

Activating the Vertical City: An Office Building in Chengdu, China

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Abstract

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In recent years, China has built more skyscrapers than any other country has in the world. The skyscrapers create an overpowering “vertical city” that could be anywhere. These tall structures stack all their major functions such as commercial space, workspace and residential space in a single tower that have become major consumers of energy and power. These tall buildings fail to address problems of the social well-being and physical health of the workers.

This thesis proposes that tall buildings in major Chinese cities need to be more active and connect to the neighborhood. The design creates separate towers with a vertical void in the middle to provide space for the needed facilities but at the same time activated the highrise buildings. The aim is to really think about the relationship between the public and the private in order to make a comfortable and active workspace.

## ACKNOWLEDGMENTS

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I would like to thank my husband, Barry, for his unconditional support and understanding.

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# CHAPTER 01: INTRODUCTION

## Issues

In recent years China has been the center of a record-setting boom in the construction of skyscrapers. For the last nine years, the country has been responsible for the building of more structures over 200 meters(656 feet) than any other country in the world. Of the twenty tallest skyscrapers in the world completed in 2016, fourteen of them are found in China.(Figure 01) Analysts predict that by 2020, six of the ten tallest buildings in the world will be in major Chinese cities. Dominating the urban skyline, these towers continue to climb higher, driven by advances in building construction technology and the desire for greater economic profits. With the rising population and the need for greater density in cities, the growth in skyscraper construction seems sure to continue to increase even more. (Davison)

These very tall structures are changing the fabric of Chinese cities like Chengdu in a way that represents commercial success and urban growth. However, these changes are not always positive. If treated as isolated islands, the buildings can be designed without consideration for the surrounding urban context or the natural environment. The skyscrapers often have a monotonous appear

ance, creating an overpowering “vertical city” that they could be anywhere. The opposite approach is to create eye-catching “object” towers that are intended to attract tenants and to manufacture a corporate identity for companies. These tall structures are also major consumers of energy and power. Often the interior environment is neglected, creating office spaces that fail to address the social well being and physical health of the workers.

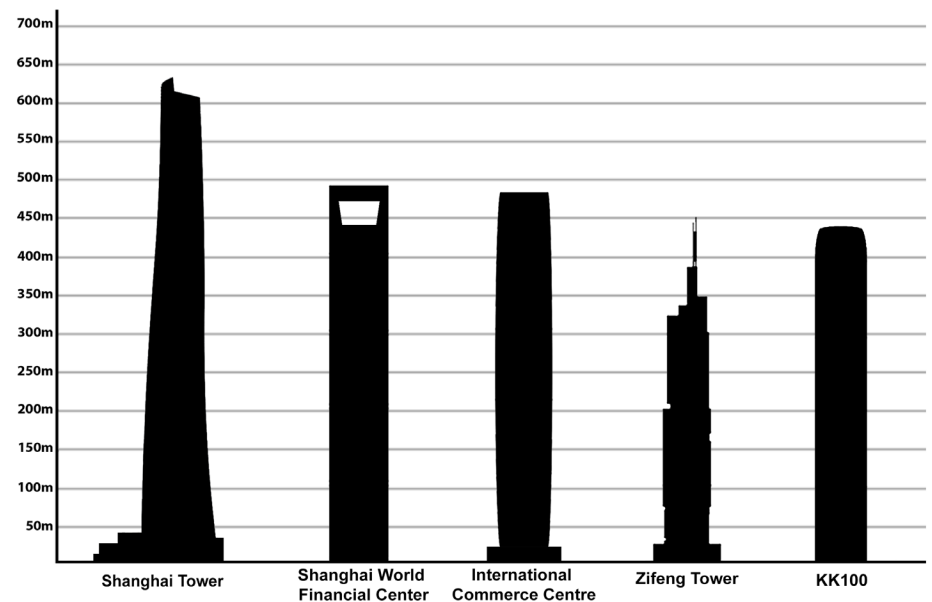


Figure 01: The tallest buildings in China in 2016

## Thesis Proposition

This thesis proposes that tall buildings in major Chinese cities need to be more responsive to their surroundings and be integrated into the local natural and built environment. The goal is to show how a more sustainable approach can be used to create tall buildings that are both efficient and environmentally responsible. The city of Chengdu, one of the fastest growing cities in the world, is rapidly transforming into a “vertical” mega-city, dominated by similar towering skyscrapers isolated from the life of the city. (Figure 02) The proposed design for an office building in Chengdu will address the human scale of the street and make use of local vernacular elements and materials. The aim is to really think about the relationship between the exterior and interior to make a comfortable and healthy workspace for the building occupants.

The methods for this thesis are to first analyze the current situation of the tall office building in China, and in particular examples in the city of Chengdu. The social character and climatic conditions of this fast-growing capital city of the Sichuan province are studied to understand how to best activate the highrise buildings. Then couple case studies will be analyzed to show how it is possible

to meet the demands for high dense work environments in a sustainable way. Mapping of the Tianfu New Area of the city will be used to identify the surrounding conditions that will be addressed in the project. The program will incorporate public spaces into the leasable office space to create a stronger connection to the neighborhood.



Figure 02: City of Chengdu, 2018

## CHAPTER 02: LITERATURE REVIEW

According to the Council of Tall Buildings and Human Habitat, China is currently home to almost half of the 100 tallest completed buildings in the world. (The skyscrapers center) Major advances in building technology along with expanding economic growth have made increasingly higher structures possible in cities throughout the country. As the population continues to rise and major cities become more crowded, the drive to build taller buildings continues to expand. By 2030 it is estimated that one billion people of 70% of the population in China will be living in cities. (Davison) In these crowded urban environments, the only space to be found is by building up to find spaces for the growing population to live and work.

At the same time, this rapid urbanization move to a “vertical city” have created an environmental crisis. Educator Li Ying of the British Council China states that the massive growth in cities has resulted in China becoming the largest consumer of energy in the world. He writes: “Over the past 30 years, Chinese architects have succeeded in solving the problems of poor living standards during the rapid process of urbanization. Looking toward the future, they are devoting themselves to improving the quality of buildings and urban spaces. However, as urbanization has led China to become

the largest energy consumer in the world, the Chinese government has been making efforts to reduce energy consumption and emissions. Under these circumstances, Chinese architects must figure out how to solve the conflict between the rapid process of urbanization and environmental protection.” (Li)

While China has some very generic regulations for environmental design, they do not address the different regions and conditions in this large country. But Ying observes that “more recently Chinese architects have been searching for ways to make buildings more energy efficient. But one of the worst and most visible offenders continue to be the tall office and residential buildings rising everywhere on the urban skyline. Li Ying observes that the problem goes beyond environmental concerns, arguing that many cities in China today “lack a clear sense of identity.” The focus on technical innovation and market-driven development has led to the loss of the cultural connection to the past. (Li)

Architect Kaley Overstreet points out that major projects like OMA's CCTV headquarters in Beijing completed in 2012 show the failure of big-name foreign architects to respond to this “fragmented condition.” Overstreet claims, “These massive building characterized by their massive size, true, but each exists as an independent



Figure 03: CCTV Headquarters/OMA

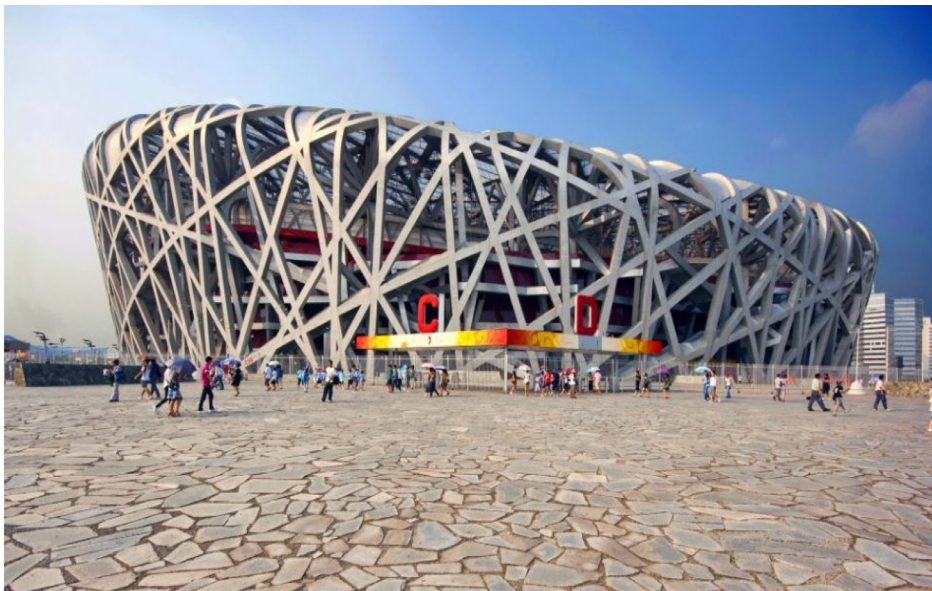


Figure 04: Beijing National stadium

object in a field, an urban sculpture with no detail betraying the relationship to human scale. They seem intended to be viewed from across town (smog permitting), from varied and multiple vantage points, much like the landforms in traditional landscape painting.” (Overstreet)(Figure 03) The CCTV headquarter is surrounded with a secured fence and is only open to the people with permission. It was intended to be viewed from across town, from multiple vantage points. However, it has failed to adapt to the human scale of the urban landscape. Another similar example is the Beijing National Stadium, known as “the Bird’s Nest.” As there is no monumental entryway, people are free to randomly enter it. (Figure 04)

Overstreet argues that the result is “the scalelessness of contemporary architecture and urbanism” in China. “While the designers of these projects sought to create cultural icons representative of an empowered nation, other developers chased after more easily-measured superlatives. To outside observers, the scale of these projects can be shocking, but rather than ascribe the frenzied construction to something inscrutable about the Chinese character, we can find historical precedent both in China and abroad and view the current wave of mega projects in their proper historical context.” (Overstreet)

This problem is visible in Chengdu, one of the fastest growing cities in Asia, located in the southwestern part of Sichuan province. This capital city of the Sichuan province has become the center of expanding economic activity. Its population recently has reached over 15 million people. In the recent ranking by the Skyscraper Center Chengdu ranked third for new skyscrapers constructed in 2017. This website states that “there are currently over 80 buildings over the height of 150 meters (656 feet) with three under construction at a height of over 300 meters.” (The skyscrapers center)

The most common function is office space which is 52%, the second most common use is residential which is 26%. (Figure 05)

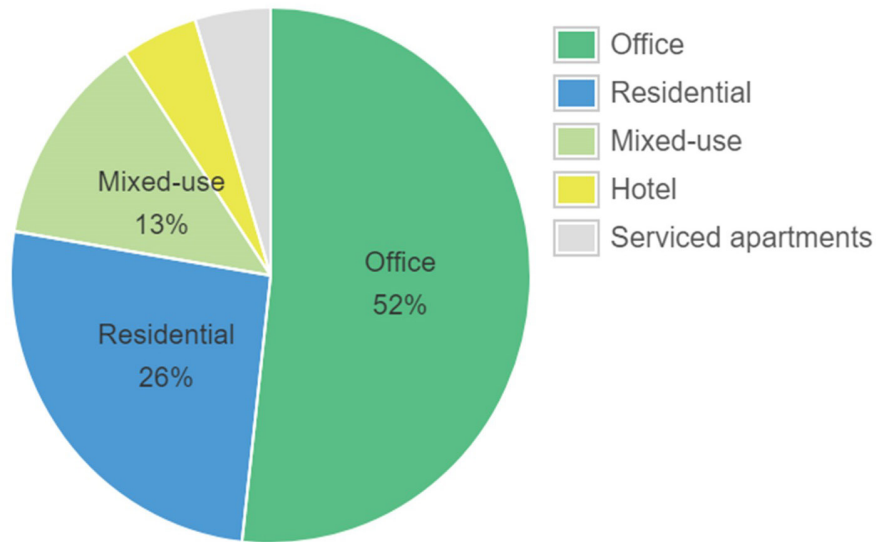


Figure 05: Building function chart for building over 150 meters

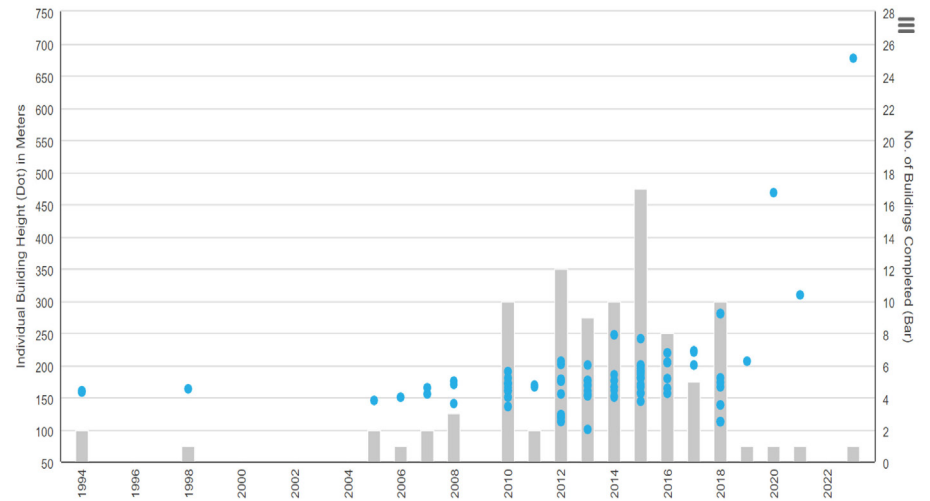


Figure 06: Building completions timeline (Last 50 years, 100m+)

The rapid growth of Chengdu has happened more recently than in other major cities of China like Beijing and Shanghai. This growth has been driven by financial companies and high-tech businesses. (Figure 06) According to the China Daily in the 1950s the tallest building in the city was thought to be the three-story Chengdu department store. But as with other Chinese cities, the city began to change after 1979 with economic reforms that brought about the opening up of the country to foreign trade. It was not until the 1990s when the first tall buildings began to be built in the city. When Sichuan Bank of China tower was completed in 1994, it was the tallest building in southwest China at that time. Today the city has become a hub for finance and technology with almost 300

Fortune 500 multi-national companies that have branches in the city. (China Daily)

As the city thrives economically, tall buildings are getting higher and higher with the aim of greater density and higher return on investment. But often as in areas like Tianfu New Area, the unchecked growth has created forms that are either very monotonous or visually appealing. For example, Chengdu Times Plaza is an office building of 28 stories that includes retail stores on the first five levels. (Figure 07) The structure offers high tech amenities like fast elevators. But these self-contained towers are creating isolation from the life of the street. In the aim of greater economy, the offices often lack comfortable and healthy working spaces. Another opposite example is the Chengdu Icon Yunduan building designed by PES-architects in 2017. (Figure 08) The project was designed to create a local landmark visible on entering the city. It was designed to attract tenants with unusual form, but it lacks connection to the street and a sense of human scale.



Figure 07: Chengdu Times Plaza



Figure 08: Chengdu Icon Yunduan

## Precedent Analysis

### Pinnacle One Office Building/Make Architects

The Pinnacle One Office Building is designed by Make Architects and was completed in 2011. The building is an impressive addition to the Tianfu new area known as the financial hub of western China. (Figure 9) The unique floor layout is flexible because the elevators and stairs are both on the side of the building which provides a large open space for the tenants. There is a 130-meter long canopy and 30-meter high atrium covered by a glass roof which is attached to the building. The exterior façade featuring sleek aluminum and glass offers energy efficiency and spectacular views. John Puttick, Partner of Make's Beijing studio said, "The concept behind the design is to create a refined, streamlined building that enhances the Chengdu skyline and minimizes environmental impact in an intelligent way. The building has been finely crafted to the requirements of its occupants and to improve the public realm for the city. At Make, we approach each project with a priority always given to the environment and local communities." (Furuto) The project considers the connection to the surrounding areas carefully. It provides a sunken garden with cafes and restaurants to connect to Chengdu's streetscape, and a pedestrian route that links to the subway station. (Figure 10)



Figure 09: Pinnacle One Office Building / Make Architects



Figure 10: Pinnacle One Office Building entry / Make Architects

*Sliced Porosity Block-Raffles city Chengdu/ Steven Holl architects*

This project completed in 2013 is made up of five towers containing office, residential and retail, including a hotel. The Sliced Porosity Block has large public plazas with a hybrid of different functions which creates a “metropolitan public space” instead of “object-icon skyscrapers.” The shape of the building is inspired by the distribution of the natural light. (Figure 11) The central large public space forms three valleys inspired by the great Chinese poet, Du Fu (713-770), who wrote, “From the northeast storm-tossed to the southwest, time has left stranded in Three Valleys.” (Minner)

This project establishes human scale through the concept of “micro-urbanism”, with shops open to the street and shopping center inside. These blocks have three large openings filled with pavilions built by Steven Holl architects, local artists, and the late experimental Architect Lebbeus Woods. (Figure 12) These pavilions are built to respect the site’s history of pavilions. (Minner)



Figure 11: Sliced Porosity Block-Raffles city Chengdu/ Steven Holl Architects

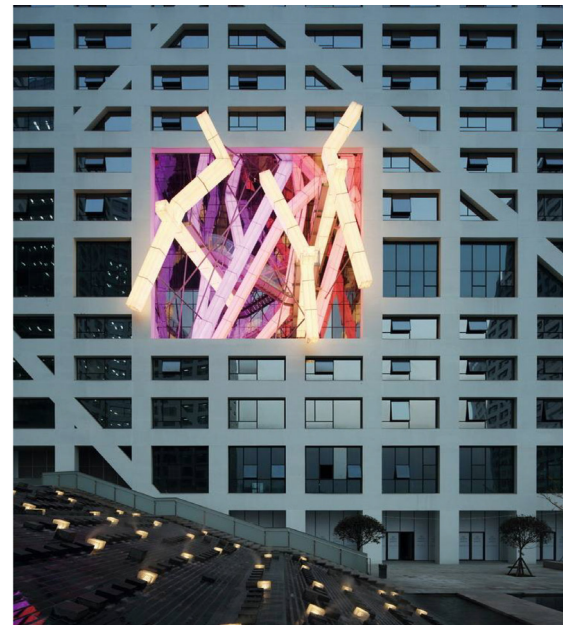


Figure 12: Pavilion by Architect Lebbeus Woods

## CHAPTER 03: METHODOLOGY

### Thesis Goals and Objectives

As the skyscrapers in China keep rising higher, these tall structures are consuming massive amounts of energy and power. However, the spaces are often still failing to address the social well being and physical health of the workers. This vertical megacity is losing the identity of the city itself.

The goal of this thesis is to use a more sustainable approach to create an office building with a public shared space that is efficient and active. The goal is to activate the tall buildings as well as the neighborhood in a way that preserves and expands upon the city's identity while allowing the megacity to create a unique place addressing the human scale of the street. This new type of office will activate the vertical megacity of Chengdu.

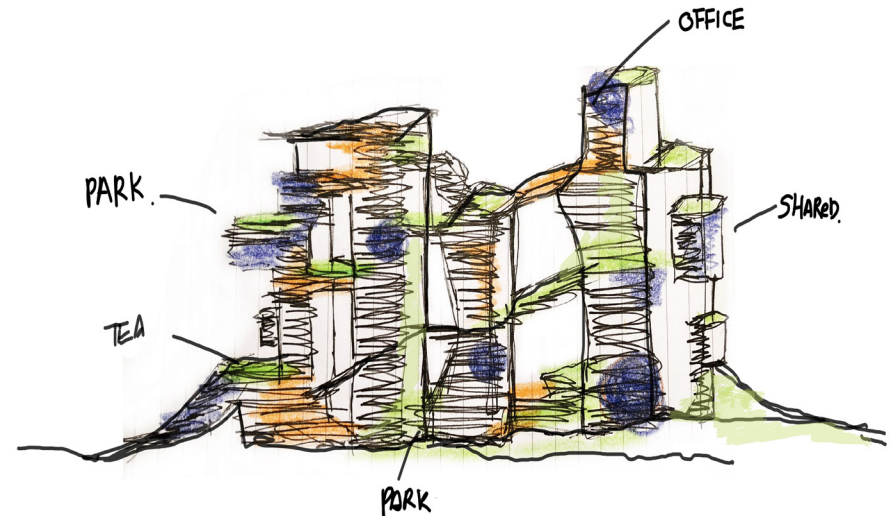


Figure 13: Early conceptual sketch

## Site Selection and Analysis

### Location

Chengdu is the capital of Sichuan province located in the central east. The history of the city dates to at least the 4th century BCE. But today, over 6000 years later, Chengdu is one of the fastest growing cities in the world. The Tianfu new area is located in the south of the city center. It was officially launched in 2011. The establishment goals of the area are to reconstruct a modern international urban area suitable for residential, industrial and commercial uses. “The Tianfu new area’s goal is to be a major center and high-tech industrial base for the west, by giving priority to a headquarters economy and cyclic economy, and top emerging industries in new energy, new materials, and information technology.”(China Daily) The project site is located in the south of Tianfu new area, at an intersection of two major roads, one block away from the metro station.

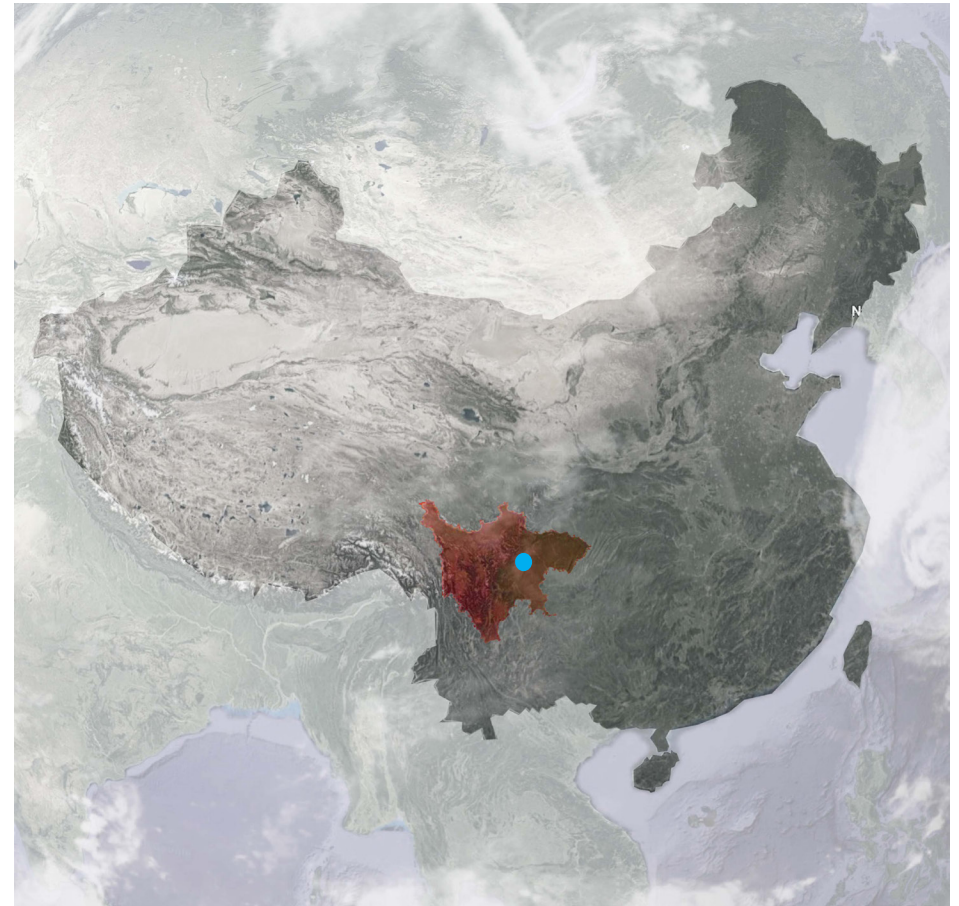


Figure 14: Map of China



Figure 15: Map of Sichuan Province

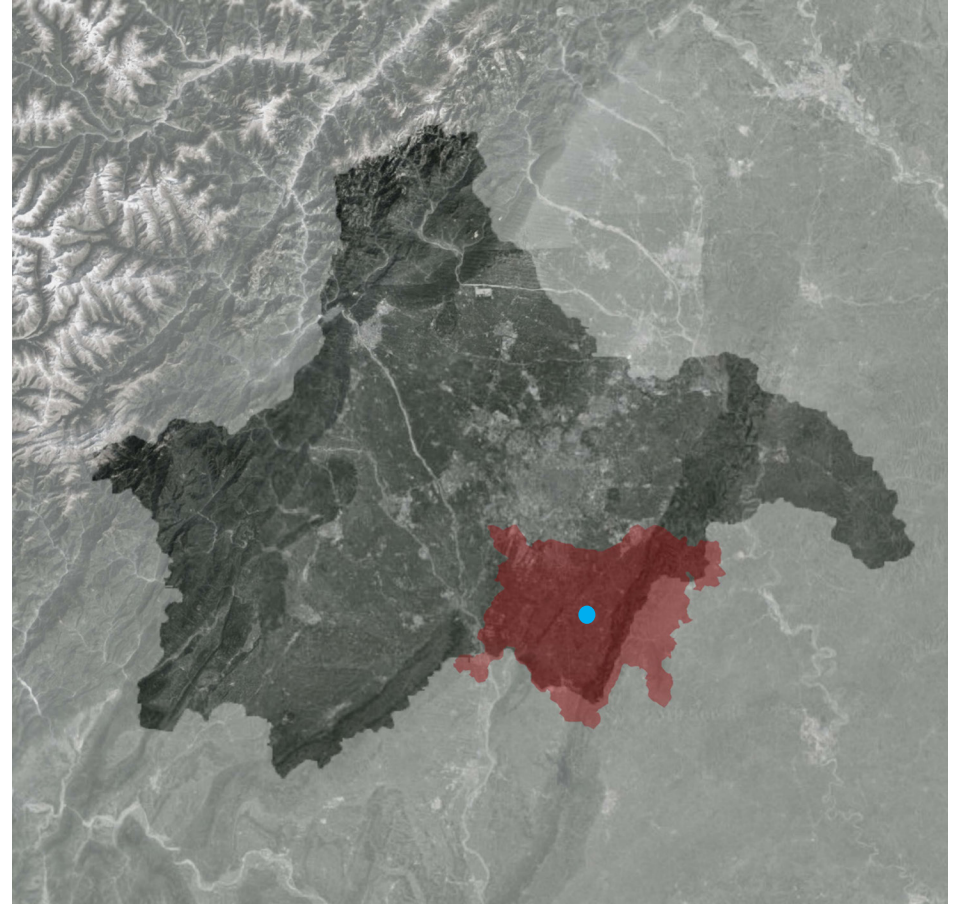


Figure 16: Map of Chengdu City

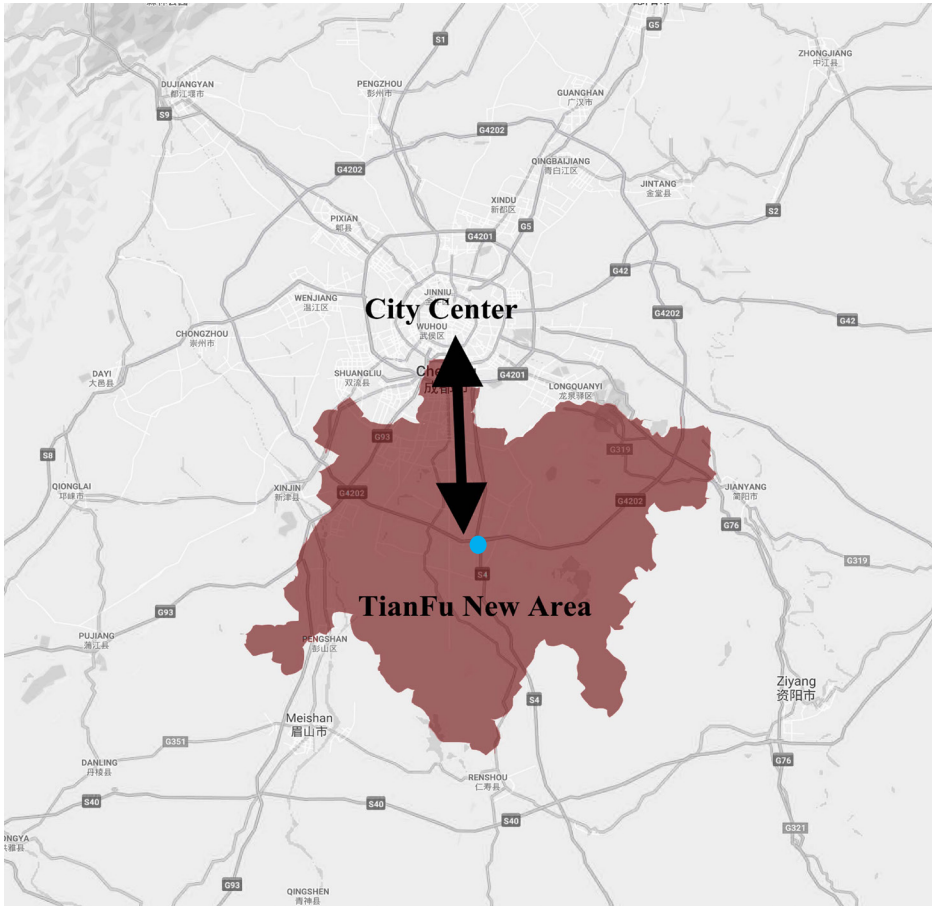


Figure 17: Map of Tianfu New Area

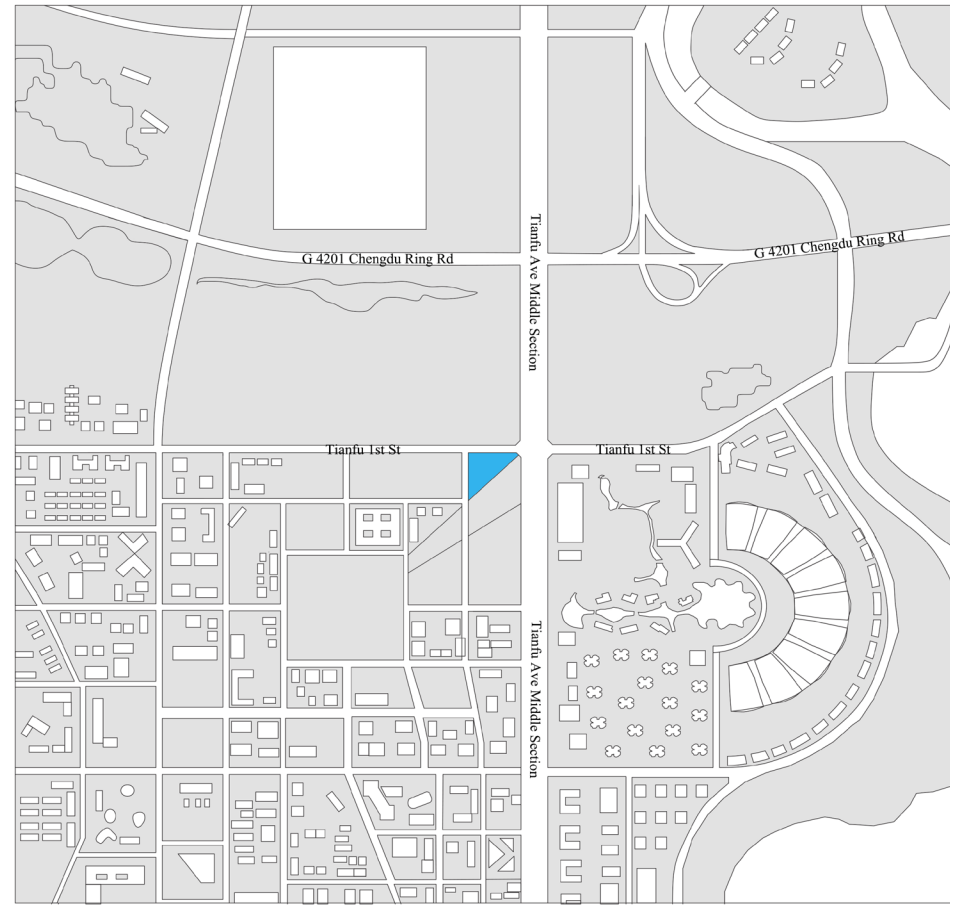


Figure 18: Map of proposed site

### Legacies of the Teahouse typology on public space

Chengdu was an important transportation center on the ancient tea route. This trade link has impacted the local culture and lifestyle. The teahouses have been important recreational places for local people since ancient times, providing spaces for Chinese storytelling, the Sichuan opera and Sichuan cymbals with the sound of bamboo clappers. Today the teahouses are important places to socialize. People from all walks of life gather there in order to hang out with both new and old friends. They sit around, gossip and talk about social events. (China Culture Tour) The teahouse, indeed, is a reflection of the social life of the local people similar to the coffee shops in Seattle with teashops on every street, and open-air tea rooms in the park. Therefore the park is another important public gathering space for the local people.

### Neighborhood Users

In the proposed site area of Tianfu, most people who work there are from the high technology companies. They spend their eight hour work time in this area and then take the train or bus home after work. Since most of them live in Tianfu new area, the area lacks restaurants and public spaces.

### Urbanization

As one of the fastest growing cities in Asia, Chengdu has become a powerhouse of economic activity. The mayor of Chengdu, Ge Honglin claims that the city avoided migration problems by encouraging families to stay in the countryside, cutting the gap between rural and urban areas and improving the conditions of schools, shops, and hospitals. (The Guardian) Therefore Tianfu area is a new innovation hub that will soon attract more people move in.

A major concern of urbanization in the city in a globalized world is the loss of local traditions to dominant imported cultures. There has been an effort to create modern shopping districts where old ones were once located that bring the traditional aspects of Sichuan life every day.

### Site Context

From the site context map. (Figure 24) There are five schools, one Buddhism temple, one metro station and an international exhibition center within 30 minutes of the proposed site. The office buildings are as same as the residential buildings. The majority of these office buildings are used for hightech innovation company, with a commercial building as second.

Circulation & Key adjacent building

15 mins walk

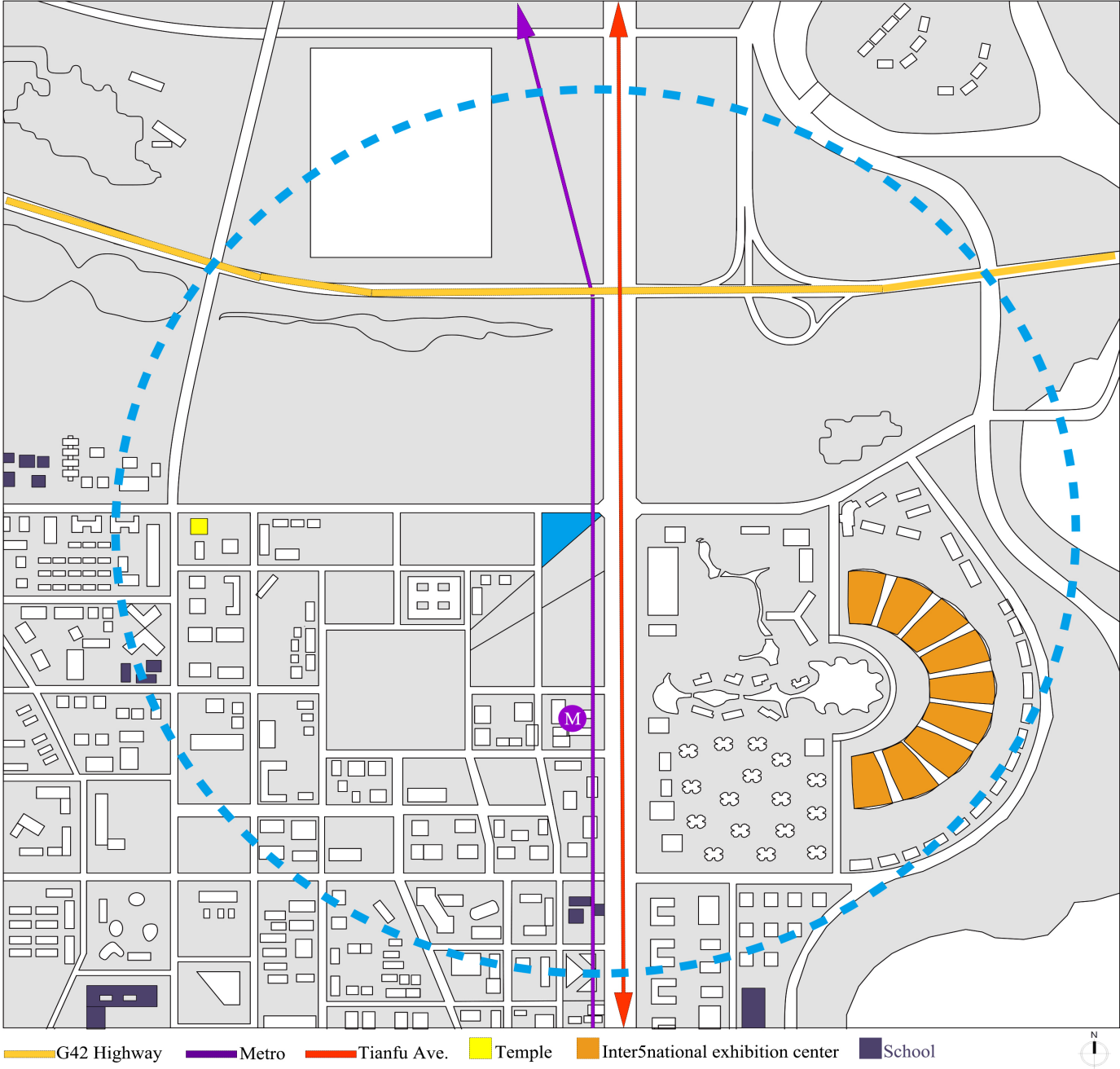


Figure 19: Site context map - Circulation and Key Adjacent building

Office

15 mins walk

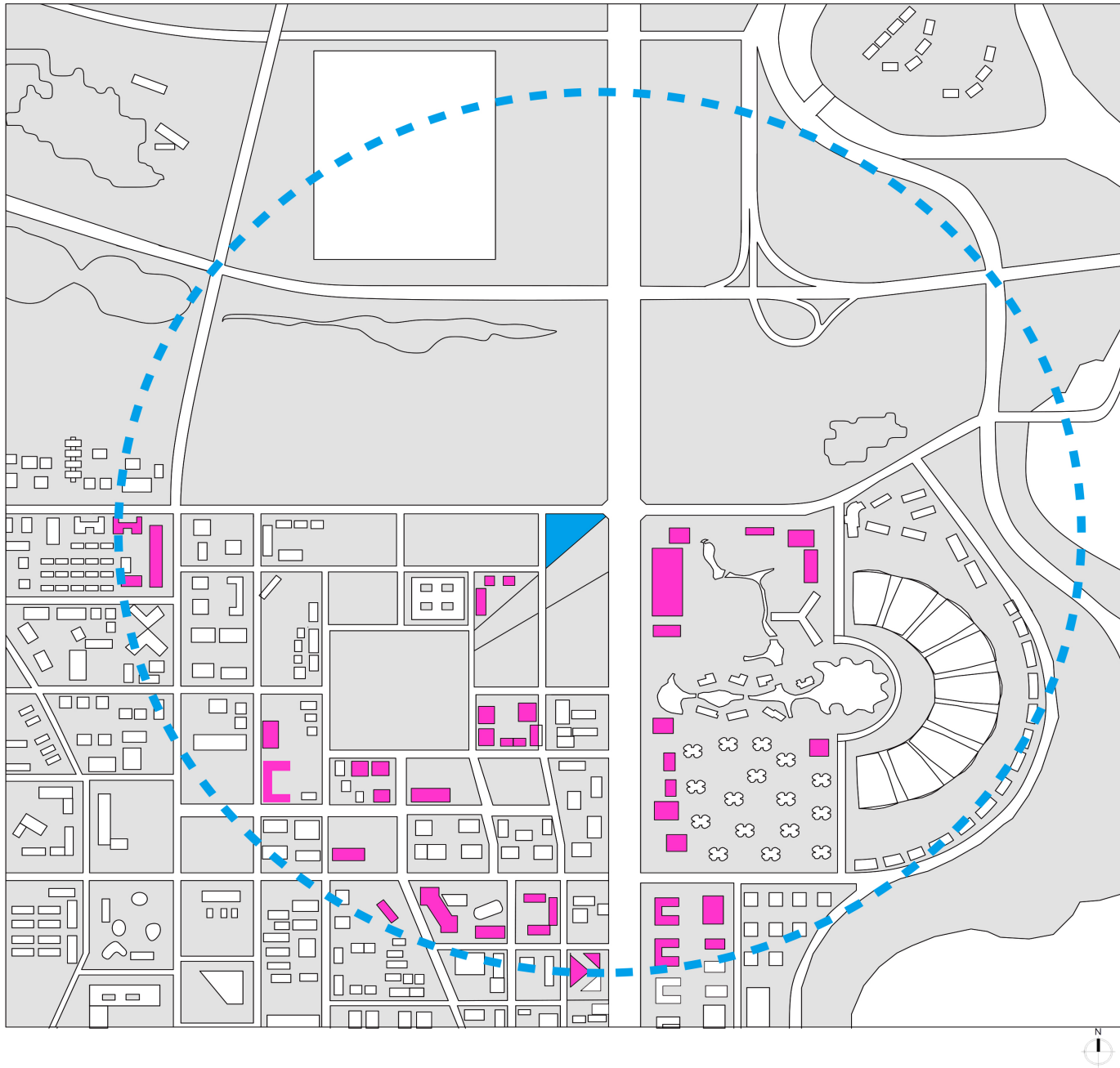


Figure 20: Site context map - Office

Retail

■ ■ ■ ■ ■ 15 mints walk

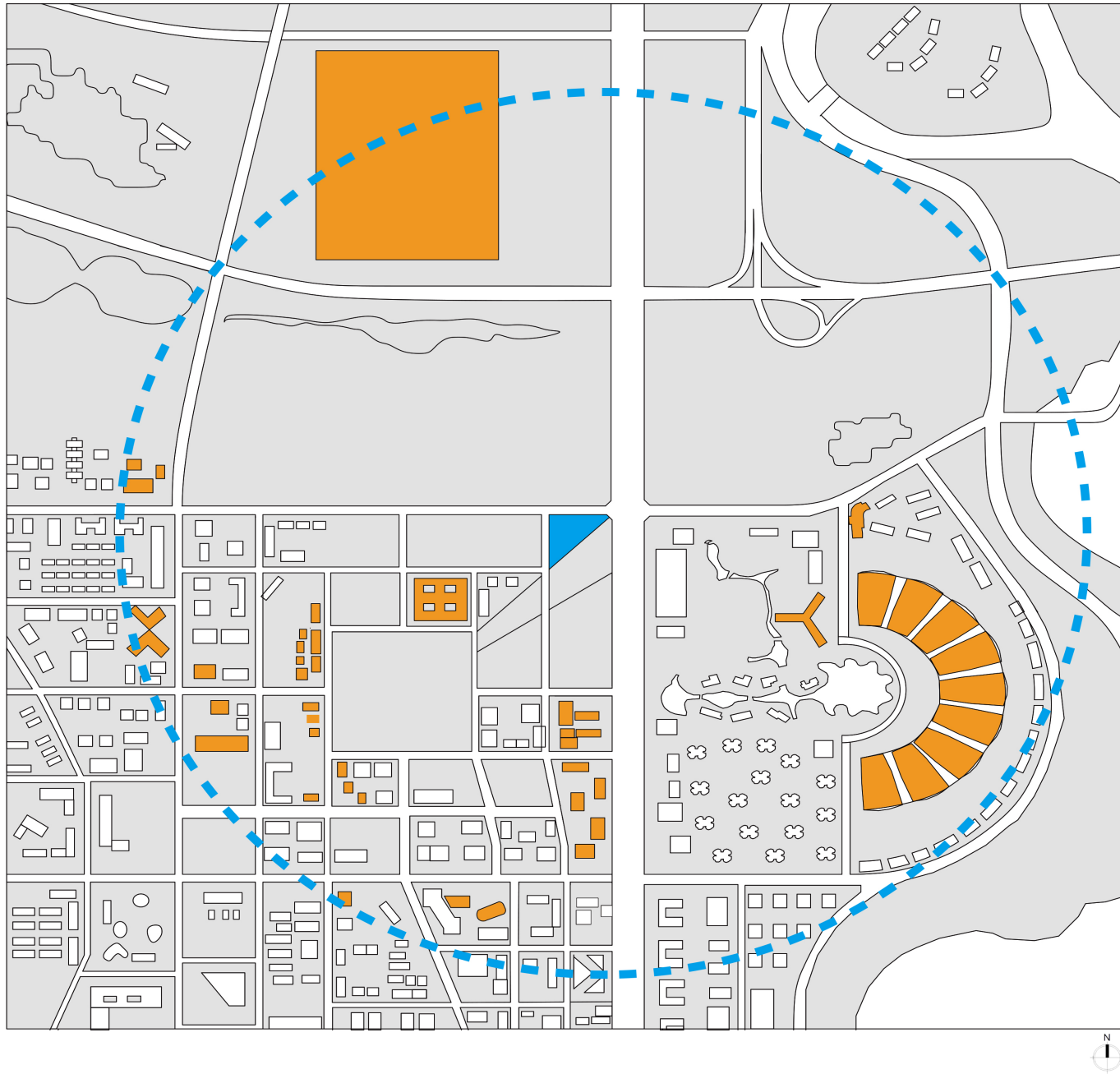


Figure 21: Site context map - Retail

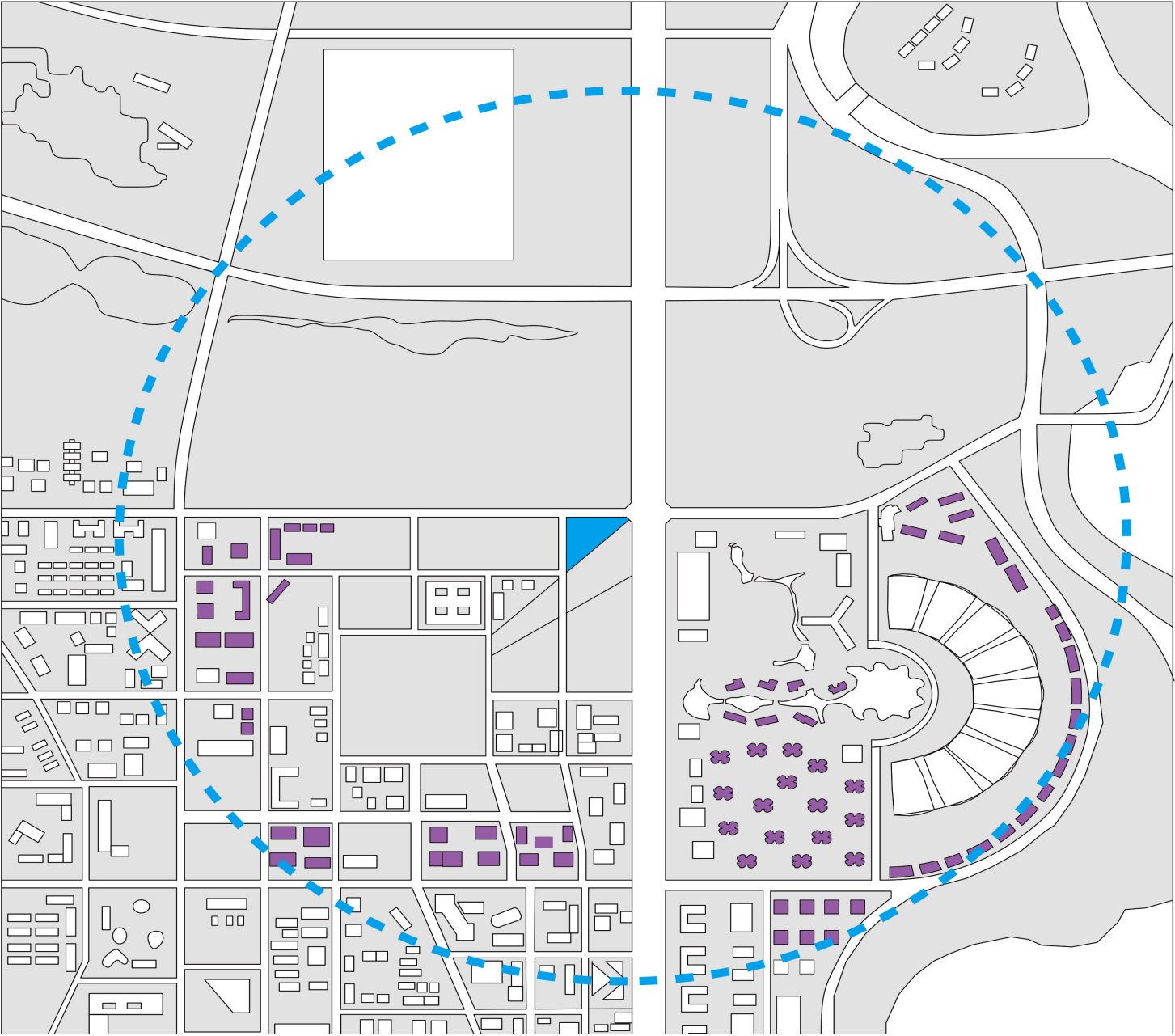


Figure 22: Site context map - Residential

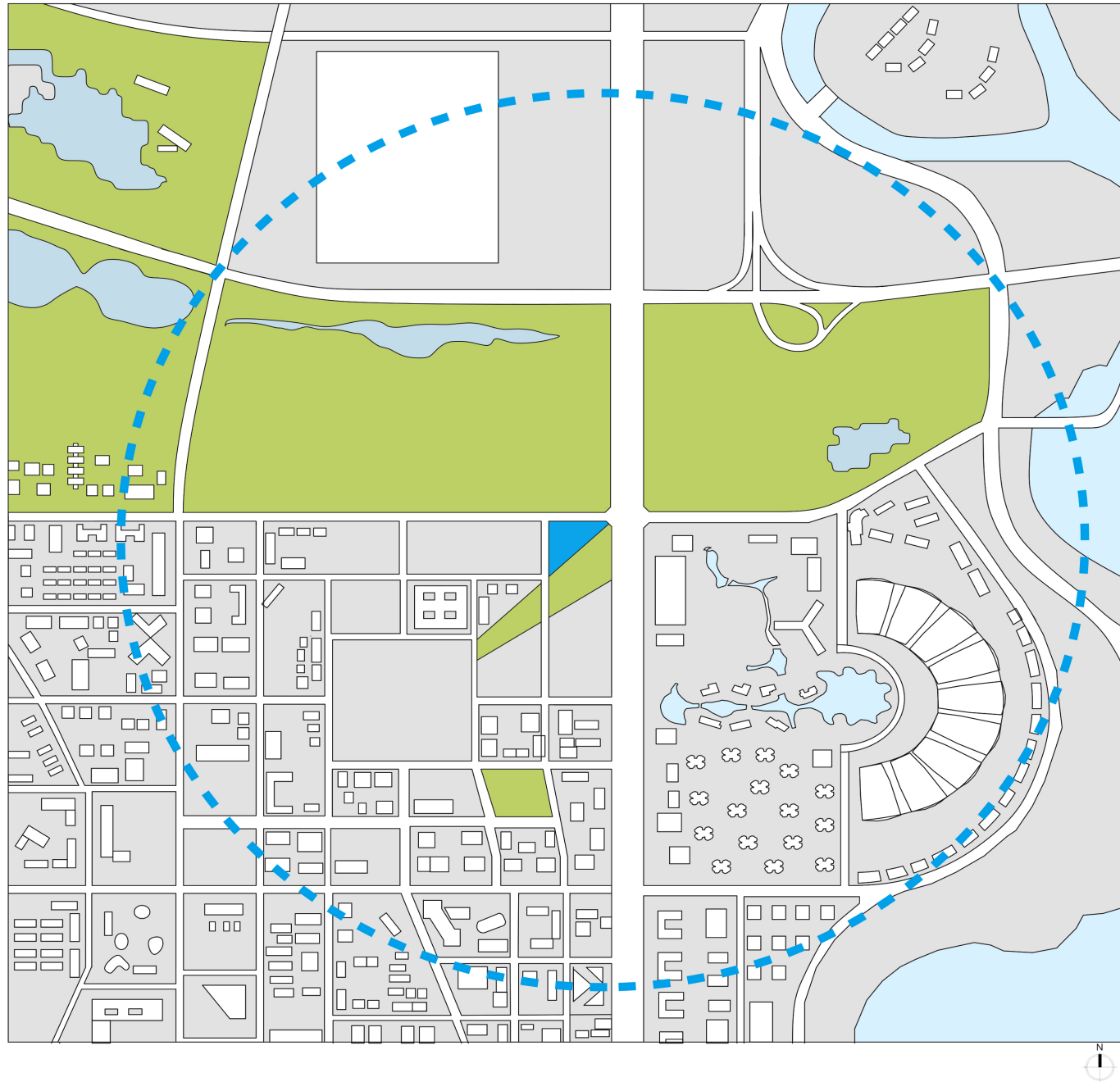


Figure 23: Site context map - Green space and River

Site context

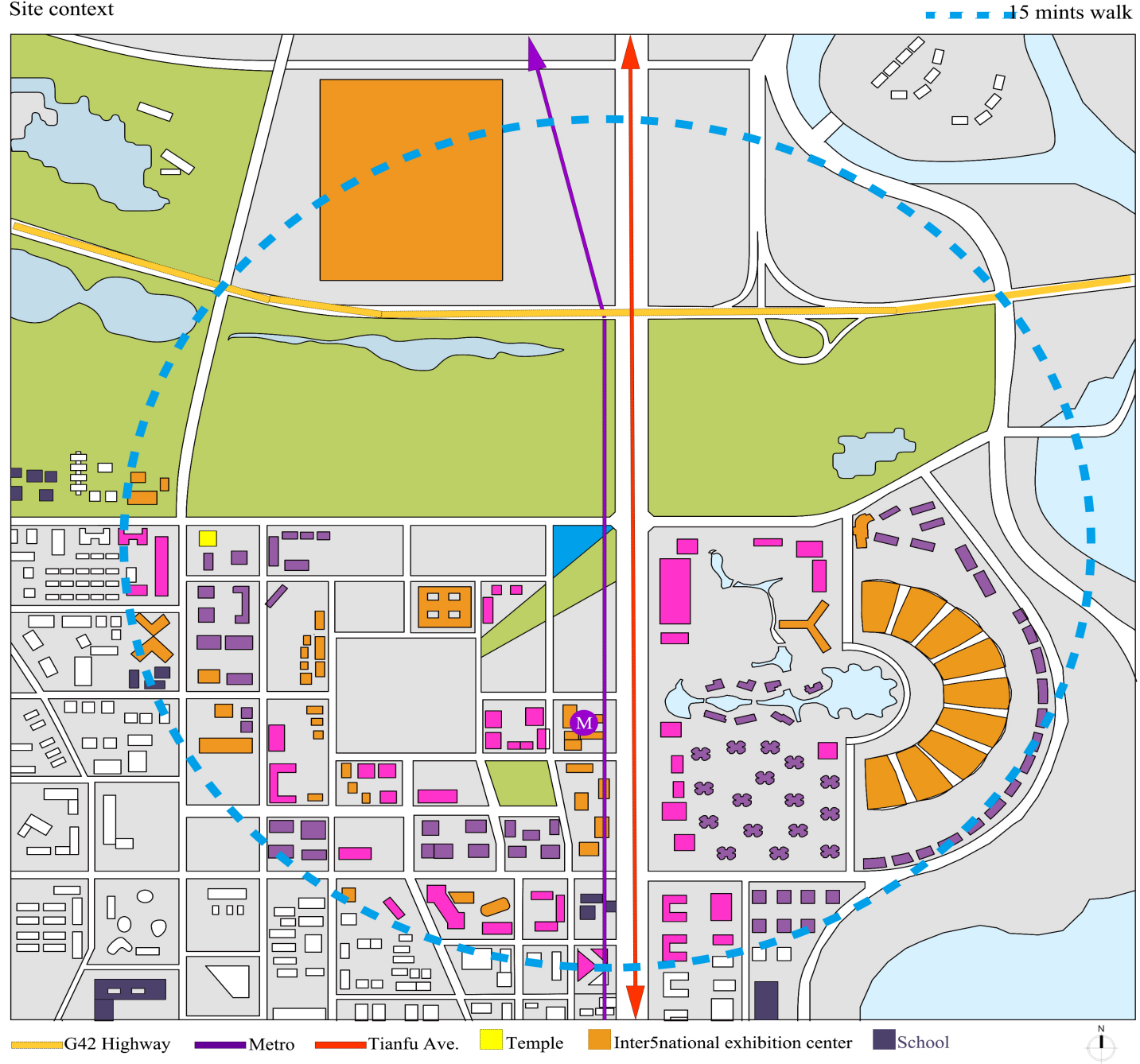


Figure 24: Site context map

## Program of Space

The program for the project is directly adapted from the earlier identified needs of the site. As a result, the main program elements are office space, restaurants and tea shops as well as public park, and shared spaces for communities. The public spaces are not only to serve the building tenants but also to provide benefits to the neighborhood.

### Working

Private office

Team office

Conference room

Event Pavilion

Studio

Meeting room

Auditorium

### Community

Theater

Public market

Green roof

Community garden

Gym

Gallery

### Living

Work & Live studio

### Education

Lecture hall

Teaching studio

Continuing education center

### Retail

Restaurant

Food court

Cafe

Teahouse

Bar

## CHAPTER 04: DESIGN

### Inspirations

The design inspiration is from the traditional Asian bookshelf. The traditional ancient bookshelf is not only used for holding books but also can be used as a wallscreen to separate space in the room or decoration. Instead of being designed as pancake layers, the layout of the bookshelves is designed by the functions. For example, the taller space is for the tall vase, and the closed drawer is to keep books away from dust.



Figure 25: Traditional Chinese Bookshelf



Figure 26: Chaekgeori, Joseon Period 1800s

The typical office buildings in China often separate their space by functional uses. With mostly commercial space at the first 6 floors and above is office space. So instead of stacking all the large functions such as retail, office and residential in a single tower, the design creates separate towers with a vertical void in the middle of the building to capture the large facilities and street level activities.

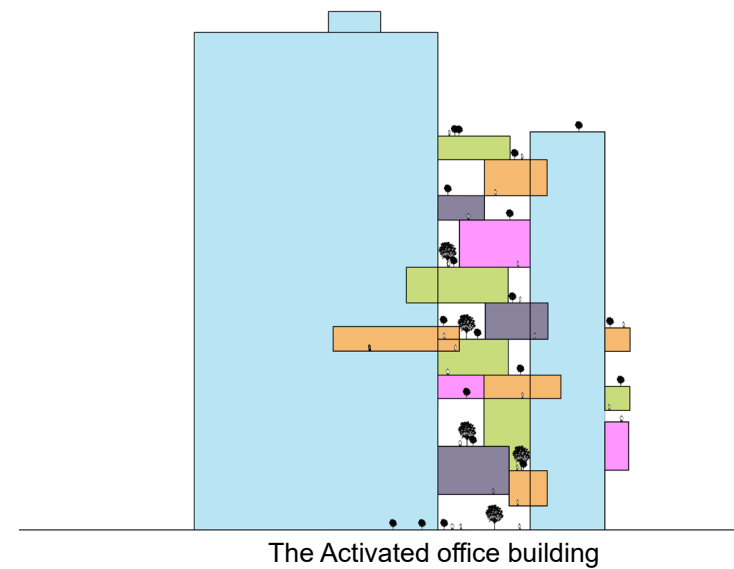
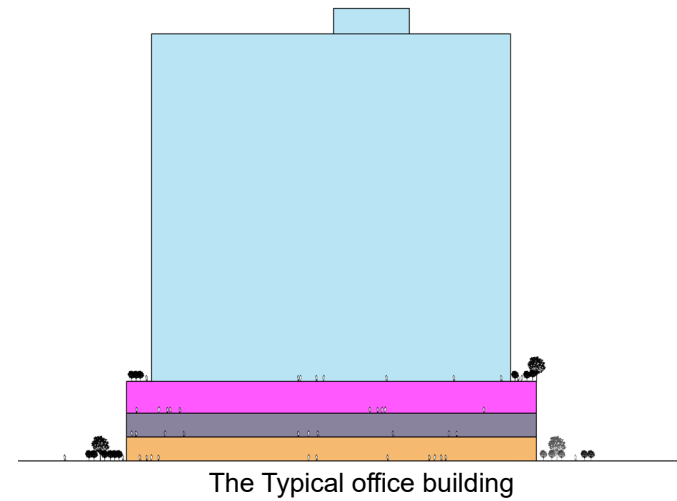


Figure 27: Typical office building VS Activated office building

## Form Evolution

The site is a 500 by 525 feet with an area of 131,250sft. The height limit in that area is 500 feet. Since there are two parks adjacent to the site, there will have entrance on each side of the site so people can get access to the park easily. The overall massing is then cut into three towers by the entrance, the three different heights of the towers respond to solar access, in order to get maximum day-lighting. The void between the towers is then pulled and pushed in order to get as many views to the park as possible. On each roof terrace, there will be gardens, cafes, and playground. Some of the terraces are public, the others are private to the building tenants.

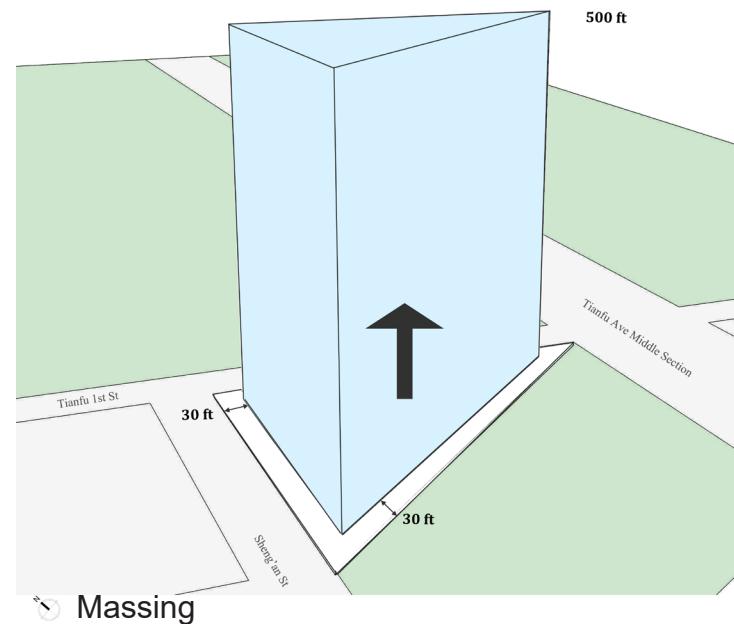
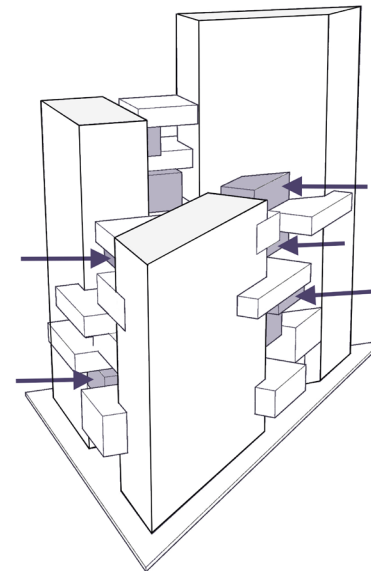
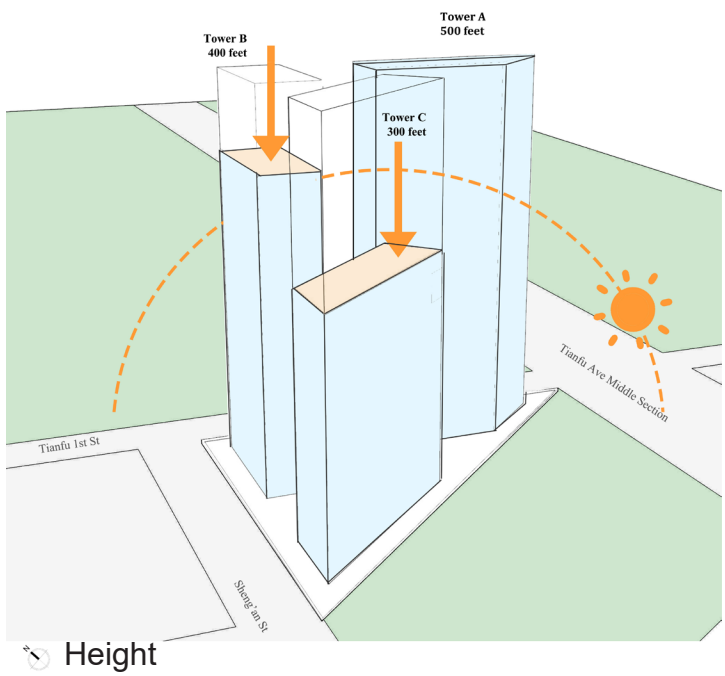
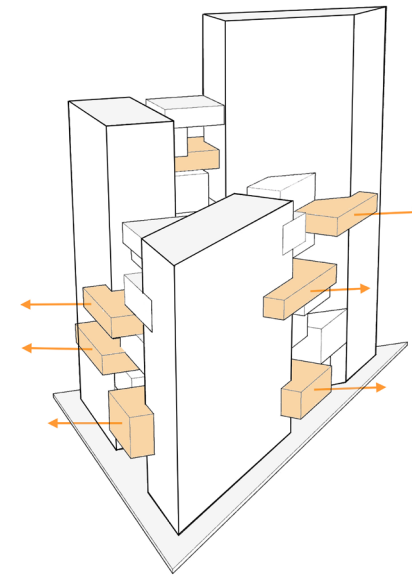
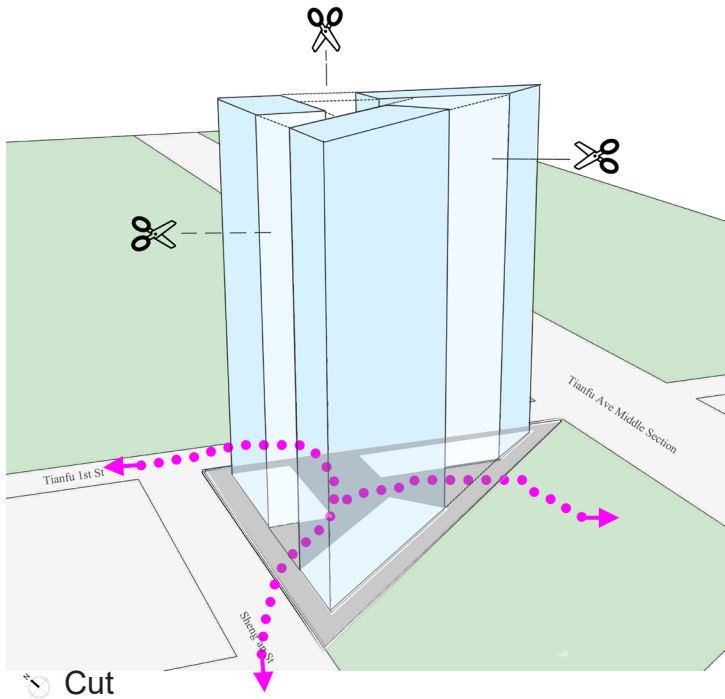
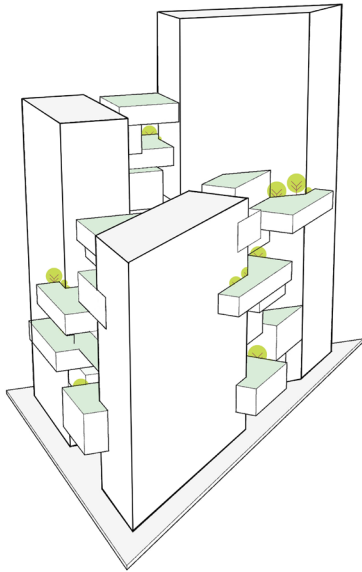
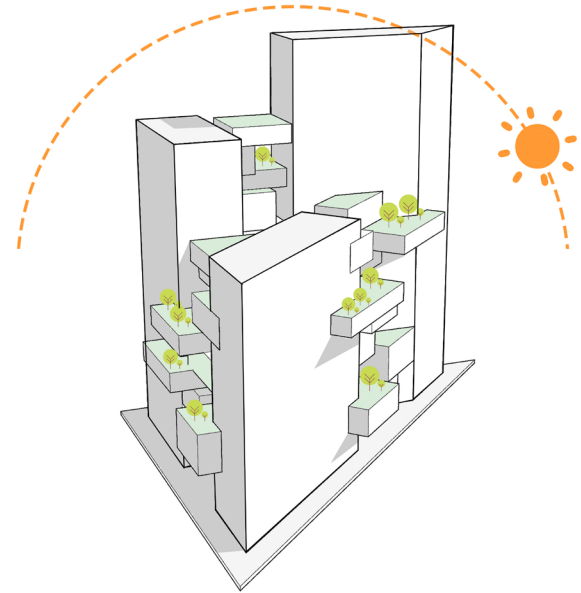


Figure 28: Form evolution diagrams

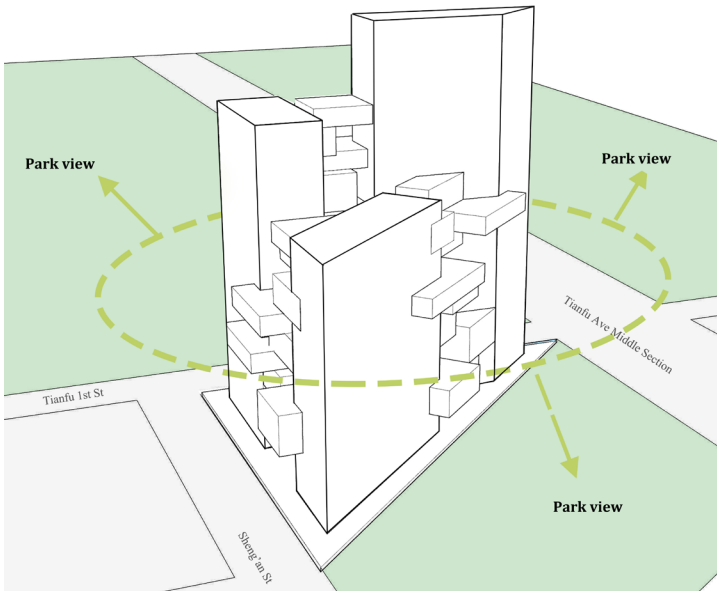




👁️ Green space



👁️ Solar access



👁️ Views

Figure 28: Form evolution diagrams

# User Activities

The proposed programs for the project contains working, living, retail, community and education spaces. The users are workers, neighbors, students, and residents. This diagram analyzes how these users are using the different spaces through the different time of the day. For example, the working space are only open to the worker and some residents, but the retail is open to all. The community and education space is to provide benefits for the neighbors. Additional a small number of residential spaces are proposed as work and live studio. The diagram helps to place the programs by the public and private, the areas and locations.

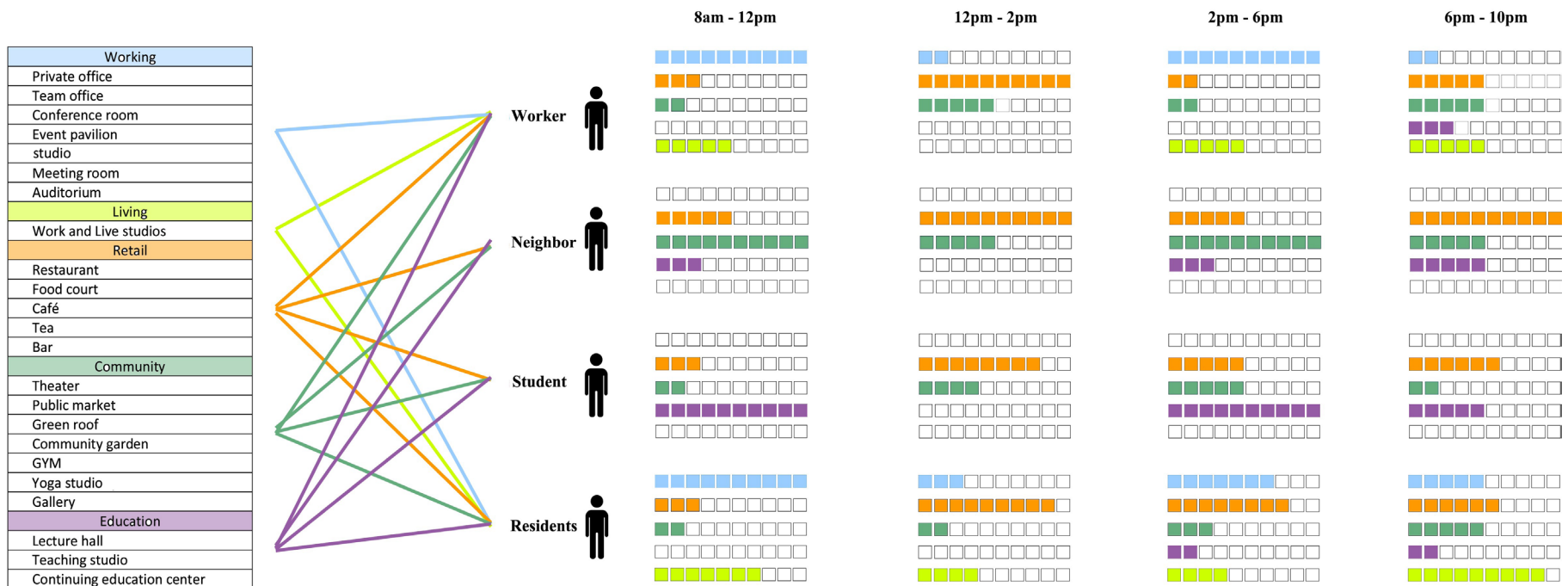


Figure 29: User Activity analysis

## Programs

The majority of the spaces of the three towers are work space. There is a small amount of living space on top of the two higher towers, the living space is being located on the east side of tower B away from the major road and also on the north side of tower A in order to get the park views. A series of floating boxes which house the other functions like retail, community and education space. The terrace and rooftop provide a spectacular balcony space and roof gardens for the building tenants and local residents.

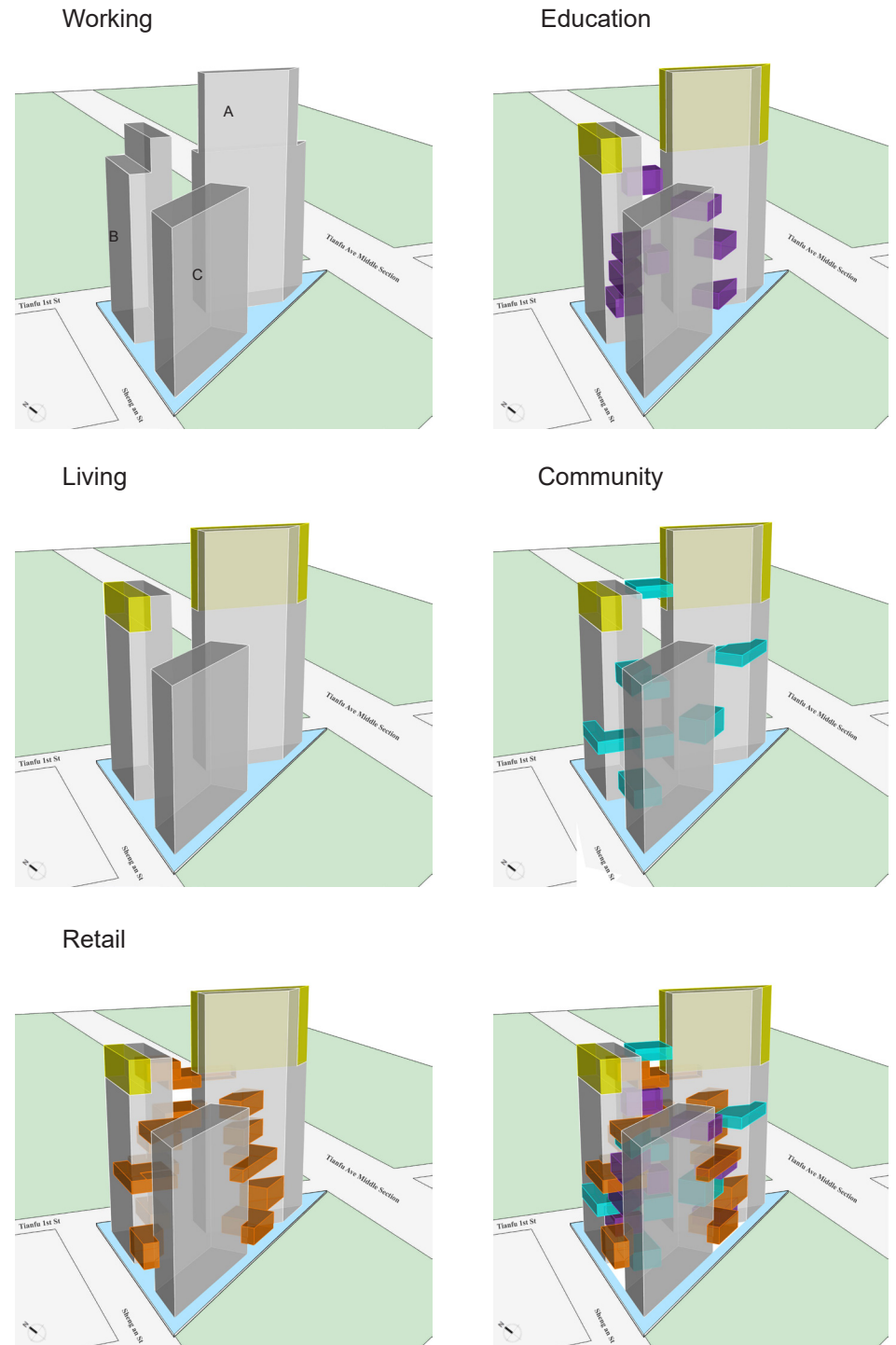


Figure 30: Program diagrams

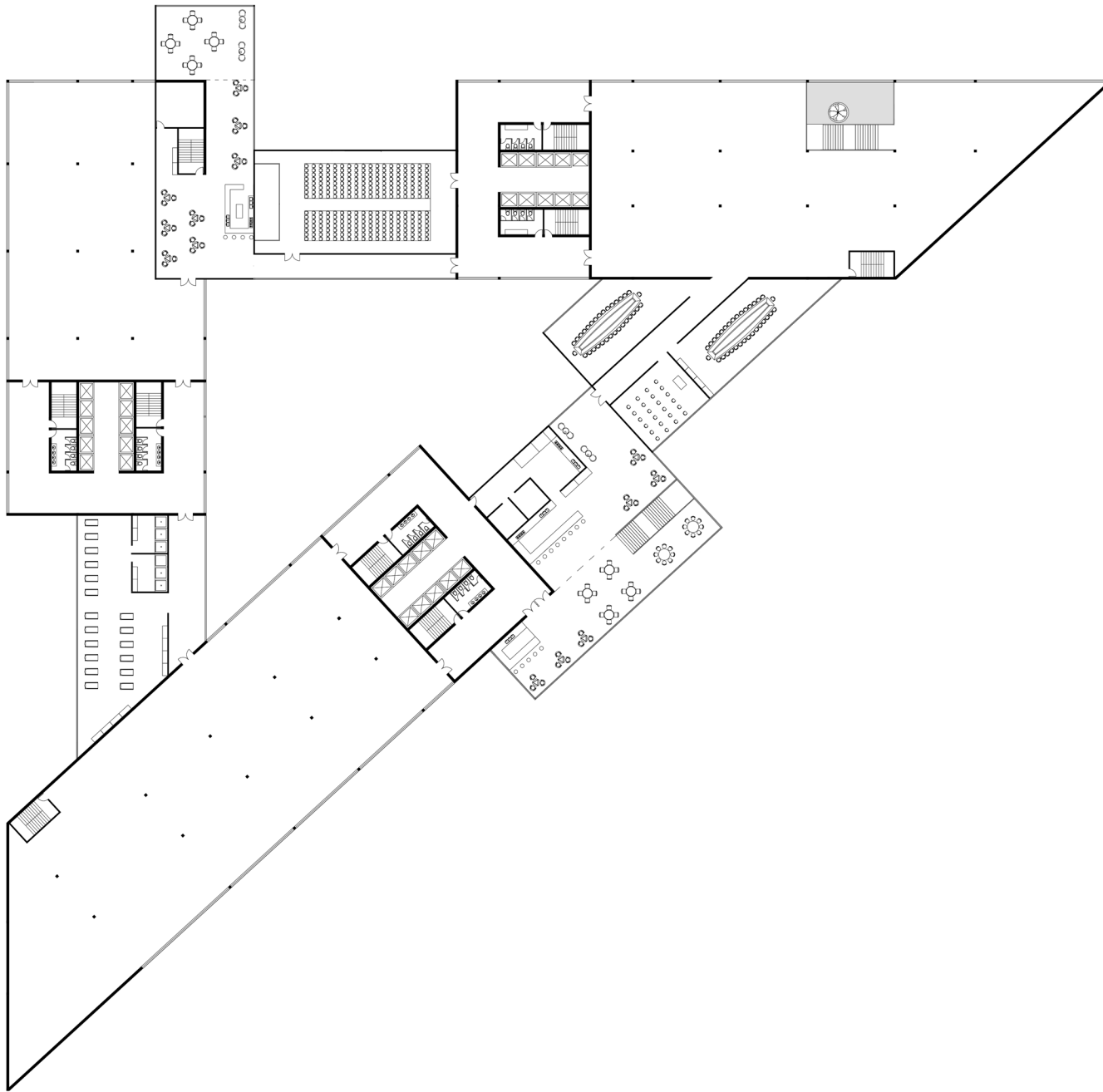


## Ground Floor

On the ground floor, there are entrances on each side, so people can get access to the towers easily. The space between the towers is used as gardens and public open markets. There is an individual service core in each tower that is shared by all the users. The public can get into the tower and access the other programs which are also used by the building tenants.

Figure 31: Ground Floor Plan

1/32"=1'

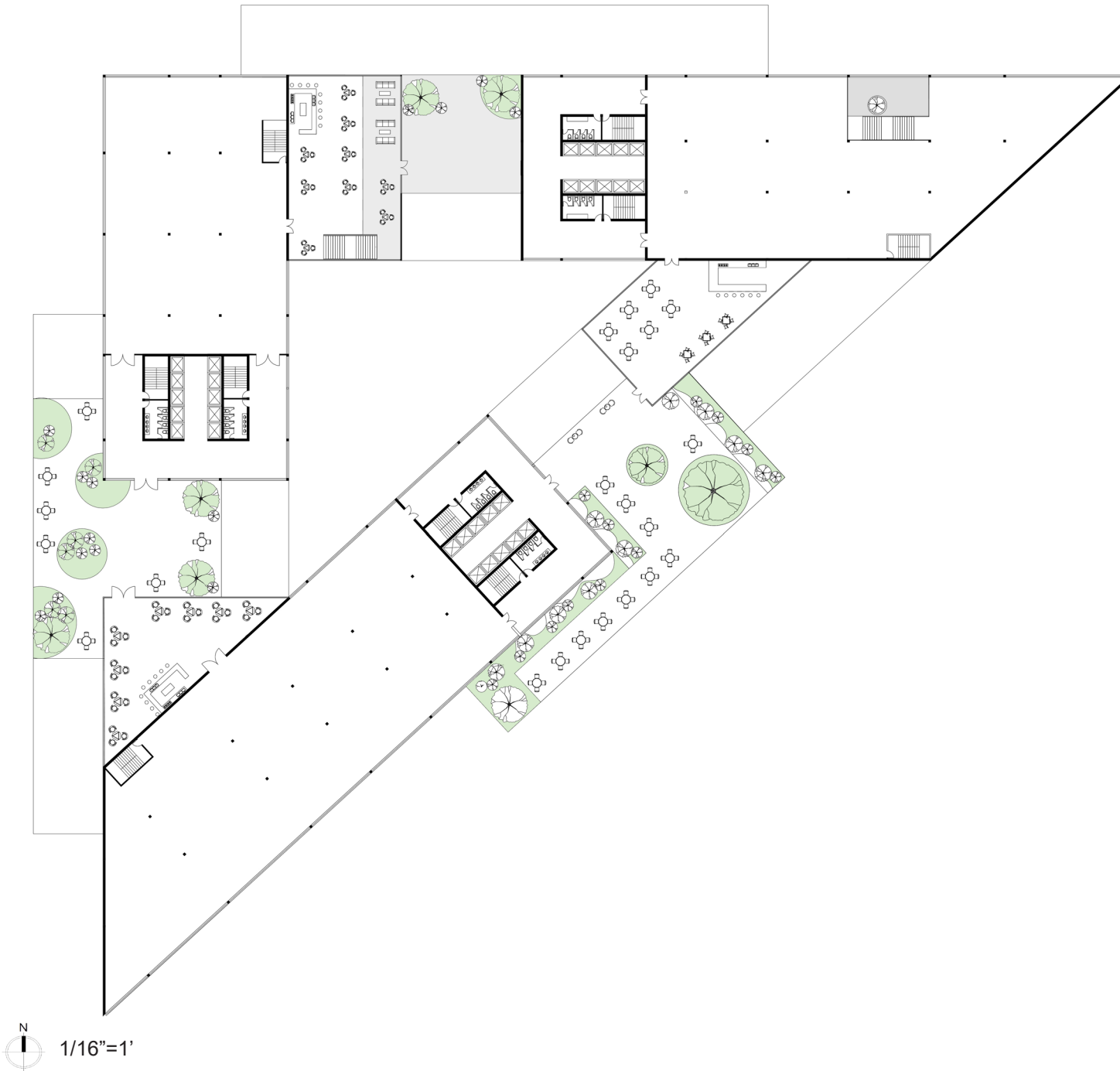


## Floor 4

On the fourth floor, the programs between the towers are the gym on the west side, public restaurant, meeting space and continuing education center on the east side. On the north side, there is a cafe and theater. The rest is open floor office in each tower.

N  
1/16"=1'

Figure 32: Floor 4th Plan



## Floor 18

On the 18th floor, there has three cafes on each side and outdoor seating space outside each cafe. Open floor office spaces between cafes.

Figure 33: Floor 18th Plan

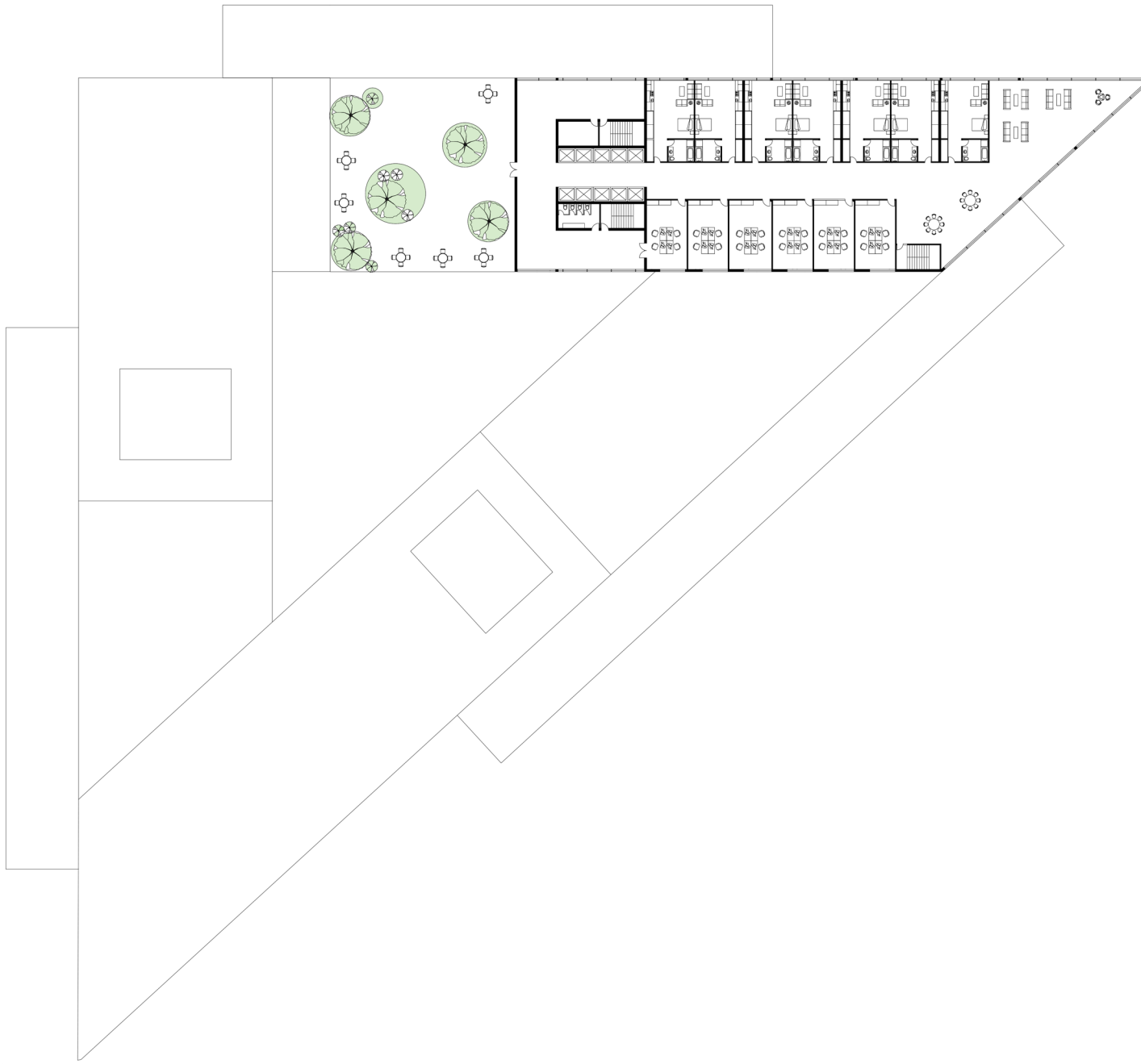


## Floor 27

The live and work studio is provided for the start-ups and small businesses on the 27th floor. The people living the studio will have a small office right cross the hallway and gathering space at the corner of each floor. The two towers are linked by the restaurant and roof garden.

N  
1/16"=1'

Figure 34: Floor 27th Plan



## Floor 34

From floor 34th to the top floor is the work and live studios in tower A. There is a private outdoor roof garden that opens only to the residents.

N  
1/16"=1'

Figure 35: Floor 34th Plan

## North Section

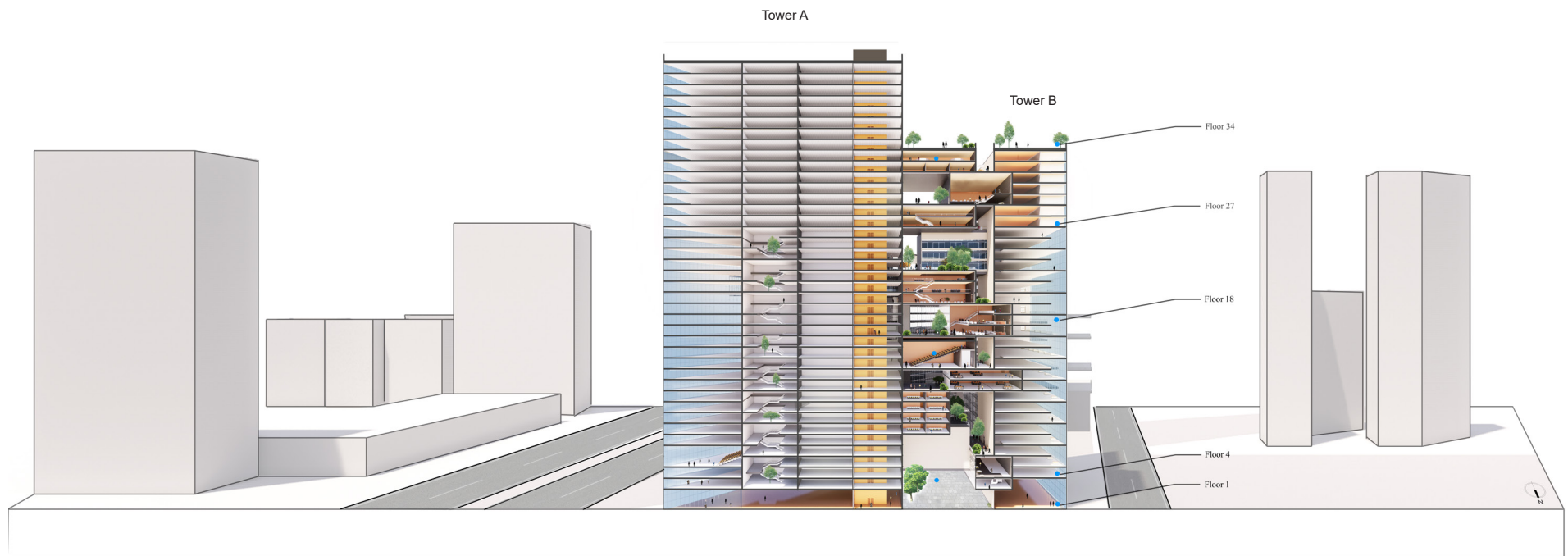


Figure 36: North section

The section in Figure 36 shows the office area in tower A and B, all the public programs are in the middle between the two towers and share one core with the office tower A. The public can get access to all the amenities through tower A's circulation and all the amenities are connected to tower B's office space, all the building tenants can use these spaces without going out of the building. For example, if a worker wants to get a coffee during the work time, he can just go to one of the cafés between the towers without going all the way down to the ground floor and have to leave the building.

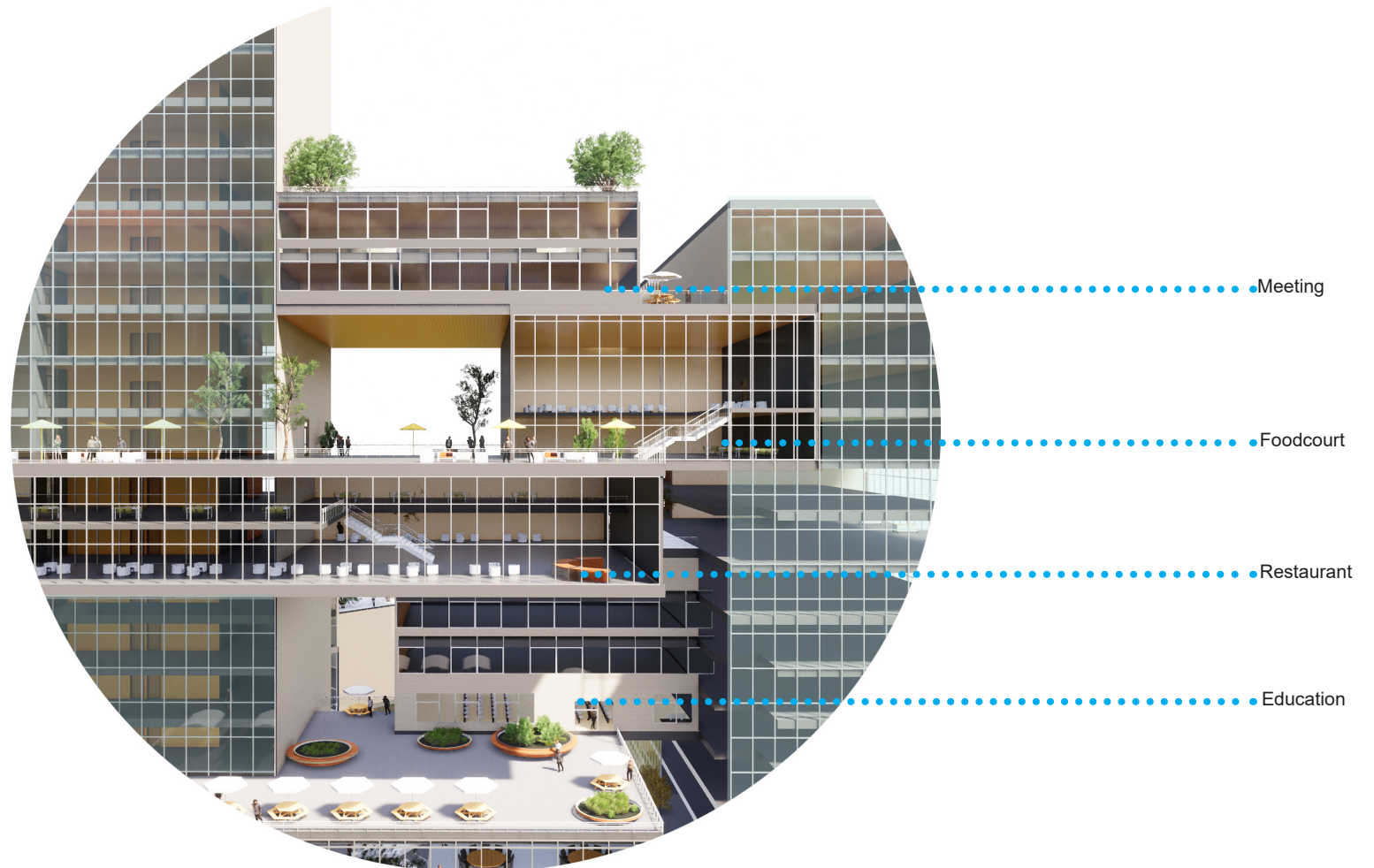


Figure 37: Close-up view 1

This close-up view in Figure 37 shows the space from floor 23th to 34th. There is a roof garden outside the four floors of education space that is used for lecture halls, teaching studios, and continuing education. Above the education space is the restaurant which opens for public and building tenants. On top of the restaurant is the food court used only for the workers during daytime and a roof terrace used for gathering and coffee during working hours. On the top, the two floors are the meeting rooms for the workers and also shared by the residents.

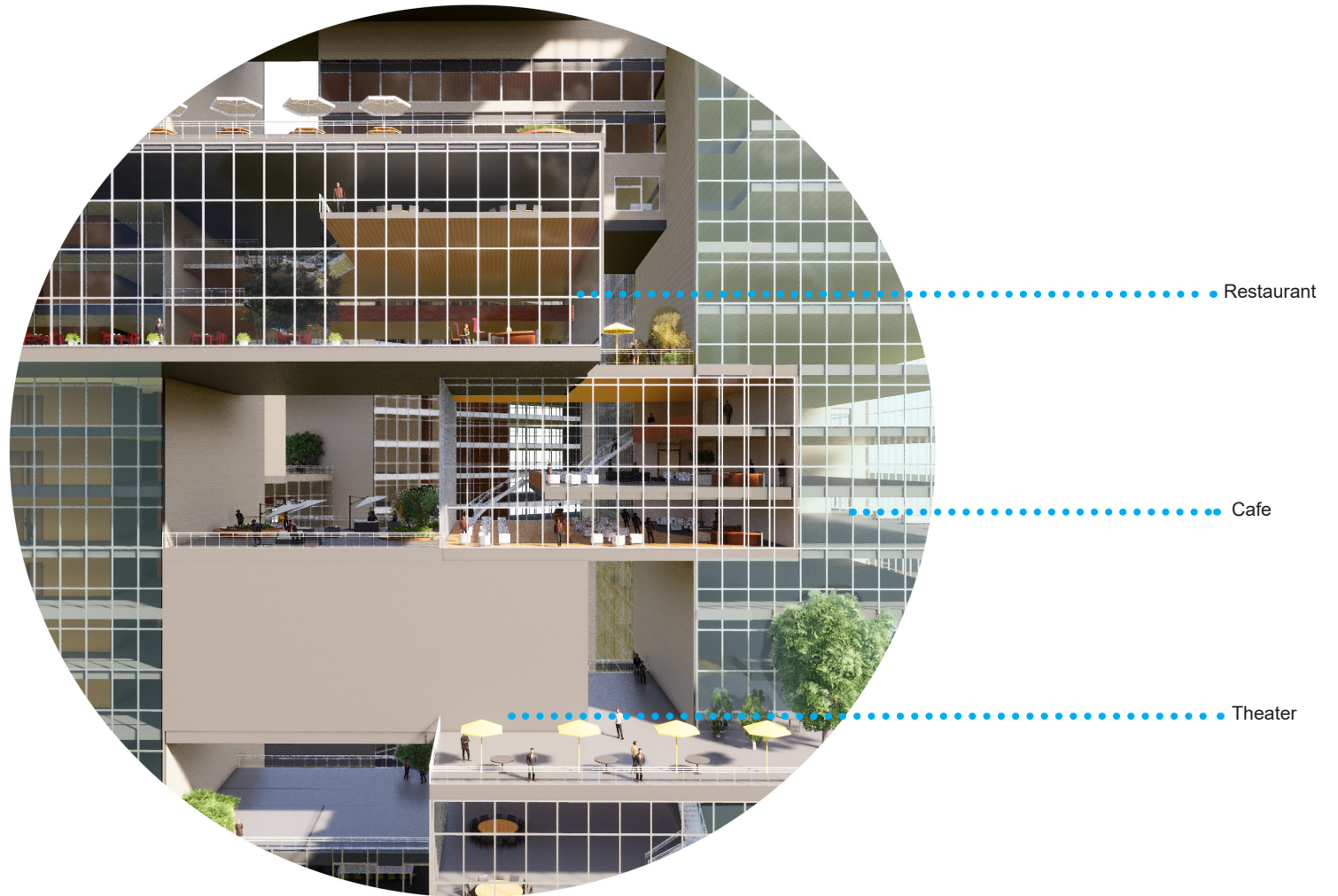


Figure 38: Close-up view 2

The public restaurant and bar is located from floor 20th to 22nd. This restaurant is open to the public who can get access from tower A's elevator, in order to go up and enter this space. The workers from tower B can also cross the roof garden to enter the restaurant. The cafe is from floor 17th to 19th. Under the cafe is a theater with a roof terrace attached to tower B.

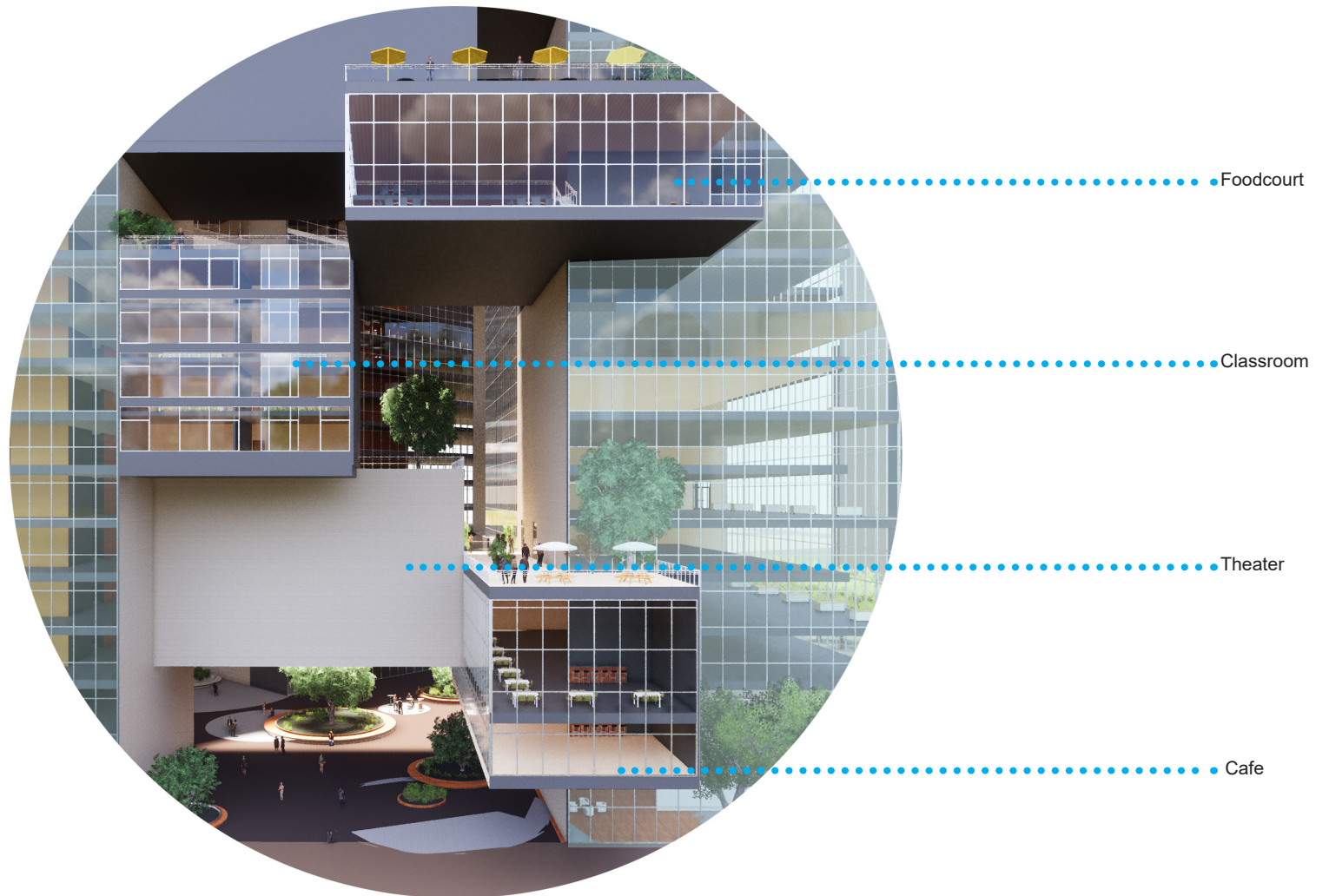


Figure 39: Close-up view 3

The ground floor courtyard is used as the public market during the daytime, from floor 3 to 5 is the cafe only open to the workers from tower B. From floor 4th to 7th is the theater space which is adjacent to floor 6th's roof terrace. Above the theater is the small classroom used by the education program. A food court is on floor 12th and 13th which is only open to the office workers.

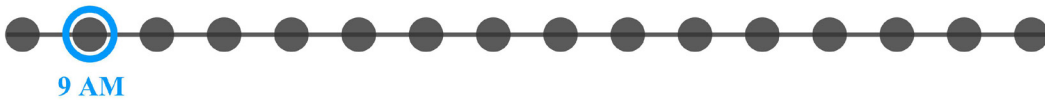


  
8 AM

**PUBLIC COURTYARD**

Figure 40: Public Courtyard

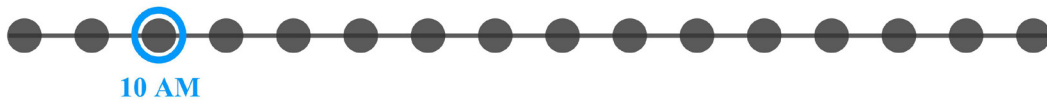
The courtyard between these three towers is the gathering space during the working days. The workers can have lunch and coffee here during their break. Each tower's entrance faces the courtyard, so people can walk into this courtyard to go up to the public amenities.



## OFFICE LOBBY

Figure 41: Office Lobby

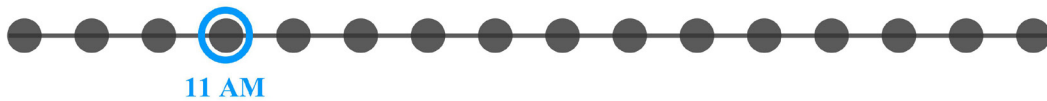
The Lobby is located on the ground floor of tower A facing the north park. There is an open meeting room adjacent to the north side, which has views of the park. Several seating areas are in this lobby.



## INDOOR CAFE

Figure 42: Indoor Cafe

A three-floor cafe located on floors 17th, 18th and 19th. The workers can access this space directly from tower B. The public can get in the space from tower A's elevator, go up to the 17th and cross the outdoor terrace to get in this space. This cafe enables interaction between people who work in different towers.



OFFICE

Figure 43: Office

A private office in tower C looks into the north park. People who work in this place have access to views in the north park and also receive enough daylighting from above.

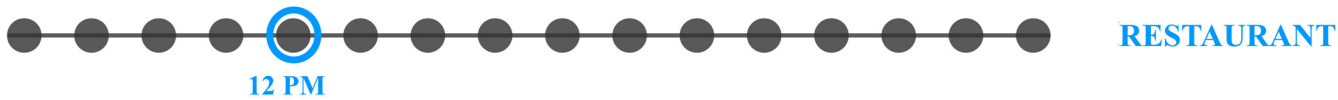
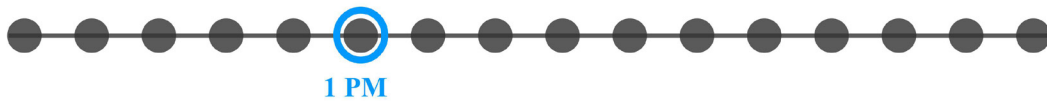


Figure 44: Restaurant

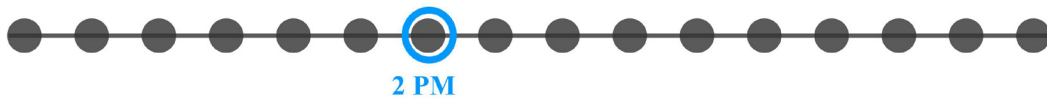
This three-floor restaurant is a formal dining and bar place for after work hours. The restaurant has the views of the north park and city views. The public can access this space from tower A's elevator. There is also a rooftop bar outside the restaurant. The restaurant can activate the building after work hours, bring more social activities to the neighborhood.



## OUTDOOR TEA PLACE

Figure 45: Outdoor Tea Place

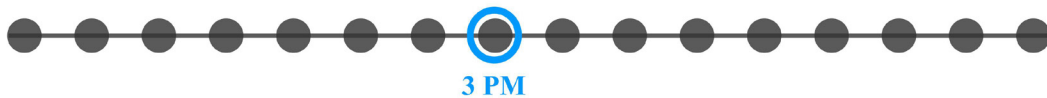
Shown in Figure 45 is the outdoor tea place on tower A. The tea culture in Chengdu is the same as the coffee culture in the west. The outdoor tea place provides space for the workers interact with others who work in the different towers as well as friends from outside of work.



## PUBLIC MARKET

Figure 46: Public Market

The courtyard is used as an open public market during the weekend. The residents and neighborhood can get together during the weekend for shopping and dining. In this way, the courtyard is activated during off-work hours.



**ROOF GARDEN**

Figure 47: Roof Garden

The roof terrace in Tower A is located outside the large lecture hall. This view shows the rooftop in Tower C. Students will have lectures inside this lecture hall. The outdoor place is used as a learning space for dance classes and other outdoor activities.

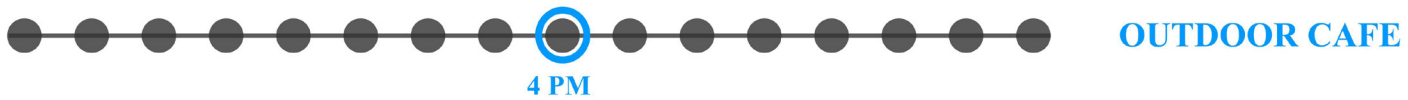
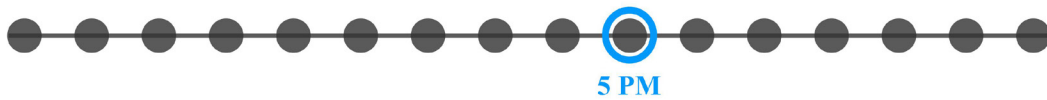
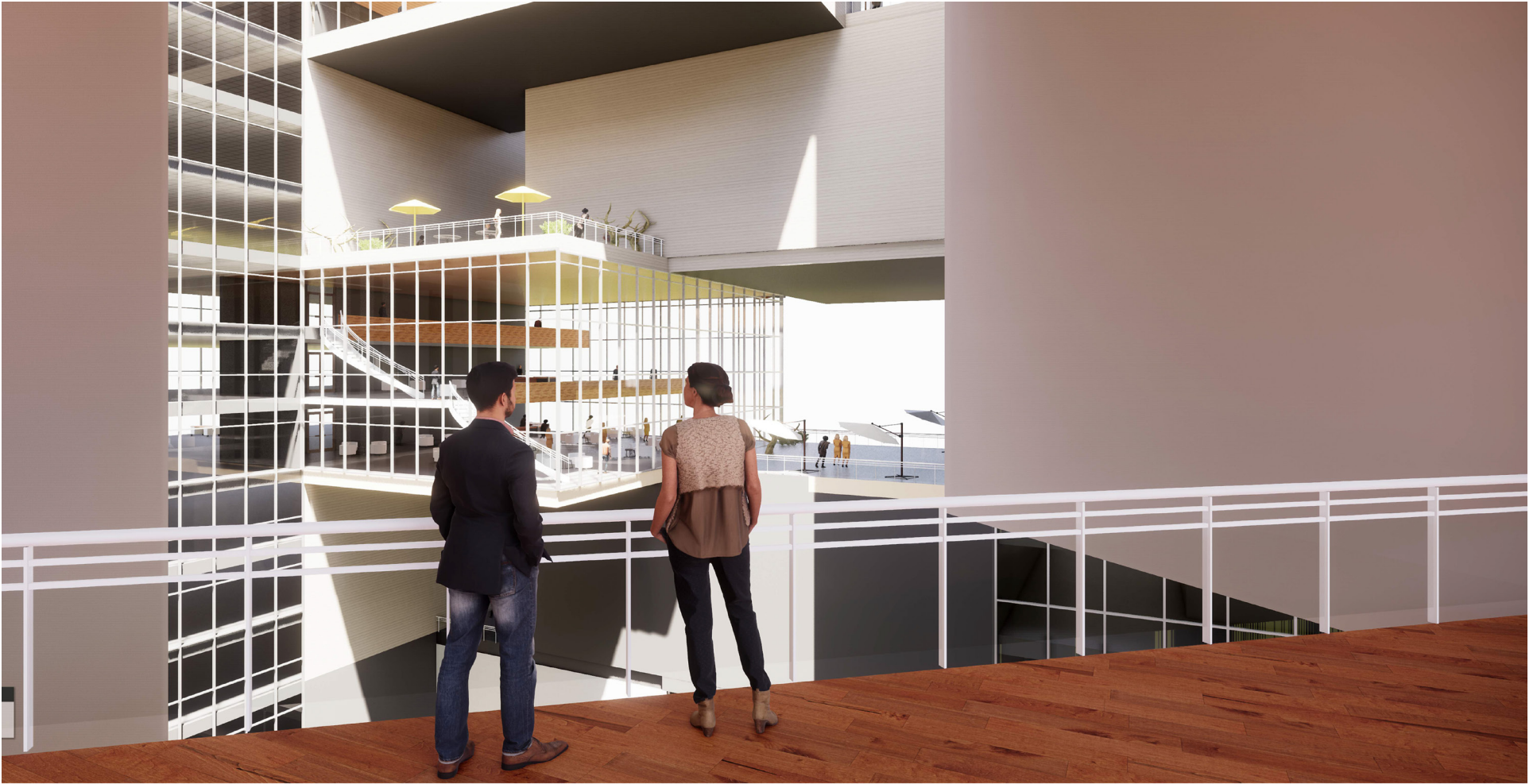


Figure 48: Outdoor Cafe

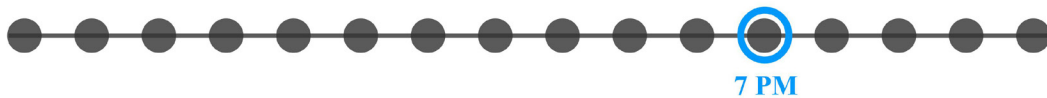
This view shows the outdoor café in Tower A on floor 17th. The space provides seating for the building tenants. The workers can have their lunch break here and enjoy the park view. This space is open to the public during the business hours.



## OUTDOOR WORKING SPACE

Figure 49: Outdoor Working Space

The semi-open working space under floor 18th is to provide a space for workers hosting happy hour parties during the business day. After the workday, this space can be rent out for other public activities.



## OFFICE LOUNGE

Figure 50: Office Lounge

A small bar is an important space for the workers. This space activates the working space by providing some table tennis, sofas, and a small bar. People can interact with each other in this space without sitting by their desk all day.

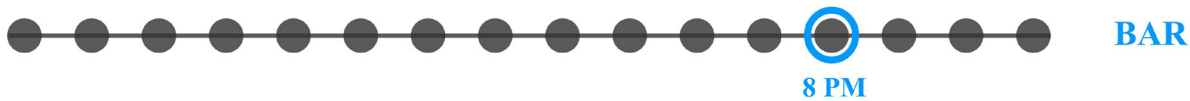


Figure 51: Bar

The bar is located in the tower A at floor 22nd. There is also a restaurant under the bar, that it is a multifunctional space that can be used by all the people. The big dining table on the third floor can host large groups of dining. The second floor provides entertainment space with table tennis and ping pong. On the first floor are the bar space and typical dining areas.



## CHAPTER 05: CONCLUSION

Figure 52: South Street View

This thesis set out to challenge the typical office building in China to transform it into an active building with commercial, residential, community and education programs inside. By rearranging the public spaces and working spaces to not be typical pancake layered floors, the activated building brings the shared public programs up to interact with the office space to create a more lively and efficient highrise building. The finished project is an active office highrise that satisfies the needs of the neighborhood and also connects the two parks adjacent to the site by providing a number of green spaces in the city. It also provides a small amount of “Live and Work” studios as residential space on top of these towers to be convenient for the workers. The new type of office building activates the highrise office buildings in one of the fastest growing cities in the world, Chengdu. This thesis illustrates how a more activated and vibrant office can stand out in the vertical cities like Chengdu.



Figure 53: North Night View

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