RESEARCH REPORT

External Research Program

Consumer Evaluation of Wheelchair Accessible Social Housing

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CONSUMER EVALUATION OF WHEELCHAIR ACCESSIBLE SOCIAL HOUSING

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PREFACE

This report has been prepared by Katherine Taylor, M.Sc., principal of Options Consulting. The author would like to thank CMHC for the generous support of this research initiative, and would also like to particularly acknowledge the contribution of all those who volunteered their time and thoughts. The consumer's perspective that each participant shared with me provided unique and valuable information that may contribute to better housing in the future.

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ABSTRACT

This study is an evaluation of the congruence between the design of wheelchair accessible units and the requirements of the consumers for whom they are designed. The study is based on a recommendation made at a 1992 consumer oriented Housing Forum on Housing and People with Disabilities. The forum recommended that "a consumer evaluation of accessible units in social housing should be carried out, and the findings should form the basis for future policy on design and planning for inclusion of such units in social housing developments".

The study sample comprised 34 people with disabilities who lived in wheelchair accessible non-profit housing units in the Greater Vancouver area. The researcher visited each participant in his or her home. A survey instrument was used to structure an interview of an hour to an hour and a half, and then the researcher obtained measurements and observations pertaining to the dwelling and specific design features related to accessibility.

The findings reflect both the subjective experiences of the participants and the objective quantitative data pertaining to the physical design features. Recommendations have been made regarding design issues which the participants identified as salient. The intent of these recommendations is to contribute to the design and construction of appropriate and accessible housing for persons with disabilities.

EXECUTIVE SUMMARY

This study is an evaluation of the congruence between the design of wheelchair accessible units and the requirements of the consumers for whom they are designed. The study is based on a recommendation made at a 1992 consumer based Housing Forum on Housing and People with Disabilities. The forum recommended that "a consumer evaluation of accessible units in social housing should be carried out, and the findings should form the basis for future policy on design and planning for inclusion of such units in social housing developments".

The study sample comprised 34 people with disabilities who lived in wheelchair accessible non-profit housing units in the Greater Vancouver area. The researcher visited each participant in his or her home. A survey instrument was used to structure an interview of an hour to an hour and a half, and then the researcher obtained measurements and observations pertaining to the dwelling and specific design features related to accessibility.

The participants represented the full range on all profile measures. Based on the occupant profile information collected, the "typical" participant was a 41 year old female who has multiple sclerosis or a spinal cord injury, uses an electric wheelchair all of the time, lives alone and receives approximately six hours per week of assistance.

A total of 29 different properties, and 34 different units were evaluated. The recommendations are not inclusive; the intent is to make recommendations only in response to the problems identified by the consumers who participated in the study.

BATHROOM

Recommendation: The design should demonstrate that a person in a wheelchair can maneuver in and out of the bathroom and use all of the fixtures.

Recommendation: Provide a toilet seat with a height not more than 400 mm.

Recommendation: A wheelchair accessible shower should be provided. The design and installation should make provision for future adaptation to a bathtub. A recessed floor area should be provided with a fitted, removable, flush, flat drainage surface. A fixed, wall mounted seat is not required.

Recommendation: Provide transfer space at both the front and side of the toilet.

Recommendation: Adequate, accessible storage should be provided in the bathroom. A counter with storage should be provided in all cases. Consider locating a general household storage room off the bathroom.

Recommendation: The sink should be placed sufficiently forward from the wall to allow a person in a wheelchair to maneuver under the sink. The counter should be 600 mm to 750 mm deep, with the sink installed close to the front.

KITCHEN

Recommendation: Provide adequate and accessible counter space, including a workspace with clearance below the counter.

Recommendation: Provide adequate and accessible storage space in the kitchen, including a pantry with narrow shelves, and large roll out drawers instead of cupboards with shelves below the counter.

Recommendation: Provide a side by side refrigerator/freezer. A frost-free model with pull-out shelves is optimal. Any walls adjacent to the refrigerator should not extend past the edge of the refrigerator door hinges, to allow unimpeded access by a person in a wheelchair.

Recommendation: The guidelines for the amount of counter space should make provision for a microwave. Consider providing a convection/microwave oven in lieu of a wall oven.

Recommendation: Provide dishwashers in all wheelchair accessible units.

Recommendation: Provide some electrical outlets which can be reached from a seated position, preferably on a side wall, or at the front of the counter. Counter front electrical outlets should not be positioned below the cooktop. Some electrical outlets at the rear of the counter should be provided for appliances.

Recommendation: Provide in-suite laundry appliances or facilities. A front loading washer and dryer installed side by side provide the most universal access.

LIVING/DINING

Recommendation: Living and dining areas should be large enough to comfortably accommodate the activities of a person who uses a wheelchair, and should include adequate space for furniture.

BEDROOM

Recommendation: The size and configuration of the bedroom should allow a turning radius of 1 500 mm on at least one side of the bed, and 900 mm circulation space in all parts of the room. The bedroom should accommodate a double bed and a wheelchair (when it is not being used).

Recommendation: All closets, including bedroom closets, linen closets, and other closets, should have a minimum clear width of 900 mm. Sliding closet doors or a single bifold should be used as appropriate. Adequate circulation space should be provided at the doors to permit access and maneuvering. Closets with recessed shelving (such as linen closets) should be avoided. Closets should have a wide opening and shallow shelves, near to the front of the closet, or roll-out shelving.

The amount of storage space should be specified and consideration should be given to the equipment (such as second and third wheelchairs) and supplies which are required by many people with disabilities.

UNIT LAYOUT AND CIRCULATION

Recommendation: The design guidelines should include a reference to minimizing the amount of circulation space and making circulation routes as straight and open as possible.

When a design is submitted for plan review, it should be demonstrated that a wheelchair can maneuver through the spaces shown, with particular attention to corridors, corners and angles, and access to appliances and to design features such as closets.

LIGHTING AND CONTROLS

Recommendation: All telephone jacks should be paired with electrical outlets.

Recommendation: Telephone jacks should be provided in the bedroom in proximity to the planned location(s) of the bed. For all other controls, the existing guidelines are appropriate and adequate, but in many cases, are not incorporated into the design or construction of units designated as wheelchair accessible.

WINDOWS

Recommendation: The criteria for window fixtures should be the same as those specified for other building controls which require manipulation, such as thermostats and electrical outlets: accessible location; adjacent to clear floor space at least 750 mm wide; located between 450 mm and 1 200 mm from the floor; operable with one hand; of a type that does not require tight grasping, pinching or twisting of the wrist.

DOORS

Recommendation: Provision should be made for the installation of automatic door openers at the unit entrance of all units designated as accessible. Wiring should be installed with a blank cover plate located above the interior of the door.

Recommendation: All pocket doors should be installed with D-type handles or other type of hardware which is accessible, and the clear door width should be specified, so that the installation of a handle does not compromise clearance.

Recommendation: Solutions to reduce door thresholds at patios and balconies should be explored. Potential solutions include construction techniques to reduce the threshold for sliding glass doors, and alternative types of doors which have a lower and bevelled threshold.

Flooring

Recommendation: Consideration should be given to carpeting options, such as a dense underlay combined with a tight weave, low pile carpet, and to floor coverings other than carpet which will meet criteria for warmth, aesthetics and cost.

COMMON AREAS AND AMENITIES

Recommendation: All common areas (indoor and outdoor) and facilities should be accessible unless there is a design justification for not providing access.

Recommendation: All units should provide wheelchair access at the entrance and into the living/dining area unless there is a design justification for not providing access. (Note: The intent of this recommendation is to improve the opportunities for meaningful integration, and to change the paradigm from "accessible units" as the exception, to "accessibility" as the norm unless other design requirements preclude it.)

COMMUNITY

Recommendation: For wheelchair accessible housing, there should be three primary site criteria: relatively level land in the surrounding area, a neighbourhood that offers safety and security, and proximity to amenities and transportation.

Recommendation: Provide safe and efficient (un)loading for HandyDart passengers.

Recommendation: Encourage designs that provide an efficient circulation route between units and parking, with the minimum number of fire and security barriers.

CONCLUSIONS AND DISCUSSION

This research has served to validate that housing design criteria are overall achieving the goal of providing appropriate accessible housing for people with disabilities. This study has served to identify specific problems and to articulate recommendations which address those issues. The intent is that these findings and recommendations will serve as a foundation to build better housing for persons with disabilities in the future.

«Évaluation par les consommateurs des logements sociaux accessibles en fauteuil roulant»

RÉSUMÉ

Cette étude évalue si la façon dont sont conçus les logements accessibles en fauteuil roulant correspond aux besoins des consommateurs auxquels ils sont destinés. Elle fait suite à une recommandation formulée lors d'un forum tenu en 1992 qui portait sur le logement des personnes handicapées et s'adressait aux consommateurs. Ce forum recommandait la tenue d'une évaluation par les consommateurs des logements sociaux accessibles en fauteuil roulant dont les résultats constitueraient la base d'une politique future sur la conception de tels logements et leur aménagement au sein d'ensembles de logements sociaux.

L'échantillon d'étude se composait de 34 personnes handicapées occupant des logements sans but lucratif accessibles en fauteuil roulant dans la région de Vancouver. Le chercheur s'est rendu au domicile de chaque participant. À l'aide d'un questionnaire, il a préparé une entrevue d'une heure à une heure et demie, puis il a pris des mesures et fait des observations relativement au logement et à des caractéristiques de conception particulières ayant trait à l'accessibilité.

Tous les types de profil étaient représentés. À partir des renseignements obtenus sur le profil des participants, on a pu établir que le participant type était une femme de 41 ans qui a la sclérose en plaques ou présente une blessure à la moelle épinière, qui utilise un fauteuil électrique en tout temps, vit seule et reçoit environ six heures d'aide par semaine.

En tout, 29 propriétés différentes et 34 logements différents ont été évalués. Les recommandations ne couvrent pas tout; elles ne sont destinées qu'à résoudre les problèmes soulevés par les consommateurs qui ont pris part à l'étude.

SALLE DE BAINS

Recommandation : Elle doit être conçue de telle sorte qu'une personne en fauteuil roulant soit en mesure d'y entrer, d'utiliser tous les appareils et d'en ressortir.

Recommandation : Prévoir un siège de toilette d'une hauteur d'au plus 400 mm.

Recommandation : Fournir une douche accessible en fauteuil roulant. Au moment de la conception et de la pose, il faut prévoir l'installation éventuelle d'une baignoire à cet endroit. On songera également à aménager une dépression dans le plancher surmontée d'une surface affleurante, plate, amovible et ajustée à travers laquelle l'eau peut s'écouler. Il n'est pas nécessaire de poser un siège mural fixe.

Recommandation : Prévoir une zone de transfert à l'avant et sur le côté de la toilette.

Recommandation : De l'espace de rangement approprié et accessible doit être prévu dans la salle de bains. Celle-ci doit toujours être dotée d'un comptoir offrant du rangement. Songer à aménager une pièce de rangement général près de la salle de bains.

Recommandation : Le lavabo doit avancer suffisamment par rapport au mur pour permettre à une personne en fauteuil roulant de manoeuvrer sous le lavabo. Le comptoir doit avoir une profondeur de 600 à 750 mm et le lavabo doit être installé à l'avant du meuble.

CUISINE

Recommandation : Prévoir un comptoir approprié et accessible offrant un plan de travail dont le dessous est dégagé.

Recommandation : Aménager un espace de rangement suffisant et accessible dans la cuisine, notamment un garde-manger pourvu d'étagères étroites et de grands tiroirs coulissants au lieu d'armoires à tablettes placées sous le comptoir.

Recommandation : Fournir un réfrigérateur-congélateur côte à côte. Les modèles sans givre munis de tablettes coulissantes offrent le plus de commodité. Tout mur adjacent au réfrigérateur ne doit pas avancer plus loin que le bord des charnières de porte pour que l'accès soit optimal pour une personne en fauteuil roulant.

Recommandation : Les critères de conception des comptoirs doivent prévoir un emplacement pour un four à micro-ondes. On pourra envisager d'installer un four à micro-ondes et à convection au lieu d'un four mural.

Recommandation : Mettre un lave-vaisselle dans tous les logements accessibles en fauteuil roulant.

Recommandation : Prévoir quelques prises de courant placées à la portée d'une personne en fauteuil en roulant, de préférence sur un mur latéral ou à l'avant du comptoir. Toutefois, il ne faut pas poser de prises de courant sous une surface de cuisson. Des prises de courant doivent être placées sur le mur du fond des comptoirs pour permettre le branchement de certains appareils.

Recommandation : Fournir des appareils ou des installations de lessive dans le logement. Une laveuse et une sécheuse à chargement devant installées côte à côte offrent l'accès le plus universel.

SÉJOUR ET SALLE À MANGER

Recommandation : Le séjour et la salle à manger doivent être suffisamment grands pour qu'une personne en fauteuil roulant puisse y vaquer à ses occupations confortablement et pour que l'on puisse y placer des meubles.

CHAMBRE

Recommandation : La taille et la configuration de la chambre doivent permettre un rayon de braquage de 1 500 mm sur au moins un côté du lit et une zone de circulation de 900 mm dans toutes les autres parties de la chambre. La chambre doit pouvoir recevoir un lit double et un fauteuil roulant (lorsqu'il n'est pas utilisé).

Recommandation : Toutes les penderies, y compris les placards de chambre, les lingeries et autres placards doivent avoir une largeur libre minimale de 900 mm. On utilisera de préférence des portes de placard coulissantes ou une seule porte accordéon selon ce qui convient le mieux. De l'espace de circulation suffisant doit être prévu près des portes pour faciliter l'accès et les manoeuvres. Les placards avec tablettes en retrait (de type lingerie) doivent être évités. Les placards doivent plutôt offrir de grandes ouvertures et des tablettes étroites aménagées à l'avant du placard ou alors des tablettes coulissantes.

Le volume de rangement doit être spécifié et il faut songer à l'équipement (comme un deuxième et un troisième fauteuil roulant) et aux fournitures que peuvent utiliser bon nombre de personnes handicapées.

AMÉNAGEMENT DU LOGEMENT ET CIRCULATION

Recommandation : Les critères de conception doivent faire mention de l'importance de réduire au minimum les distances à parcourir et de prévoir des trajets qui soient le plus directs et ouverts possible.

Lorsqu'un plan d'aménagement est soumis aux fins d'approbation, il doit démontrer qu'un fauteuil roulant peut manoeuvrer dans les espaces montrés, en particulier dans les corridors, les angles et les coins, et que les appareils et les caractéristiques de conception (comme les placards) sont accessibles.

ÉCLAIRAGE ET DISPOSITIFS DE COMMANDE

Recommandation : Toutes les prises téléphoniques doivent être jumelées à une prise de courant.

Recommandation : Des prises téléphoniques doivent être installées dans la chambre à proximité de l'endroit ou des endroits prévus pour le lit. Pour tous les autres dispositifs de commande, les directives en vigueur sont appropriées, mais, dans bien des cas, elles n'ont pas été prises en considération lors de la conception ou de la construction des logements considérés comme accessibles en fauteuil roulant.

FENÊTRES

Recommandation : Les critères régissant la conception des commandes d'ouverture des fenêtres doivent être les mêmes que pour les autres dispositifs de commande nécessitant une manipulation comme les thermostats et les prises de courant : emplacement accessible, près d'un espace dégagé d'au moins 750 mm de largeur, situés entre 450 mm et 1 200 mm du plancher, pouvant être actionnés d'une seule main et d'un type qui n'exige pas beaucoup de force des doigts, de la main ou du poignet.

PORTES

Recommandation : Il faut prévoir la pose de commandes d'ouverture automatique de la porte d'entrée pour tous les logements désignés comme accessibles. Le câblage doit être installé au préalable à l'intérieur, au-dessus de la porte, et l'ouverture fermée avec une plaque de fermeture.

Recommandation : Toutes les portes escamotables doivent être munies de poignées «2 attaches» ou d'un autre genre de quincaillerie accessible et la largeur libre de la porte doit être précisée, de manière que la pose d'une poignée ne compromette pas le dégagement.

Recommandation : Des solutions permettant d'abaisser le seuil des portes à la hauteur des terrasses et des balcons devraient être explorées. Parmi les solutions possibles, mentionnons les techniques de construction destinées à abaisser le seuil des portes coulissantes en verre et d'autres types de portes qui possèdent un seuil surbaissé et biseauté.

REVÊTEMENT DE SOL

Recommandation : Il faut prendre en considération les divers modèles de moquette comme celles à tissé serré et à velours court dotées d'une thibaude dense, ainsi que les revêtements de sol autres que la moquette qui répondent aux critères de chaleur, d'esthétique et de coût.

AIRES COMMUNES ET COMMODITÉS

Recommandation : Toutes les aires communes (intérieures et extérieures) et les installations doivent être accessibles, à moins qu'un motif d'ordre conceptuel justifie de ne pas fournir l'accès.

Recommandation : L'entrée de tous les logements ainsi que le séjour et la salle à manger doivent être accessibles en fauteuil roulant, à moins qu'un motif d'ordre conceptuel justifie de ne pas fournir l'accès. (Remarque : Le but de cette recommandation est d'améliorer les possibilités d'intégration intéressante et de faire que l'accessibilité ne soit non plus l'exception, mais la règle, sauf si d'autres exigences de conception ne l'empêchent.)

COLLECTIVITÉ

Recommandation : Pour les logements accessibles en fauteuil roulant, trois principaux critères relatifs au site devraient être utilisés : un terrain relativement plat autour du bâtiment, un quartier sûr et la proximité des commodités et des services de transport.

Recommandation : Faire en sorte que l'embarquement et le débarquement des passagers utilisant le transport adapté se fassent de manière sûre et efficace.

Recommandation : Encourager les concepts qui offrent des parcours efficaces entre les logements et le stationnement et qui présentent le moins d'obstacles possible en matière de sécurité et de sécurité incendie.

CONCLUSION ET COMMENTAIRE

Cette recherche a servi à valider le fait que les critères de conception des logements réussissent à atteindre l'objectif qui consiste à procurer aux personnes handicapées des logements accessibles appropriés. Elle a également permis de relever des problèmes particuliers et de formuler des recommandations destinées à résoudre ces problèmes, le but étant que ces résultats et ces recommandations servent de fondement à la construction de meilleurs logements pour les personnes handicapées dans les années à venir.

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INTRODUCTION

This study is an evaluation of the congruence between the design of wheelchair accessible units and the requirements of the consumers for whom they are designed. The need for this research has been identified by consumers and the proposed research methodology explicitly recognizes the consumers as the "experts" who have the knowledge and information about how appropriate the design adaptations of their units are to their needs.

The study is based on a recommendation made at a 1992 consumer oriented Housing Forum on Housing and People with Disabilities. The forum, co-sponsored by the British Columbia Premier's Advisory Council for Persons With Disabilities and B.C. Rehabilitation Society, resulted in a brief that was submitted to the provincial Commission on Housing Options. One of the recommendations was that "a consumer evaluation of accessible units in social housing should be carried out, and the findings should form the basis for future policy on design and planning for inclusion of such units in social housing developments". The Housing Forum served to clearly articulate the needs of the disability community, but the many valuable recommendations submitted from this forum to the Commission on Housing Options were largely subsumed into the broader recommendations of that report. This research is an opportunity to build on work that the disability community has already done, and to meet a specific need that has been identified by consumers.

Historically, federally funded social housing included a provision that approximately 5% of the units were to be wheelchair accessible. In British Columbia, the B.C. Housing Management Commission currently specifies that family housing projects should generally "provide approximately 5% one bedroom units modified for wheelchair accessibility".

The guidelines have evolved and improved over the years, but have been consistently and explicitly based on design provisions for people who use wheelchairs. The design guidelines and the resulting housing are not intended to meet the needs of those with other physical or cognitive disabilities. Although experience with such units is now considerable, very little feedback on the use and suitability of these units has been systematically collected. This research identifies the functional problems experienced by the consumers who live in these units, and recommends solutions to improve the functionality and accessibility of wheelchair accessible non-profit housing.

METHODOLOGY

Survey Instrument/Structured Interview

The intent of the research was to obtain design information based on both qualitative information from consumers and quantitative information about physical design elements. A structured interview format was followed, using a survey instrument (Appendix A). Three specific areas of information were collected: information profiling the occupants; information about the occupants' perceptions of design features; and information about the design features.

Each occupant was interviewed in his or her home. The interviews lasted between one and one and a half hours; an additional half hour to one hour was spent making observations and measurements of each unit.

The information profiling the occupants was based on self reporting of their abilities and disabilities, and data on each occupant's age, gender, co-habitants, clinical description of the disability, and other descriptive data.

To obtain information about the occupants' perceptions of the design, they were asked a series of questions about specific design elements or features. For each one, they rated their responses and were invited to share comments.

Additionally, quantitative information about the design of the units and the specific design features was obtained through observation and measurements which were recorded on the survey instrument. For each unit, sketches and photographs were also obtained to provide design information.

Sample

The sample was self-selected and not random. Participants were required to contact the researcher and express interest in participating. This approach was undertaken to mitigate against any perception of coercion. This was particularly important as many people with disabilities feel disempowered and vulnerable and if participation had been requested directly, for example through a co-op, there may have been a perception that failure to participate could threaten security of tenure.

Participation was solicited through notices placed at organizations and facilities which serve people with disabilities, and through word of mouth (most participants enjoyed talking about the joys and frustrations of their homes, and several subsequently encouraged friends to contact the researcher). One housing organization distributed a letter from the researcher inviting participation to all of the occupants of the wheelchair accessible units they managed. The principal strategy for soliciting participation was articles or notices, which were published in the following media:

- *The Paragraphic*, published by the B.C. Paraplegic Association
- *Scoop*, published by the Canadian Co-operative Housing Federation
- *Transitions*, published by the B.C. Coalition of People with Disabilities
- *Turning Wheels*, published by the Greater Vancouver chapter and affiliate chapters of the Muscular Dystrophy Association of Canada
- *Impact*, published by the North Shore Disability Resource Centre
- newsletter of the Voice of Cerebral Palsied of Greater Vancouver

A total of 43 people expressed interest in participating. Three were not eligible because their housing did not meet the established criteria. Two scheduled participants cancelled, and four completed interviews and site visits were omitted from the final sample because the housing or the occupant did not fit the established criteria. A total of 34 cases were included in the final sample.

Data Analysis and Findings

Following data collection, the information was tabulated and summarized. Comments were analyzed for thematic content, description, clarification and context. Quantitative data were used as a basis for comparison and evaluation.

This report presents the quantitative responses to most of the survey questions and excerpts of the participants' comments. The participants' comments have also been used as the basis for the discussion of specific survey questions and issues.

Information was compiled to provide a profile of the occupants and a profile of the units studied. The format of the survey instrument was used as the structure for formatting the findings into 10 sections, each of which discusses the findings related to a specific functional component of the dwelling or environment. Recommendations and conclusions are presented at the end of each section.

PROFILE OF OCCUPANTS

The participants represented a wide range on all profile measures. Based on the occupant profile information collected, the "typical" participant was a 41 year old female who has multiple sclerosis or a spinal cord injury, uses an electric wheelchair all of the time, lives alone and receives approximately ten hours per week of assistance.

Of all the participants, only one fit the implicit standard of the functionally independent, strong and agile paraplegic in a manual wheelchair. Wheelchair accessibility design guidelines are generally based on this standard; for example, while the standard assumes a range of reach, the actual range is much more limited for many people with disabilities. The occupant profile information serves to reinforce that wheelchair accessibility standards should be recognized as a minimum and generic design response.

Age

Participants ranged in age from 25 to 68; the median age was 41 years.

Gender

59% of the participants were female; 41% male.

Cohabitants

59% of the participants lived alone. Of the 41% (n=14) living with cohabitants, six (42.8%) were living with a spouse (and in one case with a child), three (21.4%) lived with roommates, three lived with a parent or other family member, and two lived with an attendant.

Disability

spinal cord injury	9/34	26.5%
multiple sclerosis	7/34	20.6%
cerebral palsy	6/34	17.6%
neuromuscular disorders	3/34	8.8%
post polio syndrome	3/34	8.8%
rheumatoid arthritis	2/34	5.9%
other	4/34	11.8%

Participants were asked to rate their physical abilities on a scale of "total", "partial", "very limited", and "none". They rated their ability to move and control their legs, arms, hands, neck and head. Participants were also asked to describe any disability or limitation that affected their speech, hearing, sight, breathing, sense of touch, or other disability.

> ***"I can hear ants cross the floor with their sneakers on."***

All participants cited some limitation in their ability to move and control their legs. The median response was "very limited". While some participants cited "total" ability to control and move their arms and hands, others rated their ability as "none"; the median response was "partial" for both hands and arms. The median response was "total" ability to move and control neck and head, with no participants rating their ability as "none".

> ***"I talk and I think and that's as far as it goes."***

Generally, the self-ratings of disability and ability failed to provide a valid comparison between participants, and the researcher's observations provided a more reliable means of comparison among participants. Participants' perceptions of their relative abilities varied; for example, participants ratings of "very limited" use of legs varied from being able to slightly wiggle toes to being able to stand with support.

> ***"I drop things more than average because of the short circuits"***

The range of disability varied widely. For some participants, their disability did not compromise their ability to complete activities of daily living independently; for others, their disability compromised their ability to manage without assistance.

Several participants were quadriplegics, including some who used ventilators all or part of the time to breathe and had no functional use of their bodies, or extremely limited use of some fingers. Others experienced weakness or spasticity in their limbs. Some were able to move limited distances (between rooms within their home) without a mobility device. Some participants had very stable abilities; others found that their abilities varied due to factors such as fatigue, cold, heat, or disease progression and remission.

Assistance

Of the 34 participants, 29 (85.3%) received formal, paid support services. Of the five participants not receiving formal support, one individual received unpaid support from a parent. Nine participants (26.5%) received significant additional informal support from family and friends.

Of those who received support services, the median number of hours per week was 10.5 hours of care. The maximum was 80.5 hours per week. In two cases, individuals who required 24 hour support (but were funded for less) developed creative housing arrangements with their attendants as a strategy to obtain sufficient support.

The most common forms of assistance were homemaking services related to managing cleaning, cooking, laundry, and shopping. Over half of the participants received assistance with these activities. About half of all participants received assistance with aspects of personal care, including assistance with transferring, hygiene and health care routines.

Homemaking Support		
Cleaning	84%	31/34
Laundry	70%	26/34
Shopping	67%	24/34
Cooking	59%	22/34

Personal Care and Support		
Other personal care	53%	19/34
(washing hair, cutting nails, brushing teeth)		
Personal hygiene	50%	18/34
Transferring	33%	12/34

Mobility Devices

A total of 27 (79%) participants used mobility devices all of the time. Many participants used a variety of mobility devices depending on whether they were at home or outside their home, and in some cases, depending on their abilities, which varied.

	Use all of the time	Use sometimes
Electric Wheelchair	44% (15)	12% (4)
Manual Wheelchair	32% (11)	29% (10)
Scooter	0% (0)	18% (6)
Crutches	0% (0)	12% (4)
Walker	3% (1)	6% (2)
Other (canes, leg braces, hand control bike)	0% (0)	18% (6)

Changing Profile of Occupants

The profile of occupants of wheelchair accessible social housing may be changing. Historically, young males with spinal cord injuries have represented the normative case. Others were typically housed in institutional facilities. Current trends, including the aging population and decreased use of institutional care, may contribute to a consumer profile with different, and possibly greater, physical requirements than historically. The fact that more participants in this sample used an electric wheelchair than used a manual wheelchair is one indication of the changes that may be emerging, and which may impact design solutions.

PROFILE OF UNITS

A total of 29 different housing sites, and 34 different units were evaluated. At two sites, three units each were evaluated, and at one site, two units were evaluated. All of the units were in Vancouver and the surrounding suburban areas. The properties were built between 1979 and 1994, with a median completion date of 1986. 11 of the properties were managed by a housing society, and the remaining 23 were all co-ops.

The length of tenure ranged from 14 years to less than a year, with the median length of tenure at five years. Nearly half of the participants (44%, n=15) were the original occupants of the unit.

The building types included ground oriented dwellings, three to four storey wood frame buildings, and highrises. In two cases, the wheelchair accessible units were constructed within the shells of heritage homes which had been retained and incorporated into the new construction.

Most participants classified their buildings as "mixed" in terms of the tenant profile. Tenants included families in almost all buildings. Two buildings were for low income women, two buildings were for seniors, and one building was for people with disabilities.

Typical unit features included a kitchen with clearance below the sink and cooktop, a turning radius, and a wall oven and cooktop; a bathroom with clearance below the sink, a turning radius and maneuvering space beside and in front of the toilet. These were the basic universal features; a range of other design features varied among the units.

FINDINGS AND RECOMMENDATIONS

The format of the survey was used to structure the findings and recommendations, which are presented in 10 sections:

- Bathroom
- Kitchen
- Living/Dining
- Unit Layout and Circulation
- Windows
- Doors
- Lighting
- Flooring
- Common Areas and Amenities
- Community

Within each section are sub-sections relating to specific design elements. A series of recommendations are presented at the conclusion of each section. The recommendations are not inclusive; the intent is to make recommendations only in response to the problems identified by the consumers who participated in the study.

The recommendations are compared to existing guidelines. Because all of the units studied are in British Columbia, the recommendations are compared with the 1996 B.C. Housing Management Commission Design Guidelines. Those guidelines cite CMHC's *Housing Disabled Persons* (re-published in 1996 as *Housing for Persons with Disabilities*) and the BC Building Code (most of the code requirements do not apply to residential dwelling interiors; the intent is to use the code as a design resource). These guidelines have been used as comparisons to the recommendations in this report in order to provide additional context.

BATHROOM

The bathroom tends to be the most crucial component of an accessible dwelling, because of the activities that must be accommodated and the various strategies used to complete those activities. Some people use assistive devices, some use personal assistance, and others are able to complete their activities independently but require specific design features to provide accessibility.

Overall, 53% indicated that they received some type of personal assistance (such as assistance with hairwashing, cutting toenails, or brushing teeth). 50% indicated that they obtained assistance with one or more aspects of their personal hygiene (such as changing catheters, and washing).

The following table indicates the proportion of participants who obtained assistance with specific activities. The rates reported for specific activities are lower than those reported for more generic categories such as "personal hygiene". This may indicate that most of the personal hygiene assistance was relatively minor or that the categories which were cited were inappropriate. Given the possibility of the latter, the responses given to the more general questions of "personal hygiene" and "other personal care" should be considered the more reliable as an indication of the level of assistance with activities related to the bathroom as a functional area.

Use of Assistance

	Independently	With Assistance	Not Applicable
use the toilet	68%	21%	12%
clean self at the toilet	18%	12%	62%
wash hands at sink	74%	18%	9%
wash hair at sink	3%	18%	79%
bathe	68%	26%	6%
wash personal care items at the sink (for example, catheters)	32%	20%	47%

The typical bathroom provided a toilet with clearance at one side and in front, a bathtub, a turning radius, and a sink which in some cases did not include a counter. In about half the cases, there was no storage space; in most cases where storage was provided it comprised a medicine cabinet behind a mirror or a single small drawer.

Circulation, Size, Layout and Features

Participants were asked a series of questions pertaining to specific bathroom elements.

How would you rate the size and shape of your bathroom for accessibility?

Very Good	Good	Bad	Very Bad
13	13	4	4
38%	38%	12%	12%

24% rated it as "bad" or "very bad", and 29% stated that they could not turn around in their bathroom.

> ***"I can turn around, but only without my footrests."***

In response to the question, "In terms of accessibility, what do you consider the best feature in your home?" five respondents (15%) cited the bathroom, including three who referred specifically to the wheelchair accessible shower.

In response to the question, "In terms of accessibility, what do you consider the worst feature in your home?" three respondents (9%) cited the bathroom; one saying, "the bathroom and everything about it".

> ***"Aaaagghh!!"***
>
> *Quote from a participant who was able to transfer to the toilet only if she left the bathroom door open to provide sufficient transfer space.*

In nearly half of all cases (47%) a pocket door was provided at the bathroom, which facilitated circulation. In 35% of cases, the bathroom door opened outward, a safety feature which facilitates emergency access to the bathroom if a person falls against the door.

A heat lamp was provided in 64.7% of all cases; this feature was rated as valuable by 71% of the participants.

Toilet

All of the bathrooms except one provided clearance both beside and in front of the toilet to allow for transfers from a wheelchair on and off the toilet. In the one case, the occupant was able to complete a forward transfer, but would have preferred to transfer from the side. Techniques for using the toilet vary:

Transfer Technique		
No transfer (ambulatory)	12%	4/34
Assisted	6%	2/34
Does not use facilities	12%	4/34
Lateral transfer	26%	9/34
Forward transfer	24%	8/34 (one would prefer to do a lateral transfer)
Commode chair	21%	7/34 (chair is positioned over the toilet)

The ability to get into the bathroom and to safely and efficiently maneuver to use the toilet is a critical determinant of how appropriate the bathroom is for the occupant.

How appropriate is the toilet?

Very Appropriate	Appropriate	Inappropriate	Very Inappropriate	Not Applicable
10	16	5	1	2
29%	47%	15%	3%	6%

Overall, 76% of the participants rated their toilets as either "very appropriate" or "appropriate". Only 18% indicated that their toilets were "inappropriate" or "very inappropriate".

> ***"The toilet is appropriate now. I had a regular toilet and I fell when I was transferring and broke the tank, so they had to replace it and I got a higher toilet. Now it's safer."***

The two participants who indicated "not applicable" do not use the toilet because of the nature of their disabilities. The one participant who rated the toilet as "very inappropriate" commented that a higher toilet should have been installed.

Five participants rated their toilets as inappropriate. In one case the grab bar behind the toilet was too small and was poorly placed for the occupant's needs. One occupant had a disabled left arm and the layout of her bathroom provided clearance at the wrong side of the toilet for her needs. An occupational therapist had taught her a new transfer technique when she moved in, but she was now developing tendonitis. The lack of clearance next to the toilet was the problem in one case, and in another case it was the height of the toilet seat. In one case, the layout of the bathroom was too small for the occupant in an electric wheelchair to maneuver- she had to leave the bathroom door open and use the hallway space to complete her transfer. Additionally, the toilet was not high enough for her needs.

In terms of consumer satisfaction, there are two primary problems with toilets: the height of the seat, and the provision of space for maneuvering and transferring.

Toilet Seat Height

Within the sample, toilet seat height ranged from 360 mm to 500 mm. The distribution was bi-modal, with seven cases at 380 mm and nine cases at 480 mm, and the remaining cases spread across the range.

Several participants had made modifications to their toilet. Two had replaced a high toilet with a low toilet; two had conversely replaced a low toilet with a high toilet; and four had added seat lifts to their toilets. In many cases, an individual's specific disability requires a high seat. Some are unable to get up from a lower seat, or need a seat at the same level as the wheelchair, some of which are higher than others. Conversely, many individuals have difficulty using higher toilet seats. Some people find that their feet can't reach the floor properly, jeopardizing their balance. One individual cited difficulty lifting her leg (using her arms) to empty a catheter bag.

Obviously a high seat cannot be easily adapted to a low seat, while a low seat can be adapted to a high seat relatively easily with the addition of a seat lift. However, for those who require a high seat, the seat lifts are less optimal than a high toilet seat, because they offer less strength and stability. The process of transferring may put substantial stress on equipment and the ability of equipment to support that use is a safety issue.

Maneuvering and Transferring

In all cases but one, transfer space was provided both in front of and next to the toilet. The average space next to the toilet was 1 000 mm, although it varied from none to 1 800 mm. The average space in front of the toilet was 1 200 mm, although it varied from 750 mm to 2 000 mm. Based on participants' comments, maneuvering and transferring at the toilet was a less salient issue than the height of the toilet seat. The provision of space at the front and side of the toilet varied widely and was a function of the bathroom layout. Some designs were very poor and others demonstrated considerable creativity.

Because bathrooms tend to be relatively small spaces, minor design differences can affect accessibility. One factor that affects accessibility is the equipment used by an individual. With individuals using commode chairs, electric wheelchairs, and in some cases, lifts, a bathroom designed to minimum clearance requirements for wheelchair accessibility may be inaccessible for some individuals.

Bathing

Of the total sample, 82% (n=28) showered; four (12%) took baths instead of showers, and two participants did not bathe at all because their units had tubs and their disabilities precluded using a tub.

Most of the participants used some type of assistance or assistive device for bathing. Only 26% received personal assistance, but 91% used some type of assistive device. Only 12% of the participants used the grab bars only, and 73% used a seat, chair, or lift.

Assistive Devices for Bathing

Commode Chair	32%	11/34 (wheelchair designed for use at the toilet and shower)
Chair in Shower	3%	1/34
Chair/Bench in Tub	32%	11/34
Lift or Stretcher	6%	2/34
Grab Bars Only	12%	4/34
No Assistive Device	9%	3/34
Does not Bathe	6%	2/34

Participants were asked the following questions.

How appropriate is the bathtub?

Very Appropriate	Appropriate	Inappropriate	Very Inappropriate	Not Applicable
2	9	5	5	13*
6%	26%	15%	15%	38%

* The 13 cases marked "not applicable" are those participants who had a wheelchair accessible shower instead of a bathtub.

How appropriate is the shower?

	Very Appropriate	Appropriate	Inappropriate	Very Inappropriate	Not Used
Shower in the tub	2 10%	6 29%	4 19%	6 29%	3 9%
Accessible Shower	9 69%	3 23%	1 8%	0 0%	0 0%

A total of 21 participants had bathtubs with showers, and 13 participants had wheelchair accessible showers only. Of those with tubs, fewer than half (n=9, 43%) ever bathed in the tub. Of those with tubs, five (24%) both showered and bathed, four (19%) had baths only, and twelve (57%) had showers only.

> ***"I'm dying to have a bath!"***
>
> *Participant with a wheelchair accessible shower in the unit*

Of those with showers in the tub, 48% rated the tubs as "inappropriate" or "very inappropriate". Of those who rated the tubs appropriate, half would prefer a wheelchair accessible shower, and one of the two who rated their showers in the tub as "very appropriate" would prefer a wheelchair accessible shower. One individual rated the shower as appropriate, but noted that he didn't use it because he only took baths, as did the three participants whose responses were categorized as '"not used".

All of those who had wheelchair accessible showers deemed them to be either "very appropriate" or "appropriate" with one exception. In that case, the participant preferred to have a wheelchair accessible shower, but cited this particular shower as "a bad one"; it was too small, the slope was too steep and it caused difficulty transferring. One participant rated the wheelchair accessible shower as "appropriate" but stated a preference for a bathtub.

> ***"That bathtub is the most dangerous place in the world for me... it's the easiest place for any disabled person to get hurt."***
>
> *Quote from a tenant who slipped in the tub. Other tenants heard his cries for help and the fire department rescued him. His injuries included a head wound.*

For the majority of participants, a shower is safer, more efficient, and allows greater independence. Several participants had renovated their units to provide wheelchair accessible showers, and two had been involved with the design of their units and had specified wheelchair accessible showers. Others expressed a desire to renovate but had experienced impediments to their efforts. In all, 76% (n=26) of the respondents said that, given a choice between a tub with a shower and a wheelchair accessible shower, they would prefer to have a wheelchair accessible shower.

There are always some for whom a shower is not suitable; in this study, one participant was hypersensitive as a result of injury; a shower was like being stabbed with knives. An additional three participants preferred bathing because of its therapeutic and relaxing effects.

In response to the question, "In terms of accessibility, what do you consider the best feature in your home?" three participants specified the wheelchair accessible shower as their favourite feature.

> ***"It's nice to be able to bathe on my own and not have to wait for someone to come put you in a bathtub or something. It's great to be able to do it without somebody else there."***

All of the units except one had a telephone style showerhead, and in the one unit, the occupant had replaced it with a fixed showerhead. 29 of the 34 units had grab bars in the tub or shower; most of the five that didn't were because of specific client requirements that influenced construction or renovation of the bathroom. Only one of the units with a wheelchair accessible shower had a fixed, wall mounted seat. In most other cases, the occupants used a commode chair, which was also used for other hygiene activities. No participants made any references to a wall mounted seat.

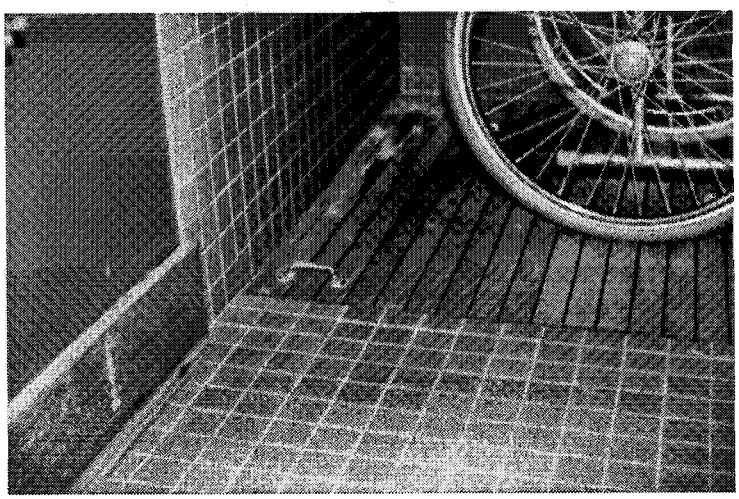
One of the potential problems with a wheelchair accessible shower is the sloping floor and the drainage requirements. An appropriate and effective wheelchair accessible shower requires detailed design and construction. Sloping is required for drainage, but simultaneously interferes with mobility as occupants in wheelchairs find themselves rolling across at the room at inopportune moments. Any type of threshold tends to be a more effective barrier to people in wheelchairs than to water on the floor.

One participant had worked with the architect to design his own shower when the building was being designed. Based on his previous experience, he designed a flush, slatted surface which fit into a recessed section of the floor with a drain. The water drained through the slatted surface, which because it was not sloped, also served as circulation space, increasing the efficiency of the bathroom space. The surrounding walls and floors were tiled to protect against water penetration.

The bathtub versus wheelchair accessible shower is a perpetual problem. From the consumers' perspective, a wheelchair accessible shower tends to be the most salient determinant of dwelling suitability. In terms of the provision of wheelchair accessible dwellings, this feature is the most inadequate. While 76% of the participants cited a preference for a wheelchair accessible shower, only 38% of the units included one.

Detail of a Flush Shower Floor

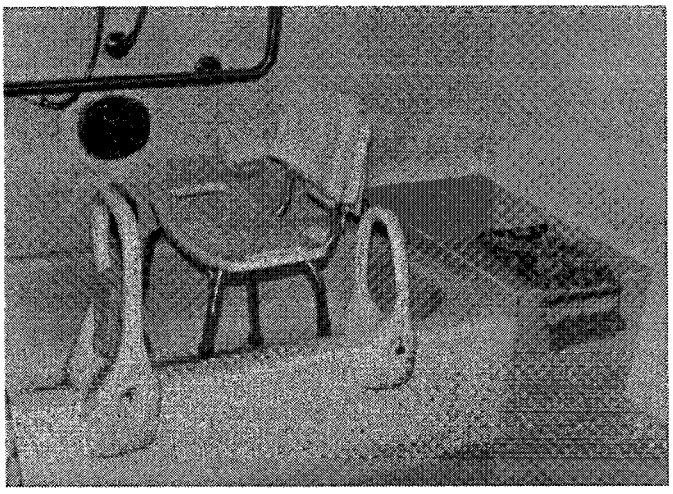
This wheelchair accessible shower has a flush, slatted floor surface which fits into a recessed section of the floor with a drain. The water drains through the slatted surface, which because it is not sloped, also served as circulation space, increasing the efficiency of the bathroom space. The surrounding walls and floors are tiled to protect against water penetration. The slatted surface can be removed for cleaning.



Bathtub with Adaptive Features

This tub provides a flexible telephone style showerhead and grab bars. Additional space has been provided at the end of the tub, which facilitates some types of transfers from a wheelchair. The fixtures are at the centre of the rear wall instead of at the end of the tub so that they can be easily reached without stretching or leaning.

Removable grab bars at the front edge of the tub, and a shower chair have been added.



Sink and Counter

How appropriate is the sink?

Very Appropriate	Appropriate	Inappropriate	Very Inappropriate	Not Applicable
7	19	4	3	1
21%	56%	12%	9%	3%

Overall, 77% of participants rated their sinks as either "very appropriate" or "appropriate". One person chose not to rate it because he or she did not use the sink. All of the sinks had clearance below the sink. In seven cases (20%) there was no counter provided at the sink.

All of the sinks had lever handles, except one unit. In that case, the lever handles had broken and the co-op replaced them with knobs. (When the occupant, who had difficulty without lever handles because of her disability, complained, she was told that the lever handle taps were more expensive.) About half of the faucets were a single lever, and half had two separate handles. The taps were at the rear in all cases but two, but this was not identified as a problem.

The pipes were offset in 80% of the units, but in only one unit were the pipes insulated or shielded. Despite the potential for injury, no participants identified the uninsulated pipes as a problem. In one case, the pipes were shielded by a sloped panel below the counter; the occupant indicated that it impeded access and would have preferred not to have it. Another participant had removed the panel to improve access to the sink.

Several participants commented about difficulties getting near enough to the sink; their wheelchair footrests would hit the rear wall before they could get close enough to the sink. Three participants noted that they wash their hair at the sink but use the kitchen sink because it is larger and is equipped with a water sprayer.

In three cases, a stainless steel kitchen style sink had been installed. These were not appreciated by the occupants. One termed it "gross" and "inappropriate", and another cited it as lacking aesthetics and being noisy.

Storage

In 47% of all cases, there was no provision for any storage at all in the bathroom. In the remaining cases, the storage was generally inadequate and inaccessible. Typically the total storage space consisted of a medicine cabinet behind a mirror; in many cases this was at the back of counter or sink and was difficult to reach from a seated position. In other cases, one or two small drawers were provided. 20% of the units (7/34) did not have a counter, and of those that did, the counterspace was very limited.

Six participants had modified their bathrooms to provide additional storage space; in many cases, modular storage units had been placed on the floor, compromising access. Several participants pointed out that contrary to the apparent assumption that people with disabilities don't require storage space, they often require additional storage space for disability related items such as personal care products and supplies. Some items (such as medications or catheter bags) require enclosed storage for security or privacy. The storage should also be accessible.

Participants were asked "have any of the fixtures or finishes in your bathroom been replaced?" and "Any other comments about the bathroom?" In response to these open-ended questions, storage emerged as a particularly salient issue.

> ***"I wouldn't say it's bad, it's just limited in its utility."***

Counter and Storage

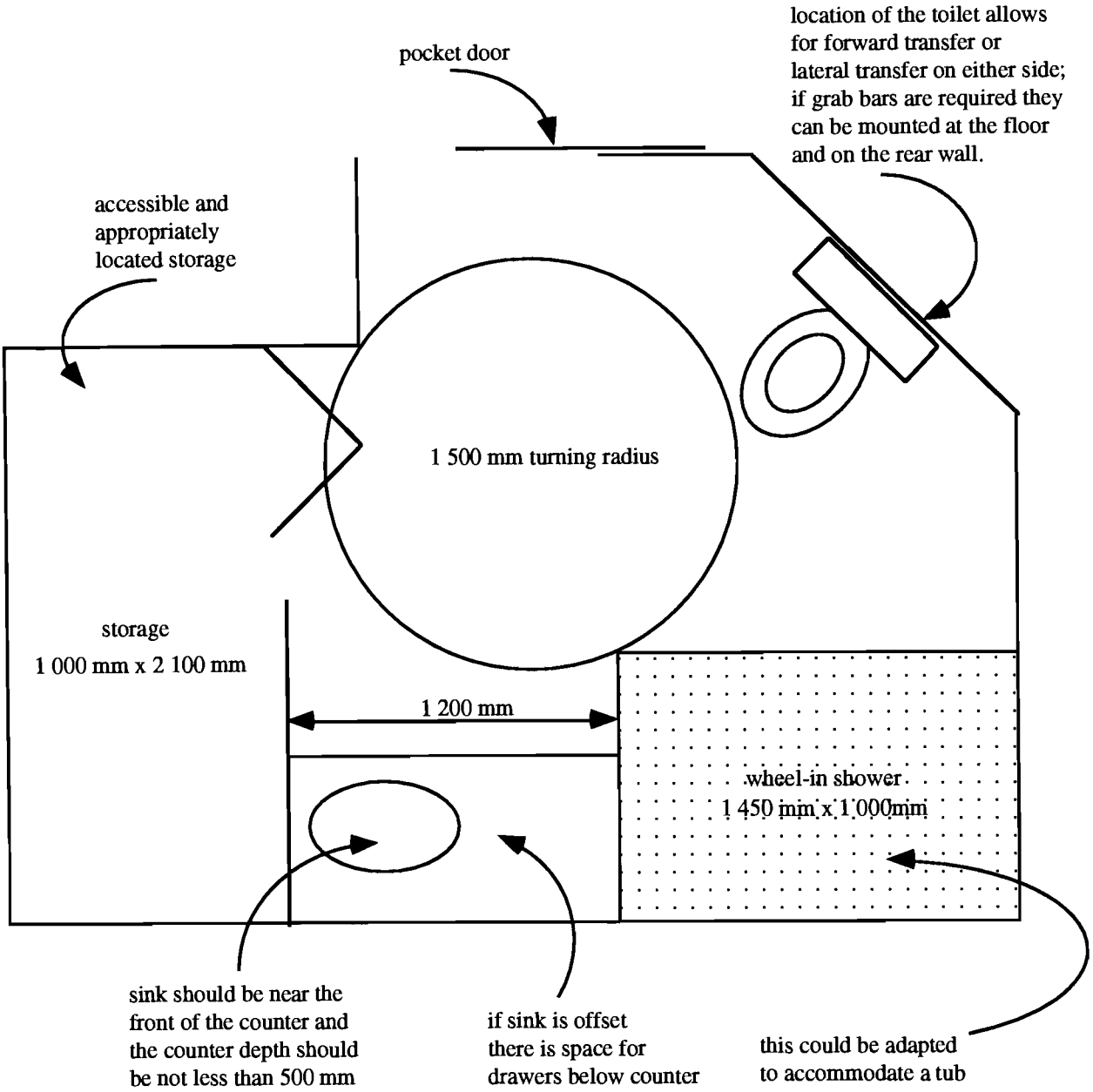
This counter has a cutaway at one end which increases the amount of clear floorspace for maneuvering. The sink has a counter and provides appropriate storage: the contents of the two drawers can be reached more easily than if a cupboard with shelves had been provided instead.

No Counter or Storage

This sink has no counter and the bathroom has no storage space. As a result, the tenant has created storage space by installing shelves where there is accessible space.

ANNOTATED DIAGRAMS

Bathroom with Storage

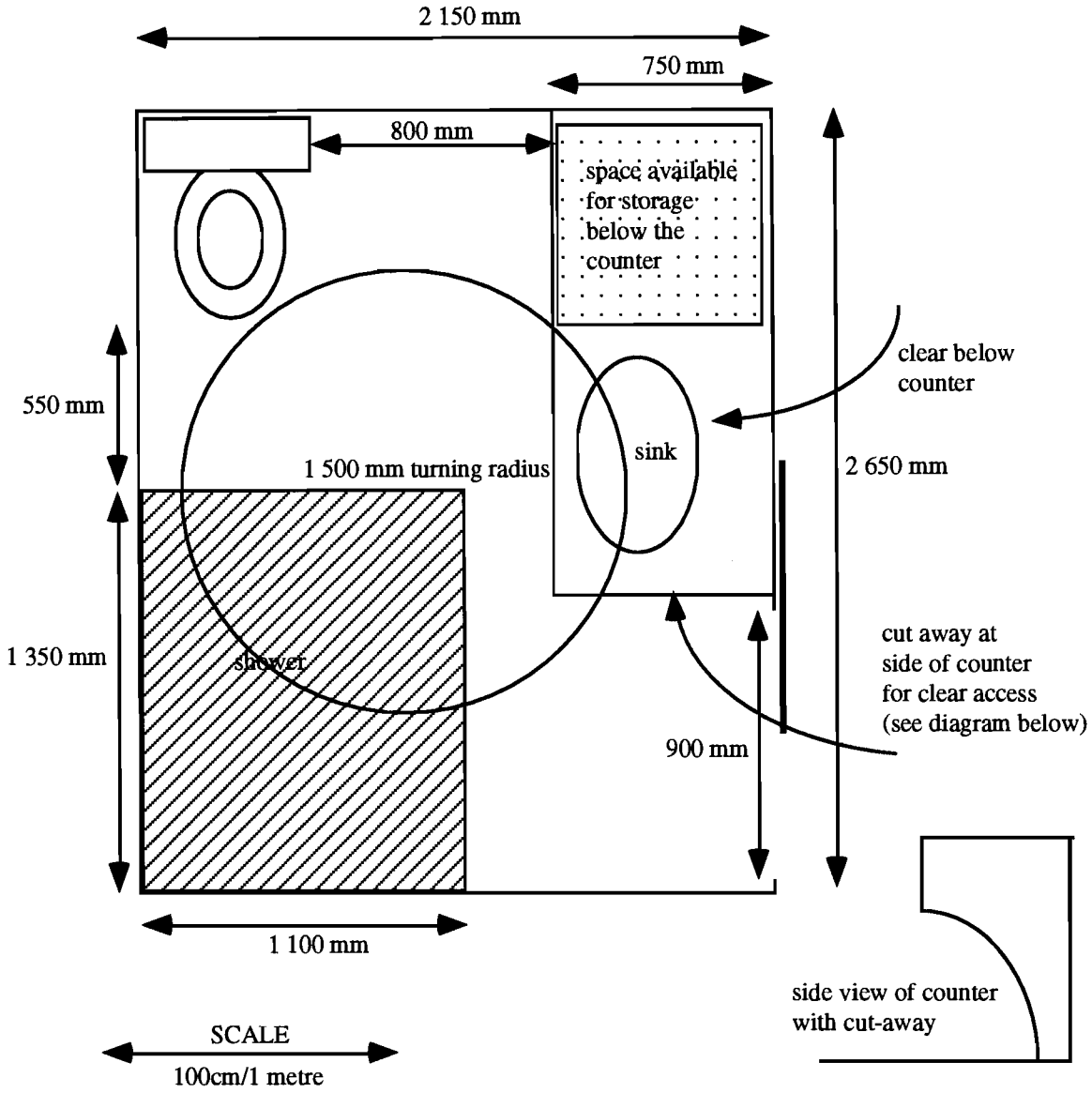


SCALE

100cm/1 metre

TOTAL AREA APPROX 7M2

Bathroom with Shower as Circulation Space



TOTAL AREA 5.7M2

RECOMMENDATIONS AND GUIDELINES- BATHROOM

Recommendation: The design should demonstrate that a person in a wheelchair can maneuver in and out of the bathroom and use all of the fixtures.

CMHC Guidelines[1]: A generous floor area is provided to allow wheelchair entry and maneuvering. Ideally, there should be at least a 1 500 mm turning circle, clear of all fixtures, at foot level.

B.C. Building Code[2]: 3.6.4.8.(9)(a) A toilet room shall have a floor space of not less than $3.7m^2$ with no dimension less than 1 700 mm when the door swings out and $4.0m^2$ with no dimension less than 1 800 mm when the door swings in.

BCHMC Guidelines[3]: Provide 1 500 mm clear turning radius inside the bathroom.

Recommendation: Provide a toilet seat with a height not more than 400 mm.

CMHC Guidelines: A standard domestic toilet with a seat height of about 400 mm should be used. (Accompanying diagram indicates a dimension of 445 mm).

B.C. Building Code: Commentary on 3.6.4.8.(9) Where security and privacy is more assured... the toilet with a rim height of 355 mm ± 25 mm and an available high lift seat is the correct installation. High rim toilets should not be used in residential occupancies.

BCHMC Guidelines: No specific guidelines.

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1 Housing for Persons with Disabilities. 1996. Canada Mortgage and Housing Corporation

2 Building Access Handbook. Building Requirements for Persons with Disabilities from the British Columbia Building Code 1992. Ministry of Municipal Affairs, 1995. The building codes cited are not applicable to residential interiors but may be used for design information.

3 HOMES BC 1996 Non-Profit Development Guidelines. These guidelines also specify "Refer also to the B.C. Building Code and CMHC's *Housing Disabled Persons*. (Revised and re-published as cited above).

Recommendation: A wheelchair accessible shower should be provided. The design and installation should make provision for future adaptation to a bathtub. A recessed floor area should be provided with a fitted, removable, flush, flat drainage surface. A fixed, wall mounted seat is not required.

CMHC Guidelines: Any threshold should be not more than 13 mm high, with a rolled or bevelled edge, and should be designed to prevent water spillage. The floor in the shower should be sloped slightly towards a drain. A minimum area of 750 mm by 1 500 mm is recommended for a roll-in shower, with a clear floor area in front, 900 mm x 1 200 mm, for wheelchair access. Shower seats are essential for the safe use of showers by many persons with disabilities. Such seats should flip up or be removable to allow use of a commode or bathing type wheelchair within the shower enclosure.

B.C. Building Code: 3.6.4.8.(11) Shower compartments shall (a) be not less than 1 500 mm wide by 900 mm deep with not less than 1 500 mm wide entrance, (b) have a clear floor area in front of the entrance to the shower not less than 1 500 mm wide by 800 mm deep, with fixtures being permitted to project into the clear area provided that access to and from the shower compartment is not restricted, (d) be provided with a portable or wall-mounted folding seat to permit lateral transfer from a wheelchair, (h) have thresholds that do not exceed 13 mm in height and are bevelled.

BCHMC Guidelines: Provide bath tubs with horizontal and vertical grab bars and telephone style shower fixture. Roll-in showers will be considered in lieu of bathtubs if required by residents.

Recommendation: Provide transfer space at both the front and one side of the toilet.

CMHC Guidelines: To provide access to the toilet for persons in wheelchairs, there should be a clear space, at least 750 mm wide, on at least one side of the toilet, to allow for lateral transfer. Alternatively, the space in front of the toilet should be at least 1050 mm deep to permit a frontal approach. Ideally, both of these spaces should be provided to allow a choice of access.

B.C. Building Code: 3.6.4.8.(2)(a) At least one toilet compartment shall be not less than 1 500 mm wide by not less than 1 500 mm deep.

BCHMC Guidelines: No specific guidelines.

Recommendation: Adequate, accessible storage should be provided in the bathroom. A counter with storage space should be provided in all cases. Consider locating a general household storage room off the bathroom.

CMHC Guidelines: Supplementary storage for cleaning supplies, toiletries, etc., is desirable, because many people with disabilities need additional linen and toiletting supplies, as well as special equipment and bathing aids.

B.C. Building Code: Commentary: An accessible shelf is recommended when a basin is not in a vanity counter.

BCHMC Guidelines: No specific guidelines.

Recommendation: The sink should be placed sufficiently forward from the wall to allow a person in a wheelchair to maneuver under the sink. The counter should be 600 mm to 750 mm deep, with the sink installed close to the front.

CMHC Guidelines: Minimum 430 mm to wall from front of sink or counter. Minimum 200 mm high clearance at wall for footrests. Minimum clearance of 680 mm high to 200 mm deep below sink or counter. Sink or counter height 810 mm to 865 mm.

B.C. Building Code: Minimum 500 mm to wall from front of sink or counter. Minimum 250 mm high clearance at wall for footrests. Minimum clearance of 660 mm high to 250 mm deep below sink or counter. Sink or counter height 815 mm ± 25 mm. Commentary: A 750 mm deep vanity counter with the sink installed close to the front is a good design.

BCHMC Guidelines: No specific guidelines.

KITCHEN

> ***"To share food is one of life's gentler rituals."***

The kitchen is the most critical functional component of the dwelling after the bathroom. However, unlike the bathroom, other people can undertake the activities and functions accommodated in the kitchen. Of the participants sampled, 59% (22/34) obtained assistance with cooking, 84% (31/34) obtained assistance with cleaning (including dishwashing), and 67% (24/34) obtained assistance with shopping. Generally, participants obtained assistance because their disabilities, not the design of the kitchen, limited their activity in the kitchen. Participants' abilities and activities varied: the majority of participants obtained assistance with washing dishes, but this may be largely due to the structure of homemaker support services.

Performance of Kitchen Activities

	Independently	With Assistance	Done by Another Person
Use counters for cutting, mixing, and food preparation	50%	18%	32%
Cook on stove	50%	12%	38%
Cook in oven	41%	15%	44%
Cook in microwave	68%	6%	26%
Wash dishes	44%	3%	53%
Get things in and out of refrigerator	68%	6%	26%
Get things in and out of cupboards	50%	12%	38%

The typical kitchen in this study provided a single sink with wheelchair clearance below, a cooktop with wheelchair clearance below, a refrigerator, wall oven, lowered counters, limited counterspace and very limited storage below the counters.

Four participants cited their kitchen as the best feature in their home, but eight participants (23%) cited it as the worst.

Kitchen Size, Shape and Layout

About half (n=15, 44%) of the kitchens were a "U" layout; 29% (n=10) were an "L" layout, and five were galley style. Two were "boxes" with two entries, and two were along one wall.

How would you rate the size and shape of your kitchen for accessibility?

Very Good	Good	Bad	Very Bad
10	13	8	3
29%	38%	24%	9%

Thirty of the participants (88%) were able to turn around in their kitchen; of the four who were unable to turn around in the kitchen, two used scooters and one used an electric wheelchair.

> ***"The kitchen design could be a lot better."***

33% of the participants rated their kitchens as "bad" or "very bad" in terms of size and shape. Their comments indicated that they were considering all of the elements of the kitchen and not just the clear floor space or the configuration. Space for storage and for food preparation were particularly salient issues.

How appropriate are the counters?

Very Appropriate	Appropriate	Inappropriate	Very Inappropriate
13	14	4	3
38%	41%	12%	9%

79% of the participants rated their counters as "very appropriate" or "appropriate". Asked if they wished to make any further comments, 35% (n=12) made comments regarding insufficient counter work space. The lack of space may be due to two factors. Firstly, the kitchens tended to be quite compact and the amount of counterspace was not generous. Secondly, in most cases there was very limited or no counter space with clearance below to permit wheelchair access. Only 26% (n=9) of the units provided a counter workspace with clearance below.

Most people with disabilities use microwave ovens, in many cases more than they use the cooktop or wall oven. This and other appliances, such as toaster ovens, consume counter space. In some cases, counter space was used for storage because the provision of storage space was inadequate or inaccessible.

On average, the kitchens provided 2 500 mm of counterfront, excluding the refrigerator, cooktop and wall oven (but including the sink). The minimum amount provided was 1 500 mm and the maximum 3 930 mm. Only four cases met or exceeded the current British Columbia non-profit housing design guidelines which specify a total of 3 300 mm of counter front, including a 900 mm workspace with clearance below the counter.

The height of counters and the clearance below counters appear to be adequate for the occupants in most cases. The average counter height was 840 mm, and ranged between 780 mm and 920 mm (the latter was an adaptable - but unadapted - kitchen). All of the units except two provided clearance at the base of the cabinets. On average, the clearance was 220 mm high and 160 mm deep.

Six participants cited the height as being too low for attendants or other caregivers. One participant had motorized counters: in that case, the disabled occupant did not use the counters at all because of her disability, but she had a short attendant during the week and a very tall attendant on weekends so they adjusted the counters regularly.

Only eight units (23%) had counters at various heights. One was the motorized adjustable counters; five had a higher counter above the dishwasher, and two varied at the sink (one was higher than the rest of the counter, the other was lower).

Eleven of the kitchens (32%) included a pullout work counter which was separate from any pullout shelf below the wall oven. The average height of the work counter was 784 mm.

Storage

The provision of adequate and appropriate storage space in the kitchen was a salient issue for most of the participants. Storage was generally regarded as inadequate and inappropriate. Over half (53%) of the participants rated their cupboards as either "inappropriate" or "very inappropriate"; the comments indicated that the dissatisfaction was related both to accessibility and the amount of storage space provided.

How appropriate are the cupboards?

Very Appropriate	Appropriate	Inappropriate	Very Inappropriate
5	11	12	6
15%	32%	35%	18%

There was particular dissatisfaction with the provision of upper cabinets above the counters. For many, these were not only inaccessible, but the provision of them in a unit designed for wheelchair accessibility was perceived as offensive. Separate from the issue of sufficient storage space, the upper cabinets were seen as symbolizing the lack of sensitivity to the functional realities of a person using a wheelchair. Only one unit was designed without upper cabinets; instead it had a pantry and a window above the sink.

> ***"Who are those cupboards for? They're not part of my world."***

Only 44% rated the cupboards and shelves as "easy to use"; comments included:

- "can't reach upper cabinets; too high and too far back"
- "can't reach into the back of the cupboards"
- "high ones are useless, can only reach bottom shelf"
- "not appropriate for me, not even bottom cupboards, have to struggle to pull shelves out... it's hard to open the cupboards and then pull the shelves out"
- "would be better if lower cupboards had pull-out shelves"
- "can't even touch the bottoms of the upper cupboards"
- "I can reach the cupboards below the counter but there's hardly any space"

In 67% of the units, cupboards were provided below the counters. In the most of the other units, drawers were provided instead of cupboards. However, only 18% of the units with cupboards had any roll-out shelving. In all cases, the upper cabinets were installed lower; the average height was 1 233 mm above the floor.

Another feature which impeded access to cupboards was the provision of inappropriate handles or, more commonly, the failure to provide any type of cupboard handles. Just over half of the units had "D" type handles on the cupboards; the remaining 47% of the units had no handles, or a grooved inside bottom edge.

> ***"It strains what functionality I've got"***
>
> *Participant talking about cupboards that had no handles.*

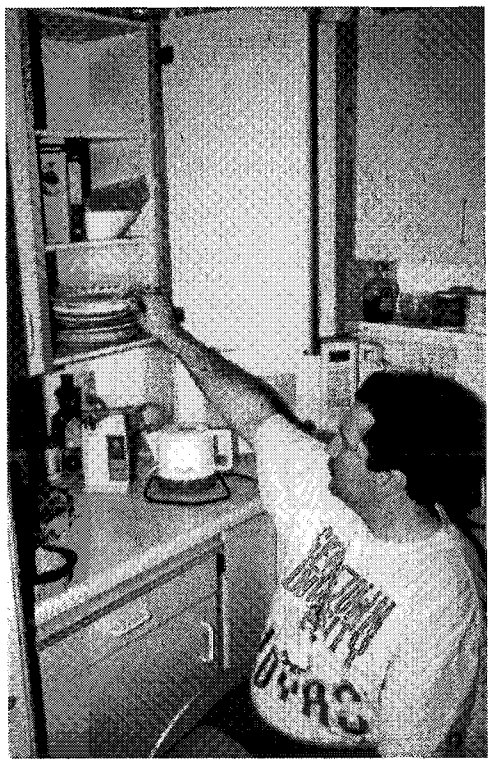
Many participants had improvised their own storage, such as plastic carts with wheels, plastic shelving on the counters, and various arrangements of carts and boxes. In the few cases where the design incorporated a pantry, participants invariably cited it as a valuable feature.

Overall, the provision of accessible and sufficient storage was identified as inadequate by the participants, and was a source of significant dissatisfaction.

> ***"Whoever makes these designs should have been in a wheelchair and tried to figure a few things out."***

Creative Storage Solutions

The tenant has purchased small plastic carts to use for storage; these are stored under the counters, reducing the clear floorspace for a wheelchair. A custom made wooden cart also provides storage.

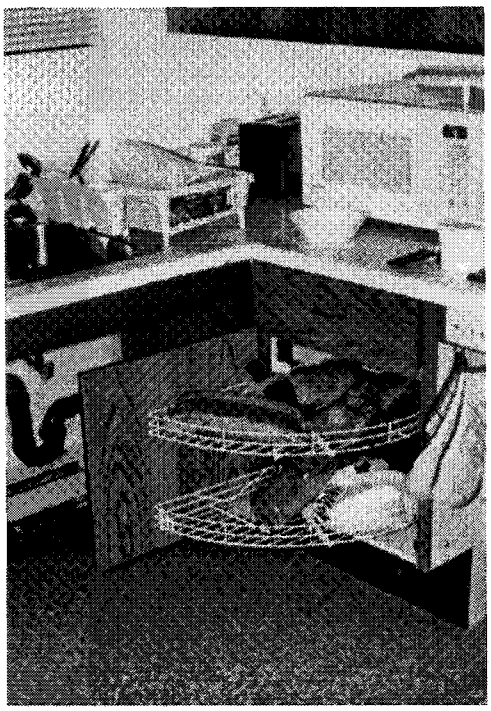


Facilitating Access to Storage

These upper cabinets are lower than the typical installation, and can be reached by some people with disabilities. The D-type handles also make it easier to open and close cupboards, drawers and pull-out work surfaces.

Storage in Corners - Lazy Susan

A lazy susan is a storage solution which is often employed to provide storage in corners. While a lazy susan does facilitate access, many people with disabilities have difficulty reaching forward and down to access the lazy susan.



A More Accessible Alternative

A more accessible alternative to the lazy susan is "half moon" or "D" shelves which are attached to the cupboard door. The cupboard door should be hinged so that it can swing wide open to maximize the exposure of the shelving. This provides a comparable amount of storage to a lazy susan, and is more accessible.

Appliances, Fixtures and Fittings

Participants were asked to specifically rate and comment on their oven, cooktop, refrigerator/freezer and sink. They were also invited to comment on any other kitchen appliances.

How appropriate is the oven?

Very Appropriate	Appropriate	Inappropriate	Very Inappropriate
12	14	5	1
35%	41%	15%	3%

While 76% of the participants indicated that their oven was either "very appropriate" or "appropriate", most participants also commented that they did not use their wall oven or used it only rarely. While the design was perceived as appropriate, the hazards and difficulties of using the oven, and the availability of alternatives such as the microwave, diminished the participants' use of the oven.

> ***"You don't have to crawl into the oven and bake yourself like you used to have to."***

Only 59% of the units had pullout boards below the oven. Several participants commented on the value of the pullout board below the oven, and three participants who did not have the pullout board noted that it would be a valuable feature.

One recurrent problem with the ovens was the incorrect installation of the door so that it did not open away from the person using it. In 26% of the cases, the oven doors did not open away from the participants. This is a relatively minor problem and can easily be rectified, but many participants were unaware of that.

73% of the participants reported that they could reach the oven controls, which were located at an average height of 1 420 mm above the floor. Anthropometric data indicate that the limit for an unobstructed side reach is 1 400 mm and 1 200 mm for a forward reach; the controls typically exceeded these thresholds. Several participants had assistive devices which they used to reach the oven controls.

Access to oven controls is exacerbated by the need to provide clear space for a wheelchair underneath the pull-out board below the oven, an important ergonomic factor. The pull-out board is typically pulled out and used when something is being put into, or removed from the oven, and serves to facilitate the transfer. In putting things into, or removing things, from the oven, the further or higher the reach, the more strength and balance are compromised. The problem is essentially with the design of the wall oven appliance; accessibility would be improved if the controls were located on the side, similarly to a microwave oven.

> ***"I think every suite in this world should have a wall oven with a side opening door - it just makes sense"***

Wall Oven

This individual is removing a baking sheet from the oven. He pulled out the pull-out board below the oven, opened the door, and will then place the baking sheet on the pull-out.

Note his position relative to the oven and the pull-out board, and the height of the oven controls.

How appropriate is the cooktop?

Very Appropriate	Appropriate	Inappropriate	Very Inappropriate
17	10	5	2
50%	29%	15%	6%

Overall, participants did not regard the cooktop as a source of functional problems. 79% rated it as either "very appropriate" or "appropriate".

In 65% (n=22) of the cases, the controls for the cooktop were at the front; in 26% (n=9) of the cases the controls were along one side from the front to the rear, and in three cases (9%) the controls were at the rear. All of the layouts except the one with the controls at the front presented difficulties in accessing all or some of the controls.

In 85% of the units, the controls for the fan and light at the cooktop had been located on the front of the counter; participants appreciated this accessible design feature.

Some participants reported difficulty reaching or using the rear elements, and some feared being too close to the cooktop. Overall, while most participants felt that the design was appropriate, there was a recognition that the stove was a potential hazard and participants tended to use their cooktops less than people without disabilities.

Microwave Ovens

Most of the participants had microwave ovens and tended to use their microwave ovens more than the either the cooktop or the wall oven. In general, the designs of the kitchens did not make specific provision for microwave ovens; as a result, this appliance reduced the amount of usable counterspace.

> ***"Generally I don't use the kitchen that much except for microwaving.***

Inappropriate Cooktop Configuration

This cooktop has drawers below it, and does not provide clearance for a wheelchair to maneuver underneath to get close to it. As a result, the tenant is unable to use the two rear elements as they are out of reach.

How appropriate is the refrigerator/freezer?

	Very Appropriate	Appropriate	Inappropriate	Very Inappropriate
Upright Refrigerator	4 25%	6 38%	5 31%	1 6%
Side by Side Refrigerator	8 44%	6 33%	1 6%	3 17%

A total of 53% (n=18) had side by side refrigerators and 47% (n=16) had upright refrigerators. The level of satisfaction varied based on the type of refrigerator. For those with upright refrigerators, 37% rated it as "inappropriate" or "very inappropriate". For those with a side by side refrigerator, only 23% rated it as "inappropriate" or "very inappropriate". Four participants with side by side refrigerators rated them as either "inappropriate" or "very inappropriate". In one case, the participant cited the location next to the oven and the lack of counter space adjacent to the fridge as the problem. In the other three cases, the refrigerator was rated as "inappropriate" because of its location. The refrigerators had been placed next to walls; this location impedes access because as one approaches the refrigerator sideways, the footrests hit the wall before the refrigerator door is within reach. A forward approach is not feasible because the forward reach required to reach the door is too great (again because of the footrests). Additionally, the walls may limit how far the refrigerator doors open, further impeding access. This configuration caused several participants considerable frustration, and the inappropriate placement of refrigerators next to walls appears to be a relatively common design/construction problem.

> ***"It's a struggle to reach the freezer, but it's do-able."***

Of those asked their preference, 83% preferred a side by side refrigerator. One participant cited the refrigerator as the best feature in his or her home, but two participants cited their refrigerators as the worst feature in their homes.

> ***"I had a side by side fridge for a long time, I loved it, it was perfect. That's the kind of fridge I like, a proper fridge."***

Some participants were able to access an upright refrigerator either because they had some ability to stand or to walk, or because they had good reach and balance and could reach up and into the freezer.

> ***"It's not appropriate for a wheelchair person. If I wasn't able to stand up at all, it would be extremely inappropriate."***

Inappropriate Placement of Refrigerators

Both these individuals are unable to reach their refrigerators because of the wall at one side.

How appropriate is the sink?

Very Appropriate	Appropriate	Inappropriate	Very Inappropriate
7	18	7	2
21%	53%	21%	6%

The kitchen sink was not an appliance that provoked a particularly passionate response. The majority of participants - 74% - rated their sink as either "very appropriate" or "appropriate".

Of those who rated it inappropriate, the complaints included:

- too low to do dishes
- only a single sink and would prefer a double sink
- two taps and would prefer a single lever handle tap
- can't reach taps
- too shallow
- too deep
- is a different height from surrounding counters and that makes it awkward
- faucet is too low (for washing hair)

All of the units had clearance below the sink (two units were adaptable and provision had been made to provide clearance at the sink, but the units had not been adapted to incorporate this feature).

The taps were lever style in all of the units but two; and in 68% of the units, it was a single tap. In all the units but one, the taps were at the rear of the sink. In the one unit, it was a push button control located on the front face of the counter. Only a few units had a flexible water sprayer at the sink, but those who had this feature cited it as valuable.

> ***"I'm mad keen about the spray nozzle"***

In only half the units were the pipes off-set to create clearance, although in most cases, the sink drain was at the rear of the sink. None of the pipes were insulated; in two cases a panel had been installed to shield the pipes.

Dishwashers

Only 18% (n=6) of the participants had dishwashers in their units. While two of those with dishwashers noted that they rarely used them, several participants who did not have dishwashers suggested that dishwashers should be provided in accessible units. (These comments were not prompted by any specific mention of a dishwasher.)

In-suite Laundry

The provision of in-suite laundry, or at least the hookups for appliances, was another appliance which participants cited as a valuable feature. (These comments were not prompted by any specific mention of laundry facilities.) Those who had laundry facilities found it to be a very useful feature, and several of those who didn't have them stated a preference for their inclusion in all wheelchair accessible units.

Electrical Outlets

When invited to make "any other comments about the kitchen", several participants discussed the provision of electrical outlets at the front of the counter. While most of the units (68%) provided electrical outlets at both the front and rear of the counter, 20% (n=7) provided outlets only at the front of the counter, and 12% (n=4) provided outlets only at the rear of the counter.

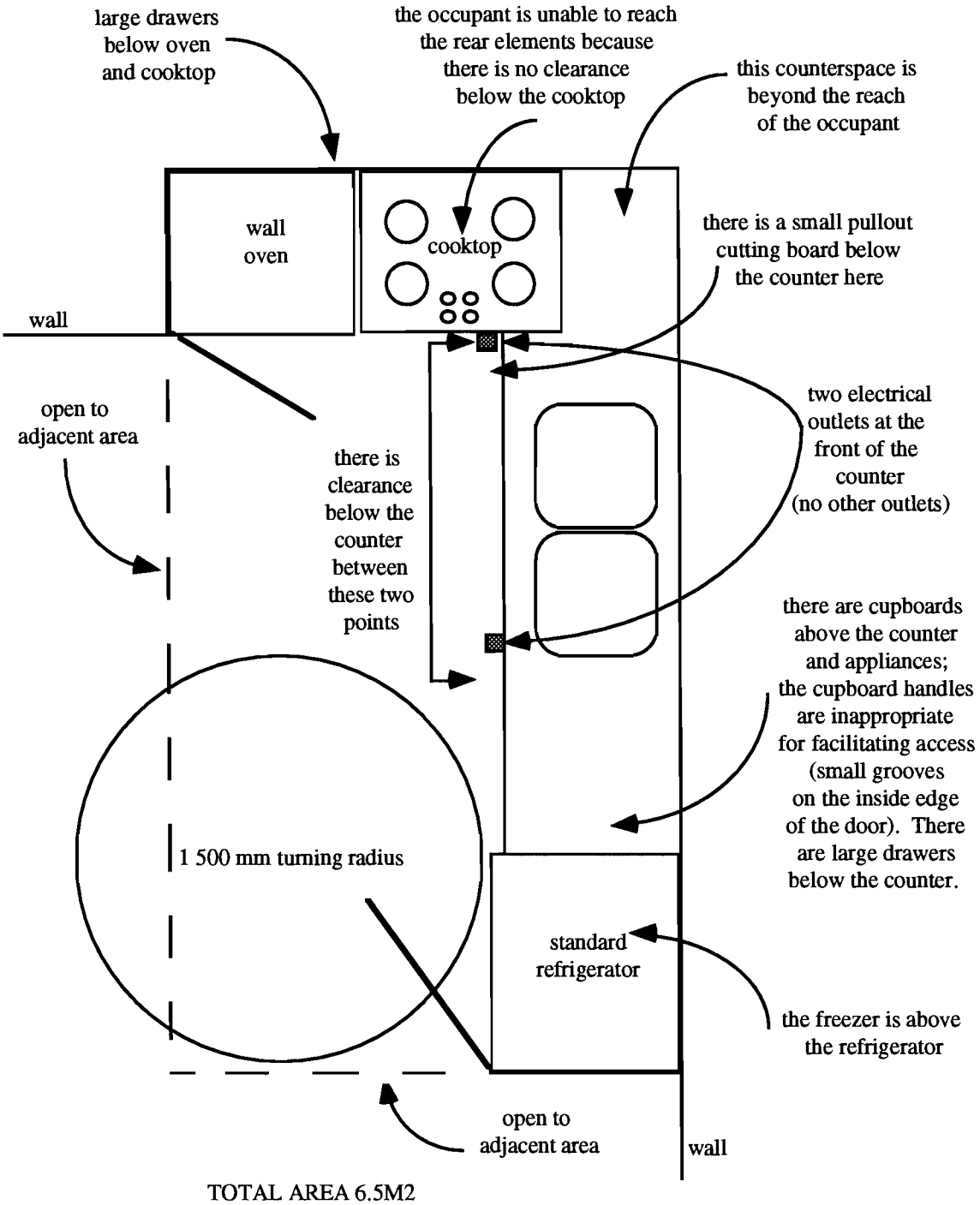
Two themes were cited repeatedly. The first was that electrical outlets at the front of the counter were not logical for appliances which are constantly plugged in, such as coffeemakers and toasters.

> ***"It's ridiculous for things that are plugged in constantly."***

The second recurring theme was that the outlets at the front of the counter, and particularly at the front of the cooktop, were a hazard. The concerns centered on safety, specifically the risk of burns and fire. Participants were afraid of catching the electrical cords with their wheelchairs and pulling the appliances of the counter. In the case of the outlets at the front of the cooktop, participants were concerned that the cord could melt on a stove element and cause a fire.

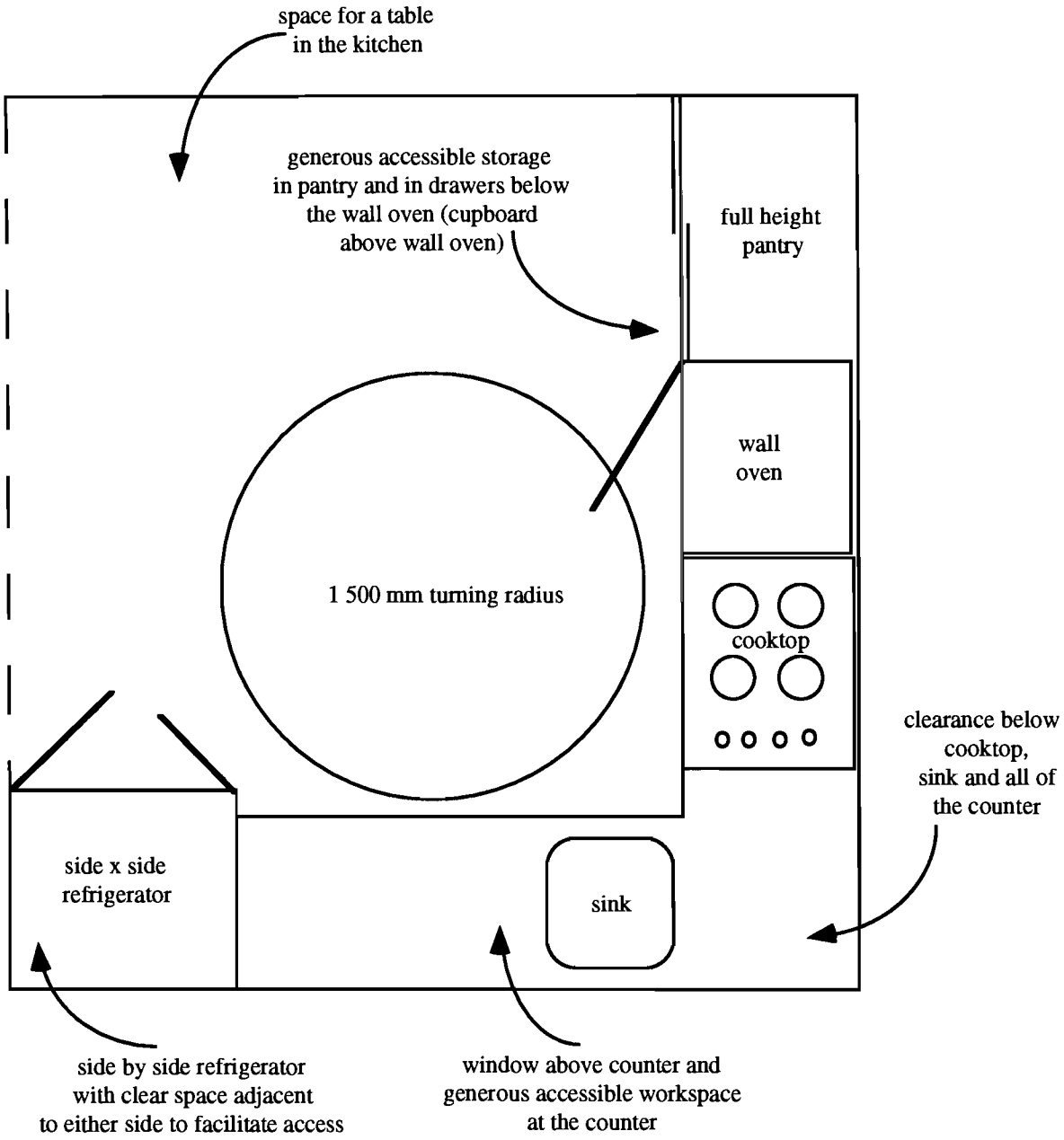
ANNOTATED DIAGRAMS

Kitchen with Numerous Inaccessible Features



TOTAL AREA 6.5M2

Kitchen with Numerous Accessible Features



TOTAL AREA 9.5 M2

RECOMMENDATIONS AND GUIDELINES- KITCHEN

Recommendation: Provide adequate and accessible counter space, including a workspace with clearance below the counter.

CMHC Guidelines: "Kitchen counters should be as continuous as possible, at a uniform height and level with a cooktop... knee space under the counter is desirable, especially at the sink and cooktop... pull-out work boards are very useful and at least two should be provided, preferably at a height of about 750 mm."

B.C. Building Code: No code requirements.

BCHMC Guidelines: Height at 840 mm. Counter length equal to 2 400 mm of cabinet frontage (excluding the refrigerator and stove) plus an additional 900 mm wide section of counter that is clear below. If a unit has more than two bedrooms, an additional 450 mm of counter length is required for each additional bedroom. Provide a 760 mm long by 550 mm wide pull-out work surface with hardwood or plastic laminate top below counter and an additional pull-out shelf below oven."

NOTE: *The existing B.C. Housing guidelines meet the recommendation for "adequate and accessible counter space", but few of the units studied, including recent construction, met the current guidelines.*

Recommendation: Provide adequate and accessible storage space in the kitchen, including a pantry with narrow shelves, and large roll out drawers instead of cupboards with shelves below the counter.

CMHC Guidelines: "Drawers on roller guides should be provided to store things under the counter, as fixed shelving is almost totally inaccessible to a person in a wheelchair and to people with flexibility impairments... Although overhead cupboards may not be totally accessible to people with various disabilities, they can provide useful storage which can by accessed by other occupants. To provide some accessible storage for people using wheelchairs, the lowest shelf should be no more than 1 300 mm from the floor... To compensate for the limited value of overhead cupboards to a person using a wheelchair, a full height pantry with adjustable shelving is desirable."

B.C. Building Code: No code requirements.

BCHMC Guidelines: "Hardware to be easily grasped lever or loop configuration. Provide full-extension pull-out shelves with minimum 40 mm raised edges on free-rolling mechanical slides rather than fixed shelving in cabinets."

No other specific guidelines about the amount or configuration of cabinetry and storage space.

NOTE: *The provision of adequate and appropriate counter space and storage space has significant design and cost implications, because of the additional space required and the provision of fittings such as drawer sliders. These additional costs are particularly relevant in the non-profit housing sector.*

Recommendation: Provide a side by side refrigerator/freezer. A frost-free model with pull-out shelves is optimal. Any walls adjacent to the refrigerator should not extend past the edge of the refrigerator door hinges, to allow unimpeded access by a person in a wheelchair.

CMHC Guidelines: "Most people using wheelchairs prefer a refrigerator model with a side-by-side freezer and refrigerator arrangement for easy access... automatic defrosting should be included for easy maintenance. Care should also be taken in designing kitchen layouts to ensure that refrigerator and freezer doors can be fully opened for easy access."

B.C. Building Code: No code requirements.

BCHMC Guidelines: Provide a side by side refrigerator (no guidelines regarding position of refrigerator/freezer, or access to it).

Recommendation: The guidelines for the amount of counter space should make provision for a microwave. Consider providing a convection/microwave oven in lieu of a wall oven.

CMHC Guidelines: "Microwave ovens are useful for many people with disabilities, as they allow easy defrosting, heating and cooking of frozen or pre-prepared items. They should be mounted on the counter in a location where loading and unloading is not impeded by the door swing."

B.C. Building Code: No code requirements.

BCHMC Guidelines: No guidelines pertaining to microwave ovens. Wall ovens are specified.

Recommendation: Provide dishwashers in all wheelchair accessible units.

CMHC Guidelines: "A garbage disposal unit and a dishwasher are two items which are highly convenient for people with disabilities."

B.C. Building Code: No code requirements.

BCHMC Guidelines: Provision of a front loading dishwasher is specified in current guidelines.

Recommendation: Provide some electrical outlets which can be reached from a seated position, preferably on a side wall, or at the front of the counter. Counter front electrical outlets should not be positioned below the cooktop. Some electrical outlets at the rear of the counter should be provided for appliances.

CMHC Guidelines: "Duplexes for kitchen and laundry equipment and countertop appliances should be reachable from a seated position."

B.C. Building Code: No code requirements.

BCHMC Guidelines: "Provide convenience outlets, light, and fan controls at locations accessible from work positions."

Recommendation: Provide in-suite laundry appliances or facilities. A front loading washer and dryer installed side by side provide the most universal access.

CMHC Guidelines: A combination washer/dryer... a front loading machine with front mounted controls is preferred. This may be placed on a platform to raise it to a convenient height for a person in a wheelchair or a person who cannot bend comfortably. Where a dryer is stacked over a washing machine, the upper door should be at a height no greater than 1 370 mm... controls should be not higher than 1 200 mm from the floor. There should be a 1 500 mm by 1 500 mm clear floor space in front of the machines."

B.C. Building Code: No code requirements.

BCHMC Guidelines: No guidelines.

LIVING/DINING

How would you rate the size and shape of your living/dining area for accessibility?

Very Good	Good	Bad	Very Bad
12	16	3	3
35%	47%	9%	9%

Overall, participants ability to access and use their living and dining areas was satisfactory and few problems were cited. 82% rated their living/dining areas as either "very good" or "good". All participants were able to turn around in their living/dining areas. There were numerous positive comments, such as "beautiful, wonderful", "great", and "perfect".

Several participants commented about the necessity of careful furniture arrangement in order to retain accessibility, which some regarded as compromises. Five participants cited the size or configuration of their living/dining areas as the best feature in their homes; none cited it as the worst feature.

> ***"Space is o.k. without any furniture, but people has to have some furniture in order to live."***

RECOMMENDATIONS AND GUIDELINES- LIVING/DINING

Recommendation: Living and dining areas should be large enough to comfortably accommodate the activities of a person who uses a wheelchair, and should include adequate space for furniture.

CMHC Guidelines: "Living and dining areas should be large enough to permit easy maneuvering and 'parking' for a wheelchair in addition to providing space for normal furnishings. The floor space in the dining area should allow clearance of 900 mm between walls and furniture for wheelchair circulation. An area of 750 mm by 1 200 mm should be provided at the table for at least one person using a wheelchair. If there is a separate dining area it should be directly accessible from the kitchen. A pass-through, level with the kitchen counter, is desirable between the two rooms.

B.C. Building Code: No code requirements.

BCHMC Guidelines: No specific guidelines.

BEDROOM

How would you rate the size and shape of your bedroom for accessibility?

Very Good	Good	Bad	Very Bad
9	16	8	1
26%	47%	24%	3%

> ***"Could be worse, I've seen worse, so I'll give it a 'good' "***

Overall, 73% of the participants rated their bedrooms as either "very good" or "good" in terms of the shape and size in relation to accessibility. However, when invited to comment on the bedroom, over half of the participants made comments regarding insufficient size or space. Additionally, 26% of participants stated that they were not able to turn around in their bedrooms.

While one participant cited the bedroom as the best feature in her home, three participants cited it as the worst - all referred to the size.

> ***"The kitchen is so big and the bedroom is so small. I wish it was the same size as the kitchen."***

For many of the bedrooms, in order to retain a 1 500 mm pivoting radius in the room, the furniture would need to be limited to a twin bed and bedside table. In most cases, participants had dressers, double beds and other typical bedroom furnishings. Several participants had specialized equipment such as a handi-pole or a lift which was necessary for transferring to and from the bed.

It was repeatedly pointed out that the typical bedroom size and configuration allowed only one furniture layout. This was an annoyance to some, but for others it meant a real functional compromise; for example, some people prefer to transfer into bed on one side rather than the other, due to greater strength on one side.

Additionally, several participants noted that it was not appropriate to base the bedroom size on a single bed. Some participants were married; others noted that their disability required a larger bed (for example, to roll over, they could only roll forward).

For many people in wheelchairs, the bedroom often accommodates a range of activities such as transferring between bed, commode chair and wheelchair; in most cases, both the activities and the equipment require space.

> ***"I've got a double bed and I've still got space galore."***

The bedroom closets were a source of dissatisfaction and frustration to many for two reasons. Firstly, in some cases the closet rods had been installed at the standard height and were not accessible. Secondly, in some cases the opening at the closet doors was too narrow or deep and impeded access in a wheelchair.

79% of participants indicated that they preferred sliding closet doors rather than bifolds, although several noted that the economical models tended to break easily, causing frustration. Three participants cited their bedroom closets as the worst feature in their home in terms of accessibility. The two key factors identified were the height of the clothes rod and the clear width with the door(s) open. The bifolds impede any angled approach unless the opening is very wide. A few participants with experience using sliding doors noted that the clear width must be wide enough for a wheelchair, otherwise access would not be possible.

How adequate is the storage space in your apartment?

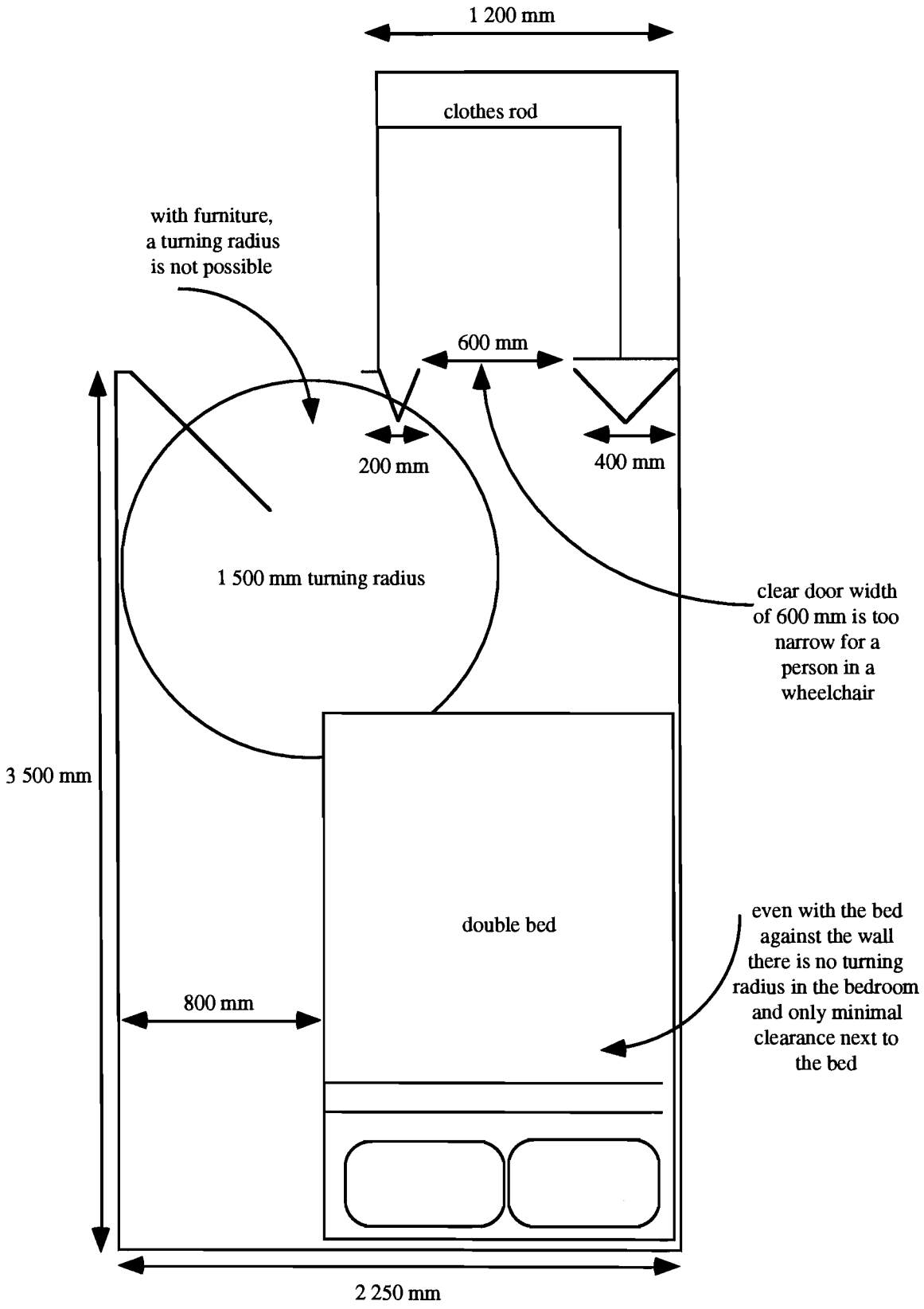
Very Good	Good	Bad	Very Bad
9	13	8	4
26%	38%	24%	12%

Overall, 64% rated their storage space as "very good" or "good". This finding is somewhat surprising as storage is generally perceived to be inadequate, and the prevailing wisdom is that people with disabilities need more storage because of equipment and supplies. However, the amount of general storage space did not emerge as a salient issue.

Although in most cases the amount of storage space was perceived as adequate, the access and configuration was less satisfactory. Most of the participants cited difficulty accessing their storage, due to design configurations, narrow closet openings and other design barriers.

Linen closets are generally inappropriate. They are inaccessible because the clear door width is typically too narrow for a wheelchair, and the shelves tend to be recessed and deep. If linen closets are provided, the design should incorporate a wider closet door, and shelves that are shallower and nearer to the front than is typically the case.

ANNOTATED DIAGRAMS



RECOMMENDATIONS AND GUIDELINES- BEDROOM

Recommendation: **The size and configuration of the bedroom should allow a turning radius of 1 500 mm on at least one side of the bed, and 900 mm circulation space in all parts of the room. The bedroom should accommodate a double bed and a wheelchair.**

CMHC Guidelines: "... one bedroom should be generous in size to accommodate a double bed and allow for both the use and storage of a wheelchair... Clearances around the bed are based on the need for a 1 500 mm x 1 500 mm wheelchair turning area on one side of the bed, a comfortable clearance of 900 mm where access or circulation by wheelchair is necessary, and a minimum clearance of 750 mm in other areas."

B.C. Building Code: 3.7.3.14.(1) Where sleeping units are required by Subsection 3.7.2. they shall have (a) sufficient space to provide a turning area of not less than 1 500 mm diameter on one side of the bed, and (b) sufficient space to provide a clearance of not less than 900 mm to allow for functional use of units by persons in wheelchairs.

BCHMC Guidelines: Provide a clear 1 500 mm turning radius inside the bedroom.

Recommendation: **All closets, including bedroom closets, linen closets, and other closets, should have a minimum clear width of 900 mm. Sliding closet doors or a single bifold should be used as appropriate. Adequate circulation space should be provided at the doors to permit access and maneuvering. Closets with recessed shelving (such as linen closets) should be avoided. Closets should have a wide opening and shallow shelves, near to the front of the closet, or roll-out shelving.**

The amount of storage space should be specified and consideration should be given to the equipment (such as second and third wheelchairs) and supplies which are required by many people with disabilities.

CMHC Guidelines: "Generous storage capacity within the dwelling is essential for people with disabilities, and a minimum capacity of $5.5m^3$ is recommended. This storage is generally required for seasonal clothing, suitcases and any equipment and supplies required by the occupant. It must be designed so that the contents are accessible to persons using wheelchairs."

B.C. Building Code: 3.7.3.14.(1) Where sleeping units are required by Subsection 3.7.2. they shall have (d) at least one closet that provides (i) a clear opening of not less than 900 mm, (ii) clothes hanger rods capable of being lowered to a height of 1 200 mm, and (iii) at least one shelf capable of being lowered to a height of 1 350 mm.

BCHMC Guidelines: "All closet rods must be adjustable from 1 200 mm to 1 500 mm above finished floor."

UNIT LAYOUT AND CIRCULATION

Participants were asked a series of questions to identify their perceptions about the size and configuration of their units and the circulation spaces. As the responses indicate, at least three quarters of the participants considered their dwelling units to be "very good" or "good" in terms of overall accessibility, layout and circulation, livability and size. However, when subsequently questioned about specific design elements such as the bathroom, participants indicated less satisfaction. (For example, a participant might rate circulation as "very good" and then when asked about the bathroom, would point out that the access to the bathroom required a right angle turn and that the doorway or corridor was too narrow.)

How would you rate the accessibility of your unit overall?

Very Good	Good	Bad	Very Bad
12	19	3	0
35%	56%	9%	0%

"Bad and a half"

In terms of overall accessibility, 91% of participants rated their units as "very good" or "good". This was the most general question about their units and was also the question with the most positive response.

How would you rate the layout in terms of livability?

Very Good	Good	Bad	Very Bad
12	15	6	1
35%	44%	18%	3%

In terms of livability, 79% rated their units as "very good" or "good".

"I love the layout here! There's lots of open space."

How would you rate the layout and circulation in terms of accessibility?

Very Good	Good	Bad	Very Bad
14	12	7	1
41%	35%	21%	3%

When accessibility was specified in terms of layout and circulation, the proportion of participants rating is a "very good" or "good" decreased to 76%.

Circulation was designed to eliminate right angle corridors in only five cases, although in some cases the right angle turned into an open area or the corridors were widened at that point. In seven cases, the circulation was designed to incorporate wide angles instead of right angles. The corridor widths varied from 840 mm to 2 050 mm; the average corridor width was 1 100 mm.

> ***"An idiot made this up; it obviously wasn't a person in a chair."***

How would you rate the size of your apartment?

Very Good	Good	Bad	Very Bad
10	16	7	1
29%	47%	21%	3%

76% of participants rated the size of their units as "very good" or "good".

Five participants cited size ("the lack of space", "overall size for both accessibility and for a family", "not a big enough space") as the worst feature in their homes. However, three participants cited size as the best feature in their homes ("the accessibility, moving around in it", "hallways are good because they're nice and wide", "having enough room").

> ***"I wouldn't characterize it as bad, it would just make it better if it was bigger."***

How would you rate the accessibility and adequacy of the entry area of your unit?

Very Good	Good	Bad	Very Bad
12	17	4	1
35%	50%	12%	3%

85% of participants rated the entry area of their units as "very good" or "good".

88% of participants stated that they were able to turn around outside their front door, but only 71% were able to turn around immediately inside their front door. One participant stated that it was possible to turn around, but only without footrests.

RECOMMENDATIONS AND GUIDELINES- UNIT LAYOUT AND CIRCULATION

Recommendation: The design guidelines should include a reference to minimizing the amount of circulation space and making circulation routes as straight and open as possible.

When a design is submitted for plan review, it should be demonstrated that a wheelchair can maneuver through the spaces shown, with particular attention to corridors, corners and angles, and access to appliances and to design features such as closets.

NOTE: This performance based criteria provides greater flexibility in design solutions while ensuring that the goal of accessibility is achieved.

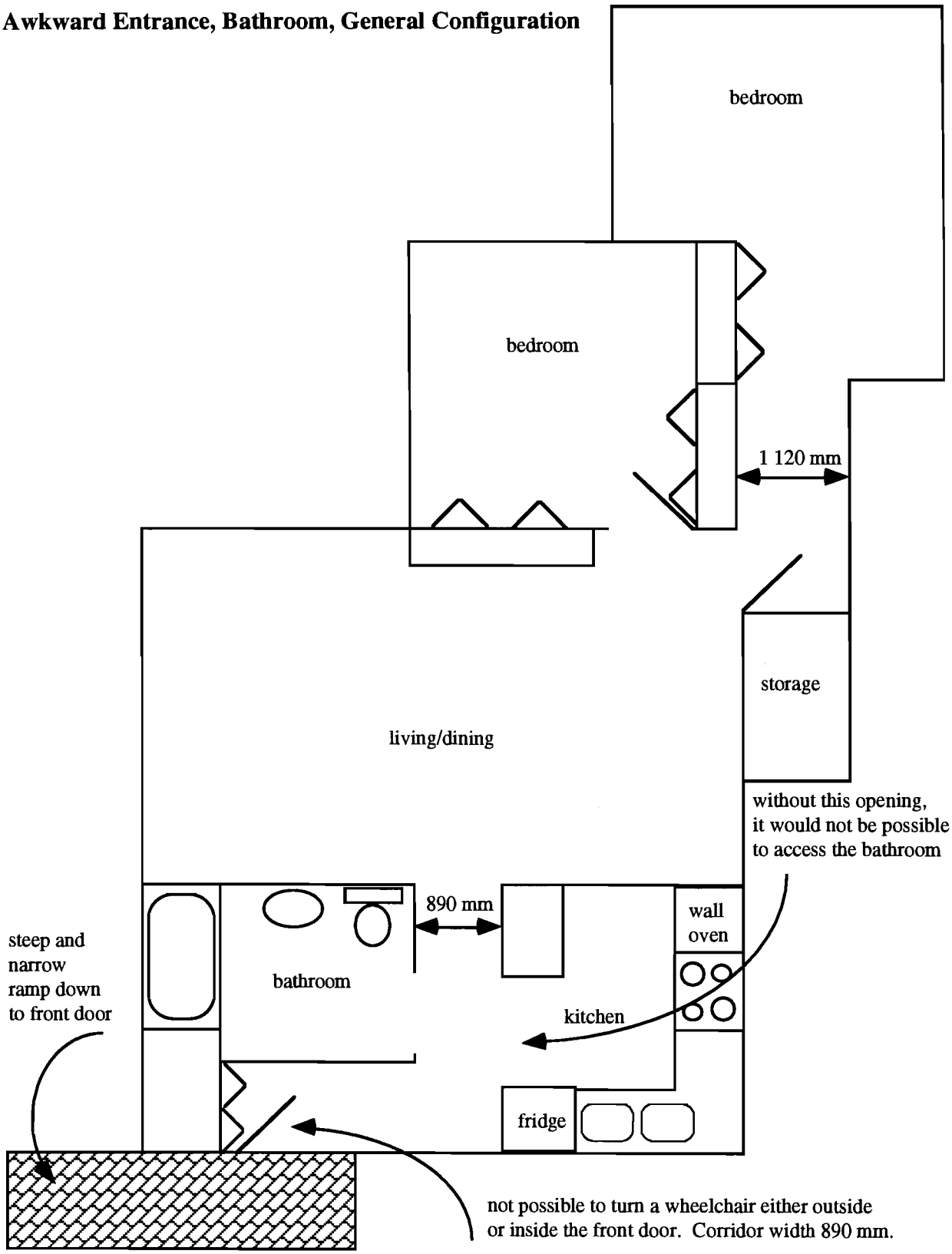
CMHC Guidelines: "An entry hall at least 1 500 mm by 1 500 mm should be provided. This will allow easy access by persons using wheelchairs, as well as space for removing outdoor clothing. Entry doors should provide a minimum of 810 mm. However, an 860 mm clear opening is recommended to minimize damage to door frames by wheelchairs... Internal corridors should be at least 920 mm wide, except where they must be wider to meet the requirements for wheelchair access at doors... There must be adequate maneuvering space for wheelchairs on both sides of a doorway and a clear space beside the latch edge of the door. Space requirements depend on the type of door, the way it is approached and whether it opens into a confined space, such as a vestibule."

B.C. Building Code: Various specifications regarding corridor widths and doorway configurations (none of which are code requirements for residential interiors). Figure 3.7.17. illustrates that a minimum corridor width of 915 mm is required for a 90° turn.

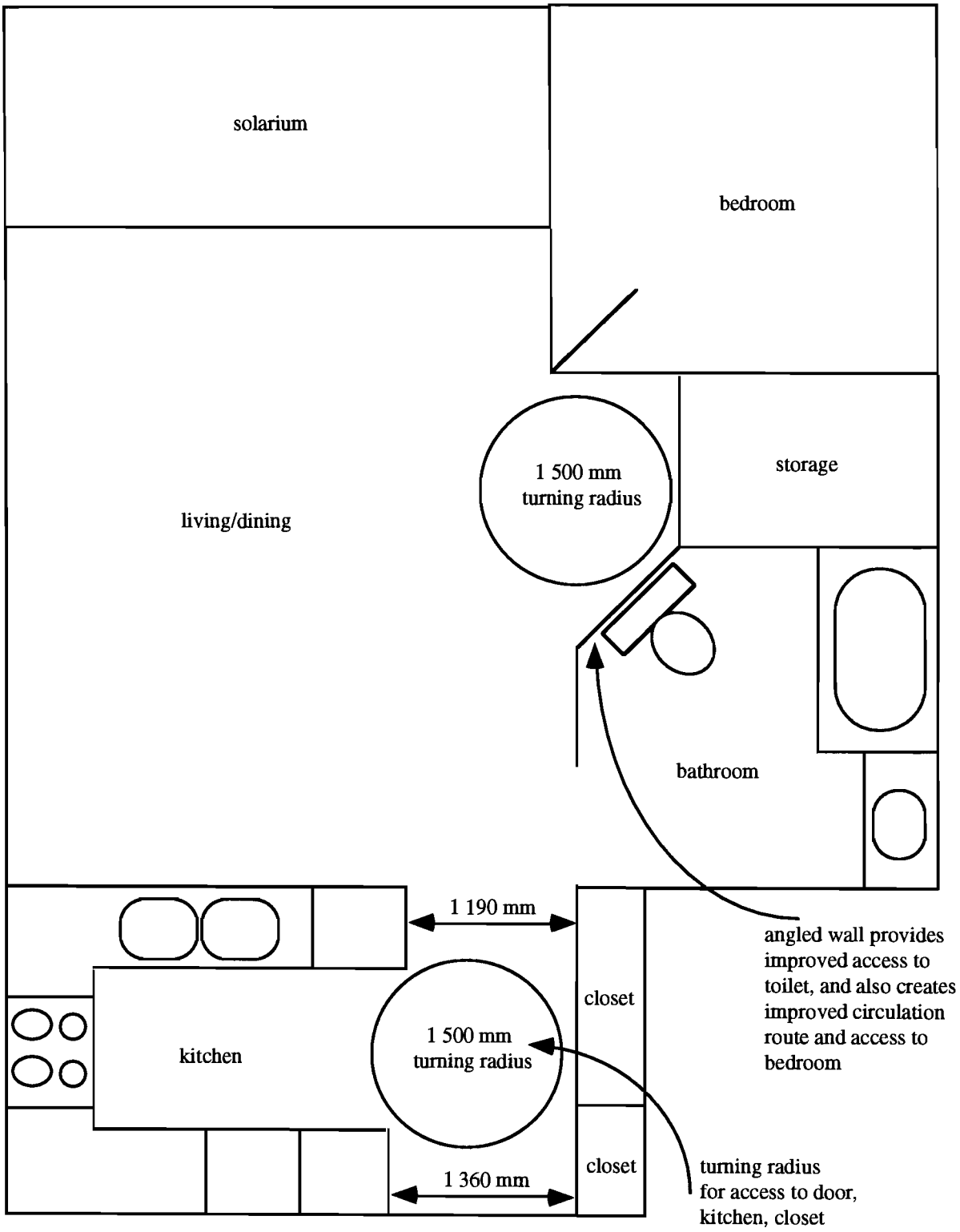
BCHMC Guidelines: Various specifications including the provision of a turning radius at the: inside and outside of entrance doors, inside the bathroom (to be clear of all cabinets and fixtures), inside the bedroom, inside the kitchen, (with radius to be clear of all cabinets, fixtures, and overhangs). All doors shall have a minimum 900 mm clear opening.

ANNOTATED DIAGRAMS

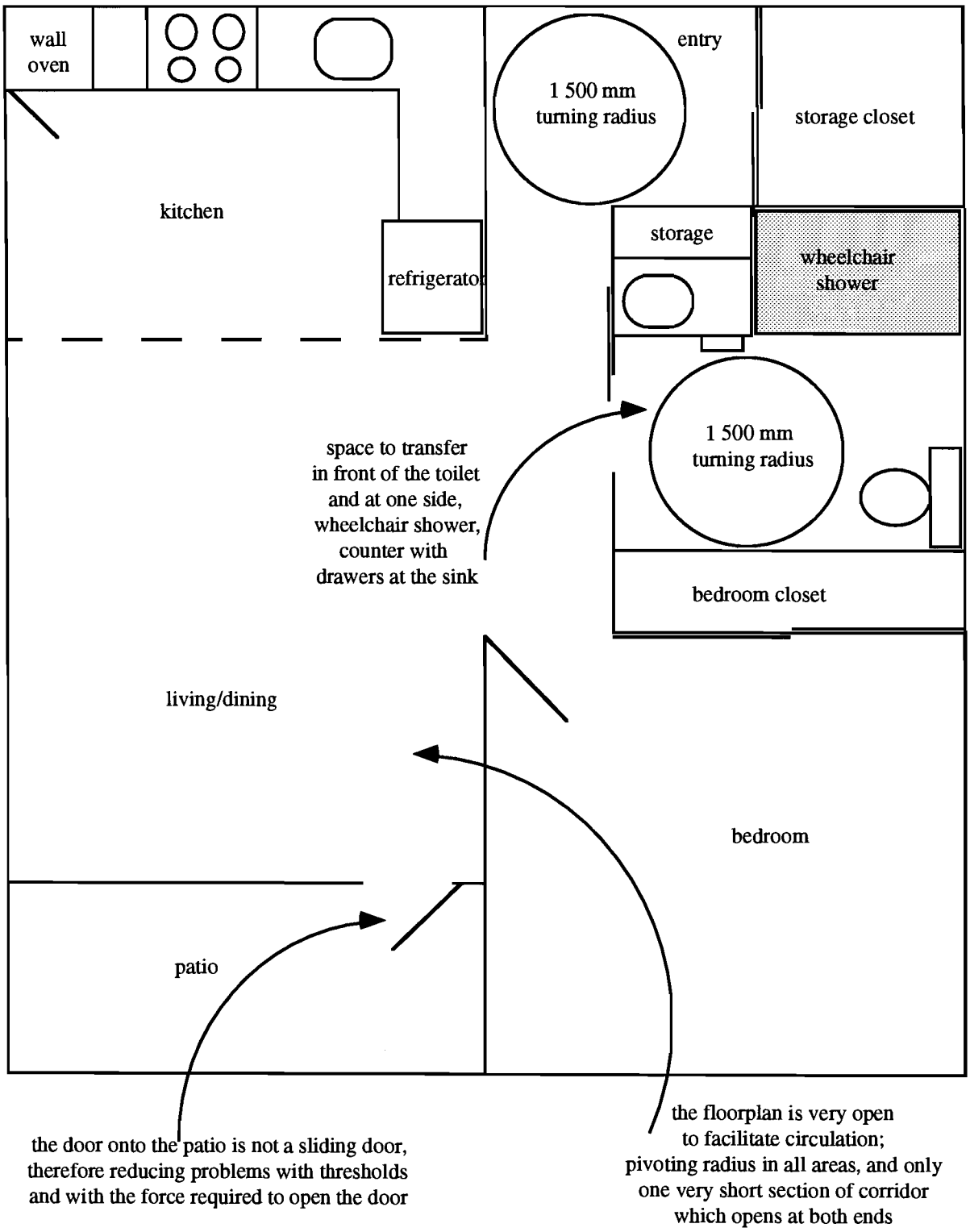
Awkward Entrance, Bathroom, General Configuration



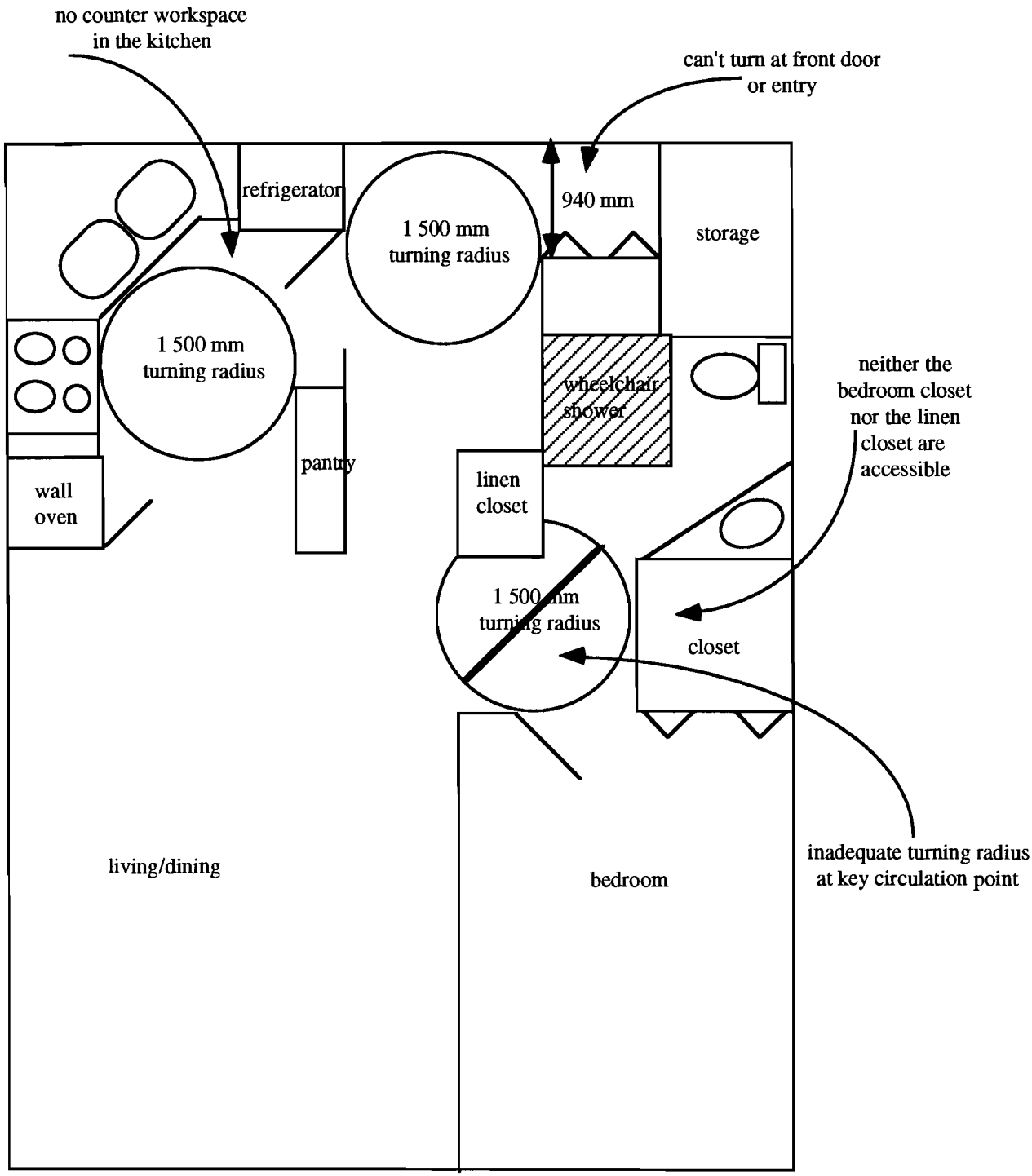
Efficient Configuration



An Efficient Layout



Poor Layout and Unit Configuration



LIGHTING AND CONTROLS

The placement of light switches, electrical outlets, thermostats and electrical panels was appropriate for persons in wheelchairs in most cases. Participants did not identify these items as a problem, and the only ones who were not able to use the switches and controls were those whose disabilities were too severe to accomplish the activity without some type of assistive device or technology.

The height of electrical outlets ranged from 390 mm to 850 mm; the median height was 500 mm. (B.C. Housing guidelines specify "a minimum of 530 mm above the floor; CMHC specifies "not less than 450 mm above the floor".)

The height of light switches ranged from 850 mm to 1 100 mm, with a median height of 1 020 mm. The height of the thermostats ranged from 775 mm to 1 520 mm, with a median height of 1 050 mm. (Both the B.C. Housing guidelines and CMHC specify that light switches and thermostats should be mounted at 840 - 1 050 mm above the finished floor.)

The height of the electrical panels ranged from 700 mm to 1 350 mm, with a median height of 950 mm. (B.C. Housing guidelines state "Locate electrical panel board at 850 mm to underside, in an accessible location".)

There was no direct question pertaining to the type of light switches, nor did any participants make any comments or indicate a preference (rocker switchplates versus traditional toggle switches).

While only a few participants identified it as a salient issue, the provision for lighting and lighting controls in the bedroom is typically inadequate. In many cases there was no ceiling light fixture in the bedroom. In about half the cases there was a three way switch which controlled an electrical outlet. In two cases, there was a switch, but participants reported that it "wasn't connected to anything". In only two cases was there an optimal configuration: there were two sets of three way switches - one controlled the ceiling fixture and the other controlled an electrical outlet.

Finally, two participants pointed out that a telephone jack should be located in proximity to the bed as both a convenience and safety feature.

RECOMMENDATIONS AND GUIDELINES- LIGHTING AND CONTROLS

Recommendation: All telephone jacks should be paired with electrical outlets.

CMHC Guidelines: No guidelines.

B.C. Building Code: No code requirements.

BCHMC Guidelines: No guidelines.

Recommendation: Telephone jacks, paired with electrical outlets, should be provided in the bedroom in proximity to the planned location(s) of the bed.

NOTE: For all other controls, the existing guidelines are appropriate and adequate, but in many cases, are not incorporated into the design or construction of units designated as wheelchair accessible.

CMHC Guidelines: In addition to the guidelines cited above, the following criteria are specified for building system controls: "In dwellings designed for people with disabilities, all controls for building systems to be operated by the occupant should be: in accessible locations; adjacent to clear floor space at least 750 mm wide; located between 450 mm and 1 200 mm from the floor; operable with one hand; of a type that does not require tight grasping, pinching or twisting of the wrist; in positions where they can be illuminated; and provided with tactile markings to aid people with vision impairments."

B.C. Building Code: No code requirements.

BCHMC Guidelines: In addition to those cited above, the following guidelines are specified: use wall mounted thermostats for heaters; built-in thermostats are not permitted on heating appliances; light fixtures must contain two or more bulbs; in bedrooms, in addition to the switched ceiling mounted fixture, provide a three-way switched wall outlet near the bed; one switch at the door of the room, and one at the bed."

WINDOWS

Over half of the participants reported that they were unable to open their windows. In most of those cases, it was the person's disability which impeded them, but 20% (n=7) of all participants had the ability but were unable to open their windows because of design barriers.

In many cases the window detailing was inappropriate to accessibility requirements, particularly anthropometric standards and codes pertaining to reach, force, and manipulation.

In some cases, large plate glass windows were too heavy to open. These types of windows also had "slider" type window opening devices which required strength and dexterity to manipulate (typically squeezing a small button in and then holding it while pulling upward). In other cases, the windows were placed too high to reach from a seated position. In many cases, the window detailing was a painful illustration of being "halfway there" in terms of accessibility: there was a lever handle, but it was out of the reach of a person in a wheelchair.

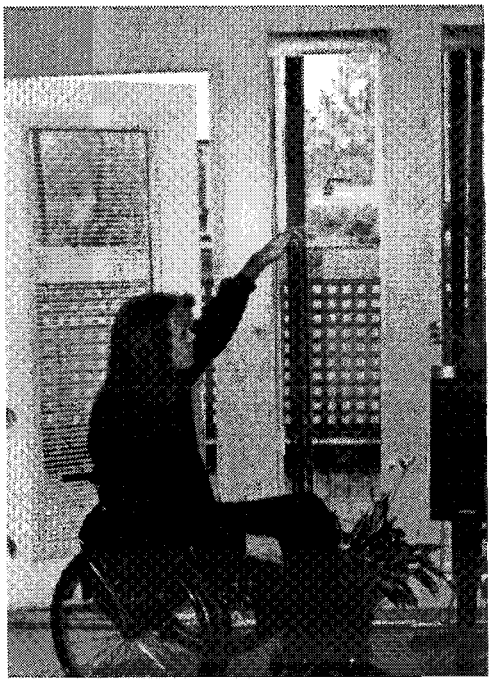
In one case, a window had three levers, with the upper lever located at 1 900 mm and a twist style handle to winch the window open. In seven cases, the windows had dual levers located at different heights along the opening edge. In these cases, the lower lever was generally accessible, but the upper lever, located between 1 550 mm and 1 800 mm above the floor, was inaccessible. It was reported from one source that these windows are favoured because they meet the requirements of "Power Smart", a rebate-based incentive program by B.C. Hydro to facilitate energy efficient design elements in new construction. If this is the case, there may be a challenge in meeting the dual goals of accessibility and energy efficiency. While it would be possible for the persons with these windows to simply leave the upper lever unlatched, that solution would probably compromise the security of their dwelling (particularly since most accessible units are located on the ground floor).

> ***"Before we start, would you mind opening the windows? I can't reach them."***
>
> *First words from one participant when the researcher arrived to conduct an interview at a very hot south-facing unit.*

Inappropriate Window Design

This window is too high for a person in a wheelchair to see out of or enjoy, and many people with disabilities would be unable to reach the window to open or close it. This tenant can open it slightly with a struggle, but has difficulty reaching and grasping the handle to close it.

The window does have a lever handle.



Inappropriate Window Detailing

The design of these windows is appropriate for a person with a disability; they are low to the floor and provide maximum viewing from a seated position. However, the handle (a lever handle) is out of reach of the tenant.

RECOMMENDATIONS AND GUIDELINES- WINDOWS

Recommendation: **The criteria for window fixtures should be the same as those specified for other hardware or controls which require manipulation, such as thermostats and electrical outlets: accessible location; adjacent to clear floor space at least 750 mm wide; located between 450 mm and 1 200 mm from the floor; operable with one hand; of a type that does not require tight grasping, pinching or twisting of the wrist.**

CMHC Guidelines: "Windows should be designed so that the sill is no more than 750 mm above the floor and there is a clear floor space not less than 750 mm wide along the full length of the window... Sliding window sashes should be selected with care... the ease of operation also depends on the ratio of height to width, the position of the locking and operating mechanisms, the quality and maintenance of glides and sliding track... Lever hardware on casement and awning windows, and large push and pull hardware on sliding windows, are preferred. Rotary hardware for windows is difficult for some people with disabilities to operate manually. However, it does lend itself to motorized operation. Window hardware should be mounted no higher than 1 200 mm from the floor."

B.C. Building Code: No code requirements.

BCHMC Guidelines: "All operable fixtures, including cabinet and window hardware, shall be easily operable by persons with limited dexterity." "Use lever handle closers and mechanical openers in seniors and handicap suites." "Normal (sill) height 750 mm, this may be raised to 900 mm in bedrooms."

DOORS

Observations and measurements were made for all doors, including the front door, balcony or patio doors and interior doors. Participants were also asked if the thresholds at either their front doors or their balcony/patio doors were a problem.

Thresholds

Most current codes and guidelines specify a maximum 13 mm bevelled threshold.

For the front door, in most of the cases, the thresholds were appropriate, with an average of 14 mm. However, in four cases the threshold was 30 mm or more; in one case it was 60 mm and the tenant had built a small ramp to access the front door from inside the unit. Only three cases did not have a bevelled threshold at the front door. Five participants reported that the threshold at the front door was a barrier.

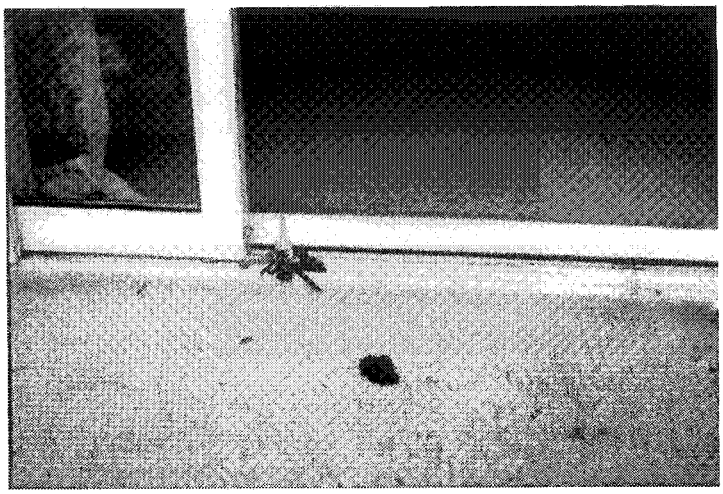
56% (n=19)of the participants rated the thresholds at patio or balcony doors as a barrier. In only ten cases was this threshold bevelled; in the majority of cases, the threshold was a sliding door track. The average threshold was 33 mm. In nine cases (26%) the threshold was between 50 and 60 mm.

> ***"It's a 'thump-bump' and I have to be careful not to spill my coffee, but I can do it."***

Typical Patio Threshold

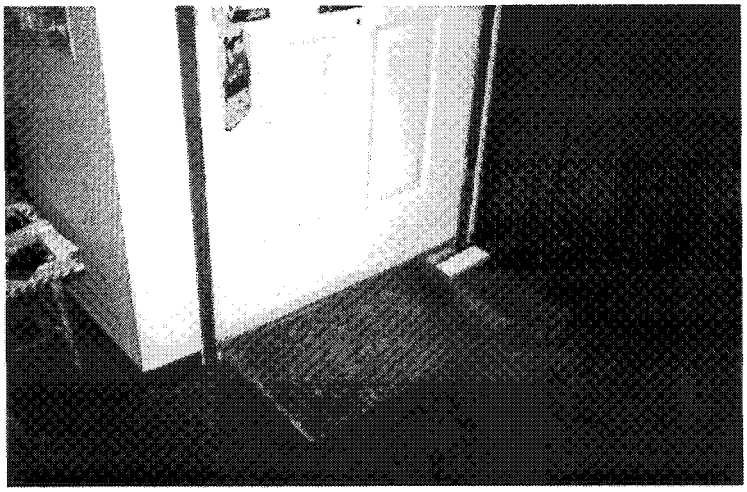
This threshold at a patio door is a common design detail. An upright key has been placed against the opening; the threshold is 50 mm, four times greater than the current standard of 13 mm. The threshold is not bevelled.

For many people with disabilities, this threshold would be impossible to negotiate, or would jeopardize their safety.



Interior Threshold

The tenant of this unit had to construct a small ramp to place inside the front door because it was not possible to negotiate the unbevelled 60 mm threshold.



Door width

The width of the front doors varied between 780 mm and 860 mm. The average width was 820 mm.

The width of doorways at the balcony or patio varied considerably; it ranged between 1 260 mm and 660 mm, with an average clear width of 840 mm.

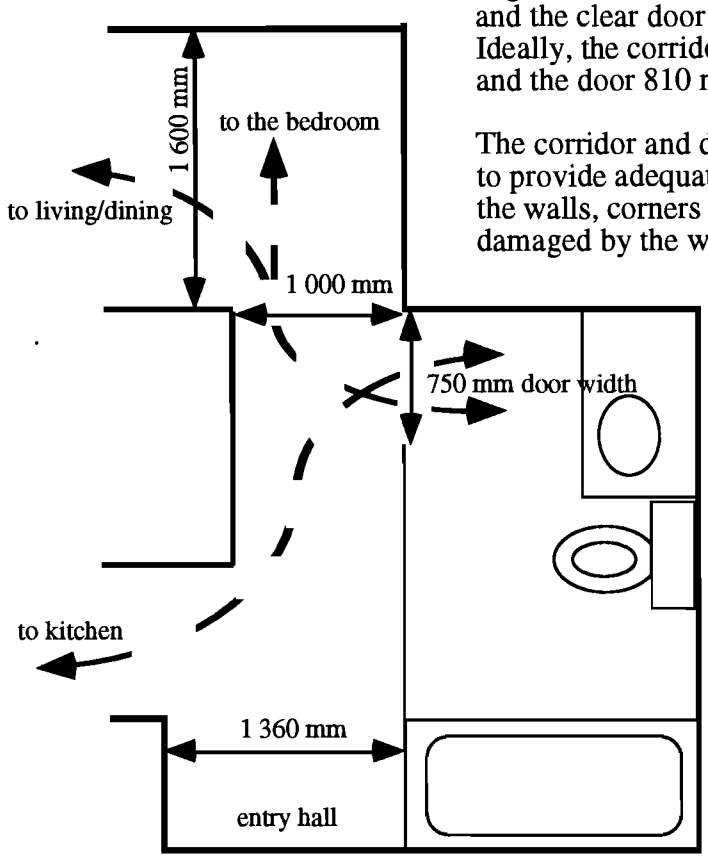
The clear width of interior doorways ranged between 750 mm and 900 mm with an average of 825 mm.

Door widths were not a particularly salient issue for participants, and problems tended to be design specific, such as the configuration of a corridor or corner, combined with the door width.

Poor Configuration - Inadequate Door Width

The path of travel to reach this bathroom requires an awkward "S" maneuver for two of the three possible approaches; the third, from the bedroom, requires a right angle door. The corridor width is 1 000 mm and the clear door width is 750 mm. Ideally, the corridor would be 1 200 mm and the door 810 mm; or the door 915 mm.

The corridor and doorway are both too narrow to provide adequate space to maneuver and the walls, corners and doorjambs have been damaged by the wheelchair.



Door Hardware

All participants had lever handles on their front doors, and most had lever handles on their interior doors. Over half of the units had at least one pocket door. In more than half of the cases, the pocket doors had standard hardware (a recessed handle and pull lever) which is very difficult for many individuals to manipulate. In some cases, a D-type handle had been affixed to the door which facilitates use, but reduces the clear door width.

> ***"It's hopeless! It's so hard to pull that little dooey out."***
>
> *Comment from participant who has difficulty manipulating standard hardware on pocket doors.*

Some participants noted that sliding glass doors are also difficult to use because of their weight and resistance (particularly if the track is dirty or worn) and the locking mechanism is difficult for some individuals to manipulate.

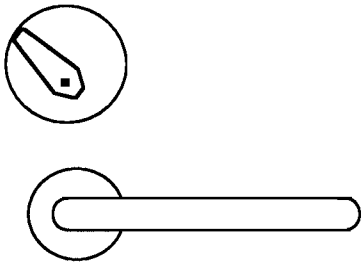
26% (n=9) of the participants had installed automatic door opening devices at the doors to their units. (This was the most common type of modification made to enhance access.) Several participants had added hooks, handles, strings or bungee cords which served as assistive devices for pulling the door open or closed. Only four participants were unable to open and close their front doors and in all cases it was due to their disability and the fact that they did not have an automated system installed.

Peephole viewers are problematic for people who use wheelchairs; installed at the standard height, the viewer is too high to use, but installed at an accessible height, it is difficult to see who is at the door. Some doors are finished with two peepholes at different heights. There are also some new types of peepholes on the market which may facilitate viewing from a seated position.

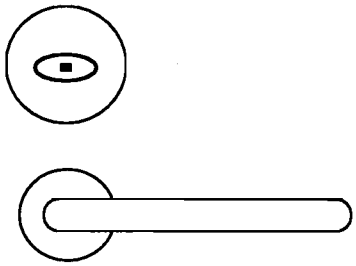
A full length window next to the door is one simple, effective and aesthetic solution to identifying who is at the door before opening it, and is an alternative to peepholes. However, this would generally require security glass and may be a more costly solution than a peephole.

85% of the participants said that they were able to lock and unlock their front doors (included in the automatic systems for those that had installed them). Several participants commented on the difficulty of manipulating keys and locksets. Some units had very small deadbolt mechanisms, but some had a large, offset lever for the deadbolt which required less dexterity and strength to use.

Different Styles of Deadbolt Hardware



This offset lever deadbolt provides a larger mechanism to grasp, and because it is offset, it requires less force to turn it.

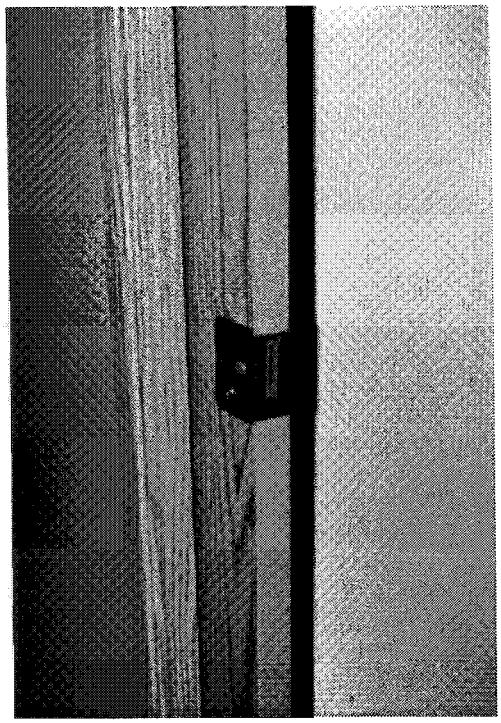


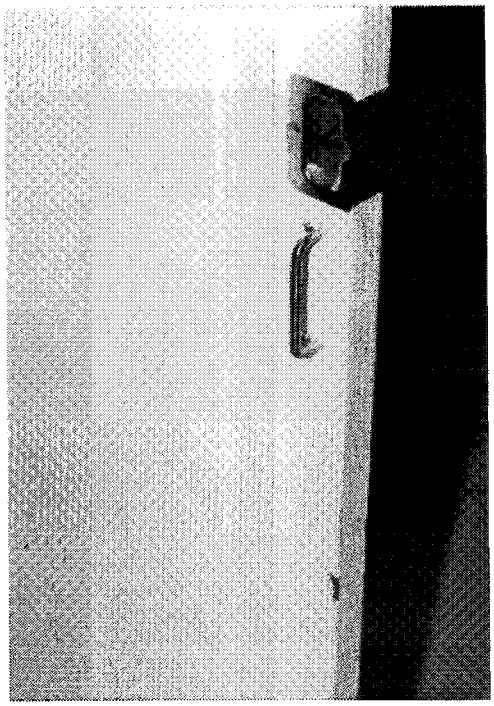
This traditional style of deadbolt has a small, rounded mechanism with a centre pivot point. It is more difficult to grasp and requires greater force to turn.

Pocket Door with Standard Hardware

This pocket door has the standard hardware for opening and closing the door. The pull lever is recessed and flush to the door edge. To use it, the top must be pushed in and then the lower edge grasped as it flips out.

The small lever handle is designed to be hooked over one finger, or alternatively, grasped. The entire sequence of manipulations to use this hardware requires dexterity, co-ordination, strength and fine motor control.



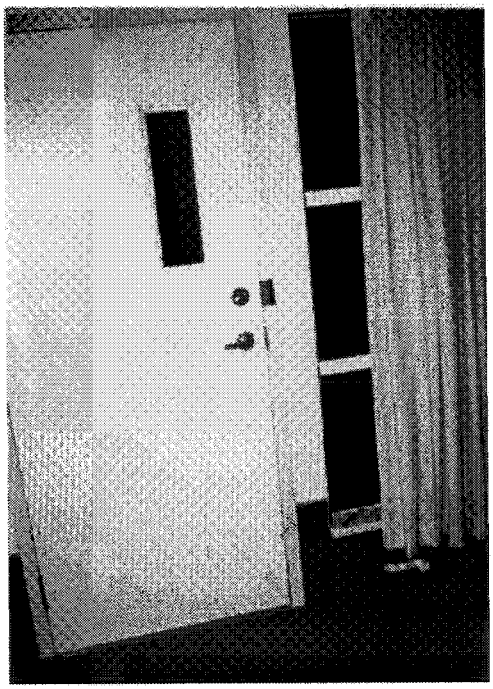


D-Handle Added to Pocket Door

A D-handle can be added to a pocket door to facilitate access. This is easier to grasp and pull than the traditional style hardware. However, the handle will impede how far the pocket door can be recessed, reducing the clear door width by up to 100 mm.

Inside Handle on Door

This door has a second handle on the inside edge. It is a D-type of handle to facilitate grasping it, and it is used to pull the door closed. Note also the lowered peephole.



Window Next to the Front Door

A full length window next to the front door is an aesthetic alternative to a lowered peephole, which is often not suitable because it is difficult to access and does not provide an appropriate view.

RECOMMENDATIONS AND GUIDELINES- DOORS

Recommendation: Provision should be made for the installation of automatic door openers at the unit entrance of all units designated as accessible. Wiring should be installed with a blank cover plate located above the interior of the door.

CMHC Guidelines: No specific guidelines regarding provision for installation.

B.C. Building Code: Automatic doors are required at the accessible entrance to hotels and buildings classified with certain occupancies.

BCHMC Guidelines: No guidelines.

Recommendation: All pocket doors should be installed with D-type handles or other type of hardware which is accessible, and the clear door width should be specified, so that the installation of a handle does not compromise clearance.

CMHC Guidelines: "Operating hardware on sliding doors should be exposed and usable from both sides when the doors are fully open. If the door retracts fully into a wall pocket, an accessible handle is required on the exposed edge of the door to permit retrieval. (Note: the clear opening should not be reduced to less than 810 mm.)"

B.C. Building Code: 3.3.1.12.(3) Door assemblies providing access shall (c) be operable by devices which do not require tight grasping, or twisting of the wrist, as the only means of operation, (d) operate when a force of not more than 38 N for exterior doors and not more than 22 N for interior doors is applied at the handle, push plate, or latch releasing device, except for locations where greater pressures are required to ensure proper building function.

BCHMC Guidelines: No guidelines. ("Pocket doors are unacceptable in family or homeless at risk projects due to durability concerns.")

Recommendation: Solutions to reduce door thresholds at patios and balconies should be explored. Potential solutions include construction techniques to reduce the threshold for sliding glass doors, and alternative types of doors which have a lower and bevelled threshold.

CMHC Guidelines: "Access to the balcony is impeded if there is a high threshold. A sloped threshold of not more 19 mm will not restrict access and is sufficient to minimize problems of water penetration."

B.C. Building Code: 3.3.1.12.(4) In doorways, where thresholds are not flush with the floor, the difference in level shall be not more than 13 mm and shall be bevelled.

BCHMC Guidelines: "Provide roll-over thresholds at all doors including balcony doors."

FLOORING

All of the units except one had carpeting. (In the one unit, the carpeting was removed after the occupant's electric wheelchair became entangled in a frayed edge and she required assistance to cut her wheelchair loose from the carpet!) In that case, the carpet was replaced with wood flooring.

In 76% of the cases, the carpet did not have any underlay. While most of the participants indicated that this was appropriate in terms of facilitating access, there were other problems with this flooring solution, including cold floors and related difficulty heating the dwelling, and the appearance of the carpets, which rapidly became crushed and worn.

Problems with cold floors were cited by nine (26%) of the participants. The problem may be exacerbated by inadequate insulation under the flooring. This problem is not inconsequential; many people with disabilities are susceptible to cold and some are frail; the ability to maintain a comfortable temperature, particularly for extremities such as the feet, is an important health factor.

Four participants suggested that they would prefer flooring other than carpet, such as tiled or wood floors.

One participant suggested that in terms of access the issue is not so much whether or not there is underlay, but the plushness of both the underlay and the carpet. It was suggested that a dense underlay combined with a tight weave, low pile carpet would be most appropriate.

RECOMMENDATIONS AND GUIDELINES- FLOORING

Recommendation: Consideration should be given to carpeting options, such as a dense underlay combined with a tight weave, low pile carpet, and to floor coverings other than carpet which will meet criteria for warmth, aesthetics and cost.

CMHC Guidelines: "Generally, all floors should be level, easy to clean and slip-resistant. People using wheelchairs often find it requires more effort to travel across carpeted, as opposed to, uncarpeted surfaces. However, many accept this disadvantage in their homes to gain other advantages... Where carpeting is used, it should be of high density, level loop nylon pile, no higher than 7 mm. Most carpets with cut pile make it impossible to wheel a chair and should be avoided. Preferably, carpet should be glued down, with no underpad, since it increases friction for wheeled traffic, and problems can occur as a result of carpeting that ripples or stretches under frequent use. If an underpad is used, it should be dense and of minimum thickness."

B.C. Building Code: No code requirements.

BCHMC Guidelines: Commercial quality (direct glue down).

COMMON AREAS AND AMENITIES

Participants were asked several questions pertaining to the overall building complex in which they lived, and were asked to rate specific building elements in the common areas.

How would you rate the accessibility of your housing complex overall?

Very Good	Good	Bad	Very Bad
9	17	6	2
26%	50%	18%	6%

Three-quarters of the participants rated the overall accessibility of their housing complexes as either "very good" or "good". When prompted to comment, participants cited problems with doors, particularly fire and security doors; elevators; and access to other units.

> ***"The battle of the doors."***

How would you rate the accessibility of the main building entrance?

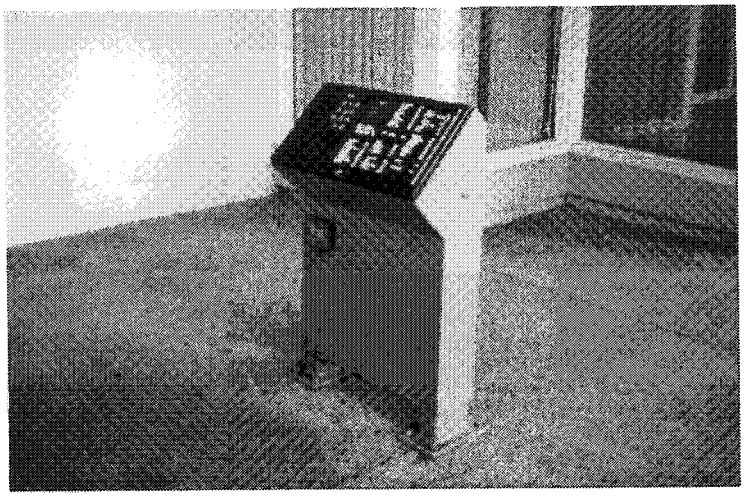
Very Good	Good	Bad	Very Bad	Not Applicable
11	4	5	3	11
32%	12%	15%	9%	32%

For one third of the participants this question was not relevant because of the type of complex (such as ground oriented townhouses). For those who did have a main building entrance, 65% rated it as "very good" or "good". Of those with a main building entrance, 61% had an automatic door opener at the main entrance. The main building entrance doors presented a barrier for many of those without automatic door openers. Several participants noted the difficulty using keys, security cards, and opening doors. In one case, the access card reader was in an inaccessible location; in another case the distance between the card reader and the door was so great that the door lock had re-activated by the time the participant was able to reach the door. In another case, the door stayed open too long, leading to security concerns.

> ***"The door is really, really, hugely heavy"***

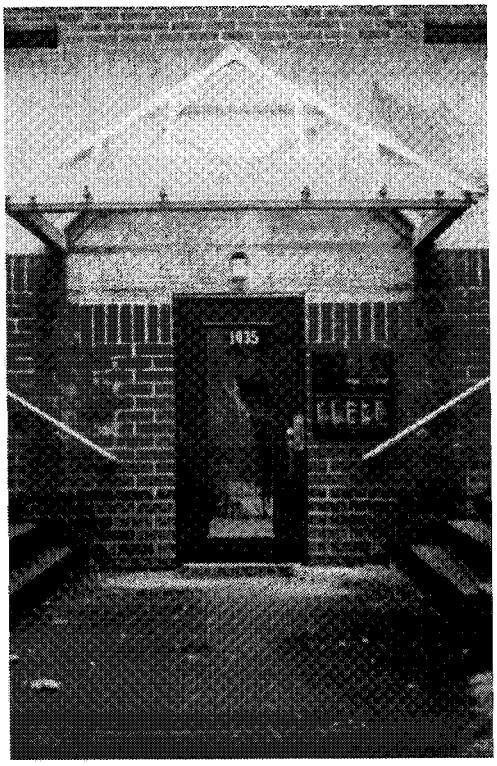
Intercom at Entrance - Good Design

This intercom is easily accessible for most people and requires minimum reaching or leaning. It is located with generous clearance around it to facilitate access, and is close to the entry door.



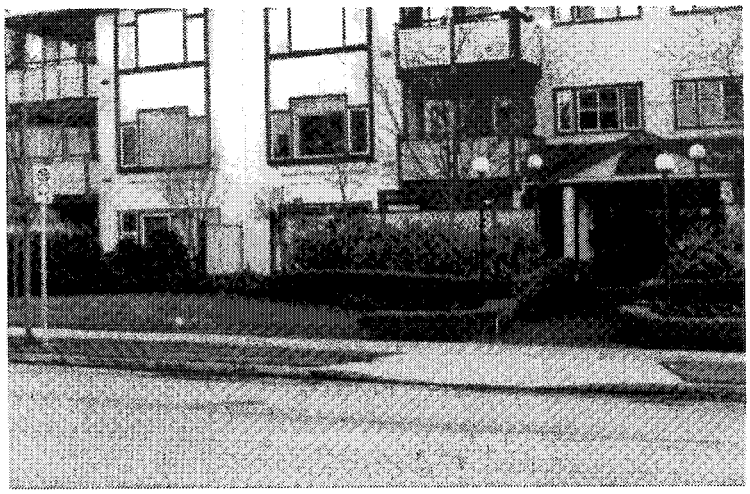
Intercom at Entrance - Poor Design

This intercom is high, particularly the buttons, and is located behind a stair railing, both of which compromise access. There is inadequate clearance around the intercom or the door for appropriate access.



Appropriate Building Entrance

The entrance to this building facilitates access for everyone. There is a wide, level, paved entrance route from the street to theentry which has a large entrance canopy to provide weather protection; a curb cut in mid-block; and a designated loading zone.



How accessible are the outdoor areas?

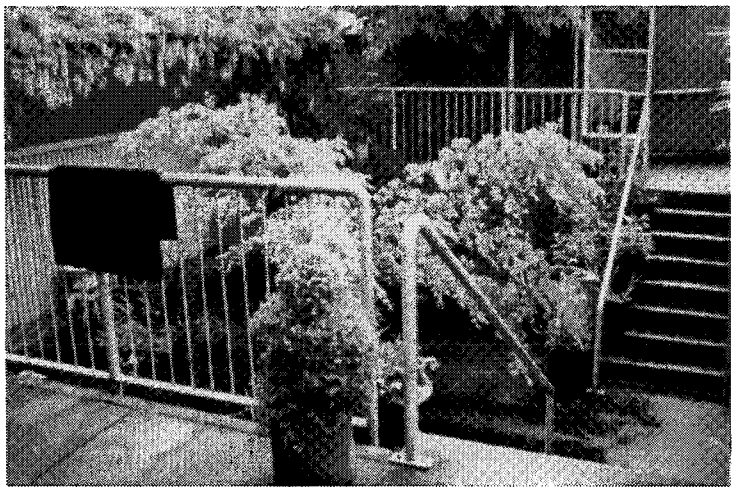
Very Good	Good	Bad	Very Bad
11	12	8	2
32%	35%	24%	6%

57% of participants rated their access to the outdoor areas as "very good" or "good". Participants' comments indicated that they valued the common outdoor areas, but that there were numerous barriers, such as gates, doors, and a lack of accessible routes.

Many of the barriers observed could easily have been avoided with a more careful consideration of accessibility criteria at the design and construction stages.

Inaccessible Common Outdoor Spaces

This sunken garden would be an optimal outdoor space for a person with a disability using a wheelchair: it has a paved, level surface and is sheltered, sunny, and warm. It is, however, inaccessible.



Inaccessible Door to Common Patio

This common patio would be ideal for a person using a wheelchair, except that the design incorporated a small change in elevation, resulting in a threshold of approximately 300 mm. This probably could have been avoided.

How easily are you able to visit with people who live in other units?

Very Good	Good	Bad	Very Bad
9	9	8	7
24%	24%	22%	19%

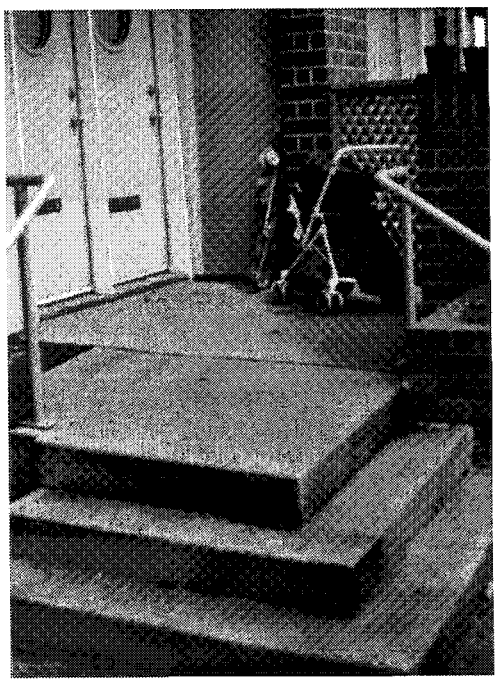
Nearly half (41%) of the participants rated access to other units as "bad" or "very bad". In some cases, only some units were accessible. In many cases, the primary barrier was steps at the front door; these were often a symbolic demarcation of the entrance, and in many cases it was a single step. In other cases, there were stairs inside the units between the entrance and the living areas within the unit. In some buildings, there was no elevator access to the upper storeys. In one cases, the elevator had been eliminated from the design at the construction stage due to project budget constraints.

> ***"It's either very easy or impossible."***

Inaccessible Entry

The front door of this unit is not accessible to a person in a wheelchair. This design feature is probably based on creating a symbolic differentiation from the common courtyard without using too much space. The steps serve as an identification of "porch" or "stoop", but also exclude visitors who use wheelchairs.

A level entry would make it easier for both people who use wheelchairs and people who use children's strollers.



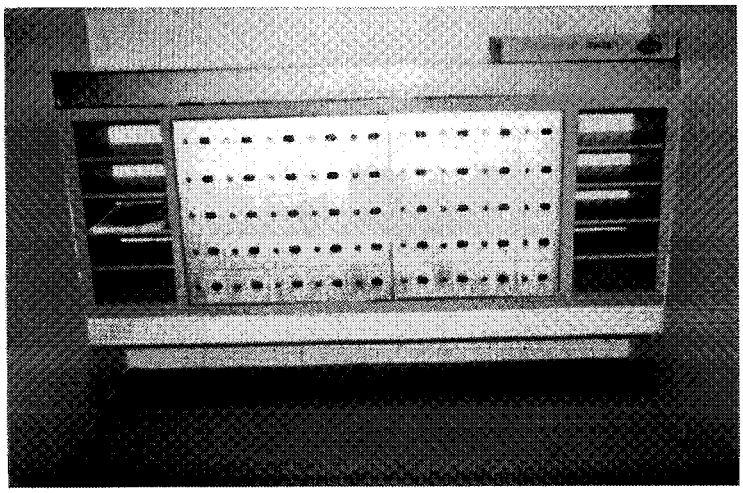
How easy is it for you to get to:

	Very Easy	Easy	Difficult	Very Difficult	Not Applicable
Laundry	13	10	6	5	
Common Room	13	12	4	2	2
Mailbox	14	15	4	1	
Storage	6	16	4	5	3

Most participants did not experience difficulty in accessing common building amenities. Laundry and storage facilities presented the greatest difficulty, due to the functional requirements of using those spaces. Several participants noted that they could get in and out of the laundry room but couldn't use the facilities. Additionally, several participants had storage and laundry facilities in their units which contributed to a positive rating.

Mailboxes

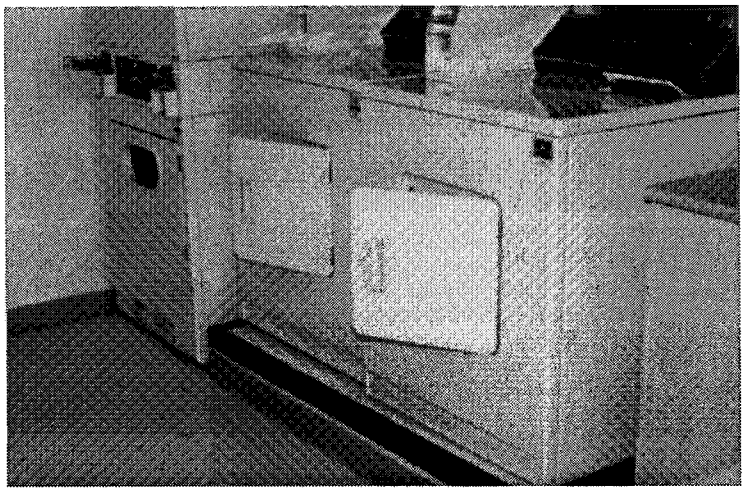
These mailboxes are easy to reach and use from a wheelchair. The boxes are as low as 600 mm above the floor and provide for a range of reaches and there is clearance below.



Accessible Laundry Equipment

The washer and dryers are all front loading, and the washer has the controls at the front. The dryer controls are out of reach; like wall ovens, this a problem with appliance design.

The dryers have been mounted on a platform to facilitate access for loading and unloading.



RECOMMENDATIONS AND GUIDELINES- COMMON AREAS AND AMENITIES

Recommendation: All common areas (indoor and outdoor) and facilities should be accessible unless there is a design justification for not providing access.

CMHC Guidelines: "Accessible routes must be provided from the site boundary to the main entrance." "A garden or other outdoor recreation area is desirable... (and) should be as level as possible, while ensuring adequate drainage."

There are also specific recommendations and criteria for common interior circulation spaces, including corridor and door widths, and elevators.

B.C. Building Code: Specific codes for specific building occupancies, regarding common interior circulation spaces, including corridor and door widths, and elevators.

BCHMC Guidelines: No provision regarding outdoor spaces. Indoor amenity spaces "should be at grade and fully wheelchair accessible" and should include "a wheelchair accessible washroom and kitchenette". For the laundry room, "one front loading washing machine (for the convenience of residents in wheelchairs)" is required.

"Sidewalks shall have curb ramps where appropriate, to facilitate wheelchair accessibility."

Recommendation: All units should provide wheelchair access at the entrance and into the living/dining area unless there is a design justification for not providing access.

NOTE: The intent of this recommendation is to improve the opportunities for meaningful integration, and to change the paradigm from "accessible units" as the exception, to "accessibility" as the norm unless other design requirements preclude it.

CMHC Guidelines: (Guidelines pertain to how to provide access, not whether or not to provide access.)

B.C. Building Code: No code requirements.

BCHMC Guidelines: "Fully integrate specialized units, such as those for persons with physical disabilities, into the community structure of the building(s). These units should not be relegated to areas not normally travelled by the rest of the community or grouped together in one area."

COMMUNITY

Participants were asked several questions about their community and neighbourhood. Two questions: "How well does your housing development fit into your neighbourhood?" and "How would you generally rate your local community?" tended to be conflated. It seems likely that the first question was not correctly understood by most participants who may not have ever considered the perspective of surrounding community members in relation to where they lived.

> ***"I think this location is the best I could ever ask for"***

Over 90% of the participants felt that their housing development fit into their neighbourhood well, and 88% rated the local community as "very good" or "good". When invited to comment, proximity to amenities and services and to transportation were salient issues. Perceptions of safety and security were also important, with both positive and negative comments.

> ***"They put this building in exactly the wrong place - family housing in the middle of Skid Row... between two really busy streets, heavy drug use, right next to a chicken factory - it stinks!"***
>
> *Comment from participant who lives in a building where the community amenity room has been taken over by the police for a surveillance operation.*

How easy is it for you to get to:

	Very Easy	Easy	Difficult	Very Difficult
Groceries	14	14	4	2
Other Shopping	8	20	3	3
Post Office	12	14	5	2
Library	13	12	6	3
Community Centre	11	16	2	1
Entertainment	7	15	8	2
Schools	1	13	3	0
Other	6	7		

The majority of respondents found it easy to get to community amenities. Other valuable amenities cited by participants included banks, drugstore, parks, and medical care.

Transportation

74% of the participants used "HandyDart", the local transit service for people with disabilities, and 68% used public transit.

47% of the participants had their own vehicles. Of those, only two participants had overheight vans. All of the participants except one had a parking space available for their use.

Participants were asked a series of questions regarding their use of transportation.

How would you rate the accessibility for HandyDart pickup and dropoff?

Very Good	Good	Bad	Very Bad
11	10	3	1
44%	40%	12%	4%

There appeared to be substantial satisfaction with being able to use HandyDart from participants' homes, with 84% of those using it rating their access as "very good" or "good". In many cases, the buildings were designed so that participants could sit inside to watch and wait. The principal problem was with building located in mid-block. Often the HandyDart van could stop directly in front of the building, but because the curb cuts were at the end of the street, participants would travel halfway down the block, descend to the street and then travel half a block back along the street, an exercise which is both dangerous and time consuming.

How would you rate your access to public transit from where you live?

Very Good	Good	Bad	Very Bad
9	6	11	4
30%	20%	37%	13%

There was much less satisfaction with the public transit system, with only 50% of those who used it rating it as "very good" or "good". The most common complaint was that there was no public transit near to participants' homes. Proximity was a function of both linear distance and geography - a short hill created a greater perceptual distance than several flat blocks.

How accessible is the parking area, including access between the parking and your unit?

Very Good	Good	Bad	Very Bad
12	15	5	2
35%	44%	15%	6%

All participants rated their access to the parking, even if they did not have a vehicle. Overall, 79% rated it as "very good" or "good". However, when invited to comment, many expressed dissatisfaction, particularly regarding fire doors.

> ***"They've gone security crazy here. I can't unlock the door, open the door, angle my chair... it's very difficult."***

There was a clear inverse relationship between fire safety and security provisions, and accessibility. Accessibility was best for those with outdoor parking spaces next to their unit entrances, and worst for those in large buildings with centralized secure parking and internal circulation routes.

> ***"The fire doors are the worst part because you've got to plow through them and sometimes they're just too heavy."***

Inappropriate Transit Access

This complex is located on a busy street and the lane at the rear is the only access for the HandyDart van. There is a significant curb at the side of the lane, which presents a hazardous barrier for people in wheelchairs, such as this tenant.

RECOMMENDATIONS AND GUIDELINES- COMMUNITY

Recommendation: For wheelchair accessible housing, there should be three primary site criteria: relatively level land in the surrounding area, a neighbourhood that offers safety and security, and proximity to amenities and transportation.

CMHC Guidelines: "There should be ready access to shopping and cultural facilities as well as local community services. The land in the immediate neighbourhood should be relatively level."

B.C. Building Code: No code requirements.

BCHMC Guidelines: The project evaluation criteria provide a 10% weighting for neighbourhood amenities including surrounding land use (3 points), community services (2 points), commercial services (2 points), public transportation (2 points), environment (1 point), and other (up to 10 points deducted for issues of concern.)

Recommendation: Provide safe and efficient (un)loading for HandyDart passengers.

CMHC Guidelines: "Approaches to the building should be designed to make it possible for a person with a disability to be dropped off directly in front of a main entrance. Shelter from the elements should be provided and the route to the entrance should be short and direct... Wherever possible, indoor parking, for both cars and vans, should be included in medium to large-sized apartment buildings with elevators."

B.C. Building Code: No code requirements.

BCHMC Guidelines: For seniors buildings only, the guidelines specify: "provide a vehicular drop-off point complete with weather protected access route to the building".

Recommendation: Encourage designs that provide an efficient circulation route between units and parking, with the minimum number of fire and security barriers.

CMHC Guidelines: "Designated parking spaces should be located close to an accessible elevator. These should be linked by an accessible route that does not cross vehicular paths of travel."

B.C. Building Code: No code requirements.

BCHMC Guidelines: "Locate parking as close to units as possible. In all projects, provide parking spaces designed and designated for persons with disabilities, in accordance with the BC Building Code and the CMHC publication 'Housing Disabled Persons' (sic)."

CONCLUSIONS AND DISCUSSION

This research has served to validate that the housing design criteria and programs implemented by CMHC in the 1970's and currently exercised by other housing agencies, are overall achieving the goal of providing appropriate accessible housing for people with disabilities. However, there is always the potential for improvements, and the goal of this research was to identify, from the consumers' perspective, those design elements which should be improved. This study has served to identify specific problems and to articulate recommendations which address those issues. The intent is that these findings and recommendations will serve as a foundation to build better housing for persons with disabilities in the future.

Two major points are worth emphasizing:

Firstly, there is reason to assume that the profile of occupants of wheelchair accessible non-profit housing units is changing. This research indicates a population which is more physically disabled than the "young paraplegic" who is the model for many of the standards. Current trends, including the aging population and decreased use of institutional care, are probably contributing to a consumer profile with different, and possibly greater, physical requirements than has previously been the norm.

The reality is that society, and the delivery of public services, is changing, and people whose housing was provided under the "health care" label are now shifting to service under the "housing" label. This trend, these people, and their functional requirements will create an unavoidable demand for appropriately planned and designed housing.

Secondly, while many of the existing guidelines are appropriate and adequate, in many projects they are not incorporated into the design or construction of units designated as wheelchair accessible. In evaluating the units, problems with compliance appeared to be common. A final recommendation of this report is therefore that the mechanisms for ensuring the provision of these features be reviewed.

In conclusion, it is recognized that some of the findings and discussion in this report may have significant economic implications in terms of wheelchair accessible non-profit housing units, which are already recognized to be more costly than other units. However, the recommendations of this report are based on functional, not economic considerations. If these units are being funded and built, it is a stronger investment if the design and construction is appropriate and adequate to the functional requirements of the intended occupants.

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APPENDIX A - SURVEY INSTRUMENT

Wheelchair Accessible Non-Market Housing Survey

INTRODUCTION

This survey is intended to provide information both about the profile of tenants who live in wheelchair accessible non-market housing, and about the design of these units. It will take about two hours to complete this survey. For the first hour, I will interview you to get information both about you and about your home. After that, I will spend about an hour making measurements and observations, and with your permission, I may take some photographs.

PART I - CONSUMER PROFILE

What is your age? _____

Please circle the appropriate gender: Male Female

Do you live alone? Yes No

If no, how many others do you live with? _____

Please describe relationships:

Partner _____

Child/Children _____

Parent(s) _____

Roommates _____

Attendant _____

Do you, or any occupant of the unit have a physical disability? Yes No

Clinical Description of Physical Disability

cerebral palsy ☐

spina bifida ☐

muscular dystrophy ☐

multiple sclerosis ☐

spinal cord injury ☐ please describe level: _____

head injury ☐

stroke ☐ please describe: _____

other ☐ please describe: _____

_____

Physical Abilities

I want to ask you some questions about your physical abilities.

Ability to move and control legs: Total Partial Very Limited None

Comments: _____

Ability to move and control arms: Total Partial Very Limited None

Comments: _____

Ability to move and control hands: Total Partial Very Limited None

Comments: _____

Ability to control and move neck and head: Total Partial Very Limited None

Comments: _____

Do you have any disability or limitation that affects your:

Speech: _____

Hearing: _____

Sight: _____

Breathing: _____

Touch: _____

Other: _____

Please fill in the following table to indicate your use of any assistive devices for mobility.

	Use all the time	Use some of the time	Comments
Scooter	☐	☐	
Electric Wheelchair	☐	☐	
Manual Wheelchair	☐	☐	
Crutches	☐	☐	
Walker	☐	☐	
Other: _____	☐	☐	

Do you use any other assistive devices? _____

_____

Do you require assistance with any of the following activities?

housecleaning	☐	transferring	☐
laundry	☐	personal hygiene	☐
cooking	☐	other personal care	☐
shopping	☐	health care	☐
washing dishes	☐	other: _____	☐
		_____	

How many hours of assistance do you use per week? _____

PART II - DESIGN

This part of the survey will provide detailed information about the design features of your housing development and your accessible unit.

What is the name of your housing complex?_____

How long have you lived here?_____ When was it built?_____

Is the building a: co-op BCHMC society name: _____

Is the main tenant group: families with children seniors
people with disabilities low income singles and couples
mixed

How well does your housing development fit into the neighbourhood?

Very Good Good Bad Very Bad

Suggestions, concerns and comments: _____

How would you generally rate your local community?

Very Good Good Bad Very Bad

Suggestions, concerns and comments: _____

How easy is it for you to get to:

Grocery shopping	Very Easy	Easy	Difficult	Very Difficult
Other shopping	Very Easy	Easy	Difficult	Very Difficult
Post Office	Very Easy	Easy	Difficult	Very Difficult
Library	Very Easy	Easy	Difficult	Very Difficult
Community Centre	Very Easy	Easy	Difficult	Very Difficult
Entertainment	Very Easy	Easy	Difficult	Very Difficult
Schools	Very Easy	Easy	Difficult	Very Difficult
Other Amenities	Very Easy	Easy	Difficult	Very Difficult

Describe:_____

Suggestions, concerns and comments: _____

Do you use HandyDart? Yes No

How would you rate the accessibility for HandyDart pickup and drop-off where you live?

Very Good Good Bad Very Bad

Suggestions, concerns and comments: _____

Do you use public transit? Yes No

How would you rate your access to public transit from where you live?

Very Good Good Bad Very Bad

Suggestions, concerns and comments: _____

Do you use an overheight van? Yes No

Do you use a vehicle? Yes No Describe:_____

Is there a parking space for your use? Yes No

How accessible is the parking area, including access between the parking and your unit?

Very Good Good Bad Very Bad

Suggestions, concerns and comments: _____

How would you generally rate the accessibility of your housing complex overall?

Very Good Good Bad Very Bad

Suggestions, concerns and comments: _____

How would you rate the accessibility of the main building entrance?

Very Good Good Bad Very Bad

Suggestions, concerns and comments: _____

AUTOMATIC DOOR OPENER Yes No

How accessible are the outdoor areas?

Very Good Good Bad Very Bad

Suggestions, concerns and comments: _____

How easy is it for you to get to:

Laundry Room	Very Easy	Easy	Difficult	Very Difficult
Common Room	Very Easy	Easy	Difficult	Very Difficult
Mailbox	Very Easy	Easy	Difficult	Very Difficult
Storage Area	Very Easy	Easy	Difficult	Very Difficult
Other	Very Easy	Easy	Difficult	Very Difficult

Describe:_____

Suggestions, concerns and comments: _____

How easily are you able to visit with people who live in other units in your complex?

Very Easy Easy Difficult Very Difficult

Suggestions, concerns and comments: _____

How many bedrooms are there in your apartment unit? 1 2 3 4

How many storeys is your apartment unit (not the building)? 1 2 3

Is your unit designed to be "accessible"? Yes No

Generally, how would you rate the accessibility of your unit overall?

Very Good Good Bad Very Bad

Suggestions, concerns and comments: _____

How would you rate the accessibility and adequacy of the entry area in your unit?

Very Good Good Bad Very Bad

Suggestions, concerns and comments: _____

Are you able to open and close the front door of your unit as you enter and leave? Yes No

Are you able to lock and unlock your door? Yes No

Can you turn around in the entryway inside your unit? Yes No

Can you turn around in the area directly outside the front door of your unit? Yes No

How would you rate the layout and circulation inside your apartment in terms of accessibility?

Very Good Good Bad Very Bad

Suggestions, concerns and comments: _____

Overall, is the design of your unit appropriate for the work of any attendants?

Very Good Good Bad Very Bad

Suggestions, concerns and comments: _____

How would you rate the layout of your unit in terms of livability? (for example, privacy, efficiency)

Very Good Good Bad Very Bad

Suggestions, concerns and comments: _____

Overall, how would you rate the size of your apartment?

Very Good Good Bad Very Bad

Suggestions, concerns and comments: _____

How adequate is the storage space in your unit?

Very Good Good Bad Very Bad

Suggestions, concerns and comments: _____

How would you rate the size and shape of your bedroom for accessibility?

Very Good Good Bad Very Bad

Suggestions, concerns and comments: _____

Are you able to turn around in your bedroom? Yes No

Are there light switches linked to an electrical outlet next to your bed so that you can plug in a light next to your bed which you can turn on when you enter the room and turn off when you are in bed? Yes No

How would you rate the size and shape of your living/dining areas for accessibility?

Very Good Good Bad Very Bad

Suggestions, concerns and comments: _____

Are you able to turn around in the living/dining area? Yes No

I am going to ask you about a series of things that people do in the kitchen. For each activity, please tell me if you do independently, with assistance, or if it is done by an attendant or other person only.

	Do Independently	Do With Assistance	Done By Attendant Only
use the counters for cutting, mixing, and workspace for food preparation	☐	☐	☐
cook on the stove	☐	☐	☐
cook in the oven	☐	☐	☐
cook with a microwave	☐	☐	☐
wash dishes in the sink	☐	☐	☐
get things from the refrigerator and put things away in the refrigerator	☐	☐	☐
take things out of cupboards and put things back in cupboards	☐	☐	☐
other: _____ _____	☐	☐	☐

How would you rate the size and shape of your kitchen for accessibility?

Very Good Good Bad Very Bad

Suggestions, concerns and comments: _____

Are you able to turn around in your kitchen? Yes No

How appropriate are the kitchen counters for the person or people who use them?

Very Appropriate | Appropriate | Inappropriate | Very Inappropriate

Suggestions, concerns and comments: _____

How appropriate are the cupboards for the person or people who use them?

Very Appropriate | Appropriate | Inappropriate | Very Inappropriate

Suggestions, concerns and comments: _____

How appropriate is the sink for the person or people who use it?

Very Appropriate | Appropriate | Inappropriate | Very Inappropriate

Suggestions, concerns and comments: _____

How appropriate is the stove for the person or people who use it?

Very Appropriate | Appropriate | Inappropriate | Very Inappropriate

Suggestions, concerns and comments: _____

How appropriate is the oven for the person or people who use it?

Very Appropriate | Appropriate | Inappropriate | Very Inappropriate

Suggestions, concerns and comments: _____

How appropriate is the refrigerator/freezer for the person or people who use it?

Very Appropriate | Appropriate | Inappropriate | Very Inappropriate

Suggestions, concerns and comments: _____

REFRIGERATOR STYLE: SIDE BY SIDE FREEZER UP

Preference: _____

How appropriate are any other appliances for the person or people who use them?

Very Appropriate	Appropriate	Inappropriate	Very Inappropriate

Suggestions, concerns and comments: _____

NOTE APPLIANCES: _____

Any other comments you want to make about your kitchen?_____

_____

_____

I'm going to list some activities which typically occur in a bathroom. For each activity, please tell me whether you do it independently, with assistance, or whether it is done by an attendant or other person only.

	Do Independently	Do With Assistance	Done By Attendant Only
use the toilet for personal hygiene	☐	☐	☐
use the toilet as part of a routine for cleaning self or personal care items	☐	☐	☐
use the sink to wash hands	☐	☐	☐
use the sink to wash hair	☐	☐	☐
use the sink to wash personal care items	☐	☐	☐
use the bathtub for bathing	☐	☐	☐
use the shower for bathing	☐	☐	☐
other: _____	☐	☐	☐

How would you rate the size and shape of your bathroom for accessibility?

Very Good Good Bad Very Bad

Suggestions, concerns and comments: _____

Are you able to turn around in the bathroom? Yes No

Can you reach the electrical outlet at the counter? Yes No

How appropriate is the sink for the ways that you and/or your attendant (if applicable) use it?

Very Appropriate Appropriate Inappropriate Very Inappropriate

Suggestions, concerns and comments: _____

Would you prefer an accessible sink (the long, shallow ones in some public wheelchair accessible washrooms)? Yes No

How appropriate is the bathtub for the ways that you and/or your attendant (if applicable) use it?

Very Appropriate Appropriate Inappropriate Very Inappropriate

Suggestions, concerns and comments: _____

How appropriate is the shower for the ways that you and/or your attendant (if applicable) use it?

Very Appropriate Appropriate Inappropriate Very Inappropriate

Suggestions, concerns and comments: _____

Would you prefer to have a wheel-in shower? Yes No

Do you use a commode chair for showering? Yes No

Do you use a lift or stretcher for bathing? Yes No

How appropriate is the toilet for the ways that you and/or your attendant (if applicable) use it?

Very Appropriate Appropriate Inappropriate Very Inappropriate

Suggestions, concerns and comments: _____

What type of transfer do you use for the toilet? _____

Have any of the fixtures or finishes in your bathroom been modified or replaced to make them more appropriate to your needs? (For example, grab bars, wheel-in shower, raised toilet seat)

Please describe: _____

Any other comments you want to make about your bathroom?_____

_____

Have you installed any devices or mobility aids in your home?_____

_____

Have you made any adaptations to your home?_____

_____

_____

In terms of accessibility, what do you consider the **best** feature in your home?_____

_____

In terms of accessibility, what do you consider the **worst** feature in your home?_____

_____

What design improvements would you suggest?_____

_____

_____

_____

_____

MEASUREMENTS AND OBSERVATIONS

Can you reach and use all electrical outlets? Yes No Height_____

Can you reach and use all light switches? Yes No Height_____

Can you adjust the thermostat? Yes No Height_____

Can you reach the electrical panel? Yes No Height_____

Is there carpet underlay? Yes No Comment_____

Can you open the windows? Yes No Height_____

Type of opening mechanism_____

Height of closet rods: _____ Do you use the closet rods yourself? Yes No

Closet door preference: bifold slider

Do the main light fixtures contain two or more bulbs? Yes No

Front door clear width: _____
Height of threshold at front door:_____ Bevelled: Yes No
Is the threshold at the front door a barrier? Yes No Why?_____

Does the front door have a lever type handle? Yes No

Do the doors inside your unit have lever type handles All Some None

Do you have an accessible balcony or patio? Yes No
Clear door width:_____
Height of threshold at patio door:_____ Bevelled: Yes No
Is the threshold at the patio door a barrier? Yes No Why?_____

Are you able to turn around on your balcony or deck? Yes No

Width of corridors: _____

90° angles? Yes No

Wide angle corners instead of 90° angles? Yes No

Width of doorways: _____

KITCHEN LAYOUT: L shape U shape galley other

Location of electrical outlets _____

Is there a section of counter that is clear below? Yes No Counter height:_____

Are the kitchen counters at various heights for different users? Yes No

Measure counter heights:_____

Is there a pull-out work surface (that is not below the oven)? Yes No
Measure height from floor:_____

Are there any cupboards below the counters? Yes No

Is there "toe space" below the cupboards? Yes No Height_____Depth_____

Do the cupboards have roll-out shelves? Yes No

Are there drawers? Yes No Describe_____

Do the cupboards have D-type handles? Yes No

Are there cupboards above the counters? Yes No Height from floor_____

Are the cupboards and shelves easy to use? Yes No Why?_____

Does the sink have a lever handle type of water faucet? Yes No

Location of taps/faucet: _____ Single Faucet Double Faucet

Location of trap: _____

Is the drain set back? Yes No Clearance from front of counter:_____

Are the pipes insulated? Yes No

TYPE OF RANGE AND OVEN: standard countertop range wall oven

Location and description of controls: _____

Can you reach the stove controls? Yes No Location_____

Can you reach the exhaust fan control? Yes No Location_____

Can you reach the stove light control? Yes No Location_____

Can you reach the oven controls? Yes No Location_____

Does oven door open away from you? Yes No

Is there a pull-out shelf below the oven? Yes No Height from floor_____

Is there a heat resistant surface on the counter next to the stove? Yes No

Do you have a dishwasher? Yes No

Is the dishwasher front loading? Yes No

SKETCH LAYOUT OF KITCHEN

Does the bathroom door open outward (away from the bathroom)? Yes No Pocket Door

Is there a heat lamp? Yes No Is this a valuable feature? Yes No

Is there clearance below the counter? Yes No Measure: _____

Counter height _____

Does the sink have lever handles? Yes No

Location of taps/faucet: _____ Single Faucet Double Faucet

Location of trap: _____

Are the pipes insulated? Yes No

Are the pipes offset? Yes No

Is there accessible storage space? Yes No

(If applicable) is the design of the bathtub specialized to enhance accessibility? Yes No

Describe: _____

Is there a separate shower? Yes No

Is it a wheel-in shower? Yes No

Is there a telephone-style showerhead? Yes No

Is there a flip-down seat? Yes No Commode Chair

Are there grab bars? Yes No

Toilet seat height _____

Is there transfer space in front of the toilet? Yes No Measure _____

Is there transfer space beside the toilet? Yes No Measure _____

Is the toilet adapted: grab bars, height, spray nozzle, etc.

Describe: _____

SKETCH LAYOUT OF BATHROOM

SKETCH FLOORPLAN OF UNIT