# FUNCTIONAL PLANNING

# 1

# HUMAN FACTORS

Human factors information refers to the variables that affect human performance in the built environment, such as human physiology and human psychology. Data accumulated from the fields of engineering, biology, psychology, and anthropology are integrated in this multidisciplinary field. "Fit" describes a design that uses human factors information to create a stimulating but nonstressful environment for human use. Some areas of fit are physiological, psychological, sensual, and cultural.

## ANTHROPOMETRICS AND ERGONOMICS

The field of anthropometrics provides information about the dimension and functional capacity of the human body. "Static anthropometrics" measures the body at rest; "dynamic anthropometrics" measures the body while performing activities defined as "work." Dimensional variation occurs in anthropometric data because of the large range of diversity in the human population. To utilize anthropometric charts effectively, a designer must identify where a subject user group falls in relation to these variables. The factors that cause human variations are gender, age, ethnicity, and race. Patterns of growth affected by human culture cause variation in human measure as well. Percentiles that refer to the frequency of occurrence describe dimensional variation on anthropometric charts: that is, the mean percentile (50 percent), the small extreme percentile (2.5 percent), and the large extreme percentile (97.5 percent). "Ergonomics" is the application of human factors data to design. This term was coined by the U.S. army when it began to design machines to fit humans, rather than trying to find humans to fit machines.

## HUMAN BEHAVIOR

Human behavior is motivated by innate attributes such as the five senses and by learned cultural attributes. Each human has a unique innate capacity to gather sensual information. How that information is understood is determined by personal and cultural experience. "Proxemics" is the study of human behavior as it relates to learned cultural behavior. Human behavior is motivated by the innate nature of the animal, and this behavior is expressed and modified by each person's learned culture and traditions.

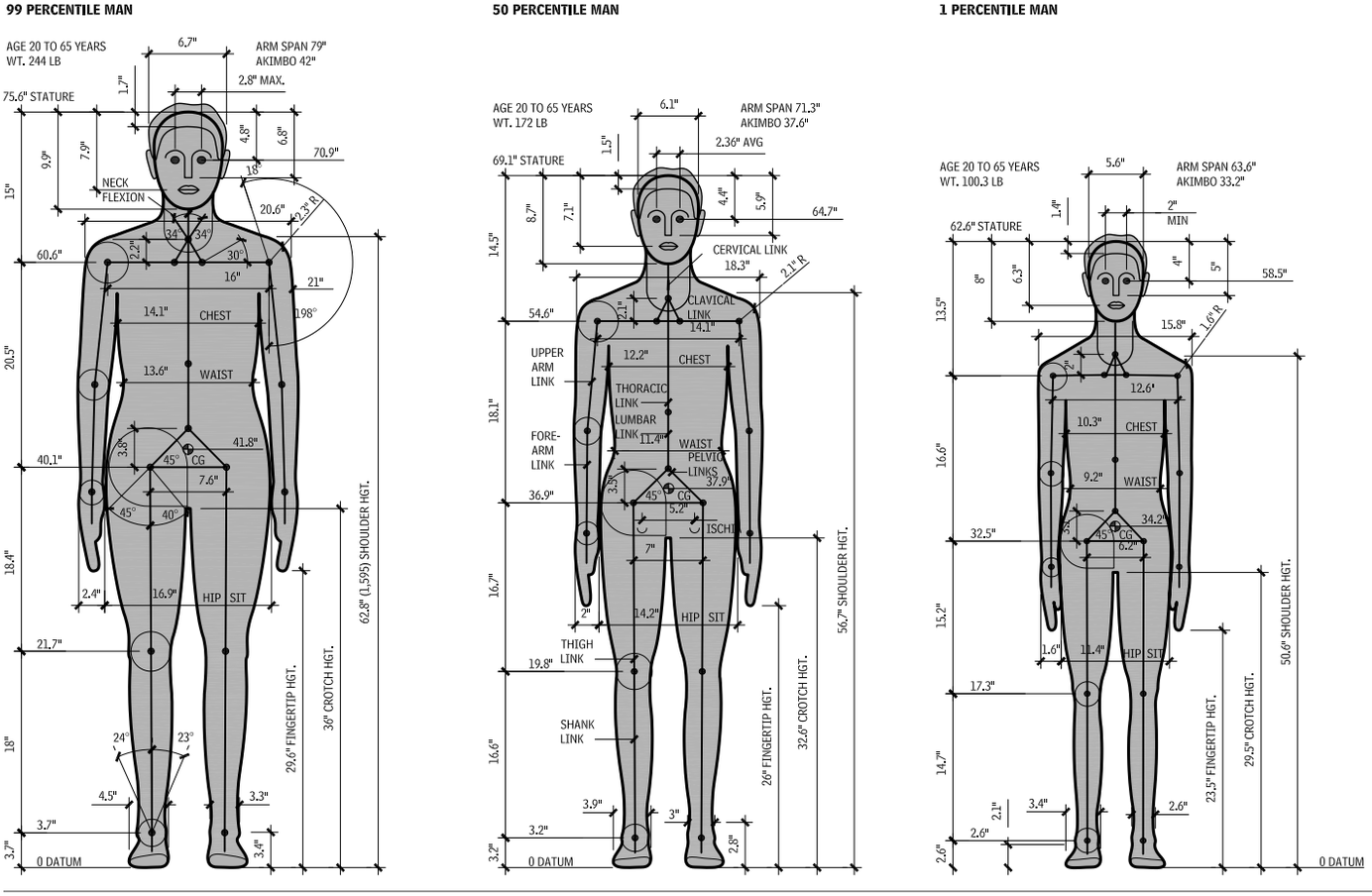
## INNATE HUMAN ATTRIBUTES

The five senses determine human comfort levels in the environment and are a part of human factors studies.

- *Site:* Behavioral scientists agree that, for human beings, seeing is the most engaged sense for gathering information. Physical form is perceived when visual data is organized into patterns, and that data is integrated with memories and emotions. Visual form is perceived as having a context with boundaries. Visual form can be understood to be a dynamic system of directional lines of forces that are innate, kinetic, and independent of the representational content of a form. Once a form's attributes have been perceived, humans tend to give the perceived form symbolic meaning. This meaning is cultural and personal, resulting from associations and past experiences.
- *Touch:* Touch is essential to human development and growth. Texture is learned most completely through skin contact. Human skin is sensitive to temperature, pain, and pressure. Vision and touch are interwoven in sighted humans. Memory of tactile experiences allows humans to understand their environment through visual scanning.
- *Hearing:* Humans can use hearing to determine distances. Sound moves in concentric circles and in horizontal and vertical planes. The ear transmits these airborne vibrations to the brain where it is processed and assigned meaning. The ability to focus hearing is called "sensory gating." The ability to gate sound varies and diminishes with aging.
- *Smell and taste:* Research about smell is difficult to conduct because human sensitivity to smell is highly variable over time and from person to person. A person's sense of smell to an odor can fatigue quickly during exposure. Smell is defined in terms of commonly perceived odors such as flowery, putrid, burned, resinous, and spicy. Taste and smell are closely related in human experience.

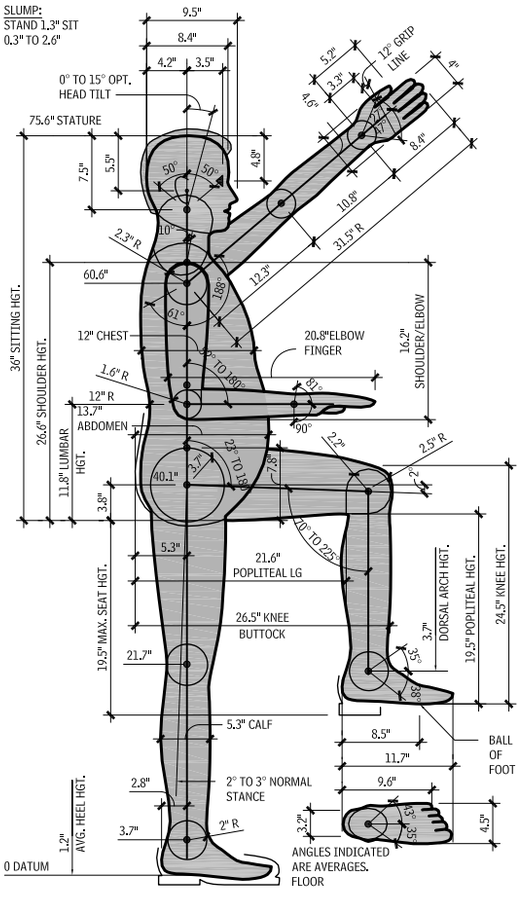
## ANTHROPOMETRIC DATA

**MEASURE OF MAN—FRONT VIEW**
**1.1**

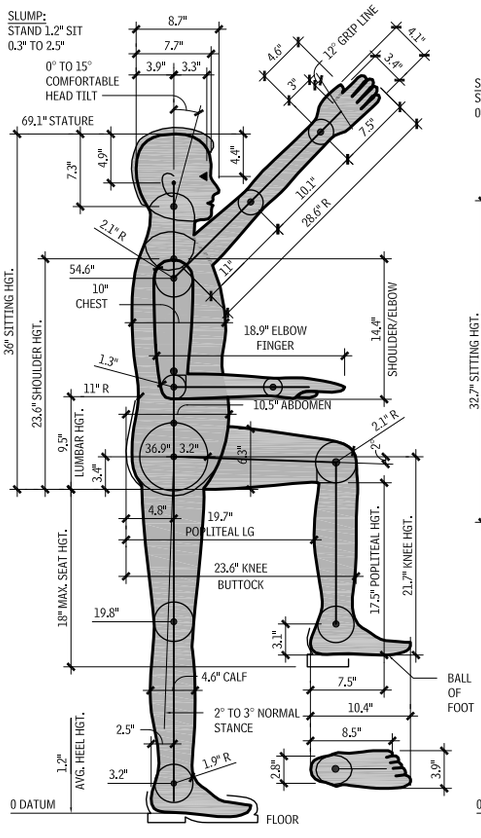


## MEASURE OF MAN—SIDE VIEW
## 1.2

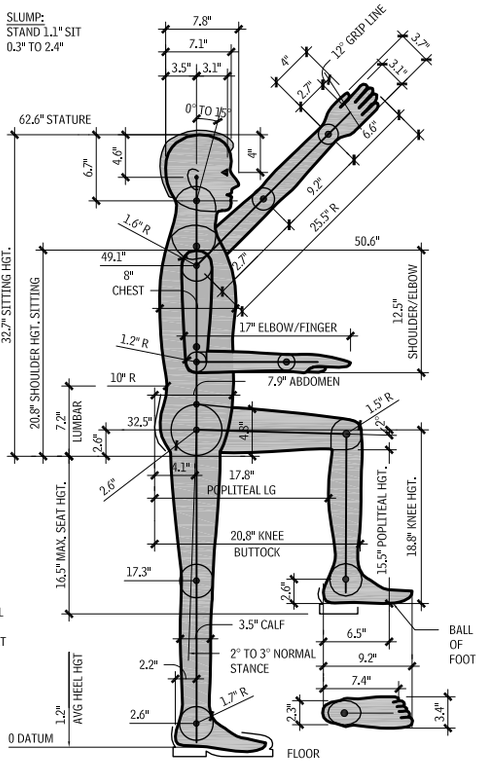
**99 PERCENTILE MAN**




**50 PERCENTILE MAN**

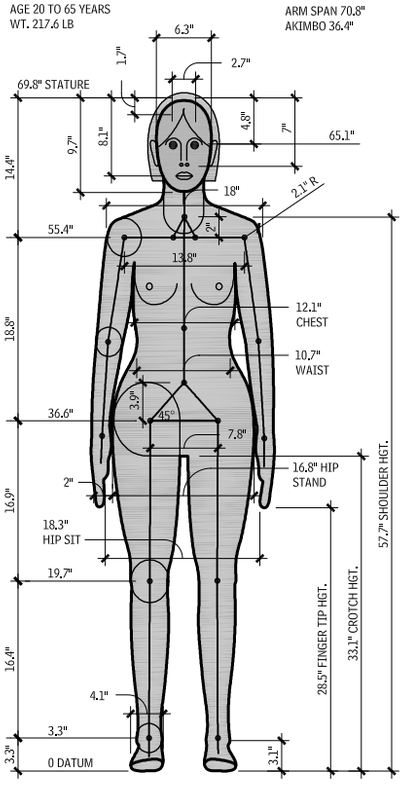



**1 PERCENTILE MAN**



**MEASURE OF WOMAN—FRONT VIEW**
**1.3**

**99 PERCENTILE WOMAN**

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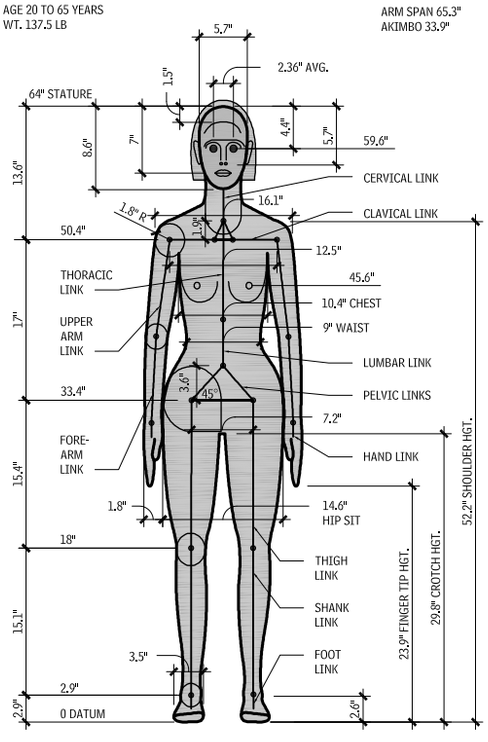


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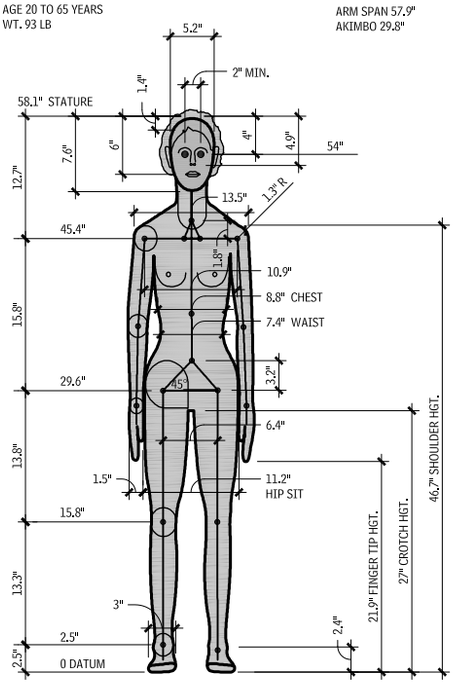
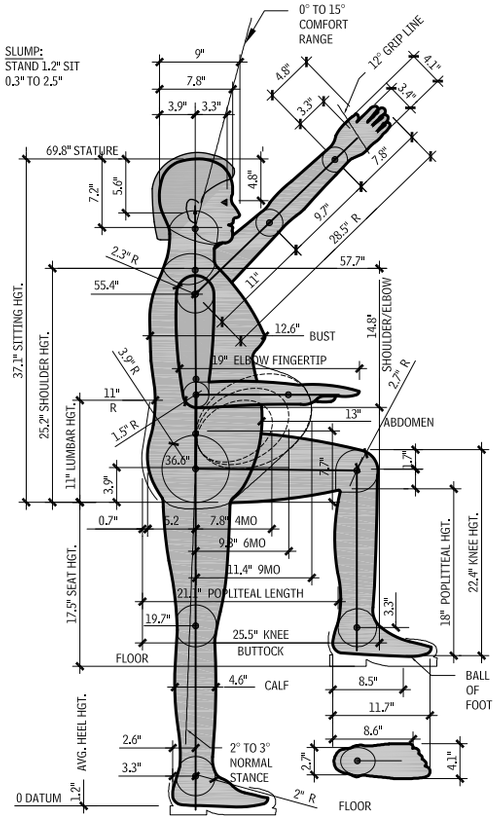


## MEASURE OF WOMAN—SIDE VIEW
## 1.4

**99 PERCENTILE WOMAN**

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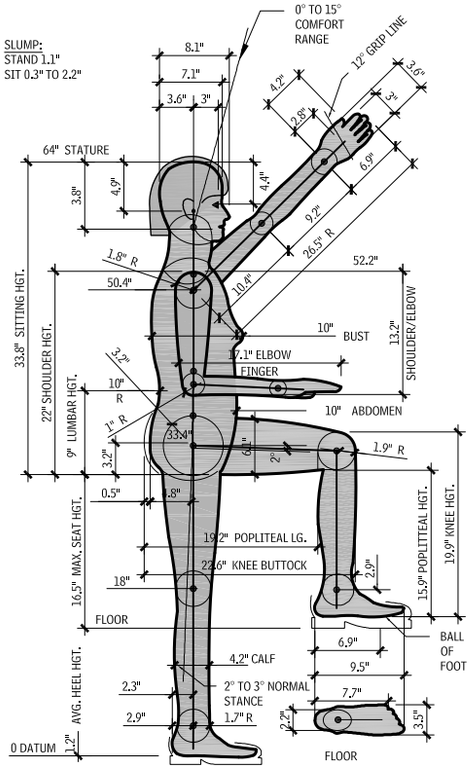


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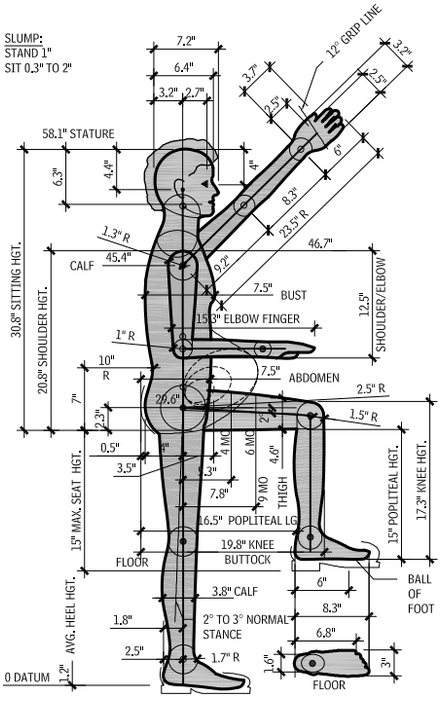
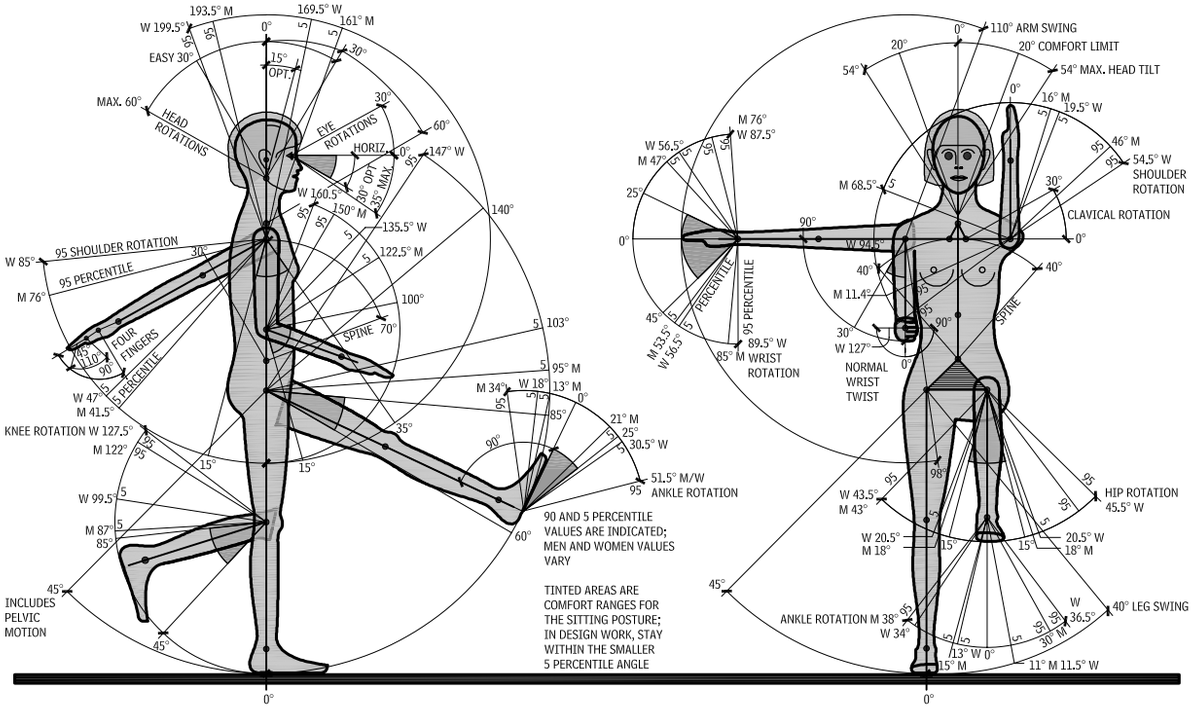
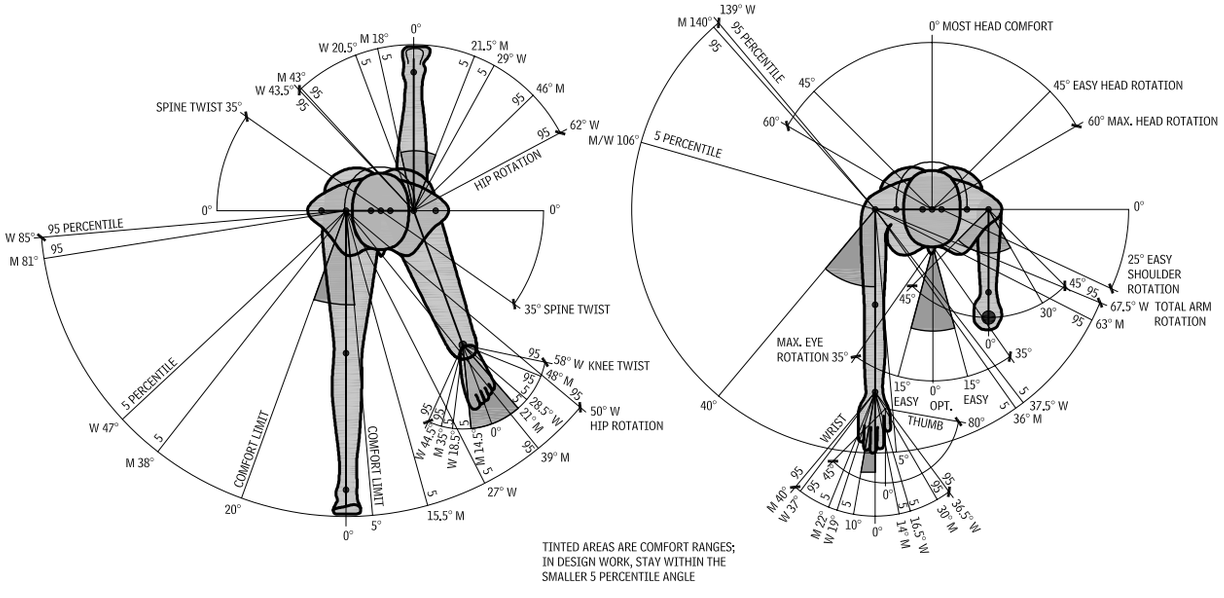


**ANGLE MOVEMENTS OF BODY COMPONENTS**
**1.5**




**ANGLE MOVEMENTS OF BODY COMPONENTS—TOP VIEW**
**1.6**




**NOTE**

1.1–1.6 Timeline data adapted from Papilia and Wendkos Olds, 1989.

Contributor:
Alvin R. Tilley, Henry Dreyfus Associates, *The Measure of Man & Woman: Human Factors in Design,* John Wiley & Sons, New York, 2001.

# UNIVERSAL AND ACCESSIBLE DESIGN

"Universal design is a process that enables and empowers a diverse population by improving human performance, health and wellness, and social participation" (Steinfeld and Maisel, 2012). Proponents of universal design view it as an approach to good design, and they posit that by considering the full range of human ability across our lifetimes (small/big, young/old, with varying abilities across every size and every stage of life), designers can provide better environments for everyone. In short, "Universal design strives to make life easier, healthier, and friendlier for all people" (Steinfeld and Maisel, 2012). While universal design must also be accessible, it exceeds the minimum requirements of accessible design standards to provide optimum conditions for people with and without disabilities.

Some equate universal design with accessible design; however, there are distinct differences. Accessible design is the design of a certain percentage of features to conform to technical requirements as required by laws such as the Architectural Barriers Act (ABA), the Rehabilitation Act, the Fair Housing Amendments Act (FHAA), and the Americans with Disabilities Act (ADA). It does not guarantee inclusion for everyone, nor does it guarantee good design in a holistic sense.

This section will explain the differences and relationship between these two very different approaches to design. One addresses the full range of human experience and abilities and the other derives from an accommodation model that has a narrower focus. The section will provide details on the basic minimum requirements for accessible design and offer suggestions on where designers should exceed the minimum to provide a more welcoming and inclusive environment for all people by addressing universal design goals.

This section is divided into three subsections:

- *Universal design:* This subsection will provide a background on the philosophy and goals of universal design and present four case studies of universal design in public buildings and housing.
- *Accessible design:* This subsection will discuss the legislative history and regulatory process of accessible design and introduce important federal laws such as the Americans with Disabilities Act (ADA), Fair Housing Amendments Act (FHAA), Architectural Barriers Act, and the Rehabilitation Act.
- *Technical criteria:* This subsection will provide detailed drawings for how to comply with key accessible design standards and provide suggestions on how to exceed those standards to exemplify best practices in universal design.

## UNIVERSAL DESIGN

Our bodies and minds are in a constant state of change across our lifetime. We are not static. We are also exceedingly diverse—young and old, small and big, fast and slow; we come in shades of many skin colors and with many different backgrounds, aspirations, and ways of life. Increasingly, we humans are gaining more control over our world, our bodies, and our minds. To design universally is to design for improving the human experience of the built environment for all. It recognizes that the designed environment can improve life experiences at the individual and societal level. Universal design is a manifestation of the increasing control we have over our world, through discovery and application of knowledge. In addition to being a philosophy that puts the needs of people first, universal design has a practical side as well. Universal design is a continual improvement process that seeks to achieve the best possible outcomes with the means available, recognizing that not every project and context has the resources available.

Universal design is most successful when fully integrated within a project. As a design movement, it is the result of a meeting of minds between human-centered design approaches and the disability rights movement. In the 1970s, architect Michael Bednar suggested that the value of "barrier free design," the term used at the time to address the removal of design practices that discriminated against people with disabilities, extends to all of us, not just the few barrier free environments (*Barrier Free Environments*, Stroudsburg, PA: Dowden, Hutchinson, and Ross, Inc., 1977).

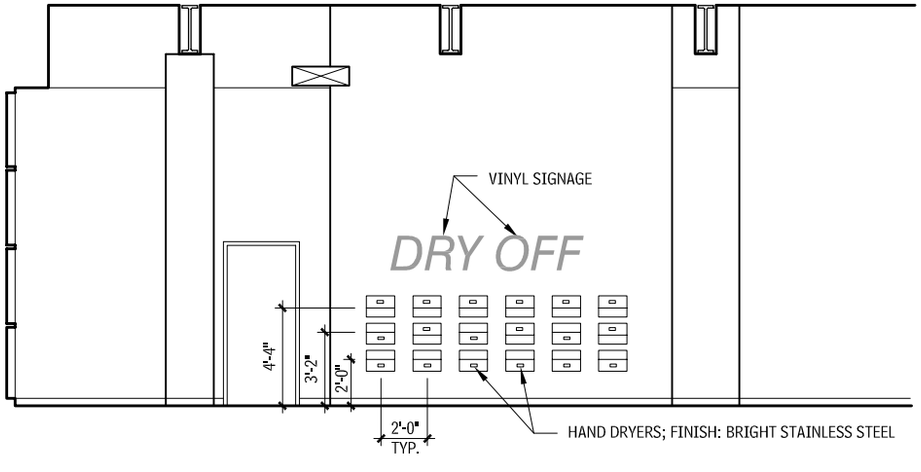
Ron Mace would give the movement its name and its first definition in his book, *Universal Design: Barrier Free Environments for Everyone* (Los Angeles, CA: Designers West, 1985): "Universal design is the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design."

In the 1990s, Mace worked with a group of fellow advocates and designers (architects, product designers, engineers, and environmental design researchers) to create the Principles of Universal Design, providing a conceptual framework for implementing universal design as an essential part of good design. The authors of the Principles argued that there was a business case for widespread adoption of the concept—increasing markets through the design of more usable products and environments. This marked a significant shift away from the regulatory approach taken by codes and standards. The Principles included a set of design criteria focused primarily on issues of usability: (1) equitable use, (2) flexibility in use, (3) simple and intuitive use, (4) perceptible information, (5) tolerance for error, (6) low physical effort, and (7) size and space for approach and use.

While the Principles proved to be valuable to early adopters of universal design, proponents of the concept across the world recognized that usability alone is not sufficient to encourage widespread adoption and to address design goals important to the broader population (see Steinfeld and Maisel, 2012). For example, more usable environments alone do not necessarily open opportunities for participation in society for people with disabilities, women, or minority groups. What good is a more usable school building to women if the schools do not provide enough security for their safe education? Additionally, a neighborhood design that does not support walking contributes to increased levels of obesity and further disability, regardless of how usable the buildings in a community might be. In addition, the Principles did not provide any evidence base or benchmarking strategy for achievement. In order to encourage adoption by the broader professional community and public, the Center for Inclusive Design and Environmental Access (IDeA Center) at the University at Buffalo—State University of New York developed eight Goals of Universal Design to complement the Principles. Each of the eight goals represents specific outcome measures and corresponds to a knowledge base from research in fields including human performance, social participation, and wellness. The first four goals focus on human performance in the knowledge areas of anthropometry, biomechanics, perception, and cognition, while the last four goals address health and social participation outcomes.

### WATER PLAY ENVIRONMENT—WALL OF DRYERS 1.7

Architect Koning Eizenberg Architecture and the exhibit designers, Springboard Architecture Communication Design, turned a mundane hand dryer into something more at the Pittsburgh Children's Museum. They took an object that is simple to use and clear in its utility, multiplied it, mounted it within multiple reach ranges, and transformed it into an experience.




## EIGHT GOALS OF UNIVERSAL DESIGN

### GOAL ONE: BODY FIT

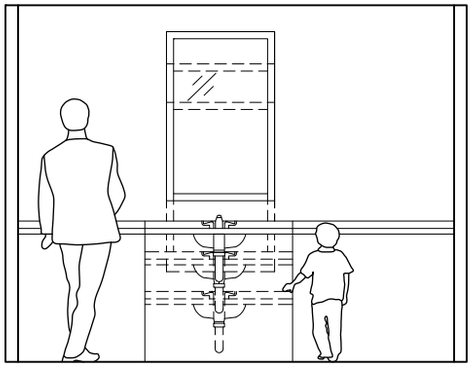
Accommodate a wide range of body sizes and abilities (see Figure 1.7).

### GOAL TWO: COMFORT

Keep demands within desirable limits of body function (see Figure 1.8).

### ADJUSTABLE-HEIGHT LAVATORY AND VANITY 1.8

In addition to achieving the goals of body fit and personalization, this adjustable-height lavatory and vanity allows adults and children to comfortably reach the faucets and use the mirror.



**NOTE**

1.7 Springboard Architecture Communication Design LLC, Pittsburgh.

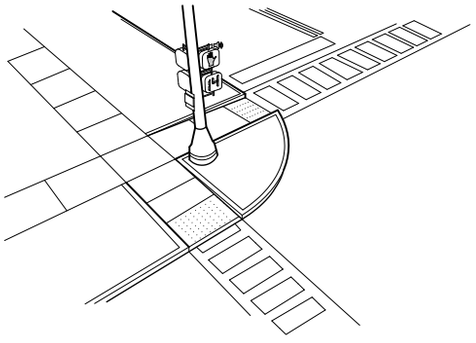
Contributors:
Dr. Ed Steinfeld, AIA and Jonathan White, Center for Inclusive Design and Environmental Access (IDeA Center), University at Buffalo, New York

## GOAL THREE: AWARENESS

Ensure critical information for use is easily perceived.

### MULTISENSORY INTERSECTION DESIGN
**1.9**

This intersection design has several features that improve awareness for all people. Curb ramps with return curbs guide pedestrians in the direction of the safe crossing zone. The detectable warnings let people know they are about to enter the street. Countdown timers, pictograms, and an audible beacon all let people know when it is safest to cross while high-contrast markings alert drivers to the presence of a crossing zone.

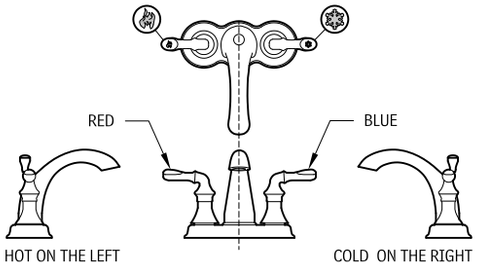


## GOAL FOUR: UNDERSTANDING

Methods of operation and use are intuitive, clear, and unambiguous.

### FAUCET FOLLOWING COMMON CONCEPTUAL MODEL
**1.10**

This faucet follows the common conceptual model of having the cold lever on the right and hot on the left. The faucet is coded with color and pictograms to aid in understanding by children and non-English speakers: blue snowflake for cold, red flame for hot.

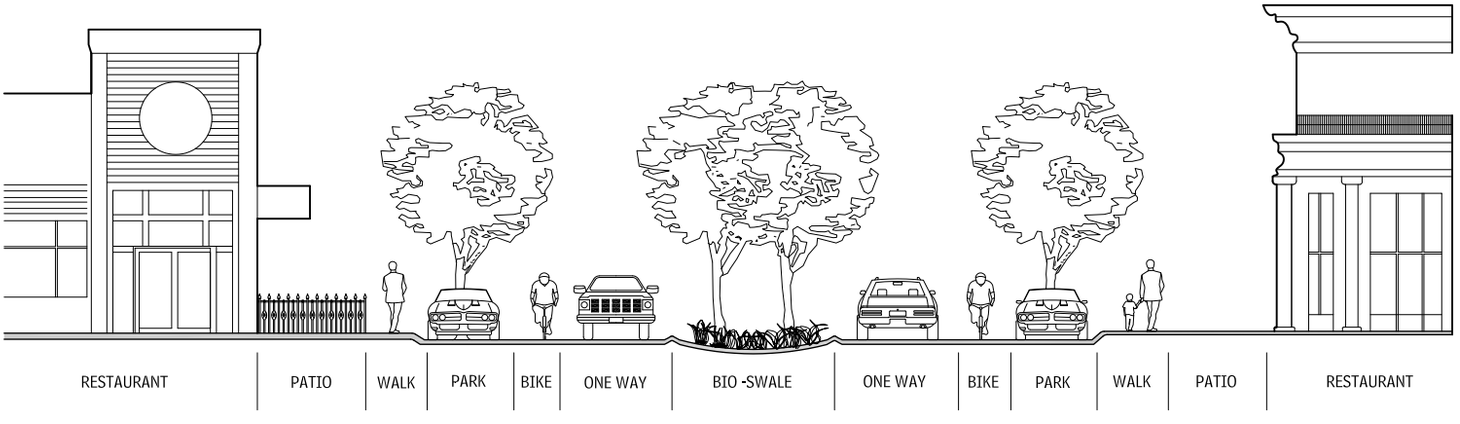



## GOAL FIVE: WELLNESS

Contribute to health promotion, avoidance of disease, and prevention of injury.

### MULTIMODAL STREETSCAPE SECTION
**1.11**

This right-of-way provides a choice of transportation method, encouraging healthy alternatives to the automobile.



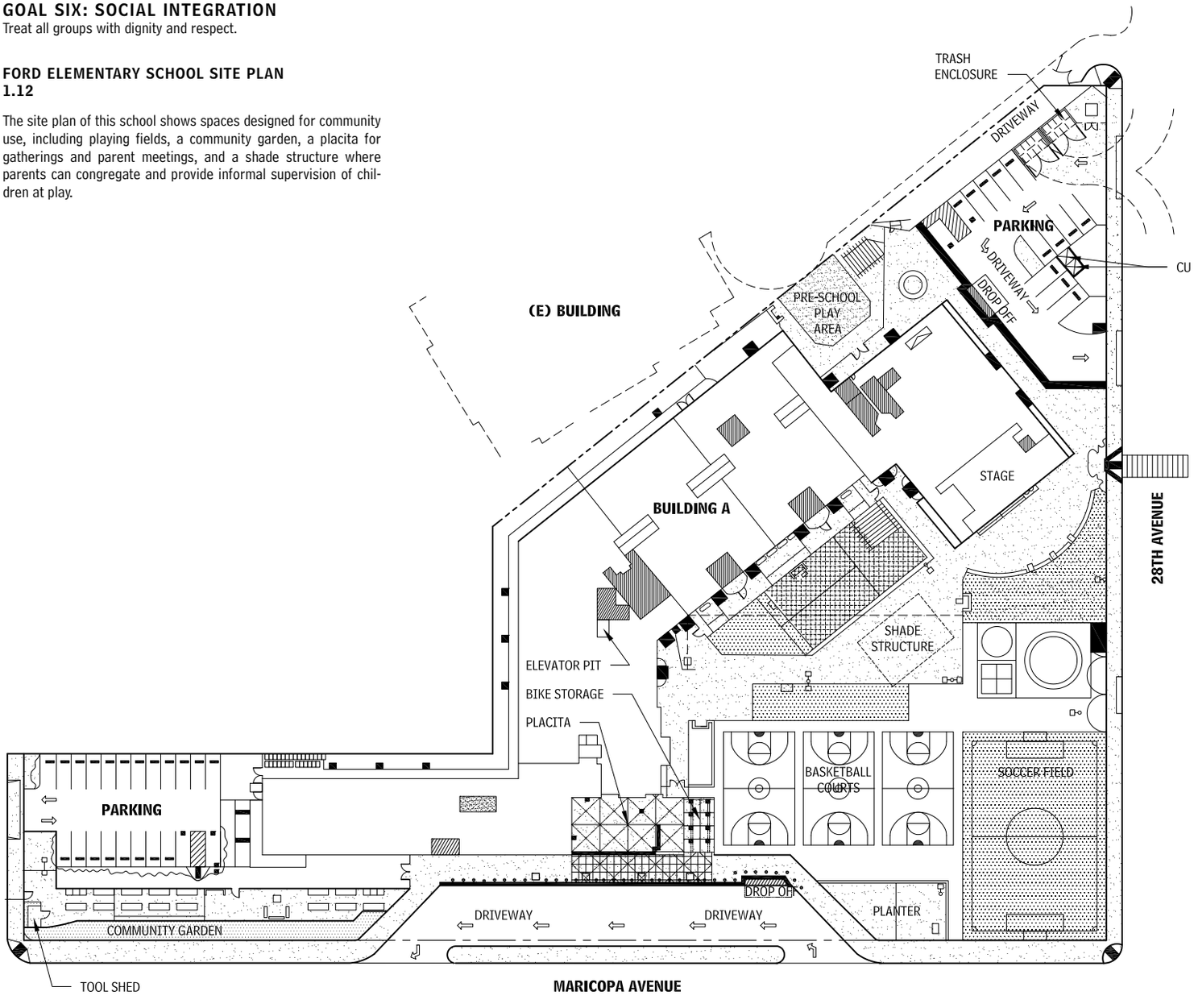

Contributors:
Dr. Ed Steinfeld, AIA and Jonathan White, Center for Inclusive Design and Environmental Access (IDeA Center), University at Buffalo, New York

## GOAL SIX: SOCIAL INTEGRATION

Treat all groups with dignity and respect.

### FORD ELEMENTARY SCHOOL SITE PLAN 1.12

The site plan of this school shows spaces designed for community use, including playing fields, a community garden, a placita for gatherings and parent meetings, and a shade structure where parents can congregate and provide informal supervision of children at play.



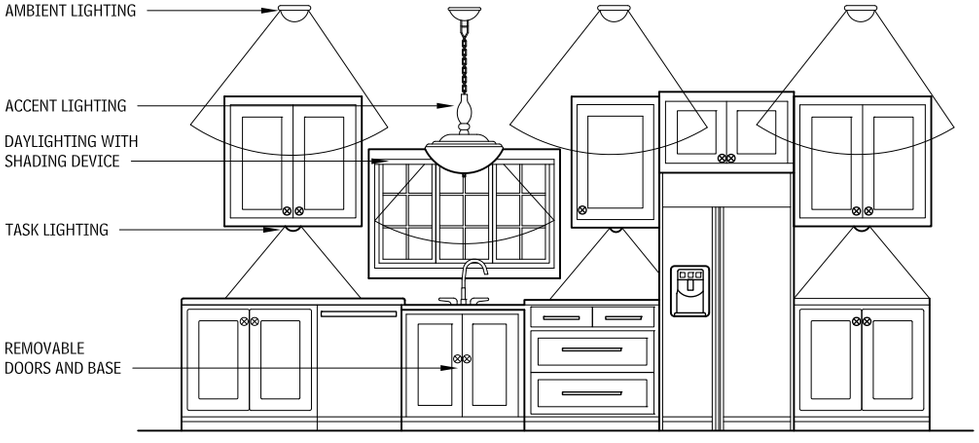

Contributor:
Sally Swanson Architects, San Francisco, California

### GOAL SEVEN: PERSONALIZATION

Incorporate opportunities for choice and the expression of individual preferences.

**KITCHEN LIGHTING**
**1.13**

Kitchens are one room of the house requiring sufficient light for detailed tasks such as cutting vegetables. This kitchen has several levels of lighting to suit anyone's preference or needs and adjust for different times of day and mood.

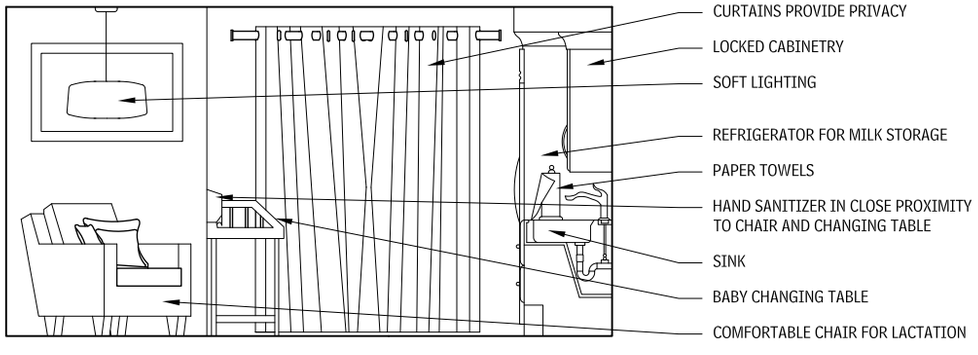



### GOAL EIGHT: CULTURAL APPROPRIATENESS

Respect and reinforce cultural values and the social and environmental context.

**LACTATION ROOM**
**1.14**

Lactation rooms are an increasingly common example of how to break down cultural barriers, allowing mothers to comfortably breastfeed or pump with privacy if desired.




## ACCESSIBLE DESIGN

"Accessible" is a design term first appearing in the 1950s, describing elements of the physical environment that are usable by people with disabilities. Originally, the term described facilities that wheelchair users would be able to access, but the term has evolved to include designs for a wider group of people with more diverse needs, such as people with hearing and vision limitations.

Continuing advances in medicine and technology have changed the character of disability since the introduction of accessible design. The population with disabilities is now more diverse, with many more people who have severe disabilities able to live independently and participate in community life. New technologies for wheeled mobility, including power wheelchairs, scooters, and seating and positioning systems, have increased the complexity of design for wheeled mobility. New building technologies, such as residential elevators, wheelchair lifts, and power-door operators, have made the provision of accessible facilities more practical and less expensive. Accessible design will continue to change as medical advances and technologies continue to evolve.

From an architect's perspective, appropriate accessible design for public facilities and multifamily housing is different from custom design of residences or workplace accommodations for people with disabilities. Public accessibility standards establish general design specifications that broadly accommodate minimal needs. Design for a specific user in a private residential setting or work environment should address that user's specific needs and involve much more interaction with the client to ensure the design accommodates the person's preferences. It is also likely that people with disabilities will appreciate universal design approaches because they improve function beyond minimum requirements and increase social participation and safety.

## LAWS, REGULATIONS, AND STANDARDS

Architects should become familiar with the federal legislative process and its terminology to help them understand the intent of laws, their requirements, and their continuing evolution. A "law" is an act of a legislative body. A "regulation" is developed by a regulatory agency such as the Department of Justice or the Department of Housing and Urban Development. A regulation defines the specific ways that a law is implemented. A "standard" is a stand-alone document, often used to implement a regulation. A "voluntary consensus standard" is developed by a standards organization such as the American National Standards Institute (ANSI) or the National Fire Protection Association (NFPA), which has rules governing the process of standards development to ensure equity and fairness. A standard can be referenced by a model code, which can in turn be adopted by a regulatory agency. Standards can also be issued by standards setting agencies of the government and referenced in their own regulations. "Guidelines" are a general term that can refer to nonbinding design criteria or to the equivalent of standards. Guidelines are sometimes issued by one government agency and then adopted as standards by another. Laws can also incorporate standards by reference or even include their full text.

At present, the laws, regulations, and standards governing the implementation of accessible design are highly complex; therefore, architects must educate themselves, and stay abreast of current developments to ensure that they have a good grasp of the requirements. Further, it behooves the architect to research the applicable laws, regulations, and standards that apply to each specific building carefully. Federal laws such as the Americans with Disabilities Act (ADA) and Fair Housing Amendments Act (FHAA), have built-in penalties for architects whose work does not comply. Thus, there is an incentive for the architect to understand thoroughly the legal requirements of accessible design regulations and their underpinnings. Guidance information such as technical assistance manuals and bulletins on interpretation are available on all the federal regulations, although it is not all collected in one place. In addition to the regulations themselves, additional information is available in the legislative history of each act and in the numerous documents issued during the "rule-making process." Architects can monitor rule-making activities to anticipate new rules and avoid unpleasant surprises late in the design stages of projects.

Contributors:
Dr. Ed Steinfeld, AIA and Jonathan White, Center for Inclusive Design and Environmental Access (IDeA Center), University at Buffalo, New York

Available information at the state and local level may be more difficult to find but most state regulations are based on federal requirements or model codes. The architectural guidelines and standards for laws such as the ADA are periodically revised through the rule-making process. To understand the complex nature of accessible design laws, regulations, and standards, architects should first understand the legislative process and accessible design regulatory history.

## ACCESSIBLE DESIGN LEGISLATIVE PROCESS

Civil rights laws are the basis for accessible design requirements. Governing bodies such as the United States Congress, state legislatures, and local governments enact laws to achieve a particular public policy objective; for instance, the right of people with disabilities to access and use public buildings. The legislation specifies the measures necessary to achieve the policy objective. The legislation might directly reference a particular standard or it might authorize a government agency to develop and maintain a guideline or standard. The administrative process for implementing federal laws requires public notice in the Federal Register and a public comment period for any proposed new regulations or guidelines. Federal standards become regulations when the Department of Justice incorporates them in the Code of Federal Regulations. States have similar processes and often have parallel legislation.

Civil rights laws often include provisions for both facility design and operations. Provisions that address operations create legal responsibilities that are shared between facility designers and facility operators. Architects should carefully record programming decisions with implications for accessibility, since the intended use of a new space often establishes the specific accessibility requirements that apply. For example, in the ADA, requirements for an employee workspace are different from those for a public space. If a facility operator changes the use of a space after the building is completed, compliance becomes the owner's rather than the architect's responsibility. Architects should carefully evaluate an owner's project funding sources to determine which local, state, and/or federal accessibility requirements apply. It is important to do this prior to preliminary design because the requirements can affect some basic early design decisions.

Accessibility regulations have two parts: technical criteria and scoping requirements. Technical criteria are the specifications for how to achieve the policy objective; i.e., "what and how." For example, to ensure people who use wheeled mobility devices can use a drinking fountain, there must be a knee clearance height of at least 27 in. Scoping is the extent to which the technical criteria must apply; i.e. "when and where." The technical criteria may apply to all project elements or to only a fraction of the elements. Scoping criteria specify how many items of what type need to be accessible, for example, at least 50 percent of drinking fountains, or 100 percent of dwelling units. One level of complexity in current accessibility regulations is caused by the presence of scoping requirements in different sections of regulations. For example, there may be scoping provisions in a beginning section of the document, and there may be scoping provisions integrated with the technical criteria. Often there are exceptions and conditional options buried deep within the technical criteria of the documents that are difficult to find.

Sometimes, scoping and technical criteria can be in two different documents. State and local governments often adopt a document developed by the International Code Council and the American National Standards Institute, the *ICC/ANSI A117.1 Standard,* to achieve their public policy objectives. Some may adopt it using a separate law while others incorporate it via reference in their building codes along with other fire and safety standards. The International Building Code (IBC) includes scoping provisions but adopts the A117.1 standard by reference for its technical provisions. Currently, ICC/ANSI A117.1 is the only consensus standard for accessible design in the United States. Since 1986, no versions of A117.1 have scoping criteria. The IBC model code and the state or local codes usually base their scoping criteria on federal regulations. The purpose of removing the scoping was to encourage adoption by states and promote uniformity; however, many states and some municipalities have modified the IBC scoping criteria and several states have their own independent accessibility "code" that differs substantially from the ICC/ANSI A117.1 standard.

The federal government empowers its standard-setting agencies to develop their own standards and processes for implementing disability rights laws such as the ADA and FHAA; however, the U.S. Access Board, a small federal agency, is charged with developing accessibility guidelines for several federal laws. This creates a complex relationship between the Access Board's guidelines, federal regulations of different agencies, and the state and local building codes across the United States. Although many of the accessible design requirements in the civil rights laws and the codes are similar, there have been considerable differences, especially since state and local rule-making, federal rule-making activities, and the revision cycles of model standards and codes are not synchronized. Despite significant efforts to harmonize national model codes and ICC/ANSI A117.1 with the federal requirements, there are still differences.

Due to this complexity, architects must be able to determine which laws, regulations, and standards apply to any project and which is more stringent for any particular element. To help reduce complexity, federal agencies identify "safe harbors," which are regulations or standards the agency certifies to be substantially similar to their own standards, permitting their use as an alternative to the federal regulations. However, federally specified safe harbors are sometimes older standards, already superseded by state or local regulations. Furthermore, unlike municipal officials, federal agencies do not issue building permits and typically do not inspect construction prior to occupancy unless they are funding a project. Civil rights law enforcement is a "complaint-based process." Federal agencies may choose to act on a citizen complaint, or a complainant may elect to seek direct relief through federal courts. Legal decisions regarding such complaints gradually refine unclear rules but the policies embedded in those decisions are not organized for designers to easy reference. Victims of discrimination under the Act can be awarded compensatory and/or punitive damages. Courts can also order remediation in the form of renovations to buildings, to bring them into compliance. Retrofitting and other conditions of remediation are considerably more expensive than complying with the law in the first place when costs are minimal. There is no statute of limitations on compliance. Complaints may be filed at any time, and violations are often uncovered during the course of due diligence. The latter can affect the sale and sales price of a property. The responsibility for compliance rests with building owners, architects, contractors, and others involved in the design and construction of covered buildings.

To add to the complexity, some of the regulations have not changed at all since they were issued while others have changed considerably. For example, while the ADA Standards were revised significantly in 2010, the FHAA Guidelines have not been changed since they were issued in 1991, the same year the original ADA Standards were issued. Some federal agencies still use "legacy" accessibility standards such as the Uniform Federal Accessibility Standards (UFAS) for some of their construction programs, and recent standards such as the 2010 ADA Standards for other programs. When more than one program is used to fund a single project, the applicable standards can be quite difficult to ascertain. Further, the date of construction or application for a building permit can trigger different regulations and standards. When architects are hired to assess compliance with building codes, they need to know what regulations or standards were in force at the time the building was designed or constructed and what applies in the present. Architects should therefore monitor federal activities related to the type of buildings they design and be familiar with the legislative history of different laws to ensure they are aware of the most current regulations, design standards, and interpretations.

## REGULATORY HISTORY OF ACCESSIBLE DESIGN

In the 1950s and 1960s, disabilities rights advocates organized and petitioned federal, state, and local governments to enact legislation that would allow people with disabilities to have access to the same public institutions to which others have access.

In 1961, ANSI published the first national standard for accessible design: Accessible and Usable Buildings and Facilities, (A117.1). Many states and local jurisdictions adopted ANSI A117.1 as their accessibility code, although they often modified selected standards to suit their communities. It quickly became the most widely used accessible design standard in the United States.

In 1968, the Architectural Barriers Act (ABA) was the first federal legislation to require accessible design in facilities owned or leased by the federal government, or financed by certain agencies of the federal government. It empowered those agencies to develop standards for accessible design. The ANSI A117.1 Standard was referenced by most of the agencies.

In 1973, Congress passed the Rehabilitation Act to address the absence of federal accessibility standards for buildings constructed by entities receiving federal funds and the lack of an enforcement mechanism. This Act created the Architectural and Transportation Barriers Compliance Board (Access Board) to develop and issue minimum guidelines for design standards to be used by the four federal standard-setting agencies. The Act required any facility built with federal funds, or built by entities that receive federal funds (such as public schools and government contractors) to be accessible to people with disabilities.

A consensus committee periodically revises ANSI A117.1 and in 1980, they expanded it significantly to reflect new research and to include housing standards. By 1982, the Access Board published "Minimum Guidelines and Requirements for Accessible Design" based largely on this document.

In 1984, the four standard-setting agencies (General Services Administration, Department of Defense, Department of Housing and Urban Development, and U.S. Postal Service) developed the Uniform Federal Accessibility Standards (UFAS) to comply with the ABA and the Rehabilitation Act. The 1980 ANSI A117.1 served as the basis for the requirements in UFAS but the agencies added additional scoping requirements and specific sections that apply to the types of buildings they construct and fund. The UFAS requires that at least 5 percent of the units in multifamily and single-family housing projects constructed with any financial assistance from the federal government be accessible to people with mobility impairments and 2 percent to be accessible to people with communication impairments.

In 1988, Congress amended the Fair Housing Amendments Act (FHAA) to prohibit discriminating against individuals based on disability. The U.S. Department of Housing and Urban Development (HUD), which oversees the regulations related to Fair Housing, was given the responsibility of developing regulations for implementing the Act which are called the Fair Housing Accessibility Guidelines (FHAG). Architects need to be aware of HUD's interpretation of this Act. *The Fair Housing Act Design Manual* is the authoritative source of information on interpretations of the FHA regulations. FHAG dwelling units are of a lower accessibility standard than previous dwelling unit requirements found in the UFAS and in many state building codes; however, the regulations apply to *all* units in high-rise buildings and ground floor units in walk-ups.

In 1990, the President signed the Americans with Disabilities Act (ADA) into law. It was a landmark piece of legislation that prohibited discrimination based on disability in employment, state and local government, places of public accommodation, transportation, and telecommunications. It provided new civil rights protections for people with disabilities. New federal accessibility standards, the ADA Accessibility Guidelines (ADAAG), similar to the 1986 ANSI A117.1 Standards, were developed that addressed the design and operation of places of employment (Title I), state and local government facilities and programs (Title II), and privately owned public accommodations (Title III). The ADAAG did not include housing design requirements.

The International Code Council (ICC) started administering the ANSI reorganized A117.1 Standard in 1998 and expanded it to include technical requirements for dwelling and sleeping units consistent with the requirements of the FHAG. These are known as "Type B" dwelling units. The original ICC/ANSI A117.1 and UFAS housing requirements, as amended, became known as "Type A."

Contributors:
Dr. Ed Steinfeld, AIA and Jonathan White, Center for Inclusive Design and Environmental Access (IDeA Center), University at Buffalo, New York

In 2003, ICC/ANSI again expanded A117.1 to add "Accessible Units," which have a higher level of accessibility than the Type A and B units, which are less accessible and have adaptability features. In 2004, the Access Board harmonized their latest ADA-ABA Guidelines with the 2003 version of ICC/ANSI A117.1. Over the next few years, the federal agencies previously using UFAS began using these guidelines to comply with the ABA and Rehabilitation Act.

In 2009, ICC/ANSI A117.1 added a "Type C" unit designation that addresses basic accessibility to single-family homes and other units not covered by other legislation. This is the result of the "visitability" movement started in 1986 by an advocacy organization called Concrete Change, directed by Eleanor Smith. Visitability provides a basic level of access to all homes that supports short-term use by people with disabilities and reduces the cost necessary to adapt the dwelling further. Many states and municipalities mandate visitable housing but there is a lot of variability in the requirements and scope of coverage. The Type C units provide a uniform set of guidelines for local and state adoption. A proposed federal law, the Inclusive Housing Design Act, would require visitability in all new housing receiving federal assistance, which could include any federal mortgage insurance. The details of Type C and visitability ordinances are not discussed here because it is a subject more appropriate for the Architectural Graphic Standards for Residential Construction.

In 2010, the Department of Justice published new ADA Standards for Accessible Design based on the 2004 ADA-ABA guidelines. It includes guidance for residential dwelling units. In 2014, HUD began allowing use of the 2010 ADA Standards as an acceptable alternative to UFAS (with certain exceptions found in the Federal Register at 79 FR 29671). Designers may use UFAS for projects under the auspices of HUD if they choose, and must use UFAS where required by HUD's exceptions.

ICC/ANSI anticipates publication of a new edition of A117.1 in 2016. This version will have major changes to fundamental requirements such as clear floor space and turning space based on more recent research than the research underlying the current standards, which was conducted in the late 1970s. While it is too early to know when state, local, or federal entities will adopt the 2016 edition, architects should begin familiarizing themselves with the new requirements as they generally exceed current minimum requirements and provide accessibility for a greater number of people with disabilities.

## DETERMINING THE APPROPRIATE STANDARD

Architects practicing in the United States understandably may be overwhelmed by the long regulatory history of accessible design and the complex way in which it is implemented. The following table can help designers determine the appropriate accessible design standard to use for any given project. The first step is to determine which laws and regulations apply. Project accessibility requirements may be determined by answering the following questions:

- What type of building or structure will be built?
- Who owns the facility?
- Will some construction funds come from a government agency?
- What other government funding will the project receive?
- Who are the intended users of a space or component?

The table lists the applicable standards for many types of projects.

## FEDERAL ACCESSIBLE DESIGN REQUIREMENTS

### AMERICANS WITH DISABILITIES ACT (ADA) REQUIREMENTS

The 2010 ADA Standards include design requirements for new facility construction, and for additions to and alterations of existing facilities that are owned, leased, or operated by both private entities and state or local governments. However, design standards and management responsibilities differ between the two owner groups: Title II for state and local governments and Title III for private entities. Title II includes the regulations at 28 CFR 35.151 and Title III includes the regulations at 28 CFR 36 subpart D. Both include the 2004 ADA-ABA Guidelines at 36 CFR part 1191, appendices B and D. The DOJ published these requirements collectively as the 2010 ADA Standards for Accessible Design.

Under Title III, owners and operators of existing private facilities that serve the public have ADA construction responsibilities under what is called "readily achievable barrier removal." Under Title II, local governments also have the additional responsibility of making all their new and existing programs accessible and are held to a higher standard. Meeting this ADA responsibility for municipal programs may sometimes require new construction or physical modifications to existing facilities. The ADA also prescribes employer responsibilities for changing their policies or modifying their facilities to accommodate employees with disabilities (Title I).

Several ADA concepts affect the design requirements for any specific building, such as "path-of-travel" components for renovation projects and the "elevator exception" for small multistory buildings. It is imperative that architects familiarize themselves with these aspects of the law as well as with the design standards to help their clients fulfill their responsibilities.

The concept of "program accessibility," which is similar to Section 504 of the 1973 Rehabilitation Act for Federal Programs, is a key component of Title II. The ADA requires state and local governments to provide access to all their programs for people with disabilities. Local government program responsibility includes policies and operations as well as the built environment. To provide access to existing inaccessible programs, state and local governments were required to develop and implement a "transition plan" that included a self-evaluation and listed the necessary changes. State and local governments should have implemented those transition plans by now. The plan can address inaccessible programs by altering policies and procedures, by modifying physical structures, or by a combination of both strategies. Although not every habitable space in every existing building needs to be accessible, enough accessible spaces to ensure access to all programs are needed. For example, if a school has only one accessible science laboratory and it is not sufficient to accommodate all grade levels, another accessible laboratory may be needed.

In new construction, all spaces need to be accessible, unless otherwise noted by the regulations.

### FAIR HOUSING AMENDMENTS ACT (FHAA) REQUIREMENTS

The FHAA covers new multifamily housing constructed by either private entities or local governments. Generally, the FHAA covers projects with four or more total dwelling or sleeping units in one structure that are built for sale or lease. This includes apartments and condominiums, as well as all types of congregate living arrangements such as dormitories, boarding houses, sorority and fraternity houses, group homes, assisted-living facilities, and nursing homes. Even condominiums that are individually designed are covered. The law applies to all units if the building has an elevator or only ground floor units if there is no elevator. Only the first floor of multistory units must comply with the law. Townhouses can be exempted because they are multistory units and do not contain an elevator but they must be constructed a certain way to be considered single-family units. Existing housing structures, remodeling, conversion, or reuse projects are not covered by FHAA. The law's design standards include requirements for both individual dwelling units and common-use facilities such as lobbies, corridors, and parking.

The Fair Housing Accessibility Guidelines (FHAG) allow the exclusion of certain dwelling units because of site considerations such as steep topography and floodplains. The guidelines include site practicality tests for analyzing site constraints. Several major scoping issues such as multistory dwelling units and multiple ground-floor levels are discussed in the supplementary information included in the FHAG.

The requirements are modest and do not constitute full accessibility, yet they address a growing demand from the aging population (market) for housing in which they can live more safely and for a longer period. To assist design professionals in meeting the requirements for compliance, HUD has developed training and published the *Fair Housing Act Design Manual*. Prior to project design, architects should carefully review this material as well as the guidelines themselves.

The Fair Housing Accessibility Guidelines have seven basic design requirements. Refer to the Technical Criteria section of this chapter for detailed information on how to comply with the seven design requirements:

1. Accessible Building Entrance on an Accessible Route
2. Accessible Public and Common Areas
3. Usable Doors
4. Accessible Route Into and Through the Covered Unit
5. Light Switches, Electrical Outlets, Thermostats, and Other Environmental Controls in Accessible Locations
6. Reinforced Walls for Grab Bars
7. Usable Kitchens and Bathrooms

HUD recognizes the following 10 safe harbors. When used with the Fair Housing Act, HUD's regulations, and the Guidelines, compliance with any one of these will fulfill the Fair Housing Act's access requirements:

1. HUD Fair Housing Accessibility Guidelines published on March 6, 1991 and the Supplemental Notice to Fair Housing Accessibility Guidelines: Questions and Answers about the Guidelines, published on June 28, 1994
2. HUD Fair Housing Act Design Manual
3. ANSI A117.1 (1986)
4. CABO/ANSI A117.1 (1992)
5. ICC/ANSI A117.1 (1998)
6. Code Requirements for Housing Accessibility, 2000 (CRHA)
7. International Building Code (2000), as amended by the 2001

**APPLICABLE ACCESSIBILITY STANDARDS FOR SAMPLE PROJECTS 1.15**

| PROJECT DESCRIPTION | LAWS | STANDARDS |
|---|---|---|
| Federally owned, leased, or financed public facility | 1968 Architectural Barriers Act<br>1973 Rehabilitation Act | ABA Standards (similar to 2010 ADA Standards for Accessible Design) |
| Federally owned, leased, or financed housing | 1968 Architectural Barriers Act<br>1973 Rehabilitation Act<br>1988 Fair Housing Amendments Act (if multifamily) | UFAS or 2010 ADA (with exceptions)<br>UFAS or 2010 ADA (with exceptions)<br>Fair Housing Accessibility Guidelines, ICC/ANSI A117.1 (2003), or other Safe Harbor |
| Local government-owned public facility | 1990 Americans with Disabilities Act (Title II)<br>1973 Rehabilitation Act (if part of federal program or receiving federal funding) | 2010 ADA Standards for Accessible Design<br>ABA Standards (similar to 2010 ADA Standards for Accessible Design) |
| Local government-owned housing | 1990 Americans with Disabilities Act (Title II)<br>1973 Rehabilitation Act (if part of federal program or receiving federal funding)<br>1988 Fair Housing Amendments Act (if multifamily) | 2010 ADA Standards for Accessible Design<br>UFAS or 2010 ADA (with exceptions)<br>Fair Housing Accessibility Guidelines, ICC/ANSI A117.1 (2003), or other Safe Harbor |
| Privately owned public accommodation or commercial facility | 1990 Americans with Disabilities Act (Title III) | 2010 ADA Standards for Accessible Design |
| Privately owned multifamily housing | 1990 Americans with Disabilities Act (Title III) (public spaces)<br>1988 Fair Housing Amendments Act (private spaces) | 2010 ADA Standards for Accessible Design<br>Fair Housing Accessibility Guidelines, ICC/ANSI A117.1 (2003), or other Safe Harbor |

**NOTES**

1.15 a. All projects may be subject to state or local laws and building codes in addition to those listed above.
b. There may be various combinations of the project descriptions above. For example, a private tenant in a government-funded building, or a federal program operating out of a privately owned building, such as a Social Security office in a mall.
c. Certain buildings may be exempt from federal requirements such as religious facilities; however, exemptions may not apply if the organization receives government funding, such as for meals or childcare programs, or if they have tenants not covered by the exemption.
d. Temporary facilities must meet the same federal standards as similar permanent facilities.

Contributors:
Dr. Ed Steinfeld, AIA and Jonathan White, Center for Inclusive Design and Environmental Access (IDeA Center), University at Buffalo, New York

Supplement to the International Codes
8. International Building Code (2003) *with one condition
9. ICC/ANSI A117.1 (2003) *with one condition
10. International Building Code (2006)

Other solutions and standards may be used only if they meet or exceed the minimum specifications set forth in the guidelines. The ICC/ANSI A117.1 Standard only contains technical criteria so it must be used in conjunction with the scoping requirements found in the Act, the regulations, and guidelines or the IBC. It is generally advised to use the most recent safe harbors, as those are more likely to have greater consistency with state and local codes.

Following the Fair Housing Act Guidelines is not the same as providing full accessibility. These requirements, like the accessibility requirements for places of public accommodation, are minimum guidelines. Some states and local jurisdictions will require greater accommodations than the FHAG. Thus, architects may want to consider going further, for example meeting ICC/ANSI A117.1 Type A unit requirements in all units, and ICC/ANSI A117.1 (Accessible Units) requirements in at least 5 percent of each unit type.

## TECHNICAL CRITERIA

As discussed earlier, technical criteria are the design specifications for achieving compliance with various laws. The scoping section of the applicable standard or building code will specify when, where, and how many elements need to conform to the technical criteria. Sometimes, the technical criteria change depending on scoping. This section will illustrate the typical technical criteria as specified by ICC/ANSI A117.1 (2009) and will provide some alternatives that would allow minimum compliance with certain laws such as the FHA. It will also illustrate best practices to exceed the minimum specifications. This section focuses primarily on design for wheeled mobility because their needs have the greatest effect on building design. There are many other requirements not illustrated here.

## HOW TO USE THIS SECTION

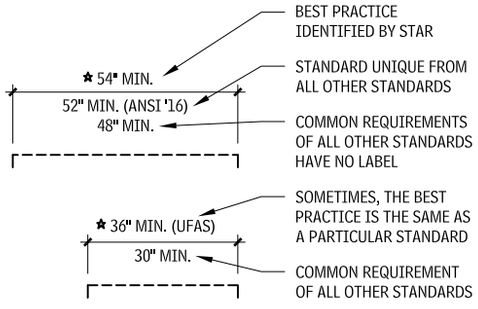
The drawings and illustrations presented herein combine the requirements for several standards and regulations and include best practices as well. A star identifies dimensions in illustrations that are best practices, typically exceeding the minimum dimensions. Illustrations without a star have no research evidence to support one dimension over another. The illustrations also note new requirements that have been approved for inclusion in the upcoming 2016 edition of ICC/ANSI A117.1, as of the time of this writing, although not finalized prior to publication of this book. Sometimes, the ICC/ANSI A117.1 (2016) dimension is also a best practice because it was adopted based on the latest research. Some illustrations may have multiple dimensions: (1) best practice (identified by star), (2) ICC/ANSI A117.1 (2009) requirements (no label), and (3) requirements of other standards or future standards (labeled accordingly). As with any resource book, it is important to realize that the illustrations depict general compliance requirements under typical conditions. Unless otherwise specified, the dimensional requirements in this section represent minimum and maximum requirements as specified by ICC/ANSI A117.1 (2009). Consult with applicable codes and standards for more detailed specifications.

## BUILDING BLOCKS

"Building blocks" provide the design foundation for accessibility and universal design. Designing access for wheeled mobility users provides generous space clearances for all building users and makes the built environment feel spacious and comfortable for all people. Critical components of the building blocks include floor surfaces, maneuvering and turning space, knee and toe clearance, and functional reach distances. The building blocks are a set of rules that apply in similar ways across a variety of spaces and situations. Learning the building blocks is a critical step for all designers and architects toward creating inclusive and accessible spaces.

**GRAPHICS KEY**
**1.16**

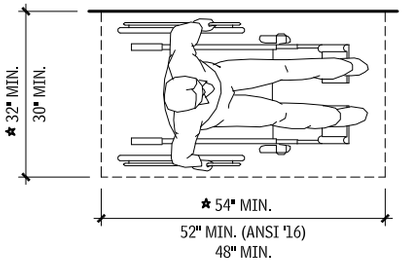
This figure represents the way in which technical criteria are dimensioned in this chapter.



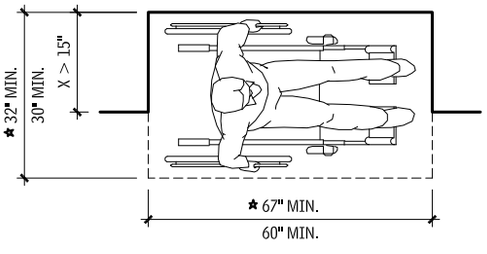

## MANEUVERING CLEARANCES

**MANEUVERING CLEARANCES**
**1.17**

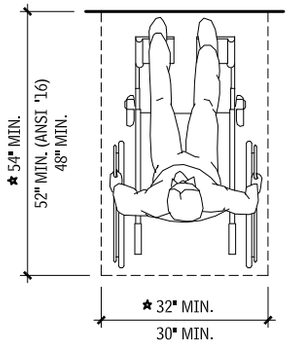
Floor surfaces of a clear floor space must have a slope no steeper than 1:48. One full, unobstructed side of the clear floor space must adjoin or overlap an accessible route or adjoin another clear floor space.



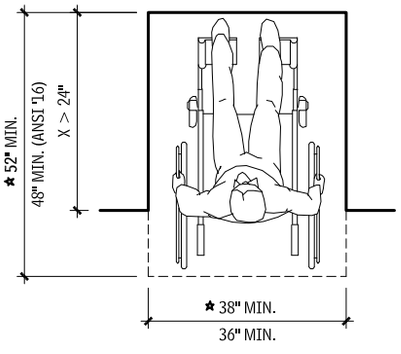

**PARALLEL APPROACH**




**PARALLEL APPROACH–ALCOVE**




**FORWARD APPROACH**



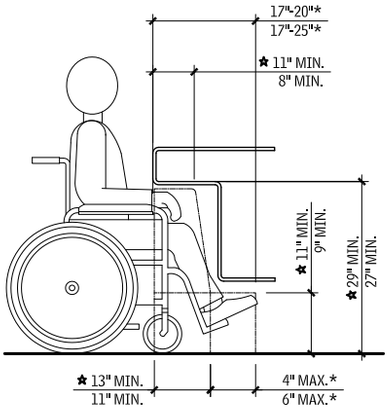

**FORWARD APPROACH–ALCOVE**

Contributors:
Dr. Ed Steinfeld, AIA and Jonathan White, Center for Inclusive Design and Environmental Access (IDeA Center), University at Buffalo, New York

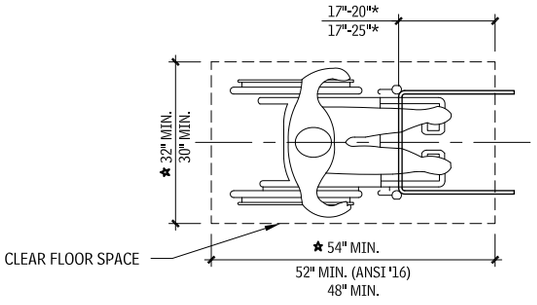
### KNEE AND TOE CLEARANCES
### 1.18

Designers have the option of using a T-shaped or circular turning space where a turning space is required.

**KNEE AND TOE CLEARANCES: ELEVATION**



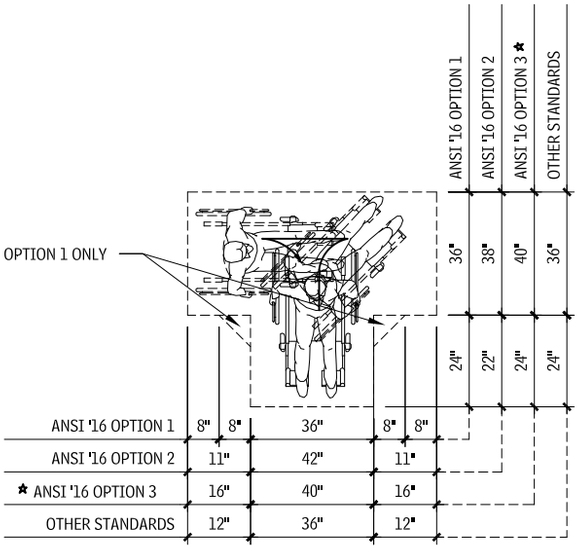

**KNEE AND TOE CLEARANCES: PLAN**



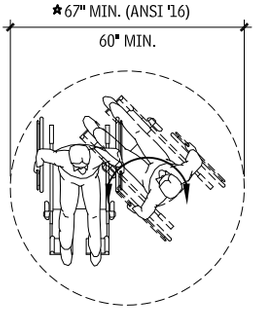

* MAY EXCEED MAXIMUM, BUT MAY NOT BE COUNTED AS PART OF CLEAR FLOOR SPACE

### WHEELCHAIR TURNING SPACE
### 1.19

Knee and toe clearance that is included as part of a T-shaped turning space is allowed only at the base of the T, or on one arm of the T. In some configurations, the obstruction of part of the T-shape may make it impossible for a wheelchair user to maneuver to the desired location. ICC/ANSI A117.1 (2016) will require that knee and toe clearance included as part of a circular turning space overlap only 10 in. of the circular turning space. Floor surfaces of a turning space must have a slope that is no steeper than 1:48 and has no level changes.




MIN. T-SHAPED TURNING SPACE DIMENSIONS

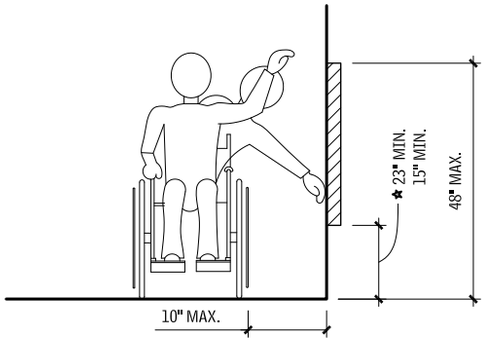



MIN. CIRCULAR TURNING SPACE DIMENSIONS

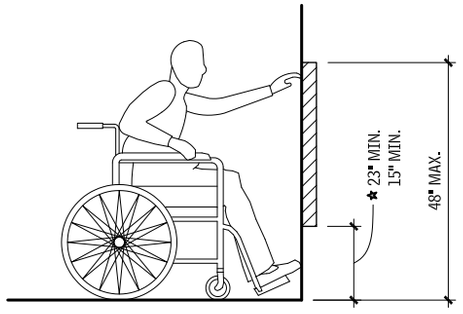
Contributors:
Dr. Ed Steinfeld, AIA and Jonathan White, Center for Inclusive Design and Environmental Access (IDeA Center), University at Buffalo, New York

**REACH RANGES**
**1.20**

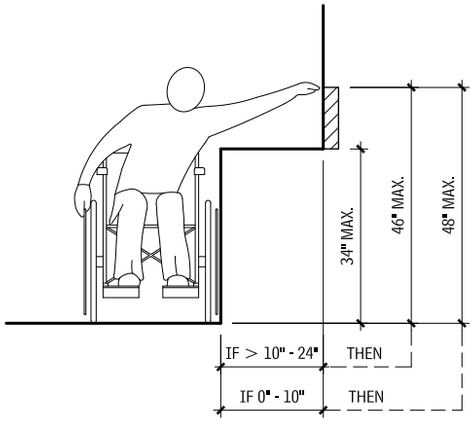
Existing elements may be located 54 in. maximum above the floor or ground. The 48-in. reach limit does not apply to tactile signs. Tactile signs must be installed so the tactile characters are between 48 and 60 in. above the floor. Below this height, tactile characters are difficult to read by standing people, as the hand must be bent awkwardly or turned over (similar to reading upside down) to read the message.



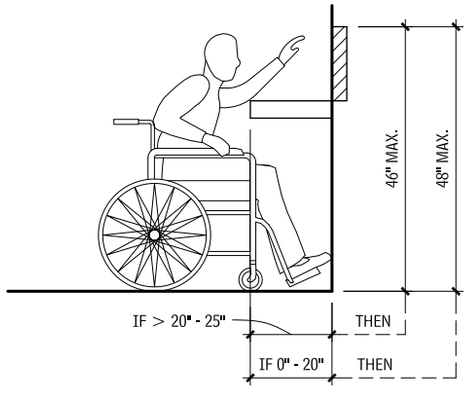

**UNOBSTRUCTED SIDE REACH**




**UNOBSTRUCTED FORWARD REACH**




**OBSTRUCTED SIDE REACH**




**OBSTRUCTED FORWARD REACH**

## ACCESSIBLE ROUTES AND WALKING SURFACES

### REQUIREMENTS FOR ACCESSIBLE ROUTES

Accessible routes generally require the following:

- *Site arrival points:* From each type of site arrival point (public transportation stops, accessible parking spaces, passenger loading zones, and public streets or sidewalks) to an accessible entrance.
- *Entrances:* Consult the applicable regulation to determine the required number of accessible entrances. Standards generally require that at least 60 percent of the public entrances, but no less than one, be accessible. The FHAG requires at least one, but may exempt some facilities from this requirement due to extreme site conditions. Consult the FHAG for site implacability tests; however, the prevailing attitude is that most sites can be made accessible.
- *Within a site:* Between accessible buildings, facilities, elements, and spaces on the site.
- *Interior routes:* Where an accessible route is required and the general circulation path is an interior route, the accessible route must also be an interior route.
- *Relation to circulation paths:* Accessible routes must coincide with or be located in the same area as a general circulation path. Avoid making the accessible route a "second-class" means of circulation. Consult the applicable regulations for additional specific requirements regarding location of accessible routes.
- *Directional signs:* Where the accessible route departs from the general circulation path and is not easily identifiable, directional signs should be provided as necessary to indicate the accessible route. The signs should be located so that a person does not need to backtrack.
- *Multilevel buildings and facilities:* Between all levels, including mezzanines, in multistory buildings, unless exempted.
- *Accessible spaces and elements:* An accessible route must connect all spaces and elements that are required to be accessible.
- *Toilet rooms and bathrooms:* The ADA and model codes generally require that all toilet and bathing rooms be accessible. This does not trigger a requirement for accessible routes if the floor level is not otherwise required to have an accessible route.

### COMPONENTS OF ACCESSIBLE ROUTES

Accessible routes are only permitted to include the following elements:

- Walking surfaces with a slope of 1:20 or less
- Curb ramps
- Ramps
- Elevators
- Platform (wheelchair) lifts (The use of lifts in new construction is limited to locations where they are specifically permitted by the applicable regulations. Lifts are generally permitted to be used as part of an accessible route in alterations.)

Each component has specific technical criteria that must be applied for use as part of an accessible route. Consult the applicable code or regulation.

## CURBS AND PARKING

Follow these design guidelines for accessible curb ramps and passenger loading.

- Design storm drainage utilities to shed water away from curb ramps.
- The dimensions shown are for new construction. When these dimensions are impractical for alterations, refer to guidelines and standards.
- Refer to applicable codes, standards, and regulations for detectable warning requirements and locations. Some have unique requirements and others do not include requirements for these features.

### PASSENGER LOADING ZONES

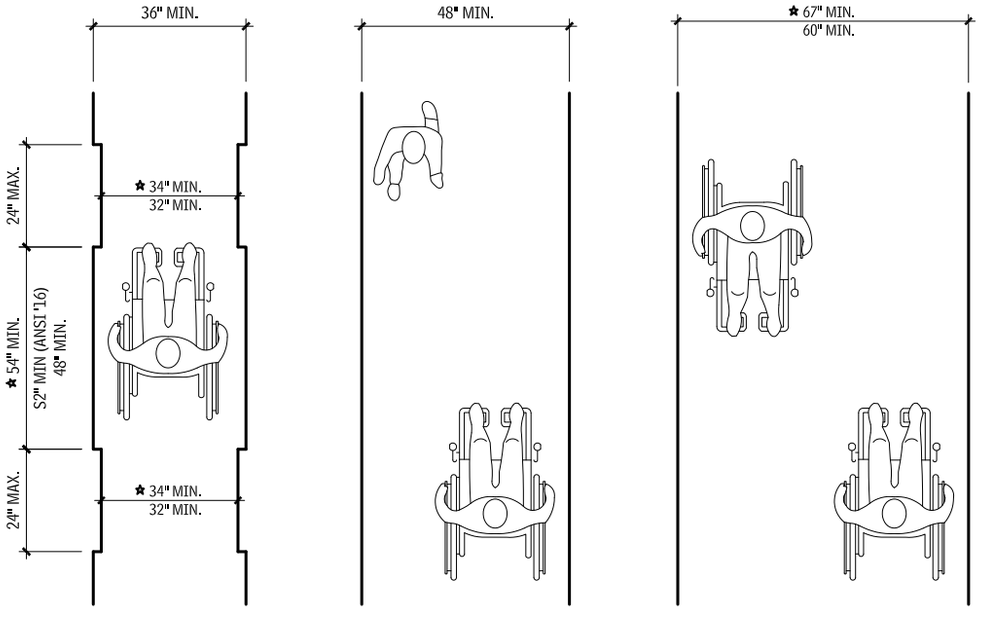
If passenger loading zones are provided, at least one must be accessible or one accessible space for each 100 linear feet of passenger loading zone provided. An accessible passenger loading zone is also required where there is valet parking.

The accessible passenger loading zone vehicle space must have an adjacent access aisle as long as the vehicle space. The access aisle must be marked, at the same level as the vehicle pull-up space, and adjoin an accessible route, including a curb ramp if the passenger loading zone is not level with the adjacent sidewalk. Curb ramps, signs, or other objects are not permitted in the access aisle.

The vehicle pull-up space and access aisle must be level, with slopes no steeper than 1:48. The accessible parking loading zone and the vehicular route to the entrance and exit serving it must have a vertical clearance of 9 ft-6 in., minimum.

Contributors:
Dr. Ed Steinfeld, AIA and Jonathan White, Center for Inclusive Design and Environmental Access (IDeA Center), University at Buffalo, New York

### CLEAR WIDTH OF AN ACCESSIBLE ROUTE
**1.21**

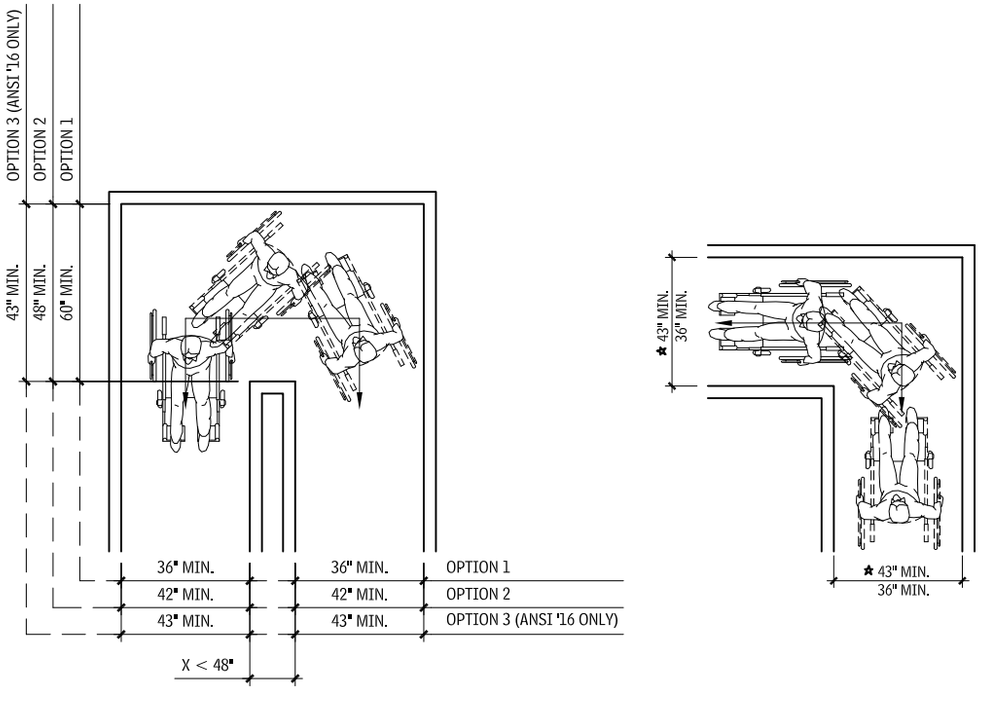



INTERIOR ACCESSIBLE ROUTE FOR SINGLE WHEELCHAIR

EXTERIOR ACCESSIBLE ROUTE (ANSI '16) AND AMBULATORY PERSON PASSING WHEELCHAIR

ACCESSIBLE ROUTE ALLOWING 180° TURN AND TWO PASSING WHEELCHAIRS

### CLEAR WIDTH AT TURNS
**1.22**

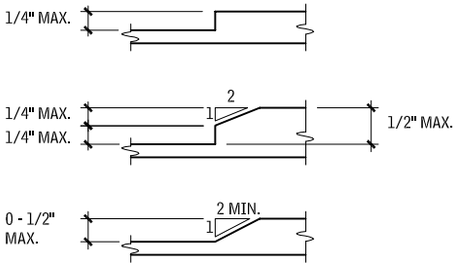



**180° TURN AROUND AN OBSTRUCTION**

**90° TURN**

### CHANGES IN LEVEL
**1.23**

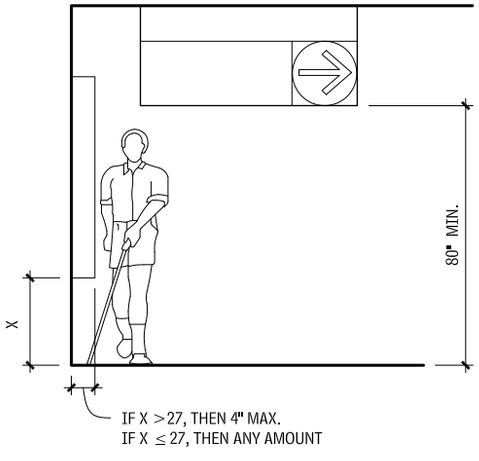
Changes in level greater than 1/2 in. must be ramped. Some standards prohibit changes in level in clear floor space, maneuvering clearances, wheelchair turning space, and access aisles.




## PROTRUDING OBJECTS IN CIRCULATION PATHS

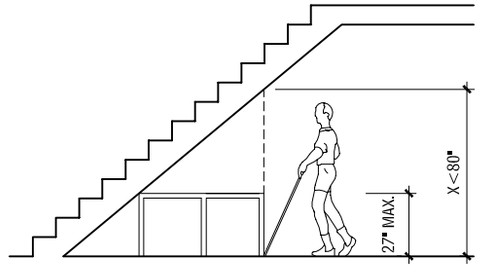
### DIMENSIONS OF PROTRUDING OBJECTS
**1.24**

Wall sconces, fire extinguisher cabinets, drinking fountains, display cases, signs, and suspended lighting fixtures are examples of protruding objects. Some standards allow doorstops and door closers 78 in. minimum above the floor. Protruding objects are not permitted to reduce the required width of an accessible route.




### REDUCED VERTICAL CLEARANCE
**1.25**

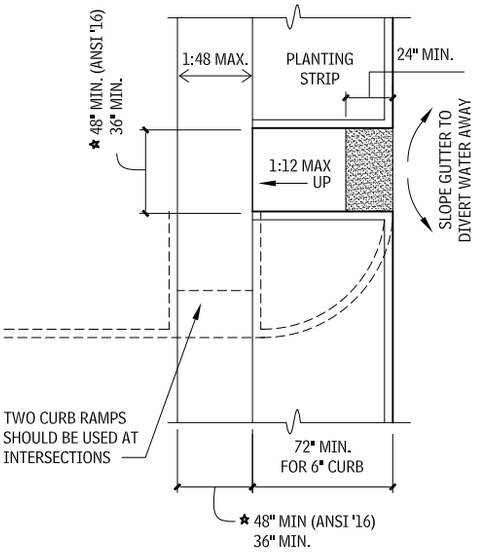
Protection from overhead hazards can be provided by built-in elements such as planters or railings, or curbs. Designers can reduce or eliminate most overhead hazards (e.g., low-headroom hazards can be avoided by enclosing areas under stairs and escalators).




Contributors:
Dr. Ed Steinfeld, AIA and Jonathan White, Center for Inclusive Design and Environmental Access (IDeA Center), University at Buffalo, New York

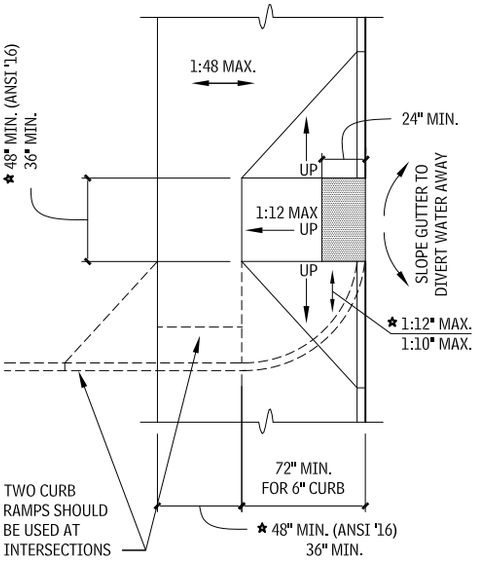
### CURB RAMP WITH RETURN CURB
**1.26**

Use this where planting strip or other objects reduce likelihood of pedestrians walking perpendicular across ramp.



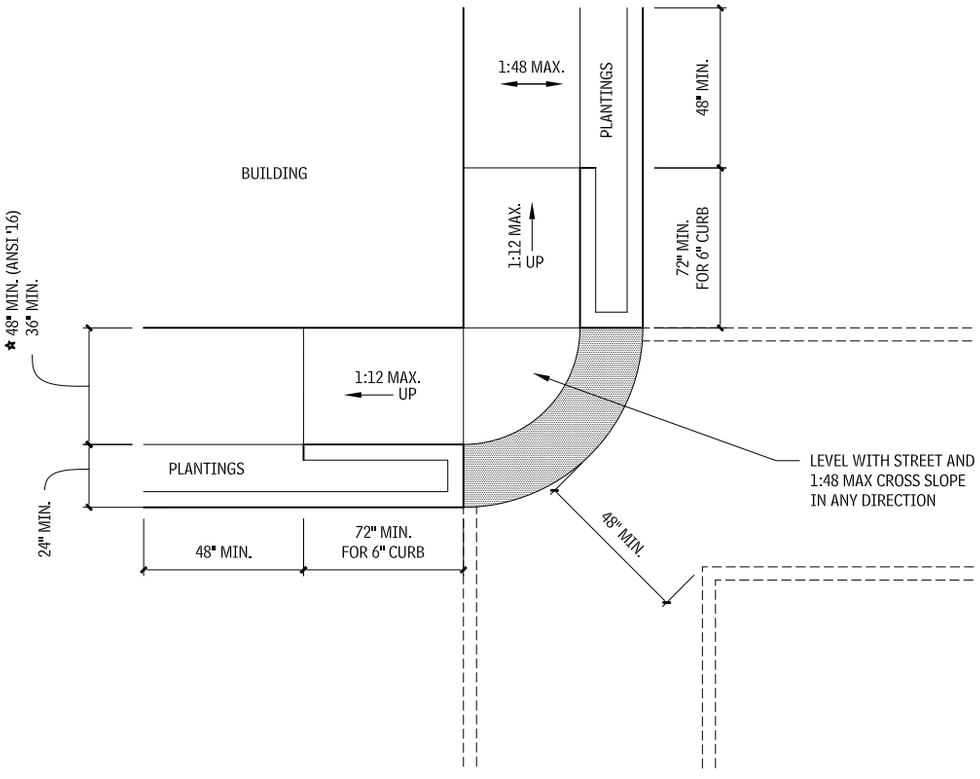

### CURB RAMP WITH FLARE
**1.27**

Use this to prevent tripping if pedestrians could walk perpendicular across ramp.



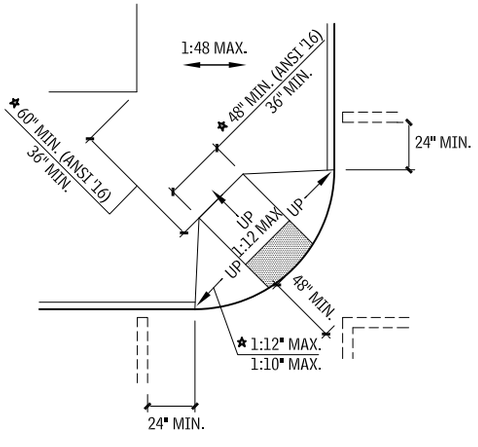

### BLENDED EDGE
**1.28**

Use this for high-volume pedestrian traffic when distance between vehicular way and structure is very narrow.



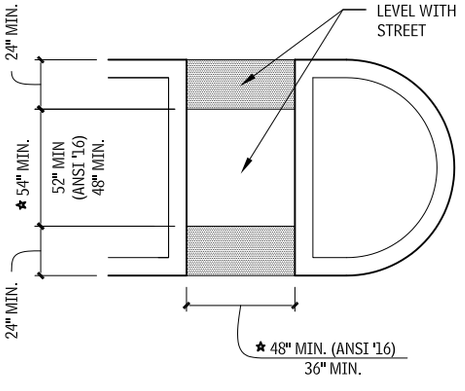

### DIAGONAL CURB RAMP
**1.29**

Use this where there is insufficient space for two curb ramps at a corner.




### CUT-THROUGH ISLAND
**1.30**

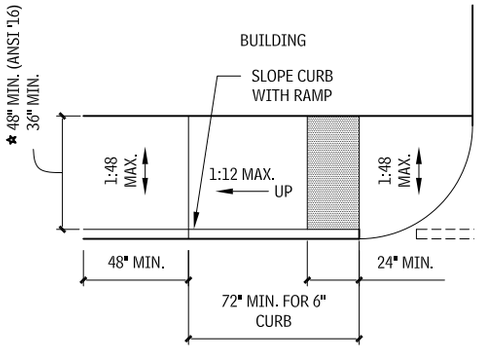
Use this where a crosswalk would otherwise be obstructed by an island.




Contributors:
Dr. Ed Steinfeld, AIA and Jonathan White, Center for Inclusive Design and Environmental Access (IDeA Center), University at Buffalo, New York

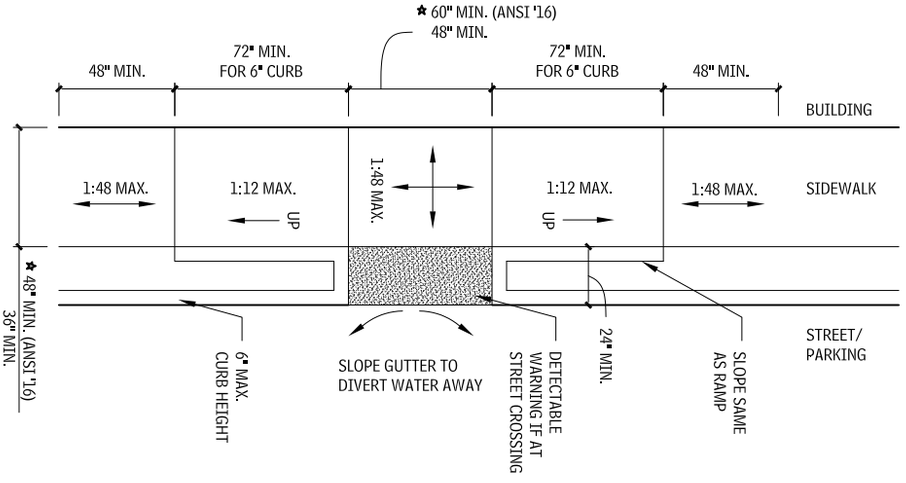
### PARALLEL CURB RAMP
**1.31**

Use this where pedestrian route only crosses a vehicular way in one direction.




### 90-DEGREE TURN TO CURB RAMP
**1.32**

Use this when there is insufficient sidewalk space for return curb or flares at an access aisle or mid-block crossing.

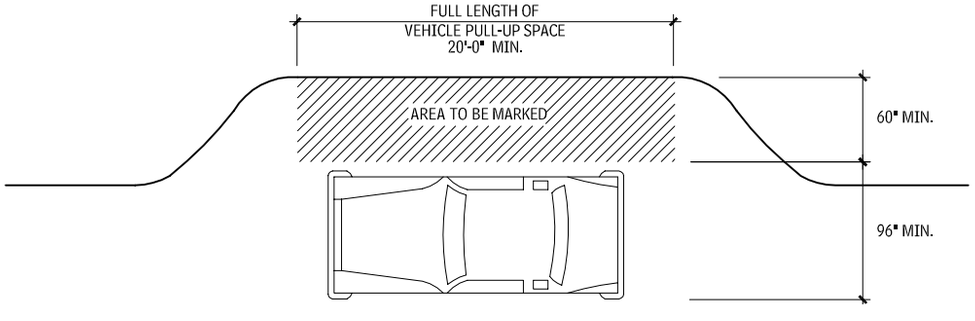



## ACCESSIBLE PARKING

The information provided here conforms to the 2010 Americans with Disabilities Act Standards for Accessible Design. State and local regulations may require greater access (for example, some states require wider access aisles).

- The access aisles must be accessible from the passenger side of the vehicle. Backing into 90-degree stalls from a two-way aisle is an acceptable method of achieving this; but with angled parking, the aisle must be on the right side of the vehicle space.
- Vehicular overhead clearance at a van-accessible stall, adjacent access aisle, and along the path of travel to and from a van-accessible stall should be 8 ft-2 in. In parking structures, van-accessible stalls may be grouped on a single level.
- Access aisles must be clearly marked to prohibit parking and be the same length as the adjacent parking space. They also must be at the same level as parking stalls (not above, at sidewalk height). Required curb ramps cannot be located in access aisles.
- Parking spaces and access aisles should be level, not exceeding 1:48 (≈2 percent) in any direction.
- The stalls required for a specific facility may be relocated to another location if equivalent or greater accessibility in terms of distance, cost, and convenience is ensured.
- Accessible stalls in the numbers shown in the accompanying table must be included in all parking facilities.
- The access aisle must join an accessible route to the accessible entrance. As a best practice, designers should configure accessible routes to minimize wheelchair travel behind parked vehicles.
- Signs with the International Symbol of Accessibility are required for accessible spaces. Signs must be mounted 5 ft. minimum from the ground surface to the bottom of the sign.
- Accessible parking spaces must be on the shortest accessible route to the accessible building entrance. If there is more than one accessible entrance with adjacent parking, accessible parking must be dispersed and located near the accessible entrances. The accessible parking spaces must be located on the shortest route to an accessible pedestrian entrance in parking facilities that do not serve a particular building.
- When different types of parking are provided (for example, surface, carport, and garage spaces), the accessible parking spaces must be dispersed among the various types.

### ACCESSIBLE PASSENGER LOADING ZONE
**1.33**



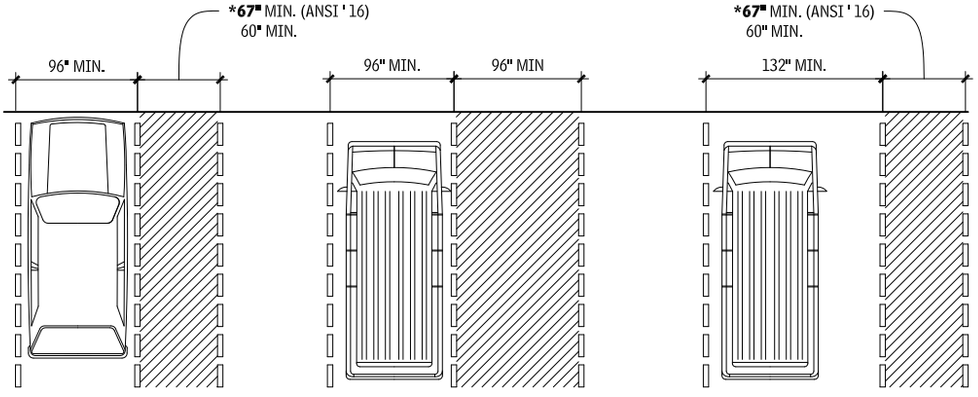

### REQUIRED MINIMUM NUMBER OF ACCESSIBLE PARKING SPACES
**1.34**

| TOTAL SPACES PROVIDED | REQUIRED MINIMUM NUMBER OF ACCESSIBLE SPACES | OF THE ACCESSIBLE SPACES, MINIMUM NUMBER REQUIRED TO ALSO BE VAN ACCESSIBLE |
|---|---|---|
| 1 to 25 | 1 | 1 |
| 26 to 50 | 2 | 1 |
| 51 to 75 | 3 | 1 |
| 76 to 100 | 4 | 1 |
| 101 to 150 | 5 | 1 |
| 151 to 200 | 6 | 1 |
| 201 to 300 | 7 | 2 |
| 301 to 400 | 8 | 2 |
| 401 to 500 | 9 | 2 |
| 501 to 1000 | 2% of total | 1 for every 6 or fraction thereof |
| More than 1000 | 20, plus one for each 100 or fraction thereof over 1000 | 1 for every 6 or fraction thereof |

NOTES: The following are exceptions to the requirements outlined in the accompanying table:

1. At hospital outpatient facilities, 10 percent of the parking spaces serving visitors and patients must be accessible.
2. At rehabilitation facilities and outpatient physical therapy facilities, 20 percent of the spaces provided for visitors and patients must be accessible.
3. The information in the table does not apply to valet parking facilities, but such facilities must have an accessible loading zone. One or more self-park, van-accessible stalls are recommended for patrons with specially equipped driving controls.
4. The requirements for residential facilities differ slightly among applicable codes and guidelines, but generally, one space must be provided for each residential dwelling unit required to be accessible. If more than one space is provided per unit, then 2 percent of the additional parking per unit is required to be accessible, in addition to visitor spaces as per the table. This parking must be dispersed among the various types of parking including surface, covered carports, and detached garages.

**PARKING SPACE AND ACCESS AISLE LAYOUT**
**1.35**

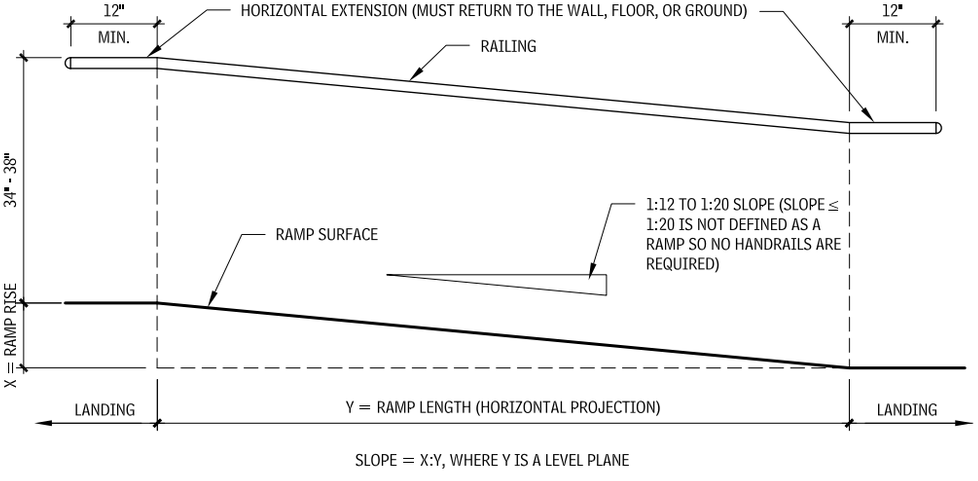



**STANDARD ACCESSIBLE SPACE** | **VAN-ACCESSIBLE SPACE OPTION 1** | **VAN-ACCESSIBLE SPACE OPTION 2**

## RAMPS

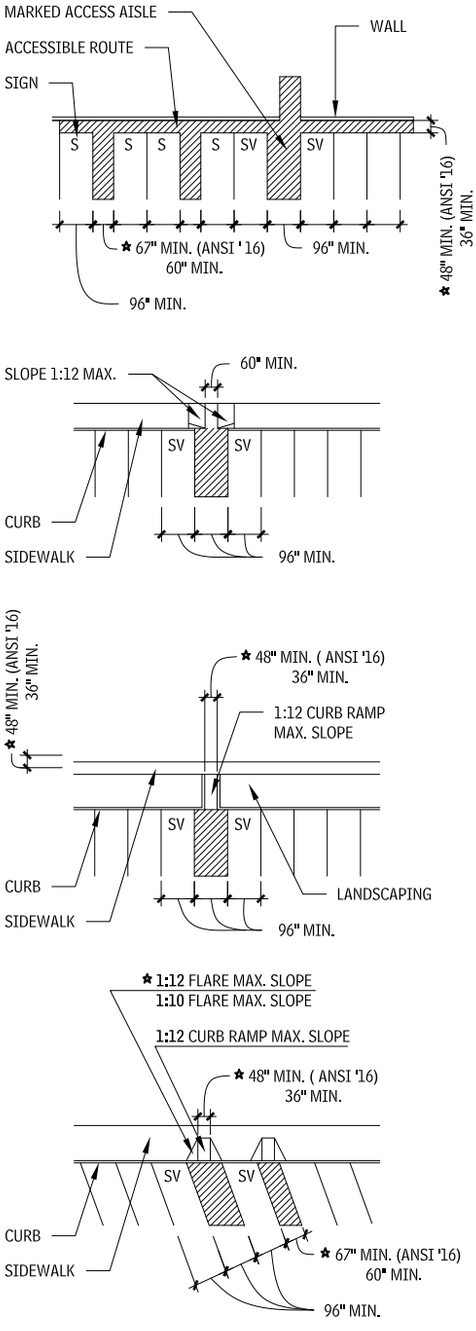
**COMPONENTS OF A RAMP**
**1.37**

Surfaces with a running slope greater than 1:20 are considered ramps. Accessible ramps must have running slopes of 1:12 or less. Provide ramps with the least possible running slope. Wherever possible, accompany ramps with stairs for use by those individuals for whom distance presents a greater barrier than steps. Maximum cross slope for ramps is 1:48. Design outdoor ramps and approaches so water will not accumulate on surface.




SLOPE = X:Y, WHERE Y IS A LEVEL PLANE

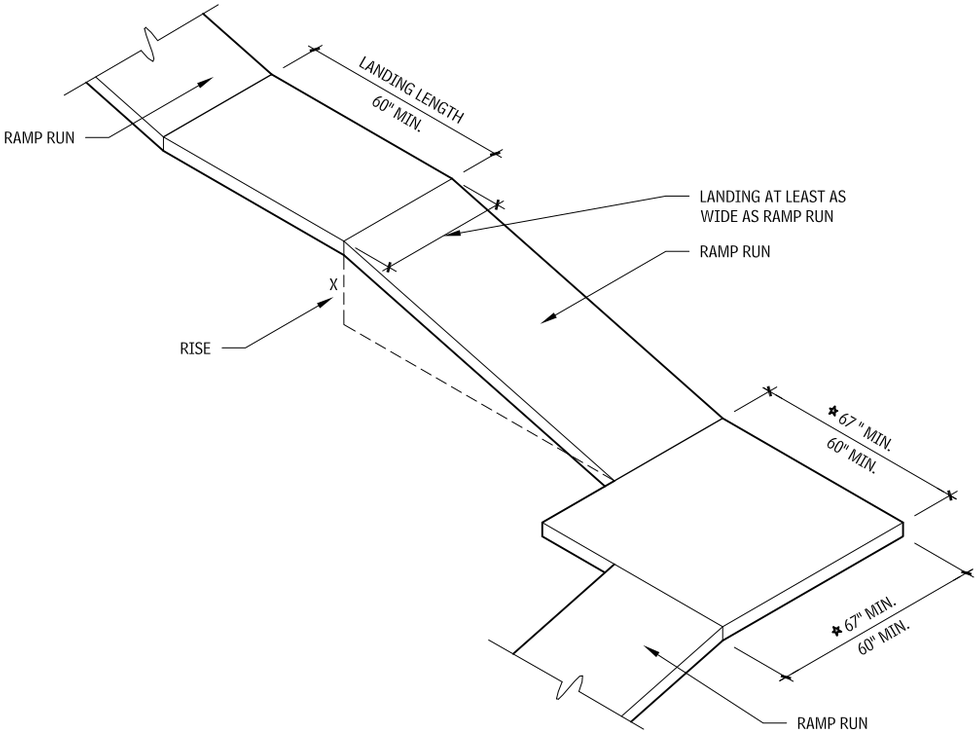
**ACCESSIBLE PARKING LAYOUTS**
**1.36**




S = ACCESSIBLE PARKING SIGN
SV = VAN-ACCESSIBLE PARKING SIGN

### RAMP LANDINGS
### 1.38

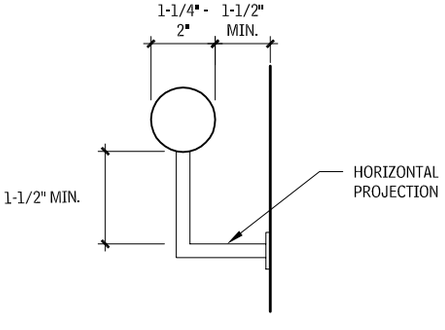
Landings should be level at top and bottom of ramp run and at least as wide as the run leading to it. A landing as shown is required where a ramp changes direction. Provide level maneuvering clearances for doors adjacent to landings. Note that required handrails and ramp edge protection are not shown in this drawing. All ramps must have edge protection and most building codes require a guardrail that does not allow passage of a 4-in sphere when the drop-off adjacent to any walking surface is greater than 30 in. This would include ramps, stairs, and landings.



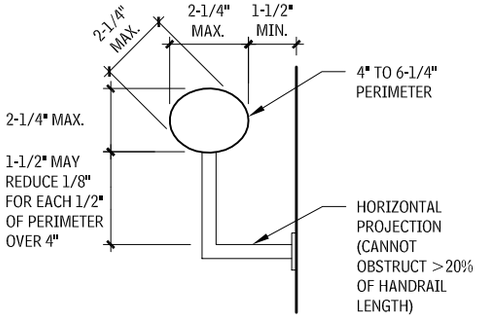

| | X | MAXIMUM SLOPE |
|---|---|---|
| NEW CONSTRUCTION | ANY RISE | 1:12 |
| EXISTING * | 6 INCHES MAX. | 1:10 |
| EXISTING * | 3 INCHES MAX. | 1:8 |

* EXISTING BUILDING EXCEPTION ONLY PERMITTED WHERE NECESSARY DUE TO SPACE LIMITATION

### HAND RAIL DESIGN
### 1.40



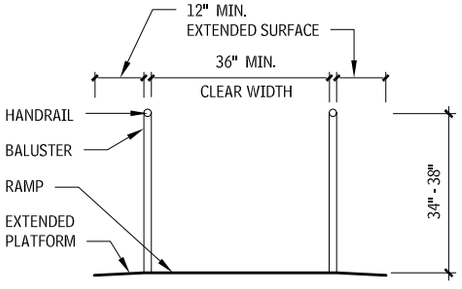

**CIRCULAR**



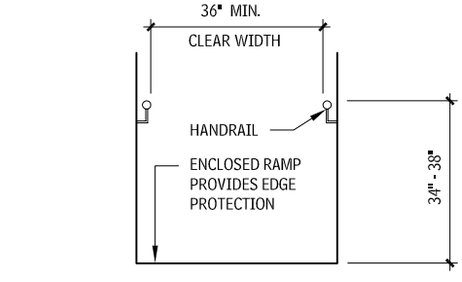

**NONCIRCULAR**

### RAMP CROSS SECTIONS
### 1.39

Handrails are required on both sides of ramps when rise is greater than 6 in. Provide continuous handrails at both sides of ramps and stairs and at the inside handrail of switchback or dogleg ramps and stairs. If handrails are not continuous at bottom, top, or landings, provide handrail extensions as shown in Figure 1.37. Ends of handrails must be rounded or returned smoothly to floor, wall, or post. Provide handrails of size and configuration shown and gripping surfaces uninterrupted by newel posts or other construction elements. Handrails must not rotate within their fittings. Handrails and adjacent surfaces must be free from sharp or abrasive elements.

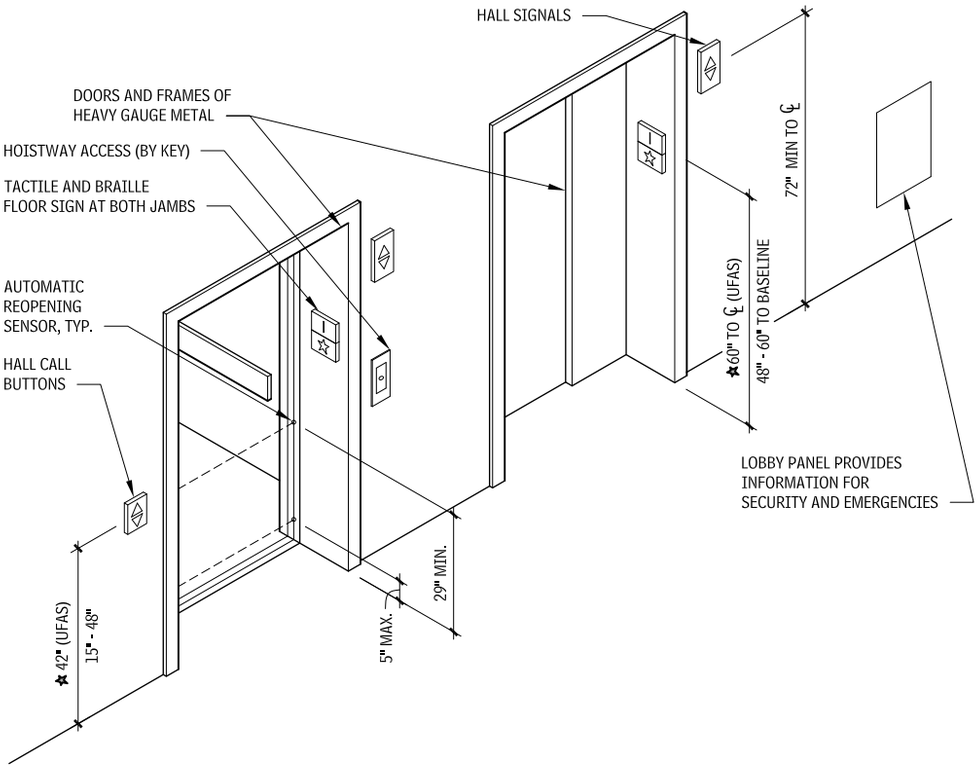



**RAMP WITH EXTENDED SURFACE**




**ENCLOSED RAMP**

**ELEVATOR LOBBY**
**1.41**




## ELEVATORS

### LOBBY

Model codes may allow or require elevators to serve as a means of egress in some circumstances when standby power is provided.

Elevator doors must open and close automatically and have a reopening device that will stop and reopen the car and hoistway door if the door is obstructed. Although the device cannot require contact to activate, contact can occur before the door reverses direction. The device must remain effective for at least 20 seconds.

Tactile designations at each jamb of hoistway doors should be 2 in. high, a maximum of 60 in. above the floor. A five-pointed star should be included at the main entry level.

Hall call buttons should be raised or flush, 15 to 48 in. (some standards require 42 in. exact) unobstructed above the floor measured to the centerline of the highest operable part, with the up button located above the down button.

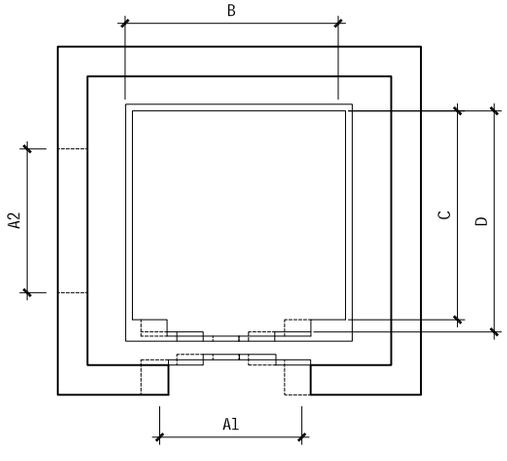
Audible hall signals should sound once for cars traveling in the up direction and twice for cars traveling down. Check the applicable regulations for required decibel level and frequency of audible signals. In-car signals are permitted in lieu of hall signals, as long as they meet all the requirements for visibility and timing.

### GENERAL REQUIREMENTS AND CAR INTERIOR

ASME A17.1, "Safety Code for Elevators and Escalators," covers general elevator safety and operational requirements. It has been adopted in virtually all jurisdictions. All sizes shown in this section are based on ICC/ANSI A117.1, which contains extensive accessibility provisions for passenger elevators, destination-oriented elevator systems, limited-use/limited-application elevators, and private residence elevators. Consult the applicable accessibility regulations for elevator exceptions and requirements.

**INSIDE DIMENSIONS OF ELEVATOR CARS**
**1.42**

Accessible Elevators: A 5/8-in. tolerance is permitted at 36-in. elevator doors, allowing the use of standard 35.43-in. clear-width doors. Any other car configuration that provides a 36-in. door and either a 60-in. diameter or T-shaped wheelchair turning space within the car, with the door in the closed position, is permitted. Inside car dimensions are intended to allow an individual in a wheelchair to enter the car, access the controls, and exit.




| TYPE/USE | DOOR POSITION | A1, A2 MIN." | B MIN." | C MIN." | D MIN." | MIN. SQFT |
|---|---|---|---|---|---|---|
| **★ NEW ELEVATOR** | **CENTERED** | **42** | **80** | **51** | **54** | **N/A** |
| NEW ELEVATOR | OFF-CENTER | 36 | 68 | 51 | 54 | N/A |
| NEW ELEVATOR | ANY | 36 | 54 | 80 | N/A | N/A |
| NEW ELEVATOR | ANY | 36 | 60 | 60 | N/A | N/A |
| PRIVATE RESIDENTIAL ELEVATOR | CENTERED | 32 | 36 | 52 (ANSI '16) 48 | N/A | N/A |
| NEW LULA | CENTERED | 32 | 42 | 54 | N/A | 15.75 |
| EXCEPTIONS: | | | | | | |
| EXISTING ELEVATOR | CENTERED | 32 | 36 | 54 | N/A | 16 |
| NEW LULA - ADJ. DOOR * | CENTERED | 36, 42 * | 42 | 54 | N/A | 18 |
| NEW LULA - ADJ. DOOR * | CENTERED | 36, 36 * | 51 | 51 | N/A | N/A |
| EXISTING LULA | CENTERED | 32 | 36 | 54 | N/A | 15 |

NOTES: * DOORS PROVIDED ON FRONT AND SIDE. SECOND DIMENSION IS ADJACENT SIDE DOOR A2.
LULA DESIGNATES LIMITED-USE/LIMITED-APPLICATION ELEVATOR.

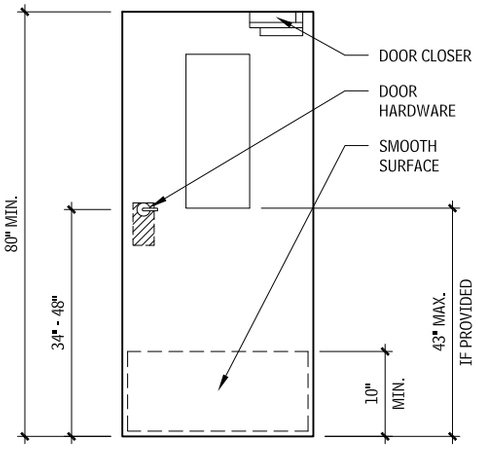
★ DENOTES BEST PRACTICE

## ACCESSIBLE DOORS

Manual doors and doorways and manual gates on accessible routes must comply with accessibility requirements. With double-leaf doors and gates, at least one of the active leaves must comply.

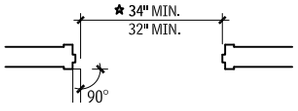
### ACCESSIBLE DOOR FEATURES 1.43

Specify door hardware that can be operated with one hand, without tight grasping, pinching, or twisting of the wrist. Thresholds are typically limited to 1/4 in. maximum height, or 1/2 in. maximum height if the top 1/4 in. is beveled at a 1:2 maximum slope; however, some standards allow a 3/4-in. height beveled at a 1:2 maximum slope for existing or altered thresholds and patio sliding doors in some residential dwelling units. Interior doors (other than fire doors) should be able to be operated with 5 lb. of force. Exterior doors and fire doors may be regulated by the authority having jurisdiction. Door closers must be adjusted so that there is at least a five-second interval from the time the door moves from 90° to 12° open.

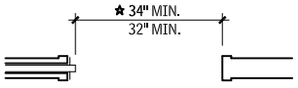



### CLEAR WIDTH OF ACCESSIBLE DOORWAYS 1.44

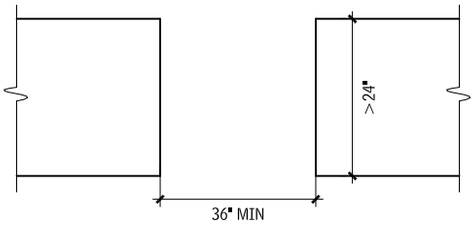
For a hinged door, the clear width is measured between the face of the door and the doorstop with the door open at a 90° angle. For a sliding or folding door, the clear width is measured between the edge of the door and the jamb with the door fully open. Hardware must be accessible with the door in fully open position. Openings and doorways without doors more than 24 in. in depth must have a clear width of 36 in. minimum. Doors in dwelling units covered by FHAG are permitted to have a "nominal" 32-in. clear width. HUD allows a 2 ft-10 in. with 31–5/8-in. clear width swing door to satisfy this requirement. ICC/ANSI A117.1 (2003) allows a 31–3/4-in. clear width in Type B dwelling units.



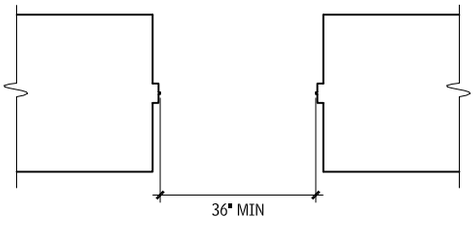

**HINGED DOOR**




**SLIDING OR FOLDING DOOR**

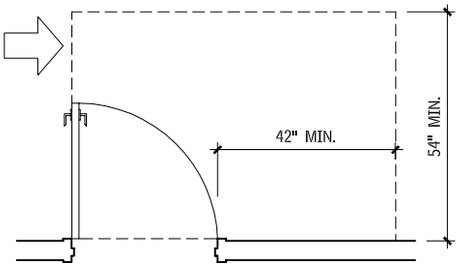



**DEEP OPENING**

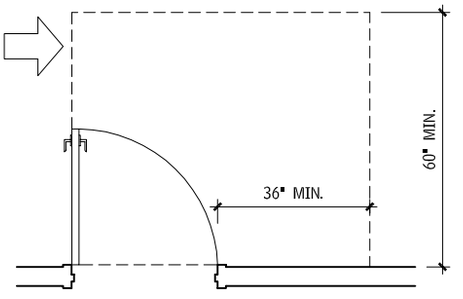



**DOORWAY WITHOUT DOOR**

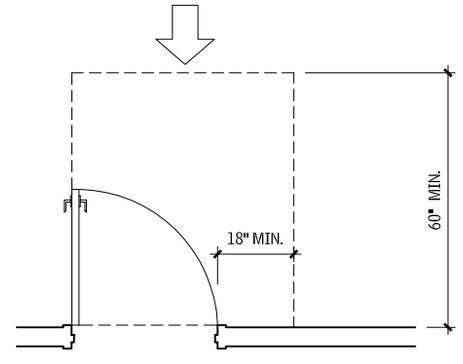
### PULL-SIDE MANEUVERING CLEARANCE AT SWINGING DOORS 1.45



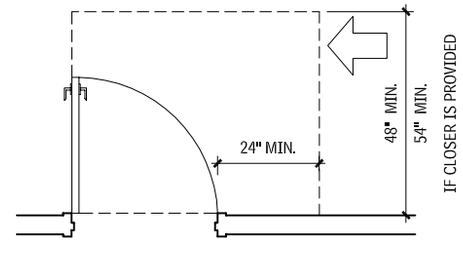

**HINGE APPROACH**




**HINGE APPROACH**




**FRONT APPROACH**




**LATCH APPROACH**

Contributors:
Dr. Ed Steinfeld, AIA and Jonathan White, Center for Inclusive Design and Environmental Access (IDeA Center), University at Buffalo, New York

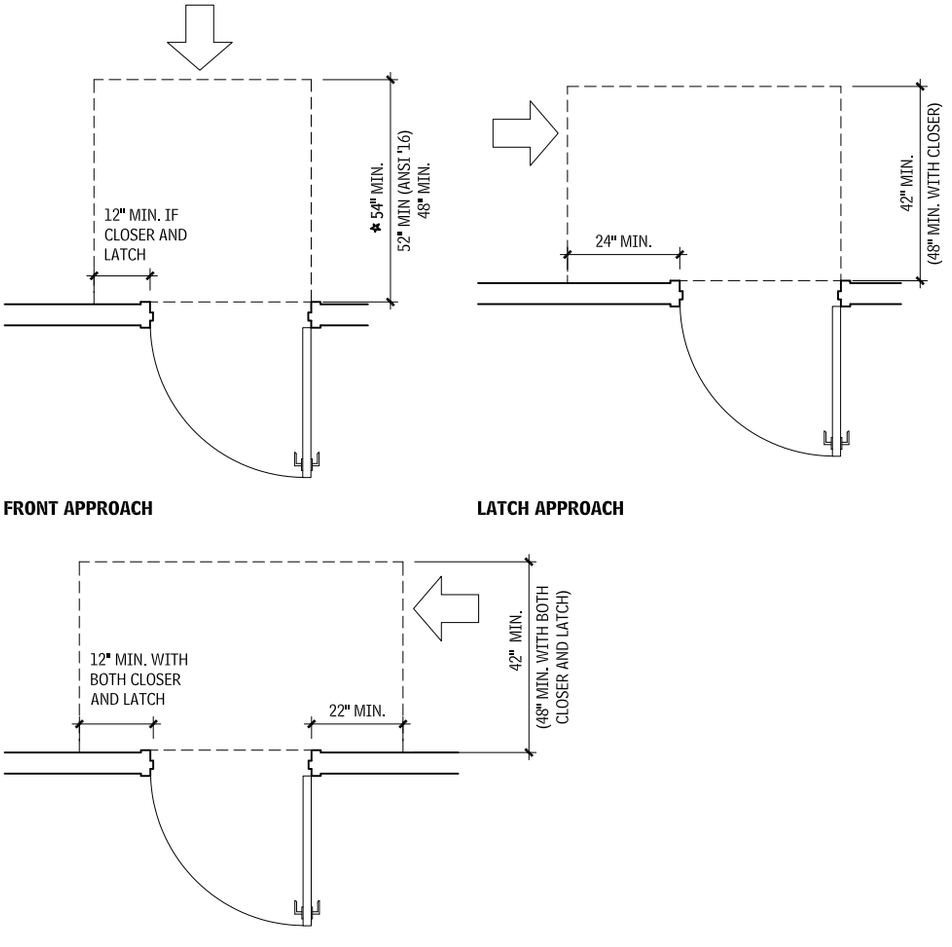
## ACCESSIBLE TOILET AND BATHING ROOMS

Accessible design of toilet and bathing rooms is the most complex of any standard and code item. Fixture requirements vary among the common accessibility standards and guidelines. The Americans with Disabilities Act (ADA) Standards for Accessible Design provide accessibility requirements for general public buildings and accommodations as well as residential dwelling units and units in transient lodging, medical and long-term care facilities, and detention and correction facilities. The Fair Housing Accessibility Guidelines (FHAG) include two options for bathroom design, designated as Option A and Option B. The primary difference is that Option B provides a more accessible approach to the bathtub. In covered dwellings with two or more bathrooms, all bathrooms must comply with Option A, or at least one must comply with Option B requirements. In covered units with only one bathroom, either Option A or B may be used. Some residential facilities may be covered by both the ADA and the FHAA—for example, dormitories and nursing homes. HUD also permits the 2010 ADA to be used as an alternative standard (with some exceptions) for residential dwelling units formerly required to comply with UFAS by the ABA or Rehabilitation Act.

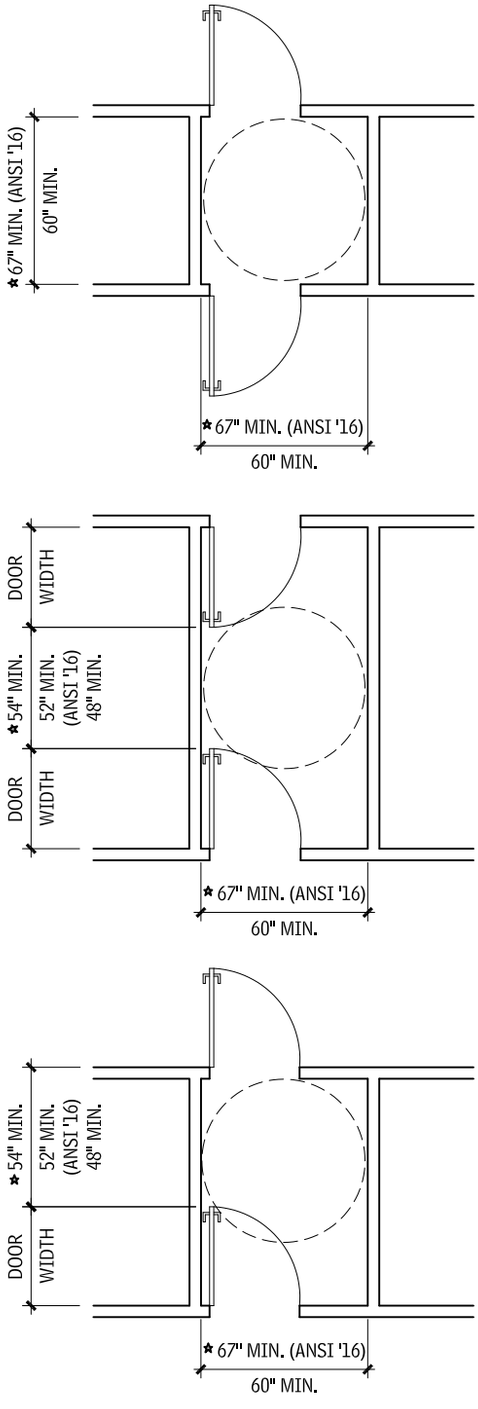
ICC/ANSI A117.1 includes the technical requirements for four types of bathrooms with mobility features and the technical requirements for the bathrooms vary significantly among these types:

- *Accessible:* Bathrooms not in residential dwelling units or in accessible dwelling units generally have the strictest requirements. The number of accessible units required by the building code typically is based on a percentage of the total number of units provided in the facility.
- *Type A:* Type A dwelling units are required by the building code in multifamily residential facilities, including apartment buildings, condominiums, monasteries, and convents. The number of units required to comply with these requirements is generally based on a percentage of the total number of units provided. Refer to the applicable building code.
- *Type B:* The requirements for Type B dwelling units are intended to be consistent with the technical requirements of the FHAG, although as of the date of this publication, the most recent version of ICC/ANSI A117.1 accepted by HUD as a safe harbor is the 2003 version.
- *Type C:* The requirements for Type C dwelling units are for covered private single-family homes and generally only require first-floor access to a half-bath and Type B clearances at the toilet as well as reinforcement for the future installation of grab bars.

**PUSH-SIDE MANEUVERING CLEARANCE AT SWINGING DOORS**
**1.46**




**TWO DOORS IN SERIES**
**1.47**




NOTE: Turning space is permitted to overlap door swing where indicated.

Contributors:
Dr. Ed Steinfeld, AIA and Jonathan White, Center for Inclusive Design and Environmental Access (IDeA Center), University at Buffalo, New York

Approach clearance requirements for the different accessibility standards are illustrated in this section. All dimensional criteria are based on ICC/ANSI A117.1 and adult anthropometrics. The differences among other standards are noted only where more stringent.

## LAVATORIES

Generally, knee and toe clearance is required below accessible lavatories. The lavatory overflow is permitted to project into the knee clearance. All residential dwelling unit types require forward approach, with the exception of FHAG and ICC/ANSI A117.1 (Type B and C units), which allow a parallel approach centered on the basin, or removable cabinetry for a future forward approach. ICC/ANSI A117.1 (Type A) and ADA residential dwelling units also allow adaptable cabinetry beneath the lavatory provided it can be removed without removing or replacing the lavatory and the flooring and walls already have a finished appearance.

ICC/ANSI A117.1 (Accessible Units) requires vanity size and proximity to the lavatory to be comparable to the nonaccessible units in a project.

ADA, ICC/ANSI A117.1 (except Type B and C units), and UFAS include requirements for faucets, mirror height, and pipe protection. All pipes located beneath these lavatories must be insulated or otherwise protected to prevent users from contact with the pipes. Lavatory controls should be within accessible reach range, be operable with one hand, and not require tight grasping, pinching, or twisting of the wrist. Automatic controls are acceptable. Manually activated, self-closing faucets should operate for not less than 10 seconds.

Mirrors located above lavatories, sinks, and vanities must be mounted with the bottom edge of the reflecting surface 40 in. maximum above the floor. Other mirrors must be mounted with the bottom edge of the reflecting surface 35 in. maximum above the floor.

## URINALS

ICC/ANSI A117.1 allows wall-hung and stall-type urinals; it does not require an elongated urinal rim for a wall urinal; however, other regulations may. Manually operated flush controls must be located 44 in. maximum above the floor.

## TOILETS

Generally, no other fixture is permitted in the toilet clear floor space and the toilet must be located adjacent to a side wall to accommodate grab bars. In residential dwelling units, UFAS, ICC/ANSI A117.1 (Types A, B, and C), FHAG, and ADA allow a lavatory within this space. The toilet is not required to be adjacent to a side wall, but if it is not, it must have 18 in. minimum clearance on both sides to accommodate the future installation of swing-up or floor-mounted grab bars. Toilet distance to side wall varies by standard. Refer to Figure 1.49 for dimensional requirements of each standard.

In addition to clearance requirements, UFAS, ICC/ANSI A117.1, and the ADA include provisions for toilet seat height. Seats must not spring to return to a lifted position. They also specify the location and operation of flush controls and toilet paper dispensers. Manually operated flush controls must be located on the open side of the toilet; they may not be centered above the toilet. ICC/ANSI A117.1 (Type A) requirements also include seat height requirements and the location and operation of flush controls. The hatched area in Figure 1.49 indicates the allowable location of the toilet paper dispenser. Dispenser outlets must be within the range shown. Dispensers should allow continuous paper flow, not control delivery.

The grab bar arrangement can influence the floor plan of an accessible bathroom. The grab bar requirements of ICC/ANSI A117.1 (Accessible and Type A), UFAS, and ADA can become critical factors in toilet and bathroom arrangements. Figure 1.49 depicts typical grab bar positions at the toilet. The ADA, ICC/ANSI A117.1 (Types A, B, and C), and FHAG allow reinforcement for future installation of grab bars in residential dwelling units in lieu of pre-installed grab bars. ICC/ANSI A117.1 (Types B and C) and FHAG grab bar standards permit a 24-in. side grab bar if space does not allow a 42-in. grab bar. ICC/ANSI A117.1 (Types B and C) and FHAG also allow the installation of swing-up grab bars in lieu of side- and rear-wall grab bars, so the wall adjacent to the toilet may be shorter or omitted entirely. Swing-up grab bars must be on both sides of the toilet, centered 15.75 in. from the toilet centerline.

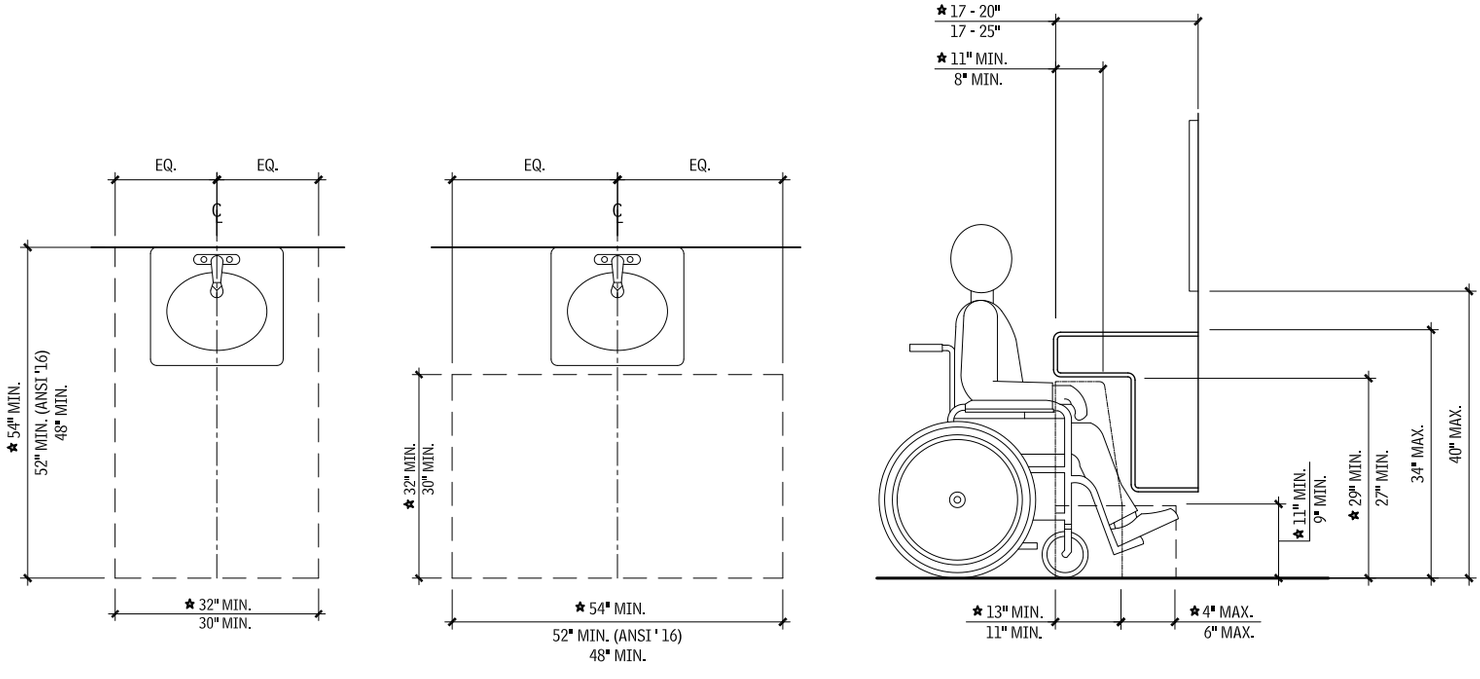
## TOILET COMPARTMENTS

Where toilet compartments are provided, at least one compartment must be wheelchair-accessible. Where six or more toilet compartments are provided in a toilet room, in addition to the wheelchair-accessible compartment, a 36-in.-wide ambulatory accessible compartment is also required. Left- or right-handed configurations are acceptable. The door to the toilet compartment must be self-closing and have an accessible pull on both sides near the latch. The locking mechanism must be operable with one hand, and not require tight grasping, pinching, or twisting of the wrist.

Minimum compartment size varies based on presence of toe clearance under the partition wall, toilet mount (side or wall), and if the stall is for adults, children, or if it is an ambulatory stall. Use the accompanying figure and table to determine the appropriate minimum stall size.

**LAVATORIES**
**1.48**

Sinks and lavatories for children ages 6 to 12 with a 31-in. maximum rim or counter surface may have a knee clearance of 24 in. minimum. Parallel approach is permitted at lavatories and sinks used primarily by children ages 5 and younger.




Contributors:
Dr. Ed Steinfeld, AIA and Jonathan White, Center for Inclusive Design and Environmental Access (IDeA Center), University at Buffalo, New York

## SINGLE-USER TOILET ROOMS

In new construction, all public and common-use toilet rooms are generally required to be accessible. In accessible toilet rooms, at least one of each type of fixture and accessory provided must be accessible. A wheelchair turning space is required within accessible toilet rooms. Doors are not permitted to swing into the required clear floor space at any fixture, except in single-user rooms where a clear floor space is provided beyond the swing of the door. UFAS does not provide this exception in single-user rooms. The same is true of single-user bathing rooms, which will be discussed later in this section.

Recent model codes require accessible single-user toilet rooms in certain assembly and mercantile occupancies. Single-user rooms are typically unisex facilities, which is beneficial for parents with small children and for people with disabilities who require personal assistance in using toilet facilities, as the assistant may be a person of the opposite sex. A requirement for unisex facilities usually applies when a total of six or more toilets (or toilets and urinals) are provided in the facility or in certain occupancy areas. Unisex facilities must be located within 500 ft. and within one floor of separate-sex facilities. In facilities with security checkpoints, such as airport terminals, unisex facilities must be located on the same side of the checkpoint as the separate-sex facilities.

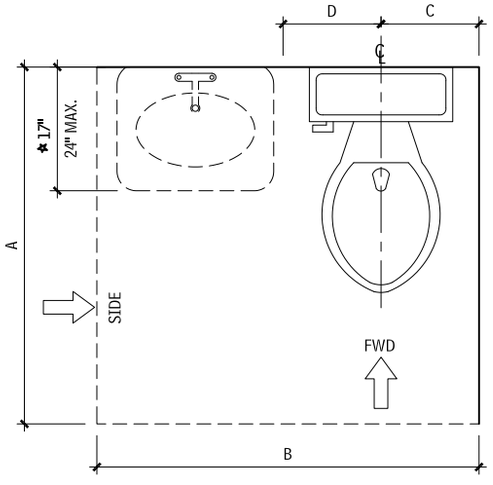
Where multiple single-user toilet rooms are clustered in a single location and each serves the same population, 5 percent, but not less than one of the rooms must be accessible. Signs must identify the accessible room(s), when not all rooms are accessible.

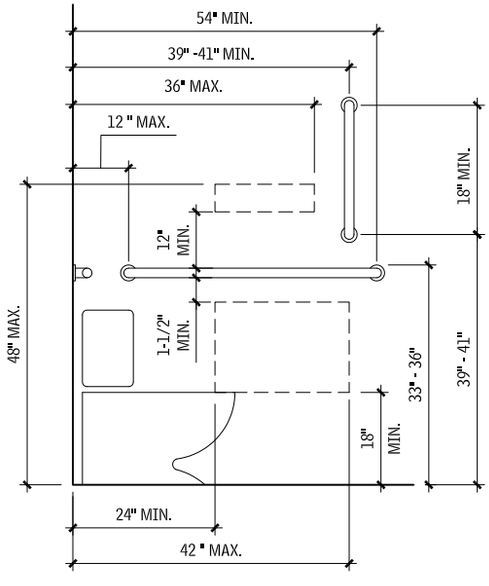
Single-user toilet rooms provided within a private office are permitted to be adaptable for future accessibility. Making the room accessible is permitted to involve replacement of the toilet and lavatory, changing the swing of the door, and installing grab bars in previously reinforced walls. Certain conditions permit accessible unisex toilet rooms in alterations in lieu of altering existing separate-sex facilities, provided they are located in the same area and on the same floor as the existing inaccessible facilities. Consult with applicable standards and codes.

Doors to single-user toilet rooms must have an accessible locking mechanism inside the room. Single-user toilet rooms require a single toilet and lavatory with an optional urinal. Fixtures provided in single-user rooms are permitted to be included in the number of required plumbing fixtures.

If storage is provided in separate-sex facilities, it must also be provided in a unisex facility. Likewise, when bathing fixtures are provided in separate-sex facilities, an accessible shower or bathtub must be provided in the unisex bathing room. Refer to the single-user bathing room section for more details.

### WATER CLOSETS
### 1.49



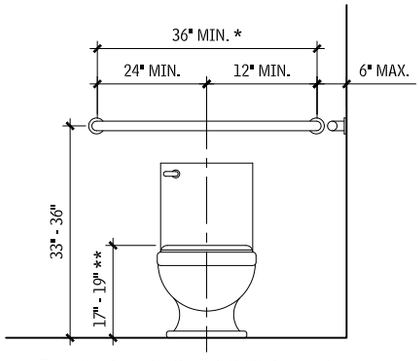

| USE | APPROACH | A" (MIN.) | B" (MIN.) | C" | D" | LAVATORY PERMITTED | PERMITTED BY STANDARD |
|---|---|---|---|---|---|---|---|
| ★ PUBLIC/RESIDENTIAL | EITHER | 56 | 60 | 16-18 * | N/A | NO *** | ALL STANDARDS |
| RESIDENTIAL DWELLING | FRONT | 66 | 60 | 16-18 * | 18 | YES | ADA, ANSI A, ANSI B, FHAG |
| RESIDENTIAL DWELLING | FRONT | 66 | 48 | 18 | 18 | YES | UFAS, ANSI B, FHAG |
| RESIDENTIAL DWELLING | SIDE | 56 | 60 | 18 | 18 | YES | UFAS, ANSI B, FHAG |
| RESIDENTIAL DWELLING | EITHER | 66 | 48 | 16-18 * | 15 ** | YES | ANSI B, FHAG |
| RESIDENTIAL DWELLING | SIDE | 56 | 48 | 16-18 * | 15 ** | YES | ANSI B, FHAG |

* 18 IN FHAG AND UFAS

** 18 IF SIDE WALL WILL NOT ACCOMMODATE A 24 " GRAB BAR 12" FROM REAR CORNER.

*** ALLOWS SIDE TRANSFER TO TOILET

★ DENOTES BEST PRACTICE




* 24" ALLOWED IF ADJACENT RECESSED FIXTURE LIMITS WALL SPACE (EXCEPT UFAS).

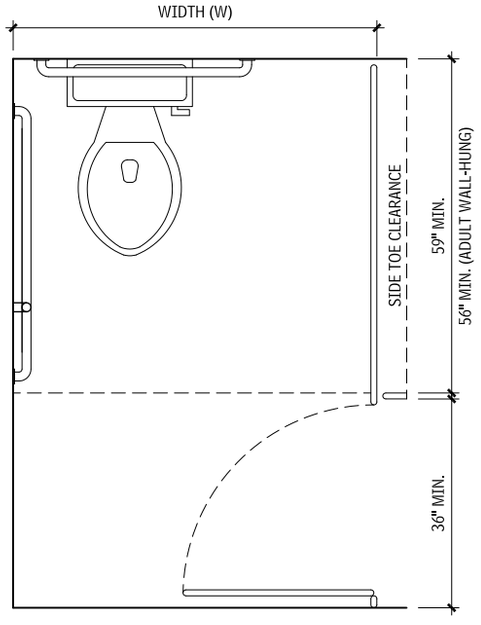
** 15-19" ALLOWED IN ICC/ANSI A177.1 (TYPE A).

**NOTE**

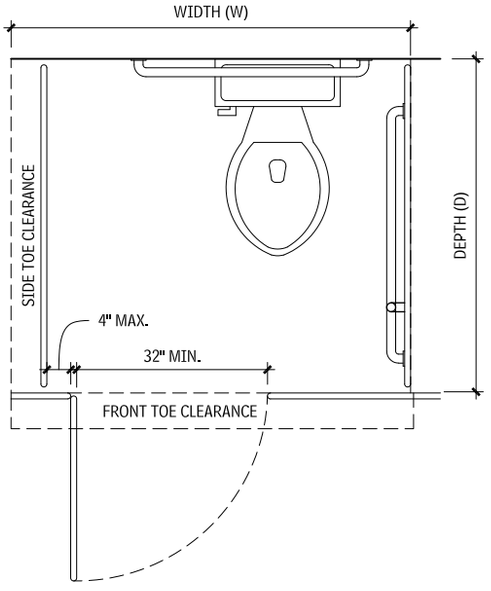
1.49 Vertical grab bar is only required by ICC/ANSI A117.1. It is omitted by other standards and is not required in Type A and B residential dwelling units.

Contributors:
Dr. Ed Steinfeld, AIA and Jonathan White, Center for Inclusive Design and Environmental Access (IDeA Center), University at Buffalo, New York

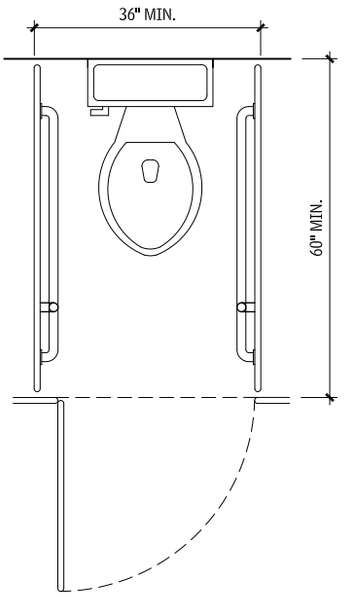
**TOILET COMPARTMENTS**
**1.50**



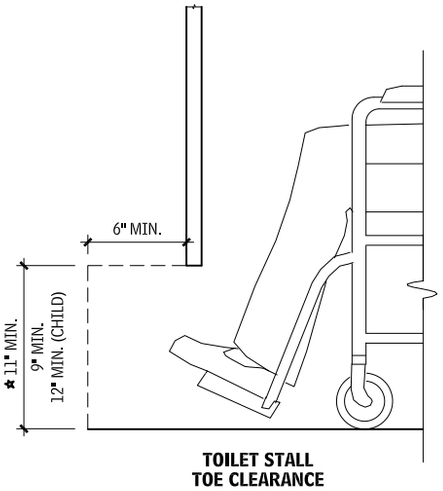

**END OF ROW**




**MIDROW**




**AMBULATORY ACCESSIBLE**



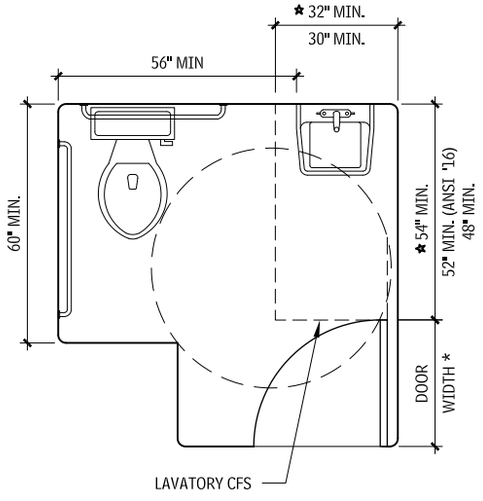

**TOILET STALL TOE CLEARANCE**

**MINIMUM WHEELCHAIR ACCESSIBLE TOILET STALL SIZE**

| 6" TOE CLEARANCE LOCATION | MIN STALL WIDTH (W) | MIN STALL DEPTH (D) | MIN STALL DEPTH (D) IF WALL-HUNG TOILET IN ADULT STALL |
|---|---|---|---|
| NO TOE CLEARANCE | 66" | 65" | 62" |
| AT FRONT ONLY | 66" | 59" | 56" |
| AT SIDE ONLY | 60" | 65" | 62" |
| AT BOTH SIDE AND FRONT | 60" | 59" | 56" |

Contributors:
Dr. Ed Steinfeld, AIA and Jonathan White, Center for Inclusive Design and Environmental Access (IDeA Center), University at Buffalo, New York

**SINGLE-USER TOILET ROOM LAYOUT**
**1.51**




* ONLY UFAS REQUIRES THAT THE DOOR NOT ENCROACH UPON THE FIXTURE CLEAR FLOOR SPACE IN SINGLE-USER TOILET AND BATHING ROOMS. OTHER STANDARDS PERMIT AN OVERLAP IF THERE IS A CLEAR FLOOR SPACE WITHIN THE ROOM AND OUTSIDE THE SWING OF THE DOOR

## SINGLE-USER BATHROOMS

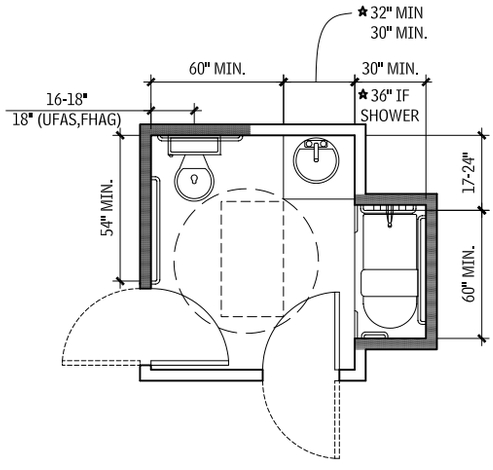
The requirements of single-user toilet rooms also apply to single-user bathrooms. The accompanying figure depicts several layout options based on the minimum clear floor space for the fixtures, grab bar position, and door location. Each bathroom plan must provide the fixture clearances required by the applicable standard. In addition, maneuvering space must be provided, although the amount of space varies by unit type.

ICC/ANSI A117.1 (Accessible and Type A units), UFAS, and the ADA require either a circular or a T-shaped wheelchair turning area within the room. Turning space can generally include knee and toe space under fixtures and accessories, as far as the building blocks section permits. The door swing may overlap the turning space. The clear floor space at a fixture is frequently more stringent than the turning space. With the exception of UFAS, the door swing may overlap the clear floor space at fixtures, provided there is enough clear space to position a wheelchair clear of the door swing. Door maneuvering clearances must also be considered.

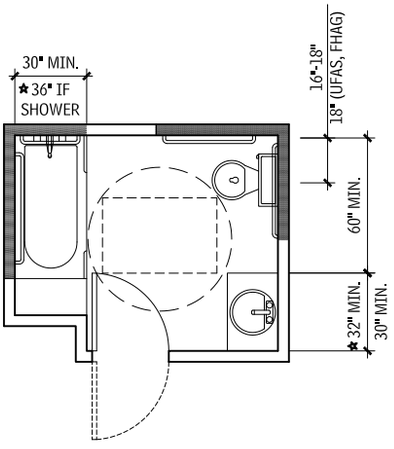
Bathrooms in ICC/ANSI A117.1 (Type B units) and FHAG must be "usable" rather than "accessible"; therefore, the minimum maneuvering clearance required is smaller. In these units, there must be enough clear space to position a wheelchair clear of the door swing and a turning space is not required. All of the standards permit required floor space for fixtures to overlap with the required maneuvering space.

Note the accompanying figure does not depict each fixture's clear floor space. Refer to the section on each fixture for specific dimensions. Dimensions provided refer to finish dimensions and do not provide a tolerance. Consider adding at least 2 in. to the overall size to allow for adjustments in the field. Doors in the figure are assumed to be 36 in. wide. Refer to the doors section for more detailed requirements.

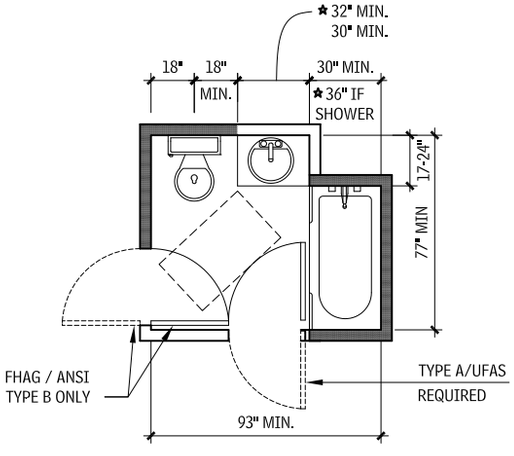
**BATHROOM LAYOUTS**
**1.52**



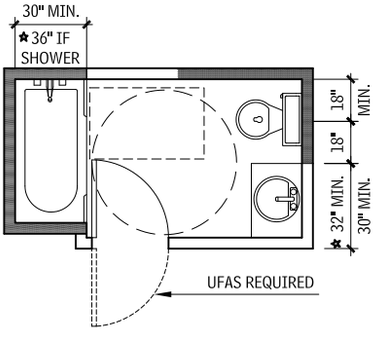

ALL STANDARDS, ALL UNIT TYPES
ONE-WALL CONFIGURATION



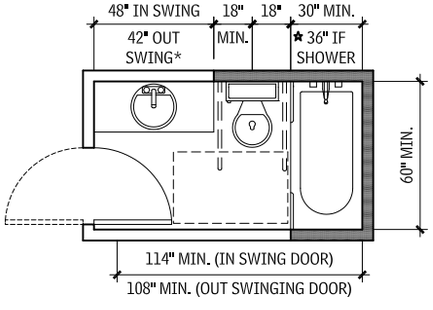

ALL STANDARDS, ALL UNIT TYPES
TWO-WALL CONFIGURATION




ANSI TYPE A AND B, UFAS, FHAG
ONE-WALL CONFIGURATION

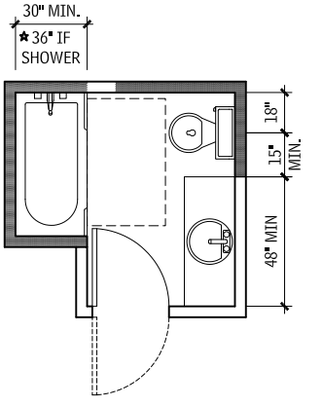



ALL TYPE A AND B, UFAS, FHAG
TWO-WALL CONFIGURATION




*42" OUT SWING DIMENSION
DEPENDS ON TOILET BOWL WIDTH

FHAG/ANSI TYPE B OPTION A
ONE-WALL CONFIGURATION




FHAG/ANSI TYPE B OPTION A OR B
TWO-WALL CONFIGURATION

Contributors:
Dr. Ed Steinfeld, AIA and Jonathan White, Center for Inclusive Design and Environmental Access (IDeA Center), University at Buffalo, New York

## PUBLIC RESTROOMS

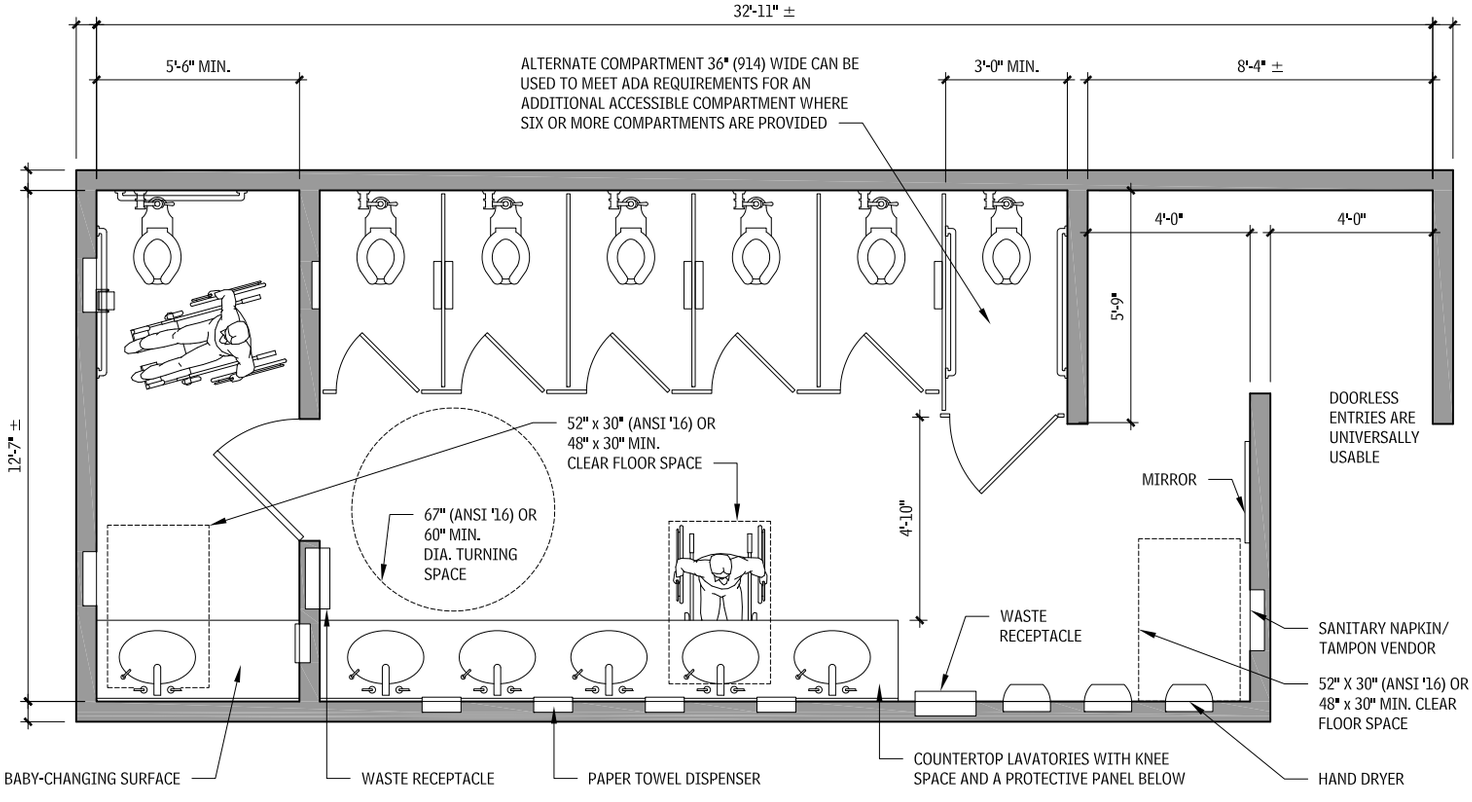
The spacing and location of plumbing fixtures and toilet rooms should respond to occupant needs and code requirements. The design professional should be aware of how water is piped to plumbing fixtures and how waste is plumbed from fixtures, along with general venting requirements. Even during preliminary design, the design team should begin to address the requirements for accumulation and flow of water through horizontal and vertical piping. Additional design issues needing to be considered include coordination of plumbing fixture location with toilet compartments and urinal screens, toilet and bath accessories, and tub and shower doors.

## CODES AND STANDARDS

Plumbing codes establish minimum acceptable standards for the design and installation of plumbing systems and the selection of the components they comprise. Requirements for plumbing system design should be based on the adopted code of the jurisdiction of the project.

The word "approved" is often used in conjunction with components and devices that come in contact with potable water and products used for human consumption or use. Nonetheless, a responsible code official or agency must examine and test these items to determine whether they are suitable for a particular intended use. Only materials and devices approved by the local jurisdiction can be used in plumbing systems. Plumbing design drawings and utility services also must be examined and found to be in compliance with local codes, rules, and regulations.

**WOMEN'S TOILET ROOM WITH OPEN VESTIBULE**
**1.53**




**NOTE**

1.53 Bobrick Washroom Equipment, Inc., North Hollywood, California.

Contributor:
Alan H. Rider, AIA, Daniel, Mann, Johnson, & Mendenhall, Washington, DC.