

**Between Inside and Outside: Expanding Environmental Context
Through Building Systems**

by

Benjamin Angus

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ABSTRACT

This thesis explores how architecture can expand the conceived notion of enclosure to a greater environmental context, and how a building may become an instrument for experience and engagement across the interior/exterior divide, hence providing a connection between body and place, and the natural and artificial.

Within a Canadian urban context the experience of environment is almost exclusively separated into an inside and an outside, while anything in-between lacks definition. The thesis seeks ways to soften this divide by exploring the in-between and reintroducing aspects of exteriority to everyday life in a palatable way. This is accomplished through the consideration of the building systems used to condition an interior, where there is the opportunity of engaging with the flow of the natural elements which they control and manipulate.

The site chosen for the study is Fenwick Tower in the South End of Halifax. Its monumentality, uniformity, and exposure to the elements provide an ideal location to test the notion of engaging with the exterior.

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I would like to give a special thank you to my parents for all their love and support and for always believing in me.

CHAPTER 1: INTRODUCTION

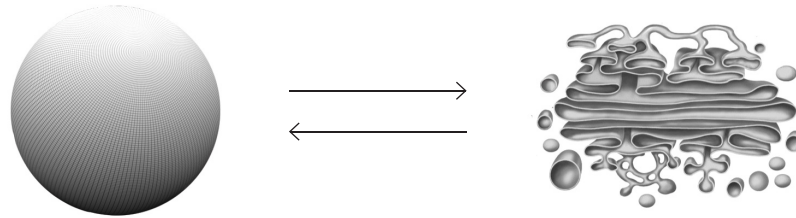
Thesis Scope

Inside, Outside and the Boundary

This opening image has served as a departure point for the thesis. It is provocative in its juxtaposition; a destructive force reveals the importance of the building edge and its role in keeping the elements at bay, while on the other hand the same forces have created a beautiful moment of atmosphere and light. It is easy to recognize the importance of keeping the harsh exterior out, however the potential that these elements hold for creating beauty is too often neglected in the design of our built environments. This first section discusses the importance of the boundary to an architecture that seeks to engage with what is beyond.



Snow drifts in an abandoned building in Colesbukta, Svalbard.



Ideogram showing high versus low potential for engagement

Surface Area

In a very conceptual way, we may find that architecture will reflect the pressure to either seek out engagement at the edge, or to shy away from it. This will manifest itself physically in a form of a maximum or minimum surface area to volume ratio, shown graphically above. The form of a building that abhors the outside will tend towards a sphere whereas one that seeks out interaction will be driven to take on a form closer to that of the Golgi apparatus.



The shape of the built environment; light pollution of NS as seen from space. (NASA/NOAA 2012)

These trends can be directly observable when investigating the extents of the built environment. Night-time satellite imagery of the earth provides one of the best ways to visualize just how pervasive human environmental control has become. Its form is very revealing of the attitudes of the people that have acted to create it. The shape taken is of high surface area, indicating that people find edges desirable; looking to cottage country where they may perch at the edge of the wilderness, engaging and experiencing it, reminding themselves of the world exterior to their control, and yet with the comfort and safety of the artificial right at their backs. This is still the selling feature of the suburban house, on the edge of the city and the wilderness, with one foot in both worlds.

Examples and Precedents

Sverre Fehn's Nordic pavilion for the world's fair in 1958 typifies the Scandinavian sentiment towards an architecture that is rooted and connects with nature. This building sends the message that this notion is not reserved solely for the inhabitant of warm temperate climates but ought to be accessible to all. I believe that we as Canadians ought to take note of the Scandinavian ability to see beauty and thrive in their cold and wet environment.

The discussed relationship of surface area and volume can also be found to exist at the building scale. If one looks at examples of architecture that claim to engage with context,

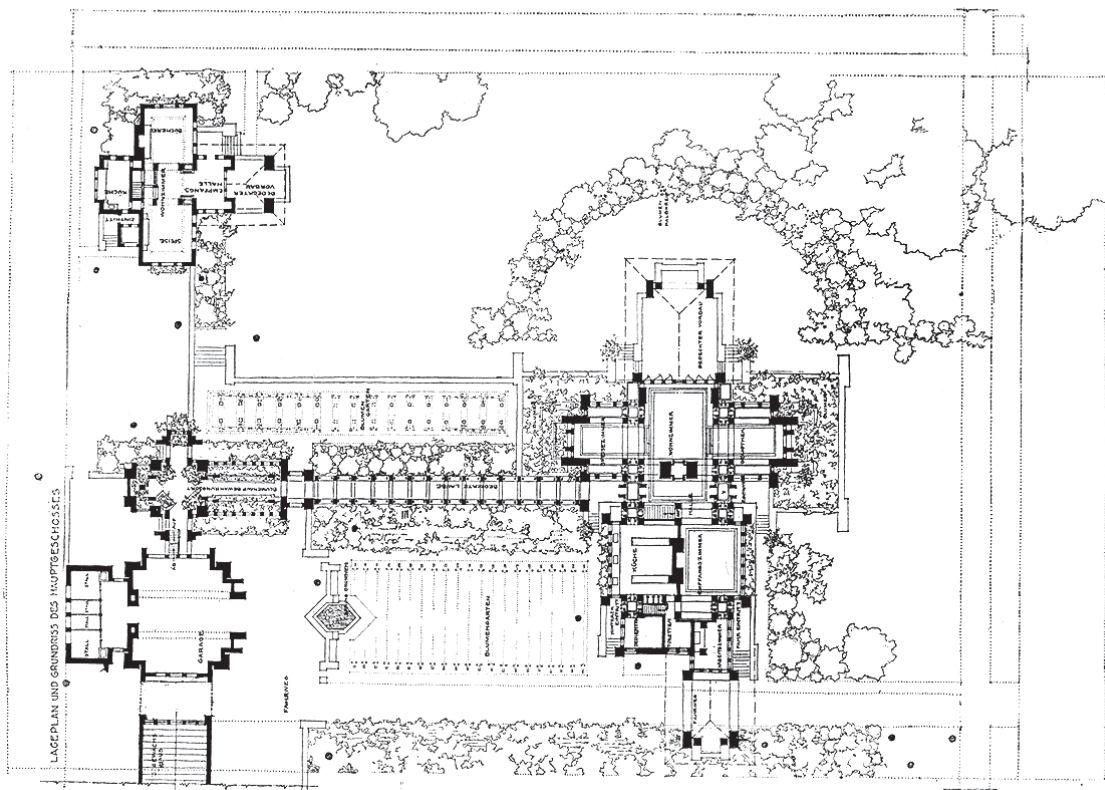


The 1958 Nordic Pavilion by Sverre Fehn plays with the notion of inside/outside and engagement with nature. (Jordana 2009)

they will find that many of these buildings are of high surface area. Frank Lloyd Wright is a prime example of an architect whose designs meld with their surroundings, and many of his buildings must contend with climates similar to what we have in Canada. The Martin House in Buffalo N.Y. is shown below, where this trend can be clearly seen.

Another commonality amongst nature-engaging precedents is that they are often villas and set in beautiful surroundings. This can be seen as necessary, for one generally requires a client with a strong desire to trump the pressures to build a low surface area structure. In other words it is only in building types with an explicit emphasis on connectedness that one will find these trends.

The emphasis is elsewhere in the Nova Scotian vernacular and in general urban typologies, and as such it is much more rare to find a building that provides connection with environment. Here the majority of buildings become “spheres.” Take the plan and elevation



The high surface area form of the Martin House, Buffalo N.Y., Frank Lloyd Wright, (Historic American Building Surveys 2015)



The low surface area form of a typical Halifax home.

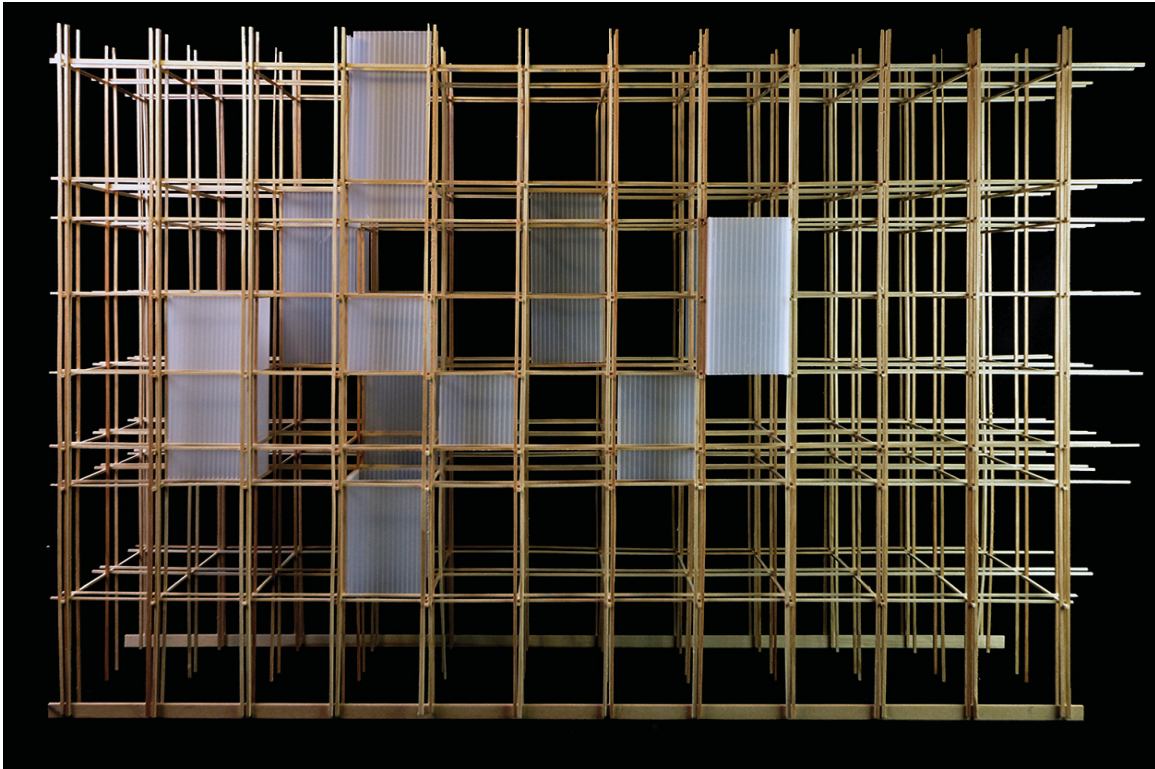
of the following typical Halifax home; the harsh climate persuades one to minimize the amount of details and joints that will inevitably one day succumb to the elements. Here economic pragmatism and a cultural rejection of weather has driven buildings to take on a tight skin around a simple box.

The Audience for the Thesis

The audience to which this thesis is directed is the urban dweller and the Nova Scotian, whom I believe can benefit from a study on how we may provide the sort of nature-engaging architecture that throughout history has seemingly been reserved for those with villas in the countryside or who live in placid, temperate climates.

Positive/Negative Space in the Vertical Dimension

One obvious difference between the forms of the “nature-engaging villa” and a typical urban building is that of height. Frank Lloyd Wright’s houses are relatively low and horizontal and masterfully planned. He has proven to the world that there is incredible richness that one may find by playing with positive/negative space and high surface area in predominately two dimensions. How can we consider a translation of this type of composure to a building with a strong vertical dimension, as one finds in urban settings?



Model exploring positive/negative space with verticality

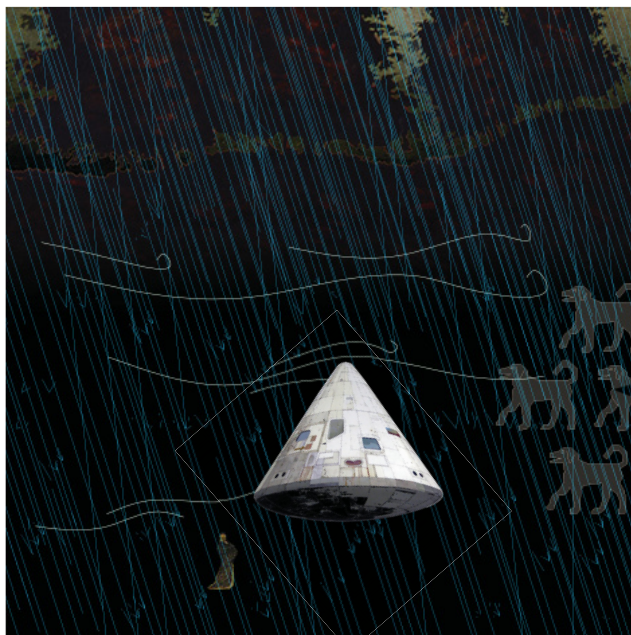
It is lamentable that the majority of tall buildings in our cities are experientially very flat, and rarely responding to orientation; a floor is repeated, then cut and pasted vertically, ad nauseam, before it is then wrapped in a tight glass skin. A devise for arranging masses in three dimensions was created to aid in exploring high surface area forms translatable to a dense urban condition. The state in which the model was photographed shows variation in the negative spaces and a certain ambiguity of the interiority of the complex. The solid translucent volumes hover within a framework which itself has a definable form, this begins to create a layered and less definable space. It is appealing to imagine this model as a building with all sorts of environments with various levels of exposure or relative intimacy of its social spaces. In some places one may find refuge from the wind or rain while in others they may may find it has a strengthened presence, the possibilities are endless.

Inside Versus Outside

Building has been understood to be a domestication of space. To domesticate space is to tame it, to construct boundaries that wrest place from space. Such construction receives its measure from our need to control the environment. (Harries 1982, 59)

The building edge delineates the boundary between two realms, the uncontrolled outside (what is being referred to as “natural”) and the controlled, artificial environment inside. The following ideogram reflects this difference in terms of controlled versus uncontrolled. The space capsule offers a hermetically sealed environment completely separated from the exterior world. Here Caspar David Friedrich’s *The Monk by the Sea* was used as a base image to represent sublime nature, containing rain, wind, darkness, and wild animals, all things which we need shelter from.

In the opening quote, the architectural philosopher Karsten Harries talks about what architecture is on a very fundamental level. The creation of a boundary that separates two distinct realms is where the story of architecture starts. We might then take the previous diagram as a representation of architecture. Here there is a controlled interior and an



Ideogram of a hermetically sealed and controlled interior versus the uncontrolled, sublime exterior.

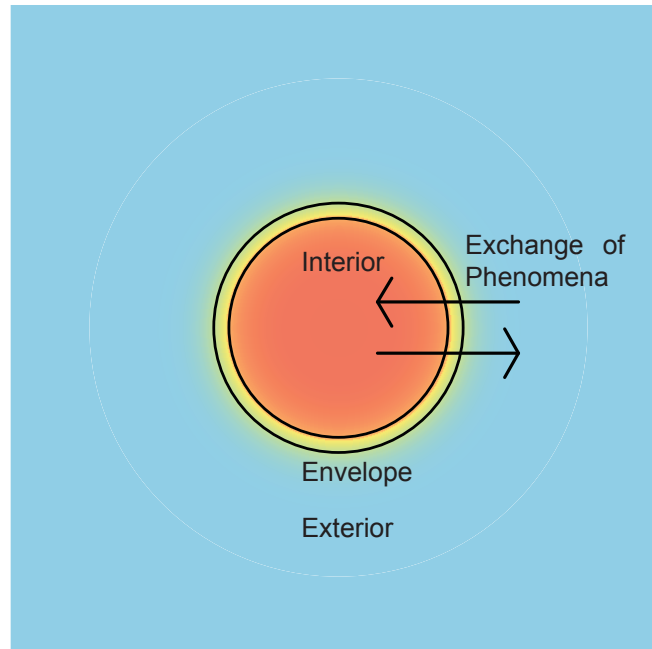


Diagram of the typical architectural condition, showing two environments and the exchange between them.

uncontrolled exterior, and in the Canadian context the tightness of the “envelope” and the range of technologic control over the interior environment is relatively very high. The arrows in the diagram represent an exchange of elements that must take place across the boundary. The building is not in fact hermetically sealed as in the preceding ideogram, but rather a region with a porous boundary that manipulates the elements as they are exchanged. All factors of environment exist, perhaps in different states on both sides of the envelope. Air must be brought into the interior rooms at a particular rate for it to be habitable, people must be able to come and go, and the same can be said for; water, heat, light, animals, etc... The flow and manipulation of these factors is each dealt with by an associated building system.

Thesis Intent

These systems are typically kept separate from us in our buildings; the thesis proposes to expand this area and make habitable the boundary zone where the manipulation and flow takes place. This will provide a gradient across the divide and an series of environmental thresholds.

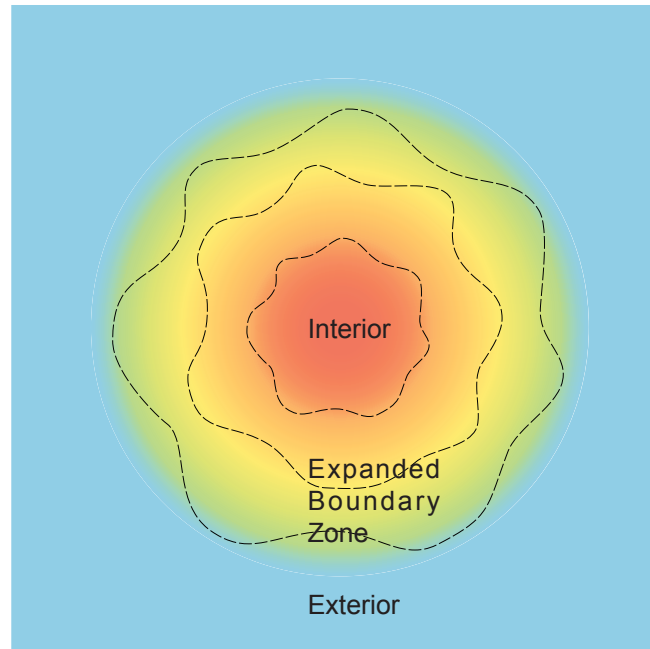


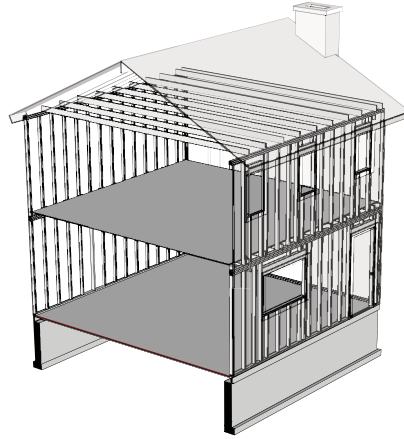
Diagram of the thesis proposal, access and inhabitation of the boundary zone and an engagement with the flow of phenomena across it.

Building Systems and Flows

The arrows in the previous diagrams could potentially represent the exchange of any number of environmental factors with similarly numerous ways in which those factors could be manipulated. However for the scope of this thesis it has been narrowed down to six convenient categories: *structure and geology*, *light and darkness*, *air flow*, *thermal flow*, *water flow*, and *people/animal flow*. Each of these categories associates the building system and an environmental factor to which that system is dedicated to control. This is a common way of breaking down and understanding a building in practice and one can see this in the way that career specialization and the trades tend to fall into these same categories.

Structure and Geology

The first category is structural, this is pictured in the following diagram of a generic house. The foundations, studs and sheathing all serve to create stable and level floors for occupation. The primary role of the structure might be thought as isolating one from the potentially varied terrain on the exterior by creating a new artificial plane(s) on which activities

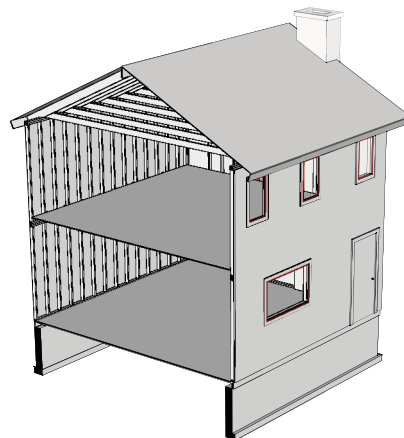


Structural systems in a generic house.

can then take place. The structure of course serves to hold up the physical components of the other systems but it doesn't explicitly contribute to areas of environmental control beyond that of topography. First and foremost the built environment starts with a safe and stable floor area.

Light and Darkness

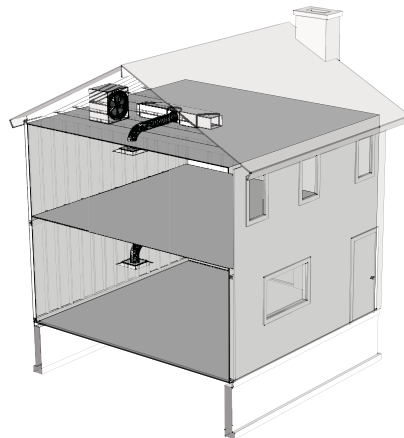
Light is an incredibly important environmental factor and there is much in a building dedicated to the creation of well lit spaces. In the generic house diagram the windows are shown as being a part of this system. Choices of opaque versus transparent materials are often carefully composed in conjunction with electrical lighting.



Opaque and transparent materials control the light and darkness in a generic house.

Air Flow

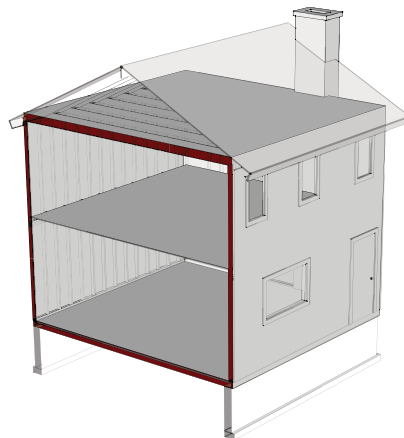
We of course need air to breath and a certain rate of fresh air is required depending on the level of activity for the comfort of any given environment. On the exterior the wind might be considered the equivalent of an air exchange rate. On the interior, a layer of plastic (the air barrier) hermetically seals the building from the outside. The flow of air into the plastic rooms are then handled through mechanical equipment. Ductwork, heat exchangers, and fans among other devices.



Components controlling air flow in a generic house.

Thermal Flow

Temperature differences can be quite extreme in Canadian climates. Thus homes here are wrapped in an insulating layer and a variety of heating sources can be employed to adjust the inside temperature.

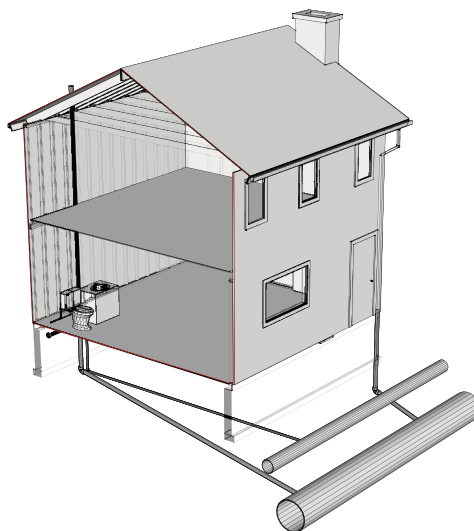


Component controlling temperature in a generic house

Water Flow

Responding to the rain is very important for the design of buildings in wet climates such as in Halifax. In a similar strategy to the preceding categories, the controlled portions of the generic house shown below are sealed off from the exterior by a water-proofing layer, then water is brought into the interior from the city's infrastructure through plumbing, and various devices. It is interesting that one might associate different forms of water with different directions; the water-proofing layer takes on a different form depending on the direction. The roof which deals with rain, snow-loads, and freeze/thaw events within the snowpack, has it's own construction assembly. From here the water is collected through the eavestroughs and downpipes and sent to the storm sewer. The walls, which deal with wind-driven rain and interior humidity use a layering of rainscreen and a moisture barrier assembly to cope. The foundations again deal with another set of conditions and are usually waterproofed with their own layer of tar, drainage pipes and gravel to collect the water and send it to the storm sewer.

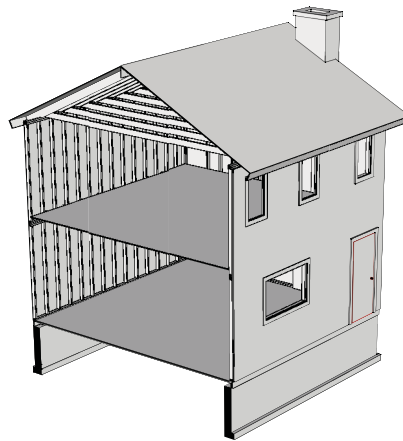
Although the roof, wall and foundation vary slightly in their construction, the overall strategy is simply, to seal off the interior completely from the water found on the exterior, then provide a technologically controlled water flow in the various devices that require it: toilets, sinks, showers, etc...



Components controlling the flow of water inside and outside a generic house

People/Animal Flow

One might think of this as the system that creates the private to public divide. This is a very broad and general category and has the element of cultural/social queues playing a very significant role. Aside from the socially learned barriers that might be present in any given environment there are a number of physical devices that are meant to seal off the interior (provide security) and then control the flow of people and animals into it. This is analogous to the other categories. A door with a lock and key is the most obvious example of this type of filter and the robustness of the materials used in construction provide the remaining barrier. A fence can be porous to all the elements but it provides security in this way. It is interesting to note that a fence is adequate as a barrier for ourselves and other terrestrial beasts that must exist on a surface, but it doesn't provide security from insects and birds. Insects and birds are often very problematic and number of pest control devices to prevent their inhabitation are commonly employed in construction.



The generic house controls the flow of people and animals to its interior

Thesis Question

How can building systems be accessed in a way that extends one's experience of environmental context?

Justification and Relevance

Transparency

Yet architectural history as it has been written up till the present time has seen no reason to apologise or explain away a division that makes no sense in terms of the way buildings are used and paid for the human race, a division into structure, which is held to be valuable and discussible, and mechanical servicing, which has been almost entirely excluded from historical discussion to date. (Banham, 1969, 11-12)

Reyner Banham discusses the way in which expression of structure has overshadowed that of mechanical servicing within a building. Of course one might consider these systems just as important as structure in the creation of an interior that is habitable. This points to an imbalance in the degree of transparency or truth that is represented in much built form.

Decorative Transparency

Transparency is a modern value. "Form follows function" has become a defining motto for architects who wish to make legible all aspects of the way in which a building functions. Exposed structures and duct work are commonplace in the modern aesthetic. The following image is of the Pompidou center, which expressed it's systems vibrantly to the world in 1977, though in a decorative way, they have been made fully visible.



Centre Georges Pompidou, (Reinraum 2012)

However this form of exposure caters only to the eye, it is lacking in an engagement with the other senses. The “Hegemony of the eye” (Pallasmaa 2005) is clear in this method of revealing, and more examples are not hard to come by. The Image below is of the heating system at Alderney Landing in Dartmouth. In this case the system is revealed to the observer in a manner similar to the Pompidou Center. There is an explanatory sign that describes what one is seeing and through the glass case as if at a museum or a 19th century exposition.



The museum-like display of a building system at Alderney Landing Dartmouth (Halifax Regional Municipality 2014)

Experiential Transparency

How might one reveal and engage these systems more fully? Is it possible to even inhabit them? One example in this spirit can be found in that of a traditional Persian home. Shown in the photograph, the home tempers the air by cooling and humidifying it with the water from a subterranean stream (qanat). Although it is part and parcel to the air handling system, it is often designed such that the occupants can access the unique atmosphere and environment for their own sensory enjoyment. This is of course a dubious example when



A traditional Persian home uses the water from a qanat to temper the air. This is an example of an inhabitation of a building system. Yazd, Iran, 2014. Photo courtesy of Hamid Mohammadi.

considering the maritime climate which is so entirely different, however it stands as a building system which itself can be inhabited and experienced. There is no segregation of served and servant spaces, but a full integration and blurring of the distinction. The same level and spirit of integration will be sought in the design.

Nature and Connectedness

Architecture is essentially an extension of nature into the man-made realm, providing the ground for perception and the horizon of experiencing and understanding the world. (Palasmaa 2005, 44)

Connecting with the Senses

Henry David Thoreau retreated from the already overwhelming technological world of New England in the 1840s when he wrote about his existential experiment in his seminal book *Walden* (Thoreau 1971). His reflections on artificiality and alienation caused by industrialized society have been developed upon by many over the almost two centuries since. This consequence of technology is still a well established concept today with seemingly little progress towards mitigating it.

One might consider the abundant use of glass within our cities as a reaction to this. Similar to Philip Johnson's Glass House which purports to connect with nature through its visual



Philip Johnson, Glass House, New Canaan, CT, 1949 (Johnson 2010)

transparency, one might imagine that so too would these urban glass boxes.

However, in these examples, nature is experienced solely as an image, similar to that of the 17th century landscape painting seen in the photograph; a safety projected representation of nature.

In the opening quote Pallasmaa is reflecting on how sight interacts with the other senses in a constant collaboration. When all sense modalities are being engaged we can experience invigorating and healthy environments. Pallasmaa recognizes that the visual is favoured in most of our modern environments and that it is crucial to reassess this hegemony. Thus if the thesis is to propose a connection with environment then it is very important to recognize that all sense modalities must be considered.

The Azuma House offers a poetic counter to the Glass House. It too has been designed to engage and connect with nature, though without an emphasis on sight. Its hardscaped



The Azuma House Courtyard (Mariana 2007)

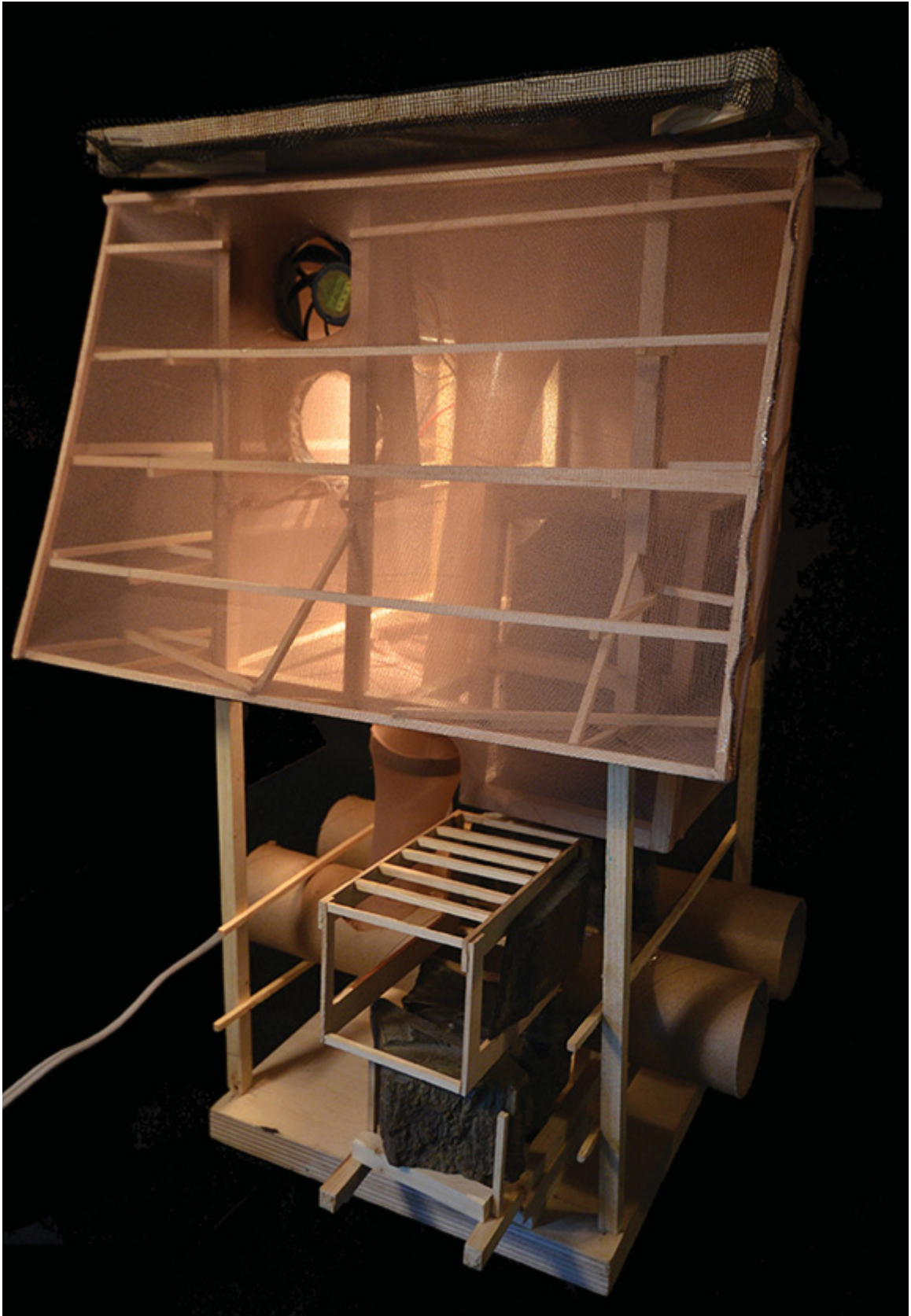
courtyard opens only to the sky where it lets the Osaka rain fall in. The presence of most other natural elements is reduced, the wind, plants, animals, even light, so as to heighten the experience of the rain. It is perhaps similar to the Glass House in that it primarily focuses only on one element, the sense of touch and rain rather than on vision and light. It is this sort of engagement, beyond visual transparency that will be sought in the design for a deeper connection with the natural world.

Methods of Enquiry

Systems

This exploratory model investigated the interrelation of systems and the potential for interaction within them. This was accomplished by the use of exaggerated scales and materiality. A semi-transparent stocking material representing the outer building envelope was stretched around a wood structure ensuring no thermal breaks or leaks. The ground has not been modeled and the city infrastructure is shown to pass beneath the building. An exaggerated downpipe controls the flow of water from the roof to the sewer and a weather viewing platform made of a black metal screen has been provided as a means to observe the water as it descends into the opening. At the terminus of its journey through the building the water enters the sewer, here too a space has been carved out for the occupants to observe the event. The dark enclosed grotto serves as a counterpoint to the bright open weather viewing platform on the roof.

The flow of other elements such as electricity or supply water is represented by the electric cord that powers the light at the interior most portion of the model. The air enters an intermediate space where it may be naturally heated before entering the heat exchanger and air handling system. The effect is a layering of zones and the creation of interesting geometries as the exhaust air punctures through both layers.



Model showing exaggerated building systems.

Structure and Geology

...there is no continuity. The inside and the outside are abruptly separate. There is no way of being partly inside, yet still connected to the outside; there is no way in which the inside of the house allows you, in you bare feet, to step out and feel the dew collecting or pick blossoms off a climbing plant because there is no surface near the house on which you can go out and yet still be the person that you are inside. (Alexander 1977, 174-178)

This Christopher Alexander quote from *A Pattern Language* #168 “connection to the earth” is aligned with the thesis topic in that it aims to combat “abrupt separation”. This particular pattern has to do with surface treatment and textures. He claims that one ought to use continuity in these factors to soften the abruptness of threshold and hence connection between inside to outside. The Katsura Imperial Villa shown above provides a great example of rich textures, surfaces and thresholds. This building is revered in its ability to meld into its site and provide the occupant with the experience of the surrounding context. Incredible attention is paid to the way in which the exterior ground cover is designed and brought under the eaves before the various wood, bamboo, and mat finished floors begin.



The unfloored loggia at the Shoiken Pavilion at the Katsura Imperial Villa, Kyoto 1987, achieves a series of thresholds through textures and surface treatments. (Isozaki 1987)

This sort of attention to surface, as Alexander notes, is neglected in most Western buildings. Construction in Canada usually proceeds by blasting or digging away any irregularities in the local topography, then creating an artificial surface that is of controlled and uniform texture and levelness. The following model of a house is attempting to depart from this by considering ways in which the irregularities and textures of the earth could be incorporated into the internal spaces of the house. The bedrock of Cowie Hill, in Halifax was chosen as a decontextualized site, the shape of the rock offered the only site factor for the design to then respond to. The building envelope (again represented by stocking material) comes down to define the walls and then outward to shed water and prevent heat dissipation from the stone. The stone becomes a contained thermal mass, mediating seasonal temperature extremes.

The great room created is one that has a unique and atmospheric quality, presenting its occupants with the textural sensations of the crystalline white granite. This sort of incorporation of natural texture and topography into a more intimate environment can add richness to space and both a metaphoric and literal connection with the land.

Light and Darkness

There still is night, [...] deep virgin darkness as humans had known it through the millenia, between the glowing embers and the stars. (Kohak 1987, ix)

Lighting is arguably the environmental factor most extensively controlled by humans. As can be seen from the night satellite image of NS in the first section of this chapter it extends out to space. Within our cities darkness has been all but banished, making it very difficult to find a place dark enough to see the stars in any amount of brilliance. The philosopher Erazim Kohak describes the darkness of night as a gift and outlines the important role it once played in our daily routines; its calm introverted effect counters the extroverted world in the day. The Circadian rhythm, inherent in our physiology is a cycle central to our being that can easily be interrupted with electric daylight.

Kohak achieved his acceptance of night through a full retreat into the wilderness, however other methods of night-appreciation can be found, most notably in the moon-viewing traditions of Japan. Another image from the Katsura Imperial Villa is shown, where a moon viewing platform takes central stage within the complex. It is sited so as to take advantage



Model showing an uncontrolled surface incorporated into the architecture



The granite floor of the house's great room.

of the reflection off the Katsura river and borrow an appropriate background from the surrounding gardens.

In addition to this ancient Japanese building feature is the more modern concept of a “moon garden”. Which is the simple idea that one can design a garden to be enjoyed at night. Vision is de-emphasized which heightens the awareness of the fragrances of the many night blooming plants which may be used. Many night bloomers have bright flowers that adequately reflect the only subtle amounts of light available at night.

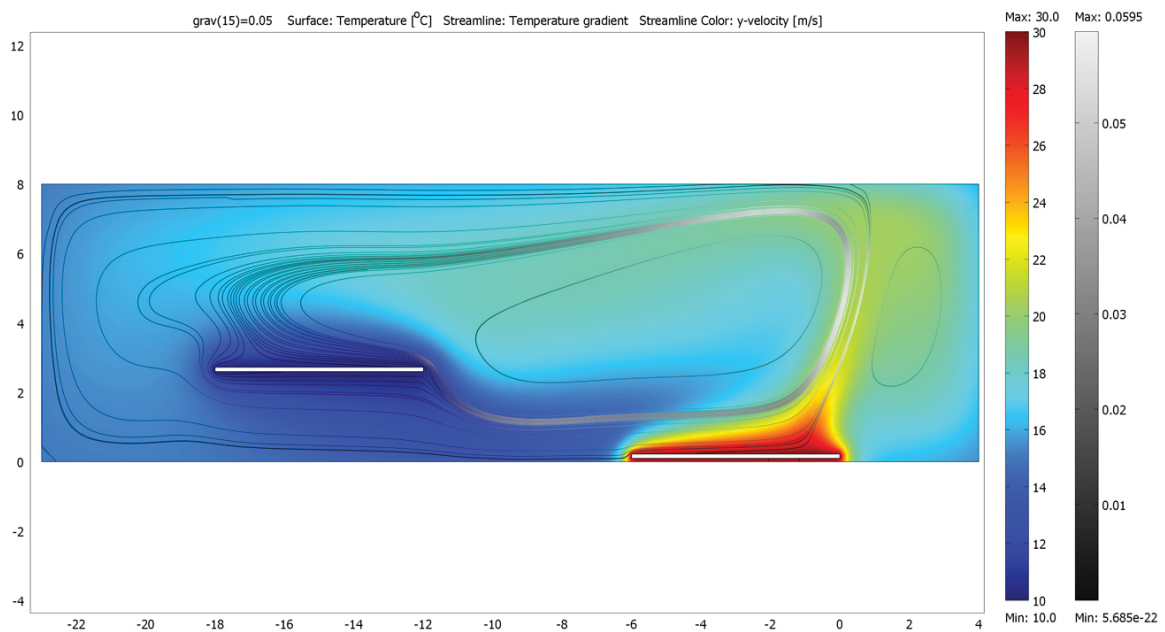


The moon-viewing platform of the Old Shoin at the Katsura Imperial Villa, Kyoto (Isozaki 2005)

Air and Thermal Flow

... beyond such socially responsible and ecological objectives, might not climate be a new architectural language, a language for architecture rethought with meteorology in mind? Might it be possible to imagine climatic phenomena such as convection, conduction or evaporation for example as new tools for architectural composition? Could vapour, heat or light become the new bricks of contemporary construction? (Philippe Rahm architectes 2015)

This is a quote from Philippe Rahm's "Office Agenda". He has pushed the concept of enclosure very far in terms of his work. Supplied are images from his pavilion titled "Digestible Gulf Stream" at the Venice Biennale in 2008 which attempted to define an archi-



Philippe Rahm's pavilion at the 2008 Venice Biennale, "Digestible Gulf Stream" (Philippe Rahm architectes 2015)

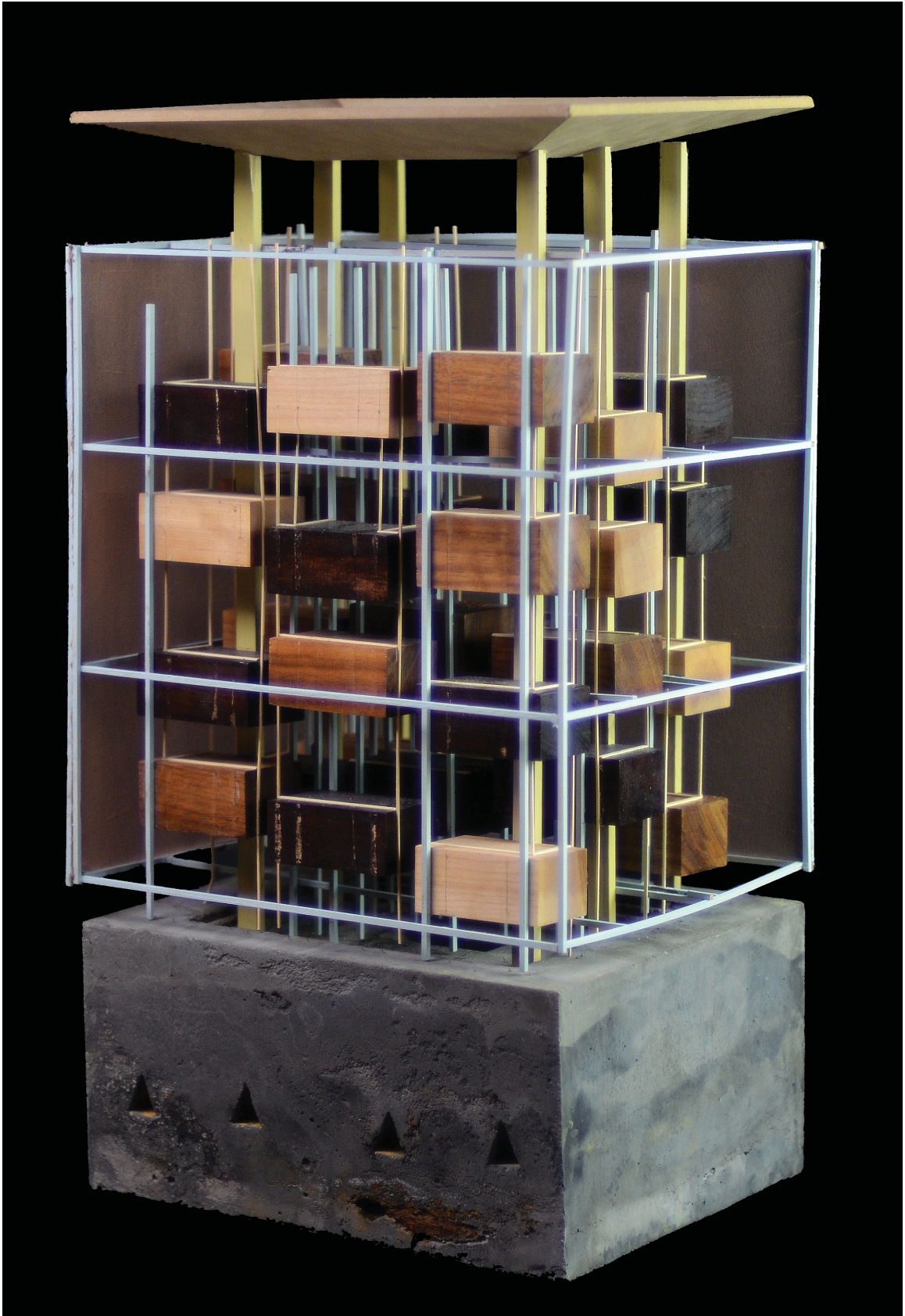
tectural space using air convection. It is very interesting to consider inside and outside in terms of such a soft boundary, one that is completely undefinable and takes on the form of a gradient.

The following model was meant to investigate a series of spaces each with a varying level of air temperament and holistically creating a passive heating strategy. It sets up a series of mediated zones to create a soft boundary condition similar to the “meteorology” that Rahm creates.

The air first enters a subterranean chamber to pick up either the warmth or coolth of the surrounding earth. Drawing from the lessons from the preceding section, these underground passages are large enough to be occupied so that the occupant can experience the rich textures of the local bedrock and the fresh intake air.

Next the semi-tempered air would then move into a region of the building that is glazed (represented by the area of the building behind the transparent fabric) to let the sun naturally heat it further before it is admitted to the individual dwelling units (represented by the wood blocks). Each unit has access to the negative spaces between so that this semi-tempered region can be fully occupied. It would be from the tempered zone that each unit would take its supply air for the interiors, after which it is exhausted through the chimneys.

The building that this conceptual model represents thus has an air handling and heating strategy which itself is inhabited and experienced through a series of tempered environments.



Model showing regions of variously tempered air.

People/Animal Flow

The Social In-between

There is a social imperative to add to this list. Air conditioning in the American South has provided many with a form of relief from the oppressive heat of the summer, however it has also been responsible for loss of heritage and degradation of community. It was once typical for southern homes to have large verandas and porches that would shade the walls of the house and provide a cool evening retreat from the heat of the interior. Never elevated above the plane of view from the street, they provided a private/public in-between space where informal interaction between neighbours fostered relationships and cemented the sense of community. However there is now no longer a need to seek refuge on the porch. The effect has been that southerners do not interact with their neighbours in an informal way quite so much anymore and the sense of community and safety of the streets has been put in jeopardy. Not just in the South but the porch all across North America has seen a decline, and with it goes both tangible and intangible forms of cultural heritage (Mugerauer 1993, 103-128).



Typical Halifax porch serves as a mediated environment between the private interior and the public street.

The effect of the decline of the porch can be seen easily in Halifax, the older neighbourhoods have a healthy and well developed porch pattern that is lacking in some of the newer neighbourhoods. A photograph of a typical Halifax porch space is shown above, it serves as a social in-between where one might have an informal conversation with their neighbour without the need to step into the private interior.

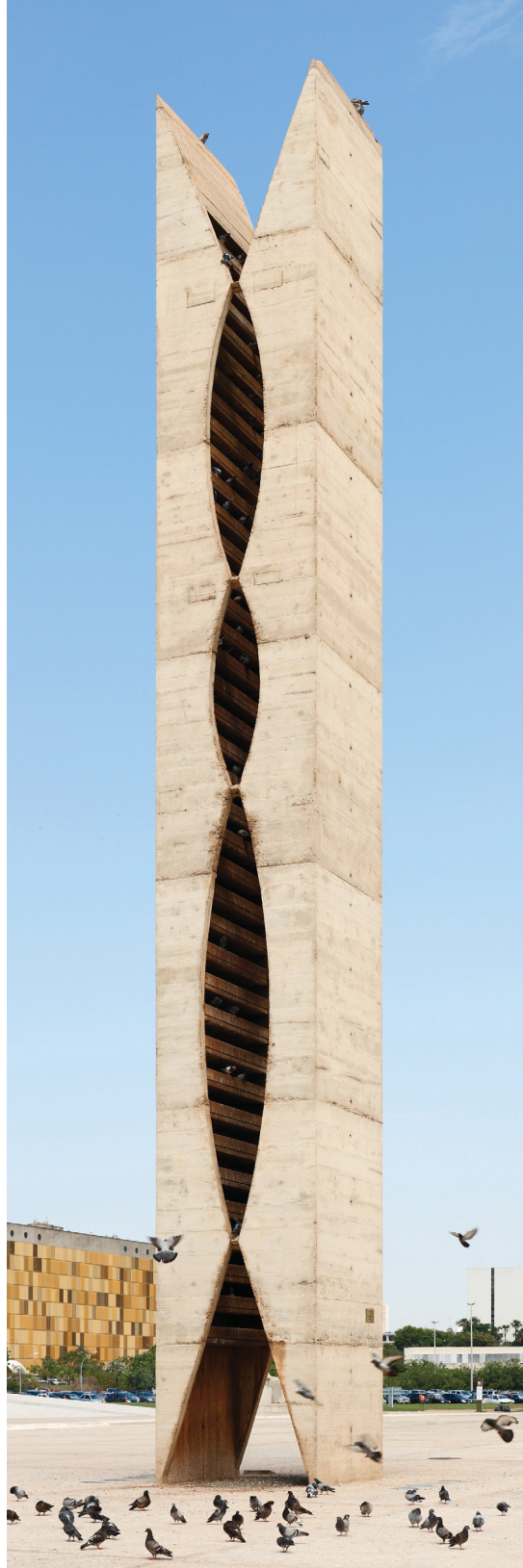
This social in-between is missing in many high density urban residential buildings and consequently so to their potential to aid in the creation of community. Some of these buildings supply their units with balconies however these are only small and disconnected and certainly fall short of playing any sort of community role. Analogous to the other sections, it is a gradient of environment that is being sought, in this case it is one from public to private.

Animals

Aside from in agriculture, buildings usually do all that they can to prevent non-domesticated animals from taking up residence. There are obviously good reasons to do this, mice, insects, birds, racoons, etc. carry disease and inconveniences. However, one may nonetheless find potential for enjoyment and engagement within this category.

Perhaps one of the more accessible species whose re-imagined presence might be enjoyable is the Pigeon. Pigeons haven't always been considered the winged rats that they are in most North American cities today. The eggs and dart motif on Greek and Roman style buildings allude to their once respected position in society (Gissen 2009, 180-192).

Dovecots are a common agrarian building in many parts of the world, and have even taken up a symbolic role in some cases, such as Oscar Niemeyer's dovecote in Brasilia. They can also fulfil the leisure role of pigeon racing. This is a traditional sport that has its origins in Europe, though there are enthusiast groups around the world. Most notably in China where it has become the sport of the nouveau riche where it is not unheard of for participants to pay upwards of \$200,000 for a Belgian thoroughbred. The world championship title comes with a million dollar prize along with the prestige (Vice Media 2013).



Dovecote on the Praça dos Três Poderes in Brasília by Oscar Niemeyer (Gaba 2010)

Site Selection and Program

What and Where

Fenwick Tower in the South End neighbourhood of Halifax typifies the disconnected living arrangements that have been being critiqued thus far. It is a high density residential building that provides its occupants with only small disconnected balconies as the sole means of accessing the exterior. These play no social role in the community of the building or the city, and the repeated, symmetric floor plates leave the occupants with only small window walls as a means to orient themselves to the world. What is proposed is a redevelopment that will supply a richer experience of the surroundings.

With its exposure, symbolism and location within the city, Fenwick Tower presents itself as one of the most interesting places to study an engagement with environment. A sense of this is immediately apparent in the follow site photos, the first shows it's prominence on the Halifax skyline and the second it's street presence.

The following mapping studies have been conducted to reveal this context more fully.

Structure and Geology - Mapping

The majority of the Halifax peninsula is constituted by a glacial till veneer, this is a layer of till material (loose stone, gravel, mud etc...) that covers the bedrock beneath. There are a few regions where this layer becomes extra thick in a well-defined and pronounced hill known as a drumlin. Notable drumlins on the peninsula are Georges Island, the Citadel Hill, Fort Needham, and Windmill Hill where an old fort known as Fort Massey used to stand, now the corner of Queen and South Streets. The site is located on the southwest edge of this hill.

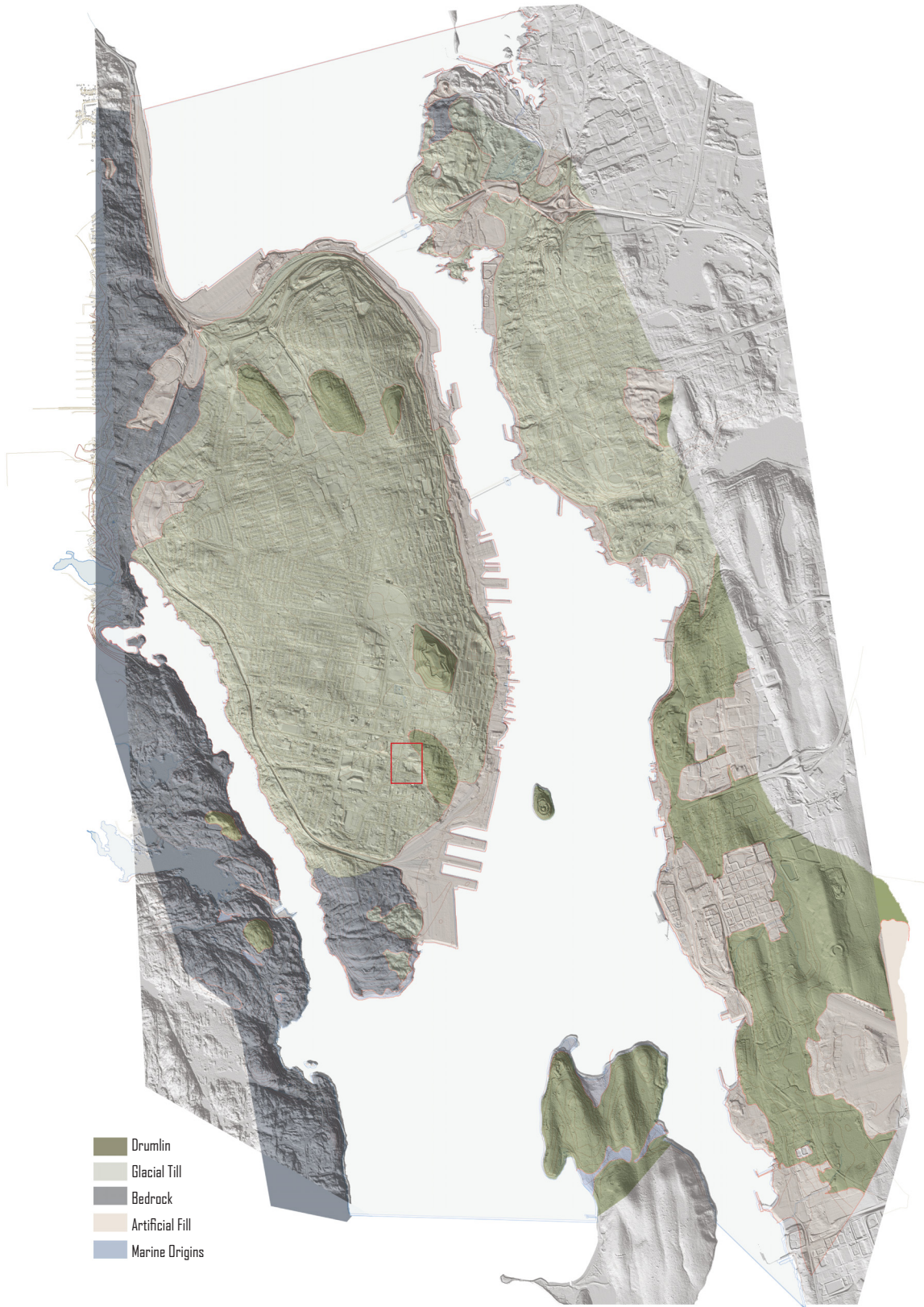
The bedrock on the peninsula is of a type known as the "bluestone formation" a slate-like stone, locally known as ironstone. Its iridescent patina consists of streaks of rusty colours over a deep and subtle purple hue. It can be enjoyed in a few outcrops on the peninsula, or in the many buildings and stone walls throughout the city that have used it as a construction material. In the area around the site it can only be seen in the foundations of the older houses.



Fenwick Tower as seen from the Halifax Public Library on Queen Street and Spring Garden Road.



Fenwick Tower as seen from Fenwick Street looking east.



Surficial geology of the Halifax Peninsula. (Compiled with data from Utting 2011 and Halifax Regional Municipality 2009)

Water Flow Mapping

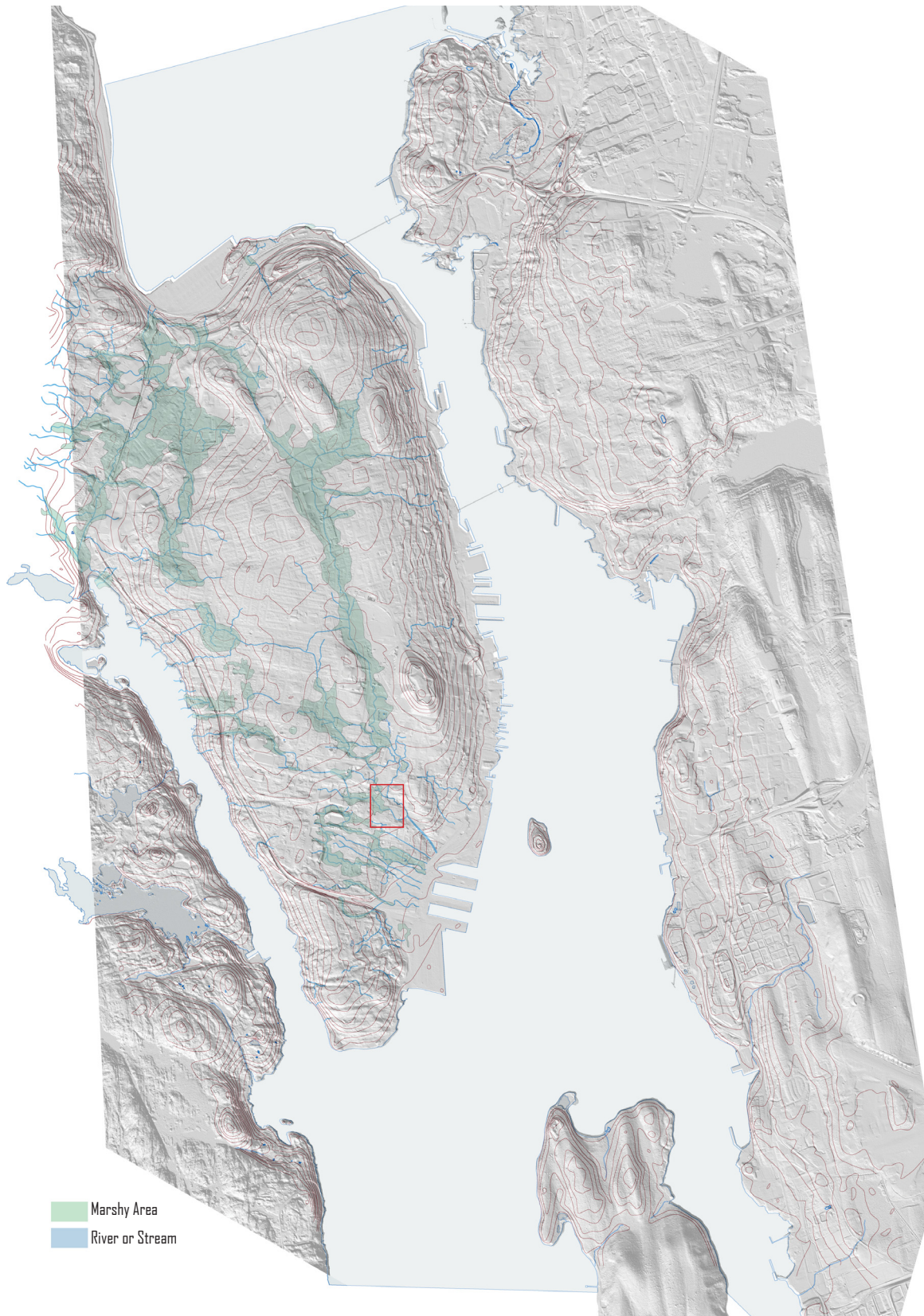
Halifax is one of the wettest cities in the country, which is perhaps no surprise to those who experience the 1468mm of rain in an average year (Osborn 2015). It was once a marshy place crisscrossed with many streams and a few small rivers. Looking at a map of the historic water routes is useful as the general drainage has not changed much except for the fact that the rivers and streams are now routed under the streets in the storm water sewer system. The most significant river was called Freshwater Creek which ran north-south as can be seen on the map. This now exists above ground for only a short duration within the public gardens before it drops underground into a 54" diameter pipe. It receives one third of the water volume from the peninsula and roughly follows the old route of the riverbed. As it enters the most populated part of the city the first high-density building it encounters is Fenwick Tower where it skirts around the outer foundation walls. Historically Fenwick Tower has been plagued with flooding problems in the event of high rainfall.

Air Flow and Wind Mapping

The city is almost entirely circumscribed by coastline and the varied topography makes for much exposure to the wind. Wind intensities are mapped on the following page where it can be seen that within the urbanized regions, the southern and northern tips of the peninsula as well as Citadel Hill are the most exposed. It is also important to note that wind increases logarithmically with height, thus any tall building will experience significantly higher intensity winds. Fenwick Tower, at 98 meters is currently the tallest building in Atlantic Canada and it is in an exposed part of the peninsula, thus it must experience a lot of windy days. Predominant wind directions in the summer and winter as well as the directions that can be associated with snow and wind are shown.

Density Mapping

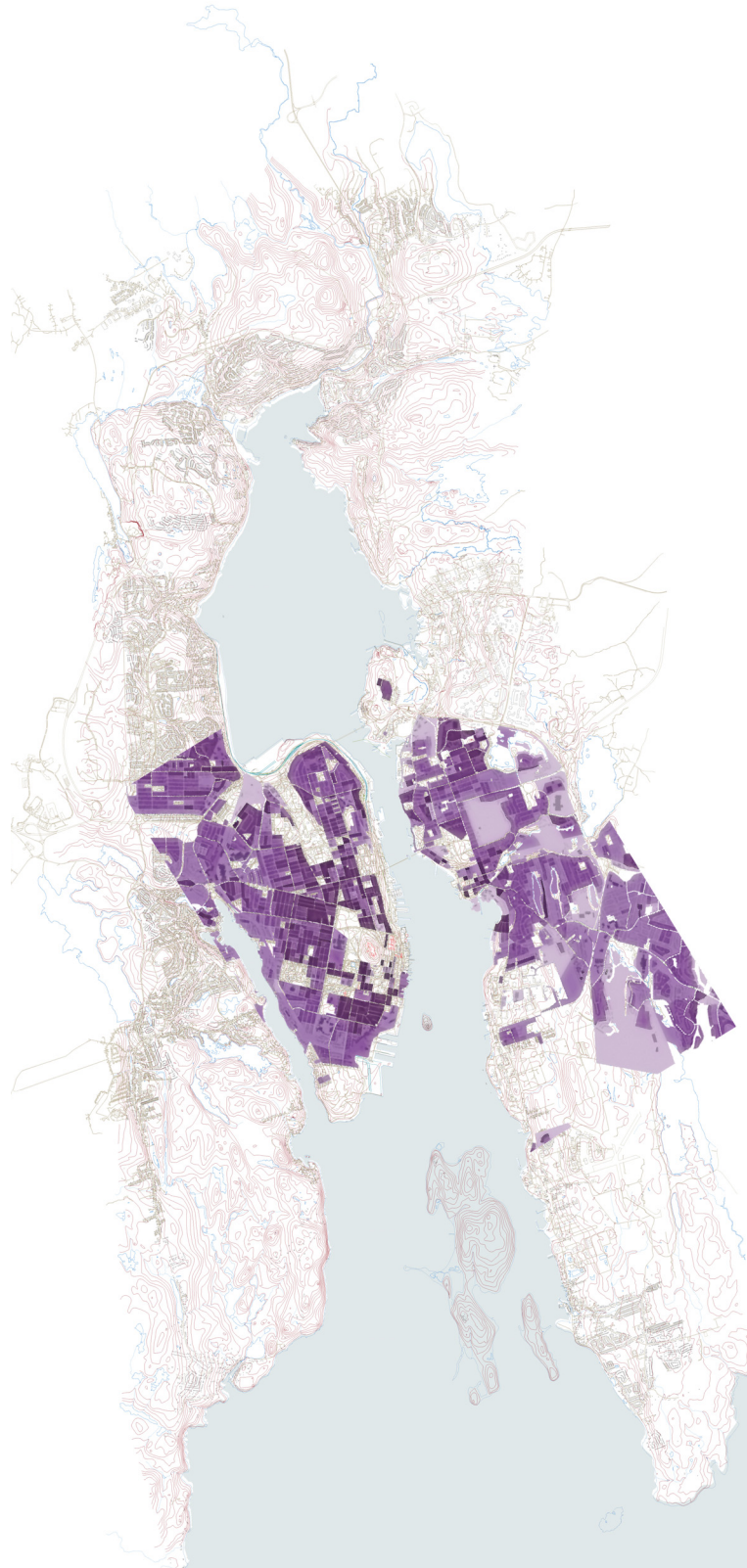
The population of Halifax is concentrated on the peninsula as can be seen in the density map provided. One of the densest neighbourhoods being south of South Street where Fenwick Tower is located. This area is a mixture of single family detached dwellings, many of which have been converted into apartments, and low to mid-rise apartment towers. Fenwick Tower is an exception as it is significantly taller than anything in its immediate surroundings.



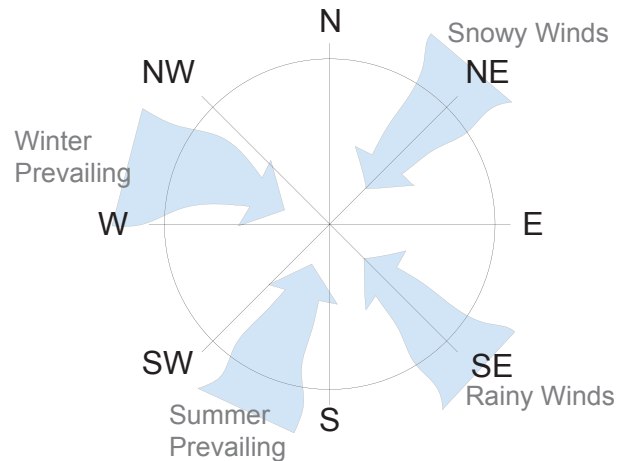
Historic water-routes and drainage of the Halifax Peninsula. (Compiled with data from Reid 2012 and Halifax Regional Municipality 2009)



Wind intensity and topographic contours on the Halifax Peninsula and environs. (Compiled with data from Government of Nova Scotia Wind Atlas 2014 and Halifax Regional Municipality 2009)



Population density of the Halifax Peninsula and environs, overlaid on road and building outlines. (Compiled with data from Taylor 2011 and Halifax Regional Municipality 2009)



Generalized wind trends in Halifax, prevailing wind statistics from Shearwater 1980-2009 (Dale 2013).

Convergence of Interest

Fenwick Tower presents itself as the most significant location where all of these environmental factors are at their most pronounced. It is among the windiest and most exposed places in the HRM, it is the wettest as it sits atop the largest drainage in the city, and it is the densest building within the city's densest neighbourhood. As one will see in the next section these factors heavily influence the form that the final design takes.

The building is accessed from Fenwick Street, a quiet residential street with a number of commercial buildings in the immediate surroundings. The Boulevard of South Park and Tower Road are within close proximity and mark out the route of the Freshwater Feature and a central axis of the city. A large graveyard on South Street, the single story grocery store and its large parking lot provide the flat terrain that aids in accentuating Fenwick's extreme verticality.

Existing Conditions

Fenwick as an Icon

The building was constructed from 1969 - 1971 and its severe concrete facade is indicative of that era's brutalist aesthetic. Its severity, ageing appearance, poor record for slummy conditions and ostentatious street presence has won it disfavour in the eyes of most Haligonians. If polarizing its presence is at least not obscure; "everyone knows



Site map. (Compiled with data from Halifax Regional Municipality 2009)



Site map. (Compiled with data from Halifax Regional Municipality 2009)

Fenwick Tower”. Looking beyond its cosmetic problems or mismanagement, this building represents the zeitgeist of an optimistic era and it is still a strong symbol within the city. Perhaps a less noticed consequence of the building is that at night when the concrete grid fades away into the shadow, the diversity of its populated rooms shine through in a variety of colour. The building almost takes on a Christmas tree like appearance.

Derelict Condition

At 45 years of age and minimal changes to its exterior condition, parts of the building are in a derelict state and in bad need of overhaul. Despite being located in one of the most desirable locations within the city there are large portions of the building that are vacant. The ground floor patio is rarely used and the large commercial space beneath is empty. The lowest parking level is unused, perhaps due to the frequency of flooding events.

The current property owner, Templeton Properties received approval to move forward with plans to redevelop the property in the month that this thesis has been written, February 2015. The Proposal is to re-clad the building as well as construct a number of new towers around the base. The changes to the cladding involve a lot more glass and this will



Fenwick Tower’s uniform and severe facade.

certainly go a long way in softening the now hard appearance. However the architecture is not fundamentally different than what is currently there.



In contrast to the preceding photo, the uniformity of the facade breaks down at night when lights of the units provide a variety of colours.

Existing Building Structure

The following axonometric diagram shows the general layout of the existing building. There are three levels of parking below grade and one commercial floor a half level below grade. The floor to floor distance is 8'8" except on the 15th and 31st mechanical floors which are 16' and 12'5" respectively. The 33rd floor was intended to be a penthouse suite, though it is now converted to dormitory style rooms. A swimming pool had originally been designed for the 32nd floor, though due to financial troubles during construction the plan was abandoned and the area has since been converted into a social space.

The tower portion consists of parallel walls at 12' intervals. Every fourth wall is a structural shear wall and is identified in the next diagram. One large core and a smaller one on the opposite end of the building provide shear strength in the opposite direction. The typical floor plate is punctured in multiple places to route services to the units.



Proposed redevelopment of Fenwick Tower (Templeton Properties 2014).

Existing Program Organization

When looking at the building programmatically it is very simple. The public circulation exists within the core and the central hallway while the single story units are arrayed off of it. Each unit has access to the outdoors through a small disconnected balcony. Also shown is an existing plan of a typical floor containing units, this is colour coded similarly to the preceding diagram. The circulation (yellow) is the only public space above the ground floor in the building and it is confined to a narrow hallway. There is no social in-between as discussed in an earlier section. There are a few different sizes of apartments as can be seen.

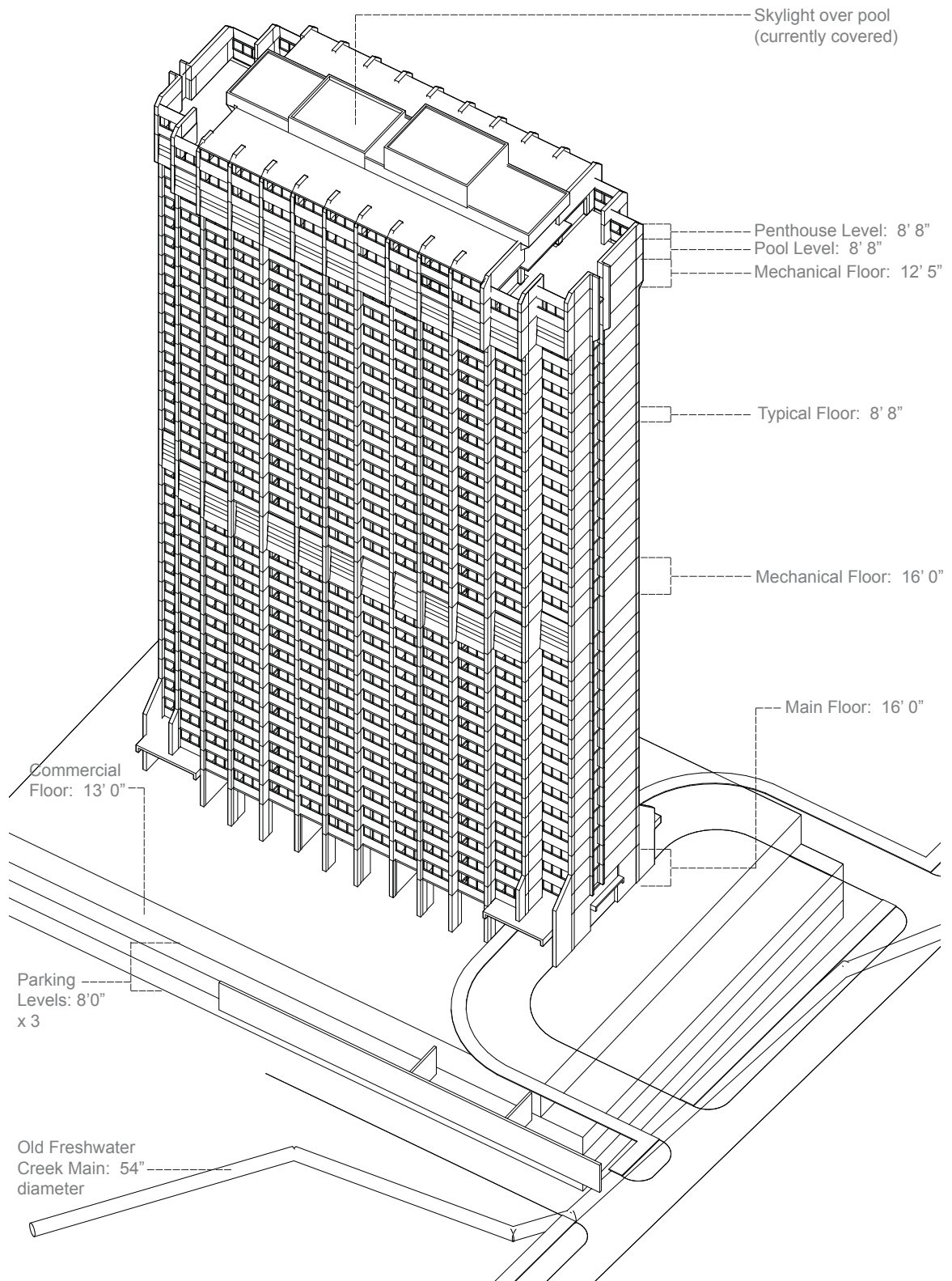


Diagram showing the general layout of Fenwick Tower

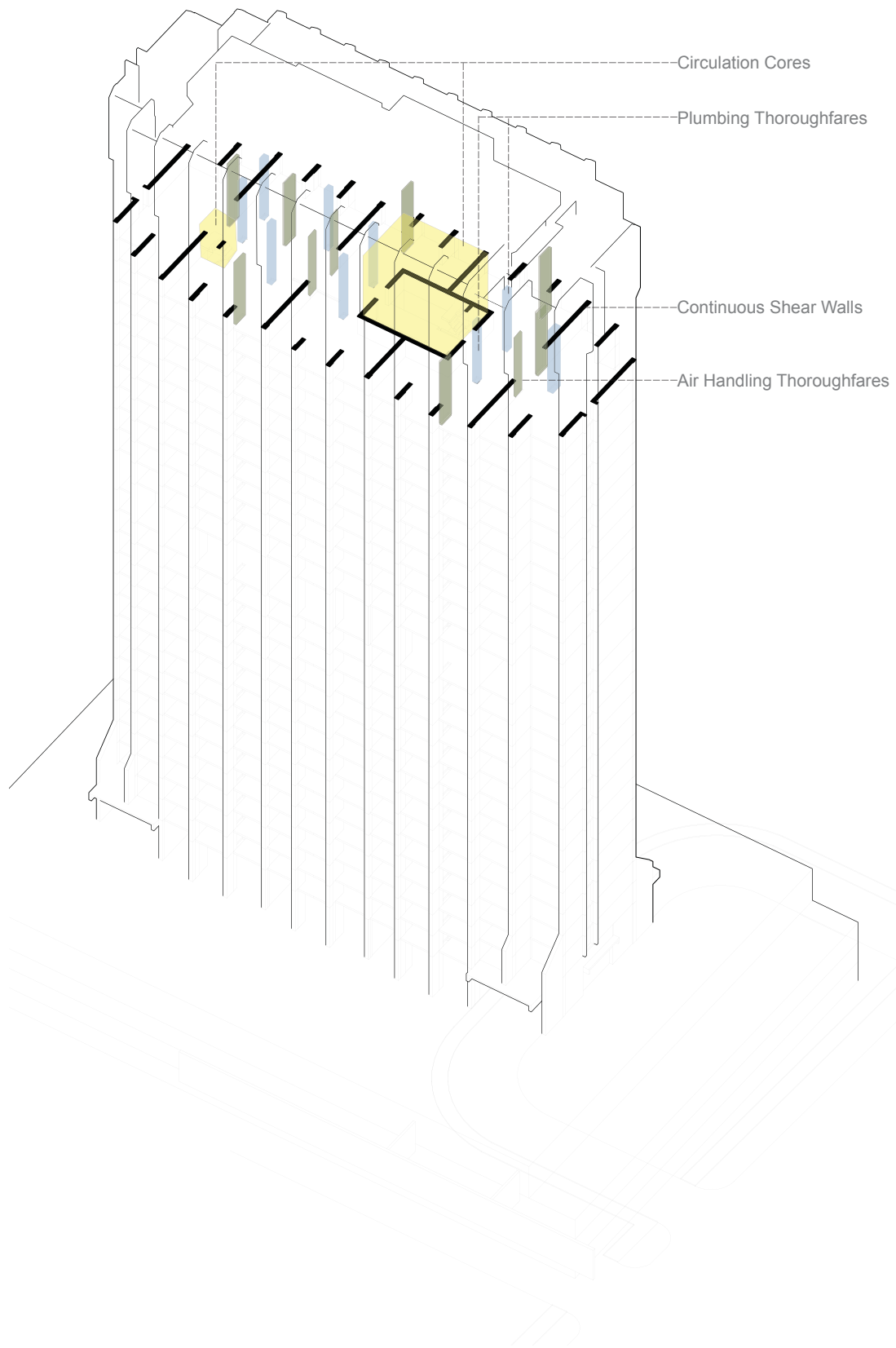
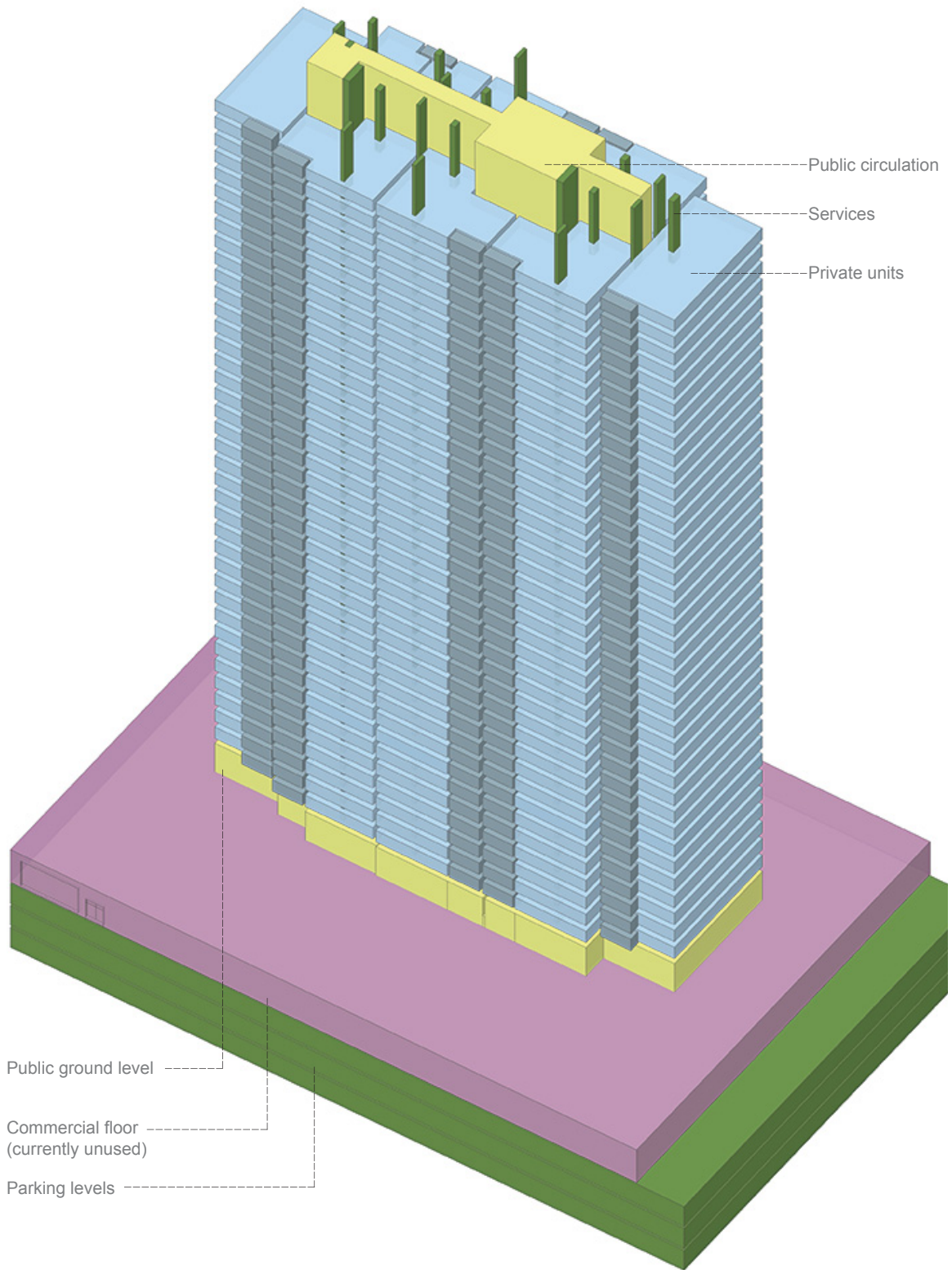


Diagram showing the structural elements of the tower and the location of the services.



Existing programmatic layout of the building



Typical floor plan - Fenwick Tower, re-drawn from original architectural plans, 16th floor (Dumaresq & Byrne Ltd 1969)

CHAPTER 2: DESIGN

General Layout

Axonometric Key

The general layout of the building is shown in the following diagram, this is a brief overview before the design components and strategies are described in further detail.

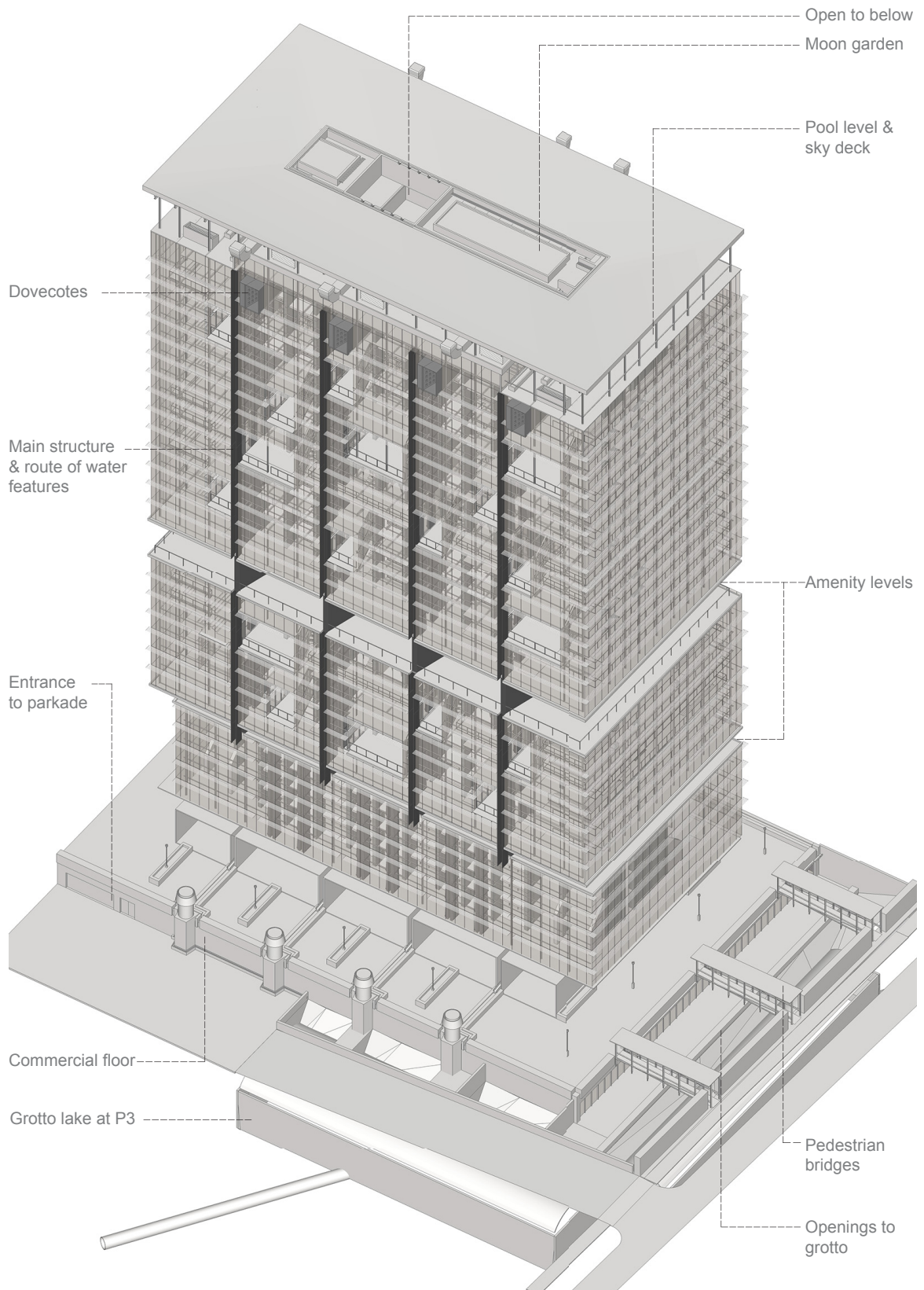
A new roof has been built over the existing, angled to slope in and collect water. The central part of this level can be occupied and contains a moon garden. The skylight over the pool has been opened to the air as shown so that water can fall from the roof into the pool below.

Two amenity floors have been placed within the building, with leaseable commercial space that could accommodate coffee shops, convenience stores or other small businesses. One of these floors is placed on floor 15, what was the double height mechanical floor, the other is on a regular single height floor as shown. A flexible social space is proposed for the pool level on the 32nd floor which connects onto large open air viewing decks. Also at this height are a series of dovecots, introducing a new form of environmental factor to the mix and providing the opportunity for sport and entertainment through pigeon racing.

The area of the building is expanded through the creation of a region outset from the original facade. This “semi-tempered zone” creates a buffer between the units and the exterior. A number of breezeways puncture the building as shown.

Aligned with the main concrete structure are the routes of new water features within the semi-tempered zone. On the ground level pedestrian access to the court is provided by bridges over openings to what is now a subterranean lake, at what was the lowest parkade level. This is accomplished by intercepting the Freshwater Creek storm main.

All of these ideas are discussed in further detail in the subsequent pages.



Axonometric layout of key design features in the building.

Unit Plans, Sections and Elevations

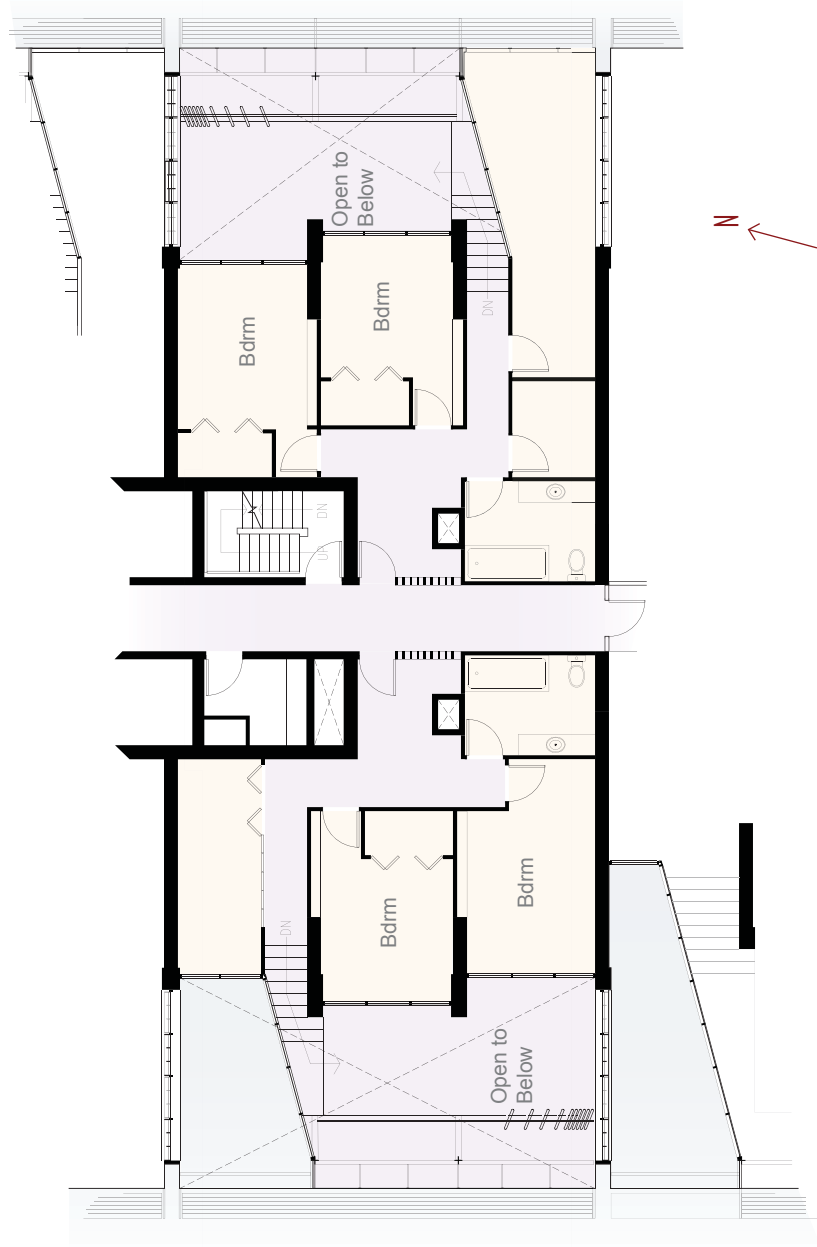
As seen in the existing floor plan of the preceding section, there is little spatial variety within the units and in the vertical dimension particularly. To accommodate more bedrooms the larger units had, in the previous plan expanded outward within the same plane. The new design proposes that the majority of the units occupy two stories, using the semi-tempered zone as a means of vertical access. This way units can maintain their sizes with the added benefit of using verticality to articulate a range of public to private spaces within the unit.

This sequence of lower floor, semi-tempered zone, and upper floor play into the larger strategy of social mixing and gradient, not only within the units but within the building as a whole.

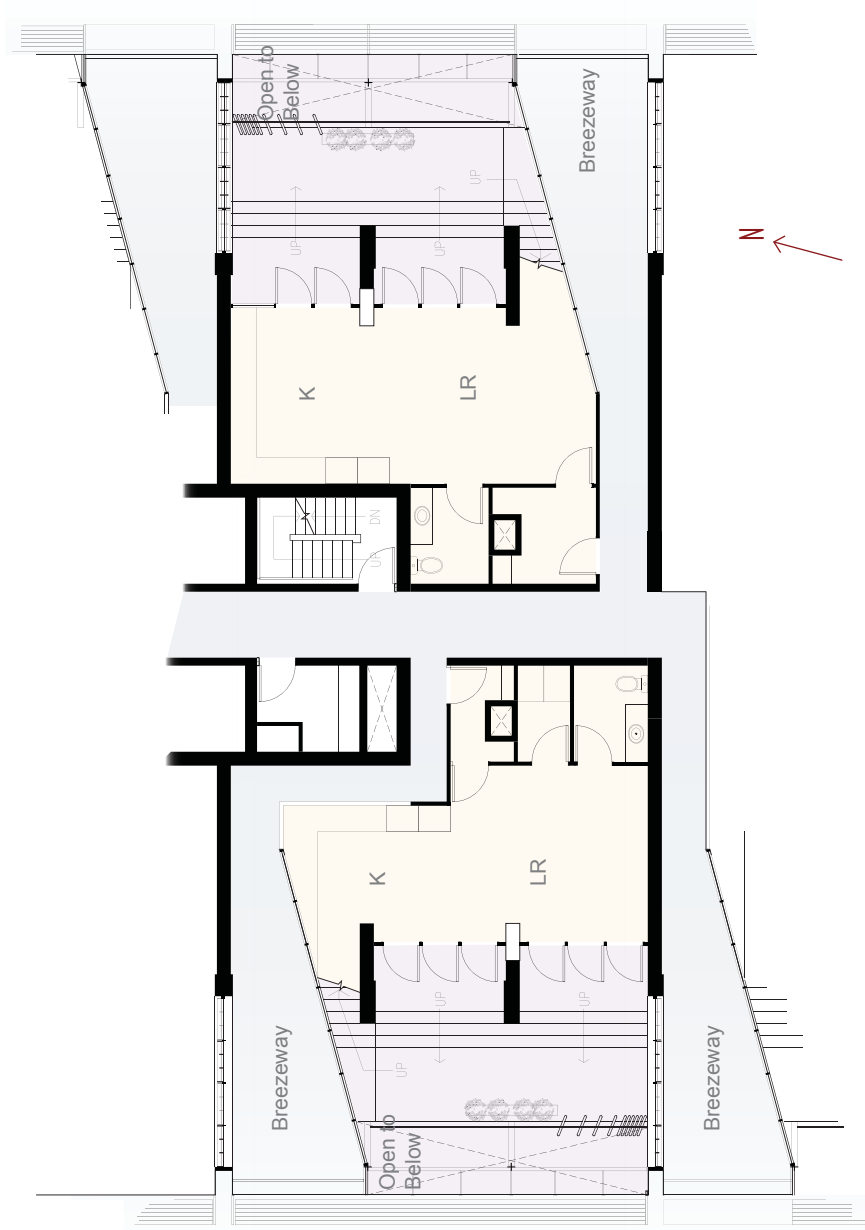
A typical unit is shown on the following pages. It has been colour coded according to the various temperaments of air found in the spaces. There are three colours, blue is for open air, magenta for the semi-tempered air, and the mechanically warmed air is yellow. The regions very roughly can be associated with the range of public to private respectively.

The open air breezeways allow for activities such as barbecuing, smoking and whatever else might require or benefit from the open air. There are versions of these breezeways that connect the semi-tempered air throughout the building and allow it to circulate more thoroughly as indicated.

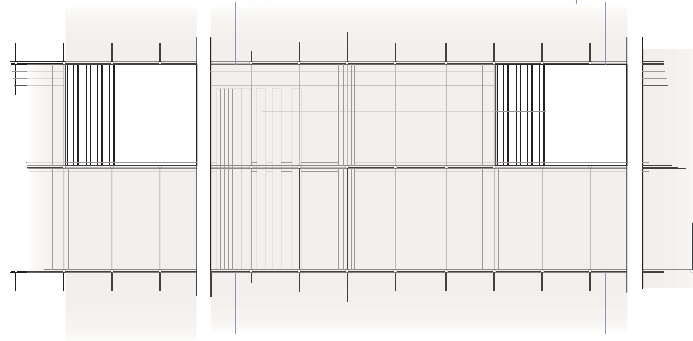
Access to the units is from the original circulation core however with the addition of the breezeways. The public corridor has now been broken up and people will have opportunities to informally meet their neighbours within acceptable social limits. This is analogous to the front porch spaces discussed earlier. Further to that, within the semi-tempered zone, the visual connection and potential for conversation at a distance also exists, within socially acceptable limits for that type of space. This is analogous to a deck that might be found in the (more private) backyards of many typical Halifax homes.



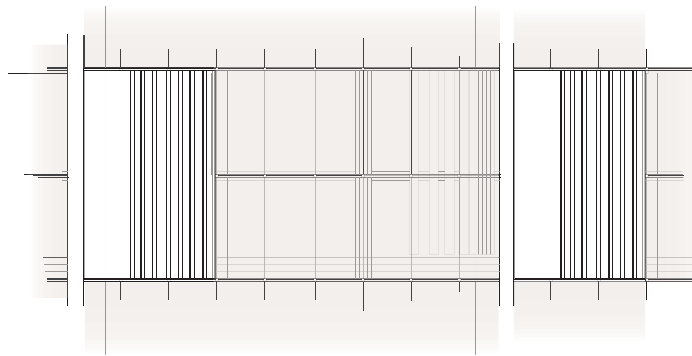
Proposed upper level of typical unit 1/16" = 1'0"



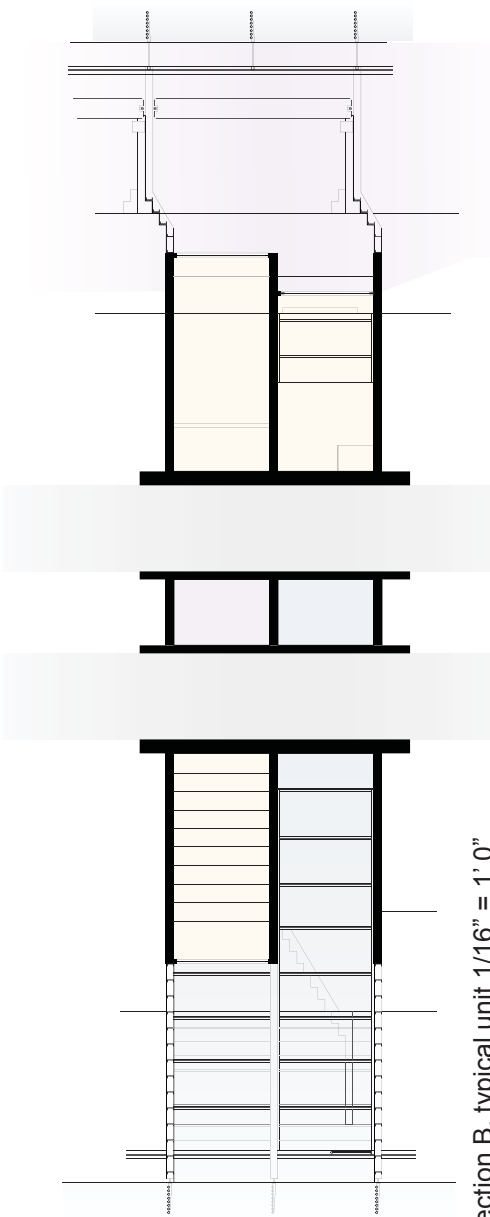
Proposed lower level of typical unit 1/16" = 1' 0"



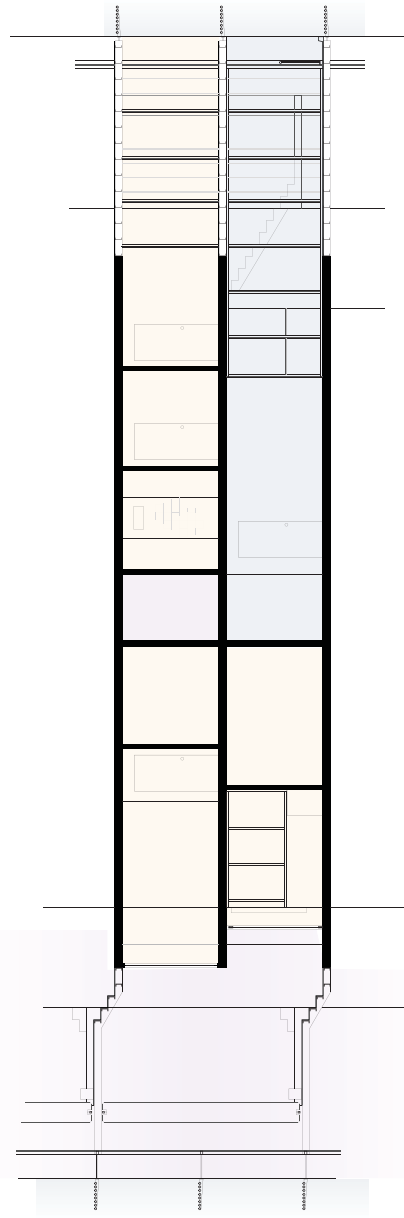
Proposed east elevation of typical unit 1/16" = 1' 0"



Proposed west elevation of typical unit 1/16" = 1' 0"



Section B, typical unit 1/16" = 1' 0"



Section A, typical unit 1/16" = 1' 0"

Design Concepts

Structure

Environmental Strategy and Spatial Implications

The environmental factor that structure deals with is inherently spatial. As discussed previously in the document many ordinary urban buildings lack in spatial variety, with floor plans simply repeated. The aim of the structural addition is to combat this trend, one that was found to be very apparent in Fenwick Tower.

The original structure is kept intact with a new skin is placed outset from it. This is arranged with enough space to form a habitable zone between the original facade location and the new skin. It is supported with a steel structure that will also provide support for any floor that might be built into this new space. The skin is punctured in many places to form breezeways, explained in more detail below.

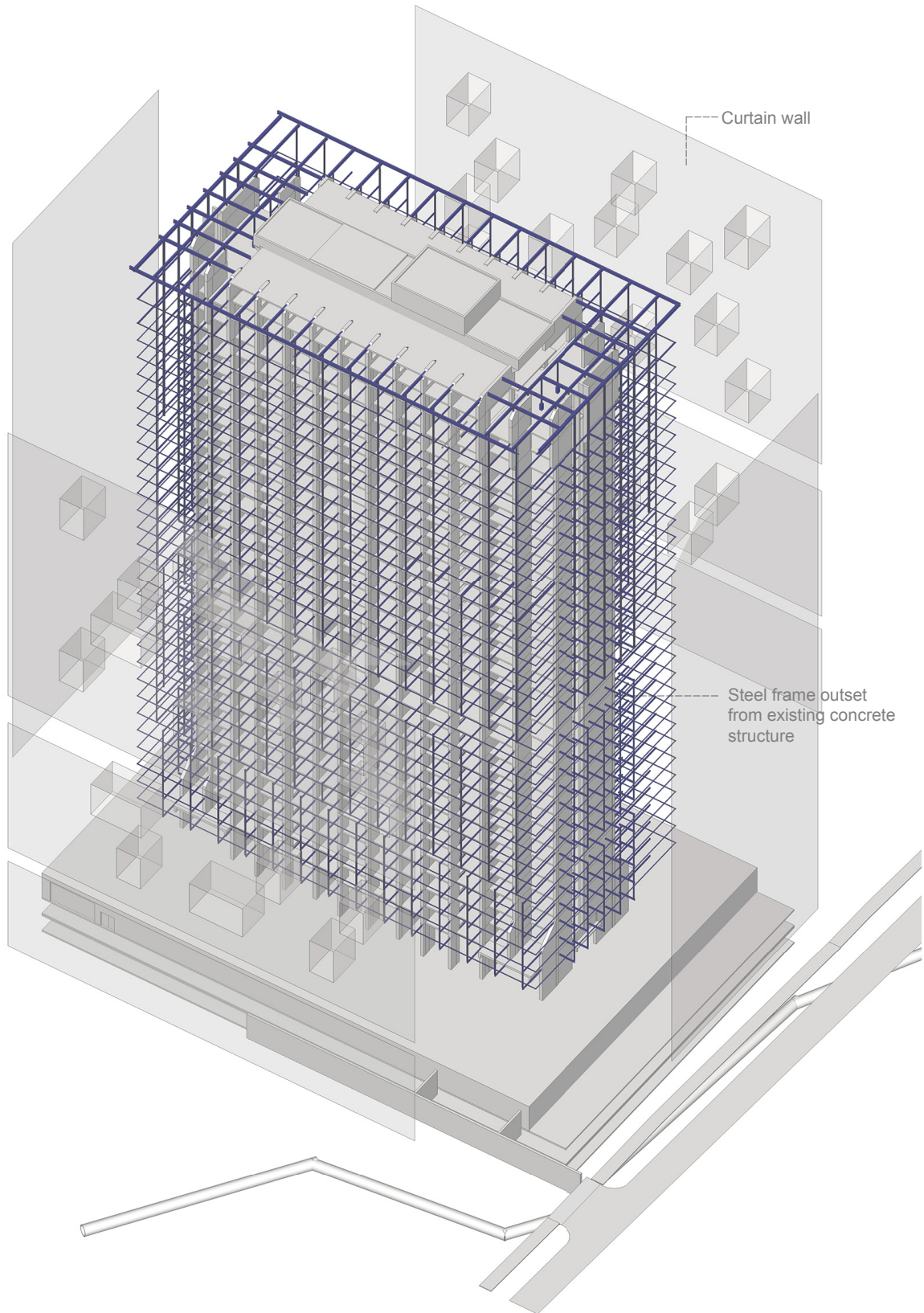
Social Implications

The steel grid provides the framework into which the social in-between spaces i.e. the “decks” discussed in the preceding section can be inserted. With slightly varied heights to provide implied or social separation. Referring back to the section on the social role of porch spaces and how slight variations in height have a very strong psychological and social implications.

Light and Darkness

Environmental Strategy and Spatial Implications

Providing access to and control of natural light is achieved in a number of ways though the design. The orientation of the long axis of the building is north-south and thus most units will look either east or west. Light from these directions can come in at a low angle and be problematic depending on ones task at hand. Thus a set of large vertical louvers is supplied to every unit so that each can control the amount of natural light admitted into their space. These are indicated on the preceding plans and sections of a typical unit.



New structure and skin are placed offset from the existing building to create a new semi-tempered region

Horizontal louvers are also used in the building to mitigate heat gain in the summer months when the sun is high. These are fixed to the outside of the building where they would act more efficiently.

The west light from the late afternoon sun can be enjoyed through double height open air spaces on that side of the building. In contrast to the east facade on which they are only single height. A secondary grid, rotated 15 degrees to the existing, has been used to angle the walls on the west side to the south to increase the amount of sunlight into these outdoor rooms. The role of this grid on the east side has to do with wind direction and is discussed in a later section. This can be seen in the elevations and the plans of the typical unit.

Social Implications

These west breezeway spaces are varied in size so that units have access to one larger and more public space in addition to the slightly more private, smaller versions. These have the previously discussed role of a social in-between space and may provide the opportunity for residents who would otherwise not have access to the equivalent of a backyard. The tower will then become much more appealing to those with children whom could meet their friends and play in these spaces.

Each set of sliding louvers would be one of a variety of colours, thus allowing one to distinguish their apartment from the street and breaking up the previously alienating effects of the existing monotonous facade. As individuals adjust their louvers to their own needs throughout the day, the look of the facade from the outside would be a dynamic one, giving a sense of the building having this adaptable and visually fluctuating character.

Poetic Narrative

In addition to these control measures, (or perhaps running counter to them) is the proposal of a space within the building dedicated to the enjoyment of darkness. A moon-garden has been placed on the roof, where it would be well above the glow of the street lights below. Though still susceptible to the light pollution of the city, especially on overcast nights. However this too may take on a form of night-time appreciation, a sort of substitute for the moon when the clouds obscure it, with its own hues and shifting character as one gazes

up at the clouds now lit from below.

It would be imagined that this place would be quiet and introverted, perhaps for an intimate conversation or ruminating to oneself. The night-owls of the city might find a place to gather and form a community or the amateur astronomers could find a reliable place to set up their telescopes without obstruction on the horizon. The architecture here aims to re-establish the night as a real part of our daily experience.

Shown in the image is a full moon brightly illuminating the fragrant moon-garden in full bloom and a couple perched at the edge, engaged in a conversation and sharing food. They are enjoying the intimacy of the outdoor space removed from hustle and bustle of the brightly lit city life below.

Water Flow

Environmental Strategy

Much was drawn from the modelling exercises described earlier, the rain is first collected on the roof, and then brought to the pool where it is stored. From the pool the water can be routed to various channels in the building depending on where the surplus heat in the tempered zone may be. This sort of flexibility may prove invaluable due to the orientation of the building; the large glazed facades are facing east and west with a much smaller exposure north and south. Large temperature differences will be present and constantly flipping between morning and afternoon. The cascading water features are thus routed through the west and east facades. Although this strategy has the potential to distribute excess heat in addition to simply mitigating it has been done in the British Pavilion in Expo '92 by Grimshaw Architects (Grimshaw Architects 2015).

The lowest level of the parkade, which is currently unused and plagued with flooding problems will be turned into a subterranean lake and riverbed. A section of the Freshwater storm sewer is removed to allow it to flow throughout this space. The running water provides an efficient source of heat and coolth to use in conjunction with a heat pump. Another benefit of a the lake would be its ability to mitigate flooding for all of the buildings downstream from it. Thus playing into a larger role within the civic infrastructure.



The roof-top moon-garden

The water that flows through the building ends its vertical journey in the lake when it falls again from the ground level as indicated on the axonometric.

Spatial and Social Implications

The moon-garden is isolated at the center of the roof level, from here one's view is projected out over the roof surface to the horizon beyond, giving the location a privileged vantage for viewing the weather. The roof is angled inward so that the rain can be observed as it flows over the surface and before it is routed to the opening in the roof where the skylights once were. From here it falls into the pool below. The large concrete walls would stain over time, the result being an atmospheric room where a variety of events may take place.

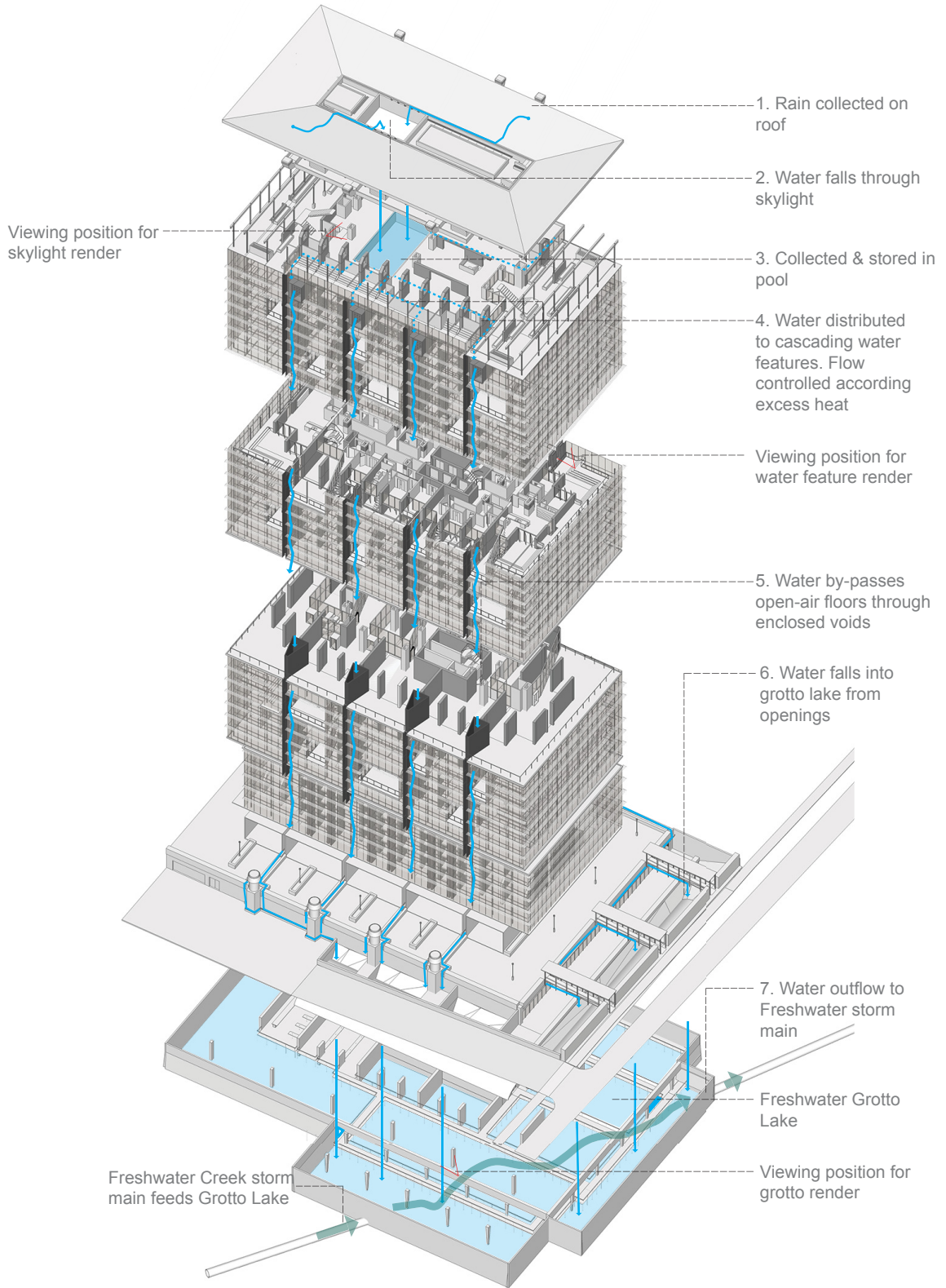
The water features themselves are arranged between units where they may add an element of separation. Each unit has access by way of an adjacent deck space in the semi-tempered zone shown in the render.

The dark and intimate nature of this subterranean lake was deemed appropriate for a bar and nightclub, with all the novelty that a space like this may provide. This has been placed in the center of the original parkade with access to the circulation core on one end and to the parkade levels above on the other.

Poetic Narrative

The rain is an element that connects earth with sky, in one form it belongs to the atmosphere and in another to the earth. When it is raining this transformation takes place, though often we do not permit it to meet the earth, collecting it on rooftops and road surfaces and sending it away in sewers. This vertical journey of the rain from the sky to the earth is exhibited in the elevation of the building and experienced at different stages in its descent.

The first render in this series is of the skylight on a rainy day. The room has predominantly opaque surfaces at the periphery, accentuating the opening as it frames the sky and the stormy clouds it contains. The surface of the water becomes alive with raindrops and the occupants can watch, smell and listen to the water as it falls into the pool.



Water flow through the building.



The pool and skylight at the top level.



The water feature seen from the semi-tempered space.



Grotto lake scene with the nightclub in the background.

These cascading water features are made of slightly angled metal surfaces, intended to stain and patina over time. Shortly after a rainfall these will come to life with the sparkle of flowing water and the chimes of drips hitting metal. The high number of wet days in Halifax, on average 142 days a year (Osborn 2015), will find these devices only lazily flowing, though the inevitable Autumn storm will reveal its ferocity to the occupants when the rush of stormwater turns them into an interior waterfall.

The second render in the series shows the water feature as it can be accessed from one of the units. On this rainy day the view over the city is blurry and the space become more inward focused. The girl in the image is sitting with her back to the view and instead chooses to watch the water as it flows down the metal surface. Mesmerizing in the same manner that a fire captivates and is so enjoyable to stare into when deep in thought.

When water connects with the earth, plants can grow and rivers and lakes can form, the cycle can be understood and experienced. This is allowed to occur in the grotto lake, where the level will fluctuate on different days and different seasons, revealing more and less of the rich and rusty tones of the ironstone lake bed.

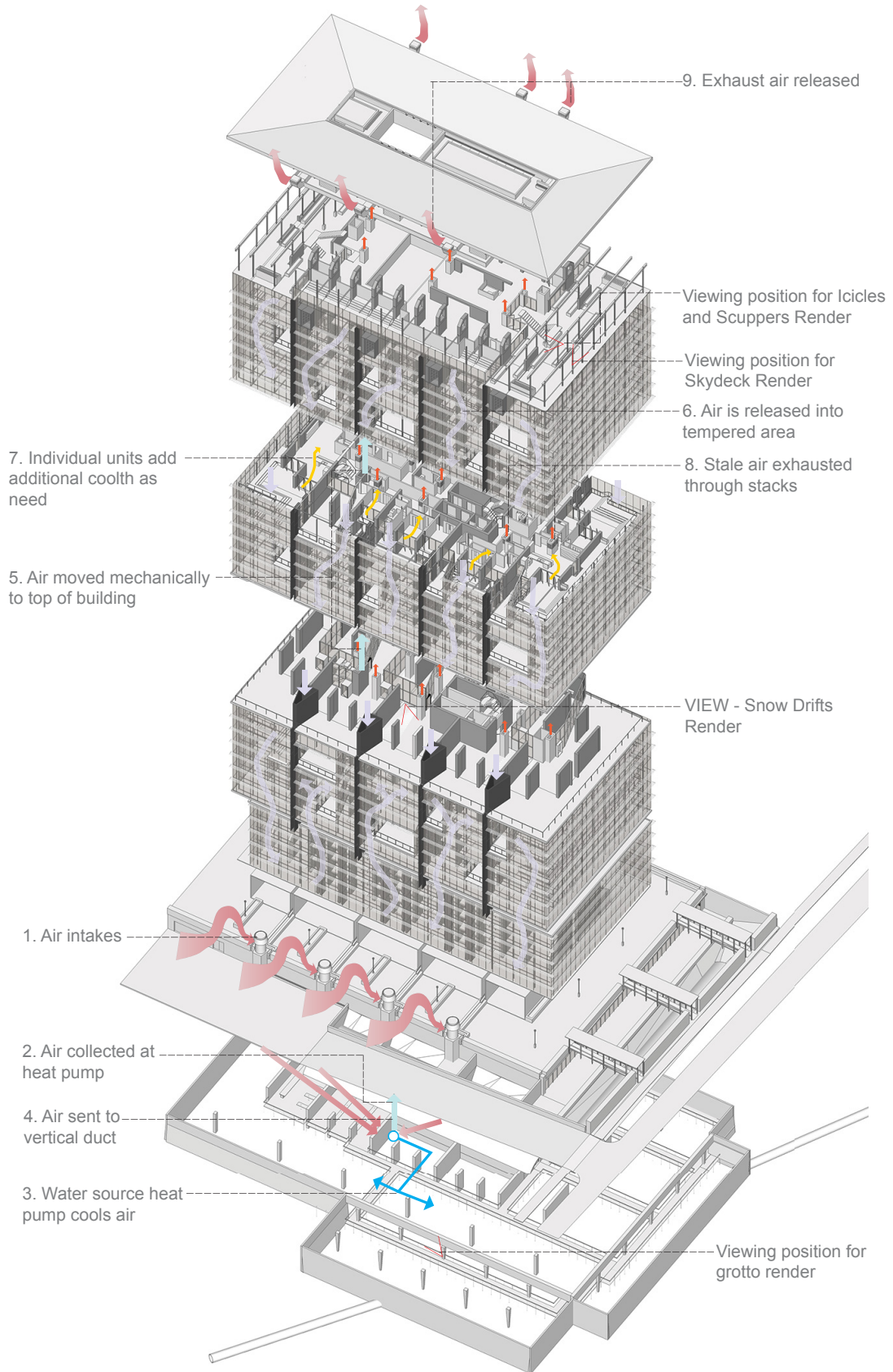
The last render in this series is of a couple on one of the boardwalks over the lake bed. They are taking a brief repose from their participation in the activities of the nightclub a short distance in the background. From this vantage the lights reflect off the water and give mood to the space while the sounds of the revelry begin to fade in the cavernous space.

Air Flow

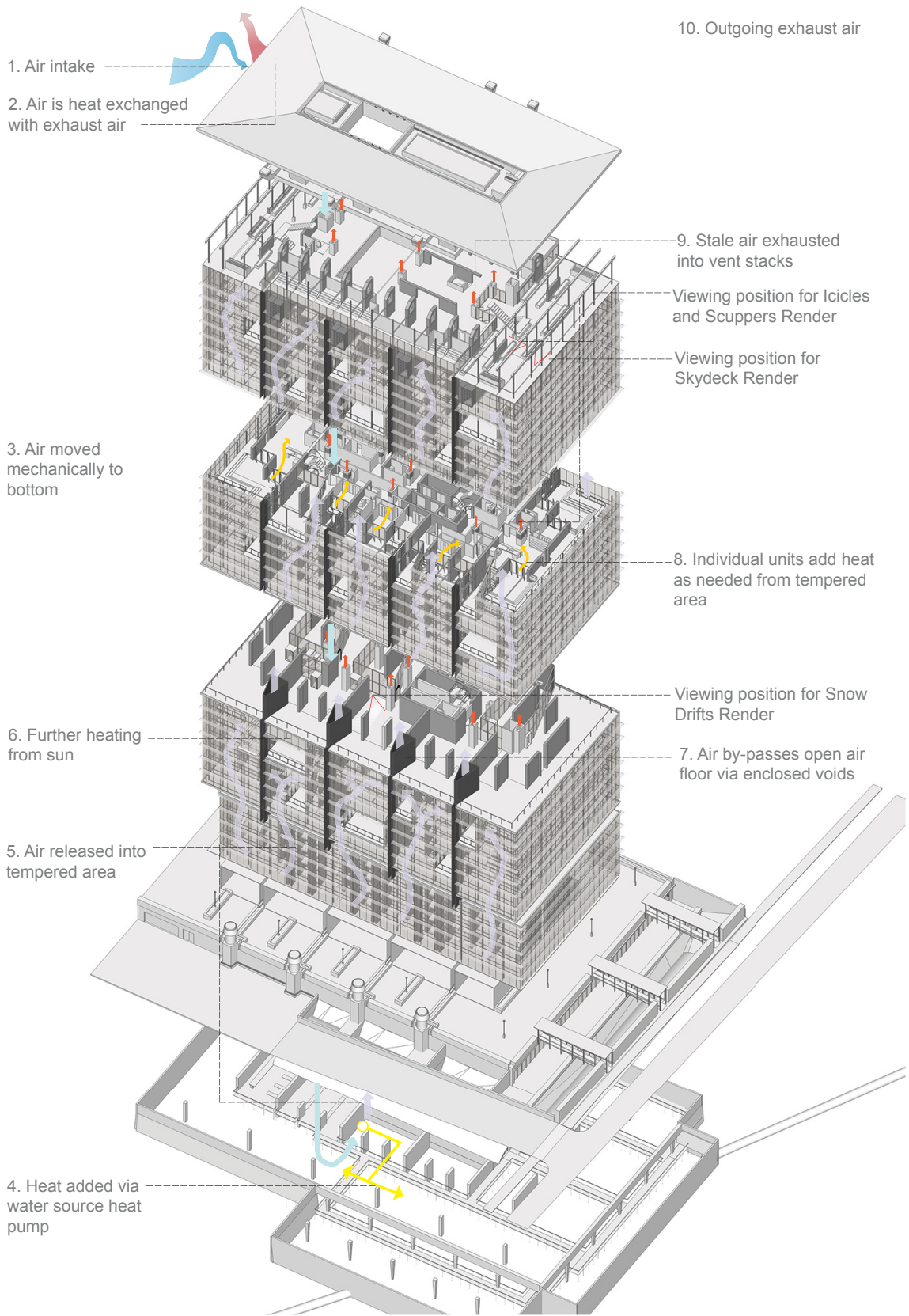
Environmental Strategy

Drawing from the research and the exploratory modelling, the design proposes a series of tempered zones that are arranged to form a sustainable heating/cooling strategy.

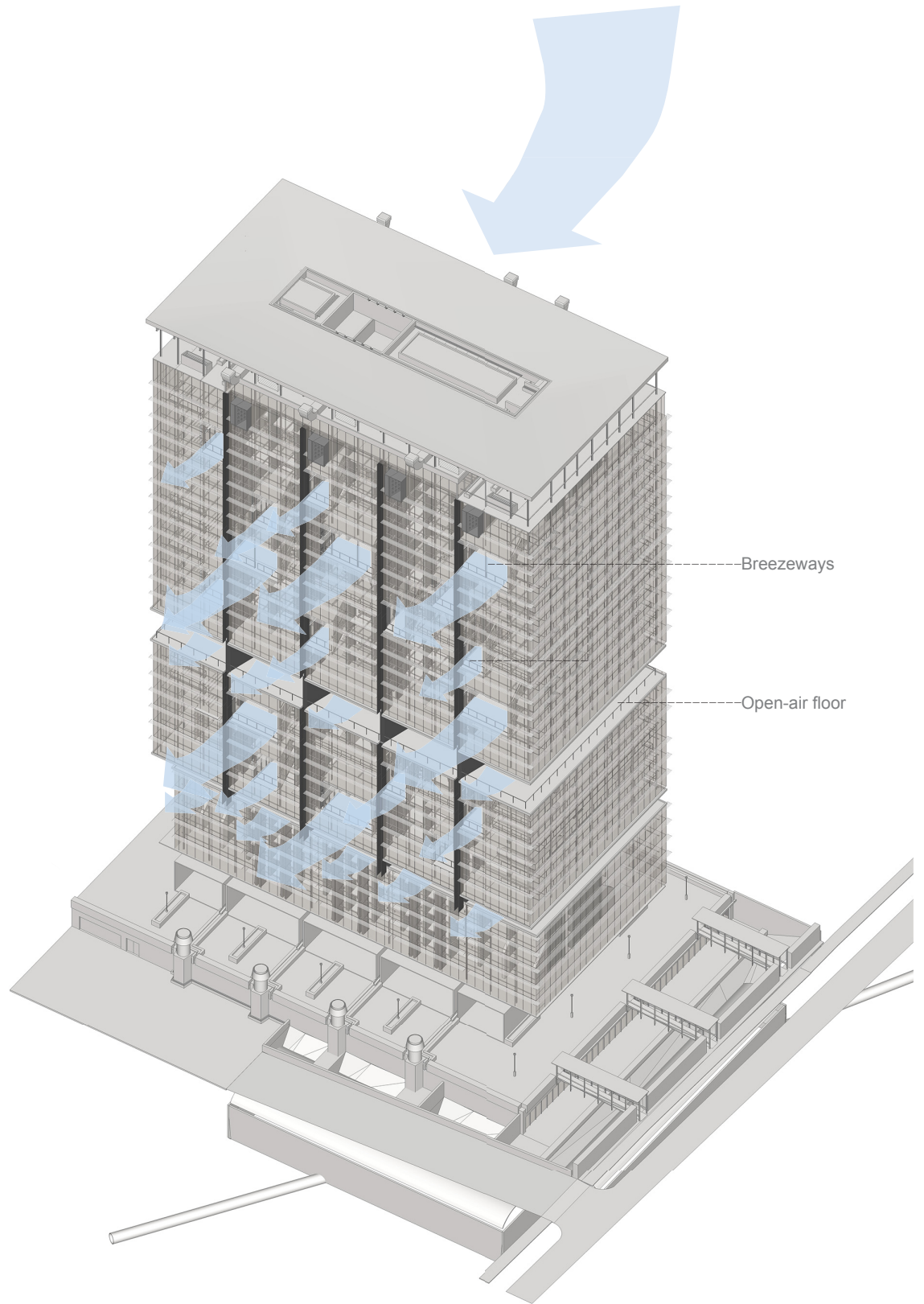
The various levels of tempered air starts with a water source heat pump in a subterranean lake created on the bottom parkade level. Here it collects an adequate amount of warmth or coolth before entering into a tempered supply-air zone between the new skin of the building and the original facade. This semi-outdoor area is insulated from the warmed interiors of the units themselves.



Summer air flow strategy.



Winter air flow strategy.



Open air areas showing interaction with the wind.

Spatial and Social Implications

There are breezeways accessible to every unit that are angled to the northeast to accept the wind-bourne snow and create sculptural snow drifts throughout the long winter. Upon vacating a unit and traversing the internal hallway, one will receive glimpses into these breezeways and the social activities that might be occurring there.

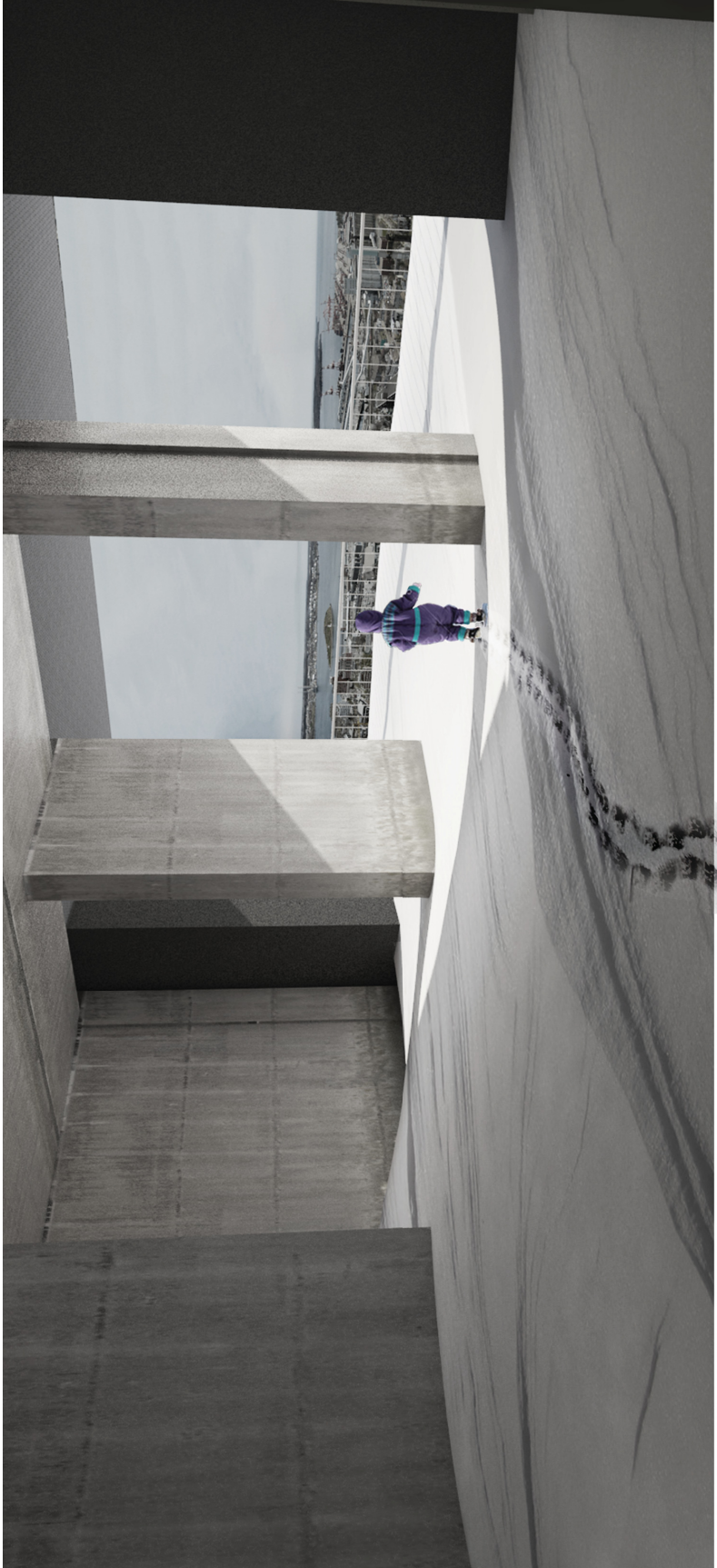
The social role of intermediate space that this new semi-tempered space plays as well as that of the breezeways have been outlined previously. The same strategy is taken up on the amenity floors which have been made to be as wide open as possible. The walls of the isolated shopping areas and cafe have similarly been angled to respond to the snow bearing wind direction.

Poetic Narrative

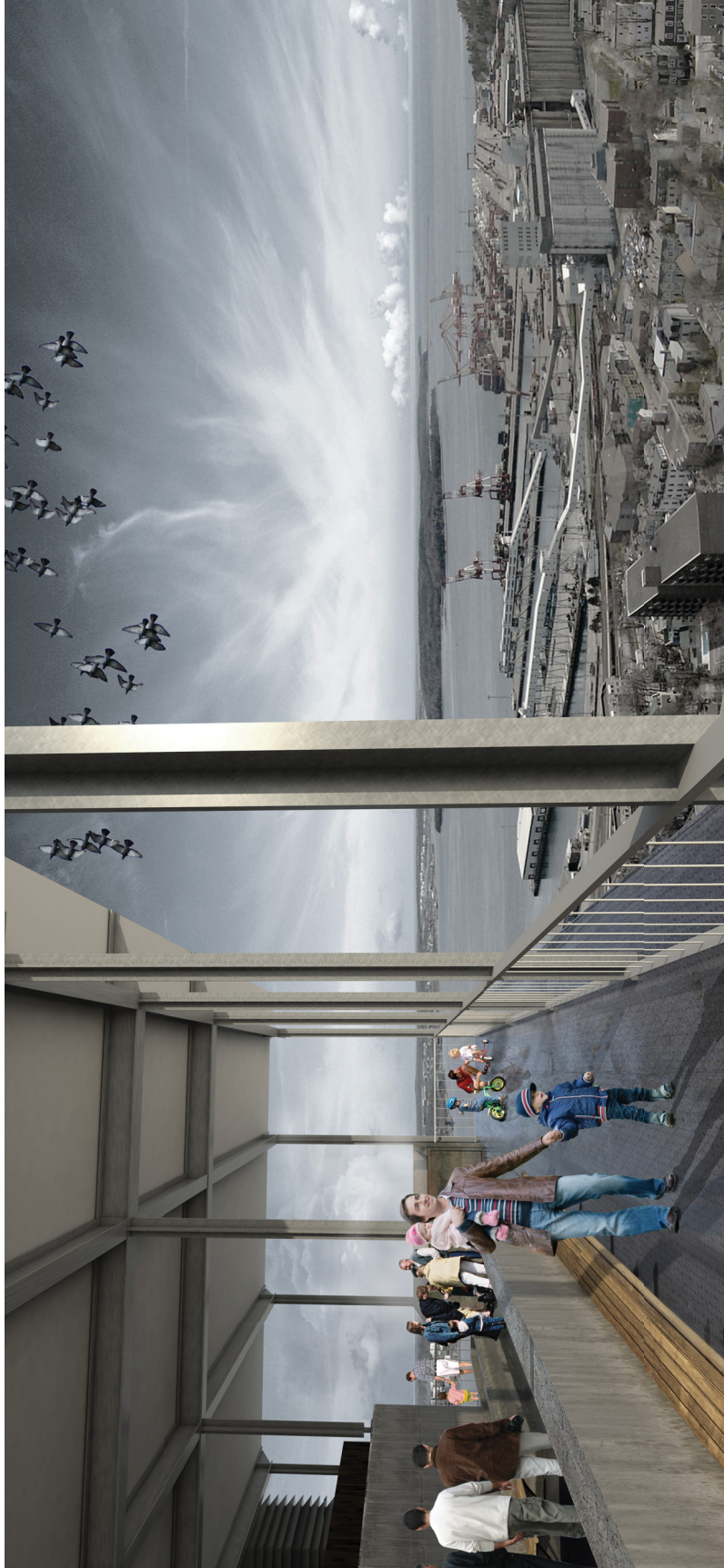
The wind is most often associated with a compass direction, though it certainly can move in three dimensions our understanding of it is horizontally. This is in contrast to the rain which can be associated with the sky and the vertical. Thus the design's response to the wind can be best seen in plan. Within the open floors the building opens up to certain directions to accept the wind and whatever it carries, leaves, rain, snow, dust, etc. In the first rendering of this series is a child running off into the snow, perhaps to climb the largest snowdrift or to marvel at the weird and wonderful shapes etched into the surface by the north east wind.

The vented air in the building is made accessible to the public on the skydeck floor, where they are offered the chance to approach the openings and feel for themselves the force of the stack effect on that particular day. This scene is depicted in the second render, where a number of people are out enjoying the view, with the vent opening in the background.

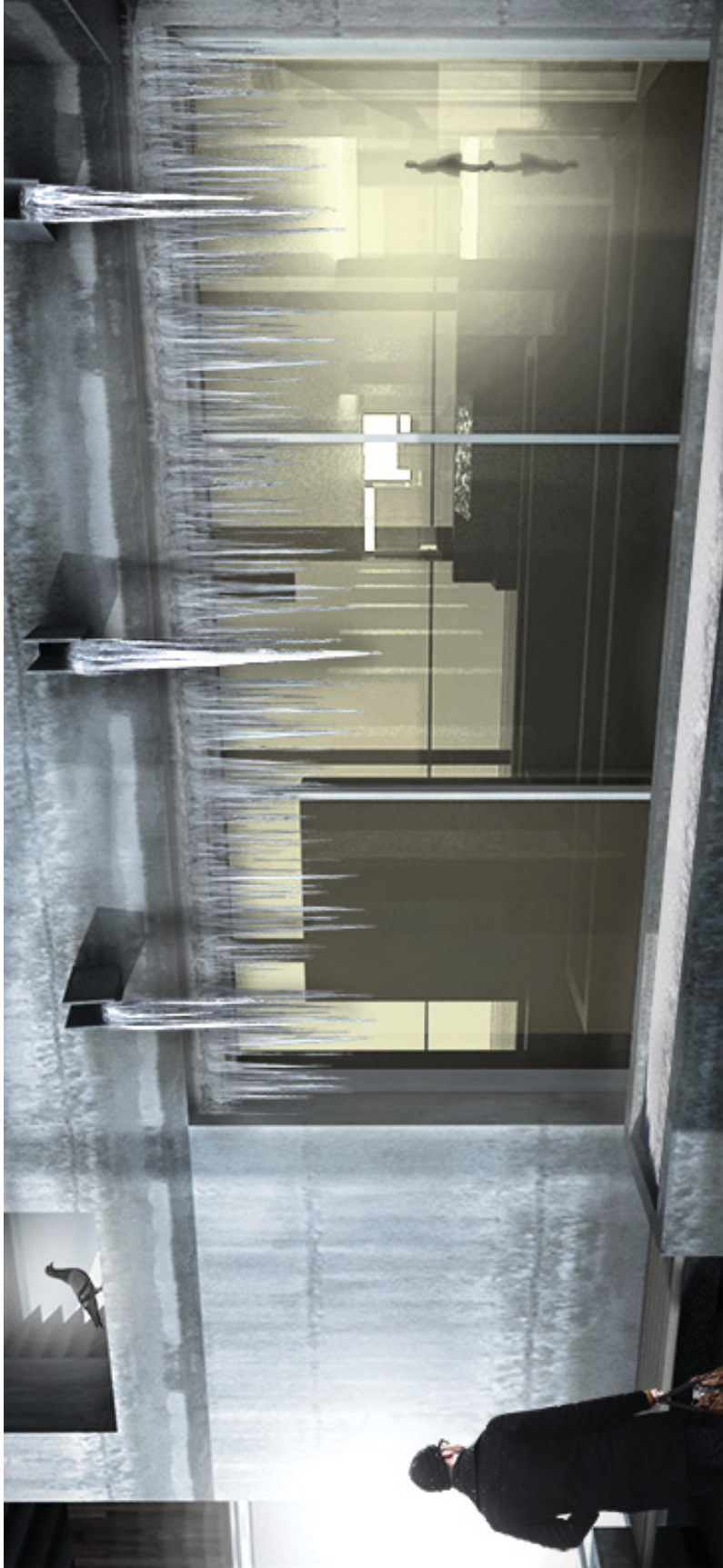
The space immediately below the roof is used for further venting of the units and the semi-tempered space. Here there is the opportunity to melt the snow that may accumulate in the winter months and use it in a way to create sculptural ice effects at the scuppers that drain this level.



Snowdrifts created on the amenity floor.



The skydeck level.



Icy scuppers created from snow melted by exhaust vents.

People and Animal Flow

Environmental Strategy

The incorporation into the building of animals as an environmental factor is a lighthearted one and meant to facilitate and fulfil social needs, rather than a physical need, as would be the case with heating or air flow.

Spatial Implications

The actual units containing the birds are relatively small and are placed aligned with the large structural shear walls. The units open to the exterior as well as the interior so that the fancier can gain access. Additional space at this level would be provided to accommodate the pigeon fancier's facility and residence. The flexible social space on the uppermost floor could serve for events based around the pigeon racing.

Social Implications and Poetic Narrative

The addition of these dovecotes do not serve any agrarian need, but rather a simple social one; that people may rediscover the joy of mingling with species other than their own. Something that is very well established in the culture of Haligonians upstream of Freshwater Creek in the Public Gardens, where children and adults alike enjoy the spectacle of the birds and partake in feeding and chasing them. Further, these dovecotes could serve as the source of the leisure activity of pigeon racing.

It is imagined that the nouveau riche of Nova Scotia might ascend the redesigned Fenwick Tower to the dovecots and joined amenity space for these regular sporting events, here they may mingle with ordinary residents who in turn have arrived to enjoy the scenic flocks of birds and odd characters that a program like this may draw.

The rendered image shows the flocks of pigeons animating the sky around the building. A group of people are gathered in one of the social breezeways spaces where they may enjoy watching the flock from above. The citizens of Halifax can now look up at the tower whose once brutalist facade represented a dull and dead monotony, and instead see it teeming with life.



Dovecotes at the upper levels of the building.

CHAPTER 3: CONCLUSION

The thesis set out to discover new ways in which one might engage with the exterior environment and what the potential is for building systems to provide the opportunity to do so. Considering the inside-outside dichotomy in a critical light represented forays into the nature of architecture itself and its role in placing us in the world. Translating these philosophical reflections into reality resulted in a proposed design with evidence of this emphasis on the imagination.

The tight skinned buildings in the Canadian urban context serve to disconnect one with nature and there is a real need for reconsideration of this condition. It was found that the regularity and uniformity commonly found within this typology lends itself easily to improvement and the potential for adding significant richness to the architectural experience. Incorporating a gradient of environment within these building types will become increasingly relevant to future architects who will be looking to utilize passive heating strategies.

The term environment can refer to any number of various factors and one significant difficulty with the research was how to categorize and study it. In addition, our way of experiencing the world through our senses and understanding can manifest itself in a great number of ways. Thus the way in which the thesis analysed “environment” and our “experience” of it has undoubtedly not been exhaustive. The infinite nature of this subject matter offers an exciting field for further exploration and the thesis contributes only the beginnings of a method for approaching it.

One of the largest difficulties with this thesis was the problem of selecting a site appropriate for testing out the research ideas. Although Fenwick Tower presents many opportunities and benefits, most of which I believe contributed to strengthening the studies, it also created unavoidable shortcomings. Committing to the choice of renovating an existing building carries with it the need to justify any large changes to its functioning. It may have been dubious to make some of the radically different proposals to the unit layout of a building which currently works well enough, given the expense to change it. It also could imply that the project is focused on another area. For example the primary focus was on the experience of the elements through building systems, not necessarily on new sustainability

strategies for buildings from the 1960s. It is easy to see how the original intent might have become obscured in this way. I believe that choosing a site on which to erect something new would have proven to supply a stronger argument, clarity and continuity from the modelling studies to the final proposal.

The thesis sought the marriage of the technical and the poetic and one shortcoming in the communication of this was in the way in which it was represented in two separate modes. The more technical narrative was represented by the axonometric diagrams and the poetic narrative through a series of rendered images. Although I believe that the integration of these two narratives was well thought out, it may have been advantageous to pick one unified mode to explain it.

Careful attention to keep within the framework of the economic system in which we operate must be paid for any conclusions of the thesis to be accessible to the public. The benefit of working with building systems to provide environmental experience is that it in part justifies the creation of such spaces within this framework. This is the direction in which the next significant development of the topic should proceed; the economic feasibility of such a proposal needs further consideration as well as resolution of the buildability, and functionality of the passive strategies. Accomplishing this, while continuing to keep within the intention of the thesis to enrich architectural experience is the next direction in which to proceed.

REFERENCES

- Alexander, Christopher, Sara Ishikawa, and Murray Silverstein. 1977. *A Pattern Language: Towns, Buildings, Construction*. New York: Oxford University Press.
- Bachelard, Gaston, and M. Jolas. 1994. *The Poetics of Space*. Boston: Beacon Press.
- Banham, Reyner. 1969. *The Architecture of the Well-Tempered Environment*. London: Architectural Press.
- Dale, Jan and Edyta Chruscinski. 2013. "Pedestrian Wind Assessment, Halifax, NS". *Blue-nose Inn and Suits*. Accessed February. <https://www.halifax.ca/planning/applications/documents/18993WindStudy.pdf>
- Dumaresq & Byrne Ltd. 1969. "Fenwick Place drawings." Halifax, Nova Scotia.
- Gaba, Eric. 2010. "Dovecote by Oscar Niemeyer in Brasília." *Wikimedia Commons*. http://commons.wikimedia.org/wiki/File:Dovecote_by_Oscar_Niemeyer_in_Bras%C3%ADlia.jpg.
- Gissen, David. 2009. *Subnature: Architecture's other Environments: Atmospheres, Matter, Life*. New York: Princeton Architectural Press.
- Government of Nova Scotia. 2014. "Wind Atlas." Accessed December 2014. <http://www.nswindatlas.ca/>.
- Grimshaw Architects. 2015. "Expo '92 British Pavilion." Accessed February. <http://grimshaw-architects.com/project/british-pavilion-expo/>.
- Halifax Regional Municipality. 2009. GIS datasets compiled December 2014 using ArcGIS [GIS software] and AutoCAD 2015 [CAD software] as a subset of the original dataset.
- Halifax Regional Municipality. 2014. "Facility Development, Alderney 5 Energy Project." <http://www.halifax.ca/facilities/Alderney5.php>.
- Harries, Karsten. 1982. "Building and the Terror of Time." *Perspecta: The Yale Architectural Journal*, 19: 59-69.
- Harries, Karsten. 1997. *The Ethical Function of Architecture*. Cambridge, Mass: MIT Press.
- Heidegger, Martin. 1962. *Being and Time*. New York: Harper.
- Heschong, Lisa. 1979. *Thermal Delight in Architecture*. Cambridge, Mass.: MIT Press.
- Historic American Building Surveys. 2015. Plate #44, "Ernst Wasmuth A.G., 1911, Plan of the Main Floors." *Library of Congress Prints and Photographs*. <http://www.loc.gov/pictures/item/ny0203.photos.116396p/>. Accessed January.

- Isozaki, Arata, and Yasuhiro Ishimoto. 1987. *Katsura Villa: Space and Form*. New York: Rizzoli.
- Isozaki, Arata, and Virginia Ponciroli. 2005. *Katsura Imperial Villa*. Milan: Electa Architecture.
- Johnson, Eirik. 2010. "The Glass House Blog." August. <http://philipjohnsonglasshouse.wordpress.com/2010/08/page/2/>.
- Jordana, Sebastian. 2009. "Sverre Fehn 1924-2009." *ArchDaily*. February 25. <http://www.archdaily.com/?p=15291>.
- Kohak, Erazim. 1987. *The Embers and the Stars: Philosophical Inquiry into the Moral Sense of Nature*. Chicago: University of Chicago Press.
- Mariana. 2007. "Azuma House." *Wikiarquitectura, Architecture of the World*. http://en.wikiarquitectura.com/index.php/Azuma_House.
- Mugerauer, Robert. 1993. "Toward an Architectural Vocabulary: The Porch as a Between." In *Dwelling, Seeing, and Designing: Toward a Phenomenological Ecology*, ed. David Seamon, 103-128. Albany: State University of New York Press.
- NASA Earth Observatory/NOAA NGDC. 2015. December 5. m.earthobservatory.nasa.gov.
- Osborn, Liz. 2015. "Canada's Rainiest Cities." *Current Results, Weather and Science Facts*. <http://www.currentresults.com/Weather-Extremes/Canada/wettest-cities.php>.
- Pallasmaa, Juhani. 2005. *The Eyes of the Skin: Architecture and the Senses*. Chichester: Wiley-Academy.
- Philippe Rahm architectes. 2008. "Digestible Gulf Stream." <http://www.philipperahm.com/data/projects/digestiblegulfstream/index.html#>.
- Philippe Rahm architectes. 2014. "Office Agenda." Accessed Dec. 19. <http://www.philipperahm.com/data/rahm-office.pdf>.
- Reid, Mike. 2012. "Historic Wetland Loss in Nova Scotia." *Government of Nova Scotia: Environment*. <http://www.novascotia.ca/nse/wetland/historic-wetland-loss-ns.asp>.
- Reinraum. 2012. "Pomidou Center Building Technology." *Wikimedia Commons*. http://en.wikipedia.org/wiki/File:Pompidou_Centre_building_technology.jpg.
- Sharr, Adam. 2007. *Heidegger for Architects*. London: Routledge.
- Solnit, Rebecca. 2003. "The Annihilation of Time and Space." In *River of Shadows: Eadweard Muybridge and the Technological Wild West*, 1-24. New York: Penguin.

- Taylor, Zack. 2011. Waye Mason Councillor - District 7: Halifax South Downtown. "Halifax Density Maps (2011 Census Data)." <http://wayemason.ca/2013/03/08/halifax-density-maps-2011-census-data/>.
- Templeton Properties. 2014. *Fenwick Tower Redevelopment*. January 31. file:///F:/Documents/2014_2015/M5/References/19293ProjectStatsand3DImages.pdf.
- Thoreau, Henry David, and J. Lyndon Shanley. 1971. *Walden*. Princeton, N.J.: Princeton University Press.
- Utting, D. J. 2011. Surficial geology map, part of the Halifax Claim Reference Sheet 11D/12D and 11D12A Halifax County, Nova Scotia; Nova Scotia Department of Natural Resources, Open File Map ME 2011-009 and ME 2011-011, scale 1:25 000.
- Vice Media. 2013. *The Swiftest Pigeon*. Vice Documentaries: Wild Things Series. http://www.vice.com/en_ca/video/the-wiftest-pigeon-part-1.