

# Overcoming Accessibility Design Challenges in the Restroom with In-Wall Technology

Public restrooms are one of the most critical building amenities because they need to be responsive to a wide range of human needs and address people with an equally wide range of abilities. The needs of a person using a wheelchair – and the space a wheelchair requires – are used as a primary source of design information for making public restrooms accessible to address these needs. Amount of space and paths of travel for wheelchairs and the fixed nature of the plumbing equipment impose finite requirements and limits on design.

However, environments built with accessible design benefit a wide range of users beyond those with special needs, including:

- People with stability and balance issues
- Children and people of different heights
- People of different weights
- People with temporary health problems, such as broken bones or those who are recovering from surgery
- Older people
- Individuals who need assistance with their restroom activities
- Parents attending to their children using strollers and baby changing activities
- Users of mobility equipment such as manual or powered wheelchairs, scooters, crutches, canes, and walkers

Also important are the sensory aspects of a person's abilities that include people with visual impairments such as low vision or blindness as well as deafness.

Clearly, an almost infinite variety of "conditions" define accessibility. Besides space consideration, many components go into designing an accessible restroom including sinks, faucets, hand dryers, toilet fixtures, flush valves, and their corresponding accessories. To simplify the discussion, the primary scope in this paper will focus on one aspect of the restroom that is, perhaps, the essence of the restroom: the single-occupant, accessible compartment area where the toilet and flush valve are located.

## Standards

There are many dimensions to consider when designing accessible restroom compartments in a public restroom. The two primary sources for accessibility information are:

- The Americans with Disabilities Act (ADA) – Architectural Barriers Act (ABA) Accessibility Guidelines (ADAAG)
- The Standard for Accessible and Usable Buildings and Facilities (ICC/ANSI A117.1)

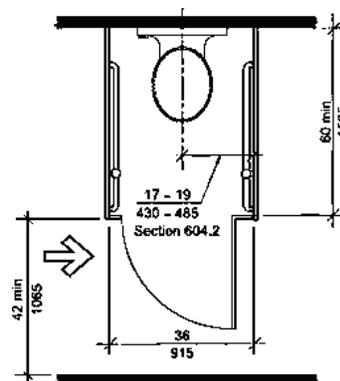
These are only guidelines, and local jurisdictions have the ability to tailor one or both of these references to accommodate local plumbing codes. Facilities that are newly constructed or altered on

or after March 15, 2012 must comply with the 2010 ADA Standards. There are potential penalties for non-compliance. Beyond delaying a Certificate of Occupancy, for example, non-compliant facilities that are found to be in violation of the ADA standard can incur steep fines and even be targeted in lawsuits by the Department of Justice (DOJ)<sup>1</sup>.

There are two basic toilet-compartment designs that are covered in the standards: (1) the Ambulatory Accessible Toilet Compartment and (2) the Wheelchair Accessible Toilet Compartment. The Ambulatory Accessible Toilet Compartment provision supports the needs of individuals who are ambulatory and may require the use of a cane, walker, or crutches. Specifically, the Ambulatory Accessible Toilet Compartment (see Figure 1) needs a depth of 60 inches (1525 mm) minimum, with 2009 ICC/ANSI Standards retaining the 36 inches (915 mm) absolute width dimension (the 2010 ADA Standards allow a range of 35 inches (890 mm) to 37 inches (940 mm) maximum width). In addition, the doors must not swing into the compartment area. Door pull hardware must be installed on both sides of the door near the latch. The toilet must be located on the back wall with the toilet centerline of 17 inches (430 mm) minimum and 19 inches (485 mm) maximum from the side wall or partition.

**Figure 1. Ambulatory**

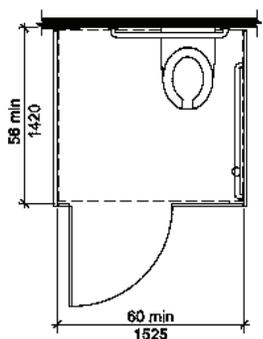
Toilet controls must be in center



**Figure 2. Standard Wheelchair**

Wide open west side –

Toilet controls must be on side



## Footnote

1. In 2009, the Civil Rights Division of DOJ launched an aggressive effort to enforce the Supreme Court's decision in *Olmstead v. L.C.*, a ruling that requires states to eliminate unnecessary segregation of persons with disabilities and to ensure that persons with disabilities receive services in the most integrated setting appropriate to their needs. President Obama issued a proclamation launching the "Year of Community Living," and has directed the Administration to redouble enforcement efforts. The Division has responded by working with state and local government officials, disability rights groups and attorneys around the country, and with representatives of the Department of Health and Human Services, to fashion an effective, nationwide program to enforce the integration mandate of the Department's regulation implementing Title II of the ADA. Pending legislation may be found at this website: [http://www.ada.gov/olmstead/olmstead\\_enforcement.htm](http://www.ada.gov/olmstead/olmstead_enforcement.htm).

Similarly, the Wheelchair Accessible Toilet Compartment (Figure 2) depth must be 56 inches (1420mm) minimum for wall-hung toilets and 59 inches (1500 mm) minimum depth for floor-mounted toilets. The minimum width measured at a right angle from the side wall is 60 inches (1525 mm). The minimum space required in toilet compartments is provided so that a person using a wheelchair can maneuver into position at the toilet. The toilet must be offset on the back wall with the toilet centerline 16 inches (405 mm) minimum to 18 inches (455 mm) maximum from the side wall or partition.

In comparison, a non-ADA toilet compartment only needs to be 30 inches wide (although 36 inches is preferable) with minimum 15 inches from toilet centerline to partition. Plus, the toilet height also differs; accessible toilets are placed 17 to 19 inches in height, whereas most regular toilets are 14 to 16 inches in height.

### Toilet Compartment Standards

Design Criteria	Non-ADA	Ambulatory	Wheelchair
Depth	60" (1525 mm)	60" (1525 mm)	56" (1420 mm) wall mount 59" (1500 mm) floor mount
Width	30-36" (762-915 mm)	36" (915 mm) or 35-37" (890-940 mm)	60" (1525 mm)
Door	Swing inward	Swing outward	Swing outward
Toilet location	Centered	Centered	16-18" from side (405-455 mm)
Flush Controls Location (wall)	Centered	Either Side	Wide Side
Flush Controls Location (height)	NA	44" (1120 mm)	46-48" (1170-1220 mm)
Seated Height Range	14-16" (356-405 mm)	17-19" (430-485 mm)	17-19" (430-485 mm)
Elongated Bowl	YES	YES	YES
Hand Operated Control	YES	YES	YES
Controls Operated with One hand	NO	YES	YES
Maximum Activation Force	NA	5 lbf (22.2 N)	5 lbf (22.2 N)
Automatic Control	YES	YES	YES

As the 2009 ICC/ANSI Standards are adopted by many states and local jurisdictions, it is important to know where the significant overlap with the 2010 ADA Standards resides. The 2010 ADA Standards and the 2009 ICC/ANSI Standards are similar. However, there are some differences in the scope of their requirements and in technical specifications. Therefore, it is imperative that all relevant standards be used in conjunction to ensure compliance with both accessibility standards.

### Solutions

There are always going to be difficulties designing the restroom space while complying with ADA regulations, especially in small, tight areas. The challenge is to find alternative solutions or other innovative methods that do not conflict with standards. Although design solutions should allow for common usage by people with a limited range of motion, nothing in the standard requirements prevents the use of designs, products, or technologies as alternatives to those prescribed, provided they result in substantially equivalent or greater accessibility and usability.

Some people with disabilities, for example, can only use certain features of fixtures and accessories if they can approach them from the left or right side. Both the 2010 ADA and the 2009 ICC/ANSI Standards require left- and right-handed controls. The controls cannot exceed 5 pounds of force (lbf) (22.2 N) to activate. Controls should also be centered over sufficient clear floor space to ensure both left- and right-hand approaches; or two of the same accessory can be provided, one for each type of approach.

One alternative option is to provide a hands-free flush, where the flush is electronic-sensor activated (Figure 3). Electronic actuators offer additional

Figure 3. Sensor Activated

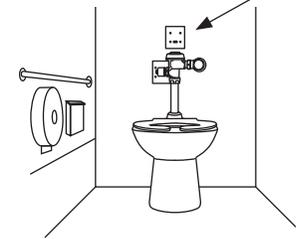
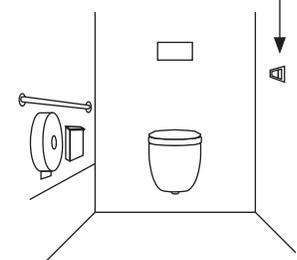
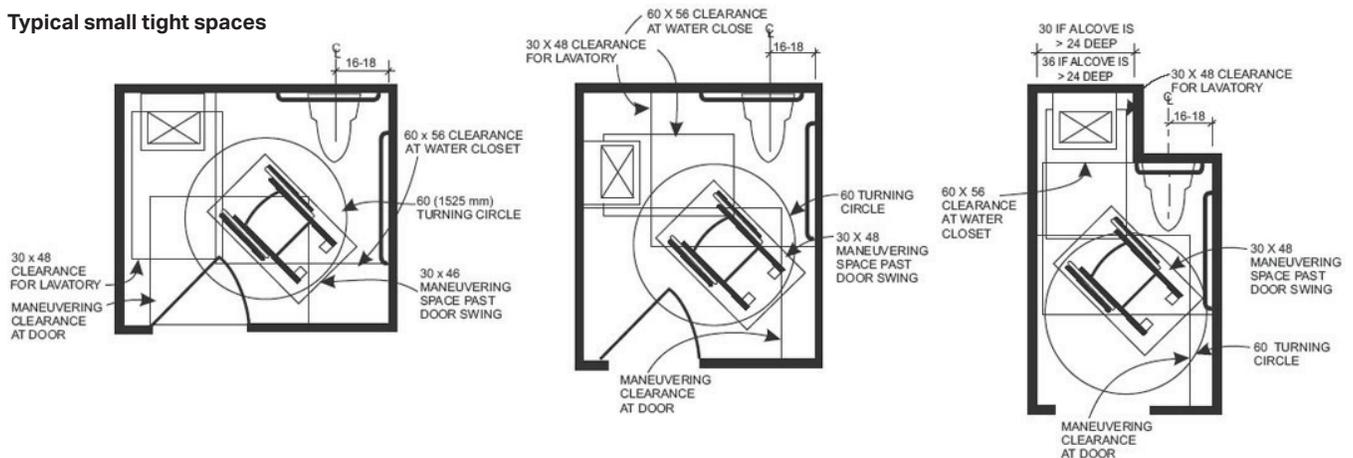


Figure 4. Remote Activated



### Typical small tight spaces

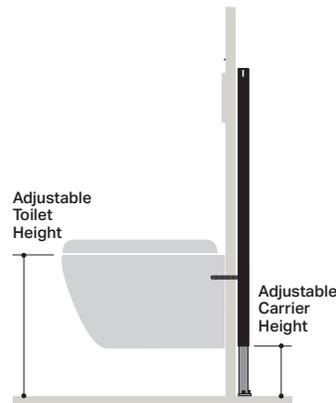


features that promote hygiene in public restrooms. The automatic trap-filling function prevents stubborn odor problems that can occur if the trap is siphoned empty. An automatic hygiene flush, pre-programmed to occur at 24-hour intervals, prevents stagnation in the toilet and pipes.

Another option is a remote flush button/plate (Figure 4) that is mounted within reach on either side of the toilet. This would grant easier access to the flushing mechanism as well as customize to user needs.

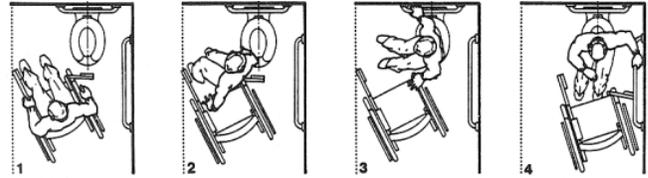
### Why Wall Hung?

Regardless of which toilet compartment is designed, wall-hung toilet bowls are recommended. Providing an ideal seat height in multi-use facilities is a design challenge as people have varying abilities and needs. The wall-hung toilet can more easily accommodate the toilet seat height requirement of a 17 inches (430 mm) minimum to 19 inches (485 mm) maximum measured to the top of the seat. Additionally, toilet seats cannot be sprung to return to a lifted position.

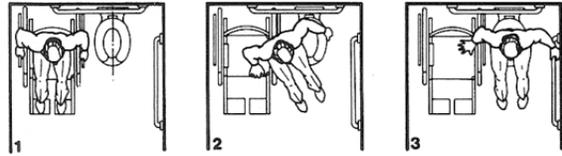


Another advantage of concealed tank and carrier systems for wall-mounted toilets is the in-wall technologies that enable plumbing fixtures to be mounted on the wall, while concealing the functional components behind the wall. Although the fill and flush valves and the supply stop are hidden from sight, these components are easily accessible through flush panels when maintenance is required.

### Diagonal Technique



### Side Technique



The flush panels appear (on the surface) to have only one function—to flush the toilet—when, in fact, they play a key, additional role. Service professionals can simply remove these flush panels to gain immediate access to in-wall plumbing components.

In-wall tank and carrier systems also provide added mobility in the stall by eliminating the flush valve obstruction on the toilet seat. This increases the open space available for maneuvering, further reducing the potential for injury.

In general, when designing the stall space, be aware of the reach ranges and the clear floor space around the water closet, and adhere to the centerline for the water closet.

### References

- ADA  
<http://www.iccsafe.org/cs/standards/A117/Pages/default.aspx>
- ICC/ANSI: Chapter 6 - Plumbing Elements and Facilities, [http://publicecodes.cyberregs.com/icc/ansi/2009/a117p1/icc\\_ansi\\_2009\\_a117p1\\_6\\_section.htm](http://publicecodes.cyberregs.com/icc/ansi/2009/a117p1/icc_ansi_2009_a117p1_6_section.htm)
- ADA Accessibility Guidelines (ADAAG)  
Website 10-16-2014  
[www.access-board.gov/guidelines-and-standards/buildings-and-sites/about-the-ada-standards/background/](http://www.access-board.gov/guidelines-and-standards/buildings-and-sites/about-the-ada-standards/background/)

## Making the hotel guest bathroom accessible

Under the ADA, hotels, motels, inns, and other places of lodging must be usable by persons with disabilities. The toilet criteria for an ADA guest bathroom are similar to the public toilet compartment. The toilet seat height, for example, is the same: toilet height of 17"-19" above the floor. Clearance around a toilet needs to be 60 inches (1525 mm) minimum measured perpendicular from the side wall and 56 inches (1420 mm) minimum measured perpendicular from the rear wall.

Flush controls can be hand operated or automatic. Here too, hand controls cannot exceed 5 lbf (22.2 N) to activate the controls and must be located on the open side of the water closet.

Things such as grab bars, toilet paper dispensers, and seat protector dispensers are allowed to hang into that space, but more obtrusive items such as cabinets are not. A horizontal grab bar along the wall behind the toilet that is at least 36" long

must be mounted 33"-36" above the floor for stabilization and assistance during transfer from a wheelchair. Similarly, the toilet in each accessible bathroom should be centered 18" from the adjacent side wall. In comparison, the criteria is 16"-18" for a public toilet compartment. In addition, a horizontal grab bar along the adjacent side wall that is at least 42" long must be mounted 33"-36" above the floor for stabilization and assistance during transfer from a wheelchair.

# The Argument for In-Wall

As explained in this white paper, Title III of the Americans with Disabilities Act of 1990 (42 U.S.C. 12182(a)) ("ADA" or the "Act") requires that "no individual shall be discriminated against on the basis of disability in the full and equal enjoyment of the goods, services, facilities, privileges, advantages or accommodations of any place of public accommodation by any person who owns, leases (or leases to) or operates a place of public accommodation." Using the word "public" includes both public and private businesses, where "public accommodation" might be defined as a private facility whose operations affect commerce. These "places" include motels, hotels, restaurants, entertainment theaters, auditoriums, grocery stores, and so on.

If the intent of the law is to require that no individual shall be discriminated against in the access of services, then clearly the law pertaining to toilets which human beings require while using these facilities should be extremely important. After all, making the facility accessible and then neglecting the restrooms would be counterproductive. Indeed, the 2010 document was written after the Department of Justice ("DOJ") enforced the ADA Standards for Accessible Design in 1991. These revised ADA Standards for Accessible Design (the "2010 Standards") went into effect in March, 2011, and incorporated the lessons learned over a generation that has passed since the Act's enactment.

But the goal did not change: accessibility. What did change are some of the requirements to achieve accessibility, which are outlined in the

new 2010 document. These changes incorporate toilet compartment considerations, just how far to take accessibility, and why an in-wall solution makes so much sense: because the overall goal of accessibility is removal of obstructions. In fact, the fewer obstructions there are, the more accessible the space becomes. But how much is "more" accessible? This is the question the designer (and owner) must consider. In other words, what is the intent of the law, or do I follow just the letter?

For example, think about the decision to put a flushing mechanism inside the wall (concealed) or outside the wall (exposed). While this seems like a minor consideration, if removal of barriers for maximum accessibility is the goal, the designer should never consider putting this mechanism outside the wall in an ADA toilet compartment. One of the main "barriers" that an in-wall system removes is, in fact, the exposed valve on the toilet. An in-wall system places the flush control behind the wall, creating a clear, more accessible space.

In-wall systems remove one of the main obstacles within the compartment itself: the valve on top of the toilet where the flushing mechanism is usually located. In fact, the law specifically calls out an "advisory" for this condition:

If plumbing valves are located directly behind the toilet seat, flush valves and related plumbing can cause injury or imbalance when a person leans back against them. To prevent causing



injury or imbalance, the plumbing can be located behind walls or to the side of the toilet; or if approved by the local authority having jurisdiction, provide a toilet seat lid.

While it does not mandate an in-wall system, if true accessibility and "removal of barriers" is our goal, there is no argument.

Furthermore, Section 604.6 Flush Controls, states that while flush controls can be hand operated or automatic, they must comply within Section 309. That section states that operable parts should be within the reach ranges in Section 308, where in (308.2.1 Unobstructed) it guides us by saying "the high forward reach shall be 48 inches (1220 mm) maximum and the low forward reach shall be 15 inches (380 mm) minimum above the finish floor or ground." With an in-wall system, this is exactly where the flush plate can be located.

Furthermore, as stated earlier, operable parts shall be operable with one hand and "shall not require tight grasping, pinching, or twisting of the wrist." The force required to activate such parts shall be 5 pounds (22.2 N) maximum. Yet there are exceptions, e.g., gas pump nozzles shall not be required to provide operable parts that have the 5 lbf (22.2 N) maximum activating force. In fact, "automatic" controls may be the best option.

### **How Much is Too Much**

Some arguments put forth against such solutions revolve around costs. However, there are counter arguments within the law itself – specifically, 28 CFR 35.151 New construction and alterations, Section (b) Alterations, which contains the following:

(A) Alterations made to provide an accessible path of travel to the altered area will be deemed disproportionate to the overall alteration when the cost exceeds 20% of the cost of the alteration to the primary function area.

The question — does the "path of travel" include the actual flushing controls involved in toilet activities, or is the compartment itself simply part of the path? — is also within the document:

"When the cost of alterations necessary to make the path of travel to the altered area fully accessible is disproportionate to the cost of the overall alteration, the path of travel shall be made accessible to the extent that it can be made accessible without incurring disproportionate costs."

But what does that mean? In fact, why should the expenditure required to provide accessibility be capped at 20% — especially in the very personal nature of "toilet?" Clearly serving a human need, the toilet compartment should have the highest consideration when it comes to accessibility, which in this case includes "path of travel." And the law, in fact, contains language defining costs that may be counted as expenditures required to provide an accessible path of travel, which includes those costs "associated with making restrooms accessible, such as installing grab bars, enlarging toilet stalls, insulating pipes, or installing accessible faucet controls."

In this very real sense, ADA Standards for Accessible Design (the "2010 Standards") approach the concept of Universal Design, which involves designing products and spaces so that they can be used by the widest range of people possible. If designers and building owners subscribe to this concept — which by the way evolved from Accessible Design — considerations such as in-wall toilet systems become obvious choices. Recognizing there is a wide spectrum of human abilities, the DOJ in their Guidance on the 2010 ADA Standards for Accessible Design (September 15, 2010) noted that one of the discussion points revolved around a recommendation that all accessible toilet facilities, toilet rooms, and compartments be required to have signage indicating that such spaces are restricted solely for the use of individuals with disabilities. DOJ ruled that such signage "is neither necessary nor appropriate to restrict the use of accessible toilet facilities." They rightly concluded that "Like many other facilities designed to be accessible, accessible toilet facilities can and do serve a wide range of individuals with and without disabilities."

Designing for human diversity makes things easier for all people to use. Because they accommodate the widest range of human abilities, in-wall toilet systems are a clearly superior choice when it comes to accessibility in toilet compartments.