

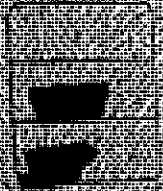
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# **The Institute for Skill Development in The Northeast of Thailand**

**March 1977**

**JAPAN INTERNATIONAL COOPERATION AGENCY**



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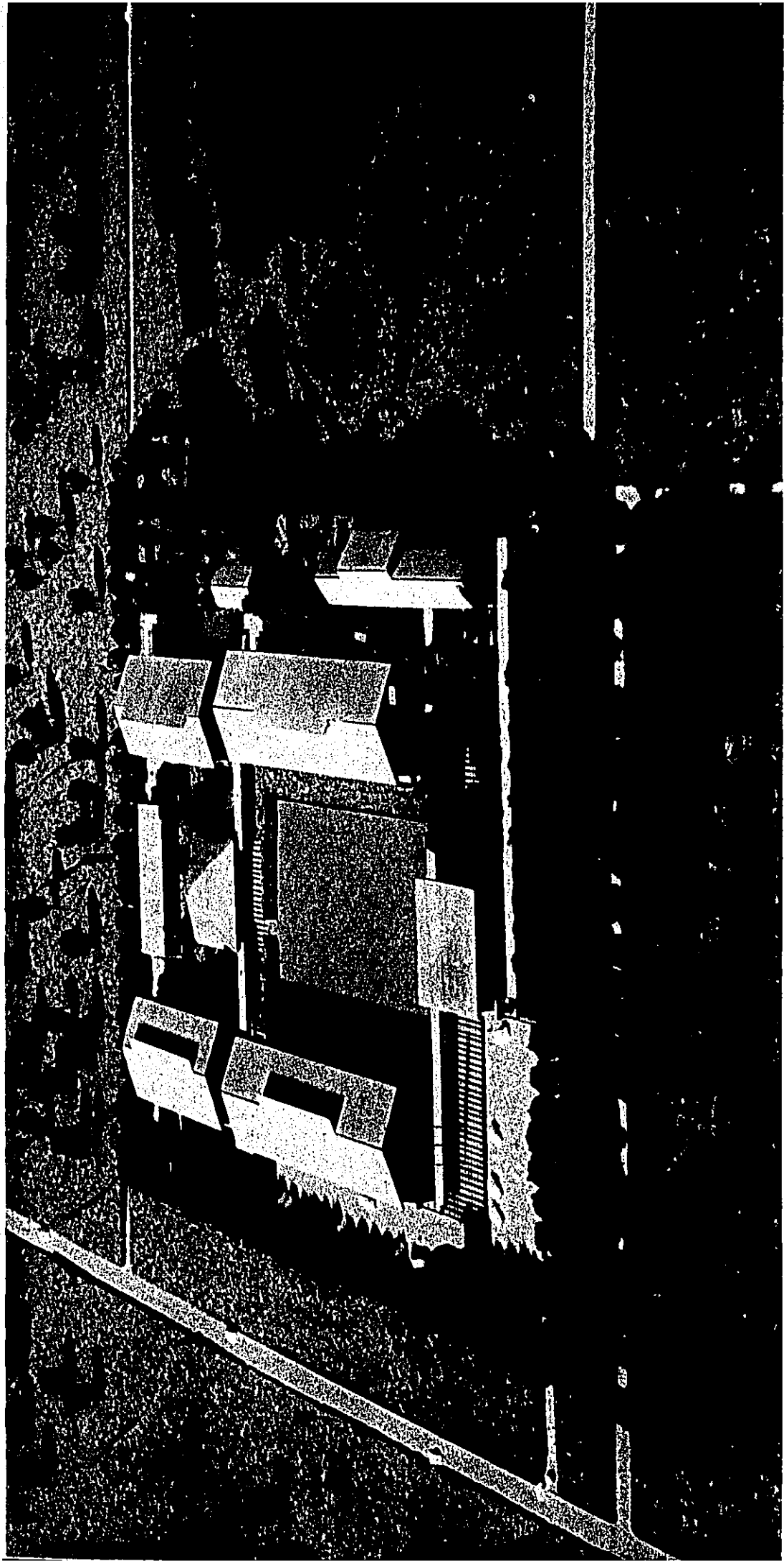
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**The Institute for Skill Development  
in The Northeast of Thailand**

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THE INSTITUTE FOR SKILL DEVELOPMENT  
IN THE NORTHEAST OF THAILAND  
Looking down from the east

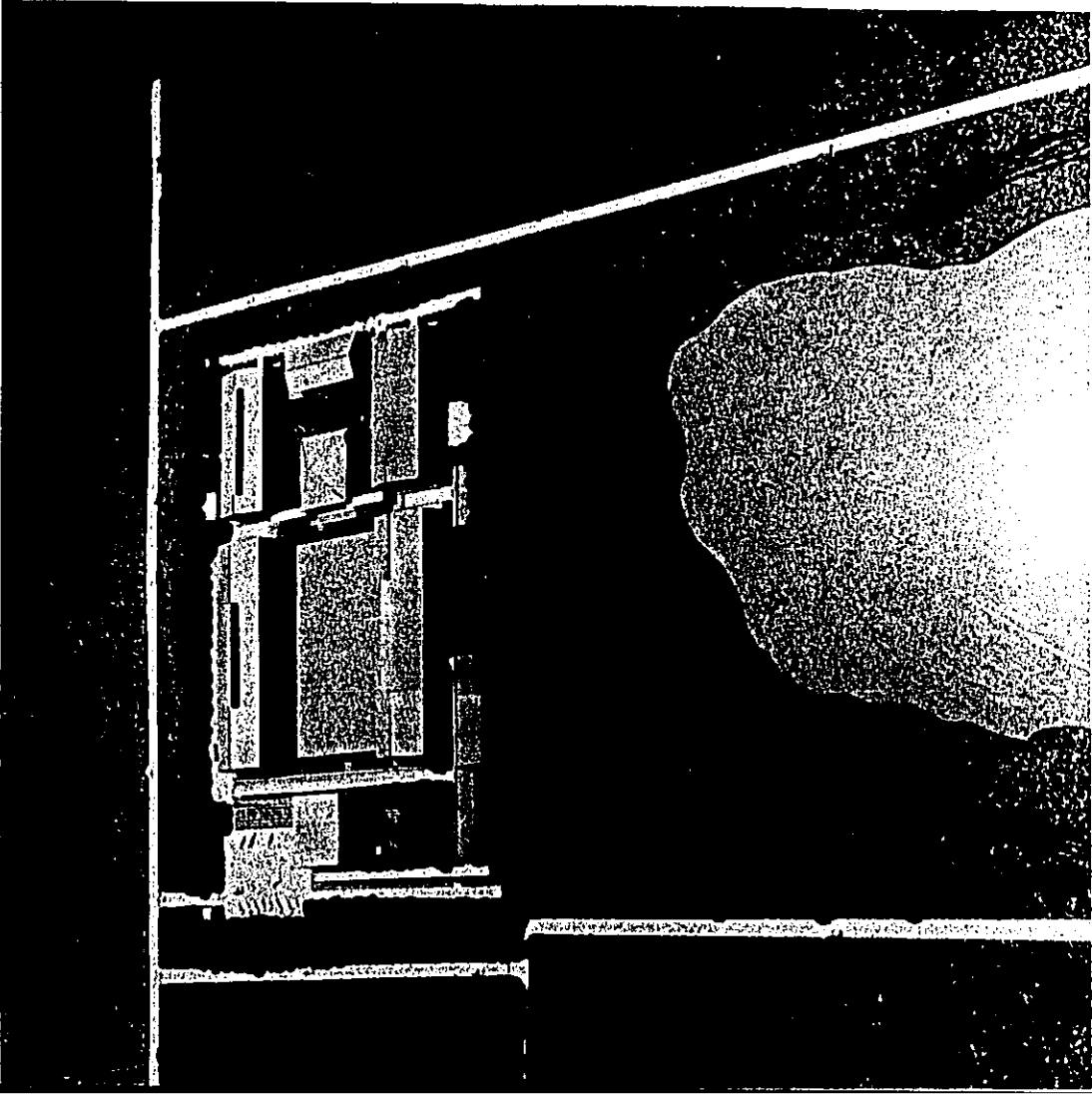
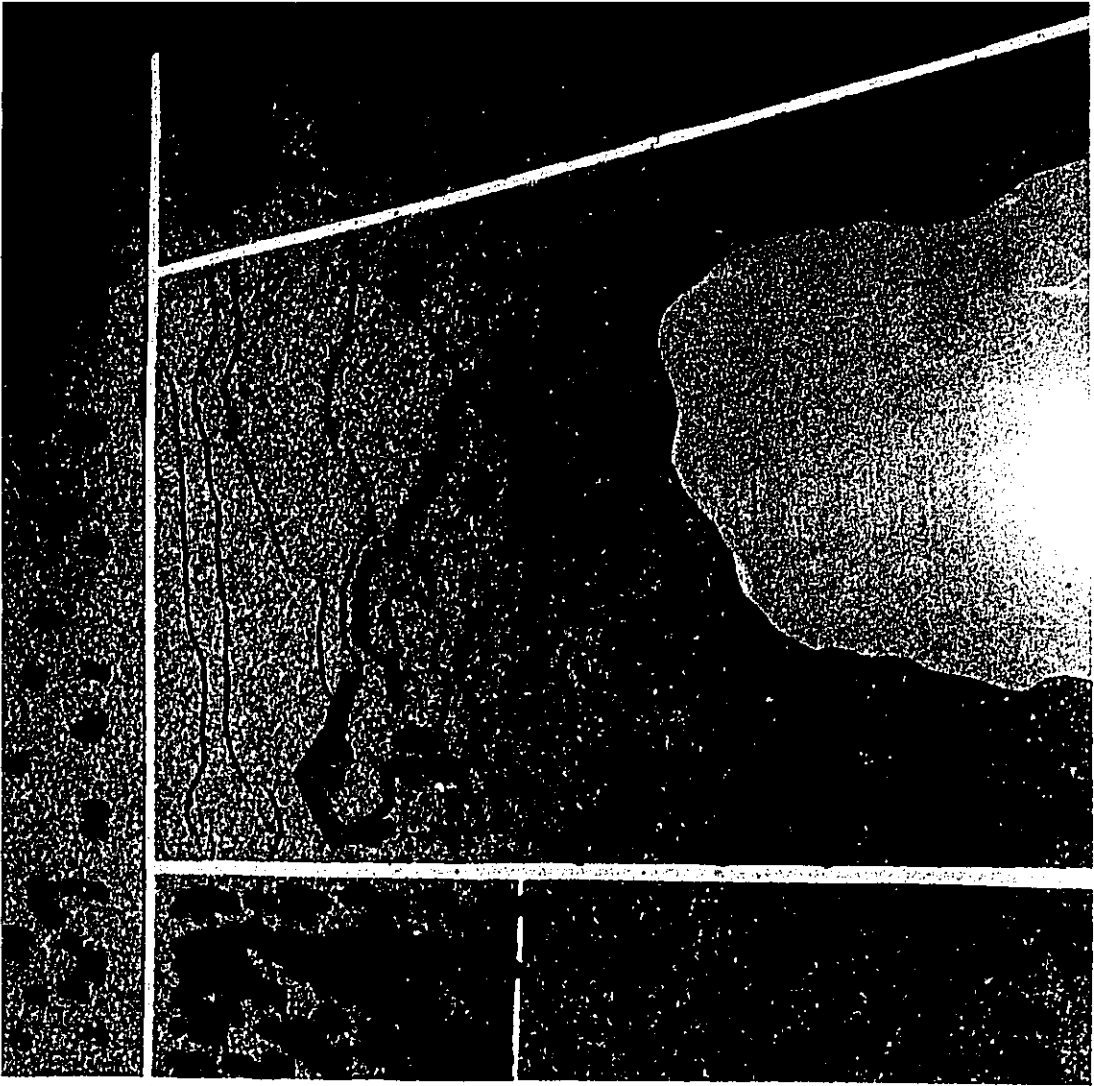


image of completion of the institute  
looking down from the north



present condition of site  
looking down from the north

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## PREFACE

In response to the request of the Government of Thailand, the Government of Japan has decided to carry out a study necessary for the preparation of the preliminary design for the Construction plan of the Institute for Skill Development in the North-east of Thailand, and the Japan International Cooperation Agency conducted the study.

The Japan International Cooperation Agency recognized that vocational training is considered to be very important for economic development, and contribute to the stabilization for the livelihood of Thailand.


In the recognition of the above background, the Japan International Cooperation Agency dispatched a survey team from January 24, to February 8, 1977 for the purpose of obtaining the necessary data for the preparation of the preliminary design, and discuss and exchange view with Thailand Authorities concerned on the construction and establishment of the Institute.

The field survey in Thailand was carried out very smoothly owing to the extensive cooperation of Thailand Authorities concerned, and upon its return to Japan, the team engaged in related studies and analysis works and its results are compiled in this report.

I sincerely hope that this report would contribute to the progress of this project in the future and at the same time serves to strengthen the friendly relations now existing between the two countries.

I avail myself of this opportunity to express my heartfelt appreciation to competent Authorities concerned for the operation and hospitality extended to the team during the study period.

March, 1977

  
Shinsaku Hogen  
President  
JAPAN INTERNATIONAL COOPERATION AGENCY

## 1. SURVEY FOR CONSTRUCTION

### 1.1 PURPOSE OF SURVEY

The purpose of this survey mission is provide the requirement of the Government of Thailand for assistance to carry out the preliminary design for the construction of the Institute for Skill Development in the Northeast of Thailand.

In advance of despatch of this mission, the Government of Japan through Japan International Cooperation Agency had sent a preliminary survey team to conduct a feasibility survey on this project and both government mutually recognized that this project is very important. Based on the result of feasibility survey report, this survey is carried out.

## 1.2 SURVEY TEAM AND SCHEDULE

Japanese survey team which is led by Mr. T. Nakamura made the survey for sixteen days from January 24, to February 8, 1977.

Members of survey team are as follows.

Mr. Tetsuo NAKAMURA  
(Leader)

Chief Trade Skill Test Officer,  
Trade Skill Test Division,  
Vocational Training Bureau,  
Ministry of Labour.

Mr. Fukuji ITOH

Section Chief,  
Training Division,  
Vocational Training Bureau,  
Ministry of Labour.

Mr. Masaaki MIYASHITA

Staff,  
Second Economic Cooperation  
Division,  
Economic Cooperation Bureau,  
Ministry of Foreign Affairs.

Mr. Shoji SHIMBO

Deputy Head,  
Second Development Survey  
Division, Social Development  
Cooperation Department, Japan  
International Cooperation Agency

Mr. Sadayuki KATOH

Staff,  
Overseas Centres Division,  
Social Development Cooperation  
Department, Japan International  
Cooperation Agency.

Mr. Seichi MATSUDA

Qualified Architect,  
Director of Overseas  
Department,  
Kume Architects-Engineers.

Mr. Osamu MATSUMURA

Qualified Architect,  
Head of Architectural Design  
Division,  
Kume Architects-Engineers.

Mr. Toshiaki SUGIE

Qualified Architect,  
Engineer of Overseas  
Department,  
Kume Architects-Engineers.

Mr. Hideo NAKATA

Engineer of Overseas  
Department,  
Kume Architects-Engineers.

Mr. Makoto NAGATOMI

Engineer of Overseas  
Department,  
Kume Architects-Engineers.

## 1.3 MINUTES

Mentioned in minutes was signed by between Mr. Suvitya Yingvorapot, Director-General Department of Labour Ministry of Interior Thailand and Mr. Tetsuo Nakamura, Team Leader of the Japanese Survey Team in presence of Mr. Xujati Pramoolpol, Director-General Department of Technical and Economic Cooperation Thailand at D.T.E.C. on 7th Feb. 1977.

This minute is important basic proceedings to carry out the construction of institute and will also be authorized by conclusion of Exchange of Notes which is exchanged between the Government of Thailand and the Government of Japan.

Minutes on the Construction Programme  
of the Institute for Skill Development  
in the Northeast of Thailand


At the request of the Government of Thailand for assistance in establishing the Institute for Skill Development in the Northeast of Thailand (hereinafter referred to as "The Institute"), the Government of Japan through Japan International Cooperation Agency (hereinafter referred to as "JICA") had sent a preliminary survey team headed by Mr. Yoshikazu Ishii, Ministry of Labour, to conduct a feasibility survey on the project for nineteen days from October 5, 1976.

Based on the results of the aforementioned survey, the Government of Japan had decided to conduct a study necessary for the preparation of the preliminary design of the Institute and the survey team organized by JICA and headed by Mr. Tetsuo Nakamura, Ministry of Labour, visited Thailand for sixteen days from January 24, 1977 for the purpose of drawing up the preliminary design for the construction of the Institute which will constitute an important integral part of vocational training in Thailand.

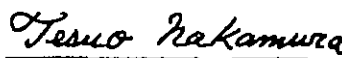
The team held a series of discussions and exchanged views with Thai Authorities concerned on the construction and establishment of the Institute.

As a result of the survey and discussions both parties have agreed to recommend to their respective Governments to start the construction toward establishing the Institute. Minutes of the discussions are attached herewith.

Bangkok, February 7, 1977.

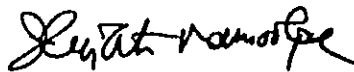


Mr. Suvitya Yingvorapant  
Director-General  
Department of Labour  
Ministry of Interior



Mr. Tetsuo Nakamura  
Team Leader  
The Japanese Survey Team

in the presence of



Mr. Xujati Pramoolpol  
Director-General  
Department of Technical  
and Economic Cooperation

## Minutes

1. The proposed Institute will be established at Muang District, Khonkaen Province.
2. The objectives of the Institute are to provide practical and theoretical training for potential skilled workers who will be contributing their skills acquired through the training to the industrial and agricultural development, thereby promoting the productivities of the industries concerned and the welfare of the people in Thailand.
3. The Institute will consist of six (6) workshops aiming at training a maximum of three hundred (300) trainees at one time as projected in Annex I.
4. The Government of Japan will take necessary measures to provide such buildings of the Institute as listed in Annex II. The layout plan of the Institute is shown in Annex III-1.
5. The Government of Thailand will take necessary measures, among other things:
  - (a) To provide data and information necessary for the construction.
  - (b) To clear and level the site before the start of construction. The reclamation plan of the site is shown in Annex III-2.
  - (c) to provide other items listed in Annex IV.

Annex I

Course planning for the Institute

Shop	Trade	Proposed number of trainees
(1) Auto-Mechanics	(a) Gasoline Engine Repair	15
	(b) Diesel Engine Repair	15
	(c) Car Body Repair	15
	(d) Car Service	15
(2) Agro-Mechanics	Agro-Machine Repair	20
(3) Sheet-Metal and Welding	(a) Sheet-Metal	20
	(b) Arc-Welding	20
	(c) Gas-Welding	20
	(d) Plumbing	10
(4) Machine	(a) Lathe-Operator	20
	(b) General Fitter	20
	(c) Fitter-Machinist	10
(5) Electrical and Electronics	(a) Electrical Installation Wiring	20
	(b) Electrical Appliance Service and Repair	10
	(c) Radio and TV Repair	10
	(d) Refrigeration and Air-Condition Repair	10
(6) Construction and Building	(a) Carpentry (including Frame Working)	20
	(b) Furniture Making	15
	(c) Building (Plastering, Bricklaying, Concrete, etc.)	15

Grand Total 300

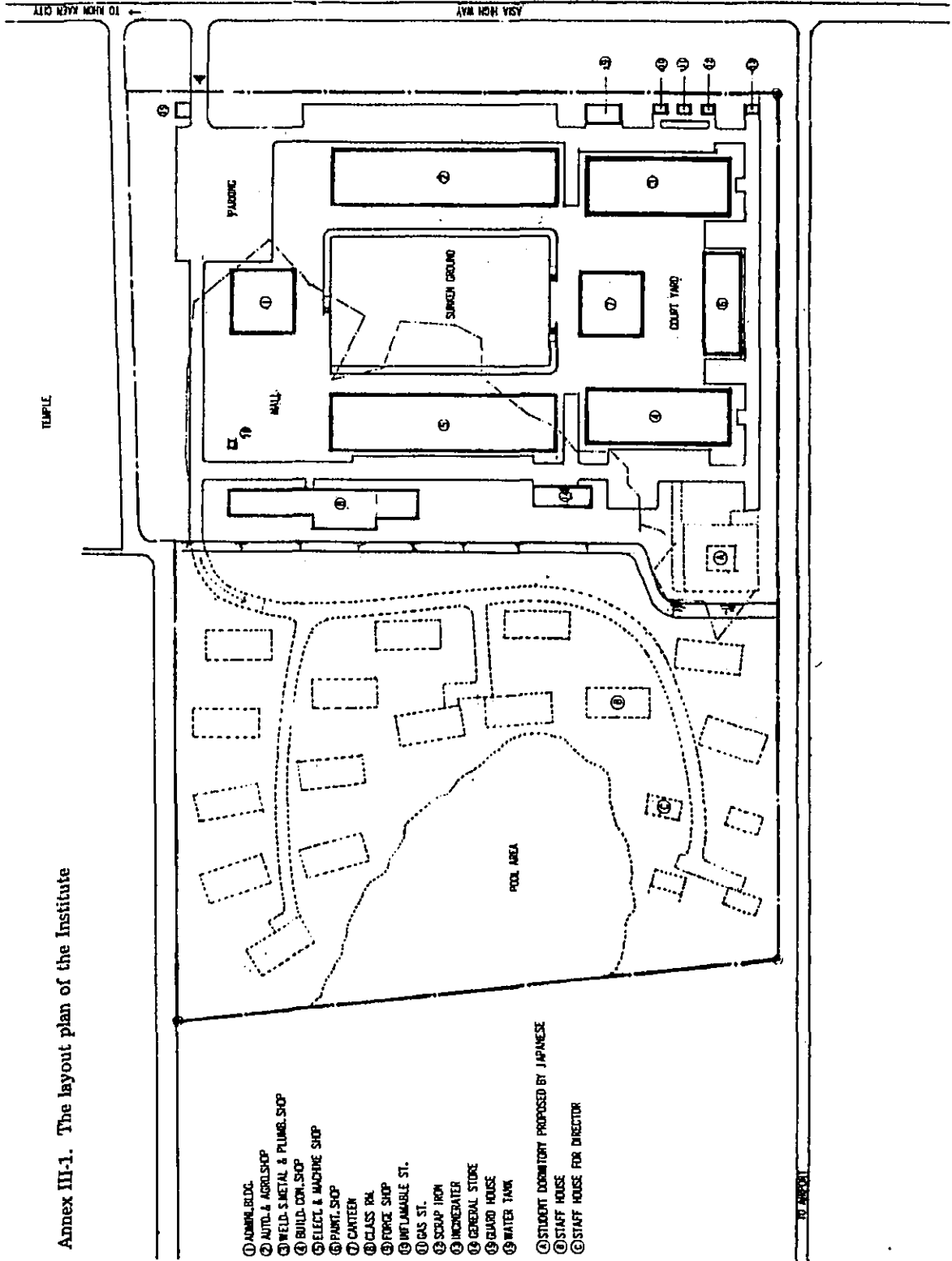
## Annex II

### Buildings to be provided by the Government of Japan

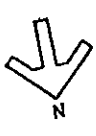
1. Administration building
2. Workshop buildings:
  - (a) Automotive and Agro-machine shop
  - (b) Welding, Sheet metal and Plumbing shop
  - (c) Building construction shop
  - (d) Electrical and Machine shop
  - (e) Painting shop
  - (f) Forge shop
3. Class room building
4. Canteen
5. General store building
6. Guard house
7. Inflammable storage
8. Gas storage
9. Covered way



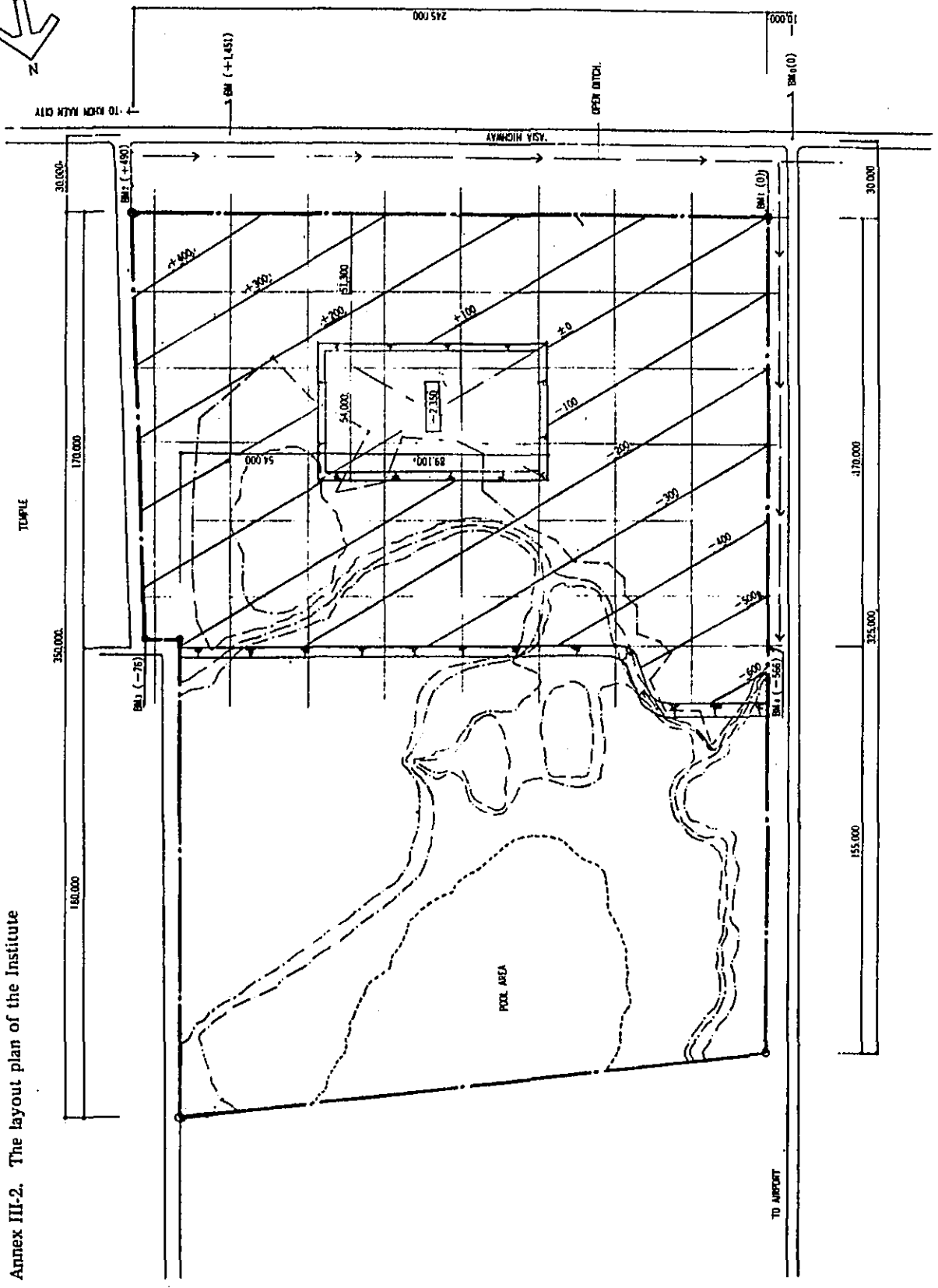
Annex III-1. The layout plan of the Institute







Annex III-2. The layout plan of the Institute



## Annex IV

### Items whose costs should be borne by the Government of Thailand

1. Fundamental work
  - (a) Site reclamation
  - (b) Water supply from main pipe to reserve tank
  - (c) Electrical power supply to transformer sub-station
  - (d) Telephone trunk line to main distributing frame
  - (e) Branch line of water supply, electric power supply, telephone extension to residential block and dormitory, water drainage and sewage treatment for residential block and dormitory
2. Building construction work
  - (a) Dormitory
  - (b) Staff house
3. Road, lawn and fence at training block and residential block
4. External lighting at residential block
5. Furnitures and miscellaneous
  - (a) Classrooms in classroom building
  - (b) Classrooms, instructor's room and working area in workshop building
  - (c) Administration building
  - (d) Dormitory
  - (e) Canteen
  - (f) General store
6. Expenses necessary for internal transportation from the port of entry to the site, of the equipment and other materials required for installation and use at the Institute.

## 2. TECHNICAL ASSISTANCE

### 2.1 OUTLINE OF THE PROJECT

- (1) The objectives of the Khonkaen Institute for Skill Development ( hereinafter referred to as the "Institute" ) are to provide practical and theoretical training for potential skilled workers who will be contributing their skills acquired through the training to the industrial and agricultural developments, thereby promoting the productivities of the industries and the welfare of the people in Thailand.
  
- (2) The following shops and trades shall be provided by the Institute. The number of trainees to be admitted to the Institute and the duration of time for the training shall be as follows:

Shop	Trade	Maximum number of trainees	Duration of training
(A) Auto-Mechanics	(a) Gasoline Engine Repair	15	6 months
	(b) Diesel Engine Repair	15	ditto
	(c) Car Body Repair	15	ditto
	(d) Car Service	15	2 months
(B) Agro-Mechanics	(a) Agro-Machine Repair	20	6 months
(C) Sheet-Metal and Welding	(a) Sheet-Metal	20	6 months
	(b) Arc-Welding	20	3 months
	(c) Gas-Welding	20	ditto
	(d) Plumbing	10	ditto
(D) Machine	(a) Lathe-operator	20	6 months
	(b) General Fitter	20	ditto
	(c) Fitter-Machinist	10	ditto
(E) Electrical and Electronics	(a) Electrical Installation Wiring	20	3 months
	(b) Electrical Appliance Service and Repair	10	ditto
	(c) Radio and TV Repair	10	6 months
	(d) Refrigeration and Air-condition Repair	10	ditto
(F) Construction and Building	(a) Carpentry (Including Frameworking)	20	6 months
	(b) Furniture Making	15	ditto
	(c) Building (Plastering, Bricklaying, concrete, etc.)	15	3 months

Grand total 300

(3) Training courses to be offered at the Institute.

The short-term training courses are to be set up at the Institute for bringing up skilled workers whose skills acquired in these courses are met with the minimum requirements of the industries concerned.

(4) Educational qualification of the candidates are as follows.

Trade	Years education including primary education
(A) Auto-Mechanics	7
(B) Agro-Mechanics	7
(C) Sheet-Metal and Welding	4-7
(D) Machine	7-10
(E) Electrical and Electronics	10
(F) Construction and Building	4-7

(5) Potential candidates for training in the Institute shall be as follows:

- (A) Those who have no skill
- (B) Selected workers from the Government and private enterprises
- (C) The self-employed
- (D) Others

## 2.2 THE JAPANESE EXPERTS ATTACHED TO THE INSTITUTE

(1) Team Leader	1
(2) Experts on:	
(A) Auto-Mechanics	1
(B) Agro-Mechanics	1
(C) Sheet-Metal and Welding	1
(D) Machine	1
(E) Electrical and Electronics	2
(F) Construction and Building	
Carpentry ( Including Frame Working )	1
Furniture Making	1
Building ( Plastering, Bricklaying, Concrete, etc. )	
(3) Coordinator	1
	Total: <u>11</u>

## 2.3 THE SERVICES TO BE RENDERED BY THE THAI STAFF

(1) Director	1
(2) Deputy Director	1
(3) Chiefs of workshops	6
(4) Professional and Technical staff for in-plant-training	6
(5) Auto-Agro Mechanics :	
Senior Instructors/Instructors	10
(6) Sheet-Metal/Welding :	
Senior Instructors/Instructors	8
(7) Machine : Senior Instructors/Instructors	6
(8) Electrical/Electronics :	
Senior Instructors/Instructors	8
(9) Construction/Building :	
Senior Instructors/Instructors	6
(10) Store keeper, drivers, guards and others	10
(11) Administration and supporting personnel	14
	Total: <u>76</u>

#### 2.4 RESPONSIBILITY FOR THE OPERATION OF THE PROJECT

Director-General, Department of Labour, the Government of Thailand, shall have the over-all responsibility for the implementation of the project.

In the meantime, Director of KISD shall be responsible for the operation of the project.

### 3. PLANNING FOR CONSTRUCTION

#### 3.1 BASIC PLAN

This basic plan, intended to serve the proposed construction of the Institute facility, is based on the survey data prepared by the preliminary survey team, and has been compiled after deliberate discussions with the authorities concerned and in compliance with the various survey results of the survey team well considered and analyzed.

##### 3.1.1 PLANNING BASES

The planning bases which govern the master plan are:

- a) The proposed facility is a facility based on which the technical cooperation extended from Japan is to be implemented, therefore it should be planned in such a manner as to meet the substance and objective of the technical cooperation.
- b) Sufficient comprehension of the natural conditions of Thailand, the people's living conditions and the state of construction projects is a prerequisite. The proposed facility should therefore be given an architectural characteristic suitable to the climatic conditions and planned to be built with the materials and method which meet the site conditions, so as to make it well planted in environs and the inhabitants in the region.
- c) The proposed facility should be provided with a sufficient function as a training center, as well as to create a human, rich training environment, with emphasis placed on all the life activities of the persons who gather at this Institute.

##### 3.1.2 FLOOR AREA OF FACILITIES

The planned Institute facility consists of the buildings listed below, with the floor area as follows. It is anticipated that the floor area of each building or structure may be changed slightly when the project is executed.



### 3. 1. 3 FACILITIES LAYOUT

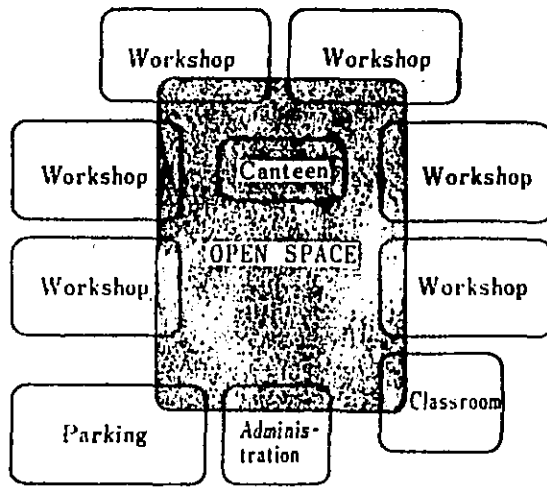
The projected construction area of the Institute is approximately 41,000 m<sup>2</sup> located to the south of the site. Another area of approximately 38,600 m<sup>2</sup> located to the north is projected to be a residential block which will be provided by the Government of Thailand.

As the site is relatively small when compared with the scale of the facility, consideration was given to the following points in establishing the layout plan.

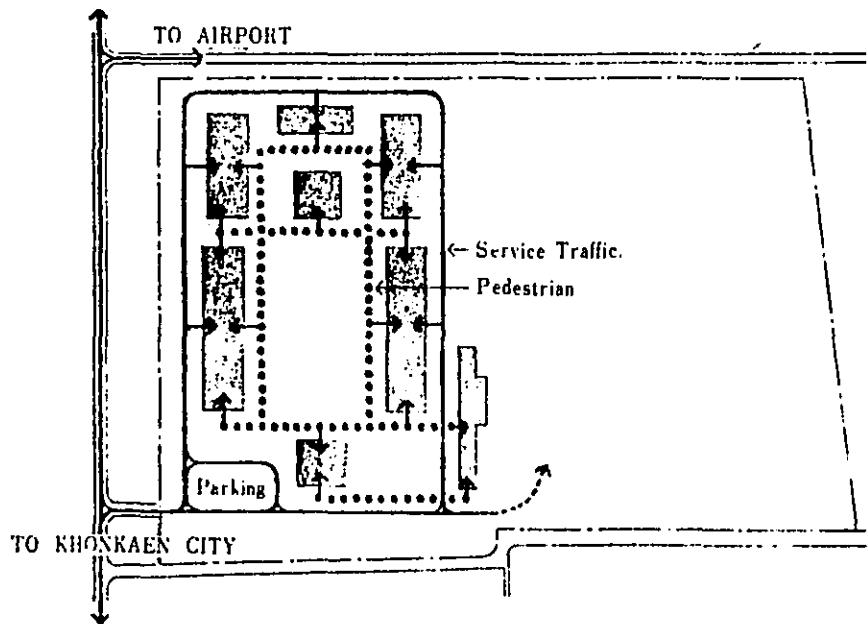
- a) The buildings and structures should be arranged properly and collectively in respect of their functions so as to ensure efficient land utilization.

#### FLOOR AREA TABULATION

	Preliminary floor area
Administration Bldg.	880.0 M <sup>2</sup>
Workshop Bldg.	8,961.3
1. Automotive & Agro-machine Shop	2,449.4 M <sup>2</sup>
2. Welding, Sheet Metal and Plumbing Shop	1,516.3
3. Building Construction Shop	1,516.3
4. Electrical & Machine Shop	2,799.3
5. Painting Shop	510.0
6. Forge Shop	100.0
Class Room	1,680.0
Canteen	400.0
General Store	350.0
Guard House	25.0
Inflammable Storage	50.0
Gas Storage	20.0
Covered Way	1,500.0
<b>Total floor area</b>	<b>13,796.3 M<sup>2</sup></b>



ZONING



CIRCULATION

- b) Emphasis should be laid on the interrelated functions of the buildings, including their internal functions.
- c) The buildings should be well arranged to harmonize with the environs.

Based on the abovementioned concepts, the following zoning, flow lines and axial lines have been planned.

#### Zoning:

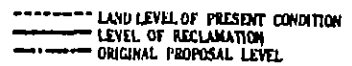
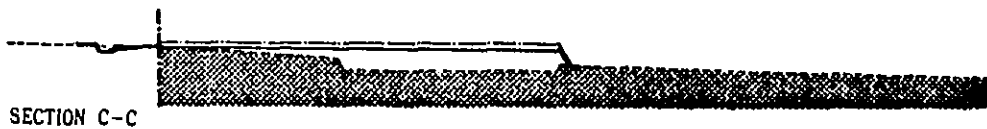
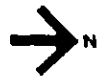
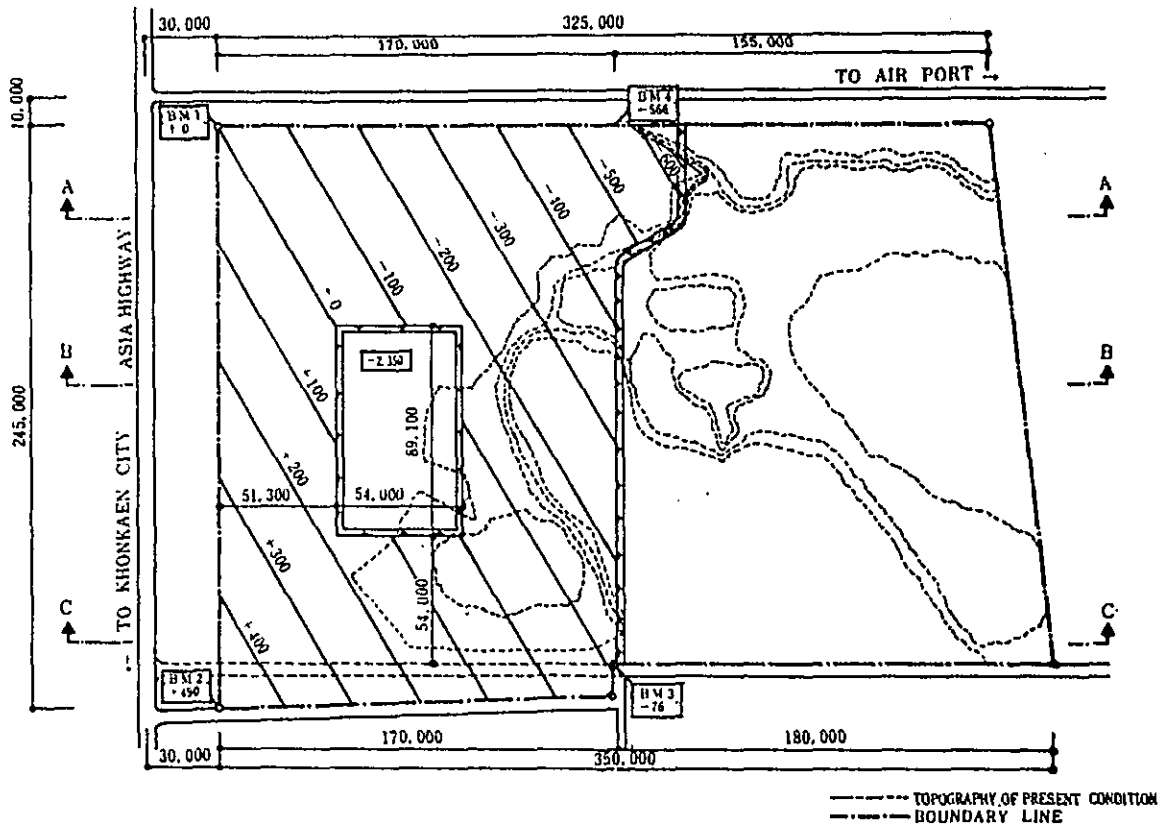
The facilities which form the Institute may be divided into the three zones depending on their respective functions - Training/Education Zone, Administration Zone and Residential Zone. The Training/Education Zone is a training facility zone consisting of workshops and class-room building, the Administration zone form, an approach zone having the Administration building at the helm, and the Residential zone is a living area consisting of the open spaces, such as sports area and mall adjacent to the canteen. The area of the training Education Zone against the total area of the campus is large, therefore it is very important to arrange it functionally in respect to the Administrative zone and the Residential Zone.

#### Circulation:

In establishing the flow-line plan of the Institute, pedestrian flow should be clearly isolated from traffic flow. In addition to the automobiles directly making access from the outside to and from the workshops, services between the workshops are busy. In this layout plan, the following flow lines are planned with emphasis laid on these points, as shown on the next figure.

In this zone, all vehicular services are performed by the peripheral loop road and the pedestrian, are allowed to the quiet, safe sidewalks adjoining the courtyard.

The buildings are linked with connecting corridor to protect the pedestrians from sunlight and rain. Electrical and mechanical mains are planned to pass the connecting corridors.



SITE RECLAMATION

#### Grid:

In the planning of the workshops, a module of 5<sup>m</sup>.400 x 5<sup>m</sup>.400 is adopted. This unit module, considered to be the standard layout grid for all facilities of the Institute, is used in arranging the buildings. In planning the layout of the buildings, the natural condition in the region is an important factor. The basic axis of all the buildings best suited in respect to sunshine, wind draft and natural light is east-west direction, therefore this direction is employed as the layout basis.

#### 3. 1. 4 SITE RECLAMATION PLAN

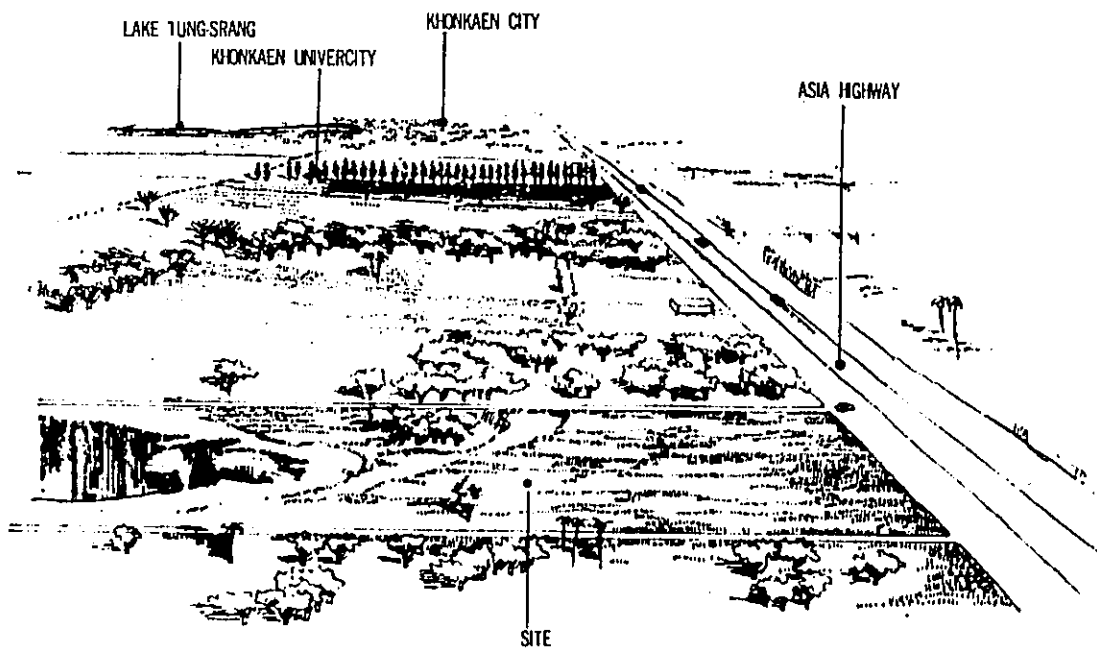
In materializing the above layout of facilities, the site of Institute contains the following problems at present.

- a) The size of area utilizeable in its present condition is small compared with the scale of the facility.
- b) The existing ground levels are complex.
- c) Rainwater from the surrounding areas flows into the site.

In order to solve these problems, it is necessary for the Government of Thailand to carry out gigantic scale of site reclamation, therefore deliberate discussions were repeated between Thai Authorities concerned and the survey team in respect to the details of site reclamation plan.

The figure on the another page shows the site reclamation plan originally proposed by the survey team, the original site reclamation plan being intended to prevent the inflow of the rainwater from the surrounding areas by leveling up the site to match the level of the Asia Highway, and to enhance the image and appearance of the Institute facility when viewed from the highway side.

The original site reclamation plan was superseded, as the volume of earth which can be provided by the Thai Government is limited, hence impossible to be materialized, by the new plan shown on the next page in which the originally planned level is lowered as a result of re-consideration, and to which the Thai Government agreed.



For the outline of the new reclamation plan, the boundary line level on the south side remains unchanged, but the area from the south-east corner to the north-west corner is graded as the rate of 1 against 300. The volume of earth estimated by the Thai Government is about 50,000 m<sup>3</sup>. The Thai Government is planning a detailed program concerning excavations, transport method and actual reclamation schedule, promising that the site reclamation based on the new plan be completed before the start of building construction.

In the new reclamation plan, the Thai Government is responsible for providing ditches in the vicinities of the south and west side of the site to prevent inflow of the rainwater from the surrounding. In respect to this point the Thai Government gave its consent and was given a description relating to the detail of the ditches.

The Thai Government is planning to build a total of 64 staff houses on a residential block to the north of the site, however it seems that the site reclamation in a larger scale is necessary to utilize this residential block.

### 3.1.5 BUILDING PLAN

Workshop:

The training facility consists of the six (6) shops, but they are planned to be as the following four (4) buildings with consideration given to the relationship between the internal functions of the individual workshops.

- Automotive & Agro-Machine Shop Building
- Welding, Sheetmetal & Plumbing Shop Building
- Building Construction Shop Building
- Electrical & Machine Shop Building

In planning the workshops, reference was made to the requirements of ILO Building Specification for Vocational Workshops.

Workshop module is taken as 5<sup>m</sup>.400 x 5<sup>m</sup>.400, with the planned depth of each building being 21.6 m, to standardize all the buildings.

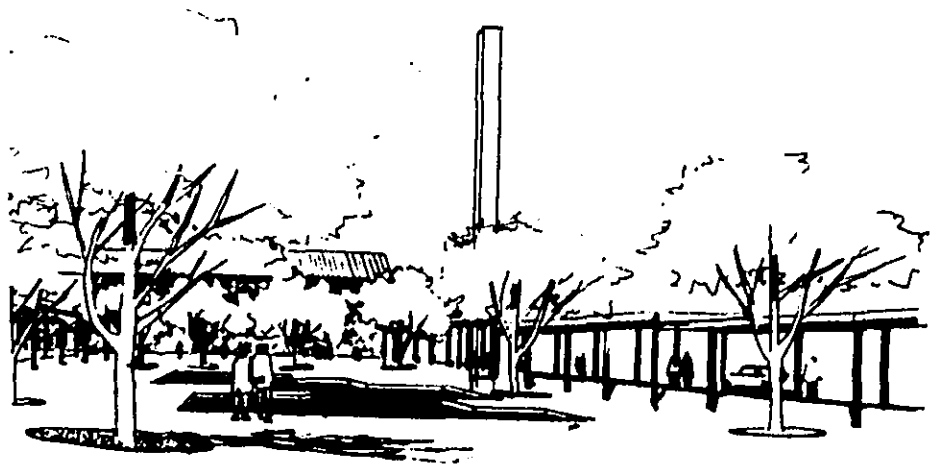
The building height is approximately 6.500<sup>m</sup>, with a mezzanine provided at a certain area of the building. Located on the mezzanine are annex rooms: such as material storage, tool storage, instructor's room, practice class room, exhibition hall, locker room, shower room and toilet.

The training room is provided on the first floor as a principle, with a flexible space having no exposed columns. The material storage and the tool storage are located in close contact with training room. The floor of training room is concrete on which lightweight training equipment are to be installed but heavy-weight equipment are to be set independently on firm foundations.

Noise from the training equipment will not be allowed to go out beyond training room.

The instructor's room is arranged at such a location on the mezzanine so that instructors can command the scene of whole training area where the trainees are engaged in practice.

The exhibition room is provided adjacent to the observation hall, and is allowed to exhibit the fruits of the trainees or models which is made by experts. It is expected that trainees and observers will deepen their understanding as to the contents of training by observing the state of training and those of such training. The exhibition room can also be utilized as a classroom.



CENTER MALL



#### Canteen:

The canteen is in the courtyard enclosed with the workshops, and is located at the center of the campus in close contact with the sports ground. The dining space is not provided with exterior wall, but left open contiguous to the broad terrace and turfed area. The building space of this type linked with the external space is popular in Thailand, and it could be a space closely related to the life activity originated from the climatic characteristics of high temperature and high humidity.

The canteen can be utilized as a multi-purpose space for gathering and recreation in addition to the function of a dining place.

Together with the sports area, this zone will serve as a place where trainees spend much of their leisure and where positive communication between trainees will be created. It is thus planned to be a central existence among the Campus.

#### Class-room and Administration Building:

The class room is a place for study, therefore it needs a quiet environment in which trainees can study in peace. The place where the class room are located is near the pond completely isolated from noises of the surrounding roads. The Administration Building is located, as an axis for administration and management in the Campus, at the point where the training zone intersects the approach zone. The piloti at the first floor opens to the mall on the north. The mall, enclosed with a covered way, is also planned to be a communication space. The floor of the plaza is paved with ornamental material, planted with trees and provided with a pond. It is desired to make this mall a static, meditative space in contrast to the sports ground which is an active space.

#### 3.1.6 ELEMENTS PLANNING

In planning the building elements, the climatic conditions in the region will form a significant factor. Sunshine, draft and rainfall greatly affect the buildings to be provided in the tropical zone of high temperature and high humidity, therefore it is very important to properly cope with such phenomenon for creating a comfortable room environment.

#### Roof:

Roof is an area largely affected by sunlight. In order to prevent transmission of the radiation of heat into the rooms, it is necessary to provide an efficient heat insulation layer between the roof surface and the rooms. The popular method of heat insulation for concrete buildings in Thailand is such that the roof slab is laid with asbestos cement sheets so as to utilize the air space in the cricket as a heat insulation layer thereby interrupting transmission of the radiating heat into the room. This method is the most reasonable. Where, like a workshop, the building is tall in structure, having a large room volume, a similar effect can be expected if, before radiating heat affects the lower portion of the room, the air close to the roof surface is ventilated thoroughly. In this case provision of any heat insulation layer is unnecessary.

#### Exterior Wall:

Exterior wall is also affected by sunlight. In addition to the use of heat insulation material, it is necessary to avoid sunlight by providing a canopy or louver. In Thailand, draft by the seasonal wind ( north-south ) can be obtained throughout the year. With consideration given to this wind direction in conjunction with natural ventilation plan, it is planned to provide large openings in the buildings so as to facilitate the wind to pass through the buildings. For door and window fittings, there are wooden, steel and aluminum of high quality produced in Thailand. In particular, aluminum sashes with movable louver are widely used throughout the country. It is possible to attain various performances, such as draft, sunlight and sun-shut by properly using louver materials, such as glass, asbestos board, etc. by region.

#### Floor Level:

It is desirable to set the floor level at a sufficiently high elevation so as to now allow concentrated rainfall to flood the building floor. In this plan, it is designed to provide the floor of the workshops raised 300 mm above the road surface, the floor being graded to the road. Other buildings are allowed to have the floor raised 500 mm above the road surface, provided with a step or gently slope to link the floor and the road. The standard road level planned is higher than the ground level established in accordance with the site reclamation plan.

#### Material Planning:

The following material can be considered usable for this project as a result of the study on the locally available building material described in paragraph 3-4-3 of this report.

#### Roof

Corrugated asbestos cement boards or roofing tiles are suitable. These materials, mass produced in Thailand and available in various types, can be obtained stably.

#### Wall

In general, masonry material such as bricks and concrete blocks are used for wall finish. There are various types of concrete blocks available in Thailand. They are of good shape and high accuracy. Facing hollow blocks are used as a heat insulator for exterior walls. Washed terrazzo ( aggregate exposed finish ) is suitable for use with exterior walls, as the terrazzo of this type is popular in Thailand, local labourer are experienced in such work, and its cost is relatively low.

#### Floor

Floor finish for the Training Room at the Workshop is planned to be constructed of exposed concrete, except for part of the Building Construction Shop which is planned to be of wood. For floor finish in living rooms, washed terrazzo, precast terrazzo blocks and cement tiles are planned to be used in whole or in combination thereof according to the conditions of the rooms.

### 3. 1. 7 STRUCTURAL PLANNING

#### A. Structural Planning Bases

Thailand is out of the circum-pan-Pacific earthquake belt, therefore has rarely experienced earthquake. For wind velocity, Thailand has only registered around 2.0 m per second ( annual mean value ) and the instantaneous wind velocity of 28.3 m per second. Accordingly the values of horizontal load acting against the building being markedly low as compared with that in Japan, a framing plan can be set with a considerable freedom. In planning the construction of a two-storied building, it is unnecessary to provide any specific horizontal load resisting frame, but frame supported with columns and beams is good enough to support vertical and horizontal load.

The projected construction site ground is markedly undulated, consisting of about 3 m thick silty sand layer, and a hard laterite layer below a sandy clay layer. The area of the ground planned to support the buildings consists of hard laterite layer on which the footings are designed to be constructed. The laterite layer has a sufficient bearing capacity. For workshop, framing plan, a steel frame structure is designed to meet 13.5 m to 21.6 m spans. For other buildings, reinforced concrete structure is planned.

#### B. Structural Design Bases

The following particulars will be taken into account when the structural design of the Institute building, are to be made.

- The values of the external forces and basic design loads acting against the building, should be determined depending on the local climatic and geographical conditions, subsoil conditions, and the usage of the building, intended.

- For Japan-produced structural materials, their allowable unit stresses should be determined in accordance with the values set forth in the Architectural Institute of Japan standards, and for local-produced materials, should be determined with consideration given to variations in quality.

- The stresses analysis and design of member sections of structural frames should be calculated in accordance with the Architectural Institute of Japan standards.

The planned external forces and loads acting against the buildings are as follows.

1) Dead load of the building

The fixed loads of all structural components and finishing materials are to be calculated.

2) Live load

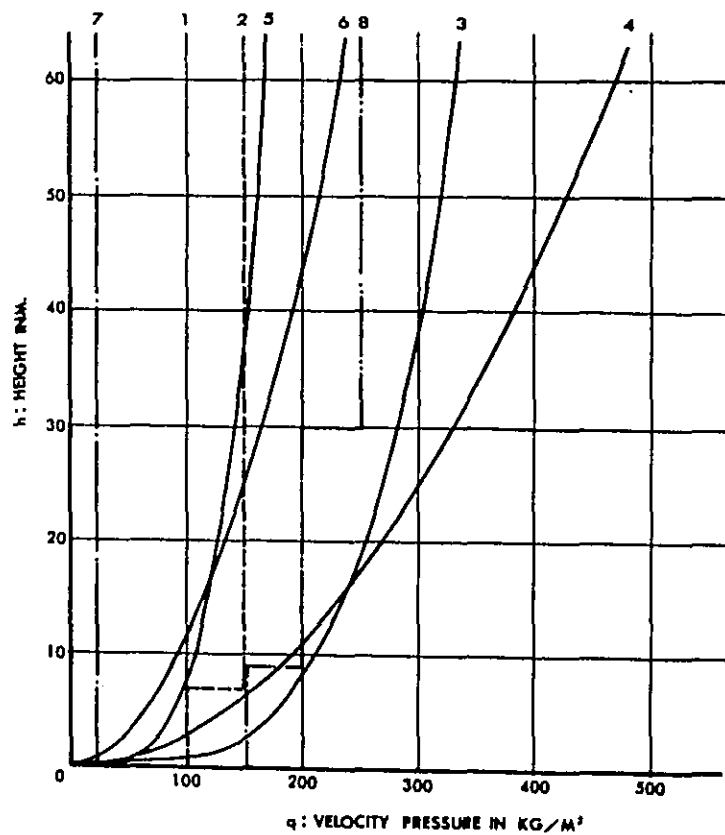
In general the Building Standard Law of Japan (BSL) values are to be adopted for calculation of live loads, but, for the types of rooms intended for specific usage, such as work rooms and machine rooms, the values which suit the actual condition thereof are to be calculated. The following table gives the criteria by main rooms set forth in the American National Standards (ANS) and that in the Building Standard Law of Japan.

LIVE LOAD	( kg/m <sup>2</sup> )		
	B S L		American National Standard
	For floor slab	For column, beam and foundation	
Class-room	230	210	195.3
Corridor	360	330	390.6
Office	300	180	244.1
Dormitory	180	130	195.3
Stair	360	330	488.0
Assembly room	300	270	488.0

3) Wind Pressure

The mean wind velocity in KHONKAEN district is 3 - 4 knots per second ( 1.5 to 2.0 m ), and the maximum instantaneous wind velocity is not over 55 knots per second ( 28.3 m ).

1. SUBURBAN DISTRICTS IN THAILAND :  $q=100$  TO  $50$   
(THE CONTROL OF THE CONSTRUCTION OF BUILDINGS ACT)
2. BANGKOK :  $q=100$  TO  $150$   
(BYE-LAWS OF THE BANGKOK MUNICIPALITY)
3. JAPAN :  $q=120 \sqrt[4]{h}$  FOR TALL BUILDING
4. JAPAN :  $q=60 \sqrt{h}$  FOR LOW BUILDING
5. VIETNAM :  $q=60 \sqrt{h}$  FOR TALL BUILDING
6. VIETNAM :  $q=30 \sqrt{h}$  FOR LOW BUILDING
7. INDONESIA :  $q=25$
8. PHILIPPINES :  $q=150$  TO  $250$



WIND PRESSURE

Taking in account the duration of life of each building, it seems proper to set the maximum design wind velocity of 40 m per second instead of the above value.

In the case of low-rise buildings, the velocity distribution of the wind pressure acting against the building is proportionate to Root 4. Assuming that the atmospheric pressure at the time of a strong wind blowing  $H = 720\text{mm}$  and the temperature  $t = 23^{\circ}\text{C}$ , the velocity pressure at a height of 10m above the ground is estimated to be  $q = 97.8 \text{ kg/m}^2$ , this value being in conforming to  $q = 100.0 \text{ kg/m}^2$  which is set forth by the county authority of Thailand, therefore  $100 \text{ kg/m}^2$  will be used for design.

For information, the following diagram shows the wind pressures set forth by the countries near Thailand, such as Vietnam, Indonesia, the Philippines and Japan. These values are considerably lower than that in Japan.

#### 4) Earthquake

Thailand is not in the circum-pan-Pacific earthquake belt, and in KHONKAEN district, none of the past records and meteorological data has indicated any earthquakes that have affected buildings. Therefore it is not necessary to consider the earthquake as the structural design factor.

#### C. Structural Materials and Methods of Application

The types of the structural materials to be used will be determined by taking into account the scales of the buildings, the types of structure, usage of buildings, the qualities of local-produced materials, supply capacity, method of construction, the shipping requirements for materials from Japan, and material costs.

However, it appears there would be some kinds of high quality materials is difficult to be supplied in a large quantity, and it seems that the following structural materials are suitable to the local conditions.

### 1) Concrete

It is planned to provide a batching plant in the site so as to effect the weighing and mixing of concrete materials. The standard design compressive strength of concrete desired is  $F_{28} = 180 \text{ kg/cm}^2$ , but the actual compressive strength of concrete mix to be employed on the site will be over  $F_{28} = 225 \text{ kg/cm}^2$  taking into account a mixing error of about  $\sigma = 45 \text{ kg/cm}^2$ .

Since the construction site is located in the high temperature district, concrete is to be of stiff mix and of a slump of 10 - 15 cm to prevent initial cracking in the course of the concrete hardening. It is recommended to add a retarder to the concrete.

### 2) Reinforcement Steel Bars

All the reinforcing steel bars produced in Thailand are of reclaimed type of varying quality, therefore those produced in Japan may be used. Being as not high compressive strength as above, and because most design of member sections are determined by permanent vertical stress, SD 30 should be used for main reinforcement, and SD 30 or SR 24 for other reinforcement.

### 3) Structural Steel

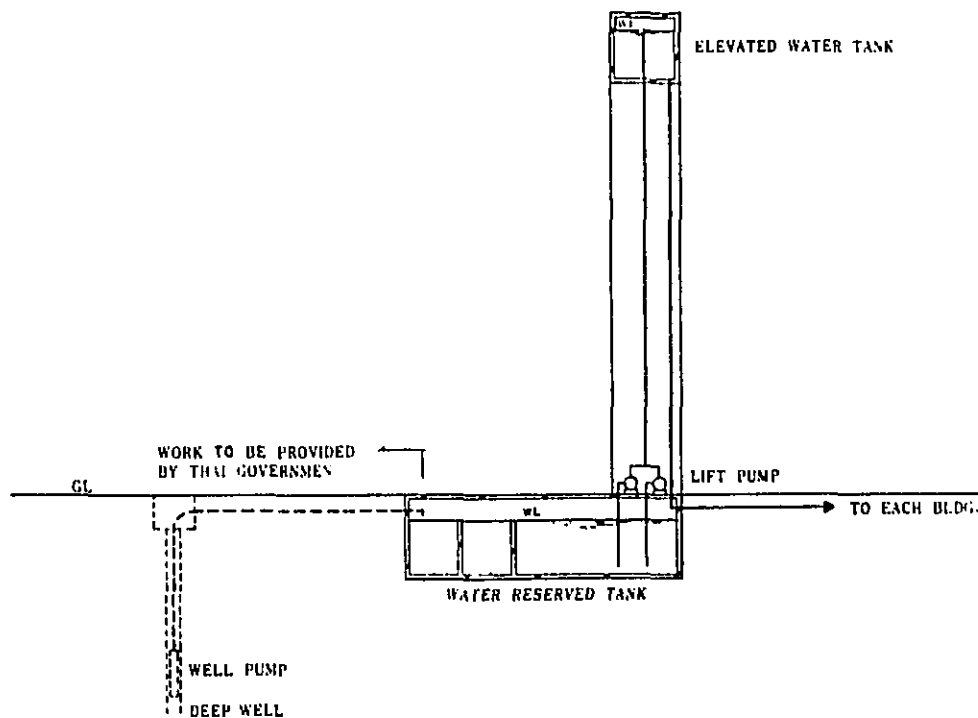
Mainly SS 41 which is produced in Japan is planned to be used it is recommended to use the reinforcement fabricated in Japan as much as possible or prefabricated frames, so as to facilitate operations on the site.



### 3. 1. 8 PLUMBING SYSTEM PLAN.

#### A. Water Supply System Plan

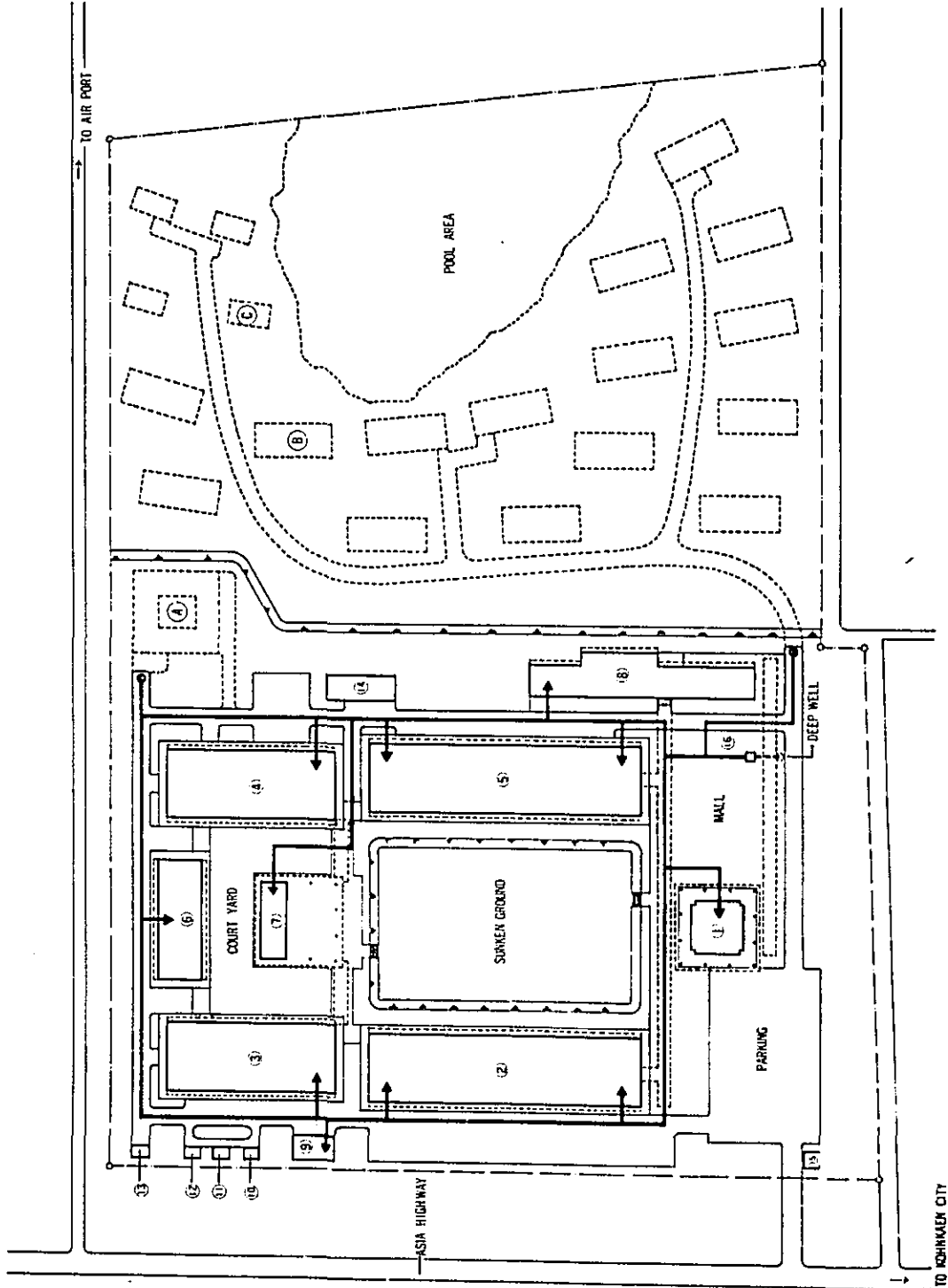
In this project, low-rise buildings are to be arranged at several places. In case of such a block plan, the types of water supply system which can be considered consist of the gravity type water supply system by means of elevated water tank, pump-running system and pressure tank system. In this project, due to required volume of water, stability of water supply pressure, and easy maintenance and control, elevated water tank system would be the best suited. Based on this concept, it is planned to provide a 120 m<sup>3</sup> water storage tank capable of storing volume of water for about one-day consumption, from which water is pumped up to elevated water tank of approximately 20 m high, and then supplied to each buildings by gravity. With consideration given to stability to maintain required volume of water, water distribution pipe line to each building is planned to be of loop type. Standby lift pumps are to be provided to cope with failure of lift pumps. Judging from the present condition of KHONKAEN city, galvanized steel pipes are to be used for piping materials. Although valves are available in Thailand, they are of poor accuracy, therefore imported valves are planned to be used.



WATER SUPPLY SYSTEM DIAGRAM



- ① ADMINISTRATION BLDG.
  - ② AUTOMOTIVE & AGROMACHINE SHOP
  - ③ WELDING, SHEETMETAL AND PLUMBING SHOP
  - ④ BUILDING CONSTRUCTION SHOP
  - ⑤ ELECTRICAL & MACHINE SHOP
  - ⑥ PAINTING SHOP
  - ⑦ CARTEER
  - ⑧ CLASS ROOM BLDG.
  - ⑨ FORCE SHOP
  - ⑩ INFLAMMABLE STORAGE
  - ⑪ GAS STORAGE
  - ⑫ SCRAP IRON STORAGE
  - ⑬ INCINERATOR
  - ⑭ GENERAL STORE
  - ⑮ GUARD HOUSE
  - ⑯ WATER TANK
- WORK TO BE PROVIDED BY THAI GOVT.
- ⑰ STUDENT DORMITORY
  - ⑱ STAFF HOUSE
  - ⑲ STAFF HOUSE FOR DIRECTOR



# WATER SUPPLY SYSTEM PLAN

## B. Drainage System Plan

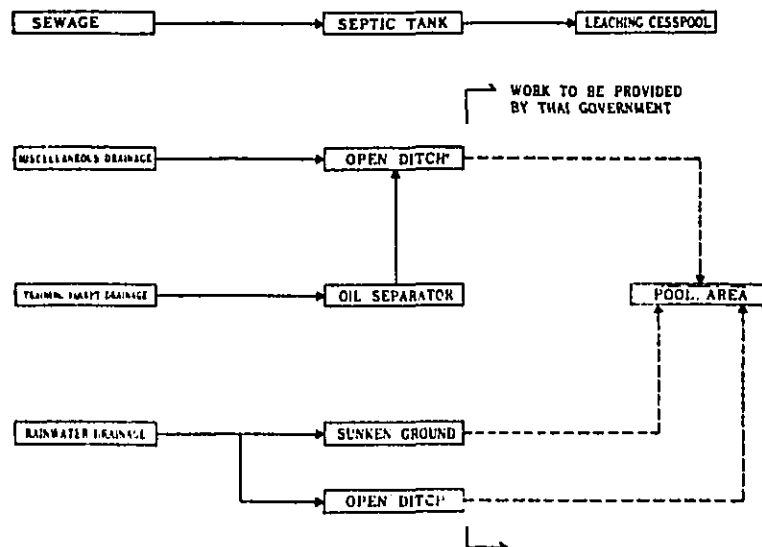
Drainage system is to be provided with care so as to make the buildings fully functional. For the overall drainage system plan, it is planned to provide three interior drainage lines ( interior sewage, miscellaneous drainage and training area drainage ), and four exterior drainage lines ( rainwater, sewage, miscellaneous drainage and training area drainage ).

### 1) Sewage Drain Plan

Sewage from toilets in each building is to be led to septic tank, and then allowed to infiltrate into the underground after treatment. Each building is to be provided with a septic tank with sewage pipe line located in the shortest possible route so as to effect a low construction cost. Piping materials planned to be used comprise of cast iron pipe for interior use, and centrifugal concrete pipe for exterior use, all locally produced products.

### 2) Miscellaneous Drainage Drain Plan

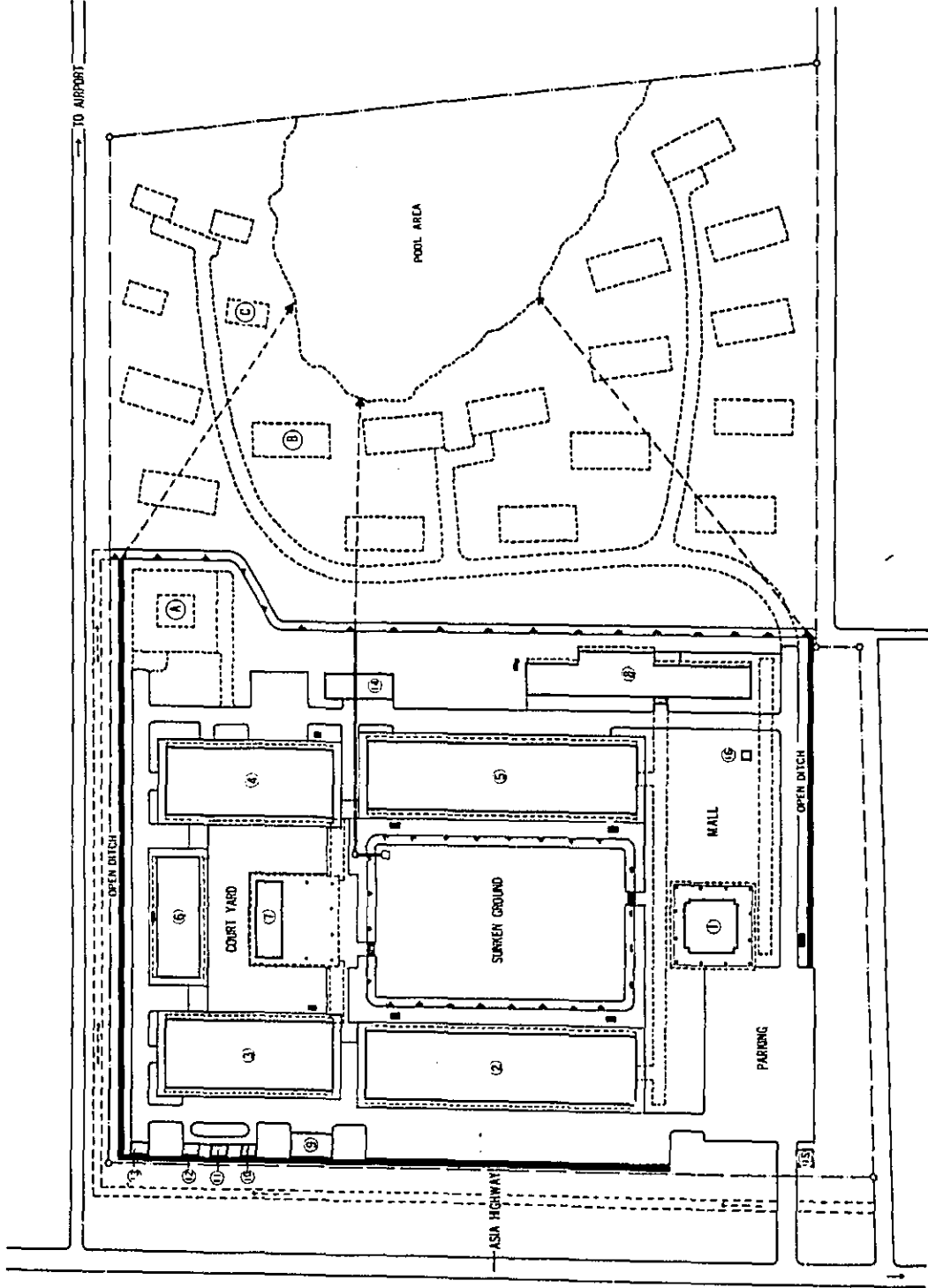
Miscellaneous drainage from each building is to be piped into the open ditch provided at the perimeter of building. From the end of open ditch, drainage piping is planned to reach open ditch at the perimeter of site. Piping materials to be used galvanized steel pipes for interior, and centrifugal concrete pipes for exterior.



DRAINAGE SYSTEM DIAGRAM



- SEPTIC TANK
  - ① ADMINISTRATION BLDG.
  - ② AUTOMOTIVE & AGRO-MACHINE SHOP
  - ③ WELDING, SHEET-METAL AND PLUMBING SHOP
  - ④ BUILDING CONSTRUCTION SHOP
  - ⑤ ELECTRICAL & MACHINE SHOP
  - ⑥ PAINTING SHOP
  - ⑦ CANTINEEN
  - ⑧ CLASS ROOM BLDG.
  - ⑨ FORGE SHOP
  - ⑩ INFLAMMABLE STORAGE
  - ⑪ GAS STORAGE
  - ⑫ SCRAP IRON STORAGE
  - ⑬ INCUBERATER
  - ⑭ GENERAL STORE
  - ⑮ GUARD HOUSE
  - ⑯ WATER TANK
- WORK TO BE PROVIDED BY THAI GOV'T.
- ⑰ STUDENT DORMITORY
  - ⑱ STAFF HOUSE
  - ⑲ STAFF HOUSE FOR DIRECTOR



SEWAGE DRAINAGE & SEPTIC TANK LAYOUT PLAN

### 3) Rainwater Drain Plan

Rainwater from each building and from within the campus is to be discharged into open ditch at the perimeter of building and site. As the method to drain a large volume of rainwater in rainy season, it is planned to use sports ground at the center of campus as a retarding basin to discharge the rainwater to outside of site.

### 4) Workshop Drainage Drain Plan

Oil-contained drainage from the equipped training machine at workshops is to be led to oil separator tank, and then water alone is discharged into the miscellaneous drainage route. Piping materials is as same as for miscellaneous drainage.

## C. Sanitary Fixtures

Lavatories and shower rooms in each building are to be provided with proper sanitary fixtures. Water closets in lavatories planned to be used are local type in general, except for Western type water closets in some lavatories. Other than imported cocks, all sanitary fixtures to be used are of local products.

## D. Septic Tank Plan

In Thai, there is some structural standard available for septic tanks. In the standard, septic tank is of simple decomposition system ( primary treatment ) and sewage treated is allowed to infiltrate into the underground. In this plan, however, it is planned to provide a septic tank with secondary treatment process, which is better than existing local type, but taking into easy maintenance and control thereof, it is designed to provide a septic tank closer to local type, but with a simpler secondary treatment process.

## E. Gas Supply System Plan

Various welding gases are to be supplied to each welding training area from gas cylinders at external gas supplying storage. For gas in general use, it is planned to provide LPG cylinders at each building, therefore no specific provision is planned for installation of pipe line.

### 3.1.9 AIR-CONDITIONING AND VENTILATING SYSTEM PLAN

#### A. Air-conditioning System

The areas planned to be air conditioned under this project are each office rooms, conference rooms at Administration Building, audiovisual room at class room building and testing rooms at workshop building. Air-conditioning is to be by independent window coolers for above. Temperature and humidity conditions is planned to be 34°C, 75% outdoors, 26°C, 50-60% indoors.

#### B. Ventilation System Plan

In this project, natural ventilation are to be employed for the most part, except for kitchens, lavatories, welders' training area, and painters' training area where forced ventilation is required, mechanical ventilation is planned.

For method of ventilation, the welding booth is planned to be provided with duct to discharge exhaust air from the booth. Other room, and areas are planned to be provided with ventilating fans on the exterior walls.

### 3.1.10 ELECTRICAL SYSTEM PLAN

Electrical system in this project consists of Main Electrical System required for entire campus and General Electrical System required by individual buildings.

#### A. Main System

##### 1) Transformer Substation

Electricity is planned to be distributed from the P.E.A. line along the Asia Highway, led to the inside of the site by a 22 KV aerial line, stepped down to a low voltage of 3  $\phi$  4 W 380V/220V at an outdoor open type substation, and distributing it to the respective loads.

Loads for service facilities are:

- |                        |   |
|------------------------|---|
| For buildings          | (1) Lighting outlets and receptacles      |
|                        | (2) Power for air-conditioning facilities |
|                        | (3) Power for plumbing facilities         |
| For training equipment | (1) Receptacles for training equipment    |
|                        | (2) Power for training equipment          |

The total electrical capacity will be about 1,200 KVA. It is planned to provide transformers on the ground, and protected by wire fencing.

## 2) Mains

### a) Power Mains

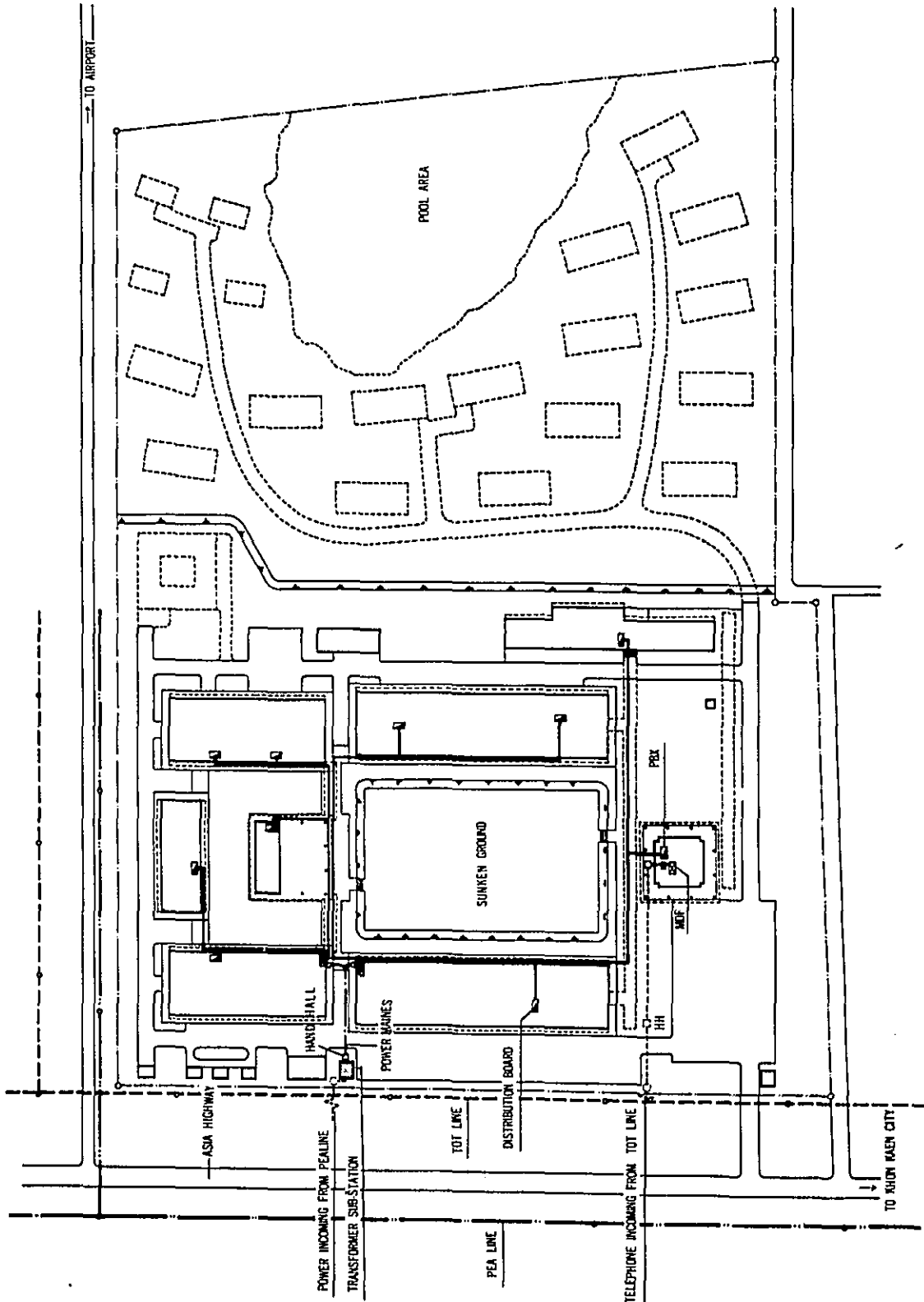
Low voltage power distribution boards are installed at Automotive & Agro-Machine Shop building and Welding, Sheet-metal & Plumbing Shop building. Low voltage power is to be supplied to distribution boards via underground cable from substation. Power is to be supplied by vinyl sheathed wire ( TIS-IV 750V, 750°C ) in conduit tube, through connecting corridor, to panel-boards of each building, the vinyl sheathed wire being in conformance to the requirement of Thai Industrial Standards. Circuit is to be of independent line to each building.

### b) Telephone Main Line System

Telephone main line is planned to be led into service pole on campus site from the TOT line on Asia Highway. Main line is to be led from the underground up to MDF board provided in office at Administration Building. From MDF board, power is to be supplied to IDF board in each building through connecting corridor.

## 3) Telephone Exchange Equipment

Telephone exchange equipment is to be provided in office at Administration Building as a means of communication within and outside of Institute. Provision is to be made to ensure rapid and smooth communication between the buildings.



- ① ADMINISTRATION BLDG
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- ④ BUILDING CONSTRUCTION SHOP
- ⑤ ELECTRICAL & MACHINE SHOP
- ⑥ PAINTING SHOP
- ⑦ CANTINEEN
- ⑧ CLASS ROOM BLDG
- ⑨ FORGE SHOP
- ⑩ INFLAMMABLE STORAGE
- ⑪ GAS STORAGE
- ⑫ SCRAP IRON STORAGE
- ⑬ INCUBATOR
- ⑭ GENERAL STORE
- ⑮ GUARD HOUSE
- ⑯ WATER TANK

WORK TO BE PROVIDED BY THAI GOVT.

⑬ STUDENT DORMITORY

⑭ STAFF HOUSE

⑮ STAFF HOUSE FOR DIRECTOR

# ELECTRIC POWER SUPPLY & TELEPHONE MAIN PLAN



a) Specification of Exchange Equipment

Exchange unit:	Cross bar type Automatic exchange unit
B board:	Cordless desk type
Power supply apparatus:	Cubicle battery charger
Main Distributing board:	Wall-mounted type
Extension Telephone set:	Dial switch type

b) Trunk Line and Extension

Number of trunk line, planned to be led from the TOT is approximately five, and number of extension, to telephone sets at the training area, administration block, and the other block is 50. Multi-core cable is to be used between MDF and IDF, and extension cable from IDF to extension telephone sets.

B. General Electric System

1) Power System

The power supply work planned to be performed covers ventilation for the buildings, operation control of plumbing system equipments and supply source to training equipments. It is planned, for supply source to training equipments, to provide panelboards and power control boards near the places supervisable by the watchman or the exits and entrances of each building. Wiring duct for secondary wiring after the board, is to be provided in the air along the wall at training area. To the load, exposed conduit tube is to be installed from top to bottom on the wall, and then led to equipment operating panels or receptacles. For power supply to equipment located at center of training room, is used cable in floor pit. Use of Class 3 grounding is required to be installed in respect to equipment which needs 3-phase power supply.

2) Lighting System

For illumination, it is planned to use fluorescent lamps in general office areas and conference rooms, and combination of mercury lamps and fluorescent lamps at training room with a

high ceiling. Lighting fixtures are to be in such a layout as to provide uniform intensity throughout training area. Lighting fixtures for training area are to be used shade type. For rotary type training equipment which may produce a strobo effect, it is planned to provide incandescent lamps to eliminate such effect.

ON-OFF Switch for lighting is controled in groups. Approximate intensity in main rooms are planned as follows:

Class-rooms, offices conference rooms and library .....	300 lx
Training area .....	400 lx
Corridors and halls .....	100 - 150 lx
Covered way .....	50 - 100 lx

### 3) Receptacles

It is planned to provide plug type receptacles where required at the buildings. Piping and wiring are to be by means of TIS-IV and conduit tube. 100V receptacles for training use are to be provided across the low voltage transformer at each building. TIS-IV and conduit tube are to be installed for supply source to the receptacles of training desk from panelboards. Number of receptacles planned to be provided in offices and instructor's room is about two or three at a rate of 40 m<sup>2</sup>, and one or two in training room at a rate of 100 m<sup>2</sup>.

### 4) Lighting outlet

Distribution boards to be used are of metal, provided at places accessible for maintenance and inspection. NFB is to be used for circuit breaker, 1-phase 220V for 2-pole load, and 1-phase 100V for 1-phase load. Lighting circuit is to be provided separately from receptacles circuit. Switch for lighting at training rooms are used NFB in distribution board.

5) Telephone Outlet

Telephone outlet boxes are installed to provide the least number of telephone sets at office and Rector room at Administration Building, and instructor's room of each workshop building. Outlet boxes are to be of wall-mounted type.

6) Public Address

Amplifier is provided at Administration Building, for public address service throughout the Institute facility to give necessary information, and to indicate the start and end of times. Announcement can be done individually to each facility. Large class-room will be provided amplifiers independently for lecture.

7) TV Community Receiving System

Master antenna is to be provided at Administration Building and Electrical & Machine Shop, with outlet boxes for TV sets.

8) Interphone System

Interphone system is to be provided to permit communication between office of Administration Building and guard-house.

9) Fire Alarm System

For the purposes of alerting the employees and trainees in facility when occurrence of a fire, manual signal transmitters and bells in each building will be provided.

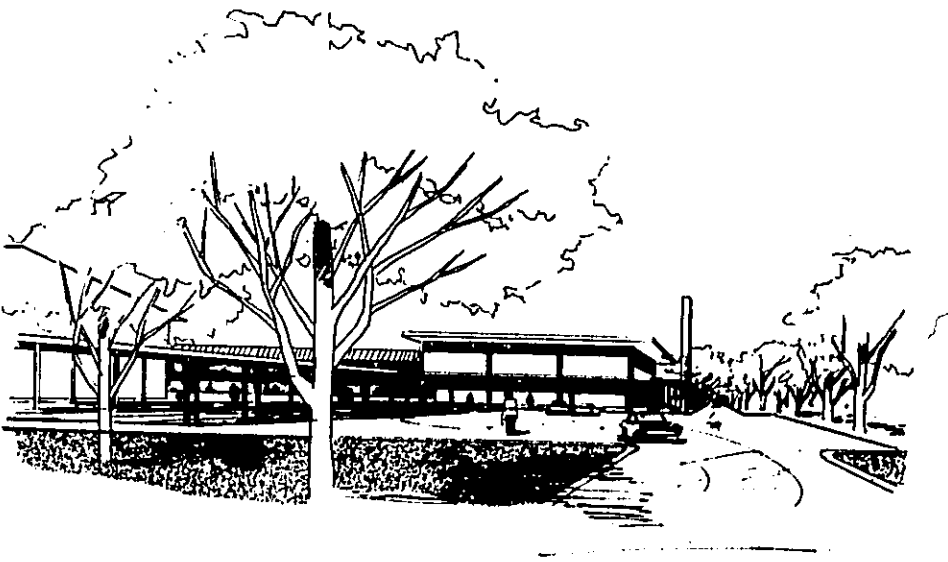
10) Lightning Arrester

Lightning arrester is installed on top of elevated water tank to prevent lightning accident.

11) External Lighting

For the purposes of illuminating external passages in the night and for prevention of crime in each building,

external lamps are to be provided in the parking areas and at the perimeter of training block of campus.

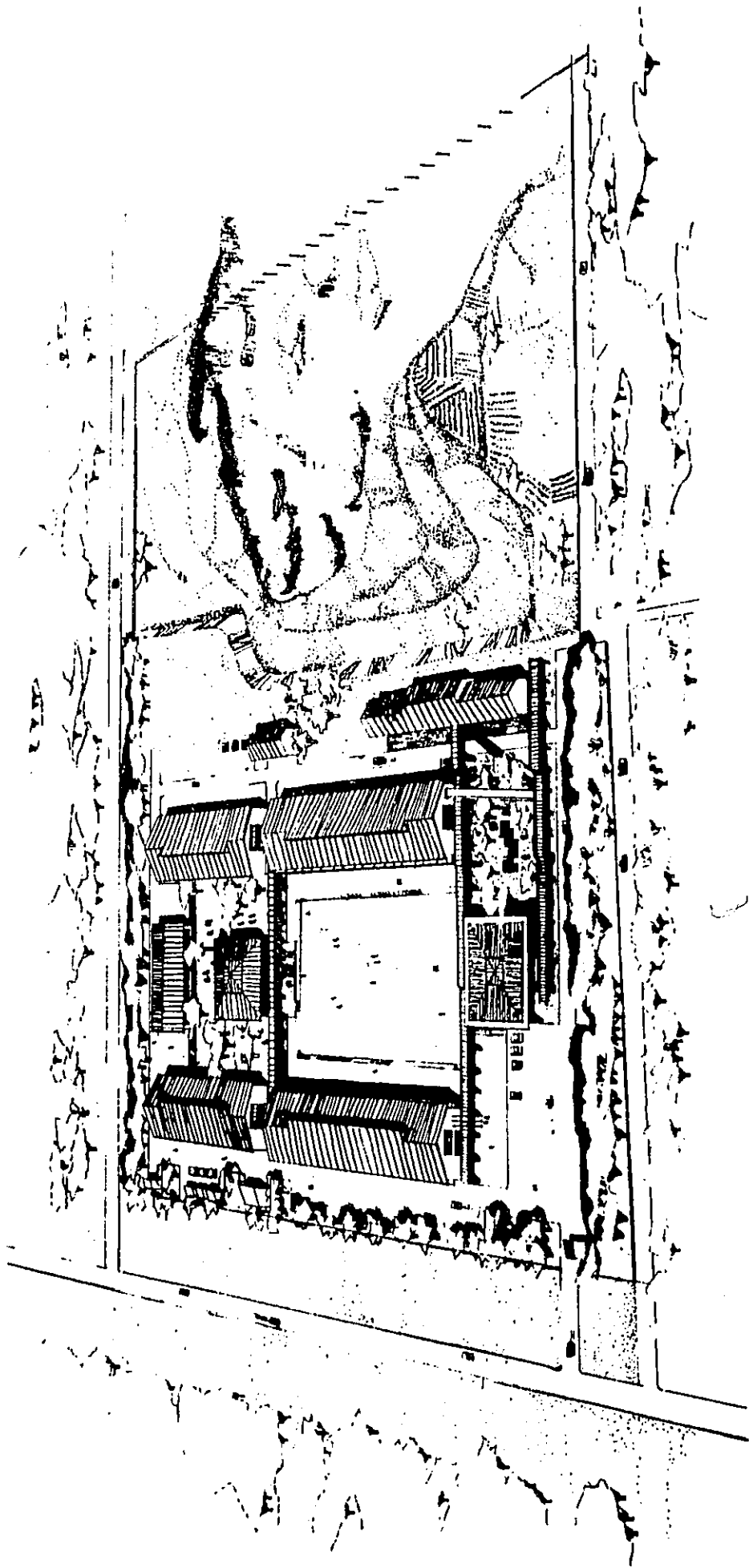


ENTRANCE TO CAMPUS

3. 1. 11 PRELIMINARY DESIGN

LIST OF DRAWING

DRW. NO.	BUILDING NAME	DRAWING TITLE
1	KHONKAEN CAMPUS	LAYOUT PLAN
2	ADMINISTRATION BLDG.	PLAN ELEVATION SECTION
3	AUTOMOTIVE & AGRO-MACHINE SHOP	PLAN 1 F & 2 F
4	WELDING, SHEET-METAL & PLUMBING SHOP	PLAN 1 F & 2 F
5	BUILDING CONSTRUCTION SHOP	PLAN 1 F & 2 F
6	ELECTRICAL & MACHINE SHOP	PLAN 1 F & 2 F
7	WORK SHOP BLDG.	ELEVATION SECTION
8	PAINTING SHOP & CANTEEN	PLAN ELEVATION SECTION
9	CLASS ROOM BLDG.	PLAN 1 F & 2 F
10	CLASS ROOM BLDG.	ELEVATION SECTION

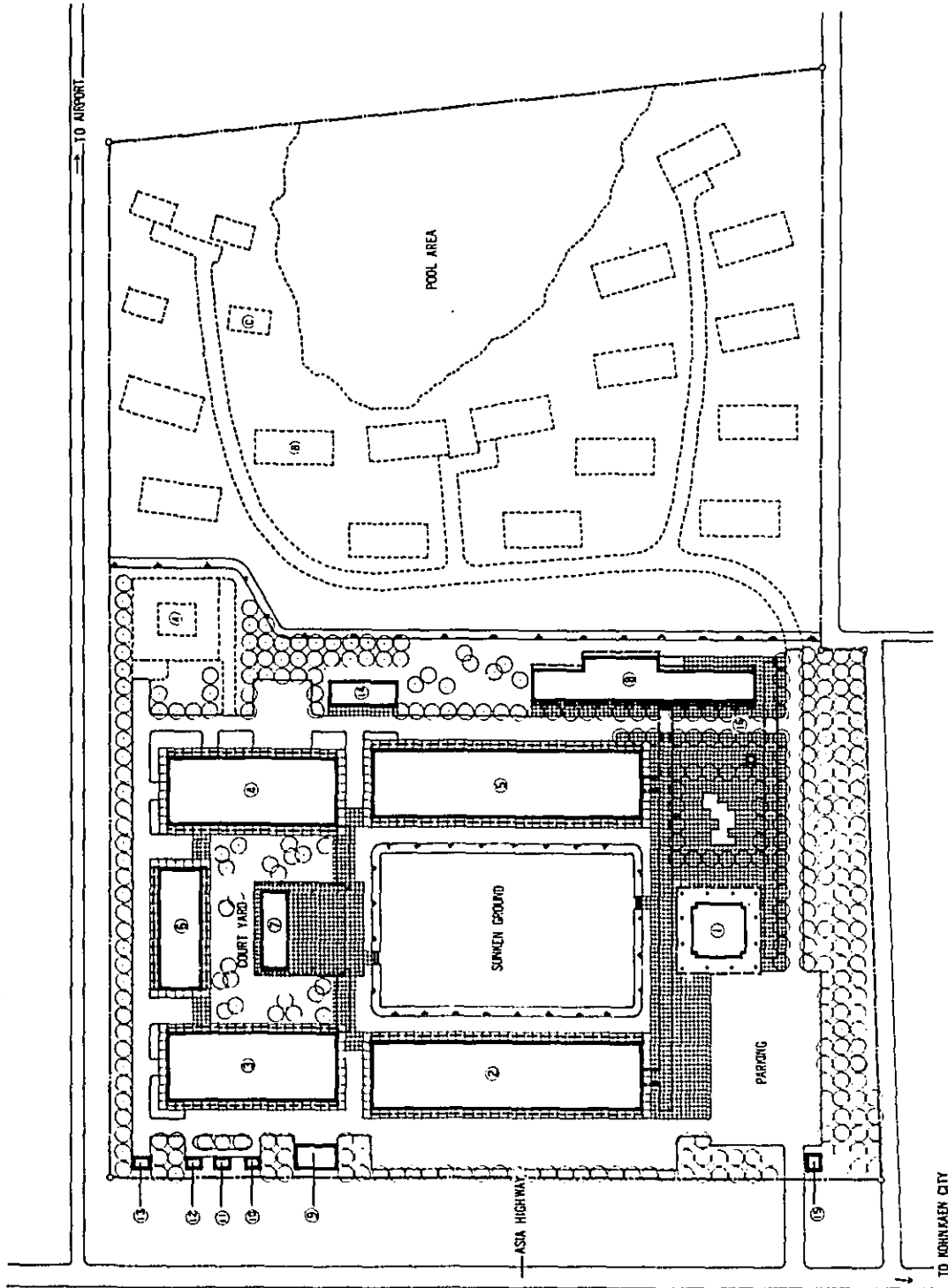


LOOKING DOWN FROM THE EAST



- ① ADMINISTRATION BLDG.
- ② AUTOMOTIVE & AGRO-MACHINE SHOP
- ③ WELDING SHEET-METAL AND PLUMBING SHOP
- ④ BUILDING CONSTRUCTION SHOP
- ⑤ ELECTRICAL & MACHINE SHOP
- ⑥ PAINTING SHOP
- ⑦ CANTINE
- ⑧ CLASS ROOM BLDG.
- ⑨ FORGE SHOP
- ⑩ REFLAMMABLE STORAGE
- ⑪ GAS STORAGE
- ⑫ SCRAP IRON STORAGE
- ⑬ INCUBATOR
- ⑭ GENERAL STORE
- ⑮ GUARD HOUSE
- ⑯ WATER TANK

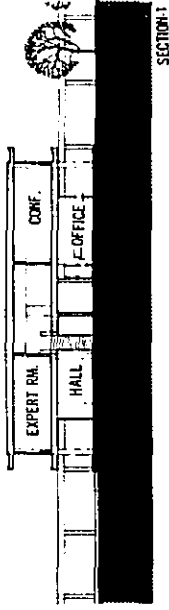
WORK TO BE PROVIDED BY THAI GOVT.  
 ⑬ STUDENT DORMITORY  
 ⑭ STAFF HOUSE  
 ⑮ STAFF HOUSE FOR DIRECTOR



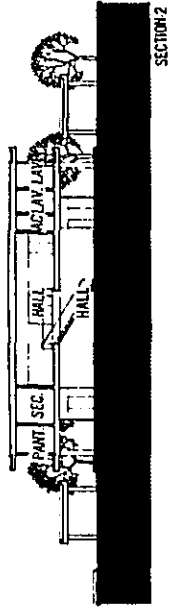
# THE LAYOUT PLAN OF THE INSTITUTE



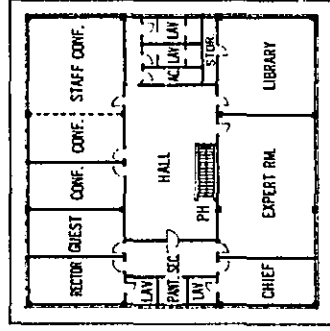
EAST ELEVATION & SECTION-1



SOUTH ELEVATION & SECTION-2

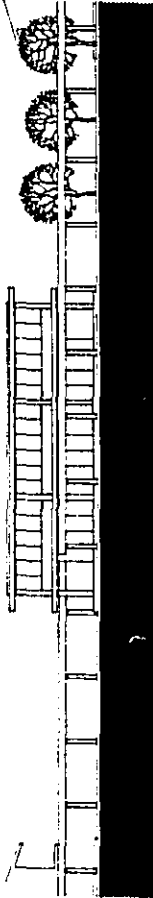


1ST FLOOR PLAN  
2ND FLOOR PLAN

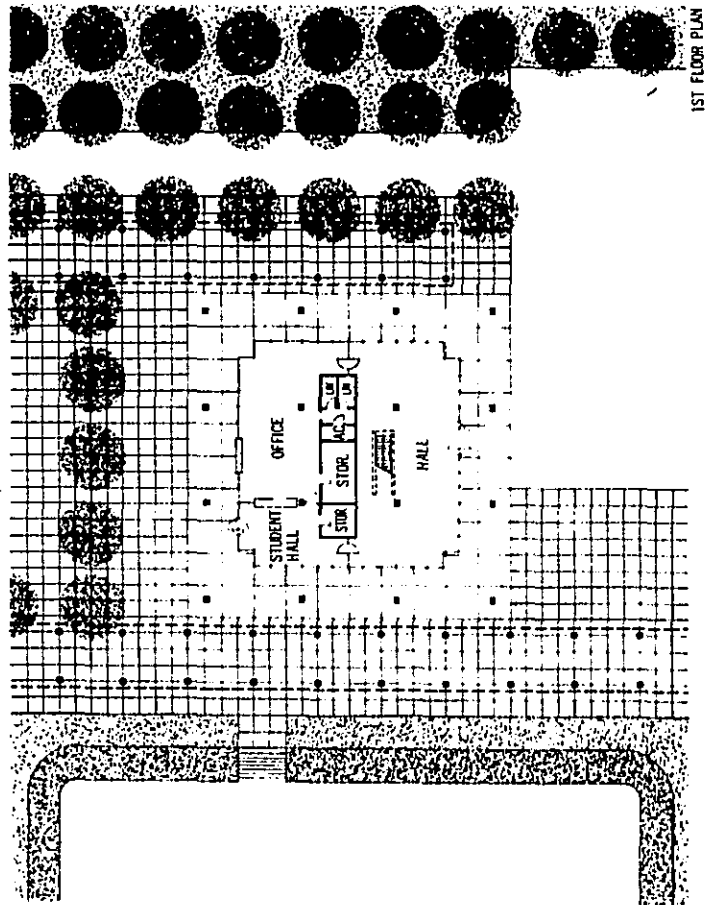
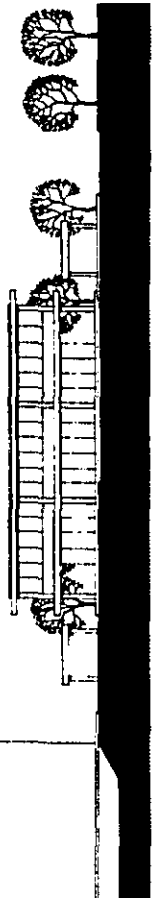


2ND FLOOR PLAN

EAST ELEVATION

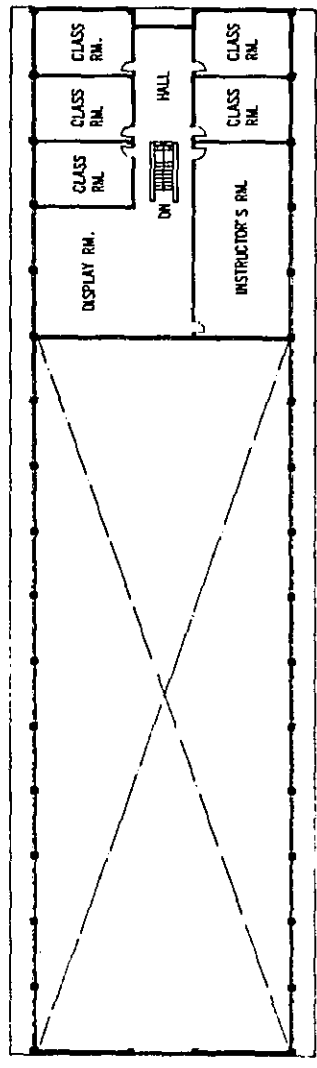


SOUTH ELEVATION

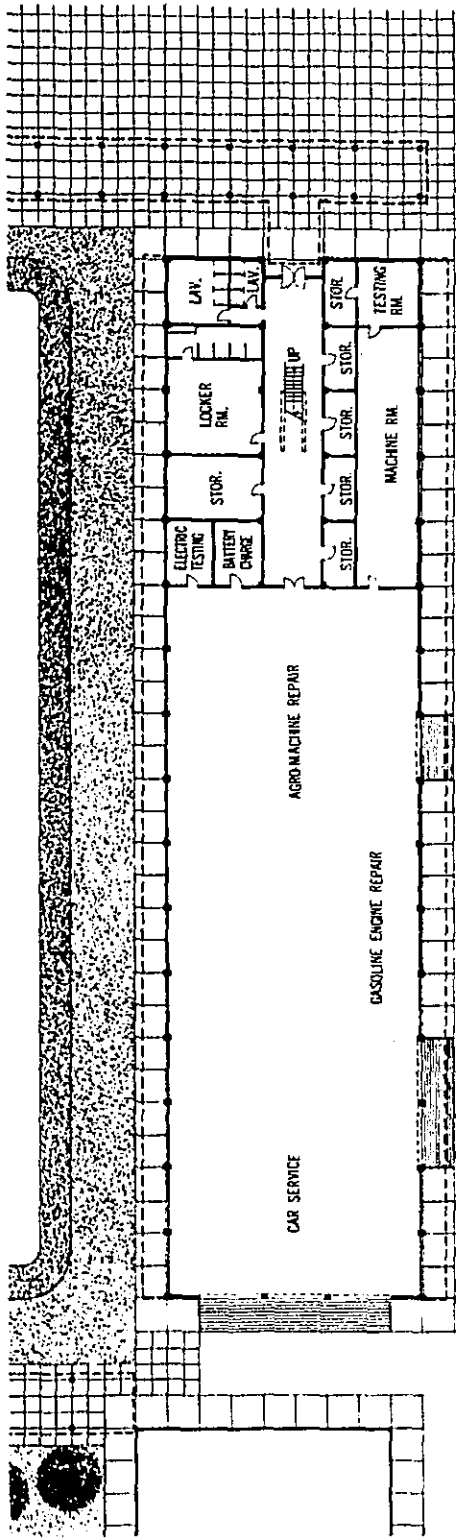


1ST FLOOR PLAN

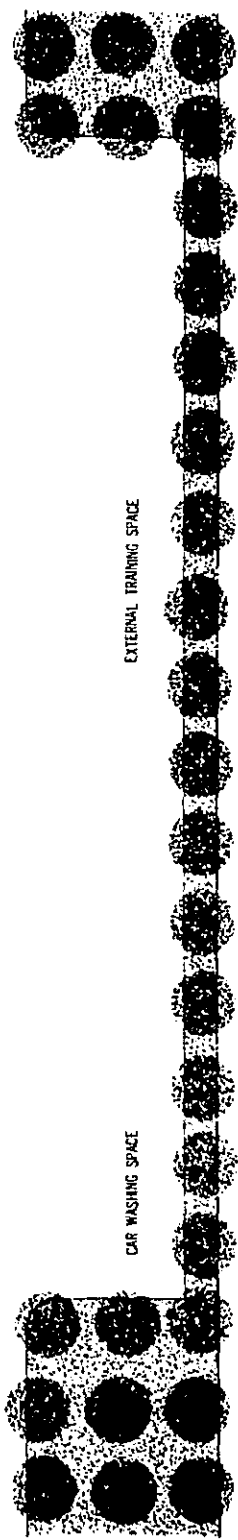


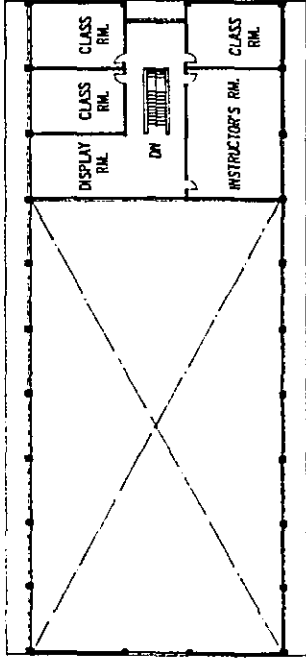


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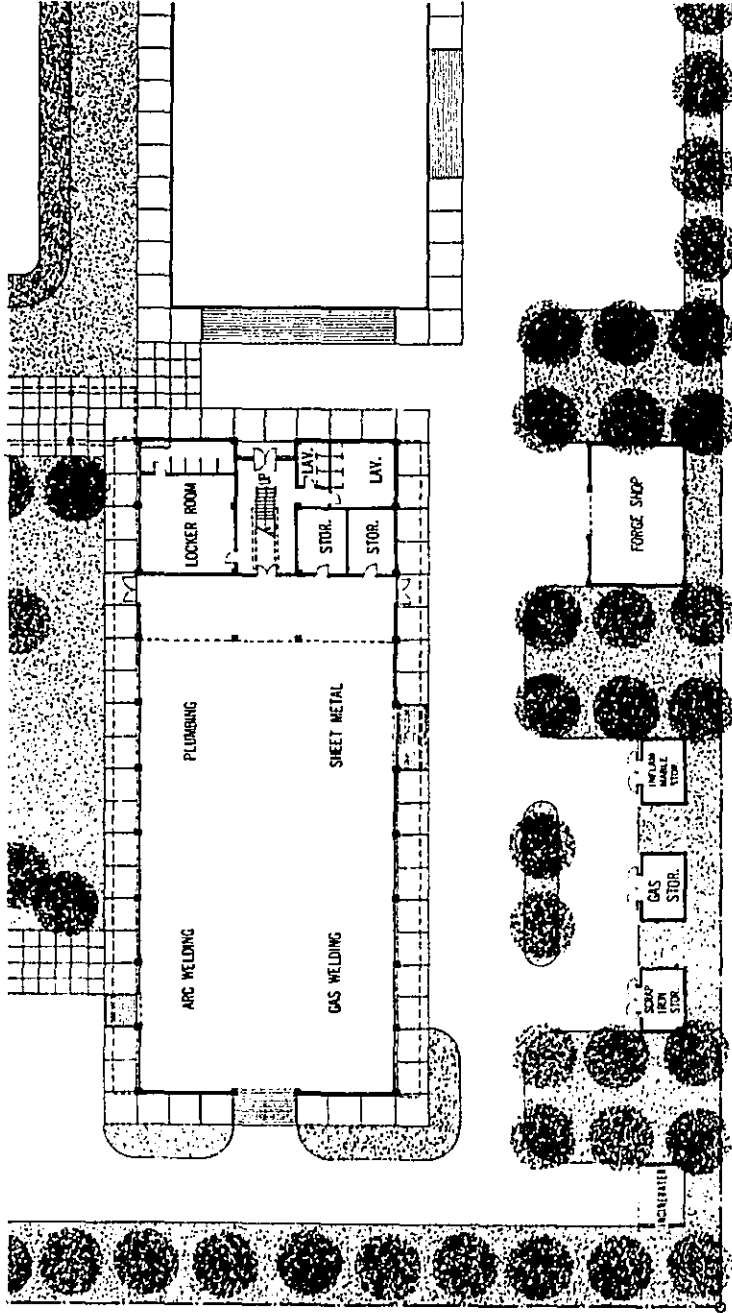


1ST FLOOR PLAN

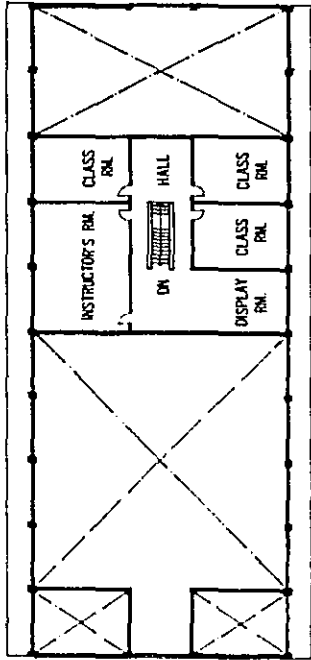




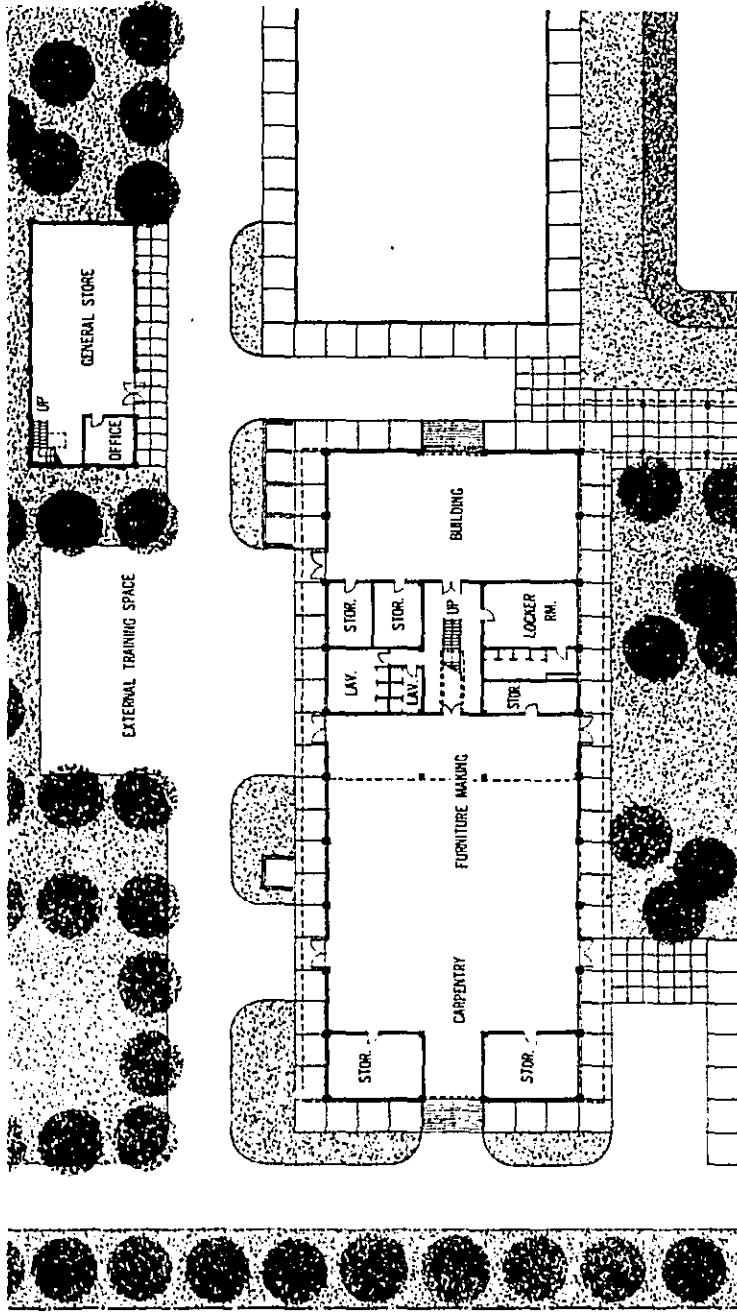
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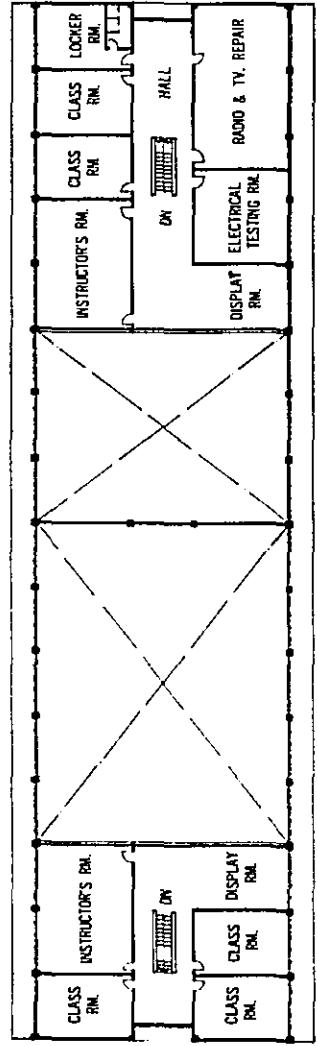
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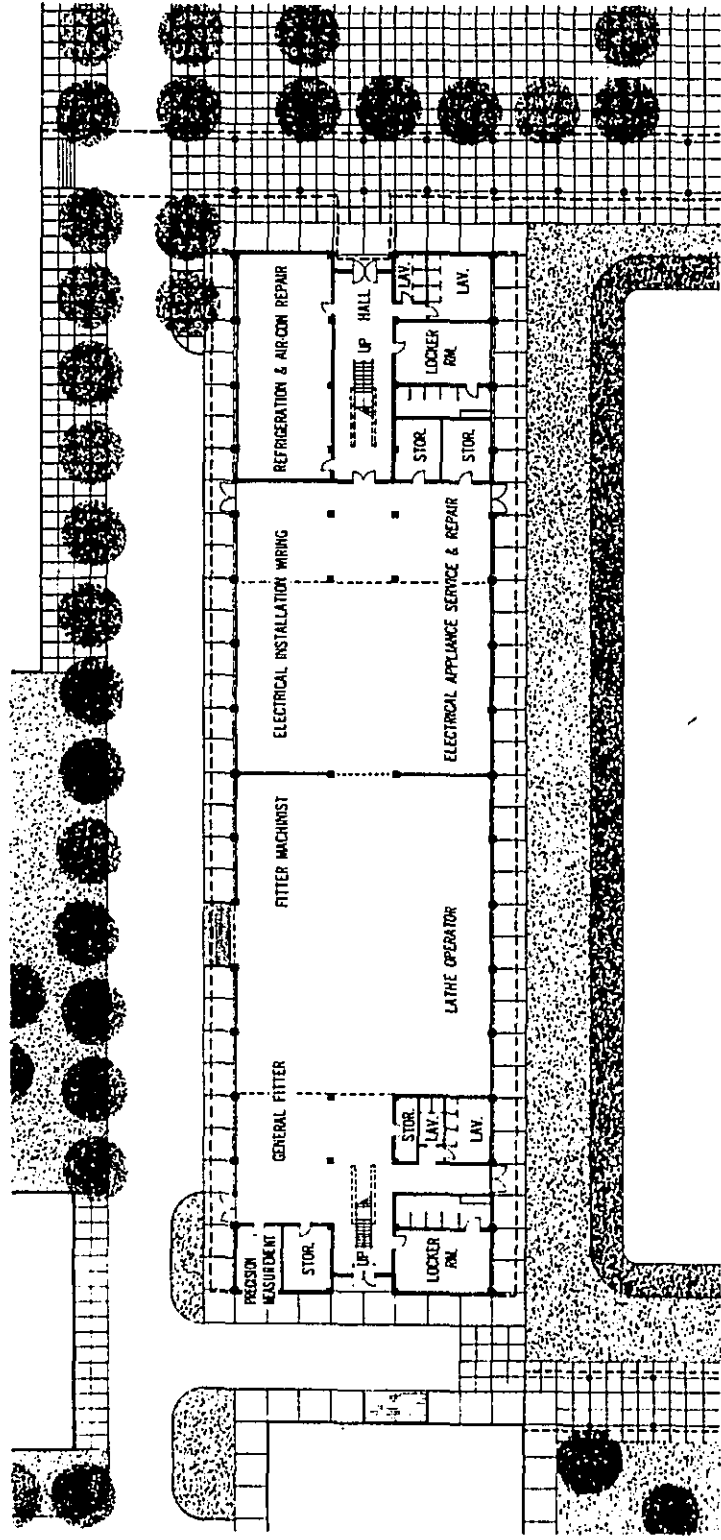
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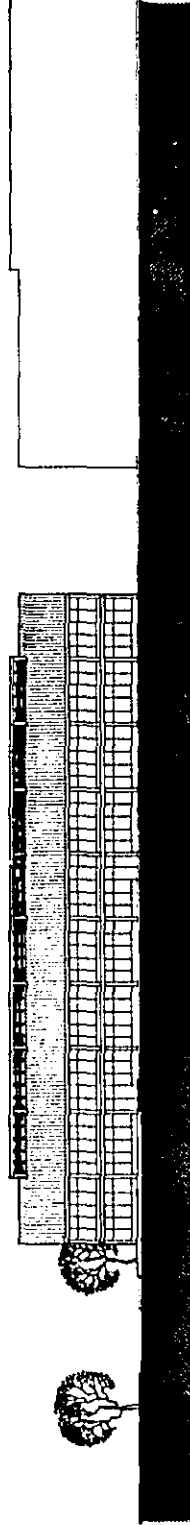
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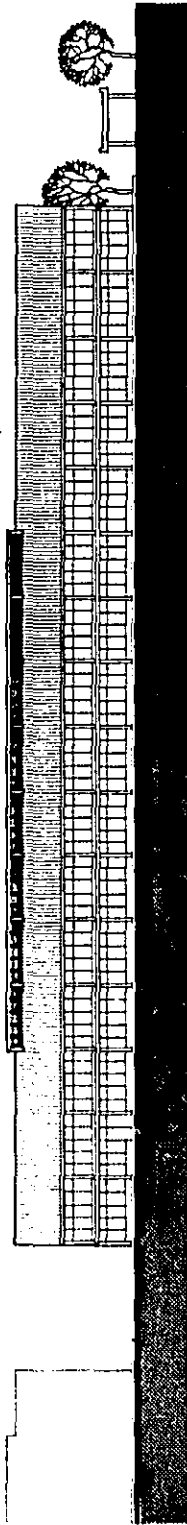
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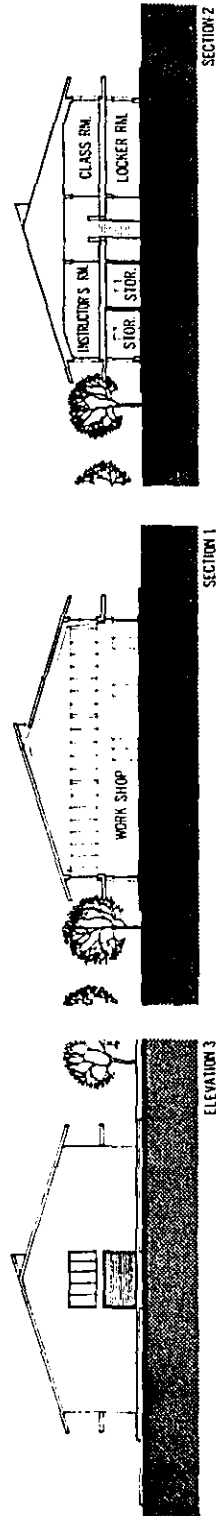
1ST FLOOR PLAN



ELEVATION-1



ELEVATION-2



ELEVATION-3  
SECTION-1  
SECTION-2

SECTION-2

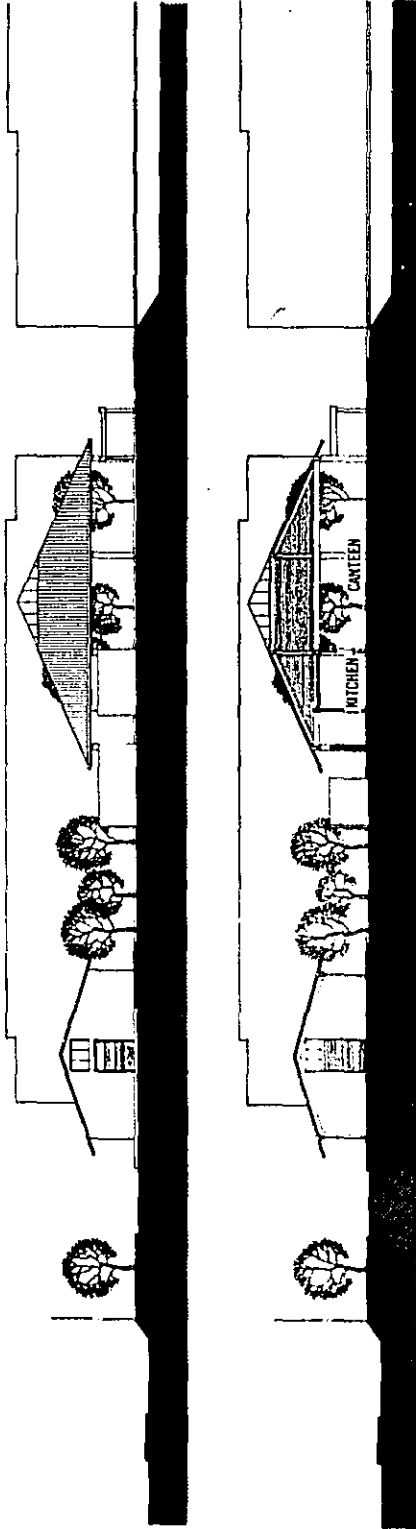
SECTION-1

ELEVATION-3

WORK SHOP BLDG.

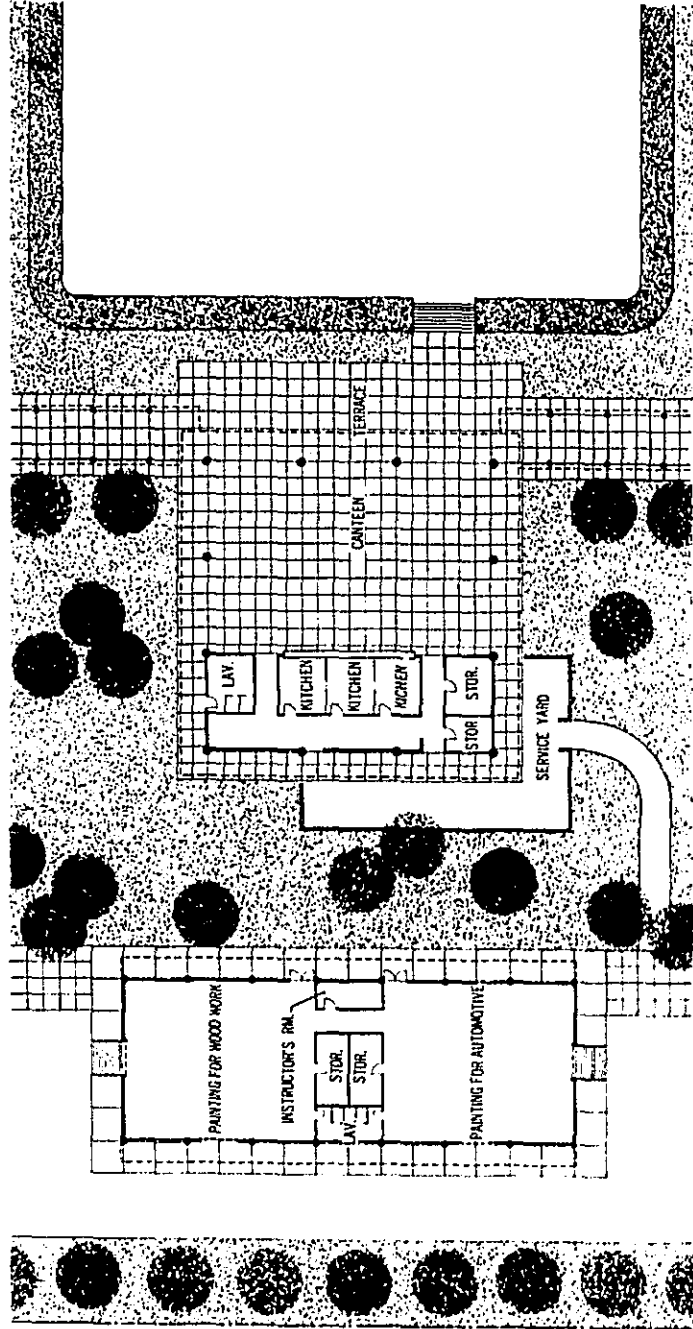


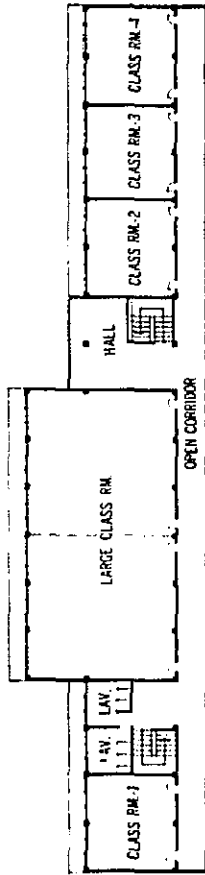
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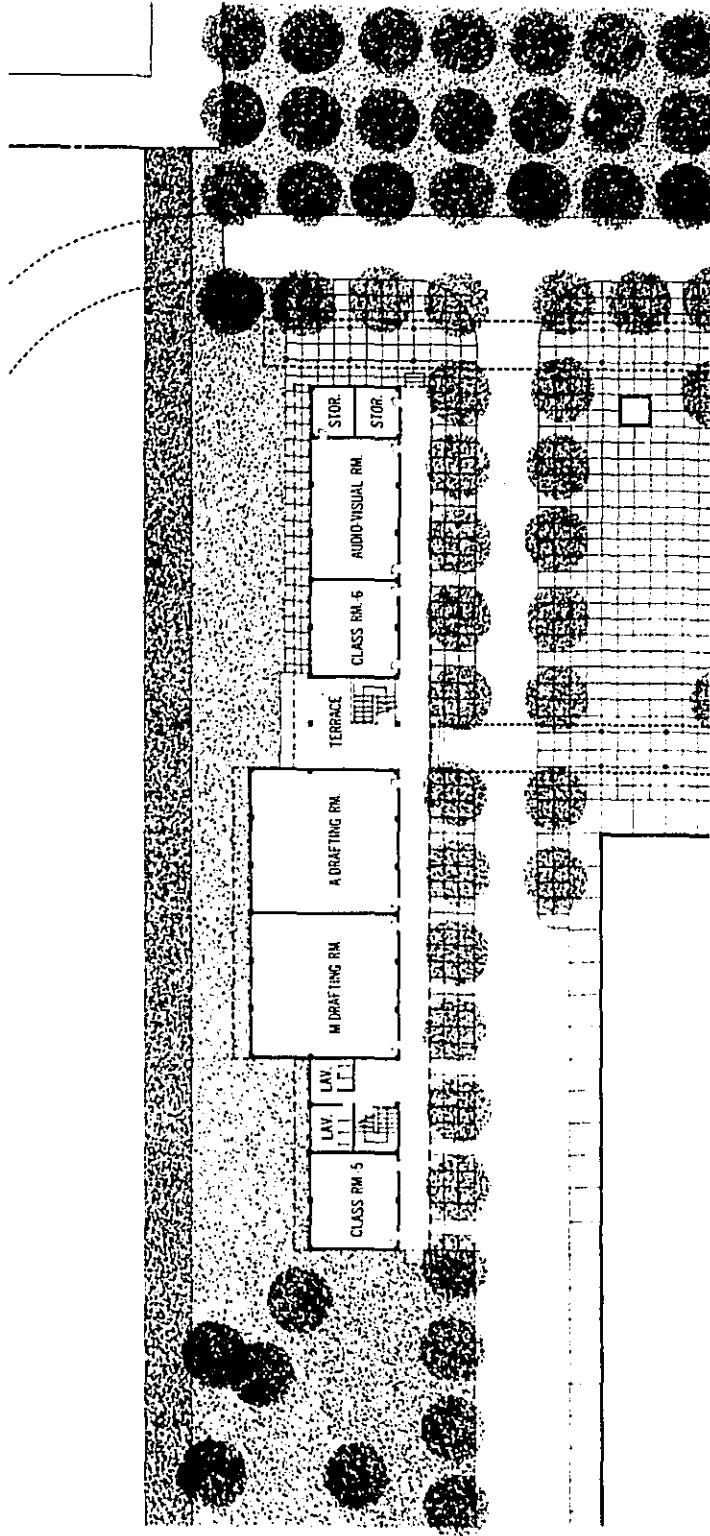
SECTION

1ST FLOOR PLAN

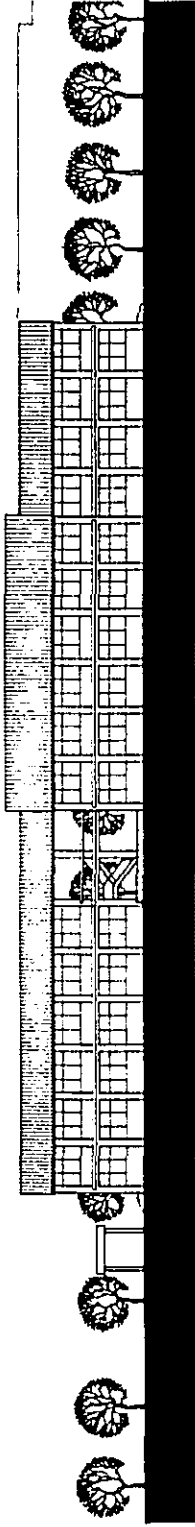




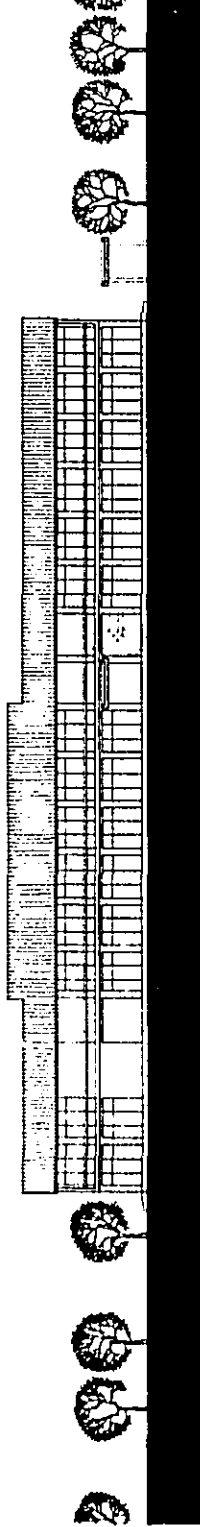
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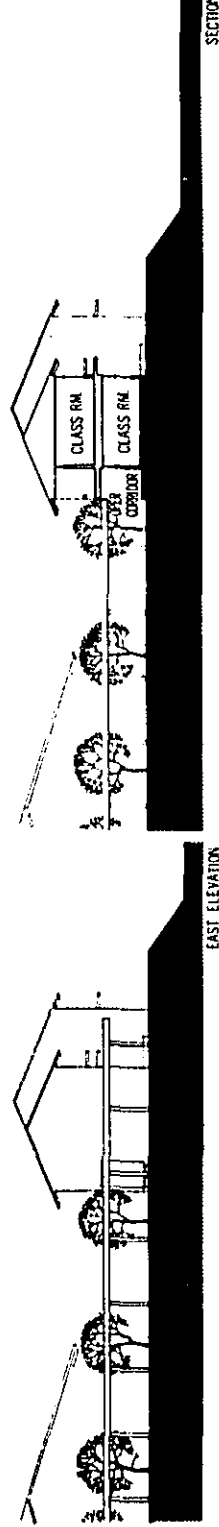
1ST FLOOR PLAN



NORTH ELEVATION



SOUTH ELEVATION



EAST ELEVATION  
SECTION



FLOOR AREA TABULATION

	PRELIMINALY
ADMINISTRATION BLDG.	880.0m <sup>2</sup>
WORK SHOP BLDG.	8,961.3m <sup>2</sup>
1. AOTOMOTIVE & AGRO-MACHINE SHOP	2,449.4m <sup>2</sup>
2. WELDING SHEET METAL AND PLUMBING SHOP	1,516.3m <sup>2</sup>
3. BUILDING CONSTRUCTION SHOP	1,516.3m <sup>2</sup>
4. ELECTRICAL & MACHINE SHOP	2,799.3m <sup>2</sup>
5. PAINTING SHOP	510.0m <sup>2</sup>
6. FORGE SHOP	100.0m <sup>2</sup>
CLASS ROOM BLDG.,	1,680.0m <sup>2</sup>
CANTEEN	400.0m <sup>2</sup>
GENERAL STORE BLDG.	350.0m <sup>2</sup>
GUARD HOUSE	25.0m <sup>2</sup>
INFLAMMABLE STORAGE	50.0m <sup>2</sup>
GAS STORAGE	20.0m <sup>2</sup>
COUERED WAY	1,500.0m <sup>2</sup>
<b>TOTAL</b>	<b>13,796.3m<sup>2</sup></b>

### 3.2 SCOPE OF WORKS AND CONSTRUCTION SCHEDULE

Several meetings were held between the survey team for this project and Mr. Suvitya Yingvorapunt, Director-General Department of Labour, Ministry of Interior and other government officials to discuss the scope of work to be executed by the Government of Thailand and the Government of Japan during the survey team's stay in Thailand.

As previously stated in the minutes of this report regarding the scope of work to be performed by the Government of Thailand, the site reclamation of all the fundamental work should be completed as soon as possible before the start of Building construction. This work is the most critical portion in this project. As the degree of work progress will largely affect the progress in the construction of building, it is necessary for the Thai Government side to execute the site reclamation work promptly.

#### 3.2.1 SCOPE OF WORKS AND WORK DEMARCATION

##### 1. Fundamental works

###### (a) Site reclamation

Thai side: Site reclamation shall be completed before the start of building construction in accordance with the site reclamation plan provided by the Government of Thailand.

###### (b) Water supply main

Thai side: Water shall be supplied to the water reserved tank provided by the Japan side.

Japan side: Water shall be supplied to the buildings from water reserved tank through the elevated water tank.

###### (c) Electrical power supply

Thai side: Electricity shall be fed by the 23 Kv PEA aerial distribution line to the transformers provided by the Japan side.

Japan side: Electricity shall be received at the substation equipped with open type exterior transformers provided by the Japan side, and where its voltage is dropped to 3  $\phi$  - 4W 380V/220V for supply to each buildings.

(d) Drainage system

Thai side: Drain pipe line from the boundary line of the training block and the ditch outside the boundary line of the campus site shall be provided.

Japan side: Drain pipe line up to the boundary line of the training block shall be provided.

(e) Telephone

Thai side: Five (5) local trunk lines shall be provided from the TOT line to the MDF board provided by the Japan side.

Japan side: Extension lines shall be provided from the MDF board through the telephone exchange box.

(f) Branch lines

Thai side: Water, electricity and telephone extension to the staff houses and student dormitory:

Water - From the branch valves provided by Japan side onward.

Electricity - From the branch boards provided by Japan side onward.

Telephone - From the telephone exchange box provided by Japan side onward.

2. Buildings

Thai side: Construction of the staff houses and student dormitory.

3. External works

Thai side: Campus roads, turfing and fencing.

Japan side: Foundation work for external training space. Terraces, flag poles and gates.

4. External lighting

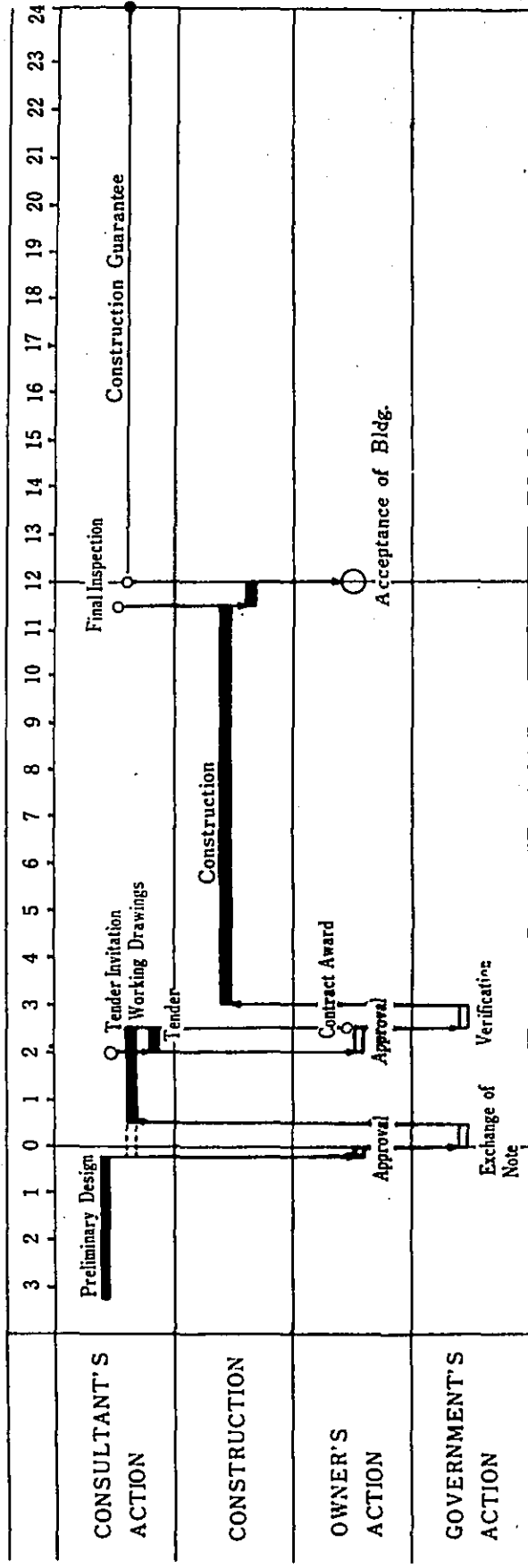
Thai side: Residential block.

Japan side: Inside the training block.

5. Furnitures and Miscellaneous

All furnitures and miscellaneous except training equipment shall be provided by the Government of Thailand.

TENTATIVE CONSTRUCTION SCHEDULE



### 3.2.2 CONSTRUCTION SCHEDULE

The construction schedule from the date of starting the preliminary survey to the date of completion of the building is planned as tabulated below:

### 3.3 ROUGH COST ESTIMATE

The following assumptions were set for determination of the estimated construction cost.

#### 3.3.1 ASSUMPTIONS

- 1) Time when the rough construction cost was estimated - February 1977
- 2) Foreign currency exchange rate - US\$1 = 20 baths = ¥280
- 3) Construction material

In general, the materials produced in Thailand and Japan shall be used. The cost of the materials to be imported from Japan include packing cost, marine freight and insurance premium. Import duties to be levied on these materials and the inland transportation cost of imported material are not included.

- 4) Validity of cost estimate

This rough cost estimate shall be valid for a period of six (6) months from February 1977. It does not include allowance for exchange rate fluctuations in commodity prices and labor cost.

- 5) It is assumed that any constructors who may be engaged solely in the construction of the Institute are exempted from all taxes, duties, dues, etc. which may otherwise be imposed on the constructors.

### 3.3.2 SUMMARY OF CONSTRUCTION COST

The following rough construction cost was determined in accordance with the scope of work given in paragraphs 3-6 and 3-7, being largely divided as follows:

		( In thousand yen )
I.	Building construction .....	¥523,100
II.	External Work .....	30,400
III.	Fundamental Service Work .....	86,500
IV.	Architectural Design and Supervising Fee .....	60,000
Total:		¥700,000

Note: For cost breakdown, refer to the table attached.

Feb., 1977

#### ROUGH COST ESTIMATE TABULATION

		Cost (¥000 Omitted)
I. Building Construction Cost		
A.	Administration Bldg. ....	53,700
B.	Work Shop Bldg.	
	1. Automotive & Agro Machine .....	96,700
	2. Welding, Sheet Metal, Plumbing .....	59,900
	3. Electrical & Machine .....	110,600
	4. Building Construction .....	59,900
	5. Painting .....	22,700
	6. Forge .....	3,600
	7. Inflammable Storage & Gas Storage. ....	1,400
	B. Sub-Total	354,800
C.	General Store .....	10,500
D.	Canteen .....	12,000
E.	Class Room .....	67,000
F.	Covered Way .....	22,500
G.	Guard House .....	600
	C. - G. Sub-Total	114,600
	I. TOTAL	523,100

	Cost (¥000 Omitted)
<b>II. External Work</b>	
1. Foundation Work for External Training Area .....	18,000
2. Terrace Paving .....	8,000
3. Flag Poles & Gate .....	4,400
<b>II. TOTAL</b>	<b>30,400</b>
 <b>III. Service</b>	
<b>A. Electrical</b>	
1. Power Circuit Main .....	16,000
2. Low-tension Circuit in Campus .....	12,000
3. Telephone Exchange & Extension .....	6,000
4. External Lighting .....	4,000
<b>A. Sub-Total</b>	<b>38,000</b>
<b>B. Plumbing</b>	
1. Water Supply Main	
Water Reserver Tank & Elevated Water Tank	
Water Supply Main Piping for Training Facilities .....	20,000
2. Surface Drainage (inc. Oil Treatment) .....	13,300
3. Septic Tank .....	15,200
<b>B. Sub-Total</b>	<b>48,500</b>
<b>III. TOTAL</b>	<b>86,500</b>
<b>GRAND TOTAL I + II + III .....</b>	<b>640,000</b>

