

CMU MEDIA ARTS AND DESIGN CENTER



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บทคัดย่อและแฟ้มข้อมูลฉบับเต็มของวิทยานิพนธ์ตั้งแต่ปีการศึกษา 2554 ที่ให้บริการในคลังปัญญาจุฬาฯ (CUIR)  
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จุฬาลงกรณ์มหาวิทยาลัย  
**CHULALONGKORN UNIVERSITY**

ศูนย์นิตรรศการสื่อศิลปะและการออกแบบสื่อ มหาวิทยาลัยเชียงใหม่



วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาสถาปัตยกรรมศาสตรมหาบัณฑิต

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เพชร จันทนยิ่งยง : ศูนย์นิทรรศการสื่อศิลปะและการออกแบบสื่อ มหาวิทยาลัยเชียงใหม่ (CMU MEDIA ARTS AND DESIGN CENTER) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: ผศ. ดร. วรภัทร์ อิงค์โรจน์ฤทธิ์, หน้า.

ในยุคปัจจุบันที่มีการเปลี่ยนแปลงทางด้านเทคโนโลยีอยู่ตลอดเวลา ศิลปะได้ถูกพัฒนารูปแบบจากสื่อรูปแบบเดิม โดยมีการใช้สื่อดิจิทัลและสื่อในลักษณะอื่นๆ เพื่อเป็นเครื่องมือสื่อสารระหว่างศิลปินและผู้ชมกันอย่างแพร่หลาย ด้วยเหตุนี้ ในแง่ของสถาปัตยกรรม การออกแบบพื้นที่แสดงงานศิลปะควรถูกพัฒนาเพื่อรองรับสื่อใหม่ๆ ที่เกิดขึ้นอย่างเหมาะสม ทั้งในแง่ของการใช้งานและความยืดหยุ่นของพื้นที่เพื่อรองรับชิ้นงานในรูปแบบต่างๆ ที่ถูกแสดง ประเด็นสำคัญอีกประเด็นหนึ่งในวิทยานิพนธ์ฉบับนี้คือ สถานที่แสดงผลงานศิลปะมีอยู่ในปัจจุบันไม่เพียงพอ เมื่อถูกนำไปเปรียบเทียบกับจำนวนผลงานจากศิลปินต่างๆ ที่ผลิตออกมาอย่างต่อเนื่อง ทั้งนี้สถานที่แสดงผลงานศิลปะบางแห่งได้มีการขยายพื้นที่แสดงผลงานเพื่อรองรับต่อจำนวนผลงานศิลปะที่มากขึ้น แต่การปรับเปลี่ยนพื้นที่มีข้อจำกัดหลายประการเนื่องจากตัวโครงสร้างเดิมมิได้คำนึงถึงการต่อเติมในอนาคต จึงทำให้การต่อเติมพื้นที่หรืออาคารควรเป็นส่วนหนึ่งของกระบวนการออกแบบเบื้องต้นของพื้นที่แสดงผลงานศิลปะ การวิจัยครั้งนี้มีจุดประสงค์เพื่อนำเสนอแนวทางการออกแบบพื้นที่แสดงผลงานศิลปะในอนาคตเพื่อรองรับชิ้นงานที่ถูกผลิตขึ้นด้วยเทคนิคต่างๆ อย่างเหมาะสม รวมถึงการออกแบบอาคารโดยใช้รูปแบบอาคารสำเร็จรูปที่สามารถรองรับการต่อเติมในอนาคตได้

งานวิจัยนี้ได้เก็บรวบรวมข้อมูลจากเอกสารทางวิชาการ เพื่อศึกษาทฤษฎีและแนวคิดที่เกี่ยวข้องในแง่ของการออกแบบและการต่อเติมพื้นที่แสดงผลงานศิลปะ โดยสามารถแบ่งแยกการต่อเติมออกได้เป็นสองประเภทคือการต่อเติมแบบแยกอาคารใหม่ และการต่อเติมโดยใช้โครงสร้างเดิมของตึก โดยจะพบว่า การต่อเติมส่วนใหญ่จะใช้การต่อเติมแบบแยกอาคารเพื่อหลีกเลี่ยงข้อกำหนดและขีดจำกัดทางด้านโครงสร้างจากอาคารเดิม พร้อมทั้งทำการสำรวจและศึกษาลักษณะการแสดงผลงานตามหอศิลป์และพิพิธภัณฑ์ต่างๆ ทั้งในประเทศและต่างประเทศเพื่อเก็บข้อมูลในด้านการออกแบบพื้นที่แสดงผลงานศิลปะ โดยพบว่าผลงานทางศิลปะจะถูกจัดแสดงในห้องที่ถูกจัดไว้ทำให้เกิดข้อจำกัดต่อการแสดงชิ้นงาน อาทิเช่นขนาดของชิ้นงาน, สภาพแวดล้อมต่อชิ้นงาน และอื่นๆ

ดังนั้นงานวิจัยฉบับนี้จึงนำข้อจำกัดที่ได้จากการวิเคราะห์มาเป็นแนวทางการออกแบบ โดยทดลองใช้พื้นที่ศูนย์นิทรรศการสื่อศิลปะและการออกแบบสื่อ มหาวิทยาลัยเชียงใหม่ เพื่อศึกษาความเป็นไปได้ในการนำไปใช้จริง พร้อมทั้งศึกษาข้อดีและข้อเสีย รวมถึงข้อเสนอแนะต่างๆ เพื่อเป็นแนวทางการออกแบบสถานที่แสดงผลงานศิลปะต่อไปในอนาคต

# # 5773702025 : MAJOR ARCHITECTURAL DESIGN

KEYWORDS: MUSEUM / GALLERY / CONTEMPORARY ART / PREFABRICATED SYSTEM / FLEXIBILITY

PACHARA CHANTANAYINGYONG: CMU MEDIA ARTS AND DESIGN CENTER. ADVISOR: ASST.  
PROF. VORAPAT INKAROJIT, Ph.D., pp.

The development of technological innovations has led to the diversification of art in terms of its form as an instrument to portray artists' ideas and creativity. Focusing on contemporary art in the twenty-first century, electronic and digital media play a dominant role as well as conventional art forms. From an architectural perspective, shifting media and form affect the design framework of art space in the twenty-first century, which requires further study for suitable criteria. In addition, existing art spaces are outnumbered by the sheer quantity of artworks due to continuous artistic production. Several art spaces counteract this problem by expanding the existing structure to support and respond to the increasing number of artworks. However, the process is facing some difficulty due to limitations of the existing structures and lack of design in support of any future expansion.

The research methods included: 1) reviewing the academic documents related to the art space, method of expansion, and case studies based on expansion of art space; and, 2) surveying existing art spaces (local and international) to analyze patterns of exhibition space toward various form of art. According to the survey, if the majority of exhibition spaces are to support contemporary art forms they need further development to improve their existing status, especially flexibility of exhibition space.

Therefore, the survey analysis has led to a design proposal using a prefabricated structure, which is suitable to support the future expansion and redesign of exhibition space in becoming more flexible in terms of curating. Finally, this design framework is implemented at the Chiang Mai Media Arts and Design Center (Chiang Mai, Thailand) to study the possibility as well as the advantages and disadvantages of the design proposal. This study will be useful for any future project as a guideline that can be adjusted to each specific site.

Field of Study: Architectural Design

Academic Year: 2017

Student's Signature .....

Advisor's Signature .....

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## Chapter 1 Introduction

### 1.1 Problem statement and research significants

This research was initiated by the author's observation through the context of contemporary art in the twenty-first century. Contemporary art encompasses many different forms, from traditional media, such as paintings and sculptures, to more recently developed approaches that use digital and time-based media to create works that incorporate both sound and image. Artworks have been developed into relational aesthetics that interact with viewers (Bourriaud, 1998). On the other hand, artworks integrated into space as a juxtaposition to architecture created a contradiction in generating user interactions (Sai, 2012). The 'Infinity Mirrored Room – The Souls of Millions of Light Years Away' by Yayoi Kasuma (2013) is an outstanding example in demonstrating how the incorporation of art and space creates an interaction between art and viewers (Figure 1.1).



Figure 1. 1 'Infinity Mirrored Room – The Souls of Millions of Light Years Away' by Yayoi Kasuma, 2013 © Hope Dickens.

The evolution of arts media affects the design aspect of art space, which was originally designed for conventional art forms. To understand the relationship between current

art forms and architecture, this thesis conducted site surveys of existing exhibition spaces (art museum, gallery, art center) on a local and an international scale to create a design framework for a contemporary art space.

The second problem that arises from this research is that the existing art spaces around the world are outnumbered by the quantity of artworks due to continuous artistic production. Several art spaces counteract this problem by expanding the existing structure to support and correspond to the increasing number of artworks. The research analyzed a series of expanded art spaces by dividing the methods of expansion into two groups, separated structure and integrated structure, to understand the boundary of the expansion process, which can improve the framework of designing art space in the future.

The results from the preliminary research provided a proposal to form a new design framework for art space. One of the most crucial points derived from the research is to provide flexibility in terms of structural and spatial design to respond to various types of art and future expansion.

## 1.2 Objective

The objective of this thesis is to develop a design proposal and new criteria for art spaces in the future. The design emphasis is on the concepts associated with flexibility of the art space to offer possibilities in transforming space for exhibit of various forms of contemporary art and to introduce a prefabricated structural system that can support an expansion procedure in the future. The design framework will be applied to the art space in Chiang Mai province to test out its application in a real context. It is anticipated that this proposal can provide an outcome that reflects and improves the current condition of art space in terms of architectural design. This thesis will also

discuss the advantages and disadvantages related to flexible art space and the current regulations.

### 1.3 Scope and limitation

The scope of this thesis is to introduce a new, alternative structural system for art space by using a prefabricated model to generate a structural system that can support a future expansion process along with the redesign of an exhibit area for contemporary art by providing flexibility to artists in creating an environment for individual art pieces without the limitation of a pre-designed space. The scope of the architectural design framework generated from research is based on case study and site survey analysis.

The scope of the architectural design in this study is governed by a legal framework from the Building Control Act and Regulations Thailand as well as local regulations. The final archetype will be portrayed on a selected site of Chiang Mai University (CMU) to demonstrate the outcome of research through architectural design within the local context of Chiang Mai.

### 1.4 Terminology

This section clarifies the terms that are frequently used in this thesis to aid in the reader's understanding. The terminology used is as follows:

*'Art Space'* is a building or space for the exhibition of art, normally visual art forms. Art gallery and art museum are the most common types of art space.

*'Prefabricated structure'* means a structural system that has been built off-site and transported for assembly on-site. There are several methods of prefabricated structure, for example, precast concrete, modular structure, and container structure.

*'Expansion unit'* means an extended unit from an original structure for increasing a building's area.

### 1.5 Methodology

The methodology of this study is divided into four parts.

The first part of the study focused on the analysis of existing art spaces in terms of the structural aspects of the expansion ability by dividing the expansion method into two types: 1) expansion using separated structures and 2) expansion using integrated structures. The author selected three art space as cases for each category to understand limitations and boundaries and the advantages and disadvantages in the selected expansion method to improve the framework of designing art space in the future.

The second part of the study explored an existing condition of exhibit space for contemporary art by visiting actual sites to form the design guidelines for a future art space using empirical evidence to demonstrate the advantages and disadvantages of each site. The author selected ten sites by dividing them into two groups: five sites as local art spaces and five sites from international sites to show variations in terms of scale of exhibition and owner entity.

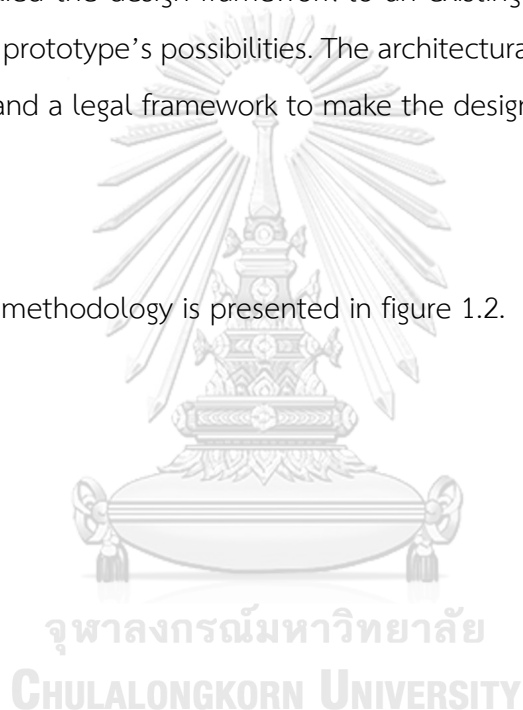
The third part of the study developed a prototype system for a contemporary art space by selected components from preliminary research as a design guideline,



focused on flexibility of exhibit space and adaptability of a structural system toward a future expansion process. The author chose a prefabricated structural system, based on advantages in the construction process, as a fundamental construction technique for the prototype, which was inspired from the prefabricated system of the traditional Thai house. The design proposal introduced various options of components to form a series of modular units assembled as a complete art space.

The final part applied the design framework to an existing site (CMU Arts and Design Center) to test the prototype's possibilities. The architectural design will be developed from site analysis and a legal framework to make the design applicable to the existing context.

A summary of the methodology is presented in figure 1.2.



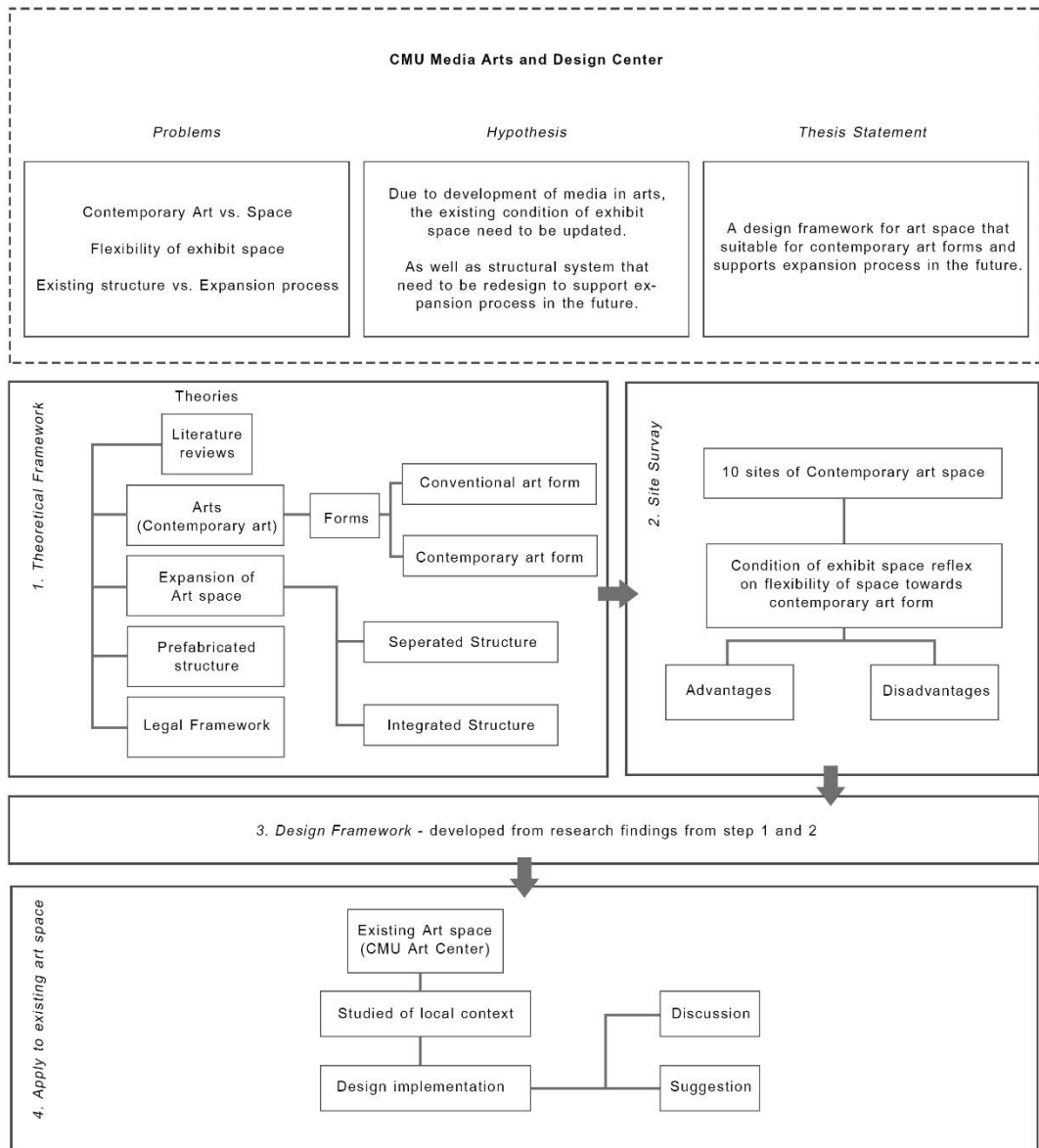


Figure 1. 2 Overall Thesis Framework

### 1.6 Benefit of study

The thesis design framework portrayed the various possibilities of design for a contemporary art space to support the transformation of art forms to display the diversity of the outcomes in terms of design layout for art space within a similar framework by using a prefabricated structure as the dominant construction technique. This study will be beneficial to architects and interior designers as a guideline for any future project within the same criteria.

Architect and interior designer can use the information from research part to form different design frameworks and possibilities for a contemporary art space. Moreover, the design framework can be used as a prototype for any future project as an alternative way to build an art gallery and museum.



## Chapter 2 Literature review

In this chapter, the preliminary research into an art space is explored in the following four categories: 1) art space and arts, 2) expansion of art space, 3) prefabricated system toward art space, and 4) the legal framework.

### 2.1 Art space and arts

An art space is a building or space for the exhibition of art of which an art gallery and art museum are two different types of art spaces. An art gallery is a privately-owned business with the primary purpose to sell art. It does not maintain a permanent collection or an endowment. On the other hand, art museum is a public entity established to collect, preserve, research, and protect objects as well as provide social services and education. Art museums are governed by trustees and a board of directors as well as a director and staff. They are often partially funded by local, state, and federal grants as well as solicited gifts and donations from private donors, foundations and companies (Walhimar, 2018). However, art spaces have become establishments for learning and enjoyment. The reinterpretation of the fundamental functions of art space placed them within a world of education and a new and rapidly growing world of the leisure and tourism industry dedicated to pleasure and consumerism (Hooper-Greenhill, 1994). Art galleries and museums now find themselves in a market place where it is important to establish an image and a reputation to attract people to their spaces (Digney, 1989). Due to the change in the public who attends art spaces, the needs and motivation of visitors as well as changes in the roles of institutions must be considered. Art spaces are attempting to adapt to changing audiences and social expectations and conditions by responding with new forms of organization, exhibition design, programming and services (Kotler, 1998).

In addition to shifting audiences, the development of media in contemporary art affects the design of art space, especially installation and performance art. The author investigated various types of contemporary art forms to analyze the characteristics and requirements from an architectural perspective.

### 2.1.1 Arts

This research focused on visual art, which played a dominant role in design criteria for the thesis, to illustrate various forms of contemporary art with empirical evidence along with the described characteristics of each art form by the technique used.

#### **Drawing and painting**

The most conventional art forms still in use by contemporary artists are drawing and painting, determined by the artists' techniques and tools. An artist can explore different tools and materials, such as canvas, paper, wall, and so forth, which can be painted on a flat surface or three-dimensional object paired with painting techniques, such as oil, water-color, pencil drawing, graffiti (spray paint on wall surface) or any method to express their creativity. This type of art form typically needs a wall structure for display by hanging or leaning and suitable for display in an indoor area to avoid UV rays from direct sunlight (pigments deteriorate).



Figure 2. 2 'Orange and Yellow' by Mark Rothko, 1956 (Left)



Figure 2. 1 'The Baroque No. 3' by Natee Utarit, 1970 © Christies (Right)

## Sculpture



Figure 2. 4 'Fountain' by Marcel Duchamp, 1917 © Alfred Stieglitz (Left)



Figure 2. 3 'Balloon Dog' by Jeff Koons, 1994-2000 © Hayk\_Shalunts (Right)

The method of making a three-dimensional art piece as representative or abstract form uses various techniques, such as carving (removal of material), modelling (addition of material), molding, and casting. The most common materials selected by artists are stone, metal, ceramics, and wood.

## Photography

A photograph or series of photographs express the artist's perceptions, creativity, and emotions to display as a representational artwork. This method can be in digital (projection of still image) or analog (process film and print on select material).



Figure 2. 5 'Ratcliffe Power Station', Study 35, Nottinghamshire, England by Michael Kenna, 1985

© Alfred Stieglitz

## Film and VDO art

A motion picture expresses an artist's perceptions, creativity, emotions or to capture and record present moment for documentary or other purposes. This method required projection from a screen or projector, for delivery to an audience, and needs specific room with control lighting to display.



Figure 2. 6 'It For Others' by Duncan Campbell, 2013 © Duncan Campbell

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## Printmaking

An original print is designed on a surface of material using various techniques of carving and molding, for example cutting into a block of wood or engraving onto a copper plate and applying paint to transfer the image from that surface onto another to create an 'impression' of it, normally printing ink onto paper. The original block can be reused in the reproduction process to create various versions of artwork (Gray, 2012).





Figure 2. 8 'An Impossible Extreme Reality #1' by Katsutoshi Yuasa, 2012 © Katsutoshi Yuasa

(Right)

Figure 2. 7 'Silence' by Inson Wongsam, 2002 © Department of Cultural Promotion, Thailand

(Left)

## Installation



Installation art is used to describe mixed-media forms of art which are often designed for a specific place or for a temporary period of time. Installation artworks, also described as environment arts, often occupy an entire room or gallery space that the spectator has to walk through in order to engage fully with the work of art. However, some installation is designed simply to be walked around and contemplated or designed to be seen partially from certain points of view. This type of art form provides a complete unified experience, rather than a display of separate, individual artworks (Tate, 2018).

Since the 1960s, installation art has become a major strand in modern art. This was increasingly the case from the early 1990s when the ‘crash’ of the art market in the late 1980s led to a reawakening of interest in conceptual art (art focused on ideas rather than objects). Miscellaneous materials (mixed media), light and sound have remained fundamental to installation art (Tate, 2018).



Figure 2. 9 'Reverse of Volume FC' by Yasuaki Onishi, 2015 © FRAC Centre - Val De Loire

## Performance art

Performance art is created through actions performed by an artist or participants, which can be spontaneous or scripted. While the term ‘performance art’ became widely used in the 1970s, throughout the twentieth century performance art often seen as a non-traditional art form. In the post-war era, performance art became aligned with conceptual art, because of its often-immaterial nature.

Now, performance art becoming accepted in the contemporary art world and the term has since been used to also describe film, video, photographic work and installation-based artworks through which the actions of artists, performers or the audience are conveyed (Tate, 2018).



Figure 2. 10 'The Artist is Present' by Marina Abramović, 2010 © Louisiana Museum

### 2.1.2 Art and lights

The conventional art forms (painting, drawing, sculpture, photography, and printmaking) have been extensively studied by researchers to provide a basic platform and to standardize the quality inside an art space. This section of the literature review demonstrates established standards and recommendations regarding the lighting environment inside of an art space.

The fundamental element to perceive art is the human visual system, which involves the eye and brain working together to interpret the visual environment. The eye's optical elements form an image of the environment on the retina by absorption of light (spectrum). To manage the light exposition from sunlight to night, the human visual system changes its sensitivity through a process called adaptation (Wahab, 2013).

When the visual system is not fully adapted to prevailing retinal illumination, it cannot perform properly (Cooper, 1995).

The IESNA Lighting Handbook (2000) stated that visual performances are concerned with the limits and visible of the visual system's capabilities. The quality of visual performance depends significantly on the characteristic of the lighting speed and accuracy and the visual system of the observer. The variables in visual performance characteristic are listed below.

#### 2.1.2.1 *Light distribution*

Light distribution plays a crucial role on the effects of target luminance contrast and color contrast. Light distribution around the artwork can be controlled and adjusted for suitable quantity by the characteristic of illuminance (depends on type of lighting fixture), the light spectrum, and the light distribution technique (direct and indirect lighting).

#### 2.1.2.2 *Visual size and location of the target*

The size of an art piece can determine distance and location of exhibit from a viewer. For visual comfort, the target should be clearly visible from given distance. The relevant size of a target is an angular measure and depends on the physical dimensions of the object itself; the angle of inclination of the target from normal to the line of sight; and the distance from the viewer. Size of art piece can be measured in a plane of two dimensions as a visual angle or a volume in three dimensions as a solid angle (Wahab, 2013), as shown figure 2.11.

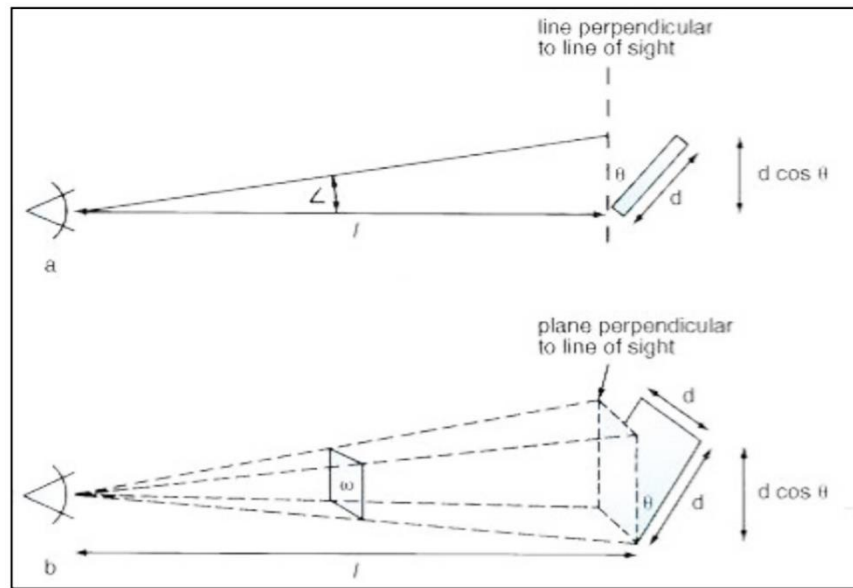


Figure 2. 11 Dimension and distance of viewer determine the size of target

Source: *The IESNA Lighting Handbook*

### 2.1.2.3 Luminance and luminance contrast

An art piece will be visible if it differs from its immediate background in luminance or color. Luminance contrast may result in making the target brighter or darker than the background. The luminance contrast is not affected by diffuse reflectors, such as matt material, but the luminance contrast can be calculated from the reflectance (Wahab, 2013).

### 2.1.2.4 Color difference

Despite luminance contrast from art pieces and background, differences in color can affect the visual comfort of the viewer. Color difference can be highlighted between immediate background (wall and partition) and the colors of the object (artwork).

#### 2.1.2.5 Glare

Glare is an effect that occurs when a large quantity of luminance enters the viewer's visual system. Other factors are: reflective surface with curtain angle of light shine directly to eyes of the viewer; and glare that can cause discomfort (image blurred or stunned) to the viewer from a sudden change of luminance amount entering the visual system.

#### 2.1.2.6 Shadow

Shadows occur when light is intercepted by an opaque object (Wahab, 2013). The effect of these shadows can be arranged by suitable position of light distribution to eliminate unnecessary shadow, which can be cast over a meaningful area of the art piece. The problem can be overcome by increasing the proportion of inter-reflected light by using high-reflectance surfaces.

#### 2.1.2.7 Veiling reflections

Veiling reflections are luminous reflections from specular or semi-matte surfaces that physically change the contrast of the visual task and consequently change the stimulus presented to the visual system. The two factors that determine the nature and magnitude of veiling reflections are the viewed speculative of the material and the geometry between the observer, the target, and any sources of high luminance (Wahab, 2013).

#### 2.1.2.8 Basic guideline of lighting position

In art space design, lighting is a crucial aspect for the visibility of viewers. Lighting can be adjusted to emphasize changes in mood, highlight elements or banish a shadow

when necessary (Wagiman, 2011). The relative contrast between the exhibit and the background gives the exhibition its drama and focuses the visitor's attention on the display (Hughes, 2010).

Lighting position is designed to relate with the art form, display setting, ceiling height and amount of displays in the same area. In normal practice, exhibition space installed with ceiling mounted light, either direct or indirect light. For vertical display, ceiling mounted light is installed in a 30° angle position with specific formulate distance of ceiling height - the human eye level + 577mm (Figure14). This calculation creates suitable distant parameter for the viewer for the best visual experience (Wahab, 2013).



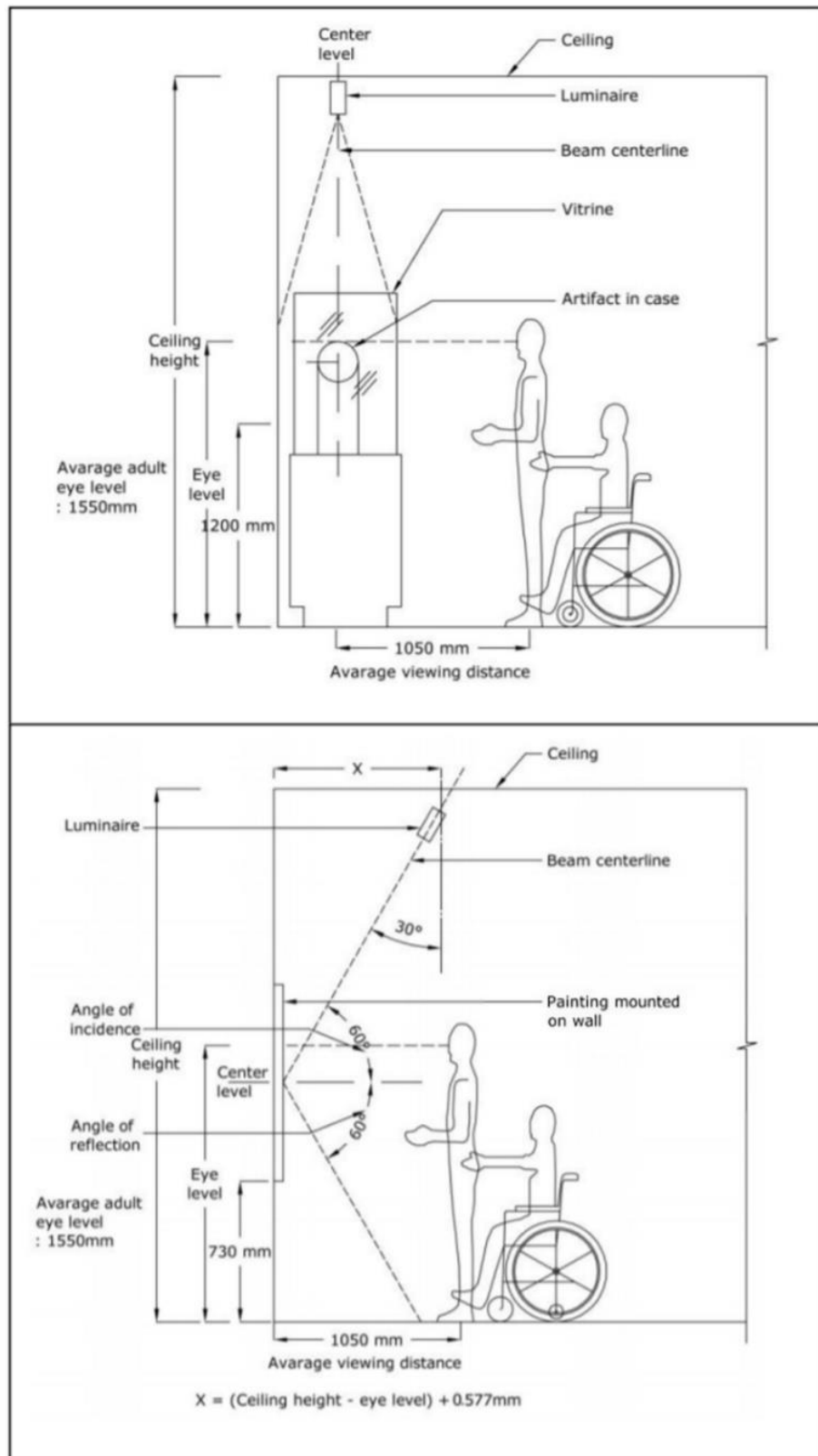


Figure 2. 12 (Top) Lighting guideline for vertical display; (Bottom) Lighting guideline for freestanding display. Source: The IESNA Lighting Handbook



Within the parameter of existing research, a basic guideline for design of exhibit space that supports installation and performance art is absent due to the diversified techniques used by various artists. This research conducted the site survey of existing contemporary art spaces to construct the design framework that can be applied as a standard protocol or at least to create a direction for a suitable lighting environment as a basic guideline for contemporary art space.

## 2.2 Expansion of art space

The main reason for art galleries and museums around the world to expand their exhibit space is to accommodate an increasing number of artworks. There are two main types of expansion structures selected as construction techniques: 1) expansion using a separated structure and 2) expansion using an integrated structure. The first method is used to expand an existing site by constructing a separated building without changing or modifying an original structure. The second method of integrated structure is used to merge a new and original structure together to form a new art space. The author chose several case studies to explore the linkage between existing and expansion units in terms of design (appearance), circulation, and functionalities.

### 2.2.1 Expansion by using separated structure

The advantage of a separated structure is to avoid limitations in terms of engineering of the existing structure, yet this technique requires an additional land plot to locate a new structure. The author selected the three cases discussed below to demonstrate the expansion process by using a separated structure.

## Jewish Museum – Berlin

The Jewish Museum in Berlin was completed and opened to the public in 2001. The museum exhibits the political, social and cultural history of the Jews in Germany from the fourth century to the present, with a focus on the postwar century in Germany and repercussions of the Holocaust. The new building is situated next to the original Prussian Court of Justice building (completed in 1735), which now serves as the entrance to the new building, as shown in figure 2.13.



*Figure 2. 13 Existing structure versus the New building of Jewish museum © Guenter Schneider*

The visitor enters the Baroque Kollegienhaus (original building) and transfers to the dramatic entry void and stairway that leads to an underground passage. The existing building links with the new extension building through the underground structure. The linkage leads visitors to three axial routes, which deliver visitors to different exhibitions. The first passage leads to the Holocaust Tower, a high ceiling room surround with a gigantic wall that allows visitors to experience the feeling of suffocation from

claustrophobia, which imitates the sensory experiences the Jews experienced during the Holocaust, such as in the gas chamber or prison. The second passage leads out to the Garden of Exile and Emigration, which is located outside of the new building as remembrance of symbol for Jewish people who suffered in war. The third passage traces a path to the Stair of Continuity and carries on to the exhibition spaces of the museum.

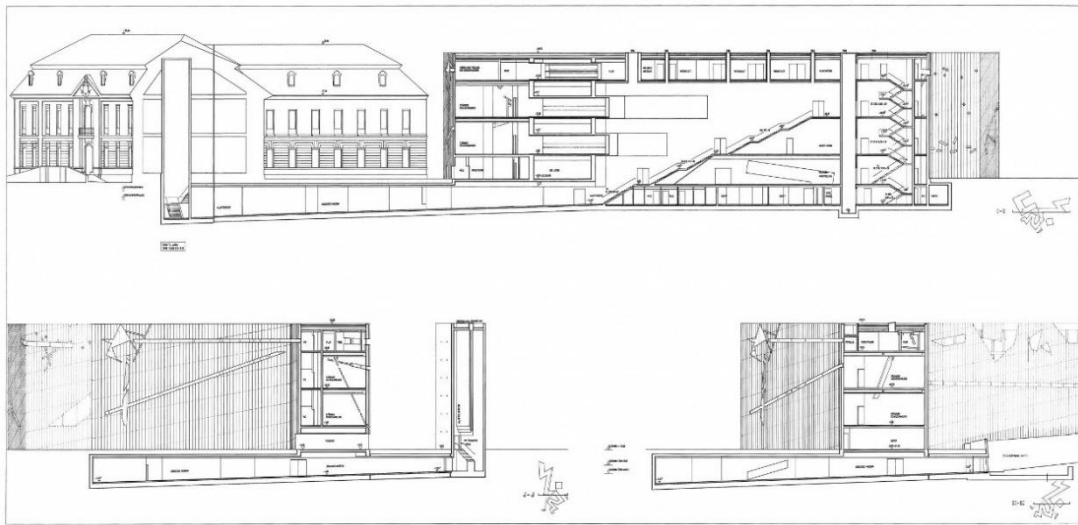


Figure 2. 14 Circulation of Jewish museum © Studio Libeskind

The new building was designed to contrast with the original building. The architect, Daniel Libeskind, wanted to preserve the existing building and historical symbolism and design the new building in juxtaposition to portray the symbolism of the modern world with hidden messages throughout the building, such as the void on the façade of the building, which is interpreted as a series of scars in the history of Jewish people during Germany's wars.

## San Francisco Museum of Modern Art

The new SFMOMA building was designed by Snøhetta Studio and completed and opened to the public in 2016. The design focused on an expansion of the original exhibition space to create ideal conditions for viewing the artworks. The front façade of the new building was inspired by a water's wave and fog of the San Francisco Bay which is contrary to the existing building that expresses the static and simplicity of brick patterns. Diverse gallery spaces support various scales of artwork. The highlight of the new galleries is flexibility by providing column-free space as curators can design layouts of temporary wall for specific exhibition. Visitors can enter the galleries by using entrances from the old and new building that are located opposite side to each other; the main foyer (Helen and Charles Schwab Hall) is located on the second floor as a linkage between the two buildings.



Figure 2. 15 San Francisco Museum of Modern Art (view from old building) © Jon McNeal

Apart from the new galleries, education zone, studios, and classrooms were situated within the new building as Kolet Education Center to served students, teachers and visitors as learning space. The additional program is designed as a complement and attraction for new users to use the space and provide a public gathering space for local context.

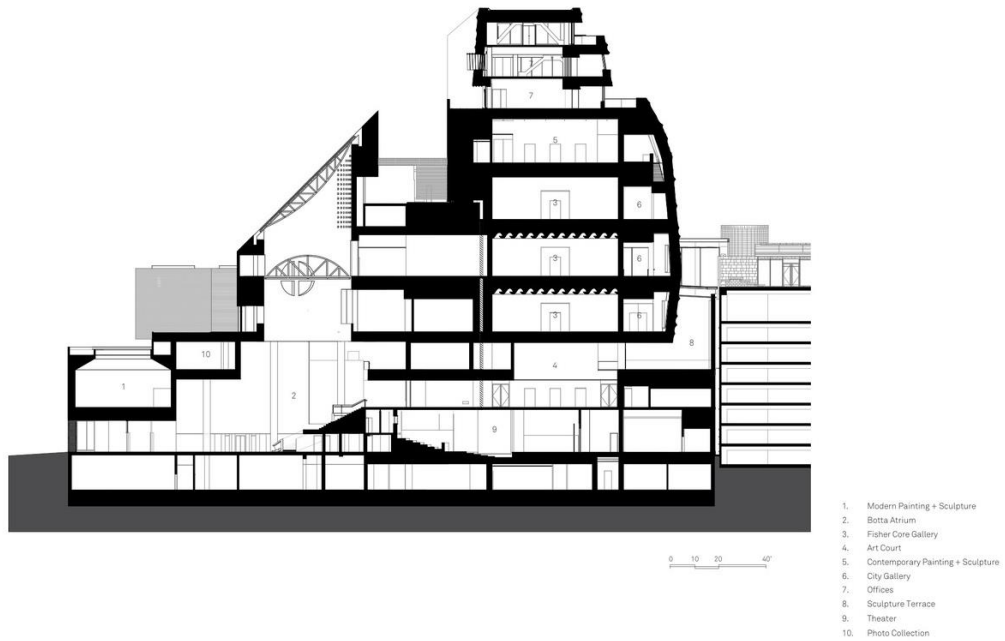


Figure 2. 16 Section of San Francisco Museum of Modern Art © Snøhetta

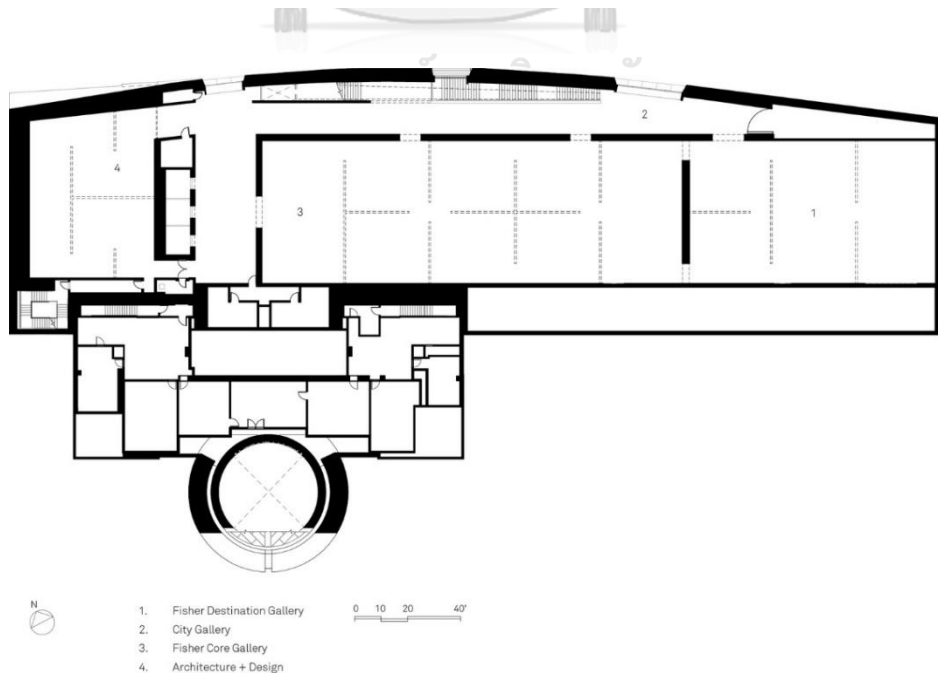


Figure 2. 17 Plan level 6 of San Francisco Museum of Modern Art © Snøhetta

## Tate Modern – London

In 2016, the expansion project of Tate Modern, London, designed by Herzog & de Meuron, was completed and opened to the public. A new ten-story building (Switch House-power station) adding 60% of total exhibition space. As the world's first museum spaces dedicated to contemporary art, the main purpose of the new extension building is to exhibit digital artwork, live art, installation and film. The new structure, the Switch House, is rooted in cylindrical underground tanks as physical foundations (30 meters span). On levels 2 through 4 are galleries in various scale and volumes, from intimate small-scale exhibition to dramatic top-lit spaces. The galleries were complemented by extensive areas dedicated to learning and interpretation, along with a new restaurant, bar and studios offering 360-degree panoramic views of London. A new linkage between the existing building and the new extension is located on level 4 of the new Switch House galleries connected to Turbine Hall of existing Boiler House galleries.



Figure 2. 18 Bird eye view of Tate Modern, London © Iwan Baan

The Switch House design was a unique twisted pyramid-shaped tower. On the other hand, the original building renovated only interior space by preserving the exterior in its original condition. The new façade reinterprets the power station’s brickwork by rearranging a brick pattern to create perforated lattice, which allows light to filter in during the day and glow out during the evening.

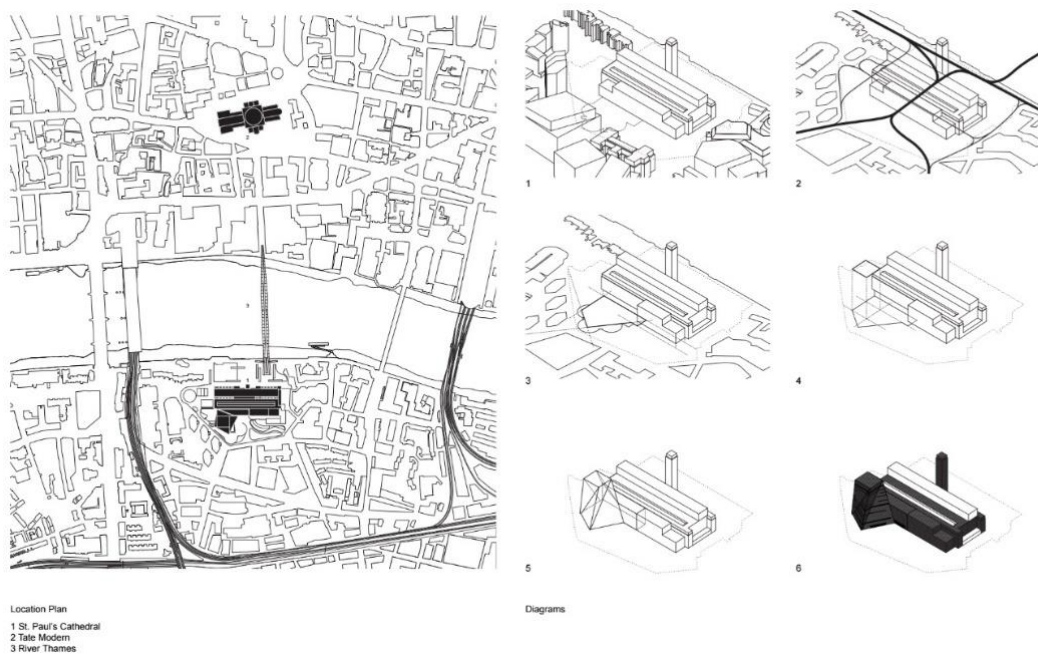


Figure 2. 19 Diagrams of Tate Modern, London © Herzog & de Meuron

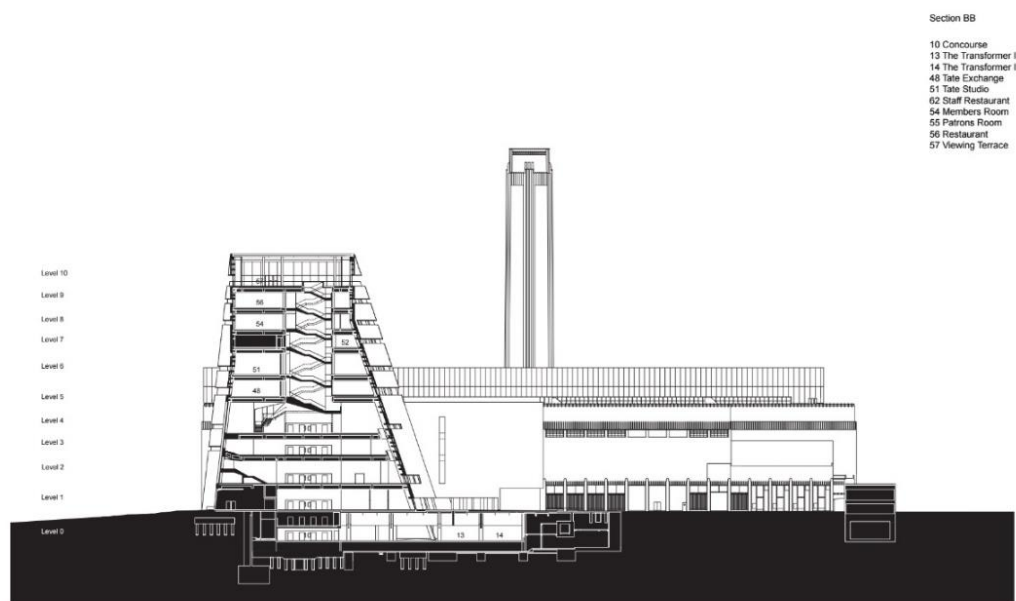


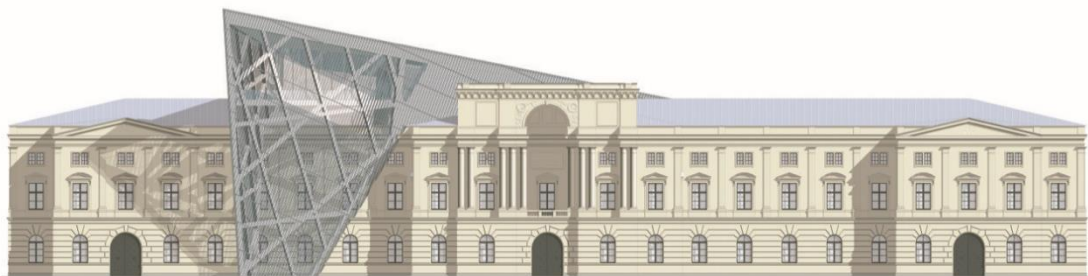
Figure 2. 20 Section of Tate Modern, London © Herzog & de Meuron

## 2.2.2 Expansion by using integrated structure

The advantage of an integrated expansion phase within the existing structure is to minimize the use of land due to a limitation in the land plot. However, limitation of an original structure can affect ability and structural aspect of expansion process. The author selected the three cases discussed below to demonstrate the expansion process by using an integrated structure.

### Dresden's Military History Museum

Dresden's Military History Museum was a redesign by Daniel Libeskind and completed in 2011. The extension is a five-story comprised of a 200-ton wedge of steel, glass and concrete that merges and cuts through the existing structure (135 years old). The 30-meter extension structure offers a viewing platform toward the modern city of Dresden, which creates a dramatic space of reflection and resurrection of Dresden as a juxtaposition to tradition and innovation.



*Figure 2. 21 Front elevation of Dresden's Military History Museum © Studio Libeskind*

Libeskind created a bold interruption by penetrating the historic arsenal and creating an additional structure. The architecture engaged the public in the deepest issue of how organized violence and how military history and the fate of the city are intertwined (Libeskind, 2011).



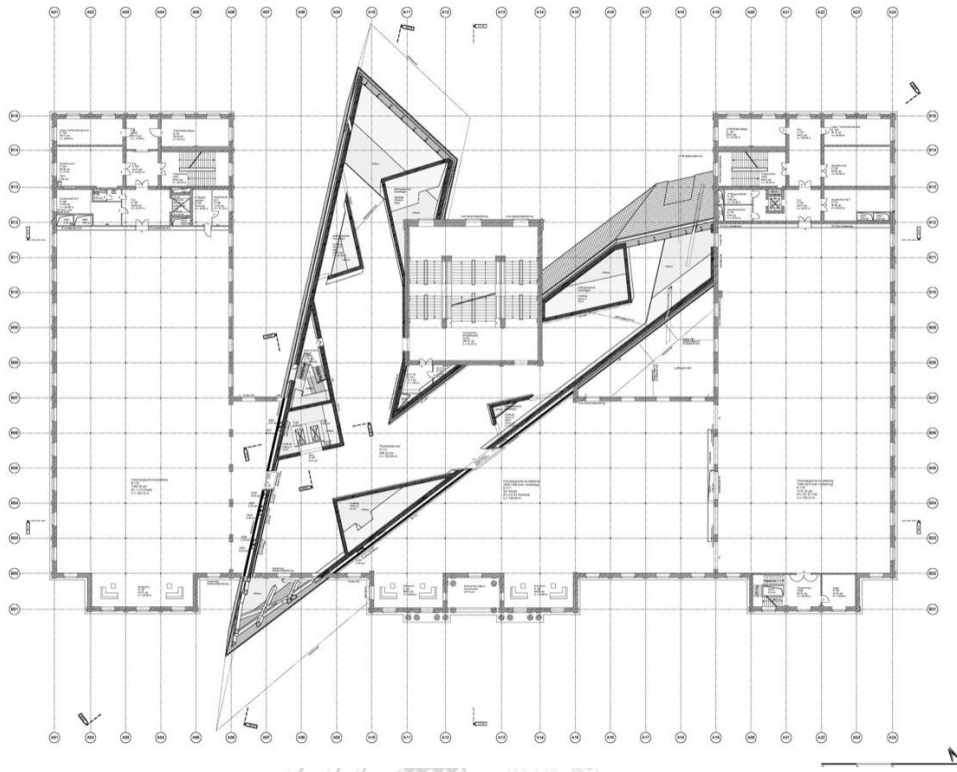


Figure 2. 22 Floor plan of Dresden's Military History Museum © Studio Lebiskind

The new façade provides transparency contradicted with opacity and rigidity that portrays the severity of the authoritarian past (existing structure). As the new façade represents openness of democratic society in which it has been reimagined. From the plan of the Dresden's Military History Museum, the main purpose of the expansion unit did not satisfy in terms of adding more space but to create symbolic intervention and contradiction of old and new eras of Dresden by the uses of architecture.

## Moritz Kunst Burg Museum – Halle

The renovation project by Nieto Sobejano Arquitectos' in 2008 kept the original structure's main architectural features, such as front façades, wall, central courtyard, and round towers at the corners of the old building. The architect's design for enlargement is based on a floating roofing structure conceived of as a large folded platform.



*Figure 2. 23 Main entrance of Moritz Kunst Burg Museum © Roland Halbe Fotografie*

The structure allows natural light to penetrate and enter exhibition spaces as the result of this structural design: the ceiling is a completely column-free area providing unique spaces that allow various types of exhibitions. The new structure is complemented with the contemporary tower, 25 meters high, which provides access to the new exhibition areas and scenic views pointed toward the city of Halle.

## Städel Museum – Frankfurt

The extended underground unit of Städel Museum was designed by Schneider+Schumacher and opened to the public in spring 2008. The architects won the international competition with their proposed new building below the museum's garden, which almost doubled the exhibition area from 4,000 sq.m. to 7,000 sq.m. The underground building is 53 meters long and 76 meters wide and a maximum point of floor to ceiling of 8.20 meters at the center of the structure.



Figure 2. 24 Underground building of Städel Museum © Christoph Bonke

The entrance of the new exhibition area connected with the underground passage from an existing building. Once inside the extended area, 195 roof lights light up the exhibition space by allowing natural light to penetrate through the space. The “eyes for art” is a doubly-curved roof slab, varying in diameter from 1.50 meters at the outer edge to 2.50 meters at the highest point in the center. The roof lights were specially developed and designed for the Städel's extension, which can be walked on by visitors in the museum's garden. During daytime, daylight entering the exhibition space can be controlled using augmented shading elements while in the nighttime, an integrated LED lighting system will light up the exhibition space.

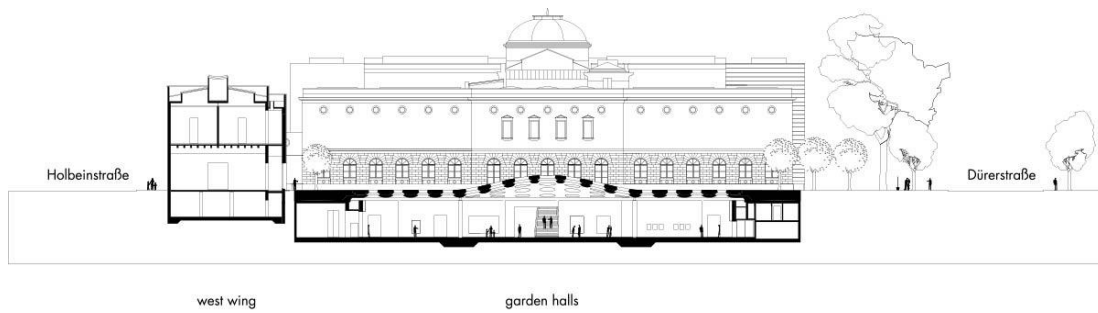


Figure 2. 25 Section of Städel Museum © Schneider+Schumacher

The entire slab is supported by 12 slim, reinforced concrete columns. The extension lies below the water table and is anchored by 160 deep piles to prevent it from floating. The new exhibition unit also incorporates 36 geothermic piles, reaching up to 82 meters into the earth, providing heat (during winter) or cooling (during summer).



Figure 2. 26 Construction phase of Städel Museum © Schneider+Schumacher

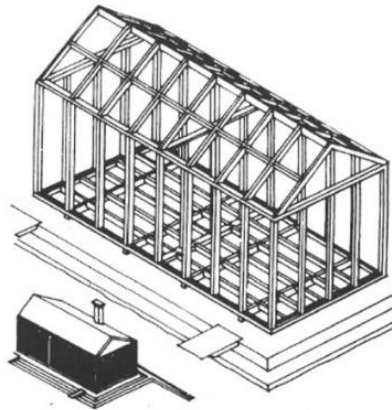
## 2.3 Design issues in expansion and modification process

The expansion and modification process are ordinary affairs that apply to architecture around the globe, from small scale expansion, such as floor extension, to modifying an existing structure or expanding a building's new functional space. For this research, the author focused on prefabrication as a main construction technique due to the system's advantages for the design framework.

The data presented in this section were selected from the author's paper 'Design Issues in Expansion and Modification Process of Detached Houses in Bangkok' prepared for the 7th International Conference on Energy and Environment of Residential Buildings, November 20-24, 2016, Brisbane, Australia, to demonstrate advantages and limitation of a prefabricated structure.

### 2.3.1 Prefabricated structure

A prefabrication system has been in use for some time. The history of prefabrication in the West begins with Great Britain's global colonization effort. Settlements in today's India, Africa, New Zealand, Australia, Canada, the Middle East, and the United States, required rapid building initiatives. Since the British were not familiar with the materials in abundance in those countries, components were manufactured in England and shipped by boat to various locations worldwide. The earliest recorded case is 1624, when houses were prepared in England and sent to the fishing village of Cape Anne in what is now a city in Massachusetts, shown in Figure 2.27. These simple shelters were timber framed for structure and timber panel infill for roof, floors and walls (Smith, 2009).



*Figure 2. 27 Portable Colonial Cottage (Manning) manufactured in Great Britain and shipped to colonies throughout the world. © Ryan E. Smith*

On the other side of the world, prefabrication in the East displays a modernization of the craft identified as Japanese vernacular architecture. The utilization of a mechanized factory to produce architecture was not fully realized until the post-war era in Japan. It is reported that various architects were inspired by the writings of Le Corbusier and the work of Walter Gropius, who developed a number of prefabricated housing schemes, usually in timber and based on a traditional ken grid (Oshima, 2008). The houses were small and simple, but modernist in their aesthetic. Japan, like Scandinavia and the United States, at the time had its own series of catalog houses that marketed panelized and preassembled houses. Also, devastated by WWII, Japan built thousands of these small dwellings to meet the need of the housing shortage.

Using a prefabrication system in a project allows for a reduction in time spent working on site. This means that the impact of the site on the local environment is a shorter period of time compared with other techniques. Site work is traditionally vulnerable to disruption from extremes of weather. Thus, by using prefabrication, the site will remain vulnerable but for a shorter time frame, lessening the risk of delay and requirements for the project's protection. Some major retail clients are actively targeting continual reduction in site development time with an overall reduction of

50% in project time is believed to be a realistic goal, with prefabrication an active part of the process to help to deliver these savings.

Incorporating the prefabrication process is important early in the process, ideally at the concept design stage (Khanzode, 2006). Problems in the lack of compatibility resulting in increased costs are common when prefabricated components are not considered until later in the process. Prefabrication requires that all persons involved in the process go through a learning curve to optimize the benefits of using the system. Changing the design of an ongoing project that uses prefabricated components introduces a range of problems for realignment as components are generally delivered to the site to fit a specific set of dimensions. Working to greater precision with good supervision should reduce the amount of adjustment and realignment that is necessary.

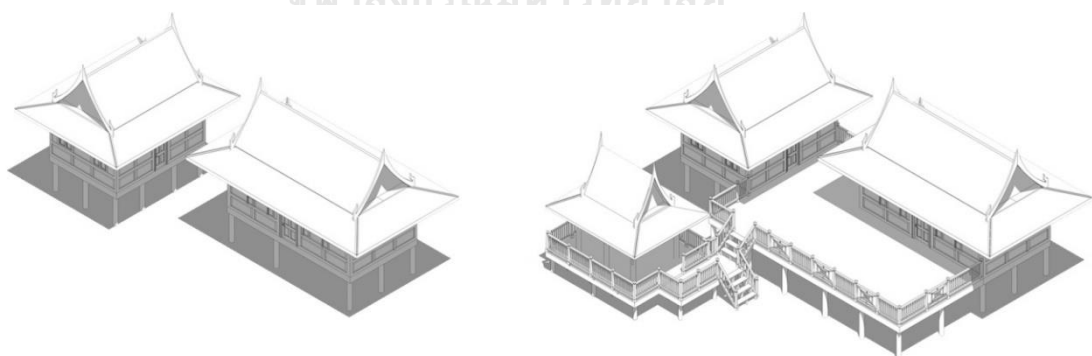
Prefabrication can offer opportunities for dealing with problems from declining workmanship standards and skilled labor shortages on site. In factory environments the quality of the finished product is much easier to ensure than on site. Thus, all that remains to ensure on-site quality is that the assembly meets the required standards to allow the design to perform to requirements. Careful attention is needed, however, as it has been a stumbling block in past applications of prefabrication systems.

Quality control of manufacturing processes enables waste to be controlled and minimized through appropriate design and recycling opportunities. In addition, the use of prefabricated components should cut the volume of site spoilage associated with current practices of over-ordering and poor site handling for the equivalent traditional processes (Phillipson, 2001).

Despite all the advantages of prefabricated systems, there are two major disadvantages. First, rigidity in terms of design, which can minimize a structure's adaptability to any future development. The second is water leakage: If joints are not carefully treated during the installation of façades and in-situ concreting, water can seep through the joints and destroy internal finishing in the building.

In Thailand, traditional Thai houses use natural wood from local areas as a main material. Prefabricating systems have been used extensively in traditional Thai houses; the system consists of a wooden structure and panels (Fa Pakon, Fa Saibua, and so forth) produced nearby the site and assembled using interlock and joint as the main construction technique. The house can be disassembling for relocation from seasonal flood.

A traditional Thai house is normally built with three notable characteristics: an elevated floor, a steeply pitched roof with a long overhang and a large open terrace (Chalermwat T., 2001). The characteristics and material of a traditional Thai house are beneficial to the modification process with flexibility to expand functional space, such as terraces to connect each unit of the house together (Figure 2.28).



*Figure 2. 28 Traditional Thai house – Terrace expansion*



The design framework for this thesis was inspired by the characteristic of Thai houses using the elevated floor to allow natural ventilation and the adoption of the fundamental process of expansion to provide flexibility to an existing structure.

#### 2.4 Legal Framework

The legal framework for this project may vary according to local regulations. For design implementation, the site is situated in an education zone governed by the ministerial regulations of Chiang Mai. The limitation of the new building should not exceed existing building height around the site which is approximately 15 meters from the ground (CMU Art Center) with 6 meters setback from the boundary of the land plot.

This project is considered a 'large building' according to the Building Control Act B.E. 2543 issue 55 wherein total functional area should exceed 2,000 square meters but not more than 10,000 square meters.

For a large building type, ministerial regulations of Chiang Mai stated that the project should provide one parking lot per 120 square meters of functional space. Lastly, the emergency exits should be within 60 meters of each other with fire resistance materials according to the Building Control Act B.E. 2543 issue 55.

## Chapter 3 Survey of Art space

The author explored ten sites of contemporary art space, both at the local and international scale, to gather information as a criteria for the design framework for this thesis. The focus was on the investigation of current conditions of exhibition space in terms of the quality in its flexibility to support various forms of contemporary art.

### 3.1 Site survey and findings

#### Bangkok Art & Cultural Center

One of the biggest art spaces in Thailand, supervised by Bangkok Metropolitan Administration, is the Bangkok Art and Cultural Center (BACC), located at the center of the city of Bangkok, with 3,500 meter<sup>2</sup> of exhibition area (BACC, 2018). The BACC exhibits temporary exhibitions of contemporary art from Thai and international artists. The museum is connected to the Bangkok Mass Transit Bts station, which allows for a variety of visitors, from local users to tourists. Moreover, Siam square, Siam Paragon, and Siam Discovery are within a 5-10 minute walk.



Figure 3. 1 Exterior of BACC (Left )-Interior of BACC (Right) © Pachara Chantanayingyong

BACC provided a front courtyard to host weekend activities, such as concerts from local music band, kid's activities, flea markets, and so forth. The building consisted of

nine floors, the lowest level to the sixth floor featured a public library, studio, art shops, offices, people's gallery, and an auditorium. The galleries were situated on the seventh, eighth and ninth floors. The main entrance for exhibition space was located on the sixth floor and visitors could enter free of charge, with a locker area provided.

According to site observation, there are some weaknesses in architectural design. Firstly, the art center should provide more exhibition spaces compared with the building's size. Secondly, a gigantic opening space in the middle of the building takes up usable space, the slope on the gallery levels (floors seven through nine), which appears to resemble the circulation ramp from Solomon R. Guggenheim Museum, was too steep for handicapped and appear superfluous in terms of design.

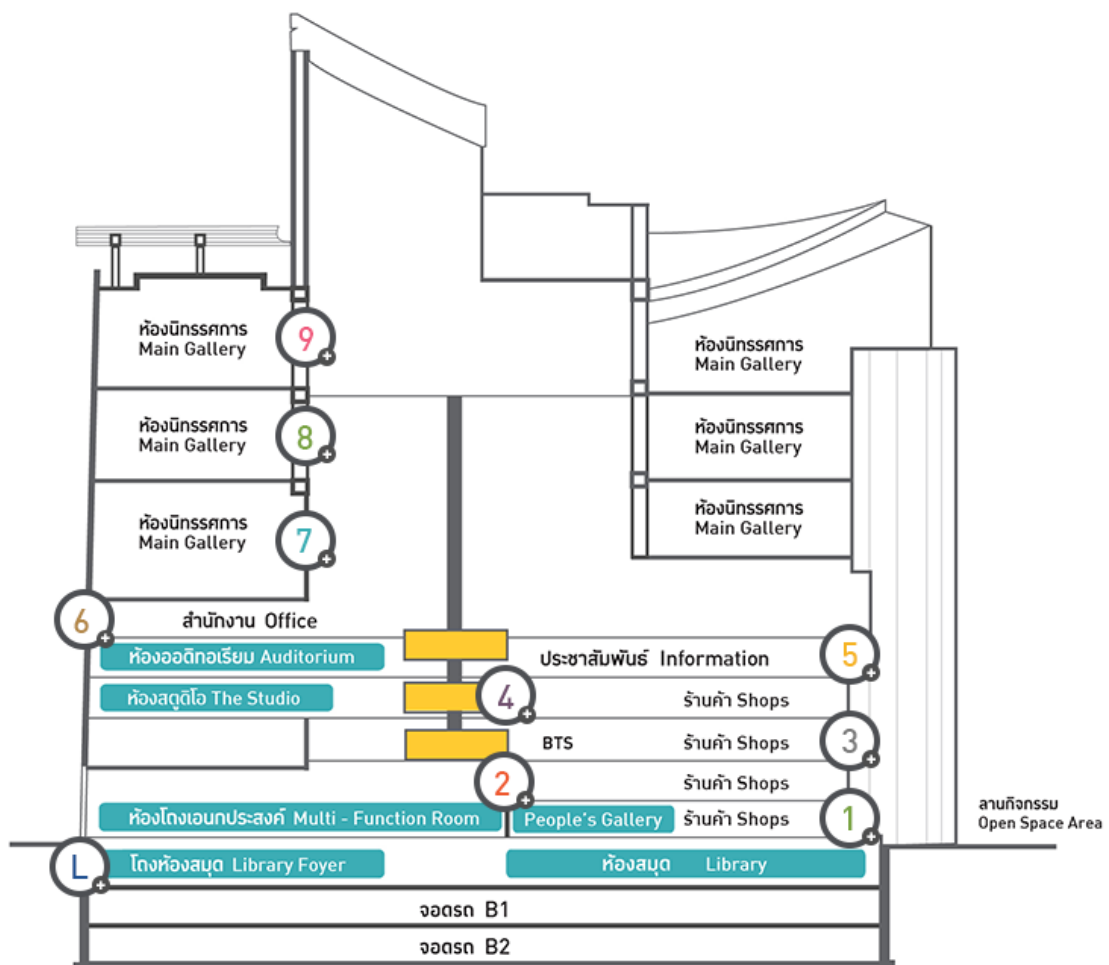


Figure 3. 2 Building Plan of BACC © BACC

The quality of the exhibition area is standard for hosted conventional artworks, which incorporated natural and artificial lighting in certain areas to create a suitable environment and amount of light for viewers. Some examples are provided in Figure 3.3.

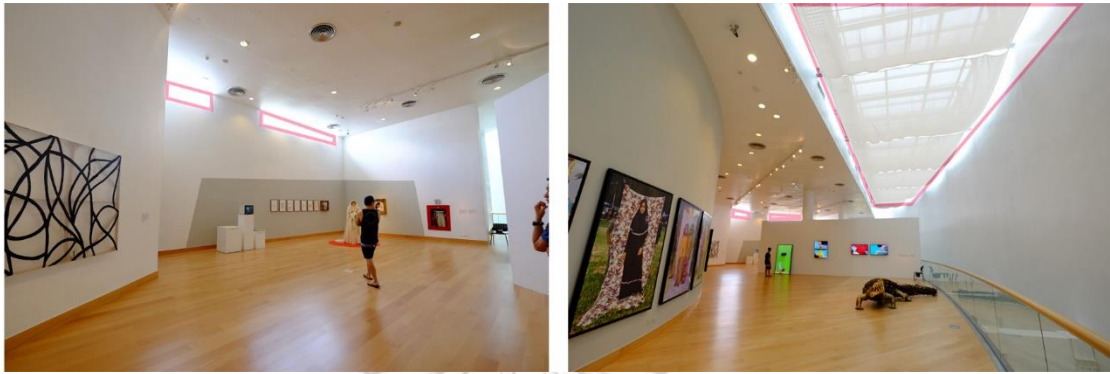


Figure 3.3 Natural and artificial lighting at BACC © Pachara Chantanayingyong

On the other hand, digital media is a major domain for contemporary art forms, yet the BACC gallery lacked an ability to conceal a system used by artists, as demonstrated in Figure 3.4.

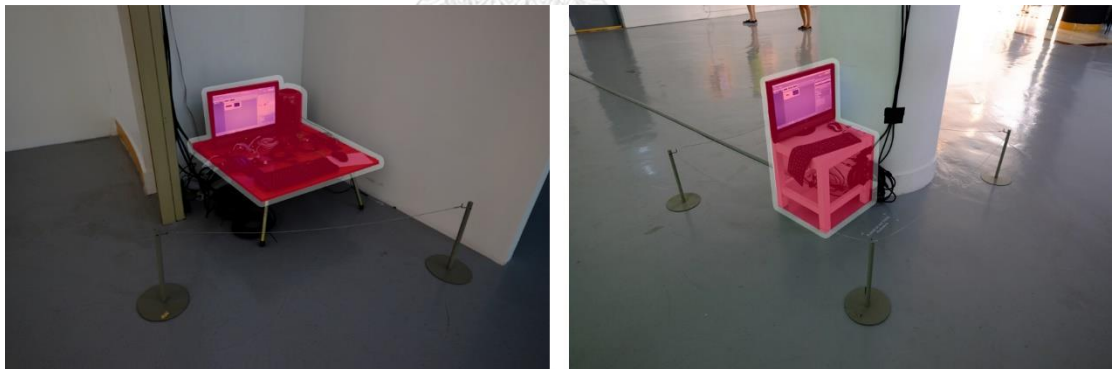


Figure 3.4 Control unit for digital art used by artist at BACC © Pachara Chantanayingyong

The solution for this problem is to provide media control rooms throughout the galleries as existing infrastructure for the art center.

Advantage(s): located at the center of Bangkok with BTS connection (transportation), good environment for conventional artworks, clear circulation for visitors.

Disadvantage(s): superfluous circulation cause losing functional space, exhibit spaces did not provide control room for digital artwork, exhibition space did not provide flexibility for artists to design their own space.

### Ratchadamnoen Contemporary Art Center – Bangkok

The Ratchadamnoen Contemporary Art Center (RCAC) is a series of renovated shop-house projects on Ratchadamnoen Road, supervised in 2012 by Crown Property Bureau, as a new contemporary art center. This project used the existing structure of the shop-houses by demolishing the mezzanine floor to form a high-ceiling space. Without any excessive decoration for exhibit spaces, visitors can focus on artworks as the architecture acts like a blank canvas. The gallery provided artificial light as a main source to light the artworks, supported by natural light through series of glass panels from the front of the shop-houses that brighten the interior space with soft light.

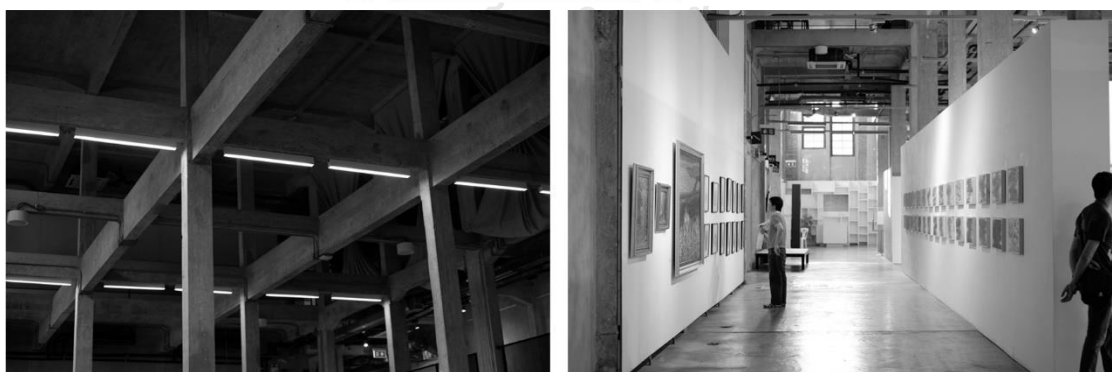


Figure 3. 5 Existing structure of RCAC (Left )-Interior of RCAC (Right) © Pachara Chantanayingyong

The RCAC also provides studios, meeting rooms, and workshops for visitor interested in the arts and a temporary thesis exhibition space for a nearby university. The best

way to travel to RCAC is by public transportation due to the lack of public parking spaces.

Advantage(s): good environment for conventional artworks, provides high ceiling space from building modification process, exhibition space provides flexibility for artists to design their own space.

Disadvantage(s): exhibit spaces did not provide control room for digital artwork, exhibition space does not provide infrastructure to support an enclosed space for digital media arts.

### Museum of Contemporary Art Bangkok

The Museum of Contemporary Art Bangkok (MOCA) was built in 2012 by Mr. Boonchai Bencharongkul as a private art museum. Most of the works exhibited in this museum are a permanent exhibition of Mr. Bencharongkul's private collection. As a private museum, an entrance fee is collect at the main entrance before users can explore the five stories packed with masterpieces from Thai and international artists. Private car and taxi are the main options to access the museum, with an adequate number of parking lots to support visitors. The author observed the main visitors to be Thai and Asian tourists.



Figure 3. 6 Exterior of MOCA (Left)-Interior of MOCA (Right) © Pachara Chantanayingyong

The highlight of the museum is the transitional space, which is a permanent walkway from gallery A to gallery B on the fifth floor, called the Universe Bridge. This transitional space provided a new experience, excitement, and acts as an emotional transition for visitors. From an architectural perspective, the transitional space gave attractiveness to the building by using solid, void, and geometric form as a unique feature for the building.

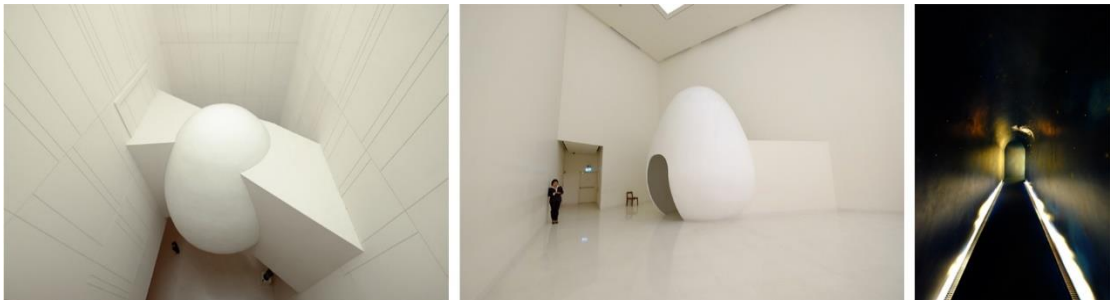


Figure 3. 7 Universe Bridge of MOCA © Pachara Chantanayingyong

Each gallery is provided with different decorative elements, such as wall color or flooring material. The decoration provided character to the exhibiting space according to artworks. Some examples are shown in Figure 3.8.



Figure 3. 8 Galleries in MOCA © Pachara Chantanayingyong

The entrance foyer is lit with a series of pixelated openings on the roof structure and façades, which allowed natural light to penetrate through the building, giving a dramatic effect and character to the space.



Figure 3. 9 Roof and façade of MOCA © Pachara Chantanayingyong

Advantage(s): good environment for conventional artworks, transitional space (highlight), clear circulation for visitors.

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Disadvantage(s): suitable for conventional art forms, art space built specifically for painting and drawing, no flexibility to support other form of arts.



## Chiang Mai University Art Center

The CMU Arts and Design Center situated at the end of Nimanhaemin-Suthep Road, which is considered a tourist area in Chiang Mai. The site is supervised by CMU, consists of three main parts within the complex: 1. art gallery, 2. small auditorium and 3. department of Media Arts and Design. The gallery served as a temporary exhibition for CMU students and selected artists. Built in 1997, the building was developed in a pre-era of contemporary art so the layout for exhibit spaces inside the gallery are not suitable for hosting digital art form.



Figure 3. 10 Exterior of CMU Art Center (Left )-Interior of CMU Art Center (Right)

© Pachara Chantanayingyong

From site observation, a front gallery easily visible from the main corridor destroyed the excitement and surprise factor for the artwork as shown in Figure 3.11.

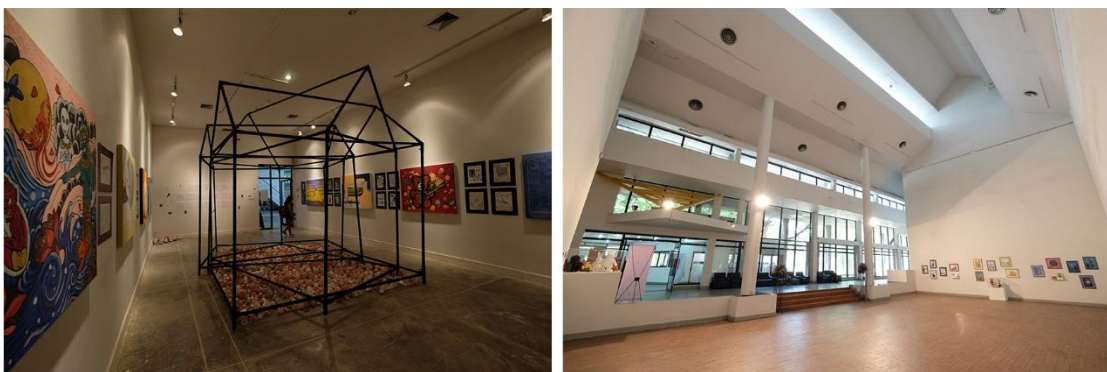


Figure 3. 11 Exhibition areas of CMU Art Center © Pachara Chantanayingyong

As the university's gallery, the art center is unoccupied from time to time due to the lack of financial support and a proper curated system. During the weekend, some exhibit spaces were occupied by a children's studio, especially gallery B which is located at the back of the art center and arranged by students from the department of fine art (CMU) as shown in Figure 3.12.



Figure 3. 12 Weekend kid's studio at CMU Art Center © Pachara Chantanayingyong

The art center is situated in the middle of the site, concealed by a thick landscape. Therefore, the building is unwelcoming to the public and visitors in term of visually aspect. On the other hand, the main entrance is situated at the side of the art center, which provided an unclear circulation route to exhibition zone.

Advantage(s): good environment for conventional artworks, much unused land to be developed.

Disadvantage(s): suitable for conventional art forms, art space built specifically for painting and drawing, no flexibility to support other forms of art.

### Maiiam Contemporary Art Museum – Chiang Mai

The Maiiam Contemporary Art Museum was completed in 2016 and is situated outside the city of Chiang Mai's center area. The museum is privately supervised by the Bunnag family, therefore, most of the museum's art pieces are private collection. The building was renovated from an old warehouse, the architect (Allzone – Rachaporn Choochuey) wanted to keep the warehouse's original structure to save construction costs by using the existing structure as an outer shell for the exhibition areas. The front façade came from the concept of seamlessly blending into nature and also the continuation of the site.

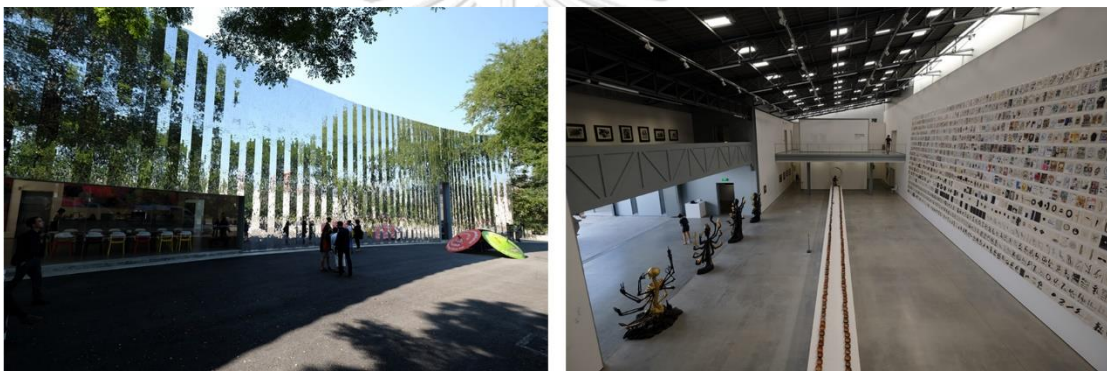


Figure 3.13 Exterior of Maiiam (Left )-Interior of Maiiam (Right) © Pachara Chantanayingyong

The building seamlessly merged outdoor space with the museum's interior to provide a continuity for visitors that circulates throughout the museum. The design incorporated translucent panels as roofing material to light the exhibition spaces as shown in Figure 3.14.



Figure 3. 14 Roofing material of Maiiam (Left )-Outdoor exhibition space of Maiiam (Right)

© Pachara Chantanayingyong

Advantage(s): good environment for conventional artworks, the design of the front façade attracts visitors, incorporated roof design with considerable natural light (energy saving).

Disadvantage(s): Suitable for conventional art forms, exhibition spaces for digital media located at fixed locations.

### Chichu Art Museum – Naoshima

The Chichu Art Museum is situated on Naoshima island located in the Seto Inland Sea of Japan. The museum was designed by renowned Japanese architect Tadao Ando and completed in 2004. The museum is specifically designed for artworks by three artists: Installation art piece by the contemporary artists Walter de Maria, the impressionist of Claude Monet, and light installations by James Turrell. Some example of the works displayed in Figure 3.16.



*Figure 3. 15 Exterior of Chichu Art Museum © Benesse-artsite*



Figure 3. 16 'Time/Timeless/No Time' by Walter De Maria, 2004 (Left)-'Open Field' by James Turrell, 2000 (Right) © Benesse-artsite

Even though the contemporary art museum is primarily subterranean, there is an abundance of natural light that changes the appearance of the artwork and the ambience of the space itself with the passage of time throughout the day and through the four seasons. This is a great example of collaboration between architect and artist to create art space that the Chichu Art Museum considers as site-specific artwork.



Figure 3. 17 A stripe of void in concrete wall by Tadao Ando (Left)-Café, Store & Garden Chichu Store by Tadao Ando (Right) © Pachara Chantanayingyong

Advantage(s): architectural design supports the arts (enhance emotional/ dramatic mood), provides a new experience for the visitor, and design is for specific artwork.

Disadvantage(s): hard to access (located in a remote area of Japan).

### **Benesse House Museum – Naoshima**

The Benesse House Museum was designed by Tadao Ando and opened to the public in 1992. The facility integrates the museum and a hotel, based on the concept of "coexistence of nature, art and architecture." The complex is built on high terrain overlooking the Seto Inland Sea and features large apertures that serve to open up the interior to the natural surroundings. In addition to exhibition, it contains permanent site-specific installations that artists have created especially for the building, selecting locations on their own and designing the works for those spaces along with temporary collections. The Museum's artworks are found scattered around the facility's interior and exterior spaces as well as along the seashore and nearby forest that borders the complex. Benesse House Museum is truly a site where architecture, art, and nature come together in an environment that accommodates numerous site-specific artworks created for the natural environs of Naoshima or inspired by the architectural spaces they inhabit.

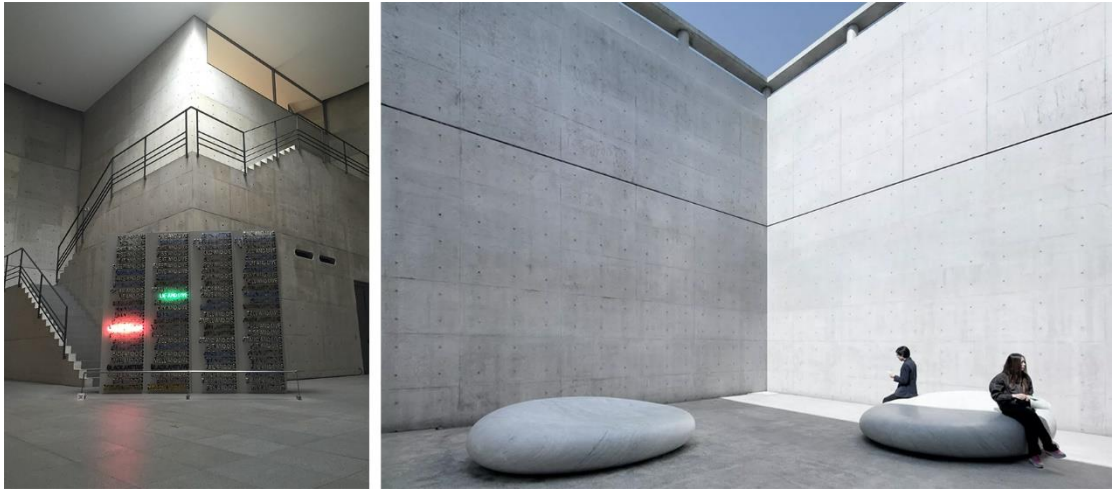


Figure 3. 18 'One Hundred Live and Die' by Bruce Nauman (Left)-roofless courtyard by Tadao Ando (Right) © Pachara Chantanayingyong

Advantage(s): artists produce artwork for specific locations, clear circulation for visitors.

Disadvantage(s): hard to access (located in a remote area of Japan), artwork limit by provided space.





## Hyogo Prefectural Museum of Art

The Hyogo Prefectural Museum of Art is a municipal art gallery located in Kobe, Hyogo Prefecture, Japan, which was designed by Tadao Ando and opened to the public in 2002.

The museum's major collections are foreign and Japanese sculptures, prints, and paintings associated with Hyogo Prefecture, in modern and contemporary styles.



*Figure 3. 19 Hyogo Prefectural Museum of Art – Kobe © Tadao Ando*

The highlight of this project is a transitional space and elements in the combination of a foyer and stairs structure as a main circulation to distribute visitors into each gallery, which creates a dramatic atmosphere in the building as shown in Figures 3.20-3.21.

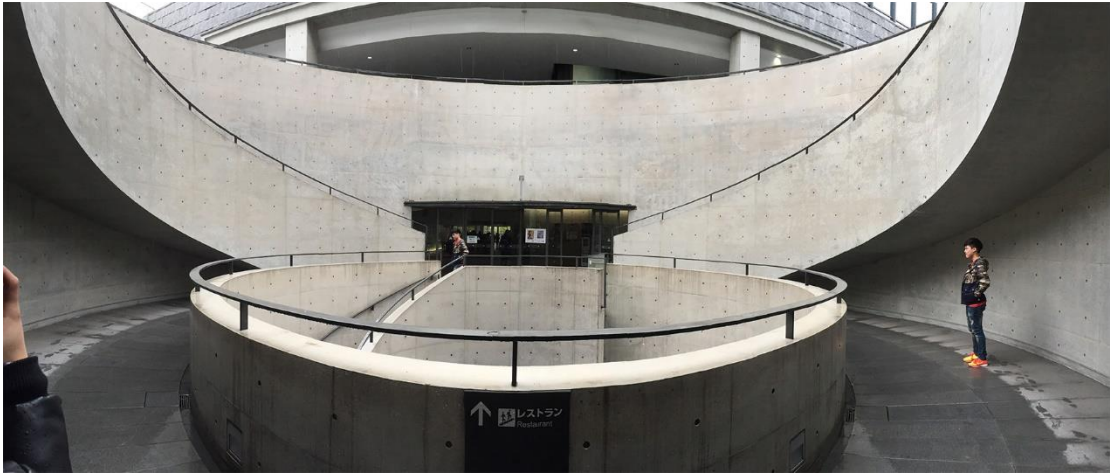


Figure 3. 20 Main entrance of Hyogo Prefectural Museum of Art © Pachara Chantanayingyong

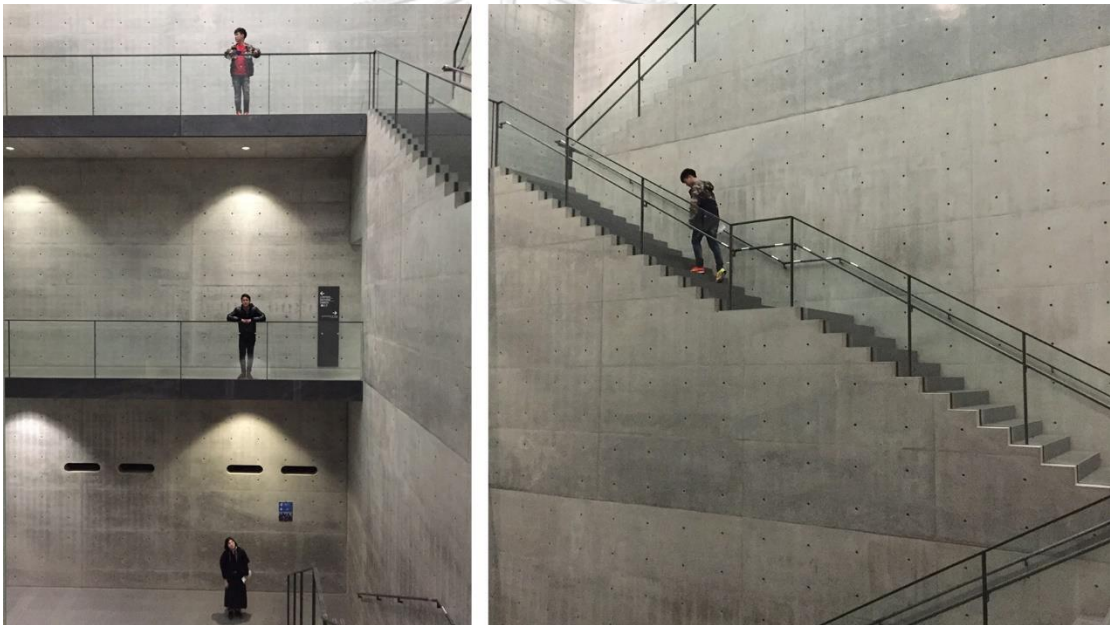


Figure 3. 21 Foyer of Hyogo Prefectural Museum of Art © Pachara Chantanayingyong

Advantage(s): transitional spaces provide dramatic atmosphere, clear circulation for visitors.

Disadvantage(s): suitable only for conventional art forms, exhibition spaces for digital media located at fixed locations.

## White Rabbit Gallery – Sydney

The White Rabbit Gallery opened in 2009. It was founded by Kerr and Judith Neilson as a privately-owned gallery focused on a contemporary Chinese art collection. The gallery was renovated from an existing shop-house, which became four stories of exhibition spaces.



Figure 3.22 Exterior of White Rabbit Gallery (Left)-Interior of White Rabbit Gallery (Right)

© Pachara Chantanayingyong

Each floor of the gallery is curated by an art form: painting, sculpture, and kinetic sculpture. A Tea house (café) and gift shop are situated on the ground floor next to the main foyer. The highlight of this gallery is a series of floating, human-size sculptors at the main entrance that welcome visitors.



Figure 3.23 Various artforms at White Rabbit Gallery © Pachara Chantanayingyong



Figure 3. 24 Human-size sculptors at the main entrance of White Rabbit Gallery

© Pachara Chantanayingyong

Advantage(s): each floor categorized by art form, clear circulation for visitors.

Disadvantage(s): Suitable for conventional art forms, limited space, no flexible space for artists.

## Museum of Contemporary Art of Australia – Sydney

An expansion project from an original building to extend exhibition areas and improve the infrastructure system inside the building to support digital and electronic arts. This project emphasized the trend of digital art-form as shown in Figures 3.26-3.27.

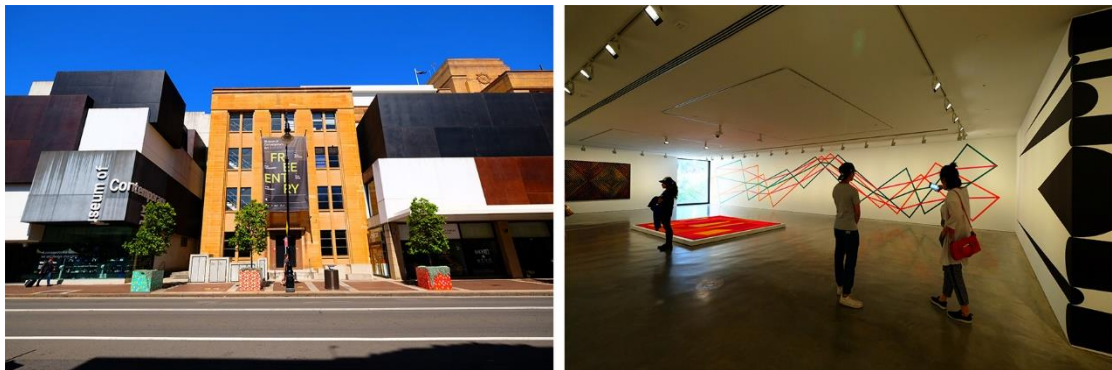


Figure 3. 26 Exterior of Museum of Contemporary Art of Australia (Left)  
Interior of Museum of Contemporary Art of Australia (Right) © Pachara Chantanayingyong

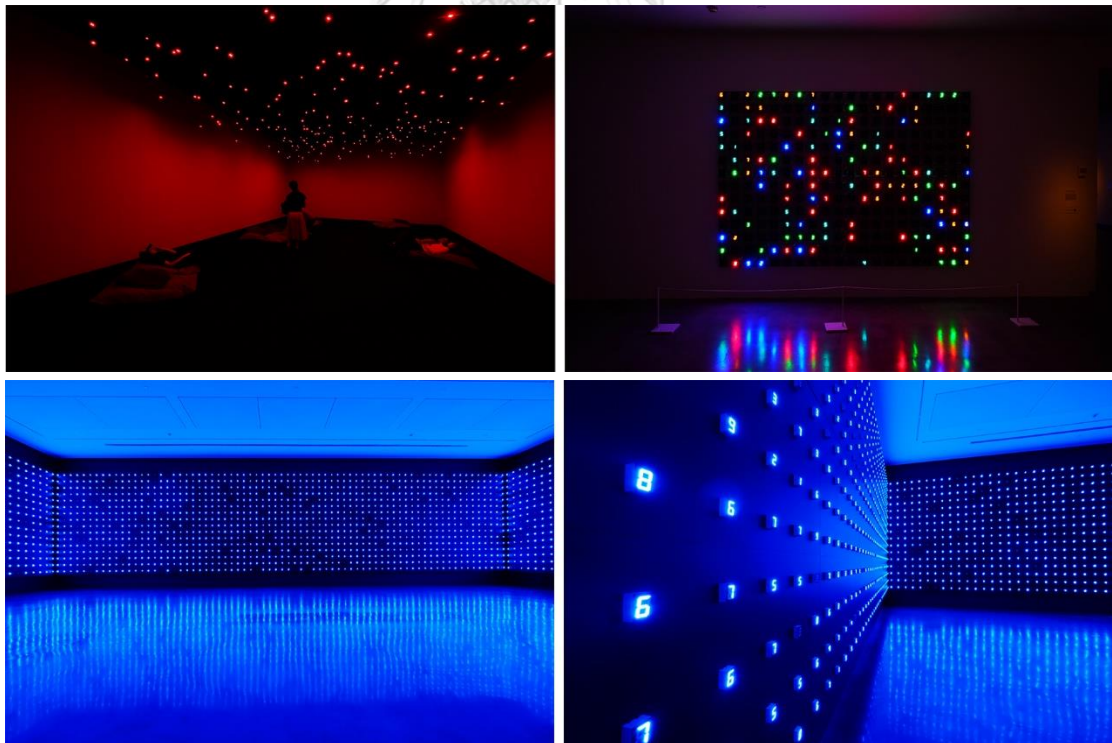


Figure 3. 25 Various work by Tatsuo Miyajima exhibited at Museum of Contemporary Art of Australia, 2016 © Pachara Chantanayingyong

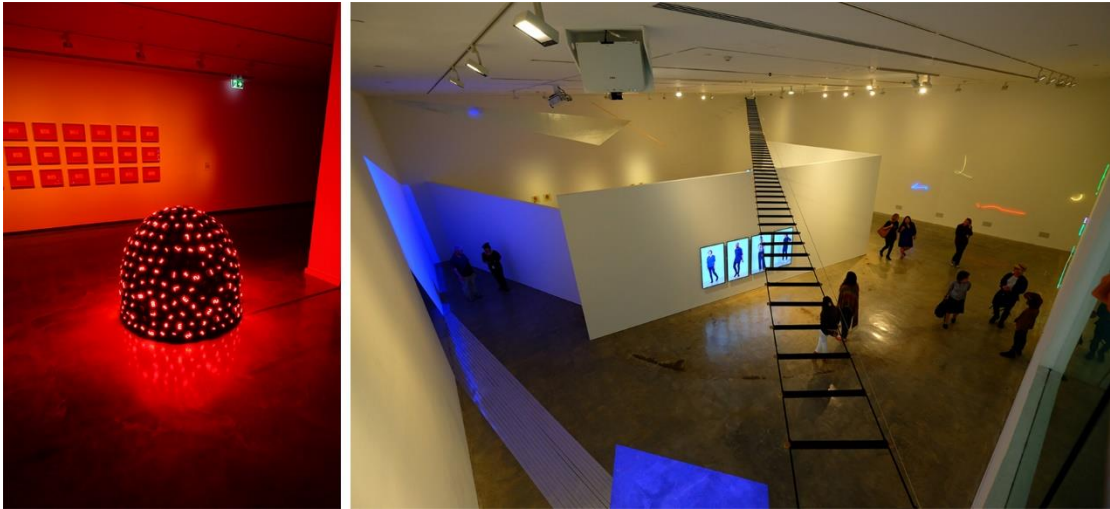


Figure 3. 27 Electronic and digital arts exhibited at Museum of Contemporary Art of Australia, 2016 © Pachara Chantanayingyong

Advantage(s): support various type of arts, especially digital format, clear circulation for visitors.

Disadvantage(s): -



### 3.2 Analysis on findings and Summary

To summarize the findings of the site survey, the author divided the criteria of concern for the aspects needed to design a contemporary art space into four categories as follows:

1. Art form plays an important role to determine a design for art space since each form of artwork need specific design criteria, for example, painting requires a wall panel to be installed, yet electronic and digital art requires an electronic outlet and projector or infrastructure that support digital display. One of the most interesting example is the exhibition of Tatsuo Miyajima at the Museum of Contemporary Art of Australia, which represents architecture informing artwork. Each of Miyajima's works was designed to fit with the gallery's provided space. The author considers this a limitation from architecture to artist. There are several cases from the site survey where the architecture design for specific artwork came out beautifully but contrarily this thesis focuses on temporary exhibitions that provide an opportunity for artists to create their own environment suitable to the characteristics of each exhibition. From the perspective of the curator, zoning and layout of the area of exhibition for suitable artforms is crucial, each type of art requires different environment in terms of light, set up system, and temperature/moisture control. The design framework should satisfy contemporary artists and curators in terms of providing flexibility of exhibition space by using architectural design to tackle this problem.

2. A highlight in the exhibition or transitional space is its added attractiveness to art spaces. For example, the Universe Bridge at the MOCA as a transitional space from gallery to gallery provide surprise factor and act as mood transition for visitors. Another remarkable example is the Chichu Art Museum by specifically designed for permanent exhibition for three artists. The most interesting point in design is each gallery was designed to compliment the artwork by using architecture to create a dramatic

atmosphere for the viewer. At the same time, Tadao Ando added natural factor, such as climate and sunlight to create dynamic change to exhibit spaces, visitors can revisit the museum with diverse atmospheres. In conclusion, art is not the only aspect that attracts people to an art space: the space itself can be considered as a highlight along with the artworks. Another crucial aspect for design an art space is to provide a clear and simple circulation to convey visitors throughout the gallery, but the complexity of the circulation may cause a disoriented experience to visitors as shown in Figure 58.

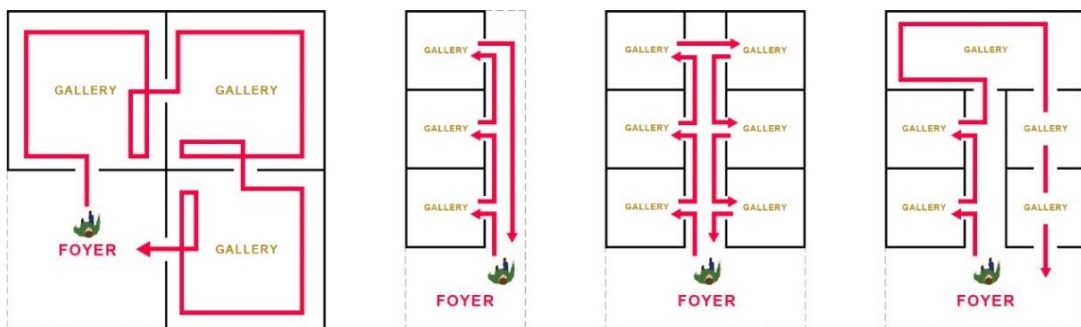


Figure 3. 28 Art space circulations

3. The author studied the users' behavior and the local context to support additional functions for art space such as library, studio, meeting room, auditorium, and so forth. According to the SFMOMA case study, the new building consists of a learning center and studio for local members, which attracts more users to the site.

4. Lighting design for an art space is another crucial factor for balancing the uses of natural and artificial light in specific areas, such as paintings sensitive to ultraviolet light (sunlight). One of the most interesting examples to demonstrate the use of natural light is the Chichu Art Museum, which embraces natural light to change the appearance of the artworks and the ambience of the space over time from day to night and across the seasons. From the site survey, the author analyzed the existing condition of lighting design into four types as shown in Figure 3.29.



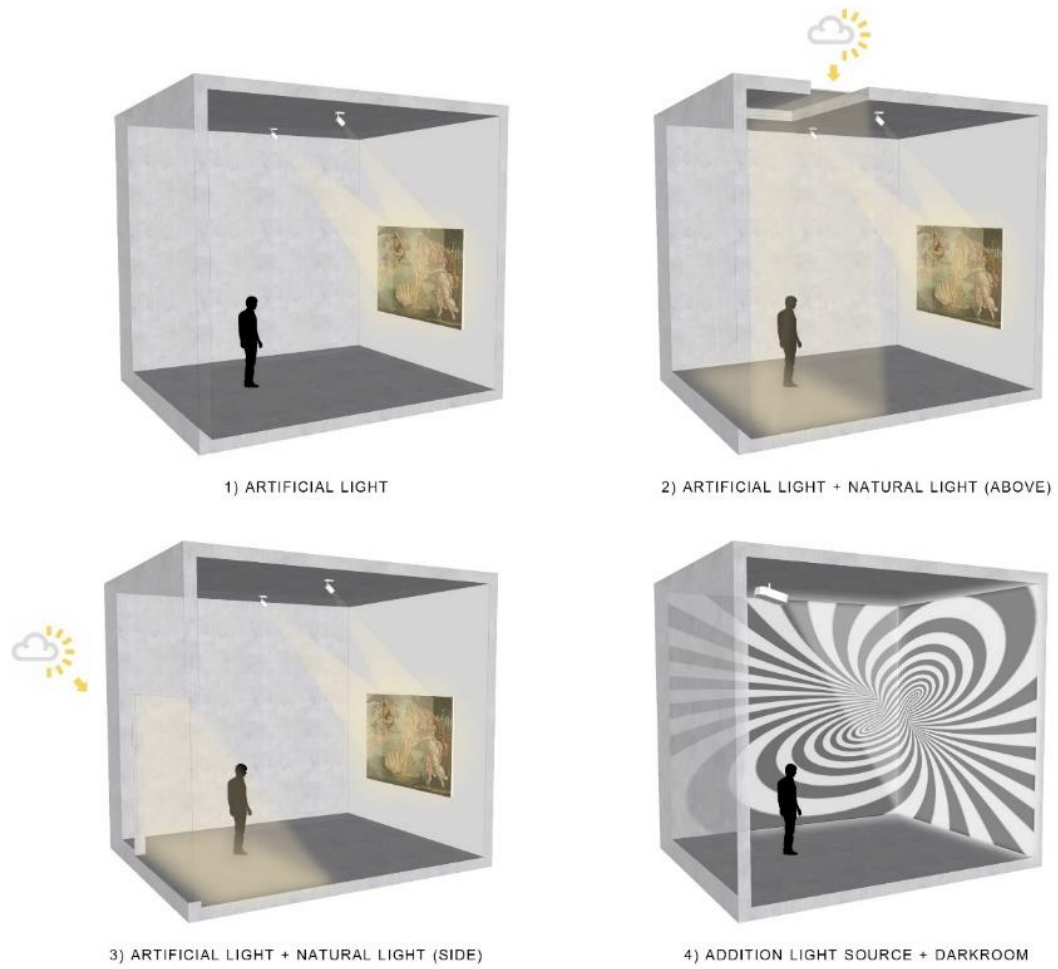


Figure 3. 29 Existing condition of lighting design in art spaces

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## Chapter 4 Design Process

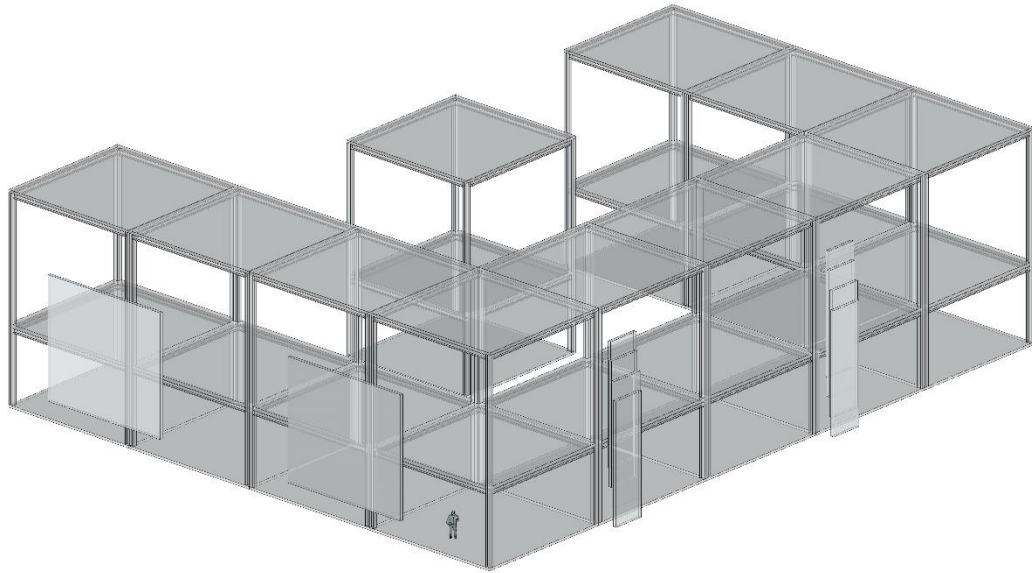
From the previous chapter, the results displayed the existing conditions of contemporary art spaces in various locations. The most common problems are flexibility of exhibit space and lacking infrastructure to support digital media, despite art spaces that intentionally design for specific artworks. Another problem that cannot be overlooked is the limitation of the structural aspect toward expansion and the modification process to increase the area for exhibition. The problem that affects the expansion process arises from two factors; 1) limitations from the site and 2) limitations from the existing structure. For future projects, the first problem can be fixed by choosing a suitable site for comparing quantity of artworks and users. The limitation from existing structure was a result from unexpected factor in design process. The problem can be tackled by redesigning a system to support the expansion process. The author used this criteria as the design framework by using a prefabricated system to demonstrate the possibility as an alternative solution for the future project.

The design process is explained in three main steps, which are 1) prefabricated structure, 2) expansion process and 3) a design proposal for the expansion unit of the CMU Arts and Design Center.

### 4.1 Prefabricated structure

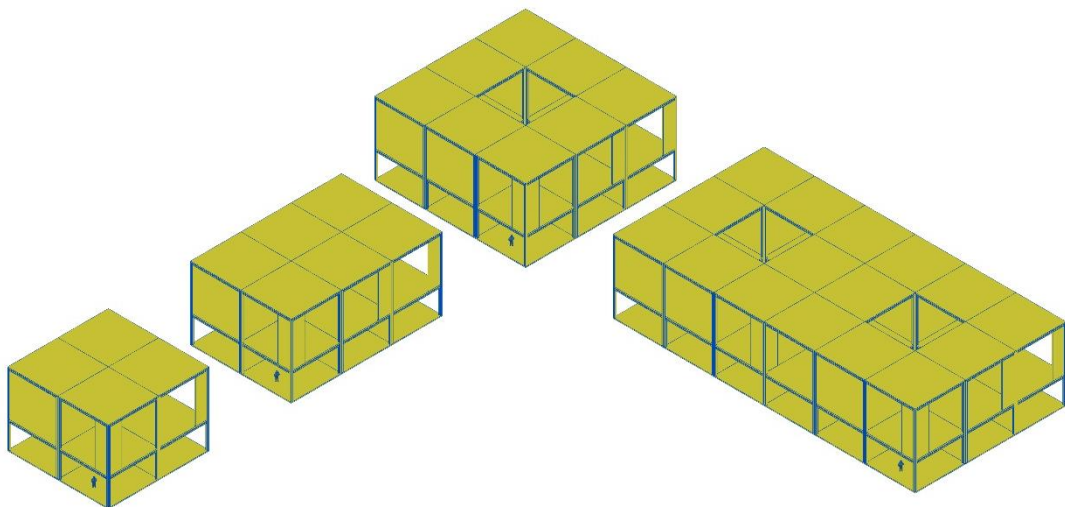
A prefabricated structure was selected as a main structural system for this project due to the following advantages of the system: savings on construction time, control of the overall budget, minimum construction waste, safety for workers on site, and the design of the expansion process. The archetype consists of a prefabricated steel structure, concrete slab for flooring, roof structure (steel truss), glass panel, staircase, and façade that can be tailored to specific site. After a design process, all the components are

delivered to the site. Each location can design a layout base on acquired area and context. An example of layout presented in Figure 4.1.



*Figure 4. 1 An example of layout using prefabricated structure*

There are two sizes for the system: 6 x 6 meters and 12 x 12 meters. This construction method provided flexibility in terms of design and budget. Architects can estimate price per unit and timeline for each project. As a starting point, each location does not require a full-scale layout but can be divided to phase by phase. Figure 4.2 demonstrates variation and possibilities of the prefabricated unit.



*Figure 4. 2 Variation and possibilities of prefabricated unit*

The design framework is inspired by the elevated floor of a traditional Thai house, which improves natural ventilation on the ground floor. The author intended to partially expose the ground floor as an outdoor exhibition space.

For the design framework, there are two crucial factors for layout of the interior space: function and flexibility of the exhibition area. Findings from the literature section revealed that each building has its own characteristic form, context and users. However, there are essential functions that need to be included inside art spaces, such as entrance hall and ticket booth information stand/locker area, water closet, storage room, circulation core, staff area, and so forth. Figure 4.3 highlights examples of layout for interior spaces.

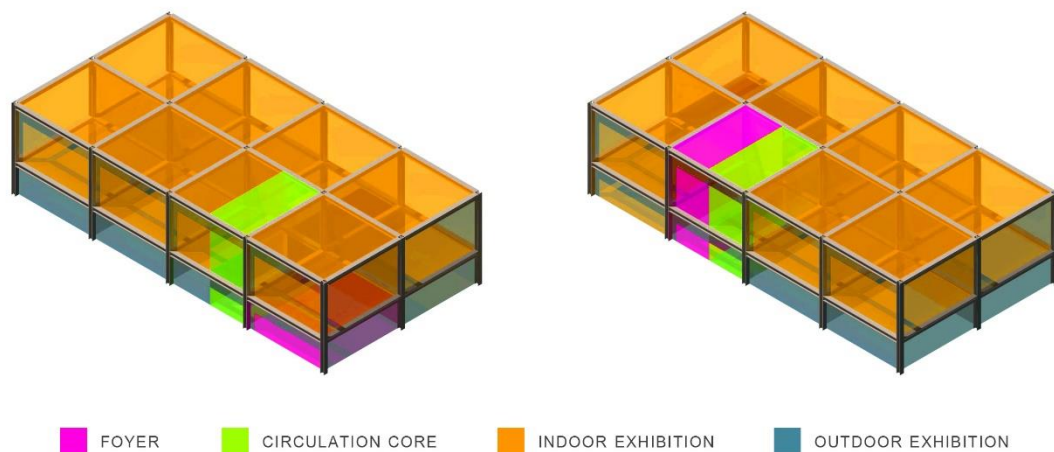


Figure 4. 3 Examples of layout for interior spaces

Components for design framework are divided into five categories: 1) main structure, 2) façade, 3) roof, 4) staircase and 5) wall. A main structure made from series of an I beam and H beam (steel) to form a skeleton structure for the rest of the components. Each element can be redesigned to the appropriate context. Standard components are shown in Figure 4.4.

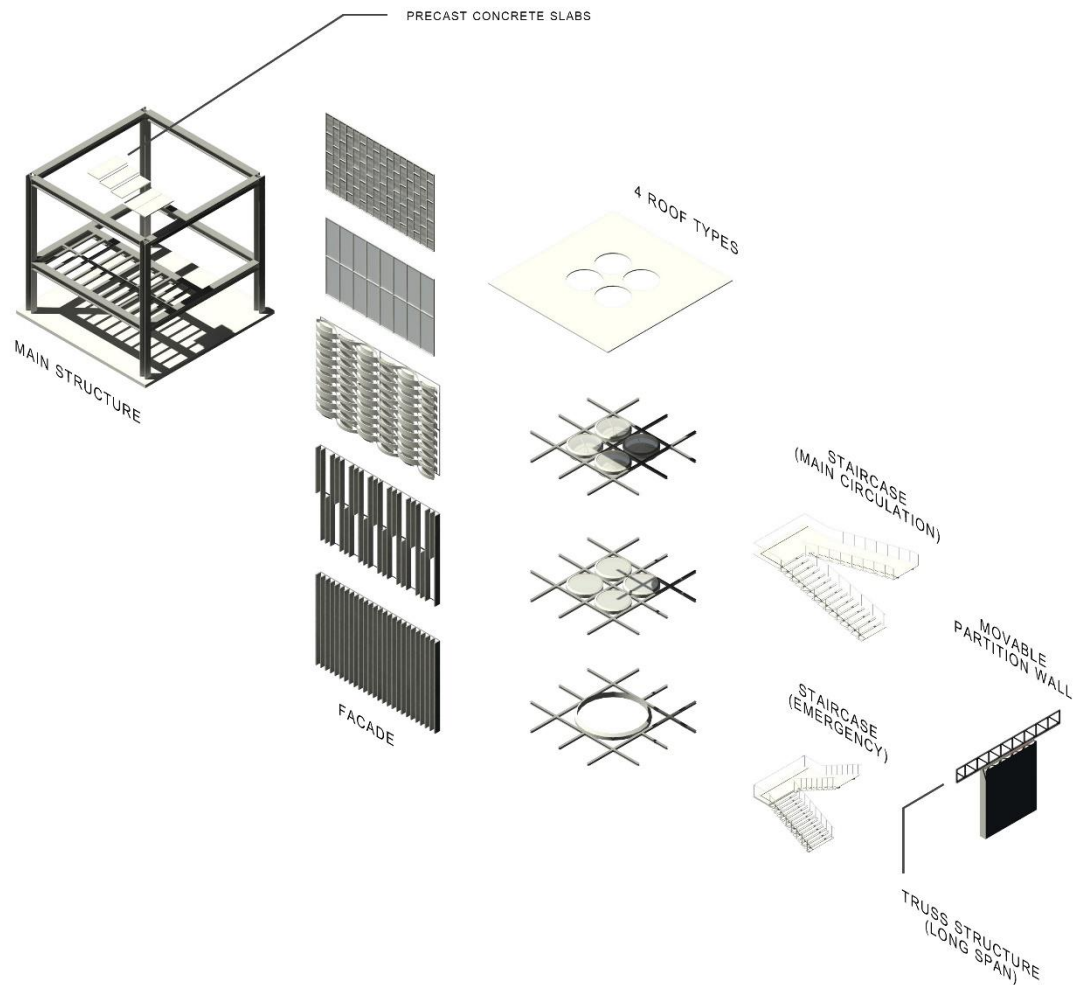
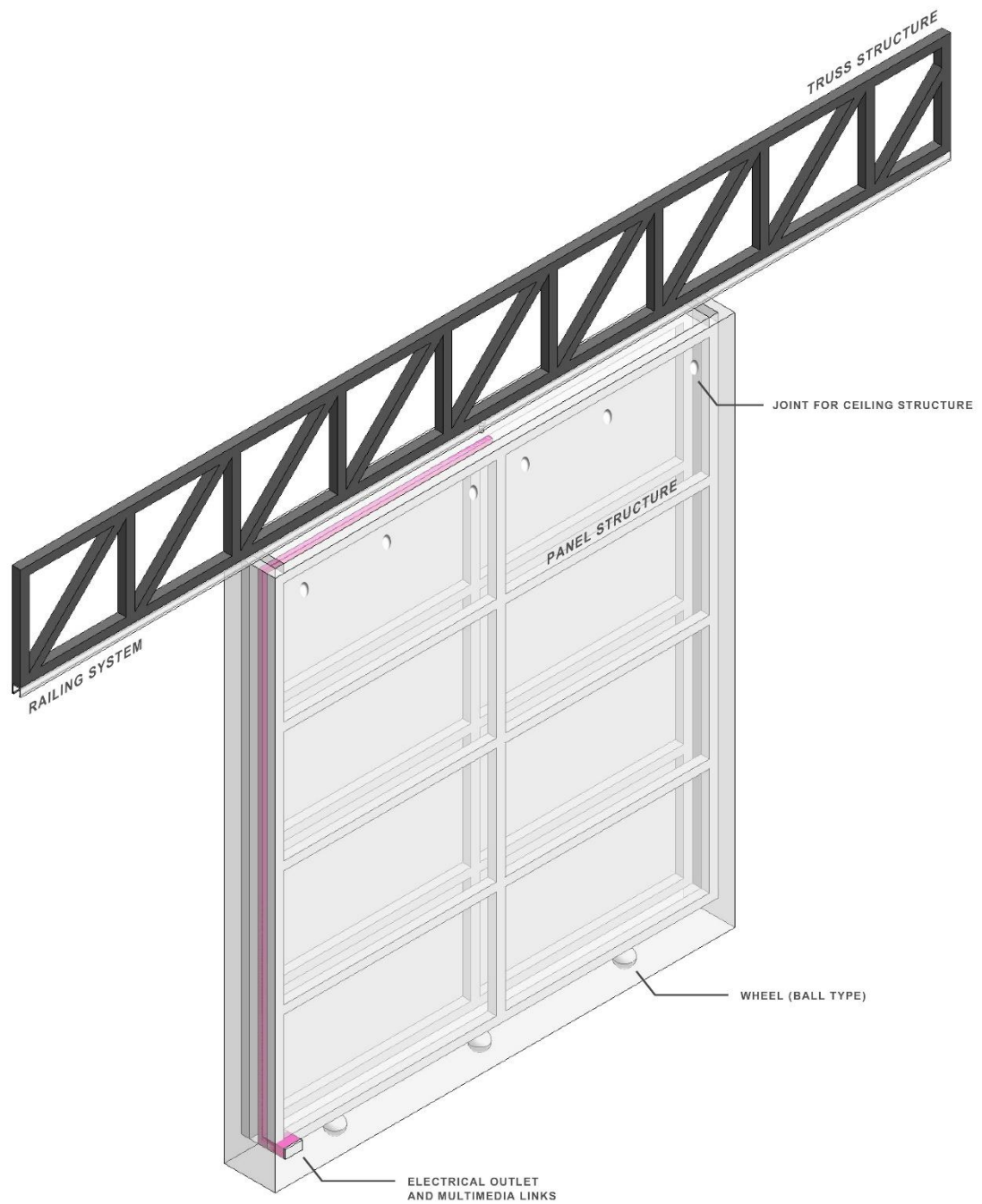


Figure 4. 4 Standard components for design framework

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Another aspect for reorganizing an interior layout for art spaces is to provide flexibility for the exhibition area. Each artist produced artwork in various forms, thus a fixed layout can limit creativity and suitable environments for artwork. The archetype provided movable panels by using a railing system attached to the truss structure (roof) to maximize the possibility of the layout of an exhibition area as shown in Figure 4.5.

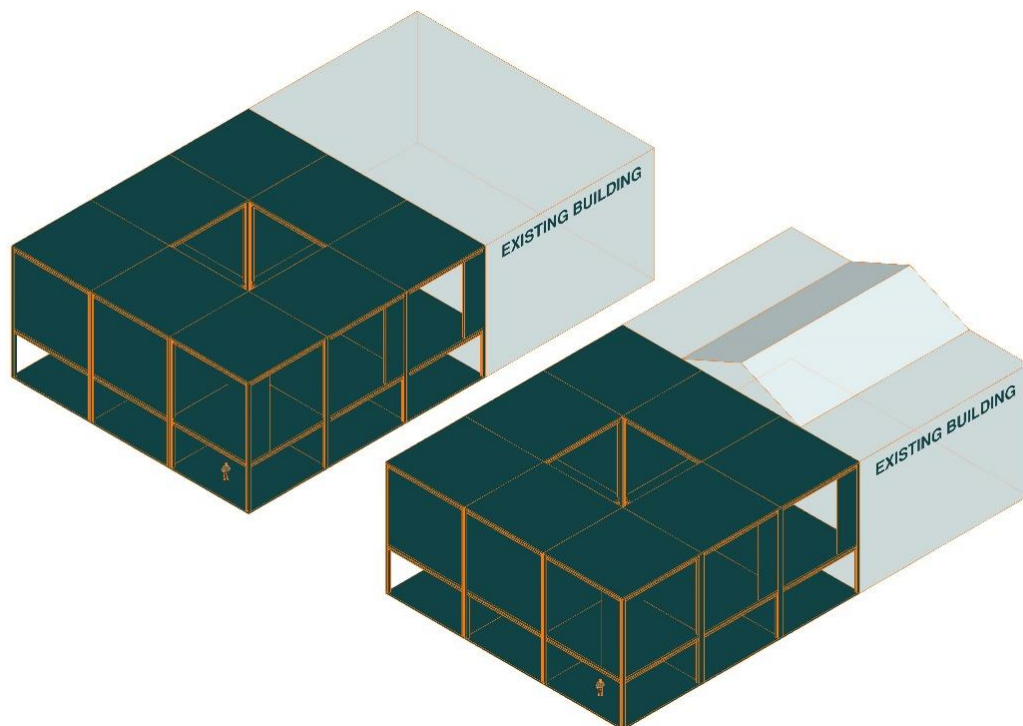


*Figure 4. 5 Movable panel*

An electrical outlet and media links (to the media control room) are provided within a panel. Each series of panels can install a ceiling structure to enclose the space based on the artist's requirements.

## 4.2 Expansion process

The design framework using a steel structure allows for flexibility in the expansion process by providing an extension joint for any future extended unit. Moreover, in case of limited area from the provided site, an extension on the existing structure can be one of the options by tailoring the height of the floor to floor to match with the existing building.



*Figure 4. 6 Expansion process with existing building*

#### 4.3 Design proposal for expansion unit of CMU Arts and Design Center

The author chose CMU Arts and Design Center as the experimental site to demonstrate the possibility in terms of design within the local context. The site consisted of an existing art center, small auditorium (125 seats) and the department of Media Arts and Design (MAD) designed in 1997 by Tonsilp Architect. The following table (Table 1.) shows existing functions compared with the design proposal.

*Table 1 Functional area of existing and expansion space*

	Existing function(s)	Expansion Phase 1	Expansion Phase 2
Indoor exhibit area	1460 sq.m.	2200 sq.m.	1500 sq.m.
Outdoor exhibit area	-	1500 sq.m.	850 sq.m.
Foyer	170 sq.m.	500 sq.m.	-
Storage	70 sq.m.	460 sq.m.	-
Giftshop	50 sq.m.	250 sq.m.	-
WC.	45 sq.m.	110 sq.m.	-
Education zone	1650 sq.m.	4000 sq.m.	-

In this proposal, the author demolished the auditorium due to its lack of use and the existence of the Chiang Mai University Convention Center (located across the street). The core idea is to design a new art center that can provide flexibility to artists (students and local artists) by incorporating with department of Media Arts and Design (MAD) and the existing CMU Arts and Design Center. The design used existing elements from the original building as a guideline to link the existing building with the expansion building.

The following diagram shows the series of layouts using the design framework.



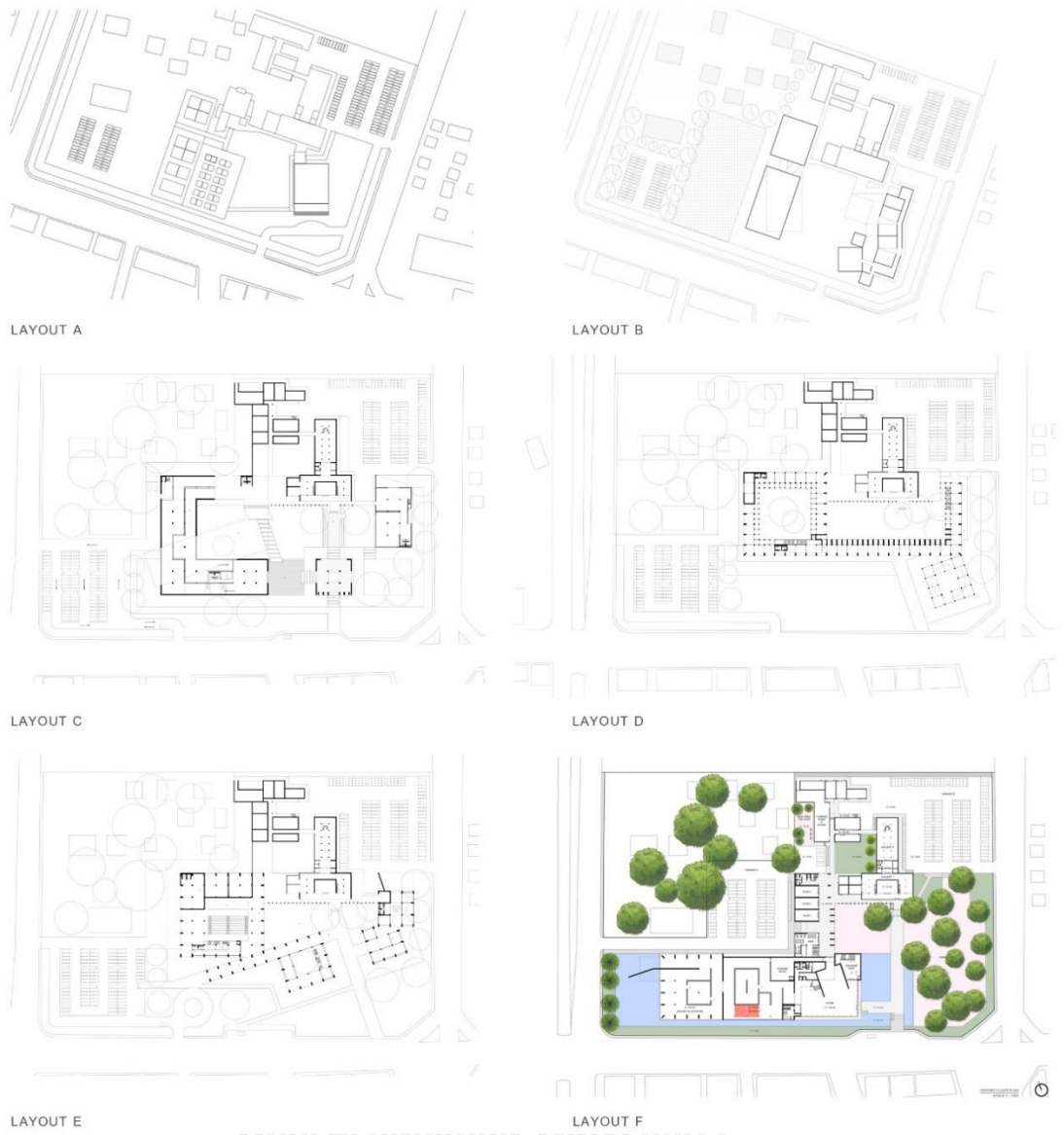


Figure 4. 7 Series of layout by using the design framework

## Chapter 5 Design Implementation

In this chapter, the design proposal will be applied to the existing CMU Arts and Design Center to improve and to expand exhibition space along with the rest of the complex. With this site-specific project, the analysis helps to develop the new building's program.

### 5.1 Analysis of existing context (Chiang Mai University Campus)

The selected site is located in Chiang Mai, which acts as the center of northern region and considered to have the highest rate of tourists from Thailand to international visitors shown by the user statistics from the Chiang Mai International Airport (Department of Tourism, 2014). The site situated in CMU area is in front of the CMU Arts and Design Center (Figure 5.1).

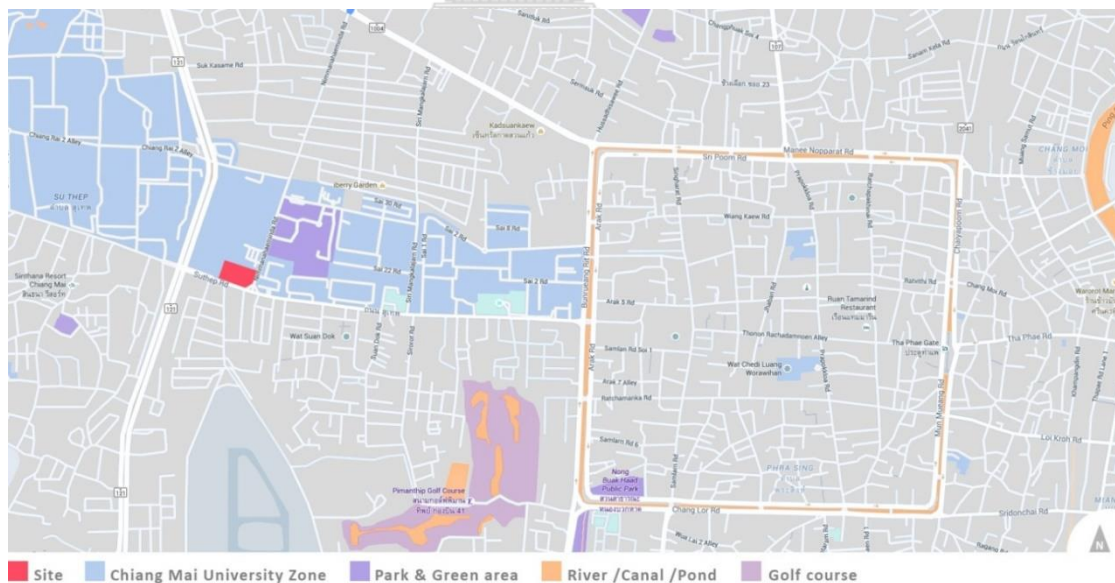


Figure 5. 1 Site and Chiang Mai University

Within one kilometer from the city center of Chiang Mai, the site is surrounded by tourist streets (Nimmanhaemin Road) and a commercial stripe of Suthep Road. A total area for selected plot is 20,718.54 sq.m.. The front of this site facing series of commercial shop-houses on Suthep Road. Shown in Figure 5.2.



Figure 5. 2 Site map

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The site was concealed with existing landscape which blocking a visual from the outside. Shown in Figure 5.3.



Figure 5. 3 Existing Landscape of the site

5.1.1 Site and users

The follow diagram show vista around the site (Figure 5.4).



Figure 5. 4 Vista of the site

As mentioned, the existing buildings on the site consist of the CMU Arts and Design Center, Department of MAD, and staff area. In the same plot of land there is the Center of Promotion of Arts and Culture CMU and Lanna Traditional House Museum, supervised by CMU as shown in Figure 5.5.



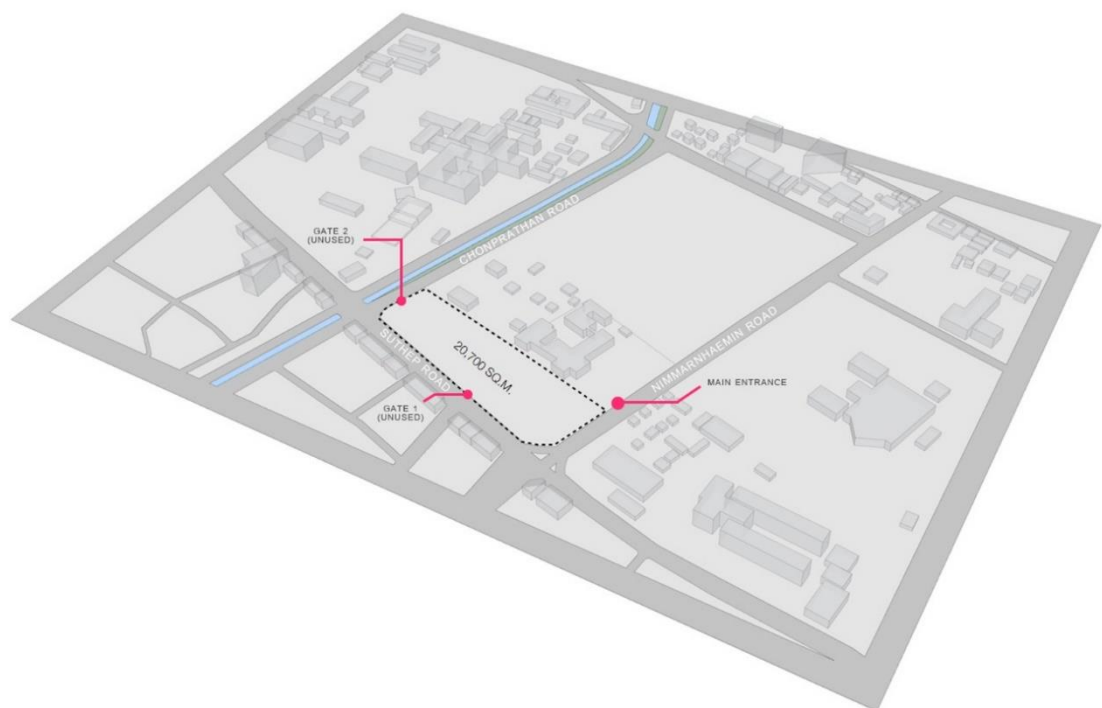
Figure 5. 5 Existing building on site

From the site survey, traffic conditions are denser at Suthep-Nimmanhaemin intersection during rush-hours between 0800 hours and 1700 hours. The site, especially Nimmanhaemin Road, becomes quite active after 1800 hours due to commercial complexes, restaurants, and bars.

Most users within the art center during the week are CMU students; but, during weekends, the center is occupied by children and parents from the ballet studio and an art class, set up by the CMU's faculty of fine art.

### 5.1.2 Accessibility

The main access for the existing art center is located at Nimmanhaemin Road. There are two gates located at Suthep and Chonprathan Roads but remains closed due to the distances from each gate to the art center and unoccupied of the space (Figure 5.6). The site can be accessed in four ways: 1) private car, 2) motorcycle, 3) taxi (rod-dang) and 4) walk-in.



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Figure 5. 6 Accessibility of the site

### 5.1.3 Light and shadow analysis

The site is located in the open area without any high-rise buildings. Light and shadow cast over the site are presented in Figure 5.7.

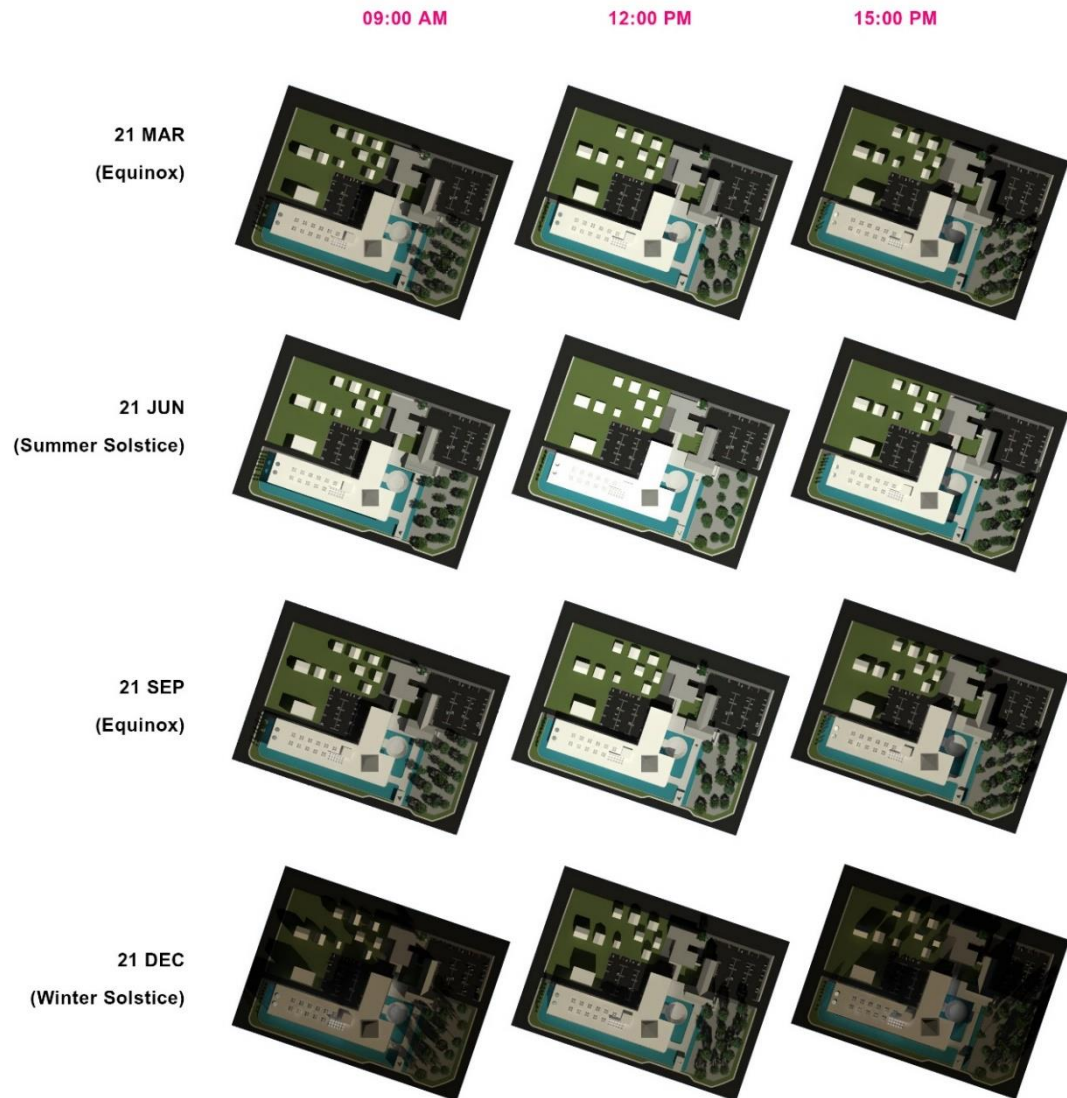


Figure 5. 7 Light and shadow analysis

## 5.2 Master plan of CMU Square

In 2015, CMU planned to develop CMU Square as a learning park for public use, into four zones: arts, culture, nature and community. This thesis uses the CMU Square's master plan as a design guideline as shown in Figure 5.8.



Figure 5. 8 Master plan of CMU Square

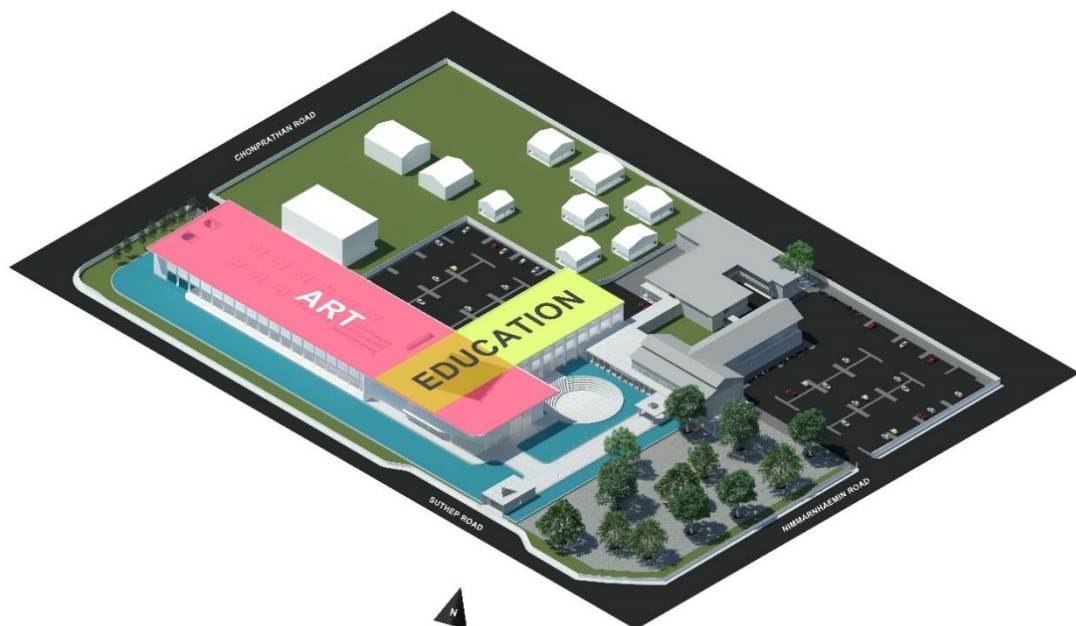
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The intension of the site changed from private use to public use. The design should provide public arcade or space to support future activities.



### 5.3 Implementation of design into the site

The outcome focused on layout and zoning the design framework. The design used the true north axis as the main core for the new building, merging education wing into the art wing. The education wing consists of the MAD classrooms and studios since the existing building is too small given the quantity of users. The existing MAD building will be used as the office for teachers and staffs. The main entrance located at Suthep Road, which enhances interaction between the art complex and the local context by exposing the front of the buildings to the public. The entrance is for users who specifically come to the site with public transportation, followed by two entrances at Nimmanhaemin and Chonprathan roads to access parking lot. The main design of the new building focused on the linking of the education and art exhibition layout to merge and provoke art in the new generation as shown in Figure 5.9.



*Figure 5. 9 Implementation of design into the site*

The following plans are designed with a prefabricated system by using 6 x 6 meters as circulation platforms and 12 x 12 meters as exhibition areas (Figures 5.10-5.13).



Figure 5. 10 Ground floor plan

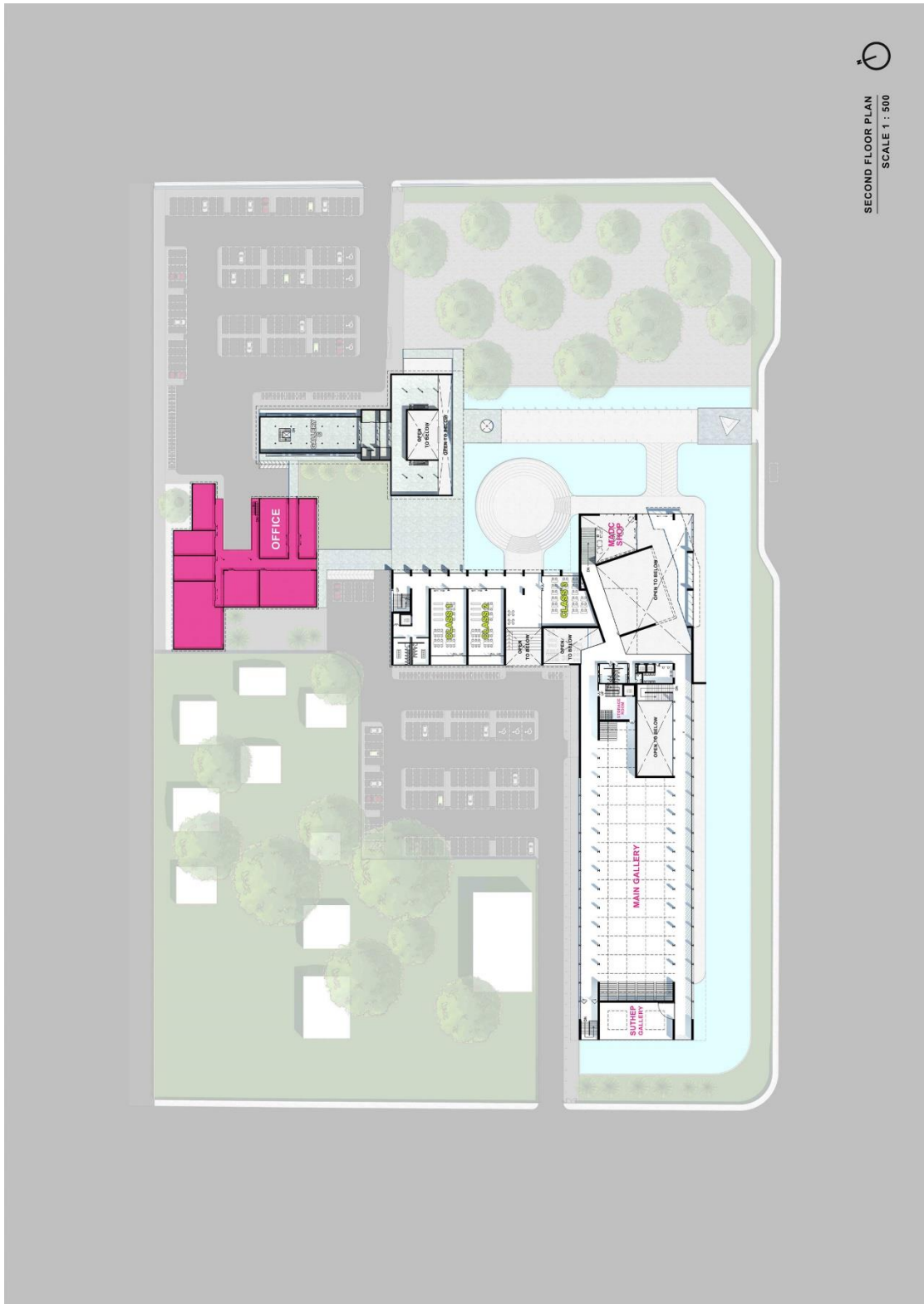


Figure 5. 11 Second floor plan

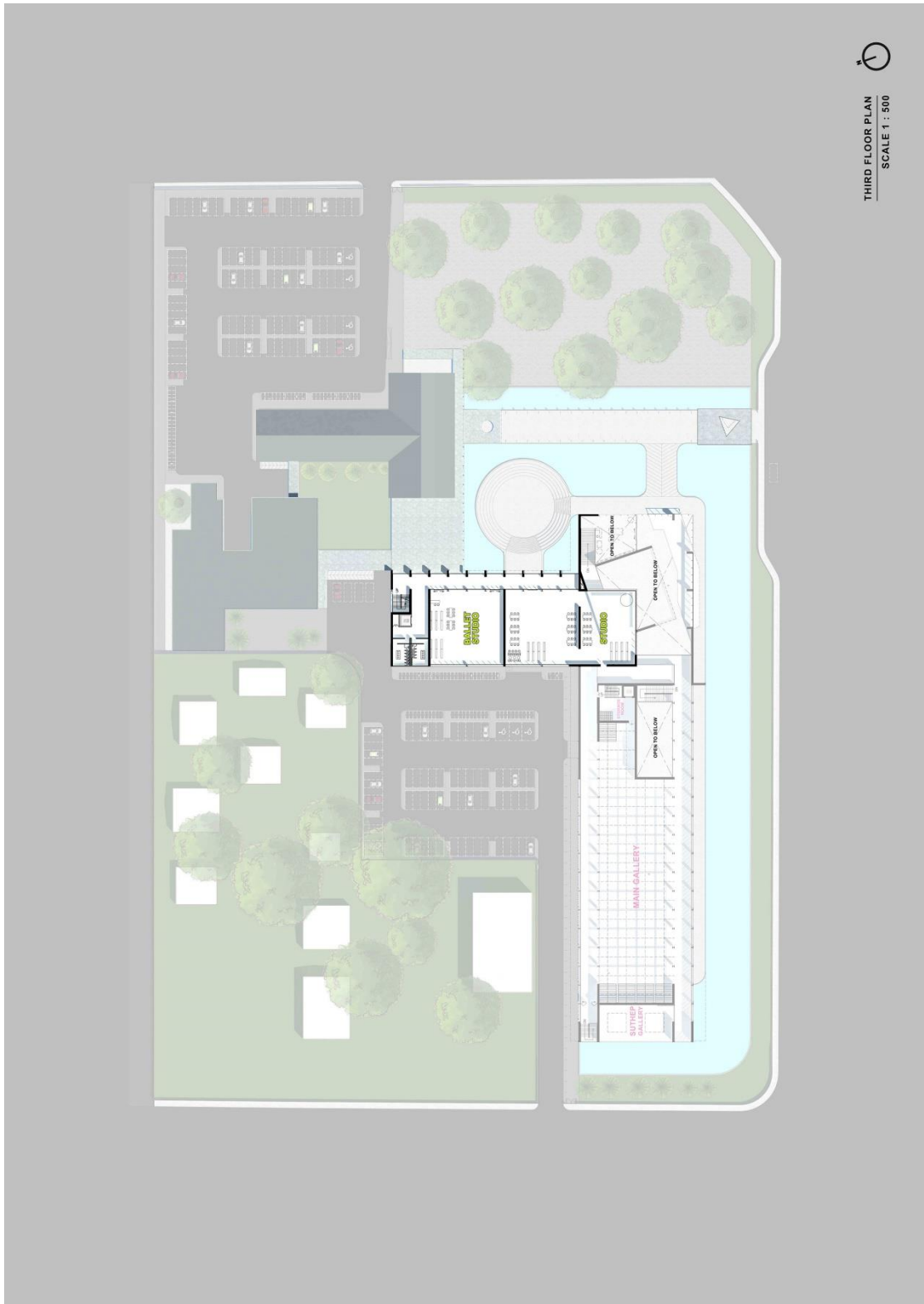


Figure 5. 12 Third floor plan

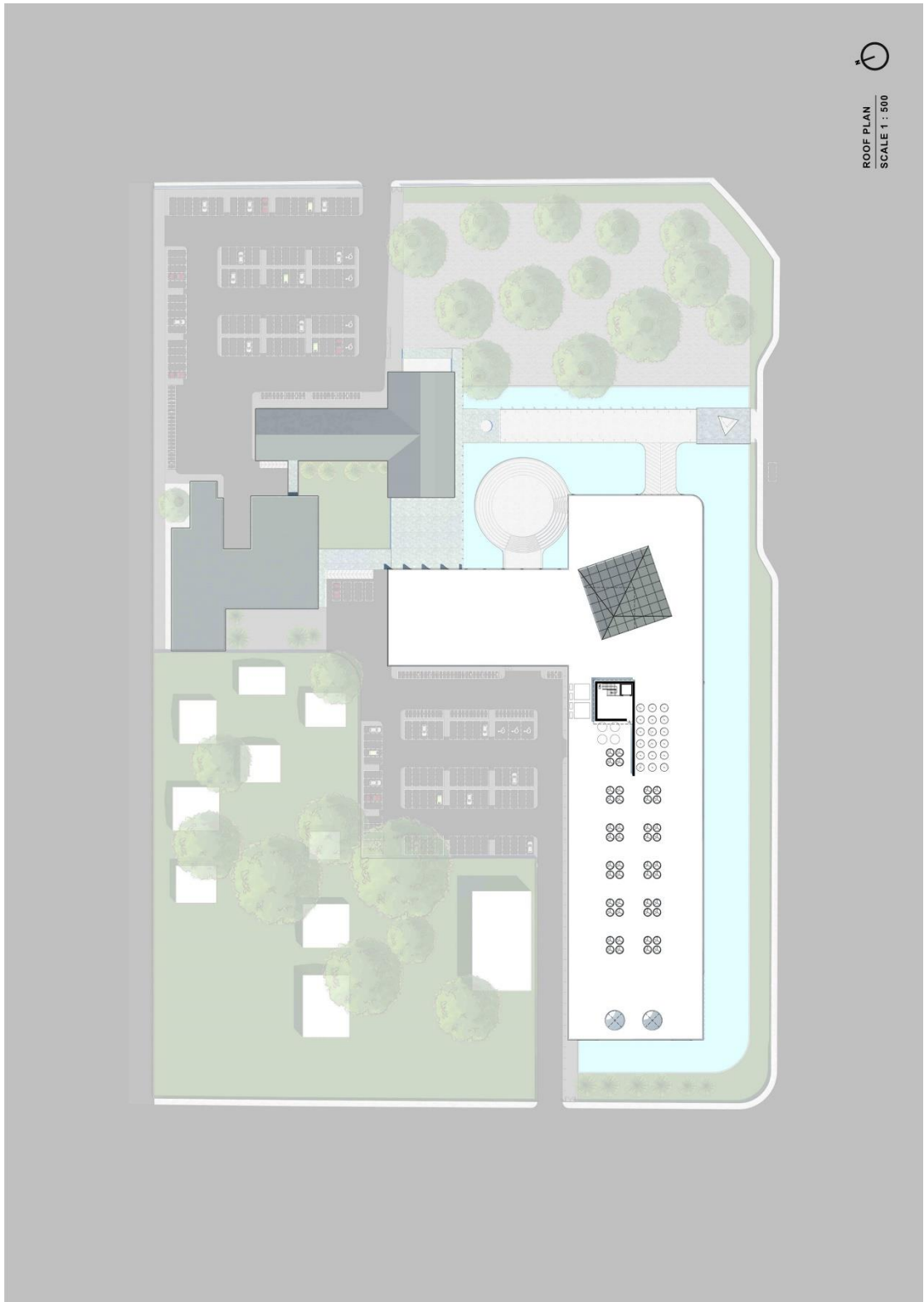


Figure 5. 13 Roof plan

To enter the new exhibition area, visitors have three options for access: 1. enter from the main entrance and turn left to enter the main foyer, 2. enter from parking lot 1 and cut through MAD building to enter the main foyer, and 3. enter from parking lot 2 and walk through the corridor of existing art center, turn right and enter the main foyer as shown in Figure 5.14.

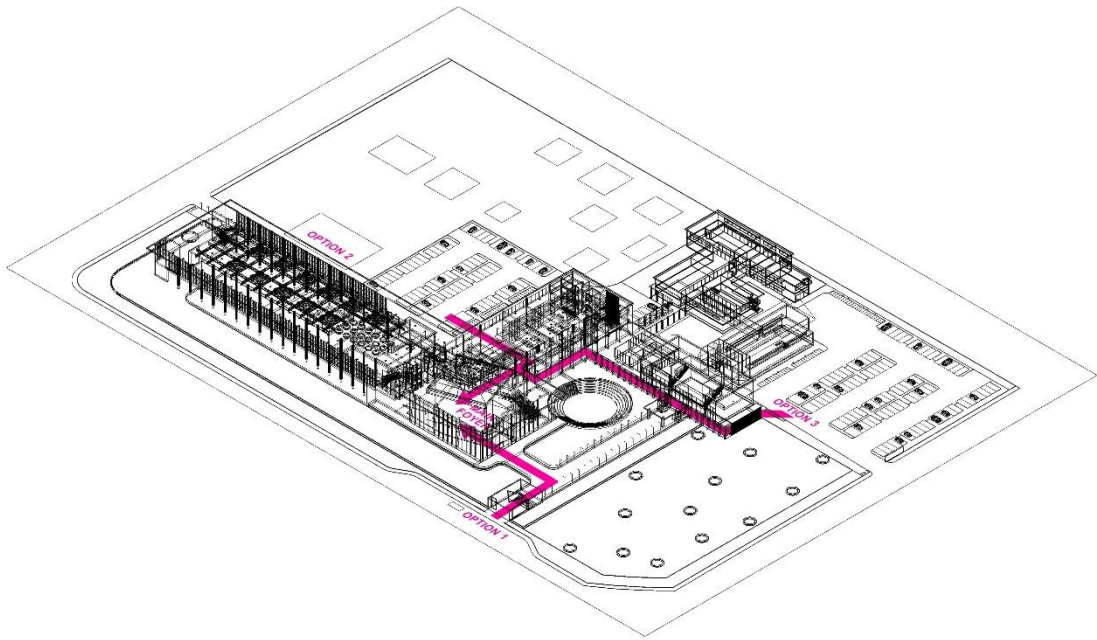


Figure 5. 14 New access paths to exhibition area

The linkages between the existing and the new building (transitional space) are designed to optimize space as a circulation and functional area for users as shown in Figures 5.15–5.17.

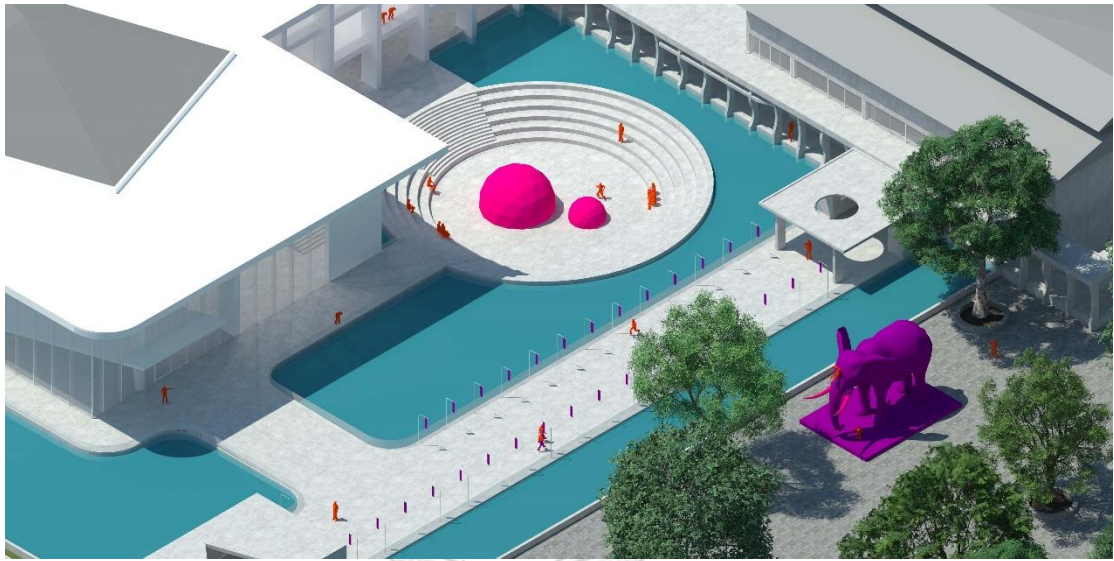


Figure 5. 15 Normal condition of transition space

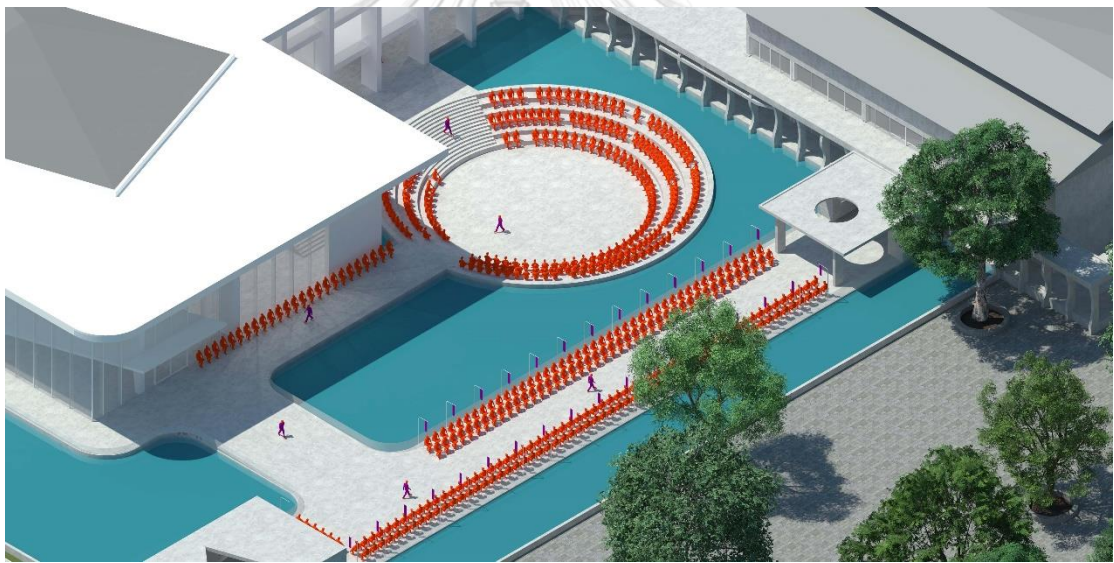


Figure 5. 16 Situation A of transition space (Fashion show)



*Figure 5. 17 Situation B of transition space (water-well)*

For the exhibition area, a circulation route guides visitor to walk from the first floor (people's gallery) to the second floor (main gallery) and end the circuit at the souvenir shop. On the second floor, the main gallery provides movable panels to support flexibility of the exhibition space. Its allow artists to reorganize the space based on their needs. An example of the layout is presented in Figures 5.18-5.21.



*Figure 5. 18 Movable panels - layout 1 (without panel)*





Figure 5. 19 Movable panels - layout 2

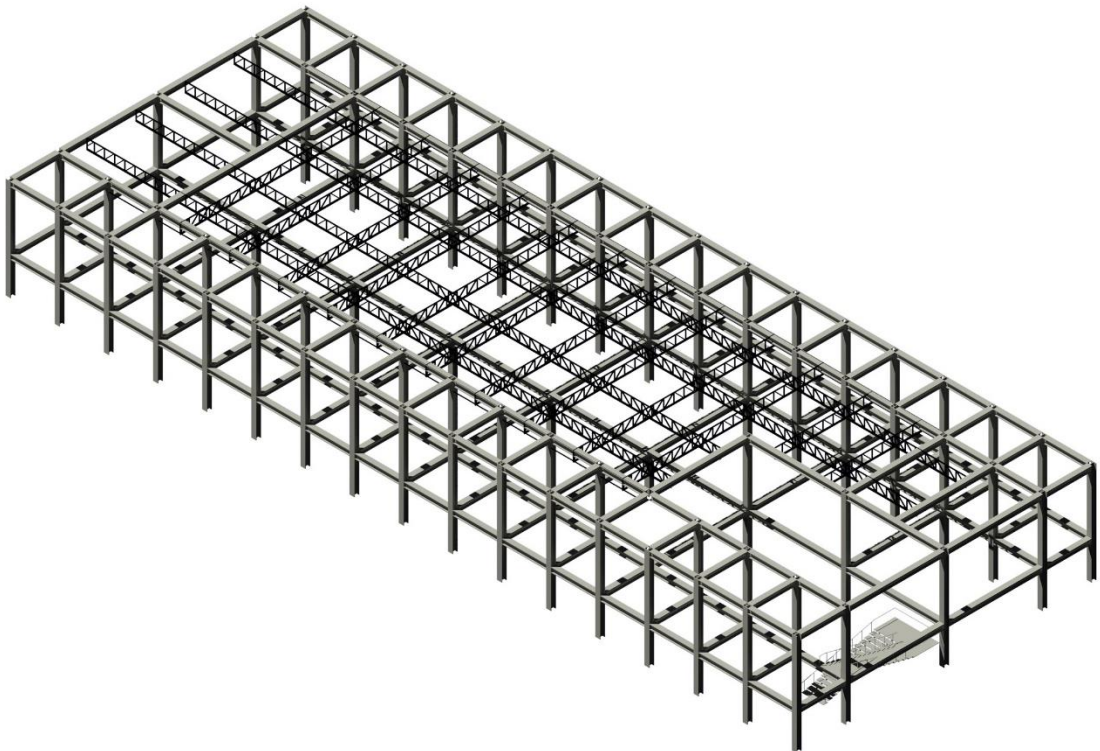


Figure 5. 20 Movable panels - layout 3



*Figure 5. 21 Movable panels - layout 4*

The structural system of exhibition and education part used prefabricated system (skeleton) attached to the main entrance's structure (load bearing wall). However, the system is designed as a standalone and does not require additional structure. The structural system of the expansion building is presented in Figure 5.22.



*Figure 5. 22 The structural system of the new exhibition*

The water and air-condition systems were located at the roof of the building and distributed down through a gap between double-wall system as shown in Figure 5.23.

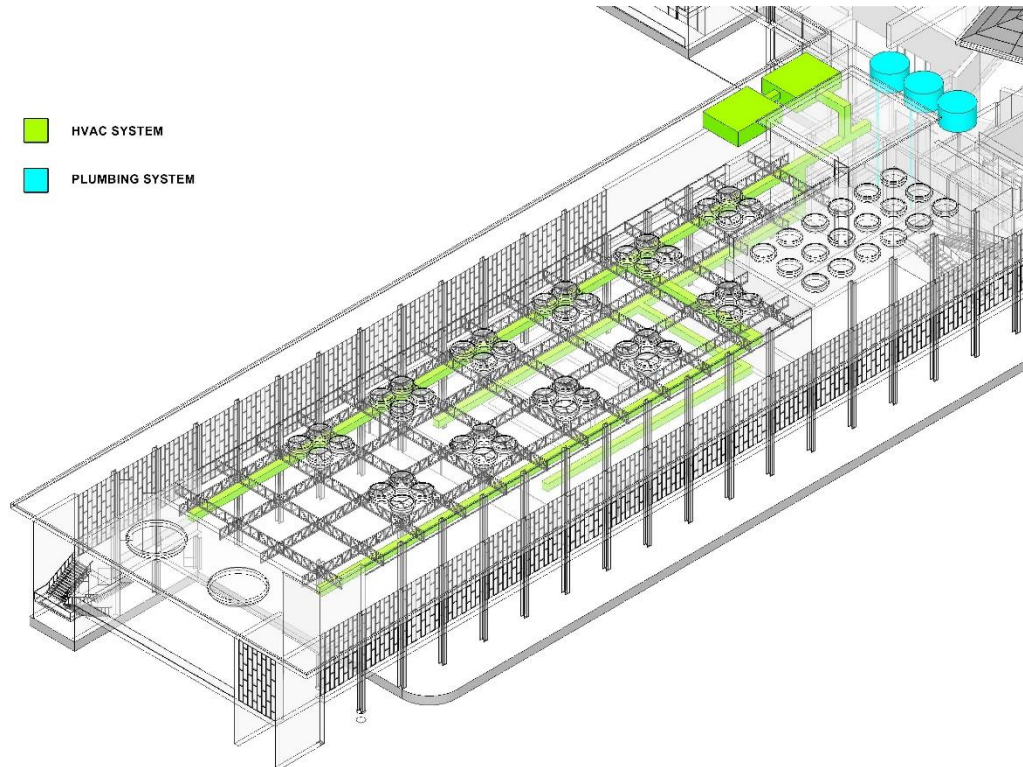


Figure 5. 23 Water and air-condition system

The appearance of the new building was inspired from the existing art center, focused on the design of columns with a free-form pattern (Figure 5.24). The new building adapted vertical elements to link together the existing and expansion building.

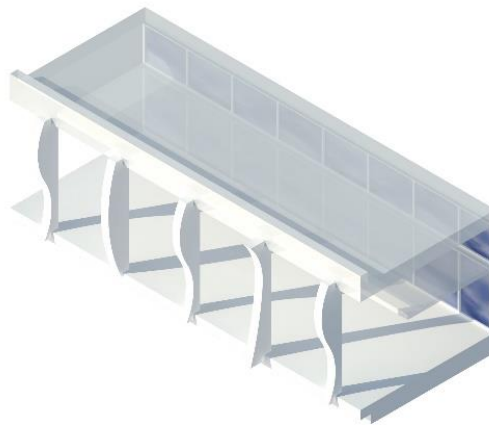


Figure 5. 24 Free-form columns (existing art center)

A façade system can be redesigned upon local context. For this site, a pattern of Fah-pa-kon (carved-wooden partition) from a traditional Thai house was selected as an inspiration with ribbed glass, which allows for the effect of a translucent and blurry from outside-in and vice versa. The design does not distract visitors with a fancy façade pattern. A series of façades were presented in Figure 5.25.

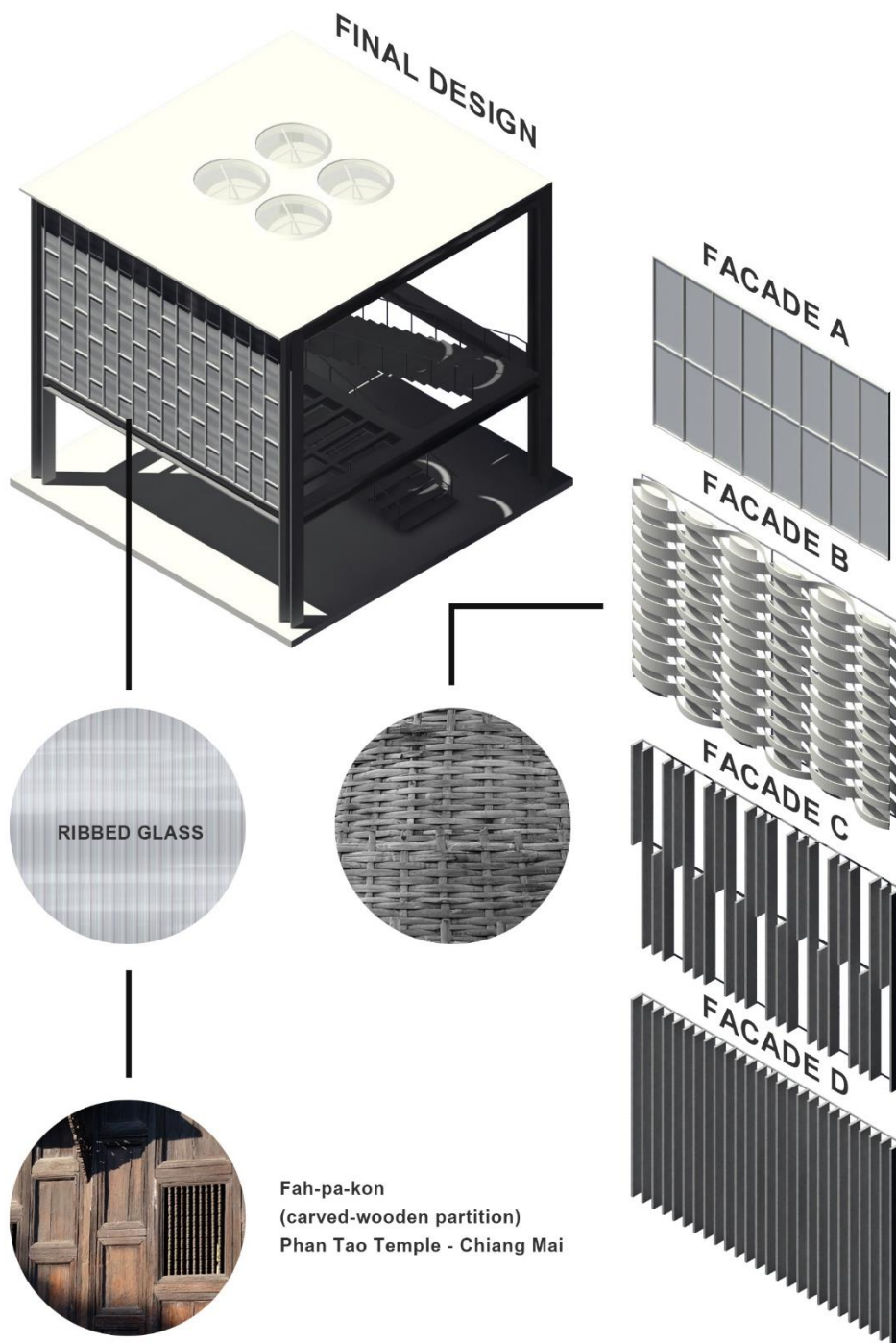


Figure 5. 25 Facade design

The prototype provides four types of roof structure to control the amount of natural light (Figures 5.26-5.27). Architects can select a suitable type of roof structure for a specific area of art space.

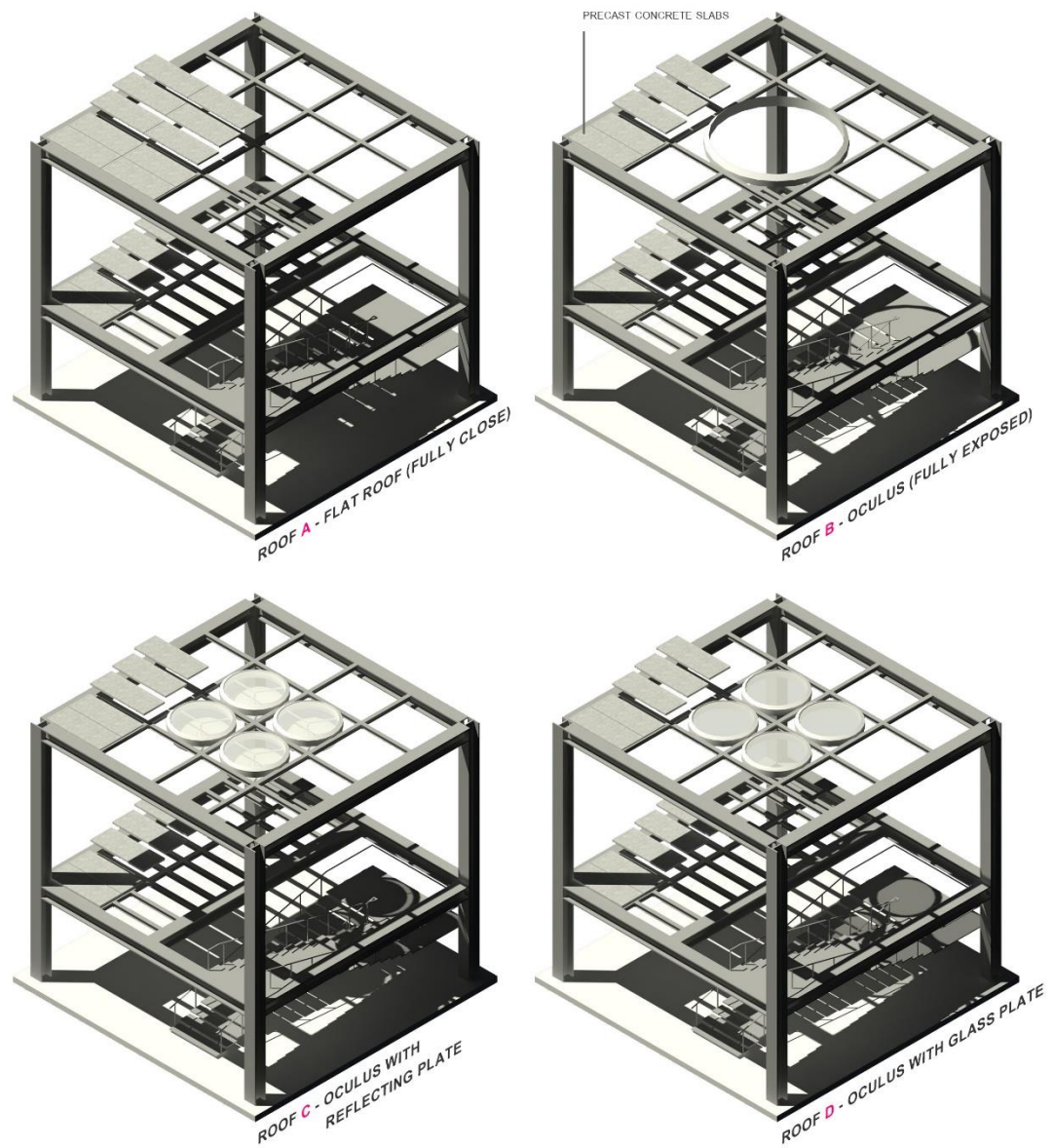


Figure 5. 26 4 types of roof structure

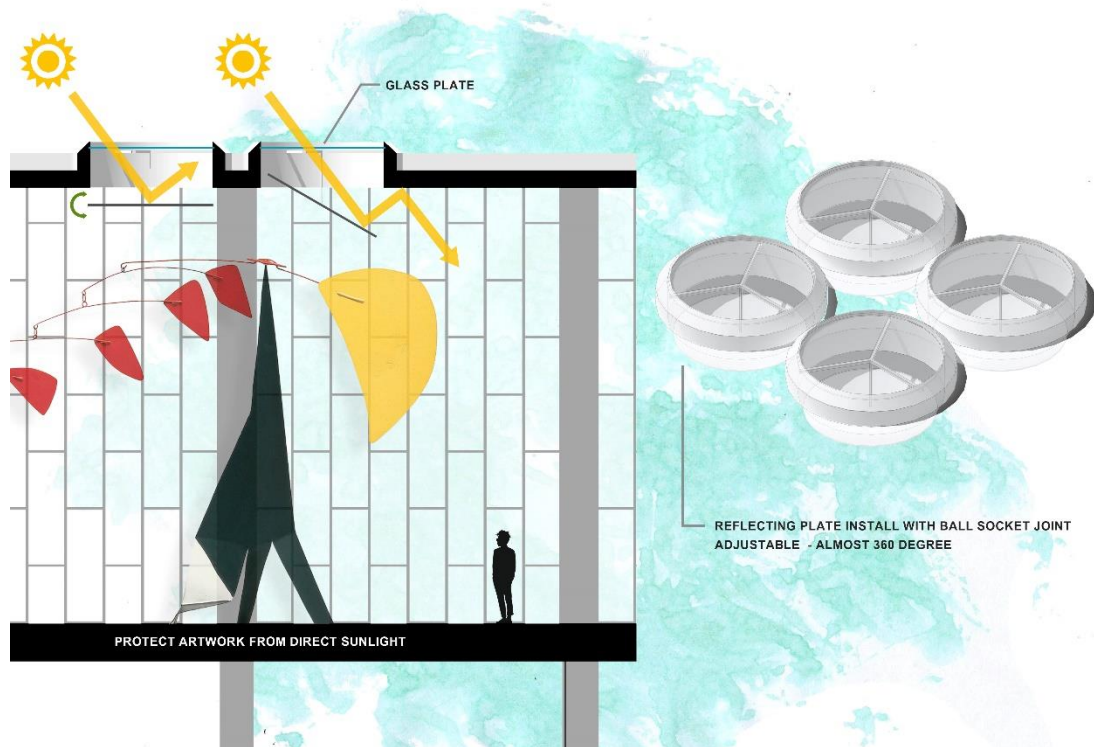


Figure 5. 27 Roof structure – type C

The advantage point of prefabricated system is to provide flexibility in terms of expansion. From the financial perspective, the system can reduce the obligation by managing the construction period into phase by phase. The exhibition area can expand as shown in Figure 5.28.



Figure 5. 28 Construction of the new building - phase 1&2

Figures 5.29-5.37 present elevations, sections, exterior and interior perspectives.



Figure 5. 29 Elevations of the new complex

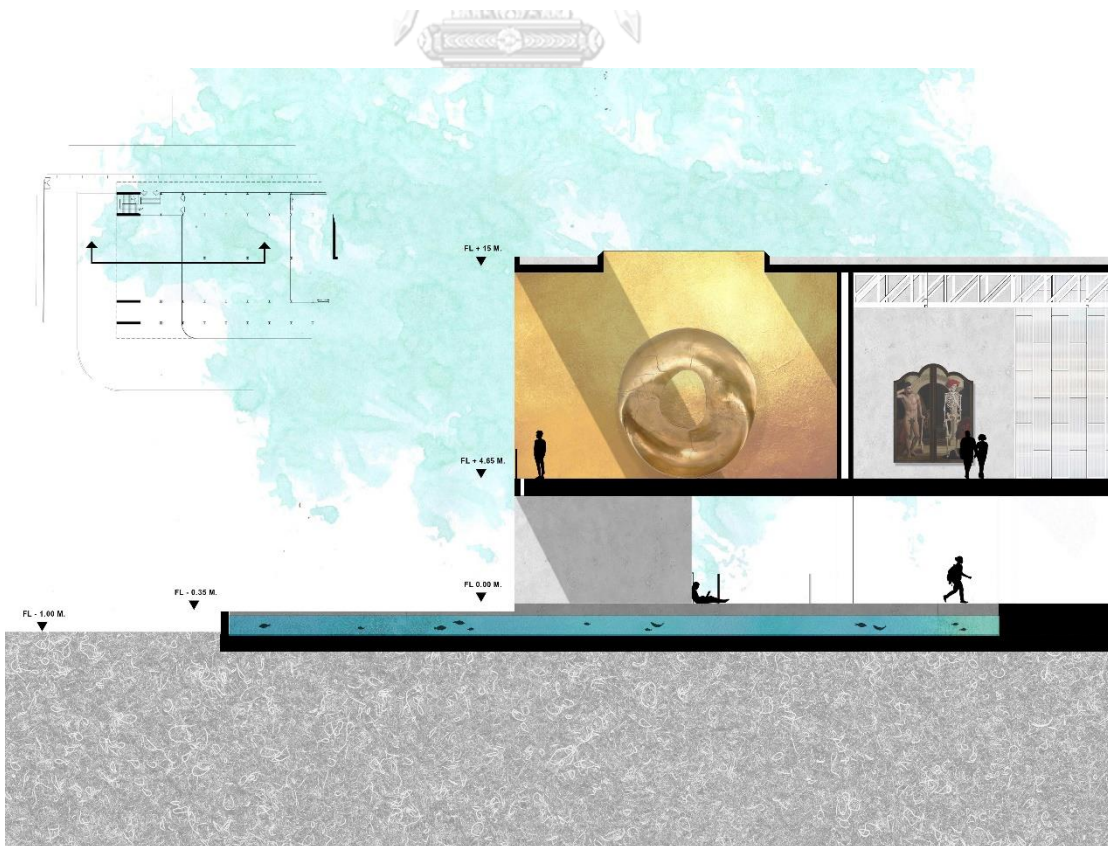


Figure 5. 30 Section A





Figure 5. 31 Section B



Figure 5. 32 Perspective - Foyer



Figure 5. 33 Perspective - Main staircase

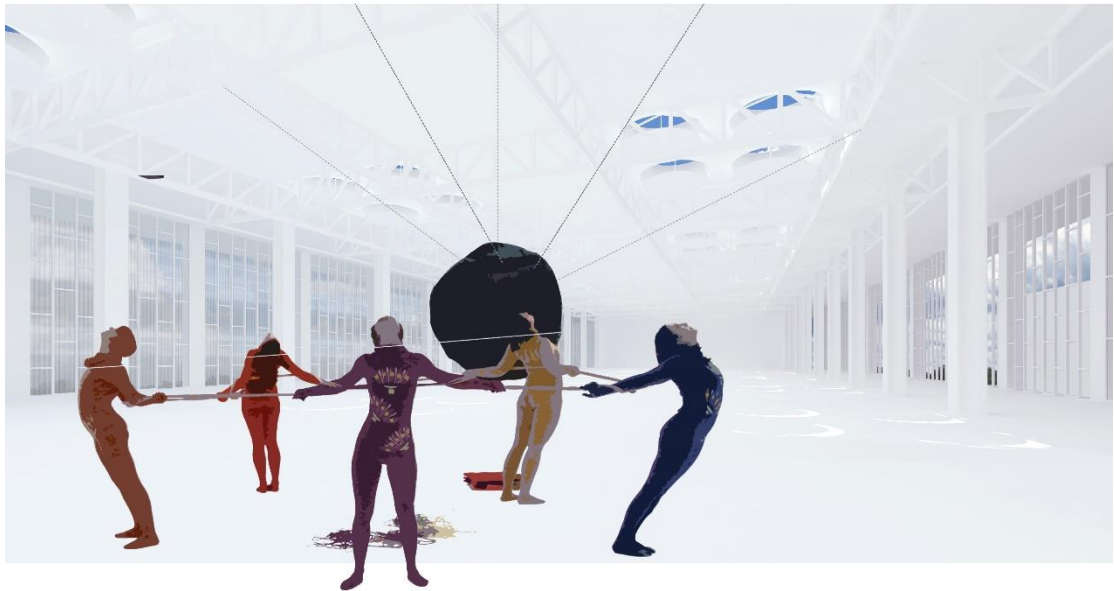


Figure 5. 34 Perspective - Exhibition space

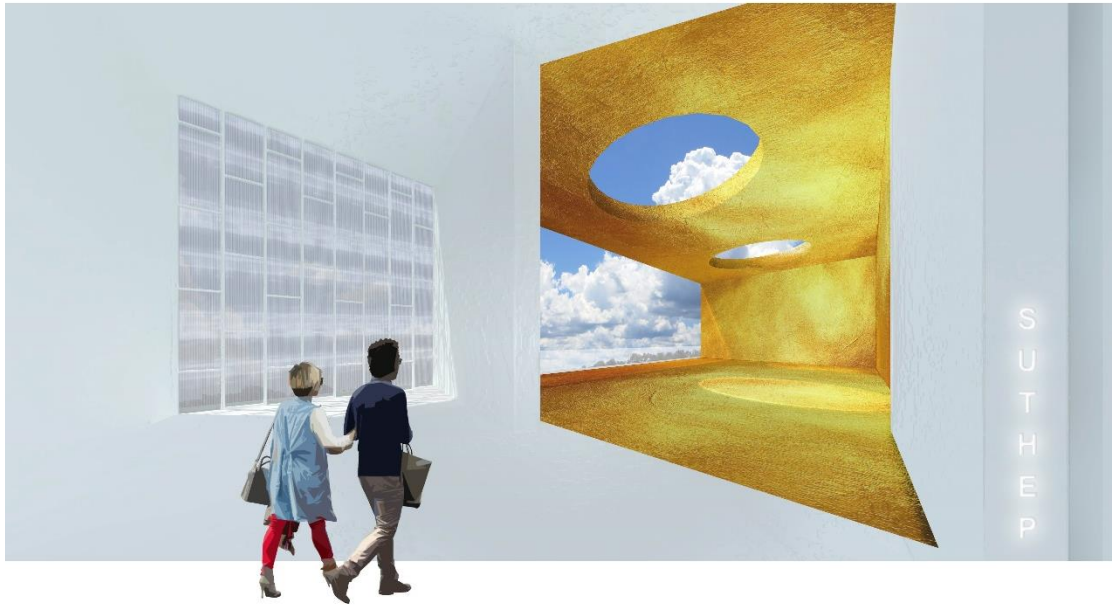


Figure 5. 35 Perspective - Suthep room (highlight exhibition)



Figure 5. 36 Perspective - Suthep room (Exterior)



*Figure 5. 37 Perspective – Main entrance*

Suthep room is a highlight exhibition of the new building: it is the room facing Doi Suthep and receives sunsets until the sun disappears into the mountain range (Figure 5.38). The room can be used as a permanent or temporary exhibition based on the exhibiting artist's needs.



*Figure 5. 38 View from the site toward Doi Suthep*

## Chapter 6 Discussion and conclusion

### 6.1 Discussions

The most crucial aspect for design of an art space is to know the various art forms and the consequences of form toward space. Architects should visit several museum or gallery to understand space and art form. There are so many type of arts, especially contemporary artists try to go beyond ordinary mean as an escape from limitation of form, on the other hand, architect should design space to accommodate a new form of art along with artists. Flexibility is a keyword for designing art spaces as the author demonstrated in design implementation (Chapter 6), the exhibition space can be reorganized by curator or artists to accommodate their works. Moreover, a layout and circulation should be easy enough for a user to explore from one destination to another.

Adding a highlight to art spaces is recommended as alternative attraction by increase liveliness and unique atmosphere to the place as mention in Chapter 3. For example, the final design used a view of Doi Suthep as a highlight for the art center to create uniqueness experience to users.

This thesis is a starting point for architects to rethink art space in the future, especially contemporary art where artists try to go beyond traditional forms. From an architectural perspective, architects should try to go beyond traditional boundaries, too.

The last aspect to mention is lighting design. Natural and artificial light are crucial to designing an art space because light can affect the observer's visualization and emotion. Architects should design a controlled environment to preserve an artwork and provide a suitable atmosphere for experiencing art.

In the future, it is necessary to think further about how this idea of flexibility could be the final answer for contemporary art space. Moreover, the idea of a prefabricated system should be further studied in other types of building.



## 6.2 Conclusion

In conclusion, the main scope of this research is to suggest an alternative design approach for contemporary art space using an analysis of existing art spaces from a local to an international scale as the framework to develop archetype. The survey reveals that art spaces need to improve existing conditions. Architects should consider the following four categories as a framework to design future art space:

1. Art form plays an important role in determining a design for art space, since each form of artwork needs its own specific design criteria, to minimize limitations from architecture to the artist. The design framework should satisfy contemporary artists and curators in terms of providing flexibility of exhibition space by using architecture design to tackle this problem.
2. Create a highlight in the exhibition or transitional space in terms of a spatial aspect to add attractiveness to art spaces. Arts is not the only aspect that attract people to an art space as the space itself can be considered a highlight along with the art pieces. Another crucial aspect for the design of an art space is to provide a clear and simple circulation to convey the visitor throughout a gallery because complex circulation may cause a disoriented experience for the visitor.
3. Study the users' behavior and local context to support additional functions for an art space, such as library, studio, meeting room, auditorium, and so forth, to attract more active users to the site.
4. Lighting design for an art space is crucial. Suitable lighting can determine mood and character of the artwork for the spectator. An architect who designs an art space should explore several art forms to find a suitable environment for specific artwork.

In addition, this thesis focused on the prefabricated structure as a main construction technique due to advantages of the system. Yet, it does not mean that this system is the most suitable choice for designing all art spaces; on the contrary, some museums or galleries may not need a flexible exhibit space due to its design for specific art pieces. Architects should focus on function, followed by the building's aesthetic aspects to maximize capacity of the space. Moreover, the design framework may benefit other building types to improve the existing framework toward the project's future expansion.





### 6.3 Recommendation

As an architect, it is important to study every aspect of the design. For a contemporary art space, the client is not only the owner of the space; so too are the visitors, curators, and artists. Art space does not need fancy material for decoration, but it does need direct and clear design to incorporate and compliment an artwork. In this author's opinion, the most successful outcome in terms of design is to represent a fully functional building not just an aesthetic building.



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APPENDIX



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