
Schluter Systems
Combining Design and Function in Today's ADA Compliant Bathroom

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Learning Objectives

- How barrier-free environments can be customized to include various design elements while remaining ADA compliant.
- Why bonded waterproofing technology lends itself to the construction requirements of barrier-free design.
- Define the principle of uncoupling, its functions, and history.
- Explore the evolution of tile setting techniques, along with the benefits and limitations of each stage of development.

This seminar will examine:

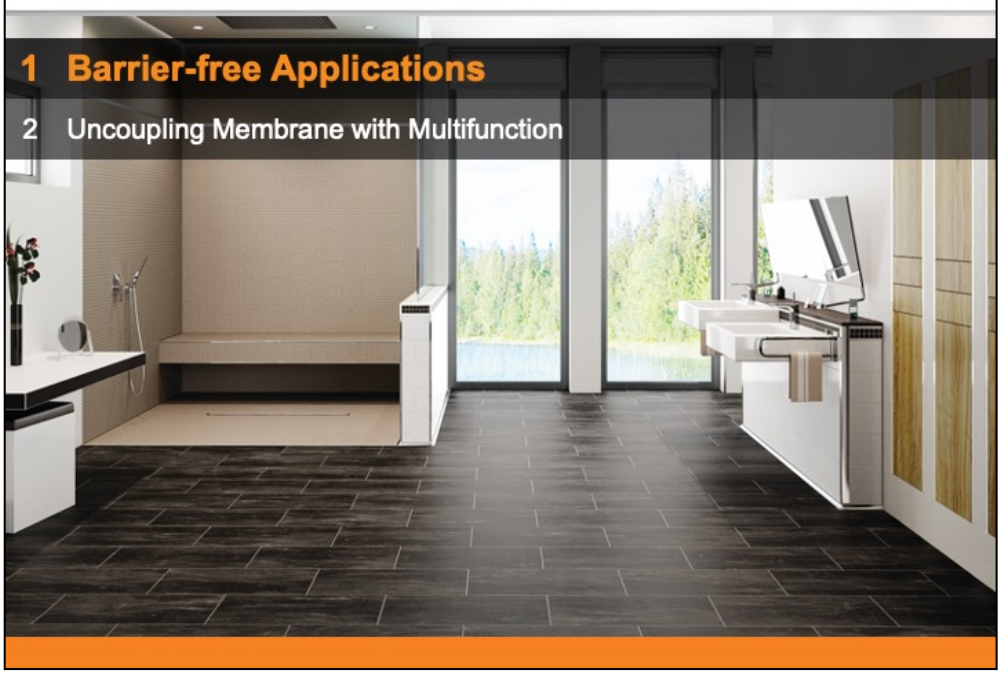
How barrier-free environments can be customized to include various design elements while remaining ADA compliant.

Why bonded waterproofing technology lends itself to the construction requirements of barrier-free design.

The principle of uncoupling, its functions, and history.

The evolution of tile setting techniques, along with the benefits and limitations of each stage of development.

Overview


1 Barrier-free Applications
2 Uncoupling Membrane with Multifunction

Curbless for Barrier-free

- Standards for accessibility
  - Architectural Barriers Act (ABA)
  - Uniform Federal Accessibility Standards (UFAS)
  - **American Disabilities Act (2010 ADA standards)**

Contribution from Architect
Jack Morgan

- Tile installation standards:
  - TCNA Handbook

Barrier-free Applications | Uncoupling Membrane with Multifunction

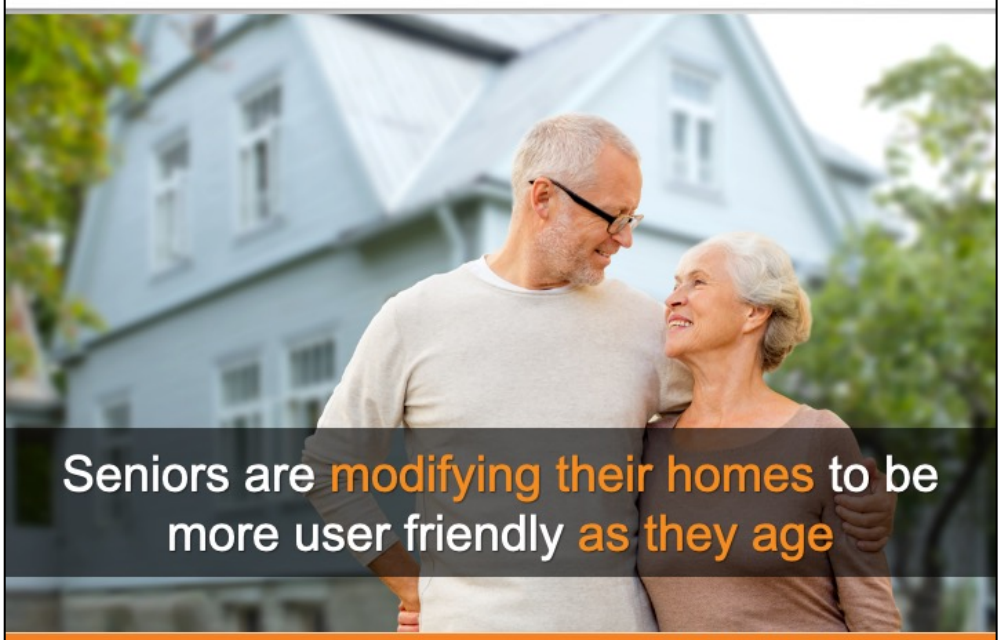
References to achieve Curbless for barrier-free:

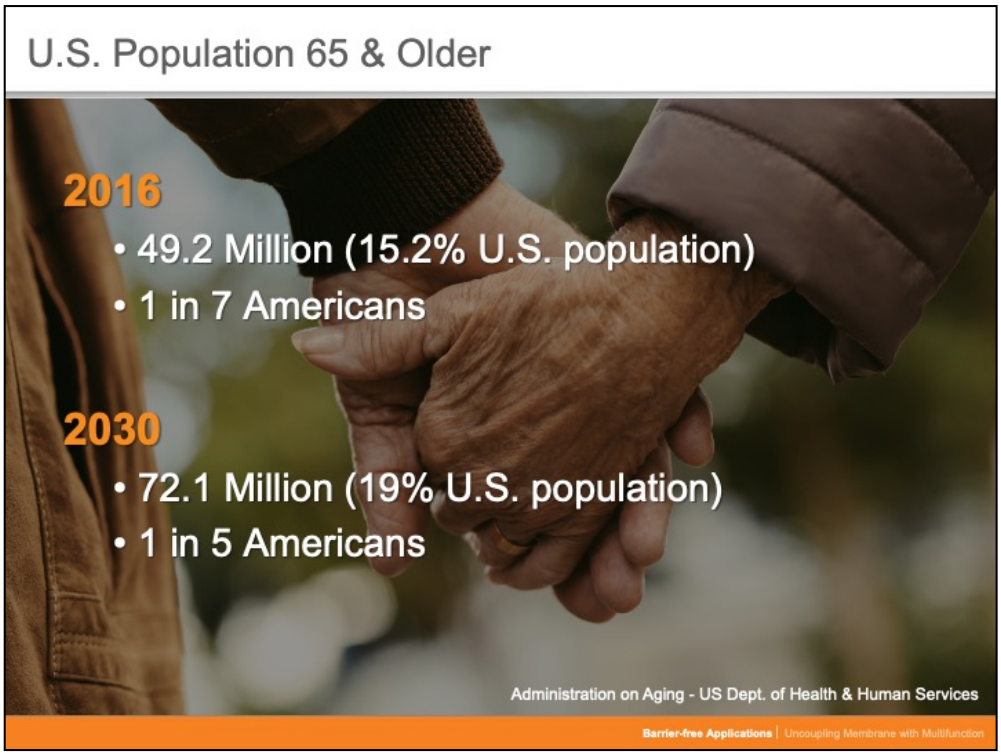
- Architectural Barriers Act (ABA)
- Uniform Federal Accessibility Standards(UFAS)
- 2010 ADA standards for accessible design (not 1991 standards)
    - Special contribution from Architect **Jack Morgan**
        - Injured in a collage accident after a night of partying & now disabled
        - Says people are “not handicapped, room / space designs are”
        - Now specializes in ADA and coached education department on this CEU

Reference for construction and installation methods of tiled environments:

- The Tile Council of North America handbook

Why Barrier-free? Aging in Place





- But just how many people are we talking about?

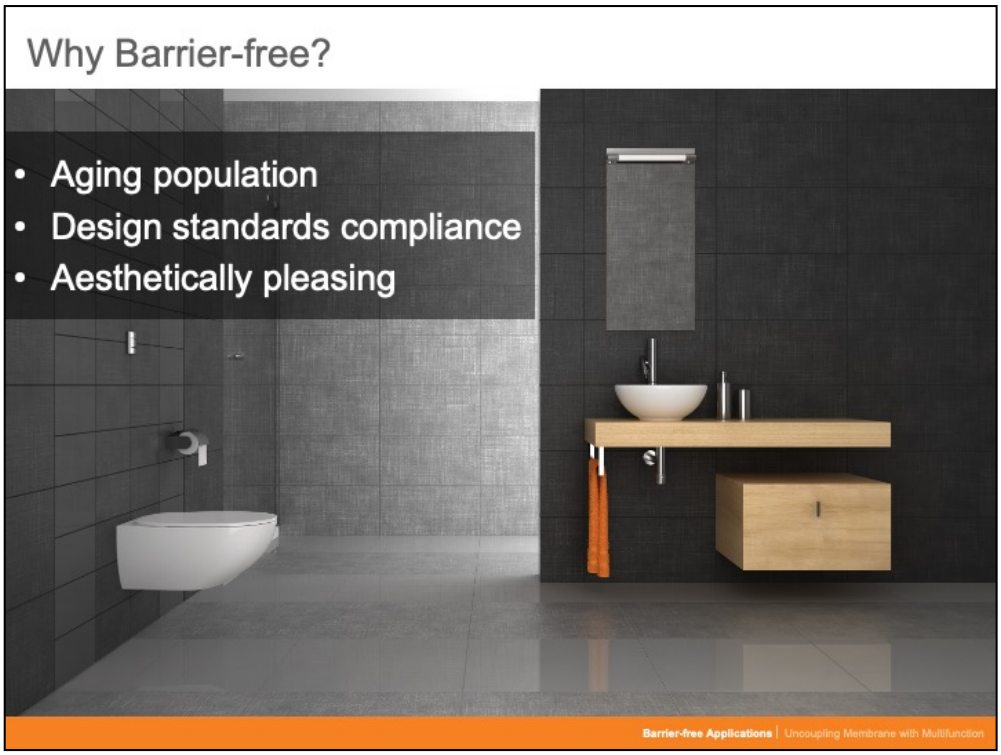
2016

- 49.2 Million (15.2% U.S. population)
- 1 in 7 Americans

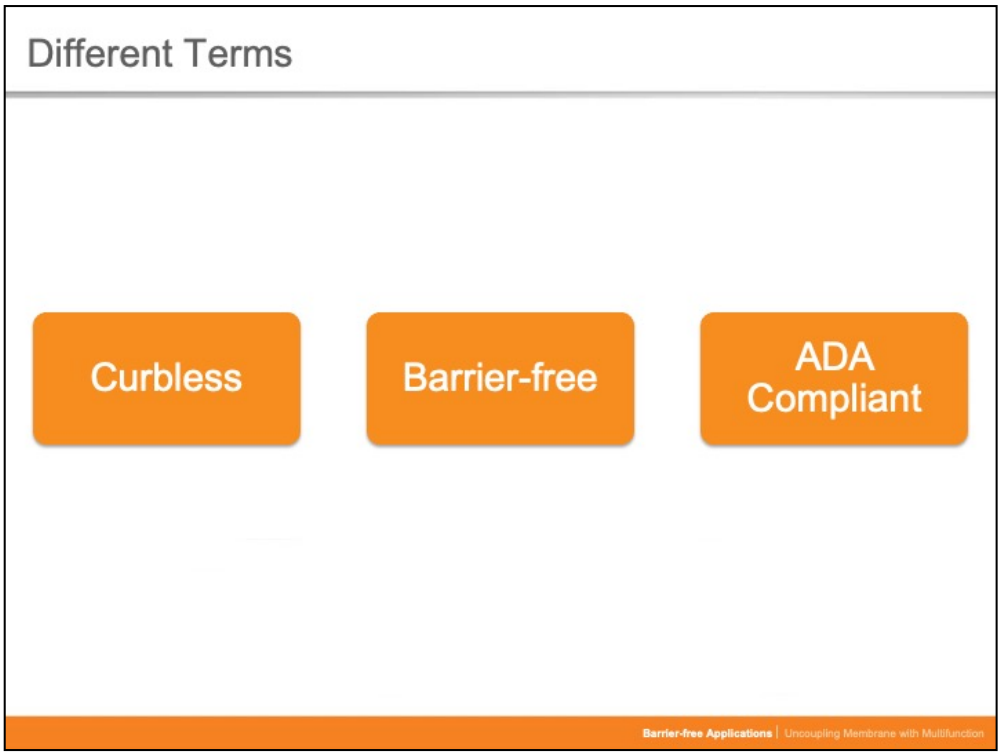
2030

- 72.1 Million (19% U.S. population)
- 1 in 5 Americans
- Double year 2000 numbers

- These are statistics from Dept. of Health and Human services – AoA
- http://www.aoa.acl.gov/aging_statistics/index.aspx (Administration on Aging - U.S. Dept. of Health & Human Services)



- So it's logical that there's a strong and foreseeable demand for accessible bathrooms to meet the needs of an aging population
- (U.S.) But also to comply with the ADA design standards applicable to all public spaces
- (CA) But also to comply with the *CSA B651-12* design standards applicable to all public spaces



Difference between three terms

Curbless:

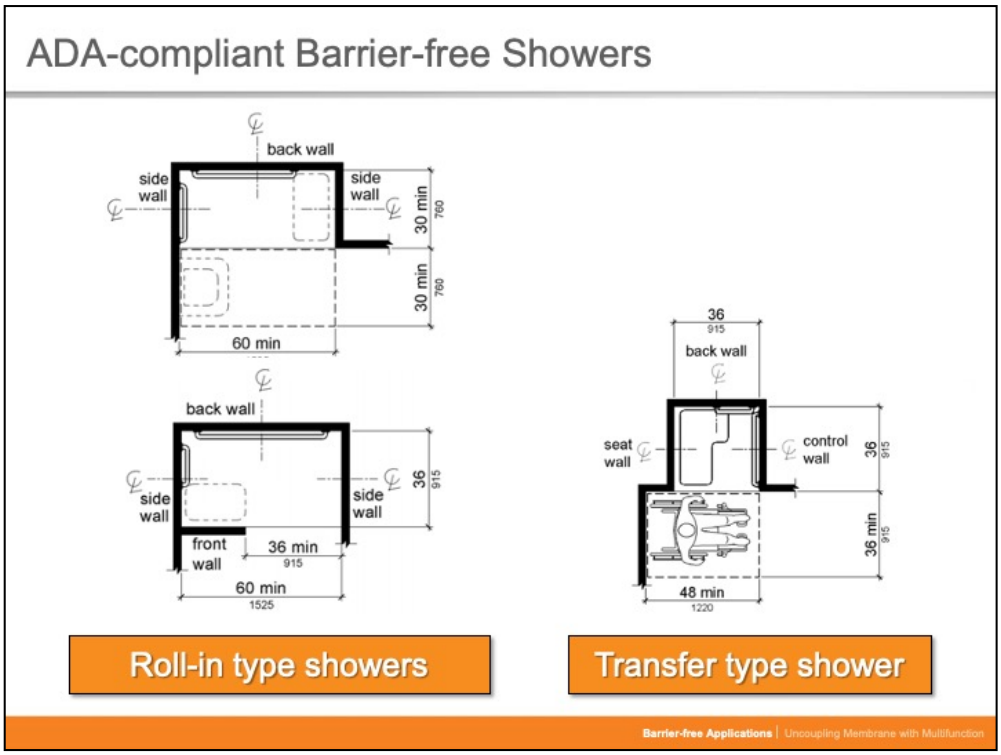
- A shower without a curb

Barrier-Free:

- A barrier-free environment refers to an environment free of any and all impediments, i.e. space restrictions, inadequate lighting, shower curbs

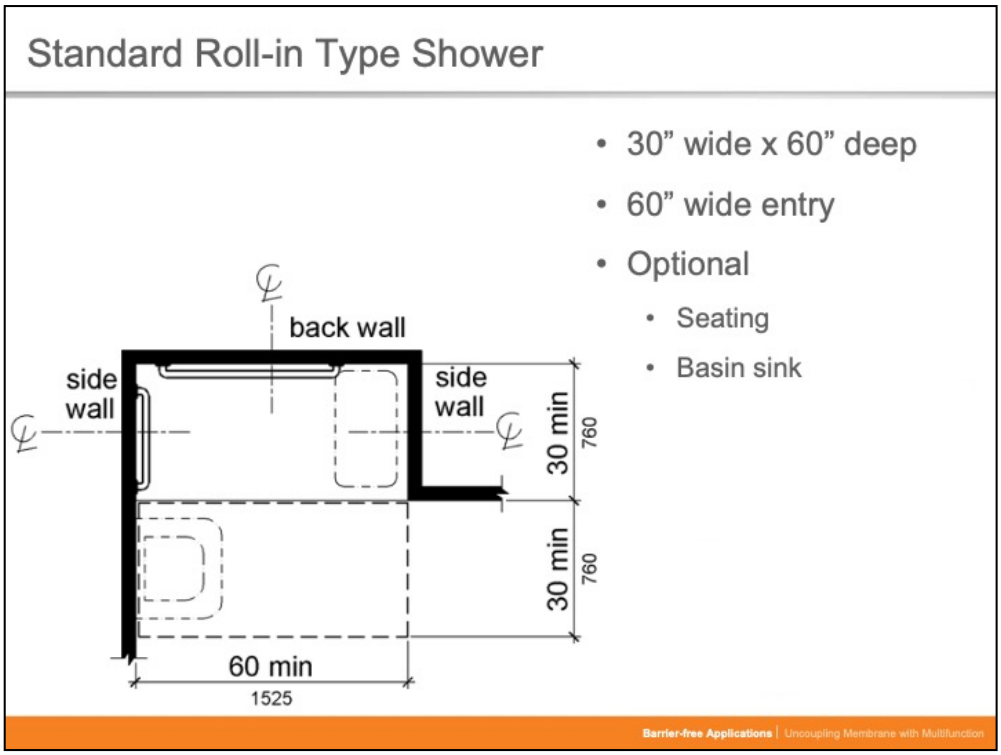
ADA Compliance:

- The 2010 standards set minimum requirements -- both scoping and technical -- for newly designed and constructed or altered state and local government facilities, public accommodations, and commercial facilities to be readily accessible to and usable by individuals with disabilities.
- Adoption of the 2010 standards also establishes a revised reference point for Title II entities that choose to make structural changes to existing facilities to meet their program accessibility requirements, and it establishes a similar reference for Title III entities undertaking readily achievable barrier removal.



- Let's begin by taking a look at some ADA-compliant barrier-free shower compartment types.
- Specifically, transfer type showers and wheelchair roll-in type showers.

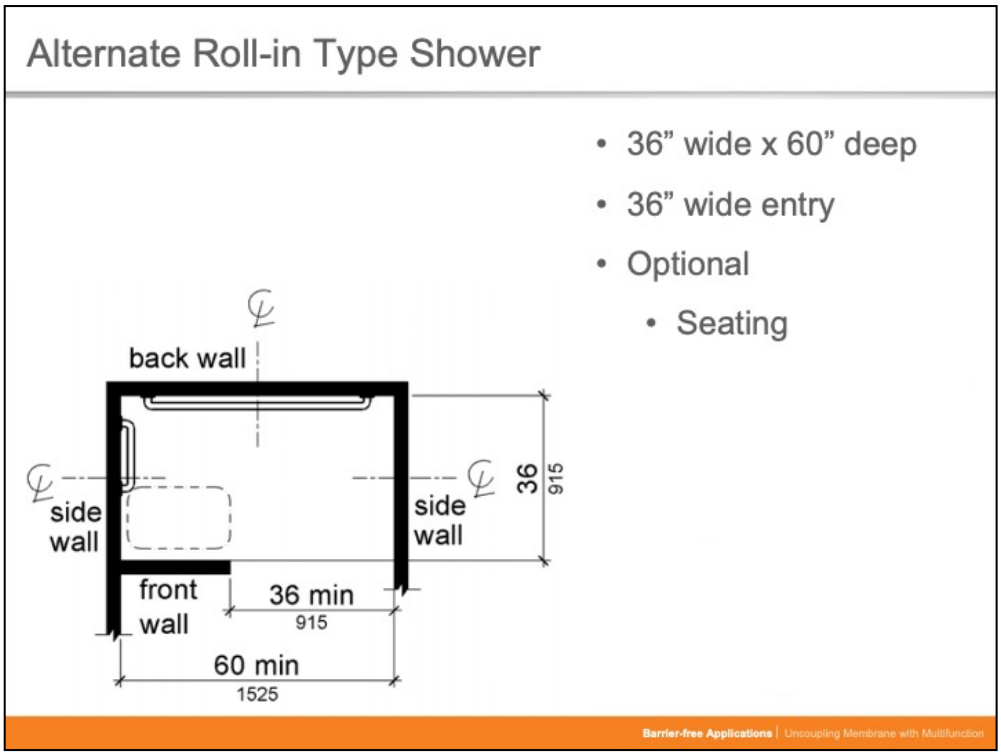
- We'll look at the minimums for each type, then we'll go over some of the ways they can be constructed and customized while adhering to ADA standards for design.



The Standard Roll-in Type Shower:

- 30 inches wide by 60 inches deep minimum (clear inside dimensions measured at center points of opposing sides)
- 60 inches wide minimum entry on the face of the shower compartment.

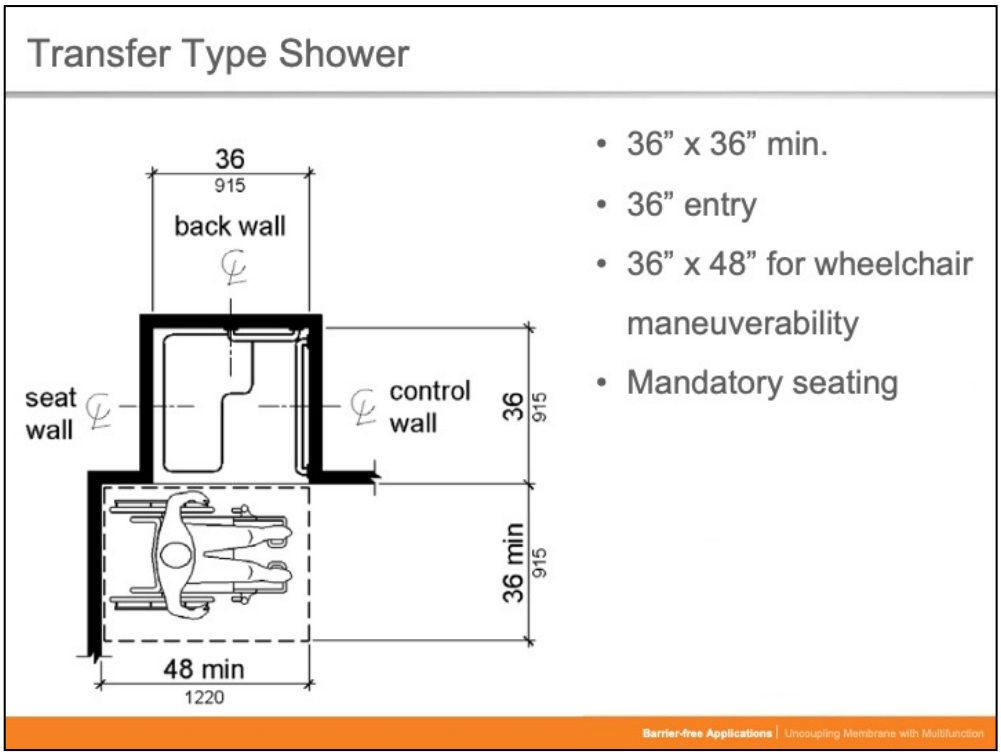
(608.2.2)



The Alternate Roll-in Type Shower

- 36 inches wide and 60 inches deep minimum (clear inside dimensions measured at center points of opposing sides)
- 36 inch wide minimum entry shall be provided at one end of the long side of the compartment

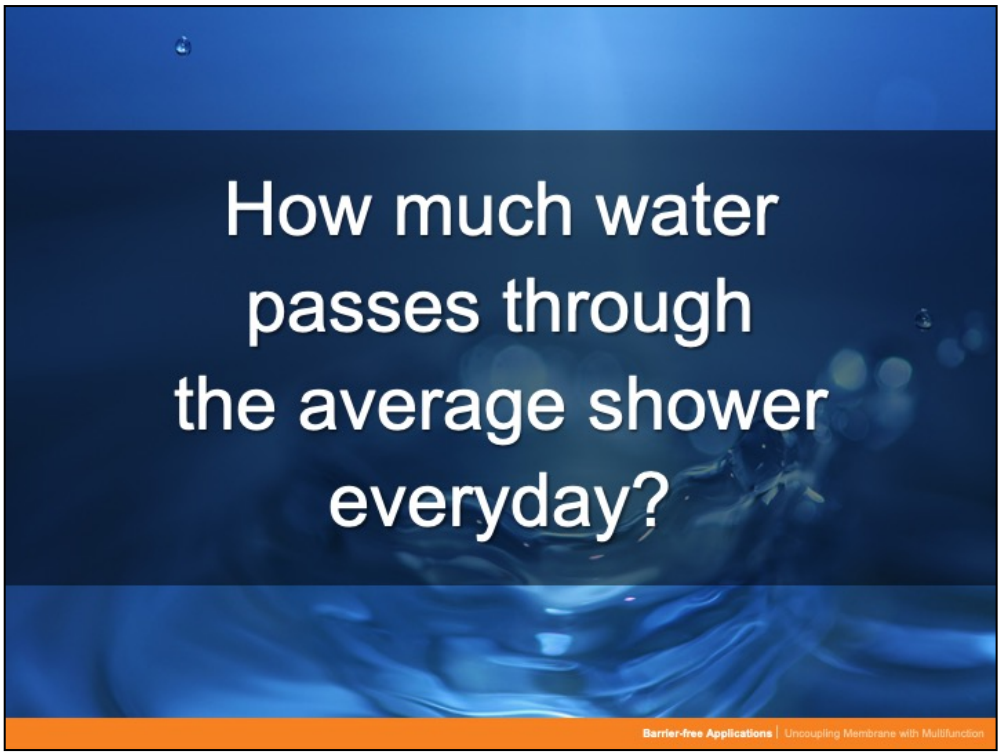
(608.2.3)



And the transfer type shower compartment:

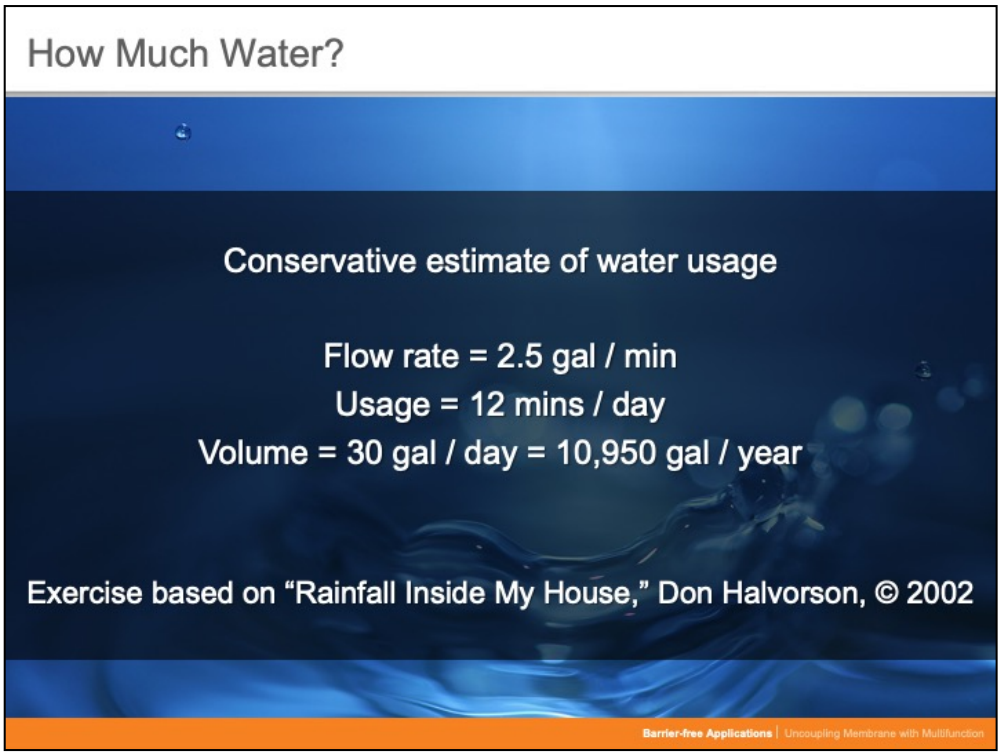
- 36 inches by 36 inches (clear inside dimensions measured at the center points of opposing sides)
- 36 inch wide minimum entry
- Clearance of 36 inches wide minimum by 48 inches long minimum measured from the control wall shall be provided

(608.2.1)

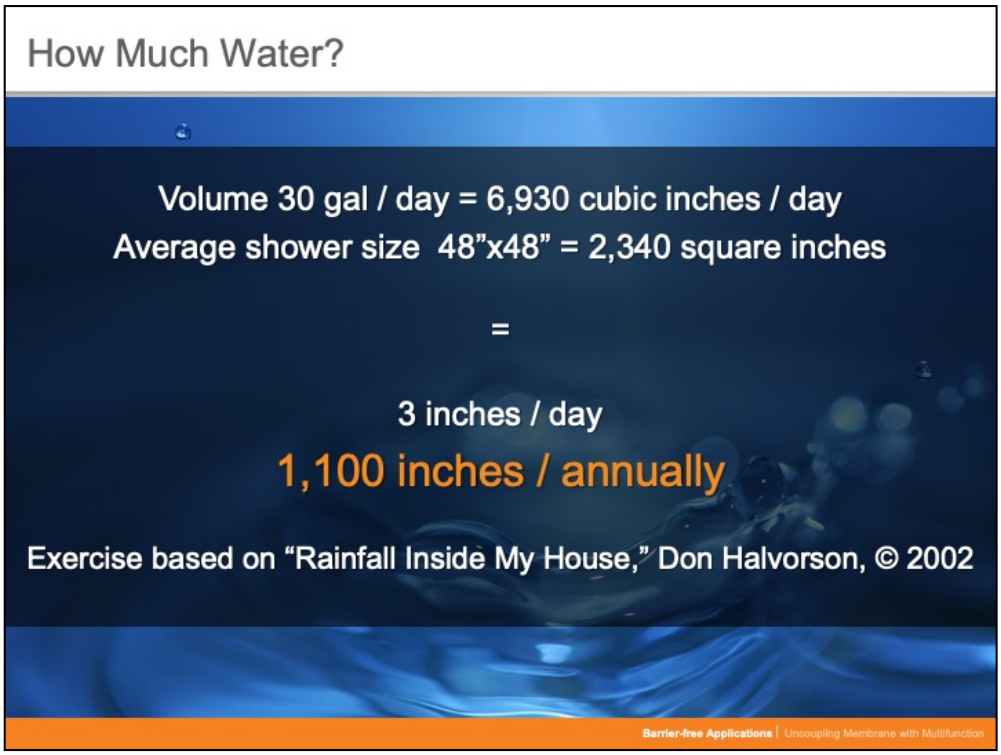


QUESTION:.

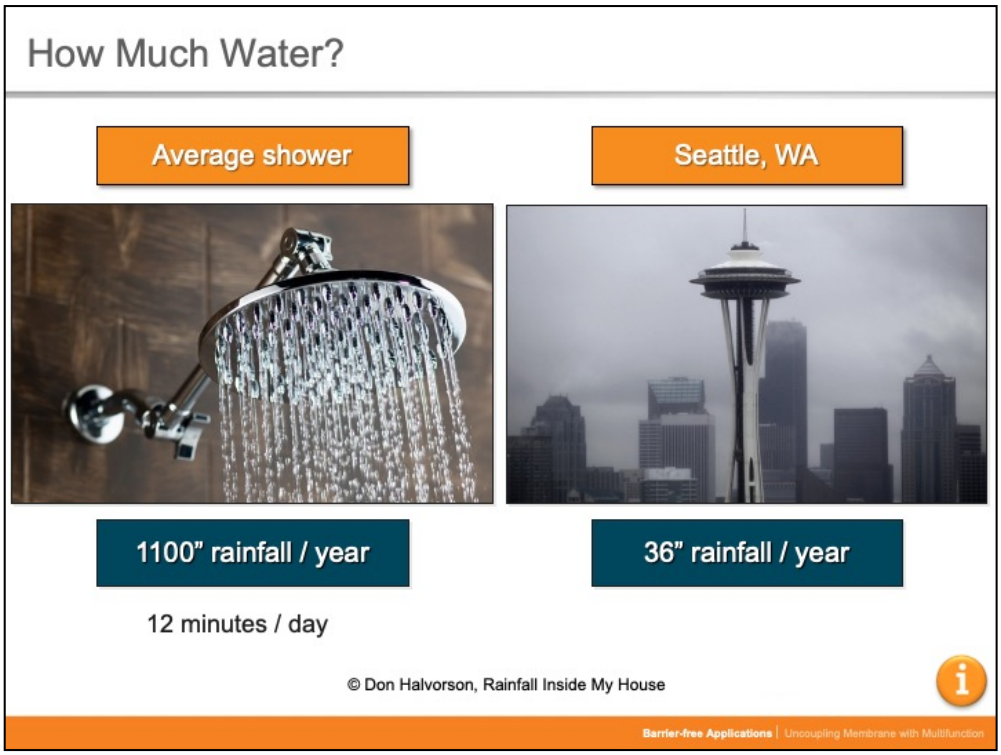
Any guesses as to how many gallons of water the average shower processes on a daily basis?



- This is a very conservative estimate based on 12 minutes of use in a 4-foot x 4-foot shower enclosure.
- But even at this estimate, you can see that this environment is exposed to a tremendous amount of water.



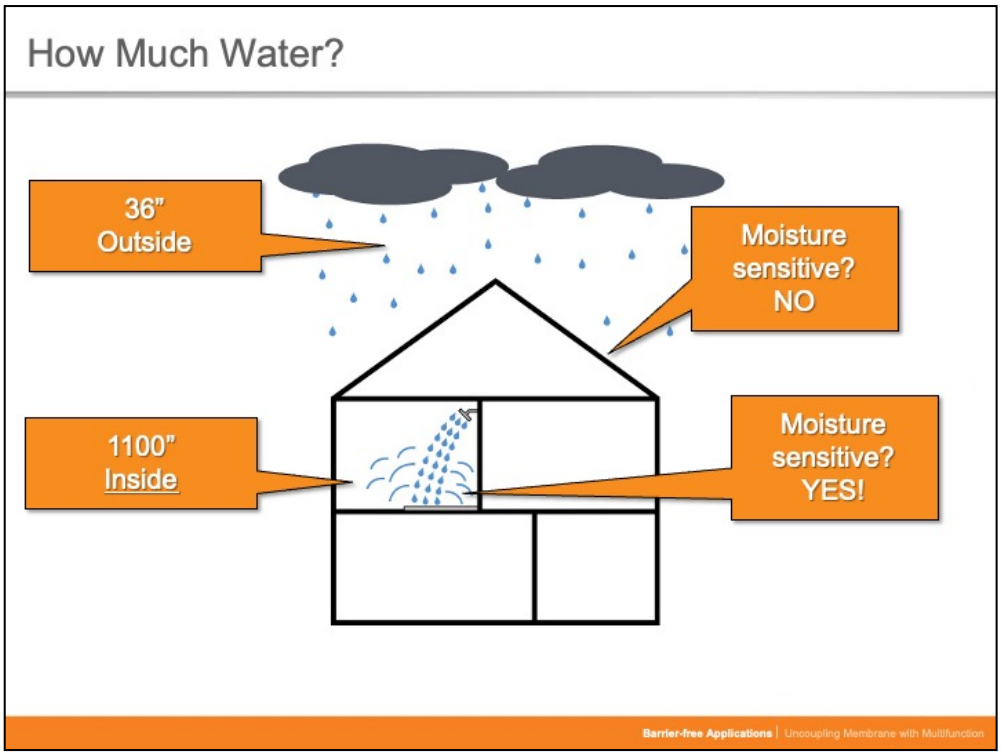
30 gallons a day in a 4-foot x 4-foot enclosure translates to 3 inches of rainfall per day. Which is a lot!



- On average, 30 gallons of water passes through the average shower everyday which would be the same as saying it receives 1100 inches of rainfall per year.
- This is a very conservative estimate based on 12 minutes of shower operation a day.
- **Do you think a *family of four* is running their shower for less than 12 minutes a day?**

- So, to put this conservative estimate in perspective, let's take a look at the average **ANNUAL** rainfall for Seattle.
- Seattle is known for being located in one of wettest regions in North America. Yet its annual rainfall is a tiny fraction of the water that passes through a shower on a yearly basis.

- *Click info Icon for explanation of calculation*



- But why compare water in a shower to rainfall?
- Because the challenge of waterproofing showers is as serious as the challenge of waterproofing the exterior of a home.
- A shower introduces massive amounts of water and moisture inside the home where we encounter many moisture sensitive building materials.
- These materials are not capable of handling this kind of moist environment.

So what happens when a tiled shower built with moisture-sensitive materials can't process all of that water that passes through it on a day to day basis?

Well, take a look at this 3-year-old shower. It's showing classic signs of an inability to **manage moisture** effectively.

- Notice the discolored grout in the corner at the floor to bench/wall transition.
- Obviously this unpleasant aesthetic, staining of grout and discoloration of tile, is a sign that something is wrong with the assembly.

When the tile was ripped out, you can clearly see the extent of the damage. The substrate is covered in mold.

•And when the bench's substrate was ripped out, you can see the full extent of the damage.

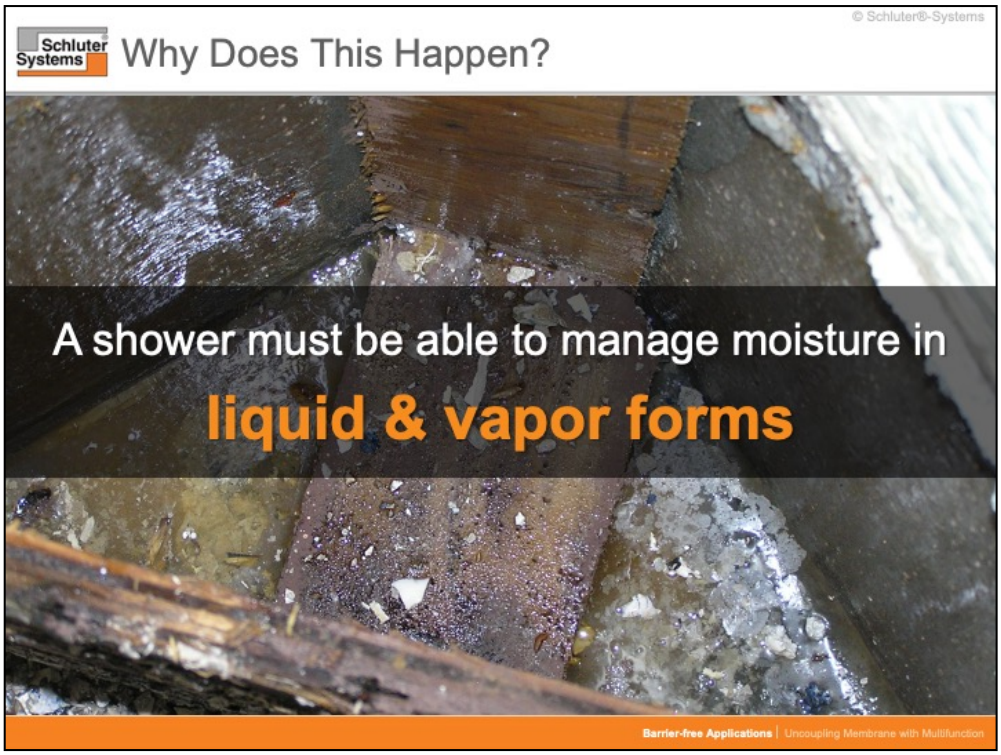
•Moisture has penetrated even further into the bench assembly to the cavity behind, causing extensive damage to moisture-sensitive materials that is costly to repair.

•Note that this bench was built with commonly used materials that are sensitive to moisture.

So any guesses as to why this happens?

•Water is getting trapped in the assembly because tiled surfaces, including grout and thin-set, are not waterproof.

•Moisture in gets trapped in the shower assembly or it can't pass through and exit the shower quickly enough.



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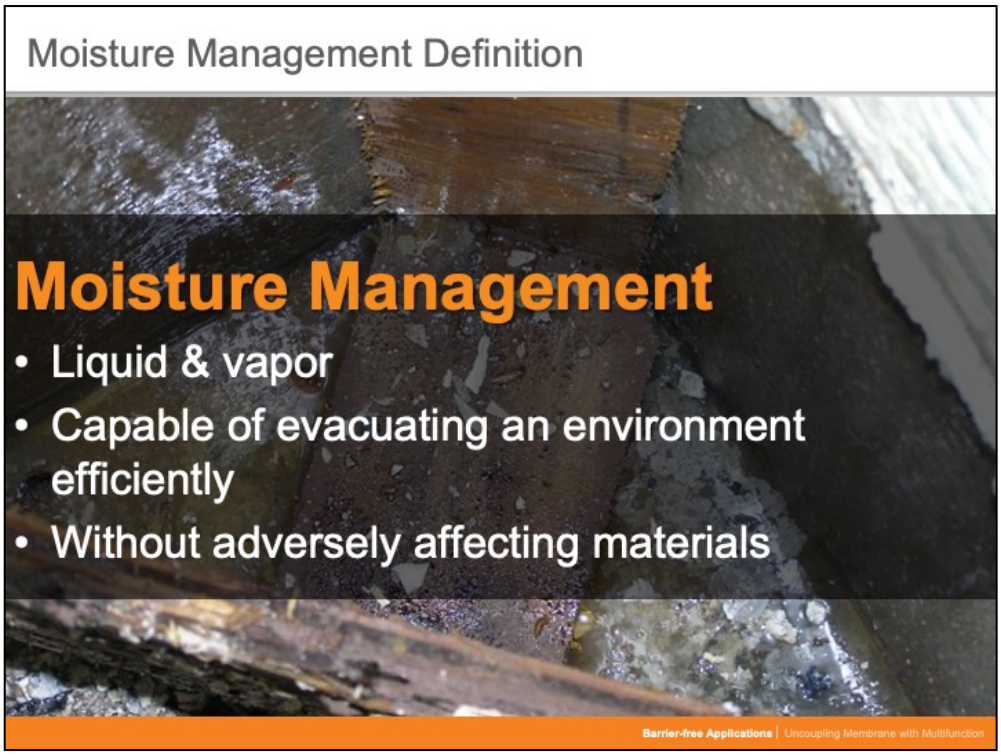
•Moisture will penetrate behind the tile.

•Moisture must be able to exit the shower enclosure.

•Therefore the shower environment must be able to manage moisture in **both liquid and vapor forms.**



•In other words, a shower must be effective at managing moisture.

•How do we define moisture management?

•MM is method of containing water in liquid and vapor forms enabling it to pass through an assembly efficiently using materials that are not adversely affected by moisture.

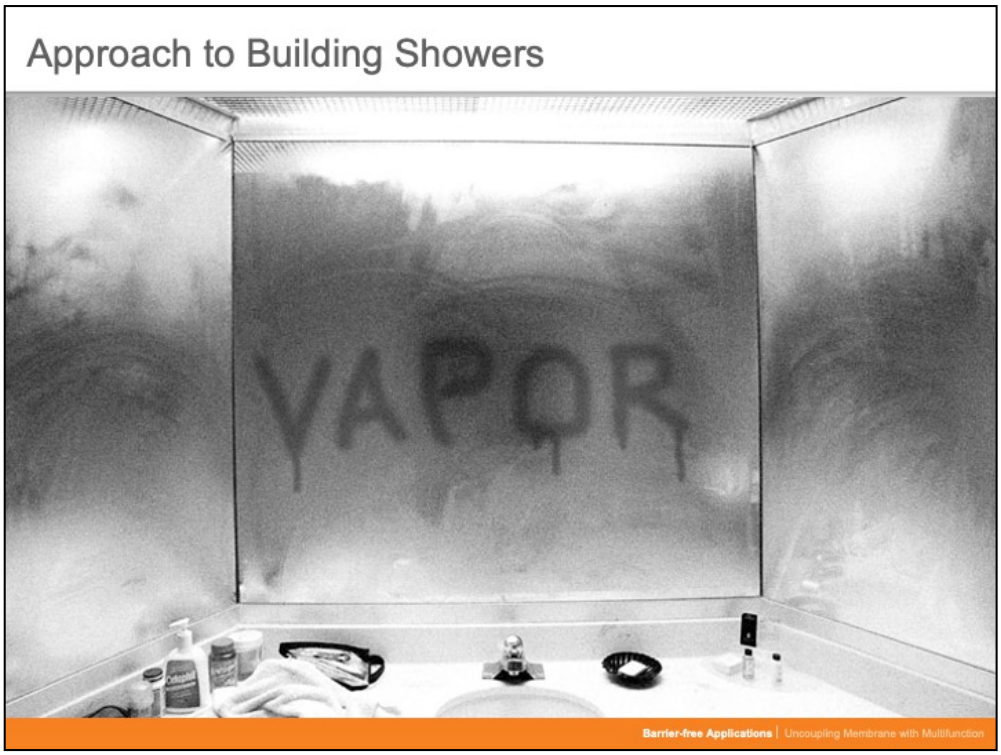
•Simply put, the building envelope must allow moisture to evacuate faster than it accumulates.

→ Segue into discussion on vapor

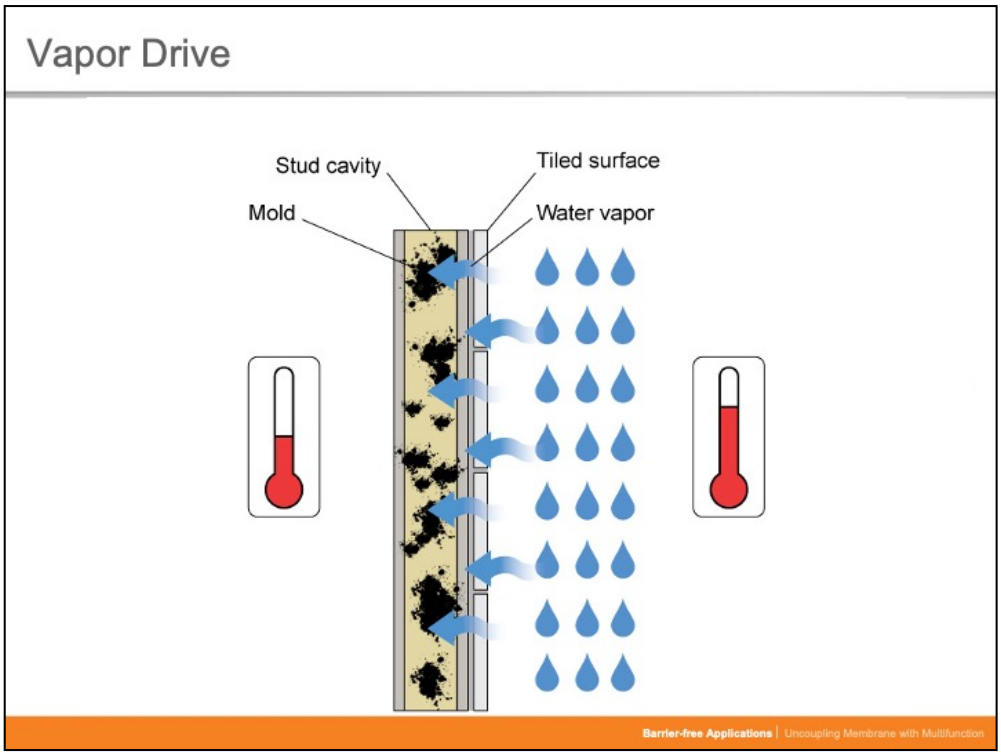
•It's important that we don't overlook the effects that vapor can have on a shower environment.

•By shower environment we mean anywhere that moisture from the shower can reach in both liquid <u>and</u> vapor forms.

•Areas that aren't traditionally considered "wet" areas – in other words areas outside the shower enclosure for example – these areas are prone to the effects of moisture.



- For these reasons it's:
    - necessary to take a comprehensive approach to constructing shower
    - necessary to retard flow of vapor outside the shower assembly
- We must consider how moisture in other areas of the bathroom (not formerly considered wet areas) is dealt with - i.e., especially with emergence of barrier-free bathrooms, (from residential 3 to residential 2).



- Water in vapor form is more challenging to manage than in liquid form.
- Vapor drive is created in the shower environment.
- Any vapor that enters a stud cavity must be able to dissipate faster than it accumulates otherwise potential for mold formation exists.
- Water in vapor form has become a larger issue due to the way the housing envelope functions, i.e. how the house "breathes.“
- The airflow that moves through the housing envelope has been significantly reduced due to increase in energy efficient houses, reducing the speed of vapor dissipation.
- If penetrations exist in vapor barrier / waterproofing it will conduct the moisture from the shower area to the wall cavity because wall cavity is cooler.

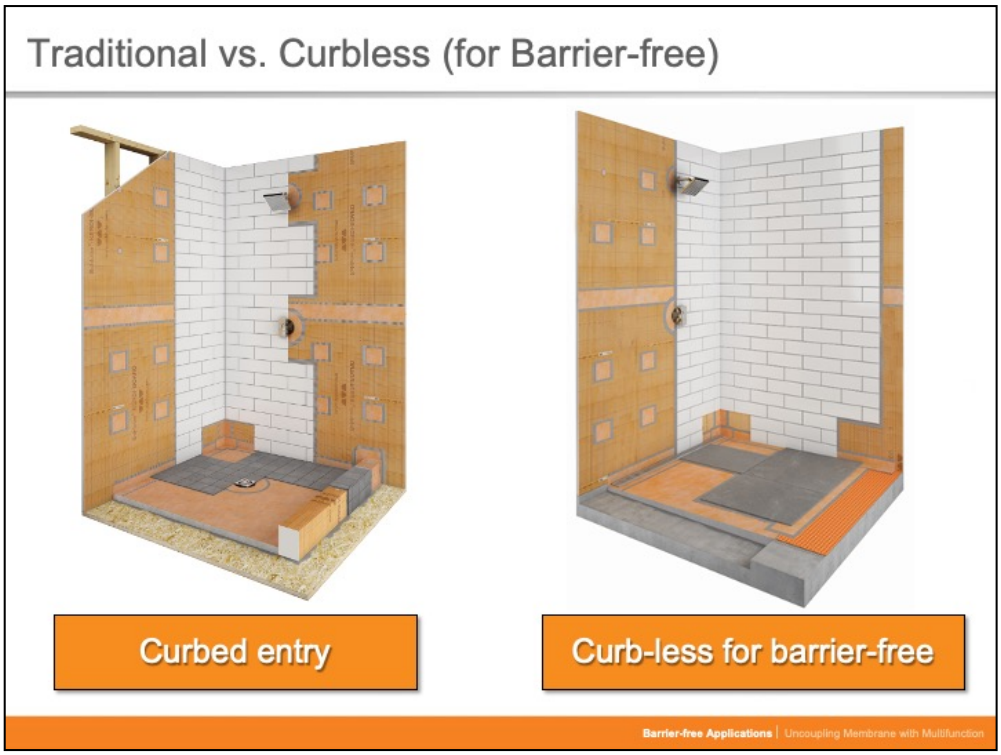
→ Have U.S. attendees open TCNA manual to definition of vapor retarder membranes (p23 TCNA 2014).

→ Have CANADIAN attendees open TTMAC manual to page 25 vapor retarder membranes.

Now we're getting into the importance of managing moisture in tiled showers. Most, if not all, of the problems associated with tiled showers can be traced back to poor moisture management.

- Moisture-sensitive building materials
- Wood subfloors
- Wood or metal studs in wall cavities
- Mold
- Organic materials (e.g., wood, paper, etc.)

- Contrary to popular belief, a tiled surface is not waterproof.
- Preventing moisture build up will prevent mold.
- Both liquid and vapor must be able to exit the shower <u>without causing damage to building materials.</u>

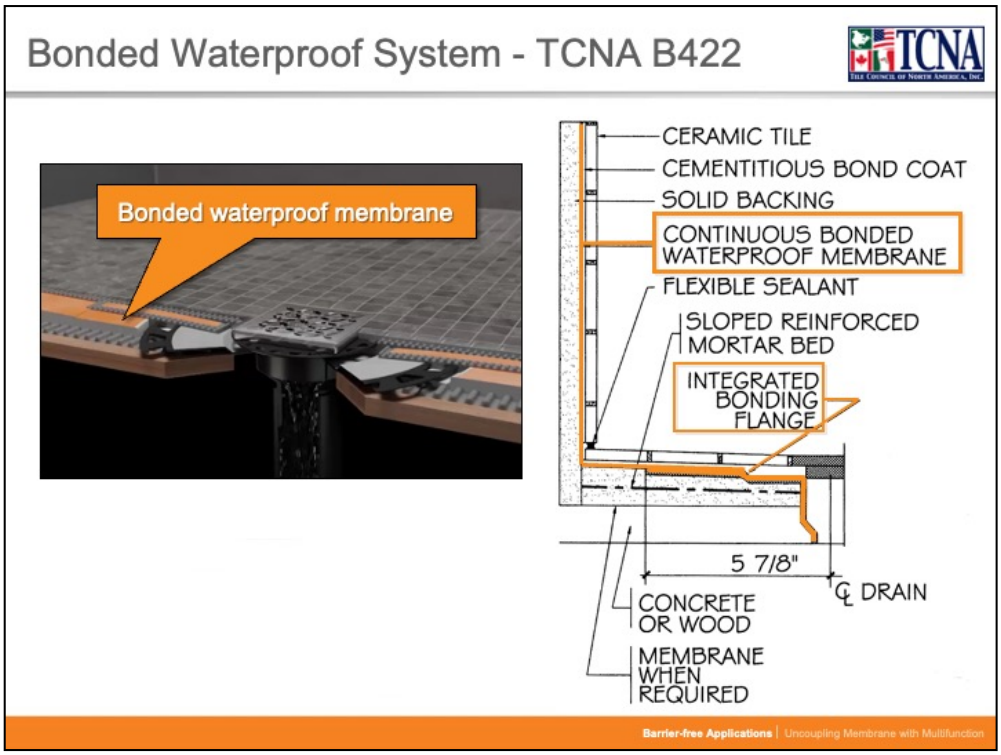


- To understand the special measures that must be taken when designing and waterproofing a curbless shower for a barrier-free environment, let's compare a traditional shower design with a curb and compare it to a curb-less shower that you'd find in a barrier-free space.

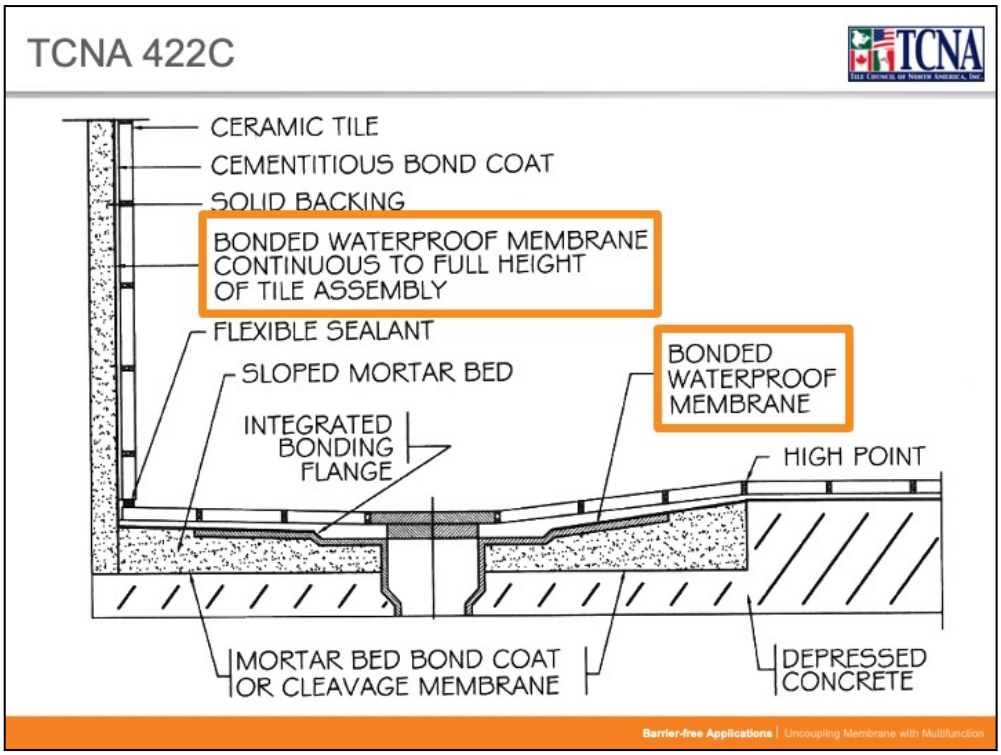
- A typical **tiled shower** is designed with a curb.
- A curb effectively defines the limit between the, so called, wet and dry areas of the bathroom.
- But a curb is also considered a barrier and therefore does not comply with ADA design standards.

- A **barrier-free shower** is curbless at its entry.
- A b-f shower is necessary for ADA compliance and provides an added benefit in that it opens up more design possibilities.

- But the absence of a curb may “blur the line” between the wet and “dry” areas of the bathroom.
- Therefore, a barrier-free environment needs specialized waterproofing considerations.
- Specifically, bonded waterproof membranes are required both inside and outside the shower enclosure.



- B422: Solid backing, Bonded waterproof membrane, Integrated bonding flange
- TCA method for a bonded waterproofing system using an integrated bonding flange
- Allows connection at top of assembly
- No weep holes



- The TCNA provides clear guidance on how to treat a curb-less entry in a barrier-free environment to ensure waterproofing is achieved.

Traditional Construction

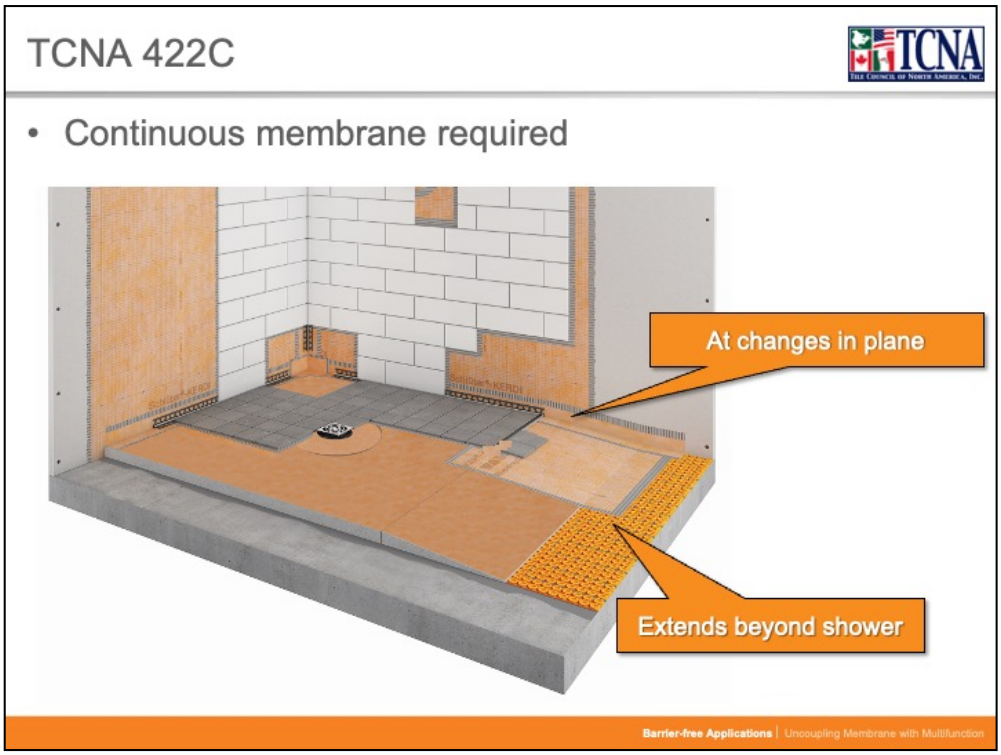
- Designed for use with curbs
- PVC connection to “dry” area prone to leaks
- No guidance from TCNA on how to achieve continuous waterproofing

Barrier-free Applications | Uncoupling Membrane with Multifunction

- By comparison…
- Many traditionally constructed showers rely on the use of a PVC pan liner for its waterproofing capability.
- PVC liners are designed for use with a curb and are not suitable for a barrier-free environment because making a waterproof bond between the PVC pan liner to the “dry” area of the bathroom is problematic and prone to leaks.

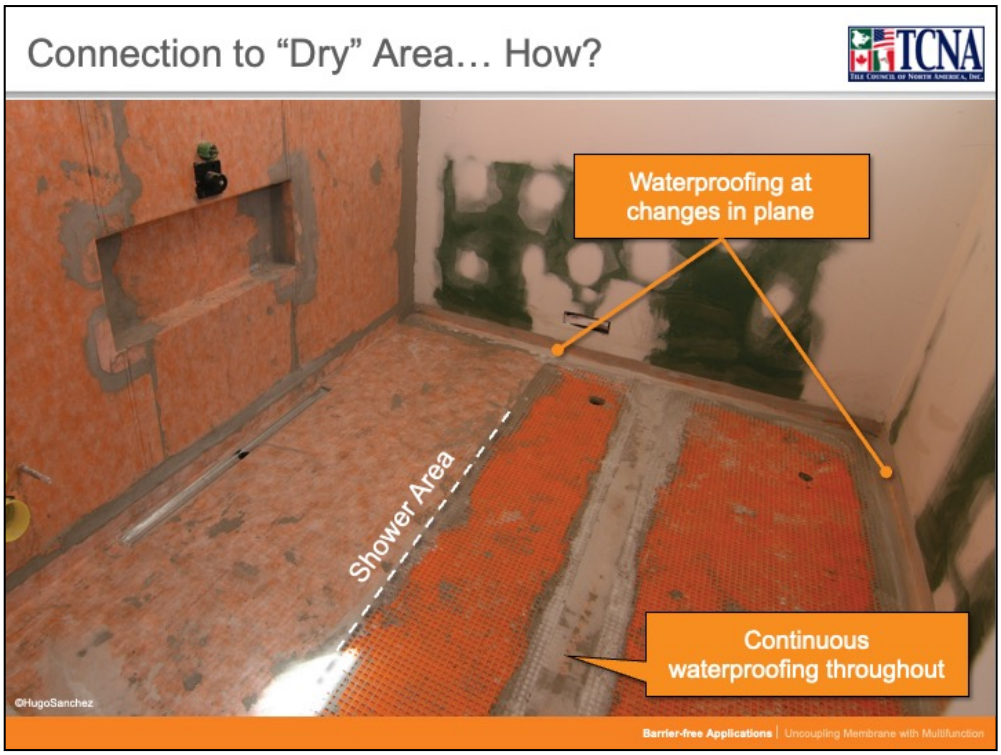
- As evidence, there is no guidance from the TCNA on how to do this with a PVC liner.

- C:\Powerpoint\ShowerDamage.mp4C:\Powerpoint\ShowerDamage.mp4



- So let's look at what's required to construct a waterproof and durable shower-entry in a barrier-free bathroom (per TCNA)

- First of all, a continuous bonded waterproof membrane is required throughout
    - The membrane must continue outside immediate shower area 1 ft minimum beyond high point of the floor, and
    - At all changes in plane within the shower.
    - In many cases, additional waterproofing may be required beyond the 1 ft minimum to effectively contain and evacuate splash water beyond the shower enclosure.



- Continuous waterproofing from "wet" to "dry" areas is accomplished by overlapping the courses of membrane and bonding them together using thin-set mortar.
- The waffle-like membrane (at the bottom of the photo) is installed beyond the shower enclosure.
- The sheet membrane (at the top of the photo) is installed inside the shower enclosure.

- The difference between the two membranes:
    - The waffle membrane is also serves as an uncoupling membrane.
    - Its function is to protect the tile surface from cracking by isolating movements in unstable substrates caused by loading, temperature, and humidity changes.
    - Uncoupling is not required on the shower floor as the sloped substrate (foam or mud bed) is stable.

TCNA 422C

- Waterproofing extended full height of tile assembly

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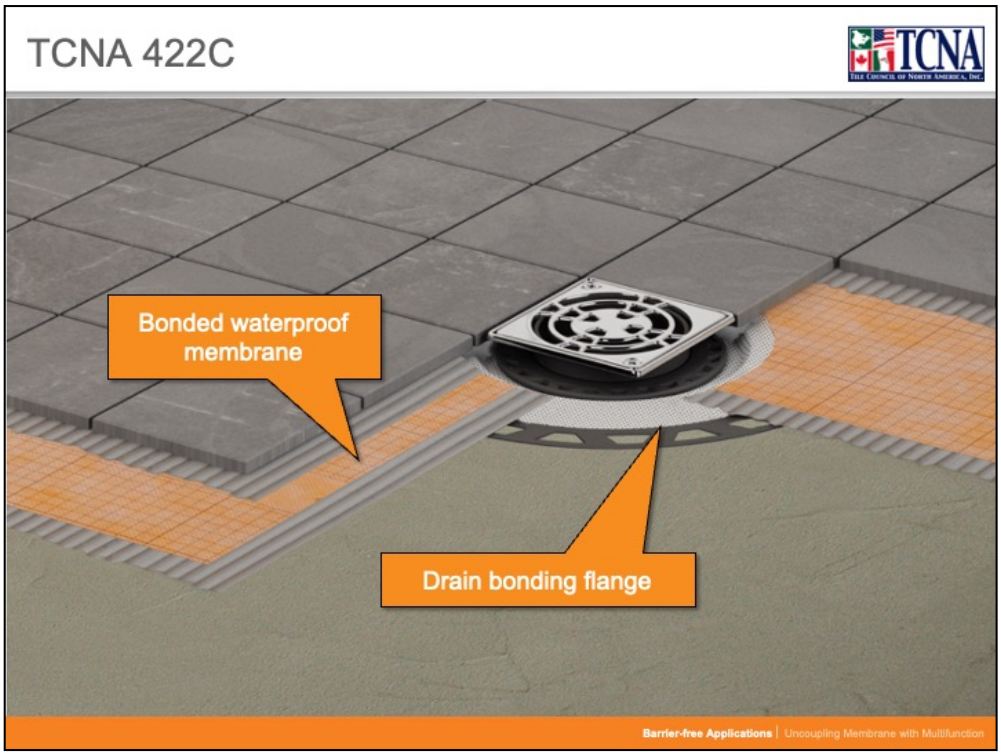
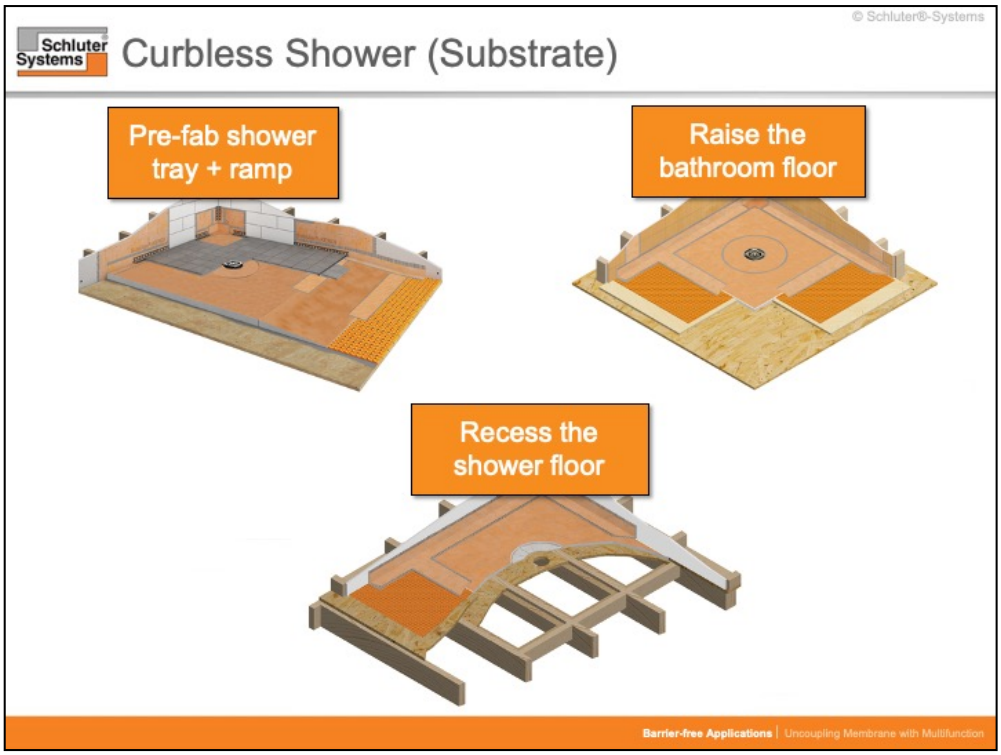
- Additionally, waterproofing must extend up the walls to the full height of tile assembly in the shower…



The bonded waterproof membrane is connected to the drain.



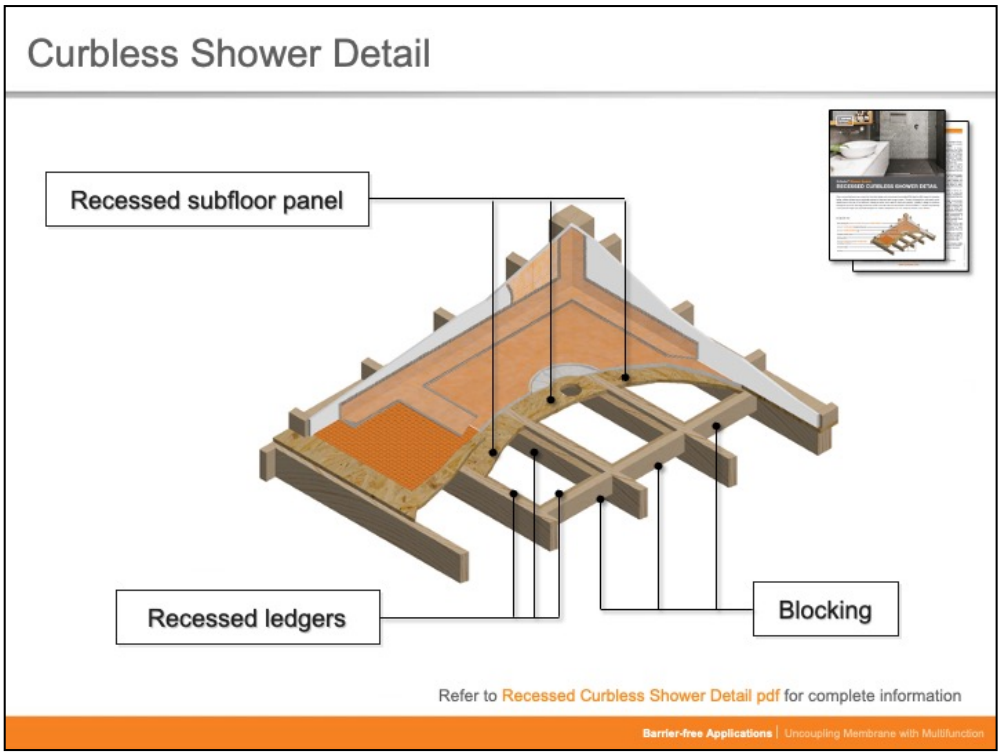
Substrate preparation: Pre-fab shower tray + ramp

- You can use a prefabricated shower tray and ramp to facilitate the transition between the shower and bathroom floors.

Substrate preparation: Raise the bathroom floor

- Using additional materials to raise the bathroom floor is another option.
- Place our thin shower tray on a wood subfloor, you can build up the rest of the bathroom floor by installing either a 5/8-inch or ¾-inch plywood/OSB panel on top of the wood subfloor along with DITRA-HEAT or DITRA-XL.
- Over a concrete subfloor use a mortar bed of appropriate thickness to build up the rest of the bathroom floor.

Substrate preparation:



Requirements

- plywood or OSB subfloor must be clean, even, and load bearing.
- maximum spacing of joists is 19" (488mm) o.c.
- minimum subfloor thickness – 23/32", 3/4" nom. (19 mm) tongue-and-groove OSB or plywood with 1/8" gap between sheets.
- ***Canada:*** *19/32", 5/8" nom. (16 mm) tongue-and-groove OSB or plywood in Canada with 16" (406 mm) o.c. maximum joist spacing, but 23/32", 3/4" nom. (19 mm) subfloor recommended.*
- existing subfloor panels extended over recessed panels to be installed according to Schluter Wood underlayment fastening schedule. See Wood Underlayment content in the Schluter®-DITRA Installation Handbook. Our recommendations currently support only dimensional lumber for floor joists. See alternate joist manufacturer for attachment specifications. Dimensional lumber shall not be ripped down from its original dimension and size.
- Recessing the floor of a bathroom must be done in a way that preserves the structural integrity and safety of the construction. This may require the services of a qualified design professional (e.g., architect, engineer, etc.). Verify with the local inspector or authority having jurisdiction (AHJ).
- Pre-drill holes in blocking and adjacent supports.

- Base : KERDI-SHOWER-T/-TS/TT/-LT/-LTS.
- Bench: KERDI-BOARD-SB, KERDI-BOARD, concrete, masonry block, or sawn lumber sheathed with solid backing (see above).
- KERDI-DRAIN/-LINE shall be properly supported.
- KERDI-DRAIN/-LINE shall be connected to the waste line; use ABS cement for ABS drains, PVC cement for PVC drains, a no-hub coupling for stainless steel drains with no-hub outlets, and thread sealing compound or tape for stainless steel drains with threaded outlets.
- KERDI, DITRA or DITRA-HEAT shall be installed in all floor areas subject to water exposure (i.e., wet area and drying area). Floor/wall connections shall be sealed with KERDI-BAND.
- When using the stainless steel KERDI-DRAIN bonding flange, use KERDI-FIX to bond KERDI to the drain.
- All horizontal surfaces (e.g. benches, window sills, shelves, etc.) must be sloped toward the shower drain. This can be done by sloping the substrate or the tile.

Substrate Preparation

- Verify that subfloor panels and solid backing are properly fastened to framing members.
- any leveling of the subfloor must be done prior to installing KERDI-SHOWER-T/-TS/-TT/-LT/-LTS/-SR and KERDI-BOARD-SB prefabricated substrates.

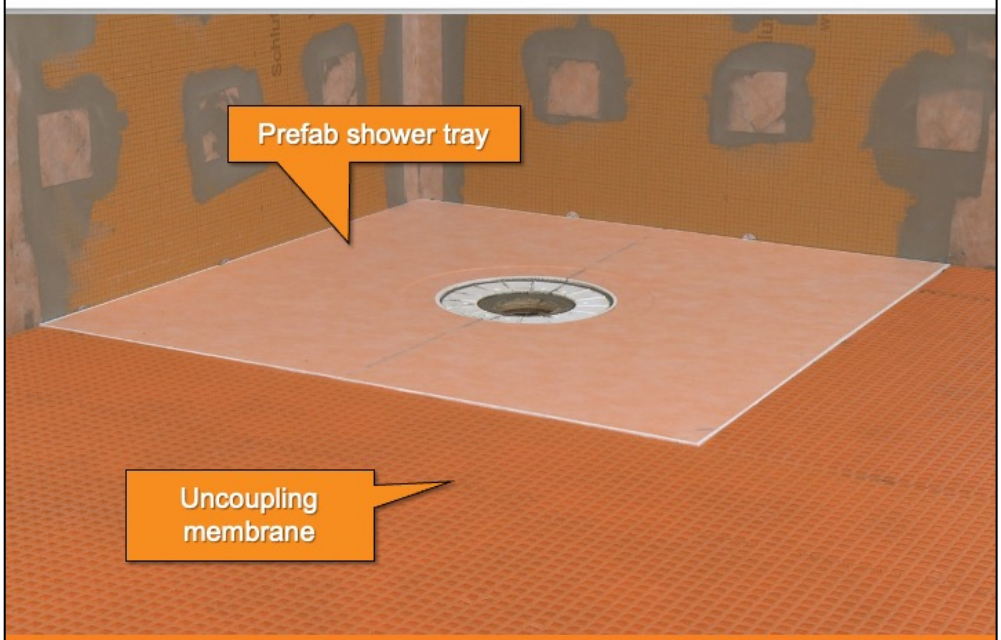
Setting and Grouting Materials

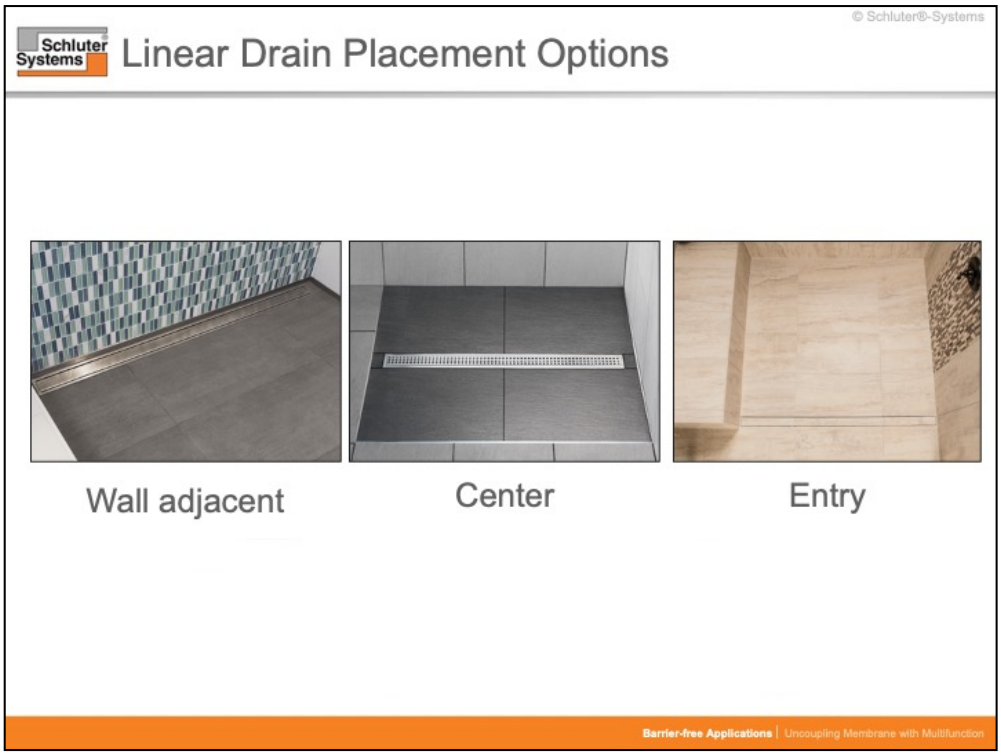
- Unmodified thin-set mortar ANSI A118.1
- grout ANSI A118.3, A118.6, A118.7

Installation Specifications

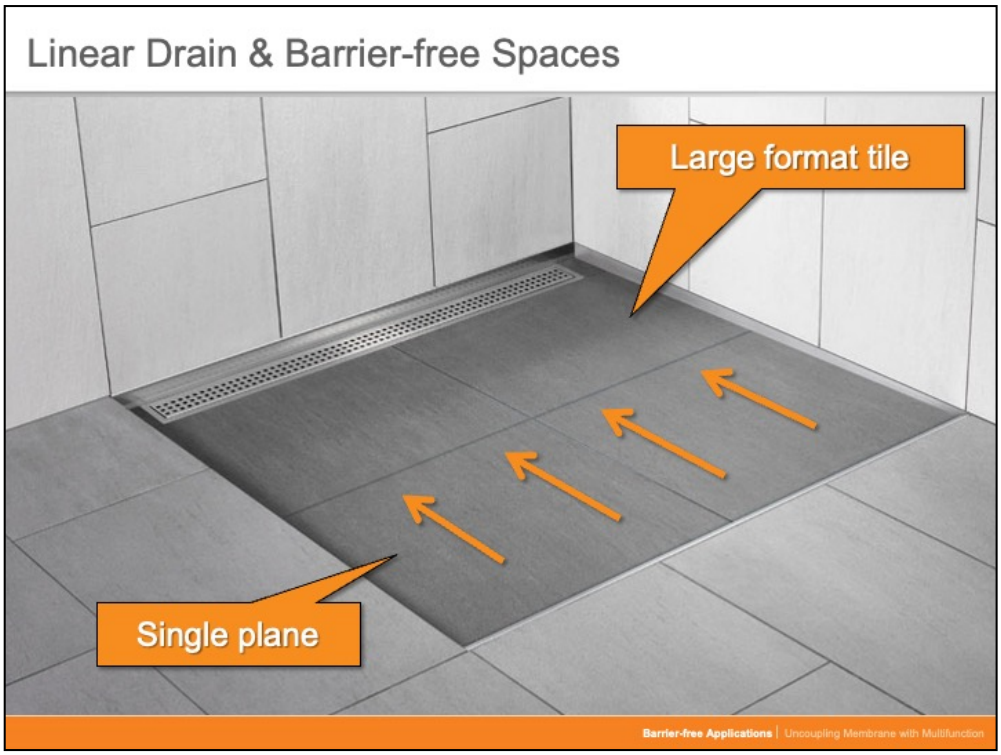
- tile ANSI A108.5
- grout ANSI A108.6, A108.10

Curbless Shower (Substrate)

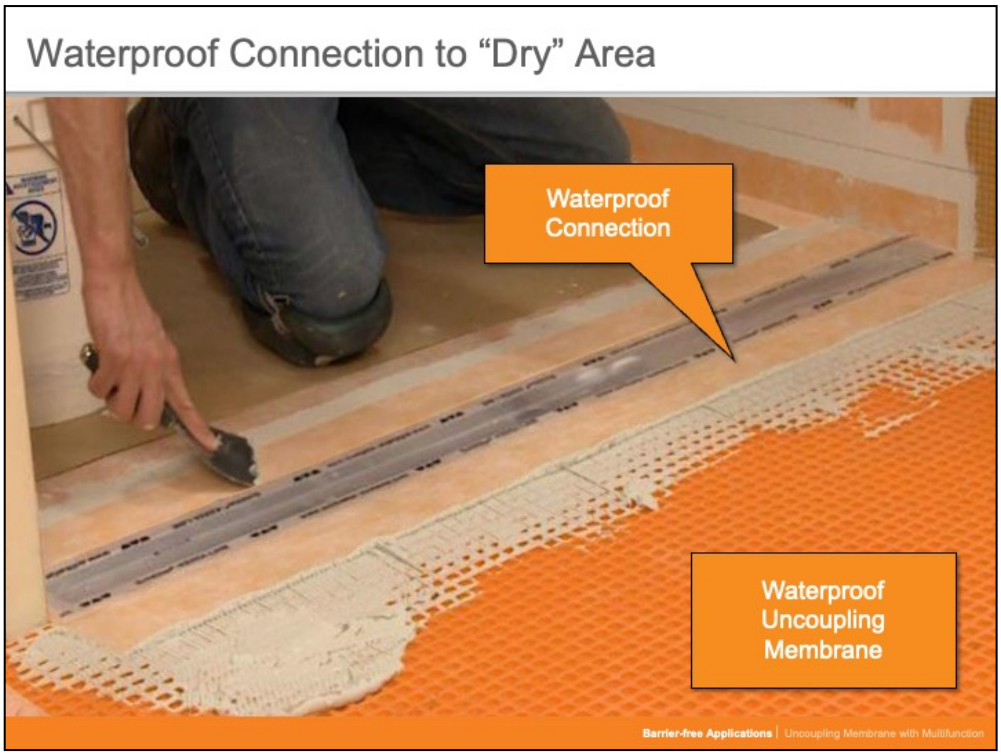




- Here you see most common options
  - Wall adjacent drain placement
  - Center drain placement
  - Entry



- Linear drains can accommodate large format tile because shower floors are sloped on a single plane toward the drain opening.
- This opens up design possibilities that simply aren't there when a shower slopes toward the drain on multiple planes.



- Here you can see a linear drain being installed at the entrance to a shower space.
- Notice how the length of the drain extends flush against each side wall – the length of the drain should be as large as possible for the opening.
- Notice how the laminated collar is being bonded to a waterproof uncoupling mat using thin-set mortar.
- This drain placement offers the benefit of reducing the need to raise the floor outside the shower area.
- This results in a lower overall elevation of the floor in “dry” area of the bathroom.

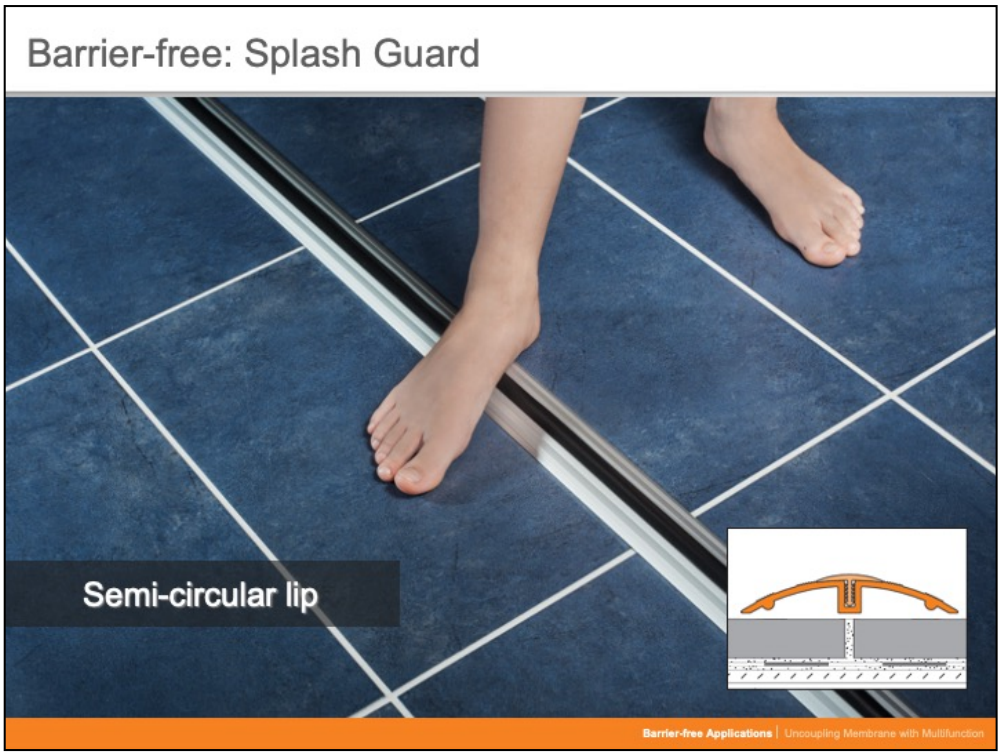
- It is recommended that a **secondary drain** be installed and may be required by some local codes to evacuate any water that accumulates beyond the shower enclosure.

•A two-part profile that forms a splashguard at the entrance of barrier-free showers.

•The anodized aluminum support profile is set in conjunction with the tile covering.

•Can be combined with either a semi-circular lip or a collapsible upright lip.

•Both variants allow for wheelchair accessibility.

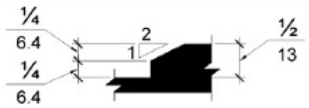


- In addition to managing the water that gets beyond the shower enclosure with a secondary drain, there are ADA-compliant profile strips designed to contain water.
- This profile strip can be used in conjunction with a secondary drain or independently, depending on how much splash water is expected in the environment.

•WSK with a semi-circular insert installed.

Barrier-free Entries

Changes in Level: Tolerances

	Roll-in	Transfer-type
Max. Change in Level	½"	½"
	 Beveled	• Rounded • Beveled • Vertical

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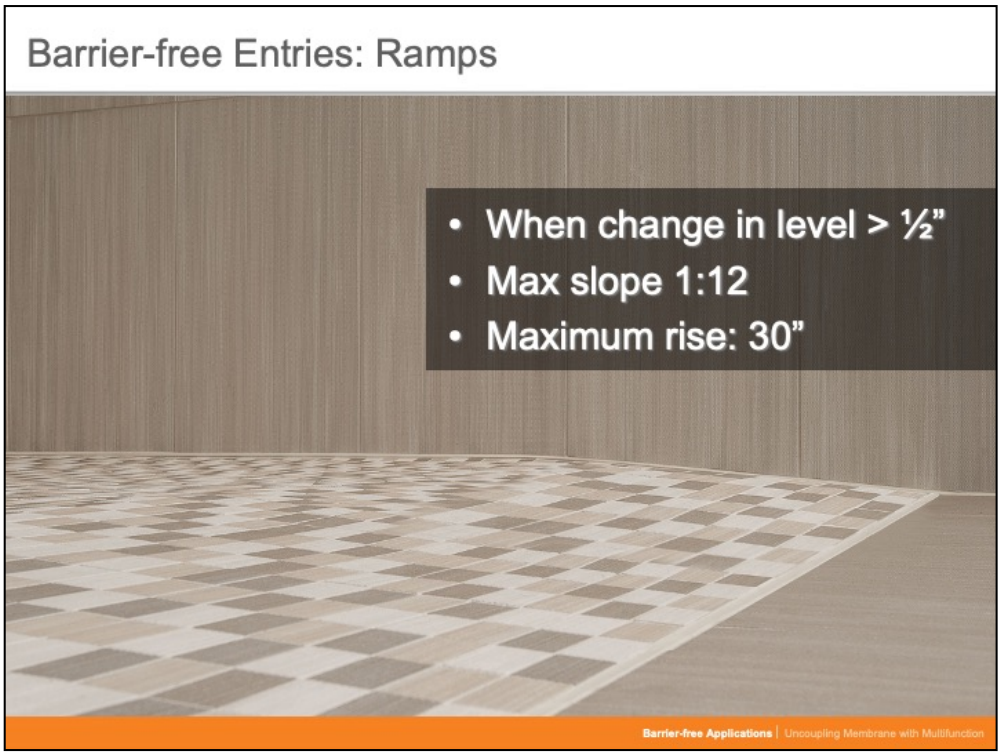
- Let's look at what ADA specifies in relation to changes in level.
- There are tolerances related to changes in level which affects entry into a barrier-free space.
- For both entry into a roll in and transfer-type shower, the max allowable change in height is ½ inch
- However, in a transfer-type compartment
    - thresholds ½-inch (13 mm) high maximum shall be beveled, rounded, *or vertical.*

- Thresholds in roll-in type shower compartments shall be ½-inch (13 mm) high maximum but must be beveled above ¼-inch in accordance with 303.

303.3 Beveled. *Changes in level between ¼ inch (6.4 mm) high minimum and ½ inch (13 mm) high maximum shall be beveled with a slope not steeper than 1:2.*

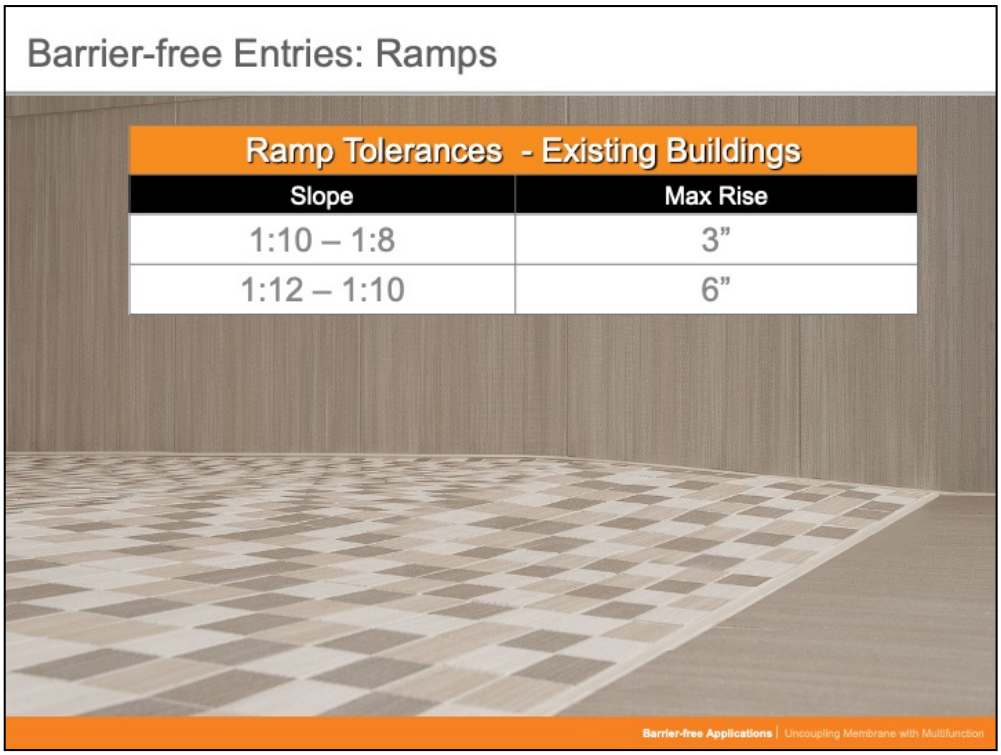
Advisory 303.3 Beveled. *A change in level of ½ inch (13 mm) is permitted to be ¼ inch (6.4 mm) vertical plus ¼ inch (6.4 mm) beveled. However, in no case*

may the combined change in level exceed ½ inch (13 mm). Changes in level exceeding ½ inch (13 mm) must comply with 405 (Ramps) or 406 (Curb Ramps).



- In cases where change in level exceeds ½ inch, a ramp is required
- ADA compliant ramps must have a slope ratio of 2 percent / ¼ inch per foot
- In new construction, ramps must not exceed a slope greater than 1:12
- The maximum rise is 30 inches

- ***303.4 Ramps.*** *Changes in level greater than ½-inch (13 mm) high shall be ramped, and shall comply with 405 or 406.*

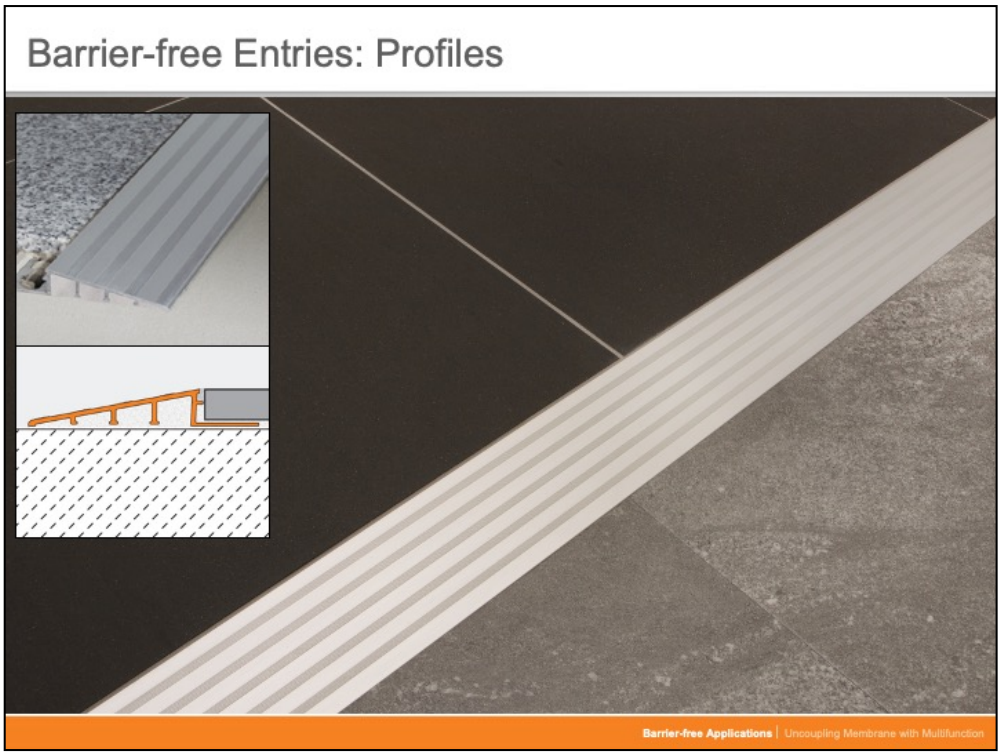


- In existing buildings, slopes may be steeper than 1:12 but limited to rises of 3 inches and 6 inches.
- In no case is a slope allowed to be steeper than 1:8.

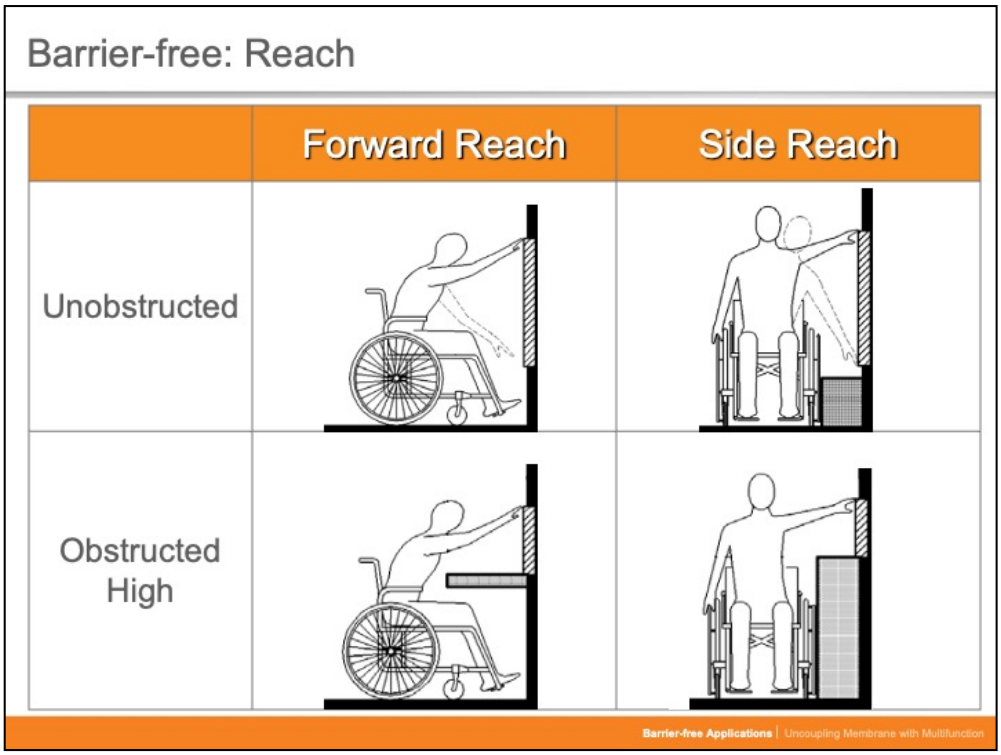
- Here's a pre-fab ramp installed prior to the application of a bonded waterproofing membrane

- Prefab ramps are made from expanded polystyrene
- Appropriate for use in areas that are exposed to moisture, i.e., slab on-grade, slab below-grade
- They are designed for easy integration into a bonded waterproof shower assembly
- Integrate quickly and easily

- This entry complies with acceptable tolerances because of the integration of on ADA-compliant tile edge profile.
- The profile trim also serves to protect the tile assembly from chipping.



Here’s another example of an ADA-compliant tile edge profile.

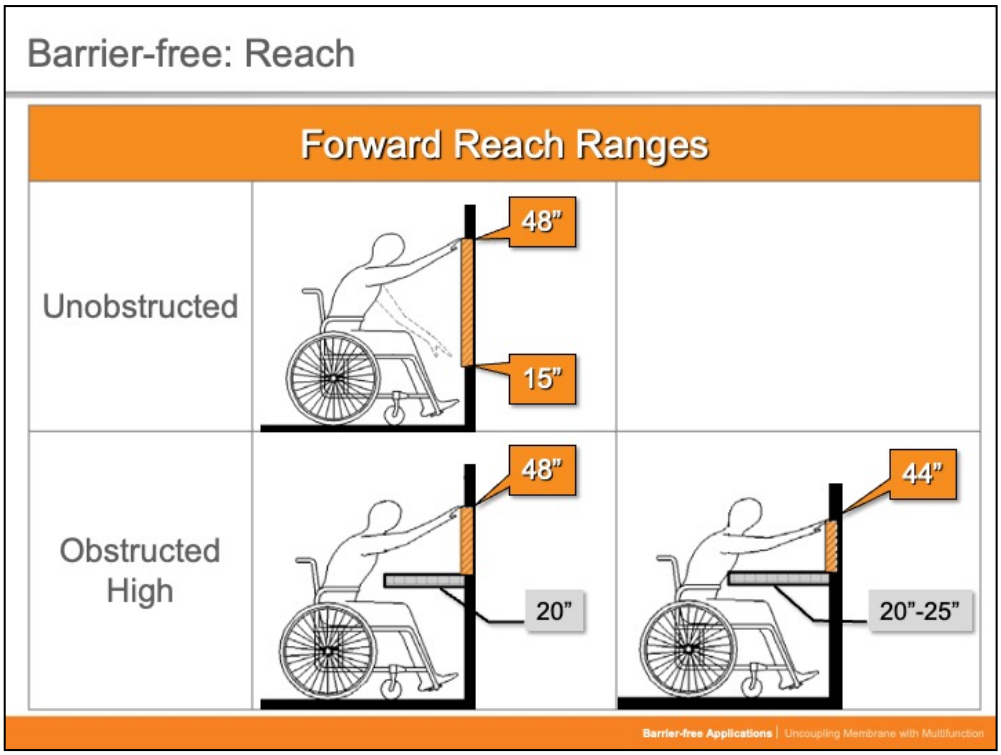


Let's examine reach and the acceptable ranges we need to observe in order to be ADA compliant.

This slide demonstrates what is meant by obstructed and unobstructed reach to the front and side.

- Forward unobstructed
- Side unobstructed high
- Forward obstructed
- Side obstructed high

(308)



When forward reach is unobstructed:

- high forward reach is 48 inches maximum
- low forward reach is 15 inches minimum above the finish floor

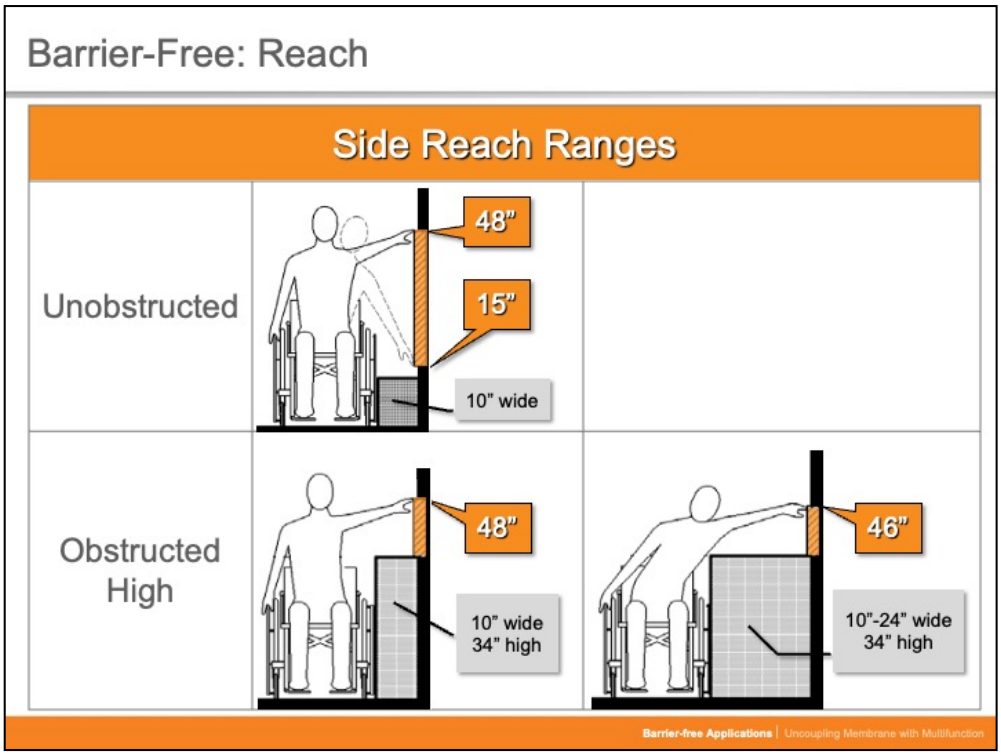
When forward reach is obstructed by a structure up to 20 inches

- High forward reach can remain at 48 inches max

When forward reach is obstructed by a structure from 20 inches to 25 inches

- High forward reach is limited to 44 inches max

(308.2)



These are the permissible ranges for unobstructed and obstructed side reach:

Unobstructed side reach

- When making a parallel approach to the element and the side reach is unobstructed, the high side reach is 48 inches max.
- An obstruction is allowed between the clear floor and the *element* where the depth of the obstruction is limited to 10 inches or less.

Obstructed side reach

- When making a parallel approach to the element and the high side reach is over an obstruction no higher than 34 inches or 10 inches wide, the high side reach is 48 inches max.
- Where the reach depth is 10 inches – 24 inches, the high side reach is 46 inches max.

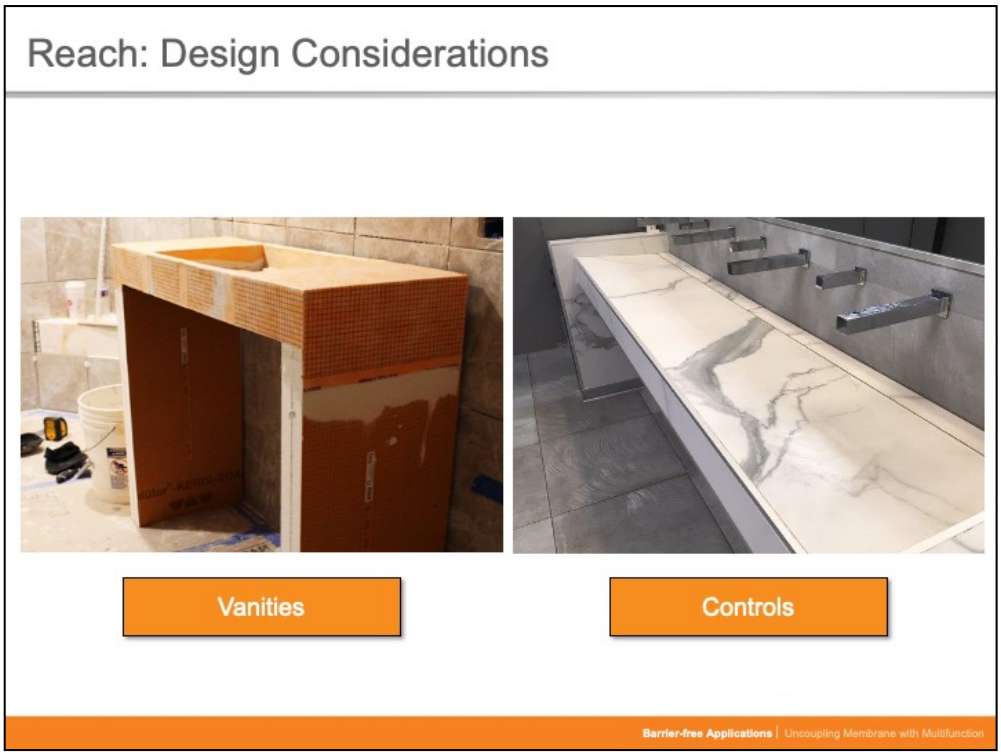
(308.3)

Barrier-Free: Reach (Children)

Children's Reach Ranges				
Forward or Side Reach	Ages 3 – 4	Ages 5 – 8	Ages 9 - 12	Adult (unobstructed)
High (max.)	36"	40"	44"	48"
Low (min.)	20"	18"	16"	15"

- Be aware that when designing primarily for children, the ranges differ based on the age(s) of the child(ren).
- These dimensions apply to either forward or side reaches.

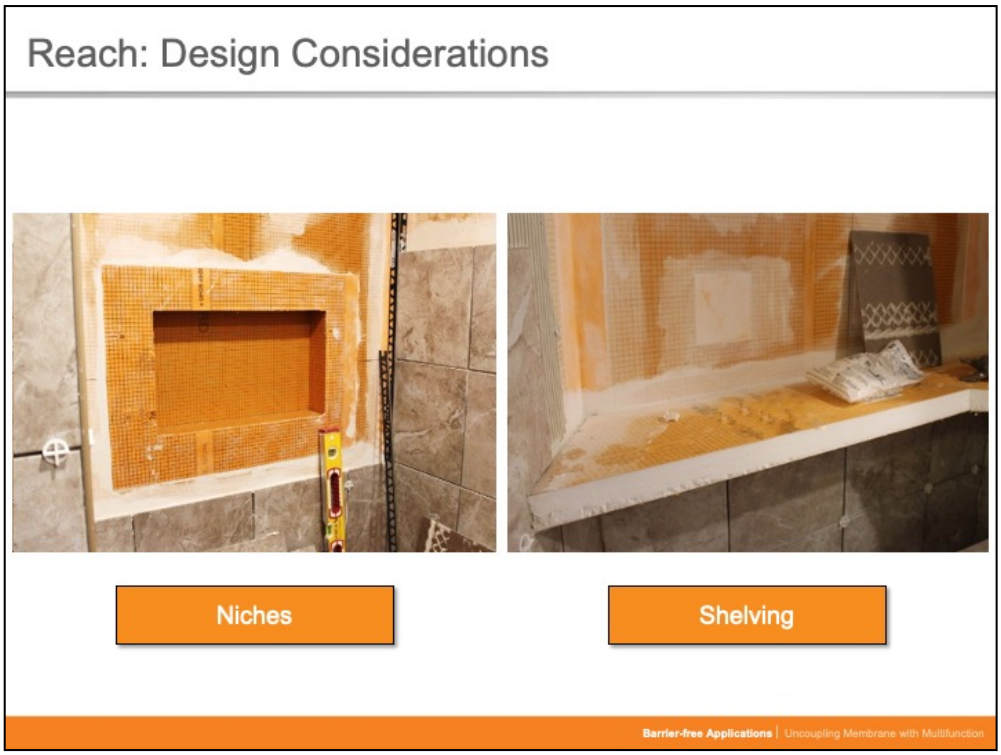
(308)



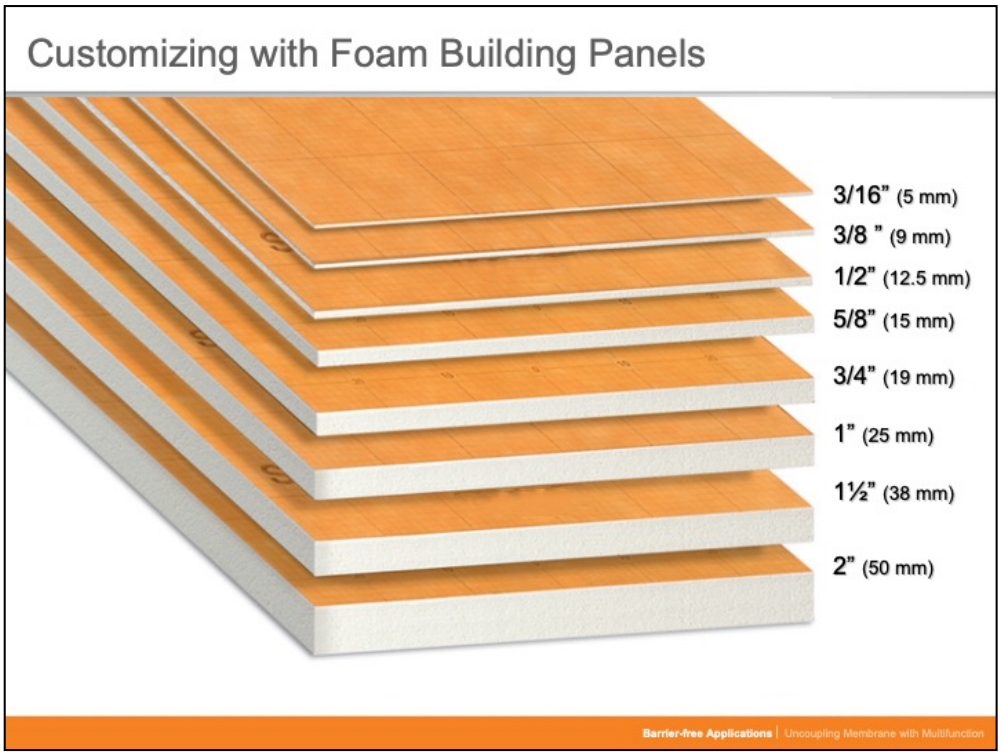
What are some specific situations when need to consider reach tolerances in a barrier-free bathroom design?

- When constructing vanities
- When positioning controls (e.g. faucets, lighting controls, shower controls, grab bars, etc.)

- This cantilevered vanity was constructed so it can be approached by someone in a wheel chair and the controls are within acceptable reach tolerances for obstructed forward reach.



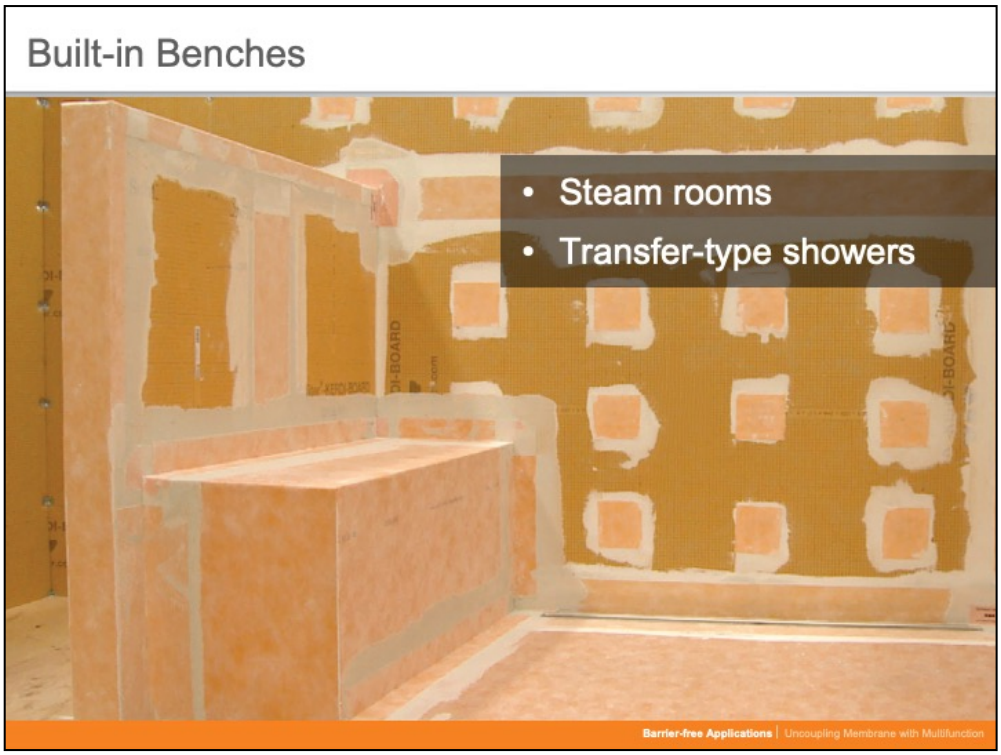
… Some other scenarios when reach tolerances must be considered… When integrating shower niches, and shelving.



- Vanities, shelving can be easily constructed and integrated into ADA-compliant environments.
- These design elements can be built using lightweight, dimensionally stable, foam building panels.
- They are designed for easy integration into a bonded waterproofed sealed shower system.

- Made from the same material as foam building panels, pre-fab niches are a time-saving custom design feature that can also be installed in a b-f environment.
- Again, appropriate placement needs to be considered for ADA compliance.

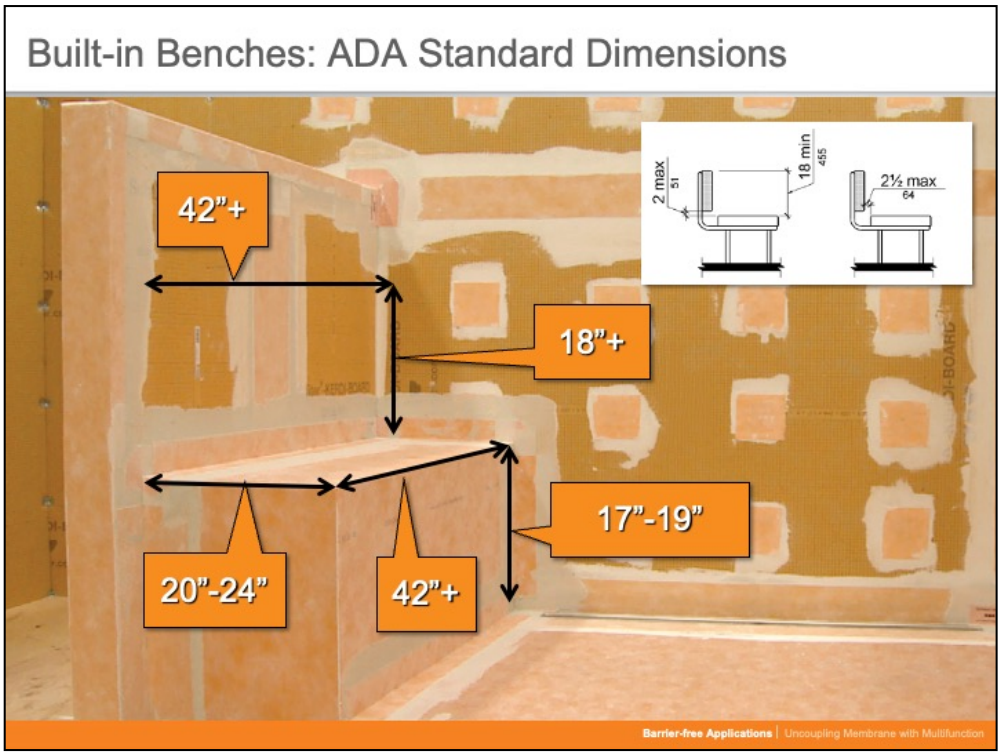
- They are available as pre-formed for “plug and play.”
- They are designed to be integrated easily into a bonded waterproof sealed shower system .
- Offers security of waterproofing integrity.



ADA-compliant <u>built-in</u> benches (i.e., non-folding) can be added to some wet areas:

- i.e., Steam rooms and transfer-type showers

(610, 903)



903.3 Size.

ADA standards dictate that:

Benches shall have seats that are:

- 42 inches long minimum
- 20 inches deep minimum
- 24 inches deep maximum

903.4 Back Support.

The bench shall provide for back support or shall be affixed to a wall.

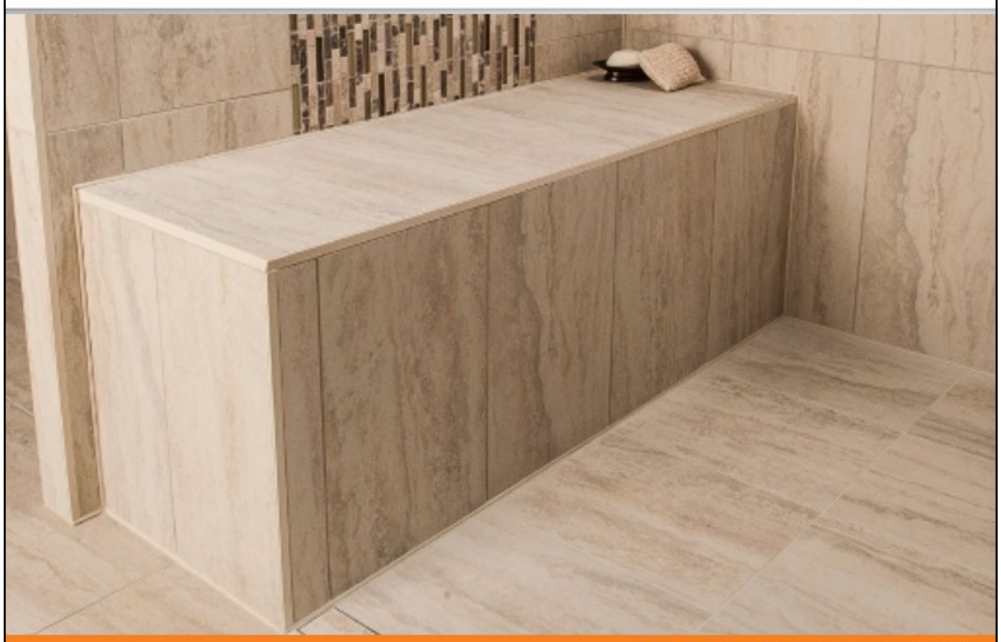
Back support shall be:

- 42 inches long minimum.
- Shall extend from a point 2 inches maximum above the seat surface to a point

18 inches minimum above the seat surface.

- Back support shall be 2½ inches maximum from the rear edge of the seat measured horizontally.

Built-in Benches



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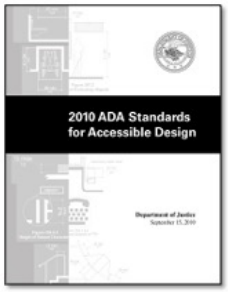
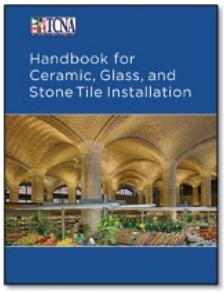
- Using foam building panels, enables limitless design possibilities.
- Allows movement away from traditional utilitarian type benches.
- While maintaining ADA compliancy.

Resources

- ADA (2010)
  - Compliance Design Standards
    - Shower compartments (608)
    - Changes in level (303)
    - Ramps (405)
    - Reach (308)
    - Seating (610, 903)
  - www.ada.gov
- TCNA
  - Installation methods
    - Waterproofing (B421C-16/ B422C-16)





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- Refer to the 2010 ADA standards for Accessible Design for more information on specific tolerances.
- Refer to the TCNA handbook for information of appropriate installation methods.

Waterproofing Barrier-free

	Sheet Membrane	Uncoupling Membrane	PVC Pan Liner
Waterproofing Method			
Where?	• Inside Shower • Walls & floor	• Outside shower • Floors	• Inside shower • Floor
Easy integration between wet & "dry" areas	**Yes**	**Yes**	**No**
Suitable for Barrier-free?	**Yes**	**Yes**	**No**

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Key takeaways with regard to bonded waterproof membranes:

- Waterproofing is required inside and outside of the shower in a barrier-free environment.
- Bonded waterproofing doesn't allow water to penetrate into the supporting substrate.
- Easy to create a waterproof connection at the limit of the shower enclosure.
- PVC pan liners are ill-suited for barrier-free construction

- Barrier-free bathroom environments can be customized while maintaining adherence to ADA standards.
- There are a multitude of products on the market that can be easily integrated into these environments.

Thank you! This concludes the continuing education systems course.

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