By Sevag Pogharian Design

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SPROUT

Designing Capacities for Incremental Change

Exploring the Support Paradigm

This project was carried out with the assistance of a grant from Canada Mortgage and Housing Corporation under the terms of the External Research Program (CMHC CR File 6585-P055). The views expressed are those of the authors and do not represent the official views of the Corporation.

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Acknowledgement

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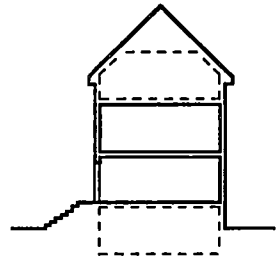
Abstract

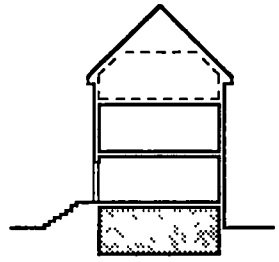
This report presents Sprout—a starter home prototype. The central objectives in developing this prototype are to enhance affordability in terms of down payment and recurring or carrying costs for first-time home-buyers while also meeting their housing needs and expectations. The investigation and proposed design solutions flow from the key themes of participation, flexibility and incrementalism inherent to the support paradigm of housing supply. The design precedents for Sprout comprise Charlie, The Grow Home, as well as Victorian and Georgian townhouses.

Part 1 of this report describes the context and ideas underlying Sprout. Part 2 describes Sprout's attributes and its potential benefits while Part 3 presents plans and elevations of eight variants of this prototype. For each variant of Sprout, the evolution of the unit from its initial period of construction to its point of maximum habitable area is hypothesized. Furthermore, each conversion or expansion of the unit is accompanied with a description of the household's emerging needs that precipitate the modifications as well as cost estimates associated with the modification.

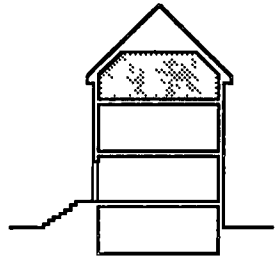
1: Initial Phase
The main and upper floors comprise the unit's habitable area. The basement and attic remain unfinished.



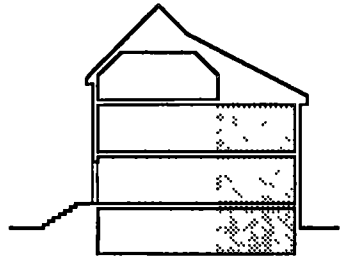
2: Intermediate Phase
The household appropriates the basement, thus, gaining new habitable space.



3: Intermediate Phase
The household appropriates the attic.



4: Final Phase
The household expands the unit envelope into the backyard. The unit reaches its state of maximum habitable area.



Progression of a two storey Sprout

Executive Summary

Sprout is a starter home prototype. Enhancing affordability in terms of down payment and recurring costs for first-time home-buyers as well as meeting their housing needs and expectations comprise the central objectives in developing this prototype. The investigation and proposed design solutions flow from the key themes of participation, flexibility and incrementalism inherent to the support paradigm of housing supply. The backdrop of design precedents for Sprout consist of Charlie, The Grow Home, as well as Victorian and Georgian townhouses. These precedents, with their virtues and shortcomings, all bear important lessons in developing this prototype.

Two paradigms, or models, exist in the geography of housing supply: the provider paradigm, and the support paradigm. These two establish significantly different intellectual, physical, political, and economic settings for the activity of housing.

The focus of this research rests on the support paradigm which contends that building large numbers of standardized houses through formal market channels rarely solves most housing problems. Furthermore, the support paradigm argues that if large-scale housing production is necessary, then large-scale local participation is essential since this delivers results efficiently and produces non-housing benefits such as empowerment of the family or community. Furthermore, the support paradigm maintains that the production of houses should be driven by the strategies of flexibility and incrementalism. Incrementalism describes an organic process of building over a long period of time—a process which presents continuous successions of phases instead of final results.

Participation, flexibility, and incrementalism can play a role in the Canadian housing context. Participation implies a new balance in the roles played by the housing industry and consumers. In a participatory arrangement, a housing consumer does not simply make the relatively easy decision

of purchasing or not purchasing a given house. A household actually takes greater responsibility over the evolution and ultimate form of its own house. Thus, a household becomes an indispensable agent in the housing process by adapting and expanding the house based on need and available resources. In the process, participation can facilitate access to home ownership, provide the opportunity to turn labor into capital in the form of home equity and can connect a household more intimately to a neighborhood.

Flexibility implies fluidity and indeterminacy, i.e. a structure that can undergo change and expansion easily and conveniently. One need not resort to expensive components such as moveable walls to achieve flexibility in housing. Conventional wood frame construction affords, for relatively long cycles of change, ample flexibility if combined with adequate design reserve, a permissive form of tenure—such as freehold—as well as non-restrictive zoning regulations. Design reserve refers to having built into a structure, from the outset, possibilities of a habitable basement, habitable attic, outward expansion, accessory apartment, home office, etc. The idea of design reserve can best be understood through examining the plans and accompanying explanations contained in Part 3.

Incrementalism implies building gradually, over a long period of time, through a continuous succession of phases. This represents the antithesis of an instant, final completed product. Incremental change along with flexibility ensure better fit and durability as opposed to eventual obsolescence.

Participation, flexibility, and incrementalism comprise together a comprehensive set. Flexibility describes attributes of a house, incrementalism describes a process, and participation describes the spark that sets the process in motion.

The design investigation which yielded Sprout was bounded by the constraints of affordability to middle-income home-buyers and by the constraints of conventional wood-frame construction. In other words, the tectonics of the proposed prototypes remain consistent with today's tradition of construction and do not rely on any technological fix. Furthermore, the developed prototypes all have a width of six metres which would allow, in many municipalities, freehold tenure.

The design objectives consist of concretizing the themes of flexibility, building incrementally, and participation in developing an affordable and appropriate starter home for middle-income young families. The challenge to affordability for these households exists in terms of the required down-payment as well as the eventual recurring or carrying costs. Another design objective, as illustrated by the plans, consists of attempting to accommodate conversions, extensions, and additions through minimal disruption to the housing structure and at minimal cost.

Semi-detached and townhouse typologies of Sprout were explored while ignoring the detached typology. Detached represents the least constrictive of these three typologies and it is assumed that if Sprout can work as a semi-detached or townhouse unit, it can certainly work as a detached unit. For each typology, a one-and-a-half as well as a two storey version were developed as well as a split level and main level entry variants.

Part 1 of this report describes the context and ideas underlying Sprout. Part 2 describes Sprout's attributes and its potential benefits while Part 3 presents plans and elevations of several variants of this prototype. For each variant of Sprout, the evolution of the unit from its initial period of construction to its point of maximum habitable area is hypothesized. Each conversion or expansion of the unit is accompanied with a description of the household's emerging needs that precipitate the modifications as well as cost estimates associated with the modification. ■

SPROUT

Conception pour un changement graduel - Exploration du modèle de soutien

Résumé

La maison Sprout est un prototype pour accédant à la propriété. Les objectifs principaux de l'élaboration de ce prototype était l'amélioration de l'abordabilité en ce qui a trait à la mise de fonds et aux frais généraux pour les nouveaux propriétaires ainsi que la satisfaction de leurs besoins et de leurs attentes en matière de logement. L'étude et les solutions de conception proposées découlent des thèmes clés que sont la participation, la flexibilité et la progressivité propres au modèle de soutien du parc de logement. La maison Sprout s'inspire de la maison CHARLIE, de la Maison évolutive et des maisons en rangée de style victorien et géorgien. Les avantages et inconvénients de ces types d'habitations ont servi à l'élaboration du prototype.

Deux modèles existent dans la structure du parc de logement : le modèle de fournisseur et le modèle de soutien. Ces deux modèles établissent des contextes intellectuels, physiques, politiques et économiques très différents pour l'activité du logement.

Cette recherche repose principalement sur le modèle de soutien selon lequel la construction d'un grand nombre de maisons uniformisées, par l'entremise des marchés officiels, résout rarement la majorité des problèmes de logement. De plus, en vertu du modèle de soutien, si une production de maison est nécessaire à grande échelle, une participation locale de la même ampleur est essentielle puisque qu'elle produit des résultats efficaces et comporte des avantages non liés au logement comme l'habilitation de la famille ou de la communauté. De plus, selon le modèle de soutien, l'aménagement de maisons devrait être guidé par les stratégies de flexibilité et de progressivité. La progressivité décrit un processus de construction échelonné sur une longue période, un processus qui présente des successions de phases continues plutôt que des résultats finals.

La participation, la flexibilité et la progressivité ont leur rôle à jouer dans le contexte de l'habitation au Canada. La participation implique un nouvel équilibre entre le rôle du secteur de l'habitation et celui des consommateurs. Dans une structure de participation, le consommateur de logement ne prend pas simplement la décision relativement simple d'acheter ou non une maison donnée. Le ménage assume en fait une responsabilité plus grande en ce qui a trait à l'évolution et à la forme finale de sa propre maison. Ainsi, il devient un agent indispensable dans le processus de logement en adaptant et en agrandissant sa maison en fonction de ses besoins et de ses ressources. Dans le processus, la participation peut faciliter l'accès à la propriété. Elle peut permettre la transformation du travail en capitaux sous la forme d'avoir propre et créer des liens étroits entre le ménage et son voisinage.

La flexibilité implique la fluidité et l'indétermination, c'est-à-dire une structure qui peut subir des changements et un agrandissement sans problème. Il n'est pas nécessaire d'avoir recours à des composantes coûteuses comme les cloisons mobiles pour rendre un logement flexible. Combinées à une conception adaptable, à un mode d'occupation souple, comme la propriété absolue, ainsi qu'à des règlements de zonage non restrictifs, les

constructions à ossature de bois habituelles offrent une grande flexibilité pour des cycles de changements relativement longs. Une conception adaptable signifie que l'on intègre, dès le départ, la possibilité de rendre le sous-sol et les combles habitables, d'agrandir vers l'extérieur, d'aménager un appartement-accessoire et un bureau, etc. On comprendra davantage la conception adaptable en consultant les plans de la partie 3.

La progressivité implique une construction étape par étape, étalée sur une longue période, par l'entremise d'une succession de phases. Cela est tout à l'opposé d'un produit immédiat, achevé et final. Le changement graduel doublé d'une flexibilité garantit l'adaptabilité et la durabilité d'un produit plutôt que son éventuelle désuétude.

Ensemble, la participation, la flexibilité et la progressivité forment un tout. La flexibilité décrit les caractéristiques d'une maison, la progressivité décrit un processus et la participation, l'étincelle qui déclenche le processus.

L'étude de conception qui a mené à la maison Sprout était liée par les contraintes de l'abordabilité chez les acheteurs à revenu moyen et par les contraintes des constructions à ossature de bois standards. Autrement dit, les techniques utilisées pour les prototypes proposés demeurent conformes aux méthodes de construction d'aujourd'hui et ne s'en remettent pas aux progrès technologiques. De plus, les prototypes élaborés ont tous une largeur de six mètres, ce qui, dans de nombreuses municipalités, permettrait la propriété absolue.

Les objectifs de conception consistent en la concrétisation des thèmes de la flexibilité, de la construction graduelle et de la participation dans l'élaboration de maisons abordables et convenables pour les jeunes familles à revenu moyen qui accèdent à la propriété. Le problème d'abordabilité se pose pour ces familles en raison de la mise de fonds requise ainsi que des frais généraux et des frais de possession. Un autre objectif de conception, comme l'indiquent les plans, est de tenter de faciliter les conversions, les agrandissements et les ajouts par de légères modifications de la structure et à des coûts minimes.

Les logements jumelés et en rangée ont été étudiés pour la maison Sprout, tandis que la maison individuelle a été écartée. Ce dernier type de logement est celui qui présente le moins de contraintes parmi les trois et l'on tient pour acquis que si le concept Sprout convient aux jumelés et aux maisons en rangée, il conviendra certainement aux logements individuels. Pour chaque type de logement, des versions d'un étage et demi et de deux étages ont été élaborées ainsi que des versions pour les maisons avec entrée à mi-étage ou au rez-de-chaussée.

La partie 1 du présent rapport décrit le contexte et les idées à la base du concept Sprout. La partie 2 décrit les caractéristiques du modèle Sprout et ses avantages potentiels. La partie 3, elle, présente les plans et les coupes de plusieurs variantes du prototype. Pour chaque variante, on présente l'hypothèse de l'évolution du logement, de la première étape de sa construction à sa forme habitable maximale. Chaque conversion ou agrandissement du logement est accompagné d'une description des besoins croissants du ménage qui précipitent les modifications ainsi que d'une estimation des coûts liés à ces travaux.

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Introduction

This report presents Sprout—a starter home prototype. The central objectives in developing this prototype are to enhance affordability in terms of down payment and recurring or carrying costs for first-time home-buyers while meeting their housing needs and expectations. The investigation and proposed design solutions described in this report flow from the key themes of participation, flexibility and incrementalism inherent to the support paradigm of housing supply. The backdrop of design precedents for Sprout consist of Charlie, The Grow Home, as well as Victorian and Georgian townhouses. These precedents, with their virtues and shortcomings, all bear important lessons which benefit Sprout.

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PART 1: THE CONTEXT

Income and Home Ownership

Between 1978 and 1986, increases in aggregate incomes of Canadian households matched increases in their aggregate shelter costs.[1] Thus, the average portion of income that Canadians spent on shelter remained at about 15% throughout this period. When these relationships are disaggregated and examined in detail, however, important findings emerge. If Canadian households are divided into five equal groups based on income, it becomes clear that as inflation adjusted incomes grew for Canada's highest income households, they actually fell for the three lower quintiles. This holds particularly true for the lowest quintile, i.e. the poorest households. Furthermore, while the proportion of income spent on shelter diminished for Canada's highest income households (with the exception of 1982, when high interest rates adversely affected homeowner mortgage expenses), it increased for the three lower quintiles. This again holds particularly true for the lowest quintile and, by 1986, the average shelter cost-to-income ratio for this group had risen above today's accepted affordability norm of 30%. As a result of these economic shifts, while the level of home ownership edged upward in the higher two quintile groups between 1978 and 1986, the level of home ownership decreased for the three lower quintiles.

Affordability of home ownership improved somewhat in 1993. This slight improvement occurred due to a drop in mortgage rates to around 25 year lows, a large housing supply, and only modest growth in home

Average Income and Shelter Cost-to-Income Ratios and Tenure Profiled by Quintiles, Selected Years

Year	Lowest Quintile	Second Quintile	Middle Quintile	Fourth Quintile	Highest Quintile
Average Income (before tax — in constant 1986 dollars)					
1978	$10,162	$21,619	$31,964	$43,124	$67,746
1982	$9,723	$20,196	$30,823	$42,664	$68,936
1986	$9,708	$19,683	$30,942	$44,107	$74,193
Average Shelter Cost-to-Income Ratios — % of income spent on shelter					
1978	28.9	18.9	16.3	13.9	10.8
1982	30.5	20	16.4	14.5	11.1
1986	33.0	21.4	16.5	13.9	10.0
Tenure Profile by Quintile (ratio of owners to renters)					
1978	48.9/51.1	49.5/50.5	62.1/37.9	73.0/27.0	85.0/15.0
1982	39.9/60.1	49.4/50.6	61.4/38.6	74.4/25.6	86.6/13.4
1986	34.1/65.9	46.7/53.3	58.3/41.7	73.6/26.4	86.7/13.3

Source: ***Canadians and Their Housing: Income, Tenure and Expenditure Shifts***, (Ottawa: CMHC, Research and Development Highlights, Issue 5, January 1992)

prices. Thus, the percentage of renters who could afford to buy an average priced NHA insured starter home increased in 12 of 27 centers. This favorable trend in the affordability of home ownership is likely to change course, however, as the nation gradually emerges out of its economic slump, mortgage rates rise and housing markets tighten once again.

Housing Expectations and Trends

First-time home-buyers may be divided into two segments: the affordable segment, i.e. those seeking a house priced below the average for the market area, and the "upscale" segment, i.e. those seeking a house priced above the average.[2] The affordable segment comprises 78% of first-time buyers. A survey conducted by Environics Research Group reveals some of the current housing aspirations of this segment. The dream house remains the single-family detached with the house and lot sizes comprising the most important elements on the shopping list. Energy-efficiency and quality also place high on this list. Furthermore, the average unit size that households within the affordable segment expect to buy measures about 175 sq m.[3]

In light of the above discussion concerning declining levels of income for the three lower quintiles, these housing expectations of the affordable segment underscore a significant "expectation gap." Most first-time buyers realize that disappointment awaits and that they will have to settle for less.[4] Most seem to understand that their expectations on space are too high and are prepared to compromise by settling for a house that gives

the illusion of spaciousness.

Environics Research Group has identified five trends that may have major impact on housing expectations during this decade.

1. Canadians will continue to believe that the ability to enjoy an affluent materialistic lifestyle is a legitimate end in itself... The dream of a home of one's own will not die, and the more space that is available inside, outside and all around, the more gadgets and toys that are available, the better. Any plan for affordable housing—simple and straightforward though it might be—must include concessions to the desire for bells and whistles.[5]

2. ...Canadians will continue to admire and express the qualities of spontaneity, informality and individualism. The home is one of the most personal vehicles for self-expression, and affordable housing will have to be flexible enough inside and out to accommodate this need. ...Canadians have a need to express themselves through the manipulation of their environment with embellishments and activities, in both private and public spaces.[6]

3. ...personal control will be an important trend for the next few decades. Owning a home, a fortress, is a key element of personal control. It is essential for Canadians to be able to control intrusions into this fortress. As a result, privacy, sound proofing, and control over heating are all essential[7]

4. Increasing social consciousness for our children's sake will mean a growing activism. Conflicts are arising between people who want a home on their own little patch of land and those who insist that society must protect agricultural land and urban woodlots. Socially conscious Canadians have these two opposing movements in their minds.[8]

5. ...Canadians are starting to express a real desire for balance, for

> greater stability and calm. The preoccupation with environmental problems and economic uncertainty is making them feel that the quality of their lives is somehow under siege, that they're paying for the excesses of the 1980s. The values that we seem to remember from the 1950s will be more attractive: family, community, stability.[9]

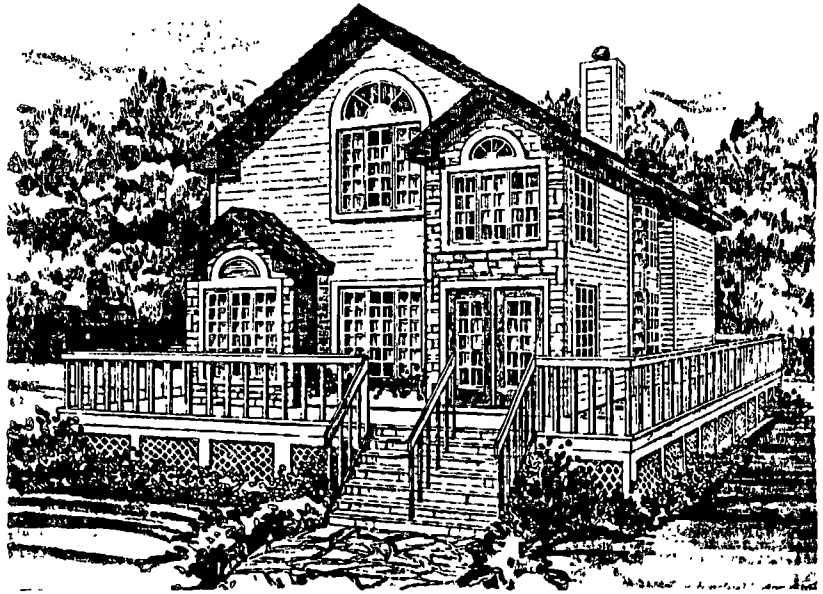
Hence, the challenge in creating successful and affordable starter home solutions lies in meeting the high expectations of the client households given their financial constraints.

Precedents

To reduce the affordability gap to home-ownership, Canadian Home Builders Association in partnership with Canada Mortgage and Housing Corporation built a demonstration home named Charlie. With the same end in mind, McGill University's Affordable Homes Program built another demonstration home named The Grow Home. These two prototypes bear several lessons. Furthermore, Victorian and Georgian townhouses also represent important precedents for developing an affordable starter home.

Charlie: CHBA / CMHC Demonstration Home

Charlie comprises a large two-storey structure with a full basement and a footprint of approximately 93 sq m.[10] An important feature of Charlie is its convertibility which is intended to promote housing affordability. It is suggested that a young family may purchase Charlie, convert the second floor



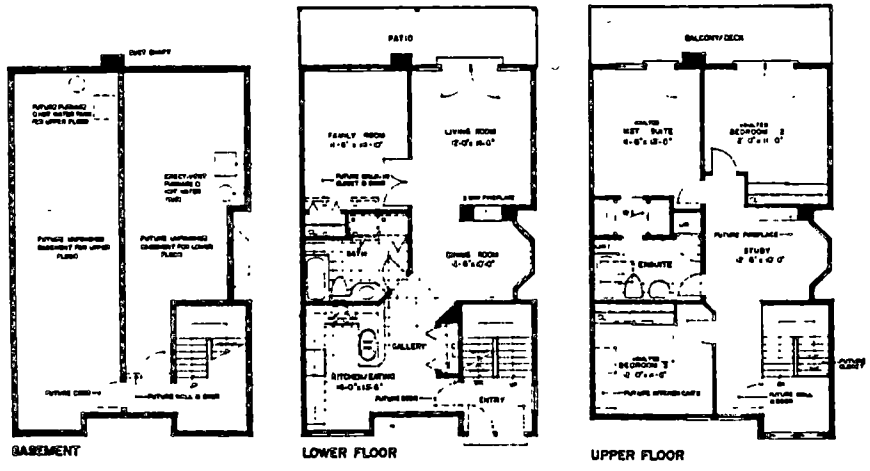


Figure 1: Charlie—CHBA/CMHC demonstration home

into a rental accessory apartment and use the income to offset the mortgage payments. When the family's housing needs expand, it may reconvert Charlie into a single housing unit and appropriate the second floor for its own use.

The kind of straightforward, low-tech flexibility built into the design of Charlie at the outset represents an intelligent and innovative approach. This feature comprises Charlie's greatest strength while the specific design solution that embodies this approach has certain shortcomings. Though a household may offset its monthly dwelling costs through converting the upper floor into an accessory apartment, the design offers no solution to the potential hurdle represented by the required down-payment on a large house such as Charlie. Charlie, therefore, primarily meets the needs of a family during its peak life-cycle and is unlikely to be accessible to most Canadian first-time home-buyers. Furthermore, the viability of Charlie rests heavily on the existence of demand for rental housing in those neighborhoods where large houses such as Charlie would be built. Finally, the proposed conversion illustrated in the report: (i) involves substantial investment and disruption to the existing structure; converting the second floor into an accessory apartment involves demolishing two closets and relocating the washer and dryer. (ii) The proposed conversion makes ineffective use of the basement; the basement, following conversion, simply becomes storage for the two apartments. The possibility of using the basement as habitable space is not explored. (iii) Thus, Charlie could undoubtedly have been planned more effectively given the large size of the unit and the consequent

latitude in design that this affords.

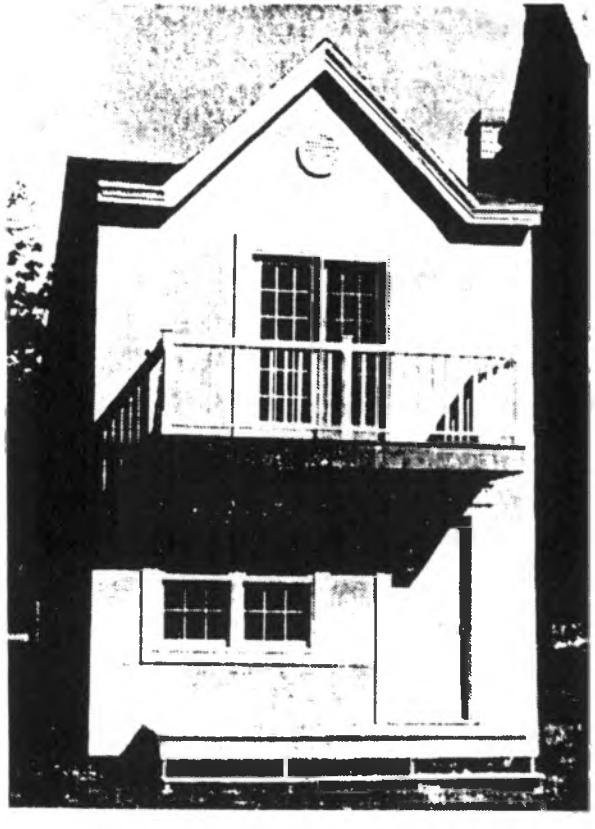


Figure 2: The Grow Home

The Grow Home

The concept of The Grow Home was developed in response to the affordability gap which exists for many prospective home owners, especially young families wanting to buy their first home. The objective of The Grow Home is to reduce the price of a housing unit by reducing its land and hard-cost components; the proposed method for achieving this is by reducing the overall size and frontage of the housing unit along with simplifying its design.

A prototype of The Grow Home—a narrow two-storey unit having a width of 4.3 m and an area of 93 sq m—was developed.[11] The concept and the prototype were adopted by several home builders in the Montreal area and several hundred Grow Home-type units built in the Montreal Metropolitan region.

The Grow Home played a valuable role by demonstrating that the strategy of reducing overall unit size and frontage along with simplifying the design works very well in reducing price and, thus, enhancing affordability. It also demonstrated by the volume of Grow Home-type unit sales that this strategy can yield a very marketable product.

The Grow Home concept, however, has certain limitations; contrary to its name, it is not significantly expandable. Expansion in the area of habitable space can only occur downward through appropriating an unfin-

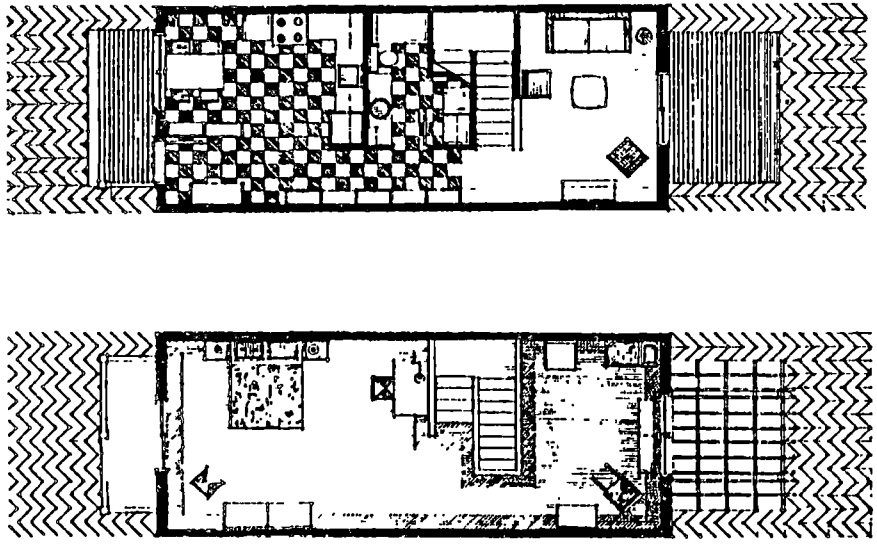


Figure 2a: The Grow Home - floor plans

Proportion of Canadian Households that are Movers*						
	1983	1985	1987	1988	1989	1990
By Tenure Types						
Owners	33.4	30.8	33.0	34.5	35.6	35.7
Renters	75.1	73.1	74.1	74.3	73.3	73.3

*Columns in 1983, 1985 and 1987 do not total to 100% since the HFE survey included a fourth choice (Don't Know).

Source: ***Mobility Characteristics of Canadian Households***, (Ottawa: CMHC, Research and Development Highlights, 90-212, NHA 6408)

ished basement where the unit has a basement. The opportunity of expanding upward into a habitable attic does not exist. Furthermore, expanding outward into the backyard is impossible due to inherent features of the unit. The unit, in its townhouse typology, cannot expand outward because this would result in a windowless bedroom at the upper floor, as well as a windowless kitchen or dining room at the ground floor. Furthermore, because of zoning regulations in most municipalities in the Montreal area, the narrow width of The Grow Home eliminates freehold as a tenure option. Grow Home-type developments in the Montreal Metropolitan area have almost exclusively been condominium which precludes improvisational expansions beyond the unit envelope. Thus, both The Grow Home prototype as well as most Grow Home-type units built in the Montreal area have limited design reserve to keep up with the needs of a growing family. This lack of design reserve manifests itself in the reported mobility characteristics of owners of Grow Home-type units.

Mobility of Home Owners: Nearly half of all Canadian households move every five years.[12] The mobility of renters and home owners is not the same, however, and while three quarters of all renters report having moved during the previous five years, only about one third of home owners report having moved during the same period. A post-occupancy evaluation of seven Grow Home-type developments in the Montreal area reveals different mobility characteristics of Grow Home-type home owners. When asked how long they plan to live in their new home, approximately 66% of respon-

How Long Occupants of Grow Home-Type Units Plan to Live in Their New Home (%)	
One or two years	4.8
Three or four years	29.6
Five or six years	31.2
Seven or eight years	1.1
More than eight years	16.9
Do not know	16.4

Source: Avi Friedman and Vince Cammalleri, ***Evaluation of Affordable Housing Projects Based on the Grow Home Concept***, (Montreal: McGill University, School of Architecture, Affordable Homes Program, April 1992), p.52

dents reported one to six years.[13] Thus, while only one third of Canadian home owners moved during the previous five years, twice that amount of Grow Home-type owners predict moving during the next six years. There exist obvious differences in the data being compared. One set of data reports the number of households that actually moved while the other reports the number of households that predict moving. Furthermore, one set of data considers a time-line of five years while the other considers six years. Both these differences make the comparison somewhat difficult. However, the difference in mobility characteristics between the population of Canadian home owners and the sample of Grow Home-type owners is significant enough to question whether owners of Grow-Home-type units would be as likely to predict moving if their units had the capacity to change and expand.

Georgian and Victorian Townhouses

Societally, we have significantly improved our construction materials and techniques while unfortunately regressing in the way we plan and design houses. Contemporary, homes have little of the thoughtfulness and flexibility in design inherent to Georgian and Victorian townhouses.[14] Despite the wide variety that exists in these townhouses, one can identify common elements in their floor plans and site plans which bear important lessons for the design of new homes. The floor plans of Georgian and Victorian townhouses tend to consist of rooms organized in series rather than an "open plan."

Their vertical circulation tends to have some redundancy with a secondary rear stair originally intended for servants. Their basements, once the realm of servants, tend have street access along with natural light and ventilation. These floor plan attributes allow more adaptability to change as a unit can easily and conveniently accommodate accessory apartments, professional offices, and stores. Basements of these dwellings, for example, are now commonly re-used as garden apartments, corner pubs and stores. Furthermore, Georgian and Victorian townhouses tend to have rear service lanes and occasionally coach houses. These site plan attributes allow flexible parking solutions and provide the potential for additions or extensions. The ultimate result of these floor plan and site plan attributes is that occupants can choose to accommodate many changes in lifestyle while remaining in the same house.

Provider / Support Paradigms

Two paradigms, or models, have emerged in the geography of housing supply: the provider paradigm, and the support paradigm.[15] These two paradigms establish significantly different intellectual, physical, political, and economic settings for the activity of housing. Though the focus in this research is on the support paradigm, a brief thumbnail sketch of the provider paradigm follows as a reference point. Readers may refer to Hamdi's ***Housing Without Houses: Participation, Flexibility, Enablement*** for a comprehensive exposition of the two paradigms.

The provider paradigm dominates the current approach to housing supply and maintains that the solution to housing problems lies in building large numbers of houses, rapidly and instantly in an attempt to close any deficit between housing supply and demand. Furthermore, mass producing large numbers of instant houses implies mechanizing and standardizing products and operations in order to achieve economies of scale. This activity, according to the provider paradigm, is best performed or controlled by public authorities or big industry within a regulated environment and with centralized resources. The provider paradigm relies on a higher level of capital and resource than the support paradigm.

The support paradigm, on the other hand, contends that mass-producing houses in the capital-intensive way in which governments and private industry usually do, represents inefficient use of resources. This paradigm holds that building large numbers of standardized houses through formal market channels rarely solves most housing or community problems. Furthermore, the support paradigm argues that if large-scale housing production through effective use of resources is necessary, then large-scale local participation is essential since this delivers results efficiently and produces non-housing benefits such as empowerment of the family or community. Furthermore, the support paradigm maintains that the production of houses should be driven by the strategies of flexibility and incrementalism—an organic process of building incrementally which presents continuous successions of phases instead of final results.

Applying the Support Paradigm to the Canadian Context

What do participation, flexibility, and incrementalism imply for the Canadian housing context? Participation implies a new balance in the roles played by the housing industry and consumers. In a participatory arrangement, a housing consumer does not simply make the relatively easy decision of purchasing or not purchasing a given house. A household actually takes greater responsibility over the evolution and ultimate form of its own house. Thus, a household becomes an indispensable agent in the housing process by adapting and expanding the house based on need and available resources. In the process, participation can facilitate access to home ownership, provide the opportunity to turn labor into capital in the form of home equity and can connect a household more intimately to a neighborhood.

Flexibility implies fluidity and indeterminacy, i.e. a structure that can undergo change and expansion easily and conveniently. One need not resort to expensive components such as moveable walls to achieve flexibility in housing. Conventional wood frame construction affords, for relatively long cycles of change, ample flexibility if combined with adequate design reserve, a permissive form of tenure—such as freehold—as well as non-restrictive zoning regulations. Design reserve refers to having built into a structure, from the outset, possibilities of a habitable basement, habitable attic, outward expansion, accessory apartment, home office, etc.

Incrementalism implies building gradually, over a long period of time, through a continuous succession of phases. This represents the

antithesis of an instant, final completed product. Incremental change along with flexibility ensure better fit and durability as opposed to eventual mismatch between occupant and house.

Participation, flexibility, and incrementalism comprise together a comprehensive set. Flexibility describes attributes of a house, incrementalism describes a process, and participation describes the spark that sets the process in motion.

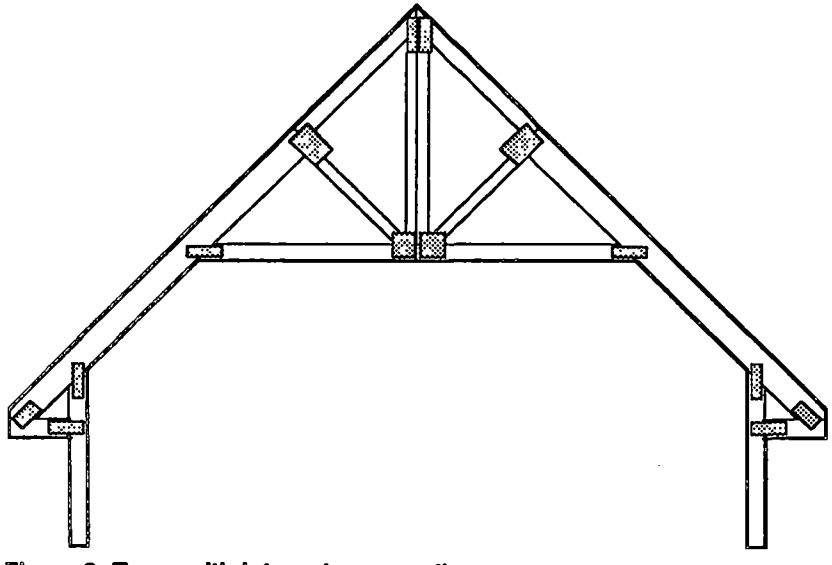


Figure 3: Truss with integral pony wall
Source: ***Habitable Attics: New Potential for an Old Idea,*** (Ottawa: CMHC, NHA 6565, 1991)

PART 2: SPROUT

Description

The design investigation which yielded Sprout was bounded by the constraints of cost and construction method. In other words, the designs produced had to be affordable to middle-income home-buyers and they had to fit within the practice of conventional wood-frame construction.

The design objectives underlying Sprout consist of concretizing the themes of flexibility, building incrementally, and participation in developing an affordable and appropriate starter home for low- and middle-income young families. The challenge to affordability for these households exists in terms of the required down-payment as well as the recurring or carrying costs involved in home ownership. Another design objective underlying Sprout consists of attempting to accommodate conversions, extensions, and additions through minimal disruption to the housing structure and at minimal cost.

The habitable attic comprises an important feature of Sprout. Like the narrow front townhouse, the habitable attic is an old idea which deserves a return to the mainstream of home building. Habitable attics remained a common feature in pre- and post-war housing until the introduction of the manufactured low-pitch roof truss in the 1950s. The manufactured truss speeded up construction and used lumber more efficiently but, in the process, eliminated the attic as a habitable space. Technological advancements in the last two decades have facilitated the manufacture of trusses that

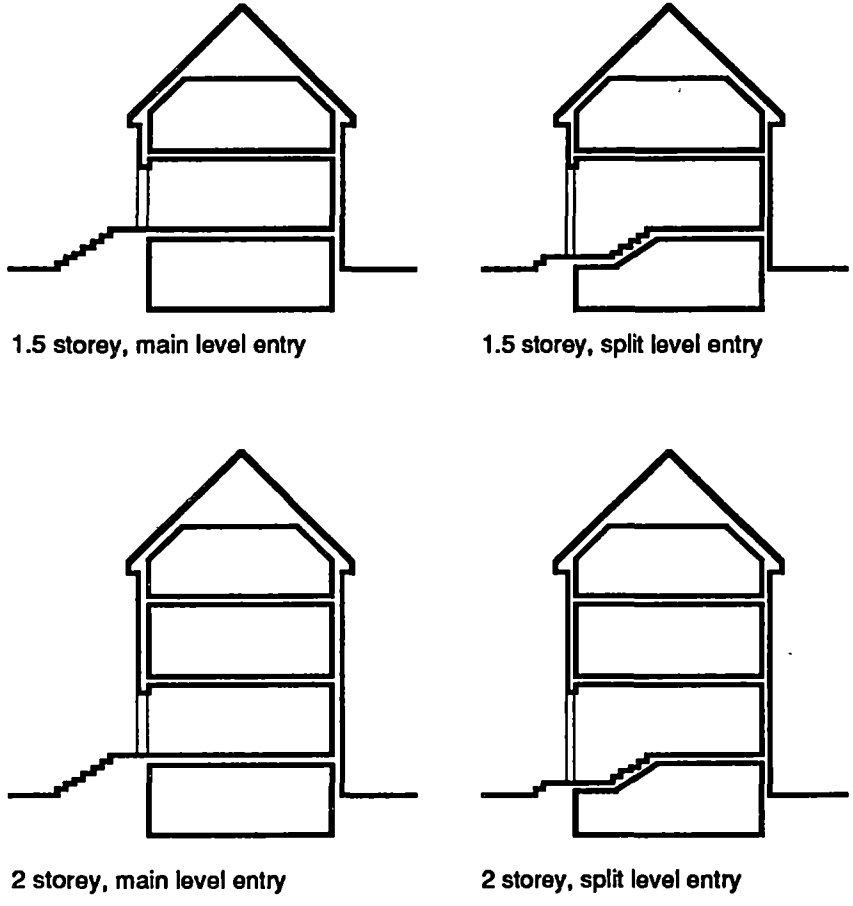


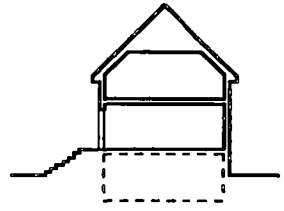
Figure 4: Design alternatives explored

can once again yield a habitable attic. As described in CMHC's ***Habitable Attics: New Potential for an Old Idea***, manufactured trusses that can satisfy the need for construction speed and economy while yielding a habitable attic currently exist on the market. The report identifies and evaluates six truss types and six attic framing systems which use rafters. Figure 3 shows the system—a truss system—recommended by the report as the optimal solution to roof framing. This truss has the benefits of low cost, ease of insulating, making airtight, transporting, installing, and finishing. The truss has integral pony walls and can be delivered to the construction site in two halves. The steep slope of the top chords has the added benefit, if building orientation allows, of providing a suitably sloped roof for solar panels. The truss shown in Figure 3 comprises the roofing system employed in Sprout.

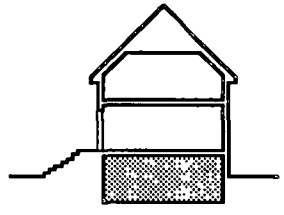
The semi-detached and townhouse typologies of Sprout were explored while ignoring the detached typology. Detached represents the least constrictive of these three typologies and it may be assumed that if Sprout can work as a semi-detached or townhouse unit, it can certainly work as a detached unit. For each typology explored, a one-and-a-half as well as a two storey version was developed. Furthermore, as shown in Figure 4, split level as well as main level entry variants of Sprout were explored. All the permutations described above result in eight unit types which are presented in Part 3 of this report.

Figure 5 illustrates the sequence in which the habitable area of the one-and-a-half storey Sprout expands. At its initial phase, the one-and-a-half storey version of Spout comprises two bedrooms, approximately 85 sq

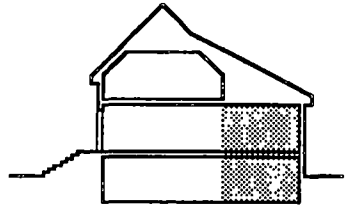
1: Initial Phase
The main and upper floors comprise the unit's habitable area while the basement remains unfinished.



2: Intermediate Phase
The household appropriates the basement, thus, gaining new habitable space.



3: Final Phase—option 1
The household expands the unit envelope into the backyard. The unit reaches its state of maximum habitable area.



Final Phase—option 2
The household expands the unit envelope into the backyard as in option 1. The roof is framed differently, thus, yielding more habitable space. The unit reaches its state of maximum habitable area.

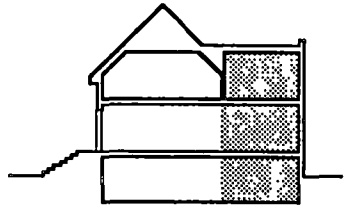


Figure 5: Progression of one-and-a-half storey Sprout

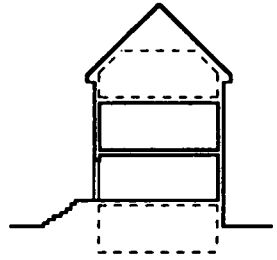
m of habitable area, 43 sq m of footprint, and an unfinished basement. The upper floor of this version comprises a finished, habitable attic. Following several phases of expansion and modification, the structure, at its final phase, can comprise two units and a total habitable area of about 180 sq m. This reflects an expansion in habitable area of about 110%.

Figure 6 illustrates the sequence in which the habitable area of the two storey Sprout expands. At its initial phase, the two storey version of Spout comprises two bedrooms, approximately 95 sq m of habitable area, 48 sq m of footprint, an unfinished basement, and an unfinished but habitable attic. Following several phases of expansion and modification, the structure, at its final phase, can comprise two units and a total habitable area of about 265 sq m. This reflects an expansion in habitable area of about 180%.

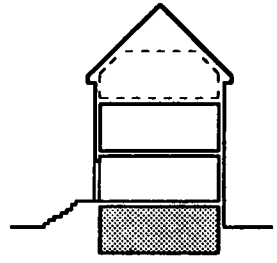
The strategy employed in making Sprout affordable to home buyers is the same as the strategy which makes The Grow Home affordable. Sprout's footprint and frontage are reduced to approximately 43 sq m and 6 m respectively. Furthermore, Sprout's shape and form are kept as simple as possible. These features reduce its estimated construction cost to approximately $80,000. Thus, the price of townhouse version of Sprout would be around $105,000 to $115,000. A household earning $39,300 gross annually can afford a $115,000 house while a household earning $36,800 gross annually can afford a $105,000 house.

Although Sprout is small at its initial phase, it has the flexibility of growing. Several features provide this flexibility. The 6 m frontage of the unit allows freehold tenure as opposed to condominium. Freehold gives the

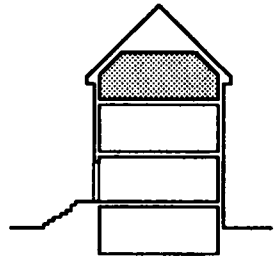
1: Initial Phase
The main and upper floors comprise the unit's habitable area. The basement and attic remain unfinished.



2: Intermediate Phase
The household appropriates the basement, thus, gaining new habitable space.



3: Intermediate Phase
The household appropriates the attic.



4: Final Phase
The household expands the unit envelope into the backyard. The unit reaches its state of maximum habitable area.

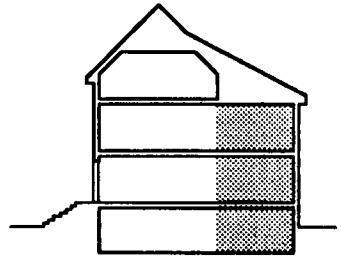


Figure 6: Progression of two storey Sprout

occupant greater control over the unit in terms of additions or modifications. Furthermore, Sprout has a measure of design reserve allowing it to grow and change. For example, the unit's main entrance can accommodate a second entrance directly to an accessory apartment. Exterior openings are coordinated with future additions. The plumbing is in place from the start to facilitate later bathroom or kitchen additions. Stairs can be extended from the upper floor to the attic without disrupting the upper floor. The design reserve inherent within Sprout means that modifications and additions can be executed at minimal disruption to the existing structure which in turn reduce the cost of the modifications. Furthermore, a large part of the work involved in the illustrated modifications, such as installing partitions, and finishes, can be completed by the occupants themselves. This provides the occupants a way of converting their own labor into home equity.

The five trends identified on pages 4 to 5 concerning housing expectations during this decade relate to Sprout as follows. The first trend describes the desire of Canadians for "bells and whistles" on a house even within the context of affordable housing. The "bells and whistles" or the "luxuries" on Sprout occur on the main façade—which is ornamented—and in the bathrooms and kitchens. The cost estimates accompanying the plans reflect a high quality of bathroom and kitchen fixtures and finishes. For example, the estimates reflect ceramic tile in these spaces as opposed to linoleum.

The second trend describes the need that Canadians have to express the qualities of spontaneity, informality and individualism. "The home is

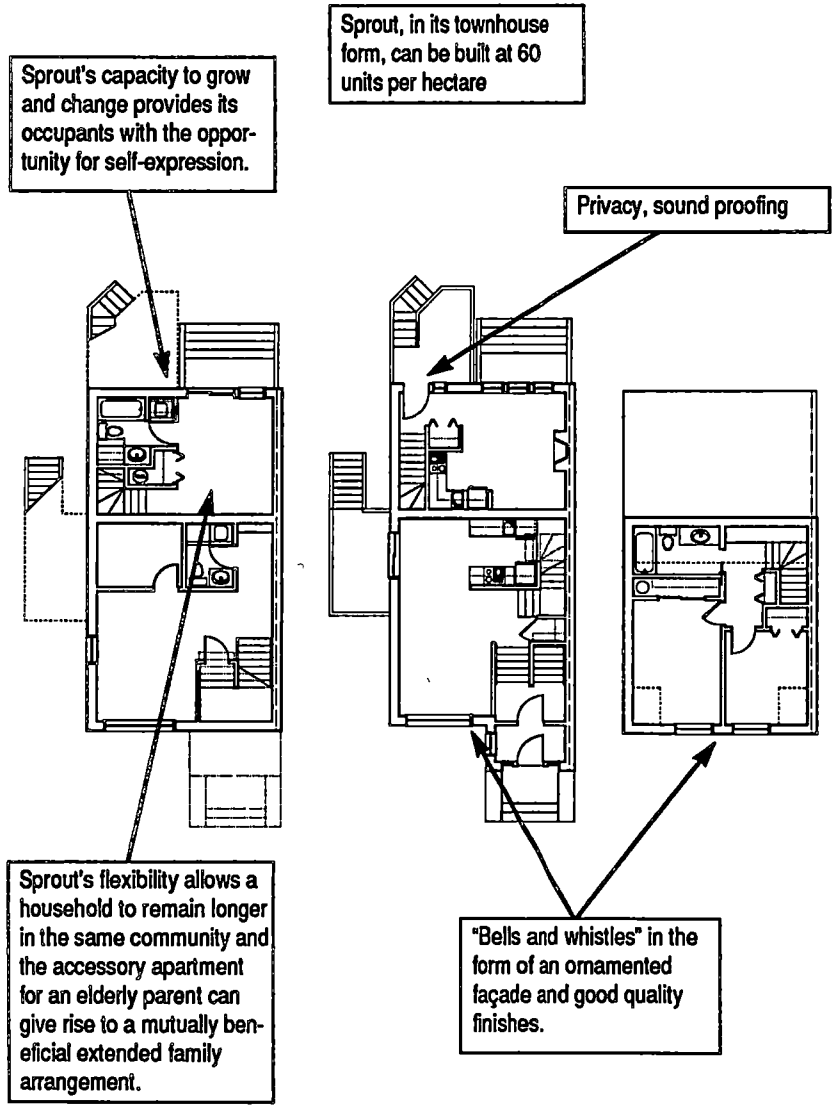


Figure 7: Illustration of the five trends

one of the most personal vehicles for self-expression, and affordable housing will have to be flexible enough inside and out to accommodate this need." Sprout, by its very nature, provides its occupant with the opportunity for self-expression. Sprout has the flexibility for growth and change and this process of growth and change is driven by the occupant's needs and desires.

The third trend describes the need that Canadians have for personal control over their house. Thus, privacy, sound proofing, and control over heating are all essential. Sprout has its own back yard and, in the case of a semi-detached unit, its own side yard. Furthermore, the cost estimates accompanying the plans reflect party walls having a sound transmission class of 63.

The fourth trend describes the increasing social consciousness of Canadians and the resulting conflict between the desire for a house with its own patch of land and the awareness of the importance of preserving natural resources. Sprout, in its townhouse form can be built at 60 units per hectare as opposed 15 units per hectare for single family detached. More importantly, however, Sprout lends itself to infill developments. Thus, it can be used in densifying already developed areas. This represents a more environmentally benign way of expanding the housing stock than new construction on newly developed land.

The fifth trend describes the shift toward values that emphasize family, community, and stability. Sprout's flexibility allows a household to remain longer in the same community since the unit can respond to a house-

hold's changing housing needs. This stability may, therefore, encourage a household to take greater ownership of its community. Furthermore, Sprout's ability to accommodate an accessory apartment for an elderly parent can give rise to a mutually beneficial extended family arrangement.

Given the above objectives and constraints, eight sets of prototypes are presented in Part 3. For each prototype, a possible evolution of the unit is hypothesized from its initial period of construction, through intermediate periods of expansion, addition or conversion up to a point of maximum habitable area. For each period, an estimated cost of construction is also presented.

Benefits to Consumers

The target market for Sprout during its initial phase consists of young families wanting to buy their first home. However, as Sprout evolves and expands over time, its target market, in the event of resale, changes. In this discussion of potential consumers of Sprout, only those households which represent potential consumers during Sprout's initial phase is considered. In other words, only young, first-time home buyers are considered.

Sprout offers several benefits to this group of consumers. Sprout's small initial size (85 sq m), hence, low construction cost and low price translate into reduced required down payment and mortgage payments. Sprout, therefore, enhances affordability and eases entry into home ownership for first-time buyers.

Sprout's inherent flexibility and design reserve provide a household with lots of choices. A household can readily modify Sprout to accommodate its changing housing needs. These changing needs may involve an additional bedroom, a family room, or even an accessory apartment. Sprout's malleability and capacity to respond to changing housing needs means that a household need not suffer the additional disruption of moving upon the unexpected arrival of twins, for example. On the contrary, a household can stay in the same house since the house can respond to the variety of spatial demands imposed upon it throughout a household's life-cycle.

Sprout's capacity to expand and easily accommodate an accessory apartment has profound financial and lifestyle implications for a home owner. A home owner may create an accessory apartment and rent it out, thus, using the rental revenue to cover household expenses. Or, a home owner may make the accessory apartment available to an elderly parent, thus, achieving a mutually beneficial extended family arrangement.

Sprout, for the reasons mentioned above, represents a viable alternative to the new stock currently offered to first-time buyers. Hence, Sprout would expand the choice of available affordable products for this segment of housing consumers. Expanding choice in this manner can only benefit consumers.

Benefits to the Home-Building Industry

Sprout represents a product ripe for today's housing market. The flexibility and expansibility of this prototype would most likely appeal to many segments of housing consumers, particularly young first-time buyers. Thus Sprout represents, for the home-building industry, an additional option of products to offer to consumers—a product that is not in any way more complicated than conventional residential construction and a product that is very marketable.

Sprout can form part of large tract developments or, more importantly, it can be built on small, infill sites. Sprout's footprint ranges from 43 sq m, at its initial phase, to around 68 sq m, at its final phase. Sprout's small initial footprint lends itself to infill developments. The significance of this to the home-building industry is great. Sprout represents a product that small, developer-builders can bring to market. Armed only with a small site and relatively little capital, a small entrepreneur can develop and sell this product, thus, benefitting both himself and housing consumers. Since most actors in the home-building industry are small in size, Sprout represents a product that can benefit a large proportion of the industry.

Benefits to Municipalities

Sprout, though not the panacea for all municipal problems, can benefit urban municipalities in many ways. In fact, this innovative starter home can respond to several important issues facing Canadian municipalities.

Over the past few decades, the downtown household population of urban municipalities has declined since many households have moved to the suburbs in search of housing which better meet their needs.[16] A large segment of the households that have made this exodus consists of young families. The elements driving this exodus of families to the suburbs involve opportunities for home ownership, access to private outdoor space, privacy, and the possibility of adapting the residence as the family evolves.

Municipalities recognize the importance of increasing the population of young families in downtown neighborhoods and of reversing the exodus of this household segment to the suburbs. Municipalities also recognize the necessity of expanding, within downtown neighborhoods, the supply of residential choices commensurate with the means and needs of these households.

Sprout, as described above, fits the means and needs of young, middle-income families. It also offers these families many of the elements that appear to be drawing them to the suburbs. These elements comprise opportunities for home ownership, access to private outdoor space, privacy, and the possibility of adapting the residence as the family evolves. Thus, Sprout may benefit urban municipalities by reducing the tide of young families toward the suburbs.

Another way in which Sprout can benefit urban municipalities is through its suitability for infill. Filling vacant lots with products such as Sprout would gradually increase a municipality's density. Densification implies, for a municipality, more efficient use of its infrastructure and resources as well as a greater tax base. Furthermore, as Sprout's habitable space is increased by its occupants, a municipality would reap tax benefits through the increased assessment value of the property.

Sprout's inherent flexibility and design reserve mean that it can respond to a wide variety of spatial demands imposed upon it throughout a household's life-cycle. This in turn means that a household can stay in the same house and community over a very long period. Thus, Sprout can promote stable neighborhoods and communities.

Sprout can fit many different stylistic contexts thus reinforcing the architectural tradition of its neighborhood rather then disrupting it. Sprout's main façade can easily adopt the indigenous architectural vocabulary whether this means grey limestone and bay-windows, or cedar shingles and clapboard. Furthermore, Sprout does not disrupt the character of a neighborhood as it grows and changes since the modifications that the dwelling undergoes do not become manifest on its main façade or building height.

Finally, the accessory apartments that could be created within Sprout would be of high quality in terms of health and safety. Many of the accessory apartments illustrated have two means of egress. Furthermore, they all have ample fenestration, and all comply fully with the ***National Building Code 1990*** requirements.

Despite the many potential benefits of Sprout to urban municipalities, there exist certain regulatory impediments that mitigate against actualizing the full potential of this innovative starter home. Some very common examples of regulatory obstacles that detract from Sprout's full potential are those regulations dealing with accessory apartments and parking requirements.

Accessory apartments are often prohibited in single-family zones. Thus, the owner of a Sprout would be unable to legally create an accessory apartment if the dwelling is in a single-family zone. The Government of Ontario's legislative change allowing any homeowner to create one accessory apartment within his home represents a major step towards eliminating this impediment .

Parking requirements can also pose a severe barrier against benefitting from a flexible housing type such as Sprout. In many cases, when an accessory apartment is created within a unit, zoning regulations require that the number of on-site parking spaces also be increased. On restrictive sites, however, this requirement for an additional parking space can effectively eliminate the possibility of an accessory apartment. In situations where the unit is located in an urban area with access to public transit, the premise that a newly created accessory apartment equates to an additional car in the neighborhood may not be valid. The validity of this premise is even more questionable if the created accessory apartment is likely to serve an elderly parent of the homeowner.

The regulations concerning accessory apartments and parking com-

prise two examples of potential regulatory impediments to Sprout.

Although Sprout is not the panacea for all municipal problems, it is an innovative starter home that can benefit urban municipalities in many ways. Thus, municipalities would perhaps do well to revisit their zoning and construction regulations with a focus on identifying and eliminating the specific regulations within their framework that present obstacles to an innovative housing type such as Sprout.

Endnotes

[1]***Canadians and Their Housing: Income, Tenure and Expenditure Shifts***, (Ottawa: CMHC, Research and Development Highlights, Issue 5, January 1992)

[2]Jordan A. Levitin, "Expectation, Disappointment and Compromise in the Search for Affordable Housing," ***The 2nd Housing Awards Symposium 1990: Housing Young Families Affordably***, (Vancouver: Proceedings, September 6 and 7, 1990), p. 29

[3]Ibid., p. 30

[4]Ibid., p. 30

[5]Ibid., p. 31

[6]Ibid., p. 31

[7]Ibid., p. 31

[8]Ibid., p. 31

[9]Ibid., p. 31

[10]***Charlie: CHBA/CMHC Demonstration Home***, (Hamilton: Hamilton & District Home Builders' Association, 1989)

[11]***The Grow Home***, (Montreal: McGill University, School of Architecture, Affordable Homes Program, May 1990)

[12]***Mobility Characteristics of Canadian Households***, (Ottawa: CMHC, Research and Development Highlights 90-212, NHA 6408), p. 1

[13]Avi Friedman and Vince Cammalleri, ***Evaluation of Affordable Housing Projects Based on the Grow Home Concept***, (Montreal: McGill University, School of Architecture, Affordable Homes Program, April 1992), p. 52

[14]Paul Reuber and Lorna Day, ***New, Old Houses***, (Ottawa: CMHC, June 1987)

[15]Nabeel Hamdi, ***Housing Without Houses: Participation, Flexibility, Enablement***, (New York: Van Nostrand Reinhold, 1991), p. 26

[16]See ***L'Art de vivre en ville: National Architectural Competition, Program and Rules***. Ville de Montréal, Service de l'habitation et du développement urbain, Module de l'habitation, 1990.

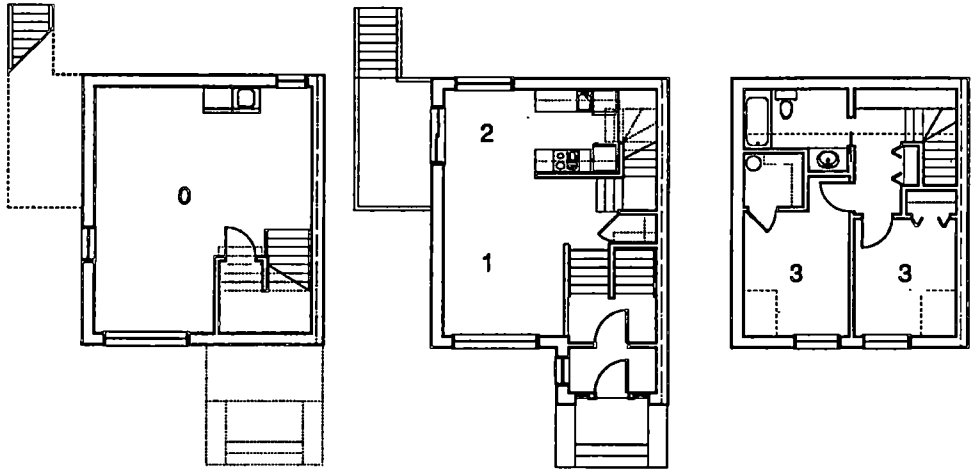
[17]Sevag Pogharian, ***Zoning and Innovative, Affordable, Urban Housing for Families***, (Unpublished Report, December 1993)

[18]***Zoning and Innovative, Affordable, Urban Housing for Families***, p. 4-5

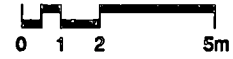
SEMI-DETACHED
1.5 Storey, Split Level Entry

	Semi-detached		*Townhouse*	
	Split level entry	*Main level entry*	*Split level entry*	*Main level entry*
1.5 Storey	●	○	○	○
2 Storey	○	○	○	○

SEMI-DETACHED
1.5 Storey, Split Level Entry: Initial Phase



Basement Main Floor Upper Floor

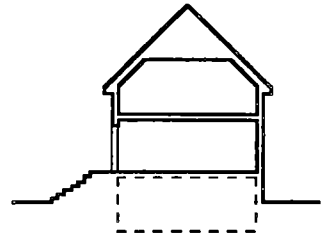


Legend:
0 Future habitable area
1 Living
2 Dining
3 Bedroom

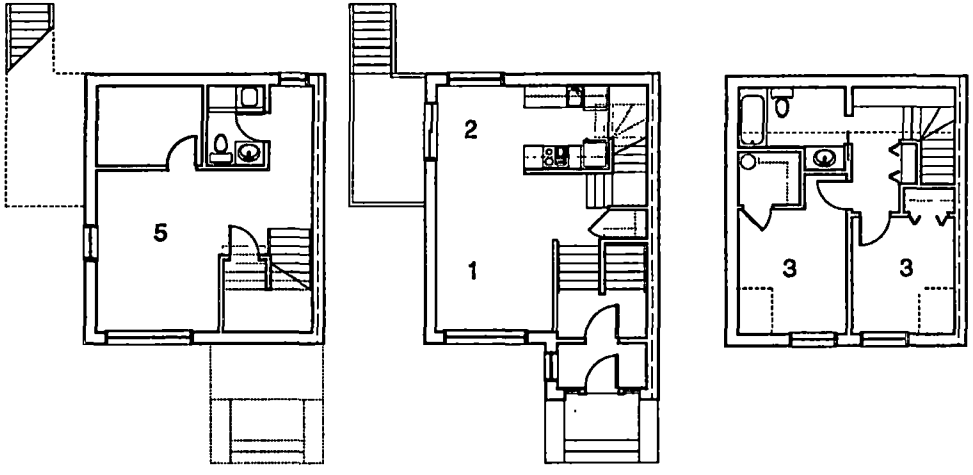
Description:
Number of units: 1
Number of bedrooms: 2
Habitable area: 85 m²

Estimated Construction Cost:
$81,743

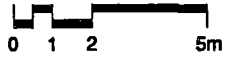
Scenario:
A young couple or a family with only 1 child buys this starter home. The home at this initial phase has only 2 bedrooms and a total habitable area of 85 m². The basement remains unfinished until the need for additional space arises.



SEMI-DETACHED
1.5 Storey, Split Level Entry: Intermediate Phase 1



Basement Main Floor Upper Floor



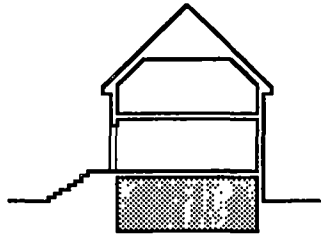
Legend:
1 Living
2 Dining
3 Bedroom
5 Family room

Description:

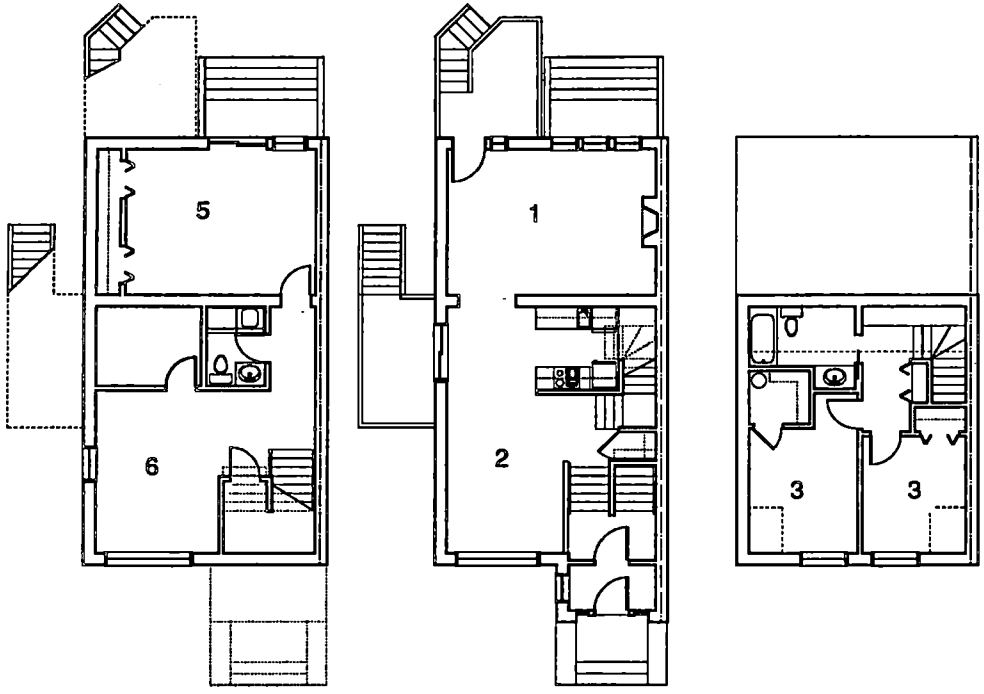
Number of units:	1
Number of bedrooms:	2
Habitable area:	128 m²
Change in area from previous phase:	+50%

Estimated Construction Cost:
Basement expansion: $11,245

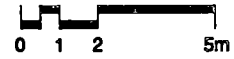
Scenario:
The basement becomes habitable as the household converts this unfinished area into a family room or an extra bedroom with a washroom and storage.



SEMI-DETACHED
1.5 Storey, Split Level Entry: Intermediate Phase 2



Basement Main Floor Upper Floor



Legend:

1 Living
2 Dining
3 Bedroom
5 Family room
6 Office

Description:

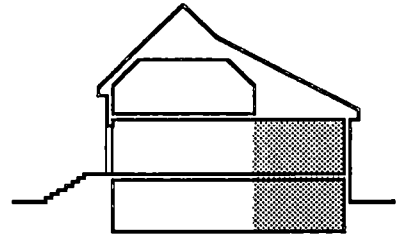
Number of units:	1
Number of bedrooms:	3
Habitable area:	178 m²
Change in area from previous phase:	+39%

Estimated Construction Cost:

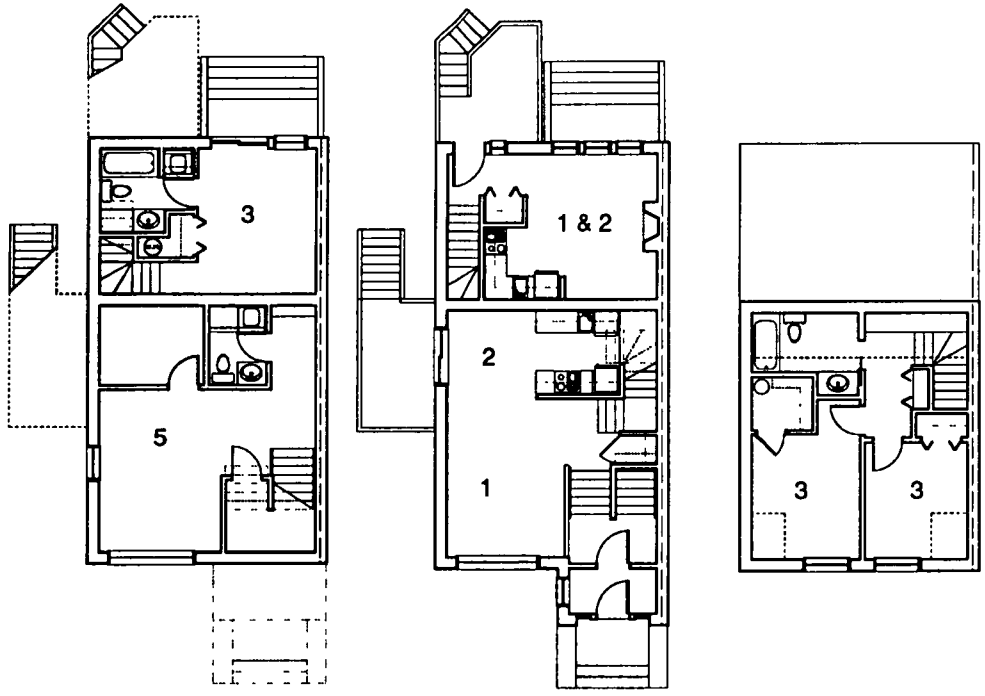
Addition:	$34,590

Scenario:

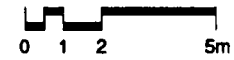
Several years after appropriating the basement, the household has the financial means to undertake an addition towards the rear. The unit expands 4.15 m into the backyard thus yielding larger living and dining rooms as well as a third bedroom in the basement.



SEMI-DETACHED
1.5 Storey, Split Level Entry: Final Phase



Basement Main Floor Upper Floor



Legend:
1 Living
2 Dining
3 Bedroom
5 Family room

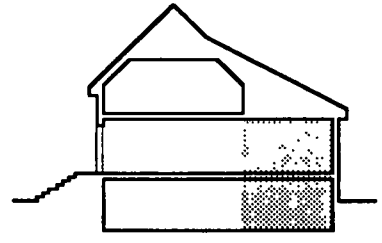
Description:

Number of units:	2
Principal unit:	
Number of bedrooms:	2
Habitable area:	128 m²
Change in area from previous phase:	-28%
Accessory apartment:	
Number of bedrooms:	1
Habitable area:	50 m²
Initial area:	85 m²
Total final area:	178 m²
Total change in area from initial phase:	+109 %

Estimated Construction Cost:

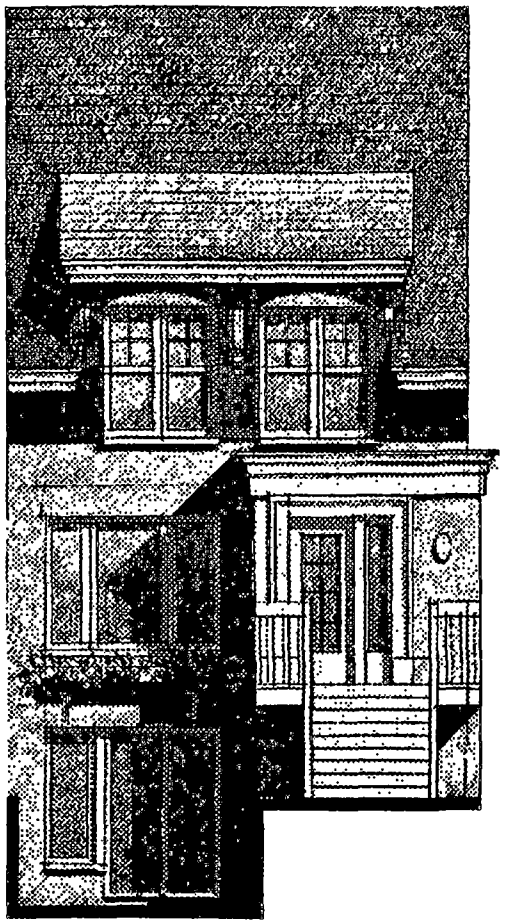
Conversion:	$16,599

Scenario:
As the household's spatial needs decline, the unit is split into two and an accessory apartment created.

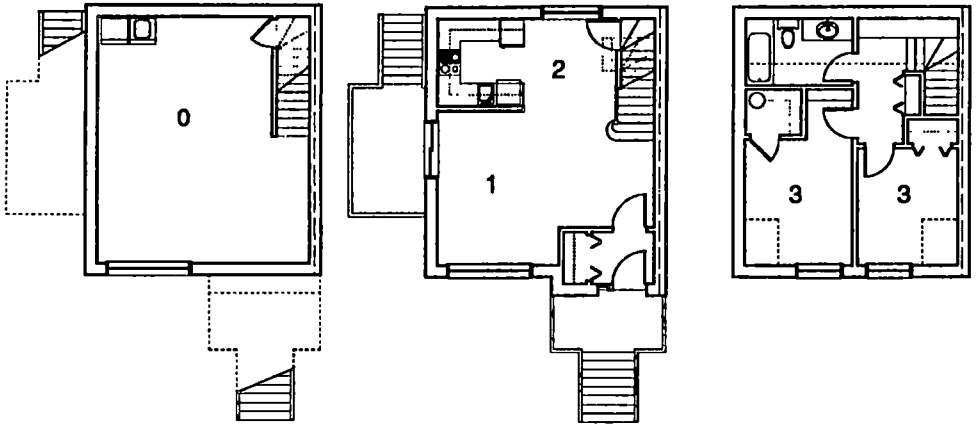


SEMI-DETACHED
1.5 Storey, Main Level Entry

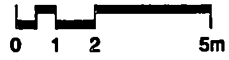
	Semi-detached		Townhouse	
	Split level entry	Main level entry	Split level entry	Main level entry
1.5 Storey	○	●	○	○
2 Storey	○	○	○	○



SEMI-DETACHED
1.5 Storey, Main Level Entry: Initial Phase



Basement Main Floor Upper Floor



Legend:

0 Future habitable area
1 Living
2 Dining
3 Bedroom

Description:

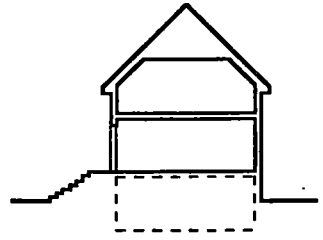
Number of units:	1
Number of bedrooms:	2
Habitable area:	85 m²

Estimated Construction Cost:

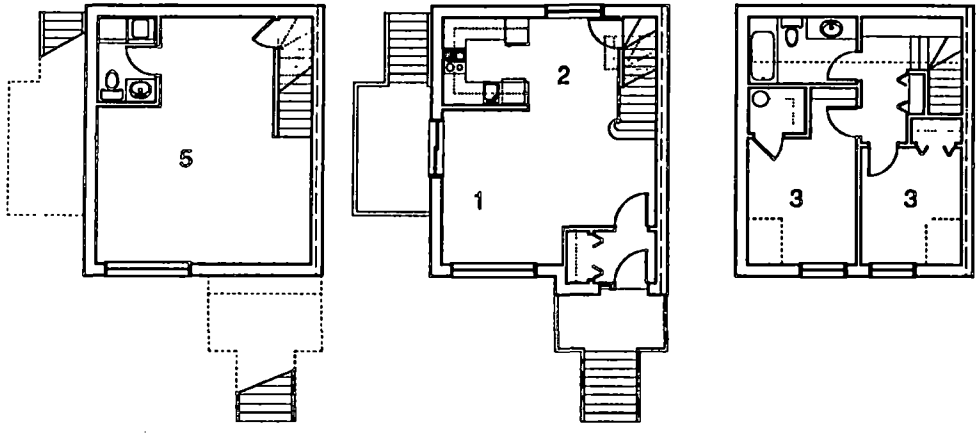
$82,977

Scenario:

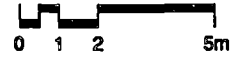
A young couple or a family with only 1 child buys this starter home. The home at this initial phase has only 2 bedrooms and a total habitable area of 85 m². The basement remains unfinished until the need for additional space arises.



SEMI-DETACHED
1.5 Storey, Main Level Entry: Intermediate Phase



Basement Main Floor Upper Floor



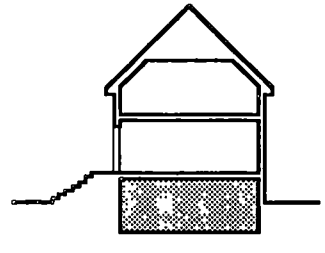
Legend:
1 Living
2 Dining
3 Bedroom
5 Family room

Description:

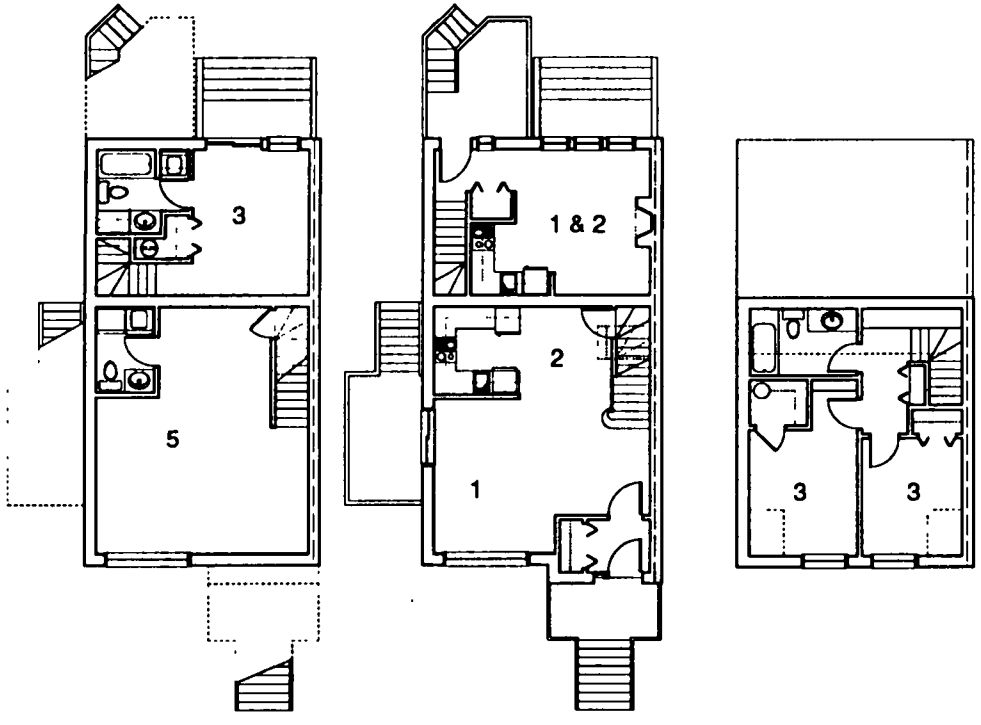
Number of units:	1
Number of bedrooms:	2
Habitable area:	128 m²
Change in area from previous phase:	+50%

Estimated Construction Cost:
Basement expansion: $10,629

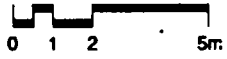
Scenario:
The basement becomes habitable as the household converts this unfinished area into a family room with a washroom.



SEMI-DETACHED
1.5 Storey, Main Level Entry: Final Phase



Basement Main Floor Upper Floor



Legend:
1 Living
2 Dining
3 Bedroom
5 Family room

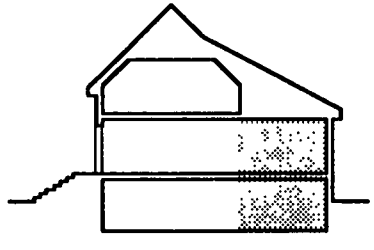
Description:

Number of units:	2
Principal unit:	
Number of bedrooms:	2
Habitable area:	128 m²
Change in area from previous phase:	0%
Accessory apartment:	
Number of bedrooms:	1
Habitable area:	50 m²
Initial area:	85 m²
Total final area:	178 m²
Total change in area from initial phase:	+109 %

Estimated Construction Cost:
Addition: $40,231

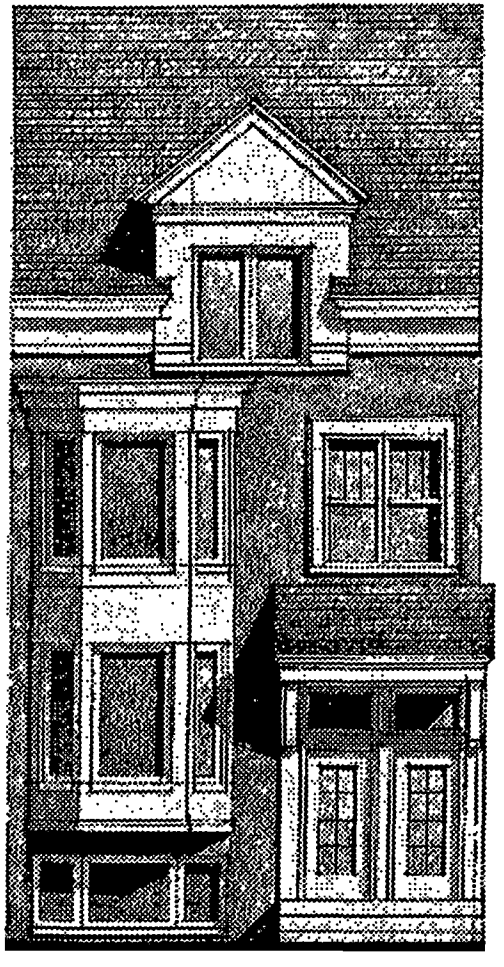
Scenario:

Several years after appropriating the basement, the household has the financial means to undertake the final phase of expansion. The unit expands 4.15 m into the backyard thus yielding an accessory apartment for an elderly parent.

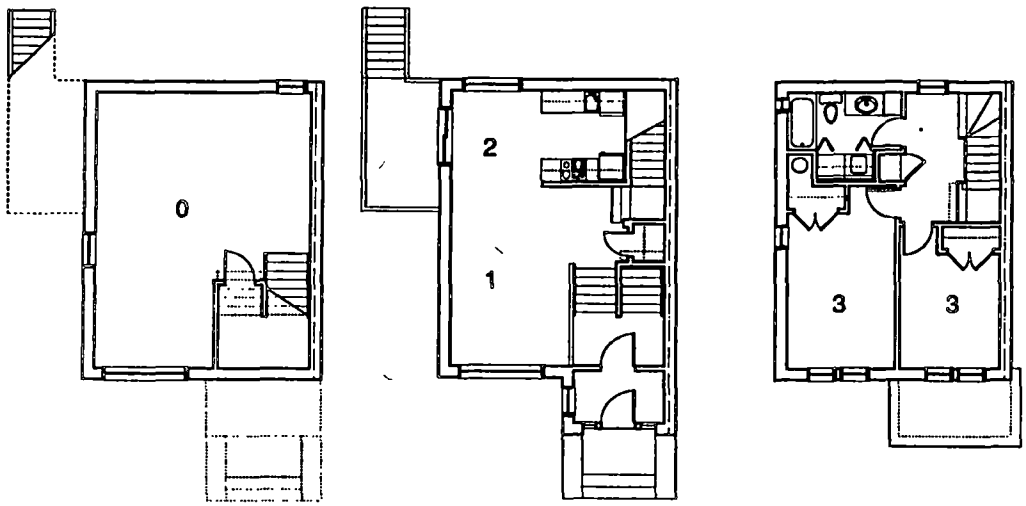


SEMI-DETACHED
2 Storey, Split Level Entry

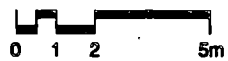
	Semi-detached		*Townhouse*	
	Split level entry	***Main level entry***	***Split level entry***	***Main level entry***
1.5 Storey	○	○	○	○
2 Storey	●	○	○	○



SEMI-DETACHED
2 Storey, Split Level Entry: Initial Phase



Basement Main Floor Upper Floor



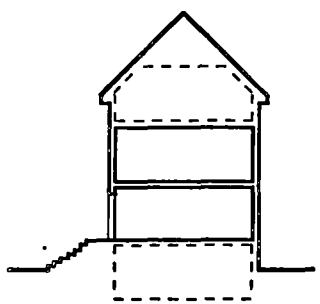
Legend:
0 Future habitable area
1 Living
2 Dining
3 Bedroom

Description:

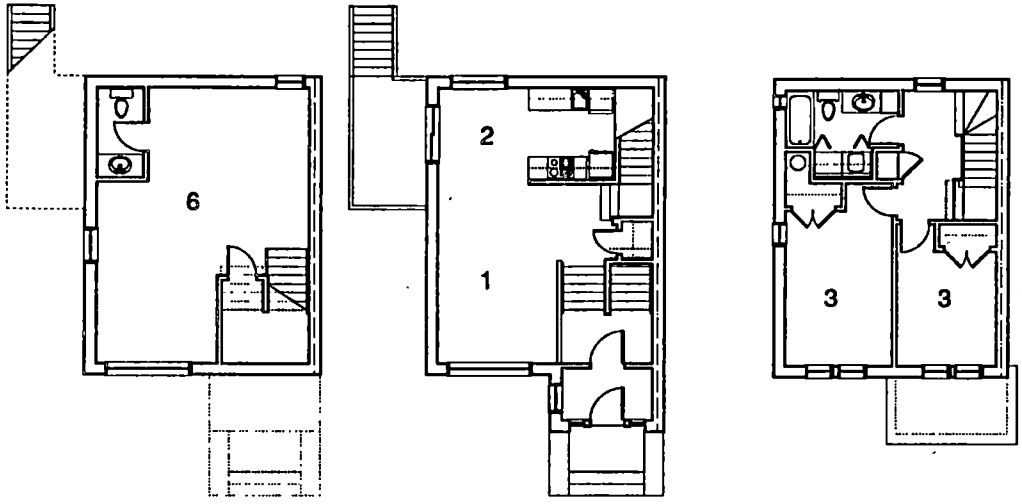
Number of units:	1
Number of bedrooms:	2
Habitable area:	94 m²

Estimated Construction Cost:
$89,552

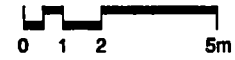
Scenario:
A young couple or a family with only 1 child buys this starter home. The home at this initial phase has only 2 bedrooms and a total habitable area of 94 m². The basement and attic remain unfinished until the need for additional space arises.



SEMI-DETACHED
2 Storey, Split Level Entry: Intermediate Phase 1



Basement Main Floor Upper Floor



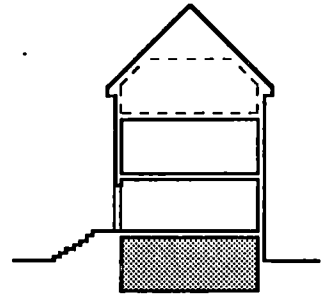
Legend:
1 Living
2 Dining
3 Bedroom
6 Office

Description:

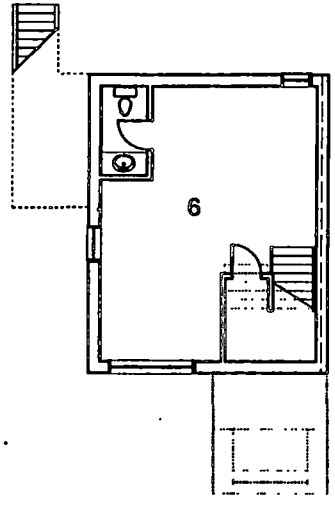
Number of units:	1
Number of bedrooms:	2
Habitable area:	141 m²
Change in area from previous phase:	+50%

Estimated Construction Cost:
Basement expansion: $9,460

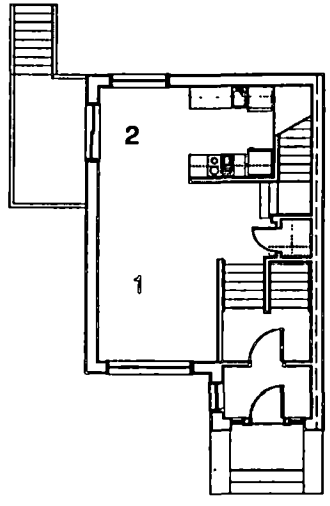
Scenario:
The basement becomes habitable as the household converts this unfinished area into an office with a washroom.



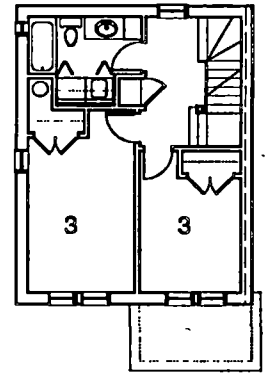
SEMI-DETACHED
2 Storey, Split Level Entry: Intermediate Phase 2



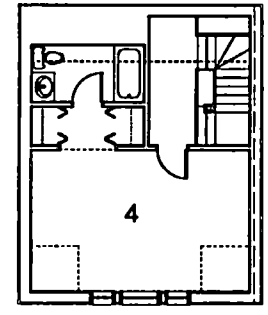
Basement



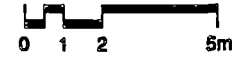
Main Floor



Upper Floor



Attic



Legend:

1 Living
2 Dining
3 Bedroom
4 Master bedroom
6 Office

Description:

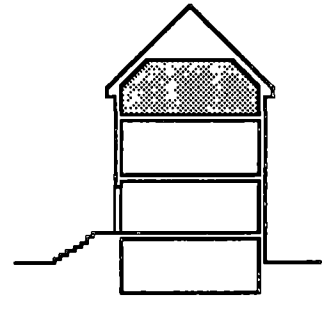
Number of units:	1
Number of bedrooms:	3
Habitable area:	186 m²
Change in area from previous phase:	+32%

Estimated Construction Cost:

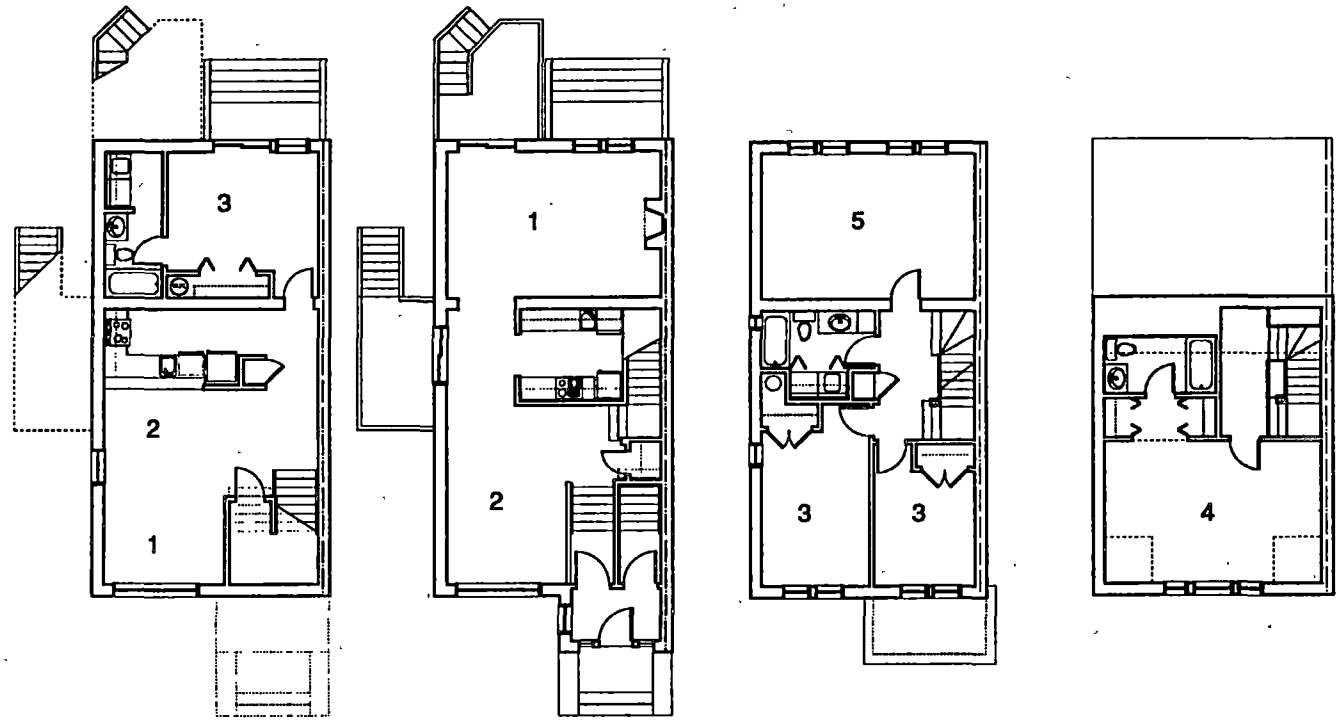
Attic expansion:	$16,906

Scenario:

With the arrival of a second child, the household appropriates the unfinished attic by converting it into a master bedroom suite. The two bedrooms on the upper floor thus become children's bedrooms.



SEMI-DETACHED
2 Storey, Split Level Entry: Final Phase, option I



Basement | Main Floor | Upper Floor | Attic

0 1 2 5m

Legend:
1 Living
2 Dining
3 Bedroom
4 Master bedroom
5 Family room

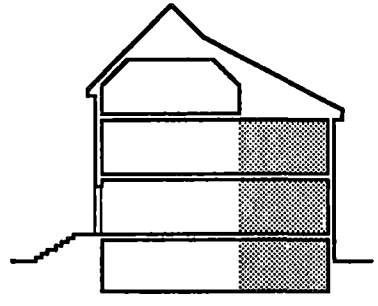
Description:

Number of units:	2
Principal unit:	
Number of bedrooms:	3
Habitable area:	191 m²
Change in area from previous phase:	+2%
Accessory apartment:	
Number of bedrooms:	1
Habitable area:	72 m²
Initial area:	94 m²
Total final area:	263 m²
Total change in area from initial phase:	+180 %

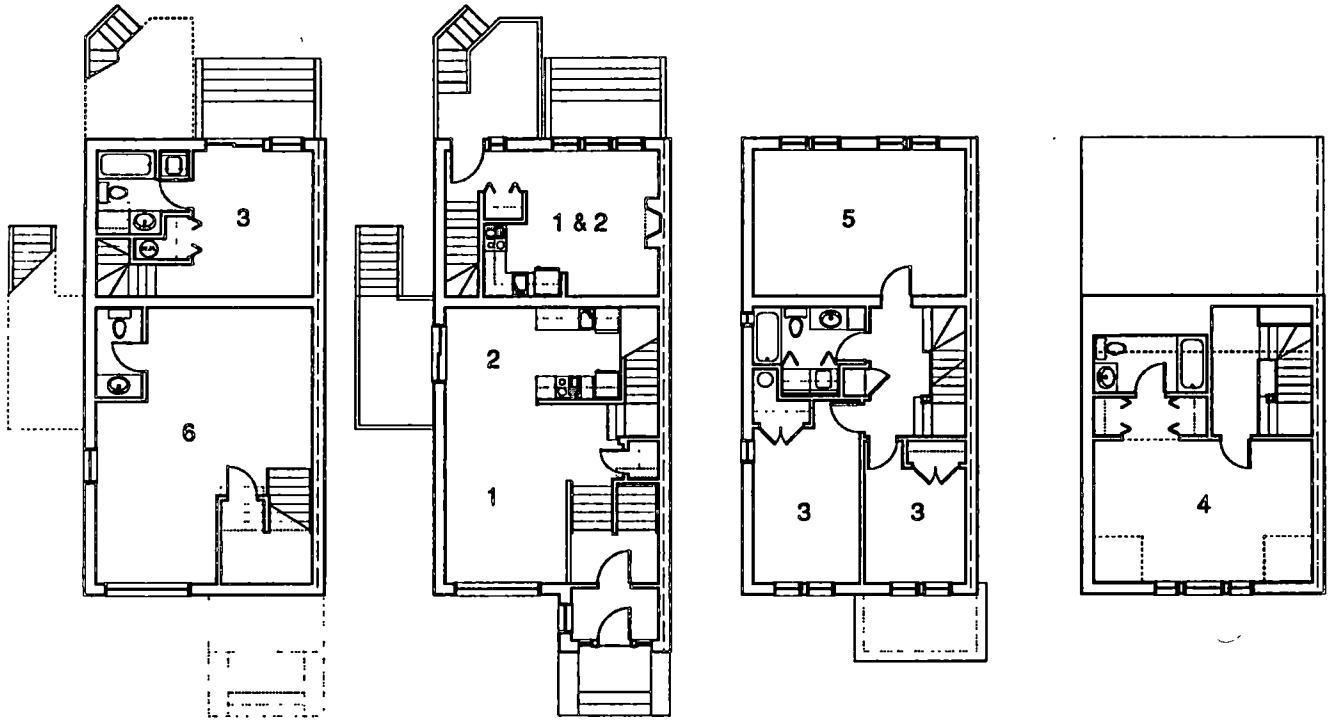
Estimated Construction Cost:

Addition:	$55,224

Scenario:
Several years after appropriating the attic, the household has the financial means to undertake the final phase of expansion. The unit expands 4.15 m into the backyard thus yielding a basement accessory apartment for an elderly parent.



SEMI-DETACHED
2 Storey, Split Level Entry: Final Phase, option II



Basement | Main Floor | Upper Floor | Attic

0 1 2 5m

Legend:
1 Living
2 Dining
3 Bedroom
4 Master bedroom
5 Family room
6 Office

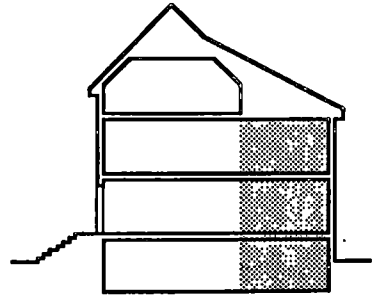
Description:

Number of units:	2
Principal unit:	
Number of bedrooms:	3
Habitable area:	213 m²
Change in area from previous phase:	+15%
Accessory apartment:	
Number of bedrooms:	1
Habitable area:	50 m²
Initial area:	94 m²
Total final area:	263 m²
Total change in area from initial phase:	+180 %

Estimated Construction Cost:

Addition:	$56,119

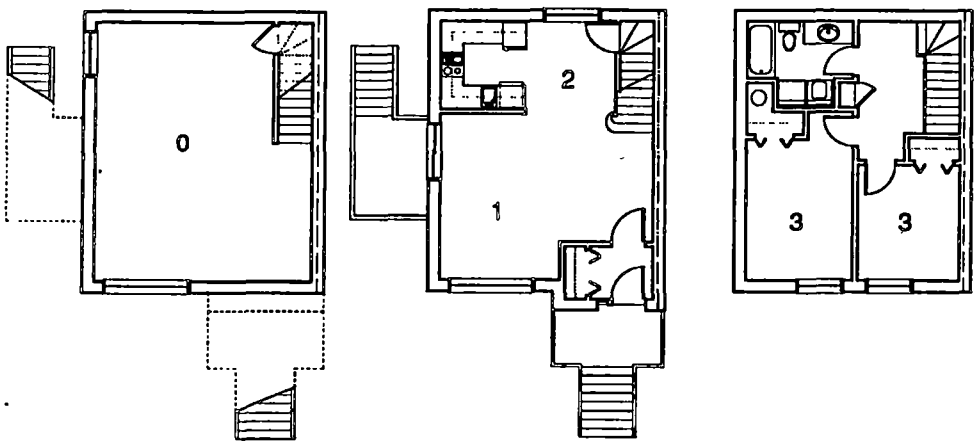
Scenario:
Several years after appropriating the attic, the household has the financial means to undertake the final phase of expansion. The unit expands 4.15 m into the backyard thus yielding a 2 storey accessory apartment for an elderly parent.



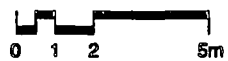
SEMI-DETACHED
2 Storey, Main Level Entry

	Semi-detached		Townhouse	
	Split level entry	Main level entry	Split level entry	Main level entry
1.5 Storey	○	○	○	○
2 Storey	○	●	○	○

SEMI-DETACHED
2 Storey, Main Level Entry: Initial Phase



Basement Main Floor Upper Floor



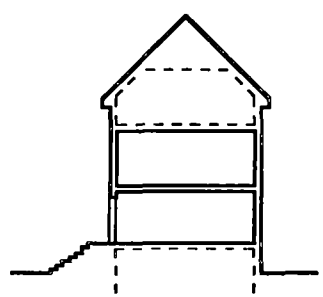
Legend:
0 Future habitable area
1 Living
2 Dining
3 Bedroom

Description:

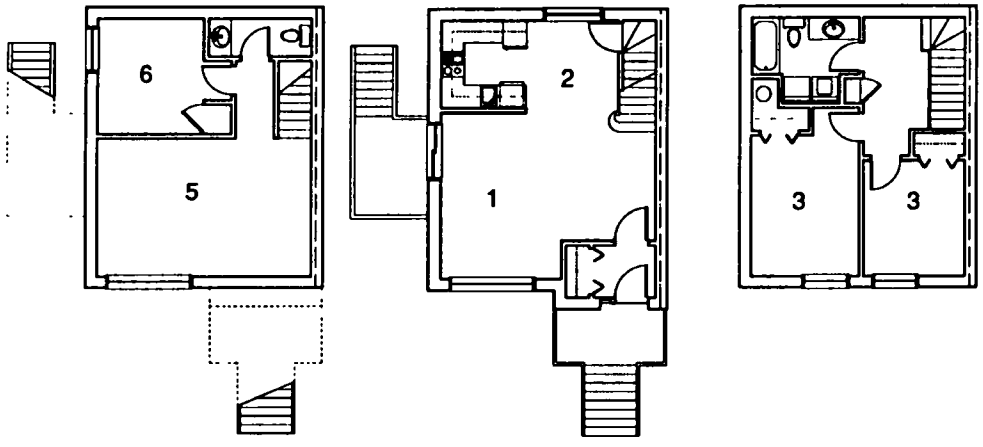
Number of units:	1
Number of bedrooms:	2
Habitable area:	89 m²

Estimated Construction Cost:
$84,788

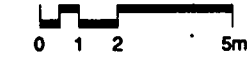
Scenario:
A young couple or a family with only 1 child buys this starter home. The home at this initial phase has only 2 bedrooms and a total habitable area of 89 m². The basement remains unfinished until the need for additional space arises.



SEMI-DETACHED
2 Storey, Main Level Entry: Intermediate Phase 1



Basement Main Floor Upper Floor



Legend:

1 Living
2 Dining
3 Bedroom
5 Family room
6 Office

Description:

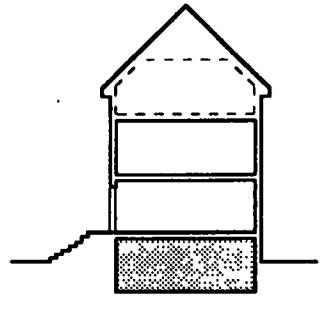
Number of units:	1
Number of bedrooms:	2
Habitable area:	133 m^2
Change in area from previous phase:	+50%

Estimated Construction Cost:

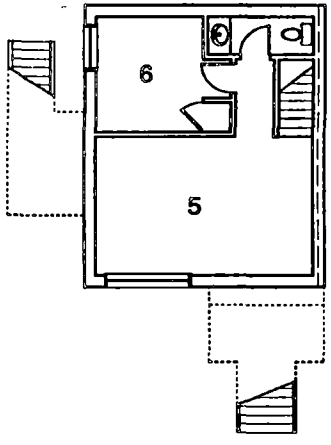
Basement expansion: $15,604

Scenario:

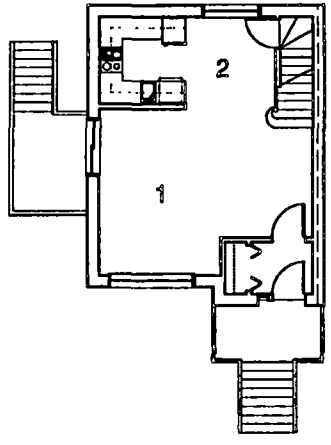
The basement becomes habitable as the household converts this unfinished area into a family room and home office.



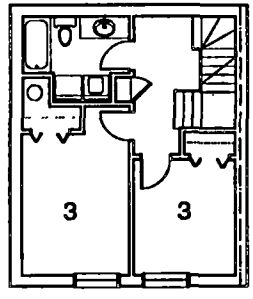
SEMI-DETACHED
2 Storey, Main Level Entry: Intermediate Phase 2



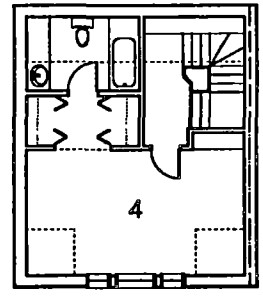
Basement



Main Floor



Upper Floor



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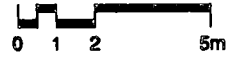


Legend:

1 Living
2 Dining
3 Bedroom
4 Master bedroom
5 Family room
6 Office

Description:

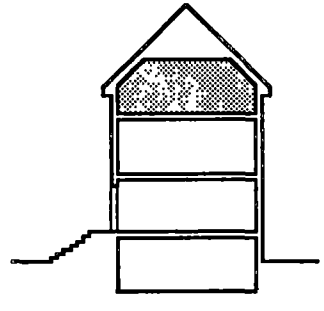
Number of units:	1
Number of bedrooms:	3
Habitable area:	178 m²
Change in area from previous phase:	+33%

Estimated Construction Cost:

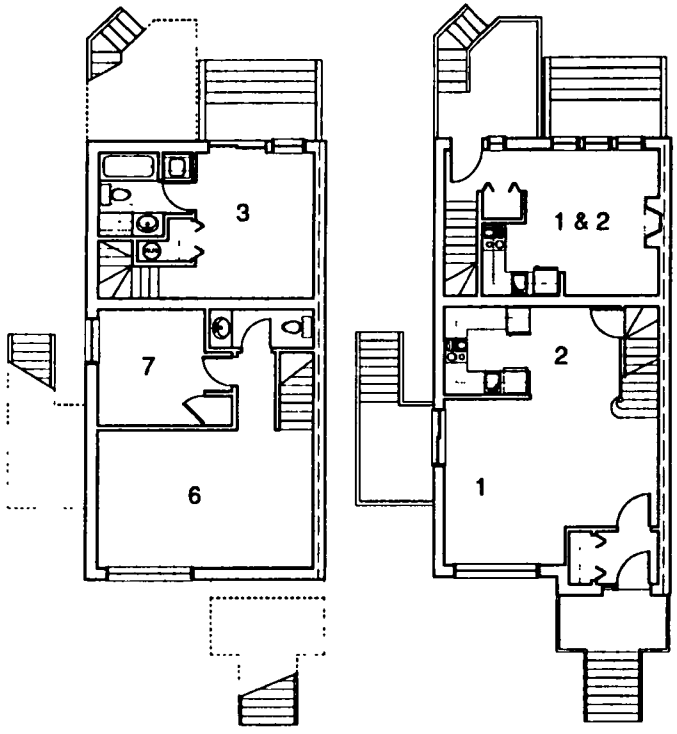
Attic expansion: $16,906

Scenario:

With the arrival of a second child, the household appropriates the unfinished attic by converting it into a master bedroom. The two bedrooms on the upper floor thus become children's bedrooms and a master bedroom is created in the attic.

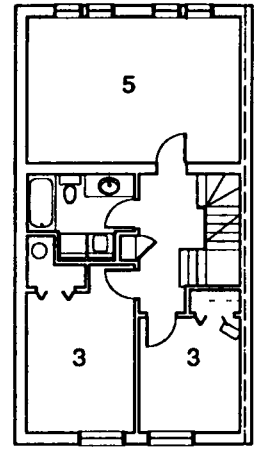


SEMI-DETACHED
2 Storey, Main Level Entry: Final Phase

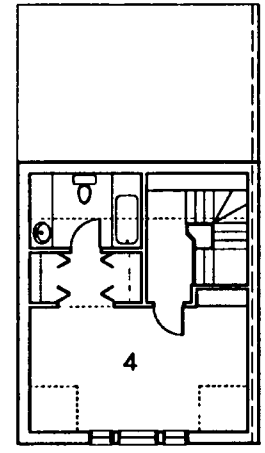


Basement

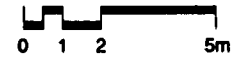
Main Floor



Upper Floor



Attic



Legend:

1 Living
2 Dining
3 Bedroom
4 Master Bedroom
5 Family room
6 Office
7 Office/Storage

Description:

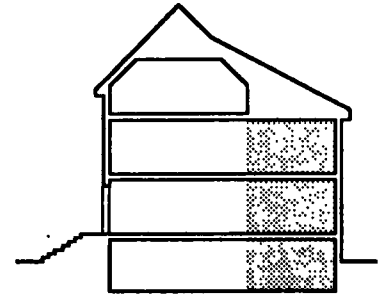
Number of units:	2
Principal unit:	
Number of bedrooms:	3
Habitable area:	203 m²
Change in area from previous phase:	+14%
Accessory apartment:	
Number of bedrooms:	1
Habitable area:	50 m²
Initial area:	89 m²
Total final area:	253 m²
Total change in area from initial phase:	+185 %

Estimated Construction Cost:

Addition:	$56,119

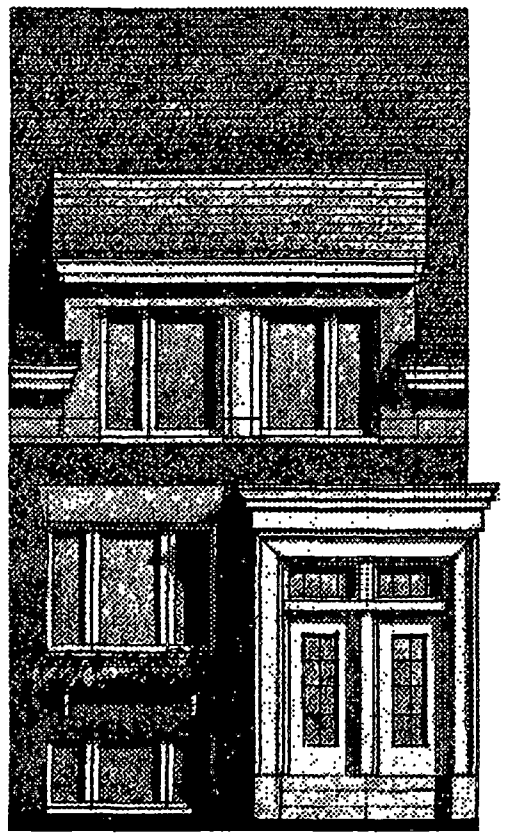
Scenario:

Several years after appropriating the basement, the household has the financial means to undertake the final phase of expansion. The unit expands 4.15 m into the backyard thus yielding an accessory apartment for an elderly parent.

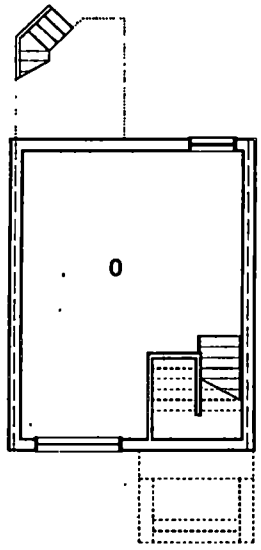


TOWNHOUSE
1.5 Storey, Split Level Entry

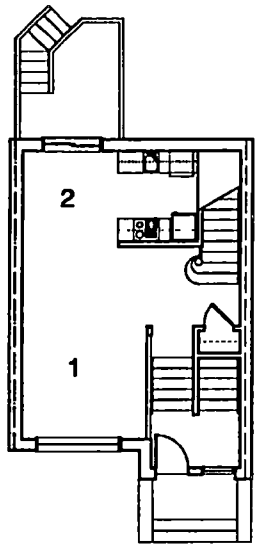
	Semi-detached		Townhouse	
	Split level entry	Main level entry	Split level entry	Main level entry
1.5 Storey	○	○	●	○
2 Storey	○	○	○	○



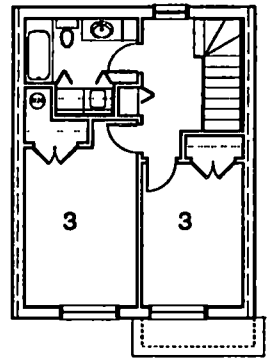
TOWNHOUSE
1.5 Storey, Split Level Entry: Initial Phase



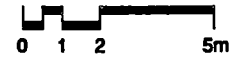
Basement



Main Floor



Upper Floor



Legend:

0 Future habitable area
1 Living
2 Dining
3 Bedroom

Description:

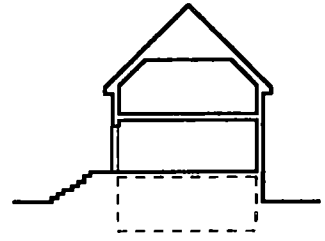
Number of units:	1
Number of bedrooms:	2
Habitable area:	98 m²

Estimated Construction Cost:

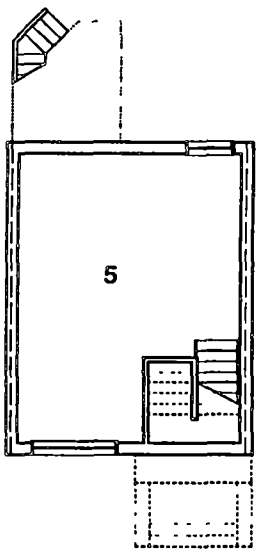
$73,748

Scenario:

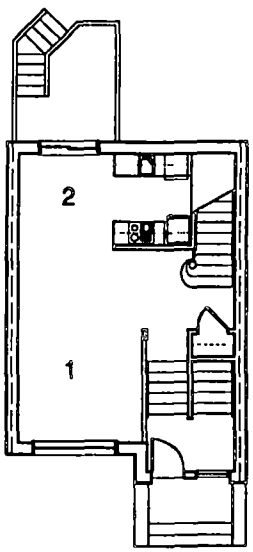
A young couple or a family with only 1 child buys this starter home. The home at this initial phase has only 2 bedrooms and a total habitable area of 98 m². The basement remains unfinished until the need for additional space arises.



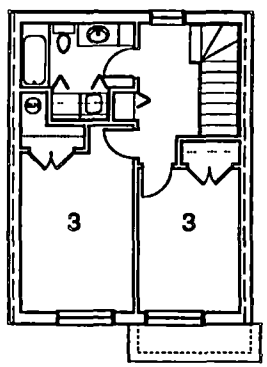
TOWNHOUSE
1.5 Storey, Split Level Entry: Intermediate Phase



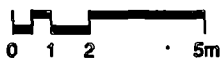
Basement



Main Floor



Upper Floor



Legend:

1 Living
2 Dining
3 Bedroom
5 Family room

Description:

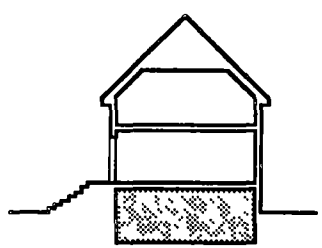
Number of units:	1
Number of bedrooms:	2
Habitable area:	148 m²
Change in area from previous phase:	+50%

Estimated Construction Cost:

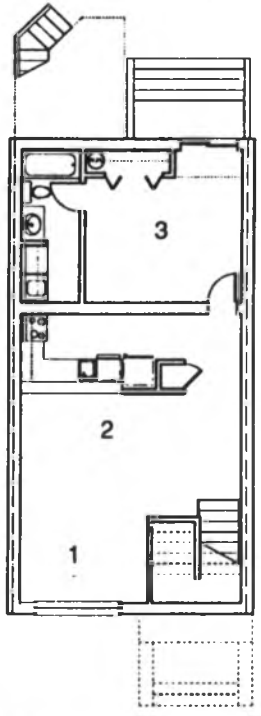
Basement expansion: $8,306

Scenario:

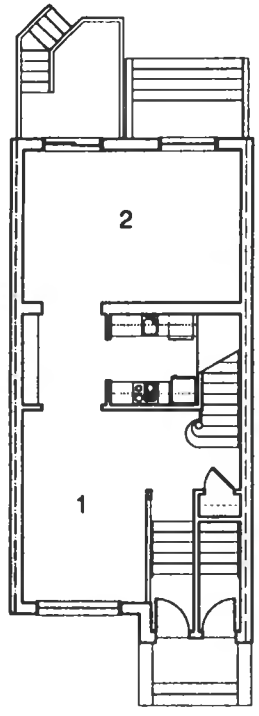
The basement becomes habitable as the household converts this unfinished area into a family room.



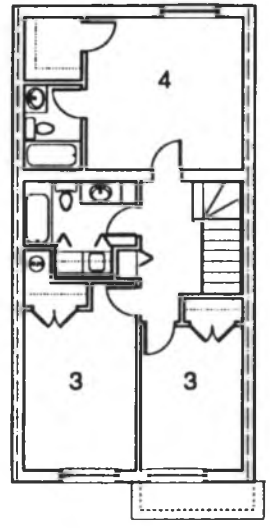
TOWNHOUSE
1.5 Storey, Split Level Entry: Final Phase



Basement



Main Floor



Upper Floor

Legend:
1 Living
2 Dining
3 Bedroom
4 Master bedroom

Description:

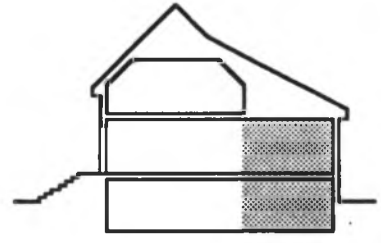
Number of units:	2
Principal unit:	
Number of bedrooms:	3
Habitable area:	150 m²
Change in area from previous phase:	+1%
Accessory apartment:	
Number of bedrooms:	1
Habitable area:	75 m²
Initial area:	98 m²
Total final area:	225 m²
Total change in area from initial phase:	+130 %

Estimated Construction Cost:

Addition:	$58,956

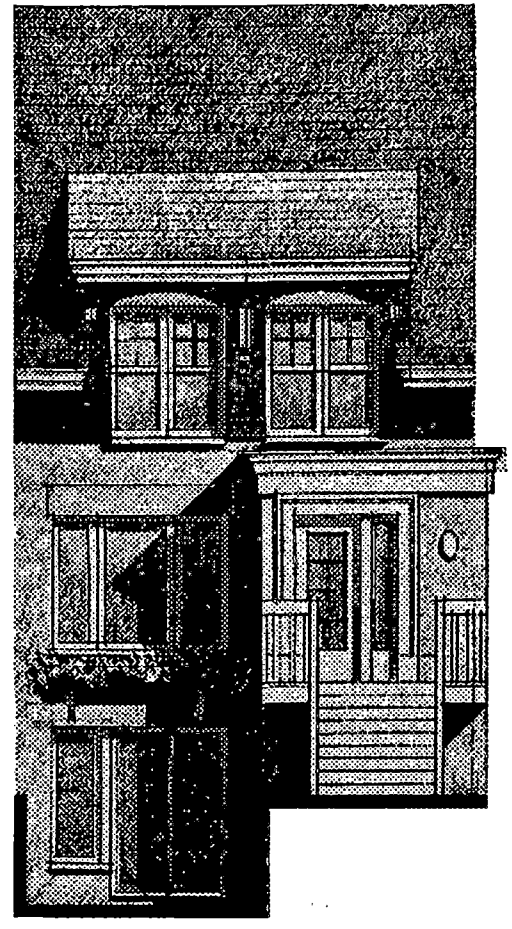
Scenario:

Several years after appropriating the basement, the household has the financial means to undertake the final phase of expansion. The unit expands 4.32 m into the backyard thus yielding a basement accessory apartment for an elderly parent.

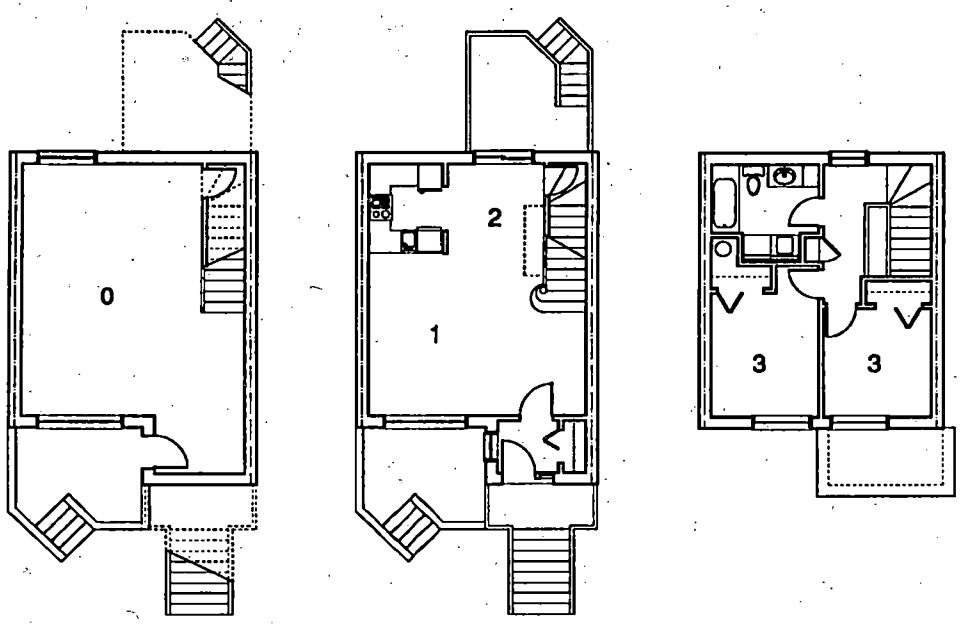


TOWNHOUSE
1.5 Storey, Main Level Entry

	Semi-detached		Townhouse	
	Split level entry	Main level entry	Split level entry	Main level entry
1.5 Storey	○	○	○	●
2 Storey	○	○	○	○



TOWNHOUSE
1.5 Storey, Main Level Entry: Initial Phase



Basement Main Floor Upper Floor

0 1 2 5m

Legend:

0 Future habitable area
1 Living
2 Dining
3 Bedroom

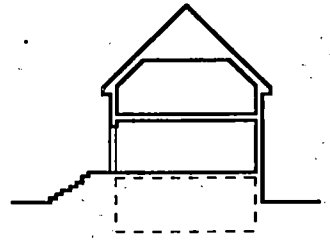
Description:

Number of units:	1
Number of bedrooms:	2
Habitable area:	95 m²

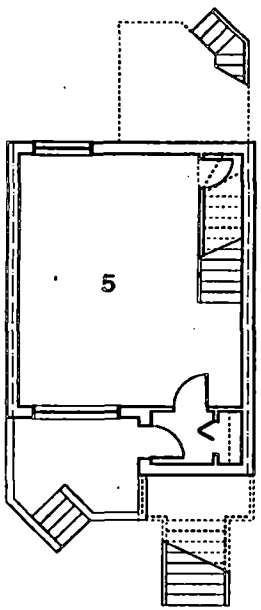
Estimated Construction Cost:
$71,490

Scenario:

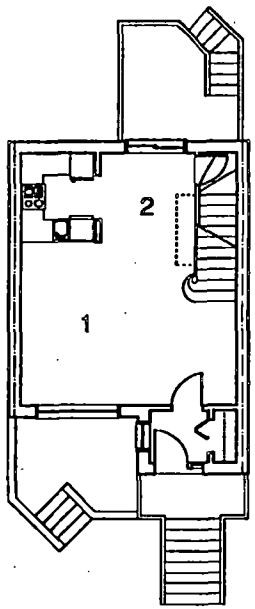
A young couple or a family with only 1 child buys this starter home. The home at this initial phase has only 2 bedrooms and a total habitable area of 95 m². The basement remains unfinished until the need for additional space arises.



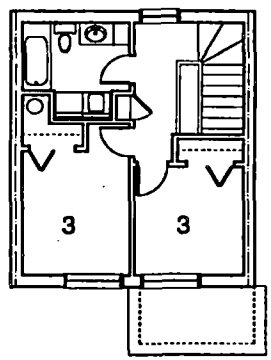
TOWNHOUSE
1.5 Storey, Main Level Entry: Intermediate Phase



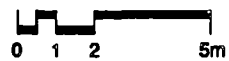
Basement



Main Floor



Upper Floor



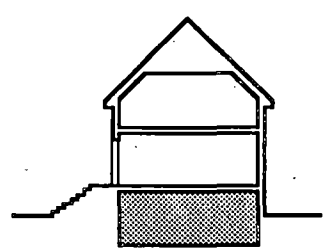
Legend:
1 Living
2 Dining
3 Bedroom
5 Family room

Description:

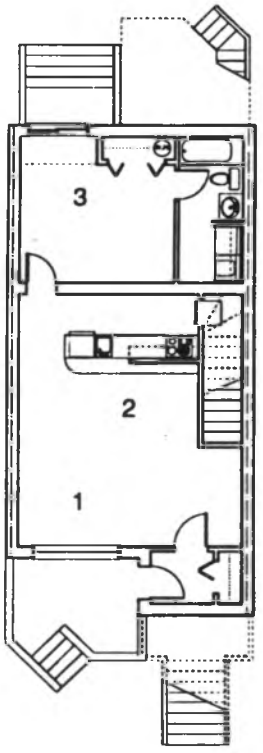
Number of units:	1
Number of bedrooms:	2
Habitable area:	142 m²
Change in area from previous phase:	+49%

Estimated Construction Cost:
Basement expansion: $8,540

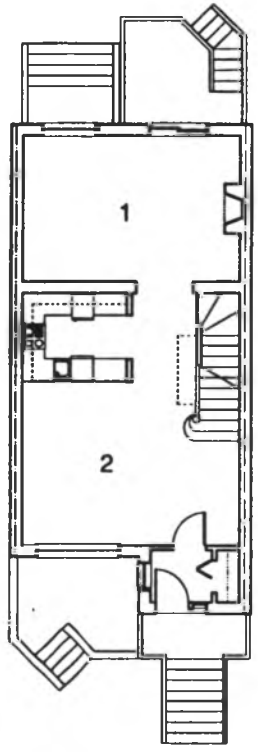
Scenario:
The basement becomes habitable as the household converts this unfinished area into a family room.



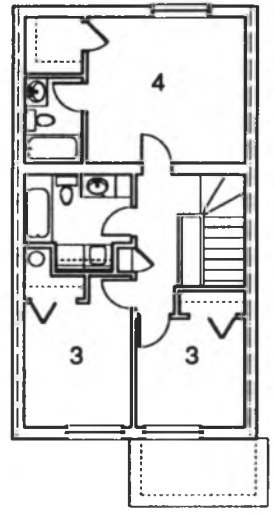
TOWNHOUSE
1.5 Storey, Main Level Entry: Final Phase



Basement



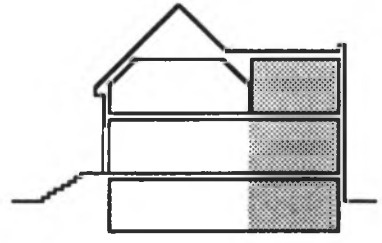
Main Floor



Upper Floor

Scenario:

Several years after appropriating the basement, the household has the financial means to undertake the final phase of expansion. The unit expands 4.15 m into the backyard thus yielding a basement accessory apartment for an elderly parent.



Legend:

1 Living
2 Dining
3 Bedroom
4 Master bedroom

Description:

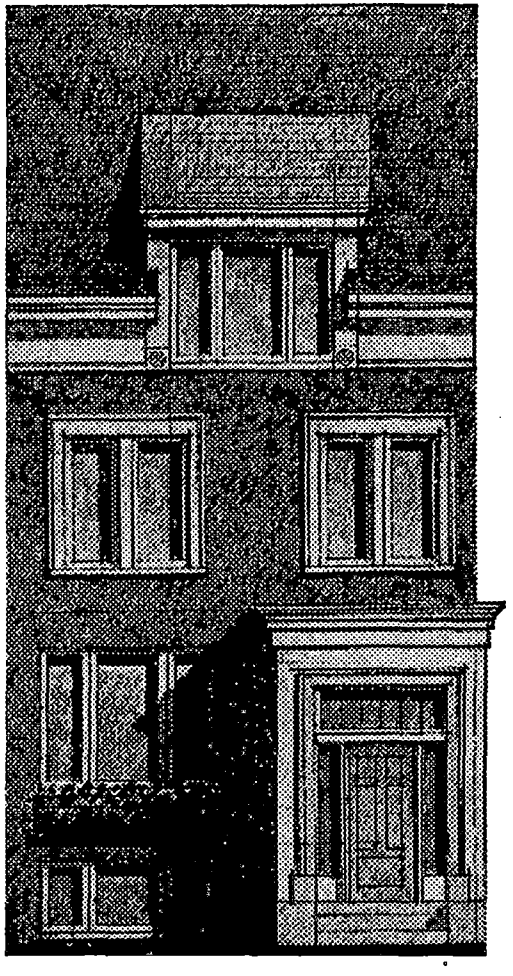
Number of units:	2
Principal unit:	
Number of bedrooms:	3
Habitable area:	144 m²
Change in area from previous phase:	+1%
Accessory apartment:	
Number of bedrooms:	1
Habitable area:	72 m²
Initial area:	95 m²
Total final area:	216 m²
Total change in area from initial phase:	+127%

Estimated Construction Cost:

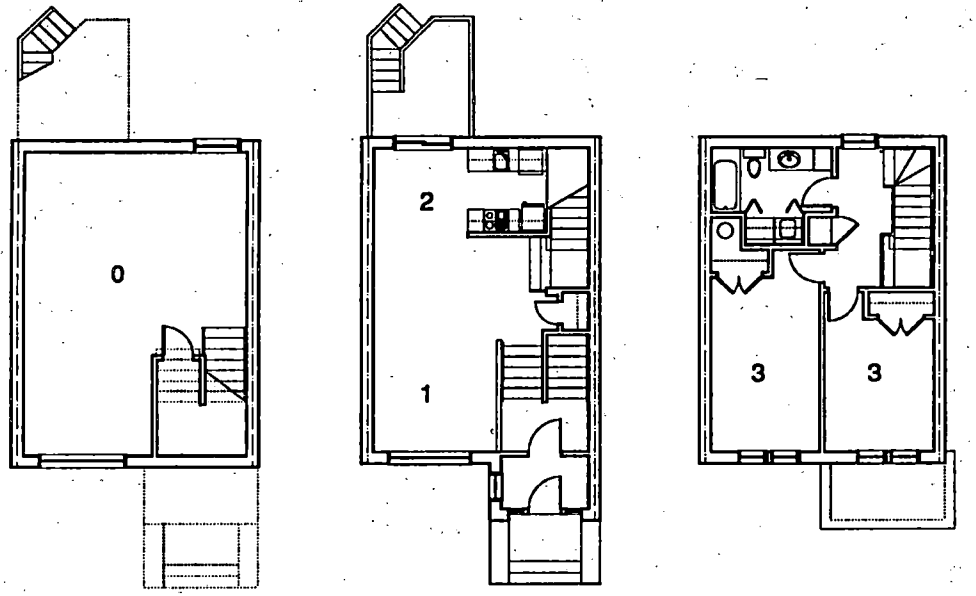
Addition:	$59,456

TOWNHOUSE
2 Storey, Split Level Entry

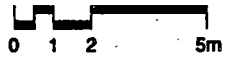
	Semi-detached		Townhouse	
	Split level entry	*Main level entry*	*Split level entry*	*Main level entry*
1.5 Storey	○	○	○	○
2 Storey	○	○	●	○



TOWNHOUSE
2 Storey, Split Level Entry: Initial Phase



Basement Main Floor Upper Floor

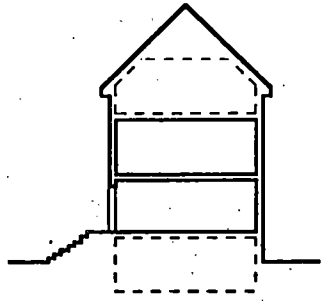


Legend:
0 Future habitable area
1 Living
2 Dining
3 Bedroom

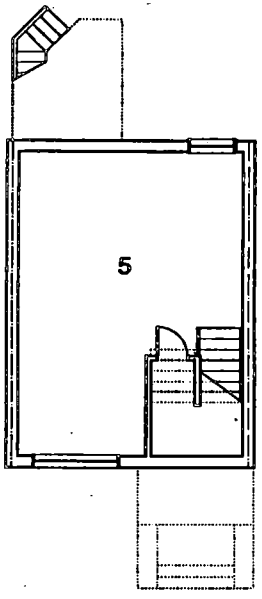
Description:
Number of units: 1
Number of bedrooms: 2
Habitable area: 116 m²

Estimated Construction Cost:
$89,293

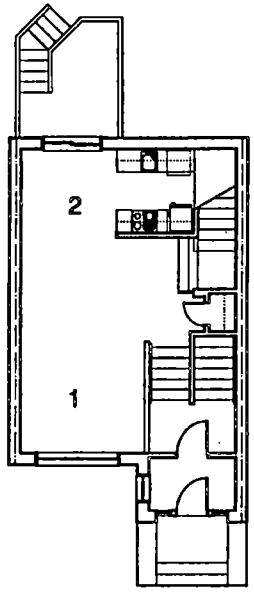
Scenario:
A young couple or a family with only 1 child buys this starter home. The home at this initial phase has only 2 bedrooms and a total habitable area of 116 m². The basement and attic remain unfinished until the need for additional space arises.



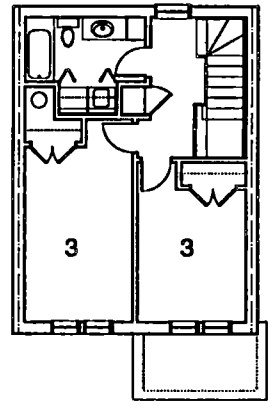
TOWNHOUSE
2 Storey, Split Level Entry: Intermediate Phase 1



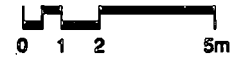
Basement



Main Floor



Upper Floor



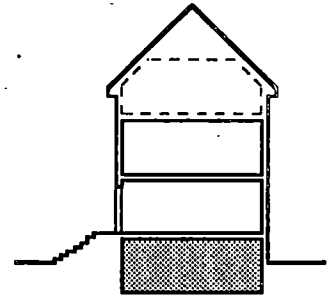
Legend:
1 Living
2 Dining
3 Bedroom
5 Family room

Description:

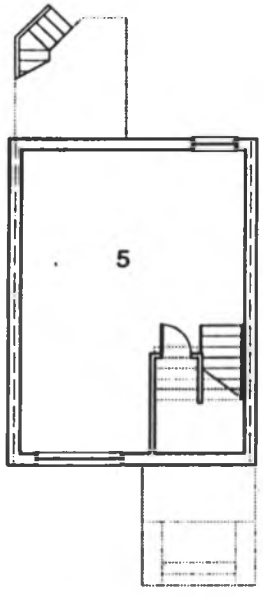
Number of units:	1
Number of bedrooms:	2
Habitable area:	168 m²
Change in area from previous phase:	+45%

Estimated Construction Cost:
Basement expansion: $9,831

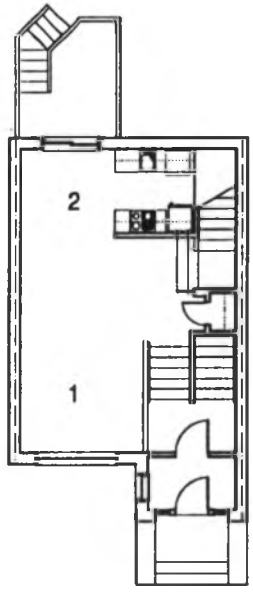
Scenario:
The basement becomes habitable as the household converts this unfinished area into a family room.



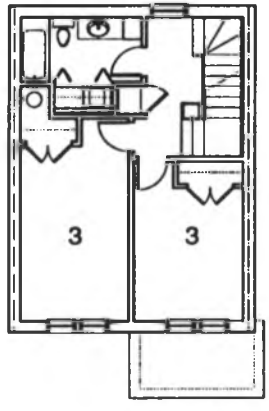
TOWNHOUSE
2 Storey, Split Level Entry: Intermediate Phase 2



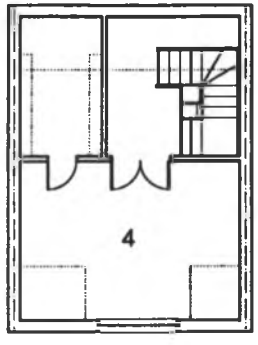
Basement



Main Floor



Upper Floor



Attic

Legend:

1 Living
2 Dining
3 Bedroom
4 Master bedroom
5 Family room

Description:

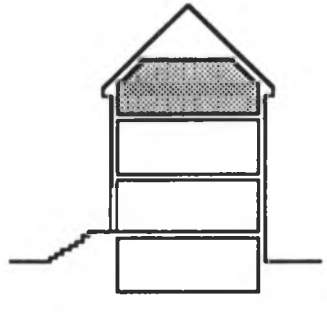
Number of units:	1
Number of bedrooms:	3
Habitable area:	220 m²
Change in area from previous phase:	+31%

Estimated Construction Cost:

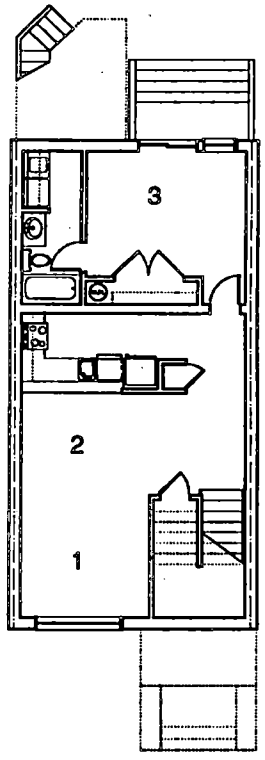
Attic expansion:	$12,808

Scenario:

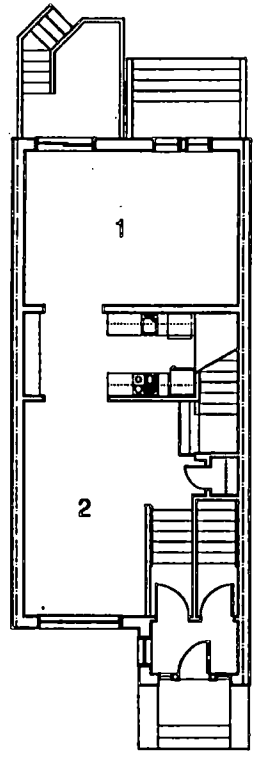
With the arrival of a second child, the household appropriates the unfinished attic by converting it into a master bedroom. The two bedrooms on the upper floor thus become children's bedrooms.



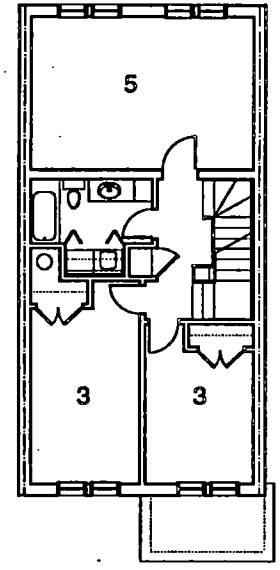
TOWNHOUSE
2 Storey, Split Level Entry: Final Phase



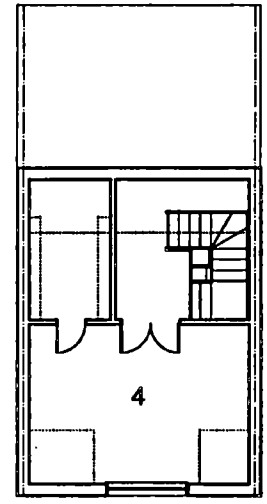
Basement



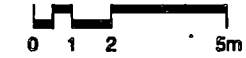
Main Floor



Upper Floor



Attic



Legend:
1 Living
2 Dining
3 Bedroom
4 Master bedroom
5 Family room

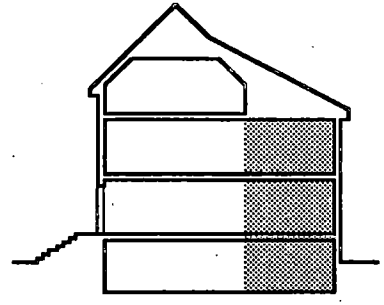
Description:

Number of units:	2
Principal unit:	
Number of bedrooms:	3
Habitable area:	206 m²
Change in area from previous phase:	-6%
Accessory apartment:	
Number of bedrooms:	1
Habitable area:	77 m²
Initial area:	116 m²
Total final area:	283 m²
Total change in area from initial phase:	+144 %

Estimated Construction Cost:

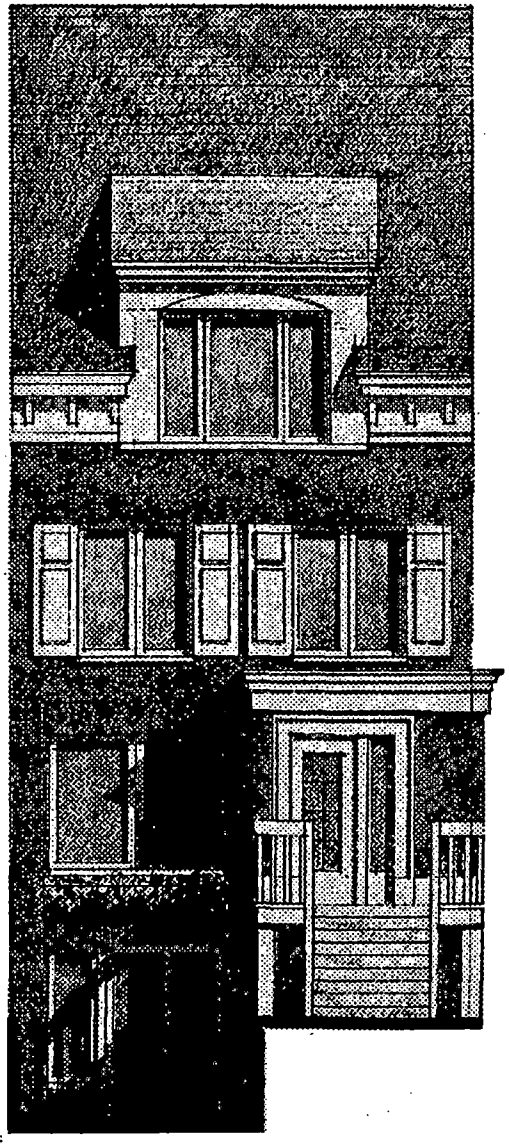
Addition:	$54,724

Scenario:
Several years after appropriating the attic, the household has the financial means to undertake the final phase of expansion. The unit expands 4.25 m into the backyard thus yielding a basement accessory apartment for an elderly parent.

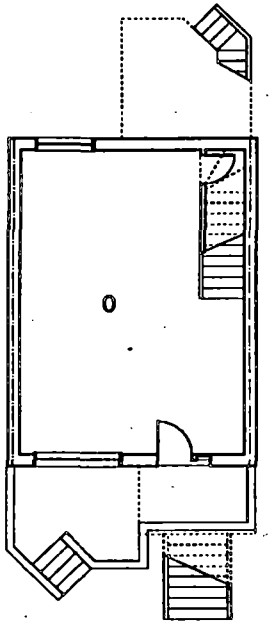


SEMI-DETACHED
2 Storey, Main Level Entry

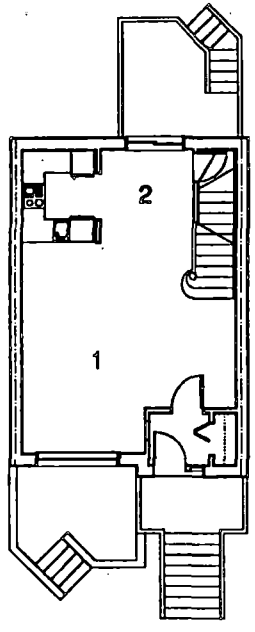
	Semi-detached		Townhouse	
	Split level entry	*Main level entry*	*Split level entry*	*Main level entry*
1.5 Storey	○	○	○	○
2 Storey	○	○	○	●



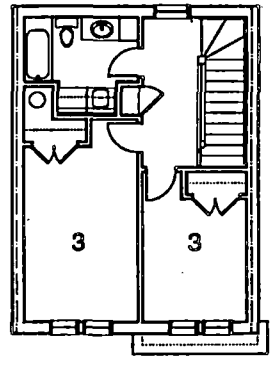
TOWNHOUSE
2 Storey, Main Level Entry: Initial Phase



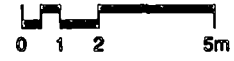
Basement



Main Floor



Upper Floor



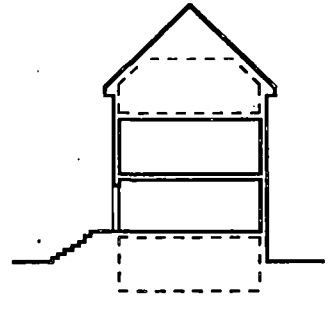
Legend:
0 Future habitable area
1 Living
2 Dining
3 Bedroom

Description:
Number of units: 1
Number of bedrooms: 2
Habitable area: 107 m²

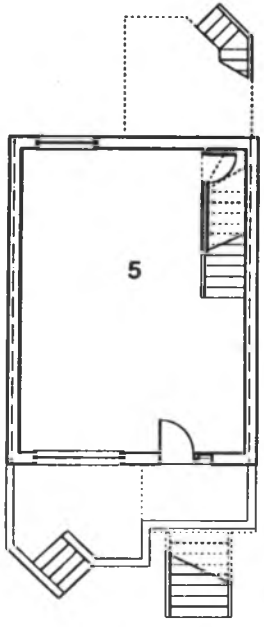
Estimated Construction Cost:
$80,520

Scenario:

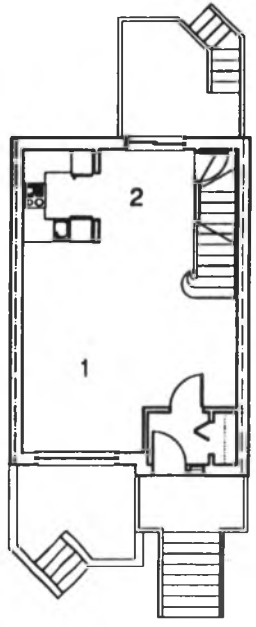
A young couple or a family with only 1 child buys this starter home. The home at this initial phase has only 2 bedrooms and a total habitable area of 107 m². The basement and attic remain unfinished until the need for additional space arises.



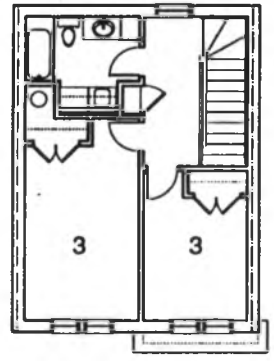
TOWNHOUSE
2 Storey, Main Level Entry: Intermediate Phase 1



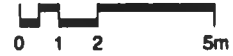
Basement



Main Floor



Upper Floor



Legend:

1 Living
2 Dining
3 Bedroom
5 Family room

Description:

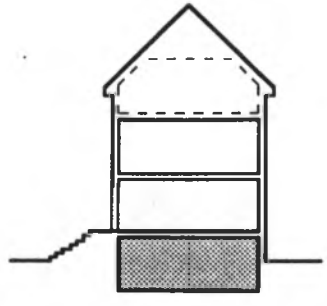
Number of units:	1
Number of bedrooms:	2
Habitable area:	160 m²
Change in area from previous phase:	+50%

Estimated Construction Cost:

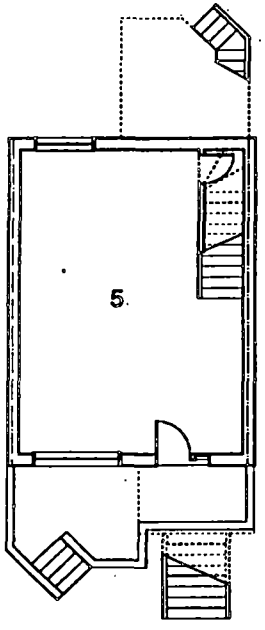
Basement expansion: $8,979

Scenario:

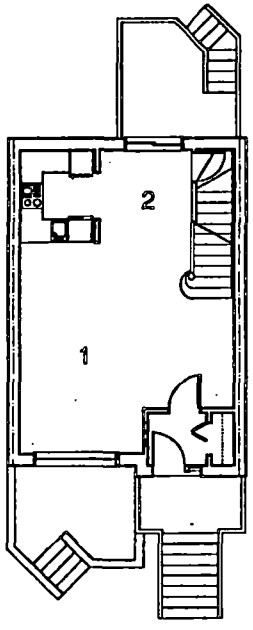
The basement becomes habitable as the household converts this unfinished area into a family room.



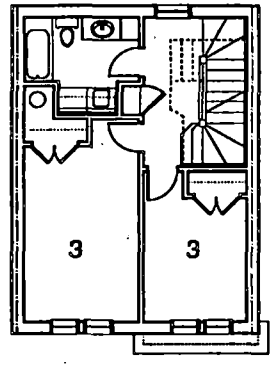
TOWNHOUSE
2 Storey, Main Level Entry: Intermediate Phase 2



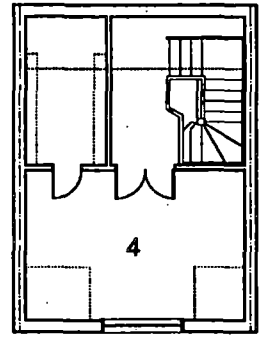
Basement



Main Floor



Upper Floor



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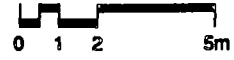


Legend:

1 Living
2 Dining
3 Bedroom
4 Master bedroom
5 Family room

Description:

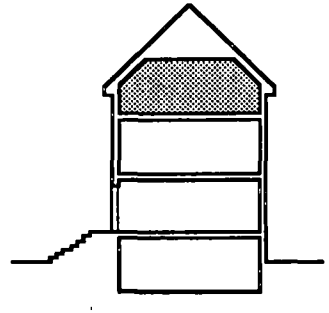
Number of units:	1
Number of bedrooms:	3
Habitable area:	212 m²
Change in area from previous phase:	+32%

Estimated Construction Cost:

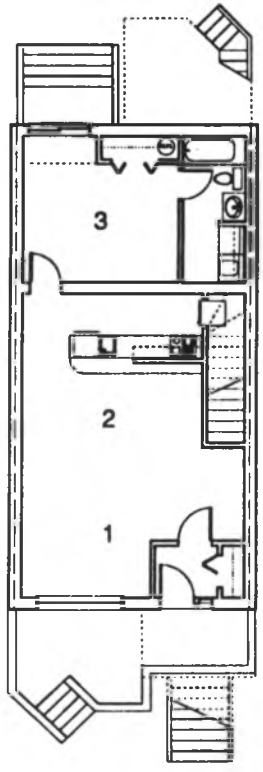
Attic expansion: $11,703

Scenario:

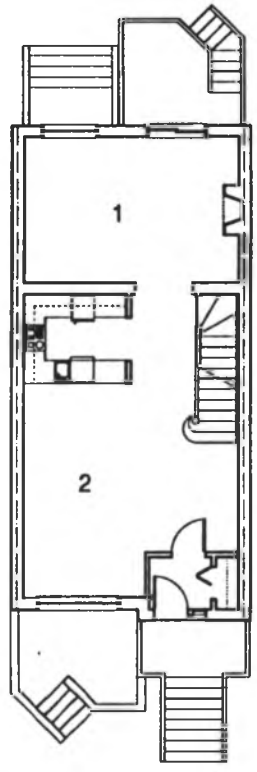
With the arrival of a second child, the household appropriates the unfinished attic by converting it into a master bedroom. The two bedrooms on the upper floor thus become children's bedrooms.



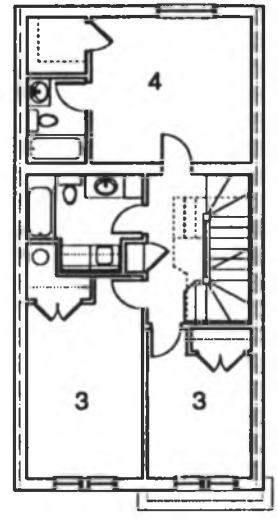
TOWNHOUSE
2 Storey, Main Level Entry: Final Phase



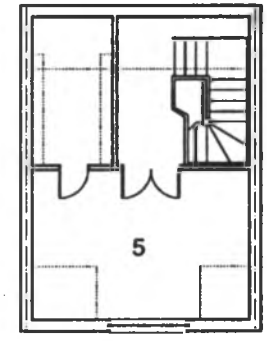
Basement



Main Floor



Upper Floor



Attic

Legend:
1 Living
2 Dining
3 Bedroom
4 Master bedroom
5 Family room

Description:

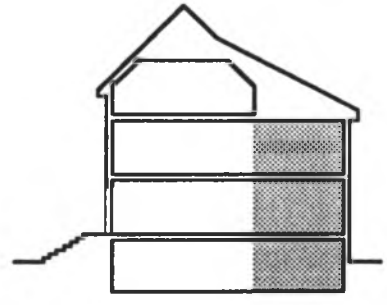
Number of units:	2
Principal unit:	
Number of bedrooms:	3
Habitable area:	209m²
Change in area from previous phase:	-1.4%
Accessory apartment:	
Number of bedrooms:	1
Habitable area:	81 m²
Initial area:	107 m²
Total final area:	290 m²
Total change in area from initial phase:	+170 %

Estimated Construction Cost:

Addition:	$54,728

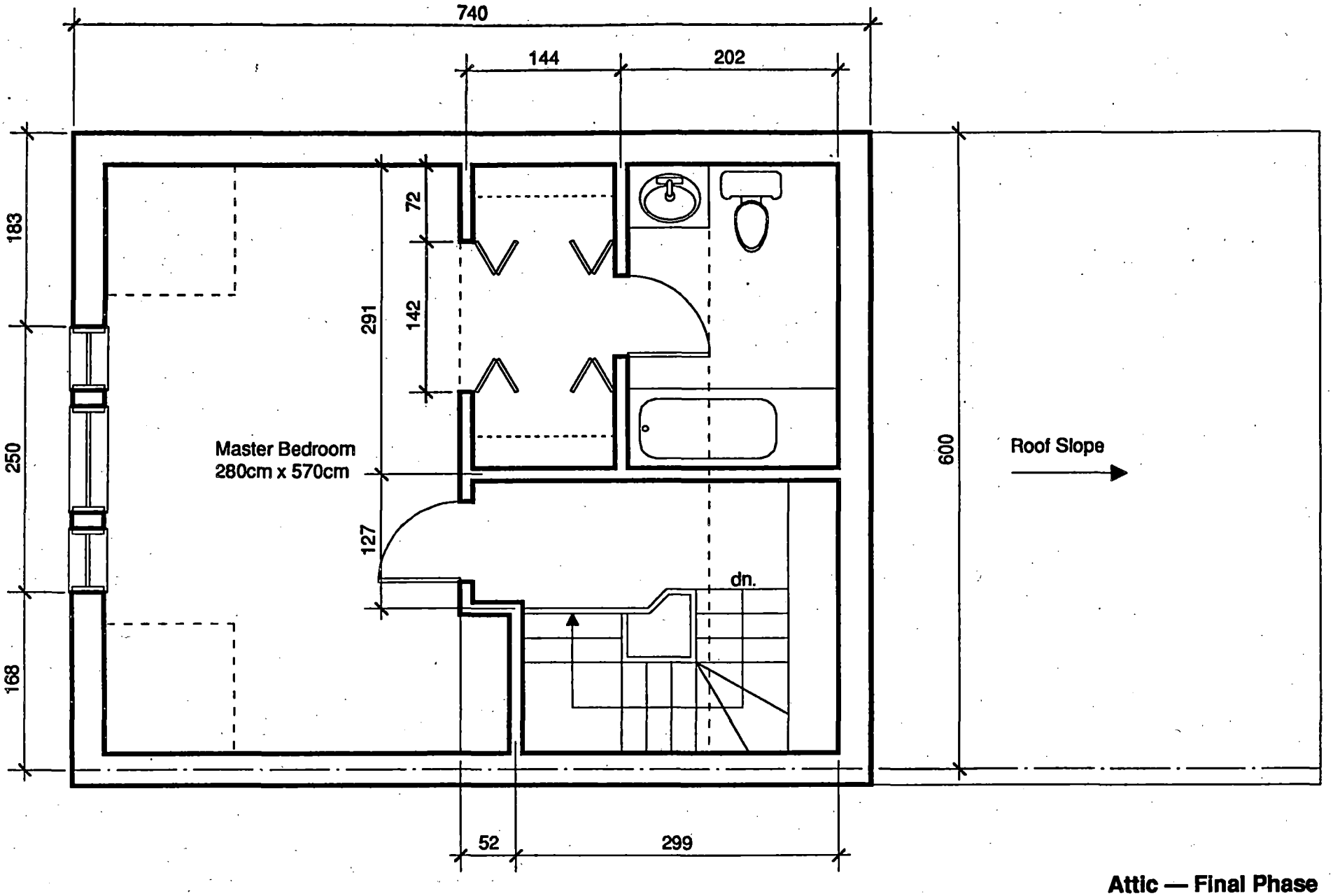
Scenario:

Several years after appropriating the attic, the household has the financial means to undertake the final phase of expansion. The unit expands 4.15 m into the backyard thus yielding a basement accessory apartment for an elderly parent. The new addition becomes, at the upper level, a master bedroom suite while the attic space is converted into a family room.



Appendix A: dimensioned plans

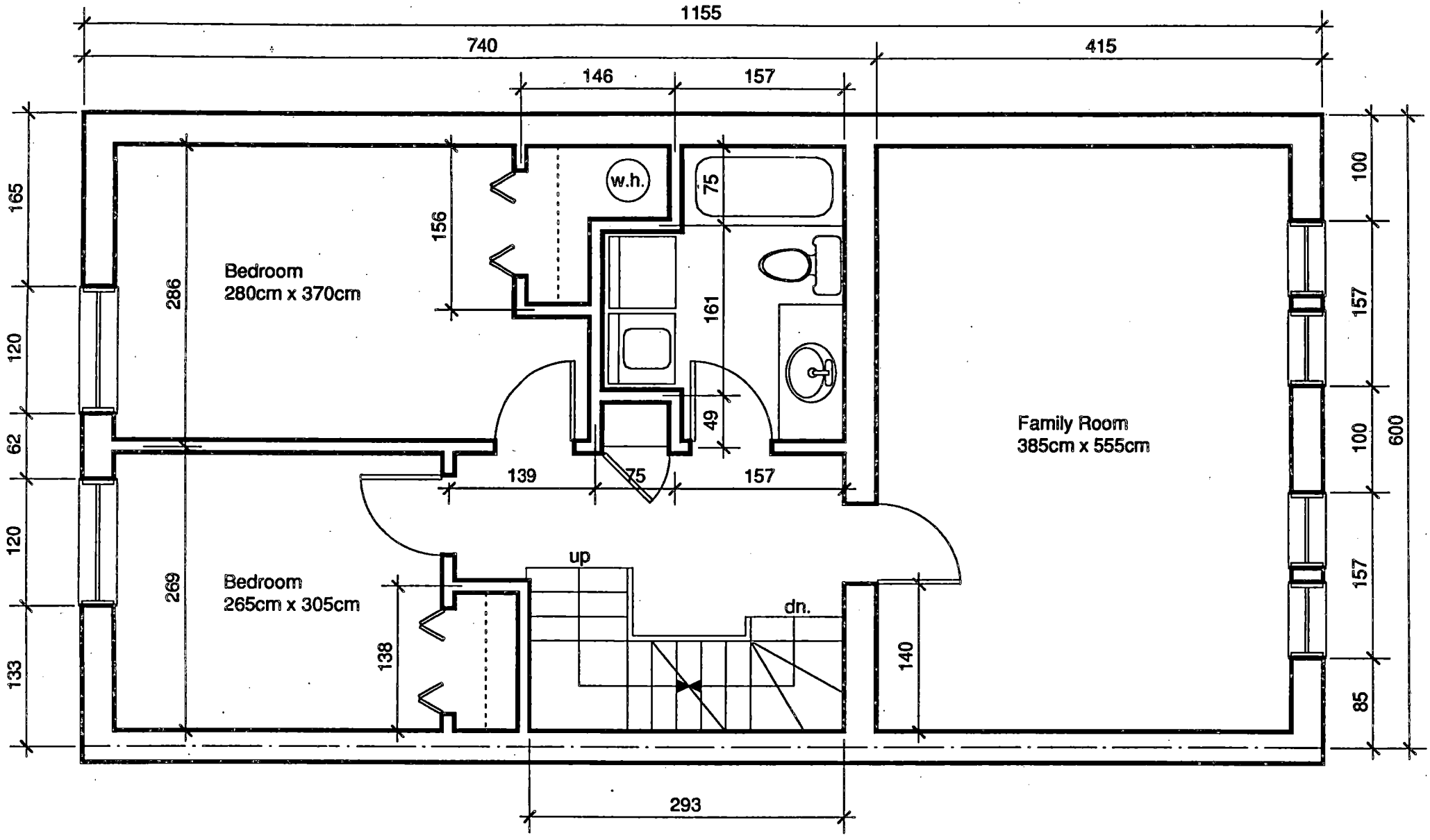
The following dimensioned set of plans describe the semi-detached, two-storey, main level entry version of Sprout. We only show the plans of the unit at its final phase since this contains all the information for the previous phases as well. The reader may consult pages 39 to 43 for this unit's progression from initial to final phase.



Attic — Final Phase

Scale: 1:50

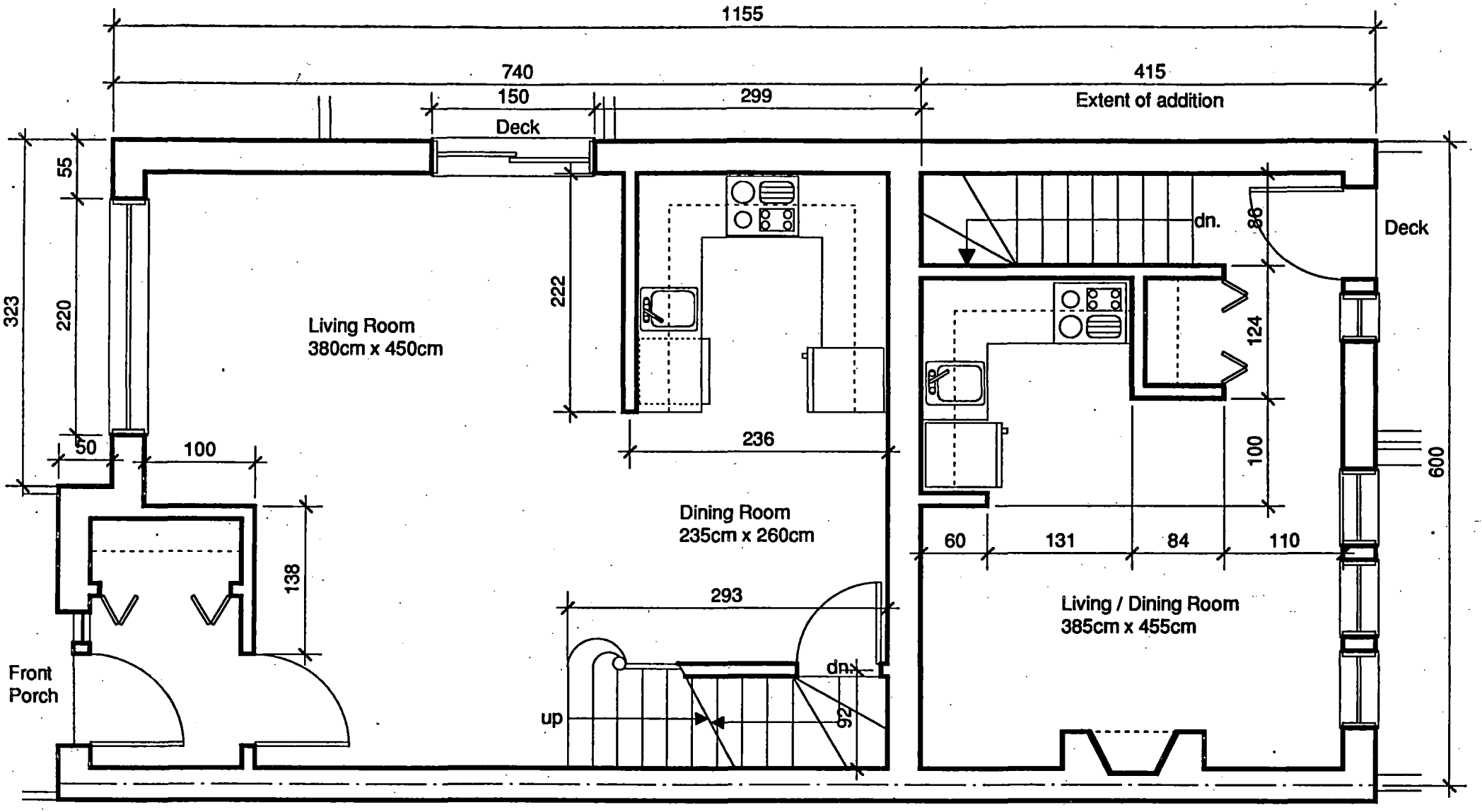
All dimensions in cm



Upper Floor — Final Phase

Scale: 1:50

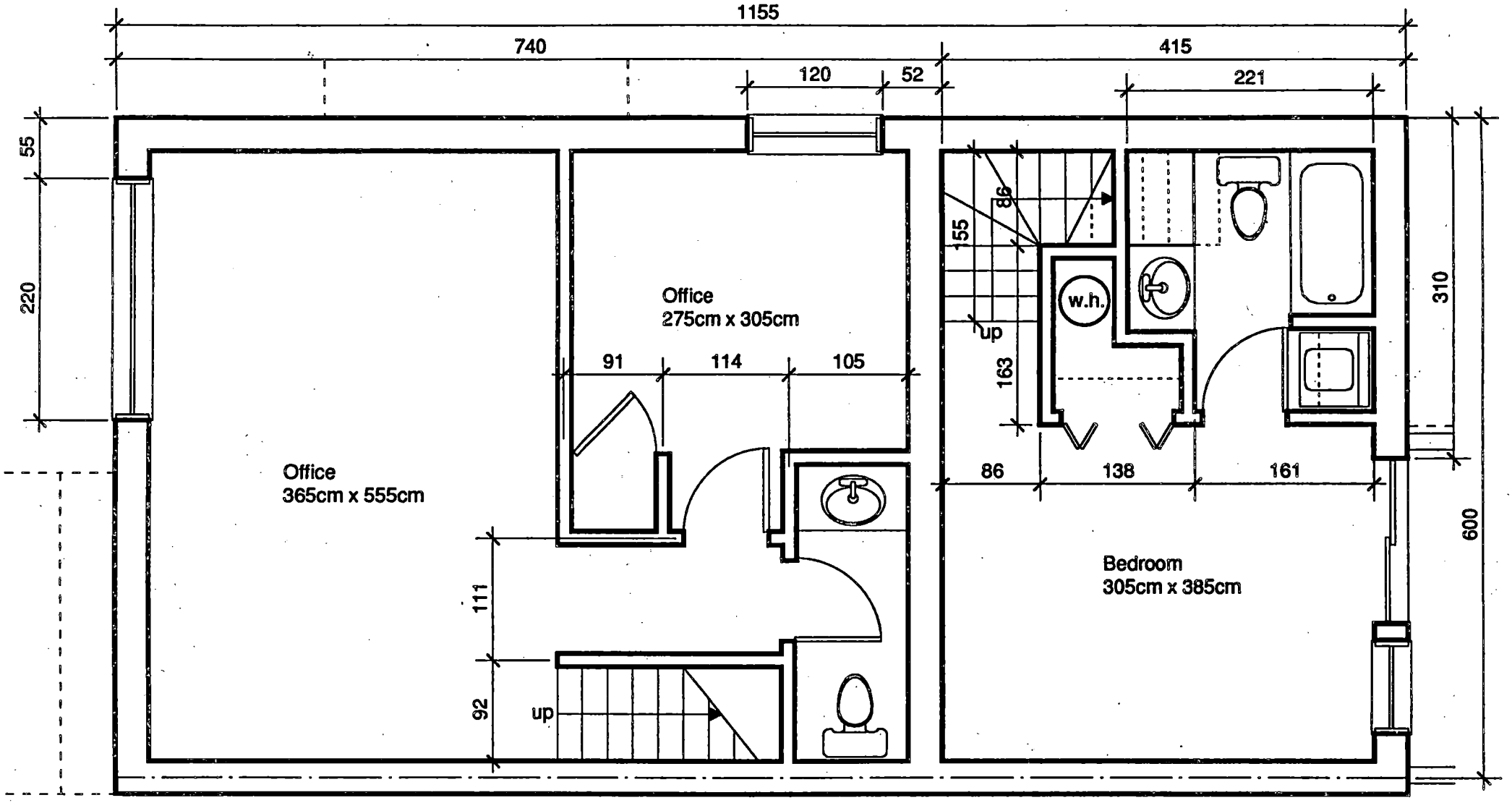
All dimensions in cm



Main Floor — Final Phase

Scale: 1:50

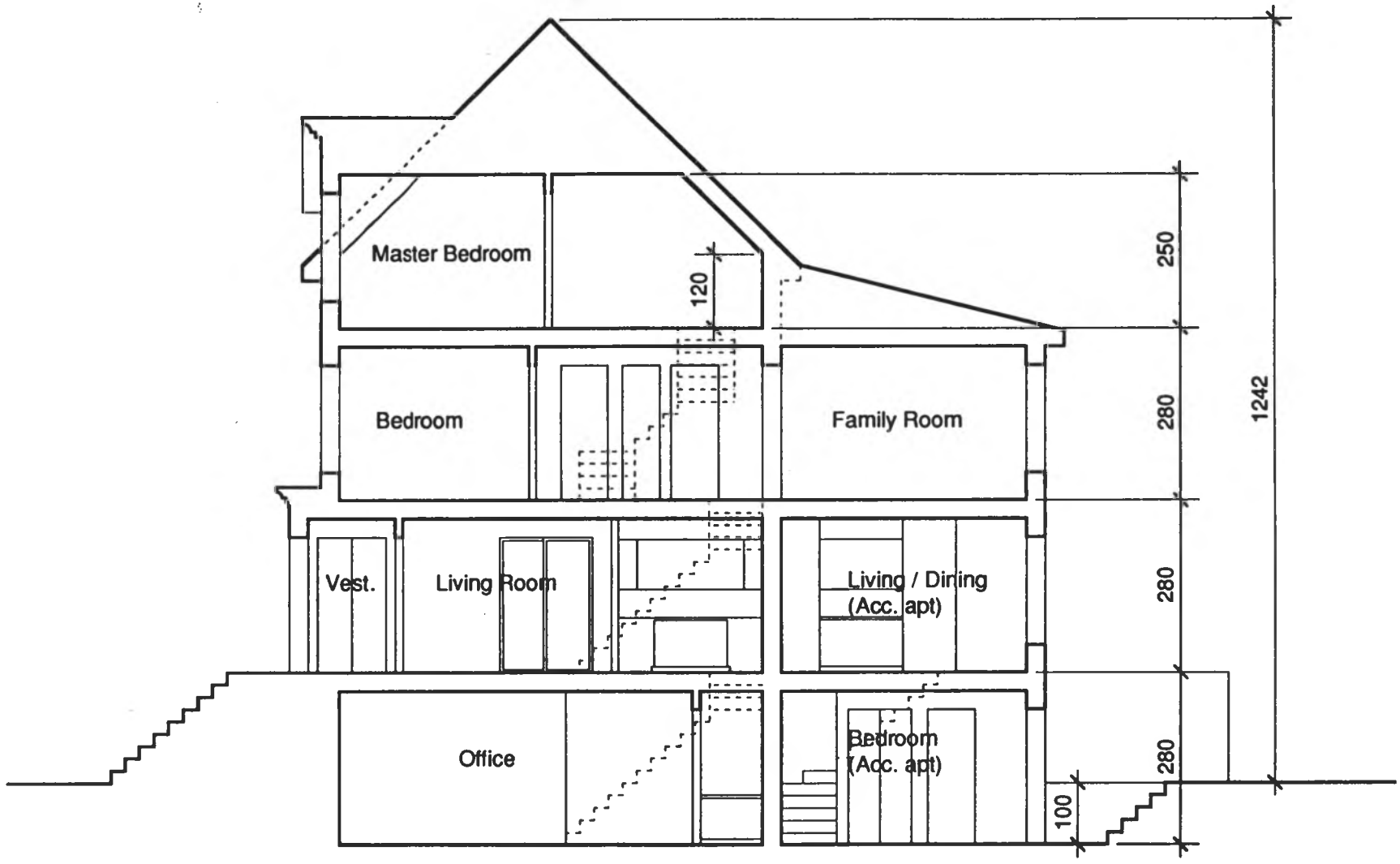
All dimensions in cm



Basement — Final Phase

Scale: 1:50

All dimensions in cm

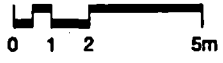


Section — Final Phase
Scale: 1:100

All dimensions in cm

Appendix B: cost estimate

We used the following spreadsheet to produce the numerous construction cost estimates in Part 3. The specific estimate included in this Appendix refers to the plans shown below. These plans also appear on page 25.



Legend:

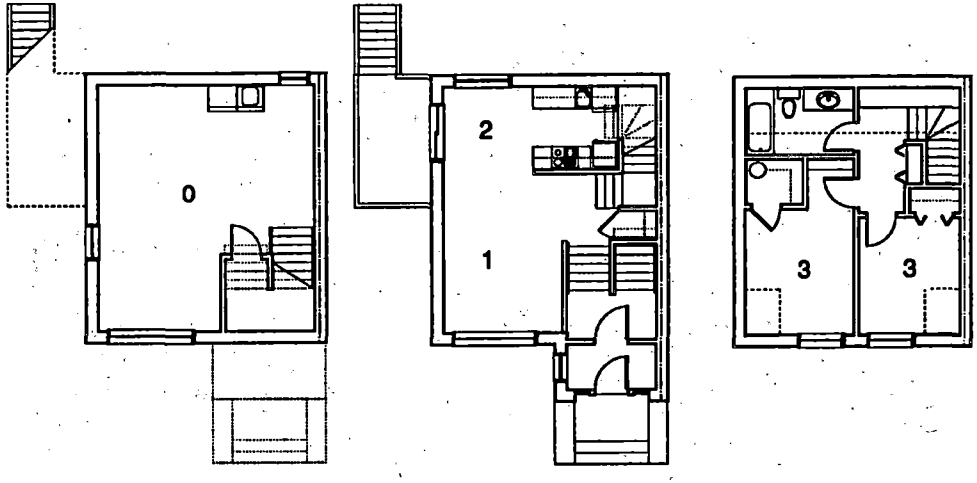
0 Future habitable area
1 Living
2 Dining
3 Bedroom

Description:

Number of units:	1
Number of bedrooms:	2
Habitable area:	85 m²

Estimated Construction Cost:

$81,743



Basement Main Floor Upper Floor

PROJECT DESCRIPTION:

Sitework Estimating Inputs:	*Site*					***Total***
Rough grading	5.0					5.0 cu m
Finish grading	10.0					10.0 sq m

Foundations Estimating Inputs:	*Bsmt.*					***Total***
Length of wall footings	22.5					22.5 m
Number of column footings	0					0
Length of foundation wall	22.5					22.5 m
Height of foundation wall	2.6					2.6 m
Area of openings in foundation wall	6.2					6.2 sq m
Area of slab-on-grade	42.0					42.0 sq m

Framing Estimating Inputs:	*Bsmt.*	*Main*	*2nd*	*Attic*	*Roof*	***Total***
Net floor framing area		42.0	0.0	42.0		84.0 sq m
Floor to ceiling height	2.5	2.5	2.5	1.2		8.7 m
Length of exterior framing	0.0	26.0	0.0	26.0		52.0 m
Area of openings in exterior framing	6.2	9.4	0.0	4.5		20.1 sq m
Number of steel columns	0	0	0	0		0.0
Length of composite beams	6.0	6.0	0.0	0.0		12.0 m
Length of interior partitions	3.0	9.3	0.0	18.2		30.5 m
Area of flat roof					0.0	0.0 sq m
Area of sloped roof					50.0	50.0 sq m
Slope of roof					0.0	0.0 in 12

Ins. & Moisture Prot. Est. Inputs:	*Bsmt.*	*Main*	*2nd*	*Attic*	*Roof*	***Total***
Area of wall to ins. & make air/water tight	50.1	55.6	0.0	26.7		132.4 sq m
Area of ceiling to ins. & make airtight	0.0	0.0	0.0	50.0		50.0 sq m
Area of flat roof to make water tight					0.0	0.0 sq m
Area of sloped roof to make water tight					50.0	50.0 sq m
Length of metal flashing	19.0	0.0	0.0	0.0	0.0	19.0 m
Area of foundation wall to waterproof	58.5					58.5 sq m
Area of vents					0.0	0.0 sq m
Area of soffits		0.0	0.0	0.0	3.6	3.6 sq m

Exterior Finish Estimating Inputs:	*Bsmt.*	*Main*	*2nd*	*Attic*	*Roof*	***Total***
Net area of brick veneer	9.0	23.0	0.0	0.0		32.0 sq m
Area of decorative brick bonding	0.0	1.5	0.0	0.0		1.5 sq m
Total length of steel lintels	3.0	3.7	0.0	0.0		6.7 m
Net area of aluminum siding	8.4	15.7	0.0	7.4		31.5 sq m
Net area of stucco finish	0.0	0.0	0.0	0.0		0.0 sq m
Net area of aggregate finish	0.0	0.0	0.0	0.0		0.0 sq m
Length of exterior mouldings & trims	0.0	6.0	0.0	0.0		6.0 m
Height of exposed foundation wall	0.2					0.2 m
Number of exterior doors	0	1	0	0		1

Total area of garage doors	0.0	0.0				0.0 sq m
Total area of window openings	3.0	9.4	0.0	4.5		16.9 sq m
Painting, 3 coats:						
Area of soffits, fascias, etc.	0.0	0.0	0.0	0.0		0.0 sq m
Length of handrails, railings, etc.	0.0	0.0	0.0	0.0		0.0 m
Number of doors to be painted	0	0	0	0		0
Roof:						
Total surface area of sloped roof					50.0	50.0 sq m
Perimeter of sloped roof					12.0	12.0 m
Roof overhang					0.3	0.3 m
Total length of eavestroughing					0.0	0.0 m
Total length of downspouts					0.0	0.0 m
Total area of skylights					0.0	0.0 sq m

Interior Finish Estimating Inputs:	*Bsmt.*	*Main*	*2nd*	*Attic*	*Total*
Walls:					
Area of drywall	12.0	102.1	0.0	70.4	184.5 sq m
Area of ceramic tile	0.0	0.0	0.0	4.0	4.0 sq m
Floors:					
Area of carpeting	0.0	30.0	0.0	30.0	60.0 sq m
Area of wood parquet flooring	0.0	0.0	0.0	0.0	0.0 sq m
Area of ceramic tile	0.0	2.4	0.0	3.6	6.0 sq m
Area of marble	0.0	0.0	0.0	0.0	0.0 sq m
Ceilings:					
Area of drywall	0.0	38.0	0.0	38.0	76.0 sq m
Number of interior doors	1	2	0	4	7
Number of closet doors	0	0	0	2	2
Number of fireplaces	0	0	0	0	0
Length of window & door trims	0.0	20.0	0.0	9.0	29.0 m
Length of mouldings (excl. baseboards)	0.0	0.0	0.0	0.0	0.0 m
Length of guardrails & handrails	0.0	0.0	0.0	0.0	0.0 m
Length of closet rods & shelves	0.0	1.0	0.0	3.9	4.9 m
Length of counters & cabinets	0.0	3.5	0.0	1.2	4.7 m

Plumbing & HVAC Estim. Inputs:	*Bsmt.*	*Main*	*2nd*	*Attic*	*Total*
Number of fixtures:					
Bathtubs	0	0	0	1	1
Bathroom sinks	0	0	0	1	1
Water closets	0	0	0	1	1
Kitchen sinks	0	1	0	0	1
Laundry sinks	0	0	0	0	0
Water heater	0	0	0	1	1
Number of accessories:					
Soap dishes	0	0	0	1	1
Toilet paper dispensers	0	0	0	1	1
Towel rings	0	0	0	0	0
Towel bars	0	0	0	1	1
Number of drains:					
Floor	1	0	0	0	1

Roof	0	0	0	0	0

PROJECT COSTING:

Preconstruction Phase:

			Estimated project costs	Totals
Site survey			$0	
Soil test			$0	
Design / architecture	0.00 %	81,743	$0	
Engineering			$0	
Total: Preconstruction Phase				***$0***

Construction Phase:

	Unit costs	Quantities	Estimated project costs	Subtotals	Totals
Variable Overheads:					
Permits, % of const. cost	0.50 %	81,743	$409		
Insurance	$2.82 / sq m	42.00 sq m	$118		
Temporary amenities:					
Toilet facilities	100 ea	0	$0		
Barricades	$30.00 / m	0.0 m	$0		
Temporary heat		0			
Electricity		0			
Water		0			
Equipment, % of const. cost	1.00 %	81,743	$817		
Dumpster	$375.00 ea	1	$375		
Subtotal: Variable Overheads				*$1,720*	
Demolition:					
Selective demolition:					
Concrete foundation wall:					
Unreinforced	$106.00 / cu m	0.0 cu m	$0		
Reinforced	$210.00 / cu m	0.0 cu m	$0		
Concrete slab-on-grade:					
Unreiforced	$6.25 / sq m	0.0 sq m	$0		
Reinforced	$9.50 / sq m	0.0 sq m	$0		
Masonry partitions:					
Partitions	$56.00 / sq m	0.0 sq m	$0		

Exterior walls	$79.00 / sq m	0.0 sq m	$0
Subtotal: Demolition			*$0*

Construction:

Sitework:

Excavations:			
Bulk exc. w/backhoe in med. soil	$2.14 / cu m	147.4 cu m	$315
Backfill & compaction:			
excavated material	$7.40 / cu m	16.9 cu m	$125
Crushed stone at perimeter	$33.75 / cu m	6.1 cu m	$205
Crushed stone below slab, 100mm	$33.75 / cu m	6.3 cu m	$213
Polyethylene below slab	$13.00 / sq m	42.0 sq m	$546
Waste material disposal, 1hr return trip	$8.55 / cu m	130.5 cu m	$1,116
Perimeter drain	$22.50 / m	22.5 m	$506
Rough grading	$2.18 / cu m	5.0 cu m	$11
Finish grading	$1.00 / sq m	10.0 sq m	$10
Subtotal: Sitework			*$3,047*

Foundations:

Formwork:			
Wall footings - level	$49.50 / sq m	13.5 sq m	$668
Column footings	$49.50 / sq m	0.0 sq m	$0
Foundation walls	$49.50 / sq m	117.0 sq m	$5,792
Wall footings, 600 x 300mm:			
Concrete: 20MPa	$85.00 / cu m	4.1 cu m	$344
Concrete placing (major equip. not inc.)	$12.00 / cu m	4.1 cu m	$49
Reinforcing 17kg / sq m	$1.00 / kg	0.0 kg	$0
Col. footings, 900 x 900 x 300mm:			
Concrete: 20MPa	$85.00 / cu m	0.0 cu m	$0
Concrete placing (major equip. not inc.)	$12.00 / cu m	0.0 cu m	$0
Reinforcing 17kg / sq m	$1.00 / kg	0.0 kg	$0
Foundation walls, 280mm thick:			
Concrete: 20MPa	$85.00 / cu m	10.2 cu m	$865
Concrete placing (major equip. not inc.)	$16.75 / cu m	10.2 cu m	$171
Reinforcing 17kg / sq m	$1.06 kg	0.0 kg	$0
Anchor bolts	0	0.0	$0
Slab-on-grade, 100mm thick:			
Concrete: 20MPa	$85.00 / cu m	4.2 cu m	$357
Concrete placing (major equip. not inc.)	$10.70 / cu m	4.2 cu m	$45
Screeding	$1.94 / sq m	42.0 sq m	$81
Mesh reinforcement	$2.20 / sq m	42.0 sq m	$92
Sutotal: Foundations			*$8,464*

Framing:

Floors:

Joists: SPF 38 x 235mm @ 400mm oc.	$435.00	/ cu m	1.9 cu m	$816
Tail joists: SPF 38 x 235mm	$435.00	/ cu m	0.2 cu m	$101
Installation	$1,100.00	/ cu m	2.1 cu m	$2,318
Plywood sheathing: 18.5mm thick	$11.35	/ sq m	84.0 sq m	$953
Installation	$5.45	/ sq m	84.0 sq m	$458
Exterior walls:				
Studs: SPF 38 x 140mm @ 400mm oc.	$330.00	/ cu m	4.3 cu m	$1,415
Plates: SPF 38 x 140mm	$330.00	/ cu m	0.8 cu m	$261
Installation	$1,310.00	/ cu m	5.1 cu m	$6,652
Plywood sheathing 12.5mm thick	$7.65	/ sq m	320.8 sq m	$2,454
Installation	$4.54	/ sq m	320.8 sq m	$1,456
Furring strips: SPF 19 x 64mm @ 400mr	$375.00	/ cu m	0.9 cu m	$352
Installation	$2.41	/ m	771.3 m	$1,859
Interior walls:				
Studs: SPF 38 x 89mm @ 400mm oc.	$320.00	/ cu m	2.2 cu m	$718
Plates: SPF 38 x 89mm @ 400mm oc.	$321.00	/ cu m	0.2 cu m	$66
Installation	$1,250.00	/ cu m	2.4 cu m	$3,062
Beams: 4-38 x 235mm SPF	$435.00	/ cu m	0.4 cu m	$186
Adjustable steel columns	$250.00	ea	0.0	$0
Roof:				
Trusses: SPF prefab. @ 600mm oc.	$150.00	/ cu m	10.0 cu m	$1,500
Installation	$200.00	/ cu m	10.0 cu m	$2,000
Plywood sheathing 12.5mm thick	$7.65	/ sq m	50.0 sq m	$383
Installation	$4.54	/ sq m	50.0 sq m	$227
Furring strips: SPF 19 x 64mm	$375.00	/ cu m	0.2 cu m	$57
Installation	$2.41	/ m	125.0 m	$301
Subtotal: Framing				*$27,595*

Insulation & Moisture Protection:				
Walls—above ground:				
Vapour barrier	$1.00	/ sq m	82.3 sq m	$82
Batt insulation	$12.00	/ sq m	82.3 sq m	$988
Moisture barrier	$3.75	/ sq m	82.3 sq m	$309
Walls—basement:				
Vapour barrier	$1.00	/ sq m	50.1 sq m	$50
Studs: SPF 38 x 64mm @ 400mm	$315.00	/ cu m	0.0 cu m	$0
Installation	$1,250.00	/ cu m	0.0 cu m	$0
Batt insulation	$8.00	/ sq m	50.1 sq m	$400
2 coats asphalt emulsion waterproofing	$4.71	/ sq m	58.5 sq m	$276
Ceiling & roof:				
Vapour barrier	$1.00	/ sq m	50.0 sq m	$50
Batt insulation	$15.00	/ sq m	50.0 sq m	$750
Building paper	$13.00	/ sq m	50.0 sq m	$650
Vents	$24.00	/ sq m	0.0 sq m	$0
Soffits	$8.00	/ sq m	3.6 sq m	$29
Flashing galvanized steel, 26 gauge	$41.25	/ sq m	19.0 sq m	$784
Subtotal: Insulation & Moisture Protection				*$4,368*

Exterior Finish:				
Walls:				
Scaffolding				
Brick veneer:				
190 x 90 x 57mm brick on cavity wall	$104.00	/ sq m	32.0 sq m	$3,328
Premium for decorative bond: 10%	$10.40	/ sq m	1.5 sq m	$16
Installation	$0.00	/ sq m	33.5 sq m	$0
Aluminum siding	$55.00	/ sq m	31.5 sq m	$1,733
Stucco	$80.00	/ sq m	0.0 sq m	$0
Aggregate	$45.00	/ sq m	0.0 sq m	$0
Mouldings	$35.00	/ m	6.0 m	$210
Parging 2 coats	$17.75	/ sq m	4.5 sq m	$80
Exterior door	$350.00	ea	1	$350
Garage door	$125.00	/ sq m	0.0 sq m	$0
Windows, wood	$120.00	/ sq m	16.9 sq m	$2,023
Glazing	$145.00	/ sq m	16.9 sq m	$2,445
Lintels	$75.00	/ m	6.7 m	$503
Painting, 3 coats:				
Soffits, fascias	$12.40	/ sq m	0.0 sq m	$0
Handrails. railings, etc.	$1.85	/ m	0.0 m	$0
Doors	$35.00	ea	0	$0
Roof:				
Asphalt shingles	$10.50	/ sq m	50.0 sq m	$525
Fascia, 250mm	$12.00	/ sq m	3.0 sq m	$36
Soffits	$12.00	/ sq m	3.6 sq m	$43
Skylights	$535.00	/ sq m	0.0 sq m	$0
Eavestroughing	$8.00	/ m	0.0 m	$0
Downspouts	$8.00	/ m	0.0 m	$0
Subtotal: Exterior Finish				***$11,291***

Interior Finish:				
Drywall:				
Gypsum wallboard: 16mm (walls)	$2.92	/ sq m	184.5 sq m	$539
Gypsum wallboard: 12mm (ceilings)	$2.65	/ sq m	76.0 sq m	$201
Installing gypsum wallboard	$6.50	/ sq m	260.5 sq m	$1,693
Taping joints and finishing	$5.75	/ sq m	260.5 sq m	$1,498
Millwork:				
Parquet flooring, oak	$60.00	/ sq m	0.0 sq m	$0
Baseboards	$1.90	/ m	113.0 m	$215
Window & door trims	$1.90	/ m	29.0 m	$55
Closet rods & shelves	$1.90	/ m	4.9 m	$9
Stairs	$18.00	/ m	0.0 m	$0
Guardrails & handrails	$25.00	/ m	0.0 m	$0
Counters & cabinets	$50.00	/ m	4.7 m	$235
Mouldings	$12.00	/ m	0.0 m	$0
Tile:				
Ceramic tile on mortar bed	$58.00	/ sq m	10.0 sq m	$580

Marble to floors	$300.00 / sq m	0.0 sq m	$0	
Interior doors	$160.00 ea	7	$1,120	
Closet doors	$225.00 ea	2	$450	
Paint: 2 coats	$5.45 / sq m	294.2 sq m	$1,603	
Carpeting:				
Wool (including underpadding)	$38.00 / sq m	60.0 sq m	$2,280	
Fireplace:				
Firebox	$450.00 ea	0	$0	
Hearth	$200.00 ea	0	$0	
Subtotal: Interior Finish				*$10,479*
Plumbing & HVAC				
Plumbing fixtures:				
Bathtubs	$1,440.00 ea	1	$1,440	
Bathroom sinks	$785.00 ea	1	$785	
Water closet	$800.00 ea	1	$800	
Kitchen sinks, 2 bowls	$845.00 ea	1	$845	
Laundry sink & trays	$710.00 ea	0	$0	
Water heater	$300.00 ea	1	$300	
Toilet &bath accessories:				
Soap dish	$15.00 ea	1	$15	
Toilet paper dispenser	$18.00 ea	1	$18	
Towel ring	$16.00 ea	0	$0	
Towel bar	$29.00 ea	1	$29	
Drains:				
Floor	$210.00 ea	1	$210	
Roof	$260.00 ea	0	$0	
Pipe insulation & cover	$0.00 ea	0	$0	
Ventilation	$0.00 ?	1	$0	
Subtotal: Plumbing & HVAC				*$4,442*
Electrical:				
Electrical	$29.60 / sq m	126.0 sq m	$3,730	
Subtotal: Electrical				*$3,730*
OVERHEAD & PROFIT:				
Contractor's overhead & profit	9.0 %	$73,416 const. cost		$6,607

COST SUMMARY:

Preconstruction Phase:

Total Preconstruction Phase Cost	$0

Construction Phase:

Variable Overheads		$1,720	
Demolition		$0	
Construction:			
Sitework	$3,047		
Foundations	$8,464		
Framing	$27,595		
Insulation & Moisture Protection	$4,368		
Exterior Finish	$11,291		
Interior Finish	$10,479		
Plumbing & HVAC	$4,442		
Electrical	$3,730		
Total Construction Cost		$73,416	
Overhead & Profit		$6,607	
Total Construction Phase Cost			**$81,743**

Total Project Cost ***$81,743***

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