ACCOMMODATING MULTIPLICITY

Adapting the Design of Canadian Urban Housing

Samuel Vandersluis . Master of Architecture Thesis 2017. Ryerson University

ACCOMMODATING MULTIPLICITY
ADAPTING THE DESIGN OF CANADIAN URBAN HOUSING

by

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Accommodating Multiplicity: Adapting the Design of Canadian Urban Housing
Samuel W. Vandersluis
Master of Architecture, 2017
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ABSTRACT

The remarkable spectrum of households, demographics and ethnicities in Canadian cities has become the primary identity of our multicultural society, an identity that typically is not reflected in our design for urban residential architecture. If our residential market does not provide housing that can accommodate the varied spatial demands of our diverse society, the quality of urban architecture will only degrade the vibrancy of city life. This thesis challenges the viability of conventional residential typologies, and introduces a new organizational system of high-density residential architecture that can flexibly accommodate a range of household types and sizes. The organization of contingent dwelling space is structured to forge a direct relationship between household, community and civic life. This restructured relationship forms a microscosmic reflection of urban diversity. By accommodating for the wide-ranging needs of urban Canadian households, this exploration adapts to the contemporary demands of urban life.

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PART 1 : LOOKING BACK

1.1 INTRODUCTION

At the beginning of the 20th century, Toronto faced a housing crisis that arose from issues of overcrowding and increasing property values. The infrastructure in Toronto could not keep up with the accelerated rate of growth in the early 1900s, which led to a massive increase in property values in the urban core. Low-income families that lived in the city were housed in dense, overpopulated slums with inadequate access to basic services. In 1911, Medical Officer of Health Dr. Charles Hastings published a report that examined the living conditions within these neighbourhoods, a report which described them as “slum conditions”. The slum conditions led to concerns that unhealthy low-income housing resulted in the decreased productivity of workers, which would subsequently impact the manufacturing industry in Toronto.[1] The availability of low-income workers was threatened by the rising cost of housing in the city core, as labourers were forced to live outside of the city limits. These events prompted prominent businessmen to respond to the need for low-income housing, as they relied upon the availability of cheap labour in the city. As a response, the Toronto Housing Company was established to provide higher quality housing for low-income residents within the city.[2]

In 1912 and 1913, Eden Smith, the architect credited with bringing the Arts and Crafts movement to Canada, was commissioned by the Toronto Housing Company to design the Spruce Court and Riverdale Court Apartments. These buildings were the first example of publicly funded affordable low-rise housing in Toronto, and remain as co-op housing to the present day.[3] The projects exemplified the Arts and Crafts principles espoused by Smith, most notably in the arrangement of dwellings around an open courtyard and the interior arrangement of living spaces. The design of the apartments opened living spaces to natural light and fresh air, a design decision that responded to the unhealthy living conditions that low-income workers typically faced in the city.[4] Smith’s designs embodied an early humanist ideal, forging a direct relationship between the interior arrangement of space and the increased living standards of residents.[5] The design standards Smith introduced to the urban Canadian context in the early 1900s challenged the architectural community to reconsider the design of high density housing, a principle that helped influence the form of the developing city.

Figure 1, 2 : The overcrowded and unhealthy living conditions typical of slum housing led the Chief Medical Officer, Dr. Charles Hastings, to call for the construction of better low-income housing.

Figure 3: Spruce Court Apartments, 1913

1.2 THE IMPACT OF MODERN DESIGN

The rapid urbanization of Canadian cities, particularly Toronto, continually forces city planners and architects to re-examine established housing models within dense urban cores. Throughout centuries of change, urban housing typologies have experienced numerous stylistic and organizational evolutions, with each successive development responding to the failures of the previous generation. An analysis of these evolutions provides fascinating insight into how architectural style and design principles adapt and respond to Canadian socio-political conditions. These evolutions are cyclical in nature, and typically respond to the same issues. The Spruce and Riverdale Court buildings were built to combat the unhealthy crowded living conditions of the low-income slums in Toronto, at a time when access to basic services plagued many residents in the city. The topic of inadequate housing surfaced again 40 years later.

From the 1950s to the early 1970s, the perceived panacea of modern design spread rapidly through Toronto at a time when political intervention was heavily influenced by the utopian promise of modern planners and the uninhibited determination of real-estate developers. Civic consensus regarding the value of modern planning principles reversed between the two decades, guided by the doctrinal philosophy of Jane Jacobs and the concerted opposition of residents throughout affected areas of the city. Concerns regarding the detrimental impact of modern design became increasingly apparent as development intensified. As entire city blocks were destroyed throughout the city to make way for modern planning interventions, the merits of Le Corbusier's tower in the park scheme were called into question by the general public. During this period of opposition, an important evolution in design thinking occurred within the city.

The Ville Radieuse scheme developed by Le Corbusier served as the prototype for urban development in Toronto during the 1950s and 1960s. The scheme emphasized the importance of high density towers, automobile freeways and vast expanses of greenery within the city, all while ignoring existing urban conditions. This vision influenced projects such as the Spadina Expressway proposal, Regent Park in the 1950s, and the St. James Town development in the 1960s. The wave of 'urban renewal' projects throughout this period eventually culminated in opposition from community advocacy groups and several city councilors, most notably during the construction of the Spadina Expressway. While it may be easy to retrospectively criticize these modern projects, Regent Park and St. James Town were built to provide affordable housing for families in a city with increasingly high property values, and were intended to achieve widespread social reform.[6] The ideas that

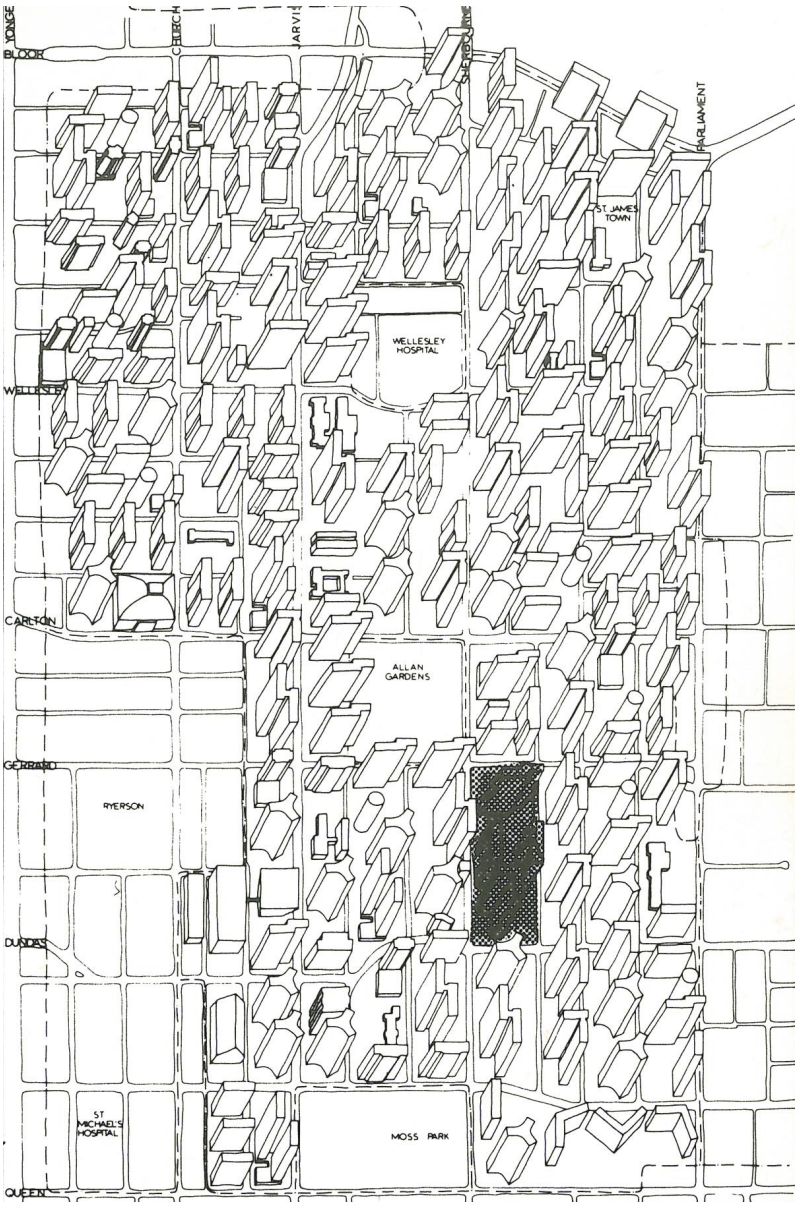


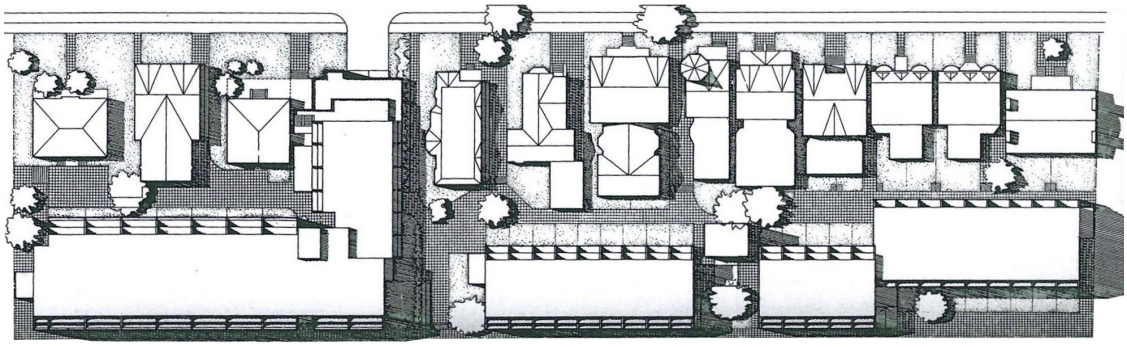
Figure 4: A drawing by Diamond and Myers
illustrating what the City of Toronto would look like if
it were to be developed according to the Official Plan.

shaped their conception were imported and adapted from foreign countries, yet the projects received the same criticisms upon construction as had been voiced previously in other parts of the world.

After two decades of prolific use throughout the city, criticisms of Le Corbusier's ideas as applied within Toronto began to emerge. The first main criticism of the tower in the park scheme was that the towers isolated their residents, as the parks were underutilized and the plans bore no relationship to the existing city fabric. The concrete towers that continued to rise across the city were uninspiringly bland and of poor quality, and the surrounding green spaces were uninviting and unusable throughout most of the year. Images of a bucolic green park space enjoyed by the entire community were replaced by the reality of unkempt underutilized lawns, and the vision espoused by urban planners failed to deliver on its initial promise.

Another significant criticism that arose with respect to the tower in the park scheme related to the economic segregation that resulted from the monotonous plans. The creation of low-income segregated housing isolated within the urban context problematized the concept of modern 'urban renewal' development. The plans for social renewal intended by city councilors and planners were eventually usurped by the economic reality of high density low-income housing. Tower in the park schemes were an inexpensive means of providing new housing in the city, and the slab style construction was replicated by numerous developers. This unfortunate outcome of a well-intentioned plan shifted public attitude towards the development of tower in the park proposals. The monotonous structure and limited tenancy options within the towers meant that only low-income households would typically be accommodated in the buildings, and the image of the towers became synonymous with poverty. As Toronto's modern social experiment began to fail, the third criticism of the scheme became increasingly evident.

Due to the green space requirements of towers in the park, large swathes of existing houses were demolished to make way for apartment towers. The houses that were destroyed were often touted as 'urban blight' by proponents of modern urban planning, but this attitude faced fierce opposition from residents and critics of modern planning.[7] The Victorian fabric of Toronto was continually threatened by the spread of cookie-cutter urban renewal development, which encouraged opposition from community groups and academics, most notably Jane Jacobs. This opposition movement expressed that the failed promise of modern housing was a poor substitute for the underappreciated value of the demolished historic city fabric. The public resistance spawned by modern renewal proposals began to infiltrate City Hall in the late 1960s and 1970s,[8] which eventually led to the cancellation of several 'urban renewal' proposals. This criticism and opposition famously led to the cancellation of the Spadina Expressway in 1971, which signaled a turning point in public opinion towards modern planning ideals.



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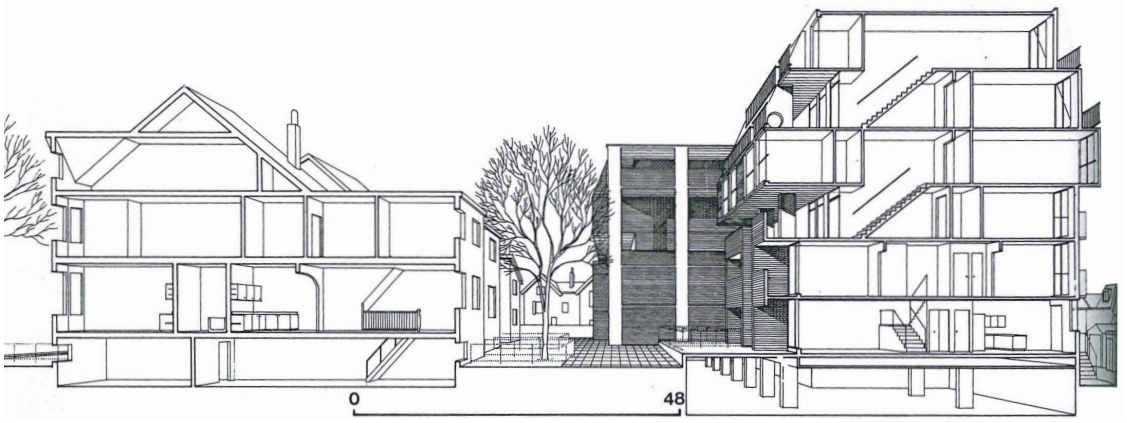

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Figure 7: View of front facade

Figure 8: Aerial View

In 1971, a proposal for the construction of two modern high-rise towers called for the demolition of the city block north-east of Dundas and Sherbourne. The modern scheme would replace thirty houses that were “built in every decade between 1840 and 1910”[9]. This prompted the community to appeal the proposal before the Ontario Municipal Board. The appeal contained an innovative housing proposal developed by Diamond and Myers, a scheme that presented a viable alternative to ‘urban renewal’ projects. The architects proposed a six-storey building that retained a majority of the historic buildings by neatly tucking behind them, as shown in Figures 5-8. The scheme contained the same number of units as the towers, which ultimately convinced the OMB to reject the proposal for the two high-rise towers.[10] The innovative approach to housing would modestly achieve the same density, yet retain the existing fabric of the city streetscape. The Sherbourne Lanes development was one of several exemplary moments in our city’s history during which the concerns of citizens and politicians aligned to combat the aggressive determination of developers in an attempt to retain and enhance the identity of the city block.

Perhaps the most important outcome of the experimentation with modern architecture in Toronto was the movement that arose in opposition to its pervasive use. A new attitude towards the city fabric transformed the shape of development in the city towards a friendlier, more humane alternative. This new attitude was captured by the development of the St. Lawrence neighbourhood during the mid to late 1970s. A primary attitude embodied by the plan was that the existing streetscape and urban fabric would be respected and expanded upon. This translated through the design of the roads and the respective organization of dwellings, which face onto public streets and are designed at a smaller scale and higher densities than conventional modern schemes at the time.[11] The development offered a mix of uses to animate the public realm throughout the year, and included a linear park connecting the residences located along the site, as seen in Figure 9. The site responsive park design indicated that the idea of open green space was still valued, but a more deliberate design approach was necessary.

As a rebuttal to the monotonous planning of modern towers, the St. Lawrence neighbourhood was developed by numerous architects who followed design guidelines in keeping with the architectural language of the existing context. The conscious relationship to the existing city broke with the idea that the old city was an antiquated entity, and encouraged participation from residents that would be affected by the scheme.[12] However, the most important aspect of the plan relates to the decision made to include a mix of tenure within the newly developed neighbourhood. The issue of segregation was directly addressed at the planning stage of the neighbourhood, as “a variety of tenures and housing managers were provided, including private rental, non-profit rental, non-profit co-operative, fee simple

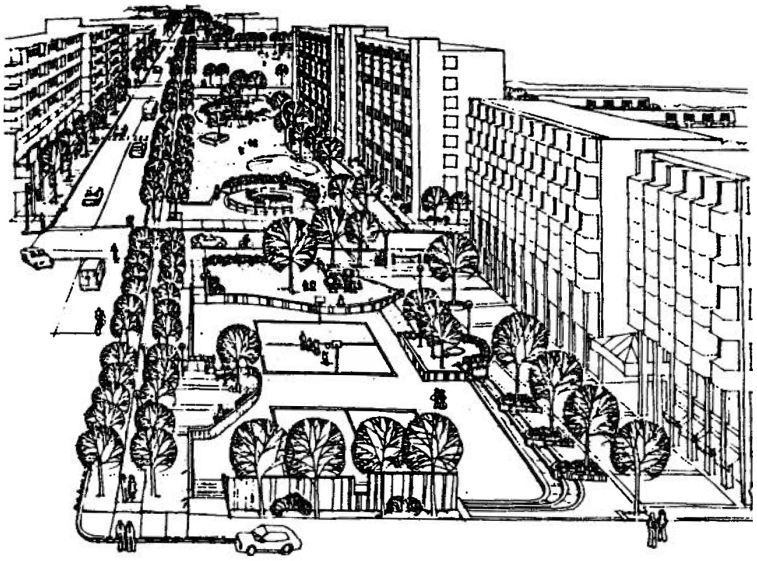

Figure 9: A drawing of David Crombie Park

Figure 10: A view of the neighbourhood in 1979

Figure 11: Low-rise housing in the St. Lawrence District

ownership and condominium ownership."[13] This attitude was reflected by the quality of design and provision of private and communal space in the plan, which allowed for a range of spatial needs depending on household size and economic background. The design guidelines provided each type of household with high quality dwelling standards, allowing for the accommodation of a diversity of household sizes and types within a community setting.

1.3 MOVING FORWARD

In many ways, the prolific development of modern high-rise towers during the 50s and 60s parallels the condominium boom of the past two decades. The development standards that have recently become commonplace in the city of Toronto are reminiscent of the low quality high density modern housing that the city successfully resisted fifty years ago. Similar to the housing market fifty years ago, this rapid densification is leading to many unintended outcomes as a result of poorly managed growth, but the outcomes result from a different set of socio-political conditions. Just like the towers built during the modern era of development, these contemporary high-density schemes have proven themselves ineffective at providing the solution to meeting diverse housing needs, which indicates that a concerted approach is necessary to address the issues that result from conventional development patterns. History shows that the appropriate response to this issue is the commitment to creatively providing alternatives to these established housing typologies.

As Toronto continues to face a wave of high density condominium development, innovation upon established residential development standards remains unexplored. The challenge of introducing development alternatives may seem insurmountable, as there are many factors that must be analyzed and understood before studying the impact of new design standards. Before discussing the potential for innovating upon established typologies, it is crucial to first understand the socio-economic issues that arise from the continued use of established housing types. This may help to identify the unique issues that an innovative model of architecture must respond to, and the necessary steps that must be taken to increase housing options and standards for Canadian households. As indicated in the next chapter, diversity has become the primary identity of our multicultural society, and is made evident through ranging demographics, a spectrum of household sizes and types, wide levels of income disparity, and shifting family priorities. The demand to accommodate such difference requires a radical shift in architectural thinking.

NOTES

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2. Ibid

3. Ibid

4. Ibid

5. Brown, W. Douglas. *Eden Smith: Toronto's Arts and Crafts Architect*. (Mississauga, Ont. W. Douglas Brown, 2003.) Page 3

6. Sewell, John. *The Shape of the City: Toronto Struggles with Modern Planning*. (Toronto: University of Toronto Press, 1993.) Page 74

7. Ibid, 106

8. Ibid, 137

9. Ibid,187

10. Ibid, 187

11. Ibid, 194

12. Ibid, 194

13. Ibid, 196

PART 2 : CURRENT REALITIES

2.1 DEVELOPMENT PATTERNS

The urban form of Toronto is characterized by two main development patterns: extensive low-rise sprawl throughout the inner and outer suburbs, and the high-density city core. The primary development type has shifted from the former to the latter, as the combination of planning policy and housing prices in the GTA have shifted market demand over the last decade. This may be understood by analyzing the change in land-use per person in the GTA. Between 1971 and 2001, the urban population of Canada grew 45 percent. This growth mainly happened in the form of sprawl, as "the amount of urbanized land grew 96 percent during the same period."[14] Urban sprawl presents numerous economic, social and environmental repercussions, problems which the City of Toronto and the Government of Ontario have addressed by implementing a plan for smart growth in the GTA, and a Greenbelt Plan. These planning interventions were intended to promote Smart Growth, which is defined as "an approach to growth management (that focuses on) creating a range of housing opportunities and choice, creating walkable neighbourhoods, fostering distinctive, attractive communities with a strong sense of place, mixing land uses, providing a variety of transportation choices, and strengthening and directing development towards existing communities."[15] While the implementation of these planning policies has led to the increased densification of the urban core, it has also resulted in many unintended consequences.

Along with every housing typology comes an ingrained socio-economic stigmatization, which is problematized by the dominance of traditional housing development practices. Based on traditional models of residential development in Canada, single family detached homes are associated with the greatest freedom and flexibility for a growing family, and are seen as the standard for healthy family life. While townhouses and duplexes bear many similarities, they begin to limit the space available to accommodate for future growth, and infringe on our notion of privacy. Finally, condominium apartments are restrictive and inflexible, and cater to a limited demographic without affording the potential to absorb a change in family structure. For decades, the typical urban Canadian mentality has been to buy or rent a condo as a young professional starting a career in the city, and move out to the suburbs to buy a single family detached home to start a household later in life. This mentality has been challenged by the development of recent trends in the GTA housing market, which are affecting the feasibility of home ownership. New single family detached homes are simply too expensive for most families, and higher density condominium apartments are quickly becoming the only economically feasible housing stock available for lower income households. Even higher density townhomes are economically out of reach for many families, which is difficult to mitigate considering

they afford a better standard of living for Canadian households. As households begin to transition towards vertical living, it becomes evident that development practices are typically not suitable for family accommodations. Compact units afford limited space and flexibility for the complex needs of an increasing variety of Canadian households.

In Canada, shifting demographic trends have begun to alter the make-up of urban city centers. As the aging baby-boomer population is retiring and life expectancy increases, the corresponding number of young adults that replace them in the work force declines, leading to an increase in median age of the population.[16] In response to this phenomenon, the diminishing growth of our domestic population is continually bolstered by the intake of immigrants. From July 1, 2015 to June 30, 2016, Canada accepted 321,000 immigrants, the largest number since 1913.[17] During this period, immigration accounted for two thirds of population growth. Since 1999, immigration has been the largest driver behind population growth, and the divide between immigrant growth and domestic natural growth increases each year.[18] The Ontario population projection update shows that Ontario's population is expected to increase by 30.1% from 2015 to 2041, from 13.8 million to an estimated 17.9 million in 26 years. It is estimated that migration will account for 76% of this growth.[19] Neighbourhoods within the city will increasingly house a remarkable spectrum of immigrants, seniors and young households, but if current development trends persist, our housing market will struggle to adequately reflect the individual needs of each demographic within this diverse population.

As the GTA continues to absorb a massive proportion of Canadian population growth, the value of detached homes in the GTA rises significantly. From 2012 to 2016, it has been estimated that homes in Toronto have increased in value by 30%. The Canadian Real Estate Association has estimated that from 2015 to 2016 alone, the average price of a house increased by 14.59%.[20] Areas that have seen the largest average increase in home value include Richmond Hill (47% since 2012), and Markham (44% since 2012). Within the city of Toronto, Scarborough house values saw the largest increase in value, up 44% from 2012.[21] The average cost of a single family detached house in Toronto was $1.02 million in 2016 (an increase of 15.8% from the previous year), and $705,600 for all homes. These numbers have become out of reach for many families, and apartment and condo living is now the only alternative. Contrary to this, the average cost of an apartment unit is $387,800, an annual increase of 9.2%.[22] This increase is highly problematic for first-time homebuyers and households in need of space to accommodate for a growing family, as their housing options are increasingly restricted to more compact forms. The planning policy implemented by the city is successfully curbing sprawl, but comes at the cost of limiting housing options for Canadian families, which is indicated by a shift in housing development. While housing starts for single detached homes have

been high, their recent decline indicates that “the rising price gap between singles and apartments will gradually shift demand to more affordable housing options.”[23] As demographics continue to shift, and homebuyers increasingly enter into home ownership through multi-unit residential buildings, it is crucial that our architecture appropriately responds to the diverse needs of the urban population.

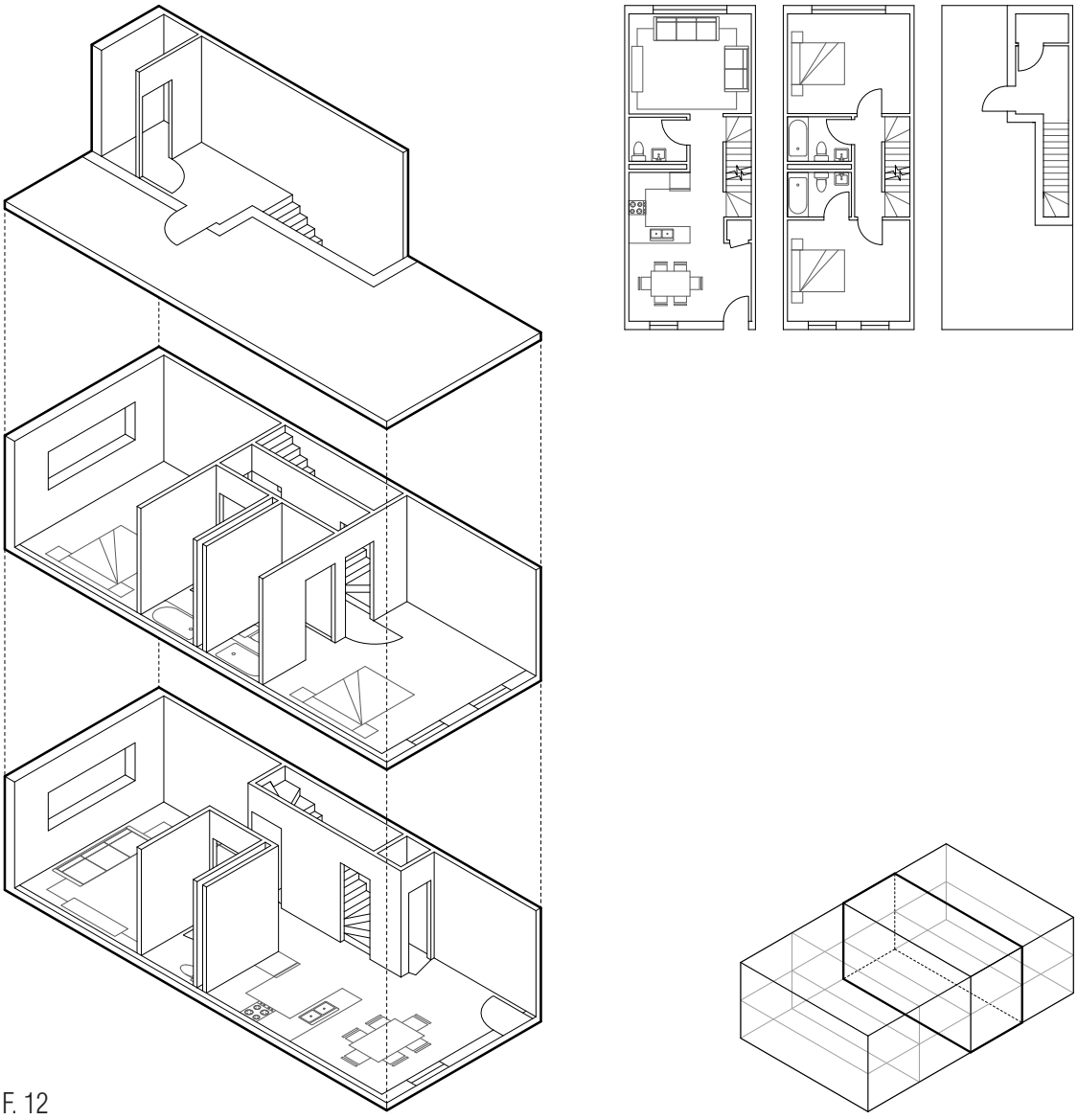
Before examining the necessary steps that must be taken to increase housing options and standards for Canadian households, an analysis of existing housing typologies will help us understand the organizational features of existing housing types and the subsequent impact on household living standards. The architectural study of each typology may expose the associated positive and negative reasons for the use of each type, which in turn may indicate what must be done to responsibly meet the spatial needs demanded by a growing number and diversity of household types within the urban context. Single detached and semi-detached homes are excluded from this analysis, as they are not typically considered as appropriate development types for urban sites.

2.2 CONVENTIONAL HOUSING TYPOLOGIES

A housing type that is common within Toronto is the townhouse. Townhouses, or row houses, are characterized as one to three storey buildings that share a party wall with adjacent homes. Each dwelling unit has exposure to two opposite exterior walls, which allows for greater flexibility when partitioning the interior space. The organization of a townhouse logically situates service spaces in the middle of the floor plate, while living spaces are located at either end of the home. This leads to a condition where living spaces are separated by service spaces, introducing a degree of privacy that is well suited to larger households. The use of row housing permits for stacked levels to be connected by an internal stair, allowing for the development of multiple living spaces on each floor. If the bay size of a townhouse is wide enough, it is also possible to develop more than one living space on one end of each floor, further increasing the number of potential living spaces that may be included within the dwelling.

Due to the ground plane access of a townhouse, one or more exterior spaces may be allotted for the private use of each unit. This feature increases the living space of each resident, and allows for extended use of the unit throughout the year. Further to this, it is possible to develop a rooftop terrace space on top of each unit by providing a unit with rooftop access. The possibility of developing private outdoor space in the front and back and on top of each townhouse affords a higher standard

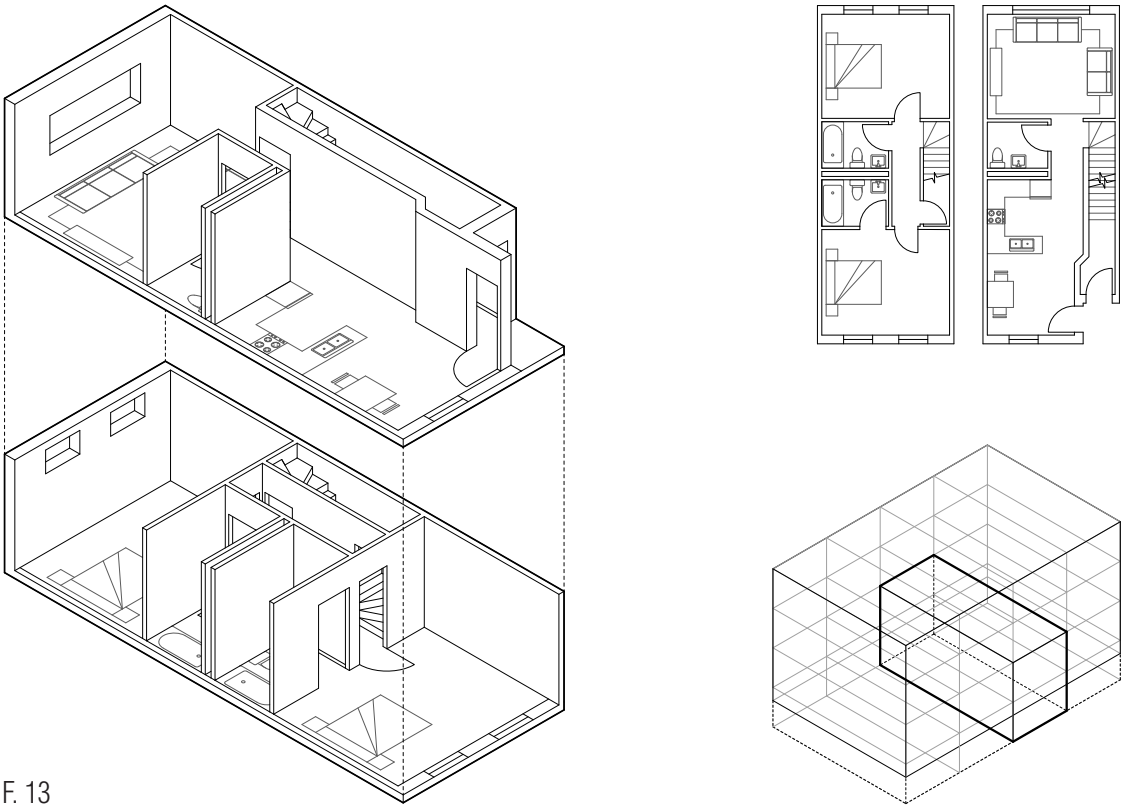
of living to the residents of this dwelling type. Townhouses also typically provide parking in front of the dwelling, or provide a garage integrated into the building or separated from the building behind the unit. The proximity to vehicular access provides an attractive alternative to shared exterior parking lots or parking garages.



F. 12

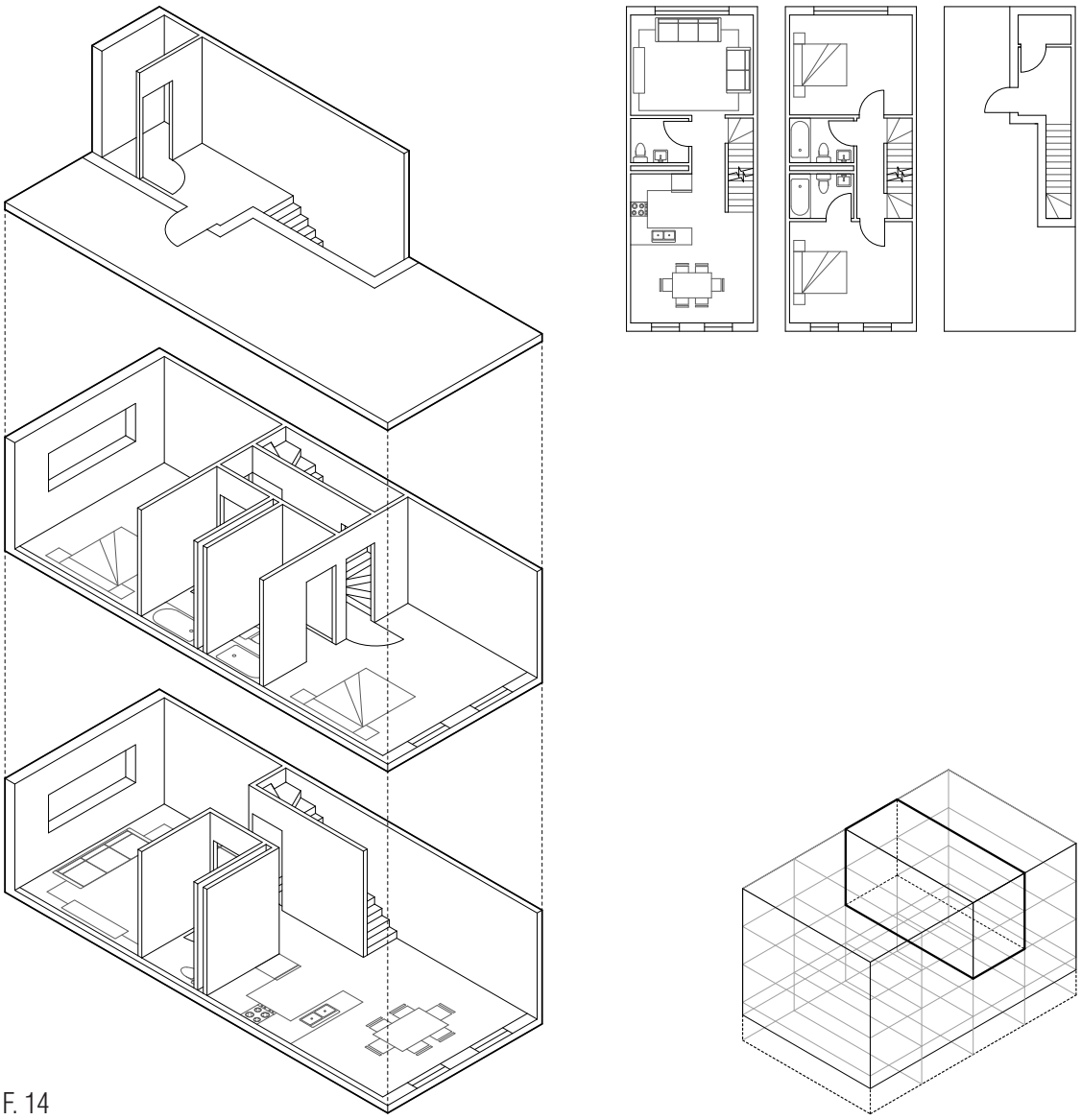
The townhouse model suffers from one main drawback: the scheme may only be developed as low rise due to the private ground plane access required by each unit. This limits its use in higher density parts of the city, which is problematic when considering increasing land values throughout Toronto. This typically relegates its use to the fringes of the city, where residents must commute longer, and infrastructure is sparse. Considering that this model of architecture is best suited for larger households, this limits the choice of housing available to families with children. In response to this, another common typology increases the density of conventional row house development in the city, the stacked townhouse.

Stacked townhouses are typically two to three and a half storeys, and consist of two or more stacked dwelling units. Each unit is privately accessed at grade, meaning that dwellings on the top floors are walk-up, with the option of developing separated basement units. Stacked townhouses retain the exposure to two exterior walls, and are organized similar to townhouses. Due to the split between levels, exterior space may only be utilized by the lower floor, while private outdoor space for the top unit is typically developed in the form of a balcony or rooftop terrace. Stacked



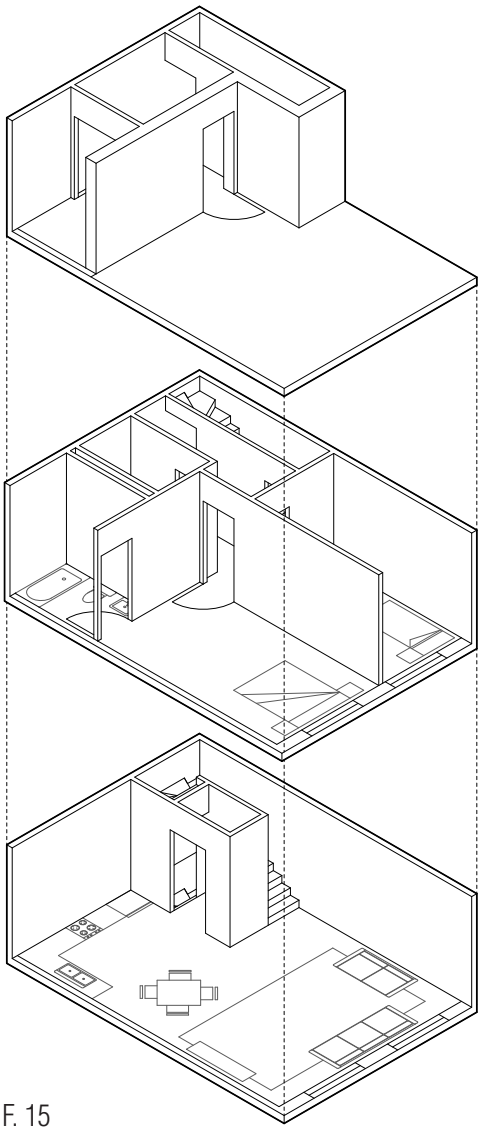
F. 13

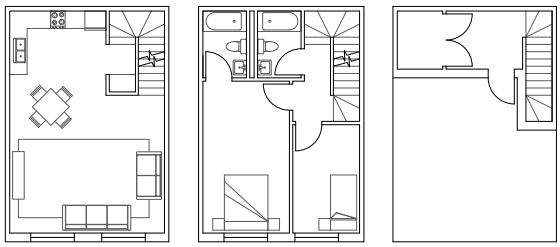
townhouses generally incorporate underground parking beneath the units or surface parking lots beside the units, which reduces vehicular accessibility to each unit, but makes more efficient use of parking space requirements on site. The organization of the stacked townhouse typology still accommodates for the spatial demands of a larger household, yet introduces a higher density to permit its use in more areas throughout the city. However, stacked townhouses may still only be built to three and a half storeys, which continues to limit their widespread use as a viable housing model within the rapidly growing city.

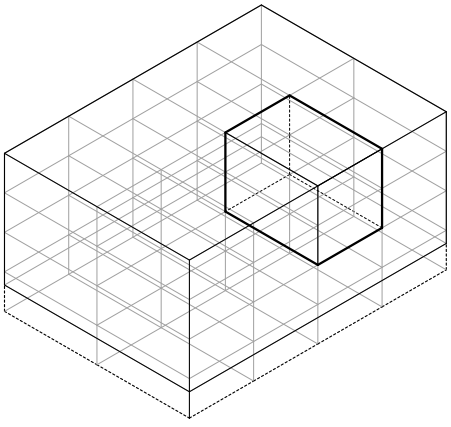


F. 14

A typology that introduces a higher density is the stacked back-to-back townhouse. This type is similar to the stacked row house model, but each unit only has exposure to one exterior face of the building. This drastically reduces the flexibility of the scheme, as fewer living spaces may be built on each floor. This scheme pushes the service spaces to the rear of the unit, a feature which closely resembles the organization of double-loaded apartment units. However, the option to connect multiple floors still offers an advantage over slab apartment buildings. The separation between floors leads to the creation of bedroom spaces on one level and living spaces on another, which offers a level of privacy that may be lacking in higher density types of housing. A major drawback is that the reduction in developable living space reduces the typologies ability to accommodate for the spatial demands of larger households.





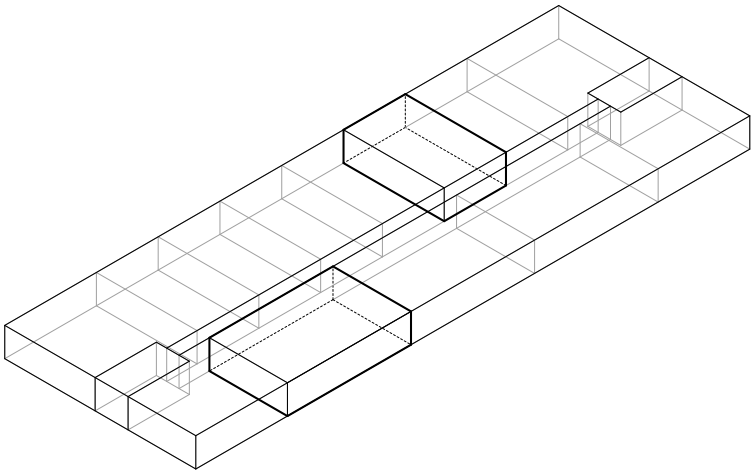


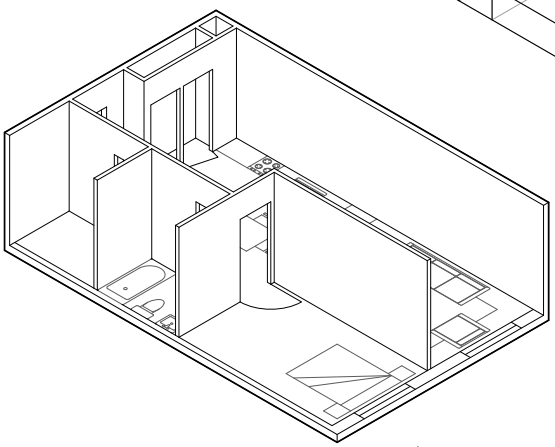
F. 15

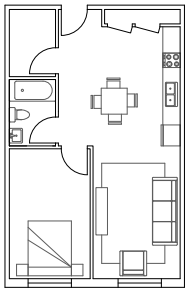
The final typology, and the most commonly developed within Toronto, is the double-loaded slab apartment. The double-loaded corridor access of this high-density typology dictates the organization of units on each floor to a rigid, prescribed layout. A number of features determine the layout of double-loaded slab apartments. First, a typical double-loaded unit will only have exposure to one exterior face of the building, which limits the possibility of adjusting the orientation of living spaces within each unit. Because living spaces and bedrooms need a certain percentage of glazing within the unit, it is common that these units are developed with only one bedroom and one main living space adjacent to the exterior face, with the kitchen, washroom and storage space located at the rear of the unit. In the case that a two or three bedroom unit is developed, the unit needs a longer exposure to the one exterior face, which takes up more space along the public corridor. Second, the slab structure of each floor typically does not allow for units on adjoining floors to connect, which limits the potential to develop larger units throughout the building. Finally, most high density residential buildings stack the plumbing on each floor to simplify the service connections throughout the building section, which prescribes the placement of facilities such as bathrooms and kitchens within each unit. These features determine the rigid organization of double-loaded apartments, a typology which is the least conducive to adjusting to meet the spatial demands of a growing household.

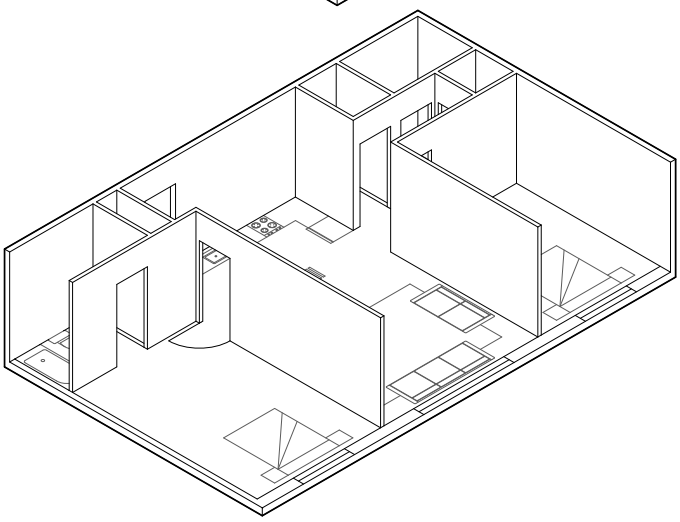
Due to the organization of double-loaded apartment units around a single corridor served by two vertical cores, the potential to develop amenity spaces on each floor is limited, as the inclusion of public space subtracts from the area that may be developed as residential units. The inherent organization of this typology reduces communal space to areas shared by the entire building, such as a party room, gym and/or pool. The reduced privacy offered by these spaces and increased proximity from each unit throughout the building limits the use of each space as a vital component of communal infrastructure.

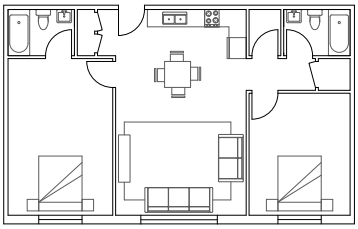
As the flexibility of each unit within a double-loaded building is already limited, private outdoor spaces are typically developed in the form of balconies at the face of each unit. While balconies may be a useful space for many families, their use may vary significantly from one family to the next. Further to this, the climatic conditions of Toronto reduce the use of a balcony throughout the year, detracting from their value as a feature within a high-density residential dwelling unit. The continued use of balconies in Toronto may be challenged by the introduction of different types of exterior private and semi-private spaces.











F. 16

A brief exploration of each typology indicates that as densities increase, limited privacy levels and spatial flexibility drastically reduce the possibility of meeting the demands of larger and more diverse household types. This problematizes the ability to affordably meet housing demands within one of the most diverse cities in the world. If we are to continue to espouse the values of promoting a diverse culture, these values must start to translate into our design of residential architecture. The continued use of each conventional housing type resists the ability to house a variety of household types and sizes within a single building, and limits the potential to implement urban diversity at a microcosmic level. As the development of higher density types of architecture persists, it is crucial that we attempt to avoid the mistakes of a previous generation, and plan to reduce detrimental socio-economic issues that arise from the use of inappropriate housing types. As the next section will indicate, the continued development of condominium apartment housing will result in issues similar to those faced by opponents of modern architecture fifty years ago.

2.3 THE CONDOMINIUM BOOM

As affordability becomes more of an issue in the housing market and demographics continue to shift, condominium housing starts continue to increase in proportion. Between the period of 1996 and 2011, 62.1% of new housing stock was apartments with five or more storeys, 27.2% was houses and low-rises, and 10.7% was townhouses.[24] During this period, the average size of a three bedroom apartment unit decreased by 20%, while the percentage of families with children living in apartments increased to 10,145, a 15% increase. Over these 15 years, average condominium unit sizes decreased from 1,087 square feet to 885 square feet.[25] Families that wish to live downtown may only afford to do so if they live in condo units, but the stock of condo units that are 3 bedroom and higher is extremely small relative to one and two bedroom units being constructed. Between 2006 and 2011, development proposals were submitted for roughly 116,000 units in Toronto. 67.5% of these units were for apartments, with 3.1% of these units developed as three or more bedroom units.[26] While this proportion has increased over the past years, it is still lower than what is to be expected when comparing the population age mix and household size in Toronto.

With the continued surge of the condominium boom of the last decade, many trends have begun to characterize the condo market. First of all, market demand has not pushed the condo market to respond to the diverse mix of household sizes and demographics. This problem is aggravated by the fact that most new condos in development (52%) are sold to investors who do not plan to live in them.[27] Further

to this, most new condo units (67%) are studios, one bedroom and one bedroom plus den.[28] A primary reason behind this is that developers solely concerned with a return on investment make more money per square foot selling bachelor, one and two bedroom units, therefore a majority of new units are developed as such. A push towards the development of three bedroom units has recently been addressed in an Official Plan amendment that requires "10% of all dwelling units in larger developments (with 100 or more dwelling units) in the downtown area to be built with either three or more bedrooms, or offer the potential to be easily converted to contain three or more bedrooms."[29] While this policy is well-intentioned, it has led to outcomes that were not intended. Further to this, the largely unregulated market has led to several shifting condominium development trends that occur free from political intervention, all of which should be analyzed carefully and understood.

One trend that has arisen is the tendency for three bedroom units to be rented out as dorm style apartments. The Official Plan amendment that required 10% of units to be developed as three bedroom apartments has led to the development of many three bedroom units in the urban core, but there is plenty of anecdotal evidence that suggests that these units do not sell as quickly as one and two bedroom units.[30] This is largely due to the inadequate size, as the three bedroom units that are developed are as small as 742 square feet,[31] which offers the bare minimum for living space, and no flexibility for the changing needs of a family. These units, which are more appropriate as 2 bedroom, are typically rented out by students, who treat the units as dormitory style apartments.[32] This unfortunate by-product of a well-intentioned amendment indicates that the lack of size constraints do not push developers to consider the appropriate size requirements for a family that desires to live downtown. In the cases that three bedroom units are built to an adequate size, they are typically built as luxury penthouse units,[33] which are well out of the price range of the majority of Canadian families. This trend indicates that building family units in a high-rise condominium may not be an appropriate means of addressing the affordability crisis, as these units are typically too expensive and/or too small for a family to live in.

As a response to this trend, the City has begun leveraging Section 37 allowances to build affordable units in newly developed condominium buildings in return for added density and height for the developers.[34] This encourages a mutual agreement between the city and developer as to the mix and type of units being developed, and benefits both parties. While this tool is certainly unconventional, it has proved to be an important step in ensuring that a portion of the vast need for affordable housing is addressed. However, this method of securing affordable housing is unreliable and varies considerably between projects. It also indicates that the push to build affordable housing requires an understanding between the City and developers, as the current need is not met through the largely unregulated free market. This may largely be due to the need for very high densities on expensive

downtown properties, which can be avoided if development occurs outside of the downtown core in areas that are still well connected to transit.

Upon examining the outcome of the current rise in condominium construction, it is apparent that several negative externalities prevent this model of development from meeting ranging housing demands within the urban Canadian context. Many of the social and economic limitations imposed by this type of development directly result from the restrictive architectural organization and structure of the typology. While the previously identified alternative residential typologies may respond to the prevalent issues associated with the use of condominium apartments, it is understood that each typological alternative is becoming increasingly out of reach for a growing portion of the market as increasing property values reduce the potential to develop land at lower densities. This divide presents a significant hurdle for larger families with spatial demands that may be financially unfeasible to attain.

2.4 ECONOMIC SEGREGATION

Throughout Toronto's relatively young history, efforts to provide mixed demographic household tenure have been a central part of planning efforts. Plans for the design of innovative neighbourhoods such as Don Mills and St. James Town were intended to attract a mix of economic tenure, but each became segregated, the former as a middle class haven, the second as a low-income ghetto. The segregation of neighbourhoods is an urban planning issue that continues to burden the City, one that may benefit from an architectural solution. Innovative plans such as the St. Lawrence neighbourhood illustrated that a dedication to providing a mix of household ownership and rental options at the planning stages of the process improved the success of the neighbourhood. While this solution may indicate the necessary political approach to healthy neighbourhood design, it does not fully explore the potential role that different typologies and urban forms may have in combatting the issues associated with income polarization and rising property values. These issues become imperative to the concept of urban growth when examining the accelerating rate of economic segregation within the city.

One of the immediate consequences of rising property values and declining median household incomes in Toronto is the increase of income polarization within Toronto's neighbourhoods. According to the 2011 report Vertical Poverty, low-income families in Toronto continue to concentrate within high-rise towers located in the inner suburbs of Toronto. The report indicates that between 1981 and 2006, the percentage of low-income families living in high-rise rental buildings increased

from 34% to 43%.[35] During the same period, the percentage of low-income families living in high-rise rental buildings, as a percentage of overall tenancy, increased from 15% to 40%. This indicates that the increasing cost of real-estate throughout the city leads to inner suburb high-rise towers becoming the only financially feasible housing option for low-income households that are unable to enter into home ownership.[36] This issue is made evident by the fact that the median income of tenant households within Toronto, adjusted for inflation, has declined by $6,396 between 1981 and 2006.[37] Following this, the number of units housing more than one person per room doubled between 1981 and 2006.[38] This socio-economic reality is commonly found within Toronto's inner suburban neighbourhoods, where the majority of high-rise rental housing is located.

From the early 1950s to the late 1970s, a large number of public non-profit and private sector high-rise rental towers were built throughout the inner suburbs of Toronto to specifically house low-income tenants.[39] The wide-spread construction of these tower in the park schemes led to high concentrations of low and median income households living within the same neighbourhoods throughout the city. Over time, the number of low-income tenants housed within these high-rise towers has increased in proportion, further increasing the rate of income polarization within these neighbourhoods.[40] The concept of mixed income tenure was abandoned by the plan for these rental towers, which has led to some dismal implications within each neighbourhood. Simply put, concentrating poverty within Toronto leads to disinvestment within neighbourhoods, heightened crime rates, and reduced safety and security, which affects every resident within a neighbourhood.[41] As these high-rise towers continue to age, the need to implement an innovative strategy to meet the demand for mixed income neighbourhoods grows urgent.

The reality of rising house values in the GTA and Toronto has led many families to apply for affordable housing in Toronto. As of March 31, 2016, there were 87,774 households on the active affordable housing waitlist, and 9,659 households on the inactive waitlist. In total, there are 177,502 people waiting for affordable housing.[42] The urgent need for new social housing is exacerbated by the $2.6 billion repair backlog of the Toronto Community Housing Corporation, the corporation that houses the majority of households that live in rent geared to income housing. While the Toronto municipal government has pledged to cover one third of this cost, the provincial and federal governments have not yet provided any funding to alleviate this deficit. The federal government has indicated that it will dedicate a portion of the budget to infrastructure and social housing, but this promise has yet to materialize.[43] Due to this massive repair backlog, combined with an annual operating deficit of $101 million, the TCHC is now forced to evacuate and close many buildings that are in immediate need of repair.[44] Rather than provide new housing for families in need of rent geared to income housing, TCHC is forced to evacuate families, slowly adding to

the existing waitlist. As low-income families continue to apply for affordable housing in a real-estate market with rapidly climbing house prices, this problem will continue to get worse.

The disparity between income classes in Toronto is pushing the city to respond to the need for affordable housing, yet no viable solution has been presented. This issue stems from rapidly inflating property values and the lack of affordable housing provided within the city. Conventional high-density housing cannot adjust to the economic means of each individual household, as each home is built to a certain standard that remains out of reach for a growing segment of the population. This issue once again stems from the rigid structure of new housing, which may not accommodate for a variety of family types and sizes with different economic means. As an increasing variety of household sizes and types continue to be housed in the city, it is crucial that we understand the strategies available to planners and architects that wish to design housing for a range of household demographics.

2.5 VARIED HOUSEHOLD DEMANDS

As household sizes and types have continued to shift throughout Canada's history, the architecture we build attempts to reflect the shifting priorities of each family type. The balance between providing adequately sized family spaces within dense urban communities is an important debate that challenges our preconception of high density living. It is clear that a monotonous, economical treatment of living space throughout the city contradicts the possibility of exploring the value that exists within our city's demographic diversity. This implies that we challenge the way residential architecture treats the needs of each individual household. An availability of options for families that may struggle to find homes that adequately provide spatial flexibility must be provided to break free from the trends that have characterized the Canadian urban housing market. This issue becomes more prevalent when considering the growth of a family over time, an issue that questions the viability of conventional high density housing for larger families. The inability to predict the size and growth of households that will live in new housing challenges the prevalence of static, unchanging and inflexible urban development models.

The "Grow Home" project, designed by Avi Friedman, a Professor in the McGill University School of Architecture whose research focuses on housing, is a housing prototype that directly addresses the issues associated with static, inflexible models of residential architecture. The prototype was built in the city of Montreal, which has an extensive stock of row housing throughout the city.[45] The project

Figure 17: TCHC housing in Etobicoke that is in danger of closing

Figure 18: A TCHC building in critical condition in North York

attempted to challenge conventional row housing by creating a typology that permits future expansion into different floors of the row house structure over the time a family lives in the home. At the time a family initially buys the Grow Home, they only use as much space as they need, leaving the basement and attic un-partitioned. As the family grows, they begin to move into the extra space of the house, which allows for each family to not only customize each space to meet their demands, but to also stay in their home for a much longer period of time. At the center of the Grow Home philosophy is the idea that each family must carefully consider their spatial needs before entering into home ownership. This philosophy allows each household to prioritize their needs, and plan for growth within a home that they may easily customize throughout the time they live there. The architectural ability to economically adjust to family needs over time fundamentally alters the social implications associated with high density residential architecture.

The Grow Home model is carefully designed with the potential end uses of each living space in mind. The typical row house organization with two exterior exposures and services located in the core dictates the arrangement of living spaces as they are partitioned throughout the life of the building. The proper sizing of spaces is an integral feature of the design scheme, as the location, orientation and size of added service spaces determines the size of adjacent living spaces within the static shell of the house. Another important feature of the design is the multi-storey structure of the home, which allows residents to rent out one or more floors of the home to tenants. The architectural organization of the structure implies economic flexibility for the residents of the home, and allows for a greater variety in tenancy. This also puts the residents in full control over the space in their home, and gives them the option to prioritize space carefully and deliberately. This attitude may prove essential to space within the city, as the small scale planned customization of each individual house may prove to be an economically and socially responsible option for city growth.

The success of the Grow Home model illustrates the importance of designing a space to allow for future expansion over time. However, the project still falls into a conventional urban development type, and fails to address community living implications in a changing society. This model successfully challenged a conventional development living standard, yet stopped short of exploring the viability of contemporary urban planning models that introduce a mix of zoned uses within an urban setting. The relatively low density afforded by the scale of the project also fails to meet densities required by higher property values within urban city centers, which limits its potential use. However, the ideas offered by the Grow Home emphasize the importance of responding to increasing consumer demand for more space and flexibility, and illustrates the value in designing to accommodate for the long term growth of a household over time. The success of the Grow Home model implies a need to develop models of residential architecture with an increased level of flexibility

Figure 19: Possible configurations of two floors of the Grow Home model

as a means to accommodate a wider variety of household types over a longer period of time. This conceptual approach to adding density within the city may serve as a valuable precedent to help guide the development of the next generation of higher density schemes of residential architecture.

2.6 ARTICULATING A RESPONSE

Before attempting to respond to the issues associated with conventional housing types, it is first helpful to expand our established architectural vocabulary through the study of international architectural precedents. The architectural study of innovative housing models found in socio-economically similar countries may help indicate which organizational strategies can effectively improve housing standards within the Canadian urban context. An understanding of the innovative organizational strategies that shape the creation of these precedents will help set a benchmark that Toronto can strive to achieve as the city continues to struggle to appropriately meet the demand for housing. The study of international precedents begins by analyzing the important modern housing prototypes that influenced a generation of European architects to explore how architectural innovation may improve household living standards. An understanding of these important modern housing prototypes helps to identify the progression in design thinking between generations, which serves as a valuable case study for a city with a limited history of exploring innovative housing types. As the exploration of these precedents may indicate, Toronto has yet to learn many lessons from the architecture of cities with a long and well-established history.

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PART 3 : LOOKING ABROAD

3.1 MODERN HOUSING

Several housing prototypes throughout the evolution of residential design have proven to be immensely influential in expanding the design vocabulary of international architects. Prominent architects such as Le Corbusier demonstrated that residential architecture can break free from established housing types to change the way residents live within a multi-unit residential building. Projects such as the Unité d'Habitation, various versions of which have been constructed in several locations in France and Germany, altered the conventional double-loaded corridor scheme to introduce the maisonette through-unit, a dwelling type that reconfigures the living space of a high density residential unit. The scheme became a prototype for future innovative models of housing around the world, and illustrated the possibility of improving upon established development patterns. Modern architects throughout the mid-20th century continued this innovative thinking to produce housing prototypes that presented alternatives to the monotonous concrete slab towers that began to proliferate on an international scale. All of these schemes experiment with the sectional arrangement of dwelling units within the building structure. This approach provides a mix of unit types and spatial living conditions within higher density residential models of architecture.

The Alexandra Road Estate development in London, U.K by Neave Brown is a housing block that embodies many prominent humanist modern ideas. Constructed between 1972 and 1979, the project combined the design of traditional London terrace housing and Le Corbusier's Durand housing prototype to introduce a higher standard of living for residents within the community.[46] The stacked housing is set back and reduces in size as it rises through each level, providing each unit with an outdoor terrace above the unit below. The units are accessed by stairs that connect to the pedestrian walkway between building blocks, and are designed to have exposure to two exterior faces of the building block. Alexandra Road Estate embodies a dominant architectural mindset of its time, attempting to utilize the organization of dwelling units and buildings to implement an improved standard of urban community living. The final product clearly espouses this attitude through the structure and organization of the stacked slab housing, the design for mixed tenure, and mixed use planning.

As demonstrated by Neave Brown, the design of intimate semi-private and semi-public space may result from the organizational structure of high-density housing. However, the ambition of the scale and size of the project resulted in issues associated with construction, cost and economy. These issues questioned the viability of innovative late modern humanist housing projects. While many late

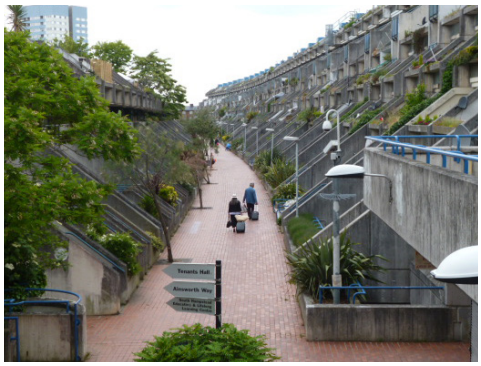
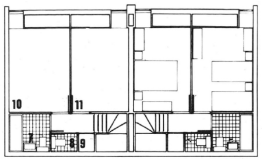


Figure 20: The pedestrian road dividing housing blocks



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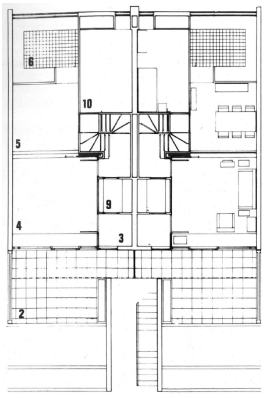

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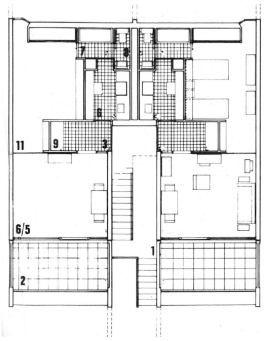
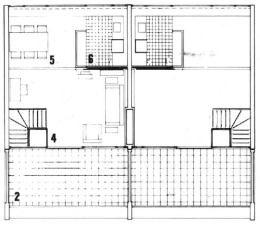


3

F. 21

1. 3 bedroom maisonette, top floor
2. 3 bedroom maisonette, bottom floor
3. 1 bedroom flat
4. 2 bedroom maisonette, bottom floor
5. 2 bedroom maisonette, top floor



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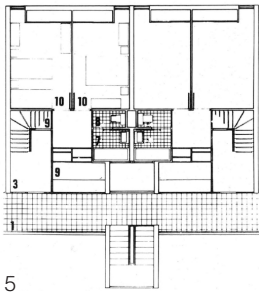

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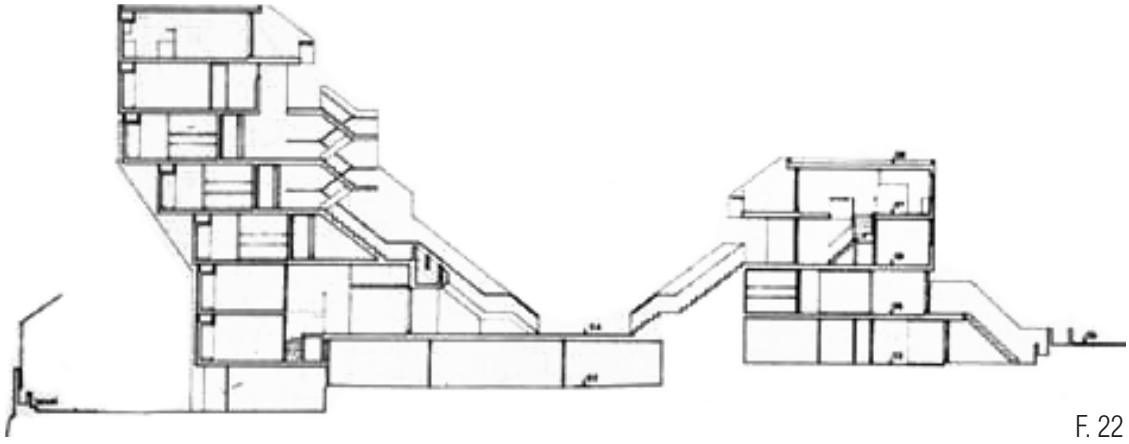
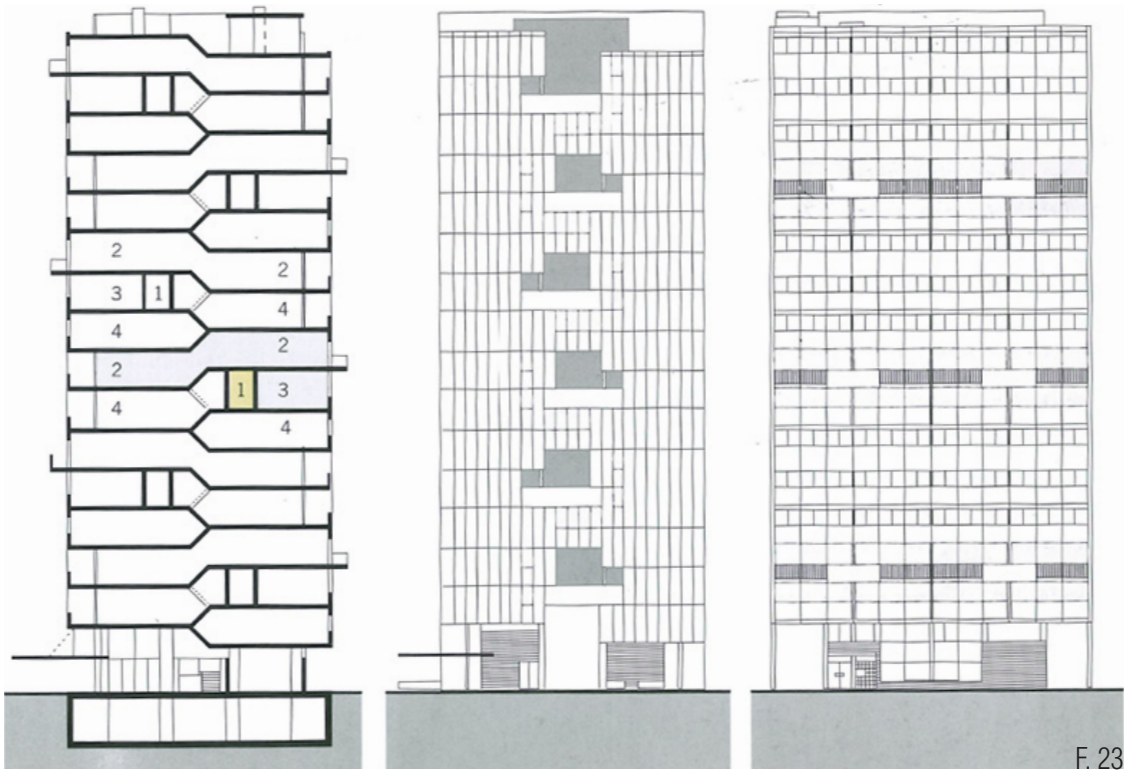


F. 22

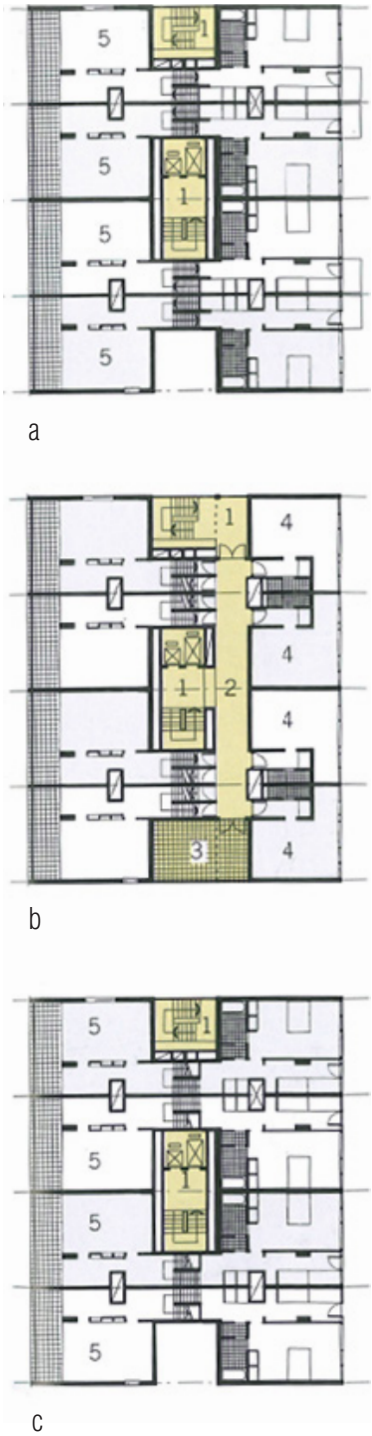
modern projects failed to present a feasible alternative to conventional building typologies, certain architects attempted to address issues of economic feasibility to promote the use of more efficient high-density residential schemes.

This thinking was illustrated in the design of the Hansaviertal tower by J.H van den Broek and J.B Bakema, a building that was a part of the Berlin International Building Exhibition of 1960. The scheme expanded on the Unité d'Habitation project by challenging some of the characteristics that reduce the economic feasibility of the prototype. The building retains the through-unit skip-stop organizational scheme, but eliminates the double height spaces by changing the location of the corridors, staggering the floors, and including studio apartments. The organization of the project dictates the unit arrangement throughout the section of the tower, requiring four studio apartments on every fourth floor. However, the bay dimension of 6 meters, as opposed to the 3.65 meter Unité d'Habitation bay sizes, provides each unit with a higher degree of flexibility when partitioning the interior living space. Community space is also situated on the roof, providing each resident of the tower with additional shared amenity space. The Hansaviertal tower scheme presents an efficient alternative to standard double-loaded corridor buildings, offering more space and flexibility within each unit while remaining economical to build.



F. 23

Figure 24: Facade of the Hansaviertal tower



Sections

1. Access corridor
2. Upper two-bedroom through unit
3. Studio flat
4. Bottom two-bedroom through unit

Plans

1. Vertical circulation
2. Access corridor
3. Double height shared terrace
4. Studio flats
5. Two-bedroom through-unit

a. Floor above corridor
b. Corridor floor
c. Floor below corridor

F. 25

Figure 26: The Trellick tower in London, England

The organization of a mix of unit types within a simple concrete slab building was an idea that was expanded upon in a number of variations by many different architects worldwide, each to varying degrees of success. One important prototype that illustrates the value of this design approach is the Balfron and Trellick Towers in London, U.K, designed by Erno Goldfinger and constructed from 1968 to 1972. The dwelling units within the towers are accessed by a single-loaded skip-stop corridor on every third floor, which allows for a wide variety of unit types and sizes throughout each floor. Located on the corridor level are entrances to the flats above and below the floor, the top floor of four bedroom maisonettes, and one bedroom units. The mix of one and two bedroom flats and four bedroom maisonettes is only made possible by the skip-stop organization and the sizing of the structural bays. The 6.75 meter bay sizing allows for the development of large one bedroom flats on the corridor level, and spacious two bedroom units on the levels above and below.[47] The possibility of housing large families within multi-unit residential buildings afforded planners with a new tool for meeting the demand for housing within the U.K.

a. Typical floor plan
b. 2 bedroom through-unit
c. 4 bedroom maisonette, upper level
d. 1 bedroom flat
e. 2 bedroom flat
f. 4 bedroom maisonette, lower level
g. 2 bedroom through-unit

1. Access corridor
2. Entrance/hall
3. Entrance to flats above and below
4. Storage
5. Kitchen
6. Living
7. Bedroom
8. Bathroom
9. Private Balcony
10. Vertical circulation

F. 27

While the majority of modern housing prototypes have been built in European countries, one of the most innovative and adventurous housing schemes of the modern era was built in Canada. Designed for the International Expo 67 in Montreal, Moshe Safdie's concept for prefabricated housing led to the creation of a scheme that attempted to introduce a new standard of living through the reconfiguration of dwelling space. What made the project significant was the restructured organization and mix of multiple size prefabricated units. The units, many of which are multi-storey, are stacked and staggered so that each unit has a private outdoor terrace on the roof of the unit below. The units are accessed by elevated walkways that span between clusters of dwellings, yet the project is still organized so that no clear organizational logic exists within the scheme.[48] Safdie's unconventional approach to high-density housing was not without its flaws, but the innovative spirit of modern housing was clearly articulated through the construction and organization of the design. The scheme attempted to accommodate for a mix of household sizes, and restructured the standard arrangement of living space.

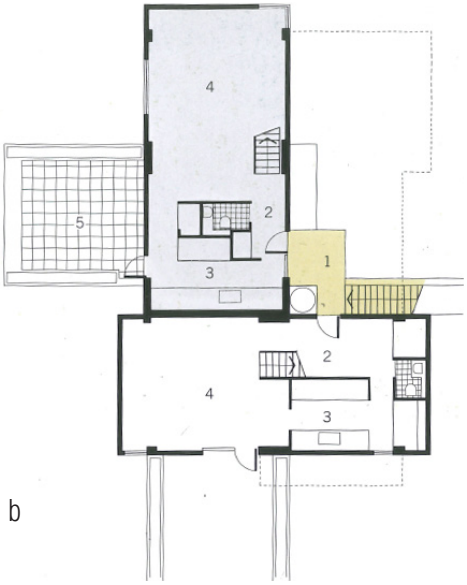
The lessons learned from the by-gone era of humanist modern architecture remain invaluable to contemporary architects struggling with similar issues associated with low quality high density models of residential architecture. The prototypes developed throughout the modern era sparked an evolution in residential design throughout Europe, which has resulted in contemporary models that present viable alternatives to current established North American housing types. While the number of relevant innovative models of housing that may be identified and studied may be vastly overwhelming, several buildings illustrate innovative qualities that may be more applicable to Canadian models of development than others.

Figure 28: The clustered dwelling units of Habitat 67

a. 2 bedroom maisonettes, upper floor
b. 2 bedroom maisonettes, lower floor
c. 3 bedroom maisonette, lower floor
d. 3 bedroom maisonette, upper floor
e. Building section

1. Access gallery
2. Entrance hall
3. Kitchen
4. Living/dining
5. Terrace
6. Bathroom
7. Bedroom

a



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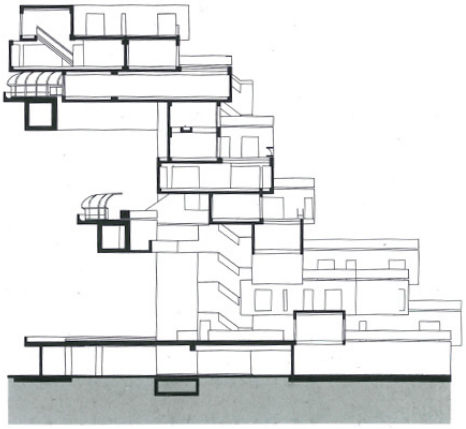
d



e

F. 29

3.2 CONTEMPORARY EUROPEAN TYPOLOGIES

Toronto has historically exhibited a tendency to borrow typologies from other socio-economically similar countries to provide a solution to housing demands. The lack of a clearly defined vernacular architecture alludes to the continued value of referencing contemporary housing types found abroad. A country that has historically excelled in providing high quality urban housing is the Netherlands. Throughout the Netherlands' history, the country has reclaimed a massive portion of its land mass from the ocean by constructing a series of dykes, sluices and dams. The polder model has imbued the Dutch landscape with an innate sense of value.[49] This attitude is translated into the design for residential architecture throughout the country, which is carefully planned and executed to achieve innovatively humane, high quality housing solutions. The Dutch approach to urban design is exemplified in the design of districts such as the Eastern Harbour District in Amsterdam. The meticulous planning of the district has resulted in socially conscious residential architecture that meets the needs of a greater variety of household types and demographics. Affordable housing was carefully inserted within the plan from the outset of the design process, and mixed use development was implemented to promote the creation of vibrant urban spaces.

The design of the Borneo-Sporenburg development is considered to be the most innovative of the five areas within the Eastern Harbour District.[50] The plan for the area mandated that a minimum density of 100 dwellings per hectare be achieved, with 30 percent of the dwellings to be built as social housing. The brief for "The Whale" project by de Architekten Cie called for the provision of 214 two and three bedroom units on a 5000 m2 site, 70% of which was to be built as social housing.[51] The brief forced the architects to develop an innovative approach to satisfy the requirements of the high density scheme. A skip-stop single-loaded corridor system was utilized to allow for an optimal unit layout within the perimeter block building. Corridors at either end of the building on every other floor are connected at both ends to the vertical circulation within the building, and stairs along the corridors connect through-units to the access floors. The efficient development of each floor plate optimizes unit arrangement and flexibility within the scheme, allowing for the creation of two and three bedroom units throughout the entire building. The through-unit arrangement is dictated by the perimeter block site organization. This condition creates an intimate courtyard at the center of the block, which is accessed through the lifted corners of the building mass. The arrangement offers valuable semi-public urban space to the residents within the dense urban scheme, a feature which is much more common throughout developed European cities.

Figure 30: Aerial view of the Borneo-Sporenburg district

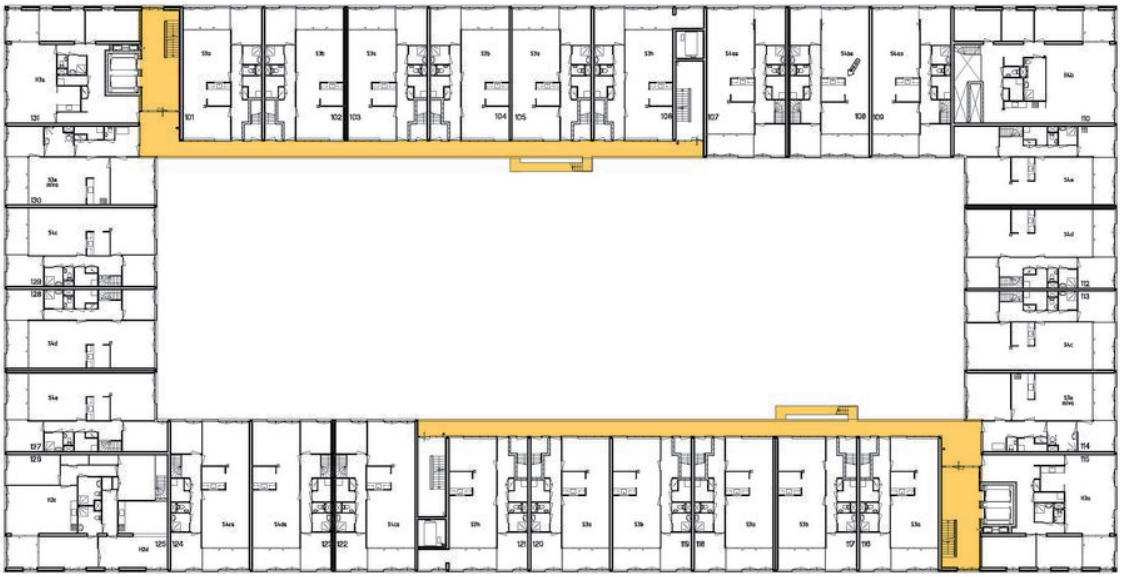


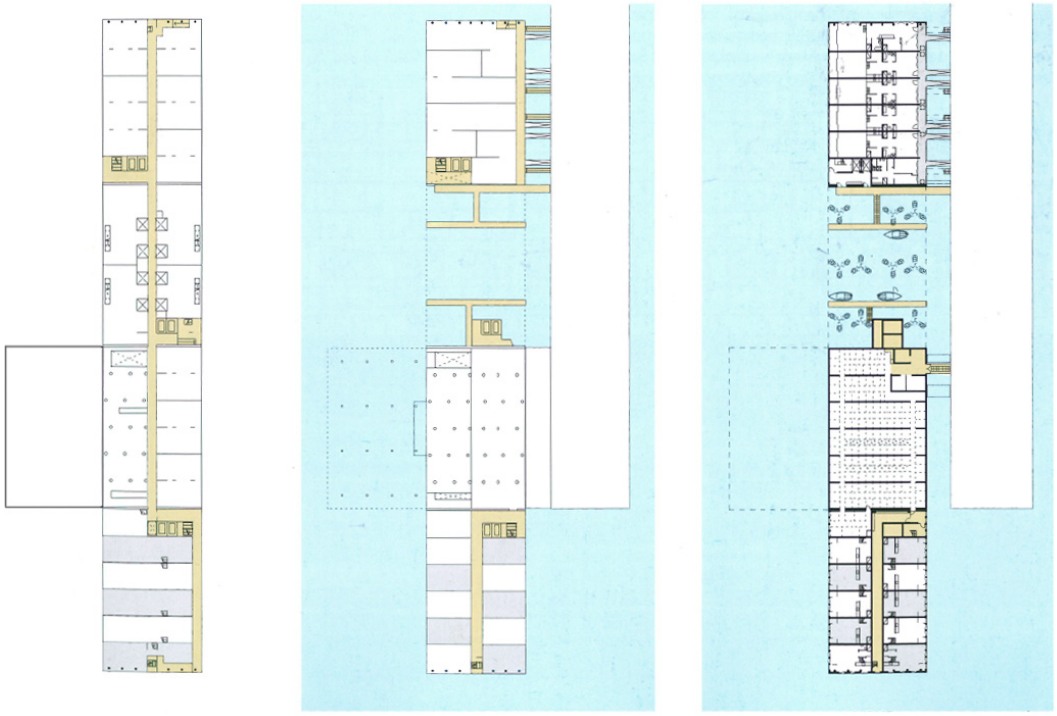
Figure 31: Floor plan of “The Whale”

The advanced architectural vocabulary of residential architects in the Netherlands is a direct result of focused cultural efforts to emphasize the value of high quality urban interventions. The architecture firm MVRDV aptly demonstrates this mentality throughout the body of their critically acclaimed work. The Silodam project in Amsterdam's Western Harbour was an early project that sought to meet the demand for a wide variety of unit types and sizes, which led the architects to experiment with several organizational strategies throughout each floor of the 10 storey building. The scheme contains a mix of single-loaded and double-loaded flats, maisonettes and courtyard units, a mix which can be identified by the varied fenestration and colouring across the façade.[52] The unit variation promotes the creation of a diverse communal microcosm within the building, and reinforces the cultural mentality of the Netherlands at a smaller scale.

The high level of control over the distribution of development type and density in the Netherlands has led to the creation of socially empathetic districts that respond to urban needs as they arise. This commitment to experimentation and innovation has propelled Dutch architecture to the world stage, where they boldly advertise the higher level of quality found throughout the urban fabric of the diverse nation. The controlled approach to adding density in the Netherlands reinforces a symbiotic relationship between cultural values and architecture, and sets an appropriate benchmark for international residential development standards.

Figure 32: Facade of the Silodam

F. 33



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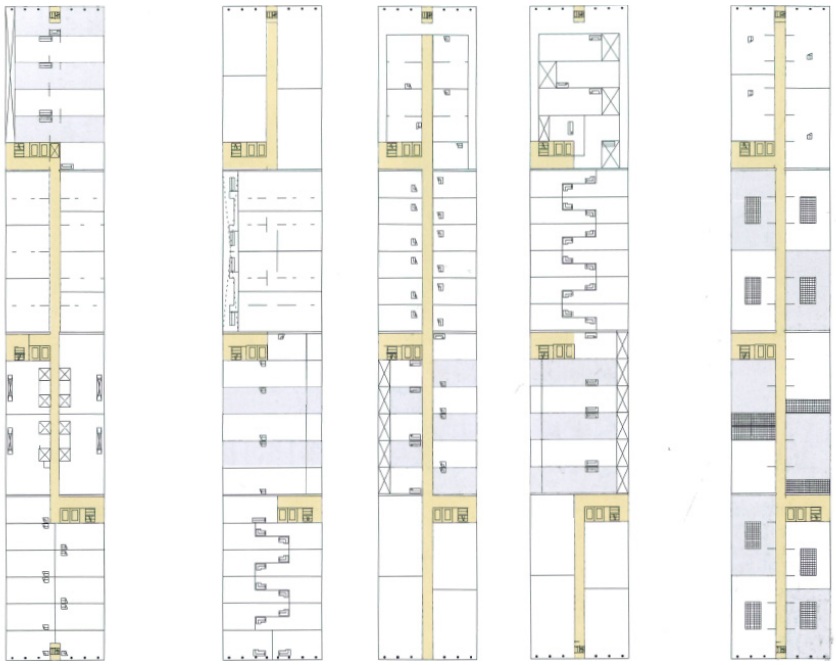

d e f g h

a. Level 0
b. Level 1
c. Level 2
d. Level 3
e. Level 4
f. Level 5
g. Level 6
h. Level 7

Another country that has recently struggled to mitigate the effects of tower in the park projects throughout urban areas is France. The lessons learned from the failure of these schemes has changed the mindset of the French architectural community, which is reflected in the design of contemporary housing. LAN architects have worked to reformulate the relationship between high density housing and its occupants, most notably in their design for housing in Begles, France. The housing scheme utilizes a single-loaded perimeter block organization to allow for through-unit dwellings arranged around a central courtyard. The two buildings in the scheme together contain 79 units, each of which has a dedicated private exterior space cut out of the mass of the building. The unfinished void spaces provide each unit with a private 'winter garden' space which is large enough to develop as an interior addition that may meet the spatial demands of each household as they change over time.[53] The structure of the housing gives each household the option to plan for contingency, an element that is typically precluded from the design of high density residential.

Figure 34: View of the Begles Apartments

Figure 35: Third floor plan

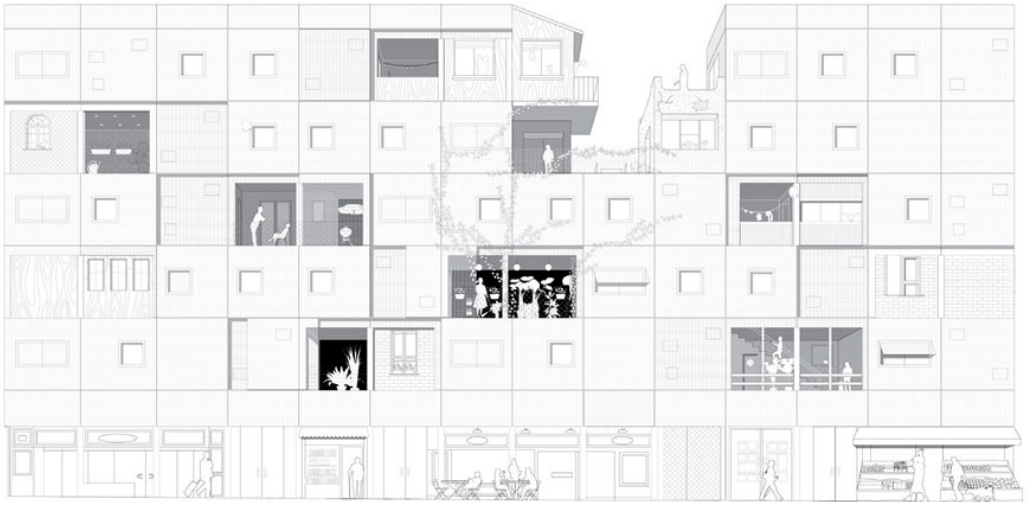

Figure 36: Elevation showing the habitable winter gardens

When studying the design of innovative residential typologies in similar countries around the world, a number of additional precedents may help challenge our established notions of high density residential architecture. The SANAA design for the Kitagata Apartment Building in Gifu, Japan, presents a radical alternative to the organizational structure of traditional Japanese housing within a high density scheme. The massive, snaking 10 storey building is strictly divided into 2.5 m bays along the length of the floor plate, and each bay may be developed either as a traditional Japanese room, a bedroom, a family room, a dining/kitchen area, or an outdoor terrace. This is made possible by the careful design of the structural bays of the building, as the architects ensured that the same size bay could be arranged in numerous different ways. Exterior single-loaded corridors serve as the access for each apartment, and also allows each unit to have access to opposite exterior faces of the building. Double height bays may be included in the configuration of each unit to expand an apartment into two floors, which further increases the flexibility of dwelling sizes and arrangements throughout the building structure.[54]

The introduction of expandable and retractable unit arrangements within a strict structural grid implies a greater degree of flexibility within the residential scheme developed by SANAA. Residents are faced with the option of deciding how much space is necessary for their household, not only when they initially purchase a space in the building, but also over the life of the building. As tenancies change within the building, units that become vacant may potentially be absorbed by an adjacent unit. The height and length of the building provides the possibility to include as many as thirty different unit configurations within the building framework. Further to this, these units may be arranged in thousands of different combinations, a possibility which results from the single-loaded organization and structural bay spacing. This enhances the mix and number of households that may inhabit the building, which effectively accommodates for a greater range and diversity of demographics.

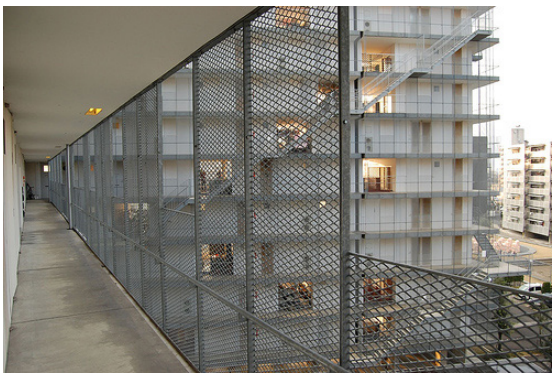

Figure 37, 38: Views of the Kitagata Apartment Building

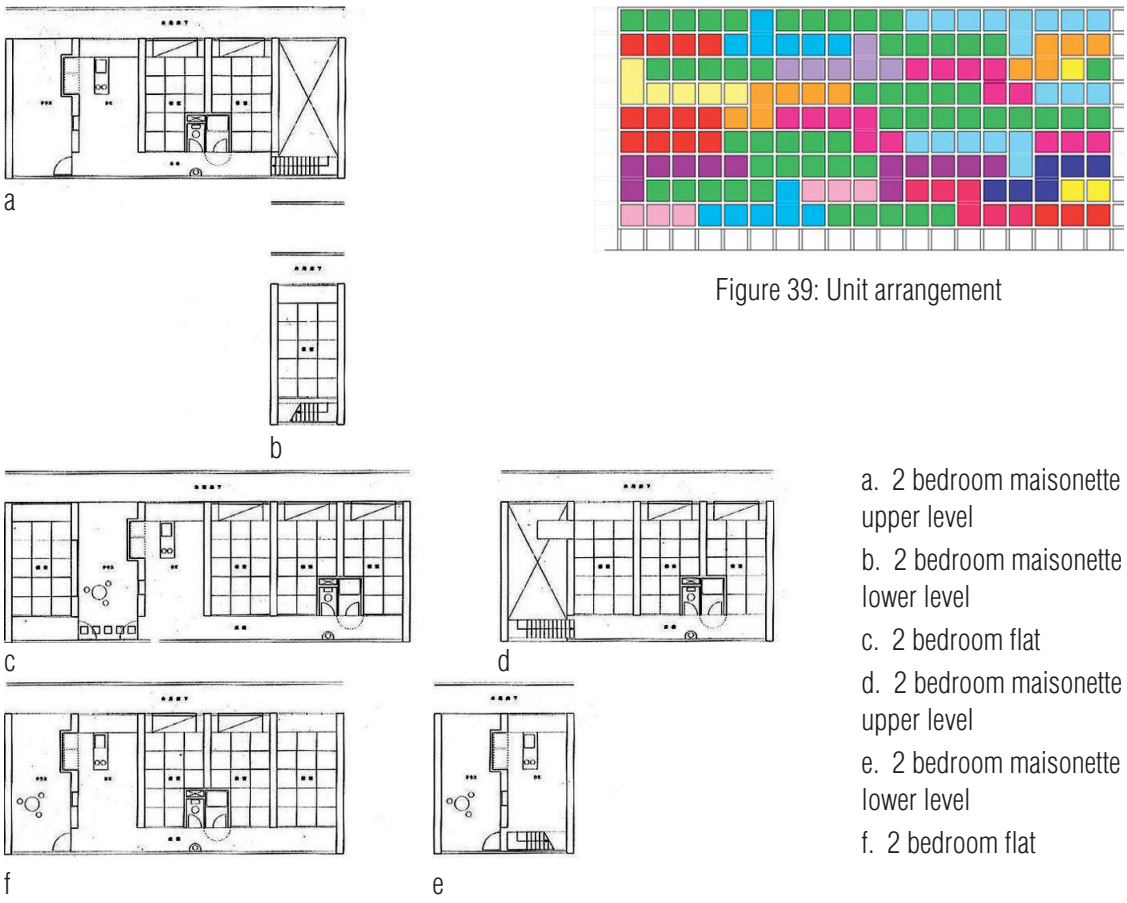

Figure 39: Unit arrangement

a. 2 bedroom maisonette upper level

b. 2 bedroom maisonette lower level

c. 2 bedroom flat

d. 2 bedroom maisonette upper level

e. 2 bedroom maisonette lower level

f. 2 bedroom flat

F. 40

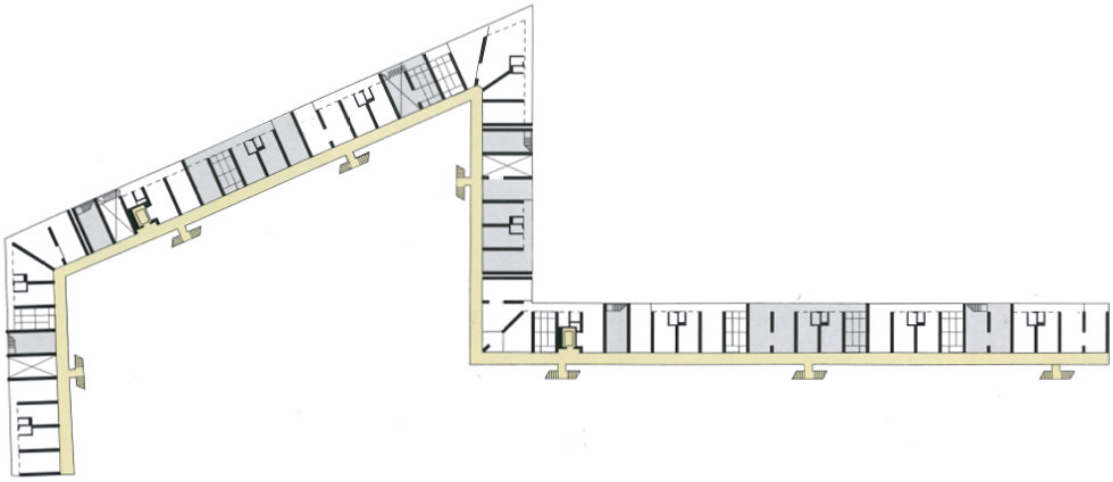

Figure 41: Typical floor plan

3.3 INTRODUCING NEW MODELS TO THE CANADIAN CONTEXT

The ideas and organizational systems found in the work detailed throughout this chapter may help forge an innovative architectural response to issues related to the design of Canadian housing. As the study of different typological patterns demonstrates, the application of different organizational strategies may help a designer reach a site-specific solution to the unique criteria identified in each project. A number of performance criteria must be evaluated before deciding what organizational scheme and unit arrangement may best suit a given site. Cultural living standards and expectations form a crucial part of these criteria, and will dictate the final arrangement, size and type of housing. Site requirements will determine the organization of main circulation elements and overall unit arrangement, and will lead to the development of higher densities based on the location within the city and proximity to infrastructure. Further to this, building codes and standards impose a set of requirements that dictate the organization of different building elements. The appropriate selection of a site is a crucial part of achieving an appropriate housing model, as the size, location and proximity to the infrastructure surrounding a given site will influence the organization and density of the design. The selection of an inappropriate site leads to the continued use of rigid formulaic housing types, which will continue to result in housing that inadequately accommodates for a diversity of household types simultaneously.

While examples of typological innovation in the Canadian urban context may be few, there are several examples of high density urban residential in the city of Toronto that are worth studying as design precedents. The following projects exemplify how innovative organizational patterns developed in other countries have been adapted to conform to the strict code requirements imposed within the urban Canadian context. In each case, innovative residential models were adapted to conform to the particularities of each urban site, and were utilized as a means to implement higher quality urban living standards.

Twenty Niagara is a mid-rise residential project designed by Architects Alliance and completed in 1997. The six storey project entirely eliminates corridors by dedicating the elevators to serve as private access to dwelling units. This arrangement dictates that two pairs of through-units on each floor of the building share an elevator. The challenge of providing access to two means of egress is circumvented by connecting the balconies of each unit to the fire escapes at opposite ends of the building.[55] The through-unit arrangement introduced by this plan type allows for the development of more living space on each floor of the building, which translates into better living standards for the building residents.

Figure 42: Twenty Niagara as seen from Victoria Memorial Square Park

Figure 43: A typical floor plan of Twenty Niagara

The District Lofts residential building, designed by Architects Alliance, is an award winning project located near the intersection of Richmond Street and Spadina Avenue. The lower half of the building contains commercial units at grade, parking on the second and third storeys, and double loaded residential units on the remaining levels. Above this, two single loaded towers connected by walkways on every other floor allow for the creation of maisonette through-units within each tower. Between the two towers, a massive courtyard contains valuable semi-private amenity space that is open to every resident within the building.[56] The creative implementation of different organizational systems within each segment of the building allows the structure to tie into the fabric of the existing neighbourhood, yet defy the conventional plan type that typically arises from this urban site condition.

Figure 44, 45: Views of the District Lofts building

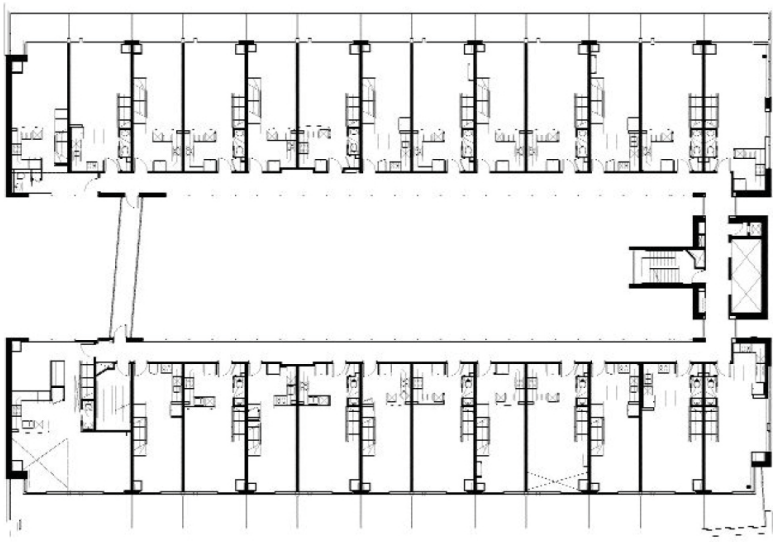

Figure 46: Plan of the District Lofts building

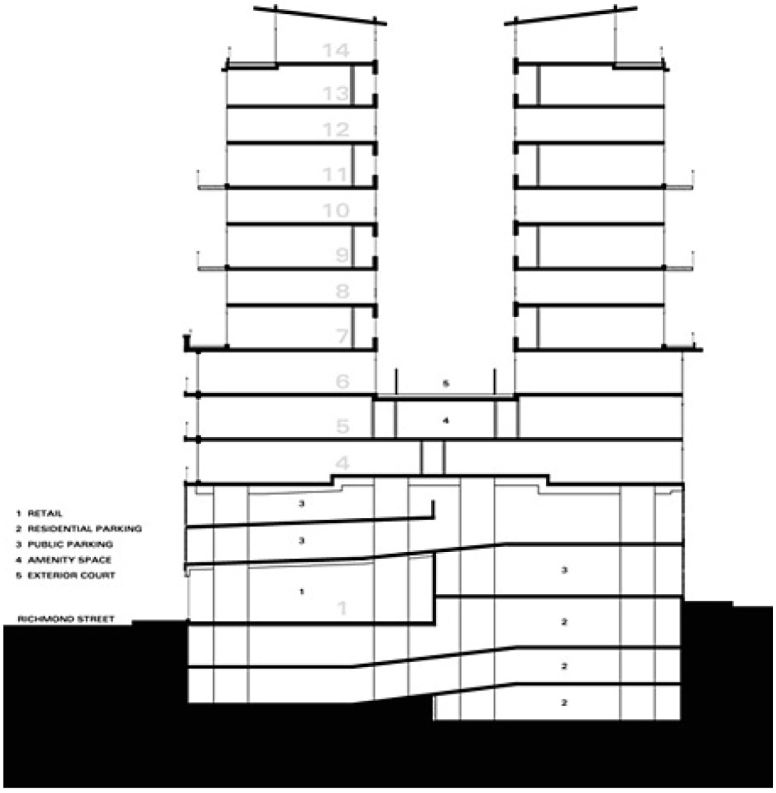

Figure 47: Section of the District Lofts building

294 Richmond Street East is an urban infill project designed by Sweeney Sterling Finlayson & Co. The six storey mixed use building contains commercial uses at grade, and a total of ten maisonette units. The building takes the town house living arrangement to the sky through the use of single-loaded corridors, which provide access to the lower level of each maisonette unit on every other floor of the building.[57] Once again, this scheme allows for the development of more living space on each floor of the building, and makes the best of a very restrictive and narrow urban site. The mid-rise scale of the building also respects the scale of the surrounding historic low-rise neighbourhood.

The study of precedents within the urban Canadian context indicates that innovative models have been experimented with, yet their wide-spread use remains limited. These plan types are vastly outnumbered by the wide-spread use of rigid formulaic housing types. As a response to this, the following chapter outlines the creation of a high density residential prototype that can flexibly accommodate a variety of household types and sizes within a single high density residential building. Similar to the design of the Kitagata Apartments, the organization of the individual living spaces contained within the prototype must first be understood before attempting to organize the dwelling units on a specific site. The resulting density of the building is contingent upon the arrangement and size of the dwelling units within the prototype. By designing the overall form of the building first, unit sizes and types are often compromised to conform to the shape of the building footprint, and a monotonous mix of units is often the result. The following prototype challenges the form first mentality by focusing on the arrangement and organization of individual dwelling units, which ensures a proper mix of unit types can be achieved within the final form of the building. After the organization of dwelling types is determined, they are then arranged to meet a specific density on a given site.

Figure 48: View of 294 Richmond Street East

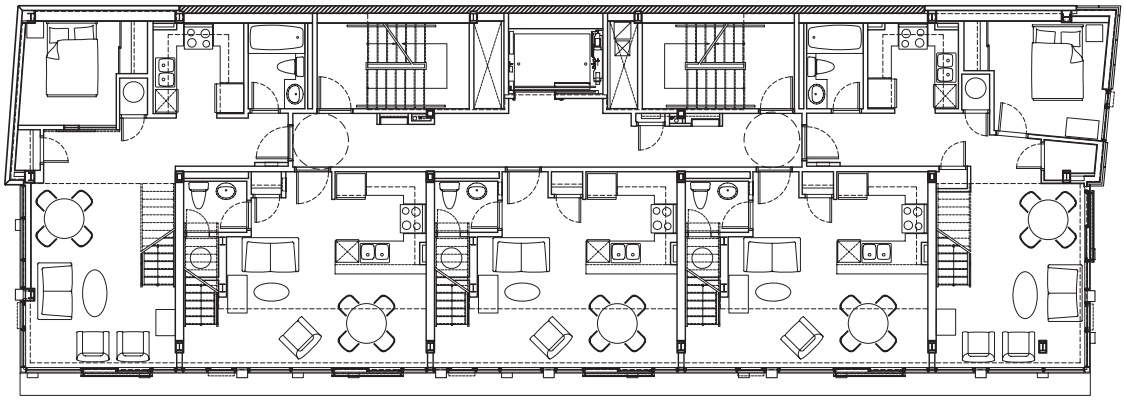

Figure 49: Corridor level plan of 294 Richmond Street East

NOTES

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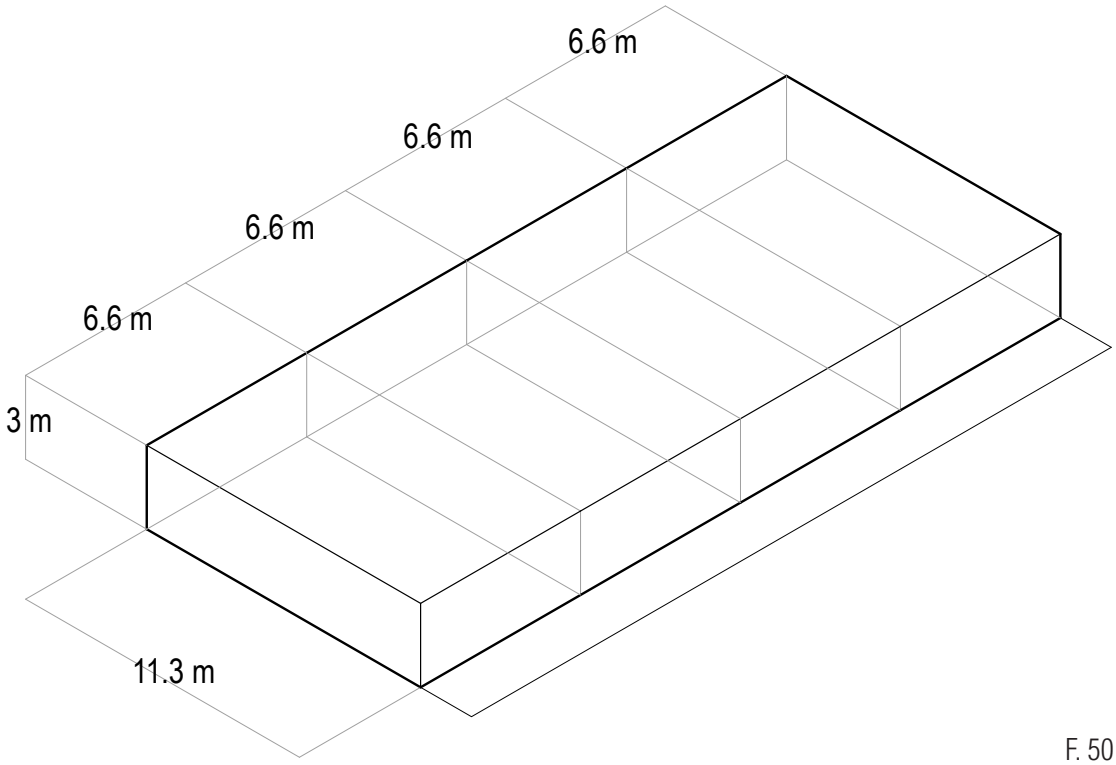
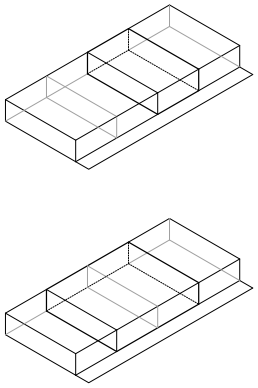
PART 4 : THE PROTOTYPE

4.1 RESTRUCTURING THE CONVENTIONAL DWELLING TYPE

The design of conventional housing typically begins with the massing of the building on a given site, which then influences the size, orientation and density of the dwelling units within the building mass. This design strategy limits the variety of unit types, as the plan of a limited number of unit types will often be repeated on every floor of the building. Rather than begin with the design of the building mass, this thesis begins by carefully sizing the individual dwelling units, which are designed to accommodate a multiplicity of possible end-uses. As a means to increase the flexibility of the building, the design carefully considers the size of the structural grid. As is typical with conventional residential design, the bay size of the structural grid will be repeated throughout the building. The units that result are the same size, and the maximum variation of units that may be developed within the main body of the building is limited to two (Figure 49). This strict organizational method serves as the fundamental starting point of this thesis, as the alteration of bay sizes results in a condition that allows for the creation of a much wider variety of unit types within the static frame of a concrete building.



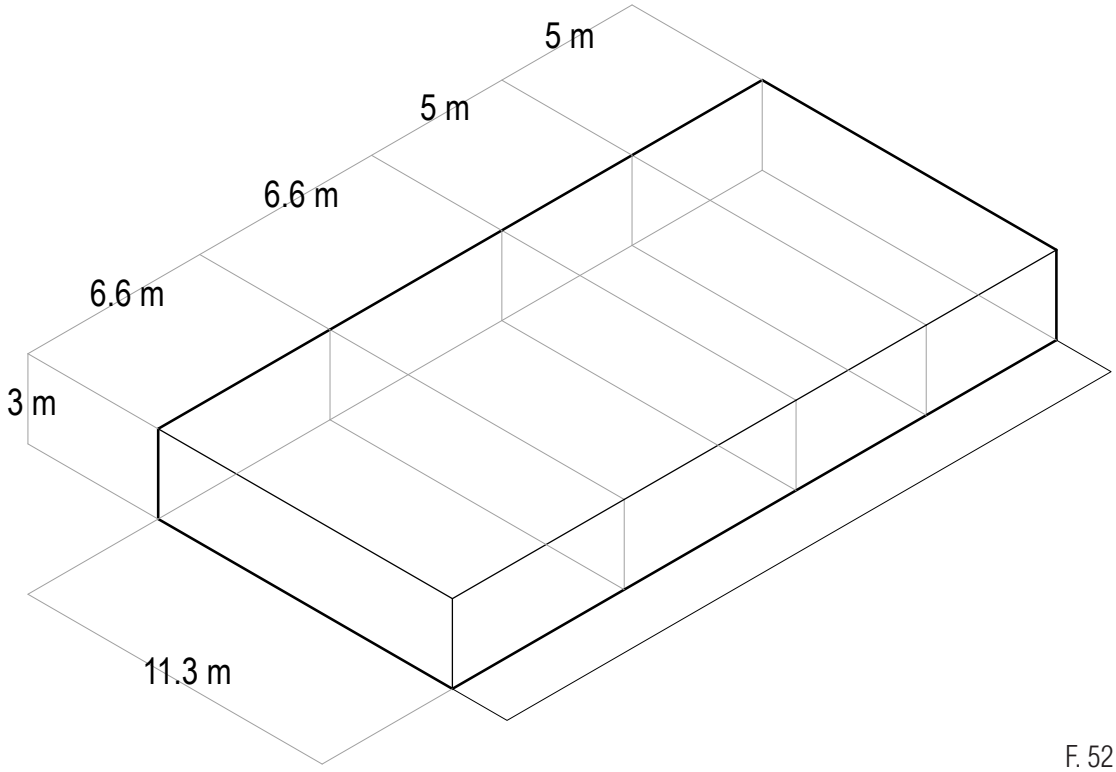
F. 50



x **2**

F. 51

As demonstrated below, an alternating structural grid provides the framework in which five units may be developed on a single floor of a residential building. The paired alternation results in the ability to join two larger bays side by side, two smaller bays side by side, and a larger bay with a smaller bay. The units may be combined by removing the party wall dividing units, which implies that the structure dividing the bays must be carefully designed to not impede the connection between units. Similar to the design of the Grow Home, the footprint of each unit must be carefully sized to allow for the design of five different unit types within the same structural grid. This design approach requires that the grid size of the building does not change when it is placed on the site. The two organizational schemes illustrated above and below work when applied to the design of a double loaded building. However, as illustrated by the next step, the final prototype only works as a single-loaded organizational scheme.



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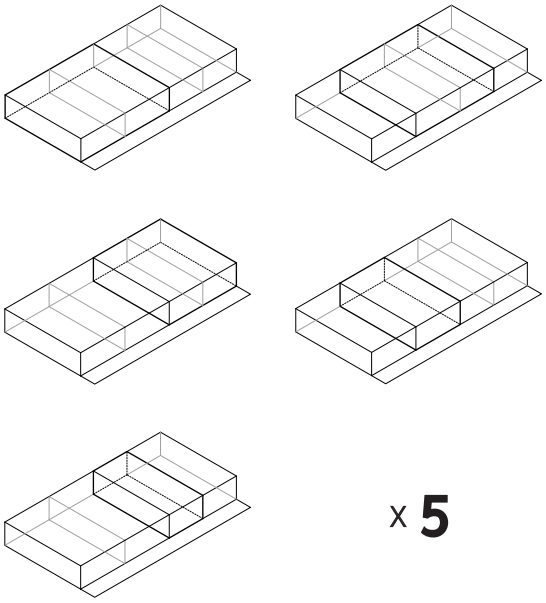
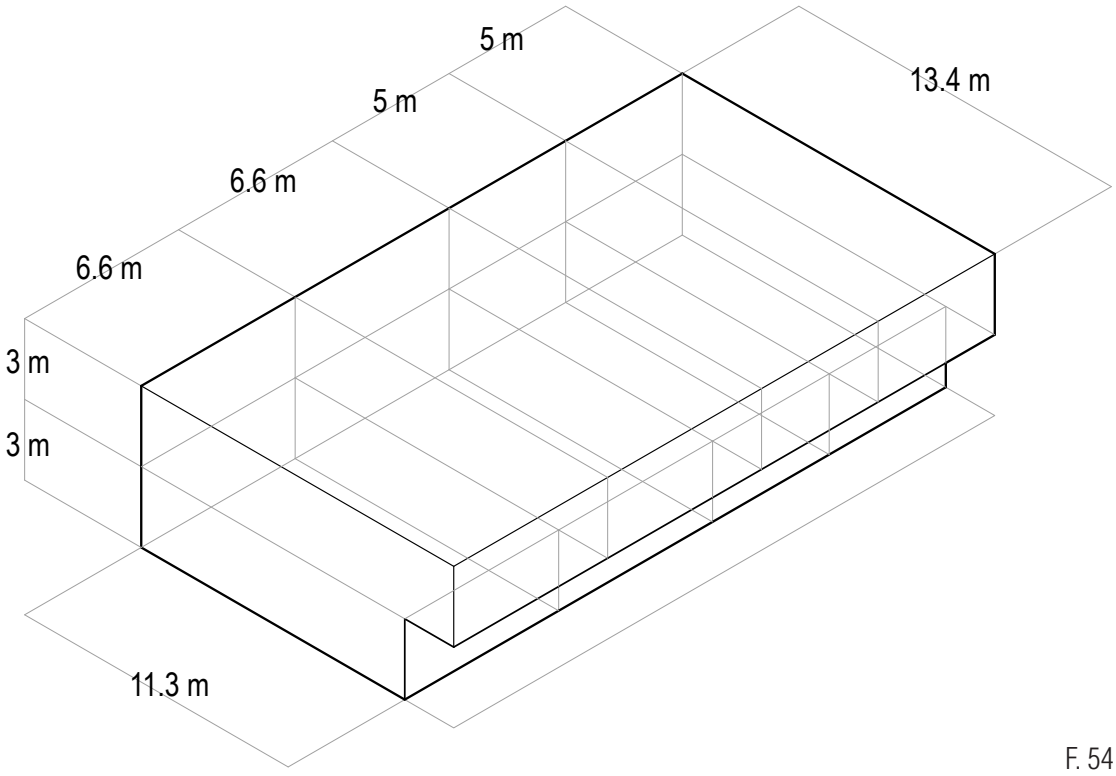


F. 53

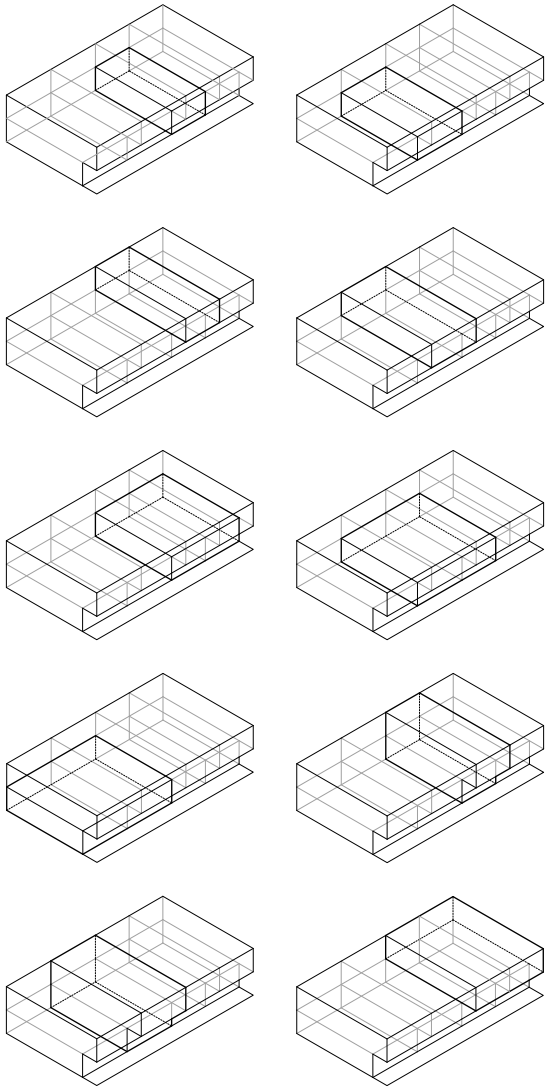
The viability of the conventional double-loaded corridor is challenged when considering the provision of an increased variety of units within a single building. Double-loaded corridors lead to the design of units that only have access to one exterior face of the building, two in the case of corner units. The spatial layout of a unit with one exposure to an exterior face of the building is difficult considering that every bedroom and main living area must be provided with a certain percentage of glazing. For units with two or more bedrooms, an extensive exterior exposure is required to provide each living area with glazing. This results in units with a long exposure to the adjacent hallway, which is typically an inefficient organizational system for a building with larger dwelling units. For this reason, many three bedroom units in condominiums are built on the corner of the building floor, as it is exposed to two exterior faces. This presents many layout challenges to building family oriented units in dense residential buildings, as the floorplan layout becomes uneconomical and inflexible.

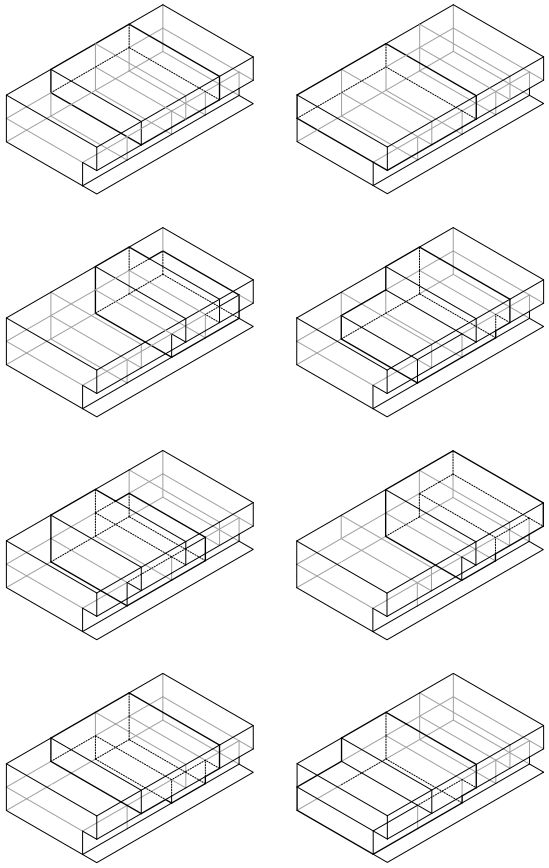


F. 54

A residential unit typology that responds to this issue is the through-unit plan. Ten of the eleven precedents that were previously identified include variations of the through unit plan. This is due to the fact that through-units are economical both in terms of space and partition flexibility. Because a through-unit has access to two, and sometime three exterior faces of the building, there is much more freedom to change the interior partitions of the floorplan. This affords a household with many different possibilities when partitioning living spaces within a unit, better serving their spatial needs as they change over time. The second benefit of through-units is the added exposure to natural light, views, and natural ventilation. In a conventional double-loaded corridor plan, units rely heavily on mechanical ventilation, which affects resident health and adds to the energy required to operate a building. The ability for residents to naturally ventilate their dwelling unit allows them to passively control the temperature of interior spaces, and flush contaminants out from stagnant interior spaces. Exposure to natural light is also a basic sustainable premise that may reduce the energy required to operate the building. Finally, exposure to natural light and views to the surrounding context considerably benefit the health and well-being of residents.

Similar to the design of the Balfron and Trellick Towers by Erno Goldfinger and The Whale by de Architekten Cie, this prototype utilizes a skip-stop organizational system to allow for the creation of a wider variety of units. The addition of through units on floors above and below each corridor level allows for the creation of an additional 13 unit types within the building framework. The possible units range in size depending on the combination of adjacent structural bays. This organizational strategy mimics the combination approach utilized by SANAA in the Kitagata Apartments. The through floors allow for the creation of units with living spaces at each end of the floor plan, which permits the development of spacious two and three bedroom units within the building framework.





x **18**

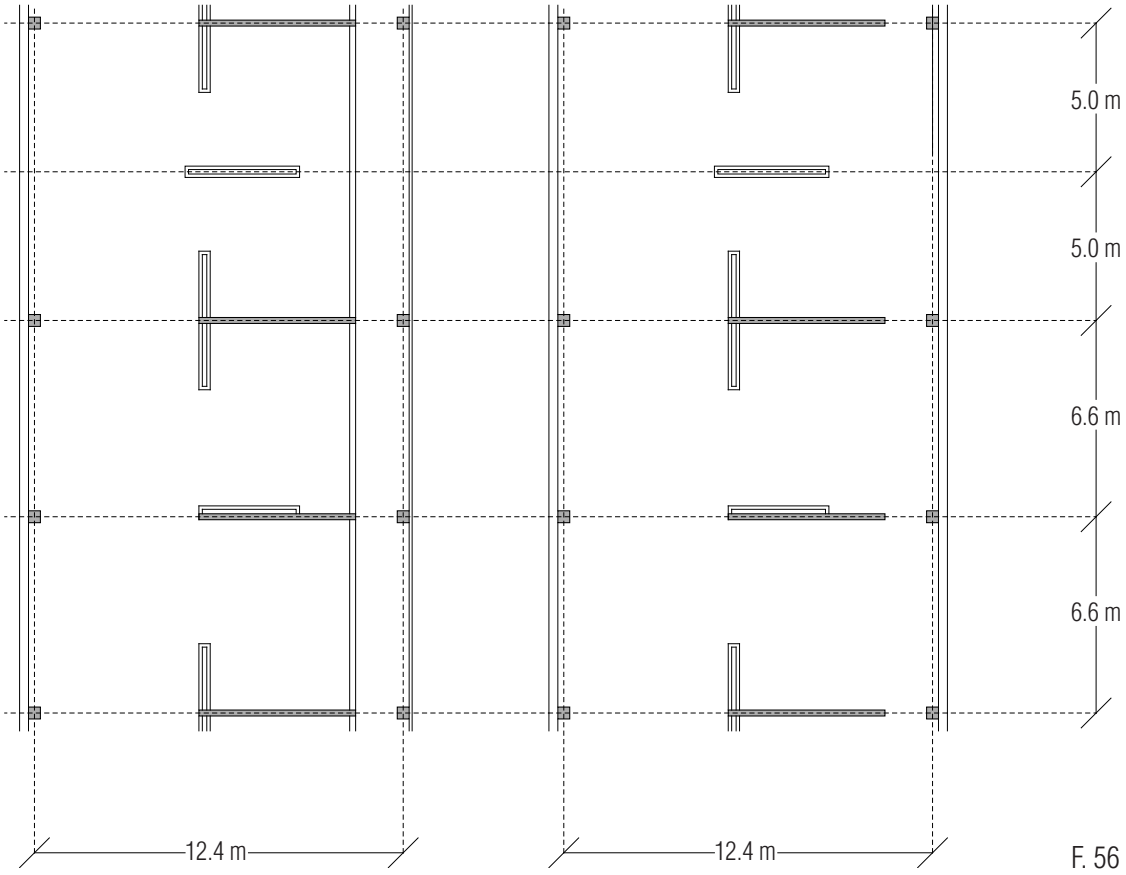
F. 55

4.2 PLAN TYPES

As a means to allow for the flexible creation of a range of unit types within a static structural framework, several important organizational strategies were utilized. The first condition that was carefully considered was the placement of the internal stairs. Locating the stairs adjacent to the circulation corridor creates a condition in which the stairs may be separated from the corridor level unit to solely provide access to the unit above, or included in the corridor level unit to combine two stacked bays into one dwelling. This strategy drastically increases the number of units that may be developed within the building framework. The next condition that was carefully considered throughout the design of the unit types in the building is the location of the stacked plumbing in every unit type. Because it is necessary to stack the plumbing throughout every unit variation, it was ensured that the layout of each unit type utilizes the same wet wall scheme. Plumbing fixtures are placed in the same areas of each plan regardless of the unit type/size. The placement of the wet walls were carefully considered so that the partitioned living spaces may still be flexibly arranged around the service spaces. Due to the maisonette arrangement with internal connecting stairs, it is logical to arrange one wet wall on one side perpendicular to the unit layout at the end of the stair landings, and one wet wall on the other side of the unit parallel to the unit layout along the party wall. The combination of perpendicular wet walls allows for a wide variation in service space layouts throughout all of the unit types, and permits a range of options when deciding where to locate service spaces.

Bachelor	*One Bedroom*	*Two Bedroom*	*Three Bedroom*	*Four Bedroom*
450 ft^2	625 ft^2	850 ft^2	1325 ft^2	2100 ft^2
	650 ft^2	925 ft^2	1550 ft^2	2225 ft^2
		1075 ft^2	1600 ft^2	
		1200 ft^2	1625 ft^2	
		1250 ft^2	1675 ft^2	
			1700 ft^2	
			1850 ft^2	
			2050 ft^2	

The strategies detailed above allow for the creation of eighteen unit types. The smallest unit, the 450 ft^2 bachelor, is located in the 5 meter bay along the corridor floor. The largest unit, the 2275 ft^2 4 bedroom, takes up two of the larger 6.6 meter bays along the corridor floor, and one 6.6 meter bay on the floor above. The scheme ultimately allows for many different unit combination types throughout the building structure, as any adjacent or stacked units may be combined. This provides a high level of flexibility when the building is initially constructed and units are sold or rented, as the final building may contain a combination of any of the 18 unit types within the building mass. What remains important to this prototype is the fact that the units throughout the building framework may vary significantly, but the building structure will always remain the same. The chart on the preceding page details the 18 different unit types which may be developed. The remainder of this section focuses on six of the eighteen unit types, and identifies the size and type of family that may be accommodated within each.



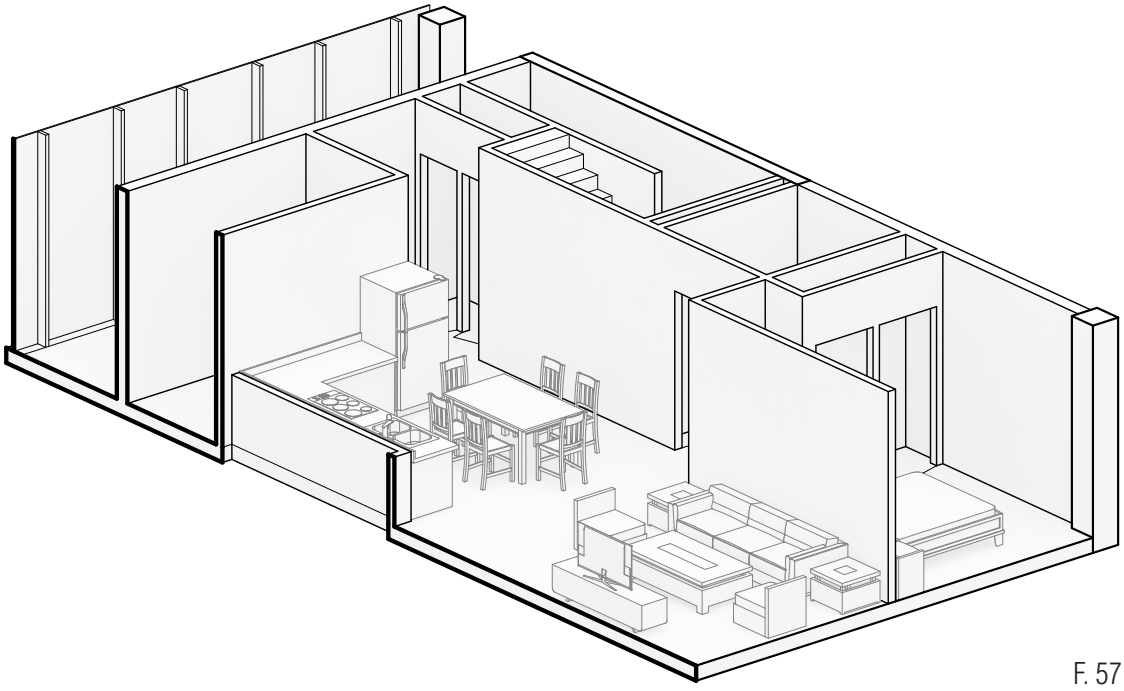
F. 56

PLAN 1

This plan is suited for a single person or couple. It is the second smallest unit that can be developed within the scheme, and is developed on the corridor floor within the 6.6 meter wide bay. The 6.6 meter bay allows for the creation of two living spaces side by side on the exterior face of the plan, each roughly 3 meters wide. This plan is one of the most conventional found within the design, as it is commonly found in a typical Toronto condominium building.

Plan Type: 1 Bedroom

Plan Size: 625 ft^2



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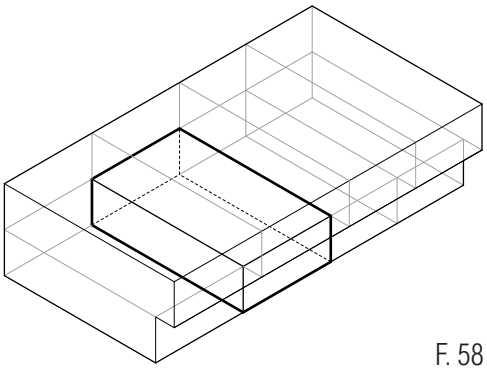

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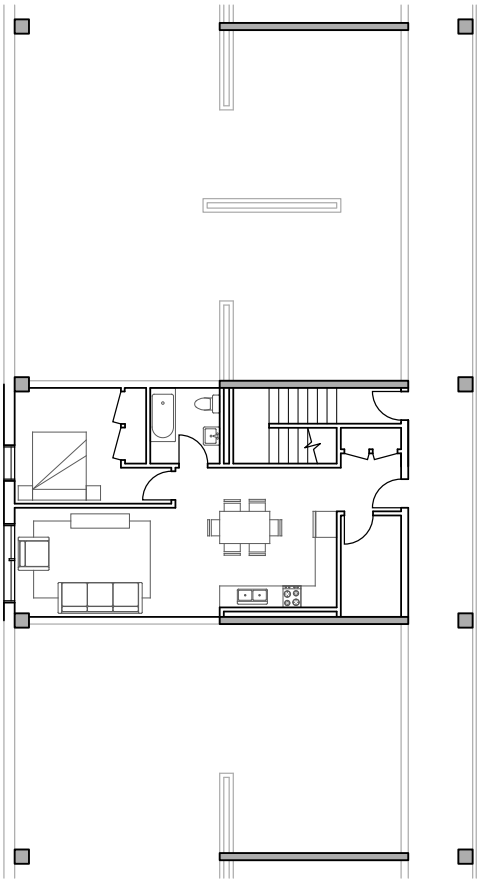
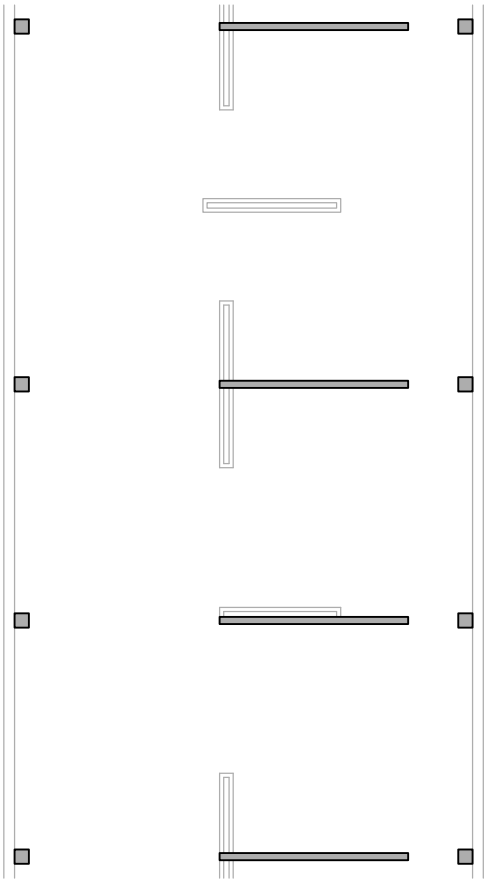


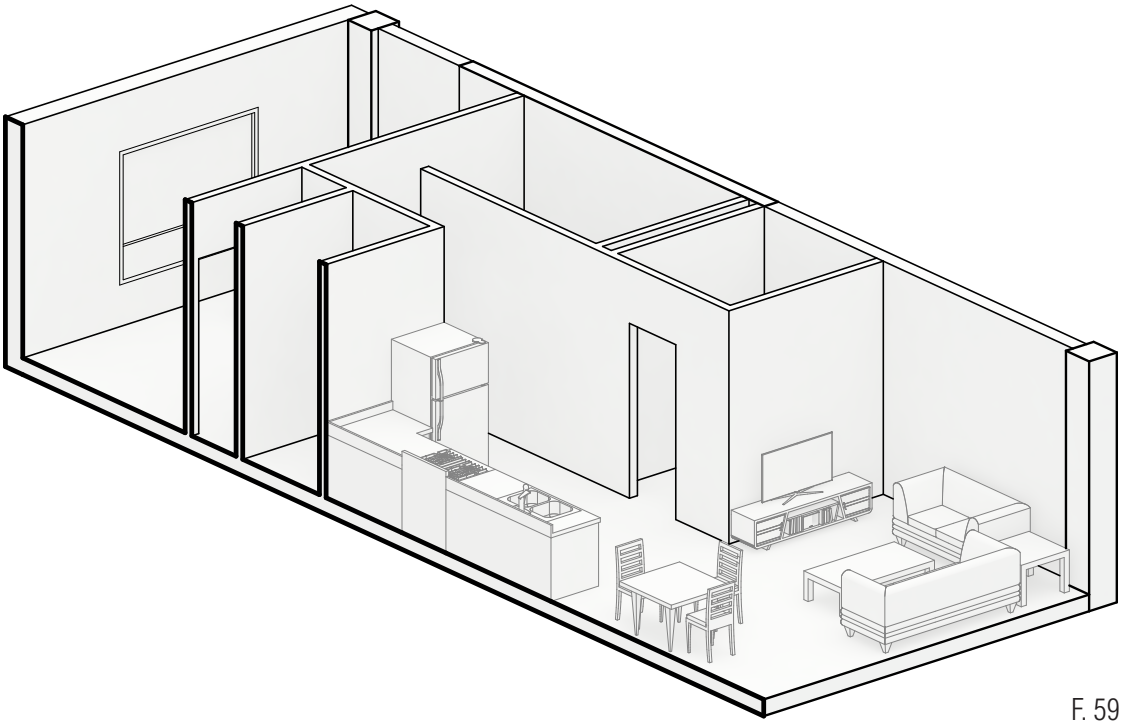


PLAN 2

This unit is once again suited to a single person or a couple with no chidren. The larger size of the unit offers more storage area and bedroom space to the household. The unit is located in the 5 meter bay on the through floor above or below a corridor floor. The five meter bay spacing allows for the creation of two main living spaces at each end of the floor plate, which is divided by the unit's service spaces. Due to the five meter width, it is possible to include a smaller living room arrangement and a dining room set-up side by side in the primary living area.

Plan Type: 1 Bedroom

Plan Size: 650 ft^2



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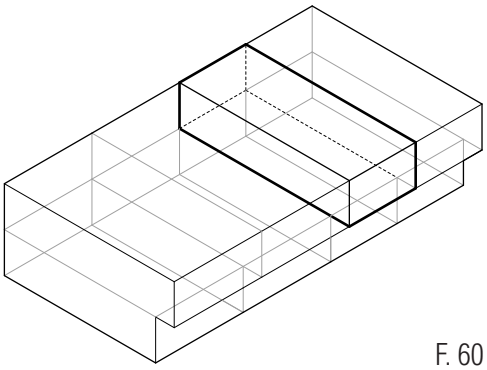

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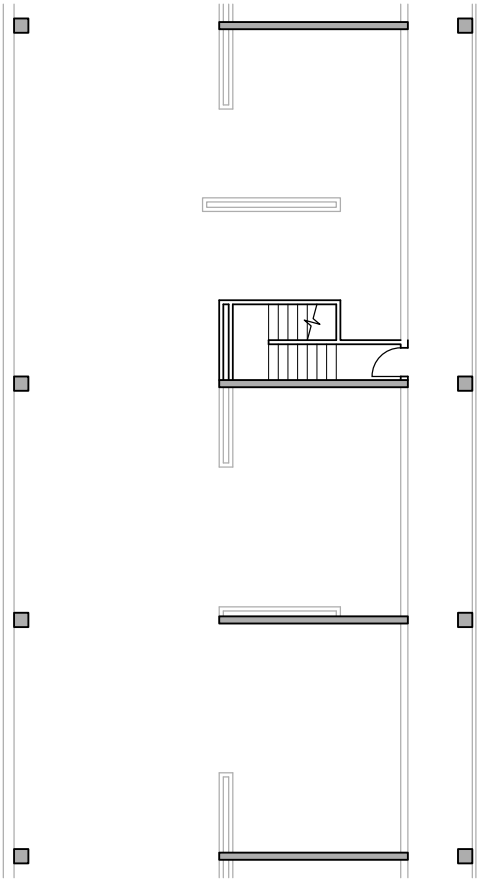
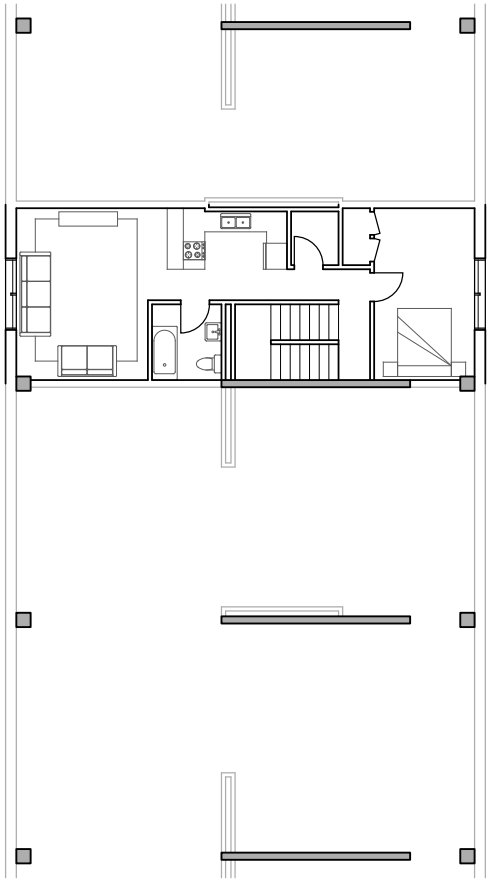


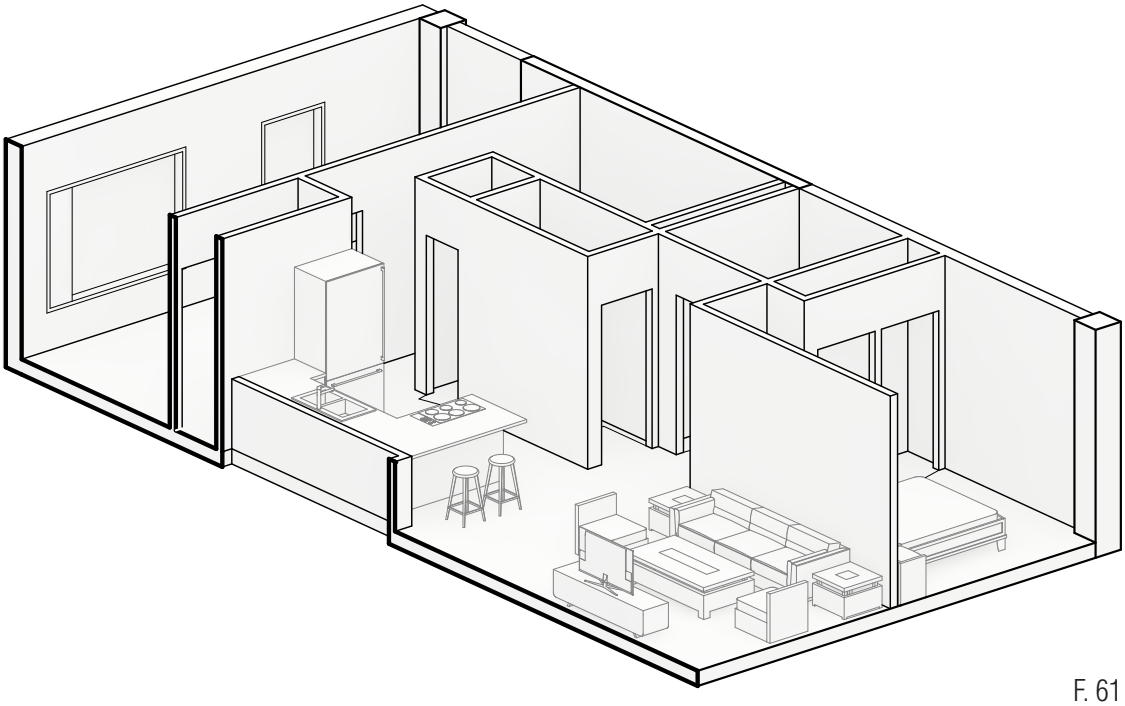


PLAN 3

This unit is the smallest available two bedroom unit, and is suited to a single parent or couple with a child. The unit is located in the through floor above the corridor level in the 6.6 meter bay. This allows for creation of a larger living area and a smaller bedroom side by side at one end of the floor plate, and a larger master bedroom at the other end.

Plan Type: 2 Bedroom

Plan Size: 850 ft^2



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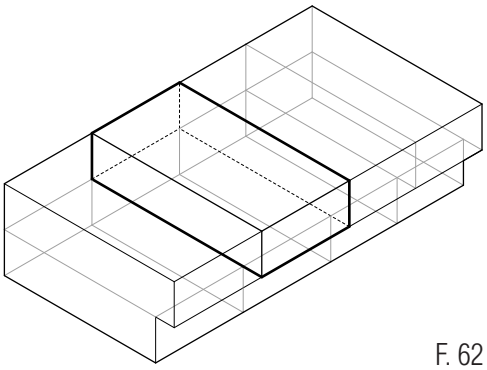

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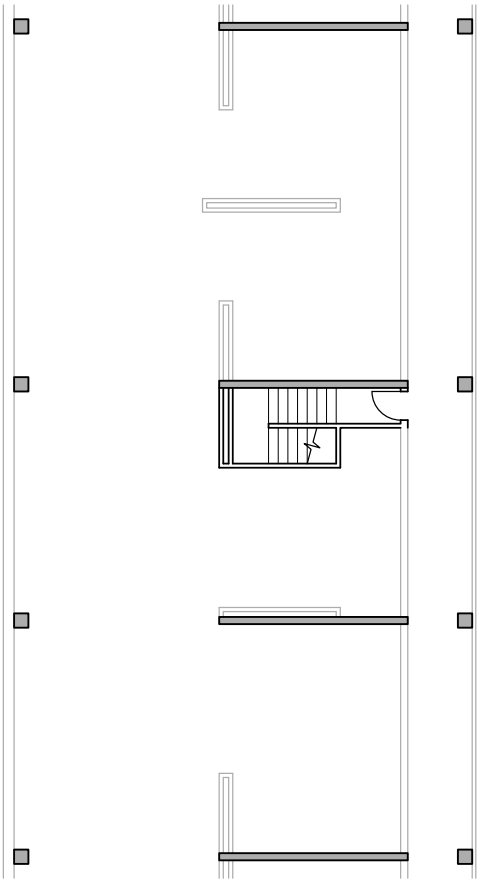
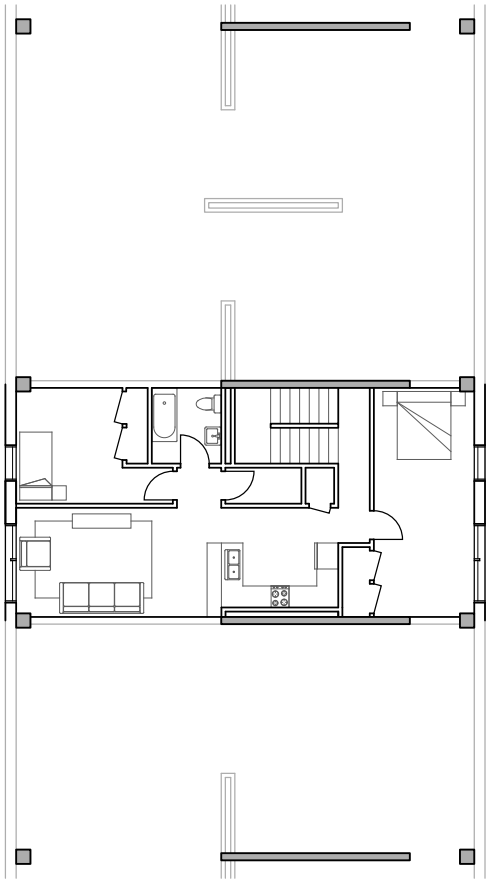


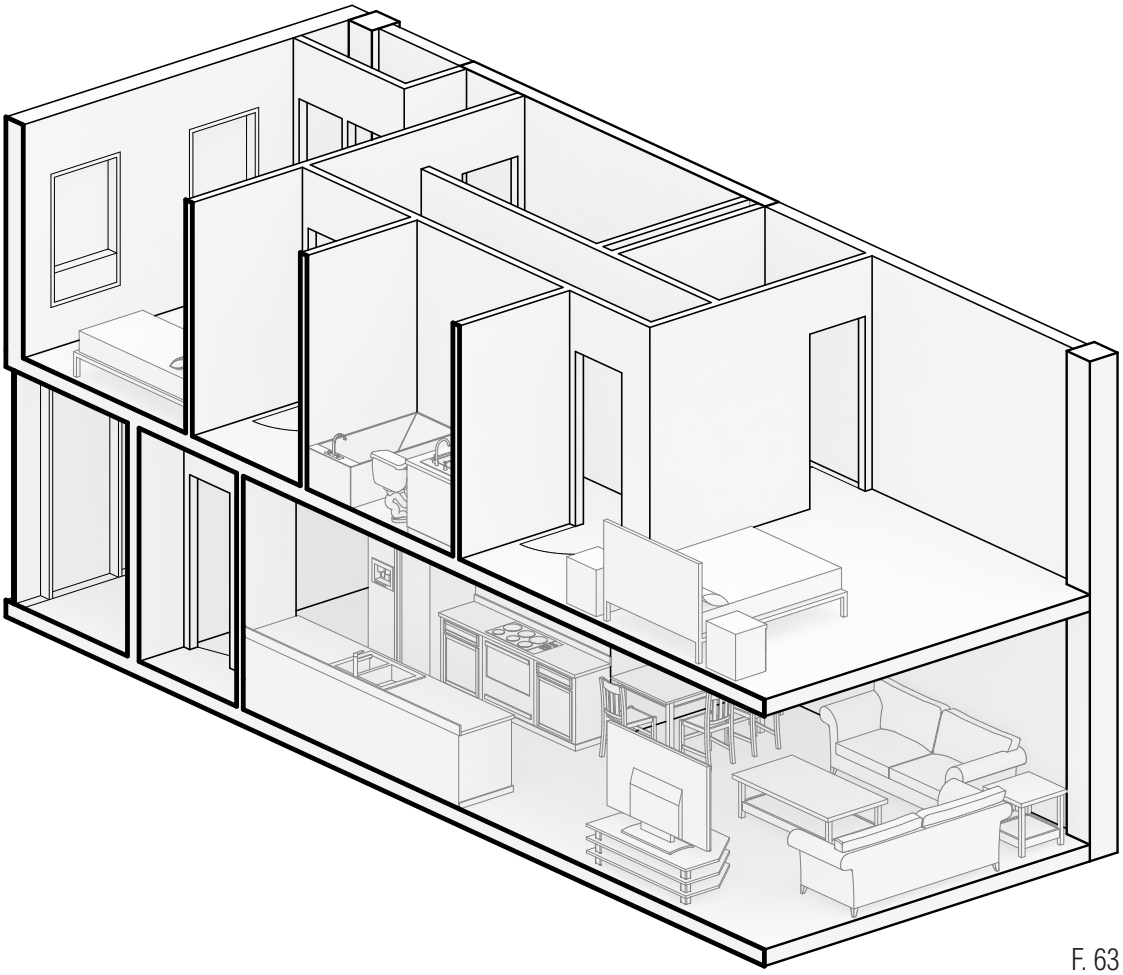


PLAN 4

This plan is the second largest of the two bedroom floor plans. It is developed by combining the corridor level and through level of the 5 meter bay. The corridor level contains all of the living spaces, while the through level contains the two bedrooms, with one at either end of the floor plate. The separation of living and sleeping areas is well suited to the needs of a larger family. The unit is suited to a single parent or couple with a child.

Plan Type: 2 Bedroom

Plan Size: 1200 ft^2



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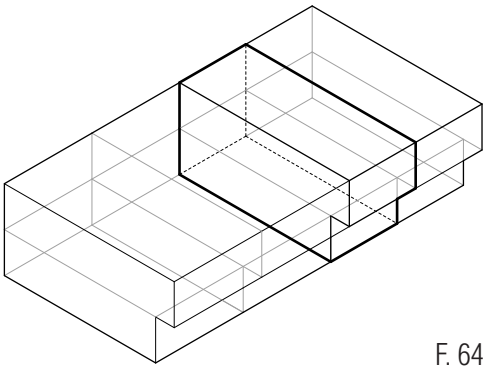

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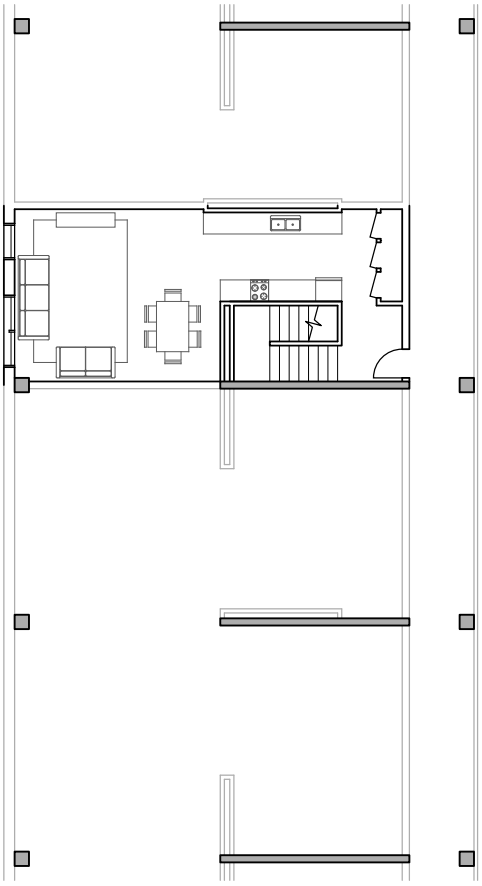
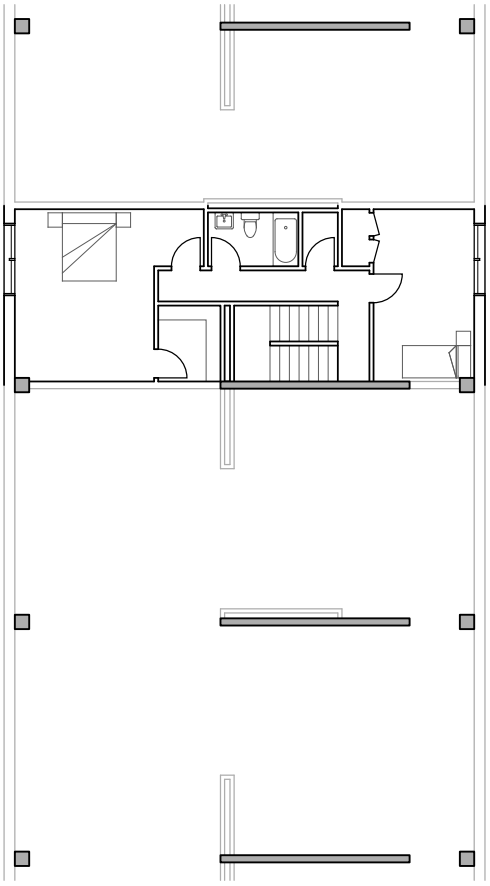


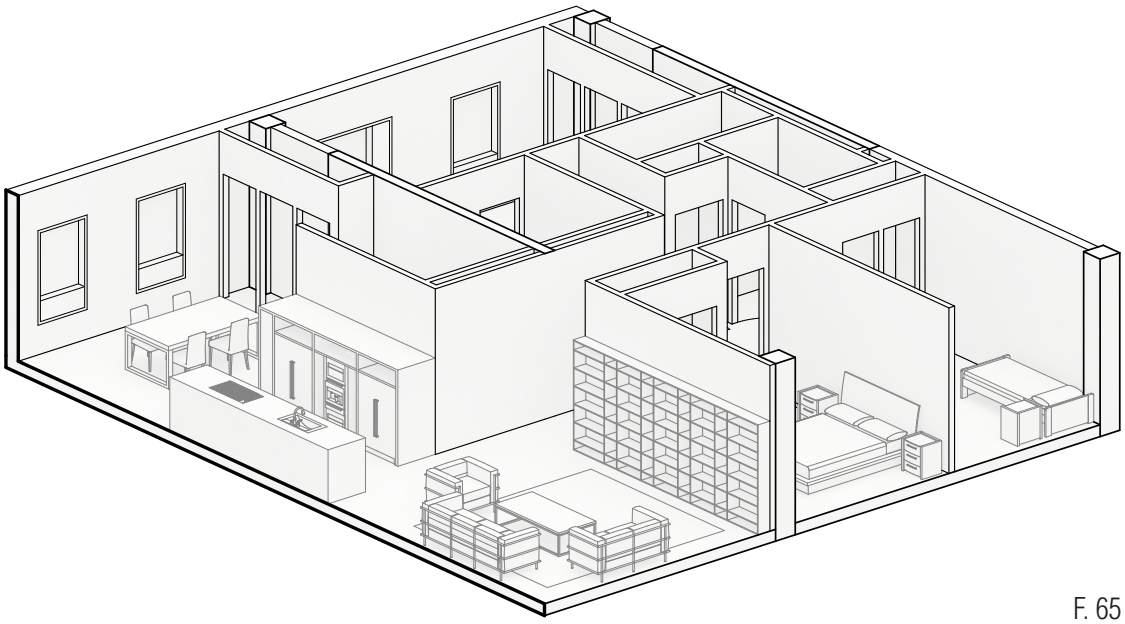


PLAN 5

This plan is the second largest three bedroom unit available within the scheme. The plan is made possible by combining the 5 meter and 6.6 meter bays on the through floor. Within the 5 meter bay, a living area and dining area are separated by a kitchen in the middle of the floor plate. Once again, the living and sleeping areas are strictly divided in the plan. Two bathrooms are provided for the residents, and more storage is allotted due to the spatial needs of a family with multiple children. This unit is suitable for a single or couple with two or three children.

Plan Type: 3 Bedroom

Plan Size: 1550 ft^2



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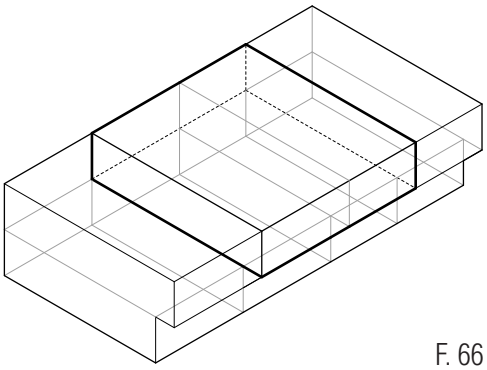

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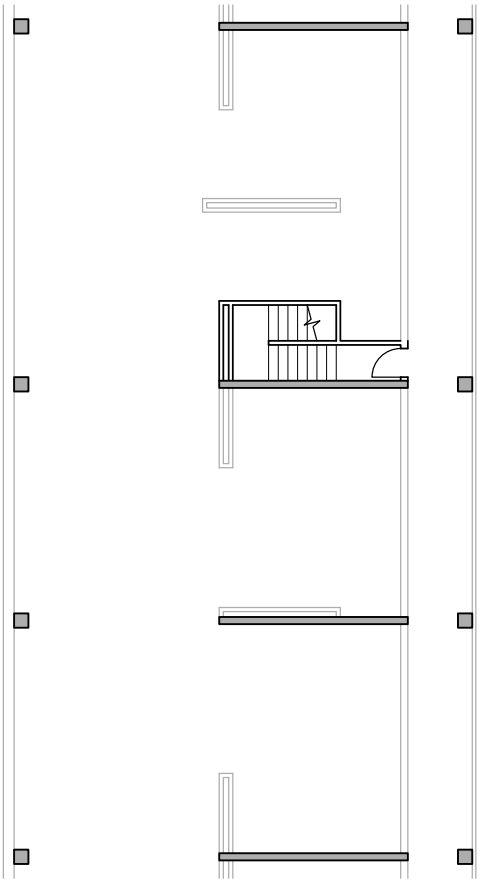
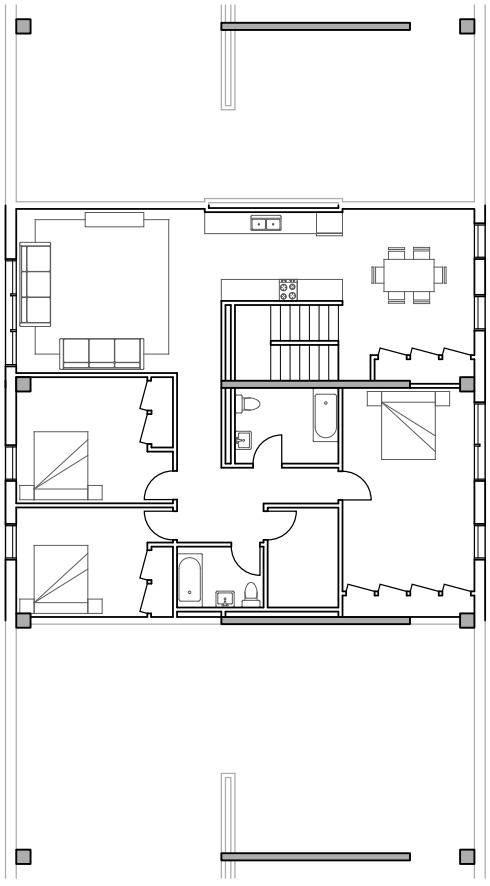


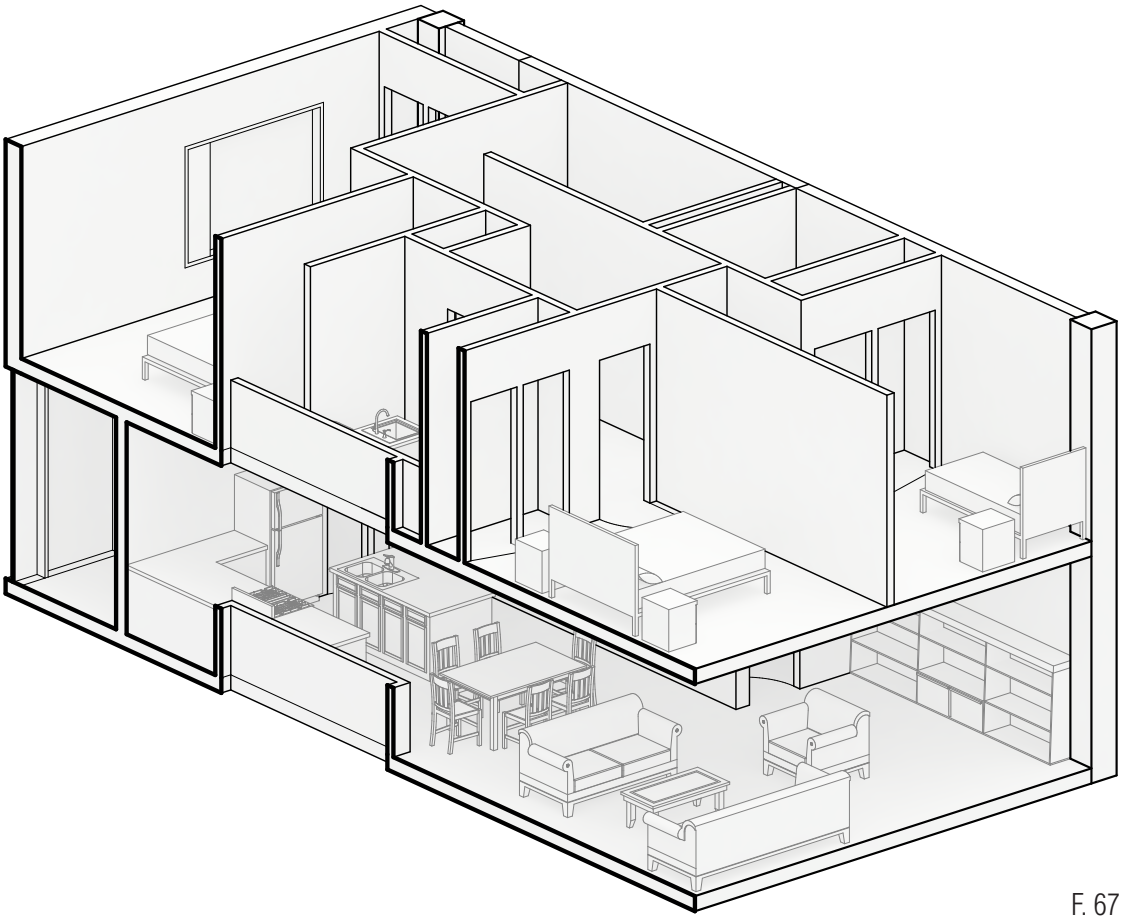


PLAN 6

The final plan is the 1600 ft^2 three bedroom unit. This unit is a combination of the 6.6 meter bays on both the corridor and through floors. Similar to the 1200 ft^2 two bedroom unit, the living areas are located on the corridor level, and sleeping spaces on the through level. Due to the higher occupancy, a smaller washroom is located on the bottom floor, and two washrooms are located on the upper floor.

Plan Type: 3 Bedroom

Plan Size: 1600 ft^2



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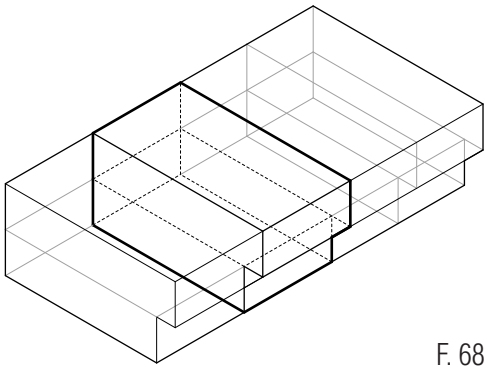

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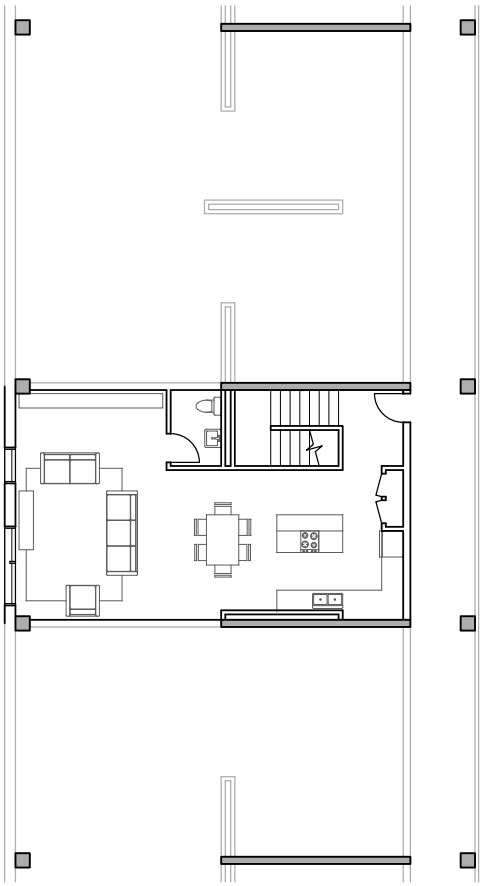
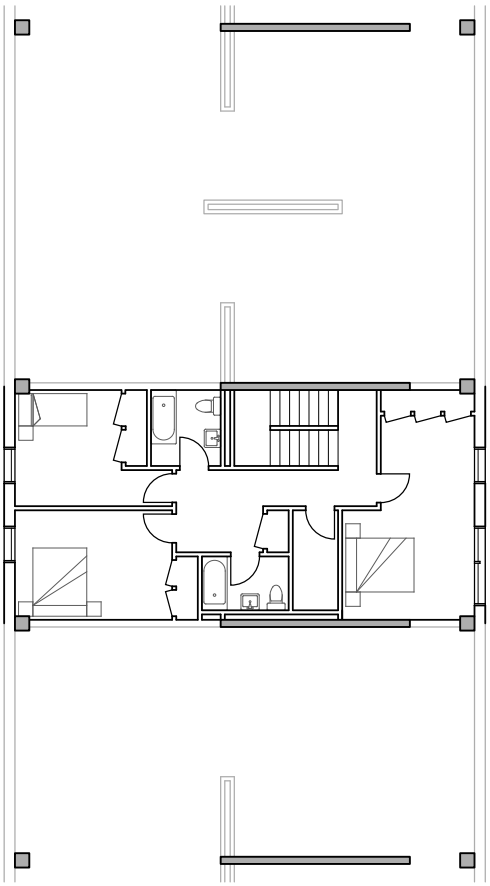




4.3 CODE REQUIREMENTS

After determining the structural spacing of the prototype and the resulting plan types, the next logical step is to determine the possibilities that occur when arranging the units on a potential site. The first element that directly dictates the configuration of dwelling units is the Ontario Building Code. According to the building code, units must have access to at least two means of egress. Further to this, the maximum travel distance to the nearest exit must not exceed 45 meters.[58] Therefore, exits must be located a maximum of 90 m apart. This limits the number of consecutive units between fire exits.

The next requirement that dictates the orientation of units on a site is the allowable distance between the main walls of the same building, which will determine the distance between connected segments of the same building. Chapter 10.8 of the Toronto Residential Multiple (RM) Zoning By-law states that the minimum distance between main walls of the same apartment building is 5.5 meters if at least one of the walls contains openings, and 11 meters if both walls contain openings.[59] This essentially means that if the dwelling units were to be organized around a courtyard as a perimeter block building, the width of the courtyard must not be less than 11 meters. While many other Ontario Building Code and Toronto Zoning By-law requirements will shape the design of this prototype, these three main requirements will shape the basic footprint and size of the multi-unit residential building on a specific site. After determining the appropriate footprint of the building, the next step is to explore the three dimensional massing possibilities.

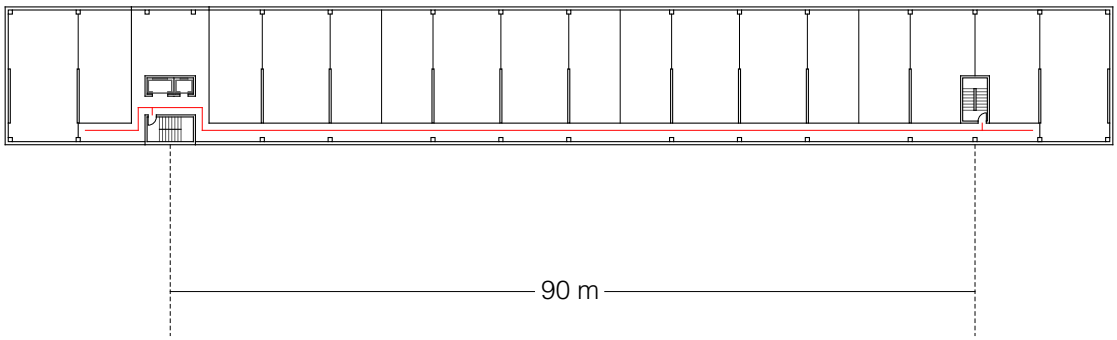


Figure 69: The maximum allowable distance between fire escapes

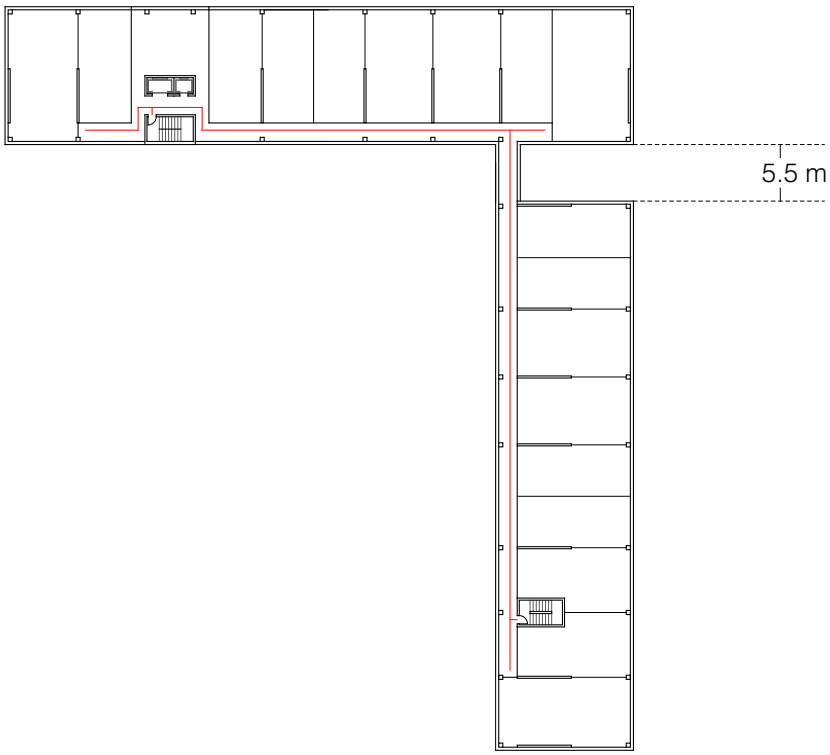


Figure 70: The minimum distance between two walls of the same building if at least one wall has openings

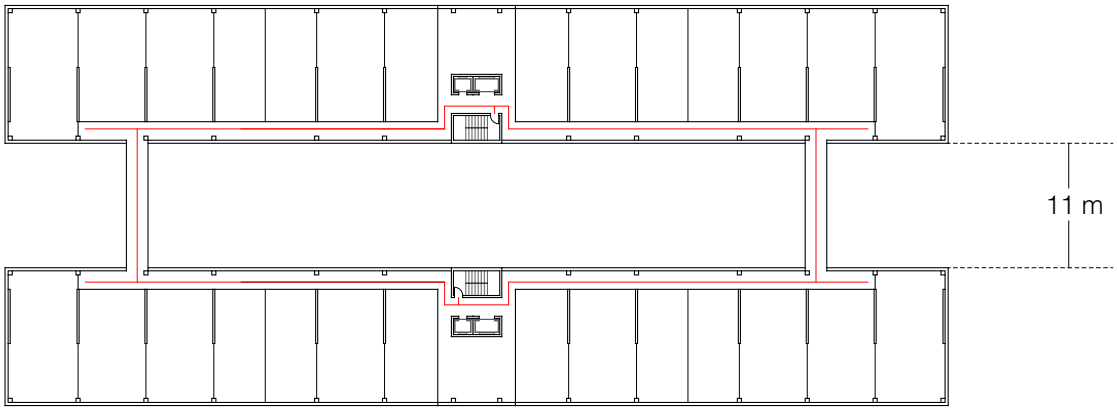


Figure 71: The minimum distance between two walls of the same building if both walls have openings

4.4 MASSING VARIATIONS

Due to the requirement to include access to a minimum of two means of egress for each unit, there is an opportunity to alter the height of the building at each fire stair. This means that if at least three means of egress are utilized, it is possible to differentiate the height of the two building segments located between the three fire escapes. This opportunity affords the possibility of stepping the segments of a building up or down to either relate to the contours of the site or respect the surrounding built form of the neighbourhood. Similar to The Whale by de Architekten Cie, it is also possible to shift the vertical location of a circulation corridor between each vertical core, which further allows for an elevation shift between each segment of the building.

At each main core, an open semi-private area is carved out of the mass of the building form. These void areas are located around each main vertical circulation element within the building, providing the residents that share each public corridor with a shared open amenity space. These spaces can vary in shape, size and orientation, as illustrated by the following four massing arrangements.

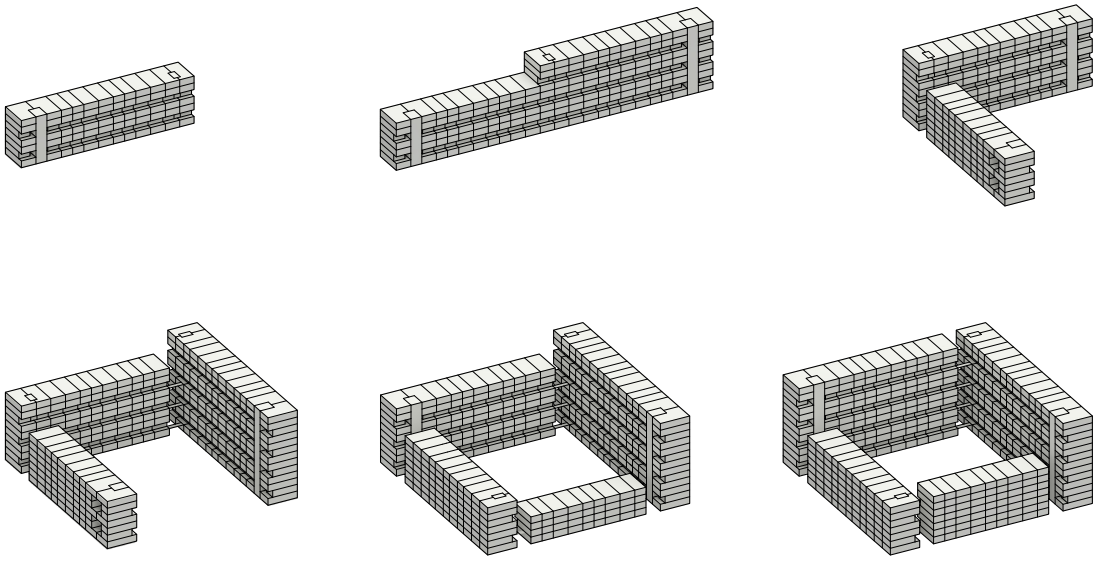
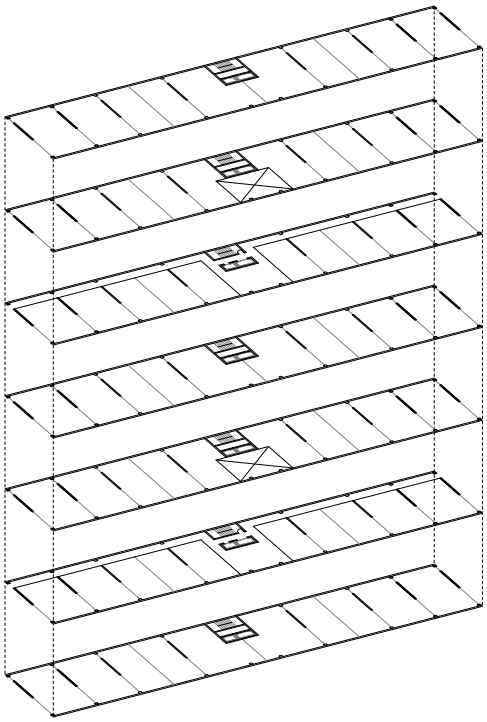
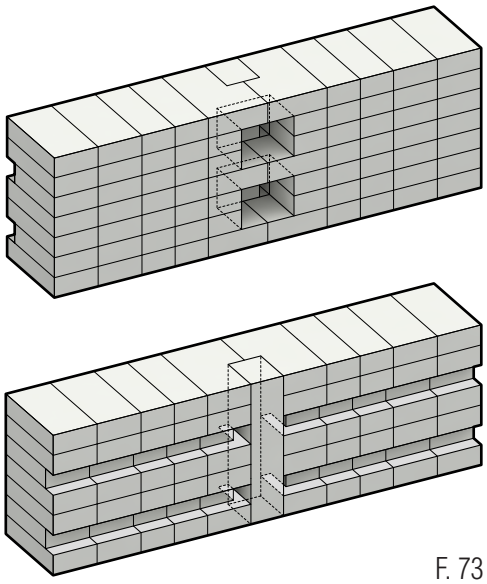


Figure 72: Six possible massing configurations

MASSING 1

The first massing example illustrates a building with a skip-stop corridor on every third floor. These corridors do not shift in height, leading to the creation of two double height semi-private amenity spaces which are accessed at the bottom level by a single corridor. This results in a condition where the only residents that have access to the amenity space are the residents that utilize each shared corridor. This allows neighbours to naturally engage with one another, as each amenity space is within close proximity to the vertical circulation of the building.

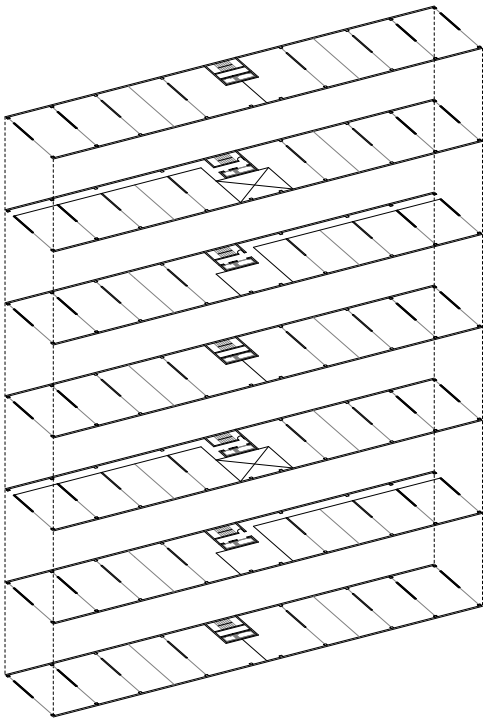


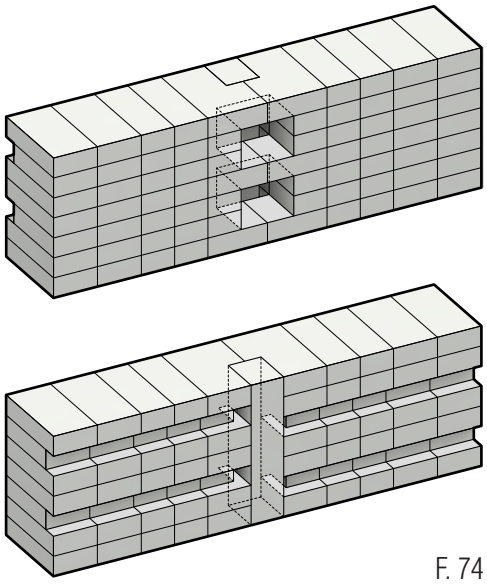


F. 73

MASSING 2

The second massing example illustrates a condition in which the public corridor at either end of the vertical circulation core shifts in height. This example also utilizes a skip-stop corridor on every third floor, allowing for the creation of two double height amenity spaces. In this instance, each corridor terminates at a different level of the double height space.

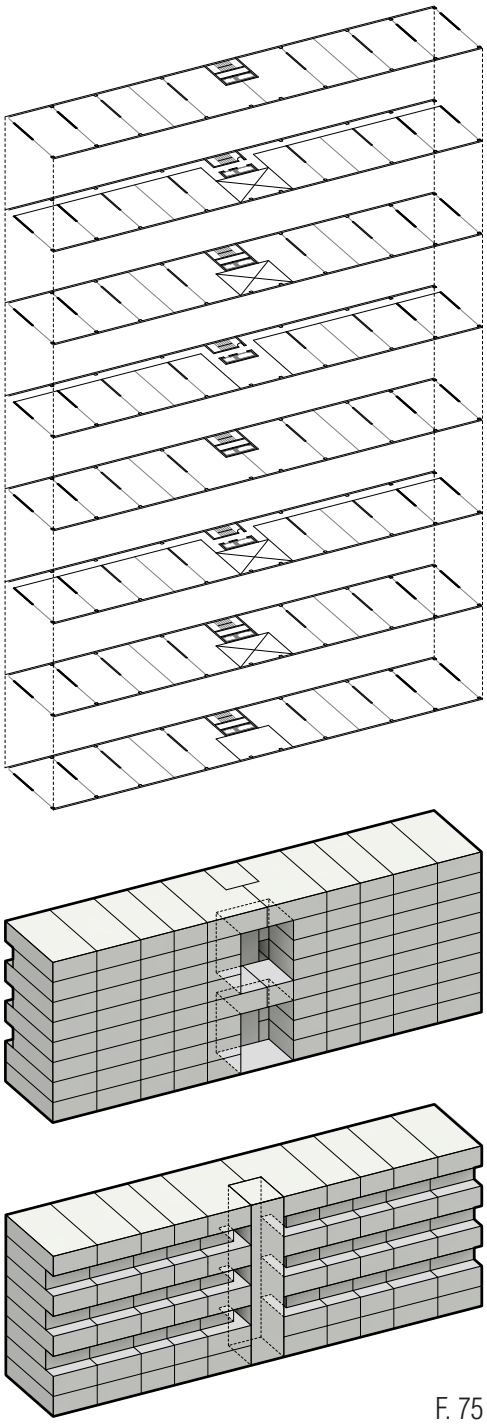




F. 74

MASSING 3

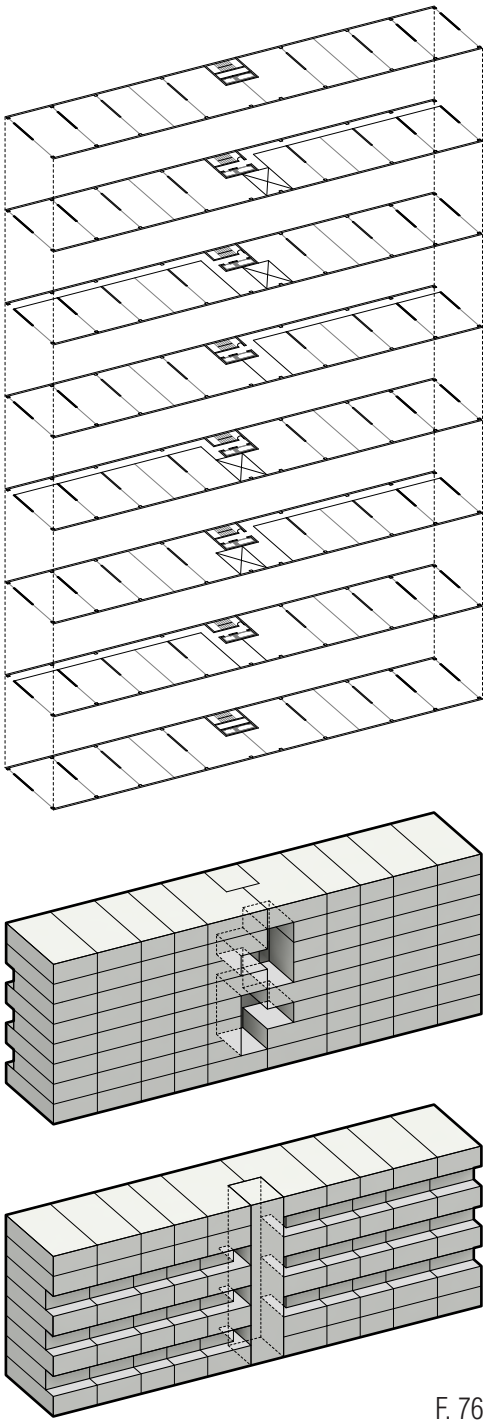
This massing variation illustrates an example of a building with a skip-stop corridor on every third floor, which results in the creation of triple height semi-private amenity spaces. In this example, each space is accessed by two circulation corridors, which increases the number of residents that share accesss to each area.



F. 75

MASSING 4

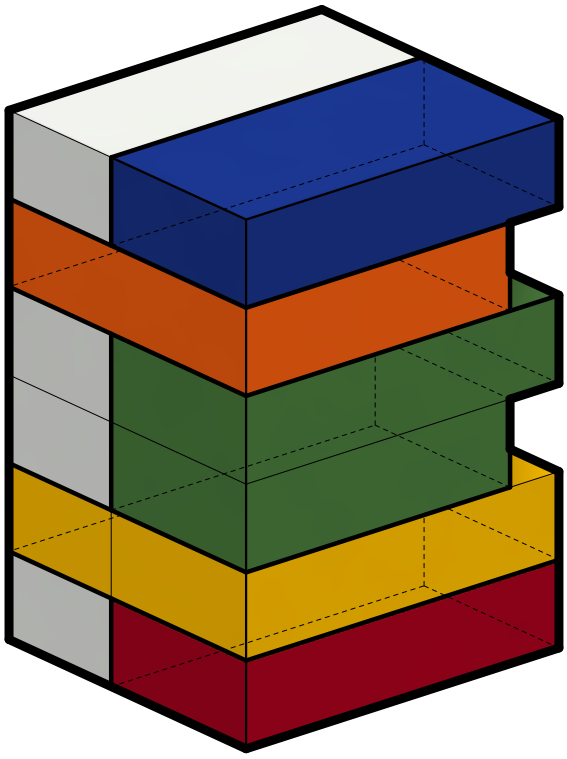
The fourth and final massing example illustrates a building with a skip-stop corridor on every other floor. These corridors shift in vertical elevation at either end of the core, creating a condition in which each triple height semi-private amenity space is divided into alternating platforms. This drastically alters the spatial quality and resident experience of each space.



F. 76

4.5 SECTIONAL ARRANGEMENT

Within the framework of the building, the location of elements such as car parking, stacked plumbing, window placement, stair access and living space arrangement are all carefully designed in tandem. This prohibits any barriers to flexibly adjusting the unit arrangement throughout the building section. At the underground level, three parking spaces are located between each pair of 5 meter bays, while two parking spaces are located between the structure of each 6.6 meter bay. Service spaces are all located in the same area in each plan, and toilets are stacked in identical locations regardless of the unit type. At the top of the building, there is an opportunity to extend the internal stair within each unit to the roof, providing the uppermost units with rooftop access. Each of these elements optimizes the use of every space throughout the building section.



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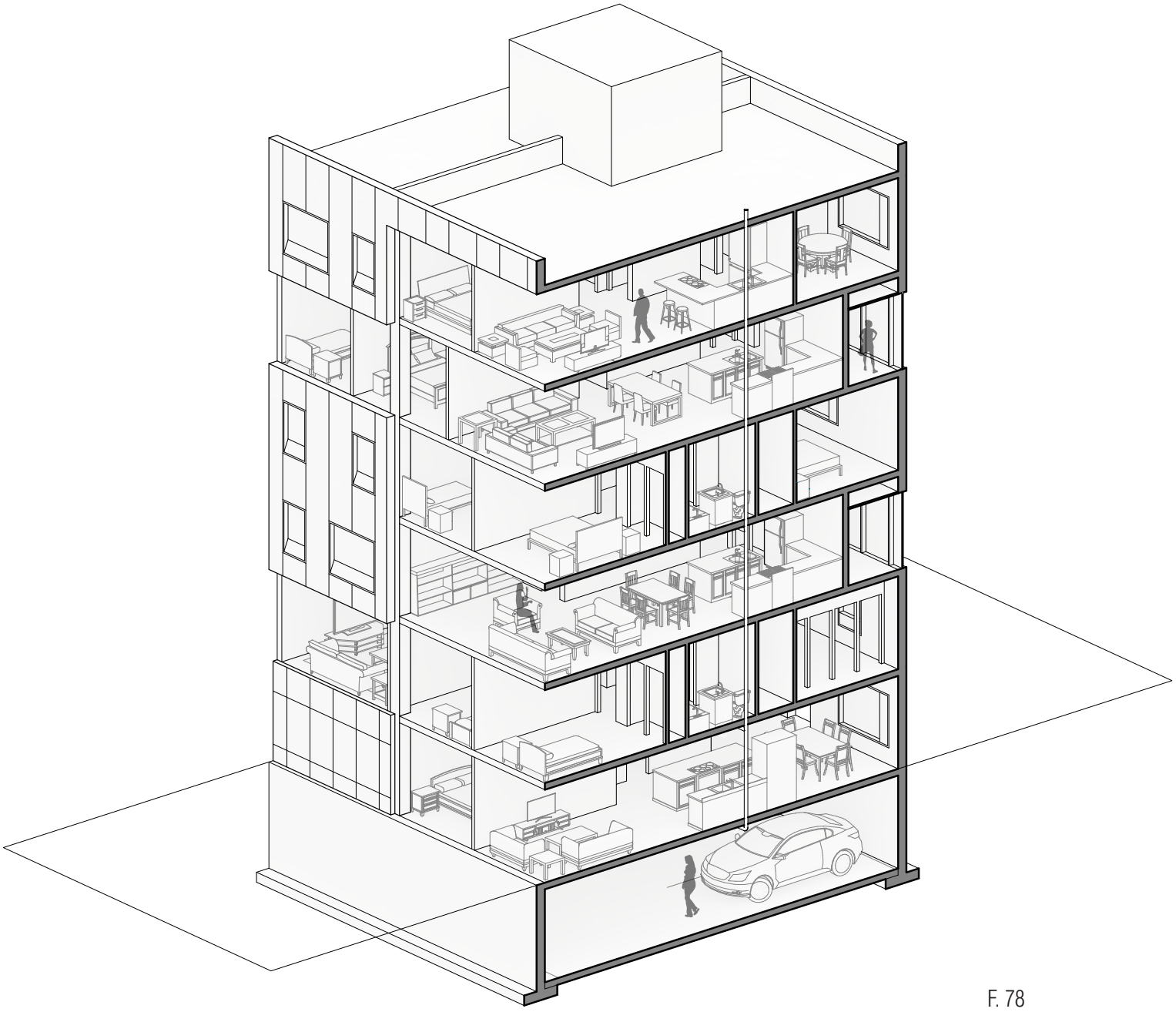
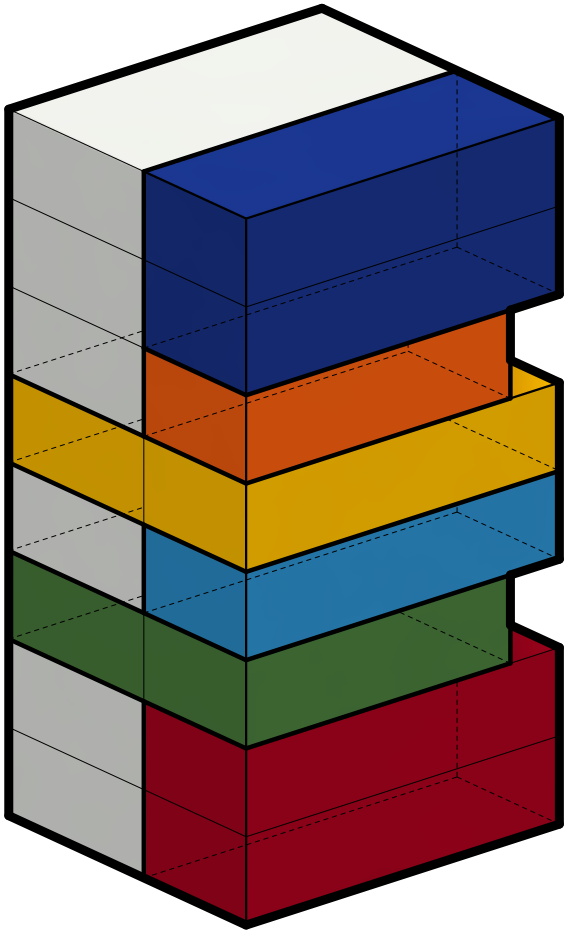


F. 78



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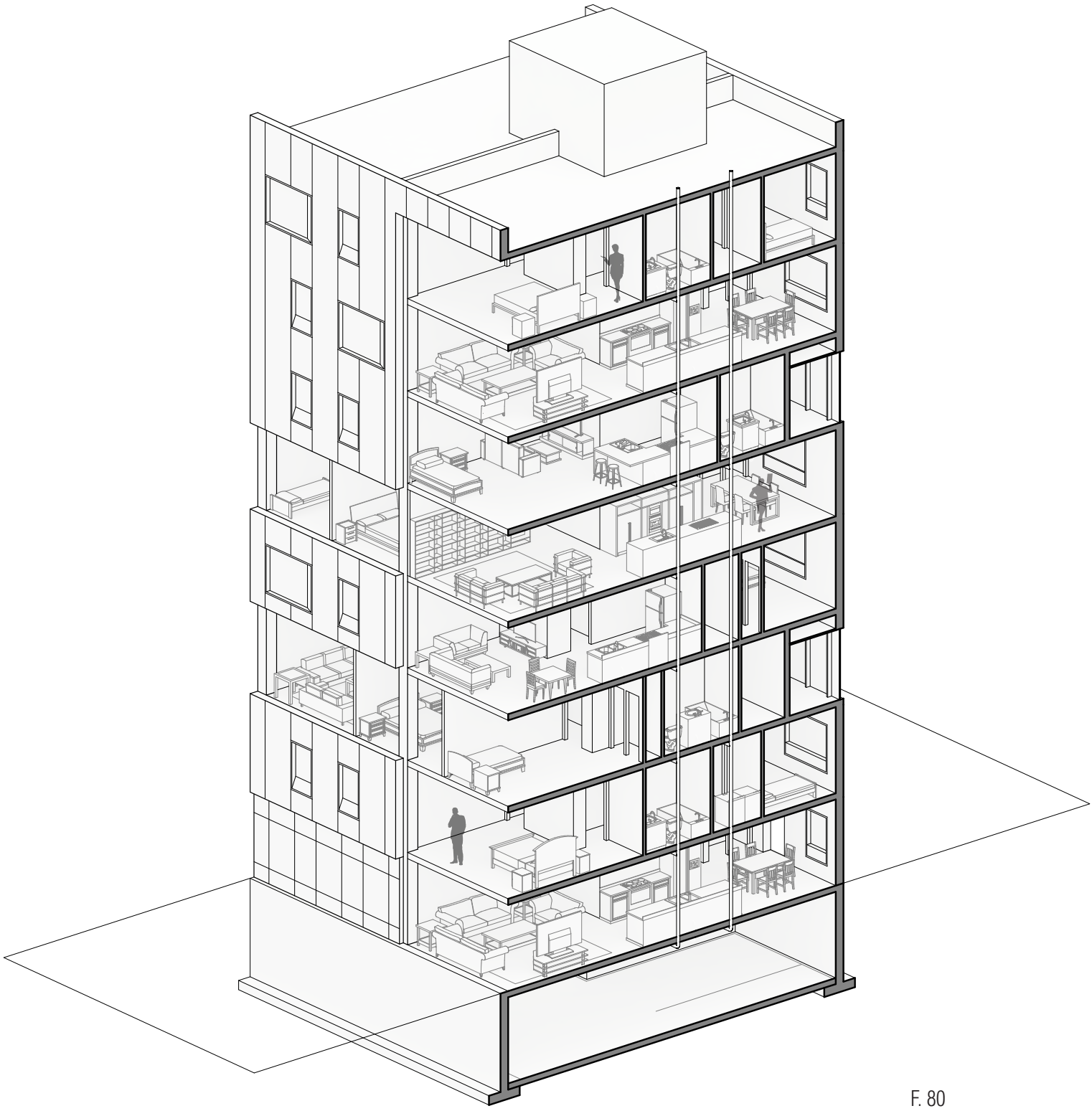


F. 80

4.6 ELEVATIONS

The final step in the creation of the prototype is the design of the building fenestration. A secondary grid is applied to the facade of the building structure, which divides each 6.6 meter unit into six alternating bays of 1 and 1.2 meters, and each 5 meter unit into five bays of 1 meter each. The challenge with the design of the building fenestration was to ensure a cohesive end result regardless of the unit arrangement within the building structure. Because different size units may be freely plugged into the frame of the building, it is important that any combination of units retains a cohesive aesthetic within the building mass. For this reason, window placement is organized to align on each level. This organizes the fenestration to align on each level regardless of the unit layout, which shapes the creation of a cohesive final elevation. The 3 meter stories are divided vertically into 1.6 and 1.4 meter segments, in which the windows are placed into the 1.6 meter space. Six different window sizes are utilized, with the selection of each based on its appropriate use in each living area. The smallest 1x1.6 meter window is located in secondary bedrooms, while the larger windows are located adjacent to main living spaces and primary bedrooms.

As illustrated on the following pages, one or two elevations were designed to correspond with each individual floor plan. The strict division of the building facade ensures that the elevations can freely be plugged into place. In several of the plan variations, a balcony is included in the scheme, which cuts into the building mass rather than protruding from the building facade. The balcony opening is designed to align with the secondary grid of the facade, such that the insertion of the balcony within the façade does not disrupt the aesthetic balance of the building mass.

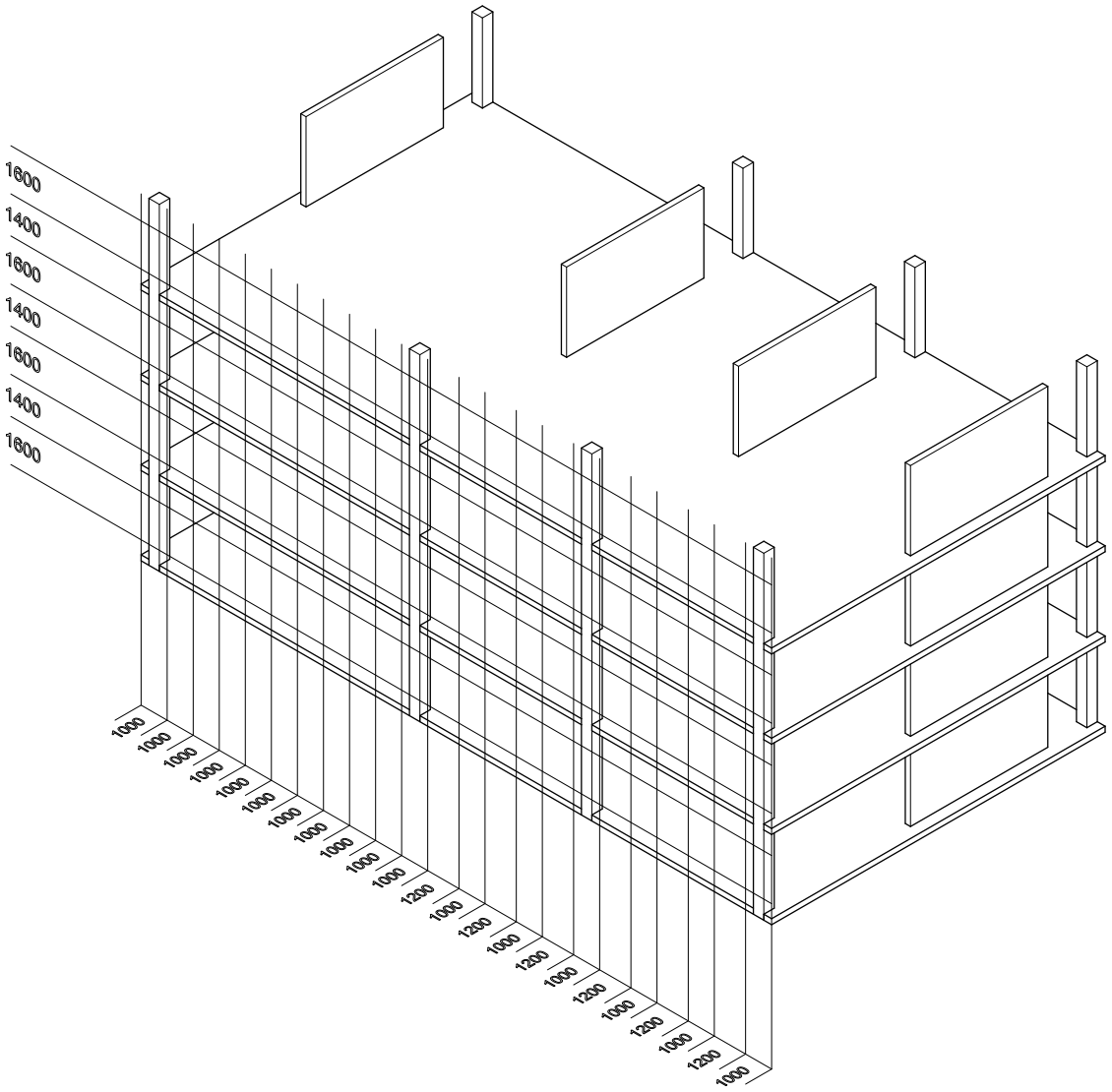
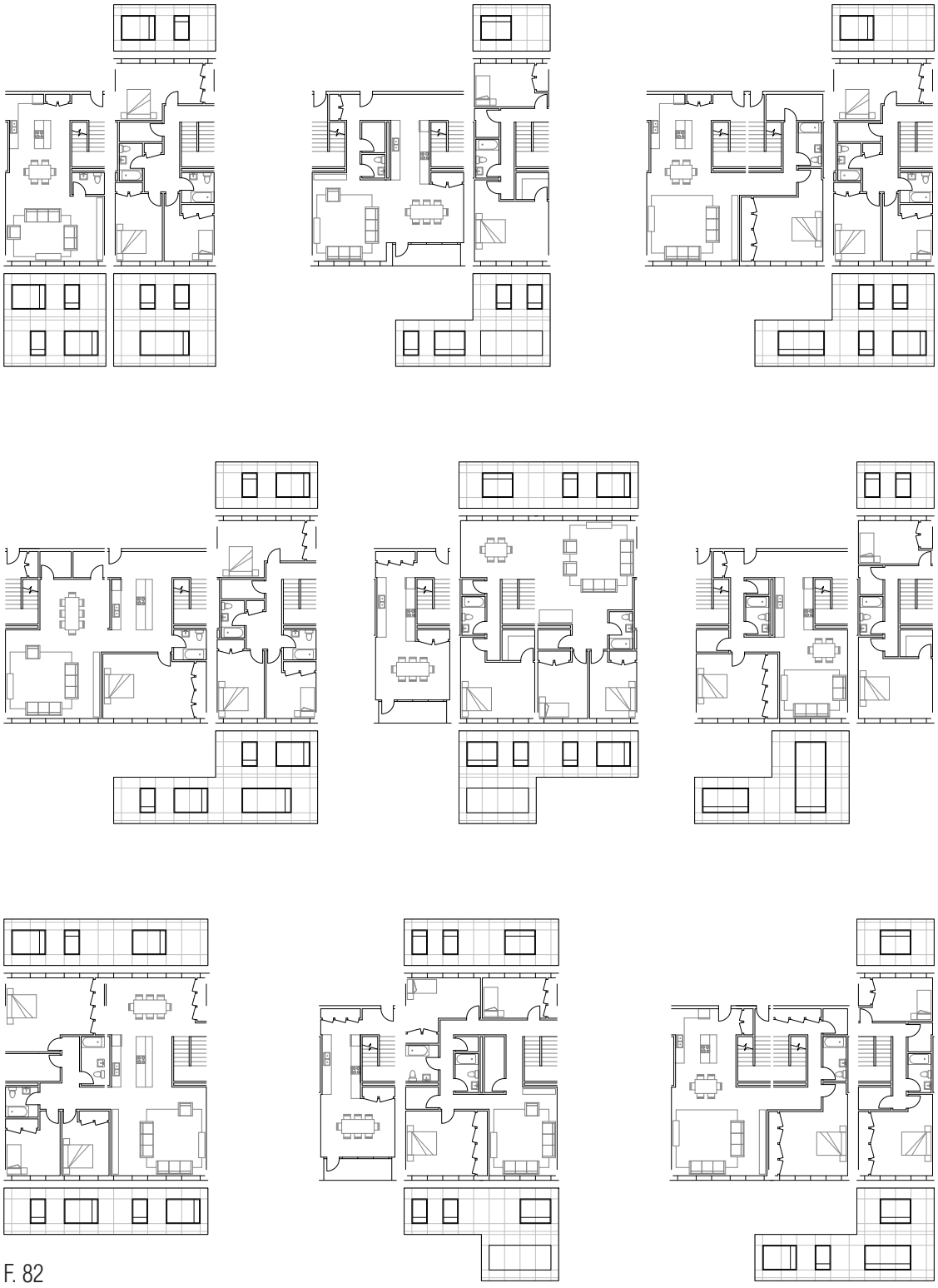


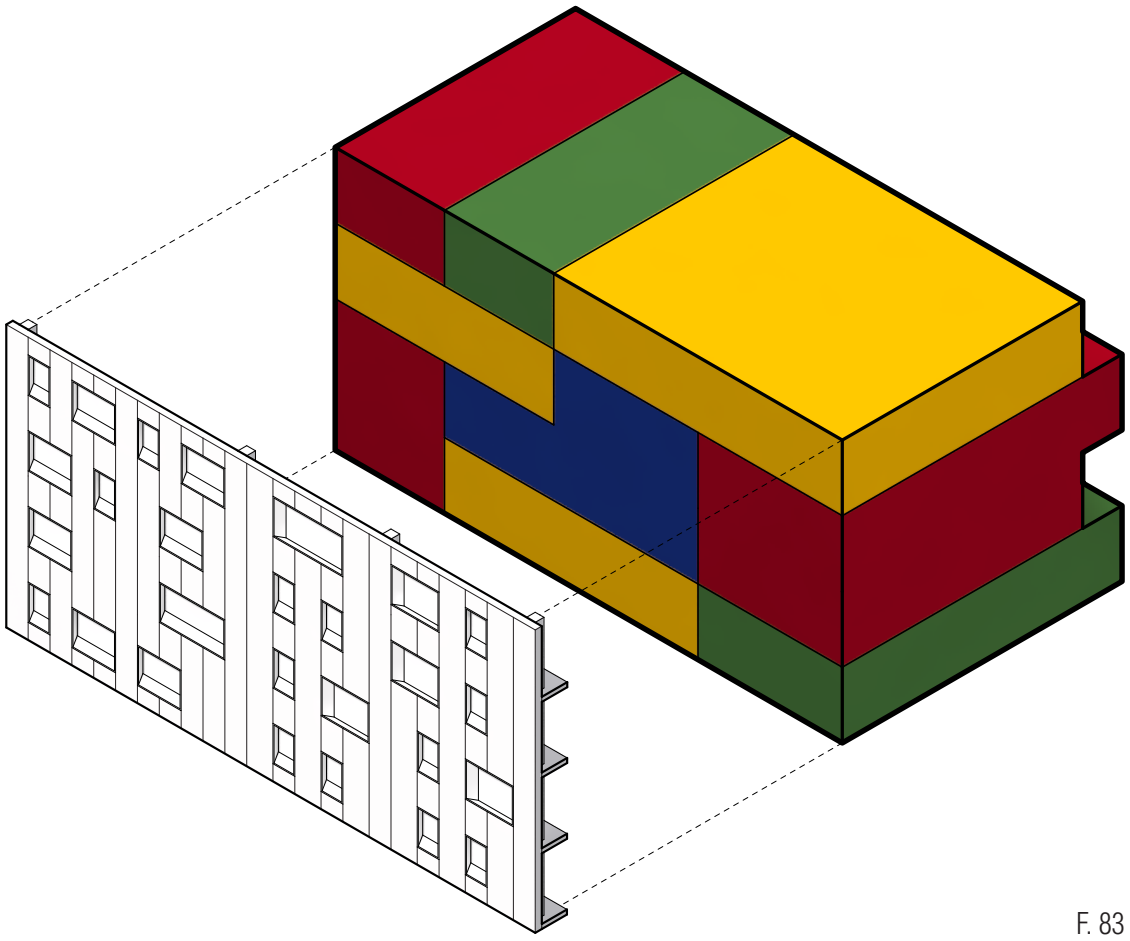
Figure 81: Secondary grid spacing
of the facade



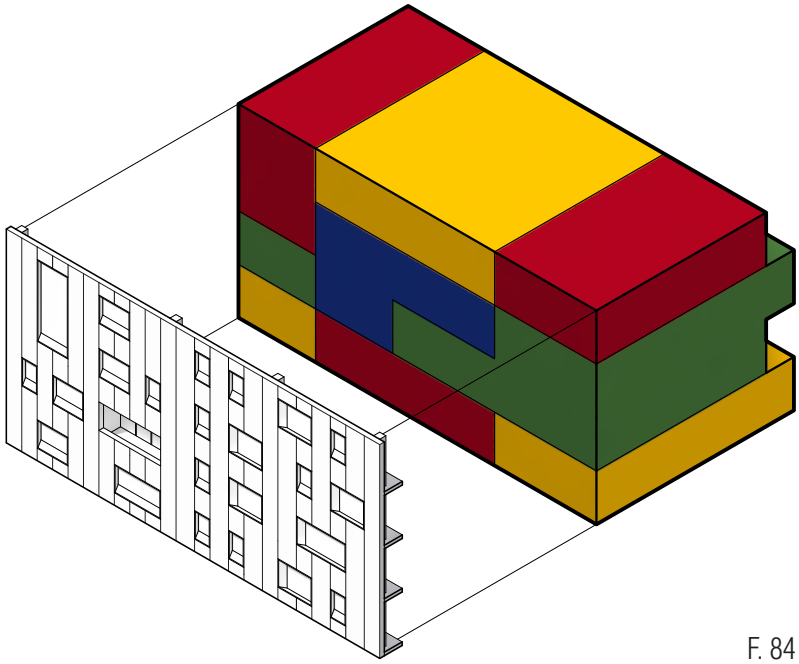
F. 82

ELEVATION VARIATIONS

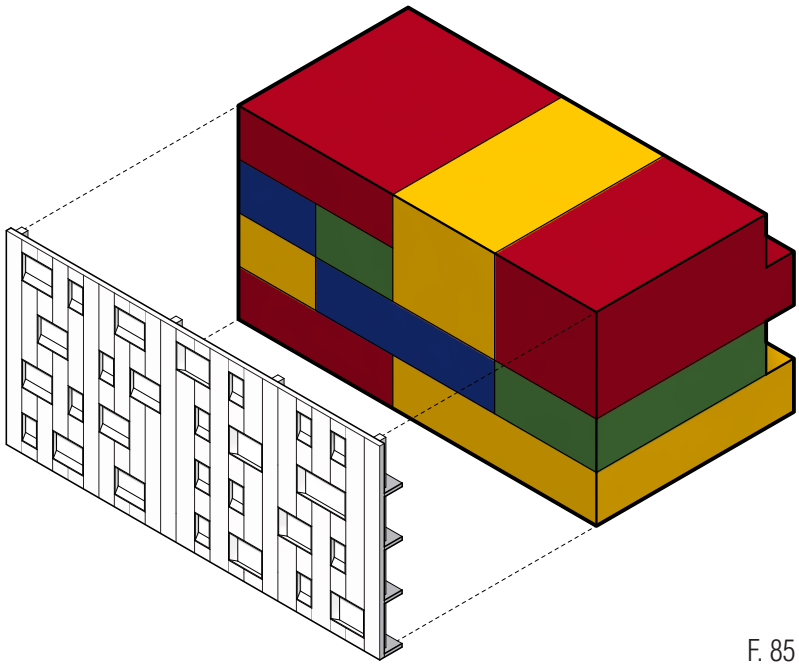
The secondary grid divides each elevation into a series of aligned windows, the size of each corresponding to the type of adjacent living space within, and a series of vertical cladding panels. The following three diagrams illustrate three variations of the same building segment, and the fenestration variation that occurs as a result of the spacing and design of the facade elements.



F. 83



F. 84



F. 85

NOTES

58. Ontario Building Code. (2012). Toronto: Queen's Printer of Ontario. Page B3-96

59. Chapter 10 Residential. (n.d.). Retrieved May 10, 2017, from http://www.toronto.ca/zoning/bylaw_amendments/ZBL_NewProvision_Chapter10_80.htm

PART 5 : THE SITE

5.1 THE PUSH FOR REURBANIZATION

In an attempt to manage the growth of the City of Toronto, many planning policies have been put in place to shape the densification and pattern of growth in the past decade. One of these planning policies in particular, the Greenbelt Plan, has led to the drastic densification of the city core. In an attempt to refocus the shape of Toronto's growth, city planners have begun to advocate for reurbanization as a principle of Smart Growth, which is prescribed by studies such as the Avenue and Mid-Rise Buildings Study. Reurbanization is defined as "a coordinated approach to the redevelopment of land within the existing urban fabric to accommodate regional growth."[60] The goal of reurbanization is to redevelop underutilized urban areas with access to existing infrastructure as a means to redistribute the extremely dense growth that is occurring in the city core. As identified by the city, reclaimed industrial sites are a prime target for reurbanization efforts within the city, as many brownfield sites are located along arterial roads and avenues within developed urban neighbourhoods. Further to this, the city continues to push for mid-rise growth along arterial roads and avenues, growth which is outlined by The Avenues and Mid-Rise Buildings Study. Reasons for mid-rise reurbanization include the introduction of higher densities, an appropriate scale and relationship to the street, activation of the public realm, and the implementation of a mix of uses.[61]

Mid-rise development as a means to achieve greater density in the city offers many advantages to homeowners, the city and the public realm. Building mid-rise in areas with existing community facilities and infrastructure adds density to neighbourhoods that are transit oriented and walkable, which animates and enlivens the public realm of the city. [62] The physical massing of mid-rise buildings affords a greater sense of open space and reduces the impact of shadows, yet still frames the street and public spaces within the urban realm. For residents, mid-rise buildings offer a better connection to the ground plane than high-rise buildings, and encourage the use of outdoor public areas. Mid-rise buildings also allow for a mix of uses, such as commercial retail at the ground floor. This intensifies use of the building's facilities throughout the day, and encourages community interaction within the immediate vicinity. Finally, in low density neighbourhoods with a majority of single detached homes, as is typical in Toronto, mid-rise development is an appropriate transition to higher densities.

While the reasons for mid-rise reurbanization may seem clear, the guidelines outlined in The Avenues and Mid-Rise Buildings Study will continue to lead to the development of inappropriate dwelling units that are shaped to conform to the footprint of a building as it sits on a site. The study prescribes the design of buildings based on a strict adherence to sightlines, setbacks, and relation to the street. This

practice leads to the creation of a building that emphasizes overall form at the expense of the suitable design of dwelling units, and often results in units that are difficult to partition due to their narrow orientation and exposure to a single exterior face of the building. This practice denies the possibility of developing a multiplicity of dwelling unit types and sizes within a single building, which continues to result in the economic ghettoization of Toronto neighbourhoods.

The sites selected to explore the massing of the prototype are all brownfield sites located within appropriate mid-rise reurbanization districts. Each site is within a 500 meter walking distance of facilities such as schools, supermarkets, banks, churches, and community centers. Further to this, each site is located on or near an arterial road or avenue, and is within walking distance of public transit stations and/or bus stops. Each of the sites is currently being developed, which offers a comparison of what the hypothetical proposed density of the thesis project offers as an alternative to the real life proposed density.

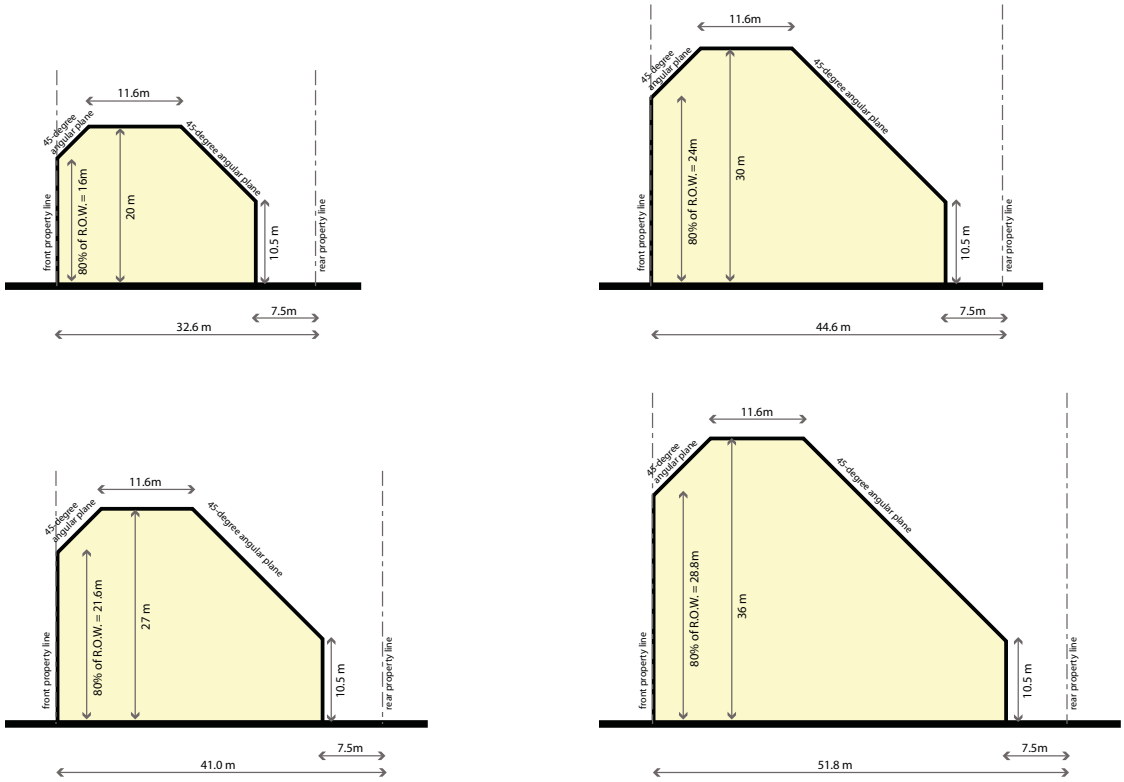


Figure 86: Building massing guidelines outlined by the Avenues and Mid-Rise Buildings Study

5.2 357 BIRCHMOUNT ROAD

357 Birchmount Road is the smallest of the four selected sites, and is located next to the CN railway. The site is located in the south-west end of Scarborough close to the Toronto waterfront. It is within walking distance of Birchcliff Heights Public School and Birchmount Park Collegiate Institute, and in close proximity to several other schools and community buildings. A proposal for 8 semi-detached and one detached 3+ bedroom units is planned for the site, which is in keeping with the density of the surrounding neighbourhood. Due to the size of the site and its location on an arterial road, it is reasonable to propose a higher density development. The hypothetical proposal for 357 Birchmount Road consists of a six storey development with ten units on each floor, totaling 60 individual units. The development is set back 14 meters from the neighbouring lot line, which respects the privacy of the adjacent detached homes. The hypothetical proposal introduces a much higher density than is currently proposed, yet the 6 storey height does not impose on the neighbouring community.

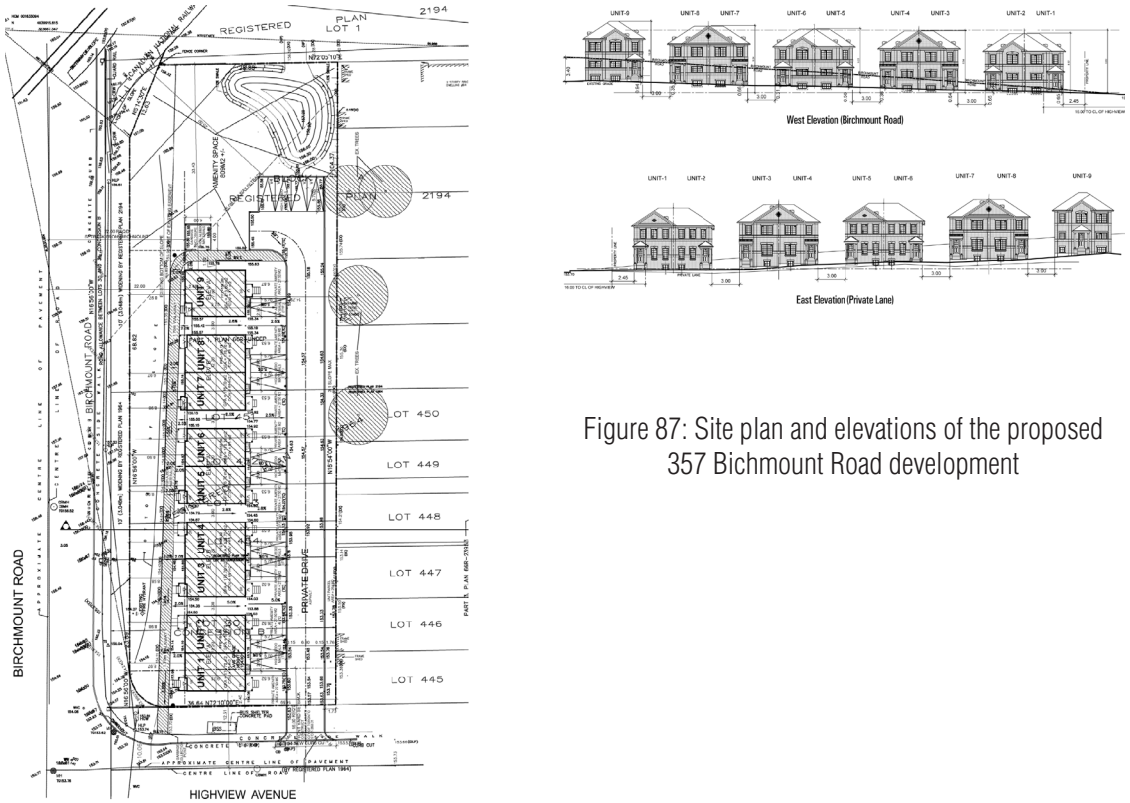
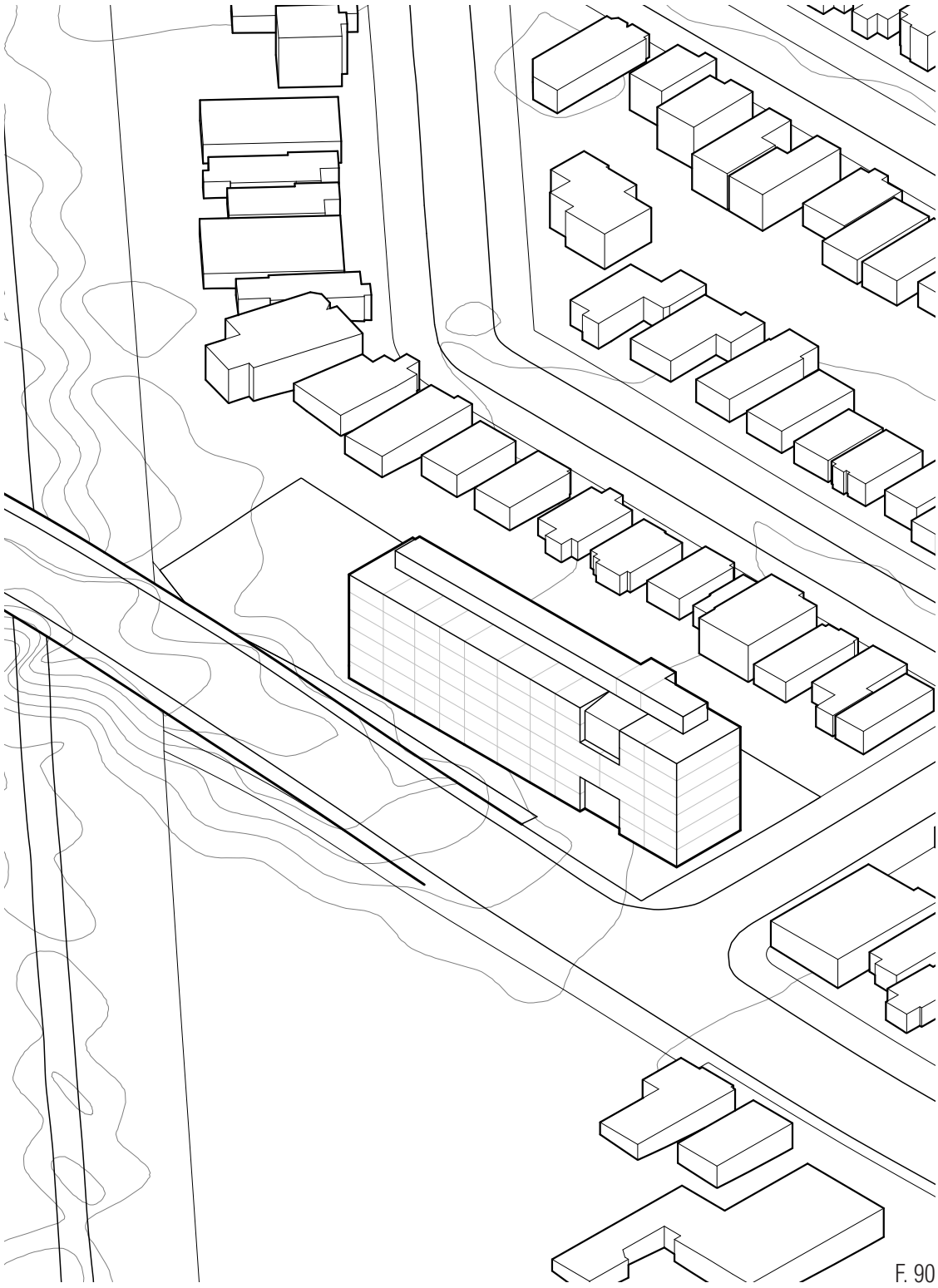


Figure 87: Site plan and elevations of the proposed 357 Bichmount Road development

Figure 88: 357 Birchmount Road context plan

Figure 89: 357 Birchmount Road site plan



F. 90

5.3 1145 OSSINGTON AVENUE

1145 Ossington Avenue is an abandoned brownfield site located on Ossington Avenue south of Davenport Road. The site is currently planned for the development of 48 three bedroom townhouse dwelling units. The three storey proposal includes the addition of a road and a laneway to access every individual house, each of which includes a built-in garage at ground level. This development is built to match the surrounding neighbourhood, but makes poor use of a relatively large abandoned brownfield site. The hypothetical proposal for 1145 Ossington Avenue consists of 120 individual units arranged around a courtyard, with the main openings to the courtyard located along Ossington Avenue. Three separated building segments face onto Ossington Avenue, and are consistent with the size and proportion of the built form of the surrounding neighbourhood. Two openings between these segments invite residents in to utilize a framed intimate semi-public courtyard space. The hypothetical proposal achieves a much higher density than is currently proposed, introduces an intimate courtyard space for use by the residents, yet still respects the height of the surrounding neighbourhood.

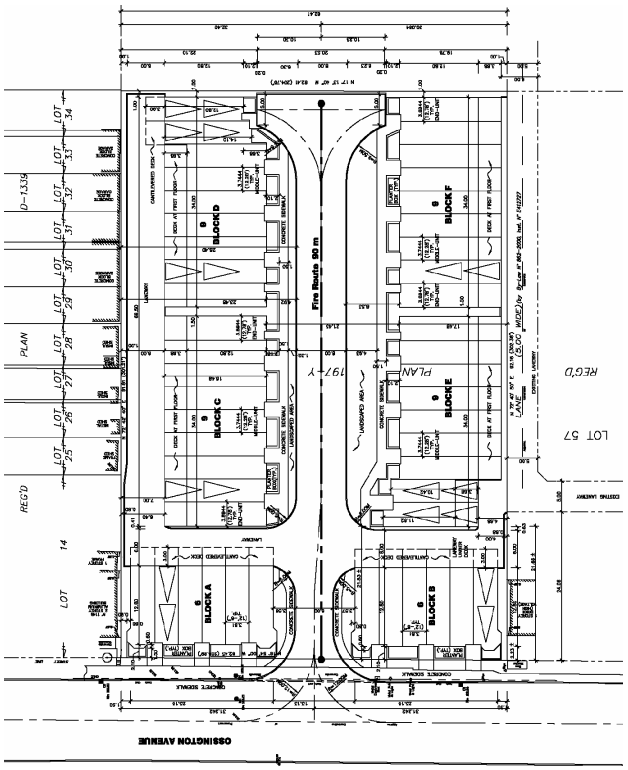


Figure 91: Site plan and elevation of the proposed 1145 Ossington Avenue development

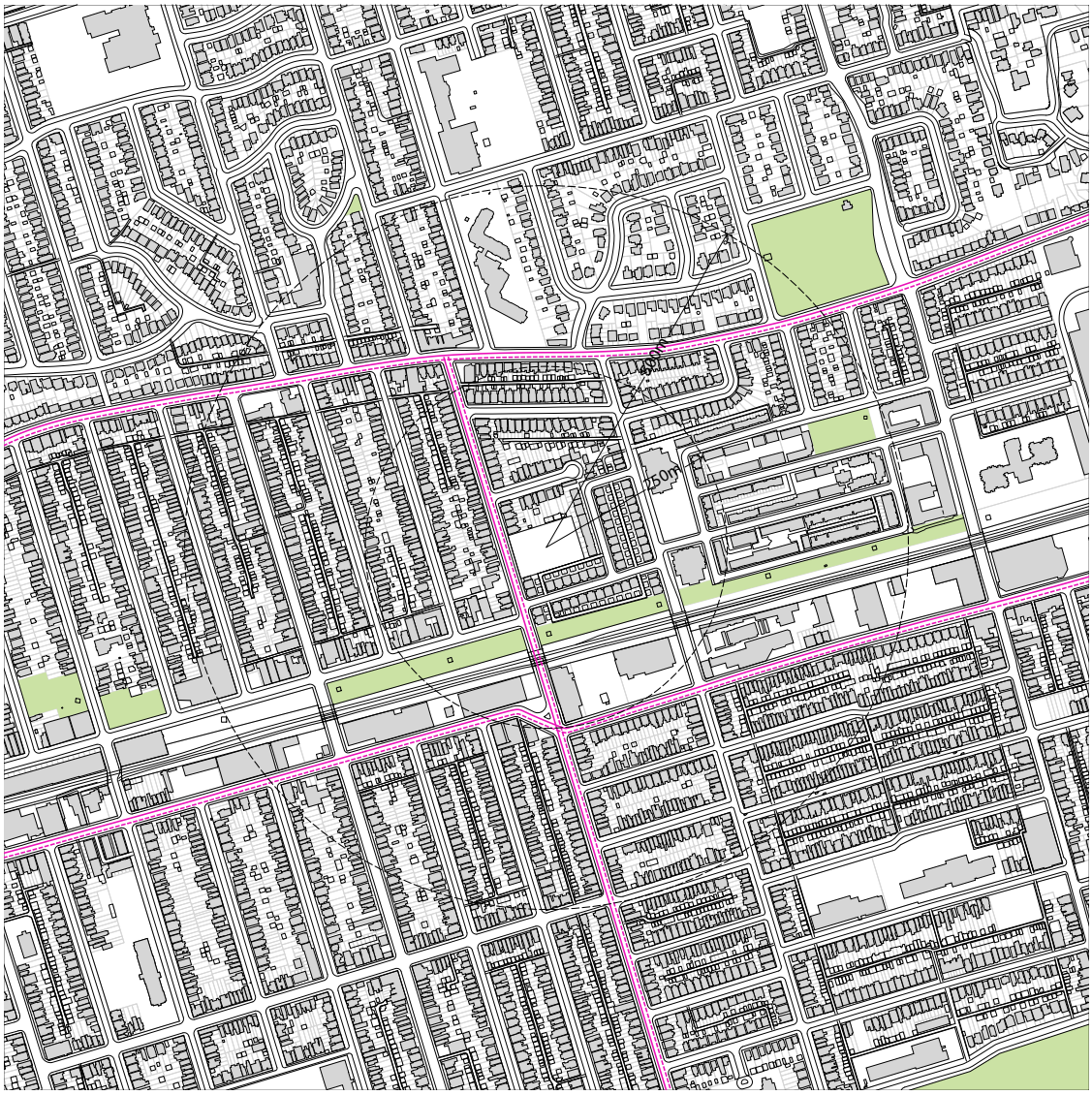
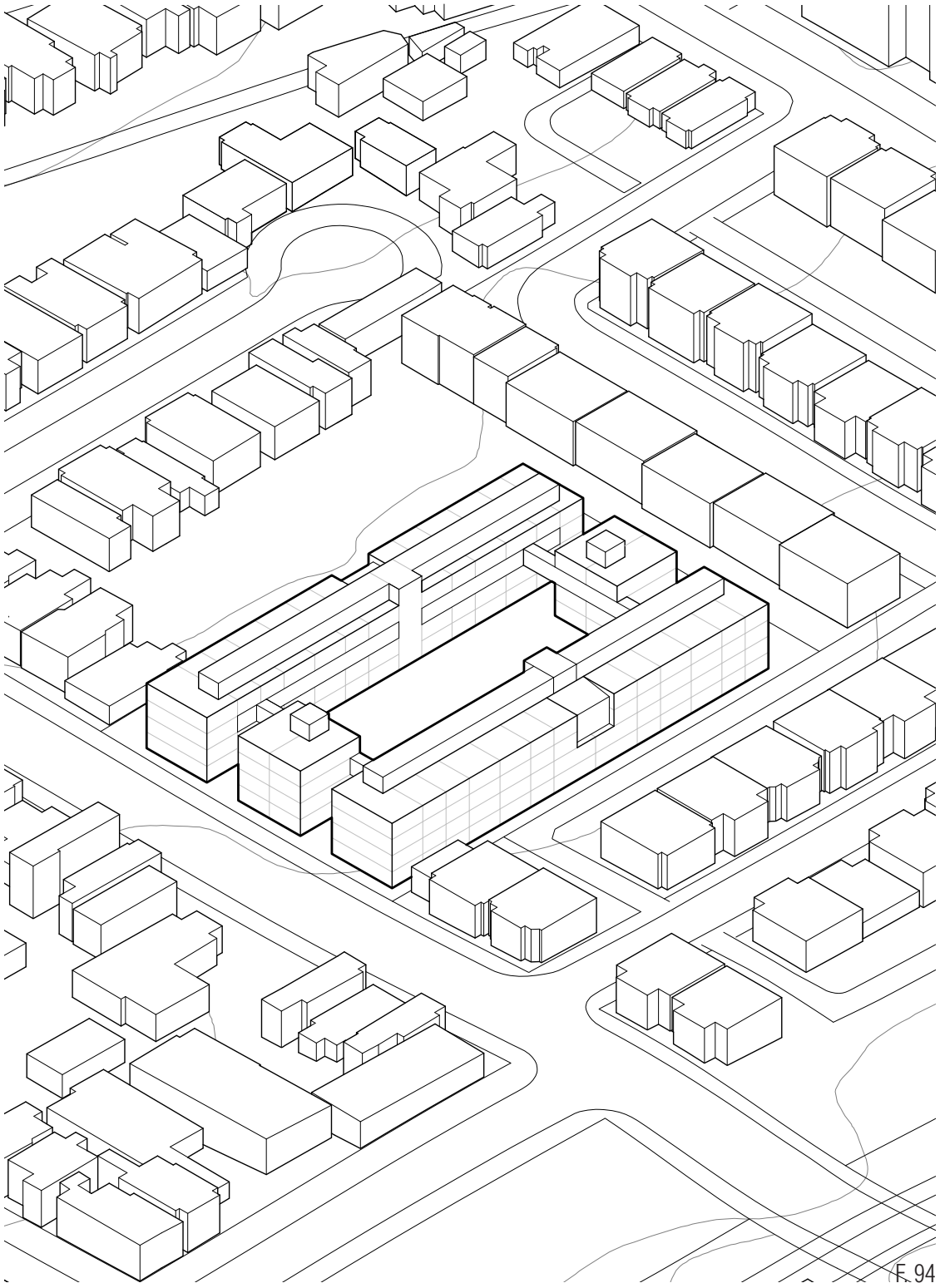


Figure 92: 1145 Ossington Avenue context plan

Figure 93: 1145 Ossington Avenue site plan



F. 94

5.4 3640 ST CLAIR AVENUE EAST

3640 St. Clair Avenue East is located south of the CN railway at a main arterial intersection, and does not share a lot line with any abutting properties. The site is a prime candidate for intensive reurbanization, as it is within walking distance of the Scarborough GO station and many other community infrastructure buildings. The current proposal for the site consists of 48 three bedroom dwelling units, all of which are three stories in height. The plan also proposes the addition of a road and laneway to access each house, similar to the 1145 Ossington development. The hypothetical proposal for this site consists of 210 individual units arranged around a large triangular courtyard, with commercial units facing onto St. Clair Avenue East and Midland Avenue. This development consists of three vertically differentiated blocks connected by vertical cores at each corner, with the largest block at the north end of the site. This density is much more appropriate when considering the size of the site, its proximity to surrounding infrastructure, and its location at the intersection of an arterial road and an avenue. The poor quality low density proposed development is an indictment of the development issues currently faced by the City.

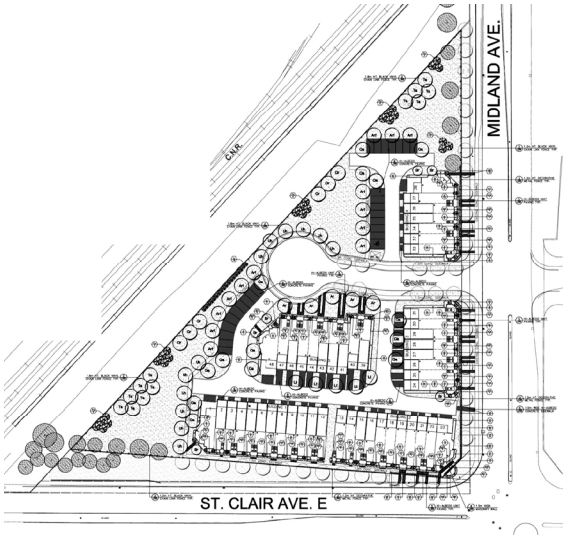


Figure 95: Site plan and elevations of the proposed 3640 St. Clair Avenue East development

Figure 96: 3640 St. Clair Avenue East context plan

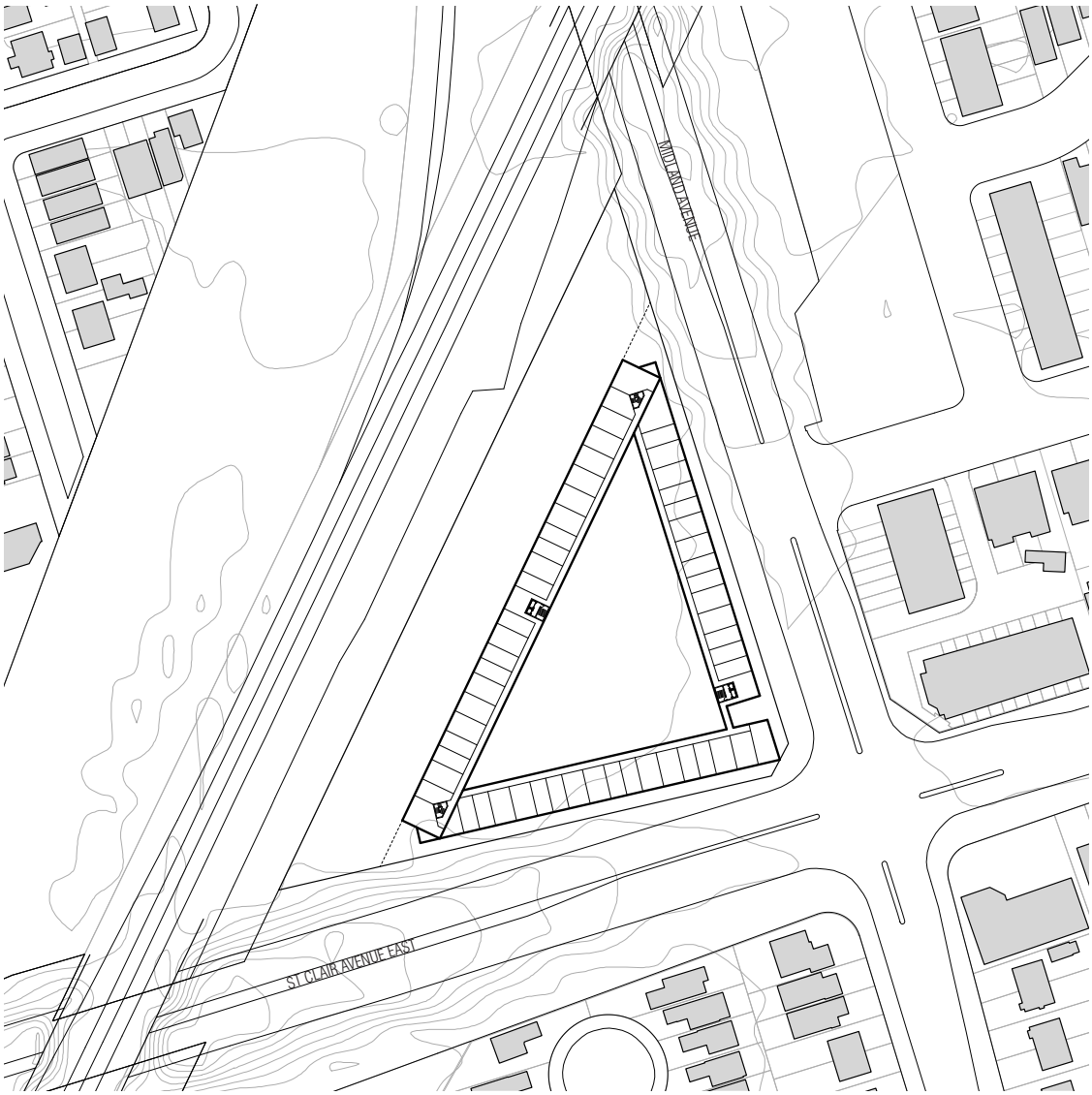
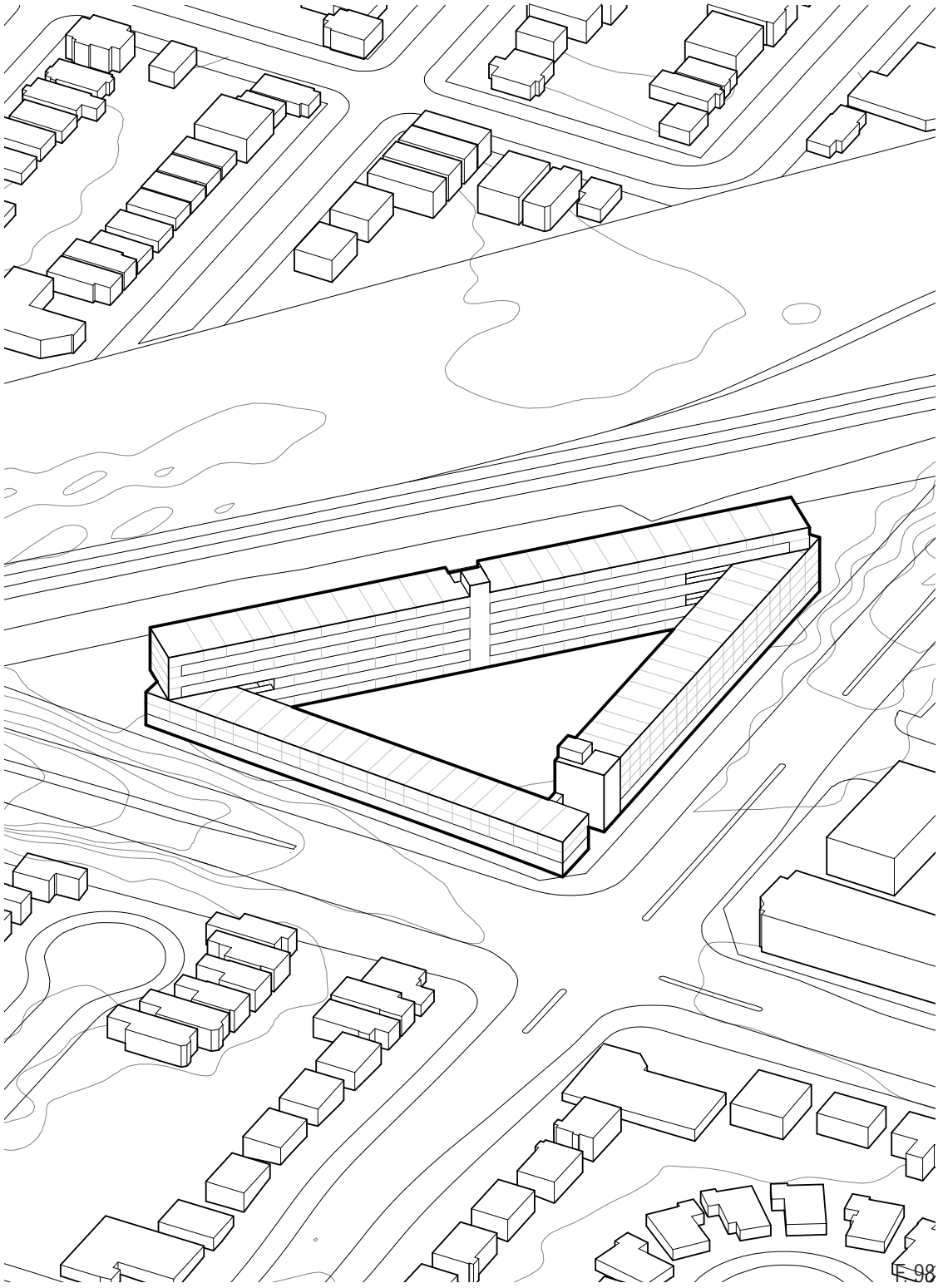


Figure 97: 3640 St. Clair Avenue East site plan



F.98

5.5 955 WESTON ROAD

The fourth and final site is located in the York municipality of Toronto at 955 Weston Road. The site is once again located adjacent to a railway, and is situated between the Weston Road and Eglinton Avenue and Weston Road and Black Creek Drive intersections. From the south to the west corners of the site, a 5 meter decrease in elevation makes the entire Weston elevation a continuous slope. The site is within walking distance of the proposed Eglinton and Weston Crosstown LRT transit station, making the site a prime candidate for mid-rise reurbanization. The current proposal for the site consists of 35 one bedroom and 36 two bedroom units within a stacked back-to-back three storey townhouse development. A cul-de-sac is proposed at the north-west end of the site to serve as access for all of the units. Serving in contrast to this proposal, the hypothetical proposal for the site consists of 192 units arranged around a central courtyard. The building faces directly onto Weston Road, and provides commercial units along the entire Weston Road frontage. This proposal increases the proposed density significantly, and offers much more to the urban realm of the surrounding neighbourhood.

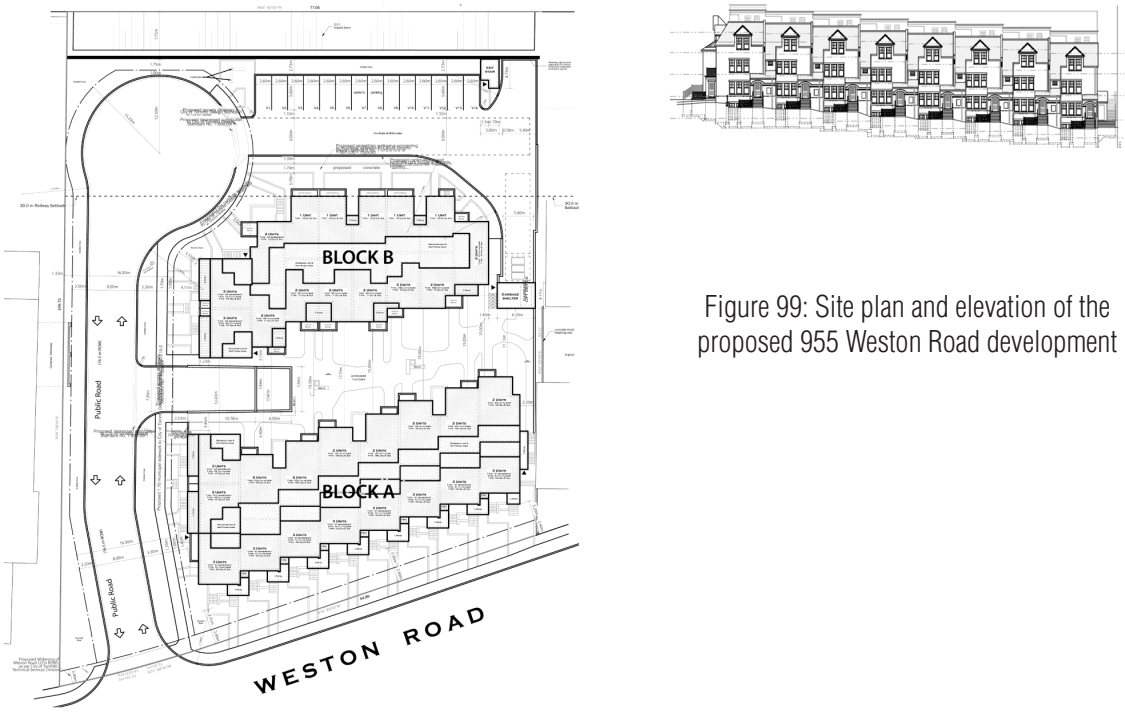


Figure 99: Site plan and elevation of the proposed 955 Weston Road development

Figure 100: 955 Weston Road context plan

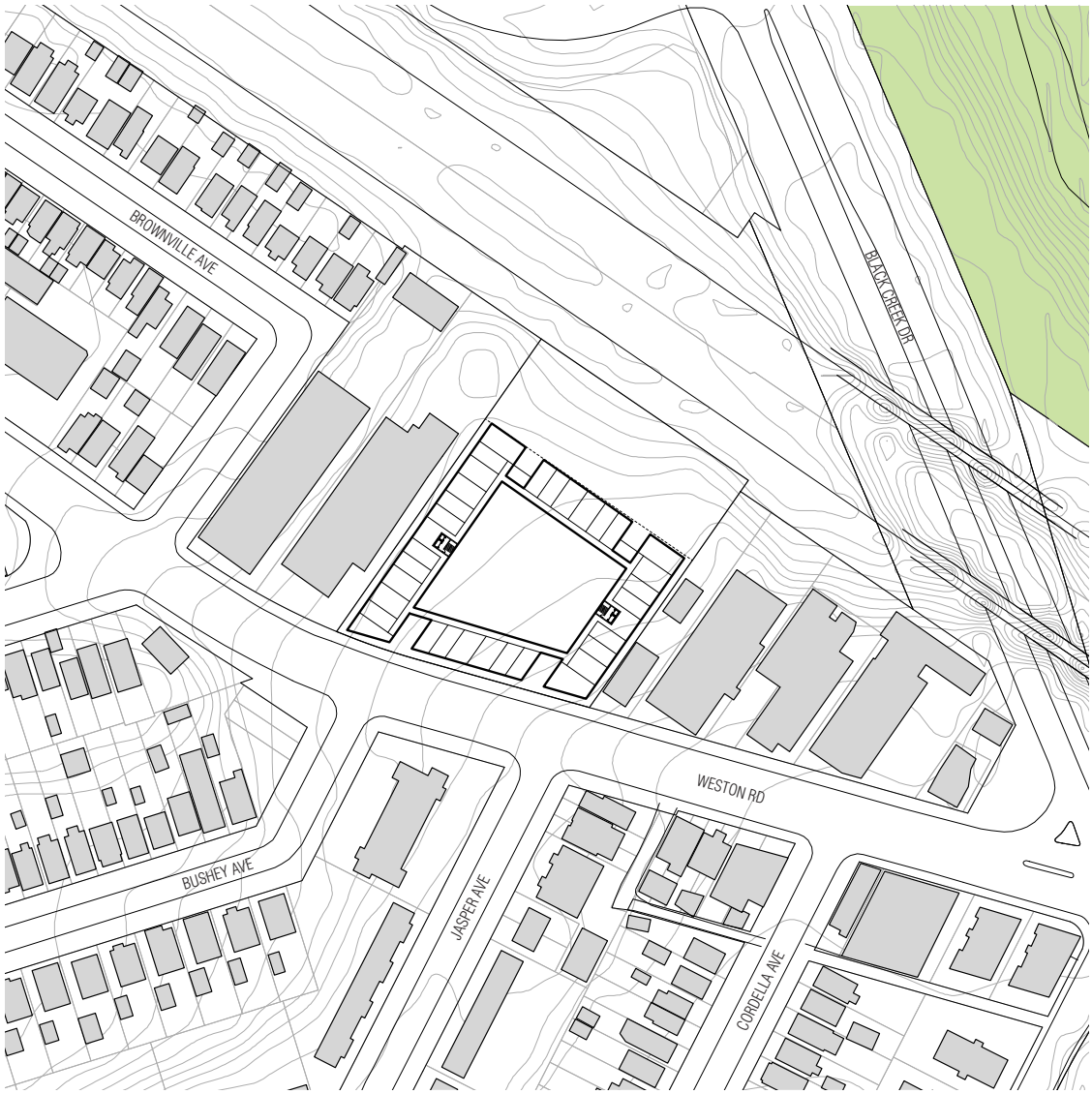
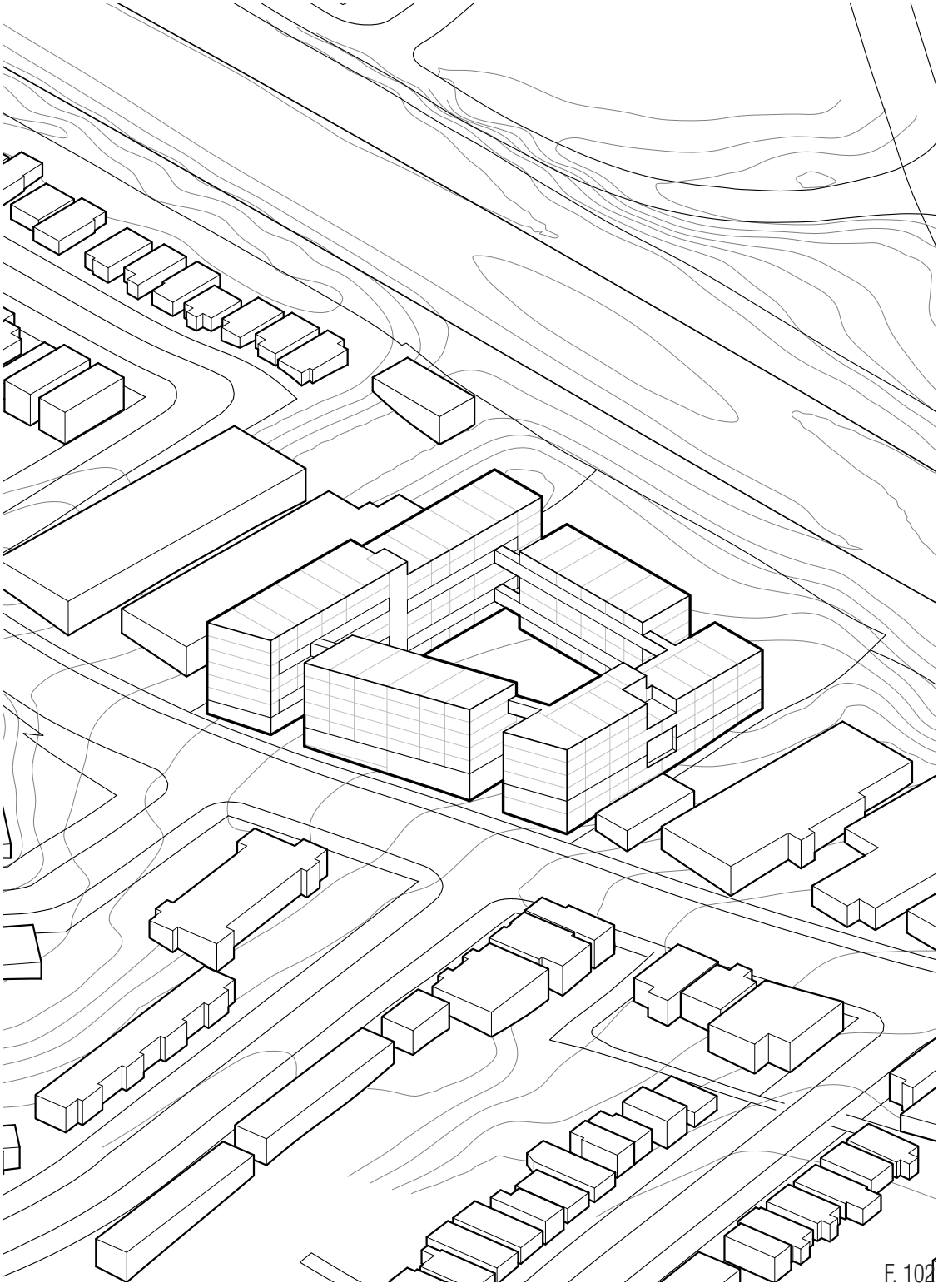


Figure 101: 955 Weston Road site plan



F. 102

NOTES

60. City of Toronto. “Avenues and Mid-Rise Buildings Study.” Urban Design. Accessed December 2, 2016. http://www1.toronto.ca/wps/portal/contentonly?vgnextoid=7238036318061410VgnVCM10000071d60f89RCRD.

61. Ibid

62. Ibid

PART 6 : THE DESIGN

6.1 ROCKCLIFFE-SMYTHE

As a means of exploring the design details and spatial qualities of the prototype on a specific site, the site at 955 Weston Road has been chosen for further design development. 955 Weston Road is located in the Rockcliffe-Smythe neighbourhood of Toronto, close to the Eglinton Avenue and Weston Road intersection. With the introduction of the Eglinton Crosstown LRT, the area will be well served by transit, and is already within a 500 meter walking distance of two TTC bus transit stops. The site is currently vacant, and is located within a strip of one-storey commercial buildings along the east side of Weston Road, and single family detached residential homes along the west side. In keeping with the guidelines of The Avenues and Mid-Rise Buildings Study, the proposed thesis project is a mid-rise building with commercial frontage along Weston Road, with the remainder developed as residential. The division between private family space, semi-private communal space, semi-public neighbourhood space and public city space is explored in this design in an attempt to create an engaging, vibrant, family oriented building. The design challenges the preconceptions associated with living in compact urban developments, as it is designed to offer a mutiplicity of uses to address the diversity that is often not accommodated for within high density high-rise and mid-rise housing schemes. If we are to identify as a diverse multicultural city, this identity must be reflected by the design for our residential architecture.

To illustrate the potential to accommodate a wide range in demographic diversity within a single building, the neighbourhood within which the site is located was carefully evaluated. From the census data taken in 2011, the neighbourhood has an overall population of 22,267. Of this population, 34% of households spend 30% or more of their income on shelter costs. Further to this, 22% of the neighbourhood's households are considered to be in the low-income category (3% above the 19% Toronto average).[63] Statistics Canada considers a household to be low-income when it spends 20% more of its after tax income on food, shelter and clothing than the average family, which is typically around 63% of its annual income.[64] Rockcliffe-Smythe has one of the most diverse populations in the City of Toronto, which is poorly reflected in the housing stock. The neighbourhood primarily contains single detached houses (31%), and apartments that are 5 storeys and above (36%), the former being economically unfeasible for a family to own, the latter typically being unsuitable to house a family. With a higher percentage of children and seniors, as well as a diverse mix of ethnicities living in the area, the neighbourhood is an excellent example of the diversity and shifting demographics typical of family oriented Toronto neighbourhoods.

1 York Memorial Collegiate Institute
2 City of York Museum
3 Chris Tonks Arena
4 Grocery Store
5 Keelesdale Junior Public School
6 Royal Canadian Legion
7 George Harvey Collegiate Institute
8 Roman Catholic Church
9 Our Lady of Victory Church
10 Santa Maria Catholic School
11 Church of Christ
12 Our Lady of Victory School
13 Catholic Secondary School

Figure 103: 955 Weston Road Context Plan

6.2 CONNECTING TO THE URBAN REALM

At a larger scale, the building volume is broken up into six segments and steps down along Weston Road to follow the slope of the site. The form suggests a direct relationship to the site topography, and is broken up to reduce its visual impact on the urban realm. These simple formal gestures forge a site specific connection at the city scale, and introduce a higher standard of design to the under-utilized urban area. The introduction of a higher design standard is intended to act as a catalyst for future development in the area. Further to this, the mid-rise scale of the building implements an appropriate transition from the existing low-density development to higher densities in the future.

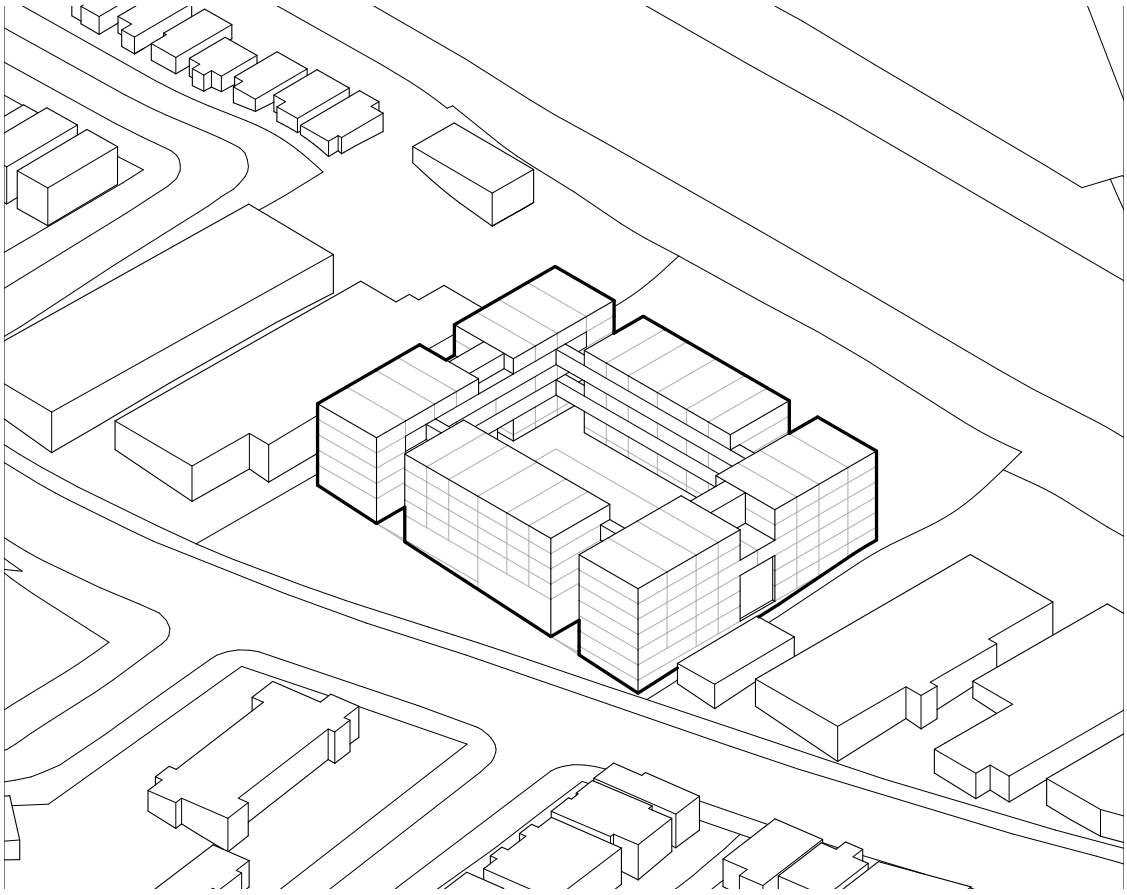


Figure 104: Basic unit arrangement on site

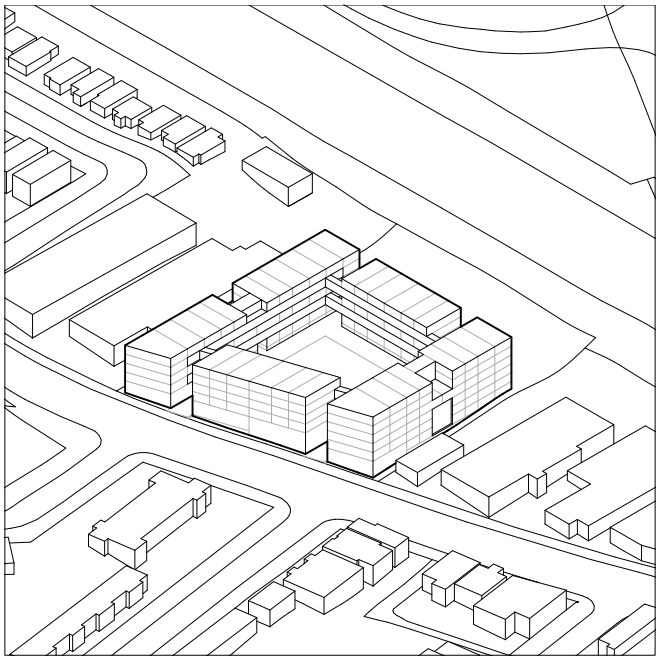


Figure 105: Footprint arranged to conform
to site boundaries

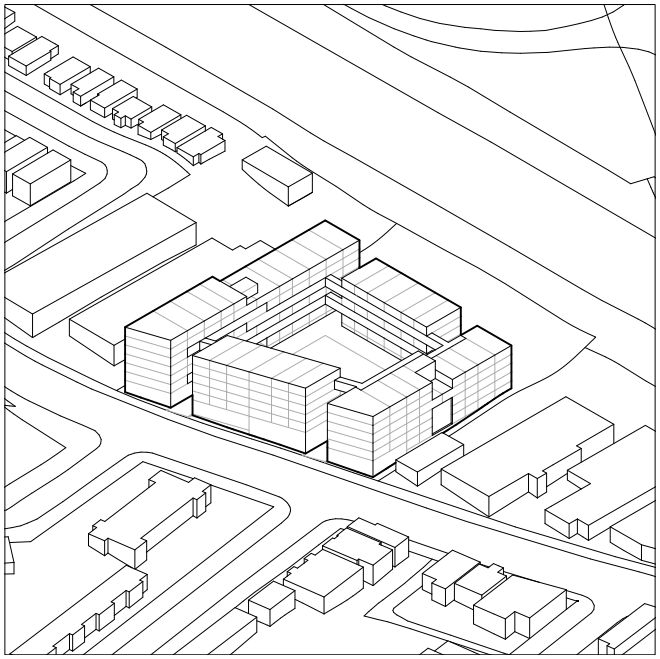


Figure 106: Building volumes stepped to
follow the site contours

In an attempt to forge a stronger connection to the urban pedestrian realm and the surrounding neighbourhood streetscape, commercial frontage is placed along Weston Road to intensify the use of the building throughout all hours of the day. The placement of commercial storefronts along the entire façade facing Weston road is conducive to a friendly pedestrian atmosphere during business hours of the day, while the residential use guarantees intensive use of building facilities throughout the morning and evening hours. The façade of the building is brought up to the edge of the sidewalk, in consideration and anticipation of future development along Weston Road and Eglinton Avenue. The under-utilized industrial brownfield sites along Weston Road beside the CN railway will inevitably undergo higher density reurbanization in the future. Future intensification implies the need to start designing high density pedestrian friendly buildings along major arterial roads throughout the neighbourhood, most notably surrounding the future LRT station.

Figure 107: View of building fron Weston Road

Figure 108: View of entrance to residential units between building volumes

As a means of minimizing the visual impact of the building form along Weston, the building is broken up into three main volumes facing onto Weston Road, and access to the commercial venues facing onto the street is provided between each of the three building segments. Access to the residential units is elevated from the area between the building volumes, which creates a level of separation from public and private use. A strong connection to the pedestrian realm along Weston road serves to benefit the residents within the Rockcliffe-Smythe area, and contributes to the walkability of the neighbourhood. However, the desirability of the residential units included within the building is still maintained by limiting the public use areas to the commercial storefronts. Located along both sides of the building are two double-height main entrances, which provide access to the upper floors of the residential building.

The building site slopes down five meters from the north to the south, a condition which is capitalized upon in the provision of underground parking space. At the south end of the building volume, the main parking entrance is located underneath the residential building volume. The parking is located around the courtyard within the basement of the building, which eliminates the need for surface parking. Due to the slope of the site this scheme does not require a ramp to access the underground parking, which reduces the cost of construction, and still allows for cars to be hidden from view. Bicycle parking is also provided below grade, which is easily accessed by the vertical circulation in the building.

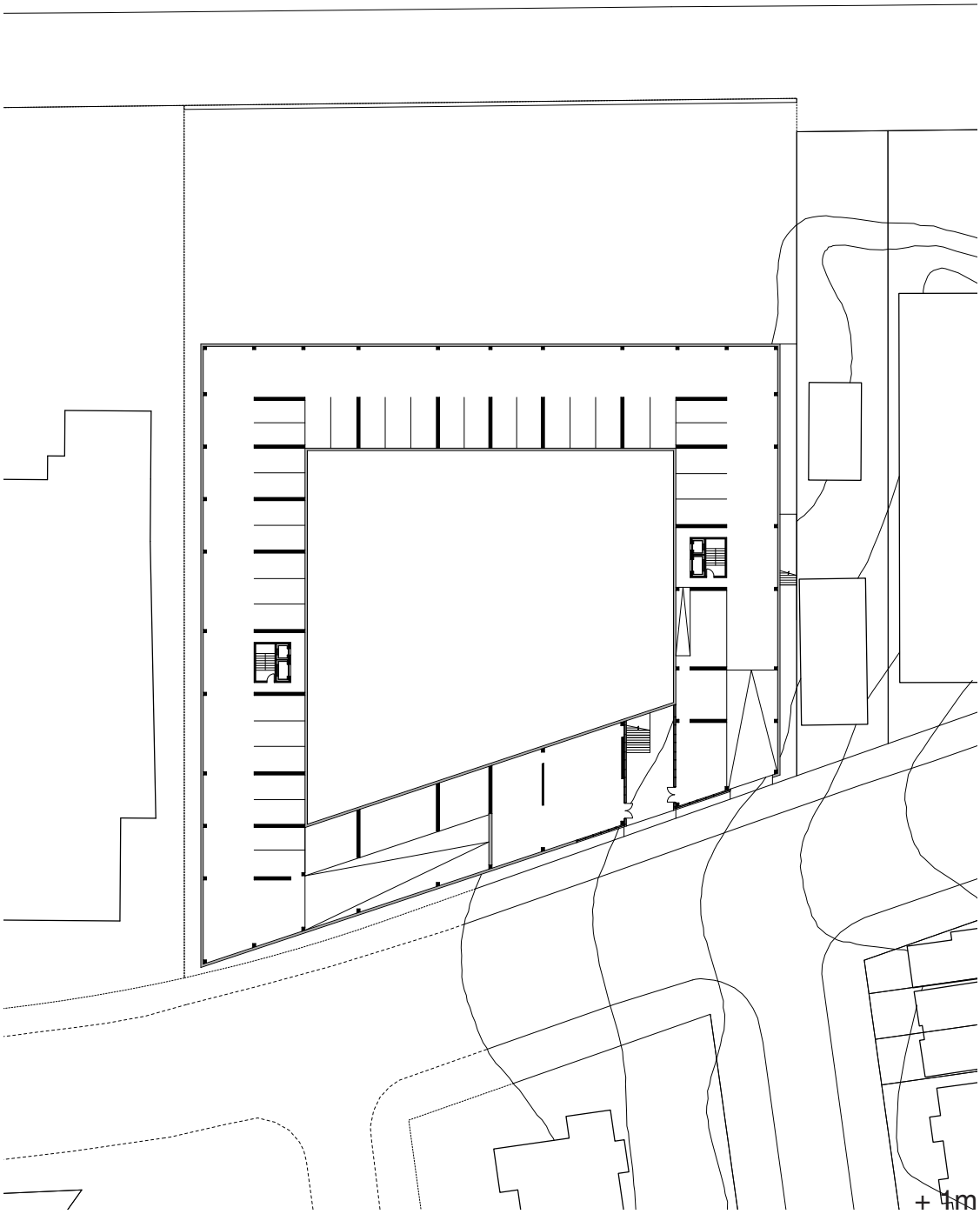


Figure 109: Parking level plan

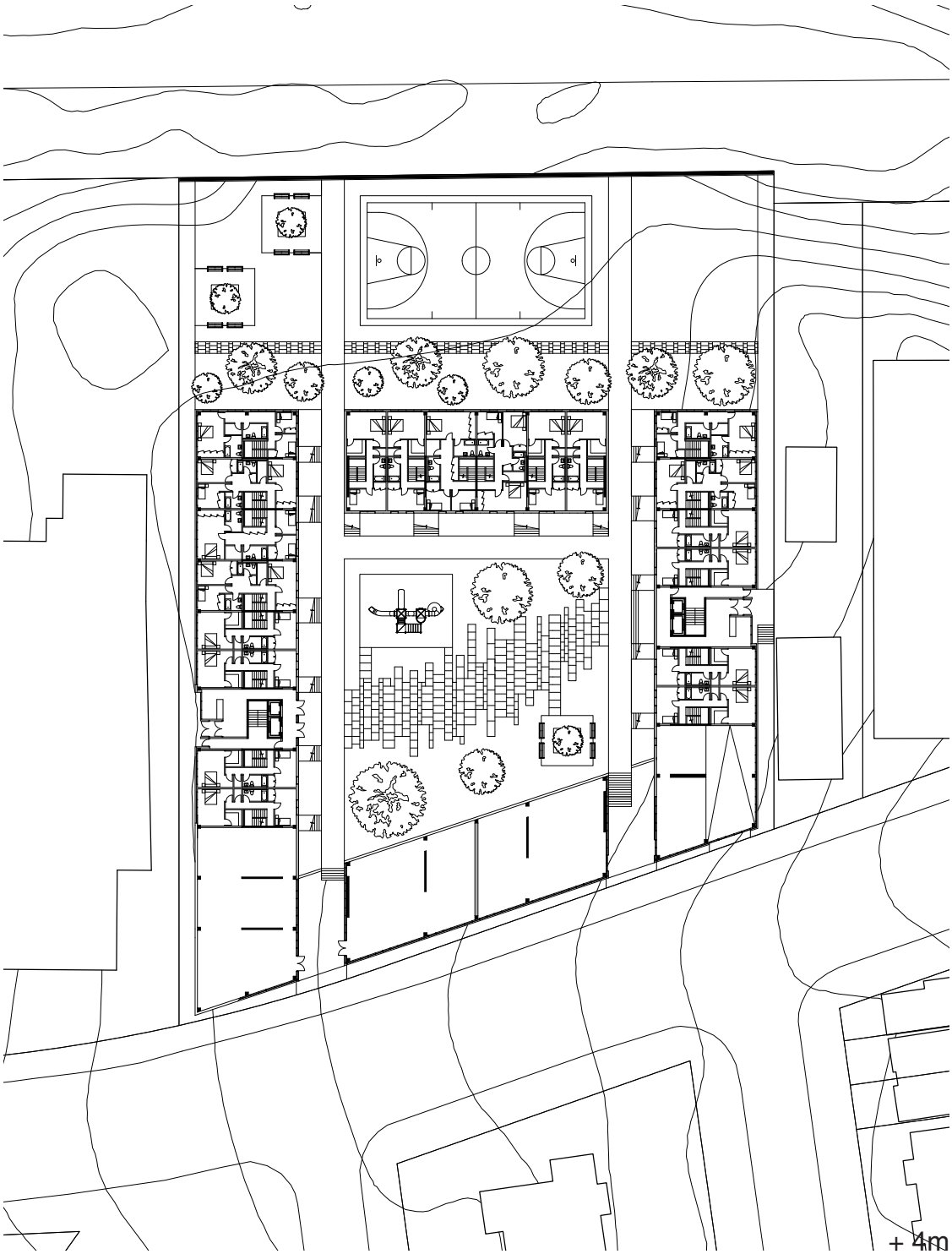


Figure 110: Basement level plan

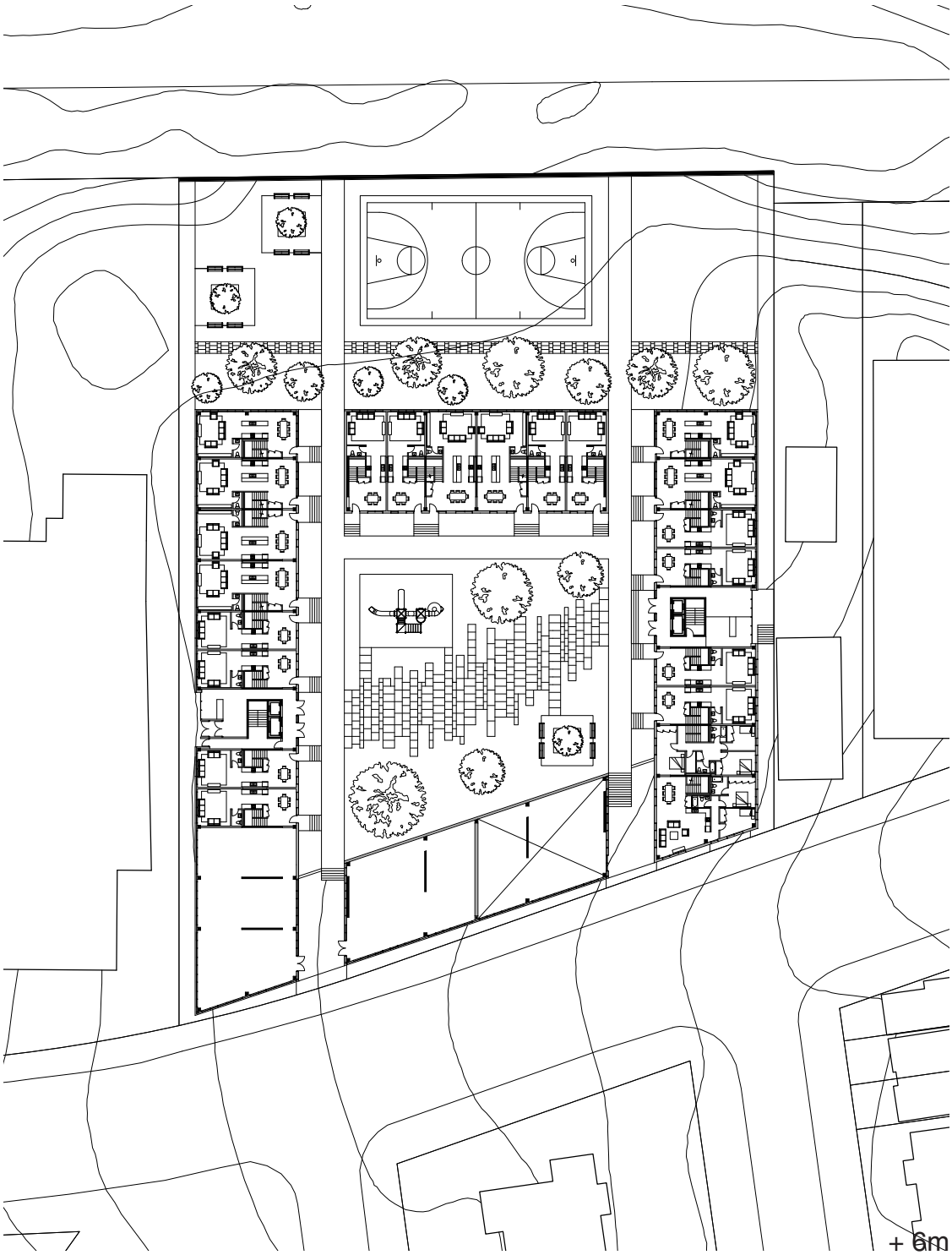


Figure 111: Ground floor plan

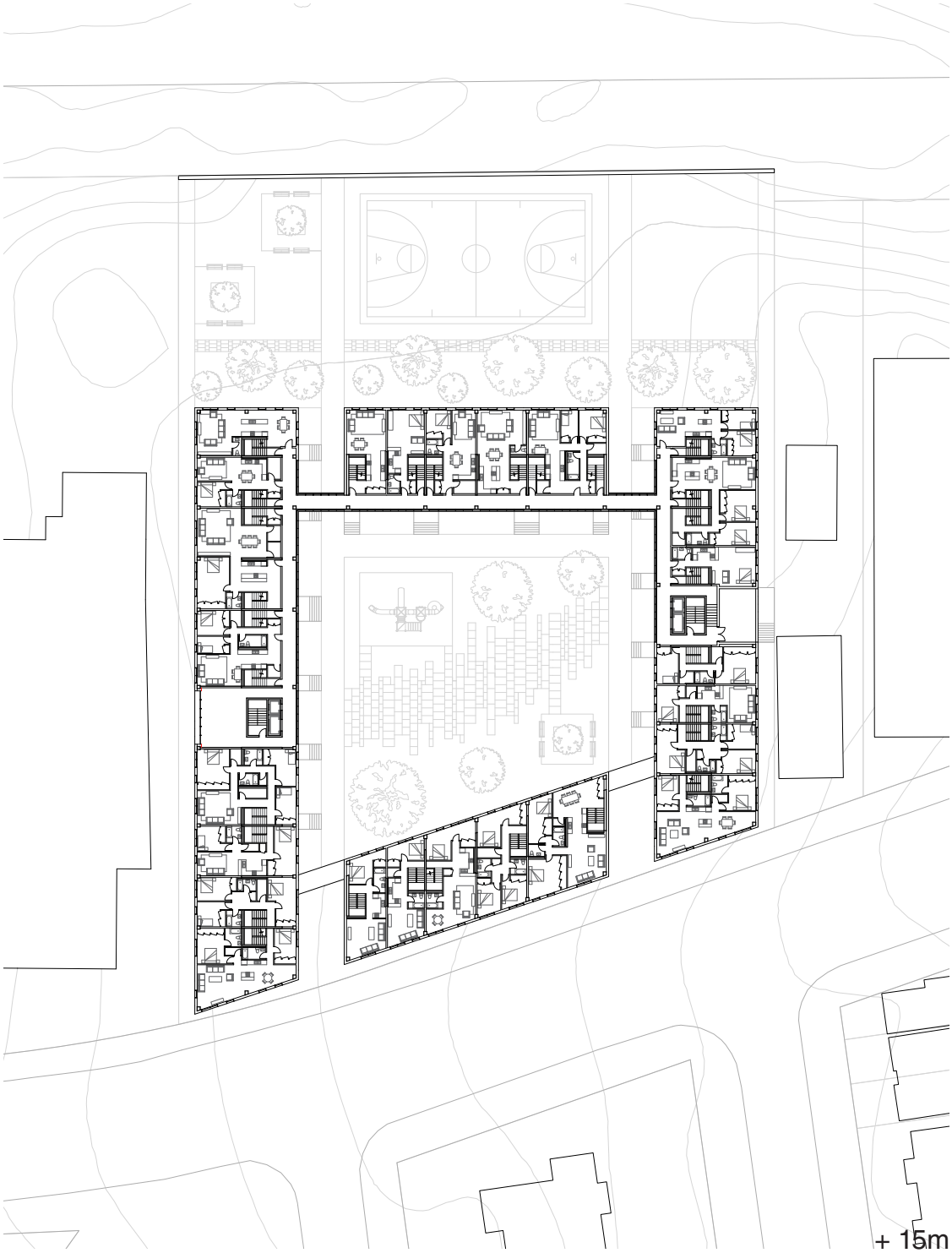


Figure 112: Fourth floor plan

Figure 113: Fifth floor plan

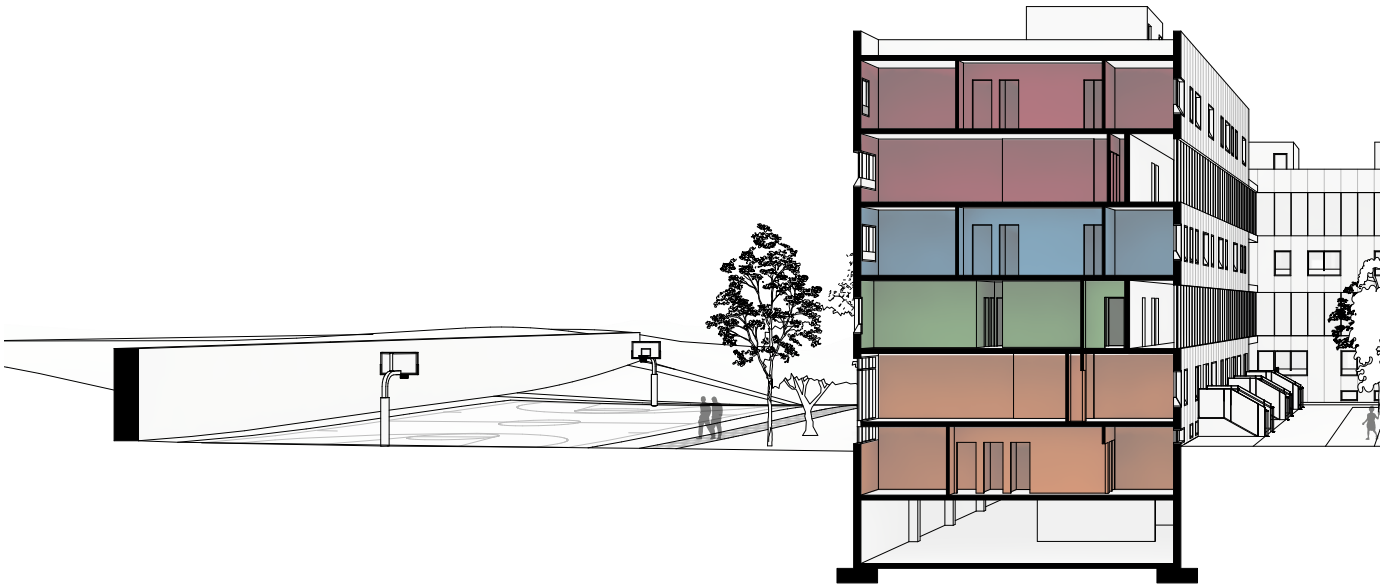
6.3 SEMI-PUBLIC COMMUNAL SPACE

The quality of family life is significantly impacted by the architecture of home and community, an issue that has been central to suburban development in North America. As an increasing number of social, environmental and economic problems challenge the viability of suburban development, Toronto has been forced to reconsider the implications of low density growth. Now that higher density residential building types have become the primary source of new home development within the GTA,[65] the living standards associated with low density suburban growth need to be adapted and included within the design of higher density developments. Current models of high density urban growth within Toronto typically preclude the design of communal space that can adequately meet the needs of larger families. Failure to address this issue exacerbates a negative stigma associated with high density living standards. In an attempt to challenge this stigma, this thesis project carefully reconsiders the provision of semi-public and semi-private communal space within an urban condition.

Communal open space and shared amenities are a socially valuable component of high density residential development. As higher density models of development become more pervasive, an increase in the value of community space will become inevitable. The rising commodification of land will place more value on public space, and the shape, size and scale of this space will feature as an increasingly important part of city development. However, the provision of added space is typically viewed as expensive and uneconomical, especially when it reduces the amount of developable land for residential units. As the study of precedents such as the Alexandra Road Estate and The Whale may indicate, intimate public spaces may be developed as a function of the organizational logic of the building circulation and unit layout on the site. Different types of open communal space may be developed based on the typological structure of a building, which may offer a range of uses and different senses of enclosure to the residents. It is important to understand that communal space may develop as a logical component of the organization of dwelling units and building circulation.


adidas

F. 114



F. 115

It is logical to assume that a high density building with dozens of larger households will require a greater amount of semi-public space for the residents. For this reason, the perimeter block typology is a suitable candidate when providing housing for larger households, as the intimate courtyard space can be designed as a valuable semi-public urban condition that caters to the collective needs of each household. Further to this, the industrial sites that are being redeveloped along the rail lines through the city are forced to comply with a 30 meter setback, which provides ample space for the creation of shared outdoor amenities. As previously shown, lower density residential developments that are currently planned for these sites require roads and surface parking to access each dwelling unit. This approach to redevelopment strips the potential to repurpose land for recreational use by the residents.

The single-loaded circulation corridors of the prototype allow building residents to view into the courtyard space when moving to their dwelling units, creating a strong visual connection between the building interior and the courtyard. The limited height of the building, which steps down towards the east end of the site, allows sunlight to reach the courtyard. A playground is placed in the courtyard space, and soft landscaping and trees scattered throughout the area increase the attraction of using the space. Finally, a wide paved walkway connecting the two main courtyard entrances provides an additional surface on which children living in the building may play. At the rear of the building, a landscaped area provides an additional space for residents to utilize freely. A paved basketball court adds an additional space upon which children living in the building may play. Entrances to the lowest level units are provided at grade along the exterior of the sides and rear of the building, which strengthens the connection between the building and the surrounding landscaped areas.

6.4 SEMI-PRIVATE COMMUNAL SPACES

The wide variety of unit types and sizes that may be developed within the building framework indicate that a combination of many different households will occupy the building upon tenure. Shared semi-private amenity space is distributed throughout the building in areas that result from the organizational logic of the dwelling unit layout. Along each corridor adjacent to the central vertical circulation cores, indoor amenity space is provided for the private use of residents. This provides each unit with an easily accessible area to utilize freely. The location of each amenity space optimizes the potential to engage with other residents throughout the building, as the proximity of each space to the vertical circulation encourages increased contact between building residents that share each corridor. Furthermore, the provision of shared interior semi-private communal space along each corridor restricts the number of residents that may utilize the space, offering a degree of exclusivity that may encourage the use of each space.

Separating each building mass at the south-west and north-east ends of the building are four outdoor amenity spaces, each of which is connected to one corridor in the building. This provides every unit with an outdoor amenity space, which is more significant considering that many of the units do not have a balcony. This optimizes the use of a building feature that is often under-utilized throughout Canadian winters. By sharing a larger outdoor balcony space with all of the units located along each corridor, the use of the space is optimized, and contact between building residents is further increased. The location of each outdoor amenity space limits the access to the dwelling units that are connected to one corridor, such that the area is semi-private. This organizational scheme allows for the same families to continually encounter each other when they use the corridors and vertical circulation system. The main intent of these break-out amenity spaces is to provide extra space for families that live throughout the building, and to foster interaction between neighbours within close proximity. The easily accessible location of each space encourages children and adults to utilize these spaces in their free time, and provides the conditions for a well-connected community to thrive. This challenges the strict private to semi-public transition of conventional residential buildings, whose units are all served by the same amenity spaces.

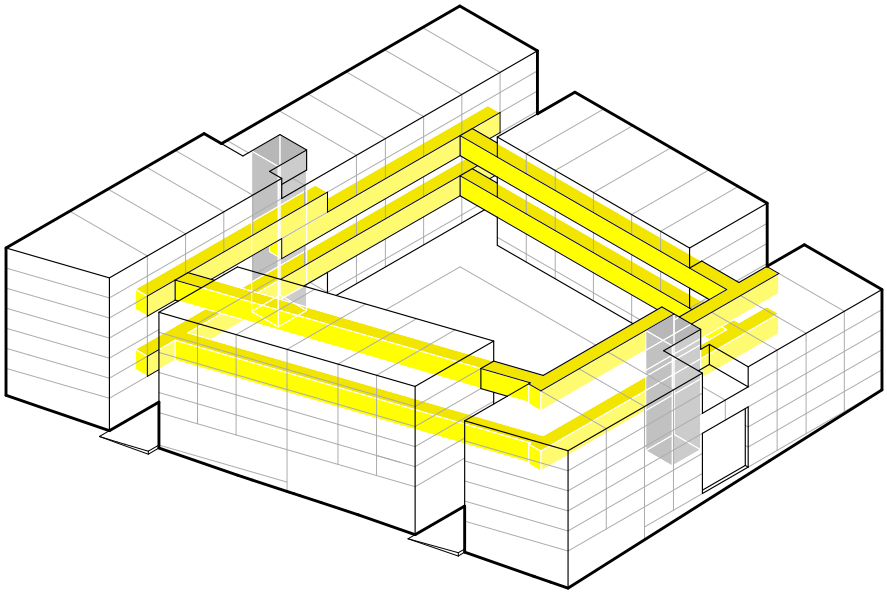


Figure 116: Circulation diagram

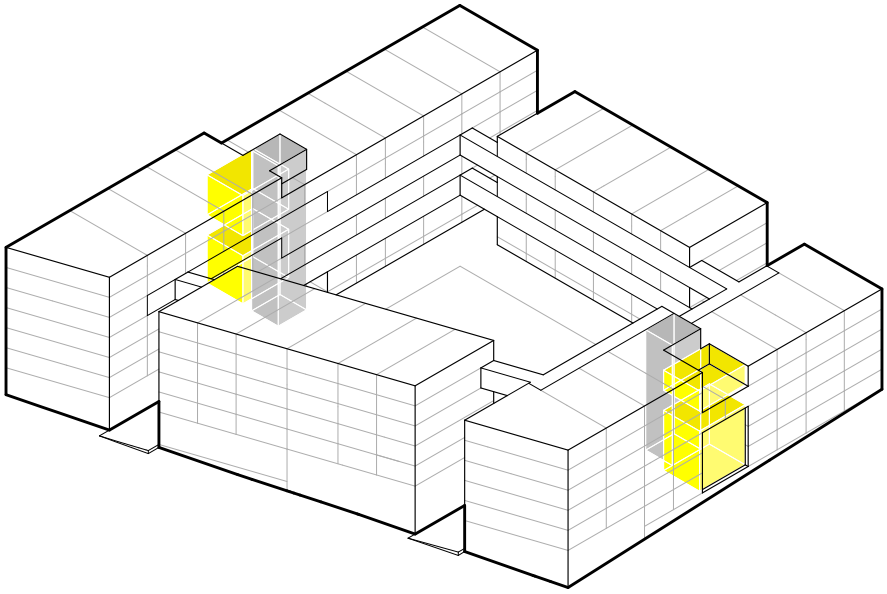


Figure 117: Location of amenity spaces

Figure 118: Axonometric of indoor amenity space

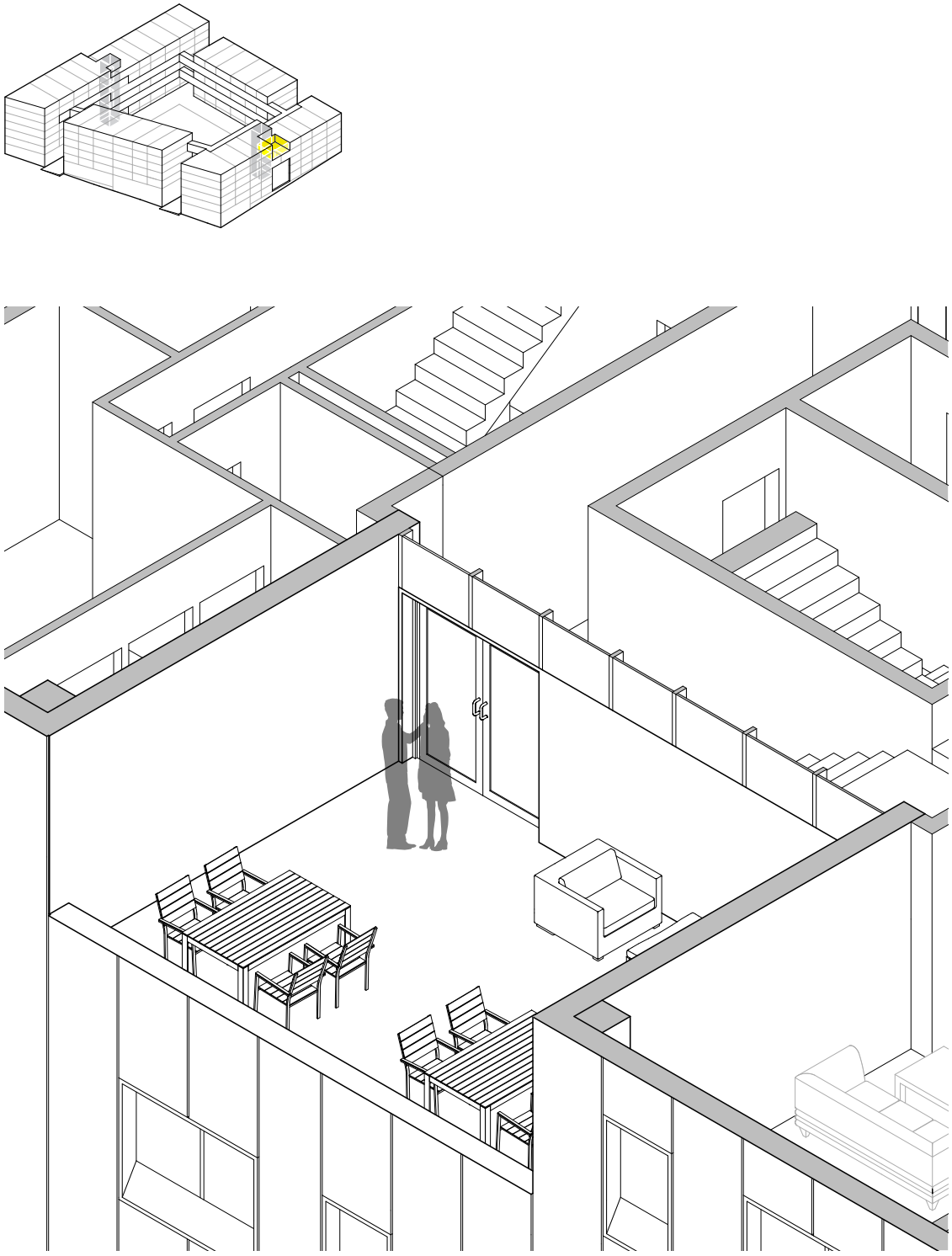


Figure 119: Axonometric of outdoor amenity space

The introduction of a variety of communal areas promotes community interaction at several different scales. The outdoor courtyard provides a large recreational area that is separated from public city life, and acts as the communal transition space between the scale of the building and the scale of the city. Typical residential schemes create a condition in which a resident transitions from the public scale of the city directly into the private scale of the residential unit, which does not allow for any gradient between public and private space. This essentially isolates a resident to be confined within their own private space. This scheme attempts to challenge the conventional notion of public and private space within the urban Canadian context.

Figure 120: View of building looking north from Weston Road

6.5 CONCLUSION

The flexibility introduced by this prototype for high density housing challenges the viability of existing building typologies within the urban Canadian context. The inability to flexibly adjust to a diversity of household sizes and types drastically limits the ability of current development models to meet continued urban growth demands. This prototype not only presents a high level of flexibility upon initial construction, but also offers the potential to adapt to changing household needs throughout the life of the building. This radically alters the stigma attached to living within high-density residential buildings. If high density buildings can easily accommodate for an increased variety and diversity of residents, high density living may become an attractive alternative for a greater number of households that live within the city. The architectural translation of cultural diversity offers the potential to embody the identity of a city that struggles to portray one.

As planners continue to struggle with appropriately meeting the increasing demand for housing, this prototype offers advantages at several different scales. At an urban scale, the relationship forged between individual units, communal spaces, building massing and site creates a cohesive relationship that indicates an innovative approach to architecturally exhibiting the diversity of life found within the City of Toronto. As each component of the design directly relates to the others, a microcosmic connection is forged between the household, the community and the city. At a communal scale, the prototype offers the potential to implement a range of semi-public and semi-private conditions that result as a function of the organization of dwelling units on a site. The relationship between public and private life offers an urban household benefits that surpass the value of existing urban living standards.

An ability to flexibly develop many different unit types within the building scheme may accommodate different household types and sizes, as well as families from widely ranging economic circumstances. This scheme can accommodate for a wide range of demographic age groups, which enables young single residents and couples, couples with children, and larger families to live within the same building. Further to this, the scheme allows for households to stay within a building for a longer period of time, as it presents the opportunity to adjust to their spatial needs over time by absorbing or subtracting adjacent bays within the building framework. This prototype essentially redefines conventional static residential development schemes, and presents a viable system of architecture that flexibly adjusts to varied housing demand in the future of urban development. The standard of living presented by the scheme could significantly reformulate the values associated with housing a variety of household types and sizes within a multi-unit residential building.

NOTES

63. City of Toronto. (2014, October). 2011 Census/Rockcliffe-Smythe. Retrieved December 10, 2016, from https://www1.toronto.ca/City%20Of%20Toronto/Social%20Development,%20Finance%20&%20Administration/Neighbourhood%20Profiles/pdf/2011/pdf4/cpa111.pdf

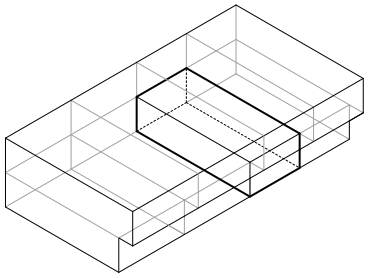
64. "Housing in Canada Online." Housing in Canada Online - Definitions - CMHC. Accessed December 02, 2016. http://cmhc.beyond2020.com/HiCODefinitions_EN.html.

65. City of Toronto. (2015, October). Housing Occupancy Trends 1996-2011 - Profile Toronto. Retrieved December 10, 2016, from http://www.toronto.ca/legdocs/mmis/2015/pg/bgrd/backgroundfile-84816.pdf

APPENDIX

BACHELOR

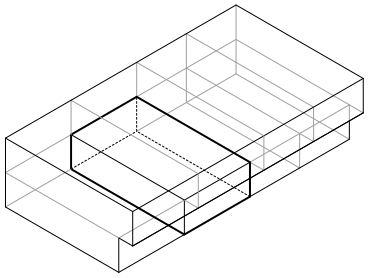
450 ft^2

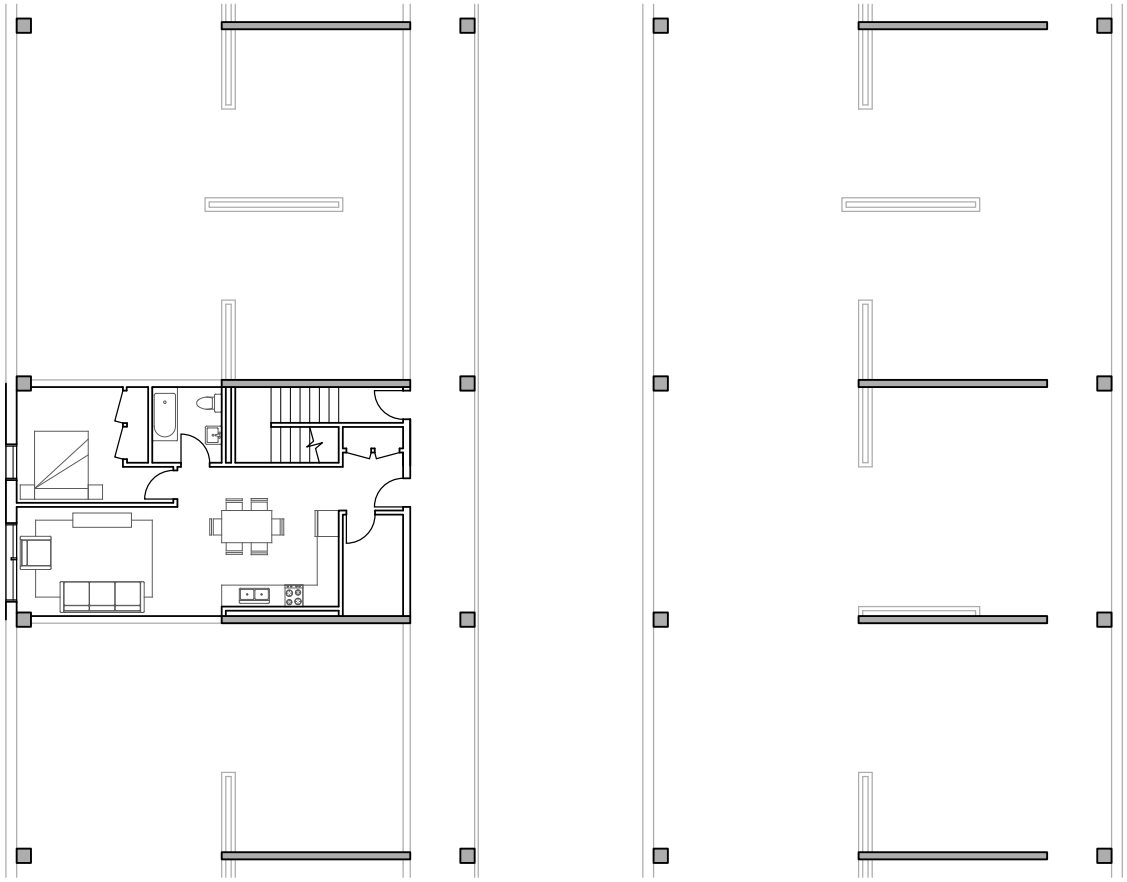


F. 121

1 BEDROOM

625 ft^2

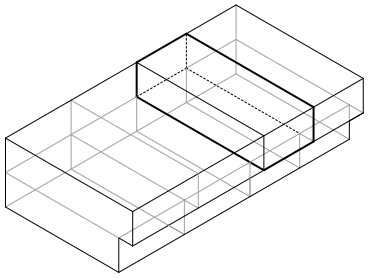


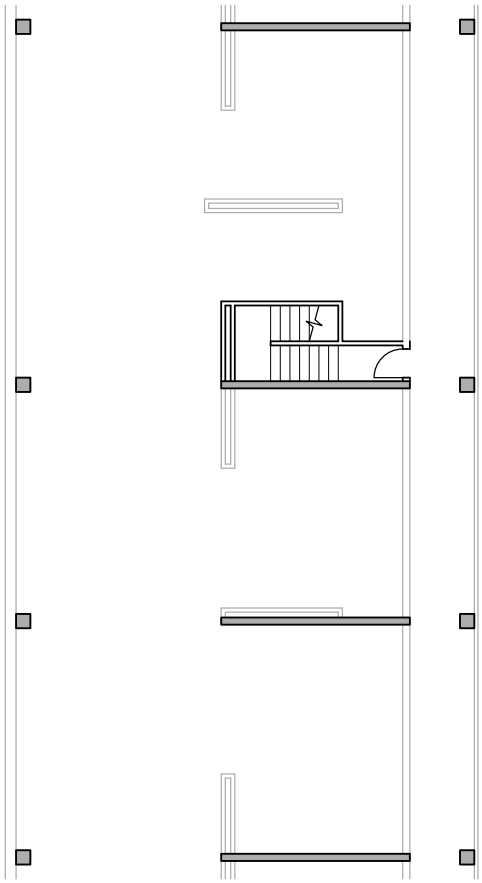


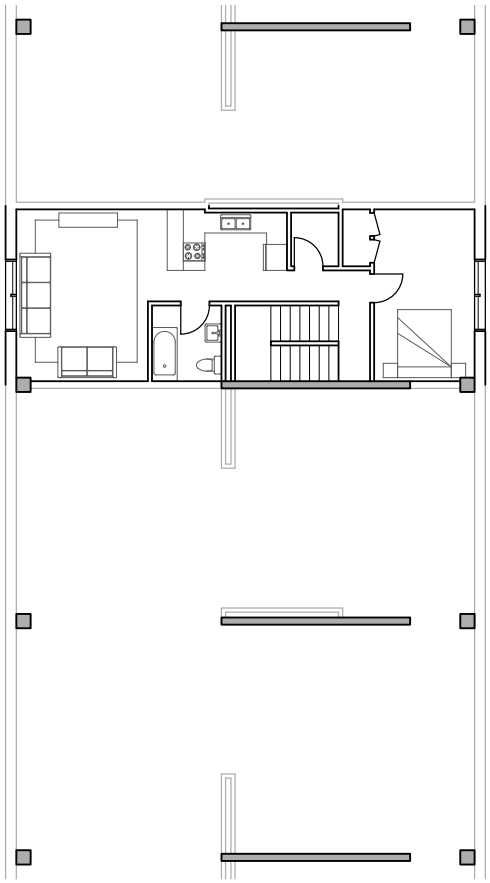
F. 122

1 BEDROOM

650 ft^2







F. 123

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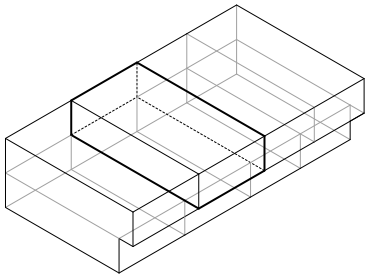

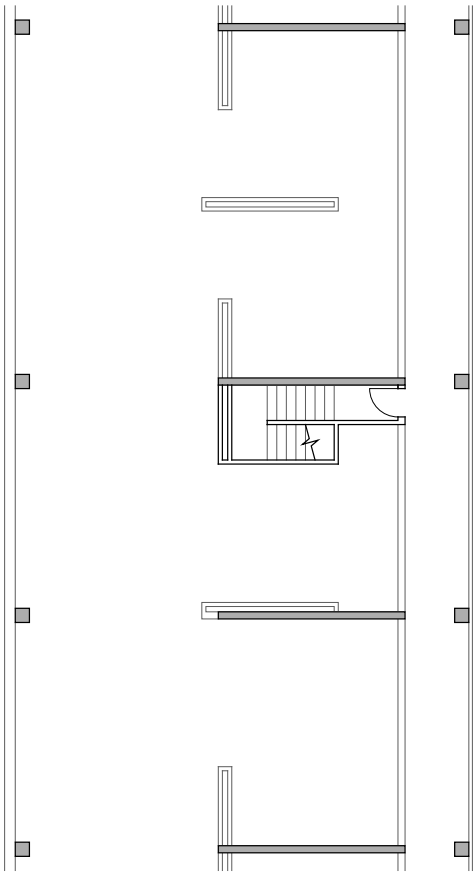

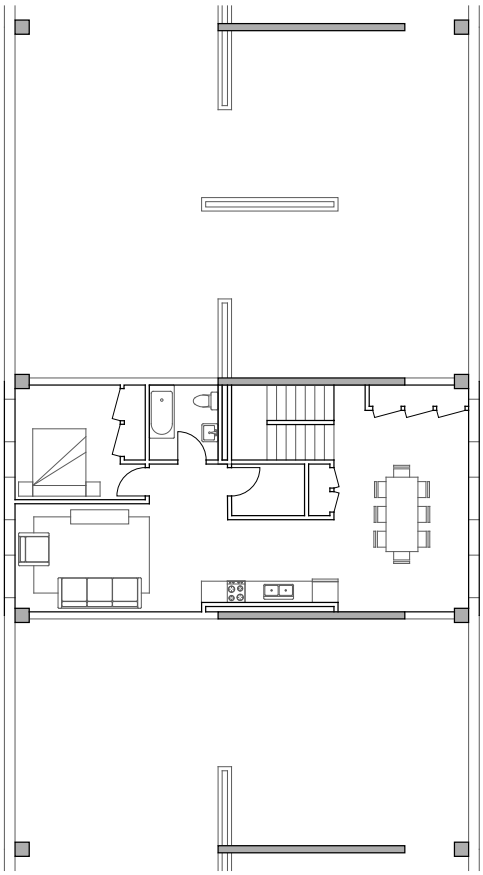

F. 124

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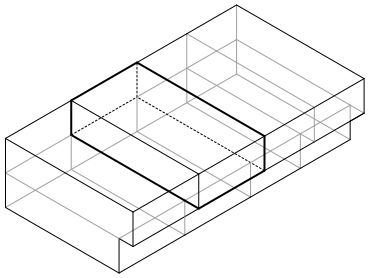
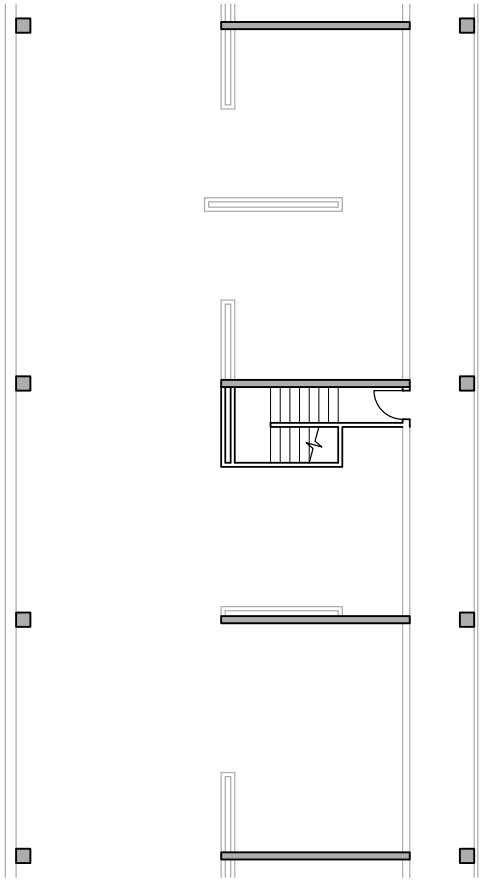
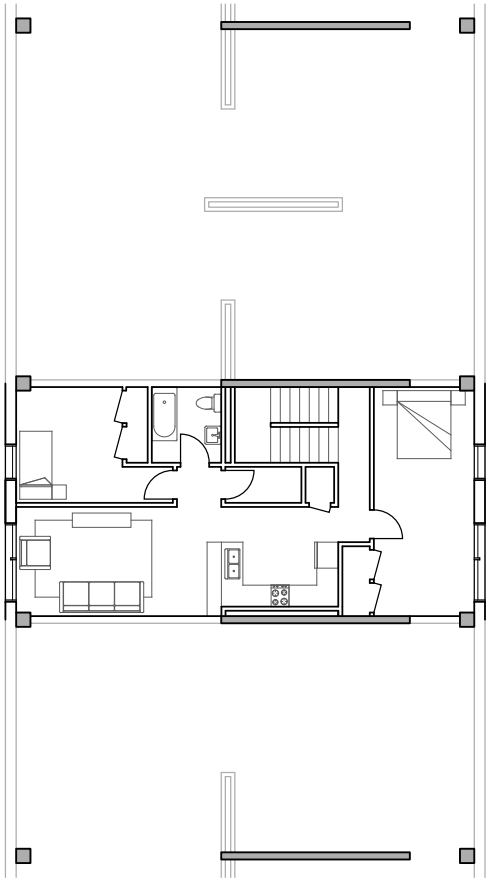


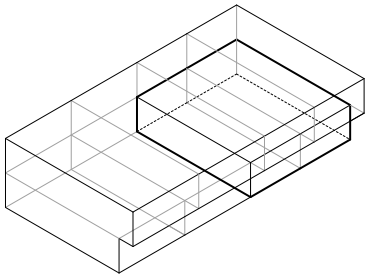




F. 125

2 BEDROOM

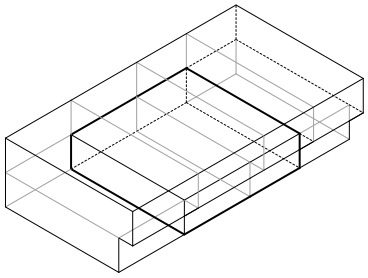
925 ft^2



F. 126

2 BEDROOM

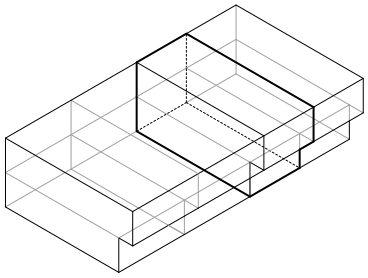
1075 ft^2

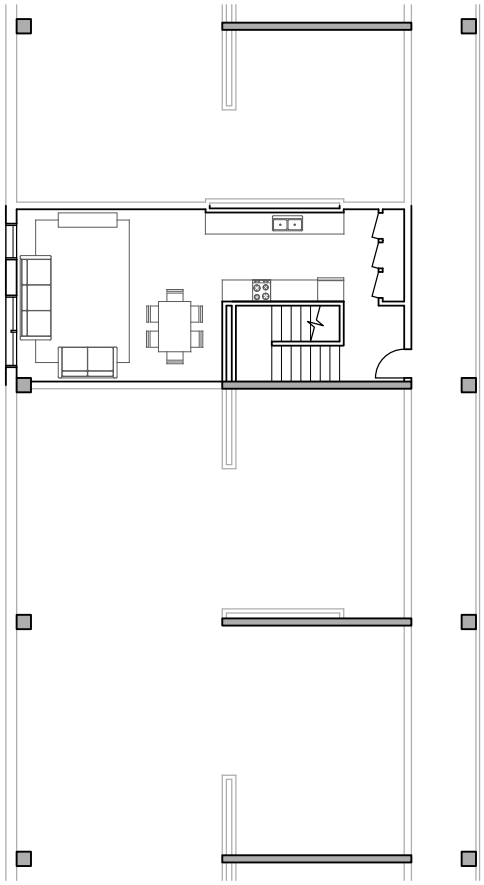


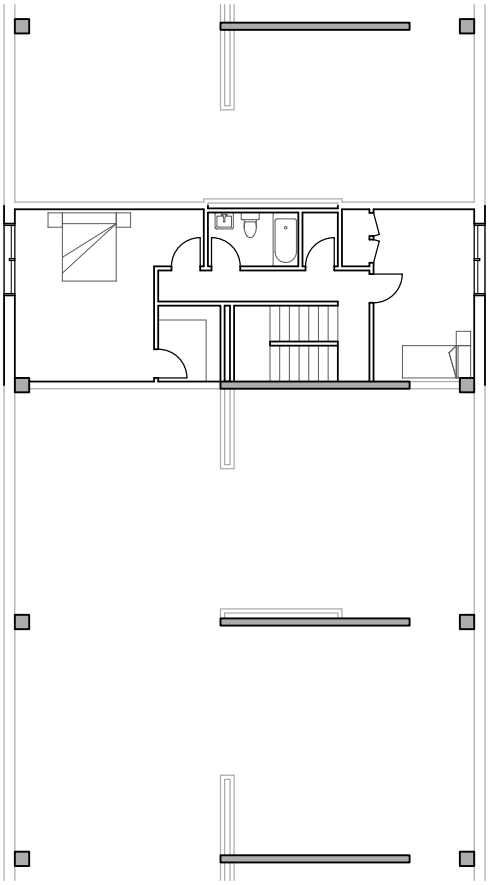
F. 127

2 BEDROOM

1200 ft^2







F. 128

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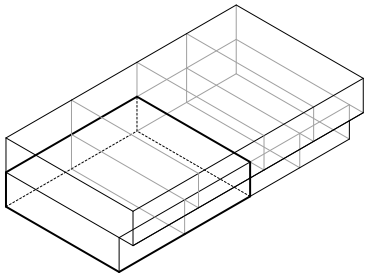
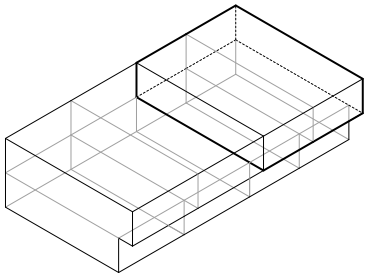
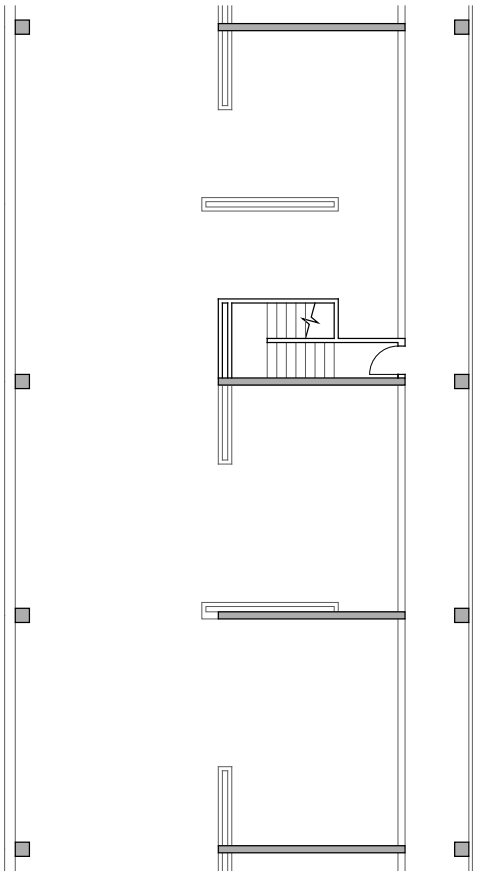


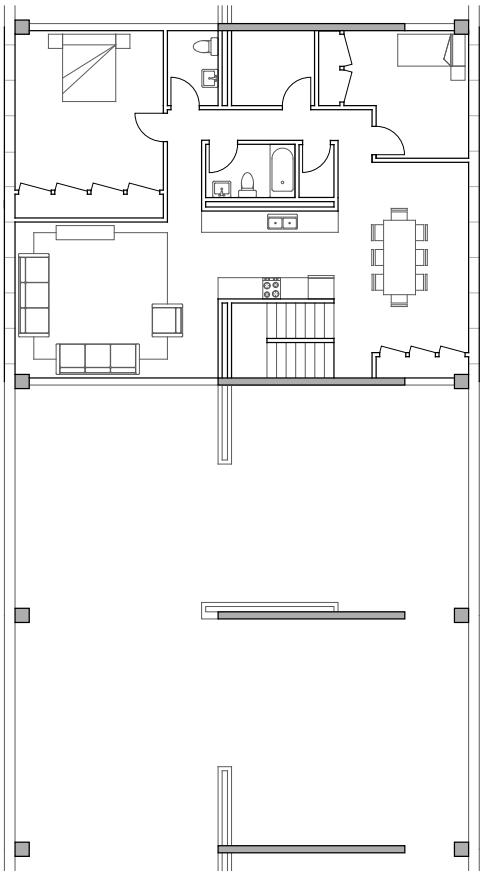
F. 129

2 BEDROOM

1325 ft^2







F. 130

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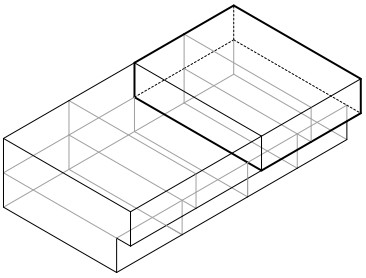
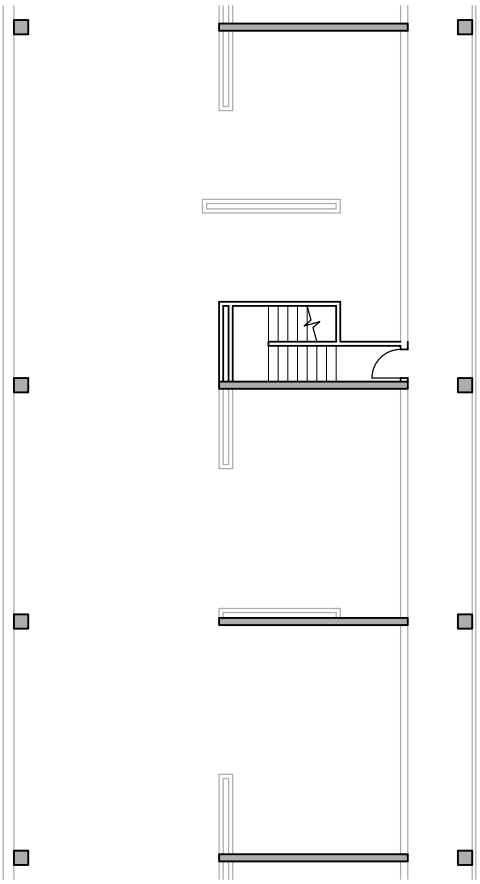
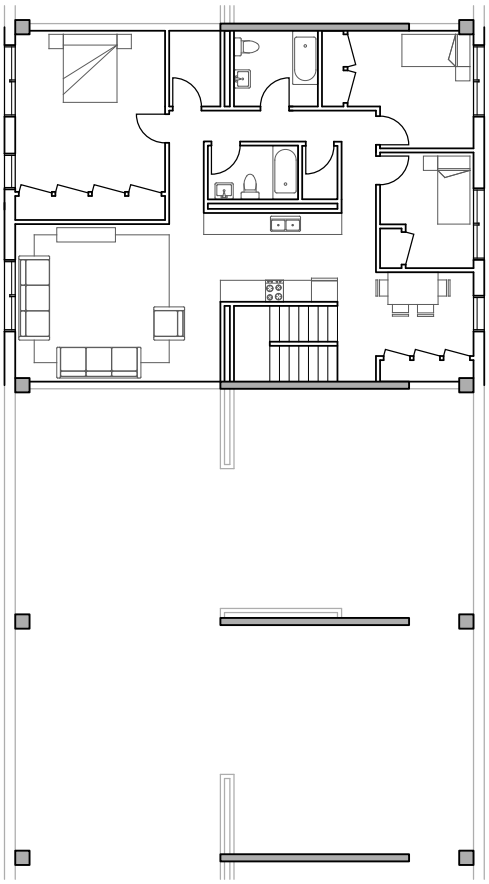


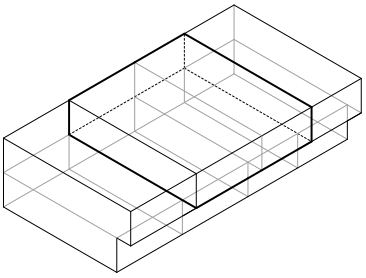


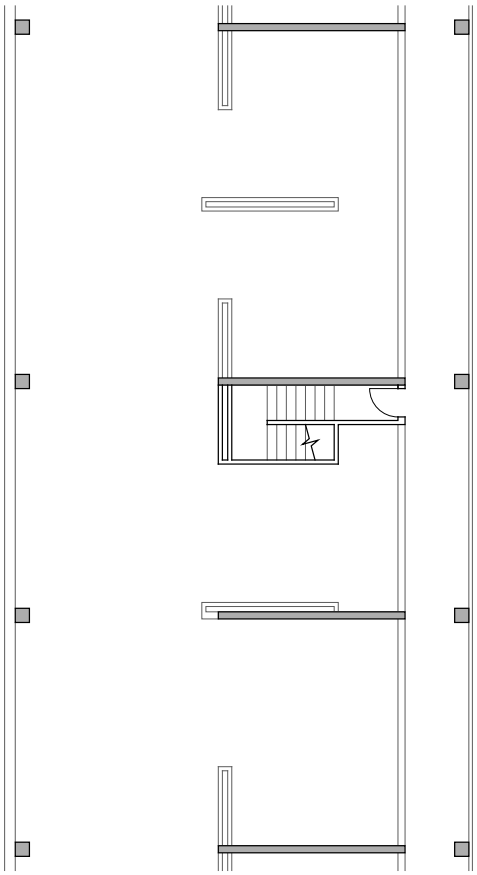


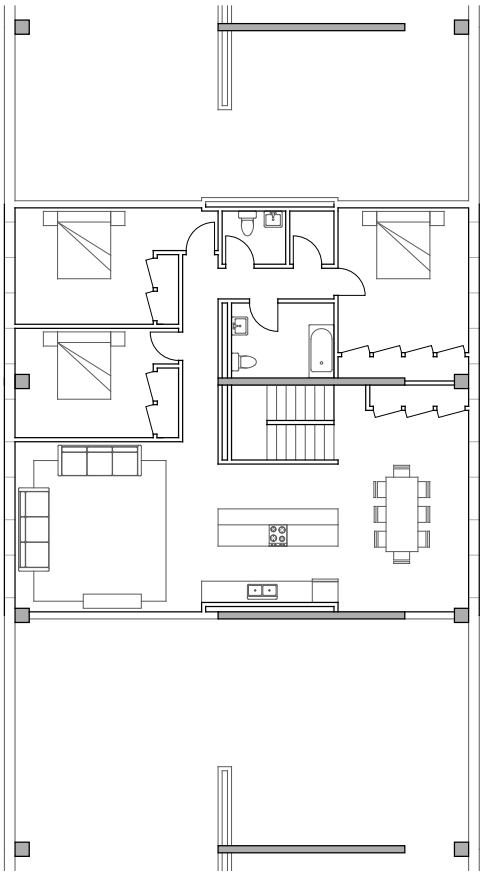
F. 131

3 BEDROOM

1550 ft^2







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3 BEDROOM

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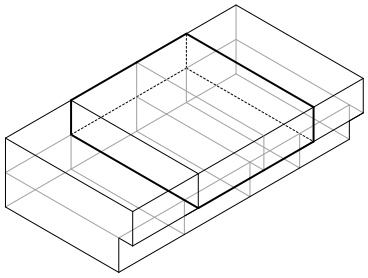
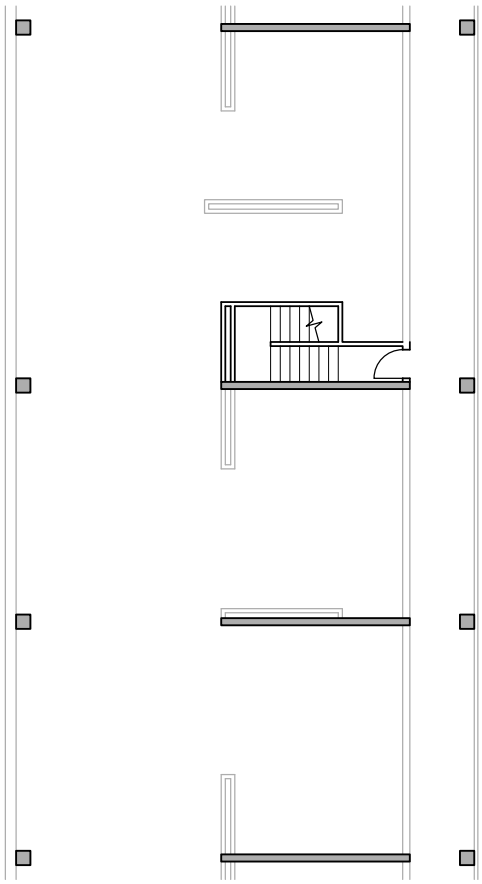
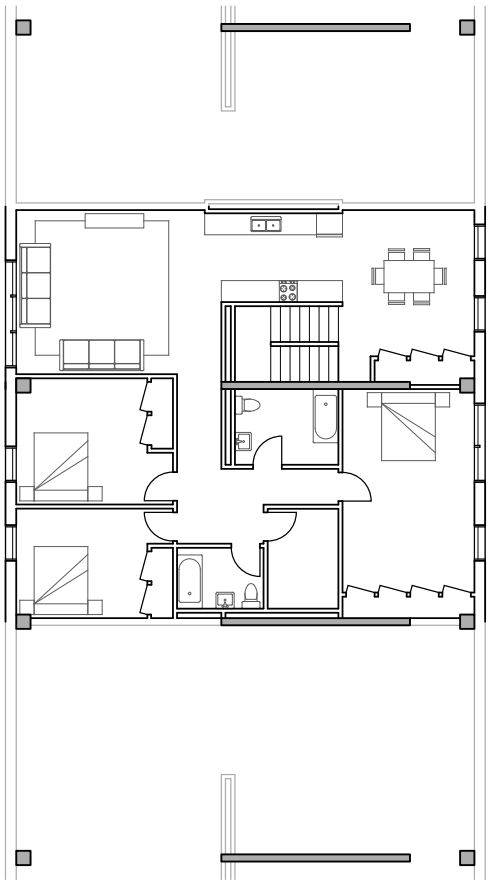


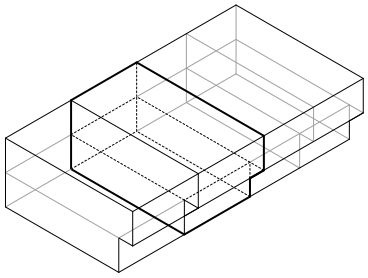


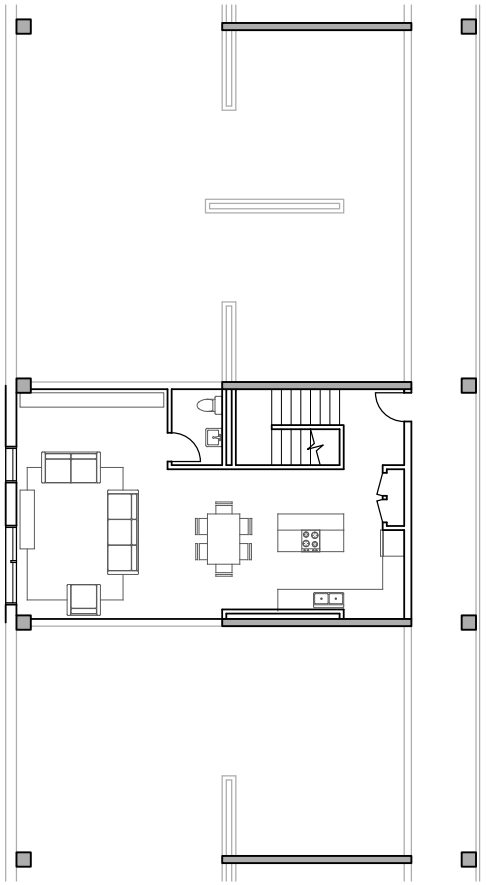


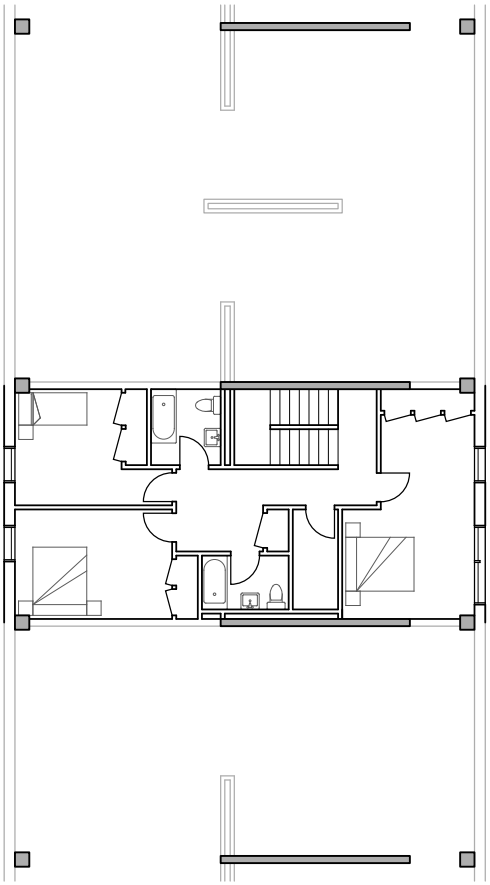
F. 133

3 BEDROOM

1600 ft^2



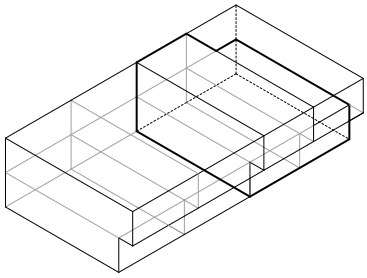


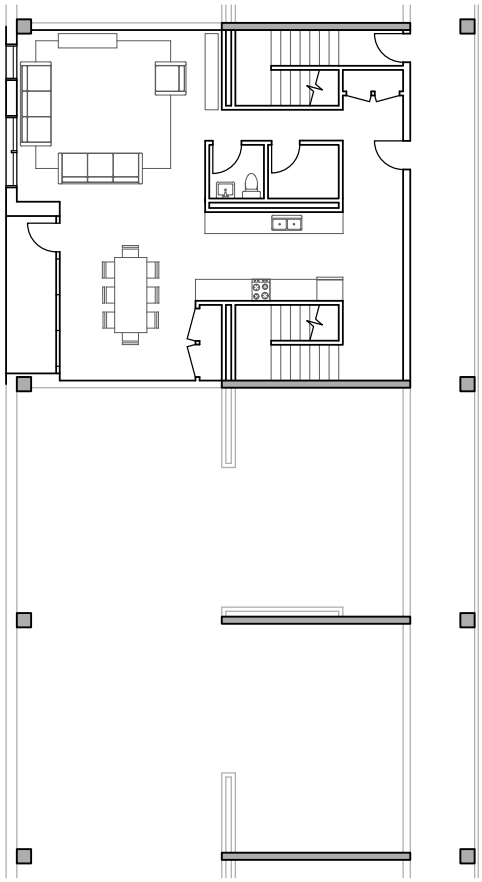


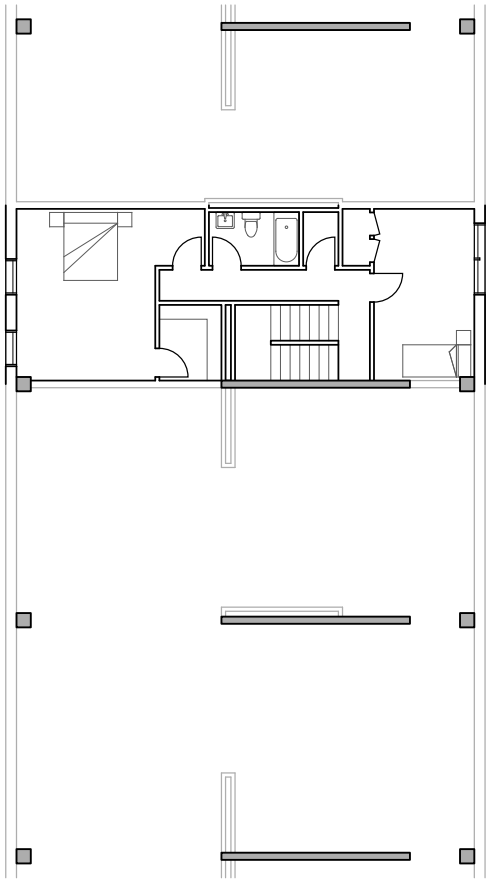
F. 134

2 BEDROOM

1625 ft^2



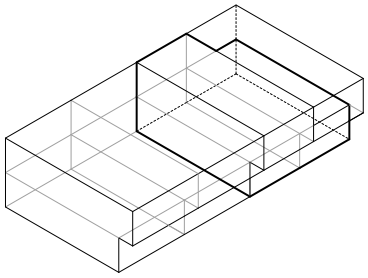


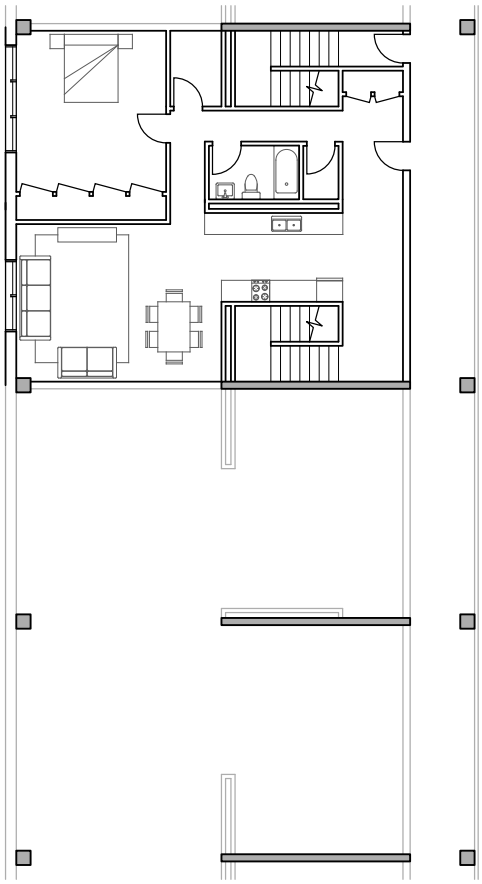


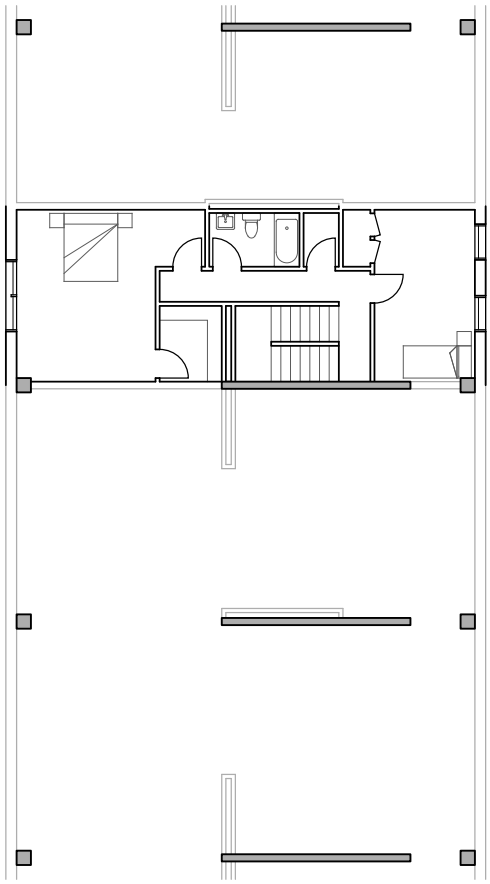
F. 135

3 BEDROOM

1675 ft^2



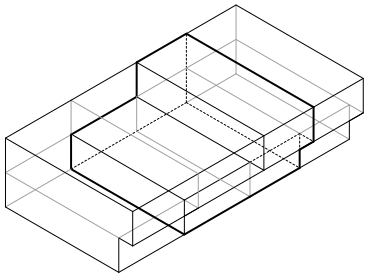


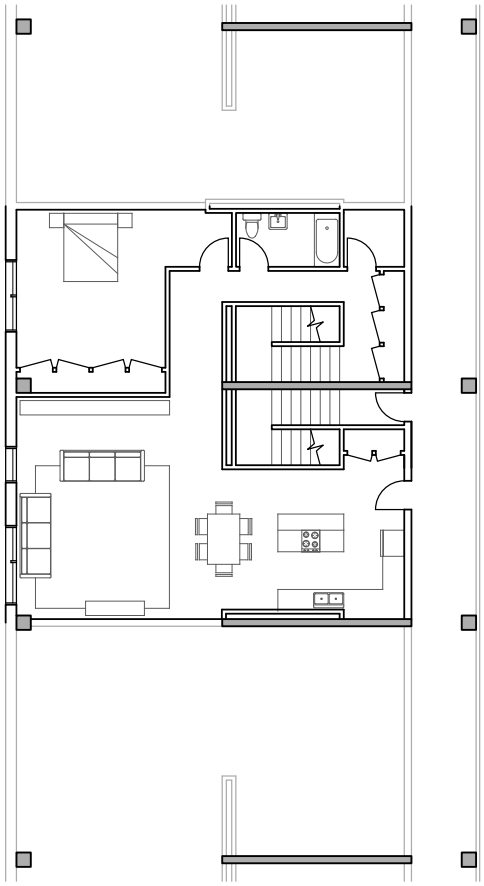


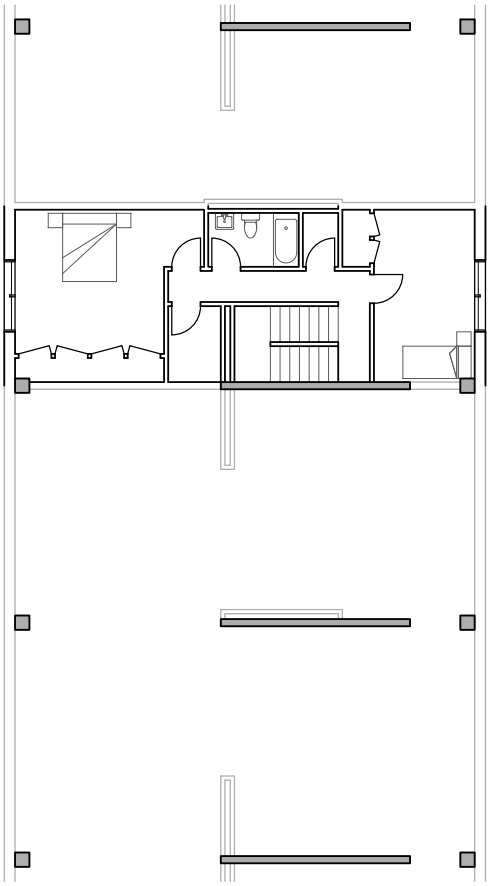
F. 136

3 BEDROOM

1850 ft^2



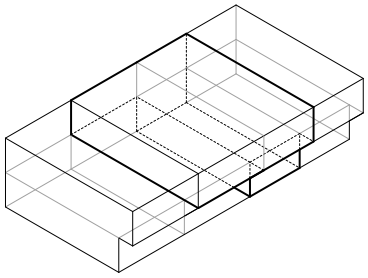


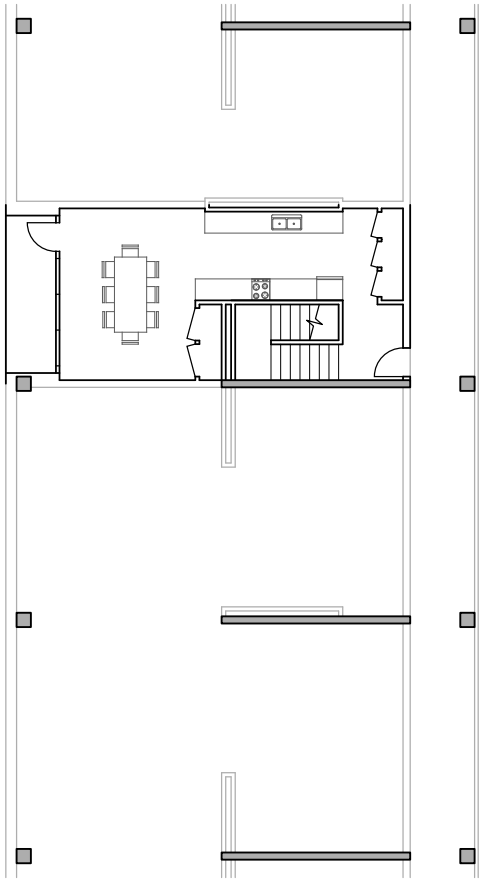


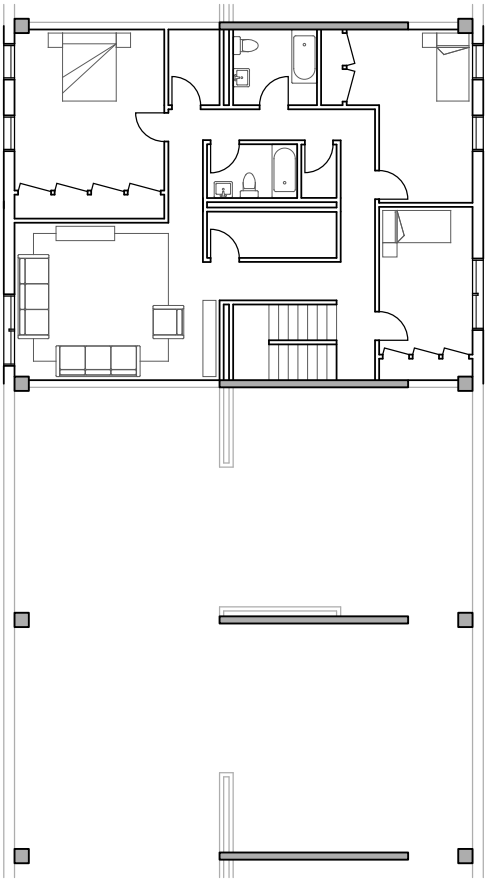
F. 137

3 BEDROOM

1850 ft^2



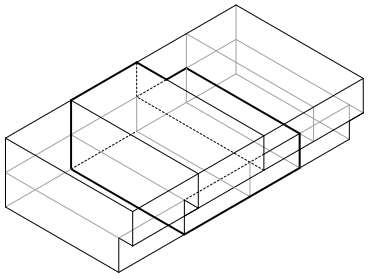


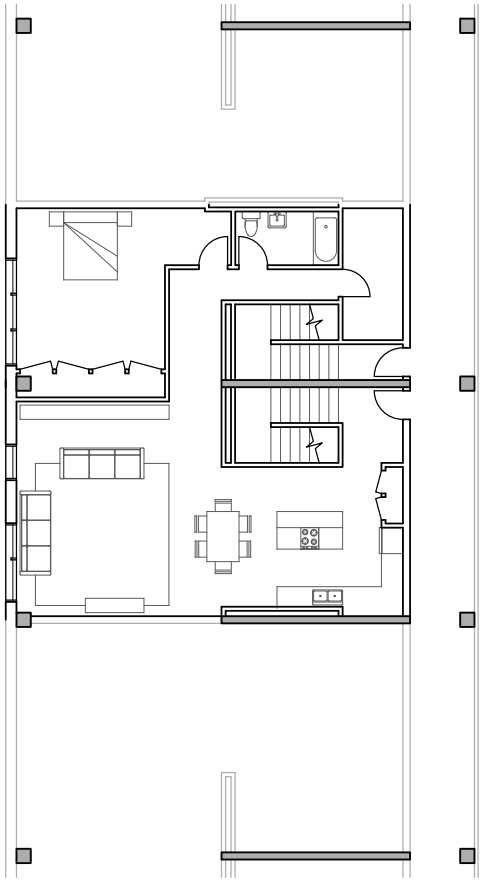


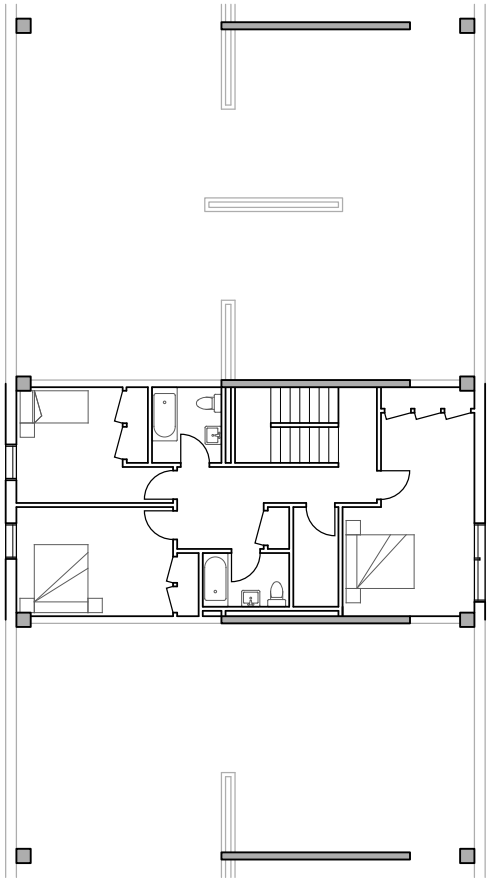
F. 138

4 BEDROOM

2100 ft^2



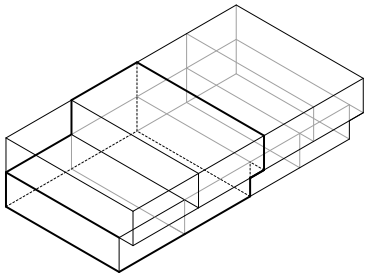


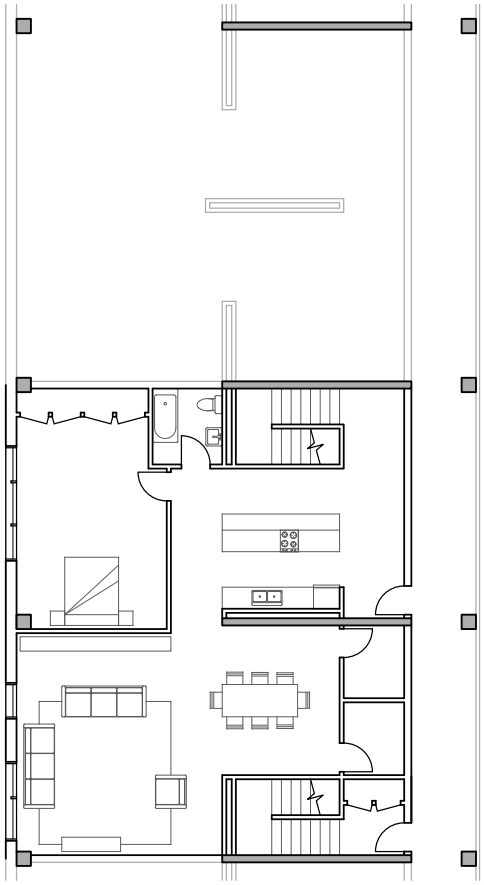


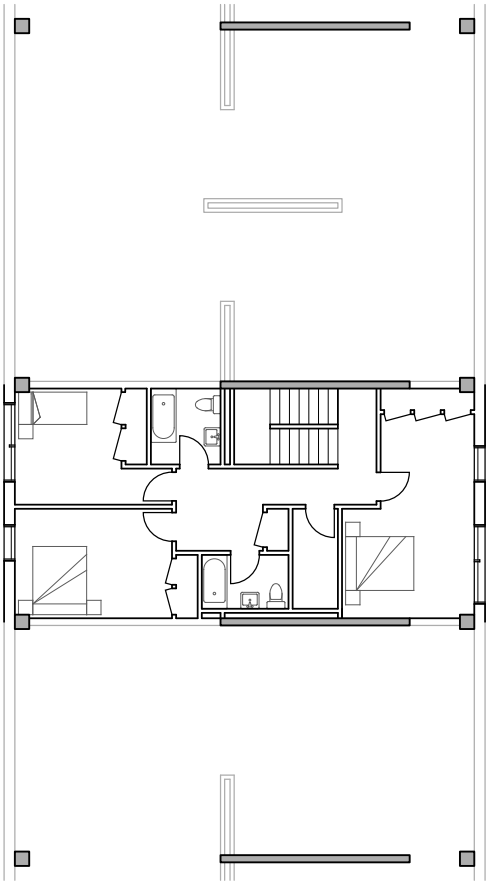
F. 139

4 BEDROOM

2225 ft^2







F. 140

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