

DISABLED PERSONS IN MEDIUM  
DENSITY HOUSING DESIGN  
CONSIDERATIONS

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DESIGN CONSIDERATIONS

Prepared for  
Canada Mortgage and Housing Corporation  
by  
Unhandicappers Limited  
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### DISCLAIMER

This study was conducted by Unhandicappers Limited for Canada Mortgage and Housing corporation under Part V of the National Housing Act. The analysis, interpretations, and recommendations are those of the consultants and do not necessarily reflect the views of Canada Mortgage and Housing Corporation and of those divisions of the Corporation that assisted in the study and its publication.

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## EXECUTIVE SUMMARY

The purpose of this handbook is to examine some of the problems and possibilities associated with making medium-density, low-rise housing accessible for physically disabled people, in an effort to provide architects, builders, housing officials, and disabled consumers with practical design recommendations and advice.

The City of Ottawa Non-profit Housing Corporation ('City Living'), a municipal body whose mandate is to provide good-quality and affordable housing to low-and medium-income residents of Ottawa, and to a lesser extent to people with handicaps, has built a number of accessible rental housing units since 1977; 27 of these were examined, the disabled tenants interviewed, and a series of observations regarding the functional accessibility of the units was compiled. The units were dispersed among six separate projects.

Where problems were identified by the tenants, suggested solutions are offered; in some places the authors have added general comments, not specific to any identified problems. It is important to note that these suggestions and comments are not intended to be precise technical recommendations; instead, they represent a somewhat subjective commentary on primarily anecdotal information. Nor are they meant as criticisms of City Living, which in fact won an award from the Canadian Housing Design council for its efforts in designing accessible housing.

Rather, underlying this report is the realization that designing for accessibility is an evolutionary process. The housing projects studied were constructed between 1978 and 1983, and steady improvement can be seen in the quality and effectiveness of accessibility features added over this time. The authors feel that an examination of the real-life experiences of disabled people, living in housing designed in accordance with current accessibility guidelines and standards, will complement and enhance the existing literature.



## INTRODUCTION

**What is Accessibility?** In the context of housing design, 'accessibility' is often taken to simply mean ingress and egress by wheelchair users, through the installation of ramps and similar devices. While this is certainly part of the process, impaired mobility is by no means the only impediment to housing access. Vision and hearing impairments, coordination deficits, chronic pain, fatigue, and numerous other disabling conditions can all restrict a person's full and effective use of a residence and its surroundings. 'Barrier-free design' is the term usually applied to the techniques used to overcome such problems; that is, a design style which incorporates awareness of all needless barriers in an environment and strives to eliminate them. For the most part, barrier-free design is a process of reduction, and need not require many special fittings or features. Most importantly, barrier-free design benefits **everyone**, whether disabled or not; because of its emphasis on clean, uncluttered environments, it encourages increased access by children, elderly people, and pregnant women, to name three groups who may face difficulties in obstructed environments. Barrier-free design is universally advantageous.

Another important facet of the accessibility questions, one all too often forgotten, is that of what might be called 'social accessibility'; the notion that physical access to housing is not all that is needed to ensure fully independent community life. The proximity of housing projects to transportation and community facilities, and the location of units within a project itself, are significant considerations, and will be acknowledged in this handbook.

**Procedure.** Meeting with tenants in their homes was selected as the main method of data collection. Information was provided both anecdotally and through the completion of an accessibility checklist, which was modeled on one developed by Jean-Remi Champagne of the National Research Council. The checklist comprised 34 questions and dealt with specific accessibility aspects of both the interior and exterior of each unit, and of the project locations. (Appendix A)

City Living contacted all disabled tenants living in accessible units by letter to advise them that this study was taking place, and to ask who would be willing to participate (Appendix B). Of 37 tenants contacted, two declined to participate and eight others were not available during the two-week survey period.

At the start of each meeting tenants were assured of their anonymity and the study was briefly explained. Tenants were then asked to discuss accessibility features of their units which either appealed to them or concerned them. This procedure always preceded the completion of the checklist, in order to avoid 'leading' the tenants, i.e., influencing their decisions on what constituted concerns. The checklist was completed with the tenant in attendance; as the interviewers moved from area to area, supplementary tenant comments were solicited and photographs taken.

After the meetings concluded the collected data were analysed. Observations which ensued from this process are listed in the next section of this report, accompanied by suggested solutions to problems identified. These suggestions are based on consultations with architects and planners as well as on an extensive literature review, and most importantly on the opinions of the tenants themselves. As mentioned previously, the authors have included some comments which are not specific to any observations.

**Characteristics of Housing Studied.** City Living, the managing agent of the housing projects studied, is mandated by the City of Ottawa to provide affordable housing to people in the low-to middle-income brackets, and to a lesser extent to people with special needs. Some tenants qualify for rent subsidies, provided by the provincial government, and funding and professional assistance for some aspects of City Living's activities are provided by Canada Mortgage and Housing Corporation. The present handbook was in fact first proposed by City Living, but could not be undertaken owing to staff shortages.

In 1977, Ottawa City Council adopted a policy stating that all new City Living projects would include a percentage of homes specifically designed for use by disabled people; by the spring of 1982, 6.3% of all new homes constructed by City Living were designed as accessible. Each project studied contains a certain percentage of accessible units, ranging from 4% to 14%. The housing projects studied were Beau Sejour, Lebreton Flats, Shearwater Court, Loretta/Young, Bathgate and Carling/Poulin.

Although there there are many different unit lay-outs, the actual housing types fall into three categories -- townhouses, stacked townhouses, and bungalows. Of the 27 units studied, 13 were bungalows, seven were townhouses and seven were stacked townhouse units. These included 12 one-bedroom units, eight two-bedroom and seven three-bedroom.

Three of the townhouses investigated were functioning as group residences. The remainder of the units were used as single-family dwellings, none housing more than one disabled tenant.

**Characteristics of Disabled Tenants Surveyed.** With the exception of those in the group residences, where attendants are employed, tenants ranged from full independence in the activities of daily living to dependence on family members and/or outside agencies for assistance.

The majority were either unemployed or homemakers, while four were employed and three attended school. Two were minors.

The range of disabling conditions present included quadriplegia, paraplegia, multiple sclerosis, amputation, club foot, dwarfism, and respiratory ailments. Several tenants were multiply disabled. Sixteen used wheelchairs at least part of the time. Although none of the tenants had vision or hearing impairments, some comments concerning sensory accessibility have been included in the handbook.

**Costs of Accessibility.** Almost invariably, designing buildings with accessibility in mind from the outset costs less than modifying them later. A 1979 American report entitled **The Estimated Cost of Accessible Buildings** states that "designing for accessibility from the beginning means some additional cost which generally amounts to less than one percent of the total construction cost."

Unfortunately, this cost can increase when the design process is not fully coordinated. An example is that of an Ottawa co-op, which features kitchen counters that are intended to be easily moved to two different heights to suit the needs of wheelchair users. Unfortunately, due to a lack of coordination during the design and construction phases, allowances weren't made for plumbing and electrical lines,

with the result that a plumber and an electrician must be called each time a counter is to be moved upon down. The cost (1984) for each move is \$350.00 (In fairness, it should be noted that this expense is incurred infrequently, perhaps once or twice a year in total.)

In summary, the most important factors in keeping costs down are: to plan for accessibility from the outset; and to make sure that there is sufficient follow-up through the construction stage.

## OBSERVATIONS AND SUGGESTIONS

The observations and comments are contained in three categories: Project Location, Unit Exterior and Unit Interior. The first category is discussed quite generally, the second is approached in more detail, and the third contains the bulk of specific observations and comments.

\* \* \*

### 1.0 Project Location

1.1 Ideally, housing projects with accessible units should be within a few blocks of shops, banks, churches, entertainment facilities and other services, but given the realities of urban land availability and cost, location choice is usually limited. Most important is that projects have easy access to public transportation, particularly in colder climates where access to services within walking distance is restricted throughout the snowbound months. The projects surveyed varied in their proximity to services -- some were very central while others were somewhat isolated -- but all had ready access to public transportation.

### 2.0 Unit Exterior

The quality of access to the unit's exterior environment is influenced by location to an extent, but thoughtful site development can make any location better meet the needs of its users. The following is a list of some of the important factors involved in making a unit's exterior more accessible. On the whole, the projects surveyed effectively incorporated the majority of these features.

**2.1 Grades.** Where the site isn't level, ramps and/or lifts can be used to compensate for elevation changes. For higher elevations, ramp slopes should not exceed a 1:12 grade and ideally should have a 1:20 grade, but for very small elevations (10cm or less) a grade of 1:1 may suffice. Any ramp with a slope steeper than 1:20 requires handrails and 15cm safety curbs at unprotected ramp edges. Long ramps require flat 'rest stops' every 3 metres.

Where stairs are unavoidable, they should follow National Research Council guidelines for rise and run, and must be straight rather than angled or curved; they should also have textured surfaces, tactile warnings for vision-impaired users, and sturdy handrails.

**2.2 Surfaces.** Ramp and stair surfaces should be of a slip-resistant texture.

**2.3 Shelter.** Ramps and stairs should be sheltered, if possible, to protect them from snow and ice build-up.

**2.4 Warning cues.** Visual and tactile cues should be present to warn of level changes.

**2.5 Curb cuts.** All walkways should have curb cuts at intersections. To accommodate both visually-impaired people and wheelchair users, curb cuts should be located directly at the angle of the corner rather than in the direct path of the sidewalks, and should have a 75cm, unobstructed flat bypass located nearby. This will reduce the chances of visually-impaired people not detecting the change in level and walking out into traffic.

**2.6 Sidewalks.** Sidewalks must be on a slight slant (1:50) for drainage purposes, thus preventing dangerous water and ice build-up.

**2.7 Obstacles.** Trees, wastebaskets, mailboxes and other objects should be located away from pathways, curb cuts, and bypasses, and should be clearly identified with colour contrast and tactile cues to make visually-impaired people aware they are there.

**2.8 Lighting.** Lighting in parking lots, approach routes, ramps and entrances must provide sufficient illumination for good night visibility.

**2.9 Signage.** (Unit numbers, parking, etc.) Letters should be at least 5cm to 10cm high, should be light-coloured against a dark background, and should be either raised or indented, allowing them to be read by touch. All signage must be well-lit.

**2.10 Parking.** Sheltered carports for each unit are preferable, with a roof high enough to accommodate a 'bubble-top' van. When shared parking lots are necessary, parking spaces for disabled tenants should be as close as possible to their units and on an accessible route of travel. These spaces should be marked with the access symbol both on the ground and on a sign. Also, spaces must be wide enough to accommodate vans with side-lifts, and bollards and curbs must not be placed such that they obstruct exit for wheelchairs between vehicles.

**2.11 Slope.** Driveways and walkways leading to units should be as level as possible; maximum acceptable grades are 1:20 over small lengths and 1:50 over greater lengths; in either case, level rest areas should be provided every 2.4m to 3m.



**2.12 Drop-off areas.** Drop-off areas should be wide enough to accommodate a van with a side-lift and should be as close to the accessible units as possible. Curb cuts must be sheltered from rain and snow to prevent dangerous icing, and a bypass for other vehicles should skirt the drop-off area.

**2.13 Lighting.** Each unit should have an outside light at the front and back door, providing non-glare illumination of both door and porch, that can be controlled by a switch inside the tenant's home.

**2.14 Eavestroughing.** Efficient eavestroughing is essential in accessible units, because water and ice build-up at the entrance can be hazardous to wheelchair users and others with mobility difficulties. Thus, drainage should be directed away from entrance areas and approaches, which in turn should be sheltered by walls, evergreen shrubs, or fences.

**2.15 Balconies/Porches.** Balconies should provide an unobstructed view for wheelchair users, through either open railings or low-wall-and-railing combinations. The latter are perhaps preferable since they provide protection for children and pets. Where employed, drainage holes should be used at the wall-base. Porches and balconies should be a minimum of 1.5m wide and door sills should be no more than 19mm high and should have beveled strips on either side.

**2.16 Patios.** Smooth, hard-surfaced patio areas are desirable, since they provide a suitable surface for maneuvering wheelchairs. Again, provisions must be made for suitable drainage.

**2.17 Unit Location.** In recent years the trend has been to scatter accessible units throughout a housing project, on the assumption that centralizing units is a form of segregation. But many of the tenants surveyed felt that such a layout might not be desirable for everyone. The comment, "I can count on my neighbour for assistance" was made more often when the neighbour was also a disabled person; for example, the tenants expressing the greatest satisfaction with their unit locations were those living close together on a cul-de-sac at the project considered most isolated from services. This suggests that a choice should be offered, so that in some cases accessible units will be close together and in others they will be scattered throughout the project. In any case, it should be remembered that the number of units occupied by disabled tenants in a given project should not exceed about 15% of the total, for a variety of safety reasons.

There was consensus however on other factors relating to unit location. All tenants felt that accessible units should be located (i) at the portion of the project closest to stores, bus stops and community facilities, (ii) in an area that can be easily cleared of snow and ice, and (iii) close to parking and drop-off areas.

### **3.0 Unit Interior**

This section presents the most specific breakdown of observations made in the course of interviewing tenants and examining their homes. Where a problem is identified a suggested solution is offered below the observation.

\* \* \*

#### **3.1 Exterior Doors**

**3.1.1** Doors in many cases had round knobs, which were difficult for people with reduced grip, coordination, or strength to turn.

All exterior doors should be equipped with lever type handles, with a bulb or a bend at the end to prevent the hand from slipping off.

**3.1.2** Many wheelchair users had difficulty closing and locking the door behind them, once they were outside.

A pull handle can be installed, about 20cm from the hinged edge of the door and at doorknob height. This can be made from leather, canvas, plastic, or a similar material.

**3.1.3** Wheelchair users with reduced upper body mobility, and who wheel themselves, sometimes had difficulty getting over thresholds.

Thresholds should be equipped with bevelled metal or wood strips on either side, and should be no higher than 19mm.

3.1.4 Screen doors, though desirable, presented problems. For example: (a) Two doors, especially when hinged on opposite sides, were difficult for wheelchair users to open and close. (b) On some screen doors the exterior door handle opened only after a small button had been pushed, which some people found difficult. (c) Tiny catch buttons on the window of the screen door were difficult to use. (d) Some screen doors closed too quickly or forcefully to allow safe passage.

(a) Both doors should be hinged on the same side. (b) Lever type handles should be used. (c) Blocks or other aids can be affixed to the buttons. (d) Equalizers and adjustable, low-pressure door closers are available which will make the door close more gently.

3.1.5 Two units had metal drainage gratings directly outside the front entrance which acted as traps for wheelchairs, by running parallel to the wheelchair tires' direction of travel.

Drainage gratings should be at a 45 degree angle to the direction of travel or should be of a checkerboard configuration.

3.1.6 People with reduced hand coordination had difficulty putting keys into locks, locking and unlocking the door, and getting the key out of the lock.

Some tenants have adapted their key rings to make using their keys easier; generally, the solution will continue to lie with the tenant. However, every effort should be made to ensure easy, unobstructed access to the lock. Push-button, combination locks are a possible alternative.

3.1.7 Some doors or locks stick, creating a safety hazard to those with reduced coordination or strength. (i.e., in the event of a fire or other emergency)

Doors can stick as a result of poor construction, climatic conditions, or settling of the foundation. The onus is on the builder to ensure that close attention is paid to the installation of doors, on the landlord to maintain them well, and on the tenant to promptly report any problems.

3.1.8 Many doors opened inward in a direction that forces a wheelchair user towards a wall rather than towards open area, reducing maneuvering space.

Doors must open towards the wall, where one is immediately adjacent to the door. Ideally a 1.8m x 1.8m vestibule will be provided, with the door centred in it, and a corresponding 1.8m x 1.8m porch area outside.

### 3.2 Interior Doors

3.2.1 As with exterior doors, round knobs presented problems.

All interior swing doors should be equipped with lever handles, with a bulb or bend at the end to prevent the hand from slipping off.

3.2.2 Pocket doors were used in many small rooms because they occupy less space, which is especially desirable for wheelchair users. However, standard finger-pull handles are inadequate for many people, and if the doors are not properly or sturdily installed serious problems can ensue, as one tenant discovered when a door came off its tracks, trapping him in his bathroom.

Pocket doors must be of high quality, and must be expertly installed. Pull-straps with D-rings are often suitable.

### 3.3 Windows

3.3.1 Window hardware caused problems for some tenants. In a few cases the window was opened with two small latches, one of which was out of reach to someone sitting in a wheelchair. Others had crank handles which posed some difficulty for people with reduced coordination. The handles also tend to be stiff or freeze in the winter. Most of the units had windows that opened with a horizontal lever type handle, which was pulled inward to open and pushed outward to close; many people found these levers too stiff to use easily.

The lever type handle seems to pose the least amount of difficulty as it requires only one movement of the hand to open or to close. Lubrication can alleviate the difficulty of stiff levers in some cases, but a poor-quality window remains a poor-quality window regardless. Window hardware should be within reach of someone sitting in a wheelchair.

3.3.2 Most of the windows were at a suitable height for people in wheelchairs. However, the placement of windows caused some problems, especially in bedrooms where space was limited. Arrangement of furniture for maximum accessibility can be hindered by the location of the window.

Depending on the shape and size of the bedroom, windows should be located in such a way as to allow for twin beds, a dresser, and closet and window access, while still allowing a wheelchair to manoeuvre throughout.

### **3.4 Hallways**

**3.4.1** In some cases hallways were too narrow to allow wheelchairs to turn directly into a room. Quite a few units had three doors opening into the hallway at one end, causing circulation problems. Although it was possible to gain access to these rooms, it required a good deal of manoeuvring.

Where it is impossible to have a wide hallway, doorways should be wider than 1m to make turning easier. Also, having doorways to two rooms opposite each other provides the added space necessary for making three-point turns to enter these rooms.

**3.4.2** Laundry facilities in about half the units were located in a closet or alcove in the main hallway. Many of these laundry areas were equipped with folding doors which, when open, occupied hall space, blocking access.

If laundry alcoves have to be located in hallways, they should have sliding doors. (See also section on Laundry Facilities)

**3.4.3** Some units had stairways leading off of the hallway to the basement. This can be very dangerous for people in wheelchairs, especially when there is an entranceway to a room directly facing this stairwell. i.e. when making a three-point turn to enter the room or when backing out of the room one could easily back into the stairwell.

Entranceways to rooms or porches should never directly face descending stairwells.

3.4.4 Hall closets generally had sliding doors, which people found easy to open, but door tracks were not installed so as to withstand heavy use. Rods and shelves were at a lower than normal height, but were still difficult for some people in wheelchairs to reach.

Sliding doors on closets are easy to open and take up less space than regular swing-type doors or folding doors. The door track should be flush or close to, so that wheelchair users can have maximum closet access. Rods and shelves should be adjustable.

### 3.5 Kitchens Counters and Cupboards

3.5.1 Although counter height was found to meet the needs of the majority of tenants who use wheelchairs, there were still some problems with counter positioning; i.e., counters placed too far from fridge, stove and sink. This can be awkward and possibly hazardous for many users.

Where possible, counter space should be available directly beside fridge, stove and sink.

3.5.2 Although the accepted wisdom is that a 1.8m x 1.8m clear space in front of the stove and refrigerator provides sufficient access for wheelchair users, some tenants felt that clear space beside these appliances would be desirable. Lack of leg and toe room was a problem to a lesser extent in other parts of some kitchens as well.

To allow for optimum use of fridge and stove, clear space under counter tops beside them can be provided. Toe space (30cm high, 15cm deep) should be provided at the base of lower kitchen cupboards.



3.5.3 In two units an electric baseboard heater was located in the toe space clearing underneath the kitchen cupboards. Besides taking up toe space that was meant to give access to wheelchair users, the tenants also felt the heaters were hazardous in that even at a very low heat the heaters caused the whole counter top to become hot to the touch.

**Baseboard heaters in kitchens should be located on walls away from counters, leaving toe space clear for wheelchair footrests.**

3.5.4 For additional counter space one unit was equipped with a pull-out shelf, directly below the counter top and above the lower cupboards. This is a very useful feature for many wheelchair users. Ideal locations would be beside appliances.

3.5.5 In several of the newer units, below-counter storage units on casters have been included. This is an excellent option in that it provides storage space, and when pulled completely out from under the counter, both a low working surface and leg room for wheelchair users.

3.5.6 Depending on the tenant's disability, kitchen storage space posed a variety of problems. Over-counter cupboards were difficult for some people to reach, as were under-counter cupboards for others. As well, material stored in corner cupboards was frequently inaccessible, cupboard door handles were sometimes difficult to grasp, and cupboard door catches were difficult to release in some cases. In a few units, some upper cupboards have been replaced with open shelves; although open shelves are more readily accessible, tenants preferred closed cupboards in order to keep dishes, etc., out of view.

There are a number of ways to make kitchen storage space more accessible:

- a lazy-susan makes a corner cupboard or the corner of a counter more useable.
- narrow and deep corner cupboards should be avoided as they are difficult to reach into; narrow and shallow cupboards are acceptable.
- doors on corner cupboards should open in the direction that provides the most clear space to access the cupboards.
- narrow shelves or bins can be fastened to the insides of cupboard doors.
- small knob-type door handles should be avoided, as they are difficult to grasp. D-rings are preferable.
- magnetic door closers are desirable on cupboard doors, since they require little strength to open and shut.
- in some cases sliding cupboard doors may be most desirable. Door handles must be easily grasped, i.e., D-ring.
- where lay-out permits, a pantry with adjustable shelves is an excellent adjunct to cupboards.
- a small drop-leaf table attached to one wall provides extra working space, and offers the option of an eat-in kitchen, which can be an advantage to people who have difficulty carrying food and dishes to the dining area.
- where the kitchen and dining space are next to each other and separated by the kitchen cupboards, it would be useful if cupboard doors opened into both the kitchen and the dining room making it easier to get dishes from either room.

### 3.6 Appliances

3.6.1 Most of the units were equipped with stoves that were at a lower than normal height, had front controls, and standard ovens. A few had controls located along one side of the stove top. The ovens presented major problems to most tenants, for two main reasons: i) They were too low for people with coordination, mobility, or balance difficulties to use easily or safely. This includes wheelchair users. ii) A front opening oven door creates a hazard for a wheelchair user, who must lean into and over a hot door. A few of the newer units were equipped with counter top stoves and wall-mounted ovens. The stove top had a space underneath for wheelchair access and controls were mounted along one side of the elements. The oven had a side-opening door, which is an advantage in that it increases access but a possible hazard in that it may increase the likelihood of dropping hot objects on one's lap.

- a counter top stove is preferable.
- front controls are most desirable, as they are easier to see and to reach. However, it is difficult if not impossible to find such units in Canada at present.
- dials should be easy to grasp and to control and should be clearly marked for visually impaired people.
- smooth-surface cooktops make it easier to safely slide pots from the stove onto the counter top.
- wall-mounted ovens with side-opening oven doors are perhaps preferable from a strict perspective of accessibility but, besides being potentially hazardous, as mentioned above, are also usually more expensive to purchase and service than standard units. If selected, the door should open in the direction that provides maximum access to counter space.
- on the wall below wall-mounted ovens should be a pull-out shelf on which hot or heavy pots should be placed.

3.6.2 In most cases a larger than necessary space was left for the stove, because it wasn't known what type of stove would be installed. Because narrow stoves were installed, there is a space between the stove and counter top, interrupting the continuous work surface.

Regardless of the type of stove installed, the importance of a continuous work surface for disabled users must be considered.

3.6.3 Refrigerators were slightly shorter than average, with the freezers located on top. Generally, people found their refrigerators to be accessible, though some had difficulty reaching their freezers. In some cases the direction of the refrigerator door swing made access to the fridge difficult.

A side-by-side unit can increase access to the freezer, but more clear space will be needed directly in front of the refrigerator to allow for two doors opening in different directions. In any case, many conventional fridges are designed such that the door can be hung on either side, which suggests a certain lack of careful purchase planning on the part of project planners.

### 3.7 Sinks

3.7.1 Low counters mean low sinks, and some tenants found insufficient knee clearance.

Shallow basins can be installed, providing increased clearance; however, some users have indicated these to be undesirable because of their meager volume. A good compromise is the combination of a standard sink with an 84cm counter. The valence in front of the basin should not hang lower than the bottom of the basin.

**3.7.2** Some drain pipes and water pipes were uninsulated. This can be extremely dangerous for people who have no leg sensation, in that they can lean unknowingly against hot pipes, causing serious burns.

**Drain pipes, water pipes, and the underside of the basin, should be well insulated.**

**3.7.3** Wheelchairs users found that the drain pipe occupies knee space under the sink.

**Pipes should be mounted with the trap to the back, towards the wall.**

**3.7.4** A number of sinks had pairs of small lever-type taps. People found these satisfactory as they required little hand dexterity. Others had the single-arm lever type tap which was also easy to control. Knob-type taps were found to be the most difficult to use as they required both grasp and rotation.

**The single-arm lever type is the best choice as it requires the use of only one hand.**

### **3.8 Kitchen - General**

**3.8.1** Some kitchens were not well lit, either artificially or naturally, making it difficult for visually impaired people to distinguish between surfaces.

**It would be ideal to have a window providing natural light, and a bright overhead light. Counter lights are helpful.**

3.8.2 In several units where the kitchen and dining spaces were not a single area, a pass-through or serving hatch has been provided to enable meals to be served and cleared without frequent trips between the two rooms. Some wheelchair users found the hatches were too high to be reached safely.

The bottom of the pass-through or serving hatch should be level with the kitchen counter. A small ledge can be installed on both sides to prevent dishes from accidentally falling.

### 3.9 Bathrooms

3.9.1 The toilets were slightly higher than standard size, and were suitable for most tenants. However, a few people mentioned that the toilet was too high to be used with a commode chair.

A standard height toilet in conjunction with a raised toilet seat is both more appropriate and cheaper. It gives the extra height to those who need it while allowing commode chairs to be used when the seat is raised.

3.9.2 In a number of bathrooms, the lay-out did not leave enough space beside and in front of the toilet to allow transfer from a wheelchair.

The toilet should be placed so that there is enough clear space at one side (1m) and in front (2m) of the toilet for a wheelchair. Conversely, the other side should be close to a wall, allowing for suitable grab bar installation.

3.9.3 A variety of grab bar styles and placements were observed; users usually know best which configuration is desirable.

Walls around the areas where the toilet will be placed should be well reinforced, so grab bars can be added later without incurring the expense of structural changes.

3.9.4 The flush handles on many newer toilets were plastic and did not stand up well to constant use, particularly by people with erratic hand movements.

Flush handles should be of stainless steel or similarly durable materials.

3.9.5 Taps and faucets were often installed at one end of the tub, and were difficult to reach for people with mobility or coordination deficits.

Taps and faucets should be placed low and in the centre of the side wall. This allows people to reach them more easily and also keeps the end walls free for the placement of grab bars, so people can get in and out using the strongest side of their bodies. (There is some controversy about this point. Some people feel that because of the risk of being burned, it is better to place the taps at one end of the tub. But, if a temperature regulator is installed this should not be a problem). Also, the drain stopper must be the rubber-and-chain type, since pop-up metal stoppers can cause injury to people without leg sensation.

3.9.6 Knob-type taps were found to be the most difficult to use, because they required both grasp and rotation. A dial-type tap gave the safest temperature control but the dial was often difficult to grasp and turn. The lever type tap was the easiest to maneuver but tended to be too sensitive to touch, making temperature control difficult.

The ideal tap for the bathtub would be a single lever-type with a temperature regulator. The shower control should also be of this type.

3.9.7 The type of grab bars needed and their location will be determined by the individual needs of the tenant. Walls around the bathtub should be reinforced, so grab bars can be added later without incurring the expense of structural changes.

3.9.8 In many units both able-bodied and disabled people used the bathtub and shower, which caused conflicts in some cases.

Shower head attachments and soap holders should be placed at two heights. Also, a non-slip surface in the bathtub will improve safety for all users.

3.9.9 Bathroom sink requires leg room beneath, the trap against the back wall, appropriate insulation, an electrical outlet on the front valence, and a rubber-and-chain stopper.

### 3.10 Bathroom - General

3.10.1 In a couple of instances drawers in the bathroom vanity and medicine cabinets were out of reach to a person sitting in a wheelchair.

Some bathroom storage space should be low and in an easily accessible place. Low cupboards and medicine cabinets should be equipped with child-proof fasteners.

3.10.2 Most mirrors were large and adjustable, meeting everyone's needs. A few units, however, had bathroom mirrors which were high and not adjustable and therefore of no use to the wheelchair user.



Mirrors should be large and placed at a suitable level for a seated person, i.e., begin at vanity top (86cm) and extend to a height of 1.8m.

Towel racks and shower curtain rails should be heavy-duty.

### 3.11 Bedrooms

3.11.1 In a number of the townhouses the one accessible bedroom on the ground floor was extremely small. In several cases wheelchair users were unable to access all parts of the bedrooms, because no matter how the furniture was arranged there was not enough room to manoeuvre a wheelchair. (see also section on window placement)

Mobility-impaired people almost invariably need more rather than less space than the ordinary user in order to safely and easily access bedrooms. Where only one bedroom is meant to be accessible, it should be a minimum of 9.8m<sup>2</sup>.

3.11.2 Most bedroom closets had sliding doors, which are desirable. In some instances, raised tracks created problems for wheelchair users.

Sliding door tracks should be flush with the floor.

3.11.3 Hanger rods were lower than normal, though still not low enough for some tenants. Many tenants suggested that two shelves above the rods would be helpful, since that space was not used.

The ideal configuration for a closet is one in which shelves and rods are as adjustable as possible. A mix of two or three shelves and two or three rods can be adapted to the needs of virtually any disabled user.

### **3.12 Laundry Facilities**

**3.12.1** About one-third of the units had either no laundry facilities, or facilities located at the second floor or basement levels, making it difficult or impossible for mobility-impaired tenants to do their own laundry.

**In-suite, ground floor laundry facilities are essential.**

**3.12.2** Other units had facilities located in alcoves or closets on the ground floor, off the main corridor. Most had folding doors, which created traffic obstacles when open.

**Sliding doors are preferable. Where space permits a separate room should be provided, on the ground floor.**

**3.12.3** Due to space limitations washers and dryers in these alcoves were most often stacked, with the washer at the bottom on tracks, allowing it to be pulled out for use. Some tenants had great difficulty accomplishing this, and most found the stacked appliances very noisy since they rattled against each other when operating.

**Washers and dryers must be installed side by side to permit wheelchair access.**

**3.12.4** Some washers and dryers had controls on the standard panel at the back, which couldn't be reached by most wheelchair users.

**Front-mounted controls are desirable but not readily available at present.**

3.12.5 Top-loading washers were difficult for some wheelchair users to reach into.

Front-loading washers are preferable, although they still may pose problems for people with balance problems, i.e., it's necessary to bend down and forward at the same time. Machines can be raised on blocks, reducing this problem somewhat. It should be pointed out that front-loading washers are usually a good deal more expensive than standard machines.

### 3.13 Electrical Outlets and Controls

3.13.1 Most tenants found light switches and power outlets to be at suitable heights, i.e., 1m for the former and 600cm for the latter. Several tenants felt that additional outlets would permit more flexibility in the placement of furniture and appliances for maximum accessibility. Thermostats and fuse boxes were sometimes located either too high or in positions which interfered with suitable furniture arrangements, such as in room corners.

Fuse boxes and thermostats should be at a height of 1 meter and in places unlikely to interfere with furniture.

3.13.2 Outlets in bathrooms and kitchens were usually located on counter fronts or valences, a desirable arrangement.

Electrical standards may vary from one location to another, and local authorities should be consulted in this regard. The need for accessible outlets in bathrooms, kitchens and others rooms should be a consideration.

3.13.3 Switches on lamps and some other applicances were sometimes difficult for tenants to reach.

As far as practical, outlets should be controllable by wall switches.

### **3.14 Other Considerations**

**3.14.1** Some ambulatory but mobility-impaired tenants found that handrails on interior staircases were not sturdy enough to give support.

Interior staircases should always have solidly mounted pairs of handrails, preferably with a non-slip surface.

**3.14.2** A few units had hardwood floors, which were easily damaged by the pressure of wheelchair tires. Most units had tile and/or low-pile carpeting which proved suitable for most tenants.

**3.14.3** Some tenants had to rely on others to take out their garbage because outdoor garbage containers were inaccessible.

Garbage containers should be located in a well-lit place easily accessible from one entrance of the unit, and should be easy for someone in a wheelchair to open and close.

**3.14.4** Protecting corners and door frames from the wear and tear caused by wheelchair footrests was a concern for some tenants. In a couple of units metal plates were installed on corners but were later removed because of their institutional look.

A clear, durable material such as acrylic can be placed on corners and on the outside edges of door frames.

## CONCLUSIONS

In addition to the information obtained by using the accessibility checklist, a final question was asked of tenants to help pinpoint their major concerns. We were interested in knowing what features another house would have to possess to make the tenant consider moving.

The tenants' most frequent response to this question was that they would like to have an extra bedroom. Many tenants felt that there should be more two and three-bedroom units built, to accommodate families having a disabled member, friends sharing, or a live-in attendant.

Larger bathrooms and bedrooms were also a major considerations. Transferring from wheelchair to toilet and bathtub requires extra space, and some people require assistance in the bathroom, necessitating enough room for two people and a wheelchair. Tenants expressed a need for larger bedrooms to enable them to arrange their furniture in such a way that they can easily transfer to the bed from a wheelchair, make the bed, and have access to the closet and window.

Other tenants said they would look for roll-in showers, more accessible cupboard space, wall-mounted ovens, units that are only on one level and driveways that are flat.

But on the whole the tenants surveyed were fairly satisfied with their accommodations. "Well, it's home!" and "It's sure better than where I used to live" were frequently heard comments, despite any obstacles to accessibility that exist. Most people have found ways of adapting their homes to the

needs of everyday life. However, as can be seen from the observations and suggestions presented in this report, there are still many ways of making accessible housing better meet the needs of disabled users.

One point which this report has perhaps obscured because of its concern with special accessibility features and fixtures is that it is neither possible nor desirable to make housing, especially public housing, completely accessible for an occupant with a given disability. A home which was oriented entirely towards the needs of a wheelchair user, for example, may present difficulties for able-bodied family members or future occupants: storage space would be wasted in closets and kitchens, counters would be too low for tall people, and so on. The designer's objective should rather be to create housing which is suitable for the entire range of the population, from children to the elderly, from the severely handicapped to the able-bodied. This goal can't be achieved if the needs of one group take precedence over those of all others.

As perhaps can be seen from the suggestions in this report, designing for accessibility demands a good deal of common sense, combined with some practical and technical knowledge of the requirements of people with various disabilities. This knowledge unfortunately does not yet seem to be common currency among Canadian architects and builders, although some progress is being made, and it's essential that the professional housing community make efforts to keep abreast of new research and technology in the field of accessibility.

As has been previously emphasized, it is also essential that accessibility features be thought of as an integral part of the design and building processes, and that conscious and explicit effort be made to coordinate these phases.

Whose responsibility this is depends on who the sponsoring agent is -- perhaps a public agency, perhaps a private developer -- but coordination is essential. Without it, expensive mistakes are made and the disabled user loses out.

On the whole the experiences of the City of Ottawa Non-profit Housing corporation with designing and building accessible housing have been a success story. Through a combination of professional skill, and trial and error the Corporation has created housing which is comfortable and fairly functional for people with wide range of physical disabilities.

The authors hope that this report will be of some small value to those committed to the creation of accessible housing. While narrow in scope, the report touches on design and construction problems which are universally experienced, and should be relevant to a wide range of professionals and consumers. Much research remains to be done in the accessibility field, especially in the way of comparative analyses of similarly-funded and constructed housing in different parts of the country. Meanwhile, we hope you can use this report to your benefit.

## Appendix A

### A C C E S S I B I L I T Y   C H E C K L I S T

(based on a checklist developed by Jean-Remi Champagne,  
Senior Research Officer, National Research Council)

#### Exterior Access at Housing Site

1. Are there accessible parking spaces close to your housing unit?
2. Are parking spaces in parking lots marked with the access symbol?
3. Is there a shelter near the parking area where you may be protected from rain, snow, sun, etc?
4. Do the sidewalks have curb cuts?
5. Are the surfaces of the sidewalks slip-resistant?
6. Are there any steps or abrupt changes in level?
7. Are there ramps provided where the change in level is abrupt?
8. Are there handrails at one side of the ramps?
9. Are these ramps protected from snow and ice?
10. Is there adequate out-of-door lighting?
11. Are there any steps leading up to the main entrance of your building?



12. Is there a ramp leading up to the main entrance and is there a handrail at the side of this ramp?
13. Can you open the main door easily and is there enough space to manoeuver a wheelchair?
14. Are the unit numbers mounted at an appropriate height for visually impaired people, is the colour contrast suitable and are figures raised to aid in tactile identification.

#### Interior of Unit

15. Is the doorway to your unit wide enough to meet your needs?
16. Can you easily open and close the door to your unit?
17. Are you able to lock and unlock the door to your unit?
18. Do you have enough turning space once you are inside the unit?
19. Are the light switches, the fuse box and thermostats at a convenient height?
20. Are there enough wall outlets throughout your unit and are they at a convenient height?
21. Are electrical devices easy to control and to see?
22. Do you think that your windows are satisfactory in terms of being low enough and easy to open?
23. Is the shelving in hallways, kitchen and washroom easy to reach?

24. Does every room have adequate lighting to meet your needs?
25. If there is a balcony, is it accessible to someone in a wheelchair?
26. Is the backyard accessible to someone in a wheelchair?
27. In the kitchen:
  - a. is the counter height adequate?
  - b. is the counter space adequate?
  - c. is there knee space at the sink?
  - d. is there adequate protection on pipes under the sink?
  - e. are the water taps easy to control?
  - f. is the colour contrast adequate on counters, oven, refrigerator, etc?
  - g. is the floor space to manoeuver a wheelchair adequate?
  - h. are the stove controls easy to reach and to operate?
28. In the washroom:
  - a. is the floor space to manoeuver a wheelchair adequate?
  - b. are towel racks, soap holders or dispensers, toothbrush holders and other such fixtures in an accessible place?
  - c. are the mirror and shelf at a convenient height?
  - d. are outlets for plugging in razors, hair dryers, etc. easy to reach
  - e. is there knee protection on pipes under the lavatory?
  - f. are there grab bars beside the toilet and are they easy to reach?
  - g. is there enough space beside the toilet to make a lateral transfer from a wheelchair?

- h. are there grab bars beside the bathtub and are they at a convenient height?
  - i. are the water taps on the bathtub and lavatory at an appropriate height and are they easy to control?
  - j. is the soap holder easy to reach while seated in the bathtub?
  - k. is the toilet flushing device easy to reach and to operate?
29. In the bedroom:
- a. is there enough space to maneuver a wheelchair around the bed and other furniture?
  - b. is the closet accessible from a wheelchair?
  - c. are the shelves, rods, and hooks within the closet easy to reach?
  - d. are the windows accessible from a wheelchair and are they easy to open and close?
  - e. are light switches and thermostats well identified, easy to reach and to control?
  - f. is the flooring of a non-slip surface?
  - g. is there a fire alarm device accessible to you?
30. Are the other rooms within your house accessible to and do the fixtures within these rooms meet your needs?

#### **Other Areas in the Building or Unit**

31. Is the laundry area easy for you to access:
32. In the laundry area:
- a. are the washers and dryers accessible?
  - b. are the controls on these appliances clearly indicated and easy to operate?
  - c. is there enough accessible counter space to place your laundry?

- d. are the light switches accessible?
- e. is the flooring surface non-slip?
- f. are seats provided for those who cannot stand for long periods of time?
- g. is there a fire alarm and is it easy to identify and to operate?
- h. is there a fire exit near the laundry room and is the door to this exit easy to open?

33. In the storage room:

- a. are there accessible lockers?
- b. can you easily open these lockers?
- c. are the shelves adjustable?
- d. is the storage room well lit?
- e. is there enough space in the corridor between the lockers?
- f. is the flooring surface non-slip?
- g. is there a fire exit near the storage area and is the door to this exit easy to open?
- h. is there an accessible fire alarm device in this area?



City of  
Villed Ottawa

Appendix E  
Non-Profit Housing  
Corporation

214 Hopewell Avenue  
Ottawa, Ontario  
K1S 2Z5  
(613) 563-3441

*File*  
Société de logement  
à but non lucratif

214, avenue Hopewell  
Ottawa (Ontario)  
K1S 2Z5  
(613) 563-3441



February 29, 1984.

Dear Tenant:

We would like to inform you that "Unhandicappers Limited" has recently signed an agreement with Canada Mortgage and Housing Corporation to prepare a report which will examine how functional our houses are for handicapped persons.

Representatives of this firm would like to meet with you to obtain your views and experience living in these specially designed units.

We would appreciate your concurrence to our submitting your name to this organization for a possible interview with its representatives. If we do not hear from you by March 7 at 4:00 p.m., we will assume you have no objection to your name being transferred to this firm.

We hope you will assist "Unhandicappers Limited" in its review.

If you require further information, please contact Helena Brown at 563-3441.

Yours truly,

Pierre Crevier,  
Director,  
Portfolio Management Branch.

PC:hb

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