrow entry door
- Lack of turning space
- Lack of maneuvering space to side of toilet
- Toilet location obstructs bathing fixture
- No knee space below lavatory
- No reinforcing in walls for grab bars

### Wall Key:

-  existing
-  new



## Inaccessible Plan

Conventional

## Changes

- Incorporate portion of adjacent right closet
- Relocate toilet plumbing
- Wider pocket door option
- New wall-hung lavatory

### Plan Meets:

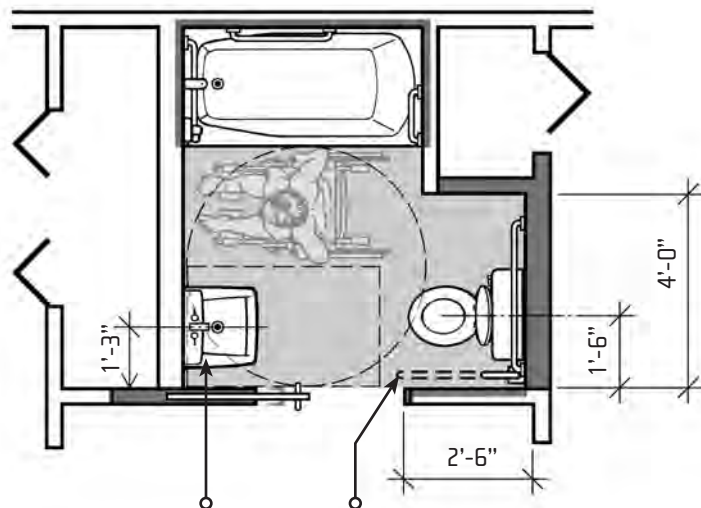
NCAC Type "B" Accessible Requirements

### Plan Does Not Meet

NCAC Type "A" Fully Accessible Requirements

## Advantages and Concerns

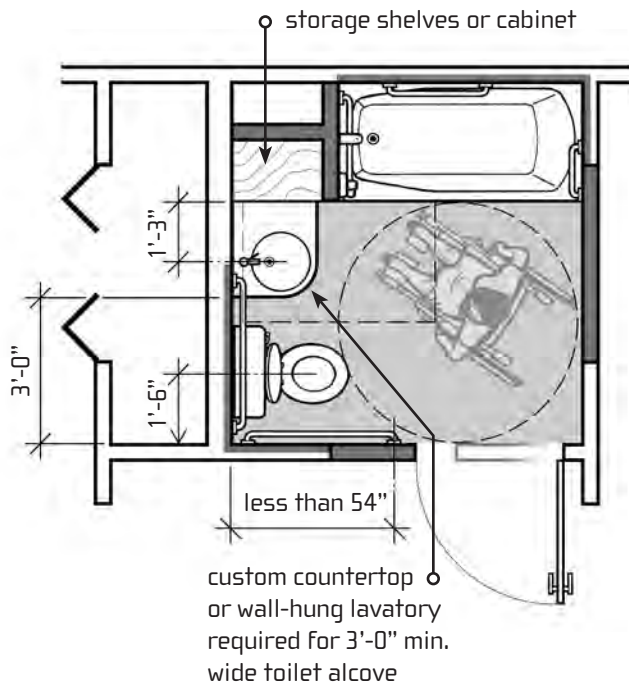
- ⊕ Improved access to bathtub
- ⊕ Existing bathtub remains
- ⚠ Recommended installation of offset tub control
- ⊖ "Obstructed" wheelchair turning space relies on clearance below lavatory
- ⊖ While additional space is provided beside toilet, this space may need to be enlarged for some users
- ⊖ Fold-down grab bar beside toilet may be required for some users. Short sidewall, reduced by door, limits grab bar length.



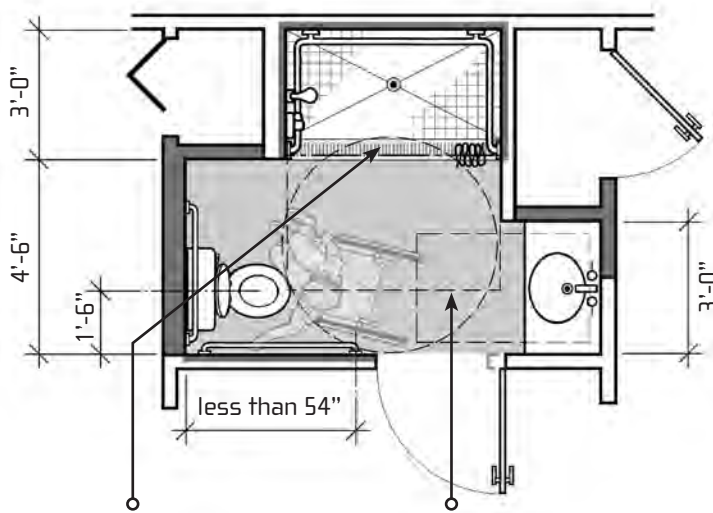
Wall-hung fixture or undersized countertop to permit door opening

Fold-down grab bar option

## Plan 4: Tub Location Unchanged (Modest Expansion)



**Plan 5: Increased Usability with Tub**  
(Modest Expansion)



trench drain provides flush transition between room and shower floors

36" x 60" clear floor space for shower

**Plan 6: Increased Usability with Shower**  
(Larger Expansion)

### Changes

- Incorporate entire adjacent right closet
- Relocate all plumbing
- New wider outswinging door
- Additional storage space

### Plan Meets:

NCAC Type "B" Accessible Requirements

NCAC Type "A" Fully Accessible Requirements (primarily because side wall too short to support a complying bar)

NCQAP for 95% of units, but not the 5% required to have curbless roll-in showers

### Advantages and Concerns

- ⊕ Improved access to all fixtures
- ⊕ Good access to bathtub and tub controls
- ⊕ Full unobstructed turning space
- ⊖ Restricted access to toilet
- ⊖ Some users may need more space beside the toilet
- ⊖ Length of grab bar beside toilet is restricted by door location

### Changes

- Incorporate portions of both adjacent closets
- Relocate toilet and lavatory plumbing
- New "curbless" roll-in shower
- New wider outswinging door
- New wider lavatory counter

### Plan Meets:

NCAC Type "B" Accessible Requirements

### Plan Does Not Meet:

NCAC Type "A" Fully Accessible Requirements (primarily because side wall too short to support a complying bar)

### Advantages and Concerns



- ⊕ Improved access for most users
- ⊕ Good bathing and lavatory access
- ⊕ Turning space overlaps flat trench drain
- ⊕ No turns are executed across shower floor warped to the center drain
- ⊕ Shower occupies bathtub space
- ⊕ 36-inch shower depth, deeper showers better contain water
- ⊖ Some users may need more space beside the toilet
- ⊖ Grab bar length on side wall restricted by door location

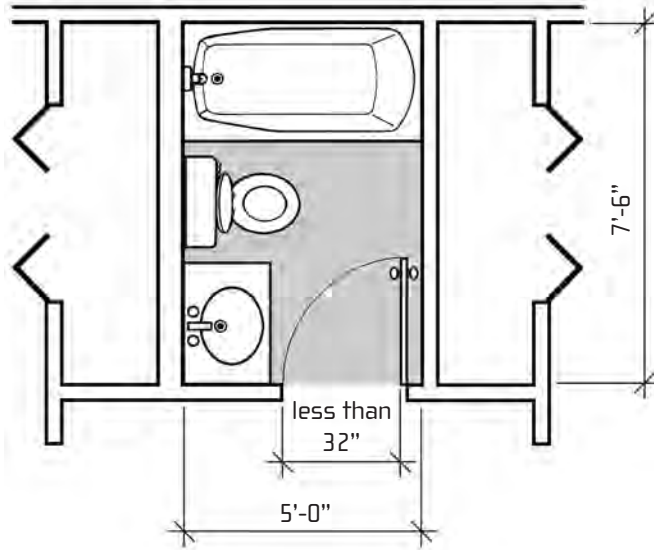
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Conventional

## Changes

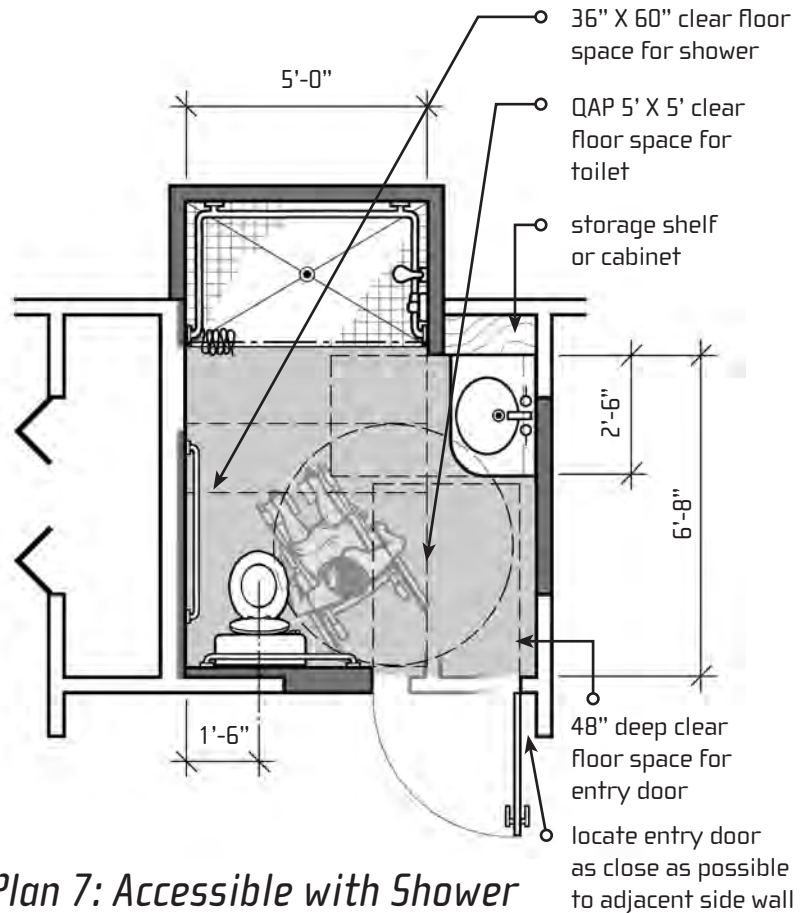
- Incorporate entire adjacent right closet
- Incorporate small "bump out" or mini-addition for shower
- Relocate plumbing and all fixtures
- New "curbless" roll-in shower
- New wider outswinging door

## Plan Meets:

- NCAC Type "B" Accessible Requirements
- NCAC Type "A" Fully Accessible Requirements
- NCQAP for bonus points

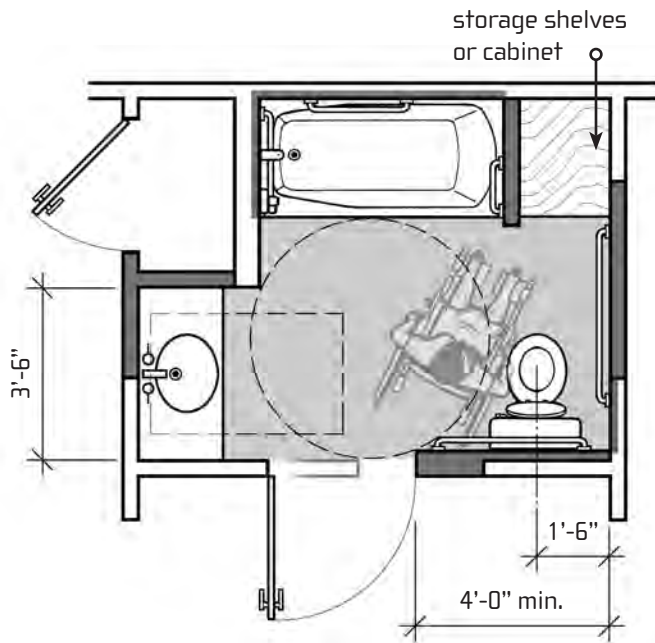
## Advantages and Concerns

- ⊕ Improved usability for most people
- ⊕ Good access to all fixtures
- ⊕ Unobstructed turning space that only minimally utilizes lavatory knee space
- ⊕ Generous space to side and front of toilet accommodates a wide range of transfer styles
- ⊖ Layout requires a mini addition



## Plan 7: Accessible with Shower

(Expansion and "Mini" Addition)



**Plan 8: Universal with Bathtub**  
(Larger Expansion)

**Changes**

- Incorporate adjacent right and of 1/2 left closet
- Relocate lavatory and toilet plumbing
- Wider lavatory counter
- Wider outswinging door
- Additional storage space
- Existing bathtub replumbed to include offset controls

**Plan Meets:**

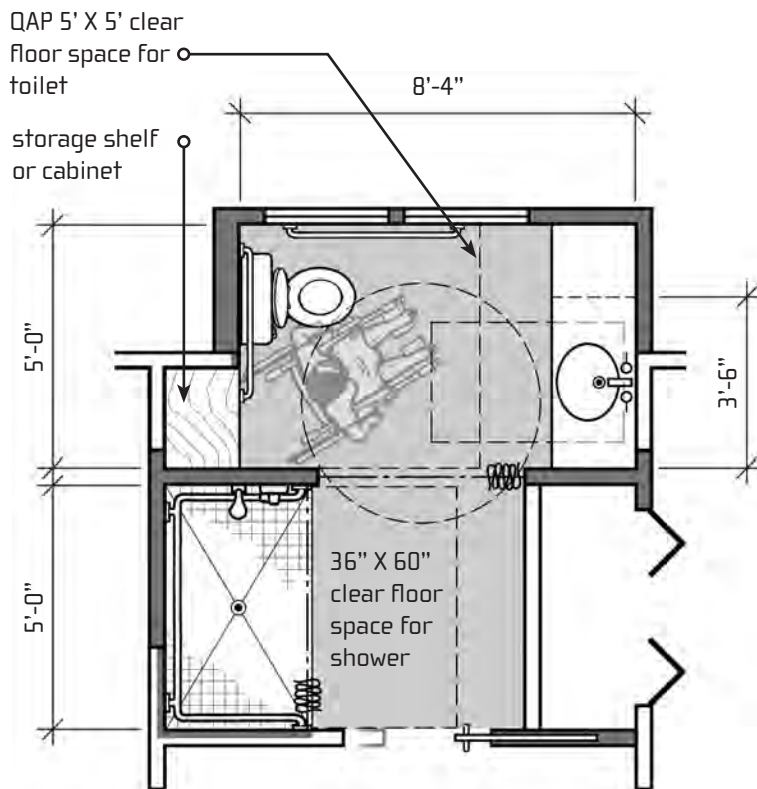
- NCAC Type "B" Accessible Requirements
- NCAC Type "A" Fully Accessible Requirements

**Plan Does Not Meet:**

- NCQAP for extra bonus points due to lack of curbless shower

**Advantages and Concerns**

- ⊕ Works well for a range of users
- ⊕ Good access to all fixtures
- ⊕ Unobstructed turning space
- ⊕ Other room improvements: wider lavatory counter and linen storage.



**Plan 9: Universal with Shower**  
(Expansion and "Mini" Addition)  
see illustration on next page

**Changes**

- Incorporate adjacent left and 1/2 of right closet
- Incorporate small "bump out"
- Relocate all plumbing
- New "curbless" roll-in shower
- Wider pocket door option
- Wider wall-hung counter lavatory
- Additional storage space

**Plan Meets:**

- NCAC Type "B" Accessible Requirements
- NCAC Type "A" Fully Accessible Requirements
- NCQAP for bonus points

**Advantages and Concerns**

- ⊕ Works well for a range of users
- ⊕ Good access to all fixtures
- ⊕ Unobstructed turning space
- ⊕ Other improvements: wider lavatory counter, linen storage, base cabinets, windows
- ⊕ Generous space to side and front of toilet accommodates range of transfer styles
- ⊕ Compartmentalized design an advantage for families and in other shared facilities

Frame width for pocket doors should be at least 36" to achieve a clear 32" opening. An accessible handle or a stop inside the pocket should prevent the door from sliding completely into the frame.

Pocket door with loop handle hardware is an alternative to out-swinging door that may obstruct hall or room circulation

Switches and outlets in easy-to-reach accessible locations

Lever handle faucet control

Shallow lavatory with rear drain to permit knee space clearances

Removable pipe protection and appearance panel carefully configured to provide the necessary knee space for a forward approach

Whole wall areas of plywood or other solid material reinforcing

Enlarged reinforced areas provide more secure mounting for future installation of shower seats

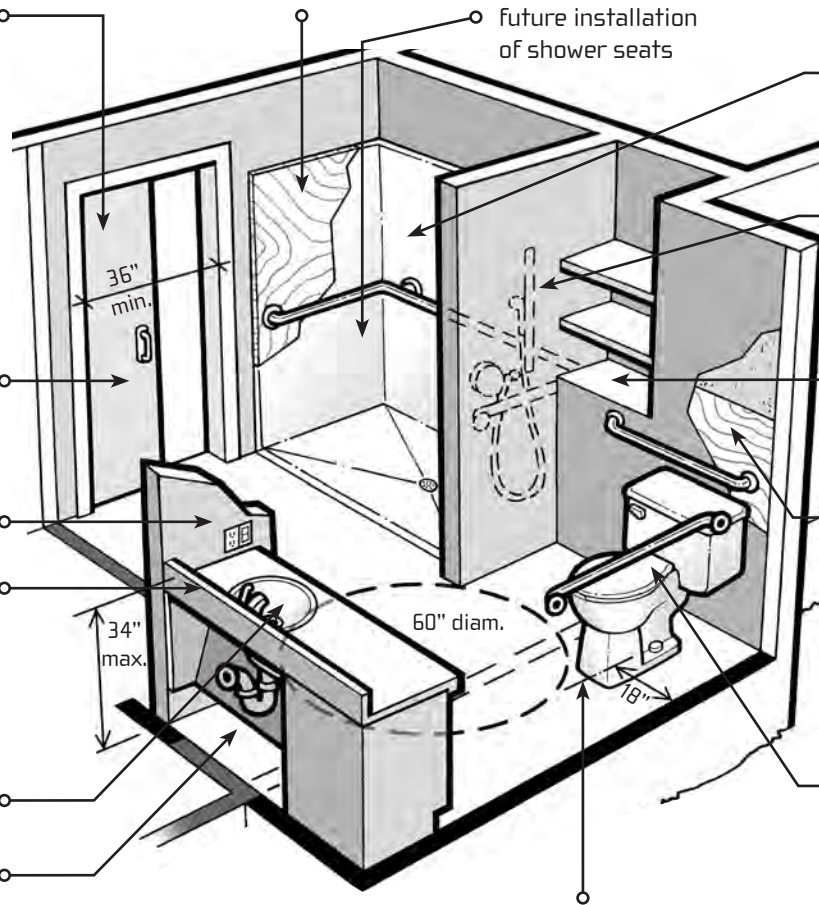
"Curbless" (roll-in) shower is a versatile fixture usable by people with differing abilities and necessary for some, 36" X 60" or larger

Hand-held shower head on adjustable height slide mount with off-set anti-scald valve and single lever handle valve

Incorporate additional "livability" features such as storage or shelving

Whole wall areas of plywood or other solid material reinforcing allow grab bar placement at the best heights and configurations to suit individual needs

Toilet seat height from 15" min. to 19" max.



Toilet placed in the corner of a 60" X 60" clear floor space is ideal, creating unobstructed areas in front and to one side—this allows greater maneuvering and transfer options for people using wheelchairs and those needing assistance

## Remodeled Bathroom

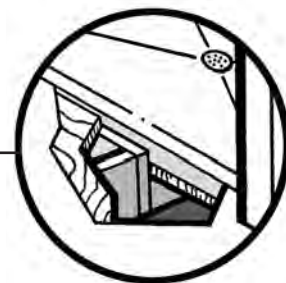


### Adaptable Vanity Cabinet

To create a more conventional and marketable appearance, knee space may be concealed with retractable doors or a removable cabinet.

### Recessed Floor Detail

To achieve a curbless flush shower threshold, the fixture must be recessed into the floor.



# Select Universal Features

for All Housing: Single + Multifamily

## Entrances

1. Accessible **parking** convenient to dwelling (covered from the elements)
2. Accessible **path of travel** to dwelling from parking or drop off area (slope of 1:20 or less eliminates the necessity for handrails, except when needed by a specific individual)
3. At least one entrance **without steps** and flush or low profile threshold
4. Minimum **5-foot X 5-foot** maneuvering space at stepless entrance
5. **36-inch** minimum exterior door with lever hardware
6. Movement sensor **light** at entrance
7. A **sidelight** or a **peephole** at 42 and 60 inches above the floor
8. Ambient and focused **lighting** at keyhole
9. High visibility **address** numbers

## General Interior

1. Hall width **42 inches** minimum (interior accessible route is 36 inches)
2. Interior door width **32-inch** minimum (requires 34 or 36-inch wide door), equipped with lever hardware
3. **Flush** transitions between floor surfaces (maximum of 1/2-inch rise)
4. **5 pounds** maximum force to open doors
5. **18-inch** minimum space at latch side of door
6. **5-foot X 5-foot** maneuvering space in each room (after furniture is placed)
7. Increased number of **electrical outlets** for additional lighting and alarm indicators, especially in bedrooms
8. Electrical outlets at **18-inch** minimum height
9. Light switches **44 inches** maximum above floor
10. View windows at **36-inch** maximum sill height and large enough to use as an escape route in the event of an emergency
11. **Crank** operated (casement) or light weight sliding windows
12. Closet **rods** adjustable from 30 inches to 66 inches above the floor
13. **Loop** or other easy-to-use handle pulls on drawers and cabinets
14. **High contrast**, glare free floor surfaces and trim
15. **Low pile** carpet or smooth anti-slip flooring
16. High-speed **Internet** access data connection port and cabling



## Bathrooms

1. **60-inch** diameter turning circle
2. **30-inch X 48-inch** area of approach (forward or parallel, depending on fixture type) in front of all fixtures
3. **Toilet** more usable by many if positioned in a 5-foot X 5-foot space with centerline 18 inches from sidewall
4. 32-inch minimum **lavatory** counter height with lever faucet control
5. Adaptable cabinets to reveal **kneespace** under lavatory. Exposed piping in kneespace should be padded or concealed.
6. When tub or shower are installed, select models designed to accept a portable bench or bathing seat
7. Curbless or **roll-in shower** plus standard tub
8. **Offset** single-lever controls in tub and shower to minimize stooping, bending, and reaching
9. Adjustable height **hand-held** shower head in addition to standard fixed shower head
10. **Anti-scald** devices on all plumbing fixtures
11. Enlarged **reinforced** areas around toilet and bathing fixture to provide secure mounting locations for grab bars and shower seats
12. **Mirror** to backsplash at lavatory
13. **Contrasting color** edge border at countertops

\* See *Curbless Shower* booklet available as free download from the Center for Universal Design website: [www.centerforuniversaldesign.org](http://www.centerforuniversaldesign.org)

2. **30-inch X 48-inch** area of approach (forward or parallel, depending on fixture type) in front of all appliances
3. **Cooktop** or range with front- or side-mounted controls and staggered burners to eliminate dangerous reaching
4. **Front-mounted** controls on washer and dryer
5. Adaptable **cabinets** to reveal kneespace (when needed) at sink and under work surface near cooking appliance
6. Variable height **sink** adjustable between 32 and 40 inches
7. Exposed **piping** and any sharp or hot elements in any kneespace should be padded or concealed
8. **Single-lever** faucet controls
9. Full height **pantry** cabinets for high and low storage.
10. **Adjustable** height shelves in wall cabinets
11. Refrigerator / freezer with frozen food storage in the bottom or side-by-side refrigerator / freezer
12. Variable height **counter surfaces** or adjustable through a range of 28 to 40 inches
13. Base **cabinets** with pullout shelves or drawers
14. **Contrasting color** edge border at countertops
15. Microwave oven at **countertop** height with uninterrupted counter surface or pull out shelf to support the safe transfer of hot and / or heavy cookware
16. Under cabinet glare free **task lighting**

## Kitchens

1. **60-inch** diameter turning space



# Recommended Universal Design References

## **Accessible Home Design: Architectural Solutions for the Wheelchair User**

Thomas D. Davies, AIA, Kim Beasley, AIA  
1999, \$22.95  
PVA Distribution Center  
P. O. Box 753  
Waldorf, MD 20604-0753  
888-860-7244 (toll free)  
[www.pva.org](http://www.pva.org)

## **Aging in Place: Aging and the Impact of Interior Design**

American Society of Interior Designers, 2002  
608 Massachusetts Ave. NE  
Washington, DC 20002  
Free at [www.asid.org/research.asp](http://www.asid.org/research.asp)

## **Building for a Lifetime: The Design and Construction of Fully Accessible Homes**

Margaret Wylde, Adrian Baron-Robbins  
1994, \$44.95  
Taunton Press  
63 S. Main Street  
P. O. Box 5560  
Newtown, CT 06470  
800-888-8286  
[www.taunton.com](http://www.taunton.com)

## **A Consumer's Guide to Home Adaptation**

Adaptive Environments, 1995, \$12.00  
374 Congress St., Suite 301  
Boston, MA 02210  
617-695-1225  
[www.adaptenv.org](http://www.adaptenv.org)

## **Creating the Not-So-Big House**

Susan Susanka, 2000, soft cover \$24.95  
Taunton Press  
63 S. Main Street  
P. O. Box 5560  
Newtown, CT 06470  
800-888-8286  
[www.taunton.com](http://www.taunton.com)

## **Directory of Accessible Building Products**

2006, \$5.00  
NAHB Research Center  
400 Prince George's Boulevard  
Upper Marlboro, MD 20774  
301-249-4000; 800-638-8556  
Free at [www.nahb.org](http://www.nahb.org)

## **Elderdesign: Designing and Furnishing a Home for Your Later Years**

Rosemary Bakker, 1997, \$14.95  
[www.elderdesign.homestead.com/elderdesign.html](http://www.elderdesign.homestead.com/elderdesign.html)  
(or [www.amazon.com](http://www.amazon.com))

## **The Healthy House**

John Bower, 2001, \$23.95  
The Healthy House Institute  
430 N. Sewell Rd.  
Bloomington, IN 47408  
Phone/fax 812-332-5073  
[www.hhinst.com/booksvideos.html](http://www.hhinst.com/booksvideos.html)

**A House for All Children: Planning a Supportive Home Environment for Children with Disabilities**

New Jersey Institute of Technology, 2000  
Campbell Hall, Room 335  
University Heights  
Newark, NJ 07102-1982  
973-596-3097  
[www.ahouseforallchildren.njit.edu](http://www.ahouseforallchildren.njit.edu)

**Housing Choices and Well-Being of Older Adults: Proper Fit**

Leon Pastalan and Benyamin Schwarz (eds.),  
2001, ISBN 0789013215, \$24.95  
The Haworth Press, Inc.  
10 Alice Street  
Binghamton, NY 13904  
800-429-6784  
[www.haworthpress.com](http://www.haworthpress.com)

**Universal Kitchen and Bathroom Planning**

Mary Jo Peterson, 1998, \$79.95  
McGraw Hill Order Services  
P. O. Box 545  
Blacklick, OH 43004  
800-722-4726  
[books.mcgraw-hill.com](http://books.mcgraw-hill.com)

*Available from CUD*

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Raleigh, NC 27695-8613  
Tel: 919-515-3082  
Info line 800-647-6777  
[www.centerforuniversaldesign.org](http://www.centerforuniversaldesign.org)

*Publications:*

**Affordable and Universal Homes: A Plan Book**

NCSU School of Design, 2000, \$10.00

**North Carolina Accessible Multifamily Housing**

1999  
NC Residents free  
Out-of-State \$5.00

**Products and Plans for Universal Homes**

Home Planners, LLC, 2000, \$20.00

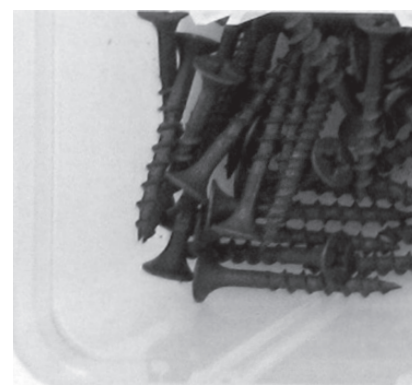
*Tech Packs*

*(subject-specific illustrated booklets):*

Bathrooms . . . . .	\$.10
Bedrooms . . . . .	\$.8
Decks, Patios, Porches, and Balconies . . . . .	\$.5
Doors and Doorways . . . . .	\$.8
Entrances and Site Design . . . . .	\$.10
Grab Bars . . . . .	\$.3
Kitchens . . . . .	\$.10
Reading Architectural Drawings . . . . .	\$.5
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