

## 2.3 ZONING REGULATIONS

### 1) INTRODUCTION

A specific solution for the design standard of the physical development for the resort development of Muang and Khok Kioi was examined in the study.

The purposes of the study are as follows;

- To establish the design policies for physical development planning such as land use and circulation plans, site plants and zoning plans for the proposed resort development areas.
- To aid architects and planners of the proponents in the preparation of their further development proposals.
- To give government officials at the national, provincial and Ampoe level a basis for adoption of suitable planning controls and review of individual development applications.

The physical design standards are composed of the following four types of planning controls;

- Zoning and building regulations
- Development guidelines and policies for the architectural and landscaping design.
- Environmental guidelines
- Infrastructure standards

### 2) ZONING AND BUILDING REGULATIONS

The type of zones to be applied in the resort development area are proposed as follows

- Accommodation Zone:
- Tourist Service Zone:
- Public Building Zone:
- Building free zone:
- Camping Ground Zone:
- Tourism Development Control Zone:
- Tourism Forest Zone:
- Tourist Excursion Zone:
- Tourist Stop-over Zone:
- Marine Zone:

#### a. Accommodation Zone(s)

##### a) Permitted Uses

- Hotels with reception areas, accommodation units for guests, conference facilities, restaurants and nightclubs, small shops for souvenirs and convenience goods, hairdressing salons, prayer rooms, offices, laundries, services and utilities, recreation facilities operated by the hotel and staff accommodations.
- Parking
- Landscaped areas

##### - Limit of Zone

The limit of the Accommodation Zone shall be between 300 m to 700 m from the mean low tide mark. The area limit will depend on the environmental conditions of the specific site.

##### - Density

The density of accommodation units not exceed that set out in the following table:

Table : Density of Accommodation Units.

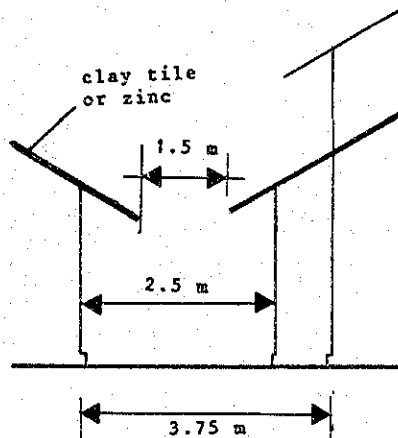
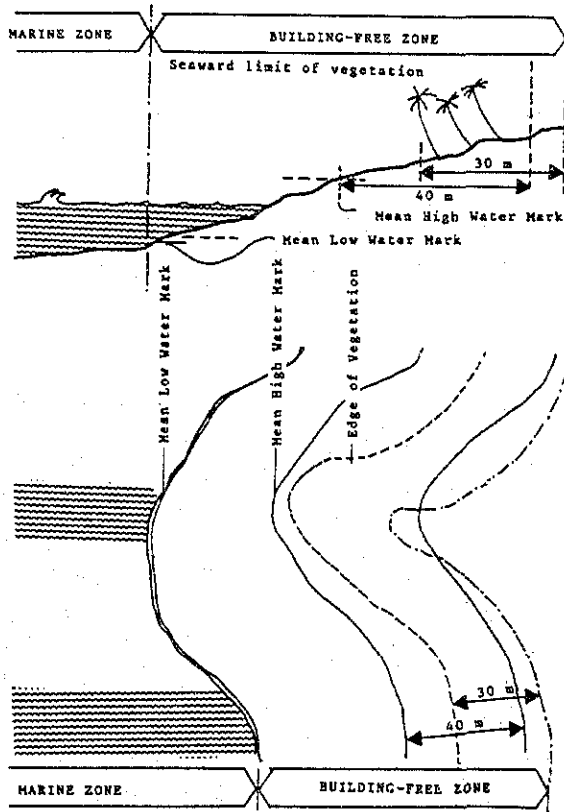
Type of Structure	Maximum Density
1 storey	20 units/hectare
1 and 2 storey, with at least 20% of accommodation units in 2 storey structures	30 units/hectare
3 and 4 stories	40 units/hectare

##### b) Building Coverage

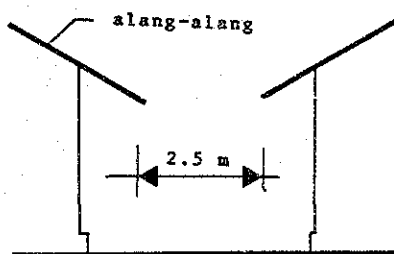
The area covered by permanent buildings, including all roofed structures, but excluding swimming pools, tennis courts and similar unroofed recreation facilities, shall not exceed:

##### c) Building Heights

The maximum height of any building shall not exceed 4 storeys and 15 m above the average elevation of the finished grade of building (flagpoles, lightning conductors and television antennas may exceed 15 m in height but must not impair the visual appearance of the development.)



- Minimum separation 1.5m between roofs made of non-flammable material.
- Minimum 2.5m between 1-storey buildings of which one is a blank wall.
- Minimum 3.75m between buildings of which one is over 1-storey.



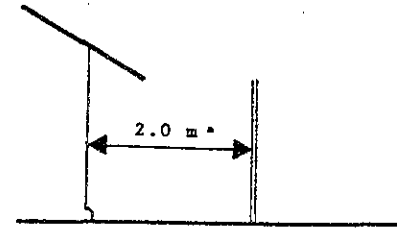
- Increased separation, 2.5m, between roofs made of flammable material such as alang-alang

d) Building Set Back from Edge of Site

- No building shall be erected within the minimum set back from the center line of public boundary roads, as shown on the zoning map.
- Unless determined by the preceding clauses, the minimum distance between any building and the site boundary shall be no less than that set out in the following table:

Size of hotel	Minimum Set Back
1-29 rooms	2 m
30-49 rooms	3 m
50-99 rooms	4 m
over 100 rooms	6 m

Notwithstanding the above, a traffic control or guard post may be located no less than 10 m from the center line of public boundary road.



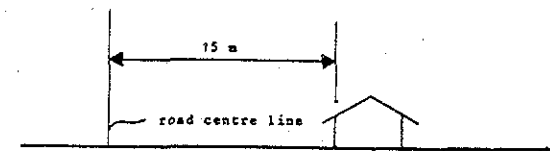
-Minimum set back of 2.0m from perimeter wall or edge of site.

e) Building Set Back Within the Site

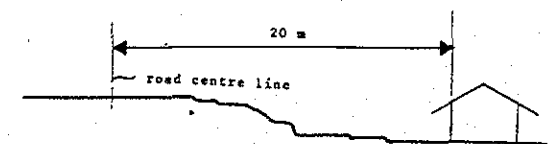
No accommodation unit, restaurant, or any other building to which the guests of the hotel ordinarily have access shall be located such that any wall of a building which contains a window, entrance door or sitting-out area shall be less than 10 m from any other wall with a window, door, or sitting-out area, or 2.5 m from any blank wall (4.0 m if one or both of the buildings are more than any other roof and not less than 2.5 m if both are of easily inflammable material).

For all other buildings the minimum set back shall be 1.5 m for buildings of fire-proof construction and 2.5 m for buildings made of easily inflammable material.

Case 1: Road and Resort Building at Same Elevation



Case 2 Major Road, or Road at Higher Elevation than Resort Building



f) Landscaping

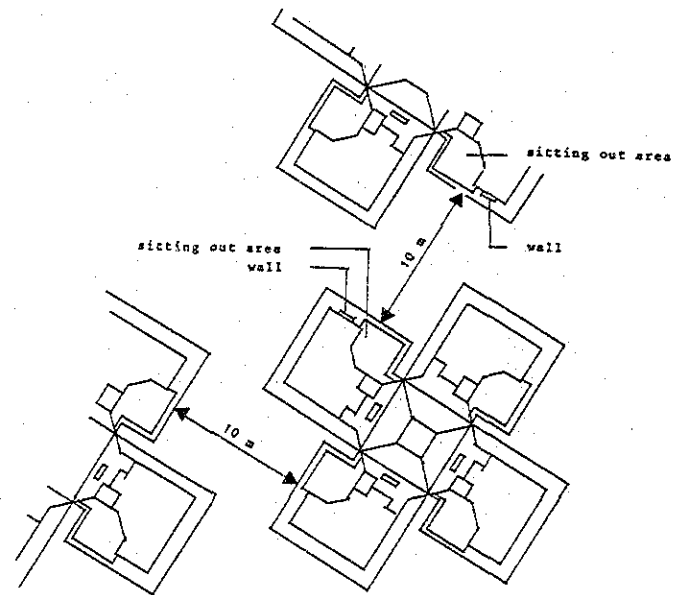
A minimum of 30% of the site area shall be landscaped open space. For the purpose of this calculation, planted areas and buffer strips, areas under natural vegetation, lawns, walkways, common sitting areas, unroofed restaurants and bars, swimming pools and minor recreation facilities such as shuffleboard surfaces and children's playgrounds may be counted as landscaped open space. Parking areas, storage areas, internal roadways, tennis courts and single-purpose performance areas may not be counted as landscaped open space.

g) Lighting

Lighting shall be so located and directed such that it does not illuminate areas beyond the boundary of the site or create glare which would constitute a hazard to traffic or inconvenience to surrounding land uses.

Lighting at the edge of the site shall be limited to floodlighting of exterior walls, principal and information signs, access points and landscaping.

10m between sitting-out areas and walls with windows



h) Signs

All signs shall be for information purposes only and not for the advertisement of products. Each hotel shall have only one principal sign giving the hotel name.

The principal sign shall be ground-oriented, not more than 3 m in height above ground level, and constructed of natural materials such as wood, bamboo, or local stone.

All signs except for the principal sign and traffic direction signs shall be subject to the same set back from public roads as for buildings. No principal sign or traffic direction sign shall be erected within 10 meters of the center line of a public road.

i) Walls and Fencing

Walls and fencing shall be of natural materials, or stucco - finish block or red brick. Unsurfaced cement, blocks or clay bricks, triplex, zinc or other corrugated metal and wire fencing are not to be used.

Security-related features such as electrified wire, barbed wire, and broken glass imbedded in the top of walls, shall be designed in a manner which minimizes the visual impact. No untreated metal components which may be subject to rusting shall be used in permanent construction. (This provision shall not preclude the use of replaceable metal components.) No wall or fence shall exceed 2.5 m in height.

j) Parking

Parking shall be provided in surfaced parking areas, 1 parking space for every 4 accommodation units plus one parking space for every 4 seats in restaurants. Each parking space shall have a minimum measurement of 2.5 m width, 6 m length, and free height of 3 m.

## **b. Tourist Services Zone**

### **a) Permitted Uses**

Permitted uses in a tourist Service Zone may include a tourist information center and offices, plaza, craft demonstrations and/or sales, small shops, restaurants, a performance stage for cultural events, a first aid station, a playground, parking, a traffic control post, and guard post.

### **b) Building Coverage**

The area covered by permanent buildings shall not exceed 25% of the site area.

### **c) Building Height**

The maximum height of any building shall not exceed 2 storeys and 15 m. (Flagpoles and lightning conductors may exceed 15 m in height but must not impair the visual appearance of the development.)

### **d) Building Set Back from Edge of Site**

- No building shall be erected within the minimum set back from the center line of public boundary roads, as shown on the zoning map.
- Not with standing the above, a traffic control post or guard post may be located not less than 10 m from the center line of a public boundary road.

### **e) Landscaping**

A minimum of 30% of the site shall be landscaped open space. For the purpose of this calculation, planted areas and buffer strips, areas under natural vegetation, lawns, walkways common sitting areas, plazas, and minor recreation areas such as children's playgrounds may be counted landscaped open space. Parking areas, storage areas, internal roadways and single-purpose performance areas may not be counted as landscaped open space.

### **f) Lighting**

Lighting shall be so located and directed such that it does not illuminate adjacent hotel sites or create a hazard to traffic.

### **g) Signs**

All signs within the zone shall be for information purposes only and not for the advertisement of products.

### **h) Walls and Fencing**

Walls and fencing shall be of natural materials or stucco - finish block or red brick unsurfaced cement, triplex, zinc or corrugated metal and wire fencing are not to be used.

Security - related features such as electrified wire, barbed wire and broken glass, imbedded in the top of walls, shall be designed in a manner which minimizes the visual impact. No untreated metal component which may be subject to rusting shall be used in permanent construction. (This provision shall not preclude the use of replaceable metal components.)

## **c. Public Building Zone**

Permitted uses in a Public Building Zone may include change rooms, toilets, restaurants, security post, parking control post, beach rentals, sports facilities, landscaped areas, parking, water tower and utilities.

Projects incorporating a visitor center may include these additional uses: visitor orientation center, auditorium, dance performance area and craft sales shops.

Projects incorporating a commercial component may include these additional uses: souvenir shops, stalls and convenience goods shops.

### **a) Building Coverage**

The area Covered by permanent buildings shall not exceed 25% of the site area.

### **b) Building Height**

The maximum height of any building shall not exceed 4 storeys and 30 m (flagpoles, lighting conductors and television antennae may exceed 30 m in height but must not impair the visual appearance of the development.)

### **c) Building Set Back from Edge of Site**

- No building shall be erected within the minimum set back from the center line of boundary roads, as shown on the zoning map.
- Not withstanding the above, a traffic control or guard post may be located no less than 10 m from the center line of a public boundary road.

d) Landscaping

A minimum of 50% of the site area shall be landscaped open space. For the purpose of this calculation, planted areas and buffer strips, areas under natural vegetation, lawns, walkways, common sitting areas, unroofed restaurants and bars, grass surface playing fields and minor recreation facilities such as shuffleboard surfaces and children's playgrounds may be counted as landscaped open space. Parking areas, storage areas, internal roadways, tennis courts and single-purpose performance areas may not be counted as open space.

e) Lighting

Lighting shall be located and directed such that it does not illuminate areas beyond the boundary of the site or create glare which would constitute a hazard to traffic or inconvenience to surrounding land uses.

Lighting at the edge of the site shall be limited to floodlighting of exterior walls, principal and information signs, access points and landscaping.

f) Signs

All signs within the zone shall be for information purposes only and not for the advertisement of products.

g) Walls and Fencing

Walls and fencing shall be of natural materials or stucco - finish block or red brick. Unsurfaced cement, triplex, zinc or corrugated metal and wire fencing are not to be used.

Security-related features such as electrified wire, barbed wire, and broken glass imbedded in the top of walls, shall be designed in a manner which minimizes the visual impact. No untreated metal component which may be subject to rusting shall be used in permanent construction. (This provision shall not preclude the use of replaceable metal components). No wall or fence shall exceed 1.5 m in height.

h) Parking

Parking space will be assessed on the basis of need.

Each parking space shall have a minimum measurement of 2.5 m width, 6 m length, and free height of 3 m.

**d. Building-Free Zone**

a) Permitted Uses

The Building-Free Zone is intended principally for public recreation. Permitted uses in a Building-Free Zone may include beach parasols, shelters, boat pier, minor recreation facilities, stall and temporary uses such as moveable barbecues and outdoor cooking facilities.

b) Limit of Zone for Beach Resorts

The landward limit of the Building-Free Zone shall be not less than 300 m measured from the mean high tide mark.

c) Extensions into the Water

- Construction of board jetties, piers, breakwaters groins, commercial facilities and other similar structural extensions from the shore into the water in a area shall require specific permission from the authority responsible for administering these regulations.

- Permission shall be given only after it is determined that the structural extension is compatible with the intended use of the Building-Free Zone and will not adversely affect the beach and shore and ecological balance, whether within or outside the stopover area. The holder of land-rights wishing to make the the extensions shall have the responsibility of proving the lack of adverse effect of the extension by conducting an appropriate study and analysis.

d) Signs

For beach resorts, no signs shall be permitted other than information signs stating regulations for use of the beach or warnings of tide and current conditions. For other resorts, no signs other than information signs shall be permitted.

e) Vehicles

Cars, motorcycles and all other vehicles except those required maintenance shall not be permitted within the building-free zone.

**e. Camping Ground Zone**

a) Permitted Uses

Permitted Uses in a Camping Ground Zone may include campsites, toilets, water stations, campground supervisor's posts and parking.

b) Signs

All signs shall be for information purposes only and not for the advertisement of products or services.

c) Parking

Parking space will be assessed on the basis of need. Each parking space shall have a minimum measurement of 2.5 m width, 6 m length, and a free height of 3 m.

**f. Tourism Development Zone**

a) Permitted Uses

Permitted uses in a Tourism Development control Zone may include residences, agricultural uses and forest.

b) Building Coverage

The area covered by permanent buildings shall not exceed 5% within any single ownership parcel of land.

c) Building Height

The maximum height of any building shall not exceed 2 storeys and 15 m (flagpoles, lightning conductors and television antennas may exceed 15 m in height but must not impair the visual appearance of the tourist area.)

d) Building Set Back from Edge of Site

No building shall be erected within the minimum set back from the center line of boundary roads, as shown on the zoning map.

e) Signs

All signs shall be for information purposes only and not for the advertisement of products or services.

**g. Tourism Forest Zone**

a) Permitted Uses

Permitted uses within a Tourism Forest Zone may include forest, agricultural uses and minor recreation facilities such as shelters, picnic areas, foot path, and interpretive displays.

b) Other Regulations

(to be determined by the government)

c) Signs

All signs shall be for information purposes only and not for the advertisement of products or services.

**h. Tourist Excursion Road Zone**

a) Permitted Uses

Permitted uses within a Tourist Road zone may include residences, agricultural uses and forest.

b) Building Coverage

The area covered by permanent buildings shall not exceed 5% within any single ownership parcel.

c) Building Height

The maximum height of any building shall not exceed 2 storeys and 15 m (flagpoles, lightning conductors and television antennas may exceed 15 m in height but must not impair the visual appearance of the tourist area).

d) Building Set Back from Road

No building shall be erected within 100 m of the center line of a boundary road.

e) Signs

All signs shall be for information purposes only and not for the advertisement of products or services.

f) Quarrying

- Any quarrying of limestone or other rock material or taking of sand within 100 m of an excursion road shall only be done after a permit is obtained from the authority responsible for administering these regulations.
- A permit shall be issued only if the proposed location is determined not to create any undesirable visual effect and not create any ecological or safety problems. Except in the case of unusual circumstances, the taking of sand from beach areas shall not be allowed.

i. Tourist Stopover Zone

a) Applicability

The following regulations are recommended to be used for development within those tourist facilities sites where no detailed plans have been prepared. They would be applied particularly to art shops and other tourist commercial facilities:

b) Building Coverage

The area covered by permanent buildings shall not exceed 50% within any ownership parcel.

c) Building Height

The maximum height of any building shall not exceed 2 storeys or 10 meters.

d) Building Set Back

No building shall be erected within 12 m of the center line of a road and 5 m from the side and rear lot lines.

e) Parking

The area allocated for parking spaces, maneuvering of vehicles and access roads shall be at least the same amount of area as the retail floor area (not including work areas, storage and housing, etc.) or a ratio of 1:1.

f) Landscaping

Ample landscaping should be provided, especially between the road and the buildings and parking area.

Where possible, it is desirable that tourist facilities, including artshops and restaurants, be planned and developed as integrated complexes with centralized access and parking and arranged in a cluster pattern.

j. Marine Zone

a) Permitted Uses

Permitted uses within a Marine Zone may include a public pier, swimming, diving, sail-boat-ing, utilizing buoys not anchors, windsurfing, fishing by traditional methods (outside the swimming area), recreational fishing and water-skiing (within designated areas).

As those uses are not necessarily compatible with each other, specific areas will be designated within the Marine Zone for these uses.

It is not permitted to:

- Remove sand, coral, rocks or shells for any purpose.
- Pollute the sea by discharge of sewage, garbage or industrial waste.
- Operate anchor, or unload large ships.

b) Limit of Zone

The seaward limit of the Marine Zone shall be a minimum of 500 m from the mean low tide mark. The seaward limit will depend on the environmental conditions of the specific site. As a general rule, the limit of the Marine Zone shall, where possible:

- be drawn between readily locatable geographic features, such as headlands; and
- encompass significant marine environments, such as reefs and sea gardens, which require protection

## 2.4 DESIGN GUIDELINES

### 1) ARCHITECTURAL GUIDELINES

#### a. Objectives

a) Design Principles:

- Adequately reflect the region's varied cultural themes
- Harmony with its environmental setting

## **b. Guidelines and Design Policies**

### **a) Outdoor - indoor relationship**

- Lobbies, dining areas, and other public spaces to be open to the outside
- Guest units to incorporate generous balconies and terraces
- Maximum use of natural ventilation rather than air-conditioning
- Introducing covered passages, arcades and colonnades to link the buildings to minimize internal corridors within the buildings.
- Visual contact with nature, such as a panoramic view from a balcony. Contact with the immediate surroundings being complemented by a backdrop of distant views.
- Physical contact with flowers, trees, rocks and other features of the natural landscape is probably more important than visual contact.
- Small cluster constructions may provide a better solution to get close contact of the tourist to the natural landscape in the provided spaces for trees and gardens among the buildings.
- The resort may be stretched out to take advantage of the views of the sea or mountains, while maintaining contact with the natural surroundings.
- Provision should be made in the layout and design to make the most of the climate, particularly the sun. Open, sunny beaches and squares in hot climates should be adjoined by cool gardens, sheltering trees and deep porticoes.

### **b) Siting**

- The concentration of buildings into groupings is preferable because it allows the site plan to be responsive to a number of unique site and project characteristics, most important of which are 1) site constraints, 2) relationship to amenities, 3) social groupings, 4) servicing efficiencies of water, sanitation, etc., and 5) maintenance concentration for short-stay, dispersion for a longer stay.

### **c) Traditional architectural themes**

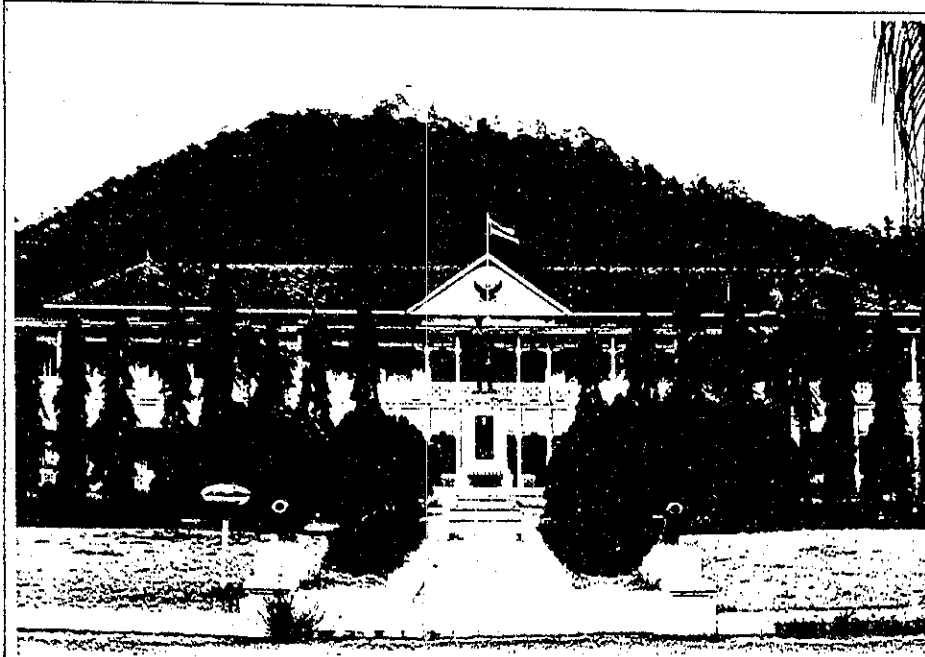
- The roofline features are outstanding in the traditional architecture in Thailand.
- Distinct housing forms can be found in Southern Thailand styles.
- Their use may be restricted to relatively small and simple structures which are in scale with the size and proportion of the original buildings. There are, however, certain characteristics which can be incorporated into the large structures.
- The most important features in tropical construction, is the use of relatively steeply pitched roofs combined with wide eaves overhangs.
- It is possible to use these roof forms even on large buildings by dividing the structure into a number of component parts, each capable of being roofed independently.
- Building design need not exactly reproduce traditional style but rather can incorporate some traditional features into modern design and still reflect Thailand's uniqueness.

### **d) Materials**

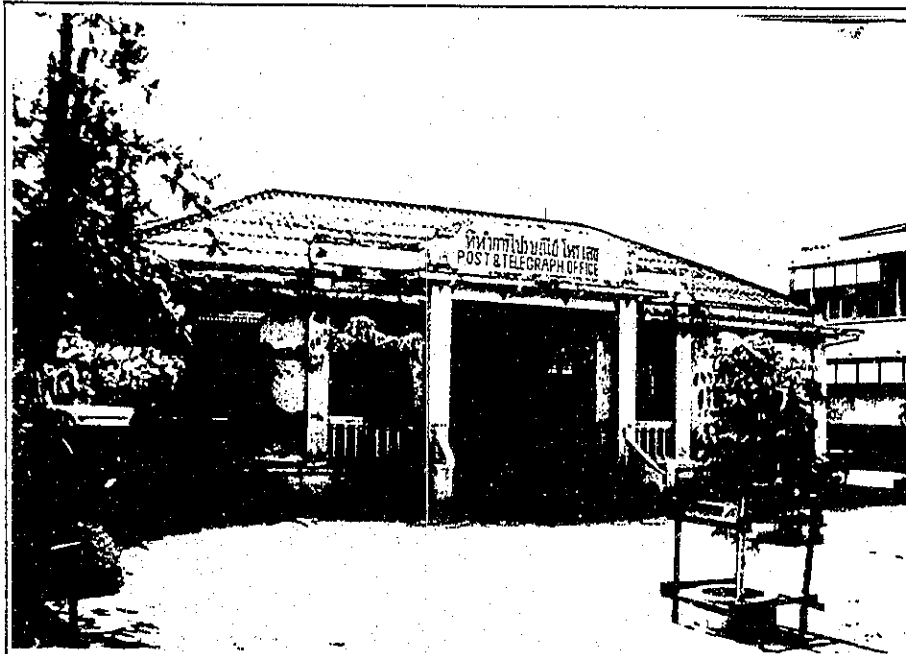
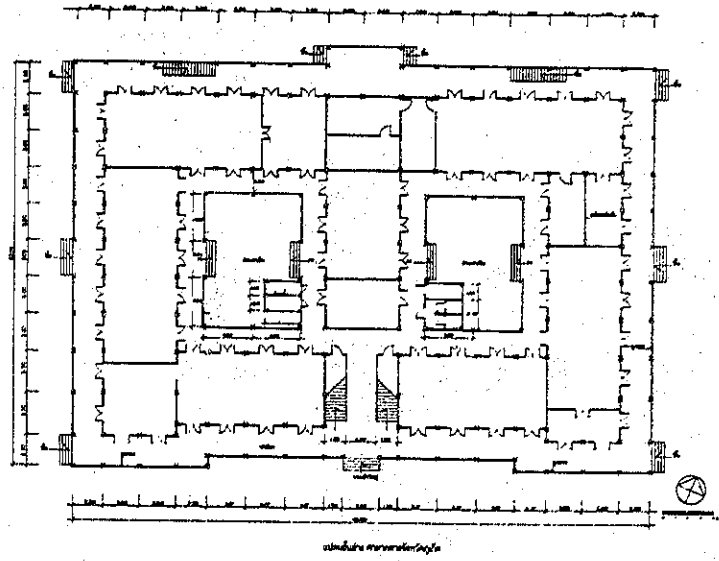
- The use of the maximum amount of local materials is to be encouraged both for its benefit to the foreign exchange balance and as a means of enhancing the indigenous character of the completed buildings.
- There is excellent Thailand timber available and its use should be urged both on the interior and exterior.
- Local hardwoods are attractive and can be used for furniture and interior finishing.
- Clay tile and bamboo roofs are also attractive and functional and their use should be encouraged.
- The use of the local sources of natural stone for exterior walls and floors for veneering of concrete block walls is also encouraged.
- There is excellent washed river stone which can be used to produce attractive finishes both for precast concrete panels and for exposed aggregate concrete paved surfaces.

### **e) Colors**

- The predominant colors of the natural environment of Southern Thailand are the greens of the natural vegetation and rubber plantation and the earth tones of the land itself.
- Additional colors are the dark grey of trunk of tree and the white and pink of coral rock.
- Traditional building materials, such as clay tile, orange brick, woods, and bamboo add a further range of colors.
- It is recommended that the external color schemes for resorts be chosen from the earth tones and colors of traditionally used materials.
- The overall effect should be one of harmony with the natural surroundings.
- Color contrast can be provided through extensive use of flowering plants.



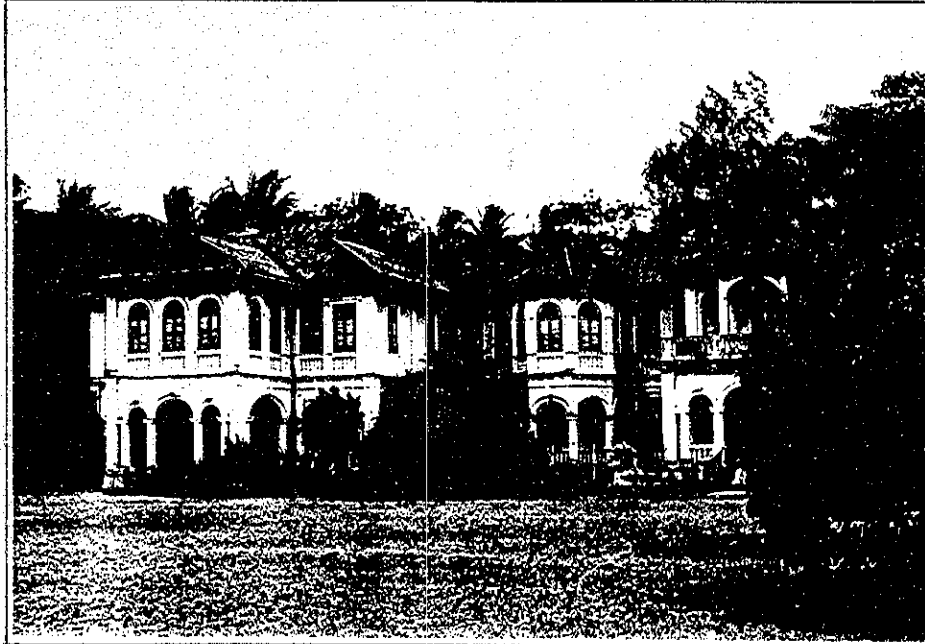
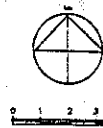
Phuket City Hall



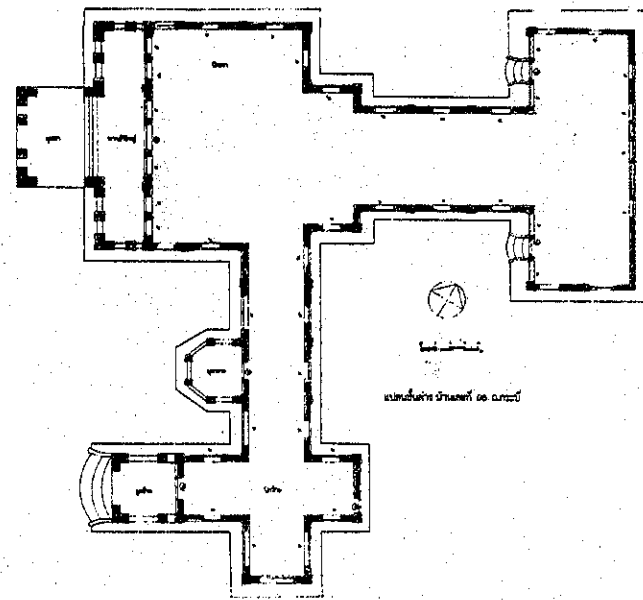
Phuket Post and Telegraph Office



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ไปรษณีย์โทรเลข



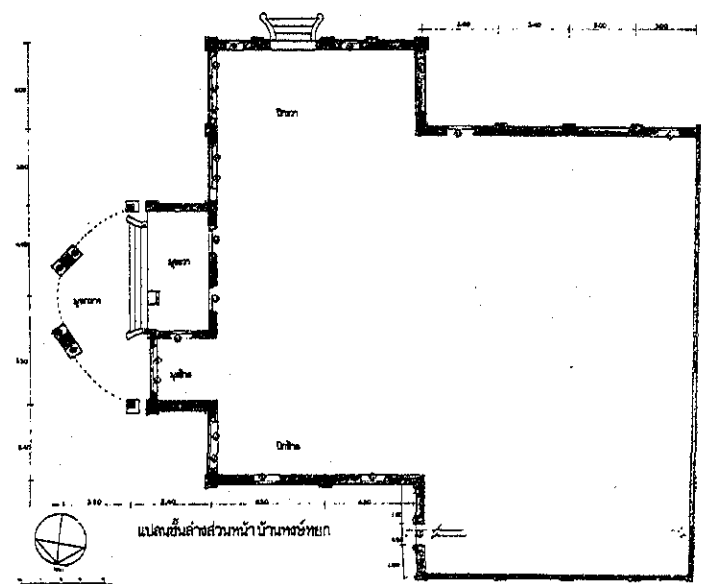
Residence in Phuket ; 96 Krabi Road



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Residence in Phuket ; 25 Thap Kasattri Road

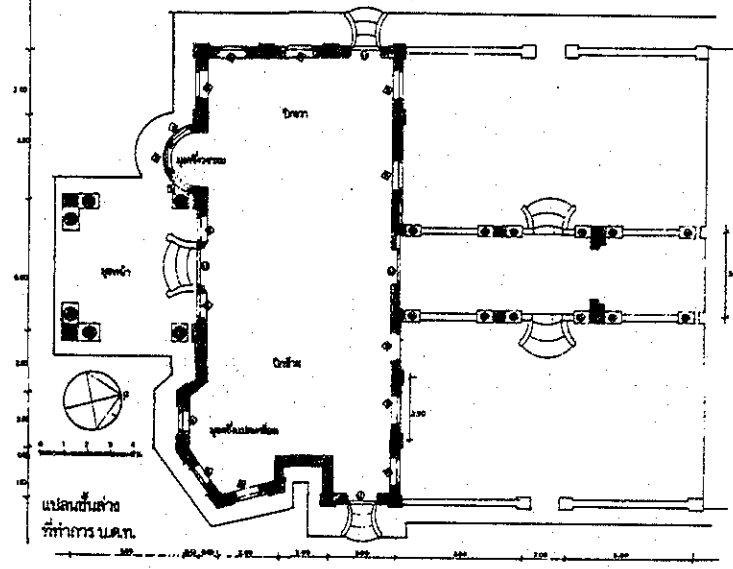


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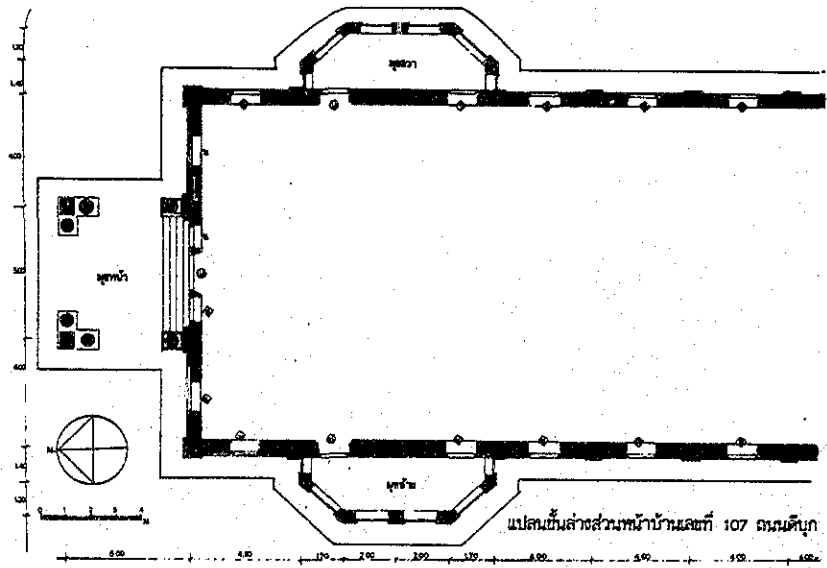




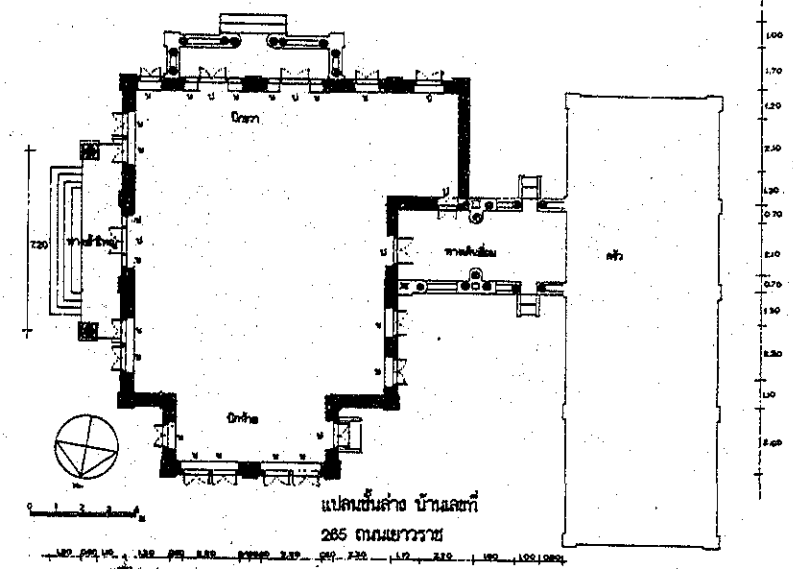
Residence in Phuket City ; 265 Yaovaraj Road

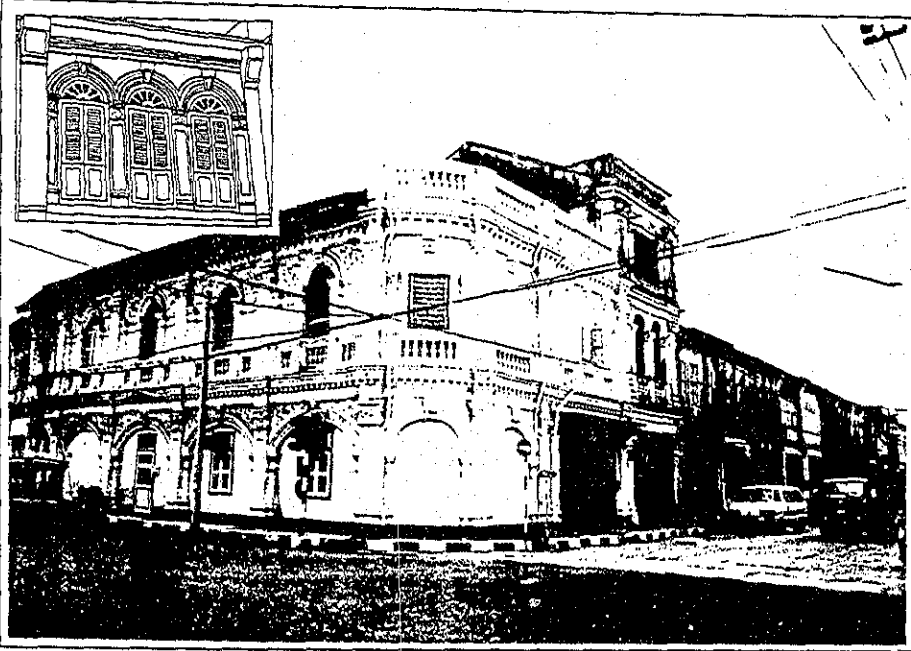


One of the Residences in Phuket . Now Houses Thai International Airline Office



Old Building in Phuket ; 107 Dee Buk Road

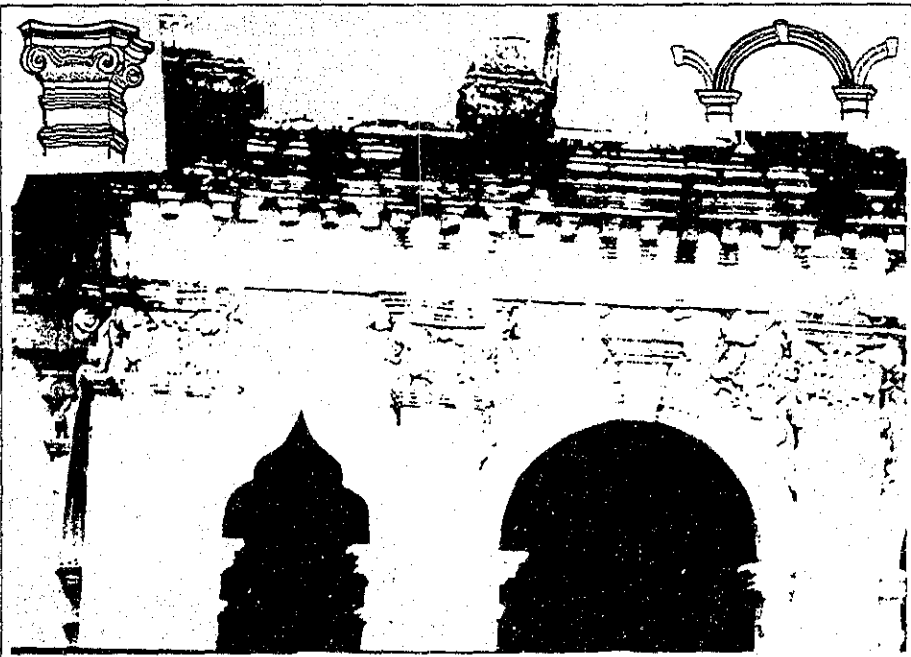




One of the Commercial Buildings in Phuket



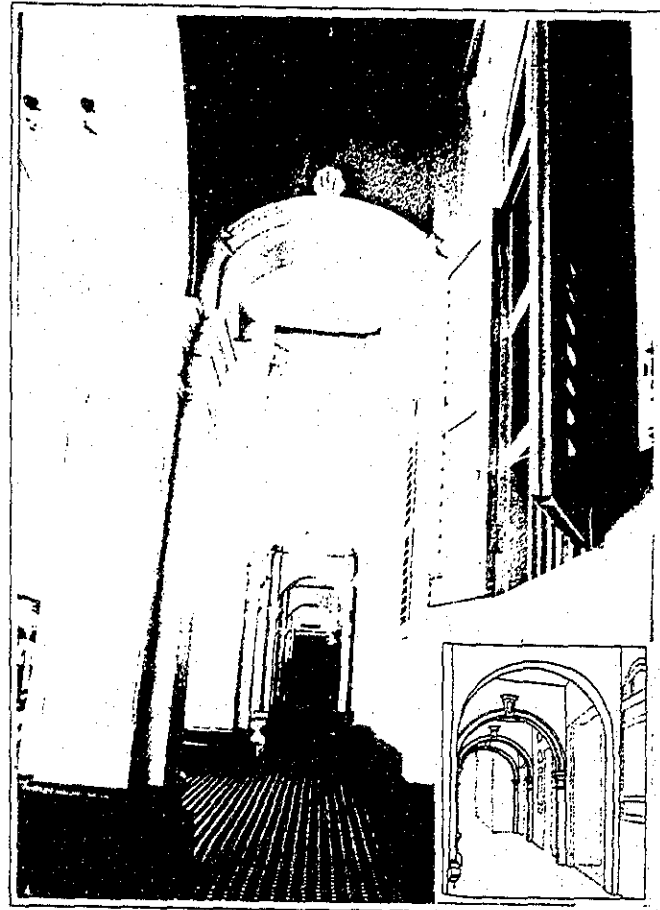
One of the Commercial Buildings in Phuket



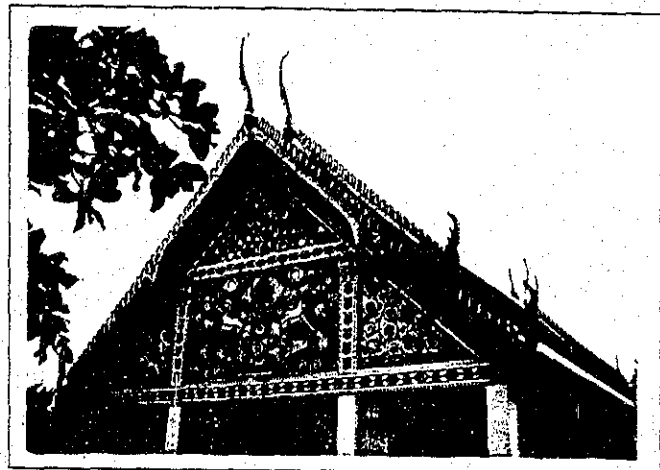
Decorative Stucco on one of Phuket Residence



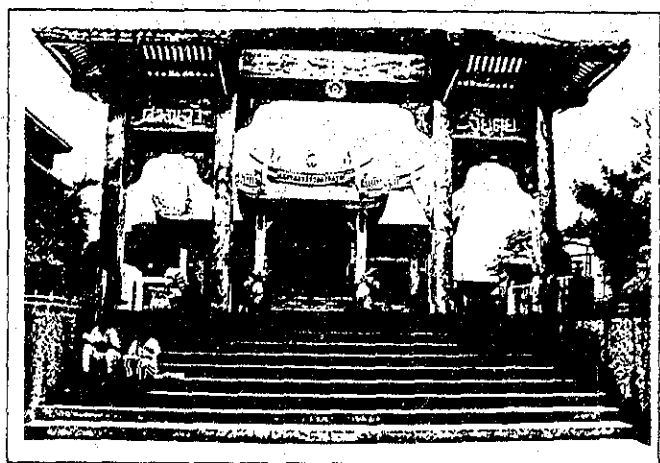
Beautiful Entrance of Phuket Shophouse



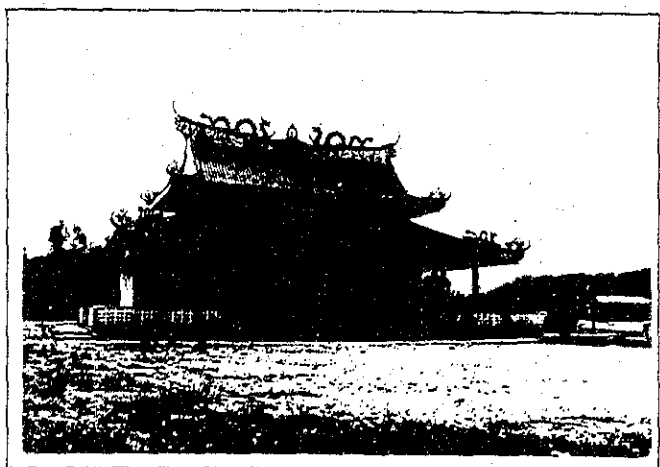
Shophouse's Archade in the Historic Centre of Phuket



One of the Buddhist Temples in the South, Phang Nga



A Chinese Shrine in Phuket



A Chinese Shrine in Takuapa, Phang Nga



Lord of Pattalung Province's Residence, Pattalung



Traditional Thai Residence in Southern Thailand, Songkla Province



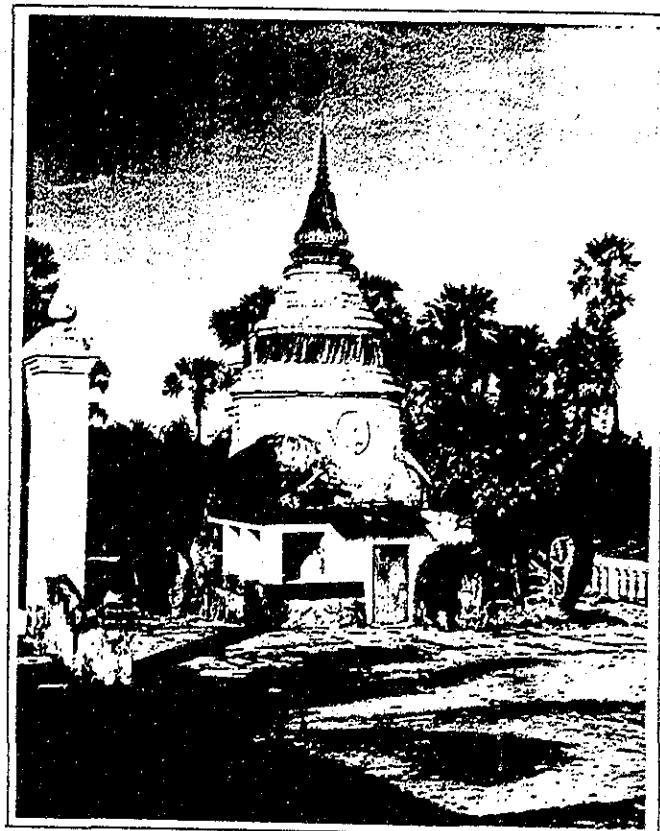
A Residence in the School at Satun Road ; Phuket Province



Shophouses in Takuapa District, Phang Nga



Shophouses in Takuapa District, Phang Nga



One of the Vernacular Pagodas in the South, Songkla Province



Native House in Southern Thailand, Yala Province



Typical Southern Residence, Yala Province

# FACILITY PLAN

## TABLE 2-41 FACILITIES PROGRAM

DEVELOPMENT COMPONENT NAME OF FACILITY	FUNCTION	SITE AREA (ha)	TOTAL FLOOR AREA (ha)	NUMBER OF STAFF PLANNED	PROPOSED DEVELOPMENT BODY			DEVELOPMENT TERMS			REMARKS
					COVT	TAT	PRIVATE	SHORT	MID	LONG	
<b>ACCOMMODATION</b>											
1. EXCLUSIVE HOTEL	LODGING	-	-	-			0				UNITS (85M2/UNIT) 1,020,000 B/unit
2. CONDOMINIUM HOTEL	LODGING	-	-	-			0				UNITS (54M2/UNIT) 450,000 B/unit
3. TOURIST VILLAS	LODGING						0				UNITS (100M2/UNIT) 400,000 B/UNIT
<b>COUNTRY CLUB AND OTHER SPORTS FACILITIES DEVELOPMENT</b>											
1. CLUB HOUSE	SUPPLE- MENTAL	1.0	3,500	30			0				4,000 B/m2 RESTAURANT PRO-SHOP MEMBER'S ROOM, MEETING ROOM, SOCIAL HALL, DRESSING ROOM, SHOWER ROOMS, ETC.
2. GOLF COURSE (MIN.18 HOLES)	SPORTS ENVIRON- MENT	75.0	120	100			0				INTERNATIONAL STANDARDS, KIOSKS, TOILETS HUTS 500 B/m2
3. TENNIS COURTS	SPORTS	0.3	300	7			0				6 TENNIS COURT, ONE WITH STAND, STORAGE, OFFICE, REST ROOM ETC. 600,000 B/COURT
4. BADMINGTON COURTS	SPORTS	0.1		3			0				2 COURTS SUPPLEMENTAL FACILITIES IS SAME USE OF TENNIS COURT 600,000 B/COURT
5. GYMNASIUM	SPORTS						0				TENNIS COURT BADMINGTON COURT, SQUASH COURTx2, PHYSICAL TRAINING ROOM 1,000 B/m2
6. INDOOR SWIMMING	SPORTS	2.0	1,000	40			0				25M x 8 COURSES 5,000 B/m2
7. HEALTH CARE CENTRE POOL	HEALTH CONTROL						0				CLINIC, FITNESS CLUB, REHABILITATION CARE, HEALTH SPA. 5,000 B/m2
8. HORSE TRAINS W/STAND ETC.	SPORTS		100	10			0				
9. MARINE SPORTS CLUB	SPORTS	0.3	600	20			0				CLUB HOUSE, STORAGE, WORKSHOP OFFICE RESTAURANT/BAR, SHOWER
10. MULTI-PURPOSE SPORTS COMPLEX	SPORTS						0				
11. BEACH SIDE RECREATION SPACE							0				SHELTER
<b>CONVENTION/CULTURAL, PARKS DEVELOPMENT</b>											
1. ROYAL FOREST PARK	ENVIRON- MENT	20.0	300	50	0	0					OVERALL DEVELOPMENT COMPONENT AREA, TO CREATE BALINESE FOREST 2,000 B/m2
2. ROYAL FOREST MUSEUM	CULTURE	0.4	1,000	8	0	0					EXPLANATION OF BLINESE NATURE W/DISPLAYS DTC. 5,000 B/m2
3. FLOWER GARDEN	ENVIRON- MENT CULTURE	1.0	200	10	0	0					TROPICAL/BALINESE FLOWER GARDEN 1,000 B/m2
4. CONVENTIION HALL	CULTURE	2.8	20,000	100	0						TOTAL 2,000 PERSONS IN MAIN HALL, SUB HALLS; SIMARTENOUS TRANSLATION SYSTEM, CULTURAL SHOW/EXCLUSIVE 5,000 B/m2
5. EXHIBITION HALL	CULTURE	0.6	1,500	10	0						SUPPLEMENTAL FACILITY OF CONVENTION HALL 4,000 B/m2
6. THAI ARTS MUSEUM	CULTURE	0.4	1,000	8	0						EXHIBITION SPACES 4,000 B/m2
7. CRAFT CENTRE	CULTURE	0.2	500	10	0	0					SCHOOL OF LEARNING BALINESE CRAFT 4 CLASSES 10 ATTENDANTS EACH 3,000 B/m2
8. CULTURAL LIBRARY	CULTURE	0.2	500	8	0	0					DATA/INFORMATION OF S. THAI ARTS AND CRAFTS 5,000 B/m2
9. RELIGIOUS COMPLEX	CULTURE	0.5	300	5	0						MOSQUE & CHURCHES 4,000 B/m2
10. OTHERS					0	0					
		37.0	25,800								
<b>AMENITY DEVELOPMENT</b>											
1. RESTAURANTS	SUPPORTING		700	200			0				TOTAL 650 SEATS 4,500 B/m2
2. SOUVENIR SHOPS	SUPPORTING		200	20			0				SHOPS 4,000 B/m2
3. BOUTIQUE	SUPPORTING		100	10			0				BOUTIQUE SHOP 4,000 B/m2
4. CHILDREN CLUB WITH PLAY LOTS	SUPPORTING		200	20			0	0			DAY CARE CENTRE WITH BABY

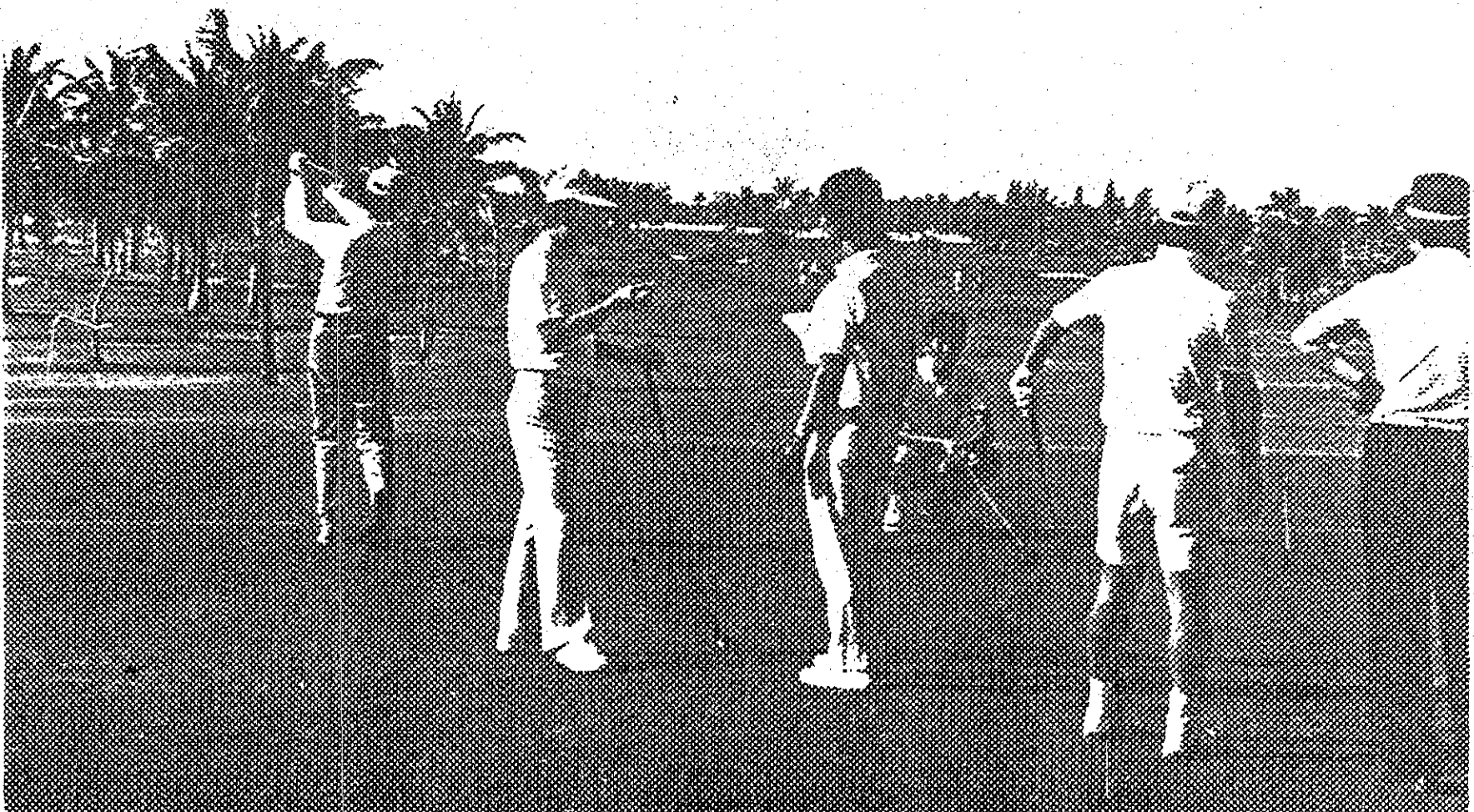
DEVELOPMENT COMPONENT NAME OF FACILITY	FUNCTION	SITE AREA (ha)	TOTAL FLOOR AREA (ha)	NUMBER OF STAFF PLANNED	PROPOSED DEVELOPMENT BODY			DEVELOPMENT TERMS			REMARKS
					COVT	TAT	PRIVATE	SHORT	MID	LONG	
5. MINIATURE PARK	AMUSEMENT RECREA- TIONAL O/S		10			0	0				3,000 B/m2
6. WORLD RESTAURANT	SUPPORTING		1,000	120			0				COMPLEX OF WORLD CUISINE, 20 CUISINE WITH COMMON EATING SPACES TOTAL SEATS 5,000 B/m2
7. INTERNATIONAL MARKET PLAZA (DUTY FREE)	SUPPORTING		1,000	50		0	0				SELLING SPACE, STORAGE, OFFICE ETC. TOURIST COMMUNITY PLAZA 4,500 B/m2
8. THEATRE CINEMA HOUSE	CULTURE		250	10		0	0				PERSONS 4,000 B/m2
9. BARSS/BEER HALLS/ NIGHT RESTAURANTS	SUPPORTING		400	80			0				RESTAURANTS, TOTAL SEATS, HIGH STANDARD 4,500 B/m2
10. AMUSEMENT CENTRE	SUPPORTING		2,500	20			0				BOWLING LANEX8, BILLIYARDX8, VIDEO GAME, ETC. 5,000 B/m2
11. MARINE GARDEN	SUPPORTING		100	5		0	0				FISHING, SWIMMING POOL, ETC. 5,000 B/m2
12. POST OFFICE	SUPPORTING		50	3	0						5,000 B/m2
13. POLICE BOX/GUARD BOXES	SUPPORTING		75	6	0	0					15m 3,000 B/m2
14. TOURIST INFORMATION CENTRE	SUPPORTING		100	3	0						4,000 B/m2
15. TRAVEL AGENTS	SUPPORTING		76	10			0				AGENTS 4,500 B/m2
16. AIRLINE OFFICE	SUPPORTING		150	15			0				AIRLINES 4,500 B/m2
17. BANK/INSURANCE OFFICE	SUPPORTING		50	15			0				4,500 B/m2
18. MONEY CHANGER	SUPPORTING		60	10			0				SHOPS 4,500 B/m2
19. RENTA CYCLE SHOPS	SUPPORTING		200	3			0				100 CYCLES 2,500 B/m2
20. TOWN, VILLAGE BEAUTIFICATION	ENVIRONMENT				0	0		0	0		
OTHER DEVELOPMENTS/ IMPROVEMENTS											
1. PIER	SUPPORTING										
2. DREDGING OF CORAL REEF	SUPPORTING										
3. BEACH EROSION CONTROL	ENVIRONMENT										
4. IMPROVEMENT OF SECONDARY ROADS	ENVIRONMENT										
INFRASTRUCTURE DEVELOPMENT											
1. ROAD PHUKET	SUPPORTING				0			0	0	0	NATIONAL ROAD 2,500,000 B/km
PHANG NGA	SUPPORTING				0				0	0	NATIONAL ROAD 2,500,000 B/km
KRABI	SUPPORTING				0				0	0	NATIONAL ROAD 2,500,000 B/km
2. IMPROVEMENT OF SECONDARY ROAD	SUPPORTING				0			0	0	0	PHUKET LINK ROAD 2,000,000 B/km
3. AIRPORT PHUKET	SUPPORTING				0				0		T
KRABI	SUPPORTING				0				0	0	FEEDER AIR TRANSPORT
4. HELIPORT	SUPPORTING				0				0		
5. PORT, PIER PHUKET	SUPPORTING				0				0	0	PHUKET - KRABI FERRY PORT
6. ROPEWAY	SUPPORTING				0	0	0				PHANG NGA WEST SOUTH
7. EXTERNAL SHUTTLE SERVICE	SUPPORTING				0			0	0	0	PHUKET - PHANG NGA - KRABI
8. INTERNAL SHUTTLE SERVICE	SUPPORTING				0		0	0			DEVELOPMENT AREA
9. WATER SUPPLY PHUKET	SUPPORTING				0			0	0	0	600 B/m2 *
PHANG NGA	SUPPORTING				0				0	0	600 B/m2 *
KRABI	SUPPORTING				0				0	0	600 B/m2 *
10. SEWAGE DISPOSAL & PLUMBING	SUPPORTING				0			0	0	0	600 B/m2 *
11. SOLID WAST TREATMENT	SUPPORTING							0	0	0	
12. ELECTRIC SUPPLY	SUPPORTING				0						
13. TELEPHONE EXPANSION	SUPPORTING				0			0	0	0	
14. BEACH EROSION CONTROL					0			0		0	USAID



DEVELOPMENT COMPONENT NAME OF FACILITY	FUNCTION	SITE AREA (ha)	TOTAL FLOOR AREA (ha)	NUMBER OF STAFF PLANNED	PROPOSED DEVELOPMENT BODY			DEVELOPMENT TERMS			REMARKS
					COVT	TAT	PRIVATE	SHORT	MID	LONG	
OTHERS											
1. TOURISM TRAINING SCHOOL	SUPPORTING				0				0		3,000 B/m2
2. NATIONAL PARK MANAGEMENT TRAINING SCHOOL	SUPPORTING				0				0		3,000 B/m2
3. HANDCRAFT TRAINING CENTRE	SUPPORTING				0				0		3,000 B/m2
4. MEDICAL CENTRE	SUPPORTING				0				0		JICA UPPER SOUTH PROJECT 5,000 B/m2
5. LANDSCAPING	SUPPORTING				0	0		0	0	0	
6. GOODS DISTRIBUTION CENTRE					0				0		4,500 B/m2

TABLE 2-42 AREA STANDARD

CATEGORY	FACILITIES	GROSS BUILT AREA (m2/BED)
RECREATIONAL AND CULTURAL	CINEMA, MULTI-PURPOSE HALL, OPEN AIR THEATRE, LIVRARY, YOUTH CENTRE; DANCING NITH CULB	0.1 (SEA SIDE) 0.2 0.3 (MOUNTAIN)
SPORTS	PLAY GROUND, BASKET, VOLLEY, TENNIS, SPORTS HALL, SWIMMING POOL, HORSE RIDING, MINI GOLF	0.4 0.5 (MOUNTAIN) 0.2 (SEA SIDE) 5 8 (CROSS OPEN AREA)
SHOPS, STORES	DAILY FOOD, GROCERIES, BAKERY, DAIRY-BUTCHERY, VEGETABLE STORE, DRUGSTORE, PHARMACY, NEWSPAPER, BOOKSHOP, TABACCONIST, FLOWER HANDICRAFT, GIFT, SOUVENIR, CLOTH, EQUIPMENT, FASHION, SPORTS GOOD, PHOTOGRAPHIC, FURNITURE, HAIRDRESSER, LAUNDRY, PETROL STATION, REPAIR, TRAVEL AGENCY, BANK, CAR RENTAL, REAL ESTATE	0.6 0.7
ADMINISTRATION AND PUBLIC	ADMINISTRATION OFFICE, MEDICAL CARE, NURSERY, BABY SITTER, DENTIST, POST OFFICE FIRE STATION	0.2



## 4. UTILITIES PLAN

### 4.1 ELECTRIC POWER SUPPLY

#### 1) GENERAL

An electrical power supply system for the proposed development areas has been worked out with basic priority given to high reliability, in compliance with the international level set for the development. Electricity will be supplied to the development areas through power cables to the Phuket area which have a large capacity and high reliability.

For the electrical power supply system for the development areas, this paper studies and describes distribution systems, substation, distribution stations, transmission lines, outdoor lighting and electrical power demand.

#### 2) SERVICE AREA

Following area the two proposed development areas which will obtain power supply from the Thai Muang Substation to be built in the Thai Muang Area.

- Thai Muang Beach Development Area
- Khok Kloi Development Area

Also, an electrical power supply system has been worked out separately for the Phuket Marine Center planned for the southern part of Phuket Island.

Development of tourism-related facilities in areas other than the above is not subject to study, since the existing power supply networks are enough in the light of the small-scale development low power demand.

#### 3) DISTRIBUTION SYSTEM

The following four methods were initially considered for an electrical power supply system to the development areas.

- a. Single Line System
- b. Double Line System
- c. Spot Network System
- d. Loop Network system

After careful study of the four methods, it has been decided to adopt the double line system for the project in view of reliability, construction cost, operation and maintenance.

#### 4) SUBSTATION

The Thai Muang Substation to be constructed in the Thai Muang Beach Development Area will have chief apparatuses, such as a main transformer and a circuit breaker, outdoor. The primary voltage for the substation is 115 KV, the same as the existing power cables to the Phuket area. The secondary voltage will be reduced to 22 KV through a main transformer for supply to each distribution station.

In the final phase of the project, three main transformer each with a capacity of 15 MVA will be installed. Until the phase II, two transformers with the same capacity will be subject to parallel operation.

Circuit breakers and line waitress will be remote-controlled, making it necessary to install storage batteries.

#### 5) TRANSMISSION LINES

Transmission lines linking the substation and the distribution station, and the distribution station and users will be buried underground, considering scenic beauty and reliability.

The transmission lines will be buried basically under the shoulders of roads.

#### 6) DISTRIBUTION STATION

The distribution station will be set up in the neighborhood of the area with the largest number of users.

Voltage of the distribution station will be fixed at 22 KV. Electricity to large users, such as hotels, will be directly supplied without reduction in voltage, whereas the electricity to small users will be reduced to 380/220 V.

Given safety and scenic beauty, the outdoor cubicle method will be adopted for the distribution station. A transformer designed to lower 22-KV electricity to 380/220 V will be installed outside the cubicle due to its transformation capacity and form.

## 7) OUTDOOR LIGHTING

The installation of outdoor lighting has been proposed at public parking lots and roads in the development areas in the light of safety in operation.

For this outdoor lighting, 400-watt mercury lamps will be installed with the average luminous intensity set at 15 luxes.

## 8) ELECTRICAL DEMAND

Electrical demands in related facilities in the development areas have been projected on the basis of the following figures.

High Class Hotel	3.50 KVA/Room
Low Class Hotel	2.70 KVA/Room
Villa Type Accommodation	3.00 KVA/Unit
Convention/Exhibition Facilities	0.16 KVA/sq.m
Sports Facilities	0.14 KVA/sq.m
Restaurant/Shops	0.10 KVA/sq.m
Office/Club House/Other Facilities	0.07 KVA/sq.m
Open Space/Garden	0.01 KVA/sq.m

Each facility in the development area has different objectives and functions, making electrical demands, vary from facility to facility.

Electrical demands in each facility have been worked out on the basis of past results-demands per room for hotels and demands per square meter for other facilities.

Electrical demands for street and road lighting has been calculated on the basis of road length with each light to be installed at the average interval of 30 meters.

Electrical demands for each development component are shown in Table 2-44/45.

## 9) POWER DISTRIBUTION NETWORK

A power distribution network and a connection diagram in the development areas are displayed in Figure-1 and Figure-2.

**TABLE 2-43 THAI MUANG DEVELOPMENT AREA ELECTRICAL DEMAND**

Name of Distribution Station	Name of Dev't Facilities	Max.Demand(KVA)		
		Phase II	Phase III	Total
N2 Distribution Station	High Class Hotels (877 Rms)	1,050	2,020	3,070
	Villa Type Accommodation (300 Units)	600	-	600
	Golf Course	140	-	140
	Recreational Park	80	-	80
	Shopping Arcade	120	-	120
	Street Lighting	154	150	304
	Sub Total	2,144	2,170	4,314
N 1 Distribution Station	High Class Hotels (860 Rms)	3,010	-	3,010
	International Park	137	-	137
	Street Lighting	109	-	109
	Sub Total	3,256	-	3,256
OO Distribution Station	High Class Hotels (567 Rms)	1,985	-	1,985
	Convention Park	1,630	-	1,630
	Vocational School	371	-	371
	Tourist Center	23	-	23
	Business Park	65	-	65
	Shopping Promenade	130	-	130
	Restaurant Plaza	230	-	230
	Marine Sports Club	42	-	42
	Transportation Center	132	-	132
	Water Treatment Plant	206	-	206
	Street Lighting	42	70	112
Sub. Total	4,856	70	4,926	
S1 Distribution Station	High Class Hotels (1,372 Rms)	-	4,802	4,802
	Villa Type Accommodation (194 Units)	-	582	582
	Sports Complex	-	959	959
	Pool Garden	-	417	417
	Street Lighting	-	127	127
	Sub. Total	-	6,887	6,887
S2. Distribution Station	High Class Hotels (792 Rms)	-	2,772	2,772
	Villa Type Accommodation (296 Units)	-	888	888
	Golf Course	-	350	350
	Villa Plaza	-	404	404
	Street Lighting	-	190	190
	Sub. Total	-	4,604	4,604
	Grand Total	10,256	13,731	23,987



**TABLE 2-44 KHOK KLOI AND OTHER DEVELOPMENT AREA ELECTRICAL DEMAND**

Name of Distribution Station	Name of Dev't Facilities	Max. Demand (KVA)		
		Phase II	Phase III	Total
XX Distribution Station	High Class Hotels (347 Rms)	-	1,215	1,215
	Low Class Hotels (553 Rms)	1,367	127	1,494
	Villa Type Accommodation (200 Units)	-	600	600
	Public Parks	35	-	35
	Transportation Center	83	-	83
	Multi Purpose Ground	49	-	49
	Seaside Promenade	18	-	18
	Street Lighting	159	175	334
	Sub. Total	1,711	2,117	3,828

**TABLE 2-45 PHUKET MARINE CENTER ELECTRICAL DEMAND**

Phuket Marine Center Distribution Station	High Class Hotels (200 Rms)	700	-	70
	Marine Center	500	-	500
	Yacht Club	140	-	140
	Workshop and Storage			

**10) COST ESTIMATION OF ELECTRICAL WORKS**

Cost estimation of an electrical power supply system construction has been carried out on the basis of an electrical power supply program for the development areas.

Construction cost for accommodation facilities, roads and other tourism-related facilities has been projected for each construction phase.

Estimated construction costs are all based on prices in 1988, excluding cost escalation and various taxes, including import taxes in connection with construction.

Various expenses related to construction have been given as 35 percent of net construction costs, while technical service costs, including design and supervision, has been set at 10 percent of the total of net construction costs and various expenses.

Construction costs for the Thai Muang Substation include those for transmission lines to the distribution station, while construction costs for the distribution station include those for transmission lines to users.

Construction costs for street lighting include those for lamps, poles, concrete foundation, power supply cables and distributing boards.

Construction costs for electricity-related equipment at hotels and tourism-related facilities are all included in construction costs for these facilities.

Construction costs for an electrical power supply system are estimated at 297 million bahts in the phase II and 310 million bahts in the phase III for an overall estimate of 607 million bahts.

Project-by-project construction costs for the proposed electrical power supply system are shown in Table-2.