

HOUSING RESEARCH REPORT

Study of the Cost of Including Accessibility Features in Newly-Constructed Modest Houses

Revised Final Report

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Canada Mortgage and Housing Corporation (CMHC)
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Newly-Constructed Modest Houses

Revised Final Report

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Executive Summary

This research estimates the cost of incorporating accessibility features in newly constructed modest houses. It identifies universal features that would allow a dwelling to be adapted as its inhabitants age and which would be difficult or expensive to incorporate after construction.

Benchmark plans for five common types of dwellings were developed and then modified to include about 60 accessibility features. The marginal cost of including these accessibility features *at the time of design and construction* were estimated for modest bungalows, townhouses, semi-detached houses, detached houses and apartments, in five Canadian cities.

The costing methodology used several sources: the www.costtobuild.net website, RSMeans *Contractor's Pricing Guide: Residential Repair & Remodeling 2015 Book*, and a proprietary design tool. Other sources used were used such as specialized manufacturers and rate schedules for the construction trades. Plans and costs reflected municipal construction regulations and were reviewed by local home builders or builders' associations.

About three-quarters of the 60 features added for future accessibility cost less than \$500 each. Cost estimates reflect both the accessibility features (e.g. lever door handles, plywood-reinforced bathroom walls to accommodate future grab bars) and extra square footage added for greater accessibility (e.g. allowance for a wheel chair turning circle in bathrooms). Some floor plans were found to be easier to adapt than others.

The total cost of adding all the accessibility features was found to represent between 6 and 12 per cent of the base construction cost, depending on the type of dwelling and city. These cost estimates were compiled to demonstrate the marginal extra cost of providing adaptable housing if accessibility features are considered at the time of design and construction. Actual costs will, of course, vary based on local conditions.

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1. Project description

This research focuses on the construction of housing units with certain basic accessibility features to enable residents to live and age at home.

The purpose of the project is to estimate the cost of including these accessibility features in newly constructed modest houses. Five types of construction were selected for this study: a two-bedroom bungalow, a semi-detached two-bedroom house, a detached three-bedroom house, a three-bedroom townhouse and a two-bedroom apartment. These are the popular home options in Canada.

In particular, the study identifies features that would have a significant impact on the home's accessibility performance and that would be difficult or expensive to incorporate after construction. These are universal features likely to be useful and pleasing to most people. The objective is not to build houses in which persons with disabilities can live. The idea is to construct accessible, adaptable homes that can be modified over time without any major upgrades or costs, based on the occupants' changing needs.

The cost of these accessibility features and their net impact on total construction costs were established for the five types of dwellings in five cities in Canada.

The following steps were undertaken to fulfill the mandate:

1. Make a list of accessibility features whose costs are to be established.
2. Select five cities for analysis of construction costs.
3. Identify municipal construction regulations that apply in each selected city.
4. Establish floor plans for five standard benchmark homes and validate these plans with homebuilders for each selected city.
5. Modify the standard benchmark plans by including the accessibility features.
6. Estimate the cost of building standard benchmark homes in each of the five cities.
7. Estimate the costs of including the accessibility features in the modified plans and confirm these costs with homebuilders for each selected city.

2. Methodology

1. Make a list of accessibility features whose costs are to be established

CMHC developed a preliminary list of features, which was subsequently completed as part of the mandate.

Features that would have a significant impact on accessibility performance and that would be difficult or expensive to incorporate after construction were selected.

Features involving details that are easy to install or that can be provided at negligible cost after construction are therefore not included in the list of features.

Features involving adaptations specific to the needs of a particular individual are also not included in the final list because the mandate does not cover construction of adapted housing; it focuses on building accessible homes that can be adapted.

2. Select five cities for analysis of construction costs

The choice of cities for the study was based on the following criteria:

- Major Canadian city
- Representative of each region (the West, Prairies, Ontario, Quebec, Atlantic)
- High 2013/2014 rate of housing starts compared to other cities in the same region (according to CMHC)
- Builders or homebuilders' association in the region that can provide information on the local situation, validate benchmark plans and provide information on construction costs
- Availability of information on construction costs

The five following cities were selected:

1. Vancouver, British Columbia
2. Winnipeg, Manitoba
3. Toronto, Ontario
4. Montréal, Quebec
5. Halifax, Nova Scotia

3. Identify municipal construction regulations that apply in each selected city

The regulatory body from which to obtain information on applicable housing construction regulations was identified for each city.

Specifically, this involved checking whether accessibility features were required in standard construction to ensure these features were not included in the incremental costs of developing modified plans.

Contact information for the individuals contacted in each city is provided in Appendix 5.

4. Establish floor plans for five standard benchmark homes and validate these plans with homebuilders for each selected city

Construction plans for various types of homes were first selected from Internet sites (real estate developers, house plans) and plans provided by CMHC. The following maximum areas were considered:

- 1,800 sq. ft. (176 m²) for a two-storey house
- 1,200 to 1,500 sq. ft. (111 to 140 m²) for a bungalow

Different builders or homebuilders' associations for each region were then contacted to ensure the selected plans were representative models for each target city. Note that, for Halifax, it was not possible to identify any stakeholders to comment on the submitted plans.

Contact information for the individuals contacted in each city is provided in Appendix 6.

The types of plans and the plans themselves were adjusted based on feedback.

Five plans for standard benchmark homes were finally selected:

- Two-bedroom bungalow with one full bathroom
- Two-storey, semi-detached, two-bedroom house with a half-bath on the entry level and one full bathroom upstairs
- Two-storey, detached, three-bedroom house with a half-bath on the entry level and a full bathroom upstairs
- Two-storey, three-bedroom townhouse with a half-bath on the entry level and two full bathrooms upstairs
- Two-bedroom apartment with one full bathroom

The homes include a garage and basement in order to take into account consumer preferences for this type of space.

The five home types are not necessarily representative of housing construction in all the cities. Typically, two or three types are representative for a given city.

5. Modify the standard benchmark plans by including the accessibility features

The standard plans selected for the five home types were modified to include the accessibility features identified in step 1.

One of the challenges was to ensure that the areas in the standard and modified plans were the same, while also ensuring the number of bedrooms and the quality of the spaces were the same. Some modifications did, however, require additional space for the home as well as for the garage.

Not all of the accessible features could be included in every plan. Some plans provided better potential for certain features, especially for getting from one floor to another.

6. Estimate the cost of building standard benchmark homes in each of the five cities

The www.costtobuild.net website was used to determine the standard construction cost of the four single-family homes (bungalow, semi-detached house, detached house and townhouse) in Montréal.

The www.costtobuild.net website can be used to calculate the construction costs of a single-family home, based on criteria such as building area, number of floors, building style, materials, number of bedrooms, number of bathrooms, presence or absence of a basement, presence or absence of a garage, etc.

For purposes of the study, the following materials were selected to calculate costs: wood flooring on upper floors, ceramic flooring in the kitchen and bathrooms, thermoplastic kitchen and bathroom cabinets, and laminate countertops.

Costs for the four other cities were assessed using the RSMeans *Contractor's Pricing Guide: Residential Repair & Remodeling 2015 Book*. This estimation tool includes data on construction costs and indexes for a number of cities in the United States and Canada.

The RSMeans *Contractor's Pricing Guide: Residential Repair & Remodeling 2015 Book* provides the following indexes for the five cities selected for this study:

Rank	City	Benchmark index
1	Toronto	100.9%
2	Montréal	100%
3	Vancouver	94.6%
4	Halifax	90.1%
5	Winnipeg	88.3%

The costs of construction for standard benchmark homes in Toronto, Vancouver, Halifax and Winnipeg were extrapolated from the costs identified for Montréal, based on the established indexes.

The costs obtained in this way were submitted to builders or regional homebuilders' associations to confirm their accuracy. Only the Toronto stakeholders commented on the costs submitted.

Various meetings were held with designers, the developer and the builder to establish the construction cost of the benchmark apartment, but information has yet

to be obtained on the cost of constructing the building in which the apartment is located. No base cost is therefore indicated.

7. Estimate the cost of including accessibility features in the modified plans and confirm these cost estimates with homebuilders for each of the selected cities

Costs were first established for Montréal, since we already had all the necessary resources for estimating costs.

There are various types of costs for accessibility features:

- Construction system: foundation wall, exterior wall or roof
- Additional area: balcony, bathroom, garage
- Module: vertical module for future built-in oven
- Hardware: lever faucet, lever hardware
- Material: plywood nailing base
- Labour: time required to install the nailing base
- And some features do not involve extra costs (some flooring, colour choices, etc.)

Several estimation strategies were used:

- The www.costtobuild.net site was again used to determine the costs of some additional areas (floor plan, garage, balcony and canopy).
- An in-house estimating tool was then used for various jobs related to accessibility (pull-out shelves, built-in oven module, etc.).
- Specialized manufacturers were consulted to identify the costs related to specific equipment (doors, hardware, plumbing fixtures and appliances, kitchen fixtures, etc.).
- The hourly rates of the various construction trades were also used to assess the cost of certain jobs.
- A senior structural technician with experience in home adaptation projects was consulted to determine the methods and costs of building an easily modifiable structure that could accommodate a vertical platform lift or curbless shower.
- Finally, three general contractors with experience in building accessible or adapted homes were consulted to confirm the costs of certain features (additional excavation, canopy, etc.).

Again, the cost of accessibility features for the four other cities was assessed using the RSMMeans *Contractor's Pricing Guide: Residential Repair & Remodeling 2015 Book*. This estimation tool includes data on construction costs and indexes for a number of cities in the United States and Canada.

The RSMMeans *Contractor's Pricing Guide: Residential Repair & Remodeling 2015 Book* provides the following indexes for the five cities selected for this study:

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1	Toronto	100.9%
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4	Halifax	90.1%
5	Winnipeg	88.3%

The cost of accessibility features for Toronto, Vancouver, Halifax and Winnipeg were extrapolated from the costs identified for Montréal, based on the established indexes.

All the estimated costs were submitted to builders or homebuilders' associations to confirm their accuracy. Only the Toronto stakeholders commented on the costs submitted.

It should be noted that the costs in this report are estimates only, compiled to demonstrate the marginal extra cost of providing adaptable housing *if accessibility features are considered at the time of design and construction*. Actual construction costs will, of course, vary based on local housing market conditions, the availability of expertise, the cost of labour, the availability and cost of materials, and other factors.

3. Municipal construction regulations

The regulatory body for each city was consulted to identify the accessibility features required under municipal regulations.

Generally speaking, the provinces covered in this study use a building code based on the 2010 National Building Code (NBC), with the exception of Quebec, whose Construction Code is based on the 2005 NBC. All the provinces in which the selected cities are located have made amendments to NBC requirements, some regarding accessibility.

However, since under the NBC single-family homes are excluded from the scope of application of the Barrier-Free Design section, no accessibility measure is required for the targeted homes.

It is then up to municipalities to establish regulations that are more stringent than those of the province. This is notably the case in Vancouver, Toronto and Halifax, which have adopted more stringent accessibility regulations.

More detailed information regarding regulations specific to each city is presented in Appendix 1.

4. Key Principles of Accessibility

The accessibility features that were identified, included in the modified plans, and whose cost was then assessed are grouped in different categories, the key principles of which are explained here. Those features are detailed in Appendix 2.

Again, the objective of these accessibility features is not to build houses in which persons with disabilities can live. The idea is to construct accessible, adaptable homes that can be modified over time without any major upgrades or costs, based on the occupants' changing needs.

Building layout

A home's accessibility performance is primarily related to the number and usability of accessible entrances.

The entrance to an accessible home is level or slightly above ground, whereas the entrance to a standard home is about 510 mm (20 in.) above ground. To make the entrance level with the ground, the joists for the entrance level are embedded in the top of the foundation wall to reduce the height from the ground.

The walkway leading to the entrance slopes gently (1:20 maximum), without any steps or ramps. This walkway also leads to the garage without any steps or ramps.

Access to the home

A landing or balcony with enough wheelchair manoeuvring space (turning circle of 1,500 mm (5 ft.) minimum in diameter) is provided at the entrances.

The front door, the door connecting the garage to the dwelling and the door leading to the back patio are 915 mm (36 in.) wide, which provides 860 mm (34 in.) of clearance. The doors are equipped with lever handles. The threshold is flat if the door is protected from the weather. If not, the threshold is standard but embedded to make it as level as possible with adjacent surfaces.

The door has a sufficiently low glass panel or a glass sidelight that allows occupants to see who is at the door. A peephole in the door is now standard in apartments. A second peephole at an accessible height must be provided. To make it easier to approach and operate the door in a wheelchair, 600 mm (24 in.) of free space is provided on the side of the handle when the door needs to be pulled open and 300 mm (12 in.) of space is provided when the door needs to be pushed open.

4. Key Principles of Accessibility

Garage dimensions and difference in elevation between the garage and the house

An accessible garage provides enough room to park a car and manoeuvre around it in a wheelchair (turning circle of 1,500 mm (5 ft.) in diameter).

The height between the garage and the house should be as low as possible to make it easy to move back and forth between them. Ideally, the path between the two should be level. A maximum 100 mm (4 in.) difference in height allows for the installation of a short access ramp, if necessary.

A 4,270 mm (14 ft.) wide by 6,100 mm (20 ft.) long single-car garage meets these needs.

The garage has a 2,750 mm (9 ft.) ceiling, providing ample space for various types of adapted vehicles.

Note that a single-car garage cannot accommodate a side-loading wheelchair van. A double garage is required for this type of vehicle.

Mobility

Corridors must be at least 920 mm (36 in.) wide. Wheelchair manoeuvring space (turning circle of 1,500 mm (5 ft.) in diameter) is provided at key locations, such as in front of the washer/dryer, on both sides of the doors, in front of storage space, in each room, etc.

Doors are 865 mm (34 in.) wide, which provides 815 mm (32 in.) of clearance. Doors are equipped with lever handles, and flooring is installed so as to eliminate door sills.

To make it easier to approach and operate doors in a wheelchair, 600 mm (24 in.) of free space is provided on the side of the handle when the door needs to be pulled open and 300 mm (12 in.) of space is provided when the door needs to be pushed open.

When wheelchair manoeuvring space is compromised by a swinging door, a recessed sliding door can be installed instead.

The bedroom is large enough to provide a 1,500 mm (5 ft.) turning circle beside the bed. At least one bedroom has a door with the required clearance on the side of the door handle.

Smooth, slip-resistant flooring is installed. Carpet is not recommended.

4. Key Principles of Accessibility

Controls and security system

Switches, thermostats and controls are located a little lower than usual.

All hardware is designed for one-hand operation: lever handles, easy-to-manoeuvre locks, D-shaped cabinet and drawer handles, etc.

Kitchen

A U-shaped counter provides a continuous work surface and makes it easy to handle dishes without having to carry them from one counter to another. A 1,500 mm (5 ft.) space in front of all sections of the counter makes it easy to move around in a wheelchair.

Counter height is standard to accommodate normal kitchen appliances, such as a dishwasher and stove. The upper cabinets are also at standard height. If necessary, the bottom cabinets can easily be modified or replaced with lower cabinets, and the upper cabinets can be lowered.

Pull-out shelves, corner lazy Susan cabinets and full-height storage allow occupants to work and access objects from a sitting position. A roll-in pantry also allows occupants to reach many objects from a sitting position. When space is limited, deep drawers in the lower cabinets can be installed instead of a roll-in pantry.

The kitchen can easily be modified by installing a built-in oven and replacing the stovetop with a movable hotplate below. Vertical storage at least 760 mm (30 in.) wide is provided for future installation of a built-in oven.

The kitchen sink cabinet is designed with a separate toe kick panel and a removable bottom section to make it easy to free the space underneath the sink for wheelchair access, if necessary. The sink is equipped with a lever faucet.

Ceramic flooring is installed throughout the kitchen, including under the counters. This provides uniform flooring underneath the sink if the space has to be converted for wheelchair access.

4. Key Principles of Accessibility

Half-bath

In two-storey houses, a half-bath is provided on the main floor with space for wheelchair access (1500-mm (5-ft) turning radius).

The toilet is adjacent to a wall and nailing bases are provided for future installation of grab bars on the side and rear walls. The space next to the toilet is free, but can be compromised when space is limited.

A wall-mounted sink with lever handles and no pedestal is preferable.

Bathroom

The bathroom is large enough to provide wheelchair access (1500-mm (5-in) turning radius).

The entire area in front of the bathtub is clear. When a shower is provided, it is large enough to be converted into a roll-in shower, if necessary. The structure underneath the shower is designed for easy conversion.

The toilet is adjacent to a wall and nailing bases are provided for future installation of grab bars on the side and rear walls. The space next to the toilet is free, but can be compromised when space is limited.

The bathtub, shower and sink have lever faucets.

Lift

Single-family homes are designed for future installation of a chair stair lift, platform stair lift or vertical platform lift in a well for access to all floors, including the basement.

Chair or platform stair lift

Where possible, a straight staircase without landings or turns is planned for future installation of a chair or platform stair lift

Since the staircase is also an evacuation route, it must meet certain width requirements to allow occupants to go downstairs to reach the exit on the entry level. A lift can be installed in a staircase 1000 mm (39 in) wide, which meets evacuation width requirements.

A space for wheelchair access (1500-mm (5-ft) turning radius) is provided at the top and bottom of the stairs. However, future installation of a platform stair lift requires

4. Key Principles of Accessibility

more space on the lower landing, which is not always provided at the time of construction. If necessary, a closet can easily be demolished to provide the additional space required.

Vertical platform lift

Space is provided by stacking closets or storage space on top of one another.

These areas have a knock-out floor panel to simplify future installation of a platform lift.

Where future installation of a vertical lift platform is planned (semi-detached and detached houses), the staircase was nevertheless expanded to offer the option of installing a chair stair lift if one is required.

Fire safety and evacuation

When the fire alarm is triggered, most people know it's time to evacuate the building. The alarm must warn all occupants regardless of their sensory abilities. Systems must be in place to allow all occupants to exit the building independently.

To achieve this, audible and visual smoke alarms are installed and all dwelling entrances are accessible (main entrance, rear entrance and access to the garage).

The floor where the bedrooms are located includes a balcony where occupants can find shelter and wait for help to arrive, away from smoke. The basement also has an exit to the outside.

Windows

Windows are installed at a height that allows occupants to see outside from a sitting position. They can easily be opened and locked with one hand from a sitting position.

5. Floor Plans

Five plans for standard benchmark homes were selected:

- Bungalow with an area of 136 m², excluding basement, with a 24-m² garage, two bedrooms and one full bathroom;
- Two-storey semi-detached house with an area of 121 m², excluding basement, with a 24-m² garage, two bedrooms, one half-bath on the main floor and one full bathroom on the second floor;
- Two-storey detached house with an area of 162 m², excluding basement, with a 24-m² garage, three bedrooms, one half-bath on the main floor and one full bathroom on the second floor;
- Two-storey townhouse with an area of 165 m², excluding basement, with a 23.8-m² garage, three bedrooms, one half-bath on the main floor and two full bathrooms on the second floor;
- Two-bedroom apartment with an area of 81 m² and one full bathroom.

Generally speaking, integrating accessibility features resulted in minor modifications to the plans, most affecting the interior layout only.

Some more substantial modifications, however, involved adding surface area or changing the interior organization more significantly, namely:

- expanding the garage by about 2 m² for benchmark homes with a garage, with the exception of the townhouse, to which 0.5 m² of additional garage space was added;
- adding 9 m² of floor space for the semi-detached house, 8 m² for the detached house, 3 m² for the townhouse and 1 m² for the apartment;
- changing the configuration of the staircase to make it straight and/or wider so that a lift could be installed, while meeting evacuation width requirements;
- adding a second bathroom upstairs in the detached house as a result of reconfiguring the staircase; and
- adding a balcony upstairs in the two-storey houses as a refuge option in case of fire and expanding the balcony in the apartment by about 0.5 m².

The standard and modified plans are presented in Appendix 3. The accessibility features are indicated in the modified plans by numbers, which are explained in the detailed features table in Appendix 2.

5. Floor Plans

Size of Modified Floor Plans

Some floor plans were easier to modify for accessibility and adaptability than others, due to design complexity, layout limitations or location of stairwells, for example. In the benchmark bungalow and the apartment accessibility features could be integrated into the standard floor plans with no increase in the living area. In the townhouse a relatively small increase of three square metres (2%) was needed. In the detached and semi-detached models, increases of eight square metres (5%) and nine square metres (7%), respectively, were required. The size of the garage was increased in all models by amounts ranging from 0.5 to 0.8 square metres.

Table 1. Increases in Area Required to Accommodate Accessibility Features

	Home (m ²)			Garage (m ²)		
	Standard Plan	Modified Plan	% Increase	Standard Plan	Modified Plan	% Increase
Bungalow	136	136	0	24	25.9	8%
Semi-detached house	121	130	7%	24	25.9	8%
Detached house	154	162	5%	24	25.9	8%
Townhouse	165	168	2%	23.8	24.3	2%
Apartment	81	82	1.2%	Not Applicable	Not Applicable	-

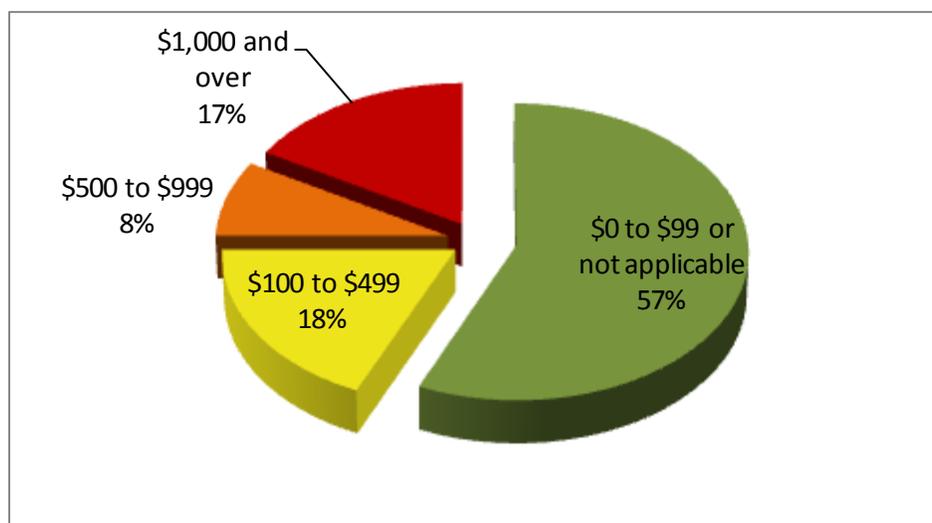
6. Costs

Cost of Individual Accessibility Features

The estimated costs of approximately 60 accessibility features (e.g. lever door handles, plywood-reinforced bathroom walls to accommodate future grab bars, extra space for a wheel chair turning circle in key areas) are shown in Appendix 4.

The vast majority of features cost less than \$500: (57%) generate nil or negligible costs, that is, between 0 and \$100. Another 18% of features are low cost, that is, \$100 to \$500. Some accessibility features even generate costs lower than those of traditional construction (e.g. wall sink in place of a vanity in the main floor half-bathroom)

Figure 1: Cost differential of accessibility features on construction costs



Some features (8%) generate an estimated cost between \$500 and \$1,000 (kitchen cabinets with a lot of drawers and shelves, vertical storage for future wall oven, easily modifiable structure in the shower, preparation for potential installation of an elevator).

Lastly, ten features (17%) generate a high cost that is more than \$1,000. These are features that have an impact on the layout of the building (single-storey, stairless); that add to the floor space (size of garage and manoeuvring area in the kitchen, in the bathroom, and at the top and bottom of the staircase); and that provide protection against the elements above a door and offer a refuge option on a balcony on the second floor in case of fire.

The detailed cost table is presented in Appendix 4. The cost of each accessibility feature is shown for each type of dwelling and for each city.

6. Costs

Since building regulations vary from one city to another, some accessibility features are included in the cost of construction of standard benchmark homes, if required by municipal regulations. Moreover, accessibility features already required by municipal regulations are not factored into the cost of construction of modified homes because they are already included in the standard benchmark homes. This situation accounts for many of the cost differences between Vancouver and the other cities.

The costs shown correspond to the cost of construction of the building only and do not include costs associated with the lot or infrastructure development. And finally, the costs shown are estimates only, compiled to demonstrate the marginal extra costs of providing adaptable housing if accessibility features are considered at the time of design and construction. Actual construction costs will, of course, vary based on local housing market conditions, the availability of expertise, the cost of labour, the availability and cost of materials, and other factors.

Total Cost of Accessibility Modifications

The cost of construction of standard benchmark homes ranges from \$162,245.00 (semi-detached house in Winnipeg) to \$224,358.00 (detached house in Toronto). Data could not be obtained for the cost of construction of the benchmark apartment.

Table 2: Cost of construction of standard benchmark homes

	Montréal	Toronto	Vancouver	Halifax	Winnipeg
Bungalow	\$213,695	\$215,618	\$202,155	\$192,539	\$188,693
Semi-detached house	\$183,743	\$185,397	\$173,821	\$165,552	\$162,245
Detached house	\$222,357	\$224,358	\$210,350	\$200,344	\$196,341
Townhouse	\$200,156	\$201,957	\$189,348	\$180,341	\$176,738
Apartment	N/A	N/A	N/A	N/A	N/A

Additional costs generated by accessibility features range from \$10,864.00 (townhouse in Vancouver) to \$23,054.00 (detached house in Montréal). For the apartment, the cost of accessibility features ranges from \$2,801.00 (Halifax) to \$4,213.00 (Montréal).

The estimated cost of construction of homes modified for accessibility and adaptability therefore ranges from \$181,914.00 (semi-detached house in Winnipeg) to \$246,903.00 (detached house in Toronto). In the absence of construction costs for the benchmark apartment, the total cost of the modified apartment could not be established.

6. Costs

Table 3: Cost of construction of homes modified for accessibility and adaptability

	Montréal	Toronto	Vancouver	Halifax	Winnipeg
Bungalow	\$227,164	\$228,906	\$213,786	\$204,675	\$200,586
Semi-detached house	\$206,018	\$207,378	\$193,556	\$185,622	\$181,914
Detached house	\$245,411	\$246,903	\$229,879	\$221,115	\$216,698
Townhouse	\$214,353	\$215,566	\$200,211	\$193,132	\$189,280
Apartment	N/A	N/A	N/A	N/A	N/A

Additional costs associated with accessibility features represent, depending on the type of dwelling and city, between 6 and 12 per cent of the base construction cost. In the absence of construction costs for the benchmark apartment, the percentage change associated with the integration of accessibility features for this type of dwelling could not be calculated.

Table 4: Cost impact between standard construction and accessible and adaptable construction (\$ and % change)

	Montréal		Toronto		Vancouver		Halifax		Winnipeg	
Bungalow	\$ 13,469.00	6%	\$ 13,287.52	6%	\$ 11,630.12	6%	\$ 12,135.57	6%	\$ 11,893.13	6%
Semi-detached house	\$ 22,275.00	12%	\$ 21,981.07	12%	\$ 19,735.45	11%	\$ 20,069.78	12%	\$ 19,668.83	12%
Detached house	\$ 23,054.00	10%	\$ 22,545.10	10%	\$ 19,529.22	9%	\$ 20,771.65	10%	\$ 20,356.68	10%
Townhouse	\$ 14,197.00	7%	\$ 13,608.38	7%	\$ 10,863.82	6%	\$ 12,791.50	7%	\$ 12,541.83	7%
Apartment	\$ 4,213.00	N/A	\$ 3,943.17	N/A	\$ 3,747.64	N/A	\$ 2,801.21	N/A	\$ 3,720.08	N/A

The incremental cost of integrating accessibility features varies somewhat among the five benchmark home types. The additional cost of accessibility features is lower for bungalows (6%) and townhouses (6% to 7%), and higher for detached houses (9% to 10%) and semi-detached houses (11% to 12%). These cost differences demonstrate that some floor plans are easier to adapt than others due to design complexity, layout limitations or location of stairwells, for example.

7. Conclusion

The purpose of this research was to show how traditionally built dwellings can be modified to allow residents to live and age at home.

Five different home models were selected to demonstrate how the plans of dwellings built in urban areas can be modified to be more accessible and adaptable.

The home models selected were modest, with a base area ranging from 121 m² to 165 m². Since construction of condominium apartments is on the rise in urban areas, this type of dwelling was also considered. The apartment model selected had an area of 81 m².

The assessment of the cost of construction of standard benchmark homes and the cost estimate for each accessibility feature were carried out and validated using various models for as much accuracy as possible. Nonetheless, the costs presented are for information purposes only and will vary based on the regions and construction contexts.

The results obtained show that accessibility features generate either negligible or low costs. A few, however, generate higher costs.

All in all, the construction of an accessible and adaptable home carries an added cost of between 6 and 12 per cent of the cost of standard construction, depending on the home model and on the city in which the home is built.

These additional costs, although not insignificant, are nonetheless much lower than the amounts that need to be invested to convert an existing dwelling in order to make it accessible. This is a value-added benefit for all citizens and taxpayers.

With the aging of the population and increasing life expectancy, the construction of sustainable homes that change with occupants' needs could also have social benefits. The majority of seniors express a preference for "aging in place". Adaptable housing could delay or eliminate the relocation of older residents. A longer period of independent living would retain residents' established support services, maintain their existing social links and allow continued participation in the community.

APPENDIX 1

Municipal construction regulations

Vancouver

- The Code in force in British Columbia is the 2012 British Columbia Building Code (BCBC) based on the 2010 National Building Code of Canada (NBC), with amendments specific to British Columbia.
- Vancouver Building Bylaw 10908 came into force on January 1, 2015, amending the 2012 BCBC. It includes provisions regarding accessibility <http://vancouver.ca/your-government/vancouver-building-bylaw.aspx>.
- The bylaw contains a number of accessibility requirements for single-family homes and dwellings in a multi-family building (a condominium-type apartment unit) that pertain mainly to the:
 - . width and threshold of the entrance door to the home or unit;
 - . glass sidelight, two peepholes or an intercom security system by the entrance door;
 - . opening hardware for the entrance door to the home or unit;
 - . width of corridors and interior doors;
 - . door opening hardware and thresholds of interior doors;
 - . width of the interior stairs*;
 - . kitchen sink faucets and pipes;
 - . location of bath and shower controls;
 - . faucets for bathroom sinks;
 - . floor structure in at least one bathroom that must be configured for the future installation of a low barrier shower with a second drain roughed in;
 - . clear floor space in front of the washbasin, toilet, bathtub or shower;
 - . wall assemblies that must include reinforcement adjacent to the toilet, bathtub and shower;
 - . requirement of having a bathroom on the entrance level of multi-level dwellings of a certain size;
 - . height of electrical and telecommunications controls;
 - . maximum height of at least one window sill in the living room; and
 - . wiring for the future installation of visual warning fire alarms inside homes.

* Note: The City of Vancouver approves the installation of an elevator in an interior stairway 915 mm wide, even if this reduces the width of the evacuation route.

Winnipeg

- The 2010 NBC is in force in Manitoba, with amendments specific to Manitoba.
- The City of Winnipeg has no accessibility regulations other than those applicable provincially.
- There are no accessibility requirements for single-family homes.
- For apartments: a visual warning fire alarm must be installed in addition to the audible alarm in all buildings.

Toronto

- The Code in force in Ontario is the 2012 Ontario Building Code (OBC) based on the 2010 NBC, with amendments specific to Ontario.
- On January 1, 2015, the *Building Code Act* was amended to incorporate changes and includes provisions for accessibility
- www.e-laws.gov.on.ca/html/regs/english/elaws_regs_120332_e.htm.
- Certain accessibility requirements are stipulated under provincial regulations for single-family homes, including in particular the following:
 - . Wall assemblies must include reinforcement adjacent to the toilet, bathtub and shower.
 - . Smoke alarms must include a visual alarm.
- Some accessibility requirements are stipulated under provincial regulations for the interior of dwellings in a multi-family building (a condominium-type apartment unit), including in particular the following:
 - . The fire alarm system must include a visual alarm inside the dwelling.
 - . Requirement for a barrier-free path of travel from the suite entrance door to at least one bedroom, at least one bathroom, a kitchen and living room for at least 15 per cent of the suites in the building.
 - . The walls next to the toilet, bathtub and shower must be reinforced (one bathroom in 15 per cent of suites in the building).
 - . Bathrooms must be designed to permit a wheelchair to turn in an open space (one bathroom in 15 per cent of suites in the building).
 - . Location and height of switches, thermostats, electrical outlets, etc.

Montréal

- The Code in force in Quebec is the Quebec Construction Code (CCQ) based on the 2005 NBC, with amendments specific to Quebec.
- In Montréal, By-law concerning the construction and conversion of buildings 11-018 came into force on December 3, 2011, amending the CCQ.
- There are no accessibility requirements for the construction of single-family homes.
- For units in a multi-family building (a condominium-type apartment unit), a visual alarm connected to the fire alarm system must be installed in each dwelling and in each bedroom of a dwelling larger than 600 m² or more than three storeys in height.

Halifax

- The Code in force in Nova Scotia is the Nova Scotia Building Code based on the 2010 NBC, with amendments specific to Nova Scotia.
- In Halifax, Bylaw M-100 Respecting Standards for Residential Occupancies Bylaw amends the Code.
- There are no accessibility requirements for single-family homes.
- Some accessibility requirements are stipulated under provincial regulations for the interior of units in a multi-family building (a condominium-type apartment unit), including in particular the following:
 - . The requirement of a barrier-free path of travel inside 1 unit in 20 for any building with three or more units.
 - . Balcony access and dimensions (1 unit in 20 for any building with three or more units).
 - . Height of switches, thermostats, electrical outlets, etc. (1 unit in 20 for any building with three or more units).
 - . Size of the bedroom and closet (1 unit in 20 for any building with three or more units).
 - . Size and fixtures of a bathroom (1 unit in 20 for any building with three or more units).
 - . Size of a kitchen, and clearance and space for counters, cabinets and appliances (1 unit in 20 for any building with three or more units).

APPENDIX 2

Accessibility features

Layout
Single-storey layout, without steps or staircases, that may include slabs on grade or a slight gradient (1:20 or less).
Access to the home
On the door handle side, clearance of 600 mm (24 in.) on the side where the door is pulled and 300 mm (12 in.) on the side where it is pushed.
Door at least 915 mm (36 in.) wide with clearance of at least 865 mm (34 in.).
<u>If the door is not exposed to the elements:</u> The threshold of the exterior entrance door is flat and bevelled at a maximum height of 12.5 mm (½ in.).
<u>If the door is exposed to the elements:</u> The threshold of the entrance door is standard but embedded so as to reduce the height to the adjacent surfaces.
The doors are equipped with lever handles.
The door is equipped with a device allowing the occupant to see who is there.
There is protection against rain and snow above the main entrance.
There is an appropriate turning circle inside and outside the entrance of 1,500 mm (60 in.).
Garage
Garage dimensions of at least 4,270x6,100 mm (14x20 ft.) so that a car can be parked and the person can manoeuvre around.
A difference in height of less than 100 mm (4 in.) between the garage level and the floor level of the house. A short ramp with a top landing measuring 1,500x1,500 mm (5x5 ft.) can easily be added.
A height of 2,700 mm (9 ft.) to accommodate various types of vehicles.

Mobility
A manoeuvring area of 1,500 mm (60 in.) in diameter for wheelchairs in primary locations throughout the home.
Avoid hallways but, if necessary, plan for a width of 920 mm (about 3 ft.) there.
Swinging or sliding doors 865 mm (34 in.) wide with clearance of 815 mm (32 in.) when open.
On the door handle side, clearance of 600 mm (24 in.) on the side where the door is pulled and 300 mm (12 in.) on the side where it is pushed.
Lever handles.
No door sill.
Flat, smooth, non-slip, anti-glare flooring.
Controls and security systems
Switches and controls installed between 450 and 1,200 mm (between 18 and 48 in.) above the ground. Controls located more than 450 mm from the inside corner of a wall.
Easy single-handed operation of switches and controls.
Faucets and other lever controls that require little strength and no gripping or turning.
Kitchen
The kitchen is designed to facilitate movement and access to the workspace and appliances and has a clearance of 1500 mm (60 in.) in front of each counter.
Continuous counter space between the stove and the sink.
Counters at regular height, allowing for integration of regular equipment: stove and sink. Plan sliding shelf to facilitate work in a seated position.
Kitchen cabinets with a lot of drawers and sliding shelves. Users pull articles toward themselves and do not have to stretch.
All cabinet handles are D-handles, enabling easy use without having to grasp them.
Kitchen cabinets and work surfaces are of contrasting colours, which enables users to see and use doors, handles and counters more easily.
The upper cabinets are installed at a maximum of 450 mm (18 in.) above the counter.
Plan a module that can be modified easily in order to clear an accessible space under the sink 760 mm wide by 685 mm high (30x27 in.) over the entire depth of the counter.
Plan for a floor covering in the entire kitchen, even under the sink countertop section.
Plan vertical storage space with an interior free width of 760 mm (30 in.) and a depth of 600 mm (24 in.) to accommodate a wall oven. Plan a sliding shelf under the oven.

Bathroom
For a two-storey home: Half-bath accessible on the main floor with a manoeuvring area of 1,500 mm (60 in.); ideally, a full bathroom.
For a two-storey home: Half-bath accessible on the main floor with the potential for being converted into a full bathroom; ideally, a full bathroom.
Main bathroom with a manoeuvring area of 1,500 mm (60 in.).
Entire area in front of the bathtub is clear.
Sink at a height of 810 to 860 mm (32 to 34 in.). Plan a module that can be modified easily in order to clear an accessible space under the sink 760 mm wide by 685 mm high (30x27 in.) over the entire depth of the counter.
Plan for a floor covering in the entire bathroom, even under the sink countertop section.
Walls behind and on either side of the toilet are reinforced with plywood so that grab bars can be installed anywhere on those walls.
Bathtub walls are reinforced with plywood so that the user can install grab bars anywhere.
The toilet is adjacent to a wall and its centreline should be between 460 mm (18 in.) and 480 mm (19 in.) from that wall.
The main bathroom is designed so that a curbless shower measuring at least 915 mm (36 in.) by 1,200 mm (48 in.) may be installed in future.
The structure can be easily modified under the shower.
The bathroom is adjacent to a bedroom for easy connection between the two. This also allows for the installation of a rail ceiling lift.
Possibility of installing a lift in future (for two-storey homes) Some options are applicable depending on the dwelling
Straight staircase with only one flight, allowing for the installation of a chair or platform stair lift.
Space (at the bottom and top of the stairs) for the future installation of a chair or platform stair lift.
Space wide enough for the future installation of a chair or platform stair lift.*
Preparation for the future installation of an elevator by superimposing closets and using a structure that can be easily modified.

*The installation of a lift on the staircase reduces the width required by regulations for evacuation. A special request for the installation of such a device must be submitted to the municipality.

Windows

Bottom of window sill max. 760 mm (30 in.) above grade.

Windows equipped with easy-to-use opening and locking systems.

Access to the balcony or deck (a wider sliding door was planned for single-family homes and a swinging door for the apartment).

French doors 1,800 mm (72 in.) wide with clearance of 810 mm (32 in.).

Swinging door, without storm door, at least 915 mm (36 in.) wide with clearance of at least 865 mm (34 in.).

The threshold of the door is standard but embedded so as to reduce the height to the adjacent surfaces.

Weather protection above the door.

Two-storey homes

Plan to lay out a bedroom on the ground floor.

Fire safety

If smoke detectors are installed in the homes, they must have an audible and visual alarm signal.

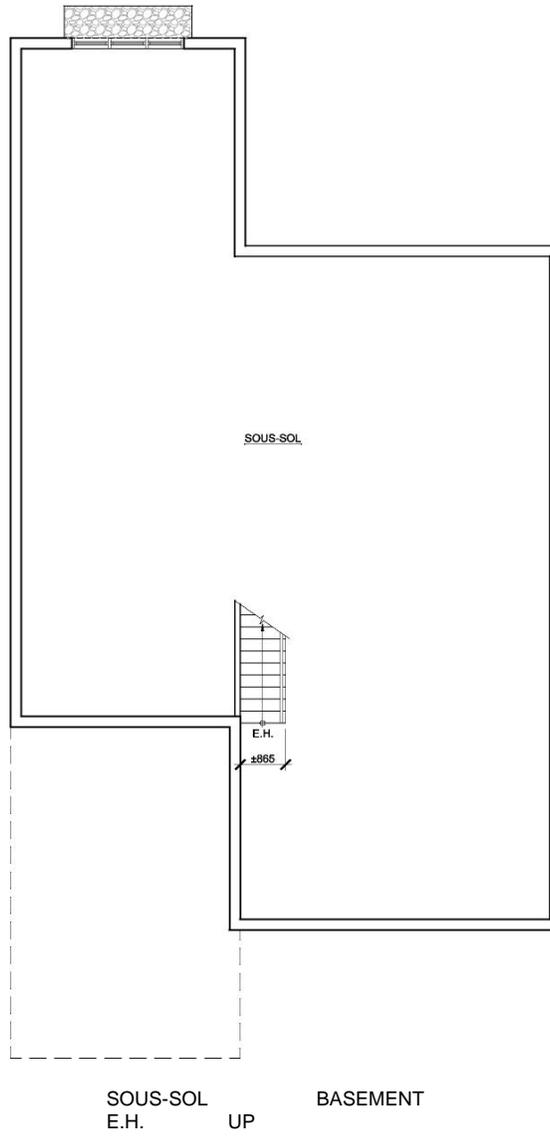
Plan for a balcony that is accessible from the bedroom floor for taking refuge in case of fire.

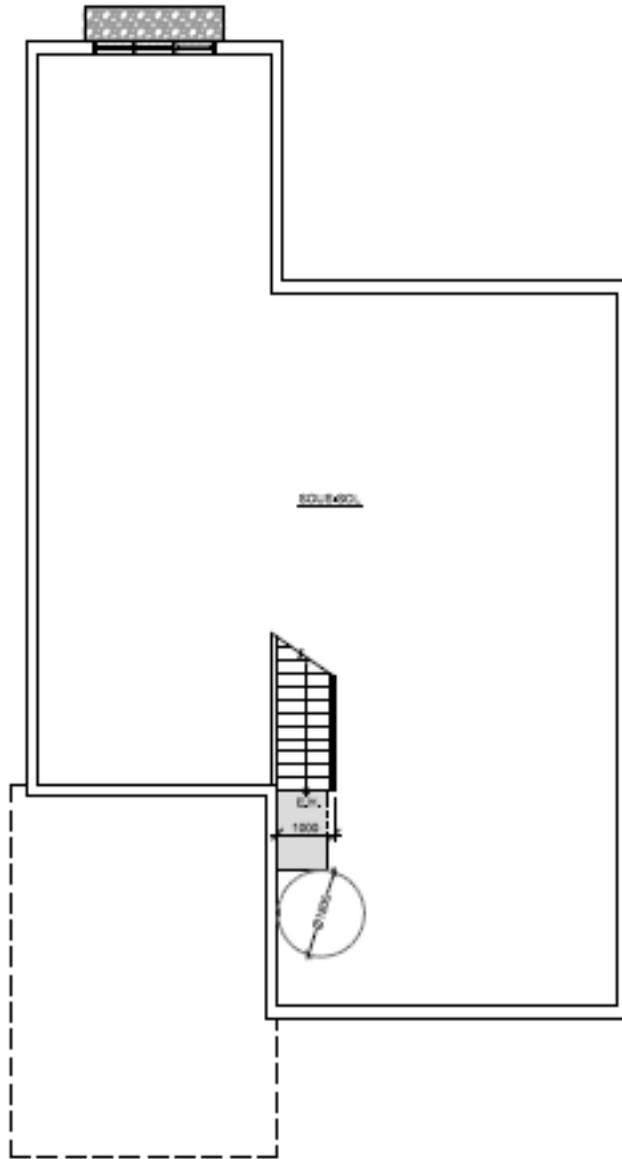
Plan for an outdoor space that is accessible from the basement for taking refuge in case of fire.

APPENDIX 3

Standard benchmark plans and modified plans

Two-bedroom bungalow
Standard plan: 136 m², excluding basement
Basement





SOUS-SOL
E.H.
FUTUR EMPLACEMENT POUR PLATE-
FORME ELÉVATRICE INCLINÉE

BASEMENT
UP
FUTURE LOCATION OF INCLINED LIFT
PLATFORM

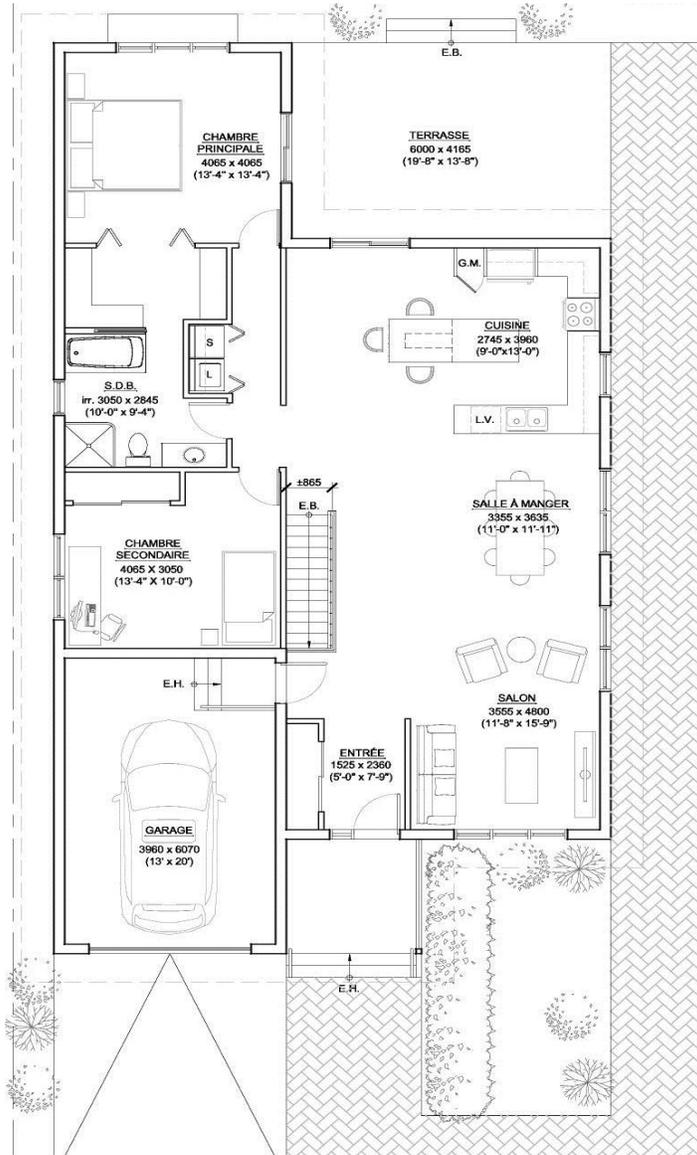
APPENDIX 3

Standard benchmark plans and modified plans

Two-bedroom bungalow

Standard plan: 136 m², excluding basement (Standard garage: 24 m²)

Main floor

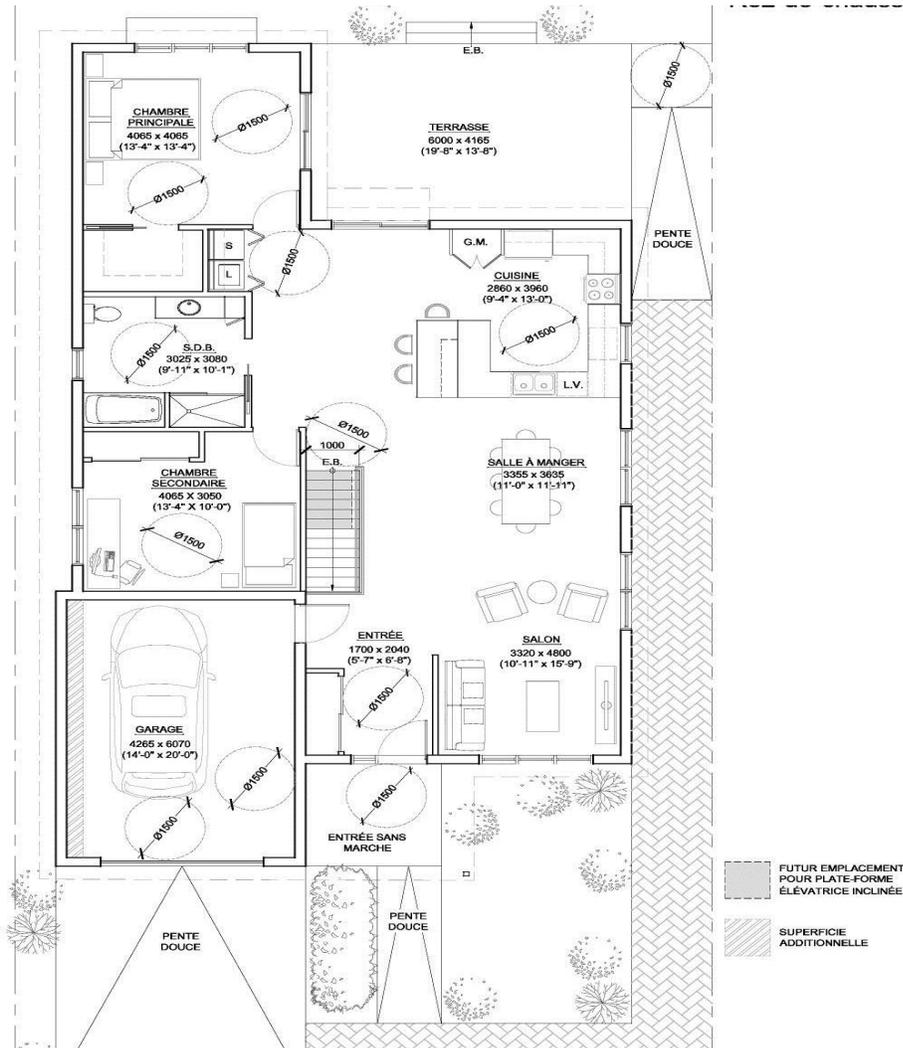


- | | |
|--------------------|----------------|
| E.B. | DWN |
| CHAMBRE PRINCIPALE | MASTER BEDROOM |
| TERRASSE | PATIO/DECK |
| S.D.B. | BTH |
| irr. 3050 x 2845 | Irr. 3050x2845 |
| S | D |
| L | W |
| CHAMBRE SECONDAIRE | BEDROOM #2 |
| E.H. | UP |
| GARAGE | GARAGE |
| ENTRÉE | ENTRANCE |
| SALON | LIVING ROOM |
| SALLE A MANGER | DINING ROOM |
| L.V. | DW |
| CUISINES | KITCHEN |
| G.M. | PTRY |

Two-bedroom bungalow

Modified plan: 136 m², excluding basement (Modified garage: 25.9 m²)

Main floor

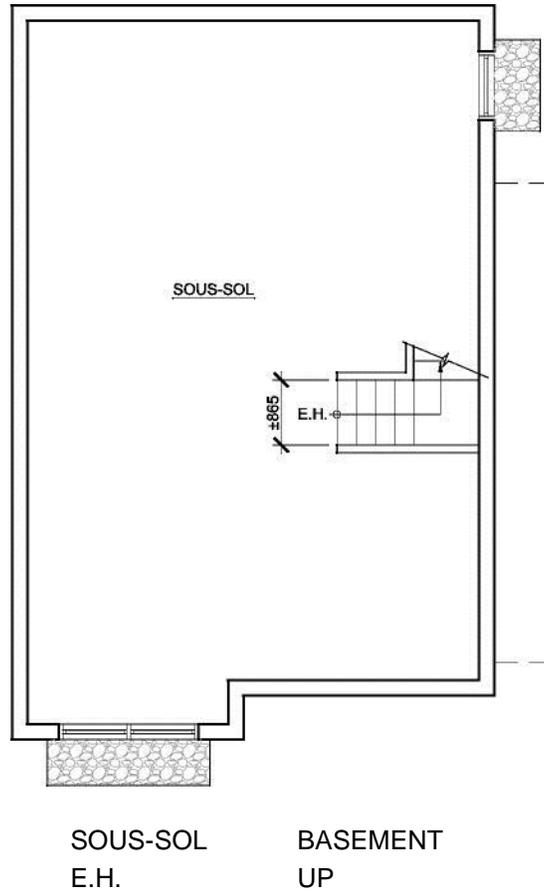


E.B.
 CHAMBRE PRINCIPALE
 TERRASSE
 S
 L
 S.D.B.
 CHAMBRE SECONDAIRE
 E.B.
 GARAGE
 PENTE DOUCE
 ENTRÉE SANS MARCHÉ
 ENTRÉE
 SALON
 SALLE À MANGER
 L.V.
 CUISINE
 G.M.
 FUTUR EMPLACEMENT POUR PLATE-FORME ELÉVATRICE INCLINÉE
 SUPERFICIE ADDITIONNELLE

DWN
 MASTER BEDROOM
 PATIO/DECK
 D
 W
 BTH
 BEDROOM #2
 DWN
 GARAGE
 GENTLE SLOPE
 STAIRLESS ENTRANCE
 ENTRANCE
 LIVING ROOM
 DINING ROOM
 DW
 KITCHEN
 PTRY
 FUTURE LOCATION OF INCLINED LIFT PLATFORM
 ADDITIONAL SURFACE AREA

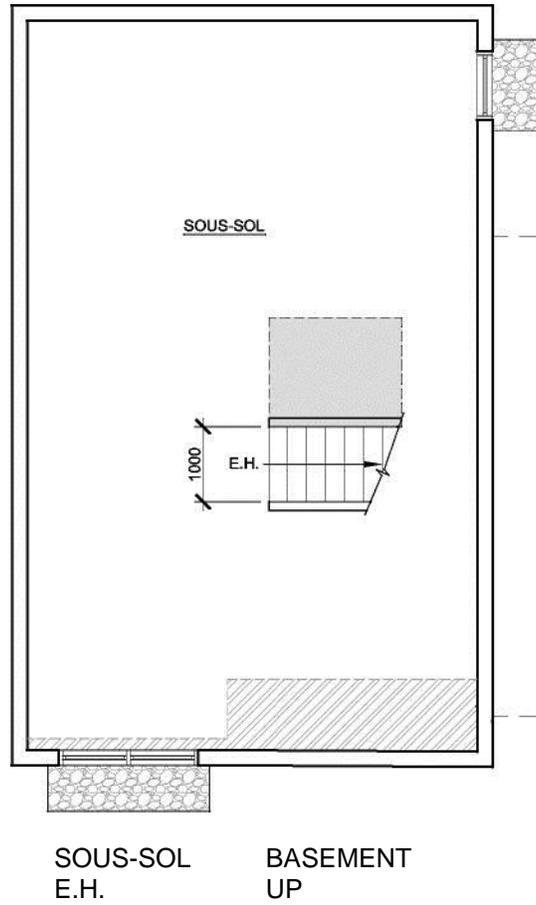
**Two-bedroom semi-detached house
Standard plan: 121 m², excluding basement**

Basement



**Two-bedroom semi-detached house
Modified plan: 130 m², excluding basement**

Basement



 FUTURE LOCATION
OF VERTICAL LIFT
PLATFORM

 ADDITIONAL
SURFACE AREA

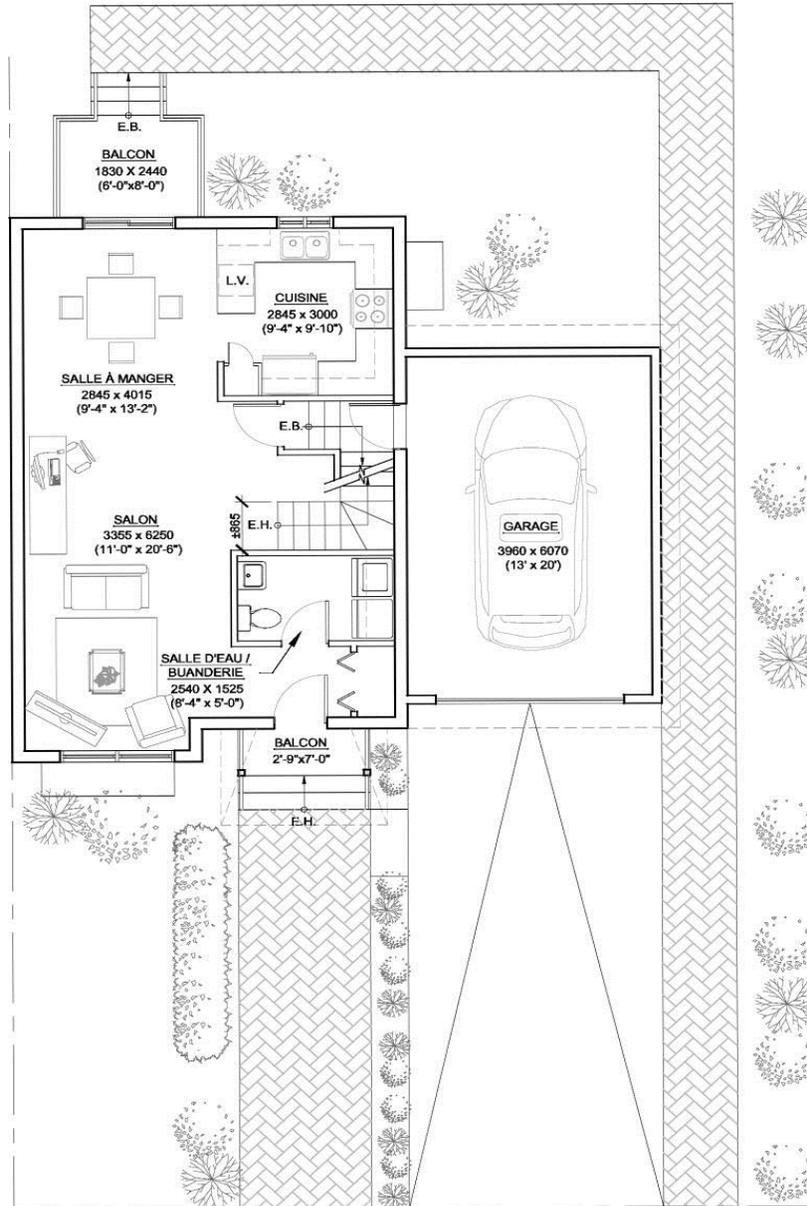
APPENDIX 3

Standard benchmark plans and modified plans

Two-bedroom semi-detached house

Standard plan: 121 m², excluding basement (Standard garage: 24 m²)

Main floor

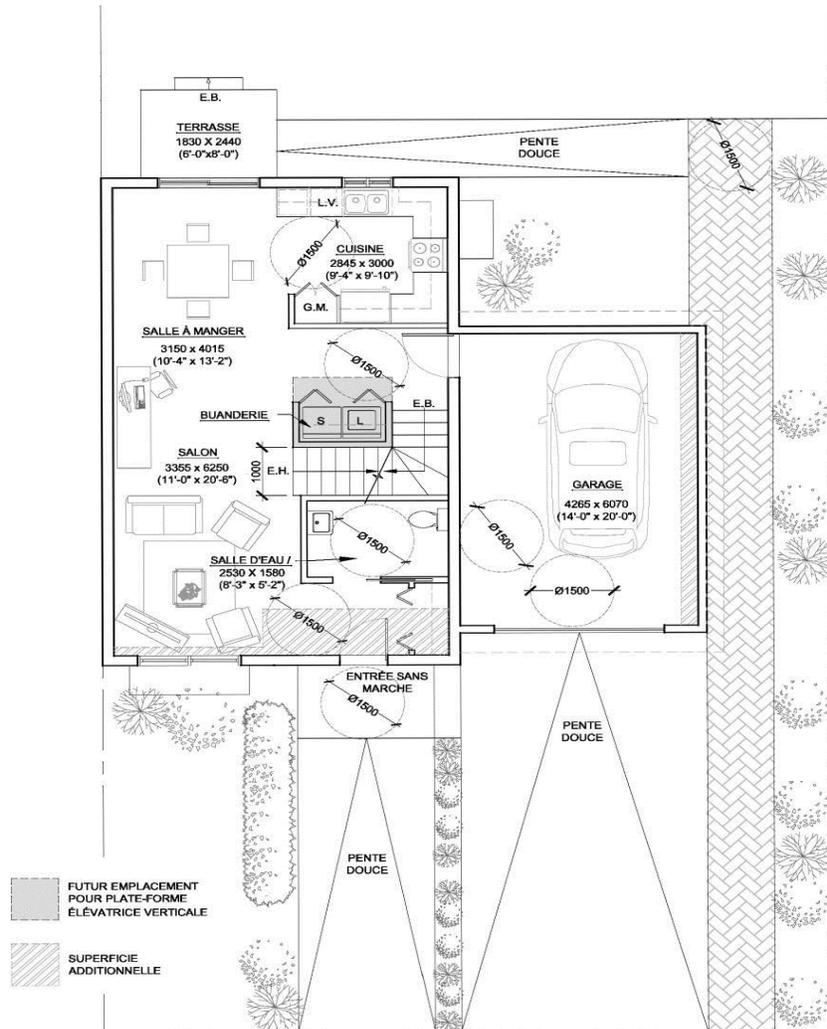


- | | |
|------------------------|-----------------------|
| E.B. | DWN |
| BALCON | BALCONY |
| L.V. | DW |
| CUISINE | KITCHEN |
| SALLE À MANGER | DINING ROOM |
| SALON | LIVING ROOM |
| E.B. | DWN |
| E.H. | UP |
| SALLE D'EAU / BUANDRIE | POWDER / LAUNDRY ROOM |
| GARAGE | GARAGE |

Two-bedroom semi-detached house

Modified plan: 130 m², excluding basement (Modified garage: 25.9 m²)

Main floor



- E.B.
- TERRASSE
- PENTE DOUCE
- SALLE À MANGER
- CUISINE
- L.V.
- G.M.
- BUANDERIE
- SALON
- E.B.
- E.H.
- S
- L
- SALLE D'EAU
- GARAGE
- ENTRÉE SANS MARCHE
- FUTUR EMPLACEMENT POUR PLATE-FORME ÉLEVATRICE VERTICALE
- SUPERFICIE ADDITIONNELLE

- DWN
- PATIO/DECK
- GENTLE SLOPE
- DINING ROOM
- KITCHEN
- DW
- PTRY
- LAUNDRY ROOM
- LIVING ROOM
- DWN
- UP
- D
- W
- POWDER ROOM
- GARAGE
- STAIRLESS ENTRANCE
- FUTURE LOCATION OF VERTICAL LIFT PLATFORM
- ADDITIONAL SURFACE AREA

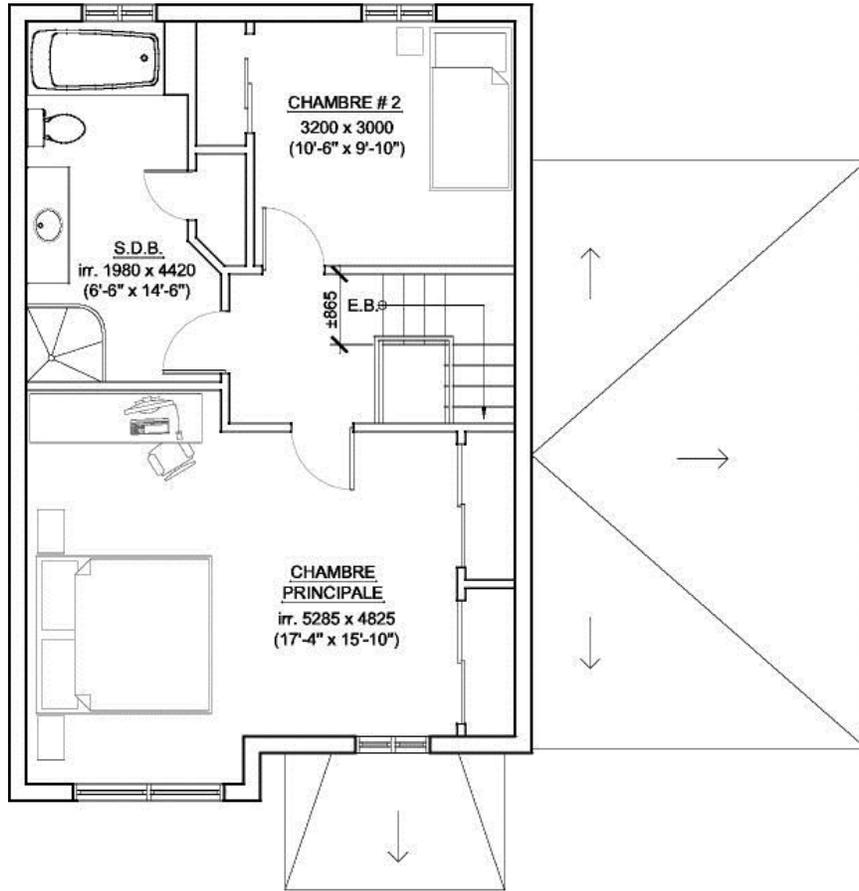
APPENDIX 3

Standard benchmark plans and modified plans

Two-bedroom semi-detached house

Standard plan: 121 m², excluding basement

2nd floor



CHAMBRE #2
S.D.B.
Irr. 1980 X 4420
E.B.

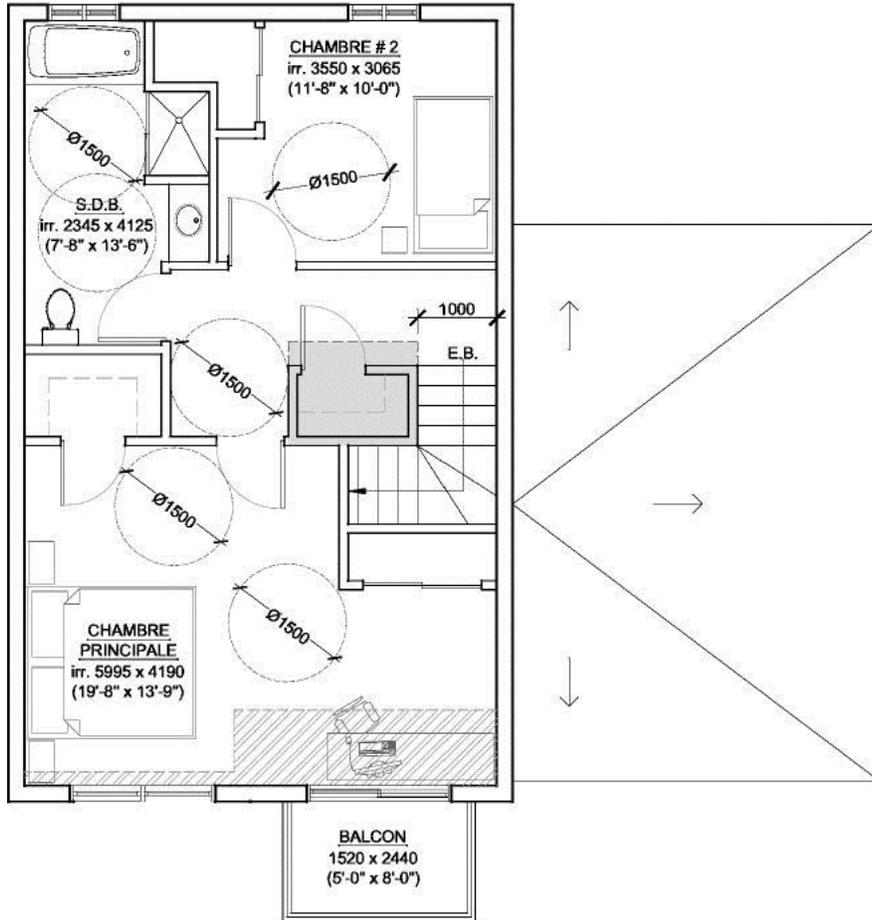
CHAMBRE PRINCIPALE

BEDROOM #2
BTH
Irr. 1980X4420
DWN

MASTER BEDROOM

**Two-bedroom semi-detached house
Modified plan: 130 m², excluding basement**

2nd floor



CHAMBRE #2
Irr. 3550 x 3065

S.D.B.
E.B.

CHAMBRE PRINCIPALE
BALCON

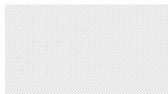
BEDROOM #2
Irr. 3550x3065

BTH
DWN

MASTER BEDROOM
BALCONY



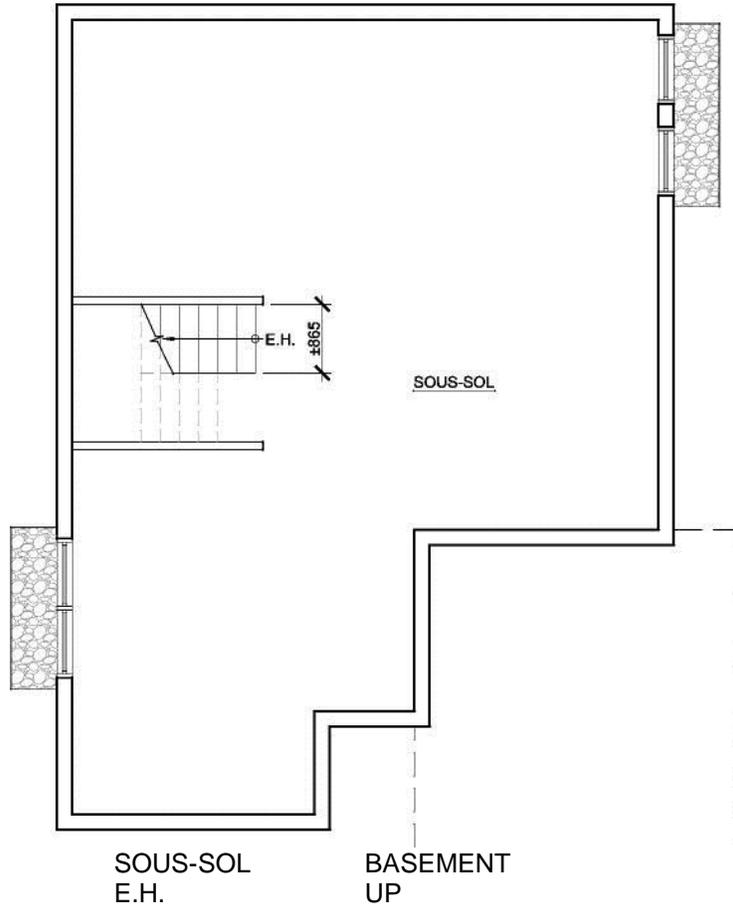
FUTURE LOCATION
OF VERTICAL LIFT
PLATFORM



ADDITIONAL
SURFACE AREA

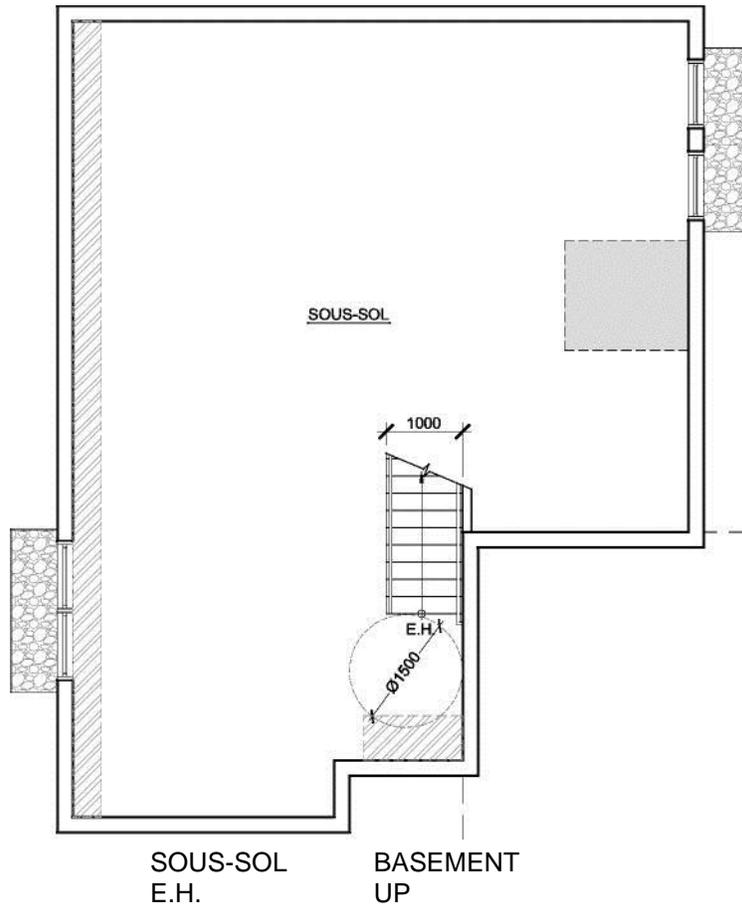
**Three-bedroom detached house
Standard plan: 154 m², excluding basement**

Basement



Three-bedroom detached house
Modified plan: 162 m², excluding basement

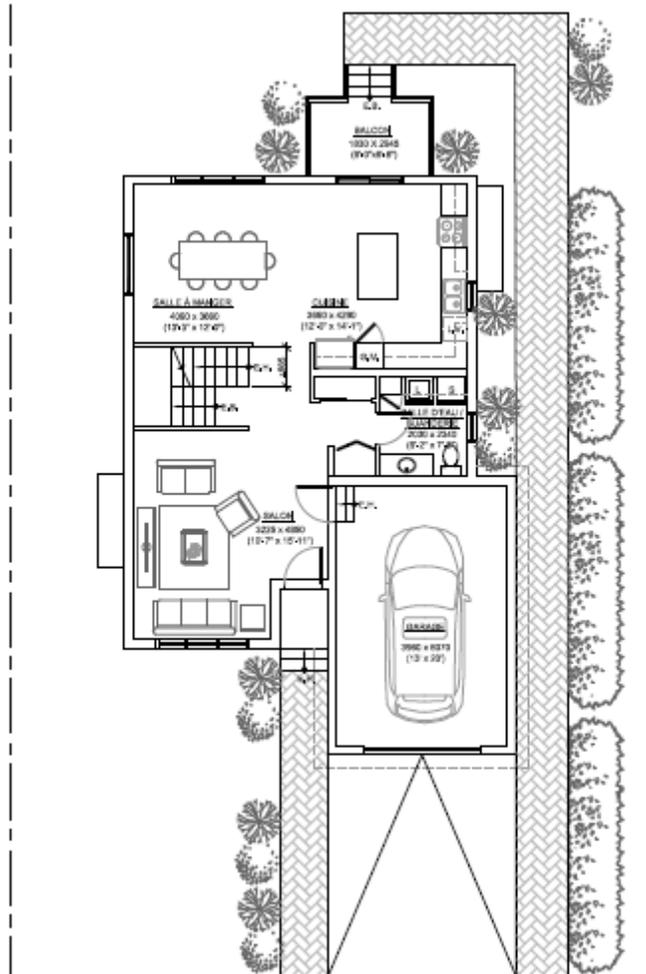
Basement



FUTURE LOCATION OF
VERTICAL LIFT PLATFORM



ADDITIONAL SURFACE
AREA



- | | |
|----------------|------------------|
| E.B. | DWN |
| BALCON | BALCONY |
| SALLE À MANGER | DINING ROOM |
| CUISINE | KITCHEN |
| L.V. | DW |
| E.H. | UP |
| E.B. | DWN |
| G.M. | PTRY |
| L | W |
| S | D |
| SALLE D'EAU | POWDER / LAUNDRY |
| /BUANDERIE | ROOM |
| SALON | LIVING ROOM |
| GARAGE | GARAGE |

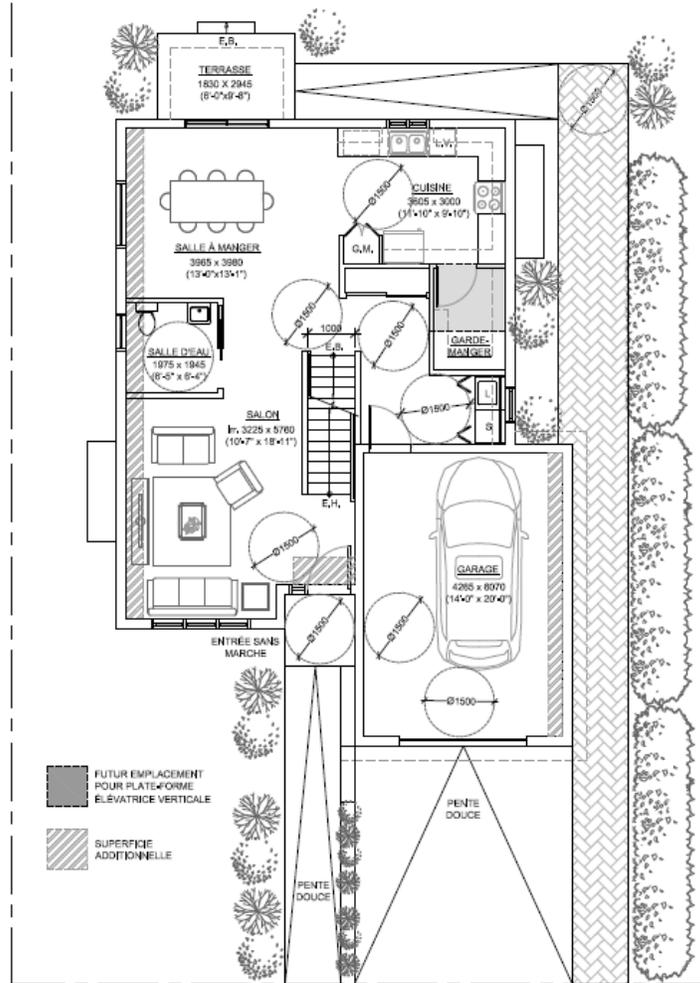
APPENDIX 3

Standard benchmark plans and modified plans

Three-bedroom detached house

Modified plan: 162 m², excluding basement (Modified garage: 25.9 m²)

Main floor

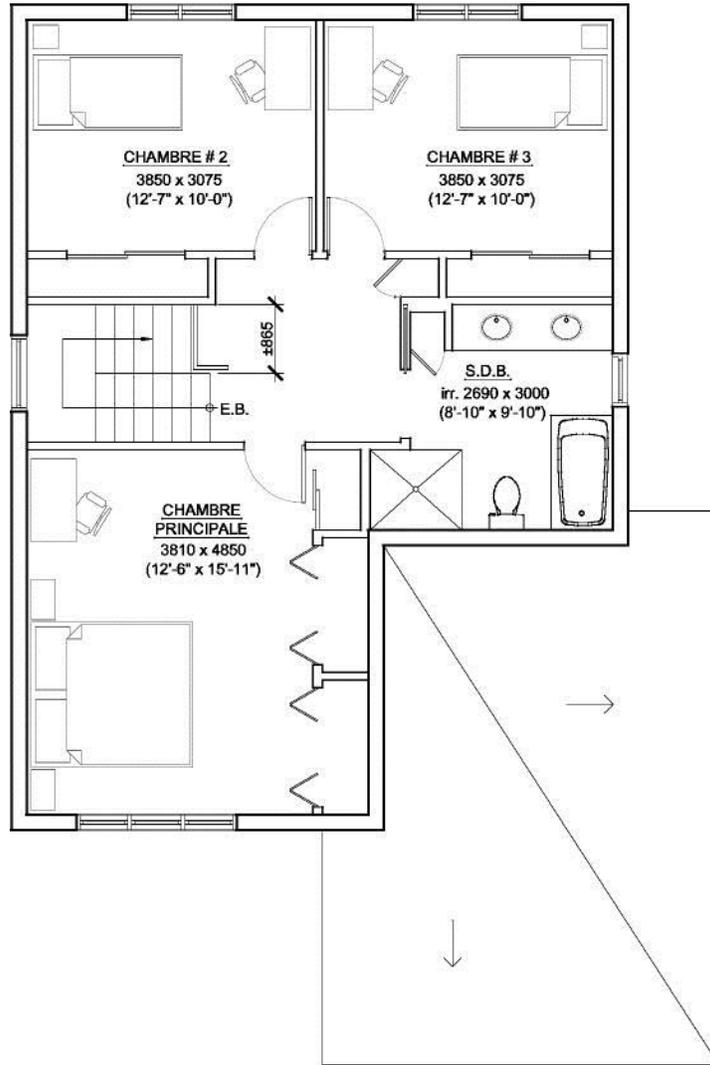


E.B.
TERRASSE
SALLE À MANGER
L.V.
CUISINE
G.M.
SALLE D'EAU
SALON
E.B.
E.H.
GARDE MANGER
L
S
GARAGE
ENTRÉE SANS MARCHÉ
PENTE DOUCE
FUTUR EMPLACEMENT POUR PLATE-FORME
ÉLÉVATRICE VERTICALE
SUPERFICIE ADDITIONNELLE

DWN
PATIO/DECK
DINING ROOM
DW
KITCHEN
PTRY
POWDER ROOM
LIVING ROOM
DWN
UP
WALK-IN PANTRY
W
D
GARAGE
STAIRLESS ENTRANCE
GENTLE SLOPE
FUTURE LOCATION OF VERTICAL LIFT
PLATFORM
ADDITIONAL SURFACE AREA

**Three-bedroom detached house
Standard plan: 154 m², excluding basement**

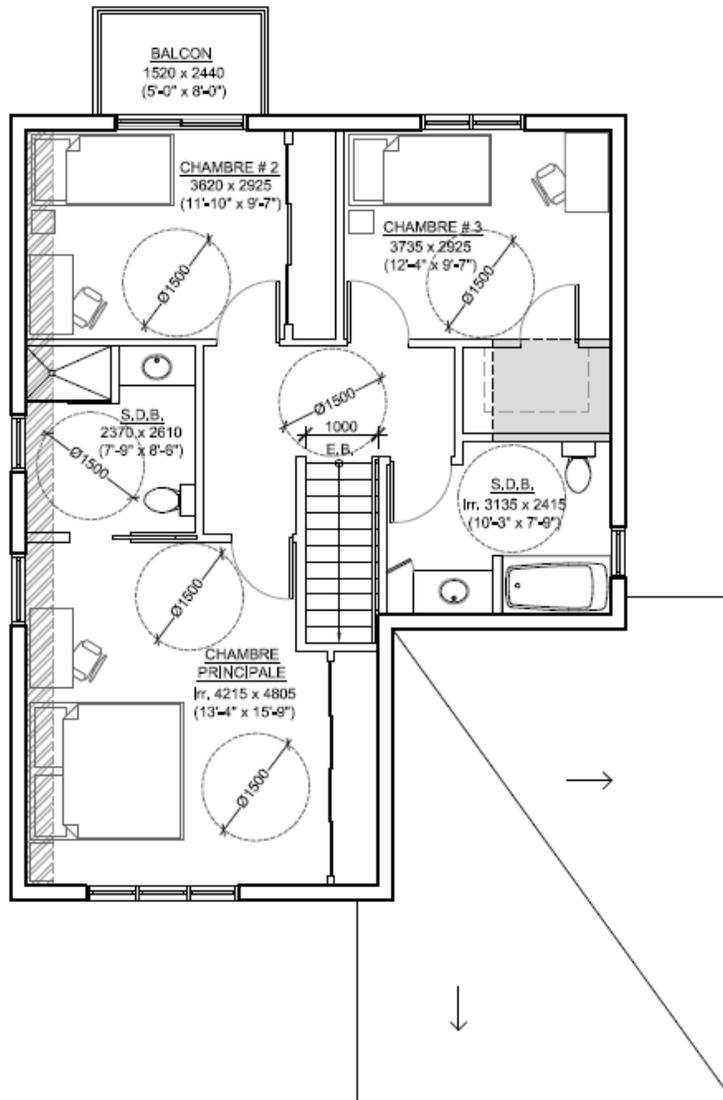
2nd floor



- | | |
|--------------------|----------------|
| CHAMBRE #2 | BEDROOM #2 |
| CHAMBRE #3 | BEDROOM #3 |
| E.B. | DWN |
| S.D.B. | BTH |
| Irr. 2690 x 3000 | Irr. 2690x3000 |
| CHAMBRE PRINCIPALE | MASTER BEDROOM |

**Three-bedroom detached house
Modified plan: 162 m², excluding basement**

2nd floor



BALCON
CHAMBRE #2
CHAMBRE #3
S.D.B.
E.B.
Irr. 3135 x 2415
CHAMBRE PRINCIPALE

BALCONY
BEDROOM #2
BEDROOM #3
BTH
DWN
Irr. 3135x2415
MASTER BEDROOM



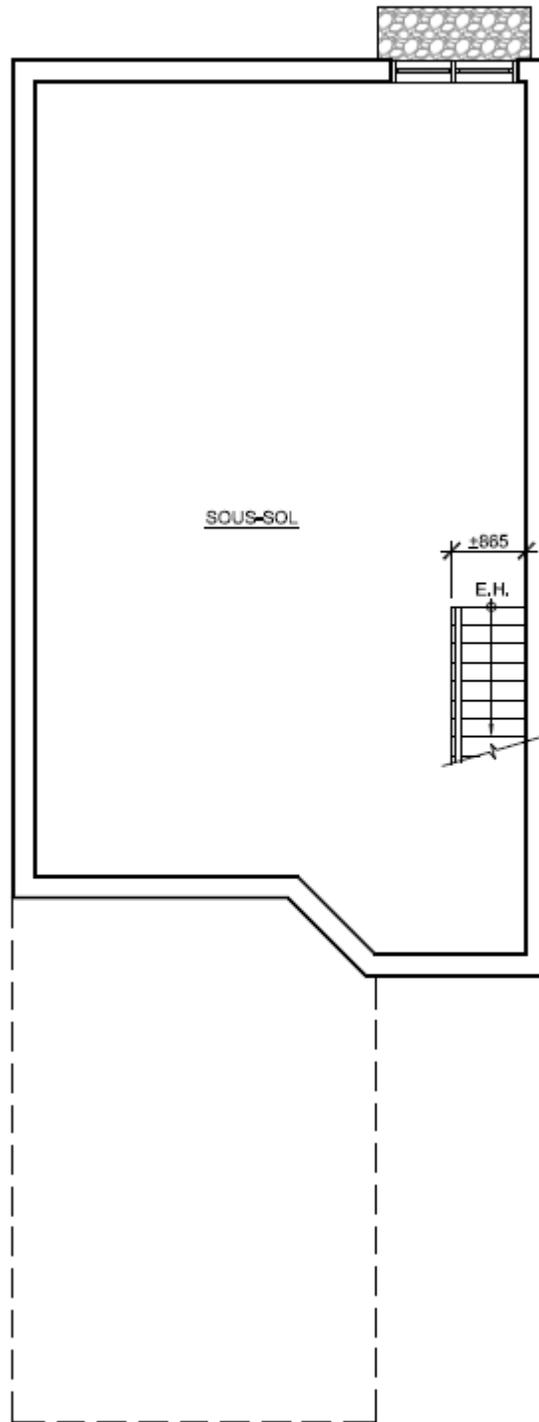
FUTURE LOCATION OF
VERTICAL LIFT PLATFORM



ADDITIONAL SURFACE
AREA

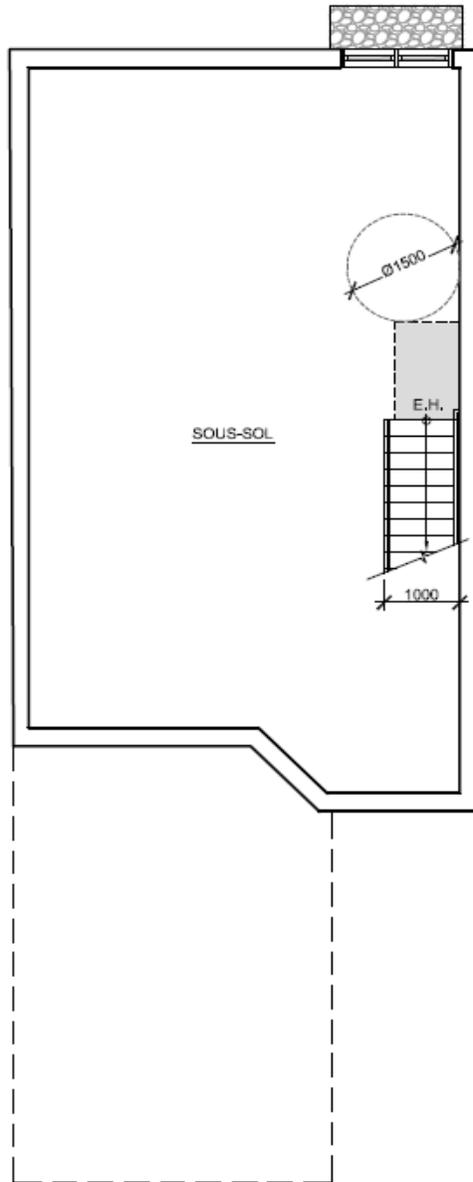
Three-bedroom townhouse
Standard plan: 165 m², excluding basement

Basement



SOUS-SOL
E.H.

BASEMENT
UP



SOUS-SOL
E.H.

BASEMENT
UP



FUTURE LOCATION OF INCLINED
LIFT PLATFORM



ADDITIONAL SURFACE AREA

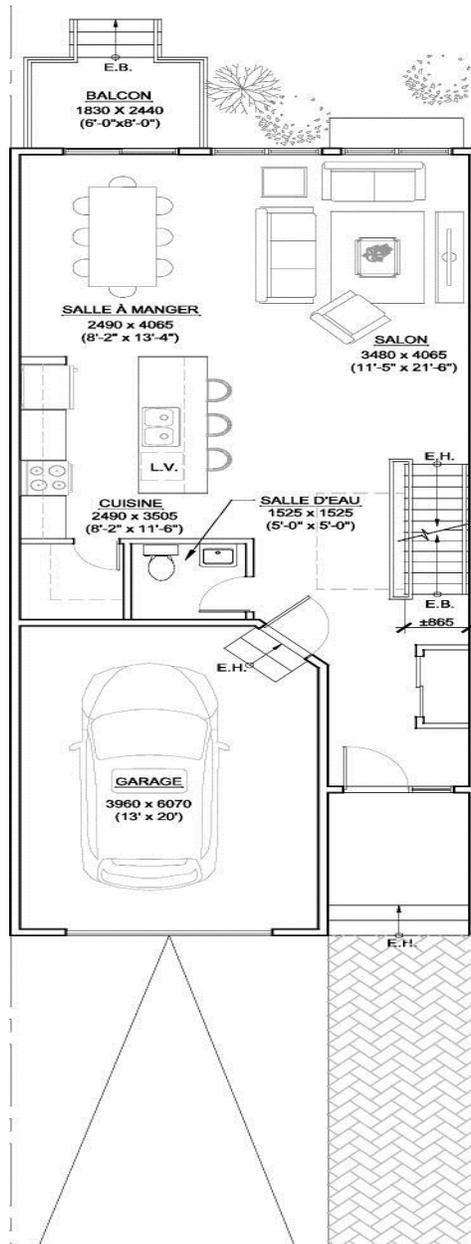
APPENDIX 3

Standard benchmark plans and modified plans

Three-bedroom townhouse

Standard plan: 165 m², excluding basement (Standard garage: 23.8 m²)

Main floor



- | | |
|----------------|-------------|
| E.B. | DWN |
| BALCON | BALCONY |
| SALLE À MANGER | DINING ROOM |
| SALON | LIVING ROOM |
| L.V. | DW |
| CUISINE | KITCHEN |
| SALLE D'EAU | POWDER ROOM |
| E.H. | UP |
| E.B. | DWN |
| GARAGE | GARAGE |

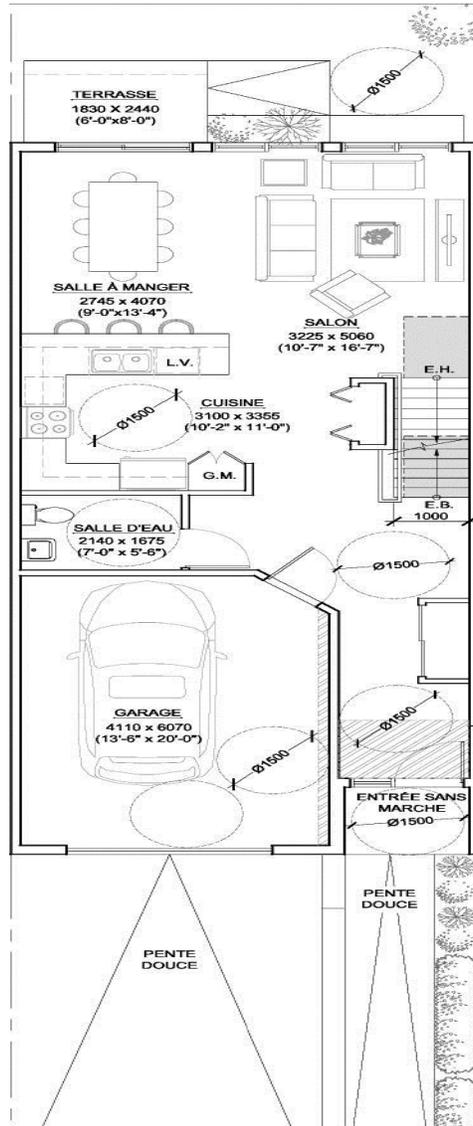
APPENDIX 3

Standard benchmark plans and modified plans

Three-bedroom townhouse

Modified plan: 168 m², excluding basement (Modified garage: 24.3 m²)

Main floor



- | | |
|--------------------|--------------------|
| TERRASSE | PATIO/DECK |
| SALLE À MANGER | DINING ROOM |
| SALON | LIVING ROOM |
| L.V. | DW |
| CUISINE | KITCHEN |
| G.M. | PTRY |
| SALLE D'EAU | POWDER ROOM |
| E.H. | UP |
| E.B. | DWN |
| GARAGE | GARAGE |
| ENTRÉE SANS MARCHÉ | STAIRLESS ENTRANCE |
| PENTE DOUCE | GENTLE SLOPE |

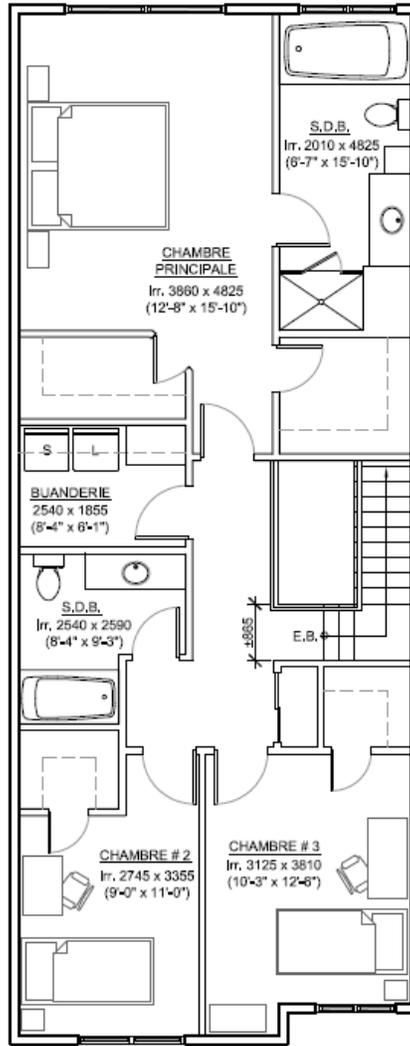
APPENDIX 3

Standard benchmark plans and modified plans

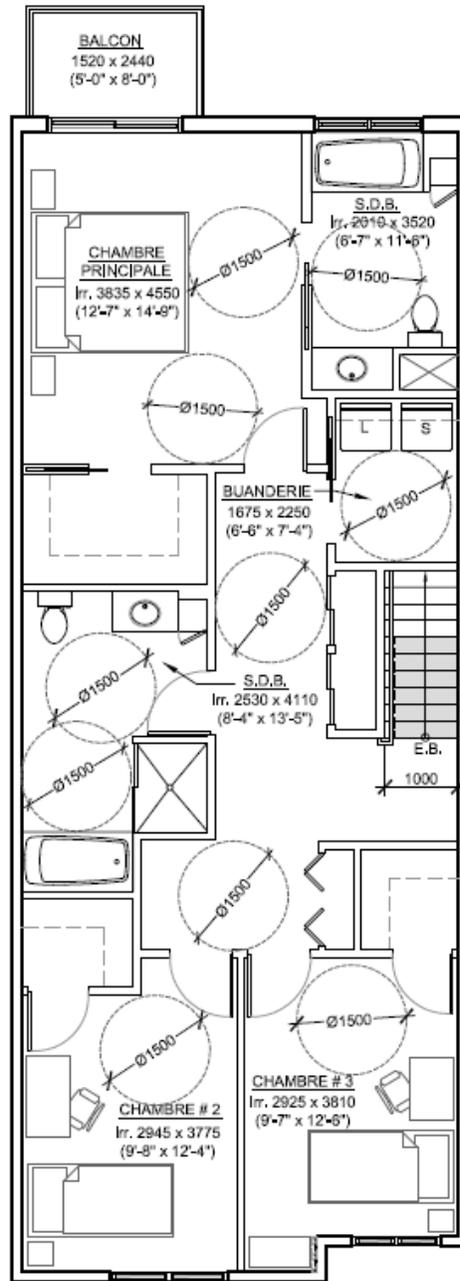
Three-bedroom townhouse

Standard plan: 165 m², excluding basement

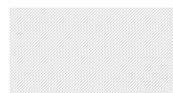
2nd floor

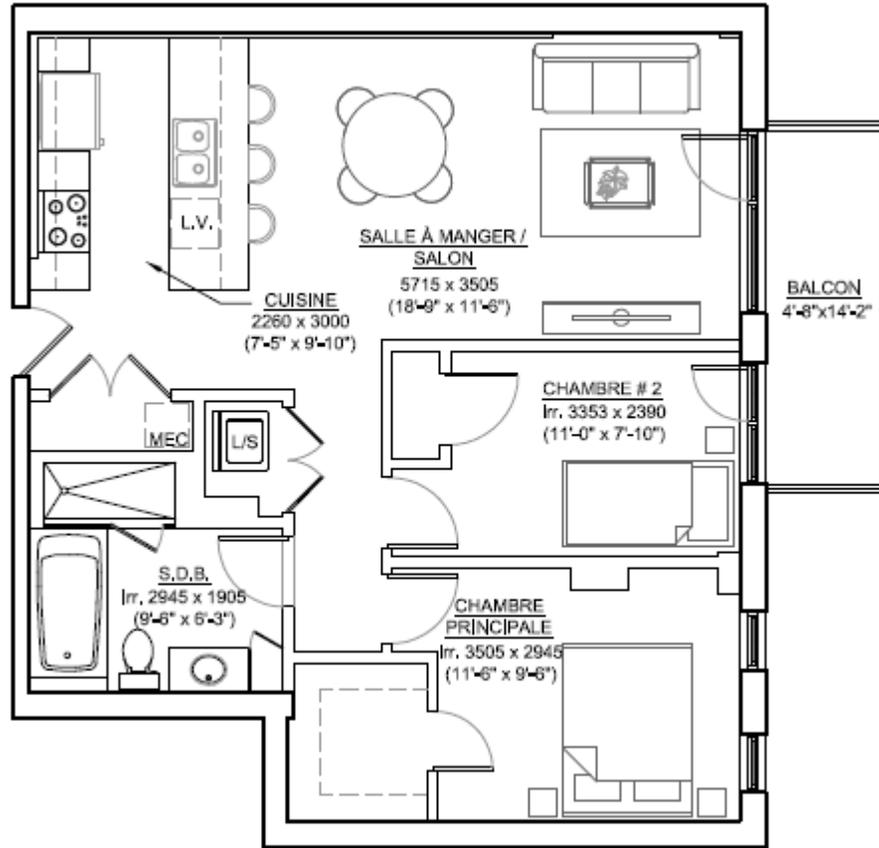


S.D.B.	BTH
Irr. 2010 x 4825	Irr. 2010x4825
Irr. 2540 x 2590	Irr. 2540x2590
CHAMBRE PRINCIPALE	MASTER BEDROOM
Irr. 3860 x 4825	Irr. 3860x4825
S	D
L	W
BUANDERIE	LAUNDRY ROOM
E.B.	DWN
CHAMBRE #2	BEDROOM #2
Irr. 2745 x 3355	Irr. 2745x3355
CHAMBRE #3	BEDROOM #3
Irr. 3125 x 3810	Irr. 3125x3810

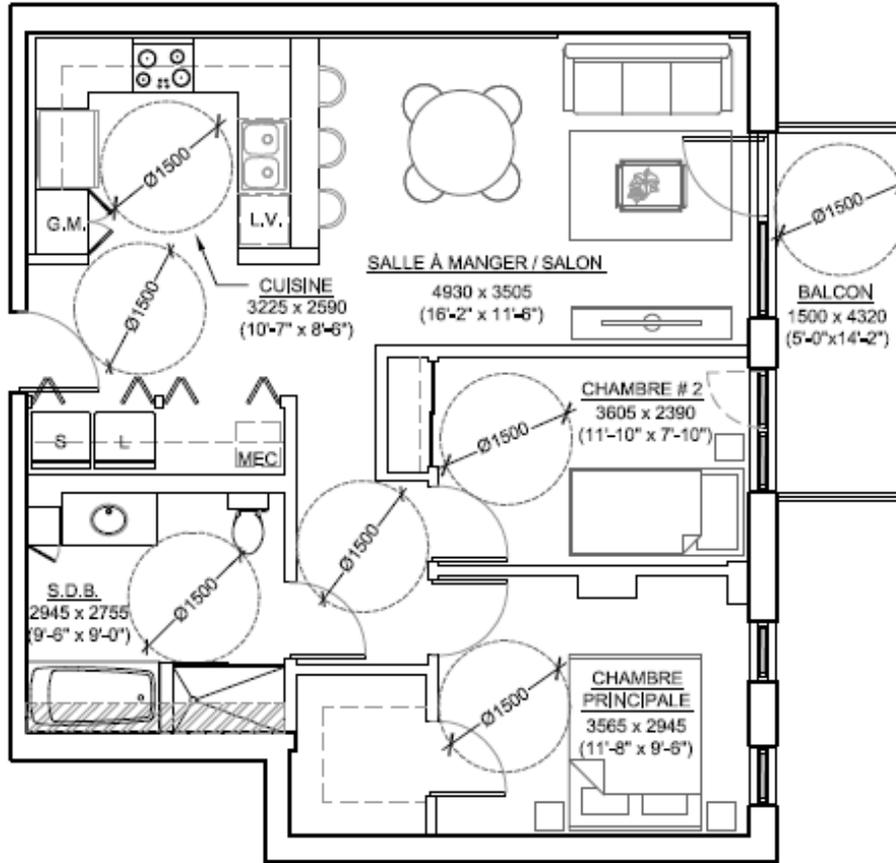


 FUTURE LOCATION OF INCLINED LIFT PLATFORM

 ADDITIONAL SURFACE AREA



- | | |
|---------------------------|--------------------|
| L.V. | DW |
| CUISINE | KITCHEN |
| SALLE À MANGER /
SALON | DINING/LIVING ROOM |
| BALCON | BALCONY |
| MEC | MECH |
| L/S | W/D |
| CHAMBRE #2 | BEDROOM #2 |
| Irr. 3353 x 2390 | Irr. 3353x2390 |
| S.D.B. | BTH |
| Irr. 2945 x 1905 | Irr. 2945x1905 |
| CHAMBRE PRINCIPALE | MASTER BEDROOM |
| Irr. 3505 x 2945 | Irr. 3505x2945 |



- | | |
|---------------------------|--------------------|
| G.M. | PTRY |
| L.V. | DW |
| CUISINE | KITCHEN |
| SALLE À MANGER /
SALON | DINING/LIVING ROOM |
| BALCON | BALCONY |
| MEC | MECH |
| L | W |
| S | D |
| CHAMBRE #2 | BEDROOM #2 |
| S.D.B. | BTH |
| CHAMBRE PRINCIPALE | MASTER BEDROOM |


 ADDITIONAL SURFACE
 AREA

Appendix 4 - Detailed Table of Costs

Bungalow

Cost impact

Legend

Nil or negligible costs (\$0 to \$99) or non applicable	\$0	Feature required in the bylaw, No additional cost
Low costs (\$100 to \$499)		
Moderate costs (\$500 to \$999)		
High costs (\$1,000 or more)		
	N.D.	Cost not available
	N.A.	Not applicable

Accessibility Features			Bungalow				
			Montréal	Toronto	Vancouver	Halifax	Winnipeg
Layout		Single-storey layout, without steps or staircases, that may include slabs on grade or a slight gradient (1:20 or less).	\$1,200	\$1,211	\$1,135	\$1,081	\$1,060
Access to the home		On the door handle side, clearance of 600 mm (24 in.) on the side where the door is pulled and 300 mm (12 in.) on the side where it is pushed.	\$0	\$0	\$0	\$0	\$0
		Door at least 915 mm (36 in.) wide with clearance of at least 865 mm (34 in.).	\$170	\$172	\$161	\$153	\$150
		If the door is not exposed to the elements: The threshold of the exterior entrance door is flat and bevelled at a maximum height of 12.5 mm (½ in.). If the door is exposed to the elements: The threshold of the entrance door is standard but embedded so as to reduce the height to the adjacent surfaces.	Included	Included	\$0	Included	Included
		The doors are equipped with lever handles.	\$0	\$0	\$0	\$0	\$0
		The door is equipped with a device allowing the occupant to see who is there.	\$0	\$0	\$0	\$0	\$0
		There is protection against rain and snow above the main entrance.	\$0	\$0	\$0	\$0	\$0
		There is an appropriate turning circle inside and outside the entrance of 1,500 mm (60 in.).	Included in the cost of the additional surface area				
Garage		Garage dimensions of at least 4,270x6,100 mm (14x20 ft.) so that a car can be parked and the person can manoeuvre around.	Included in the cost of the additional surface area				
		A difference in height of less than 100 mm (4 in.) between the garage level and the floor level of the house. A short ramp with a top landing measuring 1,500x1,500 mm (5x5 ft.) can easily be added.	\$0	\$0	\$0	\$0	\$0
		A height of 2,700 mm (9 ft.) to accommodate various types of vehicles.	\$0	\$0	\$0	\$0	\$0
Mobility		A manoeuvring area of 1,500 mm (60 in.) in diameter for wheelchairs in primary locations throughout the home.	Included in the cost of the additional surface area				

Appendix 4 - Detailed Table of Costs

Bungalow

Mobility		Avoid hallways but, if necessary, plan for width of 920 mm (about 3 ft.)	\$0	\$0	\$0	\$0	\$0
		Swinging or sliding doors 865 mm (34 in.) wide with clearance of 815 mm (32 in.) when open.	\$295	\$298	\$0	\$266	\$260
		On the door handle side, clearance of 600 mm (24 in.) on the side where the door is pulled and 300 mm (12 in.) on the side where it is pushed.	N.A.	N.A.	N.A.	N.A.	N.A.
		Lever handles.	\$60	\$61	\$0	\$54	\$53
		No door sill.	\$0	\$0	\$0	\$0	\$0
		Flat, smooth, non-slip, anti-glare flooring.	\$0	\$0	\$0	\$0	\$0
Controls and security systems		Switches and controls installed between 450 and 1,200 mm (between 18 and 48 in.) above the ground. Controls located more than 450 mm from the inside corner of a wall.	\$0	\$0	\$0	\$0	\$0
		Easy single-handed operation of switches and controls.	\$0	\$0	\$0	\$0	\$0
		Faucets and other lever controls that require little strength and no gripping or turning.	\$0	\$0	\$0	\$0	\$0
Kitchen		The kitchen is designed to facilitate movement and access to the workspace and appliances and has a clearance of 1500 mm (60 in.) in front of each counter.	Included in the cost of the additional surface area				
		Continuous counter space between the stove and the sink.	\$0	\$0	\$0	\$0	\$0
		Counters at regular height, allowing for integration of regular equipment: stove and sink. Plan sliding shelf to facilitate work in a seated position.	\$200	\$202	\$189	\$180	\$177
		Kitchen cabinets with a lot of drawers and sliding shelves. Users pull articles toward themselves and do not have to stretch.	\$975	\$984	\$922	\$878	\$861
		All cabinet handles are D-handles, enabling easy use without having to grasp them.	\$0	\$0	\$0	\$0	\$0
		Kitchen cabinets and work surfaces are of contrasting colours, which enables users to see and use doors, handles and counters more easily.	\$0	\$0	\$0	\$0	\$0
		Upper cabinets installed at a maximum height of 400 to 450 mm (about 16 to 18 in.) above the counter.	\$0	\$0	\$0	\$0	\$0
		Plan a module that can be modified easily in order to clear an accessible space under the sink 760 mm wide by 685 mm high (30x27 in.) over the entire depth of the counter.	\$400	\$404	\$378	\$360	\$353
		Plan for a floor covering in the entire kitchen, even under the sink countertop section.	\$540	\$545	\$511	\$487	\$477

Appendix 4 - Detailed Table of Costs

Bungalow

		Plan vertical storage space with an interior free width of 760 mm (30 in.) and a depth of 600 mm (24 in.) to accommodate a wall oven. Plan a sliding shelf under the oven.	\$720	\$726	\$681	\$649	\$636
Bathroom		Main bathroom with a manoeuvring area of 1,500 mm (60 in.).	Included in the cost of the additional surface area				
		Entire area in front of the bathtub is clear.	\$0	\$0	\$0	\$0	\$0
		Sink at a height of 810 to 860 mm (32 to 34 in.). Plan a module that can be modified easily in order to clear an accessible space under the sink 760 mm wide by 685 mm high (30x27 in.) over the entire depth of the counter.	\$400	\$404	\$378	\$360	\$353
		Plan for a floor covering in the entire bathroom, even under the sink countertop section.	\$96	\$97	\$91	\$86	\$85
		Walls behind and on either side of the toilet are reinforced with plywood so that grab bars can be installed anywhere on those walls.	\$110	\$0	\$0	\$99	\$97
		Bathtub walls are reinforced with plywood so that the user can install grab bars anywhere.	\$110	\$0	\$0	\$99	\$97
		The toilet is adjacent to a wall and its centreline should be between 460 mm (18 in.) and 480 mm (19 in.) from that wall.	\$0	\$0	\$0	\$0	\$0
		The main bathroom is designed so that a curbless shower measuring at least 915 mm (36 in.) by 1,200 mm (48 in.) may be installed in future.	\$500	\$505	\$473	\$451	\$442
		The structure can be easily modified under the shower.	\$500	\$505	\$0	\$451	\$442
		The bathroom is adjacent to a bedroom for easy connection between the two. This also allows for the installation of a rail ceiling lift.	N.A.	N.A.	N.A.	N.A.	N.A.
Possibility of installing a lift in future (Some options applicable depending on the dwelling)		Space (at the bottom and top of the stairs) for the future installation of a chair or platform stair lift.	Included in the cost of the additional surface area				
		Straight staircase with only one flight, allowing for the installation of a chair or platform stair lift.	\$0	\$0	\$0	\$0	\$0
		Space wide enough for the future installation of a chair or platform stair lift.	\$100	\$101	\$0	\$90	\$88
		Preparation for the future installation of an elevator by superimposing closets and using a structure that can be easily modified.	\$500	\$505	\$473	\$451	\$442

Appendix 4 - Detailed Table of Costs

Bungalow

Windows		Bottom of window sill max. 760 mm (30 in.) above grade.	\$0	\$0	\$0	\$0	\$0
		Windows equipped with easy-to-use opening and locking systems.	\$0	\$0	\$0	\$0	\$0
Access to the balcony or deck		French doors 1,800 mm (72 in.) wide with clearance of 810 mm (32 in.).	\$0	\$0	\$0	\$0	\$0
		Swinging door, without storm door, at least 915 mm (36 in.) wide with clearance of at least 865 mm (34 in.).	N.A.	N.A.	N.A.	N.A.	N.A.
		The threshold of the door is standard but embedded so as to reduce the height to the adjacent surfaces.	\$0	\$0	\$0	\$0	\$0
		Weather protection above the door.	\$1,400	\$1,413	\$1,324	\$1,261	\$1,236
Fire safety		If smoke detectors are installed in the homes, they must have an audible and visual alarm signal.	\$80	\$0	\$76	\$72	\$71
		Plan for a balcony that is accessible from the bedroom floor for taking refuge in case of fire.	N.A.	N.A.	N.A.	N.A.	N.A.
		Plan for an outdoor space that is accessible from the basement for taking refuge in case of fire.	Not included				
Additional surface area		Cost of the increase in the living area, the garage area, the bathroom area, the kitchen area, etc. (www.costtobuild.net)	\$5,113	\$5,159	\$4,837	\$4,607	\$4,515
Total cost of accessibility features			\$13,469	\$13,288	\$11,630	\$12,136	\$11,893
Cost of standard bungalow (www.costtobuild.net)			\$213,695	\$215,618	\$202,155	\$192,539	\$188,693
Cost of modified bungalow			\$227,164	\$228,906	\$213,786	\$204,675	\$200,586
Cost impact (% change between modified and standard bungalow)			6%	6%	6%	6%	6%

Appendix 4 - Detailed Table of Costs

Semi-Detached

Cost impact

Legend

	Nil or negligible costs (\$0 to \$99) or non applicable	\$0	Feature required in the bylaw, no additional cost
	Low costs (\$100 to \$499)	N.D.	Cost not available
	Moderate costs (\$500 to \$999)	N.A.	Not applicable
	High costs (\$1,000 or more)		

Accessibility Features			Semi-Detached Home				
			Montréal	Toronto	Vancouver	Halifax	Winnipeg
Layout		Single-storey layout, without steps or staircases, that may include slabs on grade or a slight gradient (1:20 or less).	\$1,350	\$1,362	\$1,277	\$1,216	\$1,192
Access to the home		On the door handle side, clearance of 600 mm (24 in.) on the side where the door is pulled and 300 mm (12 in.) on the side where it is pushed.	\$0	\$0	\$0	\$0	\$0
		Door at least 915 mm (36 in.) wide with clearance of at least 865 mm (34 in.).	\$170	\$172	\$161	\$153	\$150
		If the door is not exposed to the elements: The threshold of the exterior entrance door is flat and bevelled at a maximum height of 12.5 mm (½ in.). If the door is exposed to the elements: The threshold of the entrance door is standard but embedded so as to reduce the height to the adjacent surfaces.	Included	\$0		Included	Included
		The doors are equipped with lever handles.	\$0	\$0	\$0	\$0	\$0
		The door is equipped with a device allowing the occupant to see who is there.	\$0	\$0	\$0	\$0	\$0
		There is protection against rain and snow above the main entrance.	\$0	\$0	\$0	\$0	\$0
		There is an appropriate turning circle inside and outside the entrance of 1,500 mm (60 in.).	Included in the cost of the additional surface area				
Garage		Garage dimensions of at least 4,270x6,100 mm (14x20 ft.) so that a car can be parked and the person can manoeuvre around.	Included in the cost of the additional surface area				
		A difference in height of less than 100 mm (4 in.) between the garage level and the floor level of the house. A short ramp with a top landing measuring 1,500x1,500 mm (5x5 ft.) can easily be added.	\$0	\$0	\$0	\$0	\$0
		A height of 2,700 mm (9 ft.) to accommodate various types of vehicles.	\$0	\$0	\$0	\$0	\$0

Appendix 4 - Detailed Table of Costs

Semi-Detached

Mobility		A manoeuvring area of 1,500 mm (60 in.) in diameter for wheelchairs in primary locations throughout the home.	Included in the cost of the additional surface area				
		Avoid hallways but, if necessary, plan for a width of 920 mm (about 3 ft.) there.	\$0	\$0	\$0	\$0	\$0
		Swinging or sliding doors 865 mm (34 in.) wide with clearance of 815 mm (32 in.) when open.	\$310	\$313	\$0	\$279	\$274
		On the door handle side, clearance of 600 mm (24 in.) on the side where the door is pulled and 300 mm (12 in.) on the side where it is pushed.	N.A.	N.A.	N.A.	N.A.	N.A.
		Lever handles.	\$100	\$101	\$0	\$90	\$88
		No door sill.	\$0	\$0	\$0	\$0	\$0
		Flat, smooth, non-slip, anti-glare flooring.	\$0	\$0	\$0	\$0	\$0
Controls and security systems		Switches and controls installed between 450 and 1,200 mm (between 18 and 48 in.) above the ground. Controls located more than 450 mm from the inside corner of a wall.	\$0	\$0	\$0	\$0	\$0
		Easy single-handed operation of switches and controls.	\$0	\$0	\$0	\$0	\$0
		Faucets and other lever controls that require little strength and no gripping or turning.	\$0	\$0	\$0	\$0	\$0
Kitchen		The kitchen is designed to facilitate movement and access to the workspace and appliances and has a clearance of 1500 mm (60 in.) in front of each counter.	Included in the cost of the additional surface area				
		Continuous counter space between the stove and the sink.	\$0	\$0	\$0	\$0	\$0
		Counters at regular height, allowing for integration of regular equipment: stove and sink. Plan sliding shelf to facilitate work in a seated position.	\$200	\$202	\$189	\$180	\$177
		Kitchen cabinets with a lot of drawers and sliding shelves. Users pull articles toward themselves and do not have to stretch.	\$975	\$984	\$922	\$878	\$861
		All cabinet handles are D-handles, enabling easy use without having to grasp them.	\$0	\$0	\$0	\$0	\$0
		Kitchen cabinets and work surfaces are of contrasting colours, which enables users to see and use doors, handles and counters more easily.	\$0	\$0	\$0	\$0	\$0
		Upper cabinets installed at a maximum height of 400 to 450 mm (about 16 to 18 in.) above the counter.	\$0	\$0	\$0	\$0	\$0
Kitchen		Plan a module that can be modified easily in order to clear an accessible space under the sink 760 mm wide by 685 mm high (30x27 in.) over the entire depth of the counter.	\$400	\$404	\$378	\$360	\$353

Appendix 4 - Detailed Table of Costs

Semi-Detached

		Plan for a floor covering in the entire kitchen, even under the sink countertop section.	\$408	\$412	\$386	\$368	\$360
		Plan vertical storage space with an interior free width of 760 mm (30 in.) and a depth of 600 mm (24 in.) to accommodate a wall oven. Plan a sliding shelf under the oven.	\$720	\$726	\$681	\$649	\$636
Bathroom		For a two-storey home: Half-bath accessible on the main floor with a manoeuvring area of 1,500 mm (60 in.); ideally, a full bathroom.	\$0	\$0	\$0	\$0	\$0
		For a two-storey home: Half-bath on the main floor has potential for being converted into a full bathroom; ideally, a full bathroom.	\$0	\$0	\$0	\$0	\$0
		Main bathroom with a manoeuvring area of 1,500 mm (60 in.).	Included in the cost of the additional surface area				
		Entire area in front of the bathtub is clear.	\$0	\$0	\$0	\$0	\$0
		Sink at a height of 810 to 860 mm (32 to 34 in.). Plan a module that can be modified easily in order to clear an accessible space under the sink 760 mm wide by 685 mm high (30x27 in.) over the entire depth of the counter.	\$400	\$404	\$378	\$360	\$353
		Plan for a floor covering in the entire bathroom, even under the sink countertop section.	\$0	\$0	\$0	\$0	\$0
		Two-storey house: In the half-bathroom on the main floor, plan a wall sink with hidden wall support instead of pedestal/vanity sink.	\$0	\$0	\$0	\$0	\$0
		Walls behind and on either side of the toilet are reinforced with plywood so grab bars can be installed anywhere on those walls.	\$220	\$0	\$0	\$198	\$194
		Bathtub walls are reinforced with plywood so that the user can install grab bars anywhere.	\$110	\$0	\$0	\$99	\$97
		The toilet is adjacent to a wall and its centreline should be between 460 mm (18 in.) and 480 mm (19 in.) from that wall.	\$0	\$0	\$0	\$0	\$0
		The main bathroom is designed so that a curbless shower measuring at least 915 mm (36 in.) by 1,200 mm (48 in.) may be installed in future.	\$500	\$505	\$473	\$451	\$442
		The structure can be easily modified under the shower.	\$500	\$505	\$0	\$451	\$442
		The bathroom is adjacent to a bedroom for easy connection between the two. This also allows for the installation of a rail ceiling lift.	N.A.	N.A.	N.A.	N.A.	N.A.

Appendix 4 - Detailed Table of Costs

Semi-Detached

Possibility of installing a lift in future (Some options applicable depending on the dwelling)		Space (at the bottom and top of the stairs) for the future installation of a chair or platform stair lift.	\$0	\$0	\$0	\$0	\$0
		Straight staircase with only one flight, allowing for the installation of a chair or platform stair lift.	N.A.	N.A.	N.A.	N.A.	N.A.
		Space wide enough for the future installation of a chair or platform stair lift.	\$200	\$202	\$0	\$180	\$177
		Preparation for the future installation of an elevator by superimposing closets and using a structure that can be easily modified.	\$1,000	\$1,009	\$946	\$901	\$883
Windows		Bottom of window sill max. 760 mm (30 in.) above grade.	\$0	\$0	\$0	\$0	\$0
		Windows equipped with easy-to-use opening and locking systems.	\$0	\$0	\$0	\$0	\$0
Access to the balcony or deck		French doors 1,800 mm (72 in.) wide with clearance of 810 mm (32 in.).	\$0	\$0	\$0	\$0	\$0
		Swinging door, without storm door, at least 915 mm (36 in.) wide with clearance of at least 865 mm (34 in.).	N.A.	N.A.	N.A.	N.A.	N.A.
		The threshold of the door is standard but embedded so as to reduce the height to the adjacent surfaces.	\$0	\$0	\$0	\$0	\$0
		Weather protection above the door.	No protection				
Two-storey homes		Plan to lay out a bedroom on the ground floor.	N.A.	N.A.	N.A.	N.A.	N.A.
Fire safety		If smoke detectors are installed in the homes, they must have an audible and visual alarm signal.	\$160	\$0	\$151	\$144	\$141
		Plan for a balcony that is accessible from the bedroom floor for taking refuge in case of fire.	\$3,000	\$3,027	\$2,864	\$2,703	\$2,649
		Plan for an outdoor space that is accessible from the basement for taking refuge in case of fire.	Not included				
Additional surface area		Cost of the increase in the living area, the garage area, the bathroom area, the kitchen area, etc. (www.costtobuild.net)	\$11,552	\$11,656	\$10,928	\$10,408	\$10,200
Total cost of accessibility features			\$22,275	\$21,981	\$19,735	\$20,070	\$19,669

Cost of standard semi-detached house (www.costtobuild.net)	\$183,743	\$185,397	\$173,821	\$165,552	\$162,245
Cost of modified semi-detached house	\$206,018	\$207,378	\$193,556	\$185,622	\$181,914
Cost impact (% change between modified and standard semi-detached house)	12%	12%	11%	12%	12%

Appendix 4 - Detailed Table of Costs

Detached

Cost impact

Legend

Nil or negligible costs (\$0 to \$99) or non applicable	\$0	Feature required in the bylaw, no additional cost
Low costs (\$100 to \$499)		
Moderate costs (\$500 to \$999)	N.D.	Cost not available
High costs (\$1,000 or more)	N.A.	Not applicable

Accessibility Features			Detached				
			Montréal	Toronto	Vancouver	Halifax	Winnipeg
Layout		Single-storey layout, without steps or staircases, that may include slabs on grade or a slight gradient (1:20 or less).	\$1,350	\$1,362	\$1,277	\$1,216	\$1,192
Access to the home		On the door handle side, clearance of 600 mm (24 in.) on the side where the door is pulled and 300 mm (12 in.) on the pushed side.	\$0	\$0	\$0	\$0	\$0
		Door at least 915 mm (36 in.) wide with clearance of at least 865 mm (34 in.).	\$170	\$172	\$161	\$153	\$150
		If the door is not exposed to the elements: The threshold of the exterior entrance door is flat and bevelled at a maximum height of 12.5 mm (½ in.). If the door is exposed to the elements: The threshold of the entrance door is standard but embedded so as to reduce the height to the adjacent surfaces.	Included	Included	\$0	Included	Included
		The doors are equipped with lever handles.	\$0	\$0	\$0	\$0	\$0
		The door is equipped with a device allowing the occupant to see who is there.	\$0	\$0	\$0	\$0	\$0
		There is protection against rain and snow above the main entrance.	Included in the cost of the additional surface area				
		There is an appropriate turning circle inside and outside the entrance of 1,500 mm (60 in.).	Included in the cost of the additional surface area				
Garage		Garage dimensions of at least 4,270x6,100 mm (14x20 ft.) so that a car can be parked and the person can manoeuvre around.	Included in the cost of the additional surface area				
		A difference in height of less than 100 mm (4 in.) between the garage level and the floor level of the house. A short ramp with a top landing measuring 1,500x1,500 mm (5x5 ft.) can easily be added.	\$0	\$0	\$0	\$0	\$0
		A height of 2,700 mm (9 ft.) to accommodate various types of vehicles.	\$0	\$0	\$0	\$0	\$0
Mobility		A manoeuvring area of 1,500 mm (60 in.) in diameter for wheelchairs in primary locations throughout the home.	Included in the cost of the additional surface area				
		Avoid hallways but, if necessary, plan for width of 920 mm (about 3ft)	\$0	\$0	\$0	\$0	\$0
		Swinging or sliding doors 865 mm (34 in.) wide with clearance of 815 mm (32 in.) when open.	\$560	\$565	\$0	\$505	\$494

Appendix 4 - Detailed Table of Costs

Detached

Mobility		On the door handle side, clearance of 600 mm (24 in.) on the side where the door is pulled and 300 mm (12 in.) on the pushed side.	N.A.	N.A.	N.A.	N.A.	N.A.
		Lever handles.	\$100	\$101	\$0	\$90	\$88
		No door sill.	\$0	\$0	\$0	\$0	\$0
		Flat, smooth, non-slip, anti-glare flooring.	\$0	\$0	\$0	\$0	\$0
Controls and security systems		Switches and controls installed between 450 and 1,200 mm (between 18 and 48 in.) above the ground. Controls located more than 450 mm from the inside corner of a wall.	\$0	\$0	\$0	\$0	\$0
		Easy single-handed operation of switches and controls.	\$0	\$0	\$0	\$0	\$0
		Faucets and other lever controls that require little strength and no gripping or turning.	\$0	\$0	\$0	\$0	\$0
Kitchen		The kitchen is designed to facilitate movement and access to the workspace and appliances and has a clearance of 1500 mm (60 in.) in front of each counter.	Included in the cost of the additional surface area				
		Continuous counter space between the stove and the sink.	\$0	\$0	\$0	\$0	\$0
		Counters at regular height, allowing for integration of regular equipment: stove and sink. Plan sliding shelf to facilitate work in a seated position.	\$200	\$202	\$189	\$180	\$177
		Kitchen cabinets with a lot of drawers and sliding shelves. Users pull articles toward themselves and do not have to stretch.	\$975	\$984	\$922	\$878	\$861
		All cabinet handles are D-handles, enabling easy use without having to grasp them.	\$0	\$0	\$0	\$0	\$0
		Kitchen cabinets and work surfaces are of contrasting colours, which enables users to see and use doors, handles and counters more easily.	\$0	\$0	\$0	\$0	\$0
		Upper cabinets installed at a maximum height of 400 to 450 mm (about 16 to 18 in.) above the counter.	\$0	\$0	\$0	\$0	\$0
		Plan a module that can be modified easily in order to clear an accessible space under the sink 760 mm wide by 685 mm high (30x27 in.) over the entire depth of the counter.	\$400	\$404	\$378	\$360	\$353
		Plan for a floor covering in the entire kitchen, even under the sink countertop section.	\$0	\$0	\$0	\$0	\$0
		Plan vertical storage space with an interior free width of 760 mm (30 in.) and a depth of 600 mm (24 in.) to accommodate a wall oven. Plan a sliding shelf under the oven.	\$720	\$726	\$681	\$649	\$636

Appendix 4 - Detailed Table of Costs

Detached

Bathroom		For a two-storey home: Half-bath accessible on the main floor with a manoeuvring area of 1,500 mm (60 in.); ideally, a full bathroom.	\$84	\$85	\$79	\$76	\$74
		For a two-storey home: half-bath on the main floor has potential for being converted into a full bathroom; ideally a full bathroom.	\$0	\$0	\$0	\$0	\$0
		Main bathroom with a manoeuvring area of 1,500 mm (60 in.).	Included in the cost of the additional surface area				
		Entire area in front of the bathtub is clear.	0 \$	0 \$	0 \$	0 \$	0 \$
		Sink at a height of 810 to 860 mm (32 to 34 in.). Plan a module that can be modified easily in order to clear an accessible space under the sink 760 mm wide by 685 mm high (30x27 in.) over the entire depth of the counter.	800 \$	807 \$	757 \$	721 \$	706 \$
		Plan for a floor covering in the entire bathroom, even under the sink countertop section.	Included in the cost of the additional surface area				
		Two-storey house: In the half-bathroom on the main floor, plan a wall sink with hidden wall support instead of a pedestal or vanity sink.	-\$500	-\$505	-\$473	-\$451	-\$442
		Walls behind and on either side of the toilet are reinforced with plywood so that grab bars can be installed anywhere on those walls.	\$330	\$0	\$0	\$297	\$291
		Bathtub walls are reinforced with plywood so that the user can install grab bars anywhere.	\$220	\$0	\$0	\$198	\$194
		The toilet is adjacent to a wall and its centreline should be between 460 mm (18 in.) and 480 mm (19 in.) from that wall.	\$0	\$0	\$0	\$0	\$0
		The main bathroom is designed so a curbless shower measuring at least 915 mm (36 in.) by 1,200 mm (48 in.) may be installed in future.	\$0	\$0	\$0	\$0	\$0
		The structure can be easily modified under the shower.	\$1,000	\$1,009	\$0	\$901	\$883
		The bathroom is adjacent to a bedroom for easy connection between the two. This also allows for the installation of a rail ceiling lift.	N.A.	N.A.	N.A.	N.A.	N.A.
Possibility of installing a lift in future (Some options applicable depending on the dwelling)		Space (at the bottom and top of the stairs) for the future installation of a chair or platform stair lift.	Included in the cost of the additional surface area				
		Straight staircase with only one flight, allowing for the installation of a chair or platform stair lift.	\$0	\$0	\$0	\$0	\$0
		Space wide enough for the future installation of a chair or platform stair lift. The installation of a lift on the staircase reduces the width required by regulations for evacuation. A special request for the installation of such a device must be submitted to the municipality.	\$200	\$202	\$0	\$180	\$177
		Preparation for the future installation of an elevator by superimposing closets and using a structure that can be easily modified.	\$1,000	\$1,009	\$946	\$901	\$883

Appendix 4 - Detailed Table of Costs

Detached

Windows		Bottom of window sill max. 760 mm (30 in.) above grade.	\$0	\$0	\$0	\$0	\$0
		Windows equipped with easy-to-use opening and locking systems.	\$0	\$0	\$0	\$0	\$0
Access to the balcony or deck		French doors 1,800 mm (72 in.) wide with clearance of 810 mm (32 in.)	\$0	\$0	\$0	\$0	\$0
		Swinging door, without storm door, at least 915 mm (36 in.) wide with clearance of at least 865 mm (34 in.).	N.A.	N.A.	N.A.	N.A.	N.A.
		The threshold of the door is standard but embedded so as to reduce the height to the adjacent surfaces.	\$0	\$0	\$0	\$0	\$0
		Weather protection above the door.	\$0	\$0	\$0	\$0	\$0
Two-storey homes		Plan to lay out a bedroom on the ground floor.	N.A.	N.A.	N.A.	N.A.	N.A.
Fire safety		If smoke detectors are installed in the homes, they must have an audible and visual alarm signal.	\$160	\$0	\$151	\$144	\$141
		Plan for a balcony that is accessible from the bedroom floor for taking refuge in case of fire.	\$3,000	\$3,027	\$2,838	\$2,703	\$2,649
		Plan for an outdoor space that is accessible from the basement for taking refuge in case of fire.	Not included				
Additional surface area		Cost of the increase in the living area, the garage area, the bathroom area, the kitchen area, etc. (www.costtobuild.net)	\$12,285	\$12,396	\$11,622	\$11,069	\$10,848
Total cost of accessibility features			\$23,054	\$22,545	\$19,529	\$20,772	\$20,357

Cost of standard detached house (www.costtobuild.net)			\$222,357	\$224,358	\$210,350	\$200,344	\$196,341
Cost of modified detached house			\$245,411	\$246,903	\$229,879	\$221,115	\$216,698
Cost impact (% change between modified and standard detached house)			10%	10%	9%	10%	10%

Appendix 4 - Detailed Table of Costs

Row House

Cost impact		Legend	
	Nil or negligible costs (\$0 to \$99) or non applicable	0 \$	Feature required in the bylaw, no additional cost
	Low costs (\$100 to \$499)		
	Moderate costs (\$500 to \$999)	N.D.	Cost not available
	High costs (\$1,000 or more)	N.A.	Not applicable

Accessibility Features			Row House				
			Montréal	Toronto	Vancouver	Halifax	Winnipeg
Layout		Single-storey layout, without steps or staircases, that may include slabs on grade or a slight gradient (1:20 or less).	\$1,100	\$1,110	\$1,041	\$991	\$971
Access to the home		On the door handle side, clearance of 600 mm (24 in.) on the side where the door is pulled and 300 mm (12 in.) on the side where it is pushed.	\$0	\$0	\$0	\$0	\$0
		Door at least 915 mm (36 in.) wide with clearance of at least 865 mm (34 in.).	\$170	\$172	\$161	\$153	\$150
		If the door is not exposed to the elements: The threshold of the exterior entrance door is flat and bevelled at a maximum height of 12.5 mm (½ in.). If the door is exposed to the elements: The threshold of the entrance door is standard but embedded so as to reduce the height to the adjacent surfaces.	Included	Included	0 \$	Included	Included
		The doors are equipped with lever handles.	\$0	\$0	\$0	\$0	\$0
		The door is equipped with a device allowing the occupant to see who is there.	\$0	\$0	\$0	\$0	\$0
		There is protection against rain and snow above main entrance.	\$0	\$0	\$0	\$0	\$0
		There is an appropriate turning circle inside and outside the entrance of 1,500 mm (60 in.).	Included in the cost of the additional surface area				
Garage		Garage dimensions of at least 4,270x6,100 mm (14x20 ft.) so that a car can be parked and the person can manoeuvre around.	Included in the cost of the additional surface area				
		A difference in height of less than 100mm (4 in) between the garage level and floor level of the house. A short ramp with a top landing measuring 1,500x1,500 mm (5x5 ft) can easily be added.	\$0	\$0	\$0	\$0	\$0
		A height of 2,700 mm (9 ft.) to accommodate various types of vehicles.	\$0	\$0	\$0	\$0	\$0
Mobility		A manoeuvring area of 1,500 mm (60 in.) in diameter for wheelchairs in primary locations throughout the home.	Included in the cost of the additional surface area				
		Avoid hallways but, if necessary, plan for a width of 920 mm (about 3 ft.) there.	\$0	\$0	\$0	\$0	\$0

Appendix 4 - Detailed Table of Costs

Row House

Mobility		Swinging or sliding doors 865 mm (34 in.) wide with clearance of 815 mm (32 in.) when open.	\$825	\$832	\$0	\$743	\$728
		On the door handle side, clearance of 600 mm (24 in.) on the side where the door is pulled and 300 mm (12 in.) on push side.	N.A.	N.A.	N.A.	N.A.	N.A.
		Lever handles.	\$140	\$141	\$0	\$126	\$124
		No door sill.	\$0	\$0	\$0	\$0	\$0
		Flat, smooth, non-slip, anti-glare flooring.	\$0	\$0	\$0	\$0	\$0
Controls and security systems		Switches and controls installed between 450 and 1,200 mm (between 18 and 48 in.) above the ground. Controls located more than 450 mm from the inside corner of a wall.	\$0	\$0	\$0	\$0	\$0
		Easy single-handed operation of switches and controls.	\$0	\$0	\$0	\$0	\$0
		Faucets and other lever controls that require little strength and no gripping or turning.	\$0	\$0	\$0	\$0	\$0
Kitchen		The kitchen is designed to facilitate movement and access to the workspace and appliances and has a clearance of 1500 mm (60 in.) in front of each counter.	\$900	\$908	\$851	\$811	\$795
		Continuous counter space between the stove and the sink.	Included	Included	Included	Included	Included
		Counters at regular height, allowing for integration of regular equipment: stove and sink. Plan sliding shelf to facilitate work in a seated position.	\$200	\$202	\$189	\$180	\$177
		Kitchen cabinets with a lot of drawers and sliding shelves. Users pull articles toward themselves and do not have to stretch.	\$975	\$984	\$922	\$878	\$861
		All cabinet handles are D-handles, enabling easy use without having to grasp them.	\$0	\$0	\$0	\$0	\$0
		Kitchen cabinets and work surfaces are of contrasting colours, which enables users to see and use doors, handles and counters more easily.	\$0	\$0	\$0	\$0	\$0
		Upper cabinets installed at a maximum height of 400 to 450 mm (about 16 to 18 in.) above the counter.	\$0	\$0	\$0	\$0	\$0
		Plan a module that can be modified easily in order to clear an accessible space under the sink 760 mm wide by 685 mm high (30x27 in.) over the entire depth of the counter.	\$400	\$404	\$378	\$360	\$353
		Plan for a floor covering in the entire kitchen, even under the sink countertop section.	\$336	\$339	\$318	\$303	\$297
		Plan vertical storage space with an interior free width of 760 mm (30 in.) and a depth of 600 mm (24 in.) to accommodate a wall oven. Plan a sliding shelf under the oven.	\$720	\$726	\$681	\$649	\$636

Appendix 4 - Detailed Table of Costs

Row House

Bathroom		For a two-storey home: Half-bath accessible on the main floor with a manoeuvring area of 1,500 mm (60 in.); ideally, a full bathroom.	\$168	\$170	\$161	\$151	\$154
		For a two-storey home: Half-bath accessible on the main floor has potential for being converted into a full bathroom.	Plan does not permit including this feature				
		Main bathroom with a manoeuvring area of 1,500 mm (60 in.).	Included in the cost of the additional surface area				
		Entire area in front of the bathtub is clear.	\$0	\$0	\$0	\$0	\$0
		Sink at a height of 810 to 860 mm (32 to 34 in.). Plan a module that can be modified easily in order to clear an accessible space under the sink 760 mm wide by 685 mm high (30x27 in.) over the entire depth of the counter.	\$400	\$404	\$378	\$360	\$353
		Plan for a floor covering in the entire bathroom, even under the sink countertop section.	\$552	\$557	\$522	\$497	\$487
		Two-storey house: In the half-bathroom on the main floor, plan a wall sink with hidden wall support instead of pedestal/vanity sink.	\$0	\$0	\$0	\$0	\$0
		Walls behind and on either side of the toilet are reinforced with plywood so grab bars can be installed anywhere on those walls.	\$330	\$0	\$0	\$297	\$291
		Bathtub walls are reinforced with plywood so that the user can install grab bars anywhere.	\$220	\$0	\$0	\$198	\$194
		The toilet is adjacent to a wall and its centreline should be between 460 mm (18 in.) and 480 mm (19 in.) from that wall.	\$0	\$0	\$0	\$0	\$0
		The main bathroom is designed so that a curbless shower measuring at least 915 mm (36 in.) by 1,200 mm (48 in.) may be installed in future.	\$0	\$0	\$0	\$0	\$0
		The structure can be easily modified under the shower.	\$1,000	\$1,009	\$0	\$901	\$883
		The bathroom is adjacent to a bedroom for easy connection between the two. This also allows for the installation of a rail ceiling lift.	N.A.	N.A.	N.A.	N.A.	N.A.
	Possibility of installing a lift in future (Some options applicable depending on the dwelling)		Space (at the bottom and top of the stairs) for the future installation of a chair or platform stair lift.	Included in the cost of the additional surface area			
		Straight staircase with only one flight, allowing for the installation of a chair or platform stair lift.	\$0	\$0	\$0	\$0	\$0
		Space wide enough for the future installation of a chair or platform stair lift. The installation of a lift on the staircase reduces the width required by regulations for evacuation. A special request for the installation of such a device must be submitted to the municipality.	\$200	\$202	\$0	\$180	\$177
		Preparation for the future installation of an elevator by superimposing closets and using a structure that can be easily modified.	N.A.	N.A.	N.A.	N.A.	N.A.

Appendix 4 - Detailed Table of Costs

Row House

Windows		Bottom of window sill max. 760 mm (30 in.) above grade.	\$0	\$0	\$0	\$0	\$0
		Windows equipped with easy-to-use opening and locking systems.	\$0	\$0	\$0	\$0	\$0
Access to the balcony or deck		French doors 1,800 mm (72 in.) wide with clearance of 810 mm (32 in.).	\$0	\$0	\$0	\$0	\$0
		Swinging door, without storm door, at least 915 mm (36 in.) wide with clearance of at least 865 mm (34 in.).	N.A.	N.A.	N.A.	N.A.	N.A.
		The threshold of the door is standard but embedded so as to reduce the height to the adjacent surfaces.	\$0	\$0	\$0	\$0	\$0
		Weather protection above the door.	\$0	\$0	\$0	\$0	\$0
Two-storey homes		Plan to lay out a bedroom on the ground floor.	N.A.	N.A.	N.A.	N.A.	N.A.
Fire safety		If smoke detectors are installed in the homes, they must have an audible and visual alarm signal.	\$160	\$0	\$151	\$144	\$141
		Plan for a balcony that is accessible from the bedroom floor for taking refuge in case of fire.	\$3,000	\$3,027	\$2,838	\$2,703	\$2,649
		Plan for an outdoor space that is accessible from the basement for taking refuge in case of fire.	Not included				
Additional surface area		Cost of the increase in the living area, the garage area, the bathroom area, the kitchen area, etc. (www.costtobuild.net)	\$2,401	\$2,423	\$2,271	\$2,163	\$2,120
Total cost of accessibility features			\$14,197	\$13,608	\$10,864	\$12,791	\$12,542

Cost of standard row house (www.costtobuild.net)	\$200,156	\$201,957	\$189,348	\$180,341	\$176,738
Cost of modified row house	\$214,353	\$215,566	\$200,211	\$193,132	\$189,280
Cost impact (% change between modified and standard row house)	7%	7%	6%	7%	7%

Appendix 4 - Detailed Table of Costs

Apartment

Cost impact

Legend

	Nil or negligible costs (\$0 to \$99) or non applicable	0 \$	Feature required in the bylaw, no additional cost
	Low costs (\$100 to \$499)		
	Moderate costs (\$500 to \$999)	N.D.	Cost not available
	High costs (\$1,000 or more)	N.A.	Not applicable

Accessibility Features			Apartment				
			Montréal	Toronto	Vancouver	Halifax	Winnipeg
Layout		Single-storey layout, without steps or staircases, that may include slabs on grade or a slight gradient (1:20 or less).	N.A.	N.A.	N.A.	N.A.	N.A.
Access to the home		On the door handle side, clearance of 600 mm (24 in.) on the side where the door is pulled and 300 mm (12 in.) on the push side.	\$0	\$0	\$0	\$0	\$0
		Door at least 915 mm (36 in.) wide with clearance of at least 865 mm (34 in.).	\$85	\$0	\$80	\$0	\$75
		If the door is not exposed to the elements: The threshold of the exterior entrance door is flat and bevelled at a maximum height of 12.5 mm (½ in.). If the door is exposed to the elements: The threshold of the entrance door is standard but embedded so as to reduce the height to the adjacent surfaces.	N.A.	N.A.	N.A.	N.A.	N.A.
		The doors are equipped with lever handles.	\$0	\$0	\$0	\$0	\$0
		The door is equipped with a device allowing the occupant to see who is there.	\$50	\$50	\$0	\$45	\$44
		There is protection against rain and snow above the main entrance.	N.A.	N.A.	N.A.	N.A.	N.A.
		There is an appropriate turning circle inside and outside the entrance of 1,500 mm (60 in.).	Included in the cost of the additional surface area				
Garage		Garage dimensions of at least 4,270x6,100 mm (14x20 ft.) so that a car can be parked and the person can manoeuvre around.	N.A.	N.A.	N.A.	N.A.	N.A.
		A difference in height of less than 100 mm (4 in.) between the garage level and the floor level of the house. A short ramp with a top landing measuring 1,500x1,500 mm (5x5 ft.) can easily be added.	N.A.	N.A.	N.A.	N.A.	N.A.
		A height of 2,700 mm (9 ft.) to accommodate various types of vehicles.	N.A.	N.A.	N.A.	N.A.	N.A.
Mobility		A manoeuvring area of 1,500 mm (60 in.) in diameter for wheelchairs in primary locations throughout the home.	Included in the cost of the additional surface area				
		Avoid hallways but, if necessary, plan for width of 920 mm (about 3 ft.)	\$0	\$0	\$0	\$0	\$0

Appendix 4 - Detailed Table of Costs

Apartment

		Swinging or sliding doors 865 mm (34 in.) wide with clearance of 815 mm (32 in.) when open.	\$60	\$61	\$0	\$54	\$53
		On the door handle side, clearance of 600 mm (24 in.) on the side where the door is pulled and 300 mm (12 in.) on the push side.	N.A.	N.A.	N.A.	N.A.	N.A.
		Lever handles.	\$80	\$81	\$0	\$72	\$71
		No door sill.	\$0	\$0	\$0	\$0	\$0
		Flat, smooth, non-slip, anti-glare flooring.	\$0	\$0	\$0	\$0	\$0
Controls and security systems		Switches and controls installed between 450 and 1,200 mm (between 18 and 48 in.) above the ground. Controls located more than 450 mm from the inside corner of a wall.	\$0	\$0	\$0	\$0	\$0
		Easy single-handed operation of switches and controls.	\$0	\$0	\$0	\$0	\$0
		Faucets and other lever controls that require little strength and no gripping or turning.	\$0	\$0	\$0	\$0	\$0
Kitchen		The kitchen is designed to facilitate movement and access to the workspace and appliances and has a clearance of 1500 mm (60 in.) in front of each counter.	Included in the cost of the additional surface area				
		Continuous counter space between the stove and the sink.	\$0	\$0	\$0	\$0	\$0
		Counters at regular height, allowing for integration of regular equipment: stove and sink. Plan sliding shelf to facilitate work in a seated position.	\$0	\$0	\$0	\$0	\$0
		Kitchen cabinets with a lot of drawers and sliding shelves. Users pull articles toward themselves and do not have to stretch.	\$975	\$984	\$922	\$878	\$861
		All cabinet handles are D-handles, enabling easy use without having to grasp them.	\$0	\$0	\$0	\$0	\$0
		Kitchen cabinets and work surfaces are of contrasting colours, which enables users to see and use doors, handles and counters easily.	\$0	\$0	\$0	\$0	\$0
		Upper cabinets installed at a maximum height of 400 to 450 mm (about 16 to 18 in.) above the counter.	\$0	\$0	\$0	\$0	\$0
		Plan a module that can be modified easily in order to clear an accessible space under the sink 760 mm wide by 685 mm high (30x27 in.) over the entire depth of the counter.	\$400	\$404	\$378	\$360	\$353
		Plan for a floor covering in the entire kitchen, even under the sink countertop section.	\$324	\$327	\$307	\$292	\$286
		Plan vertical storage space with an interior free width of 760 mm (30 in.) and a depth of 600 mm (24 in.) to accommodate a wall oven. Plan a sliding shelf under the oven.	\$720	\$726	\$681	\$649	\$636
		Main bathroom with a manoeuvring area of 1,500 mm (60 in.).	Included in the cost of the additional surface area				

Appendix 4 - Detailed Table of Costs

Apartment

		Entire area in front of the bathtub is clear.	Included in the cost of the additional surface area				
		Sink at a height of 810 to 860 mm (32 to 34 in.). Plan a module that can be modified easily in order to clear an accessible space under the sink 760 mm wide by 685 mm high (30x27 in.) over the entire depth of the counter.	\$400	\$404	\$378	\$360	\$353
		Plan for a floor covering in the entire bathroom, even under the sink countertop section.	\$324	\$327	\$307	\$0	\$286
		Walls behind and on either side of the toilet are reinforced with plywood so that grab bars can be installed anywhere on those walls.	\$110	\$0	\$0	\$0	\$97
		Bathtub walls are reinforced with plywood so that the user can install grab bars anywhere.	\$110	\$0	\$0	\$0	\$97
		The toilet is adjacent to a wall and its centreline should be between 460 mm (18 in.) and 480 mm (19 in.) from that wall.	\$0	\$0	\$0	\$0	\$0
		The main bathroom is designed so that a curbless shower measuring at least 915 mm (36 in.) by 1,200 mm (48 in.) may be installed in future.	\$0	\$0	\$0	\$0	\$0
		The structure can be easily modified under the shower.	N.A.	N.A.	N.A.	\$0	N.A.
		The bathroom is adjacent to a bedroom for easy connection between the two. This also allows for the installation of a rail ceiling lift.	N.A.	N.A.	N.A.	N.A.	N.A.
Possibility of installing a lift in future (Some options applicable depending on the dwelling)		Space (at the bottom and top of the stairs) for the future installation of a chair or platform stair lift.	N.A.	N.A.	N.A.	N.A.	N.A.
		Straight staircase with only one flight, allowing for the installation of a chair or platform stair lift.	N.A.	N.A.	N.A.	N.A.	N.A.
		Space wide enough for the future installation of a chair or platform stair lift. The installation of a lift on the staircase reduces the width required by regulations for evacuation. A special request for the installation of such a device must be submitted to the municipality.	N.A.	N.A.	N.A.	N.A.	N.A.
		Preparation for the future installation of an elevator by superimposing closets and using a structure that can be easily modified.	N.A.	N.A.	N.A.	N.A.	N.A.
Windows		Bottom of window sill max. 760 mm (30 in.) above grade.	\$0	\$0	\$0	\$0	\$0
		Windows equipped with easy-to-use opening and locking systems.	\$0	\$0	\$0	\$0	\$0

Appendix 4 - Detailed Table of Costs

Apartment

Access to the balcony or deck		French doors 1,800 mm (72in) wide with clearance of 810 mm (32in)	N.A.	N.A.	N.A.	N.A.	N.A.
		Swinging door, without storm door, at least 915 mm (36 in.) wide with clearance of at least 865 mm (34 in.).	\$0	\$0	\$0	\$0	\$0
		The threshold of the door is standard but embedded so as to reduce the height to the adjacent surfaces.	\$0	\$0	\$0	\$0	\$0
		Weather protection above the door.	N.A.	N.A.	N.A.	N.A.	N.A.
Fire safety		If smoke detectors are installed in the homes, they must have an audible and visual alarm signal.	\$0	\$0	\$150	\$90	\$0
		Plan for a balcony that is accessible from the bedroom floor for taking refuge in case of fire.	\$575	\$580	\$544	\$0	\$508
		Plan for an outdoor space that is accessible from the basement for taking refuge in case of fire.	N.A.	N.A.	N.A.	N.A.	N.A.
Additional surface area		Cost of the increase in the living area, the garage area, the bathroom area, the kitchen area, etc. (www.costtobuild.net)	N.D.	N.D.	N.D.	N.D.	N.D.
Total cost of accessibility features			\$4,213	\$3,943	\$3,748	\$2,801	\$3,720

Cost of standard house (www.costtobuild.net)	N.D.	N.D.	N.D.	N.D.	N.D.
Cost of modified house	N.D.	N.D.	N.D.	N.D.	N.D.
Cost impact (% change between modified house and standard house)	N.D.	N.D.	N.D.	N.D.	N.D.

APPENDIX 5

Stakeholders' contact information – Municipalities

Vancouver

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Montréal

By-law concerning the construction and conversion of buildings 11-018:
<http://ville.montreal.qc.ca/sel/sypre-consultation/afficherpdf?idDoc=23322&typeDoc=1> (in English)
www.ville.montreal.qc.ca/pls/portal/docs/PAGE/ARROND_ANJ_FR/MEDIA/DOCUMENTS/11_018.PDF
(in French)

APPENDIX 5

Stakeholders' contact information – Municipalities

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APPENDIX 6

Stakeholders' contact information – Contractors and homebuilders' associations

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APPENDIX 6

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Halifax

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