

HACKING ARCHITECTURE: RE-ENVISIONING ARCHITECTURE TYPOLOGY

By

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Hacking Architecture: Re-envisioning Architecture Typology
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Abstract

The city is in flux. The future of living and working in city are changing. A large amount of urban fabric is changing to conciliate our needs for the future. The question is, is a new building necessary? Currently, there are large amounts of underutilized urban building stocks that can be transformed into something new to accommodate our future needs for the city. The future of building is not about creating an individual object, but rather deals with socio-cultural activities that redefine city living. This thesis will be looking at how to deal with existing building and envisioning a new building typology by using the idea of hacking. Following the logic of hackers, everything is hackable; when hackers hack into computer systems, they produce new things by altering original sources. The idea of hacking is introduced as a means of research method to modifying the features of a system and organizational tools to find a new relationship.

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To My Father

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Prologue

Today, technological advances, the changing needs and working styles of a diverse workforce have shifted the meaning of the workplace. To companies and entrepreneurs, a workplace is a pivotal tool to attract and retain top talent and enable collaboration. To employees, it is a second home where they spend a significant amount of time which impacts their efficiency, creativity and quality of life.

As a result, the future of the work environment is changing. In the past, the working environment was static, and now it is becoming mobile. People do not need to stay in a dedicated space to work anymore. An increasing number of entrepreneurs and the advancement of technology are encouraging people to collaborate with others. The current structure of working space in the city is a shadow of the post-war era. In today's society, the workplace is not about production, but rather it is a space that enables people to exchange ideas and collaborate.

In order to meet these changes in the city, working space now needs to support various forms of work. Looking at the history of the workplace shows it has evolved from a small room to an office tower. In the future, the idea of the workplace will be reshaped and defined as "community", where young and creative generation meet and reshape the city.

Compared to Asia, North America had a large inventory of building stocks that can be transformed into new workplaces meeting city future needs.

In this thesis, the idea of hacking will be introduced as a means of research on how to transform existing office building typology into the future workplace. In Abramson's book *Obsolescence*, the idea of *obsolescence* made people look at buildings as if they were disposable (Abramson, 2016, p. 5). In the past, numerous architectural concepts such as metabolism, adaptation, and the 3 R's (Reduce, Reuse,

Recycle) meant new possibilities for repurposing existing buildings. The idea of hacking as a research method is another way to reclaim the existing urban fabric. A hacker looks at *things* as sources to be hacked; to repurpose *existing things* to produce *new things*.

There are three approaches to using hacking as a research method to redefine existing office typology and workplace. The first is investigation of building typology and reprogramming of its function. The investigation of building typology unlocks the potential of re-envisioning existing typology. The second approach to using hacking is to look at a city system. The city is a living organism. In the city, integration of different layers of a system, such as transportation, buildings, and infrastructure, acts as circulation to service people. Within the linkages of the system, the city is divided into public and private spaces. The third approach is hacking an existing building. This approach looks at possible potential opportunities to use an existing building by disassembling and then reassembling the building; examines the different possibilities it may possess, both physically and purposefully. The goal of hacking in architecture is to redefine existing architecture typology, and redefine future of living and working in the city.

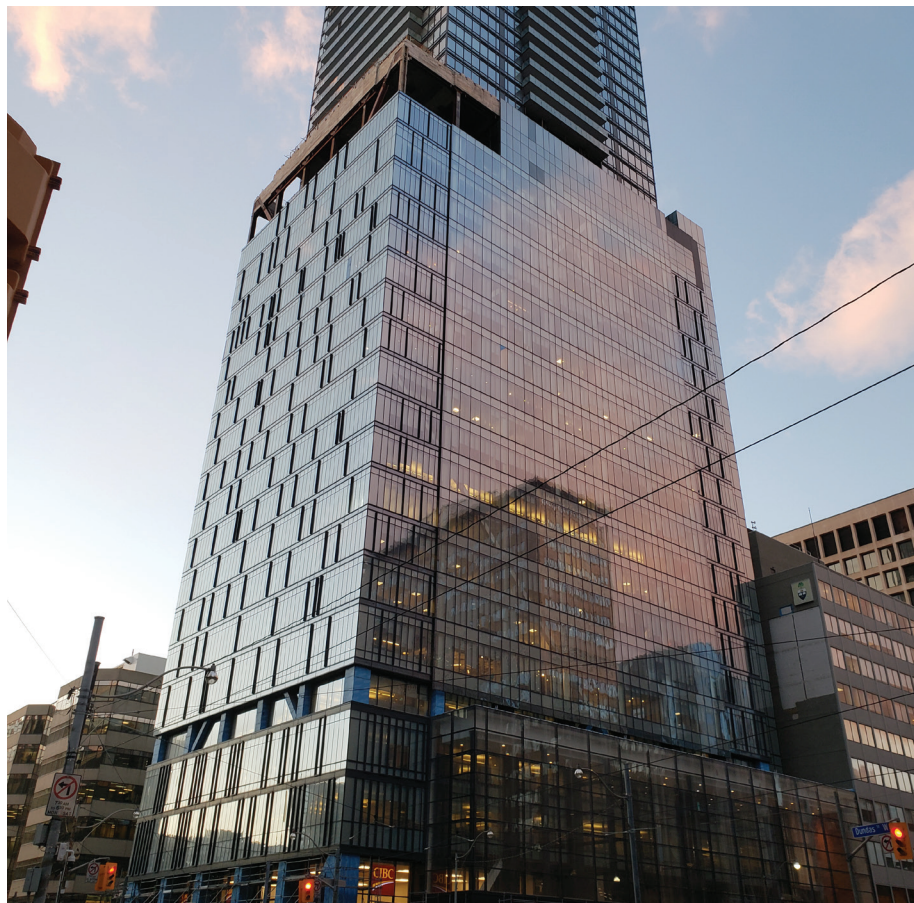


Figure 1.
Office Building
Transformation

Chapter 1. Hacking

“I was addicted to hacking, more for the intellectual challenge, the curiosity, the seduction of adventure; not for stealing, or causing damage or writing computer viruses.”

- Kevin Mitnick, (2011)

In the *Oxford Dictionary of English (2015)*, hacking is defined as:

- “a. To cut, notch, slice, chop or sever (something) with or as with heavy, irregular blows*
- b. To break up the surface of (the ground)*
- c. To damage or injure by crude, harsh, or insensitive treatment; mutilate; mangle*
- d. Be able to manage*
- e. Computer:*
 - 1. To modify (a computer program or electronic device) or write (a program) in a skillful or clever way*
 - 2. To circumvent security and break into (a network, computer, file, etc.), usually with malicious intent”.*

1.1 What is Hacking?

This question has been brought up many times over the years. Each time when we answer, the meaning of hack constantly changes due to different contexts. Society has traditionally thought of “hacking” as criminal activities or cracking illegally into computer system; hence, the word “hacking” has gained a negative connotation.

The word “hack” first appeared in English around 1200; was defined by Oxford dictionary as “roughly cutting or blowing something out” (Yagoda, 2014). It was at the Massachusetts Institute of Technology (MIT) that ‘hack’ carried a different meaning than the original definition. In 1959, MIT Model Railroad Club described *hack* as “playful cleverness” (Levy, 2010, p. 28).

In *A Hacker’s Manifesto*, McKenzie Wark defines hacking as the act of creating new information by redefining the original (Wark, 2004, p. 2). He also explains that everything is hackable; and that hackers are the ones who share information with the world and bring it new possibilities (Wark, 2004, p. 15). In recent years in the architecture field, the word hack is being used to describe a new thinking process. Hacking explores a new relationship between unrelated matter, to bring a positive impact on the city, or to use as activism.

1.2 Hacking in Literature

The term ‘hacking’ has been used in many different ways and contexts throughout history. It has been referenced as far back as Greek mythology and is a common theme in modern and historical literature. In Greek mythology, Hermes is considered a divine messenger and an inventor. Hermes was an Olympian god who could swiftly and easily move from the human world to the heavens. Because of this efficiency and his chaotic nature, he was sometimes described as a liar and a thief. Unable to be bound or captured by any mortal, he had a penchant for transferring physical objects from one place to another as a form of hacking. What Hermes was known for doing was more closely related to the concept of hacking than it was to thievery; this ‘Hermes nature’ has become part of architectural hacking as well (Smith & Smith, 2016, p. 4). Architects transfer, steal or borrow ideas across many different contexts.

A literal example of hacking comes in Mary Shelley’s horror novel *Frankenstein*. The character known as the “monster” has been assembled using a variety of different body parts and then is brought to life by Dr. Frankenstein (Laemmle & Whale, 1931). The individual body parts are meaningless alone; but when they are assembled, create meaning and essence. This idea of Dr. Frankenstein’s to assemble various ‘other’ parts and make them into a new whole has a direct reference to the ideas of hacking; in particular, McKenzie Wark’s definition of hacking where “anything is hackable” (Wark, 2004, p. 15). By salvaging these different parts, the thing is reinvented as a whole.

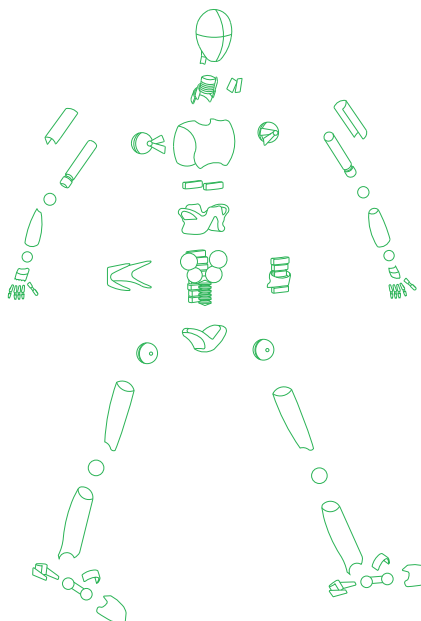


Figure 2.
Disassembly of Machine

Figure 3.
Movie *Frankenstein*,
Laemmle & Whale, 1931

In the book, *A Hacker Manifesto*, McKenzie Wark provides an alternative view on the hacker and hacking. *A Hacker Manifesto* explains the potential of hacking. Wark says, “Whatever code we hack, programming, language, poetic language, math or music curves or colourings, we create the possibility of new things entering the world. Not always great things, or even good things, but new things” (Wark, 2004, p. 14). In his view, everyone, regardless of their profession, can be a hacker. Their creativities and alternative ways of looking at things in the world create new elements that can benefit or harm. Also, Wark sees the world as a collection of information and data that can be extracted. By gathering and extracting world data, we harness the ability to create new things in the world. The modern concept of the hacker is known as a class representing a fragment of ‘normal’ society who struggles to express themselves to the world. The lack of sharing between hackers limits their ability to bring a new possibility to the world. Therefore, collaboration among hackers is required to reach a new horizon. In a word, hacking is seen as an experiment that reconstructs unrelated matters of state and is able to find a way to break out from its original state into something new.

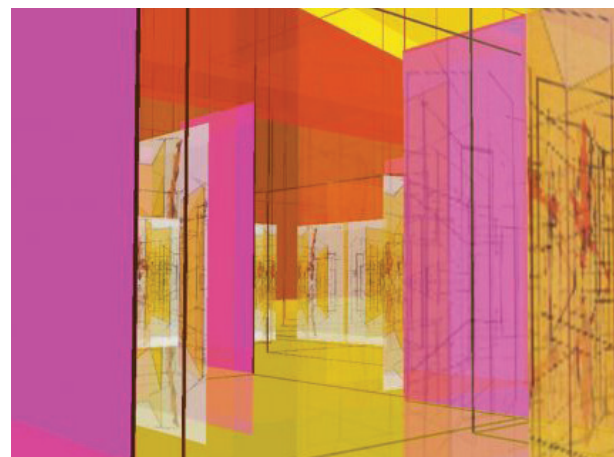
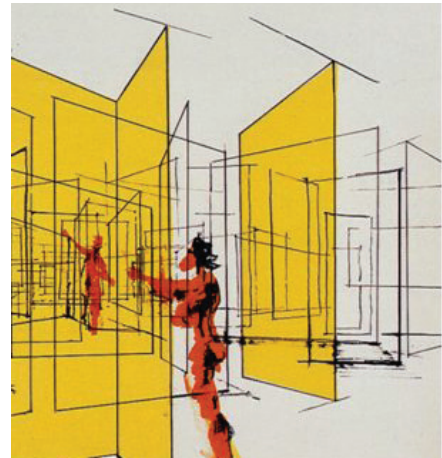


Figure 4.
New New Babylon,
Ali Dur & McKenzie
Wark, 2011

1.3 Define Hacking in Architecture

What is hacking in architecture?

Hacking:

- a. *To modify*
- b. *Finding a new relationship between unrelated matters*
- c. *Redefine the existing by altering the original*
- d. *Explore a new meaning*

Hacker = Architect



Figure 5.
Timeline of Hacking
Theory

In architecture, hacking is a process to find new meaning from the original creator's intent. As McKenzie Wark states, "a hacker is anyone that can create a new thing by redefining existing things" (Wark, 2004, p. 14). Architect and designer are seeking a new way of doing things, from built form to programming spaces. The term 'hacking' began to be used in the field of architecture after the 1900s.

In the early to the mid-1900s, the idea of hacking was represented as metabolism (James & Yoos, 2016, p. 82). These ideas have rejected the idea of egotism in the architecture field. Metabolism and cybernetic suggested that building is not meant to be there forever and it is meant to be changed (James & Yoos, 2016, p. 87). This idea is similar to 'Kitsch' style of painting. 'Kitsch' painting turns an old painting into a new painting that corresponds with the current era (Harrison & Wood, 1992, p. 534). This idea encourages architects and designers to reject the old if it is necessary because building needs to be 'up-to-date'. Having said that, abandoning an existing building completely is not a sustainable option.

The concept of unitary urbanism reflects the idea of hacking. Unitary urbanism reconstructs situations in order to recapture and transform everyday life. This theory shows how the city is in constant change and how it requires change to be relative for the future.

Cedric Price's *Fun Palace* and Archigram's work are examples of an early idea of hacking in architecture. Cedric Price's *Fun Palace* challenges the very definition of architecture; introduces an open frame structure that can interact with its user (Sadler, 2005, p. 36). The *Fun Palace* explores space, mobility, and technology; has a flexible and adaptable design that can "alter, transform, and demolish" buildings based on its users' needs and desires (Wilken, 2007, p. 11). In *Manifesto of Fun Palace*, Cedric predicts that the evolution of technology will change the future of work, education, and leisure (Fernandes, Mojaz, Arpa & Holl, 2011, p. 14). His

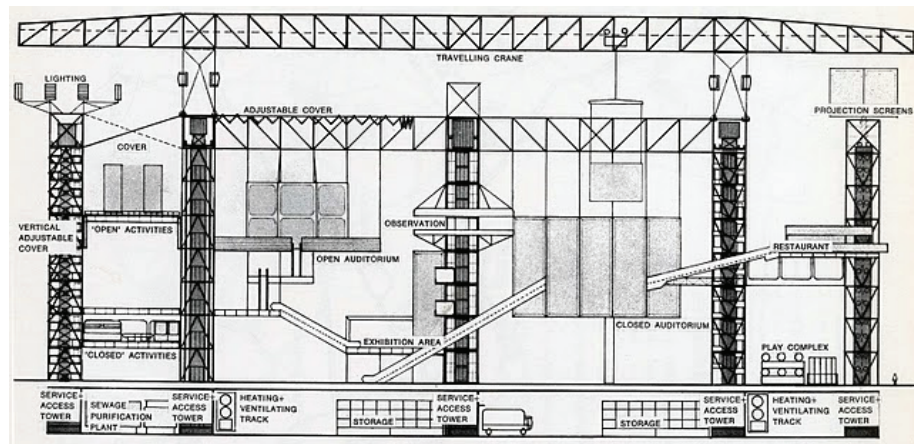


Figure 6.
Fun Palace, Cedric Price,
2014

exploration from Manifesto of Fun Palace shows a building does not have to be static, but can be movable, active, and able to adapt to change constantly. In Fun Palace, Cedric uses the idea of 'skeleton' - where within a framework, the program and space can be changeable for its user's needs. This idea of Fun Palace reflects the concept of hacking in architecture. Looking at buildings as a changeable framework brings infinite possibility to create a new meaning of space.

In 1947, the first playground designed by Aldo Van Eyck was built in Amsterdam. Over the years, the idea of the playground was forgotten by society (Withagen, 2017, p. 2). Van Eyck shifted from the 'top-down' approach of traditional practice to 'bottom-up' to fulfill his imagination. After the postwar baby boom, there was a lack of support for an area where children could play. The existing playground was accessed through membership. Van Eyck intended the playground to be temporary, but later it becomes used as a permanent solution. Van Eyck's belief was, "architecture should not forget about human aspect. Buildings should be able to facilitate activity and able to promote social interaction" (Demerijn, 2013). Van Eyck's definition of a threshold is somewhat different from what we use it in practice today. He does not use the threshold as a dividing tool, but as a link between one space to another (Teyssot, 2011, p. 51). In essence, threshold is a transitional space that can be active or passive. It is a space where people can choose to pass by or actively engage; or it can be a programmable space of the inside.

In the late 1900's, a group of urban hackers sought to reclaim the urban fabric from capitalism. Urban hackers follow a logic called 'hacktivism'. 'Hacktivism' combines the ideas of hacking and activism (Jordan, 2004, p. 1). This movement is used to bring social or political change in society. Urban hacking is the activist movement looking to find a relationship between public and private. Their approach to hacking shifts the top-down structure and challenges the hierarchy of traditional architecture practice. For example, a group of architects calls *Recetas Urbanas* tries to demonstrate urban hacking by invading and reprogramming abandoned or vacant space throughout the city in Spain. Their project, *Container*, reflects their idea of urban hacking. The Container was installed on a vacant lot where there was no playground for children in the neighbourhood due to a shortage of government funding (Bermand, 2015). *Recetas Urbanas* saw the Container as an opportunity to provide better community space for the surrounding neighbourhood.

The process of hacking happens on a micro to a macro-level in the urban fabric. Projects like *PARK(ing) Day*, transforms parking spaces to create small urban plazas. The legal code of San Francisco does not state that parking space have to be

used by a parked vehicle; thus, the ideas “to park people into parking lots” emerge. The organizer Blaine Merker states, “creative repurposing of familiar elements to produce new meaning” (Bela, 2015). The space is no longer a parking spot; it becomes a rentable public space. This small-scale activism brings the question of how we can rethink to create public space. To most people, a parking lot has a function to park vehicles, but to other people it could become an urban retreat and a space of social interaction.

In contemporary architecture practice, the idea of hacking is used by architects, such as Gensler and Nille Juul-Sorensen. They discussed the concept of “hacking” as modifying existing buildings or infrastructure, to create something new that differs from the original creator’s intent (Juul-Sorensen, 2016). Hacking is used as a means to find out if the relationship between unrelated matters can be discovered, and if the building acts as a resource to rebuilding urban fabric. This idea is similar to cybernetic and metabolism. The building is a non-static object. It is an open-frame structure that is able to adapt to change.

Figure 7.
Parking Day,
Jim Lahey, 2008



Figure 8.
Hacking the City,
Gensler, 2012



Figure 9.
Mobile Workforce

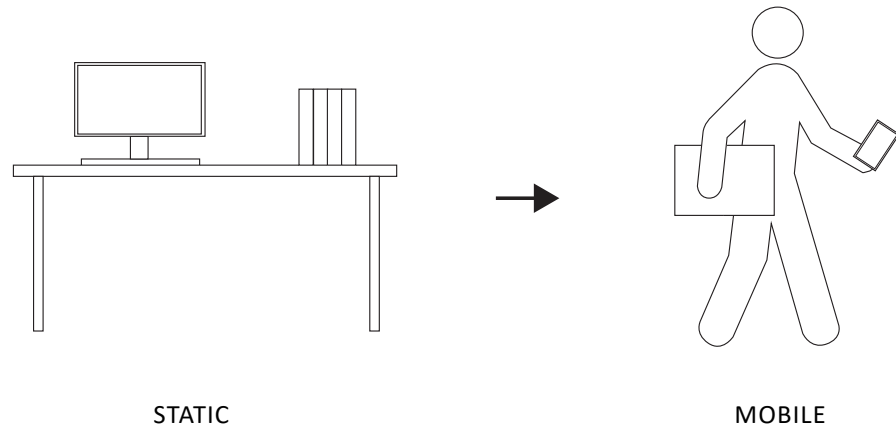


Figure 10.
Scene from TV Show
Office, Silverman,
Daniels, et al., 2013



Chapter 2. Architecture Typology

Architecture typology or building typology is the classification of a building type categorized by their function and forms. In an urban context, two methods that define building typology are function and form.

The first method is functional typology - distinguishing buildings by looking at their function. Functional typology categorizes building into groups, including hospitals, schools, housing, offices, museums, and shopping centres.

The second method to define building typology is grouping by form. Categories of buildings are subdivided by sizes, shapes, and functions. For example, an office building form could be high-rise, mid-rise, low-rise, linear buildings, point-block buildings, spine-and fingers buildings, or courtyard building (Bielefeld, 2013, p. 199).

The goal of building typology is to create documentation of different types of building forms and functions. As the city is constantly changing and evolving, building typology has been evolving too. Since after post-war era, the building typology has been rapidly changing due to advances in technology (Rassia, 2017, p. 9). In modern architecture practice, instead of creating a new building typology, the existing building typology is used as ideal models, to be reproduced throughout the urban fabric.

The exploration of building typology should be a necessary investigation of design practice to redefine existing building typology for the future. Hacking in building typology is to find a new relationship between past and current building typology in order to re-imagine a future building typology.

In this chapter, we are looking at the history of office building typology and the current paradigm of the office building, which reimagine office building typology for the future.

2.1 The Future of Office Building and Workforce

The origin of a modern office came from ancient Egypt. Egyptian 'office space' was administrative space in the building (Rassia, 2017, p. 9). This 'office space' is sometimes called a library, and it was also a storage room for scrolls and records (Rassia, 2017, p. 9).

In the Middle Ages, as Greece and Rome utilized administrative office space, the idea spread. The office space in the Middle Ages became space assigned to different jobs such as accounting, registration, and copying laws. These types of occupations are also found in the modern era of the office workplace. Office space consisted of bookshelves and a large table to allow multiple people to work at the same time. It is the era where the difference between the library and office space parted. The concept of 'hot-desking' was invented as a design strategy for a mobile working environment (Rassia, 2017, p. 9). Hot-desking means that there is no longer an allocation of permanent desk in an office space; and desk is available on a first-come, first-served basis.

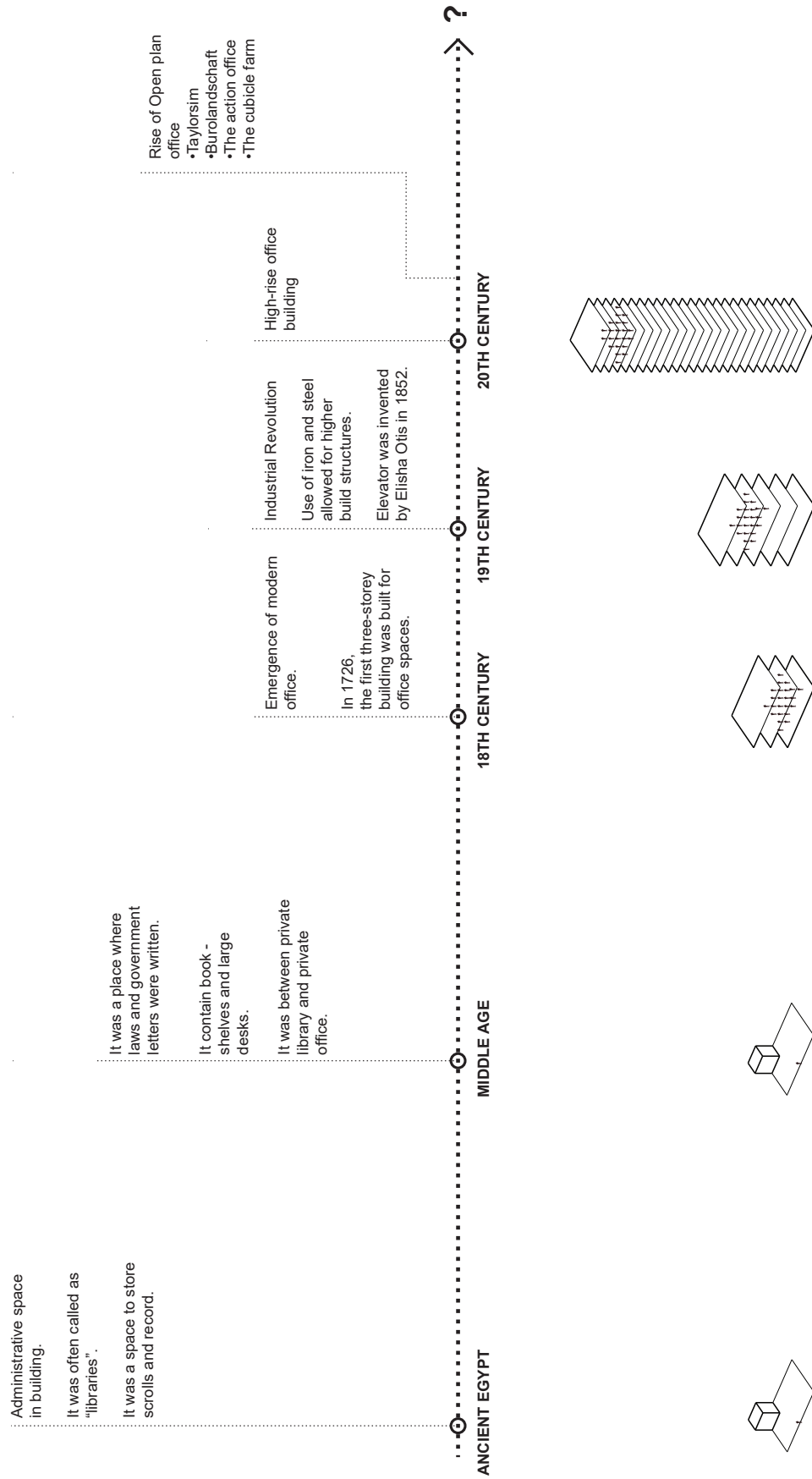
In 1560, Uffizi, the administrative and legal office of Florence had U-shaped three-story building that contained gallery spaces and office spaces throughout (Rassia, 2017, p. 10). From this moment, the development of office building was used as a foundation for the modern era of office space.

The concept of public and private development initiated office building typology. The rise of private sectors such as banks and commercial enterprises required dedicated space in order to carry out work all day. A rapid economic growth and an increased need for office work led to a rising number of office space around the city. The first office building was created in 1726 (Rassia, 2017, p. 11). This building was designed to carry out office work. Other than office space, the program of the building contained meeting rooms and housing room for high-ranking officers.

The Industrial Revolution in 18th to 19th centuries became a foundation of modern office typology. More workforce is required as a result of a rapid growth of different service sectors, such as banking, rail, insurance, and retail. The Industrial Revolution allowed the mass production of iron and steel, which are structural support materials. Iron, steel, and the invention of elevators allows the construction of taller buildings (Rassia, 2017, p. 12).

The architectural change in the 20th century of office building typology was significantly influenced by Le Corbusier (Abalos & Herreros, 2003, p. 15). He formulated an idea called *Ville-tower*, which later became the basis of the skyscraper.

Figure 11.
History of
Office Building Typology



His idea of Ville-tower was to increase urban density with commercial industry. Le Corbusier's utopian radiant city design uses a grid pattern to organize space geometrically (Abalos & Herreros, 2003, p. 16). Furthermore, he uses symmetry, repetition, and reproduction of skyscraper throughout the city; in which, reflects the idea of the Industrial Revolution. This idea becomes the basis of contemporary office building typology.

The very idea of using a building to house mass production causes problems later on in contemporary architectural practice. In contemporary architecture practice, this founding idea of Ville-tower brings a negative impact in the city because the building seems like a manufacturing, copy and paste product. However, buildings should not act as a singular object. It is a part of the system in the city that connects people and their city.

The invention of the skyscraper and development of an open-plan office is what we see in today's current workspace. The idea of the open-plan originated from Frederick Taylor's theories *Taylorism* (Eberhard & Kraft, n.d., p. 5). The vision of Taylorism was to increase productivity in the workplace—the lack of natural lighting and cramped office layout is a reminiscence of factory working environment. His theories influenced the creation of Burolandschaft, the action office, and the cubicle farm (Eberhard & Kraft, n.d., p. 5).

The cubicle is dominantly used in the modern office environment. However, due to the advance of technology development in the 21st century, the idea of the office environment is changing. The workforce becomes mobile; and workers do not need large computers and books to work with anymore. The information we create is archived through the cloud system; that means, storing information does not require a physical space. Soon, an automation of the workforce will be introduced; thus, more jobs will require creative thinking to work. This change is taking place in the office industry; the idea is re-introduced to explore the relationship of a working environment. 'Hot-desking' comes from the Middle Ages to explore a new way of working today. 'Hot-desking' refers to workers who do not have a specifically assigned desk (Rassia, 2017, p. 14). The concept is to create a less formal environment that can be flexible and collaborative. This design plan promote communication and creativity in the workplace.

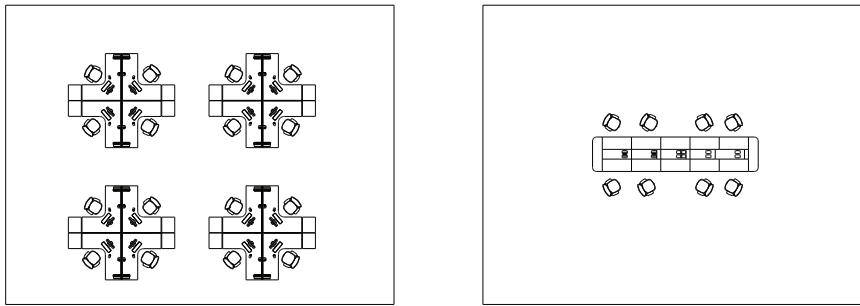


Figure 12.
Comparison between
Cubicle and Hot-Desking

In the past, a dedication of a working space layout was based on bringing maximum efficiency to the productivity of the workforce. However, in the future, with automation, and the advancement of technology, less office space will be required for working in the office. Many high-rise office buildings in North America are shifting from sole ownership to rentable space. In current day, an office building is occupied by a different type of workforce. A multi-functional open-space is required to meet the needs of a diverse workforce. Individual territory inside a working space is slowly diminishing from today's office environment. According to Duffy, the working relationship is divided into the den, the hive, the cell, and the club (Rassia, 2017, p.15).

Den – work and interaction

Hive – open-plan to supervising employees

*Cell – enclosed space for increasing productivity by isolating
the employee*

Club – individual interaction and process working

Typical Office Planning

Den
Hive
Cell
Club

Future Office Planning

Den	—	Collaboration
Hive	—	Interaction
Cell	—	
Club	—	

Figure 13.
Future Office Planning
by Duffy

In the future, the hive will be diminished; and the den, cell, and club will increase to give an active and flexible working space. Duffy's idea of reinventing the workplace shows a new possibility of an evolution of new office building typology (Rassia, 2017, p. 15). Space needs to become more interactive and adaptable to the user.

Google office is an excellent example of this upcoming change in office building typology. In the past, an office building was designed for an administrative and factory-like working environment. The Google office design provides various types of activities and spaces to support a fun and creative working environment (Coleman, 2016). The Google office design project shows how the future of office building is headed in the urban fabric. The office is becoming a fun and enjoyable space that meets various culture needs and collaboration of minds to create a new society.



Figure 14.
Google Office Space,
Marcus Fairs, 2016

2.2 Transformation of the Office Building

The working and living conditions in the city are continually changing; and a new type of building typology is produced in the urban fabric. In the book *Typology Transfer*, Emanuel states, “as the city is evolving, the alternative urban forms and function are needed for the future living condition”, (Christ & Gantenbein, 2012, p. 4). This statement means building typology is not static; it can be changed and adapted to every changing urban fabric. Office building typology alone evolves from library space to high-rise office buildings. Rossi argues that building typology can offer memory and historical reference (Koch, 2014, p. 185).

Every generation requires a new form of office building. A rapid shift in cultural movement and social life changes the future of office building. Similar to the past, the number of office spaces the city requires is shrinking. In North America, an increasing number of vacancy rates in office buildings brings up a question of how to deal with the existing building stocks. Furthermore, compared to the 20th century, office building construction has decreased as well.

In the book *This Is Hybrid*, Steven Holl suggested, “being aware of social activities and changes in living and working conditions, to bring in a new form of architecture called ‘hybrid buildings’ (Holl, 2012, p. 7). This theory shows a shifting idea of building typology. The building typology no longer exists; the ‘hybrid building’ is a mixed bag of ideas and programs combined to form one building. This idea was developed in the 21st century; explored a new form of building that possibly creates a new urban fabric. This idea allows a multi-purpose building to act as a “social condenser to a new community”, a container to carry out different function and program. The hybrid building includes work space, living space, and recreational space.

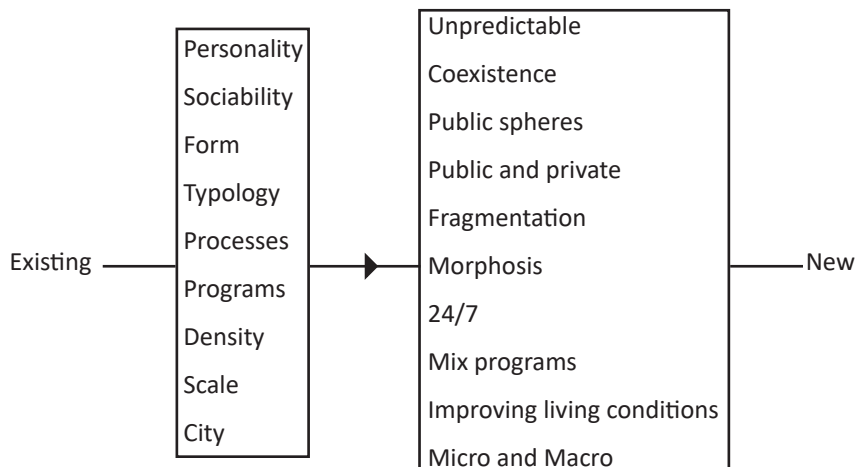


Figure 15.
Concept of
Transforming Typology

The idea of the ‘hybrid building’ carries the foundation of the hacking. ‘Hybrid buildings’ look to find a new relationship between unrelated matters. The limitations of existing office building structure cause an increase in vacancy rates in North America (Gensler, 2017). Similar to the idea of a ‘hybrid building’, the function and form of office buildings must be able to adapt to change. Office space has evolved from a library to a high-rise office building; and now users are looking to a new form of working space for the future. The future of working space must deal with sociocultural activity rather than cubicle space.

The process of transforming office building typology can be investigated through reorganizing the hierarchy of the existing framework of the building. The building typology is about redefining the relationship between form and function. The transformation of a building can be changed by modifying both form and function. The adaptive building practice is an example of altering existing typology. Moneo argues “architecture typology carries both potential and risk” (Koch, 2014, p. 186). A potential of typology is that it can be used as a means of understanding different classifications of building types. However, this idea of classification sets the limit of creating a new form of architecture. The ideology of transforming typology seeks to look at a potential a building carries within.

For example, the transformation of office typology in Hacked Offices by Gensler highlights visions of the future for existing buildings. Gensler uses the term “hacking the planet” as a way to describe how buildings are physically hacked and then repurposed for the future by reprogramming the function and improving the overall quality of the urban fabric (Gensler, 2016, p. 12).

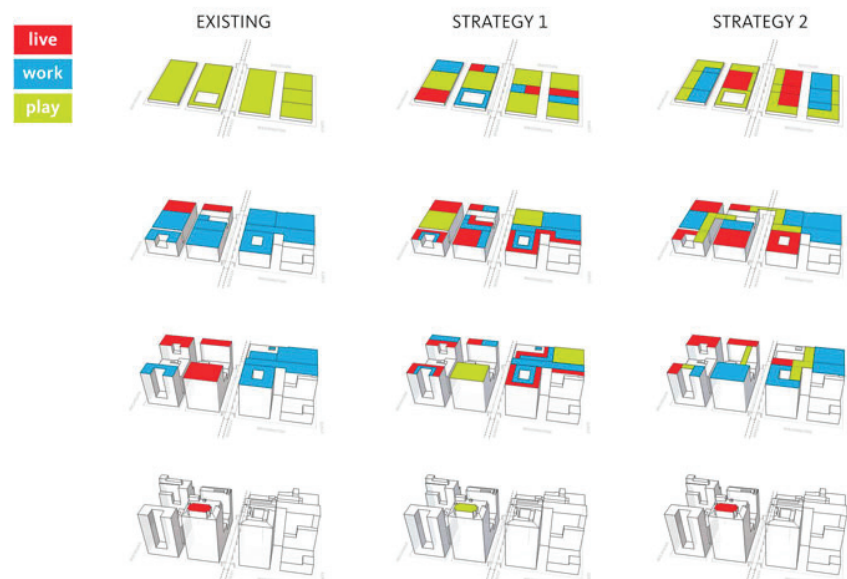


Figure 16.
Strategies for Hacking
Office, Gensler, 2014

J. Edgar Hoover building in Washington, D.C. and the Union Bank tower in Los Angeles, in essence, are 'hackable buildings' (Gensler, 2017). Both buildings have been turned into public spaces. By adding and removing parts of the building physically and programmatically, hackers can redefine the existing building structure. The introduction of new programs and functions to the buildings allows a variety of activities to take place within and around the physical space of the buildings (Gensler, 2017).

From the hackers' perspective, all buildings are candidates for architectural hacking. Looking at an existing building as an object that can be disassembled and reconstructed, Gensler's proposals and successes demonstrate that buildings can be reprogrammed to increase functionality and purpose. Singular uses can become multiple layers of functions, moving away from how things were used in the past. Gensler's Hacked Office, like hacking architecture overall, shows that buildings can further evolve to accommodate future demands.



Figure 17.
Hackable Building
Perspective Section,
Gensler, 2014

Chapter 3. The City as an Organism

This chapter introduces a notion that the city behaves like a living organism. The streets and roads act as circulation that connect between buildings. In a hacker's world, a system consists of hardware components that work together to run programs that are developed by the hacker. The hacker breaks down systems both physically and virtually to create something new for the world. The networking system allows others to access and share. Hackers use networking systems to enter the property, find regulating patterns, and represent its properties to others.

A living city is similar to a hacker's world—a multi-level networking system interconnects with an active city. Cities contain networking systems such as public transportation, pedestrian access ways, infrastructure, public spaces, and private spaces. These collections of networking systems link public and private architecture in the city. Looking at a city as a system allows architects to explore existing relationships between architecture and the environment.

The theoretical idea of Archigram's projects, such as *Computer City* and *Instant City*, look at the city as a system (Sadler, 2005, p. 53). The *Computer City*, created by Dennis Crompton, looked at architecture through the perspective of circuitry grids. In particular, it is not solely about the physical buildings, but instead about how information is processed and transferred from one place to another place (Sadler, 2005, p. 120). This illustration of *The Computer City* shows a series of network systems that connect throughout the city, enabling the inhabitants of the city to move efficiently and allowed a different perspective to be considered when discussing city layout and city planning. It established a networking theory of city investigation and creation, which is directly relevant to hacking. This kind of hacking looks at the existing systems and changing the existing to create something new.

Architectural hacking is about implementing a new usage of a building in both a micro and macro-scale, from the individual parts of a building out to the city. The *Computer City* is a series of networking systems; by altering the network system, the architecture becomes hackable. *Instant City* by Peter Cook uses the analogy of a traveling circus to explore the city as a complete system (Sadler, 2005, p. 144). The concept itself is not a single image or a drawing, but rather a series of media that developed through conversations. In a drawing *The Network Takes Over*, Cook explained that the existing idea of a city had been transformed (Sadler, 2005). A new network system has infiltrated it, showing the process of transformation.

Similar to hacking, reorganization, adapting and changing the existing architecture to better-utilized space and resources bring change for the modern era of architecture. The ideas from Instant City and The Computer City allow architects to understand the relationships between the buildings, places, and information about a city.

Figure 18.
Computer City,
Dennis Crompton, 1964

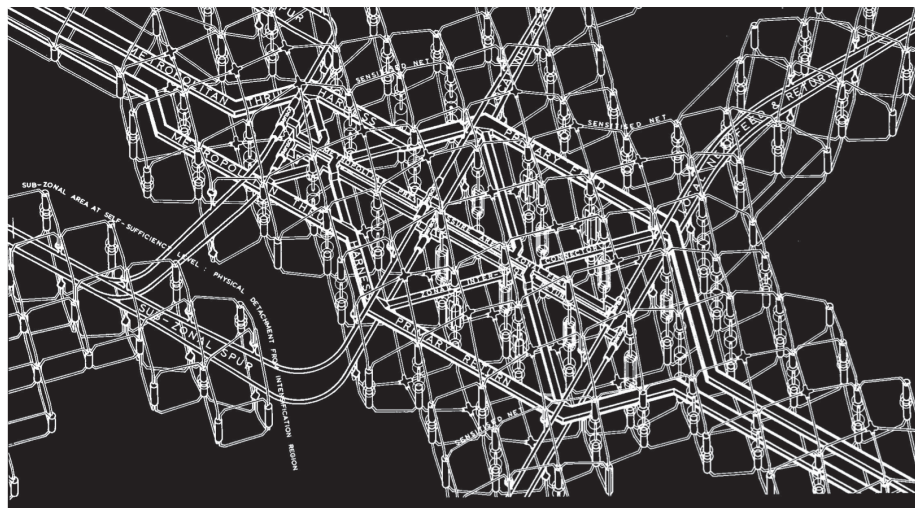
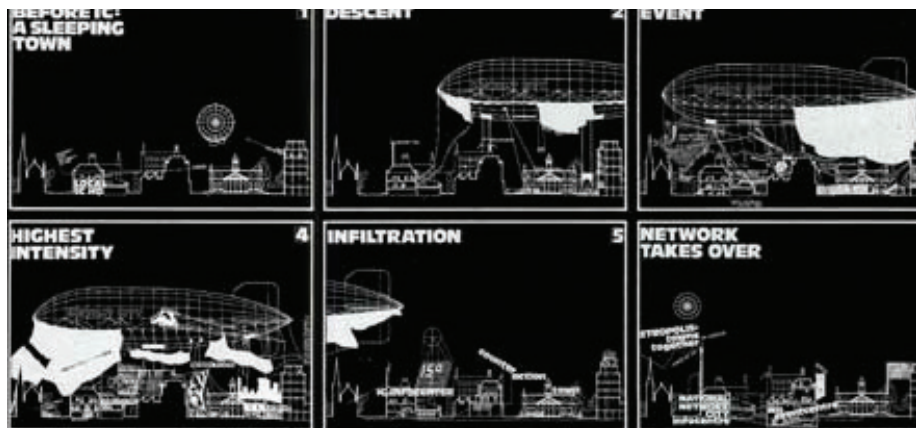


Figure 19.
Instant City,
Peter Cook, 1969



3.1 Layers of the City

In an urban fabric, a city has visible and invisible layers that integrate and co-exist. The visible layers appears on the ground and above ground level; and the invisible and transparent layers appears below the ground. These layers contain systems, such as transportation, street, infrastructure, and utilities. Looking at the layers of the city, a potential to link different levels of a city can enrich the experience of social life for the citizen.

After the 1940s, CIAM8's concepts of multi-level city life was refreshing to the public. This was going to be the future of living (James & Yoos, 2016, p. 60). The proposal of the Gruen skywalk was praised by critics such as Jane Jacobs because the design could clear traffic and had the potential of creating public activities on ground level (James & Yoos, 2016, p. 98-99).

This idea of a multi-level city led to an idea of a continuous network of skyway across the city to support the pedestrian movement. The influence of Gruen's project was widely used in North America but in a diluted form. City planners across North America were focusing on creating a continuous circulation of retail experience that did not interrupt vehicle movement (James & Yoos, 2016, p. 103). However, the problem of creating continuously elevated walkways without creating connection caused disjunction between ground level and above ground conditions. Also, the elevated walkway solely acts as pedestrian circulation; thus, it is difficult for the pedestrian to engage with a walkway. Today, the idea of creating a secondary connection above ground cannot be fully implemented in the urban fabric because

Multi-level of city Layers

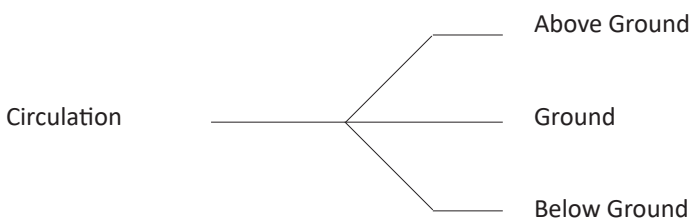


Figure 20.
Layers of the City

the idea is not driven by physical form or architecture experience, it is entirely driven by an economic mode of production (James & Yoos, 2016, p. 104).

Below ground is a layer that does not become visible in the urban fabric. Below ground is initially used for water supply and waste management. However, as population density increased and subways were developed, a new idea sparked for a potential use of the under-utilizing underground space.

In the major cities of the world, a large number of people use the subway system to commute every day. The idea was to travel to the city rapidly, without encountering traffic. Subway system becomes a solution to relieve an increase in the volume of traffic that happens on the ground level. As users of public transportation systems increased, more layers were added to support people's needs. A continuous underground pedestrian walkway, such as the PATH system in downtown Toronto, with added lower-level retail and public washroom, attracts daily commuters, tourist and resident . However, the PATH is still under-utilize. A possible explanation is that the underground layer is not visible on ground level; it causes disjointedness between the ground level and below ground level. In North America specifically, commercialized space and low visibility of light in a space lead to dead spaces after business hours.

The ground is the most active layer in the city. Since a large number of people use ground level, the majority of layers are located on ground level. On the ground level, buildings and public spaces are central to support city life, whether it's urban parks or public and private buildings that support human activity. Public space is especially an area that allows people in the city to socialize and relax from their city living. In the city, a majority of public space is located on ground level because it is easy to access from the street; and provides a natural condition that people need for a brief break. Today's city evolves from the idea of the multi-level city. Since the beginning of the practice of architecture, the ground level has been an essential level in order to integrate buildings. However, a large portion of the ground level is a disconnection between below to above ground level. During the process of urban development, all these levels do not complement one another or are left as 'last minute' thought developments. The disconnection of the ground level with below and above ground leaves some of the areas as dead spaces between and within buildings.

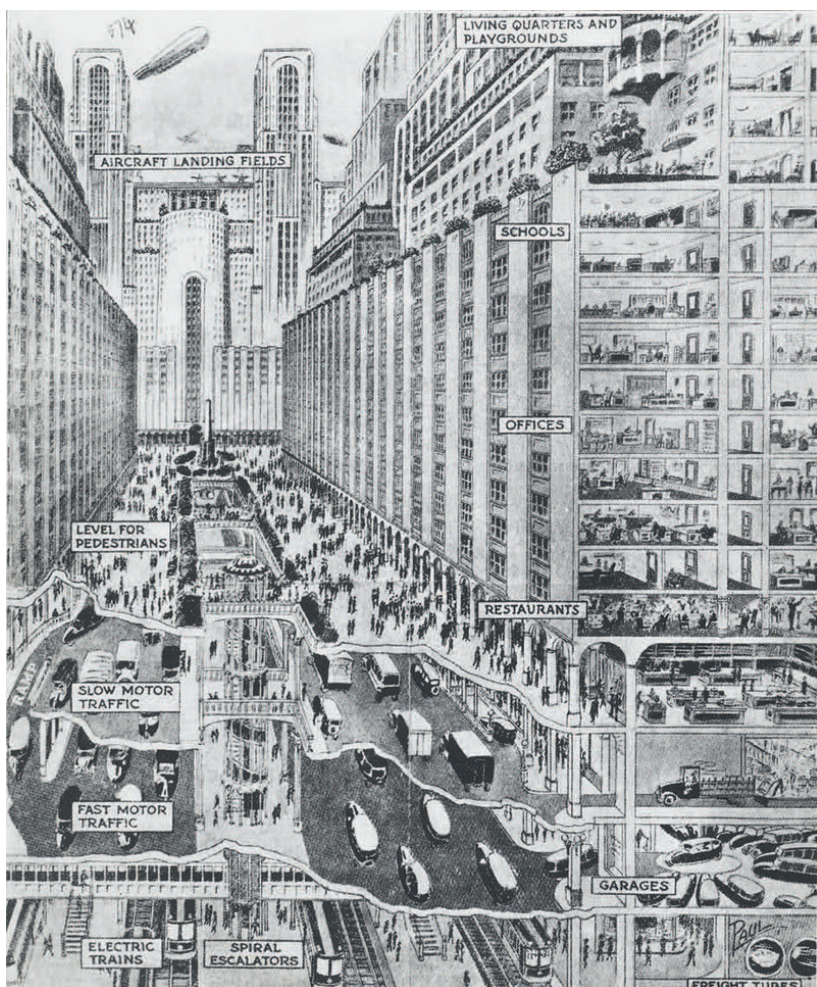


Figure 21.
The Wonder City You
May Live to See, Harvey
Wiley Corbett, 1925

3.2 Strategies for Hacking City's Layers

In the process of urban development, the underground level of the city is often overlooked. To a hacker, an overlooked or abandoned area can be an opportunity to repurpose city structures.

Architectural underground hacking brings a new potential to create a multi-dimensional public space. Over the years, many cities have been trying to redefine the underground level to invite the public. Originally, it was to ease traffic congestion on ground level. The projects *Montréal Underground City* and *New York Low Line* are examples of hacking below ground through an attempt to create social space by redefining the underground layer of the city. The idea of urban development to the underground level can bring a positive impact to the city. These projects are still in progress to create a better way to serve and accommodate public needs for the city.

The Underground City is located in Montréal, Canada. The Underground City holds over a quarter of a million visitors daily. The concept of the project is similar to the PATH system in Toronto. The purpose is to connect different areas of Montréal with the central Financial District areas. The tunnels extend 32 km through different areas (The Canadian Press, 2016). These underground network provides a secure and rapid transit system to visitors. Access to the system is granted from ground level and sky bridges.

The traffic of Underground City significantly increases during Montréal's long winters. The Underground City has robust features, including a large atrium and well-lit space, which encourages visitors to engage with the space. In contrast to the Toronto PATH system, the Underground City is more comfortable to navigate. Instead of looping around the streets, the Underground City mirrors streets which allows visitors to navigate the paths easily. The Underground City provides a continuous atrium of space and large openings of space that connect underground tunnels to allow visitors to feel the presence of streets when they are inside of the tunnels. Also, it functions as a public space, which helps to make space truly act as an underground city.

The approach and usage of the Underground City allows underground space to be further utilized from existing building network and infrastructure. It is essential to note that what makes Underground City more successful than PATH system is a secure navigation system with large open indoor public spaces that allows light to penetrate the underground area.



Figure 22.
Inside of
Montreal Underground



Figure 23.
Map of
Montreal
Underground City ,
Hazan, 2017

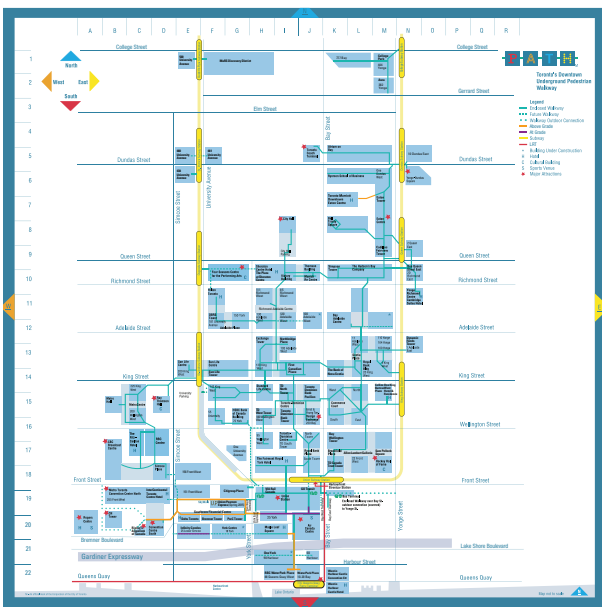


Figure 24.
Map of
Toronto PATH, Toronto
Path, 2019

The Low Line is located on the west side of New York City. The concept of the project is to change a forgotten existing space and create the first underground park in New York City. The Low Line site was originally the main railway terminal for Williamsburg Bridge. After trolley services discontinued in 1948, the site became vacant (The Lowline, 2017). Adjacent to the site, there is a subway track and stop. The vision of the project is to use technology to improve the quality of city living and create more green space in the urban fabric. The lack of public space on the ground-level means there is a need to relocate to an underground area. The project uses different technology and design strategies to provide conditions in which trees and plants can grow. The project is now slowly expanding throughout Manhattan. The project aims to create social and cultural spaces to hold community programs and various activities. When the prototype was launched, over 80,000 people visited, including people from other major cities around the world (The Lowline, 2017). The area holds yoga and meditation classes; and children play there in after-school programs. The concept of the Low Line explains how the idea of hacking can apply in today's existing infrastructure on underground space. Similar to how hackers look at existing information, the Low Line shows how every single inch of space in the city can be used as a resource, often through the reprogramming of existing space to create something new for a city.

Figure 25.
Low Line Master Plan,
Low Line, 2013

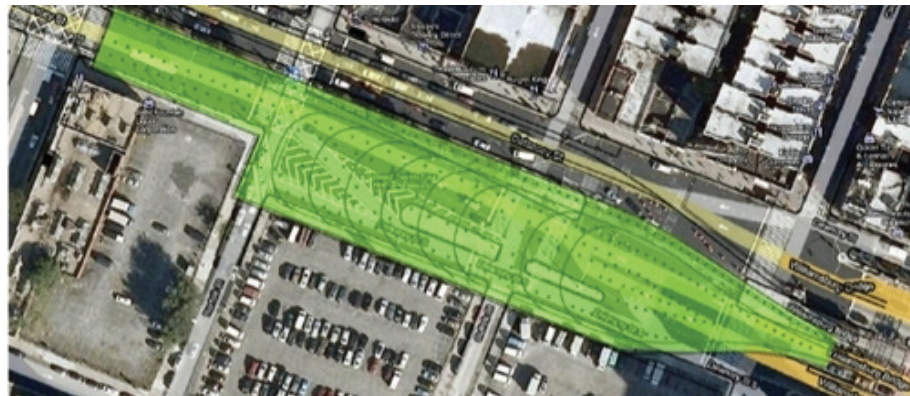


Figure 26.
Interior Image of
Low Line, Low Line, 2013



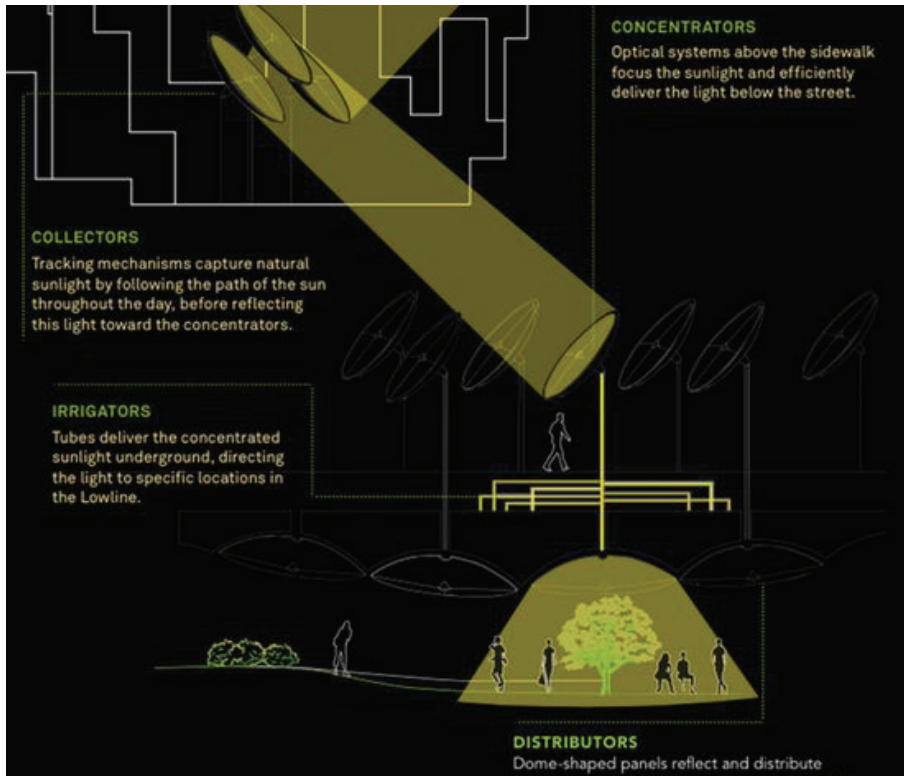


Figure 27.
Natural Light Strategy,
Low Line, 2013

Public engagement does not have to occur only on ground level. The city has existing above ground connections that allow pedestrians to travel to their destination. Compare to the CIAM8's proposal, a large number of the skywalks that connected between buildings in case studies such as *High Line* in New York and Steven Hall's *Bridge of House* are attempts to create a circulatory system that supports public spaces (James & Yoos, 2016, p. 164). The city has multi-level of connections to embrace and link with existing surrounding and buildings.

High Line was the main railway track for transporting goods. The railway passes through the centre of 22 city blocks. Lack of usage of the railway tracks in the city left High Line abandoned, but later it became repurposed as a public space. The High Line is used to gentrify the existing Chelsea neighbourhood. Promenade Plantee in Paris inspired the project. Both *Promenade Plantee* and the High Line used a similar idea—looking for different ways to repurpose existing elevated railway road tracks (Holl, 1981, p. 1). High Line demonstrates how multiple dimensions of public engagement can occur in urban conditions. High Line has over a dozen access points from the street. In order to attract visitors, each access features different public spaces, such as a sun deck, water feature, seating steps, and viewing areas. It also makes use of paving systems to allow people to walk among natural features of parks

and different public spaces. Concepts in architecture and agriculture are integrating together to engage the public.

During the night, the park is illuminated to allow visitors to enjoy the space at this time. Walking through different buildings over elevated platforms creates different engagements with architecture—visitors engage with architecture above ground.

The High Line project demonstrates a new solution for hacking existing spaces. High Line shows how retaining the old can create new purpose in allowing forgotten spaces to be rejuvenated and given new meaning.

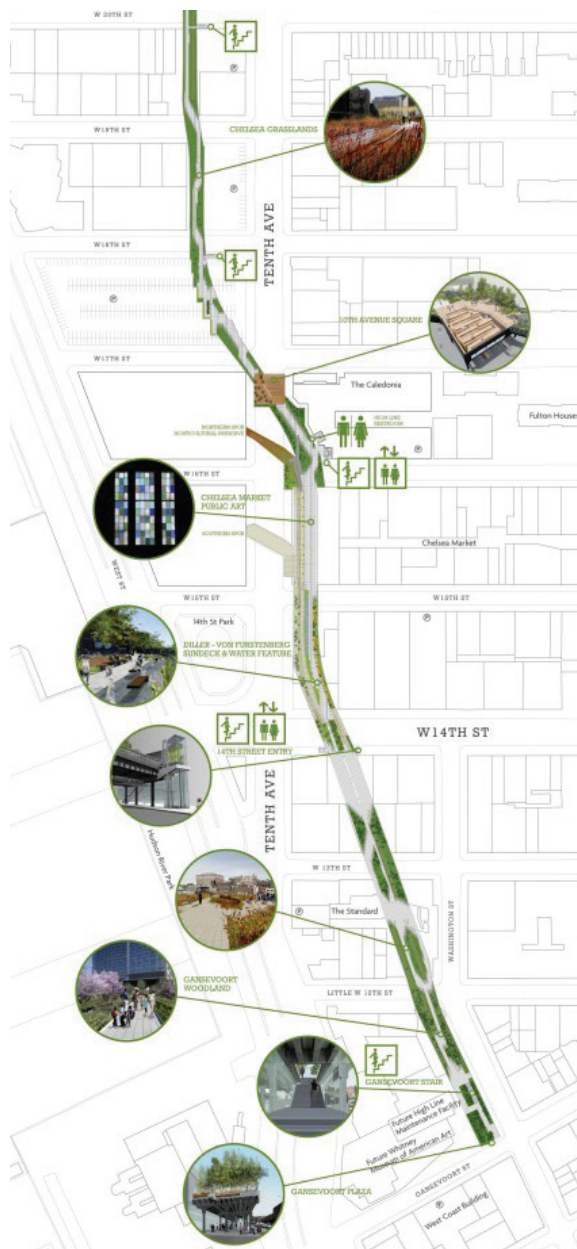


Figure 28.
High Line Program,
Diller Scofidio, 2010



Figure 29.
Beijing Linked Hybrid by
Steven Holl, Tony Law,
2011

Before the High Line proposal, Steven Holl explored reusing existing railway tracks. He was promoting the value of abandoned railway tracks as public space. He explains his proposal as an elevated public space being the ‘Manhattan Alps’. Holl is interested in linking architecture through networking systems. In *Pamphlet Architecture #7*, Steven Holl investigates the idea of dirges of houses (Holl, 1981, p. 1). The proposal is inspired by Raymond Hood’s *Skyscraper Bridges* proposal for Manhattan. Hood’s goal was to solve the traffic congestion problem and improve the quality of living conditions in waterfront areas. Based on this concept, Holl proposed the *Melbourne Project*—seven different types of inhabitant bridges that would be called “urban arms” (Holl, 1981, p. 1). These seven different types of urban arms connect to each other to create different experiences, with different functions, and purposes. Each arm has a title: Bridge of Pools and Baths, Cultural Bridge, Bridge of Piazzas, Bridge of Ancient/Modern Columns, Bridge of International Trade, Bridge of Odd Flowers and Bridge of Houses (Holl, 1981, p. 4-5).

Before the Melbourne Project, Holl developed a specific scheme for Manhattan’s Melbourne Project. Holl called this “an ornate collection of urban villas,” as each house became a passageway for the public (Holl, 1981, p. 7). Inside each villa, there is a series of public courtyards. Each house has similar volumes of space, but each of them has different programs and functions. This project is later resonated in the *Linked Hybrid* in Beijing (James & Yoos, 2016, p. 163-165).

This project explains how various types of architecture can be linked together to create a new purpose of existing space. Both Bridge of House and High Line have similar purposes—to create a new public space for cities by hacking existing infrastructure. However, their approach is very different. Bridge of House is

used to direct engagement between architecture and public space; whereas High Line is using architecture as a background to create a new means of public space. Both projects provide thrilling spatial and cultural experiences.

Figure 30.
Bridges of Houses
Section Drawing,
Steven Holl, 1981

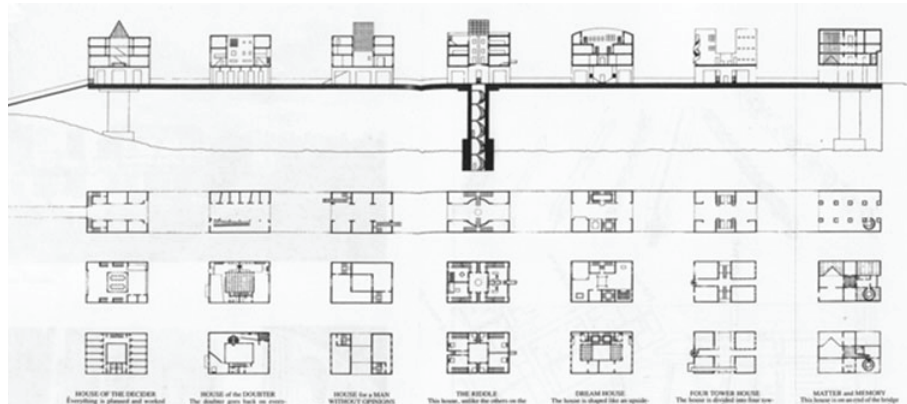
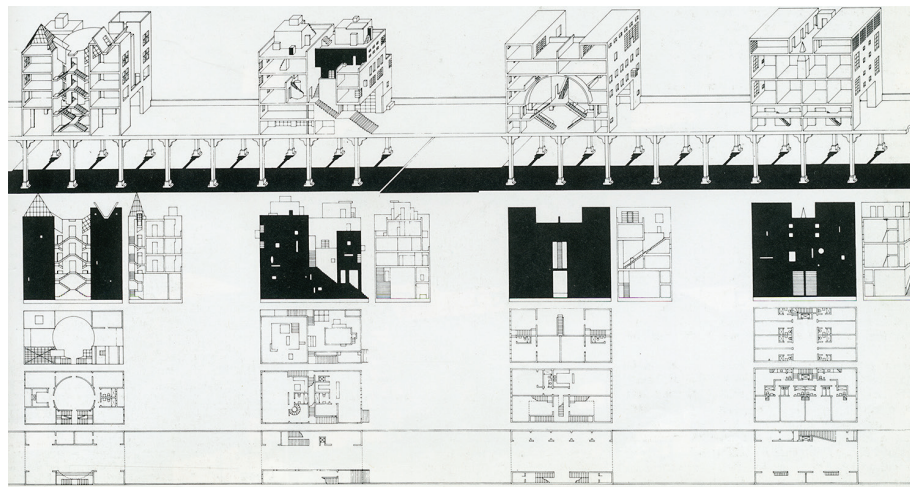


Figure 31.
Bridges of Houses
Axo Drawing,
Steven Holl, 1981



The ground is the most central place in the city. It is where everything can be connected and disconnected. In the city, a new typology called urban plaza is creating harsh environments and disconnection. Most of these space are empty squares, or sometimes a couple of benches are randomly scattered around. Using the idea of hacking is to redefine the ground for public realm. It is to explore a new potential for space through integrating existing and new programs and to find a new relationship to space. *MFO Park* and Israel's *Plad Square* are exemplary examples of hacking at ground level. The constant process of redevelopment of the ground level space allows the public to adapt and engage with the ground plane. This new paradigm of hacking ground plane brings a possibility of re-creating multi-level of ground plane carrying a new spatial relationship to the city.

MFO-Park is located in Zurich. The concept of the project is to find a solution that creates public space between high-rise buildings and flat ground planes. The site was initially used as a factory. In 1977, a new urban development replaced the existing factory with a high-rise residential building (Metalocus, n.d.). Rather than destroying the existing factory, the architect re-purposed the existing frame of the building to create a multi-level space that blends into surrounding buildings. Space is open to let the public access from different locations and walkways, balconies, and chairs are installed throughout the building. The design aimed to create public gathering space for the community. The openness and frame structure of the building create a blurring effect between a public park and a building. This project was another imitation of New York's High Line. A vine grows around the building; and allows the

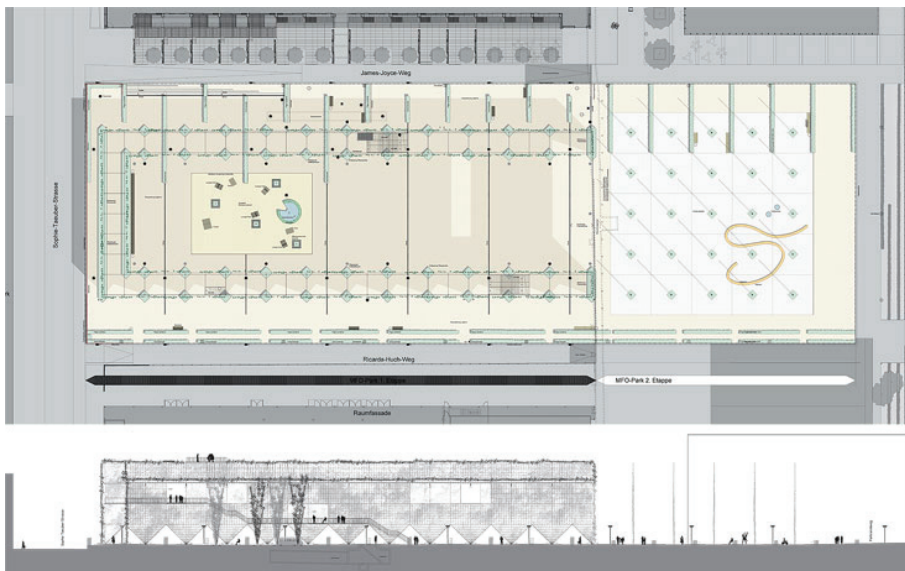


Figure 32.
Plan and Elevation
Drawing of MFO-Park,
Raderschall, 2009

building to change over time. MFO-Park is an urban structure that represents how a hacker uses ground level of the existing condition by adding a continuous space that allows a reframing approach to the ground plane. The openness of the building creates a visual connection between pedestrian and public space; is comparable to North American strategies of dealing with the urban public on ground level—flexible open space and framing the space that allows people to be more interactive and generates different types of social activity.

Israel's Plads Square is another example of hacking ground level in the city. Like many squares located throughout North America, Plads Square is the central plaza within surrounding buildings. Initially, the space was a market square; and then through re-development, the square was turned into a parking lot (Sweco Architects + COBE, 2017). However, with the new development of the plaza, the space has been turned back into public square (Sweco Architects + COBE, 2017). This is similar to *Dundas Square* located in downtown Toronto. The parking lot was inserted underground, and the surface above was reverted back to a public plaza which the city needed.

Interestingly, Plads Square is located between park and buildings. The surface of the plaza is not flat but the different elevations provide different elevations of space. The plaza is designed around a public program centred around the community. It is a large urban playground for people. Plads Square tries to provide a different type of activity. It has an observation area, open courts, and a large amount of seating to accommodate different types of activities. However, the problem of this plaza, unlike MFO-Park, is no shade and protection from the elements; and the lack of a soft surface on the plane make it an unpleasant environment during a sunny or rainy day (Sweco Architects + COBE, 2017).

3.3 Access Tree Diagram

Access Tree Diagram was designed in the 1960s as an urban planning tool. The increasing density and complexity of functional systems brought unwanted problems. This tool was developed because of the problem of circulation in midtown Manhattan. Access Tree Diagram introduced a new vision of how to create circulation systems for urban planning. It is consistent with presence of a subway system, a

vertical lift, and additional horizontal in modifying the existing infrastructure. This is called “skyscraper sidewalks” (RPA, 1969, p.29). RPA argues that the successful reorganization of the city system can provide quality living for the city (RPA, 1969, p. 29). The methodology of Access Tree Diagram is to look at unknown functions, physical forms, and amenities in the city.

The infrastructure of the city depends on various systems, like streets, transit, water, and waste. The physical form of the building hides the facility system mass, similar to how a human uses an x-ray as an investigation method to unveil the inner human body frame. Mapping and three-dimensional studies are conducted during the process of revealing hidden functions and systems of the city.

The primary functional system impacts the movement of people in the city. The research focuses on the circulatory system people use between streets, stairs, elevators, and underground paths. The author compares the city’s circulation to a living tree. The different elements of each system are divided into different connections between buildings. Like a tree, RPA describes the underground circulation as roots, the elevator cores as trunks, and the streets and building corridors as branches (Loukaitou-Sideris, 1998, p. 61). The building is a human-made ‘access tree’.

In research, the idea of a “mixing chamber” is introduced (RPA, 1969, p. 30). The mixing chamber provides direct access to the elevator. The user will experience a different area of the space during travel. RPA argues that instead of creating a concentration of office environments, diversity of jobs and social interaction spaces are required to serve as an office centre. RPA’s approach to Access Tree was to provide an alternative to the usual working environment in the Manhattan central business district.

The Access Tree Diagram is provocative. It is urban planning that seeks to find a new relationship between user and city system. Similar to the early idea of hacking where it is defined as ‘playful cleverness’, by tinkering with the system of the city, a new urban form can be created. The idea of a ‘mixing chamber’ can be used to reorganize efficient circulation on building and hidden systems to explore new possibilities of hacking architecture.

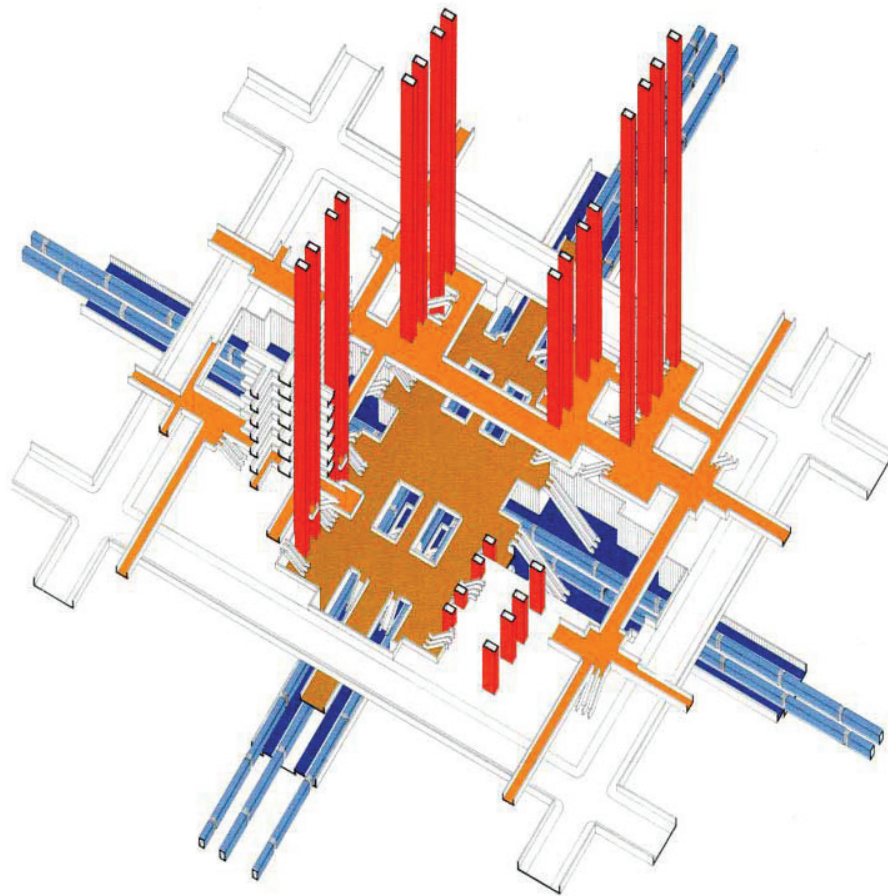


Figure 33.
The Access Tree
Diagram, RPA, 1969

Chapter 4. Hackable Building

The Gensler architecture firm proposed the ‘hackable building’ theory. The Gensler’s definition of hacking is ‘to update the existing structure that has been repurposed from its original use’ (Gensler, 2016, p. 99). The idea is to change the building.

In the urban fabric, there are large amounts of under-utilized urban building stock that can be transferred into new and functional workplaces (Gensler, 2016, p. 32). Their theory of future office building is not about creating the building, but it is about creating an urban neighbourhood or district that can be hacked into support the needs of a new generation of the workforce. Their proposal meant incorporating various types of building programs and existing updated structures to a ‘hackable building’. The change to the building can be adapted by a new working lifestyle of 21st century city living. The ‘hackable building’ finds a new opportunity to ‘hack.’ Hacking can happen in both micro and macro-level. The macro-level of hacking supports the way to hack space; and at a micro-level, a user-based design is tailored for demand and desires (Gensler, 2016, p. 6). The question of preservation of the existing building is challenging and it is necessary to determine what can be preserved and what can be changed.

The ‘hackable building’ theory is similar to ‘adaptive reuse’ strategies. Department of Environment and Heritage (2004) in Australia states their three criteria for adaptive reuse are:

- a. advising against “façadism”—constructing a new internal and retaining its façade
- b. requiring a new building to not simply be an imitation of the old historic style building, it has to be recognizable as contemporary
- c. searching for a new use that is compatible with the building’s original use”.

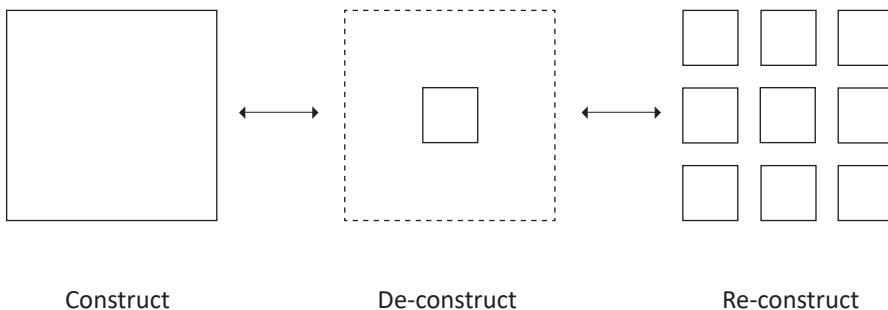


Figure 34.
De-construct to
Re-construct

'Adaptive reuse' is challenging the concept of obsolescence and seeking a new resolution to change the urban fabric. Both hacking and 'adaptive reuse' are dealing with the existing building. The difference is 'adaptive reuse' is about simple-refurbishment; and the 'hacking building' is looking at the trends and future projections of the city to find a new relationship between the existing and the new. In the end, it is about creating new things in the urban fabric, by dealing with existing.

4.1 Hacking Building

In essence, architects are hackers. Both architects and hackers use exploration to find new possible ways to create a new world. During the process of hacking, the hacker gathers information to produce new things by modifying the existing relationship. According to McKenzie Wark, 'hacking private property allows the property to reach a new potential' (Wark, 2004, p. 8). A hacker identifies constraints on the property which can be removed by its owners.

A hacker's acts show what can be hacked and suggests an alternative approach to change. The idea of the 'hacking building' can be found in projects such as Gensler's Hacking Office, Bjarkle Ingles Group (BIG) Architect's *Water Treatment Plans*, and Herzog & De Meuron's *Elbphilharmonie*. A proposal of this project shows a new way to redesign existing buildings. Gensler's Hacking Office changes the function of the building by inserting various functional programs, a civic space, and a re-organization of the existing office building typology. The re-organization of space is tailored to trends and demand. The building façade and structure are also changing when adopting a new form of function and space.

BIG Architect's Water Treatment Plans deals with finding a new relationship between separate building program. It is a new civic building typology; was created by adding a ski slope on the roof of the building. Within 'ski slope' a variety of public programs are introduced to accommodate future needs in the urban fabric (Etherington, 2011).

Herzog & De Meuron's Elbphilharmonie is changing building typology by reprogramming the building. The building site was an old factory. The use of the existing building was made into a public plaza and an auditorium was added (Sealy, 2013, p. 14-15). The harmony of the public plaza and auditorium space bring a new experience to the visitor (Sealy, 2013, p. 14). Compare to another project; the lobby

is located in the middle of the building. Moreover, the existing roofline as a boundary to illustrate the relationship between old and new (Sealy, 2013, p. 15-16).

The concept 'hacking building' is finding new possibilities to deal with an existing building that is embedded in the urban fabric. As the city evolves, the old building will become obsolete. The idea of the 'hacking building' is an investigation into an existing element and its condition to explore a new way to create a new building in the city.

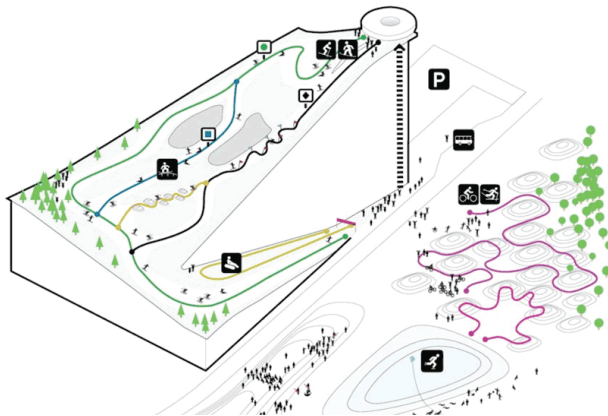


Figure 35.
Water Treatment
Facility, BIG Architects,
2010

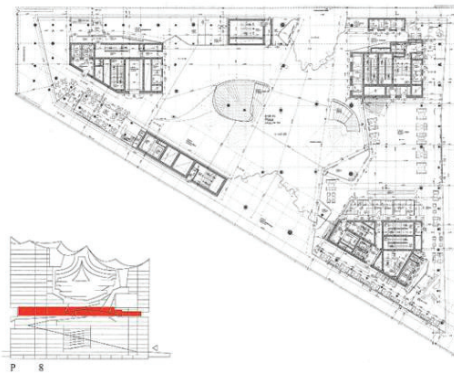


Figure 36.
Elbphilharmonie,
Herzog & De Meuron,
2015

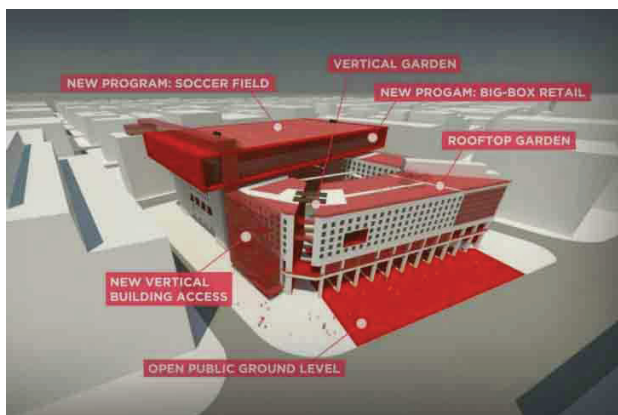


Figure 37.
Hacking FBI Building in
D.C., Gensler, 2012

4.2 Circulation

Base on the form of the building, different layouts of circulation are proposed to support the users' movement in the building.

The three-type of building forms are used in modern practice. The long building is the oldest building form that architects use for designing an office building (Bielefeld, 2013, p. 199). In the linear building, space is divided by either a single corridor or a double corridor. The depth of the floor space is equally divided and formed through linear circulation.

A courtyard building form is used to create a private outdoor space. The concept of courtyard building form is to provide a secure and entirely outdoor space for the people who have access to the building. However, the problem encountered by courtyard building form is it generates isolation because the user is less interactive with outside and existing buildings (Bielefeld, 2013, p. 200). The layout of the corridor is similar to linear building form where the corridor can be used in both single and double loaded.

Point-block building is commonly used in contemporary practice for designing an office building. The core of the building is located in the centre. Compared to another building form, the point-block building offered vertical circulation for the user. Point-block building is designed to create a flexible office layout due to minimum space for circulation (Bielefeld, 2013, p. 199). Between a single and a double-loaded corridor, a double-loaded corridor is recommended to use in office planning to increase the efficiency of the layout. However, compared to the single-loaded corridor, the lack of sunlight would cause a dark and unwelcoming circulation space.

In office tower, the vertical circulation of space provides efficiency, but a lack of circulation movement limits the experience of existing buildings. The existing point-block building form, single-corridor, and the double corridor were investigated. The result of adding a significant amount of un-programmed circulation is not beneficial to tower design. Continuous linear circulation is suggested to explore a new type of circulation for vertical movement. Instead of creating a corridor, the integration of vertical continuity and social space is accompanied to the 'hacking building'.

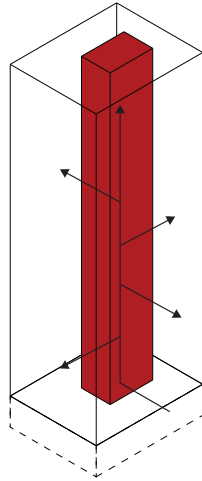


Figure 38.
Point-tower
User Movement

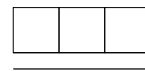
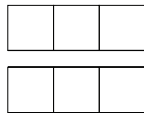
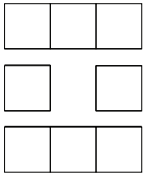
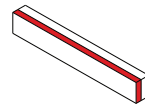
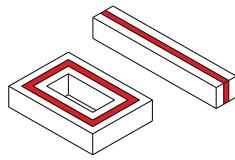
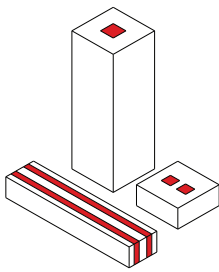


Figure 39.
Building Forms and
Circulation

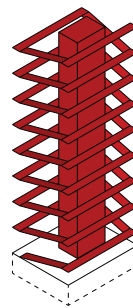
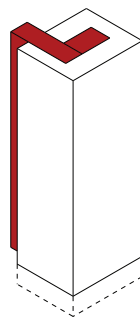
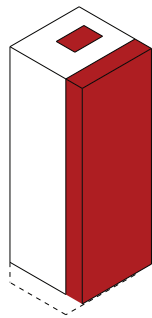
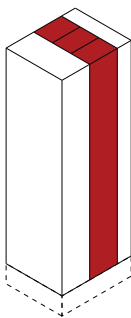


Figure 40.
Circulation Study of
Point-tower

4.3 Building Programs

In order to hack the building, modification of the building program is required to change the function and space. During the hacking process, addition and subtraction of building programs will reevaluate people's needs and desires. The office building typically has a single function—to handle administrative work. A single office tower can carry the various type of office groups in a building. Although an office building appears to be as a private space, public access allows interaction with the design.

According to Gensler, the mobility of today's working environment means less office space is needed at the moment (Gensler, 2016, p. 32). If this statement is valid, the monofunctional office building will be obsolete. In order to hack the building to meet the need and desires of a new workforce generation, a new invention of a flexible workspace is required.

In general, the workplace layout has the majority of the space dedicated to desks and storage. The space is filled with desks, office supplies room, storage, server room, kitchen, meeting and conference rooms. The future of the workplace is beyond the cubicle—an increasing number of entrepreneurs and the development of mobile technology dismiss the current practice of office layout and administration buildings (Gensler, 2016, p. 6). Since less office space requirements are a need in the future office building, a new program can be added to facilitate and increase social interaction within the work environment.

When Google designed their new office space, they sought to create an environment that can be flexible, fun, and creative (Coleman, 2016). Workplace does not need to be placed in office space; people can work in a coffee shop, library, and outdoor space. Hacking an existing definition of the workplace brings a fun and creative work environment for the future workforce. The various civic functions of a program are integrated into an office building. The function of the building should not act as a one-dimensional space, but rather brings various people and groups together to collaborate and create a creative office environment. A suggestive change to programming an office building would be to turn a large amount of private or semi-private office space to an area with higher degree of public access. This approach creates a new resolution for integrating new forms of a workplace.

Access to space is generally classified into:

Public – Open

Private – Closed

Private (Public) – Semi-open

A 'blur' relationship between public and private space addresses the issues of engagement in the urban fabric. An open space, such as a public park, plaza, urban square, and civic buildings, allows and invites the public to access it freely. Private space is the opposite of public space—an area with no public access. In an urban context, the complexity of circulation overlapping between spaces bring confusion.

According to Altman's theory on territoriality, there is a territorial boundary between public and private space (Gehl & Koch, 2011, p. 59). Based on types and functions, territory is divided into three different types: the primary, the secondary and the public territory (Gehl & Koch, 2011, p. 59). The primary territory is for private

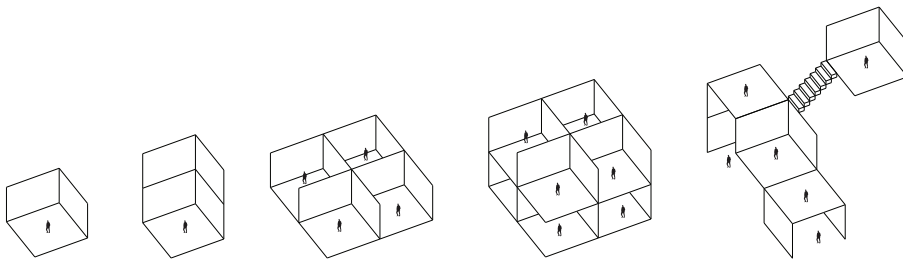


Figure 41.
Configuration of
Building Programs

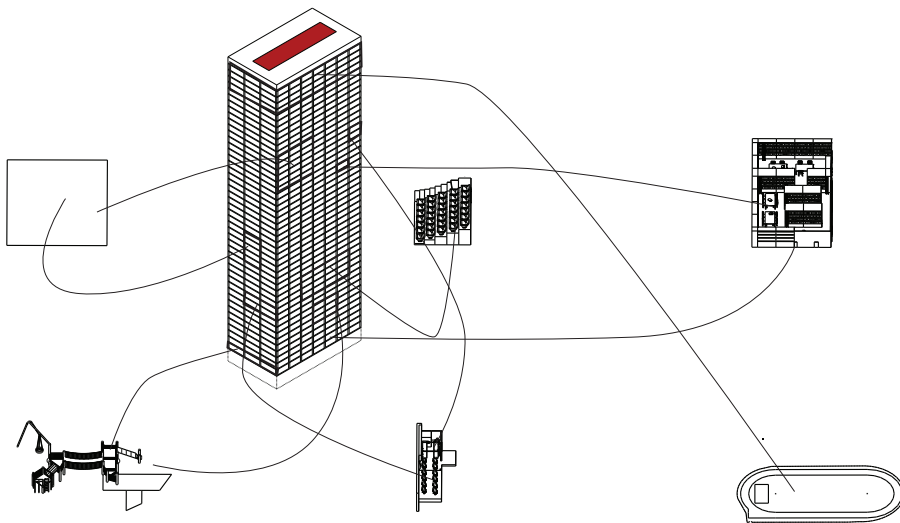


Figure 42.
Integration of
Building Programs

function, where as the public territory is for public function; and the secondary territory is a territory between public and private space (Gehl & Koch, 2011, P. 59). In Oscar Newman's *Defensible Space*, similar to Altman, he calls space between public and private a semi-private area (Gehl & Koch, 2011, p.59). Creating a semi-zone brings *visual surveillance* and security to a place because the area appears to belong to someone (Hill, 2001, p. 277) . In the urban context, a public space can be divided through spatial basis and user basis (Hill, 2001, p. 277).

Spatial basis divides public space to open space, semi-open space and enclosed space; semi-open space mainly acts as a territorial boundary between half open and half closed space. These spaces can be a lobby, a corridor, pavilion or an entryway that face the road.

The reason for the low level of contact between people is a lack of activities in buildings. The boundaries and isolation of space are also other causes for the low level of social interaction between buildings (Gehl & Koch, 2011, p. 62). Moreover, some areas between buildings do not allow public access or are just not welcoming. An increase in children's activity areas will lead to higher activity in buildings, social communication, and residential satisfaction. In order to create better public space that brings a high traffic of activity, a smooth transition must be made between public and private space. It is a strategy that invites the public to engage with the space. Instead of blocking or isolating areas, area can be opened up with multiple entries to space to allow the public to feel welcome (Gehl & Koch, 2011, p. 69). Finally, a space does not need to be empty; it can hold different activities that people can engage in.

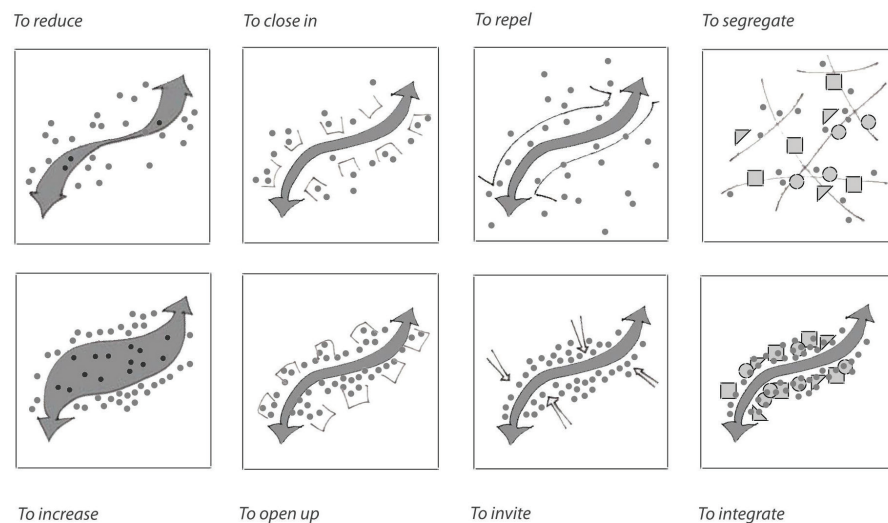


Figure 43.
The Sense of
Communication,
Jan Gehl, 2011

4.4 Building Structure and Floor

The structure and floor are the central elements of a building. Updating the existing building structure and floors is a part of creating a 'hackable building'. A tall office tower structure consists of the core and columns. Compared to other building types, the office building structure had a capability to embrace diverse functions required for space. Over the years, a large number of office buildings have been turned into residential apartments. An issue of converting an office space to a residential building is the depth of floor plate. The large spans of floor plate limit penetration of natural light. This can be solved by either removing or cutting floor plate, or the symmetry of building form can be broken by shifting multiple floors.

Architecture firm 51N4E designed *Lamot Mechelen*, a congress and heritage centre. The project finds a new relationship between new and old by updating building structures. The mixed-use facilities are recreated from an old public building. The firm uses the idea of removing, shifting, and penetrating floor plates to reorganize the circulation, program, and façade (Uffelen, 2011, p. 251). A large amount of floor has been removed and restructured to develop a large ceiling interior space. The cut of the building makes the building appear to be a 'floating structure'.

A massing study is suggested as a way to explore shifting and moving floor plate. In the study, a possibility of exploring a new space and form in an existing building is shown. The penetration of floor plate can create atrium space; and by removing multiple levels of the floor, the plate can give a higher ceiling which allows development of a new interior space. In a structural sense, carving and shifting floor plate can create asymmetry, which makes a building look as if it is floating. Opening up the floor plate can allow different configurations of circulation space in a building.

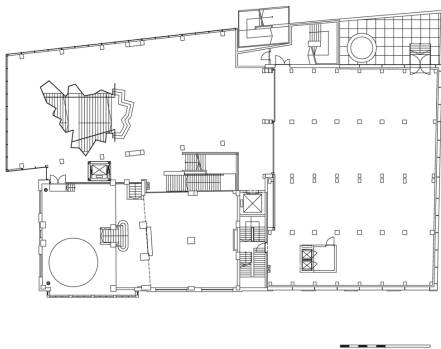


Figure 44.
Lamot Floor Plan
Drawing, Fastenaekens,
2005 (Left)

Figure 45.
Lamot Exterior View,
Fastenaekens, 2005
(Right)

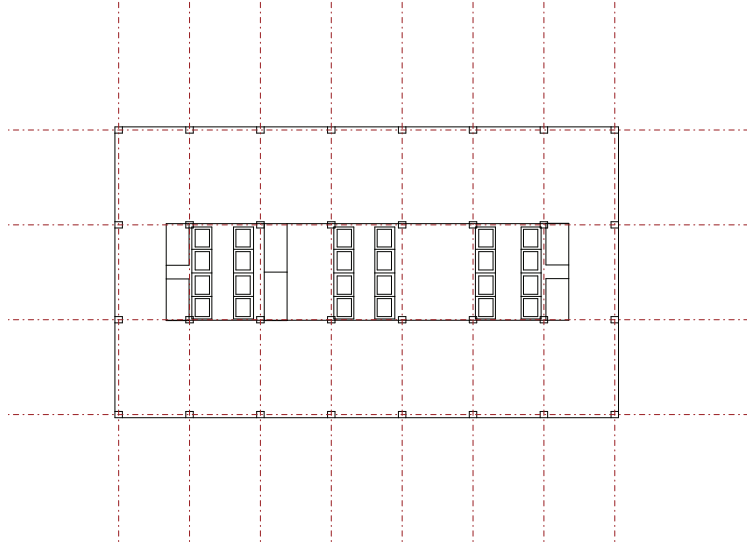


Figure 46.
Typical Point-tower
Structure

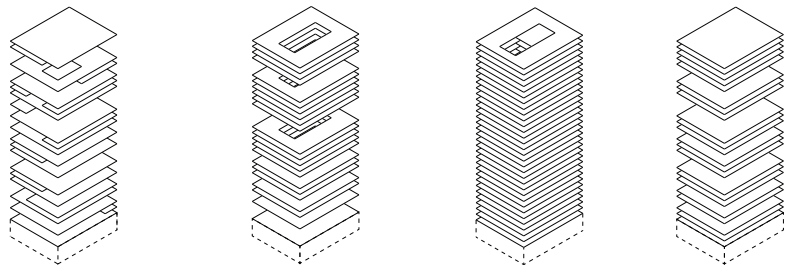


Figure 47.
Massing Study,
Floors

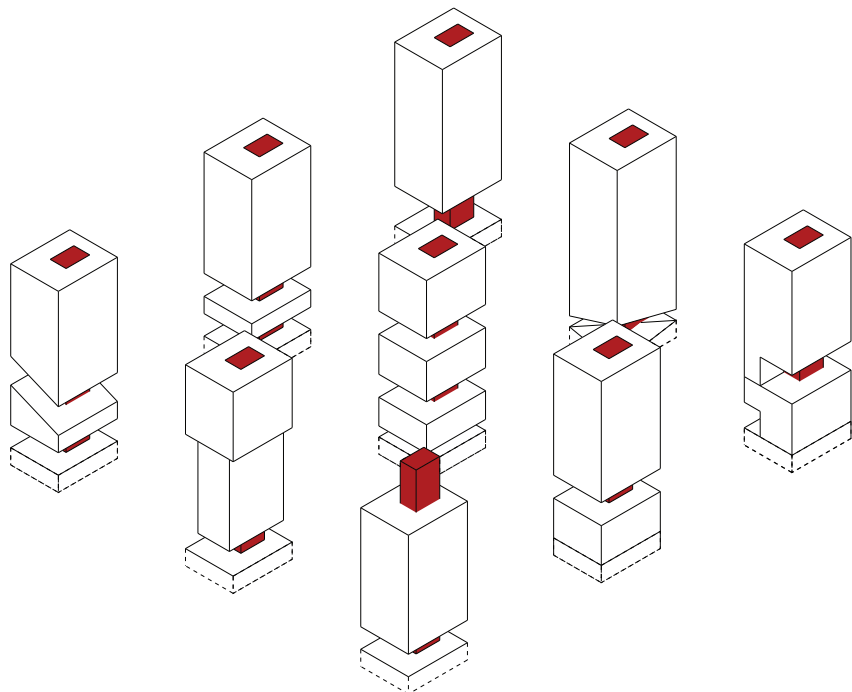


Figure 48.
Massing Study,
Structure

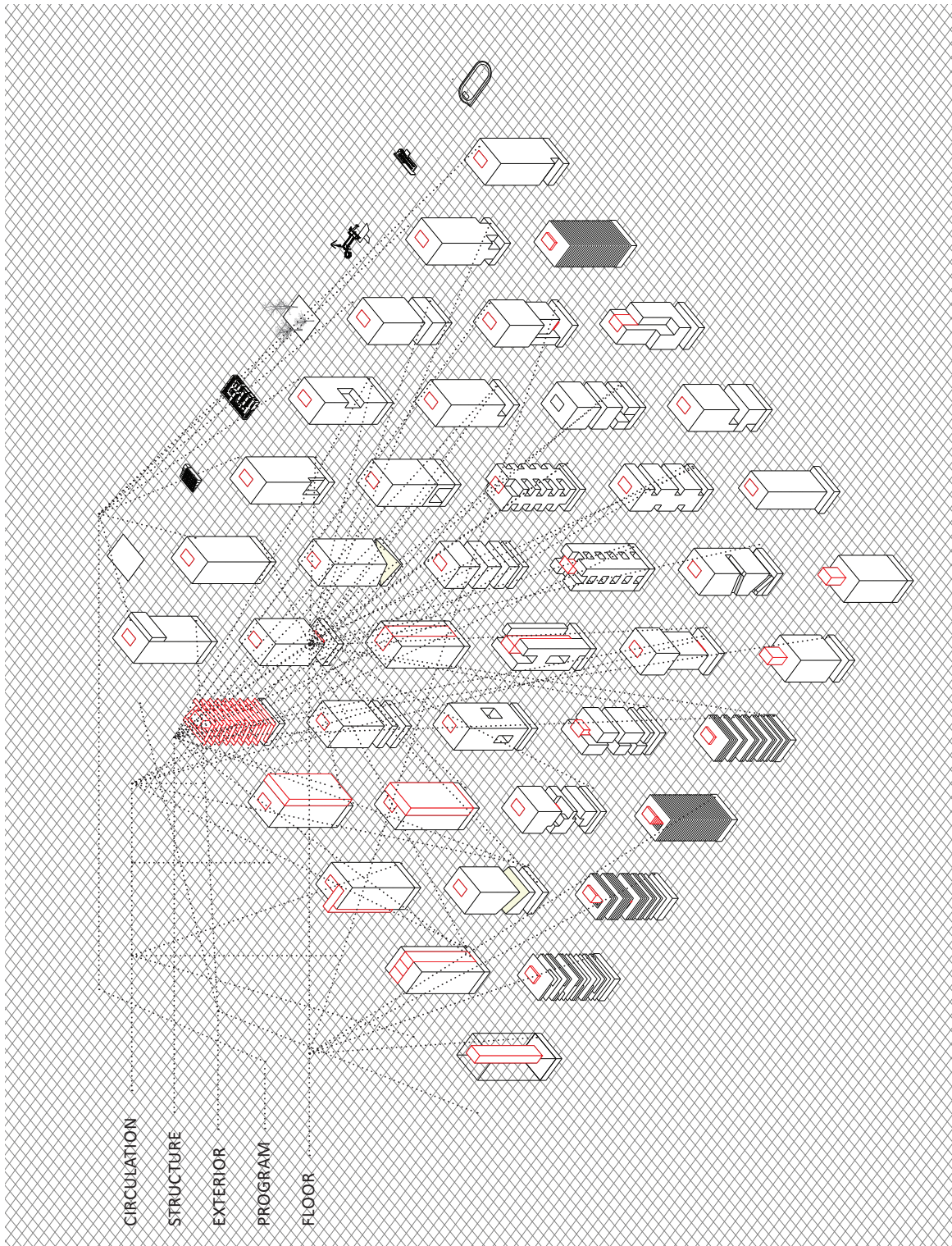


Figure 49.
Hackable Building
Massing Study

Chapter 5. Site Context

Toronto is one of the largest cities in North America; and it is also the highest population densities municipalities in Canada. The current city planning is going vertical to create high-rise, high-density in the city. The population of the Greater Toronto Area (GTA) is increasing every year. From 2015 to 2017, Toronto has more than 12% increase in population growth (more than 500,000 people) (Toronto's Financial District BIA, 2016). Due to high-demand of living and working in Toronto, high-rise residential towers are constructed to maximize floor area. Over the last few decades, Toronto downtown core buildings have become denser and taller. Currently, Toronto's public spaces are scattered throughout the city.

Surprisingly, most of the public spaces located in Toronto's downtown core are privately- owned publicly accessible spaces. The growing number of privately owned public spaces becomes a significant issue. The problem of privately owned public space is a lack of accessibility and the overall quality. Due to a large concentration of visitors in the area, a large amount of public infrastructure is required and provided to the public in the form of streetcars, the PATH system and public spaces.

During the years between 2006 and 2011, the population of Toronto's downtown core increased by 16.2% (Toronto's Financial District BIA, 2016). The city's current development strategy is to condense a large population of its citizens along Yonge Street; this project predicts the population of the downtown core will double by 2041 (Toronto's Financial District BIA, 2016). Developments, such as the Trump International Hotel and Tower, and various new-age condos, will attract additional visitors and migrants to the area.



Figure 50.
Old vs. New

5.1 Multi-Levels of GTA

The GTA has three different levels of public circulation that connect the city. Above ground, the Skywalk connects between office buildings and retails. On a ground level, road, sidewalk, and public transportation allow pedestrians to travel to a specific area. Finally, below ground, the subway system and PATH allow pedestrians to travel through indoor space. The GTA contains five public realm components: roads, sidewalks, public lanes, public parks, and privately owned public spaces. Among these areas, roads take up close to half of the area in the city. Most of these areas are located on ground level. These public realms contain public infrastructures such as the PATH, elevated spaces, and large open areas that have the potential to create connections and public engagement.

Multiple existing conditions in the GTA need to be reconfigured—concepts like circulation, streetscape, navigation, infrastructure, indoor space, night experience, and vehicle traffic.

The existing PATH allows travel through privately owned space in Toronto; and it is a unique approach in providing interior corridors to connect different locations. The PATH is a challenge as it is difficult to navigate; and the disconnection between aboveground and underground can be jarring for those who use it. The PATH has signage to help navigate areas. However, navigation within PATH is confusing, and is comparable to a labyrinth. Visitors have a hard time to find surface exit because of the unclear PATH map and unfamiliarity with building names. They also lost of sense of scale and cardinal direction when they are underground. More importantly, a lack of street presence and an absence of natural light prevent visitors from deciding to stay on the PATH longer. The PATH could be enhanced by opening up areas to better connect the network system between the aboveground and underground components of its architectural design.

5.2 Financial District

The Financial District is the economic centre of Toronto. This area alone has workforces and visitors totalling over 200,000 daily. To illustrate, the Financial District uses 0.1% of the land area in the GTA, but contains more than 19% of all the office space in the GTA (Toronto's Financial District BIA, 2016). These statistics explain why the Financial District has denser and taller towers. Between tall towers, large amounts of privately owned public spaces act as divisions of the buildings.

Land Area



Toronto office Space



Figure 51.
Office Building Rates
in Toronto, Toronto's
Financial District BIA,
2016

On the ground level, differences in the width of sidewalks and large amounts of underdeveloped open space scatter the site and leave it feeling chaotic. Over 30% of privately owned public space is located in the Financial District. Most of these areas have large and open spaces that could be further developed by connecting the space between buildings. This provides communal areas for people who do and do not work in the area. The site also has a high volume of various forms of traffic. Streets like Adelaide and Richmond provide trucks or freight vehicles delivery access. The close approximation of the site to Don Valley Parkway and Gardiner Expressway also leads to higher volumes of traffic.

Wellington and Adelaide streets are important access ways for vehicles, meaning unnecessary traffic can back up here as well. The area on Front street facing Union Station was originally traffic-heavy. Recently, it was developed into a desirable location for pedestrian—sidewalk condition becomes better and wider (Toronto's Financial District BIA, 2016).

During rush hour, both the PATH and streets aboveground have a high volume of pedestrian movement. During breaks and lunch times, visitors and workers are

looking for places to sit. Hence, a large volume of traffic becomes a problem around King and Bay streets. Cold and rainy days drive foot traffic to PATH and lowered level retails. However, the complexity and ambiguity of PATH system can make foot traffic unappealing.

The site is surrounded by high-rise buildings. In 2013, the City of Toronto's Zoning By-Law permits 137m to unlimited height range for buildings in Toronto's Financial District (City of Toronto, 2013, p. 6). The existing high-rise towers around the site block a significant amount of natural light, and create high winds for pedestrians. Future development plan for the Financial District area must identify, consider, and fix these challenges to provide a better public realm. Looking at the site, space has a potential for providing continuous three-dimensional public spaces to connect areas that allow the public to engage with architecture.

In the Financial District, the majority of building types are office buildings. Compared to ground level, more retail space is located underground; supported by the PATH system. After business hours (6 PM), PATH looks lifeless due to lack of activities and public programs on the site.

A large public plaza is concentrated around the Toronto Dominion Centre (Toronto's Financial District BIA, 2016). The Toronto Dominion Centre and Commerce Courts have one of the largest urban plazas in the Financial District. Although surrounded by high-rise office towers, the open space gets natural light throughout the day. In Toronto Dominion Centre, two different surfaces were used to create urban space. The area facing Wellington street has a soft surface with trees, sculptures and

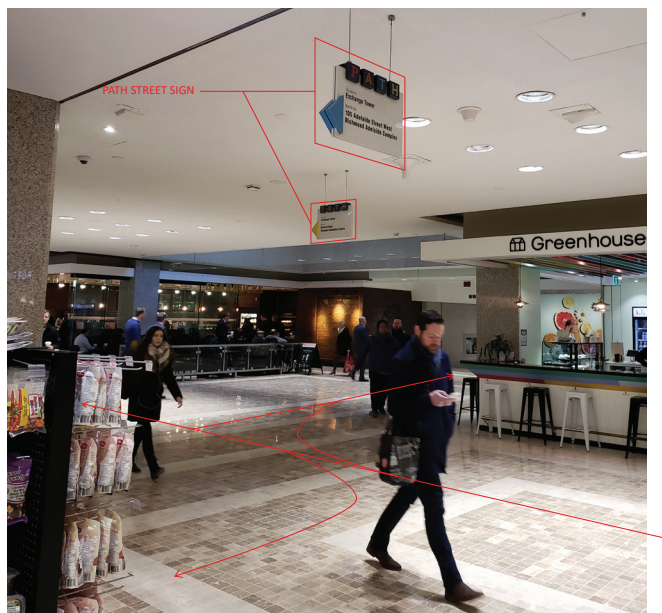


Figure 52.
Existing PATH Condition

a seating area. The plaza that faces King street has a hard surface with a couple of benches around the edge. During summer time, these plazas are occupied from time to time, satisfying the needs of public space. However, during the winter, a lack of activities are found in both urban plazas. Therefore, multiple layers of connectivity is proposed and needed, in order to create a circulatory system like a living organism.

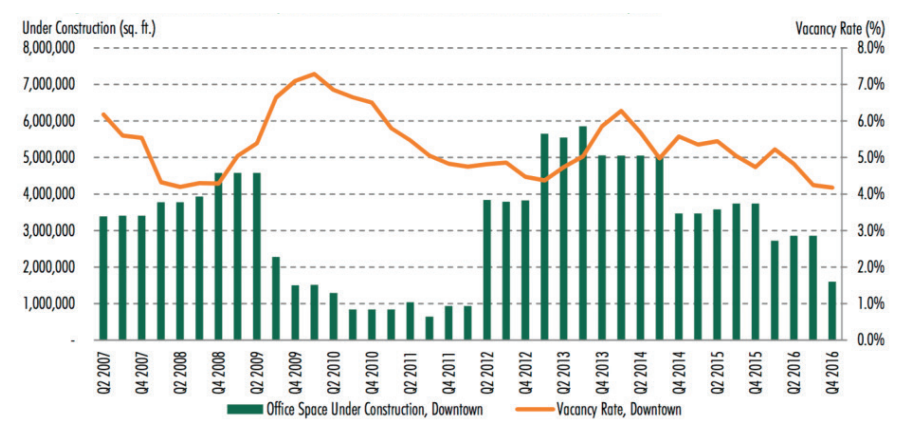


Figure 53.
Office Building Vacancy
Rate in Toronto, CBRE
Research, 2016



Figure 54.
Image of Financial
District



Figure 55.
Layers of
Financial District

5.3 Toronto Dominion Centre

The Toronto Dominion Centre (TD Centre) is a symbolic building complex in the Financial District. The building complex was designed by Modernist architect, Mies Van der Rohe. The TD Centre consists of 56-storey TD Bank Tower, 45-storey Royal Trust Tower, 36-storey tower, one-storey banking pavilion, and a granite-paved plaza (Carter, 1999, p. 61). The building is a symbolic representation of prestige. The demolition of old banking space leads to the construction of modern high-rise towers. The TD Centre was the tallest office building in Canada at one time; and the complex offers multiple facilities such as shops, restaurants, cinemas, and open space (Carter, 1999, p. 61).

The design of the TD Centre was influenced by international style architecture. Mies' intention was to create a flexible office space to incorporate various functions (Shubert, 1989). The purpose of a single-storey pavilion was to experience retail on a ground floor plane and to create a street relative to pedestrians: a careful consideration of a large tower structure and broad plaza on a ground plane. Below ground, there are 700 parking spaces, a shopping concourse and food court integrating with the PATH system. The idea of flexible design space was carried throughout below ground. A large sliding screen system is used to increase the flexibility of use.

In contrast to historical bank architecture where a solid masonry exterior was used, the openness and transparency of exterior façades and interior spaces at the TD Centre are less intimidating to the visitor. The design

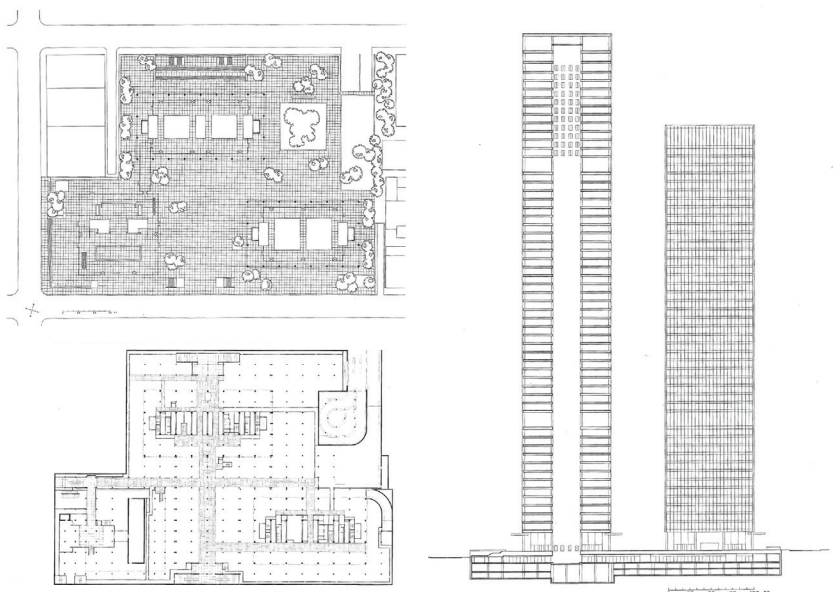


Figure 56.
TD Centre,
Plan at Plaza Level,
Mies van der Rohe, 1963

Figure 57.
TD Centre,
Plan at Concourse Level,
Mies van der Rohe, 1963

Figure 58.
TD Centre,
North-south Section,
Mies van der Rohe, 1963

Figure 59.
TD Centre,
Entrance of Escalator to
Concourse Level



Figure 60.
TD Centre,
Exterior View



of the building was a critique to being a solid object. The idea of “shaft of light” was introduced a transparency to the building which evoked light even during night time (Spielman, 2014). The structure of the buildings is steel construction. The steel cladding was pre-assembled to speed up the construction process.

In 2010, the buildings were renovated by B + H Architects. The revitalization of the TD Centre was initiated when 17 floors of Royal Trust tower suddenly become vacant (BH Architect, 2017, p. 17). The main reasons for the vacancy were outdated materials and poor indoor quality. For renovation, the windows were replaced; the exterior were repainted; the mechanical and electrical systems improved; elevators were replaced; and the lobby and plaza were redesigned (BH Architect, 2017, p. 18).

The Toronto Dominion Centre is the chosen site for creating a ‘hackable building’. The complex was the one of oldest and tallest office towers connecting between Union Station and Dundas Square. The TD Tower will be used as an exemplary site to demonstrate the idea of hacking. The building has been unaltered for decades. The building is a point tower with an open floor plan. Throughout the building, the structure is equally spaced and repetitive. Therefore, a hacker can easily manipulate the system. The underdeveloped open square and concourse level on site will be re-examine to create a new urban space for the needs of the future workforce.

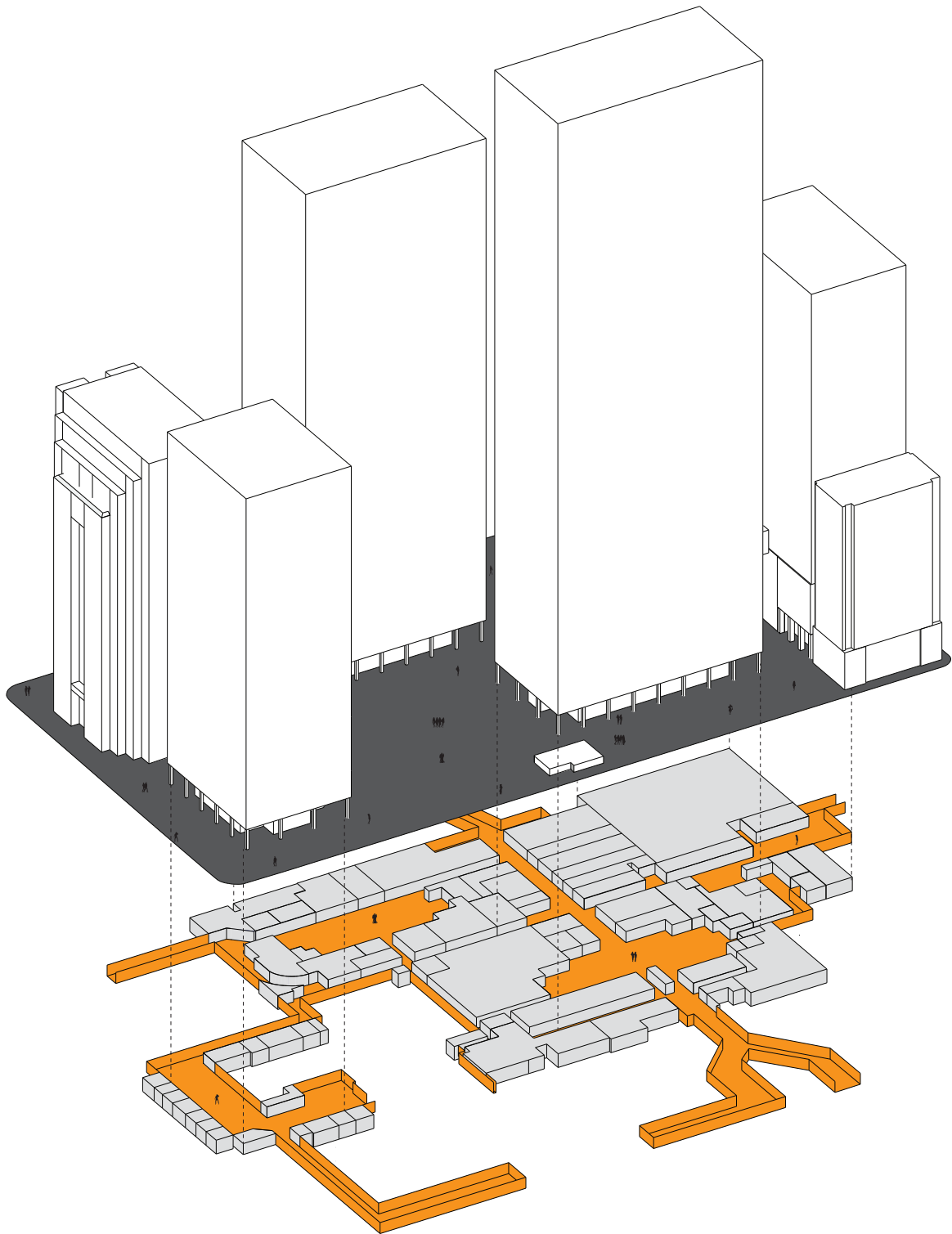


Figure 61.
TD Centre Map

Chapter 6. The Process of Hacking

The theory of hacking is used to examine and improve the TD Centre and surrounding . As previously discussed, the process of changing building typology will be shown.

The process of hacking is an investigation to re-examine how an existing building can adapt to effectively meet the needs of future population. Integration of civic function and work environment collide together to create a new type of office building. Three strategies are used to hack the TD Tower. Firstly, adopting the idea of Access Tree Diagram, a hidden relationship between the city and building's circulation will be found. Secondly, physical modifications of the building are proposed, in order to change the forms and interiors of the building. Lastly, a different type of program is integrated with the building's existing program to create a new form of office space for the future.

With rich history and context, the site brings many unfolding possibilities on how an office building can turn into a hybrid form that supports urban structure. Nille Juul-Sorensen on creating a 'hackable building' states, "hacking is the way to creating a new building by using existing building stock when the concept of hacking is applied in architecture, a new space and new function for future building" (Juul-Sorensen, 2016).

6.1 Access Tree Diagram

The concept of Access Tree Diagram is used to reveal hidden circulation below ground to above ground. Similar to the RPA idea, virtual circulation is exposed to look for a new iteration of program and circulation. The current circulation of the TD tower is vertical movement. The PATH system connects between below ground and above ground. However, a lack of street presence and a layout of circulation discourage people from accessing the building. Bringing the public into building space can give rise to a redefined relationship between work and public space. The Access Tree Diagram is illustrating how the building is not an object, but a living organism.

The problem of a high building is a lack of street presence and limited circulation experience. As movement of people is supported by linear circulation, linear circulation is proposed to connect different parts of the building to add multiple layers to the city. The linear vertical circulation of the building will be accompanied by the various type of public program to provide a city-like-experience within a building.

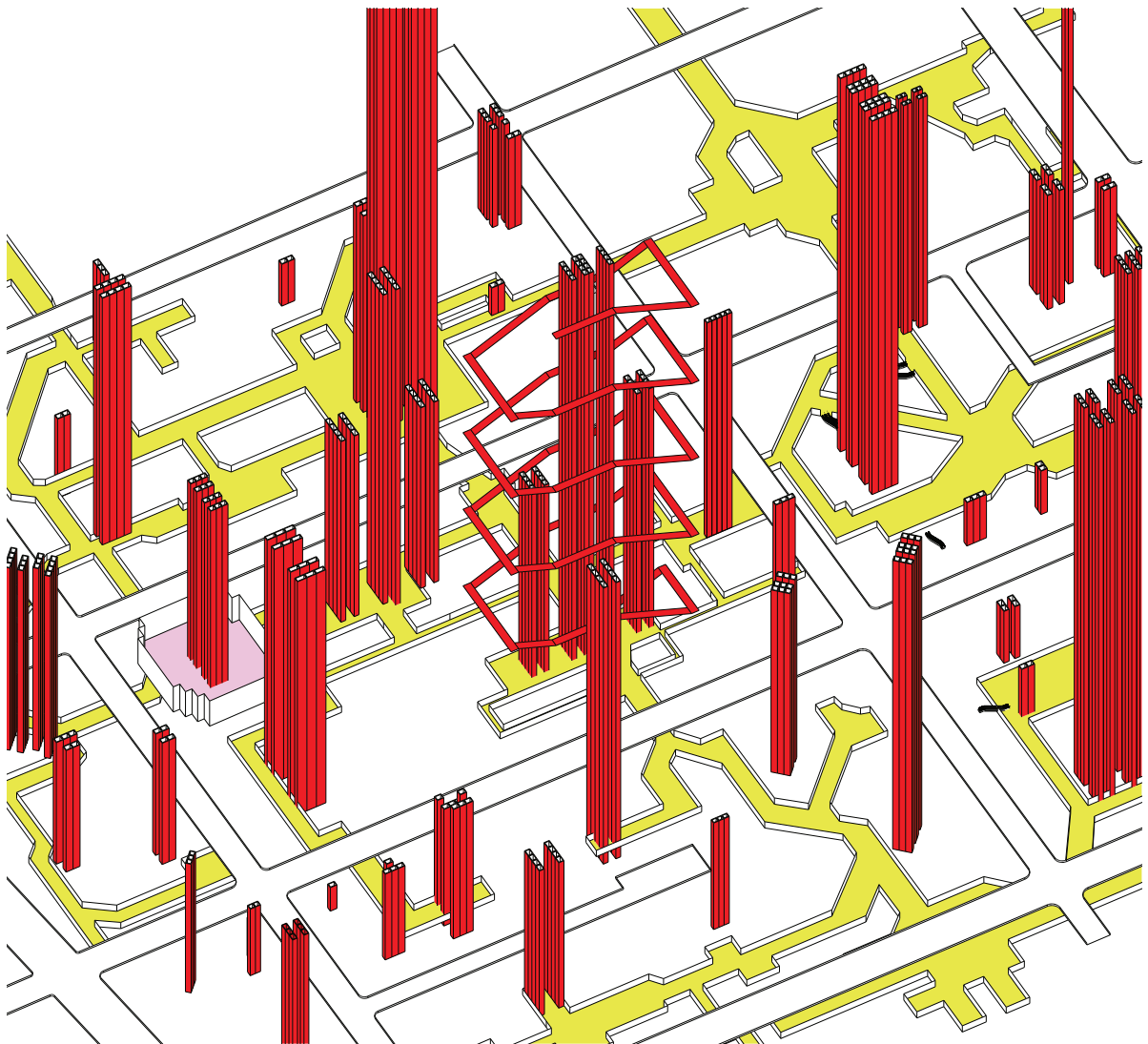


Figure 62.
Access Tree Diagram of
Financial District

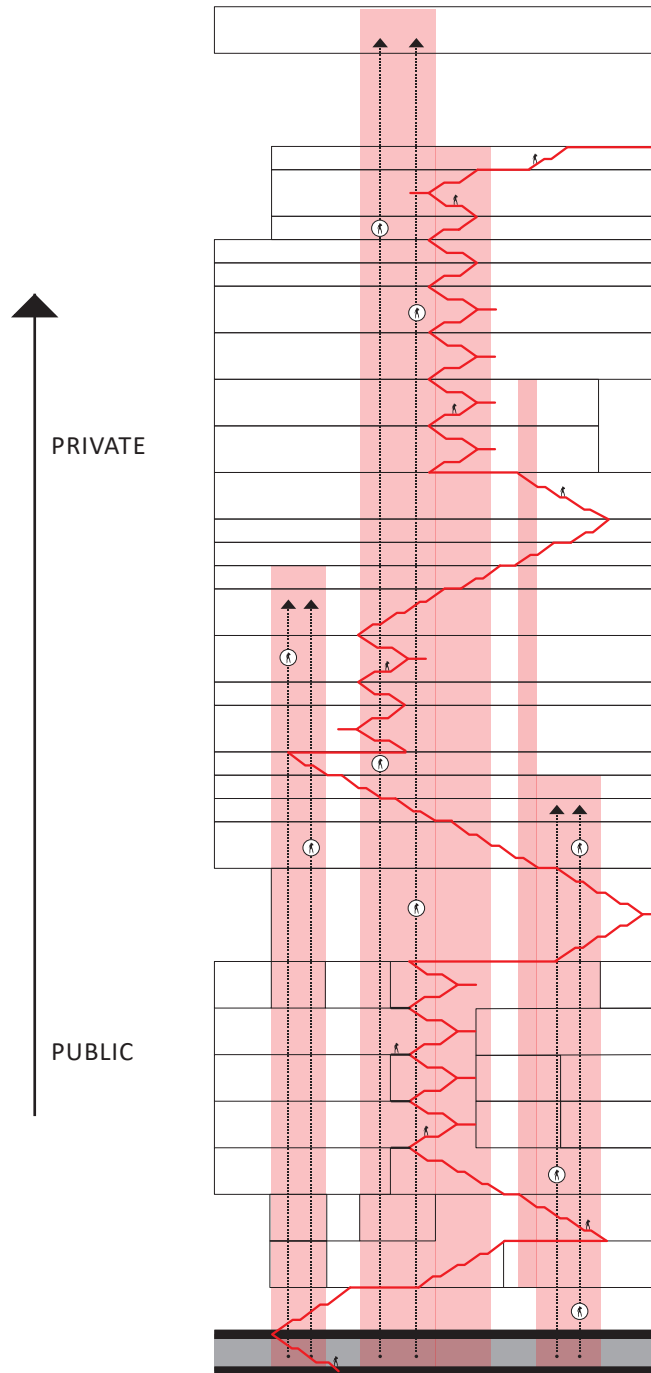


Figure 63.
Continues Linear Vertical
Circulation Proposal

6.2 Prototype

The word prototype comes from the Greek *prōtotupos*, which means 'primitive form'. From a different literature, a prototype has carried different meaning; but essentially, a prototype tests a process and learns things from it (*Oxford Dictionary of English*, 2015).

In Houde and Hill, developing a prototype brings new functionality and new technology (Houde & Hill, n.d.). Building a prototype identifies unknown issues and finds new opportunities. In hacking theory, a prototype is a sample version of the project, which creates a potential for a new relationship between matters.

Prototyping is the beginning of the development process in design. Through prototyping, we learn different processes that affect and change existing buildings and its surroundings. As shown in Figure 64, the diagram of process hacking illustrates the transformation of an existing building. By revealing hidden layers of the city and the building, we can investigate the existing potential. The different type of programs can be shuffled around to find and explore new relationships between different programs and vertical linear circulation.

The continuous vertical circulation (Figure 66) wraps around the building to support different functions and programs of the building. Within the vertical linear circulation, different type of programs are located around to explore the link between public and private space. As the building becomes higher, the layout becomes more suitable for private use. Hence, public programs and activities are concentrated on the lower level of the building. A large open space is located on each floor to create an interactive space for different visitors to the building. The different in height and form of space located on the upper level of the building provides various needs for the future workforce.

Within the building, there is a large open space available for working, or for activity programs. This will create a connection between working and living in the city. This large volume of space acts as a feature and a destination for different levels of the building.

Since the building is tall, the massing of the building is broken down by both programs and volume of space. A large volume of space is carved out of the building to create a diverse outdoor space for both workers and the public. On lower level of the building, a double-storey height of the space creates an elegant and spacious space for holding various activities and programs that accommodate both the public and the workforce.

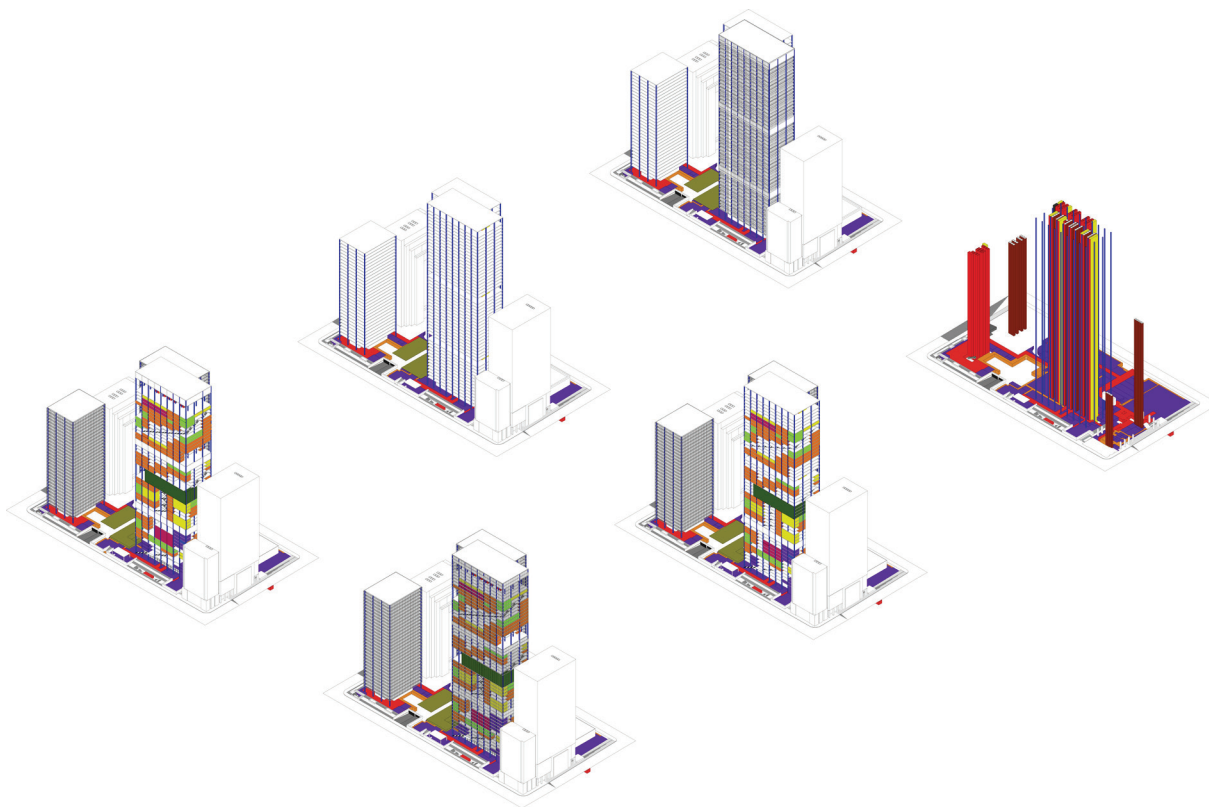


Figure 64.
Transformation of
Existing

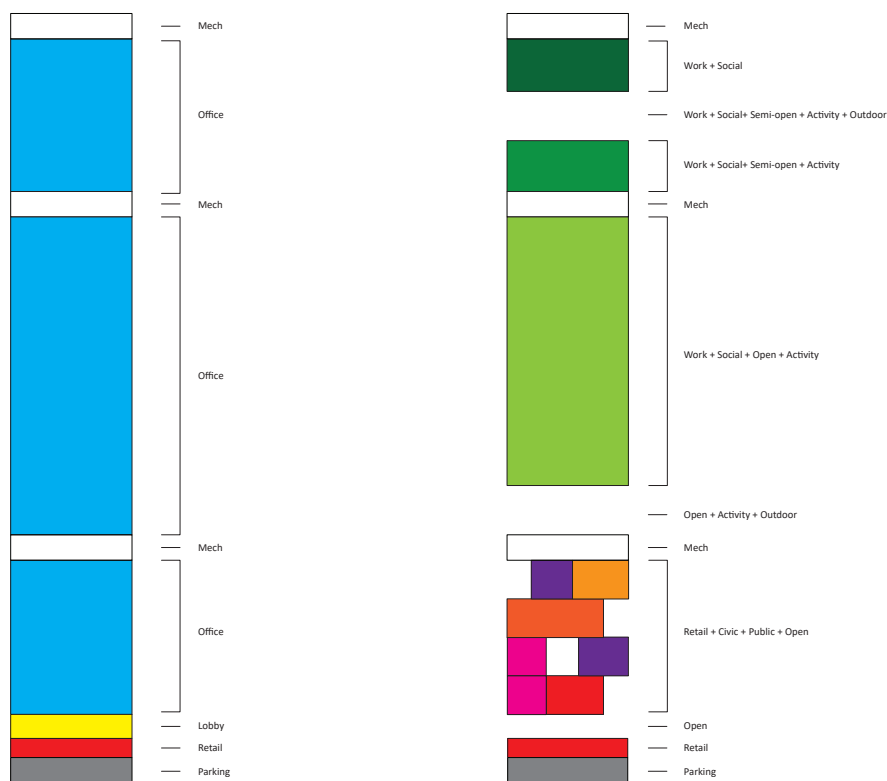


Figure 65.
Proposed Program for
TD Tower

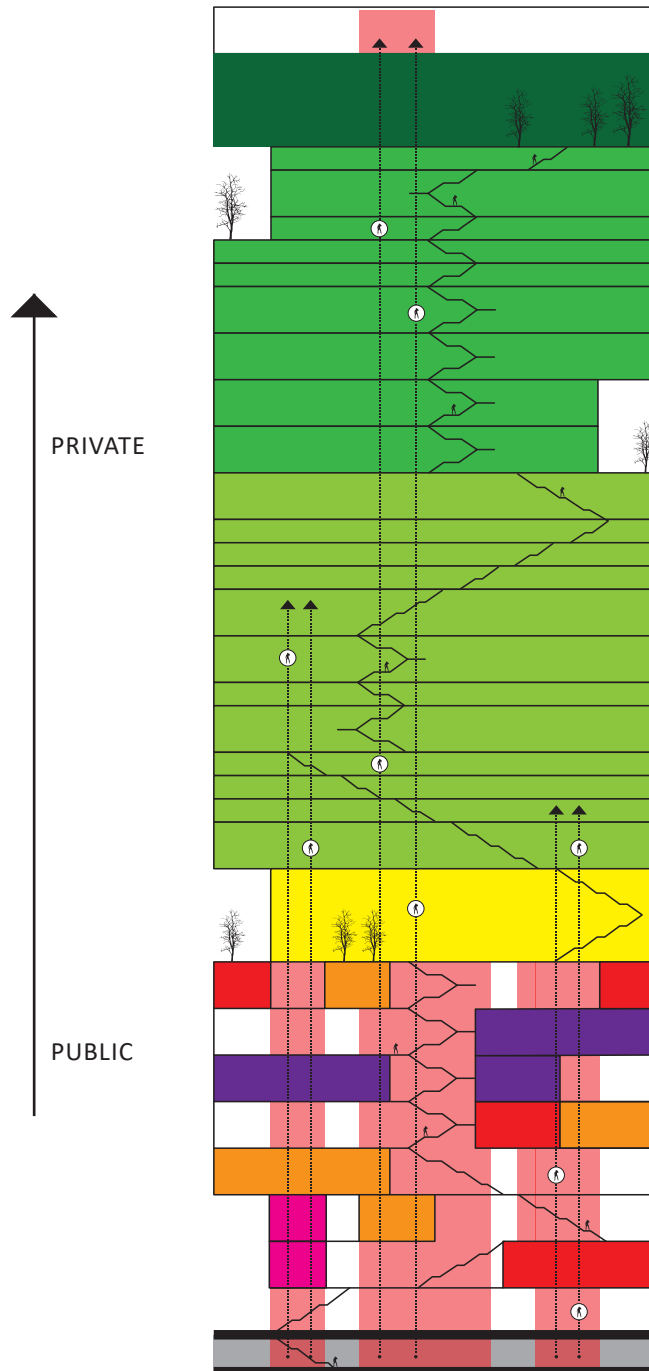


Figure 66.
Program Layout

On the concourse level, a large flexible open space is provided to increase social activity on the site. The void space located on the ground floor plane acts as a transitional space between the ground and below grade. For open space on concourse level, the light canons is scatter around void to bring natural light into the space. These light canons on the ground levels turn into seating area to increase interaction between people. The staircase is added within the footprint of existing building to provide a direct connection between PATH and the building at above grade.

On the ground level, the exterior wall can be opened up to explore the tension between interior and exterior space. The floor space is open and flexible; can hold different types of events during different seasons and weather conditions. The transparency of walls on ground planes creates a freedom for pedestrian movement between the building and outdoor space.

As for working space, the mixture of den, cell, and club is integrated into the layout to promote collaboration and interaction between people. The different height of the working space is created to provide a different environment and improve spatial quality.

Structurally, penetrating, removing, and carving the floor create a large open space that provides a connection between floor to floor. The system of cross bracing is used throughout the building to support a tall space and cantilever.

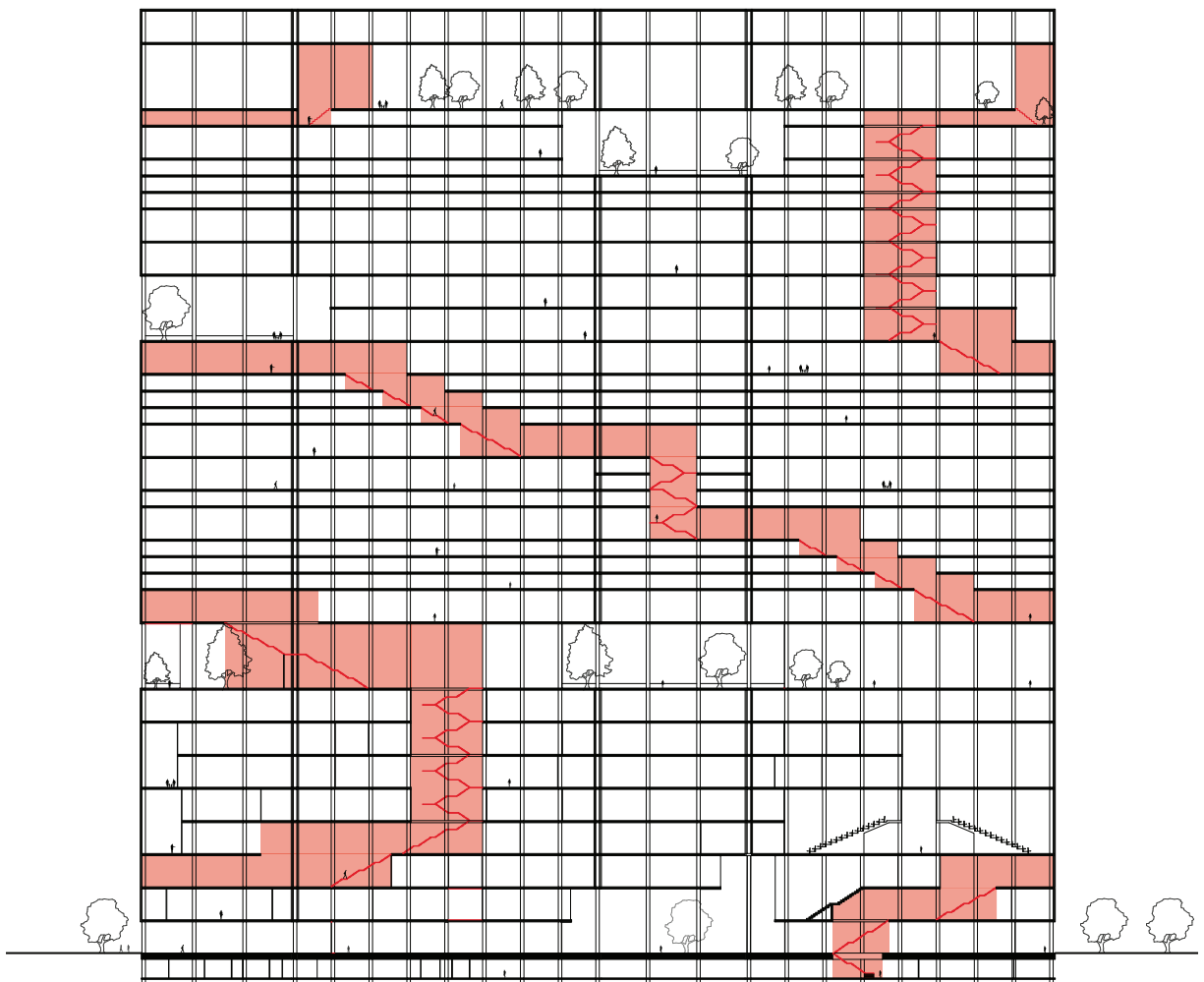


Figure 67.
Unfolded Section,
Vertical Circulation
Diagram

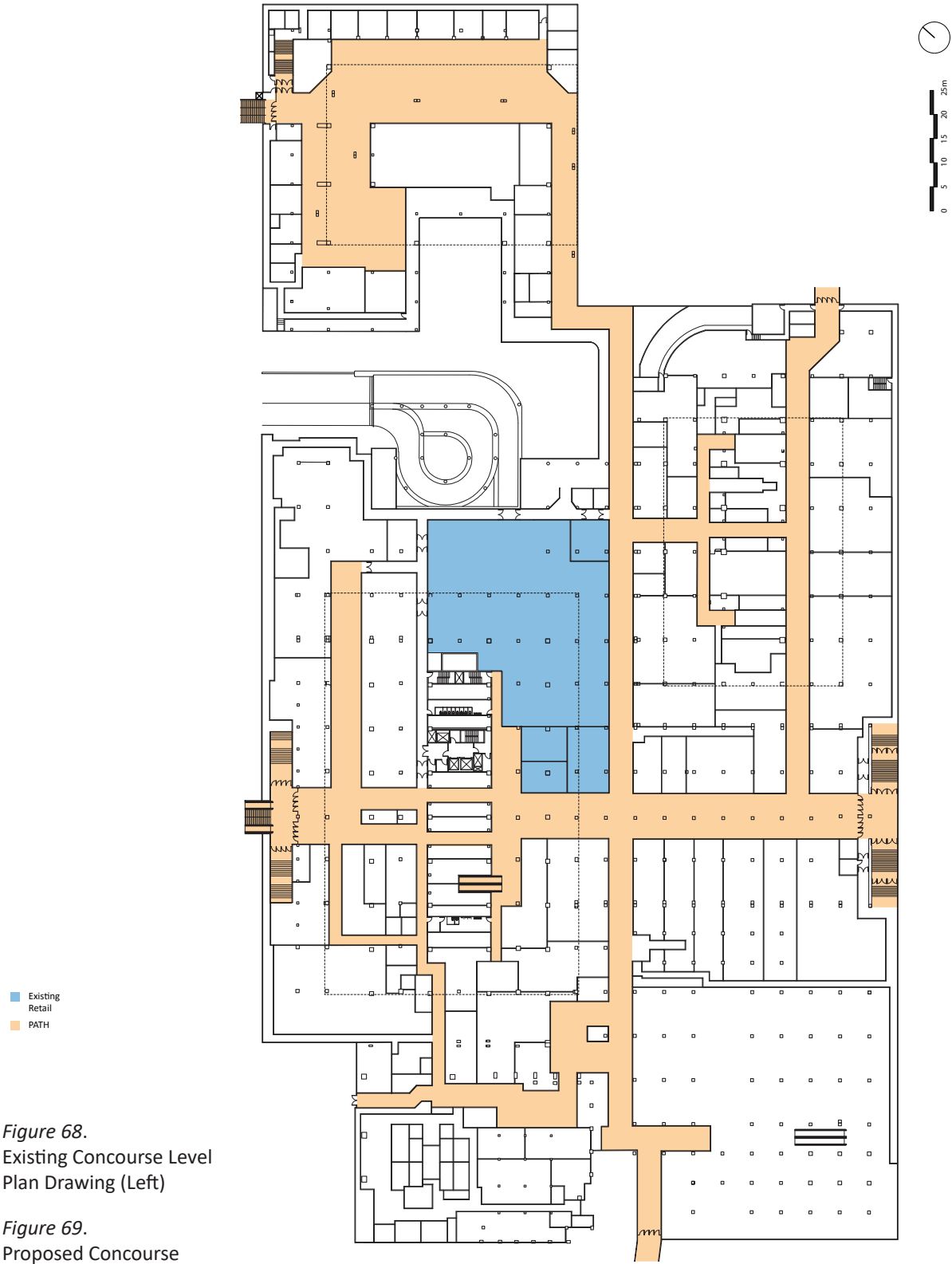


Figure 68.
Existing Concourse Level
Plan Drawing (Left)

Figure 69.
Proposed Concourse
Level Plan Drawing
(Right)

Existing
Retail
PATH

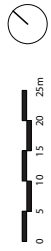
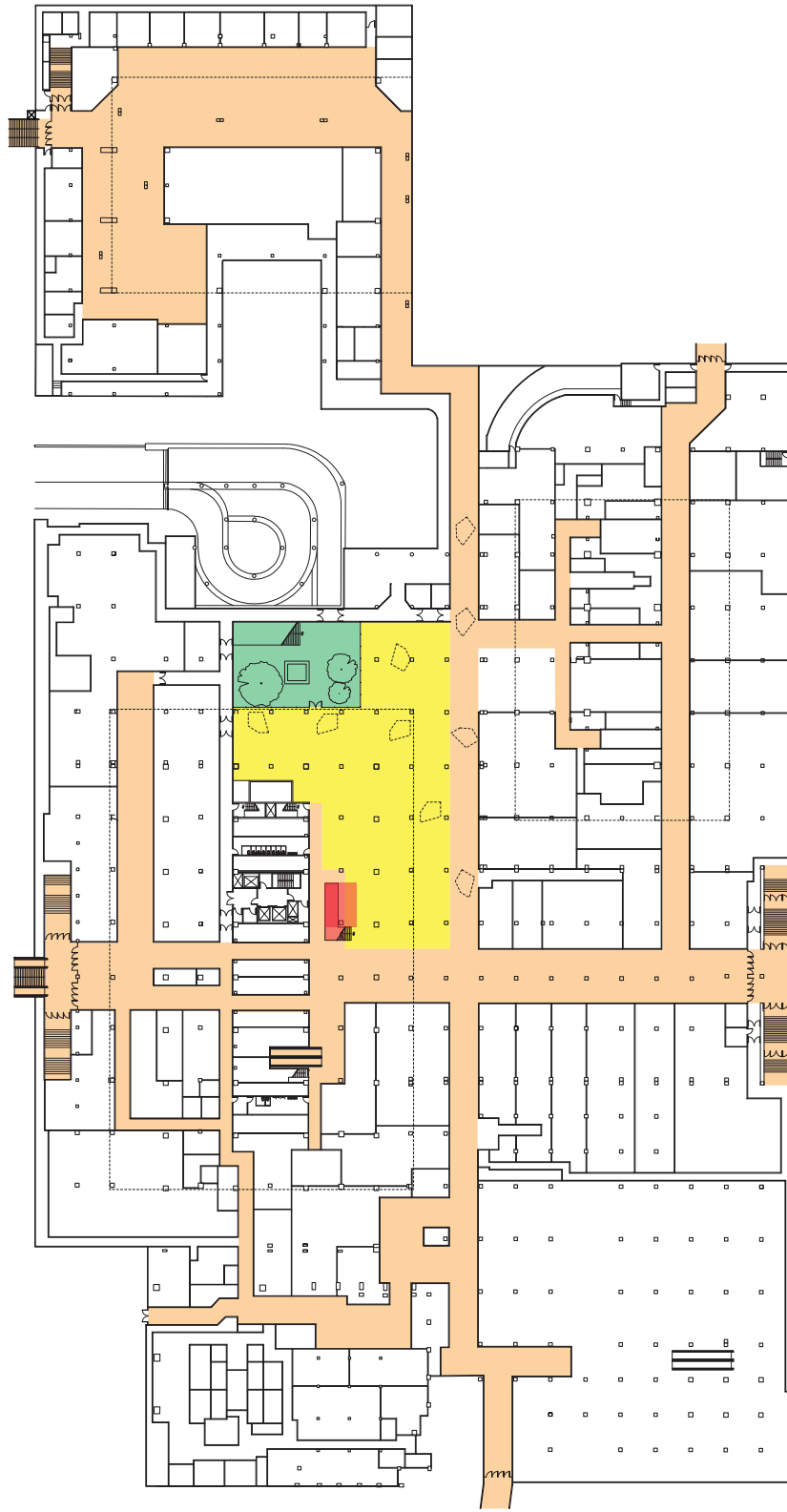
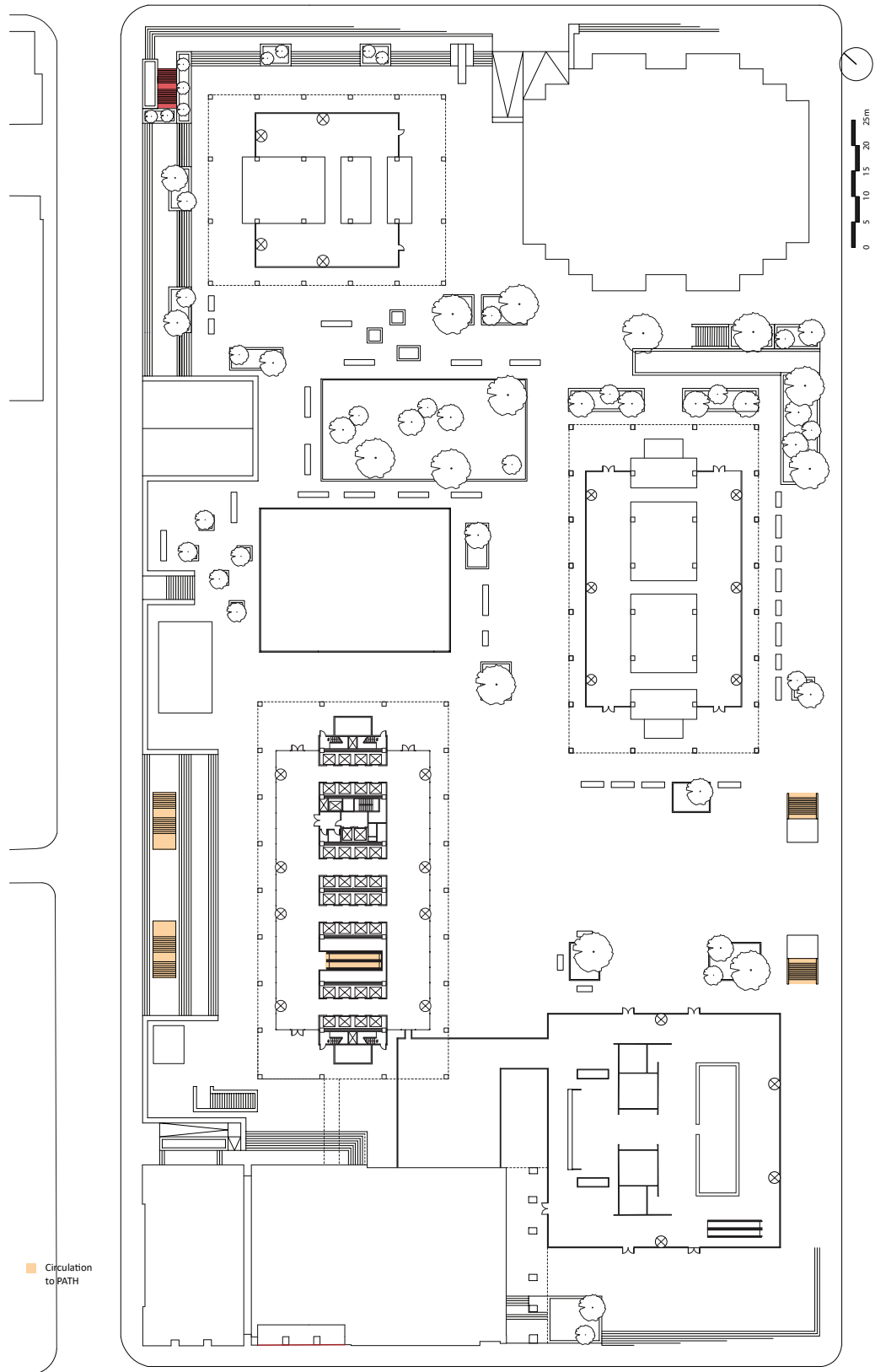




Figure 70.
Perspective View of
Concourse Level (Left)

Figure 71.
Existing Ground Level
Plan Drawing (Right)



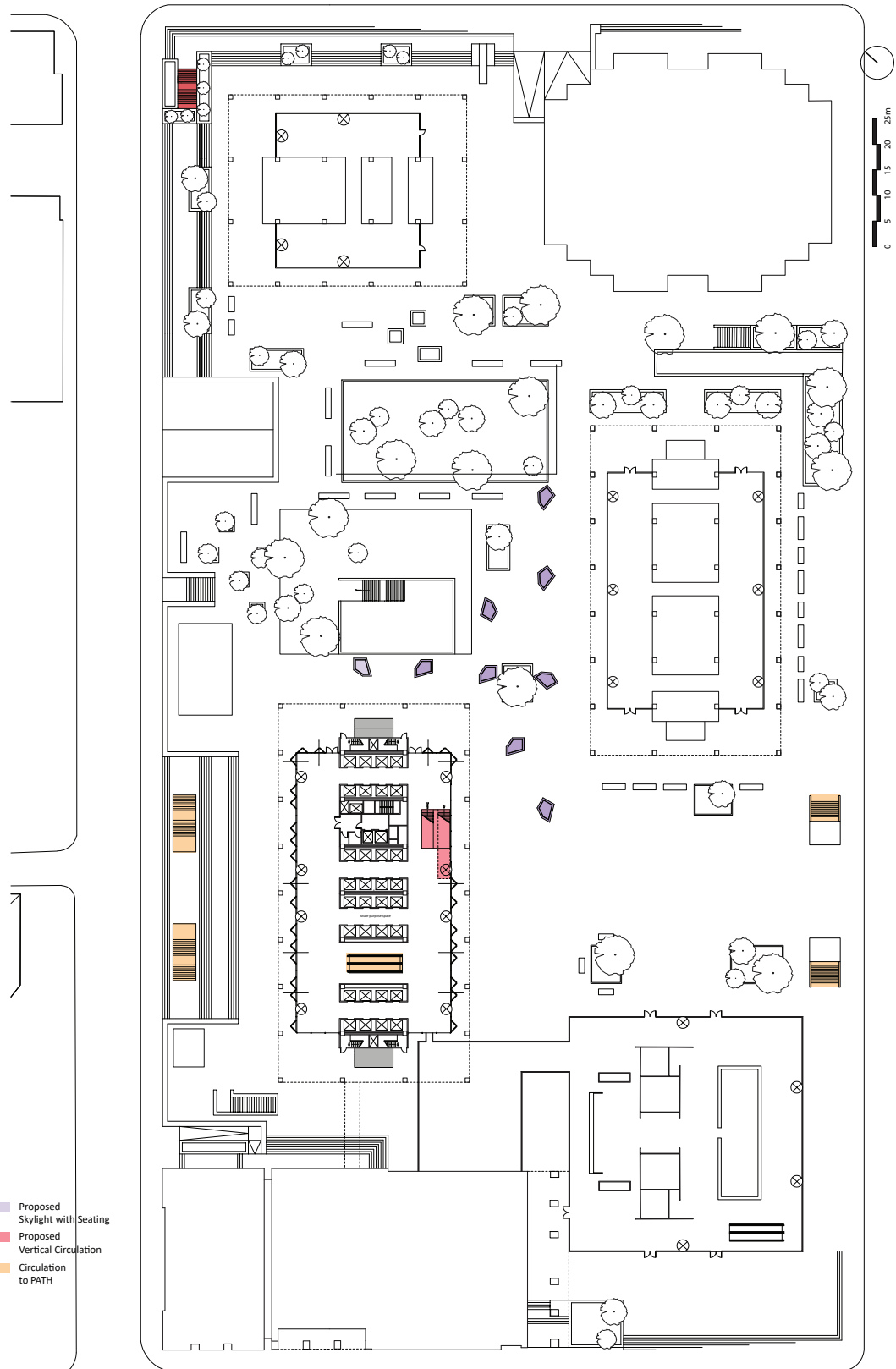


Figure 72.
Proposed Ground Level
Plan Drawing



Figure 73.
Perspective View of
Ground Level

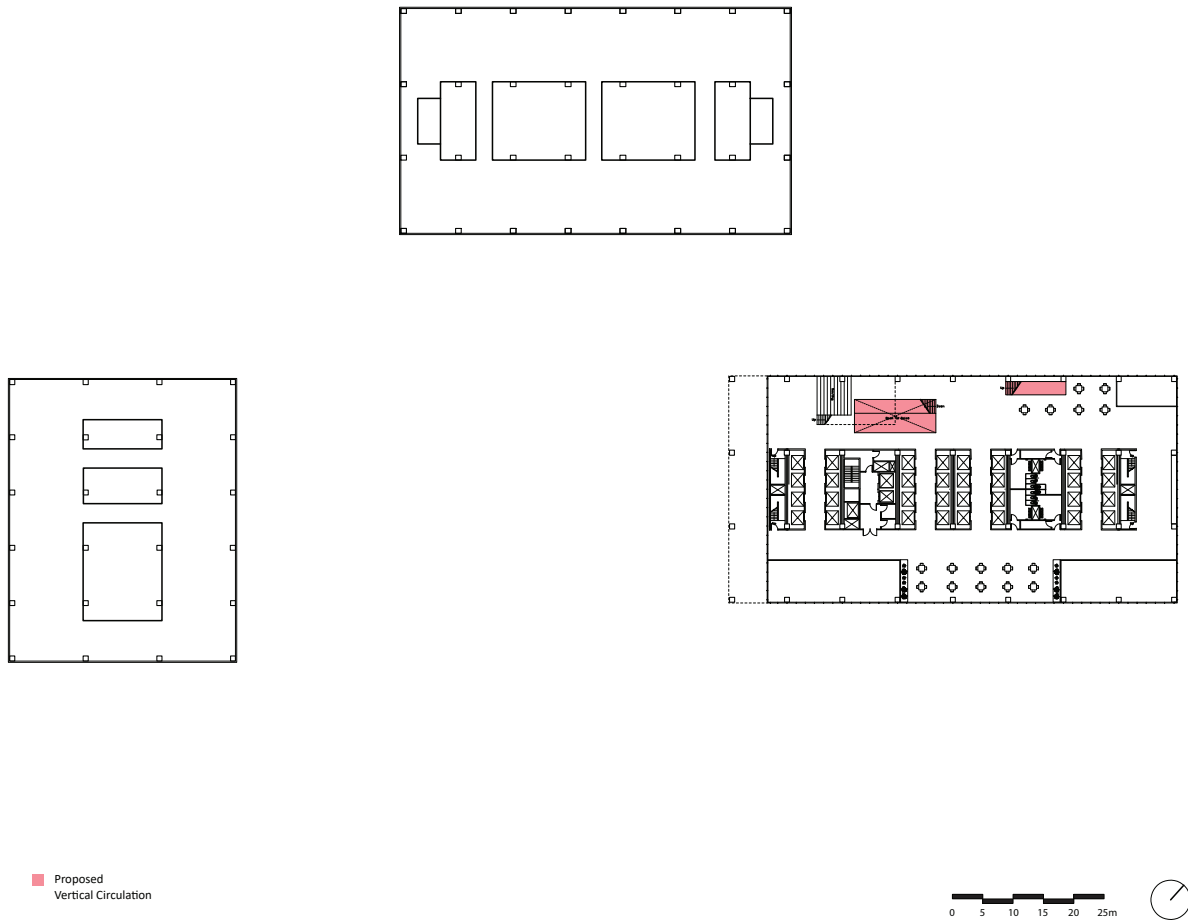


Figure 74.
Second Floor Plan
Drawing

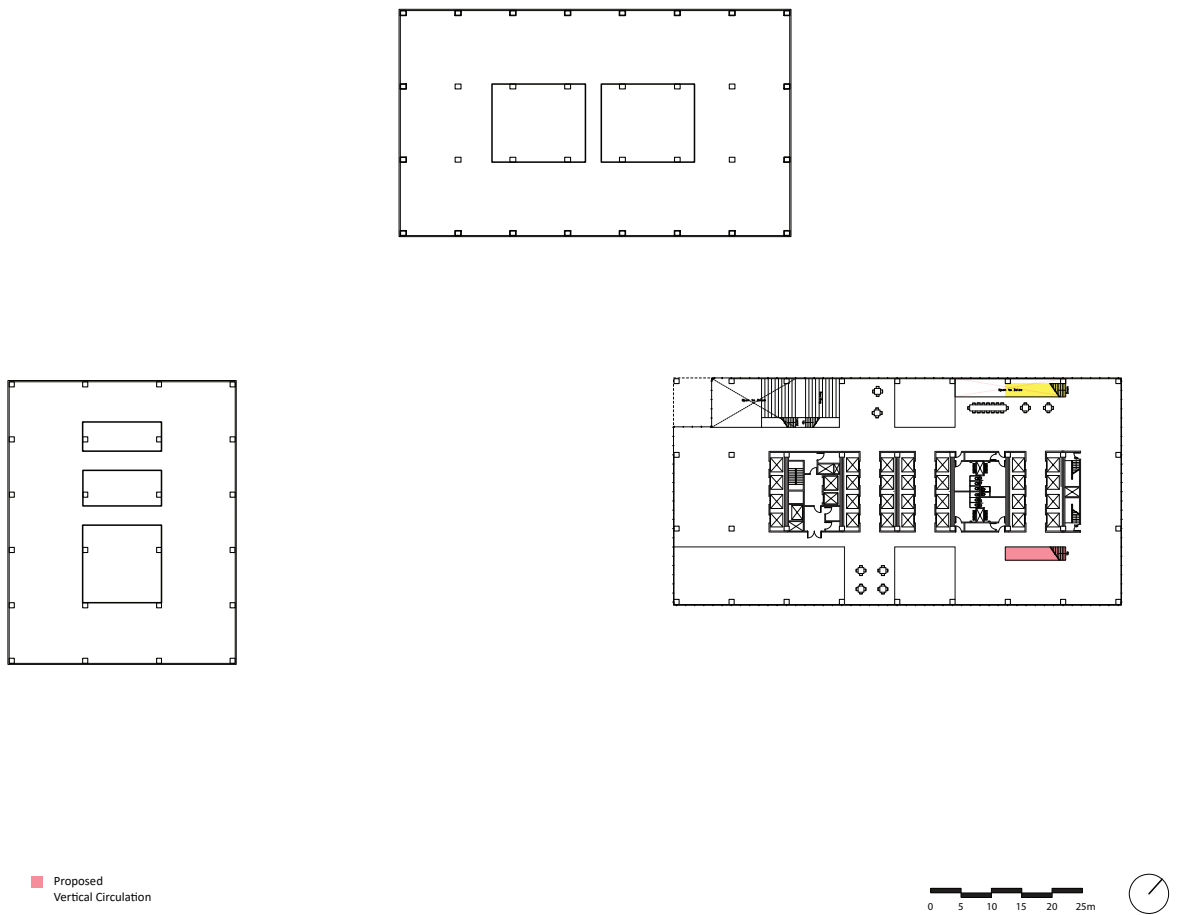


Figure 75.
Third Floor Plan Drawing

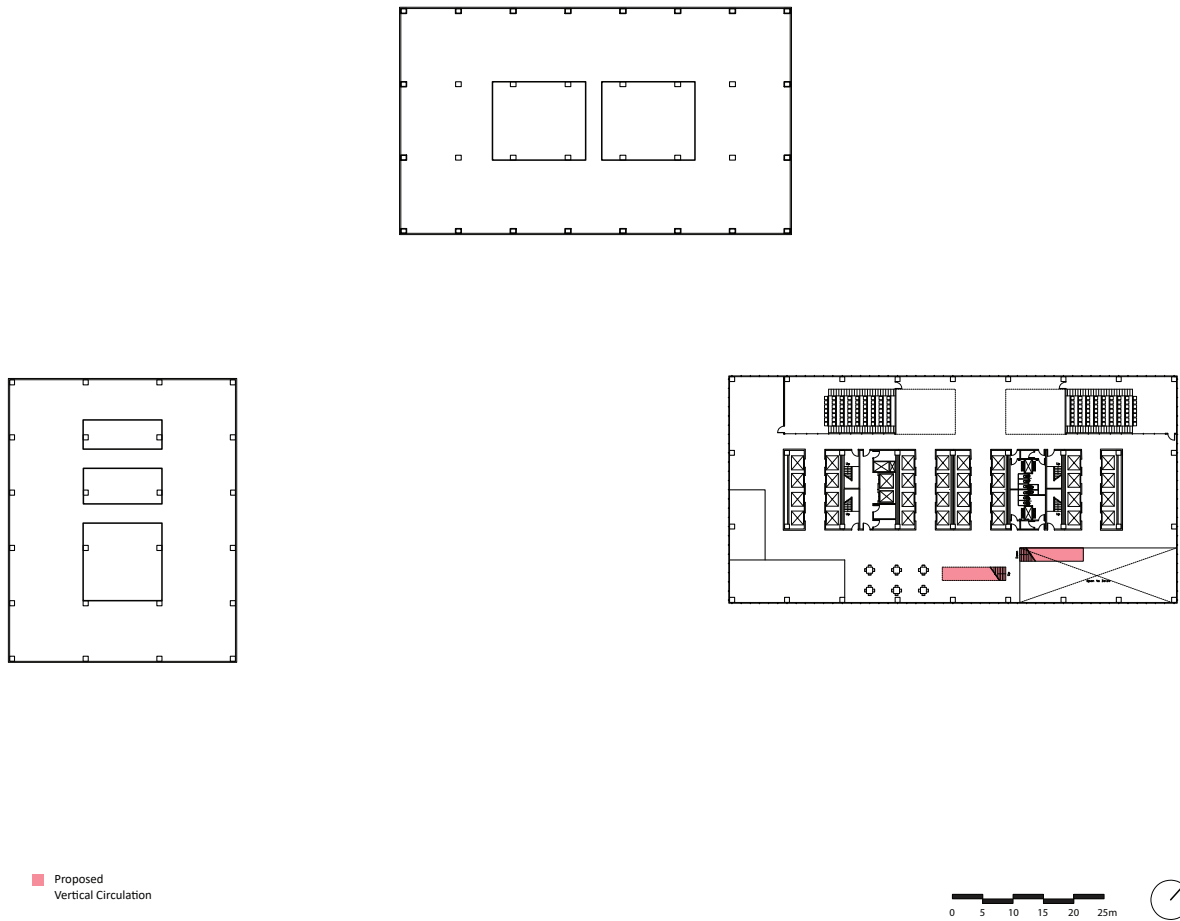


Figure 76.
Fourth Floor Plan
Drawing

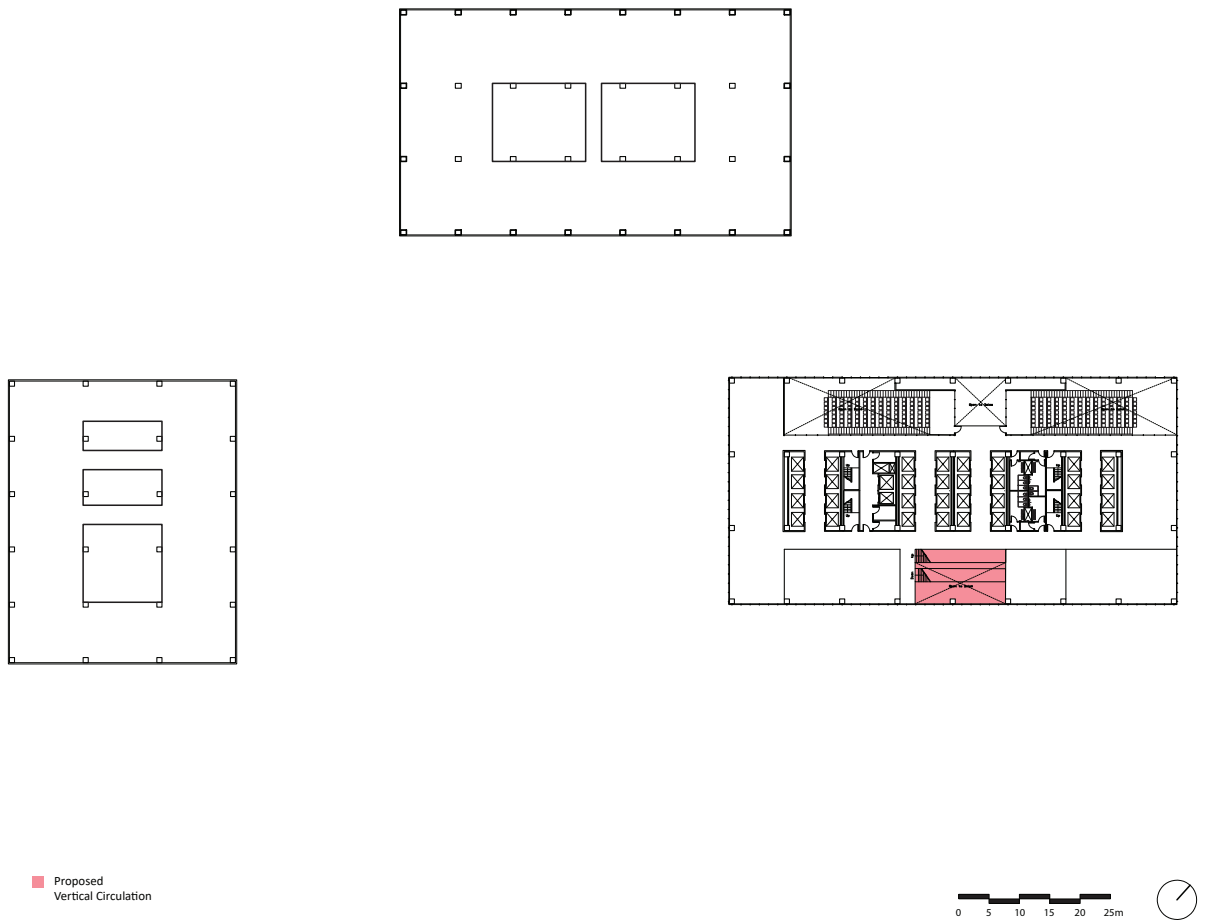


Figure 77.
Fifth Floor Plan Drawing

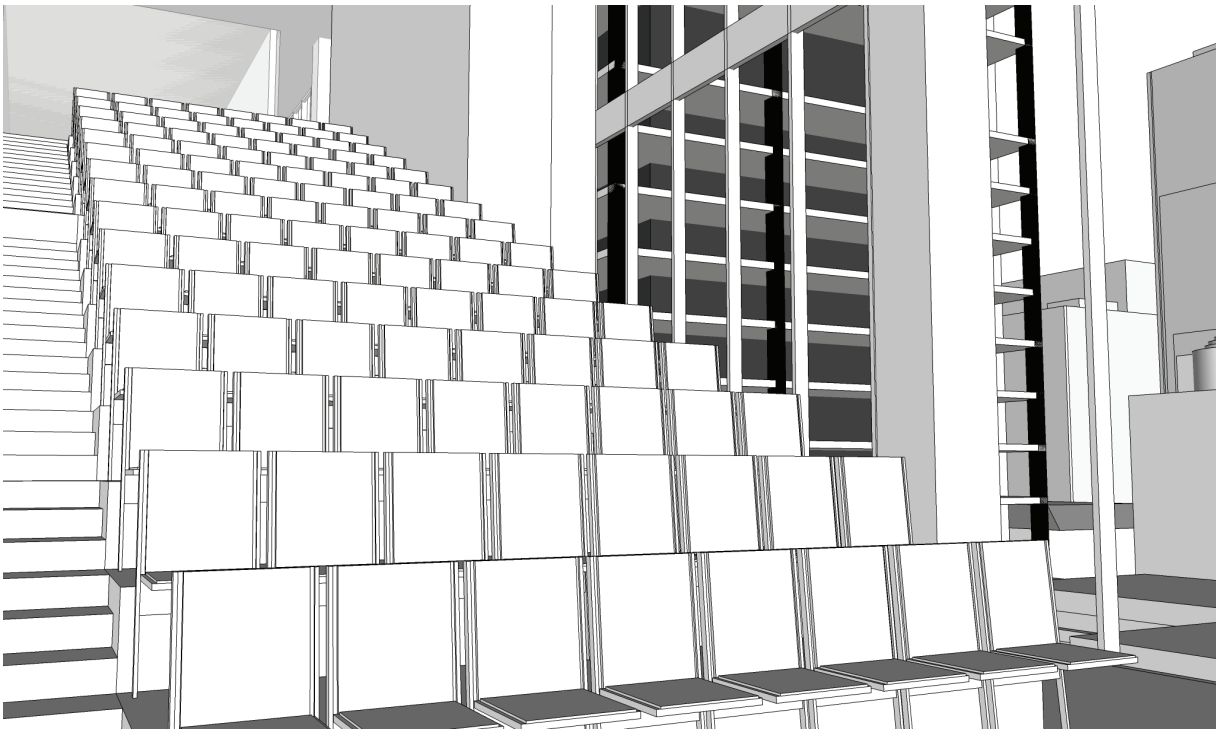


Figure 78.
Perspective View of
Theatre Space

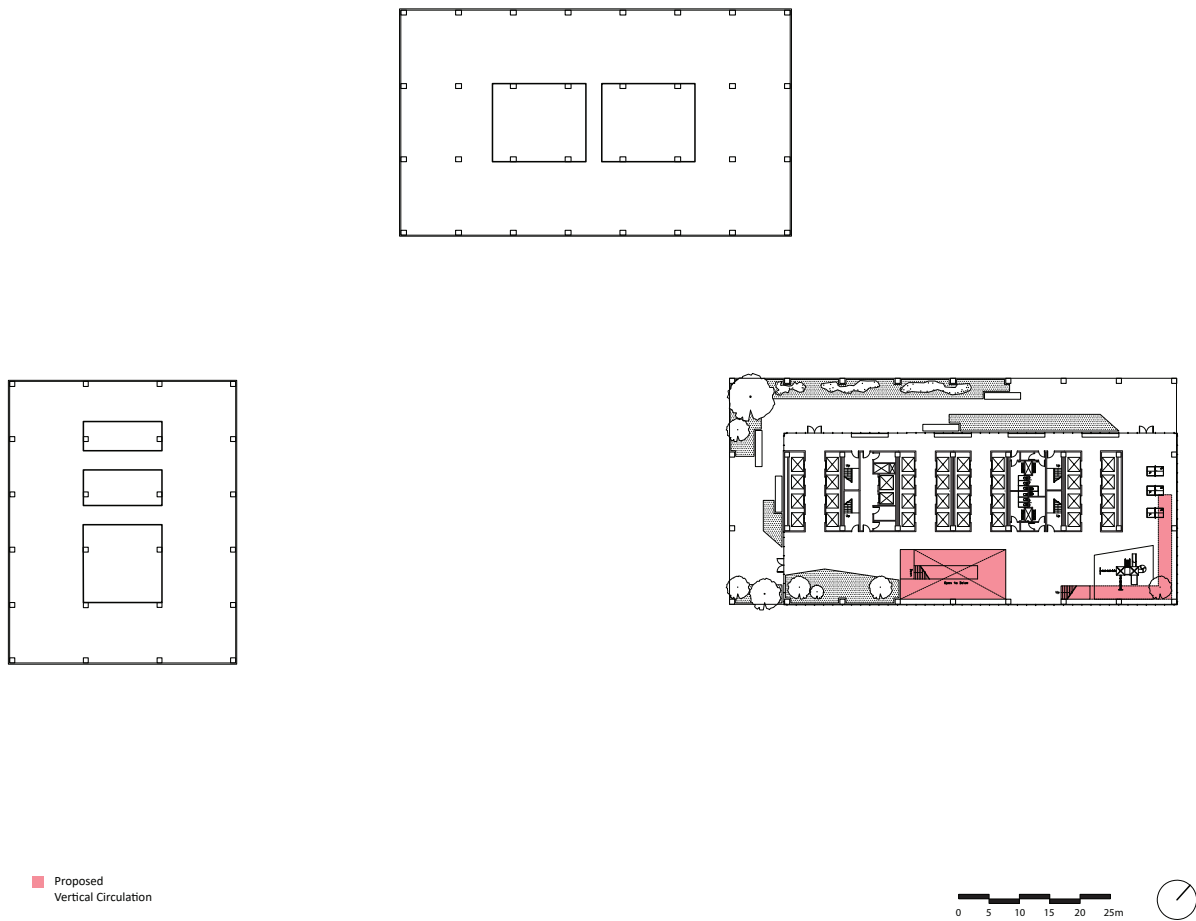


Figure 79.
Sixth Floor Plan
Drawing, Playground

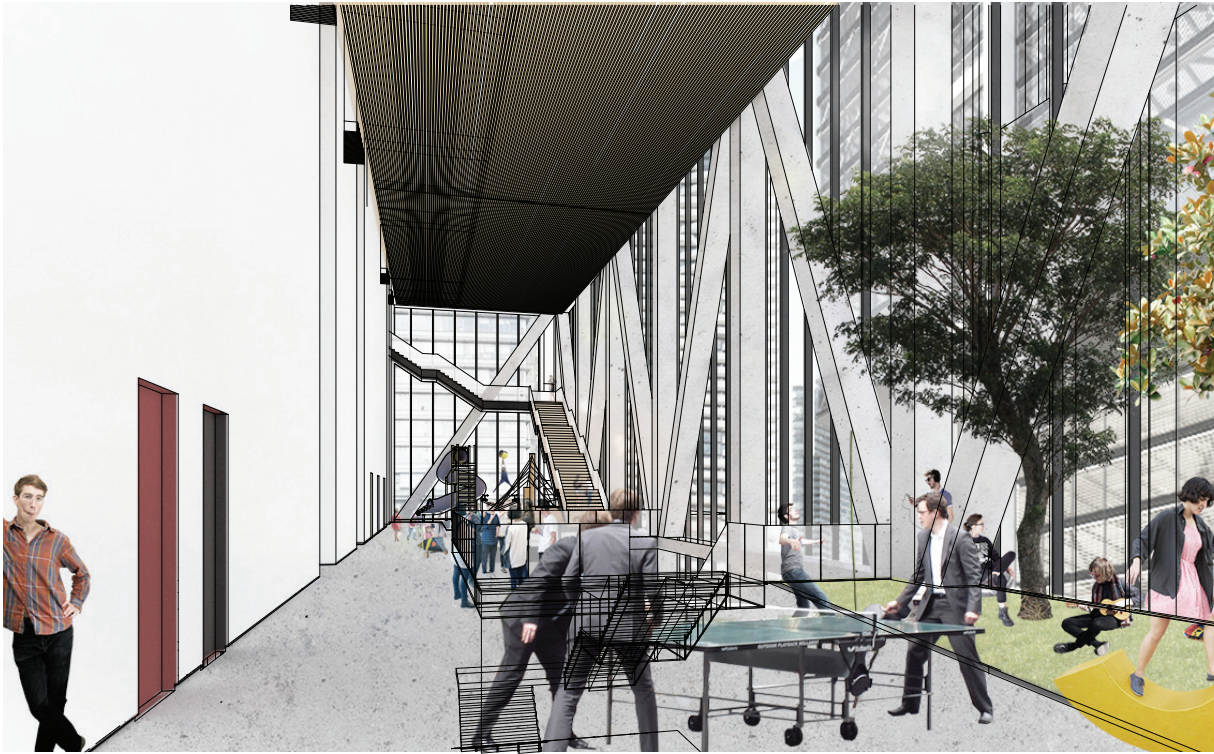


Figure 80.
Perspective View of
Playground

This image is the view of the playground. It is an open area that allows people to interact and carry activity around the space. This space is acted as a threshold within the building. It is a transitional space between different functionality of the programs. Additionally, this area is accessible to the public. It is located in the middle of the building where both public and private meet, merge, and interact with one another.

Another purpose for this area is to provide an indoor and outdoor environment to create a different atmosphere in the threshold space. This area is flexible and open-space to hold various activity to improve social quality of workers and the public. Green space is also provided in both indoor and outdoor space. This creates softness within the space.

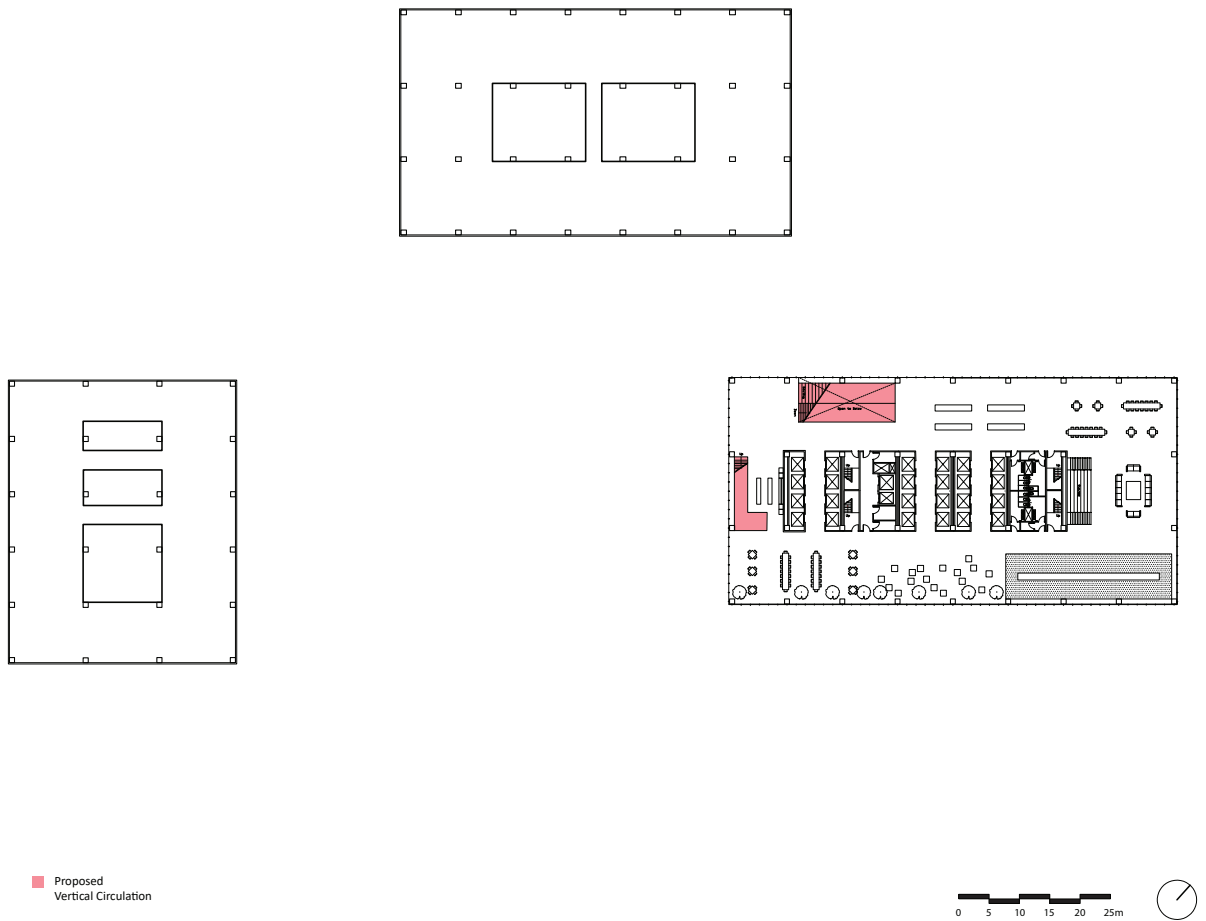


Figure 81.
Work Space Layout A,
Social + Open + Activity

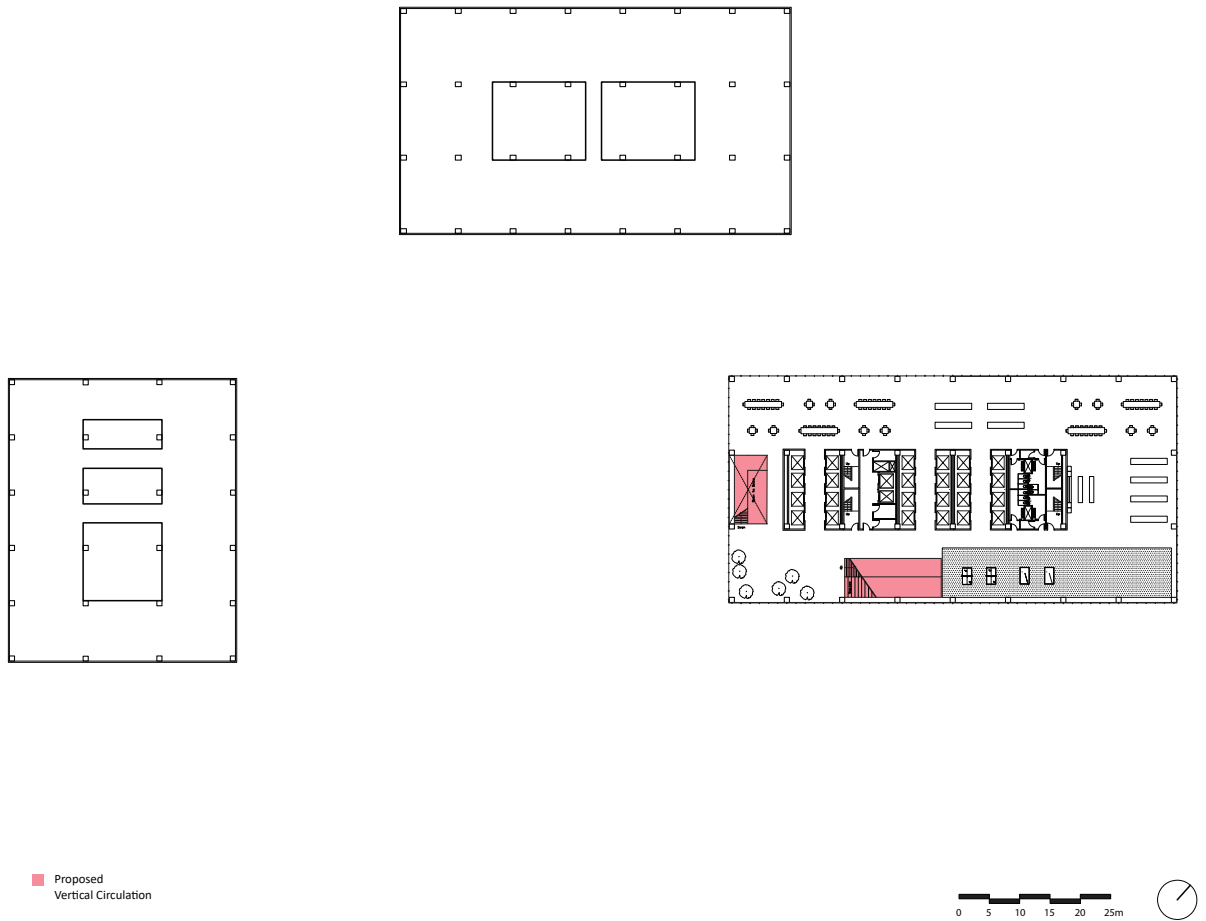


Figure 82.
Work Space Layout B,
Social + Open + Activity

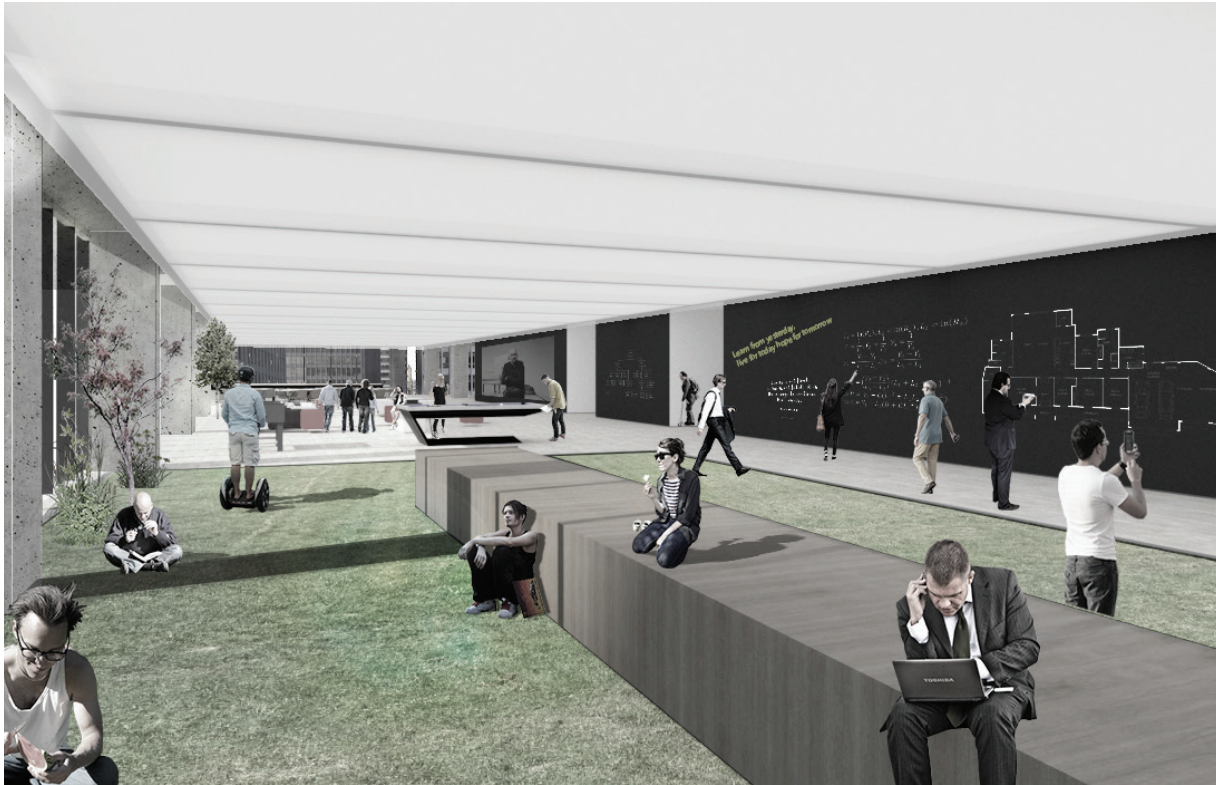


Figure 83.
Perspective View of
Work Space, Social +
Open + Activity

This is a semi-public working zone. It is an open and flexible area that allows workers to collaborate and learn from one another. This area does not have individual spaces; hence, it promotes activity and social interaction within the environment. This zone can have a single or double-height ceiling. Here, it shows different condition and activity in the space.

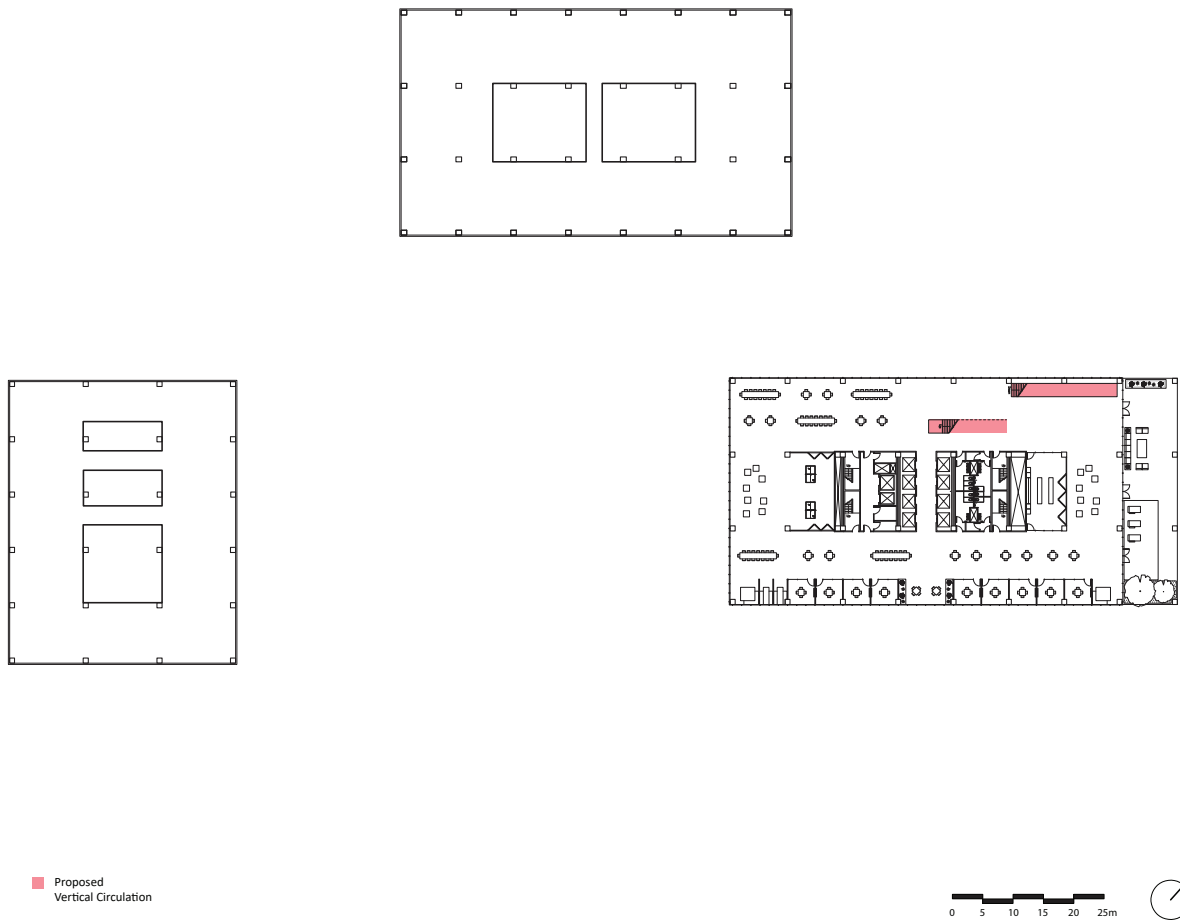


Figure 84.
 Work Space Layout C,
 Social + Semi-open
 + Activity + Outdoor

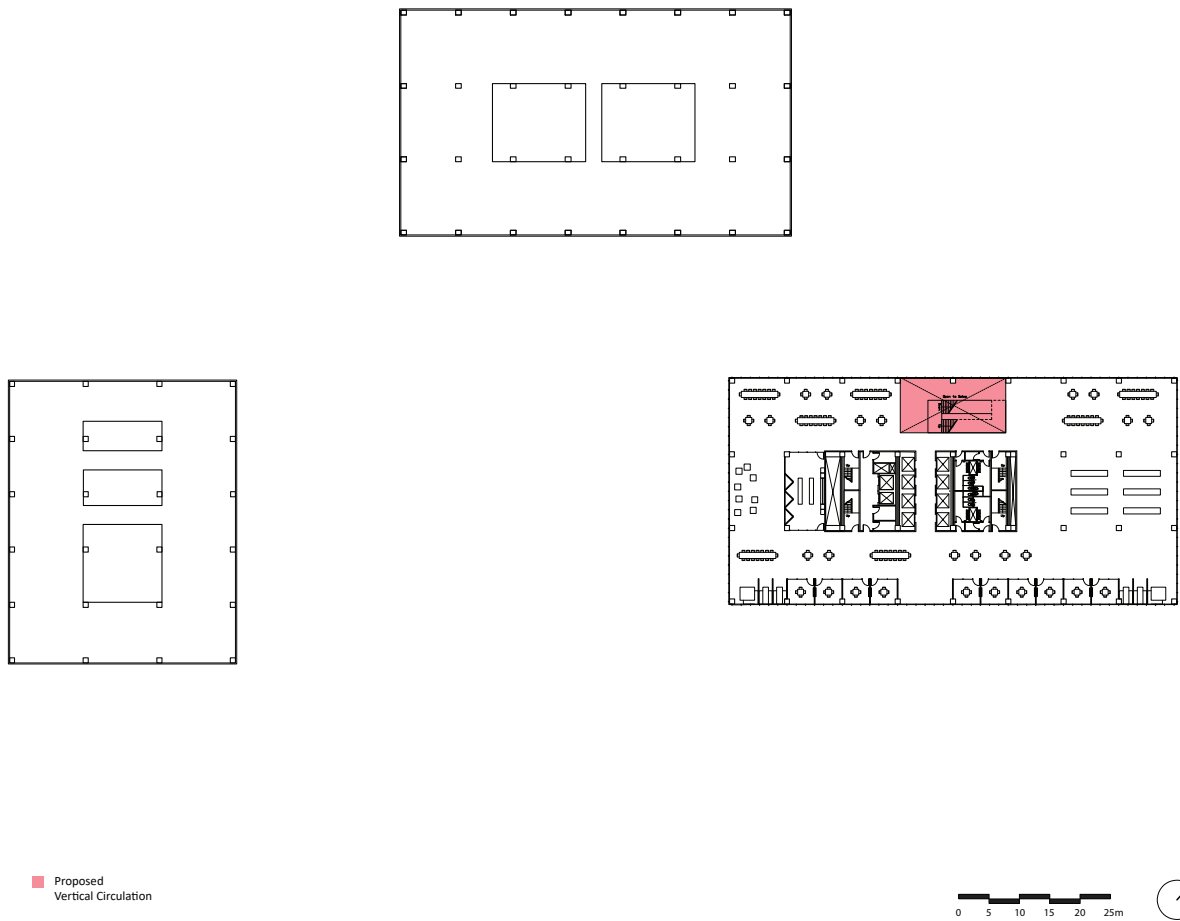


Figure 85.
Work Space Layout D,
Social + Semi-open
+ Activity



Figure 86.
Perspective View of
Work Space, Social +
Semi-Open + Activity

This is where working environment becomes semi-private. It is an integration of open and segregated space. This is an area where individual worker can collaborate with one another. Compare to the previous working layout, this area allows collaboration to happen. An individual will have their own room or a divider.

There are two types of individual spaces that are designed here. One is a glass-box that allows transparency within the space and acts as an invisible divider. The other type is an open module with no door to provide minimum isolation, but still provides openness and transparency.

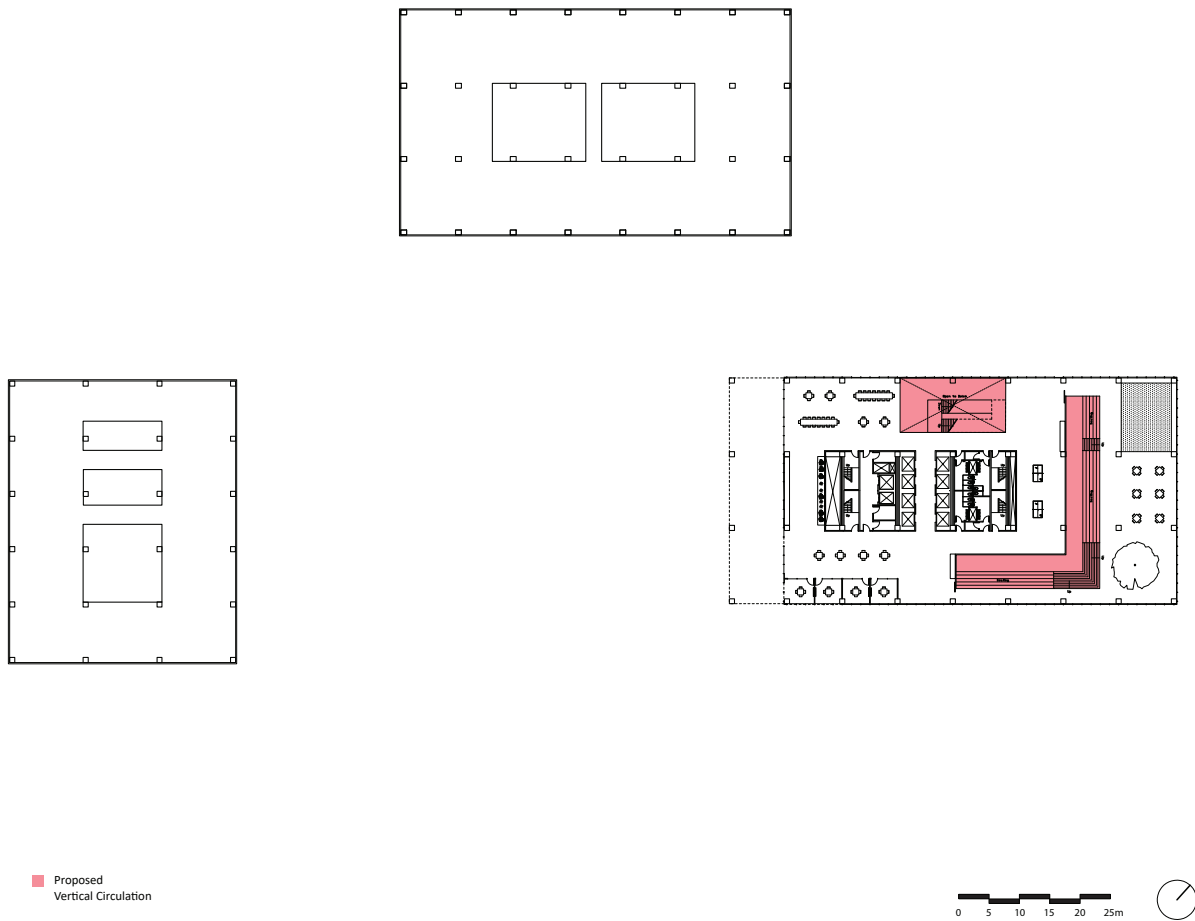


Figure 87.
Work Space Layout E,
Social + Semi-open
+ Activity

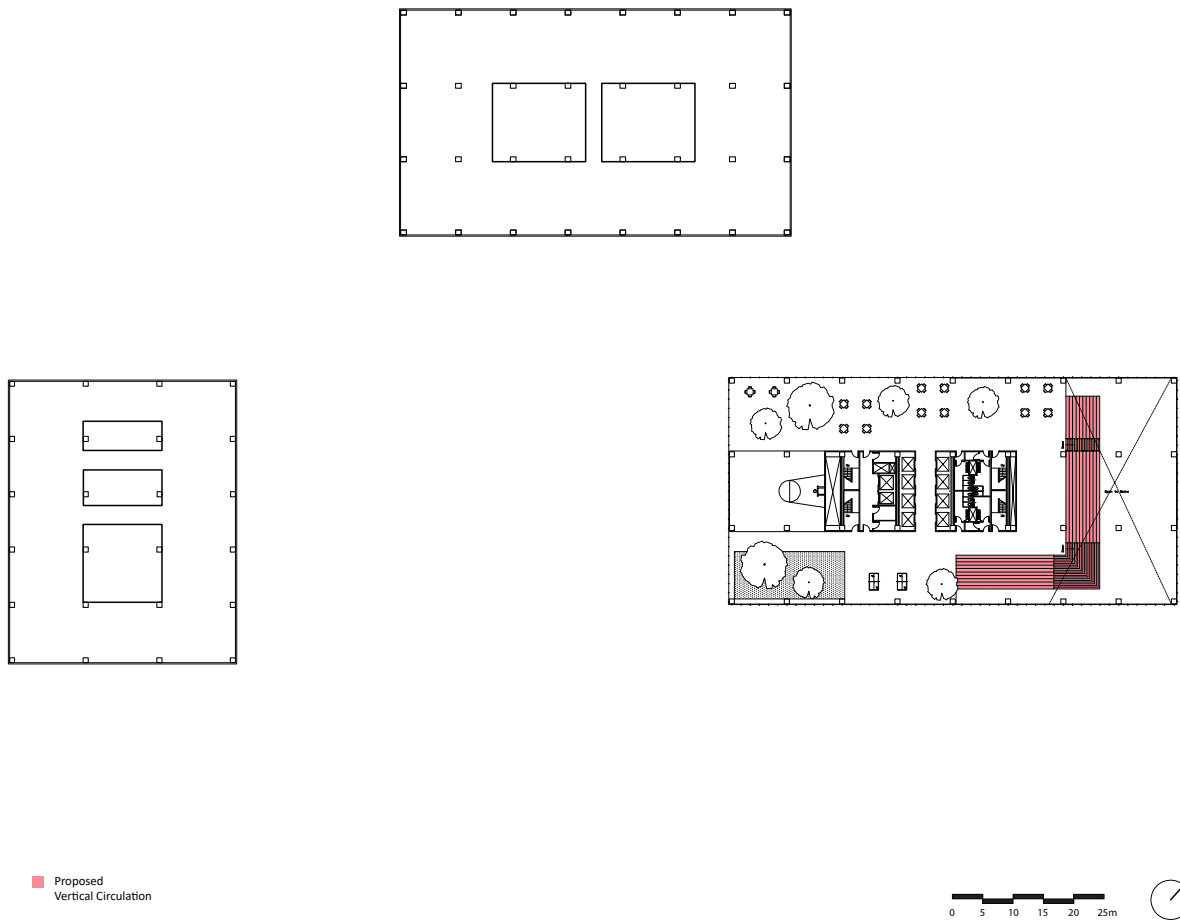


Figure 88.
Work Space Layout F,
Social



Figure 89.
Perspective View of
Work Space, Social

This is a social space. It is located on the top of the building. It is the main feature and program of the building. It is an open space that is able to hold various types of activities and events. The grand stairs submerge one floor to another. Within this transitional space, it provides seating. This area contains a large green space to bring a natural environment with activity inside; it reflects social interaction within the working environment.

The investigation of different concepts of working spaces allow integration of the space and the existing building programs. Some spaces have floors removed to create a higher ceiling height. The continuous, linear and vertical circulation creates a connection of programs between floor to floor.

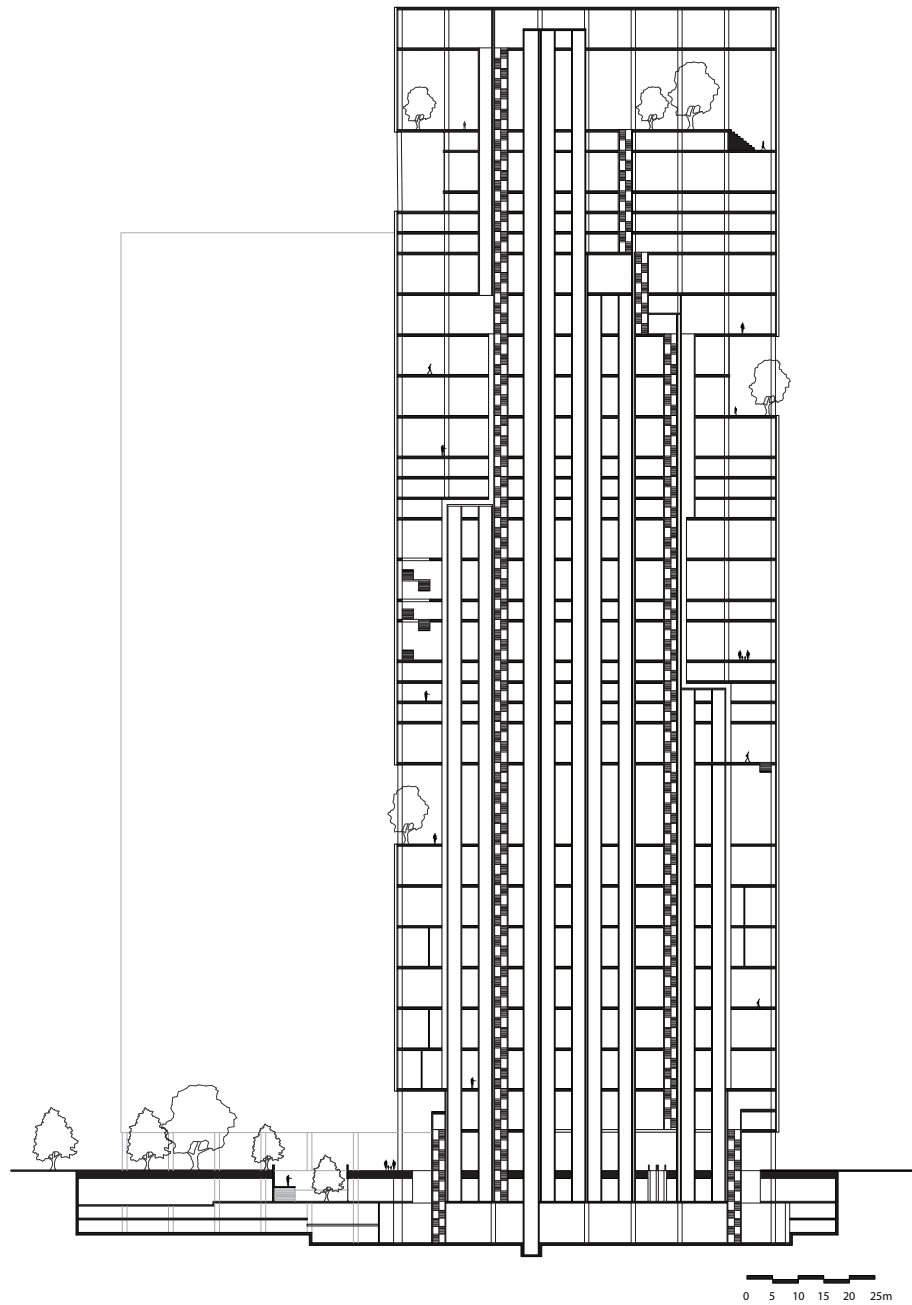


Figure 90.
Cross Section Drawing

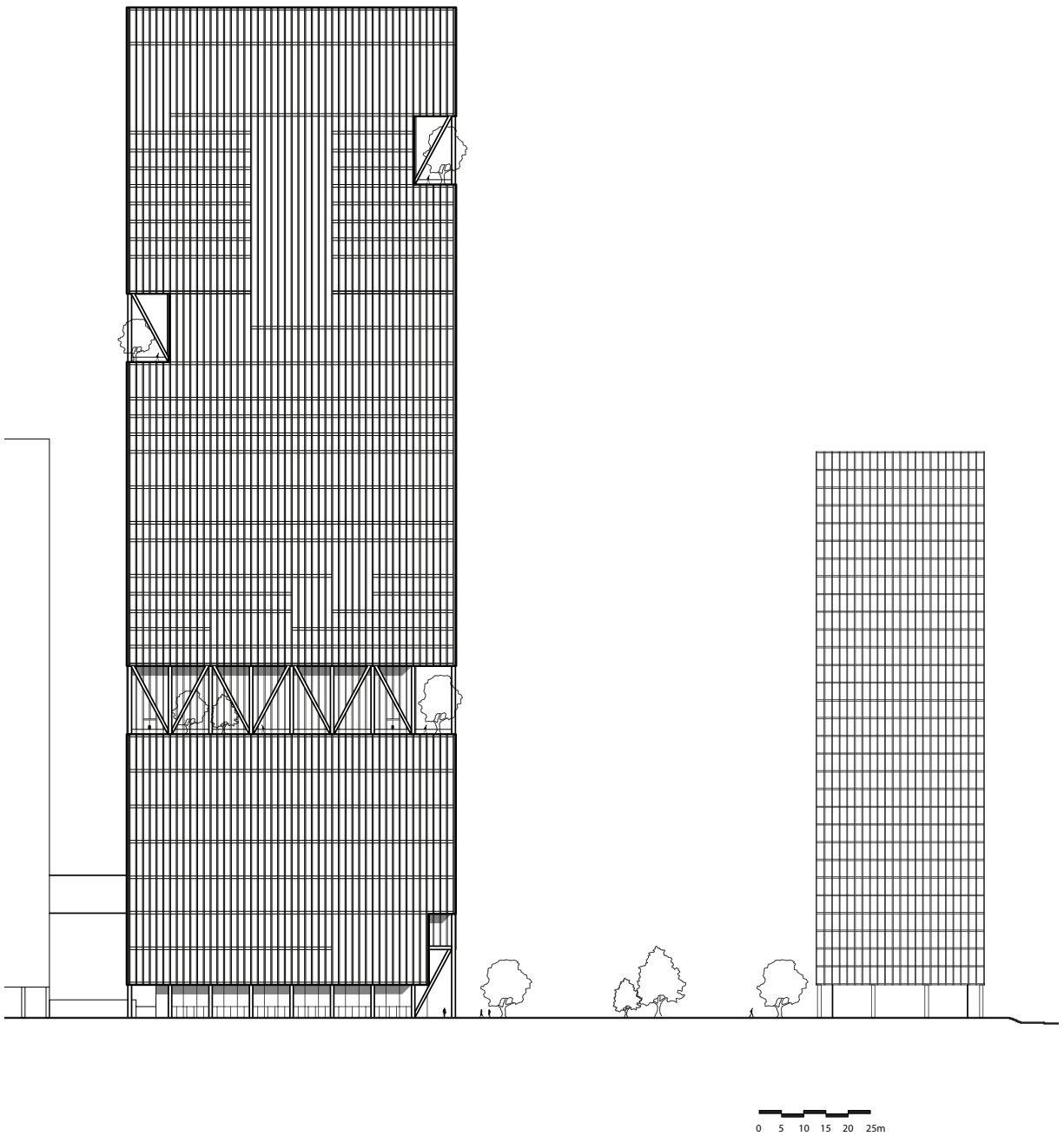


Figure 91.
North Elevation Drawing

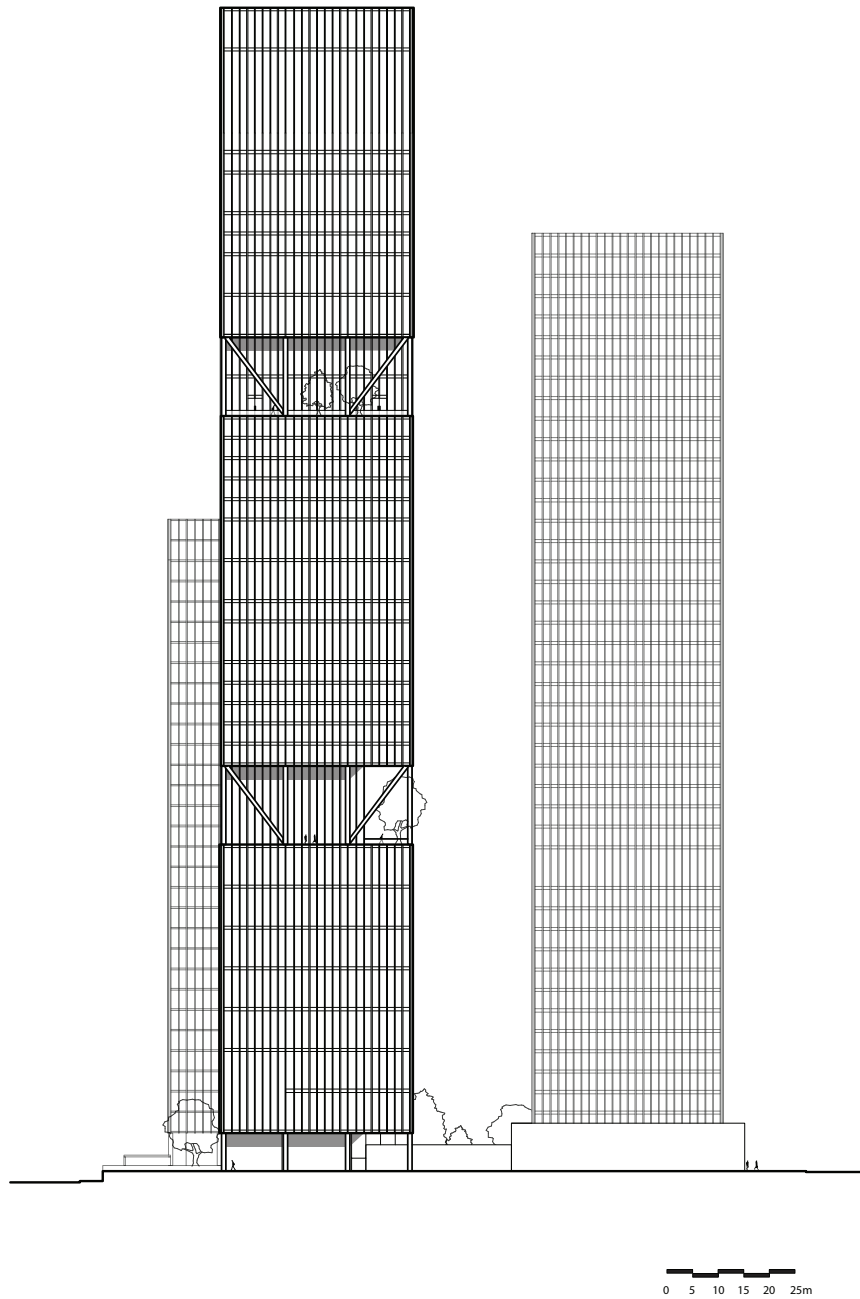


Figure 92.
East Elevation Drawing

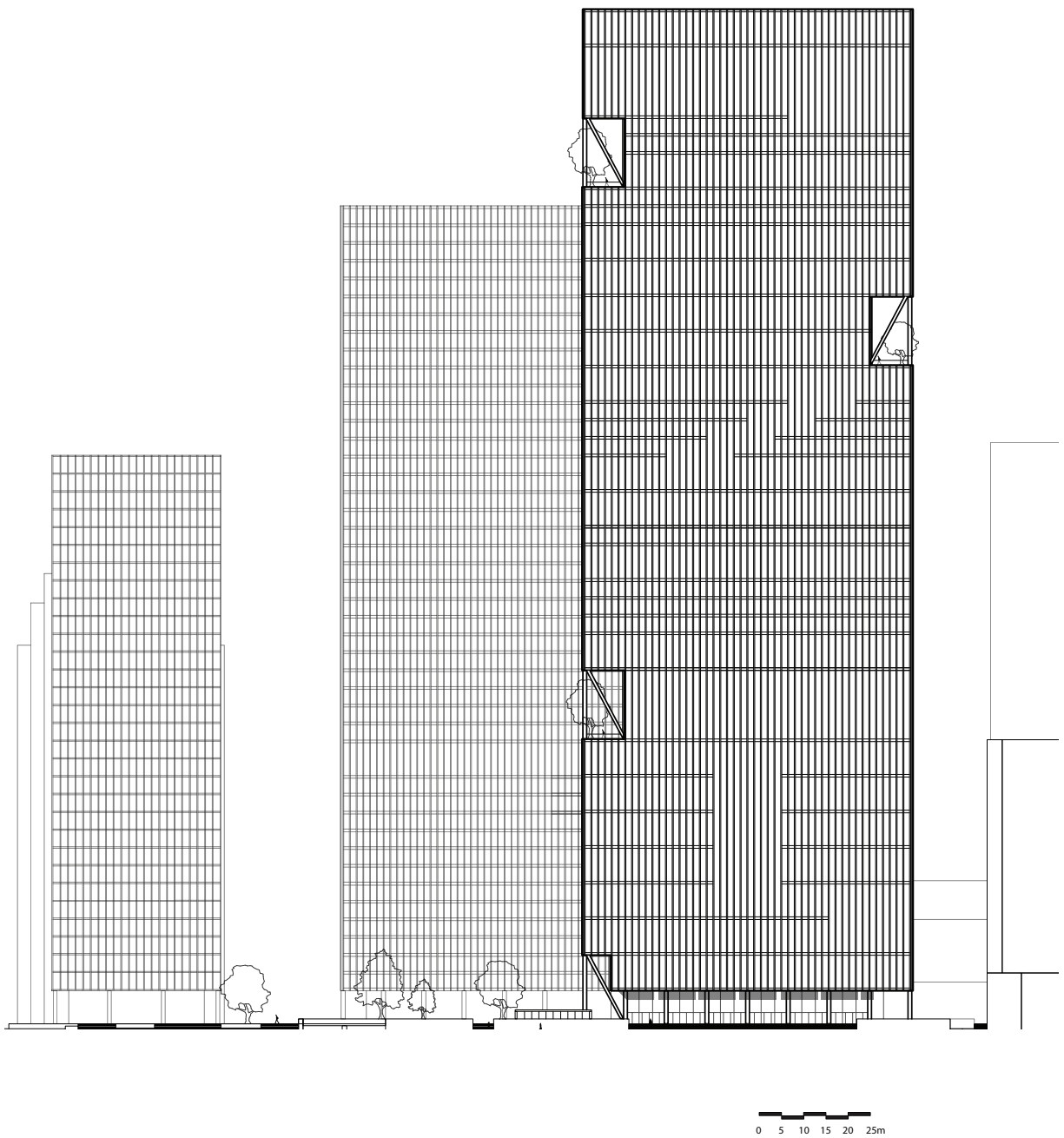


Figure 93.
South Elevation Drawing

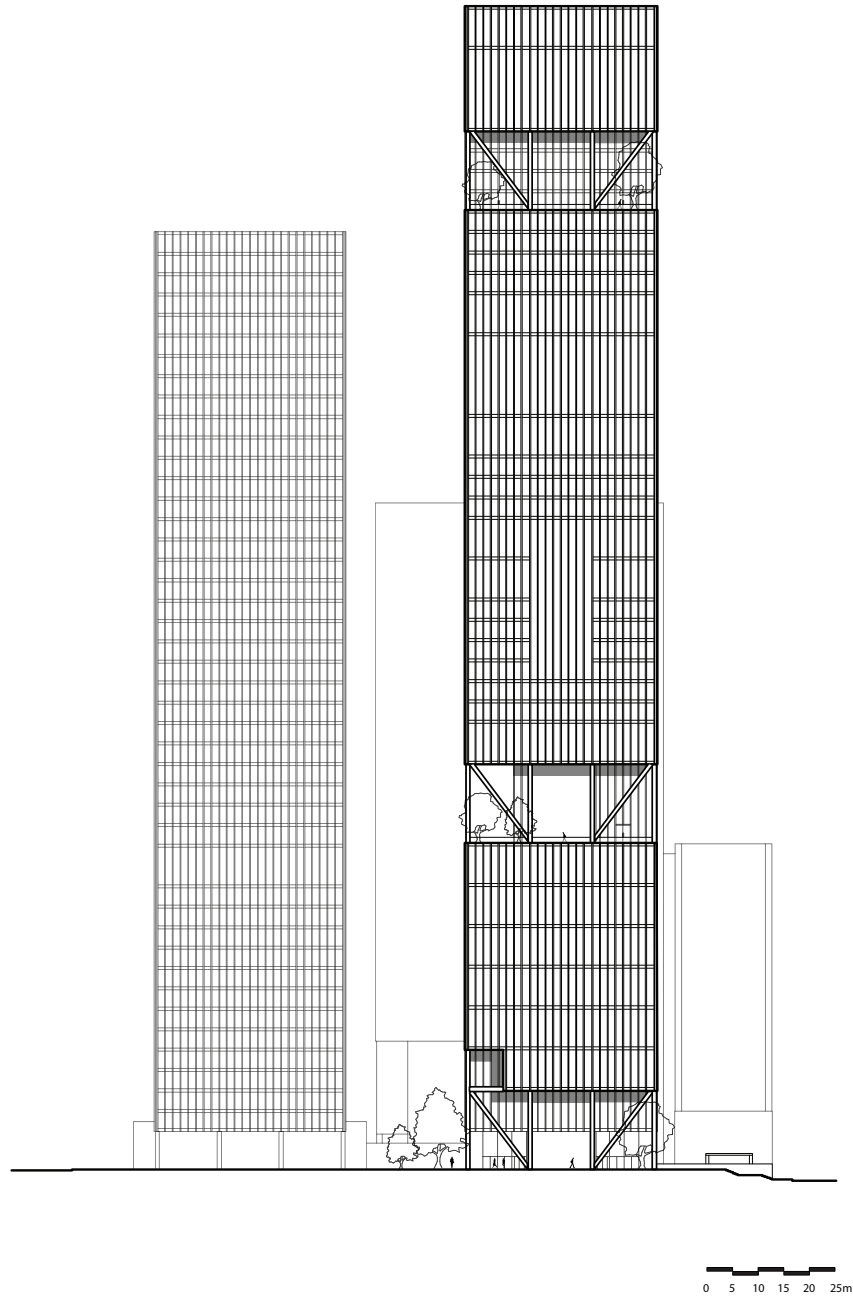


Figure 94.
West Elevation Drawing

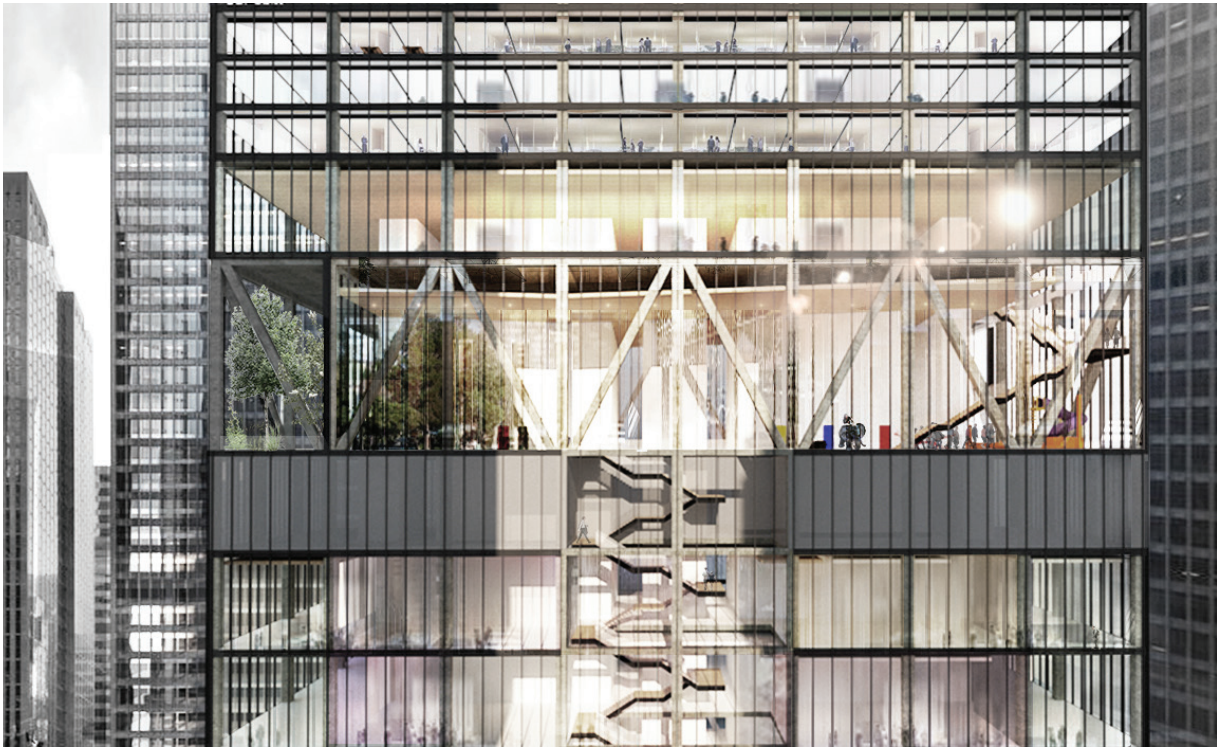


Figure 95.
Exterior View A

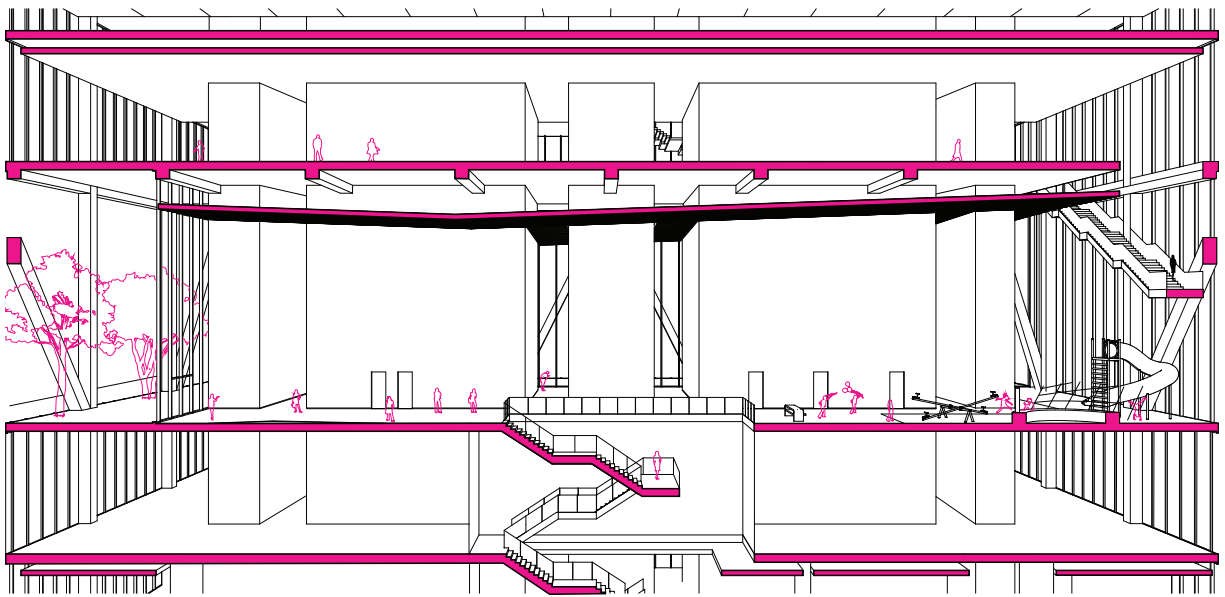


Figure 96.
Perspective Section
Drawing, Playground

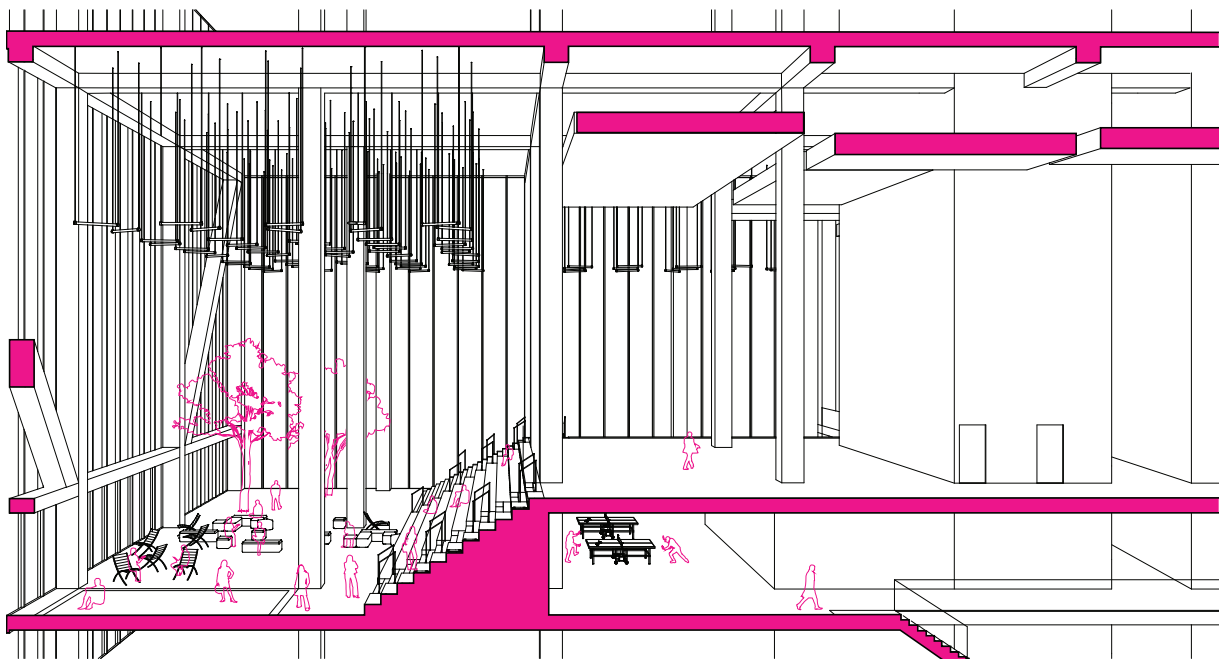


Figure 97.
Perspective Section
Drawing, Work + Social

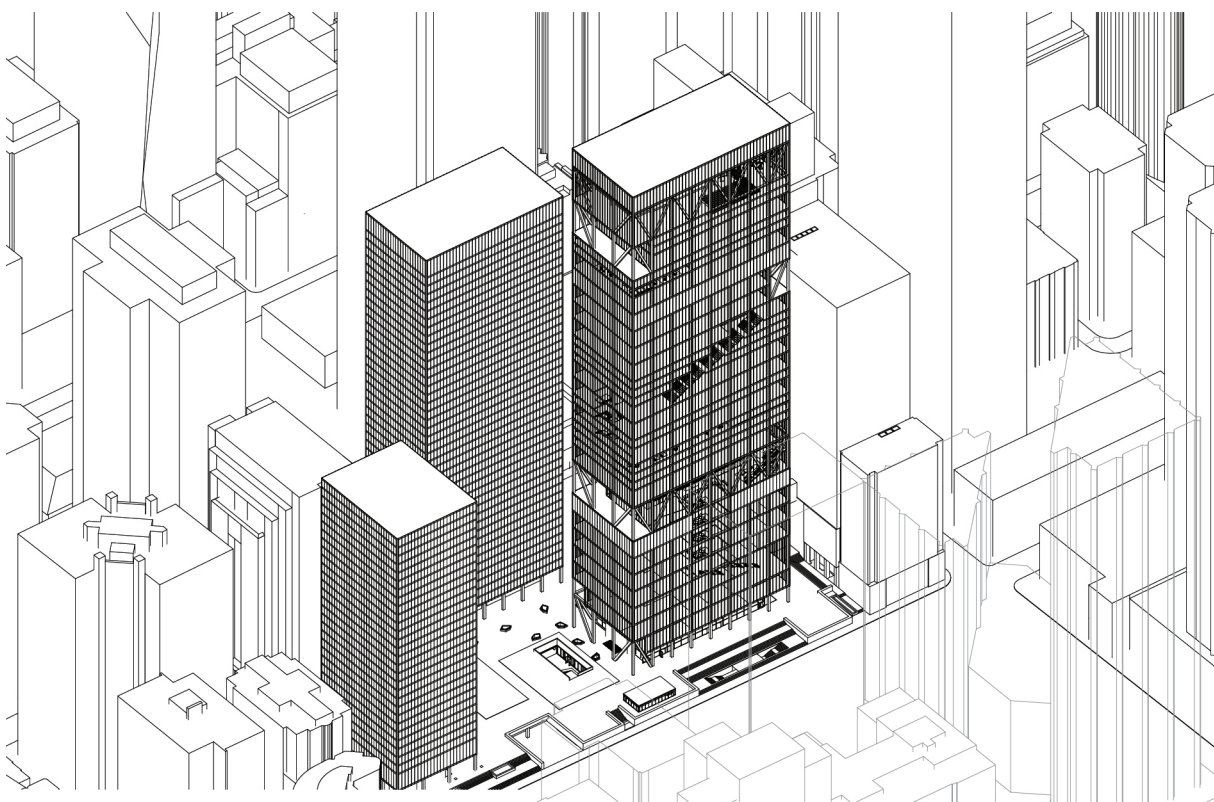


Figure 98.
Axo Drawing A

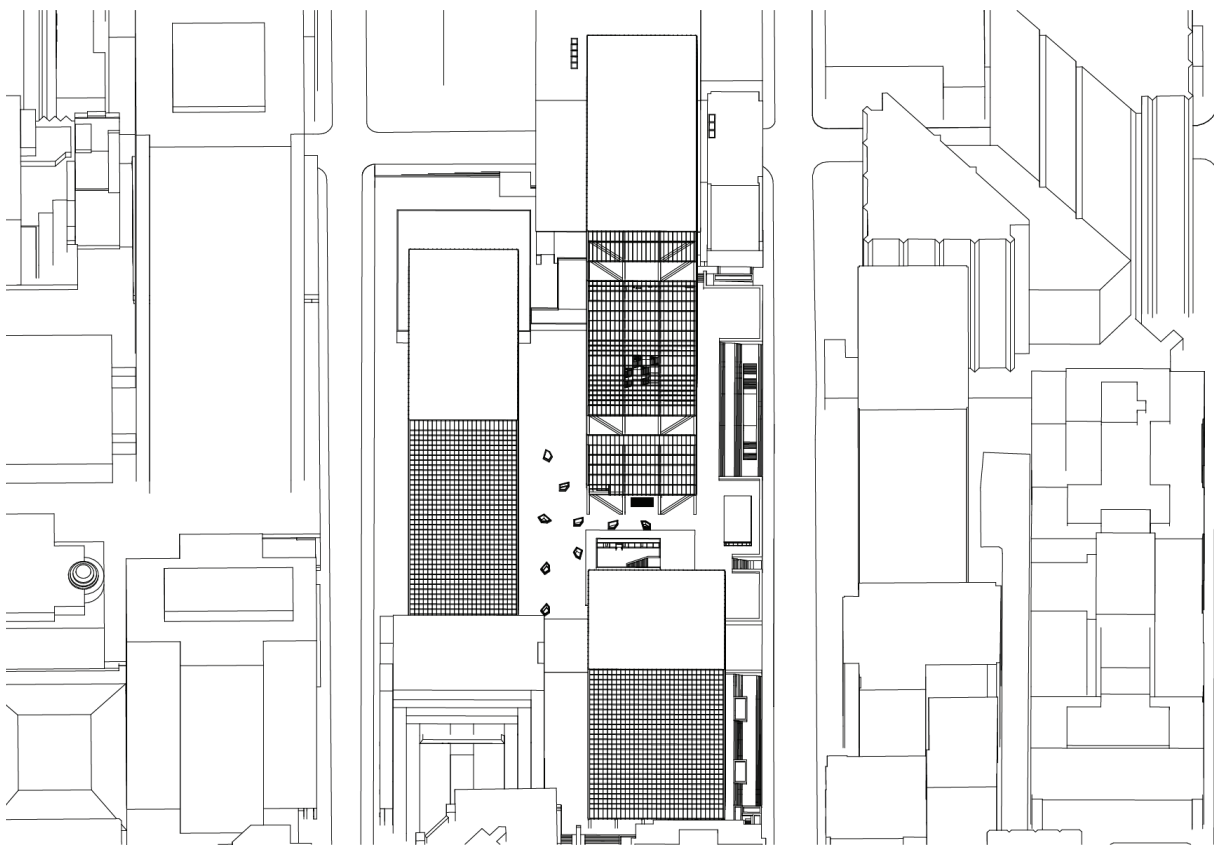


Figure 99.
Axo Drawing B

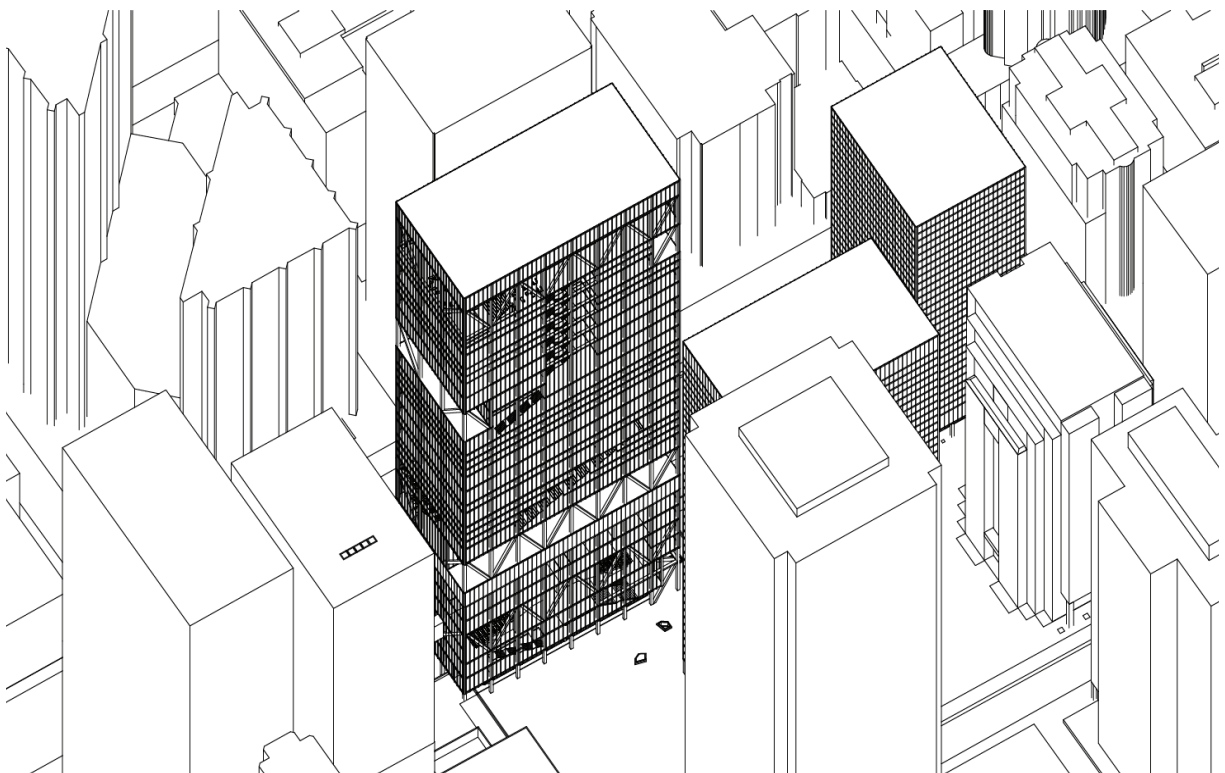


Figure 100.
Axo Drawing C



Figure 101.
Massing Model, View A



Figure 102.
Massing Model, View B



Figure 103.
Massing Model, View C



Figure 104.
Underground Circulation
Study, View A

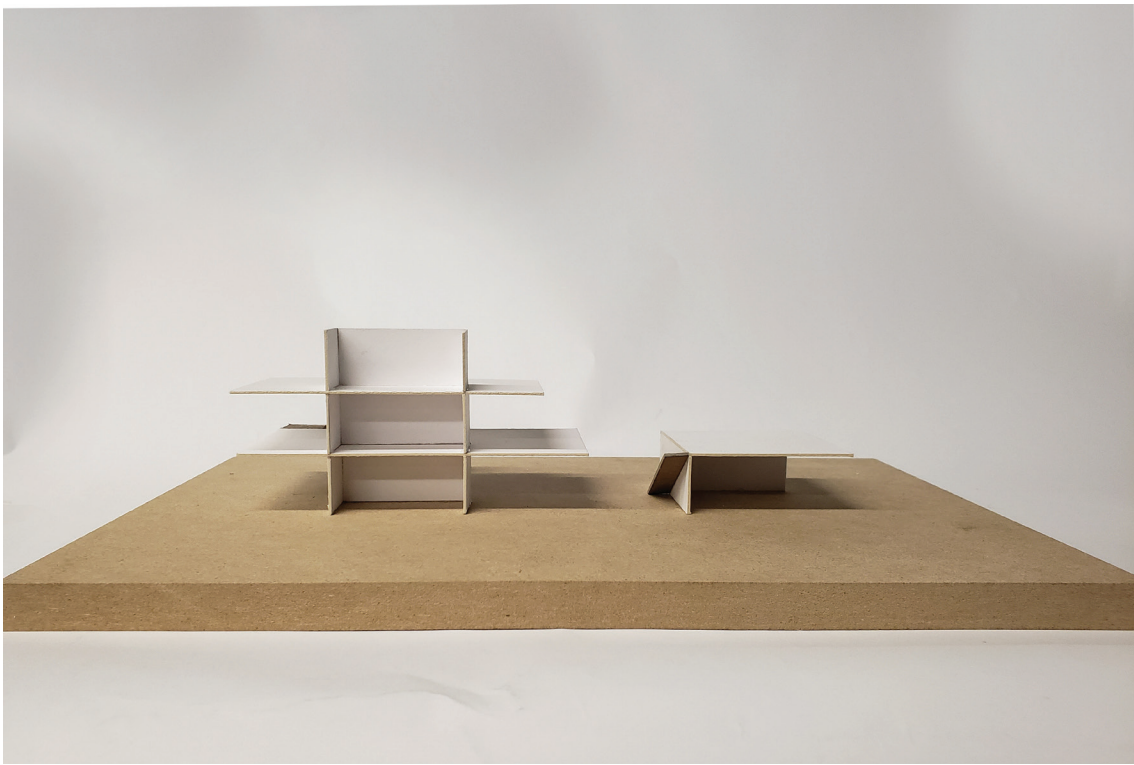


Figure 105.
Underground Circulation
Study, View B



Figure 106.
Underground Circulation
Study, View C

Chapter 7. Moving Forward

Over the years in the architecture field, there was always a question of how to deal with an existing building. The answer was either to dismantle the existing building and create a new one, or to reconstruct the existing building to meet the needs of the future.

Creating a new building is not always a necessary strategy for building and development in the city. By re-constructing an existing building, a new positive attitude is brought towards changing the urban fabric. The physical transformation of an existing building creates a new characteristic in the urban fabric. It not only shows the history of what was there, but it also shows the potential of what will be there for the future.

This thesis focuses on how to deal with existing building by using the idea of hacking. Hacking is a method of seeking out a potential of a design by bringing in an unusual way of thinking into the process and the design.

Through the process of hacking, I attempt to showcase the ways to adapt existing building to a new use. Changing the building program alone does not change the function of the existing building, but tinkering through a hacking process will create a foundation for connection and relationship between unrelated matters. As a result, it can introduce new concepts, functions, and innovations to existing buildings. Like a hacker, by going through the process of tinkering, one can find an answer or a way to create something new from something old in this world.

As we look at the downtown area of a city in North America, we see a large number of modern office buildings appear to be lifeless point towers with a single purpose. As stated by Gensler and many others, the future of office space might be different than it is today. Through the thesis' proposed prototype, various functions, layouts, and programs can be looked at differently to seek a new living and working space for the future.

During this project, I was able to see another potential of existing office building. The typology can change from office to residential or to civic building. As suggested by Steven Holl, a building could become a mixed bag of everything, and contain all sorts of programs to form residential, office, public, retail and activity space, which allows people to work and live at the same time. There are still many possibilities for an office building which require exploration. A flexible open floor plate and an evenly spread out column space can be a topic to explore for the metamorphosis of building.

The city is static. It is continuously changing, evolving, and “living”. We cannot always build a new building to meet our future needs. Our needs and desires for living in the city can be satisfied by working with what is already there. As mentioned earlier, Mckenzie Wark and Juul-Sorensen saw an existing as a possibility to create something new. Hacking is proposed as an architectural design principle and a method for future urban design.

Hacking is about finding and creating a relationship between what is already there, pushing the boundaries, identifying the potential of new concepts and adapting those concepts to make them work. People may ask, “Why is hacking so relevant in the architectural field?” The answer is that, hacking has been used for a decade to identify and change something contrary or unrelated into something with definite meaning. The term ‘hacking’ has a negative connotation. However, the definition of hacking varies based on perceptions. When a perceptual bias is removed, we can see things more clearly, perhaps in an innovative way. I believe architects and designers are hackers because we can see that everything carries a value. With hackers’ mindset, we can fulfil our obligations and responsibilities to existing buildings. We hack—to create something pioneering and meaningful to the urban fabric.

Appendices

Appendix A
Massing Study

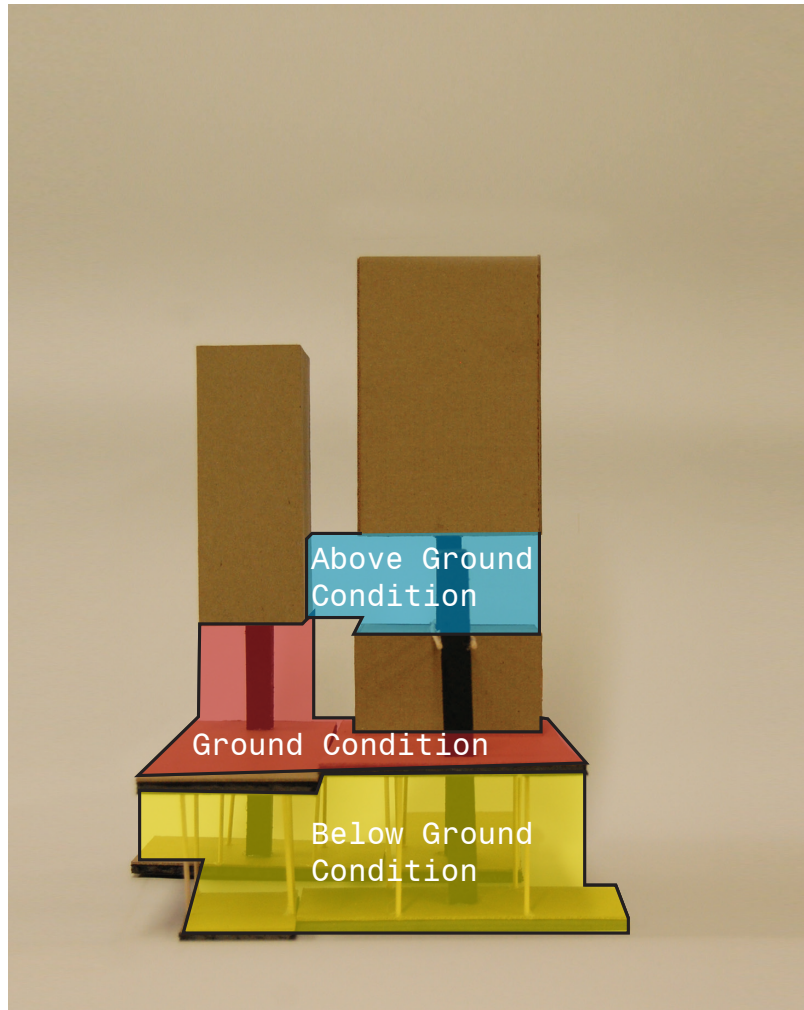


Figure No. A1.
Site Condition Study
Model

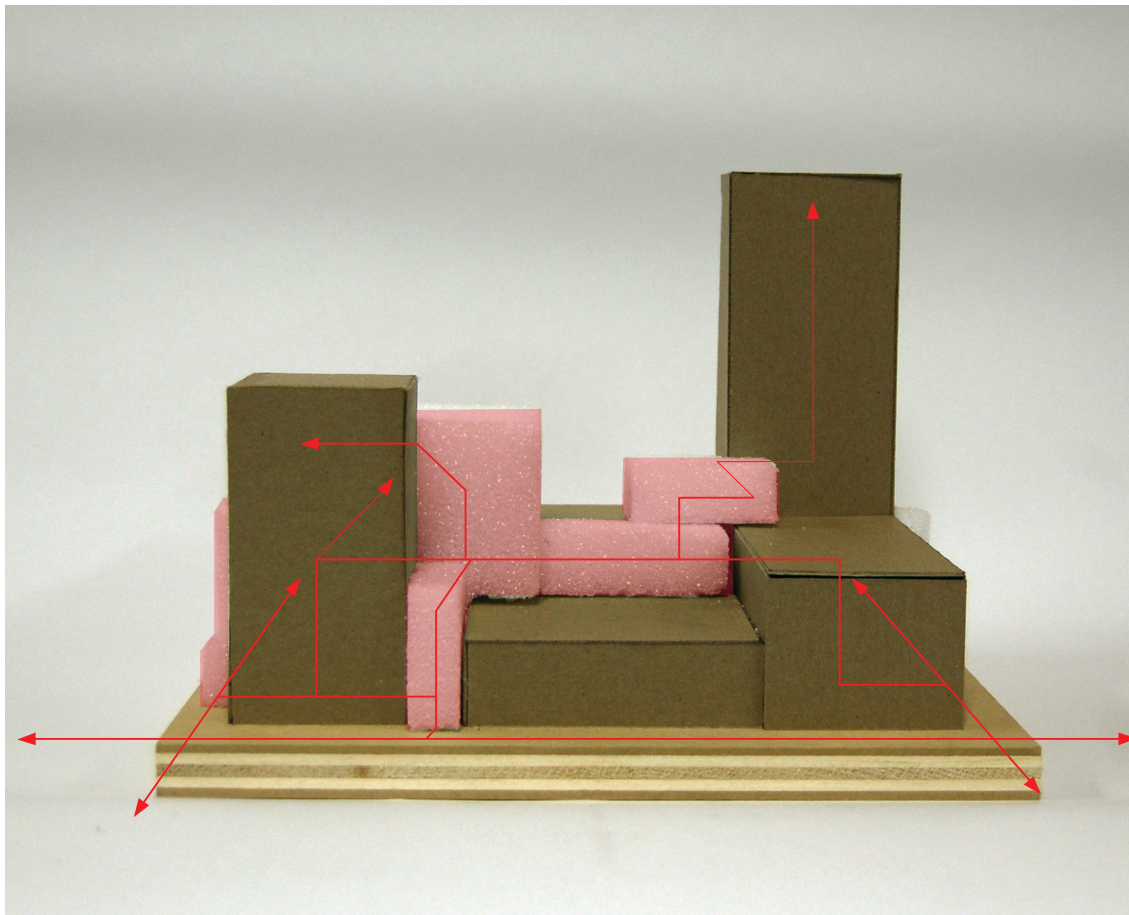


Figure No. A2.
The Idea of Hacking

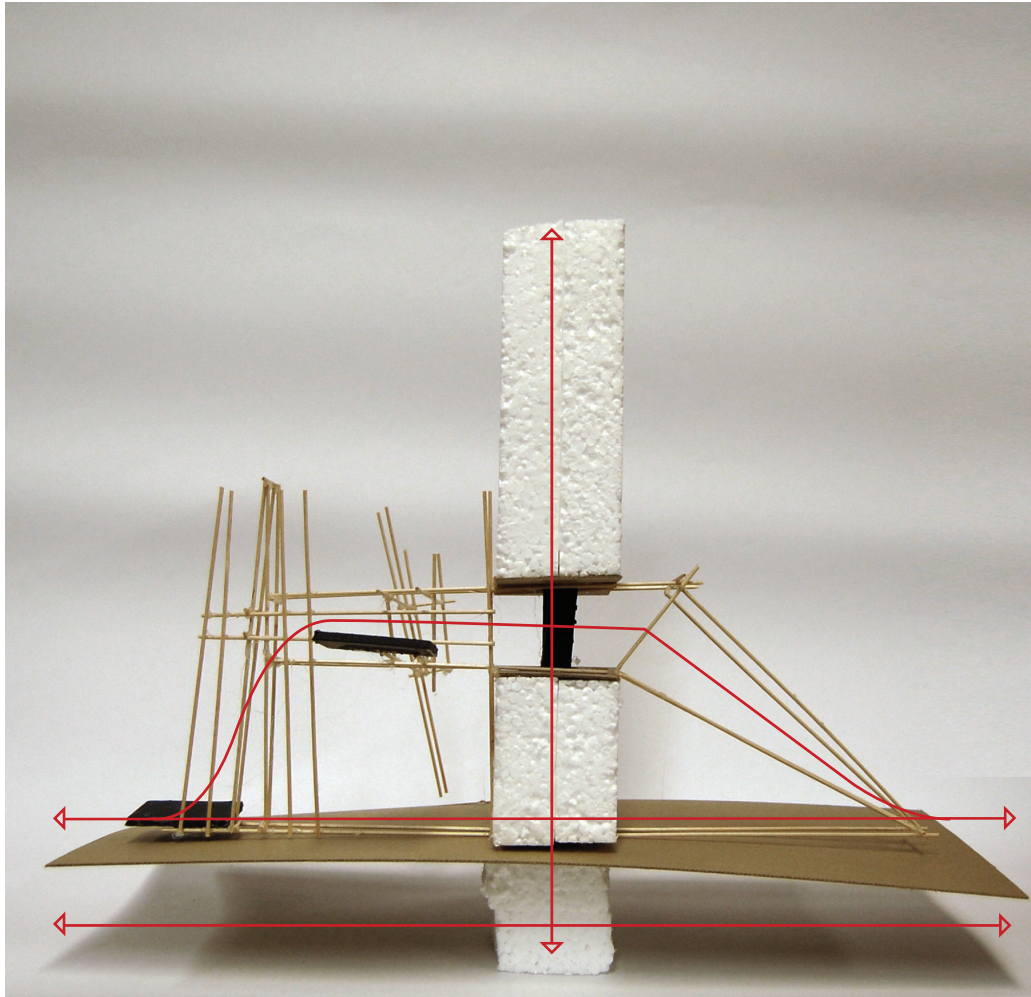


Figure No. A3.
Circulation Study

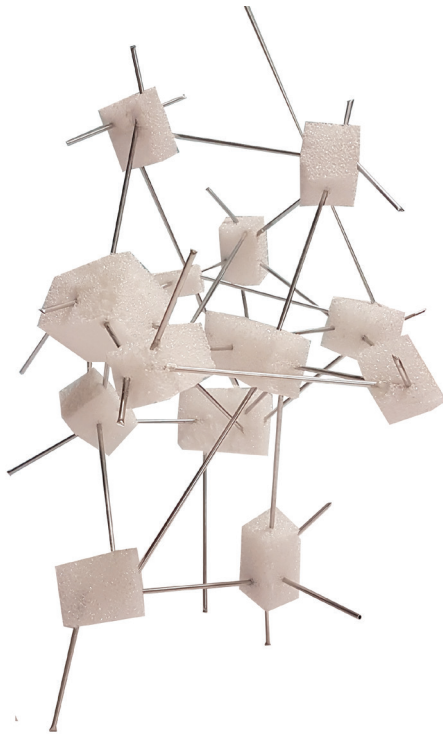


Figure No. A3.
Program Connection
Study Model

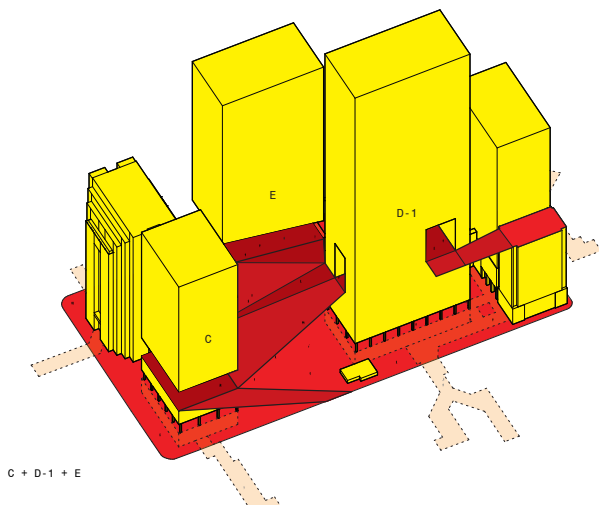
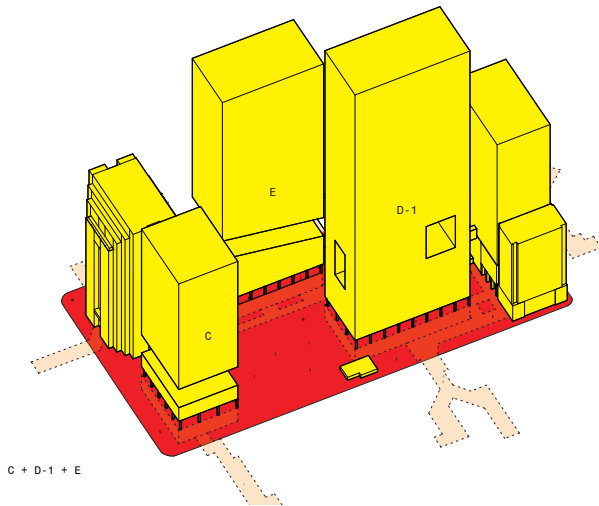
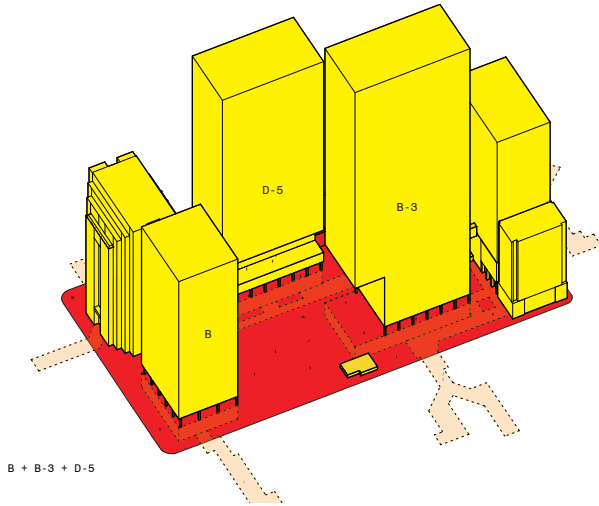


Figure No. A4.
Site Massing Study



Figure No. A5.
Circulation Massing
Study

Appendix B
Drawings

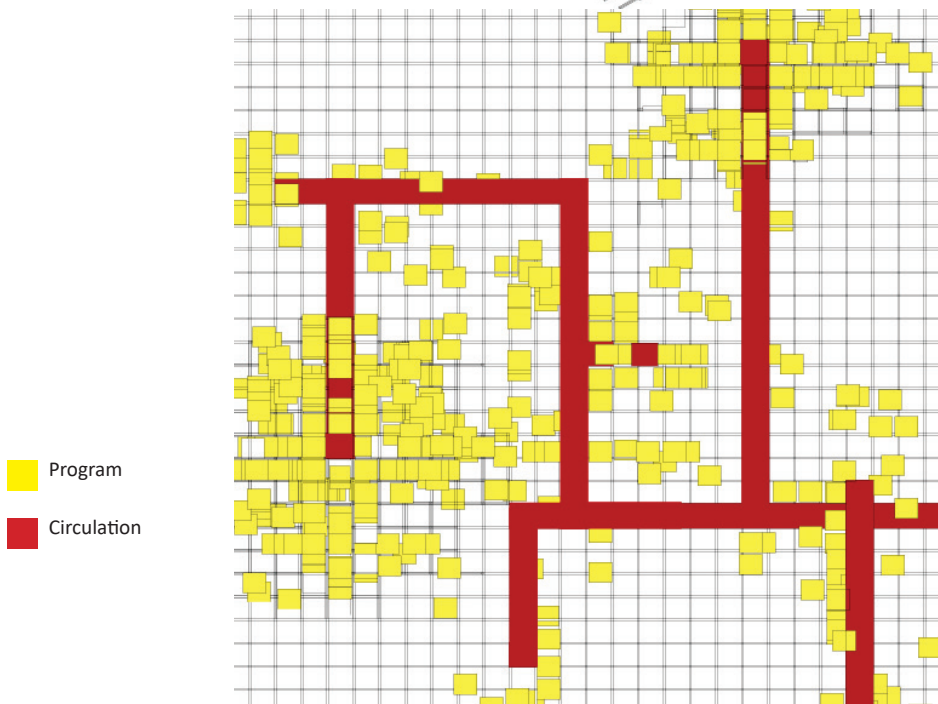
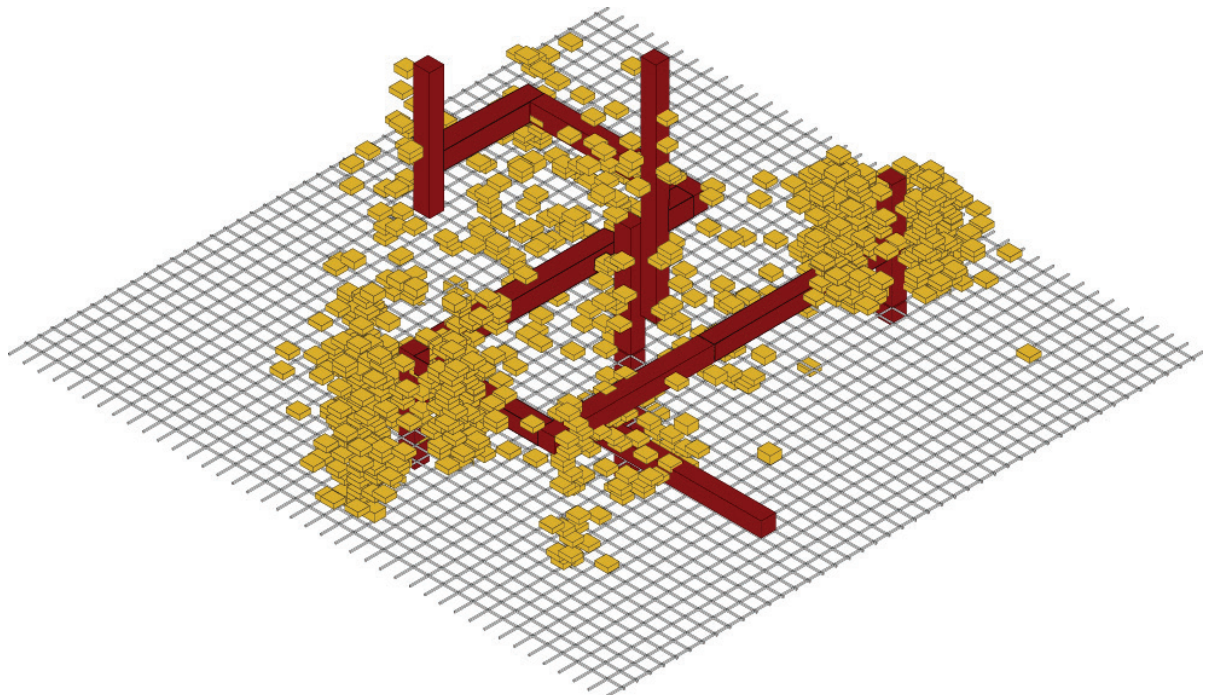


Figure No. B1.
Program + Circulation
Drawing

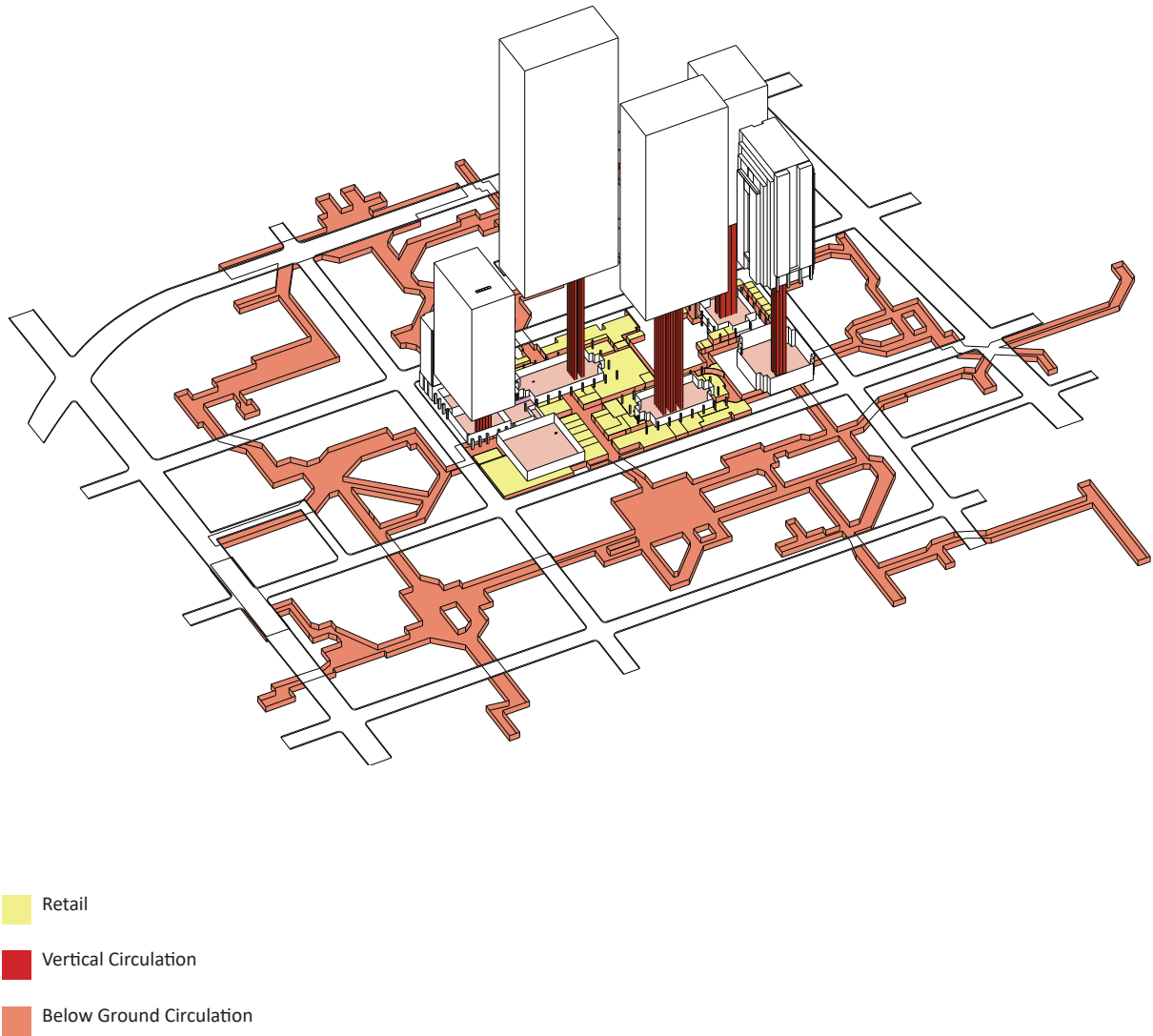


Figure No. B2.
Site Circulation Study

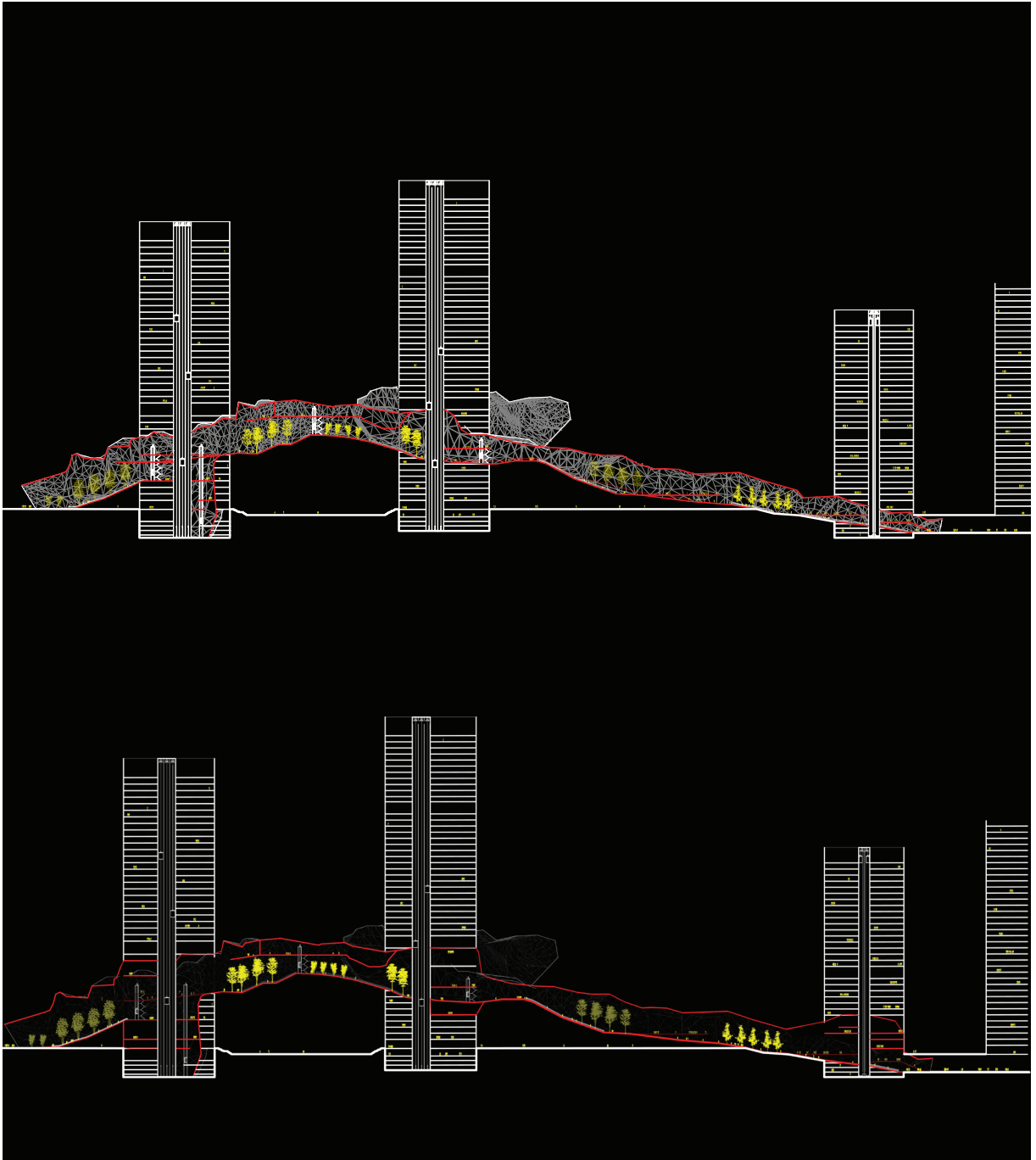


Figure No. B3.
Section Drawing,
Public Realm Takes Over

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