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Accessible Environments:
Toward Universal Design

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SYNOPSIS

Faced with a growing population of people with disabilities and advancing years, designers are finding an increased market as well as legal pressure to produce products, buildings and exterior spaces that are accessible to everyone.

The Disability Rights Movement has achieved considerable success in its effort to lobby for equal civil and environmental rights for Americans who, until recently, have been excluded on the basis of physical disability or extremes of size. The Americans with Disabilities Act requires that—in addition to education, government programs and housing—public accommodations, public transportation and telecommunications be designed and operated in such a way that people with disabilities have the same opportunities as others.

The perceived lack of market for specialized, accessible design services is a myth. At least 36 million Americans have permanent disabilities, and the rate of prevalence of severe disability has increased by 70% since 1966. In the growing population over 65 years of age, 46% have either limited or severe disabilities. The number may be even larger. The Arthritis Foundation places the number of people having only arthritic conditions capable of causing disabling conditions at 37 million. The magnitude of these figures obligates designers to consider the entire life span, including periods of temporary disability, of future users of the spaces or products being designed.

Universal design means simply designing all products, buildings and exterior spaces to be usable by all people to the greatest extent possible. It is advanced here as a sensible and economical way to reconcile the artistic integrity of a design with human needs in the environment. Solutions which result in no additional cost and no noticeable change in appearance can come about from knowledge about people, simple planning and careful selection of conventional products.

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* Preprinted from the forthcoming book: *Innovation by Design.* W.E. Preiser, J.C. Vischer, E.T. White (Eds.). Van Nostrand Reinhold, New York, 1990.

In addition to fixed, universally designed features, designers may include *adaptable* elements. These can be easily and economically added or removed when needed for a specific user. Such flexible facilities and products are usable by almost everyone and are thus significantly more marketable.

Universal and adaptable features are generally no more expensive than traditional features if incorporated by the designer at the programming and conceptual stages. The cost-conscious designer must consider and advise clients concerning not only construction costs related to accessibility, but also the long-term costs of ignoring a potentially huge segment of the population. Clients must also be made aware of the trend toward stricter accessibility standards in employment, housing, education and public services.

Many recent innovations in technology have made it easier for designers to specify both universal and specialized components. As the construction and manufacturing industries respond to the aging of the population and new legal strictures, "better for everyone" and "planning ahead for your family's needs" will begin to replace "handicapped" and "elderly" as marketing approaches.

As comfort, safety, and flexibility become more important key words in advertising, emerging technologoes will continue to respond to the needs of people of all ages, abilities and sizes. Designers will be faced with a choice: reluctant compliance with minimum accessibility standards, or a positive, sensitive offering of universal design services.

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Major changes in design requirements, both market-driven and legally mandated, are creating a new dilemma for designers. Changing demographics, statutes, and attitudes are fueling the demand for more sophisticated products, housing, and business environments, that are *accessible* for people of all ages, sizes, and abilities. These changes signal a wide array of opportunities for designers to apply their creative energies to the solution of practical, social and psychological problems. They may also hurl design practitioners into a chasm of uncharted territory without the benefit of appropriate training or technical assistance.

In much the same way as the advent of steel beams and large panes of glass influenced sudden and immense changes in building technology, the massive lobby for practical, affordable, attractive environments for people with disabilities is influencing today's design technology. As new legislation and changing societal values force housing providers and business owners to question their stereotypical assumptions about disabled people, the "no market" misconception must begin to give way to a more humanistic recognition of the difference between "physical disability" and "environmental handicap." The designer motivated to eliminate environmentally induced handicaps can assist in empowering people with all types of physical or cognitive disabilities to integrate as fully as possible into the mainstream of daily life.

The "No Market" Misconception

Architects often observe that their clients do not view people with disabilities as family members, employees, customers, clients or tenants, and are therefore not interested in going to a lot of trouble to accommodate special, unattractive features in their designs. This perceived lack of market can only result from a misunderstanding of the growing disability community which can benefit from a more thoughtful design approach.

Much of what is poorly built for people with disabilities has resulted from common misconceptions, such as:

People with disabilities don't go out much.

People with disabilities don't want or need jobs.

People with disabilities don't have families, marry, or have children, so one-bedroom apartments should be sufficient.

Figure 1. People with disabilities participate in all types of activities if they have access to them.

People with disabilities only need access to doctors' offices and other medical facilities.

People with disabilities want to live together.

People with disabilities are not affluent or self-sufficient, and thus are not an important part of the consumer market.

It is easy to see how these erroneous perceptions can result in design, planning and program decisions that prohibit participation by people with disabilities.

The disability community is large—much larger than most people think. The definition of disability is any physical or mental impairment that substantially limits one or more of the major life activities of an individual, a record of such an impairment, or being regarded as having such an impairment. It includes not just people in wheelchairs, but also people with other mobility problems related to diseases such as polio or rheumatism, people with low levels of vision, people with speech or hearing impairments, people with cognitive disabilities such as Alzheimer's Disease and Down Syndrome, and severely disabled people

who may be confined to bed. It also includes people whose arthritic hands cannot grasp a doorknob, those who cannot walk up a flight of stairs due to heart disease, those with extremes of physical size who cannot enjoy a movie theatre or airplane trip, and those with temporary disabilities related to, for example, sprained ankles, automobile accidents, or difficult pregnancies. The broader disability community includes not only the people with disabilities themselves, but also the caregivers who often must lift, transport, bathe, feed, or provide therapy or other support to the disabled person. Further, the disability community includes families and friends who wish to accompany people with disabilities wherever they may wish to go.

Disability knows no socio-economic boundaries. It strikes people at all income levels in equal measure. Depending on the definition used, the number of people regarded as having disabilities varies dramatically. An estimate of 36 million is the number most often quoted based on census data and surveys of government benefit programs. Other definitions make this estimate seem quite low. For example, the marketing department of a well-known manufacturer of durable medical products estimates after 95 years of operation that their products are sold regularly to 80 million people having some form of disabling condition. The Arthritis Foundation places the number of people having arthritic conditions capable of causing disabling conditions at 37 million alone. Some market specialists include non-disabled friends and family in the overall count of the disability community on the theory that if facilities and services are not appropriate for the disabled person in a given environment, his or her associates will often not attend or participate in that environment either.

By any definition, it seems the numbers of disabled people are increasing rapidly compared to two or three decades ago. Very few people are born with a disability; more often, disabilities are acquired over the life span. Gerben DeJong and Raymond Lifchez (1983) report a 70% increase in the rate of prevalence of severe disability from 1966 to 1979, and a 40% increase in the use of mobility aids over a similar period. This trend is continuing in part because of steady improvements in emergency rescue and medical procedures that are saving lives that once would have been lost. Exposure to new risks in a technological society has also increased. But above all, people are living longer, greatly extending the period of aging that is one of the primary causes of disabling conditions.

Popular literature is alive with information about the aging population. DeJong and Lifchez report that 46% of the population aged 65 and

over have either limited or severe disabilities. As the over-65 population increases, so does the prevalence of disability-inducing disease. Loss of hearing, whether due to aging, genetic, or accidental causes is a disability. Inability to climb steps, whether caused by a stroke, broken hip, or childhood polio is a disability. By this measure, it is likely that most people will have some disabling condition if they live long enough.

The designer, then,has a responsibility to consider the entire life span of the individual. Disability is a normal condition of life that should be taken into account in all that is designed and produced, including housing. Designs based on the "no market" assumption will often become a self-fulfilling prophecy as people with disabilities are unable to visit inaccessible housing and businesses. Inappropriately designed parking spaces, walkways, entrances, elevators, telephones, drinking fountains, door hardware, toilets, and kitchens will discourage and possibly even endanger people with disabilities. Conversely, designing *for* accessibility can arrest the viscious cycle between denial of need and lack of use, providing flexibility for users, thereby increasing or strengthening the market and more than likely improving the client's profit margin.

What is a barrier-free environment?

When one considers the full scope of abilities and age groups to be accommodated by a given design, the terms "barrier free" and "accessible" seem to be limited as definitions of reality. Because the issues are so complex, even for specialists, many in the design professions have limited knowledge and awareness of the true extent of the problem. They therefore regard accessibility codes as burdensome and unreasonable. What is barrier-free for someone in a wheelchair may not be for someone who is blind or deaf. The cantilevered drinking fountain, for example, which is more easily used by seated people, often protrudes into the path of a visually impaired person, undetected by his or her cane (Figure 2). The auditory signals which are so helpful to the visually impaired person are, of course, inaudible to the hearing impaired person, illustrating the need for redundant cuing in some situations to increase safety. Printed signs that aid hearing impaired people are often insufficient by themselves for a mentally retarded person or a person with a learning disability.

Simple "removal of barriers" obviously does not fulfill the responsibility of designers to provide environments that can be fully interpreted—and experienced qualitatively. Architect I.M. Pei notes the need to go beyond mere access: "Spatial relationships need to be experienced. Persons with disabilities must be able to enjoy the psycho-

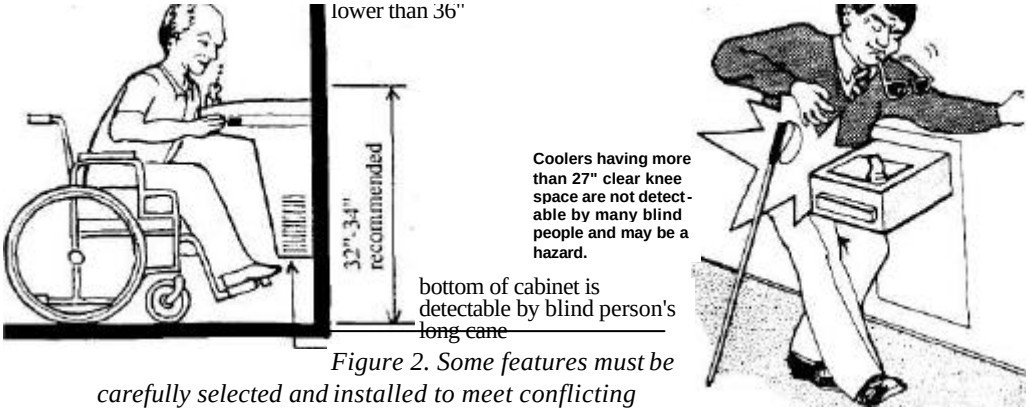


Figure 2. Some features must be carefully selected and installed to meet conflicting needs of different disability types.

logical aspects of a structure, not only the individual points or planes within it." (Goldman, 1983) As with design objectives such as energy efficiency and fire safety, there is no accessibility solution that will meet every design challenge. However, if designers are sensitive to the full range of users for products and buildings, there are numerous decisions which can be made at the conceptual design stage of a given project that will enhance the functional aspects of the design for both disabled and nondisabled people.

Toward Universal Design

A giant leap forward in reconciling the designer's dilemma with the needs of disabled people can be taken by adopting the *universal design* approach—designing all products, buildings and interiors to be usable by all people to the greatest extent possible. As stated by Lusher and Mace (1989):

> Instead of responding only to the minimum demands of laws which require a few special features for disabled people, it is possible to design most manufactured items and building elements to be usable by a broad range of human beings including

children, elderly people, people with disabilities, and people of different sizes. This... is a concept that is now entirely possible and one that makes economic and social sense.

Solutions which create no additional cost and no noticeable change in appearance can result from simple planning procedures and selection of conventional products. Wider instead of narrower doors can be substituted, and flat thresholds can easily replace raised ones, aiding not just people with mobility problems but also the millions who struggle to move their bulky pieces of furniture into new residences or offices each year. Maneuvering space in bathrooms, needed by those who use walkers and wheelchairs, can be provided if and when needed—and without increasing room size— by installing removable vanity cabinets or recessed and wall-supported, countertop lavatories. Controls and switches can be placed lower on walls, and electrical receptacles higher. Plumbing controls can be offset toward the outside edge of the bathtub with only a shift in the pipe location, providing an easier reach for everyone. Thermostats with large and/or lighted numerals can be specified. Appliances can be selected which have contrasting graphics and click stops on the controls, making them easier for anyone to see or use.

Figure 3. Some features such as lever handles are a benefit to everyone.

Accessible building entries are needed by the 10% of the adult population that has difficulty with stairs, but they benefit virtually everyone. Ramps, which are commonly used, are not ideal for people with certain disabilities, and lifts may malfunction, leaving many people unable to enter or exit a building.

Through careful design and placement on their sites, houses and commercial buildings can often be constructed without steps at entrance doors, thus at least improving access to ground floors. Some knowledgeable designers raise garages and outside walks to the building floor level to let vehicles rather than people climb the heights, benefitting not just wheelchair users but also people carrying heavy loads or pushing carts or strollers. When site and design constraints conflict, level entries can

be provided through the creative use of bridges to high ground, overhead walks, or exterior elevator towers which can be shared by .more than one building. (Lusher and Mace 1989)

The universal design approach considers the changes that can occur over a person's life span and mitigates against the possibility of having to install "clinical looking" or expensive features when unexpected disabilities occur. Architects today will find it possible to specify aesthetically pleasing and universally usable components for their buildings. Manufacturers have responded to the increased demand for items such as grab bars, handheld showers, adjustable closet organizers, easy-to-use appliances and lever handles for doors by producing a wide array of styles and colors that will appeal even to those who are unconcerned about universal design.

Figure 4. Adjustable elements make some features universally usable.

Adaptable Design

Adaptable design offers basic universal features which can easily be adapted to the needs of a specific user. Most housing built "for disabled people" is designed for those who use wheelchairs (a small percentage of the total population with disabilities) and has features that are neither needed nor preferred by others. The adaptable design concept is most applicable in rental housing where there is frequent turnover in occupancy, although certain other buildings could also benefit from this approach, at least in a marketing context. In fact, the adaptable concept resulted from a problem in renting to nondisabled tenants housing units with the fixed accessible features called for in the building codes. Owners found that after including the legally required number of accessible units in their buildings, they could not always fill them with people who needed or wanted the special features, and that others preferred not to live in them because of their special appearance.

Adaptable design includes all features normally required for full access by wheelchair users, but allows some to be hidden from view by

the use of removable elements, and others to be added when needed. It also requires a few key features to be adjustable in height for use by people of all sizes and abilities. This combination of fixed accessible features, adjustable features, and optional removable or added elements creates a flexible environment that can be tailored as needed to the specific functional limitations of the user (Lusher and Mace 1989). Such flexible facilities are usable by almost everyone and are thus significantly more marketable.

The American National Standard for Buildings and Facilities (ANSI A117.1-1986) and the Uniform Federal Accessibility Standard (UFAS), which will be discussed later, contain technical specifications for the fixed accessible, adjustable and optional features required in an adaptable dwelling. Such features include but are not limited to those shown in Figure 5, and are listed below .

Fixed Accessible Features: *(excerpted from Mace & Lusher, 1989)*

- *Wide, passable doors.* Doors that provide at least a 32-inch, clear opening.
- *An accessible route.* A clear path (generally at least 36 inches wide) connecting all accessible features and spaces. This requirement means there can be no steps or stairs at the entrance to the building or unit and that a complete set of living facilities must be on one level unless all levels are connected by a ramp, lift, or elevator.
- *Clear floor spaces.* Specified floor areas around fixtures such as toilets, tubs, showers, and sinks must be clear to allow people using wheelchairs to maneuver. The clear floor areas can be partially covered by removable elements such as cabinets. Careful design can avoid major increases in room size.
- *Controls within easy reach and easily operated.* Light switches, thermostats, electrical receptacles, faucets, and other controls should be mounted between 9 inches and 48 to 54 inches above the floor (depending on the direction of approach) and operable with one hand. They should also not require great force or grasping power to activate.
- *Operable windows.* If operable windows are provided, they must meet the requirements similar to those for controls.
- *Visual alarms.* If warning signals are provided, such as smoke and/or fire alarms, they must be both visual and auditory, or an

outlet must be provided which will connect a portable visual signal device into the alarm system.

- *Knee spaces.* Knee spaces of particular sizes must be provided under the kitchen sink and workspace, beside wall ovens in kitchens, and under lavatories in bathrooms. These knee spaces can be temporarily concealed (See Removable Features, below).
- *Tub seats.* Bathtubs must have either a built-in seat at the head end or an attachable, portable seat that fastens securely to the tub when needed. The seats are used by people who cannot step over the tub rim and sit down in the tub (See Figure 6).
- *Showers.* If showers are provided, at least one must be either a 3x3 foot size with a seat to allow transfer, or a roll-in shower that can accommodate a person in a wheelchair. If a roll-in shower is chosen, the standards do not require it to be larger than the size of a full bathtub; however, larger sized showers may be more functional for some users.
- *Offset controls.* Tubs and showers must have control valves which are offset toward the outside to be easier to reach from the side of the fixture. Hand-held shower heads on flexible hoses must also be provided.
- *Reinforcing for grab bars.* Wood blocking or other reinforcing must be placed in specific locations in walls around showers, tubs and toilets to facilitate the simple addition of grab bars at a later time.

Adjustable Features:

- *Segments of countertops over knee spaces at work surfaces and sinks* should be adjustable in height from a standard height of 36 inches to a low of 28 inches to allow use by people who must sit down to prepare food. The kitchen sink should be included in the adjustable counter segment and its plumbing can be connected with flexible supply pipes and removable segments or slip joints in the drain pipe. Cooktops and other appliances may also include adjustable features at the option of the owner, builder, or designer.
- *Adjustable height closet rods and cabinet shelves* are not specifi cally required in ANSI or UFAS but are highly recommended to improve universal usability.

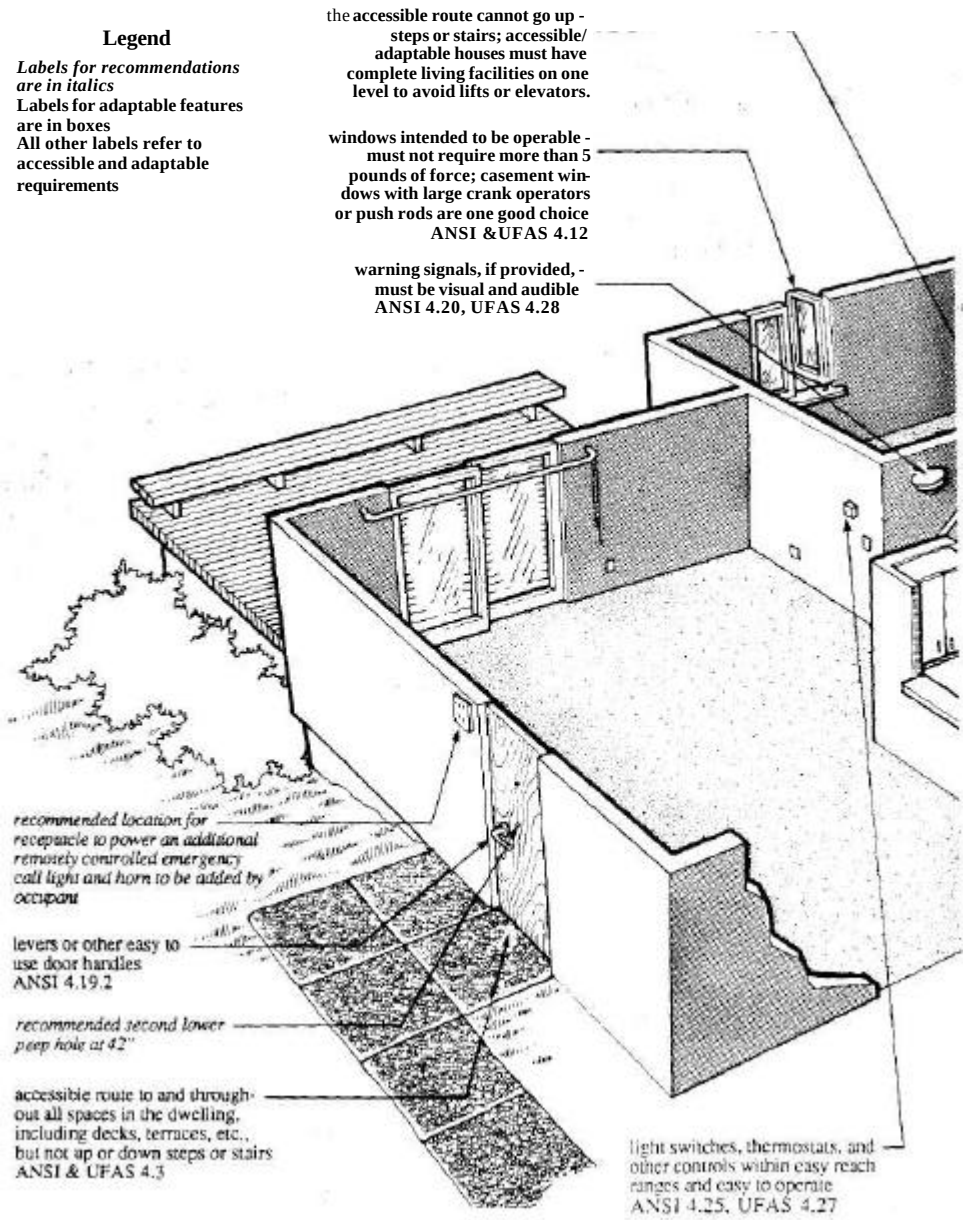
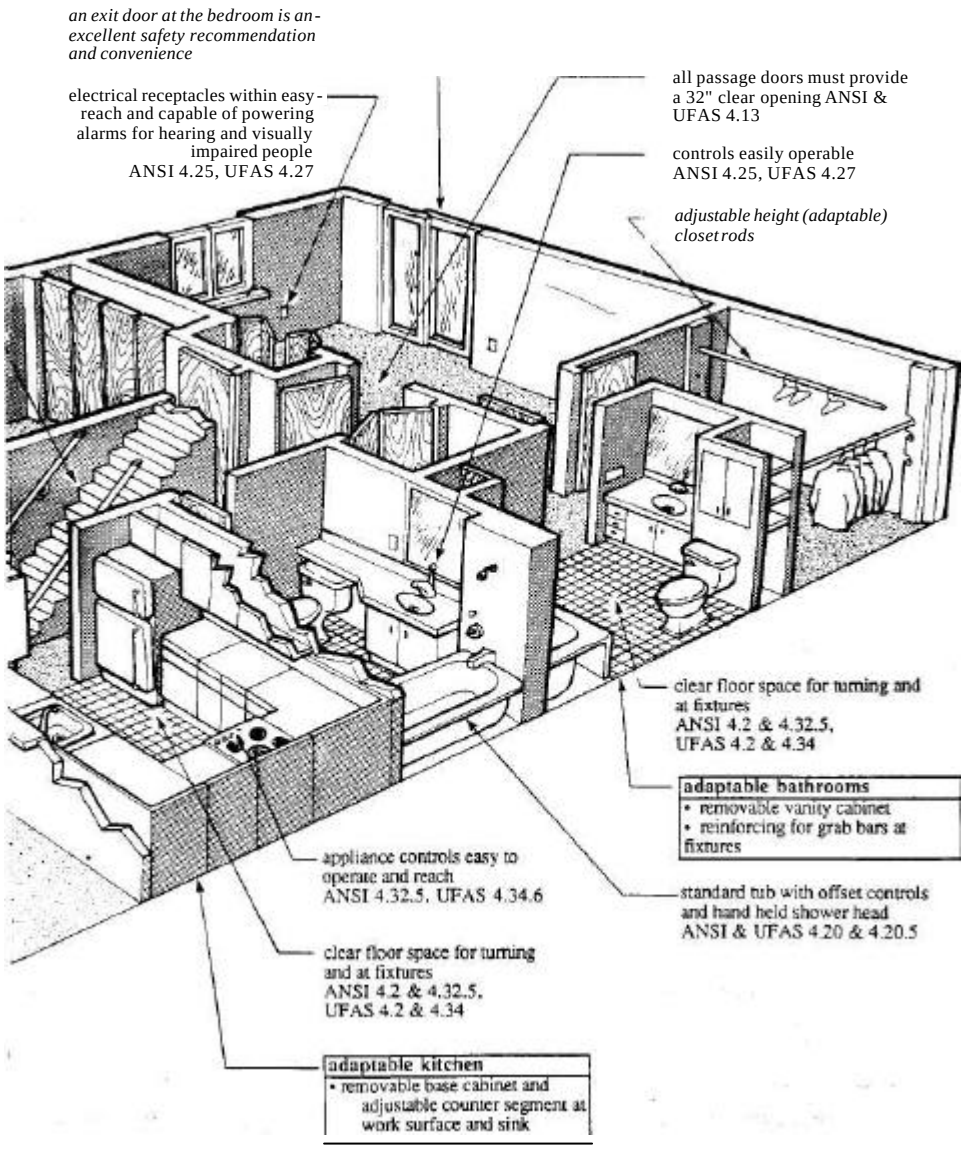


Figure 5. An accessible adaptable dwelling.


an exit door at the bedroom is an excellent safety recommendation and convenience
electrical receptacles within easy-reach and capable of powering alarms for hearing and visually impaired people ANSI 4.25, UFAS 4.27
all passage doors must provide a 32" clear opening ANSI & UFAS 4.13
controls easily operable ANSI 4.25, UFAS 4.27
adjustable height (adaptable) closet rods
clear floor space for turning and at fixtures ANSI 4.2 & 4.32.5, UFAS 4.2 & 4.34
adaptable bathrooms
• removable vanity cabinet
• reinforcing for grab bars at fixtures
appliance controls easy to operate and reach ANSI 4.32.5, UFAS 4.34.6
standard tub with offset controls and hand held shower head ANSI & UFAS 4.20 & 4.20.5
clear floor space for turning and at fixtures ANSI 4.2 & 4.32.5, UFAS 4.2 & 4.34
adaptable kitchen
• removable base cabinet and adjustable counter segment at work surface and sink

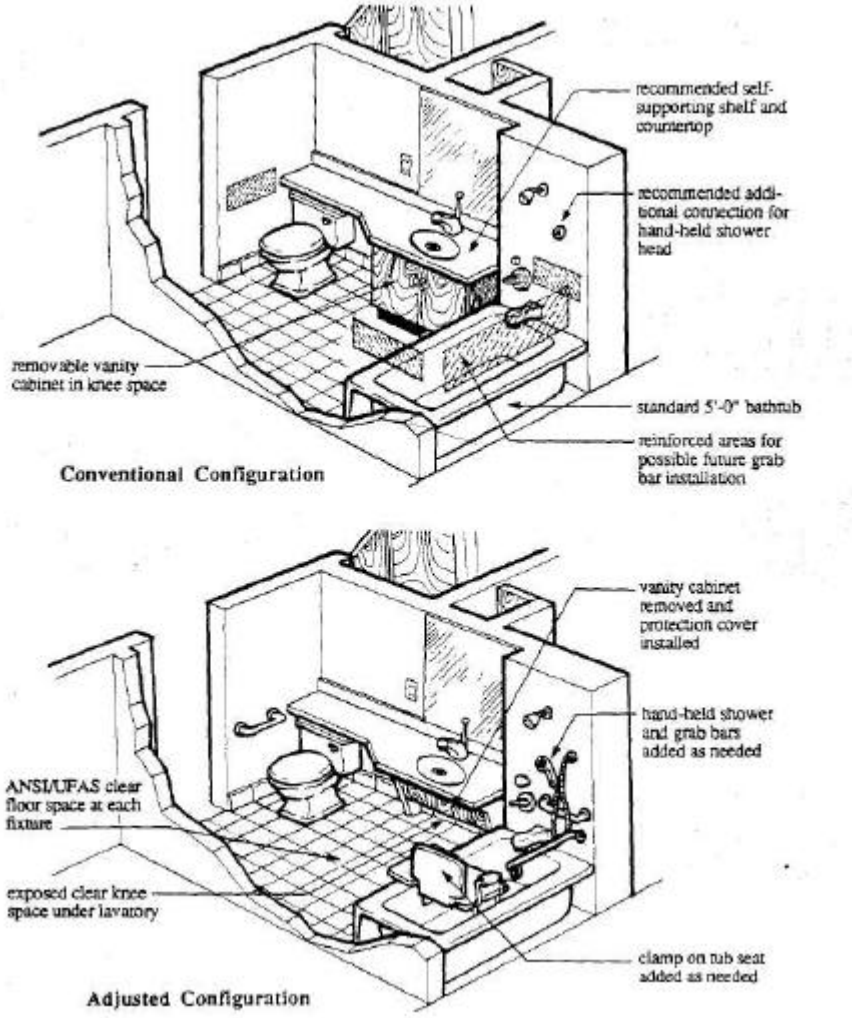


Figure 6. Small adaptable bathroom in conventional and adjusted configurations.

Optional Removable or Added Features:

- Knee spaces required under kitchen counters and bathroom lavatories can be temporarily hidden from view by removable base cabinets
- Grab bars at tubs, showers, and toilets in bathrooms can be omitted until needed so long as wall reinforcing is in place that

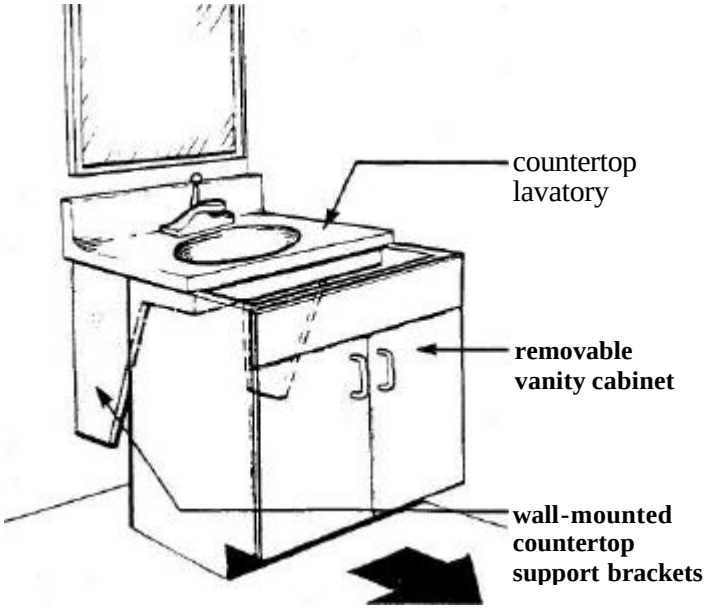


Figure 7. Removing vanity cabinet to expose knee space.

will allow bars to be simply installed with common hardware when needed without structural modifications.

- If a standard bathtub without a built-in seat is provided, a portable but securely attachable tub seat can be provided when needed.

Adjusting adaptable features of a building for accessibility should not be confused with renovating or remodeling an inaccessible unit. Remodeling for accessibility can be an unreasonably expensive process that could require weeks or months to complete, and one that may not be entirely successful in the end. A truly adaptable home can be adjusted or adapted without requiring renovation because the basic access requirements, such a door widths, ground level entrances, and reachable switches and controls, are already a part of the unit. Necessary adaptations for any occupant may include removing or replacing base cabinets to reveal or conceal knee spaces under the kitchen sink, work surface, and bathroom lavatory; changing counter and sink heights; and

installing or removing grab bars if necessary. These simple adjustments can be made in only a few hours and need not delay occupancy by the new tenant.

Designed correctly, adaptable buildings feature nothing that results in inconvenience for nondisabled people. In fact, the opposite is usually true. Most people enjoy the extra roominess and flexibility of an adaptable home or workspace. Adaptable features can actually be made into selling points that improve the marketability of a home, rental unit, or leased office space.

Balancing the Costs and Benefits

To fairly balance the costs and benefits related to accessibility, *all* costs must be considered: economic, aesthetic, functional, societal, and lost opportunity costs. The practical cost-tradeoffs in the consumer's or user's analysis may include the reduced need for dependency on attendants, placing a family member in an institution or nursing home, moving to a new home, or finding a new job. Quality-of-life issues for the person with a disability may include the ability to travel or visit friends in their homes, to raise children in a "normal" environment, to join families and friends at educational, entertainment or sporting events, or to experience the full beauty of art, architecture, or nature as others do, without unnecessary inconvenience to family or friends.

Construction/Production Considerations

As with almost every other decision a practitioner must make when producing a new design, the question of additional construction or production costs will inevitably arise. Designing for accessibility *can* result in a more costly building or product if not competently planned and executed; however, universal and adaptable features are generally no more expensive than traditional features if incorporated at the programming and conceptual design stages. The importance of incorporating universal design concepts at these early stages cannot be overstated. Calling in a consultant to review completed plans and specs for accessibility will almost always result in "too much, too late"—a need to substantially redesign or to make costly additions that may interfere with the integrity of the building design. By and large, re-designing and re-building will never be less expensive than simply "doing it right in the first place."

The basic process designers should follow is to design an accessible route through the building with appropriate clearances. Then, accessible elements andfixtures can be specified and detailed to ensure a truly

usable facility that will accommodate the changing abilities of a building's users (Hall-Phillips 1983). In today's society, where mass production is the method used to reduce costs, it will always cost more" to build a few special and different features than to mass produce all of them to be usable by everyone.

Studies by the National League of Cities and the United States General Accounting Office have led to an acceptance of the proposition that accessibility features cost less than one percent, often less than one-half of one percent, of the cost of new construction (GAO 1983). Such a cost factor appears to be insignificant when compared to the costs of decisions related to other considerations such as fire safety, energy efficiency, noise reduction and—perhaps most notably—aesthetics. (Consider, for example, the cost of a solid marble, Greek Revival entrance.)

Some designers discount even the low cost figures cited above. They maintain that accessibility does not add anything to buildings that would not already be there (except, perhaps, grab bars). Instead, accessibility calls sometimes for a different type of element. Lever handles on doors instead of knobs, contrasting colors on signs, and light switches and controls mounted lower are examples of no-cost accessibility features. These experts note also that some items are trade-offs that result in no cost increase. For example, a wider door costs less than the wall space it replaces. Thus, they maintain that most accessibility costs are mitigated, and that if the conceptual design of the building is correct, there should be no cost increases associated with accessibility.

Notwithstanding the above statements about new construction, in remodeling and renovating to increase accessibility of existing structures, costs can be a significant issue. Here, it is not merely a question of making the right design decisions and planning for the least costly method of accomplishing an objective, but often of weighing the direct costs and the direct benefits. Demolition and reconstruction costs related to any remodeling project can often be a rude awakening to the owner. In many cases, it will be prohibitively expensive to add a main floor bedroom and bath, for example, or in stall an elevator so that one can continue to live or work in the same building after the onset of a disability.

Staffing Savings

A key cost offset in planning certain types of facilities is the cost of staffing for assistance to people with disabilities when the building works against them. The University of Michigan Architecture and

Planning Research Laboratory has shown, in a full-scale study of hospital patient rooms, that "almost anything that enables the patients to act on their own, without need to call a nurse, saves the hospital money" *(Progressive Architecture,* 1985).

Tax Benefits

Designers should be aware that the Tax Reform Act of 1986 contains provisions for a $35,000 tax deduction for taxpayers who make accessibility-related modifications to their businesses, professional offices, or vehicles. Currently, the design guidelines that qualify taxpayers for the deduction are based on the 1961 ANSI standard, with some modifications and additional requirements for transit vehicles (Hall-Phillips 1987). Several states have also attempted to alleviate the costs of providing accessibility in existingfacilities through incentives included within the state's taxing mechanism (American Bar Association, 1979).

Economic Costs of Lost Opportunities

From a different point of view, designers, developers, product manufacturers, and business owners must consider not only construction or manufacturing economics, but also the cost of ignoring a potentially large segment of the consumer and employment market. One must account not just for opportunities lost when customers with vision impairments, wheelchairs, walkers or strollers cannot or will not enter the premises—but also for the costs of paid sick leave and loss of productivity for the employee whose onset of a disability prevents him or her from returning to work because the building is inaccessible, or the early retirement of valued executives for accessibility-related reasons.

The designer who takes seriously his or her responsibility to protect the client from unnecessary expense must, consequently, apprise the client of the complete spectrum of both immediate and long-term costs associated with accessibility, including the trend toward higher minimum standards in building codes and the possible necessity of future renovations to satisfy code requirements. As architect and gerontologist Edward Steinfeld (1988) notes:

> Specifying different features for different groups of people always costs more and requires massive coordination and selective judgment about who should be accommodated and where. All of these impossible issues are eliminated by the universal design concept.

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Figure 8. Employers have found that adapting work places need not be difficult or expensive.

Costs to Society

DeJong and Lifchez (1983) argue against making decisions solely on the basis of the cost-benefit rule:

> We believe in many cases a more appropriate decision rule would be the cost-effectiveness criterion: How in the face of limited resources, can a particular right be honored or societal responsibility be met in the least costly or most cost-effective way? Phrasing the issue in these terms does not challenge the rights of disabled persons or absolve society of its responsibilities, but it does face up to the unavoidable economic consequences.

From a national cost viewpoint, the forced dependency of a large proportion of the increasing population of people with disabilities has resulted in heavy and rapidly escalating economic burdens on government, business, families and taxpayers. Using data provided by federal agencies, the Task Force on the Rights and Empowerment of Americans with Disabilities (Dart, 1989) estimates that the unnecessary unemployment of more than 8 million working-age citizens with disabilities costs our society in excess of $246 billion annually. According to the Task Force, initial investments in securing the rights and productive independence for people with disabilities will be a small fraction of the cost of allowing it to continue.

Taking the world view, an incalculable cost to business, government, science, education and the arts is also part of the equation for society as a whole. What is being sacrificed when a young person with a disability and, coincidentally, a mind capable of scientific, literary, artistic or musical greatness is discouraged from achieving his or her full potential by the inability to attend schools, visit museums, or attend concerts? How many Franklin Delano Roosevelts, Stephen Hawkings, Stevie Wonders, or Itzhak Perlmans are we overlooking if we exclude the disability community from full participation in society?

When one considers the full range of costs of isolating people with disabilities, it becomes clear that ignoring this issue can have a qualitative as well as quantitative impact on all members of our society.

Renovating Historic Facilities

The problem of balancing costs, aesthetics and accessibility becomes even more prevalent when renovating an *historic* building. Not only must the changes be reasonable in cost, but designers must also exercise much more care in preserving the character of the building, usually under the watchful eye of the historical commission. The designer with facility and experience in accessible design, as well as familiarity with accessible products and components, will have the best chance of containing costs when working on historic facilities.

Section 4.1.7 of the UFAS clearly applies to accessibility in facilities listed in the National Register of Historic Places, or to "such properties designated as historic under a statute of the appropriate state or local government body." An Advisory Council determines on a case-by-case basis whether provisions required by UFAS would threaten or destroy the historic significance of the facility. If the Council decides they would, then the special minimum requirements may be used for specific features. Although the UFAS itself only applies to facilities designed, constructed or altered with federal funds, it has been incorporated by reference in numerous other regulations and codes. Every state has at least one law covering accessibility in buildings constructed or renovated with state funds.

> Where historic preservation and accessibility laws converge, there is often the incorrect assumption that renovated or rehabilitated historic buildings do not have to comply with accessibility requirements. While some state accessibility laws do exempt historic structures, other states, most notably California and Illinois, have developed very clear guidelines and procedures to ensure historic structures are accessible (Hall-Lusher 1989).

In almost every locality, the major public buildings, such as courthouses, museums, symphony halls and monuments, are among the oldest structures in town and are undergoing rehabilitation or renovations of some kind. These buildings are often covered by state accessibility codes for buildings as well as federal laws requiring access to the services or programs they house. Passage of the Americans with Disabilities Act will leave little uncertainty for designers trying to determine whether their projects are covered by the accessibility laws, although reasonable accommodation and sensitivity to preservation issues will continue to temper enforcement.

In designing renovations for historic facilities, very careful planning can often produce innovative solutions to accessibility problems without disturbing the exterior appearance. Separate routes for people with disabilities may more often be justified in historic buildings, and at times there will simply not be a solution to inaccessibility. In small house museums, for example, upper floor access may be precluded, making it necessary to provide a facsimile or model of the upper floors for people who cannot climb stairs. Urban rowhouses, with their lack of space for exterior ramps or lifts, are another example of a type of historic facility that is very difficult and often impossible to successfully renovate for accessibility.

Nevertheless, the National Park Service, which has been the most active arm of the federal government in renovating historic facilities, has demonstrated that historical status does not necessarily preclude full access. At the Lincoln and Jefferson Memorials in Washington, D.C., the daunting front steps no longer prohibit full access and enjoyment by people with mobility impairments. A walkway at the front of each memorial leads to an entrance from which an elevator rises to the main level of the monument. Nearby, the elevator in the Washington Monument is used by almost every visitor, and periscopes provide an amazingly clear view for people seated in wheelchairs or otherwise not tall enough for the windows. At the ampitheatre near the Tomb of the Unknown Soldier at Arlington National Cemetary, a retrofitted elevator rises through the slab of the second level. In none of these cases has the exterior or historic presentation of the building been adversely impacted.

The National Park Service has developed a detailed process for use in evaluating facilities for program accessibility (U.S. Department of Interior, 1983). Several factors, such as significance of the structure, original treatment, function, and visitation, are taken into account when considering accessibility. Levels of accommodation of people with dis-

abilities can vary in accordance with these four considerations. The Park Service has recently revised its policy manual to state that:

> The National Park Service will provide the highest feasible level of physical access for disabled persons to historic properties, consistent with the preservation of the properties' significant historical attributes. Access modifications for disabled persons will be designed and installed to least affect the features of a property that contribute to its significance. Some impairment of some features will be accepted in providing access. If it is determined that modifications of particular features would destroy a property's significance, however, such modifications will not be made. (U. S. Department of the Interior, 1989)

The Disability Rights Movement and Building Design Requirements

Brief History of the Movement

The rapidly increasing size of the disability community is fueling a massive civil rights movement which will undoubtedly continue to grow until a reasonable level of success in achieving its objectives is met. This movement has already resulted in sweeping changes in program regulations and building codes at the national, state, and local levels, and is continuing to make progress.

The beginnings of the movement in the United States were rooted in the struggle of disabled veterans and people affected by the polio epidemics following World War II. Although convalescence and maintenance at home were provided for disabled veterans, many were eager to complete educational programs, find jobs, and be active in their communities. The lack of accessible facilities was an obvious barrier to fulfillment of these goals, and thus resulted in lobbying activities for improved building access and other services.

The first building standards were promulgated in 1961 when the American National Standards Institute released standard A117.1. It was a sketchy, six-page attempt to make public buildings accessible, but an important beginning for the disability community. ANSI Al 17.1 would become the basis for all building accessibility codes and regulations, and would remain basically unchanged for 20 years in spite of uneven application and poor enforcement.

The ranks of the disability rights movement swelled during the 60's and 70's with the return of soldiers wounded in Vietnam, the deinstitu-

tionalization of mentally ill and mentally retarded people, numerous improvements in life-saving medical technology, and the aging of the population. Incidence of severe disability increased between 1966 and 1979 by more than 70 percent (DeJong and Lifchez, 1983). Faced with the realization that building accessibility alone would not provide equal opportunities for people with disabilities, the disability rights movement turned its focus to lobbying for program accessibility. This resulted in numerous pieces of legislation requiring accessibility and a prohibition against discrimination in federally funded programs.

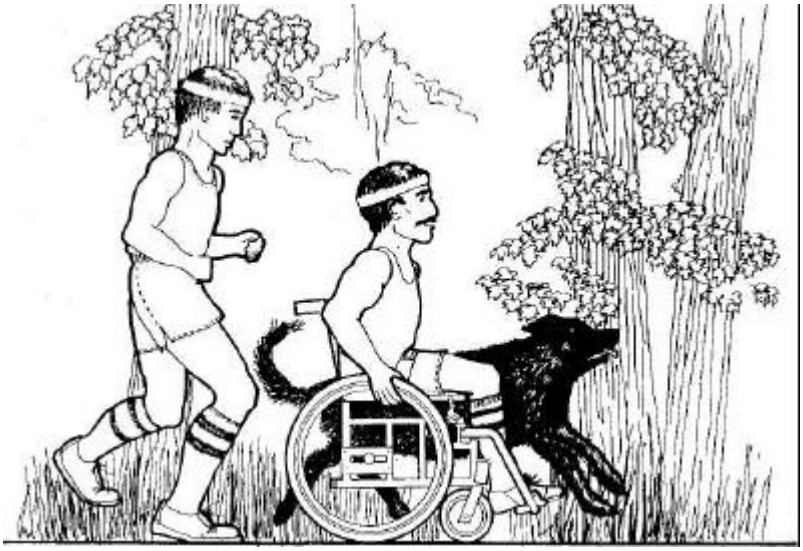

Figure 9. Many public recreation programs now have accessible facilities.

The program access legislation opened opportunities for education, health care, employment and recreation to millions of people previously denied. Many of these opportunities were challenged in the courts; some were struck down and others were reaffirmed.

In 1980, the ANSI standard was expanded to ten times its original length, and a new section of specifications for accessible dwellings was added; in 1986, it was again revised and upgraded. It now includes the needs of people with all types of physical disabilities, including vision and hearing impairments, mobility-impairments (whether or not they result in wheelchair use), coordination, reaching and manipulation limitations, and extremes of physical size. It is a voluntary standard

unless adopted by, or referenced in, legislation or regulations of a political jurisdiction having control over the design and construction of facilities (Hall-Lusher 1988).

In 1984, the ANSI specifications were incorporated into the Uniform Federal Accessibility Standard (UFAS), the standard used throughout the federal government for facilities constructed or leased with federal funds. While the technical specifications are largely the same, the major difference between the two standards is the "scoping" provisions added to the UFAS, which detail the method for determining the required number and location of accessible bathrooms, parking spaces, theatre seats, etc., based upon the size and type of building.

Numerous other pieces of legislation affecting the rights of people with disabilities have been adopted in the intervening years from 1961 until the present day. The 1968 Architectural Barriers Act requires all buildings receiving federal money for construction or leasing to be accessible to physically disabled people. The Education for Handicapped Children Act of 1975 requires school systems to educate disabled children in the same settings as nondisabled children. Section 504 of the 1973 National Rehabilitation Act requires that all federally assisted programs including public transportation be made accessible.

In addition, the majority of the states have adopted provisions of the ANSI standard, while some, most notably Massachusetts, North Carolina and California have preceded the minimum federal standards in covering, for example, privately owned and funded facilities, and providing specific enforcement penalties. A review of literature conducted in 1978 (Steinfeld, et al.) revealed that:

> All states and the District of Columbia have either directly quoted ANSI A117.1, in whole or in part, or used it as a basis for the promulgation of additional or substitute standards, or indirectly as a model. Several states adopting ANSI have deleted single or multiple sections of it; while all states have some form of legislation concerning environmental barriers, the scope and mechanisms for enforcement and review vary considerably.

Any government standard, of course, contains oversights or leaves loopholes. Likewise, the ANSI and UFAS standards are not perfect. Designers must keep in mind that standards are "minimums." By necessity, they are based on averages and stereotypes. As DeJong and Lifchez (1983) assert, "In order to produce an optimum design, the standard must be sensitively applied and adapted to meet the needs of specific users in residential settings, where the user is known, and

amplified to address the requirements of complex facilities." Indeed, some industries, such as the American Hotel and Motel Association, have prepared their own interpretations of the ANSI standard as related specifically to new buildings in their sector of business.

Recent Legal Developments

In the late 1980's, there has been a profound rethinking of how disability is viewed inthe United States. As reported in *U.S. News and World Report* (Sept. 1989), "For the first time, America is saying the biggest problem facing disabled people is not their own blindness, deafness or other physical condition, but discrimination." The building and program accessibility laws of the 1960's and 70's are being expanded to include broad civil rights protections for people with disabilities, parallel to those earlier legislated for women and minorities. Since disabilities know no racial, social or economic barriers, almost every family and business will eventually feel the impact of these laws. Perhaps more than any other group, the design profession will be required to develop the expertise to deal effectively with the requirements of these laws.

The Fair Housing Amendments Act, passed by Congress in 1988, expanded the definition of discriminatory housing practices by adding disabled people and families with young children as a protected group. Effective March 13,1991, the Act gives the Department of Housing and Urban Development the authority to penalize those who discriminate against handicapped people or families with young children in the sale, rental, financing, improvement or maintenance of new, multi-family housing. While previous legislation required that only a small percentage of units be made accessible, this new legislation requires a degree of accessibility in a greater number of multi-family units. Among other provisions, the Fair Housing Amendments Act states that:

- New, multi-family dwellings must allow ready accessibility to all common-use portions of the complex.
- The antidiscrimination requirements apply to all units in "multifamily dwellings" (defined to include those buildings consisting of four or more units), if such buildings have an elevator, and to ground floor units of multifamily dwellings without elevators.
- Four specific design features must be included within all newly constructed, multifamily dwellings:

an accessible route through the dwelling; i.e., a path with certain features such as wide doors and no steps or stairs;

accessible light switches, electrical outlets, thermostats and other environmental controls mounted within specific reach ranges;

reinforcements in the bathroom walls to allow installation of grab bars, when necessary; and

kitchens and bathrooms with floor space and other features to allow maneuvering of a wheelchair.

- Reasonable modifications to all existing rental units, at the expense of the tenant, must be allowed to provide full enjoyment of the premises by tenants with disabilities.
- All state laws must be in compliance with the federal laws, but the federal law will not invalidate state or local laws which require a greater degree of access.

As this article goes to press, the most sweeping legislation ever to affect practitioners with respect to design for people with disabilities is about to become law in the United States. The Americans with Disabilities Act (ADA), is passing through Congress and seems certain to be

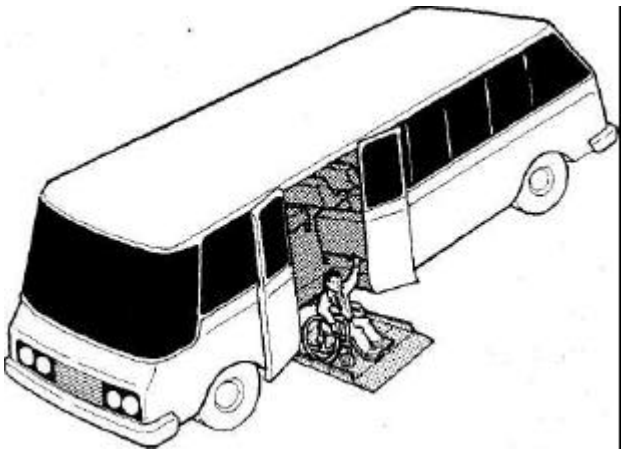

Figure 10. Public transportation is an example of a public service that is becoming more accessible as a result of the Disability Rights Movement.

signed by the President in some form. The law will extend to people with disabilities essentially the same civil rights protections that have been guaranteed to other minorities for 25 years. The stated purpose of the ADA is to "provide a clear and comprehensive national mandate for the elimination of discrimination against individuals with disabilities."

It is clearly the intent of Congress that accommodation of people with disabilities in all programs and activities will be the law of the land. The provisions apply to employment, services provided by public and private entities, public accommodations, public transportation, and telecommunications. The effect will be to require that all facilities and programs in the future be designed and operated in such a way that people with disabilities have the same opportunities as others. The Federal Architectural and Transportation Barriers Compliance Board will be charged with the responsibility of issuing minimum guidelines to clarify the bill. Virtually every designer and business owner in the country will soon be compelled to become familiar with the provisions of the ADA and related laws, and to make all new and most existing facilities accessible.

While the disability community may take justifiable pride in these accomplishments, design professionals are left to judge for themselves whether they have failed when advocacy groups are compelled to lobby for laws to *force* designers to respond to human needs.

Recent Design and Technology Developments

There are many recent technological innovations which will ultimately make it easier for people with disabilities to "mainstream." Many are products with universal applications; others help people with specific needs.

Among the most interesting universal products is the "Smart House" system, a computerized communications and electrical control network now being developed for the home, makingit possible to remotely control or pre-program almost any electronic appliance or part of the home's HVAC system. In addition to its obvious benefits to people with certain types of disabilities, this technology will help avoid overloaded sockets, accidental electrocution, and unnecessary energy costs.

On a smaller scale, there are many other universal products on the market such as programmable switches, and infrared remote controls for appliances and environmental control systems. New technologies have produced safety features such as audible and visual alarms, visual systems that supplement telephone and doorbell rings, telephone vol-

ume controls, and FAX and TDD machines. In addition to a variety of types of bathtubs and showers with seats, universally usable "wet area showers" with slip resistant tile are becoming more popular. A variety of lifting devices and furnishings capable of helping disabled people to stand, sit down and transfer from point to point are now available.

Outside the home, universal design is evident in items such as computer driven signage in transportation terminals, automatic doors, and ergonomically designed grab bars and railings available in a spectrum of beautiful colors. Both business and home owners are now able to purchase mechanical lifts, often an economical alternative to installing an elevator or a space-intensive ramp. Computers chips will continue to offer new possibilities for creating truly accessible environments and allowing greater independence for people with disabilities.

Another development is the establishment at North Carolina State University (in the summer of 1989) of The Research and Training Center for Accessible Housing, a national center with the mission of improving the usability, availability and affordability of housing for people with disabilities. With primary funding from the National Institute of Disability Rehabilitation and Research (NIDRR) of the U.S. Department of Education, the Center for Accessible Housing serves individuals and organizations requesting technical assistance, training, or published information related to accessible housing.

The Center is conducting research on topics in architecture, product design, landscape architecture and interior design, as well as the related issues of financing, zoning, legislation, and social and psychological attitudes. Research and development programs cover: housing needs of people of all ages having mobility, vision, hearing and cognitive impairments; market factors affecting accessible housing; evaluation of existing examples of new or renovated accessible housing; and development and testing of new and innovative design solutions for accessible housing.

Training and information programs at the Center will include training seminars and continuing education programs for design, rehabilitation and housing industry professionals, people with disabilities and their families, and other interested individuals; college-level courses, internships and traineeships; and written and telephone assistance. This new center will undoubtedly become a valuable resource for design practitioners seeking expert advice on accessible design, and may begin to fill the gap left by design school curricula which have traditionally neglected this issue.

Future Developments

There is a virtual certainty that the public consciousness surrounding rights for people with disabilities will continue to grow in the coming years, especially given the likelihood that the Americans with Disabilities Act will soon become law. Predictions for future trends include the following:

- The aging of the population will propel the issues of accessibility to the forefront of national consciousness. Faced with the prospect of forced dependence on an inadequate number of specialized care facilities, older Americans will migrate toward homes and other environments which support independent living.
- As the impacts of new laws such as the Fair Housing Amendments Act and the Americans with Disabilities Act become known, legal and technical clarification and enforcement of their provisions will undoubtedly be necessary.
- There will be a trend toward universal design as the design profes sions react to the new laws and discover innovative ways to reconcile aesthetics with functionality and costlimits.
- The "better for everyone" and "planning ahead for your family's needs" approaches will begin to replace specialized "handicapped" and "elderly" marketing of universally designed products, homes, commercial buildings, and outdoor environments. Terms such as "lifespan design," "comfortable," "safe," "flexible," and "adaptable" will be commonplace marketing tools.
- New and emerging technologies will continue to arise in response to the needs of people of all ages and abilities, particularly as the mar keting advantages are better understood, making it easier for designers to specify appropriate components for universally de signed products and architecture.
- Attitudes toward people with disabilities will continue to change in a positive way, although not as quickly as many would hope. As a greater percentage of the population joins the disability community, either through their own misfortunes or those of family members or friends, there will be less fear and misunderstanding of what people with disabilities want.

The Solution Lies with the Design Professions

In spite of the significant growth of legislation and public awareness, access for disabled people has received very little attention in the professional training of design practitioners. Although national and local codes require accessible design features in an increasing number of construction applications, accessible design concepts and methods are not generally taught in university programs of architecture, landscape architecture, or product design (Greer 1987). Faculty themselves often lack the awareness, sensitivity, information and skills to train students concerning disability issues, minimum versus optimum standards, and the state of the art in accessible design.

If the technologies of universal design are to fully develop and become an integral part of the building industry, design school faculty must be encouraged and supported in the development of curriculum materials which address accessibility issues, problems, and design solutions. Design studio courses must include universal design as a major focus so that students will begin to think of accessibility issues in the conceptual design stage of each project.

To supplement academic training, the professional organizations in the design fields can actively support and reward outstanding accessible design through their publications, professional training programs, and design competitions. Universally designed features tend to become invisible until pointed out, and therefore will become easier for others to imitate if well publicized. A leader in this regard has been the Adaptive Environments Center in Boston whose "Best of Accessible Boston" competitions have recognized winners such as I.M. Pei's John F. Kennedy Library, the Boston Museum of Fine Arts, and Cambridge Seven Associates' New England Aquarium.

The design profession holds the key to empowering people with all types of physical or cognitive disabilities to integrate as fully as possible into the mainstream of daily life. Legislated changes notwithstanding, it is *designers* who will decide whether accessibility will take the form of better design for everyone, or simply unattractive, costly, band-aid responses to annoying code requirements. Basic compliance with the minimum requirements in the building codes must be replaced by creative, comprehensive design services. Practitioners must become well-trained and sensitive to the full range of human needs in the environment and actively support a philosophy of maximizing abilities and independence for people of all ages, physical sizes, and abilities.

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