HUAYKAEW
INTERNATIONAL BOARDING SCHOOL

Nattika Muangkiaw

A Thesis Submitted in Partial
Fulfillment of the Requirements
for the Degree of

Bachelor of Architecture

Department of Architecture School of Architecture and Design
ASSUMPTION UNIVERSITY
2016

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INTERNATIONAL BOARDING SCHOOL

Nattika Muangkiaw

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The international boarding school is the place where students can gain more benefits from small classes and high interaction between students and their teachers. The design for campus environment aims to ensure that students are immersed in a great education where learning is center for all activities. The school is the unique place that promotes common experience, camaraderie, friendship, trust and honesty for students, teachers and parents. It's an ideal preparation facility for students to develop maturity and responsibilities as an adult. I have a personal interest in the issues about the education system in Thailand. The general public schools are usually focus in the general studies that do not develop necessary skills and knowledge for students, and the architectural designs for these facilities do not inspire or encourage students to learn. The school designs cannot satisfy students needed the way it should be to develop self-learning skills. So, I intend to design the architecture that develop good educational environment and generate a sense of community where allow an integration for specific training classrooms and create a new education experience Boarding school. Architecture can be a place where inspiring and motivating student to learn, play, live efficiently together and think out of the box without controlling like they have been before. School will not get student boring anymore. It is not equally humdrum as other ordinary school and this can improve children's development appropriately.

Thesis Approved:

Date Assoc. Prof. Pralong Phirananda, DEAN

Date A.Suparath Valaisathien, Chairperson

Date A. Suriyong Suriyachat, Thesis Advisor

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Chapter 1: Thesis Introduction

1.1 Background of interest

My background of interest focuses on the architectural design for schools, which evolved from the aspects of the school teaching and learning system in Thailand. Regular schools environments do not suit most students' knowledge development, and the architectural designs do not generate any inspirations to encourage effective learning environment. The education systems in the regular schools are equally humdrum. The school environments cannot satisfy students' needs, and students mostly learnt from the textbooks and follow their teachers' instructions. They go to school day by day to repeat the daily time schedule that the regular school system was set to learn. When you look at the classrooms in the past and compare them to today's classrooms, you will see that nothing has changed. Thus, I came up with the general question that what kind of school environment is appropriate for students learning development in the future.

"" Don't control them, don't protect them too much. They need to tumble sometimes. It makes them learn how to live, they have to be self learning instead of forcing them to do something" [1]

- - Dr. Montessori

According to this description, schools' environmental design should support and encourage self-learning system. All students should have their own individual learning plans, which relate to their talents, skills, and interests. For my thesis project, I intend to combine architectural design with the design aspects from the effective education system criteria and a sense of community where people can integrate a nontraditional classroom into the learning experience for new ways of teaching and learning.

[1] Maria, Montessori, "The Montessori method", 11 December, 2017

Another key point is about the rapidly changes in today natural environment that does not only cause pollutions and large amount of energy consumptions but it also influences the buildings designs. The natural resources are not used wisely and buildings are not designed to achieve the best comfortable living environment. Today, the schools' environmental designs cannot support and satisfy effective learning activities and learning sufficiency. Most design conceptual is aimed at the most comfortable and suitable solutions for the schools' typologies and their functions without understanding of the neither efficient spaces nor relationship to the existing context.

My thesis aims to provide an alternative design that allow students to learn, live and play together in the place where we can combine effective learning activities in the school facility with appropriate connections to the surrounding context. Furthermore, the new boarding school's design can also provide the good quality of living for students through the designs for architectural spaces, green spaces, and landscape design spaces that allow the most efficient learning development for students. (To explain, there are surrounded by nature utilizing and children will be able to do different activities not just only blocked by building or jumping on cement like they used to. Furthermore, they don't need to spend nearly two hours per day for getting to school. All of the results, these will take children outside the box and they will learn more about the changing lives outside of the classroom.) [2]

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[2] Nara, Phudkho, "The priciple of designing local school in Northen east region by natural method", Master's thesis, Chulalongkorn University, 2001.

1.2 Issue of Interest

The most efficient learning development for students, to achieve the best comfortable living environment of the school is the combination of effective self-learning activities in the school facility.

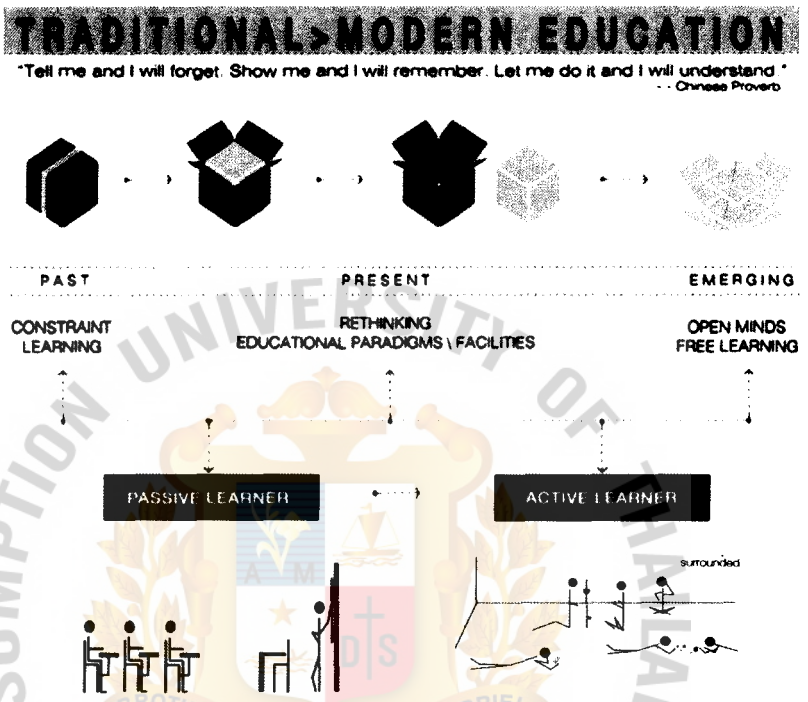

Figure 1.1 Comparison between passive learner and active learner

1.3 Objective

- To develop design criteria for effective self-learning environment for a boarding school design by studying effective boarding school systems, efficient learning development system, and students' behaviors.
- To propose an alternative design solution for the boarding school's physical environment, which focuses on students' learning development.

1.4 Hypothesis of proposal

Architectural design can create quality spaces to inspire students learning development, a place where students can play and live together harmoniously, as well as developing more efficient skills and knowledge.

1.5 Research outline

- Research theory
- Space learning theory
- Psychological space for children
- Principle and element of architectural perception
- Space and development of children

1.6 Data analysis

- Montessori theory
- Users behavior
- Analysis of children psychology and space
- Analysis of the differences between children's behavior and architectural perception
- Program and facilities
- Concept and design

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Chapter 2: Literature Reviews

2.1 Introduction to the Literature Review

This research began with the study of the developmental guideposts for children and adolescents from the three to eighteen years of age. In order to understand architectural design aspects regarding school design, the research is aimed to gain an understanding on their behaviors in terms of physical, emotional and social interactions. Example of building planning organization such as cluster model planning typology that organized around common services and corridor has been taken to the study. In the book "Elementary and Secondary School" by Lippman, he has listed as followed: [3]

Ages 3-5

- Anger directed to cause of frustration
- Changing anger is important
- Tend to imitate adult

Ages 6-9

- Begin to assert independence and demonstrate
- Begin to sense how other people feel toward them
- Family influence decrease
- Internal conflict

Ages 9-11

- Fear exclusion from peers
- Boy and girl play separately

[3] Peter C., Lippman, "Elementary and secondary school", Courtesy of Perlins Eastman.

Ages 12-14

- Emotions vacillate responses are inconsistent
- Develop sense of humor to control emotions
- Motivated by desire to fit in with peers
- Assert independence from home

Ages 15-18

- Feel restrained or controlled by adults
- Have insecure self image
- Find comfortable self image
- Independence assert
- Most concern about social life

In summary, children age of twelve to eighteen years old (the high school students from year 7 to year 12) are the most suitable age for boarding school because they can live on their own. They can develop an emotional control by themselves and they start to pay attention to the social interaction.

2.2 Space and program

Space and program development for this project began with the study on some examples of school facility programming that explain about the area requirements in boarding school design in relation to the site context. The following list is the summary of a building components to be accommodate on the site: [3]

Proper organization of the components will maximize the use and efficiency of the building. I found the relationship of these components in relations to various exterior requirements. The site plans and examples illustrated in the book "Elementary and Secondary School" by Peter C. Lippman, page 141, have demonstrated the number of

these components and their relationship in the following part. Many schools' design have used these programs for the educational and recreational zoning, these programs include: [3]

- Pathways/ walkways
- Play structures
- Free – play areas (free from equipment for creative play)
- Hard – surface open space (rectangular or square, with a variety of game markings)
- Soft – surface areas, such as sand boxes or aquatic features
- Fixed seating areas for conversation, teaching, reading, or other forms of individual and group interaction[3]
- Dramatic, musical, or other large muscle play areas, such as amphitheaters, covered pavilions or open air porches
- Sport and play fields
- Expanded on site parking and bus access

Another important space to be considered is the 'play areas'. The school playgrounds are also the important part of the school's educational experience. In the school designs, exterior programs are important for the school's appearance. It requires a mixture of space for the active activities such as ball games and sport activities.[3]

[3] Peter C., Lippman, Elementary and secondary school", Courtesy of Perlins Eastman.

2.3 Research plan: Case study approach

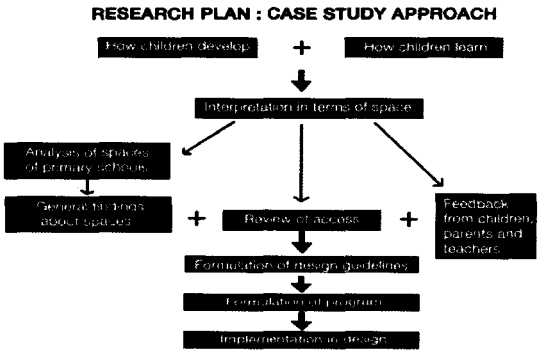


Figure 1.2 Rethinking-learning spaces for student development

How children develop

1. Cognitive development

Cognitive development is the ability to think and understand. A research focuses on how a children imagines the world. Jean Piaget was a major force in the establishment of this field, forming his theory of cognitive development.

2. Social-emotional development

Social-emotional development includes the child's experience, expression, and management of emotions and the ability to establish positive and rewarding relationships with others. Young children are particularly attuned to social and emotional stimulation. In the book "Social-emotional development Domain" by Cohen, he has explained how the children interact with peers: [4]

Interactions with Peers

In early infancy children interact with each other using simple behaviors such as looking or touching another child. Infants' social interactions with peers increase in complexity from engaging in repetitive or routine interactions with peers (for example, rolling a ball back and forth)

[4] Robert, Griffort, "Social-emotional development Domain", California Infant/Toddler Learning & Development Foundations.

to engaging in cooperative activities such as building a tower of blocks together or acting out different roles during pretend play. Through interactions with peers, infants explore their interest in others and learn about social behavior/social interaction. Interactions with peers provide the context for social learning and problem solving, including the experience of social exchanges, cooperation, turn-taking, and the demonstration of the beginning of empathy. Social interactions with peers also allow older infants to experiment with different roles in small groups and in different situations such as relating to familiar versus unfamiliar children. As noted, the foundations called Interactions with Adults, Relationships with Adults, Interactions with Peers, and Relationships with Peers are interrelated. Interactions are stepping-stones to relationships. Burk (1996, 285) writes:

As teachers, need to facilitate the development of a psychologically safe environment that promotes positive social interaction. As children interact openly with their peers, they learn more about each other as individual, and they begin a history of interactions.

3. Physical development

Physical development is the process that starts in human infancy and continues into late adolescent concentrating on gross and fine skills as well as puberty. Physical development involves developing control over the body, particularly muscles and physical coordination.

[4] Robert, Griffort, "Social-emotional development Domain", Caifornia Infant/Toddler Learning & Development Foundations.

Physical Development of the High School Learners

Module 24: is the age or stage when an organism can reproduce. It is sometimes considered synonymous with adulthood. In humans, the process of sexually maturing is termed puberty. Hormones are recognized to be powerful and highly specialized chemical substances hat interact with bodily cells. Gonadotropic hormones are secreted by the anterior pituitary, which lies beneath the base of the brain and are situated approximately at the geometric center of the human head. Gonads which are the ovaries of the female and the testis in the male, are then stimulated by the gonadrotopic hormones, in turn stimulating their own hormones. Secondary male sex characteristics are stimulated by testosterone, while estrogen is secreted when female ovary is stimulated. Spermache signals the first sign of puberty and sexual maturity in boys. the article, "Physical Development of the School Learners", The following list is the summary of the pubertal changes to adolescence researched: [5]

Pubertal changes Adolescence Sleeping Habit

- Studies show that teenagers are not getting enough sleep, and would want to sleep more.

- Early or late maturation deserves due consideration, as this can be a factor for adolescence acceptance and comfort or satisfaction with his/her body image.

The Ideal Masculine and Feminine Physiques

- Necessary for adolescent years are sufficient amounts of vitamin B12, calcium, zinc, iron, riboflavin, and vitamin D. Vegetable intake is good, but this should be balanced with food intake to form high-quality nutrition including eating protein sources such as milk, dairy products and eggs.

---

[5] Module24 : Physical development of the school learners, http://prezi.com/wmzmqjevrm8g/module-24-physical-development-of-the-high-school-learners/

Space for cognitive development

Interpretation		Observation		Implementation
- Operational thinking Think in space/space an organized logical fashion	+	Being active agents	=	active for self learning
- Development of social brain	+	through co-operation	=	interaction space for large
- Naturalistic intelligence connection with nature	+	being observant and sensitive to nature	=	space having

Space for socio emotional development

Interpretation		Observation		Implementation
- Peer relations space	+	interaction	=	Interactive
- self esteem	+	self reflection or passive thinking	=	Passive space
- The need to express their self identify space	+	personalization	=	personalized self learning
- Understanding of children's imagine of culture and tradition	+	Familiarity, cultural	=	building as an culture tradition

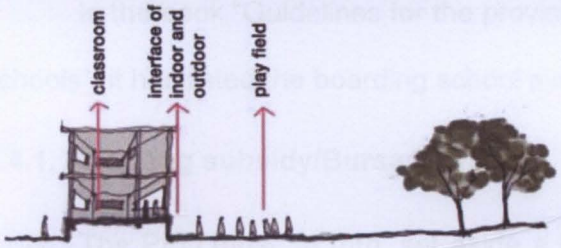
Space for physical development

Interpretation		Observation		Implementation
- healthy bodies playing	+	play	=	space for

[5] Module24 : Physical development of the school learners, http://prezi.com/wmzmqjevrm8g/module-24-physical-development-of-the-high-school-learners/

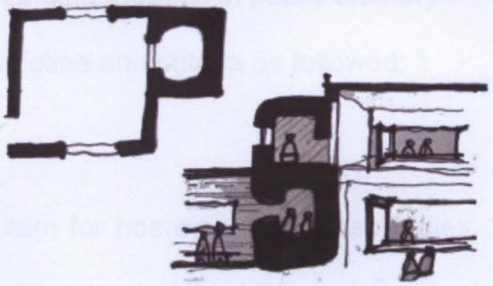
PASSIVE SPACE

Gerneral findings



- no designed passive space
- interface of two activity space work as passive space

Criteria of space



PERSONALIZED SPACE

there is no scope for personalization of student's own space

space that encourage student to be self learning

individual working table

SPACE HAVING CONNECTION WITH NATURE

- no linkage between indoor and outdoor

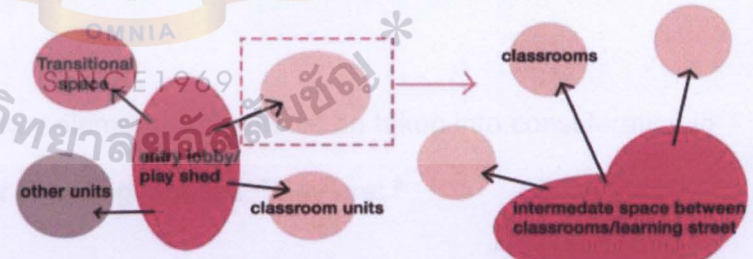
Outdoor class — Transition space — Classroom

INTERACTIVE SPACE

- open space field(under a shading tree)
- corridor
- near tube well

COMMUNITY = INTERACTION

COMMUNITY CENTRE = INTERACTIVE SPACES



- LEARNING
- TRANSPARENCY

→ BREAK DOWN BARRIER OF COMMUNITY + SPACES

2.4 Boarding School system guideline

In the book "Guidelines for the provision of boarding facilities in public ordinary schools", it has listed the boarding school system guideline and criteria as followed: [6]

2.4.1. Boarding subsidy/Bursary criteria

1. The PED must, in turn, set aside a budget item for boarding (hostel) subsidies. Schools with boarding facilities will be paid pro rata out of this budget for each of their learners:
    1. (a) Who have to walk 10km or more to and from the nearest school;
    2. (b) Whose transport time amounts to one-and-a-half hours or more;
    3. (c) If there are no available places in a school near the learners' parents' place of residence; and
    4. (d) Learners whose parents cannot afford the per-child cost.
2. The PED may adjust these criteria in order to ensure that he subsidy per learner is sufficient. The fact that this may decrease the number of learners that could be assisted and therefore requires a tightening of the targeting criteria.

2.4.2 Planning guidelines

Planning guidelines identify key elements that should be taken into consideration in the provision of infrastructure for boarding facilities. They are: [6]

Classification and capacity of boarding facilities: Prototypes

1. Secondary school boarding facility will accommodate learners from Grades 8 to 12, from a minimum of 60 to a maximum of 300 learners.

2. Size of the site of a boarding facility: The minimum site size will be four hectares for secondary schools' boarding facilities, excluding sporting fields.

3. Location of the site of a boarding facility: Where possible, boarding facilities should be located adjacent to the schools they are serving. The sites of boarding facilities will not be located immediately adjacent to cemeteries, business centres, railway stations, taxi ranks, sewage treatment plants and community hostels, nor bordering on busy roads, unless adequate preventative measures are taken to ensure the safety of the learners. The location of the boarding facilities should ensure easy accessibility to roads, sewage lines, basic services etc.

2.4.3. Architectural requirements

Architectural requirements define the spaces that are required in a boarding facility to make it an enabling, supporting educational environment. Spaces are identified in terms of the activities they house and their size. Space size is defined in terms of minimum and optimum sizes. The spaces required in boarding facilities are: [6]

1. Bedrooms/dormitories. These are areas where students spend their time when they are not in the classes, studying and extramural activities.
2. Staff quarters. Staff quarters are areas where the staff members responsible for the management of the facilities and for taking care of learners are housed. Hostel managers, matrons and support personnel occupy these spaces.
3. Administration space. This is an office in the boarding facility for administration matters, such as the manager's office.
4. Lounge. This an area, perhaps situated in the reception area that could be regarded as a waiting area for parents.

---

[6] Mafoko R.,"Guidelines for the provision of boarding facilities in public ordinary schools", Physical Resources Planning and rural schooling.

5. Nutrition center / Kitchen. This space is used for different activities, which include preparation of food, cooking, food and crockery storage, a scullery and a control room for management purposes.
6. Dining hall. This is a space where meals are served.
7. Laundry. The laundry refers to an area where learners' clothes and linen are washed, dried and ironed. The laundry comprises the washing area, the ironing area and a drying or hanging area.
8. TV room. This is a room that is dedicated for boarders watching television (TV) during their leisure time, without disturbing others.
9. Entertainment room. This is a room in which learners can participate in other leisure activities, such as indoor sport, dancing, playing games etc.
10. Computer cubicles. These are spaces that are designated for computer usage where there may be internet connections.
11. Study area. This is an area that learners use to study in the evenings and over weekends in cases where there are no study areas in the dormitories.
12. Parking spaces. Staff members and parents use parking spaces when they drop off and pick up learners.
13. Ablution blocks. These refer to toilets spaces, showers, washbasins and baths.
14. Pastoral care. This space usually houses a sickroom and/or a room for a psychologist.
15. Telephone booths. These refer to a cubicle or a room for public phones that

[6] Mafoko R., "Guidelines for the provision of boarding facilities in public ordinary schools", Physical Resources Planning and rural schooling.

2.5 The principle of design and architectural perception

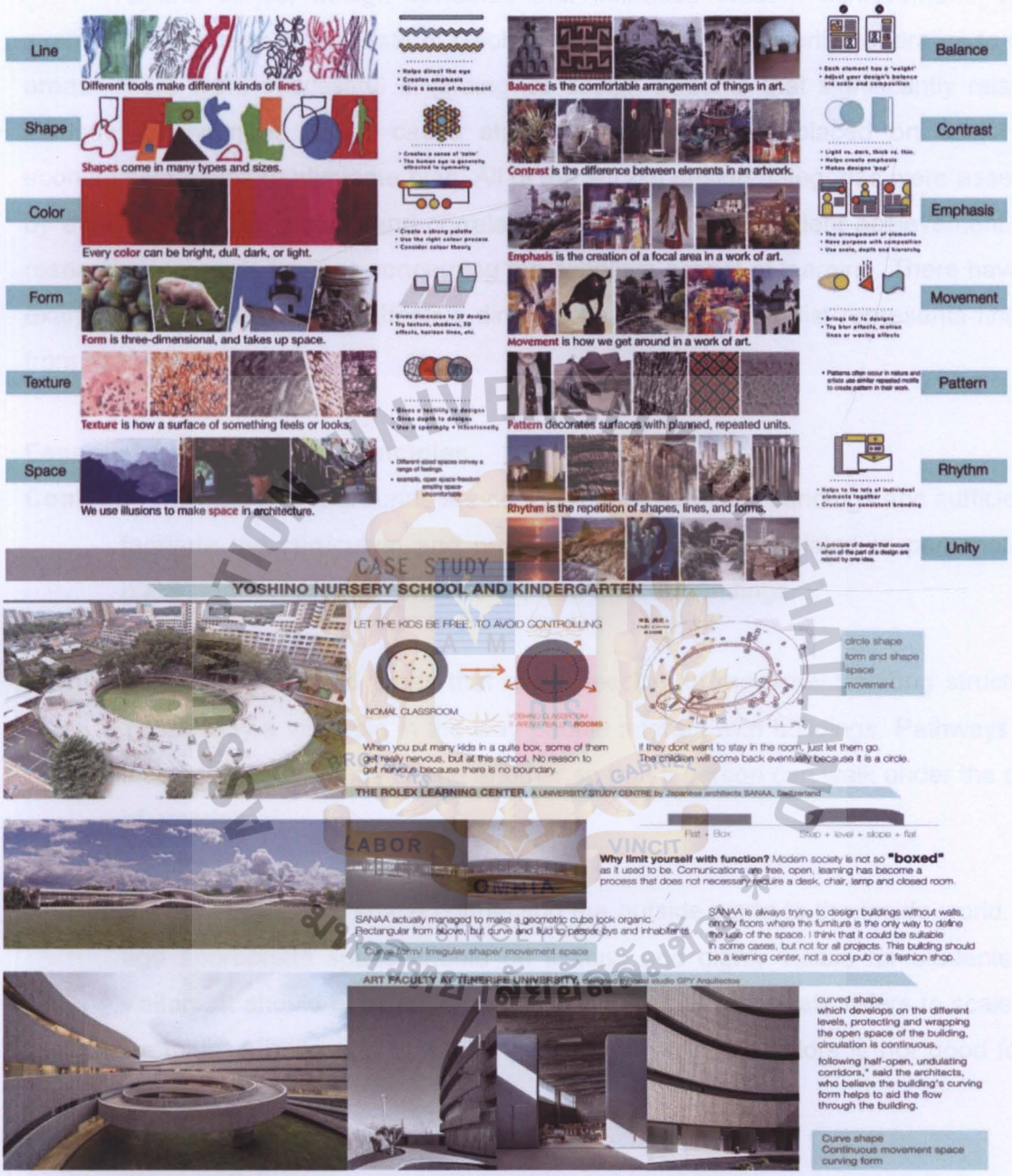


Figure 2.2 case studies of Architectural perception in school (Image source:,

https://www.dezeen.com/2010/02/17/rolex-learning-center-by-sanaa/)

[7] https://www.dezeen.com/2010/02/17/rolex-learning-center-by-sanaa/ ,https://www.dezeen.com/2016/05/12/faculty-of-fine-arts-for-the-university-of-la-laguna-gpy-arquitectos-tenerife-concrete/

2.6 Essential Aspects of Designing a School

To find school design variables that influence student achievement. These examples have been in the State of Georgia and may not necessarily generalize to other areas. There were successful in finding 29 design patterns that significantly relate to student achievement. In all cases statistical controls were placed on social and economic variables to eliminate bias. All of the school design categories were assessed by a valid and reliable scale and correlated significantly with student achievement. The research represents findings concerning the cognitive aspect of learning. There have not examined the behavioral or affective dimensions. The following list represents findings from two studies: [11]

Essential School Design Principles

Context - The school and grounds are compatible with the surroundings and sufficient to facilitate the curriculum and programs. This principle relates to personality of place and "in harmony" with nature and the surroundings.

Pathways - Clearly defined areas that allow freedom of movement among structures. These play a vital role in the way people interact with buildings. Pathways may also connect buildings to one another so that a person can walk under the cover of arcades.

Entrance Area - A friendly space connecting the outside world to the inside world. This age appropriate space should be inviting and highly visible for students and visitors. It should evoke a welcome feeling. Age appropriate refers to scale. For example, a huge and threatening entrance with bold colors is not good for an elementary school.

Public Areas - Spaces that foster a sense of community (unity and belonging) were identified as public areas (Auditorium, Amphitheater, Media Center, Commons, and Dining Room). Inviting and comfortable settings include ample lighting.

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[11] Tanner C., Kenneth, "School Design and Planning Laboratory", The University of Georgia Athens, GA 30602, April 2000.

Administration Centralized - Administrative offices are grouped together in a centralized area allowing for connection and convenience. The person in charge should be readily accessible.

Circulation Patterns - Ample spaces that allow students to circulate in and between rooms should be part of the design. The passages should be broad and well-lit allowing for freedom of movement. This pattern is also related to crowding.

Instructional Neighborhoods Within Schools - These areas include a teacher planning area, flex zones, small and large group areas, wet areas for science and art, a hearth area, and restrooms (toilets). The hearth area is also a place used for reading and quiet time. It is amenable to technology.

Multi-functionality of the Facility – Multi-functionality reflects how versatile the facility is in relation to the different tasks it can accomplish.

Physical Education Areas - P. E. or play areas are special places where students are given the opportunity to be together, exercise, build muscles, and test new skills in supervised settings. Releasing energy is an important activity seen in these areas.

Activity Pockets - Spaces should be designed for small group work.

Safe Place - The indoor and outdoor environments guarantee students and teachers security and comfort.

Personal Artifacts - Places for display of items of a personal nature that relate to each student improve school design.

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[11] Tanner C., Kenneth, "School Design and Planning Laboratory", The University of Georgia Athens, GA 30602, April 2000

Classroom Walls - Walls are conducive for displaying students' work. Hallway Display - Hallways (walls and alcoves) are suitable for displaying student work.

Windows - These should give the best possible views overlooking life and bring natural light into the school building. The SDPL recommends at least 72 square feet for windows in a 900 square feet classroom.

Natural Light/ Full Spectrum - Artificial light plus natural light from the outside, preferably on two sides of every room, is ideal. Natural light influences student behavior and attitudes.

Green Areas - Educationally sound school design includes places outside, close to the school building, where trees, grass, or gardens may be seen, but no cars or roads are in view.

Living Views - Views of indoor and outdoor spaces (gardens, animals, fountains, mountains, people, etc.) improve school design. Views allow minds and eyes to take a break. It should not be blocked by curtains, blinds, or other obstructions.

Quiet Areas - Quiet areas are spaces where students may go to pause and refresh themselves in a quiet and supervised setting.

Private Spaces for Students - Supervised private places (inside or outside) where children may go to be alone (i.e. reading area, listening area) are essential.

Technology for Students - Special spaces with computers, compact discs, software, internet connections, television, and video are important for learning activities. In our studies the schools that made computers available for student learning showed higher academic achievement on the average. This finding was after social and economic variables had been accounted for.

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[11] Tanner C., Kenneth, "School Design and Planning Laboratory", The University of Georgia Athens, GA 30602, April 2000

Technology for Teachers - Computers, multimedia, and internet connections are easily accessible. Teachers have access to technology outside the media center for use in research and planning lessons.

Communications - Phones in classrooms, intercom, faxes, e-mail and internet are necessary for educationally sound design.

Outdoor Rooms - A partly enclosed space outdoors; enough like a room, but with the added beauties of nature. This is a room with a sense of freedom. This may be a reading area, a lecture area, or an area for exploring natural habitat. It might be an amphitheater in a natural setting.

Outdoor Spaces - Places where are defined learning areas. There may be surrounded by wings of buildings, trees, hedges, fences, fields, arcades or walkways. These are specific areas that are used as outdoor learning environments such as nature trails.

Egress - Doors allow easy access to the outside environment and learning areas. This is also a safety feature allowing for quick evacuation. The SDPL recommends that each classroom (ground level) should have a door leading to an outside patio and gardens (Outdoor learning environments).

Climate Control - A system of climate control maintains a comfortable temperature in the classroom learning environment. Climate controls should be within each indoor learning environment where the teacher may have control of the temperature range.

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[11] Tanner C., Kenneth, "School Design and Planning Laboratory", The University of Georgia Athens, GA 30602, April 2000

Roof system - A leaking roof can disrupt student learning. The roof plays an important part in the health and comfort of the students and teachers.

Paint - The quality and color of the paint in the halls and classrooms influence behavior. The walls and finishes should be visually stimulating.

Overall Impression - A student friendly and teacher friendly learning environment provides a positive impression. This involves aspects of all positive or negative design patterns.

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[11] Tanner C., Kenneth, "School Design and Planning Laboratory", The University of Georgia Athens, GA 30602, April 2000

Chapter 3: Contextual position

The possibly location of the site of a boarding facility should be located adjacent to the schools they are serving. The sites of boarding facilities will not be located immediately adjacent to cemeteries, business center, railway stations, taxi ranks, sewage treatment plants and community hostels, nor bordering on busy roads, unless adequate preventative measures are taken to ensure the safety of the learners. Moreover, the school should ensure easy accessibility to roads, sewage lines and basic services. Including to the suitable education environment for boarding school, to find the location that support and encourage self-learning system to respond my issue of interest.

Figure 3.1 sites selected

3.1 District selection

The criteria of selected district are:

- Adjacent to business center, railway station, taxi rank, busy road
- Easy to access
- No mass transit not high density of traffic
- Near hospital
- Near police station
- Should not be located in the school serving area

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Figure 3.2 shows the principle city plan of Chiangmai.

Figure 3.3 Macro site planning of Chiangmai

This easy to explain that the light green is the best district selected because others are business zone where have train station, public transportation and commercial zone.

From the ancient remains at the center is the center point that split out 8 main roads in different direction. The right hands side shows the developing business areas where shouldn't be location of school as the following criteria.

Figure 3.4 there are 3-site location where almost follow all the criteria of district selection

Disadvantages of the 2nd choice are there are 1 lane road for accessibility and more closer to the residential areas. And the 3rd one is located in the area where use same road to Doi Suthep so that cause the traffic jam. Moreover, even the 3rd choice is not far from the city but it is difficult to walk from school through the risk way. There has no walkway.

Figure 3.5 shows the nearby places. (Image source: Author's image)

3.1.1 Chiangmai zoo benefit to school for relaxation time as the outdoor activity.

3.1.2 Police station in next to the school is good for emergency situation

3.1.3 Chiangmai university society.

3.1.4 Malin plaza is the place where is important for boarding life that student can buy or find their stuff, food, or something else in every week and recreation place as well.

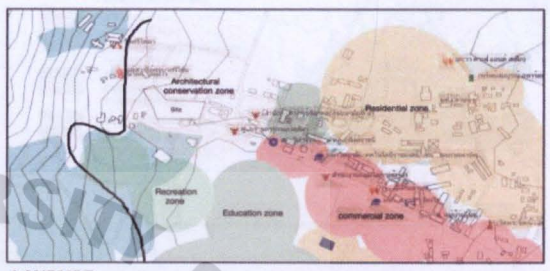
3.1.5 Big canal can be the part of boarding activity over the study time. Like doing sport activity and a garden associated with a boarding house.

Site surrounding and the site analysis

(Image source: Author's image)

3.2 Site location

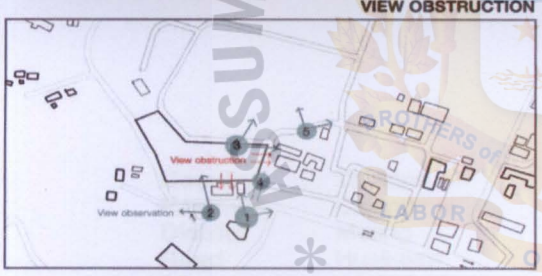
ROAD NETWORK

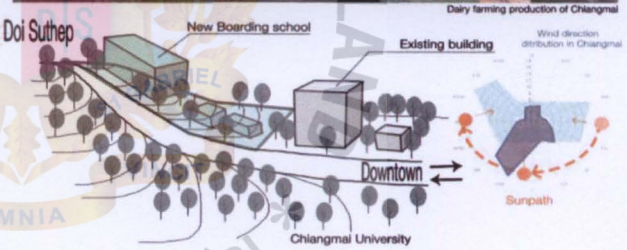


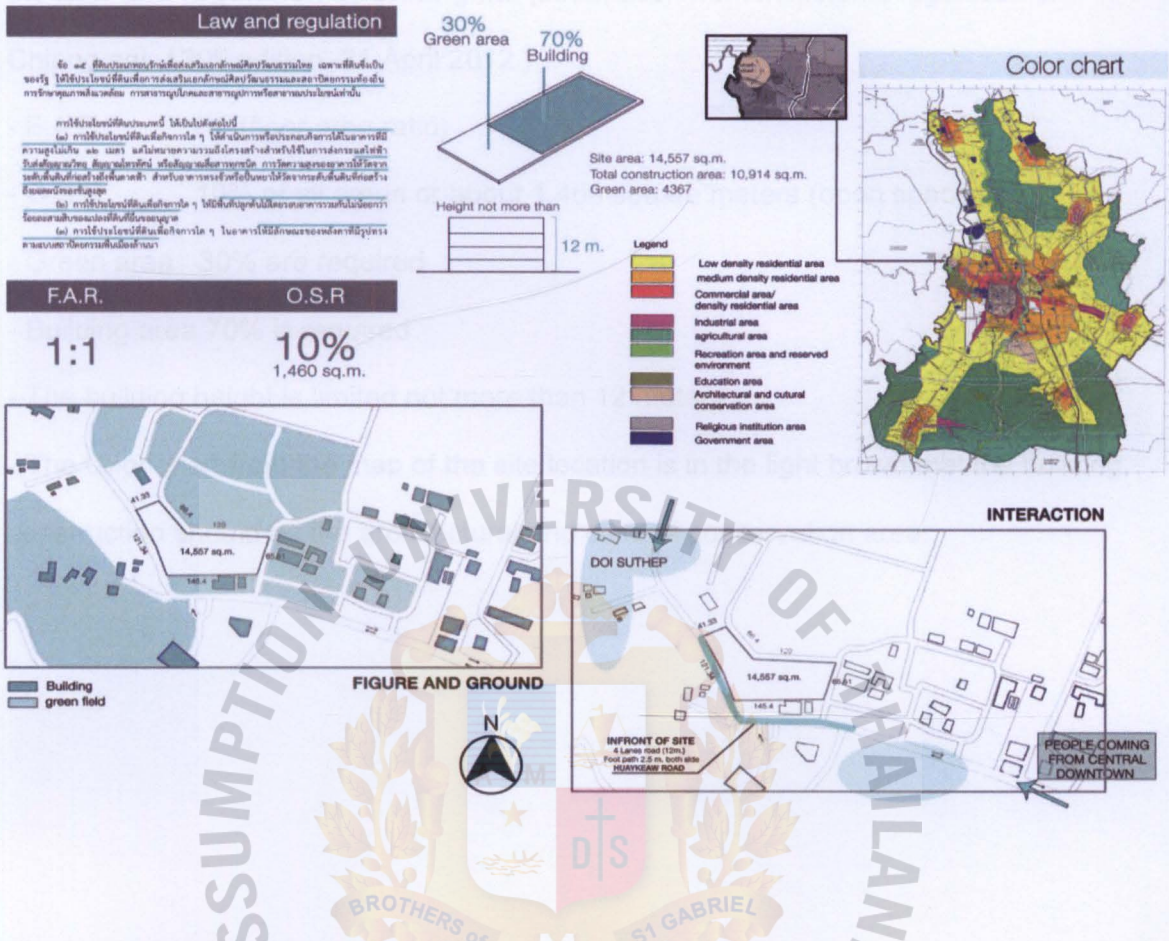
LANDUSE

VIEW OBSTRUCTION

Dairy farming production of Chiangmai







Country Thailand
Province Chiangmai
District Mueng
Road Huaikeaw
Site area 14,600 sq.m.
Owner Royalty area
(Department of livestock development)

Surrounding context

North: Green field
East: Police station
Rajamangala university
Malin plaza
South: Chiangmai university
Chiangmai zoo
West: Kru ba sriwichai Monument
Temple
School
Route to Doi Suthep

Figure 3.6 sites visual and site surrounding and the law and regulation in Chiangmai

3.3 Law and regulation of Chiangmai (information from ministerial regulation of Chiangmai, 130th edition, 21 April 2012.)

- F.A.R. 1:1 (floor area ratio)
- O.S.R. 10% of all areas or about 1,460 square meters (open space ratio)
- Green area 30% are required
- Building area 70% is required
- The building height is limited not more than 12 meters.
- The color chart from the map of the site location is in the light brown that the building construction should be the architectural and cultural conservation area.

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Chapter 4: Potential Design Response

4.1 Design Scope

This project is divided into self-learning and active in terms of designing space and facilities based on criteria and building regulation of boarding school design. This consists of study area, library, special self-learning area, boarding house, sport area or activities for boarders.

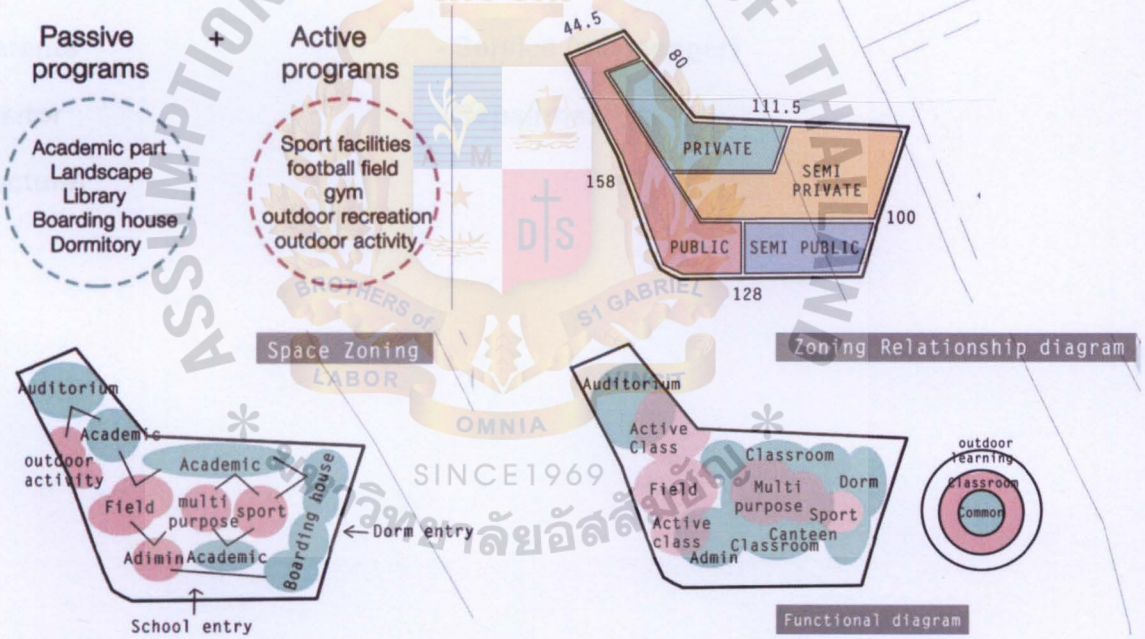

Figure 4.1 Passive and active parts with programs

4.2 User Programming

Main Users

- Students/boarders

High school: 12-18 years old

Number: 25 students/classroom

: 3 rooms/gradeTotal student: 450 students

- Teachers and staff

Number of staff in administration: 20 people

Main teacher: 18 people

: 1teacher/1classroom

Teacher in boarding house: 6

Librarian and assistance: 3 people

Maid 1 people/boarding house: 6 people

Driver: 2 people

Chef: 4 people

- Secondary users

- Parents

- Visitor

- Lecturer

- others

- Service (messenger)

- Repairman

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User behavior

Monday to Friday	
7.10am - 8.15am	Breakfast
8.30am	Prayer or form order
9.00am - 10.00am	Period 1
10.00am - 11.00am	Period 2
11.00am - 11.30am	Break
11.30am - 12.30pm	Period 3
12.30pm - 2.00pm	Lunch and activities
2.00pm - 3.00pm	Period 4
3.00pm - 4.00pm	Period 5
4.00pm - 4.30pm	Break
4.30pm - 5.30pm	Period 6
5.30pm - 6.15pm	Club/Activities/Private Study
6.15pm - 7.00pm	Supper
7.00pm - 9.30pm	Club/Activities/Private Study

Saturday	
Time	Activity
7.30am - 8.50am	Breakfast
9.00am - 10.00am	Period 1
10.00am - 11.00am	Period 2
11.00am - 12.00am	Free time or school event and break
12.00 noon	Lunch
Afternoon	Weekend programme
5.45pm - 6.30pm	Supper

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4.3 Programming

Program	Main user							Secondary user					Other user	
	Grade 7-9	Grade 10-12	Teacher	Staff	Parent	Visitor	Guest	Lecturer	Librarian	Driver	Scullion	Sweeper	Messenger	Repair man
Administration Department														
Lobby	●	●	●		●	●	●	●					●	
Reception area				●	●	●	●	●						
Waiting area	●	●	●		●	●	●	●					●	
Administration room				●	●	●	●						●	
Staff office				●									●	
Meeting room				●		●	●							
Academic section														
Classroom	●	●	●				●	●						
Common room	●		●				●							
Art, craft, cooking studio		●	●				●	●						
Multipurpose area	●	●	●				●	●						
Teacher office			●					●						
Support facility														
Outdoor activity area	●	●	●				●						●	
Conferance hall	●	●	●	●			●							
Library			●				●							
Sport facility														
Football field	●	●	●				●							
Gymnasium		●	●				●						●	
Playground	●	●	●				●						●	
Locker room														
Swimming pool	●	●	●				●						●	
Other facility														
Canteen	●	●	●				●					●		
Nurse room	●	●		●										
Convenient store		●	●	●	●	●	●		●					
Service zone														
Kitchen											●	●		
Parking area					●	●	●			●				
Staff parking			●	●				●	●		●	●	●	●
Garbage room												●		
Mechanical room														●
Pump room														●
Storage room												●		●

Table 4.1: the programming of boarding school

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These are easy to explain in diagram about the summary of areas requirement for boarding school (From the book, "Ernst Neufert Architect's Data : School guideline, Lockwood,1970."): [3]

4.4 Organization Structure

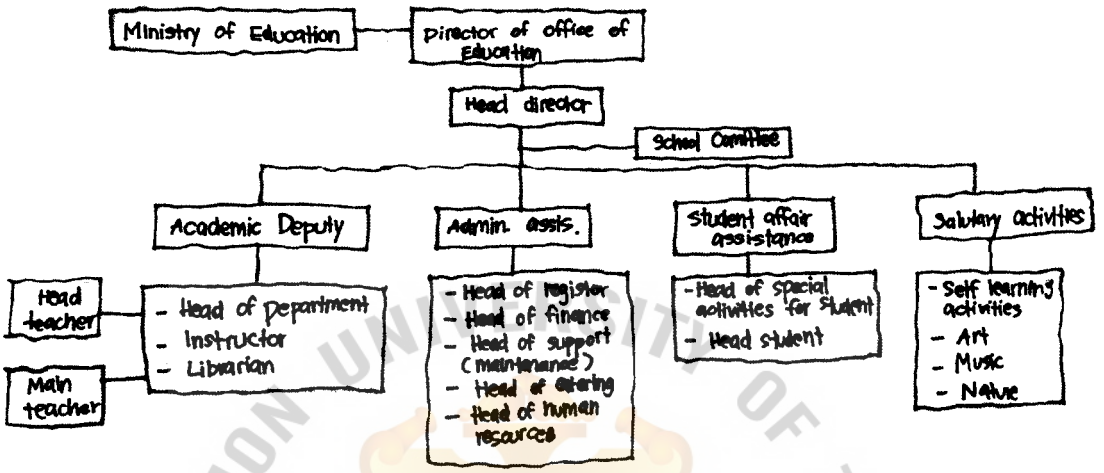

Figure 4.2: organization structure

4.5 Activities and spaces

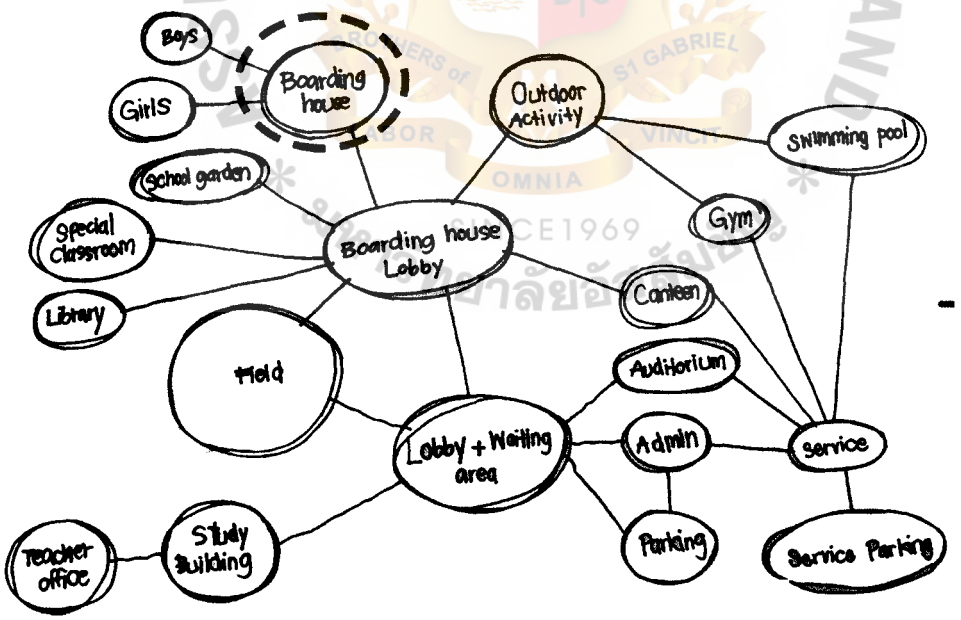

Figure 4.3 activities and spaces

[8] Ernst Neufert Architect's Data : School guideline, Lockwood,1970.

[9] Ibid.

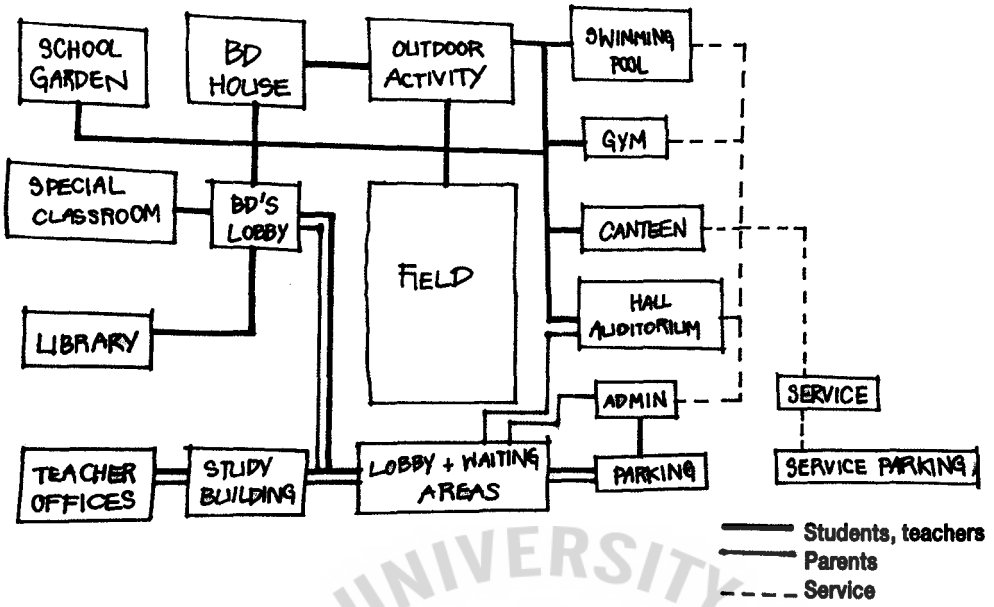

Figure 4.4: Circulation diagram

4.5 Space summary

Table 4.2: space summary of administration part

Administration part

Room	Activities	Time	User					Special need
			type	number	number	Area	total area	
1. Administration part								
1.1 Reception part								
Lobby	for welcoming visitors, guests and waiting area	Mon-Fri 8.00-16.30	Staff guest visitor parent	1	1	48	48	-near main school entrance -easy access to other part -near registration
1.2 Working part								
Head director's room	- working	Mon-Fri 8.00-16.30	director visitor	1	1	36	36	-easy access -calmness
Working for assistance	- working welcoming guests		assistant visitor	1	1	12	12	-easy access from lobby -access directly to head director's room
Academic assis room **Registrar assis** room			staff staff visitor	1 1	1	16 18	16	
Respond book **Building section** **Information action**	- responsible for documents - maintenance of building - school information welcoming guests		staff staff staff guest	1 1 1		9 9 12		-easy to cooperate between other section
Financial section **Human resources section** **Registrar section**	- accounting - taking care of all staff - register, record,interview, enroll		staff staff staff parent	1 1 2		9 9 12		-near document storage
Student affair section **Head special activities** **Head Student** **Advice service**	- promote student activity - taking care of students - working advise students		 teacher student	1 1 2 25	 1	9 9 9 45	 18 45	
1.3 Support facility								
Meeting room- **Waiting room** **Pantry** **Toilet**	- for meeting - waiting for meeting - rest		teacher teacher teacher staff	30	1	60 30 20 24	60 30 20 24	-in front of meeting room
Total area = 484 Sq.m. Circulation 30% = 145.20 Sq.m.			**Total area**					**629.2 Sq.m.**

[8] Ernst Neufert Architect's Data : School guideline, Lockwood,1970.

[9] Ibid.

Table 4.3: space summary of academic part

Academic part

Room	Activities	Time	User		Area			
			type	number	number	Area	total area	
2. Academic part / Study area								
High school Grade 7-12								
Classroom		Mon-Fri		25	12	54	648	
Privare area		8.00-16.30		3	12	1.42	17.04	
Locker						8		
Working area for teacher				1	12	4	48	
Student toilet					1	64	64	
Teacher office				12	1	96	96	
Pantry			teacher			20	20	
Teacher toilet						24	24	
Total area	= 925.04 circulation 30% = 277.512 Total area						1,202.552	
Science lab			student	25	1		80	
			teacher					
Language lab				25	1	120	168	
Computer room			student	25	1	80	80	
			teacher	1				
Art studio			student	25	2	87.5	175	
Music studio	Art work, craft		student	25	2	75	150	
Dancing studio	Practice, keep instrument						160	
Supply center			staff	1	2		48	
Nurse room			student			50	100	
Total area	= 959 circulation 30% = 287.7 Total area						1,246.7	

Table 4.4: space summary of support part

Space summary of support facilities

Reference : Ernst Neufert Architect's Data : School guideline(Lockwood,1970)
Ibid.

Room	Activities	Time	User		Area			Special need
			type	number	number	Area	total area	
3. Support facilities								
3.1 library								
Reading area		Mon-Fri	student	100	1	150	150	
book storage							90	
copy area			staff	1		6	6	
audio, visual area						60	60	
librarian area			librarian	1		37.5	37.5	
internet center			srudent	10		25	25	
telephone booth			student	1		25	25	
Total area	=						393.5 sq.m.	

Space summary of Boarding house

Room	Activities	Time	User		Area			
			type	number	number	Area	total area	
4. Boarding house								
4.1 Dormitory separate gender								
boy		Mon-Sun	student	225	45	30	1350	
girl				225	45	30	1350	
staff quarters			staff	6	3	15.6	46.8	
lounge	- learning sleep or stay when they are not engaged in learning - studying and extramural activities		student		1	200	200	
dining hall			student		1	300	300	
laundry			staff	2	1	60	60	
entertainment room			student		2	100	200	
bathroom,shower spaces			student		4	50	200	
Total area	= 3,706.6 circulation 30% = 1,111Total area						4,818.6 sq.m.	

Table 4.5: space summary of Boarding house part

[8] Ernst Neufert Architect's Data : School guideline, Lockwood,1970.

[9] Ibid.

Table 4.6: space summary of sport facilities part

Space summary of Sport facilities part

Room	Activities	Time	User		Area			
			type	number	number	Area (sq.m.)	total area (sq.m.)	
6. sport facilities								
5.1 Gym								
Sport area		Mon-Fri	student	25	1	100	100	
			teacher	1				
locker			student	25	boy1	64	64	
				25	girl1	64	64	
Bathroom			student	12	boy4		32	
				12	girl5		40	
Teacher office			teeacher	6	1	9	54	
outdoor recreation field			student			28*24	1120	
Total area =							1,474 sq.m.	

Space summary of Service part and total area of project

Room	Activities	Time	User		Area			
			type	number	number	Area (sq.m.)	total area (sq.m.)	
6. Service part								
6.1 service								
electrical room			repair			80	80	
pumproom			man			40	40	
storage						100	100	
sercurity room			sweeper			20	20	
generator room						60	80	
mechanical room						80	80	
control room						20	20	
parking area					30		750	
Total area =							1,150 sq.m.	
Total project area =							10,914.5 sq.m.	

[8] Ernst Neufert Architect's Data : School guideline, Lockwood,1970.

[9] Ibid.

Chapter 5: Building Technology

The researches about the state requirement for educational facilities from the Florida Department of Education, my project got the size of space and occupant design criteria in terms of building technology system for school as these following lists:

1. HVAC (heating/ ventilation/ air conditioning systems)
   - shall be checked to ensure proper operation
   - shall be provide humidity control and shall maintain design temperatures of at least 78 degree Fahrenheit in summer and 68 degree in the winter.
   - Shall provide air flow and air distribution systems.
2. Plumbing systems and toilet rooms
   - shall meet code requirement for connection to water and sewer
3. Building service equipment
   - Mechanical equipment
4. size of space and occupant design criteria (P.113)
   - Dry cleaning & Laundry

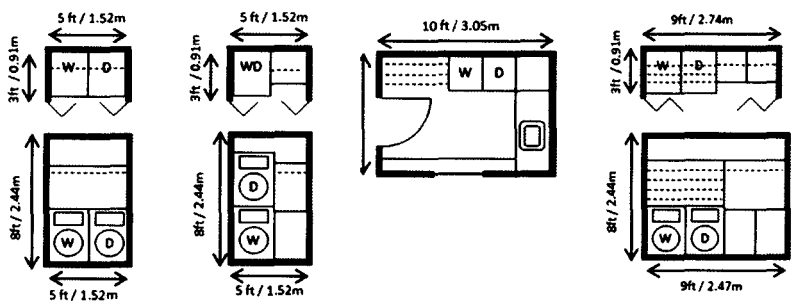

Figure 5.1.1: laundry size (Image source: http://www.houseplanshelper.com/laundry-room-dimensions.html

- Electronic motor & generator machine

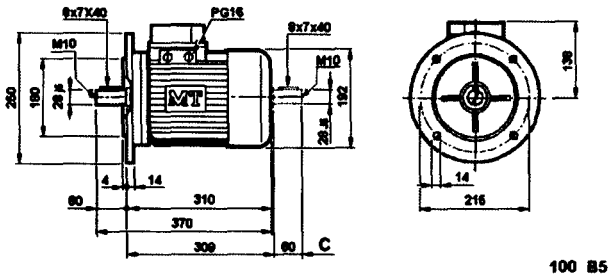

Figure 5.1.2: generator machine size (Image source: http://www.tvtamerica.com/TN100_electric_motor_dimensions.htm)

- Electronic technology & repair (standard size: 1600*800*1600mm.)

To make the sustainable building and keep the characteristic of Laanna architecture as the law regulation required. The project used timber material as a main structure and the design based on the identity of Laanna but the school should not make students boring by the design as other ordinary schools. Thus, the project got the inspiration of Laanna contemporary architecture from these two case studies:

5.1 Case study 1: Sustainable and modular school for Burmese refugee children by protuguese architects in Maesot, Chiangmai.

This below picture is the diagram and ground floor plan of Sustainable and modular school for Burmese refugee children by Protuguese architects in Maesot, Chiangmai. The total area is around 208 square meters. From the article, "GAP, Green architecture and building report, No Border School Project" that empowered by Traditional Construction. There are the summary lists of the interesting conceptual knowledge that can adapt to my project: [9]

[9] GAP, Green architecture and building report, No Border School Project Empowered by Traditional Construction, http://www.gabreport.com/2014/03/no-border-school-project-empowered-by-traditional-construction

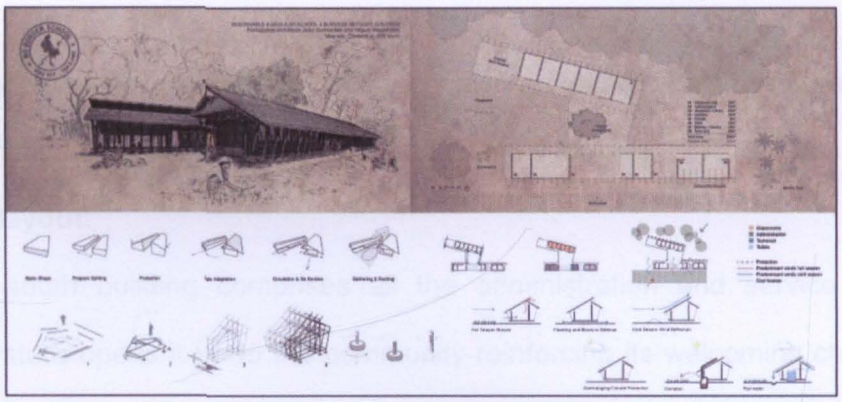

Figure 5.2: Presentation page shows the design development of No boarder school (Image source: Green architecture and building report by GAP)

Think locally:

One of the project main strategies is to make use of locally available skills and local and used materials. A simple bamboo construction system was devised through a lightweight bamboo frame and extensive onsite prefabrication of modular components, all to be assembled in place and fitted together by traditional knot technology.

Reuse:

Floors, doors and bookshelves are all to be made out of secondhand wood or old and decayed selected pieces.

"Schools began with a man under a tree who did not know he was a teacher, sharing his realizations with a few others who did not know they were students" (Louis I. Kahn).

Anchoring the school around a tree it's the starting point to merge it, symbolically and physically, with its context and surroundings, and in a bigger scale with nature and the universe.

---

[9] GAP, Green architecture and building report, No Border School Project Empowered by Traditional Construction, http://www.gabreport.com/2014/03/no-border-school-project-empowered-by-traditional-construction

Climate:

An exterior half culm-lath bamboo layer also protects the bathing area and toilet corridor from the northeast wind and north outside overlooking.

Functional layout:

The south building comprises all the administration and service rooms. Its perforated nature opens it up to the community reinforcing its welcoming character and guaranteeing optimal fresh-air flow from the horticulture plots into the school.

Context:

Sustainability and relocation need both played major roles when choosing materials and developing the construction system.

Roof:

The special roof shape promotes effective natural ventilation while allowing indirect sunlight in the rooms. At the same time the deep roof overhang protects and provides shade all around the building. The shading contributes decisively for the temperature cool down. People and walls get protected from sun and rain while covered spaces allow dry playgrounds and activities to take place during monsoons. Though with this structure we may use any kind of roofing finishing.

Toilets:

The toilets in this project are very simple devices equipped with twin pits for composting purposes. The composting dry toilet processes the excreta into organic fertilizer that can be used directly into the soil for agricultural purposes.

Installing a urine diverting system in the toilet seats will promote a better excreta waste management.

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[9] GAP, Green architecture and building report, No Border School Project Empowered by Traditional Construction, http://www.gabreport.com/2014/03/no-border-school-project-empowered-by-traditional-construction

Rain:

A rainwater collecting system conducts the water in order to make the best usage of this precious resource. Part of it is directly diverted to the vegetable plantation horticulture plots and part is collected in a big deposit. This water is first to be treated and then drunk by the school population.

Floors:

The system comprises the possibility to make use of bamboo flooring if needed by budgetary restraints, but for the most of the rooms and spaces used wood would be a more efficient solution, providing comfortable floor for all kind of uses.

Walls:

Both division and exterior walls are composed by bamboo framed prefabricated panels easy to handle and "click-in" in place. For the two different sets of needs two different types of panels were designed.

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[9] GAP, Green architecture and building report, No Border School Project Empowered by Traditional Construction, http://www.gabreport.com/2014/03/no-border-school-project-empowered-by-traditional-construction

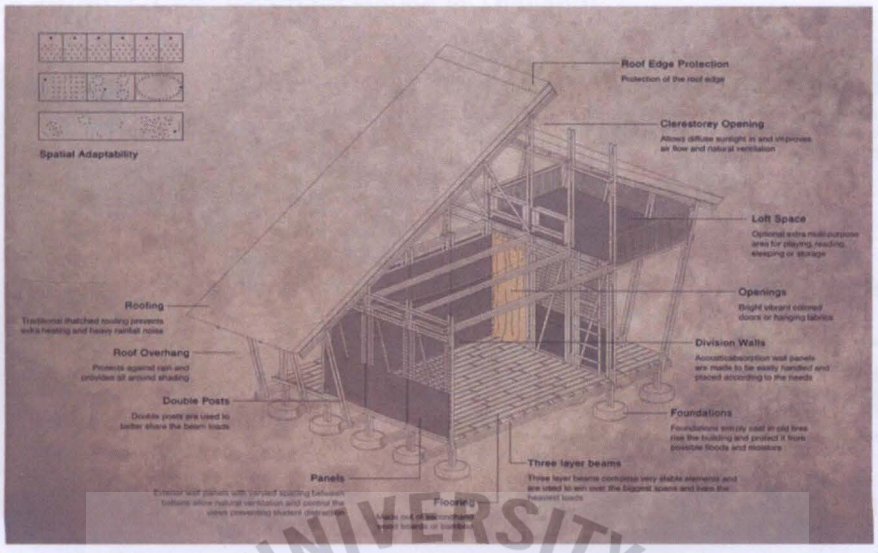

Figure 5.3: sections that show the structure and the space activities (Image source: Green architecture and building report by GAP)

Figure 5.4: sections that show the wood structure (Image source: Green architecture and building report by GAP)

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5.2 Case study 2 (CDC Boarding House in Thailand)

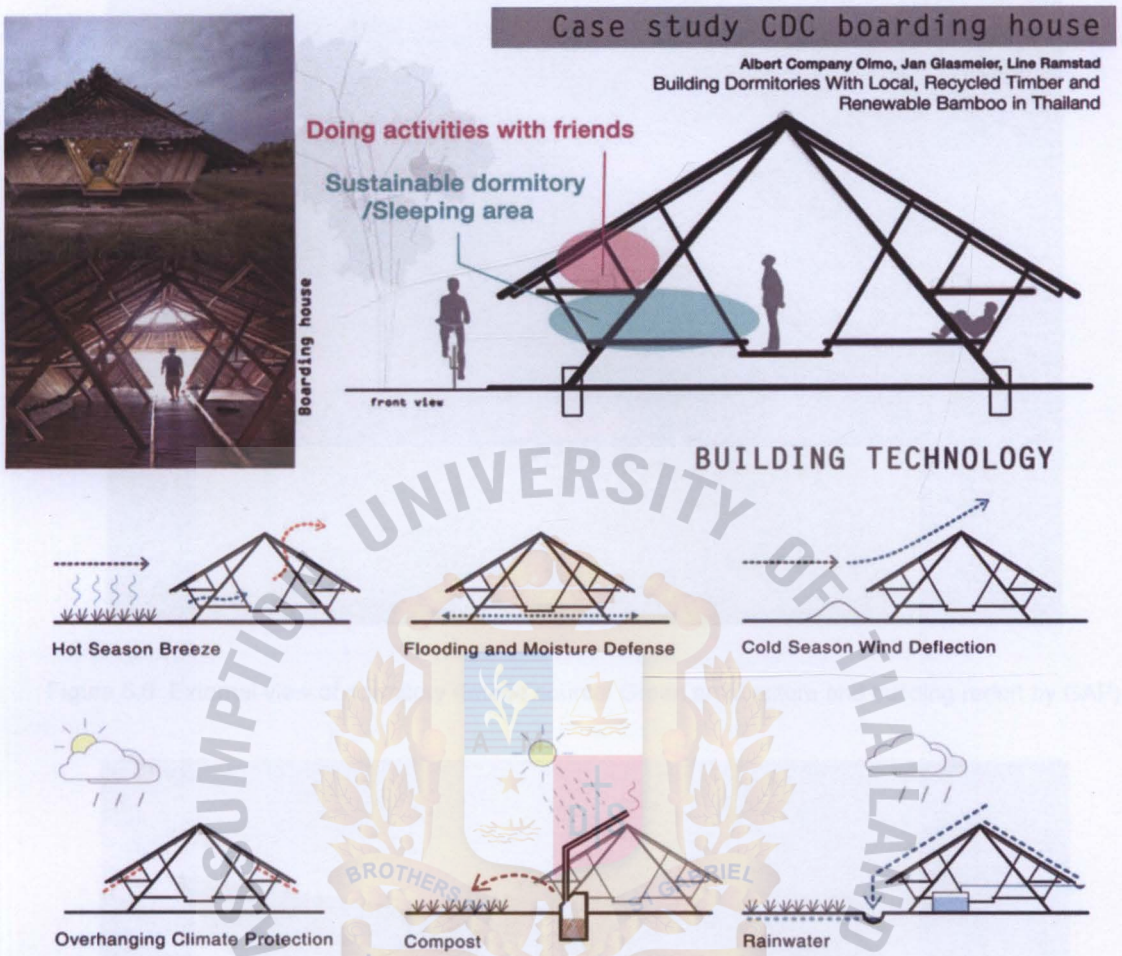

Figure 5.5: Building technology of CDC boarding house (Image source: Green architecture and building report by GAP)

The armed conflict that has persisted for decades in the Karen State of Myanmar results in a daily flow of refugees and immigrants to neighbouring Thailand. In the Thai town of Mae Sot, a few kilometres from the Burmese border, numerous schools and orphanages offer accommodation and education for the refugees and immigrants. One of these centers, the CDC School (Children Development Center) under the tutelage of Mae Tao Clinic organisation, hosts more than 500 students. The pictures below are the perspective view in different direction that shown passive design and sustainable design concept obviously: [10]

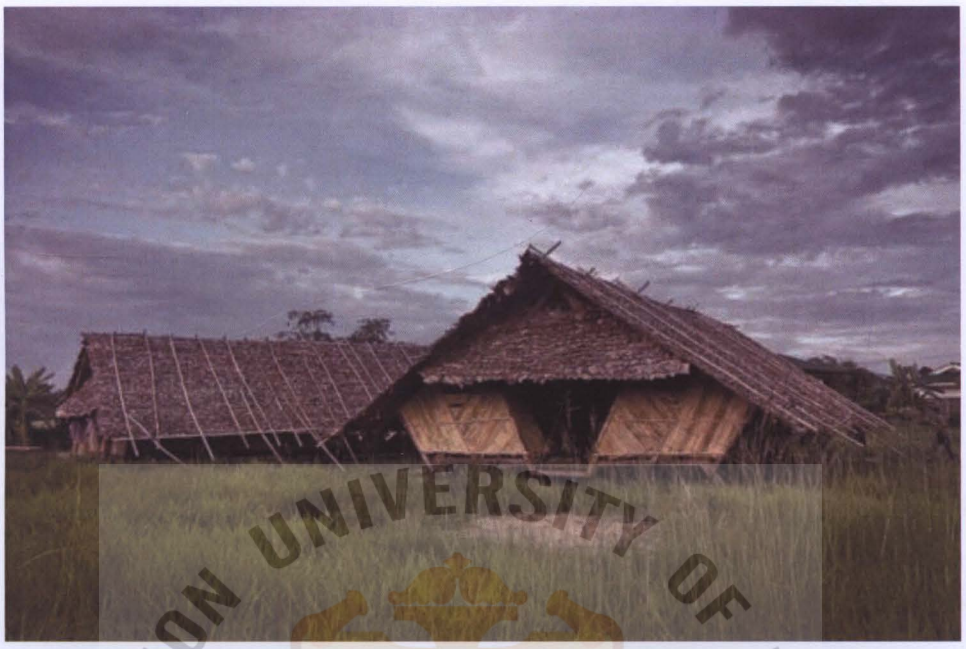

Figure 5.6: External view of dormitory (Image source: Green architecture and building report by GAP)

Figure 5.7: External views show the wood structure (Image source: Green architecture and building report by GAP)

[10]GAP, Green architecture and building report, Building Dormitories With Local, Recycled Timber and Renewable Bamboo in Thailand, http://www.gabreport.com/2013/08/building-dormitories-with-local-recycled-timber-and-renewable-bamboo-in-thailand

Figure 5.8: interior of dormitory wooden structure (Image source: Green architecture and building report by GAP)

The main cost of a temporary dormitory is the structure made from recycled timber. Bamboo and thatch are also used for walls, floors, and roofs. Although these materials are not intended to last over two years without any pre-treatment, they are easily available every season and the cost is affordable and stable for the local people.

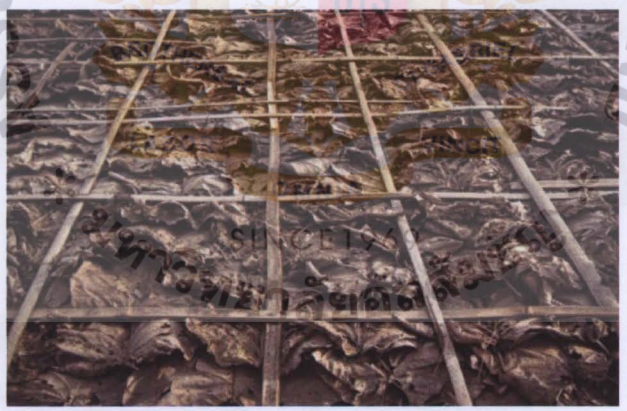

Figure 5.9: roof material and the roof structure (Image source: Green architecture and building report by GAP)

The roof is made out of eucalyptus leaves, which are in season during the dry months of February through June. It made of small strips of untreated bamboo. The recycled timber used for the dormitories comes from old buildings in town.

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[10] GAP, Green architecture and building report, Building Dormitories With Local, Recycled Timber and Renewable Bamboo in Thailand, http://www.gabreport.com/2013/08/building-dormitories-with-local-recycled-timber-and-renewable-bamboo-in-thailand

5.3 Construction particular

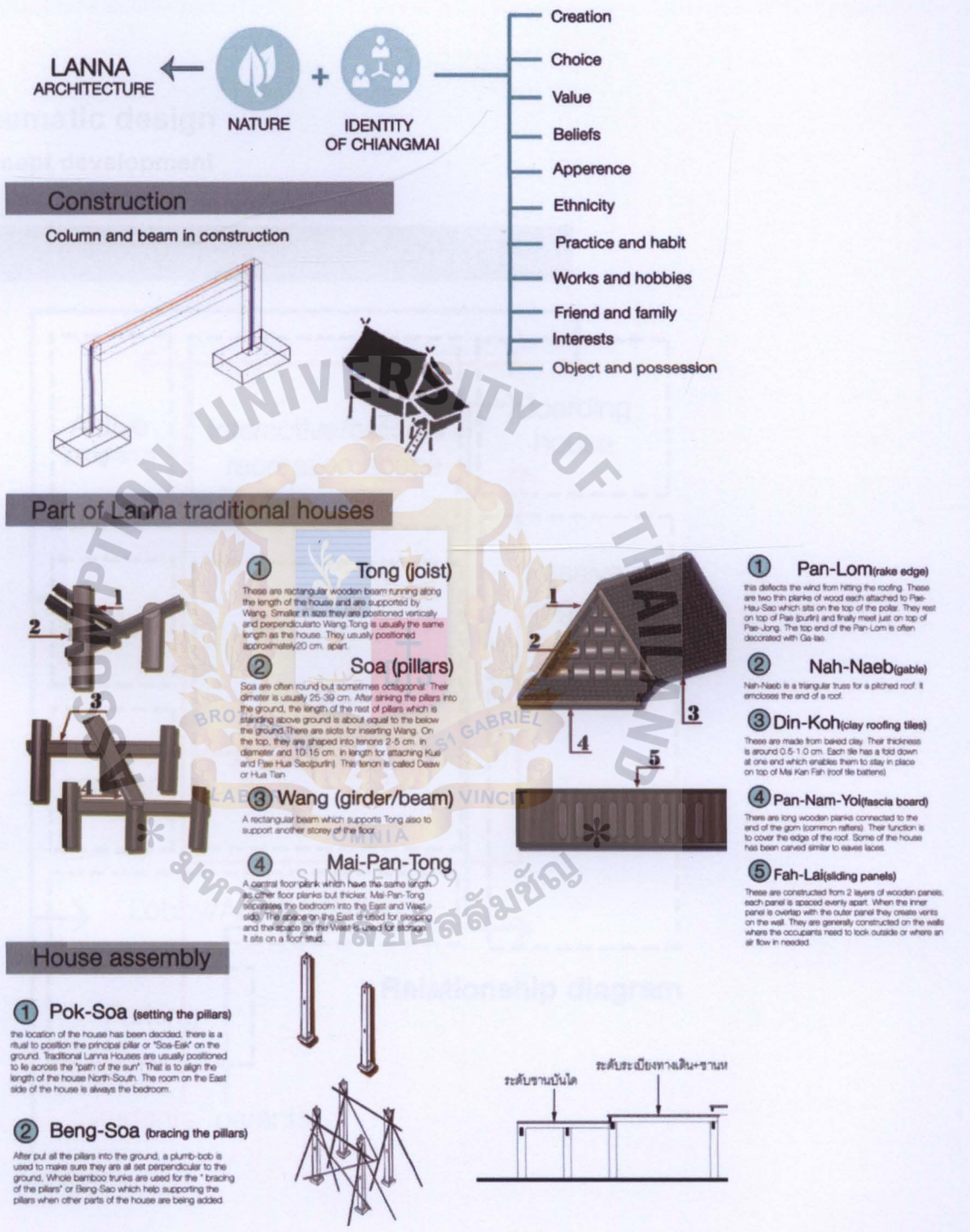

Figure 5.10: Character of Lanna construction (Image source: The Faculty of Architecture, Chiangmai University)

6. Schematic design

6.1 Concept development

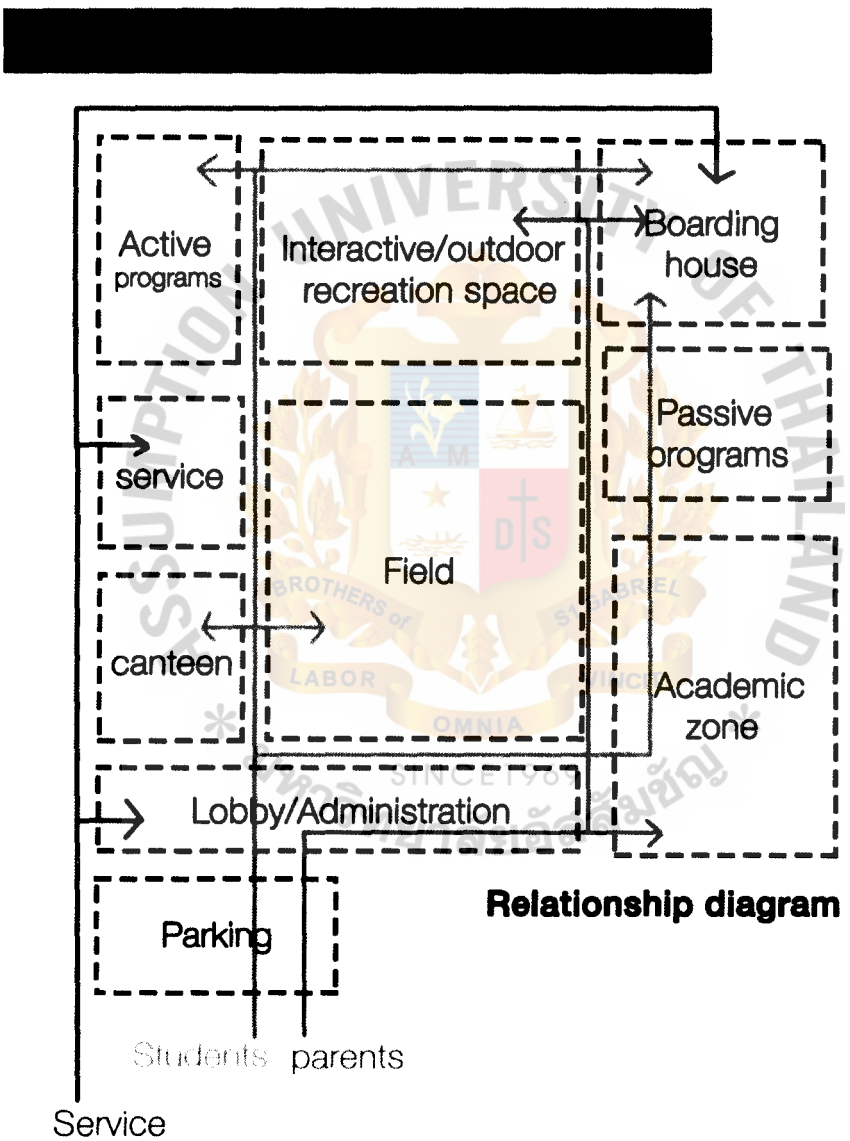

Figure 6.1: Relationship diagram

This shows the connection between one space linked to another and the circulation of three different users; 1. Service 2. Students 3. Teacher

6.2 Program analysis

of alternative design solution for physical environment og high school

program	user	public	Semi-public	Semi-private	private	passive	active	Natural light	Ventilation
Administration part									
- lobby	visitor parent staff	●				●		medium	natural
- waiting area	parent guest	●				●		high	natural
- administration room	staff/parents	●				●		medium	air-con
Academic part									
- classroom	Student teacher				●	●		high	air-con/natural
- common room	student teacher				●	●		high	air-con
- arts room	student teacher				●	●		high	natural
-multipurpose area	student teacher				●	●		high	natural
-Teacher 's office	teacher			●		●		high	air-con
Support facilities									
- outdoor activity	student teacher		●				●	high	natural
- library	student teacher librarian				●	●		high	natural/air-con
Sport facilities									
- football field	student teacher		●				●	High	natural
- gym	student teacher		●				●	high	natural
- swimming pool	student			●			●	low	natural
Boarding house									
-Dormitory	student staff				●	●		medium	natural/air-con
- lounge	student				●	●		low	natural
-dinning room	student			●		●		high	natural
-laundry	student staff			●		●		high	natural
Service part									
- kitchen	staff				●			medium	natural
- garbage room	staff				●			low	natural
- machanical room	staff				●			low	natural
- pump room	staff				●			low	natural
- storage room	staff				●			medium	natural
- parking area		●			●			medium	natural

Figure 6.2: Program analyses

6.3 Program and concept

The diagrams below represented the passive and active as a visual, which shows passive as inner view of the school and active as outer view.

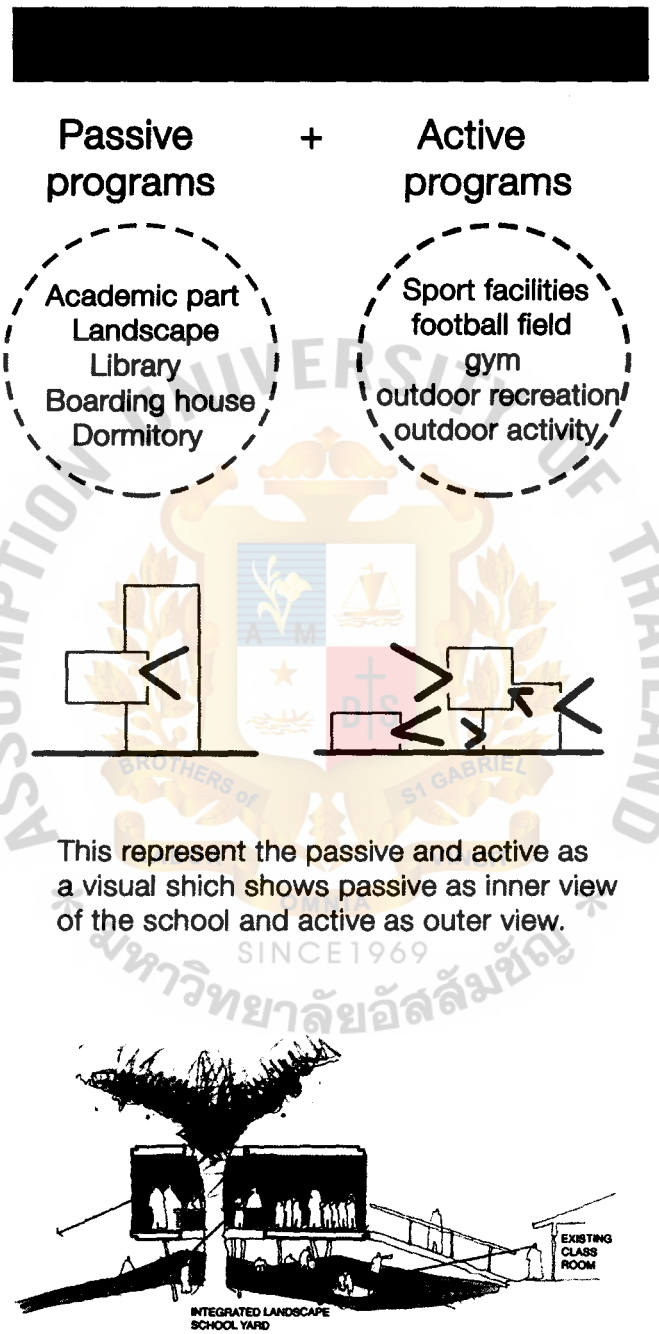

Figure 6.3: Program and concept diagram

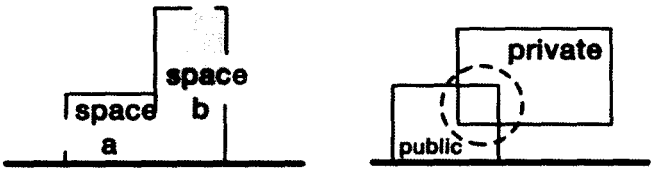

Figure 6.4: Overlap private and public spaces to create visual linkage

Figure 6.5: relationship between space a and space b

6.4 Site analysis

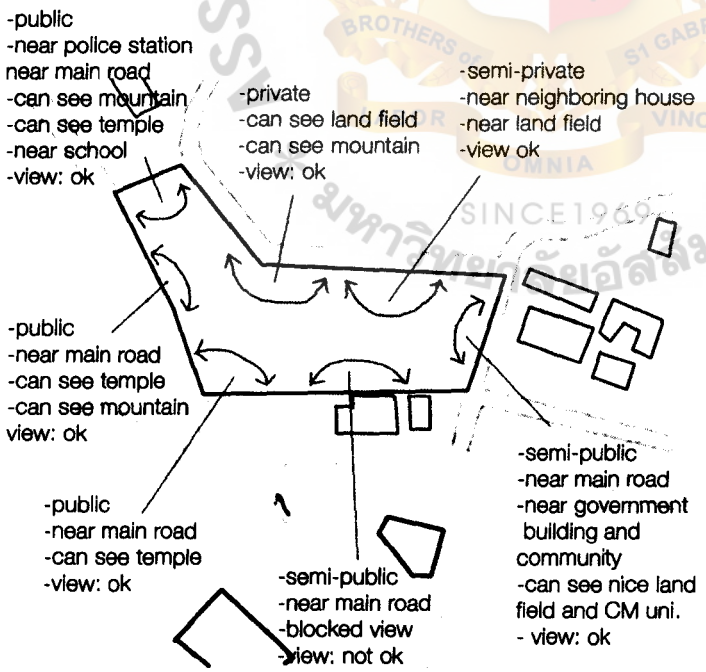

Figure 6.6: site analyses that show the space effect with surrounding

6.5 Space and User zoning

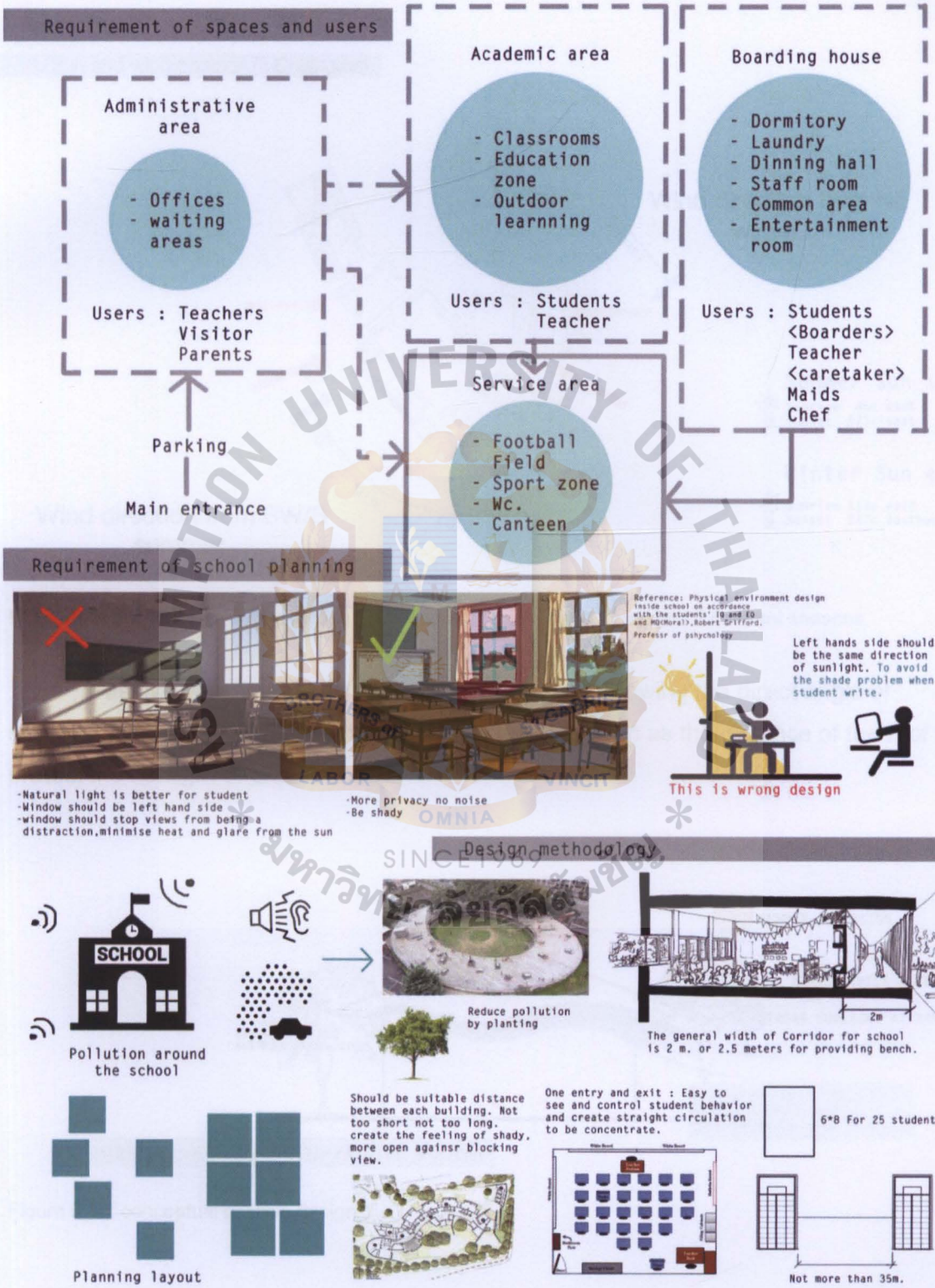

Figure 6.7: Requirement of spaces and users and school planning

Figure 6.8: Design methodology of school

6.6 Design Development

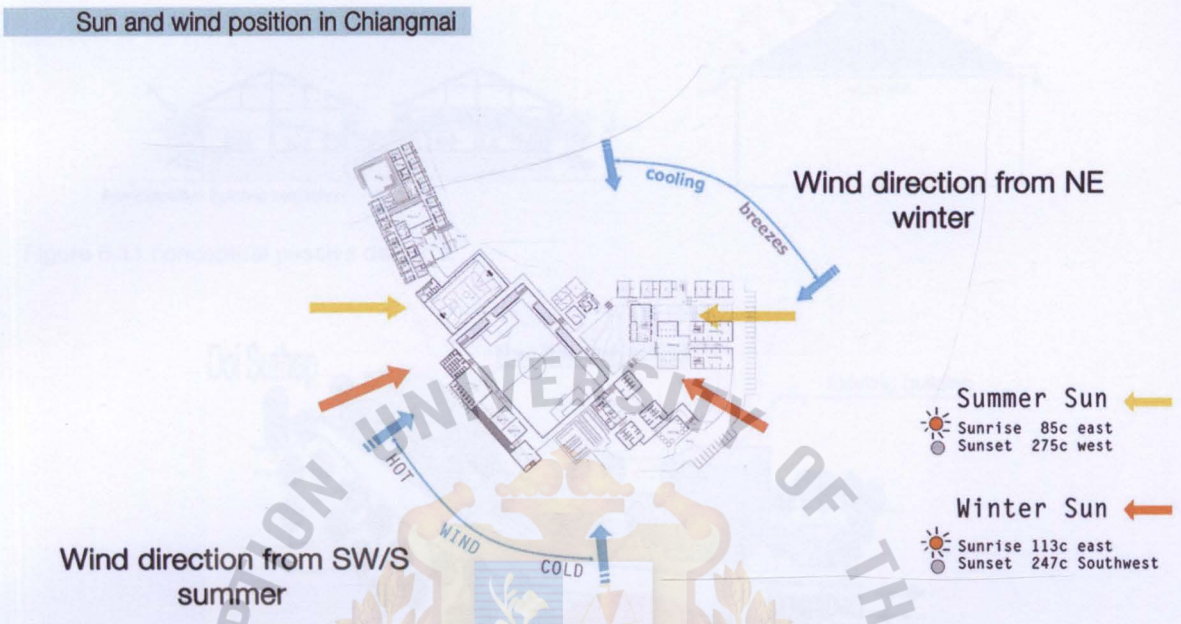

Figure 6.9: Sunlight and wind direction in Chiangmai, which is separated into 2 different seasons.

Passive design must be served in this project. Knowing the direct angle of strong sunlight will be effective to the design building such as the distance of the roof to protect the sunlight or create shady.[16]

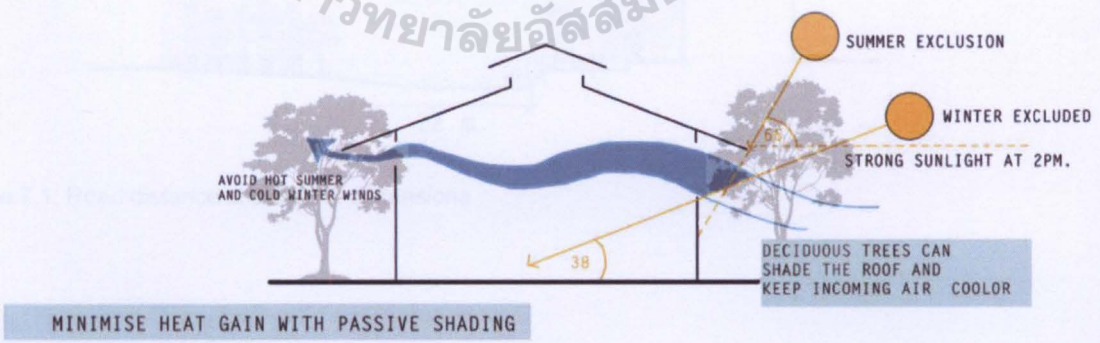

Figure 6.10: conceptual passive design 1

[16] "Journal of environment design". Faculty of architecture, Chiangmai University, Vol.2, No.1, Jan-June, 2015.

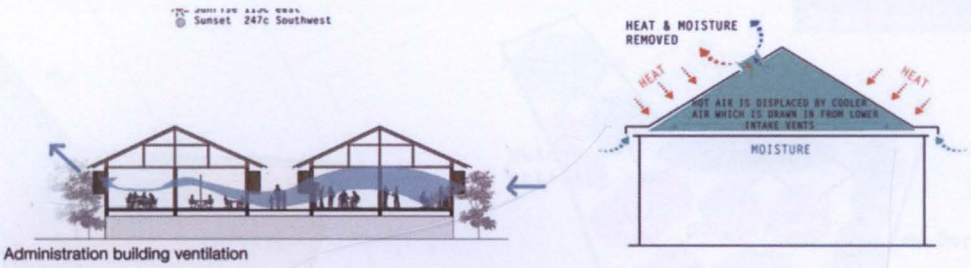

Figure 6.11 conceptual passive design 2

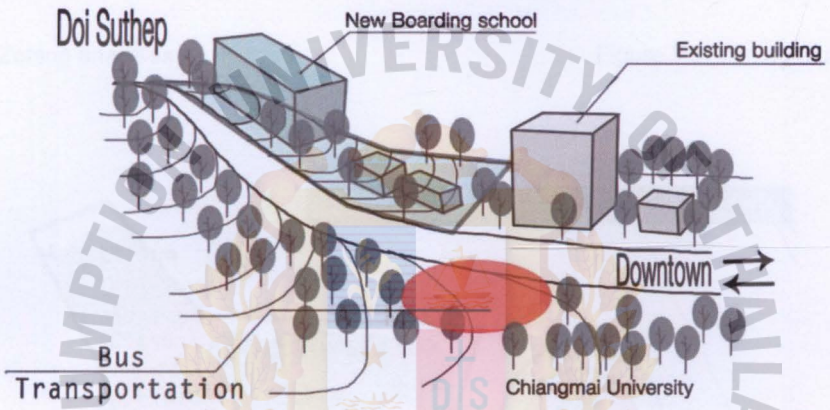

Figure 7.0: Site surrounding

Figure 7.1: Road distance shown in 2 dimensions

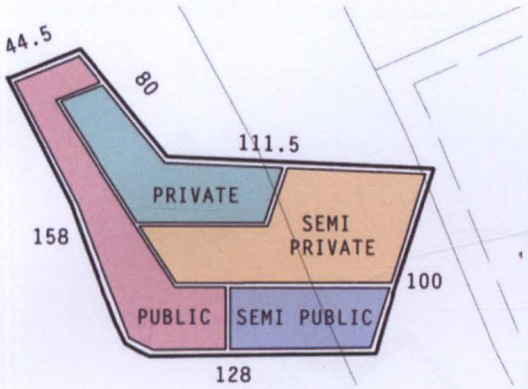

Figure 7.2: Zoning analyses 1

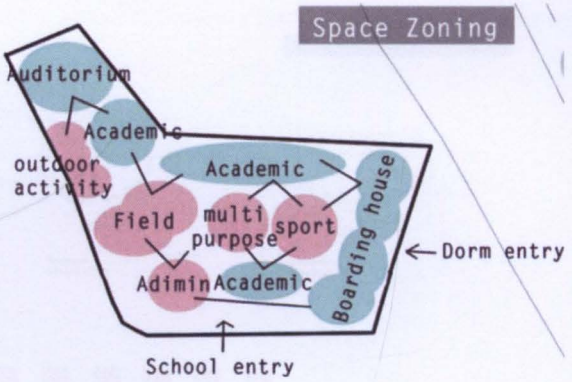

Figure 7.3: Zoning analysis 2

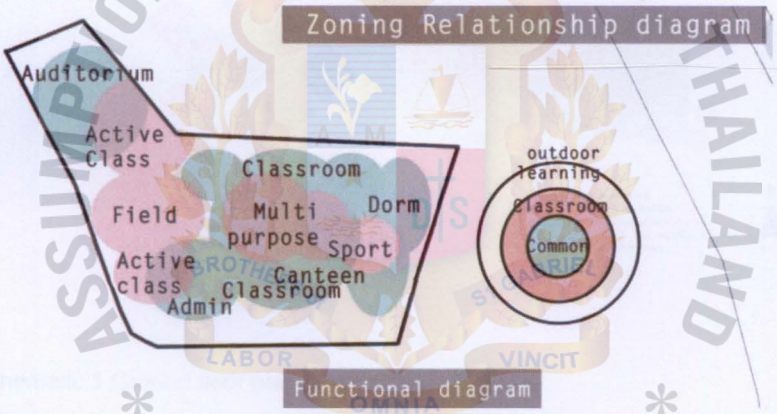

Figure 7.4: functional analyses

The integration of passive facilities and active facilities on site are located relatedly to the site analysis from the 3rd chapter and follow the state requirement of educational facilities from the 2nd chapter.

6.7 Design schematic 1

Figure 7.5: Schematic 1 Ground floor plan

The main circulation design based on the management of security controlled. There are two different user accesses, one is private and another is public. The criteria of layout planning design boarding school are;

1 The direction of sunlight must take into consideration to avoid glare and Heat effect. And design the building direction as well.

2 Academic part shouldn't be provided in the disturbance area.

3 Administration part must be linked to another part as a center.

4 The football field should be surrounded by building to easy to control student's Behavior.

5 Dormitory or boarding house should be located in the private area. There are not allowed public user. So, even boarder's parents visit the school, they can just wait their children in the waiting area, they are not allowed to get in to boarder room.

6.8 Design schematic 2

Figure 7.6: Schematic 2 Ground floor plan

This easy to explain, there is main 6 part of building types in the site. Firstly, Academic zone in the right hands side where designed 2 different facilities. Which one is private classroom where need the calmness sense of spaces. Another one is performance classroom where student can be independent. As you can see that I provide the pond between these 2 building to avoid the noise that might be affected to private classroom. Respectively, in the south of right hands side is the main entrance. This is the administration building. On the left hands side is the support building and then walk along the football field to the gymnasium and this circulation will linked you to the boarding house.

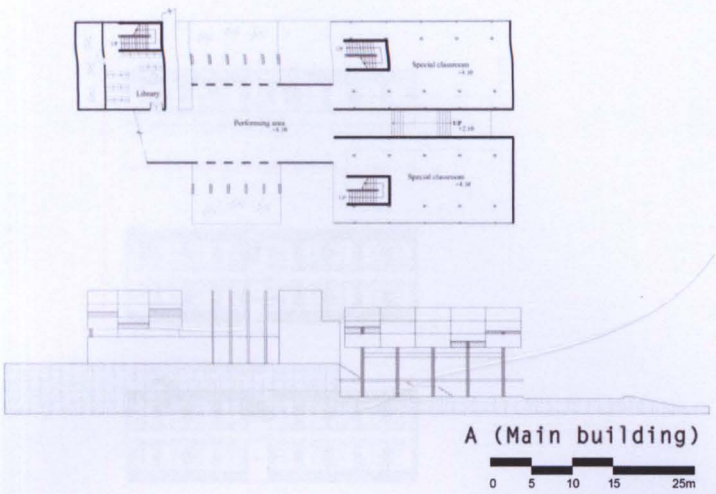

Figure 7.7: Schematic 2: 1st floor plan and elevation of Performance building (Image source: Author's image)

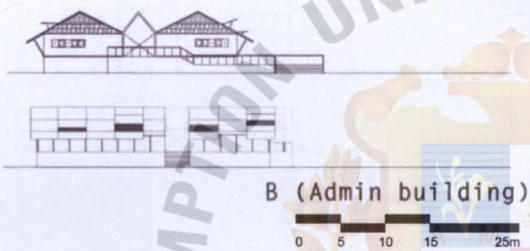

Figure 7.8: Schematic 2: 1st floor plan and elevation of Administration building

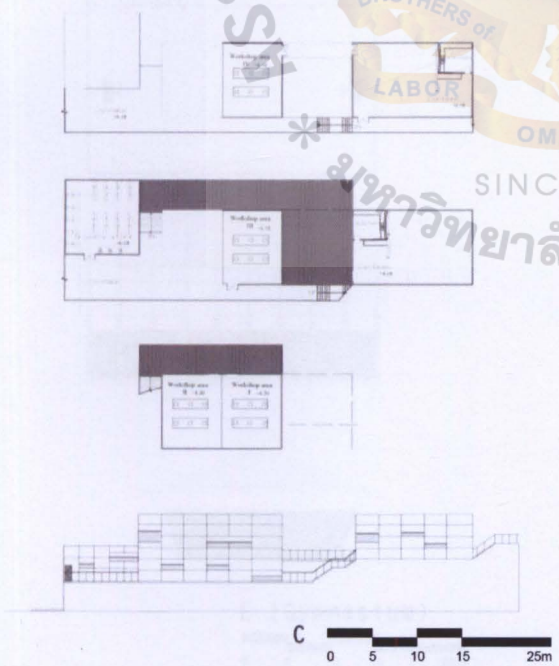

Figure 7.9 Schematic 2: all floor plans and elevation of Supports building

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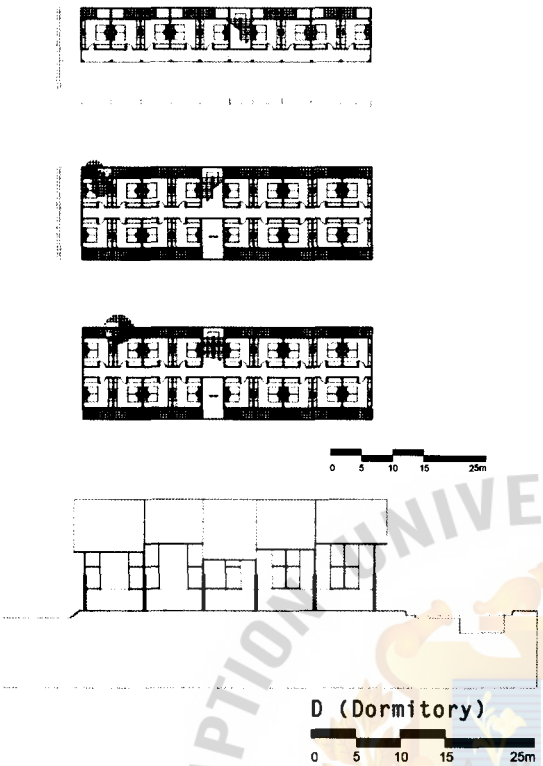

Figure 7.10: Schematic 2: all floor plans and elevation of Dormitory building

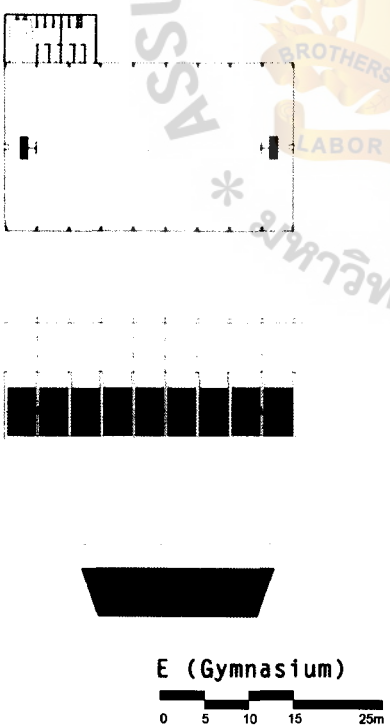

Figure 7.11: Schematic 2: all floor plans and elevation of Dormitory building

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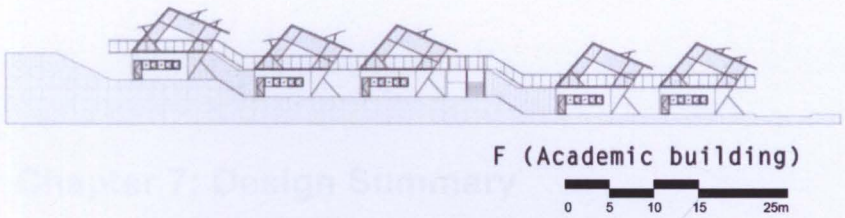

Figure 7.12: Schematic 2: elevation of Academic building

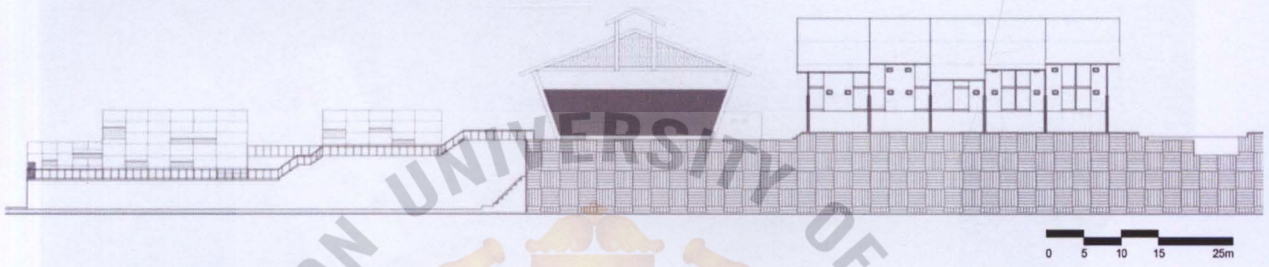

Figure 7.13: Schematic 2: elevation site

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Chapter 7: Design Summary

7.1 Layout plan

Figure 8.1: Layout plan

Building types summary

1. Academic building
2. Performance building
3. Public parking areas
4. Support and workshop building
5. Gymnasium
6. Boarding house (dormitory, laundry, dining hall, entertainment room, etc.)
7. Service building (nursing room, loading area, electricity room, pump, etc.)

7.2 plans, Sections and Elevations

Figure 8.2: Roof plan

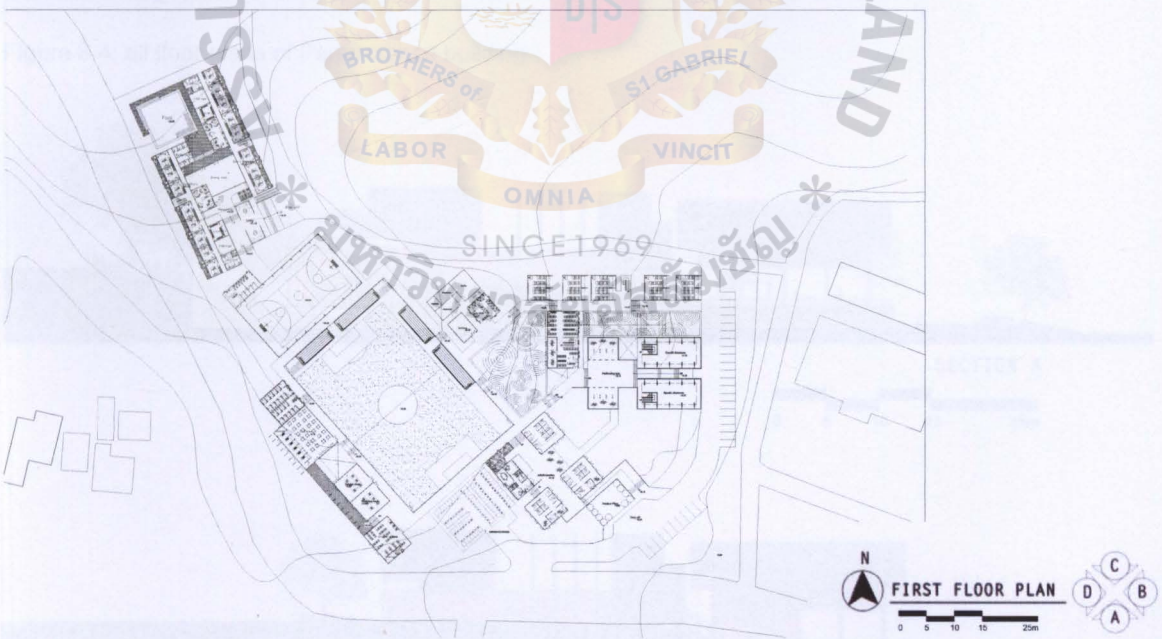

Figure 8.3: Ground floor plan

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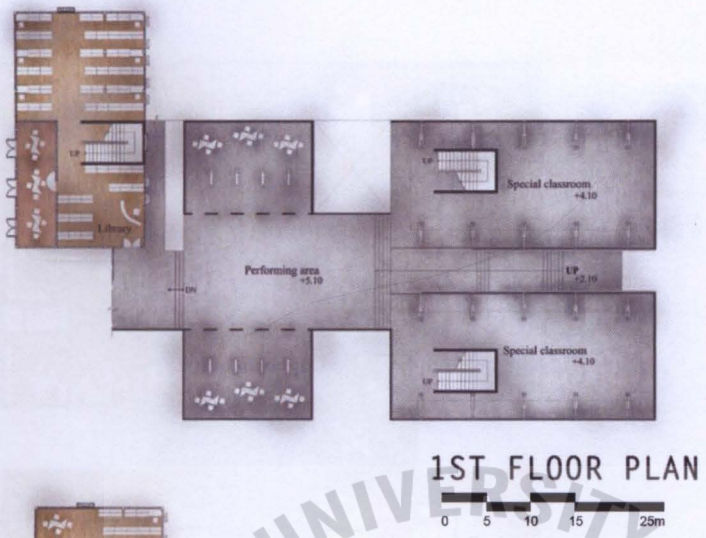

Figure 8.4: all floor plans of Performance building

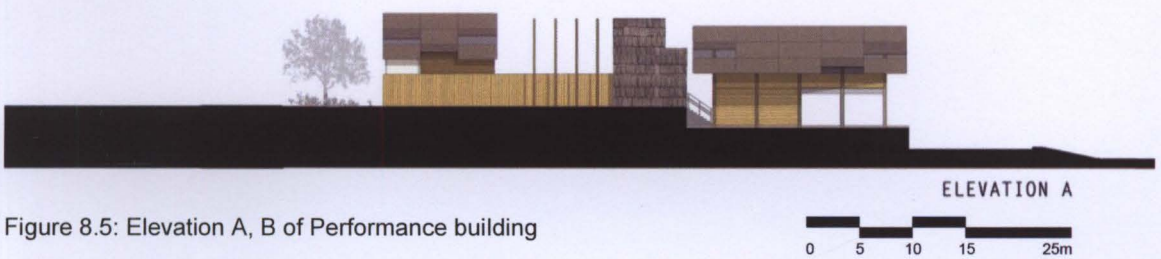

Figure 8.5: Elevation A, B of Performance building

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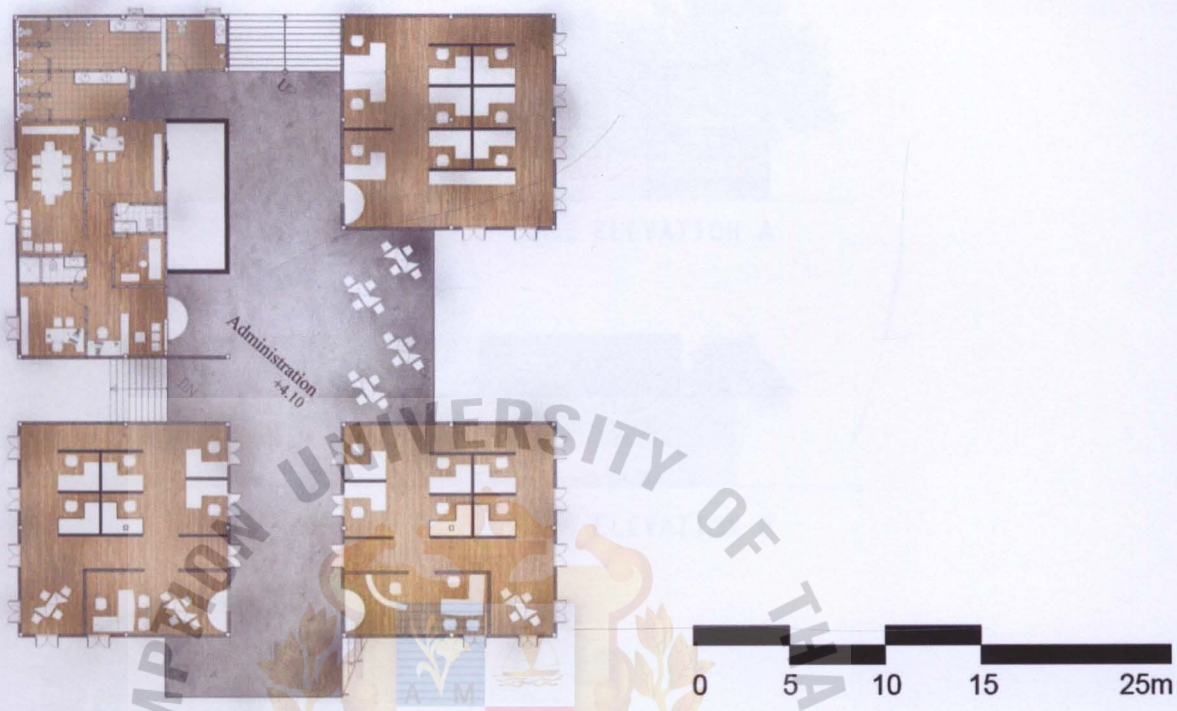

Figure 8.6: First floor plan of Administration building

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Figure 8.7: Elevation A, B and section A of Administration building

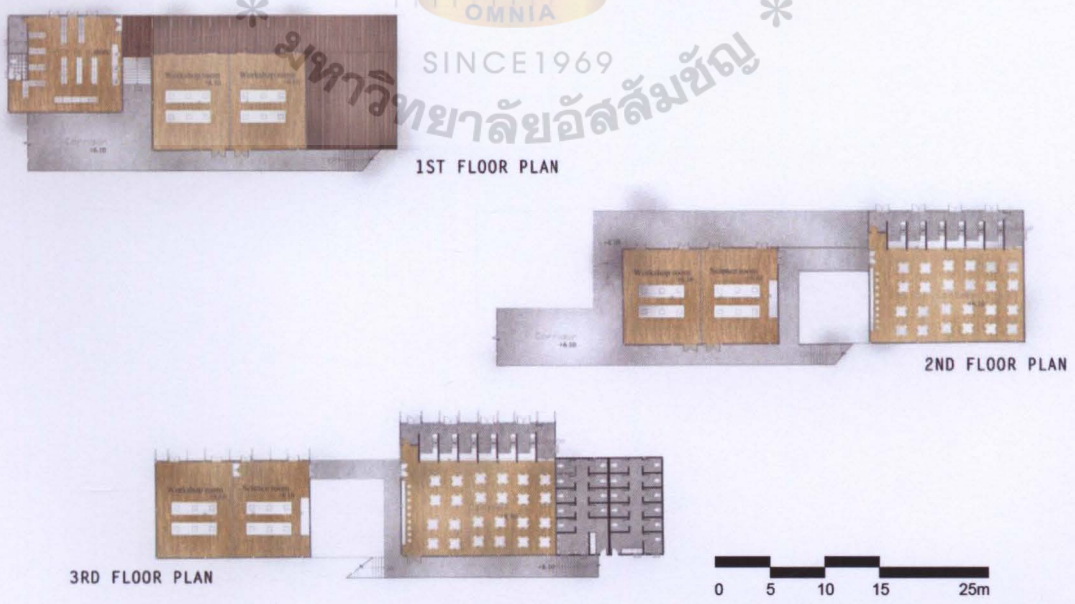

Figure 8.8: all floor plans of Support and workshop building

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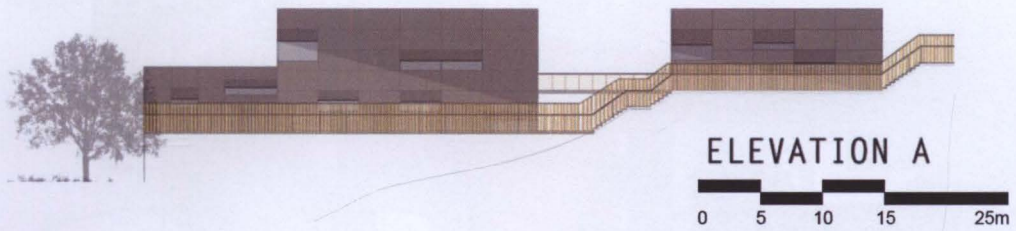

Figure 8.9: Elevation A of Support and workshop building

Figure 8.10: Plan, elevation A, B and section A, B of Gymnasium

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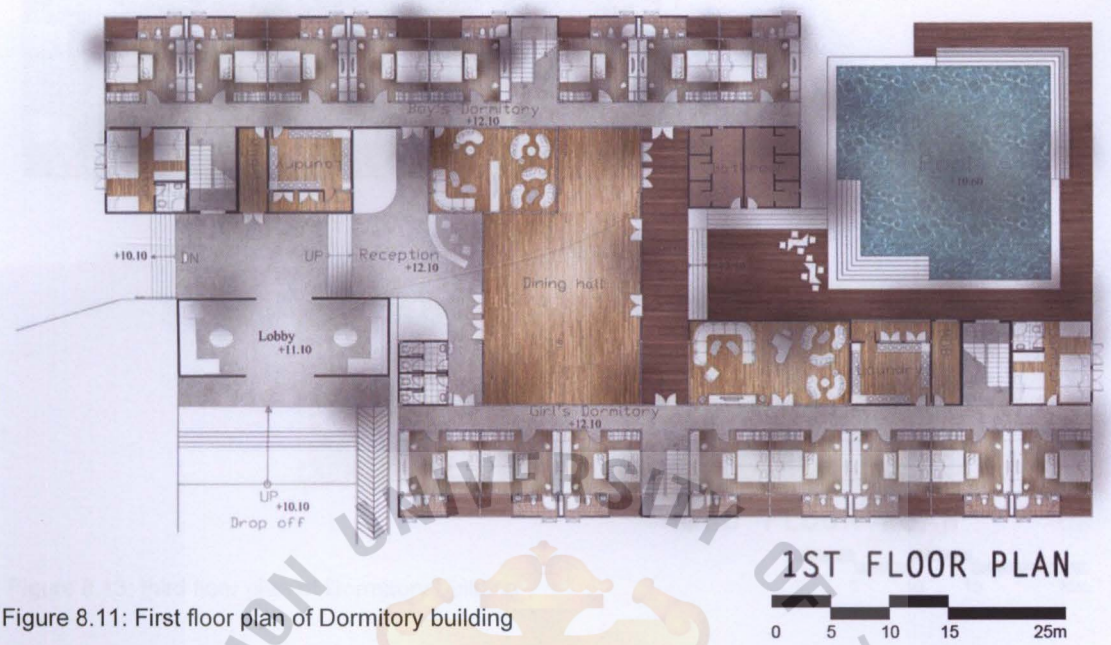

Figure 8.11: First floor plan of Dormitory building

Figure 8.12: second floor plan of Dormitory building

Figure 8.13: third floor plan of Dormitory building

Figure 8.14: Elevation A of Dormitory building (Image source: Author's image)

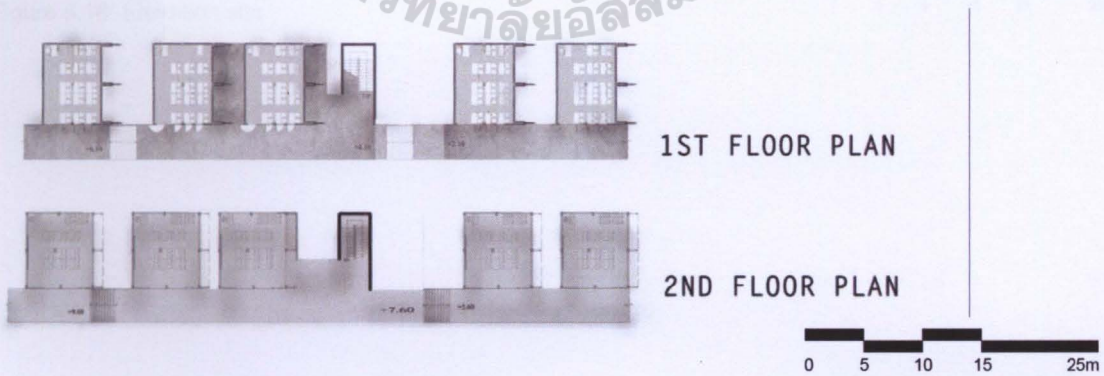

Figure 8.15: all floor plans of Academic building

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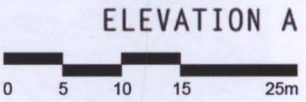
Figure 8.16: Elevation A of Academic building



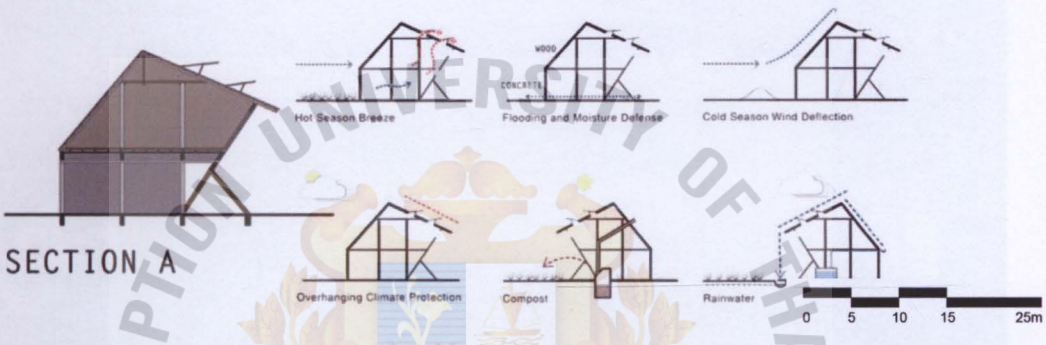


Figure 8.17: Section A of Academic building and the building technology diagram base on passive design

Figure 8.18: Elevation site

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7.3 Exterior perspective

Figure 8.19: Performance building perspective

Figure 8.20: overview from lowest level of boarding school perspective

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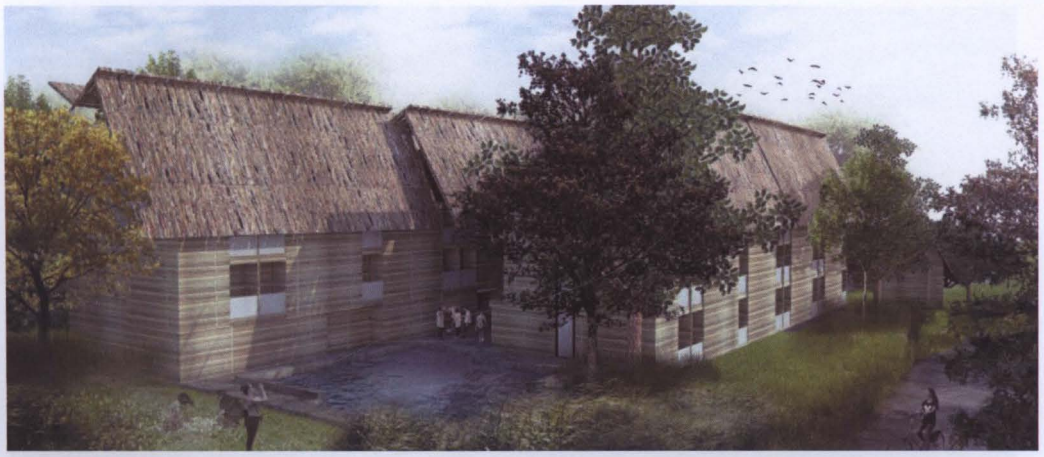

Figure 8.21: Dormitory building perspective

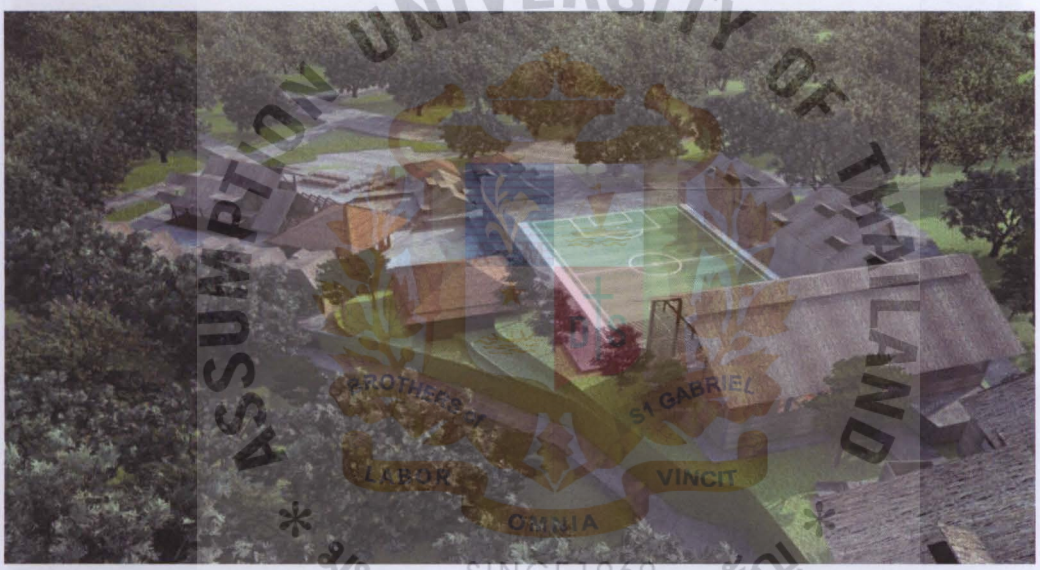

Figure 8.22: highest level of boarding school perspective

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Figure 8.23: Bird eyes view perspective

7.4 Interior perspective

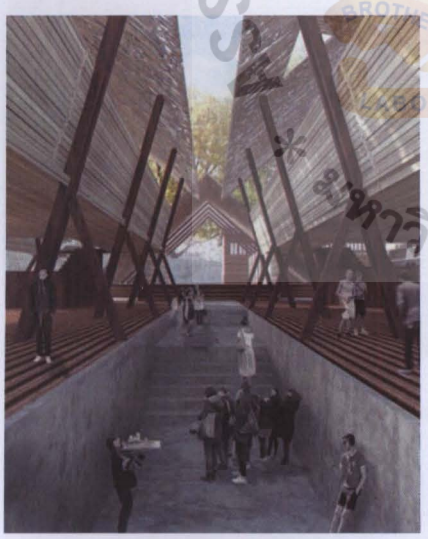

Figure 8.24: Performance perspective

Figure 8.25: Academic perspective

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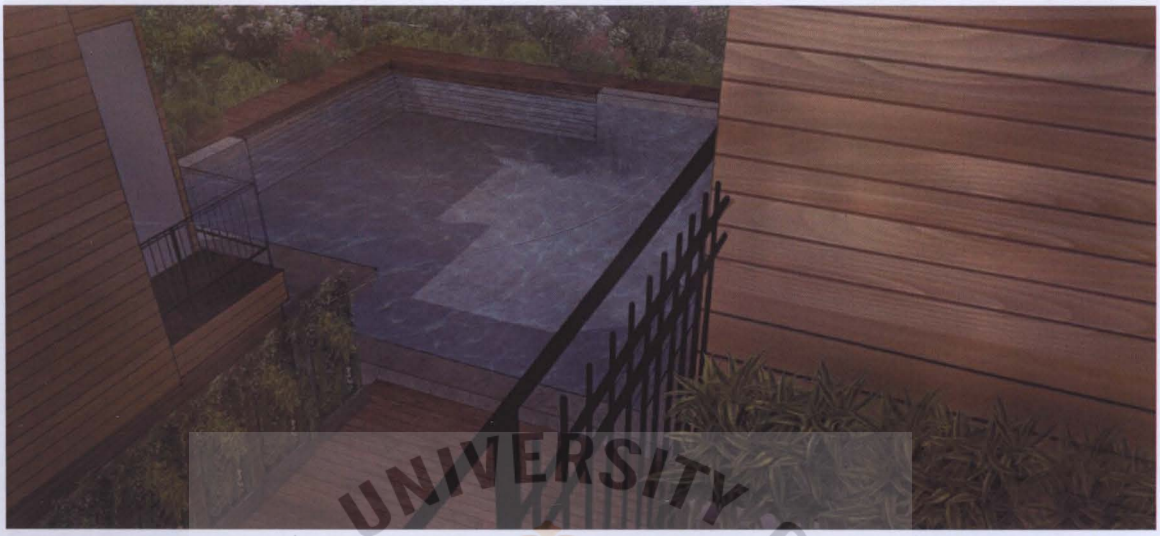

Figure 8.26: dormitory perspective

Figure 8.27: Academic building perspective

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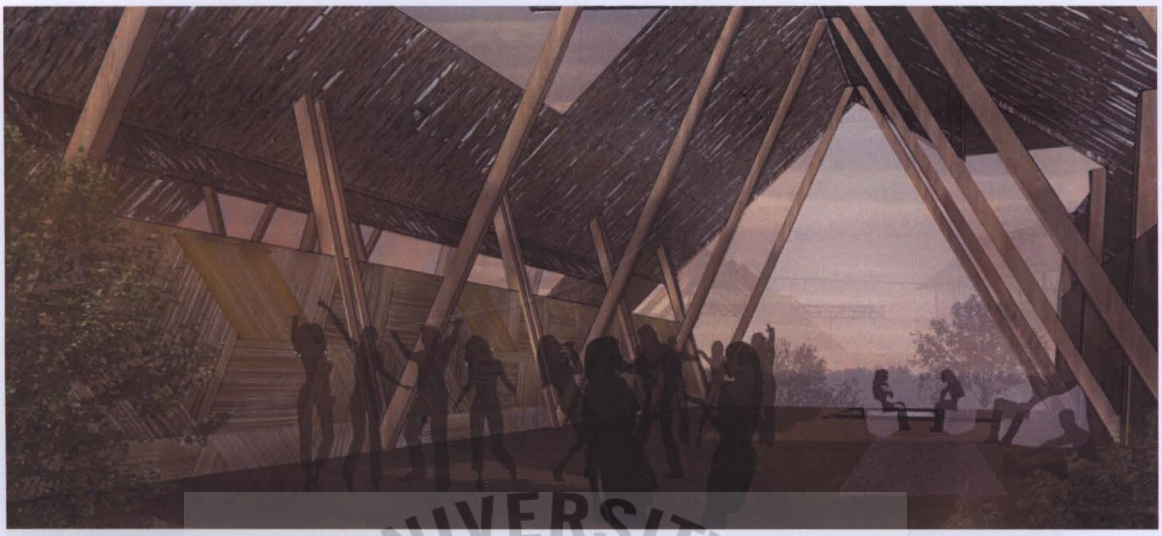

Figure 8.28: performance building perspective

7.5 Model

Figure 8.29: Model 1

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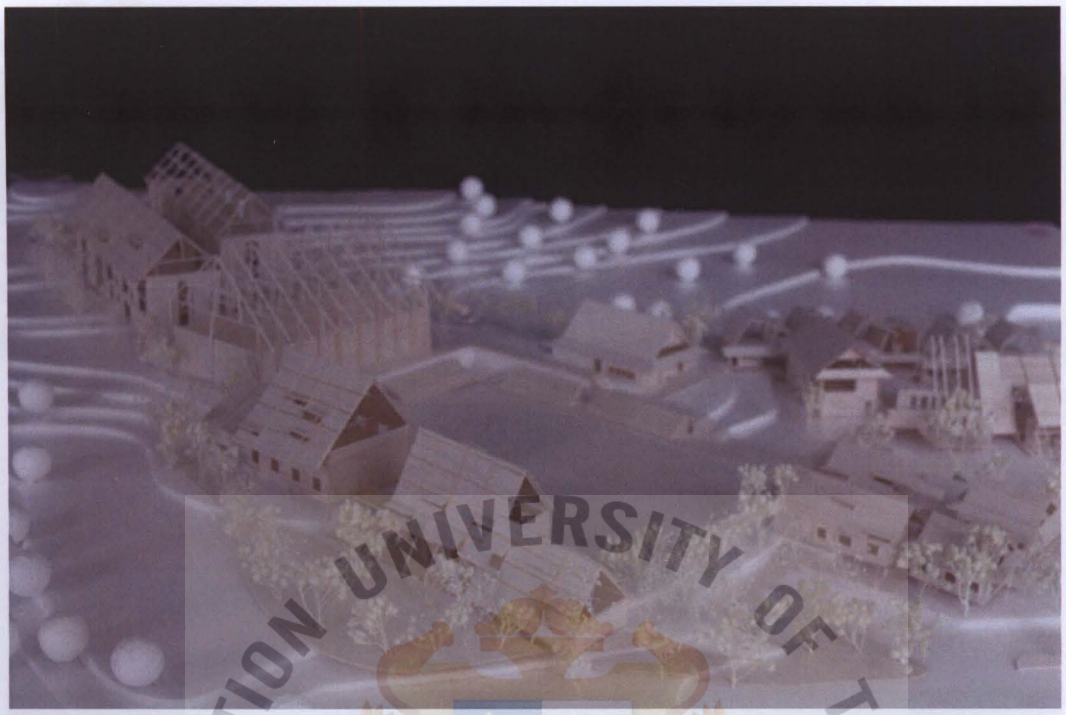

Figure 8.30: Model 2

Figure 8.31: Model 3

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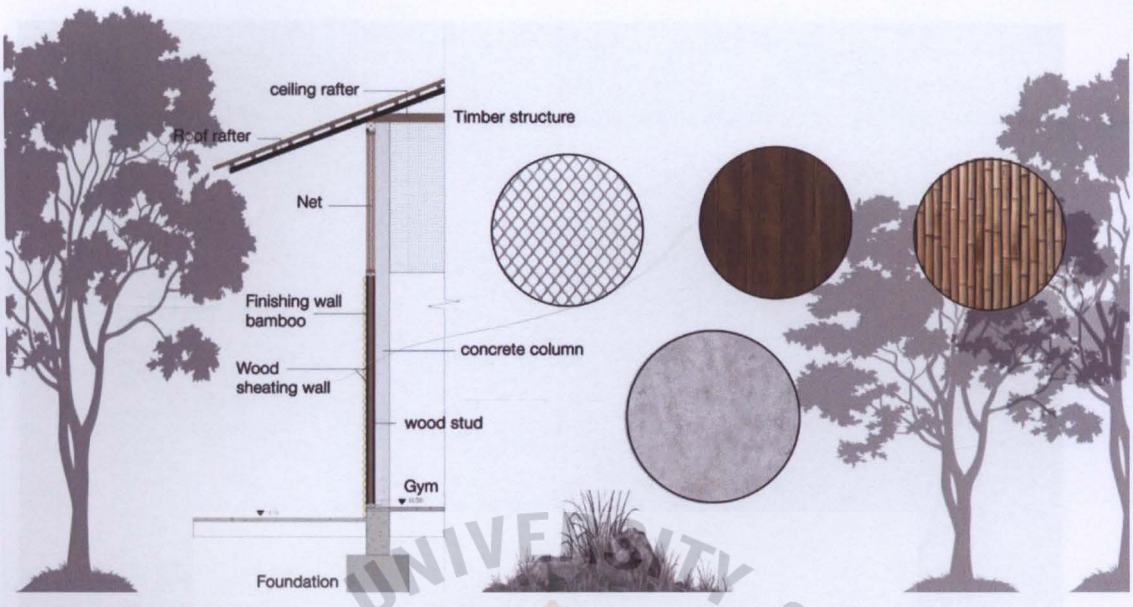

Figure 8.32: Wall section

Figure 8.33: Model 4

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Figure 8.34: Model 5

Figure 8.35: Model 6

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Figure 8.36: Model 7

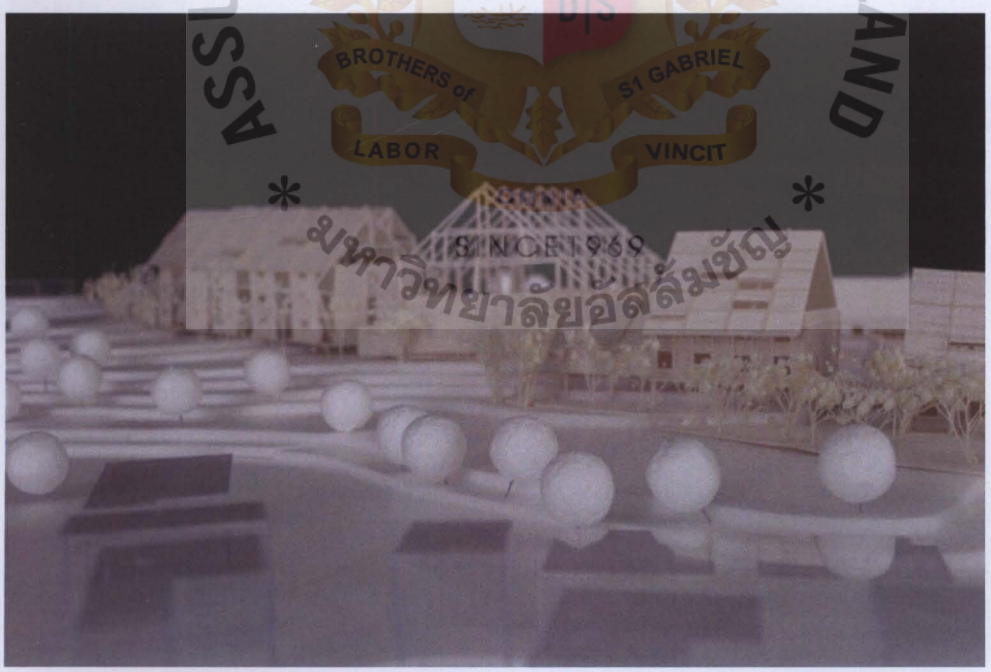

Figure 8.37: Model 8

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Figure 8.38: Model 9

Figure 8.39: Model 10

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Chapter 8: Thesis Conclusion

This Thesis is the International Boarding school project where located in Huaykaew, Chiangmai. The school was inspired by the main concept of integration between passive and active throughout the whole ideas and the objectives of the project. As the summary design from final presentation, the passive design and functional design spaces are represented in forms, layout, planning, elevations and sections under the process of conceptual design as much as it possible. Architecture can be a place where inspiring and motivating student to learn, play, live efficiently together and think out of the box without controlling like they have been. School will not get student boring anymore. It is not equally humdrum as other ordinary school and this can improve children's development appropriately.

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