A CENTER FOR PERFORMING ARTS, BANGKOK THAILAND

by

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INTRODUCTION

In recent years, the Westernized communicative arts in Thailand have become well known. But no such production has been performed to the fullest extent in the country because of limited facilities. No college or university has the funds to build modern theatres with stages designed for modern stagecraft and modern repertory requirement.

Even now there is a new boom in theatre construction; however, they are mostly movie theatres. Enterprising merchants build movie theatres to meet the demand, while music and drama are frequently ignored. The movie house owner has minimal requirements for new theatre designs. For example, as many seats as possible are often crammed into small spaces.

The other kind of performances catering to the public need, including movie art, T.V. shows and folk drama performances are not offered at a satisfactory level. Now is the time to introduce a creative visual and performing art to the public. The municipality of Bangkok has decided to establish a center to house the creative visual and performing arts. These include traditional drama, modern arts and music. This center will be a foundation in raising the art of drama and any kind of performance related to the public to a higher standard.

It is often said that demand perpetuates supply. In this case, however, the Greater Bangkok Municipal Government plans to create a limited initial supply. Along with proper promotion, it hopes to perpetuate demand on the part of the public. It is the hope of the government to generate enough interest to expand the model program to more of the same in the future.

AN INTRODUCTION TO THAILAND

General Geographical Location

As Bangkok is the heart of Thailand, so Thailand lies at the heart of South-East Asia. In addition to Thailand, this South-East Asian region is generally considered to include Burma, Indo-China, Malaya, and the island republics of Indonesia and the Philippines. Insular South-East Asia also includes the British colonies of Sarawak and North Borneo on the island of Borneo. In continental South-East Asia, Indo-China in turn includes the four newly-established countries of North and South Vietnam, Laos and Cambodia. Centering on the South China Sea, the region extends generally from the 20th parallel north to the 10th parallel south to the equator, and from the 90th to 130th meridians, east longitude. Its land area is a little over 400 million square kilometers.

Within this region the Bangkok-Thonburi metropolitan area is situated at 13°45' north latitude, on a line approximating that of Manila, Acapulco, Caracas, Dakar and Madras. Lying at 100°29' east longitude, the metropolitan area is almost due north of Singapore and Jakarta. Its regional significance is to some extent indicated by Bangkok's position as headquarters city for the South-East Asian Treaty Organization.

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 Yunnan in the twelfth century B.E. The Thais of Nanchao, after winning their independence from China, extended their political influence as far west as the Irriwaddy 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 Kingdom of Chiengmai was established in 1833 B.C. and that of Ayuthya in 1893 B.C., the later city eventually becoming the capital of what is now the Kingdom of Thailand. After the complete destruction of Ayuthya by the Burmese in 2308 B.C., a new Thai capital was established at Thonburi--to be moved later to Bangkok. The first king of the present dynasty was General Chakkri, who came to the throne as Ramah in 2325 B.C. It was not until 2475 B.C. that Thailand became a constitutional monarchy.

The policy of drawing on Western abilities and experience for the improvement of communications and administration in Thailand, which featured the reigns of King Mongut and his son, Chulalongkorn, has been carried on during the twenty-eight years that have followed the establishment of the constitutional monarchy, a counter trend toward nationalism notwithstanding. Though of proven loyalty to king and nation, the Thai people--having never been subjected to colonial rule--have no built-in resentment toward foreign people and their ways.

Natural Features

One of the most powerful determinants of a city's form and quality is its natural site. The characteristics of the site are often termed "natural features." These natural features include geographical setting, topography, geology, hydrology and climate.

Resembling an enormous fan, continental South-East Asia's land area consists of alluvial plains lying between rugged mountain ranges. These

mountain-separated deltas form a number of isolated natural regions between which communication by land is extremely difficult. On the other hand, each delta has a broad outlet to the sea, providing a natural port and a transportation route into the hinterland. The South China Sea and its surrounding waters, such as the Andaman Sea and the Gulf of Siam, form a Mediterranean-like basin to which the navigable rivers of continental South-East Asia have access. The indented coastline and hundreds of islands provide protected stopping places, and since the dawn of history, the South China Sea has served as a major geographical element unifying the area of South-East Asia.

The Kingdom of Thailand, covering 514,000 square kilometers near the heart of South-East Asia, is centered around the alluvial plain of the Chao Phraya River. From the topographic standpoint, the Kingdom can be divided into four sections. The north section, consisting of somewhat less than a third of the Kingdom's territory, is made up of long north-south mountain ridges and deep, narrow, alluvial valleys drained by the four tributaries of the Chao Phraya River. The valleys support intensive agriculture while the thickly-forested ridges produce many varieties of valuable wood--notably teak, which ranks fourth among Thailand's export commodities. Six percent of rice land is located in this north section, and it produces 10 percent of Thailand's rice crop.

The northeast section, covering a little more than a third of Thailand, consists essentially of the Khorat Plateau--an area of relatively scarce rainfall and poor soil. Draining toward the Mekong River, this section of Thailand is deprived of water routes to the Chaophra River system--a circumstance that creates a problem of isolation for the area. Forty-three percent of the Kingdom's rice land is located in this northeast section, but it produces only 29 percent of Thailand's rice crop.

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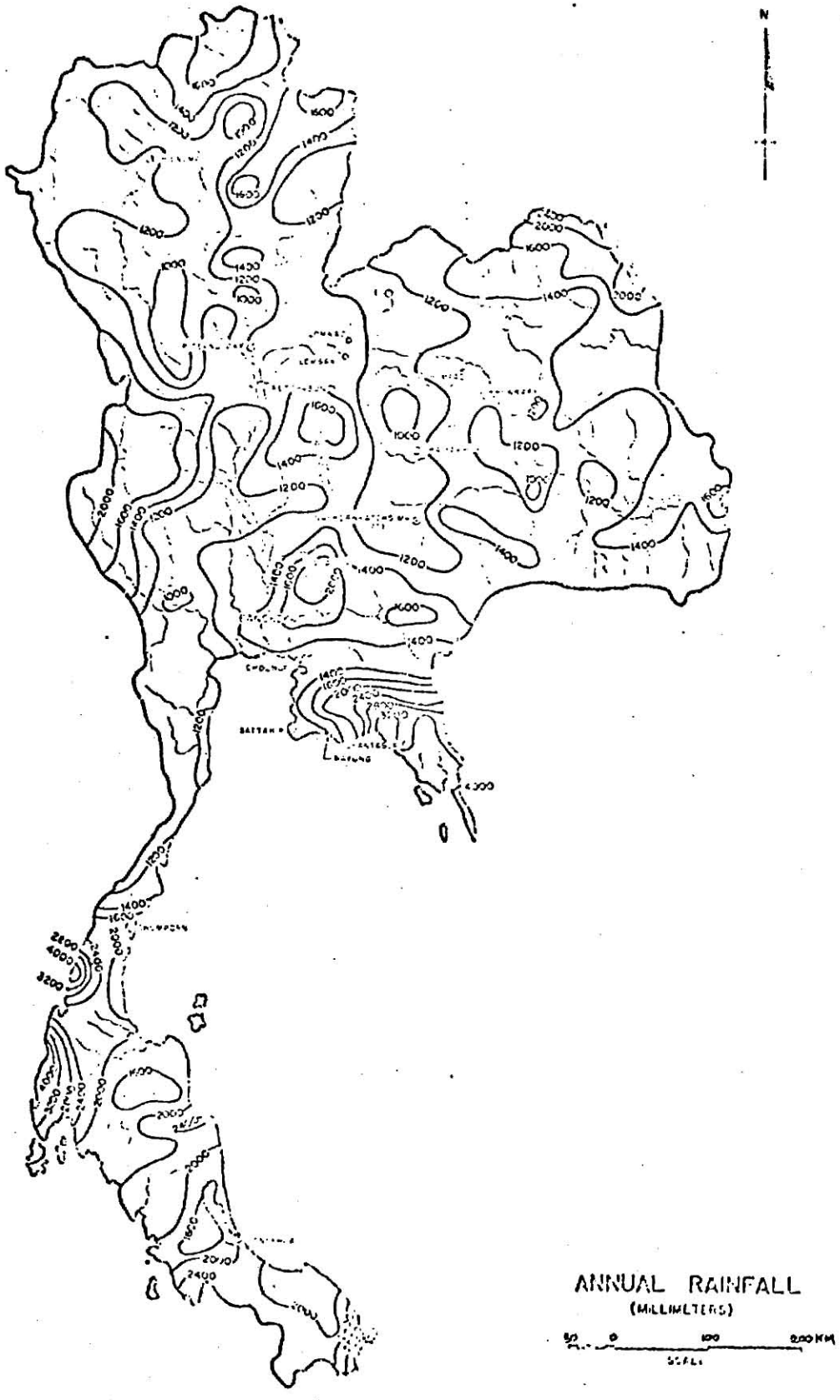


PLATE 4

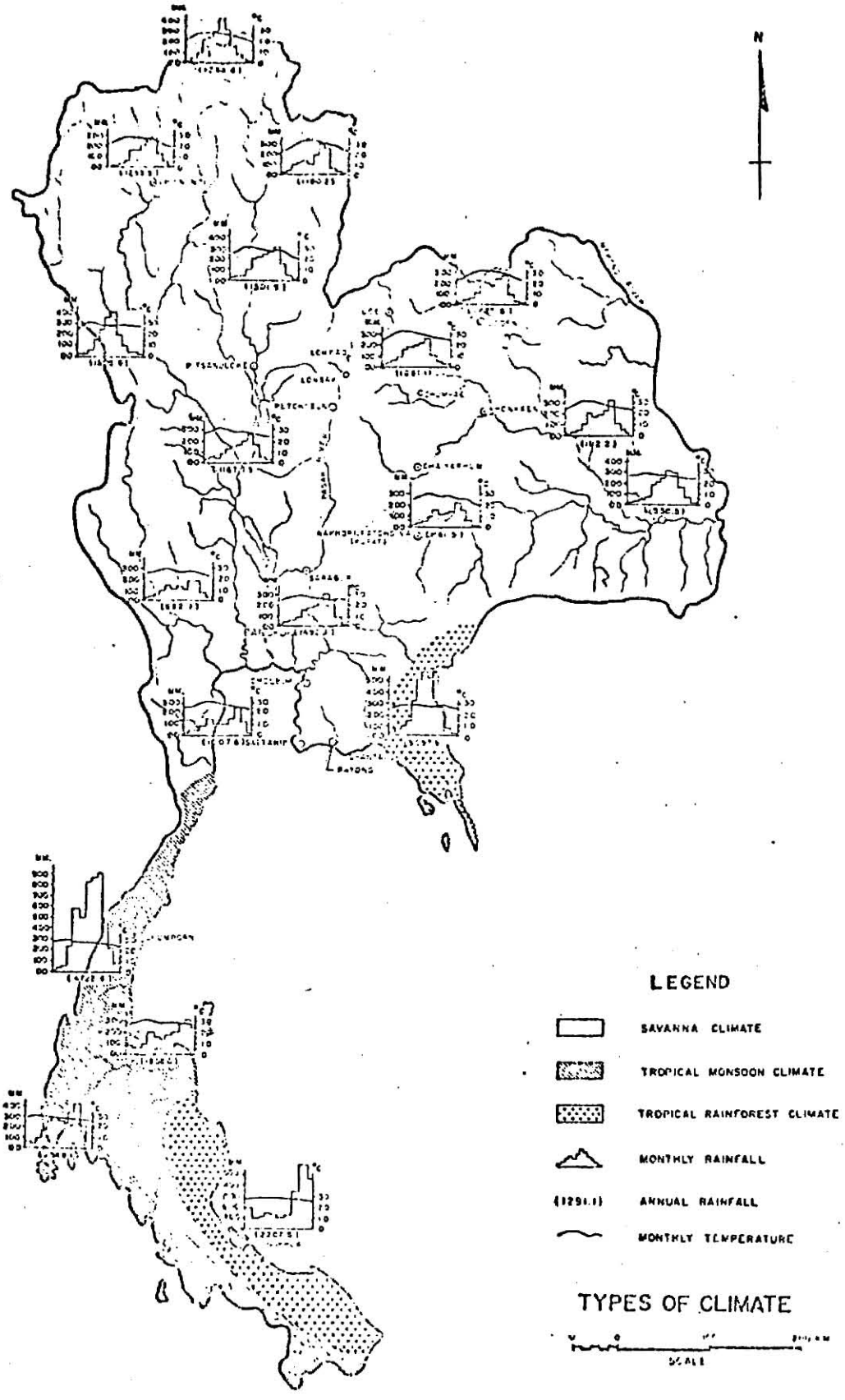

N
LEGEND
SAVANNA CLIMATE
TROPICAL MONSOON CLIMATE
TROPICAL RAINFOREST CLIMATE
MONTHLY RAINFALL
(1291.1) ANNUAL RAINFALL
MONTHLY TEMPERATURE
TYPES OF CLIMATE
SCALE

PLATE 3

The southern or "peninsula" section accounts for roughly one-tenth of the Kingdom's area. A 750 kilometer sliver varying from 15 to nearly 20 kilometers in width, the peninsula section is bounded by the Gulf to the east, Malaya to the south, the Andaman Sea to the southwest and the Burma to the northwest. Mountain ranges predominate throughout--particularly along the Andaman coast and the Burmese and Malayan frontiers. Neither coast line provides a natural deep-water harbor.

Many minor rivers and streams flow out to the Gulf and the Andaman Sea, but none are tied in with the Chao Phraya River system. The peninsula section's arable land is largely rolling in character and is used primarily for rubber production and rice. The area also contains valuable tin resources.

The central section of Thailand is generally known as the central plain and is directly oriented to the Chao Phraya River, the principal physical feature of the plain and of the entire Kingdom. Covering one-quarter of the Kingdom's total land area, the plain contains 44 percent of all rice land and produces 51 percent of the rice crop.

The central plain is an exceedingly flat area--the elevation at its northern extremity being only 44 meters above sea-level. The average slope, starting at the confluence of the Chao Phraya River's northerly tributaries and moving south to the sea coast, begins at approximately .014 percent (1:7000) and decreases gradually to .004 percent (1:25,000).

Greater Bangkok

Bangkok and Thonburi enclose some 173 square kilometers, and have a population of about 3 million. Bangkok, by Asian standard, is a sprawling

city. By Western standard, the city is remarkable for its compactness. It serves a role as the economic, political, educational, and cultural center of Thailand. It is the city of temples and considered one of the most intriguing beauty spots of the orient.

Topography, including both land and water surface features, is characterized by a low and level ground formation honeycombed with waterways. The general elevation of natural ground averages approximately a meter above mean sea level.

An equally important element is the extensive network of canals that traverse the area. Originally, the canals provided the sole means of communication, and Bangkok was known as the "Venice of the East." The canals served not only as drains for storm water, but also for fire protection and sewage disposal.

The climate of the metropolitan area is governed principally by gentle monsoon winds and is generally mild. Typhoons, an ever-present danger in and around the China Sea, dissipate much of their force in the mountains surrounding Thailand and never strike Bangkok with destructive violence.

There are three generally recognized seasons: the "hot season," extending from the beginning of February until the end of May, the "wet season" from the first of June until the end of October, and the "cold season" from the first of November until the end of January. Recorded temperatures range from a minimum of 9.9°C to a maximum of 39.9°C. Relative humidity, which varies from 17 to 100 percent, has an annual mean value of 77.7 percent, and because of this high mean the metropolitan area's evaporation rate is not as high as at similar latitudes in many other parts of the world.

The prevailing winds are the monsoons, with the "winter" monsoon bringing in cool, dry air from the north, and the "summer" monsoon bringing warm, moist air from the Indian Ocean. Winds of greater than 1.5 kilometers per hour occur for an average of two hours out of three, and provide a significant degree of natural air conditioning.

All precipitation in the area occurs in the form of rain. The rainy season begins in June and extends to November, reaching a peak in September. December and January are usually very dry, with many years having recorded zero rainfall during both of these months.

BRIEF HISTORY OF DRAMA

Primitive Drama

Early drama undoubtedly originated when primitive man came back from hunting, and felt the need to express his wonder, fear, terror and joy which he had met in the jungle. He may have been, at first, simply the most verbose member of the tribe, the one with the loudest voice and the greatest ability to elaborate and illustrate his story. The more imaginative he was--the greater his talent and keener his sense of wonder and fear--the more likely he was to elaborate his story. The story-teller gradually chose the place of his performance, the hour, even the lighting. Sitting around the campfire, he would put his back to a great boulder; thus fellow tribemen sitting on the ground around him on three sides could see clearly. With a charred piece of wood, he could draw on the rock behind him a crude but expressive outline of the mastodon he had killed or perhaps the mastodon that got away.

From this humble beginning we recognize the birth of modern theatre, and note the evolution of theatrical form. Primitive drama showed us the basic elements of theatre: a story with a climax, verbal embellishment, a seating arrangement, lighting, and scenery.

Construction of Greek Theatre

The typical theatre of the Greeks was built on the slope of a hill, thus securing sufficient elevation for the back rows of seating without the enormous substructures which the Romans used. If the surface was rocky, semicircles were hewn out, tier over tier; and if it was soft, an excavation

was made in the hillside and lined with rows of stone benches, the benches often being faced with marble, as in the theatre of Dionysus of Athens. The circular pit thus formed was enclosed by a lofty portico and balustraded terrace and was assigned to the spectators. The auditorium was divided by broad concentric belts, which served as lobbies, with eleven rows of seats between each, and these were further divided into wedges by transverse flights of stairs between the lobbies, converging on the center of the orchestra. The latter resembled the passages in a trireme with its banks of oars, and hence were called selides or gangways; the subdivisions, eleven to each section, suggestive of many benches of rowers.

The auditorium was divided into several parts, but the assignment of seats was determined by rank and other considerations. Thus the rows nearest the orchestra were set apart for a number of the council, while others were reserved for young men. Most of the space was given to the general public, who with these exceptions could make their own choice of seats.

The orchestra was ten or twelve feet below the front row of seats which formed its boundary, a portion of its space being occupied by a raised platform which presently superceded the alter of Dionysus in the center, though still known as the thymele. In the front of it, and on the level with the lowest tier of seats, was the stage to which flights of steps led from the orchestra, with others leading to the chambers below and known as charon's stairways; for they were used for the entrance of spectres from the nether world and for the ghostly apparitions of the dead.

The house consisted usually of two stories, to which a third was sometimes added. They were divided by a continuous balcony, adorned with columns corresponding to the dimensions of the orchestra and stage, and contained five doors through which the actors made their entrances.

The five doors leading from the house to the stage were for the actors' only entrances, side entrances being provided for the chorus, who passed under the stage and ascended by flights of steps. The central door was for the chief actor, the scenery hung before it representing his abode, be it a palace, a hut or a cavern. Right and left of it were the doors of the second and third actors, the two outer doors indicating to the spectators whether the actors entering them came from the city or from a distance. The stage was exceedingly narrow, forming merely a ledge at the foot of the house. Superceding as it did, the stage used in that time appears to have been a movable wooden structure, and was taken down when the theatre was required for public meetings or other non-theatrical purposes.

The huge Dionysian theatre was nearly ten times as large as any that now exists. The acoustical properties were increased by inverted bell-shaped vessels of bronze resting on pedestals and distributing the vibrations of sound throughout the auditorium.

Construction of Roman Theatre

In the main, the Roman theatres were copied closely from those of the Greeks, but were usually constructed on a level site; not scooped out of a hillside, as with Hellenic Playhouse. This necessitated an elaborate arrangement of substructures, with ranking vaults, also an additional facade with a system of arches following the semicircle of the auditorium.

The design universally adopted appears to have been tiers, usually three in number, of open arches with intermediate engaged columns, each being of a different order, as is still to be seen in the remains of the theatre of Marcellus in Rome. The development of the stone arch, and still

more the use of concrete for forming vaults, enabled the Romans to erect their theatres on any site, the favorite location being the level plain of the Campus Martius.

During the republican era the erection of permanent theatres, with seats for the spectators, was thought to savor of the Greek luxury and to be unworthy of the stern simplicity of Roman citizens. Thus in 154 B.C. Scipio Nasica induced the Senate to demolish, as useless and injurious to public morals, the first stone theatre which had been begun by Longinus. Even in 55 B.C. when Pompey began the theatre of which remains still exist in Rome, he thought it wise to place in it a shrine to Venus Victrix, as an excuse for having stone seats below it--the seats theoretically serving as steps to reach the temple. This theatre is spoken of by Vitruvius as "the stone theatre" par excellence, and is said to have held 40,000 spectators. It was also used as an amphitheatre for the bloody shows in which the Romans took greater pleasure than in the purer intellectual enjoyment of the drama. Adjoining it was the curia of Pompey, "where great Caeser fell," after which it was burned to the ground, and the site declared a "locus sceleratus," an accursed spot. The colossal statue, commonly supposed to be that of Pompey, now in the Palozzo spada, was unearthed in 1553 in the neighborhood of the theatre, which notwithstanding the interdict, was restored by Augustus, and again by others, after being several times destroyed by fire, its final restoration being in the reign of Titus. Near it was also found, in 1864, a colossal gilt bronze statue of Hercules, a third-century work, whose home is now in the Vatican.

In some cases the Romans built two theatres close together, one for the Greek and the other for the Latin drama, as at Hadrian's magnificent villa in

Tivoli. All provincial towns of any importance seem to have possessed at least one, designed with semi-circular orchestra after the Roman fashion. Those built under Roman rule in Hellenic cities seem, on the other hand, to have been usually constructed on the old Greek model, probably because they were designed by Greek architects. An important exception is the well preserved theatre at the southwest corner of the Athenian Acropolis, which has a semi-circular orchestra. Its cavea, which is excavated in the rock, held about 6,000 people, and it was connected with the great Dionysia theatre by a long and lofty porticus or stoa, of which considerable remains still exist.

The Romans used more elaborate stage effects than was the custom in Greece. They mention three sorts of movable scenery; first, for the tragic drama, facades with columns representing public buildings; second, for comic plays, private houses with windows and balconies; and third, for the satyric drama, rustic scenes, with mountains caverns and trees.

Roman stage differed essentially from that of the Greeks and modern nations. Thus two actors might enter and talk to themselves a considerable time before they saw or knew each other, which to us does not appear natural, until we consider the difference between our small, narrow stage and those of the magnificent Roman theatres, which were nearly 200 feet in frontage. The scenes of the latter were so many streets meeting together, with by-lanes, rows and alleys, so that two actors passing down separate streets or lanes could not be seen by each other; nor could they well distinguish faces at sixty yards distance.

THEATRE IN ASIA

Traditional Theatre

Traditional Theatre's most striking characteristic is a high degree of specialization in presentation form--the particular way in which each theatre uses song, dance, mime, music, gesture, and speech. Different traditional theatres may borrow stories from the same source, but each theatre treats the given material in a way appropriate to its own special form of presentation and usually chooses to do only certain kinds of episodes. The result is that Asian audiences think of theatre in terms of specific presentation form rather than specific stories. To maintain its identity, a traditional theatre must stick closely to its own parameters of subject and form.

Today, modernization and Western dominance have affected traditional theatres in different ways. But whatever the local pattern, the traditional theatres of every Asian country point in a single direction--toward attrition; traditional theatre simply cannot accommodate large-scale social change because they are so deeply and finally ground in received cultures.

Intermediary Theatre

Intermediary Theatres are a heterogeneous group occupying the vast middle ground between the Traditional and the Modern Theatres. Intermediary Theatres represent the first phase of the modernization of Asian theatre; they are traditional in form but project secular values, even when their content is religious in origin. The Intermediary Theatres are adaptive, more flexible and less prescriptive than the Traditional, though many intermediary forms developed from Traditional Theatres.

Modern Theatre

The Modern Theatres in Asia are the offspring of Western theatre and were born under dissimilar national circumstances sometime during the past 150 years. All the modern Asian theatres are started as minority projects, drawing their participants from the new class of intellectuals and students created by modernization and the impact of the West. In spite of its intellectual origins, however, the Modern Theatre seems to have latent drives toward professionalism and commercialism. So far, these goals have proved attainable only in cities with large middle class populations. And, as in the West, the institutionalized Modern Theatre has given rise to innovative or "new theatre" movement.

The first proponents of Modern Theatre in Asia felt that their indigenous theatres, whether traditional or intermediary, could not deal fully with contemporary subjects or modern sensibility; thus, they turned to Western theatre, believing that its forms could more appropriately express the new,, emerging consciousness of Asia. No doubt Asian colonization of Western styles had something to do with the social effects of Western dominance; but at the root the wide acceptance of Western concepts of theatre in Asia is a scholarly internal social change. Modern theatre has grown along with the rise of urban middle class and for the most part reifies the conflicts and dilemmas of that class. Magical, ritualistic performances obviously have little meaning for the bourgeoisie; increasingly, middle class city dwellers look for rational structure in theatre, including well made plots and domestic themes which enact or explain their every day lives.

FACTORS AFFECTING DESIGN FOR TROPICAL ENVIRONMENT

The consideration for design in the tropical environment can be divided into factors:

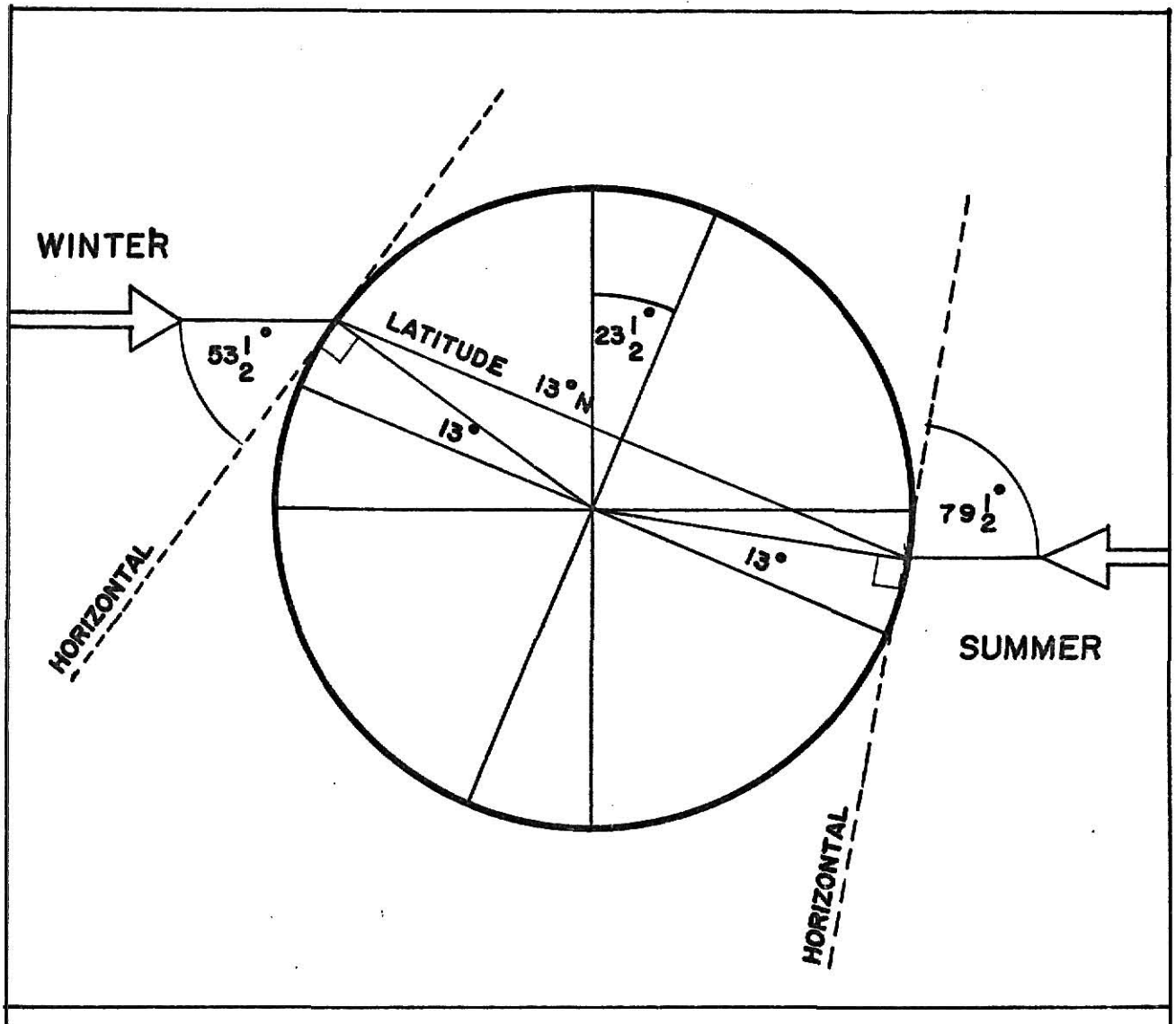
1. Climate,
2. Building Materials.

Climate

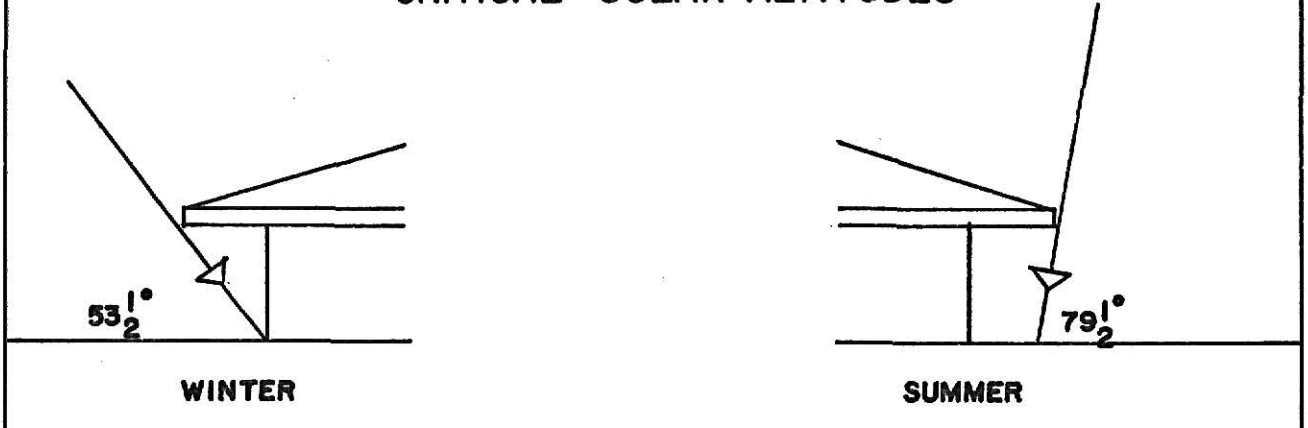
Climate is one of the most important factors affecting design in the tropical areas. Maxwell Fry and Jane Drew in their book, Tropical Architecture, divided the climate into hot-wet climate, and hot-dry climate. The climate of Thailand is classified as hot-wet climate or monsoon climate.

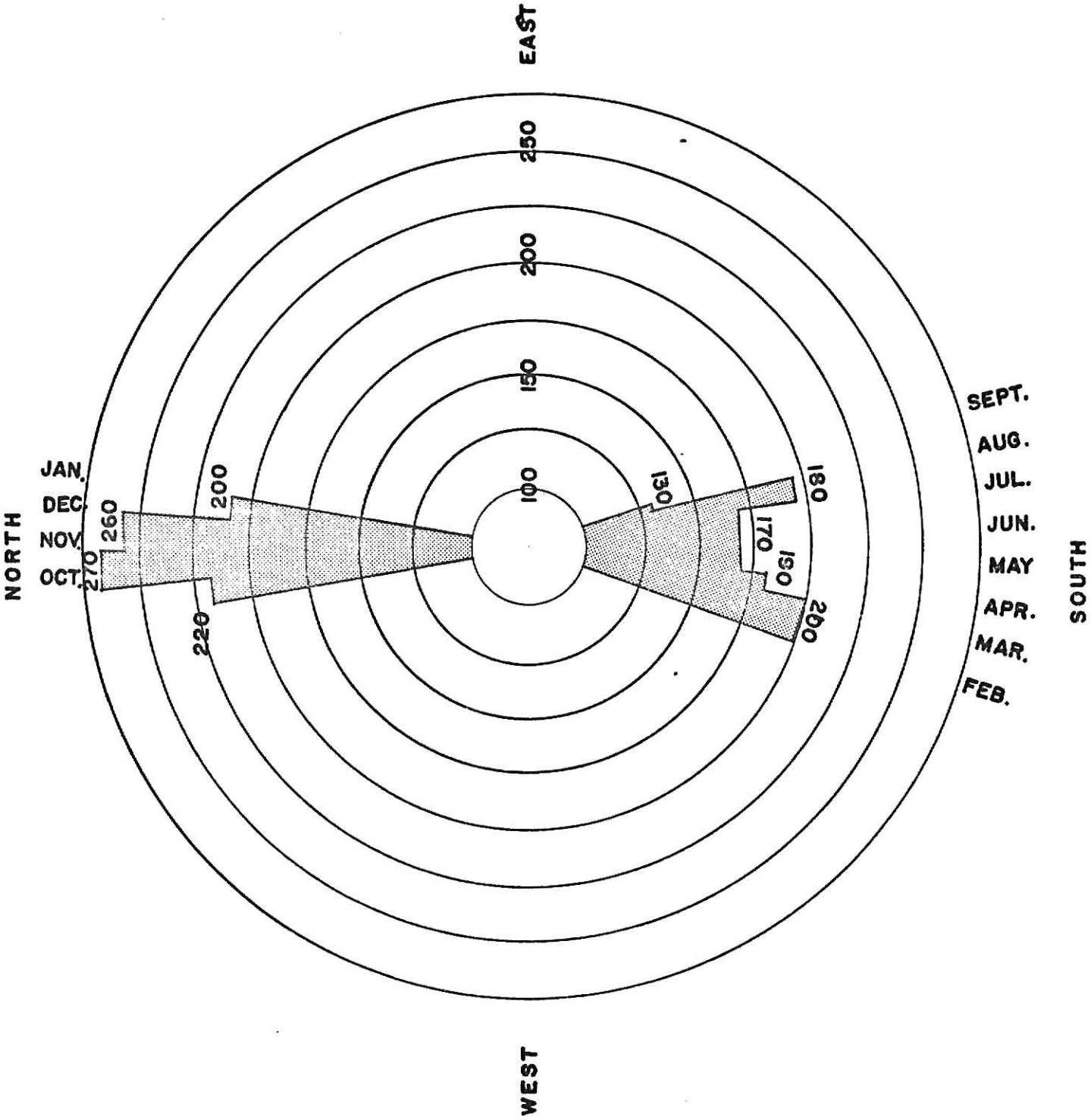
The problem of design for warm climates is different from that for cool climates. In the cold, solar radiation is required as a heating agent, but is undesirable in the tropic countries. Protection from the sun is always necessary. People protect themselves as best they can with hats, sun shade umbrellas, etc., but more effective measures are needed for their buildings.

Buildings, when occupied, perform two thermal functions. They provided shelter from the harsher features of climate, such as rain, wind, glare, and radiation. Buildings also impede the dispersal of heat developed within. In a cool climate both functions are useful; but in a warm climate people need buildings to shelter themselves against the harsh elements, and at the same time to allow the rapid dispersal of heat from inside. As a matter of fact, it is not so much heat that bothers people as the subjective feeling of warmth due to a combination of static heat and humidity when air movement is lacking.



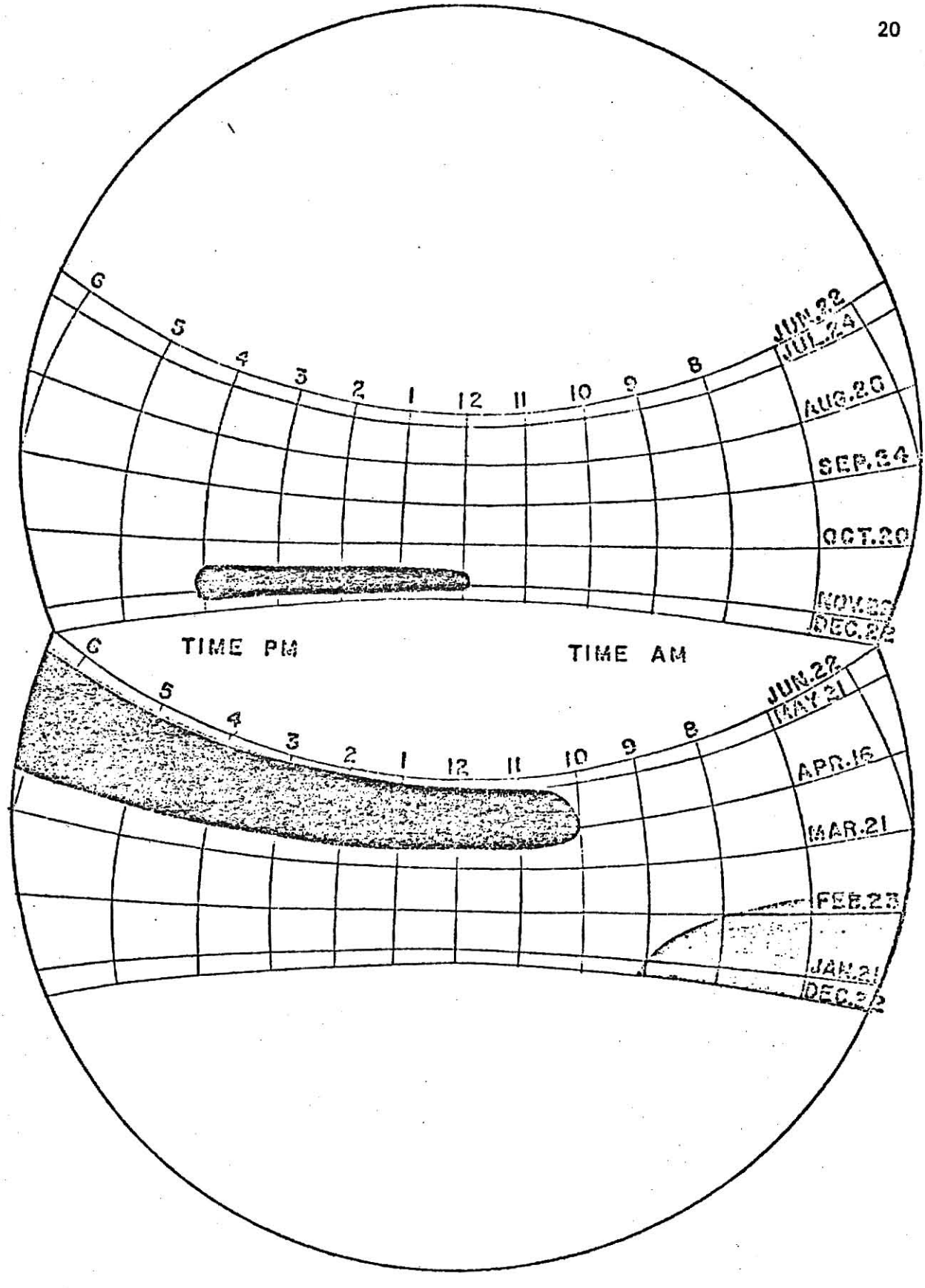
CRITICAL SOLAR ALTITUDES





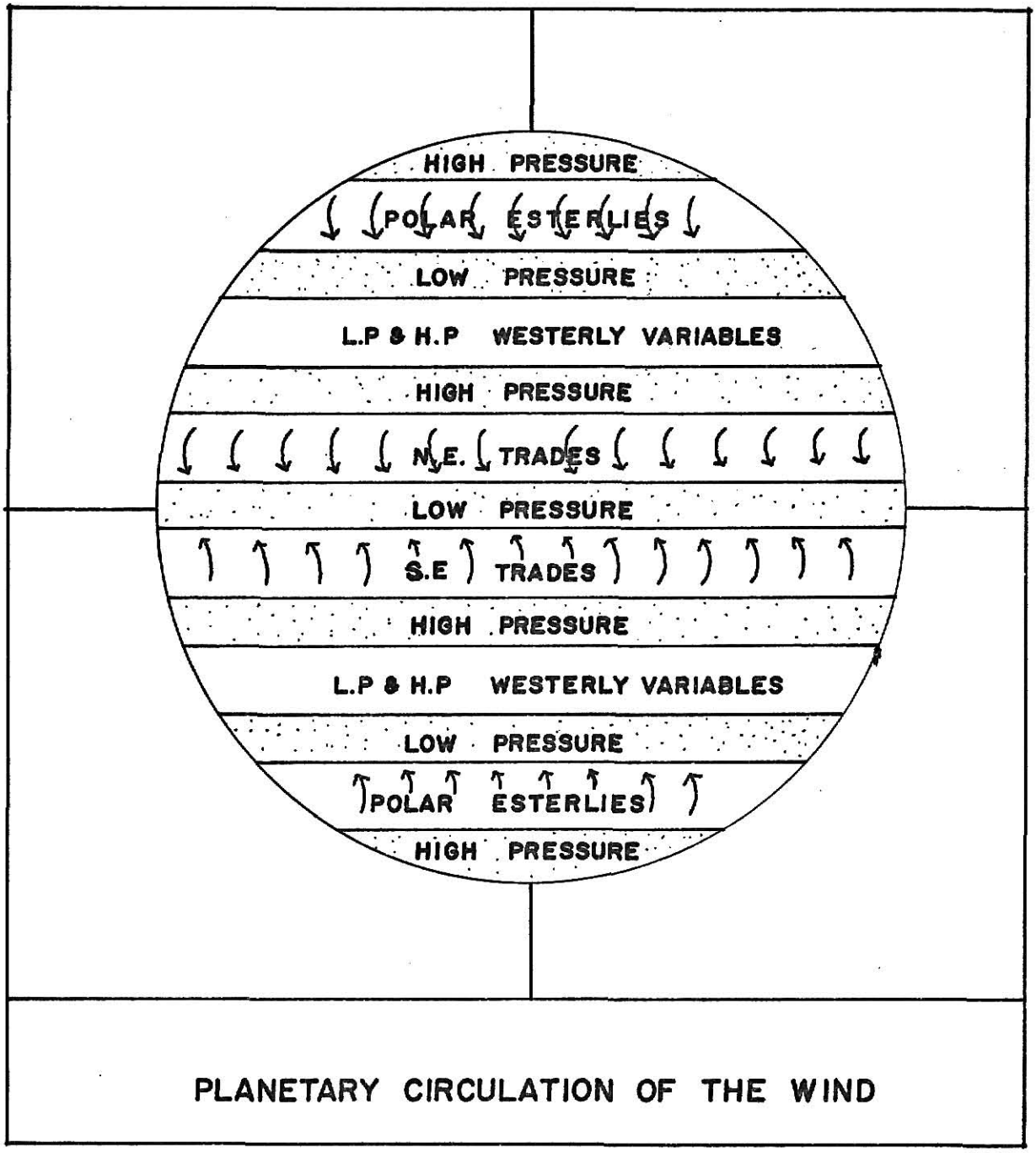
WIND SPEED & DIRECTION

FEET PER MINUTE

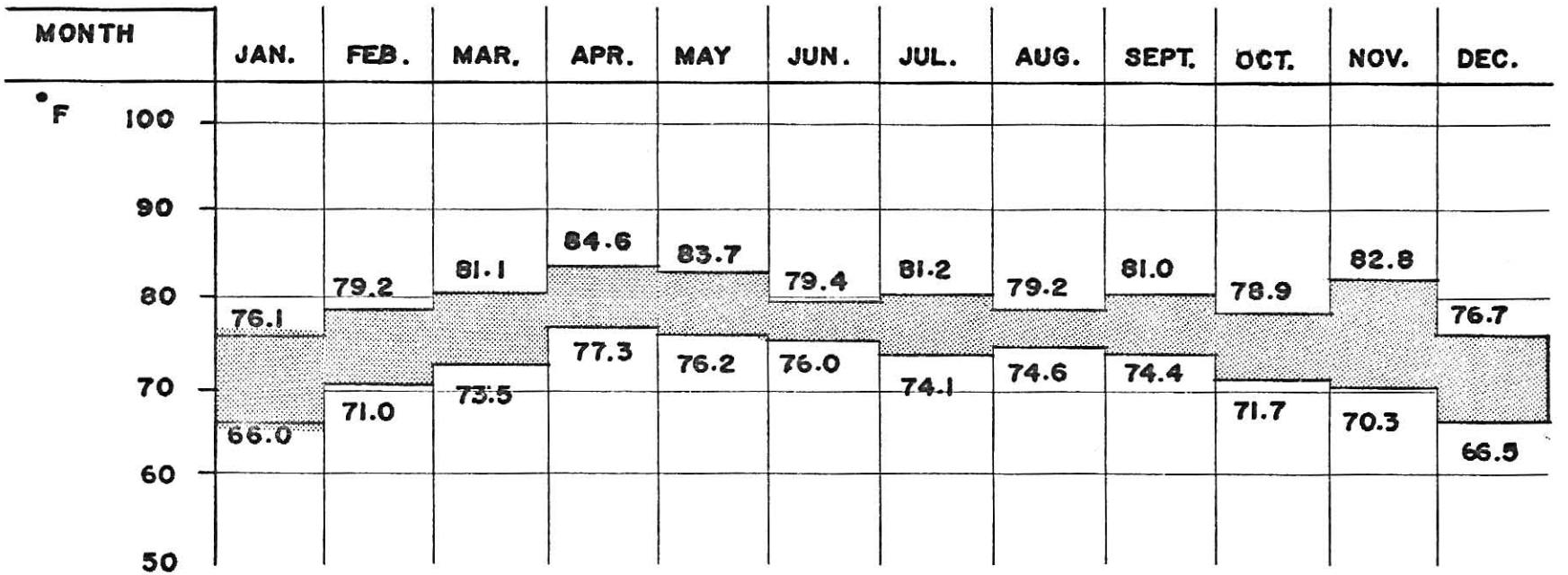


COLD (BELOW, 71°F)
COMFORT (71°- 81°F)
HOT (OVER 81°F)

EFFECTIVE TEMPERATURE



PLANETARY CIRCULATION OF THE WIND



EFFECTIVE TEMPERATURE

AVERAGE MONTHLY

MONTH	JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEPT.	OCT.	NOV.	DEC.
AM 7:00	69.2	71.2	74.0	77.6	76.5	76.2	74.5	74.5	74.9	71.8	73.7	69.7
8:00	70.0	73.0	75.6	79.2	78.5	77.1	76.0	75.8	76.0	73.2	73.5	72.2
9:00	70.9	74.9	77.4	80.8	80.0	77.8	77.8	76.5	77.8	74.8	76.3	70.3
10:00	72.7	76.7	78.8		81.2	78.2	79.0	77.9	78.9	76.0	78.6	72.5
11:00	74.1	77.8	79.9			78.8	79.8	78.1	79.7	77.0	80.0	74.0
12:00	75.1	78.4	80.3			79.0	80.2	78.8	80.0	77.5		75.0
PM 1:00	75.8	78.9	80.8			79.2	80.6	79.0	80.7	78.1		75.8
2:00	75.9	79.0	80.9			79.5	80.9	79.1	80.3	78.3		76.0
3:00	76.0	79.1	81.0			79.4	81.0	79.2	80.9	78.5		77.3
4:00	75.6	78.3	80.6			79.2	80.6	78.2	80.2	78.0		75.8
5:00	74.5	78.0	80.0			78.9	80.0	77.6	79.7	77.2	80.7	74.6
6:00	73.0	77.0	79.1			78.5	79.2	77.0	79.1	76.4	79.0	73.2

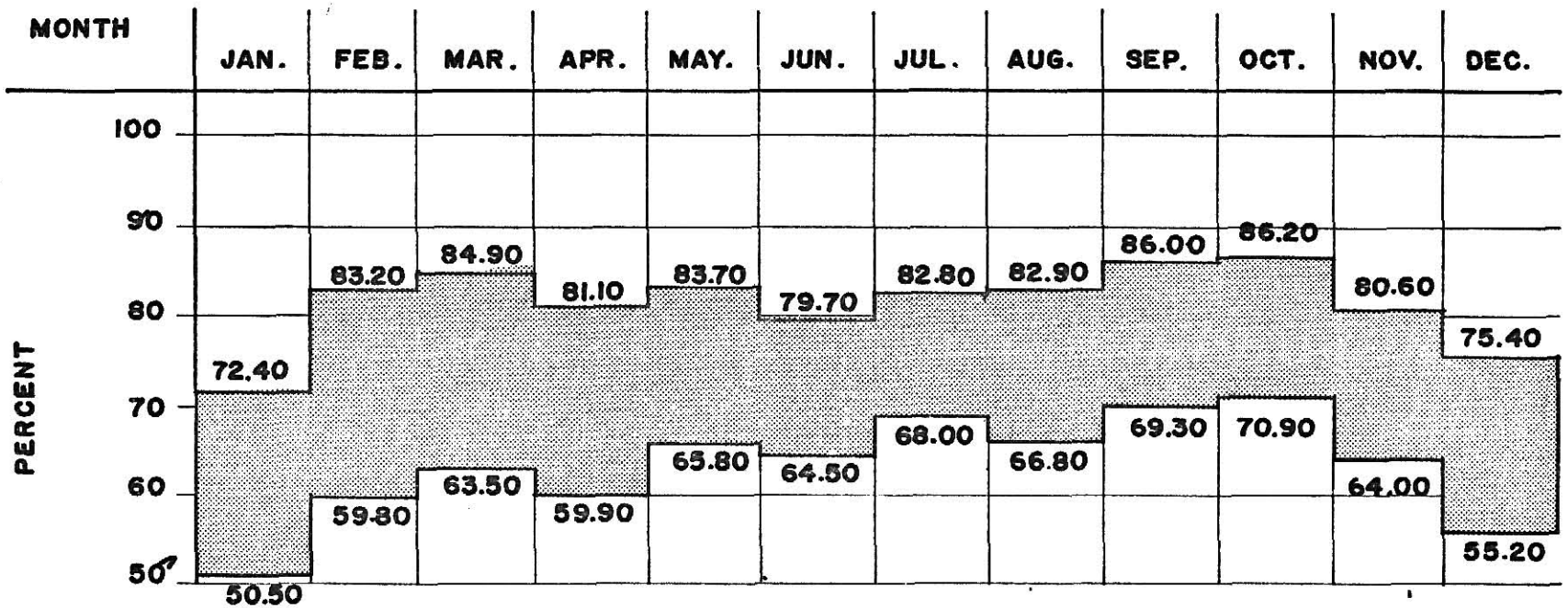
EFFECTIVE TEMPERTURE

AT EVERY HOUR

COOL

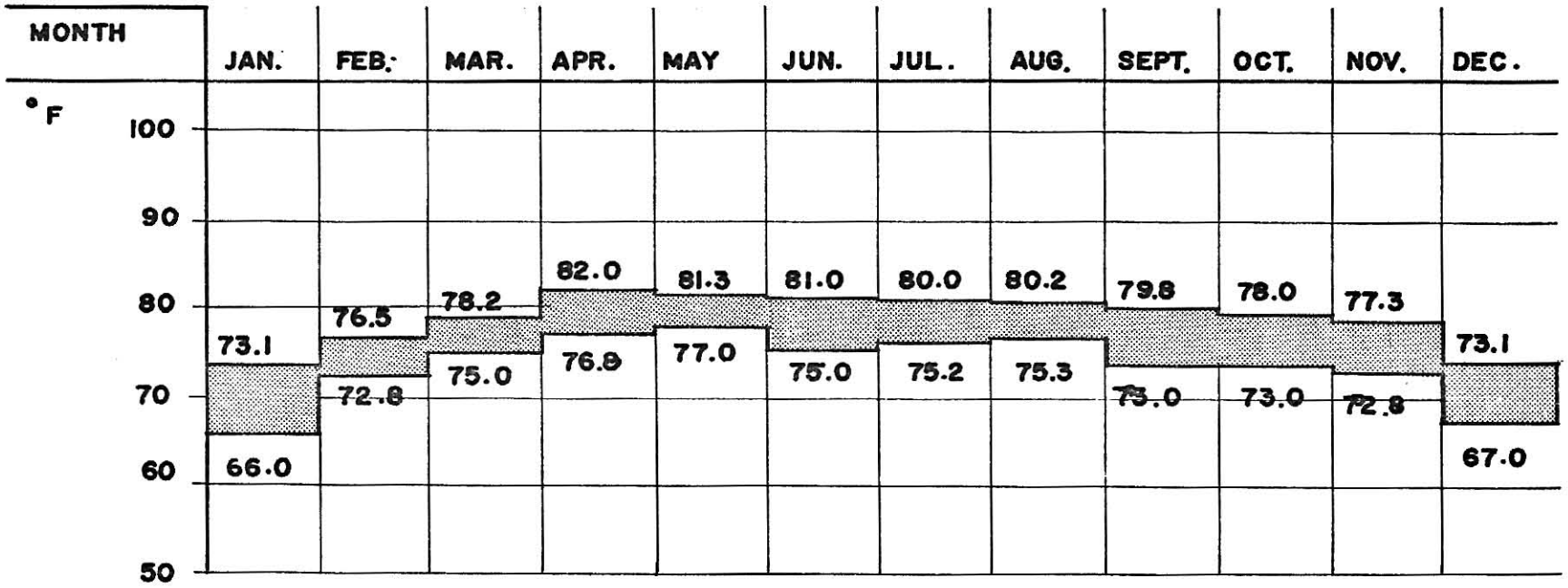
COMFORT

HOT



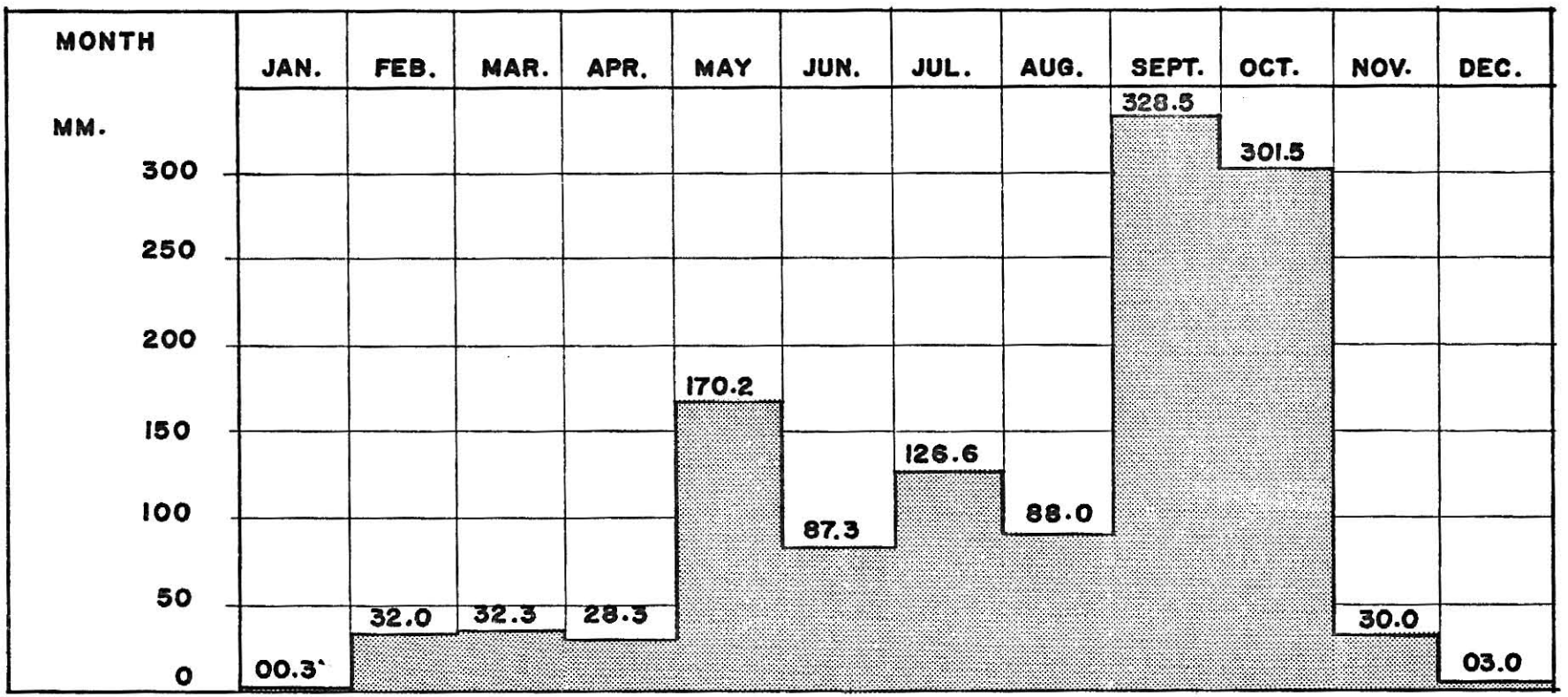
RELATIVE HUMIDITY

AVERAGE MONTHLY



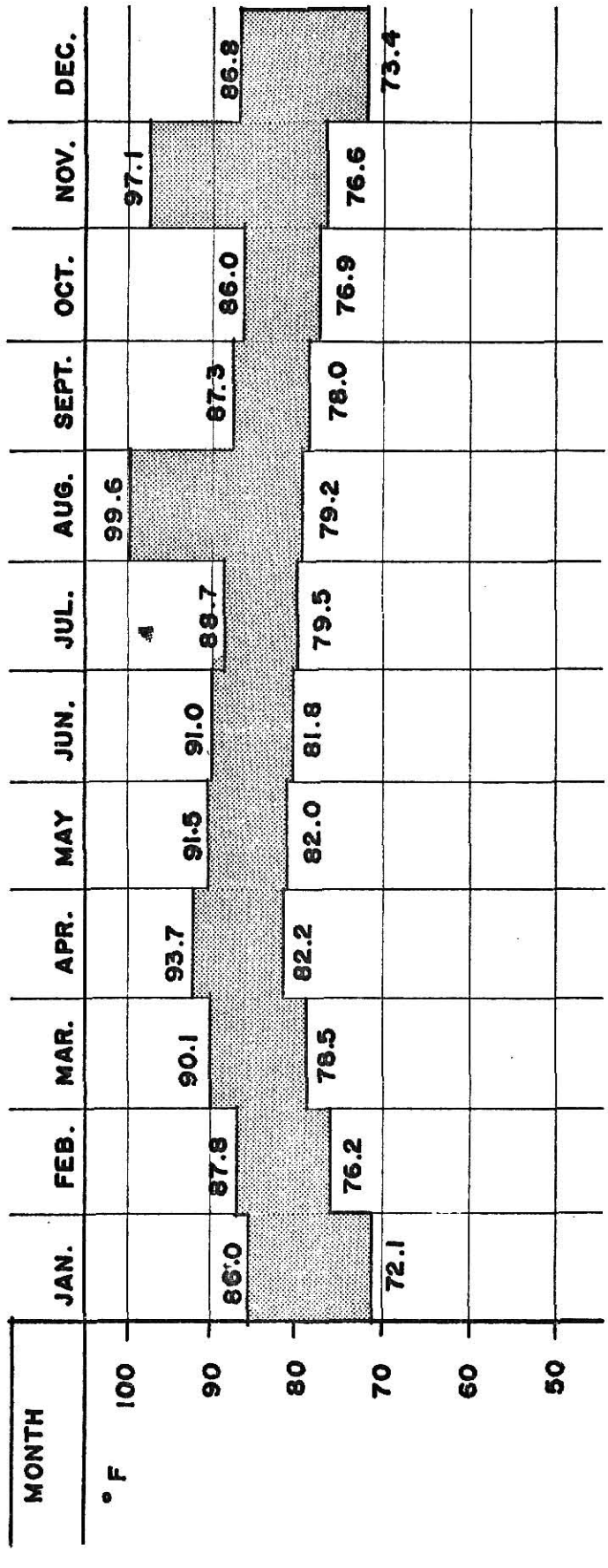
WET BULB TEMPERATURE

AVERAGE MONTHLY



RAINFALL

AVERAGE NUMBER OF DAYS OF RAIN PER YEAR



DRY BULB TEMPERATURE

AVERAGE MONTHLY

Solar radiation influences the indoor thermal climate directly by heat penetrating the windows and indirectly by heating the external envelope of the buildings. Heat flow through the walls and roof then determines the indoor surface and air temperature. Sunlight is always required for illumination within a building, but, as light is ultimately converted to heat, the human radiation requirements depend on the prevailing climate condition.

Among the factors which cause tropical climates to vary are wind, rainfall, the relationship of water, the height above the sea level, and the presence and absence of vegetation. Wind is the most useful natural means of ventilating a building in a tropical region. When designing buildings without provision for constant air-condition, the buildings should allow for the maximum passage of air. The best orientation for catching the cooling and dehumidifying breezes and dispersing the heat, is obviously to design the building with long side openings facing the wind directions.

The yearly average humidity of Thailand varies little; it is between 75 percent to 85 percent. Because of the high temperature and high humidity amidst heavy rainfall, most buildings are built 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 which at the same time allows humidifying ventilation to enter through window louvers under the protection of the overhang.

Aside from the choice of location, orientation is the first consideration in planning. North and south sides of the buildings need much less protection from the sun than the east and west sides; therefore, the best orientation for reducing the solar heat gain in the building is to plan its

long axis east-west. In some cases, the architect may have to consider the orientation of buildings for the sake of shading or breezes. To further prevent uncomfortable heat transference, building surfaces should be shaded by natural vegetation or mechanical devices expressly designed for this purpose. This shading may be achieved in a number of ways, there are:

1. overhanging eaves and balconies,
2. sun-breaking devices, such as canopies, pergolas and vertical louver screen,
3. light slab or light weight top roofs to shade subordinate flat roofs,
4. natural vegetation, such as plants, trees, shrubs.

If screens are provided to protect the buildings against sunlight, they must not create darkness inside, and certainly not obstruct against breezes, which are so desirable in a hot, humid area.

Buildings in Thailand should be thoroughly ventilated and shaded against the sun and the monsoon rain. Horizontal or vertical louvers, overhangs, canopies, and verandahs should be liberally adopted. They will allow for cross ventilation through windows enabled to remain open even when it is raining. Windows facing west should be avoided whenever possible.

In hot-humid climates visual discomfort arises mainly from glare in the sky; in hot-dry climates considerable visual discomfort is caused by surface glare. The amount of solar radiation which is reflected from the paving surrounding the building is also prohibiting. An unprotected pavement may register 110°F when the surrounding air temperature is only 90°F. It is at this point that grass and vegetation can help decrease the affects of radiation to a substantial degree. Nature is both harsh and gentle at the same time.

The reduction of solar radiation through a roof is most desirable because it is the area of the building most exposed to the sun. The problem is to reduce the penetration of solar heat and to prevent its radiation into the building. One solution is to produce low temperatures in the ceiling and to disperse excess heat rapidly. This may be accomplished by using double roofs with a space for circulating air to pass between them.

Building Materials

The factors which effect the selection of materials are availability, cost, requirements of building regulations, the ability of the materials to stand up to prevailing climate conditions, and the standard of workmanship. Since the costs of imported materials are high, there is a marked tendency towards the protection of local materials. This is evident in the case of cement and resulting in the greater use of concrete and 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 the tropical countries. The cost of a 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 for consideration.

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

High temperatures can cause a fundamental change in organic materials such as paints, plastics, bitumen, and rubber which can become embrittled. Temperature fluctuation can cause thermal movement resulting in cracking, distortion, or discoloration. Prolonged high humidity promotes mold or

algal growth while the daily range of relative humidity causes dimensional changes in timber. Although Thailand does not have much atmospheric pollution, there are other factors to contend with such as the problems of termites, sea-salt in the atmosphere of maritime areas which promotes the corrosion of metals and degrades paint films, and of expensive clay soils on which the method of tied and combined foundation on piles may be needed.

PLANNING CRITERIA

Cultural facilities old or new do not exist in a vacuum. They exist in a community and must be a vital constructive force within it. Public facilities for the arts meet these requirements. They must serve the public, and their influence must be extended into all segments of the community. The present criteria for design are:

1. The Arts Center shall be the focus for civic and community activities.
2. The ultimate objective of this Center shall be the satisfaction of the civic and social needs of the people. By its design the Center should stimulate and facilitate the execution of govenrmental and cultural activities. The human factor must be the guiding element in planning the Center.
3. The design of the Arts Center shall take into consideration future expansion needs of individual buildings and the Center as a whole. The design shall possess sufficient flexibility to provide adequately for a variety of possible future growth alternatives without destroying the integrity of the basic plan.
4. The design of all component structures of the Arts Center shall be geared to the climatological and physical conditions characteristic of the site. Landscaping shall emphasize native flora.

5. The Center shall contain a variety of architectural, landscape and artistic focal points so as to be visually inspiring, thereby avoiding monotony or the risk of a sterile or institutional appearance.
6. By the means of design and type of uses, the outdoor areas of the Arts Center shall radiate a lively and inviting atmosphere. Such facilities as the outdoor theatre and sitting area shall be developed as part of the individual building programs and in no case shall they conflict with the legitimate uses of the buildings or the Center.
7. In the design of the Arts Center consideration shall be given to variations in the horizontal plane such as sunken amphitheatre, raised terraces and buildings of varying heights.
8. To the greatest extent possible the organization of the structures in the Arts Center shall have logic, simplicity and unity of design immediately recognizable and pleasing to the eye. There must be a harmony of the whole.
9. Both function and beauty shall be prime considerations in the design of the Arts Center. It shall be friendly, creating a feeling of intimacy and radiating an atmosphere of welcome.

SITE SELECTION

Well-developed waterfronts are among the greatest and rarest of urban assets. Bangkok's beginnings were largely dependent at first upon travel by water. As time went on the railroad and the automobile came in at the central part because they had followed the easier grades at the water-edge to their principal focus of interest, the business center. As the years passed, the water frontage either was preserved as a thing of beauty or it came to be a mixture of uses--an area that was exposed to neglect and to the unrepaired havoc of flood and time, with old buildings allowed to wear away and property values allowed to dwindle. Either the original front door of the community became the very back door or the forgotten entry, or it retained in some measure at least its importance as an outstanding community feature and served rather as the approach or show place of town.

Today many communities in the world are trying to recover the water-front values that have been hidden or lost. As a community focal point, a waterfront can be expected to serve to the fullest possible extent only after the whole gamut of planning problems and possibilities has been properly explored. These are as diverse as there are various kinds of waterfront properties.

When considering the selection of a site for the proposed theatre, several requirements have to be satisfied. The first obvious requirement is that the site should be physically large enough to accommodate a public facility.

The site that was found to be the most desirable for the location of this project is the portion of land at the west corner of the Phra Mane Ground (Royal Court Yard). Besides being close to existing public facilities,

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

THIS IS AS RECEIVED FROM CUSTOMER.

SITE

the site stands on the bank of Chao Phaya River. Along the river side are other cultural institutions such as the National Library, Thammasat University, and the University of Fine Arts.

The site is taking advantage of its adjacent location to the Phra Mane Ground because it is the center of Bangkok. Phra Mane Ground is a large oval shaped open field in front of the Grand Palace. The Phra Mane Ground is like a large racetrack in shape with a wide sidewalk around its periphery, and is a great open area except for trees which border the sidewalk at its edges. The field is now used for many ceremonies and for weekend open market activities. It is also a park and playground.

The site also has an excellent view to the Chao Phaya River. The glittering, broken-pottery-covered tower of Wat Arun and the Naval Academy across the river are considered major points of interest. In the near future, the riverfront has been considered for development into an attractive combination of high-density residence plus commercial and cultural activities. Furthermore, the theatre design is therefore an integral part of the total process. The area facing the riverfront in this project should consider additional future developments along most of the front.

The criteria for selecting this site, therefore, are based on:

1. accessibility to major city arteries,
2. close proximity to the public park,
3. adequate remoteness from heavy traffic,
4. adequate parking space.

DESIGN CONCEPT

As stated previously, the Westernized communicative arts have received limited exposure in Thailand due to inadequate facilities. I have had the idea in mind for a long time to provide new facilities for serving the arts. Therefore, I have selected the Center for Performing Arts to be my thesis project. The Center will not only be for the performance of all arts, but also to encourage people who are interested in seeing more and hearing more local or visiting performances and orchestras.

As we know, the purpose of the theatre is to provide performances for the audience in spaces that meet the physical and psychological needs of the "actors' area" and "audience area." The design of spaces will vary according to the needs and type of the performance, fulfilling both "backstage" and "audience area" requirements in essentials and comforts, technical aids, and artistic quality.

No single theatre can satisfy the ideal requirements of all the performing arts; therefore, a theatre should function best for that type of presentation for which it is primarily designed, and, in addition, it should provide for as much flexibility as practicable without impairment of the primary function. Multipurpose places of assembly are very often not functionally suitable or financially realistic.

Therefore, the Arts Center will consist of:

1. a concert hall,
2. a drama theatre,
3. an art and music library, and art gallery,
4. an amphitheatre.

The concert hall is designed for concert performances which will accommodate 1204 persons. It is carefully designed for good hearing with acoustical materials to absorb the unwanted sound. Also, sound absorption is provided by people, upholstered seats and carpeting.

The drama theatre provides for dramatic performance such as folk dances, drama and ballet. The theatre accommodates 900 persons. This theatre functions independently with its own scenery shop, offices and other facilities.

The art gallery houses the works of great artists with exhibition areas on the second floor. The small library is on the third floor.

A round sunken amphitheatre is also provided, accommodating about 500 persons. It offers outdoor concert facilities and other cultural activities. Shrubs and trees provide natural protection from intruding outside noises. Parking space for 300 cars, a plaza, and necessary landscaping are included as part of the design project.

Bangkok, the capital of Thailand, with its beautiful natural scenery, situated on the right bank of Chaophaya River, has been selected for the site. The specific site is about 634,500 sq. ft. in area, facing west to the Chaophaya River. The site is protected from busy, noisy traffic and provides a pleasing view of the river. The Center will also be physically related to the University of Fine Arts, School of Drama and Thammasat University.

The east side of the site faces a 30 ft. wide street. It is feasible to make it oneway traffic in order to avoid the traffic from Thammasat University which has about 20,000 students.

The Arts Center complex is to be located on the south portion of the site readily accessible for the Universities; yet, the patron can avoid the

students from Thammasat University when approaching the Center. The north site will be the parking space for the people who come to the performances. Musicians' and performers' parking is also reserved at another area. The Center will not only satisfy a long felt need for a facility in the performing arts, but it will also provide a pleasant riverfront area in Bangkok and meet the needs of the citizens of Thailand.

Traffic Noise Control

The principal intruding outside noise is generated by the one-way vehicular traffic around the site. The sound level varies with traffic density. Usually the peak load occurs in the morning and afternoon when people are going to work or school. To alleviate the noise load, the trees around the site reduce the traffic noise (and air pollution), while other insulation and thick wall construction are provided in the structure itself.

Water Drainage and Sewage Disposal Systems

The residential house in the tropics provides most adequately for the disposal of waste water from the house, using the individual septic tank and drain field. In light of such a system, I have provided the following.

The drainage of rain water on and adjacent to the building is designed to enable the water to drain away as fast as possible. The surface run-off will be controlled by drainage pipe and will flow into the main public drainage system. The sewage disposal is dumped into large volume septic tanks to be periodically removed.

Landscaping

Landscaping is a very important aspect in this project. Land, space, plants and water are basic elements to create the pleasant environment for

the Arts Center. The history of man in his environment is the history of water. Water is a necessity for life. It is a habitat to many organisms and a source of nourishment to all. Water cleanses the body and purifies the Soul; it completes the environment of man and refreshes his spirit.

In the more humid regions like Thailand, water should be used at a scale which assumes a renewal of the source. Environment design has emphasized naturalism and a stylization of nature. Water is a spontaneous part of the designer's concept. Water-pools are utilized to create a pleasant environment, and reflect the image from the vast plaza area. The plaza surfaces themselves are brick, creating different pattern and forms. In conjunction, roadside trees provide desirable physical effects--coolness in summer, softened glare, and they freshen the air.

BUILDING ELEMENTS

I. Administration Section
   - A. General Office
   - B. Information
   - C. Accounting and Financial
   - D. Public Relations
   - E. Lounge
   - F. Toilets

II. Lecture Room

III. Concert Hall
   - A. Stage
   - B. House
   - C. Lobby
   - D. Balcony
   - E. Public Space
   - F. Refreshment Area
   - G. Storage
   - H. Mechanical Room
   - I. Toilets

IV. Drama Theatre
   - A. Stage
   - B. House
   - C. Lobby
   - D. Balcony

E. Storage

F. Dressing Rooms

G. Toilets

H. Rehearsal Room

V. Library and Gallery

A. Director's Office

B. Curator's Office

C. Lobby

D. Gallery

E. Temporary Exhibition Room

F. Library

G. Book Stacks

H. Special Study Room

I. Packing Room

J. Storage

K. Toilets

THE CIRCULATION AND ELEMENTS OF THE THEATRE

A theatre can be divided into three kinds of circulation. The first is public circulation; the second is performers' circulation; and third is backstage, working and maintenance circulation. The following study describes the function, space requirement and location of significant areas.

Public Circulation

I. Entrance and Foyer
   - A. A reasonable minimum area is one sq. ft. per theatre seat.
   - B. Direct access to the foyer on all sides.
   - C. Ticket booths must be arranged as not to interfere with the straight path from foyer to lobby.
   - D. Absorbing acoustical materials should be applied.

II. Lobby
   - A. The lobby is the principal distribution area.
   - B. Accessible to all public space, 2 sq. ft. required per person.

III. Lounge
   - A. Traffic in the lounge itself is to the bar, refreshment area and restrooms.
   - B. Tables and chairs should be provided.
   - C. Should have adequate space to accommodate the whole audience or 6 sq. ft. per seat.

IV. Auditorium

A. Seating spacing of 36 inches back to back.

B. No aisle should be located along the longitudinal axis of the auditorium, where seeing and listening conditions are most favorable.

C. The auditorium should be shaped so that the audience is as close to the sound source as possible.

D. The floor should be properly ramped because sound is more readily absorbed when it travels over the audience at grazing incidence.

E. The gradient along the sloped aisles should not be more than 1 in 8.

F. The floor area and volume should be kept at a reasonable minimum 250 cu. ft. (7.1 cu. m.).

G. Clear sightline from all seats.

H. Optimum temperature is about 67-70 F.

Performers' Circulation

I. Acting Area

A. Size, shape, equipment and arrangement depend on the nature of performance.

B. A single performer requires about 4 sq. ft. Elaborate period costume and sweeping arm gestures may enlarge to 25 sq. ft. A solo dancer of the more energetic sort requires a minimum floor area of about 300 sq. ft.

II. Orchestra Pit

A. Must have good sightline between the performers and conductor.

B. The pit must be at least as deep as the trap room, with floor adjustable in height according to the demands of the performance.

C. Space planning should allow 10 sq. ft. per person, except 20 sq. ft. for a harp, 50 sq. ft for a stand grand piano, and 100 sq. ft. for a concert grand piano.

III. Stage Entrance

A. Transition space, providing space for mail and message reception, and reading calls and notices.

B. Vestibule, required minimum 50 sq. ft.

IV. Dressing Room

A. Minimum 16 sq. ft. per person.

B. Should be near the stage.

C. One lavatory required per room.

V. Green Room

A. Minimum 300 sq. ft.

B. Near the stage, full facilities for lounge.

VI. Reception Room

A. Adjoining stars' dressing rooms for private entertainment of guests apart from the general bustle of the green room. Comfortable furniture and pleasing decoration.

VII. Rehearsal Room

A. Have adequate space and all facilities required.

B. Easy passage between auditorium and stage.

Backstage, Working and Maintenance Circulation

I. Loading Platform

A. Should have the width to accommodate for two trucks.

B. Clear and direct approach for truck.

C. Use ramps outside to adjust the grade.

D. Avoid change of inside level.

II. Receiving Area

A. Adjacent to loading platform.

B. Required 300 sq. ft. minimum.

III. Scenery Shop and Storage

A. The shop is divided into areas related to the various steps in the process theatre.

B. The size of the scenery shop depends upon the size of the stage.

C. The location of the scenery shop also effects its size. The shop near the stage could be smaller than a shop in a remote location, although a distant shop has the disadvantage of causing the additional handling of scenery from the shop to the stage.

D. The painting area is another important space in the shop. It requires overhead clearance, or sufficient height to stand the scenery upright.

E. The evaluation of the space requirements results from shop procedure, area of work tools equipment and materials of the shop.

IV. Musical Instrument Storage

A. Complete temperature and humidity control.

B. Accessible to orchestra pit and have adequate lockers.

V. Stage Floor Traps

A. Single trap must be rectangular and wide enough to allow two people to ascend side by side and long enough to produce headroom under the floor framing using stairs or ladders.

B. Traps occur in all parts of the normal acting area because it is sounder practice to plan and install a complete system of traps than to lay a solid floor.

VI. Elevators

A. Vertical movement of the stage floor is produced by elevators. Trap elevators and table elevators capable of operation in one position or portable for horizontal moving.

B. Grouped together, trap elevators may provide the elevating and lowering of larger areas.

C. Table elevators are designed to raise the strip of the stage floor, easily provide the desired stepped levels for speakers, choirs, or orchestras.

ENVIRONMENTAL TECHNOLOGY

Lighting

Deciding what the best lighting system is for a given situation involves consideration of a large number of factors--physiological, psychological and economic. First of all, the architect and lighting designer must determine what sort of luminous environment is called for, taking into account how the space is to be used and who the occupants will be.

The use of light as a component of theatrical performance is highly developed artistically and technically. It is different from conventional uses of light that afford only illumination for living or working. W. Oren Parker and Harvey K. Smith analyzed the theatrical function of light as being visibility, naturalism, design and mood.

Stage Lighting. The first and obvious use for light on the stage is visibility: to allow each member of the audience to see clearly those things which he should see. The light is needed in order that the actors may be seen; it is useful to differentiate between night and daytime scenes; and it can, by virtue of some magic or other, create a mood. Yet, this is as far as many people think on the subject. Good stage lighting must go well beyond these limited objectives.

Good lighting should tie together all the visual aspects of the stage. It is not enough to illuminate players, settings, properties, and costumes. All objects that appear on the stage must be focused by light into a picture that conveys sense and feeling to the viewing audience. The actor himself, when he walks onto the stage, must be seen in a proper relationship to his background. Important is the actor's meaning in his surroundings;

thus, it is necessary to provide him with an environment in which he may sensibly interpret his role, to assist him in every way to bring to the audience the full meaning and emotion of the playwright's script.

Often we use light in extremely arbitrary ways--sometimes even to negate the action of the play, to distort the actors, to emphasize trivia, to bring unreality to the stage, to shock the audience with fantastic color, blinding glare, distracting movement, or for any other of many reasons.

Lighting the Actor. Certainly we want visibility, but lighting the actor's face from the straight ahead position is not the way to achieve it, as such light tends to wash out all the features of the human face, all its highlights and shadows, and render it a blank expressionless mask. In most cases, a spotlight must be used, with a 45-degree angle sought in both the horizontal and vertical planes. This means that an actor standing in any part of the stage will see the spotlight trained on him at 45 degrees above him and 45 degrees to either right or left. Lit by this manner, the actor's face takes on great character, his features are clearly defined and his expressions are easily read.

Lighting the Acting Area. Enough spotlights should be placed so that all portions of the stage in which the actor moves will receive nearly equal amounts of light. On a medium sized stage, twelve spotlights are usually sufficient. It is convenient and desirable to divide the visible stage space into six lesser areas; three in the downstage and three in the upstage. Regardless of how many spotlights are finally used, care must be taken to ensure that their beams overlap sufficiently for an actor moving from one part of the stage to another to avoid passing through shadows caused by insufficient light between the beams of adjacent instruments.

Lighting Control. Modern electronics have made the old-fashioned switchboard redundant. Quicker and more frequent variations are now feasible and make it possible to preselect a number of successive combinations, simplifying the task both on the night of the performance and at rehearsal. Munster was one of the first to introduce the system, which has subsequently been adopted in many theatres. In recent years it has been improved by the punch-card technique, in which individual lights are no longer hand-fed, but selected by punched cards. It has been found that this system needs only a brief acclimatization period for the operators for the system to work well.

The siting of the light-control point has also been altered. Previously, this was located in most cases at the side in the proscenium wings, so that the operator would be within call and view of the stage. Other schemes put it in a "pocket" between the orchestra stalls and the upper stalls. But in the meantime it has become accepted that the control point should be set back at the height of the first balcony or above the highest tier of stalls. From here the operator has a good view of the stage without disturbing the audience, and there are no problems of communication with the stage staff.

Air Conditioning

It is sometimes unpleasantly difficult for the body to adjust itself to a wide difference between the temperature inside and outside of the building, particularly in hot weather. In modern society the people need a place where they can live, work and relax in controlled comfort. Thus, cooling systems are on the way to becoming universal in all buildings. It is considered a necessity for comfort, health and protection from outside noise.

In the Art Center, a central air-cooling plant will be provided, because it enables economical air conditioning of a large space. Part of the apparatus is also available as a heat pump; that is, the heating load for air-conditioned rooms can be covered by this plant to an outside temperature of about 40°F without connection to a heating system. The advantage of this machine is that the noise level is low and can be set up anywhere; thus a mechanical location can be chosen where the ducting is favorable. Since the air conditioning has to be connected to the cold water system in order to transfer heat away from the condenser, a high-pressure air-conditioning plant is usually the most economical solution for buildings of large space.

ACOUSTICS

Acoustical Requirements in the Auditorium Design

The auditorium, as a place for listening, developed from classical open-air theatres, but there is little evidence that the Greeks and Romans gave particular consideration to acoustical principle when they selected natural sites and built open-air theatres.

The listening conditions outdoors are usually poor if the audience is seated on a horizontal surface. The difficulties in hearing outdoors are due to:

1. the drop of sound energy when sound waves travel in the open air,
2. the considerable sound absorption created by audiences,
3. the interfering noises originating from various other sources.

Outdoors listening conditions can be improved by adding sound-reflective enclosures around the source and by sloping, or raking, the audience area. The ancient Greeks and Romans observed these principles and built their open-air places of assembly accordingly. They had the further advantage that interfering external noises were practically nonexistent in their time.

They also attempted to solve the line-of-sight problem and hearing conditions. They were wise to bring the audience as close as possible to the acting area by shaping the steeply banked seating area in a semicircle, which naturally resulted in at least moderately satisfactory hearing in the remote seats.

In designing the auditoriums, there are serious requirements to work out--such as comfort, safety, pleasant surroundings, good illumination, proper viewing, and good sound.

The following are the requirements for good hearing conditions in an auditorium:

1. There should be adequate loudness in every part of the auditorium, because the sound loses energy from traveling and from absorption by the audience and room contents. The auditorium should be shaped so that the audience is as close to the sound source as possible, thereby reducing the distance the sound must travel. By using the balcony we can bring more seats closer to the sound source. The sound source should be raised as much as feasible in order to secure a free flow of direct sound waves to every listener. The floor should be properly ramped, because sound is more readily absorbed when it travels over the audience at grazing incidence. Also, the sound source should be closely and abundantly surrounded with large sound-reflective surfaces in order to supply additional reflected sound energy to every portion of the audience area, particularly to the remote seats.

2. Sound energy should be uniformly distributed in the room. In an effort to provide diffusion, the surface irregularities, elements, coffered ceilings, serrated enclosures, protruding boxes, and sculptured surface decoration must be abundantly applied and must be reasonably large.

3. Optimum reverberation characteristics should be provided in the auditorium. Sound which originates in, or enters, an enclosed space is repeatedly reflected by its boundaries. At each reflection, a fraction of

acoustical energy is absorbed. Nevertheless, the sound may persist for many seconds before it dies away since the energy is no longer supplied by the source. This prolongation of sound after the original source has stopped is reverberation. Optimum reverberation characteristics of a room, depending on its volume and function, implies:

1. favorable RT versus frequency characteristic,
2. advantageous ratio of reflected to direct sound reaching the audience,
3. optimum growth and decay of sound.

Optimum reverberation time is an important step in the acoustical design of auditoriums, because if the sound dies out slowy, the prolongation of each speech will be overlapping. In many places of worship, a chord sounded by the organ may remain audible 10 or 15 seconds after the organ has stopped. Experimental studies on speech intelligibilities have shown that for reverberation times longer than about 2 seconds, the understanding of speech becomes increasingly difficult or impossible. With a reverberation time of about 1 second, hearing conditions for speech approach the ideal. It means that rooms used for speech require a shorter reverberation time than rooms of the same volume used for musical or vocal purposes.

In the acoustical design of an auditorium, once the optimum RT at the mid-frequency range has been selected and the RT versus frequency relationship below frequency decided upon, the reverberation control consists of establishing the total amount of room absorption to be supplied by acoustical finished room contents, etc., in order to produce the selected value of RT. For the simplified RT calculation of moderately sized rooms with economically applied sound-absorbing treatments, the following formula can be used:

$$RT = \begin{cases} \dfrac{0.05\ V}{A + xV} & \text{English System} \\ \dfrac{0.16\ V}{A + xV} & \text{Metric System} \end{cases}$$

where RT = reverberation time, sec.

V = room volume, cu. ft. (cu. m.)

A = total room absorption, sq-ft sabins (sq-m sabins)

x = air absorption coefficient

This formula clearly shows that the larger the room volume, the longer the RT, and the more absorption introduced into the room the shorter the RT will be. The formula also suggests that the RT can be changed within the same auditorium by increasing or decreasing the room volume or by using the variable absorbers. Since the absorption of various materials and finishes used in the design of auditoriums normally varies with frequency, the RT values also vary with frequencies (Hz) of the audio-frequency range. Generally, this means the RT at 500 Hz.

4. The room should be free of such acoustical defects as echoes, long-delayed reflections, flutter echoes, sound concentrations, distortion, sound shadow, and room resonance. Sound that reaches a listener in a room by a path involving reflections from its boundaries always travels a greater distance than does the sound that comes by the direct path. If the difference in these two path lengths is as great as 65 ft., arrival of the reflected sound is sufficient to enable a listener to hear it as a separate sound; that is, the delayed reflection produces an echo. If the distance were between 50-65 feet, the resulting overlapping of sound will be a blur.

New Acoustical Space Allows Orchestra to Leave the Formal Concert Hall and Reach Informal Mass Audience

The symphony orchestra today is on the brink either of financial disaster or of a popular renaissance. Crucial to the outcome is the development of new kinds of performing spaces that are informal, flexible, suitable for large audiences and acoustically adequate.

The priorities for orchestral performing spaces have perpetuated the forms and aesthetics of the seventeenth century salon or opera house for today's concert halls. Most orchestras remain enshrined in marble palaces furnished with ruby velvet and gold, formal and private in their attitude. Clients have assumed a different environment is second best and often communities sacrifice any concert space at all when they attempt to raise the money for a "proper" space. Architects have happily complied to the rich requests.

Few orchestras can continue to survive in this fashion. Their social roles and responsibilities have widened; many now feel the need to go out to new audiences, knowing that many of these persons will not or cannot come into the formal concert hall. Witness 70,000 persons, who flocked to New York's Central Park to hear the Philharmonic. The exclusively Licoln-Center-type approach not only ignores such audience potential, but often such monuments sacrifice acoustics for appearance.

The last five years have witnessed the growing awareness that the first priority of a concert environment must be the quality of its acoustical performance. The happy effect of this is that ideas of what constitutes a performing space have thus loosened, opening up new opportunities for communities to have concert presentations of high quality, without the capital investment and formality of the traditional concert hall.

The kind of spaces that can be made acoustically hospitable to orchestra performances are myriad, once the old formulas are abandoned. They may be existing or new spaces, intended for concerts or not, but requiring sound acoustical planning or redesign. The spaces may be indoor or outdoor, or a combination, and they may be permanent or movable. Orchestras may even develop portable acoustic accouterments they can set up for special performances. The New York Philharmonic, for example, is developing equipment it can use of union-hall performances.

The materials used in these new spaces may depart from the traditional wood and marble. Plastic, cardboard and many other newer materials are now seeing acoustical use, and electronic distribution aids are becoming increasingly sophisticated, and therefore acceptable. Such instruments are not used to amplify the sounds of the orchestra itself, but to transmit the natural sound. As an example, the speaker can have a time delay system, so that the people sitting far away from the stage can hear the sound at the same time that they would naturally hear it without artificial aid. The acoustical criteria for the new spaces are basically the same as those for an indoor concert hall, and surprisingly for many, they can approach each other in quality.

A pioneer in developing concepts and acoustical techniques for the new performing spaces is Christopher Jaffe, an acoustician practicing in Norwalk, Connecticut, and San Francisco. He is responsible for designing the acoustics of many of the summer pavillions used by major U. S. orchestras and for the acoustical redesign of such structures as the Hollywood Bowl.

Jaffe spells out the criteria for acoustical quality as the combined listening experiences of the world musical community, tempered by local

experiences over a period of time. The role of the acoustician is to interpret the physical acoustic requirements for the architect.

Acoustical criteria are achieved through manipulation and balance between the SOURCE of sound (the orchestra), the PATH of the sound (the hall: volume, shape, materials of boundary surfaces, materials of suspension objects, etc.), and the RECEIVER, or audience. To achieve quality at the source, or orchestra, a space must help achieve sectional balance among the instrumental sounds, a blending of the sounds, articulation and optimum distribution of the sound, the musicians should be able to hear themselves in the stage area and the space should develop a ratio of direct to reverberant sound that complements similar criteria in the audience area. (The time of reverberation is the number of seconds it takes a note of a given pressure level to decay 60 decibels.)

There are not any fixed optimums or any single criteria for what is "good" in this area. Acousticians used to think that a fixed fixture ratio of direct to reflected sound would assure a good acoustical environment, but this has proven untrue. At one time, 2 seconds was considered optimum, but Philharmonic Hall originally had this and was considered acoustically poor, while Meadow Brook achieved superior acoustics with a 1.3 second reverberation.

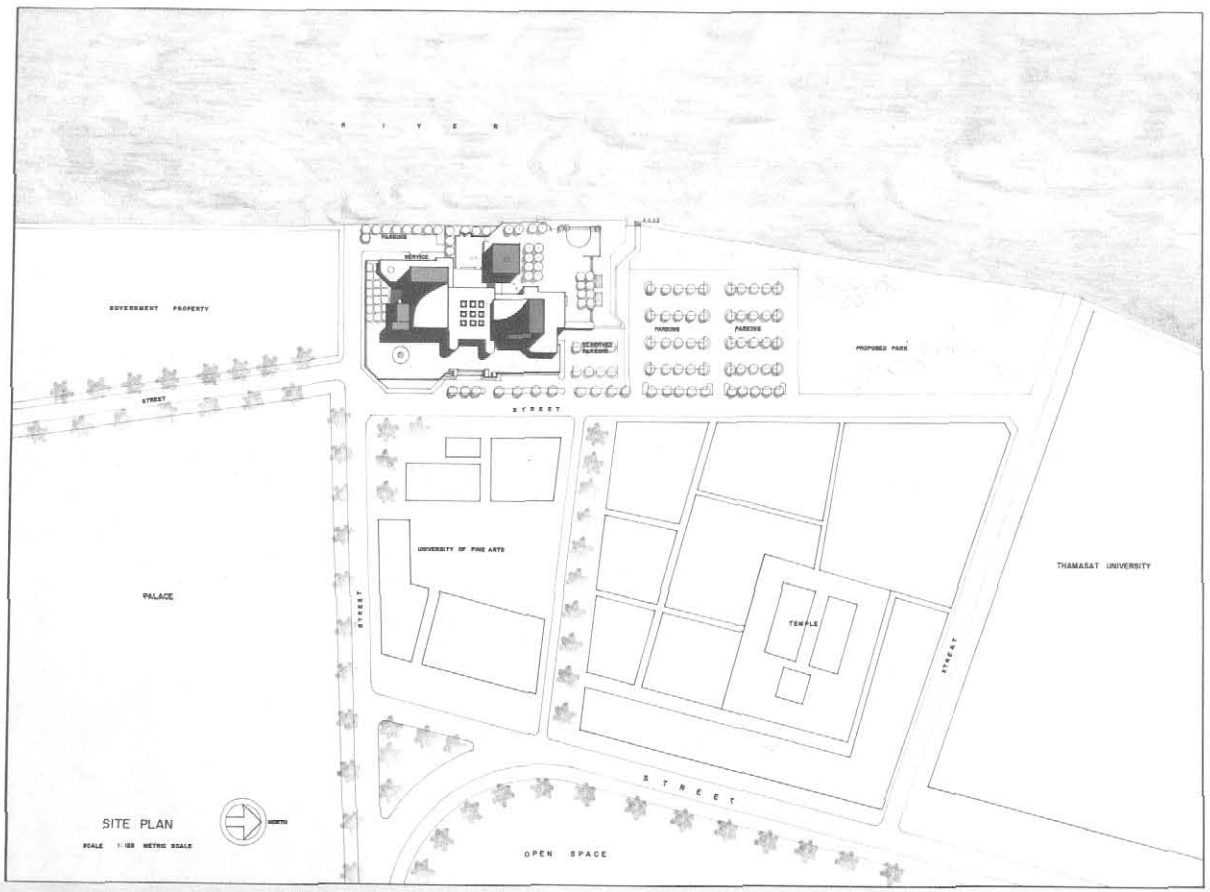
The goal of the architect and acoustician in the path area is to eliminate all possible acoustic disturbances and correct any distribution faults, echoes, focusing of sound in one direction and flutter. Frequency selectivity (among high, low and middle ranges) beyond that normal in an enclosed concert hall must be eliminated.

In the receiver or audience areas, the architect must plan eating in places where people can enjoy the familiar concert hall sound. This means they must be located within the acoustic sightlines of the source--within 20 milliseconds of the initial secondary reflections. The space must also develop a sufficient reverberant sound through a frequency spectrum within the first 500 milliseconds. The acoustician must also develop a structure-borne coupling (such as a wooden floor) of sound energy in the low frequencies (which are easily lost).

These goals are most difficult in multipurpose areas where compromise must often occur. Jaffe notes that many musicians are resistant to electronic assists as a means to recreate physical parameters. This is not only a problem in the corrective sense, but also eliminates the new kinds of sounds that can be produced with electronic aids and which are more and more a part of new repertories. Jaffe also scores the academicians and scientists who perpetuate out-of-date information in their curriculum for architects, engineers and musicians.

The problems, however, are solvable. Jaffe has worked in many kinds of spaces and the kinds of solutions he applied and continues to apply may help lead to fundamental changes in symphony presentations to come.

PRESENTATION



SCALE

FEET

METER

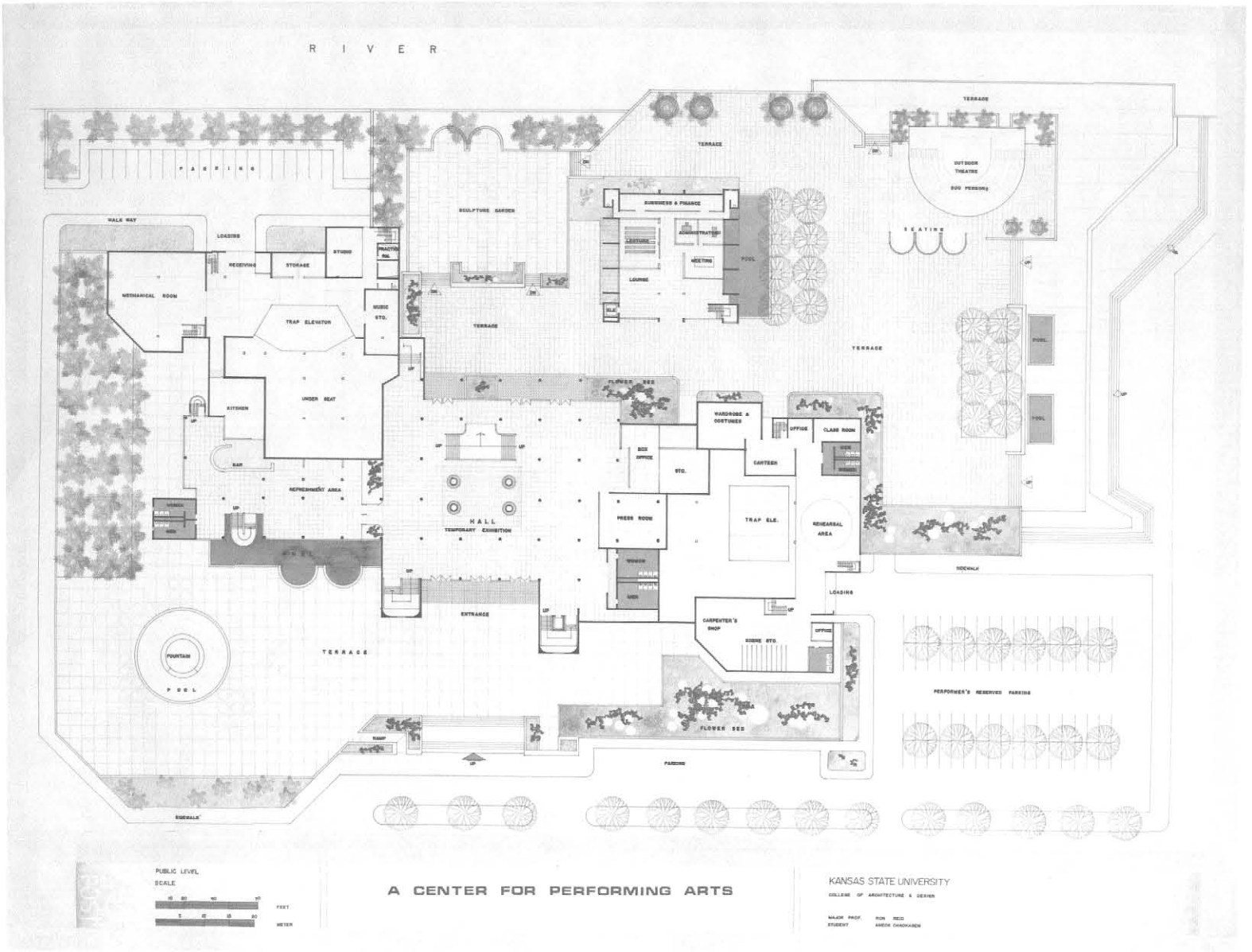
A CENTER FOR PERFORMING ARTS

KANSAS STATE UNIVERSITY

COLLEGE OF ARCHITECTURE & DESIGN

MAJOR PROF. RON REID

STUDENT ANSON CHAOKASEM



PUBLIC LEVEL

SCALE

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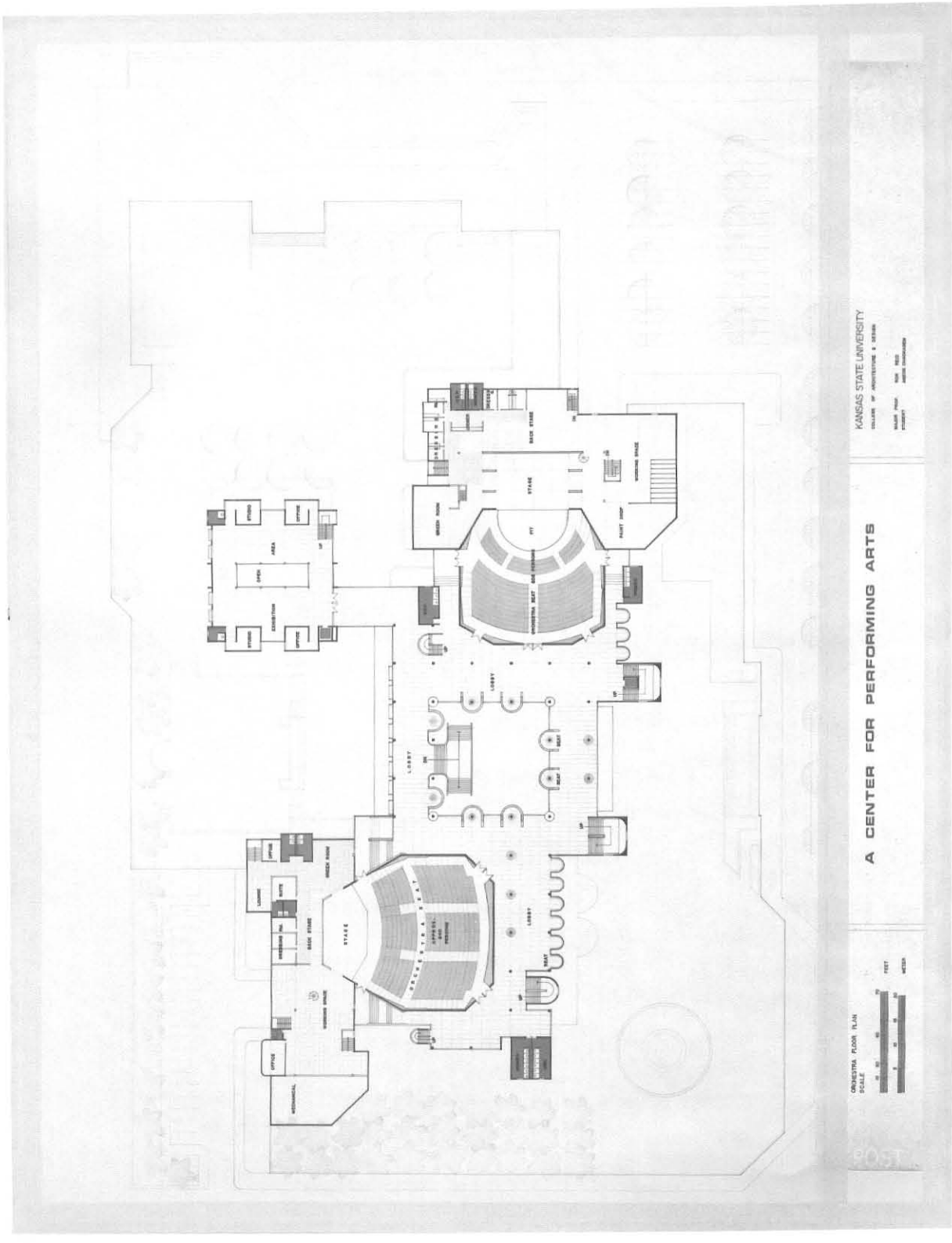
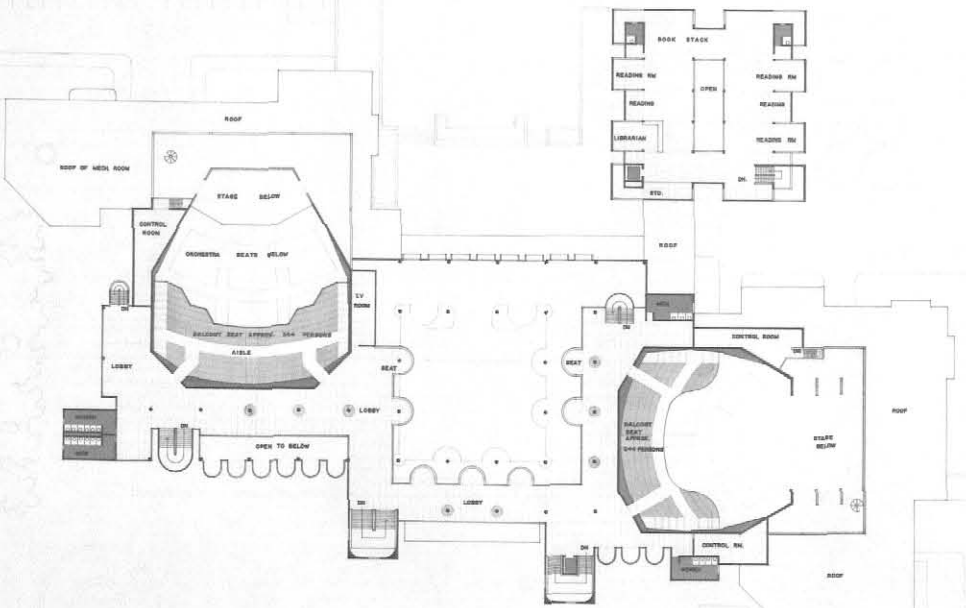
STUDENT AMEEN CHANDAVARKAR


A CENTER FOR PERFORMING ARTS
KANSAS STATE UNIVERSITY
ORCHESTRA FLOOR PLAN
SCALE
FEET
METERS
POST



BALCONY FLOOR PLAN

SCALE

10 30 40 70 FEET

2 10 12 20 METER

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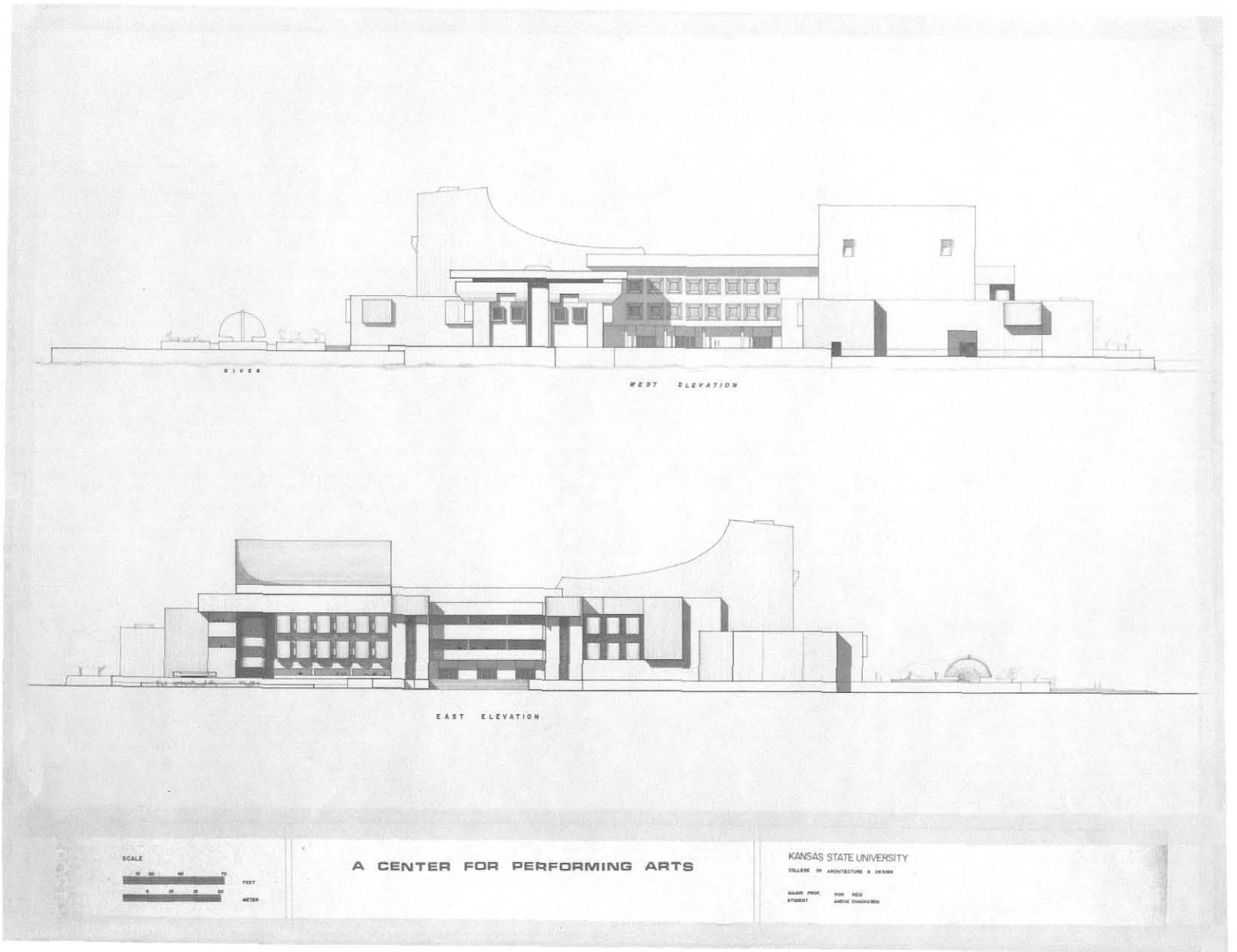
MAJOR PROF. ROB REID

STUDENT ANEEK CHAKRABEK


RIVER
WEST ELEVATION
EAST ELEVATION
SCALE
FEET
METER
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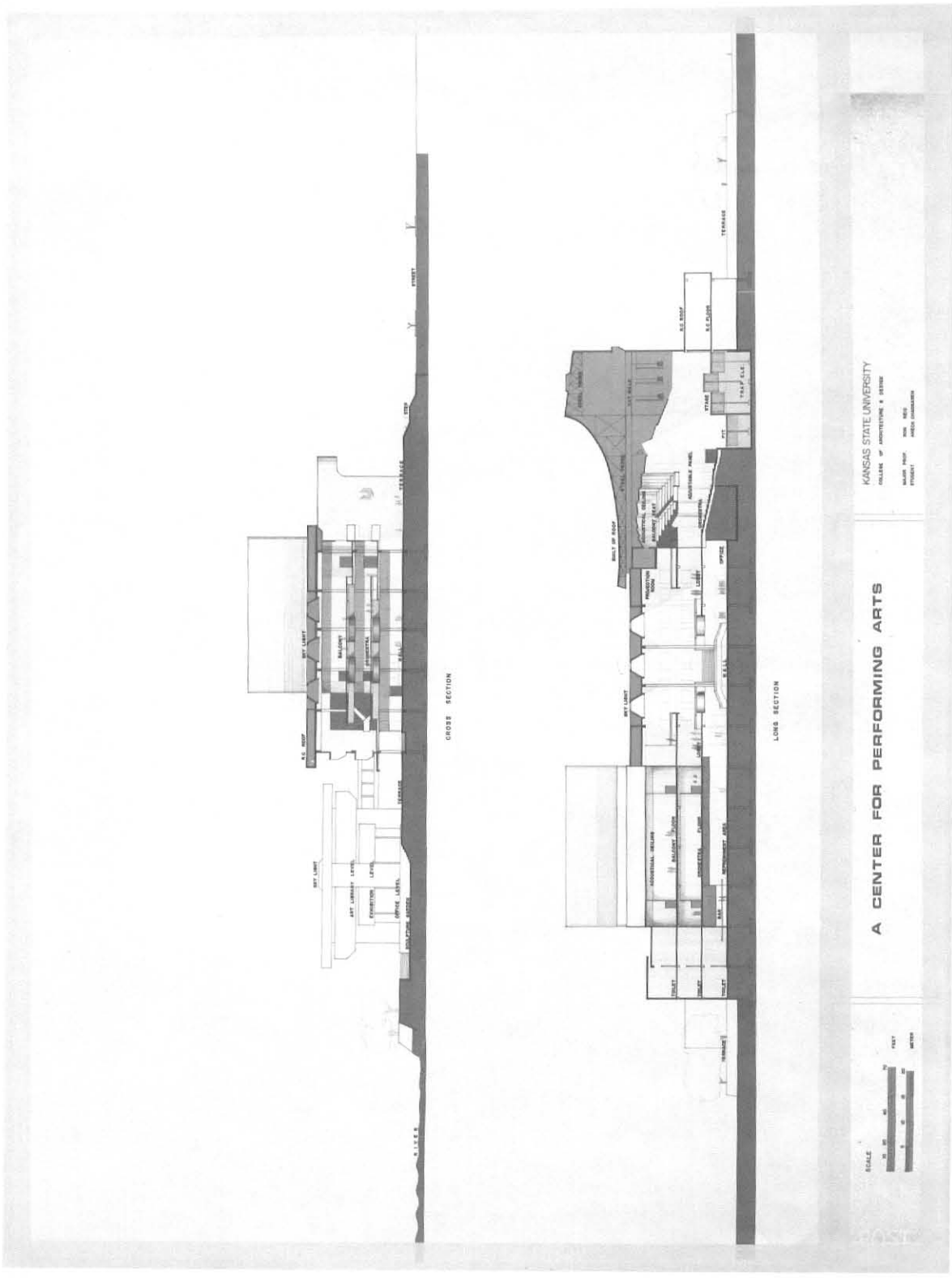
A CENTER FOR PERFORMING ARTS
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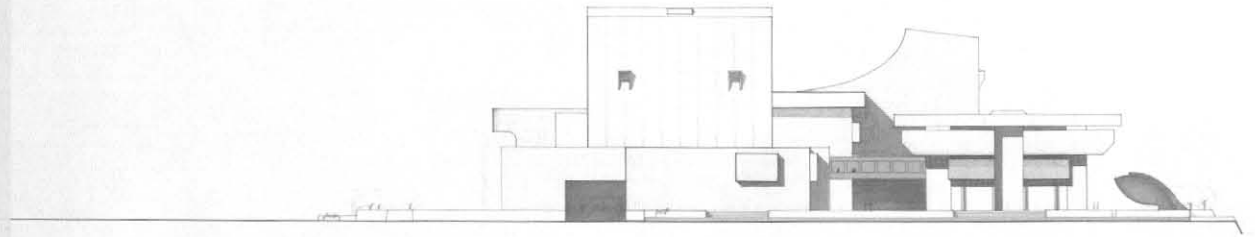
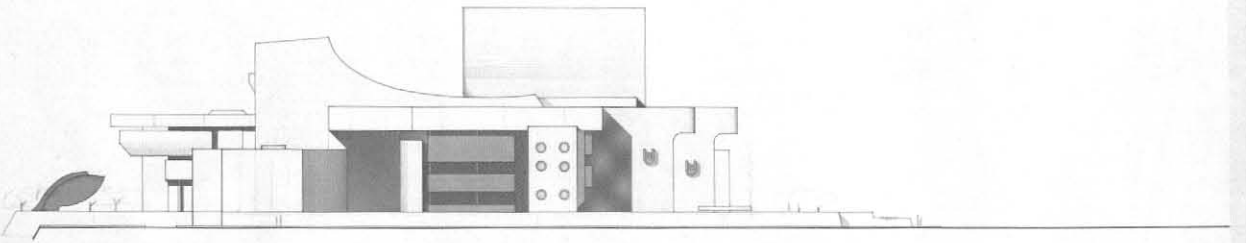
CROSS SECTION
LONG SECTION
SCALE



NORTH ELEVATION

RIVER



SOUTH ELEVATION

SCALE

FEET

METER

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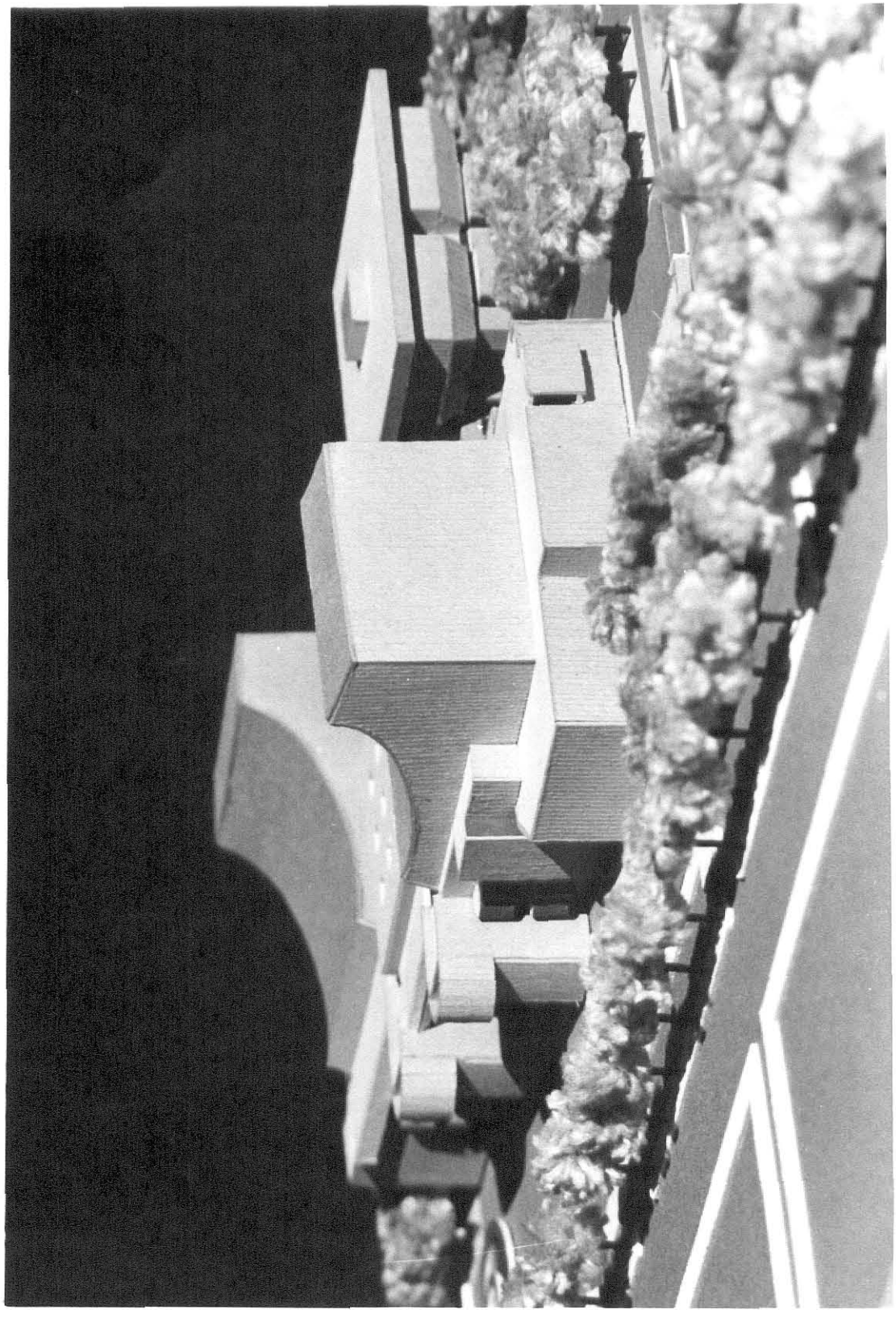
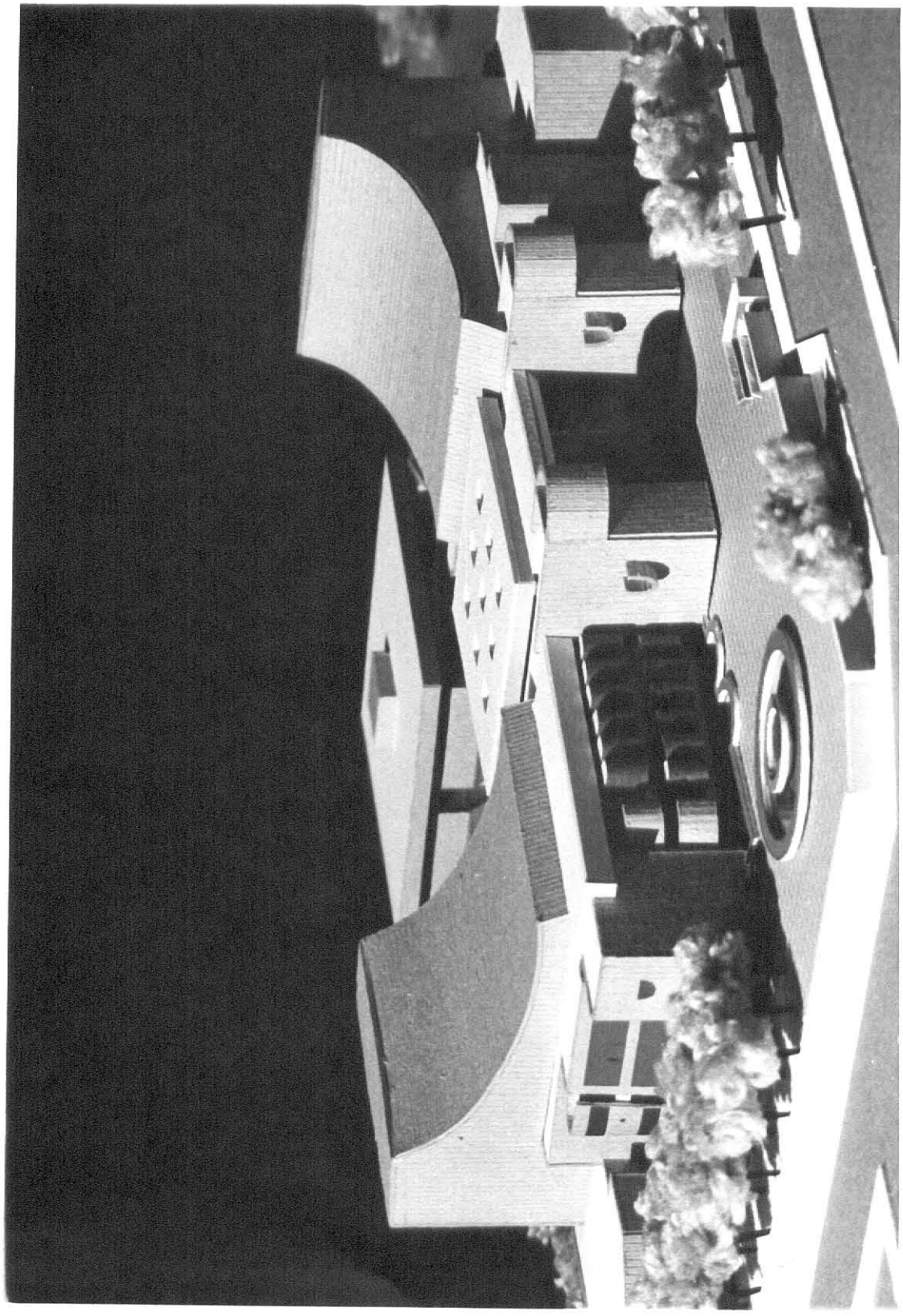
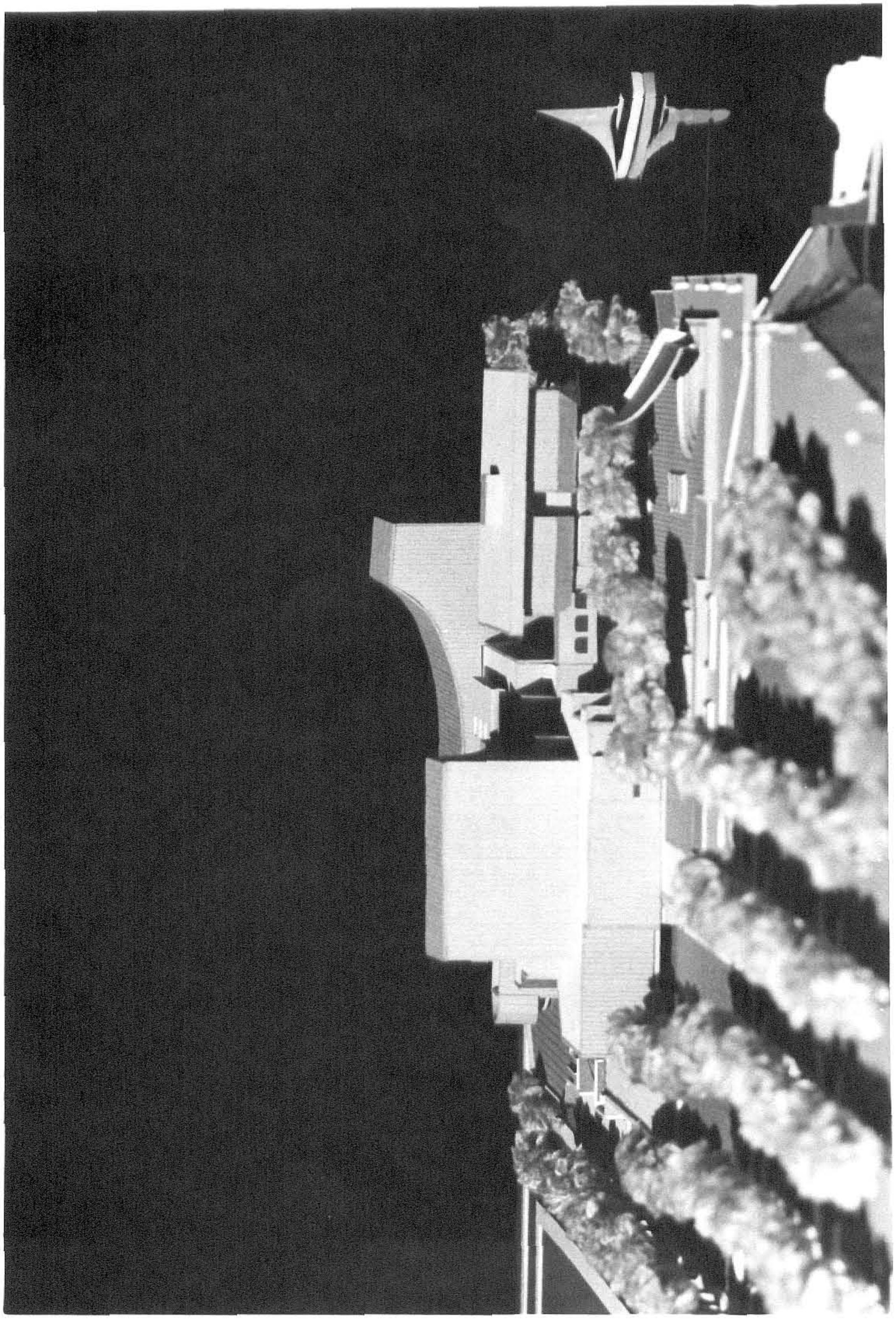
MAJOR PROF RON REID

STUDENT AMOS OMOKARIEN







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A CENTER FOR PERFORMING ARTS, BANGKOK THAILAND

by

ANECK CHAOKASEM

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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

ABSTRACT

The Arts Center for Bangkok, Thailand, fulfills an existing cultural deficiency for experiencing the contemporary performing arts. The new facility is a motivating artistic and physical architectural expression of space that provides for the functional and aesthetic requirements of the vast repertoire of the communicative arts. The complex is an inclusive expression integrating the performer, the audience, and the architectural elements. It provides for the artistic spiritual need of both participant and observer, serving as a channel for the culture of Thailand as embodied in and reflected by the communicative arts.

The project proposal emphasizes building orientation as complimentary to the riverfront location and compatible with the climatic conditions of Bangkok and the tropical region. The architectural solution compensates for environmental factors primarily detrimental to the performing of the arts; that of noise, moisture, high winds, air temperature, and radiation. The facility reinforces the complimentary environmental aspects; that of gentle breezes, vegetation, and shade.

The architectural program has been developed as an historic evolvement of spatial requirements for the performing arts, spanning from primitive drama to the complexity of the communicative arts in modern Thailand. The program provides for spatial and mechanical means as compatible to the changing expressive techniques of the arts. The acoustical, lighting, structural, and mechanical systems provide for a flexible repertoire of Thai theatre and Thai music, as well as the Western communicative arts. The new facilities will enable participation within a vast range of

artistic performances. The ultimate purpose of the Arts Center is the cultural awareness and experimental enjoyment of the residents of Bangkok, both Thai and non-Thai.