DHITI HENGRASMEE

THE CHARACTERISTICS OF MODERN THAI ARCHITECTURE

THE CHARACTERISTICS OF MODERN THAI ARCHITECTURE

by

DHITI HENGRASMEE

School of Architecture
McGill University

M. Arch.
April 1972

ABSTRACT

This thesis introduces a possible bassis for a contemporary Thai Architecture derived from traditional as well as Western influences.

The study analyses the generalize factors in the Thai context which shapes Architecture. A plurality of values and forces must be considered in the design of every building: Cultural, Political, Economic, Climatic and Technical.

The results of the analysis of these values indicate a direction toward the creation of buildings and urban spaces which are expressive of modern living, but are related to tradition.

Many problems are related to the inherent in the creation of a new form of architecture, and adaptation to the industrial age. They offer new potentialities through the use of technical achievements of the West, without submitting entirely to the Western attitude and sacrificing traditional values.

THE CHARACTERISTICS OF MODERN THAI ARCHITECTURE

by

DHITI HENGRASMEE
B.ARCH.(CHULALONGKORN)

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of Master of Architecture

School of Architecture
McGill University
Montreal, Canada

April 1972

© Dhiti Hengrasmee 1973

ACKNOWLEDGEMENTS

This thesis represents a valuable research experience, which has been made possible by the assistance rendered by many people to whom the author now wishes to express his gratutude.

Firstly, Professor Radoslav Zuk, the author's advisor, who showed great understanding and encouragement, and provided guidance, criticism and suggestions.

The author is thankful to Mrs. Frances Pramekamol for reading the prefinal draft. Her comments have led to many improvements, and Miss Hilde Schroeder for final typing and correcting of grammatical errors.

Finally, the author wishes to make his acknowledgement to Khonkaen University for allowing him study leave; to the Canadian International Development Agency (C.I.D.A.) for its fellowship which enabled him to carry out his work in this Country.

To those mentioned, to all my teachers, and the universities as a token of gratitude, affection and esteem.

TABLE OF CONTENTS

LIST OF TABLES AND ILLUSTRATIONS

PART 1. INTRODUCTION TO THAILAND

PART 1. INTRODUCTION TO THAILAND

I. TOPOGRAPHY

II CLIMATE

III ECONOMY (OCCUPATIONS):
1) Farmers
2) Forestry
3) Government
4) Fishing

IV RELIGIOUS: BUDDHISM - WAY OF THOUGHTS

V POLITICS

VI REGIONS:
CENTRAL
NORTHEAST
NORTH
SOUTH
SOUTHEAST

VII PATTERN OF LIVING

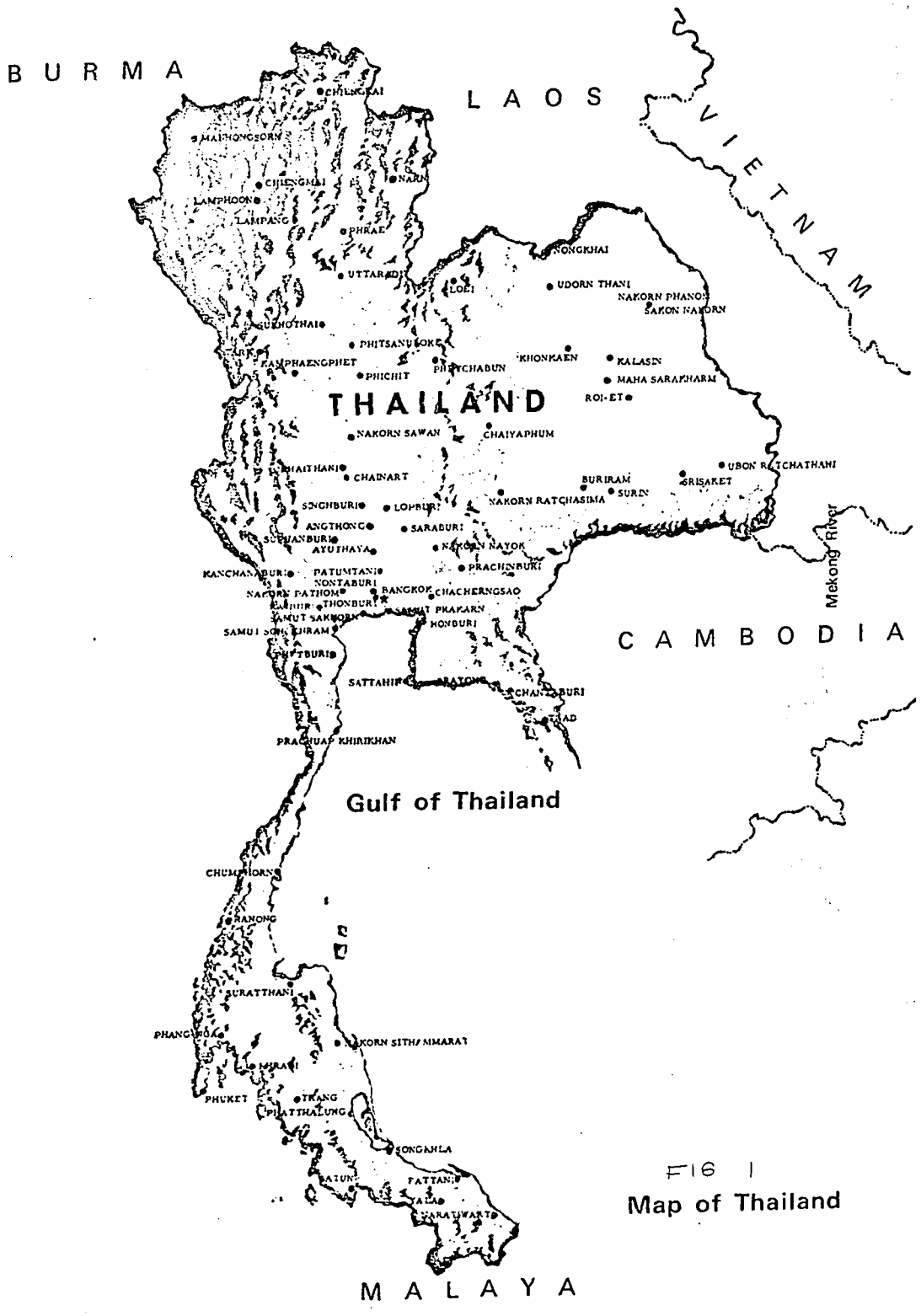


FIG 1
Map of Thailand

FIG 2.

Dilip. Oct 20, Montreal

INTRODUCTION TO THAILAND

ENVIRONMENT AND PHILOSOPHY REFLECTS THEIR WAY OF LIVING STYLE

I TOPOGRAPHY

Thailand an area of about 200,000 miles (518,000 square km.) in the heart of Southeast Asia. The Indochina Peninsular stretches from latitude 9° 40' north to 21° north and between the meridians of 97° and 106° east longitude. It thus falls entirely within the tropical zone.

The country is bounded on the northeast by Laos, on the northwest by Burma, on the southeast by Cambodia, and the south by the Gulf of Thailand and Malaya. The whole country consists of approximately 35 million people.

II CLIMATE

Since Thailand is located completely within the tropics and is part of the monsoon zone it is swept alternatively by the warm moist winds moving from the Indian ocean towards central Asia to the North, as well as by the cooler and drier winds coming down from the Asian highlands on their way back to the ocean. This rythmic pattern produces three distinct seasons: (1) Winter: from November to February, average temperature is 15°C to 19°C. Summer: from March to April, the temperature is higher rising upto 39.8°C (103.9°F) and Rainy: from May to September, abundant rain falls over the whole country. The significance of this climatic pattern derives a relation to the pattern of living which is agriculture.

III ECONOMIC (OCCUPATION)

The overwhelming majority of the population throughout history has existed like this. The traditional life cycle has been shaped to great extent by rice cultivation adjusted to the prevailing conditions of soil and climate. Due to these factors, the Thai people are the greatest rice producing society's in the world. They plant their rice at the beginning of the Rainy season because forceful rains cause flooding which resulting in the production of the best crop for the society's economic foundation. Thus the historic Thai commitment to rice cultivation fosters a traditional cycle: sowing-harvesting,-resting-sowing-harvesting, again, interwoven by various holidays and festivities which to a large part involve Buddhist blessings for the crops, and animistic propagation of spirits.

Although fishing, and forestry are included as a living style, agriculture predominantly involves up to 85% of the population, and is organized and owned by small families. The Thai have developed their views of a good life, by their values and attitude of living this simple pattern. As well, economic survival is more easy because of less pressures of population which is most evident in other Asian countries.

In the Urban society,(although a small minority) presently carry on commerial industry.

IV RELIGIOUS - BUDDHISM (BASIC PHILOSOPHY)

Buddhism's origin is from the austere southern school of Ceylon with two trends of thought: Hinayana, and Theravada. The philosophy proclaims the same; virtue, gentleness and suppression of too many desires with the exception of customs praticed. Buddhism is the state religion Theravada predominantly and 96% of the people practice it. However, the Thai Government in every period of history have bestowed upon the people freedom to profess any faith, and welcomed missionary's of any denomination to preach their ideas.

The effect of religion, and piety, in Thai countryside is very great, and plays an important role in every day life. Early risers will see yellow saffron robed monks on the streets asking for food with a bowl in their hands filled by the community. The basic philosophy denotes by letting others receive merit is returned. This custom is carried out because the monks cannot earn or ask for money, only receive donations for their religious discretion. The temple (where the monk resides) is the general responsibility of being maintained by the villargers, but governed by the teachings of the monks which direct the community towards peace and harmony. During the Rainy Season (Buddhist Lent), young men regardless of their social status are expected to spend a minimum of three months as a monk. This moral and religious training reflects soft-spoken manner, thoughtful and demure people in both business and at home.

V POLITICAL ASPECTS (REFLECTING SIMPLICITY BECAUSE OF THE NATURE OF THE PEOPLE)

Thailand has never been colonized, specifically not by their nearby European neighbours. In the political development of Burma, and the Philippines, they both were colonized (in that order) by British and American.

There are three(3) basic aspects of Thailand's politics:

(1) SIMPLICITY: Located in a compact area, it has no complex rationalized caste or feudal system, therefore ethnically homogenous.

(2) STABILITY: For almost two centuries it has not been disrupted by the intrusion of foreign rules, wars of liberation, or any wages of civil strife prevalent in most cultures.

(3) POLITICS FUNCTION EASILY, YET IT IS SOPHISTICATED AND MAINTAINS SUCCESS: The government rules a substantial population and has maintained peace, and other conditions conducive to human livelihood. In recent history, a number of external challenges were made but with no success.

There are four common uses in Thai political vocabulary:

(1) THE KING: or Monarchy, is a symbol of political conservation.

(2) BUDDHISM: is a symbol of cultural conservation and unity. It binds the highest and lowest in what is seen as a just, and a natural status of rights.

(3) THAI NATIONALISM: is assimalative by culture. Politically, it is not revolutionary but conservative often taking the form of appeals for peace and tranquility for the sake of the nation.

(4) DEMOCRACY: Democratic or "free-going" people, being simple minded they practice the way they like and enjoy a prosperous live.

In summary, due to the adaption of their climate, the Thai people have developed certain values, attitudes and tradition as follows:

(1) A belief that agriculture, specifically rice cultivation, is the most worthwhile and ennobled form of labour. Conversely, a historic distate for commercial activity, and disinterest in permanent urban (contemporary) living.

(2) A sense of self-reliance, personal dignity and economic independence.

(3) An agricultural sense of the time, and a behavioural discipline which is very different from that required by modern commercial pursuits.

(4) A psychological and cultural sense of well being which has contributed to the patterns of behaviour designated by most foreigners as "happy go lucky".

(5) A basic faith in the virtue of their way of live and country.

(6) A basic political apathy to revolt, since few demands have had to be made on the government other than for occasional protection, and simple local administrative facilations of their pursuits.

(6) Respect is submitted to wisdom, including: seniority, as they have experience with life and to monks and novices which reflect their manner.

VI REGIONS

For convenience of description, Thailand may be divided into five physiographic regions.

(1) NORTHERN FOLDED MOUNTAINS are somewhat cooler, including the area drained by the upper reaches of the Chao Phraya tributaries covering 65,000 square miles. Deep narrow alluvial valleys encompass this range. There are many limestone hills surrounded by long north-south mountain ridges which have thick forests yielding many types of valuable woods such as teak, and hardwood. The average height of these peaks in the mountain ridges are approximately 1600 meters.

(2) THE NORTHEAST OR KHORAT PLATEAU is the largest region of the country. It's area and population are about 1/3 of the whole country, approximately 70,000 square miles with population of 15 million) Poor soil, and inconsistent spurts of rain raise just a little more rice than needed for local consumption. The rest of the land is devoted to raising livestock. It is still sparsely populated due to the fact of jungle and sandy soil, with sandstone being the most apparent material.

(3) THE CENTRAL PLAIN OR CHAO PHRAYA BASIN is the economic and political heart of the nation. Bangkok-Dhonburi dominates 50,000 square miles of the central plain. Chao Phraya is generally low, and is heavily flooded in the rainy season. This is very useful for rice cultivating and therefore attributes to the largest, and most fertile plain of the country.

(4) THE SOUTHEAST: is flanked on the east by a range of hills forming part of the Frontier between Cambodia and Thailand. The area has many distributaries flowing in a southeasterly direction. These streams have built up small alluvial basins and deltas utilized for growing. The higher ground and well drained by slopes and plantations such as rubber, sugar cane, cassava, and pineapple are made.

(5) THE SOUTH: and area of 20,000 square miles characterized by the narrow southern Peninsula is the source of most of the country's tin and rubber. It's long shorelines arch around the Gulf of Thailand strung with fishing villages and balmy seaside resorts, the result of Thai moving down the Malay Pennisula during the 16th to 18th century. Contrary to other regions, the people are constituted in groups of Moslem Malay, and Chinese and Thai Buddhists.

As the climate ascertains simple-life styles, homes are similar in all regions.

	Region	Population	Degree of Wealth	Applied Decoration to home	
				Rural Area (Traditional	Urban Area (Contemporary)
(1)	CENTRAL	covers 50,000 sq.miles	most prosperous	external:clay tiles roof-grey orange and green internal:little furnitue,beam purlin,ridge pole,etc.	external: asbestos only internal:little furniture,beam purlin,ridge, pole,etc.
(2)	NORTHEAST	covers 70,000 sq.miles	most poor area	SAME	SAME
(3)	SOUTHEAST	covers 50,000 sq.miles	middle class area	SAME	SAME
(4)	SOUTH	covers 60,000 sq.miles	prosperous	SAME	SAME
(5)	NORTHERN	covers 65,000 sq.miles	prosperous	SAME	SAME

In response to society's needs: contemporary or urban communities developed, opposing to rural which is a traditional made.

PLEASE REFER TO THE FOLLOWING

VII PATTERN OF LIVING

	TRADITIONAL		CONTEMPORARY	
	RURAL AREA	URBAN AREA	RURAL AREA	URBAN AREA
(1) DRESS	women: wrap around skirt men: pants	Communities only stayed in rural areas because the source of mobility limited their living space	wear old style and western dress	women: wear wrap around skits in home and western dress out side. With beautiful silks the Thai typical costum used in formal occasions. men: Western dress exclusively
(2) HOUSING			all classes integrated in one community	Politics forced people to live According to Wealth:
a)Internal:	1) Central-room for multi-purposes		1)same,althouth the kitchen may have a covered passage linking(depending on wealth)	1) Poor-row houses,congested Central room,bedroom(s) and kitchen
	2) Bedroom(s)-depending on wealth		2)Same	2) Middle - 2 storeys,wooden walls and roof,lower floor usually concrete,kitchen connected by passageway.Some merchants and shopkeepers live in their shops
	3) Kitchen-built away from main dwelling		3) Same	3) Wealthy-live outskits,seperate structure for servants,whole complex surrounded by a fence.
	4) Bath house-usually separate unit from home			
(3) GROUPING	home attempts to achieve self sufficiency,although other complexes,according to wealth are added: (separate kitchen,bath shed and storage for animals, equipment, etc.		same as traditional (rural)	same as traditional(rural) although no shed for animals are used

(4)	FOOD	basic diet: rice with a meal,meal made spicy including meat and vegetable variations. A desert is usually fruit.	Same	Same

PART 2. CULTURAL FACTORS

I SOCIAL STRUCTURE

BASIC NUCLEAR UNIT

1. Upper Classes
2. Middle Classes
3. Lower Classes

II LIVING SPACE

(a) ELEMENTS AND LOCATIONS

IN: 1. Rural Area
2. Urban Area

(b) MOBILITY-MOVEMENT AND TRANSPORTATION

III PLANNING

(a) BUILDING
1. Traditional
2. Contemporary

(b) PLANNING AS INFLUENCED BY LOCATIONS
1. Rural Area
2. Urban Area

(c) STYLE
1. Traditional
2. Contemporary

IV SHAPES IN BUILDING

(a) INDIVIDUAL PATTERN

1. Temple
2. Royal Palace
3. Rural Area

I. SOCIAL STRUCTURE

The basic social structure in the home consists of:

1. Husband,Wife either can be owner
2. Child or Children

Should they desire, inclusive would be:

1. Parents
2. Other Relatives
3. Friends

According to the Thai philosophy, if these people have no home they are asked to join.

The basic nuclear unit lives in 3 classes or prosperity is devided up into:

Middle - Richest
Middle - Middle Wealth
Lower - Poorest .

According to prosperity, the following other people may stay at the home. Including:

(a) Supporting owner, Business

(b) Servants:
1. Gardner
2. Household
3. Chauffeur

(PLEASE SEE THE FOLLOWING CHART)

(b) INTEGRATED PATTERN-

1. Urban Area

2. Rural Area

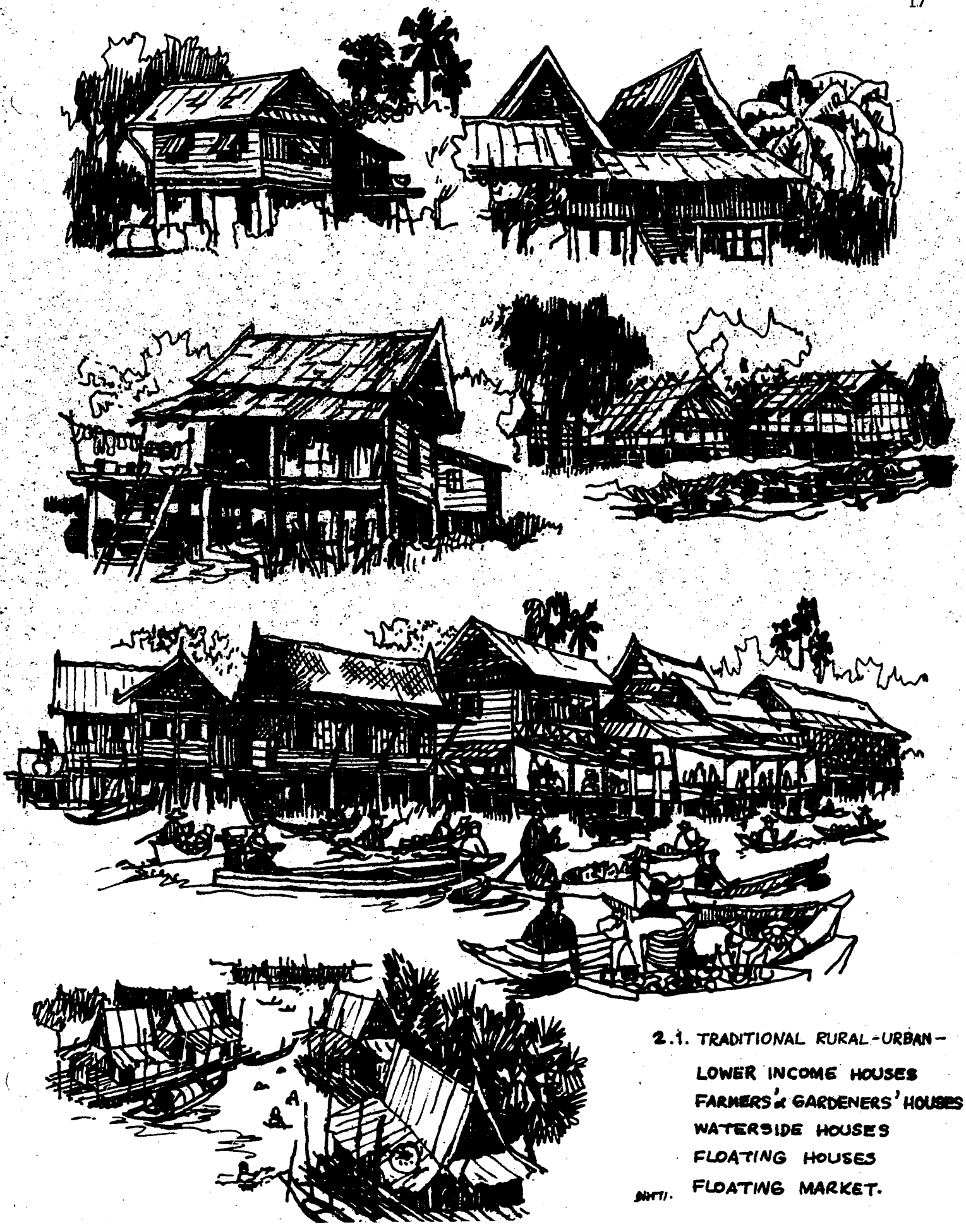
(c) PATTERN VARIABLE
(COMMERCIAL BUILDING)

1. Factory

2. Nightclub and Restaurant .

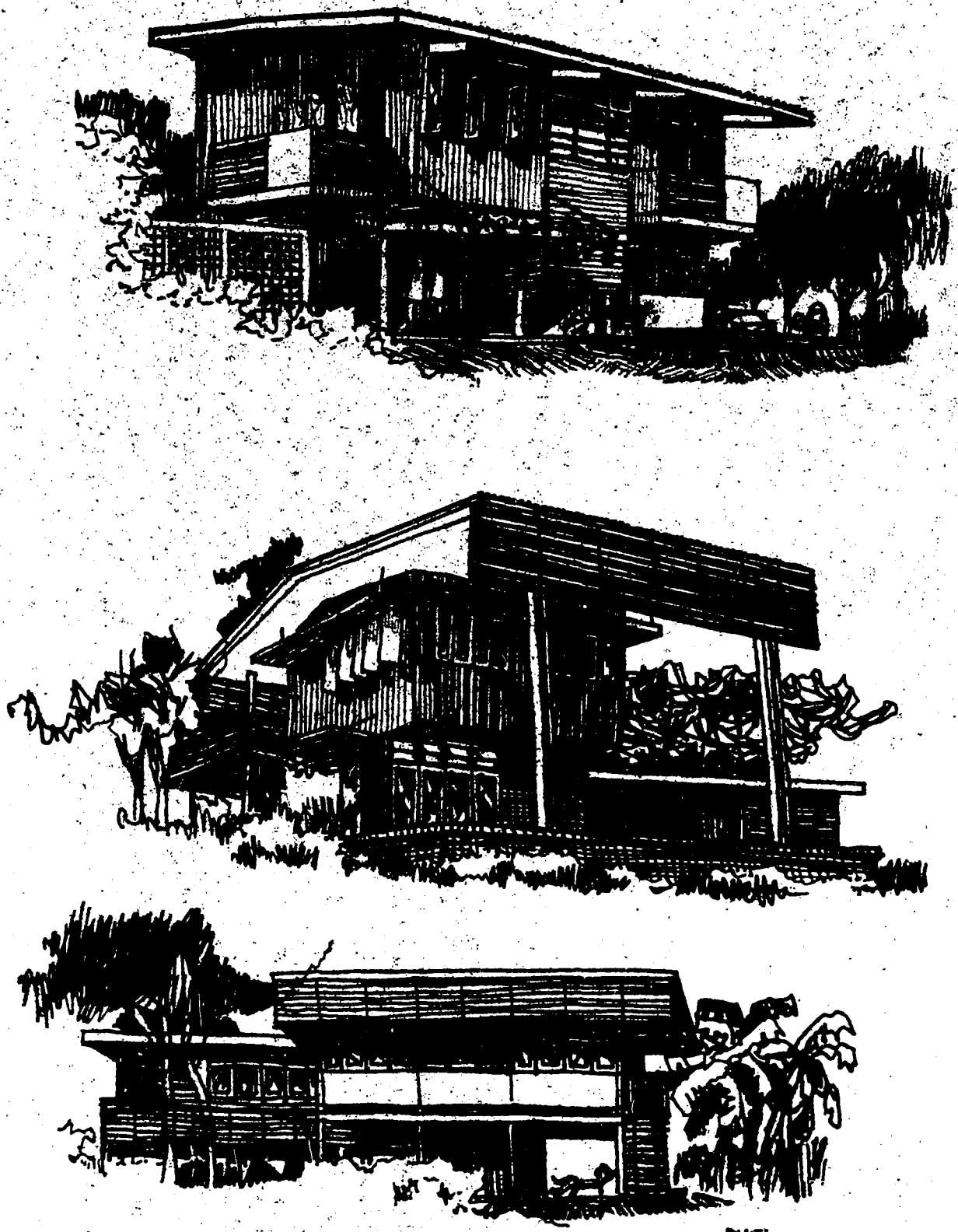
BASIC NULCEAR UNIT

UPPER CLASS		MIDDLE CLASS		LOWER CLASS	
RURAL	URBAN	RURAL	URBAN	RURAL	URBAN
all live in urban area Small percentage buy land for: 1) develop land-make home for staff (farm) 2) rent out to people no staff 3) develop entertainment buildings i.e. bowling,night-clubs, etc. no staff.	types of owner's business involved in: 1) Government-supports no staff 2) Commerical Enterprises no staff labour work in daytime. 3) Professional Dr.- if practice based at home emergency staff kept Lawyer,Architecture, Engineer etc. no staff(assisting labour work in daytime)	types of owner's business involved in: 1) Farming-extra farm labour,average 2 live in 2) Stores:Clothing no staff,Restaurant no staff, Upholstery no staff,Veriety no staff. 3) Professional -no staff 4) Government-no staff 5) Small percentage have surplus land and rent out-no staff	types of owner's business involved in: 1) Large Stores Clothing-no staff Restaurant-no staff Upholstery-no staff Variety-no staff Entertainment,i.e. bowling,nightclub-no staff. 2) Professional-no staff 3) Government-no staff 4) Small percentage have surpolus land and rent out in urban or rural and or both.	Too Poor- No own business,just labour,no staff	Too Poor- Same as Rural.
(B) SERVANTS: GARDENER,HOUSEHOLD,CHAUFFEUR					
see **	Gardener: average 2 live in ,small % do not Household:average 2 live in ,small % do not Chauffeur:average 1 live in.	Gardener:average 1 50% live in, 50% do not Household: average 1 live in,small % do not	Same as Rural	Too Poor- No servants	Too Poor:- No servants.



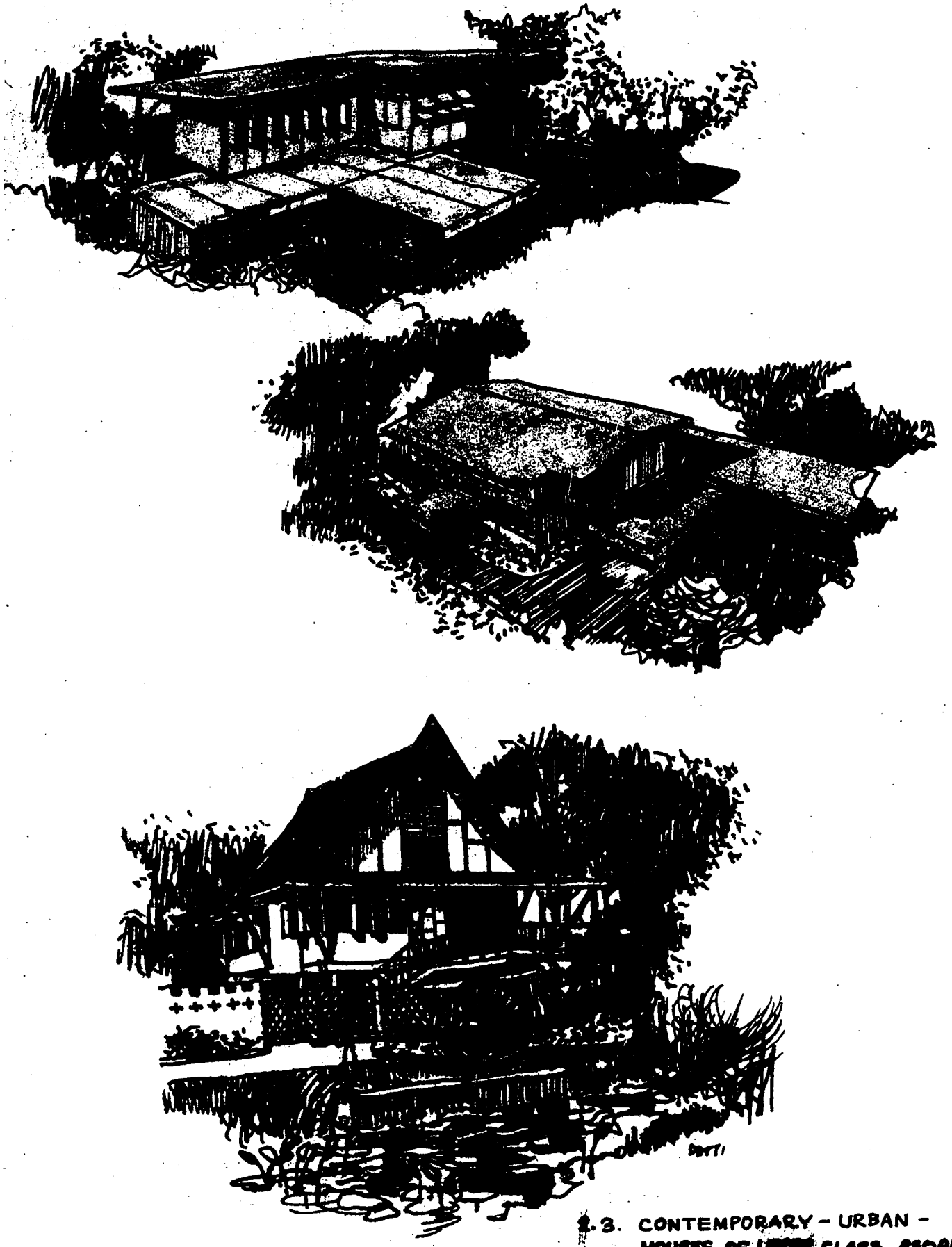
2.1. TRADITIONAL RURAL-URBAN-
LOWER INCOME HOUSES
FARMERS' & GARDENERS' HOUSES
WATERSIDE HOUSES
FLOATING HOUSES
FLOATING MARKET.

SHITI.



DIAGRAM

2.2. CONTEMPORARY – URBAN – RURAL – HOUSES OF MIDDLE CLASS PEOPLE.



1.3. CONTEMPORARY – URBAN – HOUSES OF UPPER CLASS PEOPLE.

II LIVING SPACE

There are three types of living style:

(1) Completely Indoors

(2) Outdoors

(3) Indoors and Outdoors

Staying outdoors depends primarily on temperature; seasons, time of day.

a)

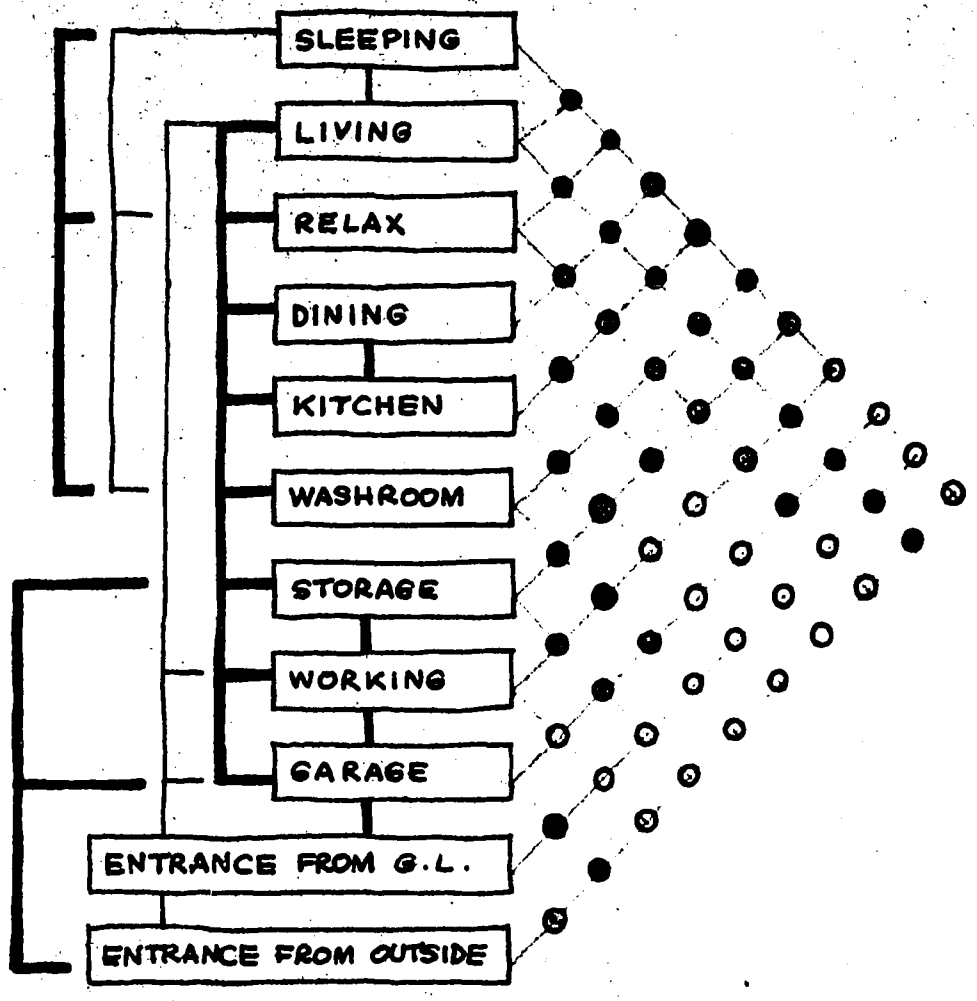
2.4. ELEMENTS AND LOCATIONS

REQUIRED ELEMENTS	LOCATIONS: GROUND LEVEL	LOCATIONS: FIRST FLOOR ABOVE G.L. APP. 0.20-1.00 METER	LOCATIONS: UPPER FLOOR ABOVE G.L. APP. 2.00-3.00 METER	SPACE ALLOCATION PER 1 UNIT (□ = 5 SQUARE METER)
SLEEPING	—	✓	√√	□□□□
LIVING	—	√√	√√	□□□□□
RELAX	√√√	√√	√√	□□□□□
DINING	✓	√√	√√	□□□
KITCHEN	✓	√√	√√	□□□
WASHROOM	—	√√	√√	□
STORAGE (LARGE)	✓	√√	√√	□□
STORAGE (SMALL)	—	√√	√√	□
WORKING	√√	√√	√√	□□
GARAGE	√√	√√	—	□□□□□
PET- ANIMAL SHED	√√	√√	✓	□□□
INDOOR STAIR	√√	√√	√√	□□
MAIN ENTRANCE	√√	√√	—	□

LEGEND :

√√√ MOST DESIRABLE
√√ MEDIUM "
✓ LOW "

2.5. LIVING SPACE PLANNING.

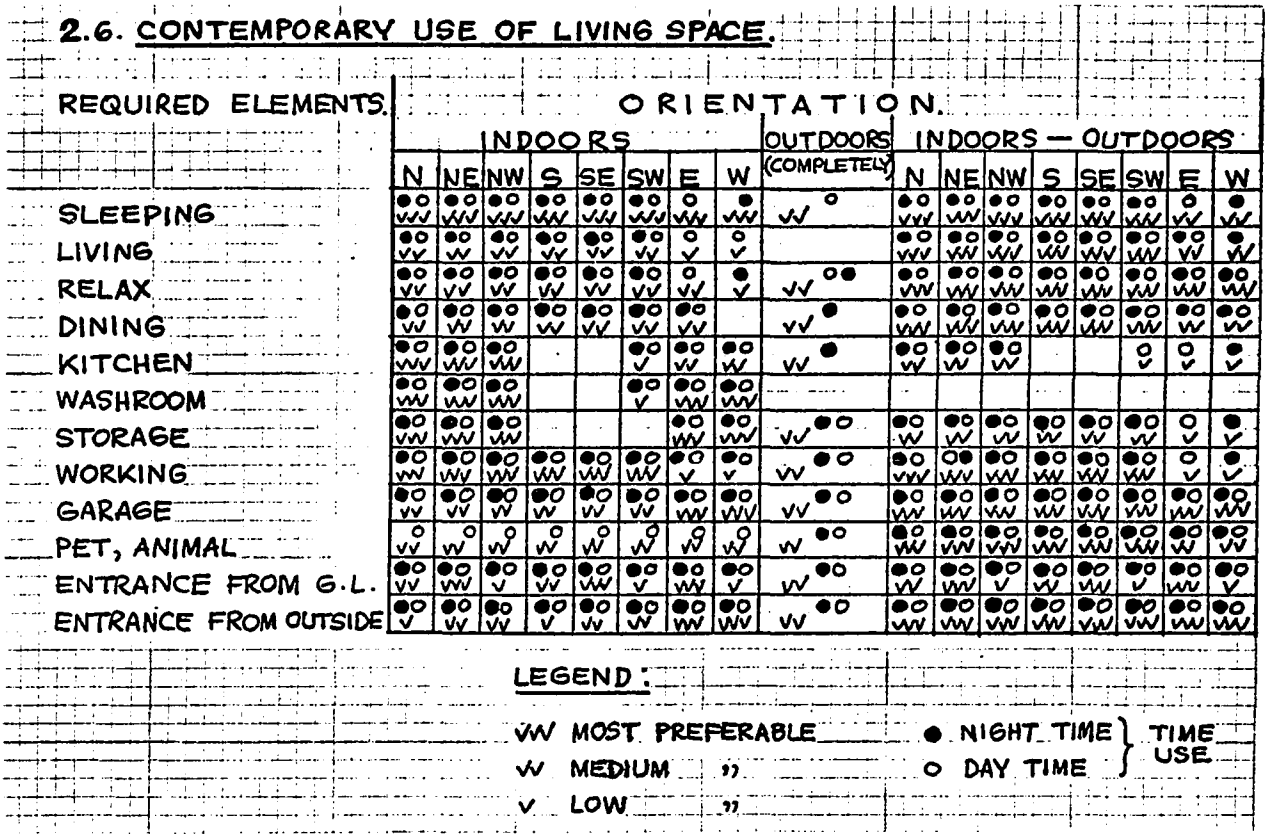


LEGEND :

- ● CLOSE
- ◉ MEDIUM
- ○ LOW
- —— VERTICAL CIRCULATION
- ▬▬ HORIZONTAL CIRCULATION

Location of spaces considers: (balance) long axis towards E-W, NE-SW, NW-SE and N-S.

2.6. CONTEMPORARY USE OF LIVING SPACE.



* REQUIRED ELEMENTS:THIS REFERS TO THE PRESENT DAY(CONSIDERING THE BASIC SOCIAL STRUCTURE: MAN,WIFE AND CHILD)

ELEMENTS	URBAN COMMUNITY	RURAL COMMUNITY
(1) SLEEPING	MASTER-for husband and wife,located upstairs	SAME
	BEDROOM-or bedrooms depending on wealth, for child or children	SAME
	GUESTROOM-for more prosperous	SAME
	OTHER ROOMS- supplied for extra help(see social structure) provided accordingly,and over a distance from the nulcear family,mostly in a seperate complex to allow family privacy.	SAME
(2) LIVING	LARGE VERANDA OR LARGE HALL to receive guests, if room provided for guests is occupied, the older boy or boys sleep here. In this case,the girl stays with the parents	SAME (size of veranda or hall depending on wealth). Guest room is only for the more prosperous family.
(3) RELAXATION	BALCONY attached to master bedroom, or in between living and aforementioned combined or in the living area. Balcony allows maximum solar exposure for relaxation.	LARGE VERANDA which may contain a raised platform with a mat (covers 1/3 space) and pillows for who prefer to lounge on ground level (being more shady.) Also used for playground,very often homemade swing is put up.

(4)	DINING	Attached to, or located in living area, the veranda is used when many guests, (otherwise kitchen)	SAME
(5)	KITCHEN	The kitchen, a separate unit from home inter connected by a covered passage,if more prosperity, a kitchenette is also made (nearby Dining area) to accomodate snacks	SAME, but passage way is not covered
(6)	WASHROOM	placed next to kitchen or near the sleeping area depending on wealth, 2 or 3 made. (<u>in office buildings</u>) washrooms are located at the side) for better circulation.	next to kitchen (in office buildings - SAME, yet very few office buildings here
(7)	STORAGE	In Kitchen area : a Pantry,which is an optional addition stores food. Other complexes are made for storage according to family's needs. i.e. a garage or carport connected to the house or a separate complex	(see Fig. 5.1-villager's house) Granary used for storing food of animals and the family's supplie . According to prosperity other rooms are supplied
(8)	WORKING	completely indoors away from humid climate.	<u>men</u>, work outdoors to grow cropo, fish or do orestry. <u>women</u> work outdoors or in. They weave fabric such as silk, and cotton to supplement the family's income.

(9) ANIMAL SPACE	Pets are kept under home	a Shed is used for pigs, chickens etc. located nearby the home, or sometimes a distance from the home protected by a bamboo or hardwood fence (See Fig.2.24)
(10) STAIRS	most houses have 2 levels, and stairs are used on main level leading to bedrooms. Also stairs leading to main entrance (See Fig. 4.5)	stairs leading to main entrance (see Fig.2.24) and stairs leading to living area.
(11) MAIN ENTRANCE	located at front building, entry by stepping (see stairs)	SAME (see stairs)

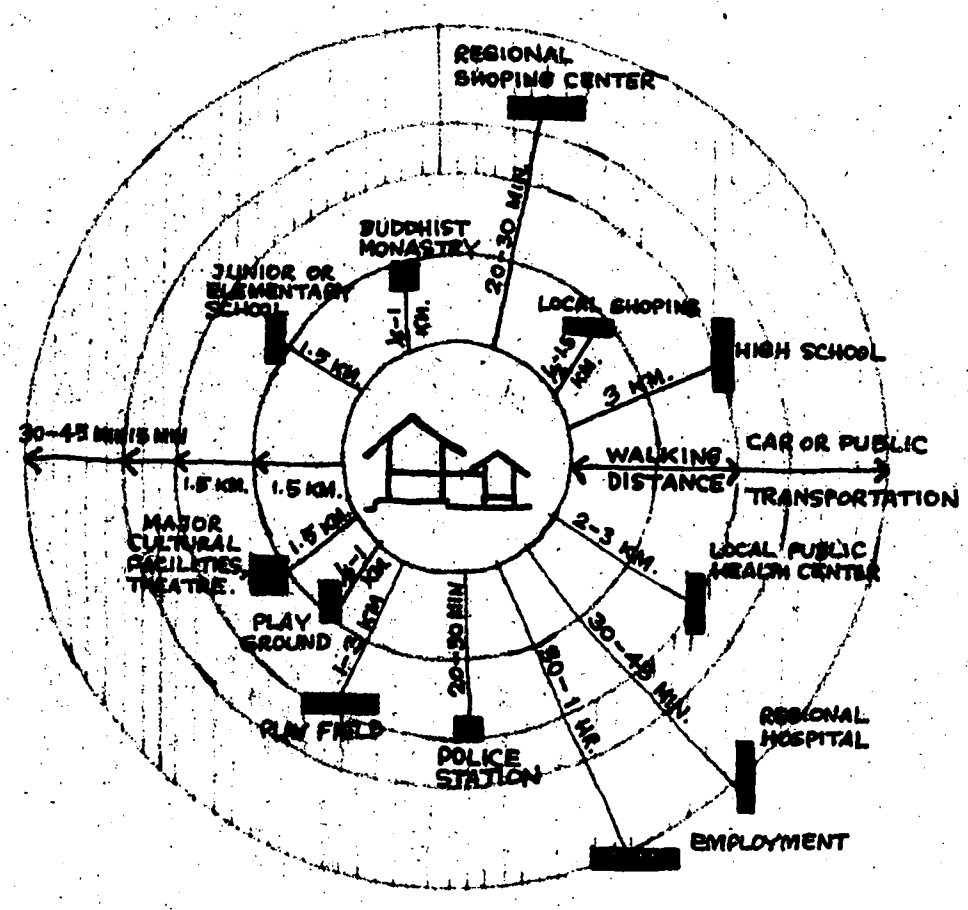
(b) MOVEMENT AND TRANSPORTATION

SOURCE OF TRANSPORT	MOVEMENT BY: FIG:2.8, - 2.12.	RURAL AREA TRADITIONAL	RURAL AREA CONTEMPORARY	URBAN AREA TRADITIONAL	URBAN AREA CONTEMPORARY
1) WATER	By Boat	To carry rice and teak and visit friends (only route)	Same as Traditional	**(NOTE)** Traditionally, people lived only in Rural area, therefore traditional does not exist in the Urban area	Just to carry rice and teak(other means to visit friends)
2) WILD ANIMALS	Buffaloes Cows and Elephants	To carry people or supplies	Same as traditional	SAME	Not used
3) AIR	Airplane	Not used	Government owned Approx.40 Airport	SAME	Government owned Approx.10 Airport
4) RAIL	Train	Not used	Government owned one line only	SAME	Government owned one line only
5) BRIDGE a) large b) small (walkway)	a) Bridge	Not used	Not used	SAME	a) 10 Principle bridges crossing Chao Phraya b) Few used, for hotels or commercial enterprises-wall between buildings

6) ROADS (filled in canals)	Dirt Roads Main Junction: Bangkok	Dirt Roads	Government owned Dirt Roads (15% Mobility)	SAME	Government owned Dirt Roads and paved Roads, approx.5 major paved roads (Highway) for emergency landing of plane
7) BUS	BUS	Not used	Government and Privat owned, (River Bus used also)	SAME	Government and Private owned, 15% mobility by roads, Overcrowed
8) SUBWAY	Not used	Not used	Not used, too poor soil	SAME	Not used, too poor soil
9) PRIVATE VEHICLES	a) Taxis	Not used	used, private owned from Urbans	**(NOTE)** Traditionally, people live only in Rural area, therefore traditional does not exist in the Urban area.	used, private owned
	b) Cars	Not used	Some Jeeps, some Trucks and some cars (small percentage)		used, private owned
	c) Motocycle	Not used	used, private owned		used, private owned
	d) Byclicle	Not used	used, private owned		used, private owned
	e) Sam-Law (3-Wheels)	Not used	used, private owned run by Manpower or by Motor		not used
10) SIDEWALKS	"feet"	walking in open air	SAME	SAME	SAME (for short distances)

2.7.

THE CHARACTERISTICS OF DISTANCES FOR COMMUNITY FACILITIES.

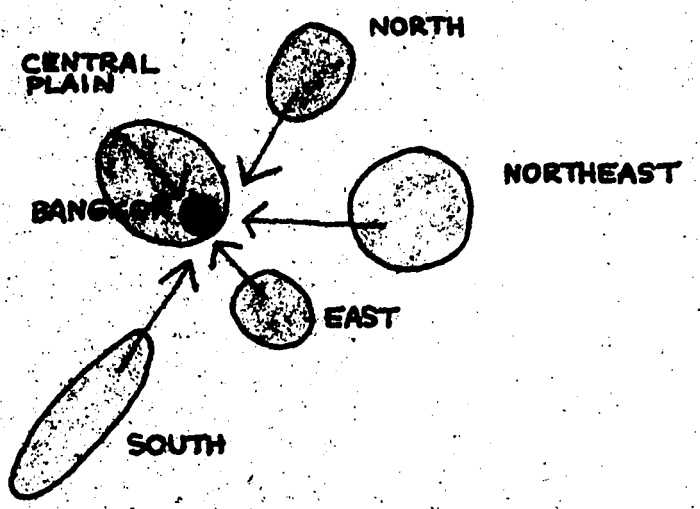


JOURNEY FROM DWELLING UNIT TO SELECTED DESTINATIONS.

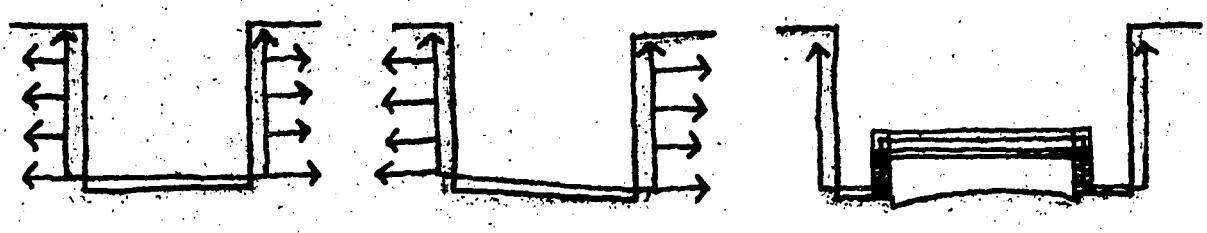
- ALL DISTANCES GIVEN ARE CONSIDERED TO BE MAXIMUM IN KILOMETER (KM.)
- IN HIGH DENSITY, URBAN AREA MOST SCHOOLS ARE LOCATED WITHIN THE MAXIMUM RECOMMENDED WALKING DISTANCES.
- IN LOW DENSITY, RURAL AREA MANY SCHOOLS ARE LOCATED BEYOND MAXIMUM RECOMMENDED WALKING DISTANCES THEY MUST HAVE BUS SERVICE OR THEIR OWN VEHICLES SUCH AS BICYCLES, MOTOR-CYCLES, ETC. WHICH ARE — POPULAR AT PRESENT.
- CAR OR PUBLIC TRANSPORTATION IS MEASURED IN TIME

SOURCE.. DEVELOPED FROM " PLANNING DESIGN CRITERIA ", BY — JOSEPH DE CHIARA, LEE KOPPELMAN

1.4. THE SITUATION OF HIGHWAYS TRANSPORTATION AT PRESENT.

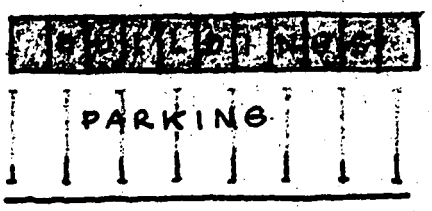


1.5. THE MOVEMENT BETWEEN BUILDINGS.

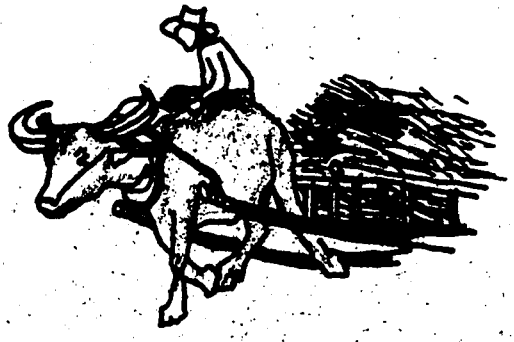


1.6. THE SITUATION OF PARKING AT PRESENT.

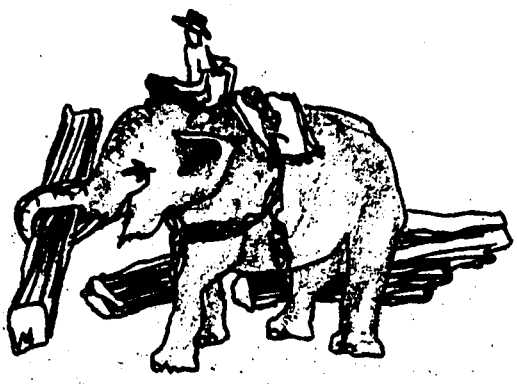
PARKING ALONG THE HIGHWAY



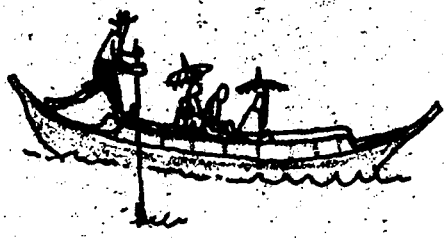
BUILDINGS MOVED BACK FROM THE HIGHWAY PERMIT PARKING IN FRONT.



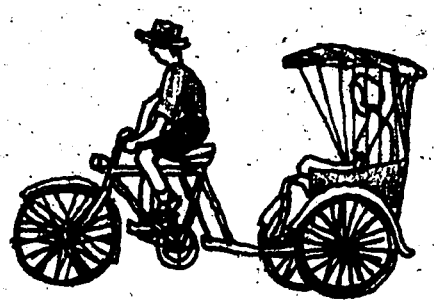
A BUFALO - DRAWN PLOUGH ILLUSTRATED THE TRADITIONAL THAI METHOD OF RICE CULTIVATION, AND ALSO USED FOR - TRANSPORT GOODS OR PRODUCTS FROM PADDY FIELDS.



ELEPHANT IS STILL INVALUABLE NOT ONLY IN FELLING TIMBER BUT ALSO IN SHIFTING IT TO THE RIVER FOR TRANSPORT.



ROWING BOAT IS STILL EMPLOYED FOR A SHORT JOURNEY.



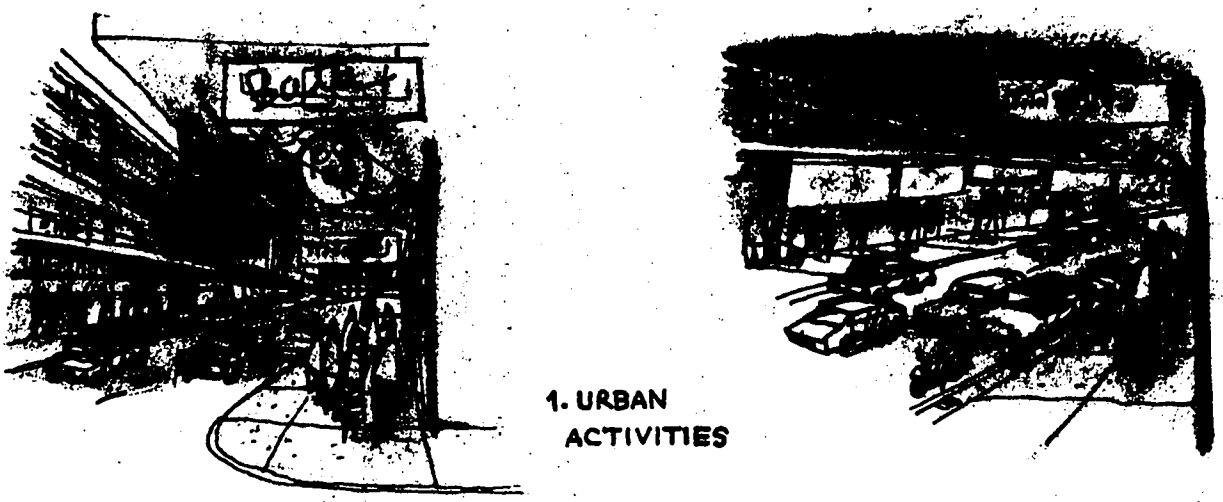
THREE WHEELED VEHICLES IS USED ONLY IN THE SMALL TOWN OR LOCAL COMMUNITY.

29. MEANS OF TRANSPORTATION IN THE PAST AND PRESENT.

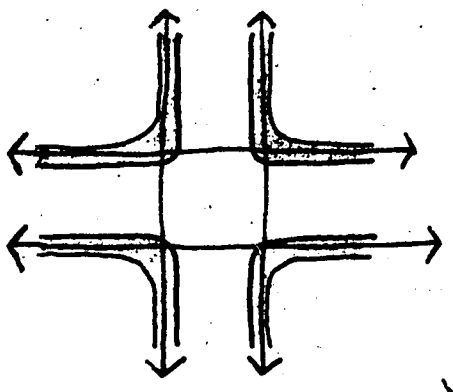
2.10. LOCAL TRANSPORTATION FACILITIES AND EQUIPMENTS.

2.11 URBAN MASS TRANSPORTATION FACILITIES AND EQUIPMENT

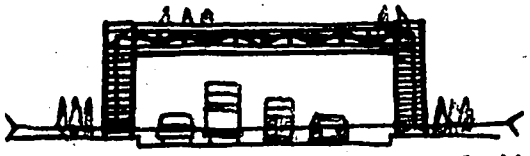
2.12. PEDESTRIAN MOVEMENT AND TRAFFIC.



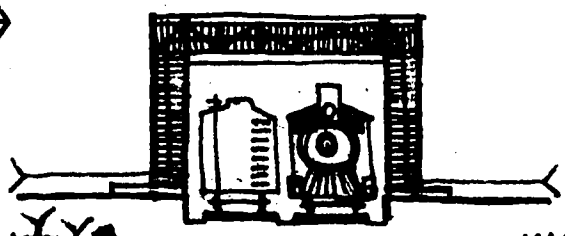
1. URBAN ACTIVITIES



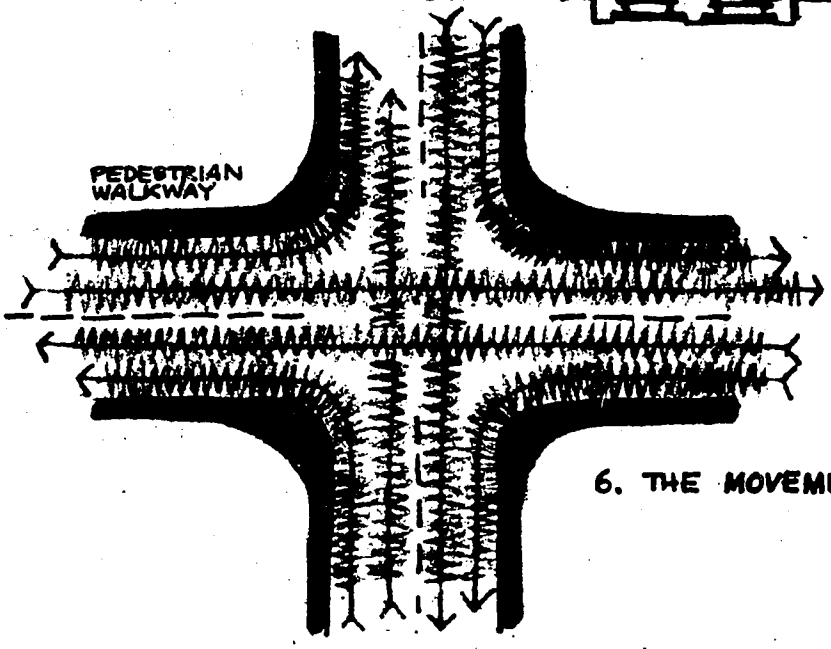
3. LOCAL STREET



2. MAIN STREET.



4. MAIN RAILWAY STATION POINT.



5. ALONG THE CANAL

6. THE MOVEMENT OF TRAFFIC IN TOWN.

2.13. CONFUSING CHAOS OF SHOPPING STREET.

III PLANNING

(a) PLANNING OF BUILDING TYPES

TRADITIONAL

1. TEMPLE: Buddhist (96%) culture is a living force, and each community has a religious center. The position of the building denotes the philosophy, "balance". That is, it has to face the east and keep the axis east to west. Within the complex are the religious and residential centers.

The religious includes:

1. PAVILLION - the community room to receive teachings
2. TEMPLE - to think about the teachings with the "Buddha" figure inspiring.
3. TEMPLE SCHOOL
   Monks are disciplined as well as passing on their learnings to children. As all schools (right now) teach religion, this Temple School is exclusively used for the monks studies.

The residential includes:

1. DRUM HOUSE where a bell and gongs are rang to tell time of function according of function according to the rhythm used.
2. SACRED LIBRARY
   Religious books(exclusively) about "Buddha"

3. STUPA(CHEDI) PAGODA
   Represnting the cycle of "Buddha's" live enlightening the monk
4. WELL water supply; to carry on simple way of life in past.
5. BATH HOUSE
6. KITCHEN
7. DORMITORY
   (See Fig. 2.14, 2.15)

2. HOUSING: (See required element 3-6) basically maintains esthetical "balance" in regard to the people's way of live. That is, farmers have a simple home, a natural way of living (their balance).

In Rural Areas (past and present) houses are raised on stilts, though in urban communities only some houses on raised. Those houses raised on stilts preserve (traditional) private living space and doesn't give access to the prowler or passerbys. (see Fig. 2.16/1)

3. INSTITUTION: Same as characteristics of the home, and Temple. That is, it is simple and composed (See Fig. 2.15/2, 2.16)

GROUPING INCLUDES: (CONTEMPORARY)

1. HOUSING: attempts to be self-sufficient (relating to cultural factor) Nuclear family leaving traditional life style, effects:

   a. Poor: row houses put together in one complex- 1 unit per family.
   b. Middle: 2 or 3 storey complex divided into units, one unit per family.

c. Rich: 1 main home complex, with other complexes for family, servants and storage etc.(according to degree of wealth) or Apartment living, average 3 rooms with modern conveniences. (See Fig. 2.17, 2.18 and see also basic social unit)

2. SHOPHOUSE - family live in Shop either upstairs or at the back exclusively, Middle - average 5 rooms. (See Fig. 2.17/4).

3. OFFICE WITH HOME UNIT - located upstairs or in the back, larger and more modifications than the Shophouse.

a. Middle - average 5 rooms (larger than Shophouse)

b. Rich - average 6 rooms, larger than Middle (See Fig. 2.17/5)

4. FACTORIES:

a. Light - with attached home unit, located central(town) home unit upstairs or in back of workshop, exclusively Middle average 6 rooms, just a little larger than Shophouse.

b. Heavy - No home unit, located on outskirts, variations in size according to degree of wealth (larger than light). Extra rooms; average 1 to 2 made for security guard or owner sleeping in for some reason. (See Fig. 2.16/6).

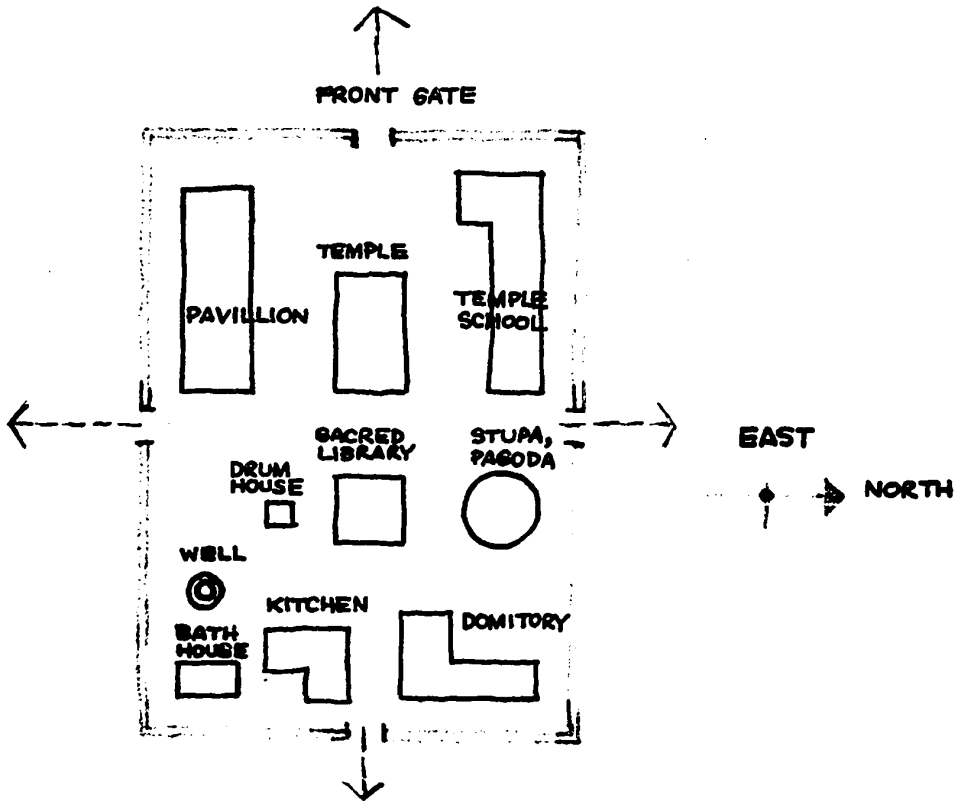
5. SCHOOLS

a. Elementary* Children wear uniforms although contemporary building smallest complex of all schools.*

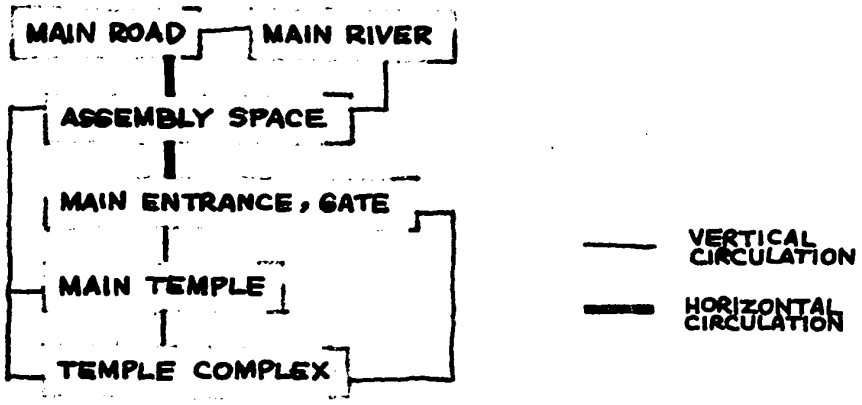
b. Highschool *same;* larger structure than elementary, average 2 to 3 complexes.

c. University *same*largerst structure, additional complex's vary from one institution to the next. (See Fig. 2.17/7)

2.14 BASIC PLANNING OF TEMPLE



1.. TYPICAL PLAN OF VILLAGE TEMPLE.

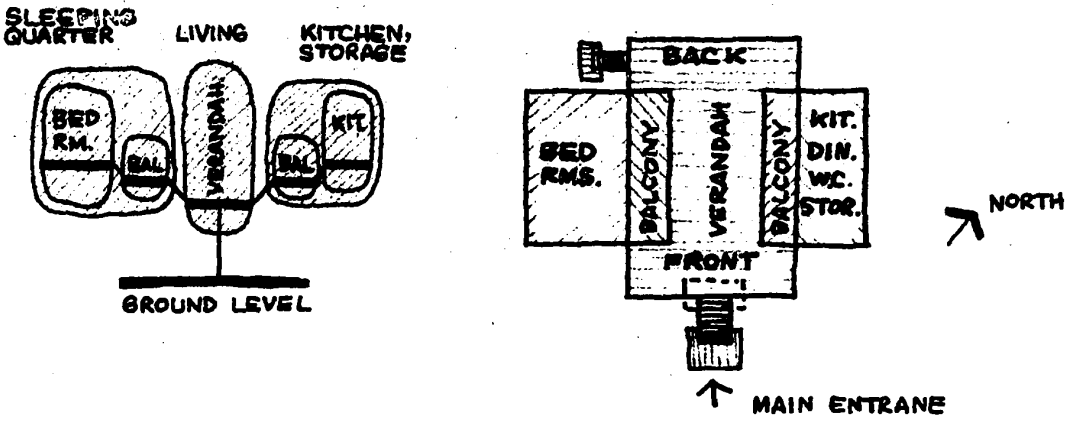


2. RELATIONSHIP OF CIRCULATION

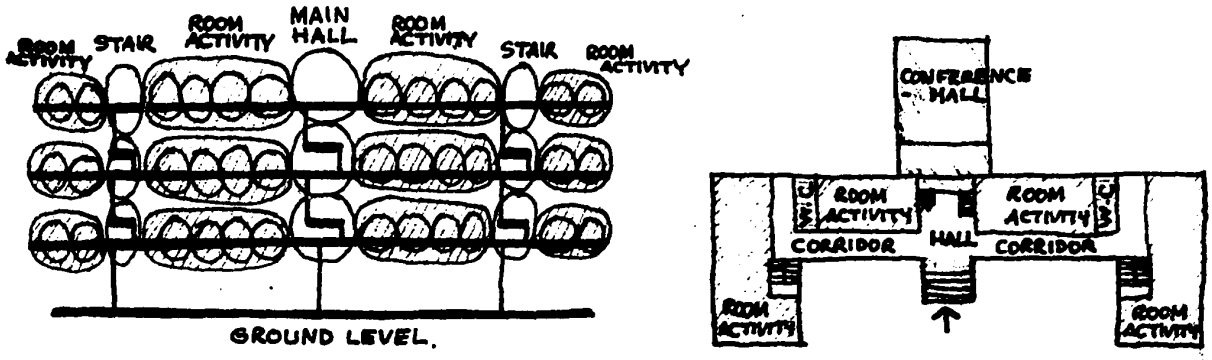
2.15. DIAGRAMATIC DRAWING OF BUILDING MOVEMENT AND PLANS.

.TRADITIONAL STYLE.

1. HOUSE



2. PUBLIC BUILDINGS ; GOVERNMENTAL, SCHOOL, OFFICE, E.T.C.

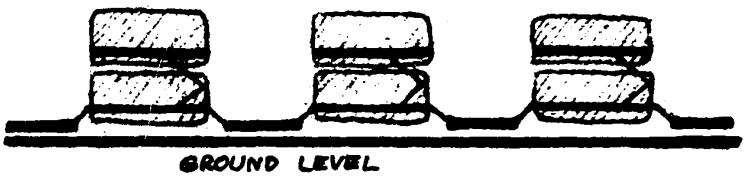


LEGEND:

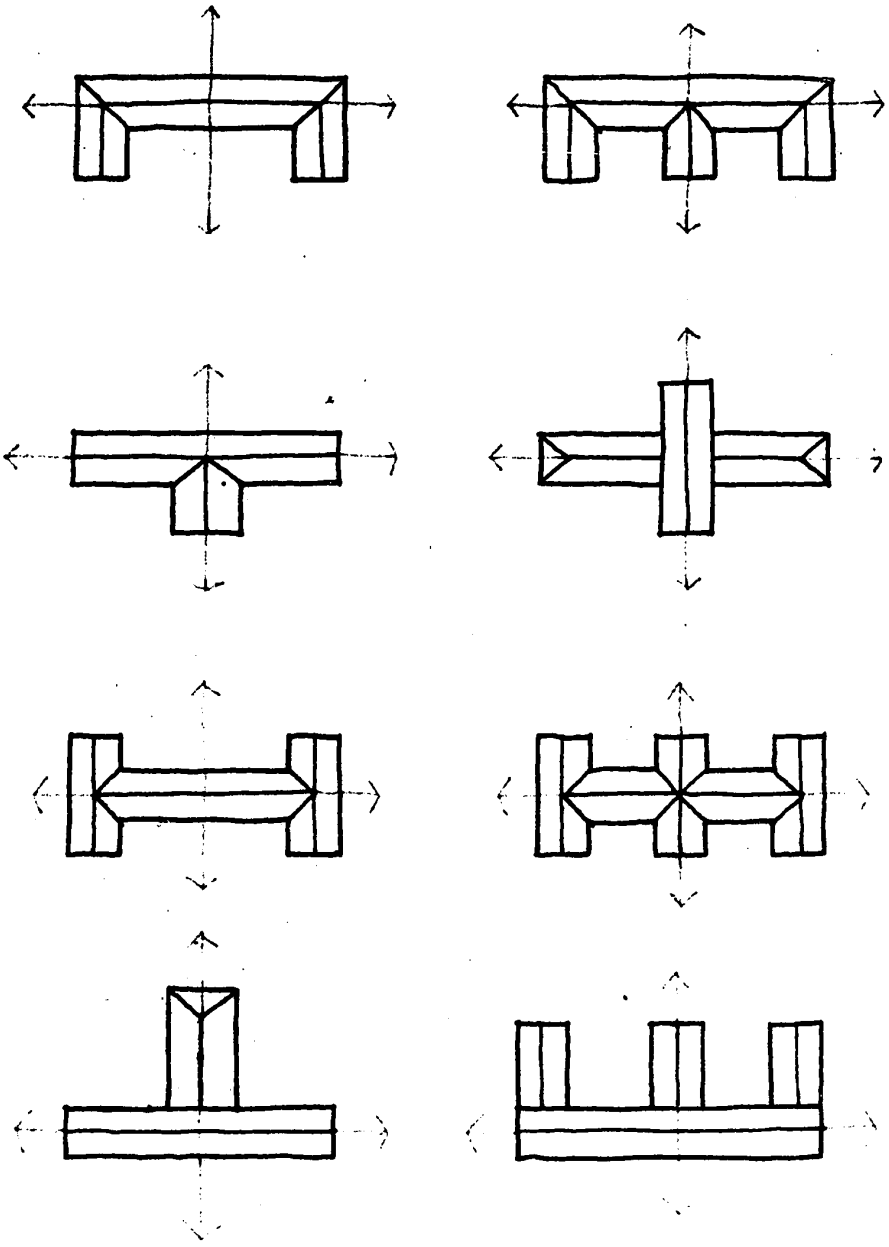
— VERTICAL CIRCULATION

▬ HORIZONTAL CIRCULATION

MOVEMENT BETWEEN BUILDING.

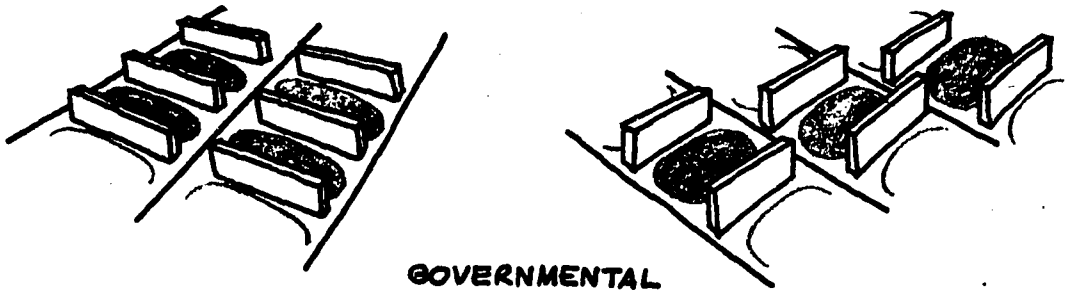


4.16. TRADITIONAL BUILDING PLANNING ; OFFICES, SCHOOLS

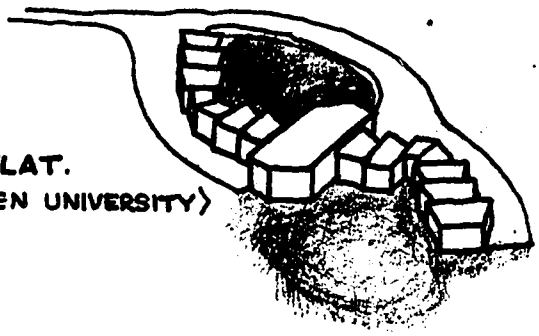


4.17. ABSTRACT DRAWING OF CONTEMPORARY PLANNING BUILDINGS.

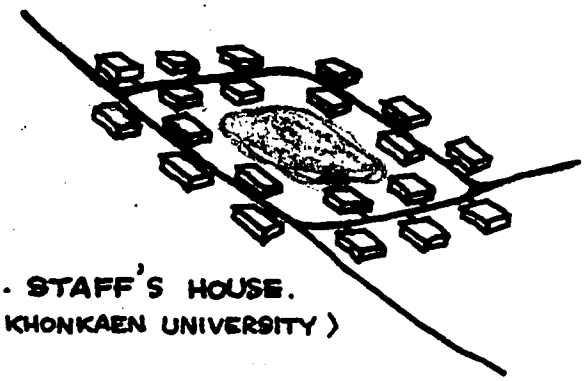
1. HOUSING



GOVERNMENTAL HOUSING PROGRAM.

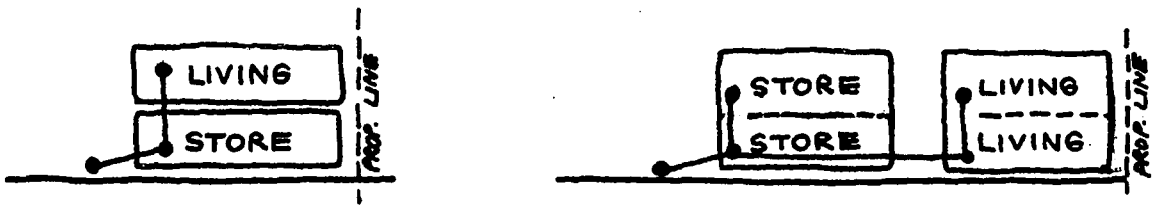


2. FLAT.
(KHONKAEN UNIVERSITY)



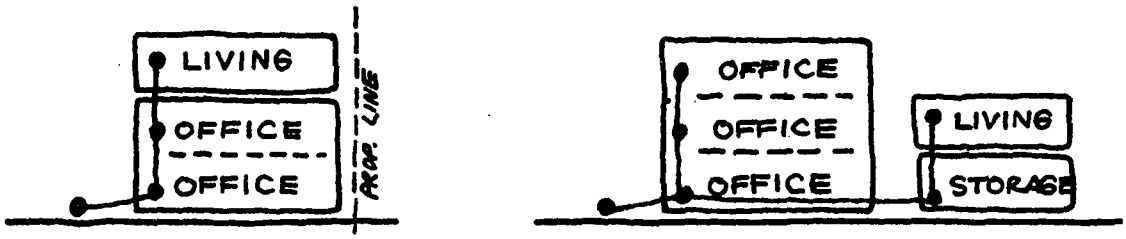
3. STAFF'S HOUSE.
(KHONKAEN UNIVERSITY)

4. STORES.



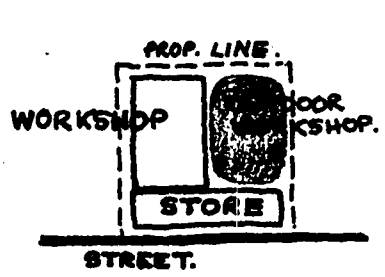
PAVEMENT LEVEL.

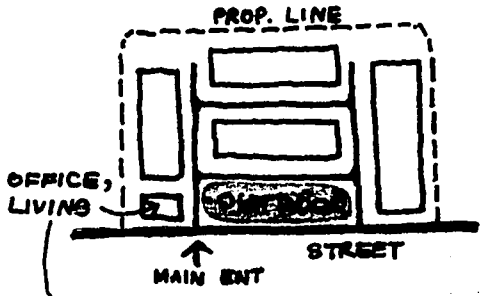
5. OFFICES.

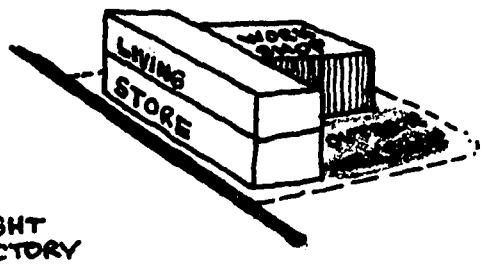


PAVEMENT LEVEL.

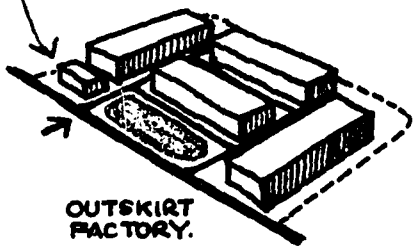
6. FACTORIES.





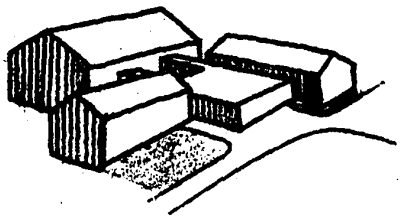


LIGHT FACTORY IN TOWN.

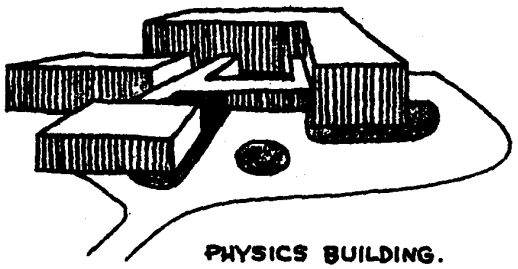


OUTSKIRT FACTORY.

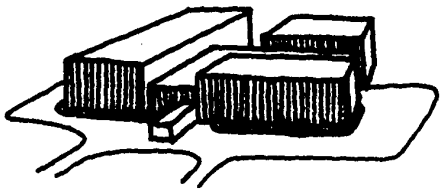
7. SCHOOL, UNIVERSITY BUILDING (KHONKAEN UNIVERSITY)



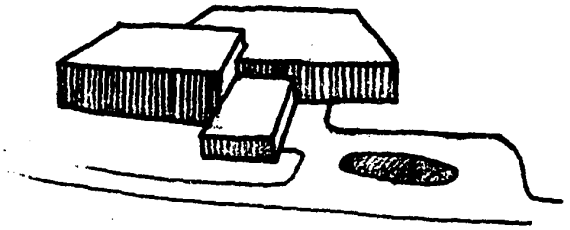
HEALTH CENTRE



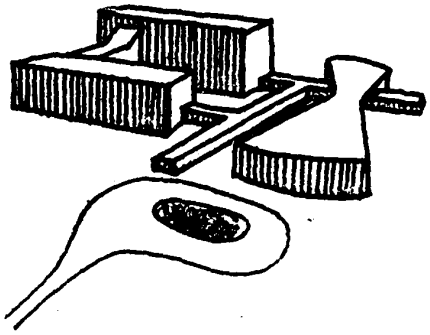
PHYSICS BUILDING.



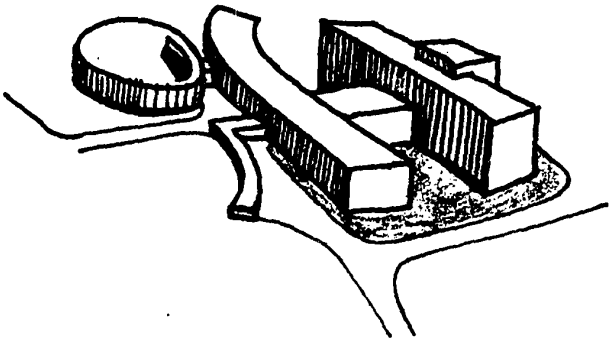
AGRICULTURAL ENGINEERING



STUDENT UNION



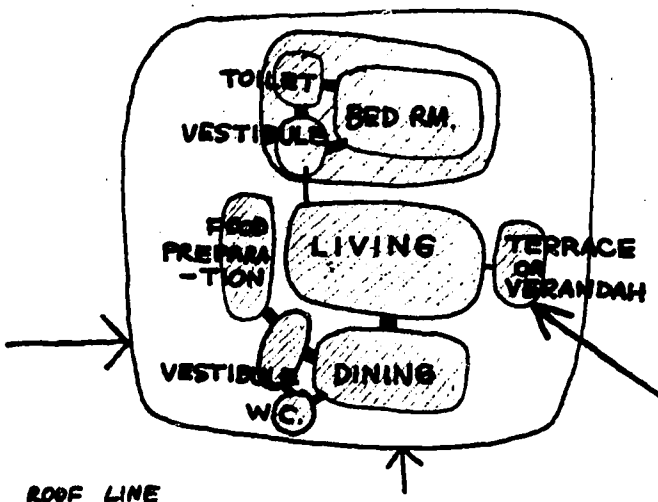
FACULTY OF AGRICULTURE



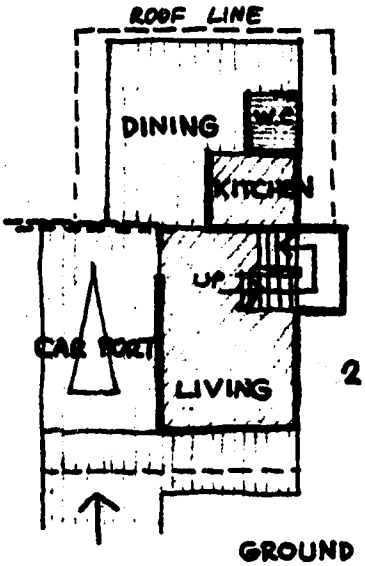
FACULTY OF SCIENCES - ARTS.

2.18 DETAILS IN CONTEMPORARY PLANNING.

HOUSING.

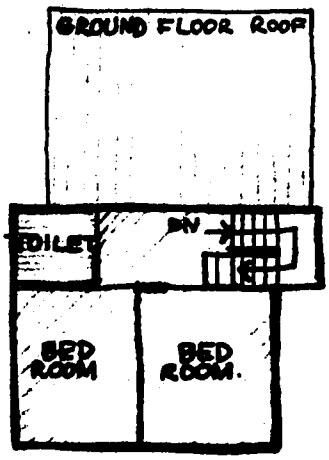


1. SPACE AND ACTIVITIES PLANNING.

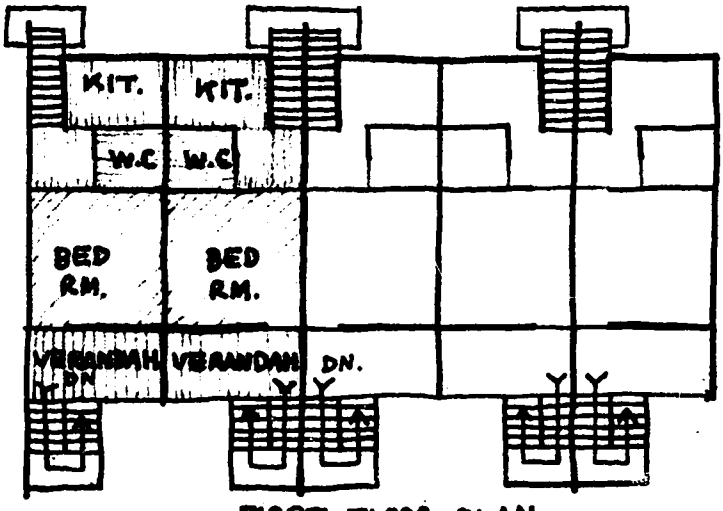


GROUND FLOOR PLAN.

2. SINGLE HOUSE (MIDDLE CLASS)



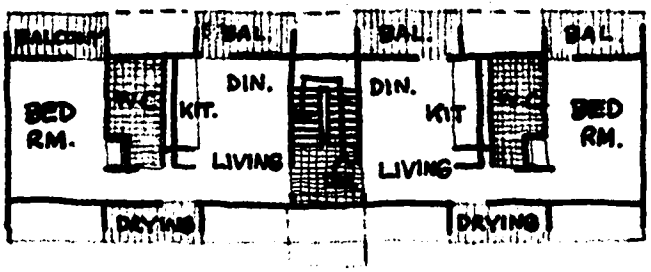
FIRST FLOOR PLAN.



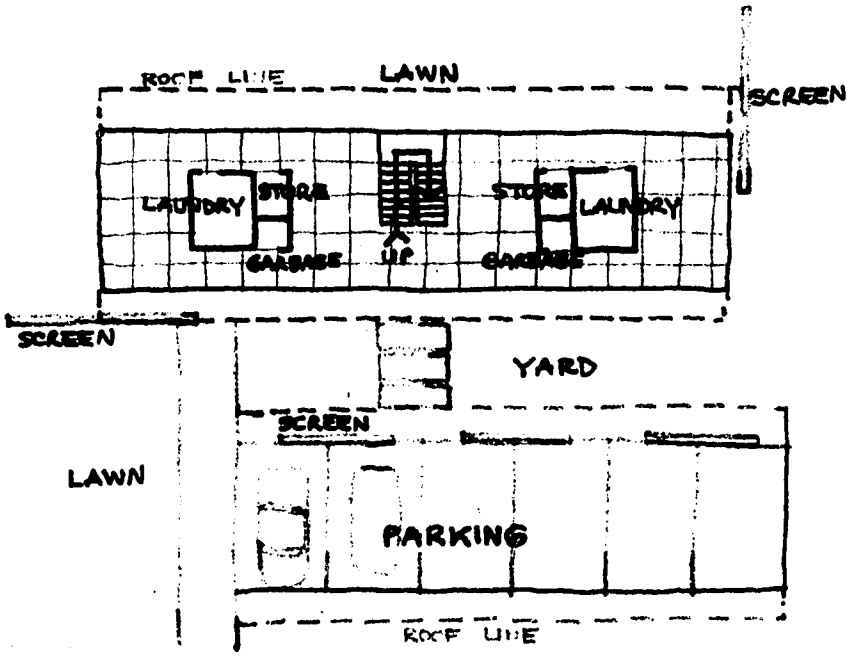
FIRST FLOOR PLAN

3. ROW HOUSE TYPE, LOW COST HOUSING FOR LOW INCOME GROUP.

SOURCES: 2. AND 3. - HOUSING DIVISION. DEPARTMENT OF PUBLIC WELFARE. MINISTER OF INTERIOR. BANGKOK.

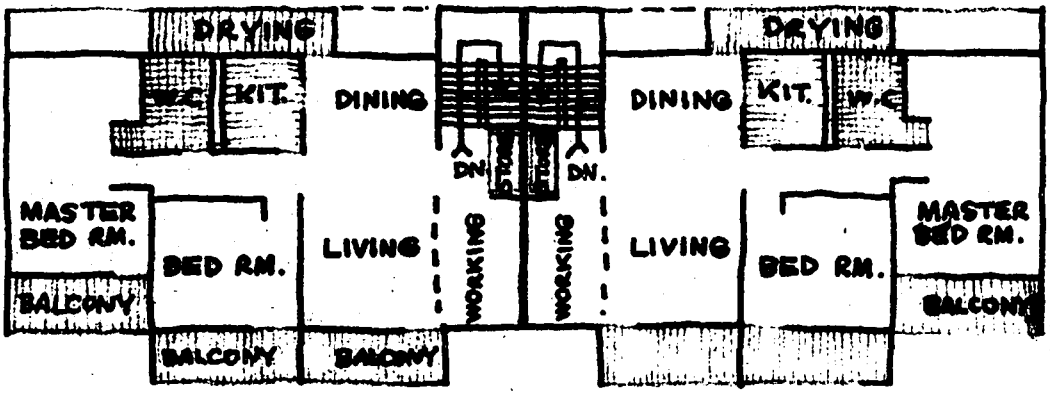


FIRST - THIRD FLOOR PLAN.

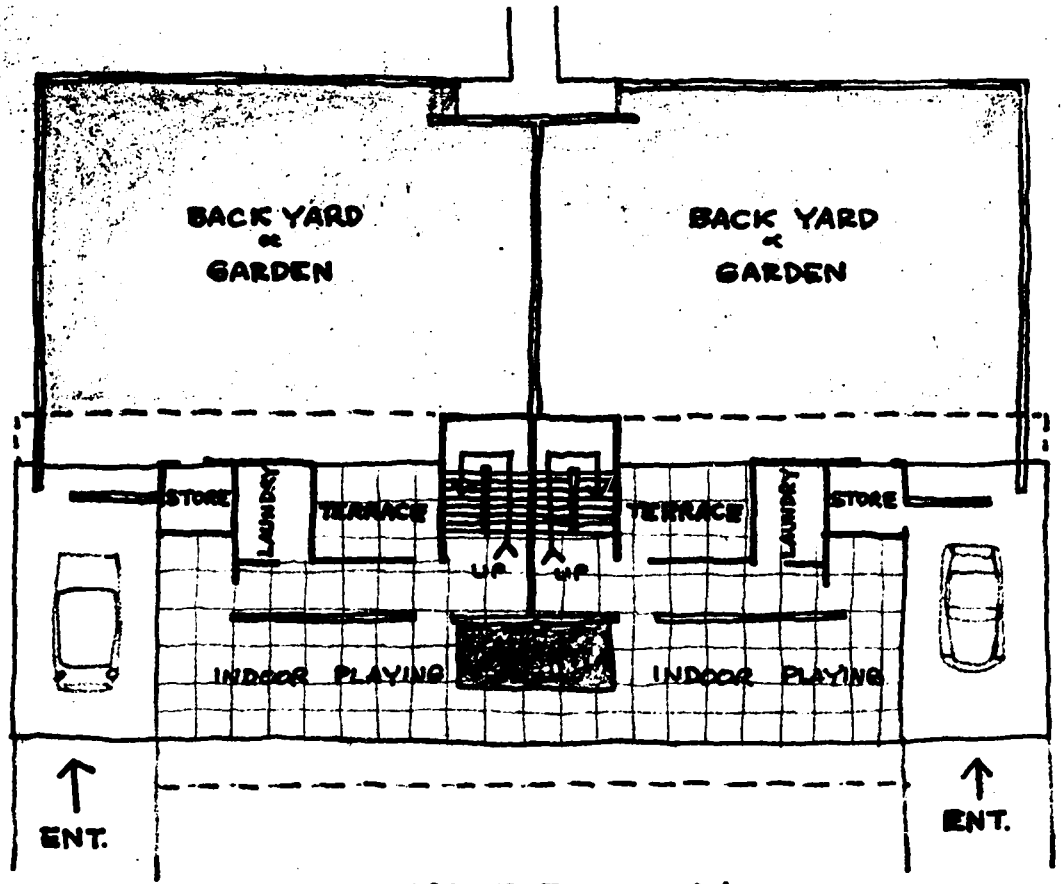


GROUND FLOOR PLAN.

4. SINGLE BEDROOM APARTMENT. (MIDDLE INCOME GROUP)



FIRST FLOOR PLAN.



GROUND FLOOR PLAN.

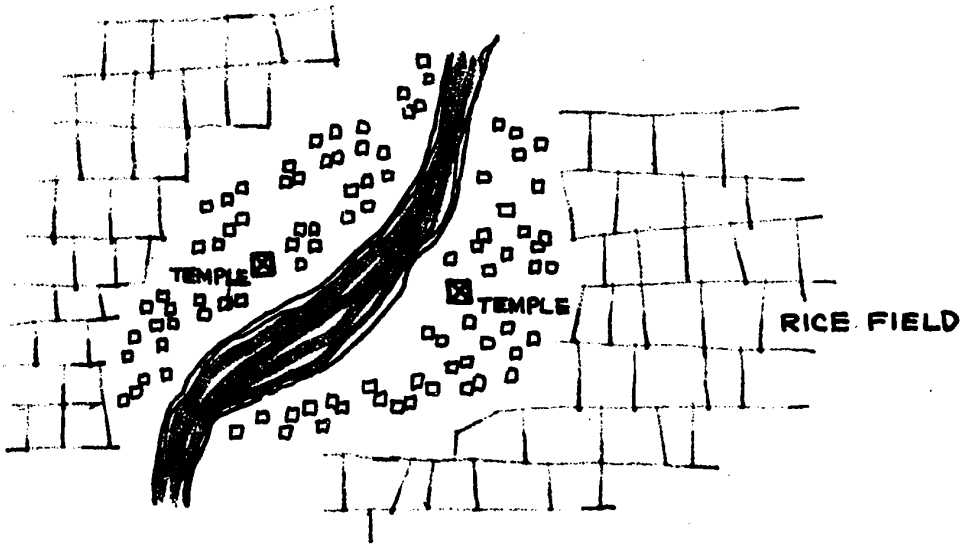
5. TWO BED ROOMS APARTMENT. (MIDDLE - UPPER MIDDLE INCOME GROUP)

SOURCE : A LOW RISE MEDIUM DENSITY HOUSING PROJECT , SAPAN KWAI, BANGKOK , THAILAND. BARDHANABEADYA.

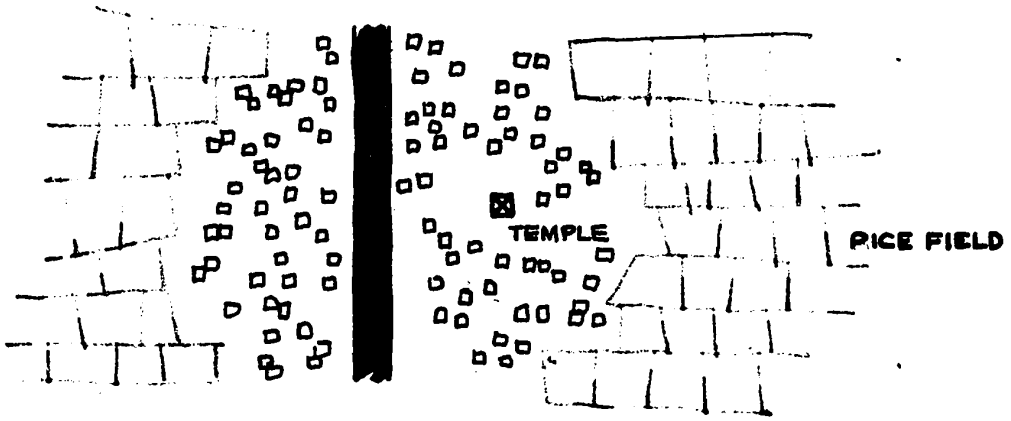
(b) PLANNING AS INFLUENCED BY LOCATION

CULTURAL FACTORS	RURAL AREA (Village or District)
More simple people, natural way of life	Organic Quality: thatched hut unified with forest background. (See Fig. 2.21)
	URBAN AREA (TOWN)
1. Confliction of idea between oald and new	1. Combination of Thai and Western style not very unified
2. Economic needs greater than simple way, therefore more materialistic	2. Houses centralize towards Industry, therefore row spacing improvised because of mass population moving down from rural
3. Skill applied to a less degree than traditional	3. Not unified in style.

2.19 TRADITIONAL COMMUNITY SETTING (RURAL AREA)



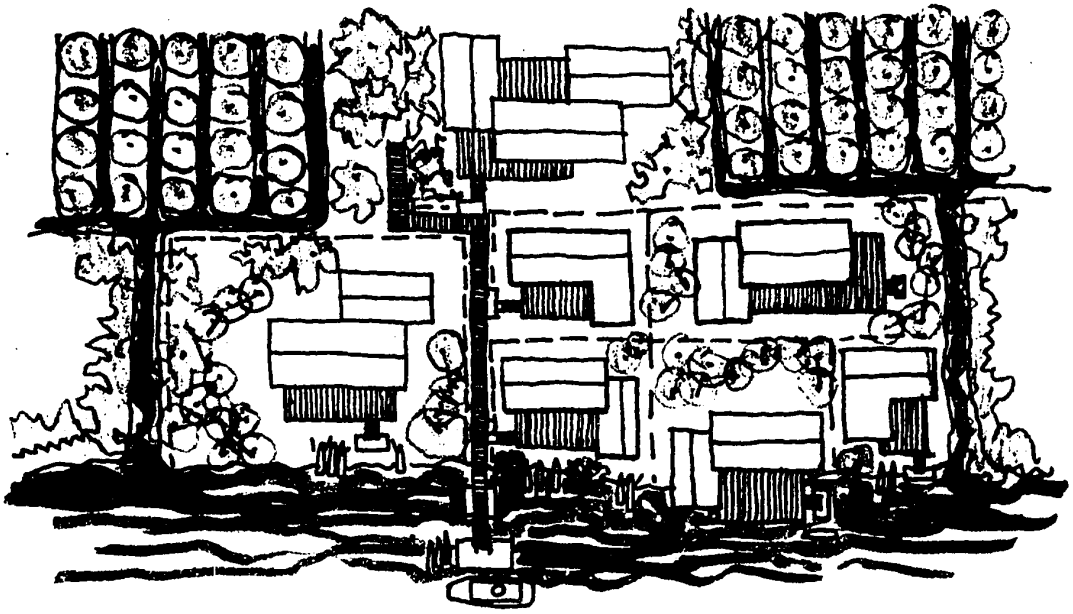
1. TYPICAL RIVER VILLAGE LAY-OUT.



2. TYPICAL ROAD VILLAGE LAY-OUT.

2.20. TRADITIONAL ZONING LOT.

1. ALONG THE RIVER OR FLOODING AREA.

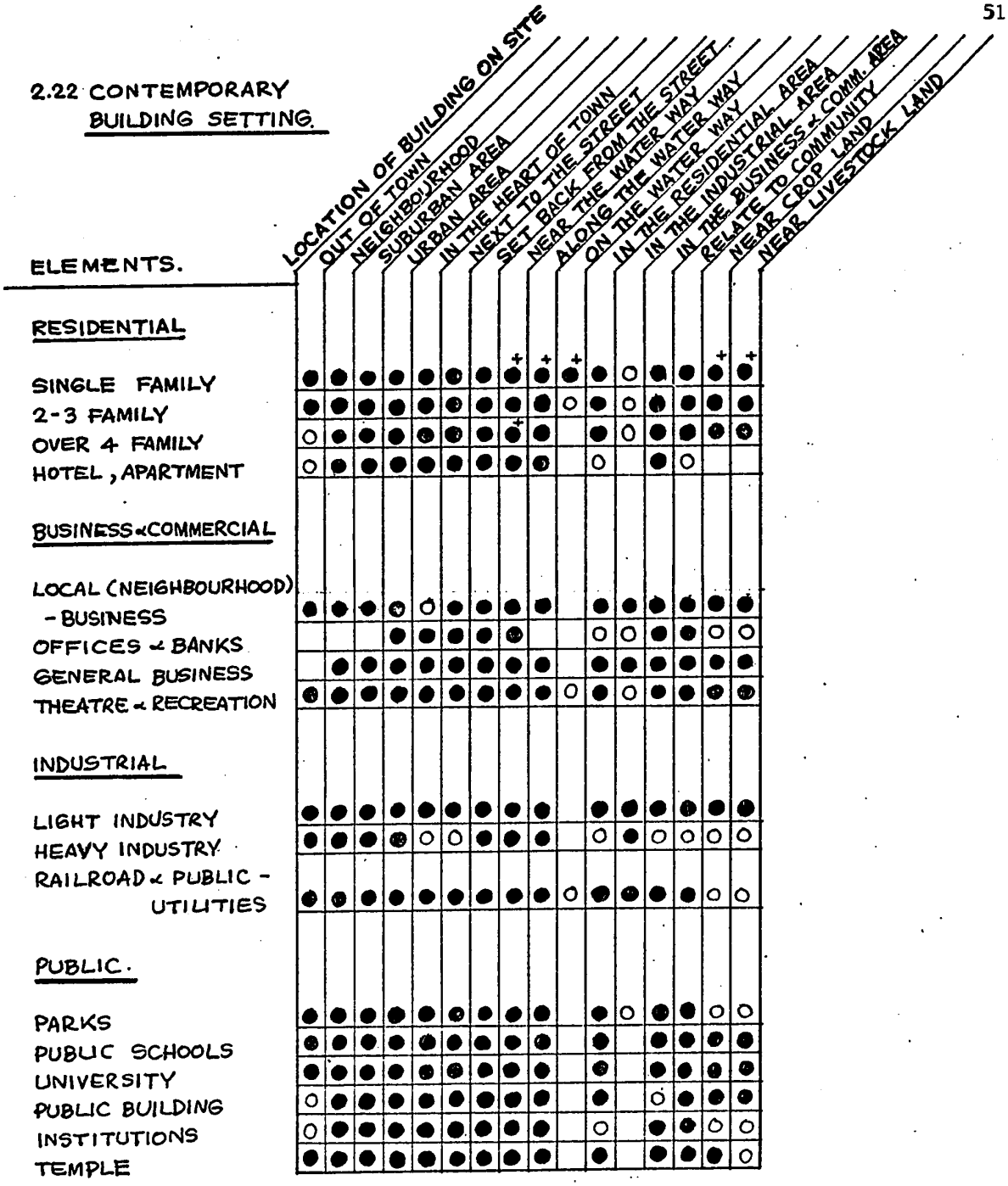


2. RURAL AREA

2.21. ORGANIC QUALITY

A VILLAGE OF COTTAGE IN RURAL AREA, ALL MADE WITH PRECISELY THE SAME MATERIALS AND TECHNIQUES BUT WITH FUNCTIONAL VARIATIONS IN SHAPE, MAY BE ACCIDENTAL AND FORMLESS, BUT IT IS ALWAYS - HARMONIOUS WITHIN ITSELF AND WITHIN THE LANDSCAPE.

2.22 CONTEMPORARY BUILDING SETTING.



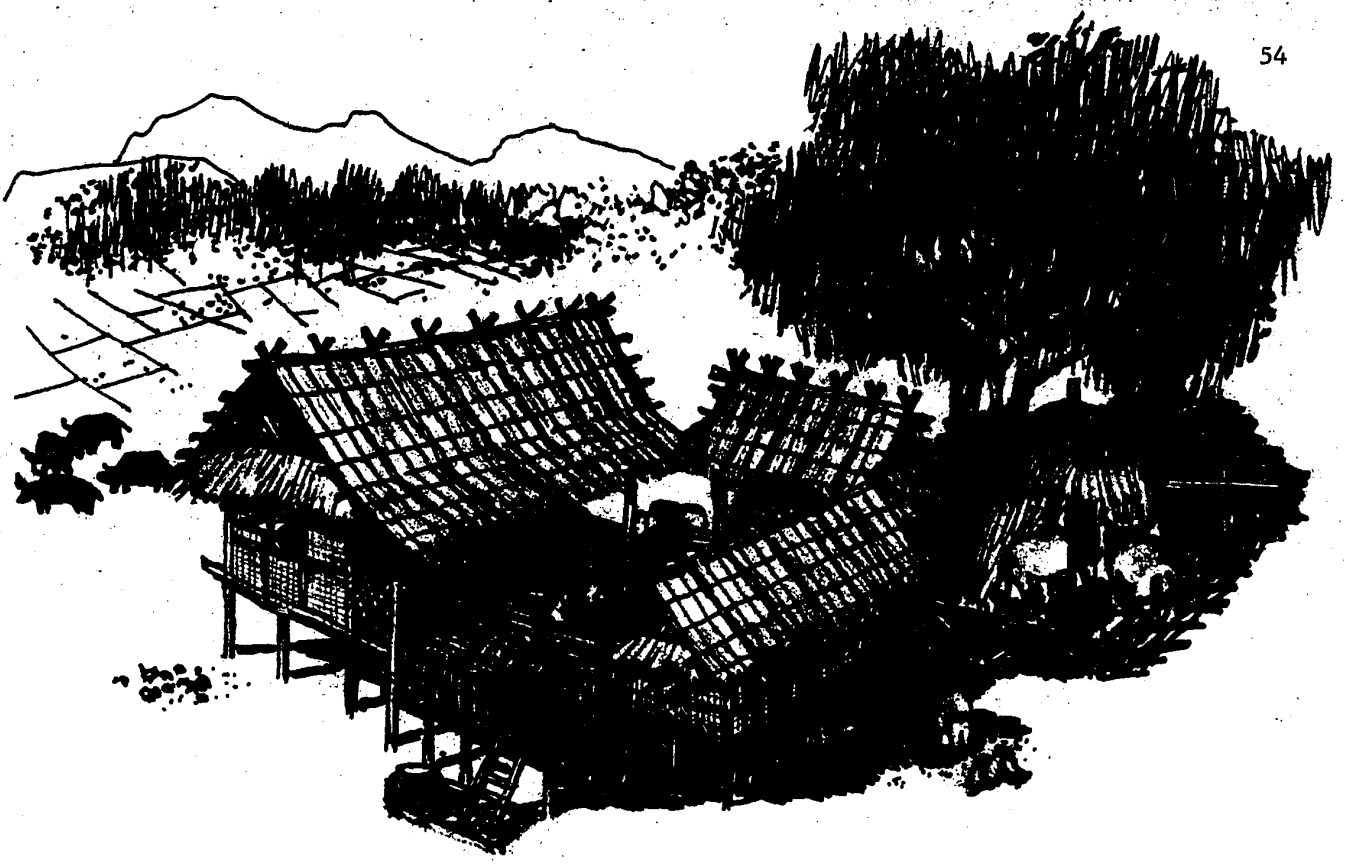
LEGEND :

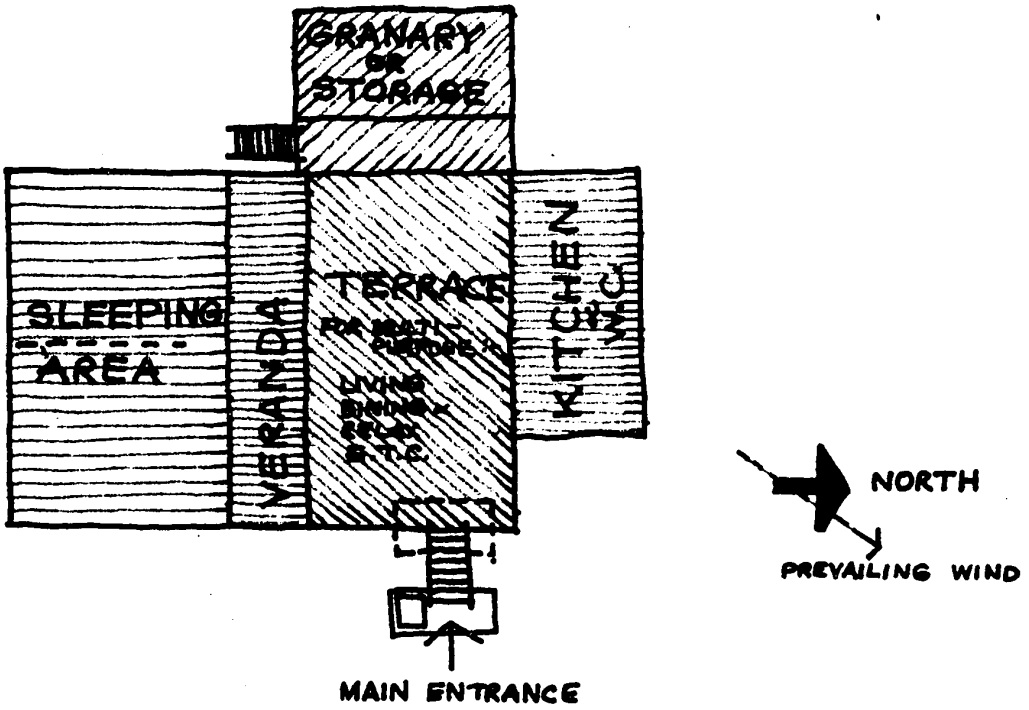
- ● MOST DESIRABLE
- ◉ MEDIUM "
- ○ LOW "
- \+ TRADITIONAL EXISTING.

(C) STYLE

	TRADITIONAL	CONTEMPORARY
SKILL	I 1) Plan designed by Architect. 2) Formal training varied .	I 1) Plan designed by Architect 2) Formal training - 5 years and at least 1 year of practice
	II Details Carried out by:	II Details Carried out by:
	1) Upholstery-detailed motifs projecting literature and religion.	1) Upholstery-not restricted to religous or epic literature, freer style, as in western
	2) Sculptor: (for more prosperous) sculpted asparus, Buddha's figure and literature,primarly for designing religous room in home,materials used: copper,bronze wood and plaster.	2) Sculptor: not used,can buy articles at any art store (made in mass production)
	3) Paintor main colours applied (for more prosperous family) gold and yellow representing "Buddha",	3) Paintor not used, paintings can be bought at any art store(made in mass production)
	4) Community helped in constructing skeleton of house	4) At present,Contractors are used
PATTERNS	I Pagoda motif- only modification in temple (upward movement)	I Pagoda motif - still used,reflecting on religious philosophy.
	II Buildings - primarily rectangular	II Buildings - freer style, and the rectangular (although prefered)is becoming more obscure, reflecting on western thought.

EXTERIOR DECORATIONS	I Geometrical forms of all variations	I SAME
PERCEPTION OF COLOUR	Domestic Buildings: use warm colours, such as brown, light grey and orange according to the local material available	Domestic Buildings: Reflect every colour or a few at a time, projecting different patterns. The colours are not restricted only to warm colours, but they use all shades and imported materials are made available.
	Buddhist Temple: are most colourful applying mosaic in all hues. Intense colours reflect the national religious belief.	Buddhist Temple: same as traditional

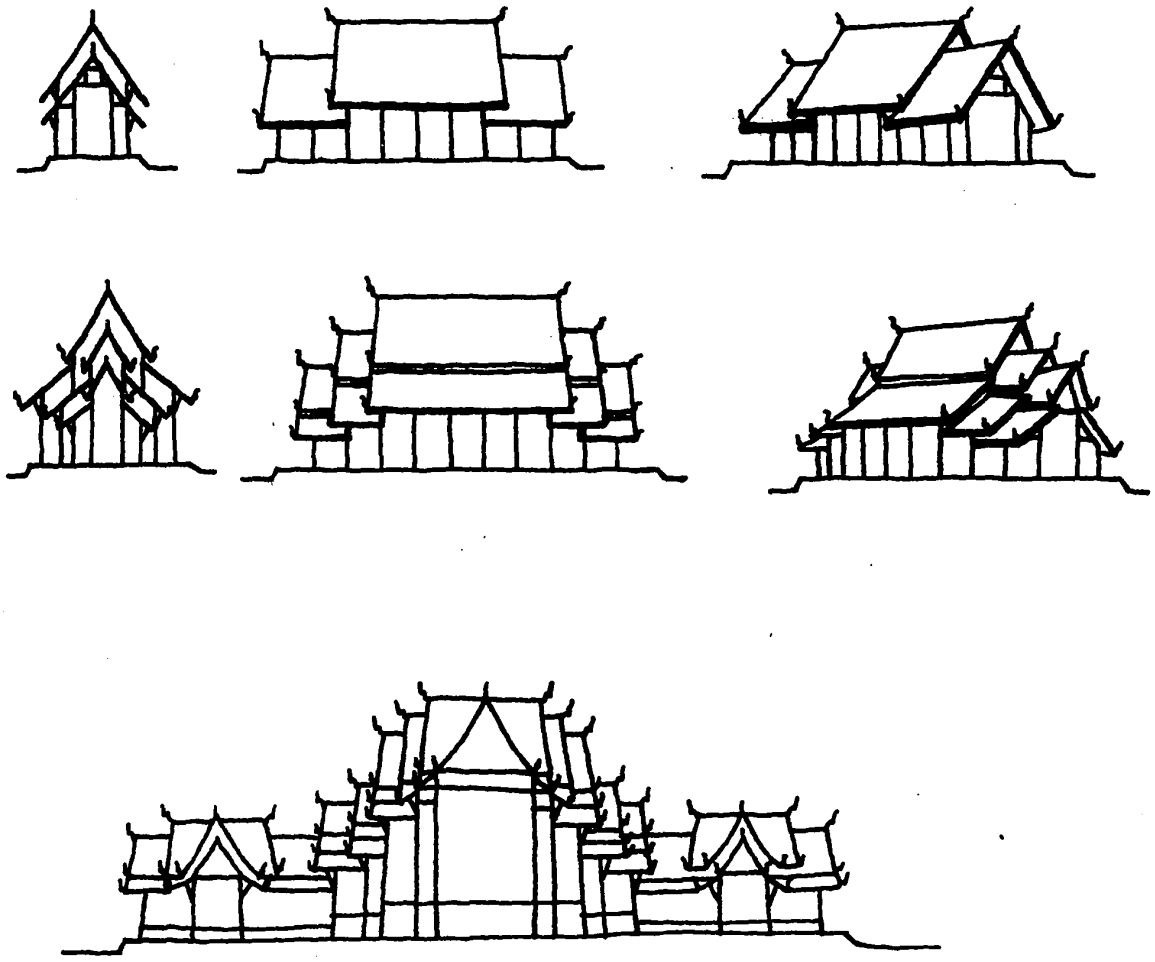




Q. 23. TYPICAL HOUSE PLANNIG
〈THAI RURAL HOUSE〉

DATTI

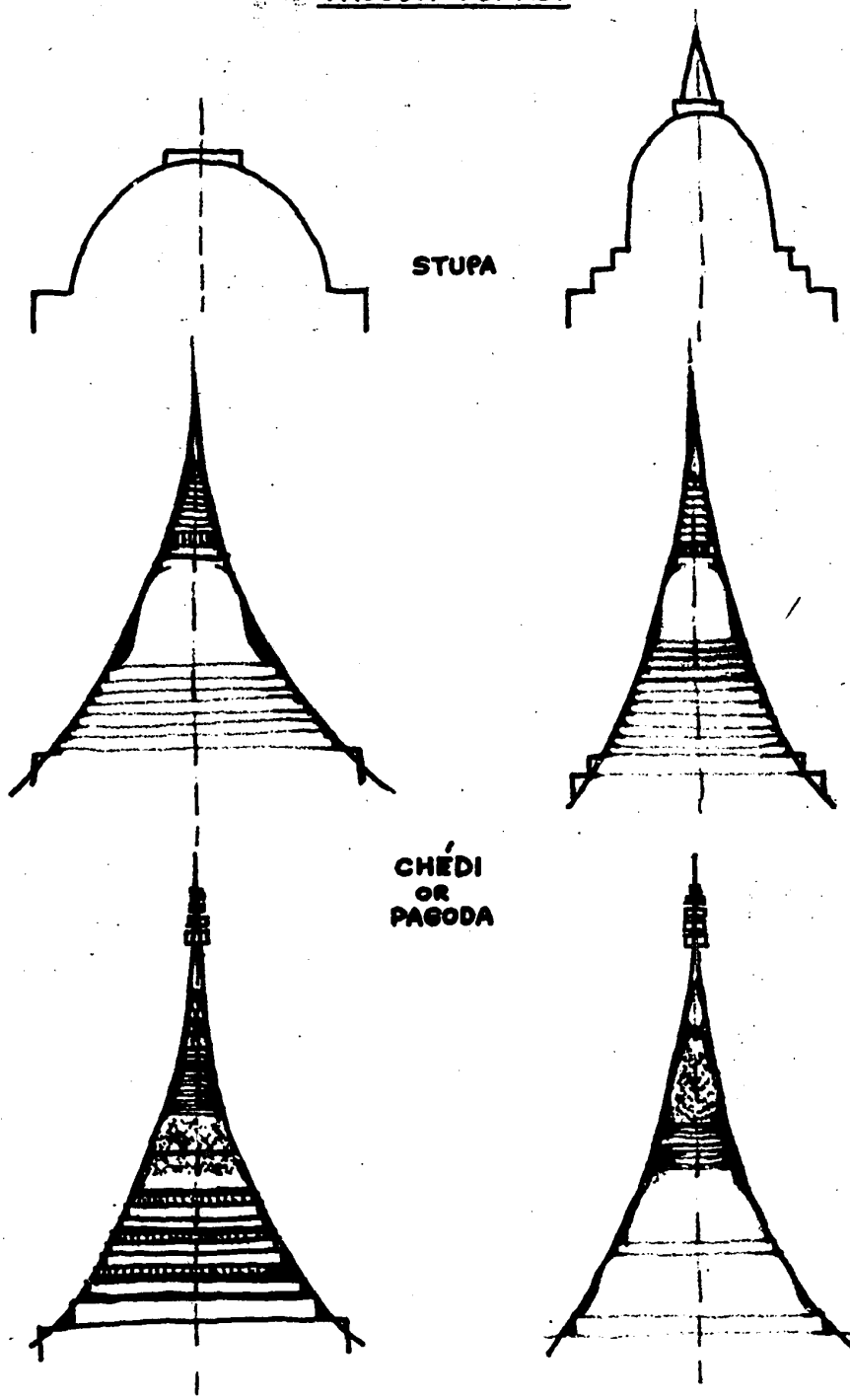
2.26 SIMPLIFIED VERSION OF TRADITIONAL LINE AND MOTIF.



THE CANNON OF TRADITIONAL BUILDING TECHNIQUES.

- A DEFINITE , FORMAL AESTHETIC
- QUIET , WELL BALANCED
- DOMINATED BY SUBJECTIVE , LYRICAL FRAME OF MIND.

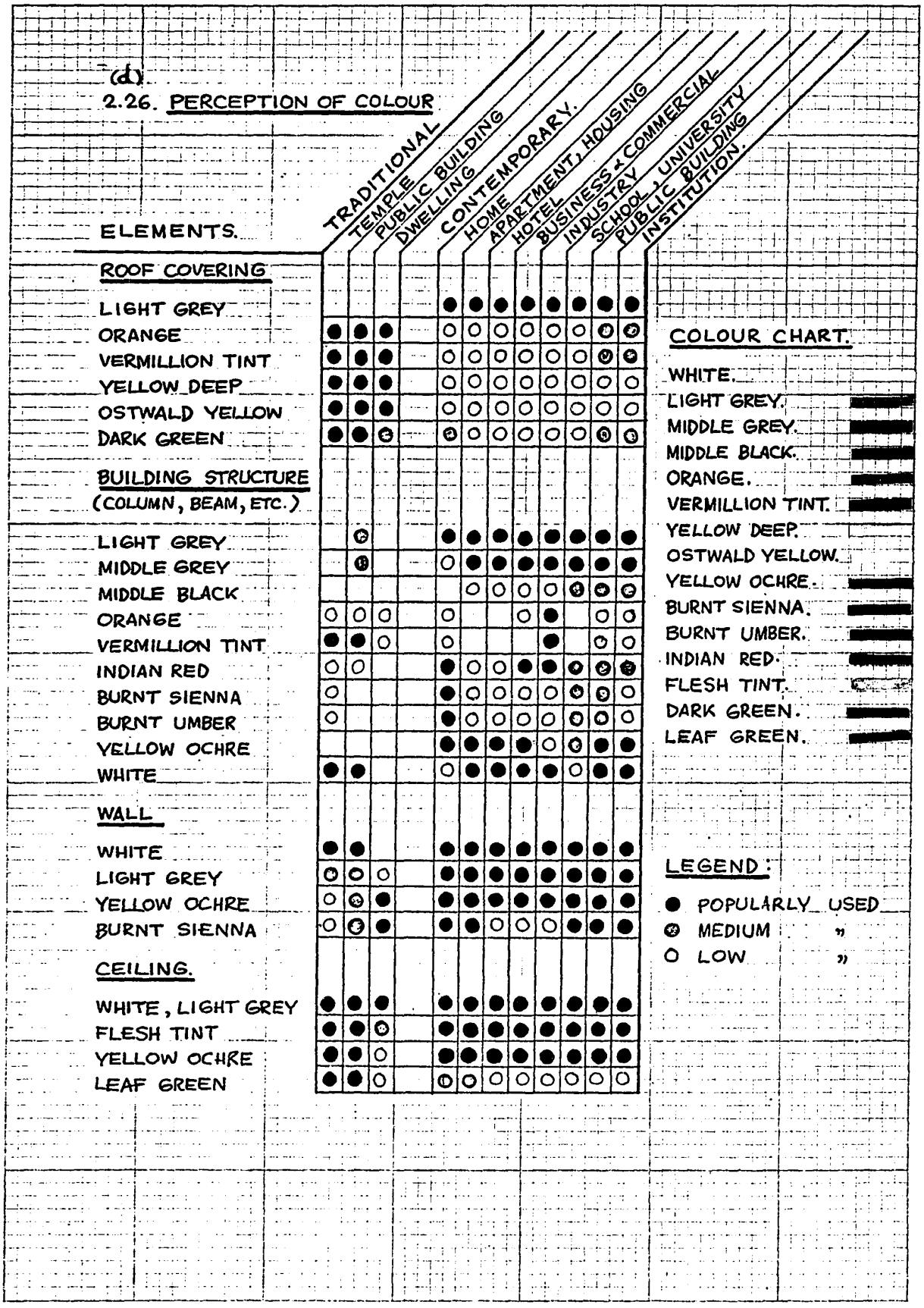
2.25. PAGODA FORMS.



- WITH SOLID CONSTRUCTION THE EXTERNAL SURFACE IS INDEPENDENT OF THE INTERNAL SPACE.

(d)

2.26. PERCEPTION OF COLOUR



IV SHAPES IN BUILDINGS

CULTURAL FACTOR	TYPE OF PATTERN (a) INDIVIDUAL PATTERN	EXAMPLE
no definite factor, several people's explanations include: 1) represents "Buddhist" philosophy 2) represents "form" of praying 3) esthetically pleasing	1) Temple: one level a little inclined on both sides to secure pagoda shape	Pagoda shaped
For: Royality	2) Royal Palace: 2 to 3 levels huge fence (6 to 8 meters) enclosed compound structure.	Pagoda shaped projecting classic royal style.
heavy flooding and also to prevent animals invading premises	3) Rural stilts raised in all four corners.	small rectangular shape
	(b) INTEGRATED PATTERN	
1) reflects religious philosophy 2) more contemporary	1) Urban house: i)pediment applied on roof copied from temple and their own modification of the rectangle ii) roof modification from western society with rectangular body copied from temple	1) (some) pagoda shaped roof with square body (See Fig.2.3) 2) inclined roof with rectangular body
reflects religious philosophy	2) Rural house: pediment applied on roof copied from temple and rectangular shape with incline on both sides also copied from temple	roof - pagoda shaped and rectangular body.

CULTURAL FACTOR	(c) PATTERN VARIABLES COMMERCIAL BUILDINGS	EXAMPLE
a) reflect religious philosophy and contemporary style	1) Factory a) rectangular copied from temple while square and hexagen contemporary modifications.	a) main structure: rectangular, square hexagon etc. b) commerical advertising: lights, colour and design
roof: pagoda shaped: reflects religious philosophy inclined Thai modification and flat copied from contemporary style	2) Nightclub and Restaurant; a) roof pagoda shape copied from temple, inclined modification allowing rain to drain more easily, flat not as convenient although contemporary copied from western society	roof: pagoda shaped, inclined or flat
old and new thought	integrated style	interior decoration western or Thai typical integrated

PART 3. POLITICAL FACTORS

I TRADITIONAL VERSUS CONTEMPORARY SYSTEM

II LOCATION OF BUILDINGS

(a) Policy of Decentralization

(b) The Idea of Uniform District

III MOVEMENT AND TRANSPORTATION

(a) Urban Area

(b) Bangkok and Nearby Provinces

IV BUILDING ACCESS AND PLANS

(a) Urban Area

(b) Throughout Thailand

V BUILDING SPECIFICATIONS THROUGHOUT THAILAND

VI BUILDING FABRIC THROUGHOUT THAILAND

I TRADITIOANL VERSUS CONTEMPORARY SYSTEM

TRADITIONAL	CONTEMPORARY
(a) Simplified Caste System, denoted by "sack-dee (rank) na" (occupation) and birth. Ordinary people- 100-1000 rai (owned) Nobility - 1000 rai and up	(a) People are divided according to wealth upper, middle and lower class.
(b) Architectural and artistic expression are dominated by religion.	(b) Western influences dominates to such a degree that Thailand's new patterns integrate old and new.
(c) The Minister of Internal Affairs has legislative powers, regulating architecture into a public policy	(c) Only restricted buildings include housing in temple areas, and governmental buildings, otherwise not restricted.

II LOCATION OF BUILDINGS:

(a) POLICY OF DECENTRALIZATION

1. Factories: The policy in the past was that all factories were located in the center of the city. Presently it represents a major pollution factor, so they are relocated in the zoned areas designated by the Government.

2. Residential: Amongst commercial and industrial areas of building. The new policy maintains that commercial building surrounding these areas must make a leeway (carriage way) allowing them passage to the street. (See Fig. 3.3)

3. New Zones: As commerical industry is more dominant than residential, the Government has relocated housing projects on the outskirts according to the zoned areas designated.

4. Redevelopment: Depending on Governmental budget, slums are destroyed to make way for new housing projects, or commercial and official buildings.

(b) THE IDEA OF UNIFORM DESTRICT

1. High-rise buildings are designated by zones that the government specifys, so as not to interject in urban housing. (See Fig. 3.3)

2. As traffic is an increasing problem, the government develops more apartments for convenience of working people.

3. The government buys off residential areas, paying only few of the owners. According to their policy they then develop high-rise building which gives the people little choise where to live other than the apartment. The small percentage that are better off buy land in the outskirts.

III MOVEMENT AND TRANSPORTATION

(a)

URBAN AREA	POLITICAL FACTORS
1. Population expansion increases contually and strangles convenient_living.(See Fig.3.1)	Decentralization scheme of government High rise building developments by relocating residential areas on the outskirts.
2. New highways and other means of communication are cut through to focus on the center of town creating traffic jams.(See Fig. 3.2)	Allowing greater mobility in commercial area only.
3. The center of town includes: dept.stores,medical facilities, official building and entertainment facilities which are not provided in the outskirts. Therefore the flow continuous again.	Decentralization scheme of government is advantaged because of their limited budget is not always possible to realize.

(b) BANGKOK AND NEARBY PROVINCES

1. One way traffice areas are zoned.	Governmental transportation scheme providing greater mobility in some areas.
2. On street parking-zoned on wider streets and narrow roads where commercial industry exists.	Government transportation scheme providing greater mobility in some areas.
3. Approximately 10 to 15 streets have parking meters.	Adds to Government budget.

IV BUILDING ACCESS AND PLANS

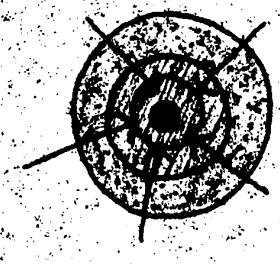
POLITICAL FACTORS

(a) URBAN AREA

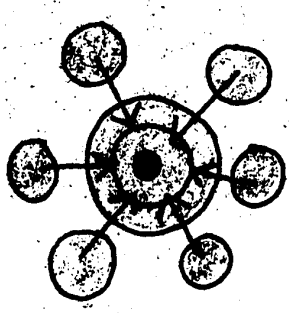
1. Restriction: proposals to maintain temple area.	1. Reflects on religious philosophy through politics and encourages future traditional modes.
2. Expansion: expansion allocated from slum clearance giving rise to modern apartments.	2. Decentralization scheme of government
3. Buidlings related to Pedestrian and Vehicles:	
3.1 sidewalks raised approximately 20-30 cm. in relation to street level.(See Fig.3.5/1-2).	3.1 Government scheme projecting less accidents.
3.2 Shelters are attached to buildings giving minimum exposure to sun or protection from heavy rains.(See Fig.3.5/1-2).	3.2 Government considering climate factor.

(b) THROUGHOUT THAILAND

1. Sterro-typed plans of restriction and expansion.	1. Grouping designated by Government
2. Stereo-typed plans of row houses and apartment buildings (see Fig.3.5/5)	2. Plans of housing designed by Government.
3. Pagoda roof, slender elongated cay and same internal structures, demand rectangular plan.	3. Government prescribes specifics plans and shapes for their buildings. (See Fig. 3.4, 3.5/5).

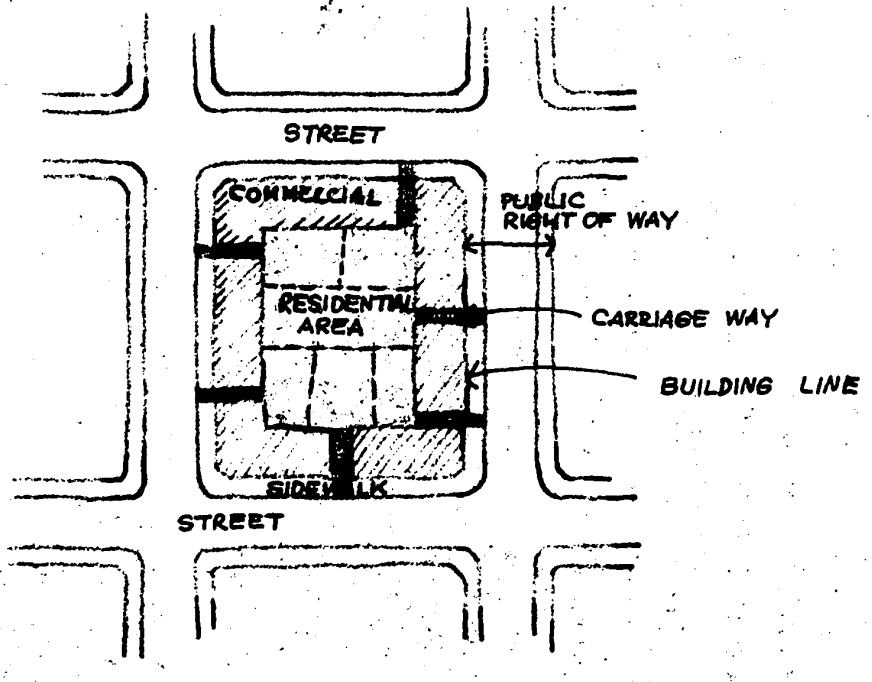


3.1. BANGKOK GROWS AS DYNAMIC ORGANISM
AS A RESULT THE PRESSURE EXERCISED ON THE CENTRAL AREA, AND STRANGLES THE CENTER AND ITS FUNCTION.

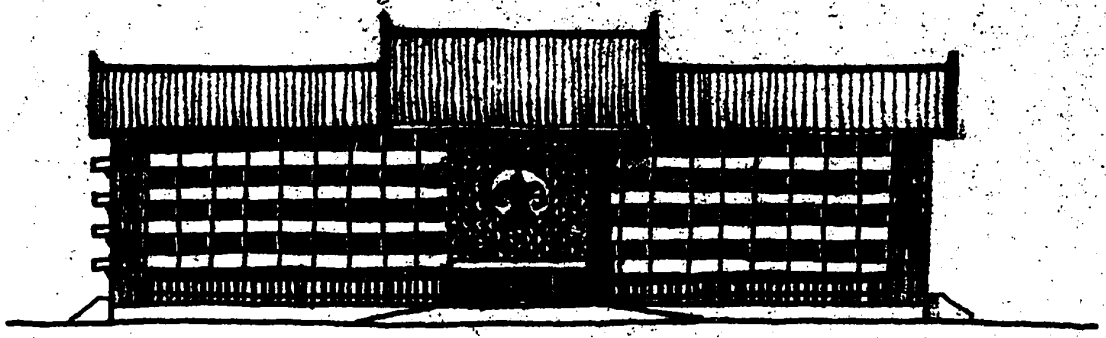


3.2. THE POLICY OF DECENTRALIZATION
DOES NOT RELIEVE THE CENTER FROM PRESSURE — IT IS AGAIN CREATED BY THE HEAVY AND SNARLED TRAFFIC.

3.3. LOCATION OF RESIDENTIAL AREA IN MIDTOWN



34. GOVERNMENTAL BUILDING.

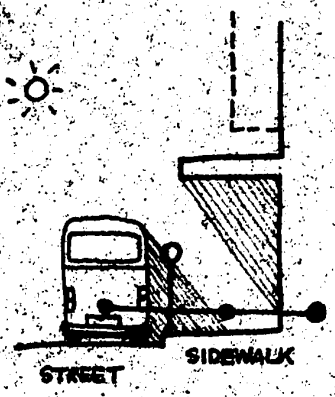


V. BUILDING SPECIFICATIONS

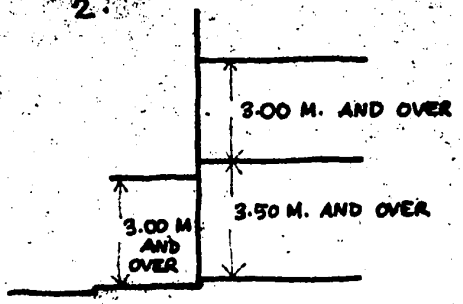
THROUGHOUT THAILAND	POLITICAL FACTORS
1. From the street to ground level it may vary in height	1. Government imposed law
2. From ground level to ceiling it must be 3.50 meters (See Fig. 3.5/3)	Same
3. Upper floor - minimum 3.00 meters If the building is air-conditioned the false ceiling can be reduced to a minimum of 2.50 meters.(See Fig. 3.5/3).	Same
4. The minimum habitable space must be 3.00 x 4.00 x 3.00 meters. (See Fig. 3.5/4).	Same
5. Zoning lots devised to a) protect each house from overflow of rain ; b) for year round comfort, each home has a small piece of landscape around it. (See Fig. 3.6)	Same

3.5. BUILDING SPECIFICATIONS.

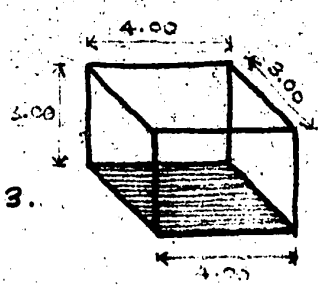
1.



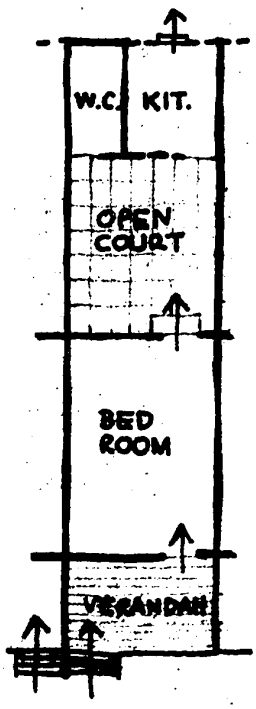
2.

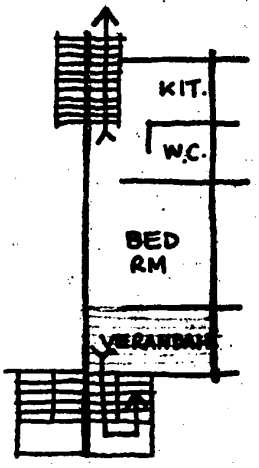


3.

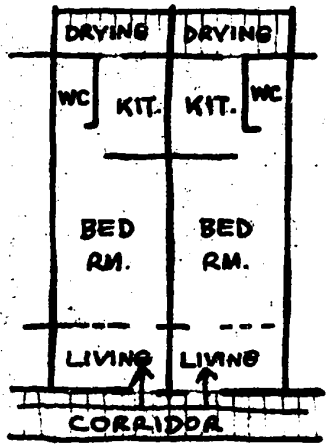


3.6. GOVERNMENTAL HOUSING PLANS





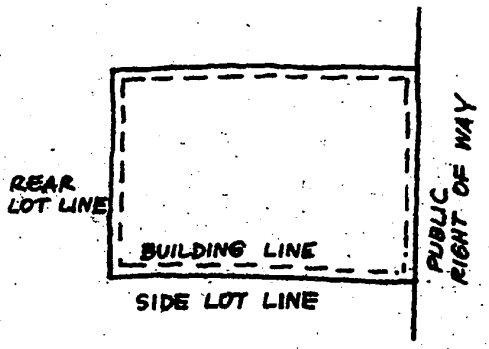
ROW-HOUSING
LIVING AREA 30 M².
GROUND FLOOR AREA -30 M².



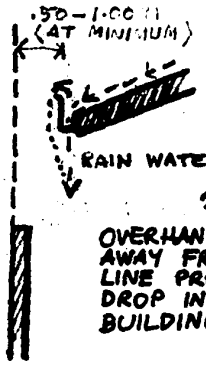
HIGH-RISE HOUSING.
AREA PER UNIT 56 M².

ROW-HOUSE
LIVING AREA 46 M².
OPEN COURT 20 M².

3.7. ZONING LOT

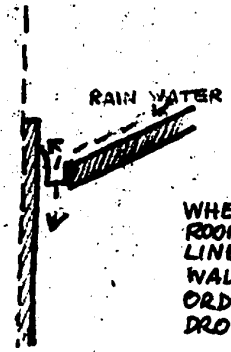


1.



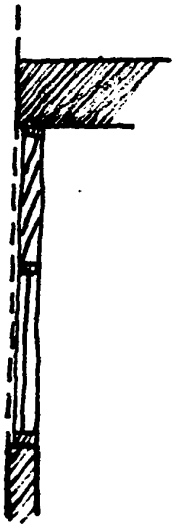
2.

OVERHANG ROOF AWAY FROM PROPERTY-LINE PREVENTS RAIN DROP INTO OTHER - BUILDING.



3.

WHENEVER CANTILIVERED - ROOF REACHES THE PROPERTY LINE, IT HAS TO PROVIDE WALL OVER THE ROOF IN - ORDER TO PREVENT RAIN - DROP.



4.

WHENEVER BUILDING IS CONSTRUCTED ATTACHED THE PROPERTY LINE THE OPENINGS ARE NOT ALLOWED TO OVERHANG.

VI BUILDING FABRIC

POLITICAL FACTORS

THROUGHOUT THAILAND

Exterior Structure

a) Fire-proof materials must be used, either locally or imported such as steel, or concrete.	Government imposed law.
b) Thick walls must be a minimum of 1' - 2' to prevent spreading of fire from the internal structure.	Same

Interior Structure

a) Local and imported materials can be used such as wood, acoustic board, cellocrete.	allows foreign influence to enter in regard to exchange of materials, and does allow for better foreign relation.

Appearance

a) All buildings in temple area must use the same materials, and similar external shapes	Government imposed law
b) All official buildings must use the same material, and same external shape.	Same

PART 4. ECONOMIC FACTORS

I. COMMERCIAL AREA

(a) Modernized structure

(b) Prospect on foreign exchange

II. ECONOMIZATION OF BUILDINGS

(a) Rural area

(b) Urban area

III. ECONOMIC MOTIVATIONS

(a) Stability

(b) Mobility

(c) Population

IV. GROUPING OF BUILDING TYPES

(a) Rural area

(b) Urban area

V. BUILDING ACCESS AND PLANS

(a) Planning

(b) Direction

(c) Procedure

(d) Shape

(e) Decorations

VI. APPEARANCE OF BUILDINGS

(a) Rural area

(b) Urban area

I. COMMERCIAL AREA

(a) Modernized Structure: involving a large element of North American and European influence.

1) Technique: use of machine-made material

2) Institution: introduced by Thais educated abroad

(b) Prospect of saving on foreign exchange:

1) Promotion of Industries (central and rural)

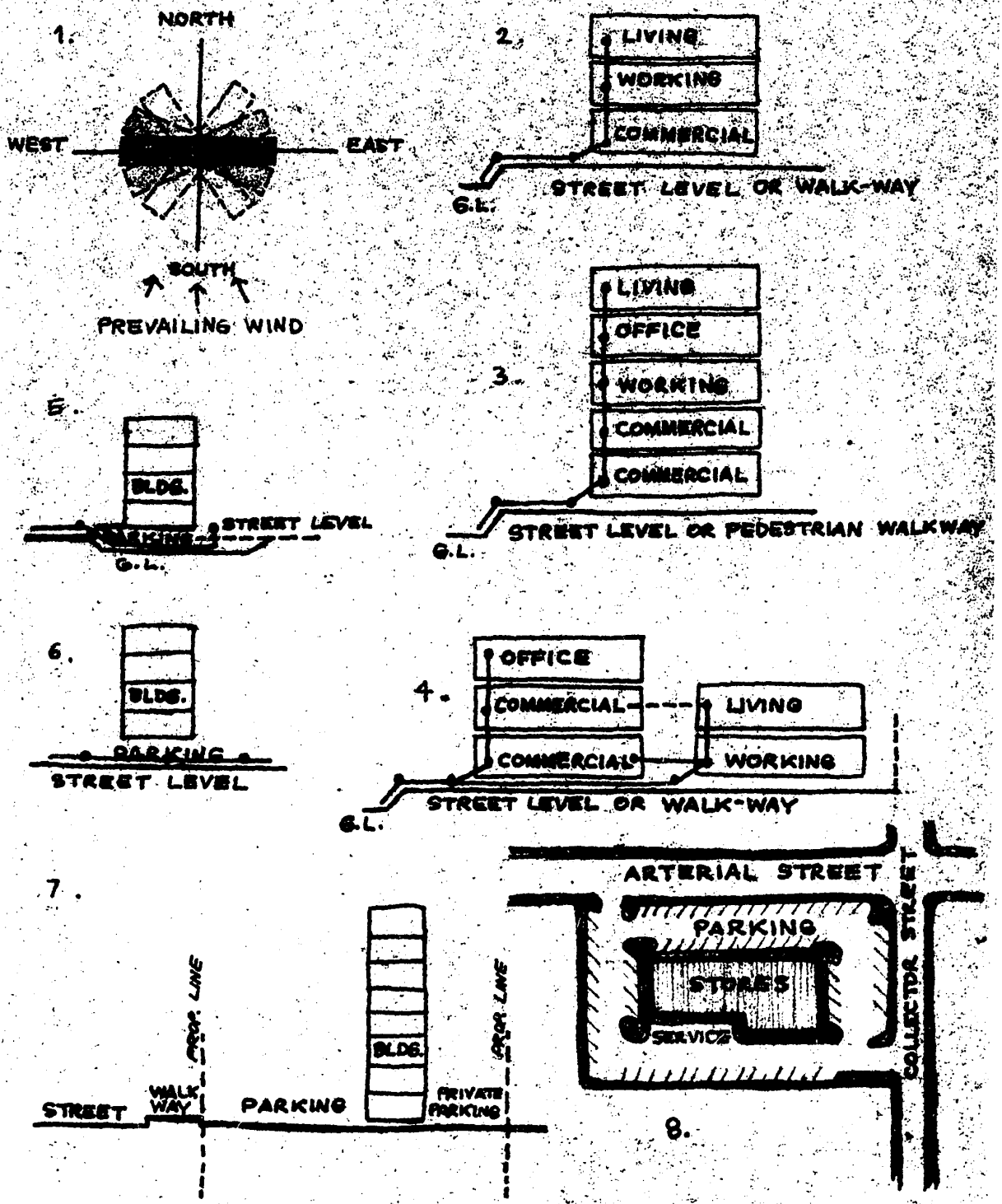
2) Government prevent too much imported luxuries by heavy taxation, and therefore it encourages the people to buy local manufactured goods.

II. ECONOMIZATION OF BUILDING

(ORIENTATION AND LOCATION)

RURAL AREA	URBAN AREA
1) Oblong side towards the prevailing wind to avoid strong radiation on E-W side and to achieve natural ventilation. (See Fig. 4.1)	1) Same as rural. As well as, the average person owns an electric fan helping cross ventilation in the "row" spacing housing scheme. For the wealthier people an air conditioner is more economical.
2) Stilts are cheaper than raising the main platform.	2) For a more beautiful appearance the ground level is raised.

4.1. DIAGRAMATIC DRAWING OF ORIENTATION & LOCATION ACCORDING TO THE ECONOMIC FACTORS.



III. ECONOMIC MOTIVATIONS

RURAL AREA	URBAN AREA
(a) STABILITY	
The basic output of goods produce in rural area equals the output being manufactured or sold raw by urban area. Stabilized as occupations are constant, 85% farmers, the remaining 14% include forestry and fishing and 1% mining.	
(1) Farmers: grow: maize, rice, kenaf, coconut, sugar cane, livestock, cotton	(1) Markets: sell food supply produced by farmer (2) Clothing: fabrics weaved by rural women and grown by farmer and then sold to public
jute, hemp	(3) Tourism: used in making souvenirs.
(2) Fisherman: sea fish caught along the Gulf of Thailand and east coast as well as fresh water fish.	(1) Markets: sold to public as food supplement (2) Restaurants: fish sold, attract-local people and tourists.
(3) Forestry: mainly teakwood	(1) sold for export (2) used as building material locally (3) used for Paper Industry-for writing which educates the people and used in signs promoting industry and tourism.

RURAL AREA	URBAN AREA
(a) STABILITY ..... continued	
(4) Mining: Tin, Wolfram, Lead, Antimony, Manganese, Gypsum, Flourite	(1) Trade:- used in export (2) Tourism:- promotes it by selling to tourists

As the goods are sold, money is circulating giving the Government a chance to develop their budget, improving the economy of the country.

Economic Variables:

(a) Investment recessing as Americans moving out, Tourism will bring them back.

(b) Balance of trade fluctuating internationally, when the market is constant investment will rise.

Proposals:

1. Industries utilizing local labor and raw materials within.
2. Industries are capable of supporting the balance of payment.
3. New proposal to develop Industries in rural areas.

(b) MOBILITY	
Slow-means of transport few animals, boat, "sam-law" only a	Higher speed many sources of public transport. (refer to page.26)

RURAL AREA	URBAN AREA
only a small minority own their own vehicles. Retaining traditional qualities.	I. Waterways -a) Main waters used for for channeling export or import. b) as a source of generating electricity to industries. II. Air - carrying import or export trade. Also bringing in tourists. III. Rail - carrying import or export trade. Also bringing in tourists. IV. Roads and Bridges - move people in order to buy goods, work etc. V. Bus and Vehicles - move people in order to buy goods, and all activities. VI. Sidewalks move people in order to buy goods and all activities. (See Fig.4.2)

(c) POPULATION

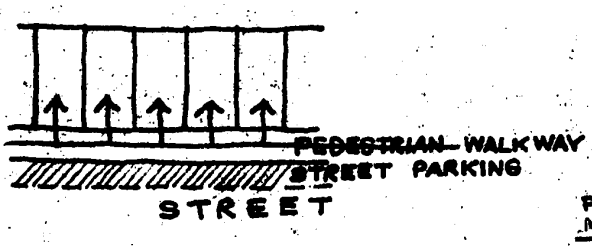
small percentage of population growth therefore minimizing expansion of town.	Rapid Growth of Population (a) Migration of Outsiders including Europeans and North Americans develop economy introducing technical knowhow and bringing business in. Under the Promotion of Industrial Investment in 1960 and revised in 1962 it encourages this type of outsider.

RURAL AREA	URBAN AREA
(c) POPULATION ... continued	
	(b) Migration of Outsiders: specifically Chinese. They come to live and assimilate well with the Thais as they are both orientals. They also bring business in. There is now a limited quota imposed considering the growth of the Thais.
	(c) Migration from Rural: believing that the "grass is greener on the other side" and add to the labor supply needed.

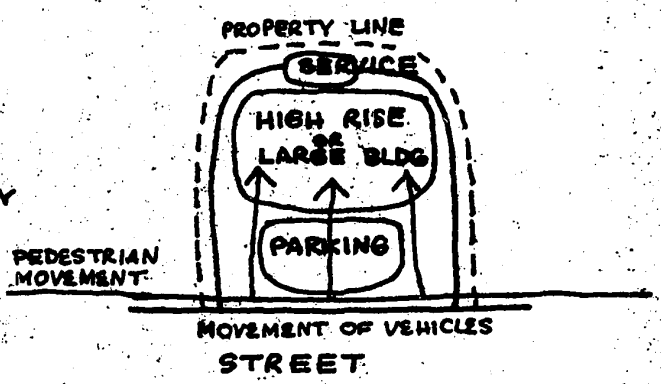
IV. GROUPING OF BUILDING TYPES

RURAL AREA	URBAN AREA
Housing: traditional buildings (same as cultural factor, page 35) maintain stabilized community.	Housing: Modern buildings (same as cultural factor, 36..) used to mobilize traffic by large residential areas being relocated and apartment put up in their place.

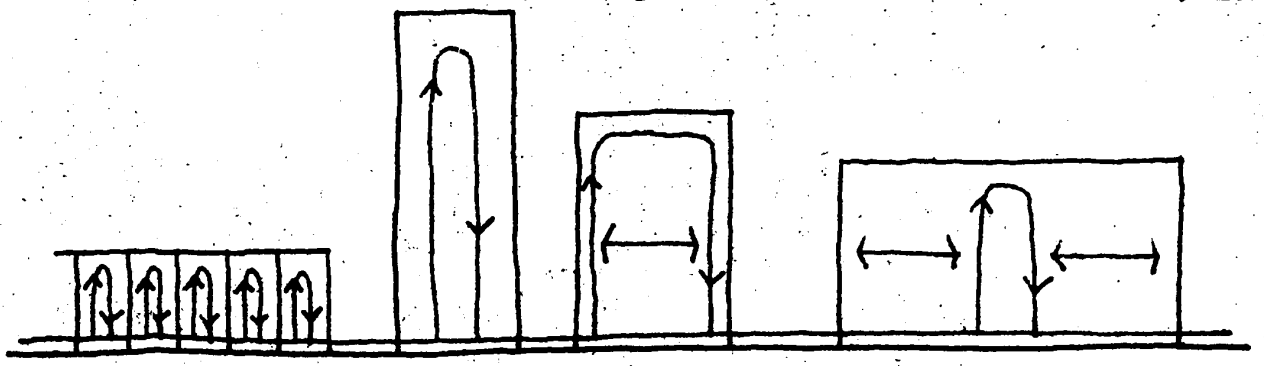
1. LOCAL ACTIVITIES, STREET MARKET.



2. PLAN OF COMMERCIAL BUILDING.



3. LAY OUT OF DEPARTMENT STORE, OFFICE, ETC.



4. SECTION OF MOVEMENT BETWEEN BUILDINGS.

4.2. DIAGRAMATIC DRAWING OF MOVEMENT AND TRANSPORTATION IN RELATION TO BUILDINGS.

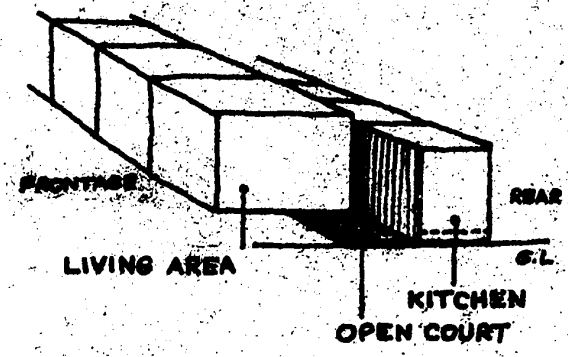
V. BUIDLING ACCESS AND PLANS

	RURAL AREA	URBAN AREA
(a)	PLANNING	
	Planning of housing is scattered as land is plenty because small percentage of population growth. (See Fig. 4.3/1,4,4/3, 4.5)	Planning is very necessary as little land space is available because of rapid growth of population. (See Fig. 4.3)
(b)	DIRECTION	
	Buildings are in horizontal direction as alot of land is available. (See Fig. 4.5)	Buildings are in vertical movement to compact space, that is available for example: High-rise building. (See Fig. 4.3/3)
(c)	PROCEDURE	
	1) Manual labour 2) Cooling the buildings natural resources affecting the landscape. (See economization page .72...)	1) Same 2) Some use this method. The majority use mechanical means: i.e. fan, air conditioner. (See economization page.72)
(d)	SHAPE	
	Primarily rectangular-economical because easily constructed.	Majority prefer rectangular some reason easy to construct. Prefabrication is modular component. (See Fig. 4.3, 4.4, 4.5).

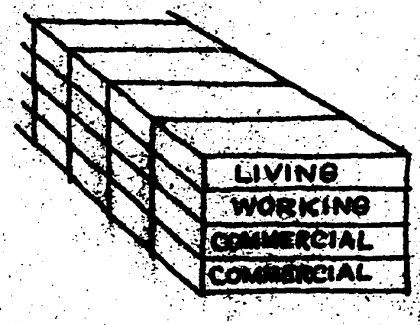
RURAL AREA	URBAN AREA
(e) DECORATIONS	
1) Local materials used: brown paint, red, and brown stains, and veneer, being local it is cheaper.	1) Local materials also used, although shades applied are more colourful. (See perception of colour).
2) Imported fixtures such as handles, and electric fittings etc. Relatively cheap coming from nearby countries. (Taiwan, Japan, Malaysia, Singapore, Hongkong).	2) Same

4.3. DIAGRAMATIC DRAWING OF GROUPING OF BUILDING TYPES ACCORDING TO ECONOMIC FACTORS.

1. HOUSING

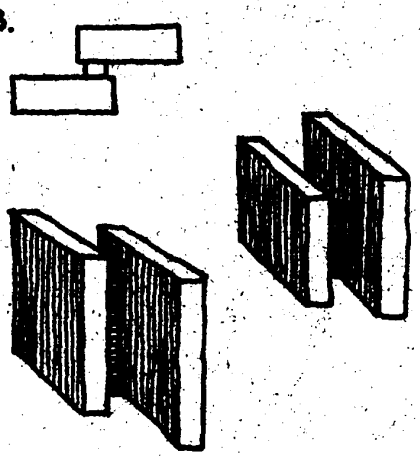


2. COMMERCIAL BUILDING

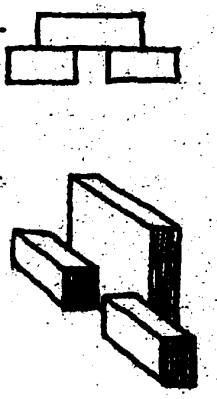


OFFICE, DEPARTMENT STORE, HOTEL, E.T.C.

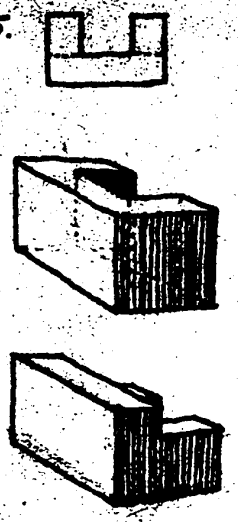
3.



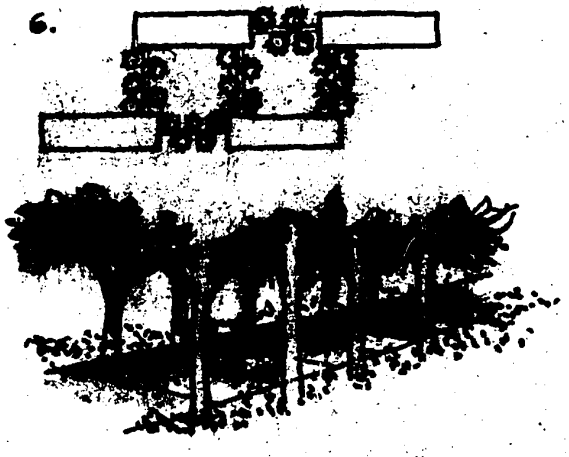
4.

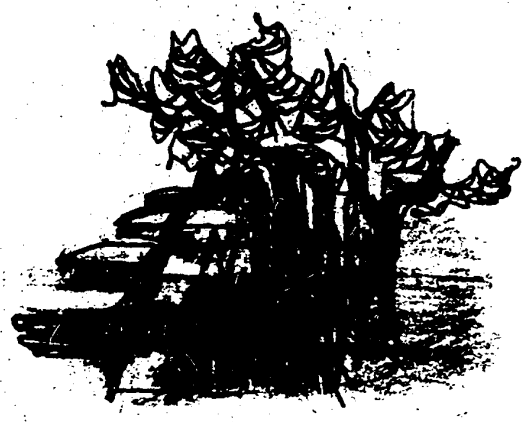


5.

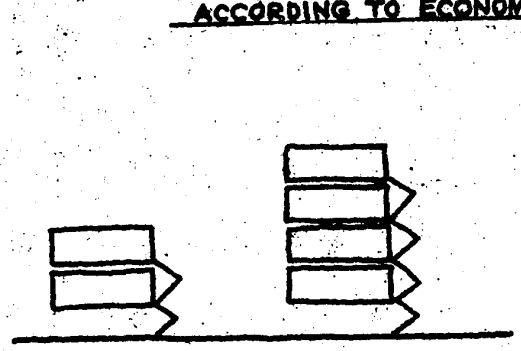


6.

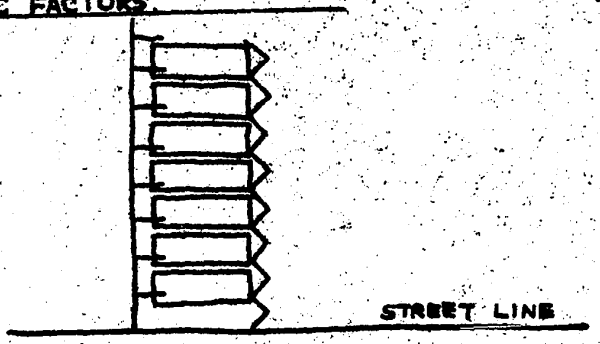




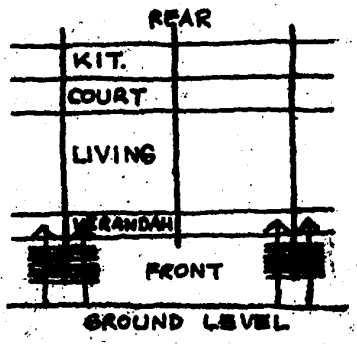
4.4. DIAGRAMATIC DRAWING OF BUILDING ACCESS ACCORDING TO ECONOMIC FACTORS.

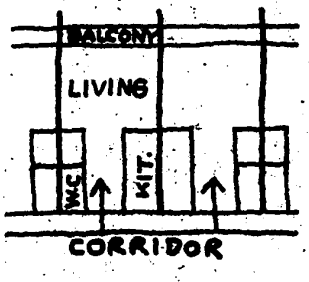


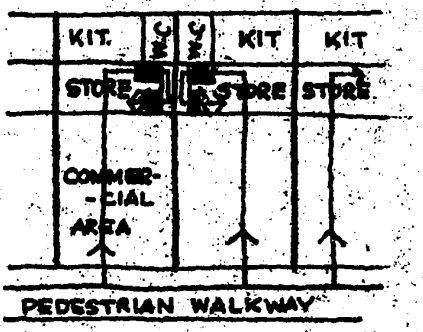
1. LOW RISE BUILDING, WALK UP TYPE



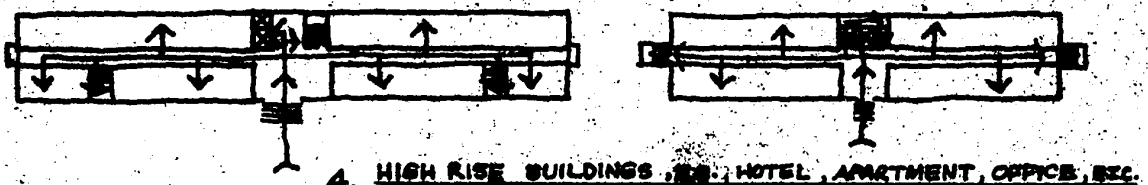
2. HIGH RISE BUILDING, ELEVATOR TYPE.



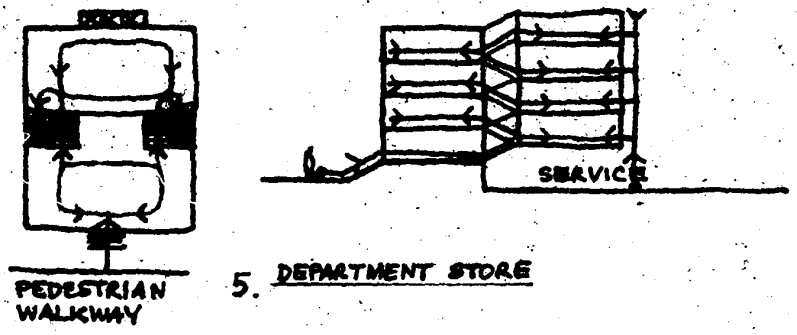




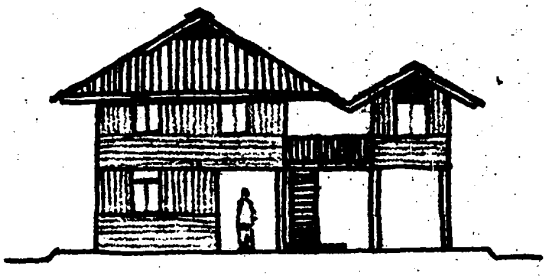
3. HOUSING



4. HIGH RISE BUILDINGS, HOTEL, APARTMENT, OFFICE, ETC.

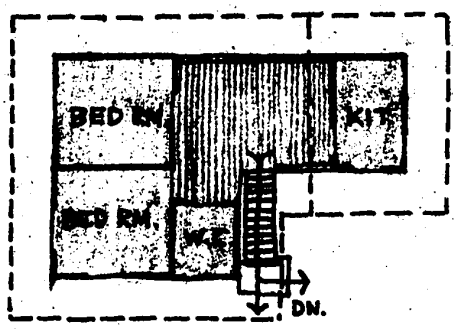


5. DEPARTMENT STORE

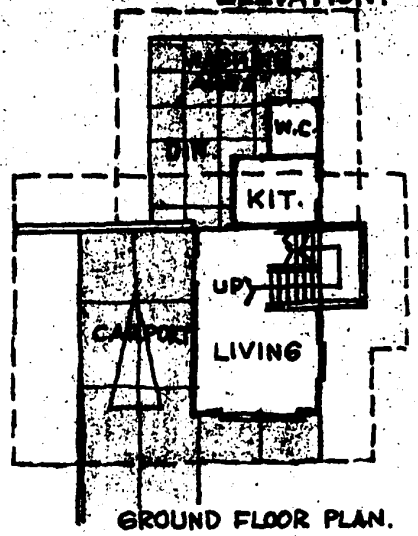


ELEVATION.

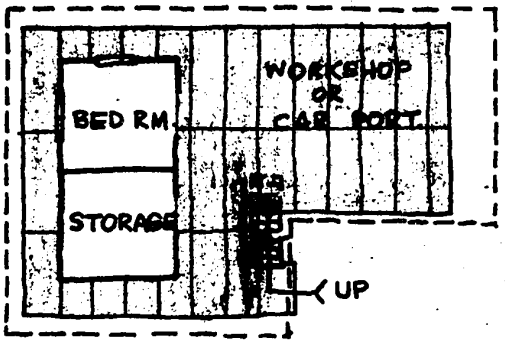
ELEVATION.



FIRST FLOOR PLAN.

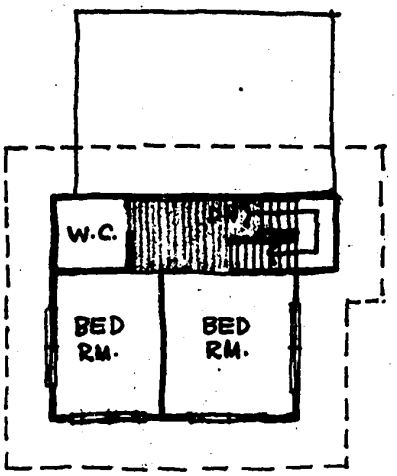


GROUND FLOOR PLAN.



GROUND FLOOR PLAN.

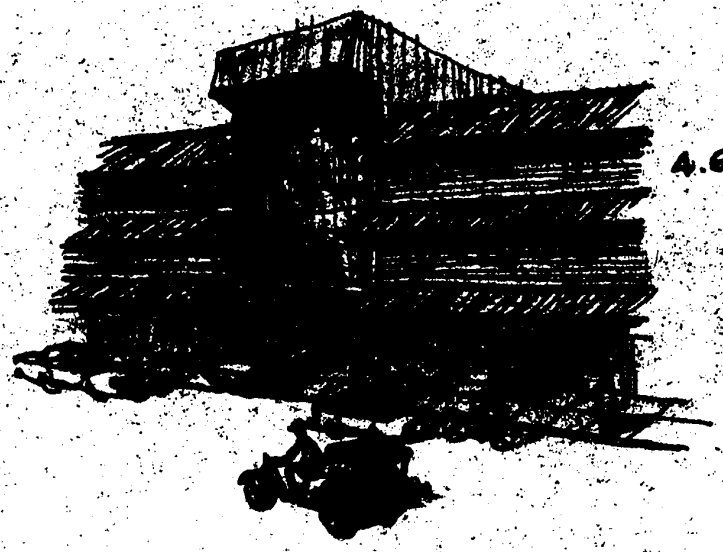
SUB-URBAN HOUSE



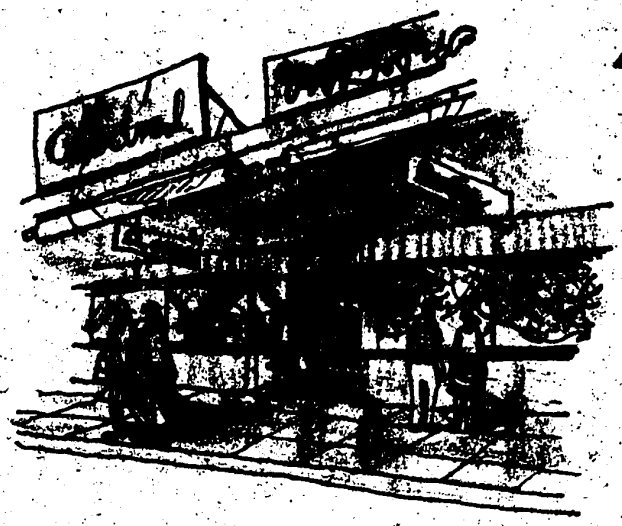
FIRST FLOOR PLAN.

URBAN-HOUSE.

4.5. TYPICAL HOUSE PLANNING.
(CONTEMPORARY)

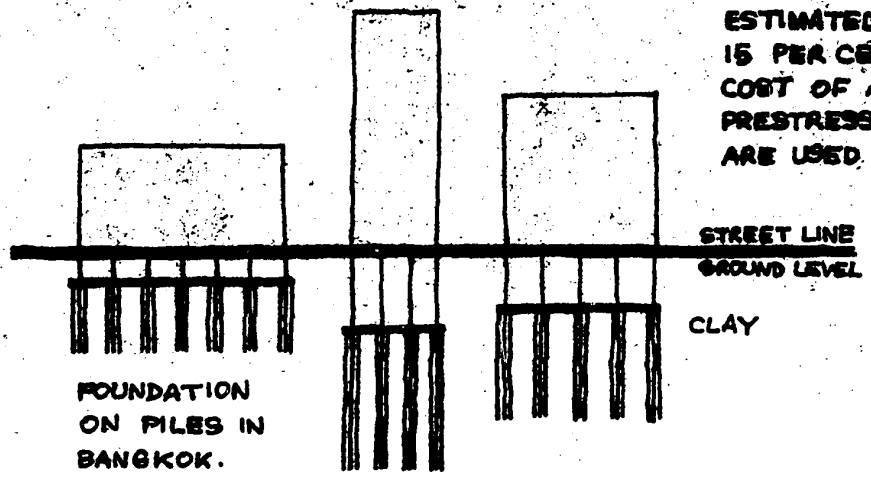


4.6. THE INFILLING BUILDING WILL ALWAYS BE TEMPORARY DIFFERENCE BETWEEN OLD AND NEW — THE EFFECT OF AGE ON EXISTING BUILDINGS WILL MAKE THE NEW STAND OUT FROM THE OLD.



4.7. NEW METHODS OF TRADING DEMAND LARGE WINDOW SIZE.

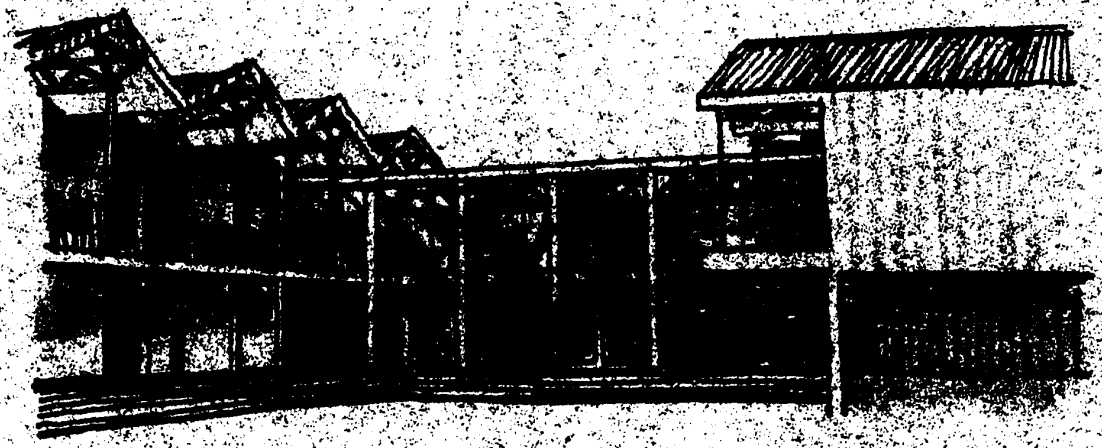
4.8. FOUNDATION ON PILES.
- THE COST OF FOUNDATION IN BANGKOK - DHONBURI IS - ESTIMATED APPROXIMATELY 10-15 PER CENT OF THE TOTAL COST OF A BUILDING WHERE PRESTRESSED CONCRETE PILES ARE USED AT PRESENT.



FOUNDATION ON PILES IN BANGKOK.

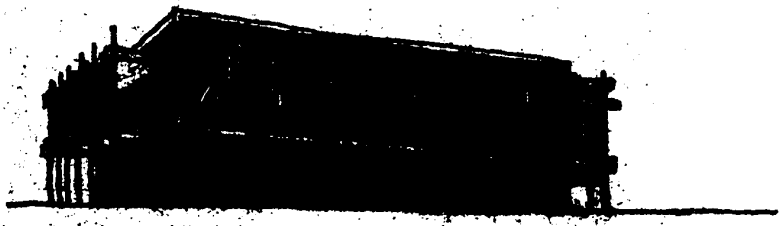
VI. APPEARANCE OF BUILDING

RURAL AREA	URBAN AREA
Organic Unity: Local materials applied on buildings and landscape defines traditional uniformity.	Mechanical Unity: Local and imported materials used, basically influenced by Western mode.
1) Materials absorption: Natural lighting.	1) Unnatural Absorption: a) too much light: Neon lights, Glass, Aluminium, Steel, etc. b) too little light: Plain concrete.
2) As the majority are poorer people's houses are smaller and the space is equipped with basic requirements. (1) Bedroom; (2) Kitchen; (3) Living-room.	2) As less space is available in row houses and apartment buildings basic requirements are modified according to space. For example: Home: Kitchen-U-shaped ; Row house: (basic bedroom and living area, Kitchen.
3) As the movement is horizontal the buildings are low.	3) The buildings are high, usually 20 to 30 storeys economizing on the expense of piles. (See Fig. 4.8).
4) Main supports include the beam(s) and column(s) not covered by decoration. This has an organic in quality and is a cheaper way.	4) According to the architect's requirements the beam(s) and column(s) are covered or not, allowing an esthetic result in each case.



4.9 INTER COURT OF ENGINEERING,
KHONKAEN UNIVERSITY.
EXPOSED STEEL ROOF TRUSS, WHICH HANGED
THE R.C. CANOPY ON BOTH SIDES.

4.10 STUDENT CAFETERIA,
KHONKAEN UNIVERSITY.
EXPOSED ASBESTOS ROOF WITH STEEL FRAME IN PYRAMID
MODULE.



4.11 DEPARTMENT OF ELECTRICAL ENGINEERING,
KHONKAEN UNIVERSITY.
EXPOSED R.C. BEAM AND COLUMN AS WELL AS
R.C. SUNSHADE.

PART 5. CLIMATIC FACTORS

I CLIMATIC FACTORS
- (1) Heat and Moisture
- (2) Rain
- (3) Prevailing Wind

II ARCHITECTURAL SOLUTIONS
- (a) MECHANICAL
- (b) NATURAL
  1. Orientation and Location
  2. Building Planning
  3. Movement and Transportation
  4. Building Fabric:
     a) wall and opening
     b) roof
     c) floor
     d) foundation
  5. The Examples of Building Skin for Climatic Control.

I. CLIMATIC FACTOR

Climatic affects men in a multitude of ways, and is probably the most important of all geographic elements influencing the design of building

CLIMATIC FACTOR	DESCRIPTION	MAJOR PROBLEMS
(1) Heat and Moisture	Generally high and humid year round. The sunlight becomes most strong between 12 to 3.	a) Excessive solar radiation b) Moisture a deteriorant element
(2) Rainfall	Throughout Thailand abundant rainfall occurs between May and September. There is some rain throughout the year. In the South the rain falls year round coming down lightly.	a) Excessive rainfall is a deteriorant element Dampness throughout the year is a deteriorant factor.
(3) Prevailing Wind	Generally blowing from south to southwest throughout the day. In the morning the wind movement is variable. In the afternoon it bends towards the southeast.	a) Rather slight and be directed to get the utmost breeze.

II. ARCHITECTURAL SOLUTIONS

(a) Mechanical: cuts down heat and humidity by a mechanical breeze. This method applies a fan or air conditioner. It is rather costly compared to the natural cooling solution.

(b) Natural: tries to solve all climatic factors, by:

1) Orientation and Location

2) Building Planning

3) Movement and Transportation

4) Building Fabric:

   (a) wall and opening

   (b) roof

   (c) floor

   (d) foundation

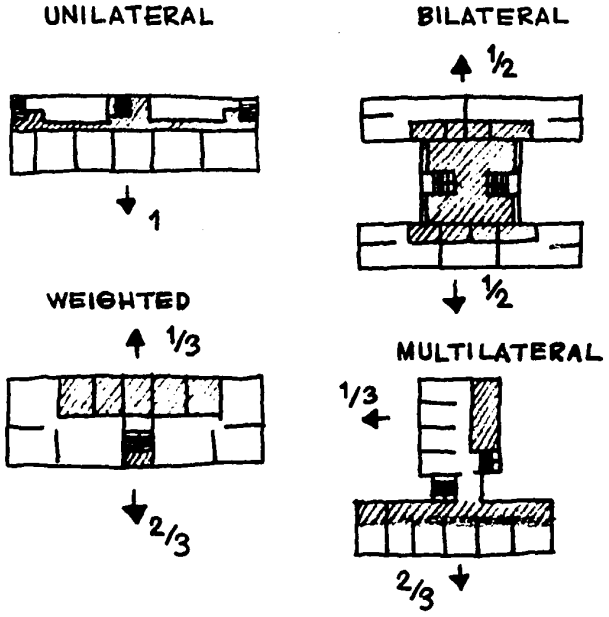
5) The Examples of Building Skin for Climatic Control .

1). ORIENTATION AND LOCATION

In Thailand the sun and wind are two main influences in physical orientation. Thus it is essential to orientate the building towards the Prevailing Wind to avoid strong radiation coming from east and west. This is done by dictating the shape of the building to a slender elongation.

Many modern buildings have been adjusted to exposure from the important sides (N-S). Buildings are arranged to different orientations taking best advantage of the climatic impact. The illustrations help explain this as follows:

5.1. SKETCHES OF BUILDING SHAPES WITH DIRECTORAL ORIENTATIONS.



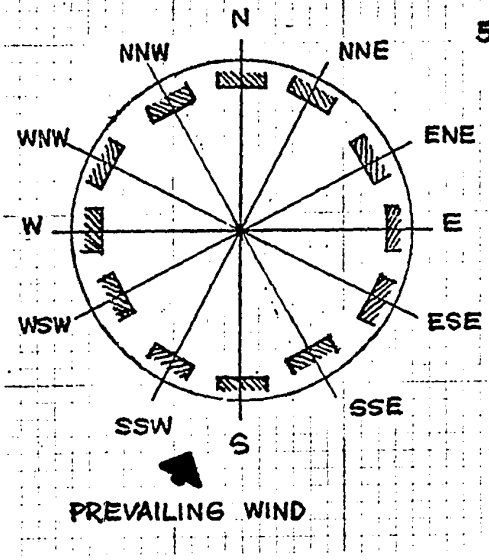
SOURCE : VICTOR OLGYAY , DESIGN WITH CLIMATE, PP. 62.

The recommendations for room exposure is composed by Jeffrey F. Aronin[1] suggesting sun orientation for various rooms, and the diagram of building orientation for comfort[2].

ELEMENTS	ORIENTATION							
	N	NE	NW	S	SE	SW	E	W
BEDROOMS	●	●		●	●	●	●	
LIVING ROOM				●	●	●		●
DINING ROOM				●	●	●	●	●
KITCHEN				●	●	●	●	
LIBRARY	●	●	●					
LAUNDRY	●	●	●					
PLAY				●	●	●		●
DRYING YARD				●	●	●		●
BATHROOMS	●	●	●	●	●	●	●	●
UTILITY	●	●						
GARAGE	●	●	●	●	●	●	●	●
WORKSHOP	●	●						
TERRACES				●	●	●	●	●
SUNPORCH				●	●	●		●

5.2.
SUGGESTED SUN ORIENTATION FOR ROOMS

1. JEFFREY E. ARONIN,
CLIMATE AND ARCHITECTURE
REINHOLD, NEW YORK, 1953
PP 94-99.



5.3.
DIAGRAM OF BUILDING - ORIENTATION FOR COMFORT

2. VICTOR OLGYAY,
DESIGN WITH CLIMATE,
BIOCLIMATIC APPROACH TO ARCHITECTURAL REGIONALISM.
P 55.

HOWEVER, ORIENTATION WITH LONG SIDE TOWARD - DIFFERING WIND DIRRECTION IS ACCEPTABLE ONLY UNDER SHADE CONDITIONS.

LOCATION

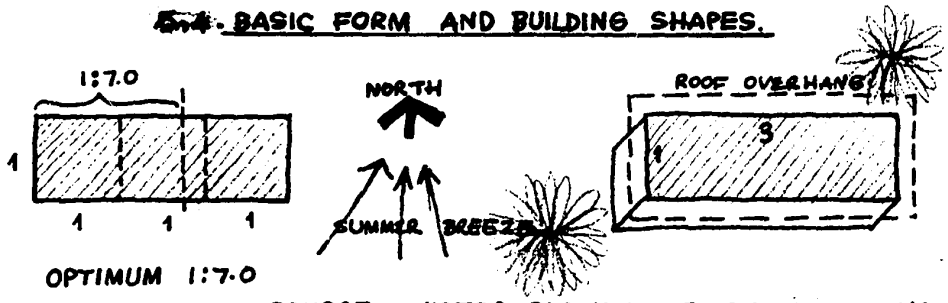
Climatic Factors	Location
Wind, Heat and Moisture	High elevation towards the windward side The crest slightly offsets the prevailing wind into the center of the house cutting humidity and heat Building sites lie elongated somewhere along the east-west direction; E-W, NE-SW, NW-SE, being considerably advantageous. (See Fig. 5.1, 5.2, 5.3)
Rain	As the monsoon season is throughout the year (with most intensity in May to September) buildings are located above ground level to avoid flooding.

2. BUILDING PLANNING

CLIMATIC FACTOR	SOLUTIONS	DESCRIPTION
(1) Heat and Moisture	(1) natural benefit from air flow. (See Fig. 5.7, 5.8)	(1) In rural areas building layouts are spread out resulting in low density. (See Fig. 5.5/2-3)
		(2) Paving should be avoided so refraction of sunlight will not occur.
	(2) mechanical benefit from air flow: fan or air conditioner.	(1) Hot and humid areas should be ventilated and seperated from the rest of the structure.

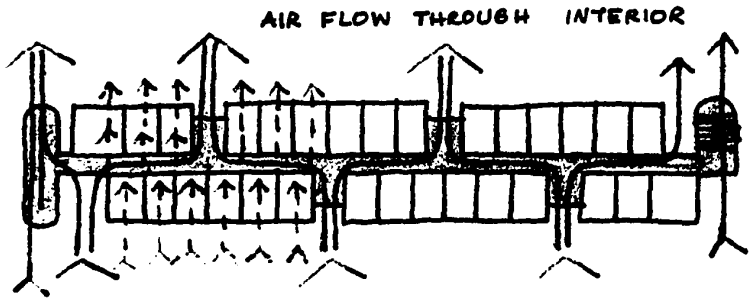
(2) Rainfall	(1) drainage ducts	(1) provided on each side to prevent soil erosion around the building
	(2) planning in accordance with contour lines. (See Fig. 5.5)	(2) helps in reducing erosion hazards
(3) Prevailing Wind	(1) strongest radiation E. and W. sides modifying shape to cut down heat.	(2) Shape is slender and elongated. The optium shape is 1:7. 0,but upto 1:3.0 on E-W axis is also acceptable.(See Fig. 5.4)

5.4. BASIC FORM AND BUILDING SHAPES.



OPTIMUM 1:7.0

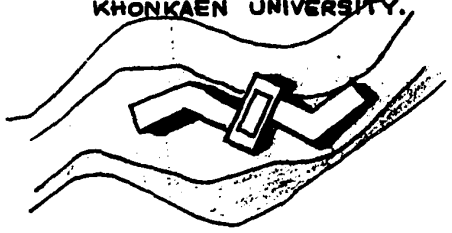
SOURCE: VICTOR OLGYAY, DESIGN WITH CLIMATE, PP 88.

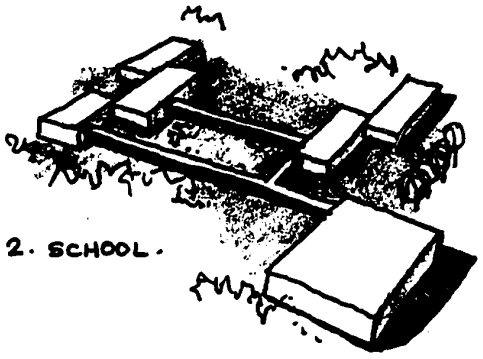


HOUSING, DORMITORY
KHONKAEN UNIVERSITY.

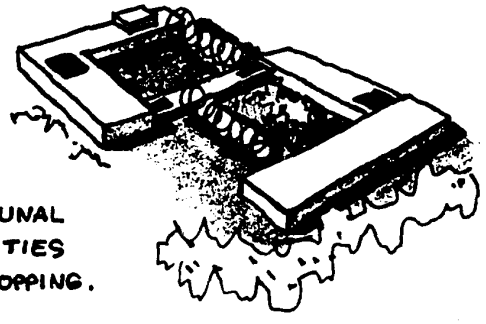
5.5, GROUPING OF BUILDING.

1. APARTMENT, FOR STAFF MEMBER
KHONKAEN UNIVERSITY.





2. SCHOOL.

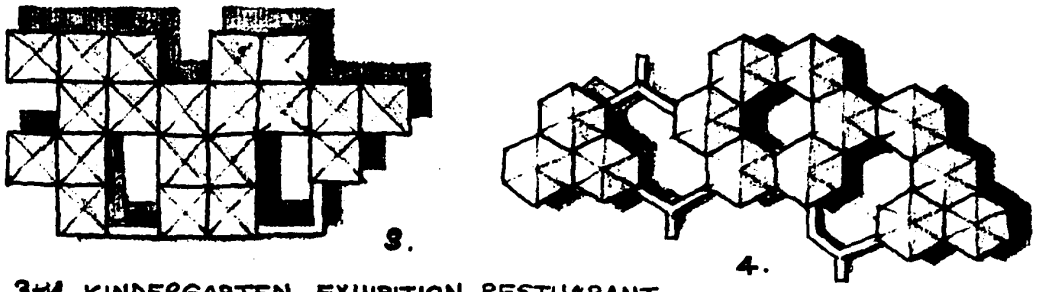


3. COMMUNAL
FACILITIES
OF SHOPPING.

5.6 PLANNING SOLUTIONS ON LOCATION.

1. 2.

1.-2. UNIVERSITY'S BUILDING, FLAT, EXHIBITION.

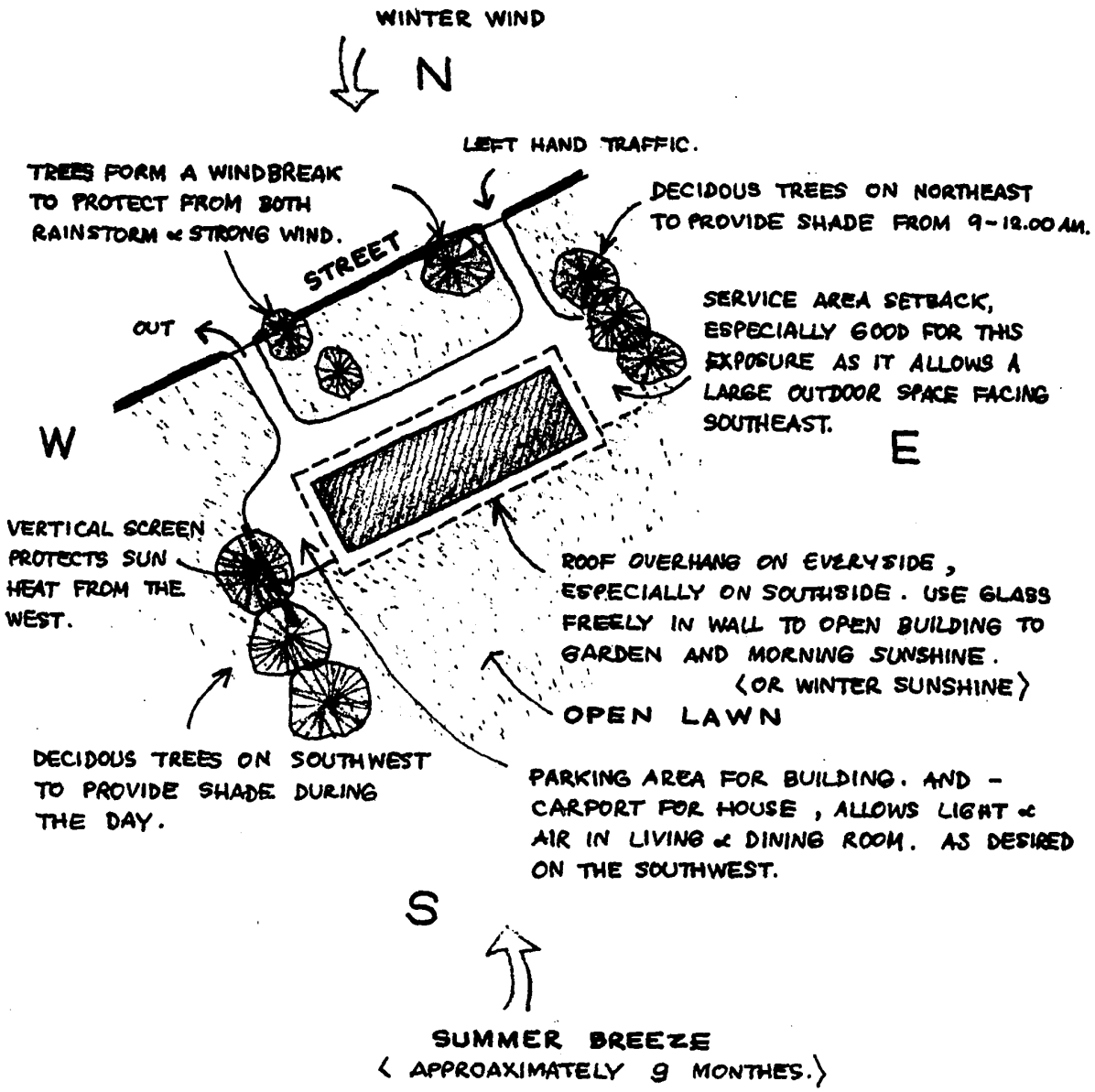


3. 4.

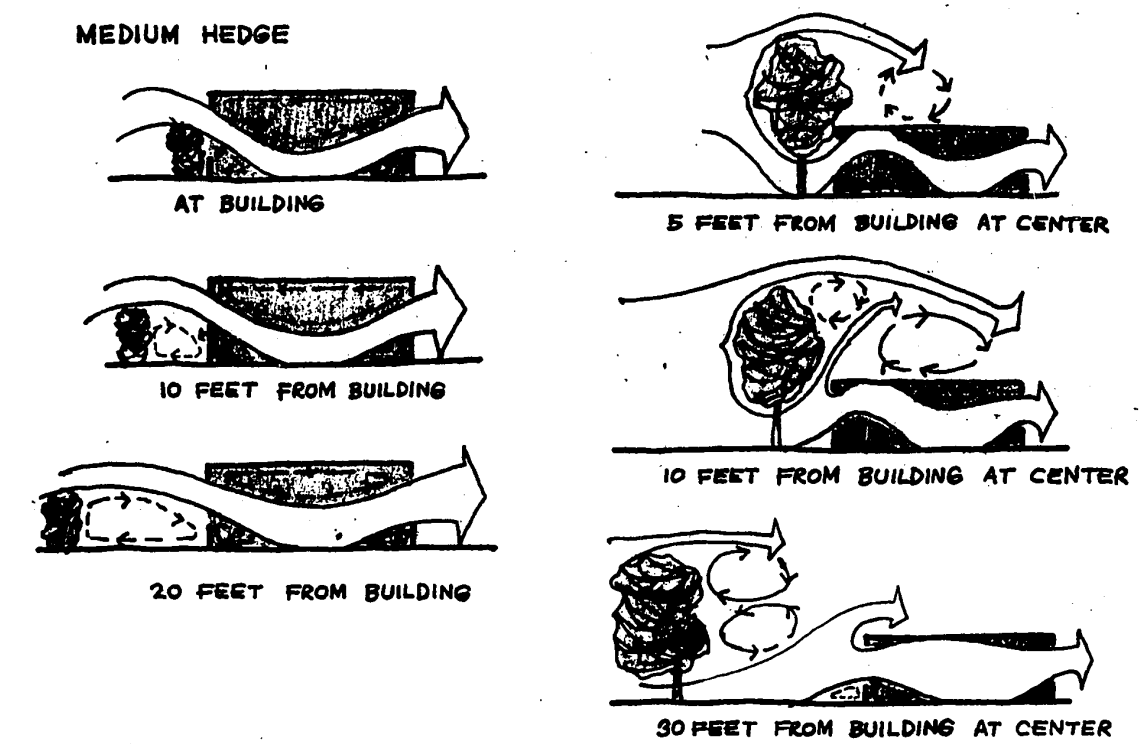
3.-4. KINDERGARTEN, EXHIBITION, RESTUARANT.

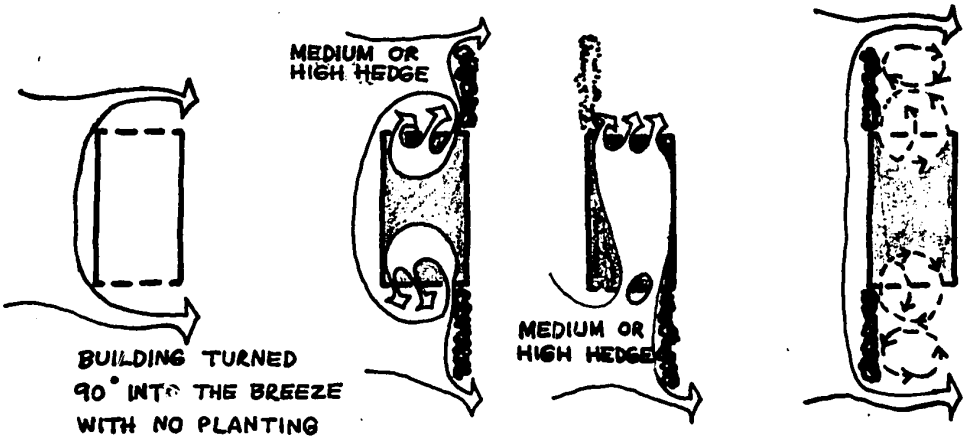
1.-4. - SETTING THE BUILDING IN IRREGULAR SHAPE TO MAKE SHADE WITHIN.

5.7. PLANNING SOLUTIONS OF BUILDING LOT.



5.8. AIR FLOW PATTERN MODIFICATION WITH LANDSCAPING.





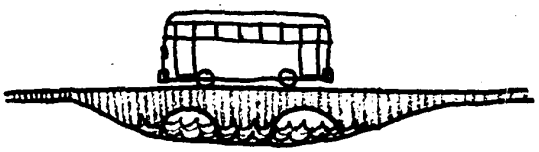
SOURCE; OLGYAY, VICTOR, DESIGN WITH CLIMATE, PP. 102.

3. MOVEMENT AND TRANSPORTATION

Climatic Factor	Pedestrian Movement along river bank and farm (flooding Area)	
	Rural Area	Urban Area
	same methods as urban, although where heavily flooded people walk on stilts or walk on a dam surounding the rice field.	due to excessive heat, little wind, and much rain, excursions are shortened to a walking distance. Protection by: (1) Shelters attached to buildings for a longer shopping promenade (2) Under the trees (3) Umbrella (4) Hat (See Fig. 5.5,5.9)
	Street Movement	
	Rural Area	Urban Area
Same	House must be an platform level to avoid flooding, obtain best wind breeze to cut down heat and humidity. And house with landscape provides some shading for the street (See Fig. 5.9) Drainage ducts must be provided opposite each side of the street, preventing soil erosion (See Fig. 5.9)	Same

5.8.

CLIMATIC FACTORS INFLUENCED ON TRANSPORTATION AND MOVEMENT.

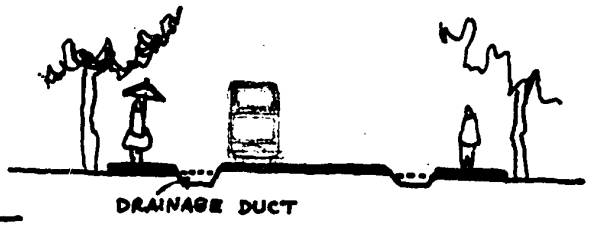


FLOODING AREA

ALONG THE RIVER-BANK

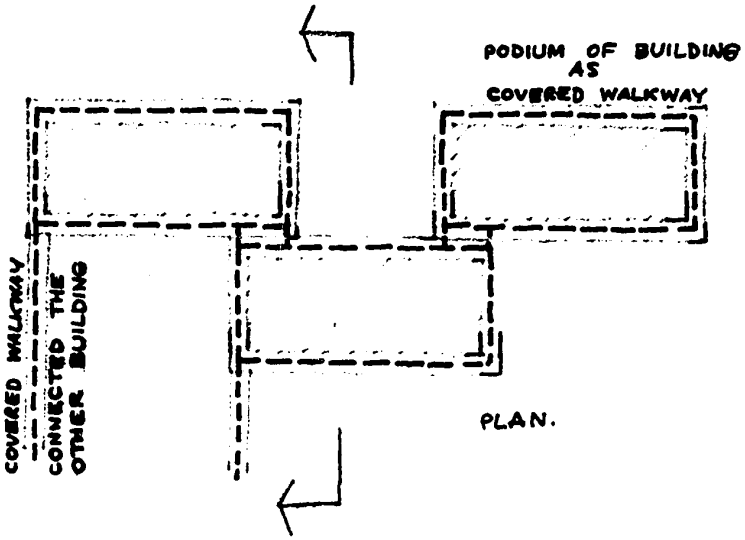
HIGH WAY

SMALL CANAL



DRAINAGE DUCT

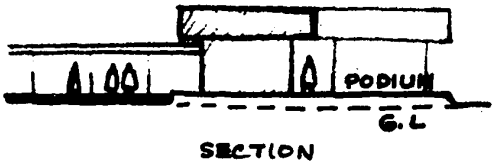
STREET



PODIUM OF BUILDING AS COVERED WALKWAY

COVERED WALKWAY CONNECTED THE OTHER BUILDING

PLAN.



PODIUM

G.L

SECTION

4. BUILDING FABRIC: a) Wall and Opening

b) Roof

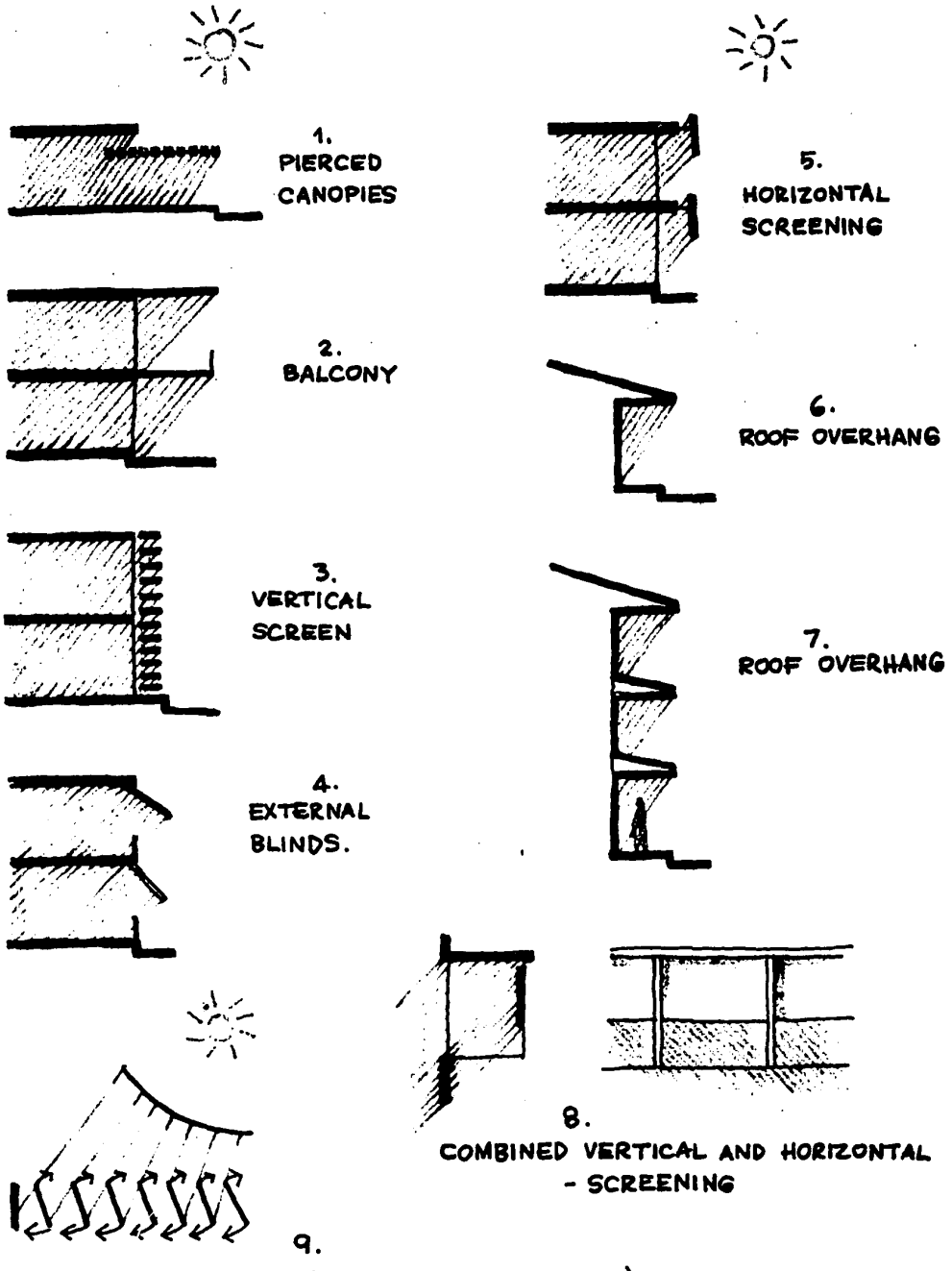
c) Floor

d) Foundation

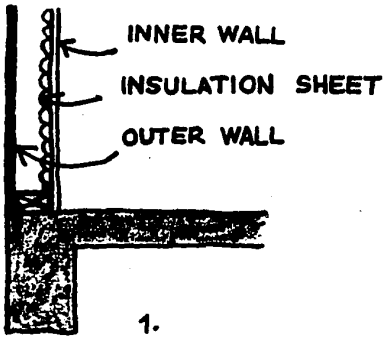
4(a) WALL AND OPENING

CLIMATIC FACTORS	METHODS	ELEMENT	MATERIAL USED	PLACEMENT
(1) Heat and Moisture	a) Continuous efficient b) Shelter from sun and insulator against pest	Shutter a) Roll back b) Removeable Types 1) Screen 2) Louvres Not used in high standard air conditioned building. 3) Grill (See Fig. 5.10)	Modern lightweight construction:i.e. Plywood,Asbestos, Panel,Alluminum Panel,Glass treated(Chemical treated)	Essential to admit air flow to cut heat and humidity 1) Through Ventilation in opposite parallel walls. 2) Corner Ventilation at right angle.
	c) Control internal-temperature not too humid	Mechanical cooling	Fan or air conditioner	where best needed to best advantage
(2) Rainfall	a) Continuous provision against heavy rain entering	Same	Same	Same method, acts as an excellent shelter too.
(3) Prevailing Wind	a) Continuous efficient ventilation	1) Window 2) Door	Same	Adjusted to trap air to best advantage and not excess (See Fig.5.10,5.11)

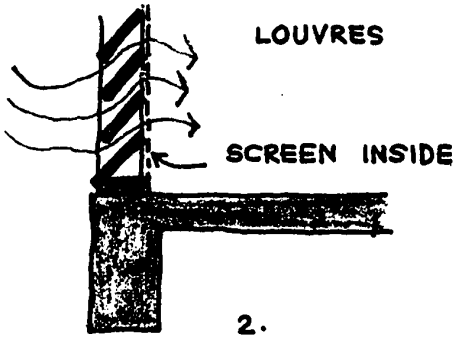
5.10. METHODS OF SUN PROTECTION FOR WALLS & OPENINGS.



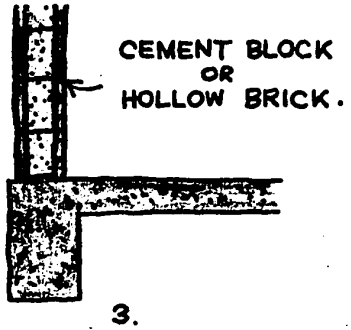
5.11. METHODS TO COOL THE WALL.



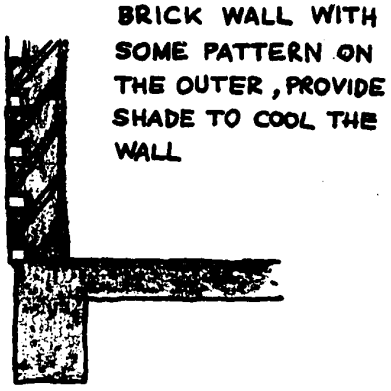
1.



2.



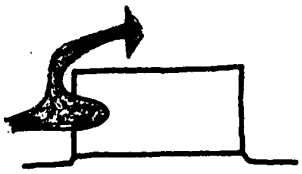
3.



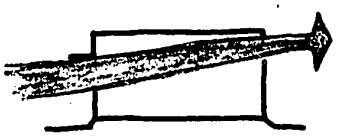
4.

5. ADJUSTING WALLS & OPENNINGS AWAY FROM SUN AND RAIN.

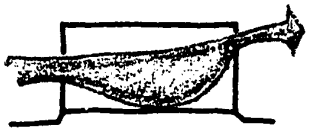
5.12. AIR FLOW WITHIN BUILDING.



1) SINCE THERE IS NO OUTLET THERE IS VIRTUALLY NO AIR MOVEMENT IN THE ROOM.



5) ADDITION OF SUN HOOD OVER WINDOW LEADS TO STILL AIR CONDITION AT BODY ZONE.



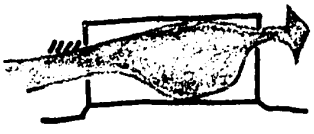
2) INLET AND OUTLET POSITIONED AS SHOWN AND SAME SIZE. AIR MOVEMENT GOOD IN BODY ZONE, IMPROVED IF - OUTLET ENLARGED.

6) VERY LITTLE IMPROVEMENT OVER 4) IS OFFERED BY THE PROVISION OF A LOWER OUTLET IN ADDITION TO UPPER.

3) WINDOW PLACED AT HIGH LEVEL - OUTLET AT NORMAL WINDOW HEIGHT CREATES A POCKET OF STILL AIR IN BODY ZONE.

7) THE PROVISION OF A GAP BETWEEN THE SUNSHADE AND WALL IMPROVES AIR-MOVEMENT IN BODY ZONE.

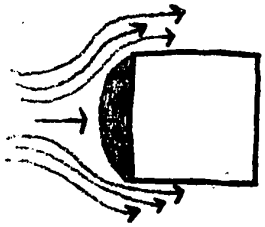
4) LARGE INLETS AND OUTLETS REACHING LOW IN THE ROOM GIVE EXCELLENT - AIR-MOVEMENT CONDITIONS.



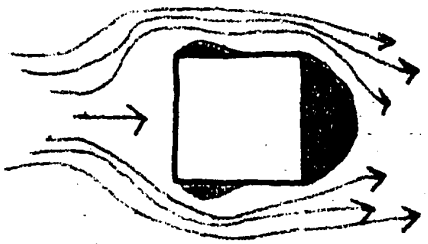
8) THE USE OF A LOUVRED SUNSHADE OFFERS FURTHER IMPROVEMENT - OVER 6) AND 7).

SOURCE : DAVID OAKLEY, TROPICAL HOUSES, TEXAS ENGINEERING - EXPERIMENT STATION, 1961, PP 122.

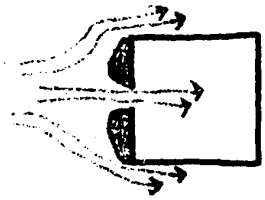
5.10. CROSS VENTILATION.



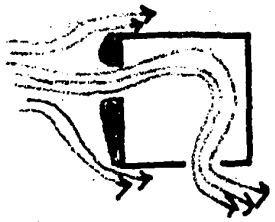
1) WIND STRIKING THE BUILDING CREATES A REGION OF HIGH PRESSURE ON THE WINDWARD-SIDE.



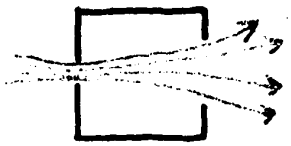
2) THE WIND IS DEFLECTED AROUND THE BUILDING CREATING LOW - PRESSURE ZONES ALONG THE SIDES AND ALONG THE ENTIRE LEE SIDE.



3) THE AIR-FLOW DOES NOT TAKE THE SHORTEST ROUTE.



4) EQUAL PRESSURES ON BOTH SIDES OF SYMMETRICALLY LOCATED INLET.



5) THE VELOCITY OF AIR FLOW IS INCREASED IF THE INLET IS SMALLER THAN THE OUTLET.

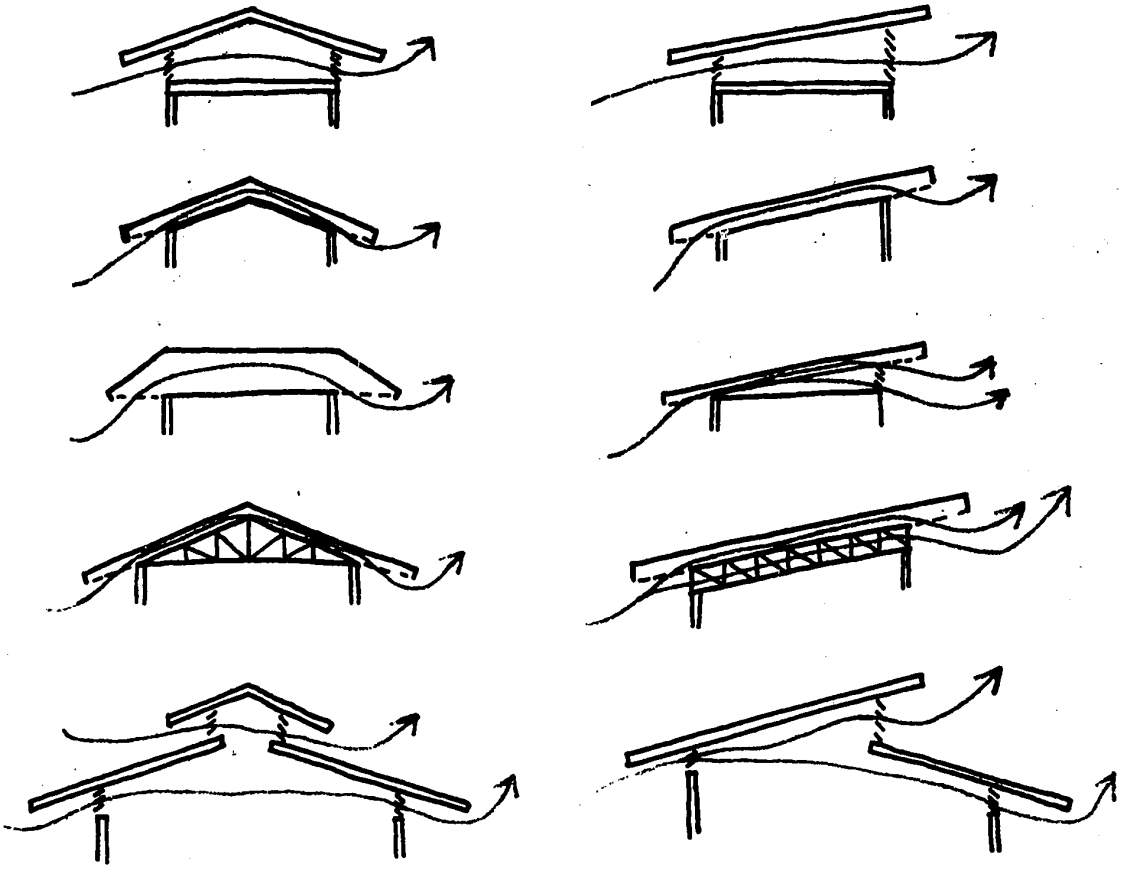
6) UNEQUAL PRESSURES ON BOTH SIDES OF INLET, AIR-FLOW DEFLECTED TO A DIFFERENT ROUTE.

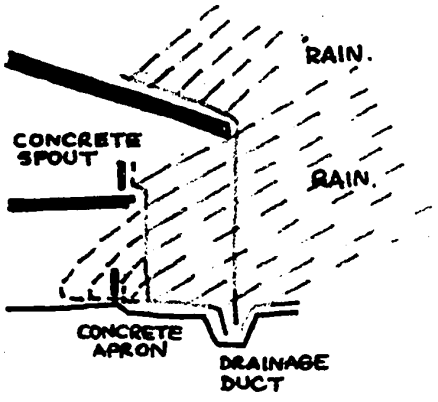
SOURCE : GEORGE LIPPSMEIR, TROPENBAU, BUILDING IN THE - TROPICS, 1969, PP 197-199.

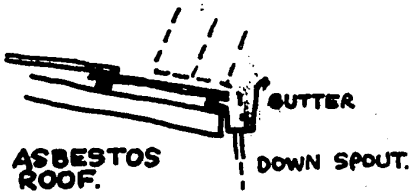
4(b) ROOF

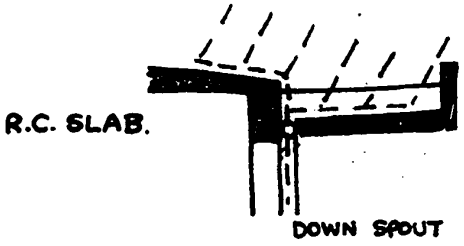
CLIMATIC FACTORS	METHODS	ELEMENTS	MATERIALS USED	PLACEMENT
(1) Heat and Moisture	a) Provision for shading b) Shelter from sun and insulation	1) Overhang: Types: a)High pitch b) Flat roof	1) Asbestos, R.C. slab	1) a) High pitch encourages reduction of heat (See Fig.5.11,5.12)
		2) Screen	Same	2) Refer to shading device
		3) Double Roof (See Fig. 5.14,5.15)	Same	3) Same, upper surface absorbs excessive heat and rest of warm air rises and escapes into the double roof where led out by Cross Ventilation.(See Fig. 5.14,5.15)
(2) Rainfall	For best drainage	Same	Same	1) Overhang-provides best drainage, away from building(See Fig.5.14) 2) Screen-where best suited 3) Double roof-on top of building (See Fig.5.14)
(3) Prevailing Wind	Act as a breeze to diffuse heat	Same	Same	Same (See Fig. 5.15,5.16)

5.14. TYPICAL ROOF STYLES



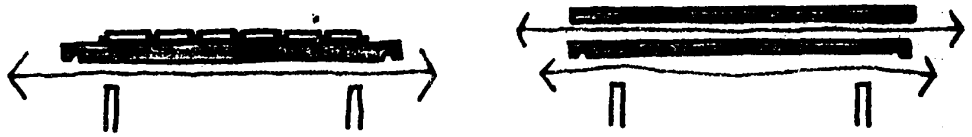






5.15. METHOD OF SUN PROTECTION BY AIR GAPS UNDER THE ROOFS - AND VENTILATION OF ROOFS.

1.

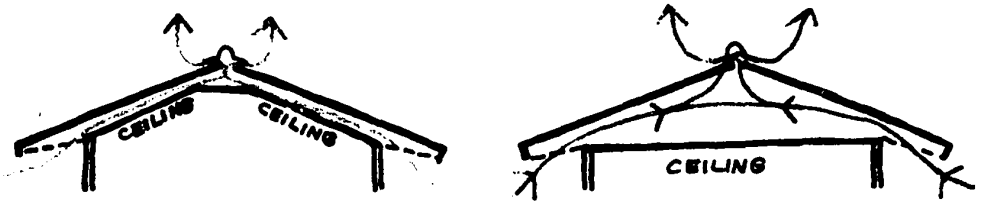


SLABBING DOUBLE ROOF

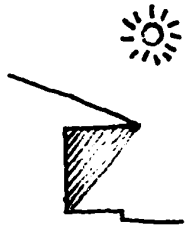
2.

3.

4.

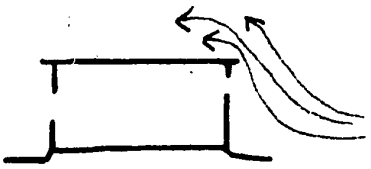


5.

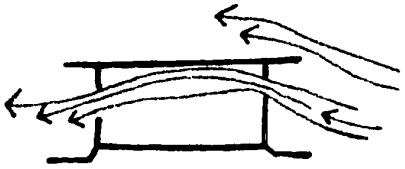


SOURCES ; M. FRY & J. DREW , TROPICAL ARCHITECTURE , P. 48 - 54.
GEORGE LIPPSMEIER , TROPENBAU , BUILDING IN THE TROPICS, P. 165 - 166.
DAVID OAKLEY , TROPICAL HOUSES , P 119.

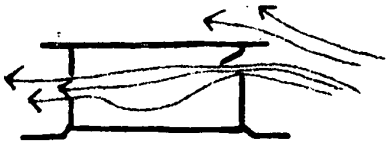
5.16 WIND EFFECT BY OVERHANG.



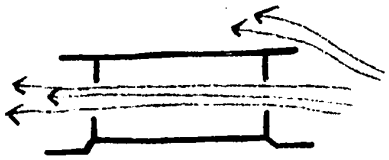
1. BUILDING WITHOUT OVERHANG HAS LESS.



2. THE OVERHANG CAN BE USED TO DEFLECT MORE AIR INTO THE ROOM.



3. CAREFULLY ADJUSTMENT OF A LOUVER CAN PUT THE MOVING AIR WHERE IT WILL HAVE THE GREATEST COOLING EFFECT.



4. THE PROPER PLACEMENT OF WINDOW GIVES THE BEST COOLING EFFECT.

THE POSITION OF INLETS AND OUTLETS, THEIR SIZES, AND THE PRESENCE, POSITIONING, OR ABSENCE OF ROOF OVERHANGS OR SUNSHADES ALL EFFECT - THE RATE AND FLOW OF AIR. KNOWLEDGE OF HOW THEY AFFECT IT IS PARTICULARLY IMPORTANT TO THE DESIGNER FOR WARM HUMID CONDITIONS WHERE COMFORT AIR MOVEMENT IS A DESIGN REQUIREMENT.

SOURCE : W.W. CANDILL, S.E. CRITS, AND E.C. SMITH : SOME CONSIDERA-TIONS IN THE NATURAL VENTILATION OF BUILDING. TEXAS ENGINEERING EXPERIMENT STATION, 1951, REPORT 22-23.

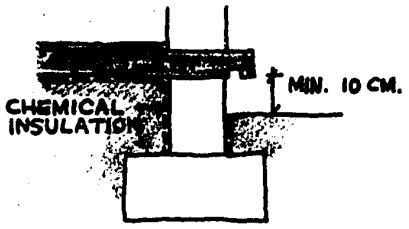
4(c) FLOOR

CLIMATIC FACTOR	METHODS	ELEMENTS	MATERIAL USED	PLACEMENT
(1) Heat and Moisture	a) Keeping it dry b) Protection from pests c) Control internal temperature comfortable	1) raised on columns	reinforced concrete timber	must be raised from ground level on columns and not a continuous footing wall if possible (See Fig. 5.17)
		2) crawl space		an opening in wall between ground level and first floor, air can circulate through crawl space
(2) Rainfall	Same	Same	Same	Same
(3) Prevailing Wind	Circulate air to keep it dry from too much humidity	Same	Same	Same

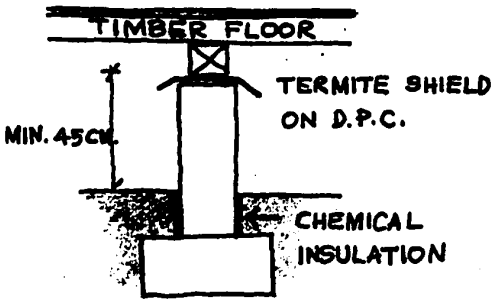
4(d) FOUNDATION

CLIMATIC FACTORS	METHODS	ELEMENT	MATERIAL USED	PLACEMENT
(1) Heat and Moisture	a) To provide protection from ground erosion	In Urban Area: Pile used, bricks, stone, R.C., sand In Rural Area: No pile used, otherwise same.	Bricks, Stone, R.C. sand	Pile (in Urban Area) placed below R.C. footing on bottom. Brick and Stone, Sand or Gravel is used to fill up foundation (Refer to technical factor
	b) To protect against humidity causing rusting	Iron	Iron	Placed inside concrete
	c) To prevent fungus, mold or pests. (See Fig. 5.17)	Chemical treatments	Bituminous Substance	
(2) Rainfall	Against dampness causing rusting	Same	Same	Directly in foundation Same
(3) Wind	None	Basement is impractical	None	None

5.17 TERMITES PROTECTION.

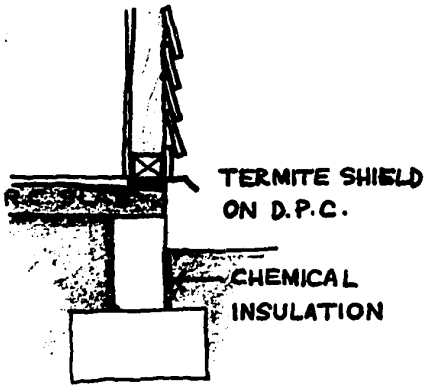


1. PROJECTING R.C. SLAB PREVENTS TERMITES FROM CRAWING UP.



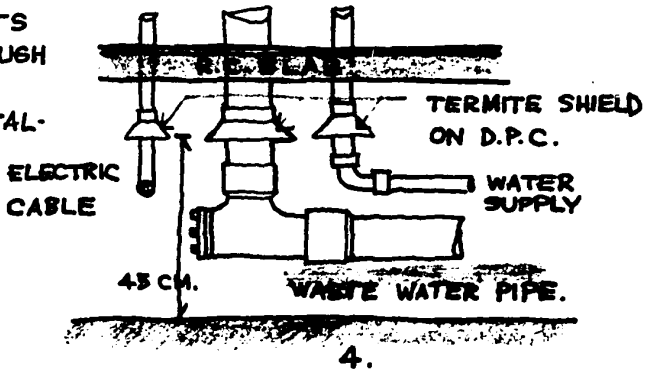
2.

2.– 3. METAL STRIP SHIELD WITH PROJECTING EDGES BENT DOWNWARDS CAN BE FIXED DIRECTLY ON THE DAMP – PROOF – COURSE OF FOOTING WALL.



3.

4. FREE ISOLATED CONDUITS AND PIPES LEADING THROUGH A CONCRETE FLOOR ARE PROVIDED WITH SHEET METAL-SHIELD BENT DOWNWARDS AT AN ANGLE OF 45°.

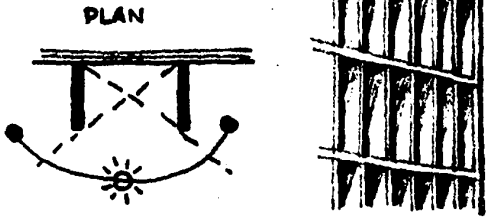


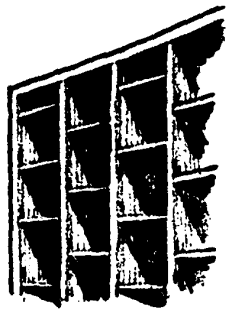
4.

SOURCE : TROPENBAU, BUILDING IN THE TROPICS, GEORG LIPPSMEIR. MUNCHEN CALLIVEY, 1969

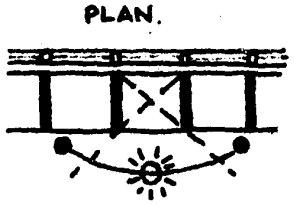
5.18 THE EXAMPLES OF BUILDING SKIN FOR CLIMATIC CONTROL.

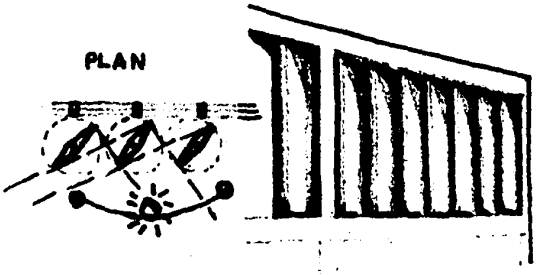
1. VERTICAL FINS SERVED WELL TOWARD EAST & WEST AND NEAR THESE ORIENTATIONS.



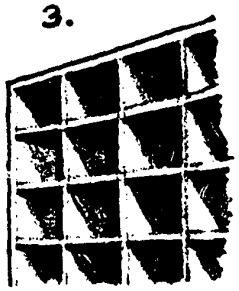


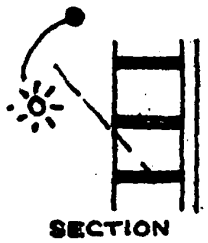
2. THE COMBINATIONS OF HORIZONTAL AND VERTICAL TYPES



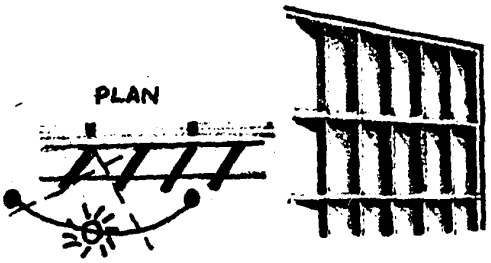


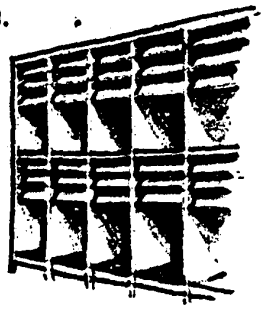
3.

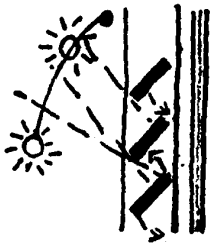




4. MOVABLE FINS CAN SHADE THE WHOLE - WALL, OR OPEN UP IN DIFFERENT, - DIRECTIONS ACCORDING TO THE SUN'S POSITION.

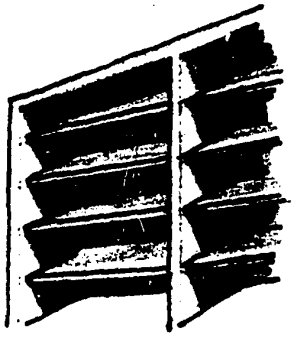


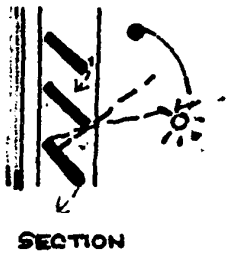




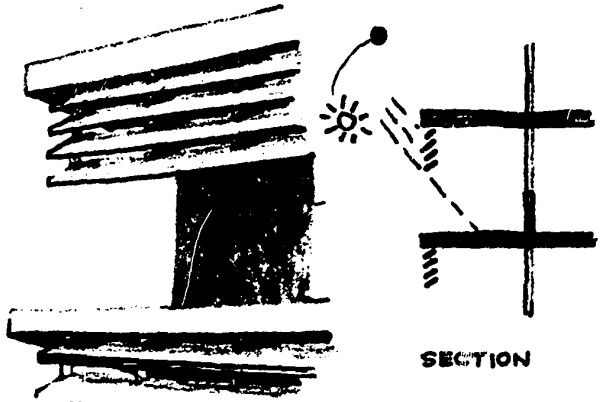
6. SLANTING VERTICAL FINS. SEPARATION FROM WALL WILL AVOID HEAT TRANSMISSION.

5. (MOVABLE) HORIZONTAL ELEMENTS COMBINED WITH VERTICAL FINS.





8 (MOVABLE) HORIZONTAL LOUVERS ARE EFFICIENT USED.



7. LOUVERS HUNG FROM SOLID HORIZONTAL - OVERHANGS, ARE NEED FOR LOW SUN ANGLES.

PART 6. TECHNICAL FACTORS:

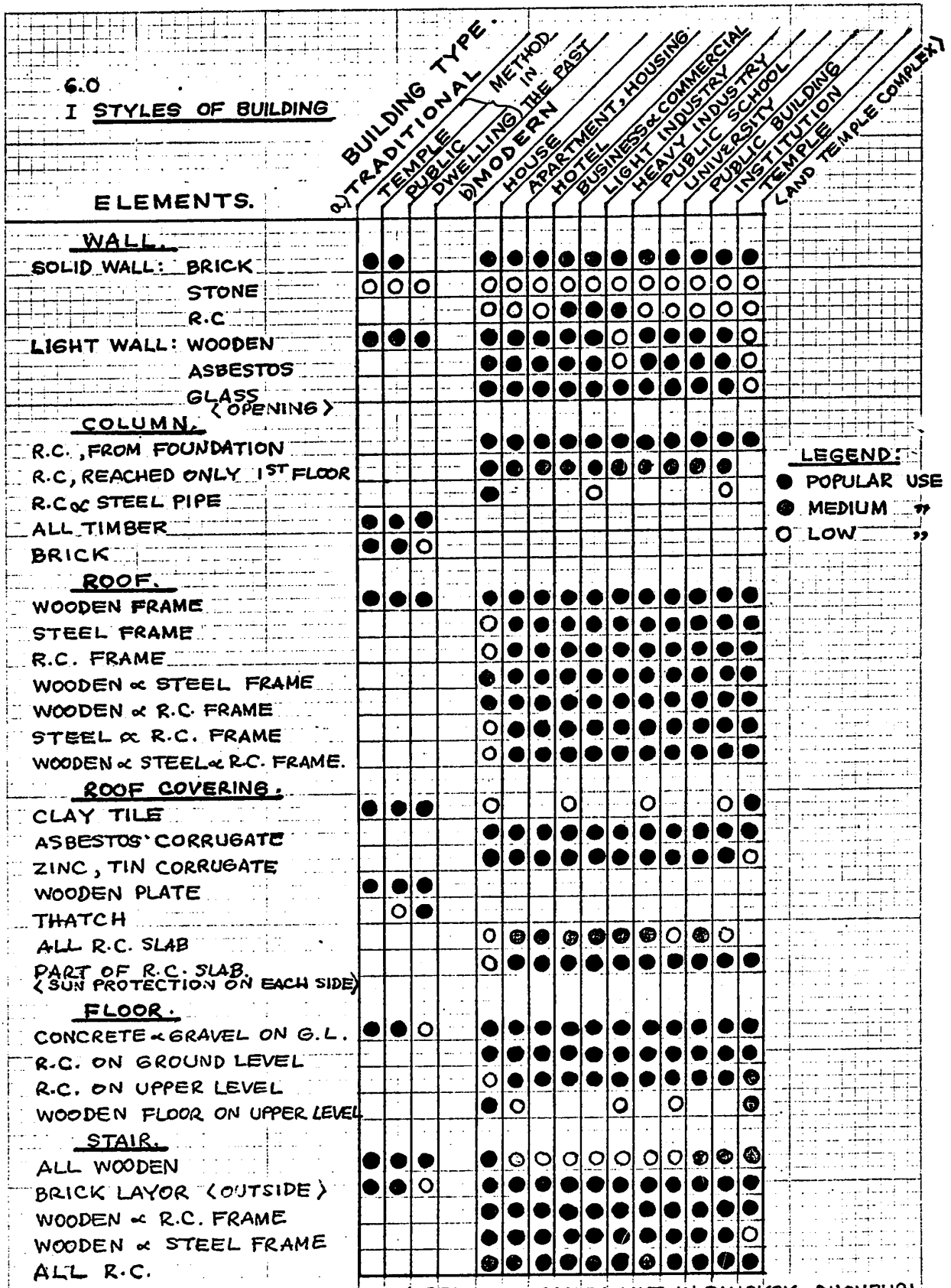
I. STYLES OF BUILDINGS
- (a) Traditional
- (b) Contemporary

II. DETAILS OF TRADITIONAL BUILDING FABRIC
- (a) Bamboo is Component Structure
- (b) Hardwood is Component Structure
- (c) Ornamentation of Structure

III DETAILS OF CONTEMPORARY BUILDING FABRIC: ELEMENTS
- (a) Wall and Opening
- (b) Roof
- (c) Floor
- (d) Foundation
- (e) Finishes

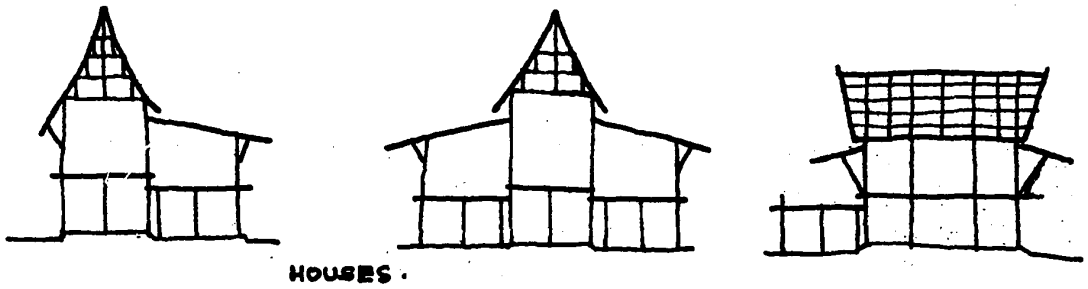
IV. APPEARANCE OF MODERN BUILDING TECHNIQUES
- (a) Generality
- (b) Visual Effect

6.0 I STYLES OF BUILDING

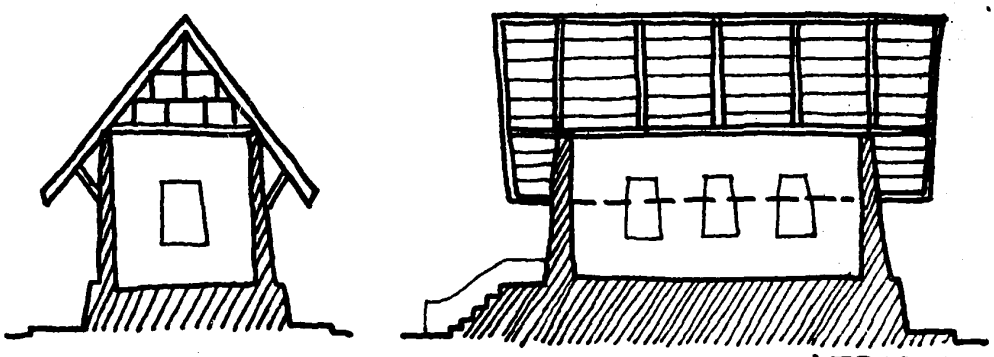


FOUNDATION, A SOIL OF LOW BEARING CAPACITY LIKE IN BANGKOK - DHONBURI EXTENDS TO GREAT DEPTH, THEN HEAVY BUILDING MUST BE FOUND ON A GRID OF PILES (PRECASTED CONCRETE OR PRESTRESSED CONCRETE PILES)

6.1 EXAMPLES OF BUILDING TYPES.

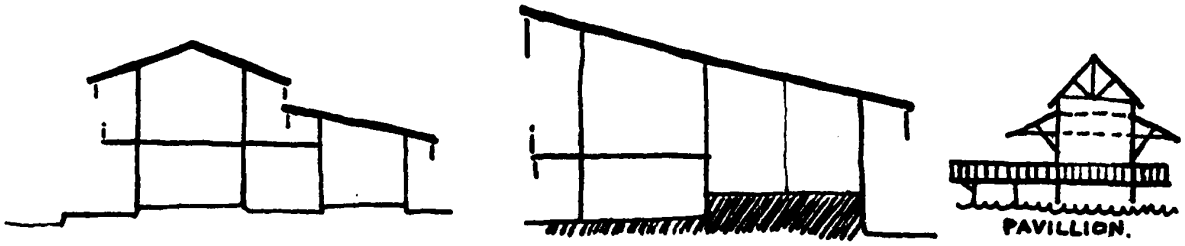


HOUSES.



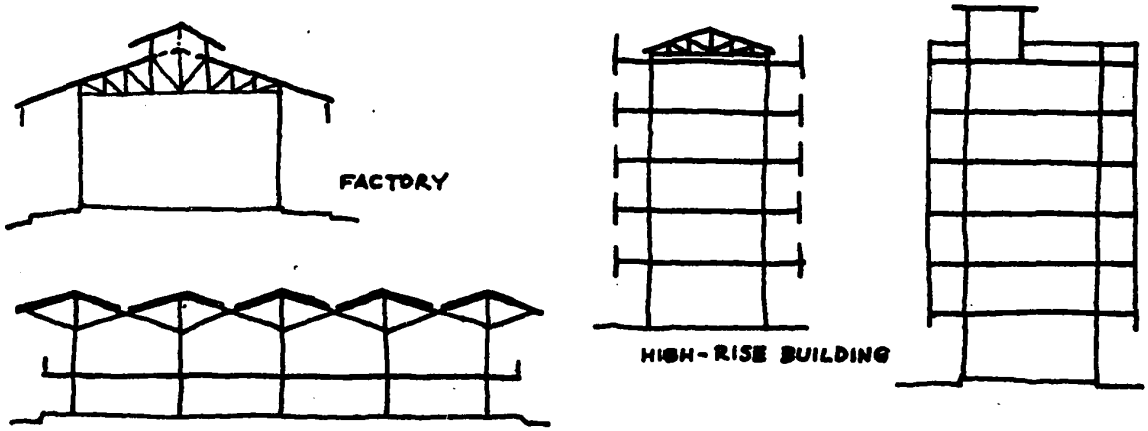
TEMPLE.

a) TRADITIONAL.



HOUSE

PAVILLION.



FACTORY

HIGH-RISE BUILDING

CONSTITUTION, TERMINAL, ENTERTAINING BUILDING, E.T.C.

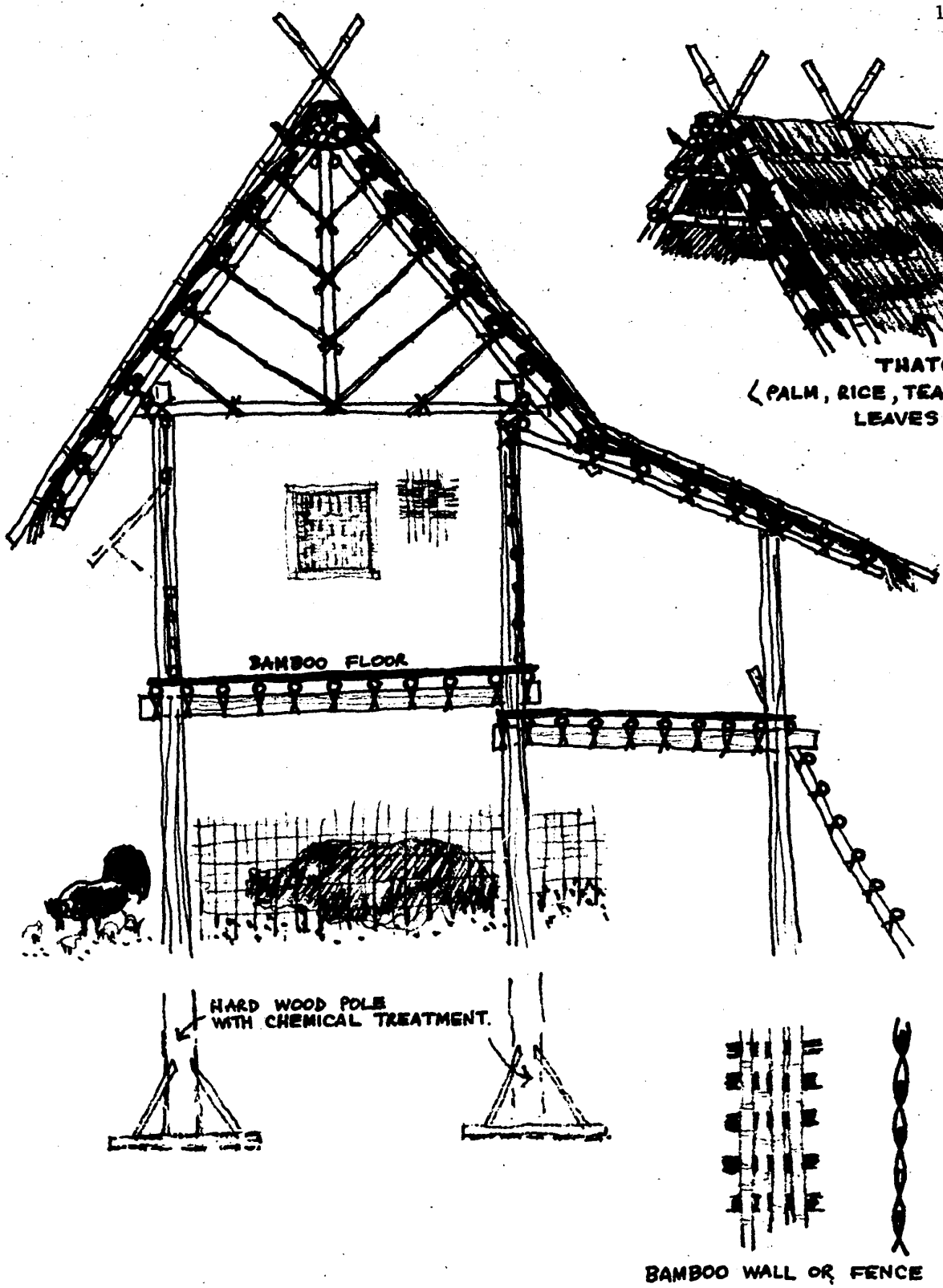
b) CONTEMPORARY.

II DETAILS OF TRADITIONAL BUILDING FABRIC

(a) Bamboo is Component Structure

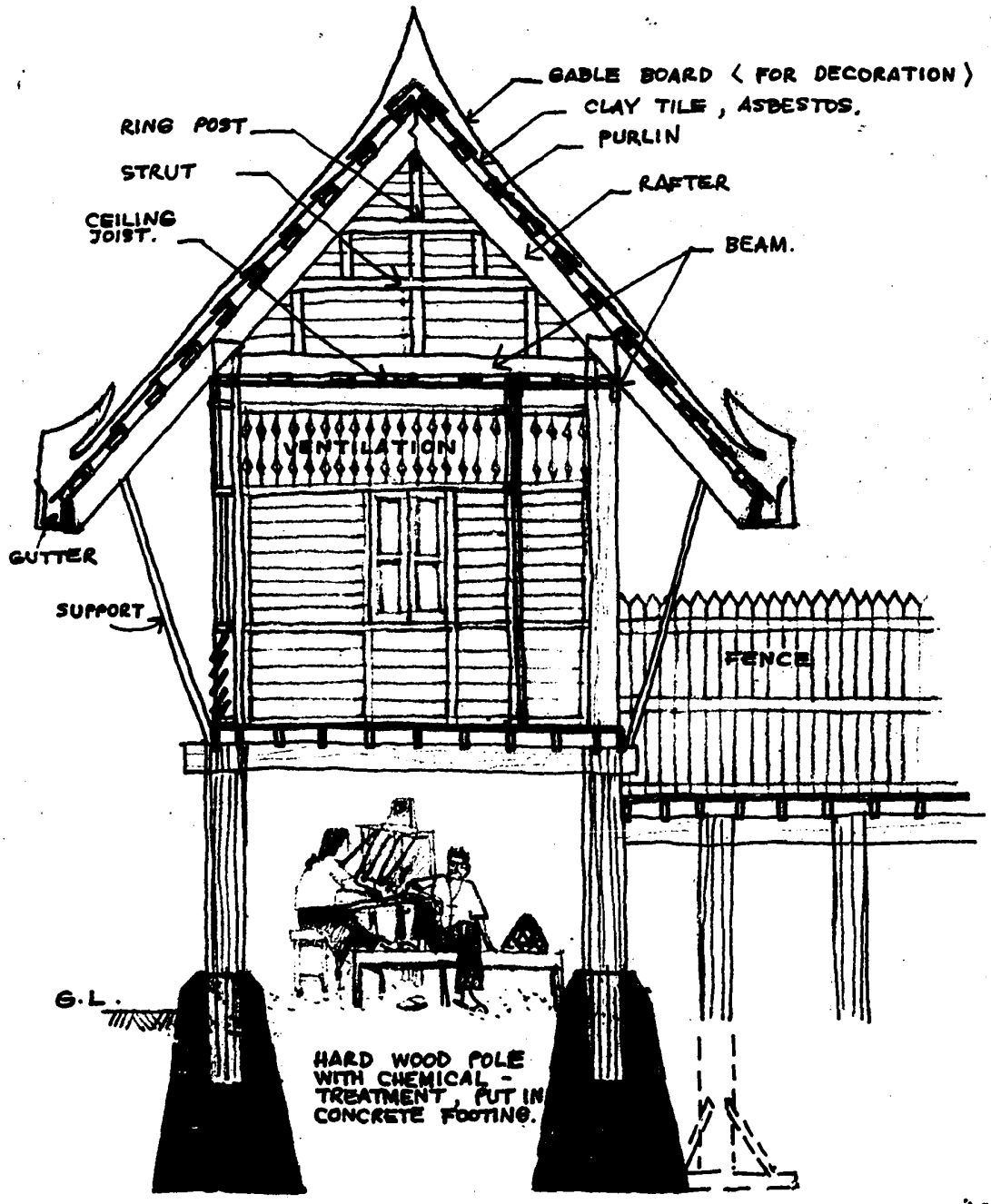
(b) Hardwood is Component Structure

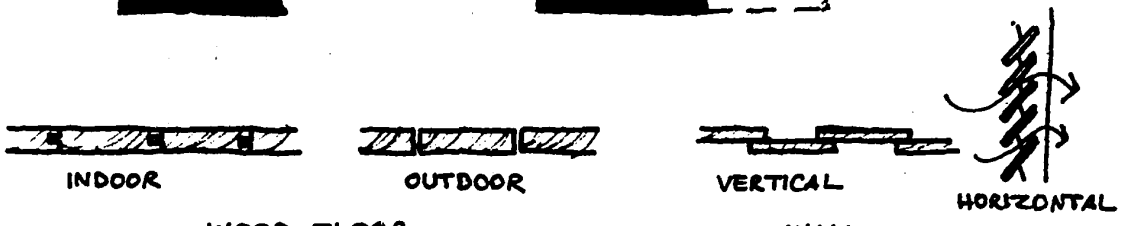
(c) Ornamentation of Structure



a) BAMBOO IS COMPONENT STRUCTURE

6.2 HILL TRIBE'S, FARM'S HOUSE (IN REMOTE AREA).





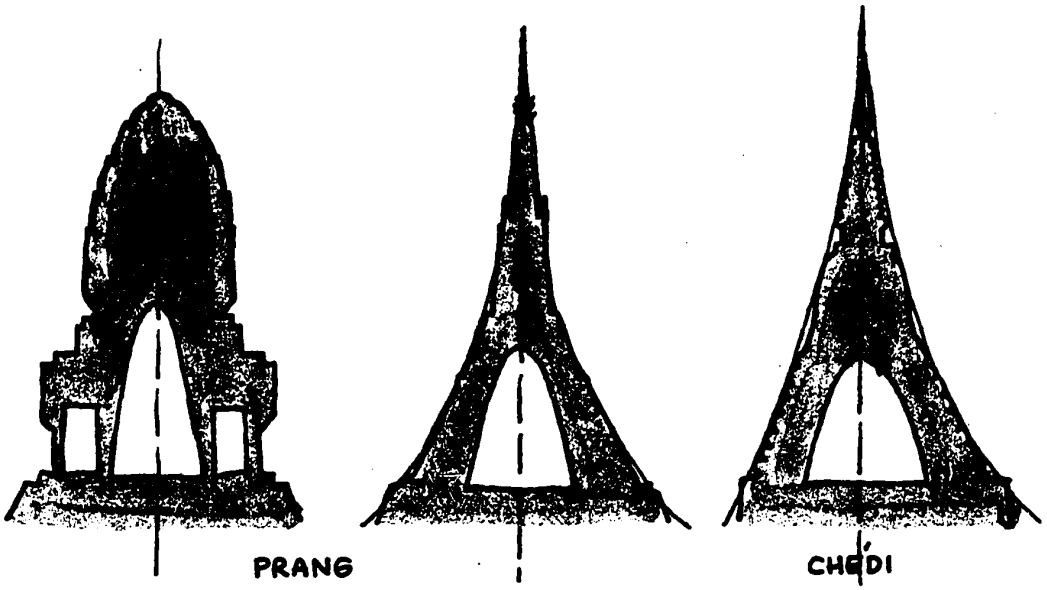
WOOD FLOOR WALL

b) HARDWOOD IS COMPONENT STRUCTURE.

6.3 TRADITIONAL HOUSE

c) ORNAMENTATION OF STRUCTURE

1. .SOLID CONSTRUCTION TYPE

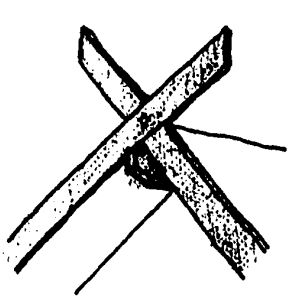


6.4. THE ORIGINAL FORM OF SOLID CONSTRUCTION

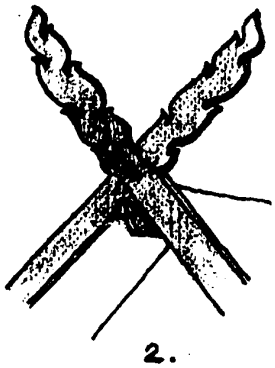
2 TRADITIONAL DECORATION

6.5. ROOF'S DECORATION.

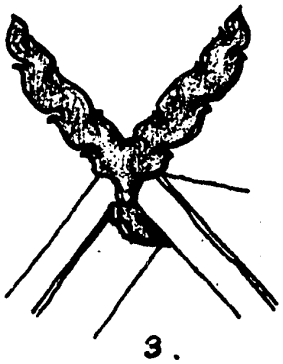
NORTHERN STYLE.



1.

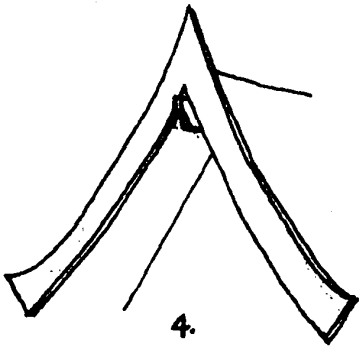


2.

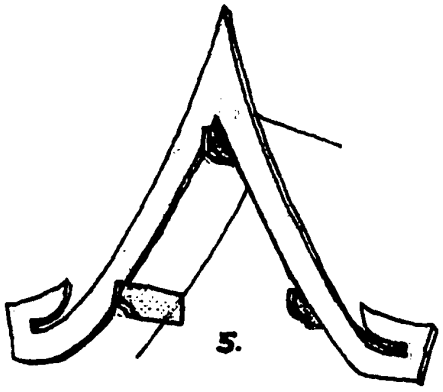


3.

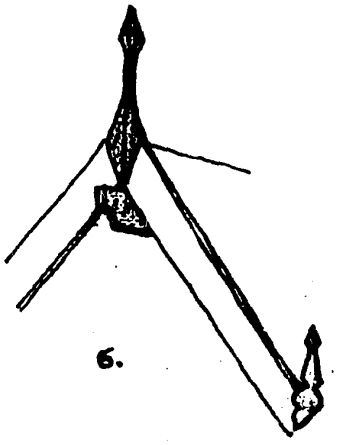
GENERAL STYLE.



4.

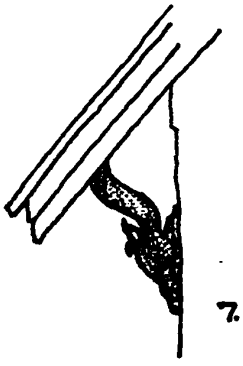


5.

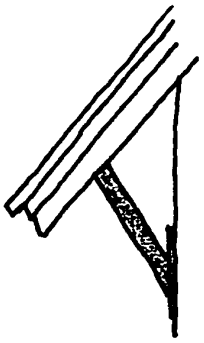


6.

ROOF'S SUPPORTER.

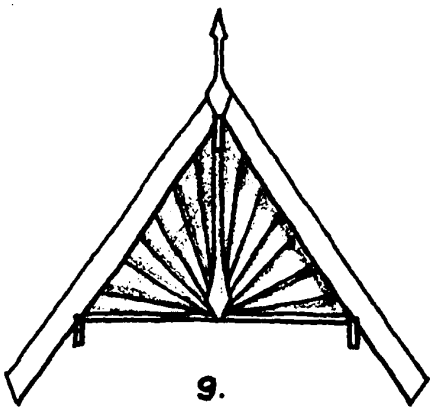


7.



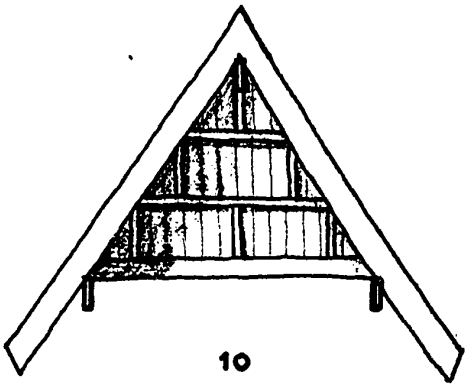
8.

THESE ORNAMENTS STILL REMAIN IN THE VILLAGES AND THE OTHER PARTS OF TOWN AS THEY HAVE BEEN IN THE PAST, ESPECIALLY ILLUSTRATION 3., 6., 8. AND IT IS THE FUNCTIONAL PURPOSE, AND OFTEN THE NECESSARY OBJECTS OF THEIR DAILY LIFES.



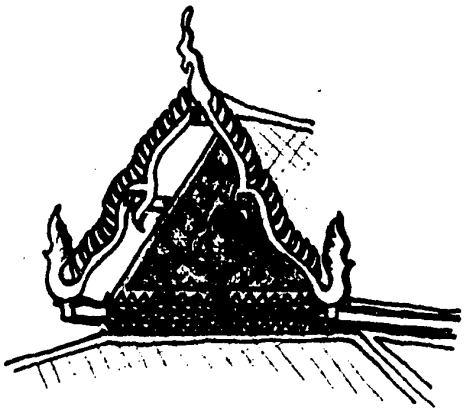
9.

ONE TYPE OF PEDIMENT IMITATED PALM'S LEAVES

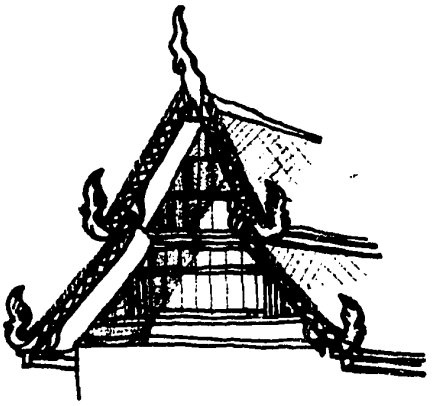


10

ROOF STRUCTURE USED AS DECORATION.



11.



12.

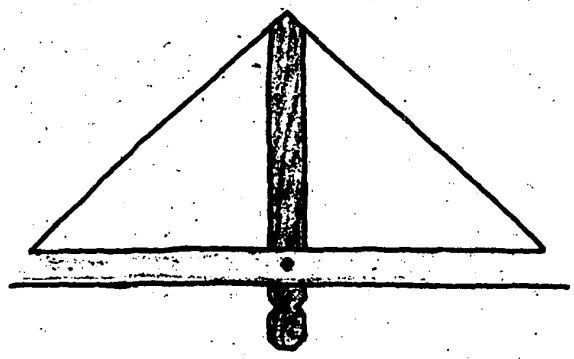
THE GILT ROOF GABLES ARE GRACEFULLY CARVED TO RESEMBLE "NAGAS", CELESTIAL SERPENTS, DEMI-GODS OF RAIN. ACCORDING TO THAI MYTHOLOGY, EACH YEAR'S RAINFALL DEPENDS UPON THE NUMBER OF NAGAS WHO ARE - RESPONSIBLE FOR IT.

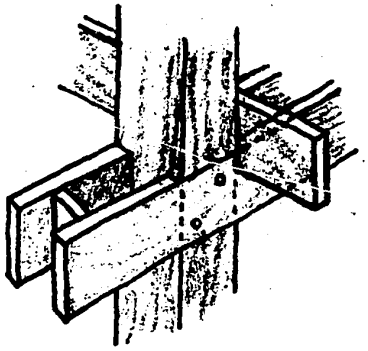
6.6. STRUCTURES AS ORNAMENT.

CANTILIVERED OR EXTENDED BEAM, PURLIN, RIDGE, POLE, ETC.

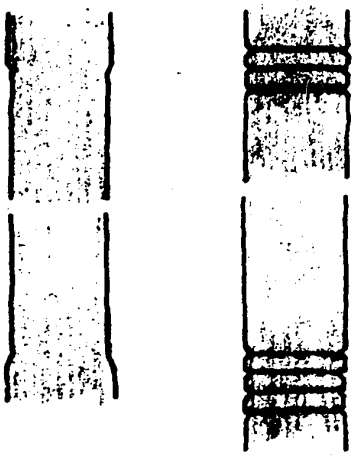
STRUT.

JOINT

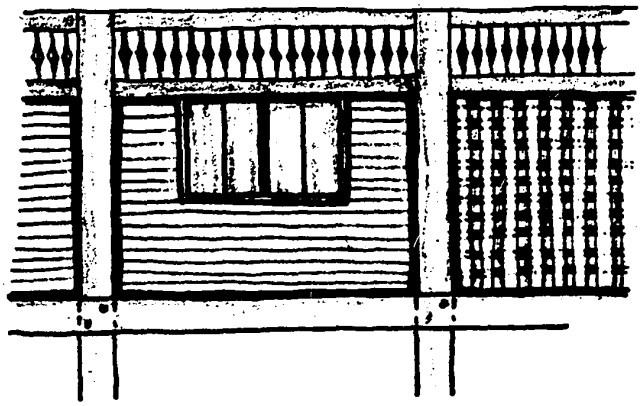




COLUMN



ACCENTUATION



III DETAILS OF CONTEMPORARY BUILDING FABRIC:

(a) Wall and Opening

Wall 1) Light Materials

2) Solid Materials

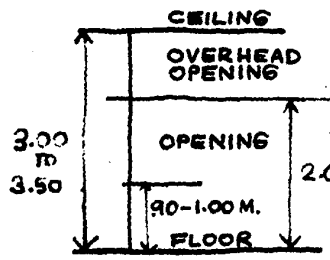
3) Wall Surfacing and Wall Appearance

Opening

1) Dwelling Building

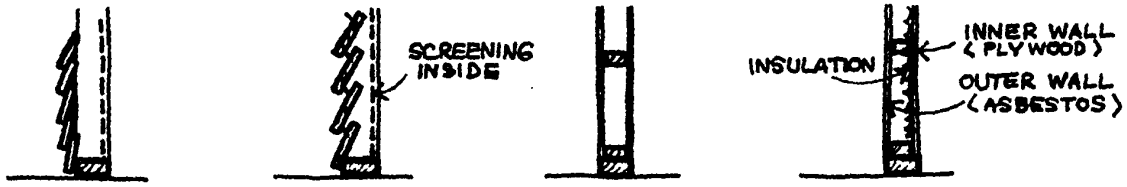
2) General Building

6.7 WALL.



- WALL HEIGHT IN GENERAL, IS 2.00—2.10 M., AND IT IS NOT BUILT UP TO CEILING UNLESS TO SEPARATE ROOM.
- OVERHEAD OPENING IS NECESSARY FOR CROSS VENTILATION, AND IT IS MOSTLY BUILT BY GLASS — LOUVRES.

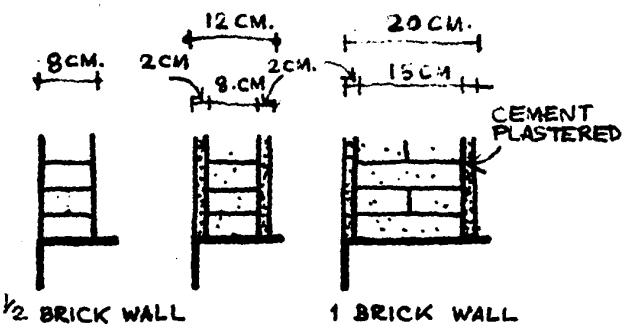
1. LIGHT MATERIALS.



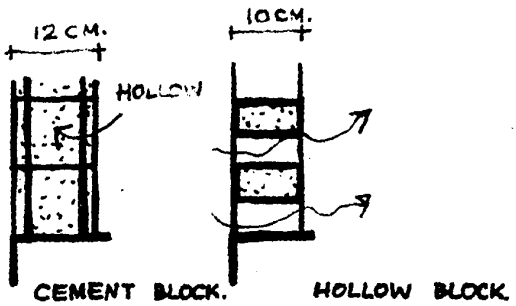
CLADDING LOUVRES DOUBLE WALL

- CLADDING AND LOUVRES WALLS ARE MOSTLY BUILT OF WOOD, AND IN SOME BUILDINGS LOUVRED WALL ARE BUILT OF ASBESTOS OR ALLUMINUM.
- DOUBLE WALLS CAN BE EITHER BOTH ASBESTOS CEMENT SHEET OR BOTH PLYWOOD OR THE COMBINATION OF PLYWOOD AND ASBESTOS. IN SOME BUILDINGS REQUIRED INSULATION SHEET INSIDE THE SPACE OF INNER AND OUTER WALLS FOR ACHIEVING AIR-CONDITIONING.

2. SOLID MATERIALS.



½ BRICK WALL 1 BRICK WALL
(LOCAL BRICK)

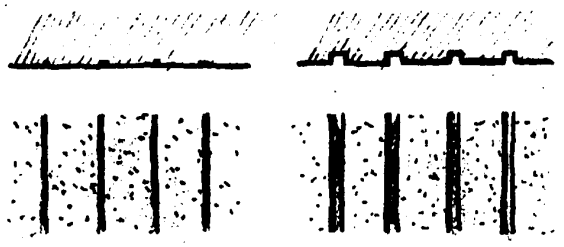


CEMENT BLOCK. HOLLOW BLOCK
(MACHINE MADE).

- ½ BRICK WALL WITH CEMENT PLASTERED IS POPULAR, AND DOUBLE ½ BRICK-WALL OR ONE BRICK WALL ARE USED ON EAST AND WEST SIDE.
- CEMENT BLOCK IS USED IN MODERN LARGE BUILDINGS, HOLLOW FOR ECOUSTICAL FACTOR AND ELECTRICAL SERVICE CONDUITS.
- HOLLOW BLOCK IS USED FOR DECORATED PARTITION AND THE CROSS VENTILATION PURPOSE, IN SOME BUILDING HOLLOW WALL IS PROVIDED IN THE WALL BETWEEN GROUND LEVEL AND FIRST LIVING FLOOR LEVEL SO THAT AIR CAN-CIRCULATE THROUGH THE CRAWL SPACE AND KEEP IT DRY.

6.8. WALL SURFACING

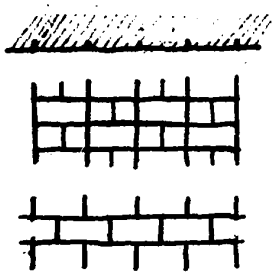
1. CARVING BOARD.



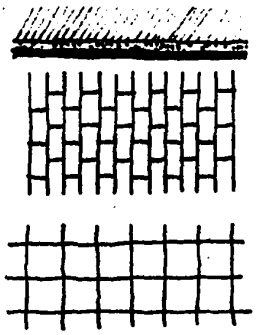
WOOD PANELLING IN VARIOUS PATTERNS.

TIN CORRUGATED SHEET.

2. FINISHING MATERIALS.



SHOWING BRICK LAYER LINE.



CLAY, CERAMICS, MOSAIC, ETC.

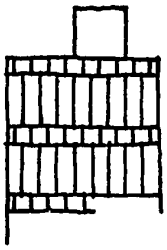
STONE CUT.

GRAVEL.

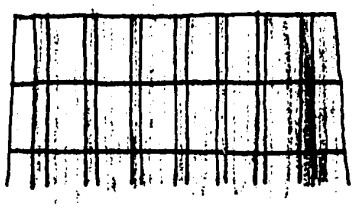
- FINISHING MATERIALS ARE USUALLY SURFACED ON BRICK WALLS WITH REQUIRE HIGH SKILL LABOURING.

6.9 . THE APPEARANCES OF WALL SURFACING.

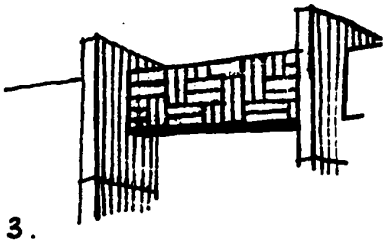
1.



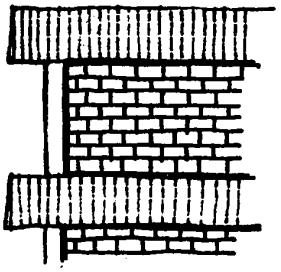
2.



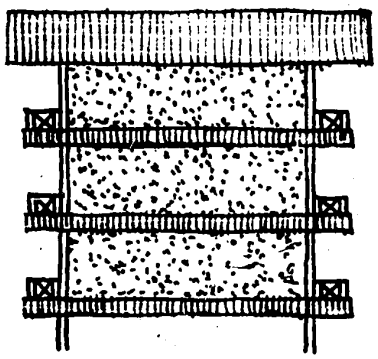
1. DRAWING LINE ON FINISHED BRICK WALL
2. DRAWING LINE ON ROUGH CONCRETE.
3. CARVING BOARD ON EACH COMPONENT STRUCTURE.
4. CARVING BOARD ON BEAM CONTRASTED WITH LAYERED BRICK WALL.
5. CARVING BOARD ON BEAM AND PARAPET WALL WITH GRAVEL OR SANDSTONE SURFACING.



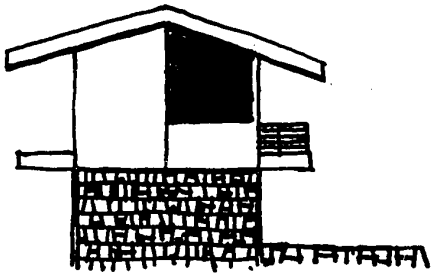
3.



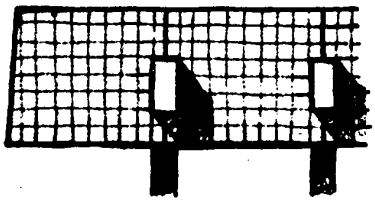
4.



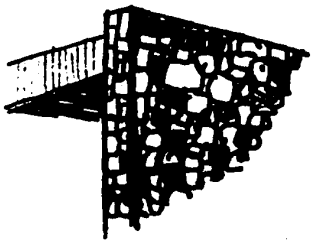
5.



6. FINISHED BRICK WALL ON UPPER WALL, AND STONE CUT ON GROUND FLOOR.



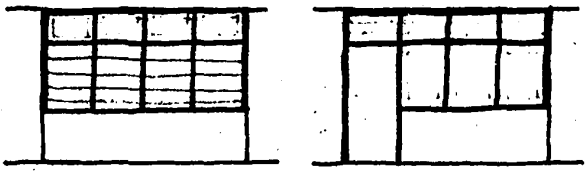
7. CLAY, MOSAIC OR CERAMIC TILES SURFACING ON R.C. SUN-SHADE, AND ALLOWING EXTENDED BEAM FOR DECORATION.



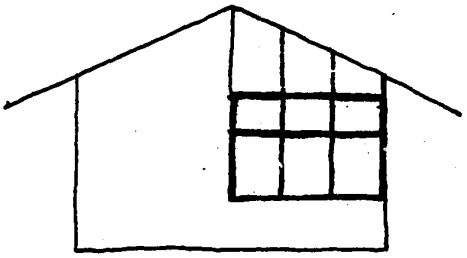
8. STONE LAYERED SIDE-WALL

6.10. OPENING.

1. DWELLING BUILDING

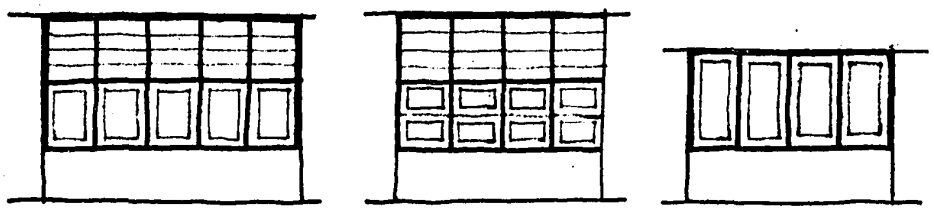


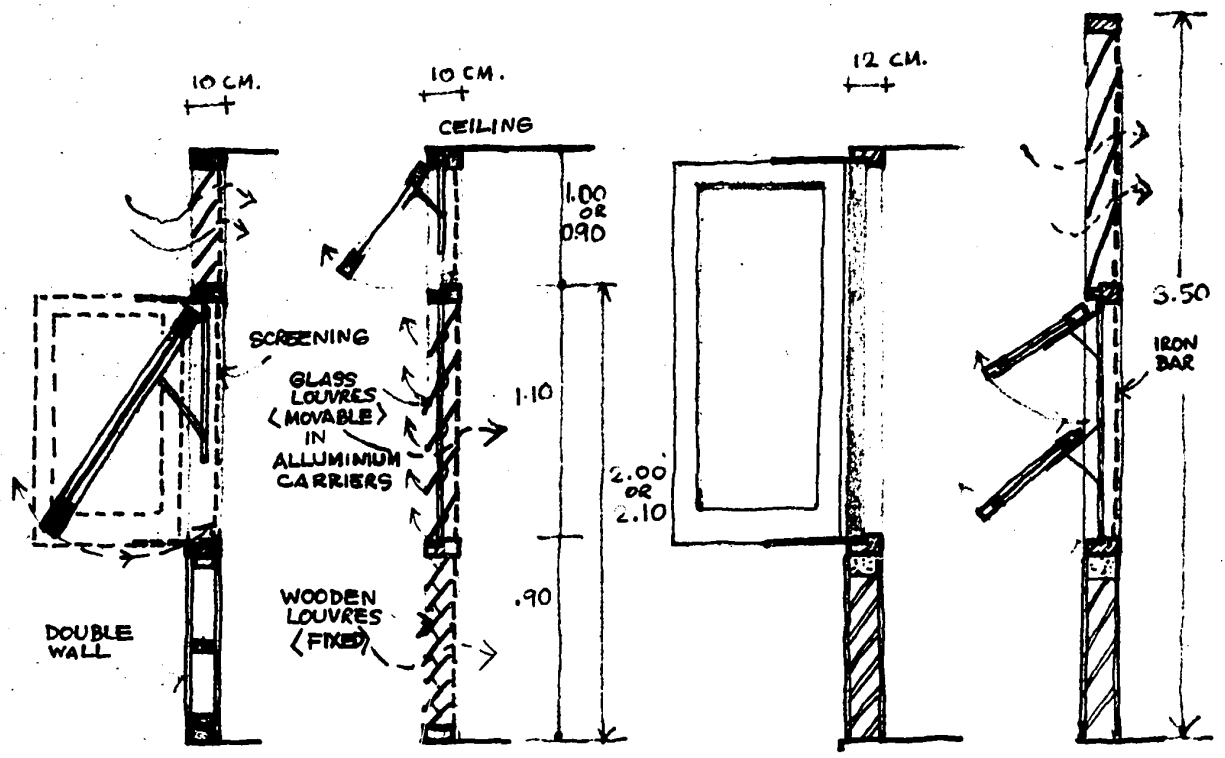
NORTH AND SOUTH DIRECTION.



WEST AND EAST DIRECTION.

2. GENERAL BUILDING.





A. B.

III DETAILS OF CONTEMPORARY BUILDING FABRIC

(b) Roof

1) Timber

2) Timber and Reinforced Concrete

3) Steel: 3.1 Truss with Asbestos Roof.

3.2 Truss with R.C.Slab

3.3 Space Frames

4) Reinforced Concrete

4.1 Simple Skeleton

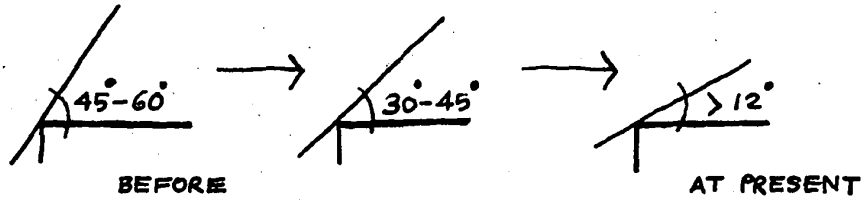
4.2 Plates

4.3 Fold Plates

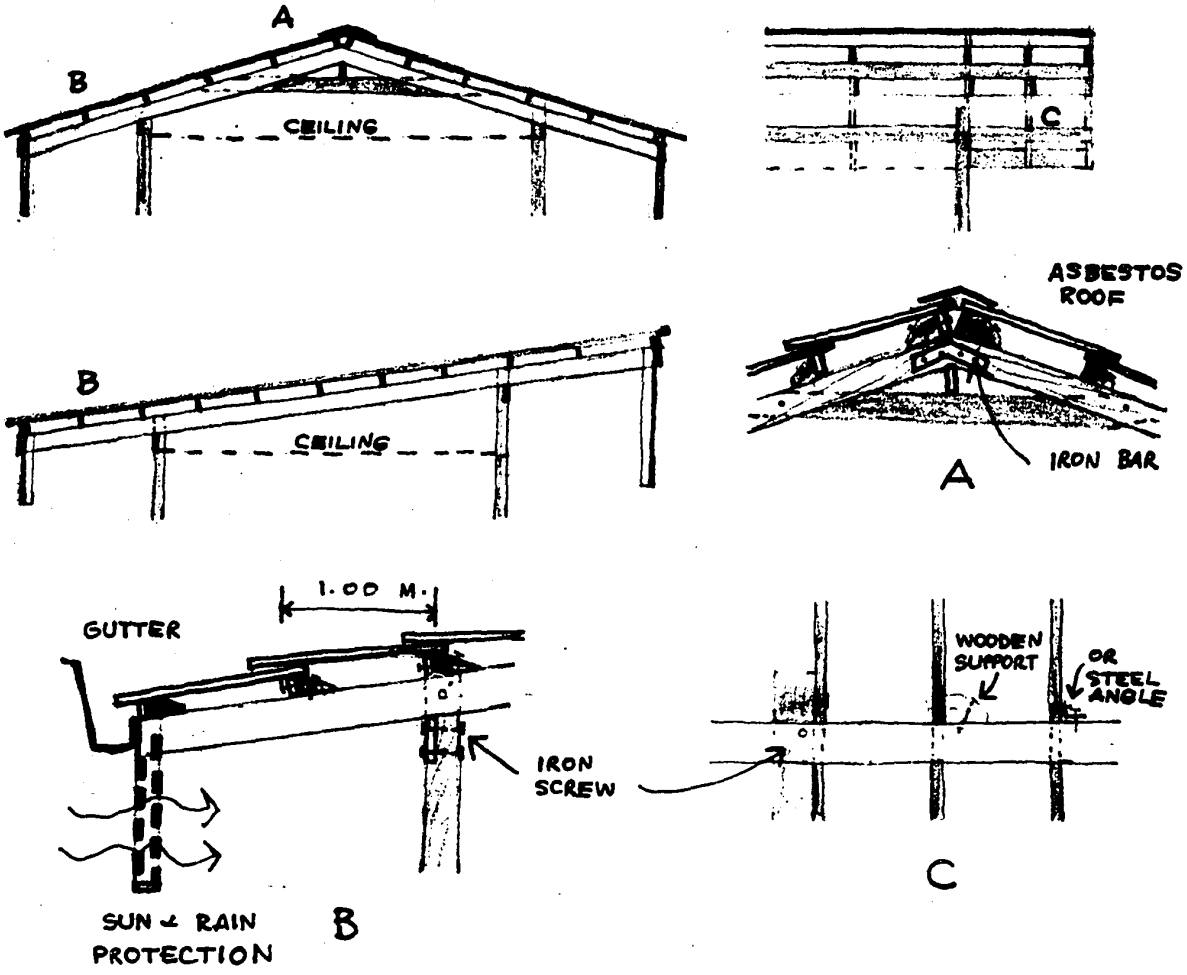
4.4 Thin Shell

6.11. ROOFING TECHNIQUES.

EVOLUTION OF ROOF ANGLE



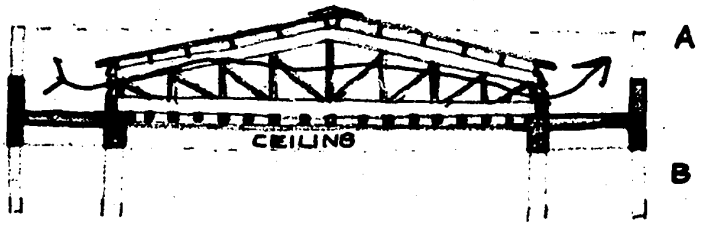
1. TIMBER.

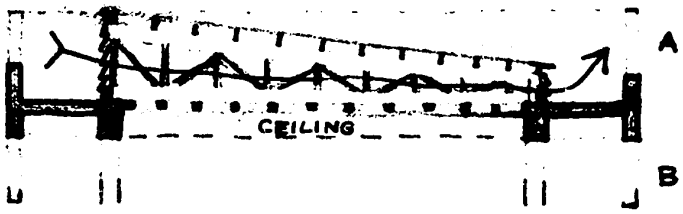


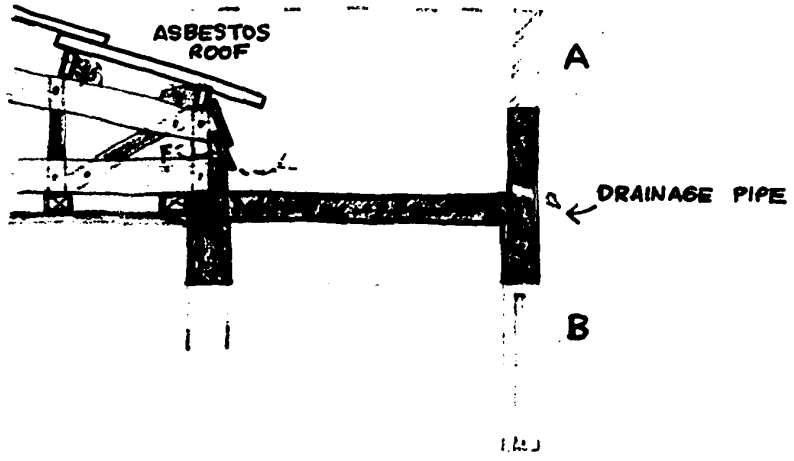
⟨ THESE TYPES ARE USED IN DOMESTIC BUILDING. ⟩

- ROOFS UNDER 10° PITCH ARE USUALLY CONSIDERED FLAT.

2. TIMBER & REINFORCED CONCRETE.







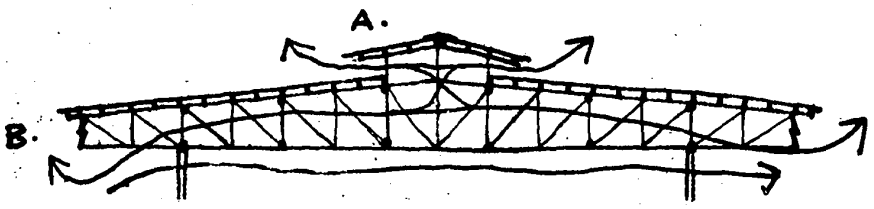
A. PARAPET WALL , MAY BE R.C. OR BRICK WALL

B. SUN AND RAIN PROTECTION , MAY BE CONSTRUCTED BY R.C., WOOD, ASBESTOS , OR ALLUMINUM GRILL.

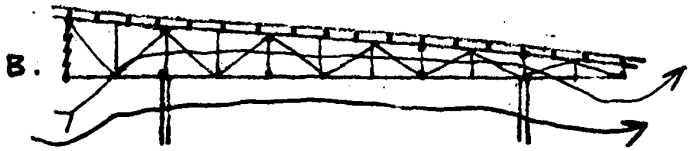
⟨ THESE TYPES ARE GENERALLY USED. AND AT PRESENT THE STEEL TRUSS - IS GRADUALLY REPLACED BY WOODEN TRUSS. BECAUSE OF ITS LONG ENDURING. ⟩

3. STEEL.

3.1 TRUSS WITH ASBESTOS ROOF

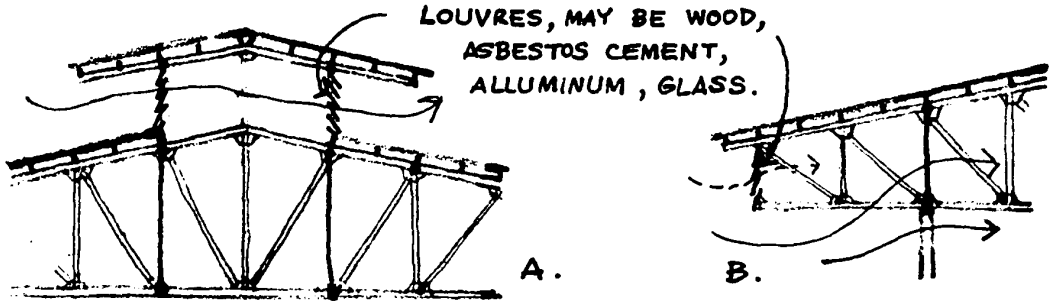


LONG SPAN , OVER 15.00 M.



MEDIUM SPAN , 8.00 - 15.00 M.

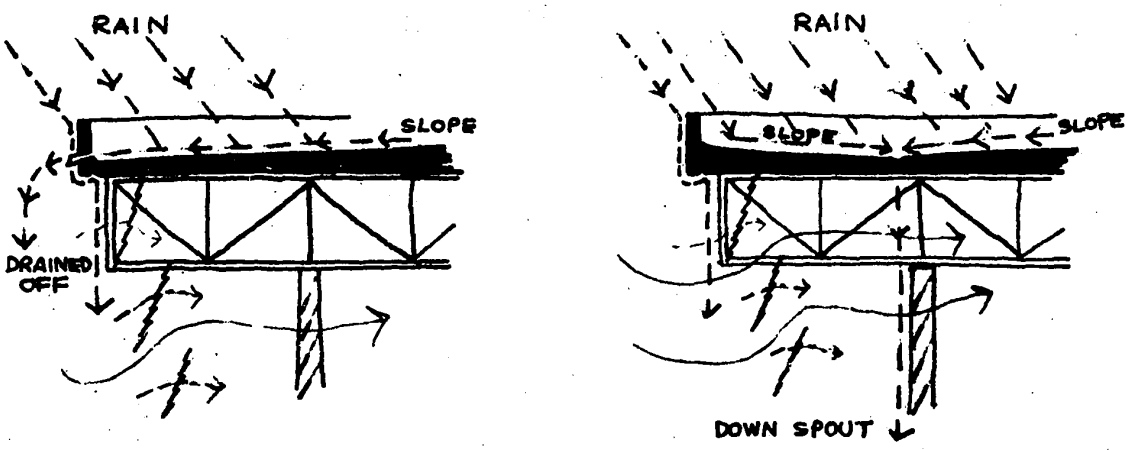
SHORT SPAN , 3.00 - 8.00 M.



A. DOUBLE LAYERED ROOF TO FACILITATE VENTILATION, AND HEAT DISSIPATION IN LARGE BUILDING

B. WIDE OVERHANG ROOF ON EACH SIDES ARE ESSENTIAL TO EXCLUDE - RADIATION AND MONSOON RAIN.

3.2 TRUSS WITH R.C. SLAB.

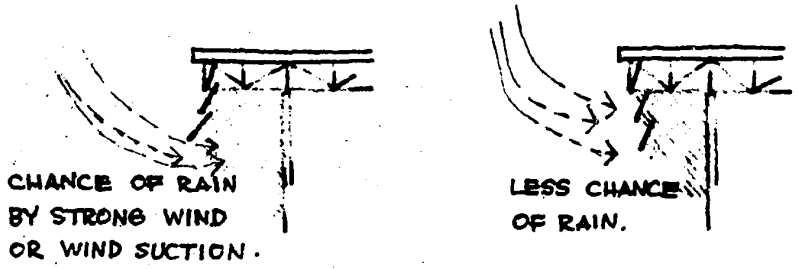


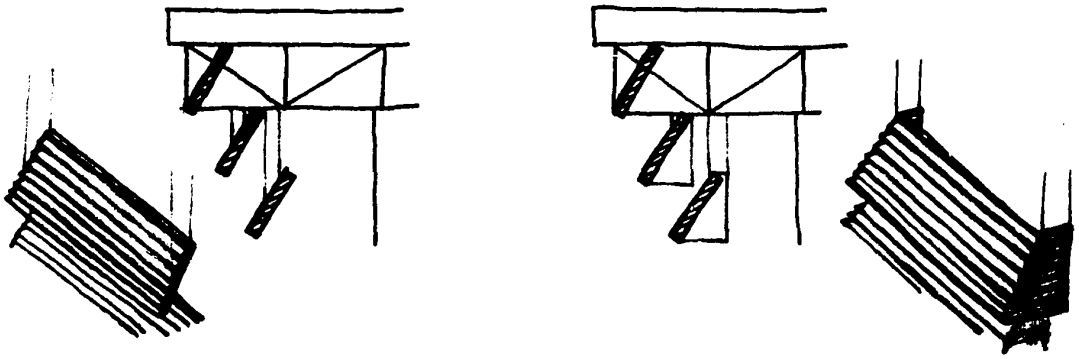
— THIS TYPE WOULD RATHER BE SELECTED IN MANY BUILDINGS AT PRESENT FOR LIGHT WEIGHT STRUCTURE AND ECONOMICAL REASON, CONSIDERABLY, TO THE TRADITIONAL STYLE ; POST AND LINTEL.

THE CANTILIVERED ROOF ON EACH SIDE IS VERY ECONOMICAL. ALTHOUGH IT PROVIDES ADEQUATE SHADING FOR WALLS AND OPENINGS, IT STILL NEEDS MORE SUN AND RAIN PROTECTION MATERIALS (THEREFORE FEW LEVELS ARE PROVIDED, DEPENDED ON ITS HEIGHT AND THE REQUIREMENT OF BUILDING) SO THAT THEY CAN ACHIEVE VERY GOOD RESULT IN CLIMATE FACTOR.

THE PROTECTION MATERIAL SHOULD BE LOUVRES FOR ALLOWING AIR FLOW THROUGH IT SUCH AS ALLUMINUM, WOODEN OR ASBESTOS LOUVRES DEPEND ON REQUIREMENT OF SURROUNDING, AND FINANCIAL FACTORS (IN URBAN AREA - ALLUMINUM LOUVRES ARE APPROPRIATE MATERIAL, PARTICULARLY FOR FIRE PROOF, GOOD QUALITY, LIGHT WEIGHT AND LONG ENDURING).

THE INCLINATION OF PROTECTION MATERIAL IS CONSIDERABLY GOOD FOR AIR TRAPPED INTO THE BUILDING. THE REASON FOR LAYERED INWARD INSTEAD OF OUTWARD FROM THE CANTILIVERED ROOF BECAUSE IT DECREASES THE STRONG WIND THROUGH THE BUILDING BY BREAKING THE FORCE OF WIND, AND IT CAN AVOID THE HEAT BY SUNLIGHT ON ITS SURFACE. AND APART FROM THESE IT - PROVIDES SIMPLE CONSTRUCTION, AND THERE IS THE LESS CHANCE OF RAIN - FALLING INTO THE BUILDING BY STRONG WIND.



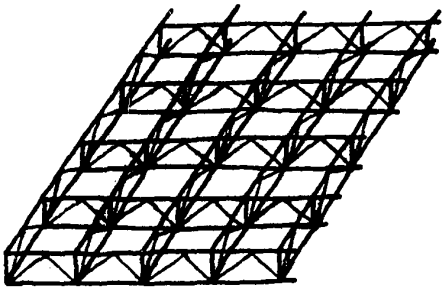


– ALL THE PROTECTION MATERIALS CAN BE HANGED FROM THE STEEL ROOF TRUSS , WHICH WE ARE ABLE TO DESIGN IN SEVERAL SHAPES.

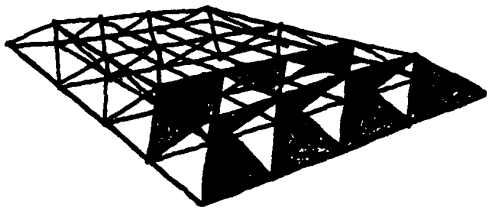
– AND WITH THE ESTHETIC SENSE OF DECORATION : THE STEEL ROOF – TRUSS.. MAY BE ARRANGED TO CANTILIVER OVER THE PROTECTION MATERIALS FROM EACH COLUMN , AND THEN WRAPPED IT UP, FOR MAKING MORE SHADOW ON THE PROTECTION PANEL SURFACE AND TO AVOID GETTING RUSTED BY HUMID AIR AND RAIN. THESE CANTILIVERED BEAMS ARE USED AS THE MONOTONEOUS BREAKING PATTERN OF THE PROTECTION MATERIALS IN THE LONG HORIZONTAL LINE.

THIS METHOD IS TO PRESERVE THE TRADITIONAL MOTIF PATTERN OUTSIDE OF THE BUILDING BY PROVIDING INCLINED OUTSIDE LINES OF THE BUILDING.

3.3 SPACE FRAMES.



A. RECTANGULAR SPACE FRAME.

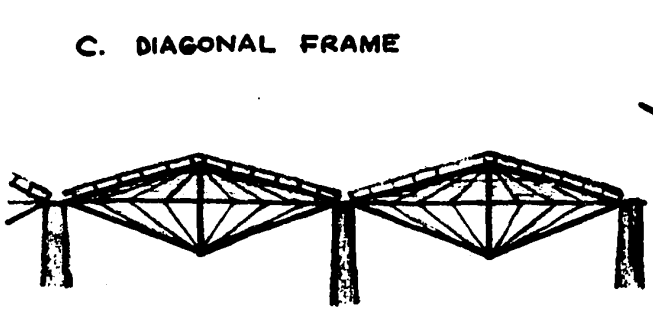


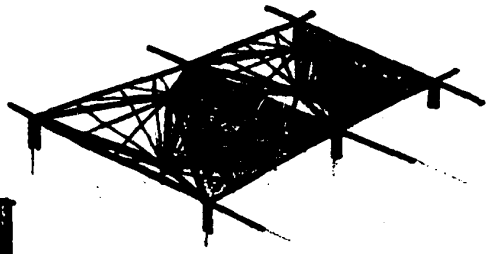
B. TRIANGULATED SPACE FRAME.

RECTANGULAR SPACE FRAME IS THE MOST POPULAR TYPE IN - - CONSTRUCTION AT PRESENT, IT OFFERS AN ECONOMIC SOLUTION TO ROOFING OF LARGE RECTANGULAR AREA IN WHICH IT IS ALSO SUITED TO THE BASIC SHAPE USED TO CREATED THEM.

TRIANGULATED SPACE FRAME : THIS TYPE IS NOT POPULARLY USED BECAUSE THE CONSTRUCTION IS MORE COMPLICATED THAN THE OTHERS.

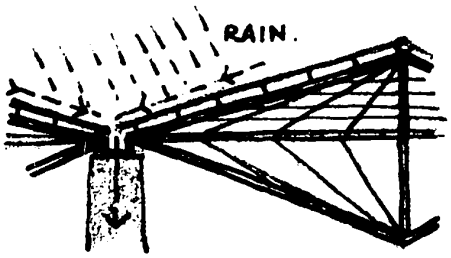
C. DIAGONAL FRAME





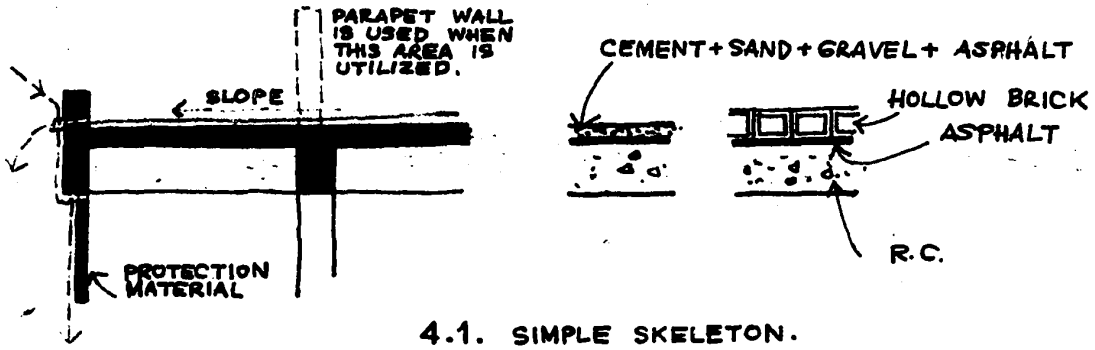
DIAGONAL FRAME, PYRAMID TYPE

THIS TYPE IS INDIVIDUAL UNIT, AND COMBINE TOGETHER IN ONE LARGE COMPLEX. IT IS THE FLEXIBLE - ARRANGEMENT, USED IN MODERN - SCHOOL BUILDING AND SOME - EXHIBITION BUILDINGS.



DOWN SPOUT IN R.C. COLUMN.

4. REINFORCED CONCRETE

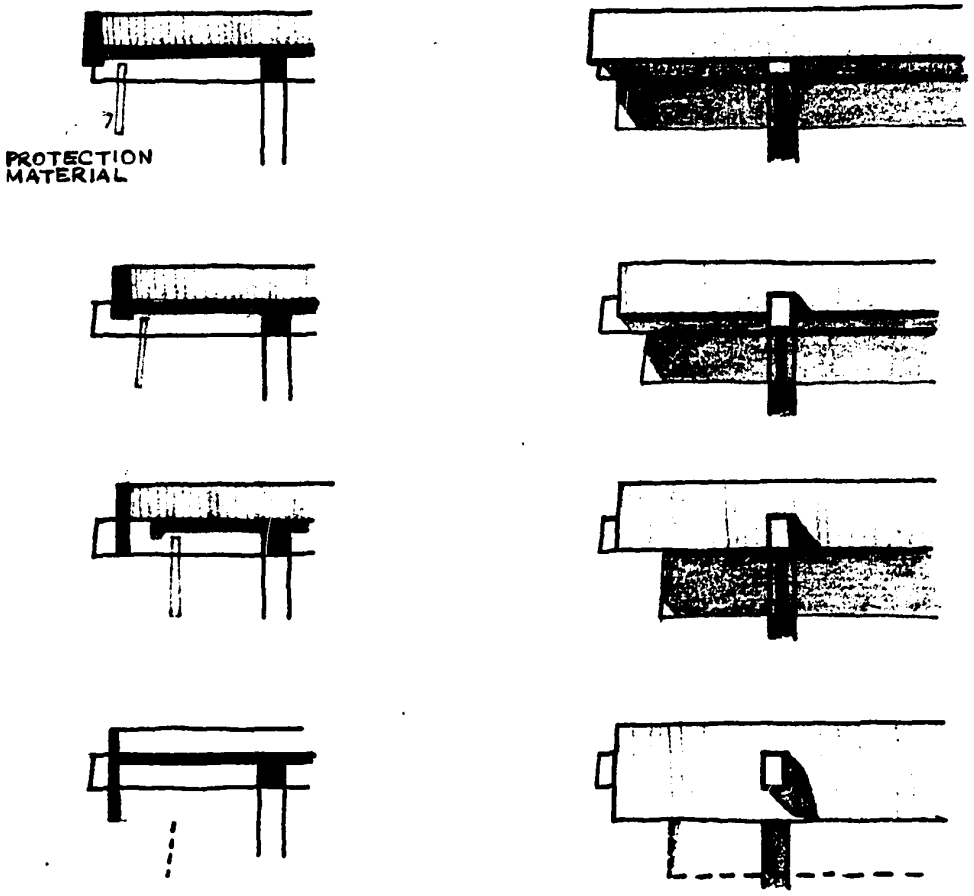


4.1. SIMPLE SKELETON.

— R.C. SLABS ARE FOUND IN PUBLIC BUILDING SUCH AS OFFICE, HOUSING, AND COMMERCIAL BUILDINGS. AND VERY OFTEN THIS AREA IS USED AS LAUNDRY AREA. (WASHING AND DRYING)

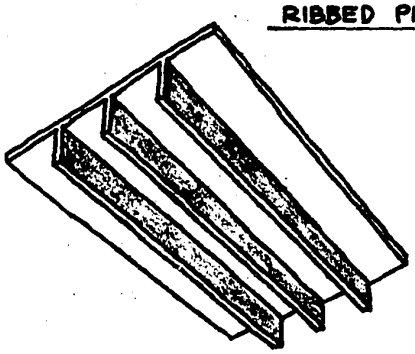
FROM THESE BASIC ELEMENTS THERE ARE MANY POSSIBLE WAYS TO DECORATE ROOF REGARDING TO ORNAMENTING THE STRUCTURE, AND USED THE BUILDING FRAMEWORK AS ORNAMENT.

SECTION. ELEVATION.

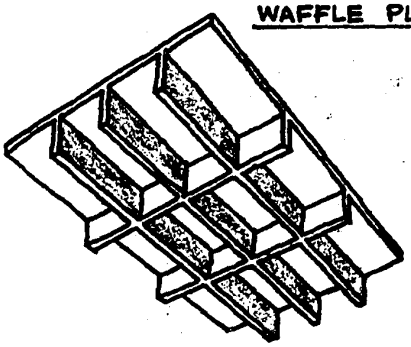


4.2. PLATES.*

RIBBED PLATE

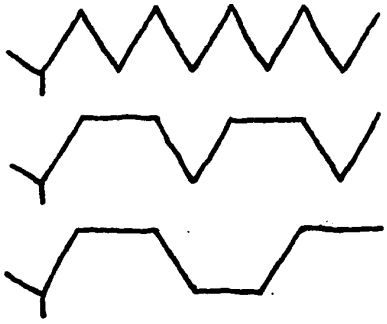


WAFFLE PLATE

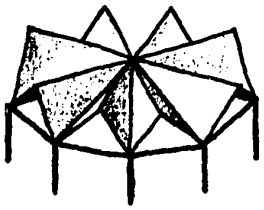


THESE TYPES ARE USED IN PREFABLICATION BUILDINGS.

4.3. FOLDED-PLATES*



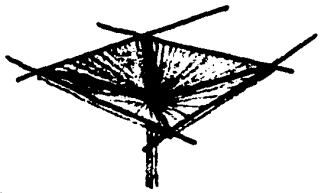
FOLDED-PLATE CROSS SECTIONS.



POLYGONAL FOLDED PLATES.
〈 NEW INDOOR STADIUM, BANGKOK 〉

4.4. THIN SHELL.*

〈 BUS, AIR-TERMINAL, BANK OF THAILAND, SERVICE STATION. 〉



〈 EXHIBITION BULLDING RESTUARANT, AIR-TERMINAL 〉

〈 BOXING STADIUM 〉

〈 THESE ARE HARDLY FOUND IN CONSTRUCTION BECAUSE THEY ARE STILL SO EXPENSIVE COMPARE TO THE SIMPLE SKELETON FRAME. 〉

* SOURCE : SALVADORI AND HELLER, "STRUCTURE IN ARCHITECTURE."

III DETAILS OF CONTEMPORARY BUILDING FABRIC

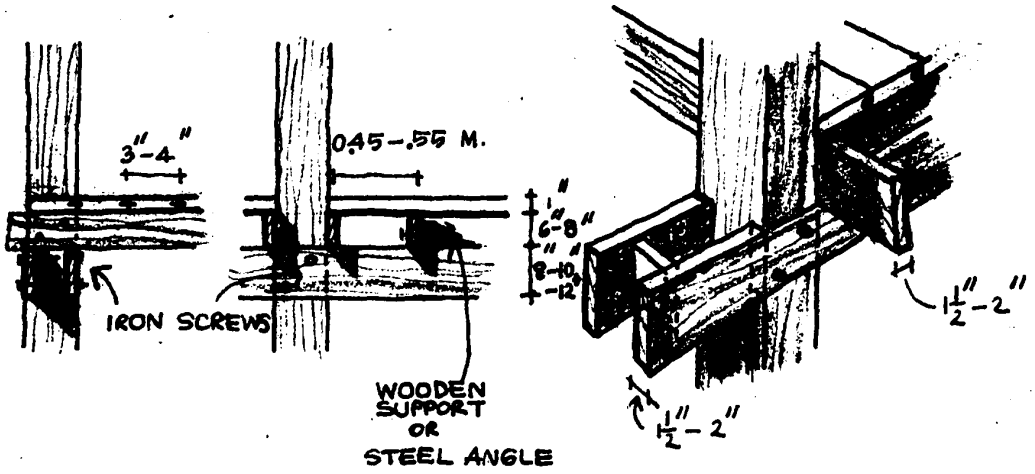
(c) Floor

1) Timber

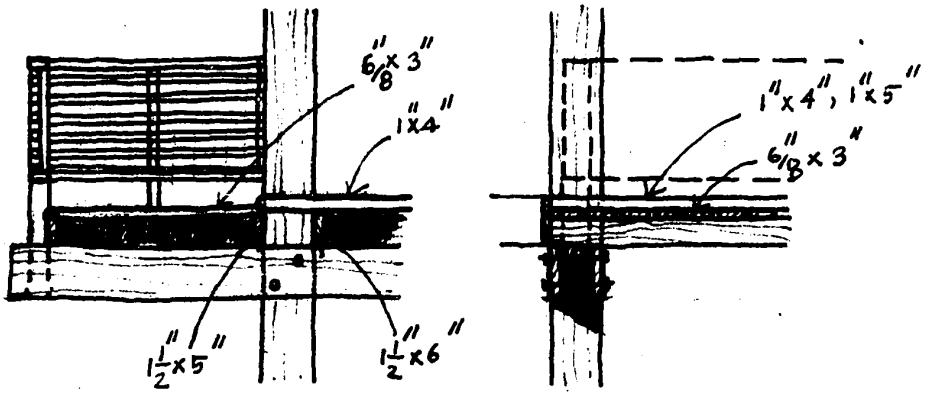
2) Reinforced Concrete

6.12 FLOORING TECHNIQUES;

1. TIMBER.

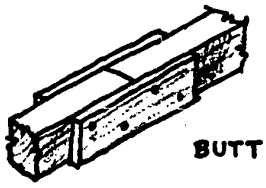


- THESE CANTILIVERED BEAM AND PURLIN ARE MADE FOR AESTHETICS PURPOSE.

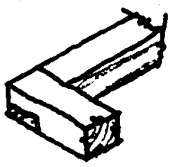


- THE CANTILIVERED BEAM ARE USED AS BALCONY AND SUN SHADE-PANEL, AND YET STILL EXPOSED TO ACCENTUATE MAIN STRUCTURE AND TRIM IT INTO ORNAMENT. IT MAY CONVEY A FEELING WITHIN THE DWELLING OF LESS HARDNESS OR STARKNESS.

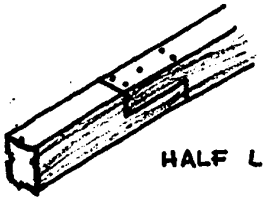
6.13 CARPENTRY JOINTS.



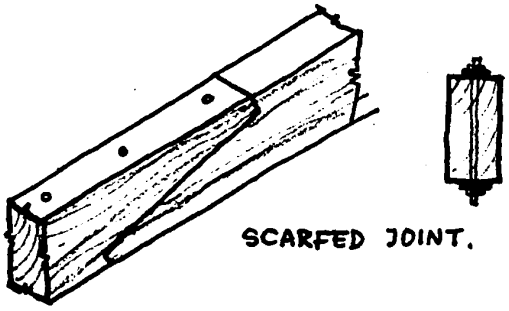
BUTT JOINT.



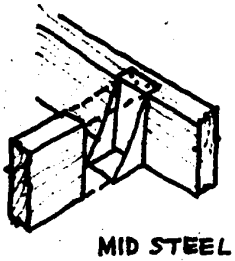
HALF LAP ANGLE JOINT.



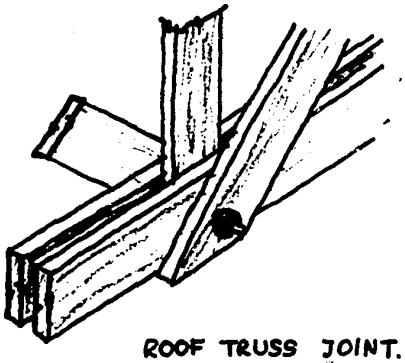
HALF LAP JOINT.



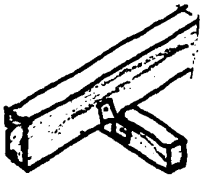
SCARFED JOINT.



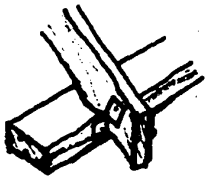
MID STEEL JOIST HANGER.



ROOF TRUSS JOINT.



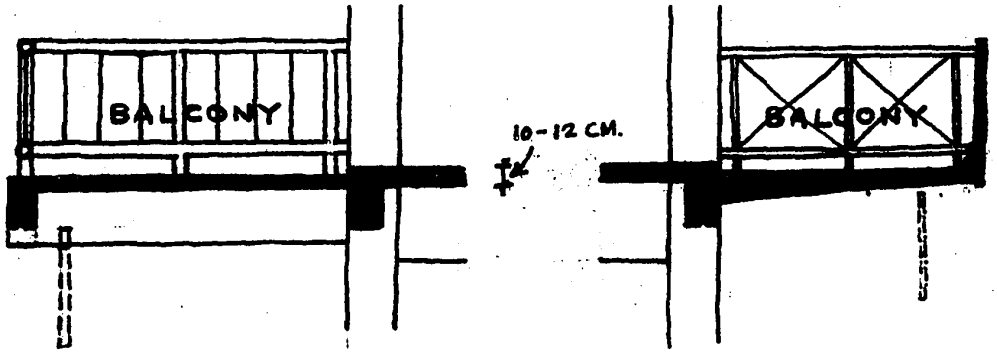
MAF- DUAL CEILING JOIST
- AND BEARER.



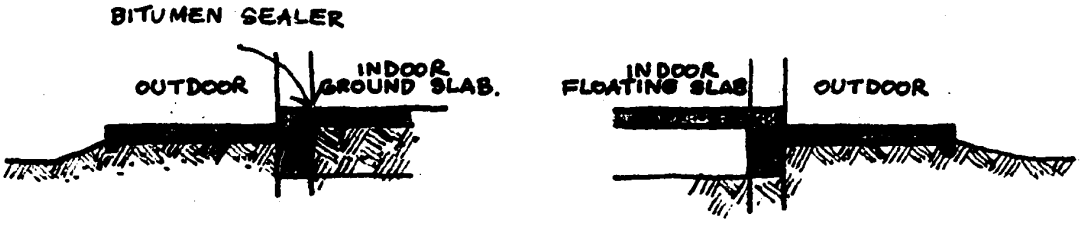
MAF - DUAL ROOF RAFTER -
- AND WALL PLATE.

2. REINFORCED CONCRETE. FLOOR.

2.1. UPPER FLOOR.



2.2. GROUND FLOOR.



FINISHED FLOOR : CERAMICS, MOSAIC, CLAY, TERRAZO, RUBBER TILE, AND WOODEN MOSAIC.

R.C. SLAB.

- THE LEVEL OF OUTDOOR IS USUALLY SETTING LOWER THAN INDOOR - BETWEEN 5 TO 10 CM. FOR PREVENTING FLOODING, AND THAI PEOPLE WOULD RATHER DISTINQUISH SPACES BETWEEN INDOOR AND OUTDOOR.

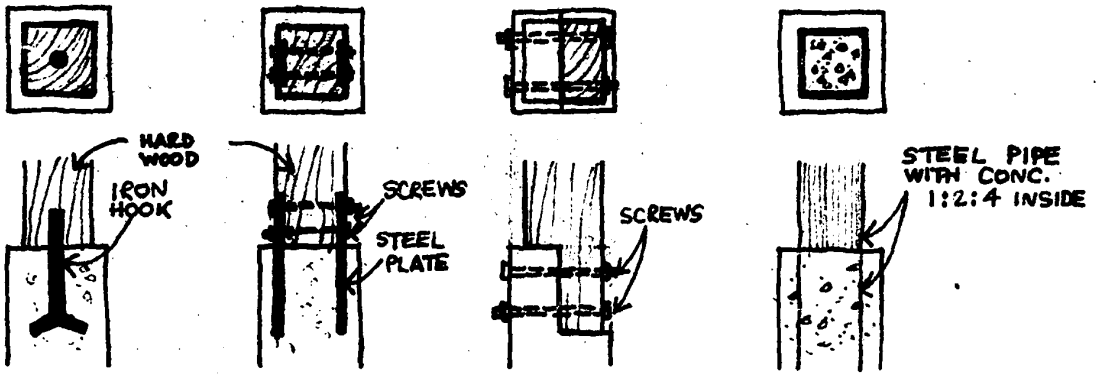
- FLOATING SLAB ON GROUND FLOOR IS USED IN THE GROUND EROSION - AREA, AND ON THE CONDITION OF ACHIEVING AIR-MOVEMENT AND - PREVENTING DAMPNESS ON GROUND LEVEL.

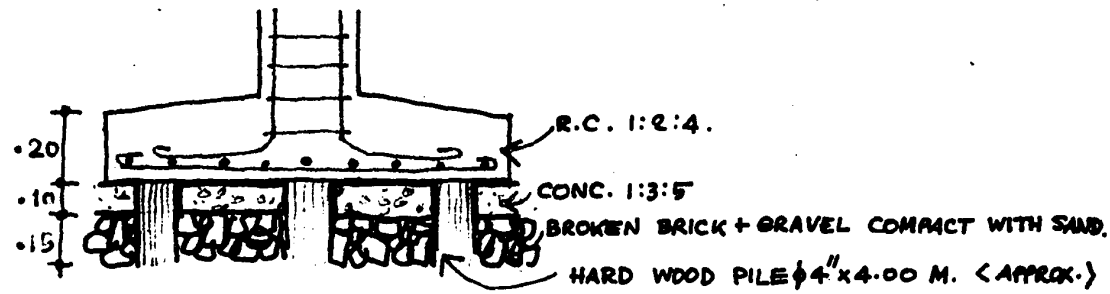
- FINISHED FLOORS SUCH AS TERRAZZO, CERAMICS, MOSAIC, RUBBER - TILE AND WOODEN MOSAIC ARE VERY POPULAR FOR INTERNAL WORK. CLAY TILE AND OTHER LOCAL MATERIALS ARE USED IN OUTDOOR AREA.

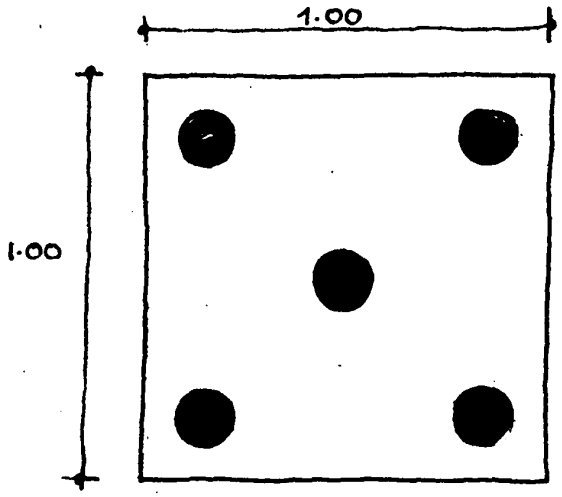
III DETAILS OF CONTEMPORARY BUILDING FABRIC

(d) Foundation

6.14. FOUNDATION.







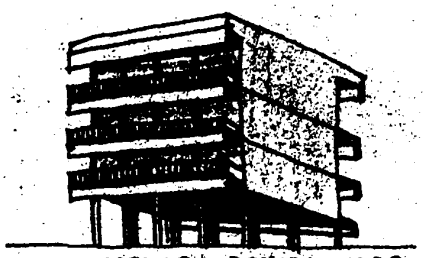
a)— IN DWELLING BUILDING HARD WOOD COLUMN IS APPROXIMATELY 6"x6" OR 8"x8", AND CONTINUE FROM R.C. COLUMN ABOVE GROUND LEVEL EITHER AT THE FIRST LIVING-FLOOR OR AT THE GROUND FLOOR.

R.C. FOOTING IS APPROXIMATELY $1.00\ M^2 - 1.30\ M^2$, AND IT IS USUALLY HAS FIVE PILES. IT IS GENERALLY USED IN THE CENTRAL PLAIN.

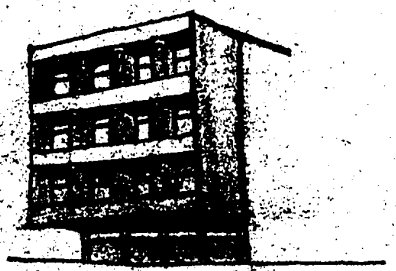
b)— IN MODERN LARGE BUILDINGS THE PRECAST CONCRETE PILES AND R.C. FOOTING ARE USED IN DIFFERENT SIZES DEPEND ON THE SOIL CONDITION.

FINISHES

Type of paint	Description	Traditional	Contemporary
(1) Water bound distemper	(1) cheap and easily applied (2) It needs frequent renewal	wall, fence, ceiling decorated roof	wall, fence, and ceiling
(2) Emulsion	(1) easily applied and requires no special skill (2) It forms a plastic skin which adheres well to cement rendering.	wall, fence, decorated roof	wall, ceiling
(3) Bitumen	(1) this type prevents from rusting (2) certain amount of skill is needed	fence, furniture	metal structure, eg. beam, column and furniture
(4) Oil base	(1) expensive and requires excellent skill	fence, furniture	fence, furniture, wall metal structure, ceiling
(5) Vanish	(1) protects against sunlight and pests (2) obtained at various prices (3) minimum amount of skill required	furniture	all internal furniture, and exterior.



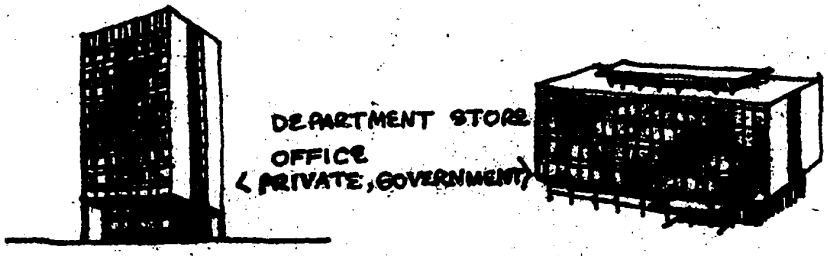
HOUSING, SCHOOL BLDG.
〈SKELETON CONSTRUCTION〉



COMMERCIAL BLDG., SHOP-HOUSES.
〈SURFACE ∝ SKELETON CONSTRUCTION〉

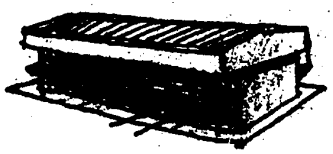
CONCRETE BUILDING.

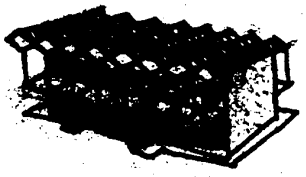
INDOOR STADIUM, BANGKOK
〈SURFACE CONSTRUCTION〉

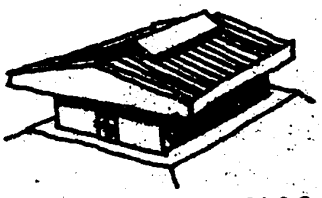


DEPARTMENT STORE
OFFICE
〈PRIVATE, GOVERNMENT〉

STEEL FRAME BUILDING.
〈SKELETON CONSTRUCTION〉





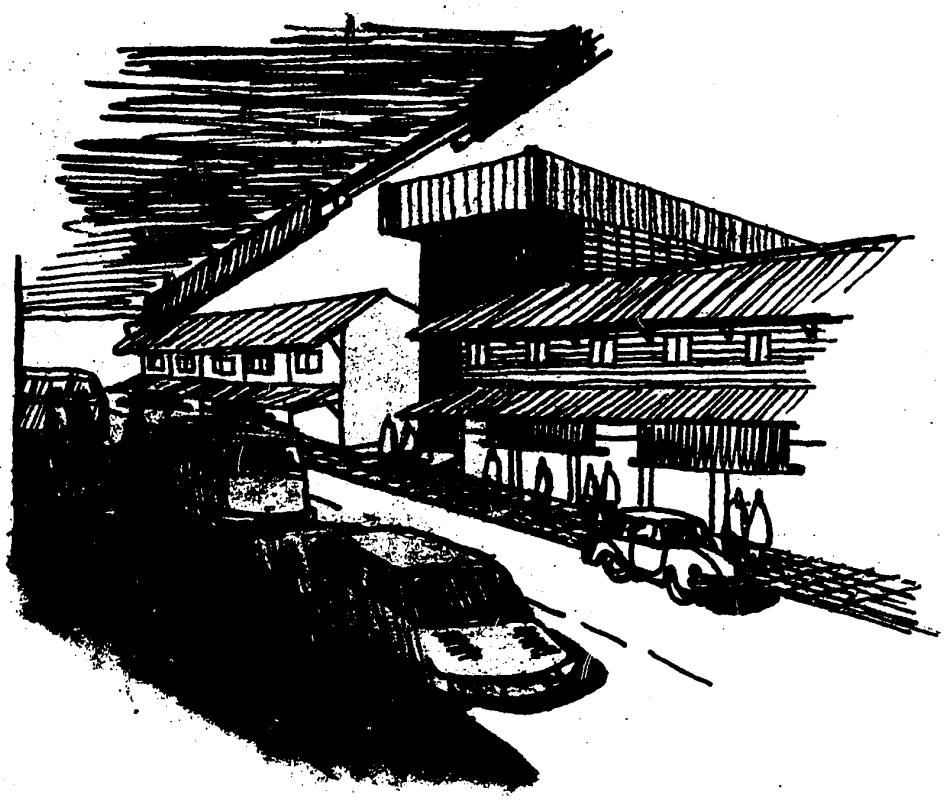


INDUSTRIAL BLDG

SCHOOL, UNIVERSITY, GOVERNMENT OFFICE

6.15 APPEARANCE OF MODERN BUILDING TECHNIQUES.

a) GENERALITY



6.16: b) VISUAL EFFECT ON MODERN TECHNIQUES.

MOST OF OLDER SHOPPING STREETS WERE CONSTRUCTED TO TWO-THREE STOREYS WITH PITCHED ROOFS. AND NEW BUILDING DOES NOT REQUIRE - MUCH SPACE ABOVE FIRST FLOOR LEVEL AND CERTAINLY DOES NOT OFTEN NEED STEEP ROOF. NEW BUILDING REQUIRES EXTRA SPACE ON UPPER - FLOORS , WHICH IS SET BACK FROM THE STREET FAÇADE IN ORDER TO REDUCE THE APPARENT HEIGHT OF THE BUILDING.

THUS THE CHARACTERISTIC OF INFILLING BUILDING IS THAT ; THE UPPER STOREYS ARE SPLIT INTO VERTICAL BAYS TO REDUCE THE - APPARENT SIZE OF THE BUILDING.

PART 7. BUILDING MATERIALS

BASIC BUILDING MATERIALS: - Raw

- Native

- Imports

I. LOCATION OF MATERIALS

II TRADITIONAL USE OF MATERIALS IN BUILDING COMPONENTS

III CONTEMPORARY USE OF MATERIALS IN BUILDING TYPES

IV CONTEMPORARY USE OF MATERIALS IN BUILDING COMPONENTS

V APPEARANCE OF MATERIALS:

a) Used in Traditional Building (See Fig. 7.1,7.2,7.3)

b) Used in Contemporary Building (See Fig.7.4, and see also in Technical Factor)

VI SUMMARY IN CONTEMPORARY USE OF MATERIALS

7.

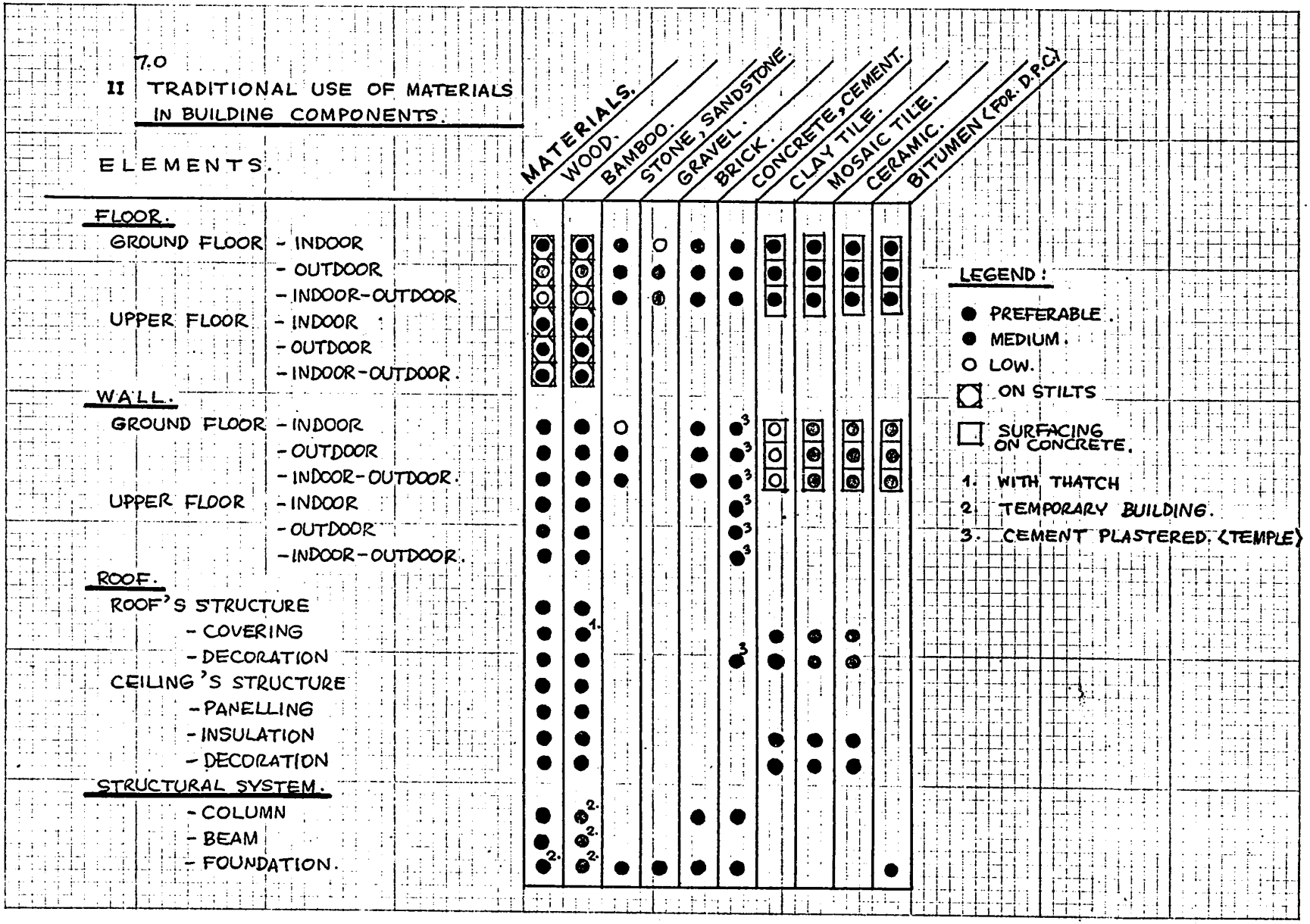
I LOCATION OF MATERIALS.

ELEMENTS.	REGIONS. CENTRAL	NORTHEAST	NORTH	SOUTH	SOUTHEAST
RAW MATERIALS.					
STONE AND GRAVEL	●	●	O	O	O
SAND, SAND STONE	●	●	●	●	●
LIME	O			●	●
MARBLE	●	O			
FORESTRY AND TIMBER, AND BAMBOO	●	●	●	●	●
NATIVE MATERIALS. (FACTORY)					
SILICA CEMENT (FOR AN ORDINARY USE)	●	●		●	
PORTLAND CEMENT (FOR THE REQUIREMENT - OF STANDARD SPECIFICATION)	●	●		●	
CEMENT PRODUCT;					
- ASBESTOS CEMENT CORRUGATED ROOFING - SHEET, .50 x 1.20, .50 x 1.80 M^2.	●	●	●	●	●
- FLAT BOARD (FOR PARTITION OR - CEILING), 1.00 x 2.00, 1.90 x .90 M^2, THICKNESS 4-6-8-10 MM.	●	●	●	●	●
- LOW PRESSURE PIPING FOR ALL SANITARY - INSTALLATION, ϕ 2½"-4"-6"-8".	●	●	●	●	●
- CEMENT BLOCK FOR SCREEN, PARTITION, 16"x4"x4", 16"x8"x8".	●	●	●	●	●
CLAY PRODUCT;	●	●	●	●	●
- BRICK, LOCAL MADE - 3x7x17 CM^3. MACHINE MADE - 7.5x10x20 CM^3.					
- TILE BURNED CLAY ROOFING (TEMPLE).					
MOSAIC-CERAMIC TILE - 4"x4", 6"x6", 8"x8", 12"x12"	●	●	●	●	●
PLYWOOD - CELLOCRETE - SHAVING BOAD	●	●	●	●	●
ZINC - GALVANIZED SHEET.	●	●	●	●	●
GLASS	●	●	●	●	●
PRECAST AND PRESTRESS CONCRETE.	●	●	●	●	●
STEEL PRODUCT.	●	●	●	●	●
IMPORT MATERIALS:					
STEEL PRODUCT, HARDWARES, LAVATORY - EQUIPMENT, PLUMBING FITTING, DOOR AND - WINDOW FITTING, ELECTRICAL FITTING, ASBESTOS - RUBBER - ACOUSTIC - ASPHALT - TILES, AND PAINTS.	◉	◉	◉	◉	◉

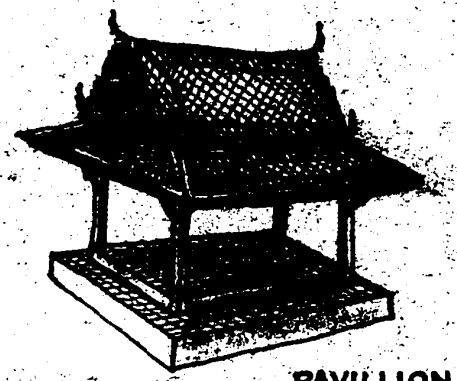
LEGEND:
- ● - ABANDANT.
- ◉ - MEDIUM.
- O - LOW.
- □ - MARKET.

7.0

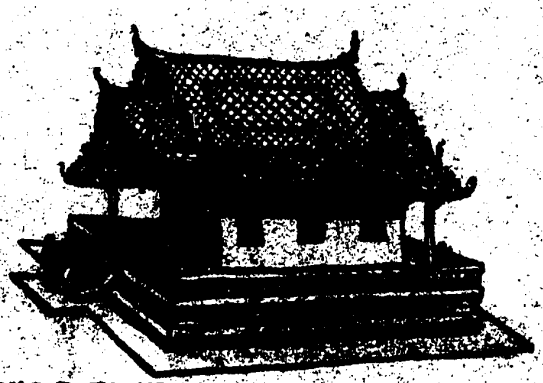
II TRADITIONAL USE OF MATERIALS IN BUILDING COMPONENTS.



7.1. TEMPLE, TEMPLE'S COMPLEX.



PAVILLION.
A TIMBER PAVILLION IS CARRIED BY THE MASONARY PODIUM.



A TEMPLE FOUND IN BOTH TIMBER AND MASONARY STRUCTURES AND DISPLAYED QUALITIES OF WHITE-WASH PLASTER-WALLS.
TEMPLE.

BURNED CLAY ROOF WITH COLOR ENAMEL

CEMENT PLASTERED FOR DECORATED GABLE

LIBRARY OF WAT SANKHONG.
〈SANKAMPHAENG, CHIENGMAI〉

IT CONSISTS OF A MASONARY PODIUM, PLASTERED AND WHITE-WASHED, CONTAINING THE LOWER READING ROOM. THE PODIUM-IS IN TURN BUILT ON ANOTHER ELABORATE BASE WITH STEPS LEADING UP FROM THE GROUND LEVEL AT THE FRONT AND THE REAR.

THE UPPER PART OF THE LIBRARY, WHICH IS IN THE FORM OF A TIMBER PAVILLION, IS CARRIED BY THE MASONARY PODIUM ITSELF.
〈SOURCE :- SUMET JUMSAI, "SEEN - ARCHITECTURAL FORMS OF NORTHERN SIAM AND OLD SIAMESE FORTIFICATIONS."〉

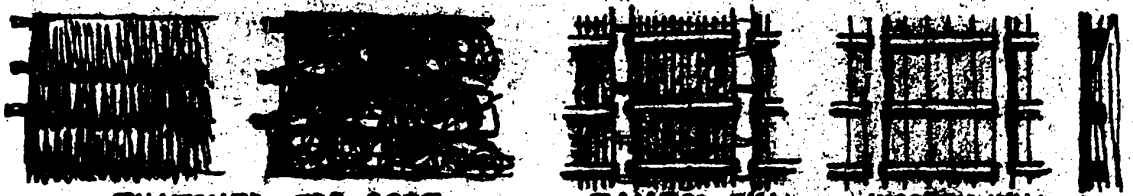
APPEARANCE OF MATERIALS IN TRADITIONAL BUILDING

AN AREA FENCED- FOR VEGETABLE GARDEN OR CHICKEN.

LIVING AREA

GRANARY

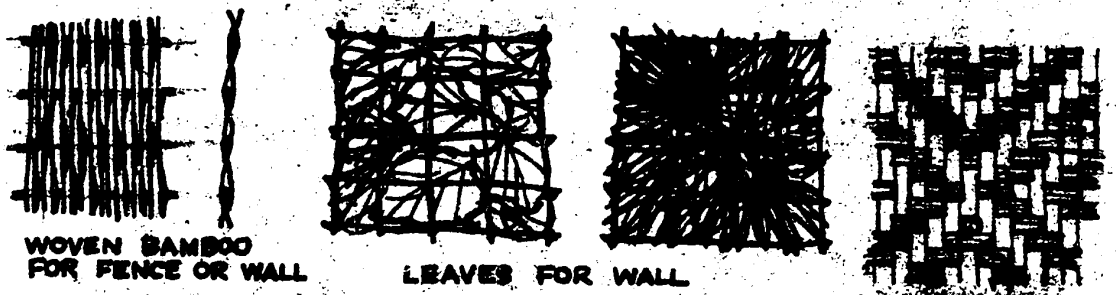
APPEARANCE OF MATERIALS.



THATCHED FOR ROOF

BAMBOO WALL

WOODEN WALL



WOVEN BAMBOO FOR FENCE OR WALL

LEAVES FOR WALL

MATTING BAMBOO USED AS WALLING AND CEILING.

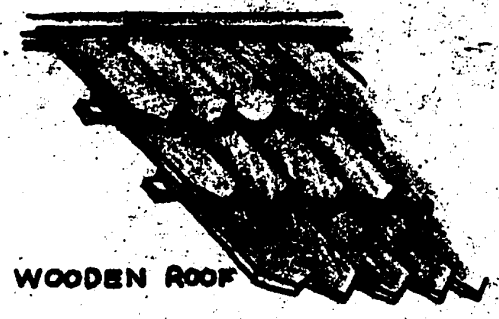
SPLIT AND FATTENED BAMBOO USED AS FLOORING AND WALLING.

HARD WOOD FLOOR

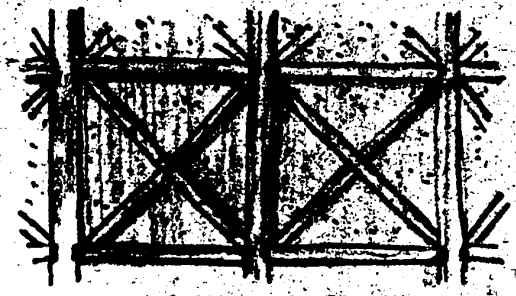
72. VILLAGER HOUSE

(FARMER, GARDENER)

7.1 HOUSE OF PROSPEROUS FAMILY.



WOODEN ROOF

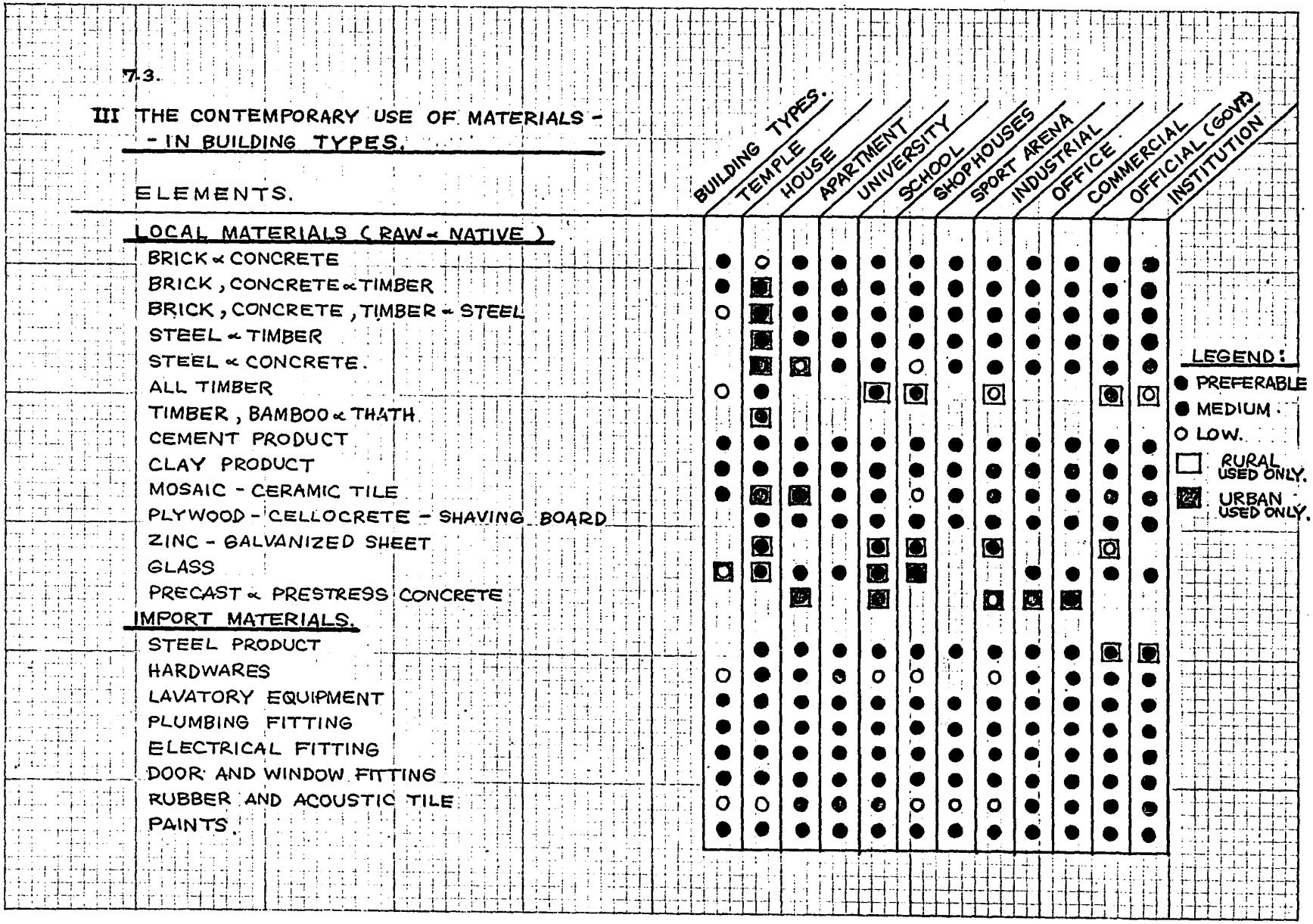


LATH AND PLASTER

WOODEN WALL, "PAKOL".

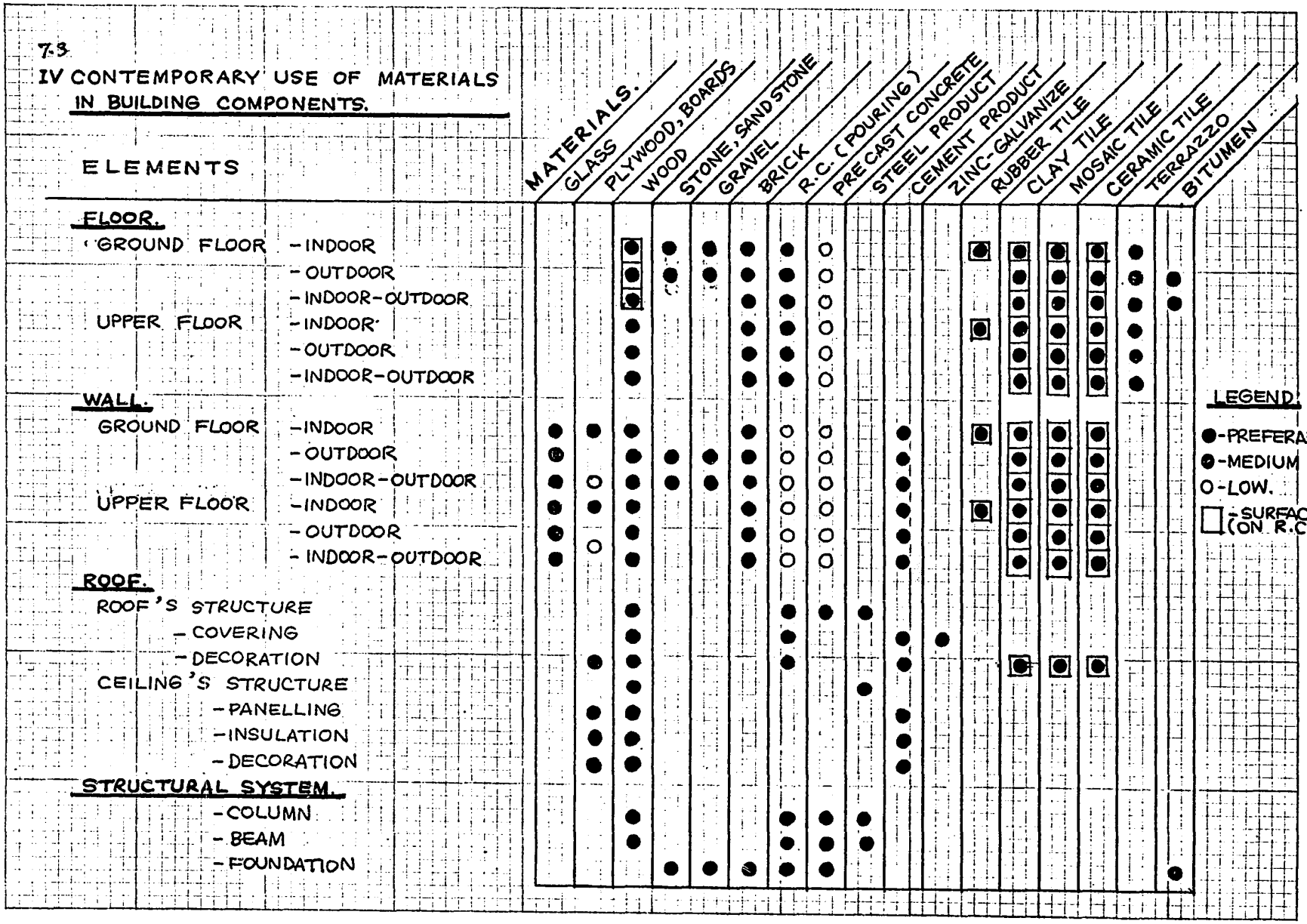
APPEARANCE OF MATERIALS IN TRADITIONAL BUILDING.

III THE CONTEMPORARY USE OF MATERIALS - - IN BUILDING TYPES.

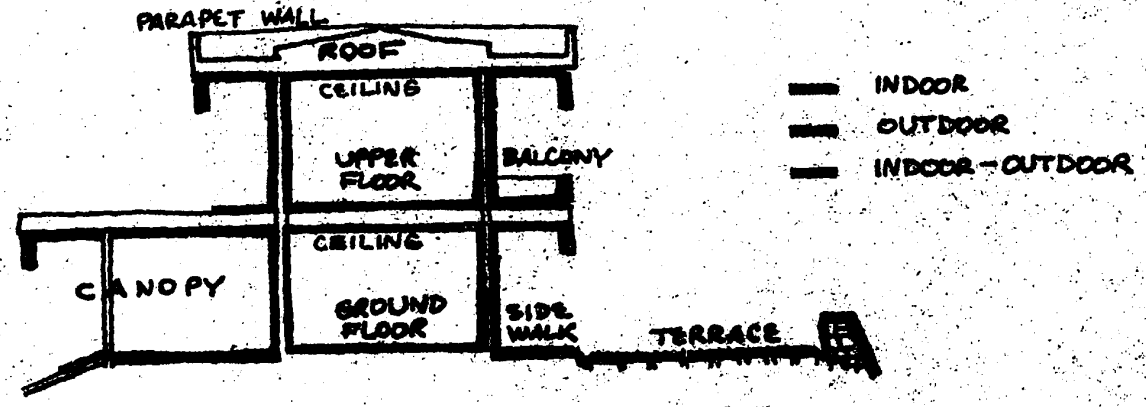


7-3

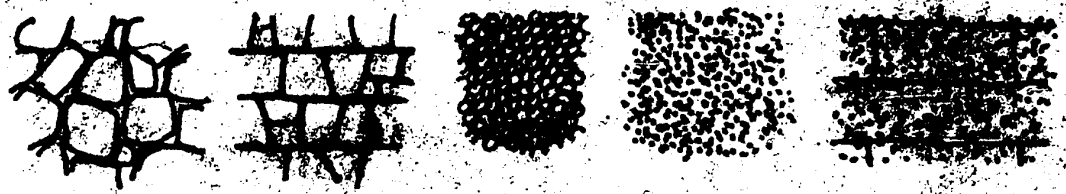
IV CONTEMPORARY USE OF MATERIALS IN BUILDING COMPONENTS.

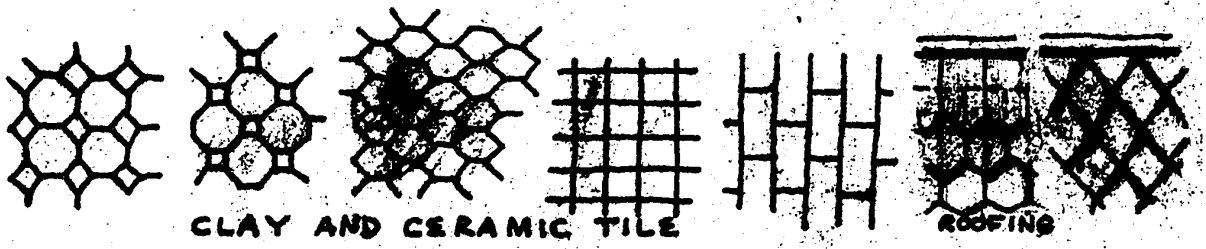


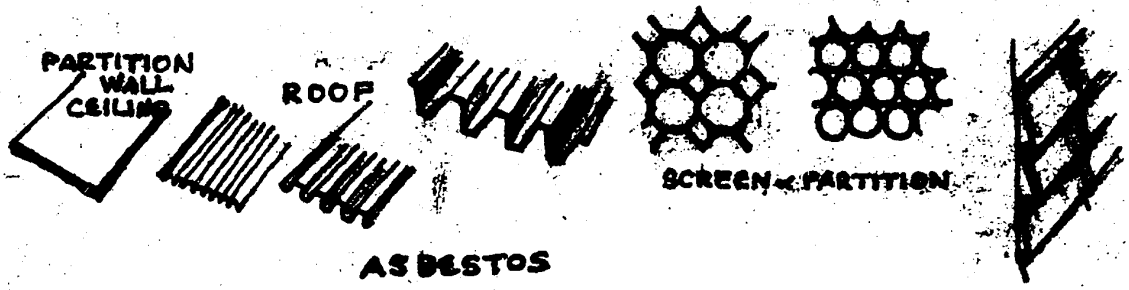
LOCATION OF MATERIALS USED IN CONTEMPORARY BUILDING.



74. THE APPEARANCES OF MATERIALS IN CONTEMPORARY BLDG.







SUMMARY IN CONTEMPORARY USE OF MATERIALS

(1) Steel and Concrete: These materials have influenced the form of contemporary buildings. They are used as the basic structure in which they are used in varying shapes.

(2) Local Materials: are by far still the best suited. They are more beautiful than machine-made and therefore economical.

(3) Import Materials: some example of modern needs: various fittings, aluminum sheet etc. (See.....)

CONCLUSION

IMAGE OF REALISTIC MODERN THAI ARCHITECTURE

It is the contemporary architect's main task to offer expert guidance at the time of decision and design. This guidance must be based on full knowledge of problems and conditions.

The selection of a particular design of building is properly undertaken in the full knowledge of all factors which have a bearing upon the choice. Each problem is regarded by the contemporary architect as a fresh problem, to be solved on its particular merits alone. However, the use of readily available materials and techniques in the manner most suited to their nature, is the principle of modern architecture as it offers a useful preliminary guide to decision-taking.

At present new materials--steel, glass and concrete have changed the appearance of buildings in Thailand buc the essence of their construction has always remained the same (Skeleton-construction).

I am also a regionist, believing that a building in Thailand should be different from one in other countries, not for the sake of being Thai, but because Thailand and other countries are different in background and living habits (even concrete should be tempered by this fact).

The difficulty of transformation from a tradition to a modern form of society, adapted to the industrial age should be carried through by Thai people in the spirit of their own culture; it should be enriched

by the new technical achievement of the West, but without submitting entirely the western attitude. Adaption and development is not an easy task. What makes it difficult is the task of changing the villagers' belief; some villagers seem to accept most of what they are introduced, while others reject any changes.

If modern Thai architecture is to achieve its role as an effective element throughout the country, it must provide better living for significant numbers of population, including those living on farms. This process should begin at the earliest possible time.

BIBLIOGRAPHY

THEORY OF ARCHITECTURE AND DESIGN

ANGERER, FRED.

Surface Structure in Building: Structure and Form , London, A, Tiranti, 1961.

ASHIHARA, YOSHINOBU

Exterior Design in Architecture: New York, Van Nostrand Reinhold Co., 1970.

DE CHIARA , JOSEPH AND KOPPELMAN, LEE.

Planning Design Criteria. New York, Van Nostrand Reinhold Co., 1969.

EDWARDS, A. TRYSTAN.

Towards Tomorrow's Architecture: The Triple Approach, London, Phoenix House, 1968.

GAUDIE, SINCLAIR

Architecture, London, New York, Oxford, U.P., 1969.

GROPIUS, WALTER

A Pollo in Democracy: The Cultural Obligation of Architect. New York, McGraw-Hill, 1967.

MAYER, ALBERT

The Urgent Future: People, Housing, City, Region. New York, McGraw-Hill, 1967.

OAKLEY, DAVID

The Phenomenon of Architecture in Cultures in Changes. Pergamon Press. Oxford, New York, Toronto, Sydney, Braunschweig. 1970.

PENOYRE, J. AND RYAN, M.

The Observer's Book of British Architecture. London, F. Warne. 1951.

SALVADORI, M. AND HELLER, R.

Structure in Architecture. Prentic-Hill, Inc., Englewood Cliffs, N.J. 1964.

WALLENFANG, W.O. AND GATZ, K.

Colour in Architectures. New York, Reinhold Publishing Corp. 1961.

WRIGHT, FRANK LLOYD

The Future of Architecture. New York, New American,1963.

ZEVI, BRUNO

Architecture as Space; How to Look at Architecture. Edited by Joseph A. Barny; Translated by Milton Gendel. New York, Horizon Press, 1957.

ARCHITECTURE AND CLIMATE

ARONIN, J.F.

Climate and Architecture, New York, Reinhold Publishing Corp. 1953.

ATKINSON, FELLO

Style and Tropical Architecture, Conference on Tropical Architecture, University College, London, 1953.

CANDILL, W.W., CRITS, S.E., AND SMITH, E.G.

Some General Considerations in the Natural Ventilation of Buildings, Texas Engineering Experiment Station, Report 22, Report 23.

FRY, MAXWELL AND DREW, JANE

Tropical Architecture in Dry and Humid Zones. London, Batsford, 1964.

FULLERTON, R.L.

Building Construction in the Warm Climates: London, Ibadan, Oxford I.P. 1967,Vol.1, 1968, Vol. 2.

GIVONI, B.

Man, Climate and Architecture: Amsterdam, New York Elsevier, 1969.

LIPPSMEIR, GEORG

Tropenbau: Building in the Tropics, Munchen Callivey,1969.

MAYER, ALBERT

Architectural Design for Hot Climates, B.R.A.B. Conference Report No. 5.

OAKLEY, DAVID

Tropical Houses: A Guide to their Design. B.T. Batsford Ltd., London, 1961.

OLGYAY AND OLGYAY

Solar Control and Shading Device: Princeton University Press, Princeton, N.J., 1957.

OLGYAY, VICTOR

Design with Climate: Bioclimatic Approach to Architectural Regionalism. Princeton, N.J.,Princeton University Press, 1963.

THE CITY

BLANCHARD, WENDELL

Thailand: New Haven, Hrap Press, 1957.

BUSH, NOEL, F.

Thailand, and Introduction of Modern Siam: 2nd Ed. Princeton, N.J. D. Van Nostrand Co., 1964.

CULLEN, GORDON

Townscape: London, Architectural Press, 1961.

DAVIES, DEREK, A.G.

Thailand, A Siamese Odyssey: Kodansha International Ltd., Japan, 1970.

EMBREE, JOHN, F.

"Thailand - A Loosely - Structure Social - System," American Anthropologist, L 11, 1960.

KAHN, GEOREGE McTURNAN(ED.)

Government and Politics in Southeast Asia: Ithaca, Cornell University Press, 1959.

MUSCAT, ROBERT, J.

Development Strategy in Thailand: A Study of Economic Growth, New York, F. Praeger,1966.

WINTER, ERIC

Urban Landscape: Bellhaven House Ltd., Scarborough, Ontario, Canada.

WIT, DANIEL

"Thailand Another Vietnam?": New York, Scribner, 1968.

WORSKETT, ROY

"The Character of a Town": An Approach to Conservation, London, the Architectural Press, 1969.

THE DWELLING

BARDHANABEADYA, CHULA

A Low-Rise, Medium Density Housing-Project Sapan Kwai, Bangkok, Thailand, McGill University Thesis,1964.

CHAKRABANDHU, PERADEJ.

Point Block Development Maharaj Road Bangkok, Thailand, McGill University Thesis, 1964.

GOTTLIB, LOIS DAVIDSON

Environment and Design in Housing: New York,McMillan.

PUBLICATIONS OF THE GOVERNMENT OFFICE

ASIAN INDUSTRY

Thailand: Special Report on the Dynamic Kingdom. The Far Easy Trade Press Ltd., Hongkong, 1968, Vol.4 No. 5.

BUSINESS IN THAILAND

Third Plan: A Blueprint for Future Development, A Special Six-Page Presentation: Business Publicity Ltd., Bangkok. 1971. Vol. 2., No. 10.

MINISTRY OF NATIONAL DEVELOPMENT

Thailand Development Report Year Book: Seventh Founding Anniversary Ministry of National Development 1970.

OFFICE OF THE NATIONAL ECONOMIC DEVELOPMENT BOARD,OFFICE OF THE PRIME MINISTER,BANGKOK, THAILAND.

National Income of Thailand, 1966.

THE INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT.

A Public Development Problem for Thailand: 1968.

Thailand Statistic Year Book: 1968

Thailand, Facts and Figures.

Thailand Private Interprise Investment Opportunity, 3rd Ed., 1968.

Housing Division Department of Public Welfare: Ministry of Interior Bangkok, 1964.