# ARCHITECTURAL DESIGN FACTORS INFLUENCING PEDESTRIAN FLOW IN COMMUNITY MALLS: A CASE STUDY OF THONG LO

Miss Nicha Wiboonpote

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

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# ปัจจัยในการออกแบบสถาปัตยกรรมที่มีอิทธิพลต่อการเดินเท้าภายในศูนย์การค้าชุมชน: กรณีศึกษาทองหล่อ

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| Thesis Advisor | Pat Seeumpornroj, Ph.D. |

Accepted by the Faculty of Architecture, Chulalongkorn University in Partial Fulfillment of the Requirements for the Master's Degree

.....Dean of the Faculty of Architecture

(Associate Professor Pinraj Khanjanusthiti, Ph.D.)

THESIS COMMITTEE

.....Chairman

(Associate Professor Pinraj Khanjanusthiti, Ph.D.)

.....Thesis Advisor

(Pat Seeumpornroj, Ph.D.)

.....Examiner

(Assistant Professor Vorapat Inkarojrit, Ph.D.)

จุฬาลงกรณ์มหาวิทยาลัย
Chulalongkorn University

.....Examiner

(Assistant Professor M.L. Chittawadi Chitrabongs, Ph.D.)

.....External Examiner

(Assistant Professor Peeradorn Kaewlai, Ph.D.)

นิชา วิบูลย์พจน์ : ปัจจัยในการออกแบบสถาปัตยกรรมที่มีอิทธิพลต่อการเดินเท้าภายในศูนย์การค้าชุมชน: กรณีศึกษาทองหล่อ (ARCHITECTURAL DESIGN FACTORS INFLUENCING PEDESTRIAN FLOW IN COMMUNITY MALLS: A CASE STUDY OF THONG LO) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: ดร. ภัทร์ สีอัมพรโรจน์, หน้า.

ในระยะเวลาสิบปีที่ผ่านมาศูนย์การค้าชุมชนเป็นรูปแบบธุรกิจการค้าที่มีการเติบโตสูงเป็นอันดับต้นๆ ของกรุงเทพ การเติบโตนี้มีผลมาจากลักษณะอาคารและประเภทผู้เช่าที่ตอบรับกับการใช้ชีวิตของคนเมือง รวมถึงกฎหมายผังเมืองที่มีข้อจำกัดมากสำหรับห้างสรรพสินค้าขนาดใหญ่ในเขตที่อยู่อาศัย ในปัจจุบันศูนย์การค้าชุมชนมีลักษณะเป็นอาคารสามถึงสี่ชั้นมากขึ้นในเขตที่อยู่อาศัยหนาแน่น โดยเฉพาะทองหล่อ เนื่องจากราคาที่ดินที่ปรับตัวสูงทำให้การสร้างศูนย์การค้าชุมชนแบบหนึ่งถึงสองชั้นนั้นไม่คุ้มค่ากับการลงทุน อย่างไรก็ดีศูนย์การค้าชุมชนแบบสามถึงสี่ชั้นนั้นมักประสบกับปัญหาลูกค้าไม่กระจายตัวสู่ชั้นบน ส่งผลให้ผู้เช่าที่อยู่ชั้นบนมีโอกาสในการขายน้อย ดังนั้นการปรับปรุงรูปแบบอาคารเพื่อสร้างความชักจูงให้ลูกค้าขึ้นชั้นบน จึงมีความจำเป็นอย่างยิ่งสำหรับความอยู่รอดของศูนย์การค้าชุมชน การวิจัยครั้งนี้มีวัตถุประสงค์เพื่อนำเสนอปัจจัยในการออกแบบสถาปัตยกรรมที่มีผลต่อการเดินเท้าภายในศูนย์การค้าชุมชน

กระบวนการในงานวิจัยเริ่มจากการเก็บรวบรวมข้อมูลจากเอกสารทางวิชาการ ร่วมกับการสัมภาษณ์สถาปนิกและผู้พัฒนาโครงการ เพื่อสร้างกรอบการวิจัยและศึกษาทฤษฎีที่นำไปสู่วิธีการเก็บข้อมูลของกรณีศึกษาในบริเวณทองหล่อ โดยมีสมมุติฐานและวิธีการเก็บข้อมูล ดังนี้ สมมุติฐานที่หนึ่ง ผู้เช่าหลักสามารถดึงดูดลูกค้าให้ขึ้นชั้นบนได้ สมมุติฐานที่สอง การอำนวยความสะดวกแก่การเคลื่อนตัวระหว่างชั้นสามารถกระจายลูกค้าขึ้นสู่ชั้นบนได้ ทั้งสองสมมุติฐานนี้มีการเก็บข้อมูลโดยการจดบันทึกประเภทและตำแหน่งที่ตั้งของผู้เช่า รวมถึงการสังเกตทิศทางในการเดินของลูกค้า สมมุติฐานที่สาม ความชัดเจนในการมองเห็นชั้นบนจากทางเข้าสามารถชักจูงให้ลูกค้าขึ้นชั้นบนได้ การเก็บข้อมูลในข้อนี้แบ่งเป็นสองส่วน ส่วนแรกคือการเก็บภาพ ๓๖๐ องศาจากทางเข้าโครงการแต่ละจุด ส่วนที่สองคือการใช้ชุดคำสั่งโปรแกรมเพื่อคำนวณระยะการมองเห็น

หลังจากทำการวิเคราะห์ข้อมูลดังกล่าว พบว่านอกจากผู้เช่าหลักแล้ว ผู้เช่าประเภทโรงเรียนกวดวิชาและศูนย์ออกกำลังกายก็มีผลต่อทิศทางการเดินของลูกค้าเช่นกัน ในส่วนของความสะดวกสบายของลูกค้า พบว่าศูนย์การค้าชุมชนมักใช้ทางขึ้นลงประเภทบันไดและลิฟท์ โดยทางขึ้นลงควรตั้งอยู่ใกล้กับทางเข้า ทั้งนี้ไม่ใช่เพียงทางเข้าหลักหน้าโครงการเท่านั้น แต่รวมถึงทางเข้าจากที่จอดรถด้วย ส่วนความชัดเจนในการมองเห็นระหว่างชั้นนั้นมีองค์ประกอบหลักคือสัดส่วนของโถงอาคาร ความสูงระหว่างชั้น และความกว้างของทางเดินชั้นบน เมื่อนำเกณฑ์เหล่านี้มาใช้เป็นแนวทางการออกแบบ พบว่าชั้นบนของอาคารศูนย์การค้าชุมชนมีการเข้าถึงที่ง่ายและทั่วถึงมากขึ้นเมื่อเทียบกับกรณีศึกษา สุดท้ายนี้คาดว่าผลงานวิจัยจะสามารถเสนอแนะแนวทางการออกแบบที่เหมาะสมกับพฤติกรรมการใช้พื้นที่ของลูกค้าได้ต่อไป

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สาขาวิชา การออกแบบสถาปัตยกรรม ลายมือชื่อนิสิต .....

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# # 5773701325 : MAJOR ARCHITECTURAL DESIGN
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NICHA WIBOONPOTE: ARCHITECTURAL DESIGN FACTORS INFLUENCING PEDESTRIAN FLOW IN COMMUNITY MALLS: A CASE STUDY OF THONG LO. ADVISOR: PAT SEEUMPORNROJ, Ph.D., pp.

During the past decade, community malls are in the fastest growing category of Bangkok's retail industry. This growth was due to their building layouts and types of tenants which match urban lifestyles; along with Bangkok zoning restrictions for large shopping centers in residential areas. Today, the number of community malls with three or more floors (mid-rise community malls) is growing, especially in Thong Lo. This is because of the increasing land prices, where investments in community malls with one-two floors are no longer cost-effective. However, mid-rise community malls commonly have the issue of low pedestrian flows on the upper floors, which leads to lower chances of sales for the tenants. Accordingly, adjustments of building layouts to encourage customers to visit the upper floors are necessary for survivals of the community malls. This research aims to provide architectural design factors influencing pedestrian flows in community malls.

For the research method, frameworks and theories are studied from literature reviews and interviews with architects and developers to form a research methodology for case studies in Thong Lo. Four methods for data collections are formed from three hypotheses. The first and the second hypotheses are the anchor tenants can draw customers to the upper floors, and the effortlessness in moving between floors can distribute pedestrian flows to the upper floors. The data of tenant placements, tenant mix, and pedestrian patterns are collected for these parts. The third hypothesis is visual accesses from entrances can encourage the customers to the upper floors. Here, the panoramic photograph is captured from each entrance and visibility graphs are generated from the program called DepthmapX (UCL, 2017).

After these data are analyzed, it is found that apart from the anchor tenants, tenants such as learning centers and fitness centers can also encourage the flow of the customers. For the effortlessness, the combinations of vertical paths in most community malls are stairs and elevators. These vertical paths should be located near both main entrances and entrance from parking areas. The visual accesses in the community malls mostly rely on the relationships between atria, vertical distances between floors, and widths of corridors. When these design criteria are implemented to the proposed community mall, the result of the visibility graph shows that the upper floors are easier for the customers to access when compares with the case studies. All in all, this research is anticipated to provide design suggestions based on customers' behaviors.

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Chulalongkorn University

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# CHAPTER 1
# INTRODUCTION

## 1.1 Problem statement and research significance

Community malls are in the fastest growing category of Bangkok's retail industry. Their growths rapidly increase every quarter from 300,000 sq.m. in 2007 to 1,167,300 sq.m. in the third quarter of 2016 (Kongcheep, 2016). This accelerating growth was due to their conveniences which match lifestyle changes in Bangkok; along with Bangkok zoning restrictions where big retailers find it difficult to open large shopping centers in residential areas (Suthisopapan & Madan, 2014). Many real estate developers and investors believed that their investments would not only be cost-effective but would also add value to residential developments nearby. This phenomenon is clearly visible in Thong Lo where more than ten community malls have been opened in the past decade.

Community malls in Bangkok share similar characteristics, where they are open-air malls providing at least one of the following functions, which are convenience shopping for daily needs, and food service and entertainment for customers' experiences. These characteristics derived from the customization strategy where functions in community malls are adjusted to suit target customers in their trade areas. From the observation of 70 community malls in Bangkok in 2016 (Figure 1.1), their characteristics can be related to the definitions of a neighborhood center and a lifestyle center in the United States (Table 1.1). The neighborhood center offers products and services focused on daily shopping needs, for example, supermarkets, dry cleaners, and pharmacies. The lifestyle center consists of specialty stores with food services and entertainments, such as restaurants, coffee shops, and hair salons. In Thong Lo, there are two neighborhood centers and nine lifestyle centers. However, the two neighborhood centers in Thong Lo also provide restaurants and coffee shops. This is because the district is famous for hangout places and nightlife attractions. Thus, community malls in this area do not only attract people in the neighborhood for convenience shopping but also attract tourists and people from other parts of Bangkok for entertainments as well.

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*Table 1.1 United States shopping-center classification, adapt from ICSC, 2015.*

| Type of shopping center | Concept | Number and type of anchors | Typical number of tenants |
|---|---|---|---|
| Neighborhood center | A center which offers products and services focused on daily shopping needs. | One or more Supermarket | 5 - 20 tenants |
| Lifestyle center | A center which provides food services and entertainments in an outdoor setting. | None to two Specialty stores | NA |

An anchor tenant is a tenant(s) within a shopping center that makes the center economically feasible by being (one of) the primary draw(s) of customers to that center (International Council of Shopping Centers, 2010). Typical anchors in community mall scheme are supermarkets, restaurants, and cafés.

Today, community malls in Bangkok show the trend of growing upwards. From figure 1.1, it appears that the 22 community malls that have three or more floors above ground (Mid-rise community mall) are mostly located in the urban area of Bangkok and along the Mass Transit System (BTS and MRT) in the out of town area. This trend is evident, especially in Thong Lo, where nine community malls from the total of eleven are mid-rise (Figure 1.2). Community malls in Thong Lo started to expand themselves vertically instead of horizontally due to the limitation of land in the urban area and the increasing land prices. The official evaluation of land price in Thong Lo is currently set at 420,000THB per sq.wah (The Treasury Department, 2016). However, the price is expected to stay at least 20 - 30% above the official evaluation price (The Nation, 2016). This land price means the low-rise community malls in Thong Lo are no longer cost-effective despite their potential growths.

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This trend of vertical expansion in community malls leads to the issue of low pedestrian flows on the upper floors (Figure 1.3). In general, all shopping centers encounter a common challenge to distribute customers to visit all commercial parts of the buildings. Their attempts to distribute the pedestrian flows derived from the mutual understanding that if customers walk through the entire shopping center, the probability that they will spend money increases (Garg & Steyn, 2015). By expanding vertically, mid-rise community malls are struggling to encourage pedestrian flows to the upper floors. This is because shoppers are generally reluctant to climb up even though elevators and escalators are provided (Yiu, Xu, & Ng, 2008).

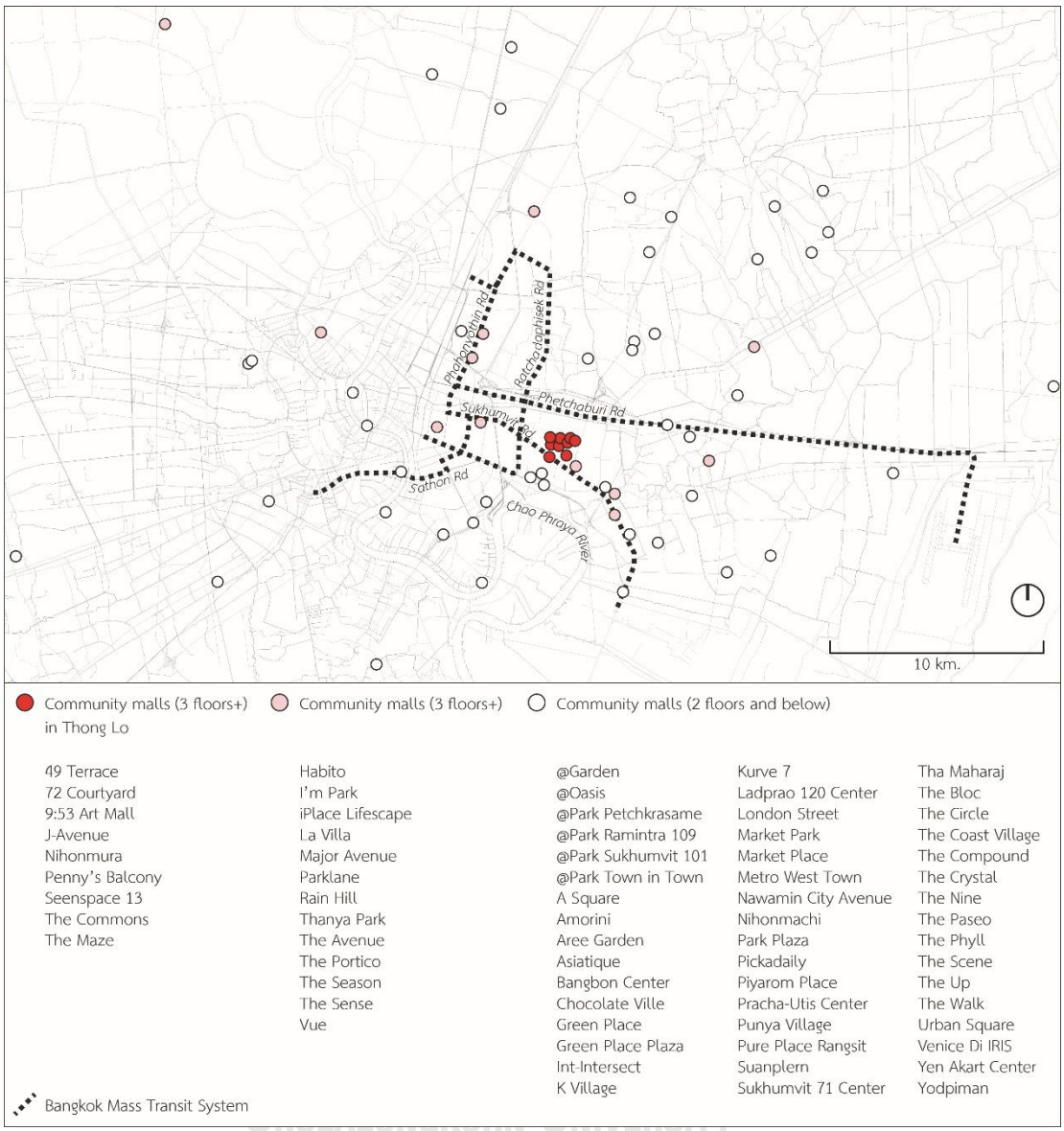


*Figure 1.1 A map shows 70 community malls in Bangkok, 2016.*

This issue leads to several difficulties for both tenants and developers. For tenants, low pedestrian flows in front of their stores mean there are lower chances of sales. This implies that these tenants may close their businesses, as their revenues cannot sustain their leases. These occurrences lead to the decrease in occupancy rates of the community malls. Consequently, the developers have to find extra tenants where they risk discounting their rental fees to meet full occupancy rate. This can result in the declines in revenues and net profit growths of the projects.

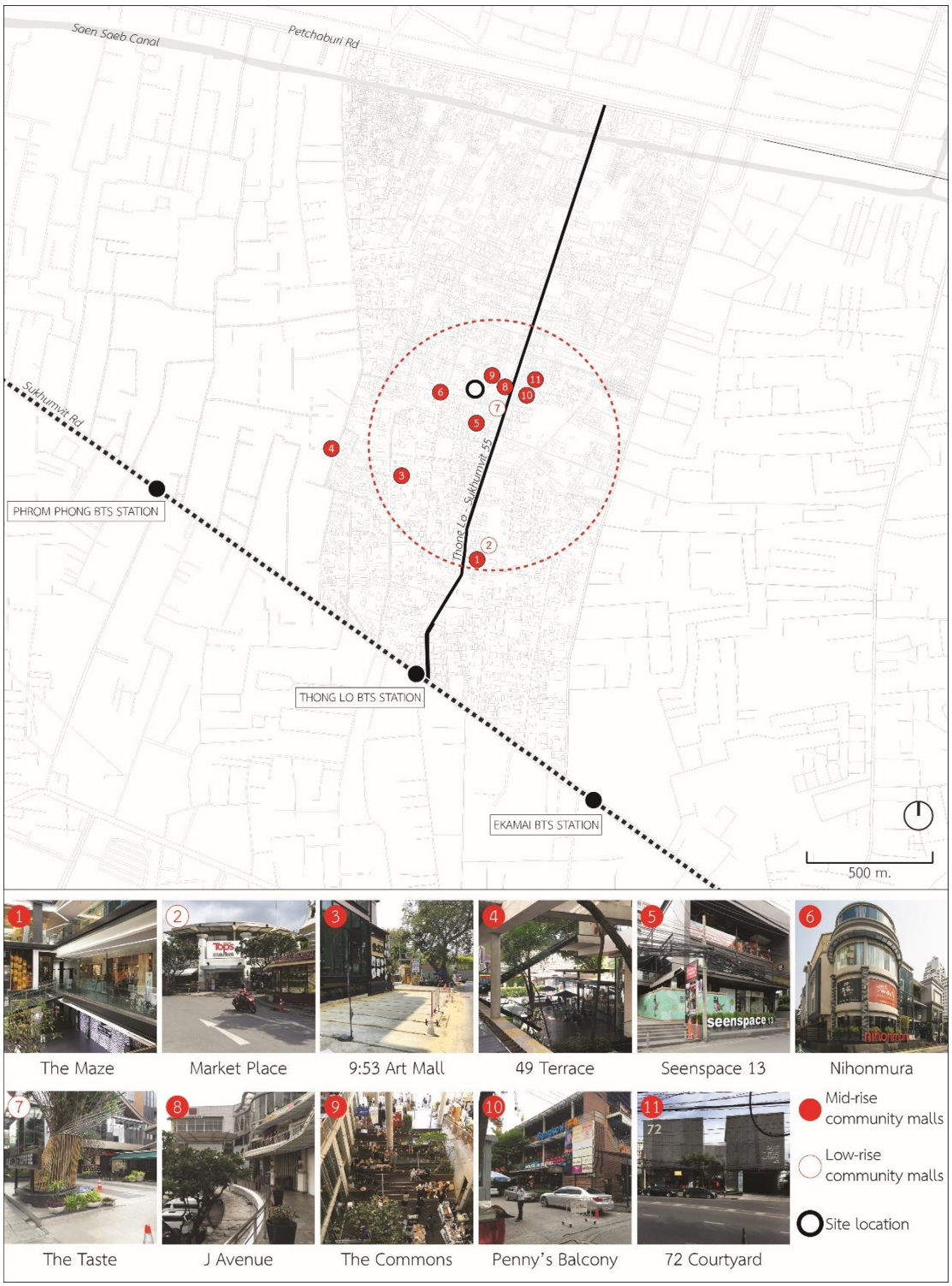


*Figure 1.2 Community malls in Thong Lo, 2016.*


*Figure 1.3 Pedestrian flows on the first floor (left) and the third floor (right), J Avenue, Thong Lo, February 2016.*

To distribute pedestrian flows evenly across the areas in the malls, this research focuses on three main theories, which are the anchor tenants, the economy of movement, and the visual and physical accesses.

In the first theory, anchor tenants refer to one or more tenants within a shopping center that makes the center economically feasible for its developer by being main attractions of the customers to that center (International Council of Shopping Centers, 2010). Commonly, each anchor tenant is placed at opposite ends of the shopping center so that the customers will have to walk past other shops to travel from one anchor tenant to another (Figure 1.4). This space arrangement to manipulate directions of pedestrian flows is widely referred to as the classic dumb-bell strategy. However, mall configurations are now developed to become more complex with vertical expansions. This results in the use of more complicated dumb-bell strategy (Fong, 2003). By applying the strategy with a mid-rise community mall, it means that an anchor tenant must be located on the top floor to distribute customers across the other floors in between. This solution is challenging to developers, as most anchor tenants are not interested in the top floor locations. Moreover, since community malls benefit from their presences, these anchor tenants have higher negotiation powers in their rental agreements and preferred locations (Meekhanon, 2016). In this section, the research aims to prove if the anchor tenants can draw customers to the upper floors. Additionally, it also aims to search for other types of tenants in community malls that can distribute customers across different floors.

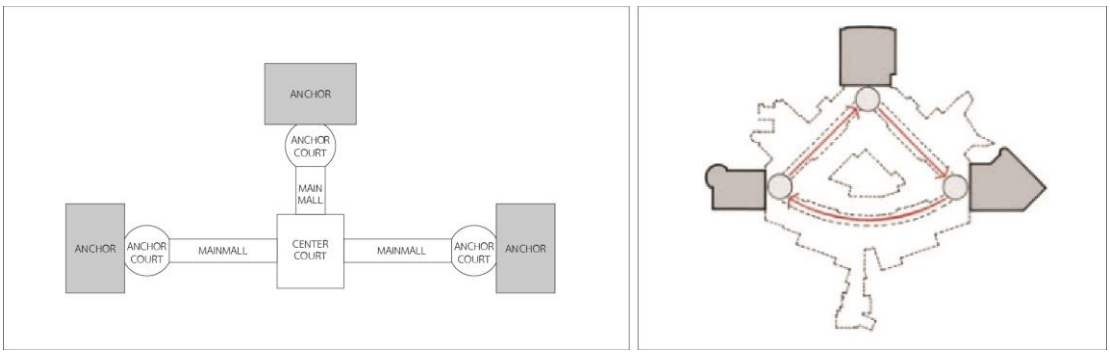


*Figure 1.4 A diagram of a regional center, redrawn from Urban Land Institute, 2004 (left) and a mall plan shows strategic positioning of anchor tenants, Coleman, 2006 (right).*

In the second theory, the economy of movement, this research continues to question the fundamental reasons why customers are not willing to move up to the upper floors. The economy of movement is the path choices analysis based on the cost (time and effort) that the customers have to make in order to get to their destinations (Bitgood & Dukes, 2005). Following the principle of least effort (Zipf, 1949), the choices are naturally made based on the least effort necessary. Thus, by moving between floors, a greater effort is required. Moving up using stairs takes on average seven times as much energy as walking on the flat (Neufert & Neufert, 2000). While the inventions of elevators and escalators can alter these costs, the customers still have to consider their costs by different means. For elevators, the customers may have to consider their waiting times. For escalators, even though their usages can ease the transitions between different floors and create continuous flows of customers, their fixed of directions (separating up and down movements) can increase the overall proximity of the paths. The hypothesis in this section is that the effortlessness in moving between different floors can help to distribute pedestrian flows evenly inside the mid-rise community malls.

The third theory focuses on relationships between visual and physical accesses. To identify path choices, visual accesses are required as a critical factor for the customers. Their relationships are expressed where visual information is linked to path choices made by customers. The paths are selected according to the available information in the immediate surrounding area (Zacharias, 2002). The hypothesis in this section is that the more visual

accessibility between the first floor and top floor of mid-rise community malls, the more likely that the customers will visit the upper floors.

In conclusion, the research question of this thesis is, what are architectural design factors that solve the common issue of low pedestrian flows on upper floors found in mid-rise community malls in Bangkok? The research will draw conclusions to form architectural design factors from the three hypotheses mentioned earlier, which are the types of tenants and tenant placement, the balance between the destination and effort required from the customers, along with the relationship between visual and physical accesses.

## 1.2 Purpose of the study

This thesis aims to study the relationships between spatial configurations and pedestrian flows in mid-rise community malls in order identify the architectural design factors that influence pedestrian flows to the upper floors. Following the three hypotheses, the design solutions are expected to enhance the connections between each floor of mid-rise community malls in order to evenly circulate the pedestrian flows within the buildings.

The research-based design will be applied to the selected site located between Thong Lo 13 alley and Thong Lo 15 alley (Figure 1.2). The location is in the middle of Thong Lo development area where there is the cluster of mid-rise community malls. This area is viewed as an opportunity to build collaborations between each community malls in order to attract more customers to Thong Lo.

## 1.3 Scope and limitation

In this section, there are the scope of areas, the scope of the theoretical framework, and the limitation of the study. The scope of areas is in Thong Lo, Bangkok. This also scopes the definition of community malls defined in this research, as an open-air mall, which provides food service, and entertainment for customers. This research focuses on the mid-rise community malls, where the issue of low pedestrian flows on the upper floors is evident.

The scope of the theoretical framework is mentioned in this section to explain the uses of two research methods in the evidence-based case studies, which are the qualitative and quantitative methods. The qualitative method is conducted by field observations using the theory of Observing Environmental Behavior by John Zeisel. The quantitative method is generated as Visibility Graph Analysis (VGA), which a set of spatial analyses based on Space Syntax by Bill Hillier. These two methods are necessary. While the qualitative method can identify the customers' behaviors, the quantitative method can distinguish the pedestrian flows influenced by the environments of the cases from the configuration of spaces.

The limitation of the study derives from specialties of community malls themselves. Since they are relatively new compared to other types of malls; the definition of the term is uniquely defined. This means that there are limited research papers on community malls themselves, and even fewer research papers specific to the architectural topics. Nevertheless, community malls still share similar fundamental strategies with other types of malls. Accordingly, many books and research papers in the literature review section are based on various types of malls.

1.4 Benefit of the study (research outcome)

The outcome of this research is presented in form of the design solutions to influence the distribution of pedestrian flows evenly across the areas in the mid-rise community malls. Here, the benefits can be categorized into two aspects, the design aspect and the commercial aspect. In the design aspect, this outcome can act as a guideline for architects to better understand behaviors and movements of the customers in the mid-rise community malls. This includes the tenant placement, the arrangement of entrances and different types of vertical paths, and the use of atria as visual connections between different floors.

For the commercial aspect, the design solutions provide alternative options for the mid-rise community malls which are unable to attract anchor tenants to their projects. Accordingly, this can benefit several groups of people, including the tenants, the developers, and the people in surrounding areas. For the tenants, the distributions of pedestrian flows all over the malls, and not only the prime locations, can help those tenants who cannot afford the

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higher rental prices. For the developers, they can increase the chances of sales on the upper floors of community malls by reducing the differences between prime areas and segregated areas of the malls. This distribution of pedestrian flows will also optimize rental return to the investors. Consequently, the successful community malls also increase the surrounding property values and widen the opportunity for the development of the neighborhood in the future.

1.5 Research methodology

There are four parts in the method of the study. First, the frameworks are set from literature reviews and preliminary field research. Second, the research methodology is chosen to identify the architectural design factors that influence pedestrian flows to the upper floors in the mid-rise community malls. Third, the design criteria are formed from the analysis. Finally, the research-based design is proposed (Figure 1.5).

This section explains the research methodology of this thesis. After the literature reviews on the theories of architectural design factors influencing pedestrian flows, three hypotheses can be concluded. First, the anchor tenants can draw customers to the upper floors. Second, the effortlessness in moving between different floors can help distribute pedestrian flows evenly inside the mid-rise community malls. Third, the more visual accessibility between the first floor and top floor of mid-rise community malls; the more distributed the pedestrian flows. These three hypotheses are used to explore the units of analysis in evidence-based case studies conducted in seven cases (six mid-rise community malls in Thong Lo, and one shopping center on Sukhumvit Road, Bangkok). The evidence-based case studies are conducted via qualitative and quantitative methods.

For the first and the second hypotheses, the data of tenant placements and the vertical paths of the community malls are collected. Then, the pedestrian patterns are observed using the Observing Environmental Behavior method. This is to collect the information on the customers' traces, from their entrances to their destinations. The data is documented by recording behaviors on floor plans of the cases. The observation period is at the most

popular time where the pedestrian flow is busiest. This time period can be achieved through the data collected by Google called "Popular Times" (Google, 2017).

For the third hypothesis, two methods are conducted in the seven cases. This is to assemble both perspective and plan views of the visual and physical accessibilities in the cases. The accessibilities in perspective views are captured using panoramic photography to include 360-degree visual accesses from the integration points and the points of entrances. From the preliminary field observations, it is found that the panoramic photographs alone are not efficient for analyzing series of spaces in the buildings. To perceive the overall data across the floors, the accessibilities from plan views are generated in a software-generating program called DepthmapX (UCL, 2017). In this study, DepthmapX is used to generate two functions of VGA, which are Visual Step Depth and Visual Integration. The details of these two functions are further explained in the literature review section.

In conclusion, there are four data from the methodology section. First, the floor plans of the seven cases labeled with tenant placement, entrances, and vertical paths. Second, the customers' traces from their entrances to their destinations. Third, the panoramic photographs from the integration points, and the points of entrances. Fourth, the Visual Step Depth and the Visual Integration graphs. These data are used to analyze the correlations between the paths chosen by the customers and the three main factors stated in the hypotheses. The results of the analyses are generated to form design criteria. These criteria are applied to the design proposal for the site in Thong Lo 13 alley. The summary of the research methodology is presented in figure 1.5.

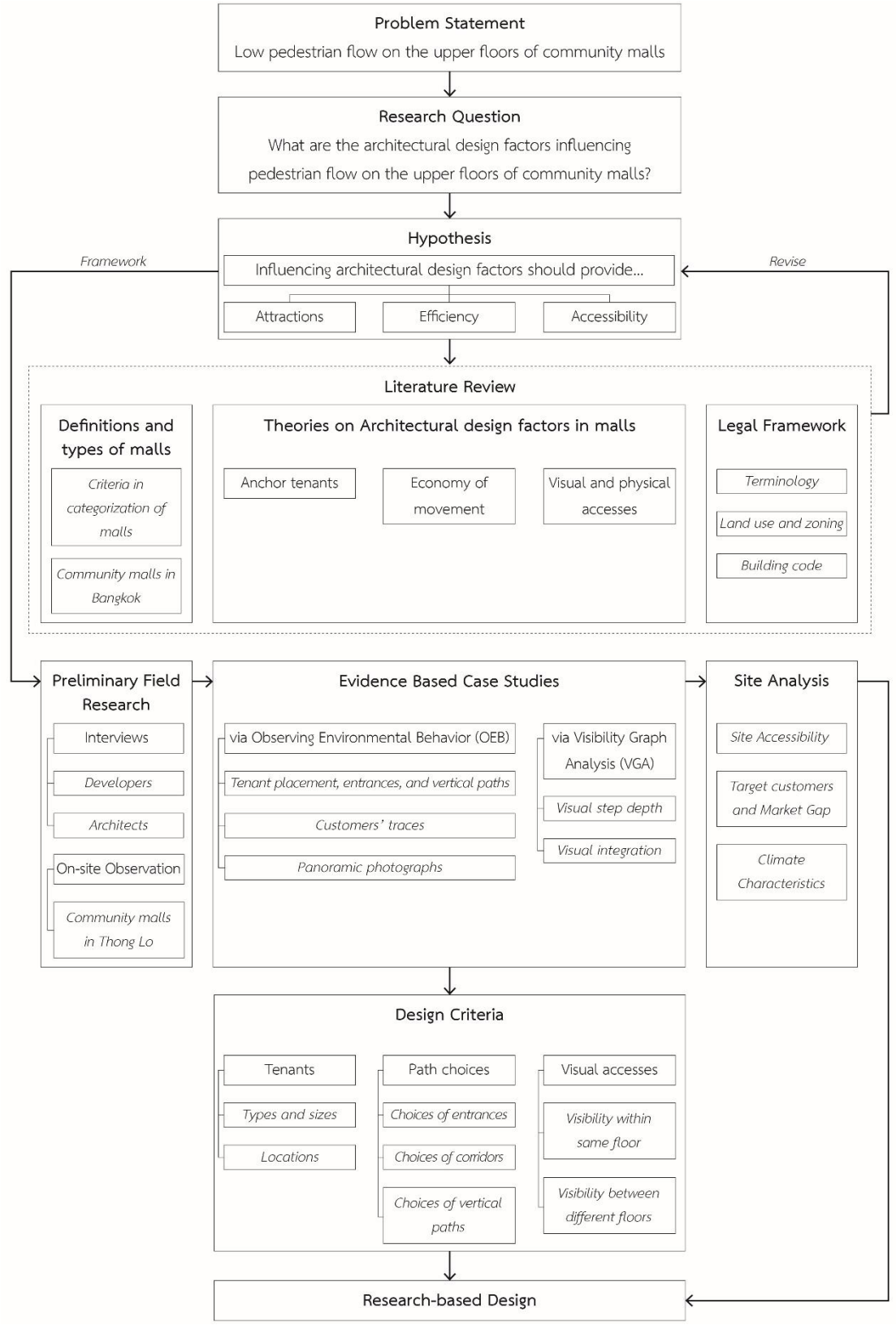


*Figure 1.5 The method of the study.*

# CHAPTER 2
# LITERATURE REVIEW

This thesis aims to analyze architectural design factors that influence pedestrian flows in community malls to identify designs that can distribute pedestrian flows to the upper floors. Hence, this literature review chapter includes three main sections. First, the background studies of community malls in Bangkok are assembled to define the term. Second, the theories and researches on the topic of pedestrian flows in shopping facilities are studied to understand the factors that influence the distribution of pedestrian. Third, the legal framework for zoning and commercial building are reviewed.

## 2.1 Definitions and types of malls

To define the term 'community mall', the study reviews the foundation of the building type, malls. A mall is a shopping facility providing a showcase for manufacturers to sell their wares (Coleman, 2006). They are customized in response to the changes in a modern industrial society. These include new inventions in the manufacturing industry, the consuming public, and the distributive industry itself (Gosling & Maitland, 1976). Consequently, malls have developed from basic trading stalls in markets to various shopping formats commonly seen today. This development shows the dynamic nature of this building type in response to the changes of their contexts (Coleman, 2006). There are three main topics in this section, which are the criteria in categorization of malls, characteristics of community malls in Bangkok, and definition of community malls in this thesis.

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### 2.1.1 Criteria in categorization of malls

There are various ways of categorizing malls. In this section, the criteria in categorization of malls are reviewed from three main sources. The first source is the ICSC with three sub-sections, which are Asia-Pacific, Pan-European, and the United States. The second source is the book called *The New Architecture of The Retail Mall (1990)* written by Barry Maitland, a Professor of Architecture at the University of Newcastle. The third source is from a more

recent book, *Shopping Environments: Evolution, Planning and Design (2006)* by Peter Coleman. The table 2.1 below shows the seven common criteria in categorization of malls. These criteria include catchment and trade area, location, size, tenant mix, style of retailing, physical form, and combination with other uses.

*Table 2.1 Criteria to categorize mall types, edit from Coleman, 2006.*

| International Council of Shopping Centers | | | Maitland (1990) | Coleman (2006) |
|---|---|---|---|---|
| Asia-Pacific | Pan-European | United States | | |
| | | Trade area | Catchment | Catchment |
| Location | | | Location | Location |
| Size | Size | Size | | Size |
| Tenant mix | Tenant mix | Tenant mix | Tenant mix | Type of retail goods |
| General purpose or special purpose | Traditional or specialized | General purpose or specialized purpose | Style of retailing | Style of retailing |
| | | | Physical form | Physical form |
| Major transport hub center | | Limited purpose property | | Combination with other uses |

The catchment area outlines the market capacity of a retail project. As shown in figure 2.1, the catchment area is commonly defined by using geographic data in three ways, which are to draw simple rings around the location, to conduct drive-time zones, and to calculate equal competition areas or Thiessen polygons (CBRE, 2012).

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For shopping locations, they can be categorized into “out-of-town” and “in-town” shopping (Coleman, 2006). The location can also affect the layout of the mall. While “out-of-town” shopping can rely on its horizontal layout over a larger site, “in-town” shopping is limited to a smaller, more restricted site.

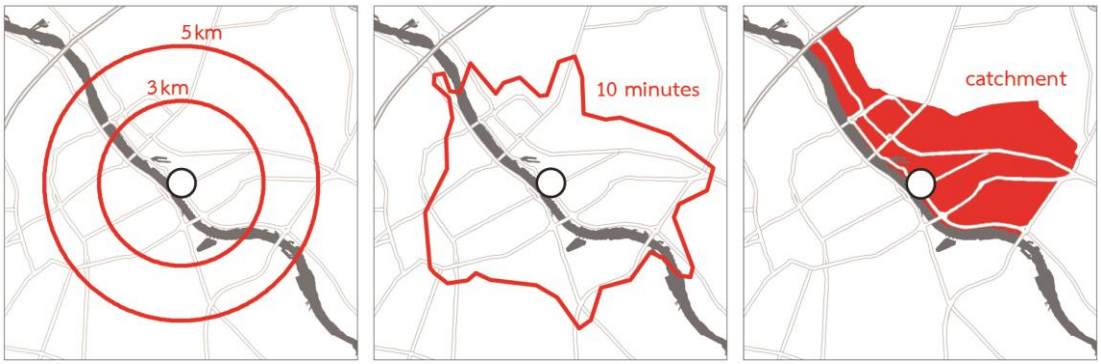


*Figure 2.1 Types of catchment areas, simple rings (left), drive-time zones (middle), and equal competition areas (right), redraw from RegioPlan Consulting, 2012.*

The size of the shopping center is generally measured in Net Leasable Area (NLA). NLA is the measurement of the internal floor space of a retail unit that can be used for selling and displaying goods and services (ICSC). Table 2.3 shows the ranges of their sizes identified in United States shopping-center classification.

*Table 2.2 The NLA range by United States shopping-center classification, ICSC, 2015.*

| Type of shopping center | Typical NLA range (sq.m.) |
|---|---|
| Super-regional mall | 74,322 or more |
| Regional mall | 37,161 – 74,322 |
| Community center | 11,612 – 73,161 |
| Neighborhood center | 2,787 – 11,612 |
| Strip/Convenience | 2,787 or less |

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Tenant mix refers to a combination of factors, including the proportion of space and number of units occupied by different tenants (Kirkup & Rafiq, 1994). Tenants in shopping centers can be categorized in two ways. First, they can be ranged by their sizes (Coleman, 2006) from unit shops (95 - 380 sq.m.), medium space user shops (460 - 1,400 sq.m.), to anchor tenants (7,000 – 23,000 sq.m.). Second, tenants can be categorized by products sold or service provided (Booth, 2004). In their study, the Urban Land Institute (ULI) arranged the tenants according to nineteen major groups, which are general merchandise (department store), food (supermarket), food service (restaurant and café), clothing and accessories (men's and women's wears), shoes, home furnishings, home appliances (musical instrument and computer), building materials (wallpaper and hardware), automotive, special interest

(art and craft), gifts (stationery), jewelry, liquor, drugs, other retail (pet shop and flower store), personal services (hair salon and dry cleaner), entertainment / community (music studio and learning center), financial (bank and insurance), and office.

Style of retailing refers to shopping environments that are designed to cater for specific tenant mix (Coleman, 2006). This can be sorted into two broad categories, which are traditional (general purpose) and specialized (special purpose). A traditional mall is an all-purpose scheme, which is classified by size. It could be either enclosed or open-air. Specialized malls are specific purpose retail schemes, which are classified by their purposes. They are typically open-air. There are many types of specialized malls include power center, lifestyle center, factory outlet, and theme-oriented center (Lambert, 2006).

Physical form can refer to the built environment of the shopping center. The simplest interpretation can be between “enclosed” and “open-air” center (Coleman, 2006). Open-air, here, describes a center that does not have enclosed walkways between stores. It can be linear, L-shaped, U-shaped, or cluster configuration. The shopping center can also be combined with other uses to form new types of retail developments. Other uses include hotels, offices, railway stations, and airports. All in all, these seven criteria are used together with the characteristics defined in the next section to identify the term ‘community mall’.

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2.1.2 Characteristics of community malls in Bangkok

In Bangkok, there are several shopping facilities that call themselves ‘community malls’. Accordingly, there is a question on what actually is considered as a ‘community mall’. The arguments range from the concern of its broad uses to the appropriation of the term ‘community’. To identify what actually is a ‘community mall’, this section of study covers the explanations by developers and architects, along with the conclusion of the term from the preliminary study of community malls in Bangkok conducted by the author.

For the developers of community malls in Bangkok, the definition of community malls was described by Nopporn Witoonchart from Siam Future Development (Businessthai, 2007). Siam Future Development develops various community malls, such as J Avenue, La Villa, Market Place Thong Lo, and chains of Market Place. Nopporn refers to community mall as a mixture of the Western lifestyle center (upscale national-chain specialty stores with food service and entertainment in an outdoor setting (ICSC, 2015)) and the commercial know-how (the proportion of tenants and the study of target customers). Together, it is a combination of a supermarket, chain stores, electronics, fast fashion, sports, well-known restaurants and salons. However, there is no common plan for all community malls. The key is the customization strategy, which is to innovate and to mix community mall formats to offer multi-dimensional experience along with providing customers convenience vary in each context (Suthisopapan & Madan, 2014).

Another explanation comes from the real estate developer, Athakehaputt Company Limited, who develops retail projects, such as K Village, A Space, and Suanplern Market. Chanoknart Pakornsiriwongse, an executive director of the company, explains that apart from their leasable areas, their model of community malls aims to provide outdoor spaces that are comfortable, open, well ventilated, and convenience for pedestrian flows. This is for their customers to spend time together with their families since the spaces are also elders, children, and pets friendly (Pakornsiriwongse, 2016).

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Addition from the customer-based customization strategy, Vicharee Vichit-Vadakan, a co-founder and managing director of The Commons, explains that she is also focusing on the tenants themselves. Vicharee states that since The Commons aims to be Thong Lo's backyard for the customers to spend quality time in the neighborhood, their tenants should be representing that as well. Consequently, The Commons is famous for their specialized products by small-medium businesses rather than international brands. Apart from these, other programs in The Commons, such as their play yard, also support the idea of the founders called 'Wholesome Living' (Vichit-Vadakan & Vivatsurakit, 2016).

In conclusion, even though these three developers share the idea on customers experience-based design, there are minor distinctions in the executions of community malls among them. This adds strengths to the customization strategy itself, as the products of the strategy can be varied due to both their contexts and their developers' interpretations.

For architects who work on community malls in Bangkok, Nithi Sthapitanonda, a president 0f 49 Group (a multi-disciplinary architecture firm), bases his definition of community mall on the United States' strip malls (Amranand, 2012). Strip malls usually located in residential areas. Their building forms are often an attached row of stores or service outlets without enclosed walkways linking the stores. They may be configured in a straight line, "L" or "U" shape with on-site parking usually located in front of the stores (ICSC, 2015).

In the same manner, Kanit Meekhanon, a managing director of Charcoal Design who has been working on several community mall projects, agrees with the statement. He explains that a model of a community mall, in the past, used to configure a supermarket at the back of the site with some restaurants and banks at the sides with on-site parking in front of the stores. However, the conveniences that community malls used to provide have changed due to the expansion of trade area. Community malls, today, aim for trade areas that are larger than the neighborhoods around them. Therefore, the projects themselves are larger. This leads to additional requirements that community malls have to provide, such as customers attractions and more parking spaces (Meekhanon, 2016).

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Similarly, Sakol Taworntaweewong, a senior architect at The Office of Bangkok Architects, describes a community mall as an open-air mall oftentimes with a supermarket as an anchor tenant. Sakol further mentions that community malls usually have two floors. Typically, the third floor and the upper floors are difficult to attract the tenants due to the low pedestrian flows. For this reason, tenants with low-impulse trade, such as banks, salons, tutoring schools, and fitness centers are commonly located on the upper floors (Taworntaweewong, 2016).

Overall, the diversity of community malls derives from the constant changes of both the propositions of the developers and the demands of the customers. Today, with the rapid growth of online shopping, the trends of malls are shifting toward entertainments and experience-based services.

2.1.3 Definition of community malls in this study

From the information in the previous sections and the preliminary study of community malls in Thong Lo, community malls in this thesis are open-air malls providing food service and entertainment for customers' experiences. The characteristics that these community malls shared can be explained through the seven criteria mentioned in 2.1.1. These criteria include catchment and trade area, location, size, tenant mix, style of retailing, physical form, and combination with other uses.

For catchment and trade area, most community malls in Thong Lo claims that their aims are to serve the people who live or work within the Thong Lo neighborhoods. However, the preliminary field observations show that their customers are combinations of people in the neighborhoods, people from other parts of Bangkok, foreign tourists. This is due to the popularity of Thong Lo itself, as the area is known to locate various renowned pubs and restaurants. For location, Thong Lo can be considered as the connection between "in-town" and "out-of-town" area. This means that the community malls in this area can be ranged from a horizontal layout over a larger site to a vertical layout over a limited site.

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This trade area and location also identify the size of the community malls in Thong Lo, which can be ranged from the strip/convenience center (NLA: 2,787 sq.m. or less) to the neighborhood center (NLA: 2,787 – 11,612 sqm.). This is due to the restriction in Land Use Regulation under the Ministerial Regulation on the Bangkok Comprehensive Plan 2013 (B.E.2556), where Thong Lo is located in high-density residential zone.

More than 50% of the tenants in community malls in Thong Lo are food service, entertainment/community, and personal services. The food service category consists of

restaurant, dessert café, coffee shop, and fast food, while the entertainment/community consists of music studio and learning center. For personal services, the tenants are hair salon, nail salon, dry cleaner, and beauty clinic. Other categories of tenants found in community malls in Thong Lo are food (supermarket), clothing and accessories, home appliances, special interest, drugs, other retails (pet shop, flower store, and eyeglasses shop), and financial (bank).

The retailing styles of community malls in Thong Lo are not specific to their purposes. Most of them use contemporary design schemes, while some of them adapt the sustainable design themes. For their physical forms, all community malls in this research are open-air. They do not have enclosed walkways between stores. Most stores are enclosed with air-conditioning system installations, while some are semi-enclosed. None of the community malls in this research are combined with other uses.

## 2.2 Theories on architectural design factors in malls

From the problem statement in chapter one, where the mid-rise community malls are struggling to encourage pedestrian flows to the upper floors. The literature reviews in this section explore the theories and studies on the pedestrian flows in shopping facilities. The section covers two different theories, the tenant placement and the visual and physical accesses in malls.

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### 2.2.1 The anchor tenants

In this thesis, the tenants are classified into three main categories, which are anchor tenants, tenants with high-impulse trade, and tenants with low-impulse trade (Sim & Cheok, 1989). The anchor tenants are the primary draws of customers to the community mall. Typical anchors in community mall scheme are supermarkets, famous restaurants, and cafés. The other non-anchor tenants can be classified into two main categories by the level of impulse that their goods/services require. Impulse goods/services are referred to as goods that customers did not intend to purchase but they purchase as a by-product of the shopping process for the products or services that they have in mind (Hassain & Penn, 1999). Consequently, the tenants with high-impulse trade require high pedestrian flow to sustain

their businesses (Sim & Cheok, 1989). These tenants include flower stores, gift shops, and toyshops. Whereas the tenants with low-impulse trade are able to draw customers towards themselves without the need to depend on the pedestrian flows that other tenants generate. The tenants with low-impulse trade include music schools, beauty clinics, salons, and fitness centers.

Generally, the tenant placement is related to the tenant mix. While tenant mix focuses on the types and proportions of the tenants in different categories, tenant placement is more about influencing pedestrian flows inside the community malls by strategically arranging the locations of the tenants. Though the tenant placement is different and individual to each mall's context, there are common concepts that are usually applied (Garg & Steyn, 2015). These concepts include the placement of anchor tenants at opposite ends of the mall with other tenants in between, the distance between main entrances and anchor tenants that generate pedestrian flows along shop fronts of other tenants, the discouragement of a dead end, the preferred locations of tenants with high-impulse trade on the lower floors, and the locations of tenants with low-impulse trade on the upper floors.

Accordingly, the first guidance is comparable to the dumb-bell strategy. The dumb-bell strategy is the most renowned solution to distribute the pedestrian flows, where the anchor tenants at the opposite ends of the mall can draw customers to move from one side to another. This encourages the movement for smaller tenants who unable to generate attractions by themselves (Fong, 2003). With this strategy, there are three main layouts commonly used in malls. Keyhole arrangement is based on the single point of entry to an anchor tenant and return to the main circulation. Linear arrangement is the organization that represents the dumb-bell strategy with two or more anchor tenants. Circuit arrangement strategically positioned anchor tenants to encourage continuous circulation past all the tenants' shop fronts, where the customers can visit the whole mall without retracing their steps (Coleman, 2006). The circuit arrangement can also generate pedestrian flows in three-dimensional space in multi-floor malls by including vertical connections (figure 2.2). The appliance of these layouts is based on the number of anchor tenants in the mall.

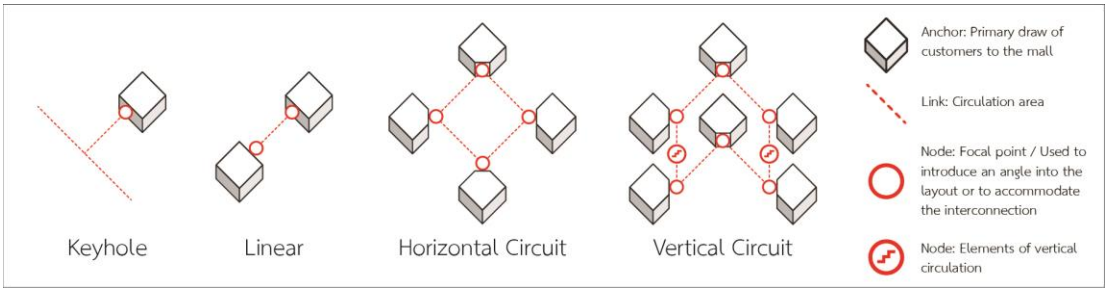


*Figure 2.2 The mall layouts, edit from Coleman, 2006.*

Applied to the configurations of the mid-rise community malls, this means that the anchor tenants should be located on the top floors, in order to distribute the flows across the other floors in between. However, the upper floors are more likely to be the locations of the tenants of low-impulse trade (Yiu et al., 2008) and are not preferable for anchor tenants. The next section explores further into the reasons behind these happenings based on the economy of movement theory. It questions why customers are not willing to move up to the upper floors.

### 2.2.2 The economy of movement

The economy of movement is based on the effort of movement people make in order to get to their destinations. In their research, Bitgood & Dukes (2005) found that people attempt to reduce the costs (time and effort) in order to maximize the benefits (value of the experience). This is consistent with a cost-benefit analysis of behavior where behavior is more strongly influenced by the costs than by the benefits (Bitgood & Dukes, 2005). The core concept of economy of movement in malls lies in the evaluation of the customers. This means that to decide on each path choices, the customers are presented with visual information where they have to weight whether the attractions worth the efforts (Bitgood & Dukes, 2005). This visual information is further explored in 2.2.3.

Furthermore, Bitgood and Dukes (2005) questioned Underhill's statement that right turning is the major pattern in retail stores (Underhill, 1999). Accordingly, they conducted their study in three intersections in two different malls where there was a significant number of destinations for each direction. As a result, they found that turning right is not a consistent pattern of choice point behavior at intersections. On the other hand, they claimed that the

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economy of movement was a valid explanation for customers' behaviors, since customers almost never turned from the right side of the corridor to the left or from the left side of the corridor to the right. This meant that customers avoided moving to the other side of the pathway before reaching the intersection due to the extra steps they would need to take and the possible cross circulation with people who walk from the other directions (Bitgood & Dukes, 2005).

To move between floors, there are more complications to the effort than the proximity of turning left or right. Generally, the greater effort is required in changing heights of planes than walking on the flat plane, either it means taking stairs, escalators, elevators, or ramps. Nonetheless, this thesis does not seek to find the differences and the choices customers make between each type of vertical path. On the other hand, it aims to observe the influences created by their locations in the mid-rise community malls. The units of analysis are the vertical paths (stairs, escalators, elevators, and ramps) in relations to the entrances and the destinations, in different configurations of the mid-rise community malls.

2.2.3 The visual and physical accesses

The visual access within the mall refers to the premise that if large parts of the building are immediately visible, visitors can rely on information directly available in their field of vision (Gibson, 1979). This visual information is linked to path choices made by visitors as the paths are selected according to the available information in the immediate surrounding area (Zacharias, 2002). This includes choice points, directional changes, and distances as seen and predicted by the visual information provided to the visitors (Best, 1970). Architectural elements which offered the visual information to the visitors are spaces that link multiple space together. In the multi-floor malls, theses spaces commonly include corridors, vertical paths, and atria.

The concept of visual access is widely explored as a part of wayfinding process. In a research on path choices in the underground settings, Zacharias (2002) conducted an experiment to find out how people distinguished between various path choices available to them by focusing on the visual stimuli in the corridors. His experiment let the participants chose their

paths using panoramic view photos and line-drawn illustrations of six different path intersections in the Montreal Underground (Figure 2.3).

*Figure 2.3 Two panoramas of two intersections presented to participants, Zacharias, 2012.*

The experiment showed that the paths highly preferred correlated to evident path options, the suggestion that the corridor leads to other spaces, the presence of people, and the amount of shopping opportunity. On the other hand, unpopular path options were related to dead-end corridors, changes of elevation, low visual simulation, and unclear circulation. The results also showed the participants' misinterpretations of spaces caused by the configurations and architectural designs. The participants associated the long corridor with choice paths where they can continue their journey, and a blank wall at the end of the corridor as the dead-end with no obvious means to continue the trip. For vertical connections, crisscross escalators with no clear destination ware not selected by the participants (Zacharias, 2002). These suggest that visual accesses are crucial to the interpretations participants have on spaces.

The results are also consistency with another research regarding wayfinding in a multi-floor mall. In their research, Hölschera et al (2006) found the importance of visual access. They explored three specific strategies for navigation, which include the central point strategy relies on well-known parts of the building, the direction strategy relies on routes that first head towards the horizontal position of the goal, and the floor strategy relies on routes that

first head towards the vertical position of the goal. As a result, Hölschera et al concluded that there are seven architectural elements that influence the navigation systems in the building. They called these elements 'hot-spots' (Table 2.3).

*Table 2.3 'Hot-spots' and the suggestions on their configurations and designs, information from Hölschera, Meilingera, Vrachliotisa, Brösamlea, & Knauffa, 2006.*

| Hot-spots | Suggestions |
|---|---|
| Entrance hall | The entrance hall symbolizes the most important point in the layout. Its function is to provide the navigation choices visible to the visitors. |
| Survey places | Survey places allow users to build well-integrated spatial knowledge. |
| Floors | The layout of the floors should be uncomplicated and well-organized |
| Interior building structure | The dissimilarity of architectural forms can help the visitors to orient themselves in the building. However, too many subsections can lead to lack of visual differentiation. |
| Dead ends | Dead ends added complications to the mental representation of the multi-floor building where the visitors have to associate with the vertical information given and the floors above. |
| Public and private space | The visitors should be able to differentiate between public and private space. This can be indicated through architectural layout and signage. |
| Stairways | Stairways help integrating vertical information while exploring multi-floor buildings. They function as a circulation node and a vertical interconnection between different floors of the building. During vertical motion, well-designed stairways can serve as a visual focus and provide access to various perspectives of the interior organization of the building. |

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From the table, hot-spots are associated with the visual access in relation to the spatial configuration. Thus, corridors are pointed out as the most fundamental aspect in the configuration for pedestrian flows, providing visual access to each hot-spot, especially the vertical paths linking one floor to another. In Figure 2.4, it showed the area of visual accesses from the main entrance hall in relation to the location of each stairway. This suggested the reason behind the difficulty in locating the stairways as seen that none of the stairways is visible from the main entrance hall. This visual access can be presented in a form of an isovist.

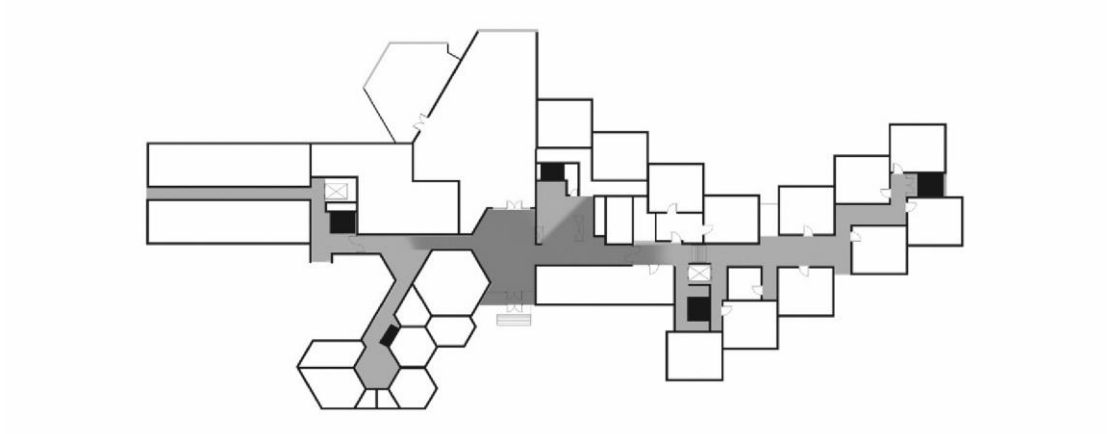

*Figure 2.4 Locations of stairways (black boxes) and an isovist (area of visual access) from the main entrance hall (darker gray shaded area in the center), Hölschera, Meilingera, Vrachliotisa, Brösamlea, & Knauffa, 2006.*

The concept of an isovist used in this research was introduced by Michael Benedikt in 1979, where he aimed to help describe architectural space in a more general way. An isovist is described as *"the set of all points visible from a given vantage point in space and with respect to an environment. The shape and size of an isovist is liable to change with position." (Benedikt, 1979).* It is stated that an isovist is able to capture local properties of visible spaces in correspond with psychological measurements of environmental perception (Stamps, 2002).

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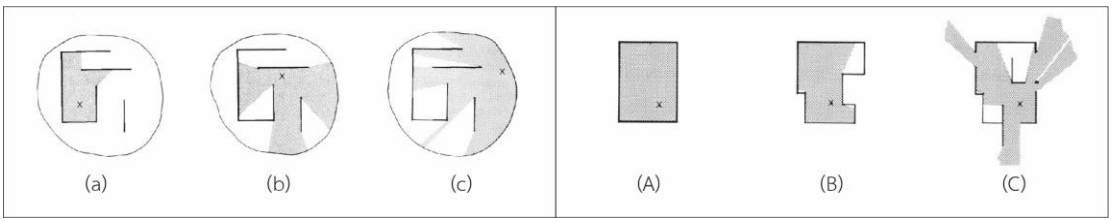


*Figure 2.5 An isovist from viewpoint x, moving from a to b and to c in an environment, inside a region (left), and an isovist from viewpoint x in environment A, B, and C (right), Benedikt, 1979.*

From Figure 2.5 (left), it can be seen that as the viewpoint x (represents the position of the observer) moves from a to b and to c, the shape and size of the highlighted area (represents region visible from the vantage point) changes within the same environment and region. On the other hand, in Figure 2.5 (right), the viewpoint x remain in the same position while the

surrounding character of environment changes. An isovist is often used as a part of Space Syntax, where the outcomes are analyzed together with field observations in order to conclude the researche results.

Space Syntax is a set of theories and techniques for the analysis of spatial configurations developed by Bill Hillier and his colleagues in the 1970s at the Bartlett unit for architectural studies. Today, spatial network analyses in Space Syntax are commonly generated in DepthmapX (Figure 2.6). DepthmapX is an open source multi-platform software written by Alasdair Turner in 2001 (Al Sayed, Turner, Hillier, Iida, & Penn, 2014). The program aims to produce a map of open space elements, connect them through a preferred relationship, and produce graph analysis of the resulting network (UCL, 2017). DepthmapX can be applied to various scales of environments, from building to urban scale.

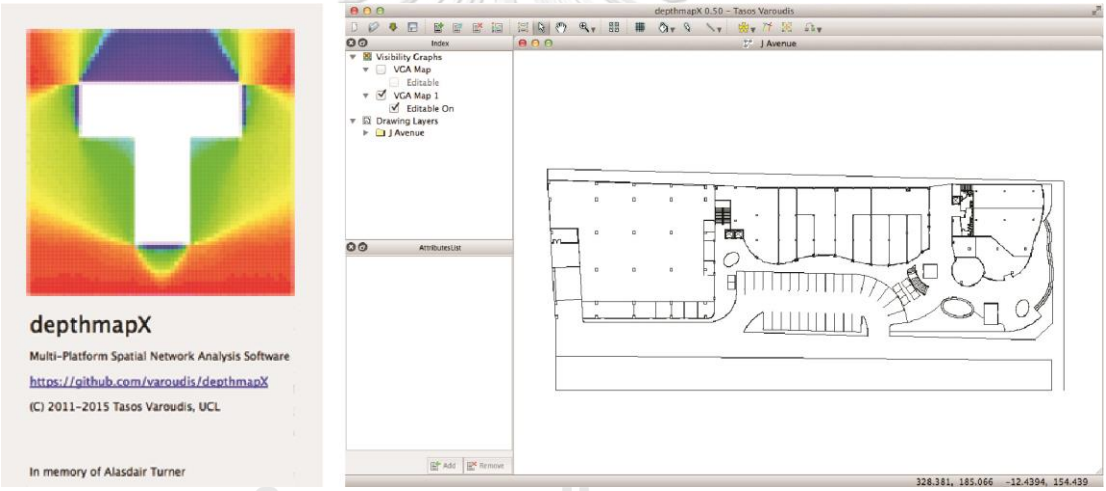


*Figure 2.6 The logo of DepthmapX (left) and the interface of the program with the first floor plan of J Avenue.*

In building scale, DepthmapX can be used to evaluate the visual accessibility in several techniques. First, the polygons of visual access can be generated by point isovists. Second, a dense grid of isovists can be joined into a graph of inter-visible points called Visibility Graph Analysis (VGA). Third, an analysis of pedestrian in the environment can be simulated in an agent-based analysis. The choice of path in an agent-based analysis technique is based on the VGA results, where the agents are moving accordingly to visual accessibility information of its current location (UCL, 2017). The result of the agents' movement can also be visualized in three-dimensional views (Figure 2.17).

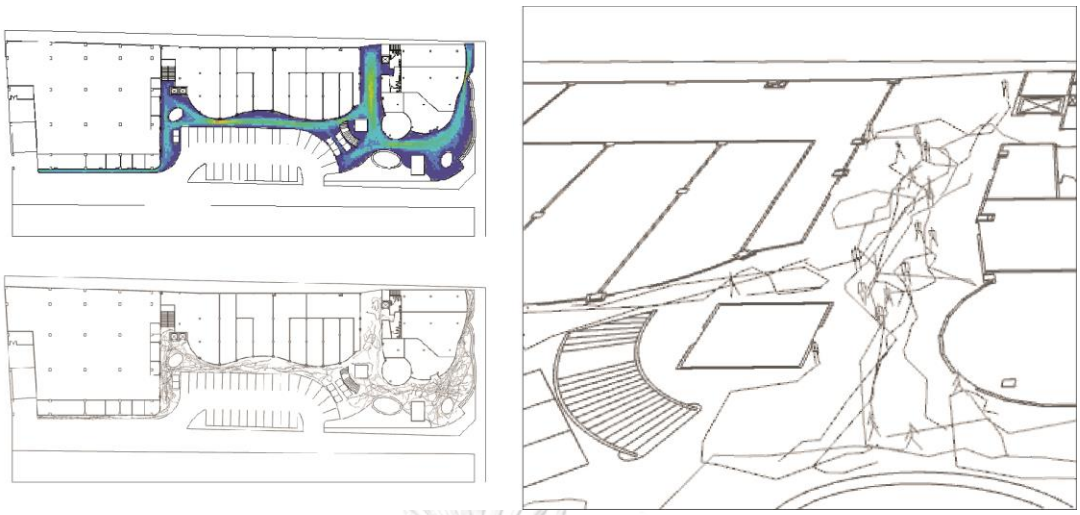

*Figure 2.7 An agent-based analysis graph (above), Agent traces (below), and real time behaviors of individual agents in a three-dimensional view of the first floor plan of J Avenue in DepthmapX.*

There are many measures generated in VGA. The measures included in this study are Visual Step Depth and Visual Integration graphs. Visual Step depth is “the number of turns (plus one) that it takes to get from the current location to any other location within the plan. Everything directly visible from the starting location is at depth one, everything visible from that at depth two, and so on throughout the plan.” (Vogels, 2012). Step depth is considered to be related to isovists. However, they are different in their calculation processes. While DepthmapX is a graph analysis software, isovists are calculated by geometric analysis.

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Visual integration is based on the number of visual steps it takes to get from that point to any other point within the system (Vogels, 2012). In figure 2.8 (right), integration (highlighted in red) is the shallowest area, represents the potential core functionality in the layout. Segregation (highlighted within the range of blue) is more depth. These are suggested to have parallel meaning with the built form which is correlated with route choices of wayfinders (Al Sayed et al., 2014).

*Figure 2.8 A step depth graph (left) and an integration graph (right).*

The correlations between VGA and wayfinding are presented in several research papers. In a research on mega-scale shopping centers, Fong (2003) conducted a comparative study comparing the effect of anchor tenants and the mall's configuration on the pedestrian flows. The study was using the observation data and VGA to examine six super-regional shopping centers of four different layout types (Figure 2.9). The VGA method was chosen in this study because of its ability to highlight locational differences of relative integration along the mall space. The results of the study showed that configuration has a direct relationship with the distribution of movement where pedestrian flows are more directed by the configurations than the anchor tenants. However, they did not suggest the layout type of the centers which best facilitate the distribution of pedestrian flows. This is because of the incomparable values between different malls' sizes (Fong, 2003).

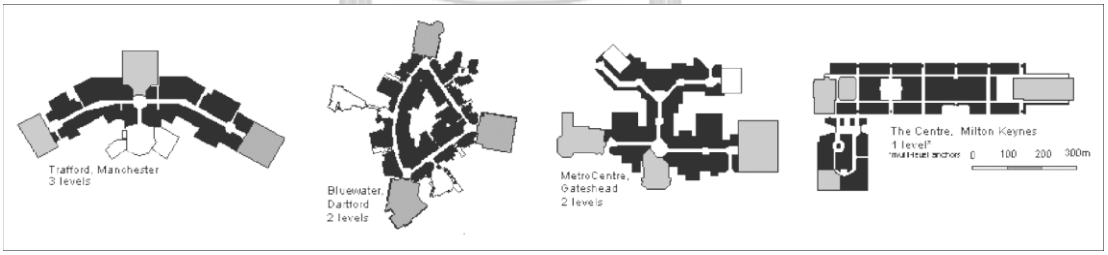


*Figure 2.9 First floor level maps of four super regional shopping centers representing different layout types, linear, circuit, cruciform, and L-shaped (from left to right), Fong, 2003.*

In this section, it can be concluded that visual accesses through corridor are very significant to the chosen paths. It also suggests that the plan view of the visual accesses within horizontal spaces can be generated through DepthmapX. Nonetheless, to analyze mid-rise community malls, these horizontal spaces have to be linked through vertical paths. The next section shows how to link these different floors in multi-floor malls.

To explore vertical space in multi-floor malls, Brösamle, Hölscher, & Vrachliotis continued a research on the hot-spots previously stated in this chapter. They re-analyzed the results by modeling the spatial interconnections between different floors. This was done by manually link staircases with each floor, using the joining tool in DepthmapX (Figure 2.10).

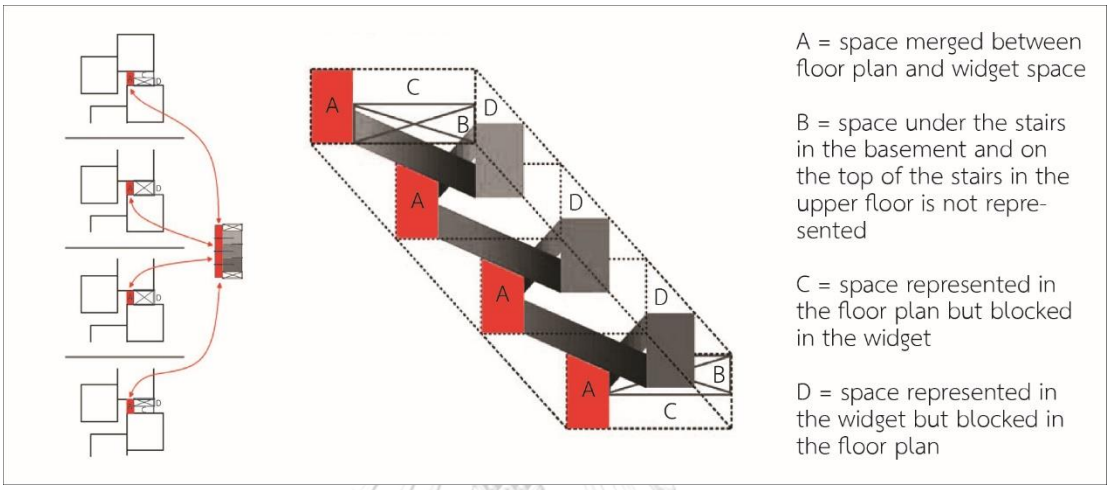


*Figure 2.10 A two-dimensional representation of the vertical interconnections via widgets and manual links (left) and a schematic three-dimensional view of the widgets (right), edit from Brösamle, Hölscher, & Vrachliotis, 2007.*

In the figure 2.10, vertical interconnections in the staircases were modeled. The type of staircases was half turn stairs (a straight staircase with 2 flights of stairs at a 180° turn). The widgets (additional space with representative spatial properties) were connected to the staircases in the floor plan by using nodes and links. This provided horizontal space with representative intervisibility structure (Brösamle, Hölscher, & Vrachliotis, 2007). The figure 2.11 is the navigational space of the Heinrich-Lübke Haus, a mixed-use conference centre in Günne, Germany. It shows how widgets linked to different plans of each floor and the results of connectivity and integration in VGA.

From their research, Brösamle, Hölscher, & Vrachliotis claimed that they have successfully connected the behavioral data from the previous wayfinding experiment to the formal spatial analysis. They stated that by using this method of analysis, structural causes for the original subjective impressions can be identified more formally. Most of the hot-spots could

be correlated to VGA results where step depth can be related to entrance hall and staircases, and integration can be related to the floor layout and dead-ends.

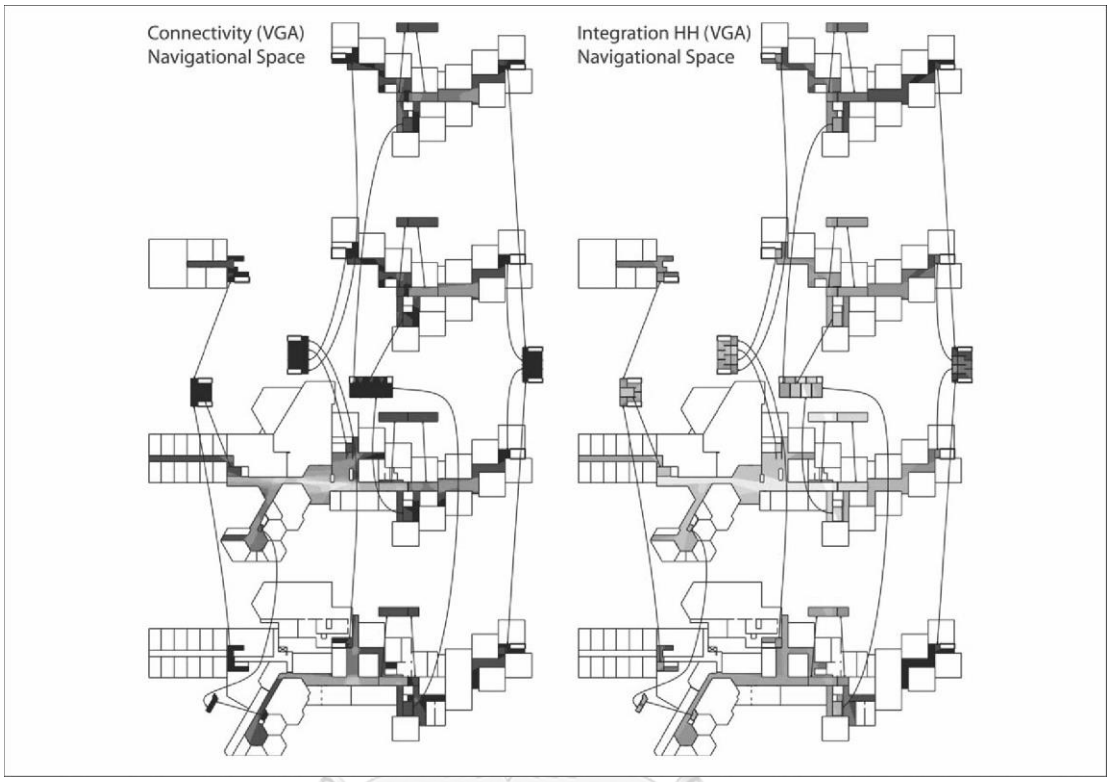


*Figure 2.11 Navigational space, Brösamle, Hölscher, & Vrachliotis, 2007.*

The use of this joining tool is also presented in another research of a six stories shopping center, Yokohama Bay Quarter, in Yokohama, Japan (Saruyama & Kishimoto, 2015). Additionally, this study included more types various vertical paths, such as escalators, elevators, and stairs. In the study, Saruyama & Kishimoto introduced the models of different vertical paths (Figure 2.12).

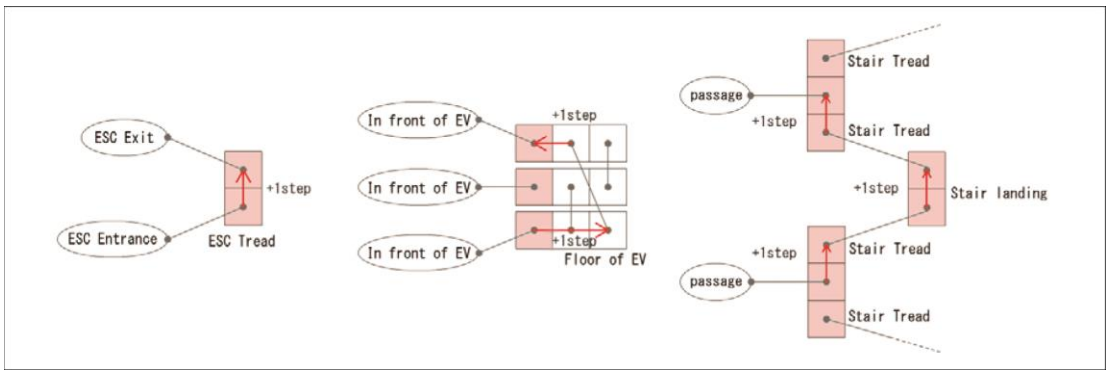


*Figure 2.12 The models of vertical paths, an escalator (left), elevators (middle), and half turn staircases (right), edit from Saruyama & Kishimoto, 2015.*

In their research, the escalator model was set so that it had one step increase per movement between floors as the escalator in the case study was straight and headed forward to the next floor. The elevator model had two steps increase per movement between floors. It did not have to consider floor differences when moving from certain floor to another. The stair model could be set varied to the shape of stairs. In this case, it modeled a half turn staircase with three steps increase per movement.

The result from the study shows that the density of pedestrian flows in the circulation space was associated with almost all space syntax indices. It had a strong relationship with integration and visual step depth from escalators. This meant that the higher pedestrian flows were influenced by easy visual access. High pedestrian flows were also found in the area with a lower number of turns from escalators (Saruyama & Kishimoto, 2015).

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Apart from the visual connection within the vertical paths themselves (escalators, elevators, stairs, and ramps), another type of vertical connection is atria. The presence of atria in multi-floor buildings can enhance visitors' orientations, explorations and circulatory movements as they provide easy visual access to multiple directions on multiple floors at the same time (Lazaridou, 2013). In a research concerning the methods of analyzing atria, Marriage & Bakshi (2013) stated that one of the key concepts for analyzing atria is the ability to analyze and illustrate connectivity. This means that, dissimilar to the vertical paths, atria have the quality of "augmented visibilities" where space is visible but inaccessible (Varoudis & Penn, 2015). In their study, Varoudis & Penn suggested a new methodology of Augmented Visibility Graph

Analysis (AVGA) which operated based on mixed-directionality graph structure. The study explored the spaces with half-height partitions, transparencies, office furniture, and voids. To produce the outcomes, they use a new experimental AVGA software, vSpace (version 0.10) and the figures with a combination of R/ggplot2, and Grasshopper (a graphical algorithm editor integrated with Rhino's modeling tools). Since differences between the new models and the traditional analysis were evident in the result, Varoudis & Penn concluded that their methodology was able to display the results of more complex settings. Despite that, the AVGA software is still in the process of development for the multi-dimensional properties and is not yet available for public use.

Another set of methodologies on the role of atria is presented in Lazaridou's research (2013), where she aimed to understand how the atria help visitors with navigating and experiencing the museum. There were four methodologies in her study. The first and the second parts are the VGA analyses of the path choices offered in the museum and the ways they enter people's visual fields with accessibility and visibility relations. The third part is the field observation of human activity inside the museum by tracking 50 visitors. Lastly, agent-based analysis is used in comparison with the movement data from the field observations (Lazaridou, 2013). In the first and the second part, Lazaridou used the isovist function to construct various isovists from different points in the building (Figure 2.13). It was shown in the figure 2.13 (left) that the location of the three atria were in various intersections multiple vistas. On the right of the figure, the isovists were drawn from the center points of each atrium where it is shown that the three atria gave different effects. While the atria A and B had 360-degree vistas around them, the atrium C was located next to the long corridor where visitors can see it from further away.

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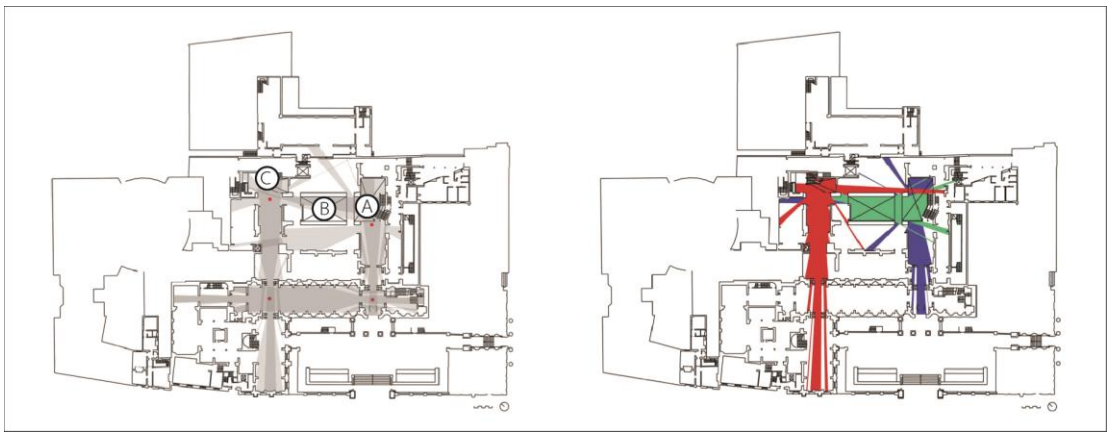


*Figure 2.13 Isovists (gray shaded area) drawn from various points (red dots) on the first floor of the museum (left), and the isovists from the center points of the three atria (right), Lazaridou, 2013.*

In their behavior tracking method, the percentages of visitors who looked up, down, or through the atria spaces are recorded by observing their head movements. The results from the observation shown that after they browsed the atria, the visitors showed signs of directional change. This was because the atria offered the visitors' more path choices via three-dimensional vistas (Lazaridou, 2013). This method of observation helped fill the gap from the previous two-dimensional analysis approach.

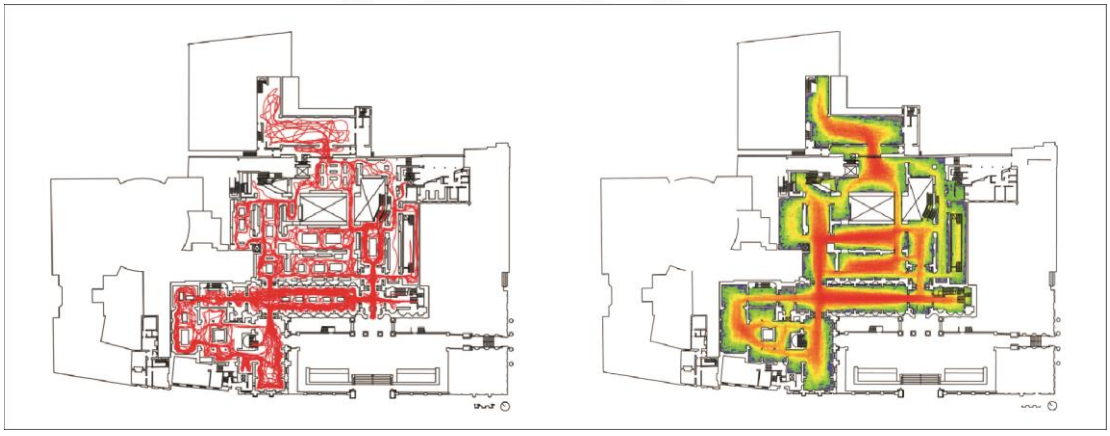

*Figure 2.14 The paths of 50 visitors observed for the first hour of their visits on the first floor of the museum (left), and trails from 50 agents moving through the museum where red colored areas indicate high counts and blue colored areas indicate low counts (right), Lazaridou, 2013.*

Lastly, The agent-based analysis was used to compare the results from the behavior tracking method. In this part, Lazaridou observed the points where the agents' traces divert and compared them with the pedestrian flow patterns. She found that there were several similarities shown in the graph (Figure 2.14). Nonetheless, there was a difference in the observation where there was more concentration of flows around the atrium A than the agent-based analysis. This could mean that the three-dimensionality of the atria attracted and influenced visitors in their navigational processes and spatial cognition. Moreover, the atria can act as gravity points which draw people to the deeper part of the building. Their cross-visibility around the atria also increases the visual encounters among visitors who are moving around, enhancing movements in the museum (Lazaridou, 2013).

From these researches, it is evident that the data generated from VGA in DepthmapX can be used to identify the concentrations of pedestrian flows in the corridors and vertical paths. Therefore, these functions are considered to be beneficial for the field observations in terms of comparisons. A comparative table of various methodology approaches (Table 2.4) shows that an integration of method can be conducted in the same research to reassure the results of the studies. It shows that by combining qualitative and quantitative methodologies together, often times the explanations for research results can further be enhanced. Moreover, this combination of methods can also be used to evaluate the design solutions proposed in this thesis.

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2.2.4 Hypotheses of architectural design factors in malls

In conclusion, three hypotheses can be formed from this chapter. The first hypothesis is formed around the comparison between the principles of attractions in the dumb-bell strategy. The units of analysis in this section are the types of tenants and their locations in the community malls. The second hypothesis deals with efficiency in the economy of movement. The units of analysis in this section are choices of entrances, choices of corridors, and choices of vertical paths in the community malls. The third hypothesis is developed from the statement that customers are influenced by the visual information provided. It was stated that the paths highly preferred correlated to evident path options, and the lack of the visual information means there is lack of choices for customers to choose. The units of

analysis in this section are the visibility within the same floor, and the visibility between different floors through atria.

*Table 2.4 A comparative table of various methodology approaches.*

| Author | Methodology | Building type | Data collection |
|---|---|---|---|
| Bitgood & Dukes (2005) | Field observations at six possible traffic patterns to find the combinations of walking on the right or left side of the path; and turning right or left or continuing straight ahead. | One intersection in shopping center A (66,890 sq.m. GLA), and two intersections in shopping center B (45,458 sq.m. GLA), in northeast Alabama, United States. | Customers avoided moving to the other side of the pathway before reaching the intersection due to the potential of extra steps and cross-circulation. |
| Zacharias (2002) | Photos taken from a single vantage point at the center of the intersection were assembled into a panorama on display boards, along with line and fill drawings. These were presented to the 32 participants, where six questions regarding their choice paths and their interpretations of the paths were asked. | The Montreal Underground in Canada. It is an underground system connecting various office buildings and shopping centers. Its hallways and corridors provide commercial space. | The paths highly preferred correlated to evident path options, suggestion that corridor leads to other spaces, presence of people, and amount of shopping opportunity. The unpopular path options were related to dead-end corridors, changes of elevation, low visual simulation, and unclear circulation. |
| Saruyama & Kishimoto (2015) | Field observations were conducted from 12:00 to 15:30 during weekend in 2013). The pedestrian distributions were counted by the snap shot method. Ten indices from VGA via DepthmapX are generated (Connectivity, Integration value, three types of Metric Shortest Path Length, four types of Visual Step Depth, and shop window length) | The Yokohama Bay Quarter (six-floors shopping center in Yokohama, Japan) | The concentration of pedestrian flows has a strong correlation with Global integration and Visual Step Depth from escalators. The results showed that the pedestrian flows were influenced from accessibility and the number of the turns from escalators. |

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| Author | Methodology | Building type | Data collection |
|---|---|---|---|
| Fong (2003) | Field observations were conducted during 13:00 - 16:00 on Saturday. The pedestrians were counted for six minutes in each mall. Total Depth measures from the two types of Depthmap models (excluding and including shop floorspace) were tested against observed movement rate to find correlated values. | Six super regional shopping centers of four different layout types (linear, circuit, cruciform, and L-shaped) in United Kingdom. | Shopping centers' configurations provide a strong predictive power of pedestrian flows. However, the principle of attractions also affected the distributions of pedestrian flows through the arrangement. |
| Brösamle, Hölscher, & Vrachliotis, (2007) | The research continued on the existing wayfinding experiment where participants were assigned to three specific strategies for navigating their ways through the building. It compared the results from the previous experiment with axial line analysis and VGA via DepthmapX, using the functions of Step Depth, Connectivity, and Integration. | The Heinrich-Lübke Haus (a conference center) in Günne, near Düsseldorf, Germany. | Compared to the seven hot-spots, most of their features were connected to the VGA results where step depth could be linked to entrance hall and staircases, and integration can be related to the floor layout and dead-ends. The research could then identify structural causes for originally purely subjective impressions. |
| Lazadirou (2013) | After constructed various isovists around the three atria, on-site observations were conducted by tracking 50 visitors around the museum. The agent-based analysis was then used to compare the software-generated data to the movement data from the field observation. | Ashmolean Museum of Art and Archaeology in Oxford, United Kingdom | The atria could act as visual gravitation points that draw visitors to the deeper part of the museum; and encourage exploration of the space. |

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2.3 Legal framework

There are two main regulations related to the construction of community malls. The first regulation is the Land Use Regulation under the Ministerial Regulation on the Bangkok Comprehensive Plan 2013 (B.E.2556). This regulation is used to define the maximum buildable area, along with the programs in the building within the site. The second regulation is the Building Control Act (B.E.2533, B.E.2543, B.E.2544, and B.E.2548). The Building Control Act is used to specify the standard for characteristics and parts of the constructed area, such as ceiling heights, stairs and number of parking space required.

In the Land Use Regulation under the Ministerial Regulation on the Bangkok Comprehensive Plan 2013 (B.E.2556), the site is located in high-density residential zone (R.9). or brown zone. This means that the Floor Area Ratio (FAR), or the ratios of the total floor area of all floors in all buildings to the size of the land plot which the buildings are located, is 7:1. The Open Space Ratio (OSR), or the ratio of the total area of the uncovered space to the total floor area of all buildings on the same land plot, shall be no less than 4.5% of the FAR or 10% of the land plot. The green space shall be no less than 50% of the OSR.

In this high-density residential zone (R.9), the Gross Floor Area (GFA) of the building is limited to 10,000 sq.m., and the programs for commercial purposes are limited to 5,000 sq.m. due to the width of the adjacent road (6 m.). In this site condition, a community mall building with less than 300 sq.m. of department store area (considered as a “commercial building”) can be built. With its size and programs, it can also be considered as a “public building” and a “large building” with additional programs of “restaurant”, “department store”, and “office”. In the building, each leasable area for educational purposes must be more than 100 sq.m. for the educational institution to be able to certify its students. Their definitions according to the Building Control Act (B.E.2543) are listed below

*“Commercial building” means a building used for commercial purpose, commercial service, or industrial purpose.*

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*"Public building" means a building used as an assembly for various purposes, such as government, education, religious, entertainment, and commercial activities.*

*"Large building" means a building which has total floor area more than 2,000 sq.m. or a building which is 15 m. high with area more than 1,000 and not more than 2,000 sq.m.*

*"Restaurant" means a building or any part of a building which is used for selling food and drink with an area for dining tables.*

*"Department store" means building or any part of a building used as commercial building for displaying or selling goods.*

*"Office" means a building or any part of a building used as an office or workplace;*

*"Warehouse" means a building or any part of a building used as goods or articles storage for commercial or industrial purpose.*

*(The Building Control Act, B.E.2543)*

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The Building Control Act (B.E.2543) includes four main chapters, building characteristics, building parts, outdoor open space, and building boundary and clearances. Related regulations in this Building Control Act includes minimum width of corridors (Clause 21), vertical distance (Clause 22), building stairs (Clause 24), fire escape stairs (Clause 27), and building boundary and clearance (Clause 41). In this section, these building requirements are studied together with the Building Control Act (B.E.2544), and the Prescribing Accessible Facilities for Persons with Disabilities and the Elderly (B.E.2548).

*"For public building and commercial building, if the width of the public road is less than 10 m., the setback of the building shall be at least 6 m. from the center of the public road.*

*Building height from any point to another point shall not be greater than double of horizontal distance from such point which is perpendicular to boundary of the opposite side of the nearest public road. The building's walls which have windows, doors, vents, fixed light windows, or building balconies must be at least 3 m. away from site boundary." (Chapter four, The Building Control Act, B.E.2543).*

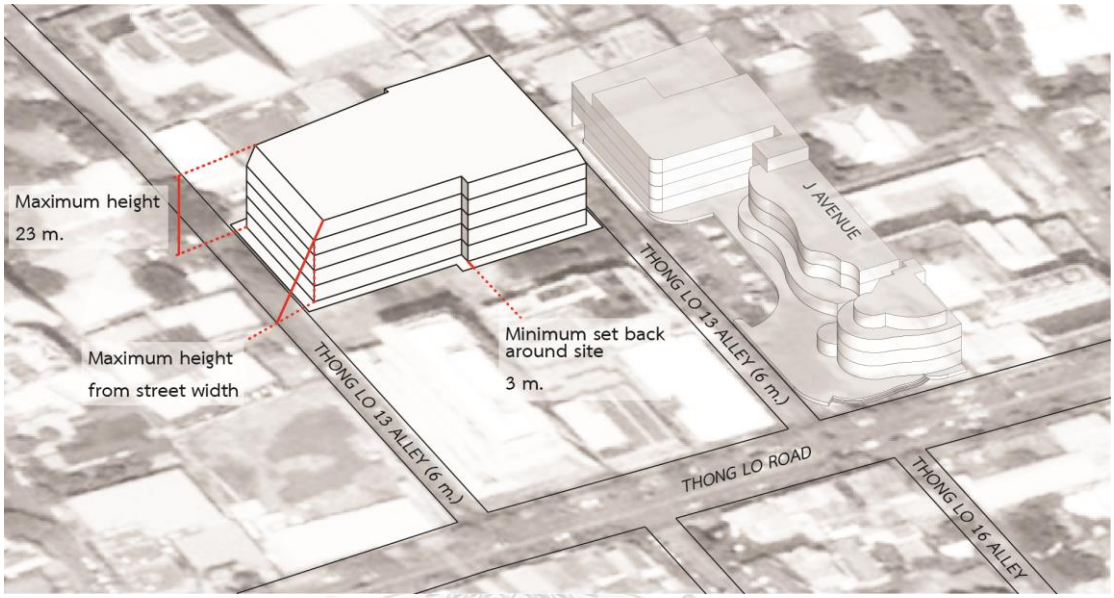


*Figure 2.15 Maximum building footprint of the chosen site, Thong Lo, Bangkok.*

Minimum width of public building and commercial building corridors is 1.5 m. However, there are more requirements for the corridors in the Prescribing Accessible Facilities for Persons with Disabilities and the Elderly. If the difference between floor levels exceeds 20 mm., a ramp or lift shall be provided. The Minimum clear width of a ramp shall be 900 mm. The minimum width of landing shall be 1,500 mm. The maximum slope of a ramp shall be 1:12.

The vertical distances, or measurement from floor to floor, are prescribed differently according to the occupancy type. The vertical distance for an office, classroom, and dining room shall be no less than 3 m., for commercial building kitchen, market, and other similar occupancy types shall be no less than 3.5 m., and for washroom and toilet, the vertical distance from floor to ceiling shall not be less than 2.2 m. A mezzanine floor can be added, if a vertical distance of an interior room between the floor and upper adjacent floor is 5 m.

or more. The area of such mezzanine floor shall not be greater than 40% of the area of the room. Vertical distance between mezzanine floor and upper adjacent floor and between room floor and mezzanine floor must not less than 2.40 m.

If the upper floor area is greater 300 sq.m., a set of stairs with clear width of at least 1.50 m., or at least two sets of stairs with clear width of at least 1.20 m. must be provided. A set of stairs which is 4 m. high or more must have a landing. A vertical distance between landing and the floor above must not be less than 2.10 m. Stairs must have risers not higher than 180 mm., threads not narrower than 250 m. (Chapter two, The Building Control Act, B.E.2543). In the Prescribing Accessible Facilities for Persons with Disabilities and the Elderly, it states that at least a set of accessible stairs with a clear width no less than 1.50 m. must be provided. This set of stairs shall have a landing at every 2 m. of vertical distance with uniform risers of maximum 150 mm. and threads of minimum 180 mm. For an accessible lift, the minimum dimension of the lift car shall be 1,100 mm. wide by 1,400 mm. long. Door of the lift shall have a clear width of at least 900 mm.

At least one set of fire escape stairs is required in a building not higher than 23 m. Indoor fire escape stairs must have a clear width of not less than 800 mm., be enclosed with solid walls made of permanent fire-resistant materials except the vents and fire doors and allow ventilation from outdoor. (Chapter two, The Building Control Act, B.E.2543).

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According to the Building Control Act (B.E.2544), A large building shall have car parking, turning area, and access way. There are two ways to calculate the minimum car parking space. One is to provide car parking at a minimum ratio of one parking space for every 120 sq.m. or fraction thereof. Another is to prescribe car parking according to total of each occupancy area of such building. However, the greater number shall be applied. Following are the number of car parking space that each program shall provide (Table 2.5). If there are 101 parking space or more, at least 2 accessible parking spaces are required, and one additional accessible parking space is required for every subsequent 100 car parking space. The location of accessible parking shall be as close as possible to the entrance of a building and not parallel to roadway. The dimension of accessible parking shall be rectangular with

minimum dimension of 2,400 mm. by 6,000 mm. and a clear space beside the parking lot with the size of at least 1,000 mm. wide along the length of the lot.

*Table 2.5 Minimum parking space requirements.*

| **Minimum parking space requirements** | |
|---|---|
| **Calculation by Gross Leasable Area** | |
| Gross Leasable Area | 1 parking stall per 120 sq.m. |
| **Calculation by areas of programs** | |
| Education | 1 parking stall per 240 sq.m. |
| Resraurant | 10 parking stall for the first 150 sq.m. / 1 per 20 sq.m. for further addition |
| Retail | 1 parking stall per 20 sq.m. |
| Office | 1 parking stall per 60 sq.m. |
| Storage (includes in-store storage) | 1 parking stall per 240 sq.m. |

The minimum requirements of toilets are shown in table 2.6. The area of each toilet shall not be less than 0.9 sq.m. with the minimum width of 0.9 m. There shall be at least one individual toilet for persons with disability or the elderly located in the same area of guest toilet. “Accessible toilet shall have clear internal dimensions of at least 1,500 mm. (Chapter seven, The Building Control Act, B.E.2548).

*Table 2.6 Minimum toilet requirements.*

| **Minimum toilet requirements** | | **Toilet** | | **Washbasin** |
|---|---|---|---|---|
| | | **Toilet** | **Urinal** | |
| Education (per 300 sq.m.) | Male | 1 | 1 | 1 |
| | Female | 1 | | 1 |
| Restaurant (per 200 sq.m. of dining area) | Male | 1 | 2 | 1 |
| | Female | 2 | | 1 |
| Retail (per 200 sq.m. of sale area) | Male | 1 | 2 | 1 |
| | Female | 2 | | 1 |
| Office (per 300 sq.m.) | Male | 1 | 2 | 1 |
| | Female | 2 | | 1 |
| Parking (per 1000 sq.m.) | Male | 1 | 1 | 1 |
| | Female | 1 | | 1 |
| Storage (per 1000 sq.m.) | Male | 1 | 1 | 1 |
| | Female | 1 | | 1 |

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Sewage water treatment system and grey water drainage requirements are as followed. Storm drainage of a building could be drained to receiving water area directly. Sewage water

treatment system could be an individual system particularly for single building or sharing system for multiple buildings. Disposable water outlets must be easy to inspect and clean. In case of covered drainage, there must be a manhole for draining inspection every 8.00 m. and on every corner." (Chapter three, The Building Control Act, B.E.2535).

Quantity of solid waste in a commercial building is at least 0.4 liter per sq.m. per day. The solid waste collection area shall not be smaller than three times the total quantity of solid waste. If volume of the solid waste collection area is more than 3 cubic m., it shall be located at least 10.00 m. away from food preparation and storage area. (Chapter three, The Building Control Act, B.E.2535).

For passageway, it shall not be used for other purposes than to provide convenience pedestrian connection between two buildings. The clear width of a passageway shall not be less than 3 m. but not more than 6 m. The vertical distance from ground level shall not be less than 5.50 m. The area of a passageway is not to be included in Gross Floor Area of both buildings it connected. A passageway is not considered as a roof and an area under a passage way can be considered as an open space.

The legal framework in this section demonstrate the constrains of designing a community mall in a high-density residential zone (R.9). It shows the limitation that the zoning, road width, and the ratio between leasable area and car parking space create. In conclusion, this revision of legal framework helps forming the basic understanding of the customized building type called "community mall". However, to investigate how different community malls apply and develop from this minimum requirement, the evidence-based case studies are conducted in the next chapter.

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# CHAPTER 3
# INVESTIGATION OF COMMUNITY MALLS IN THONG LO

This chapter of thesis aims to conduct evidence-based case studies by investigating community malls in Thong Lo. This is to study how different community malls deal with the issue of low pedestrian flows on the upper floors. As the results, this chapter intends to scope down the elements that influence pedestrian flows in mid-rise community malls in order to identify the architectural design factors that can distribute pedestrian flows to the upper floors. There are three sections in this chapter, which are criteria in choosing case studies, research methods, and research results.

## 3.1 Criteria in choosing case studies

In order to conduct evidence-based case studies, the cases chosen must be relevant to the issues in the research. This section scopes down the 70 community malls stated in the first chapter (Figure 1.1) by applying six criteria in choosing the cases, which are building type, number of floors, location, size, configuration, and vertical connections. These criteria are based on the objective to find diverse solutions applied to different conditions that community malls may encounter. Accordingly, the chosen cases in this research should share their features in the first four criteria and show variety of characteristics for the latter two criteria.

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The first criterion is the building type. This is based on the definition of community mall in this research, which is an open-air mall, which provides food service, and entertainment for customers. The second criterion is the number of floors in the building. Since this research is focusing on the vertical connections, the cases must contain three or more floors (mid-rise community malls). At this point, it can be found that mid-rise community malls are commonly located in the urban area, adjacent to two-lane or four-lane streets. This is due to the building restriction on the maximum area and height of the building. The third criterion is the location. Observing from the locations of the 70 community malls in Bangkok,

it is found that there is a cluster of more than eleven community malls Thong Lo (Figure 1.2). Nine of which are mid-rise community malls. The fourth criterion is the area of the building footprint, which is between 800 – 3,550 sq.m. This scope of areas is to eliminate external factors caused by the sizes, which may affect the research results.

For the latter two criteria, the configuration requires variety of floor plans to compare the results of the investigations. There are three common types of configurations that can be found in community malls in Thong Lo, which are L-shaped, U-shaped, and O-shaped building. Here, the floor plan configuration can also be related to the shape of atrium. As shown in table 3.1, the six case studies represent different types of configurations and atria.

*Table 3.1 Different configurations and atria in six case studies.*

| Atrium / Configuration | L-Shaped | U-Shaped | O-Shaped |
|---|---|---|---|
| Single atrium / Continuous | 9:53 Art Mall<br>J Avenue | 72 Courtyard<br>The 49 Terrace | The Maze Thonglor |
| Multi-atria / Discontinuous | | | The Commons |

Finally, the criteria of different orientation and location of vertical paths can help highlight the factors affecting pedestrian flows in the community malls. From the preliminary field research, it is found that the most common vertical paths used in community malls are the combination of stairs and elevators. This combination can be found in the six cases. However, it is important to add alternative possibilities to the research results. Here, The Helix (EmQuartier) is added to the study as the seventh case for the use of a helical ramp to connect multiple floors in the building together. In conclusion, the case studies in this research include The 49 Terrace, 72 Courtyard, J Avenue, 9:53 Art Mall, The Commons, The

Maze Thonglor, and The Helix (EmQuartier). Their locations and first floor plans are shown in figure 3.1.

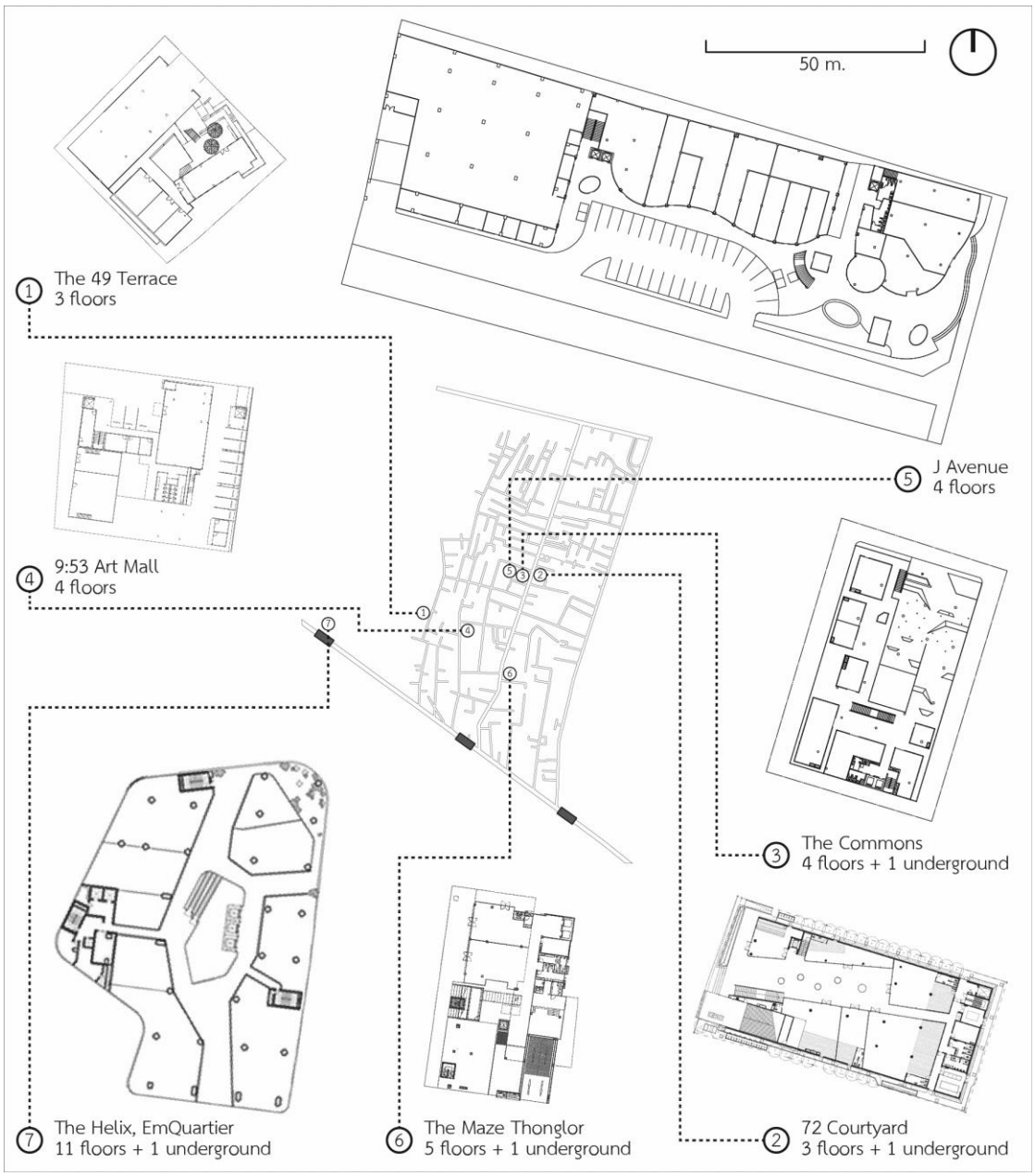


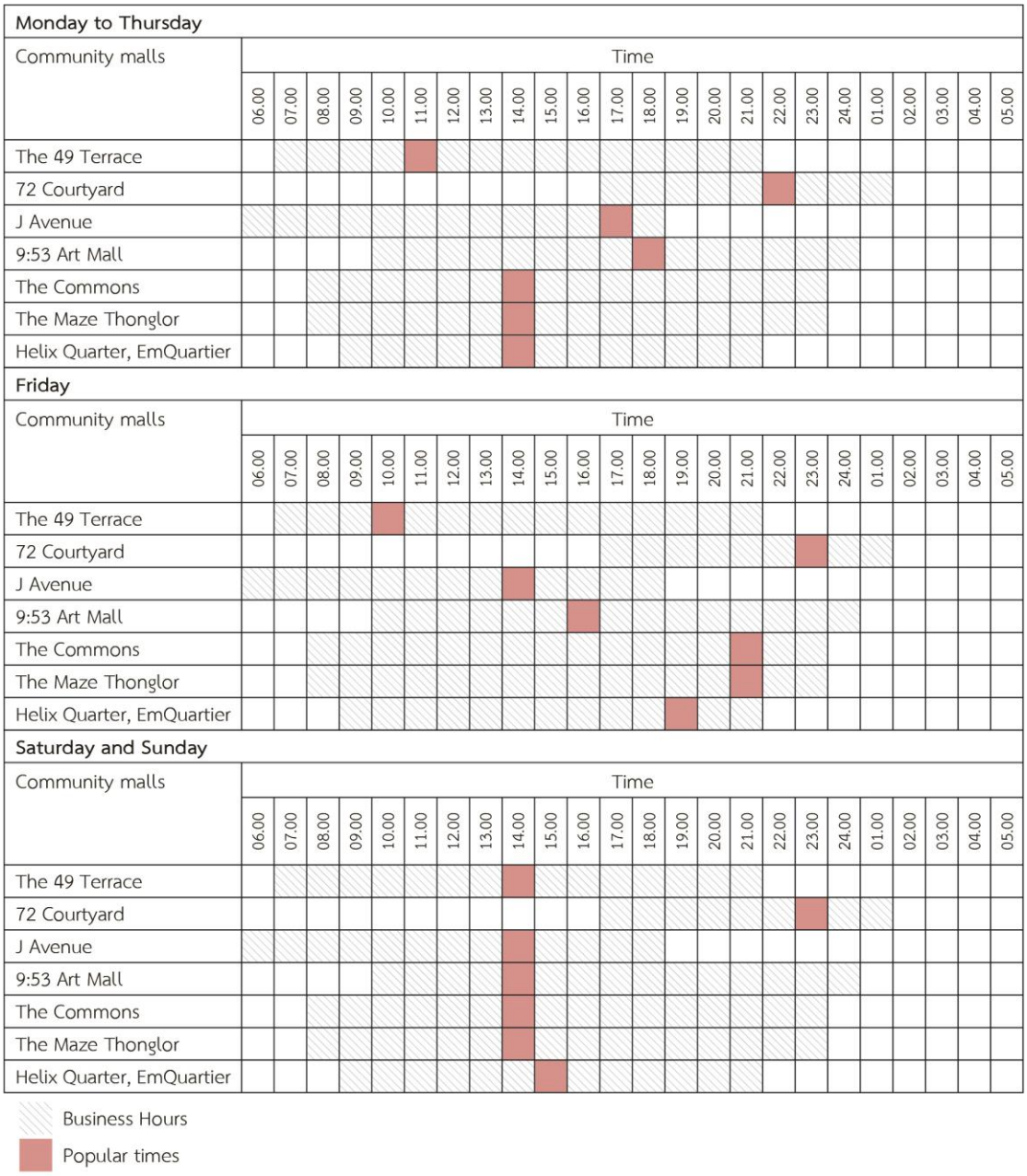

*Figure 3.1 Seven case studies.*

## 3.2 Research methods

In this research methodology section, there are four main parts of investigations following the three hypotheses formed in the literature review chapter. These three hypotheses

include, the anchor tenants on the upper floors can help distribute pedestrian flows evenly inside the mid-rise community mall; the effortlessness on moving between different floors can help distribute pedestrian flows evenly inside the mid-rise community malls; and the level of visual accessibility between top floor and first floor in mid-rise community malls can directly influence the distribution of the pedestrian flows. Accordingly, each part of the research methodology is designed to verify these hypotheses.

*Table 3.2 Popular times, information from Google, 2017.*



The first part of the investigation is to collect the floor plans of the chosen cases. These floor plans are then labeled with tenant placement, entrances, and vertical paths. This is to record the types, sizes, and locations of the tenants in order to find the patterns among the chosen cases. The types of tenants are classified into anchor tenants, low-impulse trade tenants, and high-impulse trade tenants. The relationship between entrances and vertical paths in relation to each tenant is considered as it defines the layout (keyhole, linear, horizontal circuit, or vertical circuit) of the community mall. The identification of these is expected to validate the first hypothesis where existences and placements of anchor tenants are required for community malls' survivals.

The second part is to observe customers' traces from their entrances to their destinations. The data is documented by recording behaviors on floor plans of the community malls, where the preferred paths are highlighted in red color (Figure 3.2). The paths with high pedestrian flows are highlighted in thicker red lines and the paths with low pedestrian flows are highlighted in thinner red lines. The observation periods take place three days in a week during the most popular times of each day where the pedestrian flows are the busiest. These periods of time can be achieved through the data collected by Google called "Popular Times" (Table 3.2). The overall period of the observation is from February to March 2017. This part of the investigation aims to study preferences of the customers who visit the community malls, along with the balance between efforts required and powers of attraction according to the second hypothesis.

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The third part and the fourth part of the investigation aim to verify the relationship between visual access and distribution of the pedestrian flows. The third part is to take panoramic photographs from the points of entrances. These points include entrances from the streets and the entrances from car parking space. Due to the openness of the building type, entrances from the streets are not limited to the main entrances but along the sides of the building adjacent to the streets. Thus, the most used entrance points are chosen from the observation during popular times in the previous part of the investigation. This panorama is taken at each of these points to record what the customers can perceive once they enter the community malls. In the diagrams, the visible vertical path choices from these entrances

are marked as the options presented to the customers. However, it is found that the panoramic photographs alone are not efficient for analyzing the series of spaces in the building. Therefore, the fourth part of the investigation is included in this research to connect the data across the floors.

The fourth part aims to fulfill this gap by generating Visual Step Depth and Visual Integration graphs via DepthmapX. The outcomes of these generations are presented in floor plans of the community malls (Figure 3.4). Here, the Visual Step Depth graphs are used together with the results from the field observations to define relationships between the sequences of visual accesses from the entrances and the choices of vertical paths customers choose. This is because the Visual Step Depth graph can present the number of turns that it takes to get from the entrance to any other location within the plan. Accordingly, the first step or depth one (represent in red color) is the first visual access the customers perceive once they enter the community mall. Moreover, this generation of Visual Step Depth graph can also benefit the research by offering further visual steps throughout the plan (depth two in orange, depth three in yellow, and depth four in green). These visual steps can point out the parts of the building that are hard to be seen. The Visual Integration graphs are used to define the most integrated area of the building (represent in red color). This is the area where customers are expected to walk towards, as it is the most seen area from every other point in the building. The graphs are also used in coordinate with the data from the field observations to verify the hypothesis.

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3.3 Data collections from case studies

In this section, the case studies are ranged from The 49 Terrace, 72 Courtyard, J Avenue, 9:53 Art Mall, The Commons, The Maze Thonglor, to The Helix (EmQuartier). The data collected from each case study are explained in four parts according to the four parts of the investigations.

### 3.3.1 The 49 Terrace


*Figure 3.2 Mapping of pedestrian entrances and tenants in The 49 Terrace showing the tenant location pattern (left), and the vertical paths and pedestrian traces showing customers' selected paths during the observation period (right), 2017.*

The 49 Terrace is located at the intersection of Sukhumvit 49 alley and Sukhumvit 49/1 alley. It is a three-floor community mall with GFA of 1,885 sq.m. The building was designed by Architects 49 Limited. It was completed in 2005. The types of tenants on each floor are varied. The tenants on the first floor include a chained coffee shop, a restaurant, clothing shops, accessories shops, and a nail salon. On the second floor, there are a restaurant, a children's wear shop, a furniture shop, and a dry cleaner. On the third floor, there are a

massage therapy, a hair salon, a furniture shop, a clothing shop, and a vacant unit (Figure 3.2 left). It can be observed that the anchor tenant (a chained coffee shop) is located on the first floor, while the low-impulse trade tenants (a nail salon, a dry cleaner, and a massage therapy) are located on every floor of the building.

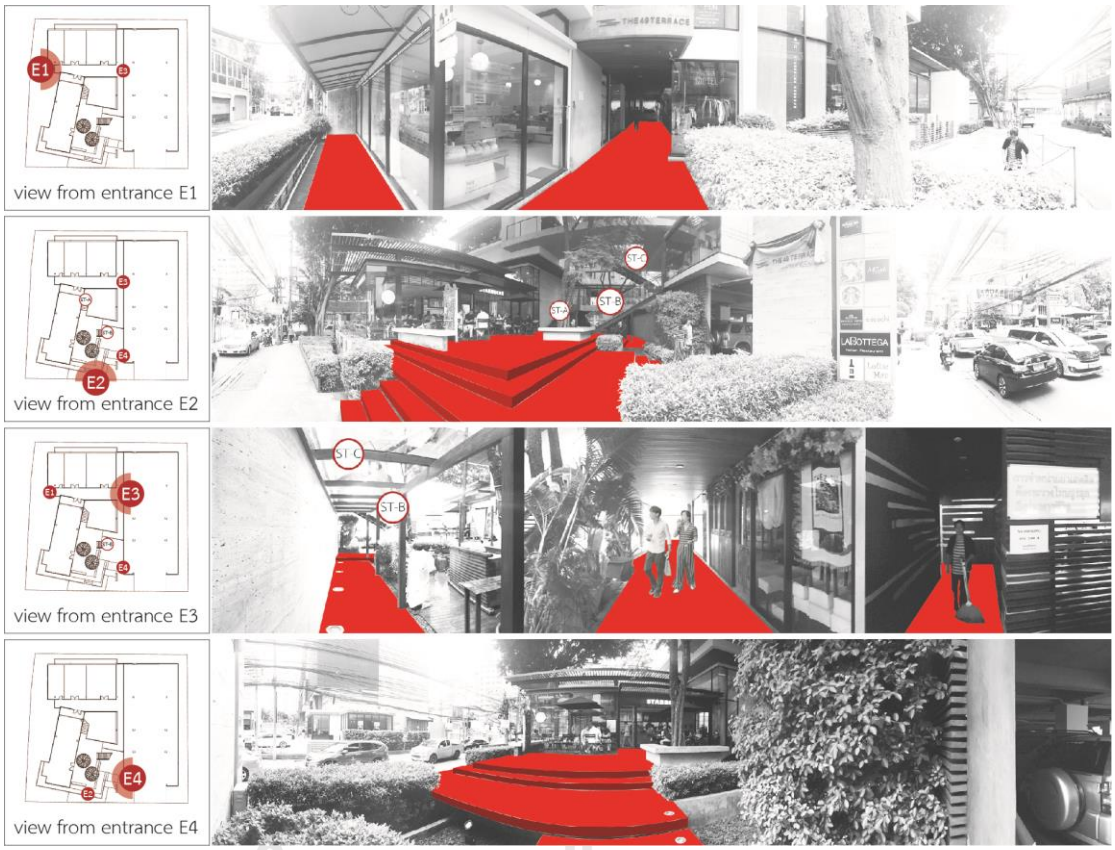


*Figure 3.3 Panoramic photographs from pedestrian entrances in The 49 Terrace showing visible vertical path choices from each entrance, 2017.*

To enter the community mall, there are two entrances from the street (E1 and E2) and two entrances from a parking space (E3 and E4) on the first floor (Figure 3.2). Entrance E2 is the main entrance. It is an open space connected to the coffee shop and a central courtyard of the community mall. Entrance E1 is located on another side of the community mall next to Sukhumvit 49/1 alley. It leads to a dark corridor connected to the courtyard. The two entrances from the parking space also connected to the courtyard (Figure 3.3). To move to the upper floors, there are two sets of stairs (ST-A and ST-B) linking a central courtyard on

the first floor and outdoor terraces on the second floor. There is one set of stairs (ST-C) linking the second floor and the third floor.

The busiest time of the community mall is during 10:00-11:00 on weekdays and 14:00-15:00 on weekends (observation period). During the observation period, most of the customers entered the community mall through the two entrances from the parking space as they traveled by cars. Some of the customers walked to the community mall and used entrance E2. Only a couple of the customers use entrance E1. The customers mostly use stair ST-B to get to the second floor. The coffee shop, the restaurant on the second floor, and the outdoor area next to entrance E2 are the areas with the highest number of customers. There are not many customers on the third floor, only six customers walk up to the massage therapy and the furniture shop during the period of one hour (Figure 3.2 right).

The 49 Terrace consists of multiple open spaces on each floor. It is claimed that visual accesses are available to all shops in the projects from the central courtyard (Architect 49, 2009). From the panoramic photographs (Figure 3.3), they show that the outdoor area in front of the coffee shop is the first area that the customers will see from the two entrances (E2 and E4). From entrance E2, most parts of the building are visible through the continuous atrium between the first floor a d the top floor. Moreover, it appears that all three vertical paths (ST-A, ST-B, and ST-C) are clearly visible from entrance E2. However, the vertical path ST-B and ST-C are barely visible through the transparent roof from entrance E3, while none of the vertical paths are visible from entrance E1 and E4. When including the results of visibility from all entrances, the Visual Step Depth graph shows that most parts of the first floor are visible. They are also lead to the visibility of the vertical paths and to the upper floors (Figure 3.4 left). Nevertheless, it takes eight visual steps to reach the two ends of the corridors on the top floor. This derives from the nature of the dead-end itself and the absent of elevator, where an elevator can help decrease the number of steps taken for the customers to go to the upper floors. The visual integration graph (Figure 3.4 right) shows that the most integrated areas are around entrance E3, which is at the joint connected long corridors together. However, there are only a few customers walk through this area due to the lack of light in the corridor connected to entrance E1. This shows that environmental

factors affecting the pedestrian flows, such as ceiling height and the amount of sunlight reaching open-air area should be taken into consideration as well.

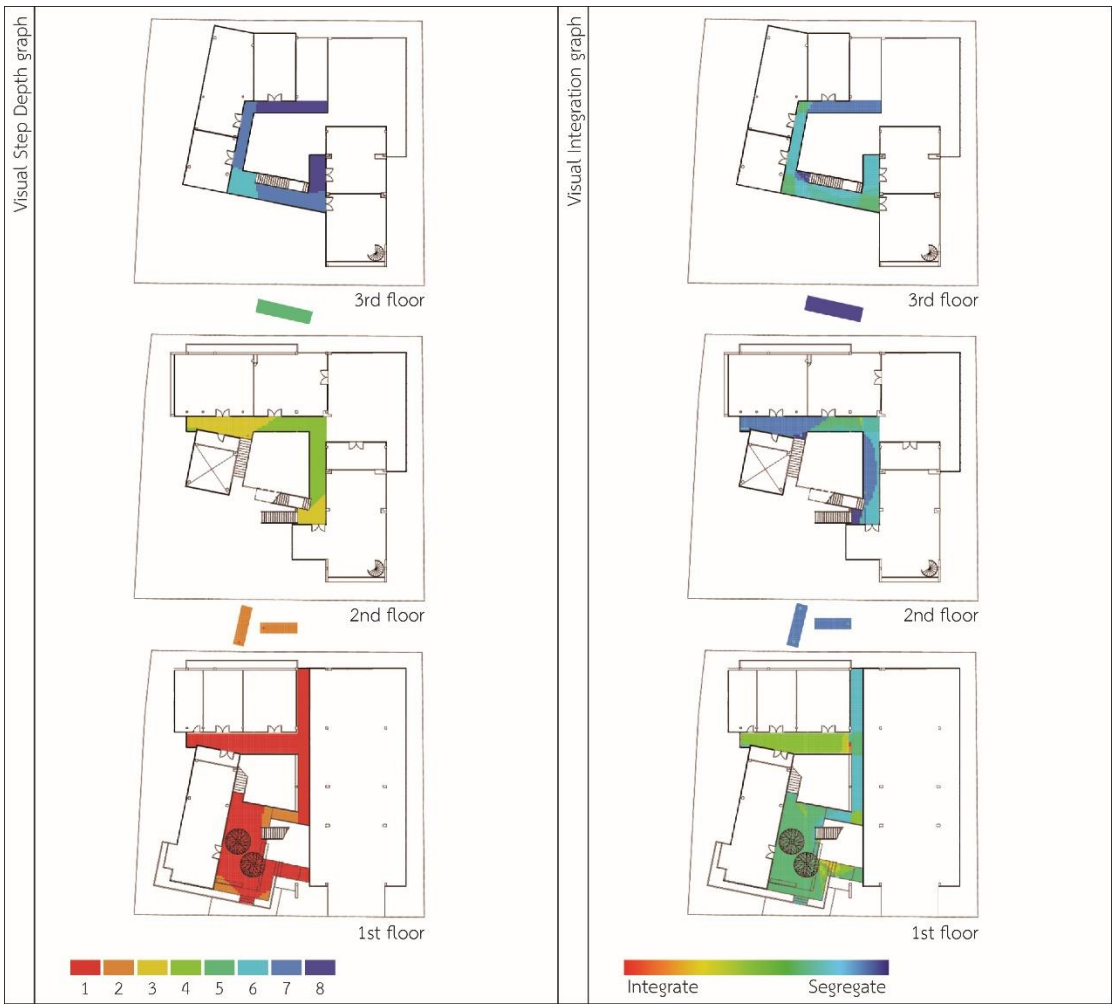


*Figure 3.4 Visual Step Depth showing number of turns that it takes to get from the pedestrian entrances (left), and Visual Integration showing the integrated and segregated area (right).*

### 3.3.2 72 Courtyard

72 Courtyard is located between Thong Lo 16 and Thong Lo 18 alley. It is a collaborative project between Amanda Levete Architects and VaSLab Architecture. Completed in 2016, it is a three-floor community mall with a theme of nightlife experiences. It seeks to redefine the typology of community mall with a nightclub as an anchor tenant. On the first floor, there are restaurants and pubs. The rental units on the second floor are multi-floor units.

There are restaurants, pubs, a nightclub, and one vacant unit (Figure 3.5 left). The nightclub on the second floor is considered to be an anchor tenant of 72 Courtyard. The outdoor terrace on the second floor located small pocket parks. The façades of the upper floors toward the street are opaque, while the inner sides that faced the parks are transparent.

There are two entrances in this community mall. The main entrance from the pedestrian street (E1) is open to the central courtyard, in which accommodate tables and chairs for outdoor dining. The main stair ST-A, which leads to the second floor, is visible from the entrance. Another entrance to the first floor (E2) is from the underground parking space through an elevator EL-A. This elevator services from the underground floor to the second floor. To move to the third floor, the customers have to get inside a specific shop on the second floor that has direct stairs to the shop on the third floor.

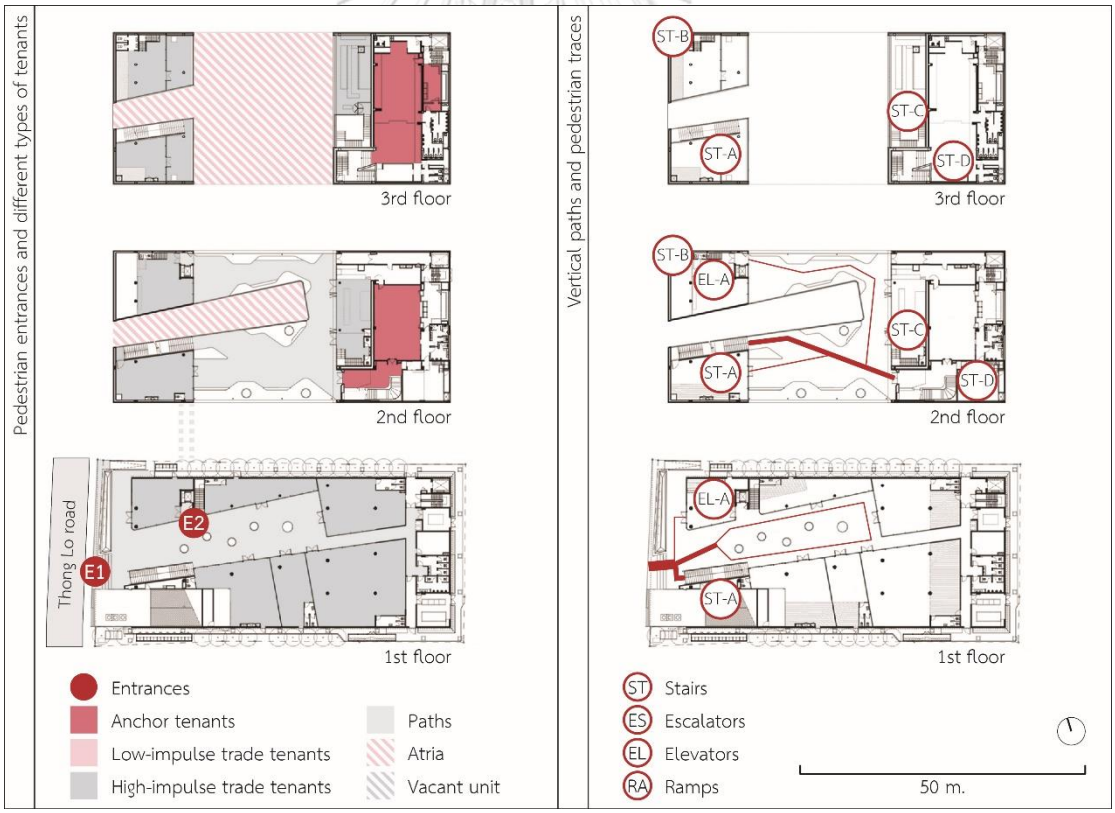


*Figure 3.5 Mapping of pedestrian entrances and tenants in 72 Courtyard showing the tenant location pattern (left), and the vertical paths and pedestrian traces showing customers' selected paths during the observation period (right).*

Since 72 Courtyard is focusing on the nightlife experiences, most of their tenants' operation hours are during 17:00-02:00. This is except for the restaurant in the front which operate from 10:00-02:00. The busiest hour of the community mall is 22:00-23:00 on weekdays and 23:00-24:00 on weekends. From the observation, most customers used the community mall valet parking service where they got off their cars in front of the building near stair ST-A (Figure 3.6). Other customers traveled to the community mall by taxi, while some customers parked elsewhere and walked to the community mall. Unlike other community malls, 72 Courtyard does not provide parking spaces in front of the building. The nightclub held the highest number of customers. The outdoor seating area are full of customers in the evening of weekends. There are also many customers on the second floor, and the top floor. This means that the multi-floor units on the top floor are not undesirable and can be applied. Moreover, the existence of mezzanine floor can increase the height of the unit. This height means that the unit can be more easily seen through the atrium from the first floor of the community mall.


*Figure 3.6 Panoramic photographs from pedestrian entrances in 72 Courtyard showing visible vertical path choices from each entrance, 2017.*

The Visual Step Depth graphs show that all shop fronts on the first floor are visible from entrance E1. They show that the elevator help decreases the number of turns to get to at the other end of the second floor where the area is the most segregated (Figure 3.7 left). Comparing to the observation, the customers hardly use this elevator because the front of the elevator on the second floor is narrow and located between the entrance of the restaurant and the corridor. The visual integration graph shows that the most integrated

areas are around entrance E1 and stair ST-A. The central courtyard of the community mall, along with stair ST-A, leads the eye to the outdoor terrace on the second floor. It also appears in figure 3.6 that from the point of entrance E1, the customers can see the pocket park on the second floor and some of the shopfronts due to the height of the mezzanine floors of the multi-floor units.

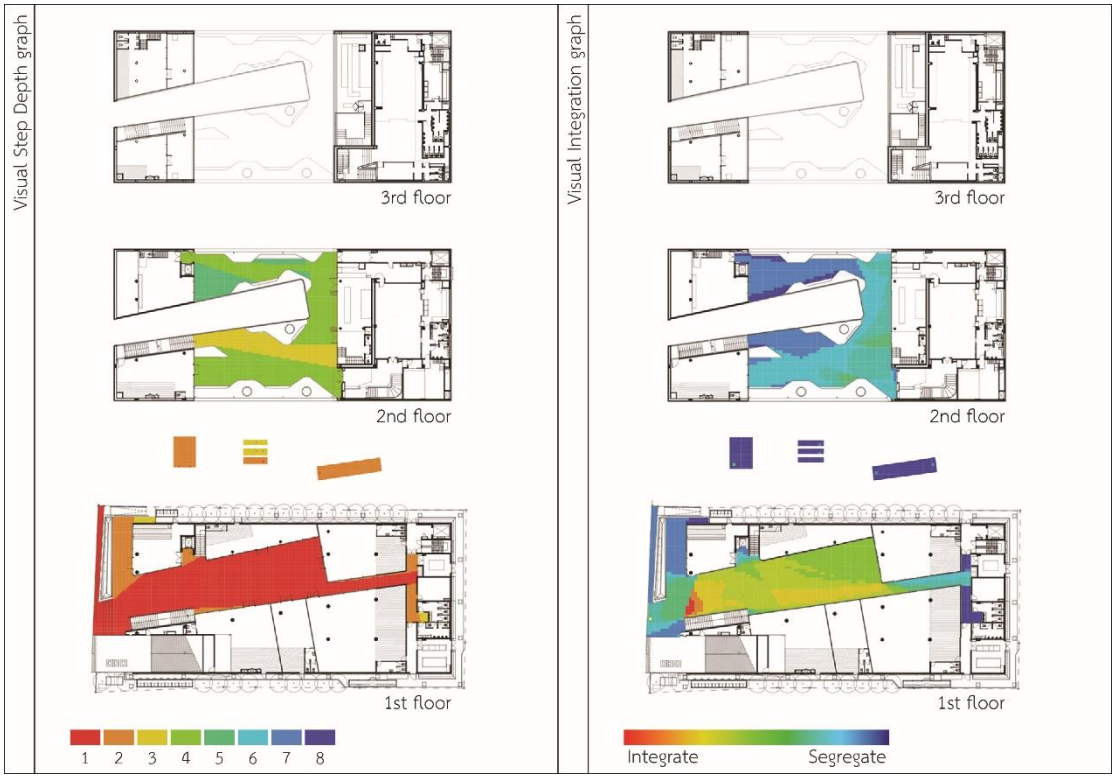


*Figure 3.7 Visual Step Depth showing number of turns that it takes to get from the pedestrian entrances (left), and Visual Integration showing the integrated and segregated area (right).*

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### 3.3.3 J Avenue

J Avenue is located between Thong Lo 15 and Thong Lo 17 alley. It is a commercial project by Siam Future Development and Contour in 2004. It consists of two buildings joined by an elevated walkway on each floor with total GLA of 7,000 sq.m. There are four floors of leasable spaces providing wide ranges of tenants to introduce an original lifestyle experience with Japanese concept. On the first floor, there are a supermarket, banks, coffee shops, restaurants, dessert cafés, clothing and accessories shops, pet shops, a gadget shop, a hair

salon, a dry cleaner, and a flower store. On the second floor, there are Japanese restaurants, a retail shop, and a vacant unit. On the third floor, there are beauty clinics, hair and nail salons, a travel agency, and a music school. On the fourth floor, there are a fitness center and a restaurant. In this case, there are more than one anchor tenant in the community malls, which are a supermarket, a coffee shop, and a restaurant on the first floor. There are also multiple low-impulse trade tenants on every floor of the building with a large low-impulse trade tenant (a fitness center) on the top floor.

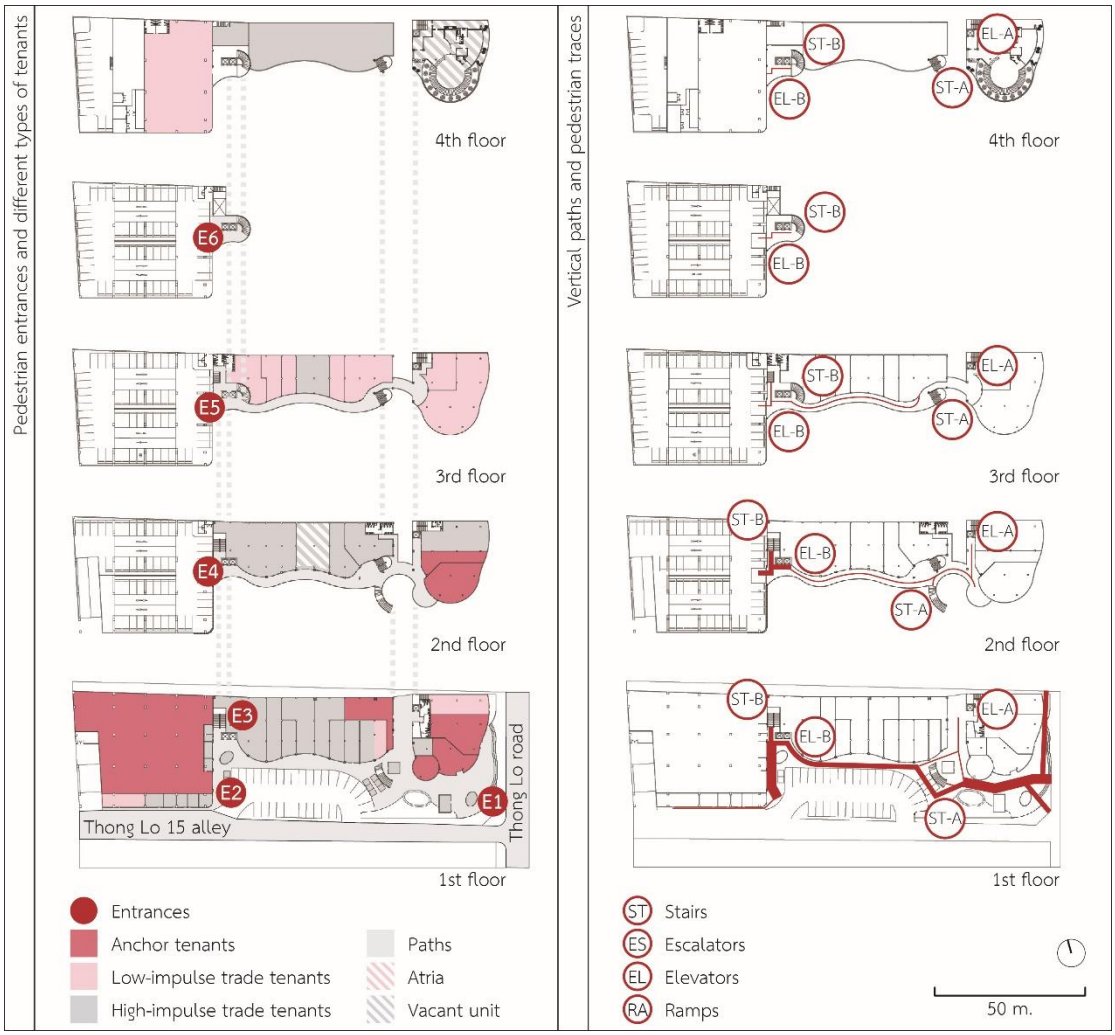


*Figure 3.8 Mapping of pedestrian entrances and tenants in J Avenue showing the tenant location pattern (left), and the vertical paths and pedestrian traces showing customers' selected paths during the observation period (right).*


*Figure 3.9 Panoramic photographs from pedestrian entrances in 72 Courtyard showing visible vertical path choices from each entrance, 2017.*

To enter the community mall, there are two entrances from the pedestrian street on the first floor. Entrance E1 is the main entrance from Thong Lo road, while entrance E2 is a drop-off area in front of the supermarket next to Thong Lo 15 alley. Other entrances (E3, E4, and E5) are entrances from parking spaces on the second floor, third floor, and fourth floor accordingly. Stair ST-A is visible from entrance E1, while stairs EL-B and Elevator EL-B are visible from entrances E2, E3, E4, and E5 (Figure 3.9).

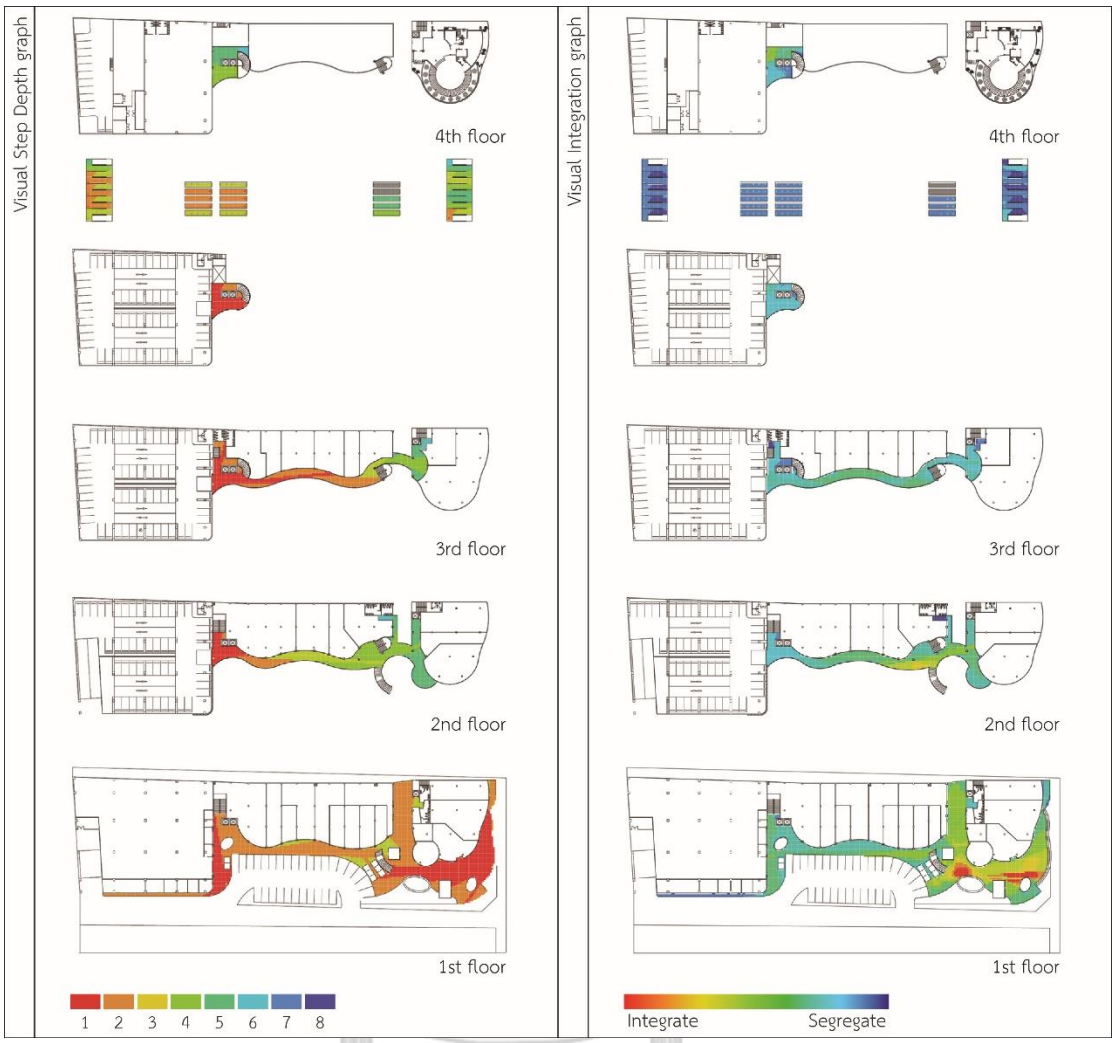


*Figure 3.10 Visual Step Depth showing number of turns that it takes to get from the pedestrian entrances (left), and Visual Integration showing the integrated and segregated area (right).*

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The community mall is busiest during 17:00-18:00 on weekdays and 14:00-15:00 on weekends. From the observation, most customers spent their times in the supermarket and the coffee shop. These two tenants are located at the opposite ends of the site encouraged the customers to walk between them. This created high pedestrian flows on the first floor as the customers enter the community mall area from all three entrances (E1, E2, and E3). For the upper floors, the customers parked on the floors where their destinations are located. The customers who went to the fitness center mostly parked on the third (E5) and the fourth floors (E6) where they can go straight up to the fitness center (Figure 3.8 right). It can be observed that customers only use stairs to walk down, while use elevators to go up.

This is coordinate to the hypothesis on the economy of movement. In this case, the customers are not willing to take effort to walk up more than one floor as the floor to floor height is 4 m.

Another factor affecting the pattern of the pedestrian flow is the lack of shading devices. This can be observed from the preferences of customers who parked on the upper floors while their destinations were on the lower floors. They mostly used elevator EL-B or stairs ST-B near the parking space before they continued their journeys on the floors where their destinations are located, as the alternative set of stairs (ST-A) is exposed to direct sunlight. It can be confirmed with the result of Visual Step Depth graph, where it shows that the entrance from each floor decreases the number of turns taken to reach the upper floors (Figure 3.10 left). While this should mean that the pedestrian flows are distributed equally between each floor, the reality is that there are great differences between the amount of the pedestrian flows on the first floor and the upper floors. The customers were not encouraged to walk through the entire floors as the corridors on the upper floors are exposed to direct sunlight. Moreover, the Visual Integration graph shows that the most integrated areas are in front of the coffee shop and on the intersection around stairs ST-A. From the observation, these locations are busy with both the customers who hang out around the areas and the customers who walk from one end of the community mall to another. All these results point that the location of stairs ST-A is the best location to attract the customers to the upper floors, thus the stairs ST-A are barely used. All in all, the preferable amount of sunlight is another factor which should be considered.

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3.3.4 9:53 Art Mall

9:53 Art Mall is located at the intersections of Thong Lo 9 alley and Sukhumvit 53 alley. It was completed in 2014. It consists of three buildings. The first building has three floors. The first floor of the building is a space for parking and vehicle circulations. The second floor is a music school and the third floor is a pet spa. The other two buildings each consist of four floors. They are joined together by stairs on the third floor and the fourth floor. The tenants on the first floor are restaurants, an ice cream shop, a collectible store, and three vacant units. On the second floor, there are a restaurant, a hair salon, a furniture shop, a flower

store, and three vacant units. On the third floor, there are a beauty clinic, a Japanese snack bar, and a fitness center. On the fourth floor, there are a Japanese restaurant, and two vacant units.

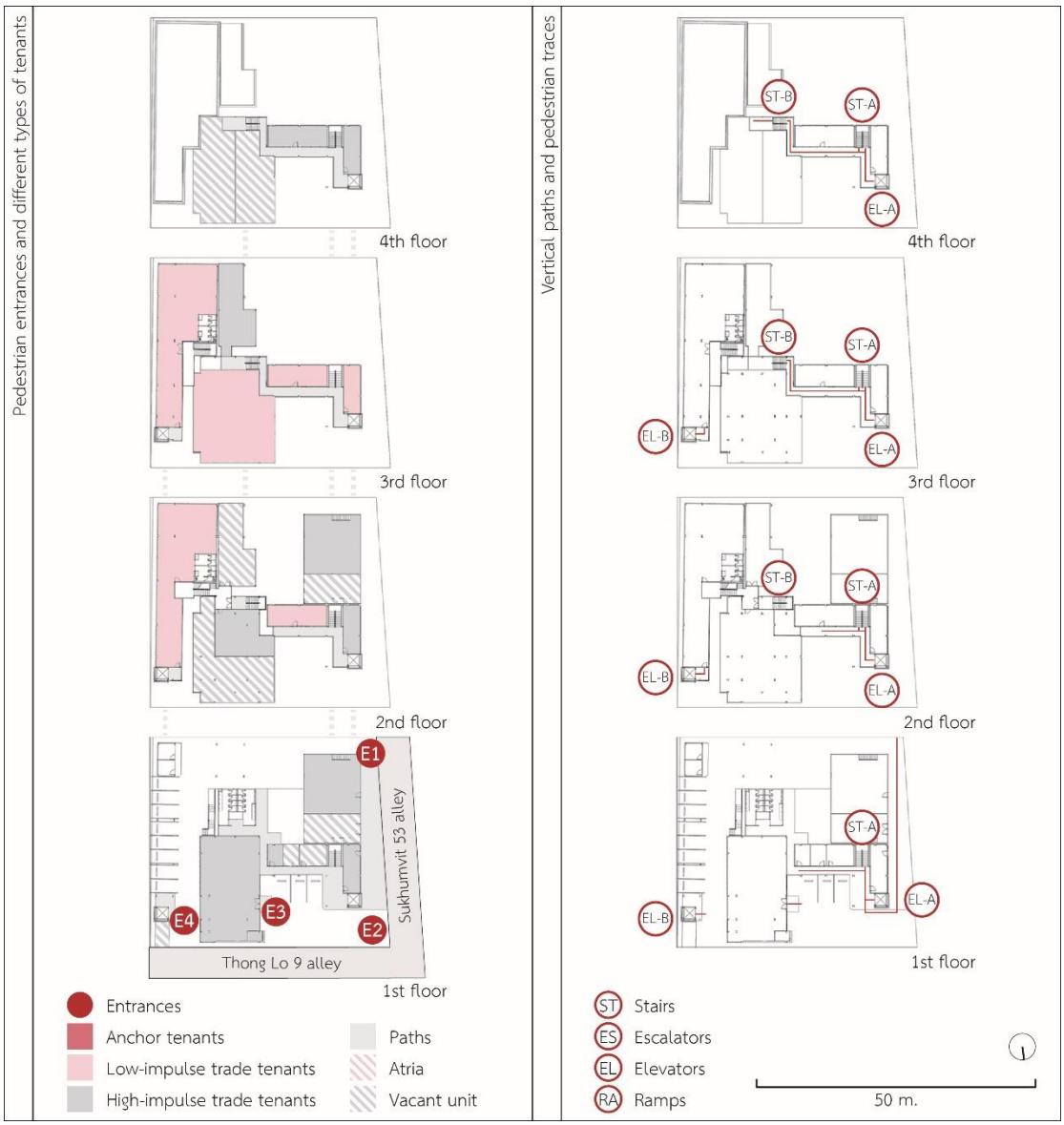


*Figure 3.11 Mapping of pedestrian entrances and tenants in 9:53 Art Mall showing the tenant location pattern (left), and the vertical paths and pedestrian traces showing customers' selected paths during the observation period (right).*

To enter the first building, the only entrance available for the customers is entrance E1 through elevator EL-B in front of the building. For the other two buildings, the customers

can enter the shops on the first floor through the parking space in front of the building (E2 and E3). Another entrance is on the other side of the building next to Sukhumvit 53 alley (E1). To move up to the upper floors of the third building, the customers can use an elevator EL-A or stairs ST-A. However, to enter the upper floors of the second building, the customers have to go through the connected stairs (ST-B) available from the third and the fourth floor.

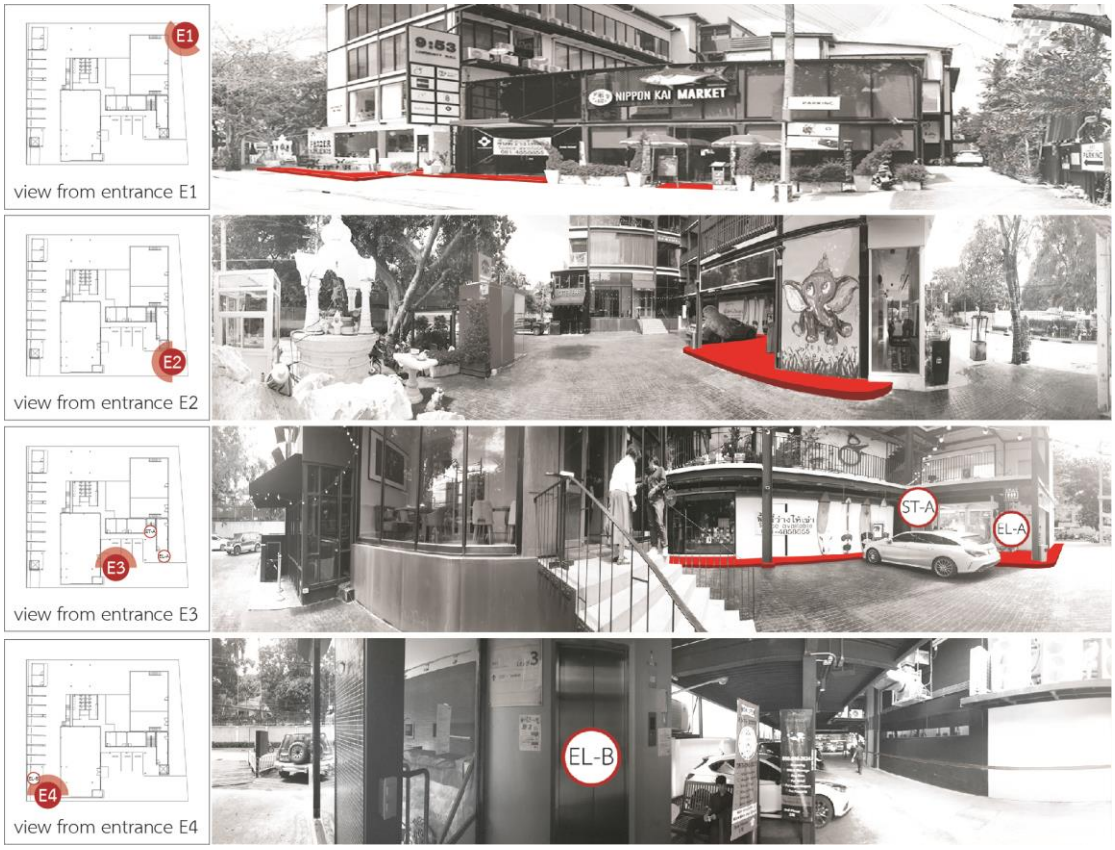


*Figure 3.12 Panoramic photographs from pedestrian entrances in 9:53 Art Mall showing visible vertical path choices from each entrance, 2017.*

The community mall is busiest during 18:00-19:00 on weekdays and 14:00-15:00 on weekends. From the observation, most customers visited the community mall by cars as the community mall is located far away from public transportation system. They used valet parking service around entrance E4 due to lack of parking space. Most customers visited two restaurants on the first floor and the music school on the second floor. Apart from the music school and the salon, there is no customers upstairs during the observation. There is no customer walking around the community mall either. The customers tend to go straight to

their destinations. It can be because the pedestrian paths are not desirable to walk. On the first floor, the pedestrian and vehicle circulations are not separated. Accordingly, most of the time the circulation area in front of the community mall is occupied by cars.

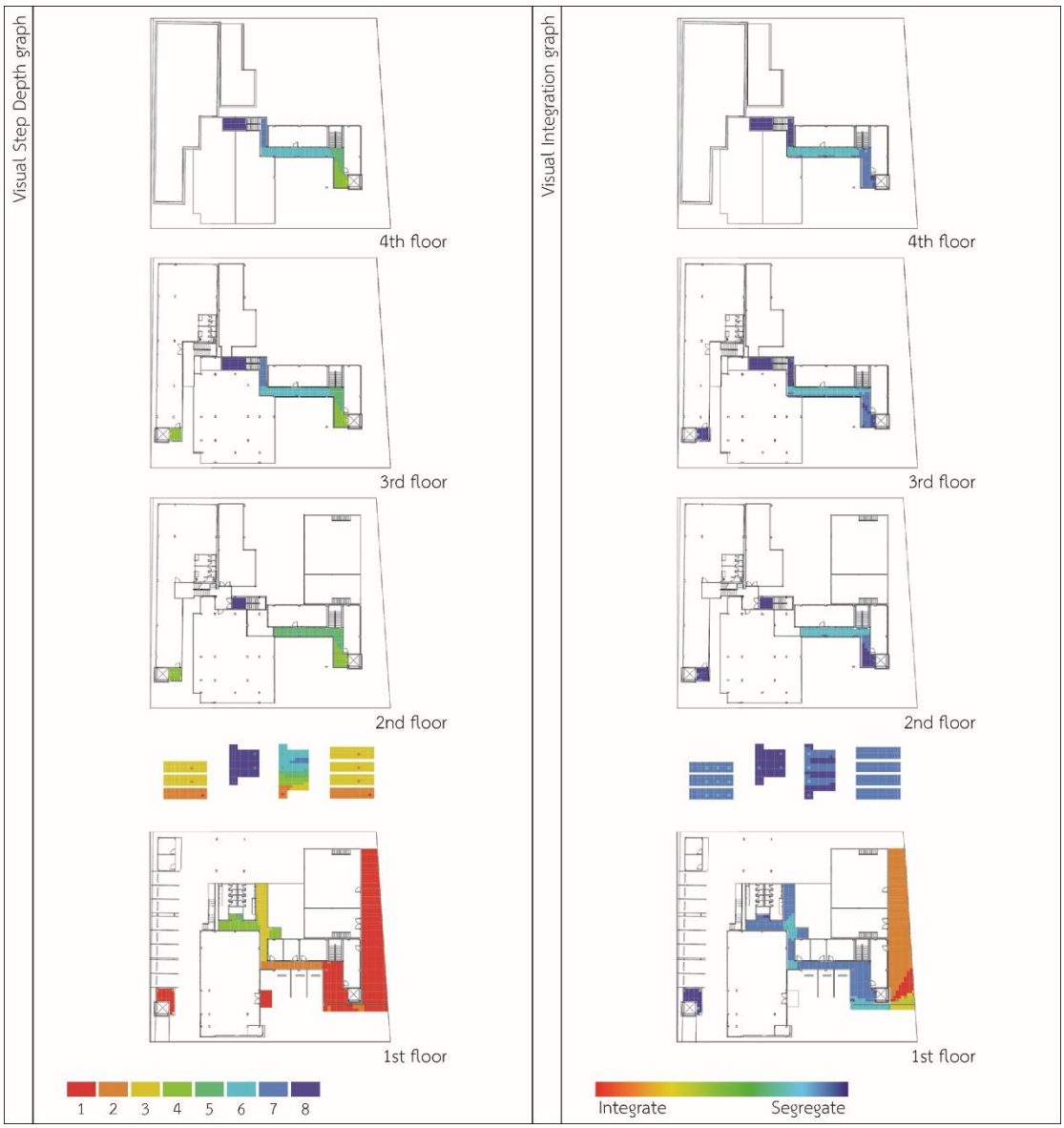


*Figure 3.13 Visual Step Depth showing number of turns that it takes to get from the pedestrian entrances (left), and Visual Integration showing the integrated and segregated area (right).*

On the upper floors, the corridors are very narrow and the connections between three buildings are complicated. The Visual Step Depth shows that it takes eleven turns to get to

the second floor of the second building where the two vacant units are located. From the panoramic photographs (Figure 3.13), they show that the connected stairs (ST-B) are not visible from any of the entrances. Thus, there is no visual information from the point of entrance and the directions to the upper floors tenants had to be given to the first-time customers. The outdoor terraces of 9:53 Art Mall are only available in the third building. The walkways of the other two buildings are located indoor.

3.3.5 The Commons

The Commons is located in Thong Lo 17 alley. It was designed by Department of Architecture and was completed in 2016. The building has GFA of 5,000 sq.m. There are four floors and an underground parking. The first floor consists of large ramps and steps, which lead to the upper floors. These ramps and steps, together with multiple atria, were claimed to provide a solution to a challenge to draw customers to the upper floors. Beside the ramps, there is an entrance (E1) to an indoor market area with an air conditioning system on the first floor. In the market area, there are restaurants and coffee shops, which are open to the corridor. These restaurants and coffee shops share their seating area both indoor and outdoor. On the second floor, there are dessert cafés, a gadget shop, a flower store, a pub, a clothing shop, and two vacant units. On the third floor, there are a yoga studio, a kid's center, and a toy shop. On the fourth floor, there is a restaurant and an empty room for special events and workshops. The restaurant on the top floor, owned by The Commons' owners, is claimed to be an anchor tenant of the community mall.

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There are two main entrances from the pedestrian street, entrance E1 to the air conditioning market and entrance E2 to the ramps and steps. Another entrance is from the underground parking where the customers can go to the upper floors through an elevator EL-A and stairs ST-A. The elevator services from the underground parking to the fourth floor.

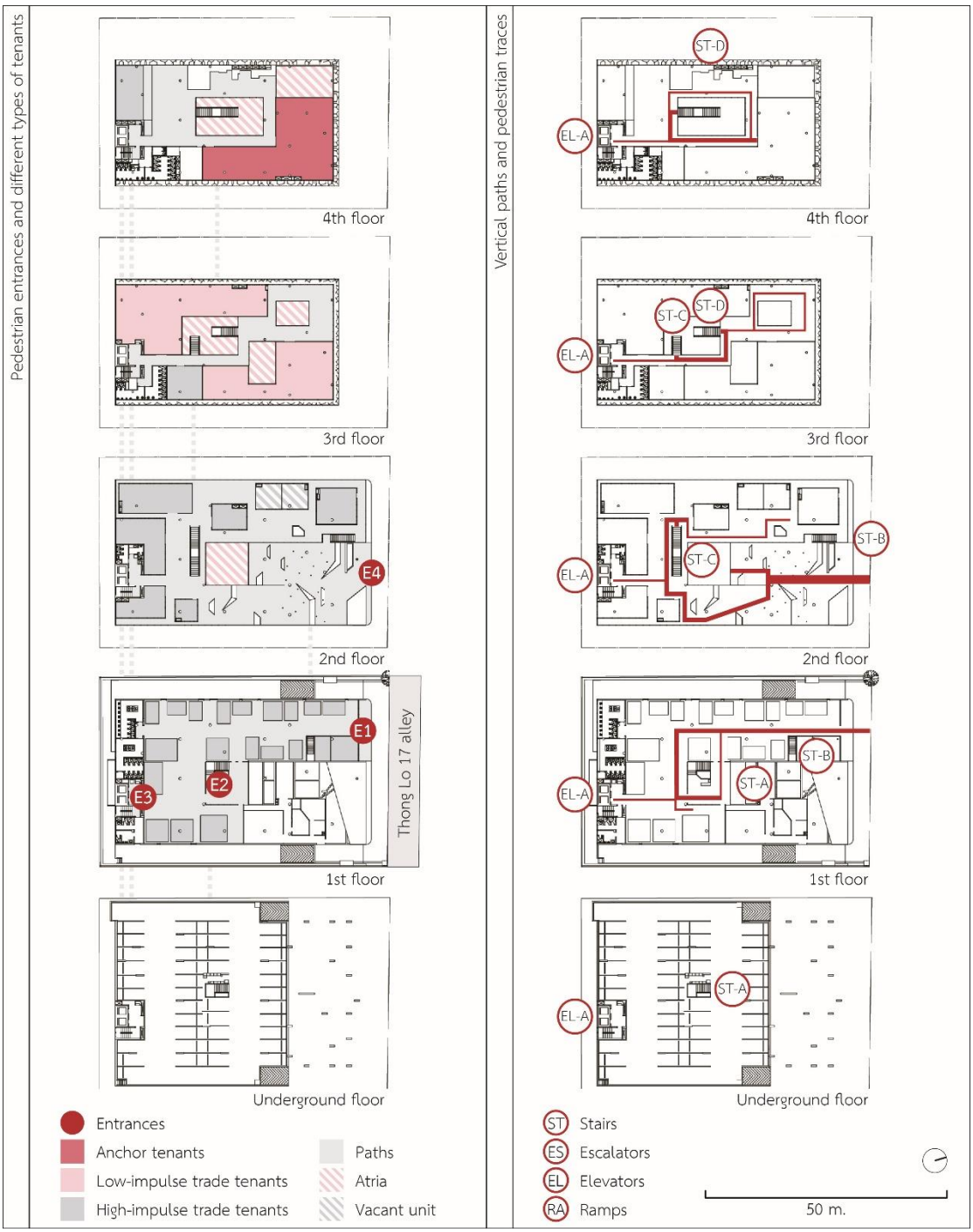


*Figure 3.14 Mapping of pedestrian entrances and tenants in The Commons showing the tenant location pattern (left), and the vertical paths and pedestrian traces showing customers' selected paths during the observation period (right).*

The community mall is busiest during 14:00-15:00 on weekdays and weekends. During the observation period, most customers visited the community mall by cars. They used the

community mall valet parking service where they got off their cars in front of entrance E1. Other customers traveled to the community mall by taxi or parked elsewhere walked to the community mall. These customers mostly used entrance E2. The customers who used entrance E1 were mostly stayed in the air conditioning market, while the customers who used entrance E2 were exploring other parts of the community mall. These customers used stairs ST-C and ST-D to explore the upper floors of the building. The restaurant on the top floor had the highest amount of customers. The air-conditioning market, the yoga studio, and the kid's center also held high amount of customers.

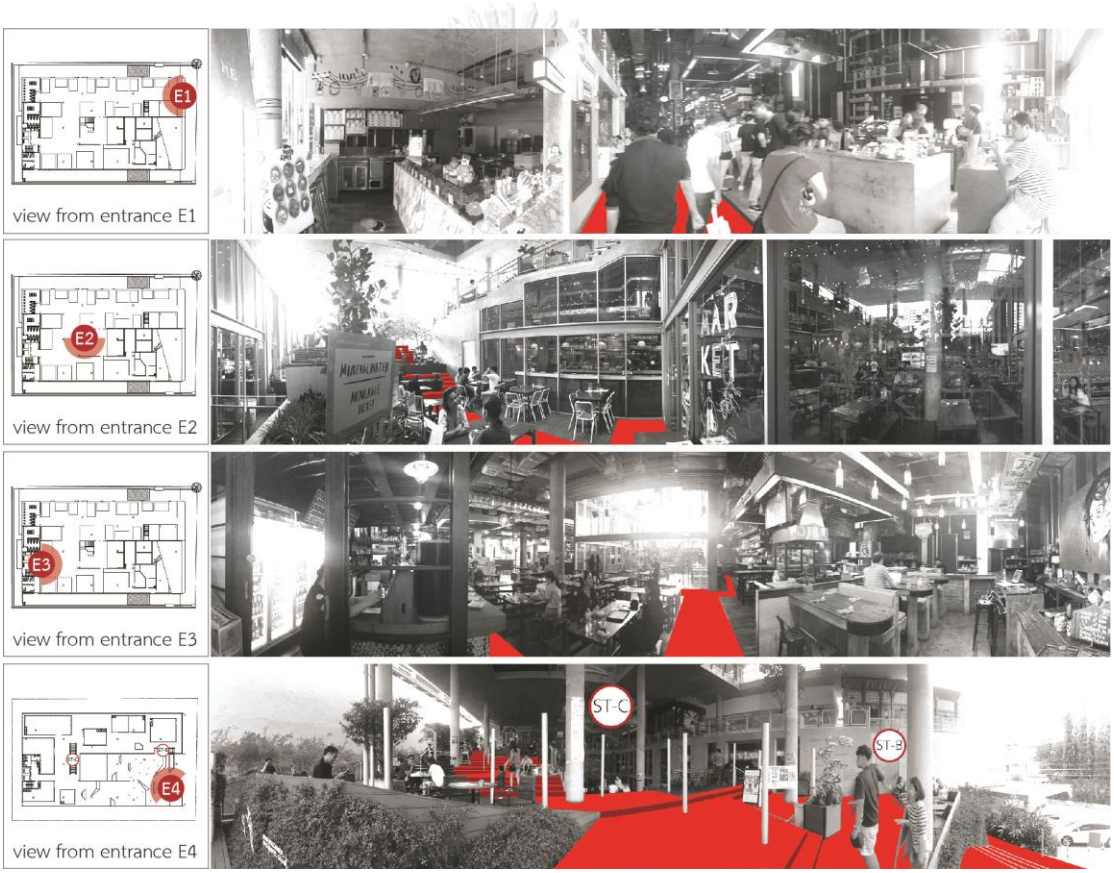


*Figure 3.15 Panoramic photographs from pedestrian entrances in The Commons showing visible vertical path choices from each entrance, 2017.*

The pedestrian flows between floors are well distributed. This can be explained, both by the interview with the architect himself and by the investigation of the researcher. The explanation by the architect of the project is the comfort of the customers. First, the design aims to make the customers feel comfortable moving to the upper floors. This concept is applied in the large ramps and steps between the first floor and the second floor (Figure

3.15). Second, the design concerns with the human comfort. Due to hot and rainy weather of Bangkok, the community mall is designed so that it allows ventilation through the building. Here, hot air can escape through the top of the building, and cold air can enter from the front of the building.

After the investigation, it appears that from entrance E2, stairs to the second floor (ST-B) and stairs to the third floor (ST-C) are visible (Figure 3.16 left). The back of stairs to the fourth floor (ST-D) is also visible through an atrium in the center of the community mall. There are multiple atria in The Commons (Figure 3.14). These atria help increase visibility between floors. From entrance E2, the customers are able to see the tenants on the third floors. These openings also allow natural ventilation to flow throughout the whole building. This is correlated to the Visual Step Depth graphs, which show that the larger size of the entrances helps reduce the number of turns taken to explore the building. The locations of the stairs themselves allow the customers to choose between the shorter path and the longer path as seen on the third floor (Figure 3.14 right). At this point, the customers do not feel forced to walk through the whole floor. Still, some of them do walk through the whole floor. It is found that the customers who choose the longer paths are taking photos in the different areas in the mall. This means that other from anchor tenants, there are other types of attractions that can influence the customers to visit different parts of the mall as well. However, there is an area on the second floor where not many customers visit. This is around the area of stairs ST-B (Figure 3.14 right). It is because the area is not integrated with overall layout of the community mall. While other parts of the mall are connected to another floor in form of a circuit layout, where the customers can complete their journeys on one floor and continue up to explore another, the area near ST-B only offers the way down.

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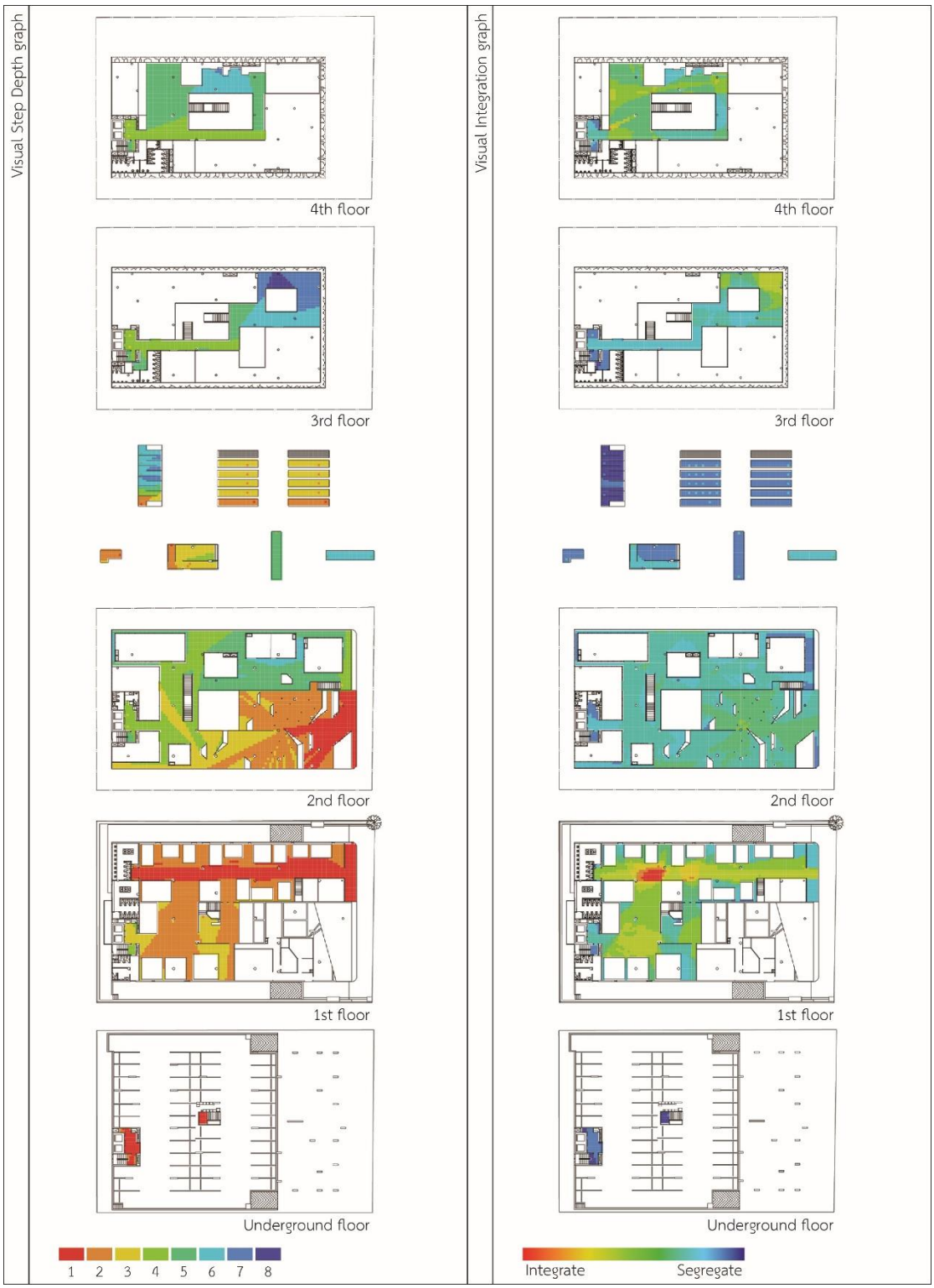


*Figure 3.16 Visual Step Depth showing number of turns that it takes to get from the pedestrian entrances (left), and Visual Integration showing the integrated and segregated area (right).*

### 3.3.6 The Maze Thonglor


*Figure 3.17 Mapping of pedestrian entrances and tenants in The Maze Thonglor showing the tenant location pattern (left), and the vertical paths and pedestrian traces showing customers' selected paths during the observation period (right).*

The Maze Thonglor is located between Thong Lo 4 and Thong Lo 6 alley. It was completed in 2016 with GFA of 6,600 sq.m. It is a five-floor community mall with an underground parking. On the first floor, there are dessert cafés, a coffee shop, and a restaurant. On the second floor, there are three restaurants and two vacant units. On the third floor, there are a beauty clinic, a hair salon, a nail salon, a clothing shop, a candle shop, and two vacant units. There is no tenant on the fourth floor and the fifth floor (rooftop). According to their initial plans, there were going to be a yoga studio and a fitness center on the fourth floor, and a wine and cocktail bar on the fifth floor.

There are two entrances to the community mall. The main entrance E1 is an entrance from the pedestrian street. In this entrance, there is a set of stairs ST-A, which lead to the second floor. A dessert café, a coffee shop, and a restaurant on the first floor are facing the pedestrian street. The customers can directly use their entrances without entering the community mall's common area. Another entrance is an entrance from the underground parking through an elevator EL-A. The elevator is operated from the underground floor to the fifth floor.

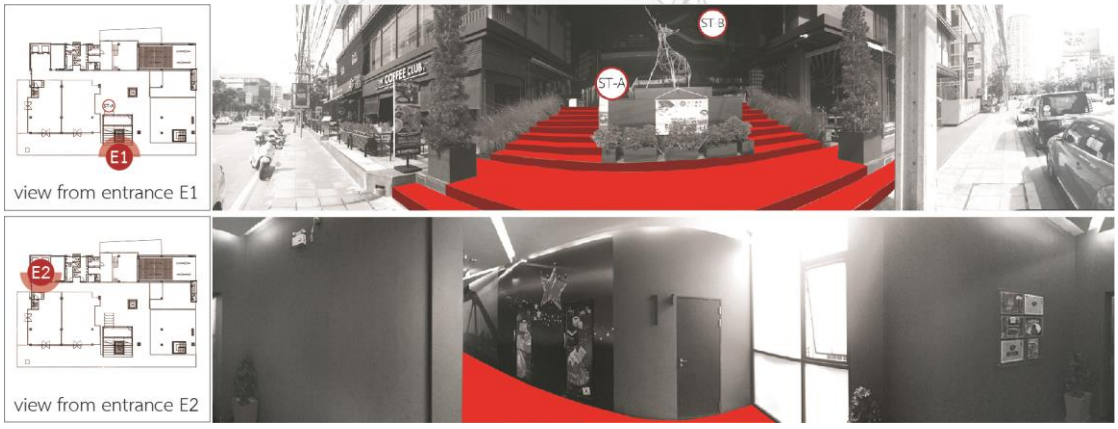


*Figure 3.18 Panoramic photographs from pedestrian entrances in The Maze Thonglor showing visible vertical path choices from each entrance, 2017.*

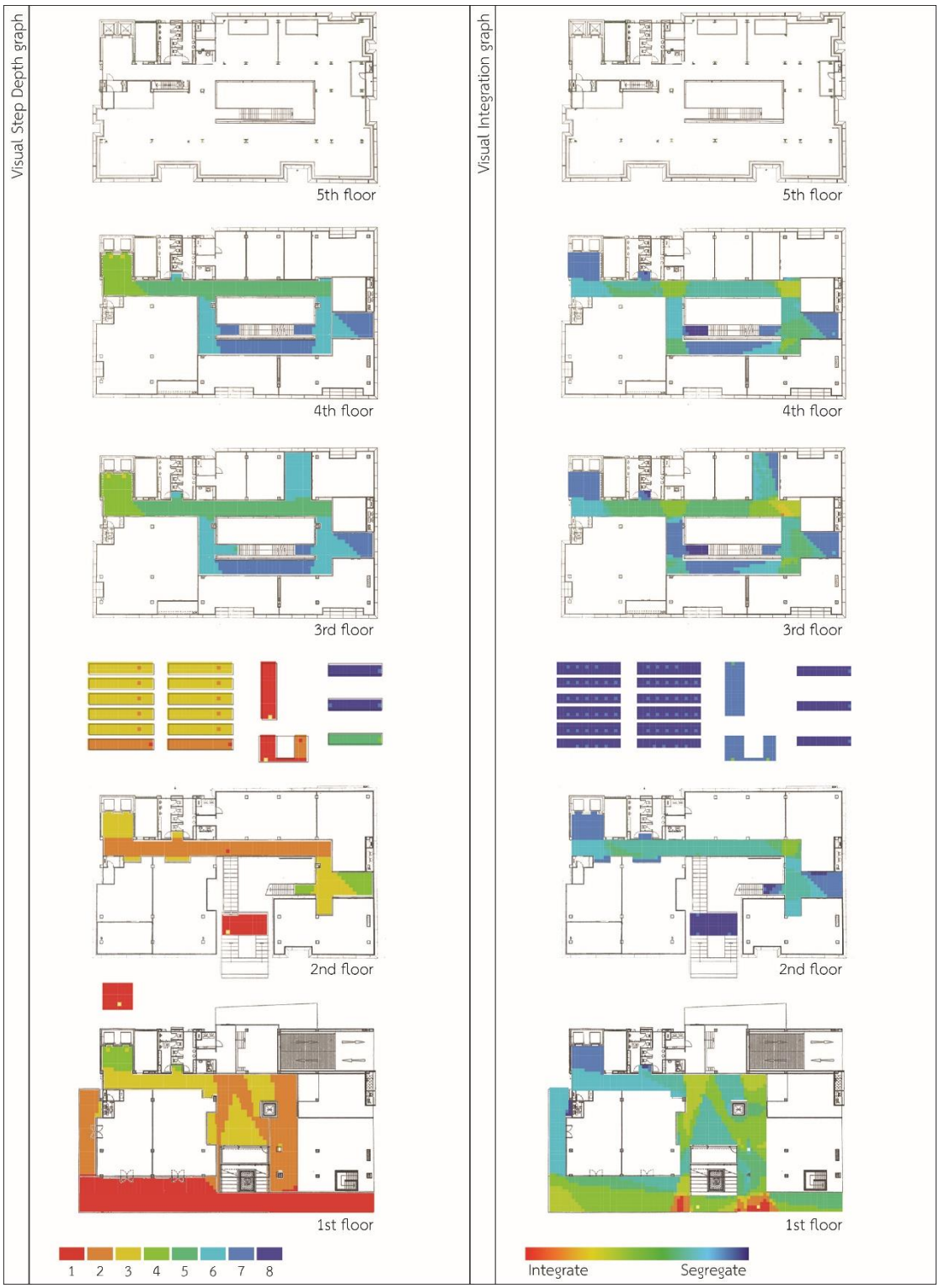


*Figure 3.19 Visual Step Depth showing number of turns that it takes to get from the pedestrian entrances (left), and Visual Integration showing the integrated and segregated area (right).*

The busiest time of the community mall is during 14:00-15:00 on weekdays and weekends. From the observation, some customers visited the community mall by cars and parked their cars in the underground parking, while others walked from the pedestrian street. Though there are a lot of people walk past the front of the community mall during the period of observation, only a few people decide to walk in and explore the space. This might be because of many vacant units in the mall, which are clearly visible from the street view. As the building façades are mainly glass panes, the vacant units behind the glasses can appear to be unwelcome to the potential customers. The pedestrian flow is low on the first floor, and even lower on the upper floors. Most customers spent their times in the coffee shop on the first floor. Only a few customers visit Japanese restaurants on the second floor and a beauty clinic on the third floor. The customers who visit a beauty clinic on the third floor tend to use the longer path despite the availability of the shorter path nearby (Figure 3.17). This is because a clothing shop located adjacent to the shorter path is always closed. Thus, the lighting along that area is dim and not desirable to walk through. Shop fronts are visible from different floors through the central atrium. However, the corridors around the atrium are not well lit by daylight due to the size of the atrium and the width of the building.

### 3.3.7 The Helix, EmQuartier

The Helix is one of three buildings in EmQuartier. The other two buildings are The Glass and The Waterfall. EmQuartier, along with Emporium and EmSphere are located on Sukhumvit road with direct connections from Phrom Phong BTS station. The Helix was designed by Leeser Architecture. It was completed in 2015. It consists of eleven floors above ground and an automated underground parking. To avoid complications, the floor numbers in this case study are based on the numbers used in the building itself where the first floor is “Floor G” and the upper floors are “Floor M”, and “Floor One” to “Floor Nine” accordingly (Figure 3.21). The Helix is connected to common spaces between The Waterfall and The Glass on floor G and floor M. They are also connected via elevated walkways on floor one to floor five. The tenants on floor G and floor M of The Helix are luxury clothing and accessories brands, dessert cafés, and restaurants. The tenants on floor one and floor two are clothing and accessories brands, a home products shop, shoes shops and restaurants. The tenants on floor three are mobile shops, home appliances shops, and eyeglasses shops. The tenants on floor four are beauty clinics, hair salons, a concept store, and a travel agency. Floor five

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consists of pocket parks and an indoor garden. The tenants on floor six to floor nine are restaurants and dessert cafés. There are one vacant unit on Floor Seven and two vacant units on floor nine.

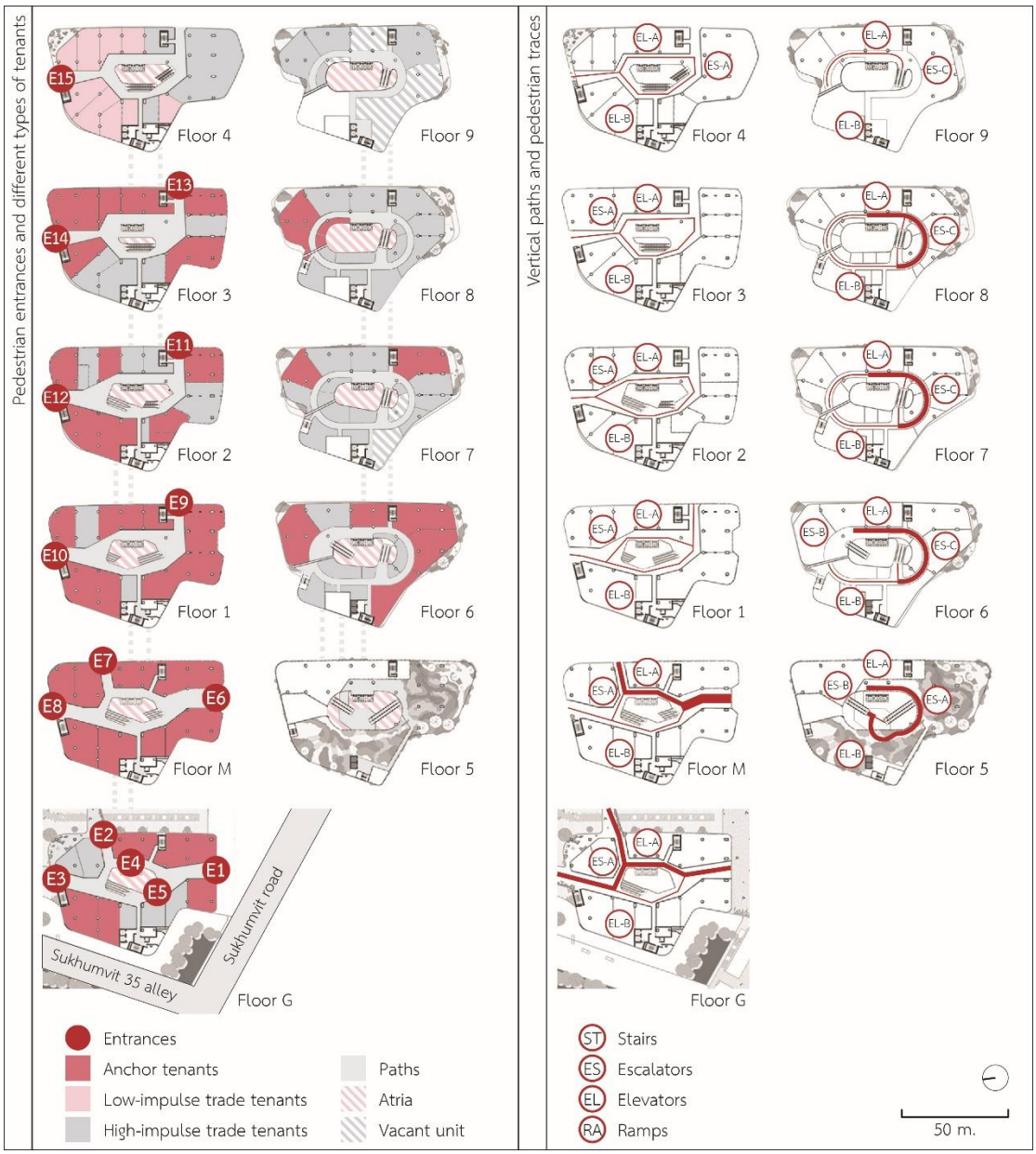


*Figure 3.20 Mapping of pedestrian entrances and tenants in The Helix, EmQuartier showing the tenant location pattern (left), and the vertical paths and pedestrian traces showing customers' selected paths during the observation period (right).*

There are thirteen entrances to The Helix. The main entrances are entrance E1 on floor G from the pedestrian street and entrance E4 on floor M, which connects to the elevated walkways from Phrom Phong BTS station and Emporium (Figure 3.21). Other entrances are connections between The Helix, The Glass, and The Waterfall where entrances E2, E5, E7, E9, and E11 are connected to The Glass, and entrances E3, E6, E8, E10, E12, and E13 are connected to The Waterfall. To move to the upper floors, the customers can use elevators EL-A and EL-B. These elevators operate from the underground parking to floor nine. The customers can also use escalators ES-A from the underground parking to floor five, and escalators ES-B from floor five to floor nine.

The Helix is busiest during 14:00-15:00 on weekdays and 15:00-16:00 on weekends. During the observation period, it appears that most customers visited the mall by BTS and cars. The customers who visited the mall by BTS entered the mall through entrances E4 and E5. There are three ways for the customers who used cars. They can park their cars at The Helix's underground parking and used elevators EL-A. They can park their cars at The Waterfall's parking and use entrances E3, E6, E8, E10, E12, and E13. They can park their cars at Emporium and use entrances E4 and E5. Most customers who visit The Helix use elevators EL-A to go straight to floor five, where there are pocket parks and an indoor garden. From floor five, they either use escalators ES-B or continue their journey through step garden to go up to floor six. Floor six is where the helical ramp starts. This ramp connects multiple floors together and ends at floor nine. This design aims to create the continuous journey for the customers where they are not interrupted by other types of vertical paths like stairs and escalators. Moreover, the customers will not retrace their steps as they continue walking forward. Another way that the customers may approach this space is to take elevators EL-A to the top floor and walk down to the lower floor. This method of movement is called "move up and trickle down" (Tan, 2015). From this kind of layout, the customers are required to complete the whole journey. However, The Helix also provides escalators ES-B as shortcuts between floor for those who do not wish to walk all the way up or down. Many customers choose to take these shortcuts from one floor to another.

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*Figure 3.21 Panoramic photographs from pedestrian entrances in The Helix, EmQuartier showing visible vertical path choices from each entrance, 2017.*


*Figure 3.22 A panoramic photograph shows a view from Floor Five, 2017.*

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There are two parts of the visual access investigation. The first part includes the views from floor G, floor M, and floor one entrances. The entrances on floor two to floor four are not shown because they repeat with the plan of floor one. It appears that escalators ES-A is visible from almost every entrance. It is also the customers' main choice of vertical paths. The Visual Step Depth graphs show that these entrances reduce the number of steps taken to reach the upper floors. There is also one central atrium between floor M and floor four, where opening on each floor plate is various in shape and size.

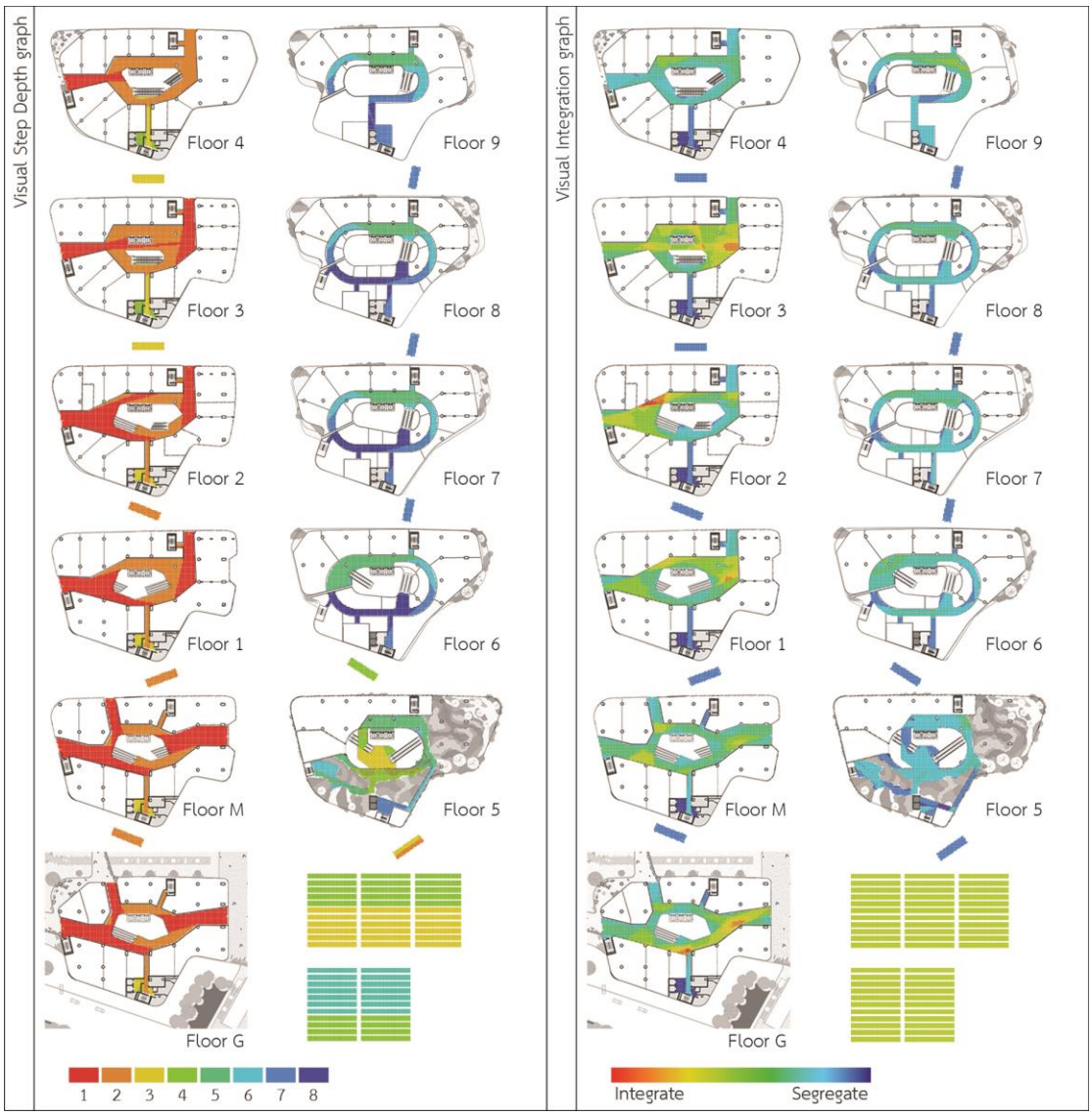


*Figure 3.23 Visual Step Depth showing number of turns that it takes to get from the pedestrian entrances (left), and Visual Integration showing the integrated and segregated area (right).*

The second part includes the visibility from floor five to floor nine. From figure 3.22, it appears that there are two options of vertical paths visible from escalators ES-A (a set of escalators from floor four). The circular atrium above floor five opens to the indoor terraces on helical floor on floor six to floor nine. Some parts of the restaurants and cafes on the terraces are visible from this point. There is an installation in the middle of the atrium. The installation is a rainforest chandelier hung from the ceiling above floor nine. This installation leads the customers' eyes upwards. The visual accesses along the helical ramp are shown

in figure 3.24. There are both advantages and disadvantages to this layout. The advantages are the continuous journey and the sense of discovery where the customers can unfold their journey by seeing two to three restaurant shop fronts at a time. The disadvantages are that the customers can easily lose their senses of location by the lack of visual information, and that it takes more than eight visual steps for the customers who start their journey at floor five to reach the top floor. For the lack of visual information, there are signages added in multiple spots on the ceiling to tell the customers which floor they are at. However, there is no customer on the top floor during the period of the investigation.

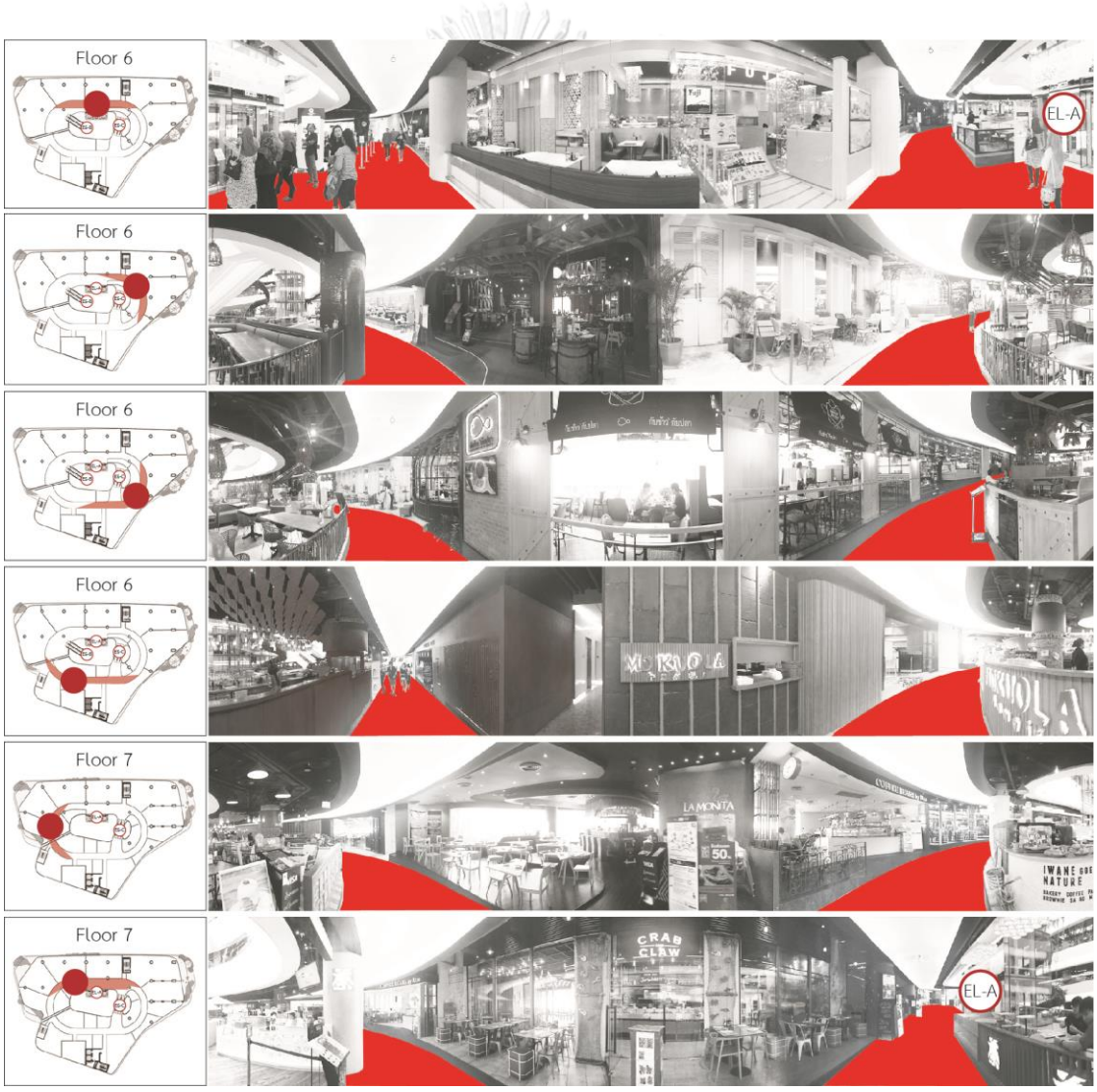


*Figure 3.24 Panoramic photographs display visual accesses from different parts of the helical ramps from floor six to floor seven, 2017.*

3.3.8 Conclusion from the investigation of community malls in Thong Lo

From the investigation of six mid-rise community malls in Thong Lo, and one shopping center on Sukhumvit road, there are visible evidence of the factors that influence pedestrian flows in mid-rise community malls. These include both architectural design factors in the hypotheses (the anchor tenants, the economy of movement, and the visual and physical accesses), and additional factors which are raised to attention during the observation. The additional factors are the level of sunlight in the building, ventilation, ceiling height (related to visual access), installation in the atrium (that can lead the customers' eyes upward), and other attractions (such as pocket parks, indoor garden, and photography spots).

*Figure 3.25 Photography spots in The Commons, 2017.*

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The seven cases can also be categorized into three categories from the level of pedestrian flows on each floor. The first category includes the community malls that can influence their customers to visit the upper floors, which are 72 Courtyard, The Commons, and The Helix. These cases are successful in the distribution of the pedestrian flows in each floor. The second category consists of the community malls that can attract the customers to visit the mall, but unable to influence most of them to visit the upper floors. These community malls are The 49 Terrace, and J Avenue. The last category includes the cases that are not able to attract the customers to their project, which are 9:53 Art Mall and The Maze Thonglor. This categorization is to be analyzed together with data collections on the tenants, path choices, and influences of visual accesses in the next chapter.

# CHAPTER 4
# RESEARCH ANALYSIS

This chapter shows a set of analyses from the previous chapter's findings in three different parts. These parts are classified according to the three hypotheses. The first part is the tenants in the community malls. In this part, the types, sizes, and locations of the tenants are analyzed. This follows the hypothesis, where the anchor tenants can draw customers to the upper floors. The second part is the path choices in which the customers chose to take during the observation periods. This part of analysis is based on the economy of movement, where the effortlessness in moving between floors can influence the distribution of the customers. The third part is the influences that visual accesses have on the pedestrian flows, which is based on the hypothesis that visual accessibility between the first floor and top floor can motivate the customers to visit the upper floors.

## 4.1 Tenants in the community malls

The tenants in the community malls are analyzed using the information from the collections of floor plans and the observations of case studies. To examine these results, the tenants in community malls are organized into three types, which are the anchor tenants, the tenants with low-impulse trade, and the tenants with high-impulse trade. During the observations, it is also found that there are several vacant units in some of the case studies. These vacant units can be used as another key to evaluate these cases.

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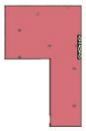
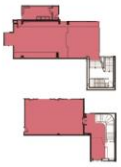
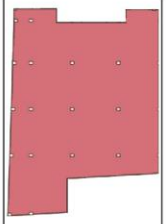
### 4.1.1 Anchor tenants in the community malls

Anchor tenants found in the community malls are coffee shops, restaurants, nightclubs, and supermarkets (Table 4.1). These are usually well-known chain tenants, such as Starbucks, Au Bon Pain, McDonald's, and Villa Market. However, there are tenants that claimed to be popular among their target customers as well. These are Roast (restaurant) and Beam (nightclub). The selection of these tenants is according to the target customers that the

community malls aim to attract. There are two main locations for anchor tenants in community malls, which are on the first floors and on the top floors.

*Table 4.1 Types, sizes, and plans of anchor tenants in the community malls.*

| Anchor tenants | | | | | | |
|---|---|---|---|---|---|---|
| Type / Size | The 49 terrace | 72 Courtyard | J Avenue | 9:53 Art Mall | The Commons | The Maze |
| Coffee shop and cafe 60 - 115 sq.m. |  Starbucks | |  Au Bon Pain | | |  The Coffee Club |
| Restaurant 127 - 373 sq.m. | | |  McDonald's  Ootoya  Greyhound | |  Roast | |
| Nightclub 407 sq.m. | |  Beam | | | | |
| Supermarket 1,308 sq.m. | | |  Villa Market | | | 10 m. |

The anchor tenants on the first floors are coffee shops, restaurants, and supermarkets. The average size of each tenant is varied, depending on the functions it serves. Coffee shops are commonly 60 – 115 sq.m., while fast-food restaurants are 127 – 373 sq.m. The rental units provided for these tenants are semi-outdoor, where the outdoor seating areas always have visual access toward the street. These tenants are generally located in front of the community malls and have their own direct entrances from the pedestrian walkway. Another type of tenant that located on the first floor is a supermarket. Supermarkets are usually located at the back of the community malls, near car parking areas. This is due to both the

convenience of the customers who visit the malls by cars, and the attraction for the customers who visit the malls from the pedestrian walkway.

The anchor tenants which are located on the top floors of the community malls are restaurants and nightclubs. It is found that the restaurant on the top floor also provides outdoor seating for its dining area. The main considerations for these outdoor seating areas are ventilation, rain, and sunlight. These factors are explored further in section 4.2.2. For the nightclub in this research, the tenant does not need the shopfront to display the activities inside or the openings to allow outside views for the customers. Thus, its location at the back of the community malls does not affect its number of customers. Moreover, the rental unit for this nightclub is a multi-floor unit. The positioning of a multi-floor unit on the floor under the top floor help decrease the need to bring the pedestrian flows to the top floor. This is consistent with the literature review, where it suggested that a multi-floor unit is not appropriate to be located on the first floor. This is because it will elongate the distance between the first floor and the upper floors, which can be undesirable for the customers.

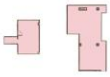
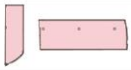
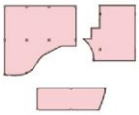
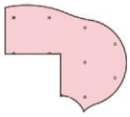
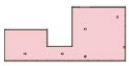
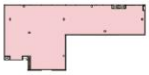
All in all, the locations of the anchor tenants are varied due to many factors. One of the explanations to this can refer to the interviews with the architects, where anchor tenants have higher negotiation powers in their rental agreements and preferred locations (Meekhanon, 2016) and that they aim to locate in the prime areas of the community malls. However, an anchor tenant always located at one or more ends of a community mall, either it is on the top floor, or in front of a community mall. From the research, the community malls with the anchor tenants on the top floors have the best distribution of pedestrian flows.

4.1.2 Tenants with low-impulse trade in the community malls

The tenants with low-impulse trade in the community malls include dry cleaners, hair salons, nail salons, banks, pet shops and pet spas, beauty clinics, massage therapies, music schools, learning centers, yoga studios, and fitness centers (table 4.2). Although most tenants with

low-impulse trade can be found on the third floors and fourth floors of the community malls, there are tenants with low-impulse trade on the first floors and second floors as well.

*Table 4.2 Types, sizes, and plans of tenants with low-impulse trade.*

| Tenants with low-impulse trade | | | | | | |
|---|---|---|---|---|---|---|
| Type / Size | The 49 terrace | 72 Courtyard | J Avenue | 9:53 Art Mall | The Commons | The Maze |
| Drycleaner<br>9 - 11 sq.m. |  | |  | | | |
| Nail salon and hair salon<br>32 - 116 sq.m. |  | |  |  | |  |
| Bank<br>60 - 126 sq.m. | | |  | | | |
| Pet shop and pet spa<br>60 - 206 sq.m. | | |  |  | | |
| Beauty clinic and massage therapy<br>66 - 211 sq.m. |  | |  |  | | |
| Music school and learning center<br>201 - 355 sq.m. | | |  |  |  |  |
| Fitness center and yoga studio<br>226 - 810 sq.m. | | |  |  |  | 10 m. |

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The tenants with low-impulse trade on the third and the fourth floors include beauty clinics, music schools, learning centers, fitness centers, and yoga studios. It is visible that the larger unit areas required for the tenants, the higher they are located. Thus, the tenants which require more space for both their equipment and their customers to conduct activities inside the facilities, such as music schools (201 – 355 sq.m.) and fitness centers (226 – 810 sq.m.), are located on the top floors.

The tenants with low-impulse trade on the first floors are dry cleaners. This is because a dry cleaner only requires 9 – 11 sq.m. for its rental area, since it can transport the clothes

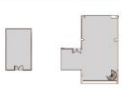
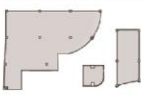
elsewhere to be cleaned. Moreover, a dry cleaner always located near the car parking areas where the customers can easily bring their clothes to the tenant.

In conclusion, the tenants with low-impulse trade located on the third and the fourth floors require larger area per unit than that located on the lower floors. This corresponds to the hypothesis, where the tenants with low-impulse trade require more rental space and do not demand high pedestrian flow.

4.1.3 Tenants with high-impulse trade in the community malls

The tenants with high-impulse trade in the community malls are flower stores, toy shops, furniture shops, travel agencies, gadget shops, clothing shops, and accessories shops (table 4.3). The location of these tenants is not higher than the second floors. This is due to their needs to locate in the areas with higher pedestrian flows. The average sizes of these tenants can be ranged from 7 – 227 sq.m., which are smaller than the anchor tenants and the tenants with low-impulse trade. This corresponds to the information from the literature reviews, where the sizes of the tenants with high-impulse trade are smaller because of the higher rental rate on the first floors and the second floors

*Table 4.3 Types, sizes, and plans of tenants with high-impulse trade.*

| Tenants with high-impulse trade | | | | | | |
|---|---|---|---|---|---|---|
| Type / Size | The 49 terrace | 72 Courtyard | J Avenue | 9:53 Art Mall | The Commons | The Maze |
| Flower store<br>7 - 67 sq.m. | | |  |  |  | |
| Toy shop<br>8 - 41 sq.m. | | | |  |  |  |
| Furniture shop<br>26 - 90 sq.m. |  | | |  | | |
| Travel agency<br>139 sq.m. | | |  | | | |
| Gadget shop<br>43 - 147 sq.m. | | |  | |  | |
| Clothing and accessories shop<br>15 - 227 sq.m. |  | |  | |  |  |

The locations of the tenants with high-impulse trade are scattered around the first and the second floors of the community malls. There is no particular pattern to this kind of tenant. However, it can be observed that they are more likely to survive longer if they are surrounded by similar categories of tenants, such as groups of clothing and accessories shops and groups of newly opened restaurants.

Additionally, there are multiple vacant units in the community malls. These vacant units in community malls are mostly found on the upper floors and the top floors. In the 49 Terrace, 72 Courtyard, J Avenue, and The Commons, there are one to two vacant units in each mall. On the other hand, 9:53 Art Mall has eight vacant units, while The Maze Thonglor has four vacant units, excluding the two top floors that still not operated. Even though there are more than architectural factors affecting this, there are shared characteristics of the community malls with greater number of vacant units. The shared characteristic is that either of them has an anchor tenant or a tenant with low-impulse trade located on their top floors.

4.1.4 Design criteria for tenant mix in the community malls

Design suggestions from this section include tenant mix, tenant placement, and the average size of rental units on each floor. From the analysis of the case studies, it can be concluded that the more anchor tenants and tenants with low-impulse trade in the community mall, the more likely that the customers will visit there. However, the common ratio of anchor tenants to tenants with low-impulse trade to tenants with high-impulse trade shared in the community malls that are more successful in attracting the customers is 1 : 1.36 : 1.96. This ratio represents the proportions of leasable area in the community mall, where there are 23% of anchor tenants, 32% of tenants with low-impulse trade, and 45% of tenants with high-impulse trade.

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For the tenant placement in the community malls, figure 4.1 shows the seven cases that are classified into four groups of tenant placements. These four groups are community malls with no anchor tenant, with anchor tenant on the first floor, with anchor tenant on the upper floor, and with anchor tenants on multiple floors. When compared this to the categorization at the end of chapter three (the community malls that can influence their

customers to visit the upper floors, the community malls that can attract the customers to visit the mall but unable to influence most of them to visit the upper floors, and the community malls that are not able to attract the customers to their project), it is found that there are correlations which can validate the hypothesis. The anchor tenants on the top floors can influence the pedestrian flows to the upper floors of the community malls, as shown in The Commons and 72 Courtyard. The placement of tenants with low-impulse trade on the upper floors, as shown in J Avenue, can also distribute the pedestrian flows. However, they do not have as much impacts as the anchor tenants. The anchor tenants on the first floor can attract the customers to visit the mall (The 49 Terrace and J Avenue), while 9:53 Art Mall with no anchor tenant is unable to attract customers to its project. All in all, the existence of anchor tenants in the community malls is very important to the survival of the business. Additionally, it is found that the units of tenants with low-impulse trade located on the upper floors are larger than that located on the lower floors. The tenants with high-impulse trade are not to be located higher than the second floor of the community malls. Moreover, the similar categories of tenants with high-impulse trade should be grouped together in order to make them more appealing to the customers.

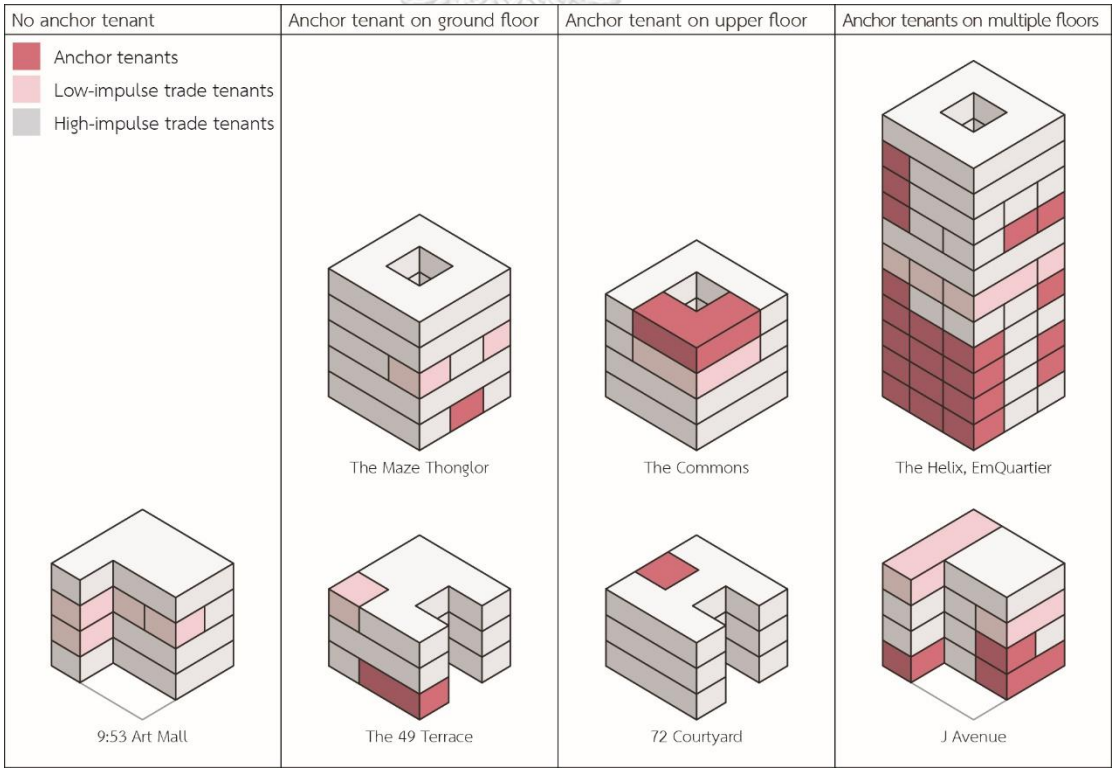


*Figure 4.1 Locations of tenants in the community malls.*

The average sizes of rental units in community malls correspond with the types of tenants and the placement of those tenants. There are three average sizes, which are small (smaller than 60 sq.m.), medium (61 – 180 sq.m.), and large (larger than 181 sq.m.). These units in community malls are usually flexible for reduction and expansion to suit the tenants' demands. From the investigation, it shows that the rental units on the first floor consist of one large unit in the front and one large unit at the back (for anchor tenants), with small rental units (for tenants with high-impulse trade) in between. The second floor consists of small and medium rental units for the tenants with high-impulse trade. The third floor consists of medium rental units (for tenants with low-impulse trade), and the fourth floor consists of large rental units.

*Table 4.4 List of tenants in the community malls and their locations by floors, 2017.*

| Locations of tenants | Community malls | | | | | |
|---|---|---|---|---|---|---|
| | The 49 Terrace | 72 Courtyard | J Avenue | 9:53 Art Mall | The Commons | The Maze |
| First floors | Coffee shop<br>Nail salon<br>Restaurant<br>Clothing shop<br>Accessories shop | Restaurant<br>Pubs | Supermarket<br>Coffee shops<br>Dessert café<br>Restaurant<br>Banks<br>Pet shop<br>Hair salon<br>Dry cleaner<br>Clothing shop<br>Accessories shop<br>Flower store | Restaurants<br>Ice-cream shop<br>Collectible store<br>Vacant unit x3 | Coffee shop<br>Restaurants | Coffee shop<br>Dessert café<br>Restaurant |
| Upper floors | Dry cleaner<br>Restaurant<br>Children's wear<br>Furniture shop | Nightclub (double space)<br>Restaurants<br>Pub | Japanese restaurants<br>Retail shop<br>Music school<br>Beauty clinic<br>Hair salon<br>Nail salon<br>Travel agency<br>Vacant unit | Music school<br>Hair salon<br>Restaurant<br>Furniture shop<br>Flower store<br>Vacant unit x3 | Yoga studio<br>Kid's center<br>Dessert café<br>Gadget shop<br>Flower store<br>Clothing shop<br>Toy shop<br>Pub<br>Vacant unit x2 | Beauty clinic<br>Hair salon<br>Nail salon<br>Restaurants<br>Clothing shop<br>Candle shop<br>Vacant unit x4 |
| Top floors | Massage therapy<br>Nail salon<br>Furniture shop<br>Clothing shop<br>Vacant unit | Nightclub (double space)<br>Restaurants<br>Pub<br>Vacant unit | Fitness center<br>Restaurant | Pet spa<br>Japanese res.<br>Vacant unit x2 | Restaurant | No tenants |

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4.2 Path choices

The path choices in the community malls are analyzed using the customers' traces from their entrances to their destinations during the most popular time where the pedestrian flow is busiest. The traces and the photographs are used to show the customers' walking patterns. In this part, the patterns are categorized into the choices of entrances, the choices of corridors, and the choices of vertical paths inside the community malls.

4.2.1 Choices of entrances in the community malls

The pedestrian entrances that the customers choose depend on the availability of accesses and their choices of transportations. These include walking, private cars, bicycles, and public transports (sky trains, public buses, taxis, and motorcycle taxis). For the community malls in Thong Lo, there are two main pedestrian entrances for these means of transportation. The first type is the entrance from the street. This is the entrance attached to the pedestrian walkway where customers can walk to the community malls from the street. The second type is the entrance from the parking space.

The arrangements of these entrances are varied to the combinations of roads and the types of parking spaces that the community malls offer. Figure 4.2 shows the possible pedestrian and vehicle entrances from different combinations of roads. From case studies, there are two types of connections between combinations of roads and the community malls. The first type is a connection to one side of the road/alley. The second type is a connection to the intersection between road/alleys. The difference between road and alley in Thong Lo is that there are public red buses along the main road. This increases the possibilities of the customers visiting the community malls by pedestrian ways, since they can walk from nearest bus stops.

Since the community malls are open-air malls, most of them provide their entrances from the streets that are not limited to the main doors. The customers can enter the community malls along the sides of the buildings connected to road/alley. This means that the more sides connect to road/alley, the more accessibility to the building. These entrances are

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commonly designed to blend the border between public walkway and the community mall's areas so that the customers can walk in the site without feeling like they enter the private property.

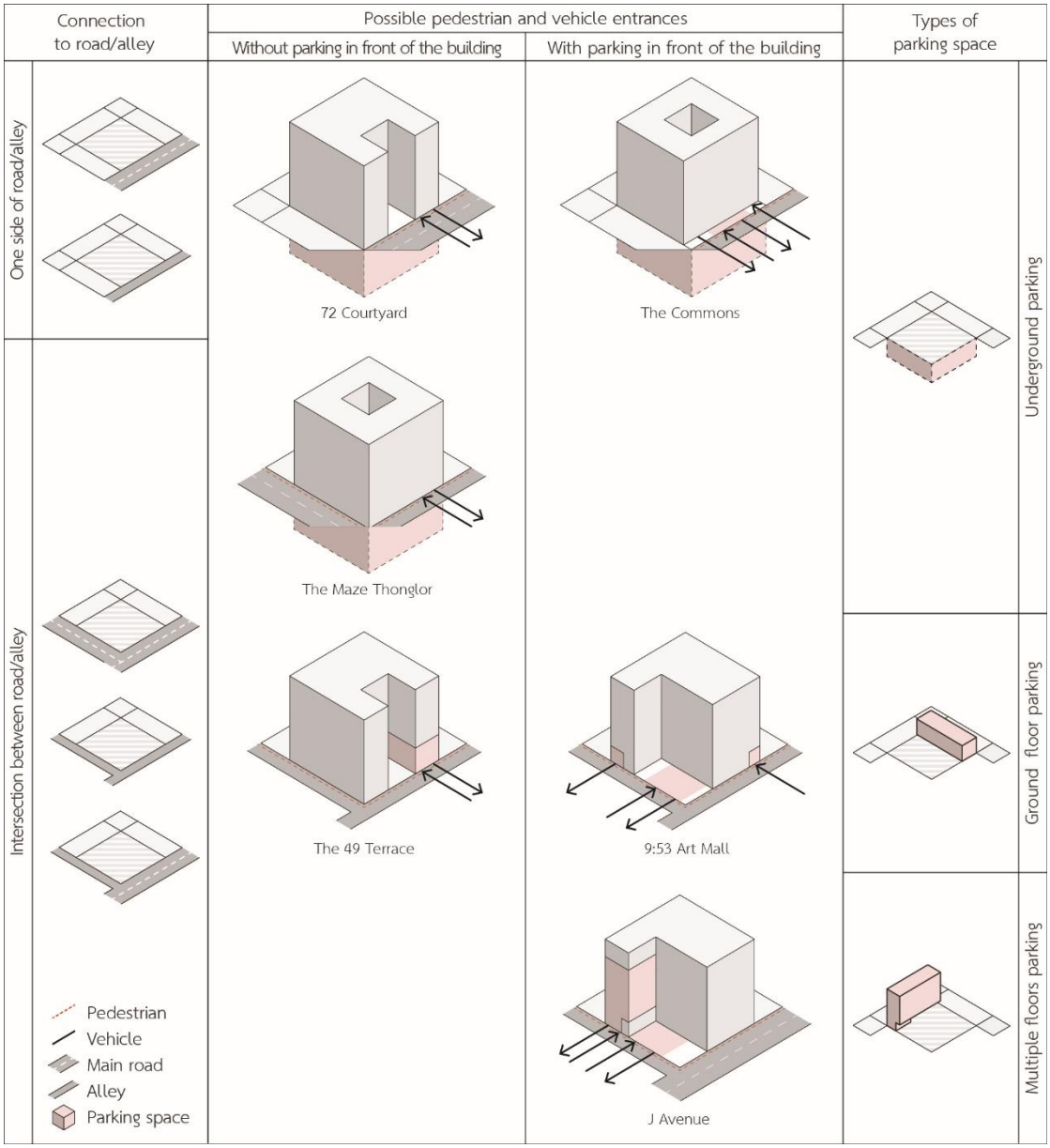


*Figure 4.2 Combinations of roads, and possible pedestrian and vehicle entrances.*

Connecting to one side of the road/alley, 72 Courtyard and The Commons encounter similar situation where there are cross circulations between pedestrians and vehicles. While 72 Courtyard groups their parking entrance and exit together, The Commons separate their

underground parking entrance and exit to two sides of the building due to minimum set back of 3 m. from adjacent private properties. This means that no matter which way the customers come from, they will have to walk past the vehicle ways to enter the pedestrian entrances in front of the building.

Connecting to the intersection between road/alleys, The 49 Terrace, The Maze Thonglor, 9:53 Art Mall, and J Avenue shows that the pedestrian entrances and vehicle entrances are separated. The side adjacent to the main street is commonly used for pedestrian entrances only. For the other side, the vehicle entrance always located after the vehicle exit and the building itself. This allows the customers to see the building first, before they decide to enter the community mall.

Different locations of parking also result in the numbers of pedestrian entrances from the parking spaces. Main entrance from the underground parking is through the elevators. The first-floor parking can increase the entrance spots to along the sides of the parking connected to the community mall areas. The multi-floor parking can increase the entrance spots to the floors they connected to. The parking type commonly found in Thong Lo is the underground parking. This is due to the limited area of the site and the land price. Most community malls' parking spaces are not enough for the numbers of the customers' vehicles. Some community malls' solution is to provide valet parking service for their customers.

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The investigation on the first floors of the cases shows that the community malls adjacent to the main Thong Lo road have more customers from the pedestrian walkway entrance, while the community malls that located far away from the main Thong Lo road tend to have similar amount of customers enter from the parking entrances and the pedestrian walkway entrances. This is because the pedestrian walkways along the alleys are very narrow and not suitable for walking, thus some customers visit the community malls by cars. Consequently, the entrances from the parking areas are as important as the entrances from the street. This means that the location of the elevators, which are the connections between the parking areas and the commercial areas are very significant. They should serve the customers' conveniences and are easy to navigate from.

Additionally, it is visible that the community malls with convenience parking spaces in front of the building require two more vehicle entrances. This creates more spots where cross-circulation between pedestrians and vehicles occur. Nevertheless, the convenience parking is the critical factor to the effortlessness of shopping at the community malls. To minimize the effects of cross-circulation created by the vehicle entrances, J Avenue move this parking to the side of the building and leave the other side merely for the pedestrian entrances. This also means that the area in front of the community malls, which is the area with the highest rental rate compared to other parts of the building, is available for rental units

### 4.2.2 Choices of corridors in the community malls

Corridors in community malls can be categorized into three categories, the circulation area on the first floor, the corridors on the upper floors, and the corridors on the top floors. The circulation area in each floor is clearly seen from the investigation. Their characteristics can suggest different ways that space in the community malls are designed for the customers to interact and how these customers approach these spaces in real circumstances.

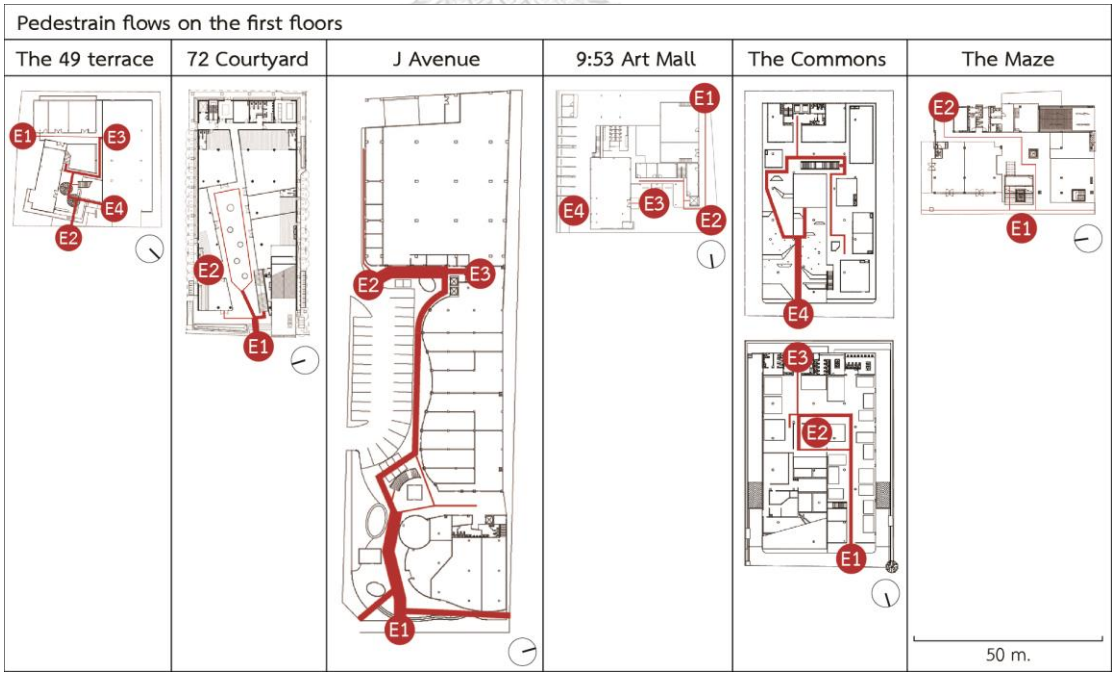


*Figure 4.3* Pedestrian flows on the first floors of the community malls shown in red lines, 2017.

The circulation spaces on the first floors are varied to the proportions of the sites. The site with similar ratio between the width and the length usually have U-shaped layout, where the central courtyard opens to the entrance from the street. For the site with the ratio between the width and the length greater than 1:2 with the main entrance on the narrow side, such as J-Avenue, the layout of the building is L-shaped (Figure 4.3). This is to avoid having long and narrow circulation area, which is not desirable to walk from one end to another.

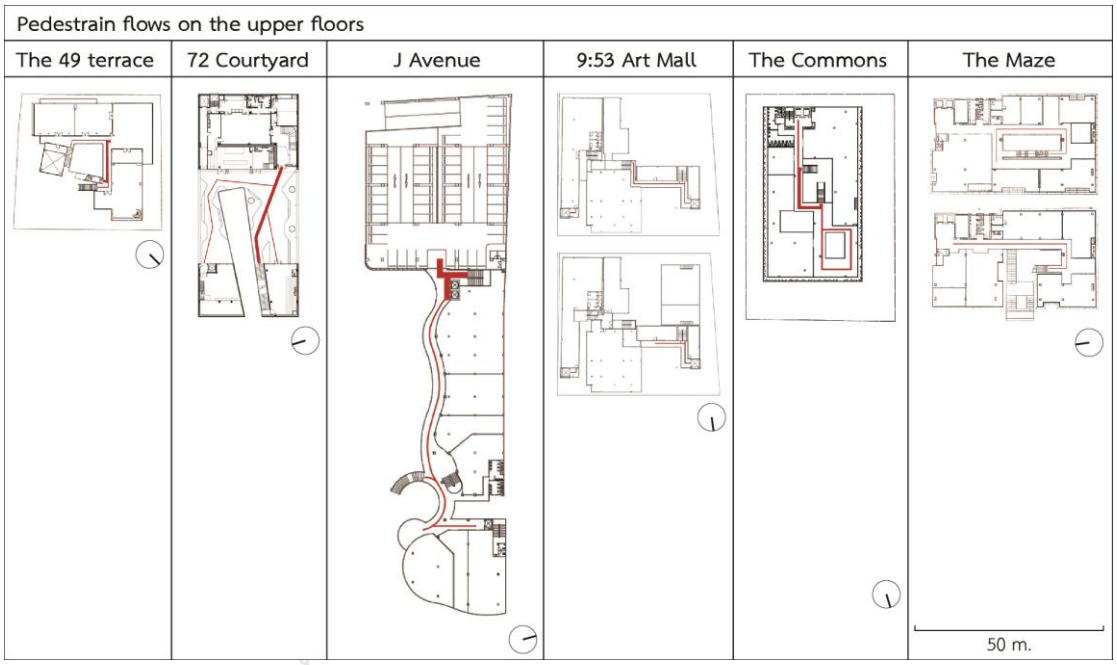


Figure 4.4 *Pedestrian flows on the upper floors of the community malls shown in red lines, 2017.*

On the upper floors of the community malls, it is found that J Avenue has a very low pedestrian flows compare to its first floor (Figure 4.4). Even though J Avenue provide multi-floor parking that can distribute the pedestrian flows equally to different floors, it is because of the amount of sunlight on its single-loaded corridors during the day that discourages the customers from walking through its upper floors corridors. Consequently, the customers who park on the upper floors choose to take the elevators next to the parking area to continue their paths on the first floor where less amount of sunlight can enter. Other factors influencing the pedestrian flows are found in the other cases where there are alternate paths and shortcuts. It is found that the customers are not always looking for the shortest path

possible, but they also consider the attractiveness and unattractiveness of the path as well. The attractiveness of the path includes the attractions along the paths, such as pocket parks, outdoor gardens, and photography spots. The unattractiveness of the path includes the corridors with tenants that are temporary-closed and vacant units, dark corridors, and dead-end corridors.

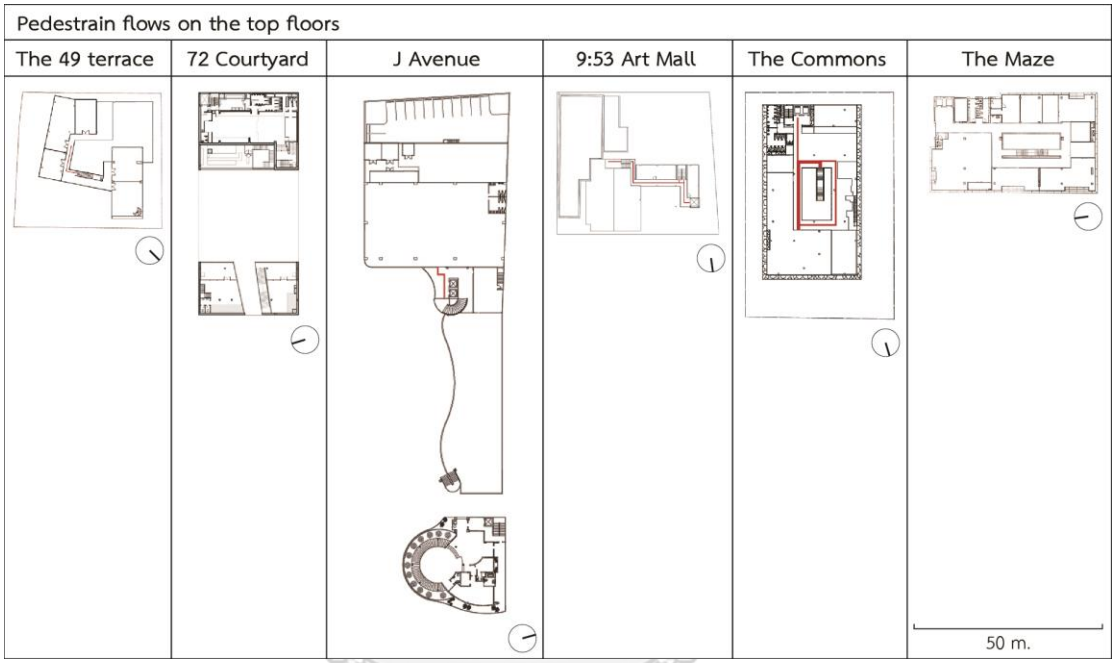


*Figure 4.5* Pedestrian flows on the top floors of the community malls shown in red lines, 2017.

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It can be observed that the corridor areas are significantly decreased on the top floors of the community malls (Figure 4.5). There are two cases that the level of pedestrian flows on the top floors are as high as the first floors, which are The Commons, and 72 Courtyard. The features that distinguish these two cases from the others include, a multi-purpose room and a pocket park on the top floor, and the use of the multi-floor units. The multi-purpose room in The Commons is an empty room for special events and workshops. These events and workshops can be hosted by the management team of the mall themselves, the tenants or the other event organizers. For 72 Courtyard, the floor below the top floor consists of multi-floor units. This eliminates the corridor on the top floor.

4.2.3 Choices of vertical paths in the community malls

The field observations in this section focus on the types of vertical paths in the community malls, the effortlessness in traveling up and down the elevations, and the corridors attached to the vertical paths. Table 4.5 shows that the combinations of vertical paths in the community malls are mostly the combinations of stairs and elevators. This is due to both the construction cost and the maintenance cost. Since the pedestrian flows in the community malls are not very high, there are low frequency of escalator usages. Moreover, the outdoor escalator cost is higher than the indoor escalators applied in common shopping centers.

*Table 4.5 Combinations of vertical paths in the community malls, 2017.*

| Vertical paths | (ST) The 49 Terrace | (ES) | (EL) | (RA) | | |
|---|---|---|---|---|---|---|
| Combinations of two vertical paths | (ST)(ES) | (ST)(EL) J Avenue, 72 Courtyard, The Maze Thonglor, 9:53 Art Mall | (ST)(RA) | (ES)(EL) | (ES)(RA) | (EL)(RA) |
| Combinations of three vertical paths | (ST)(ES)(EL) | (ST)(ES)(RA) | (ST)(EL)(RA) The Commons | (ES)(EL)(RA) The Helix, EmQuartier | | |
| Combinations of four vertical paths | (ST)(ES)(EL)(RA) | | | | | |

(ST) Stairs
(ES) Escalators
(EL) Elevators
(RA) Ramps

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There are usually more than one set of stairs between the first floor and the second floor. The main set of stairs is normally located at the front of the community mall, so the customers can conveniently go to the upper floors. The location of another set of stairs is located next to an elevator. Here, the elevators can be found located near the front and at the back of the community mall. When compare the choice of usage between stairs and elevators, most customers do not prefer using stairs to go up. In J Avenue and 9:53 Art Mall, most customers are using the elevators on their ways up and the stairs on their ways down. This is because the locations of the elevators and the stairs are very close. On the other hand, in the cases of 72 Courtyards and The Maze Thonglor, most customers are using the stairs, since the elevators are located far away from the pedestrian entrances.

Additionally, there are two cases that integrate the uses of ramps into their designs for the effortlessness in traveling up and down the elevations, which are The Commons and The Helix, EmQuartier (Figure 4.6). The difference between these two cases is that The Commons use the mixture of ramps and steps as landscape leading the customers to the second floor, meanwhile The Helix creates a long journey through its helical ramp. This helical ramp leads the customers to multiple floors, since the ramp acts as a continuous strip that is not interrupted by corners or immediate changes in elevations. This layout differs from the four layouts mentioned in the literature reviews, thus the continuous ramp is added as the fifth layout in this research (Figure 4.7). This continuous ramp can be seen applied in both malls (Omotesando Hills by Tadao Ando) and other types of buildings (Solomon R. Guggenheim Museum by Frank Lloyd Wright) as well.

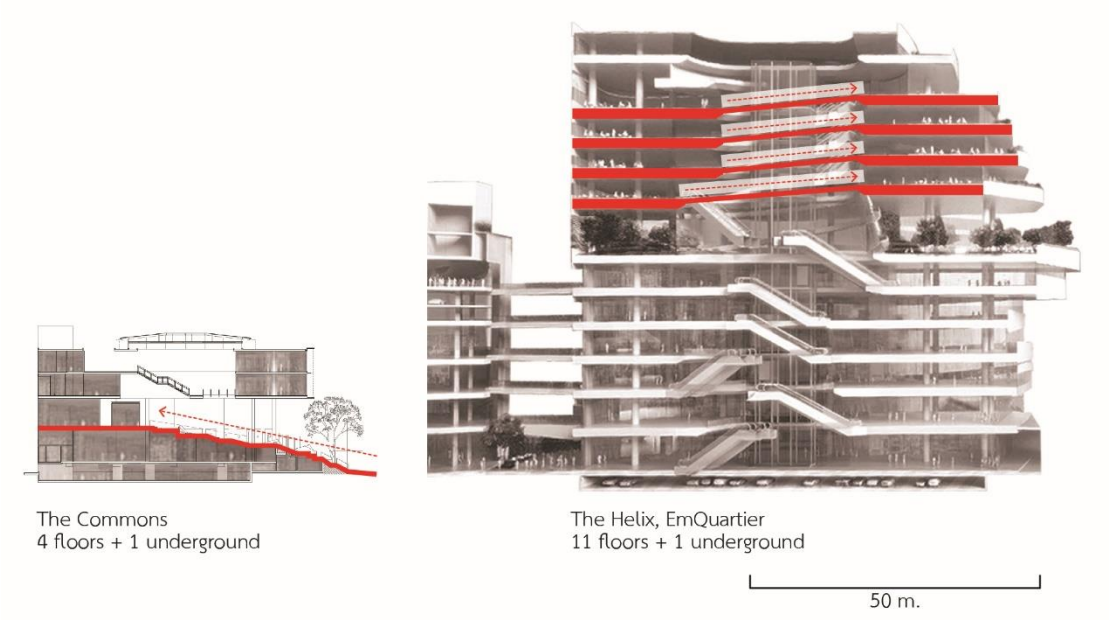


*Figure 4.6 Sections of The Commons and The Helix, EmQuartier.*

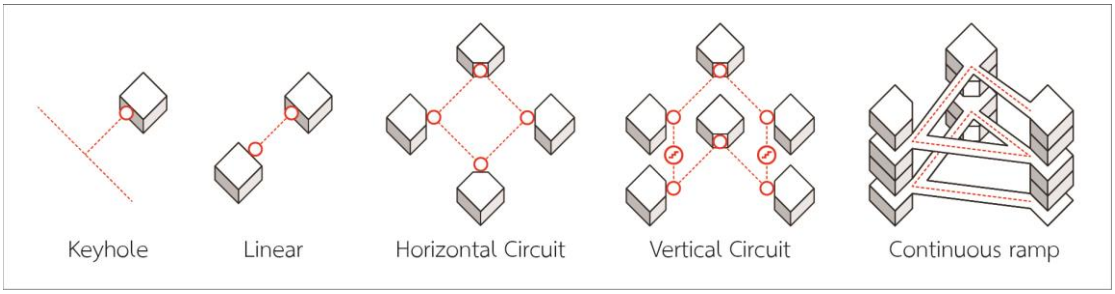


*Figure 4.7 The mall layouts, edit from Coleman, with addition of Continuous ramp from The Helix, EmQuartier.*

The relationships between the vertical paths and corridors are shown in figure 4.8. There are three main connections between vertical paths and corridors in the community malls. These include the vertical path that located away from the main corridor (Figure 4.8a), the vertical path that located at the corner of the corridor (Figure 4.8b), and the vertical path that located at the corridor intersection (Figure 4.8c). It can be observed that there are cross circulations between pedestrians at the vertical path that located at the corridor intersection. This also occurs with the vertical that located in the middle of the large empty space.

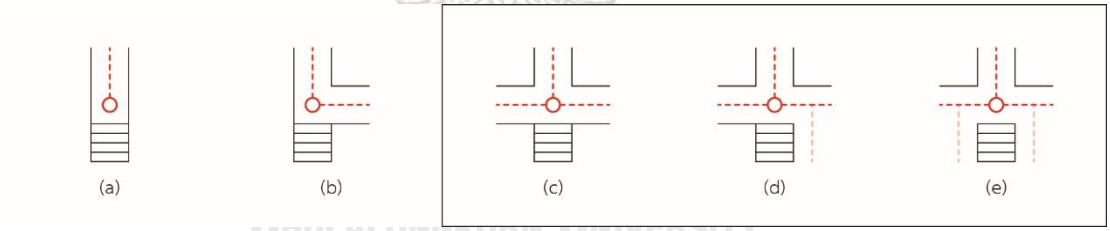


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*Figure 4.8 Relationships between stairs and corridors.*

Based on the literature review, the intersection is the area that the customers avoid. However, the investigation suggests that the customers in the community malls are not avoiding these areas. This is because the pedestrian flows in the community malls are not very high, thus the cross circulations between the customers from different directions do not often happen. Still, the pedestrian flows around the intersection is considered to be higher than other parts of the community malls. This means that the area is beneficial to the tenants nearby.

4.2.4 Design criteria for circulation in the community malls

Design criteria that can be gathered from the research results in this section are the entrances, parking space, the corridors, and the vertical paths in the community malls. For the entrances, the vehicle entrances should not cause cross circulation with the pedestrian entrances. The vehicle entrances should be located after the exits. They should also be easily seen from distance. The pedestrian entrances from the street should blend the boundaries between the pedestrian walkway of the public and the community mall area. The locations of the entrances from the parking spaces should also be easily reached.

The types of parking space applied in the community mall depend on the size and proportion of the site. Nevertheless, the convenience parking on the first floor is required. The location of the convenience parking can be in the front or at the side of the community mall. However, it should not obstruct the pedestrian entrances.

Circulation areas on the first floor should be open to the front of the community mall. It should provide green area and comfort level of sunlight. The back of the tenant units should not be present in the circulation area. Most corridors in the community malls are single-loaded corridors, due to ventilation in open-air setting. On the upper floors, alternative paths can be available for the customers. There should also be at least one attraction on each floor. These attractions include pocket parks, outdoor gardens, and photography spots. The undesirable paths include corridors with vacant units, dark corridors, and dead-end corridors. The rental units on the floor below the top floor can be multi-floor units to eliminate the corridor on the top floor.

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The vertical paths in the community mall are stairs and elevators. They should be located at the front of the building and the area of intersection. The stairs lead to the upper floors should look effortless to climb up.

## 4.3 Influences of visual accesses

The influences of visual accesses are explored using the panoramic photographs, along with Visual Step Depth and Visual Integration graphs. They are used to show the available paths visible. In this section, the visual accesses can be classified into the visibility within the same floor and the visibility between different floors through atrium.

### 4.3.1 Visibility within the same floor

Visibility within the same floor explores the visual access from the entrances of the mall. From the panoramic photographs, the tenants in front of the community malls are visible from the street view before the customers enter the building itself. However, the visibility of the tenants inside the community malls depends on the size of the central courtyard and the building layouts. It can be seen that the cases that can attract the customers (J Avenue, The Commons, 72 Courtyard, and The 49 Terrace) have L-shaped and U-shaped layouts on the first floor. This corresponds with the results from the Visual Step Depth graph. When arrange the level of visual access into bar chart, three cases with the most step one (in proportion to other steps of the circulation area within the building) are 72 Courtyard, The 49 Terrace, and The Commons (Figure 4.9).

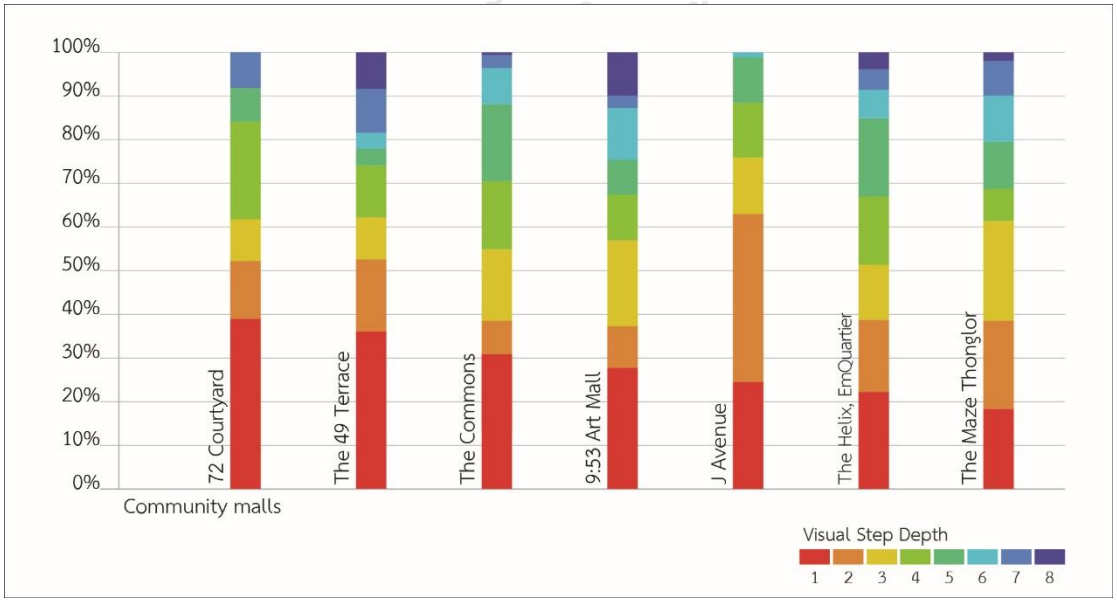



*Figure 4.9 Bar chart shows the level of visual accesses of the seven cases.*

To compare the results of the two investigations, the photographs of these three cases are highlighted with the range of colors represent the level of visibility (Figure 4.10). Here, the visibility between different floors are also presented through the atrium. This is explored in 4.3.2. The three cases below also shows that they provide visibility to most shopfronts, signages, and vertical paths available in the buildings (Figure 4.10, 4.11, and 4.13). These elements are significant because they help the customers to integrate spatial information, thus they can make choice on their navigation. However, directories are required in some community malls with more complex layouts since all shopfronts are not visible from the entrances.

The case that has the least visibility from the entrance is The Maze Thonglor. This is because the opening to the back of the building is narrow, as the main stairs lead to the second floor cover a larger proportion of the opening (Figure 4.13). Moreover, there is a continuous blank wall behind the opening. This can misinterpret the customers' association of space that this is where the building ends. According to the literature review, the path options and suggestion that it leads to something is more desirable for the customers than dead-end corridors and spaces with low virtual simulation.

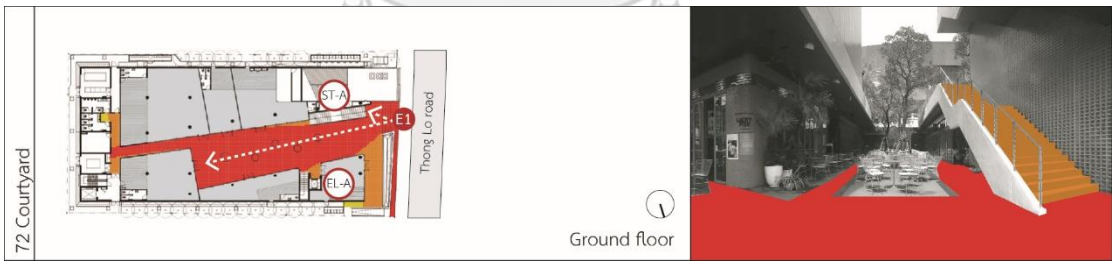



*Figure 4.10 Visual step depth mapped on the photograph of entrance E1, 72 Courtyard, 2017.*


*Figure 4.11 Visual step depth mapped on the photograph of entrance E2, The 49 Terrace, 2017.*

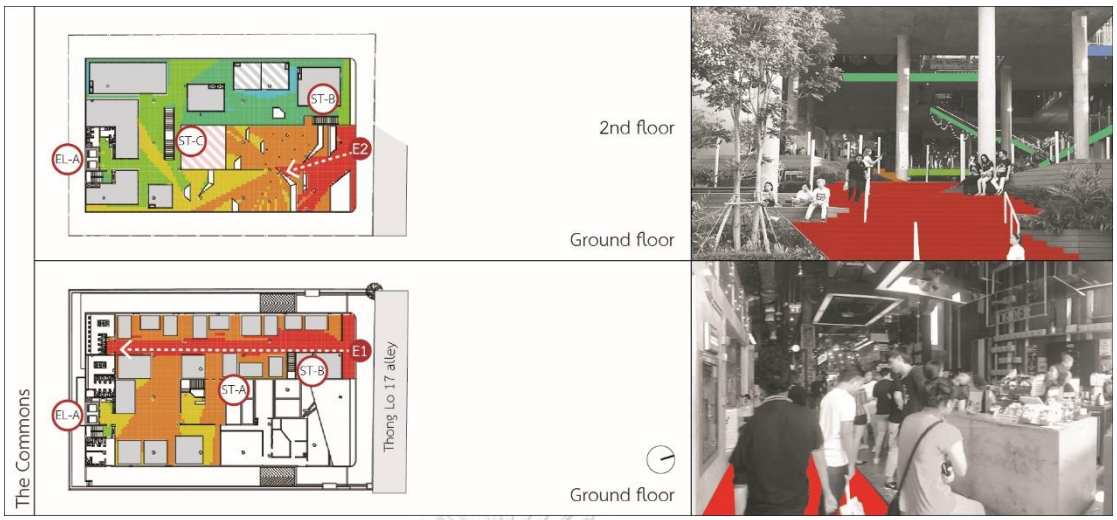



*Figure 4.12 Visual step depth mapped on the photograph of entrance E2, The Commons, 2017.*

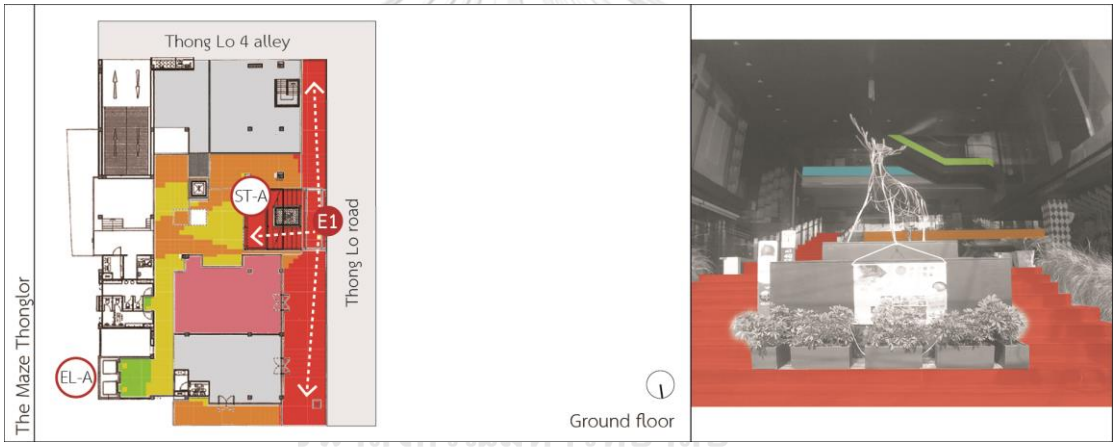



*Figure 4.13 Visual step depth mapped on the photograph of entrance E2, The Maze Thonglor, 2017.*

From the research, the corridors on the upper floors of the community malls can be categorized into straight corridor, curved corridor and freeform corridor (Figure 4.14). This difference can specify the level of visibility through the whole length of the corridor. Here, the straight corridor has the best visibility, while curved and freeform reveal a part of the corridor as a sequence. However, there are differences between the visibilities through single-loaded corridor and double-loaded corridor as well. While most community malls have single-loaded corridors that allow visibility in the same floor through the atrium, some parts of The Helix are double-loaded corridors. This limited the visibility to only two to three shopfronts ahead (depends on the angle of the curve and the width of the shopfront as

well). Accordingly, the width of the corridor also affects the visibility of the shopfronts. It is found in another case of a shopping center (Central Embassy) that wide corridors can create too much space between the customers and the tenants. Moreover, if the light inside the rental unit is darker than the circulation area, the window display behind the glass pane will not be seen. Instead, the customers will see the reflections of the circulation area. In this case, they solve the issue by adding the shop signage from the middle of the corridor's ceiling.

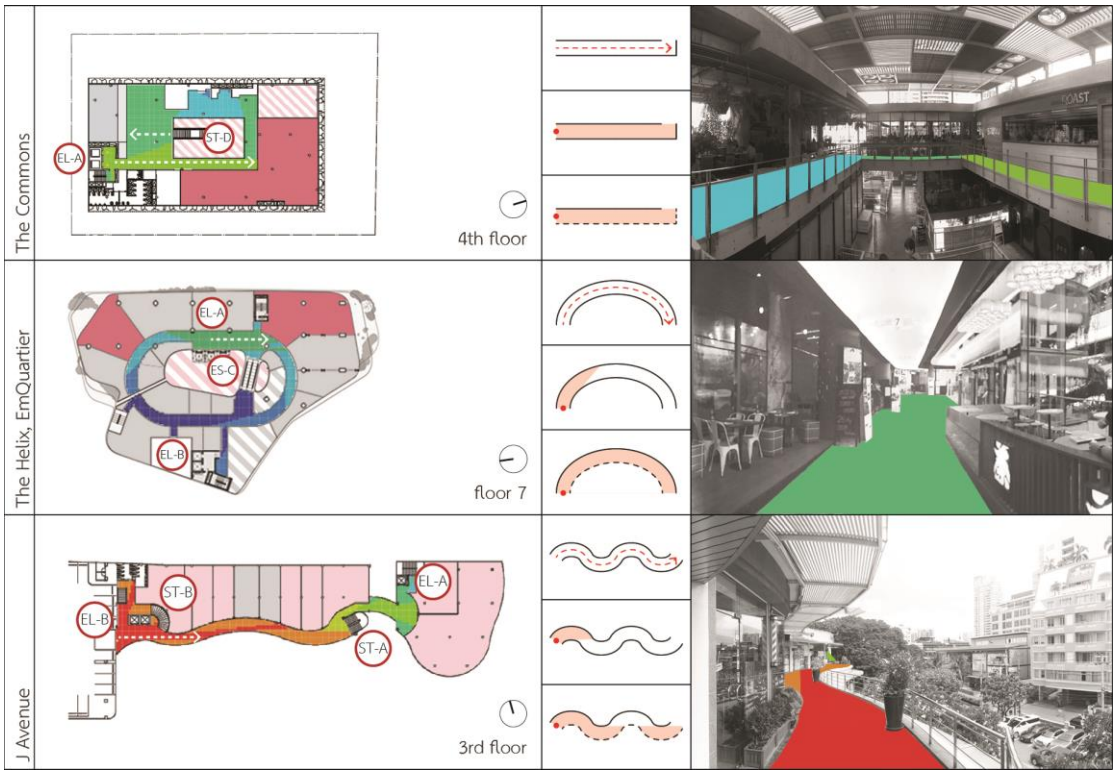



*Figure 4.14 Different types of corridors on the upper floors of the community malls, 2017.*

4.3.2 Visibility between different floors

Visibility between different floors explores in two different sections, the visual access from the vertical paths and the visual access through atria. In the first section, case studies are arranged from the level of visual accessibility, from easy to hard. The bar chart shows the easy access case with the least step eight and the hard to access case with the most step eight (Figure 4.15). From this arrangement, table 4.6 is organizing the numbers of vertical paths in the community malls with the color range from the Visual Step Depth

graph. The results from table 4.6 suggest that the level of accessibility are not necessary correlated with the amount of vertical paths, since the case with more vertical paths available (9:53 Art Mall) appears to has the least visual accessibility.

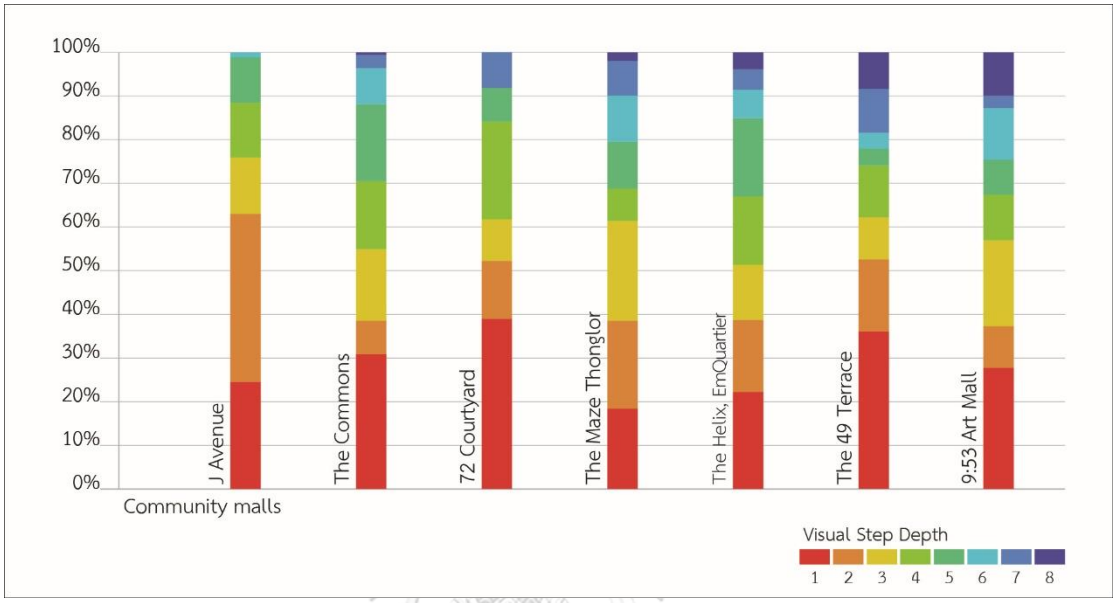
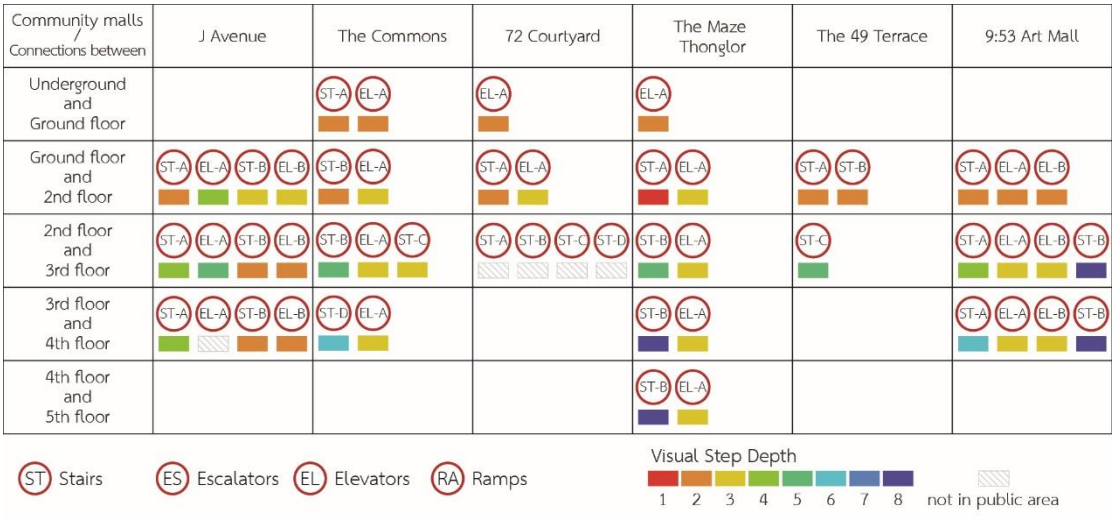



*Figure 4.15 Bar chart shows the level of visual accesses of the seven cases.*

Accordingly, the research focuses more on the locations of the vertical paths. It is found that the stairs between the first floor to the second floor should be immediately visible from the entrances. Moreover, the stairs between the second floor to the third floor should also be visible from the stairs between the first floor and the second floor. This continues to the top floors of the community malls.

*Table 4.6 Vertical paths available in the community malls highlighted with the color range of visual step depth.*




The shape of the atrium in the community mall is related to the floor plate of each floor. Here, successful cases share the L-shaped and U-shaped layouts on the first floors, second floors, and third floors. There are two possibilities for the top floors' layouts. The Commons' top floor layout expands into O-shaped, while 72 Courtyard's reduces to three separate blocks above the second floor's plates. However, the visibility between floors also depends on the proportion between the width of the atrium, the width of the corridor, and the height of the ceiling (Figure 4.16). From the literature review, it is important for the customers to see the shopfronts in order to attract them to the upper floors.

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Apart from these, other factors such as columns, other structures, and the materials of the railings are also significant to the visibility between floors. For the case that columns are placed in front of the shopfronts or in the atrium, signages can be added to the columns themselves. Moreover, when there are no signages, other promotion banners can also be placed there as well. The materials of the railings in the community malls are usually transparent and allow ventilation to flow through. It is visible in figure 4.16 that the transparency of the railing can increase the visibility between floors.

4.3.3 Design criteria for visibility in the community malls

Design criteria in this section are additions to the previous section (Path choices), since they share the same architectural elements. However, the analysis in this section focuses more on visual accesses. The criteria include the entrances, the circulation areas on the first floors, the corridors, the vertical paths, and the atrium

The entrances of the community malls act as survey spaces. From this point, the customers should be able to see the following elements, shopfronts, signages, and vertical paths available in the buildings. These can be seen through the circulation areas on the first floor. The shopfronts on the upper floors should also be visible through the atrium.

The corridors of the community malls can be in any forms that allow visual accessibility, so that the customers can integrate the visual information they receive with the path choices they make. Although straight corridor allows the furthest visual through the building, curved corridor can also allow panoramic visual around the building. This is because most corridors in the community malls are single-loaded corridors.

The vertical paths from the first floor to the top floor should be visible from each point to another. This is because stairs can also act as nodes. Consequently, stairs should be located at the point of intersection where Visual Integration is most integrated. This means that they are able to see most and are most seen.

Visual accessibility through the atrium is one of the most critical factors in the community malls. When looking through the atrium, the customers can mark their locations and also plan their journeys. While the more they see means the more information they can get, some designs aim to create the sense of discovery for the customers. This means that rather than give the whole information to the customers, they can be given clues which are interesting enough for them to go forward. All in all, the design criteria in this chapter are explored further in the design process.

# CHAPTER 5
# DESIGN PROCESS AND DESIGN IMPLEMENTATION

In this chapter, the design criteria from the previous chapter are implemented on the site between Thong Lo 13 and Thong Lo 15 alleys. This site is located opposite to J Avenue. It is currently called “Mid J”. One part of Mid J is a parking space for J Avenue with restaurants, dessert café, and other types of tenants. There are three main topics in this chapter, which are circulation areas and vertical paths for customers in the community mall, tenant mix and tenant placement in the community mall, and programs and other requirements for the community mall. These topics are rearranged to follow the order of the design process. First, path choices and visual accessibility are analyzed together to form the design of circulation areas and vertical paths. Then, target customers and market gap are evaluated together with the design criteria to form tenant mix and tenant placement in the community mall. Lastly, other details in the community malls are studied to identify the arrangement of back of house areas and the design of façades and openings. The design implementations are presented at the end of each topic.

## 5.1 Circulation areas and vertical paths for customers in the community mall

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The designs of circulation areas and vertical paths are analyzed from paths choices and visual accessibility. Path choices for customers in the community mall can be classified into choices of entrances, choices of corridors, and choices of vertical paths. Visual accessibility includes visual accessibility within the same floor and visual accessibility between different floors. In this section, the study covers the site accessibility of the community mall. After the site analysis, research-based possibilities are applied the site context to identify the design proposal that is most appropriate for the project.

### 5.1.1 Site accessibility of the community mall

The site is accessible by cars and pedestrian walkways from both Thong Lo 13 alley and Thong Lo 15 alley (Figure 5.1). It is located 100 m. from the main Thong Lo road, where

public red buses are operated. From the observation, the customers of the case studies are more likely to visit community malls by pedestrian ways if they are in a walkable distance from the main Thong Lo road. Most Japanese customers walk from Thong Lo 13 alley, since it is connected to Sukhumvit 49 alley (Japanese town area). However, the customers who do not live in the neighborhood mostly visit the community malls by their personal cars. Beside from these, there are also taxis and motorcycle taxis provided along the main Thong Lo road.

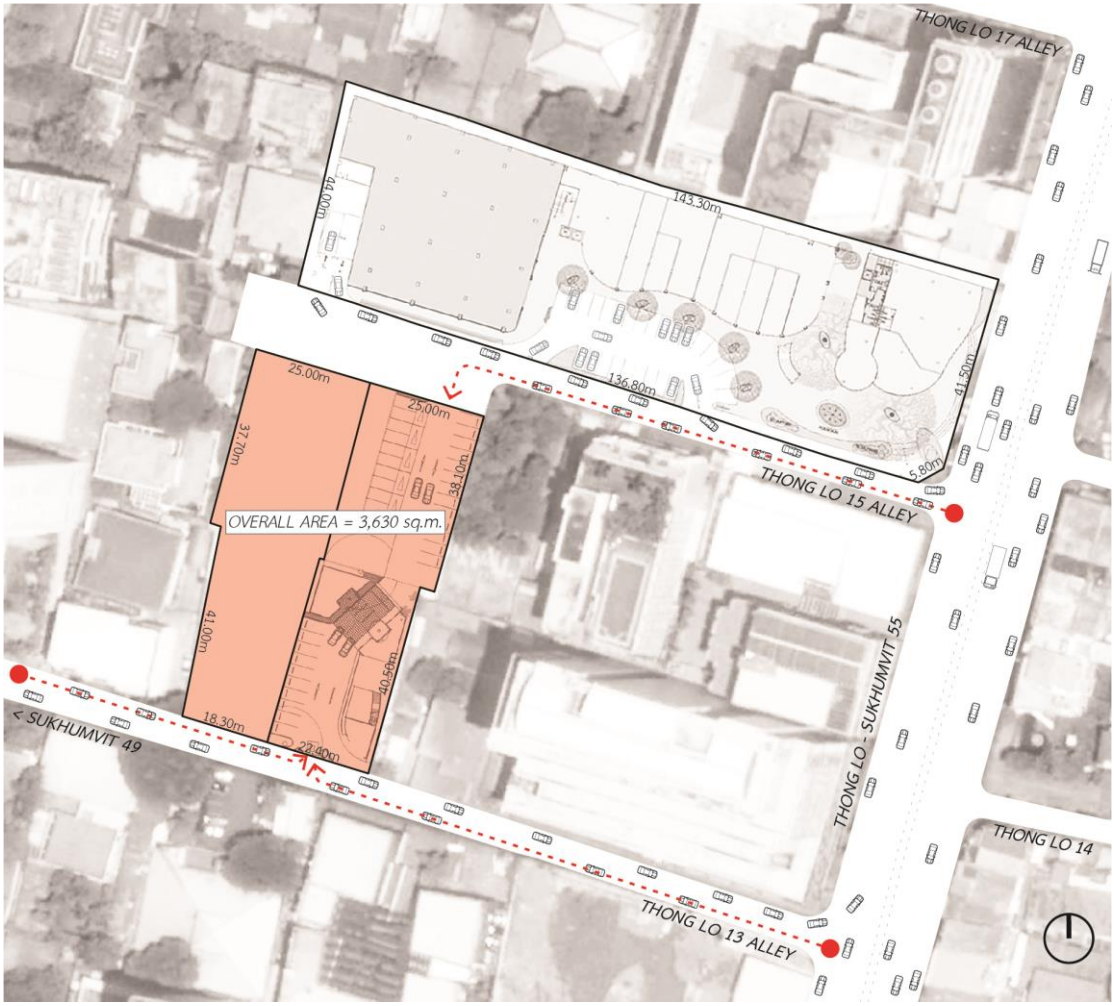


*Figure 5.1 Accessibility of the site.*

5.1.2 Design process for path choices

The design process begins with the possibilities of pedestrian, vehicle, and service entrances through both the south (Thong Lo 13 alley) and the north (Thong Lo 15 alley) of the site. These entrances are studied together with the possible location of convenience parking and car parking spaces. The minimum requirement of the car parking spaces can be calculated by two methods. One is to provide car parking at a minimum ratio of one parking space for every 120 sq.m. or fraction thereof. Another is to prescribe car parking according to total of each occupancy area. Commonly, the higher result is used (Table 5.1). The occupancy area in this case is calculated based on the feasibility study. The result from the base-case scenario suggests that the leasable area of the proposed community mall shall be about 3,875 sq.m. to reach the break-even point at year 10 (See Appendix).

*Table 5.1 Minimum parking space requirement calculation.*

| **Minimum parking space requirements** | | |
|---|---|---|
| **Calculation by Gross Leasable Area** | | |
| Gross Leasable Area | 1 parking stall per 120 sq.m. | 83 |
| **Calculation by areas of programs** | | |
| Education | 1 parking stall per 240 sq.m. | 4 |
| Commercial | 1 parking stall per 60 sq.m. | 14 |
| Resraurant | 10 parking stall for the first 150 sq.m. / 1 per 20 sq.m. for further addition | 37 |
| Retail | 1 parking stall per 20 sq.m. | 39 |
| Office | 1 parking stall per 60 sq.m. | 1 |
| Storage (includes in-store storage) | 1 parking stall per 240 sq.m. | 1 |
| Total parking requirement (cars) | | **96** |

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From figure 5.2, there are three types of parking schemes for the community mall. These schemes are generated using the minimum of 96 parking spaces. There are three types of parking, which are underground parking, multi-floor parking, and an integration of underground and multi-floor parking. The underground parking is the most efficient option for this site due to the limitation of space. It is the option with the most flexibility to the commercial part of the building. This is because other options require more lengths for the ramps between parking floors and more spaces for vehicle circulations. There is also the restriction on the height of the building where it should not exceed 23 m. However, the

underground parking also creates constraints in term of structure. Since the upper floors share columns with the underground parking, the size of the columns and the width of the spans are designed with two main priorities. These priorities are the efficiency of the parking space and the appropriate widths of the shopfronts.

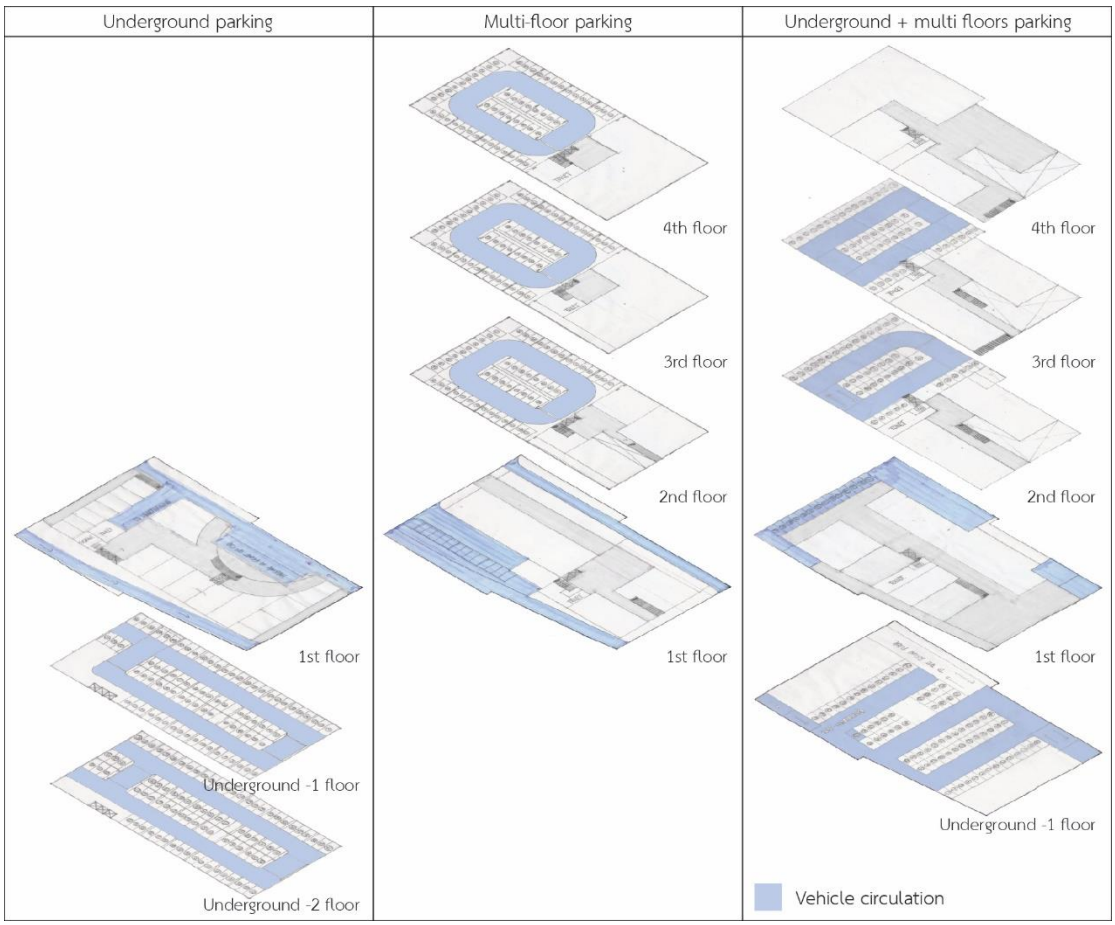


*Figure 5.2 Design schemes of different types of parking for the proposed community mall.*

The next parts of the design process include site entrances, convenience parking, and vehicle circulations. From six design schemes in figure 5.3, it is visible that vehicle circulations around the building decrease the leasable area on the first floor. Moreover, the convenience parking on the side of the building requires 6 m. width vehicle way. This vehicle way, together with the convenience parking narrows down the leasable areas and the pedestrian circulation on the first floor. Furthermore, vehicle circulations that connect Thong Lo 13 alley and Thong Lo 15 alley also create cross circulation between vehicle and pedestrian. The best scheme for this site is to limit the vehicle entrances only from Thong Lo 13 alley. This also decreases

the costs of security guards. For the underground parking, the best solution is to apply split-level schemes which decrease the length of the ramp between parking floors.

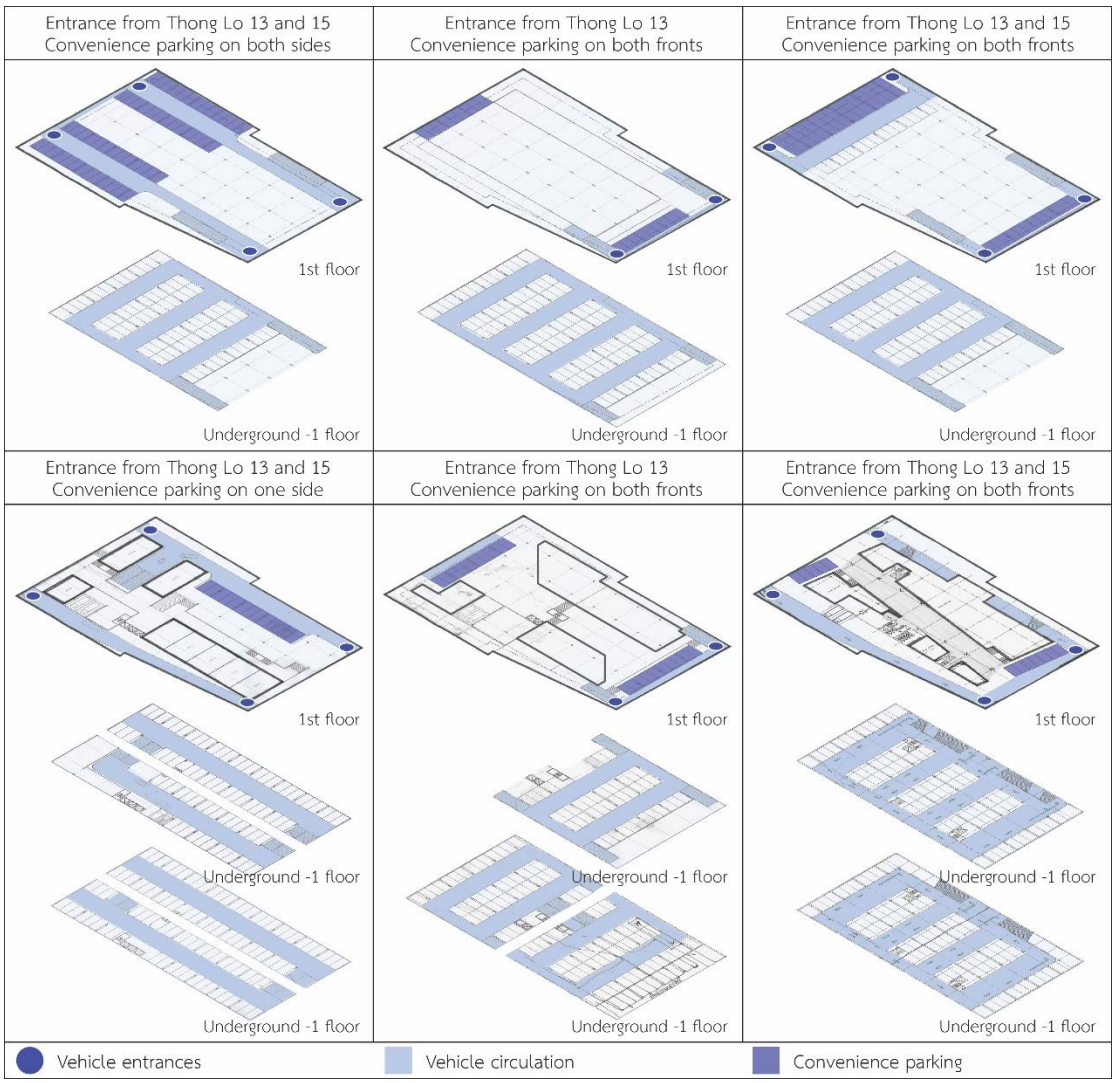


*Figure 5.3 Design schemes of different convenience parking locations and underground parking configurations.*

Then, the choices of layouts for the community mall are studied. Here, eight design schemes are formed based on the design criteria in the previous chapter and the site context. Figure 5.4 shows different approaches of pedestrian circulations, atria, and vertical paths. For the pedestrian circulations and atria, the layouts on the first floors are adapted U-shaped layout criteria to the site with two accessible sides. From the eight schemes, it is found that the layout with central atrium gives the most effective design to the balance between pedestrian

circulations and leasable areas. It is also found that the circulation areas on the upper floors can be reduced to increase the leasable areas in the building.

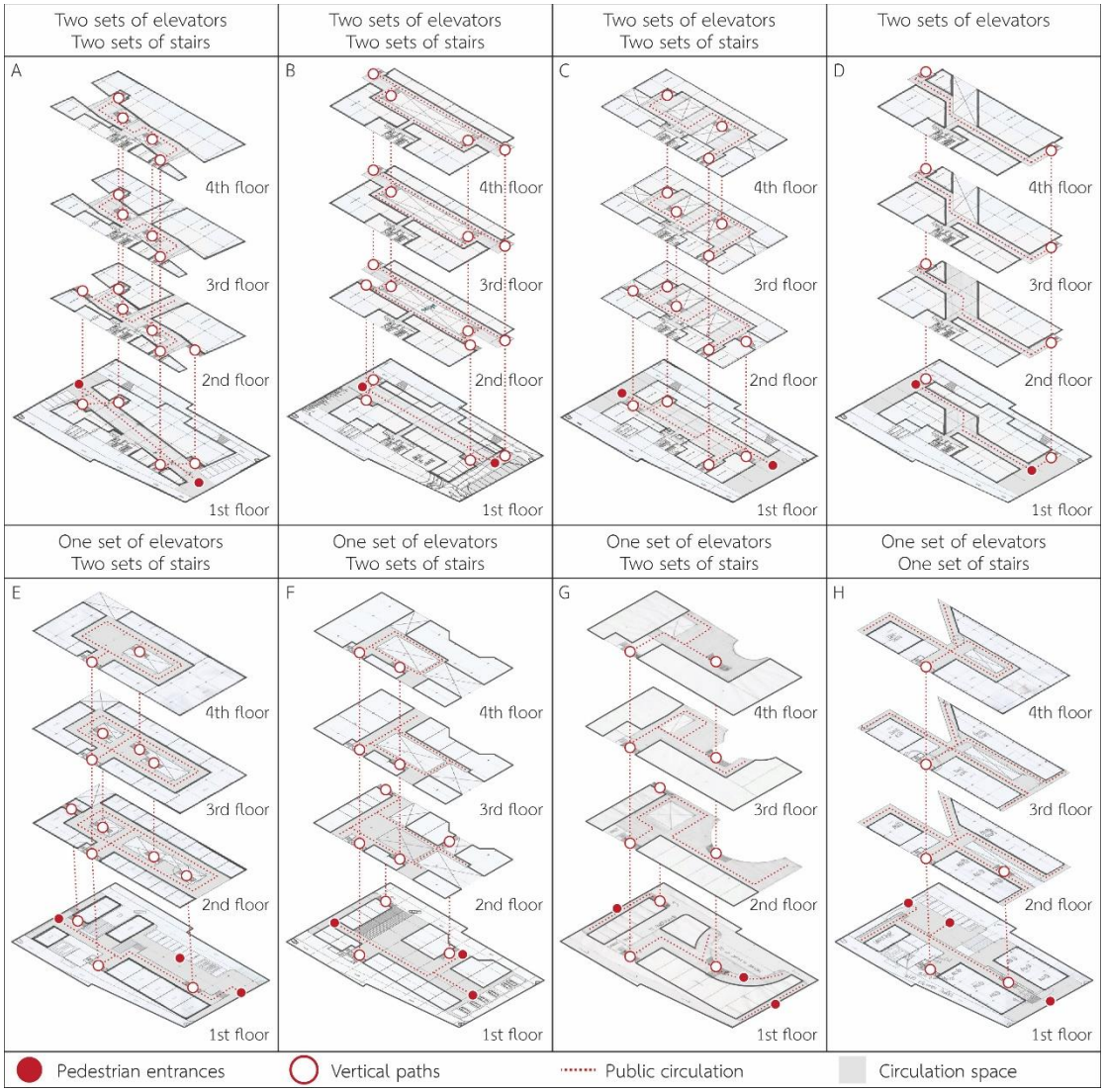


*Figure 5.4 Design schemes of different types of layouts for the proposed community mall.*

The locations of the vertical paths are very crucial to the pedestrian flows inside the community mall. In figure 5.4, the eight schemes show two different locations of the elevators, which are at the two fronts of the building and in the middle of the building. It is found that the elevators at the fronts of the building are in the area with the highest rental fees. Moreover, they also obstruct the visibility from the entrance of the building. The elevators in the middle of the building are harder for the customers to find. In the next

section, Visual Step Depth graphs are generated for these schemes to evaluate the visibility of space in the building.

5.1.3 Design process for visual accessibility within the same floor

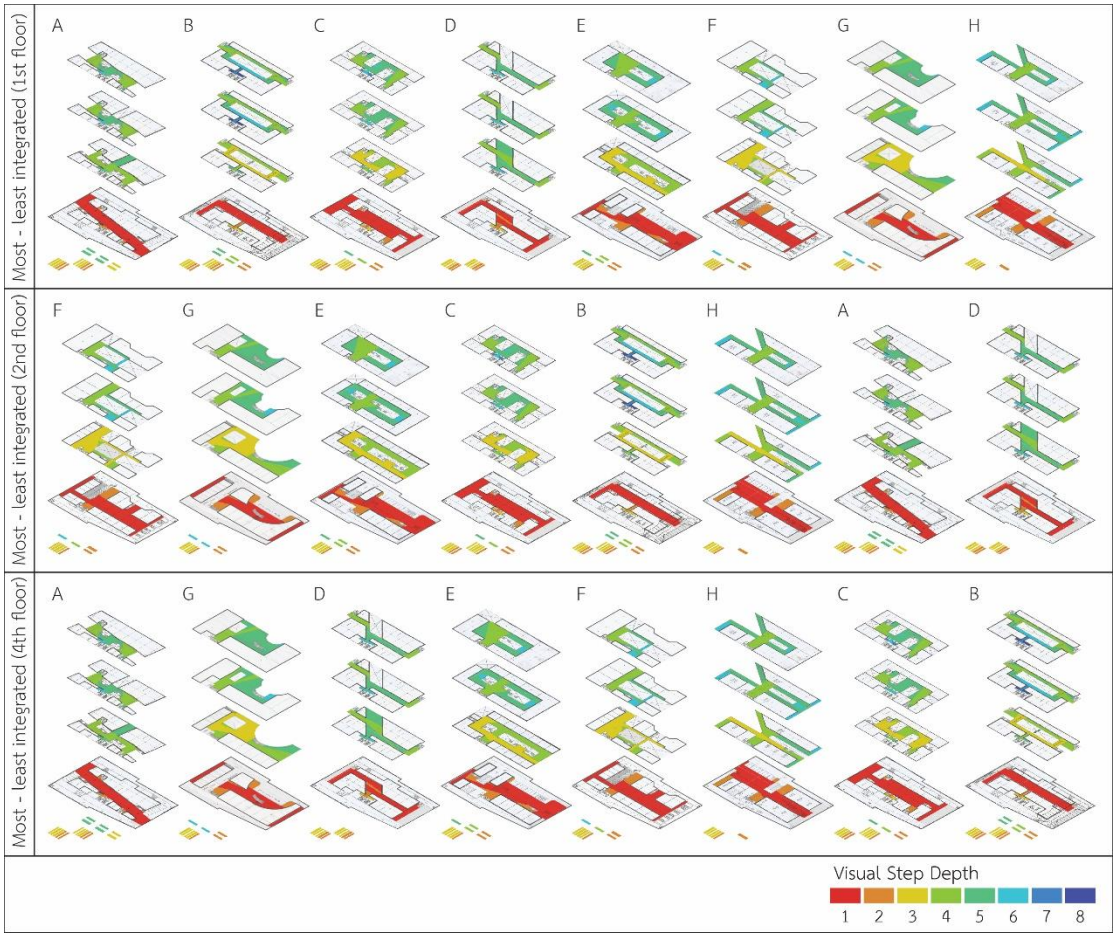


*Figure 5.5 Design schemes of different types of layouts for the proposed community mall arranged by their Visual Step Depth.*

Visual accessibility of the community mall is very significant to customers' preferences of the paths. From the analysis, it is found that if the customers can tell where the paths lead, they are more likely to select those paths. Thus, more visual accessibility available to the upper floors means more distributed pedestrian flows. Here, the design of the proposed community mall can be categorized into accessibility within the same floor and visual accessibility between different floors.

Visibility within the same floor includes the visibility of the interior from the entrances and the visibility of shopfronts from the corridors on the upper floors. This visibility can be evaluated from the Visual step depth graphs of the eight schemes (Figure 5.5). The first roll in the figure shows the range of visibility (most to least) on the first floor of the community mall. Here, the most visible scheme shows that straight walkway with no turn provides the best visibility. The second roll shows the range of visibility (most to least) on the second floor of the community mall. It is found that the vertical paths should be located along the main circulation of each floor. The third roll shows the range of visibility (most to least) on the top floor of the community mall. This points out that the locations of the vertical paths can create a vertical circuit. Thus, a horizontal circuit within the same floor is not necessary. It is also found that slight changes in the elevators' locations can differ the results of the visibility. Figure 5.6 illustrates the effect of the elevator's location to the visual visibility once the customers exit the elevator. It appears that, when located on the same side of the building, the orientations of elevators in diagram (a) have fewer steps required for the customers to reach the other side of the building than those in diagram (b).

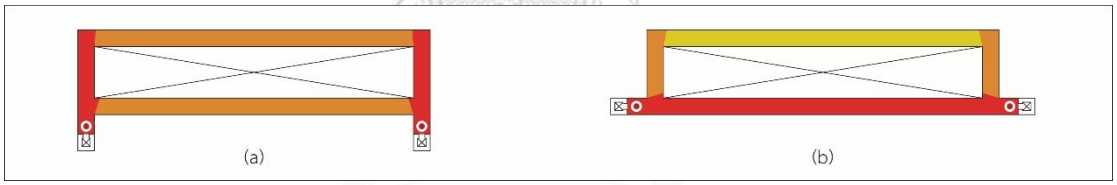


*Figure 5.6 Different elevators' arrangements can increase the step required for the customers to reach their destinations.*

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5.1.4 Design process for visual accessibility between different floors

This visual accessibility through the atrium helps the customers to mark their locations and plan their journeys. Thus, the shopfronts on the upper floor are visible through the atrium. This is possible since the corridors on the upper floors are single-loaded corridors, due to ventilation in open-air setting. The materials of the railings can affect the visual access as well. In the proposed community mall, the railings are designed to be as transparent as possible to help increase the visual access. Visual accessibility between floors through atrium can be calculated by adjusting the proportion between the width of the atrium, the width

of the corridor, and the height of the ceiling. This is to find the right proportion which correlates with the depth of the rental units in the proposed community mall.

The proportion can be calculated using the similar triangles equation as shown below. In this study, the case is set to have four floors with a central atrium and corridors (of the same width) around the atrium. The customers are able to see the top parts of shopfronts on the fourth floor.

$$\frac{X_1}{X_2} = \frac{Y_1}{Y_2}$$

The variables are the representations of the following ranges of widths and heights.

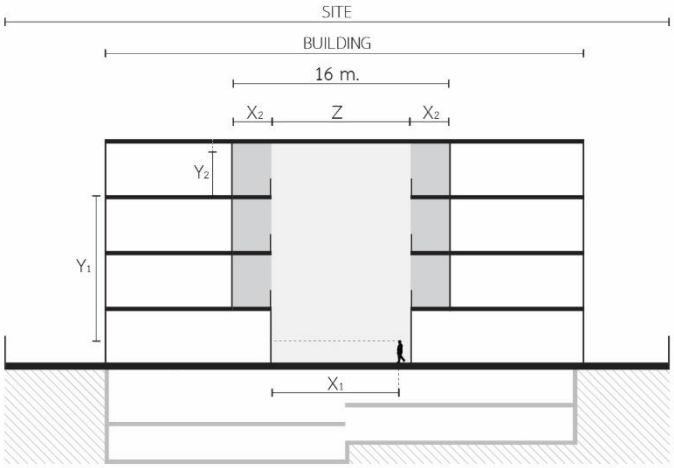



*Figure 5.7 The section of the proposed community mall labeled with variables for the similar triangles equation.*

$X_1$ = The horizontal distance between the customer and the railing of the corridor. The customer is set to stand 1 m. away from the corridor of the opposite side ($X_1$=Z-1) where Z is the variable for the atrium.

$X_2$ = The width of the corridor. This width is an inverse variation to the atrium (Z) where Z+2$X_2$ is constantly equal to the distance between two sides of the building.

$Y_1$ = The height from the eye-level of the customer (1.5 m.) to the floor level of the fourth floor. The equation $Y_1=3n-1.5$ is applied to calculate this height, where n is a variable for the floor to floor height.

$Y_2$ = The height from the floor level of the fourth floor to lowest part of the shopfront on the fourth floor where the customers are able to see. The equation for this is $Y_2=n-n_2$ where $n_2$ is equal to the height from the top of the fourth floor to the part that the customer is expected to see (1 m. from the floor of the fifth floor).

The first part of the calculation is to find the distance between two sides of the building. This distance can be identified from the design schemes in the previous section. The depth of the rental units is calculated from these schemes to find the minimum leasable area that matches with the feasibility study of the project. The minimum depth of the rental units is 9 m. This means that the distance between two sides of the building is around 16 m. ($Z+2X_2=16$). This number is then plugged into the equation below where floor to floor height is set to be 4 m. The result of the equation is shown in figure 5.8.

$$\frac{X_1}{X_2} = \frac{Y_1}{Y_2}$$

$$\frac{((Z+2X_2)-1)-2X_2}{X_2} = \frac{((3n)-1.5)}{(n-n_2)}$$

$$\frac{((16)-1)-2X_2}{X_2} = \frac{((12)-1.5)}{(4-1)}$$

$$\frac{15-2X_2}{X_2} = \frac{10.5}{3}$$

$$10.5X_2+6X_2 = 45$$

| | | | |
|---|---|---|---|
| Corridor width | $X_2$ | = | 2.73 |

| | | | |
|---|---|---|---|
| Atrium width | Z | = | $16-2X_2$ |
| | | = | 16-(2.73x2) |
| | | = | 10.54 |

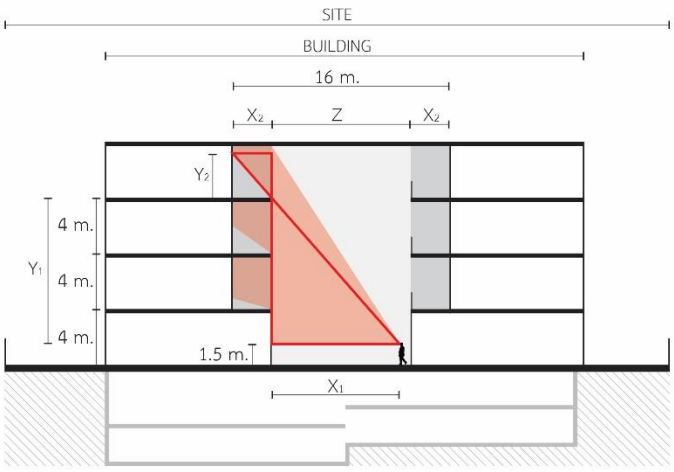



*Figure 5.8 The section of the proposed community mall (floor to floor height 4 m.) with visible parts from the first floor highlighted in red.*

From the calculation, the customers can see the top of the fourth floor when the atrium width is 10.54 m. and the corridor width is 2.73 m. If more visible area on the fourth floor is required, this proportion can be adjusted by reducing the width of the corridor. Figure 5.9 shows the case that floor to floor height is 5 m.

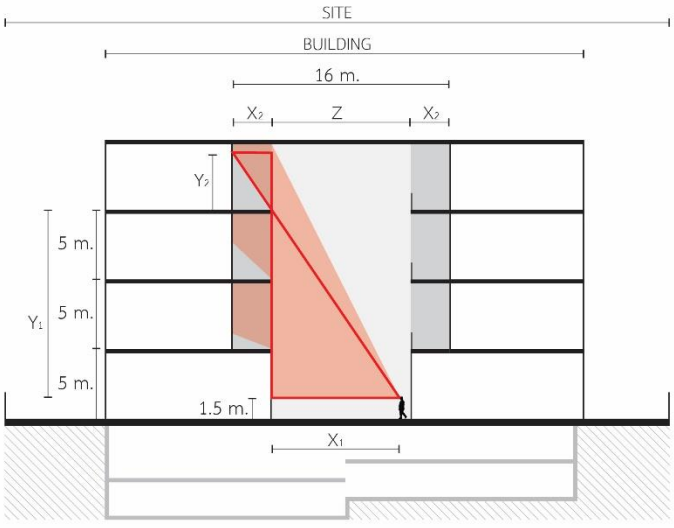
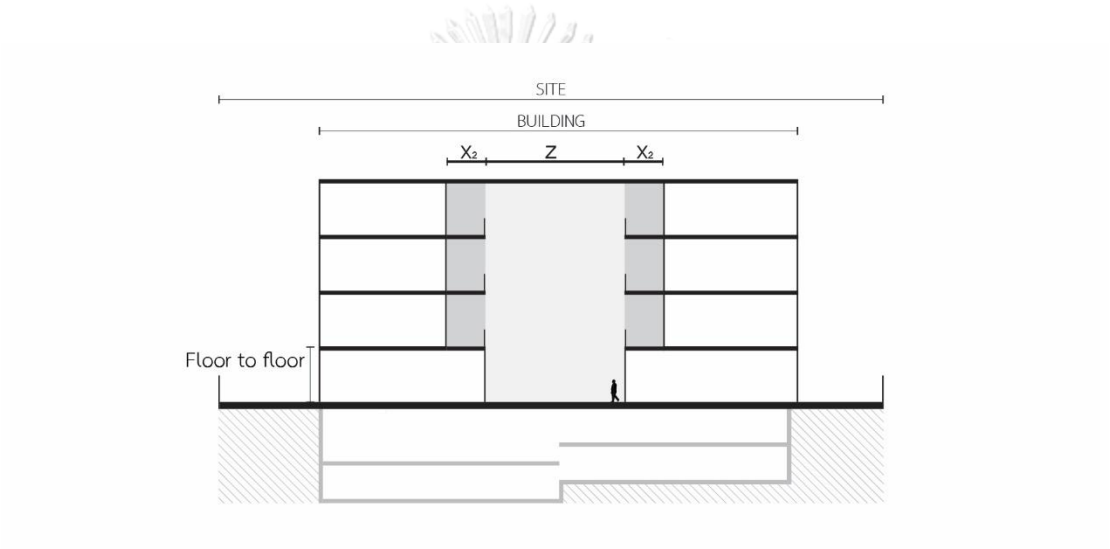



*Figure 5.9 The section of the proposed community mall (floor to floor height 5 m.) with visible parts from the first floor highlighted in red.*

After the calculation of the 5 m. floor to floor height case, it is found that the proportion between the width of the atrium and the width of the corridor changes. The atrium width is 10.41 m. and the corridor width is 2.79 m. Here, the height of the top floor allows the corridor to be wider with slightly higher proportion than the 4 m. floor to floor height case. In addition to the study, figure 5.10 shows the ranges of possibilities with floor to floor height from 4 m. to 6 m. and the distance between two sides of the building from 9 m. to 18 m. The table displays small changes of proportions between the corridor and the atrium when floor to floor height increases and when the distance between two sides of the building increases.




| Z | | Distance of space between two sides of the building (m.) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| Floor to floor heights (m.) | 4 | 4.19$X_2$ | 4.11$X_2$ | 4.05$X_2$ | 4.00$X_2$ | 3.96$X_2$ | 3.92$X_2$ | 3.89$X_2$ | 3.87$X_2$ | 3.84$X_2$ | 3.82$X_2$ |
| | 5 | 4.05$X_2$ | 3.97$X_2$ | 3.91$X_2$ | 3.86$X_2$ | 3.82$X_2$ | 3.79$X_2$ | 3.76$X_2$ | 3.73$X_2$ | 3.71$X_2$ | 3.69$X_2$ |
| | 6 | 3.96$X_2$ | 3.89$X_2$ | 3.83$X_2$ | 3.79$X_2$ | 3.74$X_2$ | 3.71$X_2$ | 3.68$X_2$ | 3.65$X_2$ | 3.63$X_2$ | 3.61$X_2$ |

*Figure 5.10 The section of the proposed community mall with ranges of proportions between the corridor and the atrium.*

5.1.5 Design implementations for circulation areas and vertical paths

Accordingly, the pedestrian entrances are available from both the south (Thong Lo 13 alley) and the north of the site (Thong Lo 15 alley). The pedestrian entrance from the north of the site blends the boundaries between the pedestrian walkway of the public and the community mall area. The vehicle entrance for the customers is only available from the south of the site (Thong Lo 13 alley). It is located after the exit and is visible from distance. From this entrance, there are twelve convenience parking spaces provided for the customers. Then, there is a drop-off area in front of the main entrance to the building

The entrance to the underground parking is located near the drop-off area. The circulation of underground parking is straightforward and easy to navigate through. A split deck arrangement with integral ramps is applied, as the total area of the site is very limited. This split deck arranges the next floor of the car parking at the half-floor level of the adjacent car parking floor. This utilizes the length of the ramp required between each floor. When the arrangement of the car parking space is applied to the site, the total numbers of the underground parking are 111 cars.

There are three types of vertical paths in this community mall, which are ramps, stairs, and elevators (Figure 5.11). Ramps are applied to the design of corridors, following the research results. This design helps ease the customers' efforts of moving up. This continuous ramp also leads customers through multiple floors without interruption of immediate change in elevation. There are two sets of stairs located near the two entrances of the community mall. On the upper floors, these stairs are located at the intersection where the pedestrian flows are high. The stairs from the first floor to the top floor are visible from each point to another. Elevators are located at the front and at the back of the community mall to help distribute the pedestrian flows. It is available for the customers' uses from the underground floor to the top floor. There are two sets of fire stairs from the underground floor to the top floor of the building.

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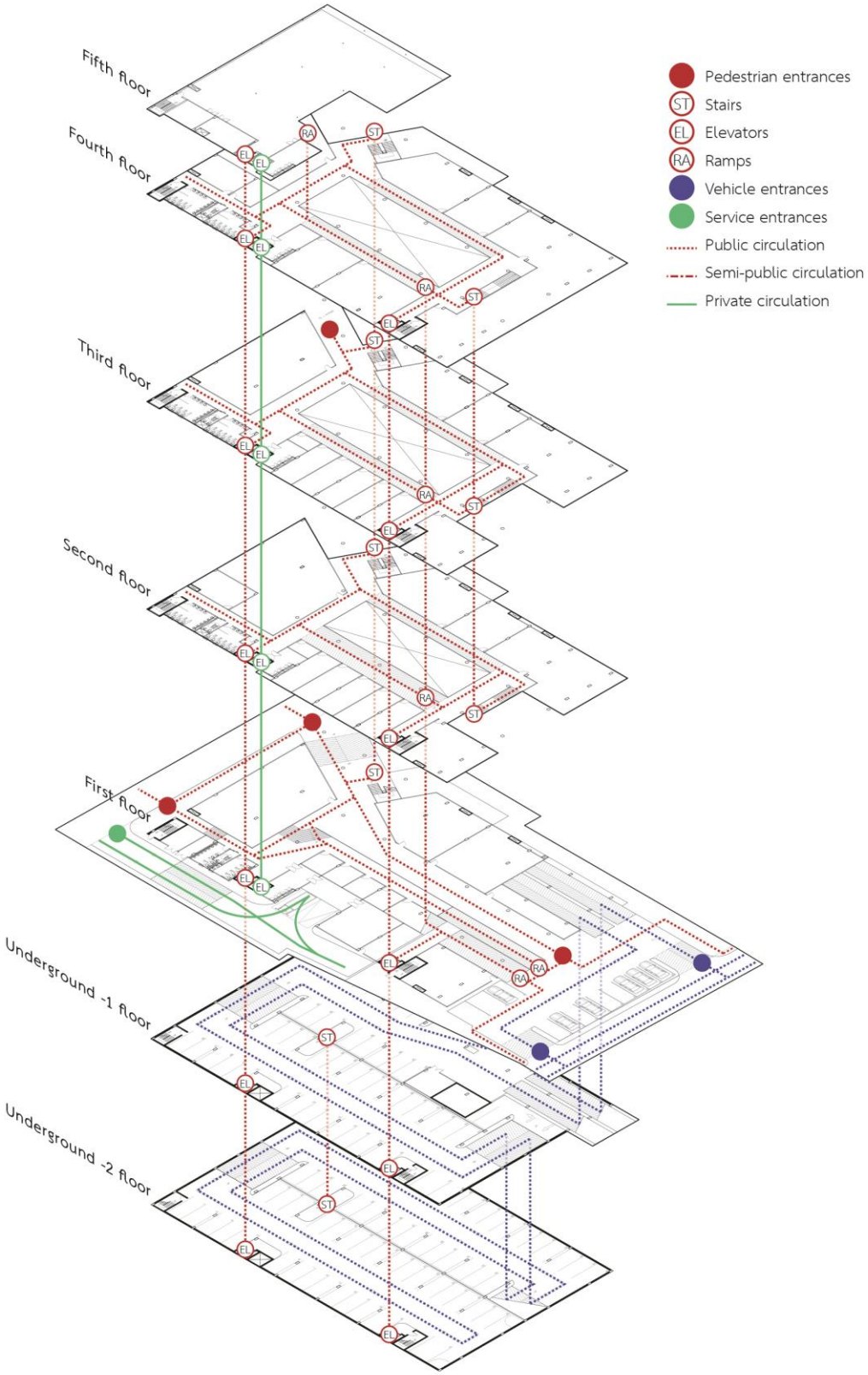


*Figure 5.11 Circulation areas and vertical paths in Mid J.*

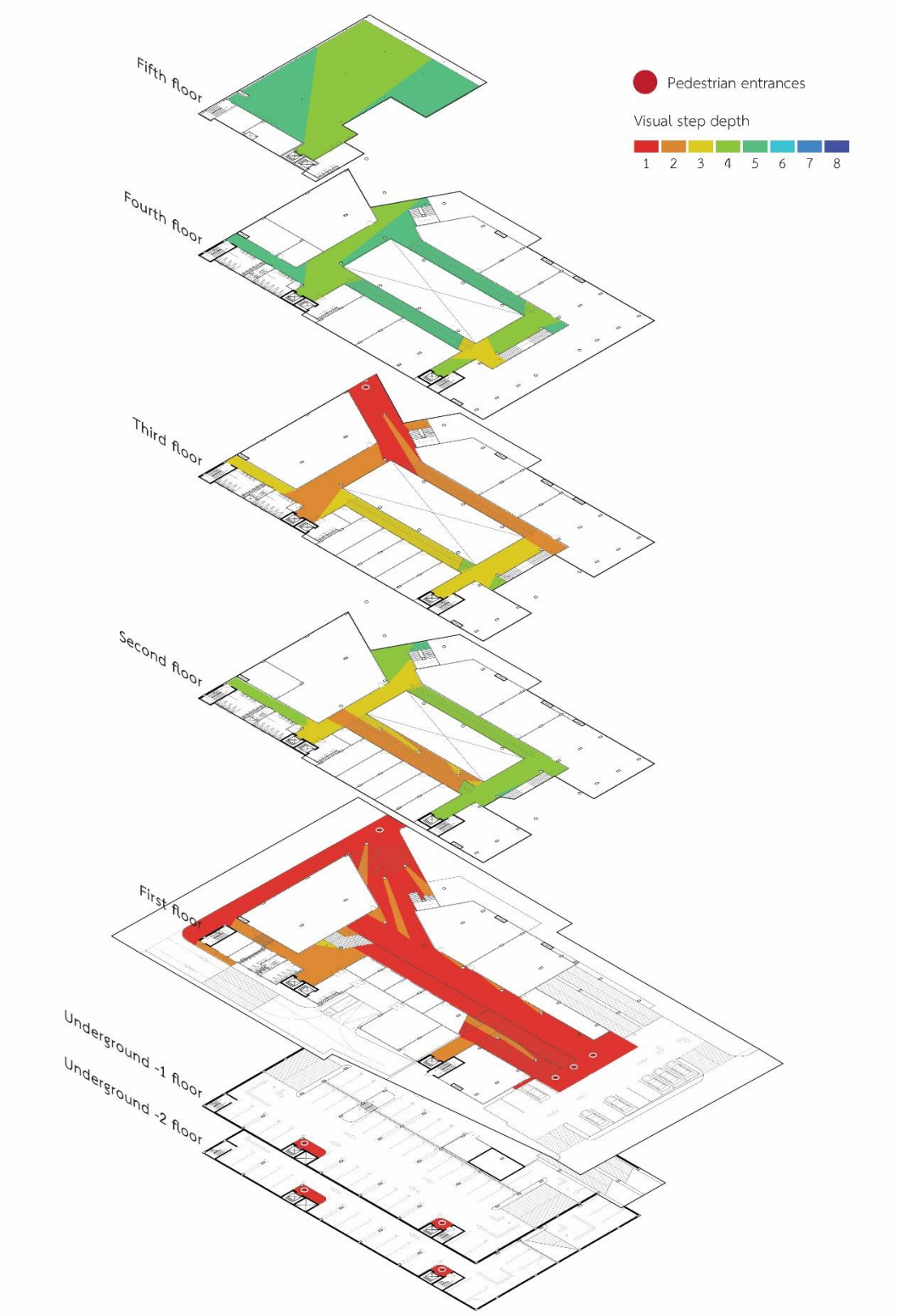


*Figure 5.12 Visual step depth in Mid J.*

For the visual accessibility, the tenants located in front of the community mall are visible from Thong lo 13 alley. The void in the middle of the building allows the customers to see the central courtyard. This central courtyard on the first floor also connects to another entrance from Thong lo 15 alley. From this circulation area, the customers are able to see shopfronts, signage, and vertical paths available.

The result of the analysis in figure 5.12 shows that the layout of the building requires only five turns for the customers to reach the innermost part of the public area in the building. This is also due to the multiple entrances available, including the entrances from the underground parking. From the underground parking, there are two elevators available. These elevators are located separately to distribute the pedestrian flows to two opposite ends of the building. Moreover, the vertical paths to the second floors are visible from the two entrances from the street. From Thong lo 13 alley entrance, the customers can see the ramp leads to the second floor. From Thong lo 15 alley entrance, the customers can see the staircase lead to the second floor. The corridors on the upper floors are straight corridors as they allow the best visibility throughout their whole lengths.

Figure 5.13 shows the section of the proposed community mall. It can be seen that from the corridor on the left-hand side, the customer can see full shopfronts on the first floor and the second floor through the atrium. The upper half of the shopfronts on the third floor and the fourth floor are also visible to the customer who stand in that position. This is possible because of the calculation of the proportion between the corridors and the atrium. Moreover, this also dues to the levels of the floors themselves. As the floor levels of the two opposite sides are not the same, it increases the visibility for the customer to see more portions of shopfronts on the other floors.


*Figure 5.13 The section of the proposed community mall with visible parts from the first floor highlighted in red.*

## 5.2 Tenant mix and tenant placement in the community mall

Tenant mix and tenant placement in the community malls derived from the combination of the research results and the market research. Market research is critical for retail businesses because it can identify the needs and preferences of the target customers in the catchment area. In this thesis, the market research identifies the target customers and the market gap of the community malls in Thong Lo to find the design concept. This design concept is then applied to varieties of research-based possibilities in the design process to form the design proposal.

### 5.2.1 Target customers and market gap of community mall in Thong Lo

The target customers and the market gap can signify the types of tenants and the attractions provided in the proposed community mall. This information can be studied from both primary data collection and secondary data collection. Primary data collection includes the observations and the lists of tenants of the case studies. The secondary data includes information from external sources, such as growth, new developments, and reports.

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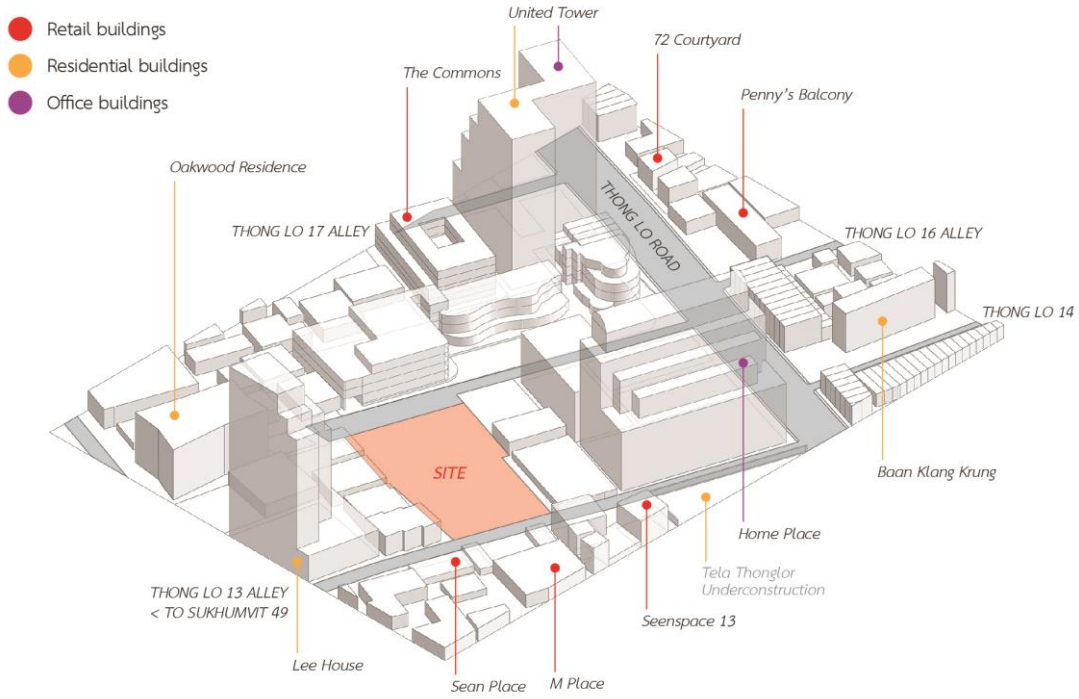


*Figure 5.14 Buildings around the site area.*

From the observation, it is found that the residential buildings in Thong Lo consist of single-family homes, townhouses, low-rise apartments and high-rise condominiums. Figure 5.14 shows that there are multiple apartments and condominiums with the radius of 200 m. from the site. These include United Tower, Oakwood Residence, Lee House Apartment, and The Pentacles. Moreover, there is an under-construction project called Tela Thonglor Condominium with 84 living units. 87% of residents in apartments and condominiums in Thong Lo are foreigners mostly from Japan, Singapore, and Hong Kong (DDproperty, 2017). This level of residential density can be seen throughout Thong Lo area. There are also a lot of single family homes located in alleys of Thong Lo. The residences of these homes are big families with ranges of generations. The nearest parks to Thong Lo are Suan Somdet Saranrat Manirom (figure 5.15). This amount of green spaces, in comparison to the number of the population, shows that there are not enough green spaces in the area. Thus, the proposal of green space, such as pocket parks and indoor gardens are preferable for the community malls. These green features can act as hangout spots for the customers. Moreover, when located on the upper floors, these spaces can also be attractions influencing the customers to go to the upper floors.

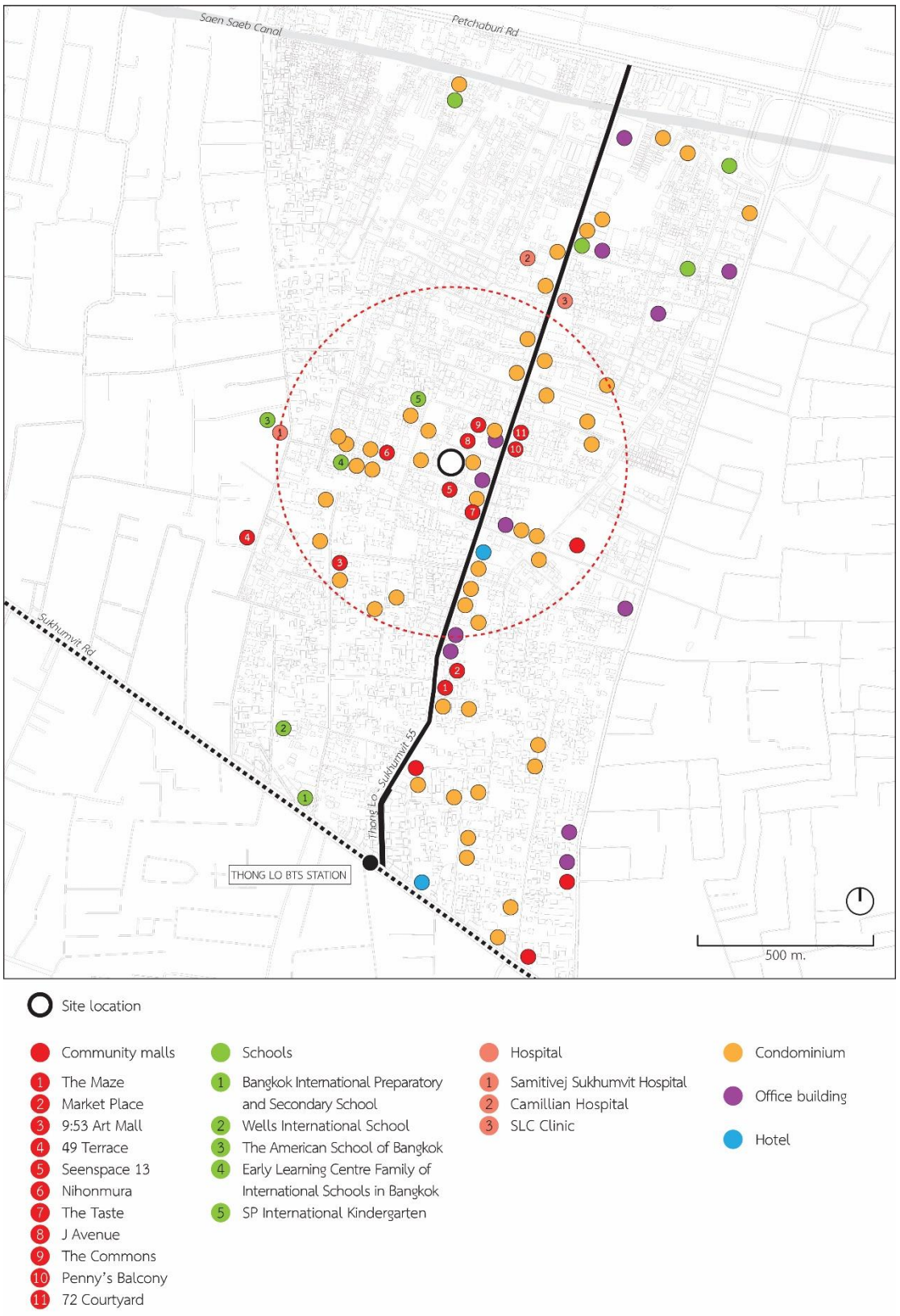


*Figure 5.15 Different building types in Thong Lo, 2018.*

There are also office buildings, schools, and hospitals around the site as well (figure 5.15). These buildings can identify the group of people who visit Thong Lo area during the daytime. There are two main types of schools, which are kindergartens, and international schools for primary and secondary educations. This means that the potential customers for the community malls, apart from office workers, can include parents of the students and relatives of patients in the hospitals.

It is visible that apart from community malls, there are also other retail shops and restaurants in shophouses and mixed-use buildings in Thong Lo. Here, these commercial businesses share similar target groups of customers, which are the Japanese people and young adults with expensive lifestyle. However, some community malls in Thong Lo do aim for more specific types of customers. This can be seen from their themes of decorations and the types of tenants in the projects. J Avenue focuses on Japanese people in the neighborhood. 72 Courtyard focuses more on nightlife experiences for young adults While The Commons focuses on their communal areas that they claim to provide greenery and close to nature sensation for residents in the neighborhood, they are also famous among the vicenarian tourists. This can reflect both local and international customers' preferences on green and communal spaces.

In conclusion, the target customers for the design proposal can be categorized by the time period that they spend in Thong Lo area. During the daytime, the customers can include both Thai and foreign families in the neighborhood area and the parents of students from nearby schools. These groups of customers can enjoy the green spaces provided in the design proposal. The types of tenants for them include fitness center, learning center, beauty clinic, hair salon, nail salon, toy shop, restaurant, and coffee shop. They can also participate in arts and crafts workshops organized in the event space. During the night time, the customers can be the young adults with high spending power, and the foreign tourists. These groups of customers seek for hangout spaces with pleasant environments. Here, the green space on the top floor can turn into special events with outdoor seating and music. The tenants for them include restaurants with outdoor seating area, dessert café, clothing shops, and accessories shops.

5.2.2 Design process for leasable area and other attractions

The leasable area can be classified into anchor tenants, tenants with low-impulse trade, and tenants with high-impulse trade. According to the research results, the percentages of these tenants are 23%, 32%, and 45%. The three average sizes of these rental units are small (smaller than 60 sqm), medium (81 – 180 sqm), and large (larger than 181 sqm). These units are usually flexible for reduction and expansion to suit customers demand. Figure 5.16 illustrates the design criteria of tenant placement to different design schemes. When combining the Visual Step Depth graphs to the locations of tenants, it helps evaluating the suitability of the locations of the tenants themselves and how anchor tenants can be used to influence the flows of the customers to the locations which are hard to be reached. From the three schemes, it can be concluded that the connection to J Avenue on the fourth floor should be relocated to the third floor. This is because the anchor tenant on the fourth floor can attract the customers. Thus, it can create the pedestrian flows from the third floor to the fourth floor. Moreover, the connection on the third floor can distribute the pedestrian flows to other areas on the third floor and the second floor as well.

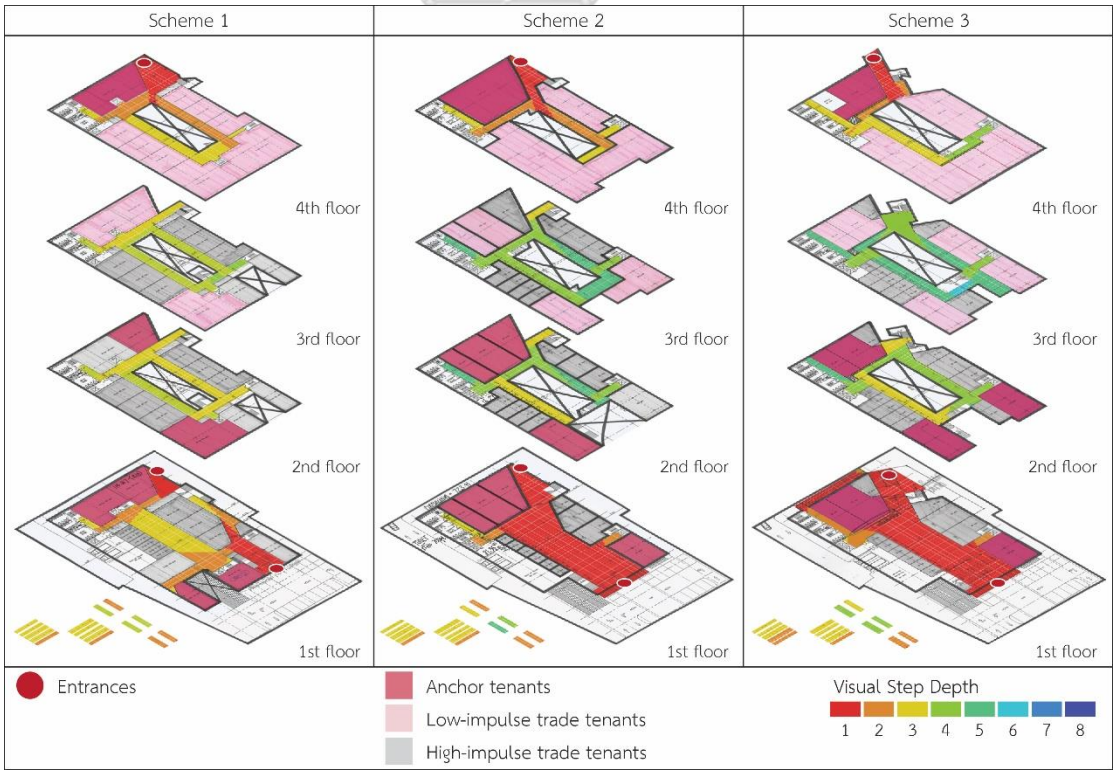


*Figure 5.16 Design schemes of tenant placements for the proposed community mall.*

5.2.3 Design implementations for leasable area and other attractions

The tenant placement schemes in figure 5.3 are arranged accordingly to the research findings. Hence, the rental units on the first floor consist of one anchor tenant in the front, one anchor tenant at the back, and tenants with high-impulse trade in between. Tenants on the first floor are coffee shops, restaurants, toy shops, flower shops, and clothing shops. Semi-outdoor for outdoor seating are required for coffee shops and restaurants. These semi-outdoor areas also provide visual accesses towards the street. The second floor mainly consists of tenants with high-impulse trade, such as clothing shops and newly opened restaurants. Here, similar categories of tenants with high-impulse trade are grouped together. A small unit of tenant with low-impulse trade, dry cleaner, also located on this floor. The tenants on the third floor are mixtures of tenants with low-impulse trade and tenants with high-impulse trade. Some of these rental units are multi-floor units to eliminate a part of the corridor on the fourth floor. The fourth floor consists of large rental units for tenants with low-impulse trade. Tenants on the fourth floors include beauty clinics, music schools, learning centers, and yoga studio.

Event space and pocket park are considered to be attractions in the community malls. As mentioned in the market analysis part, these areas are occupied by the customers in both daytime and nighttime. Thus, they need to be maintained daily. The design for these spaces aims to provide the ease of maintenance for the staffs. Accordingly, the customers can access these spaces from only one entrance on the fourth floor for security control. Specific area in the park is chosen to accommodate events. These spaces should also be photography in this social media era.

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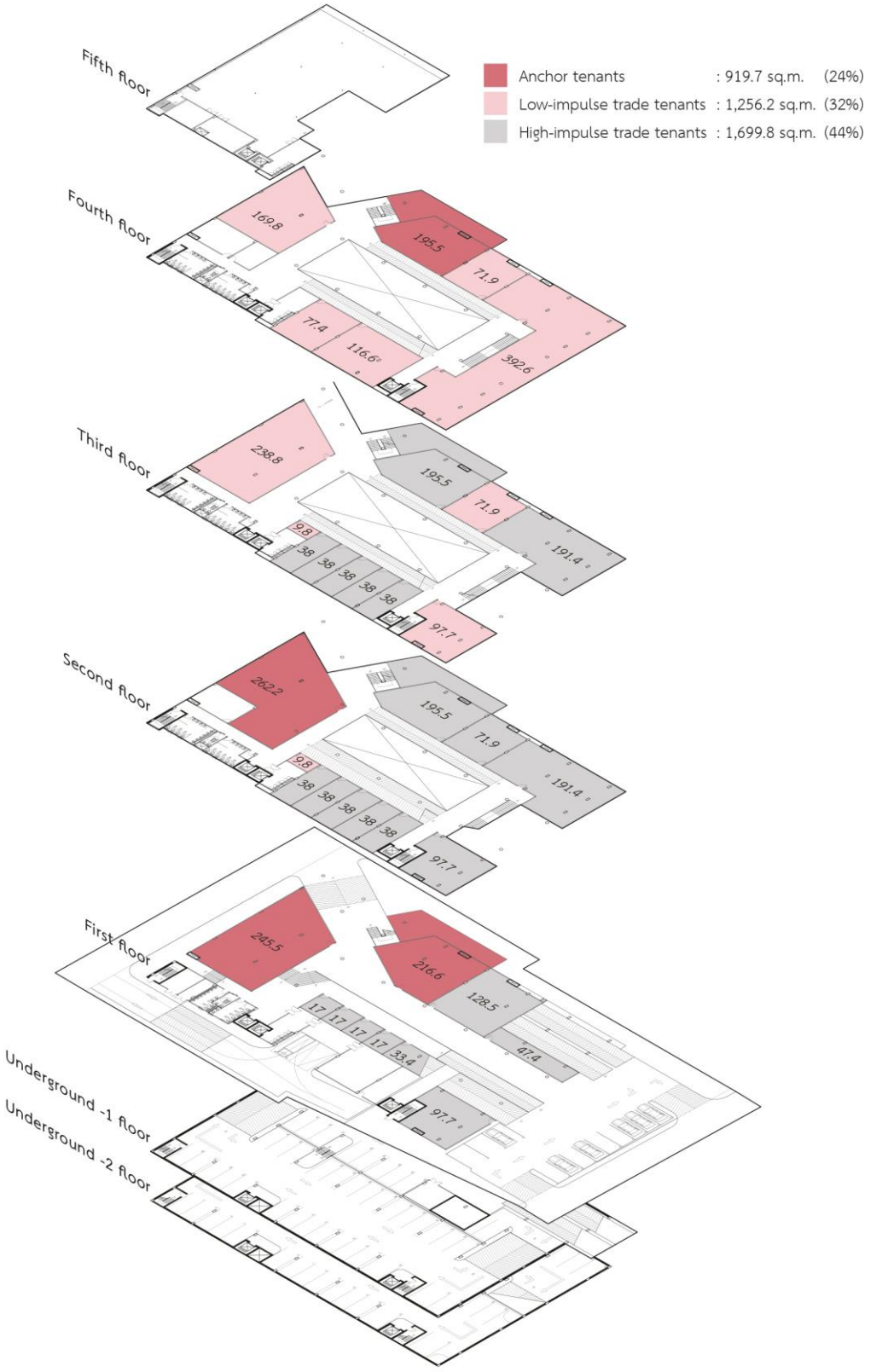


*Figure 5.17 Tenant placement and percentages of different types tenants in Mid J.*

## 5.3 Programs and other requirements for the community mall

### 5.3.1 Overall programs of the community mall

*Table 5.2 Proposed programs for the community mall.*

| Function | Time period | User group | Area | | | | | | | | % |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | U2 | U1 | F1 | F2 | F3 | F4 | F5 | Total | |
| Leasable area | | | | | | | | | | | |
| Restaurant | 10.00 - 22.00 | Staffs and customers | | | 688.2 | 818.6 | 795.3 | 660.0 | | 2962.0 | |
| Other tenants | 10.00 - 22.00 | Staffs and customers | | | 149.3 | 200.3 | 200.3 | 363.9 | | 913.7 | |
| Total | | | | | | | | | | **3875.7** | 39% |
| Circulation and other public areas | | | | | | | | | | | |
| Event space and pocket park | 10.00 - 22.00 | Staffs and customers | | | | | | | 185 | 185 | |
| Circulation | 10.00 - 22.00 | Staffs and customers | | | 526 | 376.9 | 447 | 427.6 | | 1777.5 | |
| Fire stair | 10.00 - 22.00 | Staffs and customers | 17.6 | 17.6 | 20.8 | 20.8 | 20.8 | 20.8 | 20.8 | 139.2 | |
| Toilet | 10.00 - 22.00 | Staffs and customers | | | 41 | 56 | 56 | 56 | | 209 | |
| Total | | | | | | | | | | **2311** | 23% |
| Mamagement facility | | | | | | | | | | | |
| Administrative office | 09.00 - 18.00 | Staffs | | | | | | 22.7 | | 22.7 | |
| Staff area | 09.00 - 18.00 | Staffs | | | | | | 44 | | 44 | |
| Control room | 09.00 - 18.00 | Staffs | | | 32.3 | | | | | 32.3 | |
| Total | | | | | | | | | | **99** | 1% |
| Access and deliveries | | | | | | | | | | | |
| Service yards | 09.00 - 23.00 | Staffs | | | 31.6 | | | | | 31.6 | |
| Service room | 09.00 - 23.00 | Staffs | | | 29.8 | 19.7 | 19.7 | 29.8 | | 99 | |
| Storage | 09.00 - 23.00 | Staffs | | | | 44 | | | | 44 | |
| Total | | | | | | | | | | **174.6** | 2% |
| Plants and installation | | | | | | | | | | | |
| Electrical room | 09.00 - 23.00 | Staffs | | | 70 | | | | | 70 | |
| Garbage room | 09.00 - 23.00 | Staffs | | | 29 | | | | | 29 | |
| Pump room | 09.00 - 23.00 | Staffs | | 25 | | | | | | 25 | |
| Water storage | 09.00 - 23.00 | Staffs | | 30 | | | | | | 30 | |
| Total | | | | | | | | | | **154** | 2% |
| Underground | | | | | | | | | | | |
| Underground parking | 00.00 - 24.00 | Staffs and customers | 1741 | 1635 | | | | | | 3376 | |
| Total parking (111 cars) | | | | | | | | | | **3376** | 34% |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Gross Floor Area (GFA) | | | | | | | | | | **9990** | 100% |
| | | | | | | | | | | | |
| Outdoor area | | | | | | | | | | | |
| Landscape | 09.00 - 23.00 | Staffs and customers | | | 645 | | | | | 645 | |
| Vehicle circulation | 09.00 - 23.00 | Staffs and customers | | | 816 | | | | | 816 | |
| Parking (12 cars) | 09.00 - 23.00 | Staffs and customers | | | 169 | | | | | 169 | |
| Total | | | | | | | | | | 1630 | |

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Programs in community malls can be classified into two main categories, which are front of house areas and back of house areas. Front of house areas or public spaces in this research refer to leasable areas, public circulation, underground parking, and outdoor area as previously mentioned in the prior sections (Table 5.2).

These areas, except for the outdoor areas, are used together with back of house areas are used to calculate the Gross Floor Area (GFA). However, leasable areas in this section are classified by the units' preparations. This method is used due to the differences in the costs of construction. Two types of units are retail units, and restaurant units. The retail units only require electrical supply, while restaurant units require electrical supply, water supply, drainage, and ventilation system. This does not mean that all the restaurant units have to be occupied by restaurant tenants. It only means that these units are more suitable for restaurants and other types of tenants that require such systems to operate.

Another program that requires the system preparation is toilet. Toilets in the community malls are located near the elevators of each floor. This is due to the construction purposes and easy accessibility for all the customers. The numbers of toilets are calculated from the minimum toilet requirement for each area in the community mall (Table 5.3). These numbers are then designed into men toilets, women toilets, and accessible toilets.

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*Table 5.3 Minimum toilet requirement calculation.*

| **Minimum toilet requirements** | | **Toilet** | | **Washbasin** |
|---|---|---|---|---|
| | | **Toilet** | **Urinal** | |
| Restaurant (per 200 sq.m. of dining area) | Male | 9 | 18 | 9 |
| | Female | 18 | | 9 |
| Retail (per 200 sq.m. of sale area) | Male | 4 | 7 | 4 |
| | Female | 4 | | 4 |
| Office (per 300 sq.m.) | Male | 1 | 2 | 1 |
| | Female | 2 | | 1 |
| Parking (per 1000 sq.m.) | Male | 3 | 3 | 3 |
| | Female | 3 | | 3 |
| | | | | |
| Total | | **44** | **30** | **34** |
| Male | | 17 | 30 | 17 |
| Female | | 27 | | 17 |

5.3.2 Back of house areas

There are three main categories of back of house areas or services areas in the community mall, which are management facility, access and deliveries, and plants and installations. The management facilities are the facilities provided for the staffs who operate the community mall. There are administrative office, staff area, and control room. Administrative office is an office space for the staffs and an information desk where the tenants and customers can contact the staffs. In the staff area, there are lockers for the staffs to keep their personal belongings and a lounge for the staffs to relax and socialize while they are not working. Control room is used to monitor the safety and security systems, along with coordinating with the emergency services. It also addresses broadcasting system.

Accesses and deliveries include service yard, service room, and storage. The service yard can be accessed from the service entrance, which is separated from the public entrances. It is used for unloading goods to each rental unit. Thus, it is located within 150 m. from the furthest rental units of the community mall. Service room is connected to the service elevator, which is also separated from the public elevators. The storage stores outdoor furniture for the event space, along with equipment used to maintain the circulation and public areas in the community mall.

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Plants and installations include electrical room, garbage room, pump room, and water storage. The electrical room is a room for electrical equipment, such as electric switchboards, circuit breakers, and electricity meters. Floors are usually reinforced for this room due to the weights of the equipment. Garbage room can be separated into two parts, dry waste (recyclable waste), and wet waste (biodegradable waste). Wet wastes usually come from the restaurants tenants. The size of each room is calculated by the equation mentioned in the legal framework (Chapter 2). Garbage room is located near the service entrance, where the garbage truck can collect the wastes without having to enter the community mall areas. As the community mall uses upfeed water supply system, water from the main supply are stored in the water storage room. Then, it is distributed from the pump room on the underground floor upward through the vertical piping system.

5.3.3 Façades and openings

Climate characteristics of each site are specific to its location and context. In this part of site analysis, four main aspects of climate are analyzed. The first aspect is sunlight. This includes directions of the sun's path on the site throughout the year, and shadow patterns of the surrounding buildings around the site. The second aspect is temperature. The third aspect is rainfall, and the final aspect is wind. These aspects are especially important for the community mall building type because it is an open-air building. Thus, it needs to be integrated with both natural elements and constructed surroundings.

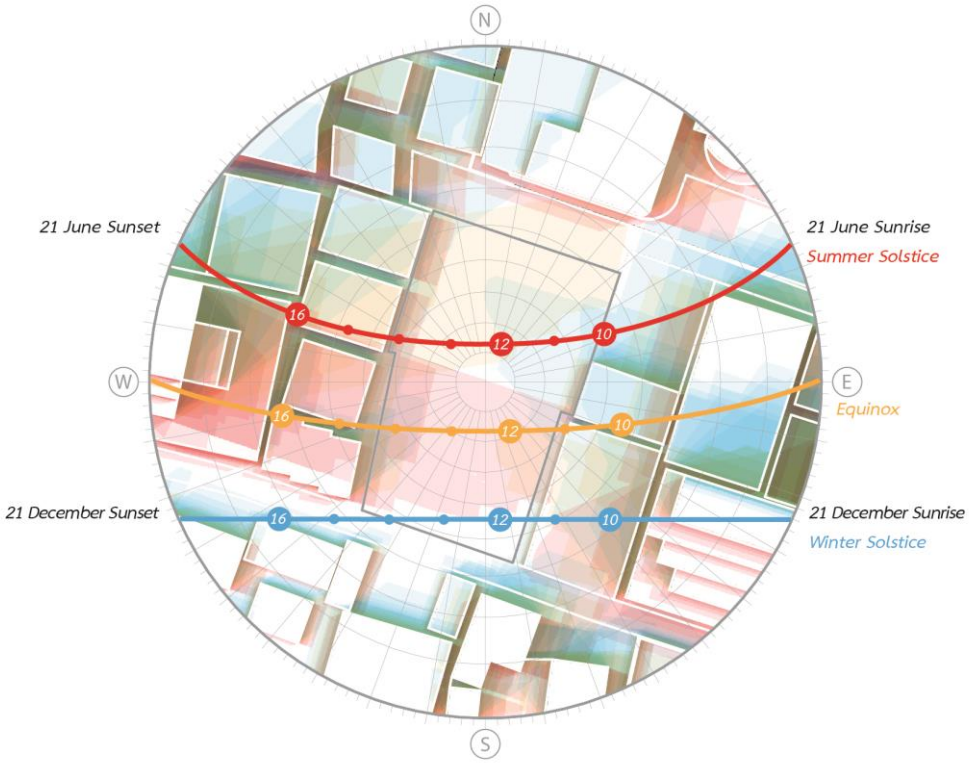


*Figure 5.18 Sun path diagrams showing the angle of azimuth, and the shadows cast on the site throughout the year (the red overlay layer represents the shadows cast during the summer solstice, the yellow overlay layer represents the shadows cast during the equinox, and the blue overlay layer represents the shadows cast during the winter solstice), 2018.*

The analysis of the sun is to identify the spatial arrangement and orientation of the building. It can suggest the window placement and the façade system according to the amount, time period, and direction that the sunlight enters the building. Figure 5.18 shows the sun path

diagrams of the site. The red, yellow, and blue lines represent the time during the day that the site receives sunlight throughout the year. During the summer solstice, the sun rises at 05:51 and sets at 18:48 (represent in red line). During the winter solstice, the sun rises at 6:36 and sets at 17:55 (represent in blue line). However, very strong sun strength (according to the UV index) during 10:00 – 16:00 should be avoided. Accordingly, it is the time where shading devices should be designed to limit the amount of sunlight received into the community mall.

The red, yellow, and blue lines also represent the angle of azimuth which determines the angle of sunlight received into the community mall and shadows cast by the buildings around the site. These, along with the size of the openings, are used to calculate the width, height, and thickness of the shading devices. From figure 5.18, it is visible that the angle of azimuth during the winter solstice (blue line) has the most effect on the south façade. Additionally, while the other sides of façades have shadows of adjacent buildings cast over during the morning and afternoon, there is no time period that shadow casts on the south façade. This means that south façade, which is the community mall main entrance, require more shading devices than the other three sides.

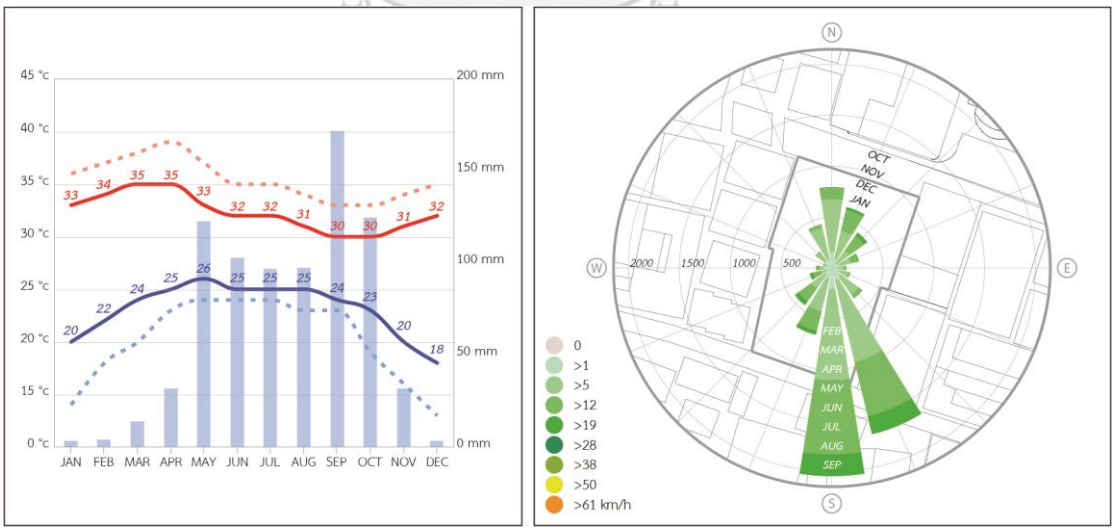


*Figure 5.19 Average temperature and precipitation in Bangkok throughout the year (left), and the wind rose showing the amount, speed and direction of wind in Bangkok (right).*

For temperature, Bangkok has three seasons throughout the year: summer, rainy, and winter. Summer (March-June) has the highest temperature of 35° Celsius, while winter (November-February) has the lowest temperature of 18° Celsius (Figure 5.19 left). From the interview, it is stated that most customers visit the community mall during winter. This is because it is too hot in the summer to spend their daytime outdoors. Similarly, there are not many customers during the rainy season, since the roof provided in the community mall cannot fully protect them from the rain.

The factor of rain is very important for the roof design, as Bangkok has very heavy rain. Accordingly, roof drainage system needs to receive maximum rainwater as it falls on the roof and convey to storm water drainage facility. Furthermore, rain can be brought by the wind direction as well. This also affects the design of the façade.

Figure 5.19 (right) shows that the prevailing wind direction comes from the south for eight months in a year, and the north during the other four months. This suggests that the openings on these two sides of the building are very crucial to the ventilation flow in the building. However, the wind from the south also brings the rain with them. Thus, these openings should have the façade that allow ventilation flows but prevent rain.

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In conclusion, these climate factors can scope down the types of facades that are appropriate for the community mall. Here, the façade should be energy efficient to reduce the heat gain from the sun. It should be resistant to the rain and durable in hot climate. and last at least three years before it has to be maintained, or fifteen years before it has to be replaced. All in all, fiber cement façade is selected for its durability and cost efficiency. It can be designed to integrate with clear glass panel where the tenants' shopfronts required to be visible.

### 5.3.4 Design implementations of the community mall

In conclusion, the design process of the proposed community mall is shown in figure 5.20. First, the underground parking is chosen for the parking type based on the availability of the

site area and the leasable area required. Second, the split-level parking configuration is applied as it is the most efficient option for the vehicle circulation. Third, the layout of the community mall is the combination of two different schemes according to the design criteria in Chapter 4 and their Visual Step Depth generation results. Lastly, the tenant placements are applied together with the Visual Step Depth graphs to adjust the proposed design to its full potential.

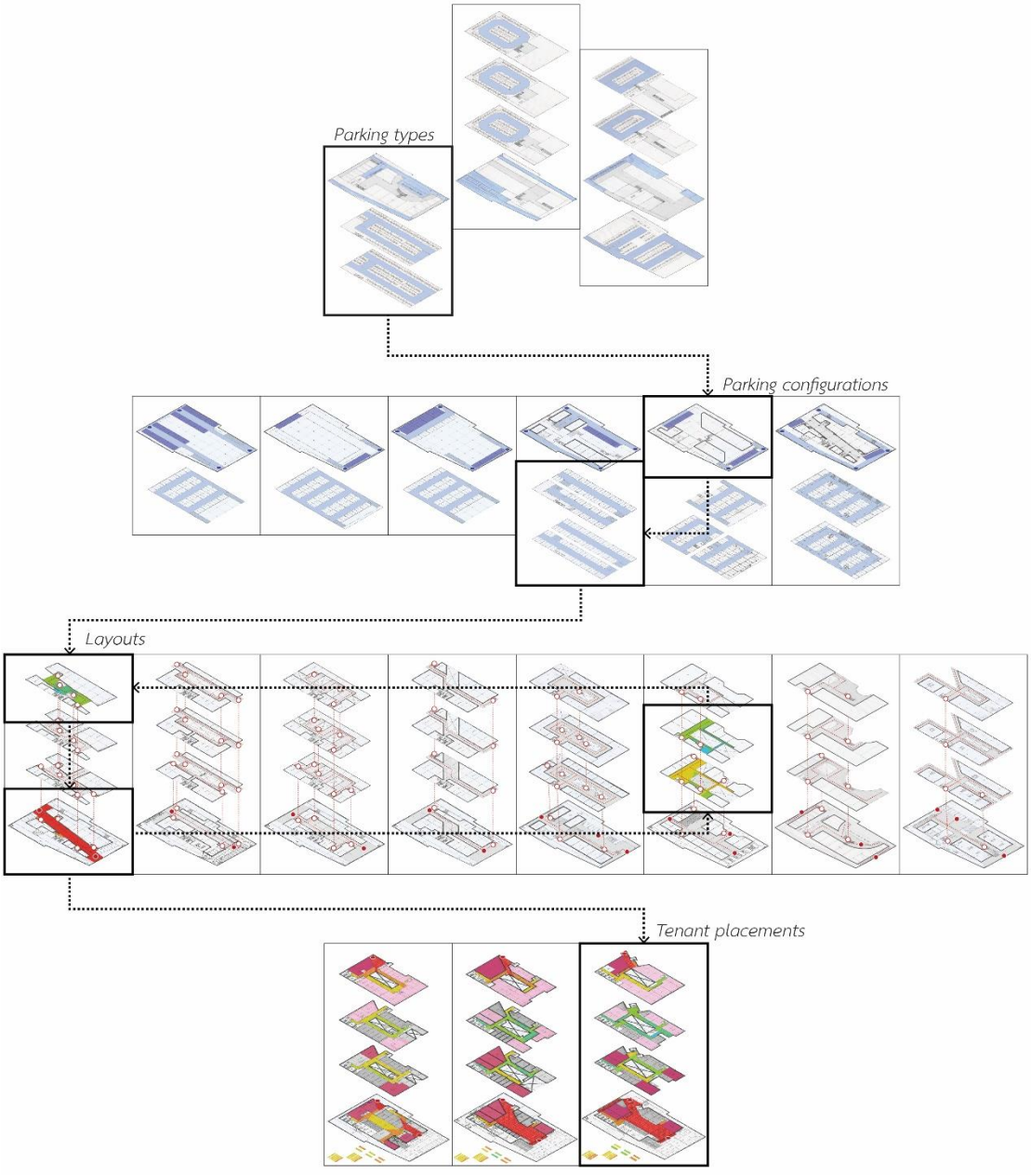



*Figure 5.20 The design process of the proposed community mall.*

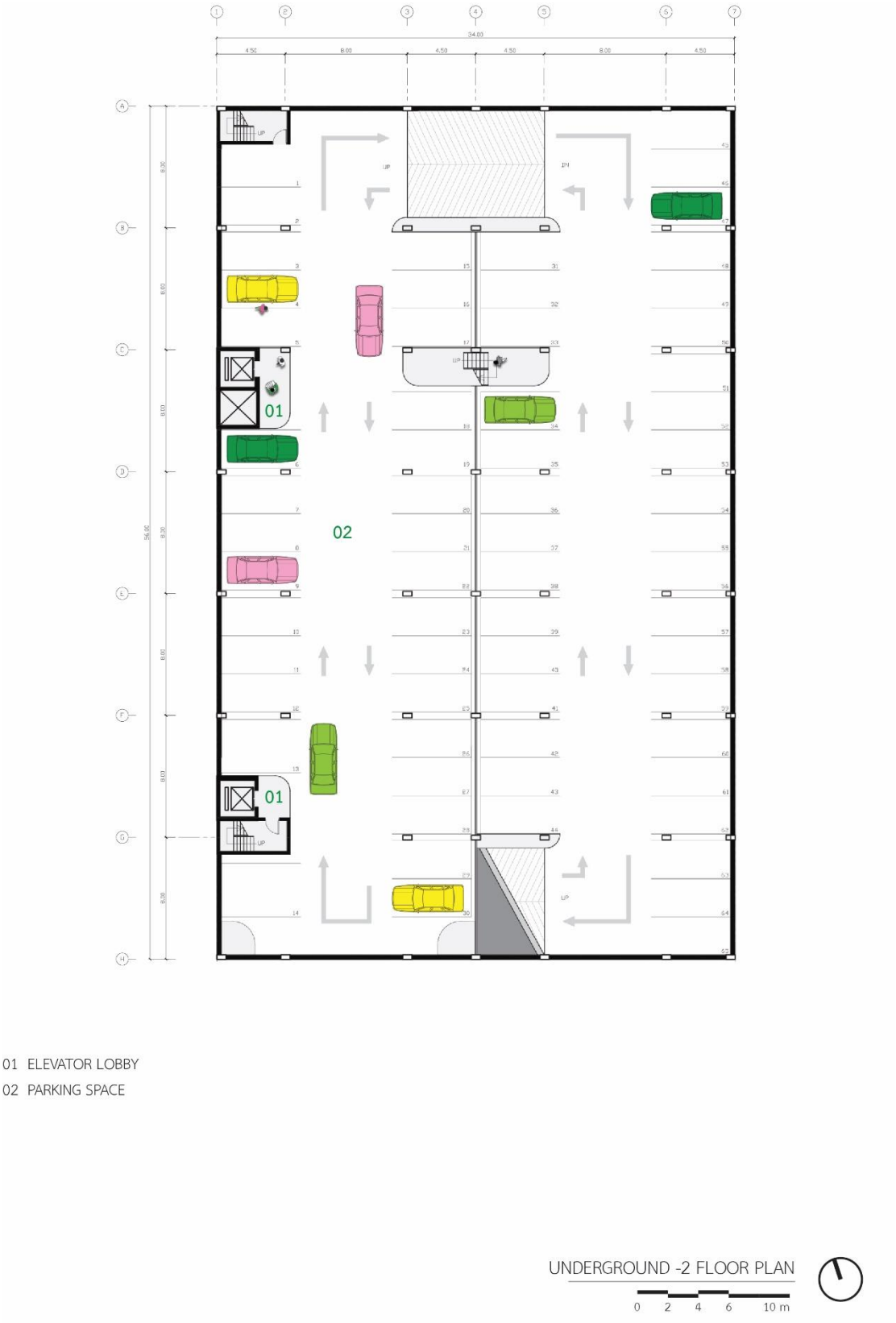



*Figure 5.21 Underground -2 floor plan of the proposed community mall.*


01 ELEVATOR LOBBY
02 PARKING SPACE
03 PUMP ROOM
04 WATER STORAGE

UNDERGROUND -1 FLOOR PLAN

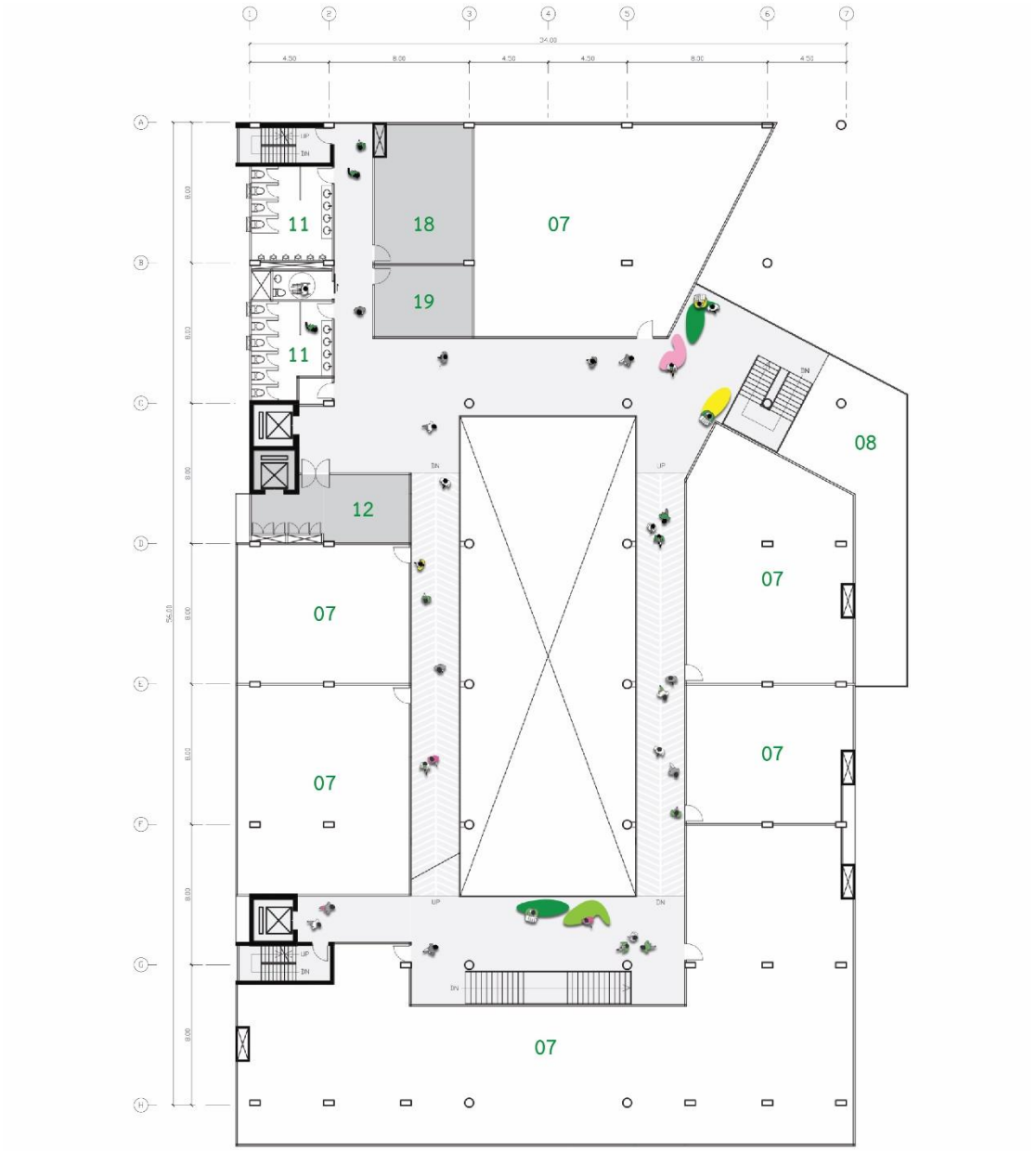
0 2 4 6 10 m

*Figure 5.22 Underground -1 floor plan of the proposed community mall.*


*Figure 5.23 First floor plan of the proposed community mall.*


*Figure 5.24 Second floor plan of the proposed community mall.*


*Figure 5.25 Third floor plan of the proposed community mall.*

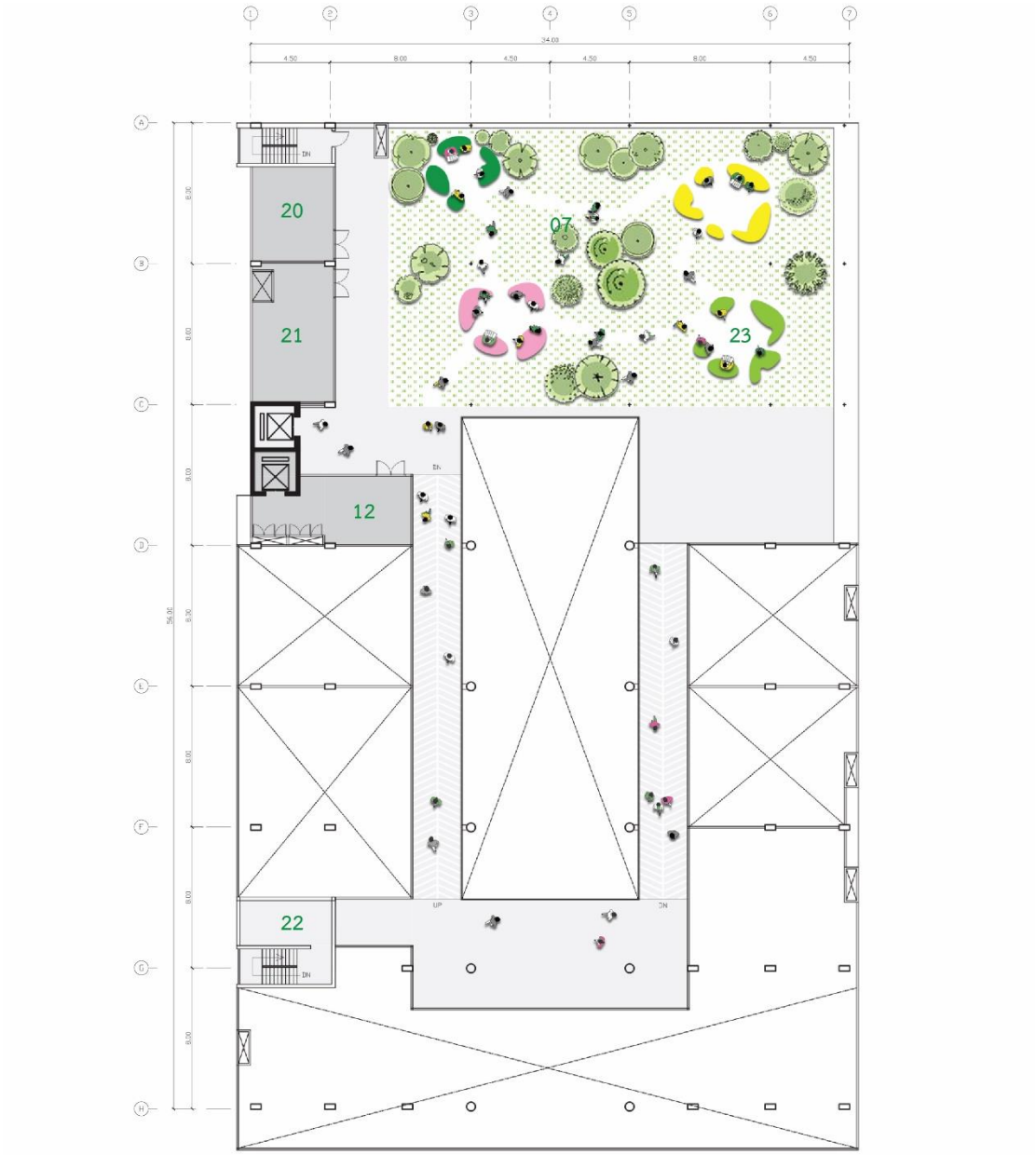



07 RENTAL UNIT
08 RENTAL UNIT (OUTDOOR)
11 TOILET
12 SERVICE ROOM
18 STAFF AREA
19 ADMINISTRATIVE OFFICE

FOURTH FLOOR PLAN

0 2 4 6 10 m

*Figure 5.26 Fourth floor plan of the proposed community mall.*




12 SERVICE ROOM
20 BOOSTER PUMP ROOM
21 WATER STORAGE
22 ELEVATOR ROOM
23 ROOFTOP GARDEN

*Figure 5.27 Fifth floor plan of the proposed community mall.*

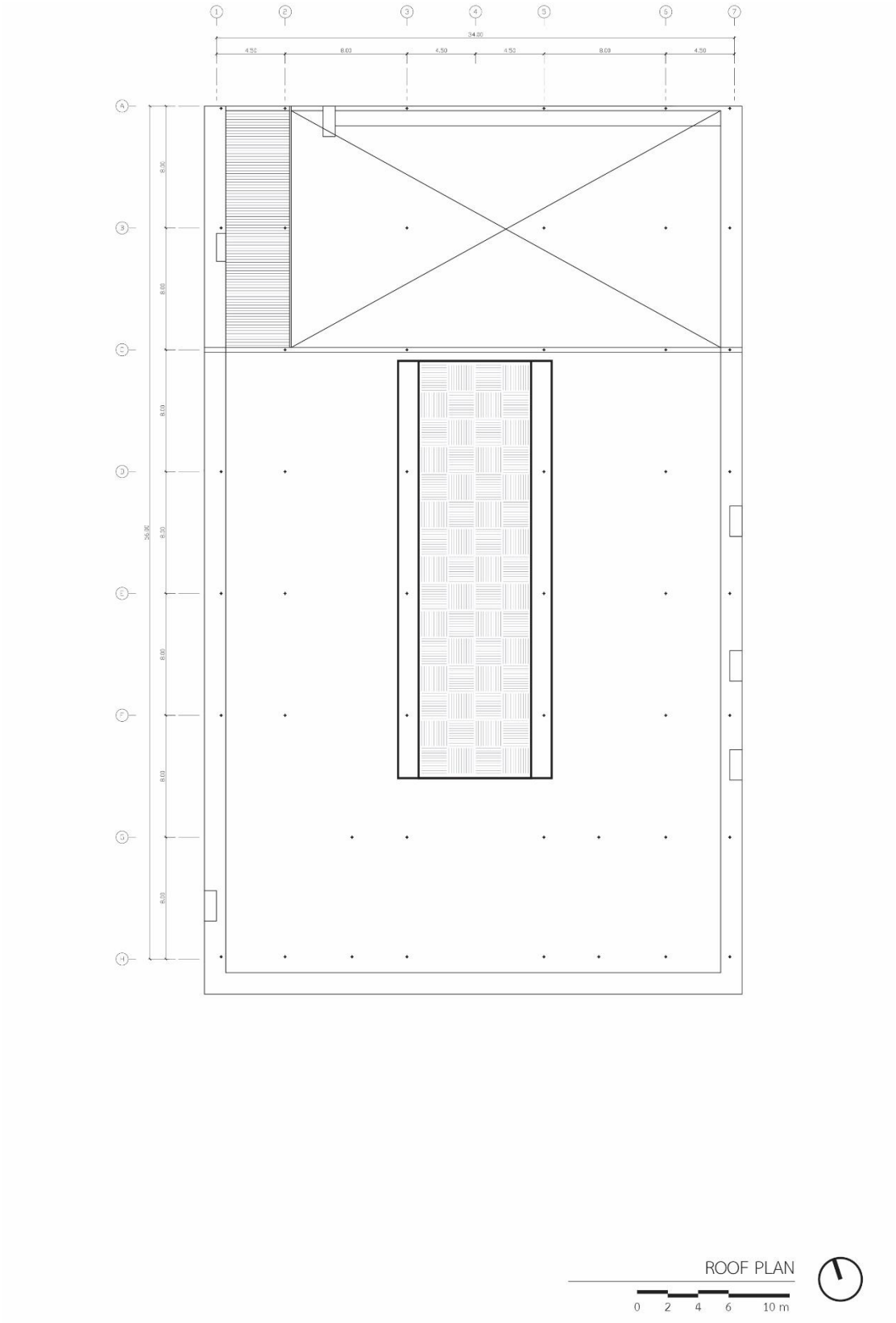



*Figure 5.28 Roof plan of the proposed community mall.*

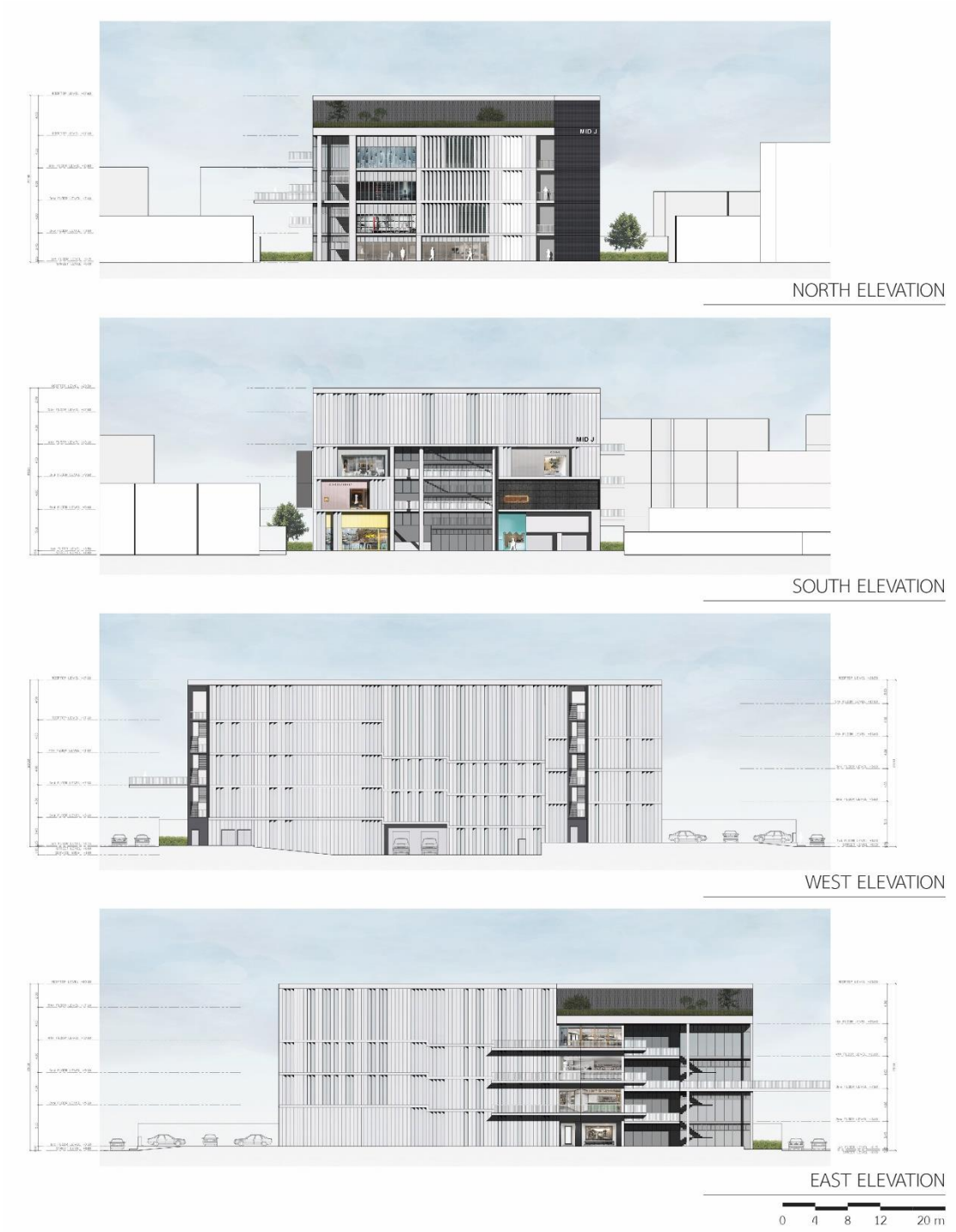



*Figure 5.29 Elevations of the proposed community mall.*

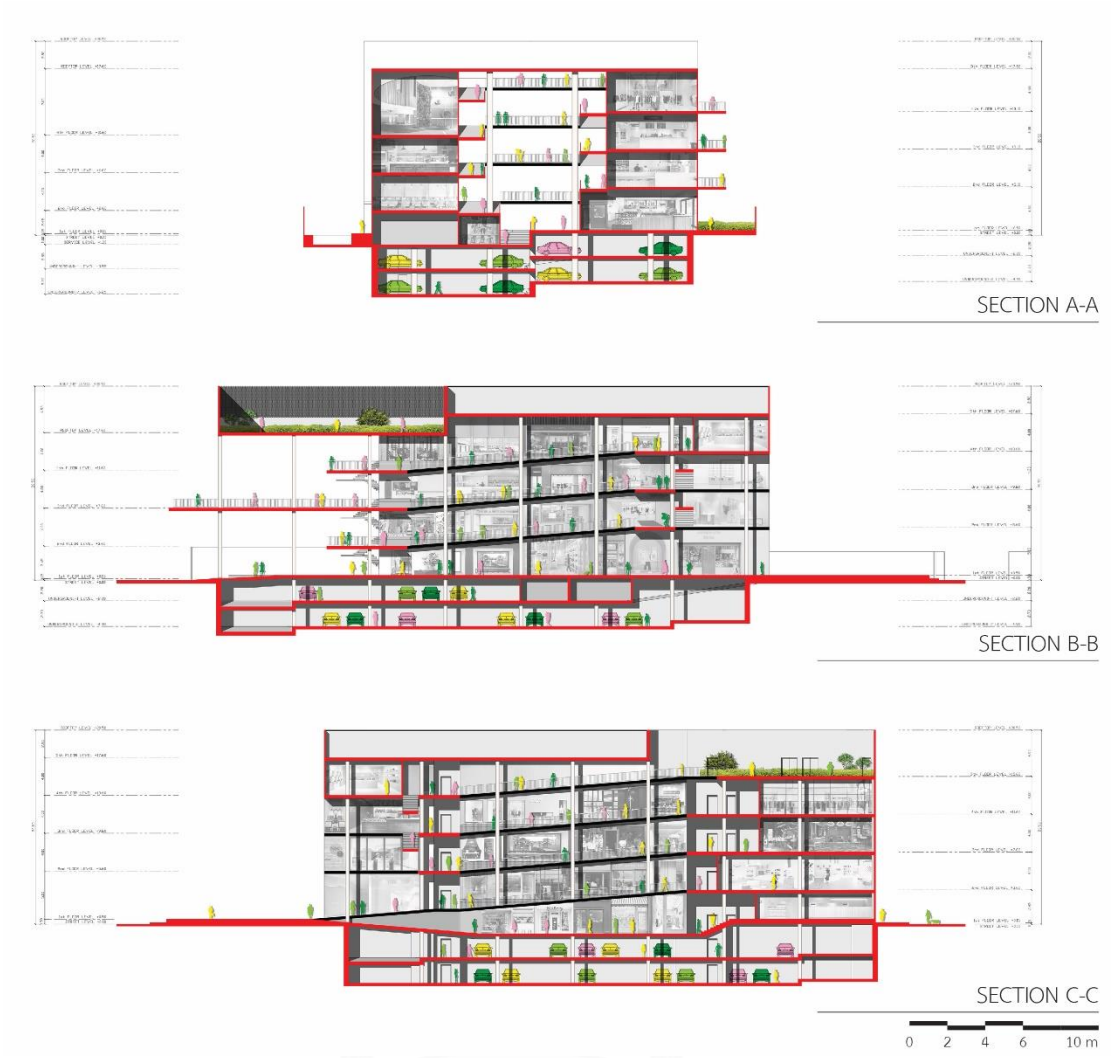



*Figure 5.30 Sections of the proposed community mall.*

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*Figure 5.31 Perspective image of the proposed community mall (view from Thong Lo 13 alley).*

*Figure 5.32 Perspective image of the proposed community mall (view from Thong Lo 15 alley).*

*Figure 5.33 Perspective image of the proposed community mall (view from Thong Lo 13 entrance).*

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# CHAPTER 6
# CONCLUSION

## 6.1 Conclusion

Today, more mid-rise community malls in Bangkok are constructed as land in the urban area become more limited. However, customers are not attracted to visit the upper floors of community malls. Meanwhile influencing the customers to visit all parts of the community malls is the key to survival of both the tenants and the community malls themselves, as generating more pedestrian flows can increase the chance of the customers' spending. Even though most retail businesses are focusing on the tenants and their placements, the study of architectural design factors which can distribute the pedestrian flows are also significant.

This thesis aims to identify these architectural design factors, along with analyze the spatial characteristics that can influence the distribution of pedestrian flows across the areas in the community malls. Following three theories from the literature reviews, three main hypotheses are suggested. These hypotheses include; anchor tenants can draw customers to the upper floors (the anchor tenants), the effortlessness in moving between floors can draw the customers to the upper floors (the economy of movement), and the availability of visual access of shopfronts can draw the customers to the upper floors (the visual and physical accesses). These hypotheses are studied through seven case studies in Thong lo.

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The information from the seven case studies are collected in four methods. The first method is to collect the data of tenant placements and the vertical paths of the cases. The second method is to observe the pedestrian patterns, including the amount of the pedestrian flows during "Popular Times" periods. The third method is to take panoramic photography from the points of entrance in order to capture the 360-degree visual accesses. The fourth method is to generate Visual Step Depth graph and Visual Integration graph from a software-generating program called DepthmapX.

After analyzing the information from each case, the research results can be concluded as design criteria for mid-rise community malls. These design criteria are categorized into three main categories following the mentioned hypotheses. For the tenant mix and tenant placements in the community malls, the common ratio of anchor tenants to tenants with low-impulse trade to tenants with high-impulse trade is 1 : 1.36 : 1.96. On the top floor, the tenants with low-impulse trade can also attract the customers.

In this study, there are three types of path choices, which are choices of entrances, choices of corridors, and choices of vertical paths. For the choices of entrances, the pedestrian entrances from the street should blend the boundaries between the pedestrian walkway of the public and the community mall area. The circulation areas on the first floor should be opened to the front of the community mall. Blank walls and vacant units should not be visible from this area. Dark and dead-end corridors are also undesirable. The vertical paths in the community mall should be located at the front of the building.

For the visual accessibility, the customers should be able to see the shopfronts, signages, and vertical paths from the point of entrance. Here, the visibility of the upper floors should be available through atrium. A straight corridor allows the furthest visual through the building. The vertical paths from the first floor to the top floor should be visible from each point to another.

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When these design criteria are implemented to the site, it is found from the generation of Visual step depth that the layout of the floor plans and the locations of the vertical paths can decrease the number of turns required for the customers to see each part of the community mall. This can be related with the ease to visit each part of the community mall in the physical access. However, the effect of the tenant mix and tenant placements are not able to be validated. This is explained further in the limitations of the study.

## 6.2 Limitations of the study

Apart from the mentioned limitations in chapter one, it is found during the investigation that there are also the limitations in the research methods and validation processes as well. The limitations in research methods include the difficulties in obtaining the information from private organizations and analyzing the materials from environmental behavior observations. Since observing the customers' behaviors can be interpreted in various ways, the results are often concerned to be affected by the subjectivity of the researcher. However, the observation results in this study is analyzed together with the results from VGA graph analysis. Together, they can increase the validity of the research results.

Another limitation of this study is the validity of the design proposal based on the design criteria. This design proposal can only be verified of its success via VGA graph analysis, since the functions of tenant mix and tenant placement cannot be tested by computer simulation. Nevertheless, there are researches mentioned in the literature reviews that link the relationships between the results of the graphs and the probability of customers' behaviors in terms of the pedestrian flows

## 6.3 Suggestions

The study focuses on the distribution of pedestrian flows in the community malls. It identifies three key factors for the developers and architects to adapt the design criteria to both existing and future mid-rise community malls. For the researchers, this research can be improved both in terms of methods and validations.

Suggestions for investors and developers are about design that affect the survival of the business. Based on the case studies, the cases with designs that aim toward maximum leasable areas always lead to undesirable circulation spaces and lack of additional attractions. Here, the customers' preferences should be surveyed and studied before the initiation of the investments.

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For architects and designers, it is very important to consider the customers' behaviors in the designs. Today, the interactions between the customers and retail spaces are changing due to various factors. While online shopping and online communication can decrease the necessity of public space for physical interactions, architects and designers should be able to adapt their approaches to create spaces that can respond to these changes.

For the researchers, there are some adjustments in the research part that can improve the results of the study. First, the demographic of the customers can be systematically categorized during the environmental behavior observation. Second, a set of interviews can be conducted to find out more in-depth information. For example, if they are the first-time visitors or frequent customers. Finally, the validation of the research results and the implementation of the design proposal can be improved by developing computational tools to evaluate the space based on the customers' behaviors.

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# APPENDIX

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# APPENDIX A

## A.1 Feasibility study of the proposed community mall

In this research, the feasibility of the proposed community mall is studied to find the break-even point of the project. This is to suggest if the project is appropriate for the investment or not. The break-even point is the point where the total cost and total income are equal. Generally, the break-even point of the successful community malls is within ten years. In order to calculate the break-even point, the assumptions of cashflow (costs and incomes) are generated. Furthermore, different scenarios are applied to the calculations to find out the possibilities of the outcomes.

## A.2 Estimated costs of the proposed community mall

The costs of the community malls can be categorized into the investment cost and the operation cost. The investment cost includes the land, the construction cost, maintenance cost, and soft cost (Table 5.5). The land cost is 50% of the total price of the land. The appraisal price of the land in Thong Lo 13 alley, by the Treasury Department, is 220,000THB per sq.wah. The total price of the land is expected to be 20 - 30% higher. Thus, it is 260,000THB per sq.wah.

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The construction cost of the community mall is estimated from Thai Appraisal Foundation. Since the community mall is an open-air building, its cost of construction cannot be compared with shopping mall with an air-conditioning system. Accordingly, the appraisal price for a commercial building is applied at 17,600THB per sq.m. The construction price of the underground parking is 18,000THB per sq.m. The construction price of landscape and infrastructure is averagely 4,000THB per sq.m. The community mall is expected to be maintained every three years, starting from year six of the project. The cost of the maintenance is around 1.5% of the construction cost. The cost of the renovation, every 15 years, include the façade, the circulation area, pocket park, landscape, management facilities, plants, and installations.

*Table A.1 Investment cost of the proposed community mall, 2018.*

| | | (Baht per sq.m.) | Area (sq.m.) | Total (Baht) | Period (Year) |
|---|---|---|---|---|---|
| Investment cost | | | | | |
| Land | Land price for 3,630 sq.m. (907.5 sq.wah) | 260,000 | 907.5 | 235,950,000 | |
| | Long lease 30 years (50%) | 130,000 | 907.5 | 117,975,000 | Year 0 |
| Construction cost | Building (4 floors) | 17,600 | 6,614 | 116,406,224 | Year 0 - 2 |
| | Underground parking (2 floors) | 18,000 | 3,376 | 60,768,000 | Year 0 - 2 |
| | Landscape and infrastructure | 4,000 | 1,630 | 6,520,000 | Year 0 - 2 |
| | Total construction cost | | | 183,694,224 | |
| Maintenance cost | every 3 years (1.5% of constrcution cost) | | | 2,755,413 | Year 6 - 30 |
| | renovation | 17,600 | 2738.3 | 48,194,080 | Year 15 |
| Soft cost | Architect (2% of construction cost) | | | 3,673,884 | Year 0 |
| | Engineer (2% of construction cost) | | | 3,673,884 | Year 0 - 2 |
| | Marketing (1% of construction cost) | | | 1,836,942 | Year 2 |
| Total investment cost | | | | **310,853,935** | |

The operation cost of the community mall includes administrative expenses and managements remuneration, utility cost, and marketing and advertisement. The administrative cost covers the salaries of employees, staffs, security guards, and cleaners. This is around 20% of the total income. The utility cost includes electricity bills, water supply bills, and telephone bills. Averagely, the utility cost is 120THB per sq.m. Marketing and advertisement commonly cost 2% of the total income. Income tax (20% of net income) and property tax (12.5% of incomes from rental) are also included in this list.

*Table A.2 Operation cost per month of the proposed community mall, 2018.*

| | Area (sq.m.) | Total (Baht) | Period (Year) |
|---|---|---|---|
| Operation Cost per month | | | |
| Administrative expenses and managements remuneration (20% of total income) | | 1,527,206 | Year 3 - 30 |
| Utility cost (120 baht per sq.m.) | 3,876 | 465,083 | Year 3 - 30 |
| Marketing and Advertisment (2% of total income) | | 152,721 | Year 3 - 30 |
| Total operation cost | | 2,145,010 | |

A.3 Estimated incomes of the proposed community mall

Estimated incomes of the community mall are from the rental units, utility and service charges from the tenants, the event spaces, and the parking space. The rental fees from the rental units are highest on the first floor at 2,500-3,000THB per sq.m. This also depends on the size of the unit and the type of the tenant. The rental fees on the second floor are around 1,500-2,000THB per sq.m. The rental fees per sq.m. on the upper floors are around 1,000-1,500THB per sq.m. Utility and services charges are collected from the tenants at 20% higher than the regular cost. Event spaces of the community mall can be rented by the tenants or other organizations to organize workshops, parties, and small concerts. This can be estimated to be around 90,000THB per month. A part of the incomes is from the parking fees. This is estimated to be 1,000THB per car parking space per month.

*Table A.3 Income per month (100% occupancy rate) of the proposed community mall, 2018.*

| | | (Baht per sq.m.) | Area (sq.m.) | Total (Baht) | Period (Year) |
|---|---|---|---|---|---|
| Income per month | | | | | |
| Rental | Ground floor | 2,500 - 3,000 | 837 | 2,302,988 | Year 3 - 30 |
| | 2nd floor | 1,500 - 2,500 | 1,019 | 2,037,720 | Year 3 - 30 |
| | Upper floors | 1,000 - 1,500 | 2,019 | 2,524,225 | Year 3 - 30 |
| | | | | | |
| Utility and service | 120% of utility cost | | 3,876 | 558,099 | Year 3 - 30 |
| Event spaces | | | 185 | 90,000 | Year 3 - 30 |
| Parking (per car) | | 1,000 | 123 cars | 123,000 | Year 3 - 30 |
| Total Income (occupancy rate 100%) | | | | 7,636,032 | |

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A.4 Scenarios and returns

These costs and incomes are then calculated via excel sheet to find the break-even point of the project. However, community malls do not commonly have 100% of occupancy rate. Thus, three different scenarios are proposed to calculate the possibilities of the project. These scenarios are base case, worst case, and base case (Table 5.8). Generally, the result from the base case is considered to be the most accurate answer. In this case, the break-even point of the project is at year 10.

*Table A.4 Base-case, worst-case, and best-case scenarios of the community mall, 2018*

| Case | Occupancy rate | | | Breakeven pt. |
|---|---|---|---|---|
| | Year 3 | Year 4 | Year 5 | |
| Base case | 75% | 80% | 85% | Year 10 |
| Worst case | 75% | 65% | 55% | Year 13 |
| Best case | 85% | 95% | 100% | Year 9 |



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# VITA

Nicha Wiboonpote was born on December 10, 1989, in Bangkok, Thailand.

In 2012, she received a Bachelor of Science Degree in Architectural Design (International Program) from the faculty of Architecture, Chulalongkorn University. She then proceeded to enroll in the Master of Architecture in Architecture Design (International Program) at Chulalongkorn University.

She published the paper entitled “A Place to P(r)ay: A Study of Spiritual Rituals in Bangkok Malls” for Nakhara: Journal of Environmental Design and Planning Volume 12 on October 2016.

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