

Guidelines For Adaptive Housing For The Elderly And Handicapped

Marilyn Dee Casto
Savannah S. Day

Considerable progress has been made in removing architectural barriers from public buildings, but much private and public housing remains inaccessible or inconvenient to the handicapped and elderly. Many times small adaptations would make housing suitable for the elderly or handicapped, but because the builder or architect lacks readily available information, alterations are not made, even though it has been stated that most adaptations cost no more during construction than the usual method (Hilleary, 1969). Adaptations need not be so obvious as to render the housing unattractive; many features which make life easier for the handicapped also improve comfort for the able-bodied (Disabled Living Foundation, 1969; Schwab, 1974). Alexander Kira (1960) indicated that the housing environment may be therapeutic if modifications to permit independent functioning are included in the design of the unit.

Lessened mobility, as well as failing eyesight and hearing may lead to constriction of life space for the

elderly (Montgomery, 1972). As the aged individual becomes disabled, he may find it difficult to negotiate the entrance of a poorly designed housing unit. Hence his environment is restricted to the house. If the interior is also improperly planned for his needs, he may even be unable to function adequately within the house. While the person confined to his house suffers from constriction of life space, the individual restrained to one room suffers to a much greater degree. Such confinement may result in withdrawal from active participation in life activities and induce adverse changes in mental health.

Adaptive housing is planned for varying degrees of physical disability, incorporating features which enable independent performance of household tasks and daily life activities. The inclusion of such housing features may enhance self-concept by allowing participation in home maintenance activities and promote mental stimulation through increased mobility.

Existing Recommendations

This article is based upon a study conducted at Florida State University, in which published reports relating to the design of housing for the elderly and handicapped were examined and

Marilyn Dee Casto is a lecturer in Housing and Management, School of Home Economics, East Carolina University, Greenville, N.C. 27834.

Savannah S. Day is a professor of Housing, College of Home Economics, Florida State University, Tallahassee, Florida, 32306.

synthesized into guidelines for adaptive housing. Features which were found to be most frequently recommended are discussed in this article. The majority of the existing recommendations pertain to the wheelchair confined, with a slightly lesser number devoted to the ambulatory disabled. Few recommendations were located regarding adaptive housing for the hearing and sight impaired.

Recommendations for the kitchen, one of the areas often cited as a problem for the disabled, comprise a large part of the data collected. Relatively few specific recommendations are found which relate to the bathroom, although it is often inconvenient to the handicapped. Many recommendations for structural components (such as door knobs and light switches) are available, but advice concerning the layout of the house is less frequent. An additional shortcoming of existing recommendations is a lack of consistency, particularly with respect to material and product specifications.

Recommendations for House Planning

It is suggested that housing for the elderly and handicapped be single story or situated on the ground floor of multi-family housing. Such an arrangement may be necessary for the handicapped persons experiencing ambulatory difficulties and expedient to elderly persons who may develop mobility problems. If possible, the entrance should be level, but on inclines, a ramp should be constructed with a gradient of 1 foot in 12 feet (Goldsmith, 1967).

Since the wheel chair confined may require a large amount of maneuvering space, an open plan with wide halls is advisable. Open plans are also suggested for the visually impaired, but large spaces should be clearly delineated into smaller sections as an aid to orientation (Braf, 1974). An L-shaped kitchen arrangement is most frequently suggested for the wheelchair confined, although ambulatory persons may prefer the security of a parallel kitchen. To provide space for maneuvering, kitchens for the wheelchair confined should

allow 5 feet between opposite counters (CMHC, 1974).

When there is no alternative to the inclusion of stairs in the house, the riser and tread should be of uniform dimensions (riser 6-7 inches and tread 11 inches) with a non-projecting nosing (NYSU, 1974). Handrails 1.25 to 2 inches in diameter should project 18 inches beyond both ends of the stairs (ANSI, 1961; NYSU, 1974) and be capable of supporting 250 pounds. As an aid to the visually impaired the riser and tread may be painted in contrasting colors (Braf, 1974). Open stairs, winders, and curved treads are to be avoided.

Since many disabled persons suffer from impaired balance and restricted arm span, storage should be located at midpoint. Sliding doors may be easier than side-hung doors for some disabled persons to manipulate (Lowman, 1969). Although low clothes rods have been recommended, some publications caution against locating rods so low that clothing hangs to the floor.

General Structural Components

Design of doors is of importance to almost all disabled persons, whether they lack strength, grasp, coordination, or visual acuity. The door width most commonly recommended is 3 feet as this space is sufficient to permit passage of most wheelchairs and the door pressure should not exceed 8 pounds (NYSU, 1974). Top-hung sliding doors are often suggested, but many publications refer to swinging doors as hazardous, stating that a glass panel should be incorporated in such doors (Goldsmith, 1967; NYSU, 1974). Kickplates forestall damage by wheelchair footrests (Schwab, 1974). A color contrast on frames may be helpful to the visually impaired and all doors should open against a wall, rather than into a circulation area (Braf, 1974). As a safety precaution, bathroom doors should open out and unlock from the exterior.

The door knob configuration most often mentioned is the lever type, which requires no grasping. Placement of the knob approximately 3 feet

high enables the wheelchair confined to reach it with comparative ease (Schwab, 1974).

Raised thresholds constitute a hazard to both the wheelchair confined (who must propel the chair over the sill) and the ambulatory (who risk tripping over the raised area). If the threshold must be raised (e.g. to provide a watertight closing) it should be no more than 0.5 inches high and preferably of a material such as polyethylene which depresses under pressure (Olson and Meredith, 1973). Painting the raised threshold in a contrasting color may lessen the potential for accidents (Goldsmith, 1967).

Although there is general agreement that flooring should be slip-resistant there is no consensus on which flooring materials are slip-resistant and recommendations vary greatly. Cork is the material most frequently advised since it is relatively slip-resistant and provides some cushioning in the event of a fall. Wall-to-wall, low pile carpeting is mentioned nearly as often, but it may create a problem in propulsion of wheelchairs.

Highly reflective flooring materials may be psychologically disturbing to a disabled person (Kira, 1960) and might also be confusing to the visually impaired. Changes in flooring materials may serve as an orientation guide to the visually impaired, but surfaces should not be hard enough to echo. Individuals with hearing impairments may prefer that flooring muffle extraneous sound (Bayes and Franklin, 1971).

Wall treatments have received little attention in publications on adaptive housing, but it is generally agreed that walls should be both smooth (to prevent abrasion) and easy to clean (Fishman, 1971). Unnecessary projections and odd angles are to be avoided. Housing for the hearing impaired should feature sound absorbent walls (Bayes and Franklin, 1971).

Despite the importance of windows in expanding the environment of the housebound, there are few recommendations to assist in their design and little agreement regarding types and dimensions. Most publications concur only that sash windows are difficult to operate and projecting windows are

hazardous. Whatever the type, the lower level of the window should be between 2 and 3 feet from the floor (Disabled Living Foundation, 1969; Braf, 1974). Cranking controls are often suggested (Schwab, 1974). A larger window area may be desirable for the visually impaired and windows should be grouped to avoid confusing contrasts of light and dark.

Lighting is seldom mentioned in the literature except in the context of design for the elderly, who may require higher illumination levels. It is agreed that pulldown fixtures may be convenient for the disabled and that lighting should be increased where the floor level changes (Kira, 1960).

Authors generally agree that positioning switches at 3 feet in height and outlets at 18 inches enables the wheelchair confined to reach these devices provided they are not situated in a corner (Lowman and Klinger, 1969). Three-way switches located at the room entrance eliminate the need to cross a dark room (Goldsmith, 1967). Although several switch types were recommended, the rocker switch, which is especially advantageous to the hand impaired, is mentioned most frequently.

Few recommendations are available on climate control for the handicapped and those in existence are widely divergent. Recommendations for placement of controls ranged from 2 to 4 feet high to provide accessibility to the wheelchair confined. As a safety precaution radiators should be shielded (Goldsmith, 1967).

Kitchen Features

Due to the close proximity of work centers, effective design and placement of kitchen facilities are necessary for work efficiency. The majority of kitchen recommendations pertain to storage of equipment and food.

Recommended placement of storage facilities varies greatly, but should be located between 2 feet 2 inches and 6 feet 4 inches, since a midpoint height permits most individuals to retrieve stored items. Cabinets in housing for the elderly and

handicapped should never be installed over appliances. Other storage recommendations are shallow cabinets of about 1 foot deep, open storage, revolving and pull-out shelves, vertical storage, and pegboards. Magnetic catches and bar type handles 3 to 4 inches long and set at a 45 degree angle are suggested for the hand impaired (Lowman and Klinger, 1969).

Low counters with a recess beneath permit the wheelchair confined to roll beneath the counter and work with comfortable body alignment. Recommended heights vary from 2 feet 4 inches to 2 feet 9 inches and the recess should be no less than 2 feet high and 2 feet wide (McCullough and Farnham, 1960; CMHC, 1974). Pull-out boards assist in achieving comfortable work heights when it is not possible to lower the entire counter. Continuous counters are advantageous to the hand impaired. Lowering the counter necessitates a shallow sink approximately 4 to 6 inches deep, with both the sink and pipes insulated (Olson and Meredith; Fishman, 1971).

Single control lever faucets are frequently suggested in both kitchens and bathrooms for the hand impaired. A thermostatic regulator is recommended even with mixing mechanisms, as paraplegics are often insensitive to temperature changes. Maximum water temperatures recommended vary from 105 to 120 degrees Fahrenheit (Goldsmith, 1967; Fishman, 1971). Those with hand impairments or lack of strength may benefit from spray attachments and swing spouts which allow shifting the water source rather than the receptacle, and controls may be positioned at the sides of sinks, lavatories, and bathtubs if there is limited arm span (Lowman and Klinger, 1969; Schwab, 1974).

Appliances such as dishwashers, washers, and dryers intended for use by the wheelchair confined should be front opening to admit close approach, but if ambulatory disabled persons will be operating the appliance it should be top loading. A combination washer/dryer is advised to avoid transferring clothing during the laundry process (Olson and Meredith, 1973; CMHC, 1974). Push-

button controls should be located at the front of all appliances and may feature raised or color coded markings for the visually impaired (Lowman and Klinger, 1969).

Wall ovens at counter height with a pullout board beneath improve safety conditions by eliminating the need to bend over conventional ovens (McCullough and Farnham, 1960). Side-opening doors are most often recommended though other types are mentioned.

Recommended range heights vary from 2 feet 8 inches to 3 feet but there is agreement that burners should be aligned straight or staggered and flush with the counter. Few suggestions were located regarding the refrigerator, but an upright, vertically divided model with non-tip, swing out and revolving shelves is often advised (McCullough and Farnham, 1960).

Bathroom Features

The bathroom is of particular importance to the disabled since it incorporates a number of potentially hazardous facilities in a small area. It is desirable to enlarge the bathroom area for the wheelchair confined. Grab bars should be positioned near the lavatory, toilet, bathtub, and shower. Numerous alignments are suggested for grab bars, but most publications concur that they should be slip-resistant, capable of supporting 250-300 pounds, about 1.5 inches in diameter, and should extend 1.5 inches from the wall (ANSI, 1961).

Wall-hung lavatories with a clear recess of 2 feet 2 inches beneath are suggested as this arrangement facilitates close approach (Goldsmith, 1967; Olson and Meredith, 1973).

Recommended lavatory depth ranges from 3 to 7 inches with several publications advising a shallow front sloped to the rear (ANSI, 1961; Goldsmith, 1967). Pipes should be situated at the posterior of the lavatory and insulated.

The disability group most affected by the design and placement of the toilet is the wheelchair confined since the height of a standard toilet is lower than the wheelchair seat, thus requiring the oc-

TABLE 1.
Guidelines For Adaptive Housing

Design feature	Wheelchair confined	Ambulatory	Visually impaired	Hearing impaired	Hand impaired
Bathtub	Bottom flat and slip-resistant Built-in seat 2 accessible sides	Bottom flat and slip-resistant Built-in seat 2 accessible sides			
Climate control	Shield radiators Controls 2-4' high	Shield radiators			
Counter	2'4"-2'9" high Recess 2' high, 2' wide Pull-out boards Continuous counter	Pull-out boards Continuous counter			Pull-out boards Continuous counters
Dishwasher; washer/dryer	Front loading Combination washer/dryer Front controls	Top loading Combination washer/dryer Front controls	Controls raised or color coded		Combination washer/dryer Pushbutton controls at front
Door	3' wide Door pressure 8 pounds Top-hung sliding doors Kickplates Bathroom door open out Lever knob Knob 3' high	Top-hung sliding doors Door pressure 8 pounds Bathroom door open out Lever knob	Color contrast on frames Door open against wall		Door pressure 8 pounds Lever knob
Faucet	Thermostatic control Spray attachments; swing spouts At side of sink	Thermostatic control Spray attachments; swing spouts At side of sink	Single control lever Thermostatic control		Single control lever Thermostatic control Spray attachment; swing spouts At side of sink
Floor	Slip-resistant Cork or wall-to-wall low pile carpeting	Slip-resistant Cork or wall-to-wall low pile carpeting	Slip-resistant Low gloss Changes in material hard enough to echo	Muffle sound	
Floor Plan	Single story Level Open plan Wide halls L-kitchen; 5' between counters	Single story Level Open plan Parallel kitchen	Level Open plan with clearly divided sections	Open plan	
Grab bar	Slip-resistant Support 250-300 pounds 1½" diameter Extend 1½" from wall	Slip resistant Support 250-300 pounds 1½" diameter Extend 1½" from wall			Slip resistant Support 250-300 pounds 1½" diameter Extend 1½" from wall
Kitchen storage	2'2"-6'4" high 1' deep Open storage Revolving and pullout shelves Vertical storage Pegboard	2'2"-6'4" high 1' deep Open storage Revolving and pullout shelves Vertical storage Pegboard			2'2"-6'4" high 1' deep Open storage Revolving and pullout shelves Vertical storage Pegboard Magnetic catches Bar handles 3-4" long at 45° angle

Design feature	Wheelchair confined	Ambulatory	Visually impaired	Hearing impaired	Hand impaired
Lavatory	Wall-hung 2'2" high recess 3-7" deep Shallow front Pipes insulated				
Lighting	Pull-down fixtures Increase at changes in floor level	Pull-down fixtures Increase at changes in floor level	Increase illumination Increase at changes in floor level		Pull-down fixtures
Mirror	3' high or slanted				
Oven	Wall oven with pull- out board beneath Side opening	Wall oven with pull- out board beneath Side opening			Wall oven with pull- out board beneath Side opening
Range	2'6"-3' high Burners straight or staggered Burners flush with counter	Burners straight or staggered Burners flush with counter	Burners straight or staggered		Burners straight or staggered Burners flush with counter
Refrigerator	Upright, vertically divided Non-tip, swing out & revolving shelves	Upright, vertically divided Non-tip, swing out & revolving shelves			Upright, vertically divided Non-tip, swing out & revolving shelves
Shower	Eliminate curbs At least 3' x 3' Hinged shower seat Curtains	Eliminate curbs Hinged shower seat Curtains			
Sink	4-6" deep Sink & pipes insulated				
Stairs		Uniform dimensions Riser 6-7"; Tread 11" Non-projecting nosing Handrails extend 1'6" at ends Handrails 1 1/4" diameter Handrails support 250 pounds	Uniform dimensions Non-projecting nosing Handrails extend 1'6" at ends Riser & tread con- trasting color		Handrails 1 1/4-2" in diameter Handrails extend 1'6" at ends Handrails support 250 pounds
Storage	Midpoint height Sliding doors Low clothes rods	Midpoint height Sliding doors			Midpoint height Sliding doors
Switches & Outlets	Switches 3' high 3-way switches Outlets 1'6" high	3-way switches	3-way switches		Rocker switches
Threshold	Flat, 1/2" high, or polyethelene	Flat, 1/2" high, or polyethelene	Flat Contrasting color if raised		
Toilet	Wall-hung 1'6"-1'8" high Built-in spray & warm air dryer Backrest	Built-in spray & warm air dryer Backrest			Built-in spray & warm air dryer
Walls	Smooth	Smooth	Smooth Right angles at corners	Sound absorbent Right angles at corners	Smooth
Window	Sliding 2-3' high	Sliding	Large window area Spaced to avoid contrasts of light and dark		Sliding Cranking controls

cupant to transfer to a lower position. For this reason, a wall-hung toilet 18 to 20 inches is recommended. A backrest and a built-in spray with warm air dryer increases comfort (SVCK, 1972).

Because transfer to a bathtub may be difficult and hazardous for the handicapped, showers are usually advised. If a bathtub is utilized the bottom should be flat and slip-resistant (Olson and Meredith, 1973). Built-in seats, which may extend over the side of tub, improve ease of transfer. Opinions are divided as to whether the rim should be raised or lowered. Some think it is easier to transfer to a high rim, while others believe that the distance between the rim and the bottom should be reduced for safety. Recommended heights vary from 15 to 25 inches.

Placement recommendations vary, but at least two sides should be accessible.

In order to admit a wheelchair into the shower cubicle, curbs should be avoided and the floor slightly sloped toward the drain (Fishman, 1971). Recommendations reflect wide variation, but the cubicle should be no less than 3 feet by 3 feet (Fishman, 1971; NYSU, 1974). Both the ambulatory and the wheelchair confined may benefit from a hinged shower seat, possibly extended outside the enclosed area (Lowman and Klinger, 1969). Curtains are preferred to glass doors as a safety precaution (Olson and Meredith, 1973).

Mirrors which would otherwise be too high may be placed within range of the wheelchair confined by slanting (Fishman, 1971) but if possible mirrors and cabinets should be lowered to approximately 3 feet high. It is preferable that these fixtures not be situated over the lavatory.

Summary

Design of the housing unit determines accessibility and ease of use by handicapped individuals and elderly persons suffering from impaired health. Lack of accessibility hampers independence, restricts life space, and may have psychological repercussions. Therefore, it is important that dwellings be planned for maximum safety and efficiency.

Since many features are applicable to two or more disability groups and inasmuch as some disabled persons have multiple handicaps it may be advisable to consider recommendations for all disability groups when designing adaptive housing. Many adaptations are neither difficult nor expensive to install and increased mobility may add many dimensions to the life of a handicapped or elderly individual.

References

- American National Standards Institute. *Specifications for making buildings and facilities accessible to and usable by the physically handicapped*. New York: Author, 1961.
- Bayes, K. and Franklin, S. (Eds.) *Designing for the handicapped*. London: George Godwin Ltd., 1971.
- Braf, P.G. *The physical environment and the visually impaired*. Sweden: ICTA Information Centre, 1974.
- Carp, F.M. *A future for the aged: Victoria Plaza and its residents*. Austin: Hogg Foundation for Mental Health, 1966.
- Central Mortgage and Housing Corporation. *Housing the handicapped*. Canada: National Housing Association, 1974.
- Chasin, J. and Saltman, J. *The wheelchair in the kitchen. A guide to easier living for the handicapped homemaker*. Washington, D.C.: Paralyzed Veterans of America, 1973.
- Disabled Living Foundation. *Disabled housewives in their kitchens*. London: Author, 1969.
- Fishman, P.L. *Adaptive housing for the handicapped*. Boston: Tufts-New England Medical Center, 1971.
- Goldsmith, S. *Designing for the disabled*. New York: McGraw Hill, 1967.
- Hilleary, J.F. Barrier free architecture. *AIA Journal*, 1969 47 (3), 41-47.

- Kira, A. Housing needs of the aged with a guide to functional planning for the elderly and handicapped. *Rehabilitation Literature*, 1960, 21 (12) 370-377, 384.
- Lowman, E. and Klinger, J.L. *Aids to independent living*. New York: McGraw Hill, 1969.
- McCullough, H.E. and Farnham, M.B. *Space and design requirements for wheelchair kitchens*. Illinois: University of Illinois Agricultural Experiment Station, 1960.
- Montgomery, J. Housing patterns of older families. *The Family Coordinator*, 1972, 21 (1), 37-46.
- New York State University Construction Fund. *Making facilities accessible to the physically handicapped*. Albany: Author, 1974.
- Olson, S.C. and Meredith, D.K. *Wheelchair interiors*. Chicago: National Easter Seal Society for Crippled Children and Adults, 1973.
- Schwab, L.O. Barrier free housing for the handicapped. In *Handbook for the home*. Washington, D.C.: United States Department of Agriculture, 1974.
- Svenska Vanforevardens Centralkommittee. *Technical aids bulletins*. Sweden: International Information Center on Technical Aids, 1972.
- Wheeler, V.H. *Planning kitchens for handicapped homemakers*. New York: Institute of Physical Medicine and Rehabilitation, n.d.

Clarification

In the article "A Simulated Exercise for Teaching Home Mortgage," published in **HEJ** Volume 4 (1), the second sentence states, "In 1969, the cost of financing a typical single-family detached home was \$1790 or 7% of the cost of the house; by 1974, this cost had increased to \$3580, or 10% the total cost." The statistics cited here refer to the financial cost of construction which will eventually be transmitted to the home buyer. According to a recent congressional study, the monthly mortgage payment for a median-price new home buyer has increased by 73.4% between 1971 and 1975 (\$143 and \$248, respectively).¹ Out of this increase, 24% is due to rising mortgage interest rates and 76% is attributed to sales price increases. In other words, the new home buyer has to borrow more money and pay higher mortgage interest than earlier buyers.

1. Congressional Budget Office, "Homeownership: The Changing Relationship of Costs and Incomes, and Possible Federal Roles," (Washington, D.C.: U.S. Government Printing Office, 1977), Tables 11a and 12a.