

219-6641A

CULTURAL CENTER  
BANGKOK, THAILAND

by

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B. Arch., Silpakorn University 1969

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A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF ARCHITECTURE

Department of Architecture and Design

KANSAS STATE UNIVERSITY

Manhattan, Kansas

1973

Approved by:



Major Professor

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## I. INTRODUCTION

A culture is the essence of life of a homogeneous human group; it includes all the learned and standardized forms of behavior which one uses for interaction and communication with others in one's group. It draws the sharp line between human being and animal. All humans use language and symbols, have a learned social heritage, operate in societies whose forms of organization are peculiarly and particularly human, while animals use mainly instinct and a relatively lower level of communication for their survival.

The development of a culture of each human group has been taking place for a long period of time. Some cultures may influence others. But depending on social, political, and geographical proximity, some are almost independent. However, each culture brought the pride to each human group, affecting and forming cultural orientations to succeeding generations.

The early development of Thai culture was originated in China a thousand years ago with the rise of the Mongol Empire, China was conquered by the great army of Kublai Khan and Genghis Khan, and the Thais were then forced to move down south to the land known as Indo-China Peninsula. Since then, Indian culture influenced the development of early Thai culture. Today, in spite of the strong influence of western culture, Thai culture still maintains her unique identity. Both the people and their government were responsible for preserving this culture and tradition which includes music, customs art, architecture and many religions and non-religions ceremonials.

The pride of the Thai nation depends upon the opportunity to express and exhibit to other nations her culture which has survived so many hundred years. Many cultural centers have been established both at home and aboard.

The cultural center, in this project provides a place for people to attend many events in Thai and other cultures. To create an understanding of the cultural heritage among Thai people areas are provided including auditoriums, conference rooms, galleries and other exhibition areas. Therefore, the main objectives of this project are:

1. To exhibit the living behaviors of the Thai primitive people including their everyday life, customs, and other household facilities.
2. To exhibit homemade crafts and many other artistic products by the primitive people.
3. To exhibit the primitive dwelling and other significant architectural buildings and their styles of the different parts of the country.

Thai culture and the tradition passed on from generation to generation should be preserved. People should be informed of the significance of their culture. It is their responsibility to keep the Thai tradition from being strongly influenced by other western cultures.

## II. AN INTRODUCTION TO THAILAND

### GEOGRAPHICAL AND PHYSICAL BACKGROUND OF THAILAND

#### 1. GENERAL ASPECTS OF THAILAND\*

Thailand has been known for centuries as the ancient kingdom of Siam; only since 1948 this country has been known by its present name, which means "Land of the Free". The word "Exotic" seems to have been invented to describe this fabled "Land of Smile", to mingle with her smiling hospitable people, to watch her colorful Buddhist ceremonies and festivals, to explore her canals and river life, and to see her unique architecture, including fabulous temples and palaces.

#### 2. GEOGRAPHY\*

Thailand is situated between the parallels of 5 and 21 degree North Latitude, and between the meridians of 97 and 106 degree East Longitude. A convenient description is that Thailand is divided into four parts: Northern, Central, Eastern and Peninsular (Southern) Thailand. Peninsular Thailand is bounded to the west by the Indian Ocean and in its northern areas, by Burma; to the east are the South China Sea and Gulf of Thailand, while in the extreme south is the federation of Malaya; North, Central and Eastern Thailand are bounded to the west, northwest and north by Burma; Laos and Cambodia are neighbors to the northeast and east. Thailand is about 1,000 miles long at its greatest length and 500 miles

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\*Thailand Official Year Book 1969

(Government House Printing Office)



wide at its maximum width. It may be compared in size to France.

a. Area

198,000 square miles or 518,000 square kilometres (U.S.A. 3,600,000 square miles. Great Britain 89,000 square miles. France 213,000 square miles. Australia 3,000,000 square miles).

b. Regional divisions:

1. The Western Region. This region consists of high mountain ranges. In the north is the Thong Chai Range and further south is the Tenasserim Range, both of which constitute the drainage divide between Thailand and Burma. At the point where the Khwae Noi takes its rise is situated the famous Three Pagodas Pass.

2. The Northern Region. This region is bordered by the Salween and the Mekong rivers and comprises a series of high parallel limestone ranges (the Dan Lao, the Khun Tan, the Phee Pan Nam and the Luang Prabang). Between these ranges are the valleys of four of the rivers which finally unite their waters in the Chao Phraya (the Mae Ping, the Mae Wang, the Mae Yom and the Mae Nan).

The average height of the peaks in this northern area is 1600 metres (5,200 ft.) Doi Angka (Doi Inthanon), 2576 metres (7,740 ft.), the highest peak is situated about 30 miles to the south-west of Chiangmai. The ground level in the city of Chiangmai is 300 metres (1,000 ft.) and at Chiangrai 378 metres (1,250 ft.) above mean sea level.

3. The Central Region. This part consists of vast alluvial plains stretching from the Western Ranges to the Korat Plateau and from the Northern Ranges to the Gulf of Thailand. It is the most densely populated and the most economically productive part of the country. Among the numerous rivers that flow through this vast alluvial plain, the principal ones are the Chao Phraya, the Pa-sak, the Bang Pakong and the Mae Klong.

(The Chao Phraya is 750 miles long; the Thames 209 miles; the Mississippi 2470 miles, the Seine 480 miles).

The central plain is about 300 miles in length and it varies in breadth from 30 to 140 miles.

At Pak Nam Pho the banks of the Chao Phraya are about 80 feet above mean sea level, at Ayudhya not more than 13 feet whilst in Bangkok most of the land does not exceed 6 feet above mean sea level.

4. The North-eastern Region. This region consists of a saucer shaped plateau tilted towards the south-east. It is bounded on the north and east by the Mae Khong, on the west by the Petchaboon and the Dong Phaya Yen Ranges and on the south by the San Kampaeng and the DongRak Ranges.

The western and northern sides of the plateau vary in height from 400 ft. to 650 ft. above mean sea level, whilst at Ubon Province the levels are in the neighbourhood of 160 ft.

5. The South-eastern Region. This region consists of the area between the Chantaburi Mountains and the Gulf. The area is drained by numerous short rivers flowing in a

southerly direction; the chief of which are the Chantaburi and the Trad. The principal peaks in the Chantaburi Mountains are Khao Kheo (2650 ft.) Khao Soi Kao (5400 ft.) and Khao Sabap (300 ft.).

The coast of this part of Thailand is much indented and fringed with rocky islands. The island of Koh Si Chang forms a good natural shelter for large steamers which cannot cross the bar of the Chao Phraya. The largest island on this coast is Koh Chang (70 square miles).

6. The Southern Region. This region is often called the Thai Peninsula. On the west the Tenasserim Range forms the boundary between Thailand and Burma and on the south the Karakiri Range separates Thailand from the Malaya States.

On the east coast there are few bays, Ao Sawi, Ao Bandon, and Ao Nakhon, being the most important. The islands are also few in number, the largest being Koh Samui and Koh Pa-ngan. The west coast, on the other hand, is much indented with bays and closely fringed with rocky islands. The biggest island along the coast which is also the biggest in the country is Koh Phuket (230 square miles).

### 3. CLIMATE

The climate of Thailand is classified under the name of

a. Tropical Monsoon, which means that it is tropical in character but the prevailing winds vary from season to season. During the north east monsoon, i.e. from November to February, cold dry air from the North of China enters the country, resulting in a cool dry season for most parts of the

country, except the east coast of the Peninsula which receives a considerable amount of rain. From May to September the southwest monsoon brings a stream of warm moist air from the Indian Ocean, causing much rain over most parts of the country.

b. Temperature. Upper Thailand maximum 91°F - 100°F  
minimum 59°F - 88°F

Peninsular Thailand maximum 91°F  
minimum 72°F

c. Rainfall. 40-60 inches annually, except along the west coast of the Peninsula and the east coast of the Gulf which receive more than 200 inches.

#### 4. THE PEOPLE

The Thai people have a long and honorable history. Making their first appearance in Southern China during the last century before Buddha, they founded the Kingdom of Nanchao in Yunan in the 12<sup>th</sup> century B.E. The Thai of Nanchao, after winning their independence from China, extended their political influence as far west as the Irrawaddy delta. The fall of Nanchao in 1796 B.E. to the Mongols intensified the Thai push to the South, and within two generations a large part of South-East Asia was under Thai control.

The Thai preference for village life and rice farming plus an abundance of unused land, which has absorbed expansion of population, has caused the Thai not to compete in the area of commerce and industrial labor. Thailand has therefore attracted large number of immigrants, many of whom have filled the commercial and industrial jobs. The vast majority of

these have been Chinese; and this group has been a significant factor affecting the population growth and the general economic development of the country as a whole, and especially of the Bangkok-Thonburi area.

#### 5. BANGKOK\*

Bangkok, the capital of Thailand, has a total population of more than 2,000,000. It is a richly decorated modern city, situated on the east bank of the Chao Phraya River about 23 miles north of the Gulf of Thailand. Founded in 1782, it serves as center of the nation's cultural, financial, commercial, industrial, and educational life. It is virtually a city of temples, and in regard to tourist interest, it is considered one of the most intriguing beauty spots of the Orient. Because of its unique features of numerous canals, elegant palaces, and colorful temples and shrines, Bangkok is often referred to by westerners as the "Venice of the East". It is one of the major sea ports in Southeast Asia and certainly the principle international air-travel center in the Far East. There are 24 international airlines offering their facilities at Bangkok Airport and 42 companies of 12 nationalities have their ocean liners dock there.

#### 6. POPULATION\*\*

The total population of Thailand is approximately 33 million with annual growth rate of almost 3%. Between 85%

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\*Thailand Land of the Free (New York Times, February 1965)

\*\*Thailand: Facts and Figures 1966

and 90% of the people live in the rural villages. There are only two classified cities: Bangkok and Chiangmai. About 6% of the country's total population lives in this urban area, and its annual growth rate is in excess of 7%. Average population density in Thailand is about 114 persons per square mile. Bangkok is the most populated city whose density is obviously high but fortunately not yet among the highest of the major cities of the world. No specific figure is available at the moment.

The principle minorities are the Chinese, who make up approximately 15% of the population; the Thai-Malays of the Peninsula, forming a little over 3% of the population; and a small number of Vietnamese.

Four out of five Thai are engaged in farming. By 1990, it is estimated that the population of Thailand will be 53,000,000.

## 7. GOVERNMENT\*

Thailand is constitutional monarchy with a centralized government. The King is the head of the country. He exercises sovereign power through the three branches of government is organized into 13 ministries, all headed by the prime minister. For local administration, Thailand is divided into 71 provinces (Changwats). Each province consists of districts, communes, and villages, and is ministered by a governor appointed by the minister of the Interior. Local government

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\*Thailand: Facts and Figures 1966

is controlled and financed by the central government. All officials are appointed except the village headman who is elected by the villagers.

## 8. CULTURE AND RELIGION\*

The traditional occupation of Thai people is the agriculture. They have lived relatively like their neighbors on the mainland of Southeast Asia, in an underpopulated but fertile land. Though the life of the farming people is at times arduous, there is still ample time left for them to enjoy their leisure time.

Socially, the Thai, to a certain extent, remain village centered people. They are public minded as far as their village is concerned. They work and help one another in time of need and enjoy their social life together.

Buddhism is predominant in this country (93.6% in 1960). There are about one million, 460,000 confucianists, 150,000 christians of various denomination and many small groups having other religions and beliefs. Traditionally, young male buddhists, regardless of their social status, are supposed to spend a minimum period of three months as monks, usually during Buddhist lent.

Feasts and Festivals observed by the Thai Buddhists are mainly religions and are connected with the changing seasons. The wat or monastery, is the center of social meeting. All the traditional arts and literature of the Thais are essen-

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\*Presenting Thailand

(Government House Printing Office, Bangkok, 1968)



tially religious in nature and most of them are dedicated to Buddhism.

Thai people have their own language, the language and the alphabet known as Thai. Though Thai is the official language and is used most of the time, many inhabitants of the main cities also speak and understand English, the second official language, especially for those whose profession brings them into frequent contact with westerners.

Western civilization has had some influence on the Thai culture, though not to a very noticeable extent. Thai people have been able to maintain the great proportion of the heritage handed down from generation to generation. For example, their deep respect for the elders, traditional music, art and literature, their complete devotion and respect to the true, and their strong sense of freedom.

#### 9. FAMILY AND PATTERN OF LIVING IN THAILAND

Various types of families are found among the numerous ethnic minorities. The predominant type, that of percents of the population which is rural Thai, is the simple nuclear family of husband, wife and children. This family generally becomes a small extended family as a result of the temporary presence of a married older child and spouse, and by the permanent inclusion of the spouse of the youngest child. The basic unit of village society, however, is not the nuclear family as such, but the household, which at times may contain more than one nuclear family. Except for the aristocracy, concentrated in Bangkok, which derives its status from its



connections with the king through males, and except for occasional families of commoners with aristocratic or official antecedents, the majority of people in town or country show little interest in generalities and feel strong bonds of sentiment only for kinsmen within the circle of grandparents, parents, aunts, uncles, brothers and sisters among whom they grow up and with whom they continue to associate. Condition of life in the town's constricted living place, high cost of living, and low level of income, greater frequency of individual rather than family enterprise and labor, tend to prevent many poor urban households from including a married daughter or spouse.

The basic socioeconomic unit of rural Thailand is the household, which usually is the nuclear family of a married couple and their children. Each such family is regarded as an essentially independent unit in a widening circle of kinsmen on both maternal and paternal sides.

### III. THE TRADITIONAL CULTURE AND ITS REVIVAL AND SURVIVAL\*

#### 1. TRADITIONAL CULTURE

Basically the traditional culture of the Thai of these countries is an agricultural one. The Thais have lived relatively like their neighbors on the mainland of South-East Asia in an underpopulated but fertile land where their requirements for subsistence are easily obtained. Rice and fish were their staple food and in fact, in the vocabulary of the people, the word food is "rice-fish", which reflects their main physical needs from their clothes which they wove for themselves. Famine was comparatively rare in this sparsely populated but fertile land. In such a self-sufficient economic life, to work more than one wants or to be thrifty and to accumulate wealth in the modern sense was senseless in those days. Though the life of the farming masses was at times arduous, there was still ample time left for the people to enjoy their leisure.

#### 2. VILLAGE-CENTERED

Socially the Thais, to a certain extent, remain a village-centered people. In Thai language the word "village" is BAN, and the larger centers of population were ruled by a chief or a king, who was called MUANG in Thai. These two words formed the conception of the universe for the older generations of

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\*Presenting Thailand

(Government House Printing Office, Bangkok, Thailand 1968)

the people. They were public-minded people in so far as their village was concerned. They worked and helped one another in times of need and enjoyed their lives socially and aesthetically together. In such circumstances of life, money was valueless. And in fact there was very little currency in circulation.

There were wealthy and poor people of the village, but the enjoyment of life was nearly in the same level. The individual villager calculated his wealth in arable land, oxen and buffaloes, and implements and tools. In later times, when money was a medium of exchange, the wealthy people of this village would spend their money on public utilities such as building roads and bridges, public rest houses, or a monastery.

The surplus money in silver coins was either hidden under the ground or spent on gold and jewelry. The poor villagers would contribute help in public utility undertaking by their labors, the wealthy ones would supply the food and drinks. After the completion of such undertakings there were celebrations and feasts supplied by the people themselves with the wealthy ones bearing the major share of expense. The Thai family structure is of bilateral descent, with an exogamous system where the male is married out into another village family. There are reciprocal and friendly meetings with at one or another village during the festive occasions.

### 3. SPIRITUAL LIFE

There are two strata of belief of the Thai people. The first stratum is animism not unlike that of other peoples in

their primitive days, and there are traces of their beliefs and conception similar to that of the Chinese-no doubt due to the earlier contact with and influence of the Chinese, in Southern China. Next comes Buddhism, with elements of Brahmanism and Hinduism, which was mostly confined to the elite class. In Thai popular Buddhism, these two layers of beliefs and conceptions among the mass of the Thai people have become intermingled in an inextricable degree. In every village there is at least one Buddhist temple called WAT in Thai and shrine of the village tutelary guardian. An abbot of the village wat, if he is a man of age full of lore and wisdom, he will be a highly respected person in the village. His counsel is eagerly sought in difficulties and differences. The villagers would prefer his advice and decision even in a serious case rather than refer the case to the official authorities for decision. The abbot, in his spare time, will make a round of afternoon visits to the villagers, advice or distribute his home-made medicine or other things as needed by the people.

Feasts and festivals as observed by the Thai Buddhists are mainly religious and connected with the changing seasons. The wat, or monastery, is therefore the center of social meetings whether in life or in death of the folk. All traditional arts and literature of the Thai are essentially religious and most of them are dedicated to their religion, Buddhism.

#### 4. WAT SCHOOLING

The culture pattern of the people in various areas of the

country was more or less identical. It is still the culture pattern of the personality of the Thai, despite the fact that there have been some radical changes in the last centuries in behavior and thinking, particularly in modern towns or cities which have come into contact with modern civilization. In the old days when schooling was practically the monopoly of the wat or monastery, it was no wonder that the people were desirous of having their male relatives become at least temporary novices or monks. When a man becomes old, he sometimes, as a devotional act, becomes a monk for life, or if for various reasons, he is not able to do so, he will frequently on Buddhist holy days repair to the wat.

The Thai observes certain religious precepts and hears sermons, thus detaching from himself all the worldly cares. This is no doubt due to the influence of the Indian four stages of life. Many retired officials even in Bangkok in the present day still observe such a practice. It was in such an economic and social environment that the Thai traditional culture evolved.

##### 5. THE INDIVIDUALISTIC NATURE OF CULTURE

The individualistic nature of culture, placing responsibility for self squarely on the individual, is reflected in the pattern of status ranking and authority, as in most other phases of Thai society and behavior. The concept of KARMA, by which persons are assigned particular positions in life according to their merit, militates against any concept of social equality between men. Structurally, Society is an

elaborate hierarchy of status in which each individual tends to see himself as above or below but seldom precisely equal to those around him. A feature of this pattern is a system of highly formalized respect usages which are expressed in language, gesture and posture. Perhaps the first social act a child learns is the gesture of respect (WAI), which is made by pressing the palms together as in prayer. The gesture is used in variety of ways, from simple salutations, particularly between persons of different status, to veneration of Buddha. Similarly, there are prescribed ways of sitting in the presence of superiors and of handing items to them or receiving items from them.

Moderation and peacefulness are among the most important social values. Moderation is thought of as a means to good health and the keynote of successful social relationships. One should be friendly, pleasant and polite with other people not too involved, yet not too distant and moderation should be maintained even in the closest relationships. Children are taught to show respect and deference to parents, but they are not expected to be compulsively dutiful or obedient. Peacefulness, mildness and nonaggression are perhaps most frequently named as the most important of all personal values.

Until the relative status of two persons is established, it is difficult to speak or act properly. Polite speech requires the use of personal pronouns and polite particles based on status differences, there being no neutral terms, and it is the province of the superior to initiate action,

not that of the interior. For this reason the polite course in dealing with strangers is to grant them nominally superior status by using the pronouns and particles one would use toward a superior until their status is known. On first encounters it is usual to ask a number of personal questions: the person's age, his plans and the cost of his clothes. This usage has, in fact, come to be regarded as an expression of polite interest.

## 6. FESTIVAL AND CEREMONIES\*

The people of Bangkok manage to observe in all parts of the year their impressive festivals and ceremonies, which they have preserved for centuries. Those festivals are basically for the pleasure of themselves and enjoy life.

### a. Songgran

The Thai new year or 'Songgran' is a three days festival starting in mid-April. This consists of religious ceremony with the people enjoying the festivity by carrying sand from the River Ping to the wats and there forming small Chedies. Water throwing joyfully takes place by all the people as the part of the festival. The main characteristic is the water throwing which continues unabated during daylight hours. Songgran used to be the time for paying respectful visits to senior members of the family, when a little water from a silver bowl was sprinkled on the well-wisher as a token of blessing.

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\*Festival and Ceremonies Book

(Government House Printing Office, Bangkok, Thailand, 1970)



b. Loi Krathong

In complete contrast to Songgran, the festival of Loi Krathong takes place on a cold night in October or November, when the moon is full, the sky is clear and the stars are shining with every one in their best clothes and on their best behavior. The evening approaches, and family groups make their way down to the river, moat or nearby stream. At home, they will have left lighted candles or wicks by the gate and around the house for good luck. They will have made a Kra Thong, the simplest Kra Thongs are those with a candle stuck on the top of the fibrous trunk of a banana tree. More elaborate models are made out of all types of material, to resemble houses, boats, ship, temples, fort etc. all will have candle and joss-sticks, and many will contain flowers and perhaps a small coin. At the river's edge, the candles will be lit, and the Krathong floated. With a gentle push it will glide away into the darkness, carrying with it all the wishes of the family for the following year. The purpose of this procedure is to send their respects to some kind of god in the ocean.

c. Buddhist Ordination Ceremony

It is customary for young men of the Buddhist Faith, when they attain the age of 21, to go into priesthood during the Lent Season for the purpose of religious training and acquirement of knowledge of Buddhism in general, a special course in the theological school. This training serves to a great extent as guidance to the conduct of their worldly



life after they have left the priesthood. Ordination is regarded as an act of great merit done to parents and is, therefore, popular amongst young men. It does not in fact bind you with everlasting vows and there are indeed very few who have not spent several months at least in the monastery either as a novice before reaching the age of twenty, or as a monk after attaining his maturity.

On the day of the ordination, the NAAG (a youth, after deciding to enter the priesthood, becomes known as NAAG), will be dressed in garb similar to the rich prince Gautama, with conical shaped hat and a thin gold embroidered net robe. Holding a wax candle, an incense stick, and a flower between his palms held in an attitude of worship, he proceeds with his retinue to the wat. After circumambulating thrice around the chapel, he is divested of his robe and he may scatter coins to the crowd. Led by his father, he enters the ordination hall already filled with a chapter of monks and elders awaiting to perform the religious ceremony of ordination. When everything is in order and everyone seated, the young man advances towards the assembly, sits on his heels with the yellow robes in his hands and asks in pali for his ordination. When consent is given, he goes out to don the yellow robes and is usually assisted by someone experienced in draping them. Then the novice, as he is now, asks the elder monk to be his preceptor, and when this is granted he receives an oral examination as to his qualification: Does he have leprosy; whether he is human, a male, is free, and free of debt; whether he has

been released from government service, has permission from his parents, is twenty one years old, has the required paraphernalia of a monk. If all are answered satisfactorily, the announcer monk informs the assemblage of his findings and if no vote of disagreement is raised, then the pronouncement of their service of admission to the monkhood is concluded.

d. Buddhist Lent

The Buddhist Lent or so-called in Thai 'Khao Pansa' usually falls on the first day of the waning moon of the eighth lunar month and those wishing to enter the priesthood before Lent have done so. The ceremony of moulding the lenten candles has also been performed. And from now on the monks will be confined more closely to the temples than usual for three months; that is during this period the monks do not stay overnight away from their fixed abode or monastery.

The 'Khao Pansa' ceremony itself concerns only the monks, for the main purpose of it is for the monks to declare their intention of remaining in the monastery for the duration of three months. After making the declaration three times, chant other services, starting that they wish to live together in harmony and the good of all. They note that they must share with one another, must not annoy others with wrong behavior or wrong opinions. Afterwards the monks ask forgiveness of each other, first of their leader and thereafter to younger monks. If they have not already been assigned rooms, this is then done by the process of pouring water by the one in charge into the hands of the newcomers, signifying transfer of ownership to them.

The daily routine of monks for the duration of lent is strictly observed throughout the kingdom. Their sallies forth into the village are curtailed to a minimum, mostly to the morning round for alms, but even this is curtailed since the lay buddhists attempt during this season to occure greater merit than before and a greater number than usual offer food, many even taking the food to the monastery rather than waiting in front of their homes for the monks to pass by. The newly-ordained monk goes for instruction and training in religious matter to the abbot's quarters or to his preceptor, while a monk who has been in the monkhood for a number of years has time at his own disposal for resting, meditation or study.

People of every class, from the princes and nobles down to the ordinary householders, assemble all their children and grand-children, other relatives and friends, and take them to the temples large and small, throughout the country, where they make offering to the priests and novices. They also make various vows with religious fervour, some to adhere even more strictly to the commandments for a shorter or longer period of time. First comes the lighting of lenten candles in all temples, natural centers of activity. This is the auspicious hour of worship. From every walk of life, the faithful gather to do reverence and to listen to words of divine wisdom. They go, not so much because they feel it to be a duty or a social obligation, but because they sense the desire to add to their own limited store of righteousness.

e. Kathin Ceremony

The presentation of 'Kathin' robes is held throughout the kingdom after the three-month Lent. Kathin is a great occasion of merit-making for laymen and it is observed as a way of paying gratitude to priests for maintaining and propagating the Lord Buddha's Teachings and practicing his tenets. The ceremony is purely a buddhist observance and is deeply religious in character.

Over two thousand five hundred years ago, the Buddha taught that those in search of spiritual treasure must free themselves of worldly ties. He recognized that piling up worldly possessions or mourning their absence are the causes of so much care and frustration as to constitute severe impediments to spiritual progress; so he enjoined the monks never to touch gold or silver and to retain no individual possessions beyond a set of garments and a few daily necessities, such as a razor and a needle. Consequently, Buddhist monks rely entirely upon the laity to provide these and the rest of their simple needs.

Offerings to monks other than food are of two kinds: (1) cloth for garments together with the handful of necessities which monks are allowed to own individually; (2) whatever is required for their communal use, including a large number of household items such as brooms and soap. Tradition requires that only one Kathin can be celebrated in each monastery during one year: when the ceremony has been performed, a flag bearing the effigy of a crocodile is hoisted

for the rest of the Kathin season to indicate to would-be donors that they should benefit some other monastery. If the gifts provided during the Kathin are insufficient for use during the whole year. The people in that village will create a special festival for the people getting together and donating things or money in order to purchase the missed items for monks, but fortunately, are not noticed too much.

## 7. TEMPLES

Thailand is a devout Buddhist country and has many Buddhist temples or wats. Wats have been the center of the civilization of the Thai people for a long time. Besides being used for the religious purpose, a wat is, at the same time, a school, a community center with a collection ornaments and a calm atmosphere. A wat has an architecture magnificent in itself. It is proudly said that the wats help beautify the scenery of the cities and yet purify the spirits of the people.

A wat compound, which is basically similar to the others, is divided into two separate sections. The Sangkawas is the area where the monks live while the Buddhawas is the area in which the buildings of different activities are located. Viharn, the largest building in the Buddhawas area, contain the largest image of the Lord Buddha in the whole compound and is used as a place for meeting of various types. Bost is smaller than Viharn and the place where many important ceremonies including daily prayer, are held. The other buildings in the Buddhawas areas are a bell tower, a library,

a teaching hall and some others for different activities such as a place for burying and a grade school, for example: there are some structures located in the wat compound such as Chedies which are tower like structures which usually contain the ashes of distinguished people, occasionally king and member of the royal families, and even the relic of the Lord Buddha in some important wats.

#### 8. ARTISTIC EXPRESSION\*

Thai art may be divided into six schools or periods:

Chiengsaen (or Chiengmai)	1250 - 1450
Sukhothai	1250 - 1450
Uthong	1250 - 1450
Ayutthaya	1350 - 1767
Ratanakosin (Bangkok)	1782 - 1868

and modern revival, twentieth century. The Chiengsaen period, recently termed "Chiengmai" as a result of archaeological discoveries. Spans the migratory centuries of Thai history and extends in to the era of the Kingdom of Chiengmai, thus becoming "Northern art". With in this period appear the first efforts toward a uniquely Thai mode of expression, utilizing certain features of surrounding cultures.

##### a. Sculpture

Thai sculpture before the twentieth century was mostly Buddhist and totally conventionalized. Most pieces which have been discovered are portrayals of the Buddha.

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\*Thailand: Facts and Figures 1968

The sculpture was conventionalized as were vehicles and expressions of Buddhism, were to be "remainders of the doctrine" not portraits of an individual only certain poses were appropriate, and the physical appearance of Buddha was governed by religious purposes and ideals.

#### b. Architecture

The Thai architecture was the native adaptation of India and Chinese influences. The basic form, purposes and construction materials were unchanged after the close of the thirteenth century. Northern buildings followed the pattern of the rural wooden thatch-roofed house, even duplicating the concave slope of thatch after it becomes old and wet. Before 1900 wood was used almost exclusively as the construction material. The earlier Thai structures, which were rectangular in plan, had a rigid horizontal line, with wall low in relation to length. Superimposed upon the walls was a step-like progression of roofs, usually though, the number depended upon the length of the building.

#### c. Painting

Thai painting on the whole appears to have been greatly influenced by other cultures; and its classical Thai style is essentially the crystallization of the stylistic experiments made in Sukhothai and Chiengsaen sculpture. The classical period Thai painting opened with the seventeenth century, and the conventions of developing then continued to govern the style of Thai painting well into the middle of the century. Certain gestures, similar to those used in the



classical dance, were used to suggest certain emotions and moods. The portrayal of persons was governed by status distinctions. Royal and celestial beings were classically conventionalized in form and gesture, serenely expressionless, with great refinement of life and harmonious color, the established of symbolism of dress and appurtenances was faithfully followed. There was some compromise between classic and realistic style in portraying nonroyal personages of the court, but the distinguishing mark of rank were always clear. The common people were portrayed realistically in dress, gesture and expression.

#### d. Dance Drama and Music

Traditional Thai dance drama (Khon and Lakornrum) played for the royal court and aristocracy was unknown to the peasantry. The meticulously trained dance-actors were held in the courtyards or hall of the palaces. The Nang (shadow play) and the Hun (Thai marionette) are two other forms of classic traditional theatrical art.

The peasantry enjoyed its own particular form of drama. Puppet shows and amateur productions were played by wandering troupes in wats and village squares. Such drama, which has been a feature of Thai life for centuries, was light and spontaneous, virtually unrelated to the formalism of court dance drama. Thai classical drama is in a dance form, elaborate and highly stylized, and accompanied by choral narration and orchestral music. The stage decore and scenic backdrop are kept to the minimum, barely suggesting the



background of the story. However, Thai admiration for decoration achieves full expression in the splendor of magnificent costumes of silk and brocades and dazzling personal ornaments of gold, silver and jewels, the plot is conveyed by conventionalized and stylized gestures, emphasizing intricate hand and arm movements.

#### e. Popular Drama and Dance

The major popular drama, LIKE is performed in the villages and in provincial and urban centers, where there are many small LIKE theaters. It is performed at temple fair festivals by wandering troupes and appeals mainly to members of the older generation and the lower class. Adapted version are produced for radio and television. Music is provided by Pinphat Band, and the lives are sung or spoken by the actors themselves. In the north and north-east, there are similar entertainments. The Molam of the northeast consists, as in Laos, of a declamation sung to the accompaniment of a indigenous Lao panpipe or mouth organ. In the north, the analogous musical form is call saw, but the flute is substituted for the Lao panpipe.

The temple dance of the northern region, the Fon Lep, retains its traditional popularity and is frequently performed, particularly in Chiangmai. At Wat festivals and in Buddhist processions dancers move in stylized, serene and slow motions suggesting spiritual tranquillity and contemplation. The simplicity of the Fon Lep provides a direct contrast to the intricate character of the classical court dance in the central Thailand.

#### f. Music

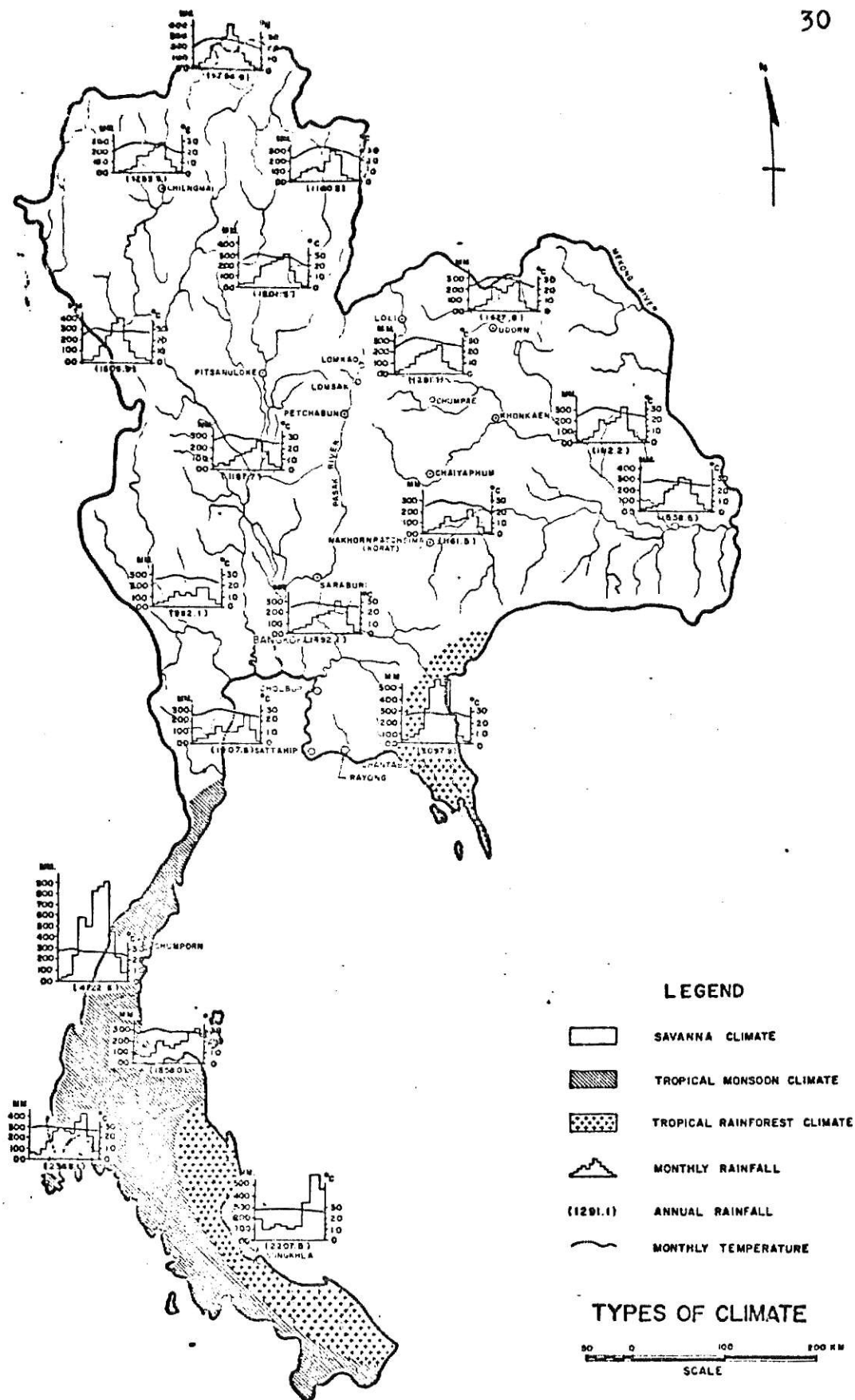
Thai music has a seven-note scale of the same octave spread as the western scale, but the half-tone intervals are not used-hamony is unknown; a certain variation is achieved by counter point. Formalized music to accompany with dramas was played by a type of band called the Piphat, which uses only wind and percussion instruments. The one type of wind instrument used is a wood wind with reed, played in the manner of the clarinet. Percussion instruments are either melodic or rhythmic, without specific pitch. The melodic section comprises several kinds of instruments similar to the xylophone, and one type, consisting of small discs or chimes hung in a rattan frame, produces an effect like the glockenspiel or the celesta. The rhythm section has drums some played with the bare hands and some with slicks. Band may be up of from 5 to 20 or more pieces.

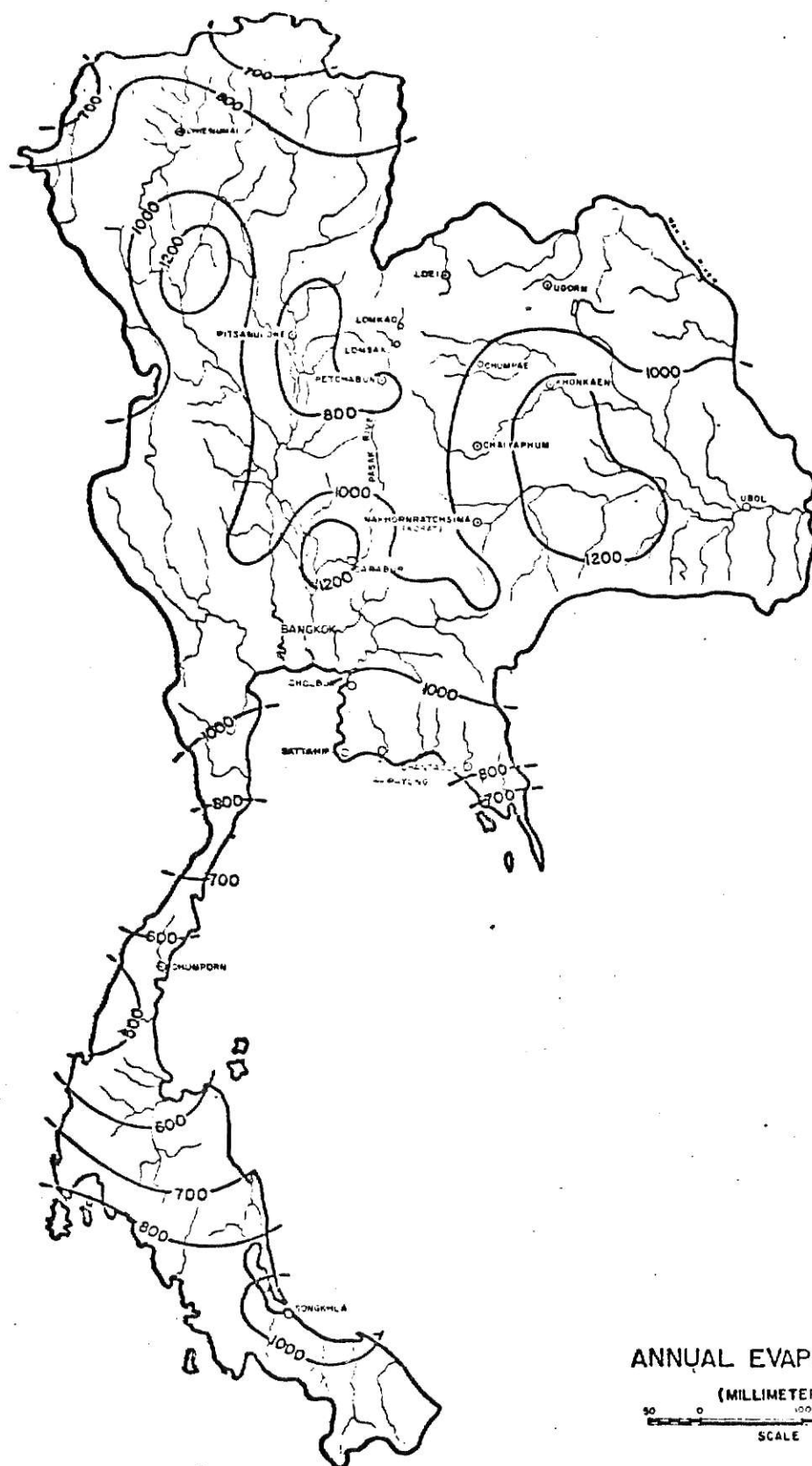
#### g. Literature

Thai literature derives in part from an oral tradition composed of folklore, tales of life of the people and historical experiences of the nation. These tales have been preserved from generation by oral communication, as a result of which multiple version of the same stories are common. This tradition has served as an important source of inspiration for subsequent classical and popular literature. Its basic characteristics include admiration for wit and human and appreciation of nature.

**THIS BOOK  
CONTAINS  
NUMEROUS PAGES  
WITH DIAGRAMS  
THAT ARE CROOKED  
COMPARED TO THE  
REST OF THE  
INFORMATION ON  
THE PAGE.**

**THIS IS AS  
RECEIVED FROM  
CUSTOMER.**







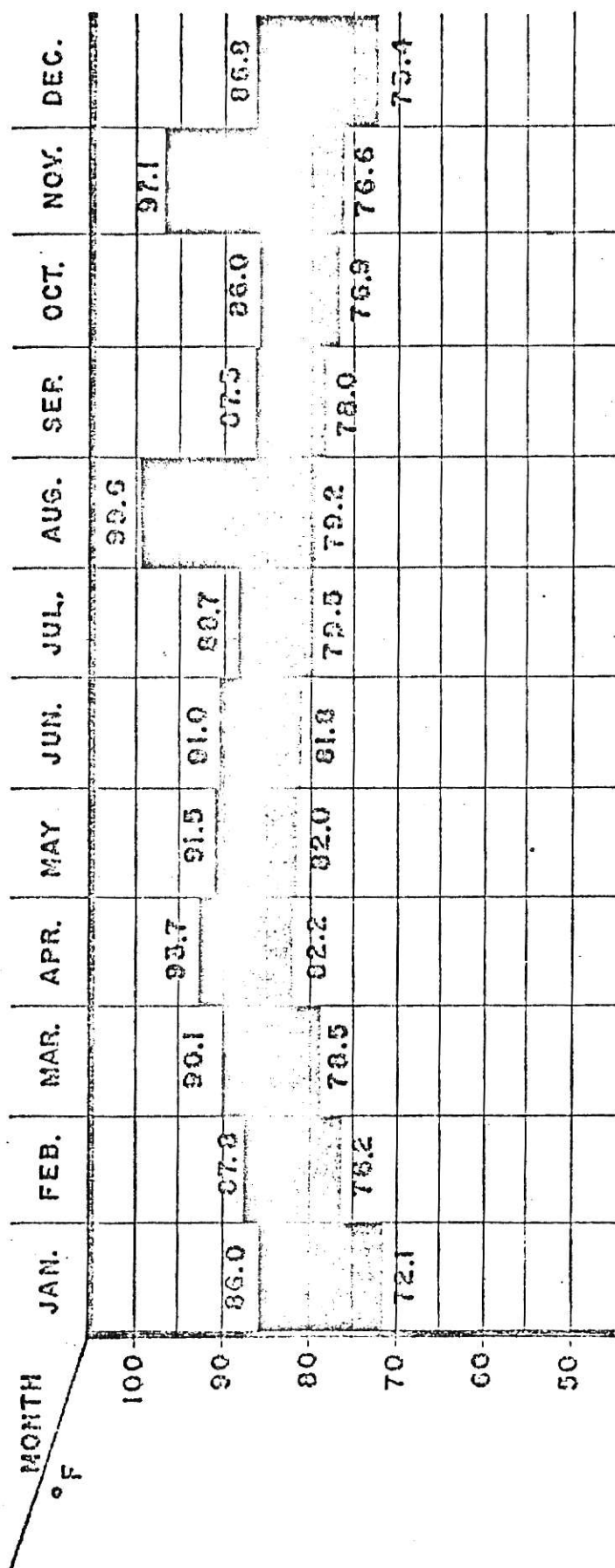
MONTH PERCENT	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.
100												
90												
80		83.2	84.0	81.1	83.7	79.7	82.2	82.9	88.0	88.2	80.6	
70	72.4											75.4
60							68.0		69.3	70.9		
50								66.3			64.0	
		59.8	63.5	59.9		65.3	64.5					
												55.2
	60.5											

RELATIVE HUMIDITY  
AVERAGE MONTHLY

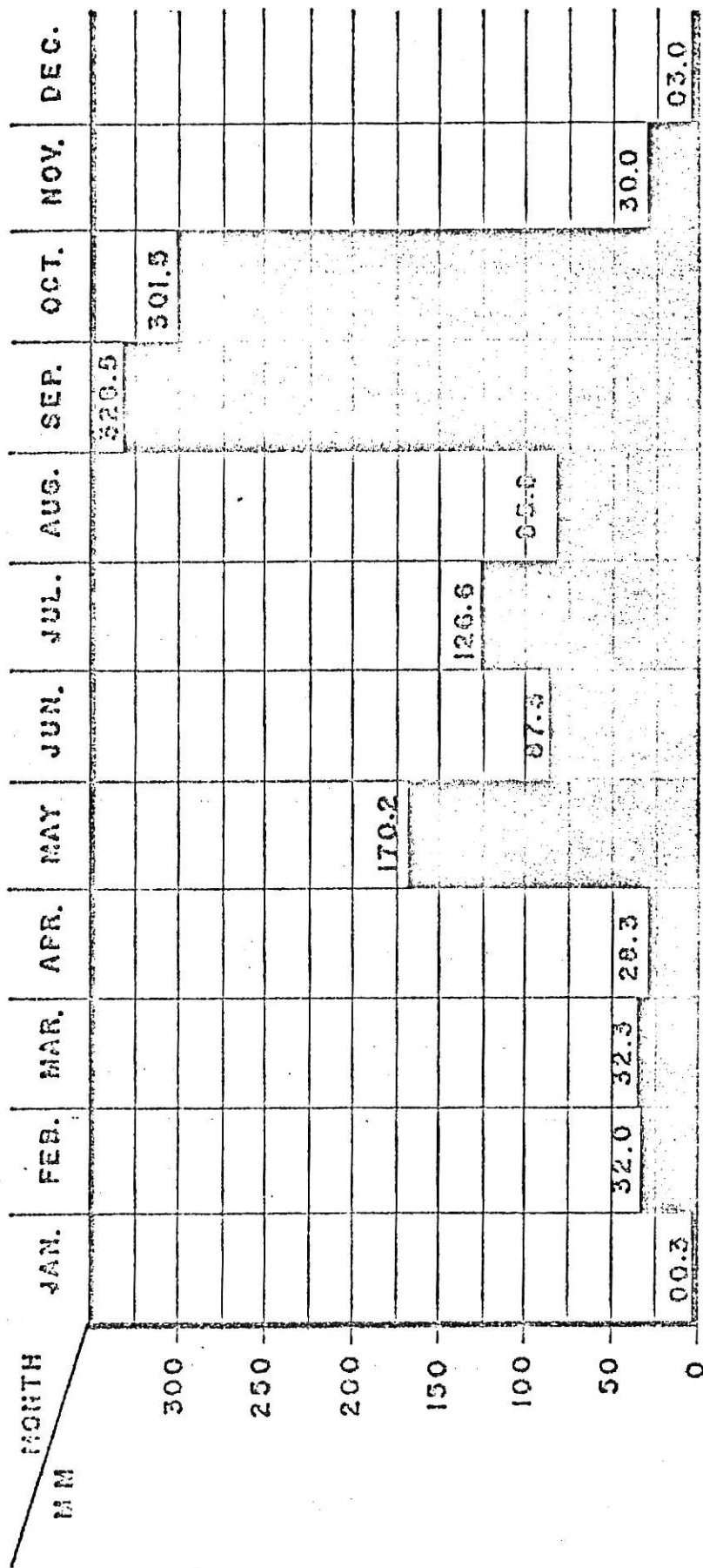








DRY BULB TEMPERATURE  
AVERAGE MONTHLY

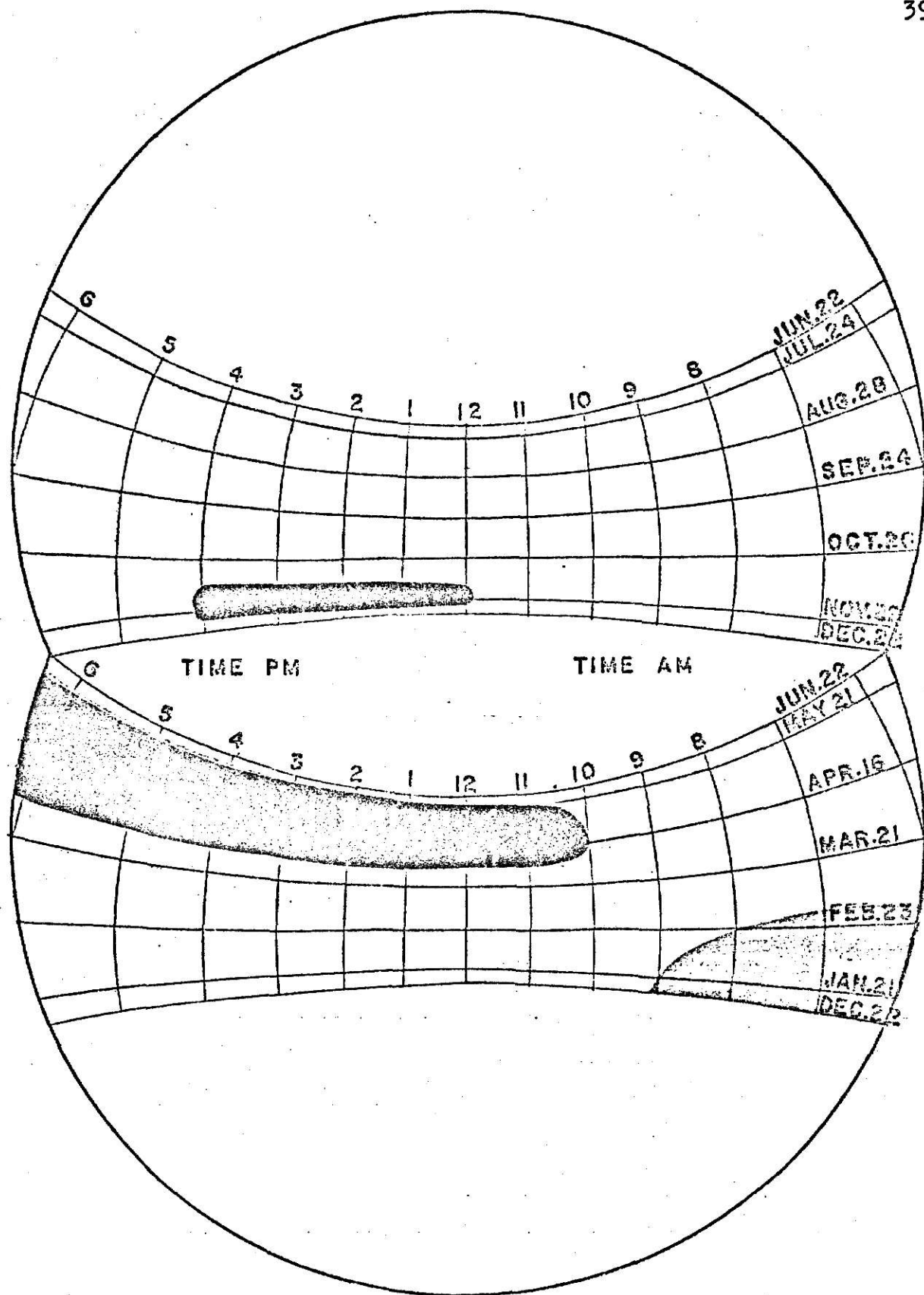





RAIN FALL  
AVERAGE NUMBER  
OF DAYS OF RAIN PER YEAR

MONTH HOUR	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.
	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
AM	65.2	71.2	74.0	77.6	76.5	76.2	74.5	74.5	74.9	71.8	70.3	66.7
	68.0	73.0	75.6	79.2	78.5	77.1	76.0	75.8	76.0	73.2	73.5	69.5
	70.9	74.9	77.4	80.8	80.0	77.8	77.8	76.5	77.3	74.3	76.3	70.9
	72.7	76.7	79.9	81.2	81.2	78.2	79.0	77.9	79.9	76.0	78.6	72.5
	74.1	77.3	79.9	81.2	81.2	78.2	79.8	78.1	79.7	77.0	80.0	74.0
	75.1	78.4	80.3	81.2	81.2	79.0	80.2	79.9	80.0	77.5	80.0	73.0
PM	75.8	76.9	80.6	81.2	81.2	79.2	80.6	79.0	80.7	79.1	80.0	75.8
	75.9	79.0	80.9	81.2	81.2	79.3	80.9	79.1	80.8	78.3	80.0	76.0
	76.0	79.1	81.0	81.2	81.2	79.4	81.0	79.2	80.9	78.5	80.0	77.3
	75.6	78.8	80.6	81.2	81.2	79.2	80.6	79.2	80.2	78.0	80.0	75.0
	74.5	78.0	80.0	81.2	81.2	78.9	80.0	77.6	79.7	77.2	80.7	74.6
	73.0	77.0	79.1	81.2	81.2	78.5	79.2	77.0	79.1	76.4	79.0	73.2

EFFECTIVE TEMPERATURE  
AT EVERY HOUR FROM SUN RISE TO SUN SET

COOL  
COMFORT  
HOT



 COLD (BELOW 71°F)  
 COMFORT (71°F-81°F)  
 HOT (OVER 81°F)

EFFECTIVE TEMPERATURE

#### IV. FACTORS AFFECTING DESIGN

##### 1. CLIMATE\* (see plates pages 30-39)

###### a. Seasons

There are three seasons in this region: the rainy season (May-November), winter (November-February), and summer (February-April).

The rainy season is the longest season in Thailand. The greatest quantities of rain fall in this area in September and October when the southwest monsoon sweeps in from the Gulf of Thailand and strikes the high mountains.

In winter time, the cold weather is mitigated by the northeast monsoon winds which blow warm air from the continent, as well as warm steam from the ocean.

Bangkok itself is located about 25 miles from the ocean. The yearly average temperature in Bangkok is  $89^{\circ}\text{F}$ . It is quite hot in summer and not too cold in winter. The average temperature in summer and in the rainy season is  $85.4^{\circ}\text{F}$ .- $90^{\circ}\text{F}$ ., and in the nominal winter,  $75.8^{\circ}\text{F}$ . The total mean rainfall is 50 to 70 inches.

###### b. Prevailing Winds

Wind is the most useful natural means for ventilating a building in tropical regions. When designing buildings without provision for constant air-conditioning, the buildings should allow for the maximum passage of air. At the coast, the winds blow from the sea to the land during the day and from the land to the sea during the night. The best orientation for catching the cooling and dehumidifying breeze and

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\*Area Hand Book for Thailand, June 1963 by George L. Harris

dispersing the heat, obviously, is to design the buildings with long open sides facing the wind directions.

c. Humidity

The yearly average humidity of Thailand varies little; it is between 75% to 85%. Because of the high temperature and high humidity amidst heavy rainfall, most buildings are built very open with overhangs and sunshades not merely to cut the glare of the sun and its heat from penetrating into interior space, but mainly to protect the interior space against rain and consequent humidity infiltration while at the same time allowing dehumidifying ventilation to go through windows or louvres under the protection of the great overhang.

2. BUILDING MATERIALS

a. Availability of Building Materials in Thailand

Wood

This common material has been used extensively in building construction in hot-humid countries, especially in Thailand. The qualities of wood are categorized into three grades: A, B, and C.

Teak

Teak has the highest quality which is in Grade A, but at the present time it is quite expensive because the supply is low while the demand is high.

Red Wood

Red Wood, Takien and Teng are in Grade B, their qualities are relatively good and may be used the major structure members. Although cheaper than teak, their strength is more or less close to that of teak.

### Yang

Yang is cheap yet reasonably strong; it is placed in Grade C. However, it shrinks every so often and is easily destroyed by termites and moisture. It is therefore used only for temporary buildings.

### Concrete

Concrete and cement product are becoming more and more extensively used for building construction in Thailand. Cement and cement products are being produced by the large cement factories in the country.

Reinforced concrete is very popular because of new techniques and methods in production. Pre-cast concrete prefabricated concrete, shell concrete, long span prestressed concrete beams, floating concrete, and concrete block are used extensively in most structures.

### Bricks

There are two kinds of bricks which have been used in Thailand for years. The standard size is: 5" wide 10" long and  $1\frac{1}{2}$ "-2" thick.

1. Bang-Boa-Tong has a fine and beautiful texture and furthermore this kind of brick will stand up to a relatively high pressure.

2. Morn-Bricks have lower quality than Bang-Boa-Tong brick in terms of both beauty and capacity; but the price is cheaper. They are used for lighter construction works.

### Concrete Blocks

This kind of material is very useful in the hot-



humid tropical countries for sun control, ventilation, protection from rain, and are simple and economical to produce.

#### Roofing Materials

1. Asbestos cement sheets are used commonly in the tropics if there is a high amount of precipitation.

2. Continuous Waves Cement Tile and Double Waves Cement Tile are made in 3 x 6 feet and 4 x 8 feet by one of the cement factories. They are cheap and satisfactory for use in the tropics.

3. Aluminum sheet are generally used for houses and other contemporary buildings.

#### b. Imported Materials

##### Rubber Tiles

Most of the rubber tiles used in construction are imported from Japan, U.S.A. and Germany.

##### Paints

Most of the paints are imported from foreign countries. Locally-made paints are not desirable in term of quality.

##### Aluminum Products

The aluminum window and door frame, grilles, and other products are used extensively in modern Thai architecture.

##### Steel Rods

High tension and special quality steel rods are very high in demand in the market, and are imported from Japan and Taiwan.

## II. REFLECTIVITY OF BUILDING MATERIALS AND OUTSIDE SURFACES

(SOLAR RADIATION)

Material	Reflectance (%)	Approximate Reflectance (%) of Color
Aluminum Paint	45	Azure Blue 55
Aluminum Polished	85	Brown 40-20
Asbestos Cement	29	Buff 70-40
Asphalt	15	Buff Stone 20
Asphalt (free from dirt)	7	Cardinal Red 20
Black Mattle Paint	3	Dark Gray 19
Blue Stone	18	Gray 70-44
Blick, Light Buff	48	Green 55-20
Dark Buff	40	Ivory White 80
Dark Red Glazed	30	Ivory 71-63
Cement	27	Pearl Gray 72
Chromium Plate	72	Pink 70-50
Concrete	55	Red 40-15
Copper Polished	75	Shell Pink 54
Desert	24-28	Sky Blue 37
Earth (Moist cultivated)	7	Tan 50-30
Fields, Green	3-15	White 83
Forest, Dark	5	
Granite	40	
Granolite Pavement	17	
Grass, Dry	32	
Grass (Dark green)	6	
Gray Paint	25	
Gravel	13	
Ground, Bare dry	10-25	
wet	8-9	
Indiana Limestone	43	
Leaves, Green	25-32	
Macadam	18	
Marble (White)	45	

## III. REFLECTIVITY OF MATERIAL

<u>Color</u>	<u>Material</u>	<u>Solar Reflectance</u> <u>Percent</u>
White	Plaster	93
	Paint	75
	Snow	74
	Cardboard or paper	64-70
	Asbestos cement	58
	Steel sheet	57
	Marble	45
Light buff	Brick	48
Dark buff	Brick	40
Sand	Sandstone	31
Red	Asbestos cement	31
	Clay tile	38
Dark red	Brick	30
	Steel sheet	19
Cream	Brick (Gault)	64
	Paint	60
Blue	Brick (Stafford)	11
Light green	Paint	50
Green	Steel sheet	24
	Marble	34
	Vegetation	25
Dark green	Grass	6
Brown	Concrete tile	15
Light gray	Slate	21
Gray	Paint	25
Dark gray	Slate (Smoth)	11
	Slate	8
Black	Paint	7
	Concrete tile	9
	Matt fin.	3

### c. Building Hardware and Sanitary Equipment

The locally made products are not as good in quality and beauty as are the imported products. Their low prices do not compensate for their poor qualities, and hence, they are not used in contemporary construction. The better quality building hardwares are imported from England, Belgium and Japan.

## 3. PUBLIC UTILITIES

### a. Electricity

Available from the Central Electricity Board, Electricity Organization of Thailand. Standard electricity supply is of the 220 volt, 3 phase, 50 A.C. current. Connection to the main is controlled by the Electricity Department of the Organization.

### b. Water Supply

Water supply is by the Water Works Department, Municipality of Bangkok. Charges are based on bulk system.

### c. Gas

Gas usually comes in tanks, but it will be available from the mains in the next few years.

### d. Refuse Disposal

Refuse disposal are:

1. Combustion in incinerators.

2. Disposal by the Municipal Workers and Cleaning Department. Wrought iron bins of 10 cubic feet (2' x 2' x 2' 6") are provided and placed in convenient position for collection by the Department.

e. Sewage

Disposal is controlled by the Water Works Department through septic tanks on each site drainage into the underground water.

4. MUNICIPALITY OF BANGKOK AUTHORITIES AND BUILDING REGULATIONS\*

The Municipal Architect: approves proposed building scheme.

The Municipal Sewage Engineer: sewage system and engineering works.

The Municipal Surveyor: site surveys, etc., issue certificate of fitness for occupancy.

Building By-Law (Bangkok): Building regulations and requirements.

a. Public Building

"Public Building" means a building used or constructed or adapted to be used as a school, college, hospital, hotel, church....or used or constructed or adapted to be used for any other public purpose.

b. Open Area in Rear of

Public buildings, warehouses abutting a back lane shall have an open space inclusive of half of the back lane equal to 10% of the building area and all such buildings

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\*Thailand: Facts and Figures 1966

(Department of Technical and Economic Cooperation Ministry of National Development, Thailand).

shall be provided with quarters for a watchman and such quarters shall be provided with bathroom and latrine.

c. Detached House Boundaries

For a detached house there shall be at least two meters clear between the building and the boundaries of its plot.

d. Corridor Width

No corridor shall be constructed less than one and one-half meters wide.

e. Corridor Lighting

All corridors shall be efficiently lighted by openings to the external air.

f. Fire Escape

Every building used for manufacturing, trade purposes, or public assemblies shall be provided on every story with separate and adequate means of escape in case of fire as the Municipal Commissioners may direct.

g. Buildings of Iron or Glass

Buildings known as frame buildings or buildings made wholly or partly of glass, iron or other material not provided for in these By-Laws shall be subject to the approval of the Municipal Commissioners in each particular case. Plans and specifications and calculations shall be submitted.

h. Projection of Footings

The projection at the widest part of the footings of every wall on each side of such wall shall be at least equal to one-half of the thickness of such wall at its base unless

an adjoining wall exists, in which case the projection may be omitted where that wall abutts.

i. Width of Offset of Footings

The dimensions of the footings shall be in regular offsets or in one offset at the top of the footings and the height from the bottom of the footings to the base of the wall shall be at least equal to two-thirds of the thickness of the wall at its base, the lowest footing to be at least two courses high. No one course offset shall project more than 70 centimeters beyond the course above it.

j. Every Building to Have a Separate Approach

Every building not abutting on a street shall have a right of way for an approach from the street open to the sky and at least 6 meters in width.

k. Thickness of Walls in Public Buildings

Every wall of a public buildings shall be constructed of the following thicknesses:

1. In buildings 7 meters high or under, the thickness of the wall shall be 30 centimeters throughout.

2. In buildings from 7-12 meters high, the thickness of wall shall be 40 centimeters for the first story, 30 centimeters all above.

1. Height of Story

No story of public building shall be less than 3 meters and shall be over 6 meters high without the permission in writing of the Municipal Commissioners who may in every such case prescribe to what extent the walls shall be increased in thickness or otherwise strengthened.

m. Thickness of Cross Walls

The thickness of every internal cross wall shall be at least two-third of the thickness prescribed for an external or party wall of the same height and length, provided that if such cross wall supports a load the whole of such cross wall shall be of the thickness prescribed for an external or party wall and all cross walls shall be bounded to the main walls to which they abut.

n. Walls, Openings In

Every building having an extent of opening in any external wall which is greater than one-half of the vertical face or elevation of that wall or of the story in which the opening is left, shall be constructed with such piers of brick or other supports of incombustible material and so disposed as to be sufficient to carry to the superstructure.

o. Reinforced Walls

Approved reinforcement properly clean and without rust and bedded in cement or other suitable bondings shall be built in the walls where required by the Municipal Building Surveyor.

<u>For a floor intend to be used for purpose of</u>	<u>Equivalent dead load in kilograms per sq. m.</u>
Offices	450
Churches	500
Lecture rooms	500
Public assembly	500
Workshops	500
Domestic buildings	300



p. Staircase Not Less Than 1 Meter Clear Width

Every main staircase shall be not less than 1 meter clear width with not more than 17.5 centimeters risers and not less than 20 centimeters going.

q. Handrails and Exits

All staircases shall have proper handrails and balusters, and shall be situated in such portion of a building as will reasonably afford the best means of exit in case of fire and shall be adequately lighted.

r. Building 20 Meters Deep to Have Two Staircases

All buildings 20 meters or more in depth abutting on a street shall have at least one staircase in addition to the main staircase not less than 1 meter wide, from uppermost floor to the ground floor.

s. Staircases to be Enclosed by Brick Walls

The floor of every lobby, corridor passage and landing and every flight of stairs and all supports of such floor and flight of stairs in every public building and business premises shall be constructed of incombustible and fire-resisting material.

t. Gable to be Vented

All external gables shall be provided with sufficient openings to promote circulation of air.

u. Room, Ventilation of

No room in any building shall be a greater depth than 12 meters unless it is sufficiently lighted laterally, or at both ends, by one or more openings free of any obstruc-

tion and communication directly with the external air. Where one air-well is provided, it shall not be less than 12 square meter for three story buildings, but in such case no single airwell shall have a less area than 5 square meters, of unobstructed daylight.

v. Area or Rooms

No room, used as a bed room, cubicles excepted, shall be of less than 14 square meters or less than 2.40 meters wide and when not cross ventilated not less than 16 square meters in area.

w. Width of Buildings

No domestic building shall have a less width than 4.80 meters in the clear, such width shall be measured at ground floor level between walls of any shop house or terrace house. For corner sites 3.50 meters in the clear.

x. Height of Stories

No ground floor story shall be constructed of less than the following height measured vertically from floor to ceiling.

1. In buildings other than outbuildings, 3 meters.
2. In outbuilding consisting of:
  - a. Rooms other than bathrooms or latrines, 2.50 meters.
  - b. Bathrooms or latrines or both, 2.20 meters.

On upper story shall hereafter be constructed so as to be less than 2.50 meters in height measured vertically from floor to ceiling.

y. Height of Buildings

The height of any building, measured to the top of the wall plate above the center of the street, not being a domestic building in a business or office area abutting on a street, may not exceed in height one and one-half times the width of the street except with the sanction of the Municipal Commissioners.

The decision of the Municipal Commissioners as to whether an area is a dwelling house area or office area shall be final.

V. FACTOR TO BE CONSIDERED IN THE DESIGN OF A BUILDING IN  
THE HOT HUMID TROPICS\*

1. Humid tropics demand heavy shade externally provided by sunshade devices and large overhangs which give protection from the rain and sun.

2. An open plan and wall spread out layout, taking advantage of the prevailing breezes.

3. All light-frame structure allowing maximum openings. The wall should be thin and have openings large for maximum air movement.

4. The building should expose its greatest length and its open side to the prevailing breeze.

5. The building should be preferably be only one room thick to insure cross-ventilation.

6. Heavy rainfall and excessive run-off will influence the site of the buildings.

7. It is preferable to raise the buildings on stilts to remove them from the ground radiation and to allow them to take advantage of cool night temperature from all sides.

Thus, ideally, a hot humid tropical house is a thing of point supports, a light framework allowing the maximum of openings adjustable louver. Windows, mosquito screening, and whatever other devices can be invented to induce ventilation and keep out sun, rain and insects. Economy may dictate

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\*The Design of a College Preparatory Boarding School for Thailand, V. Charusorn, 1971

cheaper and heavier construction, but adequate ventilation must be provided where it is required.

## VI. MATERIALS AND METHOD OF CONSTRUCTION\*

The factors which effect the selection of materials are availability, cost, requirement of building regulations, the ability of the materials to stand up to prevailing climatic conditions, and the standard of workmanship as communications and transportation improve in Thailand, the range and choice of building materials increase. Since the cost of imported materials, due to shipping, insurance and custom charges is high, there is a marked tendency towards the protection of local materials. This is evident in the case of cement, with resulting greater use of concrete products. The cost of buildings in Thailand is based on the rates of labor cost, both for construction and manufacturing of materials, which is usually low in most tropical countries such as Thailand. The cost of building, however, should not be estimated exclusively on the basis of its initial cost. The cost of maintaining its integrity while exposed to harsh conditions is also a vital factor of consideration.

The standard of workmanship affects the performance of any material. Many imported materials or components may require special skills in fixing. Supervision may be needed to guide inexperienced labor.

High temperatures in Thailand can cause fundamental changes in organic materials such as paints, plastics, bitumen, and rubber causing deterioration. Temperature fluctua-

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\*The Association of Siamese Architects Journal, Bangkok, Thailand, 1966

tions can cause thermal movement resulting in cracking, distortion or discoloration. Prolonged high humidity promotes mold or algae growth. Wide daily range in relative humidity causes dimensional changes in timber. Although Thailand like other tropical areas, has less atmospheric pollution, there are other factors to contend with such as the problem of termites, seasalt in the atmosphere of maritime areas which promote the corrosion of metals and degrade paint films, and of expansive clay soils on which a method of tied and combined foundation on pile may be needed.

## VII. SITE SELECTION AND DESIGN CONCEPT

Considerations for selecting an appropriate site is a component of many factors. Due to the nature of use, this Cultural Complex should be located near a public use area, preferably in close proximity to other facilities of similar nature.

Only 3% of all the families in Bangkok have access to an automobile. Public transit system is therefore a major means of transportation. This complex should therefore be conveniently accessible via mass transit.

The performing facilities, especially the outdoor theater, should be acoustically isolated from outside noise. This may be accomplished by isolating the location from other parts of the city district in terms of distance, earth mounds, and/or heavily planted vegetation.

The site selected for this proposed complex is close to the existing museum complex, temple, and a public park. It is fringed by a school and a temple on the north, a canal on the south with the school of Music and Drama across the canal, a park and a governmental administration center on the east, and a river on the west. In most cases, trees fairly well screen and frame very interesting open spaces. The site is serviced directly by 5 different bus routes, with 15 more routes within fifteen minutes walking distance.

The design concept, based on functional relationship, shows that art exhibition and library areas are related, with conference room and administrative offices functionally in



close proximity, and are designed to share common areas such as lobby, and plaza, allowing both visual continuity and functional conveniences.

From both the point of view of acoustics and design concept, the auditorium and outdoor theater are tied to other areas by only the plaza. In this case, the plaza serves three main purposes. First, it allows people to relax outdoor in the evening. Secondly, it prevents sound transmission from the performing functions to disturb the other activities, and serves to keep noise from other buildings disturbing performances. Thirdly, the plaza visually ties the entire complex together.

The building design itself has its own character, and the form is an honest expression of the building function. The important element in this design is that functions are physically quite well related. The form, therefore, is a harmoniously composed expression. Furthermore, the tight relationship of function allows continuity in the circulatory systems within the building.

The pedestrian and vehicular entrances are separate. Parking garage is at the semi-basement level, with lobby and office on this same level. Lobby, lounge, and other services are on the ground floor, fringing the auditorium and closely tied to the outdoor theater. In the evening, the outdoor theater is in the shadow cast by the auditorium to allow the use of the theater at a prime time-early evening. The following illustrates various functional relationships.

## VIII. BUILDING PROGRAM ANALYSIS AND SPACE REQUIREMENTS

## A. MUSEUM CENTER

## a. Administration Office

1. General office . . . . .	45	m <sup>2</sup>
2. Information office . . . . .	15	m <sup>2</sup>
3. Accounts and financial . . . . .	30	m <sup>2</sup>
4. General records . . . . .	30	m <sup>2</sup>
5. Public relations . . . . .	70	m <sup>2</sup>
6. Exhibition office . . . . .	40	m <sup>2</sup>
7. Public lounge . . . . .	30	m <sup>2</sup>

## b. Exhibition Hall

## 1. Permanent exhibition

- Painting . . . . .	200	m <sup>2</sup>
- Sculpture . . . . .	200	m <sup>2</sup>
- Architecture . . . . .	200	m <sup>2</sup>
- Handicrafts . . . . .	200	m <sup>2</sup>
- The national heritage in dress . .	200	m <sup>2</sup>

2. Temporary exhibitions . . . . .	300	m <sup>2</sup>
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## c. Cafeteria

1. Dining area . . . . .	120	m <sup>2</sup>
2. Kitchen & Bar . . . . .	30	m <sup>2</sup>
3. Storage . . . . .	25	m <sup>2</sup>

d. Conference Hall for 200 persons . . . . .	144	m <sup>2</sup>
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e. Meeting Room for 20 persons . . . . .	40	m <sup>2</sup>
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## f. Art Library

1. Book stack . . . . .	200	m <sup>2</sup>
2. Study space . . . . .	375	m <sup>2</sup>
3. Check out area . . . . .	30	m <sup>2</sup>

4. Lounge . . . . .	20	m <sup>2</sup>
5. Storage . . . . .	88	m <sup>2</sup>
g. Ceremonies and Religion Room for a Formal Interpretation of Religious Ceremonies . .	150	m <sup>2</sup>
h. Wedding Room . . . . .	62	m <sup>2</sup>
i. Main Public Lounge . . . . .	200	m <sup>2</sup>

## B. THEATER AND MUSIC CENTER

### a. Auditorium for 2,000 Persons

1. Stage . . . . .	192	m <sup>2</sup>
2. House . . . . .	970	m <sup>2</sup>
3. Hall and public space . . . . .	635	m <sup>2</sup>
4. Balcony . . . . .	620	m <sup>2</sup>
5. Toilets room . . . . .	232	m <sup>2</sup>
6. Refreshment area . . . . .	176	m <sup>2</sup>
7. Ticket booth . . . . .	24	m <sup>2</sup>
8. Auditorium office . . . . .	200	m <sup>2</sup>
9. Dressing area . . . . .	180	m <sup>2</sup>
10. Green room . . . . .	200	m <sup>2</sup>
11. General storage . . . . .	80	m <sup>2</sup>
12. Work shop and storage . . . . .	300	m <sup>2</sup>
13. Mechanical room . . . . .	180	m <sup>2</sup>

### b. Outdoor Theater for 1,000 Persons

1. Stage . . . . .	105	m <sup>2</sup>
2. Audience area . . . . .	625	m <sup>2</sup>
3. Toilets room . . . . .	140	m <sup>2</sup>

### c. The several functions of an auditorium are:

1. Public circulation
2. Performers' circulation
3. Backstage circulation
4. Maintenance circulation

1. Public circulation

#### Auditorium entrance hall

- An auditorium entrance hall is used as a transitional space between the intermission hall and the auditorium. It also is used as a circulation hallway. It has several entrances to the auditorium for easy access. The auditorium entrance hall is designed so that it will also help in blocking the noise from the intermission hall to the auditorium and noise in the entrance hall itself. A highly absorbent acoustical material such as slats of teak wood, which is a native product, over 3-4" of fiberglass is used as an acoustical material in this area (see drawing No. 3, p. 106).

#### Ticket office

- located at the basement lobby in front of the auditorium office (see drawing No. 2, p. 105)
- required 1 person/500 patrons, (as many patrons have reserved ahead)
- efficiency a key-note

### Intermission hall

- There are several entrances to the intermission hall from the main plaza. There are several convenience facilities located in the intermission hall such as bar area, storage area, and restroom facilities. The entrance-ways are open to take advantage of the views. Entrance to the ticket office in the basement is through this area (see drawing Nos. 3 and 4, p. 106-107).

### Washrooms

- Men - 5 urinals, 5 basins, 2 water closets, 1,000 seat (approx. 1 sq. m. per w. c.)
- Women - 5 toilets and basins per 1,000 seats and powder room

### Auditorium (see drawings, p. 66-69)

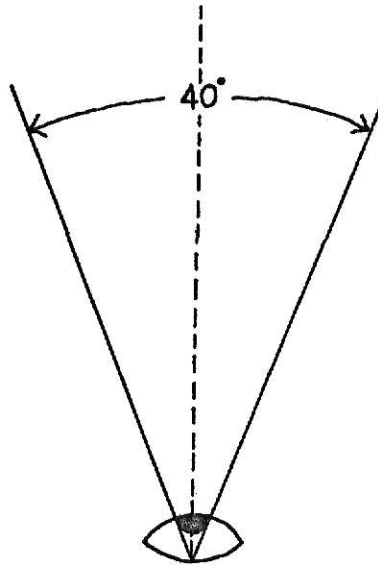
- The form and aesthetic considerations for this auditorium are a combination of acoustical considerations function and sympathy with its environments. The free-form in this case, is a direct result of acoustical design. Its form, however, creates an interesting atmosphere in the interior. The cross aisles with islands of seats is being used to relieve monotony and provide circulation to the exits at sides (see drawing No. 3, p. 106).
- Seating for 2,000 persons at .90 sq. m. per person (including circulation).

- Seats should not be less than 20 inches wide.
- The minimum back-to-back distance between rows for comfort and easy access is 0.90-1.00 m.
- The rows of seats should be curved so that each seat is set at right angles to the focal point of vision. Generally, the radius for the front row is at the back of the stage.
- To get maximum from the best seat locations.
- Occupancy of 2-3 hours.
- Should be inviting, stimulating, exciting and yet able to fade into complementary background during presentation of show.
- Maximum audience enjoyment of show occurs when characters on stage are not visually distorted. To achieve this, no seats should be at a greater vertical angle from the base line of the proscenium than 30 degrees; and the horizontal angle to the center line at which objects on stage, upstage of the curtain line, cease to bear the intended relationship to other objects onstage and to the background is approximately 60 degrees.
- Clear sight lines from all seats, by staggering of seats, sloping orchestra floor and stepping of balcony should be maintained.
- Spot light and stage light control booths should be provided.

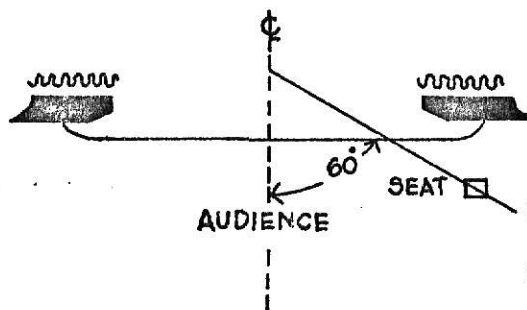
- Optimum temperature of auditorium is 67-70 degrees.
- Warm, neutral lighting desirable within the auditorium.

#### Cocktail bar

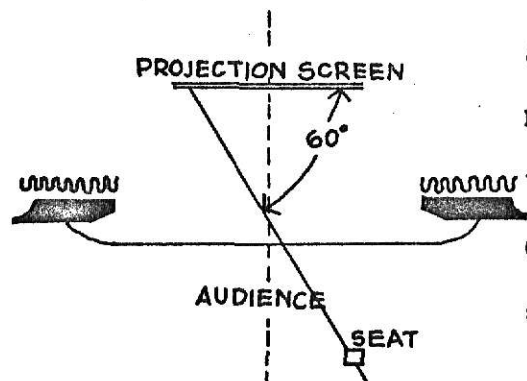
- Located in the center of the intermission area  
(see drawing no. 3-4, p. 106-107)
- Oriented to all users of intermission hall and directly accessible thereto--for the sale of hot and cold beverages, liquor, cocktails, etc.



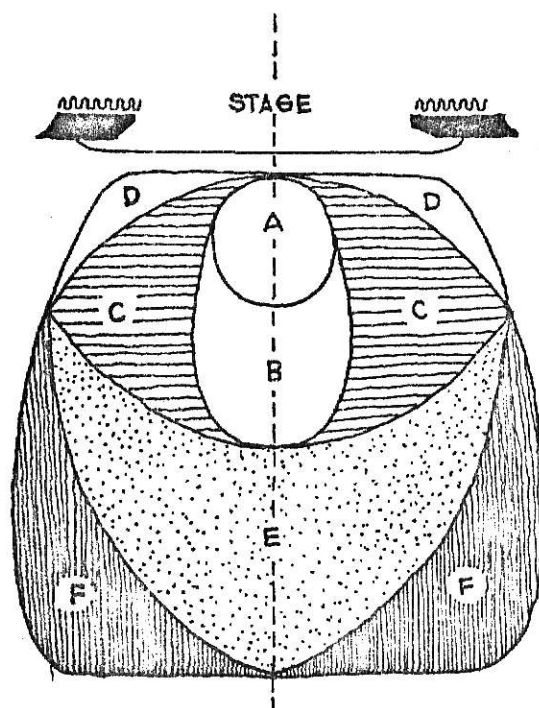
The horizontal angle of polychromatic vision (no eye movement) is approximately  $40^{\circ}$ .



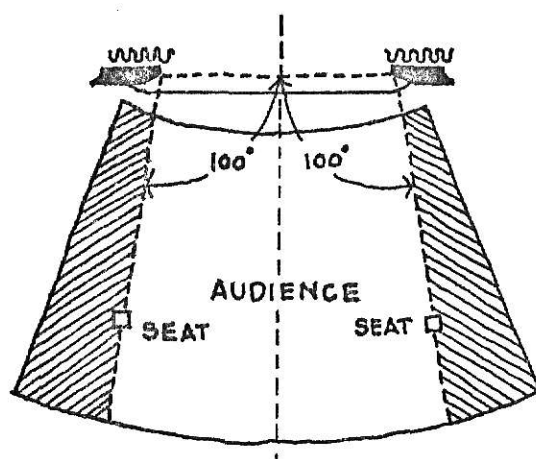
The horizontal angle to the center line at which objects onstage, upstage of the curtain, cease to bear the intended relationship to other objects onstage and to the background is approximately  $60^{\circ}$ . The horizontal angle to the projection screen at which distortion on the screen becomes substantially intolerable is  $60^{\circ}$ .



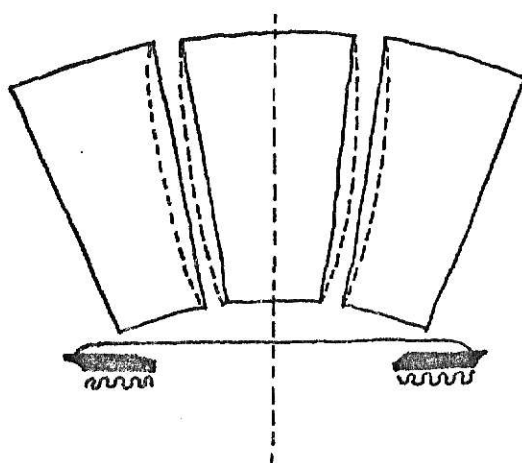




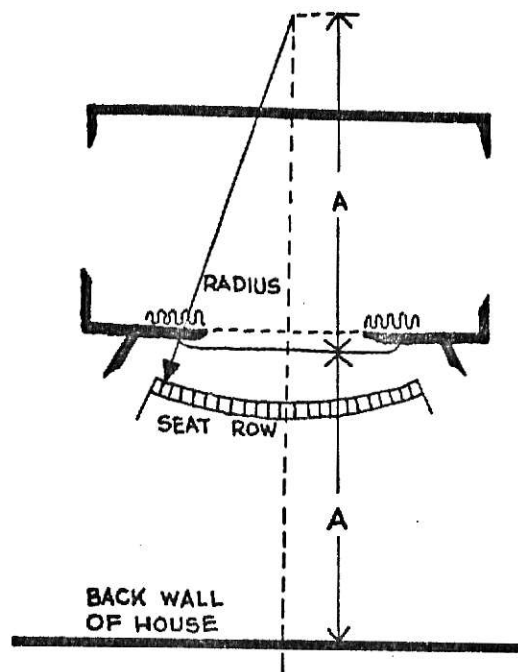
Based on the ability to recognize shapes and confirmed by sequential seat selection of unreserved seats, the order of desirability of location is:  
 A. front center, except when the picture screen is close to the front row; B. middle center; C. middle side; D. front side; E. rear center; F. rear side.



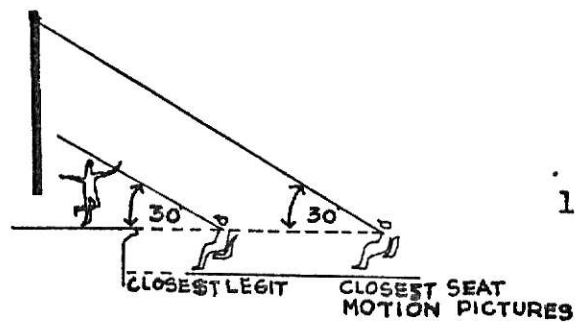
Audiences will not choose locations beyond a line approximately  $100^{\circ}$  to the curtain at the proscenium. The shaded areas contain undesirable seats.



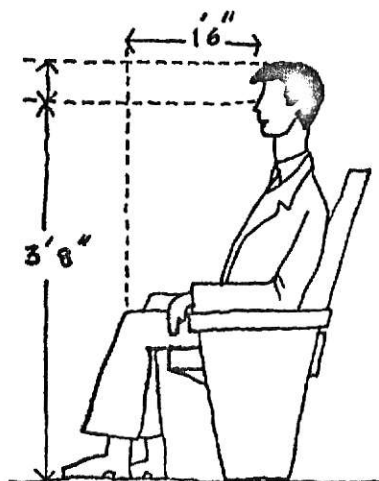
Straight radial aisles are better than aisles which curve or bend.



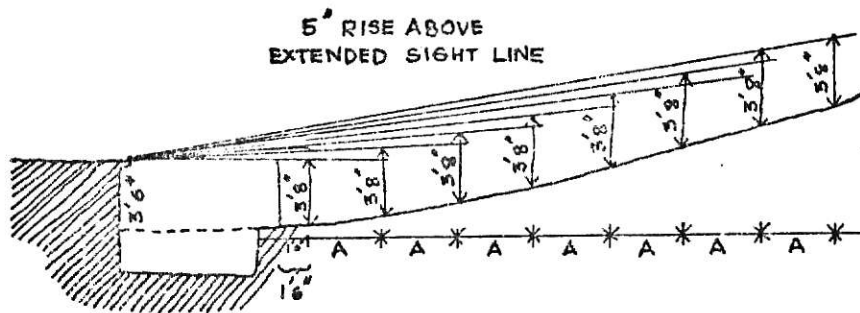
Location of center of curvature of rows of seats.



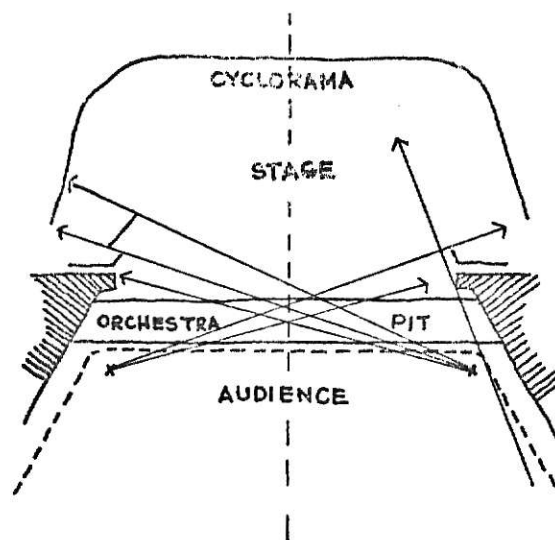
Maximum angle determines location of closest seats.



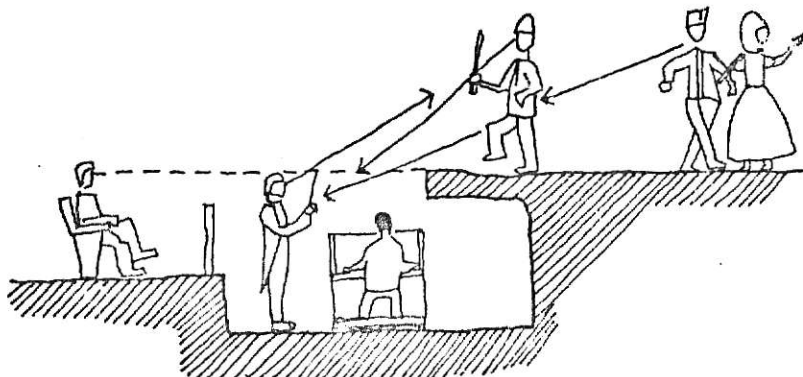
Basic dimensions for plotting floor slope.



Developed floor slope for unobstructed vision.



The basic sight lines.



Sight lines relating to the orchestra pit: patrons' vision must not be obstructed by orchestra or conductor; performers must see conductor; conductor must see singers.

## 2. Performers' circulation

- Director's - for 1 person up to 3 persons.
- Office - close to green room.
  - exit leading to the back stage corridor should be provided.
- Conductor's - for 1 person to rest and study.
- Office - exit leading to the orchestra pit.
- Musician room - Basement level near pit and stage.
- Actors' dress-
  - ing rooms - one for men and the other for women.
    - minimum 0.14 sq. m./person.
    - minimum width 3.50 m.
    - dressing table, lights, clothes, cupboard for hanging items.
    - full length mirror.
    - toilet facilities.
    - near stage and green room.
- Green room - where actors rest and wait to go on stage.
  - should be directly adjoined to the director's room.
  - close to dressing room and stage.
  - a kitchenette and snack bar are desirable.
  - stage manager check cast, assembles choruses. Director talks to cast. Actors' social room where public can meet star&cast after performance.

- Orchestra pit - accommodate 75-100 musicians.
- minimum 0.10 sq. m. per person.
  - 1.9 sq. m. for harp, 4.8 sq. m. for a piano and 4.8 sq. m. for the tympan.
  - the orchestra area should be designed as a hydraulic lift.
- Stage
- a revolving stage is desirable.
  - for production of plays, choral, operas and orchestral work.
  - base at 1.00 m. above floor level at the first row of seats.
  - removable stepped tiers for choir on stage, .10 m. risers.
  - proscenium opening approximately 17 m. wide by 9 m. high to provide adequate area for musical and large choral groups.
  - timber construction of stage floor improves resonance.
  - 2 main curtains for proscenium, both of fly type (go up when opened and fall down to close).
- Stage house - a fire curtain should be provided.
- fly gallery - gridiron-an open-work floor of steel should be provided, on which ropes or wires will be dropped for suspension of scenery, lighting equipment,

etc. minimum headroom 1.90 m. under roof girders.

- a spiral staircase, access to fly gallery and gridiron.
- fly gallery - for the operation of fly systems.
- flying light bridge - suspended from wire ropes, directly behind the teaser.
- provide automatically controlled louvers for ventilation and fire protection.

#### Cyclorama\*

- To supply the ultimate scenic background. With representational scenery, the cyclorama has some recognizable scenic aspects: commonly sky, less commonly landscape, forest, seascape. With abstract scenery the cyclorama may be a decorative curtain hung to enclose the scenery space, a back velour curtain hung flat or in folds to absorb all light and give a background effect of total darkness, or various other fabrics or combinations of fabrics, variously lighted

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\*Theater and Auditorium, Marold Burris, Meyer, and Edward C. Cole

to make the background an integral part of the stage design. The cyclorama may be used as a screen upon which light patterns are projected, from either front or rear, as a part of the scenic scheme. These light patterns may be abstract or representational, static or mobile even motion pictures.

- To supply the ultimate masking. For open scenes the cyclorama may mask the entire stage space as delineated by the extreme horizontal and vertical sightlines through the maximum proscenium opening.

Cat walk area\*- Cat walk is the space between the ceiling and the roof, should be laid to very possible ceiling repair point, where ceiling light may be changed conveniently and comfortably without risk. It should not be necessary for maintenance personnel to climb over ducts, straddle beams, or do a tight-rope act to accomplish a repair job or even to change an electric bulb.

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\*Encyclopedic Guide to Planning & Establishing an Auditorium  
by Herman J. Penn, 1962.

Good illumination in the ceiling area is necessary. It is essential that panels be easily removed for replacement as well as for show riggings.

### 3. Backstage circulation

#### Entrance vestibule

- waiting and transition space.

#### Doorkeeper's office

- control over entrance and main circulation corridors behind stage.
- all access from exterior for performers and maintenance staff (except loading dock) to be past stage doorkeeper.

#### Loading platform

- adequate access for 2 small trucks.
- rain protection.
- adjacent to workshops and storage areas.

#### Scenery building area

- adjacent to loading platform and freight elevator.
- complete sound insulation from stage.
- minimum ceiling height is 4.20 m.

#### a. Repair shop

- work bench with carpenter tools about 4.20 m. ceiling.



b. Paint shop

- fireproof paint storage area.

c. Hydraulic lifts

- full width and length of stage proscenium x 3 m. deep for raising stage and flying scenery into position.

Wardrobe room and costume shop

- provide with costume hangers 20 linear feet, ironing board, sewing machine.
- fit, repair, store costumes up to 100 at 15 costumes/m. of hanger.
- should be direct access to dressing rooms.

Stage hand lounge

- locker for 20 men.
- provide 1 washroom.
- kitchenette is desirable.

Musical instrument storage

- complete temperature and humidity control.
- immediately adjacent to orchestra pit.

General storage

- near loading platform.
- about 4.50 m. ceiling height.
- for storing general equipment.

### Scenery storage

- easy access from workshop.
- about 4.80 m. ceiling height.

## 4. Maintenance circulation

### Mechanical service

- approximate square footage for air conditioning of auditorium and their service is about 180 m<sup>2</sup>.
- vacuum and polishing outlets to a central system should exist in all rooms.

### Projection and lighting control booths

- usually located at the rear of the upper most level of seating, it should be so planned that spotlights inside it are at an angle of between 35° and 45° of projection to the performing area that they do not "blind" the front row of spectators.
- minimum width is 3 m.

### Sound control booth and equipment

- the sound control console must be located so that the operator can see and hear the show. The best installations are in a booth with open front at the back of the house. The booth must be acoustically live so that the operator can hear as well as the

audience. Obviously, there should be direct access to the motion picture projection booth from the sound control booth.

Radio-television

- a control booth is desirable.

## IX. ENVIRONMENTAL TECHNOLOGY

### 1. LIGHTING

Lighting integrates with the design elements of architecture. It illuminates the space, expresses structure, and enhances surface characteristics. In the interest of aesthetics, lighting should be designed to harmonize with architecture and to define function in revealing manner.

Both natural light and artificial light will be used together in this design. Because of psychological and economical reasons, natural light will be predominantly used wherever possible. The problem of glare from natural light can be solved by using screen and overhangs. Trees and shrubs may help, of course.

#### a. Principles of stage lighting\*

Individual lanterns normally serve one of two purposes: either they light the acting-area or they illuminate a backing on a proscenium stage, for example, we normally direct spotlights on to the acting-area and use flood lights on a backing seen through a door. Whatever the shape of the stage-area, open or end, we must use acting-lights. Lighting the backing is normally very important on an end stage, but is less so on an open stage, and not required on an arena. But we should note that when both type of illumination are used, the acting-area is usually lit to a greater intensity than the backing.

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\*Encyclopedic Guide to Planning & Establishing an Auditorium  
by Herman J. Penn, 1962

b. Lighting backings

Lighting backings are mainly concerned with small openings in the scenery (door, window, etc.) and the wider expanse of the cyclorama. Backings behind door and windows are usually illuminated by floodlights, often on telescopic stands. But as the positions of the lanterns must vary from show to show, lighting is required at both the top and bottom of the cyclorama.

c. Lighting in the exhibition hall<sup>\*</sup>

Lighting for exhibition hall has two main methods: one is skylighting and other is artificial lighting-electrical lighting. Skylight lighting is uncontrollable and useless in evening or night time. Also it has the glare and brightness which attracts the eye to them and causes some unpleasantness. On the other hand, electrical lighting has many advantageous factors-easy control, use of valuable wall space, flexibility of lighting pattern and effectiveness of displaying.

In this exhibition hall, fluorescent lighting and incandescent lighting are used together. This scheme of the combination is to control the different colorful effects from both fluorescent and incandescent lightings. With the other purpose, fluorescent lighting is used for the general illumination of the displaying room and incandescent lighting is the special illumination on the certain area by the spotlighting.

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<sup>\*</sup>Lawrence Vail Coleman, Museum Building, American Association of Museum, 1950

Basically, the layout of the lighting in the displaying room should have the flexibility which can easily change the lighting patterns for the different purpose.

#### d. Exterior lighting

Exterior lighting is usually introduced to control the area lighting and to complement and enhance surrounding landscapes and architecture. Particularly in this cultural center project, the architectural aesthetics and functional illumination should be carefully considered for nighttime as well as daytime because the most of the extracurricular activities of music and drama will be held at night. In the daytime, the natural lighting (sunlight) creates the variety of the architectural structure from the view point of the elevation by the contrast of brightness and shadow. Those visual effects also come from the variety of the structure itself in plan and elevation, and from the surrounding landscape.

Flood and spot lighting with various colors for the fountain at the center of the main plaza given very attractive atmosphere to the visitors at the night. For the area lighting of the main plaza, inner court, streets and walkways, the combination of the incandescent and mercury vapor lamps are suggested. Also flood and spot lighting is suggested for the illumination of the facades. The outdoor theater should have console control.

## 2. AIR-CONDITIONING

In this tropical area, heating is not needed, but air cooling is considered a necessary for comfort, health and quietness from outside noises. Besides cooling the rooms,

air-conditioning controls the gentle movement of the air and eliminates smoke, bacteria, fumes, odors, and excessive moisture.

For cooling economy, the design of the buildings should be so oriented that most of wall areas would face north and south to absorb the least of solar heat. Overhangs and sun screens should be liberally adopted in order to reduce the cooling load.

In the designing of the cultural center, as in any application of air-conditioning, the comfort and health of the occupants is a prime consideration. Proper temperatures and humidity levels should be maintained, especially in the auditorium, drama and music facilities, art library exhibition hall and conference halls. Two types of air-conditioning systems will be used in this cultural center: First, the central air-conditioning system will be used in the auditorium. Since, the mechanical and air-conditioning requirement for the performance facilities of music and drama are inevitable factors, the recommended temperature ranges for comfort is from 68° to 72° Fahrenheit humidity level 50%. Secondly, the unit window air-conditioning will be provided for office space, coffee shop festival room and public space because of their low price and individual control temperature.

### 3. ACOUSTICAL STUDY (See Drawing p. 84-85)

Architectural acoustics are basically concerned with two objectives:

- the provision of good hearing conditions within a space, by controlling the direction, impact, and duration of sound wave and

- the provision of a satisfactory acoustical environment by raising barriers against unwanted sounds, originating outside the space.

Size, shape, and volume of the auditorium are also important in acoustical design. The acoustical design of this particular auditorium is based on these following considerations.

#### Factors Influencing Hearing Conditions\*

The environment of the auditorium should provide good hearing conditions.

1. It must be completely quiet without any intruding noises from adjacent areas.

2. The desired sounds must be sufficiently loud.

3. The sounds must be well distributed through the room to give a desirable degree of acoustic uniformity, and to avoid disturbing echoes and focusing.

4. The reverberation time must be long enough to give proper blending of sounds and yet be short enough so that there is no excessive overlapping and confusion.

#### a. Sound vibration of air

Any audible signal is sound. The source of a sound is some system in vibration. Musical systems include vibrating strings, diaphragms, such as drum heads or cymbals, or vibrating air columns exemplified by flutes, horns, or the human singing voice. Less-musical generators of sound include

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\*Time-Saver Standard, Fourth Edition



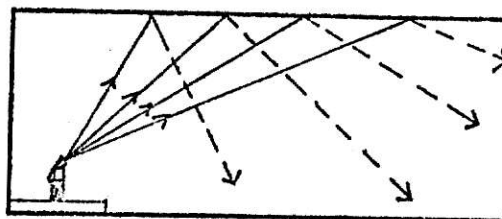
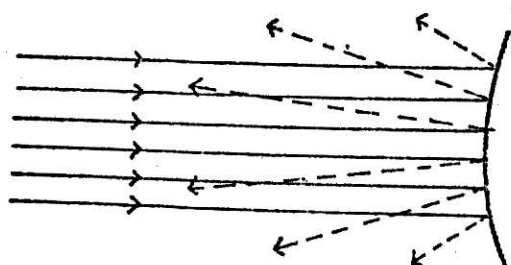
vibrating machinery surfaces, air flow through orifices, or the impact of two or more hard surfaces. A sound source causes stress changes in the surrounding medium, air. These changes fluctuate with time in sympathy with the source and may be rapid or slow, or may fluctuate in a regular or irregular way, or may be transient. A musical instrument producing a high note causes a regular rapid fluctuation of stress; traffic, an irregular continuously fluctuating stress; a gun shot, a nonrepetitive stress. A sound source can cause compressive stress changes in gases and liquids, and compressive, shear, and bending stresses in solids.

b. Wavelength and frequency

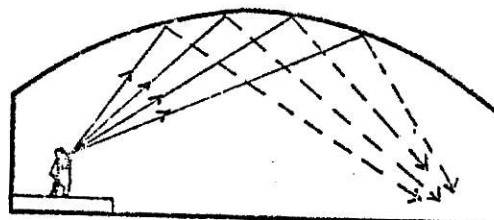
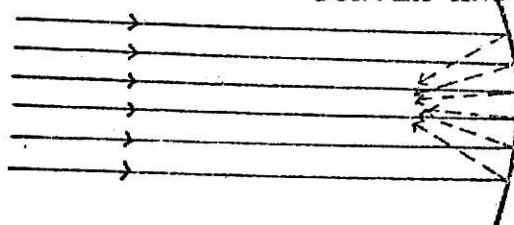
The quality of a sound is dependent upon many things, such as pure tones, overtones, and harmonics. All are frequency dependent. By frequency we mean the number of times per second that the atmospheric pressure of the air is changed by the vibrations of the sound source. Only rarely do we encounter a regular periodic atmospheric pressure change. When we do, it is called a pure tone.

c. Sound quality is complex

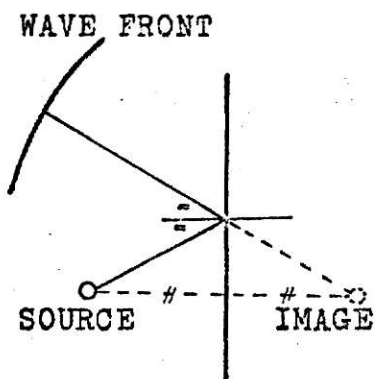
Most of the sounds that we hear are quite complex in quality. While our ear does not respond to pressure changes that occur at a rate of less than 20,000 times a seconds, this range permits a practically unlimited number of combinations of sounds. A violin, trumpet, or the human voice provide good examples of these multifrequency complex sounds. Their frequency spectra may be studied measuring



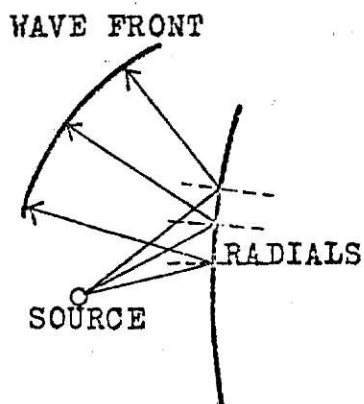
CONVEX AND FLAT SURFACES DISPERSE SOUND



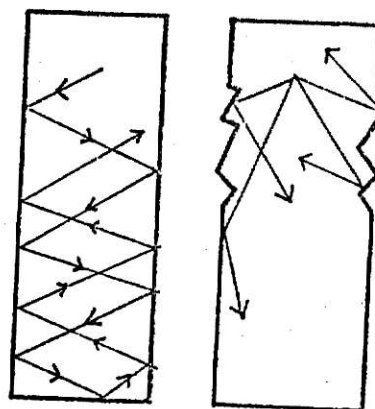
CONCAVE SURFACES CAUSE FOCUSSING (BAD)



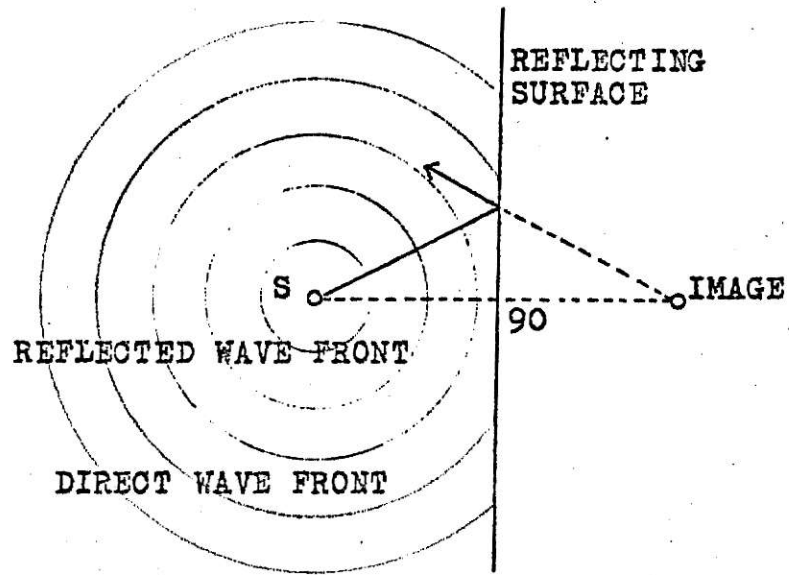
REFLECTOR



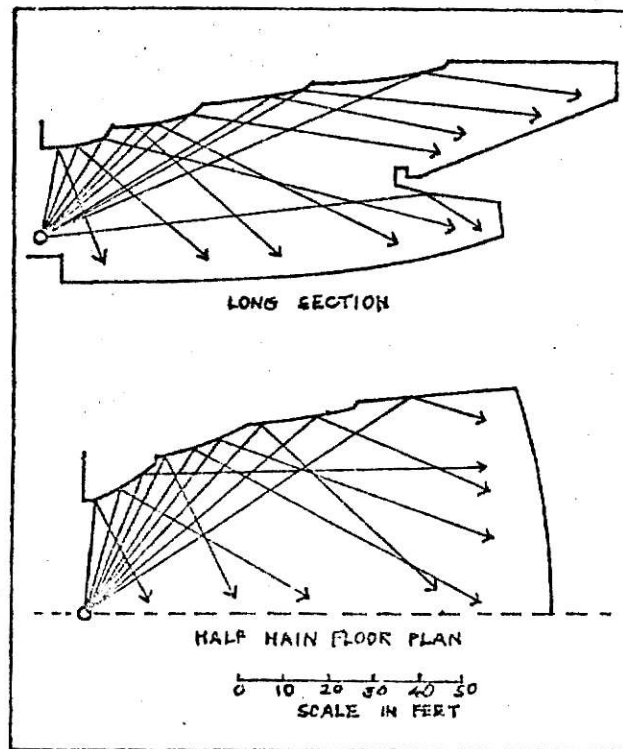
REFLECTOR



Long parallel unbroken walls produce flutter effect. Splayed surfaces correct this.



**AUDITORIUM DESIGNED FOR MAXIMUM REINFORCEMENT OF  
DIRECT SOUND BY REFLECTED SOUND**



how the sound energy is distributed in narrow contiguous frequency bands, such as octave,  $1/2$ , or  $1/3$  octave bands.

d. Sound quantity and pressure

The concept of the quantity of sound is easy to understand since it is merely the average deviation in atmospheric pressure above or below the static atmospheric pressure. The deviation in pressure is very small. For example, a very loud noise produces a change in pressure of only 0.001% of the atmospheric pressure. Since this is an alternating pressure change, it may be defined as a root mean square (rms) quantity. This rms pressure change is known as the sound-pressure level and is measured by microphones and sound-level meters.

e. Sound absorption

It is well known that soft, porous materials and fabrics and also people absorb a considerable portion of sound waves bouncing on them; in other words, they are sound absorbers. By definition, sound absorption is the change of sound energy into some other form, usually heat, in passing through a material or on striking a surface. The amount of heat produced by the conversion of sound energy is extremely small. The speed of the traveling sound wave is not affected by absorption.

Practically all building materials absorb sound to some extent, but successful acoustical control of buildings requires the application of materials with a high degree of sound absorption.

In environmental acoustics the following elements may contribute to sound absorption:

1. Surface treatments of wall, floors and ceilings.
2. Room contents, such as the audience, draperies, upholstered seats and carpet.
3. The air of the space.

f. Sound reflection

Hard, rigid and flat surfaces, such as concrete, brick, stone, plaster or glass, reflect almost all incident sound energy striking them. This phenomenon of sound reflection of light since the incident and the reflected sound rays lie in the same plane and angle of the incident sound wave equals the angle of the reflected sound wave. It must be remembered, however, that the wavelengths of sound waves are much larger than those of light rays, and the law of sound reflection is valid only if the wavelengths of the sound waves are small compared to the dimension of the reflecting surfaces. This means that the application of this law must be very critically considered for low-frequency sounds.

g. Room acoustics

The reflection of sound signals from large plane or convex surfaces enhances the quality and signal strength of both speech and music. The paths of the reflected sound may be predicted by the law of sound propagation, "the angle of incidence equals the angle of reflection". The first reflection is especially important. Reflected sound that arrives

at the ear within an interval of 50 milliseconds after the direct sound tends to reinforce the sound of individual speech syllables. All later-arriving reflected sounds have a blurring and interfering effect, which reduces speech intelligibility. It is considered good practice to arrange the room surfaces so that as much reflected sound as possible arrives at each seat by a path not more than 50 ft. longer than the direct sound path. 50 ft. corresponds to approximately 50 milliseconds at the speed of sound.

#### h. Sound foci

Sound foci is a condition created by concave surfaces, in which sound energy reflected from each of such surfaces tends to focus in definite points. The basically concave wall in the back of the auditorium is broken into smaller portion of flat surfaces, each having characteristics similar in dimension to those of long wavelengths.

#### i. Echoes

It would be a mistake, however, to consider only the beneficial effects of sound-reflective surfaces in an auditorium. Long delayed reflections from the rear of the room and multiple-reflected sounds may become undesirable echoes. If a first reflection of a short impulsive sound, such as a speech syllable, is delayed more than 0.06 second longer than the direct sound (difference in sound path greater than 50 ft.), the first reflection may be heard as an echo. Rear walls are the most common source of echoes and, for this reason, usually require the application of sound-absorptive materials and diffusive constructions.

The auditorium for the proposed the cultural center is designed to avoid echoes and blurs by careful measurement of the sound-source and audience relationship created by each reflecting surface and by keeping this distance difference discribed above to below 50 feet in each case. This check is shown in drawing no.8 p. no. 111.

j. Air resonance\*

In room with parallel and plain opposite walls "standing waves" may be set up by sounds of long wavelength. This occurs when the wavelength coincides with the distance between the walls, or is an exact fraction of this distance. A resonant effect is then produced which accentuates and prolongs sounds of certain frequencies, and creates a distortion in the balance of frequencies. Changes in pitch and vibrato effects may be also occur during the decay of reverberation.

In large auditorium, with dimensions greater than about 35 feet, these effects will not be discernible. In smaller rooms, parallel and plain opposite wall should be avoided in this design, especially where they flank the source of sound.

k. Resonance provides by wood screen\*

When sound waves strike the enclosing structure of a room it is set into vibration to a greater or less extent according to its nature. The materials vibrate at the same

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\*Design for Good Acoustics, J. E. Moore, Architectural Press: London, 1961

frequency as the incident sound waves, and in turn emit sound on both sides of the partition this is how sound is heard "through" a wall. Walls, partitions, floors, ceilings, panelling, etc., respond in this way-by sympathetic vibration or resonance. Heavy walls respond less than light partitions, and partitions less than panelling.

On the other hand, any given material will respond to a varying extent according to the frequency of the sound waves striking it. All materials have a 'dominant response frequency', the frequency at which they respond best, and if this is too sharply defined it may be disturbing acoustically.

Wood panelling responds over a range of frequencies in the lower register and, if the sign of the panels is varied in a room, this frequency band can be broadened. In rooms for music, advantage is taken of this characteristic by the employment of extensive areas of wood paneling to give richness of tone. In concert halls it is essential part of the design.

Because of resonance, music produced on a staged platform will be louder, as well as richer in tone, than if played on a platform of solid construction. A wood panelled apron to the platform will contribute also to the total resonance of the construction. Panelling around and near the source of sound will be more effective than that at a distance, being activated by stronger sound waves.

Finally it should be noted that resonance reinforces sound without appreciably prolonging it, as does reverberation.



It may therefore be usefully employed in multi-purpose halls where a short period of reverberation is required for speech, yet some substitute for reverberation is desired in the case of music.

#### 1. Flutter echo

Large parallel wall surfaces should also be considered as problem sources in the design of rooms used for speech. This potential problem consists of a rapid echo, called flutter echo, that results from multiple reflections of an impulsive sound such as a speech syllable or a hand clap. The flutter echo sounds somewhat like a stick run rapidly across a picket fence. A small area of acoustical material, or an out of parallel wall surface, or even a large slanted mirror or glazed frame will provide sufficient diffusion to alleviate flutter echo.

#### m. Signal-noise ratio<sup>\*</sup>

Auditoriums are intended for listening. Whether we listen to speech or to music signals, the signal must be considerably louder than the noise in the auditorium. We can maintain a high speech signal throughout the auditorium by restricting the distance between the speaker and listener to a maximum of 40 or 50 ft. and by providing sound-reflective

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<sup>\*</sup>Knudsen and Harris

surfaces to supplement the direct speech signal. The most important sound-reflecting surface is usually the front half of the ceiling of the auditorium. We therefore do not use this space for the application of sound-absorptive material. When the distance between speaker and listen exceeds 50 ft. or the auditorium volume exceeds 50,000 cu. ft., it becomes necessary to provide an electronic-amplification system.

#### n. Noise control-auditorium

Maintaining a strong sound signal by means of sound-reflective surfaces is only half of the problem. It also becomes necessary to keep the noise level in the auditorium low. The use of efficient sound-absorptive surfaces is essential in reducing disturbing ventilating noise and audience noise such as shuffling of feet, body movement, talking, coughing.

#### o. Signal propagation-auditorium

The location of the acoustical treatment in the auditorium is very important. We must not apply acoustical materials to surfaces that aid in propagating the speech signal. These surfaces, called the first reflection surfaces, consist primarily of the front one-half to two-thirds of the ceiling and the front one-half of the sidewalls. The remaining wall or ceiling surfaces, however, may receive acoustical treatment without reducing the speech-signal reinforcement or propagation. The remaining wall and ceiling surfaces and especially the rear wall surfaces may be the source of long delayed reflections and echoes that materially reduce the

intelligibility of the speech signal. It is usually mandatory for good acoustics that these surfaces be acoustically treated.

p. Air absorption

Another absorber of sound that must be considered in large rooms is air. This absorption is very small for frequencies below 2000 cps. but increases rapidly at 2000 cps. and higher frequencies. It also increases with decreasing relative humidity.

q. Upholstered-chair absorption

The acoustical environment of an auditorium will always benefit from the use of upholstered chairs. The sound absorption provided by an unoccupied upholstered chair is approximately equal to the occupied chair. As a result, the reverberation time in the auditorium remains constant regardless of occupancy. Pew cushions can serve in a similar manner in a church. For example, the following are coefficients of absorption at 500 cps. for people and chairs:

Man seated in upholstered chair      4.0 sabins

Upholstered chair without occupant    3.0 sabins

Chair-plywood seat & back without occupant 0.3 sabins.

The unit "sabin" is the equivalent of one square foot of surface having an absorption coefficient of 1.00. An upholstered chair (3 sabins) therefore has the same amount of sound absorption coefficient of 0.60.

r. Room shape and acoustics

The shape of a room used for speech or music is very

important. Large concave surfaces tend to focus and increase the severity of echoes. They also concentrate sound energy at a small focal point. If this point is near the height of the listener's ear, speech intelligibility deteriorates rapidly and music listening becomes unsatisfactory. Large convex surfaces, on the other hand, provide beneficial sound dispersion and propagation, thus increasing the uniformity of sound throughout the room. The size of the convex surface, to be an effective diffuser, must be in the same order of magnitude as the wavelength of the sound that it is to radiate; 100-cps. sound is about 11 ft. long; 1000-cps., about 13 in. long.

#### s. Reverberation

The sound waves which are already originated in a room will continue to travel back and forth between the room surfaces, and as these waves successively pass a listener's ear, he will hear them as a continuation of the sound after it was stopped at the source. The sound waves, however, lose energy by absorption at each successive reflection, and since this energy is no longer supplied by the source, the sound will be heard to die out more or less gradually. This prolongation and diminishing of the loudness of sound after the source has stopped, due to continued multiple reflection, is termed reverberation.

If sound dies out very slowly, a room is described "live" or "excessively reverberant", and if it dies out very rapidly, a room is called "dead".

Reverberation is one of the most important factors which govern hearing conditions in auditoriums, and it also has an important bearing on the "noisiness" of working areas. Of special importance is its effect on the understanding of speech. If sound dies out very slowly in an auditorium used for speaking, the prolongation of each speech sound causes an overlapping and confusion of successive words or syllables which may render intelligibility extremely difficult or impossible. A similar effect is noted in music, where the sustaining effect of reverberation, if excessive, produces a blurring and lack of definition of melody and harmony. This is observed most strikingly when rapid organ music is played in a large, highly reverberant church. In rooms where quiet surroundings are required, reverberation is annoying because it prolongs distracting noises.

#### t. Reverberation time

The amount of reverberation in a room is measured by its reverberation time. This is defined as the number of seconds required for the energy of the reflected sound in the room to die out to one millionth of the value it had at the moment the source was cut off. The reverberation time is a basic acoustical property of a room which depends only on its dimensions and the absorbing properties of its surfaces and contents. It is essentially the same throughout the room, regardless of the position of either the source of the listener. The reverberation time corresponds roughly to the number of seconds which a sound of "average" initial loudness can be

heard by a person with normal hearing acuity before it dies out to inaudibility under complete quiet conditions. This may vary typically from a fraction of a second in a very dead room to the order of 5 to 15 seconds in a very live room.

u. Effect of reverberation time on speech and music

Experimental studies on speech intelligibility have shown that for reverberation times longer than about 2 seconds, the understanding of speech becomes increasingly difficult or impossible. As the reverberation time is lowered below 2 seconds, intelligibility and clarity of hearing steadily improve. With a reverberation time of about 1 second, hearing conditions for speech approach the ideal, and further lowering of the reverberation time produces no substantial improvement. It is also found that lower of the reverberation of time can to some degree compensate for other adverse conditions, such as inadequate loudness or interfering noise.

Since hearing conditions for music are more a matter of taste and tradition than of intelligibility, acceptable reverberation times cannot be specified as precisely as for speech. There is actually a wide range of reverberation time which are considered acceptable for music of a given type and for a music room of a given size. However, the average requirements for performed music may be placed roughly within the following ranges:

Chamber music	1 to $1\frac{1}{2}$ seconds
Orchestral, choral average church music	$1\frac{1}{2}$ to 2 seconds

Large organ,  
liturgical choir                      2 seconds or higher

Exception to these ranges are of course frequently made, as in the case of a piano or instrumental solo recital being performed in a large concert hall whose reverberation time may be designed primarily for symphony orchestra.

Rehearsal rooms, such as school band rooms, due to their comparatively small size and the need for critical listening by the conductor, have been found most satisfactory when the reverberation time is between about 0.8 and 1.0 seconds.

#### v. Calculation of reverberation time

The reverberation time depends on the cubic volume of the room and on its total absorption, and is given by the formula:-

$$T = \frac{0.049 V^*}{S_a}$$

where      T = reverberation time in seconds,

V = volume of room in cubic feet, and

S<sub>a</sub> = area of total surfaces times their average coefficient of absorption of room in sabins.

The auditorium in this proposal is designed for multipurpose uses such as speech, plays, music, dramas, operas and movies. According to past studies made by authorities in acoustical design, the desirable reverberation time in such an auditorium should 1.3 seconds for medium and 1.885 for

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\*Knudsen and Harris, Acoustical Design in Architecture

J. E. Moore, Design for Good Acoustics



low frequencies. More detailed calculations are listed in the page no. 99-101.

The auditorium in the cultural center is designed for multi-purpose uses such as speeches, movies, plays, music and operas. According to past studies made by authorities in acoustical design, the desirable reverberation time in such an auditorium should be 1.83 seconds for medium and low frequencies 2.63. In designing an auditorium, we should first of all remember that it is a sound box in which people may experience sounds generated from within.

The first consideration in designing this auditorium was to keep the room down to one space, thus keeping the sound energy within the auditorium, and avoiding the phenomenon known as coupled space. Secondly, sound reinforcement is achieved through the use of ceiling and wall panels carefully angled to fully distribute sound to every seat. Thirdly, panels forming interior walls are non-parallel to facilitate sound diffusion and to leave out resonant frequencies. Fourthly, the seating areas are sloped to obtain optimum audibility. Each row will be clearly exposed to the sound source without interference from successive rows in front. The proscenium is used to maintain an atmosphere of intimacy between the audience and the stage. No noticeable parallel walls exist, hence flutter is alleviated. Furthermore, no concave surface exists, canceling any possibility for sound foci. The areas designed for absorption keep the optimum reverberation time at 1.83 seconds, a desirable time for an auditorium of this type.



## w. Auditorium acoustical design

	sq. meter	sq. ft.
1. Main floor	1,136	12,332
2. Balcony floor	554.2	5,975
3. Walls	1,065	11,459
4. Ceiling	1,239	13,326
5. Ceiling under the balcony	316	3,394
6. Opening	61	656
Total surfacing		47,124
Volume	13,326 x 52.5	= 699,615 ft <sup>3</sup>
Volume to be taken out (under the balcony)	40,752	= 658,862 ft <sup>3</sup>
Total Volume		= 658,862 ft <sup>3</sup>
330 ft <sup>3</sup> /person	10 sq. ft./person	

## Require absorption

$$t_{60} = \frac{.049V}{Sa}$$

$$s = 47,124 \text{ ft}^2$$

$$v = 658,862 \text{ ft}^3$$

$$a = \text{absorption}$$

for 658,862 should be 1.83 (concert hall)

$$\text{@ 512 cycles } t = 1.83$$

$$\text{and @ 125 cycles } t = 1.83 \times 1.45 = 2.63$$

$$\text{For (512) } a = \frac{(0.049)(658,862)}{(47,124)(1.83)} = 0.38$$

$$Sa = (47,124)(0.38) = 17,907.12$$

$$\text{For (125) } a = \frac{(0.049)(658,862)}{(47,124)(2.63)} = 0.29$$

$$Sa = (47,124)(0.29) = 13,394.96$$

## For Sound Frequencies in cps.

	125	500	2000
Optimum reverberation time	2.63 (1.45 x 1.83)	1.83	1.83
Total absorption required Sa	13,394.96	17,907.12	17,907.12

**THIS BOOK  
CONTAINS  
NUMEROUS PAGES  
WITH ILLEGIBLE  
PAGE NUMBERS  
THAT ARE CUT OFF,  
MISSING OR OF POOR  
QUALITY TEXT.**

**THIS IS AS RECEIVED  
FROM THE  
CUSTOMER.**

# ABSORPTION BY SURFACES

Absorption materials	area/ sq. ft.	125 cps. coef.	units	500 cps. coef.	units	2000 cps. coef.	units
<u>Floor</u>							
Audience, seated in upholstered seats, per sq. ft. of floor area, (2/3)	9,761	.60	7,315.20	.90	8,784.90	.93	9,077.73
Unoccupied cloth-covered upholstered seats, per sq. ft. of floor area, (1/3)	4,880	.50	3,046.00	.80	3,904.00	.82	4,001.60
Carpet in aisle area on concrete 7/16" thick	3,645	.09	328.05	.28	1,020.60	.24	876.80
<u>Ceiling</u>							
Plaster on metal lath 3/4" thick	16,720	.02	334.40	.06	1,003.20	.04	868.80
Wall							
Wood screen	4,000	.11	440	.12	480	.10	400
Concrete behind wood screen	12,115	.01	121	.02	242	.02	242
TOTAL SURFACE	47,124	-	-	-	-	-	-
Air 50% relative humidity	658,862 ft <sup>3</sup>	-	-	-	-	2.5 1,000	1,647.15
TOTAL ABSORPTION			11,784.65		15,956.70		16,714.08
ADDED ABS. REQ'D.			1,610.31		1,942.42		1,192.04
Total unit of Abs. are in line with Eyring Formula computations			11,000		15,000		15,000
reverberation time			2.63		1.45		1.7

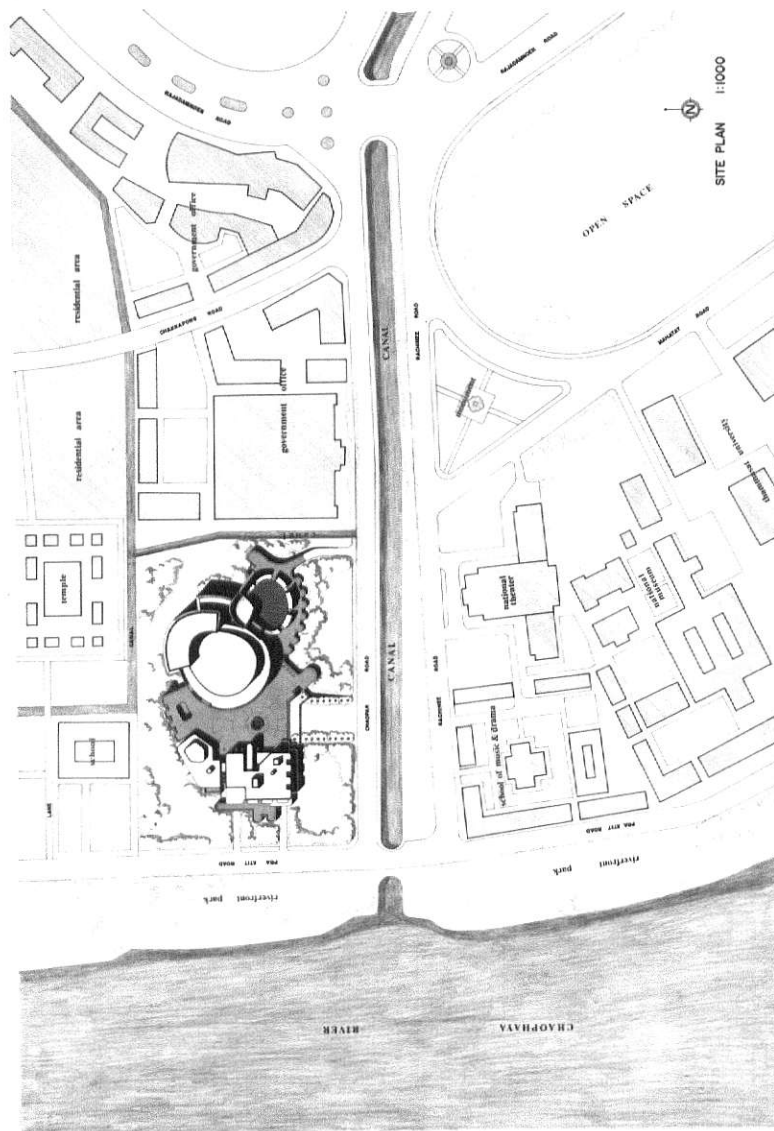
METERS TO FEET CONVERSION TABLE

61 METERS	=	200 FEET
1 METER	=	3 FT. and 3.36 in.
.305 METER	=	1 FOOT
13 SQ. METER	=	140 SQ. FEET
1 SQ. METER	=	10.75 SQ. FEET
.0928 SQ. METER	=	1 SQ. FOOT
85 CUB. METERS	=	3,000 CUB. FEET
1 CUB. METER	=	35.3 CUB. FEET
.0283 CUB. METER	=	1 CUB. FOOT

## X. PRESENTATIONS

**THIS BOOK  
CONTAINS SEVERAL  
DOCUMENTS THAT  
ARE OF POOR  
QUALITY DUE TO  
BEING A  
PHOTOCOPY OF A  
PHOTO.**

**THIS IS AS RECEIVED  
FROM CUSTOMER.**

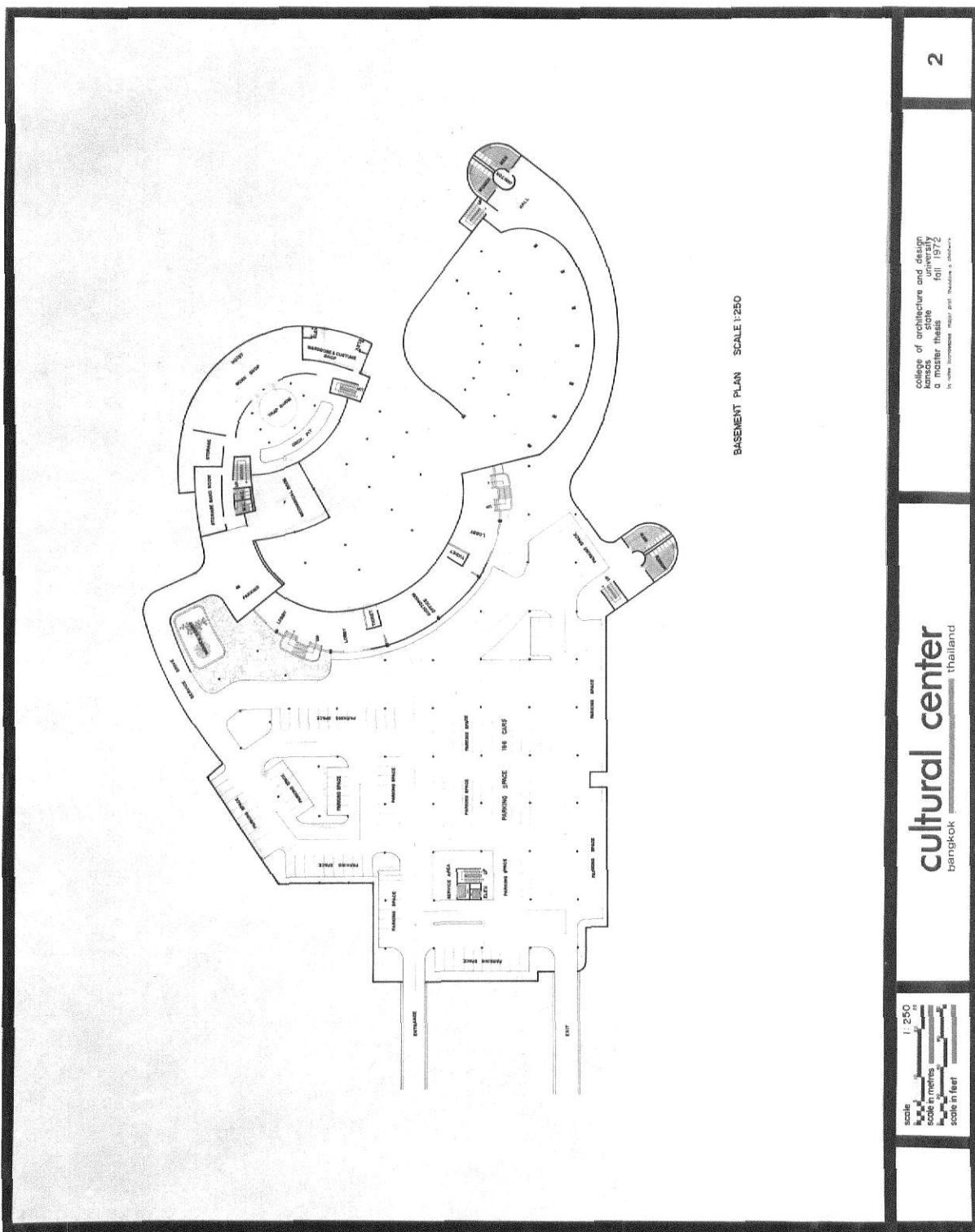


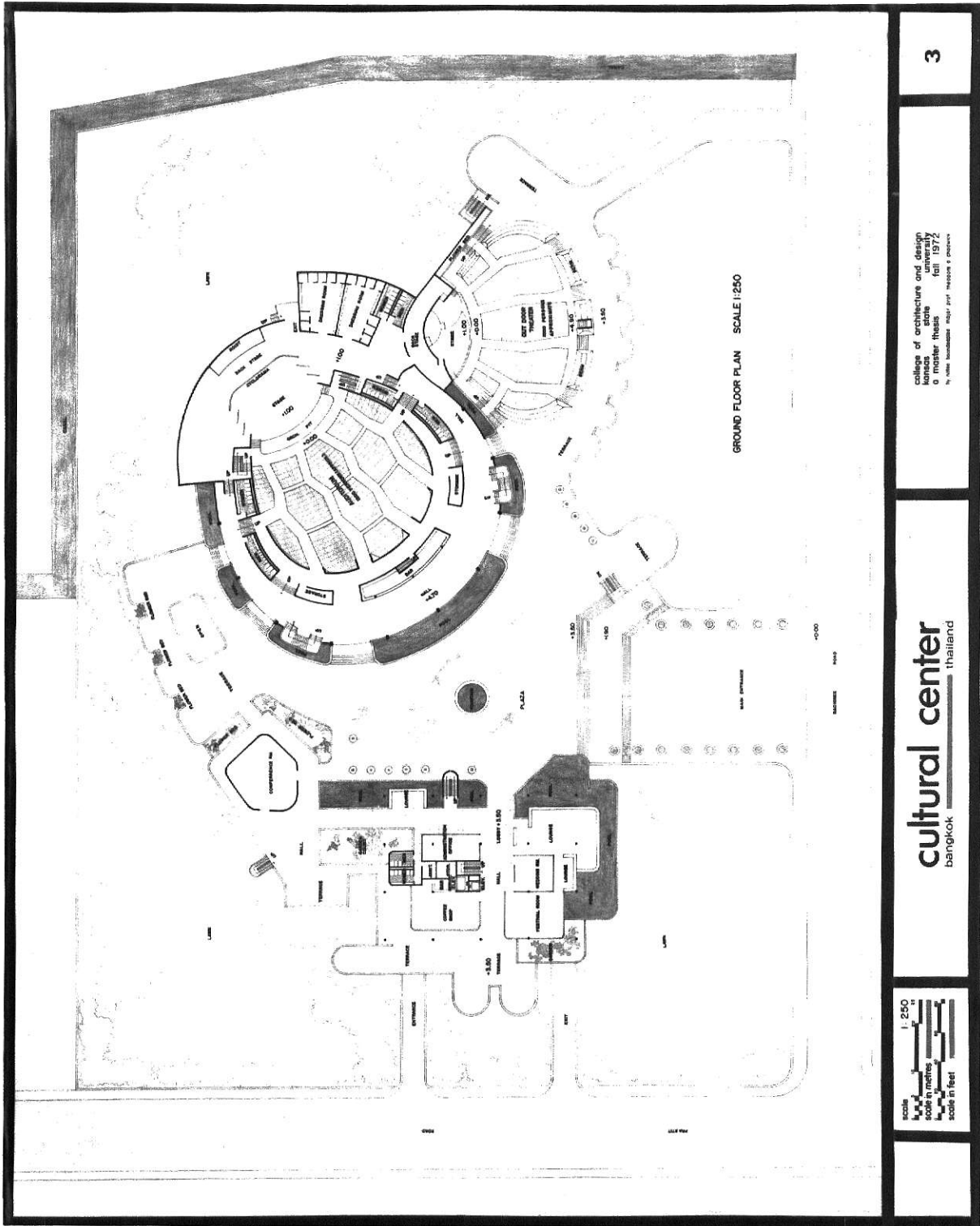
scale  
1:250  
scale in metres  
scale in feet

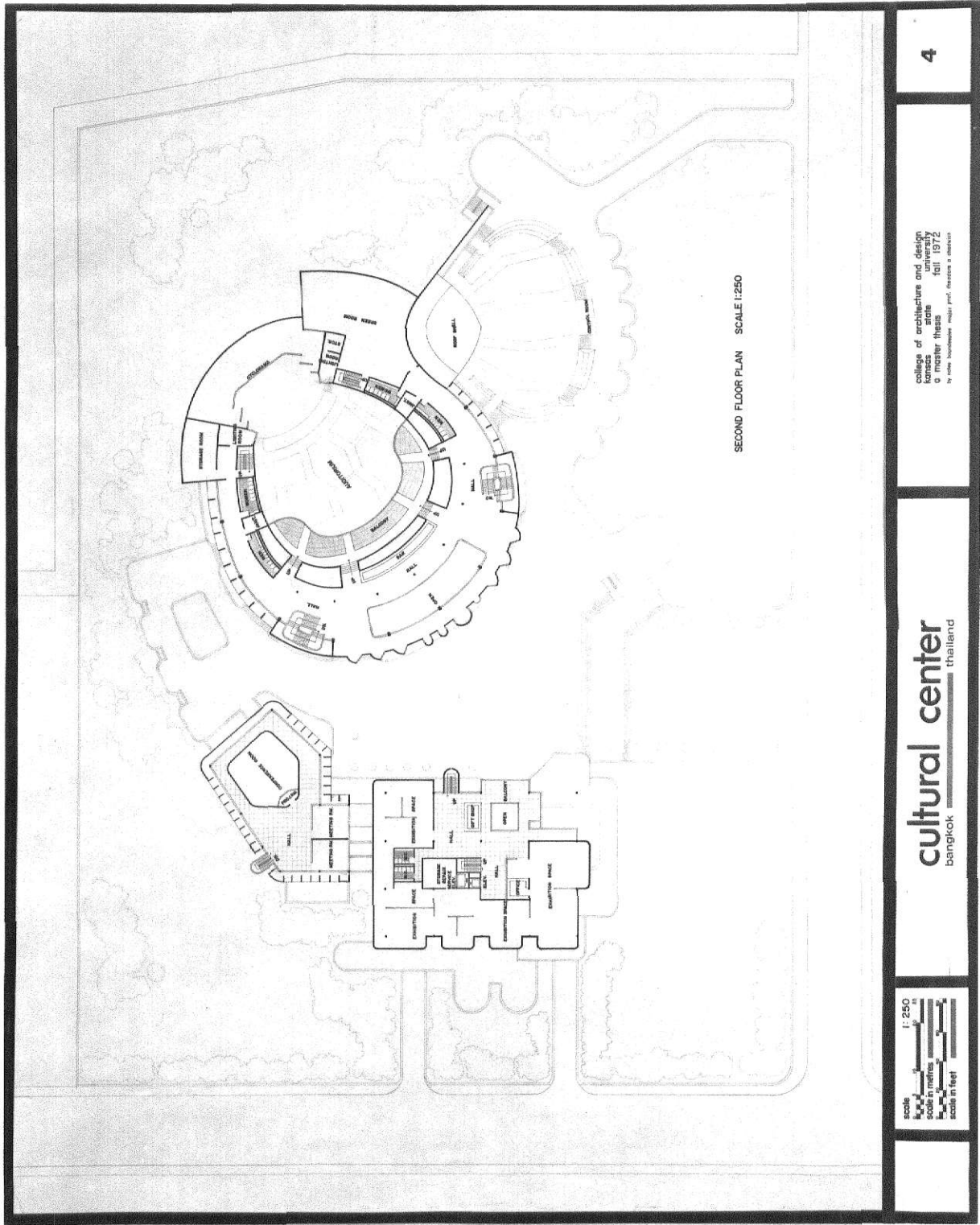
cultural center  
bangkok thailand

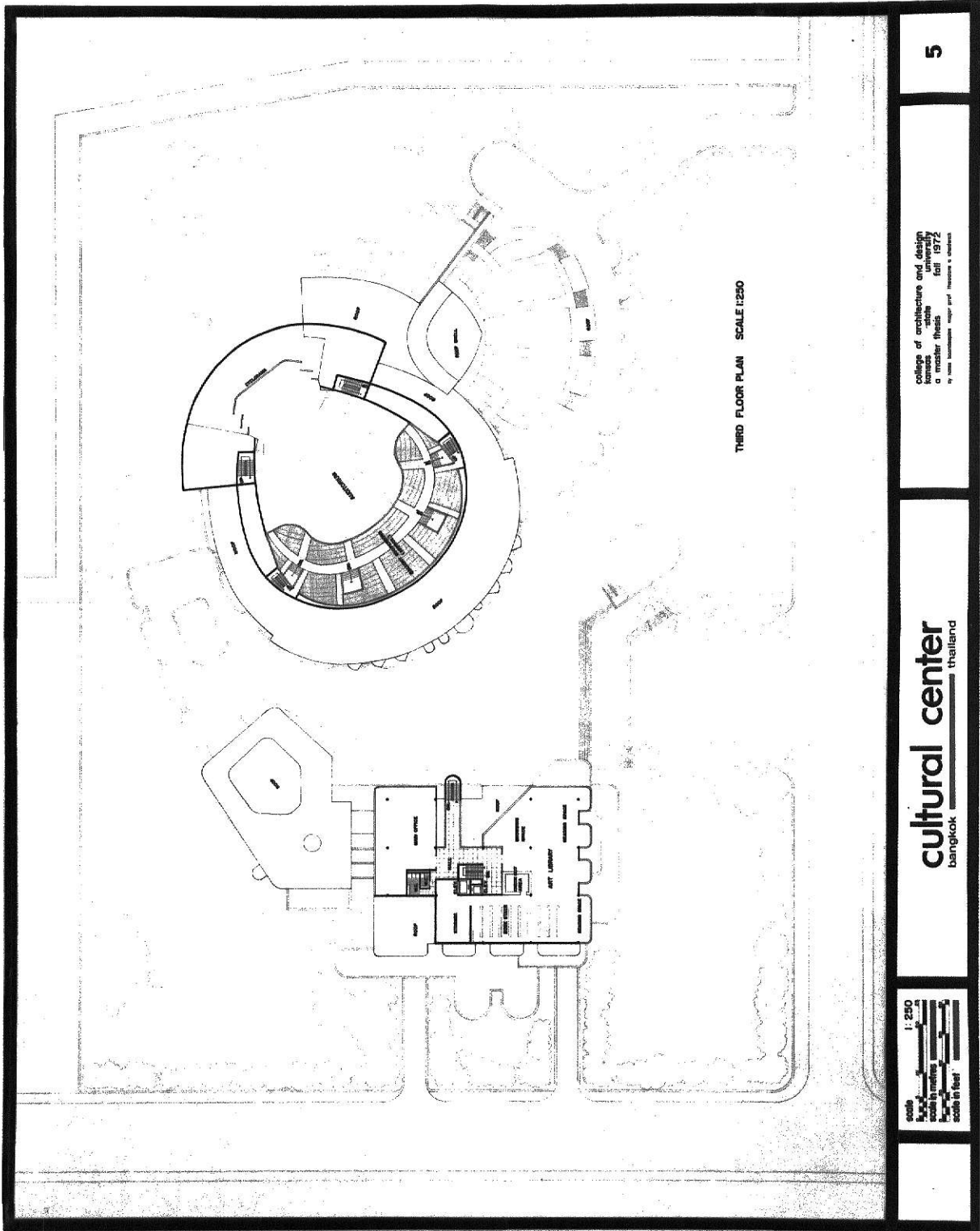
college of architecture and design  
koma university  
state fall 1972  
by shiro kuramata major part, heather & shiro

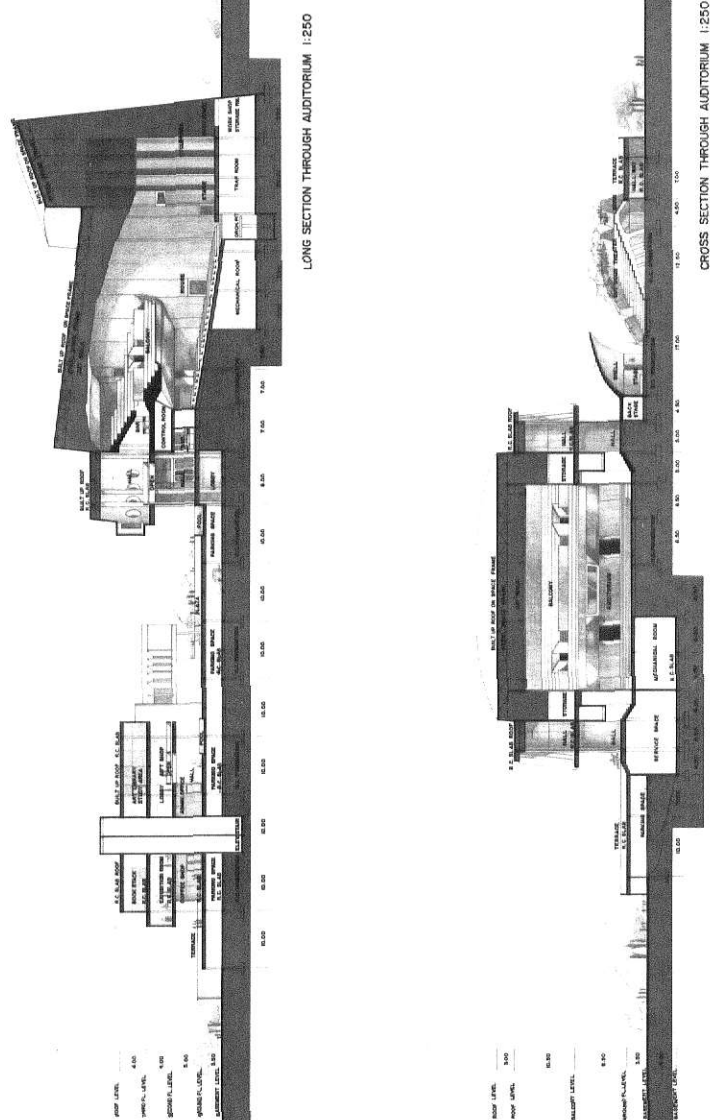


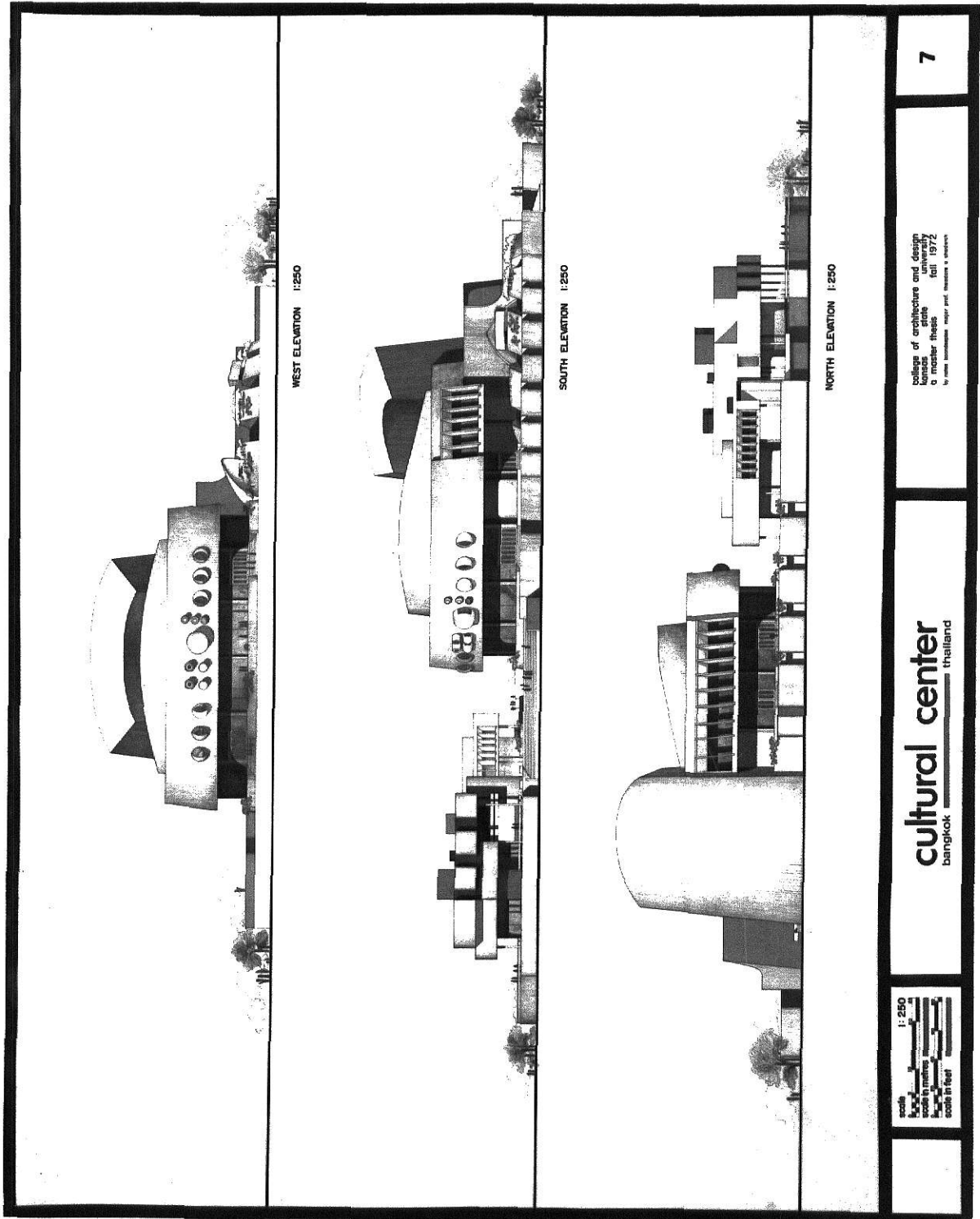












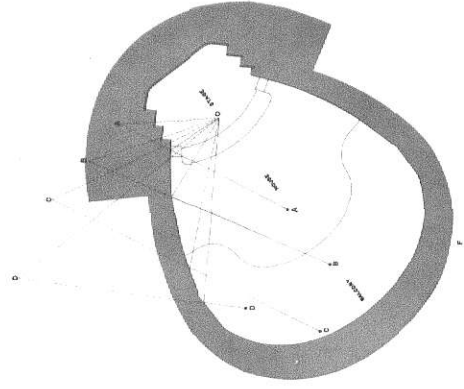


DIAGRAM SHOWING THE WALL ARRANGEMENT FOR ACOUSTICAL PURPOSES

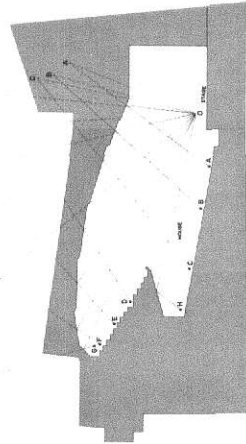


DIAGRAM SHOWING THE CEILING ARRANGEMENT FOR ACOUSTICAL PURPOSES

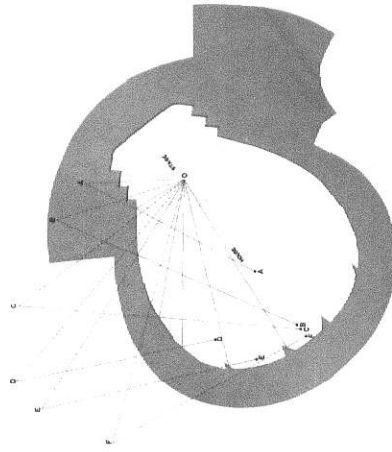


DIAGRAM SHOWING THE WALL ARRANGEMENT FOR ACOUSTICAL PURPOSES

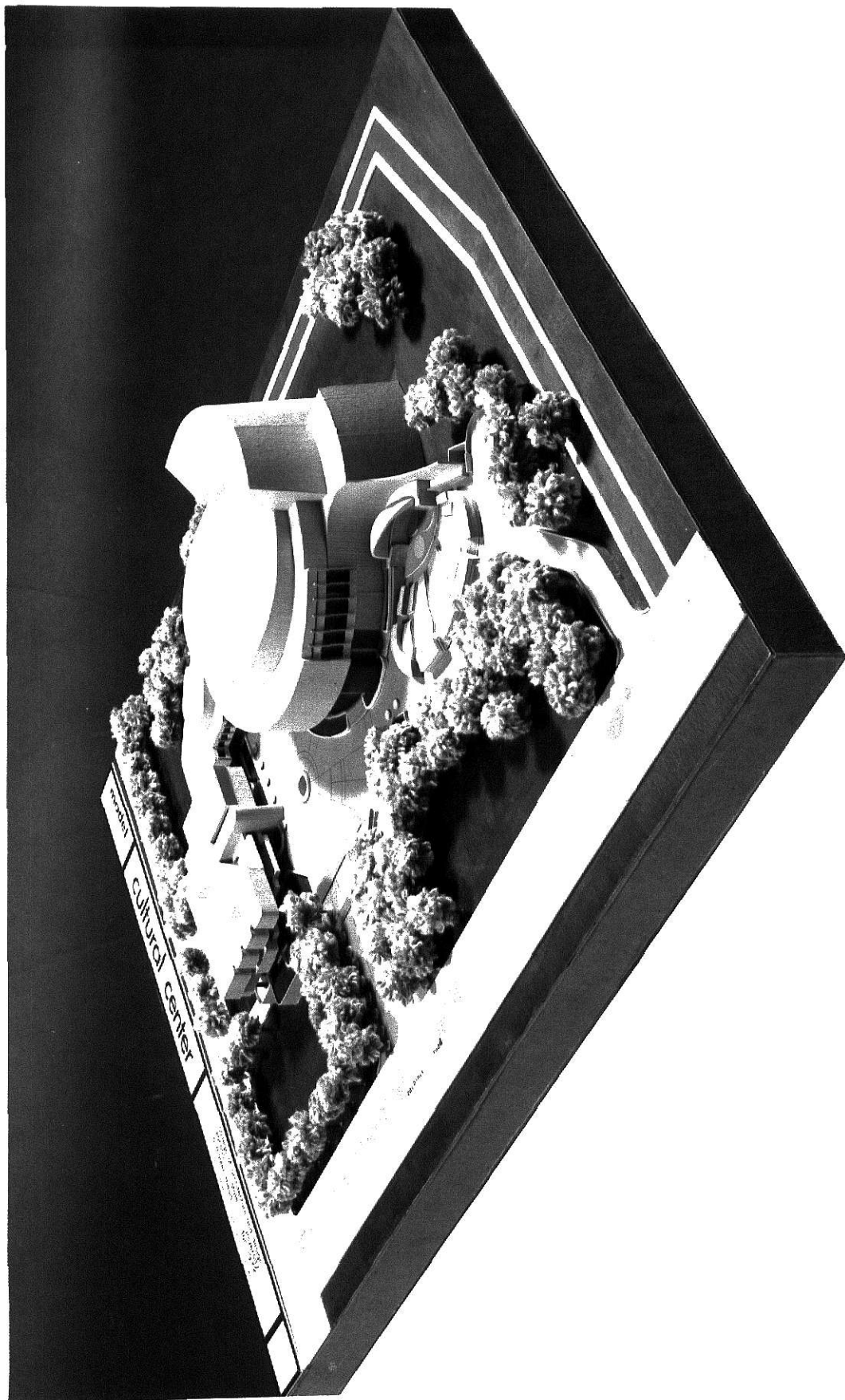


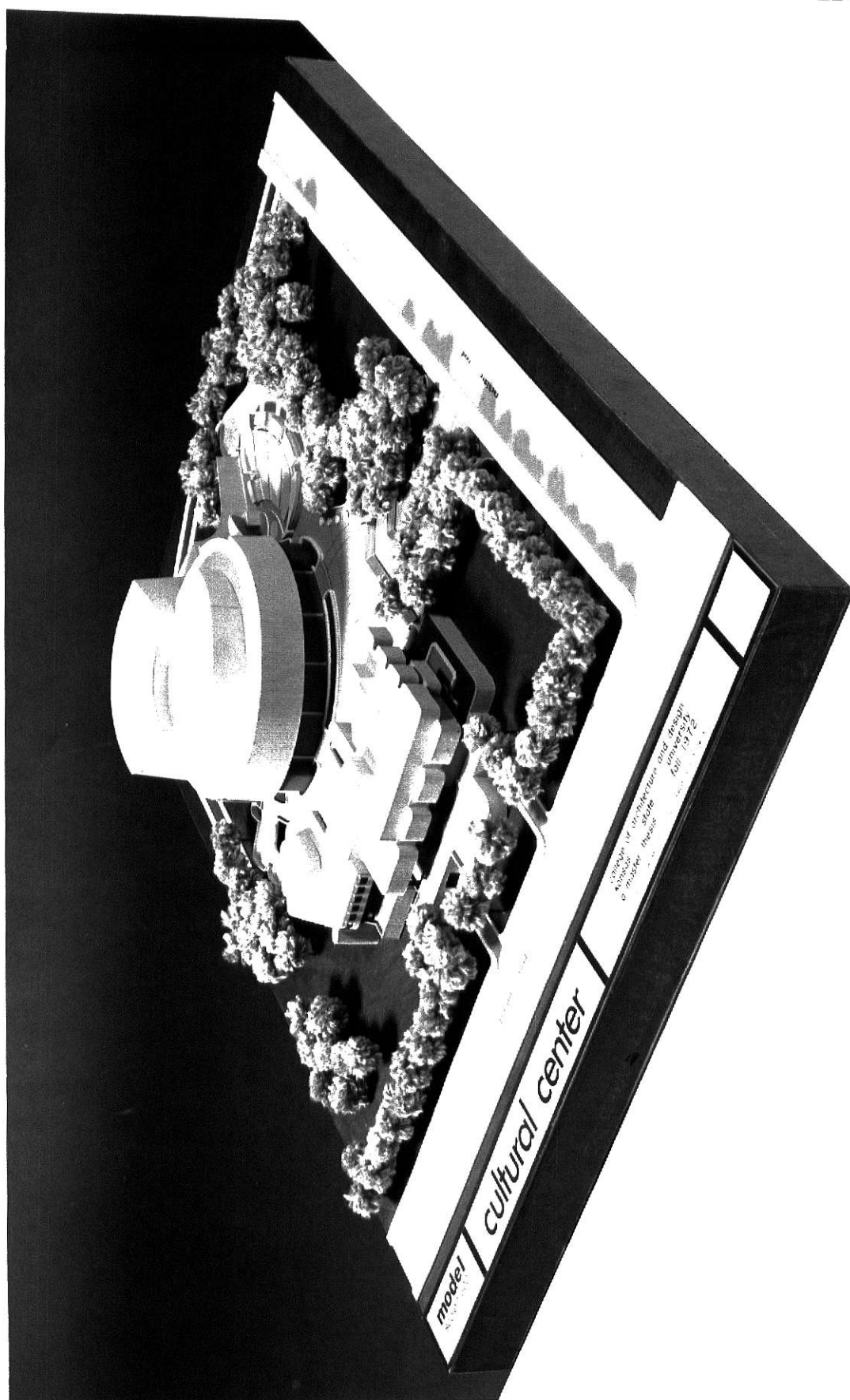
DIAGRAM SHOWING THE SHELL ARRANGEMENT FOR ACOUSTICAL PURPOSES











## XI. ACKNOWLEDGEMENTS

The author wishes to take this opportunity to express his deepest appreciation and acknowledgements to his major advisor Professor Theodore A. Chadwick of the Department of Architecture, Dean Emil C. Fischer of the Department of Architecture, Professor Robert P. Ealy of the Department of Landscape Architecture, Professor Ray Weisenburger of the Department of the Regional Community Planning, and Professor Eugene T. McGraw of the Department of Interior Architecture, for their cooperation and encouragement in the supervision of this thesis.

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CULTURAL CENTER  
BANGKOK, THAILAND

by

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AN ABSTRACT OF A MASTER'S THESIS  
  
submitted in partial fulfillment of the  
  
requirements for the degree

MASTER OF ARCHITECTURE

Department of Architecture and Design

KANSAS STATE UNIVERSITY  
Manhattan, Kansas  
1973

### XIII. ABSTRACT

The city of Bangkok is in need of public activity facilities to support her community's various needs. Cultural activities include those of music, drama, and art exhibitions.

A facility to house these activities, therefore, should center on several functions, requiring a certain degree of flexibility. Two major kinds of spaces should be considered in such a cultural complex in order to meet the community needs: Indoor auditorium and outdoor theater for music and drama. A library and a museum for the arts.

In brief, net spaces to support the basic elements in a cultural complex are listed as follows:

#### Primary Elements

##### Performance

2,000 seat auditorium

1,000 seat outdoor theater

##### Graphic Arts

Exhibition Hall

Library

#### Supporting Elements

Administrative Office

Conference Rooms

200 Car Underground Parking Area