

The Courtyard House

Using cultural references of the past as an alternative to Ottawa's current housing typologies

by

Saba Khalili

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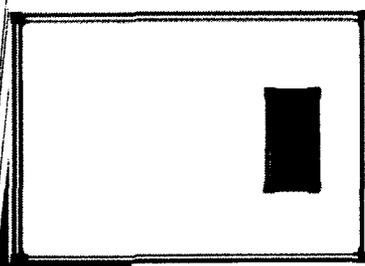
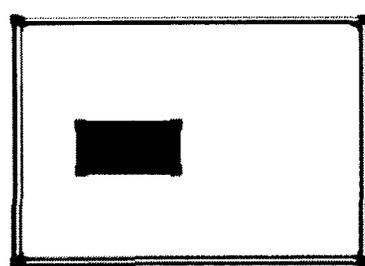
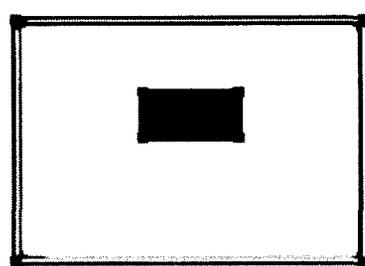
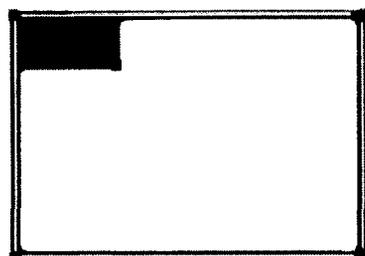
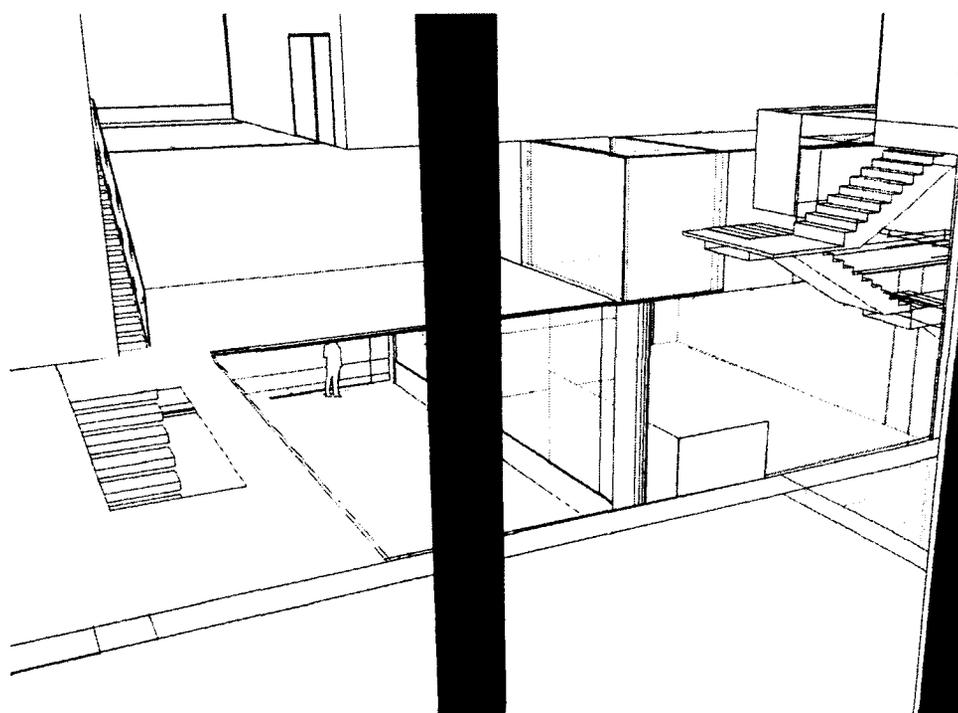
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Abstract

Historically, courtyard houses were built in various cultures and have existed in greater numbers in the past because of limited land. Cities were crowded and urban densities were much higher since residents needed to be in close proximity to city commerce. The efficient use of constricted space in a sprawling city is what made the courtyard home an attractive proposal for residents wanting personal space, which provided access to the outside environment. More often than not, these spaces were meticulously maintained since it was considered an extension of their own personal living space, and was viewed as the centerpiece of the house. Over the last century, suburban living has become increasingly popular because urban living did not provide residents with the same level of personal space. Could this type be a valid type of housing to effectively increase present day urban density? This thesis will explore the courtyard housing form in downtown Ottawa.

ACKNOWLEDGMENTS

This thesis is dedicated to my lovely grandma who passed away in October 2012. She is truly my role model and the reason why I furthered my education. I am truly blessed to have had her in my life and love and miss her dearly.

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Introduction

Land use and urban sprawl are major environmental concerns affecting many citizens in a variety of ways. While traditional cities were in the past compact and efficient, over the years the density of land used per person has declined drastically. The continuing expansion of the city requires a tremendous amount of money in recent years. In order to ameliorate the problems caused by low-density urban form, the idea of the compact city has been reintroduced. By changing the proportions of different housing types, or by providing infill within the city, there would be less need to expand outwards. Densification and intensification necessarily mean just that. However, densification can imply a loss of other important urban quality factors, such as private green spaces, and this is a prime reason why families spread to the suburbs.

Nowadays, the image of an ideal life is based on role models difficult to achieve in a dense urban environment. The detached residential house represents a longing for autonomy and privacy. However, within this context, the courtyard house, characterized by its introverted nature, could experience a renaissance. The courtyard as a secluded open space is a central element, which can be utilized to provide daylight and ventilation. The courtyard type carries the potential to solve many of the problems currently related to density. Considering the qualities, offered in the courtyard house form, the question can be asked; can the courtyard provide the basis for a valid type of housing to increase density and a viable concept to future application? This thesis will explore the notion of the courtyard as means to provide an alternative housing form in downtown Ottawa.

01- Intensification/Densification

Ottawa's Planning Strategy

The goal of Ottawa's official planning document "20/20" is to provide a framework and long-term strategic plan upon which the City of Ottawa will be able to manage its future growth and respond to the new challenges that it will experience over the next 20 years. One factor that will play a significant role in the future is Ottawa's increasing population size.

Ottawa is the fourth largest city in Canada and in recent years has experienced rapid population growth compared to other Canadian cities. According to Canada Counts, Ottawa's population grew by 7.9% from 2001 to 2006; reaching a total count of 870,254 people. By mid 2011, the city's population had grown to a size of 1,011,800 people. Over the next 20 years, the City's population will push past the 1.2 million mark.¹ Ottawa's population growth rate is faster than that of Ontario's (6.2%) and Canada's rate of (4.8%) as a whole.² Most of the population growth will be due to immigration. The development of strategies for how and where to accommodate for this rapid growth has been a major objective for city planners.

¹ City of Ottawa. (2012). Retrieved from www.ottawa.ca/en/city_hall/budgettaxes/financial/.../index.html

² City of Ottawa. (2012). Retrieved from http://www.ottawa.ca/city_hall/ottawa2020/official_plan/vol_1/01_introduction/index_en-01.html

The projection of housing requirements by the city of Ottawa predicts the construction of 147,507 new dwellings in Ottawa by 2031, of which 13,276 are to be built in rural areas. In Ottawa, rural areas are defined as agricultural lands, mineral resources, natural environment areas, villages, hamlets, subdivisions, scattered development³ and areas outside of the urban boundary which are not yet serviced and may not be serviced with major roads, transit and piped sewer and water services.

At the present time, single family, detached homes are the most desired model for residential living in Ottawa. This is illustrated in the graph below.

Housing preferences by household type. (2001 census)

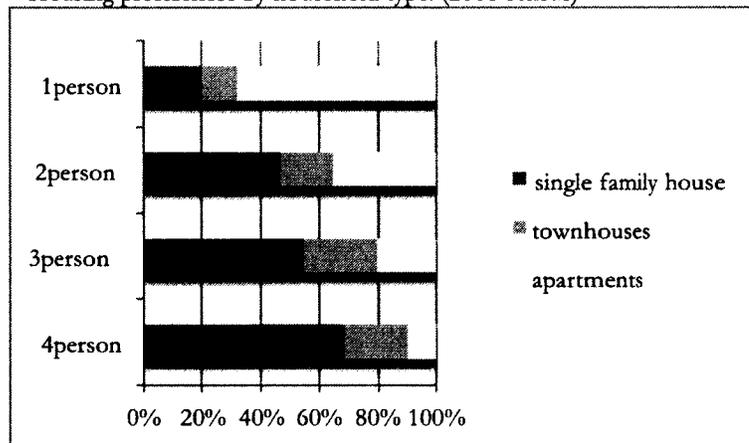


Figure 1

³ City of Ottawa. (2012). Retrieved from http://ottawa.ca/en/city_hall/planningprojectsreports/public_consult/rural_review/country_lot_estates/definitions/index.html

Constructing new homes in the suburbs and building in the traditional pattern in which green space is placed all around the house consumes a great deal of land per housing unit. The ratio of living area, surface area and volume is uneconomic and irresponsible from an ecological point of view. It has proven to be extremely expensive from a public finance point of view, largely because of the cost involved in extending public infrastructure such as sewers and roads into new growth areas.⁴

Public attitudes have changed over the past decades, as people have increasingly developed a desire to preserve rural and natural landscapes instead of seeing the further spread of the city.⁵ High oil prices, longer commutes and the reliance on private transportation have become an environmental, social and economical concern. People are spending less time walking and biking and relying more on cars for their daily transportation.⁶ Ottawa's best chance to contain urban sprawl and to change the way it grows lies in its ability to urbanize greenfields differently. Ottawa must adopt density targets and development standards that facilitate compact urban form.

The City of Ottawa expects to build 134,231 new dwellings in the urban area by 2031 with a minimum intensification target of 40%.⁷ According to the table below, most of these new dwelling units will be in the form of apartments.

⁴ Pfeifer, G., Brauneck, P. (2008). *The Courtyard Houses; A Housing Typology*. Germany; Birkhauser Verlag AG.

⁵ City of Ottawa. (2012). "City Corporate Plan" Retrieved from: http://www.ottawa.ca/city_services/planningzoning/2020/window/wrapup1a_en.shtml

⁶ Retrieved from <http://www.gisborneherald.co.nz/article/?id=26670>

⁷ City of Ottawa. (2012). "City Corporate Plan" Retrieved from: http://www.ottawa.ca/city_services/planningzoning/2020/window/wrapup1a_en.shtml

Projected residential intensification by dwelling type, 2006-2031

Dwelling type	Units	Share
Single detached	3,225	6%
Semi-detached	2,150	4%
Row	10,200	19%
Apartment	38,125	71%
Total	53,700	100%

Figure 2

In addition to the intensification target of 40%, City of Ottawa planners would like a good part of this growth to occur in the historic city core. If this were to take place it would mean that the majority of this new construction in the core would also be in the form of apartment houses. Records of building activity that took place between mid-2001 and mid-2006 show this.⁸ The city of Ottawa predicts that the apartment type building will continue to be the most common type of intensification up until the year 2031, as illustrated in the table above. However, there will also remain opportunities for intensification with ground-oriented dwellings including single detached and semi-detached homes.

As mentioned above while on the one hand most of the people residing in Ottawa would like to live in a single detached house while on the other the City of Ottawa's plan is to construct 38,125 new apartments in order to densify the city, the issue arises that perhaps the current moment represents an opportunity in the evolution of Ottawa's

⁸ City of Ottawa (2012). Retrieved from www.ottawa.ca/doc_repository/.../residential_land_strategy_en.pdf

housing forms. Perhaps recent and ongoing population growth could provide the socio-economic conditions for a new approach to city building in Ottawa.

Changes in Ottawa's Urban Density

Since the beginning of the 1900's, up until 2012, Ottawa has undergone many transformations to its urban density (figs. 3-5). Early development in Ottawa was characterized by compact form and relatively high density. People lived within walking distance of work, shopping and transit. In 1906, new residential development consisted mainly of houses on 7.6x30.5m (25x100ft) lots or 43 units per net hectare (17 units per acre).

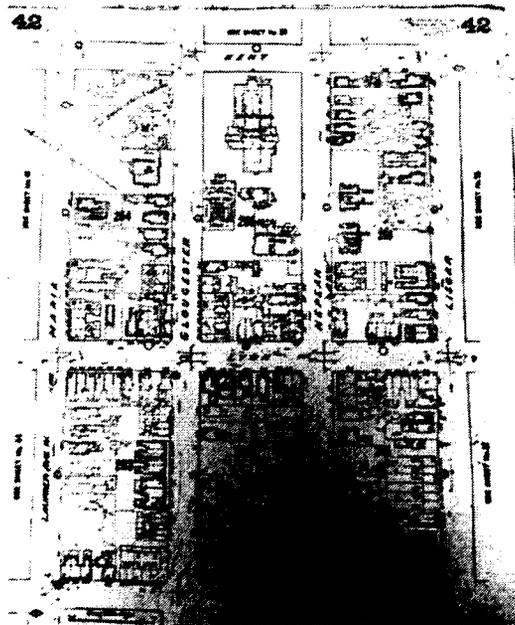


Figure 3- Example of a few parcels of land in downtown Ottawa in 1912

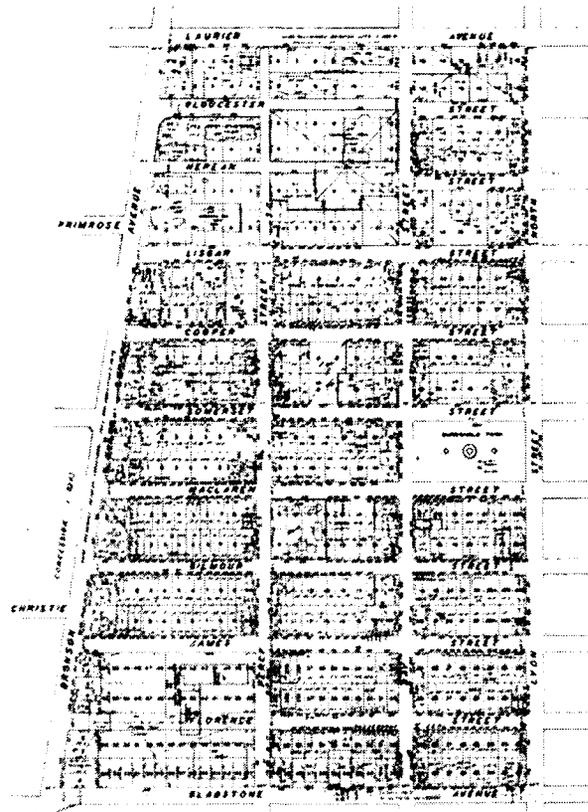


Figure 4- Division of land parcels in Downtown Ottawa, 1945

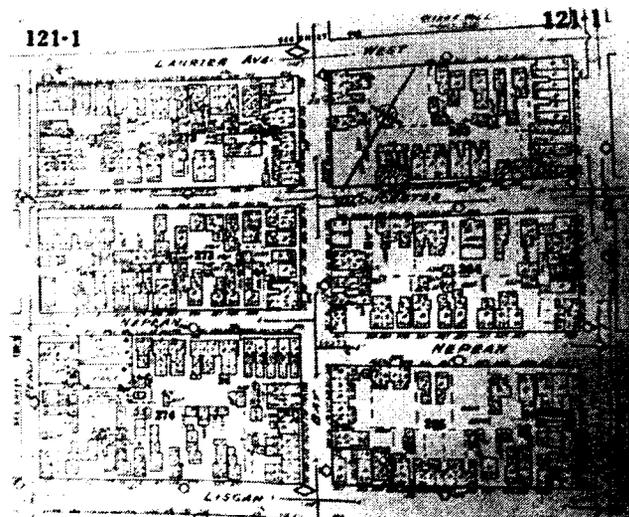


Figure 5- Parcels of land in downtown Ottawa in 1956

By comparison, over the five-year period between 1989-93, single detached densities in Ottawa have averaged 20 units per net hectare (8 units per acre)⁹, which corresponds to a lot of 16.7x30.5m (55x100ft). In 1993, densities for single detached development averaged as low as 18.8 units per net hectare (8 units per acre). The average density for all new housing units built between 1989 and 1993 in the three urban centers outside the greenbelt, which refer to Kanata, Stittsville, and Orléans was 26 units per net hectare (11 units per acre). This density corresponds to an average lot size of 12x30.5m (40x100ft). Unlike the older pattern of development, the current development pattern features low residential densities and separation of land uses with an emphasis on the use of the private automobile. The following table provides information on the net densities in Ottawa.¹⁰

Densities in Ottawa

(Units per net hectare)

	Net density of new housing 1989-93	Net density, all housing, 1991
South-urban centre	30.8	17.3
Average urban centre	26.3	17.0
Inside Greenbelt	35.7	27.9
Kanata	25.4	16.3
Orleans	25.3	17.1
Stittsville	17.9	8.4
Weighted average	27.8	24.6

Figure 6

⁹ Vacant urban residential land survey, 1993 update, RMOC, aug.1994

¹⁰ Understanding Residential Density 1995, Ottawa Carleton "partnership and progress, planning and environmental committee agenda.

From the beginning of the 1900's up until 1991, many changes occurred in Ottawa in the number of persons per land area and this had an impact on urban and household density.¹¹ While the proportion of Ottawa's housing types, such as townhomes, semi-detached and apartments had increased from 33% in 1921 to 58% in 1992, urban density (person per hectare) had nonetheless declined. In 1906, there were approximately 53 persons per hectare in the urban area. In the early 1960's, high-rise apartments were introduced but the number of person per hectare still declined steadily to 34 as seen in the figure below. By 1991, there were only 28 persons per hectare in the urban area, about half the 1906 level. The drop in urban density can be attributed to increased lot sizes and the drop of household size and structure over the past decades.

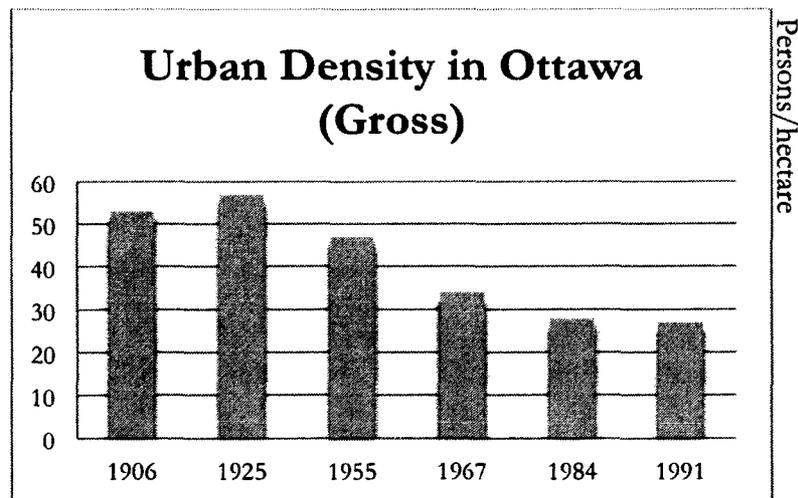


Figure 7

¹¹ Understanding Residential Density 1995, Ottawa Carleton "partnership and progress, planning and environmental committee agenda.

In spite of the recent drop in household size and structure, all the population growth which has occurred in Ottawa over the past century could still have been housed within the greenbelt with enough vacant land to last past the year 2011 if the city had continued to build according to 1906 densities.¹² This means that there would have been enough land for all the new population growth without the need to construct the high-rise apartments that began to appear in the 1960's or the new construction sprawls in urban areas. The notion of increased densities often evokes images of crowded conditions and high-rise buildings; however achieving higher residential densities can be accomplished through medium densities with a mix of singles, townhouses and three storey apartment structures and a more effective use of land parcels.

Density and housing form

The term “density” is often applied to land development and is used as a descriptive tool to understand urban built form. Residential density is usually a measure of the number of persons, household or dwelling units per land area. A number of variables can influence the density measures as well as the perception of density: by changing the size of the building lot without modifying the building, greater density can be achieved with little disruption of present patterns of land use.

¹² Understanding Residential Density 1995, Ottawa Carleton “partnership and progress, planning and environmental committee agenda.

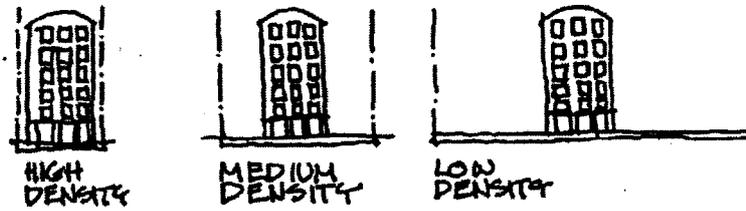


Figure 8

Changing the number of units built on a fixed area of land also changes the density.



Figure 9

While not regularly considered in the planning phase, changing the number of people residing in a fixed number of units also has an impact on density.



Figure 10

Another way to change the amount of land needed to support development and therefore density is to change the amount of surface parking provided for a fixed number of units.

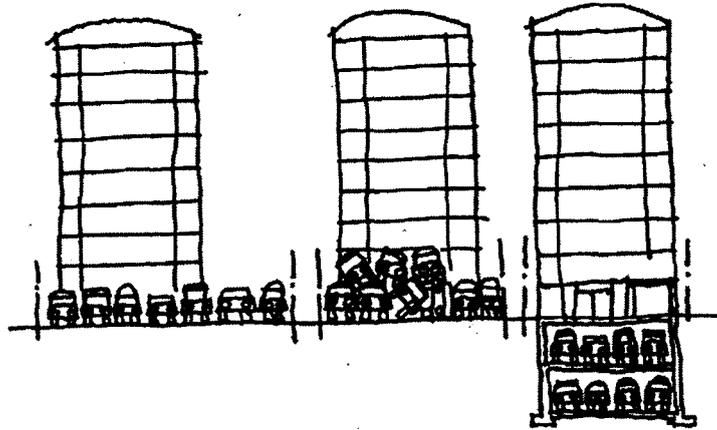


Figure 11

Residential density has a direct effect on the amount of land required to accommodate new development. Higher densities decrease the pressure for expansion into undeveloped land. Based on the predictions outlined in the Regional Official Plan, about 9000 additional hectares of Greenfield land were required to accommodate projected urban growth in Ottawa over the 1991-2011 period.¹³

¹³ Understanding Residential Density 1995, Ottawa Carleton "partnership and progress, planning and environmental committee agenda.

-Alternative strategies

Naturally, intensification occurs in growing cities and as shown above (figs. 8-11) there are several ways in which it can be achieved. Intensification can be understood as an increase per unit of land area (e.g. hectare) of any defined unit, be it the number of people, buildings, jobs, commerce or any other urban function including recreational space. As a result of the current interest in the intensification of urban activity, there is a growing awareness of urban form and design as being among the most important elements needed to successfully integrate infill or otherwise introduce more intensive development into an existing context while still achieving a well-designed, pedestrian-scaled development.¹⁴ Although intensification is an essential step in setting a course for the city's future, people living in Ottawa are keen to avoid any repetition of the unsightly urban landscapes that have sometimes resulted from a lack of good planning.¹⁵ To solve some of the issues related to density in the city of Ottawa, perhaps looking at historic approaches in different countries can be beneficial.

One such approach is to reconsider the idea of the courtyards as the basis for an urban redevelopment/densification model. Although traditionally courtyard types have not been widely used in Ottawa, in many cultures, such as those found in the Middle East and Asia, limited availability of space in a sprawling city made the

¹⁴ City of Ottawa. (2012). Retrieved from: http://ottawa.ca/city_services/statistics/counts/intensification/index_en.html

¹⁵ City of Ottawa. (2012). "City Corporate Plan" Retrieved from: http://www.ottawa.ca/city_services/planningzoning/2020/window/wrapup1a_en.shtml

courtyard type dwelling an attractive proposal for residents wanting personal space, and accessibility to green-space.

Historically the courtyard-type dwelling was compact and flexible because it didn't necessary need to be placed on a grid. The courtyard didn't need set backs, and could be built up to the property line, making denser development possible. The walls of the courtyards could be shared by other units making residential homes more livable in the downtown core as it allowed many of the benefits of suburban living in an urban setting, such as a private garden, a calm and relaxing space where the city noise could not penetrate the introverted nature of the courtyard.

As the city of Ottawa continues to become more dense, urban and diverse, perhaps a reconsideration of the courtyard in the context of the issues facing contemporary Ottawa could help in the evolution of new housing forms adapted to present needs. My research goal is thus to investigate how the idea of the courtyard might play a role or be a catalyst in the rethinking of housing typologies currently in use in the Ottawa area.

02- Defining the idea of the courtyard

In this chapter we will define various forms of traditional courtyards and examine how courtyard spaces are being used in Ottawa.

Traditionally, the courtyard house is commonly a one storey angle-shaped house used as a single-family dwelling, where the court is contained within boundary walls, or by adjoining buildings.¹⁶ A court is a private open space surrounded by walls or buildings. The earliest known courtyard houses were built in Iran and China and date as far back as 3000 BC. Courtyards have historically been used for many purposes including cooking, sleeping, working, playing, gardening, and even places to keep animals. The courtyard was also a space where a resident was able to escape, meditate, seek peace, and let children play freely without the fear of danger from the outside environment. At the same time this space provided contact with the two most basic natural elements, namely the earth and the sky above. Thus, the flow of fresh air and the sounds, and aromas of nature could all be accessed directly.

To recognize a building as a type of courtyard housing, one must first define the constituent conventions of the

¹⁶ "Courtyard House" *The Oxford Companion to Local and Family History*. Ed. David Hey. Oxford University Press, 2009. *Oxford Reference Online*. Oxford University Press. Carleton University. 4 February 2012 <<http://www.oxfordreference.com/views/ENTRY.html?subview=Main&entry=t266.e494>>

courtyard housing typology. The definition depends on the description of formal and spatial elements and on the relationship between them. Courtyard homes have been designed and built throughout the world with many variations. Let us go through a few examples on how they are being used in Ottawa.

Difference between an extroverted form versus an introverted space

In a dense environmental space, having a private personal space that is enclosed is the fundamental purpose of the courtyard house. The court form binds human living space and the outside space together. It creates a spatial relationship that the resident can call his own without the intrusion of unwanted people or without being viewed by unwanted strangers or unwanted views.

What is distinctive about the courtyard house is that the private garden forces a volume of the house to be cut and removed from the building mass. This void becomes the courtyard and the focus of the house becomes the void.

Architect Kenneth D.B. Carruthers writes: "As we begin to experience space positive architecture, our perception turns literally inside out: form is monumental and introverted. Space is non-monumental and extroverted. Outside becomes inside. Contrary to our accustomed confrontation where we stand outside the inside of form, in a space positive world we are inside the outside. Space is not a leftover on a Cartesian grid. It is designed as surely as monumental building is

The entire front lawn of the extroverted house has to be treated as a semi-public domain, visually and physically accessible to everyone, and with its manicured front yard, serving aesthetic rather than utilitarian purposes. The courtyard house, on the other hand reestablishes this freedom of complete privacy protected from outside intrusion of the street.¹⁸

Downtown residential homes end up being isolated containers of interior space. Traditional courtyards of the past in most cultures had controlled views and regardless of where the building was placed, and no matter the size of the yard, it still had a clear demarcation of private and public domains. The courtyard offers a favorable environment within its own perimeter, thus making it different from the extroverted home.

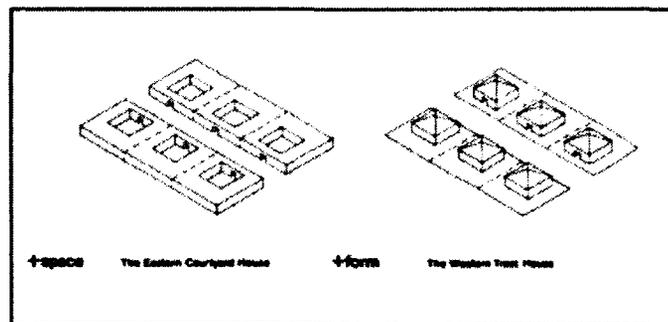


Figure 14

¹⁸ Schoenauer, N., & Seeman, S. (1962). *The Court Garden House*. Montreal: McGill UP.

Existing courtyard buildings in Downtown Ottawa

Downtown Ottawa has several courtyard buildings. Of these courts, some are for residential use and others for public use, particularly in the ByWard Market.

In the past, the courtyards of Ottawa's ByWard Market we know today were unattractive empty spaces, used for parking and keeping garbage. In the 1970's the National Capital Commission took over and converted the parking spaces into beautiful pedestrian friendly spaces. Today, there are four different public courtyard spaces in the ByWard Market. These are called the Beaux-Art Courtyard, the Tin House Courtyard, Jeanne d'Arc Court and Clarendon Court. The largest of these four courts is the Clarendon Court and it contains several restaurants, cafes and shops.

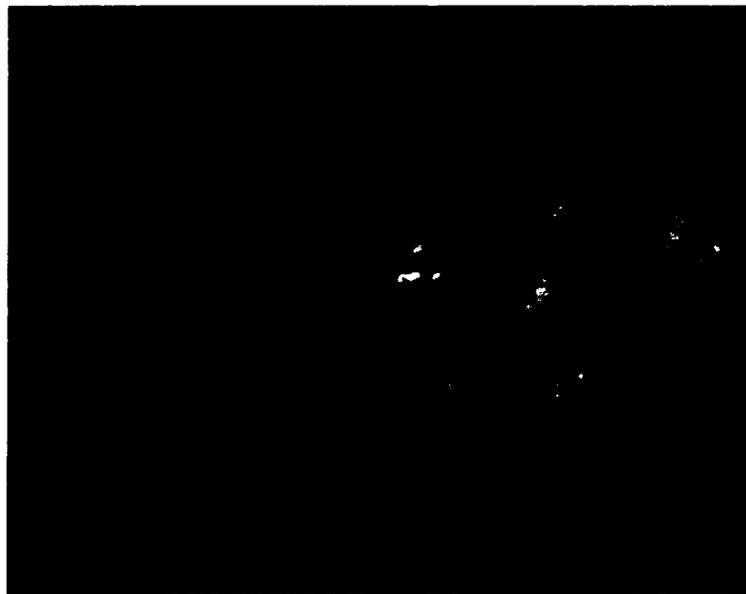


Figure 15

These courtyards have no car access today, and are strictly for pedestrian use and link one street to another. Aside from their beautiful setting, these court spaces promote social integration, where people can meet, relax on a bench, talk and sit for food and drinks.

Like publicly accessed commercial courtyards, residential courtyard spaces are also found in downtown Ottawa. Located on Somerset and Kent, 13 Radstock is designed strictly for a residential purpose. A series of 13 unit townhomes forms a central court ().



Figure 16

These townhomes share a public courtyard that is mainly used for cars to enter and park in individual single garages. However, there are many other advantages to the townhouse

courtyard layout; for instance the configuration of the townhomes allows for a better use of land, since more units can be placed within a limited land space. The shared walls with other neighbors also provides advantages since fewer walls have direct outdoor exposure and this helps conserve heat in the winter. Apart from these advantages, there are also disadvantages, such as the lack of outdoor private space.

We now shift our focus from the single detached house and townhouse, to larger scale courts. The Beaver Barrack project's history dates back to the 1800's, with the city of Ottawa purchasing the site for a dollar from the federal government in 1992 then demolishing the former temporary wartime housing on the site. The site sat vacant for a decade with all sorts of competing pressures on how to use the land says Barry J. Hobin who is the principal architect of the project. Beaver Barrack site is located in Ottawa, on the northwest block of Catherine St. and Metcalfe St. in Centertown. Since the project is close to the Queensway, a requirement for the project was to reduce noise quality for the residents. As well, the city imposed design guidelines for environmental sustainability and set out requirements for a mixture of affordable and market rate housing. This site is comprised of a four storey and an eight-storey building, two rows of stacked houses and a seven story apartment building on Catherine St. The buildings alone are not courtyard dwellings but the arrangements of the 7 buildings together form an exterior community courtyard space (fig. 17a).

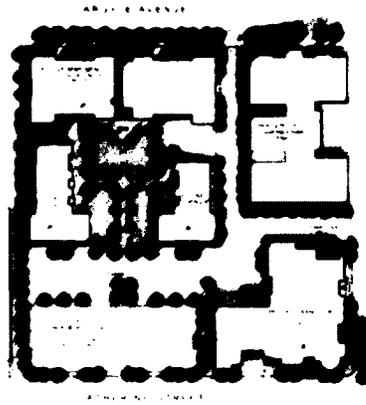


Figure 17a – Beaver Barack development in 2012

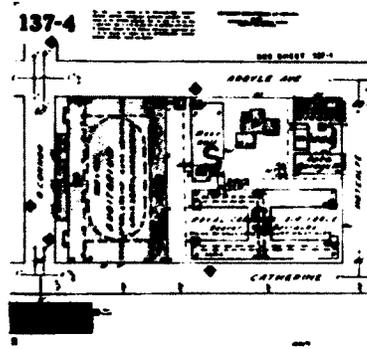


Figure 17b – Beaver Barack development in 1956

All the buildings that existed on this site in 1956 with the exception of the top right hand corner building named the Windsor and built for the Taggart family were demolished in 1991 to make way for the Beaver Barack proposal (). Potentially these buildings could have all been assembled together. This would have created many advantages such as the cost savings from heat conservation by sharing walls, and a more efficient use of land coverage, and thus a denser environment. It is notable that of the 7 buildings, building 111 facing Catherine Street, which is on the bottom left hand corner was the only building that housed a commercial space.

Today it is believed that in dense urban areas the more opportunities a neighborhood provides in terms of housing, workplaces, stores, public facilities, parks and places to meet informally, the more likely it is to offer residents a sense of attachment and a sense of community.

Upcoming courtyard condos in downtown Ottawa

At the present time many Ottawa developers such as Domicile, Tamarack and Ashcraft are constructing mid-rise courtyard condos. These are being sold in phases and will be completed by the end of 2012 and 2013.

Located at 101 Island Park Drive, the Richmond condo is presently under construction (fig. 17). The condo is set for completion in 2013. The Richmond condo proposes an 8 storey mid-rise condo with commercial space on the main floor and residential housing on the top floors. The advantage of having a courtyard within a condo is that more units have exposure to daylight. The commercial space on the ground floor also adds benefits by creating a socially integrated area. Having retail space and services within the perimeter of the property encourages a non-vehicular atmosphere enhancing the pedestrian ambiance.

Richmond condo shares many common aspects of traditional courtyards including enclosure of three sides, which forms the U-shaped courtyard and is open to the sky (fig. 18).



Figure 18

Many of the courtyard houses of the past, however were built up around an outside space with the starting point being the courtyard. It was an additive process of constructing around the negative space that is treated as a physical object, unlike the new constructions where the starting points are the parameters, which then become a courtyard building by simply creating a void at the center.

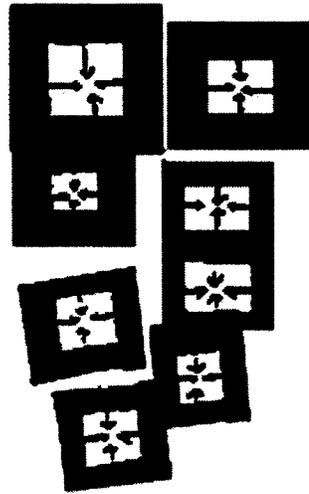
Advantages and disadvantages

A common advantage of the use of courtyard in downtown Ottawa is the creation of shared outdoor green space that is otherwise difficult to attain. There is also the benefit of having more daylight penetrating into the units and a sense of enclosure. Scale is also an important factor; as all the courtyard typologies in Ottawa are low to mid-rise buildings this has the effect of improving the pedestrian environment.

Historically, the benefit of the courtyard space was largely attributed to the private exterior green space it provided for each unit. As previously mentioned, people in Ottawa favor the single detached homes more than any other type of housing. One reason the single detached model is preferred is that it provides the homeowners with personal and private green private space. The disadvantage of current courtyard developments in Ottawa is the lack of providing each unit with their own private green space. Most of the courtyards built in Ottawa are shared amongst many people; not just the resident living in that space but also the general public.

The weakness of the project at 101 Richmond and other new courtyard condos such as Central and Hideaway Hill located on Gladstone and Bank St. by Tamarack developers is that developers normally strip all existing buildings from the site to begin new construction on the land as opposed to working around existing buildings. The courtyard typology, however, offers an alternative model for the development of infill sites.

In dense areas, in the past, courtyards were built side by side, sharing the same walls. Rather than demolishing older buildings on the site, the courtyard type can be woven into existing landscape. The old and the new can thus be integrated together and in this way create a higher density coverage.



(Adapted and modified from Rapoport).

Figure 19

Effectively the courtyard typology is a great model for infill sites. Contemporary courtyard housing is a suitable alternative for rebuilding contemporary downtowns, because it can be easily knitted into the existing urban fabric as infill and made to harmonize with existing businesses and housing stock. Its introverted character gives it the advantage of being able to be located on busy, noisy commercial streets, and to be unaffected by the inconveniences of the city core. Thus it provides city dwellers with a congenial living environment sheltered from everyday city chaos. In addition, residential zones created in and around downtown areas are a great asset for those seeking reduced commuting times. Simultaneously they also solve the problem of deserted downtowns after working hours.

03- LEARNING FROM COURTYARDS

Influences Around the World

A reason for the study of courtyards is the assumption behind any historical approach that one can learn from the past and that study of the past is of value philosophically as well as in making us aware of the complexity and overlapping of things. As R. Amos has written, “ While technology may progress, architecture does not necessarily do so”.¹⁹

Therefore if one was to ask the question, why study primitive and preindustrial house forms in the modern age? One reason might be that these houses are the direct expression of changing values, images and perceptions, which have evolved over time. Another important reason would be that this connection with the past is needed for cross-cultural studies and comparisons and this is useful in two ways. First, from the practical point of view, different cultures and subcultures coexist in our cities and so there is a consequent need for different housing and settlement patterns to accommodate this difference. Secondly, and more generally, comparisons of this type can offer an insight into the basic nature of shelter and dwelling and the meaning of basic needs.²⁰

¹⁹ Amos, R. (1969). *House Form and Culture*. Englewood Cliffs. NJ: Prentice Hall.

²⁰ Amos, R. (1969). *House Form and Culture*. Englewood Cliffs. NJ: Prentice Hall.

The Persian Courtyard

In the Persian language, the courtyard is called *Hayat Markazi*. In order to better understand the idea of the courtyard in Iran it is very important to understand Persian culture. For example, privacy is a key factor in the Persian culture, which is why the architecture is faced inwards.



Figure 20

Iran's courtyard houses provide separation of domains and effectively separate the house and its life from both street and neighbors. A clear transition occurs from the noisy public domain to the quiet private one, and from the relatively plain, simple, and restrained exterior to whatever richness and luxury exist inside. There is little concern for what happens in the street, which is merely a way of getting to the fields, wells, or shops, or of defining ethnic and caste groupings.²¹

²¹ Amos, R. (1969). *House Form and Culture*. Englewood Cliffs, NJ: Prentice Hall.

Until recently Iran was primarily a rural culture. Even today with rampant urbanization, Iranians value nature and make every attempt to spend time in the open air. This is one of the reasons for the popularity of the courtyard; the natural element earth beneath and sky above ensure direct contact with nature. Because Iran is largely a desert, however, the ideal open space is a culturally constructed space, a garden. At the same time, Iranians will try to bring the outdoors inside whenever possible. The ancient Persians built many of their courtyards as miniature representations of paradise. Each contained a water element, a carefully selected landscape, with attention to orientation, form and pattern. The wonderfully intricate carpets that every family strives to own are miniature gardens replete with flower and animal designs. Fresh fruit and flowers are a part of every entertainment, and nature and gardens are central themes in literature and poetry. This underscores a fascinating central motif in Iranian architecture, which is the juxtaposition of "inside" and "outside." These two concepts are more than architectural themes. They are deeply central to Iranian life, pervading spiritual life and social conduct. The inside, also known as "*andaruni*", is the most private, intimate area of any architectural space. It is the place where family members are most relaxed and able to behave in the most unguarded manner. The outside, or "*biruni*", is by contrast a public space where social niceties must be observed.

Until the nineteenth century, Iranians did not use chairs. They normally sat cross-legged on the floor, preferably on a carpet with bolsters or pillows. In the twentieth century, furniture became the hallmark of the "*biruni*", and now every family of any standing has a room stuffed with

uncomfortable furniture for receiving important visitors. When the guests leave, family members give a sigh of relief and go to the *andaruni* where they can relax on the plush carpet.²² In the Iranian courtyard home, the *andaruni* and the *biruni* function as the links between spaces. In this way the courtyard helped eliminate the need for corridors or an entrance porch or hall. The interior plan of these homes are planned in such way that any room, with the exception of those used for cooking and bodily functions, can be used for any social purpose, for example, eating, sleeping, entertainment, business, or whatever else one can conceive. One spreads a dinner cloth, and it is a dining room. After dinner, the cloth is removed, cotton mattresses are spread, and the room becomes a bedchamber. The opposite is seen in Canadian homes where each room has specific functions, or is designated the specific territory of a given family member. As a result, Iranian families can live and entertain many guests in much less space than in the West. Iranian homes usually had one courtyard space, but the houses that had several courtyards were usually homes with the need to accommodate public and social functions.

Another characteristic of the Persian courtyard house is that it provides a natural cooling system by encouraging natural airflow. It also provides safety for the family and children to play and relax, and provides a green and enjoyable space. The important element of the introverted court allows linkage from exterior space to most of the interior spaces.

²² Beeman. W.O. (2012). Culture of Iran: history, people, clothing, traditions, women, beliefs. Retrieved from <http://www.everyculture.com/Ge-It/Iran.html>

However the lack of direct visual connection of the inside spaces with its outside urban spaces can lead to social disconnection.

Scale and urban context

In the past, the courtyard typology consisted mainly of two types: low-rise and midrise forms. Also, like many housing types, the courtyard form varied in height depending on its purpose or regional setting. Residential courtyards comprised primarily of low-rise structure (about 1 to 3 floors at the most) were common whereas commercial buildings or mosques were larger in terms of height and scale varying from 4 to 12 floors. The picture below showcases a typical residential courtyard situated in Yazd, Iran.



Figure 21- Yazd, Iran. Photograph: Ahmadreza Foruzanmehr

The horizontally spread city of Bam located in Kerman, Iran is approximately 44 acres large and provides another example

where the residential courtyards are present (fig. 22).²³ The houses in Bam vary in sizes depending on people's social status. The castles, mosques and bazaar located in the city displays a variety of different scale courtyards depending on the purpose of the structure.

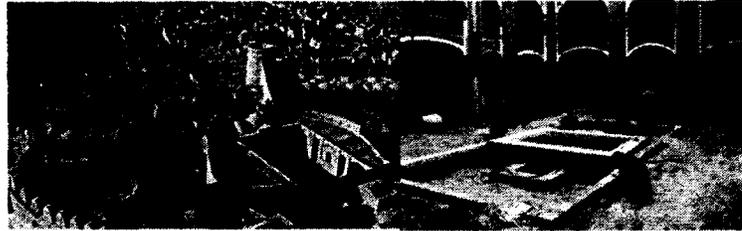


Figure 22- Exterior view of a house in the Jewish quarter from within the courtyard.

The town of Massouleh is located in the Northwest mountainous region of Iran and experiences relatively colder temperatures. Here, the domestic architecture of Iran and the form of the building have been significantly influenced by the climate and topography (fig. 23).



Figure 23- Massouleh, Iran

²³ Mimar: Architecture in Development (unknown). Citadel of Bam. Retrieved from http://archnet.org/library/sites/one-site.jsp?site_id=7861

Primarily south facing, the houses of Massouleh are built on slopes one above the other on a multitude of different levels. The multitude of all the different levels forms an intricate network of pedestrian streets and gardens for the upper-level houses. The collaboration of the houses creates high density living with the benefit of garden space for the homeowners.

In Iran, mid-rise courtyards were generally open to the public and provided a space for social gathering rather than the closed-off private space seen in most residential courtyard homes. The mid-rise type was commonly observed in monumental buildings such as mosques and castles.

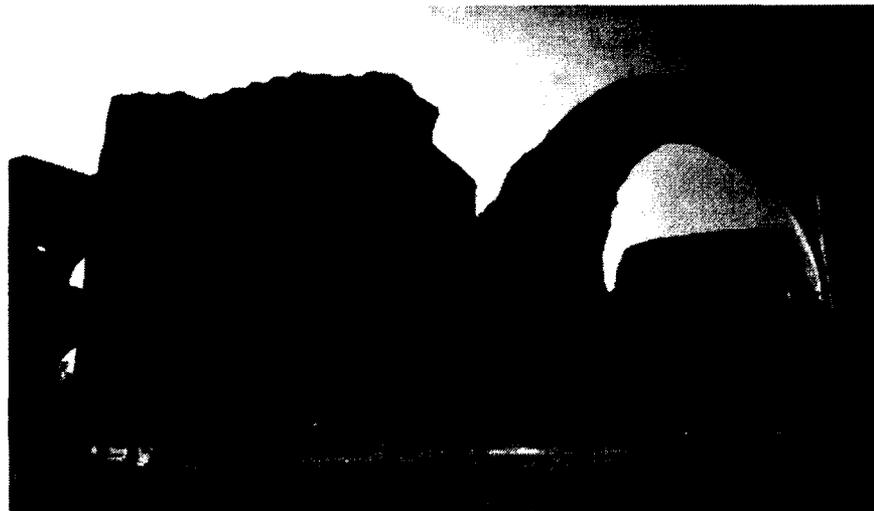


Figure 24- Iwan of Khosrau

An example of the mid-rise courtyard is the palace of Iwan of Khosrau, built in the Persian Sassanid-era. The Iwan is a vaulted hall or space, walled on three sides, with one end entirely open. Typically, Iwans open onto a central

courtyard.²⁴ The Iwan of Khosrau was built after a campaign against the Eastern Romans in 540AD. The arched Iwan hall, open on the façade side, was about 37meters high 26 meters across and 50 meters long.²⁵

The Courtyards of China

Courtyards have existed in China for more than 5000 years.²⁶ In China, many of the courtyards are known as four in one courtyards or as “*sibeyuan*” because they were meant to house four generations in one compound.

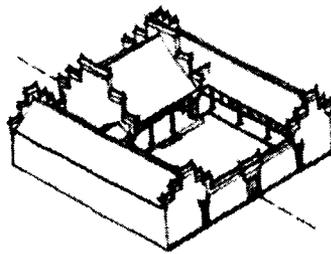


Figure 25

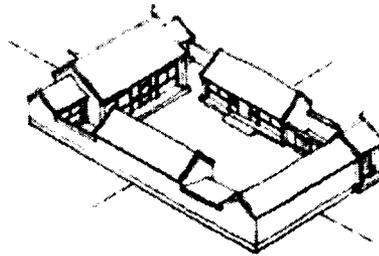


Figure 26

These individual homes were arranged in the form of a square. Additional houses were created behind this arrangement to accommodate additional family members as needed. Chinese courtyards were always constructed to buffer street noise and were meant to be a place of privacy

²⁴ Dictionary of Islamic architecture: Pishtaq archnet.org.

²⁵ Iran, Seven Faces of Civilization retrieved from, <http://www.youtube.com/watch?v=NtcE3711qfQ&feature=related>

²⁶ Keister, D. (2005). Courtyards: Intimate Outdoor Spaces. Layton, Utah: Gibbs Smith.

and tranquility, almost always incorporating a garden and water feature. In some cases, houses were constructed with multiple courtyards that increased in privacy as they recede from the street.

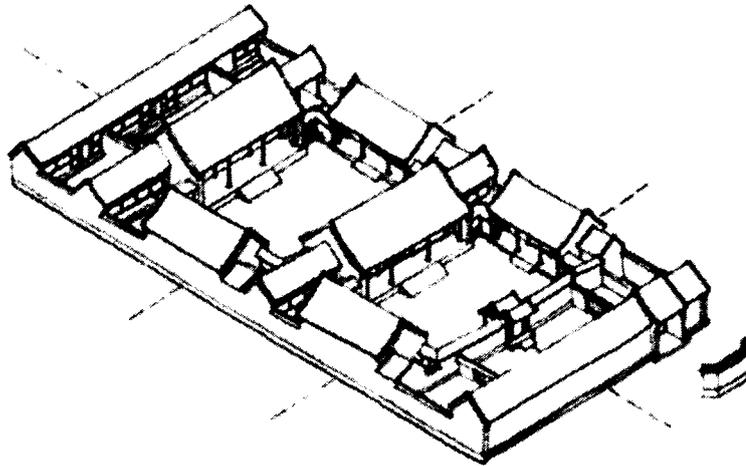


Figure 27- Multiple courtyards

In these houses, strangers would be received in the outermost courtyard, with the innermost ones being reserved for close friends and family members.

To construct a Chinese courtyard a set of strict guidelines had to be followed. The “*sibeytan*” typically had the shape of a rectangle with one-story houses lined up on the cardinal points with a courtyard in the middle. The main house was situated on the north end of the outer courtyard and positioned towards the south side to capture light and warmth as much as possible. A small passageway opened to

an outer courtyard flanked by rooms to the east and west. These rooms were used in the past for servant's kitchens and living quarters. To access the inner courtyard house two passages on either side of the main house were provided. The bedrooms of married children as well as other family members were all located towards the inner courtyard. While the purposes of the inner courtyards offered haven for contemplation, the outer courtyard, served more utilitarian purposes. Following superstition, the Chinese house often had "A pair of stone lions that sat before a bright red door with a painted lintel. Anyone entering must step over a high wooden threshold, where a stone screen is encountered that blocks prying outside eyes and dispels evil spirits."²⁷

In a more contemporary version of the traditional Chinese model, a courtyard can also be used to separate a home into wings; for example, one wing of the house may be for entertaining or dining, and the other wing may be for sleeping, family, or privacy.

In conclusion, the courtyard in residential buildings of China consisted of four buildings forming a courtyard. This courtyard house was meant for four generations and the inner courtyard was used amongst all the generations living in those homes. The outer courtyard was used for guests and strangers. Similarities can be found in comparing the Persian and Chinese courtyards. In both cultures, the courtyard is used as an organizing device, to build a green and enjoyable space, to allow natural cooling system to pass by wind, and to provide a safe place for the comfort of the family.

²⁷ Keister, D. (2005). *Courtyards: Intimate Outdoor Spaces*. Layton, Utah: Gibbs Smith.

04- The courtyard and the Canadian climate

The responsibility to provide usable outdoor areas year round in a cold climate represents a critical challenge to architectural designers. In order to create a comfortable experience for residents, cities need to be reshaped to adapt to climate conditions. The type of climate is a prime factor in determining the form and type of human habitation, and its effect upon any dwelling is the result of the interplay between macro and microclimatic conditions. A macroclimate is the result of the unpredictable nature of climate, temperatures and seasonal variation, wind, humidity and so on. Microclimates on the other hand are controllable as they relate to manmade structures, such as vegetation, and topography around a building.

While most courtyards are built in areas with warmer climates, there is longstanding evidence of courtyards built in colder climates as well. The climate plays a significant role in the design of a building. Most cities in Canada, experience severe winter conditions, and the cold weather leads people to spend more time indoors than they do outdoors. For colder climates, it must be accepted that, for much of the year, outdoor space will essentially be uninhabitable. In climatic terms, therefore, a building needs to respond to heat, cold, ground and sky radiation, wind, and other stresses. The various parts of the building may thus be considered as environmental control devices.²⁸ The form and design of the shelter thus plays a big factor in the comfort of people. Here

²⁸ Rapoport, A. (1969). *House Form and Culture*. Englewood Cliffs, N.J.: Prentice-Hall.

comfort implies the way we design in order to offer natural landscapes all year round to occupants without the discomfort of experiencing the freezing cold. Critical factors have to be addressed in order for the courtyard to be successful in cold temperatures; these factors include appropriate orientation, color and size of courtyards.

The orientation of a building in a cold climate is particularly important because it determines which sides of the buildings receive the most sunlight. A southern oriented courtyard in a northern hemisphere country such as Canada is necessary. Rooms facing the courtyard can then be given large windows without any loss of privacy.

Cold winters appear in different intensities and duration. The principle of heat conservation involves the presence of a heat source within the house and the prevention of heat outflow beyond the boundaries of living space. High heat loss is a significant problem in a northern climate, which must be overcome. In such an environment, heat loss is typically avoided by limiting surface exposure to the outside environment and by properly insulating exterior walls, including the roof. In order to reduce heat loss, lower ceilings and thick walls ought to be used to insulate and keep heat in. Centrally located heating and small windows are also an important factor to consider as ways that contribute to heat reduction. Location and sizes of windows should take in account variables such as wind and sunshine. Doors, windows, and openers ought to be located in a place with the least amount of air pressure.

The color of a building's wall affects not only interior climate conditions, but also light and glares in the streets. Light colors, especially white, reflect solar radiation and thus reduce the heat gain of the building and its indoor temperatures.²⁹ Dark colors, on the other hand absorb this type of radiation. Texture determines the quality of light reflected. Rough and matte textures create diffuse light, while smooth or glossy textures create reflected light and potentially create glare problems. It is important to note that in Canada, with its long winters, strong winds, limited winter sunshine, heavy snowfalls and very low, nearly polar temperatures, any device optimizing the capture of direct or reflected sunshine off the snow has a desirable effect.

In northern climates, to allow the penetration of the northern sun's long rays into the house, the courtyard needs to be wide and open, rather than deep. Martin and March, researchers at Cambridge University, explained that the height for courtyards should not exceed more than four storeys to allow the sun to penetrate. The proportion of the courtyard can trigger radical variations, "for instance, large courtyards are environmentally adequate in cold climates, since under certain geometrical conditions they can act as sun concentrators and retain their sheltering effect against cold winds."³⁰

According to Schoenauer and Seeman: "A snow blanket would seem desirable in most regions of Canada and it does not represent an insurmountable problem in an enclosed court garden. Its retention in an undisturbed state is to be

²⁹ Givoni, B. (1998). *Climate Considerations in Buildings*, Canada: Van Nostrand Reinhold.
³⁰ M'nty, J. (1988.). *Cities Designed for Winter*. Helsinki: Norman Pressman Building Book Ltd.

recommended if the court is used for gardening. However, when desired, the removal of snow in this relatively small area can be economically feasible and practical through the installation of a radiant heating and drainage system in the ground.”³¹

Swedish architect Hans Eek, also states that the attraction of the street orientation has disappeared with the increase of environmental pollution: traffic, noise, dirt and so on. The courtyard provides a quiet, sometimes even green oasis in the city. The softly landscaped floor retains the snow better and is more attractive as a playground even during the winter.

In colder climates, a low-sloped roof can absorb a sizable amount of direct sunlight. Additional reasons for choosing the low sloped roof is to keep the snow on the roof as heat insulator and to allow water to run off instead of building up and causing damage. In the hot summer months, when heat and excessive light are not desirable, planting of deciduous trees and creepers along the court walls will reduce the amount of reflected light from the walls.³² Grass and vegetation also reduce undesirable reflection during the summer months. A high degree of temperature control can be attained by the use of carefully selected planting. An enclosed court garden is effective in the control of air temperature both in and around the house.

³¹ Norbert, S., Seeman, S. (1962). *The Court-Garden House*. Montreal: McGill University Press.

³² Norbert, S., Seeman, S. (1962). *The Court-Garden House*. Montreal: McGill University Press.

In winter a higher temperature can be gained within the introverted nature of the courtyard space by trapping heat rays of the sun and by reducing the wind factor by means of the enclosure of the wall.

In general, it is important to improve the microclimate of the courtyard so that the outdoor season can be extended. The concept of the courtyard as a social space takes on a greater significance when one realizes the importance of outdoor activities in cold climate areas. In contrast, significant differences in comfort level can be produced by the configuration of the courtyard height, width, color, location of buildings and the massing of plants within the space.³³

³³ Mänty, J. (1988). *Cities Designed for Winter*. Helsinki: Norman Pressman Building Book Ltd.

05- *Investigation of the courtyard*

Throughout history the courtyard house has played a major role in many countries of the world, and perhaps the idea can benefit Ottawa's current density problem, which is intrinsically urban in character.

Downtown Ottawa is full of empty lots, which do much harm by de-urbanizing the city. To create diversity, and add a human touch, courtyard buildings can be used as infill structures whether the project is a single story or multiple stories. The courtyard design can easily be knitted into the existing urban fabric to create dynamic spaces, as it can be linked to other units on three sides.³⁴ The quality of adding onto a house type on three sides also allows for linking different units so that the growing or shrinking modules can be realized with minimal constructional effort. This degree of flexibility could encourage a turning away from the ideal of a self-contained dwelling in favor of open structures that are no longer bound to property lines. The courtyard requires very little surface area and can be used as an energy garden that is comprised of glazed surfaces in combination with storage walls oriented towards the sun. It thereby realizes energy gains and creates transparent living spaces.

An important aspect of the courtyard house is that many of its advantages are difficult to obtain by means of other

³⁴ Pfeifer, G., Brauneck, P.(2008) *Courtyard Houses: A housing Typology*. Boston: Springer.

residential building-types,³⁵ such as the semi detached house, the linear high-rise block, and row house (fig. 28).

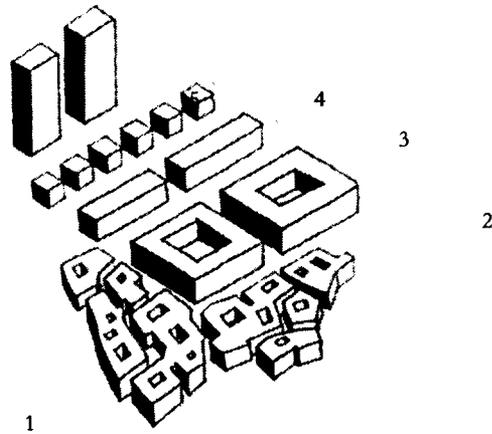


Figure 28 Comparison of the major housing typologies in the world: (1) courtyard housing, (2) European perimeter block, (3) terraced or row houses, (4) detached or villa housing, (5) high-rise blocks.

According to Brian Edwards, the courtyard type is beneficial in a number of ways: “ by covering the land surface with a relatively even spacing of buildings and open areas, the internal environment of the dwellings is moderated to the advantage of the occupants. Furthermore, the external streets and lanes are also sheltered from the sun, wind and rain.”³⁶ The second advantage is that by enclosing the courtyard, the inner court and the exterior space looking at the street together creates a high level of surveillance.³⁷

³⁵ Schoenauer, N., Seeman, S. (1962). *The Court-Garden House*. Montreal: McGill university press.

³⁶ Edwards, B. (2005). *Courtyard Housing: Past, Present, Future*. New York: Ingram Content Group, Inc.,

³⁷ Edwards, B. (2005). *Courtyard Housing: Past, Present, Future*. New York: Ingram Content Group, Inc.,

06- *Land use strategy*

The city of Ottawa's current strategic direction is to make more effective use of existing land and infrastructure and avoid the outward sprawl and density of the 1960's. Within this framework it is helpful to look at the work of Martin, March and Trace, researchers at Cambridge University who investigated the nature of efficient land use in 1968. Their findings are still useful today as we search for ways to improve the efficiency of land use in cities. In their research, Martin, March and Trace explored what building forms make the best use of land. The definition of optimum land-use can be linked to quantifiable parameters, such as the built potential and ratio of floor area to the built form. Martin and March examined a number of simplified or archetypal forms. They tested a wide range of building forms against the criterion of sun penetration: terrace housing at various heights, blocks, slabs, T-shaped and other kinds of towers. This allowed them to limit the complexities found in real urban textures and to examine and compare the impact of geometry alone.

In the figure below (fig. 29) we can see Martin and March compare two forms: the courtyard and the pavilion type found in North America. Both types cover 50% of the site and carry the same floor area and height.³⁸ The first interesting observation is how much more open space (white) there seems to be in the courtyard option. This is

³⁸ Leslie, M., Lionel, M. (1972). *Urban Space and Structures*. Great Britain: Cambridge University Press

because open areas “clot” together, instead of being dispersed around pavilions, which in environmental terms is a critical characteristic of courtyards.

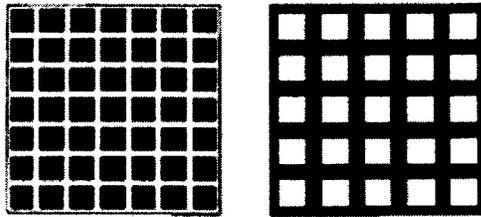


Figure 29 Two archetypal urban patterns, based on pavilions and courts (black represents buildings) with the same coverage, building height and total floor space.

An important aspect of the work of Martin, March and Trace was their use of earlier research ideas. At the end of the 19th century, Raymond Unwin (1863-1940) a British engineer, architect and town planner investigated the improvement in working class housing.³⁹ His direct successor was Ebenezer Howard who was known for his publication of the *Garden Cities of To-morrow* (1898).⁴⁰ In this book, Howard described a utopian city in which people live harmoniously together with nature. The publication resulted in the founding of the garden city movement and the Garden City tradition. Based on the publication it was observed that as population increases around the perimeter of a town, the commuting time (distance from the center) is increased by less than the direct proportion to the increased population. This is shown in Fresnel’s diagram below (fig. 30).

³⁹ Miller, M. (1992). *Garden Cities and Town planning*. New York: Leicester University Press.

⁴⁰ Miller, M. (1992). *Garden Cities and Town planning*. New York: Leicester University Press.

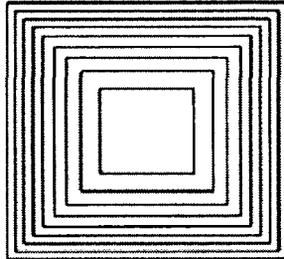


Figure 30 Fresnel's diagram: all concentric squared annuluses have the same surface area, which is also equal to the area of the center square.

In their work Martin, March and Trace continued the investigation begun by Ebenezer Howard using the center logo in order to emphasize the effectiveness of distributing the built volume on the perimeter of a site, creating the courtyard shape, and placing the centralized form to generate the pavilion form.

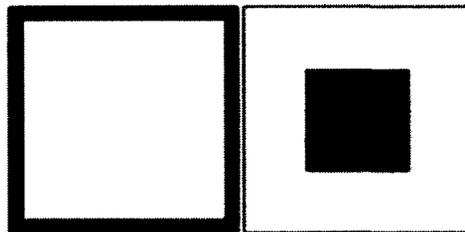


Figure 31 Martin center logo, where the surface area of the black perimeter on the left (court archetype) is the same as the central square on the right (pavilion archetype).

In their work, the Cambridge researchers then extended the same kind of reasoning in three dimensions. Here we can imagine a comparison between the two forms presented below:

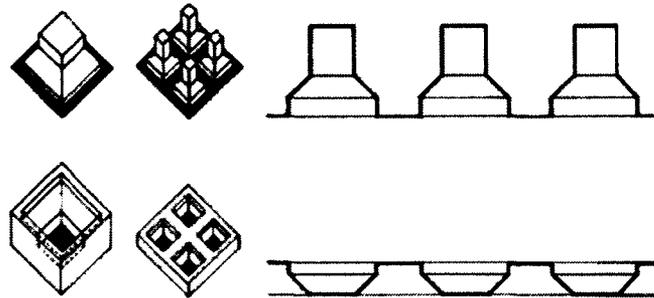


Figure 32

As we can see in (fig. 32) a pavilion and a courtyard (also called antiform), each equate to the same floor space and the same internal depth of room. As a result “the court form is seen to place the same amount of floor space on the same site area with the same condition of building depth and in approximately one-third the height required by the pavilion form”.⁴¹

In their work Martin, March and Trace examined the courtyard for its efficiency but also in terms of intake of daylight. Martin and March concluded that for the most part, courtyards behave better than pavilions depending on how they are built from the point of light penetration and land use.

⁴¹ Ratti,C. Raydan,D. Steemers,K. (2003). Building Form and Environmental Performance: Archetypes, Analysis and an Arid Climate.

March and Martin's analysis remains one of the most significant pieces of research ever to have been undertaken on urban built form. As G. Broadbent remarked "Until recently so few architects have seized the opportunities which March and Trace had provided for building such urban forms."⁴² If we can expect a denser form of living accommodations in the future with the courtyard type as March and Martin's research states, then it is certainly a worthwhile undertaking to identify as well as document the salient characteristics of significant existing courtyard types.

⁴² Broadbent, G. (1990). *Emerging Concepts in Urban Space Design*. NY: Van Nostrand Reinhold.

07 -Type forms

The courtyard type allows for many different interpretations. No two examples are ever alike. Typology is basically systematic. Within any system many variations of interpretation are always possible. In all cases the result is that the courtyard houses are perceived as individuals, each having their own identity-but of a same family⁴³. Once we understand the framework and fundamentals of one type of courtyard we can familiarize ourselves with various types.

The garden courtyard, also called the single bar parti, is organized around an enclosed garden. By definition it does not constitute a courtyard but within an urban framework, the space between a building and its neighbors assumes the quality of a formed outdoor place.⁴⁴

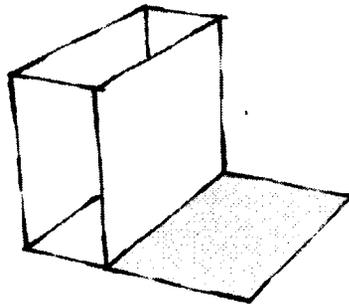


Figure 33 – The garden courtyard

⁴³ Habraken, J.N. (1988). Type as a Social Agreement. Retrieved from habraken.org/html/downloads/type_as_a_social_agreement.pdf.

⁴⁴ Polyzoides, S., Sherwood, R., and Tice, A. (1992). *Courtyard Housing in Los Angeles: a typological analysis*. New York: Princeton architectural press.

Relatively speaking, the garden courtyard is a rare type because, most often, buildings of this kind are added to and are transformed over time into higher order partis.⁴⁵ This type is ideally suited for dense urban housing developments as it creates a very intimate space when other buildings surround it on all three sides.

Another form of courtyard is the double bar parti, which is not very common⁴⁶. In the evolution of the courtyard type it is an intermediate stage leading to the most common form of courtyard, which is the U-shaped configuration.

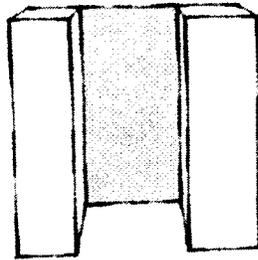


Figure 34 – Double bar parti

The courtyard in the double bar parti arrangement is too narrow for a developed landscape or for a rich private extension off the individual's unit. The configuration makes it difficult to adjust architecturally to the automobile. The double bar parti can be used to its potential when a corner site gives access to multiple side entrances with an access into a central courtyard space.

⁴⁵ Polyzoides, S., Sherwood, R., and Tice, A. (1992). *Courtyard Housing in Los Angeles: a typological analysis*. New York: Princeton architectural press.

⁴⁶ Polyzoides, S., Sherwood, R., and Tice, A. (1992). *Courtyard Housing in Los Angeles: a typological analysis*. New York: Princeton architectural press.

The shared courtyard house consists of several building volumes that, to their specific arrangement, create a courtyard. Historically, the shared courtyard house type originates from farms located in municipal areas enclosed by city walls.

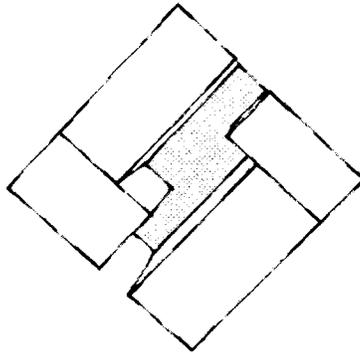


Figure 35 – The shared courtyard house

These farms were used to accommodate a stable, barn, servants' and main house on a confined lot.⁴⁷

The L-shaped floor plan offers maximum daylight exposure and economic use of space.

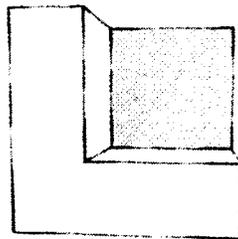


Figure 36 – L-shaped courtyard

⁴⁷ Pfeifer, G., Brauneck, P. (2008). Courtyard houses: A housing Typology. Boston: Springer.

Despite the benefits the L-shape floor plan has to offer, the organization of the floor plan is a serious challenge when options are considered for attaching neighboring units to the sides of the house. Typically the L-shaped court opens up to the street, probably to conceal automobiles behind the bar of the leg farthest from the street. In general the L-shaped courtyard provides many advantages to the city. The large, pleasantly landscaped courtyards open directly to the sidewalk substantially expanding the public realm.

A group of L-shaped houses illustrates the potential of the L-shaped house type within a housing development structure.

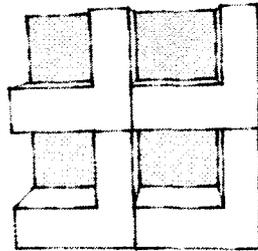


Figure 37 – A group of L-shaped courtyards

Intelligent floor plan zoning with focus on orientation and staggering of levels can create very efficient housing development structures.

The patio house type utilizes several small courtyards cut out of the building volume to naturally light the floor space with the additional benefit of creating interesting spatial relationships.

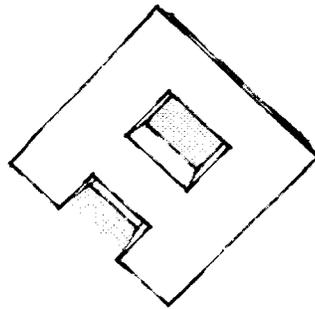


Figure 38 – The patio house type

Individual patios can be arranged on different levels. In combination with courtyards, this allows for highly versatile floor plans.

The U-shaped courtyard is the most common and typical courtyard-housing scheme.⁴⁸ The U-shaped plan wraps three sides of the house together providing visual access to each side with a strong level of control in terms of privacy.

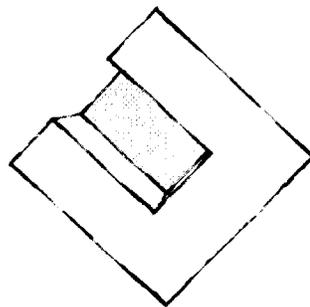


Figure 39 – U-shaped courtyard

⁴⁸ Pfeifer, G., Brauneck, P. (2008). Courtyard houses: A housing Typology. Boston: Springer.

Due to the great number of observed examples of the U-shaped types, there are many interesting variations of the idea. This type can transform from a detached-unit, single storey building to a two-storey attached unit and more.

The atrium-type house, also known as the four-sided courtyard type, is the spatial center of the house contrary to the patio house in which one or more courtyards can be arranged in different locations within the floor plan.⁴⁹

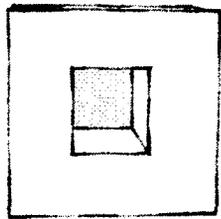


Figure 40 – The four-sided courtyard

The inner courtyard also serves as a circulation zone, a recreational space and an access zone to adjacent rooms.

Throughout various forms of courtyard types, the sense of enclosure, private green space and the notion that the courtyard type can hold much higher density versus other types of buildings in crowded cities is what makes the courtyards fascinating and important to understand. Making the courtyard type is thus a question of logical form.

⁴⁹ Pfeifer, G., Brauneck, P. (2008). *Courtyard Houses: A housing Typology*. Boston: Springer.

Site Analysis

The new courtyard Housing

The site I have chosen in Ottawa is situated on the southeast side of the intersection of Bay Street and Gloucester Street. The subject site is zoned R5B [482] H(37) – Residential Fifth Density Zone, Subzone B, Exception 482, Maximum Height 37m. The purpose of the Residential Fifth Density Zone is to allow a wide mix of residential building forms including mid-high rise apartment dwellings, and regulate development in a manner that is compatible with existing land use patterns so that the mixed building form, residential character of a neighbourhood is maintained or enhanced.

The Floor Space Index for the site is 3.0. The site area is 2144m² indicating that the floor space index will be 6432m². The proposed project has a total 6719m² and therefore a zoning variance will be required in order to accommodate the proposal.

Gloucester Street is considered the front lot line for the purposes of the zoning review. Five low-rise vacant buildings, which once occupied the site, have been demolished.



Figure 41 – Site contour

The subject site is located at the edge of three neighborhoods that are distinguishable based on their built form and uses: the central business district (CBD) to the northeast, characterized by high-profile office buildings; the Upper Town area to the north and northwest, characterized primarily by high-profile apartment buildings; and the West Centertown area to the south, characterized primarily by low-profile residential buildings (fig. 42).

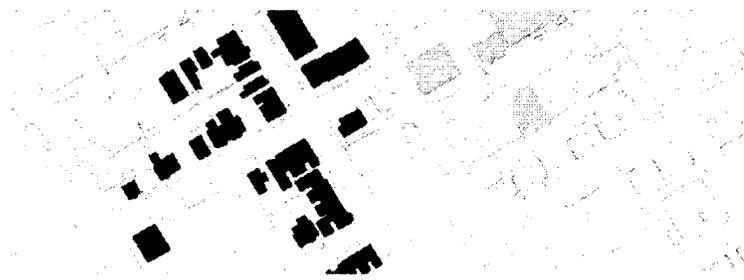


Figure 42 - Low profile residential High profile office buildings and apt.

Given the site's location in a transition zone between these neighborhoods, the surrounding area is very eclectic and includes older low-profile buildings, new townhouses, high profile apartments and office buildings, and several underutilized and vacant lots.

The site immediately to the north, across Gloucester Street, is occupied by the eight-storey Crystal Arms apartment building at the northeast corner of Gloucester Street and Bay Street. Further to the east of this block, lining the north side of Gloucester Street, is a two and-a-half storey row-house consisting of three dwelling units. The two and-a-half storey Victorian row house is occupied by a bed and breakfast and a language school, a five storey concrete garage and an eleven

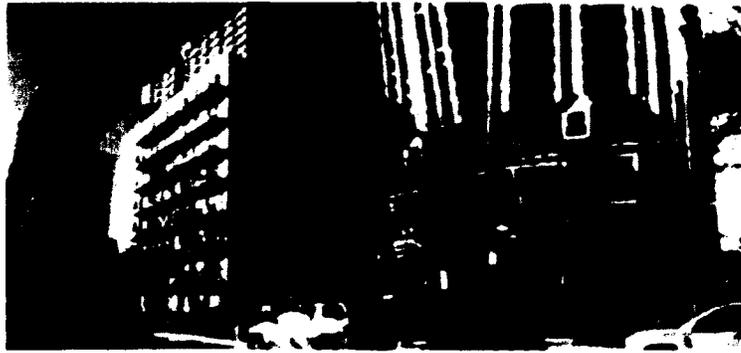


Figure 43 - North of subject site: 8storey apartment and a bed and breakfast row house

storey apartment building and a twenty-three storey apartment building.

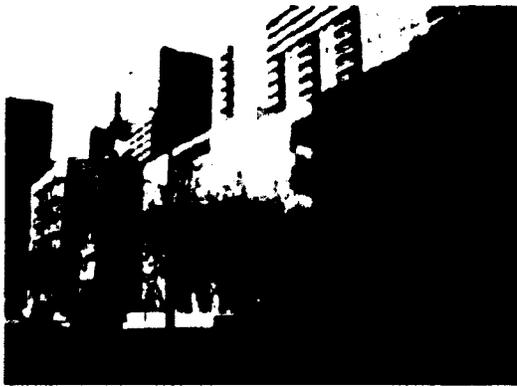


Figure 45 - Parking Garage



Figure 44 - Convenient store on the southeast corner of Gloucester and Bay Street, directly adjacent to subject site



Figure 46 - Pizzeria and a convenience store

The southeast corner of Gloucester and Bay Street, northwest and directly adjacent to the subject site is occupied by a two-storey convenience store ().

The south of the subject site includes a two-storey building at the corner of Nepean Street and Bay Street, which features Ricardo's pizza at grade and a residential unit on the second storey. A Hydro Ottawa substation, two and-a-half residential buildings, and a two and-a-half storey office building are located along the south side of Nepean Street.



Figure 47 - Pizzeria on ground floor and residential on the second floor.



Figure 48- Hydro Ottawa substation

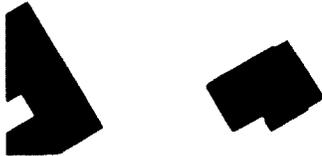


Figure 49- School and hydro substation

To the west of the site is the Centennial Public School. Parking access to this school is located on Percy Street. North of the Centennial public school, across Gloucester Street, are twenty-eight storey apartment buildings which dominate the visual landscape at that location.



Figure 50 - Centennial Public School

To the immediate south of the school, on the west side of Bay Street is a recent development of infill townhouses.



Figure 51- Town homes

A mix of residential characterizes the surrounding site and office uses of various built forms. Most of the low-rise buildings are located to the south toward the core of the primarily residential West Centretown community. High-rise buildings and office buildings are located to the north within the central business district and the primarily residential Upper Town area. The subject site is located in a transition area between these neighborhoods.

The site is located close to the following amenities: St. Patrick adult school, Centennial Public school, St. Patrick Basilica, Nanny Goat Hill community garden, Bronson, Dundonald and McNabb park and arena, the Central Public Library, a commercial corridor along Bank Street and Somerset Street West. Bike lanes along Bay Street, Percy and Laurier Avenue West are provided. In addition, the surrounding site serves as a major hub for the Ottawa area, including numerous federal government and private sector tenant-occupied office buildings. In addition to being in proximity to areas of work, the site has access to several transit stations along Slater and Albert Street.

The road network along Gloucester Street is a one-way system heading west. Nepean Street is one-way heading east and Bay Street is one-way heading north.

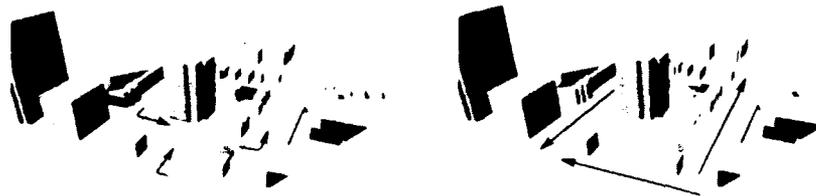


Figure 52- Circulation network

Design Proposal

The new courtyard housing

Ground Level

When I began the design process, I wanted to increase the density of the area by being sensitive to the site and creating a very subtle change to the existing condition. On the ground level along both ends of the site, there already existed two commercial buildings: one was a convenient store and the other a pizzeria. Since the City of Ottawa, encourages commercial space and infill within new complexes, the decision was made to integrate these existing commercial structures into any new project:

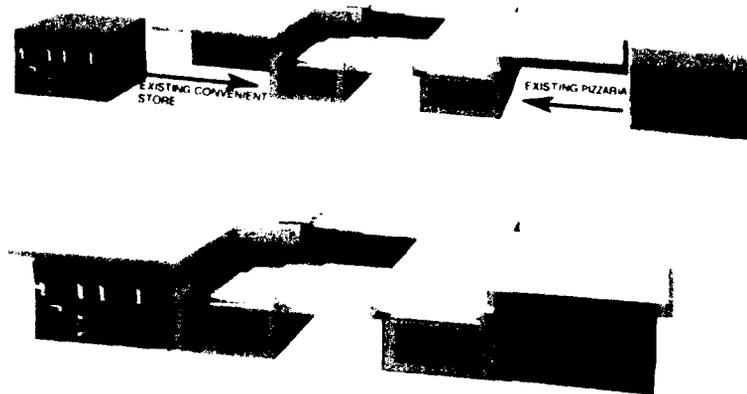


Figure 53- Existing convenient store and pizzeria integrated as part of the design

* Retrieved from http://www.ottawa.ca/city_hall/ottawa2020/official_plan/vol_1/03_design_land_use/index_en-06.html

While the courtyard form allows for an easy integration of old and new structures, it also allows for walls to be shared, thus improving the thermo conductivity of the final building. It was therefore critical to use these two commercial buildings and integrate them as part of my design. These two commercial buildings are then attached to newly built commercial space at grade. The presence of these connected commercial spaces will help create diversity and enliven the character of the existing convenient store and pizzeria. By blending old and new commercial spaces, public space is enhanced without disrupting the established community unnecessarily. In the center of the commercial spaces a central courtyard is presented. The courtyard serves as both an entry from and a connection to the outdoors thus joining the inside and outside and enriching the urban experience. It becomes a place for social opportunities to occur.

The concept of the courtyard as a social space takes on a greater significance when one realizes the importance of outdoor activity in colder climates as well as the need for public space. The need for increasing densities in urban residential development could result in terrestrial green space being reduced or lost. In the urban core the provision of green space is usually already severely limited. Areas of green can provide accessible space for people to enjoy while providing seating, shops and a place to play or relax.

Height

Earlier in this paper, it was shown that researchers Martin and March concluded that the best courtyards in terms of light penetration were those no greater than 4storeys in height. The limit of the height of my design is based on this research.

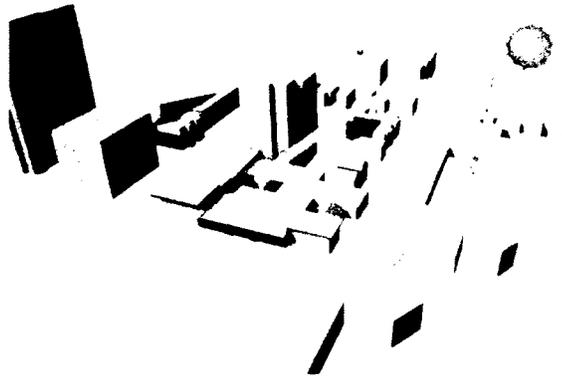


Figure 54- Light entering the courtyard

Since I wanted to create as pleasant a space for residents as possible, the use of tall buildings was discounted, since a tower would have affected airflow and most likely would have caused strong gusty winds, and produce severe overshadowing.

Parking

Parking for the commercial spaces and for the residents above will be provided underground. In addition, the Zoning By-Law requires a total of 19 parking spaces for the 30 residential units (15 for residents and 4 for visitors). This parking requirement is satisfied in the proposed building being that there is space provided for 60 parking spaces.

Underground parking has multiple benefits since it allows precious outdoor areas to serve as public space amenities for residents, rather than functioning as driveways and parking. Public resident use also allows opportunities for landscaping.

Form of units

The most common courtyard in the past was the four-sided wall court also known as the atrium-type house.

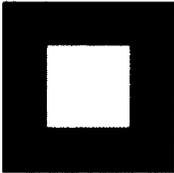


Figure 55

This form appears in Martin and March’s research as well as in Brian Edwards book (*Courtyard Housing: Past, Present and Future*).

Therefore in exploring the use of the courtyard form for this project I took the concept of the four-sided wall court plan and began to re-arrange the centralized court in order to generate different configurations.



Figure 56- Different arrangements of the court and space

The next step in the investigation process was to arrange the interior rooms around the courtyard so that each could have a view and access to the court space and allow maximum daylight to penetrate each room. Since each unit is built around the courtyard space, each room is easily accessible to it and also acts as a circulation area to get from one space to the other. Retractable walls around the courtyard will provide the opportunity to open all the walls and create ventilation.

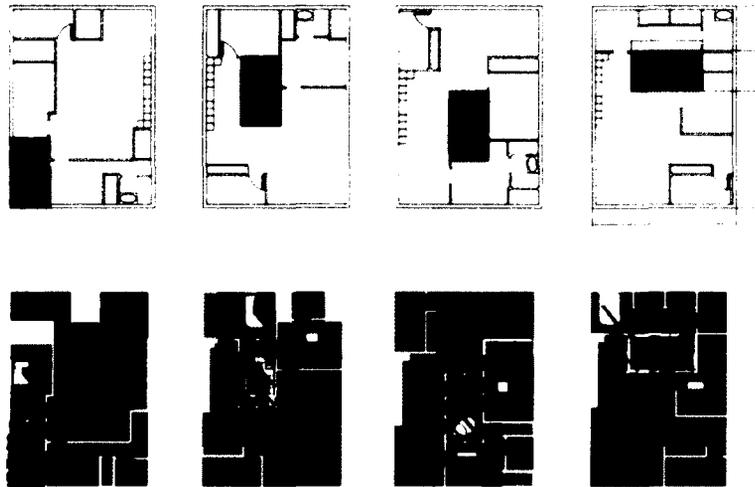


Figure 57- Courtyard plans arranged around the courtyard

An important goal was to provide private green space that is quiet and secure. It was important to me that every courtyard was open to the sky while maintaining complete privacy. Therefore the stacking of the individual units was done in such a way that no unit on a higher level would close off the courtyard on the lower floor or have access to it visually from above.

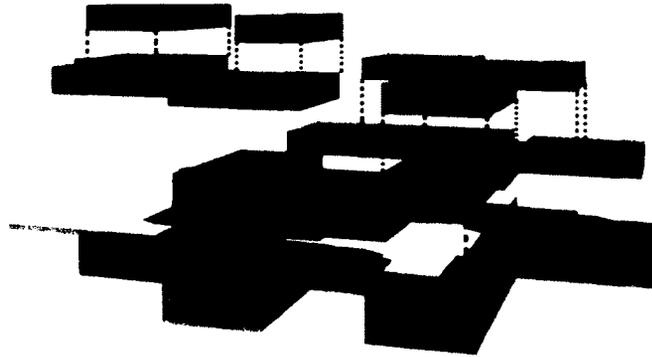


Figure 58- Stacking of the units, every courtyard is open to the sky

With respect to the contextual influences of geometry, street pattern, and building mass it was significant that the arrangement of these units fit the site harmoniously. Existing conditions are such that one side of the site is faced with low profile residential buildings while on the side are high profile commercial and office buildings. Hence on the low-profile residential side of the site, the units were stacked no more than three storey high. In this way it was hoped a smooth transition would occur vis-a-vis the surrounding neighbourhood and this would help to soften the impact of the sudden change in density.

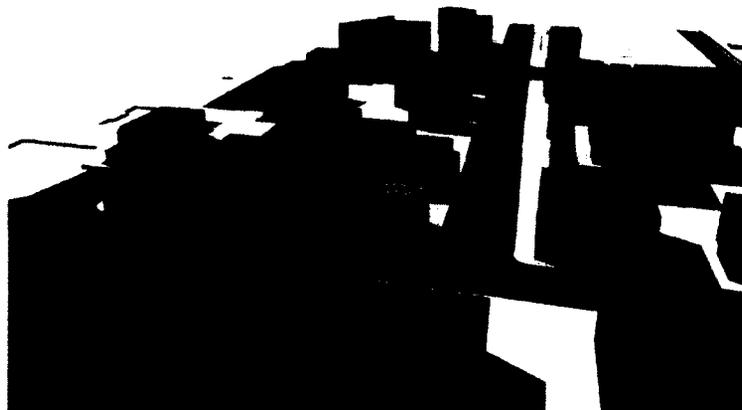


Figure 59- Half of the design addressing the site contextually

On the other half of the site, which consists of high profile buildings, the decision was made to use L-shaped, U-shaped patio type courtyards, because this allowed an arrangement which provided a courtyard space opened to the sky for each unit.



Figure 60- The other side of the building, using the L-shape, u-shape and patio type design

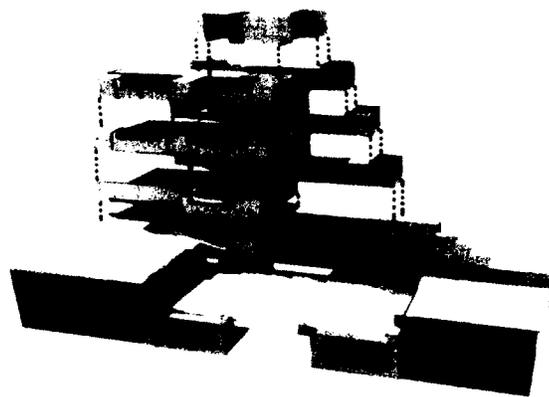


Figure 61- The L-shape, u-shape, patio type courtyard stacked

An important consideration in the design process was to create a hybrid courtyard design that addressed the two different site conditions, one side being low-rise and the other high-rise. As a result, the proposed development would house thirty units in total, ranging from two bedrooms to bachelor spaces, each having their own private courtyard space on 1,856.60m² of land. The four-sided wall courtyards measures 126m², while the courtyard within that space would be about 14m² and is a two-bedroom unit. The L-shaped courtyard measures 97.5m² with a courtyard space of 18m² and is a one-bedroom unit; the U-shaped court measures 159.5m² with a courtyard space of 18.9m² and is a two-bedroom unit. Finally the patio courtyard is a bachelor space measuring 53m² with a courtyard space of 13m². The building is also equipped with a gym on the first and second floor. The total floor area per level is the following: Ground Level (1535m²), Level 1 (1169m²), Level 2 (1775m²), Level 3 (793m²), Level 4 (530m²), Level 5 (530m²), and Level 6 (387m²) being that there is a total of 30units in the proposed building the average Unit Size will be 224m².

The City of Ottawa Zoning By-law requires a minimum landscaped area of 30% of the total lot area. The proposed project provides 681m² of un-built, landscaped area, which accounts to 30.75% of the total lot area of 2144m². (figs. 62-68).

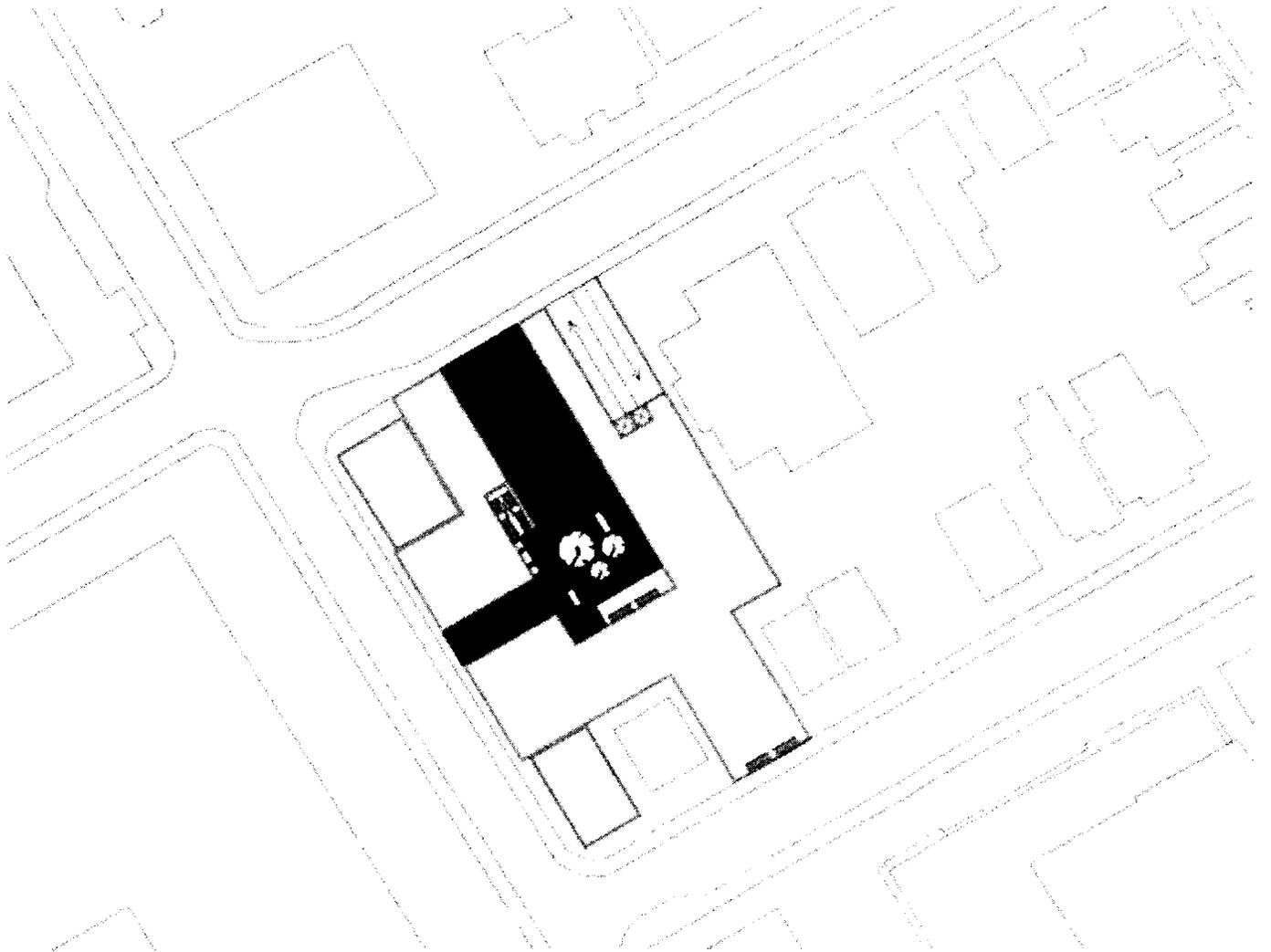


Figure 62

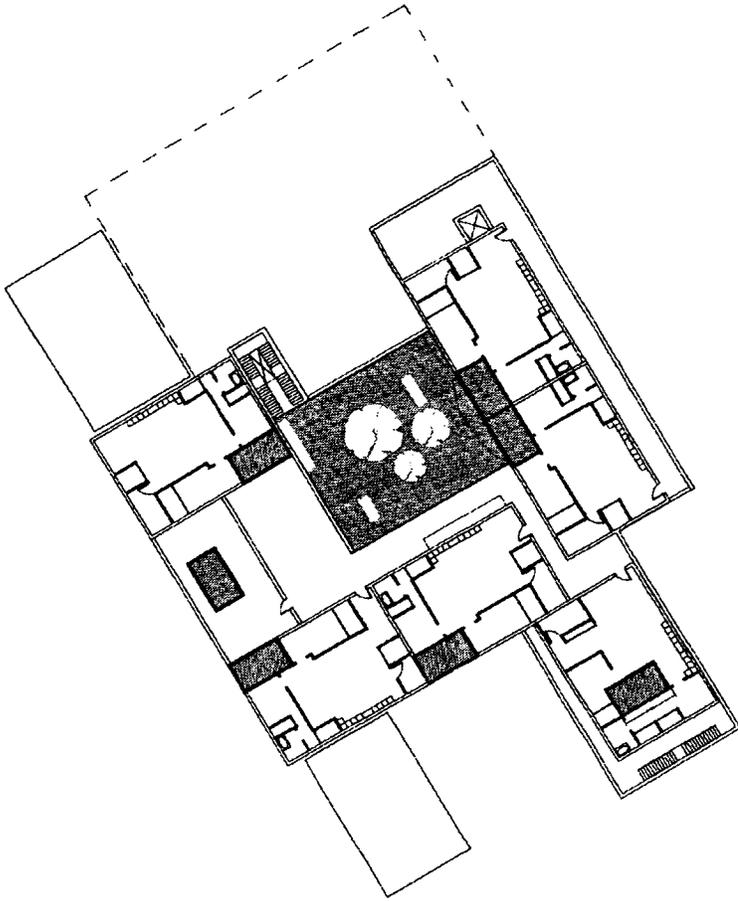


Figure 63 - Level One

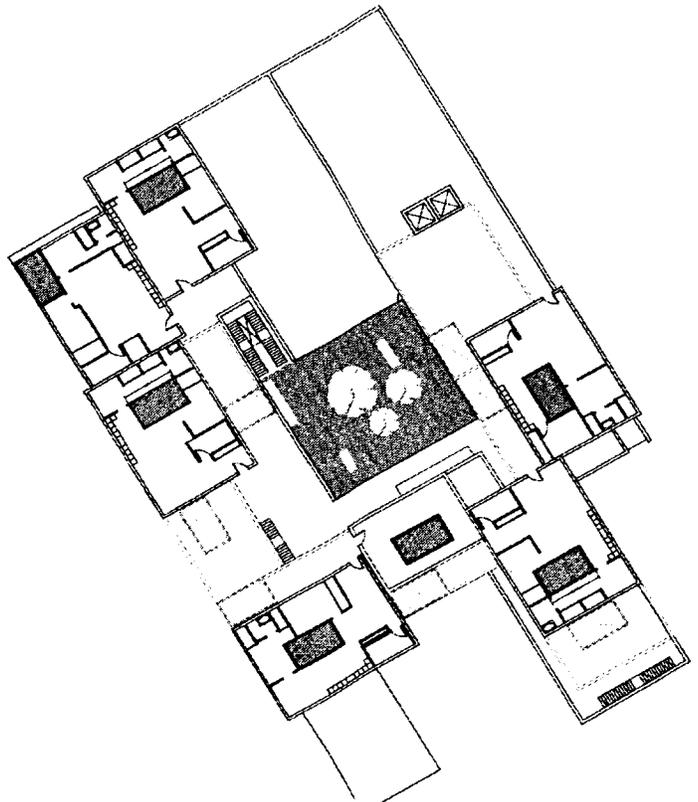


Figure 64 - Level Two

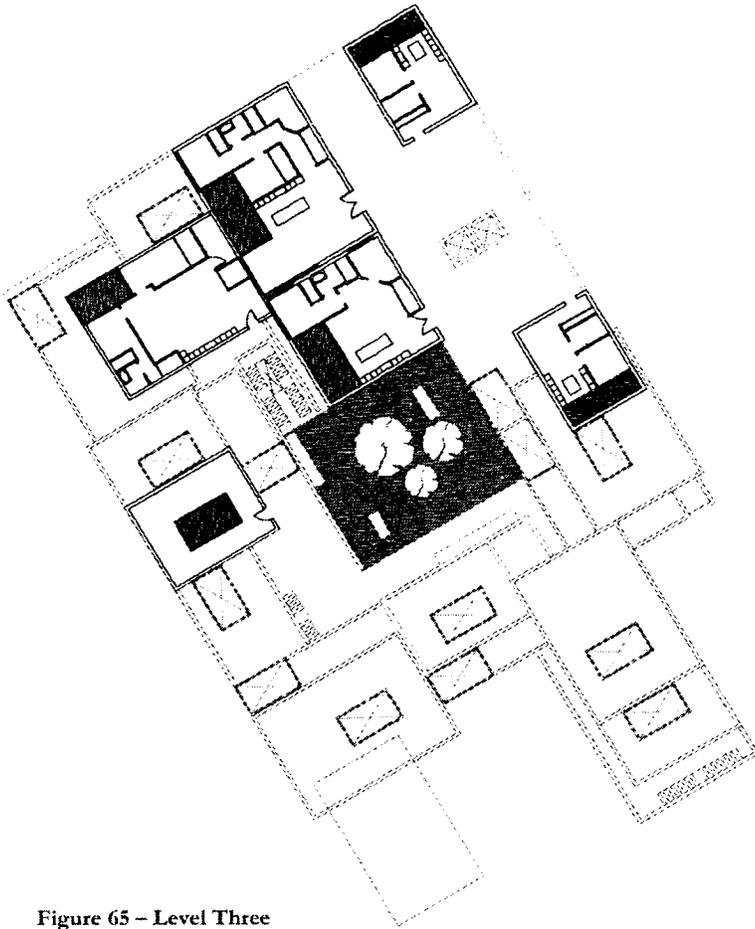


Figure 65 – Level Three

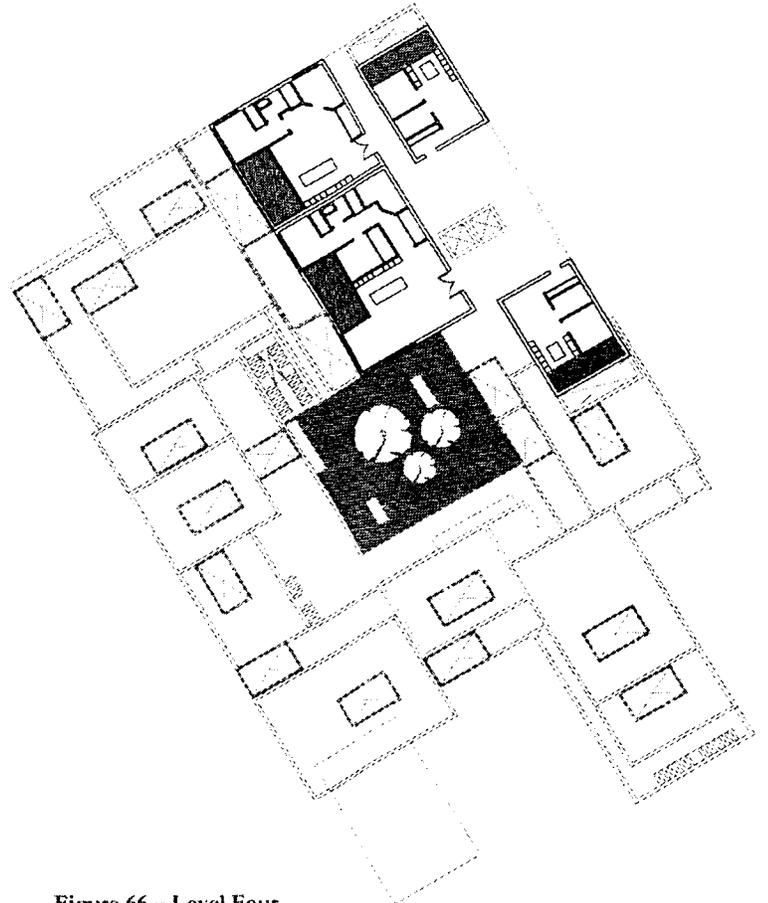


Figure 66 – Level Four

Figure 68 - Level Six

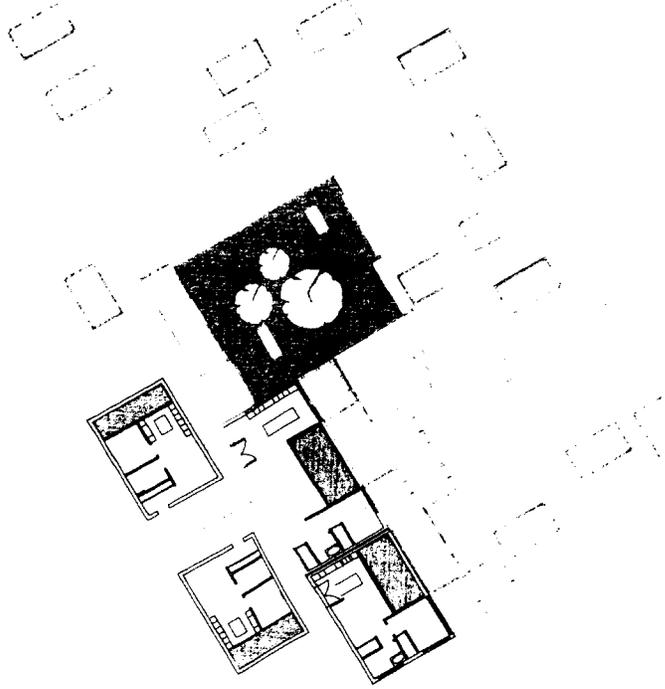
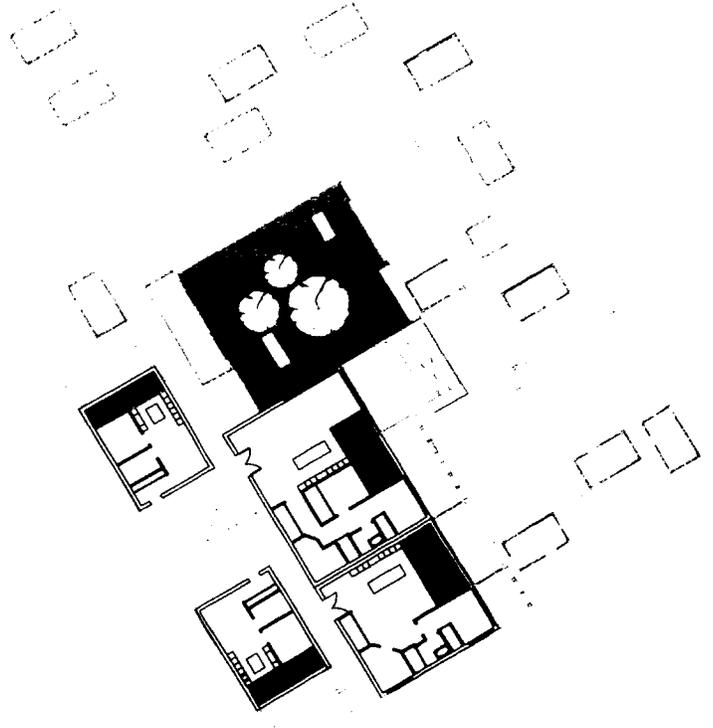


Figure 67 - Level Five



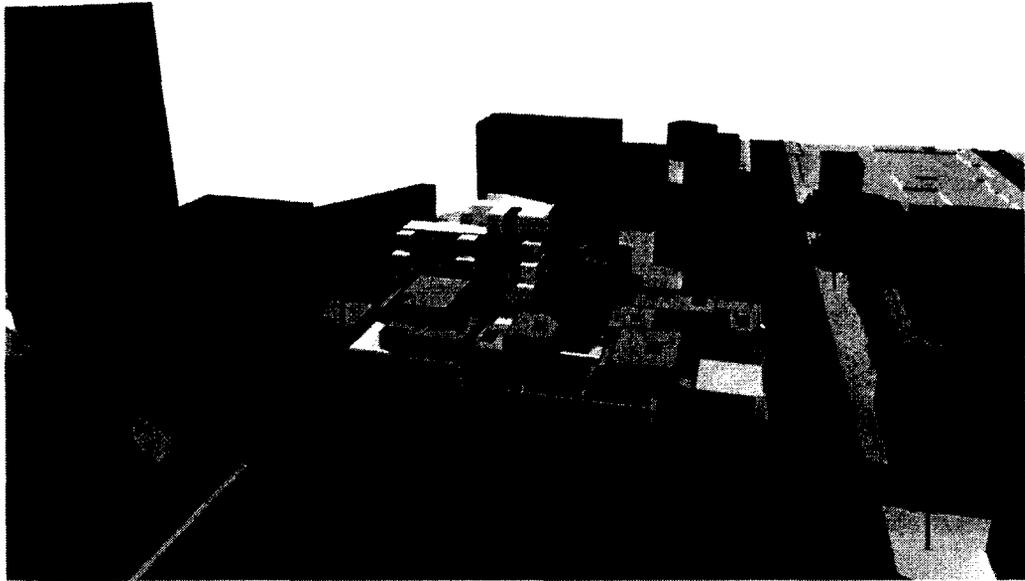


Figure 69- Building on site

The design as proposed is characterized by a clear distinction between public, semi-private and private spaces. Entering the building into the courtyard, the space is clearly a public space. Then moving towards the second floor, into the circulation area and into outdoor balcony areas, the spaces become semi-private, since not everyone could have access to that area. Since privacy is a key element in the courtyard design, an opportunity for residential units to be raised above grade, will also increase privacy along busy streets.

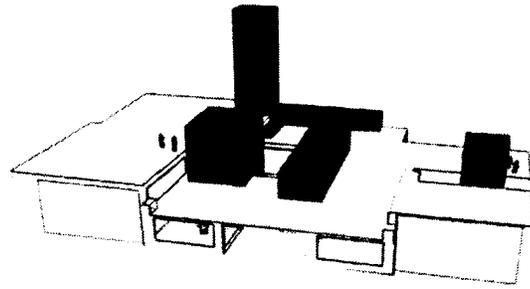


Figure 70- Circulation corridors

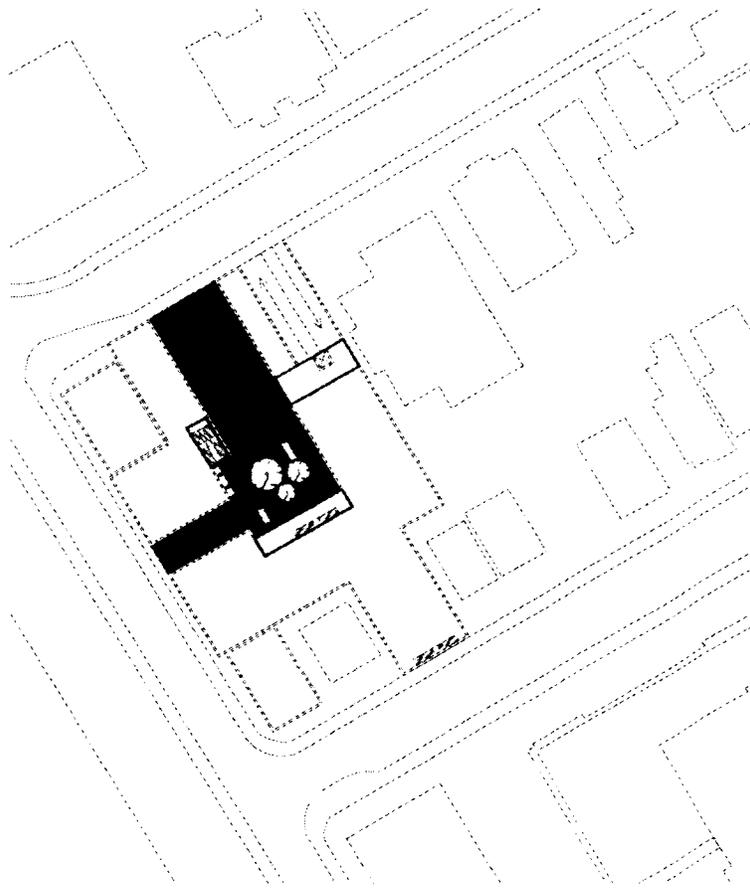


Figure 71 – Circulation Ground Level

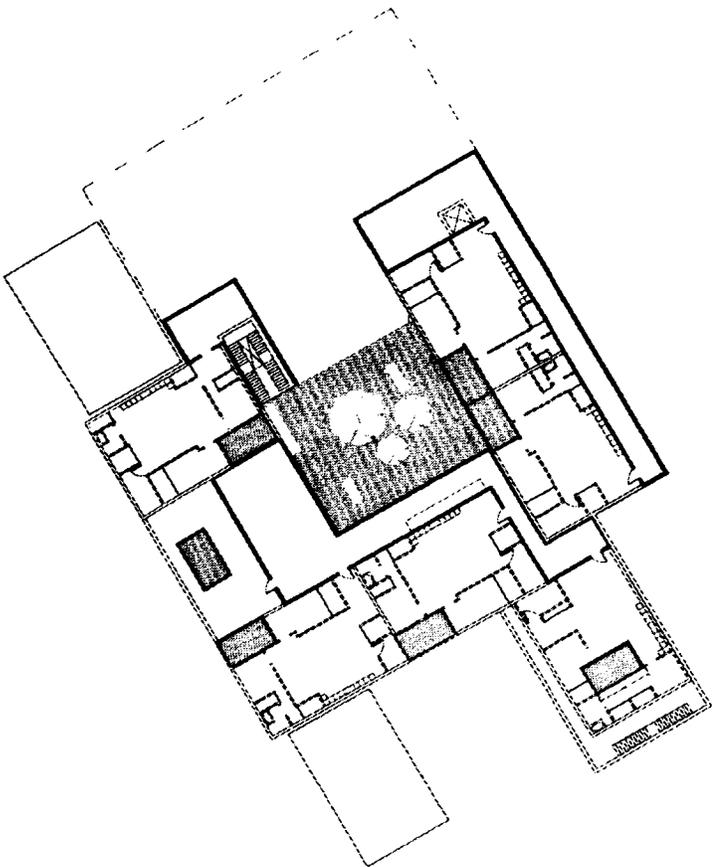


Figure 72 - Circulation Level One

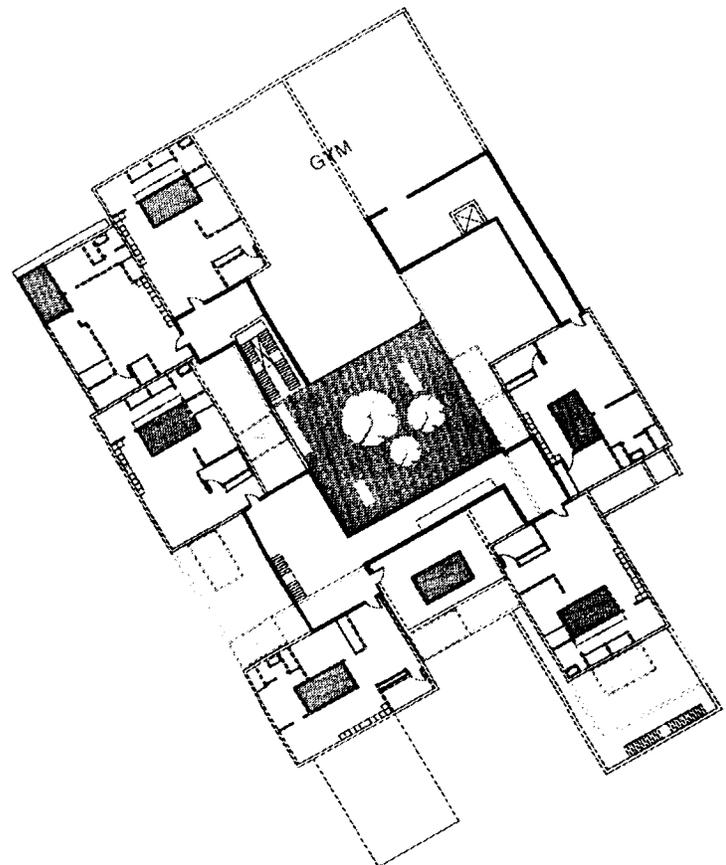


Figure 73 - Circulation Level Two

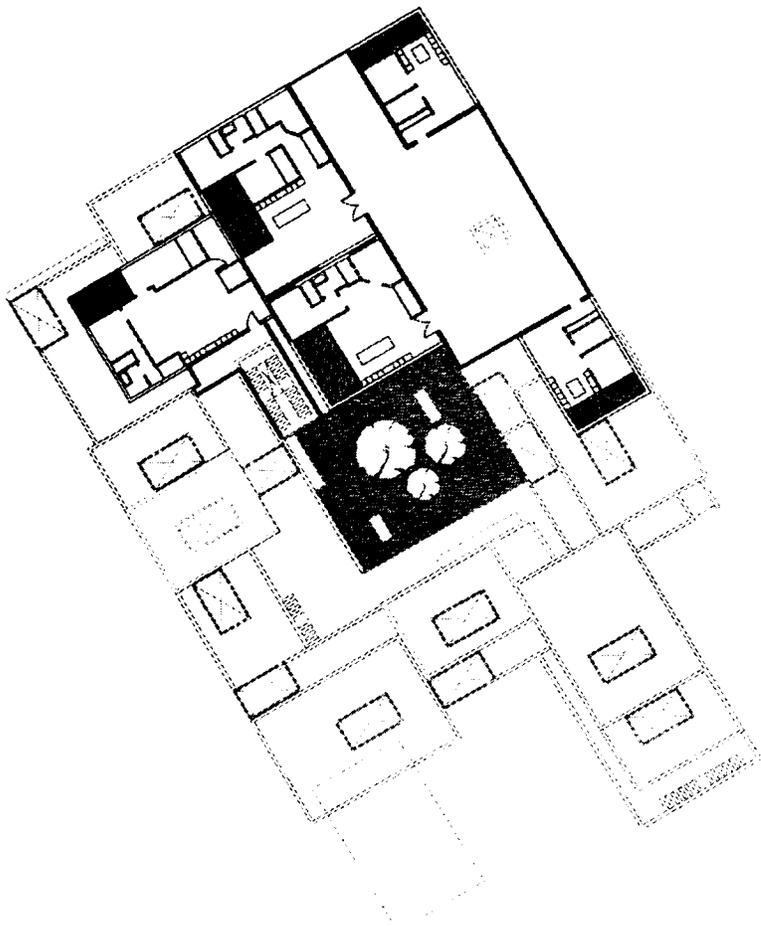


Figure 74 – Circulation Level Three

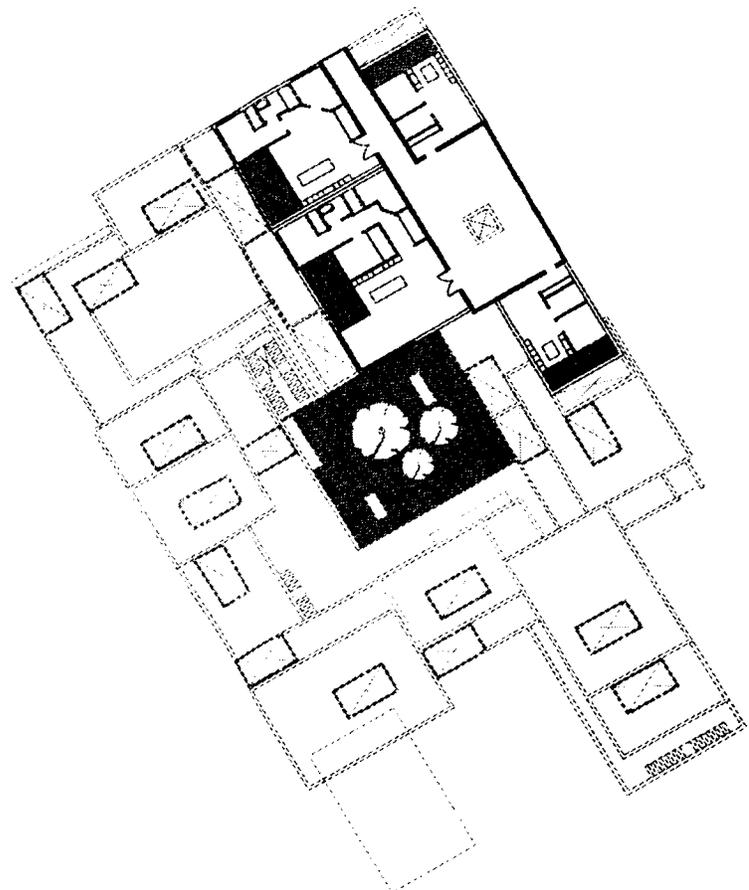


Figure 75- Circulation Level Four

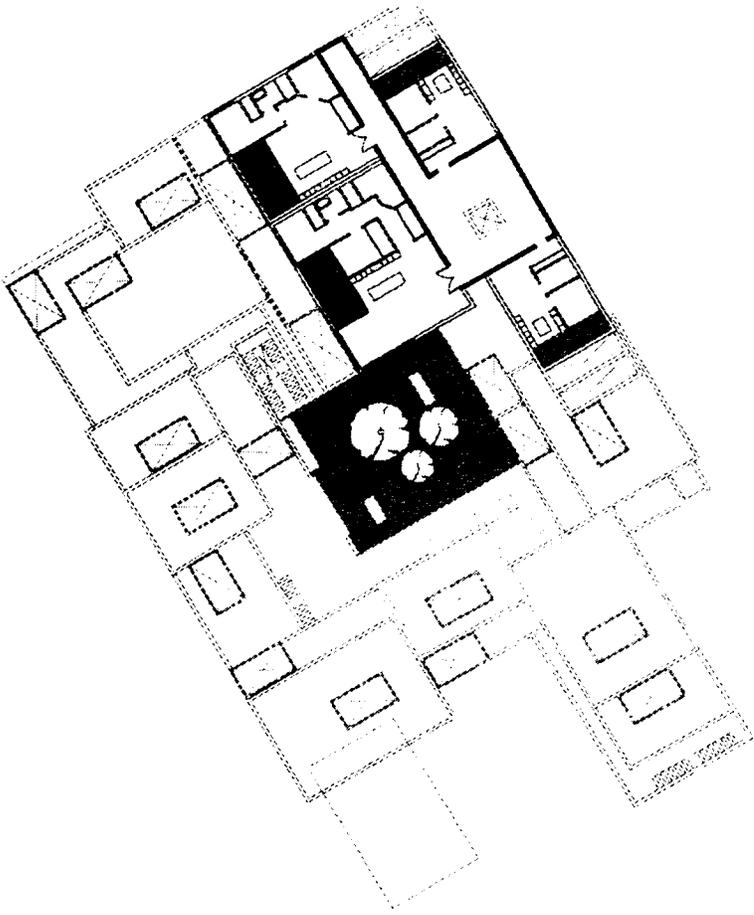


Figure 76- Circulation Level Five

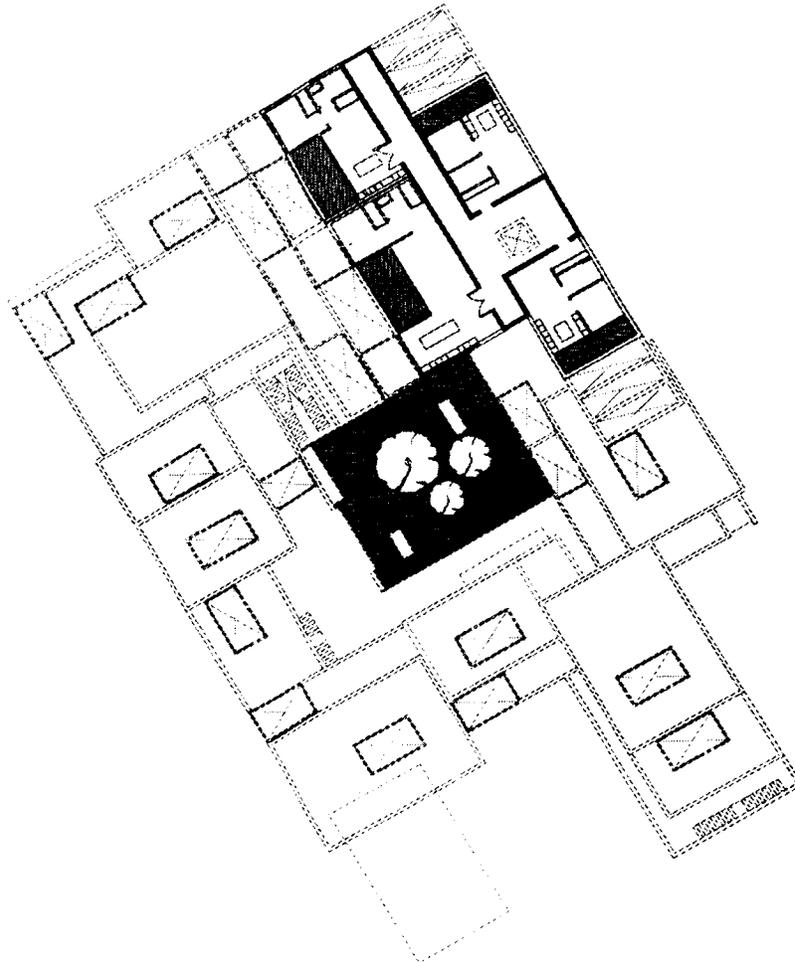


Figure 77- Circulation Level Six

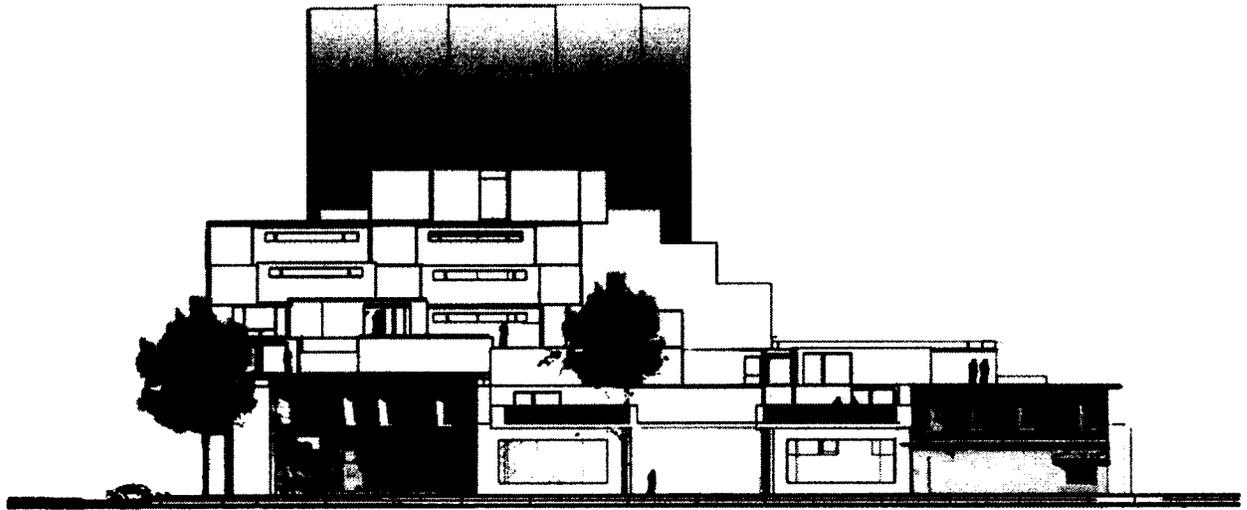


Figure 78- Elevation of the courtyard building

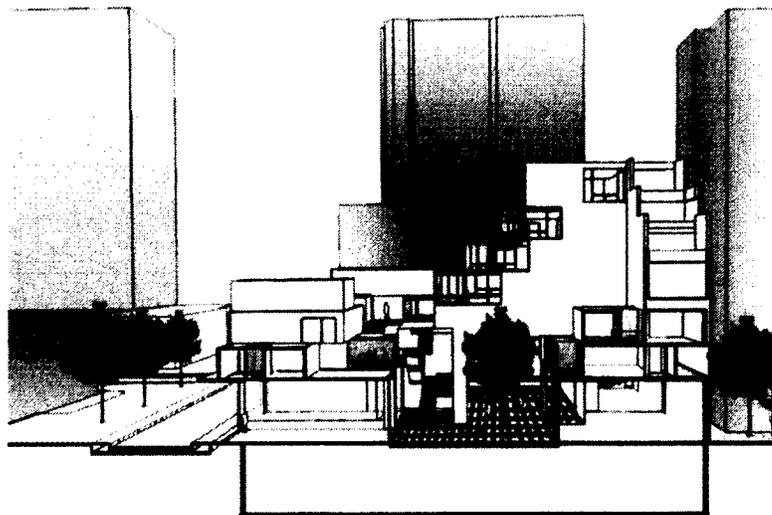


Figure 79- Cross section cutting into the central courtyard

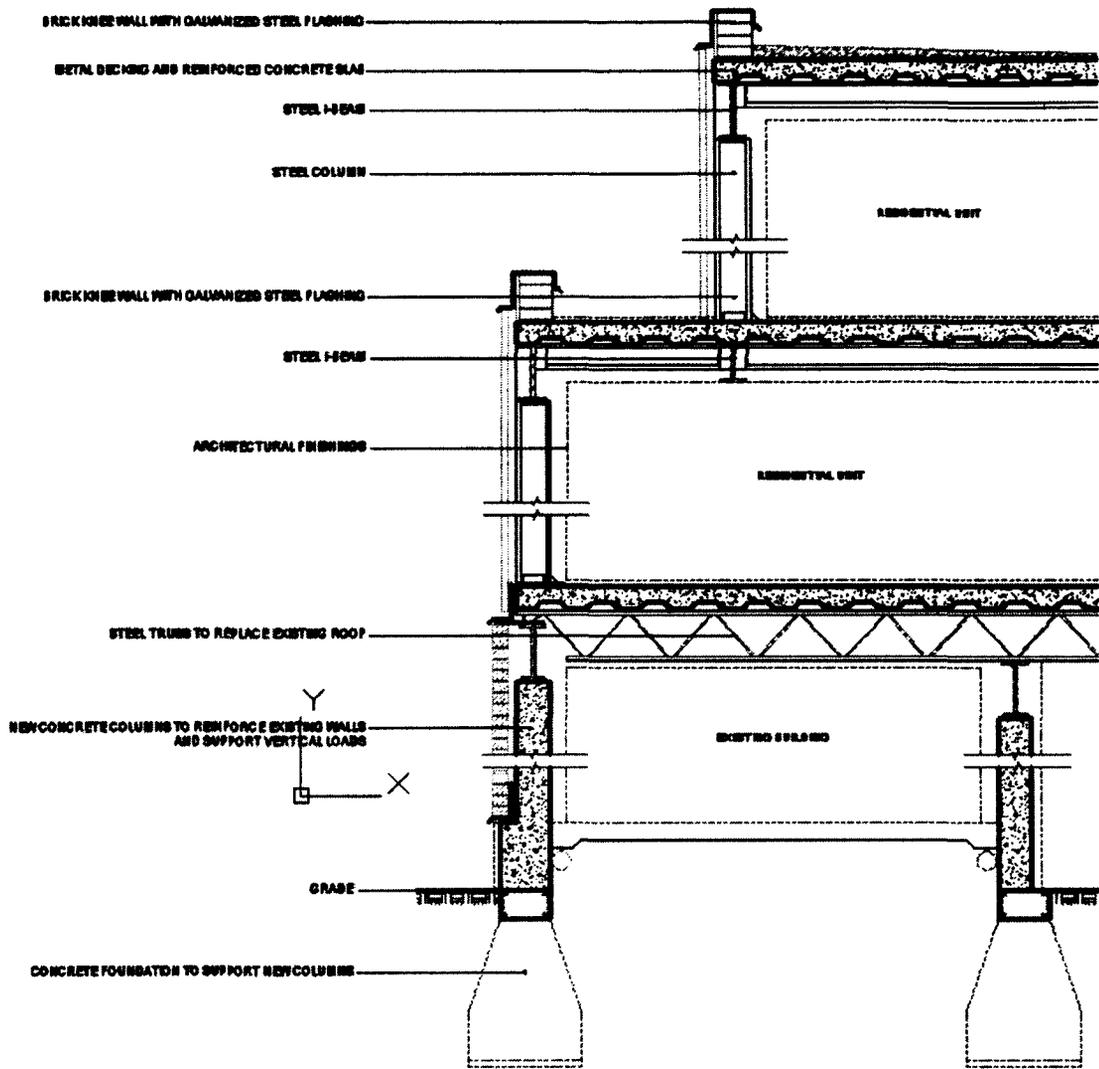


Figure 80- Detail of units over the convenient store.

Earlier in the paper it was noted that Schoenauer and Seeman say that the removal of snow in the relatively small area of the courtyard is economically feasible and practical through the installation of a radiant heating and drainage system in the ground. If residents are keen to garden all year round than the opportunity of having a glass retractable roof system over the court area could be considered.

Conclusion

Ottawa is a very multi-cultural city. Most of its recent population growth has been due to immigration. Therefore it is important to learn from the cultural heritage of newcomers. People from all over the world live in Ottawa, and the architecture of the city should start reflecting the needs of these diverse individuals in a creative and mutually beneficial way.

The aim of this thesis was to investigate the possibilities of a dense and different housing typology for downtown Ottawa. One can appreciate the virtues of compact living if one has access to a private garden in an urban area. If we can provide green spaces, and distinguish the difference between public, semi-private and private spaces than perhaps residents will consider multi-unit apartment buildings as a true alternative to the suburbs. As this research shows, there are many ways of using the courtyard typology. The ability to adapt the courtyard to a variety of shapes and sizes makes it a suitable shelter-type adaptable for all income groups. Its variety and conformity to different lifestyles makes it a housing typology for all cultures. Its adjustability to all climates makes it a house for all seasons and its continuous reoccurrence in history and its sustainability makes it a housing typology suitable for all time.

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“ Courtyard house is a model of low-energy design... support social activity of a house... when clustered together may form a sustainable city”.

Brian Edwards, Magda Sibley, Mohamad Hakmi and Peter Land 2006

“Long narrow multi-court house appeared to be successful in providing the community and privacy”

Serge Chermayeff and Christopher Alexander, 1966

“Courtyard house form is the best performing urban type in terms of efficiency in site coverage compared with the towers or horizontal block type buildings.”

Leslie Martin and Lionel March, 1972

“Courtyard house form uses only 50percent of the area of the conventional garden to entrap the same amount of sun. The 21 hypothetical schemes with front to depth ratios of 2:1 through 1:1 to 1:6 plus demonstrated that the lot ratio increases, economy in infrastructure and density increases”.

Peter Land, 1977

“ The potential to improve the environmental performance by adopting court forms in cold climate regions exists but with lower height to width ratio.”

Dana Raydan, Carlo Ratti and Koen Steemers, 2006