EVALUATION OF PHYSICAL ADAPTATIONS AND HOME AUTOMATION FEATURES IN FOUR HOUSING UNITS LOCATED IN VILLE ST-LAURENT

FINAL REPORT

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LA DOMOTIQUE AU SERVICE DES PERSONNES HANDICAPÉES: ÉVALUATION DES ADAPTATIONS DANS QUATRE LOGEMENTS SITUÉS À VILLE ST-LAURENT

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SUMMARY

This study focuses on traditional, adapted and adapted/automated units in a low-rental building in Ville St-Laurent.

The adapted/automated unit was developed in a pilot project undertaken for experimentation and demonstration purposes. This project was executed jointly by le ministère de l'Industrie, du Commerce et de la Technologie du Québec, Canada Mortgage and Housing Corporation and la Société d'habitation du Québec.

In this study you will find the observations made by ten tenants in the building.

Four of the respondents are disabled and live in adapted units.

The other tenants are seniors, a certain number of whom are experiencing mobility problems. They live in traditional units.

The survey was carried out over a six-month period and meetings were organized with the tenants on several occasions to register the extent to which the various accessibility elements in the building and in their units were used, and the difficulties experienced.

Section four in the document presents the results of the meetings with the tenants. Table 4.6.1, page 76, presents a synthesis of these meetings.

The main observation ares as follows:

- In spite of the fact that the building and the adapted units have integrated a good number of architectural accessibility principles, a number of improvements are required mainly as concerns access to, and circulation in, the building and fire protection.

- Seniors who are losing their independence have comments which are similar to those formulated by the physically challenged. There thus exists a certain similarity of needs.

- The tenant in the adapted/automated unit makes use of part of the elements made available to him. He does this based on his values, needs and habits. He uses the movement detectors to control lighting, the intercoms, the automated kitchen window, the television screen to identify visitors, certain X-10 outlets and, occasionally, the predetermined scenarios.

The use of the functions and equipment by the people questioned was put in a cost-benefit context. The relevancy of the functions and equipment was subsequently assessed for the people questioned and then extrapolated to cover a wider client group (Section 6.0, Table 6.1).

For the tenant in the adapted/automated unit, the equipment and functions used are those which are relevant for him. He thus becomes our benchmark. Based on this benchmark, i.e., a quadriplegic with limited use of upper body members, we can assume that the greater the limitations faced by the user, the more relevant the home automation system becomes.

Thus, quadriplegics with no use of upper members, persons with degenerative diseases affecting the nervous or muscular system (multiple sclerosis, muscular dystrophy), persons with severa cerebral palsy, etc., are all good candidates for the use of a home automation system and for the specialized equipment presented in a demonstration context in the adapted/ automated unit.

In addition, home automation represents definite benefits for most users, whether they are disabled or not, as well as for landlords. It is in this general framework that the choice of installing home automation equipment in all housing units should be made.

INTRODUCTION

La Société d'habitation du Québec, Canada Mortgage and Housing Corporation and le ministère de l'Industrie du Commerce et de la Technologie du Québec decided to undertake an innovative project on a joint basis: to make it possible for the physically challenged to live, and to use the facilities offered, in an automated housing unit.

There are physically challenged people who are able to live in normal residential settings, but who need assistance in a large number of daily activities. The fact is that home automation, a new technology combining computer science, electronics and telecommunications, makes it possible to control the environment in housing units.

The postulate on which the three agencies promoting this project based themselves was the following: home automation can increase the independence of physically challenged people who make use of it by making it possible for them to execute certain activities which, until then, had been impossible, or which required excessive effort for the results obtained.

To verify how home automation could be used by the physically challenged and to identify the most important elements involved, an adapted unit was equipped with a complete home automation system as well as other pieces of specialized equipment making it possible to control the environment. This unit has been occupied by a physically challenged person since the Spring of 1993.

This document is a case study. It provides information on the results of this project. After over six months of observations, we are presenting the use made of the home automation elements by the tenant as well as his degree of satisfaction with them.

For comparison purposes, information was also collected from physically challenged tenants living in adapted units without home automation systems, and from seniors living in traditional units.

This study is meant to be a catalyst for thought. Of course, the sampling is too limited to allow us to draw generalized conclusions. It does make it possible, however, to identify orientations for future uses of new technologies to make life easier for the physically challenged.

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1.0 STUDY'S OBJECTIFS

This document is essentially a case study. It has three major objectives.

The first objective consists in examining the compliance of home automation and architectural accessibility elements to the needs of tenants in the units studied. We wanted to know what elements the people used, the reasons for this use and the degree to which they were satisfied or dissatisfied with the elements made available to them. Our hypothesis is the following: the people questioned will use a certain number out of all the elements made available to them. These elements form a subset which adequately provides the degree of independence which the people consider necessary in terms of the efforts they invest to execute particuliar activities and the result obtained, of their values, and of the outside assistance which they may obtain. For example, a person may well be able to operate a wall switch but prefers movement detectors which, for comparable results, requires much less effort.

The second objective consists in determining the follow-up necessary on the home automation and mechanical elements to improve the extent to which the needs of the physically challenged are met. Two aspects will be considered: improvements and technical follow-up and improvements and follow-up on training, setting up of systems and others.

The third objective consists in determining, for reference purposes in planning future housing projects, **the relevancy of the home automation and accessibility elements** vis-à-vis the costs. Of course, considering the very limited sample used, the results may be biaised, as relevancy is being established based on the information obtained from the tenants participating in the study.

2.0 ADAPTATION AND HOME AUTOMATION ELEMENTS STUDIED

The building under study is located at 680 boulevard Ste-Croix, in Ville St-Laurent.

This is a low-rental housing building with 48 units, designed for seniors. This building is managed by Ville St-Laurent's Municipal Housing Board. Built in 1992-1993, most of the tenants arrived in the Spring of 1993. You will find, in Appendix A, the ground floor plan and a sketch of the adapted/automated unit.

Architectural accessibility elements were integrated into the building's exterior and interior common spaces. Table 2.1 provides a list of these elements.

Four of the forty-eight units in the building where adapted to meet the specific needs of the physically challenged. One of the four units, on the ground floor, was, in addition, equipped with a home automation system and other specialized equipment making it possible to better control the environment. Table 2.2 illustrates the features of the adapted units and Table 2.3 specifies the additional equipment in the automated unit, as well as the possibilities offered by the home automation system.

It is imperative here to clearly define the system used in the automated unit. The home automation system chosen was that offered by Domotique Sécant Inc. This system, which is designed for use by the public at large, is currently available on the market. It can be programmed and controlled by wall panels as well as by remote controls and by telephone. In Appendix B, you will find a promotional document put out by Domotique Sécant.

Among physically challenged people, the best candidates for automation systems are first of all, those who may be unable, on a temporary or permanent basis, to operate traditional controls regulating their environmental conditions. We are thinking here of people who need assistance getting out of bed or who do not have full use of their upper members. These people may eventually have trouble using the wall panel.

The Sécant home automation system was then incorporated in a interface which makes it possible to control it in another way, i.e., a universal infrared remote control system. This interface was produced by Fabco Électronique. Other types of interface could also have been examined, such as voice recognition, for example.

Lastly, other specialized pieces of equipment were added to the preceding systems.

TABLE 2.1

Main Architectural Accessibility Elements in Building's Common Spaces

- Parking area reserve for the disabled
- Obstacle-free passage between the parking spot and the access ramp
- Access ramp
- Accessible main entry: turning space on landings and absence of threshold in air-lock at the main entrance
- Electromagnetic door opener for main front doors
- Obstacle-free interior passage
- Elevator
- Special toilets for men and women
- Electromagnetic door-opener on toilet doors
- Electromagnetic door-opener for garbage chute door (ground floor)
- Electromagnetic door-opener for laundry room
- Electromagnetic door-opener for common room
- Centralized communication system in the common room
- Electromagnetic door-opener on common room and exterior door
- Access ramp in the back yard
- Obstacle-free passage from the back yard to the front entrance
- Handrail in the corridors
- Emergency alarm activated by opening exit doors
- Signs

TABLE 2.2

Specific Architectural Accessibility Elements in Adapted Units

ENTRY

- No threshold at entrance door to the unit, door opened with lever handle, independent lock, double peep hole and key- and push-button-activated electromagnetic door opener
- Turning space in entry
- Identification of visitors using television screen, with image transmitted by the camera located in the building entrance way
- Electric controls lowered on walls (switches, thermostats, etc.); electrical outlets are raised
- Wall intercom with telephone receiver
- Central communication system for the building

KITCHEN

- Turning space in the kitchen
- Lowered kitchen counter
- Lowered kitchen cupboards
- Cook top and microwave/convection oven
- Clearance under sink and cook top
- Service hatch to pass things back and forth between the kitchen and the dining room
- Lever faucets
- Lighting switch, ventilation hood control and electrical outlets located at the front on counter
- Lazy Susan
- Window-opening device equipped with humidity detector

BATHROOM

- Turning space in the bathroom
- Clearance under the wash basin
- Lever faucets
- Full height mirror
- Nailing strips to attach grab bars in the toilet and beside the bath tub
- Lowered medicine cabinet
- Clearance along bath tub
- Lever control faucets in the bath tub, with stationary/hand shower
- Slip-proof finish in bathtub

BEDROOM

- Lowered clothes-closet rod

LIVING ROOM

- Sliding window on rollers
- Electromagnetic door opener for the balcony door, push-button activated
- Turning space on the balcony

TABLE 2.3

Additional Equipment Incorporated into Automated Unit

DOMOTIQUE SÉCANT INC.

- Telephone remote alarm system preprogramed for specific external telephone numbers transmitting digital voice messages in case of accident, fire, theft or flooding.

- Break-in alarm system equipped with a presence simulator, activated by movement detectors, placed in each room and by entry detectors placed on the doors and windows.

- Lighting system automatically turns on and off, activated by a movement detector placed in each room.

- Temperature control, by the detectors placed in each room, temperature programming in each room, based on household's living habits.

- Predetermined scenarios, i.e., programming of the various elements controlled by the home automation system based on a representative "script" of the living habits of the residents. For example, the "Get up" scenario increases the temperature in the bedroom and in the bathroom, then opens the bedroom blinds and turns on the coffee maker.

- Telephone remote control of all functions in the home automation system.

- Heat and smoke detectors placed at a central point in the unit which activate the remote alarm in case of emergency.

FABCO ÉLECTRONIQUE INTERFACE

- Control of appliances plugged into the numerous X-10 outlets in the unit.

- Network of infrared transmission relays make it possible for remote control orders to be transmitted from one room to another.

- Universal infrared remote control making it possible to directly control all equipment, from any point in the unit.

- Interface with the Sécant system, so that the latter receives information from the universal remote control commands and that it can keep close tabs on the state of the various equipment controlled by it up-to-date (example: blinds opened or closed).

- Emergency call station, activated by pull cords, placed in the bedroom, bathroom and living room. Activating the emergency call automatically opens the electric lock in the unit door, an emergency horn is heard, a warning light comes on in the corridor and a telephone remote alarm is activated in an external location.

OTHER SPECIALIZED PIECES OF EQUIPMENT

- Hand-free intercom located in the unit's entry and in the bedroom. The intercom may also be activated by the universal remote control system.

- A safety timer automatically turns off the cook top elements after a programmed timeframe.

- The kitchen ventilation hood is equipped with an automatic extinguisher.

- A humidity detector under the sink sets off a remote telephone alarm in case of flooding.

- Electromechanical blind-openers make it possible to open, close and pivot the vertical venitian blinds in the bedroom and in the living room.

- The electromechanical door-opener for the main door to the unit is activated by remote control.

- Platform in treated wood which elevates the balcony thus eliminating the exterior threshold.

- Special bi-fold doors requiring reduced opening radius allowing access to the bedroom and bathroom.

- Electric multi-positioned bed operated by the universal remote control.

3.0 METHODOLOGY

The methodology chosen to collect and analyse the data required to meet the objectives described in the preceding section is presented for you below.

3.1 Methodology as Pertains to the First Objective: Compliance of Elements with Tenants' Needs

The information required to meet this objective are qualitative in nature. We want to know how the accessibility and home automation elements have contributed to increasing the tenants' independance and the tenants' level of satisfaction vis-à-vis these elements.

The information was collected during interviews with the tenants. Using open-ended questions, we were able to obtain the level of detail and refinement desired.

Using elements or equipment implies learning how to use the latter. A series of interviews were thus planned to make it possible for us to ascertain how the tenants discovered, and learned how to use, the elements made available to them.

The number of interviews varies depending on the different types of groups questioned.

3.1.1 Sample

Three types of tenants were questioned. They are characterized by degree of unit accessibility and extent of home automation available in the unit.

Thus we chose the tenant in the adapted/automated unit, the tenants in the three other adapted units, and finally a sample of seniors living in traditionally designed units.

The choice of all tenants, including those in the adapted units, was made by the Ville St-Laurent Municipal Housing Board, in accordance with low-rental project renting procedures used by the Société d'habitation du Québec.

One should clearly understand the impact of this selection procedure: the people were not chosen based on the nature of their limitations, their interest in the study, their past experience, level of independence, etc. They were selected, above all, based on their incomes, the state of their former units, the urgency of their situations and the number of years they were on the Municipal Housing Board waiting list.

For the tenant occuping the adapted/automated unit, additional criteria were added: the person had to be facing sufficient

restrictions to be likely to make good use of the home automation possibilities provided is the unit. The person had to be able to get along in the unit using the home care services offered by the CLSC and be eligible to receive the services. A person with excession restrictions, needing additional services, could not have been chosen, as neither the Municipal Housing Board nor the person involved would have wanted to run the risk of losing these services.

This person was referred by le Centre Lucie-Bruneau.

The sample of tenants occupying traditional units was chosen among the other tenants in the building. The Ville St-Laurent Municipal Housing Board provided us with a list of tenants and we chose the names in a random fashion. Candidates were contacted until we found three people interested in the study and who were free to meet with us on two occasions. The fourth person is a women with mobility problems whom we contacted directly due to her condition.

During the study, two of our initial candidates withdrew from the project for personal reasons which had nothing to do with the study. We replaced them with new people chosen once again in a random fashion.

All the sample respondents occupying traditional units are elderly women.

3.1.2 Project Itinerary

3.1.2.1 The Tenant in Adapted/Automated Unit and the Tenants in Adapted Units

The tenant in the adapted/automated unit and the tenants in adapted units were interviewed on five occasions in their units, between June and November 1993.

During these meetings, we questioned them, based on a list of accessibility and home automation elements, on the use made of these elements, how to operate the equipment, difficulties experienced and their levels of satisfaction. The questions dealt with the units as well as with the common spaces in the building. Appendix A presents the questionnaire used for the adapted/automated unit.

The goal of the first meeting was to instill confidence in the participants and to generate their collaboration in general.

This meeting make it possible to collect information on the tenants' shelter history , to assess the degree to which they were familiar with the various elements of accessibility and/or home automation which were available in their new units. We also questioned them as to their expectations vis-à-vis the new units, always in relation with their levels of independence. Lastly, the first meeting made it possible to present all the elements of accessibility and/or home automation available in the units to make the tenants aware of the latter and to identify, with them, the elements which they would never use given their functional limitations (example: some cannot use the toilet).

This first meeting, with a very long agenda, was the only one which was divided into two stages so as not to needlessly tire the tenants and to keep their interest and attention.

With the tenants' approval, this first meeting was recorded on a cassette.

The second meeting, one month later, took place in the presence of an occupational therapist. For each of the tenants, we invited an occupational therapist who had had the opportunity to meet them previously. The occupational therapist's role was essentially to advise tenants as to the use of certain elements available in the units which were likely to increase their independence. (Example: Why don't you use the remote control to activate the door-opening device? All you have to do is this; you see, it would be easier for you, etc.) The tenants were invited to try out the various elements, to attempt to undertake certain activities which, at first glance, were of no interest to them. (Example: Why don't you try to pick-up your mail, just to tell us what you think of the letter box?)

The tenants have to explore the possibilities of their various units and make use of the elements and possibilities offered to them. As the notion of learning is very important, the involvement of the occupational therapist made it possible to direct the efforts of the tenants toward those elements which would be most beneficial for them.

For each of the tenants, the notes taken during the various meetings are all indicated on the same questionnaire, which makes it possible for the interviewer to come back to certain questions at various points during the interview.

The third and fourth meetings has their objective to identify any changes in the use of the various accessibility and/or home automation elements in relation to the information obtained during the first two meetings.

We observed, during meetings three and four, that, in general, the tenants had very little to add, in spite of more detailed questioning by us. Although, at the beginning of the study, a one-month interval was decided on between interviews to allow the tenants the time to reflect and to try the various elements, it now seems, after four interviews, that there is not really much new to be obtained.

A certain number of our observations, forwarded to SHQ and to Ville St-Laurent Municipal Housing Board led to modifications in certain elements. Meetings three, four and five made it possible to ascertain any changes in both the use made of the elements subsequent to these modifications and in tenant satisfaction levels.

The fifth and last meeting gave us the opportunity to deal once again with the accessibility and home automation elements, with the use of the latter, the degree of tenant satisfaction and the difficulties experienced.

We also asked the tenants to point out to us the three elements which they would prefer to keep if they had to choose among all the possibilities offered in the building and in the unit. We wanted them to try to identify the three elements which were most important for them.

Subsequently, we gave them the possibility of choosing three other elements which were important but not as essential.

Lastly, they pointed out to us the unneccesary elements, and even elements which did them more harm than good.

During this fifth meeting, we touched once again on the tenant's expectations, and the tenant reported to us on his stay at la Maison Badeau-Sauvé.

Lastly, the three tenants in the adapted/non automated units were questioned has to their interest in the possibilities offered by the home automation system, and this was done to broaden the number and the type of respondents.

3.1.2.2 Sampling of Tenants in Traditional Units

The tenants in this group were met with on two occasions, on an individual basis.

In fact, the nature of the information which we were looking for dictated an individual interview rather than group meetings. We chose to continue our research by concentrating on four people rather than superficially questioning ten people as was initially planned.

With the exception of the tenant with reduced mobility limitations, the other tenants in this group were questioned solely on the elements and the equipment found in the building's common spaces.

The first meeting took place in June 1993.

As for the preceding group, this first meeting made it possible to establish a climate of confidence, to collect shelter history information and to note the person's expectations, to inform the person of the existence of accessibility elements available in the common spaces, to verify the use of these elements as well as to promote their use.

The second meeting occurred six months later. At this time we once again verified the use, the difficulties experienced and the degree of satisfaction with the accessibility elements and equipment in the building. The tenants had had the opportunity to adapt to their new living environments and were in a better position to make comments to us.

As mentioned previously, two tenants questioned in June were not interviewed in November. Three new tenants were questioned, with the biais which this may entail. In fact, these tenants had not been made aware of the building's accessibility characteristics at a previous meeting, and one can assume that they would not have given as much thought to this issue.

Lastly, another important source of information, the occupational therapist for one of the tenants occupying an adapted unit works with the CLSC in the district and regularly intervenes with a number of tenants in the building. During one meeting, she presented for us a good picture of the problems experienced by seniors living in the building.

3.2 Methodology as Pertains to the Second Objective: Technical Follow-Up Necessary on Automated and Mechanical Elements

To collect information concerning the technical follow-up necessary for the electronic and mechanical equipment, we had planned to contact the Ville St-Laurent Municipal Housing Board. In fact, we thought that there was a repair/maintenance procedure involving the resident janitor and that any problems with the accessibility and home automation elements would be covered by this procedure.

The fact of the matter is that there is no resident janitor in the building. At the beginning of the study, a janitor was present during the day, and thus could react to requests from the tenants. Subsequently, this presence was reduced to half-days, which greatly limited the role which the janitor could assume in the study.

The initial idea was to channel all the information concerning equipment breakdowns to the janitor to facilitate the collection of all information. In fact, it was out of the question to request the tenants to contact us in this regard: we would thus be seen as resource people to solve the tenants' problems and this was not our mandate.

Thus, being unable to centralize the information as initially planned, we had to change the procedure and to collect the information where it was to be found, i.e., from Mr. Pierre Girardin with the Société d'habitation du Québec, from Domotique Sécant and from Fabco Électronique. In fact, it so happens that the tenants use these three resources to solve the problems experienced with the various pieces of equipement.

Interviews were organized with these three parties, to collect information on the problems and on equipment breakdowns which occurred at the beginning of the project.

The comments obtained allowed us to issue recommendations on improvements to be made in the equipment, as well as on the support necessary for equipment use.

Our analysis will remain qualitative, however. In fact, even if it is made up of equipment and systems available on the market, the home automation system in unit 108 remains a prototype, due to the interfaces between the various pieces of equipment and the various technologies. It becomes impossible to quantify the cost of the follow-up necessary, especially since this equipment, as is the case for most of the equipment available in the building, is covered by a manufacturer's/installer's warranty.

3.3 Methodology as Pertains to the Third Objective: Relevancy of Elements vis-à-vis Costs

The relevancy of the accessibility and home automation elements is determined partially by the observations made and by the comments provided by the tenants. It is presented in the form of a table.

Here the limits of the information collected should be pointed out, mainly as concerns the home automation elements. It is not possible to generalize, for all physically challenged, the information collected from one physically challenged person facing his own particular limitations, with his own level of independence and his specific interests. The notion of "relevancy" of the elements becomes very subjective here and could not be used for reference purposes in planning new housing projects without being validated by additional data. We did try, however, to set forth the main thrust. The table presents the relevancy in two different columns: the first indicates relevancy for the current tenant in the adapted/automated unit; the second column indicates the relevancy for a wider client group.

The notion of cost makes it possible to relativize the importance of the elements based on a "universal" architectural accessibility budget versus an adaptation budget.

In fact, it is not necessary, nor desirable, to integrate all the accessibility and home automation elements which are included in this study in new housing projects. Certains elements deal more with adaptation, and represent specific replies to the needs of particular individuals.

The cost of the elements can assist us in establishing the limits. The ease with which the elements considered as adaptations can be installed will have to be considered, however, in planning these projects.

As concerns the cost of the accessibility and home automation elements, the sources of information used are the following:

- suppliers and subcontractors having sold and installed the various accessibility and home automation elements in the project;
- data collected by our agency, taken from over one hundred home adaptation files prepared for la Société d'habitation du Québec (city of Montréal), la Société de l'assurance automobile du Québec and la Commission de la santé et de la sécurité du travail.

4.0 RESULTS OF THE TENANT SURVEY

The results presented include, for each participant, a socio-demographic profile, the tenant's shelter history, a summary of major expectations, the use made of the accessibility and/or home automation elements made available to the tenant and the list of elements which each tenant finds particularly important.

4.1 Unit # 108 - Adapted/Automated unit

4.1.1 *Socio-Demographic Profile and Shelter History*

The tenant in unit # 108 is a man about 30 years old. He lives alone.

He became quadraplegic twelve years ago, after a diving accident, and lived ten years in his home area in Sorel. During this time, he always lived in traditional units which did not allow him to be independent in the kitchen, the bathroom nor to enter or leave the unit alone. The tenant did not have any service plan nor any assistance from the CLSC: his spouse and his friends looked after him.

In 1991, the tenant was admitted to le Centre Lucie-Bruneau to start a rehabilitation process. There, he shared a room with another physically challenged person. During this period, he took a cooking course but did not have to prepare his own meals: these were served in a cafeteria. From his room, he had access to a toilet and a bathroom. A common living room was available for all the residents on his floor.

Table 4.1.1 indicates the accessibility characteristics of the building and of the room occupied by the tenant, prior to his arrival in the adapted/automated unit.

The tenant did not experience much difficulty moving about in the building where his former apartment was located. The equipement, controls and facilities were all inaccessible for him.

At le Centre Lucie-Bruneau, the tenant had assistance in dressing himself, transferring from bed to wheelchair, and taking his shower. Given that he was in an institutional milieu, the support staff was very present. Thus the tenant could receive assistance as needed an any time during the day, at any occasion and for any type of activity.

TABLE 4.1.1 **Accessibility Characteristics of Former Unit (at le Centre Lucie-Bruneau) Occupied by Current Tenant in Apartment 108**

ROOM		
Window	.	Inacessible due to furniture
Balcony	.	No door-opening device
	.	Bevelled threshold easy to get over
	.	Turning space on the balcony
Door	.	No door-opening device
	.	No threshold
	.	Turning space in corridor and bedroom
Clothes-Closet (only storage space)	.	Sliding doors
	.	Lateral approach
	.	Standard round door handle
	.	Lower clothes-closet rod
Bed	.	Electric
	.	Remote control
Lighting	.	Wall switch
Emergency Call	.	Pull cords
Toilet	.	Separate from the bathroom
	.	Wide door, easy to open
	.	Did not use the lock
	.	Clearance under vanity, counter at the proper height
	.	Lever faucets
	.	Plumbing trap placed off to the side
	.	Full height mirror
	.	Electric outlet for rasor at proper height, well placed
	.	Medicine cabinet without a door, able to reach all the shelves
	.	No need to transfer out of chair at the toilet, sufficient clearance to approach
Television	.	Remote control
Identification of Visitors	.	Guard at the entrance way, resident advised by telephone

COMMON SPACES

Kitchen	.	Classroom
	.	Clearance under counter along total length
	.	No cupboards
	.	Standard sink
	.	Lever taps
	.	Cook top
	.	Electric appliances always plugged-in
	.	Switch on wall and in front of counter
Bathroom	.	Did not use lift-mechanism, transfer with assistance of two attendants
	.	Clearance around bathtub
	.	Shower bench
	.	Stationary/Hand shower, used by the attendant
	.	Thermostatically controlled faucets, placed on the side of the bathtub, used by the attendant
	.	Grab bar used by the attendant
Public Toilet	.	Did not use it
Mail Service	.	Delivered directly to the room
Laundry Room	.	Did not use it
Garbage Chute	.	None
Exterior Circulation	.	Access ramp difficult (steep slope)
	.	Interaction with vehicles
Entrance - Building Door	.	*Door-opening device with movement detector*
	.	Bevelled threshold
	.	No air-lock
Interior Circulation	.	Very wide corridor
	.	Elevator: - good dimensions - bottons at the proper height, outside as well as inside the elevator - difficulty opening the emergency telephone compartiment
Fire Safety	.	Alarm device too high
	.	Fire drill

4.1.2 Expectations

For the tenant, living in the adapted unit in Ville St-Laurent represents a major transition. At the present time, he has home-care services to help him get in and out of bed, with personal hygiene, grocery shopping and house work. These services are scheduled for specific hours. For most of the other activities, he must get along on his own.

Feeling ready to live in a unit after two years of rehabilitation at le Centre Lucie-Bruneau, the adapted unit in Ville St-Laurent was the first one that he visited. He immediately liked the way the unit was divided up as well as the immediate environment. The trees and lawns in this district of Ville St-Laurent were much more to his taste than the densely populated spaces on Plateau Mont-Royal (le Centre Lucie-Bruneau).

The first time that the tenant visited the unit, the home automation elements had not yet been installed. He had vaguely heard about these, but he did not know really what he was getting into.

It was after having signed the lease that the tenant slowly discovered the features that this unit had.

He was present for the programming and adjusting of most of the home automation elements so that the system became functional and easy for him. Although this process is necessary, the tenant had the impression that home automation was complex to use and that he would require a major learning effort.

On the other hand, he was anxious to start to use the kitchen since, as he confided to us, he likes to cook a lot. His expectations concerning this room and the unit were very high.

4.1.3 Use of Accessibility and Home Automation Elements

The tenant had, after all, lived a long time in an inaccessible unit and during this time he was dependent on others for most of his activities.

Two years at le Centre Lucie-Bruneau had made it possible for him to acquire a certain degree of independence. Living in a unit by himself represents a new challenge.

The tenant's shelter history indicates to us that he tends to adapt to his environment and to make do with the facilities which are provided to him. It is thus foreseeable that he, himself, not use all the facilities made available to him especially since a number of a functions were only there for demonstration purposes (cook top alarm).

Table 4.1.3 lists the accessibility and home automation elements in the unit and common spaces and indicates the use which the tenant makes thereof. The information contained in this table was collected during five interviews with the tenant.

The accessibility and home automation elements made available to him offer a number of possibilities to execute certain tasks. For example, the unit door can be open using the door handle and lock or with a push-botton control activating the door-opener or using a remote control which also activates the door-opener.

Each of these choices represents, for the tenant, a different effort/result combination. The means chosen by the tenant, in our opinion, represents the effort/result combination which is most convenient for him among all the possibilities offered.

Needless to say, although the choice depends, to a great extent, on the architectural characteristics and on the tenant's capacities, it also depends on his personal preferences and tastes.

The table below thus outlines all the observations and comments made during the meetings with the tenant.

Most of the means available to activate the elements are mentioned. The means the tenant used, and why he did not use the other means, are indicated. This is not meant to be a judgment on the quality of the elements and the means but is essentially presented to help in better understanding the importance of the means used for the tenant.

One has to keep in mind, on consulting this table, that there is no miraculous combination which meets all the needs of the physically challenged. Each person, and especially those facing the greatest limitations, has particular needs which cannot be met by any one standard solution. It is thus up to each person to make choices in line with very specific, personal critera.

TABLE 4.1.3 **Use of Accessibility and Home Automation Elements in Unit and in Common Spaces, # 108**

UNIT

Unit Entry Door	. Uses the door-opening device . Usually activates the door-opening device using the small remote control, except in the morning, when he opens the door for the attendant, at which time he uses the larger remote control system. . Is unable to use the key and the door handle/lock; more complicated than the remote control. . Has difficulty using the push-button control inside since he has to back up rapidly to avoid being hit by the door which is opening. Poor positioning of the push-button. Thus, he uses it very rarely. . Does not have any difficulty going through the door opening.
Break-in Alarm	. Does not use it because (according to him) it is does not function. . Does not use the remote programming system (by telephone) because he says he does not know how to operate it. . He is still does not know, or does not remember, how it functions as of the fifth visit. Changes: . An exterior light signal was added. The tenant still does not use it; he says that the system is not operating as it should in the "presence" mode, and does not see the utility thereof in the "absence" mode. . Still does not know how to activate the system for vacation, ambulance/fire protection, remote telephone. During the last visit, he mentioned to us that he must simultaneously press on two buttons on the panel which requires good dexterity.
Turning Spaces	. Satisfied with the spaces in the kitchen, bathroom, storage room, bedroom and dining room. . Narrow dimensions in the entry way due to the wall opposite the door.

Balcony

- Inaccessible balcony due to exterior threshold and the tenant is not capable of operating the lock.
- Cannot use the vertically sliding window in the door.

Changes:

- Balcony raised to eliminate exterior threshold.
- Slight interior threshold which the tenant can use but this requires an adjustment in the slope which would be added in the Spring of 1994.
- The lock was changed so that the tenant can now use it.

Kitchen Window

- Uses the window-opening device without any problem.
- Uses the wall panel control because it is the only way to open the window.
- Has not noticed whether the rain detector is operating.
- Has not noticed whether the window closes when the power is off.

Changes:

- Observed that the rain detector is operating.

Living Room Window

- Does not open the window himself even if the positioning of the furniture is no problem.

Bedroom Window

- Does not open the window himself as the position of the bed prevents him from doing so.

Tenant's remark:

- The dimensions of the bedroom and the positioning of the intercom system does not make it possible to accomodate a double bed while at the same time leaving clearance in front of the window.

Blind-Opening Device/Living Room-Bedroom

- Uses the blind-opening device and is very satisfied with it.
- Without the blind-opening device, he would be unable to open the blinds.
- Opens them in the morning and closes them at night.
- Does not use the timing program because his schedule is irregular.
- At the fifth visit, the tenant told us that he used one scenario in the morning to simultanously open the two blinds; he realizes that it would be just as practical to program a scenario for the evening to shut them at the same time. He will do this.
- Uses the scenarios very rarely.
- Almost always make use of the large remote control system because it is handy.
- Does not use the wall panel because it is located in the corner of the living room to which he does not have access and the other device, in the bedroom, is difficult to access because of the furniture.
- Does not change the horizontal position of the blinds, uses only the open or closed positions, at his choice.

Intercom (close circuit telephone)

- As a rule, uses the system in the corridor, a hand-free adapted intercom with a push-button control.
- Uses the intercom near the bed in the morning, to let the attendant in (same type of apparatus).
- Has difficulty with the regular intercom particularly due to the shape of the telephone and to the mechanism for hanging up the receiver.
- Does not use the telephone to identify visitors, too complicated and not very important for the tenant. Security is not important for him.

Change:

- Uses the television when he is waiting for adapted transportation or when friends are coming to pick him up so he is ready to leave, finds this very practical.

Tenant's remarks:

- His physically challenged visitors are not always capable of opening the building's main entry door. It would be preferable for the tenant to open the door using a remote control door opening device when needed.

Peep Hole

- Does not use this.
- Prefers to ask who is at the door.

Lighting:

. Kitchen: above the sink	. Uses the switch in front of the counter. . The wall switch is not used because it is difficult to reach. . Does not use the other means of turning the light on.
. Kitchen: ceiling light	. Almost always uses the movement detector. . When a visitor uses the wall switch, the Sécant system is put out of sync. Thus he uses a scenario to deactivate the system. . Uses the wall switch to adjust intensity: the Sécant panel seems too complicated for him.
. Entry	. Uses the remote control or the wall switch.
. Storage	. Uses the movement detector; however, he makes very little use of the storage area himself.
. Bathroom	. Uses the movement detector.
. Bedroom, ceiling light	. Uses the movement detector.
. Bedroom, bedside lamp	. Plugged into an X-10 outlet. . Uses the remote control.
	Changes: . Replaced the lamp with a fan for the Summer. . In October, still had not reinstalled the lamp; he is waiting for the occupational therapist.
. Dining Area	. Uses the movement detector. Makes little use of the remote control. . Uses the wall switch to adjust light intensity. It is possible to operate the light intensity with the Sécant panel, but the tenant finds this too complicated.
. Living Room	. Turns on the lamp using touch control.
. Balcony	. Does not use it because the tenant does not want to out on the balcony.

Emergency Call Station (pull cords))	. The tenant has not had to use it. He is quite sceptical, however, as to its efficiency; he believes that neighbouring tenants are not aware of the existence and the signification of the signal in the corridor in spite of the fact that this information was forwarded to the tenant by the Municipal Housing Board. . The tenant informs us that he did not know how to program the telephone numbers. However, the numbers were programmed several times for him. For the time being, the system would sound the alarm in the building and, as the janitor who has the keys is only present approximately four hours a day, the tenant does not have much confidence in the system. . In addition, we observed that the pull cords were rolled up and sometimes difficult to access due to furniture. . The tenant does not wear a neck control, but thinks that eventually be will have it connected to a central surveillance station. . At our the last visit, the tenant still did not have a neck control as he fears that it might be activated by accident and that he will not be able to stop it. . The pull cords remain rolled up because the tenant says that if he falls, in any case, he would not be able to reach the cords.
Kitchen	
. Kitchen Cupboards	. No difficulty with the height of the counter, the clearance under the cook top and the knee space. . Does not experience any difficulty opening the drawers and the lower cupboards. Cannot reach the first shelf in the upper cupboards. In any case, even if they were lower, he does not have the hand strength to use them. . Uses the "Lazy Susan", but has difficulty manipulating it. Also has difficulty opening the door, because of the direction in which it opens. . Makes much use of the sliding drawers. . At our last visit, the tenant had learned to use the "Lazy Susan" with greater ease. . The tenant would appreciate having a pantry.

. Sink	. Has some difficulty with the clearance space under the sink partially obstructed by an electrical basebaord heater. This heater was unplugged so the tenant would not burn himself but the owner refuses to remove it and it takes up space in the clearance. . The tenant uses the shallow sink. He would find it easier to have ordinary faucets instead of single lever fancets. His knees keep hitting the plumbing trap. . At our last visit, the tenant had got accustomed to the single lever faucets which he now appreciates.
. Work Surface	. Uses the retractable work surface under the microwave oven to install his electric frying pan which he makes frequent use of. It would find it practical and safer to have an electrical outlet nearby. . At our last visit, an electricial outlet had been added.
. Cook Top	. Uses the cook top but fears getting burned while moving pans and adjusting the controls. Controls on the side of the cook top would be preferable. . Does not see the utility of the timer and the warning bell. This element bothers him, in particular, as he does not know how to remove it.
. Ventilating Hood	. Uses the controls at the front of the counter because he is unable to use those on the hood. . The extinguisher has never been used.
. Microwave/ Convection Oven	. Uses the sliding module which he considers essential. The tenant could not use the microwave oven before the sliding module was installed. . The tenant would find it easier if the door of the microwave oven opened in the opposite direction (right hand). He was told that this model is not available. Provision should me made for this in designing kitchens. . Does not have any difficulty with the controls. . The mechanism for opening the microwave oven door is very difficult to activate for the tenant. He must press and pull at the same time: he uses his forehead.

. Electrical Outlets	. Uses the electrical outlets at the front of the counter for the appliances which he uses on a daily basis. . As he cannot reach the wall outlets, he thus uses them for appliances which are always plugged-in, among others, the coffee maker. . At his request, an electrical outlet at the front of the counter was added near the microwave oven, to plug in his electric frying pan which he sets on the work surface.

Bathroom:

. Special Bi-fold Door with reduced opening radius	. The tenant says that he is not having any trouble with the door. However, as he lives alone, the door is rarely shut.
. Counter/ Vanity	. The tenant uses it. . Does not have any particular difficulty with the height of the counter, clearance, wash basin, plumbing trap and mirror. . Would prefer ordinary faucets as opposed to single lever model. . Never uses the electrical outlet for the rasor.
. Bathtub	. The tenant uses it. . The tenant uses the shower bench and is helped on to the bench by an attendant. The space in the bathroom is sufficient to make this transfer comfortably. The shower bench was easily installed in the bathtub. . The hand shower, faucets and grab bars are used by the attendant.
. Toilet	. This physically challenged tenant cannot use the toilet.

Bedroom

. Special Bi-Fold Door	. Never closes the bedroom door.

. Clothes-Closet	.	The tenant does not use the clothes-closet. The attendant looks after opening and closing the door and hanging up and removing the clothes.
	.	The tenant does say, however, that he could get along alone, but he has never tried.
	.	When he is alone, the tenant leaves his clothes/coats on a chair or on a piece of furniture.
	.	The occupational therapist finds that the clothes-closets rod is a little high (54" instead of 48").
. Electric Bed	.	The tenant uses it.
	.	The tenant operates his electric bed using the larger remote control system.
. Storage	.	The tenant does not use the storage areas. These activities are handled by the attendant. He could, however, access these areas. Much space in the bed linen closet in the bathroom was taken up by a baseboard heater; the latter was removed but the tenant still does not use it. As pertains to the strength of his upper body members and of his hands, there is little likelihood that the tenant use the storage space with the exception of shelves at his arm height and the sliding doors.
X-10 Outlets	.	The X-10 outlets in the living room are not used as he does not have any appliances to plug into these outlets. The tenant prefers to use his tv/sound system remote control rather than the larger remote control system.
	.	One electrical outlet is used in the bedroom: a lamp or a fan is plugged in here. He never moves these appliances and always turns them on and off using the remote control.
	.	There is a second X-10 outlet in the bedroom, but the tenant does not want to use it because it is connected to the wall switch. When the switch is turned off, the appliances connected to this outlet no longer function.
	.	The tenant does not see the utility of the X-10 outlet in the entry, he saids that if a samll table were placed there, he would not be able to get through in his wheelchair.
	.	The tenant does not use the X-10 outlet in the storage area.
		The tenant plugged in a fan (Summer only) in the X-10 outlet in the dining area. He never moves it and turns it on and off with the remote control.

Heating

- The tenant has not yet used the heating.
- Can manipulate the wall thermostats. .
- Does not have a clear understanding of the programming for the home automation system. Would like to use the Sécant panel, to control temperature in the whole unit from one location, but observes that setting thermostats has priority over the home automation system. The tenant cannot seem to get to the point where he can operate the system to his satisfaction.

Scenarios

- The tenant uses two scenarios:

  OFF: When he has visitors, to avoid any programming mix-up (in particular, when his daughter comes to visit him).

  DAY: He activates it when he gets up in the morning.

Security/ Evauation

- The tenant is unable to activate the alarm system in the building's corridor.
- In case of a power failure, he is unable to open the doors manually because the door-openers make this too difficult.
- The tenant is unable to lock the door of his balcony which is supposed to be a refuge in case of fire, this was corrected by changing the lock.
- To the tenant's knowledge, there was one meeting concerning a fire drill in December, but he did not go.

Living Environment

- The tenant has one young child who visits him regularly. He feels slightly uncomfortable living in a building where most of the tenants are seniors.

COMMON SPACES

Parking	. Uses it when he travels with his friends since he does not have a car himself. Does not have any difficulty.
Exterior Pathways	. Moves around without difficulty.
Ramp	. Uses it alone but with a lot of difficulty as the slope is too steep for him. . Does not use the railing as he needs his hands to move the wheelchair. . Cannot use it alone when it is raining or snowing. The hand rim on his wheelchair becomes too slippery.
Entrance Door	. Uses the door-opening device because the door is too difficult to open. The tenant affirms that the door-opener creates this problem. He would probably be unable to open it, in any case. . As a rule, uses the small remote control and only rarely the push-button controls. . The tenant finds that the opening time is clearly insufficient. . Changes were made in the opening time but the tenant has not yet tested these.
Air-Lock	. Does not have any difficulty.
Interior Door	. Uses the door-opening device and the remote control. . Is unable to use the key-activated lock because of the time required. . The opening time for this door is also insufficient.
Circulation in Building	. The width of the corridor is sufficient and the tenant can turn around in various locations. . The carpets makes circulation difficult. . The tenant does not use the handrails. . The tenant and the occupational therapist mentioned that the corridor has a transversal slope toward the street which hinders circulation.

Mail box

- Mail is picked up by the attendant. According to the tenant, he is capable, however, of going and picking up the mail himself. We asked him to try.

Garbage Chute

- The attendant takes care of the garbage. According to the tenant, he would be able to do this himself. We asked him to try. The tenant was unable to open the chute hatch.

Laundry Room

- The attendant does the laundry.
- The tenant did, however, accept to try. He can open the door with the door-opening device without any difficulty. He is unable to use the machines and did not attempt to get close to the counter.

Public Toilet

- The tenant does not use the toilet in his unit, nor the public toilet. At our request, he nevertheless attempted to open the door which he is capable of doing by using the door-opening device. He would not be able to lock the door.

Community Room

- As the community room door is open all day long, the tenants rarely use the door-opening device.
- To go to the backyard, the tenant uses the push-button control and the door-opening device.
- He is unable to use the key-activated lock to operate the door-opening device and enter the community room.
- He is capable of using the panic bar but this requires too much effort from him.
- At the tenant's request, he will soon be able to activate the door-opening device for the exterior door using his remote control.
- According to the tenant, the remote control for the door-opener is low quality; he has to hold it up in the air as it does not operate properly on his lap.

4.1.4 Particularly Important Elements

During the last interview, we asked the tenant to indicate to us the home automation or accessibility elements which he would choose if, among all those made available to him, he could only keep three.

He mentioned to us:
- the intercom to identify his visitors and to let in the attendant in the morning;
- the electromechanical door-opening devices and the remote control;
- the adapted kitchen. The kitchen contains a number of accessibility and home automation elements; the tenant considers it as one whole entity, however, as it is the element package which can makes it possible for him to carry on his activities there. He does not want to prioritize the various elements in the kitchen.

Curiously, the tenant, as is the case for almost all the other people questioned, did not mention obstacle-free access to the building (ramp) and interior circulation as being important elements. It would seem, after discussing this, that they take these elements for granted and that, for this tenant, these two elements were not on our list. The conclusion to be drawn here is that access to the building and obstacle-free circulation within the building are essential for the tenant.

The tenant also mentioned to us that the following elements were important:
- movement detectors to control the lighting;
- remote control which makes it possible for the tenant to turn on lights when he hears something and cannot get up;
- easy access to all rooms in his unit;
- blind-opening device;
- window-opening device in the kitchen and,
- the X-10 outlets into which the bedside lamp in the Winter, and the fan in the Summer, are plugged.

Other elements, of no use for him, are:
- the break-in detector;
- the security timer for the cook top.

Lastly, the tenant seems rather ambiguous about certain elements. They would very important without the home automation system and without the other equipment, but given the fact that the latter more than fill the bill, these other elements becomes useless for the tenant. This is the case for switches (height-location), replaced by movement detectors as well as lever handle and easy-to-use locks, which have been replaced by electromechanical door-opening devices.

Among elements judged very important, going from the most important to the least important:

- obstacle-free access to the building
- obstacle-free circulation in the building and in the unit
- electromechanical door-opening devices and remote control
- the adapted kitchen, with special mention for the cook top and the microwave installation on sliders
- bathroom: turning space, clearance around bathtub, clearance under the washbasin, lever faucets, easy access to the toilet
- lowered controls (switches, thermostats)
- kitchen window opening-device
- blind-opening device

Among the elements judged fairly important:

- possibilities offered by the home automation system, particularly the telephone alarm system in case of an emergency, the neck control and the pull cords
- the fact that there were other physically challenged people in the building is reassuring for the tenant. The tenant does not think that the fact that the other tenants are seniors is a problem. On the contrary, according to him, these people are more open.

Among the elements judged interesting but not essential:

- movement detectors to automatically turn on the lights
- heating control by the home automation system

4.1.5 Occupational Therapist's Comments

The occupational therapist considered as useless the security timer for the cook top, at least for this tenant. In general, she was satisfied with her client's situation. She does suggest, four improvements, however, for future projects.

1) position the building entry at ground level so as to avoid the ramp
2) design the bedroom so that it is a little larger
3) avoid the carpet which hinders circulation in the corridor
4) choose a window locking and opening mechanism which is easier to manipulate.

There would appear to be a discrepancy between the occupational therapist's perception and that of her client, the tenant. We can assume that this is not based her evaluation of the tenant's capacities, but rather on subjective differences in values and priorities.

This underscores the importance of tenant participation in selecting the technical assistance which the tenant will have to use. The occupational therapist who recommends the technical assistance may be well aware of her client's needs, but without necessarily knowing her tenant's interests.

4.2 Unit # 212, Adapted

4.2.1 Socio-Demographic Profile and Tenant's Shelter History

The tenant in unit 212 is a English-speaking senior who lives alone. Subsequent to breaking her hip, she now moves about with the assistance of a walker.

This accident meant that she spent one year in a hospital before moving into her new unit. The unit where she lived before her accident was of traditional design and she had to use a stairway to access it.

4.2.2 Expectations

The tenant did not have the opportunity to visit the unit before moving in. She was not really informed of the accessibility characteristics of the unit nor of her possible participation in this study.

Thus she did not have any particular expectations, other than her satisfaction about not having to use a stairway to enter the unit: the building had an elevator. Concerning the unit as such, there was no way for her to know what to expect.

At first contact, three elements impressed her favorably: the unit was new, economically accessible and the bathroom was large.

At the time of our first visit, the tenant had only been in the unit for one month. She had not yet had the opportunity to use all the accessibility elements nor to explore the building's common spaces. In fact, we had observed that she was disoriented by her move. She had difficulty moving about.

At our subsequent meetings, the tenant became increasingly more mobile. At out last visit, we observed that the tenant always remained standing in her unit and that she no longer uses her walker inside the unit. This is a person who likes to be independent. She is requesting less and less home-care services for her personal hygiene. She had to give up the wheelchair which was lent to her by CLSC and had made enquiries as to obtaining one of her own.

She looks after the maintenance of her unit herself and has special need of assistance to do the grocery shopping. The tenant is learning how to use the facilities offered in the unit and in the building. She is increasingly acquiring more confidence and independence.

4.2.3 Use of Accessibility Elements

Table 4.2.3 indicates the use which the tenant makes of the accessibility elements made available to her in her unit and in the common spaces in the building.

The remarks formulated in section 4.1.3 also apply here.

TABLE 4.2.3 - Use of Accessibility Elements, # 212

UNIT

Unit Entrance Door	. Uses the door-opening device. . Finds it very pratical especially when carrying packages. . Moves through the door opening without difficulty. . Now has a remote control which she uses and finds satisfactory.
Turning Space	. Satisfied with the turning spaces everywhere in the unit.
Balcony	. Uses the door-opening device. . Finds this easier than using the door handle due to her walker. . Finds the closing time a little tight. Subsquent to this comment, the closing time was adjusted to her satisfaction. . The threshold is too high to access the balcony, she has difficulty here. . Does not spend much time on the balcony because she finds that it is too noisy.
Kitchen Window	. Uses the window-opening device since we showed her how to operate it. . Uses the wall control panel as this is the only way to open the window. . Has not noticed whether the rain detector or the power failure detector are operating.

Living Room Window	.	Can easily open/close the window (sliding windows on ball bearings).
	.	Has difficulty opening the vertically-opening window in the door.
Bedroom Window	.	Has trouble opening/closing the window (standard sliding window).
Opening/Closing the Blinds in the Bedroom and Living Room	.	Does not have any difficulty.
Identifying Visitors	.	Uses the telephone receiver on the intercom but has difficulty hanging up the receiver.
	.	Uses top peephole.
	.	Would not find it useful to have a remote control to open the door. Uses the handle/lock or the push-button control. Since the last visit, she has received a remote control which she is using and appreciates.
	.	The tenant does not subscribe to cable tv and does not know that she could use the television screen to identify visitors. She was informed that she could do so using channel 9.
Lighting	.	Uses, without difficulty, all the switches in the unit.
Kitchen	.	Cooks in a standing position.
	.	Thus she does not use the clearance under the sink and under the cook top.
. Cupboards	.	Satisfied with counter height.
	.	Opens/closes without difficulty all the cupboard drawers and doors.
	.	Can easily reach the first shelf in the upper cupboards.
. Sink	.	Prefers the lever faucet to the traditional ones.
	.	Does not have any difficulty with the depth of the sink.
. Ventilation Hood	.	Uses the switch at the front of the counter.
. Cook Top	.	Does not have any difficulty with the location of the control buttons.

. Microwave Oven	. She did not know how to use the oven. The tenant in unit 108 explained this to her and since then she has been exploring the appliance's possibilities with pleasure. . She finds the microwave easy to use. However, she is not convinced of the efficiency of the convection option. She would have preferred a conventional electric stove for making cookies, etc.
. Electrical Outlets	. She never leaves appliances permanently plugged-in. . Sometimes she uses the electrical outlets located at the front of the counter. . Mainly uses the wall outlet, located near the microwave and the cook top.
Bathroom	. The tenant remains standing for the most part. Thus, she does not use the clearance under the wash basin, but appreciates the counter height. . She appreciates the single lever faucet which is easier for her to manipulate. . She had no comments on the full height mirror. . She never uses the electric outlet. . She uses the grab bars near the toilet and in the bathtub which she finds well located. Since the grab bar near the toilets was installed, she no longer needs to lean on the walker to make the transfer. . The tenant needs CLSC assistance in the bathtub. At our last visit, she bathed herself without any assistance. . The tenant finds that the medicine cabinet is easy to access. She can reach all the shelves. . She added a rubber carpet inside the bathtub, to prevent her from slipping (she is not 100 % sure of the no-slip bottom.) . She uses the hand shower. . The tenant put in an application to the CLSC for a shower bench.
Bedroom	. Does not have any difficulty opening/closing the bedroom door and the door to the clothes-closet. . Appreciates the height of the clothes-closet rod.
Storage	. Uses all the storage spaces, without any difficulty, except for the top shelves which are hard to reach.

COMMON SPACES

Parking	.	The tenant does not have a car and never uses the parking space.
Exterior Circulation	.	The tenant occasionally uses a manual wheelchair when she ventures outside. However, she does need assistance. Her wheelchair was lent to her by the CLSC and she had to give it back. She has filed an application to obtain her own.
	.	She uses the walker for very short distances: to get to the taxi when she plays bingo.
Access Ramp	.	Uses the access ramp with her walker, instead of the stairway.
	.	Must be assisted when on the ramp in her wheelchair.
	.	Does not use the handrails.
Landing / Air-Lock / Door	.	The tenant only rarely leaves the building (less than once a month). She never leaves alone. The people accompanying her open and close the doors, etc.
	.	At our last visit, we observed that the tenant was going out more often, always accompagnied or in a taxi. She uses the electromechanical door-opening device which she operates using her remote control.
Mailbox	.	The tenant picks up her mail herself.
	.	She finds that her mailbox is too low. She has difficulty reaching it, opening it and taking out her mail.
	.	When she goes to get her mail, the tenant uses the walker.
Circulation in Corridors	.	The tenant does not have any difficulty circulating in the corridors. She did not make any comments on the rug.
	.	Uses the walker in the corridors.
Elevator	.	The tenant finds the height of the elevator control buttons adequate.

Laundry Room	.	At the beginning, the CLSC looked after the tenant's laundry.
	.	At the present time, the tenant does her own laundry. She does not have any difficulty inserting the change in the collection boxes and taking the clothes out of the machines. Since she no longer has a wheelchair, she uses her walker to go to the laundry room and has difficulty carrying the clothes.
Garbage Chute	.	Did not realize that it existed.
	.	We showed it to her.
	.	She has yet to use it.
	.	At our last visit, she used the garbage chute on the second floor (without a door-opening device). She sometimes requests assistance from a neighbour.
Public Toilet	.	She had not yet used it.
	.	We showed her where it was.
	.	She promised to try it.
	.	She has yet to try it.
Community Room	.	She had never visited the community room nor gone out in the backyard.
	.	At our last visit, the told us that she occasionally went into the community room. She has not yet met an English-speaking person.
Communication	.	The tenant finds that the volume of the loud speaker in the unit is set too high.
Security/ Evaluation	.	The tenant does not know whether she can set off the fire alarm herself.
	.	She has already heard the fire alarm.
	.	She does not know what to do in case of an alarm.
	.	At our last visit, she had received information and was preparing for the fire alarm drill scheduled for the end of December.

4.2.4 Elements Particularly Important for the Tenant

When we ask the tenant to identify the three elements most important for her, she mentioned to us:

- the electricomechanical door-opening devices
- the laundry room in the building
- grab bars in the bathroom

She also found it useful to have a remote control to activate the door-opening devices, and appreciated the size of the bathroom.

The other accessibility elements in the building and in the unit left her indifferent.

During the last interview, we tried to find out how interested she was in the facilities offered by the home automation system. After having explained the various possibilities to her, she did not seem to have any interest in regulating the heating, in movement detectors automatically controlling the lighting, in the break-in detector, nor in the telephone remote control system.

The tenant is a person who likes doing things herself.

4.3 Unit 312, Adapted

4.3.1 Socio-demographic Profile and Resident's Shelter History

The tenant in unit 312 is around 40 years of age and lives alone.

She has a neuromusuclar disease, which she has had since her infancy. Her physical condition has deteriorated progressively over the last 20 years and, at the present time, the tenant moves around in a manual wheelchair. She can get up to reach objects and can walk short distances using an orthotic device. She gets tired very quickly, however, and has limitations as pertains to manual dexterity and to the physical strength of her upper members.

The tenant would like to obtain a motorized wheelchair which would greatly assist her in moving around and increase her independence.

Previously, the tenant lived with her parents, on the ground floor of a duplex.

In this unit, she had numerous difficulties:

- steps and door thresholds which made circulation difficult;
- she could not enter either her bedroom or the bathroom in the wheelchair;
- she did not have any space to circulate easily in the house;
- the entry was long and narrow, thus making it difficult to enter the house
- the vertically-sliding windows almost impossible to open or close for the tenant;
- she could not reach the medicine cabinet;
- the toilet was too low and the transfer to the toilet was very difficult;
- the faucets in the kitchen and in the bathroom were difficult to manipulate.

4.3.2 Expectations

In her new unit, the tenant lives alone. She appreciates her privacy and the greater degree of independence she has due to the architectural accessibility features in the unit and common spaces.

Her first reaction was very positive: the unit was nice and she was anxious to try the bathroom and the kitchen.

At the present time, she is receiving assistance for house keeping chores, i.e., three hours a month. The also receives assistance from her parents to do the grocery shopping and occasionally, uses the services provided by PIMO, a community agency set up to provide supportive care to the physically challenged.

The tenant has made a number of friends in the building. However, these are seniors who cannot push her wheelchair when she is outside.

4.3.3 Use of Accessibility Elements

Table 4.3.3 indicates the use which the tenant makes of the accessibility elements made available to her in her unit and in the building's common spaces.

TABLE 4.3.3 - Use of Accessibility Elements, # 312

UNIT

Unit Entry Door	. Uses the door-opening device. . Cannot open the door without the door opening device as this is too difficult. The tenant is unable to open the door in case of a power failure. . Has difficulty with the interior push-button control which is poorly positioned. She also has difficulty with the key-activated control as the handle has to be rotated to turn the key. . No problem getting through the doorway (threshold). Modification: . The tenant now has a remote control to activate the door-opening device. She still cannot open her door in case of a power failure.
Turning Space	. Maneuvring through the entry is difficult due to lack of space between the door and the wall facing it. Modification: . The tenant had a plexiglass sheet installed to protect the lower part of the wall.
Balcony	. Exterior threshold makes the balcony inacessible for someone in a wheelchair. The tenant was not to be out-done and tried to go through the opening using her orthotic device but fell. . The lock on the balcony door is difficulty to manipulate for the tenant. . Vertically sliding window in the door is difficult to open. Modification: . The lock in the door was replaced in November by a model which is easier to manipulate by the tenant.
Kitchen Window	. Uses the window-opening device. The tenant finds that opening this window allows for good air flow.
Living Room Window	. The glazed panels on rollers and the larger handle make it possible for the tenant to open and close the window easily.

Bedroom Window	.	Has difficulty opening and closing the window. The occupational therapist unsuccessfully tried to find a technical device to allow the tenant to use the window. According to the tenant, the handle is too small and hard to grasp for most of the users.
Opening/Closing the Blinds in the Bedroom and in the Living Room	.	Has some difficulty here. The tenant must use both hands, due to a lack of co-ordination and manual dexterity. The occupational therapist is also looking for some sort of technical devices to help her.
Identifying Visitors	.	Uses the intercom telephone receiver but has difficulty hanging up the receiver.
	.	Gets up to use the upper peep hole in the door; the lower hole is too low.
	.	Since the tenant received her remote-control device, she uses it approximately 50 % at the time to open the door for visitors.
Lighting	.	Uses all the switches without any difficulty. The tenant would, however, have preferred them lower.
Kitchen:	.	The tenant finds that the cupboards are too high, even if she can reach the first shelf in a seated position. She has difficulty grasping and setting down objects due to the lack of strength in her upper body members.
. Kitchen Cupboards and Counters	.	She also finds the counters too high.
	.	The tenant works standing up or in a seated position although when she seated, she has trouble with her back and has more difficulty using her arms.
	.	Appreciates the "Lazy Susan".
	.	Would like a pantry.
. Sink	.	Satisfied with the clearance under the sink and with the space created by moving the plumbing trap.
	.	Satisfied with the lever faucets.
	.	Prefers a deeper sink which contains more water for washing the dishes and which would generate less splashing.
. Ventilation Hood	.	Always uses the switch at the front of the counter.
. Cook Top	.	Is afraid of burning herself if she uses the control buttons.

. Microwave	. Appreciates the microwave oven. . The tenant did not cook very much when she lived with her parents. . Finds the oven a little too high. . Would prefer the door to open in the other direction. . Uses the work surface under the oven to set plates on. . In the beginning, the tenant did not use the convection component of the oven but she is now gradually learning to do so.
. Electrical Outlets	. The tenant was afraid to use the electrical outlet at the front of the counter. At the third visit, we observed that she was using it. . Would like to have another electrical outlet at the front of the counter, between the cook top and the microwave. . Uses the electrical outlet on the wall for appliances which are permanently plugged-in because they are difficult to access.
Bathroom	. The tenant uses her wheelchair or her orthotic device in the bathroom depending on how she feels physically. . Does not have any difficulty opening/closing the bathroom door. . Appreciates the height of the counter, the clearance under the wash basin and the lever faucets. . Uses the electric outlet for the hair dryer. The tenant is satisfied with the height and the positioning. . Uses the grab bars to transfer to the toilet when she is the wheelchair. . Does not use the grab bars in the bathtub. During our first few visit, the tenant did not have a shower bench. She sat directly on the bottom of the bathtub. Since that time, she has obtain a transfer board. She uses it when she feels weaker but prefers to sit in the bottom of the bathtub because she is not as cold there. . Does not use the hand shower, as the wall shower is preferable as far as she is concerned. Since the shower is not exactly in the centre of the wall in its stationary position, the tenant had an additional hook added. . The heater prevented easy access to the linen closet and it was replaced by a built-in model. . Uses the linen closet in a standing position.

Bedroom	.	The tenant has a single bed and thus she can move about more easily in the bedroom.
	.	The bedroom door does not open completely because of the wall. The tenant had a plexiglass sheet installed to protect the wall.
Storage	.	Uses the storage areas in a standing position as she does not have much strength in a seated position.
	.	Moved the shelves and rods up to make them easier to reach in a standing position.
	.	The occupational therapist observed that the type of handle used for the clothes-closet door is difficult to use for a large number of people.
Emergency Call Station	.	As of our last visit, the tenant had not yet used the emergency call system. The pull cords were still rolled up. With her consent, we unravelled them so they could be reached on the ground if she were to fall. She is nervous, however, as to what will happen when young children come to visit her.

COMMON SPACES

Parking	.	Does not have a car.
	.	Uses the reserved parking space with friends.
Exterior Movement and Access Ramp	.	The tenant does not move around alone outside the building.
	.	She does not have the physical strength necessary to manoeuver her wheelchair. Someone has to push her.
Landing / Air-Lock / Door	.	Uses the door-opening device.
	.	Has difficult using the key-activated entry system due to the rotating movement necessary to operate the handle.

Modifications:

- The tenant now has a remote control to activate the door-opener.
- She uses this remote control 9 times out of 10. She still sometimes uses the push button control inside.
- The door-opening time was increased which satisfies the tenant.

Mailbox	.	Uses the wheelchair to pick up her mail.
	.	Satisfied with the mechanism for opening her mailbox.
	.	Finds her mailbox too low.
Circulation in Corridors	.	Difficult to move about in the corridors because of the carpet.
	.	Difficult to grasp the handrails (size, shape).
	.	Occupational therapist suggests handrails on each side of the corridor for hemiplegics.
	.	Adapted units are located at the far end of the corridor which requires additional effort by the physically challenged to move about.
Elevator	.	Uses the elevator and is satisfied with it.
	.	Has difficulty with the emergency telephone because the cord is too short.
Laundry Room	.	Does not use the laundry room. Doing her washing requires too much energy for her.
Garbage Chute	.	Uses the ground floor chute as the door is equipped with an automatic door-opening device.
	.	On occasions leaves her garbage bags beside the chute hatch which is heavy and difficult to manipulate for the tenant.
Public Toilet	.	Does not use it. Prefers to use the toilet in her unit.
	.	The tenant, at our request, did use it without any difficulty.
Community Room	.	Uses it and does not have any difficulty.
	.	Never goes out alone in the yard.
Security/ Evacuation	.	A fire drill was organized for December 17.
	.	The firemen are already aware of the units occupied by physicalled challenged tenants.
	.	The tenant is a little confused as to the guidelines given during the meeting with the firemen. She still cannot go out on the balcony.

4.3.4 Particularly Important Elements for the Tenant

When we asked the tenant to indicate to us the three most important elements for her, she mentioned the following:

- electromechanical door-opening device for the main entrance doors and for the unit, as well as the remote control
- open circulation and access to all the rooms in the unit
- possibility of wheelchair access to the bathroom and the grab bars which makes transfer possible

She considers that the accessibility elements in the kitchen are currently useful but that they will become essential as she is forced to use her wheelchair more and more.

Other useful, but not essential, elements are:

- the emergency call station (pull cords) for security
- lever handles
- sliding doors on rollers
- lowered switches and thermostats
- intercom near the bed

During the last interview, we explored her interest for the facilities offered by the home-automation system. After having explained the different possibilities to her, she said that she was interested in the movement detectors which automatically control the lighting, and in the possibility of programming the heating. She is not interested in the remote alarm system in case of emergency.

Lastly, the tenant made the following comments to us.

Two elements disappointed her: the size of the room and the fact that the kitchen counter was too high.

On the whole, she does, however, appreciate her unit: it is new, pretty, has a balcony and the kitchen appliances are provided.

She would have preferred to live in a building with a greater tenant mix. She has made friends in spite of the generational difference but she still sometimes feels excluded beacause of her age.

4.4 Unit # 414

4.4.1 Socio-demographic Profile and Resident's Shelter History

The tenant in unit 414 is an anglophone about 40 years old who lives alone.

Subsquent to a automobile accident, this tenant became paraplegic 20 years ago and he moves about in a manual wheelchair. The tenant is quite tall, over six feet; in a seated position he is higher in his wheelchair than the most of the people in his condition. This has a certain impact on the use made of the wheelchair and on his satisfaction with the accessibility equipement made available to him.

The tenant is interested in architectural accessibility, he has documentation on this subject and is forever coming up with new solutions to problems which are experienced.

Before moving in to 680 boul. Ste-Croix, the tenant lived in a traditionally designed studio unit in a multi-unit building in Ville St-Laurent. He lived alone and, at is the case today, did not receive any exterior assistance.

In his former unit, the tenant accessed the building by the back entrance, using an access ramp with a very steep slope.

He could get around easily in the corridors of the building, but had difficulty using the elevator because of the height and the location of the control buttons.

The studio unit in which the tenant lived was traditionally designed and had not been adapted to his needs.

It presented the following difficulties for the tenant:

- no turning space in the entry, the kitchen and the bathroom
- no access possible to the balcony because the threshold was too high
- difficulty opening/closing the only window in the unit, as the handle was positioned too high in a corner without sufficient clearance
- difficulty identifying visitors, could not use the intercom nor the peep hole in the door, as these elements were located too high
- kitchen was traditionally design without any clearances
- the tenant had to have the door removed from the bathroom in order to access it, difficulty with the vanity without any clearance, electric outlet for the rasor was too high, height of the medecine cabinet was not appropriate and insufficient clearance in front of the bathtub which made transferring difficult

- difficult to use the storage spaces due to width of the door opening and to the height of the clothes-closet rod
- seasonal storage space was not accessible
- mailboxes not accessible
- laundry room and garbage chute difficult to use because of the lack of space and doors which were too heavy

4.4.2 Expectations

It was at a food bank where the tenant first time heard about his current unit.

Being interested in architectural accessibility, he knew what facilities he would find in his new unit and is in a position to appreciate them.

Two elements in particular interested him: the electromechanical door-opening devices and the fact that he could use the main door of the building, just like the other tenants.

4.4.3 Use of Accessibility Elements

Table 4.4.3 presents the use which the tenant makes of the accessibility elements available to him in his unit and in the building's common spaces.

TABLE 4.4.3 - Use of Accessibility Elements, # 414

UNIT

Unit Door	. Always uses the electromechanical door-opening device. . Finds that the push-button control on the inside is poorly positioned: has to back up to avoid being hit by the opening door. . At our last visit, the tenant had received a remote control which he uses and appreciates.
Turning Space	. The wall between the microwave oven and the entry hinders circulation.
Balcony	. The exterior threshold prevents the tenant from going out on the balcony. . The door's lock is difficult to manipulate. . At our last visit, the lock had been replaced to the tenant's satisfaction.
Kitchen Window	. Uses the window-opening device.
Living Room Window	. Appreciates the mechanism which greatly facilitates opening and closing the window.
Bedroom Window the	. Uses this window but finds it more difficult than window in the living room.
Opening/Closing the Blinds in the Bedroom and the Living Room	. Does not have any problems.
Identifying Visitors	. Uses the intercom but finds the receiver difficult to hang up. . Has difficulty using the peep hole which is too high or too low. . Does not have a television and thus cannot identify visitors using the camera in the air-lock.
Lighting	. Uses the switches without any problems but would have preferred them a little higher or a little lower.

Kitchen	.	Has difficulty operating in the kitchen as it is "U" shaped.
. Cupboards	.	Lacks storage in the lower cupboards and lacks sliding doors.
	.	Would have liked to have had a pantry.
	.	"Lazy Susan" is not well positioned, would have preferred a clearance between the sink and the cook top.
	.	Knee room is not deep enough for him.
. Sink	.	Finds that the sink is not really deep enough and causes splashing.
	.	Has difficulty with the clearance under the sink; too low for him to use it.
. Ventilation Hood	.	Uses and appreciate the controls at the front of the counter.
. Cook Top	.	Has difficulty with the clearance under the cook top; too low for him to use it.
	.	Finds that the position of the control buttons makes it dangerous to use the cook top.
. Microwave	.	Has difficulty as the door opens in the wrong direction.
. Electrical Outlets	.	Uses the outlet at the front of the counter for his mixer. If he had other appliances, he would use the wall outlets and leave them plugged-in permanently.
Bathroom	.	Has difficulty with the clearance under the sink which is too low.
	.	Has difficulty shutting the door when he is in the bathroom. Would need a pull-type handle or spring hinges.
	.	Has difficulty reaching the upper shelf in the medicine cabinet.
	.	Finds that the height of the toilet is ideal.
	.	Finds that the towel rod is poorly positioned.
	.	Uses the grab bars for the toilet and the bathtub.
Bedroom	.	Too small.
	.	Has difficulty entrering/leaving the room because the door does not open completely: it hits against the wall.

COMMON SPACES

Parking	.	Never uses the exterior parking.
Exterior Movement	.	Has no difficulty moving around outside the building. Moves about independently.
Access Ramp	.	Uses the ramp without difficulty. Never uses the handrails.
	.	Would prefer the building entrance to be at ground level without any ramps or steps.
Landing / Air-Lock / Door	.	Always uses the electromechanical door-opening devices.
	.	Has difficulty using the key-activated entry system in the air-lock due to its location.
	.	At our last visit, the tenant had a remote control device which he was using and he appreciates it.
Mailbox	.	Has difficulty with his mailbox because it is too high. The tenant does not want to change his mailbox, however, as he is concerned that the post office would make errors.
	.	It is noted that mailboxes are assigned by storey; the fact that some tenants are physically challenged is not a criterion.
Circulation in Corridors	.	The tenant gets around easily in the corridors.
Elevator	.	The tenant uses the elevator and finds it perfect.
Laundry Room	.	Uses the laundry room and the machines without any problem.
	.	The clearance under the sink in the laundry room is too low; the tenant cannot use it.
Garbage Chute	.	Even if he lives on the fourth floor, the tenant uses the garbage chute on the ground floor because of the electromechanical door-opening device.
	.	Does not have any trouble opening the hatch.
Public Toilet	.	Rarely uses the public toilet; does not have any difficulty doing so.

Community Room . Occasionally goes down to the community room and does not have any difficulty doing so. His only comment concerns the clearance under the tables which he finds too low.

Communication . Finds the building's communication system adequate.

Security/ Evacuation . Is aware of emergency procedures.
. Would be quite difficult for him to seek refuge on the balcony in case of fire due to the exterior threshold.

Access to Yard . Before getting his remote control system (electromechanical door-opener), the tenant entered the building through the yard, as he was easier for him to use the key-activated entry system in the back door than the entry system in the air-lock.

4.4.4 Particularly Important Elements for the Tenant

When we asked the tenant to indicate to us the three most important elements, he pointed out:

- obstacle-free entrance way (access ramp)
- clearances under the kitchen sink and under the wash basin in the bathroom (which are not functional for the tenant at the present time)
- the electromechanical door-opening devices and the remote control

He also finds the turning spaces useful and the fact of having access to all rooms in his unit. Moreover, he had the following comments for us:

- He would have preferred slider-mounted storage spaces in the kitchen. He makes virtually no use of the current storage space.
- He would also have preferred an open kitchen in an "L" form to be able to move about easier than in a "U"-shaped kitchen. Similarly, he would have preferred an open studio unit rather than a unit with three small closed rooms.
- Lastly he mentioned to us that he greatly appreciates the fact that he can use the same door to enter the building as everybody else.

Turning the last interview, we sounded out the tenant's interest for the facilities offered by the home automation system. After having explained the various possibilities to him, the tenant said he was interested in the movement detectors which automatically control the lighting, and in the telephone emergency alarm system.

Being able to regulate the heat is not important for him. When it comes right down to it, in a building where the tenants do not have to pay their own heating bills, only those with highly developed environmental consciences will be interested in regulating their heating systems.

4.5 Sampling of Tenants Living in a Traditional Units

The initial group was made up of four tenants, all elderly ladies. During the study, two of the four withdrew. The first one was hospitalized and the second one lost her son. This two participants were replaced by three new people.

We thus have two people who were only interviewed in June and three others who were only interviewed in November.

Among the two people whom we meet on two occasions, there is one lady who is physically challenged. In her case, the interview was more detailled as we asked her questions concerning her current and former units.

The other tenants were questioned solely on the common spaces in the building.

4.5.1 Physically Challenged Tenant Occupying a Traditional Unit (2 interviews)

The tenant is a person around 50 years of age living with her mother. Subsequent to a stroke, five years ago, she now gets around using a tripod cane.

Before moving to 680 boul. Ste-Croix, the tenant lived with a foster family, in a traditional two-storey house. This house was not accessible and she had difficulty moving around and in opening windows. Moreover, this house did not have any grab bars in the toilet. The door handles were difficult to use by the tenant.

Table 4.5.1 outlines the difficulties experienced by the tenant in her current (traditional) unit.

Table 4.5.1 - Difficulties Experienced by the Tenant in her Current (Traditional) Unit

UNIT	
Unit Door	. Has difficulty opening/closing the door, however, her mother is always there to assist her.
Balcony	. Has difficulty getting over the threshold of the patio door to get on the balcony.
Living Room Window	. Opens/closes the patio door without any problem.
Bedroom Window	. Has difficulty opening the bedroom window.
Identifying Visitors	. Has difficulty hanging up the telephone receiver.
Kitchen	. Has never had the opportunity to try a lowered counter with clearances, and thus she does not really know whether it would be preferable. . Would like to have lever faucets. . Has difficulty reaching objects in the upper cupboards. She would prefer the cupboards lower.
Bathroom	. Would like to have grab bars.

COMMON SPACES

Access Ramp	.	Almost never uses the ramp. The tenant uses the stairway instead, using the railings for support.
Door/Landing/ Air-Lock	.	Always uses the door-opening device. The tenant has difficulty with the key, she intends to apply for a remote control.
Mailbox	.	Her mother looks after the mail.
Laundry Room	.	Uses it without any problems and appreciates the door-opening device.
Garbage Chute	.	Uses it but has difficulty with the hatch.
Community Room	.	Would like to have a remote control to go out in the yard; the tenant has difficulty using the key.
Security/ Evacuation	.	Is aware of emergency procedures. Has the fire department identified this tenant as being a physically challenged?

The tenant mentioned to us that the most important elements for her in the building and in the unit are:

- the electromechanical door-openers and the remote control which she would like to have;
- grab bars in the bathroom, which she would also like to have;
- circulation space which is found in the building and in the unit.

We then presented the tenant with the possibilities of the home automation system, as well as the integrated adaptation elements in the unit 108. She showed interest for the following functions and elements:

- regulating the heating
- controllng the lighting through movement detectors
- remote alarm for emergency situations
- remote controls for the electromechanical door-openers
- intercom system near the bed

Lastly, the tenant and her mother say that they are very satisfied with their new unit. We observed that they did not dare to be too critical because their unit is new and the rent is relatively low.

4.5.2 Senior Tenant (2 interviews)

The tenant is an anglophone who lives alone. She does not have any mobility problems.

This tenant made the following comments to us:

- she does not like the carpets in the units, for health and hygienic reasons;
- she uses the electromechanical door-openers to come in or to go out when she is carrying parcels;
- she finds her mailbox a little low;
- she uses the garbage chute without any problem;
- she never goes to the community room nor out in the yard;
- she uses the elevator without any problems.

The tenant mentioned the following three elements to us as being very important for her:

- the elevator
- the electromechanical door-openers
- being able to identify her visitors on the tv screen makes her feel safer.

As concerns the home automation functions and the adaptation elements, the tenant expressed interest in the window installed on rollers and in the obstacle-free balcony. However, she would not like it if the fact of moving the heater would disrupt the way the furniture is placed; the heater is currently installed under the patio door.

The tenant showed no interest whatsoever for home automation functions, i.e. regulating the heating, controlling the lighting by movement detectors and the remote alarm system for emergency situations.

For the tenant, living at 680 boul. Ste-Croix, makes her feel much better financially. She likes her unit, with exception of the carpet.

4.5.3 First Senior Tenant, Met in November

This tenant is a francophone living alone. She does not have any mobility problems.

Previously, this tenant lived in a one-bedroom unit, located in a four-unit building. The unit was bigger and had a better view than her current unit. She can shop in the same stores as she did when she lived in her former unit.

The tenant had the following comments for us:

- she does not use the electromechanical door-opening devices, with exception of the one for the laundry room;
- her mailbox is satisfactory for her;
- uses the garbage chute without any problems on her floor (fourth floor without door-opening device);
- occasionally goes to the community room;
- she had a grab bar installed in the bathtub;
- she does not have enough storage space;
- stucco ceiling difficult to look after;
- full height railing without any openings on the balcony cuts off part of her view;

Concerning the home automation functions and the adaptation elements, the tenant said that she was interested in the obstacle-free balcony. The home automation functions are not really very important for her.

4.5.4 Two Senior Tenants, Interviewed in November

The tenants are two sisters who have no mobility problems.

Their former unit, a three-bedroom model, was located in a triplex. Their new unit is in the same district and they currently do their shopping in the same stores as they did previously.

The tenants had the following comments for us:

- they use the access ramp occasionally;
- they never use the electromechanical door-opening device for the main entrance way;
- they have no difficulties with their mailbox;
- they use the electromechanical door-opener for the laundry room;
- they use the garbage chute on the third floor without any problem, in spite of the fact it does not have a door-opening mechanism;
- they use a grab bar in the bathtub.

The elements which the tenants find particularly important have very little to do with accessibility. They like the natural lighting in the unit, the tranquillity of the building and the security provided by the controlled entrance way and the possibility of identifying their visitors on the tv screens.

Concerning the home automation functions and the adaptation elements, the tenants did not show very much interest.

Lastly, they appreciated the closed-in kitchen, and the carpet as flooring. They find that it would be preferable for the building to have a resident janitor, or at least a full-time janitor.

4.5.5 Third Senior Tenant, Interviewed in November

This tenant has some mobility problems. At least a year ago, she broke her hip which means that she is now forced to wear a corset and uses a cane for moving about outside.

For about a dozen years, the tenant lived in a two-bedroom unit, located in a multi-family building. She is thus familiar with the type of building in which her new unit is located (common entrance, elevator, etc.).

The tenant had the following comments for us concerning the building and her new unit:

- since her accident, she uses the access ramp;
- she uses the electromechanical door-openers for the main entrance;
- she has no difficulty with her mailbox;
- she finds the electromechanical door-opening device for the laundry room very useful;
- she uses the garbage chute on the second floor without difficulty (without a door-opening device);
- she does not venture out in the yard; she prefers to remain on her balcony. On the other hand, it is hard for her to go out on the balcony because of the threshold.

The building elements which the tenant finds particularly important are the following:

- the access ramp
- electromechanical door-opening devices
- width of the corridor and handrails along the wall
- security elements such as fire alarm, identification of visitors on the television screens and the intercom system

Concerning the home automation functions and the accessibility elements inside in her unit, the tenant expressed interest in lower kitchen cupboards (when she made this comment she was using a step ladder) an ajustable-height stationary/hand shower, a balcony without a threshold and a remote alarm system in a case of emergency. Regulating the heating and controlling the lighting using movement detectors are not very important for her.

In conclusion, the tenant tells us that she wanted a new unit and less expensive one and that she is very satisfied with her new unit.

4.5.6 First Senior Tenant, Interviewed in June

The tenant is a woman who has no mobility problems. Her last unit was located in a multi-family building.

The tenant does not use the electromechanical door-opening devices located at the entrance to the building; she does uses this device, however, to open the community room door allowing access to the yard. To operate the automatic door-opening device when she is in the yard and wants to go back into the community room, she uses the exterior lock without any trouble.

The tenant is one the rare people questioned who had tried out the public bathroom, and she had no difficulty with it.

Although she uses the garbage chute on her floor without any problems, she observed that a certain number of her neighbours on the same floor had difficulty with it.

She noted two elements which were not quite up to scratch as far she was concerns, i.e. the height of the mailboxes (too low) and the balcony threshold where the electric baseboard heater hinders circulation.

4.5.7 Second Senior Tenant, Interviewed in June

The tenant is a lady living alone. She has no mobility problems.

She was not too open at first to an interview because she did not appreciate the fact that someone had given us her telephone number without informing her. She nevertheless decided that she would participate in the exercice.

On the whole, the tenant did not have any comments or criticisms to make about the building in which she lived. Her replies to most of the questions was: everything is perfect.

She does not use the access ramp and uses the electromechanical door-opening devices solely when she her hands are full. She finds her mailbox a little low but she manages to get by. As for the garbage chute, she uses the one located on her floor without any difficulty.

4.5.8 Meeting with an Occupational Therapist

The occupational therapist for one of the physically challenged people living in an adapted unit is attached to the Ville St-Laurent CLSC and intervenes with a number of seniors in the building.

The tenants that she visits are mainly people who have mobility problems or who are losing their independence.

Mrs. Serretti was kind enough to answer our questions and informed us of her general observations concerning the difficulties experienced by her clients at 680 boul. Ste-Croix.

- Certain people have trouble opening their unit doors; they have difficulty manipulating the opening mechanism and the door is too heavy to push.

- Most of the people have difficulty going out on the balcony due to the threshold which is too high and too wide.

- Most of the tenants have difficulty manipulating the opening/ closing system for the bedroom window. The handle is too small.

- The tenants have trouble hanging up the intercom receiver. With this equipment, seniors cannot answer the door from their bedroom. An intercom connected to the regular telephone would seem preferable.

- The door handles for the clothes-closet doors and storage areas are difficult to manipulate.

- The handrail in the corridors is too big to allow the people to firmly grasp it. It is installed on only one side of the corridor whereas it should be on both sides. Hemiplegics, for example, have difficulty using it.

- The electromechanical door-opening device for the laundry room door is used and appreciated by a number of tenants. On the other hand, the mechanism for the collection boxes is difficult to manipulate.

- The garbage chute hatch is hard to use for a certain number of tenants.

- Lever faucets are preferable in the kitchen and in the bathroom. The traditional faucets currently installed are hard to manipulate for people suffering from arthritis.

4.6 Highlights

For each of the tenants questioned, table 4.6 provides a synthesis of the use made of the principle elements in the common space and in the unit, as well as the difficulties experienced with these elements.

The elements in italics are specific to the adapted/automated unit. All the tenants were questioned as to their interest in certain home automation functions. Letter A indicates that the tenant would like to have a facility which is not currently available in the unit.

We estabished two degrees of use and difficulty: the large circle, O, indicates that the tenant routinely uses the element, the small circle, o, indicates that the tenant uses it occasionally. For the backyard, for example, o signifies that the tenant goes out in the backyard on a few occasions but not regularly.

Where the tenant does not use an element, there is no indication in the "Use" box. The information on use is supplemented by that on the degree of difficulty experienced.

As concerns the difficulty which these elements present, the large circle, O, indicates major difficulty which may prevent use or oblige the tenant to find an alternative solution. For example, one tenant experiencing major difficulty with the front door of the building, chose to use the back access instead, going through the community room.

A small circle, o, indicates a difficulty which is not insurmontable for the tenant. There is, nevertheless, room for improvement. A tenant experiencing a small degree of difficulty with a particular element may choose not to use it if a more suitable alternative is offered.

Lastly, where there is no indication in the "difficulty" box, two interpretations are possible: either the tenant does not, in fact, experience any difficulty with the element, or the element does not apply in this tenant's case. In fact, if the tenant does not use an element and if he does not mention any difficulty, this is because there is no reason for him to do so, because the tenant does not need it, or has found a more suitable alternative.

4.6.1 Common Spaces

The **access ramp** is difficult to use because of the relatively steep slope. We observed, on several occasions, that a slope of 1:12, the maximum slope recommended, poses a problem for a good number of people in wheelchairs. It would be preferable that the building entrance be located in such a fashion that it allows for access along an approach with a gentle slope (1:20).

The **electromechanical door-opening devices** installed at the front entrance doors, at the door to the backyard, at the laundry room door and at the garbage chute door on the ground floor are used by most of the tenants questioned. It is observed that people use the door-opening devices when the door is heavy or when they are carrying objects (groceries, laundry basket, garbage bags).

On the other hand, the automatic door-opening devices for the doors to the community room and to the public toilet were not used. The door to the community room is, in fact, always open and, as for the toilet, one has to wonder whether someone who is unable to open the door can, in fact, use the toilet alone. To optimize investments in electromechanical door-opening devices, it is important to choose the doors where they are installed depending on the weight of the door, clearance space on both sides, on the use of the room to which the door provides access (do people arrive at this door with packages in their arms, for example), management policies concerning this door, and lastly the capacity of those using automatic door-opening devices to execute the activities which occur in this room.

Once a door is equipped with a door-opening device, it becomes more difficult to open it manually, which could lead a certain number of people to use the automatic devices in spite of being fully capable of opening a door without them. When an electromagnetic door-opening device is installed on the door to a common space, it is to be be expected that it will be used by much more than just those people who are physically challenged or mobility restricted. No comment was made concerning the inherent shortcomings of automatic door-opening devices.

Due to the difficulty of manually opening doors equipped with automatic opening devices, these devices should be equipped with emergency batteries or be connected to a generator to make them operational in case of a power failure.

The door-opening devices installed in the entrance doors are operated by a key-activated entry system which is difficult to manipulate for a number of tenants. The location of the key-activated entry system also poses a problem in the air-lock at the main entrance way. All people with remote controls use them. These door-opening devices are essential (case in point: the paraplegic tenant who always went around to the back to get into

the building before having a remote control device: the doors were too heavy to open and he could not reach to key-activated entry system in the air-lock. Thus it is important that all the door-opening devices be equipped with an infrared sensor, making it possible to operate them by remote control. The location of the push-button controls and the key-activated entry systems must be carefully studied.

Where a number of door-opening devices are installed in a building, particular care must be taken as to the use of infrared frequencies. A protocol must be drawn up and kept by the owner to avoid code duplication problems and situations where doors keep opening by accident.

Few people use the **handrails in the corridors.** It would be important, however, to make provision for handrails on both sides: a person would thus be able to use them both leaving the unit and coming back leaning on his/her strongest arm in both cases, which is particularly important for a hemiplegic.

The **carpet in the corridor** makes movement along the corridor a problem for two of the five physically challenged tenants. Moreover, the adapted units are located at the far end of the corridor. Thus, the distance to be travelled on the carpet is quite long. It would appear to be clearly preferable that adapted units be located near the entrance way. In this case, a carpet floor covering, if absolutely necessary, would be more acceptable. One of the arguments for locating adapted units at the end of corridors could be the proximity to means of egress. However, in this case, the means of egress is not accessible as there are steps outside.

Most of tenants questioned have difficulty with their **mailboxes** which are either too high or too low. It would be preferable to eliminate the higher and lower mailboxes, and to increase the depth of the mailboxes.

Very few tenants use the **public toilet.** They prefer to go back to their units. The two public toilets are thus only used by rare visitors who come in to the community room. Provision for only one public toilet for both men and women, in the current context, would have been clearly sufficient.

Two of the four physically challenged tenants who do not live on the ground floor told us that they use the **garbage chute** on the ground floor because it has an automatic door-opening device. The other respondents use the chutes on their respective floors and their difficulties had nothing to do with the door but rather with the chute hatch. This hatch is, in fact, a general problem which is not particuliar to 680 boul. Ste-Croix. The movement required to unlock the hatch, the strength necessary to open it and the necessity to use both hands to keep the hatch open and to put the

bag in the chute make this very complex. Efforts should be made to improve the hatch design.

We do not believe that automatic door-opening devices should be systematically installed for all garbage chutes unless there is a general policy not to allow tenants to leave their garbage bags in the air-lock to be picked up later by the janitor or by a tenant capable of opening the hatch.

Tenants using the **laundry room** did not have any difficulty with exception of the collection boxes which posed some difficulty for a certain number. Almost all the tenants who said that they used the laundry room used the automatic door-opening device.

The tenants questioned occasionally spend time in the **backyard** and in the **community room**. They never use the door-opening device for the community room as the door to the latter is always open. All the tenants who spend time in the yard use the automatic door-opening device and most of them have difficulty with the key-activated entry system. Four of the five physically challenged tenants have remote controls and those who go out in the yard use them. The slope of the access ramp at the back is not as steep as at the front and, in general, the tenants have less difficulty with the back ramp.

The **elevator** is perfect.

The tenants questioned were informed of **emergency procedures**. However, a number of them do not clearly understand what they must do. The most important aspect involves the physically challenged tenants: in case of emergency, the firemen recommend that they go out on their balconies. But these balconies are not accessible on the upper floors. The exterior threshold is too high and the tenants cannot get over it safely. We will come back to this point. The physically challenged person who lives in a traditional unit also has this threshold problem. This situation could have serious consequences if a fire were to break out in the building.

CAPTION

AD-AU	.....	Adapted/automated unit
A	.....	Adapted unit
T	.....	Traditional unit
P-C-S	.....	Physically Challenged Senior
R.M.S.	.....	Reduced mobility senior
U	.....	Use
D	.....	Difficulty
O	.....	Major
o	.....	Minor

TABLE 4.6.1 **Synthesis - Use and Difficulties Experienced: Accessibility and Home Automated Elements**

ELEMENT	AD-AU # 108		A # 212		A # 312		A # 414		T P.C.S.		T R.M.S.		T SENIOR		T SENIOR		T SENIOR		T SENIOR		T SENIOR	
	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D
INTERIOR AND EXTERIOR COMMON SPACES																						
. Reserved parking																						
. Access ramp																						
. Stairway																						
. Entrance doors:																						
- handle/lock																						
- electromechanical door-opening devices																						
- push button control/ key-activated entry system																						
- remote control																						
. Corridor:																						
- circulation																						
- handrails																						
. Mailboxes																						

The elements in italics are specific to the adapted/automated unit.

TABLE 4.6.1 (cont'd) **Synthesis – Use and Difficulties Experienced: Accessibility and Home Automated Elements**

ELEMENT	AD-AU # 108		A # 212		A # 312		A # 414		T P.C.S.		T R.M.S.		T SENIOR		T SENIOR		T SENIOR		T SENIOR		T SENIOR	
	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D
INTERIOR AND EXTERIOR COMMON SPACES (cont'd)																						
. Special toilet																						
. Door-opening device/toilet																						
. Garbage chute (upper floors)																						
. Garbage chute (ground floor)																						
. Door-opening device/ garbage chute																						
. Laundry room																						
. Door-opening device/ laundry room																						
. Community room																						
. Door-opening device/ community room																						
. Back door:																						
- handle/lock																						
- door-opening device																						

TABLE 4.6.1 (cont'd) **Synthesis - Use and Difficulties Experienced: Accessibility and Home Automated Elements**

ELEMENT	AD-AU # 108		A # 212		A # 312		A # 414		T P.C.S.		T R.M.S.		T SENIOR		T SENIOR		T SENIOR		T SENIOR		T SENIOR	
	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D
INTERIOR AND EXTERIOR COMMON SPACES (cont'd)																						
- push-button control/ key-activated entry system																						
- remote control																						
. Backyard:																						
- access ramp																						
- stairway																						
. Signage																						
. Elevator																						
. Security/Evacuation:																						
- setting off alarm																						
- procedures																						

TABLE 4.6.1 (cont'd) **Synthesis - Use and Difficulties Experienced: Accessibility and Home Automated Elements**

ELEMENT	AD-AU # 108		A # 212		A # 312		A # 414		T P.C.S.		T R.M.S.		T SENIOR		T SENIOR		T SENIOR		T SENIOR		T SENIOR	
	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D
UNIT - GENERAL POINTS																						
. Circulation/width of doors/ turning space																						
. Electric controls (switches...)																						
. Central intercom system																						
. Identification of visitors by television																						
. Remote break-in alarm																						
. Fire remote-alarm																						
. Pull cords, neck control: remote accident alarms																						
. Break-in detector																						
. Movement detector lighting control																						
. Temperature regulation																						
. Pre-determined Scenarios																						
. Telephone remote control																						
. Universal remote control																						

TABLE 4.6.1 (cont'd) **Synthesis - Use and Difficulties Experienced: Accessibility and Home Automated Elements**

ELEMENT	AD-AU # 108		A # 212		A # 312		A # 414		T P.C.S.		T R.M.S.		T SENIOR		T SENIOR		T SENIOR		T SENIOR		T SENIOR	
	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D
UNIT - ENTRY																						
. Door:																						

- handle/lock
  - door-opening device
    push-button/key-operated
    remote control
  - peep hole
- Wall intercom: telephone receiver
- Hands-free intercom
- Sécant control panel

TABLE 4.6.1 (*cont'd*) **Synthesis - Use and Difficulties Experienced: Accessibility and Home Automated Elements**

ELEMENT	AD-AU # 108		A # 212		A # 312		A # 414		T P.C.S.		T R.M.S.		T SENIOR		T SENIOR		T SENIOR		T SENIOR		T SENIOR	
	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D
UNIT - KITCHEN																						
. Circulation																						
. Lower counter																						
. Clearances: sink and cook top																						
. Cook Top																						
. Microwave oven																						
. Lowered cupboards																						
. Pass-through																						
. Shallow sink																						
. Lever faucets																						
. Switch in front of counter (ventilation hood)																						
. Outlet in front of the counter																						
. Outlet on the wall																						

TABLE 4.6.1 (cont'd) **Synthesis - Use and Difficulties Experienced: Accessibility and Home Automated Elements**

ELEMENT	AD-AU # 108		A # 212		A # 312		A # 414		T P.C.S.		T R.M.S.		T SENIOR		T SENIOR		T SENIOR		T SENIOR		T SENIOR	
	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D
UNIT - KITCHEN (cont'd)																						
. Lazy Susan																						
. Window-opening device																						
. Work surface																						
. Safety timer - Cook Top																						
. Automatic fire extinguisher - ventilation hood																						
. Humidity detector under the sink																						
UNIT - BATHROOM																						
. Circulation																						
. Vanity																						
. Clearance under the wash basin																						
. Lever faucet/wash basin																						
. Full height mirror																						

TABLE 4.6.1 (cont'd) **Synthesis - Use and Difficulties Experienced: Accessibility and Home Automated Elements**

ELEMENT	AD-AU # 108		A # 212		A # 312		A # 414		T P.C.S.		T R.M.S.		T SENIOR		T SENIOR		T SENIOR		T SENIOR		T SENIOR	
	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D
UNIT - BATHROOM (cont'd)																						
. Grab bars																						
. Lowered medicine cabinet																						
. Clearance around the bathtub																						
. Lever faucets/bathtub																						
. Adjustable height stationary/hand shower																						
. Door																						
. Bi-fold door: reduced opening radius																						
UNIT - BEDROOM																						
. Window																						
. Clothes-closet rod lowered																						
. Door																						
. Circulation																						

TABLE 4.6.1 (cont'd) **Synthesis - Use and Difficulties Experienced: Accessibility and Home Automated Elements**

ELEMENT	AD-AU # 108		A # 212		A # 312		A # 414		T P.C.S.		T R.M.S.		T SENIOR		T SENIOR		T SENIOR		T SENIOR		T SENIOR	
	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D
UNIT - BEDROOM (cont'd)																						
. Curtain-opening device																						
. Electric bed																						
. Hands-free intercom																						
. Bi-fold door: reduce opening radius																						
UNIT - BALCONY																						
. Balcony door:																						
- handle/lock																						
- door-opening device																						
- push-utton control (mandatory lock)																						
. Threshold																						
. Dimensions																						
. Treated wood platform																						

TABLE 4.6.1 (cont'd) **Synthesis - Use and Difficulties Experienced: Accessibility and Home Automated Elements**

ELEMENT	AD-AU # 108		A # 212		A # 312		A # 414		T P.C.S.		T R.M.S.		T SENIOR		T SENIOR		T SENIOR		T SENIOR		T SENIOR	
	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D	U	D
UNIT - LIVING AREA																						
. Sliding window on rollers (patio door)																						
. Blind-opening device																						
. Touch control lamp																						

4.6.2 The units

Those tenants in wheelchairs circulate easily in their units except in the entry way and when they enter their bedrooms. A number of them scratch the corner of the wall opposite the entrance door which impedes their turning maneuvers. The bedroom door opens to approximately a 90° angle where it hits against the storage space wall. Since the bedroom is small to begin with, once there is furniture in the room, the turning space becomes insufficient.

A certain number of tenants find that the **switches and the thermostats** are too high. These elements could be lowered slightly.

Identifying visitors using the television is a very important element for most of the tenants questioned.

The **central communication system** leaves the tenants indifferent; the party which finds this useful is the Municipal Housing Board.

The four tenants in the adapted units use the remote control door-opening device **to enter and to leave their units.** Most have difficulty with the push-button control which is poorly located, and with the key-activated system which is difficult to manipulate. The remarks concerning the door-opening devices for the common spaces also apply here. The **door-opening devices** should always be remote controlled and equipped with a battery in case of a power failure. The location of the control buttons is very important and must be carefully chosen.

The **balcony door** in the adapted units is also equipped with a door-opening device. However, to ensure that the tenant is not locked outside, a push-button control is installed both on the inside and on the outside. The door is locked on the inside of the unit. Most of the physically challenged tenants were unable to operate this lock, and thus were unable to go out on their balconies.

The locks were replaced recently by a model which is easier to manipulate. However, the tenants still have to go through a mechanical operation before the door-opening device is activated. And the very reason for installing a door-opening device is to make it easier for people who have difficulty effecting this type of operation... More thought will have to be given to the design of the opening device and the lock to make them more tenant-friendly and tenant-protective (burglar-proof, tenants not stranded on the balcony).

In a building such as the one at 680 boul. St-Laurent, the **balcony** is used as a refuge in case of emergency. At the present time, no home adaptation grants program covers the cost of making means of egress in units or buildings occupied by

physically challenged people accessible, whereas all construction codes require this for traditional units. Installing a door-opening device on the balcony door is a step in this direction: the balcony is part of the unit and can be very useful in case of emergency. Getting the door to open is one thing but actually getting through the door-opening is quite another. Both the **interior and exterior thresholds** represent obstacles which are virtually insurmontable for almost all the physically challenged tenants. Bevelled thresholds exist on the market which are specially designed to minimize any change in level.

It is also possible to build units so that the balcony floor levels are more in line with the unit floor levels. This detail is very important for the security and well-being of the physically challenged tenants. Even if the door threshold problem cannot be completely resolved, it can at the very least be greatly minimized. We believe that it is urgent to come up with a solution to this problem. The same line of reasoning applies to the traditional units occupied by seniors. To have access to the balconies, these people must straddle the electric baseboard heater located under the patio door. The tenants questioned told us they had difficulty getting out on their balconies. In such a building, all balconies should be on the same level as their units without any floor surface obstruction.

Tenants who use the peep hole in the entrance door to their units find that they are either too high or too low.

All the tenants questioned say that they experience difficulty hanging up the **intercom receiver**. A number mentioned to us that they would have preferred to be able to answer people coming to see them at the entrance door directly from their room. An intercom using the regular telephone system would appear more appropriate than the system which was chosen. In fact, the tenants can use the intercom from all the rooms in their units, especially if they have a portable telephone.

The following comments deal with the **kitchen**, considering the observations made by the physically challenged tenants; seniors were not questioned on the elements of the units.

It is observed that all the elements in the kitchen are interconnected and that, for the tenants, the important thing is to have space to circulate, to reach the necessary elements, to turn the equipment and controls on and off and to have work surfaces and storage space which are easy accessible.

Each one uses and evaluates the kitchen in line with his/her capacities and limitations. The judgments made on one element have cause and effect relations on other elements.

For example, one of the tenants cannot use the clearance under the sink and the cook top as this clearance is insufficient. Thus, he works at the counter laterally, has difficulty using the lower storage space and also has difficulty moving around... For him, the counters are too low, the clearance too low, storage space in not sufficient and the shape of the kitchen is not adequate.

The counter in the adapted/automated unit is lower than in the other units and the tenant is satisfied. On the other hand, he cannot reach the upper cupboards. The third tenant, who is in a wheelchair, finds the counter too high but is able nevertheless to use it; the two other physically challenged people, who are not in wheelchairs, are relatively satisfied with their counter heights.

Before coming to a decision concerning the **counter** heights, one has to consider the feasibility, in rental units, of allowing tenants to choose the ideal high of their counters. It would be also necessary to assess the clearance range acceptable for the various tenants. In fact, a counter one half inch higher would not perhaps prevent the tenant from using it. Also, in the perspective of generalizing a standard for other projects, we have to consider all the members of particular households. Determining counter heights is no simple task. This study certainly attests to this, but our very limited sampling of tenants prevents us from drawing other conclusions. A study involving a large number of physically challenged people would make it possible to determine whether an acceptable average height exists, or if the solution of adjustable counters would be adequate.

All the tenants would have preferred to have **pantries**. In fact, the clearance under the sink reduces the storage space available. Moreover, it is all the tenants can do to reach the first shelf in the upper cupboards. A pantry would provide the storage space necessary. As far as we know, at least one tenant has converted the entry closet into a pantry.

Among the tenants questioned, there was a consensus involving the following items. The tenants who use the **work surface** appreciate it. The controls for the **cook top** are placed in the centre and all the tenants are afraid to burn themselves on the elements or the pots close by when they go to turn off or adjust the intensity of an element.

All the tenants find that the direction in which the **microwave oven** opens is not very practical. A certain number also find it difficult to operate the opening mechanism.

No tenant uses the **serving hatch** to pass food from the kitchen to the dining area. A certain number appreciate the additional lighting which this provides in the kitchen.

Two tenants out of four find that the **sink is too shallow** and water splashes over the side. All tenants, with one exception, appreciate the **lever faucets.** All tenants use and appreciate the **electrical outlets** and the **ventilator hood switch** located at the front of the counter.

Most of the tenants use the **electrical outlets on the wall** for appliances which remain plugged-in.

Two tenants out of four have difficulty with the **"Lazy Susan"**, including the tenant who is unable to use the clearances.

All tenants use the **window-opening device** in the kitchen and, with the exception of one tenant, none apparently are able to open or close the window without this equipment.

Thus it is observed that the tenants use and appreciate most of the accessibility elements which are provided to them in the kitchen. On the other hand, the sticky problem of the counter height and its consequences (height of clearance, depth of wash basin, height of cupboards) has yet to be solved.

In the **bathroom**, the only difficulty experienced is due to the insufficient clearance under the vanity, for the tenant who also experiences difficulty in the kitchen.

All the other elements in the bathroom are found to be satisfactory by all the tenants questioned, i.e. **turning space, clearance in front of the bathtub, type of bathtub, its faucets, hand shower**, and **grab bars, toilet, vanity, faucets, mirror** and **medicine cabinet.**

One tenant mentioned his difficulty in closing the **bathroom door;** he would have preferred a pull type handle or spring hinges.

Two seniors mentioned to us that they use the **grab bars.**

The five physically challenged tenants told us that they have difficulty in opening/closing the **sliding window in the bedroom.** A certain number are successful in doing this, others are unable to use it.

On the other hand, four out of five use the **sliding window on rollers in the living room area** without difficulty (patio door for the physically challenged tenant in a traditional unit).

We observed that people living alone make little use of the **interior doors in the units.** In the bedroom, however, two of the three tenants who are in wheelchairs find that the door does not open sufficiently to allow easy entry into bedroom. The door hits against a storage area.

As for the adapted/automated unit, the tenant always leaves the the bedroom and bathroom doors open. Thus he does not use the **bi-fold door with reduced opening radius.** However, it is observed that these doors, once open, take up less room in the bedroom and in the corridor, which may explain why the tenant in the adapted/automated unit did not formulate the same comments as the other two tenants who are in wheelchairs, concerning the fact that the bedroom door did not open completely. The reduced radius bi-fold door could be a solution where architectural constraints prevent doors from opening completely. Here, the installation of such a door seems to be more pertinent in the bedroom than in the bathroom.

Lastly, one tenant told us that he did use the **lowered clothes-closet rod.** Two physically challenged tenants had the rod installed higher and a fourth tenant cannot hang up his clothes himself.

4.6.3 Electromechanical and Home Automation Elements

Of the electromechanical and home automation elements which were made available to the tenants, the tenant in the adapted/automated unit uses:

- the **movement detector lighting control** (home automation)
- the **universal remote control**
- the **hands-free intercom** in the entry and the bedroom
- the **automatic blind-opening device** in the bedroom and living room (predetermined scenarios)
- the **electric bed**
- the **touch-control lamp**
- identification of visitors by **television**

Occasionally, he programs the **Sécant control panel** and uses the **scenarios** (home automation).

The home automation equipment and functions which are not used by the tenant are of three types:

- First of all, there are the **security**-related functions which, as we have seen, are not a priority for the tenant. Thus he does not use the **break-in detector**, the **pull cords**, the **neck control**, and the **remote alarm in case of emergency.**

- Secondly, the tenant has the possibility of **using the home automation system** in several ways: he can do this through hourly programming (by scenario) and by direct action (on the Sécant control panel, on the universal remote control and by telephone). He has never used the remote control and very seldom, the hourly programming. He makes use almost exclusively of the remote control and occasionally, the scenarios and the Sécant control panel. The tenant does not seem inclined to exploit the numerous possibilities offered by the system.

- Thirdly, certains functions are more useful for a homeowner than for a tenant, especially when the latter does not have to pay the heating bill. Unless a tenant has a highly developed environmental conscience, there is no incentive to use the functions making it possible to **regulate the temperature** in the unit. The tenant does not use the "comfort and energy-saving" settings to reduce the heating in certain rooms, at certain times during the day. However, thanks to temperature sensors in the home automation system, which are more accurate and those used in ordinary thermostats, the tenant enjoys a more constant temperature in the unit. Three others elements went unnoticed by the tenant, but may prove important for a homeowner. The **humidity detector** under the kitchen sink, the **remote alarm in case of flooding** and the **remote alarm in case of fire.** Domotique Sécant informed us of its intention to develop a home automation system for homeowners which could include all the above functions, plus other features. Completely "invisible" as far as the tenant is concerned, this system could make it possible for the owner to control the heating in units where heating is included in the rent (Municipal Housing Board units, for example), to avoid waste.

- Fourthly and lastly, two pieces of equipment installed in this adapted/automated unit could prove to be of value in terms of security both for the tenant as well for the owner, in cases where tenants have memory lapses or are losing their intellectual faculties. These elements are the **safety timing system for the cook top**, which automatically turns off elements which have been turned on after a certain time and the **fire extinguisher element incorporated in the ventilation hood system**, which comes on automatically when there is a fire in a pot or pan. The tenant in the adapted/automated unit has never had the opportunity to test the efficiency of the fire extinguisher and found that the safety timing system was very bothersome especially when he wanted to let his sphagetti sauce simmer...

5.0 TECHNICAL FOLLOW-UP: RESULTS OF THE EVALUATION

As mentioned in section 2.0, the home automation system installed in unit 108 is available on the market. Generally speaking, this system makes it possible to control security, heating and lighting.

To this system were added a universal remote control and several other pieces of electromechanical equipment making it possible for physically challenged people to control their environments.

To our knowledge, at the present time, there is no complete technology which makes it possible to integrate and interconnect all the equipement required to meet the needs of the physically challenged.

The adapted/automated unit system is thus a combination of three technologies: electricity, infrared and radio waves.

It is made up of equipment and components available on the regular market, mainly in Québec, Ontario, the United States and Sweden.

Thus one can easily imagine the complexity of the total system when considering such elements as the compatibility of the three technologies used and the various standards for the equipment and devices integrated therein.

The home automated unit is a prototype. Putting together all the elements which make up the automated aspect of the unit requires indepth knowledge of each of the technologies used. At the present time, such a unit can not be reproduced easily, for example, by general contractors. However, if the demand was sufficiently high, a global system, easy to install, could be designed.

Identifying the technical follow-up necessary is thus very delicate in this context.

We have attempted, in the following sections, to identify the difficulties which were experienced during the project. These difficulties are related above all to breaking-in the system, to equipment breakdowns, to the use made of the system by the tenants and to the characteristics of the equipment as such.

5.1. Breaking-in Phase

The breaking-in process begin with the arrival of the tenant and still continues today although much less intensely. The most active period was from the moment the equipment was installed until approximately two months after the tenant moved in. At the present time, the tenant has had the opportunity to use almost all the home automated functions and we can assume that all the difficulties have already been pointed out. The heating control system is the only element which still poses some problems.

Since the beginning of the project, the problems experienced have been raised essentially by the suppliers, the SHQ representative, the tenant and the tenant's friends and relatives.

These problems have all been solved within reasonable delays and the tenants claim to be satisfied with the service offered by the suppliers.

The difficulties associated with the equipment's breaking-in period are the following:

- The Fabco/Sécant Communication Protocol

  The system installed by Fabco makes it possible to directly control the equipment. The Sécant home automated system allows for programming and remote control of the same equipment.

  The X-10 technology used is unidirectional: it makes it possible to forward, to the Sécant system, information concerning any change in status for any piece of equipment. Since it is not bidirectional, the Sécant system cannot, as desired, check the status of a particular piece of equipment. Thus it is necessary to keep a record of the status of each piece of equipment where all the information received is duly registered.

  Is understood that the protocol concluded by Fabco and Sécant which allows for direct control is important. If a light comes on activated by a direct control and if the message is not received by Sécant, the latter considers the light as still being out.

  The project's breaking-in period, made it possible to draw up a protocol. However, a few problems due to incompatibility of the codes used by the two companies did occur: blinds which opened up at midnight, for example...

. Programming the Universal Remote Control System

The remote control system is programmed four times:

- Basic programming;
- Addition of new codes for certain functions as new equipement is added and as the protocol between Fabco and Sécant was being developed;
- The repositioning of codes on the keys easiest to use by the tenant;
- Complete reprogramming, after the battery completely lost its charge.

In fact, a battery makes it possible to keep the programming of the remote control in operation. When the battery becomes weak, a signal appears on the remote control system. The tenant must then replace the battery in the next few hours or days. When the battery is removed, a new battery must be inserted within 30 minutes, otherwise all the programming is lost. In this case, the tenant simply neglected to notice the warning signal and the battery ran completely down.

. Lowering of Kitchen Counters to 32 Inches

Initially, the counters were installed at 34 and a half inches from the floor, which was too high for the tenant to work there comfortably.

. Modifications in the Break-in Detector

Initially, the tenant could not know whether the system was turned on or not. As he did not want to activate it systematically, every time he left his unit, he was afraid to forget the system's status and to inadvertently set off the alarm. In order to reassure the tenant, a warning light was added in the corridor. This light comes on when the system is operational.

. Adjustment in the control module installed by Fabco

The module installed by Fabco was produced in Sweden. It is equipped with a mechanism which makes it possible to continually feed power to the system after the current has been interrupted. Following a power failure at 680 boul. Ste-Croix, the current was re-established after some difficulty: a major reduction in current occured without there being a complete interruption, however. The system reacted to the reduction in current, without going so far as to completely reboot the system: it froze and refused to accept any more commands. It should be pointed out that all the electronic appliances in the unit ended up in the same boat. To solve the problem a mechanism was added to the module so that a drop in current will, in the future, be interpreted as a power failure by the system.

- Programming the Sécant System

  A publicity campaign was organized to publicize the adapted/automated unit. A press conference and a number of visits were scheduled to make this technology better known. A demonstration was prepared for each visit. Many people thus had the occasion to manipulate the system which meant that the latter was re-programmed a number of times to suit the tenant's tasks.

  In addition, the tenant and the members of his entourage (including the occupational therapist) explored the system's possibilities and altered or cancelled certain programming elements. The electric baseboard heater in the bedroom, which was operating "full blast", is an example, according to Domotique Sécant, of third-party programming.

  During the first few months, the breaking-in period, when the system had to be verified regularly, the tenant was discouraged. Everything seemed so complicated ans especially so easy to deprogram and to mix up. Subsequently, use won out over technology and the tenant slowly started to use the various functions offered by the system.

5.2 Equipment Breakdown

Only once was an equipment breakdown brought to our attention.

One infrared receiver, installed by Fabco, was replaced very early during the project.

5.3 Use

As mentioned previously, the home automation system in unit 108 is complex. Since it is a prototype, it has presented us with certain "challenges" which would not exist in a commercial system. We are dealing here with intermediate technology which requires user flexibility.

To use the system satisfactorily, the user must thus be relatively conversant with the system. He must be able to program it and to diagnose the simplest problems which may be faced (switches misplaced, batteries to be replaced, etc.)

The tenant and his occupational therapist were given a few lessons on the system at the beginning and during the project. They also received documentation on the Sécant system programming.

The tenant received ten hours of information in the presence of a third party. Unfortunately, he did not have the opportunity to practice programming the system in the presence of a professional. Although, one training program was scheduled in la Société d'habitation du Québec's initial specifications, lack of funds made it impossible to organize such a program. Moreover, the tenant never showed any interest in programming the system on his own.

Thus, it seems that the information received was not sufficient. Even after the fifth interview, the tenant still did not grasp a number of important notions. Lack of training certainly had an impact on the use made of the home automation system by the tenant. He used what seemed to him to be most beneficial, but he did not explore the system for the pleasure of doing so.

This lack of training concerning the basic functioning of his system also had an impact on the tenant's problem-solving capacity. Domotique Sécant, Fabco and the SHQ representatives became resource people. After the breaking-in period for all the systems, responsibility for follow-up was left with the Ville St-Laurent Municipal Housing Board which administers and manages the housing project.

The approach now adapted by the companies involved is to provide a diagnosis of the problems by telephone and to ask the Municipal Housing Board to intervene to make the necessary corrections. Domotique Sécant is currently working on the development of an after-sale telephone service for all the aspects involved in programming its system. It could thus establish contact with the computer controlling the client's system and make modifications in the programming as desired by the client.

5.4 Problems Associated with Characteristics of the Equipment

Certain pieces of equipment present weaknesses which, eventually, could generate problems.

- Electromechanical Blind-Opening Devices

The blind-opening devices have their own programming system. Parameters provide the opening width and speed, slat angle. When there is a power failure, the blind-opening device retains its programming for a maximum of 15 minutes. When the power comes back, the blind-opening device may have lost all its parameters and if it is used before being reprogrammed, too much stress may be put on the motor and the equipment may break. As for the home automation system, it does not lose its programming in case of power failure, and

continues, once the power is restored, to send the commands to the equipment, to the blind-opening device, etc.

This weakness in the equipment, which remains relatively unnoticed when used alone, may become a cause for breakdown when it is twinned up with the home automation system.

- Dominance of Mechanical Controls

The wall switches and thermostats have priority oyer the home automated system and over direct remote controls or movement detector controls. When the switch in one room is turned off manually, the system is no longer able to control the lighting in this room.

Problems arise when the tenant has visitors who, without thinking, turn off the switch. The resident can no longer control the lighting and must find out what the problem is.

As for the thermostats, the temperature cannot go above that indicated on the thermostat. The tenant must see that his thermostats are always set at a temperature above that desired, as the home automation system will take care of all the desired temperature variations below the latter.

The tenant in the home automated unit lives alone. He has a few visitors and his attendant visits him daily. It is thus relatively simple for him to inform his visitors in his regard. On the other hand, in the case of a large family or of a person with a very active social life, the presence of mechanical controls can become problematic.

On the other hand, it seems that the regulations currently in force do not make it possible to have solely electronic thermostats; wall controls are also required. This requirement makes the use of the home automation system even more complex.

- Absence of Emergency Batteries for the Electromechanical Door-Opening Devices

Once an electromechanical door opening device is installed on a door it becomes more difficult to open it manually. A person able to open a door may find it very difficult, or even impossible, once the door-opening device is installed. A push-and-go system may be added as an option to the door-opening device. As soon as pressure is felt against the door handle to open the door, the door-opening device is activated.

Another problem, the door-opening device is electric. If there is a power failure, the tenants can no longer use it and must open the door manually. A number of tenants are not capable of doing this and thus end up confined to their units or locked out of the building. In an emergency, if the power failure goes on for a long time, this situation could become serious.

The electromechanical door-opening devices identified for the physically challenged do not usually have emergency batteries. This is an option offered by the manufacturers, however. A battery makes it possible for the system to be independent for a certain lapse of time.

If all the tenants were to use the door-opening device at the entrance doors to the building while the power is off, the battery would not last very long. On the other hand, at the unit doors, this is essential for the tenant's security.

- Universal Remote Control

The universal remote control has small buttons with very little space between them. Since the tenant has some difficulty in terms of manual dexterity, he sometimes presses two buttons at once.

The telephone alarm system in case of an emergency was programmed to call the Sécant office and the tenant has, on a number of occasions set off the break-in alarm by accident by pressing the wrong remote control key, thus putting the staff at the Sécant office on alert.

6.0 RELEVANCY OF THE ELEMENTS VIS-À-VIS COSTS: EVALUATION RESULTS

The important elements identified in section 4 are co-related with the use made by the tenants and the price lists obtained from the various suppliers. These elements are illustrated in Table 6.1

6.1 Use

The use made of the different elements is indicated based on the number of people questioned likely to use them. Thus, as pertains to the Access Ramp, six tenants used the ramp out of a potential of eleven people. Here 6/11 is indicated. Where a person uses an element occasionally, the figure 0.5 is entered. Thus, as pertains to the Interior Corridor, one person occasionally uses the handrail out a potential of eleven (0.5/11). Where questions have been directed solely to the physically challenged, the number of potential users is 4. Thus, as pertains to the Unit Entry Door, four tenants out of a potential of four use the remote control to activate the door-opening device (4/4).

6.2 Costs

The prices indicated in the "COSTS" column represent the costs of the accessibility and home automation elements installed in the common spaces and in the units in the Badeau-Sauvé Residence. They do not represent the difference in cost between accessible construction and traditional construction, as the price of the traditional elements was not substracted from the price of the accessibility elements.

These are before tax prices and do not include labour. In a new construction project, as was the case in the Badeau-Sauvé Residence, it is very difficult to breakdown the labour cost into elements as specific as those on the list. Indeed, it is certain that the services of an electrician are required to install the door-opening devices. However, electricians are present a good deal of time on site while the building is being erected for and execute this work at the same time they are doing many other jobs. It is possible to evaluate the labour cost for an intervention in an existing building but, in a new building, any evaluation becomes very risky, due to the economies of scales generated.

It should be noted, however, that the question concerning labour cost was put to most of the suppliers and subcontractors contacted. Most were unable to quantity the additional costs related to accessibility and a number mentioned to us that these costs were minimal.

Only the specialized equipment, which is not standard in the units, can generate significant labour costs (electromechanical door-opening devices as opposed to single-lever faucets).

We thus chose to limit ourself to the price of that equipment which remains relatively constant regardless of the project type. The contractors can thus compare these costs to their regular equipment costs.

Considering the information available, a certain number of these prices were estimated. In our opinion, they provide a rather realistic appraisal of the price for the architectural accessibility and home automation elements included in the project.

As additional information, Canada Mortgage and Housing Corporation is currently working on a document entitled "Terms of References for a Project to develop Barrier Free and Adaptable Design Options". The Execution Costs component will represent a major section in this document. This component will be prepared by a company specialized in construction cost estimates. We refer the reader to this document for additional information on costs.

6.3 Notion of Relevancy

Let us come back to our initial statement. We assume in this research project that if the tenant uses a piece of equipment this then mean that use of the latter is RELEVANT for the tenant.

The idea of relevancy thus goes beyond the notion of independence. The energy that a tenant can save by the use of a particular device makes it possible for this tenant to execute other more important activities in terms of social integration.

Thus, a person investing less effort in purely domestic activities will have more energy to invest in studies, work and pleasure. Everyone has a limited quantity of energy. Certain specialized pieces of equipment, which are not essential to the independence of a physically challenged person, may make it possible for this person to channel the energy saved into different activities.

The notion of relevancy is similar to that of security and prevention. Take the example of one of the senior tenants in an adapted unit.

When this senior arrived, she used a walker and a manual wheelchair virtually all the time to move around. She had just left a hospital where she had spent more than a year following a hip fracture.

The absence of obstacles in her unit and in the building gave her a feeling of security. She was less afraid of stumbling, falling, becoming tired, etc. The end result here was that, a few months, later she decided to abandon her wheelchair and walker.

At the present time, the tenant moves around with a cane. The fact that she now feels more secure in her environment has made it possible for her to rapidly regain her mobility.

We have determined **two levels of relevancy** for the architectural accessibility elements.

The first level indicates the relevancy for the tenants questioned as part of this study. These are verifiable observations, the product of case studies.

The second level of relevancy involves an extrapolation for a wider client base. We indicate here the elements which, considering all our observations and the related costs, should be contained in other housing projects. Here, we bring into play our experience along with a certain dose of subjectivity. We have also tried to compensate for the low number of respondents who are not always representative of an average.

6.4 Interpretation

This interpretation deals essentially with the **general relevancy** of the elements, i.e. the potential for including these elements in other housing projects. The relevancy for the tenants is a synthesis of section 4.

Here, the project under study is a building intended for seniors. However, the elements deemed relevant may also be used for projects for more varied client groups.

6.4.1 Building's Common Areas

Thus, for the building's common areas, we identified as being relevant for generalized application the elements which increase security and which decrease effort. Obstacle-free circulation and electromechanical door-opening devices in circulation areas are good examples of this. In all locations where tenants will have to carry packages, automatic door-opening devices are necessary. They are also required at entrance, exit doors and for any door kept closed in circulation corridors used for general circulation purposes.

Obstacle-free entrance ways and provisions for the physically challenged in elevators are also relevant elements.

In fact, we have observed that seniors experience architectural problems much in the same way as the physically challenged. Solutions promoting the independence of the physically challenged are also valid to cope with the difficulties faced by seniors. It is also possible to extrapolate as concerns the needs of parents with young children, adolescents with bicycles, etc.

6.4.2 Adapted Units

As concerns adapted units, we found that certain elements were RELEVANT for all client groups whereas others were required for only certain people.

The latter are called ADAPTATION elements. This means that the element is not required generally but that the possibility of it being installed must exist, in order to meet certain individuals' needs.

The adaptation concept is applied solely inside individual units, with the possibility of generalized use constantly being studied.

The relevant elements in the adapted units are the following: the entrance door at ground level, identification of visitors using the television, specifications for the kitchen (with the exception of the cook top), specifications for the bathroom, (with the exception of the grab bars), sliding window in the living area and level access to the balcony.

Provision must be made for the eventual installation of the following adaptation elements: automatic door-opening device at the main entrance way and on the balcony, window-opening device in the kitchen, grab bars in the bathroom as well as the cook top and the microwave in the kitchen.

Once again, seniors, as well as a good number of other people, will be able to benefit from these elements. Obstacle-free circulation in the whole unit is essential for all.

6.4.3 Adapted/Automated Unit

The tenant in the adapted/automated unit is a quadriplegic with partial use of his upper members.

We are aware of the home automated system and the specialized equipment functions necessary for this tenant.

We can then assume that for other physically challenged tenants with similar limitations, the relevancy should be comparable. It is highly probable that people more conscious of their security would also use the remote alarm.

Thus, the tenant becomes a benchmark for us.

We also assume that the relevancy of the various functions offered would increase proportionally depending on the degree to which the tenant is physically challenged.

Quadriplegics without the use their upper members, persons with degenerative diseases affecting the nervous or muscular systems (multiple sclerosis, muscular dystrophy), people with severe cerebral palsy, etc., could all make good use of home automation systems and of the specialized equipment, as presented in a demonstration format in the adapted/automated unit.

Anyone who finds it difficult, or who is unable, to control or to activate equipment is a good candidate for home automation. The challenge here is providing them with the means to interact with the system.

Anyone needing assistance and surveillance on a continuous basis will also appreciate certain aspects of the home automation system as a number of additional functions may be added to the basic function studied.

In brief, the home automation system is relevant for the current tenant and would be even more so, if the tenant were a little less independent.

The home automation system is also relevant for the owner due, among other things, to the temperature regulation functions which allows for energy savings and for the remote alarm functions.

One potentially interesting feature which could have been offered in the home automated unit: having the whole unit wired when it was being built with a "built-in" basic system making it possible to control the temperature. The X-10 outlets, movement detectors and control panels could be added to meet the specific needs of the tenants.

Table 6.1 Relevancy of Elements vis-à-vis Costs

ELEMENT	Use	Cost	Relevancy for Tenants	General Relevancy
INTERIOR AND EXTERIOR COMMON SPACES				
Reserved Parking	0/5		NO	YES Important for physically challenged visitors
Access Ramp: .Access Ramp in Concrete (concrete, reinforcing, frost free support, excavation, granular base) .Steel handrail	6/11	$450.00 per square meter $106.00 per linear meter	YES	YES but it would be preferable for the building entrance to be at ground level
Main Entrance Door: .Marking (900 mm long) .Flat aluminium threshold (1800 mm long) .Automatic door-opening device .Push-button controls (2) .Key switch .Infrared receiver on door-opening device .Remote controls (3)	7/11	$1,545.00/each $3.00/door $60.00 $150.00/each $60.00 $650.00 $125.00/each $2,933.00	YES The door opening device should be equipped with an emergency battery and remote controls should be available for the tenants expressing the need for them.	YES
Entrance Door - Air-Lock: .Door-opening device (electric keeper) .Press-button .Key switch .Infrared receiver on door-opening device	7/11	$1950.00 $150.00 $70.00 $650.00 $2,820.00	YES The door opening device should be equipped with an emergency battery and remote controls should be available for the tenants expressing the need for them.	YES
Interior Corridor: .Vinyl handrail	0.5/11	$4.30/linear meter	NO The people questioned are not perhaps representative of all the tenants in the building.	YES In a building with a high concentration of seniors.

Community Toilet: door (2)	0/11		NO	NO
.Door handle (lever)		$194.00		
.Kick plate		$38.00		
.Automatic door opening device (electric keeper included)		$1,555.00		
.Push-buttons controls (2)		$150.00/each		
		$1,1937.00 x 2		

Table 6.1 (cont'd)

ELEMENT	Use	Cost	Relevancy for Tenants	General Relevancy
Common Toilet: interior (2)	1/11		YES	NO
.Vanity		$399.00	However, only one	However, only one
.Grab bar		$110.00	toilet for both sexes	toilet for both
.Sink		$368.00	would be sufficient.	sexes would be
.Faucets (with plug off center)		$208.00	This toilet is mainly	sufficient. This
.Plumbing catch set off to the side		$90.00	for visitors.	toilet is use mainly
.Mirror		$80.00/sq.m.		by visitors.
.Hook		$3.00		
		$1,258.00		
Garbage Chute: Ground Floor	3/10		YES	YES
.Lever type door handle as in air-lock	these people	$153.00	Considering the cost,	but not as high
.Kick plate	do not live	$38.00	one garbage chute	priority
.Automatic door opening device (Electric keeper included)	on the ground floor	$1,555.00	alone with a door-opening device seem	
.Push-button controls (2)		$150.00/each	sufficient. The	
.Chute hatch opens laterally (metal frame with "deflector" included)		$825.00	lateral opening hatch as included in the	
		$2,871.00	specifications did not materialize.	
Laundry Room:	6/10		YES	YES
.Lever handle	one tenant	$212.00		
.Kick plate	cannot do	$38.00		
.Automatic door-opening device (electric keeper included)	his laundry alone	$1,805.00		
.Push-button controls (2)		$150.00/each		
.Clearance around counter		$230.00/l.m.		
		$2,585,00		
Community Room: Entrance Door	0/11		NO	NO
.Lever door handle		$212.00	The door is always	depends on the
.Kick plate		$38.00	open.	context.
.Automatic door-opening device (electric keeper included)		$1,805.00		
.Push-buttons controls (2)		$150.00/each		
Community Room: Interior			*TO BE DETERMINED*	Variable
.Flooring (vinyl tiles)		$26.00/sq.m.	The sound system could	
.General sound system (loud speakers)		$3,500.00	be used by the owner or by the tenants' association.	

Table 6.1 (cont'd)

ELEMENT	Use	Cost	Relevancy for Tenants	General Relevancy
Community Room: Exit Door	5/8		YES	YES
.Emergency door lock (compact panic bar included)		$243.00	The automatic door-opening device should	for any door leading to a common outside
.Automatic door-opening device (electric keeper included)		$30.00	be equipped with an infrared receiver and	space.
.Push-button control		$1,805.00	an emergency battery.	
.Key switch		$150.00	Same remote control	
		$70.00	code as the main	
		$2,298.00	entrance door.	
Access Ramp - Backyard:	3/8		YES	YES
.Access ramp in concrete		$450.00/sq.m.	However, it would be	However, it would be
.Handrail in steel		$106.00/l.m.	preferable for the main entrance to the building to be at ground level.	preferable for the main entrance to the building to be at ground level.
Elevator:	10/10		YES	YES
.Provisions made for the physically challenged (additional handrail, controls in braille, photoelectric bells and cells)		$1,500.00		
ADAPTED UNIT	4/4		YES	ADAPTATIONS
			Essential for two	
Unit Entry Door:			tenants, practical for	
.Lever handle		$141.00	the others.	
.Bevelled threshold		$60.00		
.Second peep hole		$6.00	The automatic door-opening device should	
.Wood threshold		$54.00		
.Automatic door-opening device (electric keeper included)		$1,950.00	be equipped with an infrared receiver and	
.Push-button switch		$60.00	an emergency battery.	
.Key switch		$70.00		
.Infrared receiver		$650.00		
.Remote controls (3) (included in the main entrance way)		included		
		$2,9991.00		
Identification of Visitors:	7.5/10		YES	YES
.Seeing who is at the entrance way on the tv screens (camera, central equipment and hook-up to the unit included)		$1,500.00		security

Table 6.1 (cont'd)

ELEMENT	Use	Cost	Relevancy for Tenants	General Relevancy
Exit Door from the Unit to the Balcony:	3/4		YES	YES
.Flat aluminium threshold		$30.00	Balcony on same level	
.Elevated platform		$20.00/sq.m.	as unit for all tenants.	
.Automatic door-opening device (electric keeper included)		$1,720.00	Required for certain	ADAPTATION
.Push-button controls (2)		$60.00/each	tenants, with infrared	
.Steel handrail		$106.00/l.m.	receiver and emergency battery.	
ADAPTED/AUTOMATED UNIT				
Intercom/Visitor Welcoming System:	YES	$1,075.00/each	YES	ADAPTATION
.Adaptations to the intercom (2)				
.Break-in and remote alarm	NO		NO	YES
.Remote alarm in case of fire	N/A		NO	Wiring put in when
.Remote alarm in case of emergency	NO		NO	unit was built (±
.Temperature control	NO		NO	$200.00 when built),
.Lighting controlled by movement detector	YES		YES	Module to control heating and remote
.Predermined schenarios	VERY LITTLE		YES	alarms, for the
.Telephone remote control	NO		NO	owners use.
.X-10 electrical outlets (fan, lamps and appliances)	2/12		YES	ADAPTATION: Addition of home automation functions depending on the tenants' needs.
Home Automation System (Sécant):				
.Central Sécant control		$2,000.00		
.Sécant programming panel		$660.00		
.Sécant security panel		$400.00		
.Temperature censors (4)		$100.00/each		
.Sécant junction boxes (6)		$16.00/each		
.Heating relays (4)		$40.00		
.Door contacts (2)		$4.00/each		
.Smoke detector		$42.00/each		
.Plate with key and warning light		$30.00		
.Interface		$35.00		
.Communicators (11)		$50.00		
.X-10 outlets (12)		$30.00/each		
.Outlets for air conditioner		$40.00		
		$4,281.00		

Table 6.1 (cont'd)

ELEMENT	Use	Cost	Relevancy for Tenants	General Relevancy
.Direct control by universal remote control	YES	$100.00	YES	ADAPTATION
.Neck controls, accident remote alarm	NO		NO	To be determined
Kitchen:				
.Chemical extinguisher for the ventilator hood	NO	$595.00 $125.00	NO	ADAPTATION
.Automatic timer for cook top	NO	$100.00/each	NO	ADAPTATION
.Flood control humidity detectors (2)	NO	$25.00	NO	To be determined
.Rail-mounted module (microwave oven)	YES	$945.00	YES	ADAPTATION
Bathroom:				
.Special bi-fold door (hardware included)	NO	$850.00	NO	To be determined, depending on the space available.
Living Area:				
.Automatic blind-opening device	YES	$1,862.00	YES	ADAPTATION
Bedroom:				
.Special bi-fold door (hardware included)	NO	$850.00	YES	To be determined, depending on the space available
.Automatic curtain-opening device	YES	$1,862.00 $2,712.00		

7.0 CONCLUSION

7.1 Scope of the Study

It has to be noted, first of all, that the survey was conducted among a very limited group: one tenant for the adapted/automated unit and three tenants for the adapted units. This is than a case study more than anything else.

The sample use for the traditional units is also quite limited: only six tenants were questioned.

It is not possible to draw global conclusions based on such a sample. At the very most, we could point to areas to be further explored as pertains to use and to difficulties experienced. Section 4.6 gives an overview of this.

The characteristics of the residents in the building must not be overlooked either: these are seniors. Thus the results obtained may provoke further reflection concerning housing conditions for seniors. Based on this study, however, we cannot draw conclusions concerning projects containing mixed client groups.

In this respect, la Société Logique is in the process of completing a survey on the use of universal accessibility elements by tenants in three of its housing projects. Nearly 70 tenants, representing a wide client mix, were questioned. This survey will be available shortly from CMHC and may also contribute to further reflection in this matter.

7.2 Architectural Accessibility

On the whole, it is observed that the building and the adapted units under study rated well in terms of architectural accessibility, which made it possible for both the seniors, as well as the physically challenged, to maximize their independence.

The comments collected indicate to us, however, that a good number of problems have not yet been solved. The siting of the building (ramps required), the location of the adapted units at the far end of corridors, balcony access, exterior steps in the means of egress from the ground floors, the location and use of key-activated switches (door-opening device), the small dimensions of the entries in the units are a few examples of this.

Thus there is room for improvement in planning and building future housing projects. The elements mentioned above are but a few avenues to be explored which were raised by the people questioned. For example, the whole issue of means of communication for the auditively challenged was not addressed in this study since none of the tenants questioned had limitations in this regard.

The comments collected confirm the importance of architectural accessibility in a building intended for seniors. Completely independent seniors can live without any difficulty in the building. On the other hand, as soon as they start having to cope with limitations in terms of mobility, seniors have identified, both in the building and in their units, difficulties which are similar to those identified by the physically challenged.

In this respect, the traditional design of units intended for seniors does not lend itself easily to adaptations accomodating a progressive loss of independence by seniors. Certains elements, such as the threshold under the patio door, can even cause falls and consequently accelerate this process.

A number of the accessibility elements in the adapted units should therefore be incorporated in traditional units, which would promote home care among for seniors. When programming new projects, an attempt should be made to avoid differentiating between adapted and traditional units and to strive instead to amalgamate these two concepts to create hydrid, easily adaptable units.

7.3 Home Automation

As for home automation, our observations were made on one unit. The tenant here was not exactly an electronics fanatic. At the beginning of the project, all the intervening parties had great expectations for him and his lack of motivation disappointed a number of people.

In fact, the tenant showed no interest whatsoever in exploring and mastering the home automation system. As for us, who wanted to observe and comment on the use he made of the different functions, we found that the tenant's rare attempts to test the system's possibilities were feeble indeed.

However, we believe, after due consideration, that this tenant is probably representative of the average individual in his attitude to technological facilities. His current use of the system coincides with his values, priorities and physical capacities. The mere fact that this tenants is offered a wide range of electronic possibilities does not necessarily mean that he will use them. We must not forget that the Ville St-Laurent project is also a demonstration project.

In the same vein, we noted that just because the occupational therapist considered a particular function important does not mean that her client will necessarily share this opinion.

We observed, by comparing the priority elements as ranked by the client and by the occupational therapist, that there was a difference. Of course, this remains a factual observation, but certain studies conducted recently, or which are being conducted at the present time by occupational therapists, identify a problem here.

> "..., in the absence of an evaluation of the client's satisfaction, the intervening party's perception may well supercede that of the elderly person. This may create a wholly biaised situation. In fact, each occupational therapist has a different perception of the needs to be satisfied, with this perception being the natural result of the therapist's own values, experience and resources."(1)

The tenant's involvement in the choice of functions and specialized equipment necessary to adapt the unit to his needs seems to have a positive influence on his use of, and degree of satisfaction with, them. This hypothesis may also be applied to the home automation functions.

We also noticed a change in attitude, and consequently in the use of the home automation functions, by the tenant, over the six-month study.

The tenant became more familiar with his unit and his environment. He became aware of his possibilities in this adapted environment and, slowly but surely, started to use the equipment and the functions which made up for his limitations or which met unsatisfied needs. We observed a significant improvement in the use made of the systems available to him, and it is highly probable that this trend will continue after the study is completed.

We have to specify that this is the first time that this tenant has lived alone in an adapted unit. Learning how to live alone was already very difficult and, in addition, this tenant also had to cope with the home automation system. The nature of the tenant's limitations is such that he can live alone in an apartment on the condition that he receives assistance on a regular basis.

The observations that we made do not allow us to claim that, without the home automation system, the tenant would not have been able to function in a regular unit. Neither do they allow us to claim that the assistance which he is currently receiving is less than that which he would have received if there had been no home automation system in his unit.

All we can affirm that the **home automation system contributed to improving the quality of life and the security of this tenant; that the efforts invested previously for certain activities may be now used to undertake more profitable activities for the tenant.**

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(1) The development of an instrument to evaluate seniors satisfaction

with the equipment made available to assist them, Louise Demers, January 1994, page 1.

If the tenant had been more restricted in his activities, the home automation system might have become an essential element allowing him to live alone once again. In the case of the tenant in unit 108, the architectural accessibility features, both in the building and in the unit, as well as the adaptation equipment which was made available in the unit, appear to us to be more important that the home automation system.

Automation can be Addressed in Two Ways.

The first approach consists in looking at the home automation system as one intended for the public at large, including the physically challenged. This system, thanks to its control, regulatory, alarm and security functions, improves the quality of life of the residents in the units. This is the approach chosen by Domotique Sécant, and by the SHQ in its new renovation program "Accent on Renovation".

The other approach consists in treating home automation as an adaptation making it possible for the physically challenged to live in a regular environment as opposed to institutions.

With the disinstitutionalization process and the trend toward social integration of the physically challenged, an increasingly large number of the latter are living in regular environments. Architectural accessibility and, above all, home care services have definitely postponed the point at which a person has to go into an institution.

In this context, home automation may prove to be an essential adaptation for very restricted physically challenged people or to promote better resource management. This study, which is, in fact, a case study, allows us to state that, for the tenant in the adapted/automated unit, home automation is important.

Using this tenant as a benchmark, we can assume that the more the physically challenged person is restricted, the more relevant the various functions offered would become.

Quadriplegics without any use of their upper members, people with degenerative diseases affecting their nervous or musuclar systems (multiple sclerosis, muscular dystrophy), people with severe cerebral palsy, etc., all are good candidates for home automation systems with specialized equipment, such as those represented in a demonstration context in the adapted/automated unit.

Any person experiencing difficulty, or being unable, to control or activate equipment is a good candidate for a home automation system. The challenge here is to provide them with the means to interact with the system. In this study, universal remote control was used. In other systems, a voice recognition systems such as the RT-8000 is essential. Once against, this is a matter of adaptation.

For certain people, home automation may prove essential. But what must be clearly understood here is that a piece of equipment does not have to be essential to be relevant.

Thus, the energy saved through the use of a particular piece of equipment makes it possible for the physically challenged to undertake other more crucial activities in terms of social integration.

If the physically challenged person invests less effort in domestic chores, this means more time is freed-up for studying, working and pleasure. Everyone has a limited quantity of energy. Certain specialized pieces of equipment, which are not essential for the independence of a particular person, may make it possible for this person to channel the energy thus saved into different, more profitable activities.

Similarly, it can be said that a physically challenged person with less restrictions than the tenant in the adapted/automated unit, a paraplegic for example, would not have as much to gain from a home automation system.

In general, home automation can be considered on a scale going from a luxury item to an essential item, depending on the person involved.

Home Automation is thus an Element of Adaptability.

Should the widespread use of home automation systems be considered to accommodate the physically challenged? As is the case for universal accessibility, home automation may allow the physically challenged to enjoy greater independence in their units... **To the extent that funds are available, home automation should be integrated into residential projects.** Especially since home automation elements can be used by the population at large.

Another consideration helps make the case for home automation: the system makes it possible to "remote control" various systems in the building which can be particularly beneficial for a landlord. We are thinking here in terms of fire security, flooding, control of heating and lighting, etc.

Our observations allow us to conclude that home automation is multifaceted: it is an element of architectural accessibility, an adaptation to specific needs, a technology which makes it possible to enhance the comfort and security of the residents in the units, and it is beneficial to the landlord as well as to the residents.

With its basic functions and its numerous possibilities, home automation is relevant for the physically challenged and it is reasonable to suppose that the greater the restrictions faced by the physically challenged, the more relevant this system becomes.

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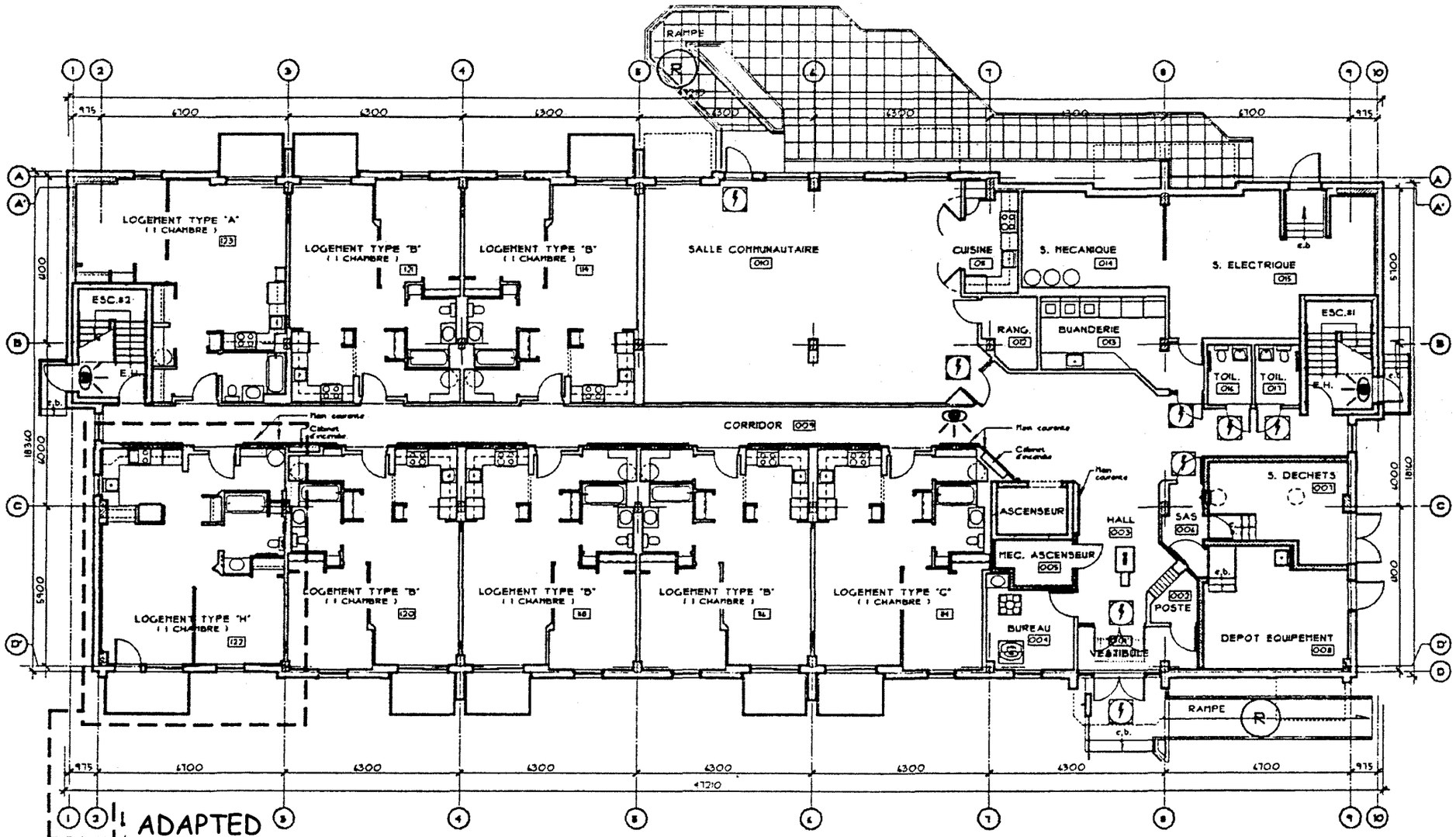
APPENDIX A

DRAWINGS

Storey Plan and Adapted Unit



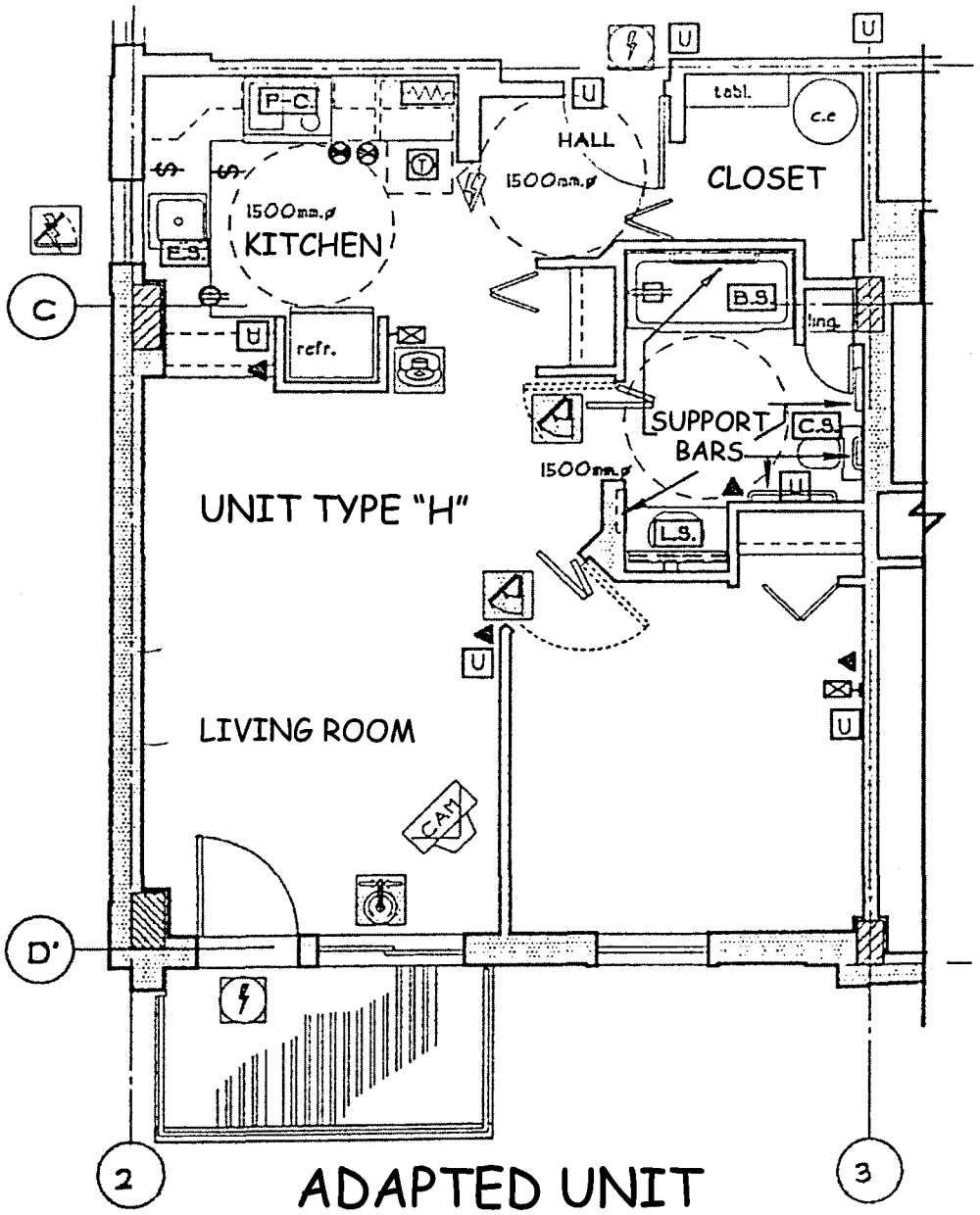
ADAPTED UNIT

See sketch 2/2 for blow up.

EQUIPMENT LOCATION

- Detection system to open secondary exit door
- Obstacle-free access ramp
- Surveillance camera
- Electromechanical door operator
- Water supply in the office to accommodate an infirmery
- Intercom connected to units and common room

GROUND FLOOR PLAN SKETCH 1/2



EQUIPMENT LOCATION

- Electromechanical door operator with remote control
- Intercom system/loud speaker relay to the office
- Special bi-fold door with reduced opening radius
- Adapted window with roller slides instead of nylon blades
- Remote control motorized window with rain detector and emergency power supply
- Motorized window operator
- CAM — Television via surveillance camera
- P-C. — Cook top with front controls
- E.S. — Special sink and faucets
- B.S. — Bathtub with right-angled corners for a bench; balanced pressure system
- L.S. — Special sink and faucets
- C.S. — Special cabinet
- U — Emergency call station
- Retractable work surface
- Microwave provided
- Controls for ventilator and light at the front of the counter
- Electrical outlet at the front of the counter
- $ — Three-way switch for light above the sink
- Telephone outlet
- Intercom station with telephone receiver
- Full height mirror
- Special regulated shower

SKETCH 2/2