Adaptive Reuse of Old Shophouses in Bangkok

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ปัจจุบัน ในเขตตัวเมืองกรุงเทพมหานครที่มูลค่าที่ดินมีราคาสูง และความต้องการในการใช้พื้นที่ในรูปแบบต่างๆ ได้เพิ่มขึ้น อย่างต่อเนื่อง ซึ่งเป็นผลมาจากการเปลี่ยนแปลงทางสภาพเศรษฐกิจและสังคมที่มีการเติบโตอย่างรวดเร็วในช่วง 10 ปีที่ผ่านมา จากการสำรวจพบว่า มีตึกแถวจำนวนมากในพื้นที่กรุงเทพ ที่ถูกปล่อยทิ้งร้างหรือไม่สามารถนำมาใช้ประโยชน์ได้อย่างเต็มที่ เนื่องจากไม่สามารถทำการปรับเปลี่ยนทางด้านกายภาพของอาคารให้รองรับการใช้งานในรูปแบบใหม่ๆได้ การทุบตึกแถวเดิม และสร้างใหม่ให้เท่ากับขนาดของอาคารเดิมนั้น ไม่สามารถทำได้เนื่องจากข้อบังคับทางฎหมายเรื่องระยะร่นของอาคาร ดังนั้น จึงมีความจำเป็นที่จะต้องทำการปรับปรุงอาคารทางด้านกายภาพ เพื่อรองรับการใช้งานในรูปแบบใหม่ๆที่เกิดขึ้น การวิจัยครั้งนี้จึงมีวัตถุประสงค์เพื่อนำเสนอแนวทางการปรับปรุงตึกแถวให้รองรับการเปลี่ยนแปลงที่เกิดขึ้น ในด้านกายภาพและใช้งานพื้นที่ภายในของอาคารประเภทตึกแถว

งายวิจัยนี้ได้เก็บรวบรวมข้อมูลจากเอกสารทางวิชาการ เพื่อศึกษาทฤษฎีและแนวคิดที่เกี่ยวข้อง พร้อมทั้งทำการสำรวจ และศึกษาลักษณะการใช้งานตึกแถวที่เกิดขึ้นในสยามสแควร์ โดยทำการถ่ายภาพและจดบันทึกการใช้งานของพื้นที่ส่วนต่างๆในอาคาร เพื่อนำมาวิเคราะห์รูปแบบการใช้งาน จากการสำรวจพบว่าการใช้งานพื้นที่ภายใน มีลักษณะไม่ตายตัวเพราะขึ้นอยู่กับประเภทของธุรกิจ ความต้องการของเจ้าของอาคารหรือผู้ใช้อาคารที่แตกต่างกัน โดยมีการต่อเติมและลดทอนส่วนต่างๆของอาคาร เพื่อให้สอดคล้องกับลักษณะของการใช้งาน ซึ่งมักขัดกับข้อบังคับของกฎหมายว่าด้วยเรื่องการดัดแปลงอาคาร และจากการวิเคราะห์ลักษณะการเปลี่ยนแปลงที่เกิดขึ้นพบว่าระบบโครงสร้างของอาคาร แผ่นพื้น เป็นส่วนประกอบของอาคารที่มีลักษณะตายตัวและยากต่อการปรับเปลี่ยน งานระบบท่อน้ำดี-น้ำเสีย จะพบในส่วนด้านท้ายของอาคาร ซึ่งยากต่อการเชื่อมต่อเมื่อต้องการพื้นที่ ที่เข้าถึงงานระบบนี้ในส่วนด้านหน้าอาคาร นอกจากนี้ยังพบว่าตำแหน่งบันไดมักพบในบริเวณด้านในสุดของอาคาร เป็นข้อจำกัดในการปรับเปลี่ยนการใช้งานพื้นที่ภายในของอาคาร เนื่องจากเป็นตัวกำหนดตำแหน่งการเข้าถึงพื้นที่ในแต่ละชั้นของอาคาร

ดังนั้นงานวิจัยชิ้นนี้จึงนำข้อจำกัดที่ได้จากการวิเคราะห์มาเป็นแนวทางในการออกแบบ เพื่อให้อาคารประเภทตึกแถวเก่าที่มีอยู่ในกรุงเทพมหานคร สามารถทำการปรับเปลี่ยนประโยชน์ใช้สอย และรองรับการเปลี่ยนแปลงในด้านกายภาพและพื้นที่การใช้งานที่เกิดขึ้นในอนาคต โดยการวางงานระบบให้เข้าถึงพื้นที่ในแต่ละส่วนของอาคาร และออกแบบบันได แผ่นพื้น และ ส่วนด้านหน้าอาคาร ให้มีลักษณะเป็นหน่วยย่อย ที่สามารถแยกส่วน หรือประกอบเข้ากันได้ โดยแนวทางการออกแบบนี้ได้นำไปทดลองใช้กับตึกแถวบริเวณอโศกเพื่อศึกษาความเป็นไปได้ในการนำไปใช้จริง พร้อมทั้งศึกษาข้อดีและข้อเสียที่เกิดขึ้น ท้ายที่สุด งานวิจัยนี้คาดว่าจะสามารถเสนอแนวทางการปรับเปลี่ยนประโยชน์ใช้สอยตึกแถวเก่าที่เหมาะสม แก่สถาปนิก เจ้าของอาคาร และผู้ใช้อาคาร

สาขาวิชา การออกแบบสถาปัตยกรรม ลายมือชื่อนิสิต .....

ปีการศึกษา 2558 ลายมือชื่อ อ.ที่ปรึกษาหลัก .....

5573704025 : MAJOR ARCHITECTURAL DESIGN
KEYWORDS: ADAPTIVE REUSE / SHOPHOUSE / SHOPHOUSE TRANSFORMATION / ADAPTABILITY / BANGKOK

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Currently in central Bangkok where land value is high, the demand for space in various forms has been increasing steadily. This is a result of the urban development that has grown rapidly over the last 10 years. Today, there are many shophouses in Bangkok that have been in vacant condition or underutilized. The demolition of particular slot and reconstruction in the same footprint as original building is impossible because of the setback requirement. Therefore, the reuse of old shophouse is necessary. Thus, this research aims to provide guidelines for reusing the old shophouse to support the changes in physical components, spatial organization and adaptability.

The research methods include 1) reviewing the academic documents related to the shophouse and theory related to adaptability and 2) surveying spatial and physical characteristic of the shophouse in Siam Square area. Photographic documentation and hand sketch are the primary method of collecting information in order to analyze the usage patterns. The findings reveal that the spatial characteristic of shophouse shows irregularity and obscurity of the usage patterns which depends on the type of businesses. While, the physical characteristic has high rigidity in structural layout, dimension and supporting utility. This physical characteristic has already determined the circulation, location of sewage system and floor slab that are difficult to modify to follow the usage patterns. This contrary is the key reason that make shophouse difficult to adapt.

Therefore, the analysis from the survey has led to the proposal of design guideline for reusing old shophouse in Bangkok. In order to accommodate changes in the physical and spatial configuration in the future, the supporting utility should be placed along with the structural columns that is distributed throughout. The stair and slab should be designed as a modular unit that can be filled in or moved out easily. The façade should be designed as a frame with adaptable module that corresponds to the interior space. This design guideline is implemented in the vacant shophouse in Asoke to study the possibility, as well as advantages and disadvantages of the design proposal. Finally, it is anticipated that the knowledge gained from this study will provide architects, building owners, and users of old shophouse with appropriate adaptive reuse design alternatives.

Field of Study: Architectural Design Student's Signature .....

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Chapter 1 Introduction

1.1 Problem statement and research significance

Shophouse was a dominant building typology in Bangkok that emerged along with the development of road transportation during the late 19th century (Oostrum, 2013). Due to that phenomenon, these concrete shophouses became a typical building model for the city. Unfortunately, nowadays, many of them are in vacant condition and begin to show a sign of disrepair as they are no longer efficient to support social contemporary demands.

During the end of 20th century, traffic problem and pollution in Bangkok triggered investment in a form of urban infrastructure which is the rail-based public transportation system. It had negligible impact on the development patterns in the city transformation. Several transportation systems connect once isolated neighborhoods from the city. This leads to the increasing in land value, higher demand for property, and attract new investments (Jhearmaneechotchai, 2015). Closed proximity to the transportation network is one of the advantage in real estate development projects in private sector as the cluster of condominiums, department stores, and office buildings are concentrated around the mass transit stations. Likewise, shophouse that exist in the urban area with the ease of accessibility to mass transportation systems should be able to adapt to support new activities along with the urban development.

The origin of the shophouse was speculated and brought to Siam by Chinese immigrants over different periods of time (Pharawong, 2013). Its flexibility qualification in space configuration, affordable construction cost, fast in production, and high benefit

for business investors were the main reasons for shophouse popularity among other types of building (Tirapas, 2012). The strength of the shophouse bases on the location and the flexibility in accommodating for many functions. However, its weaknesses are lack of natural light and ventilation due to the long and narrow configuration of the shophouse.

In terms of functional capability, the original design of the shophouse is to accommodate mercantile activity on the ground floor, and the above living area levels. However, these two functions in the present day are obsolete for contemporary demand. Shophouse that was once hosted miscellaneous commercial activities of locals has been gradually developed to accommodate more modern businesses such as café, hostel, or co-working space. Still, the transformation of shophouse entails several difficulties due to the fact that each unit of shophouse belongs to different owners. The complications in construction process as a result of the limitation in the site is also inspected as one of the obstacles for shophouse transformation. Demolition of the particular slot and reconstruction within the same footprint to facilitate new programs are impossible because of the setback requirement issued by ministerial regulation.

For these reasons, the study of present condition as well as transformation of shophouse is necessary in order to understand in depth of this architectural typology. Old shophouse in the urban area of Bangkok should be reused and adapted for new spatial program to increase the efficiency in space configuration, revitalize the neighborhood, and encourage the concept of creative economy in the city. Understanding in the architectural typology of shophouse will enable the opportunity to seek for practical and creative design solutions in reusing old shophouse that respond to the contemporary demand of the fast growing urbanization in Bangkok. Due to the advantage of shophouse in flexibility and space configuration aspect, this study aims to establish the architectural design guideline that offers the adaptability

of the space configuration of the shophouse. The design will not only extend the life cycle of the building, but also enhance shophouse utilization for further urban development.

1.2 Objective

The objective of this thesis is to develop a design guideline to reuse the old shophouse in Bangkok. This research puts an emphasis on the concepts associated with building adaptability in order to offer the possibility in transforming the architectural configurations of existing shophouse with least difficulty in the modification process. The design guideline will be applied to the shophouse in central Bangkok to test out about its application in the real context. There is anticipation that this guideline can be adapted to fit with existing structure of old shophouse from a single to multiple unit. The advantages and disadvantages, issues related to the adaptable shophouse, and the current regulations will be discussed in this thesis.

1.3 Scope and limitation

The limitation of the field survey is limited to report the transformation of shophouses in Siam Square area under the criteria of the transformation degree. Siam Square is the commercial area where the transformation of shophouse occurs rapidly due to high demand in commercial space. Shophouse will be explored under two aspects; spatial configuration and the physical character. The documentation will be done through visual observation, photograph, and hand sketch during on-site survey. However, the architectural layout of particular shophouse cannot be documented as the author is not permitted to enter the building.

According to the limit of regulation, the modification of particular building is allowed to be made not until 10 percent of the total weight of the building or the area must not exceed five square meter. As this thesis requires the entire change in the physical components of the shophouse, the legal framework related to the building modification is held as it limits the scope of flexibility in reusing shophouse. However, the issues in the current regulation will be analyzed and discussed in the chapter two of this thesis.

The scope of the architectural design part in this study is limited to the reuse of typical shophouse belong to a single owner. The physical characteristic of shophouse is limited to the dimension of 4 meters in width and 16 meters in depth with 4 stories. The design guideline will be applied to the plot with 5 vacant rows shophouse in Asoke area where chosen as site in this study.

1.4 Terminology

To clarify the term that frequently used in this paper, the terminology given by the Building Control Act B.E. 2522 in the Section 4 is stated as follows;

"**Shophouse**" means buildings that constructed as a continuous rows of 2 units or more with fire resistance shared wall with adjacent unit

"**Construction**" means building an entirely new one. Whether or not a representation of the original.

"**Modify**" means to alter, add, reduce or expand the characteristic of extent, model, form, proportion, weight, area of the building structure or any parts of existing constructed building from its original state, which is not considered as reparation or modification in accordance with ministerial regulation

"**Repair**" means to fix or change any parts of building in order to maintain its original state

"**Demolish**" means to dismantle and remove any part which is considered structure of building such as columns, beams, joists or any other parts which is considered as structure in accordance with ministerial regulation

1.5 Benefit of the study

The final design of the study will be presented as a building prototype that offer adaptability in space configuration. This study will be beneficial to shophouse owner, architect, user, real estate developer as well as to raise the issues regarding the regulation that related to the modification of the building.

For the shophouse owner and real estate developer, this study is believed to offer the alternative design guideline for adaptive reuse of the old shophouse to increase adaptability in the space usage. Incorporation of the building adaptation guideline, the shophouse can be easily adapted to accommodate new use without difficulty in modification process. The new space of the shophouse would allow the owner, and the developer to manage and organize the space in order to increase the building value and to provide adaptability in usage pattern.

For the architect, this study is a guideline for reusing of old shophouse that can be further explored in other aspects such as material standard, installation process and facade design. These ideas can also be applied to other types of the building that share similar structural components as the shophouse.

1.6 Methodology

The methodology of this study is divided into three parts;

The first part of the study is to structure the theoretical framework of the thesis by reviewing the literature related to the topic of shophouse, flexibility and adaptability in the building design. The survey of the existing shophouse is conducted to document the physical transformation of the shophouse in order to analyze the spatial configuration and physical characteristic to establish the criteria of how the building has been modified.

The second part is the design development that aims to establish the design guideline by adopting the theory of Support and Infill and design criteria from the survey as the main design approach. Shophouse component is dismantled in order to identify its component as Support and Infill.

The final part is to apply the design guideline to the existing shophouse in Bangkok as the prototype. The architectural design will be developed from the site analysis and existing users that help to set up the program for this prototype.

The summary of the methodology is presented in the figure 1.

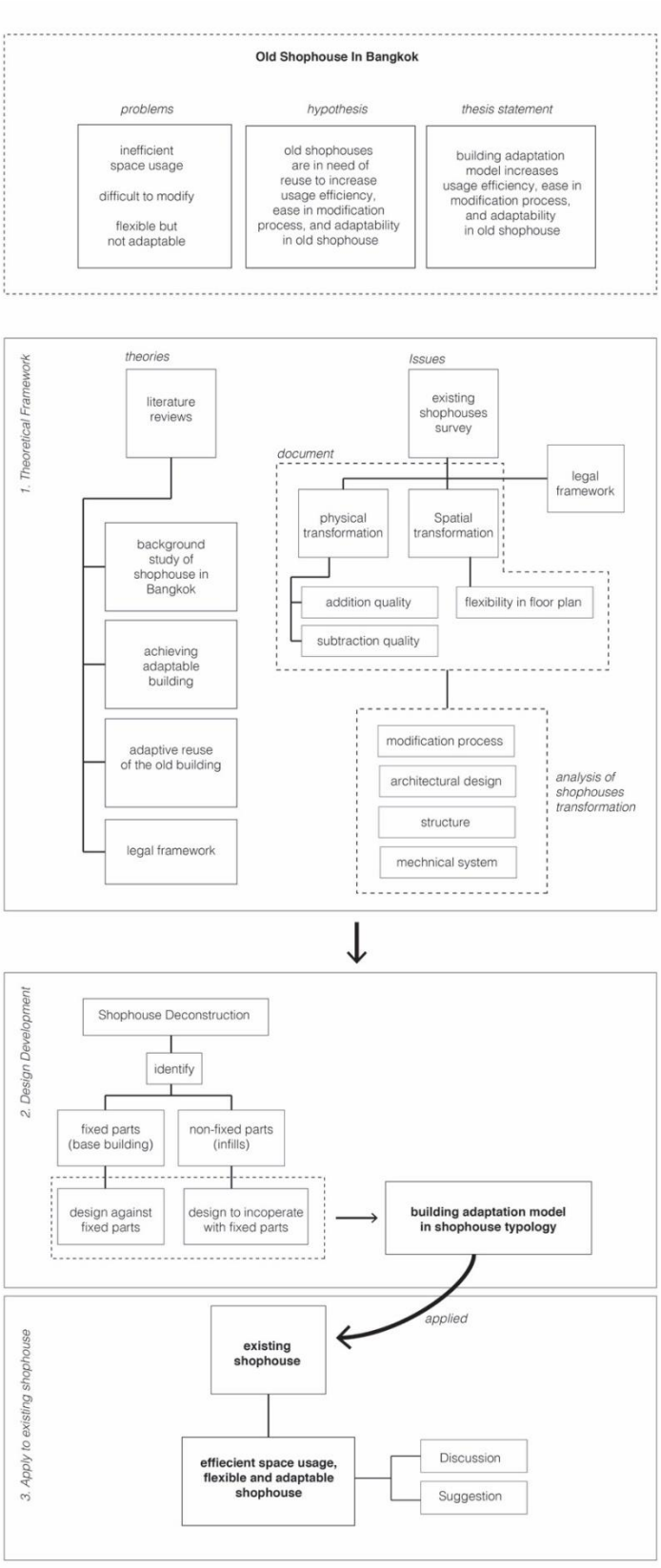


Figure 1 Summary of research methodology

Chapter 2 Literature Review

In this chapter, the study of shophouse background is explored under 5 categories which are 1) definition of shophouse, 2) spatial feature, 3) physical character, 4) architectural problems, 5) adaptability potential in shophouse typology. Moreover, literature related to the theories and practices of adaptable buildings as well as current regulations related to the modification of building in Bangkok are reviewed to complete all aspects for this study.

2.1 Background study of shophouse in Bangkok

2.1.1 Definition

Shophouse is a continuous built structure with narrow frontage constructed aligned with the road. Each unit constitutes of uniformed façade with different ornamental decorations. This is a prototype of bi-functional building that integrates commercial and residential use in a single building (Puncharoenluck, 2000). By law (Ministerial regulation NO. 55), shophouse is defined as a set of building that has more than two units, and each unit must have a fire resistant party wall in between. This definition has given the physical characteristics of shophouse; it suggests built form and material of the shophouse as continuous rows with the durable material used. For instance, the use of brick as the party wall due to the fire resistant quality, and the use of reinforce concrete for the structural material because it is durability (Tirapas, 2012). Besides, the regulation also controls the built dimension of the width and the length, setback, opening, floor area, maximum rows, height, and other detail descriptions of shophouse.

From researcher perspectives, shophouse is determined by functional aspect that indicates its multi-usage. Generally, shophouse is a building that contains a shop with

separated residential space. The shop can be noticed as a local grocery, a food and beverage outlet, a service provider (e.g. clinic, financial institute), an industrial activity (e.g. auto workshop) or a community space (e.g. school, association), while one or more families accommodate on the resident space above. Shophouse can be defined as a two-story or more in height, continuous row of units, and multi-use based on different levels. Moreover, shophouse can be differentiated according to the degree of user between residential or commercial, including income generated from residents (Sachakul, 1982).

In short, shophouse can be defined in two ways; by regulation and functional aspect. Regulation verifies the rigidity in the structural dimension and built form that affects to the physical characteristic of the shophouse. Similarly, multi-functional quality of shophouse confirms the change in function of the shophouse to support more diversified activities along with the urban development. Thus, these becomes the main factor that leads to the physical transformation of shophouse.

2.1.2 Spatial feature

The spatial feature of typical shophouse is defined according to its used and location (Tirapas, 2011). The study of Tirapas, entitled: *Bangkok shophouse: an approach for quality design solution (2011)* differentiates spatial feature in to 8 zones which are; front entrance, hall, service area, back area, room, roof deck, terrace, and circulation (Figure 2). The front entrance connects public space of the street to more semi-public of the hall, where double-story height leads to the opportunity for commercial activities. Hall can be divided into room, which are various in size and functions. Rooms are also located on the upper floor adjacent to front and back façade for obtaining light and ventilation. Back area is the space at the back of the shophouse that has the width of 3 m. followed by the setback requirement. This area usually functions as service area which are kitchen, bathroom, washing, or drying area. Sometimes service

area such as drying spot is noticed on the roof deck because of the benefit from strong sunlight. The terrace is part of the façade which sometimes built for balcony or other service purposes such as a spot for installing a/c condensers. Finally, the circulation of the shophouse is the concrete staircase. It provides zoning connection as well as accessibility to the upper level. The staircase is usually located at the back of the shophouse and normally attached to the party wall.

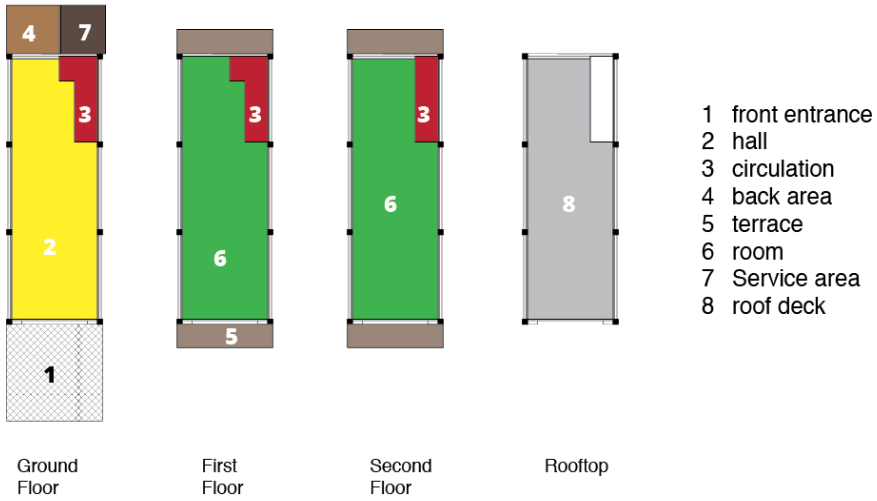


Figure 2 Spatial feature in typical shophouse

Given these points, spatial feature is explained as the relationship of each zone of usage. These zones illustrate an overlapped architectural programming that can be defined by different use according to the inhabitant's preferences. For example, room boundary can be defined by set of furniture such as cabinet, book shelf, or more contemporary material such as dry wall (aluminum frame with gypsum or wooden board). All in all, this suggests the flexible quality of the spatial feature in the shophouse.

2.1.3 Physical character

Apart from the aspect that the built form of shophouse is fundamentally controlled by regulation, the physical character is, to put it another way, explained through the physical elements such as column, beam, floor finishing, wall and etc. This can be explored by; 1) built dimension, 2) structure, 3) supporting utilities 4) façade

2.1.3.1 Built dimension

Before the enforcement of building control B.E. 2522, the frontage dimension shophouse is vary from the range of 3.00 meters to 6.00 meters. However, the most constructed dimension of the shophouse frontage is in the range of 3.51-4.00 meters (Chantawarang, 1985). With this dimension, it is the most cost efficient for the construction and material using.

Table 1 The frontage dimension of shophouse in Bangkok (adapt from Chantawarang, 1985)

Frontage Dimension (m.)	**Survey Shophouses**	
	Number	%
2.50-3.00	4	2.60
3.01-3.50	17	10.90
3.51-4.00	74	47.40
4.01-4.50	32	20.50
4.51-5.00	20	12.80
5.01-5.50	7	4.50
5.01-6.00	3	1.90
Total	**156**	**100**

From the table 1, it should be noted that the finding of the survey shophouse with the frontage in the range of 3.51-4.00 meters which documented 74 units or 47.40 percentage are mostly construct throughout Bangkok. With this dimension, the cost of the building is considered as the most efficient in terms of building structure and

material. This frontage range is also the dimension directed in the Building Control Act.

Table 2 The length dimension of Bangkok Shophouse (adapt from Chantawarang, 1985)

Length Dimension (m.)	Survey Shophouses	
	Number	%
Less than 8.00	7	4.50
8.01-10.00	14	9.00
10.01-12.00	57	36.50
12.01-14.00	48	30.80
14.01-16.00	15	9.60
16.01-18.00	9	5.80
More than 18.00	6	3.80
Total	**156**	**100**

From the table 2, it is recoded that the shophouse length is various, and depends on the land dimension. According to this survey, the most common length is on the range of 10.01-12.00 meters as because this dimension is the most accustomed practice for many of contractors. This dimension proves cost and material efficiency, as they are considered as the main factor when constructing a shophouse.

Table 3 The height of the Bangkok Shophouse (adapt from Chantawarang, 1985)

Height (storey.) (without mezzanine)	Survey Shophouses	
	Number	%
2-3	13	8.30
3-4	48	30.80
4-5	46	29.50
5-6	24	15.40
More than 6	25	16.00
Total	**156**	**100**

From the table 3, the most documented original height is in the range from 3-4 stories. However, the additional floors can be added up to extend the building capacity,

especially in the high density area where horizontal expansion is impossible. Most of the modification are done without permission from the municipal authority, including the lack of strong enforcement in building safety concern. Moreover, the height of the shophouse suggests the functional activities inside them. It is inspected that building with small industrial activity usually has less height, whereas the serviced commercial activities record the highest floor levels as 4-6 stories.

As shown above, shophouse has come with various physical dimensions. However, the dimension of 4.00 meters frontage, and 12.00 meters length, with 4-6 stories height are the most common dimension of shophouse found in Bangkok because of cost efficiency in construction. This dimension is commonly measured in a typical shophouse as referred in this thesis.

2.1.3.2 Structure

A typical shophouse is constructed with reinforce concrete skeleton built in modular structure of 4.00 x 4.00 as shown in figure 3. The column is shared with adjacent unit, measured 0.20 x 0.20 meter which determines the width, length, and height of the shophouse unit. While the beam and floor structure is prefabricated concrete (Tirapas, 2012). Mezzanine is usually inspected above the ground level as part of the building components. The roof structure is also a flat slab because it can be used for the extra space for the purpose of laundry, vegetation, and etc. The roof deck, however, usually get adding later on as an addition level to maximize the space usage.

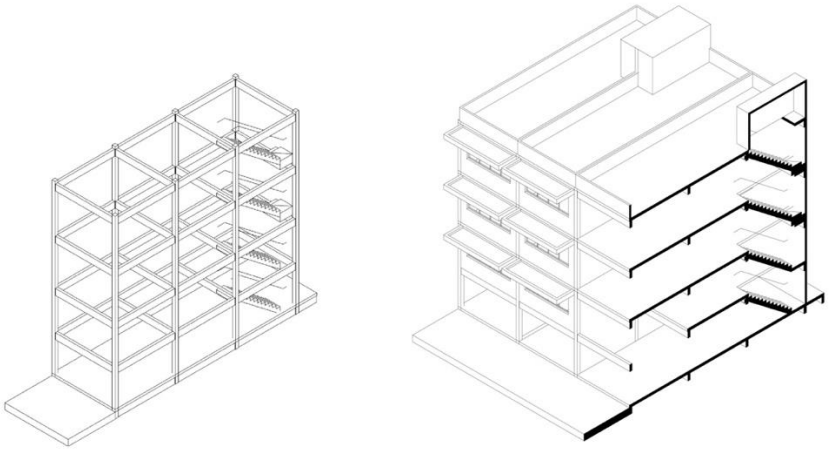


Figure 3 Shophouse skeleton structure (left), shophouse sectional cut (right)

2.1.3.3 Supporting utilities

Supporting utilities include water system, and sanitary system that are positioned at the back corner of the shophouse where the location of bathroom and kitchen are followed. Typically, shophouse allocates the water tank at the back of each unit for fresh water supply. The electrical system can be various from one another. The bathroom is usually located underneath the staircase as to maximize the useable floor plan. The kitchen is designed at the back of the unit for the purpose of ventilation. Vertical circulation is directed by a concrete staircase at the back of the shophouse with the width of 1.00-1.20 meters.

2.2.1.4 Façade

Façade is the exterior face of the building. Typical shophouse has a uniformed façade in front of the building that can be easily noticed from the road and pedestrian. This free standing structure, attached to the concrete skeleton frame of the building, acts as a shading device that protect interior space from the strong sunlight with various

design. Some shophouse has balcony each floor as the façade. Different types of signage are easily seen attached on the exterior of the building (figure 4).

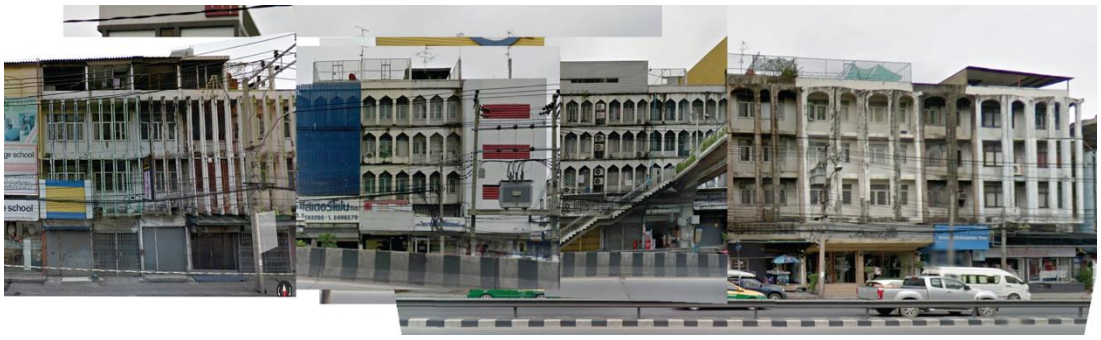


Figure 4 Various design of shophouse facades

2.1.4 Development of shophouse typology

The development of shophouse typology in Bangkok can be defined into stages, which are differentiated by the physical characteristic, built period, and its location as the main criteria (Puncharoenluck, 2000). The development of shophouse can also be seen from the change in material used; from wood to concrete and structure built; from loading bearing wall (shophouse built during 1862-1896) to skeleton structure (shophouse built in 1890 onward). As the construction technology improves, the simple structure such as load bearing wall, big column, and the use of materials such as woods and brick are being replaced with reinforce concrete and steel structure. The development stages are as follow;

1) *Early stage (1862-1896)*

   The shophouse in this stage was initially brought to Bangkok by Chinese immigrant, with the technology and style from Western country. It is mostly located in the inner Bangkok (figure 5). Built structure are load bearing wall with the height which is not exceed than 2-storey. Wooden material can be inspected in this stage. Gable and hipped roof that influence from China are commonly used.

Figure 5 Early stage shophouse on Bamrungmuang road

(Source: Online http://www.thaigoodview.com/node/87964)

2) *Transitional stage (1936-1980)*

The shophouse in this stage was influenced by the implementation of building control act. The handbook "shophouse manual, 1979 (คู่มือตึกแถว, 2522)" proposes what is known as 'typical shophouse' for the standard in structural dimension but varies in height. Built structure is skeleton concrete frame with the height of 2-3 stories (Lewtanamongkol, 1979). The roof deck is inspected as flat slap that replaced the tile roofing in the earlier stage. The design is considered as a prototype in shophouse construction that later on has been later duplicated throughout the city (figure 6).

Figure 6 Typical shophouse along Rama V road

3) *Modern stage (1980-present)*

The shophouse in this stage has increased its level to 3-7 stories. The car parking at the front of the shophouse becomes a concern. It is the stage of new development and technology. The use of prefabricated floor slab, frameless window, and aluminum frame become a common built component which have never been used the earlier stage (figure 7).

Figure 7 Modern stage shophouse along Ratcharapisek road

As shown above, shophouse in this particular periods reveals similarity in terms of physical character of the width and length dimensions. However, the height, decoration style, and construction material are different which relate to the construction technology and the regulation.

2.1.5 Architectural problems in shophouse typology

As shophouse typology has become a part of the urban development for centuries, several issues or negative effects has been pointed out by the user, architect and researcher from time to time. One of the main reason that causes all these problems comes from special privilege than other types of building which is not obligatory for any architectural license for construction permission (Faculty of Architecture, 1981). Hence, anyone without professional license could design his or her own shophouse. The design has been finally carried out and duplicated throughout the city, which later on causes many architectural problems for this typology. The problems can be summarized as;

- Lack of natural light and ventilation of the interior space due to physical character of the shophouse (long and narrow) with only front and back openings. In addition, the unplanned room subdivisions are also one of the reason that blocks cross ventilation.
- Excessive density of users because of too flexibility in accommodating purpose, businesses and activities. This leads to hygienic concern in the space and the lack of privacy for user.
- lack of technical understanding of building construction for example the improper installation of sun shading device or rain protection could cause water leakage.
- Vertical expansion; this additional part will cause the water leakage, or the building subsidence if this attached to the building with improper construction technique. It is also raised the concern of building safety as it increases the weight into the building structure.

Furthermore, from report of many shophouse dwellers, lacks of open space in the building is always discovered. This force the dwellers to take up the only space in front of the building as their 'recreational space' which obstructs the pedestrian traffic. For the city aesthetic, the façade of the shophouse become a major concern as each unit personalize its own façade without proper guidance from the authority. Most of the time, the façade has never been cleaned or maintained. The construction, sometimes, is also done imprecisely and carelessly in order to save cost and reduce the cost of labor which later on lead to the building safety issue.

In present day, these issues mentioned from the earlier studies, still, can be obvious noticed from the street throughout the city. Some are fixed, and some are still in its original condition. All of these architectural issues and their related aspects must be understood in order to successfully reuse this shophouse typology.

2.1.6 Adaptability potential in shophouse typology

In the present day, many shophouses in Bangkok have already incorporated certain degree of physical transformation and spatial adjustment such as the addition of rooftop space, installation of signboard on the existing façade, or even conversion to small hostel. All of these are not the original function of the design of the shophouse. However, these transformations imply the capability of change in the spatial configuration and physical characteristic of the shophouse.

To emphasis this point, the clear example of adaptability in existing shophouse can be further explored in the case of Siam Square which will be discussed in detail in chapter 3. Siam Square is known as a shopping district where a row of shophouses has been turned to house a wide range of shops and services as well as a social meeting point for teenager to hang out. Today, the space usage of the shophouse has been changed

from bi-functional to multi-functional utilization where has more than one activity taking place in a single building. These transformations usually occur multiple times in each particular building as the demand has continuously grown. Even now, several units can be inspected to transform as the area receive high in demand for commercial use. (figure 8)

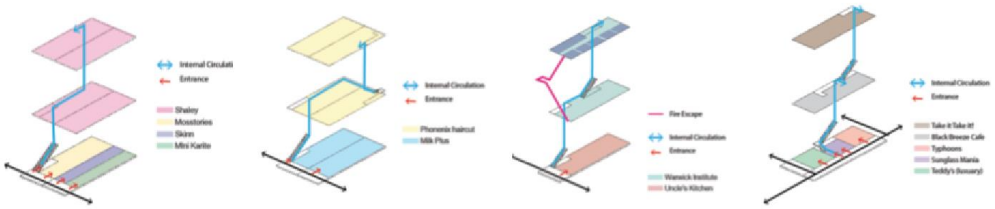


Figure 8 Spatial characters of shophouse in Siam Square area

The transformation can be seen in both physical and spatial aspects. Some units are entirely renovated, while others are just minor space division with use lightweight material as a partition board. Some units are merged together to form a bigger space, and converted to cafe, restaurant, tuition institute, or retail brands. For the cornered units that has high pedestrian traffic, the space configuration is subdivided into smaller sections because of high potential in commercial purpose. The transformation leads to the change in spatial configuration as well as the physical character according to the specific programs. Above all, users and shophouse owner decision to make certain degree of change in built components relates to the lease contract and the right of procession of the building (Tirapas, 2012). Moreover, the transformation of shophouse should be done with awareness on the structural limitation and high concern in building safety because the modification or renovation of shophouse in Siam Square has not been legally approved (Tangsilapaolarn, 2002).

Another example is ‘Shophouse Transformation’ project designed by all(zone) in 2009. The architects have transformed two typical units of shophouse in prime area of Bangkok into a working-living unit that create new spatial character. The architect

redefined the back staircase that usually integrate the internal circulation, as a separated element that each floor can be accessed individually. As a result, the architect can control the level of accessibility as well as privacy of each function efficiently. For physical character aspect, the existing façade is replaced with metal frame filled with prefabricated concrete blocks. The material is not only acting as sun shading but controlling visual privacy, as well as allowing natural ventilation and light to get through the interior space. (figure 9-10)

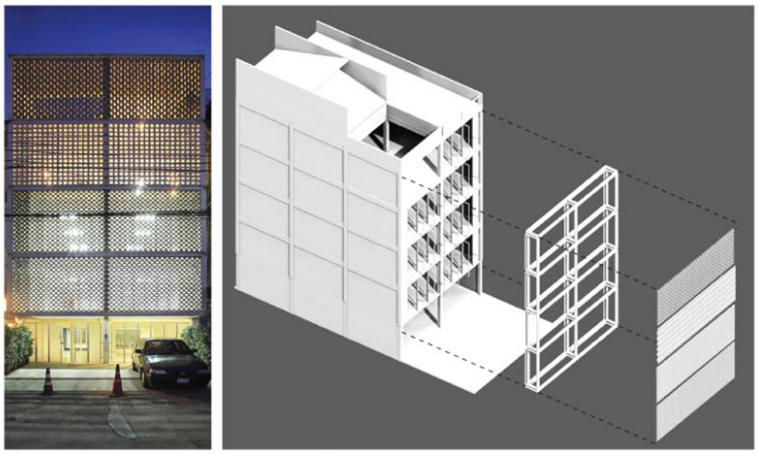


Figure 9 Shophouse Transformation by allzone (2009)

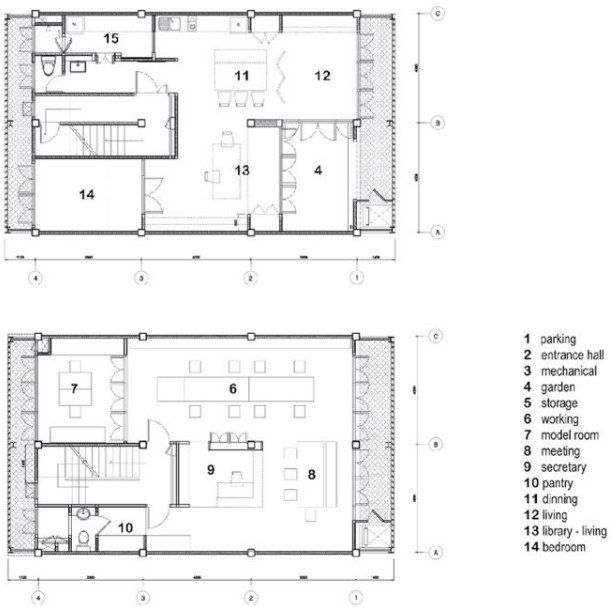


Figure 10 Shophouse Transformation by allzone (2009)

(drawing courtesy of allzone)

Given these two examples, it is speculated that the shophouse has high potential in adaptability. Therefore, the opportunity in designing shophouse with adaptable capability is very challenging and will be explored in the following section.

2.2 Terminology and Conceptual Framework

As this thesis is about reusing old shophouse with flexibility in design to facilitate adaptability in responding to functional and physical change of building use in future, it is necessary to clarify the meaning of the terms “flexibility” and “adaptability”. In architectural discourse, these two terms have been defined in different ways. However, These is similar meaning and often overlap (J. Habraken, 2008). The work of Tatjana Schneider and Jeremy Till (2005, 2007) and N. John Habraken (2008) are reviewed and used as the main sources in this thesis because it focuses on the latest studied that represents a comprehensive research on case of flexible housing in the UK. It is believed to provide a departure point for constructing the conceptual framework in this study.

2.2.1 Definition of flexibility and adaptability

According to the Cambridge Academic Content Dictionary, the term ‘flexibility’ is defined as ‘*the quality of being able to change or change easily according to the situation’* while adaptability defines as ‘*ability or willingness to change’.* In architecture, the term flexibility and adaptability are highly elaborated in the context of European housing design in the early twentieth century which is believed to be an important concern at that time. The term ‘flexibility’ can be identified as of how permanent and fixed part of the building, which are structure system and service space, are configured (Rabeneck, 1974). For adaptability, the relationship between space

(dimension, organization) and their function is concerned. The adaptability approach is emphasized on architectural layout while flexibility relates to construction technique and service distribution. Adaptability is also related to the changing use of space or capability of different social uses (Groák, 2002). 'Flexibility' on the other hand is related to the capability of *different physical arrangements* both interior and exterior adjustments.

This idea of flexibility and adaptability have been further emphasized on the study of Schneider and Till (2005) that describe '*where adaptability is based around issues of use, flexibility involves issues of form and technique'.*(Schneider & Till, 2005) In that respect, flexibility refers to the idea of accommodating change in use over time. It is an ability to adapt to the changing needs of users (Schneider & Till, 2005). Flexibility is seen as something that gives the user the choice of how they want the space to be. The flexible arrangements help blur the physical boundary and support ongoing change as well as new invention. In order to provide flexibility, architect should consider the possible future need of user during the design process to avoid the design of inflexible parts in the building. Schneider and Till (2007) also argues that there are two controversial methods in flexible design which are determinate and indeterminate ways (rhetoric of flexibility). The first one refers to the movable and transformable space, whereas the latter offers endless changes in design. These two ways of design indicate foreground consideration of flexibility in the design process. However, in reality, flexibility is also seen to operates on the background (Schneider & Till, 2007).

With respect to this, the Bangkok shophouse is the exemplify for the latter approach. In fact, users themselves are the main factor that begin to operate flexibility in the 'background' as part of their daily life while the issue of flexibility is not the main criteria for architect to design the shophouse at that time.

2.2.2 Adaptable building

In the context of buildings, adaptation is broadly interpreted with definitions referring to ‘change of use’, maximum ‘retention’ of original structure and fabric, and extending ‘useful life’ of a property (Douglas, 2002). There are terms such as ‘renovation’, ‘adaptive reuse’, ‘refurbishment’, ‘remodeling’, ‘retrofitting’, ‘conversion’, ‘transformation’, ‘rehabilitation’, ‘restoration’ and ‘recycling’ of buildings that frequency use to define adaptation activities (figure 11). Adaptation can occur ‘within use’ for example, office building can undergo adaptation and remain and office and ‘across use’ where office may change to use for residential purpose.

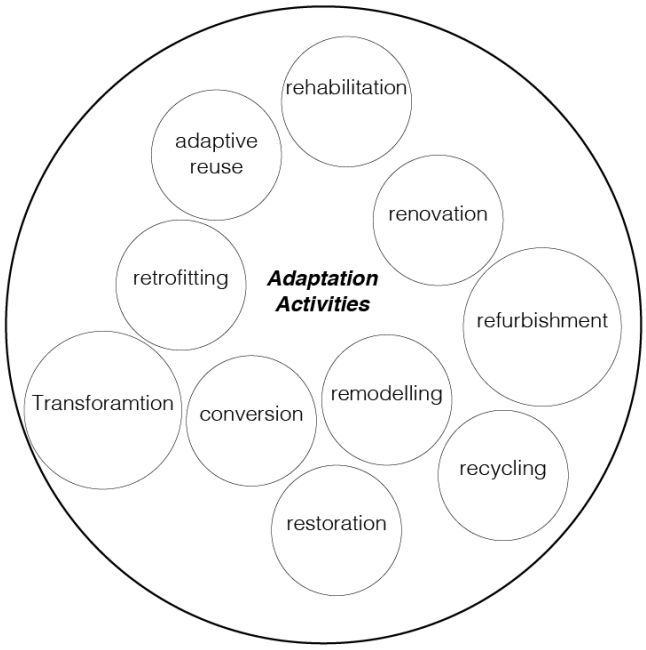
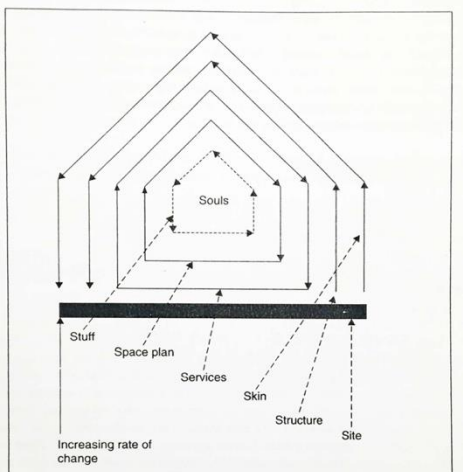


Figure 11 Adaptation activity and its related terms

Building adaptation is about managing and controlling change in the context of the functional and physical attributes of existing buildings (Douglas, 2002). Buildings are not static in a use or condition sense in their service lives. The level of activity or intensity of occupancy is changed over the building’s existence. In short, adaptability deals with any intervention to adjust, reuse, or upgrade a building to suit new

conditions or requirements. In case of the shophouse, for example, the use of shophouse as bi-function building (commercial and residential) is occupied by a single family will be changed even in one generation. As children grow up and move out, one or more parts of the house tends to under-used or used for other activities. The business in the lower level may need the vertical expansion as its flourish. The change in usage can affect the architectural layout of the building from minor to major change. As the economic growth and urbanization nowadays, it prompts property owners to update and improve their building assets to suit up with these circumstance one way or another.

Building change occurs through the variety of influences that can be categorized as external and internal change. The first one result from the external factors such as economic, climate, or market influence, while the latter emerges from factors that relate to the building itself. These changes are normally user generated. Some buildings can be subjected to various uses during their service life (Douglas, 2002). To emphasize this aspect, the '*shearing layers'* diagram (figure 12) reveals that every building composes of a hierarchical system of layers and components (Brand, 1994). They all have a different life cycle and inherently changes at different timescale. This implies that each layer of building has a capacity to absorb minor and major change of each layer individually in a certain degree. In Brand's diagram, it shows that, for example, the space plan has its typical lifespan of three years, which means the spatial layout of particular building is in need of '*change*' in about three years, while the site is considered permanent. His diagram also suggests that architect needs to think about these layers individually and design each of these components independently to avoid the conflict between these layers when changes occur.



Shearing layers	Description	Typical lifespan/activity
Site	Location and context	Permanent
Structure	Bones	30–300 years
Skin	Envelope	20+ years
Services	Lifeblood	7–20 years
Space plan	Interior layout	3 years
Stuff	Furniture and equipment	Under 3 years
Souls	People	Daily

Figure 12 Shearing layer of change (Brand, 1994 cited in Douglas, 2006)

2.2.3 Achieving adaptable building

There are multiple methods of achieving adaptable building. However, in this thesis, three main perspectives on the design approaches toward adaptable building form the three figures are reviewed and concluded as follow;

2.2.3.1 Supports, John Habraken (N. J. Habraken, Teicher, & Valkenburg, 1999)

In 1962, Dutch architect N. John Habraken proposes a concept of ‘house as a process’ that offers an alternative to mass housing. Mass housing, at that time, is considered repetitive, massive, and homogeneous built structure without any relationship with dwellers. According to Habraken, the main problem of residential architecture at that time is intended to build for people who will never have a chance to make basic decision about their living environment. Oppose to this idea, he proposes a theory of ‘Support’ that facilitate flexibility

in housing design for the dweller. He believes it will give the users the choice as how they want to use the space and able to rearrange the space themselves. He improves the mass housing quality by separating architectural layout from the base building or *Support* that provide access to common mechanical system. This offers the opportunity for users to be able to adjust and configure their dwelling unit to their needs with supported by base building.

The theory of 'Support' is later developed in to an approach that wildly known as Open Building. The term is used to indicate a number of concepts that consider architecture and built environment as a series of distinct levels of intervention or process as the environment is transformed and changed. Open building practice is the reemergence of a changeable and user responsive infill (fit-out) level, which emphasizes on the concept of "Support" and "infill". (Kendall & Teicher, 2010)

Support or base building can be understood as the permanent, and shared part of the building which provide service space for the occupancy. Typical support elements include building structure, façade, entrance staircase, corridors, lines for electricity, water, gas and drainage. Supports can be constructed in any durable materials with any technical system, and it is either newly constructed or made from existing building stock.

Infill or fit-out refers to any mutable part of the building that may be determined or altered individually without affecting the Support or base building. Infill can be more durable and stationary than furniture, but less durable than the base building.

Milestone projects that incorporate concept of Support and in fill can be seen since 1966. However, one interesting example is the NEXT 21 project located in Osaka, Japan. The building is an experimental 18 units housing project that the plan and design are not only to meet the need of the urban lifestyle of

the initial occupants but also meet those in the future adaptively. In the NEXT 21, the building systems are classified as the infrastructure and the infill. The infrastructure consists of the structure, cladding, public doors and windows, and plumbing and mechanical equipment outside the living unit. Infill includes the unit partitions, fittings, interior finishes, door and windows, and the mechanical equipment within the unit. (figure 13-14)

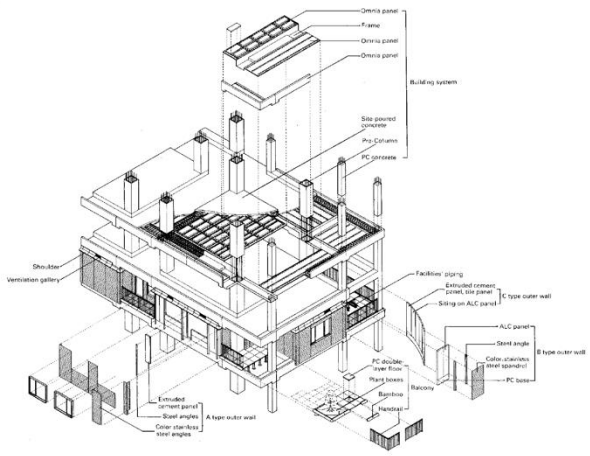


Figure 13 Building system, NEXT 21, Osaka, Japan
(drawing courtesy of Shu-Kho-Sha Architecture and Urban Design Studio)

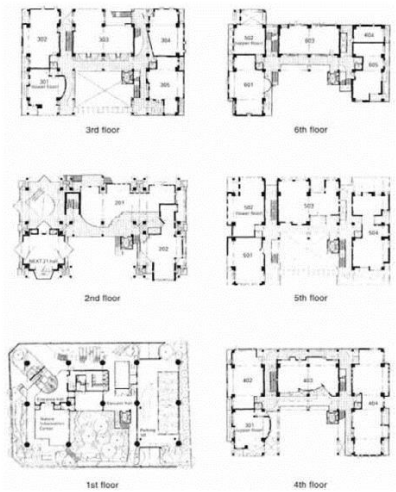


Figure 14 Floor plans, NEXT 21, Osaka, Japan
(drawing courtesy of Shu-Kho-Sha Architecture and Urban Design Studio)

2.2.3.2 Design for flexibility, E.Sarah Slaughter (Slaughter, 2001)

Slaughter (2001) suggests that the means to increase building flexibility in order to achieve adaptable building can be grouped into three general design approaches which are;

1) Physically separating the major building system as well as their sub-system. The purpose for this is that the changes in one area can be isolated from changes in other parts of the building.
2) The use of prefabrication of major system components. This would increase the ease of modification process because these components can be easily change out over time. For example, the use of interior partition system and ceiling mounted track.
3) Design the system and their component overcapacity. This approach aims to reduce the replacement or extension of current capabilities for the future change in the building. For example, the use of better capacity structural member than the current required by the design. This provides the opportunity to add more loads to the building in the future.

2.2.3.3 Design for flexibility, Schneider and Till (Schneider & Till, 2007)

Another theoretical framework in achieving flexibility design is the study of Schneider and Till (2007) on flexibility design in housing. The strategies are explored through four main themes, which are 1) structural system, 2) service space, 3), architectural layout, 4) furnishing for flexible use.

1.) *Structural System*

The structural system is considered the fixed and permanent part of the building. It is important system to determine whether the architectural layout will be flexible or not. There are two methods to attain flexibility for this system, which are;

1.1) Base Structure – structural system that allows unfix layout, mostly composes of columns and beams.

1.2) Polyvalent – the term means incorporate many functions in a single space or what Schiner and Till defines as “rooms without label”. It embraces the idea of modularity and neutrality in housing design. Their dimensions are appropriate for different uses as the rooms are given without labels.

1.3) Both (Base Structure and Polyvalent organization) – It is possible to adopt these two approaches in relation to the structural system.

2.) *Services Space*

The position of service spaces and service cores can be regarded as determinant for the configuration of the main space. It can be configured as;

2.1) Part of structural system

2.2) Separate for structural system

However, the service space should be accessible for future adaptation and adjustment of the building infrastructure.

3.) *Architectural Layout* (building scale and unit scale)

Flexibility of architectural layout depends on the configuration of the permanent components of the building. It focuses on two scales which are;

3.1) Building Scale – it concerns with type of unit (typological variety) and the permanent components (service, structural element) in the building.

3.2) Unit Scale – it refers to the spatial organization of different function in the unit.

4.) *Furnishing for Flexible Use*

Furniture can serve as a separator or a compact unit that accommodate functions. It can be designed to fit with the conception of flexibility in each particular project. The use of moveable/foldable furniture could transform space between day and night according to the user's needs.

2.2.4 Adaptive Reuse

This study incorporates the adaptability into the existing shophouse, therefore the term 'adaptive reuse' is selected as the topic of this thesis. Adaptive reuse refers to any building work and intervention that change the capacity, function or performance of the building in order to adjust, reuse or upgrade to suit new conditions or requirements (Douglas, 2002). Shophouses, which seen as a redundant, and inefficient building stock in Bangkok, are in the need of reuse to increase in usage efficiency.

The adaptive reuse of buildings can include modifications for aesthetic purpose while original structure and physical character are left as original. Adaptive reuse can be explained as the process of converting obsolete buildings into new uses, along with the elements of the original design and existing structure (Gause, Hoch, Macomber, & Rose, 1996). This technique preserves the character of time and place, while accommodating new changes in demand, technology, tastes, and uses. The importance of reusing an existing built could create new possibilities for the city. Adaptive reuse can be applicable to any type of existing building, from industrial buildings to churches and anything in between where a redundancy in the prior use of the old building is presented (Austin, 1988).

For any adaptive reuse project, the good condition of the structural components as well as the building life cycle must be inspected to ensures a project can be adopted for new use while remain profitable for developer. The limitation of the existing built structure, utility system as well as regulation related to the modification of building are also important factor that must be considered (Burchell & Listokin, 1981). Apart from the architectural aspects, the intangible aspect- *the spirit of the place* such as site context, site history, and local activities that establish between a place, a building and a society should also be considered in the process of adaptive reuse. (Esther H.K. Yung, 2013)

2.3 Legal Framework

Another key consideration when one need to modify the building to accommodate new use is the legal framework. Law regulates the use that is made of the building (Kincaid, 2003). In Thailand, the application of ministerial regulation No.11, which issued under the Building Control Act BE 2522 states the criteria of modification of particular building as follow;

NO. 1. The following actions is not considered a modification;

(1) Changing the structure of the building material, size, and type as in the original state. Except the change in reinforce concrete, and steel structure

(2) Replacement, addition, expansion parts of building that is not the structure by using the same material as the original or other materials that do not add weight to the structure of the original building more than ten percent.

(3) Any changes, or the addition features which expand or reduce the scope and shape of the space within ten percent of the weight ratio of the building.

(4) Reducing or expanding the floor area within five square meters without reducing or increasing the number of columns or beams.

(5) Reducing or expanding the area of the roof within five square meters without reducing or increasing the number of columns or beams.

The action shall not be contrary to the regulations issued under Section 8, local law issued under Section 9 or Section 10, or the announcement of the Minister under Section 13 or Section 59 of the Building Control Act 2522.

NO.2 The dismantle of the following built structures are considered as demolish.

(1) Reinforce concrete awning

(2) Reinforce concrete envelop or wall

(3) Reinforce concrete staircase

(4) Reinforced concrete floor slab (second level above)

From the criteria above, it can be concluded that the modification can be achieved within only 10 percent of the total weight of the building or the area not exceed 5 square meters without the need for authority permission. If the modification is more than 10 percent or 5, the design of the building must be in comply with the Building Control Act B.E. 2522 and in need to ask for the official permission. However, old shophouse that built decade ago has already maximized its capacity in its land slot and the new modification usually exceed the given 5 square meter or 10 percent of the total weight. As the result, it is almost impossible to ask for official modification for the old shophouse typology.

Furthermore, the demolition of the existing slice of shophouse and rebuild within the same footprint cannot be executed because of the setback requirement. (figure 15) According to the ministerial regulation No. 55 under the Building Control Acts BE 2522, the setback requirement (chapter 4) of shophouse state as follows;

For shophouse built adjacent to public road;

(1) 6-meter setback from the middle of the road (road width less than or equal to 10 meter)

(2) setback equal to 10 percent of the width of the road (road width more than 10-meter but less than 20 meter)

(3) setback not less than 2-meter (road width more than 20 meter)

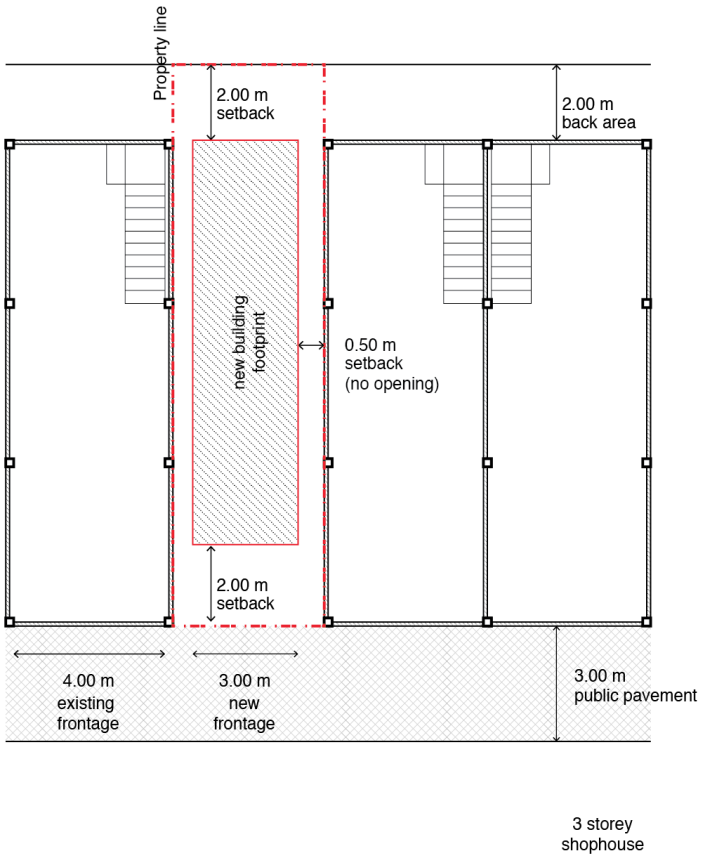


Figure 15 New building footprint

From this aspect, it can be noted that the new building is not considered 'shophouse' because, by law, shophouse must have frontage not less than 4 meters and built more than 2 continuous rows. Therefore, if the new building is built between existing shophouse unit, it requires at least 0.50-meter setback of the side wall (without any openings) and 2-meter clearance from the property line of the front and the back.

Moreover, shophouse is type of building that is built in continuous rows and receives construction permission as a single building. If the owner wants to demolish a single

slice of shophouse, there must be an approval from owner of every unit of shophouses in that row. The consideration of building safety due to the continuous built structure is also a factor when demolishing is taking place.

For this reason, the issue of the legal framework becomes one of the constrains when shophouse is in need of transformation. Moreover, this conflict of the re-using old building and the implementation of current regulation lead to the modifications that undergo without the official permission and control.

In summary, the review covers the background study of the shophouse typology which clarify the definition, spatial feature, physical character, development of the shophouse typology as well as the architectural issues. It is noted that shophouse has high flexibility in facilitating many businesses and activities. However, with the narrow and long configuration, fixed position of supporting utilities, and the fixed position of staircase are key factors that limit the potential in adaptability of shophouse.

In order to achieve adaptability in shophouse, the theoretical framework on 'Support and Infill' is explored. Support is the permanent, and shared part of the building that provide service space for the occupancy. Infill is understood as any mutable parts of the building that may be altered individually without affecting the Support to accommodate new use or function. To attain the adaptability followed by this framework, the existing shophouse will be surveyed and analyzed to point out the Support and Infill components as well as factors that affect the adaptability of shophouse.

As has been noted, the legal framework reveals the reason why old shophouse is still commonly seen along the street of Bangkok, especially in the city center. That is to say shophouse cannot be demolished and rebuilt within the same footprint due to the new setback requirement. To maximized the usable floor area, shophouse must be modified and reused to accommodate new programs.

Chapter 3 Survey of Shophouse Transformation

The study of shophouse transformation is conducted through a survey by visual observation and photographic documentation to inspect the physical and spatial changes in the shophouse typology. Siam Square area is selected as the site as the location is constructed with a number of commercial shophouse that support various businesses. Due to the limited in land, shophouse in Siam Square has been dramatically changed in the internal space as well as the physical appearance to suit for diversity of businesses and to maximize the efficiency of space usage (figure 16). These businesses, however, located according to the lease contract which range from 1, 3, or 5 years, and the competitiveness of the business. For this reason, shophouse in Siam Square is frequently transformed which can be inspected in terms of spatial configuration and physical character. During the survey, the physical characteristics were recorded in aspect of build dimension, structure and façade. Similarly, the spatial configuration as well as the accessibility were noted for further analysis.

Figure 16 Shophouse transformation in Siam Square

3.1 Findings

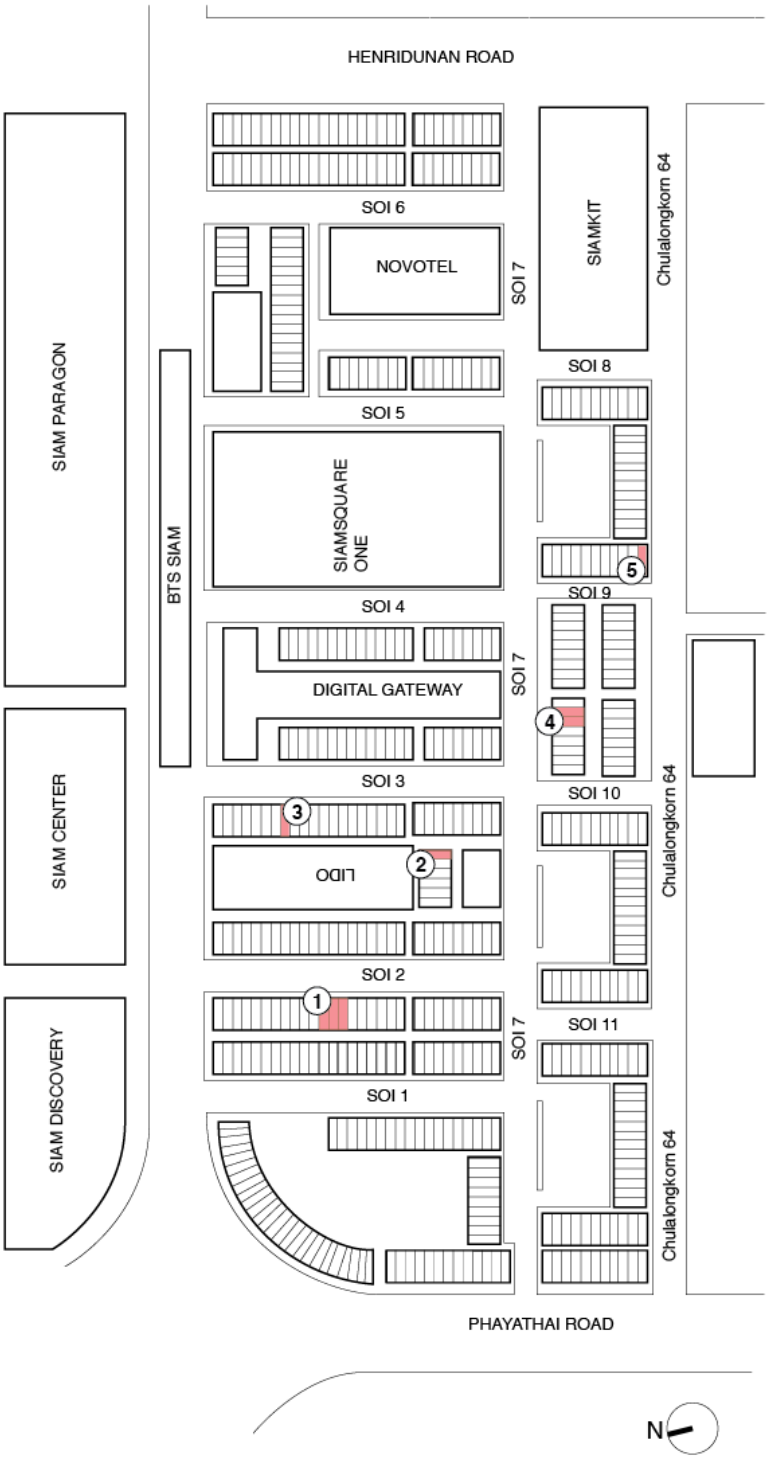


Figure 17 Siam Square map and location of survey shophouse

Cases presented in this chapter is shophouse that is selected under the criteria of the degree of transformation from the original building in terms of space configuration, and physical components. (figure 17) According to the survey, it can be noted that the transformation of shophouse is related to the programs and users. As each program requires different function, shophouse are transformed by mean of addition, subtraction, extraction of the physical components which lead to the change in spatial configuration.

3.1.1 Shophouse no. 1

Figure 18 Shophouse frontage no.1

3.1.1.1 Physical character

This shophouse is located in Siam Square Soi 2 is marked as no.1 in the figure 17. Two shophouse units are rented out as a restaurant on the above level, and commercial

shops on ground level. The shopfront is measured 8 meters with the depth of 12 meters.

The structure is reinforced concrete. The ground level is raised 10 centimeter of the pedestrian level. The original façade is replaced with the metal sheet that acts as a restaurant banner on second and third level. The small extension on the façade on the second floor to expand the seating area is inspected from the outside.

3.1.1.2 Spatial feature

The front houses 4 different programs within two building units. The space organization on the ground level have been merged two units together and subdivided into 4 sections for three commercial shops and one entrance to restaurant on upper level.

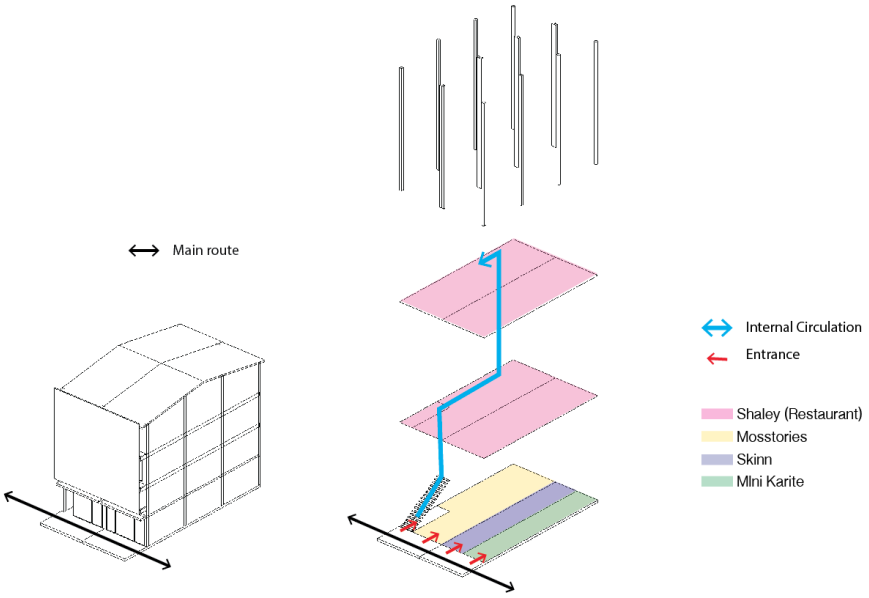


Figure 19 Spatial feature in shophouse no.1

Ground level: the left end of the shophouse is allocated as the main entrance to the restaurant that leads the users directly to the first level. Next to the entrance

located the commercial shops with frontage of 2.8 meter, 2 meter, and 2 meter as shown in figure 19. These commercial shops have none access to the above level.

First level: the space on the first level is mainly used for dining area of Shaley restaurant, cashier counter, pantry, and small storage space.

Second level: the space on the second level is dedicated for the kitchen and storage purpose. The toilet is also found in this level.

Third level: this level mainly used for storage purpose.

3.1.2 Shophouse no. 2

Figure 20 Shophouse frontage no. 2

3.1.2.1 Physical character

This shophouse is located at the back of Lido multiplex in Siam Square Soi 2 marked as no.2 in the figure 17. This shophouse unit houses 6 different programs. The front and the back can be accessed by pedestrian. The shopfront is measured 4 meter with the depth of 12 meter. The structure is reinforced concrete. The ground level is raised 10 centimeter of the pedestrian level. The original façade is removed. Windows one the second floor is removed and replaced with clear glass. (figure 20)

3.1.2.2 Spatial feature

This shophouse houses 6 different programs within on building. The space organization on the ground level have been divided into 4 sub space for commercial, while the upper floor is the hair salon that can be entered from the second floor of LIDO.

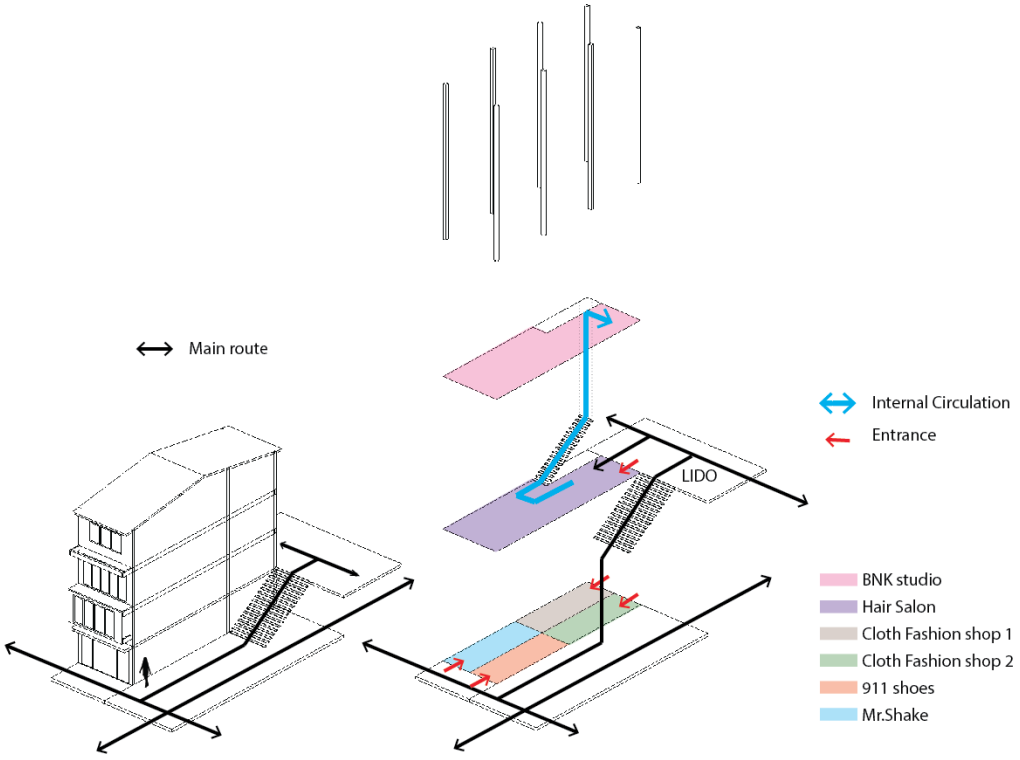


Figure 21 Spatial feature in shophouse no.2

Ground level: the space on the ground level is subdivided into 4 sections as in figure 20 as commercial shops. The front and the back part can be accessed by the pedestrian on street level.

First level: the space on the first level is used as hair salon where the entrance is on the first floor of the LIDO multiplex.

Second level: the space on the second level is BNK studio (fashion & design school) where user can get access from the Hair Salon or the second floor of LIDO multiplex.

3.1.3 Shophouse no. 3

Figure 22 Shophouse frontage no.3

3.1.3.1 Physical character

This shophouse is located in Siam Square Soi 3 marked as no.3 in the figure 17. This shophouse unit houses 2 different programs. The shopfront is measured 4 meter with the depth of 12 meter. The structure is reinforced concrete. The ground level is raised 10 centimeter of the pedestrian level. The original façade is presented with the addition of metal structure fire escape (figure 22).

3.1.3.2 Spatial feature

The space organization on the ground level has been divided into 2 sections; the staircase as entrance to Warwick school and the restaurant.

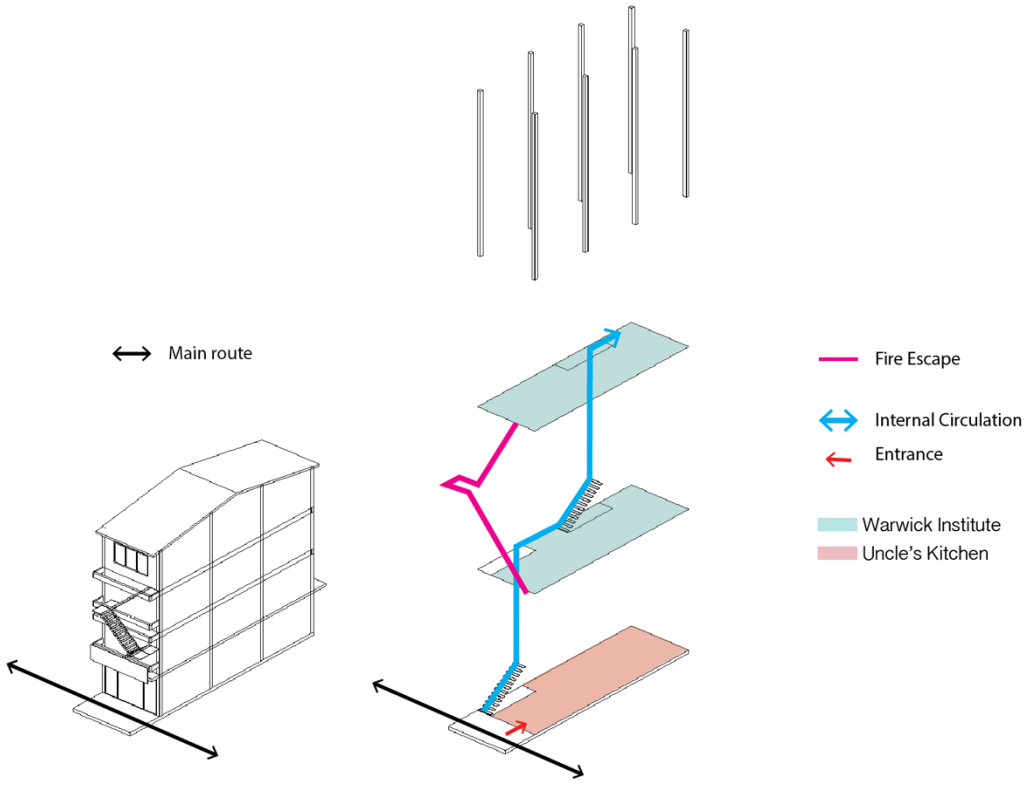


Figure 23 Spatial feature of shophouse no.3

Ground level: the space on the ground level is subdivided into 2 sections; the staircase as entrance to Warwick school, and shopfront for the Uncle's kitchen restaurant.

First level: the space on the first level is used as Warwick school's reception and classroom that can be accessed by the front staircase.

Second level: the space on second level is used mainly as classroom where students can access directly from the ground level.

3.1.4 Shophouse no. 4

Figure 24 Shophouse frontage no.4

3.1.4.1 Physical character

This shophouse is located in Siam Square Soi 7 marked as no.4 in the figure 17. The shopfront is measured 4 meter with the depth of 12 meter. The structure is reinforced concrete. The ground level is raised 10 centimeter of the pedestrian level. This shophouse located in the area with high pedestrian traffic. Therefore, the original façade is replaced with the digital screen for advertisement purpose. (figure 24).

3.1.4.2 Spatial feature

The space organization on the ground level have been divided into 2 sections; the staircase as entrance to hair salon above and the Milk Plus café on ground level.

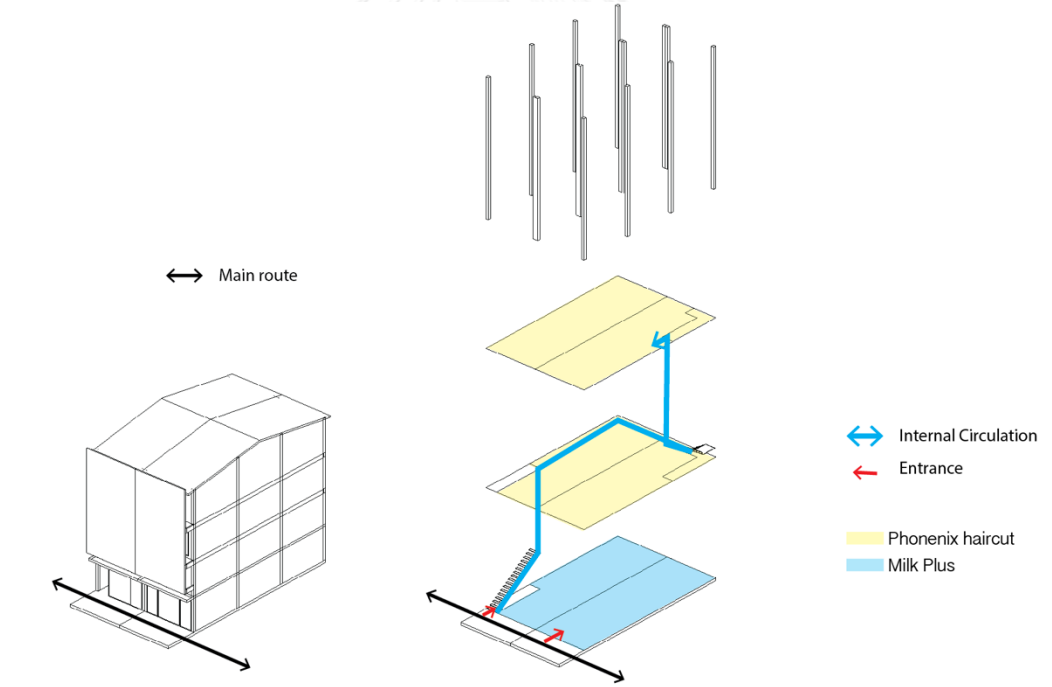


Figure 25 Spatial feature of shophouse no.4

Ground level: the space on the ground level is subdivided into 2 sections; the staircase as entrance to Phonenix haircut, and shopfront for the milk plus café.

First level: the space on the first level is used as salon that can be accessed from the front staircase.

Second level: the space on second level is used as salon.

3.1.5 Shophouse no. 5

Figure 26 Shophouse no.5

3.1.5.1 Physical character

This shophouse is located in Siam Square Soi 9 marked as no.4 in the figure 17. The shopfront is measured 4 meter with the depth of 12 meter. The structure is reinforced concrete. The ground level is raised 10 centimeter of the pedestrian level. This shophouse is the last unit of the row. Therefore, the side wall is turned into commercial shopfront. (figure 26).

3.1.5.2 Spatial feature

In this case, the side of the shophouse on ground level turned into 3 different shopfronts. The staircase to the upper level is located in the middle of the building where user can get access from the side of the building (figure 27). The staircase leads to two different programs on the upper level which can be accessed independently.

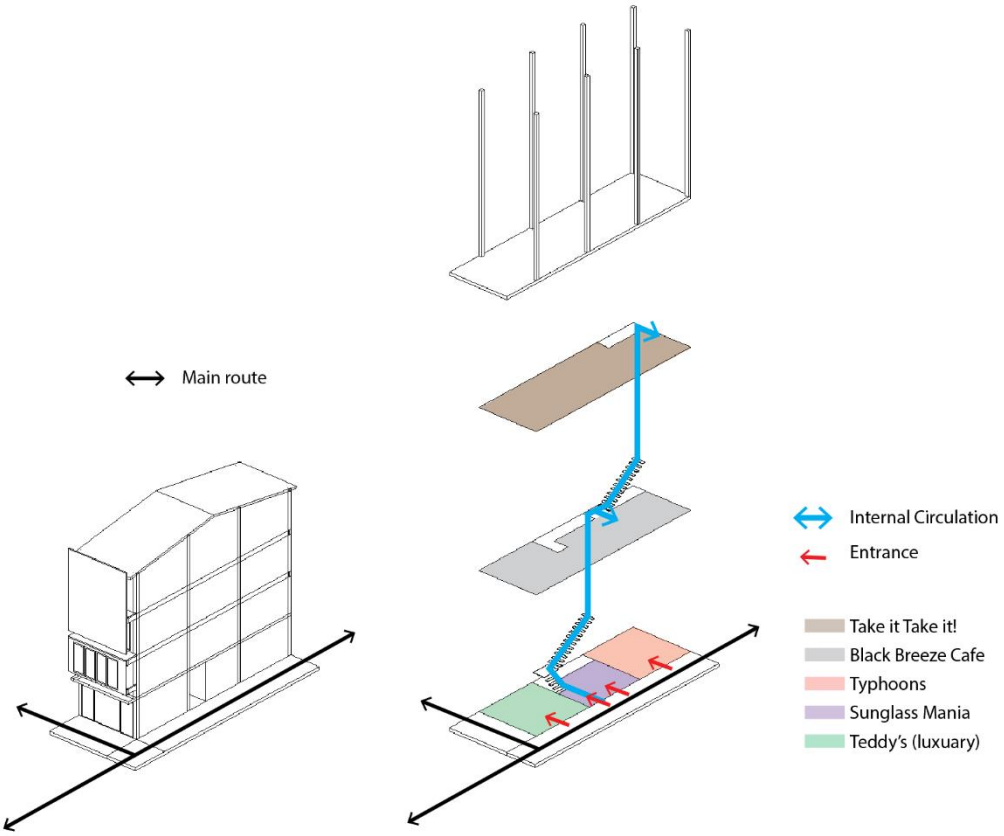


Figure 27 Spatial feature of shophouse no.5

Ground level: three commercial shops with one entrance to upper level.

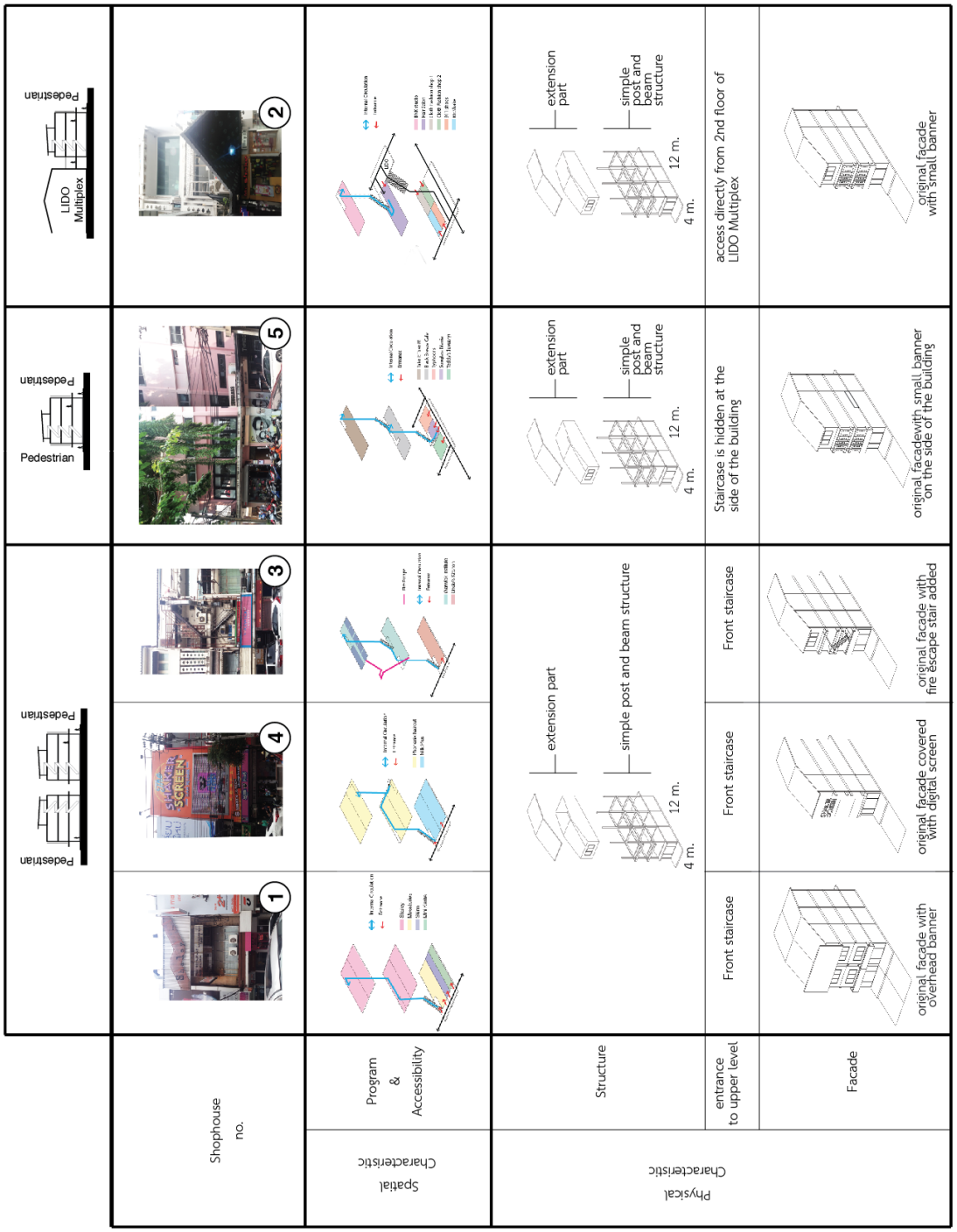
First level: the space on the first level is café with small pantry at the back

Second level: the space on second level is belong to Take it Take it

3.2 Analysis on findings

The result of findings on 5 survey cases are summarized as in the table 4.

Table 4 Summary of the survey result



3.2.1 Physical aspect

Built dimension:

Building footprint is usually maintained because it cannot expand any further. However, the height of the building can be increased due to the expansion of the roof deck. This expansion causes the discontinuity of the existing roof structure. If the modification is improperly done, the building will have chance to face water leakage. In the same manner, if heavy weight roofing structure is used, it affects the loading of structural components.

Structure:

The structure of the shophouse is usually maintained. There might be some addition of supporting beam in some parts of the building.

Supporting utilities:

The supporting utilities such as water system and sanitary system is usually positioned at fixed point on the floor plan (usually at the back of the shophouse). From the survey, the change in program or floor layout may affect the position of the bathroom. The change in position of this supporting utility may lead to the problem of leakage due to the cut in floor slab, or difficulty in connecting the system to fixture because of the position of fixture is too far from the shaft, which limit the flexibility and adaptability of the spatial configuration.

Façade:

The façade is the most transformed element of the shophouse. In Siam Square area, façade usually covered with the advertisement board to attract pedestrian. However,

this advertisement panel block natural ventilation to the interior space as well as visual connection.

3.2.2 Spatial aspect

It can be noted that spatial feature in the shophouse is directed by the accessibility of users and the circulation of the internal space. In every survey cases, the upper level can be accessed by the staircase that located at the front of the building. This staircase directs users to the upper floor without any intervention to the lower space. The space above street level has a disadvantage in loosing visual connection from the pedestrian. Therefore, the programs are inspected as hair salon, office working space, tuition, small cafe or programs that does not require shopfront. On the other hand, commercial shops or programs that require shopfront usually located on ground level.

From the survey, it is important to realize that the staircase is the key element toward the configuration of space. The position of the stair directs the circulation and control the accessibility to particular program. The position of the stair has an effect to the configuration of internal space. (figure 28)

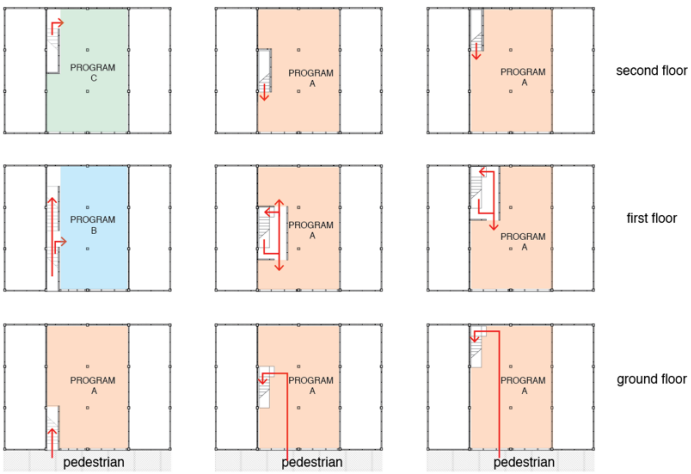


Figure 28 Position of stair and the circulation linear type (left), stack type (middle), and corner type (right)

3.3 Summary

From finding, it can be noted that physical character of shophouse has high rigidity in terms of dimension, structure, and supporting utility, while the spatial configuration is irregular and obscure. According to the survey, it is common to see that the space can be merged, or subdivided without any specific pattern. However, the structural element, supporting utility, floor slab, and staircase have already fixed its position. Because shophouse is never designed to support any specific program but rather an empty shell to be filled in. This conflict between the rigidity of physical character and irregularity of spatial configuration is the reason that makes shophouse to be very difficult to adapt.

Chapter 4 Design Process

From previous chapter, the result shows the conflict between the physical character and the usage pattern of the shophouse. It is now clear that the physical components have difficulty in corresponding to the spatial configuration. Therefore, in this chapter, the design process will try to establish the connection of physical components and the configuration of space in order to increase the adaptable capability.

To achieve adaptability in shophouse, the theory of Support and Infill is employed. The design process is explained in three main steps which are 1) Analysis of existing shophouse components 2) Reorganization of the Support in Infill components 3) Design proposal of Support and Infill components to establish the connection between of physical components and the configuration of space.

4.1 Analysis of existing shophouse components

The findings from previous chapter reveals that the staircase and supporting utility are the key component toward the flexibility and adaptability of shophouse. To analyze further about the components and its capacity to absorb change, the shophouse is dismantled (figure 30) and overlay with Brand's 'shearing layer of change' (Brand, 1994) mentioned in chapter 2.

Brand's shearing layers of change (figure 29) shows six layers of building components that changes at different time scale. These six layers are site (permanent), structure (60-200 yrs), skin (30-60 yrs), services (5-30 yrs), space plan (5-20 yrs), and stuff (5-15 yrs). The faster changing layers such as space plan are controlled by the slower changing layers such as structure. For example, the space plan configuration can be limited due to the conflict of structure. In shophouse typology, the disassemble shophouse components uncovers the building layers that can help to identify each individual component separately. The shophouse components in Brand's layers are established and presented in the table 5

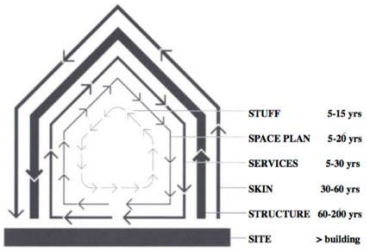


Figure 29 Brand's shearing layers of change diagram (Brand, 1994)

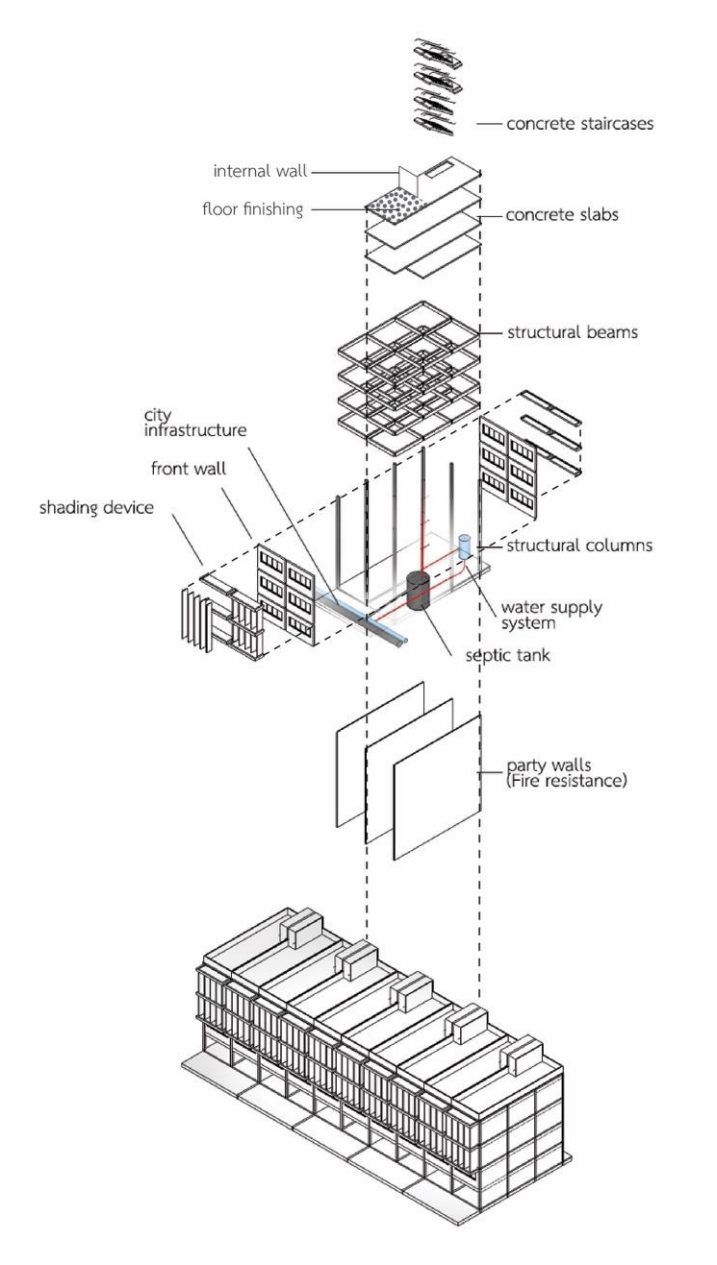


Figure 30 Shophouse components

Table 5 Shophouse components in Brand's layer of change

Brand's shearing layer of change	Life cycle (years)	Shophouse components
Site *(geographical setting)*	permanent	Shophouse location
Structure *(foundation/load-bearing elements)*	60-200	Concrete column (30x30 cm) Concrete beam (30x40cm)
Skin *(building envelop)*	30-60	Window frames Shading device Balcony Party wall
Service *(building system/utility)*	5-30	plumbing system Bathroom and Kitchen
Space plan *(division of space)*	5-20	Concrete staircase Internal wall Concrete slab (15 cm thickness)
Stuff *(furniture)*	5-15	Movable furniture

From table 5, shophouse components are categorized into six different layers that imply the changeability of the components. The skin, service, space plan, and stuff layers have shorter lived than the structure. The structure can be modified, upgraded, or removed to accommodate new use. However, adaptability is achieved through the theoretical framework of Support and Infill by Open Building mentioned in chapter 2. It is applied toward shophouse typology to identify Support and Infill components.

Support is classified as permanent and shared part of the building that provides service space for occupancy. In shophouse typology, Support is structure layer, and service layer that control the overall architectural layout of the building. For example, the addition of toilet in the front part of the building can face challenges due to fixed

location of the main piping system.

On the other hand, Infill refers to any movable part that can be altered individually without affecting the Support. Infill is identified as skin, space plan, and stuff layers that are able to transform, remove, or relocate without disturbing the Support. Infill components such as internal wall, window frame, or furniture can be modified with ease while floor slab facade and concrete staircase are difficult to modify. (table 6)

Table 6 Existing shophouse components categorized as support and infill

	Existing shophouse components
Support	**Structure** (column/beam/slab) **Service** (toilet/kitchen/piping system)
Infill	**Skin** (façade, balcony, window frame, etc.) **Space plan** (internal wall, slab, staircase) **Stuff** (moveable furniture)

This analysis can be concluded that the support components in the shophouse typology control and limit the reconfiguration of floor plan especially the toilet and kitchen components that require access to the main piping system.

Therefore, to achieve adaptability in shophouse, the Support layer will be reorganized to increase flexibility of floor plan that will be occupied by variety of infill.

4.2 Reorganization of the Support and Infill Components

To develop the adaptability system, the Support and Infill of existing shophouse components must be reorganized. The Support provides capacity serve need of variety and changing demands of infill throughout its useful life. As the Support and infill components have been clarified, it reveals that the existing Support cannot facilitate the diversity in plans and subdivisions of space utilization. The fixed position of service

core (shaft) is limited accessibility of the new installation of toilet or kitchen. In many cases, shophouse owner would instead install the water pipe along the interior wall and connect to the desired position of fixture. On the other hand, the shophouse envelop, which is commonly seen as concrete shading device is also fixed and cannot correspond to the function of its interior. To summarize, the components in Support are in need to be reorganized to provide the infinite floor plan layout.

The Support and Infill component in exiting shophouse are reorganized toward adaptable one. The summary is presented in table 7.

Table 7 Summary support and infill components

	Existing shophouse components	**Adaptable shophouse components**
Support	**Structure** (column/beam) **Service** (toilet/kitchen/piping system)	**structure** (column/beam) **Service** (piping system) **Skin** (façade frame)
Infill	**Skin** (façade, balcony, window frame, etc.) **Space plan** (internal wall, slab, staircase) **Stuff** (moveable furniture)	**Service** (toilet/kitchen) **Skin** (façade components) **Space plan** (partition wall, prefab slab, staircase) **Stuff** (movable furniture)

From table 7, the Support in adaptable shophouse should be composed of structure, service core, and envelop. The structure is existing column and beam as stated in table 7. The service core should be designed with integral parts of main system and subsystem as separating units. This would allow users to be in total control in allocating the services (toilets, and kitchens) as well as the possibility in designing the rest of the space flexibility. The skin or building envelop should also be designed as neutral as possible for the purpose that it can be changed or modified in corresponding to the function of the interior.

On the other hand, the Infill will be designed as module components that can be

configured by the users. The Infill includes service components (toilets, and kitchens), façade components, partition wall, prefabricated slab, prefabricated staircase, and movable furniture.

Lastly, it is important to note that the potential of the Support and Infill in adaptable shophouse is not designed for specific brief or program, but rather to generate a number of possible arrangement in the shophouse layout. It is believed to respond to the different pattern and needs of users that can be adapted not only for the residential function, but nonresidential function as well.

4.3 Design proposal for Support and Infill components

As the Support and Infill of adaptable shophouse components are clarified, it is essential to analyze the design approach for the Support and Infill which are piping system, neutral façade frame, and prefabricated stair and slab. Departing from these components, the two design approaches will be later explained in the proposal. First approach is systems building that constructed based on multiple independent subsystem and the main system. The latter is modular coordination that the components are set out in modular unit that coordinate with one another. The summary is presented in the table 8.

Table 8 Shophouse components and design approach for achieving adaptability

components	Design approach
Piping system (shaft)	System building
Neutral façade frame	Modular coordination
Stair + Slab	Modular coordination

4.3.1 The configuration and position of the piping system

The configuration and strategic position of piping system are carefully considered to achieve maximum adaptability of the shophouse. As the existing position of bathroom which connects with piping system in the shophouse is the major problem toward the design for adaptability in the architectural plan, this can be resolved by grouping main piping system along with the structural column (figure 31, 32, 33). This pre-installed system provides the possibility in connecting the bathroom and kitchen in any position in the floor plan. (figure 32) Assuming that configuration is a departure point, it is important to figure out the most suitable position of this main piping system in the shophouse floor plan. As the shophouse can be owned from single to multiple units, it is necessary to propose the strategic positioning of these piping system.

This preinstall main piping system in the position shown in figure 34 can be regarded as the Support that allow for different arrangement and adaptable to accommodate subsequence division of space according to specific need.

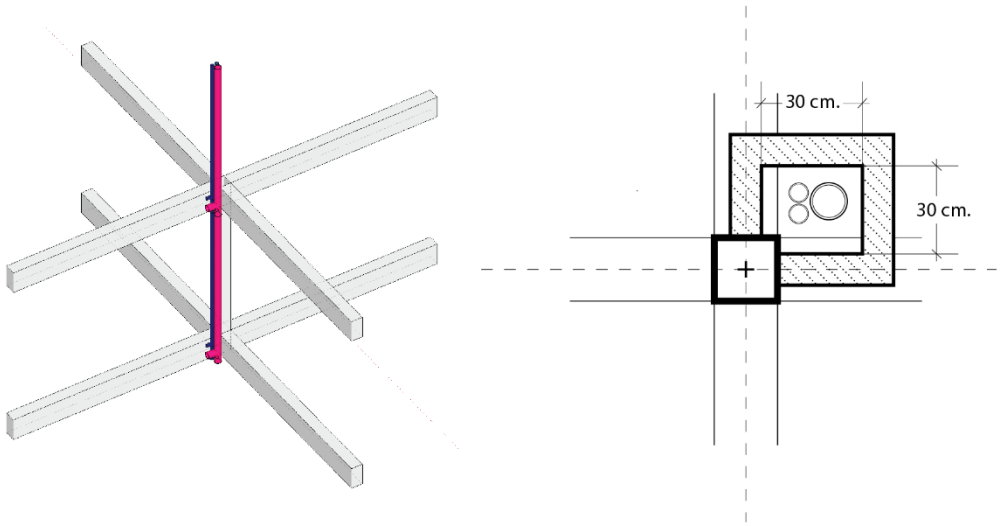


Figure 31 Integration of piping system to the structural column

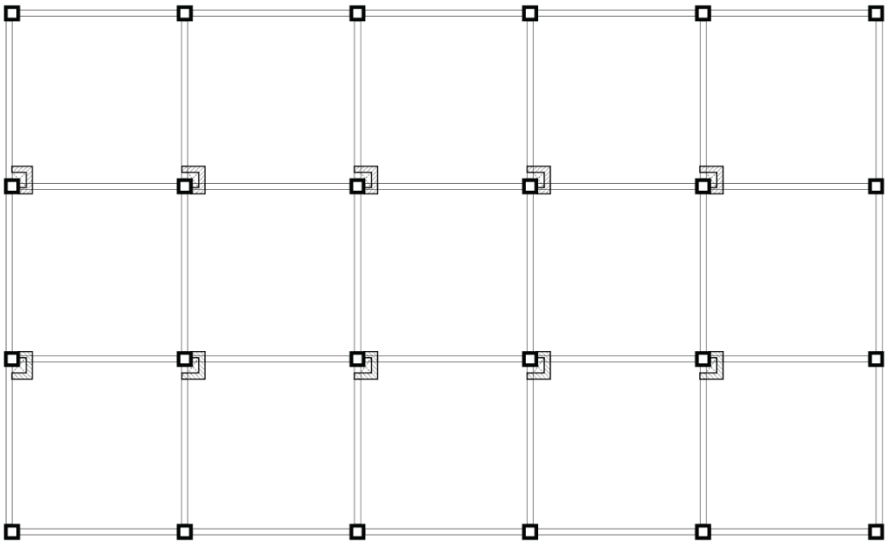


Figure 32 Positions of shaft in multiple units of shophouse

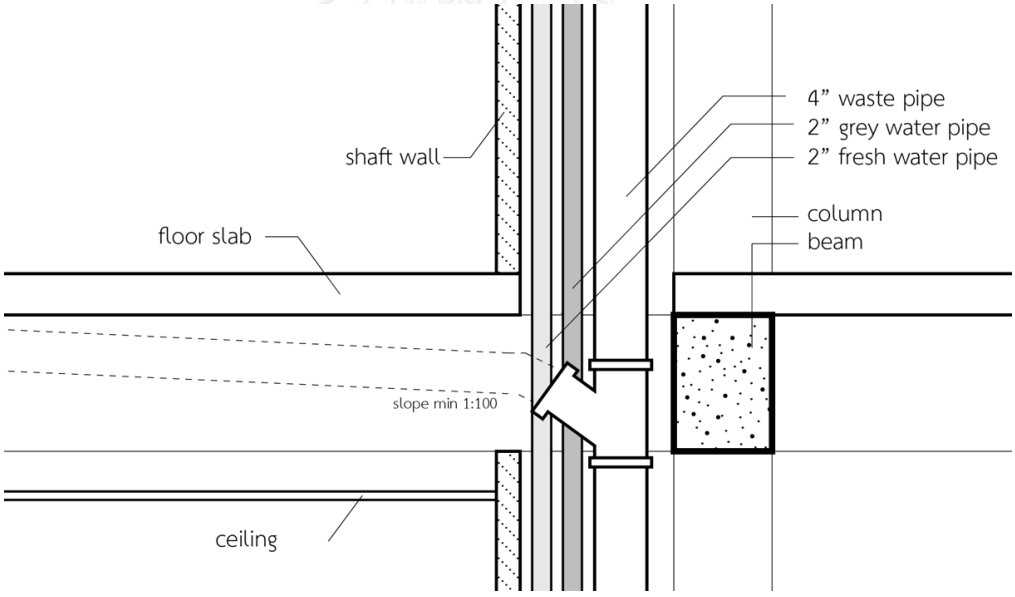


Figure 33 Detail of the piping system (section)

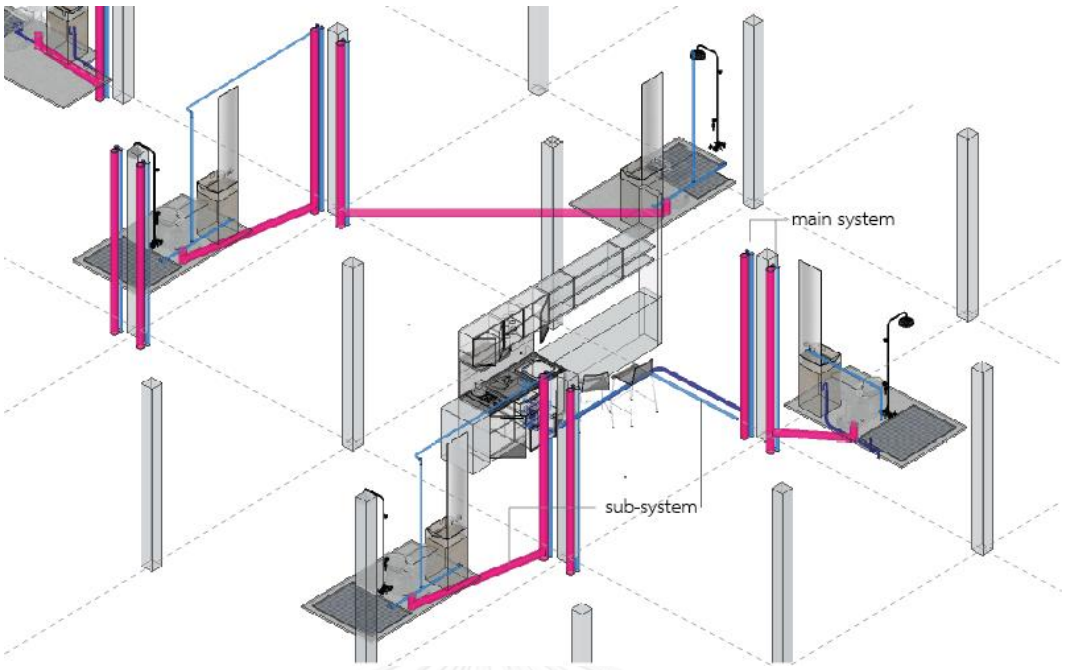


Figure 34 Main system and sub system of pipe

4.3.2 Façade frame and adaptable module

The façade frame should be installed without any specific architectural style. Typically, façade that shows too specific function of the interior is the worst condition to accept new use. For example, the façade with specific type of windows that show situation of bedroom would face difficulty when subdivision and change occur in the future.

The design of this façade frame is very simple and can be directly attached to the existing beams or cantilevered front part of the shophouse. With this approach, the façade module, which is designed in correspond with the frame, can be designed according to given interior space. This modular system provides the ease of modification of the façade to accept new use along the year. (figure 35)

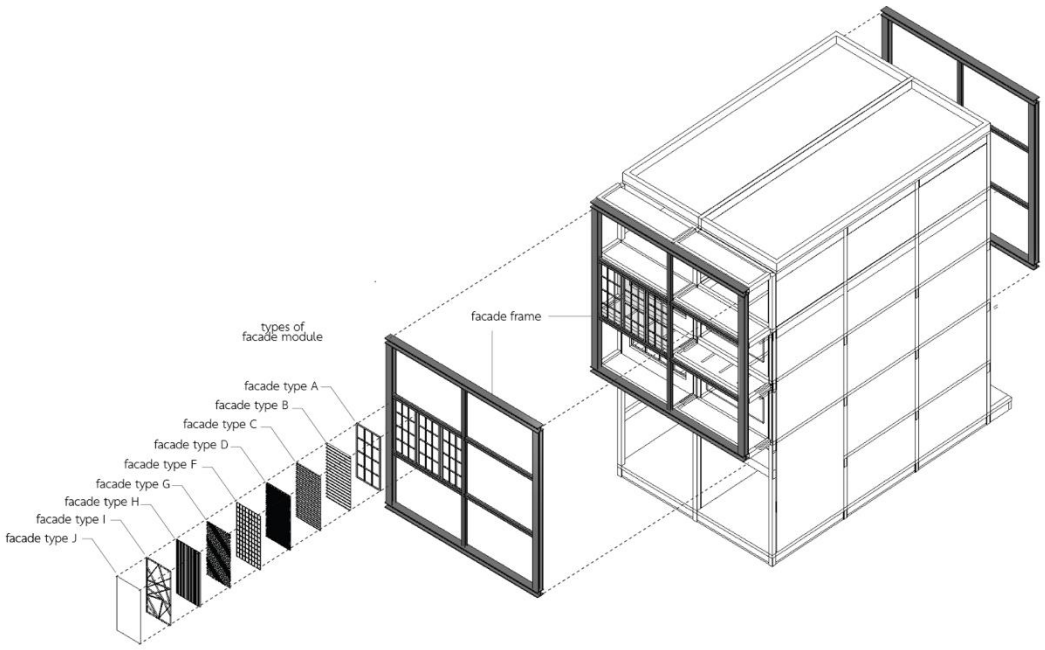


Figure 35 Façade frame and its adaptable module

4.3.3 Modular Stair and Slab

The fixed existing staircase is usually located at the rear end of the building, limiting the space configuration in the shophouse. The circulation is directed by the location of the staircase. By designing the stair as modular component, it enables the possibility to relocate the staircase in any spot of the floor plan, which allow more flexibility in circulation. The new dimension of the staircase is set with the minimum of the width of 1.20 meters as to comply with the regulation. The floor plate is also designed as a module that has the same dimension as the width of the staircase so that the addition of the staircase will correspond with the floor plate panel. (figure 36)

The existing floor slab are made from concrete. When the building is in need of vertical circulation, the entire floor slab must be demolished in order to add new staircase. To

embrace the idea of adaptability, the floor need to be prefabricated as metal plate with the width dimension of 1.20 meters and the length of 4.20 meters placed on the existing structural beam. The width dimension of 1.20 meter is designed to be fitted with the width of the staircase required by the regulation. With this approach, the floor slab can be easily removed for the future functional change without any demolishing of the entire floor. The user can remove the slab from a single plate to multiple plate as wish in both directions. (figure 37)

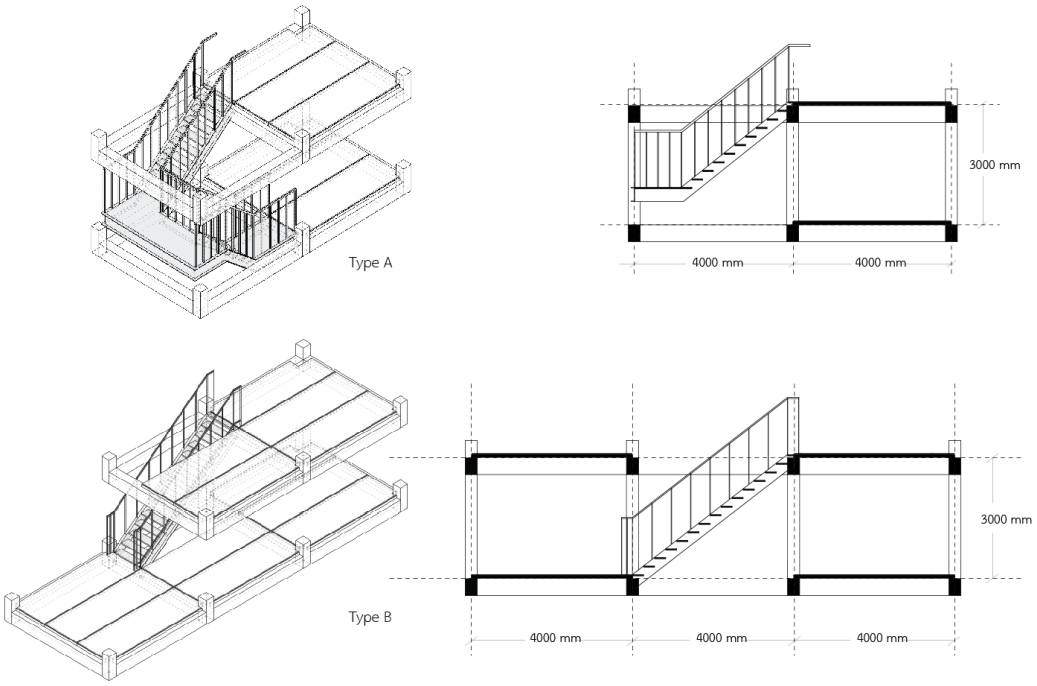


Figure 36 Two configurations of staircase

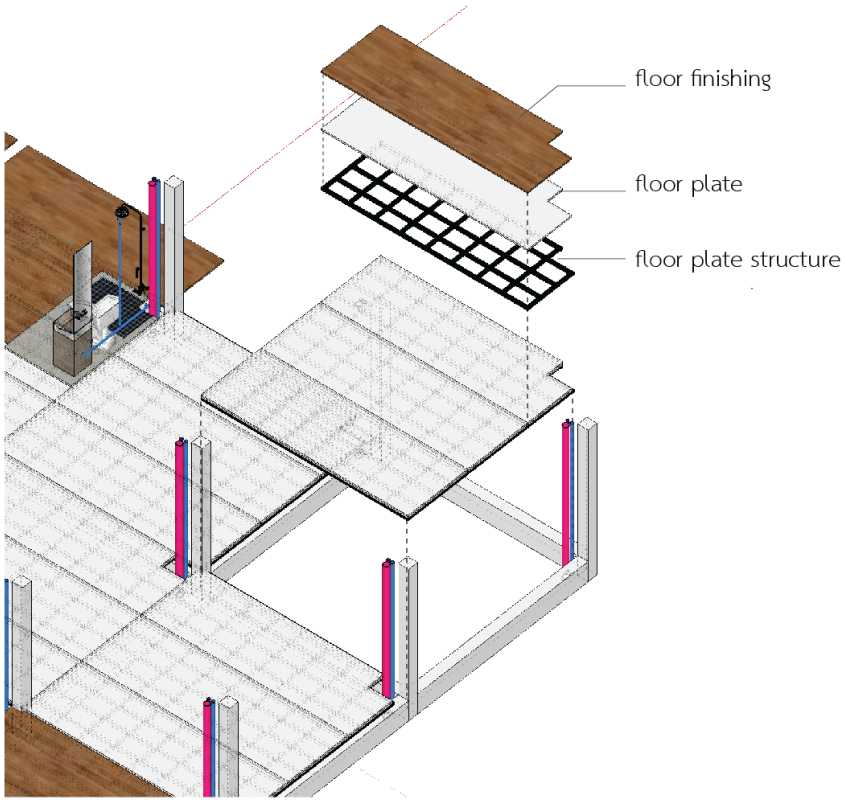


Figure 37 Modular prefabricated floor slab

In conclusion, to establish the connection between of physical components and the configuration of space, the existing Support and Infill must be reorganized in a way that the components of the Support should provide serviced space for occupancy, while infill components should generate a variety of possible layout according to the users. The proposed design guideline can be summarized as follow;

1) Install the main piping system (shaft) along the structural column (Support component)
2) Install façade frame with adaptable types of façade module (Support component)
3) Use of module prefabricated stair and floor slab for the ease of reorganize the floor plan, void, and vertical circulation (Infill component)

From this perspective, there is a high possibility that the proposed system is the key toward the adaptability in the floor plan as well as the potential of future adaptability. In the next chapter, this proposed guideline will be implemented in abandoned shophouse in Asoke area to test out the design proposal.

Chapter 5 Design Implementation

In this chapter, the design guideline will be applied to the existing shophouse in Bangkok. With a site specific project, the site and user analysis provide the development of the architectural program. The program is divided into two stages; the initial program, and the projection program. With the proposed design, the building components can be adapted to support the projection program in the future.

5.1 Site and users

The site selection is based on preliminary survey of the existing shophouses along Asoke Montri Road. (figure 38-39) The row of 5 shophouses is found in abandoned stage and selected as a site for the design proposal. The site is located in the cluster of high-rise buildings of offices, residences, and educational facilities (figure 39) allocated as high density zone of Bangkok. Therefore, the main users for this site are;

- University students
- Office workers
- Multi- nationality tourists

Table 9 Site information

Selected Site	
Address	Ruam Saub market, Sukhumvit 21 (Asoke), Wattana, Bangkok 10110
Landlord	Owner of Ruam Saub market
Total area	1400 sq.m.
Land size	240 sq.m.
Urban Zone	High density residential zoning

As the selected building is located in the prime area of Bangkok, there is always high demands of an affordable living space that serve students or office workers. According to National Statistical Office report, the density of population in Asoke area is measured

6,577 people per sq.km. and the over 10,000 people travel by MRT Petchaburi. This is an evidence that the flux and flow of people are massive. Therefore, the site has high potential for the demand in affordable living unit. Living in such place reduces time one spend in commuting from living to working/studying place. The site is also accessible by major public transportations which are bus, BTS, MRT, and pier. Other facilities such as hospital, parks, department stores can be reached within 2 kilometer radius. However, the site cannot offer any parking space.

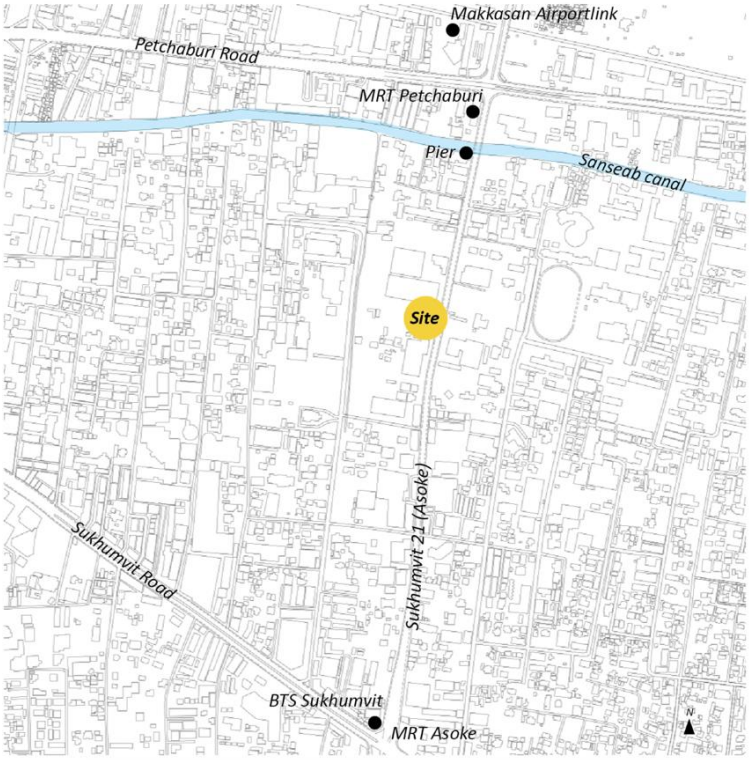


Figure 38 Site map

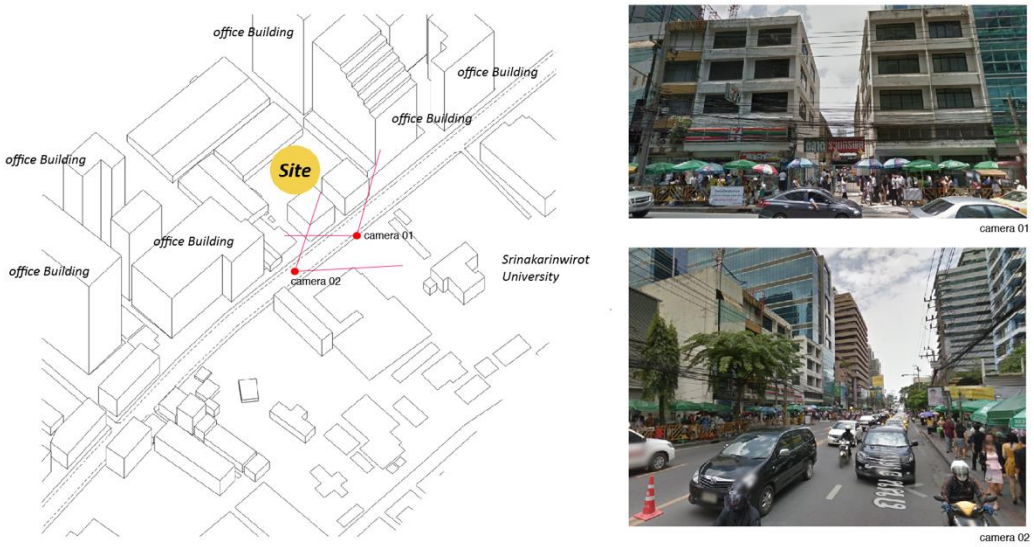


Figure 39 Site location and context

5.2 Existing condition

The existing shophouse is in a good physical condition as shown in figure 41-42 even though it has been used as a storage space by the vendors in the canteen for many years. The dimension is measure as the same as the typical shophouse. (figure 40) The ground floor has double height ceiling as it is intended for commercial purpose (figure 41-42). The mezzanine is inspected in this building. Staircase is located at the back of the building as the same as the typical shophouse. The total area of the 5 units is equal to 1400 sq.m.

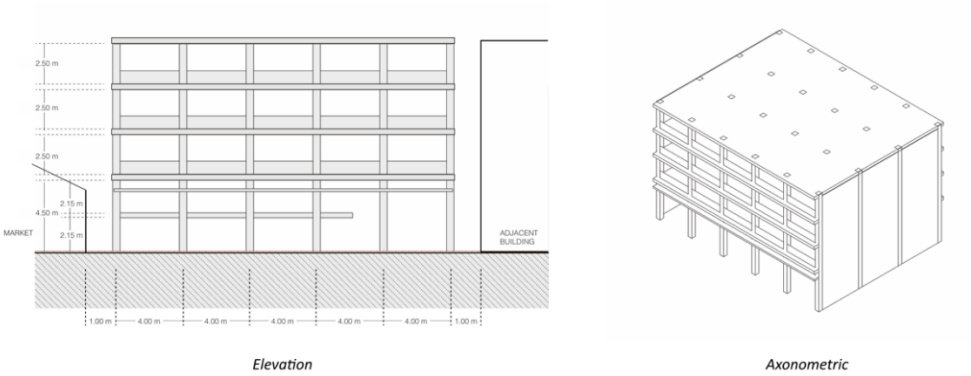


Figure 40 Selected shophouse elevation (left), shophouse axonometric (right)

Figure 41 Photographic of the interior space

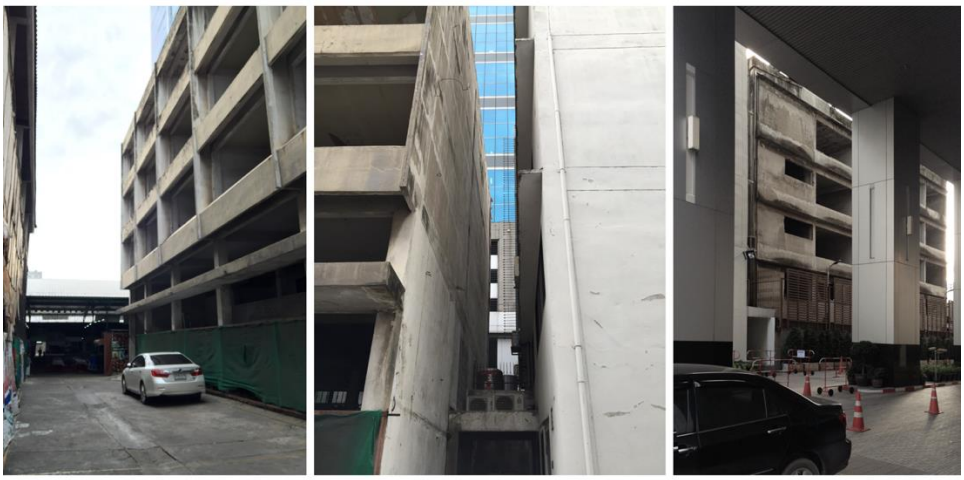


Figure 42 Photographic of the exterior space condition

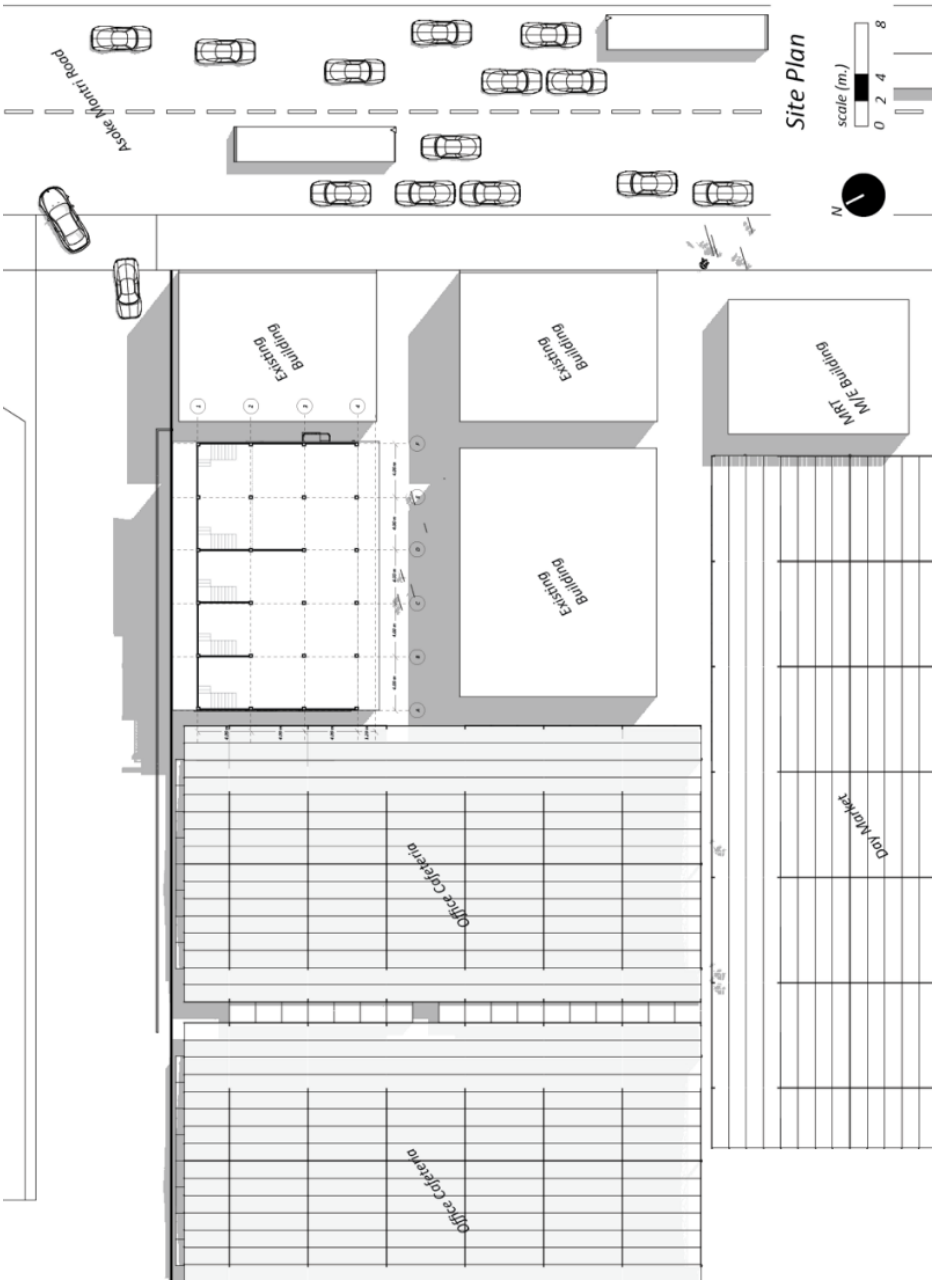


Figure 43 Existing floor plan and context

5.2.1 Accessibility

The site is located within the walking radius to the 3 types of mass transit system which are Asoke Pier (0.4 km.), MRT Petchburi (0.5 km.), and BTS Asoke (1.0 km.) as shown in the figure 44. However, the site can only be accessed by the pedestrian walkway (figure 45)

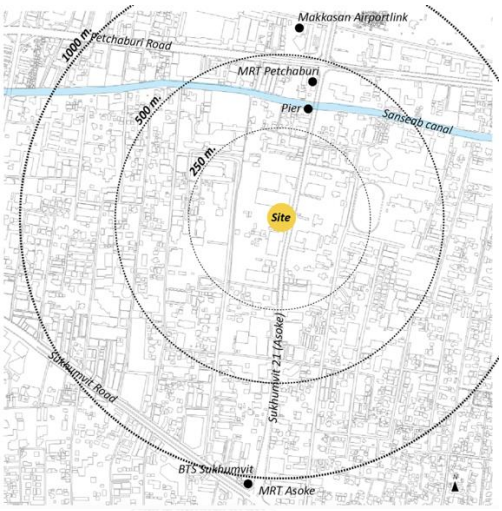


Figure 44 Site location and transit system

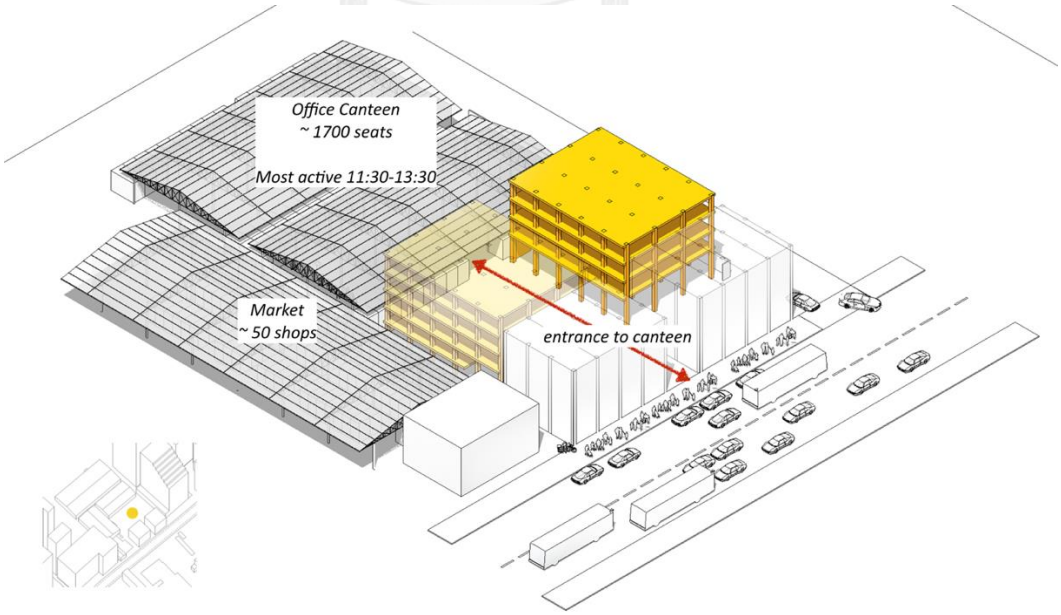


Figure 45 Site and its approach

5.2.2 Light and shadow analysis

The site is located in the area in between high rise building. Light and shadow that cast over the site are presented in the figure 46.

Figure 46 Light and shadow analysis

Figure 46 shows the effect of shadow that cast to the site during different time of the year. As the site surrounded by high rise building, shade and non-shade area is identified and explored in order to design a suitable shading device on the façade of shophouse.

5.3 Programs

The programs are derived from the user's analysis of the site context which are university student, office worker, and multi-nationality tourist. Two main programs are developed; commercial and residential space.

- The commercial space for this proposal is categorized as;

  1) Shop with front (commercial shop, café, restaurant)

  2) Shop without front. (tuition school, clinic, spa/massage place, co-working space)

- The residential space is focused on a studio unit type because the target user is university student and officer worker who is in need of affordable unit with the area of 16-18 square meter (figure 47). However, other room type such as one-bedroom units is also provided. (figure 48)

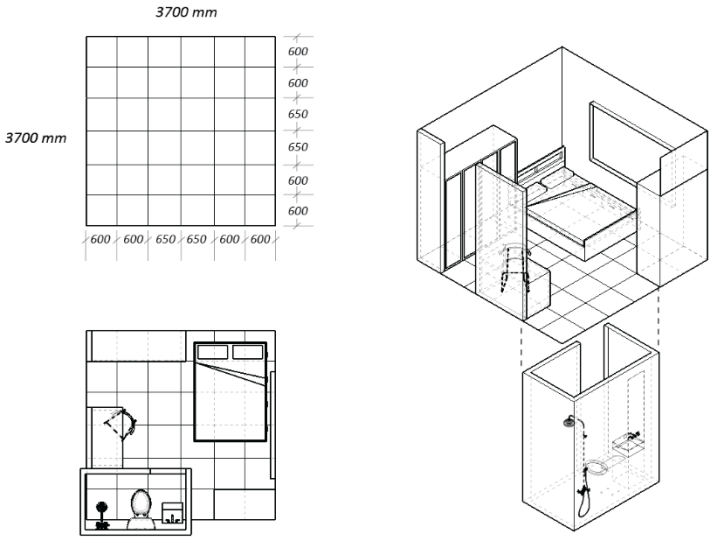


Figure 47 Infill component as studio type living unit

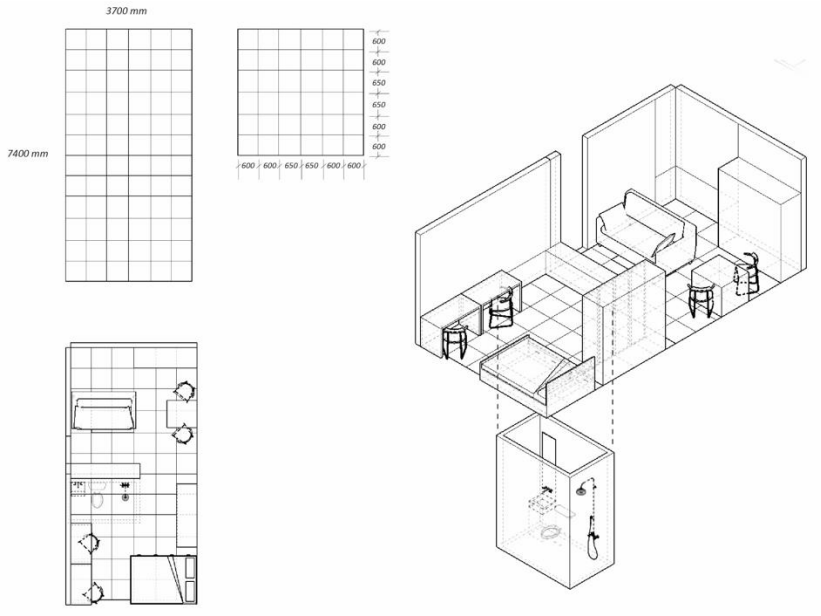


Figure 48 Infill components as one-bedroom type living unit

Moreover, the program will be divided into 2 stages; the initial and the projection to test out the adaptability of shophouse. The detail of the initial and future programs is presented in table 10 and 11.

Table 10 Initial proposed program

Program	Space	Area (sq.m.)	users
Commercial	*Cafe*	64	Office worker, Student Tourist, visitors
	Spa/massage	112	Office worker, Student Tourist, visitors
	Co-working space	400	Office worker
	Dental Clinic	64	Office worker, Student Tourist, visitors
Residential	*Studio unit (16 sq.m.)*	496	Office worker, Tourist, visitors
	1 Bedroom (30 sq.m.)	120	Office worker, Tourist, visitors

Table 11 Scenario 1 Projection program (future)

Program	function	Area (sq.m.)	users
Commercial	*Cafe*	64	Office worker, Student Tourist, visitors
	Spa/massage	192	Office worker, Student Tourist, visitors
	Office space	440	Office worker
	Dental Clinic	64	Office worker, Student Tourist, visitors
	Language school	80	Student, office worker
Residential	*Studio unit*	368	Office worker, Tourist, visitors
	1 Bedroom (30 sq.m.)	120	Office worker, Tourist, visitors

From the table 10, the initial program is categorized into two groups; commercial and residential. The commercial group includes the program that does not require shopfront as part of the business which is appointed as massage place and co-working space. While the program such as café and dental clinic should have shopfront as part of the business to attract customer. Similarly, the residential group is chosen as studio units and one bed room units according to the analysis of the user. The organization of the initial program in figure 49 reveals how the space is configured in the floor plan with Support and Infill components. Moreover, the connection to supporting utility of the building is also presented. For instance, the resident can be accessed to entrance, which guides the user directly to the main staircase to the corridor or the common area. The hierarchical level of accessibility is indicated by different line types.

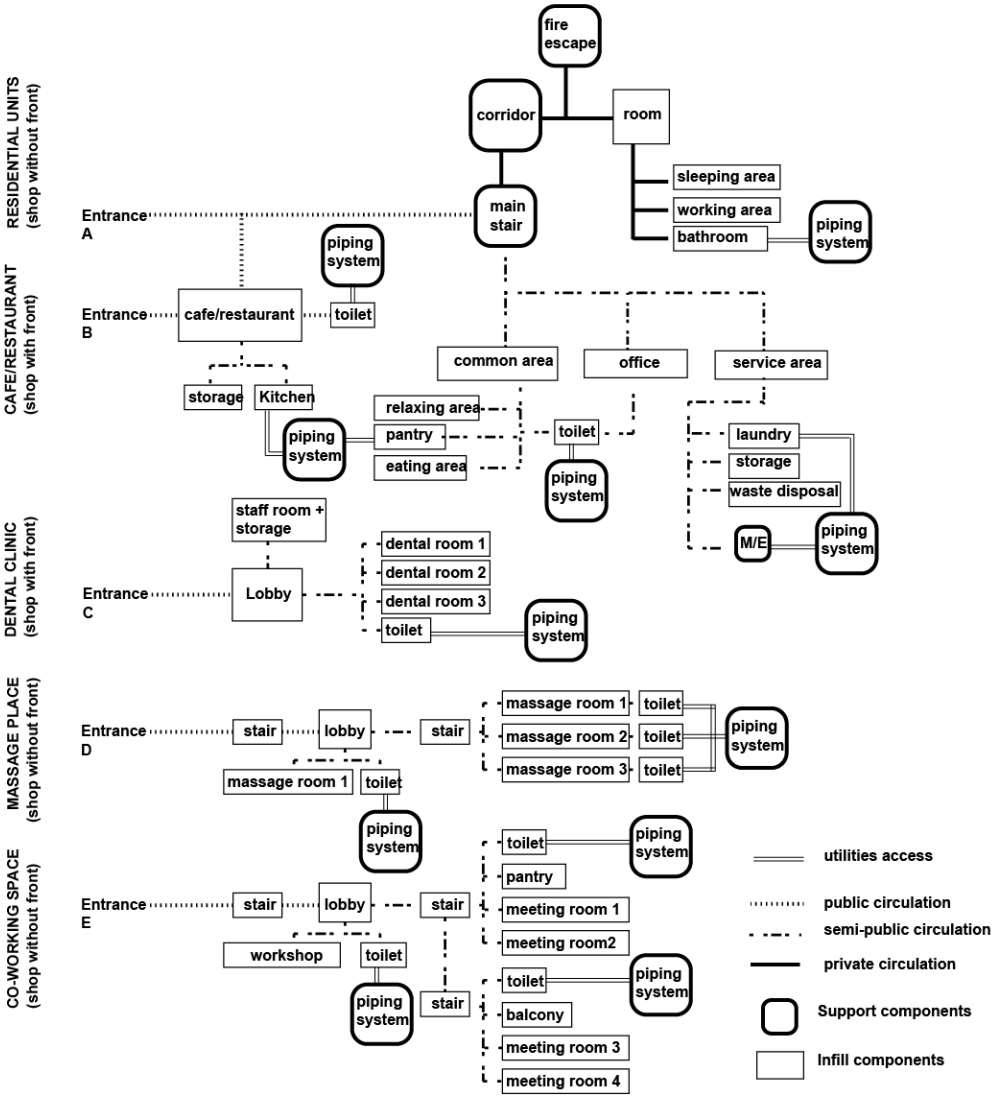


Figure 49 Organization of the initial program

5.4 Design Criteria

After the programs have been set up, the architectural design of the proposed design shophouse is achieved under the 4 main criteria;

5.4.1 Commercial Space

Shop with frontage

- Main space should be on ground level to have visual connection to pedestrian
- Should be able to subdivide for different type arrangements by lightweight infill components
- Opening to external air
- Access to supporting utility

Shop without frontage

- Can be on the upper level of the building
- The entrance should be accessible from the pedestrian level
- Should be able to subdivide for different arrangements by lightweight infill components
- Opening to external air
- Access to supporting utilities

5.4.2 Residential Space

For any unit type

- Must have opening to external air
- The room equipped with bathroom
- Separated Sleeping/working area

- Access to supporting utilities
- Located on the upper level (for privacy and safety issue)

5.4.3 Common area

- Include semi-public stair, corridor, common room, laundry space, kitchen
- Opening to external air
- Adequate natural ventilation and light
- Accessible only for resident
- Access to supporting utilities

5.4.4 Related Regulation for the design proposal (Ministerial regulation No.55, Section 2)

- Corridor with not less than 1.50 m. for residential building
- Ceiling height not less than 2.60 m.
- Width of the staircase of 1.20 m.
- Shophouse with less than 4 levels may install the ladder as fire escape staircase (with landing on every floor, 60 cm minimum width, slide to ground level)

The above criterias determine the proposed design of space configuration in the floor plan of the shophouse. The layout of initial program is developed from these criterias and presented in the next section.

5.5 Spatial layout

Based on the appointed programs and design criteria, the initial program is planned to separate the residential space out of commercial space by the circulation route. The residential space is arranged to the highest level and expand downward for privacy and security reason, while lower level designate for commercial purpose. The initial layout is presented in figure 50.

In future, when the particular business or demand grows, there might be the need of space expansion. The scenario 1 of future program in table 11 shows the increasing space of the massage place. In this scenario, a new language school is moved in, while café and dental clinic are retained the same positions. However, the number of studio units is reduced. The spatial configuration of this scenario is presented in the figure 51.

In the scenario 2, the future program is predicted with having a hostel (temporary residence) with separated circulation from the initial residential group. In this scenario, massage place, co-working space, café and dental clinic are maintained their position. The spatial configuration of this scenario is presented in the figure 52.

The scenario 3, the fashion store (shop with front) is inserted for the new configuration of the layout. This scenario, the café is moved out and replaced with the fashion store. The residential, massage place, co-working space and dental clinic are maintained. The spatial configuration of this scenario is presented in the figure 53.

All three scenarios present the capability of adaptable space configuration as well as the internal circulation that correspond to the particular space. With the design proposal in chapter 4, the existing shophouse can be recognized as adaptable building.

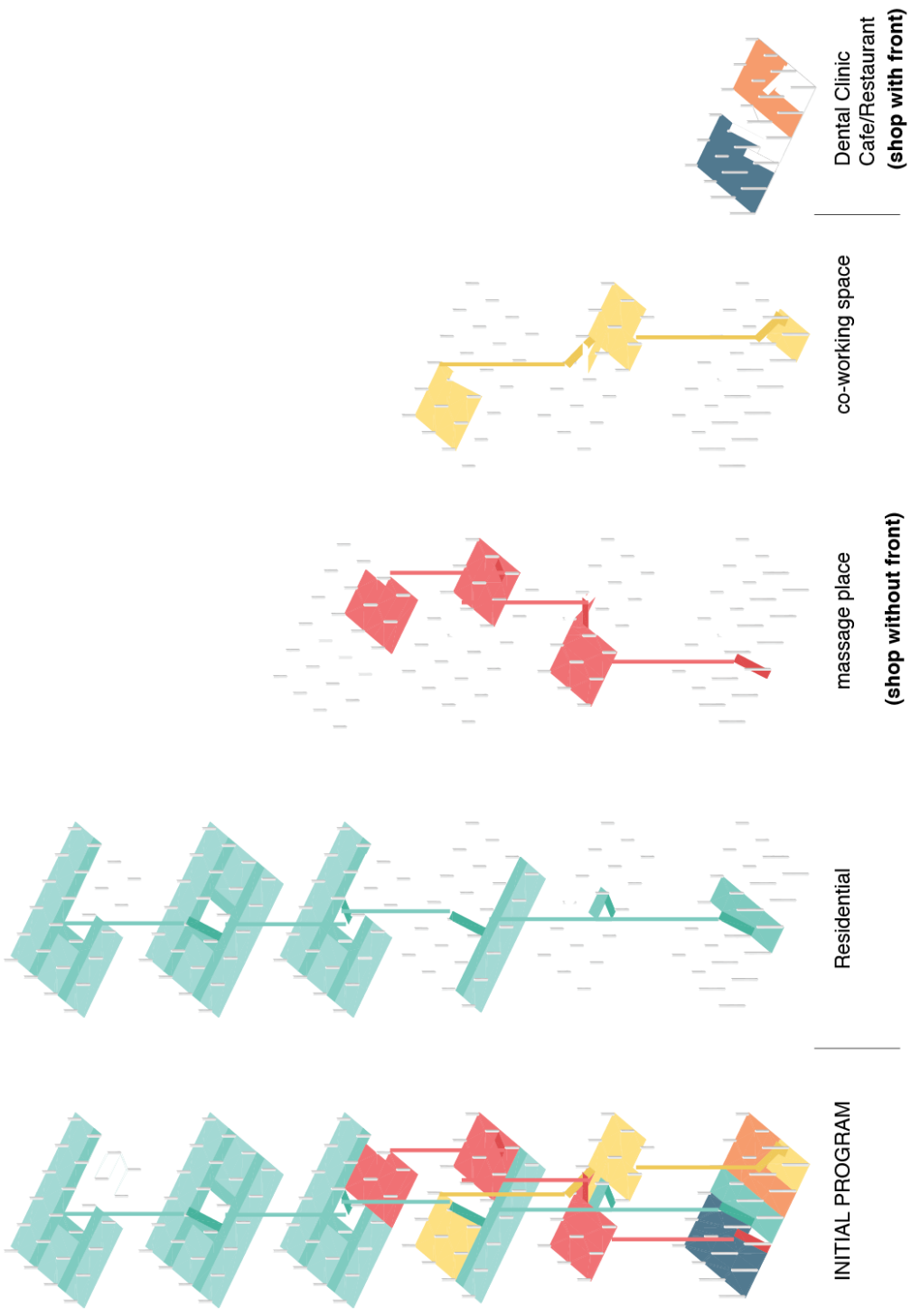


Figure 50 Initial program layout

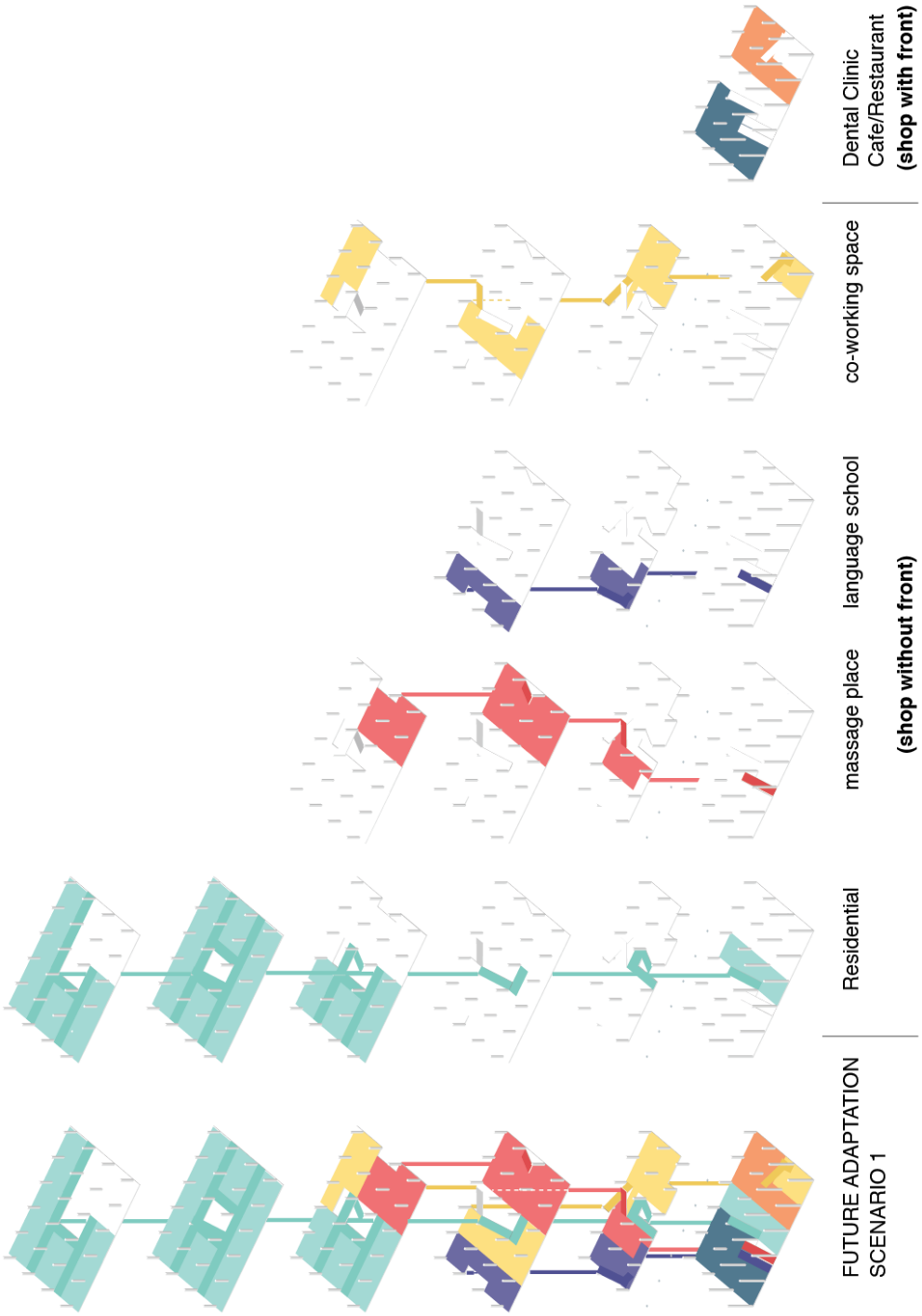


Figure 51 Future layout SCENARIO 1

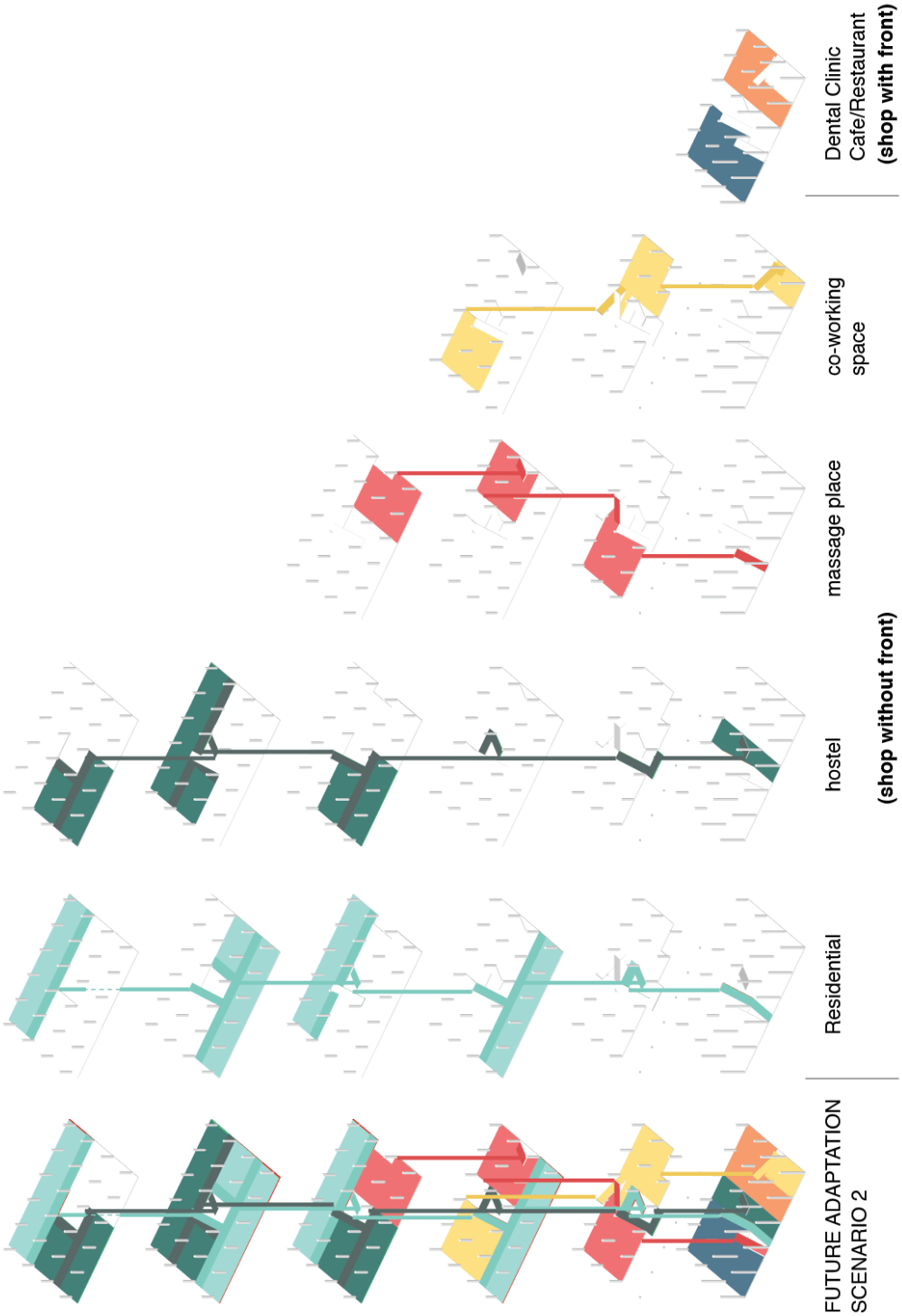


Figure 52 Future layout SCENARIO 2

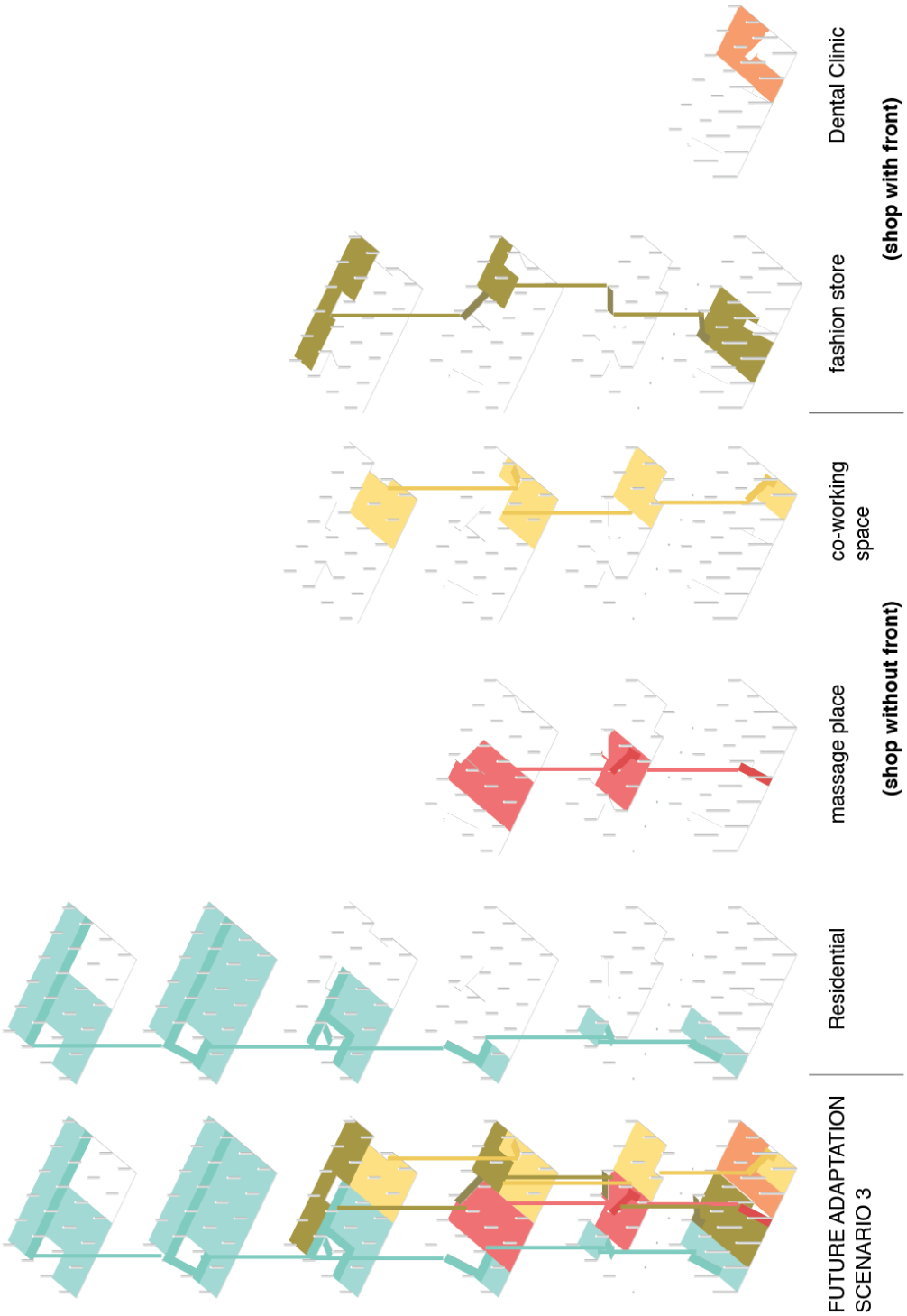


Figure 53 Future layout SCENARIO 3

It can be noted in all scenario, the space in the middle of the shophouse is designated as the main circulation toward the residence with the internal void. This void will allow natural ventilation and light to the middle part of the shophouse which is usually dark and less ventilated in typical shophouse.

5.5 Design implementation

The proposed design guideline is developed in chapter 4 and the proposed spatial layout is applied to the shophouse. The existing components are removed except the structural column and beam. The initial program is implemented through the use of adaptability model in the existing floor plans.

The supporting utility such as water and sewage system are installed and distributed along the existing structural column as proposed in chapter 4. This is to ensure that any position on the floor plan can be thoroughly connected. The existing floor slabs are removed and replaced with the modular panels. Three module slabs are fitted with the existing grid dimension of 4x4 meters. This module can be partially removed and exposed as internal void. The module staircase (type A, B) in figure 36 is also implemented in these floor plans. The organization of floor plan is presented according to the initial program and the future adaptation in scenario 1 to demonstrate the adaptability in the floor plan as shown in figure 54.

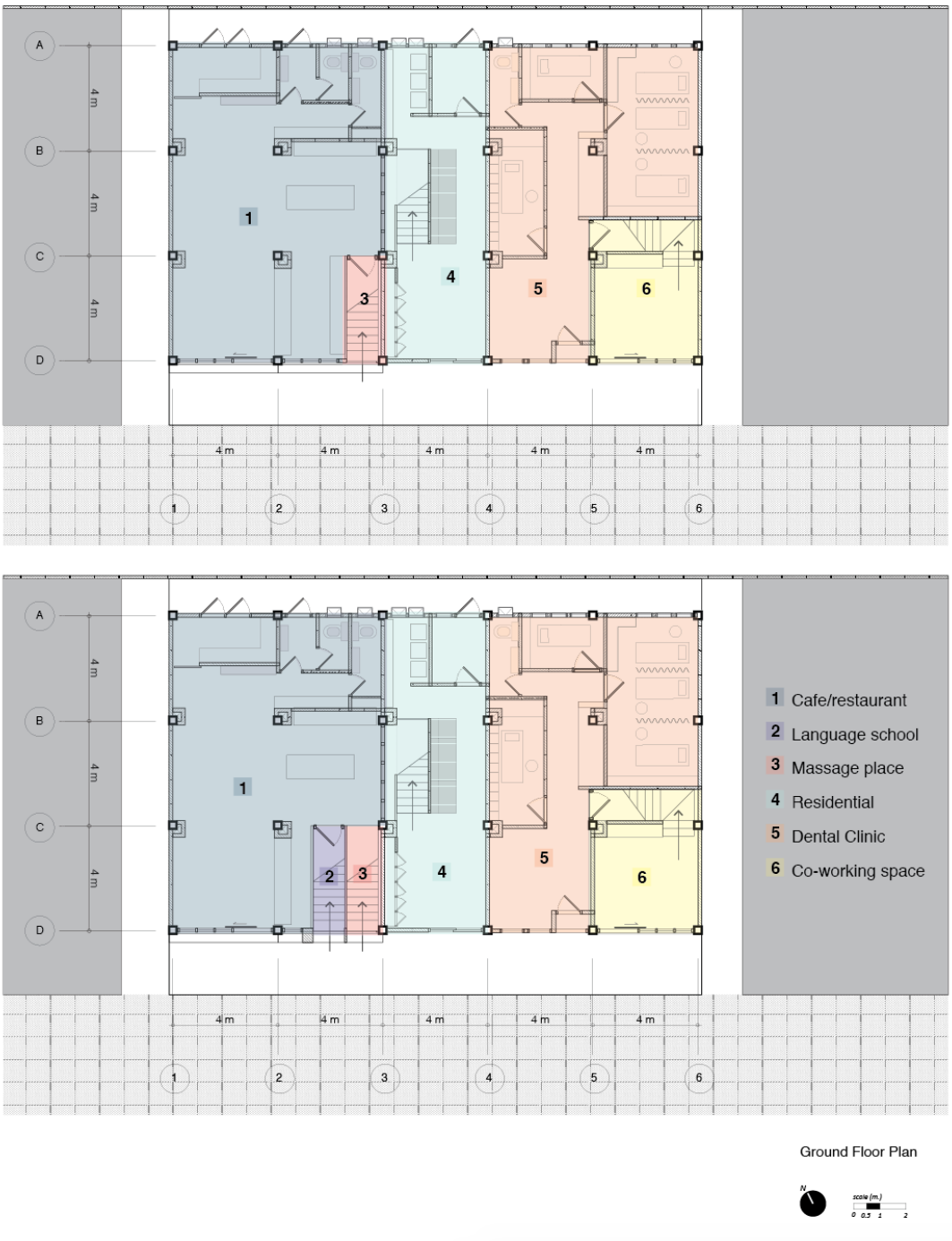


Figure 54 Ground floor plan with initial program (above), with scenario 1 (below)

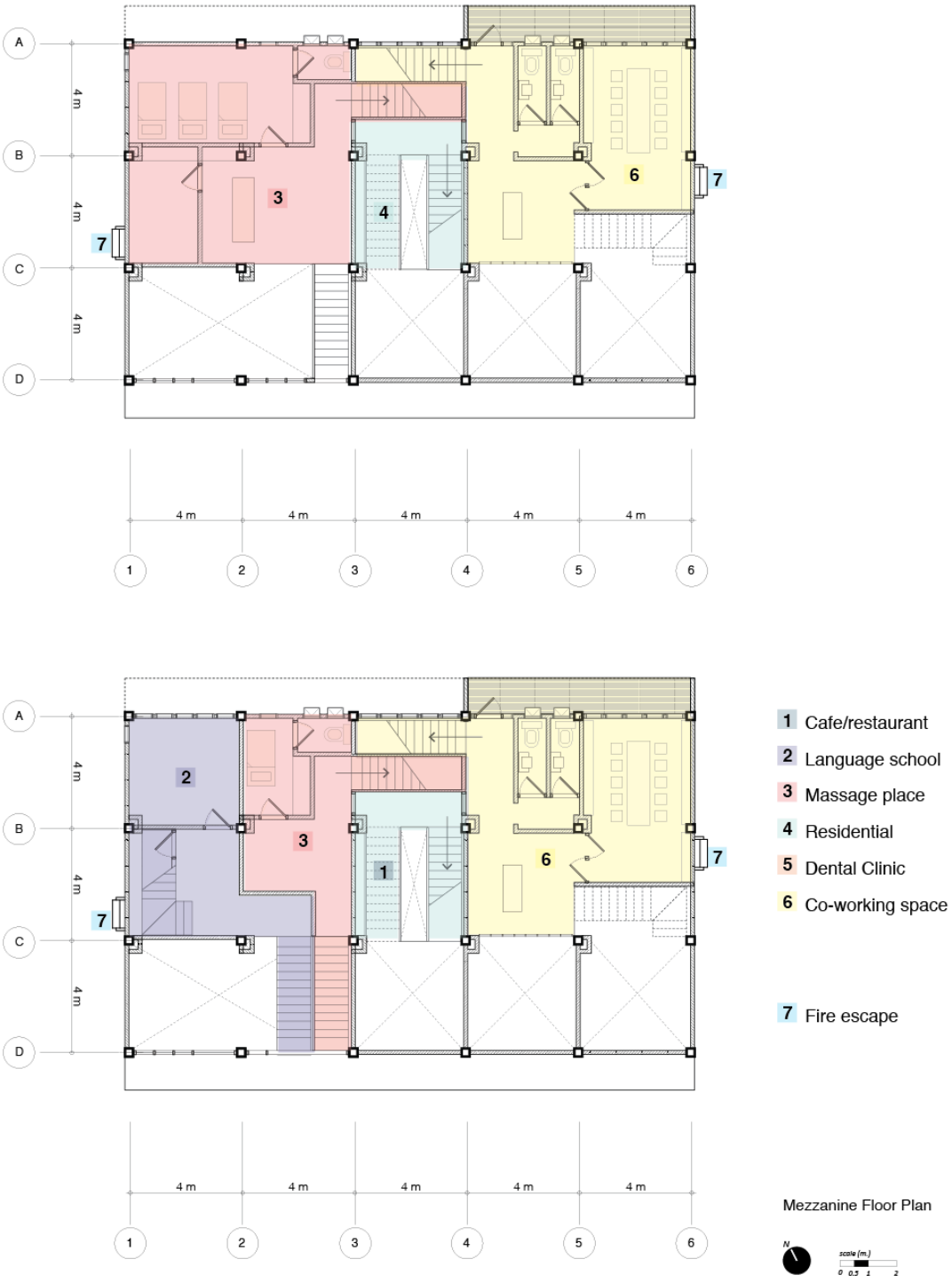


Figure 55 Mezzanine floor plan with initial program (above), with scenario 1 (below)

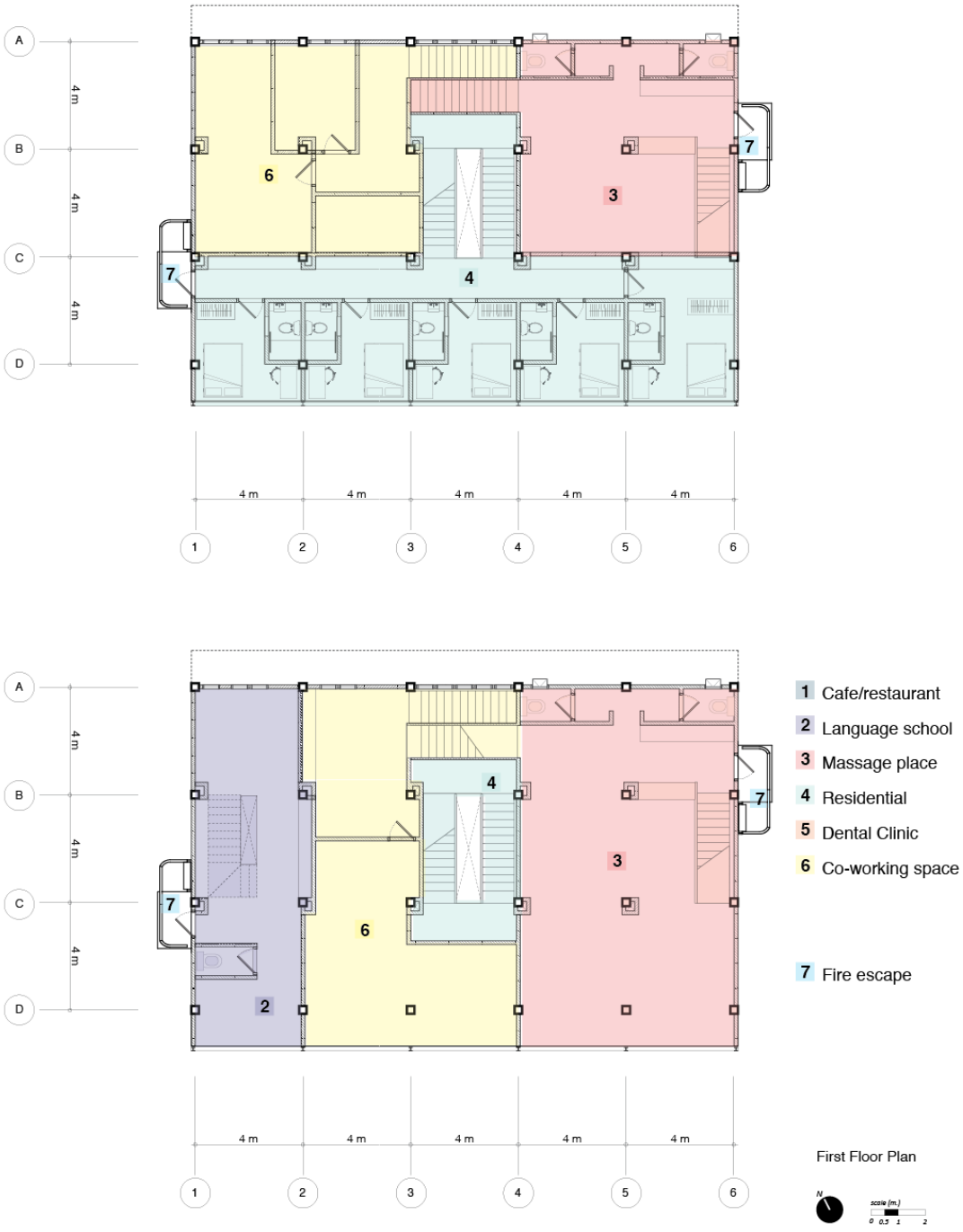


Figure 56 First floor plan with initial program (above), with scenario 1 (below)

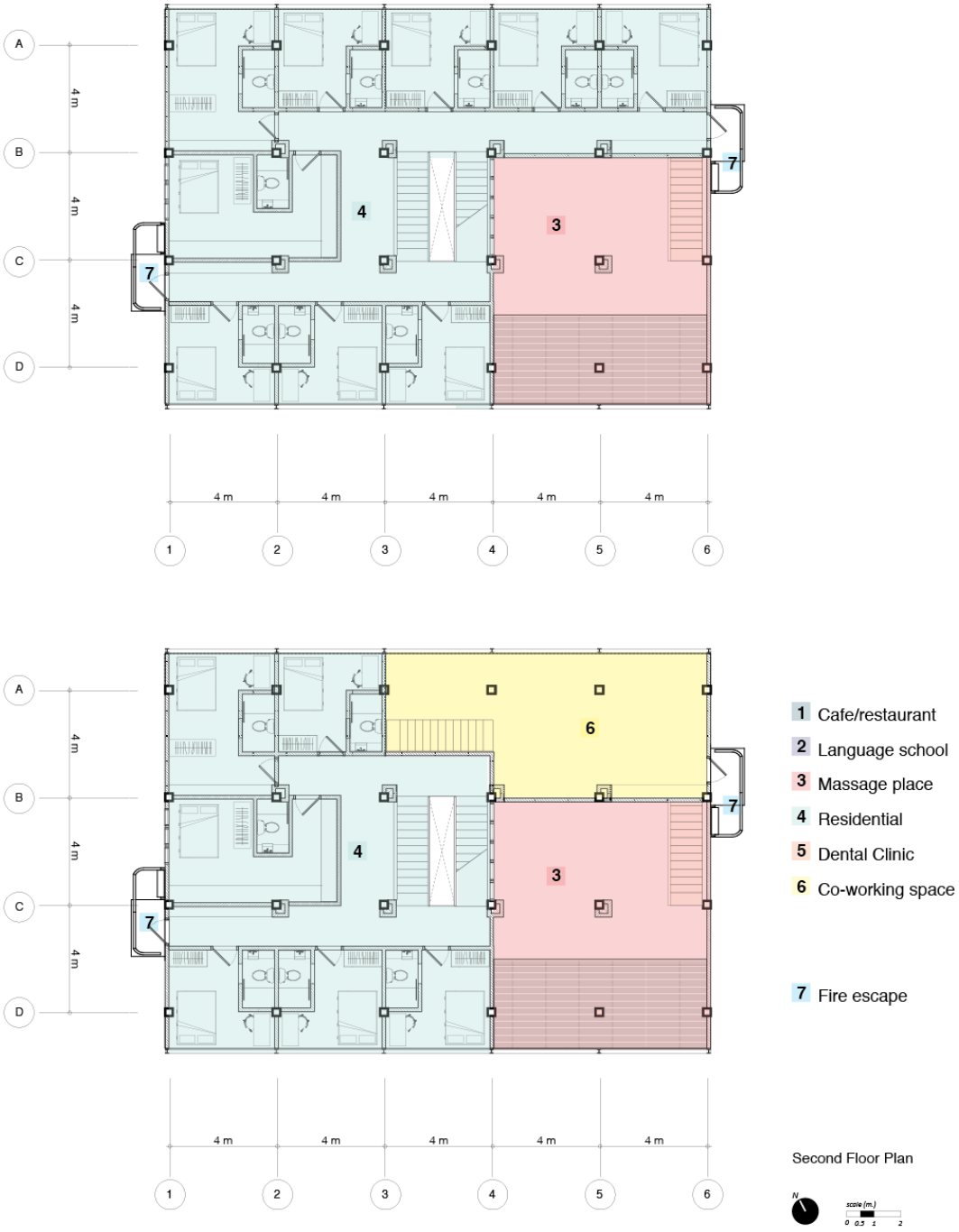


Figure 57 Second floor plan with initial program (above), with scenario 1 (below)

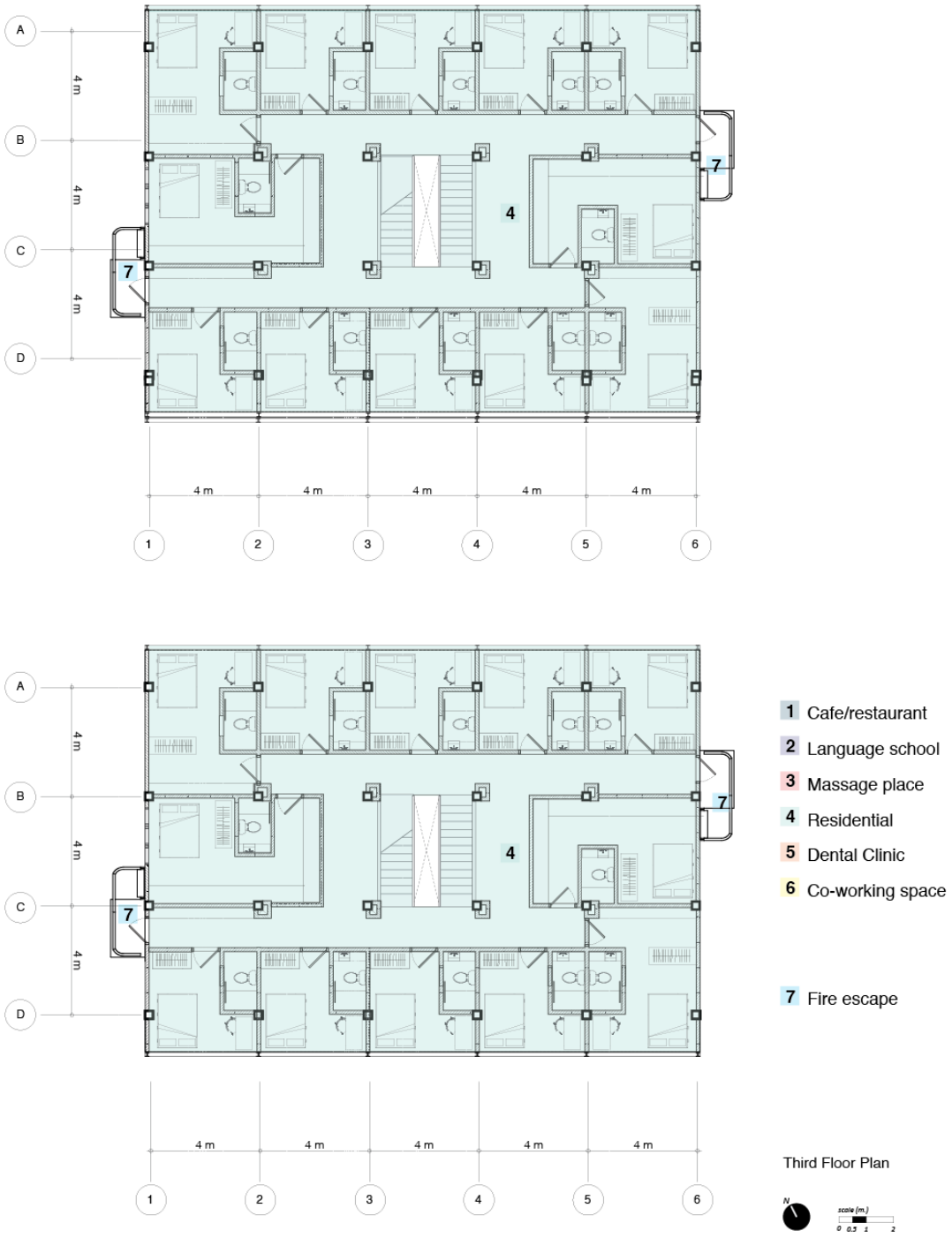


Figure 58 Third floor plan with initial program (above), with scenario 1 (below)

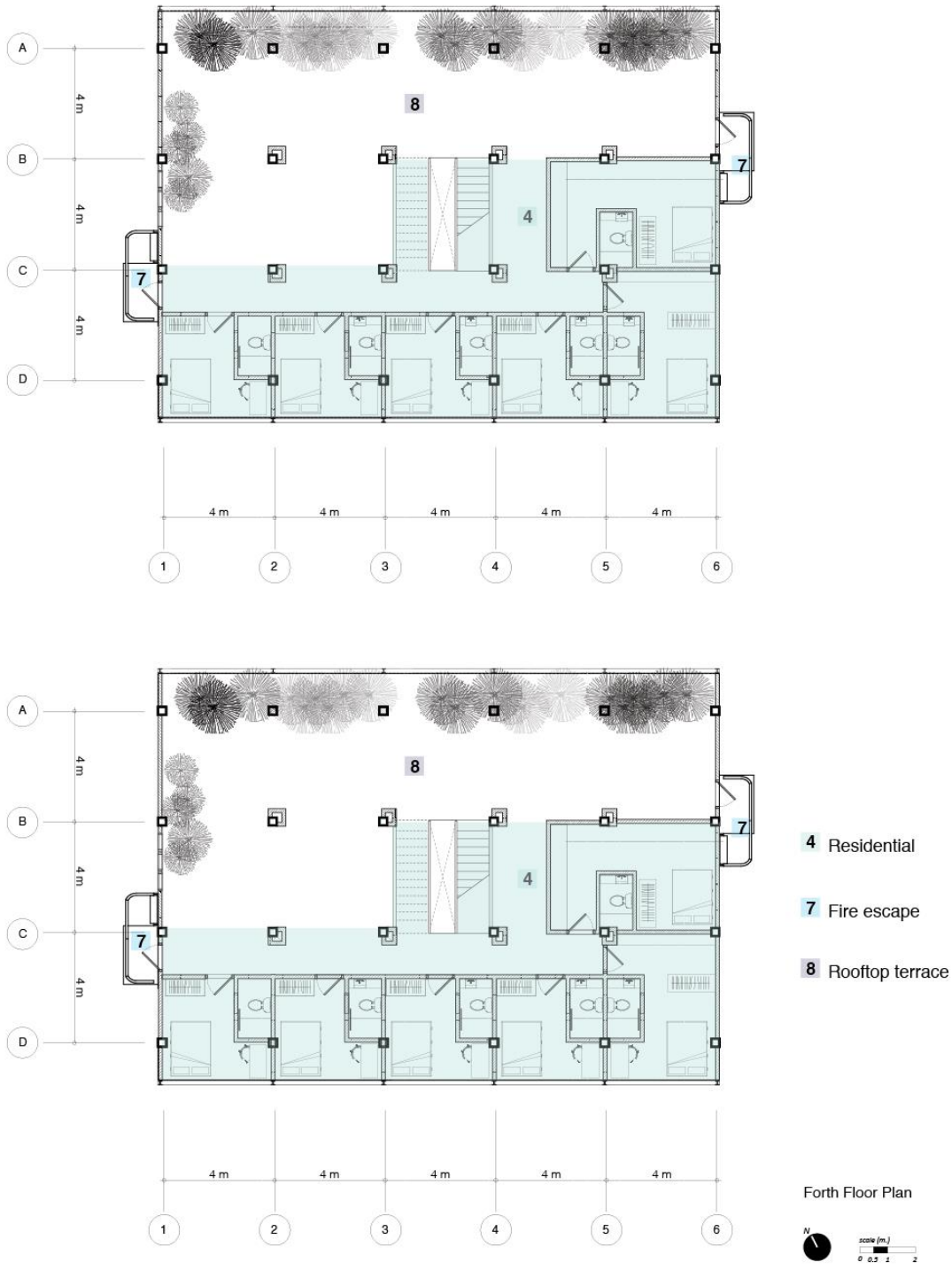


Figure 59 Forth floor plan with initial program (above), with scenario 1 (below)

Figure 54-59 show the precise arrangement of the space configuration that can be adapted overtime. Part of the building that direct contact with the exterior dedicated

to living unit which need ventilation and natural light. The positions of shaft are distributed throughout the floor plan to support any connection needed (figure 60).

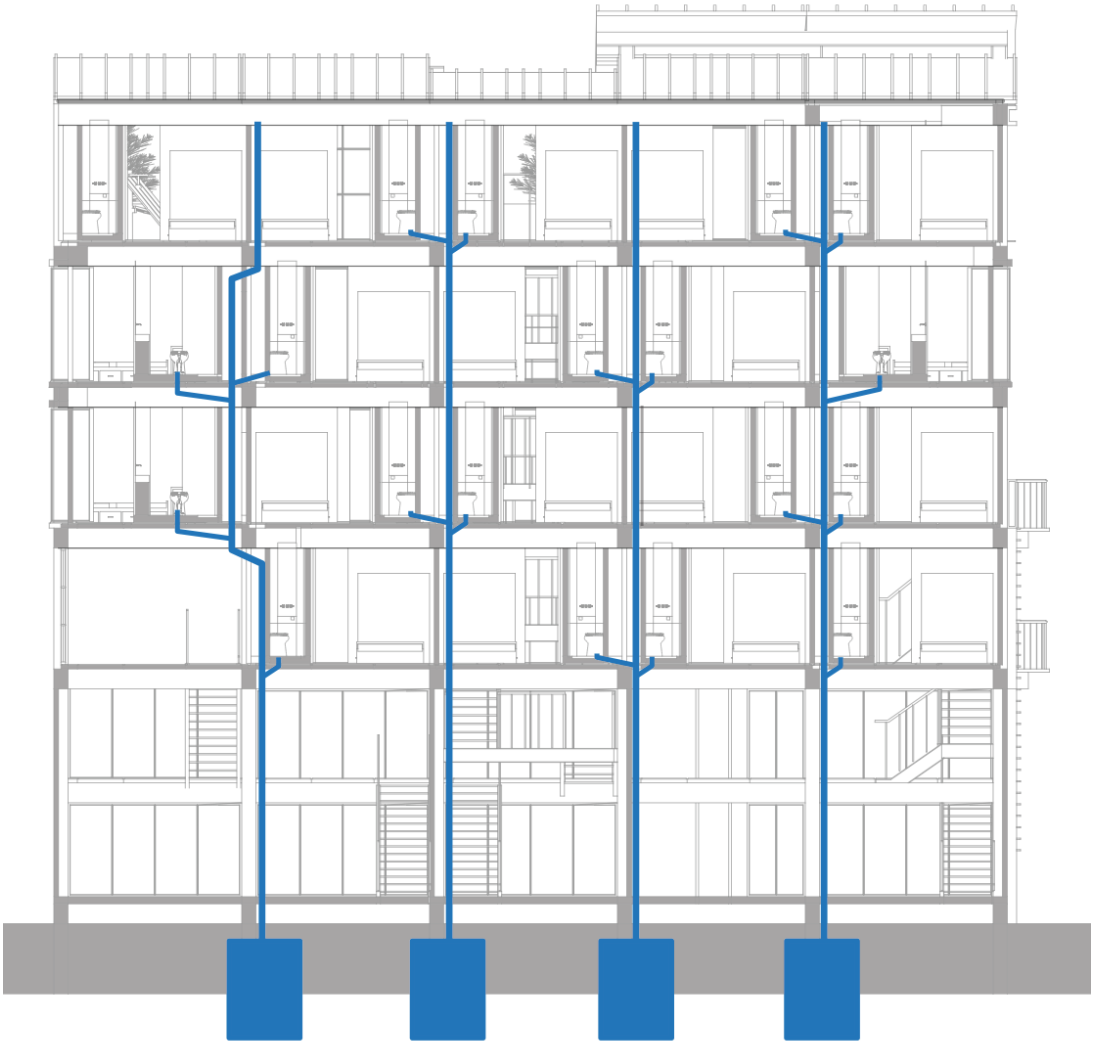


Figure 60 Shaft along the structural column

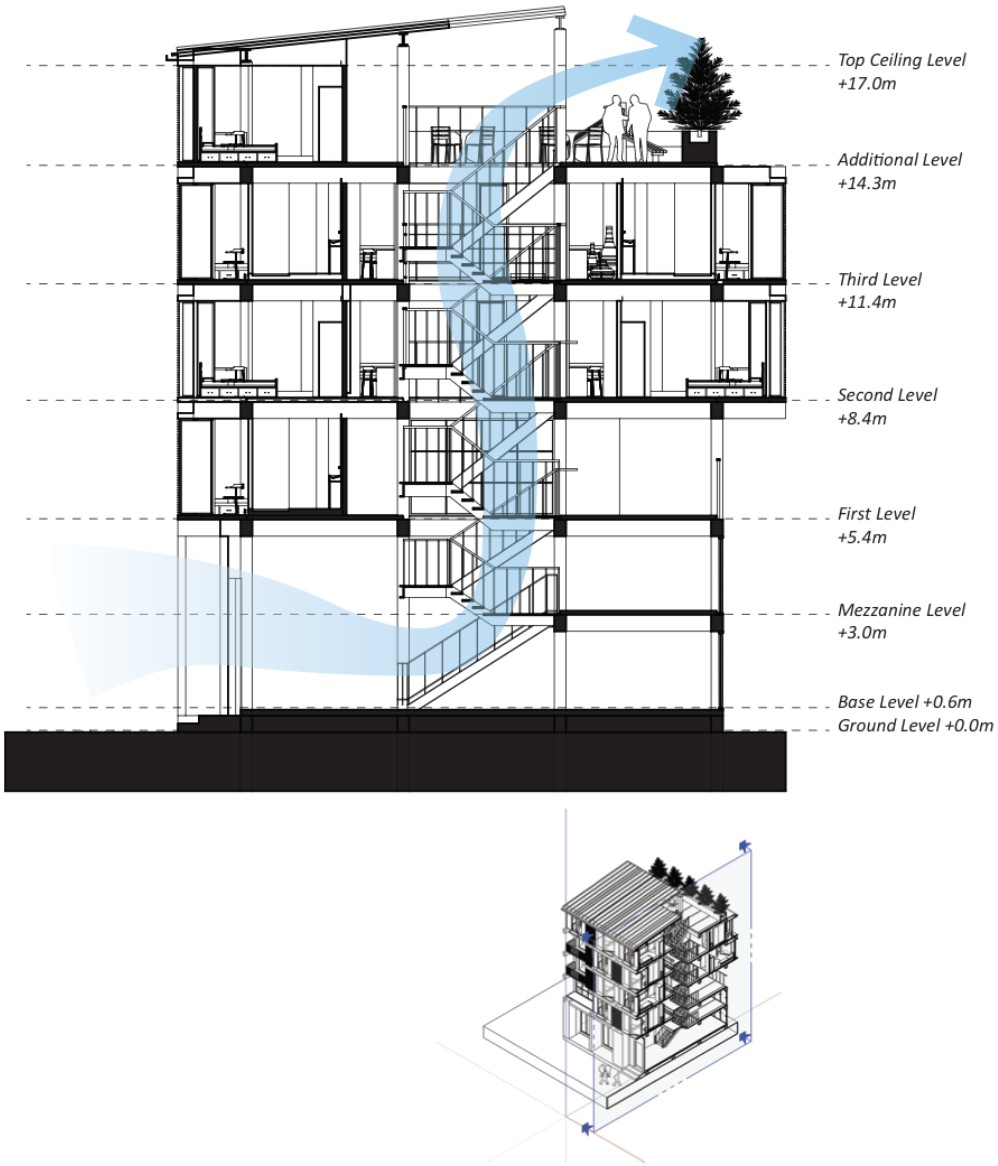


Figure 61 Ventilation in the middle part of the shophouse

In this scenario, the residential staircases with the internal void are placed in the middle part of the shophouse to allow the ventilation and light through interior space as shown in figure 61. The implementation of modular slab, metal stair and façade frame with adaptable module is shown in figure 62.

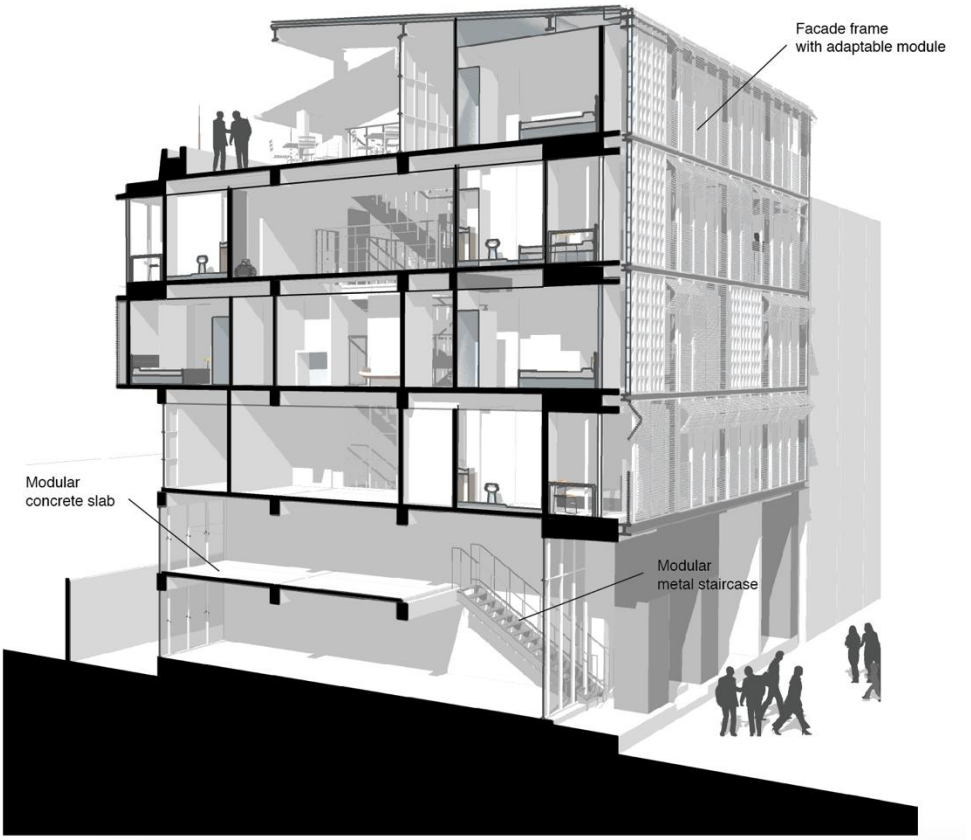


Figure 62 Implementation of slab, stair and facade frame

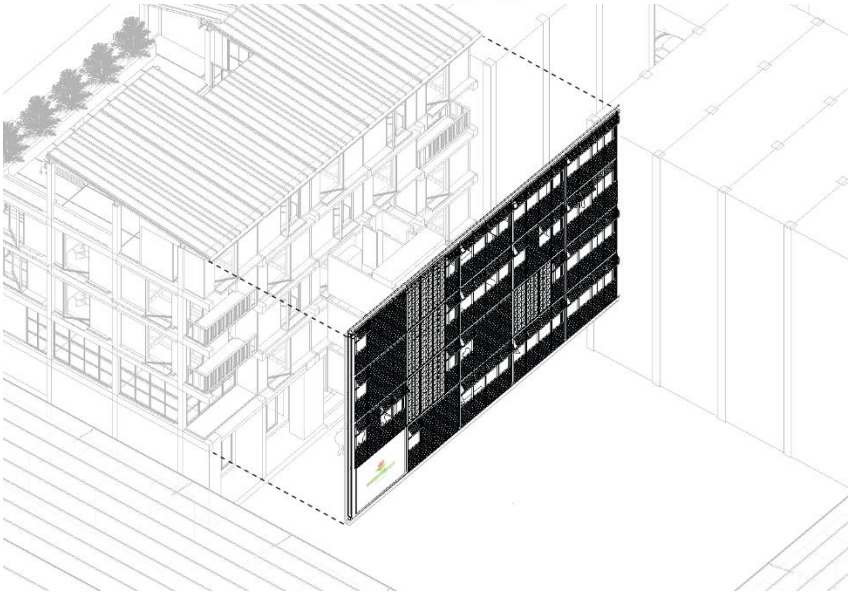


Figure 63 façade frame with adaptable façade module

Figure 64 Perspective rendering

Figure 64 shows the perspective view in the pedestrian level approaching the site.

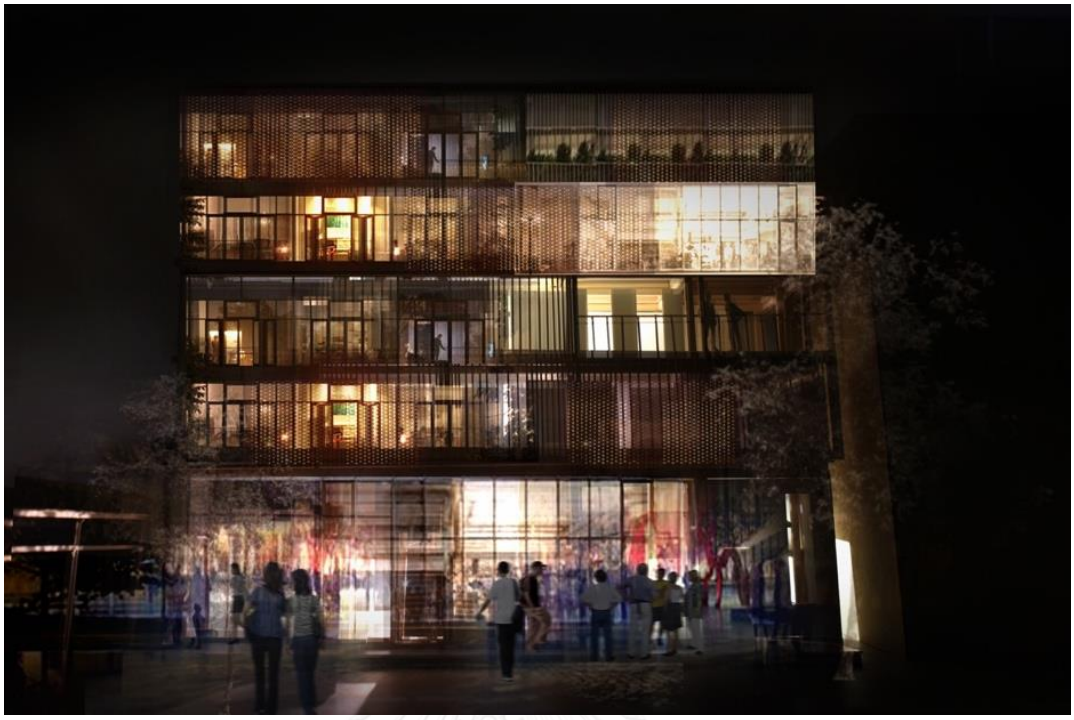


Figure 65 Night rendering

The design implementation for vacant shophouse in Asoke shows the possibility to put this guideline to a pragmatic use. This guideline can be implemented in different sceneries and context, depending on the specific requirement of the project. To this end, the outcome of this study is not intended for specific aim, but rather an open guideline of possibilities in reusing of old shophouse in Bangkok.

Chapter 6 Conclusion and Suggestion

6.1 Conclusion

In present day, many shophouses in Bangkok are in vacant condition or underutilized because the existing physical component cannot support to the new usage pattern. This means the building is difficult to adapt for new use. Demolition and reconstruction a new shophouse in the same footprint are impossible because of the constraint in regulation. Therefore, the reuse of shophouse is necessary.

To allow adaptability in building, the theoretical framework developed by Habraken and Open Building of Support and Infill is selected as the departing point for this study. Support provides all necessary services such as structure, building infrastructure, or the circulation for occupants. On the other aspect, Infill is any movable parts that can be altered individually without affecting the Support. This provides the opportunity for user to make any change and adaptation in the building according to their needs over time. For this purpose, this study establishes the design guideline that helps architects, shophouse owners and developer to achieve the adaptable shophouse project.

The survey of existing shophouse in Bangkok proves that shophouse is flexible typology but unlikely adaptable due to the conflict between physical component and spatial character. Moreover, this transformation usually occurs against the regulation in the aspect of building modification.

To achieve adaptability in shophouse typology, the connection of physical component and the configuration of space are established in order to increase the adaptable capability. The existing shophouse is dismantled to analyze the individual components to understand its functions. The theoretical framework of Support and Infill is used to point out what are components that limit the reconfiguration of floor plan for the

future adaptability. The component such as structural column and beam, piping system, and neutral façade frame are reconfigured as Support whereas the rest are Infill. These components intend to serve as service part of the building that are occupied by variety of Infills. The potential of Support and Infill offer a number of possible arrangements and configurations in the shophouse layout. It is believed to respond to different needs of user that can be adapted not only for the residential, but non-residential function as well. The design of the Support and Infill in adaptable shophouse to achieve the adaptability in shophouse is summarized as follow;

1) Install the main piping system (shaft) along the structural column (Support component)
2) Install façade frame with adaptable types of façade module (Support component)
3) Use of module prefabricated stair and floor slab for the ease of reorganize the floor plan, void, and vertical circulation (Infill component)

To test out the design, this adaptation model is applied to actual site in Asoke. With specific context, the site and user analysis helps to develop the program of this building. The program is divided into two stages; the initial program, and the projection program. The proposed design shows that with the adaptation guideline, the building components can be adapted to support the projection program in the future.

To discuss this further, the analysis in chapter 3 shows the space configuration of shophouse that reveals irregularity in usage pattern and can be varied according to the usage. However, shophouse structure, supporting utility, position of stair, as well as façade are designated in a fixed position in shophouse that are unable to support irregularity in usage pattern. The proposed design guideline establishes the connection of physical components and configuration of space that reconnect this conflict by proposing new configuration of piping system, the use of façade frame, and modular stair and slab.

From this point, the advantage of this design would allow the endless possibility in transforming architectural layout that can be adapted to variety of usage pattern once the connection is established. In the area where the transformation of shophouse frequently occurs, the implantation of this adaptability guideline would encourage the reuse of old shophouse to revitalize the neighborhood instead of abandonment. However, the first implementation requires dismantle of many parts of shophouse in order to install the Support system. This is perhaps considered as the disadvantage of this design.

As this thesis aims to enhance the adaptability in shophouse that focus on the architectural aspect, however, in the transformation process, other factors such as investment and financial concern, leasing contract, construction method, or material performance should also be further discussed. The new development in technology and building construction is also reshaping the Support and Infill components that can be applied further. For example, the façade system that is integrated with energy enhancement panel can be replaced the conventional one.

Another limitation of this study is the regulation framework that limits the modification of shophouse as mentioned in the earlier chapter. This issue is one of the most significant aspect that need to be discussed so that the study in this topic could be further elaborated and make it into pragmatic use.

In the future, it is necessary to think that how these ideas of adaptability could answer the higher demands of consumer choice, responsiveness, and technical upgrade that need to be discussed. Finally, this idea of adaptability could be further studied for other types of building rather than the shophouse.

6.2 Suggestions

For shophouse owner and real estate developer, the adaptable guideline can increase the real estate values as well as the efficiency in the space utilization. This is important to note that the adaptation model can be improved by further study in various scenarios and aspects of shophouse in Bangkok. More interview with various generations of occupant in the shophouse will also help architects in shaping the design of Support and Infill of the future design.

Moreover, the regulation review related to the modification of building should be deployed in order to allow new possible adjustment to existing building. Perhaps, the allowance for percentage in modification according to the regulation especially in shophouse typology should be increased, so that various alternative in adaptive reuse shophouse designs could be developed.

As an architect, it is important to note that the way of people lifestyle has been always changing according to many factors. Therefore, the adaptive characteristic of architecture is significant for further innovative design.

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