4-3 Basic Plan

4-3-1 Site and Facility Layout Plan

Since all the proposed project sites are conveniently located in the outskirts of the provincial cities facing the public roads including the highway, it is very advantageous to enter the sites for carrying construction materials and hired workers. Moreover, there are flat or gentle slopes and few undulations. They also have good field drainage and comparatively good water source. Accordingly, it is said that the conditions of the four proposed project sites are suitable for the nursery centers.

(1) Site Plan

In site planning, the site for the administrative facilities and the nursery facilities should be distributed in order to fulfill their individual functions effectively and efficiently in addition to considering the following.

- The site for the administrative facilities should be situated at the open central port of the site in consideration of the need to provide direct access and fine sight.
- A considerable distance should be secured between the office and training building and the main road in consideration of the possible adverse effect of traffic noise.
- Taking the facilities constructed by the Thai side into consideration, necessary space for the site should be maintained.
- The flat ground area should be utilized as the site for the facilities, and the rest should be reserved as forest land area.
- The site for the nursery facilities should be constructed next to the site for the administrative facilities and be linked by a work road.
- With due regards to the topographical conditions of the whole area, the utilization of the site should be planned to set up an effective water system.
- The existing infrastructures should be utilized as much as possible for the site plan.

(2) Facility Layout Plan

The layout of the administrative facilities should be planned to plot the office and training building, workshop, garage(s), generator house and oil tank base to keep safety and interrelationship. The workshop and generator house should be plotted at an appropriate distance from the office and training building in order to avoid noise. The office and training building should be plotted facing north and south to get natural ventilation.

The layout of the nursery facilities should be constructed mainly for 50 units of open nurseries with 13 blocks plotted for 26 units and 12 blocks for 24 units, which are divided at the central part by the nursery facilities. At the central part, the potting house, compost house, closed nurseries and storage should be plotted to save labor and get efficient works for nursery production activities.

The water distribution tank should be plotted at an advantageous topographical position to save power for water distribution.

4-3-2 Facility Designs

(1) Administration Facilities

Among the administration facilities, architectural designs regarding the office and training building is mainly described in this section. However, the designs related to the other buildings are also applied to the design of the other buildings.

1) Floor Plan

As for the main building of each nursery center (i.e. the office and training building), Mahasarakham Nursery Center is designed to be a two story building and Nakhan Ratchasima, Udonthani and Yasothon Nursery Centers are to be one storied in accordance with their floor area. Each main building is symmetrically designed having an entrance hall at the center. For the floor plan of each main building, the following items are to be considered in addition to functional use and landscaping.

- Upon consideration of the relation of each section and room of each center, the location of each room is designed in order to facilitate functional work.
- The floor plan of each room is designed to be flexible as much as possible. For example, instead of independent and small rooms for each section, a

large room without dividing walls is designed for the common use of several sections with shared work loads. If occasion demands it, movable partitions are to be used for dividing sections.

2) Section Plan

In working out the sectional plan the following factors are to be taken into consideration: ① securing natural ventilation, ② preventing rainwater from entering the building, ③ screening sunlight and ④ establishing flood emergency measures.

The height of the first floor is 3.3 m and that of the second floor is 3.0 m. However, the height of the rooms which accommodate many persons such as the lecture room is 3.3 ~ 3.5, allowing natural ventilation.

Basically, there will be doors and windows on both sides of the rooms facing the corridor and the balcony for natural ventilation. Furthermore, reinforced concrete slab is to be constructed beneath the roof and finishing ceiling will be installed under the slab in order to enhance heat insulation.

The eaves will be lengthened to prevent the openings from rain intrusion against heavy rain in the rainy season. Eaves gutter and downspout are to be installed to prevent rainwater from entering the building. Furthermore, as a protection from inundation, the height of the ground floor will be 1 m above ground level. This will also enhance the efficiency of natural ventilation and prevention of moisture.

3) Structural Design

◦ Design Principles

The structural system should be economical and durable, considering the natural condition in the Northeast of Thailand and the size and mode of the building facilities. Upon consideration of the quality of locally available materials and construction techniques, suitable structural materials and method shall be determined.

◦ Design of Structures

As a rule, a rigid frame reinforced concrete structure most prevailing in Thailand will be adapted. Walls will be built of bricks and concrete blocks piled in the frames. Bearing capacity will be determined based on the boring test results which will be done at the time of the detailed design of

the Project. According to the available geological data of the proposed four sites, the subsoil of the sites is composed of sandy loam and relatively weak ground with an N-value of 3 ~ 15. At the depth of 6 m the N-value of the subsoil becomes 25 ~ 30 which is considered to be a stable supporting ground. Therefore, the foundations of the heavy structure such as the office and training building will basically be supported by piles while there will be a direct foundation on the supporting ground for other light structures.

The structural computation will be made following the applicable design standards established by the Architectural Institute of Japan. The allowable stresses of structural members will be taken at practical values by referring to the design standards adopted in Thailand and Japan while giving due allowance to the workmanship and irregularity in quality of products.

◦ Design Load and External Force

Design load and external force are determined as follows;

- Dead Loads

Reinforced concrete	2.4	ton/m^3
Structural steel	7.85	ton/m^3
Bricks and concrete blocks	1.9	ton/m^3

- Live Loads

Roof (general)	50	kg/m^2
Roof (concrete overhang)	100	kg/m^2
Toilet	150	kg/m^2
Office, meeting room, lecture room, laboratory, library and storage	300	kg/m^2
Generator house, workshop	500	kg/m^2

Portions carrying heavy loads such as water tank and special machine room floor will be separately determined

- Wind Loads

For wind loads, those values adopted in "By-laws of the Bangkok Metropolis, Re; Control of the Construction of Building, 1979" will be used.

Height of Building	Wind Pressure
Less than 10 m	50 kg/m^2
10 m to 20m	80 kg/m^2
20 m to 40m	120 kg/m^2

- Seismic Load

The design will be given no seismic consideration in view that the project sites have not been subjected to considerable magnitudes of earthquakes.

- Structural Materials

Major construction materials will be designated as follows.

Reinforcing bars	:	Deformed bar, SD 30 (TIS)
Concrete	:	Fc=210 kg/cm^2 (Cylinder test for 4-week-strength) Fc=180 kg/cm^2 (Cylinder test for 4-week-strength)
Cement	:	Normal portland cement (ASTM)
Structural steel	:	SS41 (JIS) or equivalent
Pile	:	Precast concrete product

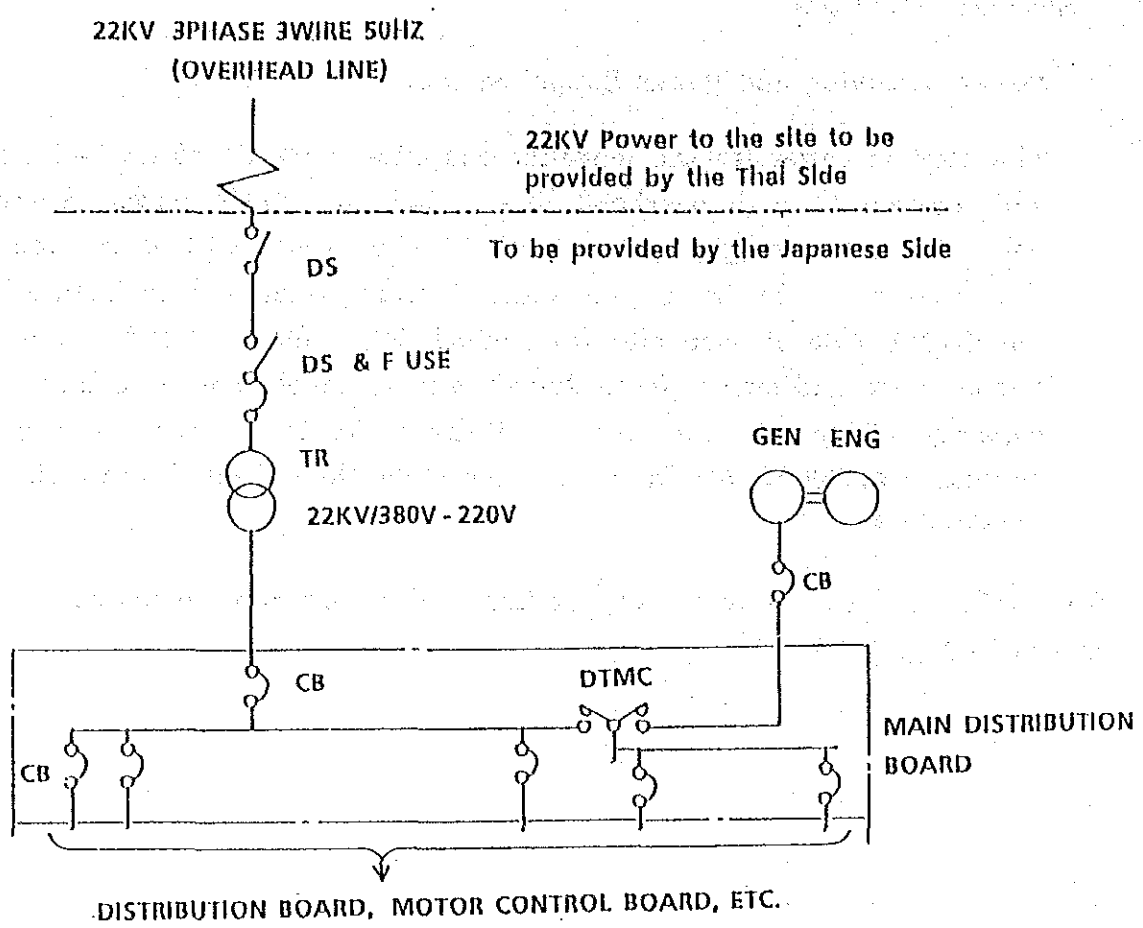
4) Building Facility Plan

◦ Electrical Facilities

– Power Receiving and Power Supply System

The electric power for the four proposed sites is 22 kV 50 Hz 3-phase 3-wire system through overhead line. After the 22 kV power receiving point, the power supply system work for the Project will be included in the scope of the Japanese side work. A transformer will be installed on an electric pole of each site from which low voltage electric power (3-phase 380 V and single phase 220 V) will be supplied to each load. The capacity of the transformer of Mahasarakham Nursery Center is estimated at 300 KVA and those of the other three Centers are estimated at 250 KVA.

The outline of the power supply system and construction demarcation are shown in Fig. 4-3-1.



Note: DS : DISCONNECTING SWITCH

TR : TRANSFORMER

CB : CIRCUIT BREAKER

ENG : ENGINE

GEN : GENERATOR

DTMC : DOUBL THROW MAGNETIC CONTACTOR

Fig. 4-3-1 Outline of Power Supply System

- Emergency Generator

As a measure of city power failure, a diesel engine generator set will be provided to each nursery center. The capacity of the generator for Mahasarakham Nursery Center is about 74 KVA and about 50KVA for the other centers. The generator power will be supplied to the following equipments.

Lift pumps and drainage pumps

Cold seed storage room

Laboratory equipment (dry oven, refrigerator, etc.)

Emergency light

Personal microcomputer

- Power Mains

The power mains will be installed from the main distribution board to the administration building, workshop and pump house by a 3 phase 3 wire 380 V ~ 220 V overhead line. Then, the power mains inside of the buildings will be installed in metal ducts and be led to the lighting panel boards, power control panels and panel boards for laboratory equipment (refer to Fig. 4-3-2).

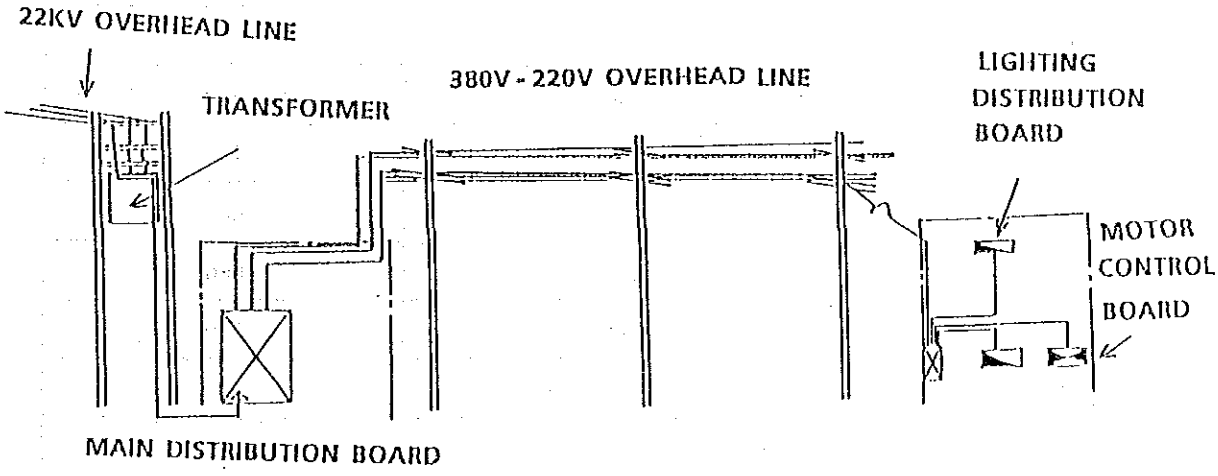


Fig. 4-3-2 Power Riser Diagram

- Power Control

Power control will be made to supply power to lift pumps and drainage pumps, air-conditioning units, ventilating fans, etc.. As a rule, the supply voltage will be a single phase 220 V for small motors such as ventilating fans and ceiling fans, and 3 phase 380 volts for other motors.

- Lighting

Lighting fixtures will mostly be fluorescent lights and will be basically surface mounted or recessed. Design target illumination level does not include natural light from windows, and shows illumination from lighting fixtures only.

However, design target illumination level is set lower than JIS (Japanese Industrial Standard) illumination level.

In case of power failure, some of the lights of the corridor and the main rooms will be connected to the generator system and will work as emergency lights. The following table shows design target illumination level for each room.

Table 4-3-1 Design Target Illumination Level

Room	Design target illumination level (Lux)	JIS illumination level (Lux)
Office Room	250 ~ 350	500
Laboratory	300 ~ 400	500
Lecture Room	250 ~ 350	400
Library	250 ~ 350	500
Meeting Room	200 ~ 300	500
Cafeteria	50 ~ 100	300
Workshop	150 ~ 200	200
Garage	50 ~ 100	200

Note: The numerical value in the column of JIS illumination level shows average value between maximum and minimum of JIS.

- Socket outlets

The Socket outlets for supplying electric power to the equipment for laboratory and small electric appliances will be installed at necessary places. the Socket outlets for supplying electric power to the refrigerator and dry oven in the laboratory and other outlets which require electricity even during a power failure are connected to the generator circuit. Most of the outlets will be single phase 220 V in principle.

- Telephone System

For communication purposes between the Nursery Centers, outside and among the rooms in the Centers, a telephone system will be provided.

One trunk line will be extended outside to the main terminal board in the Administration Room by the Thai side.

A PABX (telephone switchboard) and a reception telephone will be installed in the administration room. Also, extension telephones will be installed in the major rooms. The PABX will be simple electronic type and its capacity will be about 20 extensions. The extension telephones will be installed in the following rooms;

Project director and Field director room
Chief of center room
Expert leader room
Experts and JOCV room
Lecture room
Meeting room
Meeting and Seminar room
Laboratory
Library
Preparation room
etc.

- TV and Radio Antenna System

The TV and Radio antenna and necessary outlets will be provided in the Project director and Field director room, Chief of center room, Lecture room, etc..

- Lighting Protection System

A lighting protection system will be installed to prevent damage due to lightning. The system will consist of an elevation rod, a lightning conductor, an earth electrode, etc. Overhead ground wire system is not provided.

◦ Air Conditioning and Ventilation System

- Air Conditioner

The air conditioner will be an air-cooled separate type room air conditioner. Each room will only be provided with temperature control not with humidity control. The design conditions of the air conditioner is described as follows;

Outside air temperature design	;	Temperature 34 °C (DB) Relative humidity 60 %
Room temperature design	;	Temperature 26 °C ± 2 °C (DB) Relative humidity 55 %

The air conditioner will be installed in the following rooms;

For Mahasarakham Nursery Center	;	Project director and Field director room, Chief of center room, Expert leader room, Experts and JOCV room, Administration section room and Meeting room
For Nakhon Ratchasima, Udonthani and Yasothon Nursery Centers	;	Chief of director room, Administration section room and Meeting and Seminar room

- Pipes

Pipes for refrigerant and condensed water from the air conditioners will be laid. Copper pipes for the refrigerant and polyvinyl chloride pipes (PVC) or its equivalent for condensed water respectively.

- Ventilating System

Ventilating equipment will be installed in toilets, dark room, laboratories, kitchen, storage room, vinyl house, generator house, etc.. Ceiling fans will be installed in the nursery section room, laboratory, meeting room, library, mechanization section room, extension and training section room, JOCV room, lecture room, etc..

- Plumbing and Sanitary Facilities

  - Water Supply System

    Since there is no public water service available near the project site, rain water will be used for drinking water and reservoir or underground water will be used for low quality water. The rainwater will be stored in water tanks by collecting them through the eaves of the cafeteria and the office and training building. Water tanks will be set at both sides of the administration building. For Mahasarakham Nursery Center, a water tank will be placed at the cafeteria in addition to the above.

    As for low quality water, reservoir water will be used for Mahasarakham Nursery Center and Udonthani Nursery Center, and underground water will be used for Nakhon Ratchasima Nursery Center and Yasothon Nursery Center. The water will be pumped from each water resources to each elevated tank. From there, water will be supplied to the administration and training building and workshop by gravity. The capacity of the elevated tank will be 9 ~ 10 m^3 and its height will be 20 ~ 30 m in order to obtain sufficient water pressure.

  - Drainage System

    Since there is no sewerage system available in the proposed sites, waste water from the toilet will be collected into the septic tanks and treated water from the tanks will be penetrated into the soil at the penetration pit. Waste water from other places will be collected at the penetration pits and will be penetrated into the soil.

    Since it is likely that during the rainy season the rate of penetration will decrease due to the high water content of the soil, overflow pipes will be laid at the penetration pits in order to discharge it into rain water drain.

The overflow pipes will be PVC pipes or its equivalent. There will be no drain pipe for rainwater around the buildings, rainwater will be naturally drained.

A grease trap for the kitchen waste water and a gasoline trap for the workshop waste water will be installed.

- Sanitary Fixture Installation

The following sanitary fixture which fits in with the local customs will be installed;

Toilets: Water closets, urinals, wash basins and service sinks

- Kitchen Equipment Installation

Kitchen equipment suitable for the cook of the local food will be installed. According to the available space, a refrigerator, a dresser, a dish rack and so on will be installed.

- Gas

LP gas will be supplied to the kitchen. The gas cylinders are stored in the exterior near the kitchen.

- Fire Fighting System

Fire extinguishers will be provided for the office and training building, workshop, kitchen, storage house, etc. The capacity and specification of the fire extinguishers will follow Thai standards.

5) Building Materials Plan

Since most of the building materials regarding the Project are available in Thailand, local building materials which comply with TIS (Thai Industrial Standards) will be used. Upon consideration of the local construction situation and cost, local climate and customs, the local materials which are reasonable and durable are encouraged to be used for the building material plan.

° Structural Materials

The structural materials will be those which can be manufactured locally and fit in well with the planned combination of the reinforced concrete structure and the brick walls. Locally manufactured cement, aggregate

reinforcing bars, concrete blocks and bricks pose no problem in terms of product quality and quantity supplied.

However, due to construction boom in the metropolitan area, it is necessary to consider the amount of time required for the delivery from the order.

- External Finishing Materials

  - Roof

    Tile roofs will be used for the office and training building because of its popularity and easiness of procurement in the project sites. Sloped roof is designed in order to facilitate rain water drain during heavy rains, to allow natural ventilation and to enhance heat insulation for the prevention of the upper floor from heating. Corrugated slate roof will be applied to the nursery facilities because of its easy availability in the Project sites.

  - External Walls

    External walls will be made from locally popular concrete blocks and will be finished by applying paint spray after mortar coating.

- Internal Finishing Materials

  - Floor

    In order to protect the floor from inundation during heavy rains and to enhance natural ventilation under the floor, the height of the ground floor will be 1 m above ground level.

    The flooring materials for the lecture room and laboratory will be terrazzos, and P - tile for the administration section room and the meeting room. The floors of the generator house and the workshop will be coated with the inexpensive and highly durable steel trowel concrete.

  - Internal Walls

    Reinforced concrete walls and brick walls will be coated with steel troweled mortar on which paint will be applied. Walls of lavatories and kitchenette will be coated with ceramic tiles beause of its highly waterproof quality. Walls of the workshop and storage house will be coated with mortar in consideration of its low-price and durability.

Finishing materials for the baseboards will be selected from among terrazzo, cement mortar and paint, taking into account the durability and waterproofings required.

- Ceilings

Basically, locally popular system ceilings and use rock boards will be applied. However, calcium silicate boards which are highly resistant to water will be used for toilet ceilings.

- Doors and Windows

Basically, doors facing outside will be aluminum-framed and those inside will be wooden. Aluminum-framed sliding windows will be applied. For security purposes, steel grille will be also installed in the rooms on the ground floor.

- Plumbing Facilities

For water supply pipes, galvanized steel pipes or rigid polyvinyl chloride (VP) pipe which are strong at rusting and deterioration will be used. For waste water pipes, VP pipes or PVC (polyvinyl chloride) pipes will be applied too. With one consideration to public health, a grease trap for the kitchen waste water will be installed.

◦ Lighting Facilities

Lighting fixtures will mostly be fluorescent lights and will be basically surface mounted or recessed. However, lighting fixtures of the entrance hall will be down lights in order to present a fine spectacle of the building. Code pendant light fixtures will be used for the cafeteria of Mahasarakham Nursery Center.

(2) Nursery Facilities

1) Closed Nursery(Germination House) (20×40m=)800m^2, 2 Units)

Each unit is provided with 2m wide central path and 25 germination beds (1 m wide and 9m long with inside measurements of 0.86m in width and 8.86m in length) are installed on each side of the central path. The bed frame is made of concrete blocks and is 30cm above the ground. Three foundation layers, i.e. gravel and small gravel layers (each 5 cm tick) and river sand layer (15cm thick), and a work path of 0.5 m in width is provided between the beds. The germination house is 2.5 m in height, and the side walls have a concrete block bottom up to 80 cm in height and a wire net above these blocks. A shading net with a shading rate of 50% is used as the roof. The net is fixed with hooks so that it can be removed manually when necessary. The 2.5m high pole pipes are vertically erected on the floor at 4m by 5m intervals. The top ends are assembled to horizontal pipes to make a grid pattern to support the shading net above it. A mixed mist sprinkler system is installed at a height of 2m to conduct watering.

2) Vinyl House (6m × 25m=150m^2, 2 Units) (Only for Mahasarakham Nursery Center)

The vinyl house has a dome shape with a height of 3m. The side walls have a concrete block bottom up to 80 cm in height and reversed U shape pipes are erected on top of the block walls to form the dome. A thick, transparent vinyl sheet is placed on the dome and fixed. An entrance is provided at both ends of the house and 2 ventilation fans (a total of 4) are installed above each entrance to lower the house temperature. A shading net with a shading rate of 50% is placed directly on top of the vinyl sheet and fixed. The shading net is removed manually when not required. The net is 2m wide to facilitate its placement and removal. Three rows of Hiko block stands are established in each unit. The stand measurements are 1m in width, 21m in length and 0.65m in height. The foundation is made of concrete blocks. A wire net is placed on top of the foundation with 4 Hiko blocks (50m × 50m each) placed at every square meter. The work path between the stands is 1m wide. A mist sprinkler is installed above each stand and through the free fall mist sprinkling method the relative humidity within the house will be maintained at 70 – 100%.

3) Open Nursery (Nursery Beds for Potted Seedlings) (20m × 40m=800m^2, 50 Units)◦ Nursery Bed with Fixed Bed Frames

Fixed bed frames made of 2 layers of bricks are built for the 26 units at the Mahasarakham and Udonthani Nursery Centers and for the 24 units at the Nakhon Ratchasima and Yasothon Nursery Centers. The bed floor is flatly compacted. The bed floor height is 6 – 7cm and the standard internal measurements of the frame are 1m by 9m. The path between the beds is 0.6 m wide. A total of 44 beds (4 lines by 11 rows) are set up in one unit. Three water tanks for watering (internal measurements: 1m wide × 1m long × 1.2m deep) are installed along the central path, shortening the internal length of the neighboring bed frames to 8.8m (3 frames) or 7.7m (3 frames). Each unit consists of the following frames.

Measurements

1m wide × 9m long	38 beds	(bed area: 342m^2)
1m wide × 8.5m long	3 beds	(bed area: 25.5m^2)
1m wide × 7.7m long	3 beds	(bed area: 23.1m^2)
Total 44beds		(bed area: 390.6m^2)

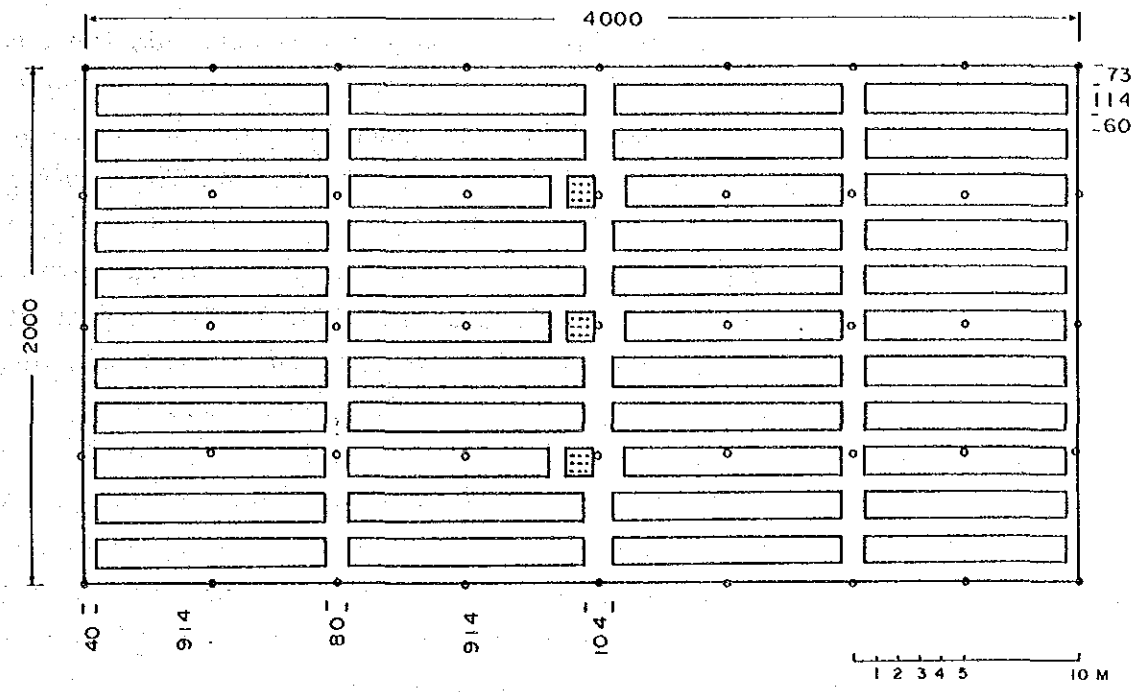
Open Nursery Beds with frames are shown in Fig 4-2-3.

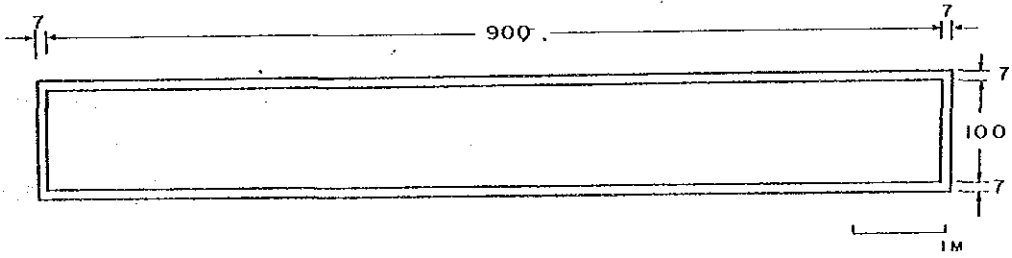
– Nursery Bed without Fixed Bed Frames

These unfixed bed frames are used for the 24 units at the Mahasarakham and Udontahani Nursery Center and for the 26 units at the Nakahonratchasima and Yasothon Nursery Centers. The floor is flatly compacted and the bed frame size is flexible to cater for pots of different sizes and different bedding materials. However, 3 water tanks are installed in each unit with fixed bed frames.

◦ Shading Facilities

Sunshine control is conducted by the high cover system using a black shading net with a shading rate of 50%. Two meter high iron pole pipes are vertically erected on the ground at 5m intervals and the top ends are assembled to 5m long rod pipes with T-junction pipes, X-junction Pipes and L-junction pipes to form a 5 m by 5 m mesh pipe grids. Shading nets are combined together to make a sheet of 10 m × 20 m with hooks attached around it. These hooks are hooked onto the pipe frame to fix the net. The net is removed manually to place the nursery stocks under the sunshine to make them stronger.





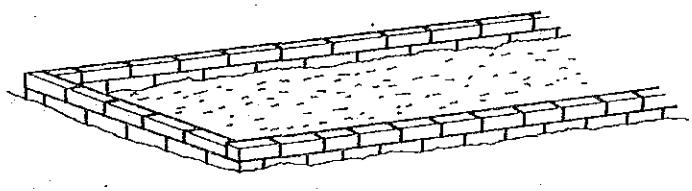


Fig. 4-2-3 Nursery Bed with Fixed Bed Frames

4) Potting House (12m × 40m = 480m^2, 1 Unit)

The potting house is 4m in height and is largely separated into the medium preparation area and the soil potting area. The floor is concrete throughout. The medium preparation area is further divided by concrete walls for the storage of sifted soils, sand, husk, compost and crushed coconut husks, etc. Three mixers are provided at the medium mixing pit to prepare the medium based on the given mixing ratios. The prepared medium is sent to the medium storage room by 3 conveyors. This concrete floor medium storage room (7m ×11m) is encircled by 2m high concrete walls and the floor is tilted towards the feeding side (next to the soil potting area). The floor height at the intake side is 1.5m while the floor height at the feeding side is 0.5 m. Two feeding outlets are provided on the feeding side. The soil potting area is 22 m by 12 m and 2 conveyors are set against the feeding outlets. The workers sit on chairs with tables in front of them on both sides of these conveyors and pick up the medium from the trays on the conveyor belts for filling into plastic pots. These pots are placed into seeding containers. The fully loaded seeding containers are forwarded to one side of the potting house by 3 conveyors located on opposite sides of the medium conveyors and are transported to the open nursery by wheel loaders. The potting house consists of a concrete floor, pillars and a roof with no walls. A concrete floor of 10 m by 15 m is provided next for the potting house to miscellaneous works, including seed drying work.

5) Compost House (10m × 8m = 80m^2, 1 Unit)

The floor area of 8 m in length and 10 m in width is surrounded by 2.5 m high concrete walls. An entrance of 5 m in width is made in the 10m wide section. The floor is concrete. A roof with eaves at a height of 4.1 m is set against pillars to complete the compost house.

6) Storage House (15m × 10m = 150m^2, 1 Unit)

The entrance and the exit are both wide to facilitate the taking in and out of tools, machinery and materials.

7) Seed Solar Dryer f(189" × 154.5" = 4.8m × 3.9m = 18.72m^2, 1 Unit)

This dryer is assembled with a wood frame and a glass above a concrete floor of 7m by 6m (42m^2). The height of the tilted section ranges from 10.0" (0.245m) to 30.0" (0.762m). The section with drawers with a wire net bottom in which the pods containing seeds are dried is 60" (1.524m) high, and a 27" (0.686m) high ventilation passage (with a roof) is built into this section.

(3) Other facilities

1) Irrigation facilities

Calculation of water requirement

Water requirement is determined in such a way that the peak daily evapotranspiration is calculated from pan evaporation and pan coefficient which may be influenced by climate and pan environment.

$$ETo = KpEpan$$

Where ETo : Reference crop evapotranspiration in mm/day

Epan : Pan evaporation in mm/day

Kp : Pan coefficient

According to the meteorological data given in Table 4-1-1, the peak value of daily evaporation is observed in April showing 7.22mm in Mahasarakham, 6.4mm in Nakhon Ratchasima, 6.46mm in Udon Thani and 7.02mm in Yasothon. In consideration of the relative humidity and wind conditions of the project area the appropriate value of Kp will be 0.85. Based on the above formula, the ETo of each site are calculated as follows:

Mahasarakham	6.14mm/day
Nakhon Ratchasima	5.44mm/day
Udonthani	5.49mm/day
Yasothon	5.97mm/day

After determining ETo, designed evapotranspiration (ET crop) can be predicted using the appropriate crop coefficient (Kc). Kc value differs according to seedling variety and seeding period. It is assumed to be 1 in this case, so that the values for ETo can be considered to be ET crop or consumptive use. In determining the designed consumptive use, it is necessary to take into account some safety allowances. From this point of view the value of Mahasarakham is judged to be most reasonable to represent the required quantity of water for each project site because it shows the highest value which allows for safe factors to the calculated values. Assuming that the irrigation efficiency is 85%, water requirement (Q) for each nursery facility can be obtained from;

Q = (designed consumptive use) × (area of irrigation) ÷ 0.85

Thus,

Open nursery : 0.00614 × 390.6 × 50 ÷ 0.85 = 141m^3

Closed nursery : 0.00614 × 800 × 2 ÷ 0.85 = 11.6m^3

Vinyl house : 0.00614 × 150 × 2 ÷ 0.85 = 2.2m^3

As a result of the above calculation, the required quantity of water per day totals 154.8m^3.

Water resource

Since the reservoir is considered to be the water resource for the nursery centers of Mahasarakhama, Nakhon Ratchasima and Yasothon, a pump station shall be constructed at an appropriate place at each site to deliver nearly 160m^3 of water to the distribution tank. A pair of pumps to operate four hours daily will be installed.

In the case of Yasothon ground water shall be developed in order that irrigation water may be conveyed to the distribution tank by a submergible pump which should be installed in a well of 50m deep and 150mm in diameter. The pump is designed to be operated for 9 hours per day. The location of the well and its discharge shall be defined according to the result of the study on the detailed design stage.

Pumps to be used for water resource development are specified as follows;

	Mahasarakham	Nakhon Ratchasima	Udon Thani	Yasothon
Dia(mm)	65	65	65	65
Discharge(m^3/m)	0.33	0.33	0.33	0.3
Total head(m)	25	27	12	40
Motor Cap.(Kw)	3.7 × 2	3.7 × 2	2.2 × 2	5.5

Tank capacity

Tanks shall be built of reinforced concrete and designed to store required quantity of water for one day. Distribution tank shall have an effective capacity of 160m^3 (see Fig. 4-3-4). Each open nursery unit requires three tanks with an effective storage capacity of 1m^3 (see Fig. 4-3-5), and tanks that can hold 11.6m^3 and 2.2m^3 for closed nursery and vinyl houses. Furthermore, thecompost house also needs a tank with a capacity of 2.2m^3.

Irrigation System

Two pumps with 3.2KW motor each designed to operate alternately will apply pressure to the distribution tank in order to deliver water to each segment of nursery. Hard polyvinyl chloride pipes will be laid underground to connect the tanks. the diameter of the pipes will be defined as design velocity is 0.5~1.0m/sec.

In view of the irrigation efficiency as well as the maintenance cost, watering system at the open nursery shall be carried out manually. In this case the maximum walking distance for watering will not be more than 23m. Watering will be carried out twice a day, in the morning and in the afternoon.

It is necessary to reduce the sprinkling intensity for the closed nursery and the vinyl house to the minimum possible so that pumps can be installed at the storage tank to apply enough pressure to the water to conduct mist spraying through the overhead nozzles. A pair of pumps can be alternately operated for this purpose, and their specifications are as follows;

Unit diameter	:	32mm
Suction diameter	:	40mm
Discharge	:	180ℓ/min
Discharge pressure	:	45m
Motor Capacity	:	3.7kw

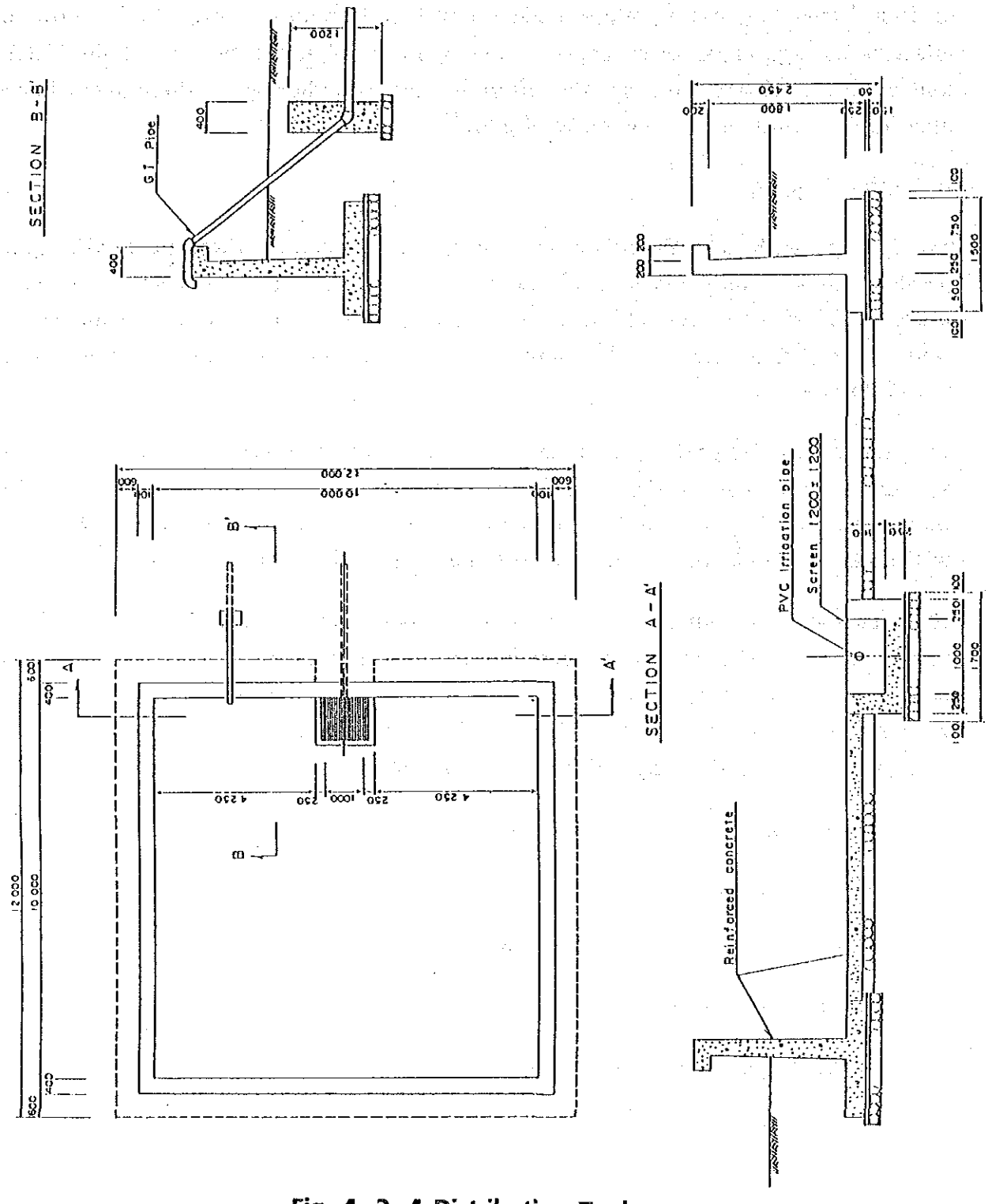


Fig. 4-3-4 Distribution Tank

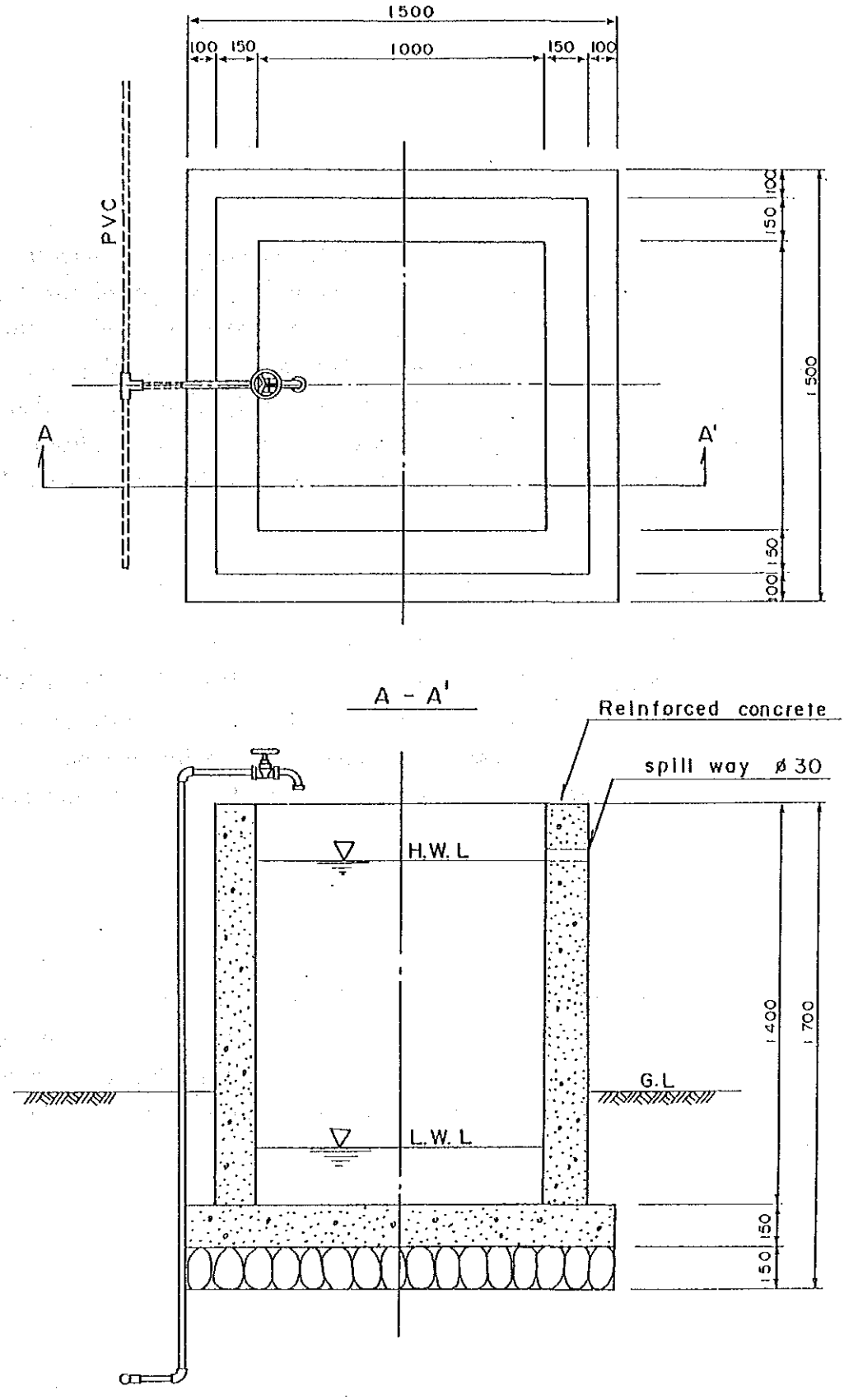


Fig. 4-3-5 Water Tank of Open Nursery

2) Other Appurtenant Facilities

Road

a. Access Road

For the smooth and safety traffic of the vehicles and heavy machineries an access road with an effective width of 4m and a total width of 6m shall be designed. A crushed stone of 40mm in maximum size shall be laid on the lower bed and be well compacted. The finished surface shall be gravel paved with a thickness of 10m. Earth made drain ditches are provided on both sides of the road in order to evacuate run - off in the rainy season. The longitudinal gradient of ditches shall be less than 1%, and drop structures will be required as the case may be.

b. Work Road

Although a width of 8.6m is provided for road spacing, in view of the economic aspect and work efficiency, the total width shall be 4m of which 3m are supposed to be effective width. Road surface shall be paved with gravel sizing from 0 to 40mm requiring a thickness of 15cm after being compacted in the proper way. The cross sections of both access road and work road are shown in Fig. 4-3-6.

Drainage Facilities

In road crossing sections, concrete hume pipes of 400mm in diameter shall be laid to drain rain water. The earth coverage above the pipe will be 1m thick. It is necessary that concrete boxes are to be installed to connect drain pipe at both ends. Water collected by ditches shall be released from the site as soon as possible through underground drain pipe, and be discharged to the natural drain system at the extreme end.

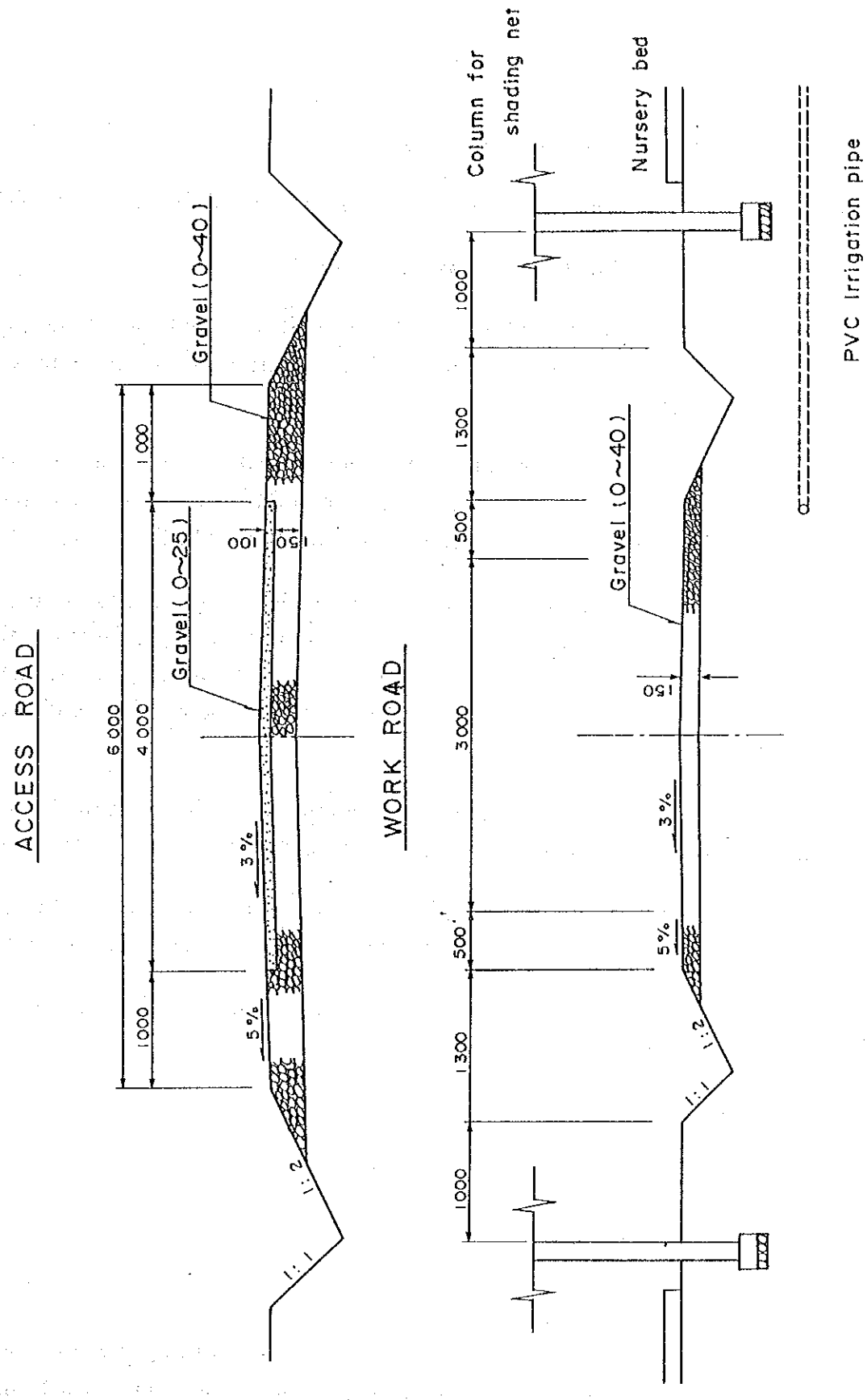


Fig 4-3-6 Typical Cross Sections of Access Road and Work Road

4-3-3 Equipment Plan

(1) Policy for the Selection of Equipment

The following specific requirements should be considered for the equipment plan.

1) To be simple, durable and easy to maintain.

2) To reduce the running cost in order to avoid insufficient use of the equipment and machinery due to the difficulty of the operation and maintenance; i.e. due to economic reasons.

3) To have an optimum number of equipment and machineries to attain the Project objectives and to consider considering their common and substitutional use in order to avoid excess supply and idle equipment.

4) Equipment and tools for the laboratory which require advanced technical knowledge in handling and operation should not be selected. With the exclusion of the research and development purpose, only those which are suitable for the test required for the seedling production and plantation should be selected.

5) The machineries for forest road construction should be suitable for the forest road width which is less than 6 meters according to the RFD standard.

6) Equipment and tools for use in the workshop should be those mainly necessary for the preventive maintenance of the vehicles and machinery.

The equipment, tools and machines selected in accordance with the above criteria are described in item (2) List of Equipment.

(2) List of Equipment

–For Mahasarakham Nursery Center–

1) Equipment and Tools

① For Nursery

In order to transport and to distribute five million seedlings per year within 120 days, the number of seedling container is determined as 500. Two hundred fifty units of potting stands are to be provided for the work on the two units of vinyl houses. These potting stands will be supplied in Thailand to curtail expenses.

NO	ITEMS	SPECIFICATION	Q/UNIT
	For Seed collection		
1	Safety Belt	With rope chuck	4
2	Tree Climber System	For tree climbing belt, steps and hanger	4
3	Single-strut Sectional Ladder	≧ 6 m	1
4	Pruning Saw	With long handle	4
5	Automatic Camera	35 mm AF camera	1
	For Nursery Activities		
6	Seedling Container	Inside dimensions; ≧ 780 * 470 * 500 mm	500
7	Potting Stand	Container set made of polyethene using Hiko system	250
8	Knock-down Nursery	20m * 20 m * 2 m * 2, metal pole ø=1.5″	10
9	U-shape Shed Net	To be fixed with metal wire string	100
10	Knap-sack	Pack pump chemical sprayer, Capacity; ≧ 10 liters	5
11	Power Sprayer	Gasoline engine ≧ 3 HP, with 1 tank and ø 1/2″ high pressure hose	1
12	Plastic Sealer	Sealing dimensions (W=2~5 mm, L=30 cm)	1
13	Grain Sieve Set	5 sieves, ø=120 mm	1
14	Soil Sieve Set	4 sieves, ø=200 mm	2
15	Meteorological Equipment Set	Max-Min thermometer, rain gauge, evaporation pan, moisturemeter, anemometer, thermo-hygrograph, aneroid barograph and all are non-automatic type and instrument shelter	1

② For Plantation

VHF/FM transceiver set is supplied for each pick-up truck, and the total sets are three.

NO	ITEMS	SPECIFICATION	Q/UNIT
	For Forest Fire Control System		
1	Back-pack Pump	Tank capacity; ≧ 18 ℓ	15
2	VHF/FM Transceiver Set	3 synthesizer walky-talky (5 w) and 1 car-transceiver (30 w)	3

NO	ITEMS	SPECIFICATION	Q/UNIT
	For Surveying		
3	Hand Level Compass	With arc for vertical type	2
4	Compass Set	Telescope length; ≧ 120 mm, tripod; wood staff; L=3 m	2
5	Binocular	Magnification; 7 X	2
6	Planimeter	Roller type	1
7	Measuring Tape Set	50 m and 100 m nylon coated steel measuring tapes	6
8	Diameter Tape	PVC coated fiberglass, L=10 m	6
9	Measuring Pole	L=3 m 3 sections	3
10	Drafter Set	A drafter, stand, board, lamp and chair	1

③ For Administration and Extension

In order to communicate with the other three centers, an SSB (single side band) transceiver is to be supplied.

NO	ITEMS	SPECIFICATION	Q/UNIT
	For Office		
1	Electric Typewriter	Thai-English	1
2	Electronic Calculator	AC 220V, 12 figures used on a table	1
3	Automatic Copying Machine	220 V copying machine with accessory can reduce and enlarge with speed at 25 papers/min. at A4 size	1
4	White Board	Width ≧ 1,800 mm, Height ≧ 900 mm	5
5	Facsimile Machine	AC 220 V, Effective image width; ≧ 11″	1
	For Extension		
6	Single Side Band Transceiver	For trans-communication to remote station	1
7	Walkie Talkie (FM)	For mobile unit of extension	6
8	Personal Microcomputer Set	32 bit IBM compatible computer with printer 60 MB hard disk, table, chair and floppy disk drive with AVR and UPS	1
9	Sound System for Field Extension	≧ 30 W wireless amplifier with speaker	1

④ For Workshop

NO	ITEMS	SPECIFICATION	Q/UNIT
1	Gas Cutting Tool and Regulator	Gas welding and cutting tool, regulator for oxygen, etc.	1
2	Vernier Caliper	0 - 300 mm, min. 0.05 mm	2
3	Mechanic Kit for Heavy Machine	Open end wrench, socket wrench, etc.	1
4	Hand Tool Set	Tool set for field maintenance	1
5	Tool Cabinet Set	For small vehicle	2
6	Garage Jack 10 tons	Air-hydraulic type 10 tons	1
7	Garage Jack 18 tons	Air-hydraulic type 18 tons	1
8	Portable Jack 2 tons	Portable hydraulic type 2 tons	2
9	Portable Jack 5 tons	Portable hydraulic type 5 tons	2
10	Portable Jack 7 tons	Portable hydraulic type 7 tons	2
11	Portable Air Compressor	Working pressure ; 5.5~7.0 kgf/cm^2	1
12	Electric Air Compressor	Working pressure ; 8.0~9.9 kgf/cm^2	1
13	Parts Washing Stand	Tank capacity; oil $\geqq$ 120 ℓ, water $\geqq$ 85 ℓ	1
14	Car Washer	Water pressure ; 20 - 100 kg/cm^2	1
15	Engine Cleaning Gun	L $\geqq$ 500 mm with oil hose	1
16	Air Blow Gun	L $\geqq$ 160 mm	1
17	Grease Gun	$\geqq$ 500 cc, 500 kg/cm^2	1
18	Electric Welding Set	$\geqq$ 24 KVA	1
19	Grinder	Electric bench type	1
20	Drilling Machine	Floor type	1
21	Electric Drill	Portable type	1
22	Portable High Speed Grinder	Diameter ; $\geqq$ 180 mm	1
23	Electric Cutting Grinder	$\geqq$ 1.5 KW	1
24	Battery Charger	12 - 24 V, 0 - 100 A	1
25	Carpenter Tool Set	Including electric saw, wood drill, etc.	1
26	Electric Tool Set	Portable type	1
27	Universal Puller Set	Gear puller, terminal puller, etc.	1
28	Fuel and Oil Station	Two 3000 ℓ capacity fuel tanks both for gasoline and diesel with electric pump	1
29	Fire Extinguisher	Weight ; $\geqq$ 40 kg	1
30	Water Tank and Pump	For car washer and parts washing stand, tank capacity ; $\geqq$ 2 m^3	1

⑤ For Laboratory

NO	ITEMS	SPECIFICATION	Q/UNIT
	For Nursery Laboratory		
1	Table	Dimension ; ≧ 1500 * 900 * 800 mm	2
2	Cabinet	Dimension ; ≧ 1200 * 400 * 1800 mm	3
3	Stool	ø ≧ 310 mm with caster	16
4	Stainless Square Tray (Small)	Dimension ; ≧ 290 * 330 * 45 mm	25
5	Stainless Square Tray (Big)	Dimension ; ≧ 465 * 610 * 100 mm	10
6	Shears	Length ; ≧200 mm	25
7	Scissors	Blade length ; ≧195 mm	25
8	Budding Knife	Length ; ≧200 mm	12
9	Prunning Tools	Prunning scissors and saw with spare blades	12
10	Thermostatic Germinator	Dimension ; ≧ 900 * 600 * 800 mm	1
11	Electric Balance	Capacity ; ≧ 60 kg, sensitivity ; 1 g	1
12	Seed Divider	Capacity ; 1500 - 2000 g, 200 W	1
13	Stainless Bucket	Size ; Ø ≧ 39 * 39 cm, capacity ; ≧ 45 ℓ	10
14	Refrigerator	Capacity ; ≧ 400 liter	2
15	Portable Lux-meter	Measuring range ; 0 - 300 / 0 - 2000 L X 0 - 30000 / 0 - 200000 L X (with filter)	1
16	Dry Oven	Temp. range ; 50 - 250 ℃	
		Dimension ; ≧ 600 * 500 * 500 mm	1
17	Wood Calliper	Measuring range ; ≧ 45 cm	4
	For Plantation Laboratory		
18	Field pH Meter	Measuring range; pH ; 0 - 14, DC 9V	1
19	pH Meter	pH ; 0 - 14, 0±0.01 pH = 1 digit	1
20	Soil Sampling Trowel Set	Trowel, folding scale and hand lens	1
21	Soil Sampling Cylinder Set	100 mℓ×6pcs.	1
22	Standard Soil Sample for Soil Texture Class	Six standard soil samples; sandy soil, sandy loam, loam, clay loam, clay and fine clay each 100 mℓ	
23	Soil Moisture Meter Tester	Measuring method; electric resistance method, DC 1.5 V	1 1
24	Soil Acid Tester	Measuring range; pH ; 3.5 - 8.0	1
25	Soil Saline Tester	Measuring accuracy; 0.05 %	1
26	Soil Nutrient Tester	For pH, ammonia nitrogen and nitrate nitrogen, etc.	1
27	Electric Conductivity Meter	Measuring range ; 0~199 µS:0~1.99 mS ; 19.9 mS/cm	1

NO	ITEMS	SPECIFICATION	Q/UNIT
28	Balance Set	0.1 mg resolution, capacity of 180 g	1
29	Hot Plate	Operating temperature range; 70 - 250 °C	1
30	Oven	Dimension ; ≧ 600 * 500 * 990 mm	1
31	Water Filter System	Carbon Cartridge Type	1
32	Distillation Apparatus	Distillated water capacity; ≧ 1.8 ℓ/hr	1
33	Soil Sieve Plate	Frame diameter ; ≧ 200 mm, 12 sieves	1
34	Sieving Machine	7 sieves with a pan and cover	1
35	Tensiometer	With manometer measuring range ; 0~ - 1 kgf/cm^2	1
36	Furnace	Operating temperature range; 200~1100°C	1
	<u>For Pathology Laboratory</u>		
37	Clean Bench	Laminar flow type vertical, air volume 20 m^3/min,	1
38	Incubator	Operating temperature range; +4~50°C Max. 23000 ℓx	2
39	Autoclave	Temperature; 60 - 132 °C, Pressure; 0 ~ 1.9 kg/cm^2	1
40	Compounding Microscope	Photomicrographic system with accessory	1
41	Stereomicroscope	Zoom stereomicroscope	1
42	Sliding Microtome	Sliding way length ; ≧ 400 mm	1
43	Microtome Knife Set	3 kinds of knives	2
44	Scalpel Set	Material ; stainless	1
45	Knife Sharpener	Griding range ; 80 ~ 250 mm, thickness ; 7.5 ~ 14 mm	1
46	Balance Set	0.1 mg, resolution, capacity ; ≧200 g	1
47	Refrigerator	For chemical storage	1
48	Stainless Basket	≧ 210 * 120 * 80 mm	4
	<u>For Extension and Training Laboratory (Main Center)</u>		
49	Camera with Accessory	Camera Body, tripod, flash, etc.	1
50	Slide copier	Bellows Focusing Attachment and others	1
51	Copying Stand	Macro Copy Stand, Lighting unit, etc.	1
52	Slide Projector	Carousel slide tray and manual control	1
53	Screen	≧1500 * 1500 mm with stand	1
54	TV Set	29″ Monitor, Multi System Deck,	1
55	Audio-system	120 W AMP, with acoustic speaker and loud speaker	1
56	Overhead Projector	With Zoom Mechanism	1

NO	ITEMS	SPECIFICATION	Q/UNIT
	For Glass Ware		
57	Test Tube	≧35 mℓ	1000
58	Test Tube Rack	Capacity ; 20 pcs	50
59	Petri Dish	ø 75 mm * 20 mm (H)	800
60	Small Vials	Capacity ; 3 mℓ	500
61	Reagent Bottle with Glass Stopper	Capacity ; 500 mℓ	12
62	Graduate Pipette Set	1, 2, 3, 5, 10 cc	40
63	Thermometer	0 °C ~ 200 °C	20
64	Cylinder	100 mℓ	2
65	Medicine Dropper	5 mℓ	50
66	Glass Rod	ø 6 × 275 mm	40
67	Beaker Set	50, 100, 200, 500, 1000, 2000 cc	20
68	Beaker	5 mℓ	20
69	Forceps	Material ; Stainless	50
70	Slide & Cover Glass	Slide ; ≧ 75 * 25 mm, cover glass ; ≧ 18 × 24 mm	200
71	Wash Dish	ø 90 mm	10
72	Flask Set	50, 100, 200, 500, 1,000 mℓ	10
73	Spatula Set	Small, middle, big	10

2) Machinery

① Heavy Machine

NO	ITEMS	SPECIFICATION	Q/UNIT
1	Bulldozer (large)	≧ 160 HP with blade (dozer), rake, ripper	1
2	Wheel Loader	≧ 80 HP with bucket ≧ 1.2 m^3, backhoe	1
3	Hydraulic Excavator	≧ 115 HP with bucket ≧ 0.7 m^3, cab with air condition, rock breaker	1
4	Dump Truck	Payload ≧ 6 ton	1
5	Truck for Transportation with crane	Payload ≧ 4 ton, crane capacity ≧ 2 tons	1
6	Truck for Transportation without crane	Payload ≧ 4 ton	1
7	Water Tank Truck	Tank capacity ≧ 6,000 ℓ	1
8	Farm Tractor (large)	≧ 80 HP with 3 disk plow, 7 disk plow, rotaslusher for weeding	1

② Vehicle

NO	ITEMS	SPECIFICATION	Q/UNIT
1	Pick-up Truck (Small)	Extra single cab with air conditioned diesel engine ≧ 80 HP	2
2	Pick-up Truck (4 WD)	Double cab with air conditioned diesel engine ≧ 85 HP	3
3	Motorcycle	≧ 125 cc mountainous type	2
4	Station Wagon	4 WD diesel engine ≧ 125 HP with air con.	1
5	Microbus	Seating capacity ; ≧ 25 persons	2

③ Others

NO	ITEMS	SPECIFICATION	Q/UNIT
1	Generator (Small)	≧ 1.9 KW	8
2	Seed Scarifier Machine	Capacity ; 10 - 20 kg/hr with gasoline eng.	1
3	Coconut Husk Crusher	≧ 22 KW, chip size ; 10 - 45 mm	1
4	Soil Sieving Machine	Sieving frame ; ≧ 1750 * 500 mm, 0.75 KW	2
5	Belt Conveyer	5 meters	3
6	Roller Conveyor	100 meters per center	1
7	Soil Mixture Machine	Capacity ; ≧ 0.1 m^3	3
8	Water Pump	Gasoline engine ; ≧ 5 HP, outlet ; 3″ total head ; ≧28 m	15
9	Chain Saw	Bar length ≧ 20″	2
10	Brush Cutter	Tank capacity ; ≧0.6 ℓ	12
11	Cutter Blade	For brush cutter (saw type)	100
12	Saw Grinder	For brush cutter	1
13	Soil Sterilizer	Capacity; 2 - 5 ton/hr. 1.75 KVA	1
14	Vibrating Plate Compactor	≧ 80 kg, Vibrating frequency ; ≧ 5800 rpm	1

–For Nakhon Ratchasima Nursery Center, Udonthani Nursery Center and Yasothon Nursery Center–

1) Equipment and Tools

① For Nursery

In order to transport and to distribute five million seedlings per year within 120 days, the number of seedling container to be supplied for each center is determined as 500.

NO	ITEMS	SPECIFICATION	Q/UNIT
	For Seed Collection		
1	Safety Belt	With rope chuck	4
2	Tree Climber System	For tree climbing belt, step and hanger	4
3	Single-strut Sectional Ladder	≧ 6 m	1
4	Pruning Saw	With long handle	4
5	Automatic Camera	35 mm AF Camera	1
	For Nursery Activities		
6	Seedling Container	Inside Dimensions; ≧780 * 470 * 500 mm	500
7	Knock-down Nursery	20 m * 20 m * 2 m * 2, metal pole ø=1.5″	10
8	U-shape shed Net	To be fixed with metal wire string	100
9	Knap-sack	Pack pump chemical sprayer, Capacity; ≧ 10 liters	5
10	Power Sprayer	Gasoline engine ≧3 5 HP, with 1 tank and ø1/2″ high pressure hose	1
11	Plastic Sealer	Sealing dimensions (W=2 ~ 5 mm, L=30 cm)	1
12	Grain Sieve Set	5 sieves, ø=120 mm	1
13	Soil Sieve Set	4 sieves, ø=200 mm	2
14	Meteorological Equipment Set	Max-Min thermometer, rain gauge, evaporation pan, moisturemeter, anemometer, thermo-hygrograph, aneroid barograph and all are non-automatic type and instrument shelter	1

② For Plantation

VHF/FM transceiver set is supplied for each pick-up truck.

NO	ITEMS	SPECIFICATION	Q/UNIT
	For Forest Fire Control System		
1	Back-pack Pump	Tank capacity; ≧ 18 ℓ	15
2	VHF/FM Transceiver Set	3 synthesizer walky-talky (5 w) and 1 car-transceiver (30 w)	3
	For Surveying		
3	Hand Level Compass	With arc for vertical type,	2
4	Compass Set	Telescope length; ≧120 mm, tripod; wood, staff; L=3 m	2
5	Binocular	Magnification; 7 X	2
6	Planimeter	Roller type	1
7	Measuring Tape Set	50 m and 100 m nylon coated steel measuring tapes	6
8	Diameter Tape	PVC coated fiberglass, L=10 m	6
9	Measuring Pole	L=3 m 3 sections	3
10	Drafter Set	A drafter, stand, board, lamp and chair	1

③ For Administration and Extension

In order to communicate with the other three centers, an SSB (single side band) transceiver for each center is to be supplied.

NO	ITEMS	SPECIFICATION	Q/UNIT
	For Office		
1	Electric Typewriter	Thai-English	1
2	Electronic Calculator	AC 220 V, 12 figures used on a table	1
3	Automatic Copying Machine	220 V copying machine with accessory can reduce and enlarge with speed at 25 papers/min. at A4 size	1
4	White Board	Width ≧ 1,800 mm, Height ≧ 900 mm	5
5	Facsimile Machine	AC 220 V, Effective image width; ≧ 11″	1

NO	ITEMS	SPECIFICATION	Q/UNIT
	For Extension		
6	Slide Projector	Carousel slide tray, manual control	1
7	Screen	≧ 1500 * 1500 mm with stand	1
8	Over-head Projector	220 V, elevation angle 20°, portable type	1
9	Television Set	25″ , multi system, video deck, TV rack	1
10	Camera with Accessory	Camera, flash light, tripod, component case	1
11	Single Side Band Transceiver	For trans-communication to remote station	1
12	Walkie Talkie (FM)	For mobile unit of extension	6
13	Personal Microcomputer Set	32 bit IBM compatible computer with printer, 60 MB hard disk, table, chair and floppy disk drive with AVR and UPS	1
14	Sound System for Building	Lecture room sound system, ≧ 30 W	1
15	Shoulder Type Megaphone	≧ 30 W	1
16	Sound System for Field Extension	≧ 30 W wire-less amplifier with speaker	1

④ For Workshop

NO	ITEMS	SPECIFICATION	Q/UNIT
1	Gas Cutting Tool and Regulator	Gas welding and cutting tool, regulator for oxygen, etc.	1
2	Vernier Caliper	0 - 300 mm, min. 0.05 mm	2
3	Mechanic Kit for Heavy Machine	Open end wrench, socket wrench, etc.	1
4	Hand Tool Set	Tool set for field maintenance	1
5	Tool Cabinet Set	For small vehicle	2
6	Garage Jack 10 tons	Air-hydraulic type 10 tons	1
7	Garage Jack 18 tons	Air-hydraulic type 18 tons	1
8	Portable Jack 2 tons	Portable hydraulic type 2 tons	2
9	Portable Jack 5 tons	Portable hydraulic type 5 tons	2
10	Portable Jack 7 tons	Portable hydraulic type 7 tons	2
11	Portable Air Compressor	Working pressure; 5.5~7.0kgf/cm^2	1
12	Electric Air Compressor	Working pressure; 8.0~9.9kgf/cm^2	1
13	Parts Washing Stand	Tank capacity; oil ≧ 120 ℓ, water ≧ 85 ℓ	1
14	Car Washer	20 - 100 kg/cm^2, with pump and water tank capacity ; 2 m^2	1
15	Engine Cleaning Gun	L ≧ 500 mm with oil hose	1

NO	ITEMS	SPECIFICATION	Q/UNIT
16	Air Blow Gun	L ≧ 160 mm	1
17	Grease Gun	≧ 500 cc, 500 kg/cm^2	1
18	Electric Welding Set	≧ 24 KVA	1
19	Grinder	Electric bench type	1
20	Drilling Machine	Floor type	1
21	Electric Drill	Portable type	1
22	Portable High Speed Grinder	Diameter ; ≧ 180 mm	1
23	Electric Cutting Grinder	≧ 1.5 KW	1
24	Battery Charger	12 - 24 V, 0 - 100 A	1
25	Carpenter Tool Set	Including electric saw, wood drill, etc.	1
26	Electric Tool Set	Portable type	1
27	Universal Puller Set	Gear puller, terminal puller, etc.	1
28	Fuel and Oil Station	Two 3000 ℓ capacity fuel tanks both for gasoline and diesel with electric pump	1
29	Fire Extinguisher	Weight ; ≧ 40 kg	1
30	Water Tank and Pump	For car washer and parts washing stand, tank capacity ; ≧ 2 m^2	1

⑤ For Laboratory

NO	ITEMS	SPECIFICATION	Q/UNIT
	<u>For Nursery Laboratory</u>		
1	Table	Dimension ; ≧ 1500 * 900 * 800 mm	2
2	Cabinet	Dimension ; ≧ 1200 * 400 * 1800 mm	3
3	Stool	Ø ≧ 310 mm with caster	16
4	Stainless Square Tray (Small)	Dimension ; ≧ 290 * 330 * 45 mm	25
5	Stainless Square Tray (Big)	Dimension ; ≧ 465 * 610 * 100 mm	10
6	Shears	Length ; ≧200 mm	25
7	Scissors	Blade length ; ≧195 mm	25
8	Budding Knife	Length ; ≧200 mm	12
9	Prunning Tools	Prunning scissors and saw with spare blades	12
10	Electric Balance	Capacity ; ≧ 60 kg, sensitivity ; 1 g	1
11	Seed Divider	Capacity ; 1500 - 2000 g, 200 W	1
12	Stainless Bucket	Size ; Ø ≧ 39 * 39 cm, capacity ; 45 ℓ	10
13	Refrigerator	Capacity ; 400 liter	2
14	Portable Lux-meter	Measuring range ; 0 - 300 / 0 - 2000 L X 0 - 30000 / 0 - 200000 L X	1
15	Dry Oven	Temp. range ; 50 - 250 °C Dimension ; ≧ 600 * 500 * 500 mm	1
16	Wood Calliper	Measuring range ; ≧ 45 cm	4

NO	ITEMS	SPECIFICATION	Q/UNIT
	For Plantation Laboratory		
17	Field pH Meter	Measuring range;pH ; 0 - 14, DC 9V	1
18	Soil Sampling Trowel Set	Trowel, folding scale and hand lens	1
19	Soil Sampling Cylinder Set	100 mℓ×6 pcs.	1
20	Standard Soil Sample for Soil Texture Class	Six standard soil samples; sandy soil, sandy loam, loam, clay loam, clay and fine clay each 100 mℓ	1
21	Soil Moisture Meter Tester	Measuring method; Electric resistance method, DC 1.5 V	1
22	Soil Acid Tester	Measuring range; pH ; 3.5 - 8.0	1
23	Soil Saline Tester	Measuring accuracy; 0.05 %	1
24	Soil Nutrient Tester	For pH, ammonia nitrogen and nitrate notrogen, etc	1
25	Electric Conductivity Meter	Measuring range ; 0~199 μS ; 0~1.99 mS ; 19.9 mS/cm	1
	For Glass Ware		
26	Test Tube	≧ 35 mℓ	200
27	Test Tube Rack	Capacity ; 20 pcs	10
28	Petri Dish	ø 75 mm * 20 mm (H)	100
39	Thermometer	0 ℃ ~ 200 ℃	5
30	Medicine Dropper	5 mℓ	15
31	Glass Rod	ø 6 × 275 mm	10
32	Beaker	5 mℓ	5
33	Forceps	Material ; Stainless	10

2) Machinery

① Heavy Machine

NO	ITEMS	SPECIFICATION	Q/UNIT
1	Bulldozer (large)	≧ 160 HP with blade (dozer), rake, ripper	1
2	Wheel Loader	≧ 80 HP with bucket ≧ 1.2 m^3, backhoe	1
3	Hydraulic Excavator	≧ 115 HP with bucket ≧ 0.7 m^3, cab with air condition, rock breaker	1
4	Dump Truck	Payload ≧ 6 ton	1
5	Truck for Transportation with crane	Payload ≧ 4 ton, crane capacity ≧ 2 tons	1
6	Truck for Transportation without crane	Payload ≧ 4 ton	1
7	Water Tank Truck	Tank capacity ≧ 6,000 ℓ	1
8	Farm Tractor (large)	≧ 80 HP with 3 disk plow, 7 disk plow, rotaslusher for weeding	1

② Vehicle

NO	ITEMS	SPECIFICATION	Q/UNIT
1	Pick-up Truck (Small)	Extra single cab with air conditioned diesel engine ≧ 80 HP	2
2	Pick-up Truck (4 WD)	Double cab with air conditioned diesel engine ≧ 85 HP	3
3	Motorcycle	≧ 125 cc mountainous type	2

③ Others

NO	ITEMS	SPECIFICATION	Q/UNIT
1	Generator (Small)	≧ 1.9 KW	2
2	Seed Scarifier Machine	Capacity ; 10 - 20 kg/hr with gasoline eng.	1
3	Coconut Husk Crusher	≧ 22 KW, chip size ; 10 - 45 mm	1
4	Soil Sieving Machine	Sieving frame ; ≧ 1750 * 500 mm, 0.75 KW	2
5	Belt Conveyer	5 meters	3
6	Roller Conveyor	100 meters per center	1
7	Soil Mixture Machine	Capacity ; ≧ 0.1 m^3	3
8	Water Pump	Gasoline engine ; ≧ 5 HP, outlet ; 3″ total head ; ≧28 m	15
9	Chain Saw	Bar length ≧ 20″	2
10	Brush Cutter	Tank capacity ; ≧0.6 ℓ	12
11	Cutter Blade	For brush cutter (saw type)	100
12	Saw Grinder	For brush cutter	1
13	Soil Sterilizer	Capacity; 2 - 5 ton/hr. 1.75 KVA	1
14	Vibrating Plate Compactor	≧ 80 kg, Vibrating frequency ; ≧ 5800 rpm	1

4-3-4 Basic Design Drawing

(1) Project Site & Facility Layout

1) Mahasarakham Nursery Center 01

2) Nakhann Ratchasima Nursery Center 02

3) Udonthani Nursery Center 03

4) Yasothon Nursery Center 04

(2) Plan, Elevation & Section of Principal Facilities

1) Office and Training Building (Mahasarakham)

· Plan

- 1 st. Floor Plan 05

- 2 nd. Floor Plan 06

· Elevation & Section

- Office and Training Building (1) 07

- Office and Training Building (2) 08

2) Office and Training Building
(Nakhon Ratchasima, Udonthani & Yasothon)

- Plan 09

- Elevation & Section 10

3) Work Shop 11

4) Garage (A) 12

5) Garage (B) 13

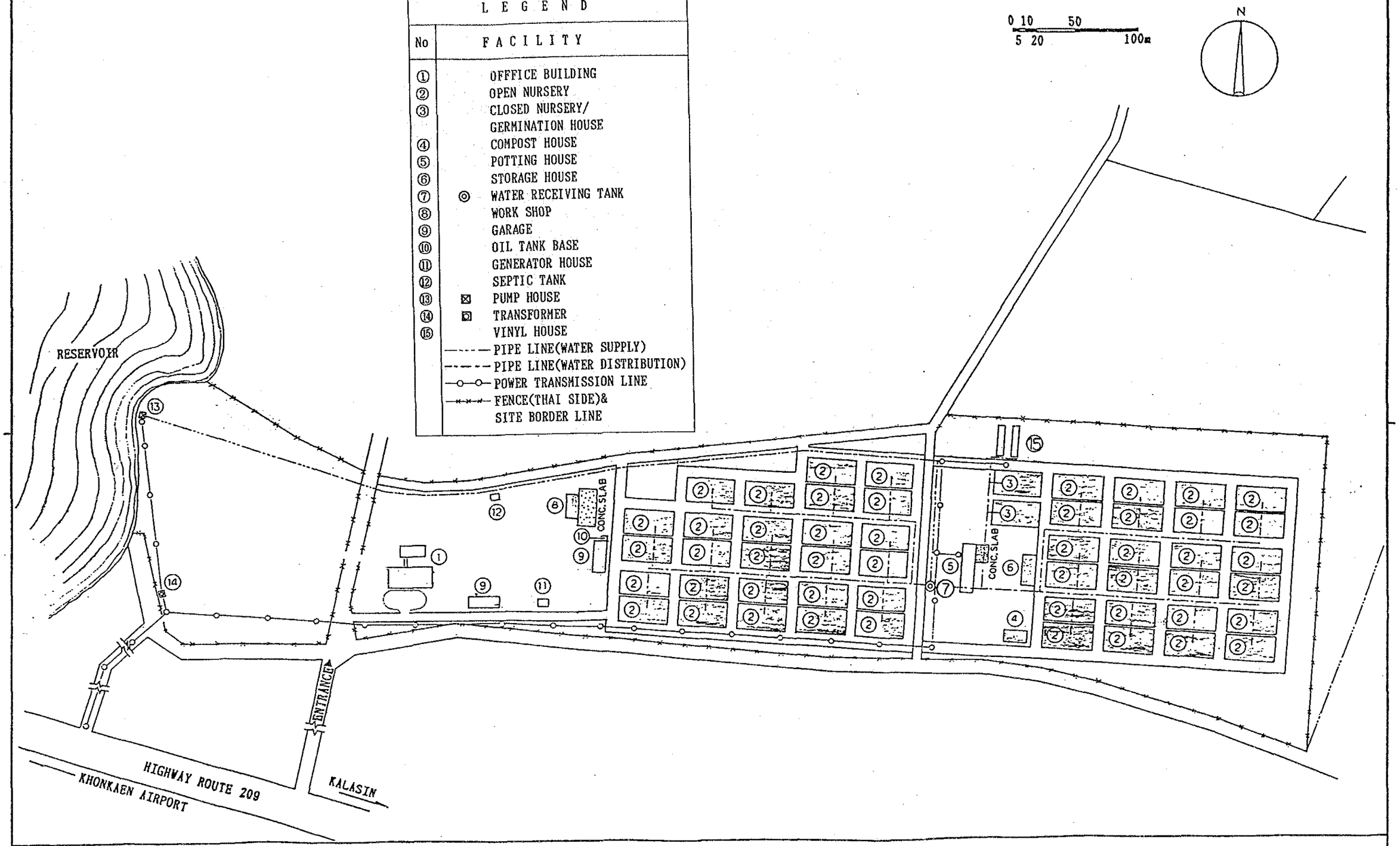
6) Generator House 14

7) Closed Nursery/Germination House 15

8) Vinyl House 16

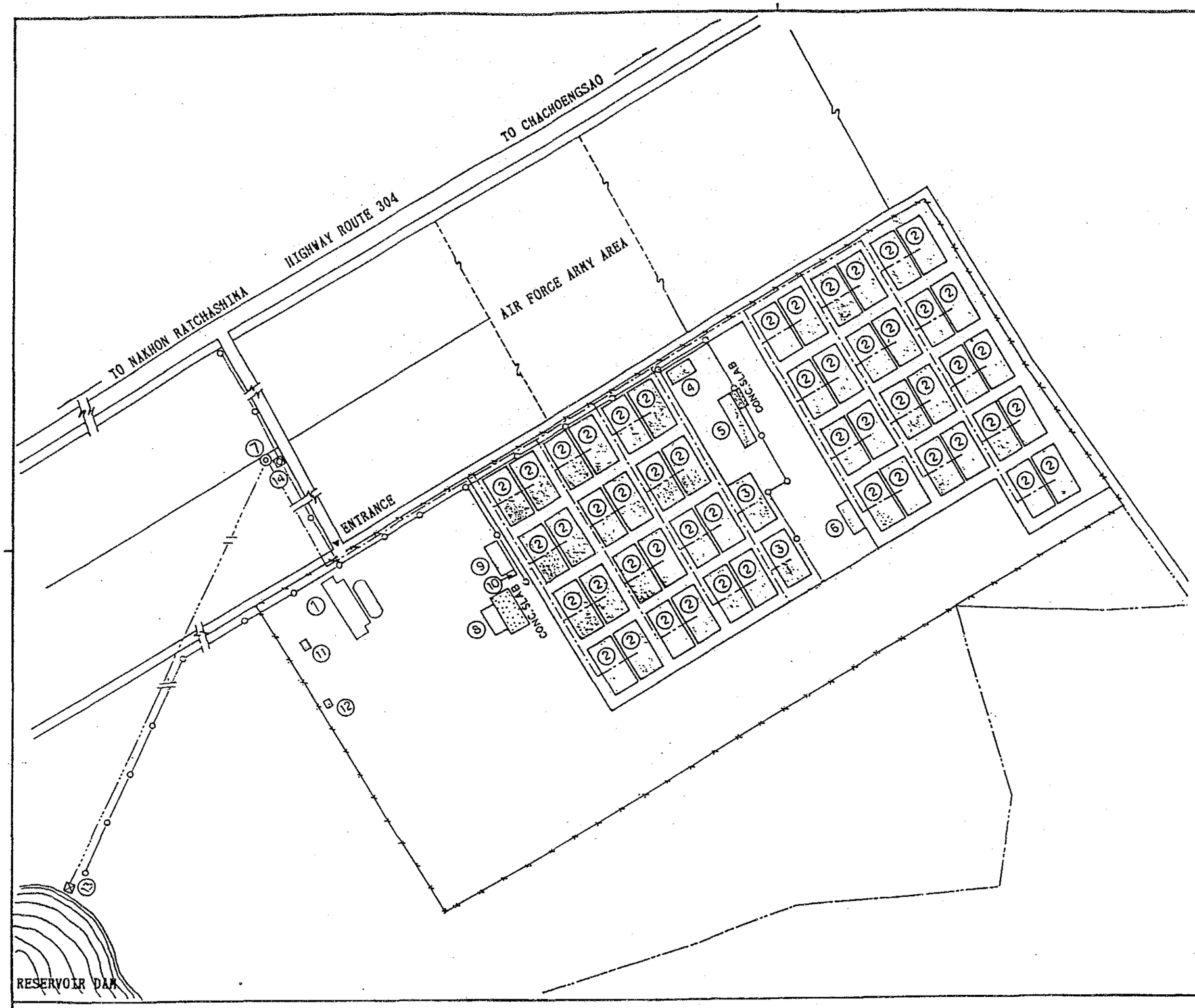
9)	Potting House	17
10)	Compost House	18
11)	Storage House	19

L E G E N D	
No	F A C I L I T Y
①	OFFFICE BUILDING
②	OPEN NURSERY
③	CLOSED NURSERY/ GERMINATION HOUSE
④	COMPOST HOUSE
⑤	POTTING HOUSE
⑥	STORAGE HOUSE
⑦	WATER RECEIVING TANK
⑧	WORK SHOP
⑨	GARAGE
⑩	OIL TANK BASE
⑪	GENERATOR HOUSE
⑫	SEPTIC TANK
⑬	PUMP HOUSE
⑭	TRANSFORMER
⑮	VINYL HOUSE
	PIPE LINE(WATER SUPPLY)
	PIPE LINE(WATER DISTRIBUTION)
	POWER TRANSMISSION LINE
	FENCE(THAI SIDE)& SITE BORDER LINE



PROJECT SITE & FACILITY LAYOUT
— MAHASARAKHAM NURSERY CENTER —

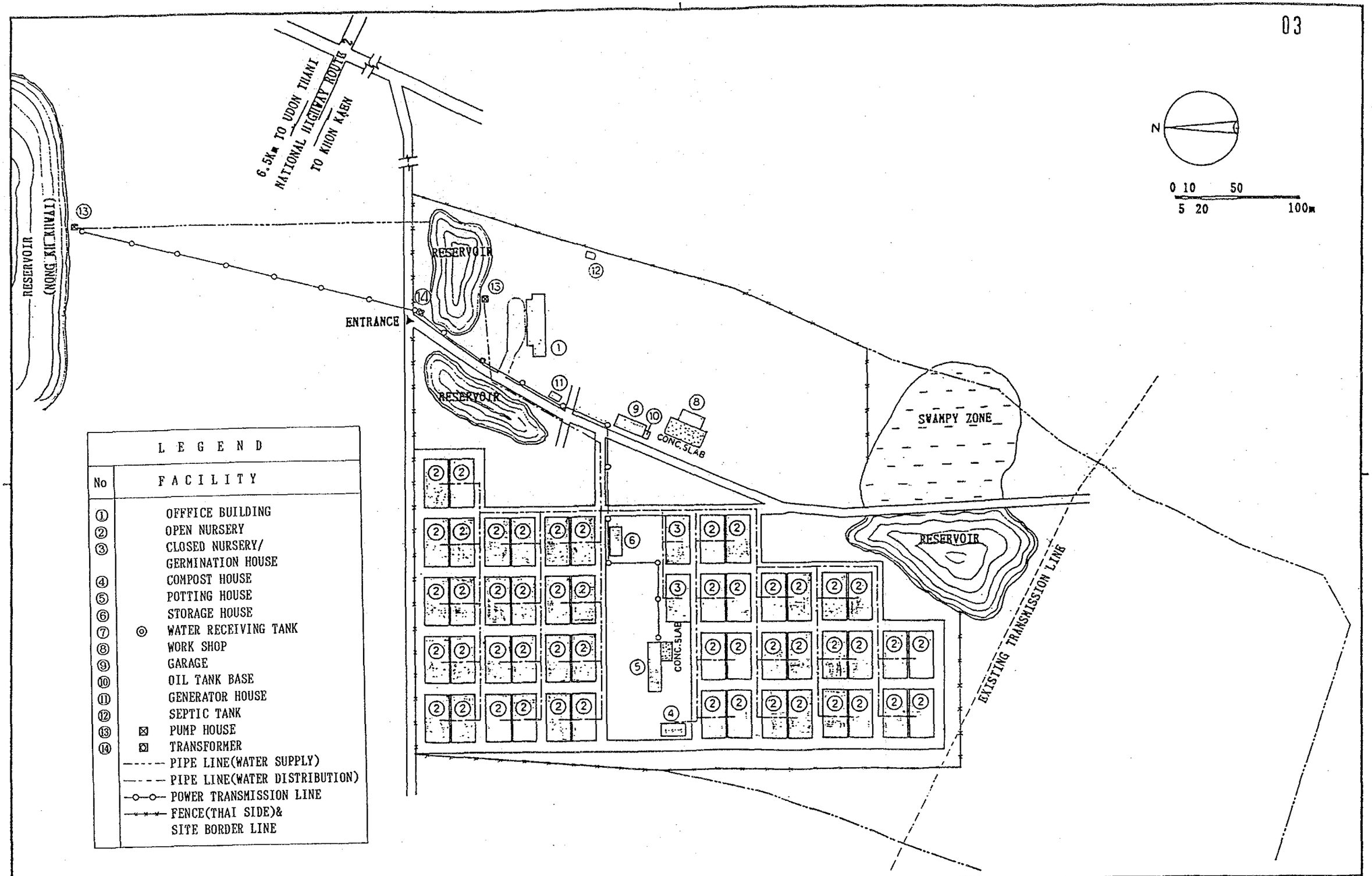
THE PROJECT FOR THE ESTABLISHMENT OF
LARGE-SCALE NURSERY CENTERS IN THE NORTHEAST OF THAILAND



L E G E N D	
No	FACILITY
①	OFFFICE BUILDING
②	OPEN NURSERY
③	CLOSED NURSERY/ GERMINATION HOUSE
④	COMPOST HOUSE
⑤	POTTING HOUSE
⑥	STORAGE HOUSE
⑦	◎ WATER RECEIVING TANK
⑧	WORK SHOP
⑨	GARAGE
⑩	OIL TANK BASE
⑪	GENERATOR HOUSE
⑫	SEPTIC TANK
⑬	⊠ PUMP HOUSE
⑭	⊠ TRANSFORMER
	----- PIPE LINE(WATER SUPPLY)
	- - - - PIPE LINE(WATER DISTRIBUTION)
	—o—o— POWER TRANSMISSION LINE
	—×—×— FENCE(THAI SIDE)& SITE BORDER LINE

PROJECT SITE & FACILITY LAYOUT
— NAKHON RATCHASIMA NURSERY CENTER —

THE PROJECT FOR THE ESTABLISHMENT OF
LARGE-SCALE NURSERY CENTERS IN THE NORTHEAST OF THAILAND

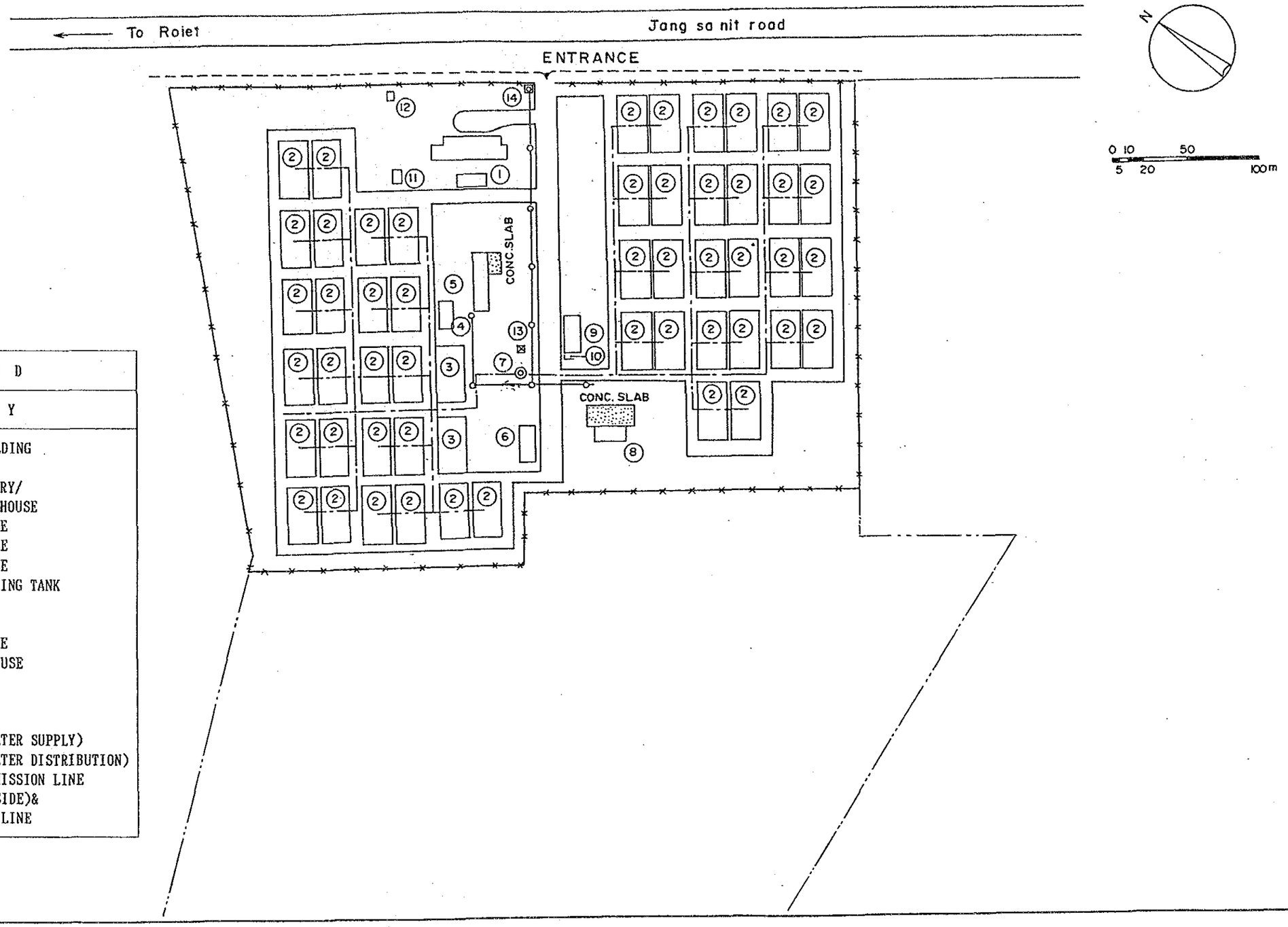


L E G E N D

No	FACILITY
①	OFFFICE BUILDING
②	OPEN NURSERY
③	CLOSED NURSERY/ GERMINATION HOUSE
④	COMPOST HOUSE
⑤	POTTING HOUSE
⑥	STORAGE HOUSE
⑦	◎ WATER RECEIVING TANK
⑧	WORK SHOP
⑨	GARAGE
⑩	OIL TANK BASE
⑪	GENERATOR HOUSE
⑫	SEPTIC TANK
⑬	⊠ PUMP HOUSE
⑭	⊡ TRANSFORMER
	------ PIPE LINE(WATER SUPPLY)
	- - - - PIPE LINE(WATER DISTRIBUTION)
	—o—o— POWER TRANSMISSION LINE
	—×—×— FENCE(THAI SIDE)& SITE BORDER LINE

PROJECT SITE & FACILITY LAYOUT
— UDONTHANI NURSERY CENTER —

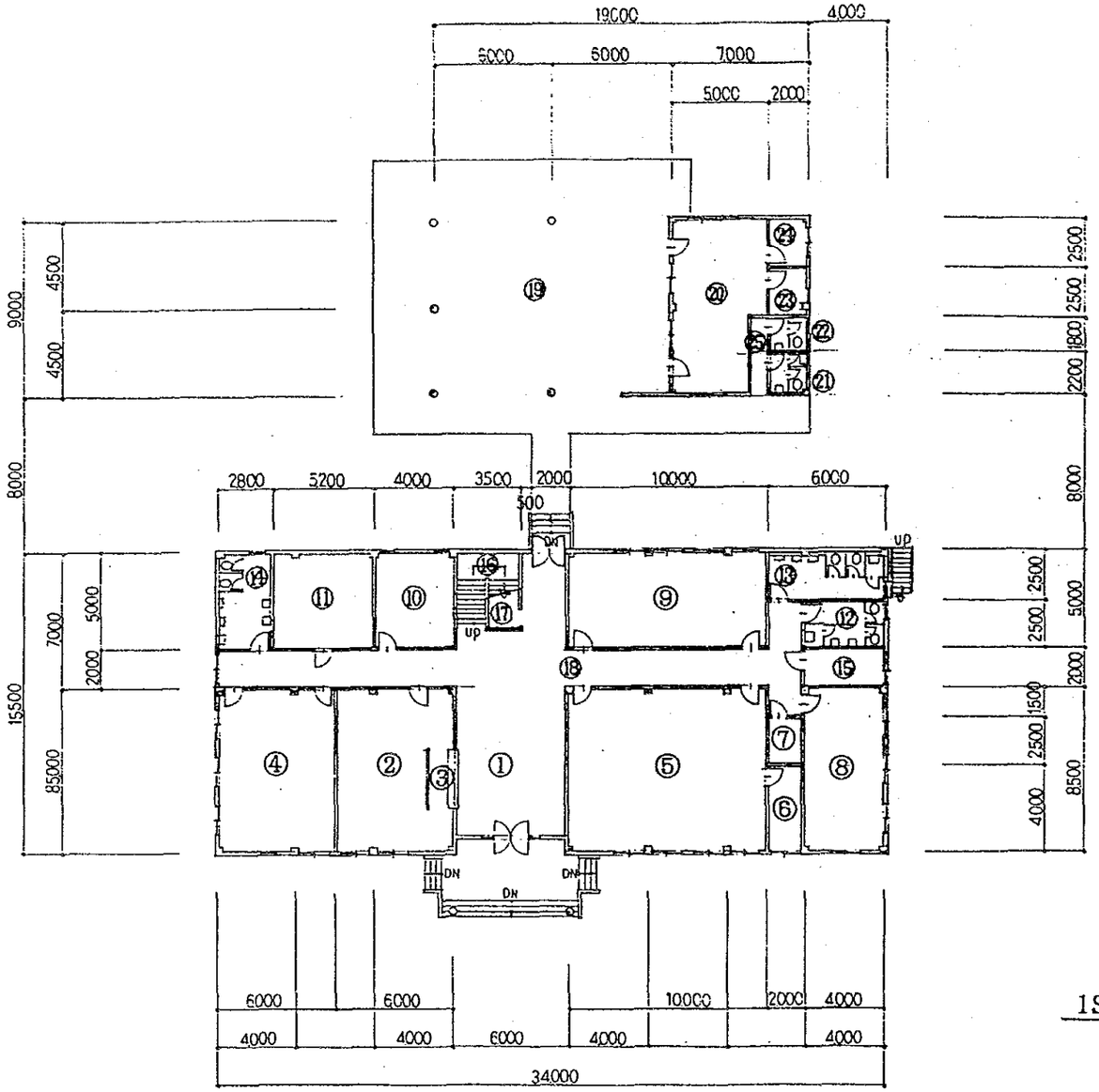
THE PROJECT FOR THE ESTABLISHMENT OF
LARGE-SCALE NURSERY CENTERS IN THE NORTHEAST OF THAILAND



LEGEND	
No	FACILITY
①	OFFFICE BUILDING
②	OPEN NURSERY
③	CLOSED NURSERY/ GERMINATION HOUSE
④	COMPOST HOUSE
⑤	POTTING HOUSE
⑥	STORAGE HOUSE
⑦ ◎	WATER RECEIVING TANK
⑧	WORK SHOP
⑨	GARAGE
⑩	OIL TANK BASE
⑪	GENERATOR HOUSE
⑫	SEPTIC TANK
⑬ ⊠	PUMP HOUSE
⑭ ⊡	TRANSFORMER
------	PIPE LINE(WATER SUPPLY)
— - — -	PIPE LINE(WATER DISTRIBUTION)
—o—o—	POWER TRANSMISSION LINE
—×—×—	FENCE(THAI SIDE)& SITE BORDER LINE

PROJECT SITE & FACILITY LAYOUT
— YASOTHON NURSERY CENTER —

THE PROJECT FOR THE ESTABLISHMENT OF
LARGE-SCALE NURSERY CENTERS IN THE NORTHEAST OF THAILAND



1ST FLOOR PLAN

NO.	NAME OF ROOM	FLOOR AREA (m²)
	(1st. FLOOR)	
①	ENTRANCE HALL (INC.EXHIBITION AREA)	46.50
②	ADMINISTRATION SECTION ROOM	47.10
③	RECEPTION	3.90
④	NURSERY & PLANNING SECTION ROOM	51.00
⑤	LABORATORY	85.00
⑥	PREPARATION ROOM	8.00
⑦	DARK ROOM	5.00
⑧	LIBRARY	34.00
⑨	MEETING & SEMINAR ROOM	50.00
⑩	MECHANIZATION SECTION ROOM	20.00
⑪	COLD STORAGE	26.00
⑫	WC(LADY)	10.00
⑬	WC(MEN)	15.00
⑭	WC(MEN)	14.00
⑮	STORAGE	8.00
⑯	STAIR CASE	14.00
⑰	KITCHENETTE	3.50
⑱	CORRIDOR & OTHERS	81.50
⑲	CAFETERIA	108.00
⑳	KITCHEN	41.00
㉑	WC(MEN)	4.40
㉒	WC(LADY)	3.60
㉓	STORAGE	5.00
㉔	LAUNDRY	5.00
㉕	CORRIDOR	4.00
	SUB TOTAL	693.50

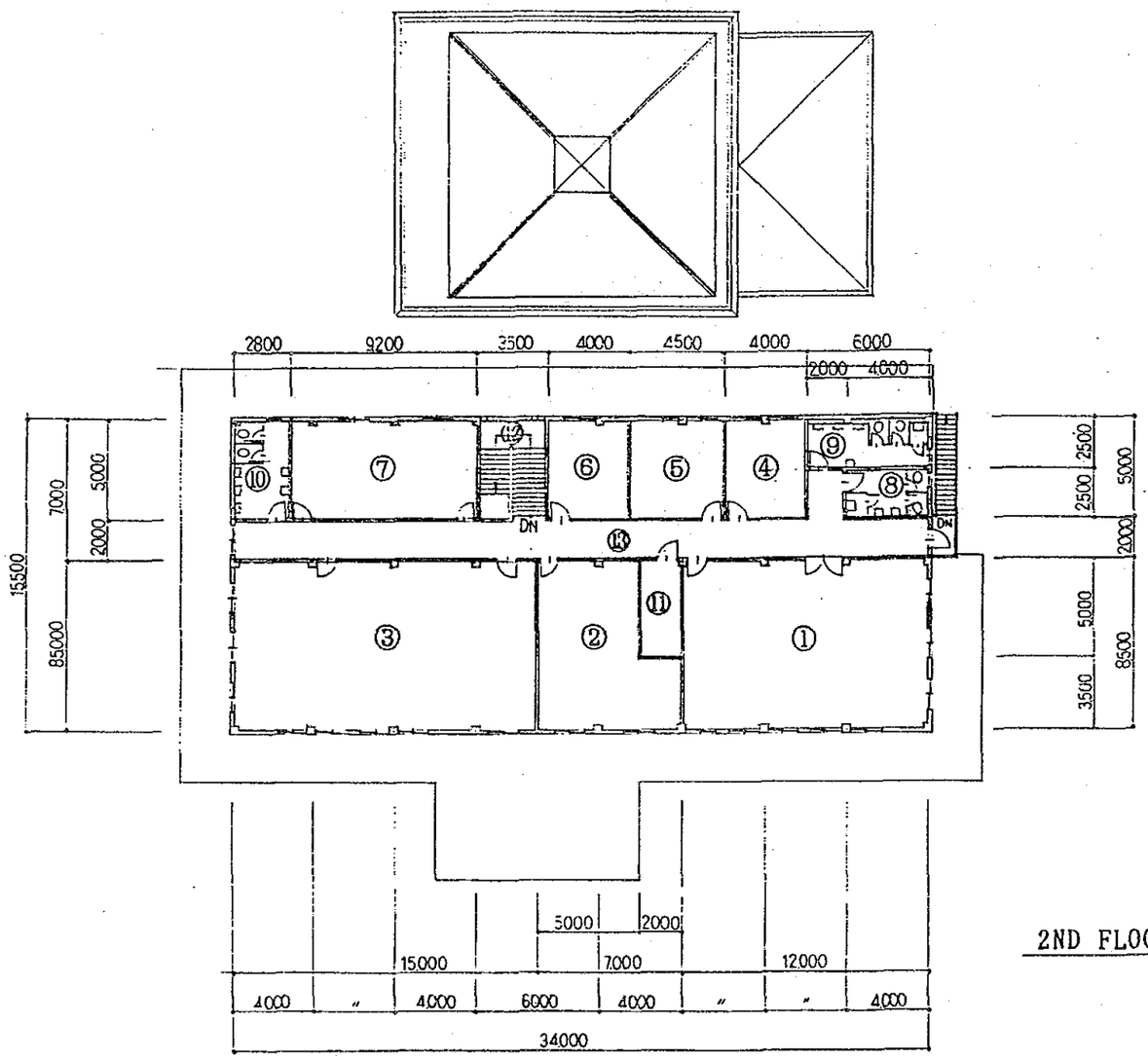
0 1 2 3 4 5 10 20m

OFFICE BUILDING FOR MAHASARAKHAM N.C.,

1ST FLOOR PLAN

THE PROJECT FOR THE ESTABLISHMENT OF
LARGE-SCALE NURSERY CENTERS IN THE NORTHEAST OF THAILAND

L E G E N D		
NO.	NAME OF ROOM	FLOOR AREA(m^2)
	(2nd. FLOOR)	
①	LECTURE ROOM	102.00
②	MEETING ROOM	49.50
③	EXTENSION, REFORESTATION & TRAINING SECTION ROOM	127.50
④	CHIEF OF CENTER ROOM	20.00
⑤	PROJECT DIRECTOR & FIELD DIRECTOR ROOM	22.50
⑥	EXPERT LEADER ROOM	20.00
⑦	EXPERT & JOCV ROOM	46.00
⑧	WC(LADY)	10.00
⑨	WC(MEN)	15.00
⑩	WC(MEN)	14.00
⑪	STORAGE	10.00
⑫	STAIR CASE	17.50
⑬	CORRIDOR	73.00
S U B T O T A L		527.00
T O T A L		1220.50



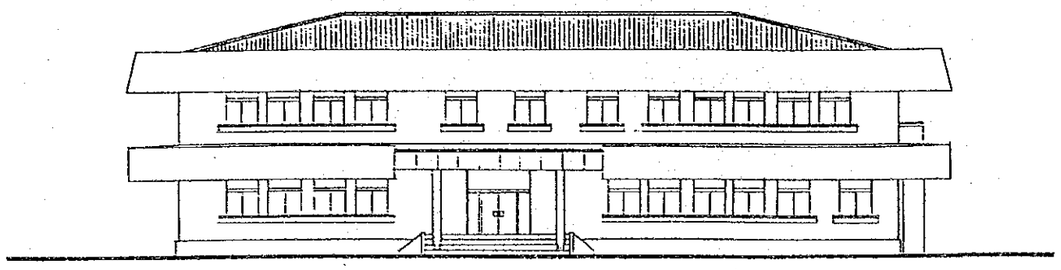
2ND FLOOR PLAN

0 1 2 3 4 5 10 20m

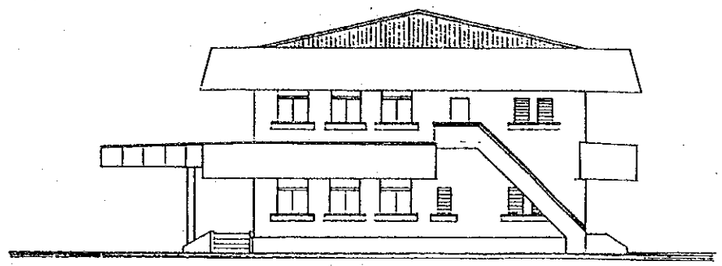
OFFICE BUILDING FOR MAHASARAKHAM N.C.,

2ND FLOOR PLAN

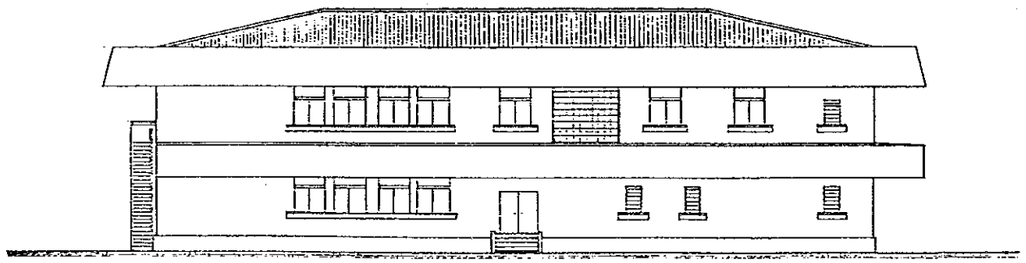
THE PROJECT FOR THE ESTABLISHMENT OF
LARGE-SCALE NURSERY CENTERS IN THE NORTHEAST OF THAILAND



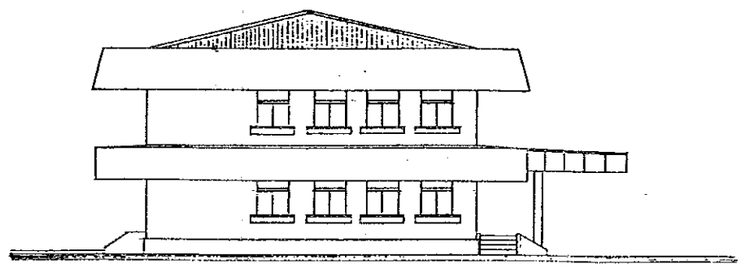
FRONT ELEVATION



RIGHT SIDE ELEVATION



--REAR ELEVATION



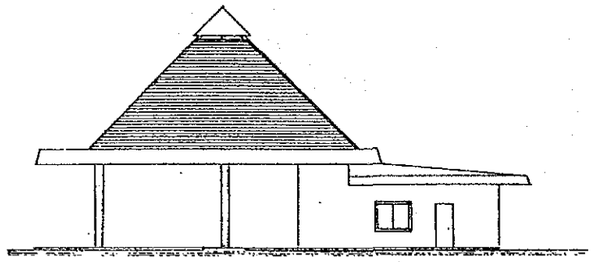
LEFT SIDE ELEVATION

0 1 2 3 4 5 10 20m

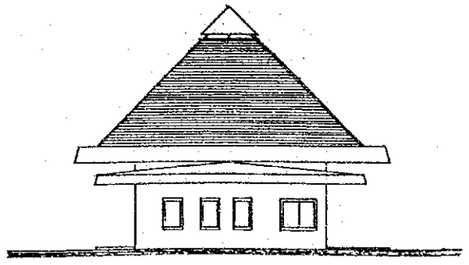
OFFICE BUILDING FOR MAHASARAKHAM N.C.,

ELEVATIONS

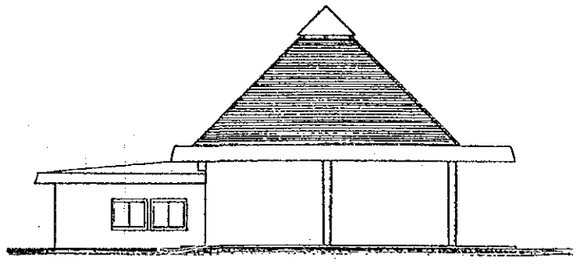
THE PROJECT FOR THE ESTABLISHMENT OF
LARGE-SCALE NURSERY CENTERS IN THE NORTHEAST OF THAILAND



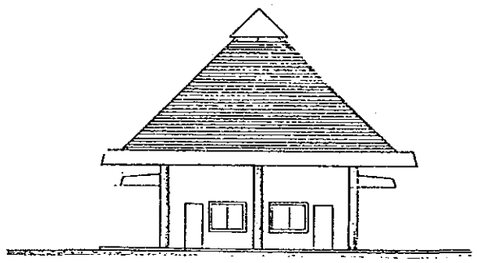
FRONT ELEVATION



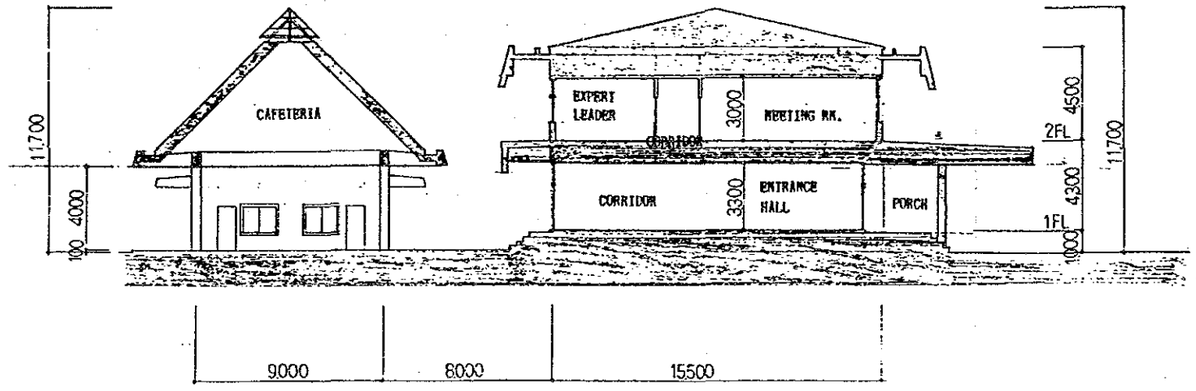
RIGHT SIDE ELEVATION



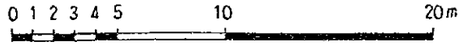
REAR ELEVATION



LEFT SIDE ELEVATION



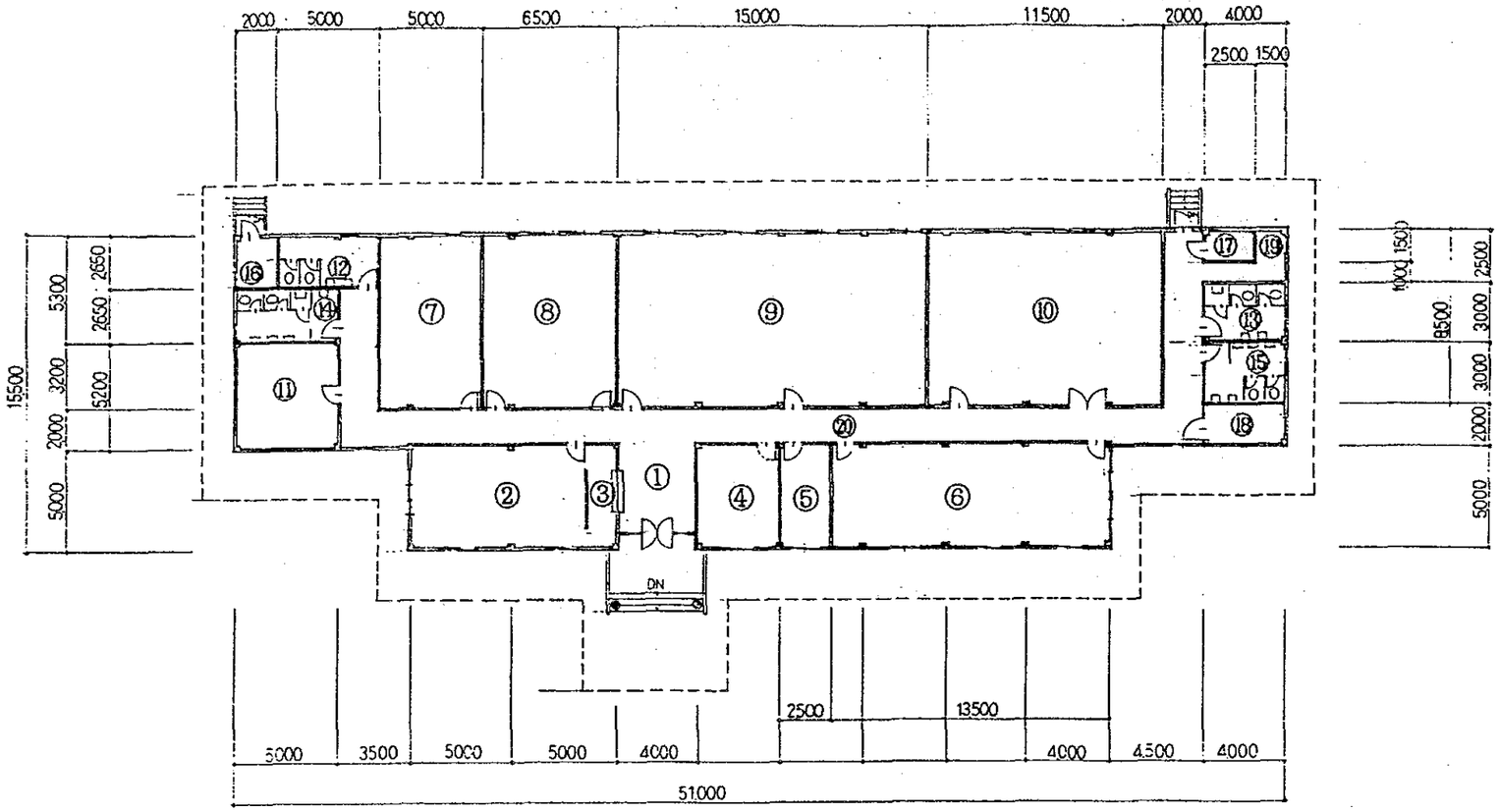
SECTION



OFFICE BUILDING FOR MAHASARAKHAM N.C.,

CAFETERIA ELEVATIONS AND SECTIONS

THE PROJECT FOR THE ESTABLISHMENT OF
LARGE-SCALE NURSERY CENTERS IN THE NORTHEAST OF THAILAND



L E G E N D		
NO.	NAME OF ROOM	FLOOR AREA(㎡)
①	ENTRANCE HALL	17.00
②	ADMINISTRATION SECTION ROOM	40.00
③	RECEPTION	10.00
④	CHIEF OF CENTER ROOM	20.00
⑤	JOCV ROOM	12.50
⑥	LABORATORY	67.50
⑦	MEETING & SEMINAR ROOM	42.50
⑧	NURSERY & PLANNING SECTION ROOM	55.25
⑨	EXTENSION, REFORESTATION & TRAINNING SECTION ROOM	127.50
⑩	LECTURE ROOM	97.75
⑪	COLD STORAGE	26.00
⑫	WC(LADY)	13.25
⑬	WC(LADY)	12.00
⑭	WC(MEN)	13.25
⑮	WC(MEN)	12.00
⑯	STORAGE	5.30
⑰	STORAGE	3.75
⑱	STORAGE	8.00
⑲	KITCHENETTE	3.75
⑳	CORRIDOR	115.20
T O T A L		702.50

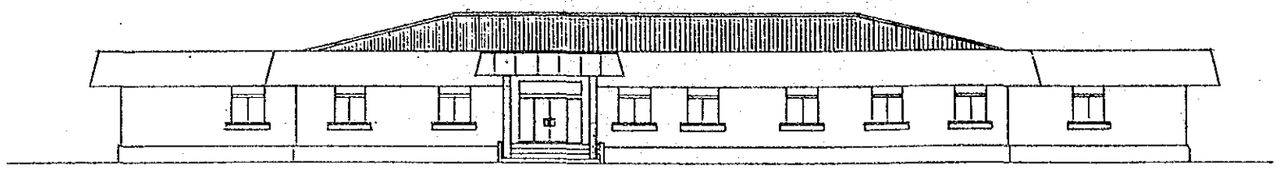
FLOOR PLAN

0 1 2 3 4 5 10 20m

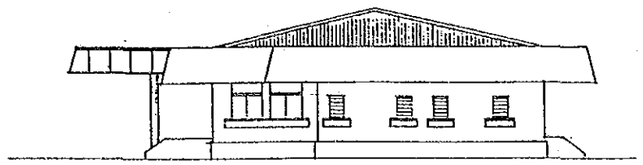
OFFICE BUILDING FOR NAKHON RATCHASIMA N.C.,
UDONTHANI N.C & YASOTHON N.C.

FLOOR PLAN

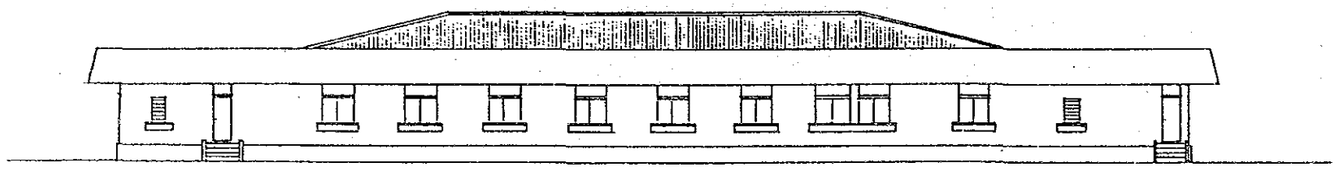
THE PROJECT FOR THE ESTABLISHMENT OF
LARGE-SCALE NURSERY CENTERS IN THE NORTHEAST OF THAILAND



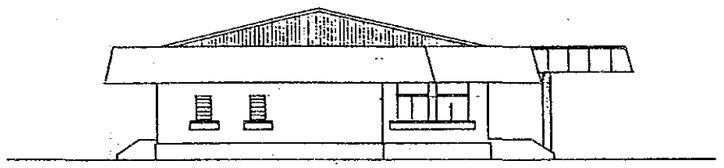
FRONT ELEVATION



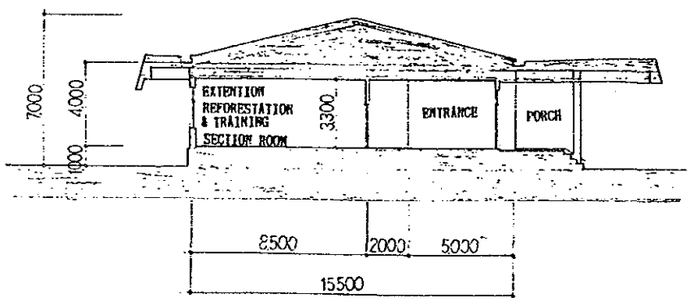
RIGHT SIDE ELEVATION



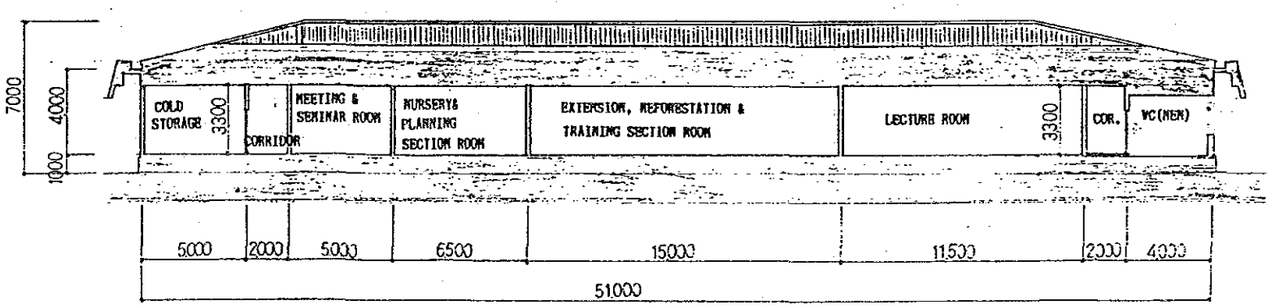
REAR ELEVATION



LEFT SIDE ELEVATION



SECTION



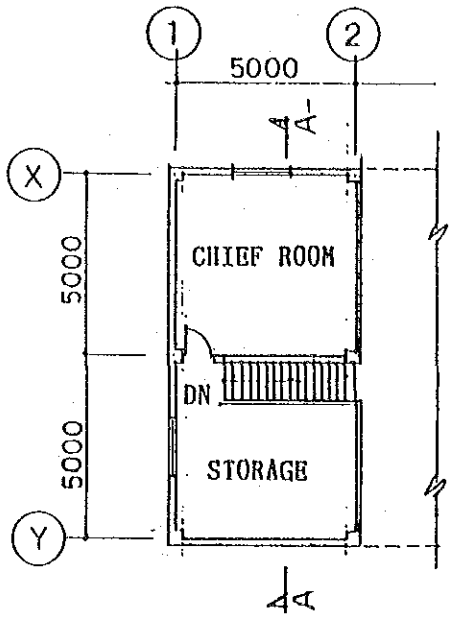
SECTION

0 1 2 3 4 5 10 20m

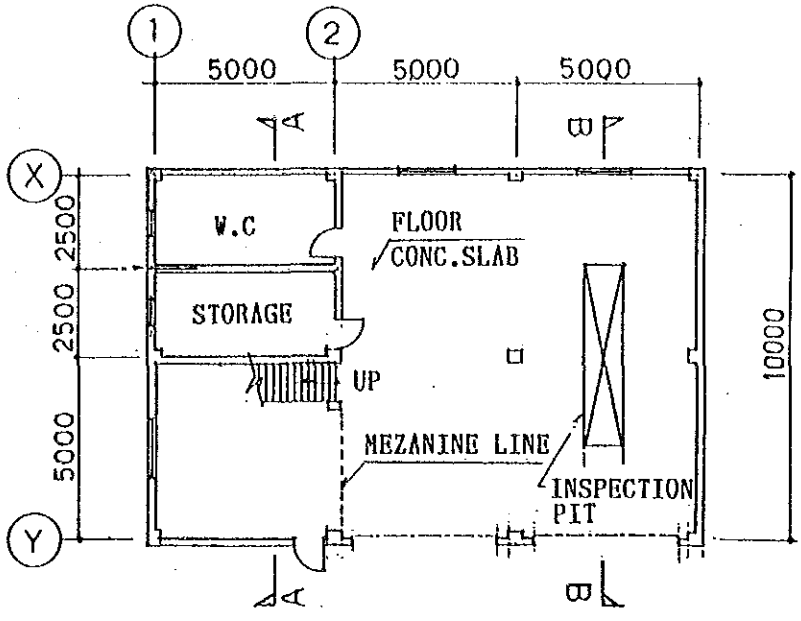
OFFICE BUILDING FOR NAKHON RATCHASIMA N.C.,
UDONTHANI N.C & YASOTHON N.C.

ELEVATIONS AND SECTIONS

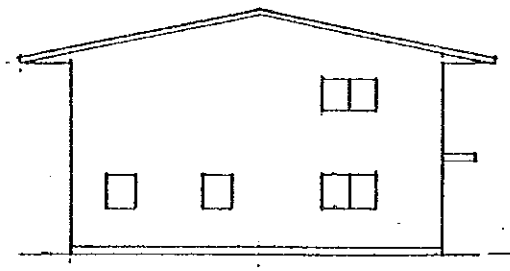
THE PROJECT FOR THE ESTABLISHMENT OF
LARGE-SCALE NURSERY CENTERS IN THE NORTHEAST OF THAILAND



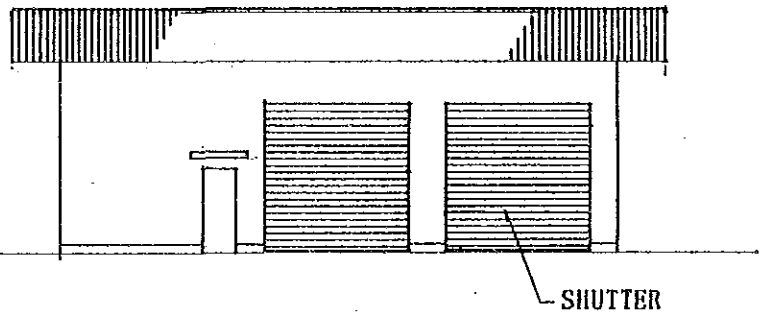
MEZANINE PLAN



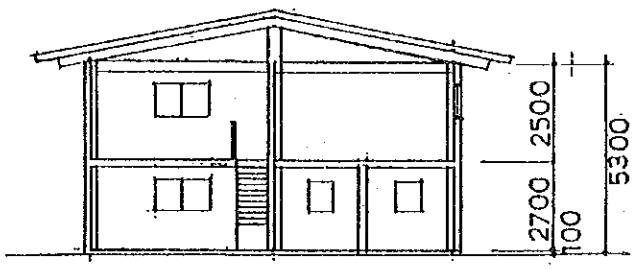
GROUND FLOOR PLAN



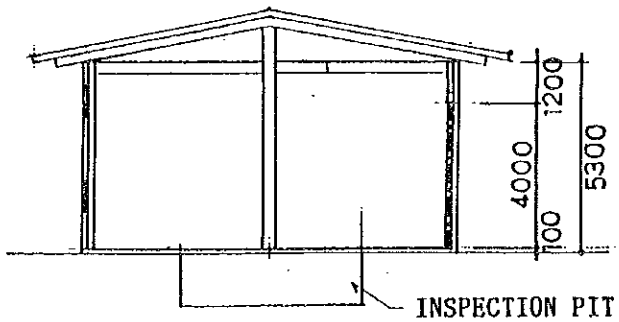
SIDE ELEVATION



FRONT ELEVATION



A-A SECTION

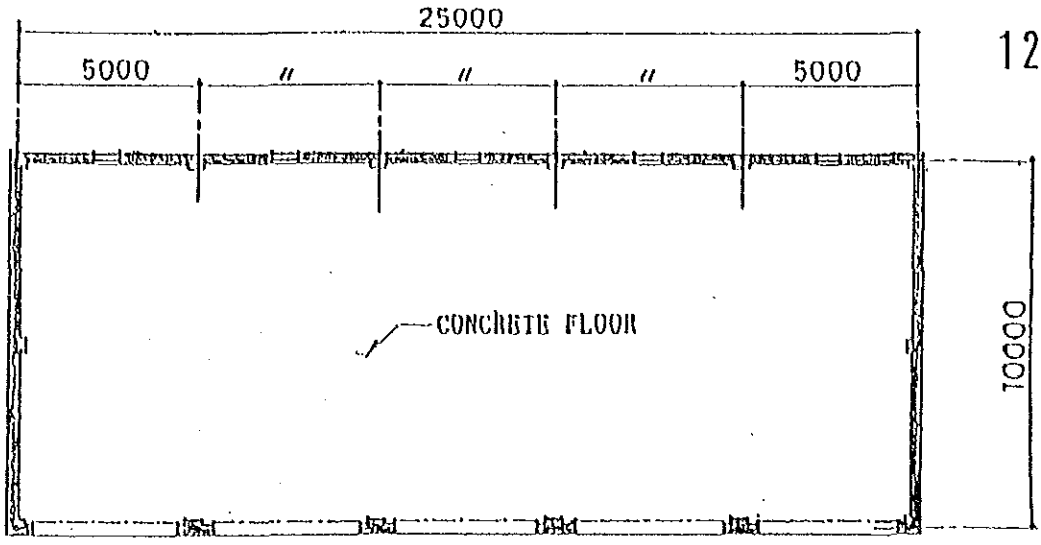


B-B SECTION

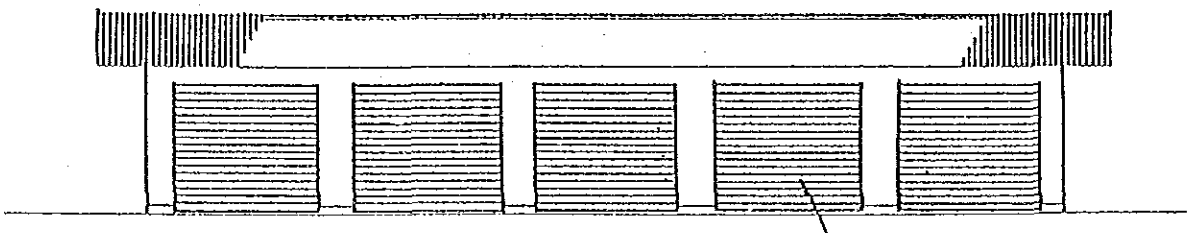
SCALE 1:200

WORK SHOP

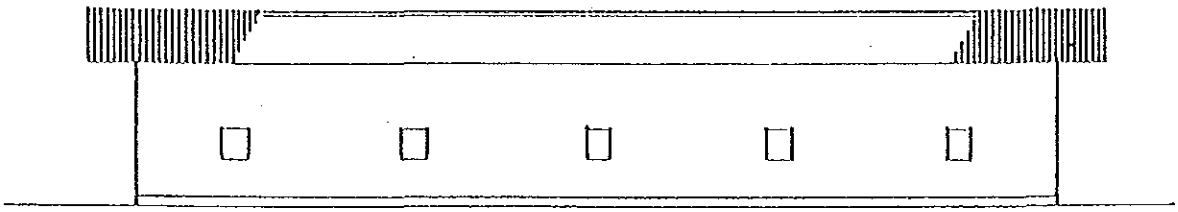
THE PROJECT FOR THE ESTABLISHMENT OF LARGE-SCALE NURSERY CENTERS IN THE NORTHEAST OF THAILAND



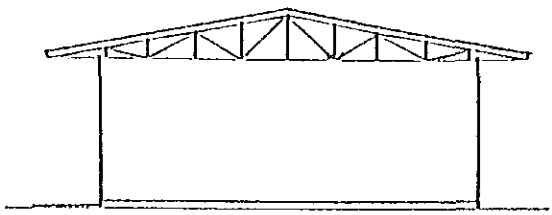
PLAN



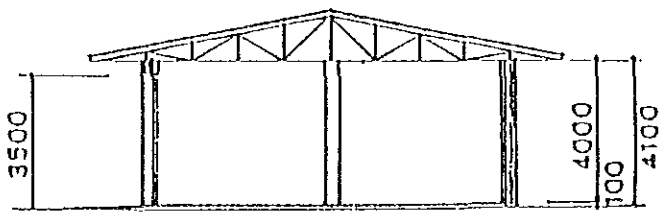
FRONT ELEVATION



BACK ELEVATION



SIDE ELEVATION

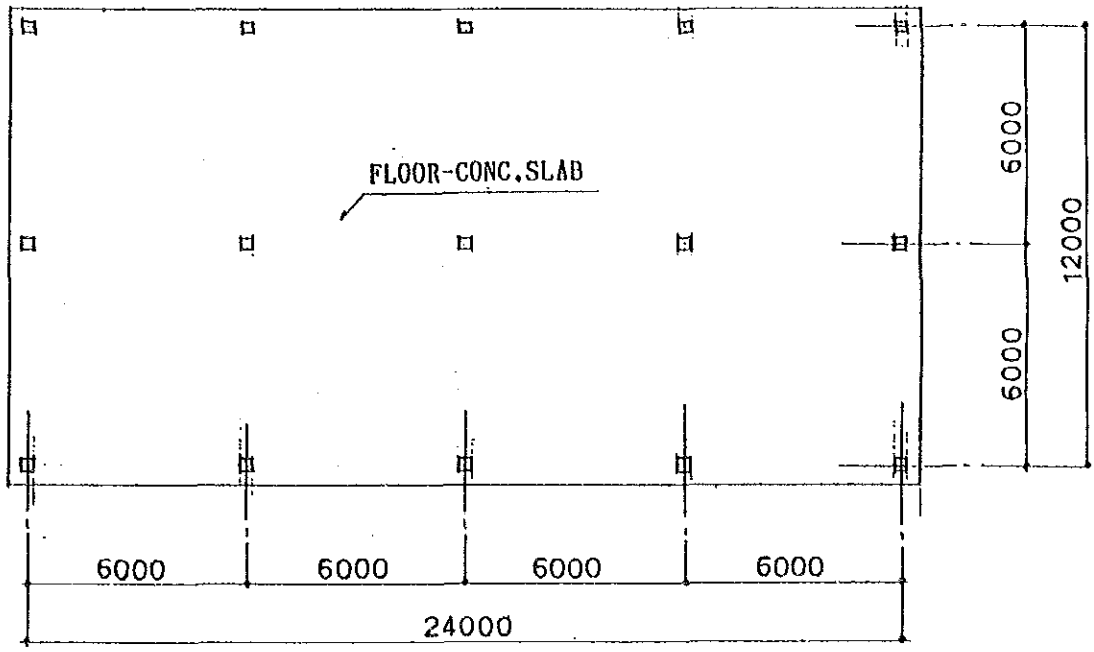


SECTION

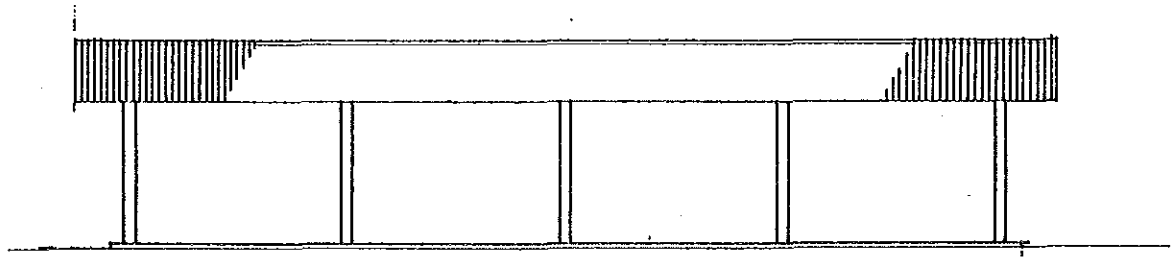
SCALE 1:200

GARAGE A

THE PROJECT FOR THE ESTABLISHMENT OF
LARGE-SCALE NURSERY CENTERS IN THE NORTHEAST OF THAILAND



PLAN



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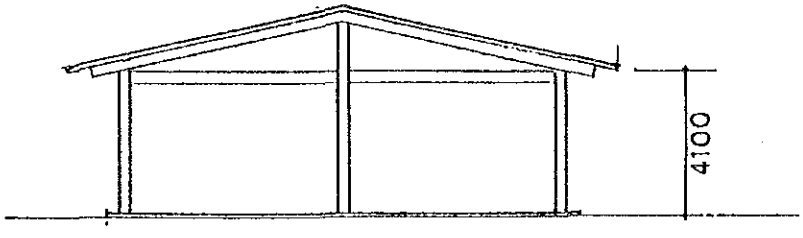
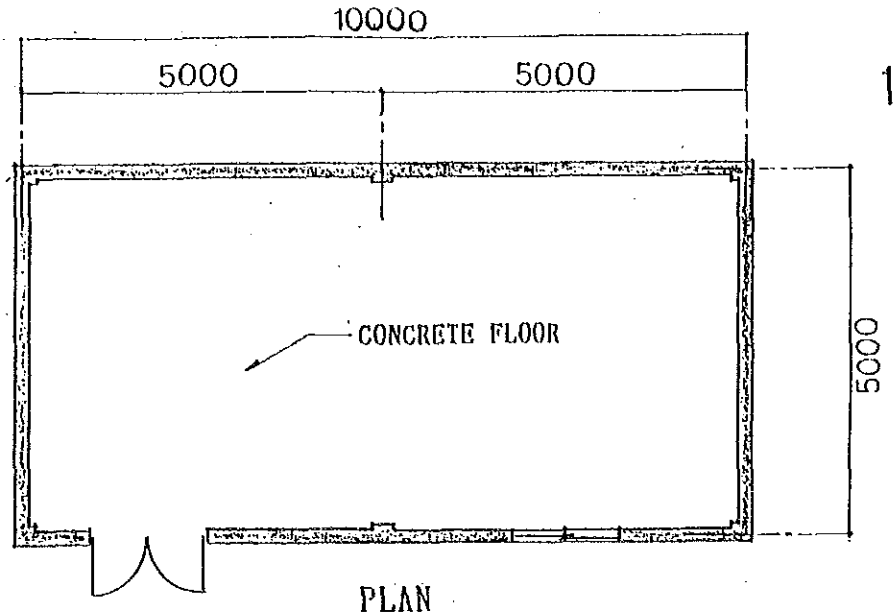


SECTION

SCALE 1:200

GARAGE B



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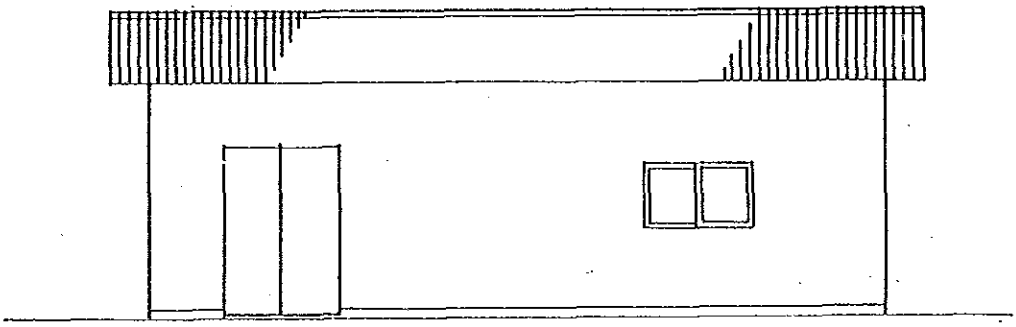

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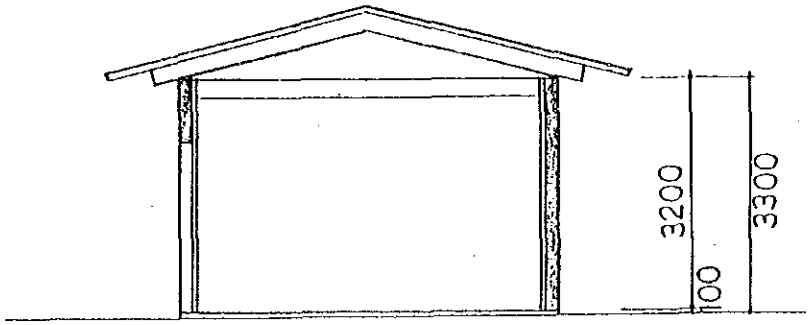
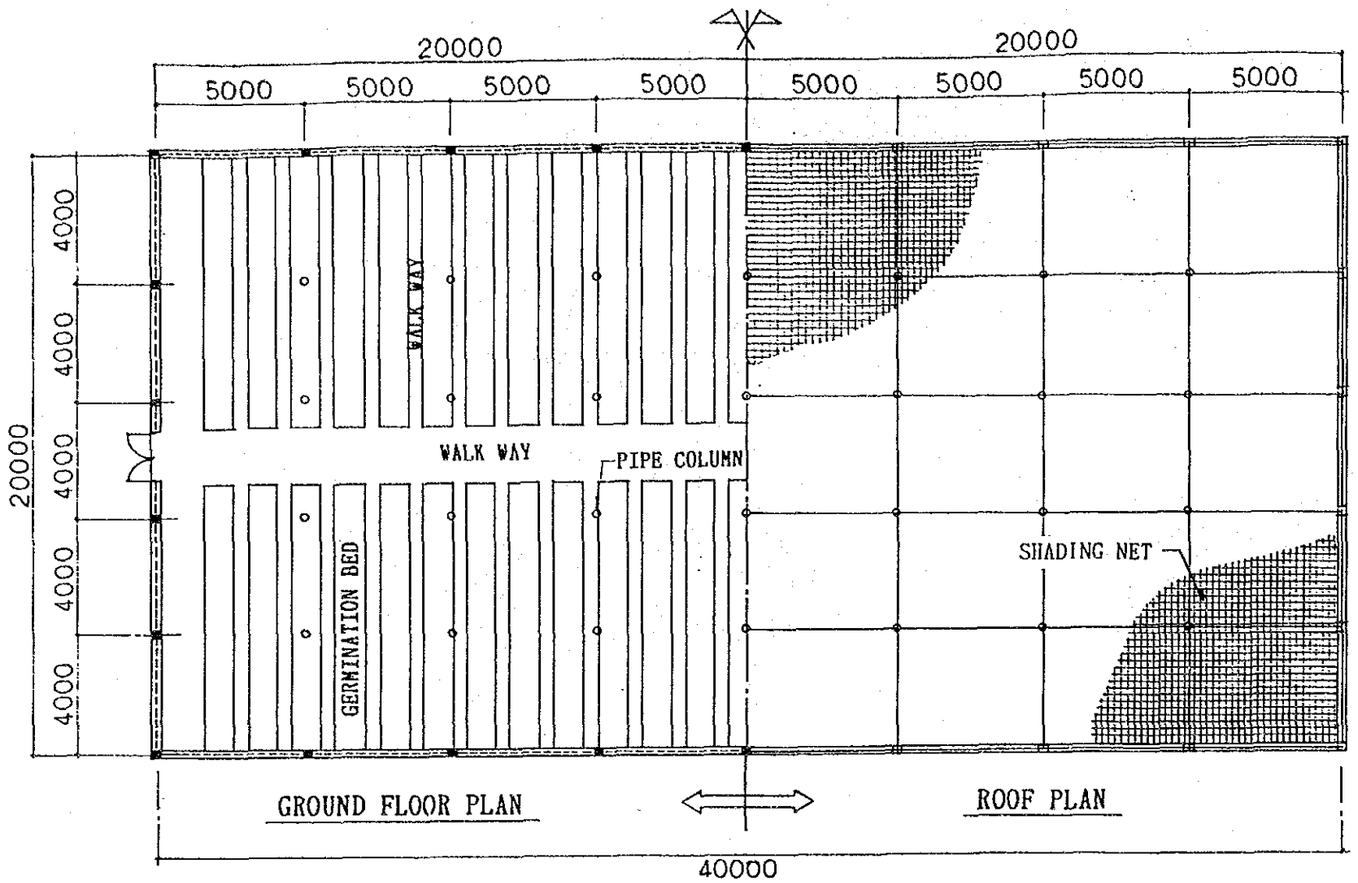


SECTION

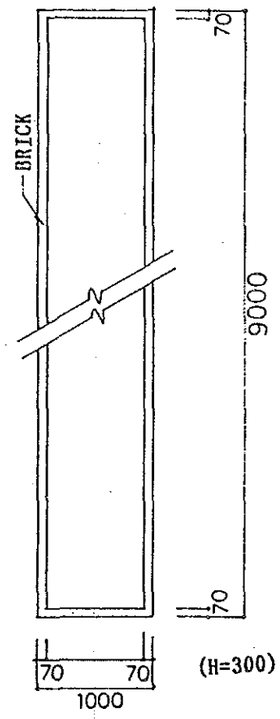
SCALE 1:100

GENERATOR HOUSE

THE PROJECT FOR THE ESTABLISHMENT OF LARGE-SCALE NURSERY CENTERS IN THE NORTHEAST OF THAILAND

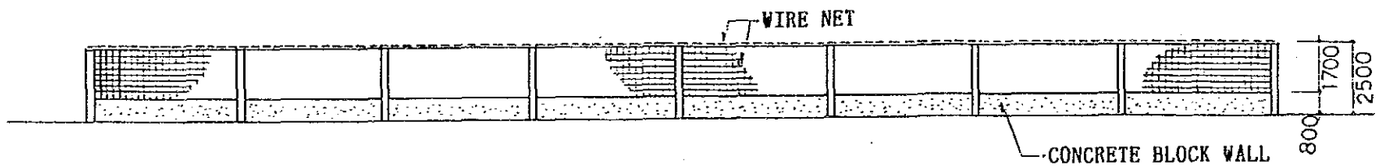


PLAN SCALE-1:200



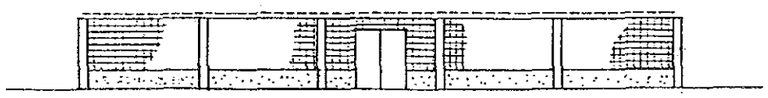
GERMINATION BED-DETAIL

SCALE-1:50



SIDE ELEVATION

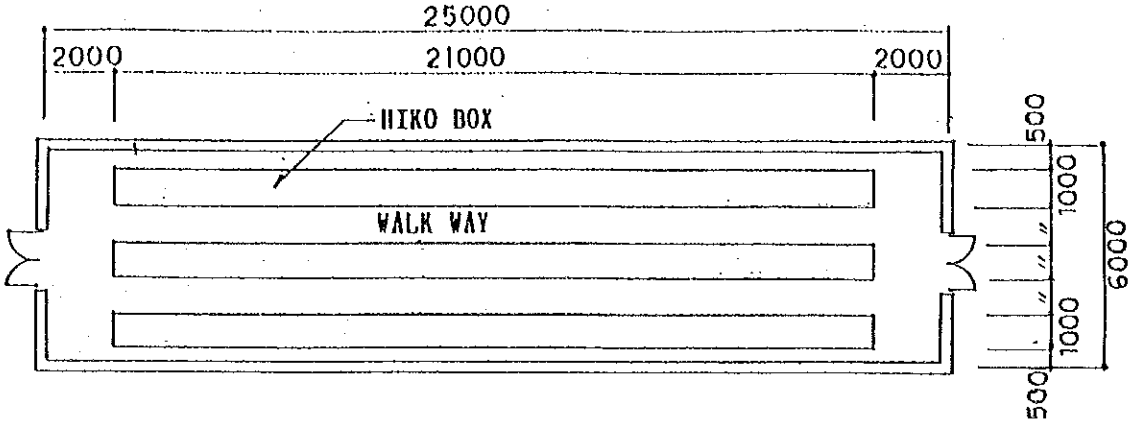
S-1:200



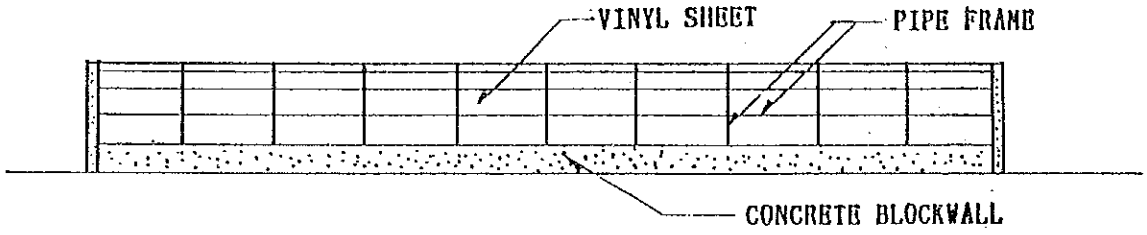
FRONT ELEVATION

CLOSED/GERMINATION NURSERY

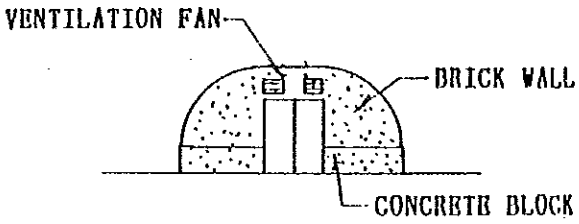
THE PROJECT FOR THE ESTABLISHMENT OF
LARGE-SCALE NURSERY CENTERS IN THE NORTHEAST OF THAILAND



PLAN S-1:200



SIDE ELEVATION S-1:200



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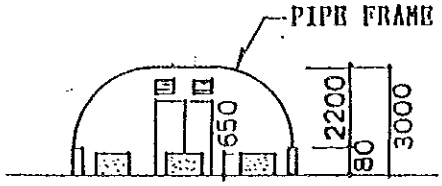
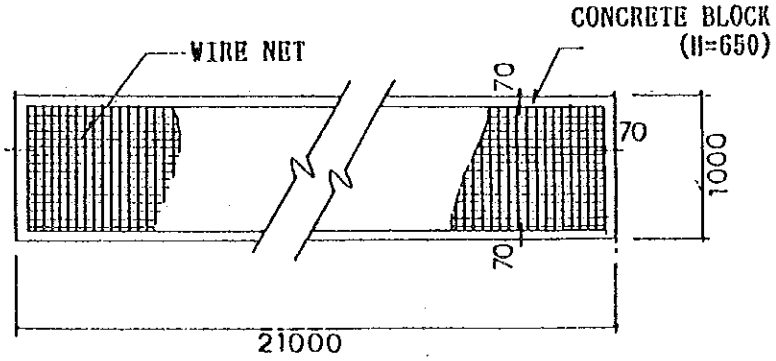
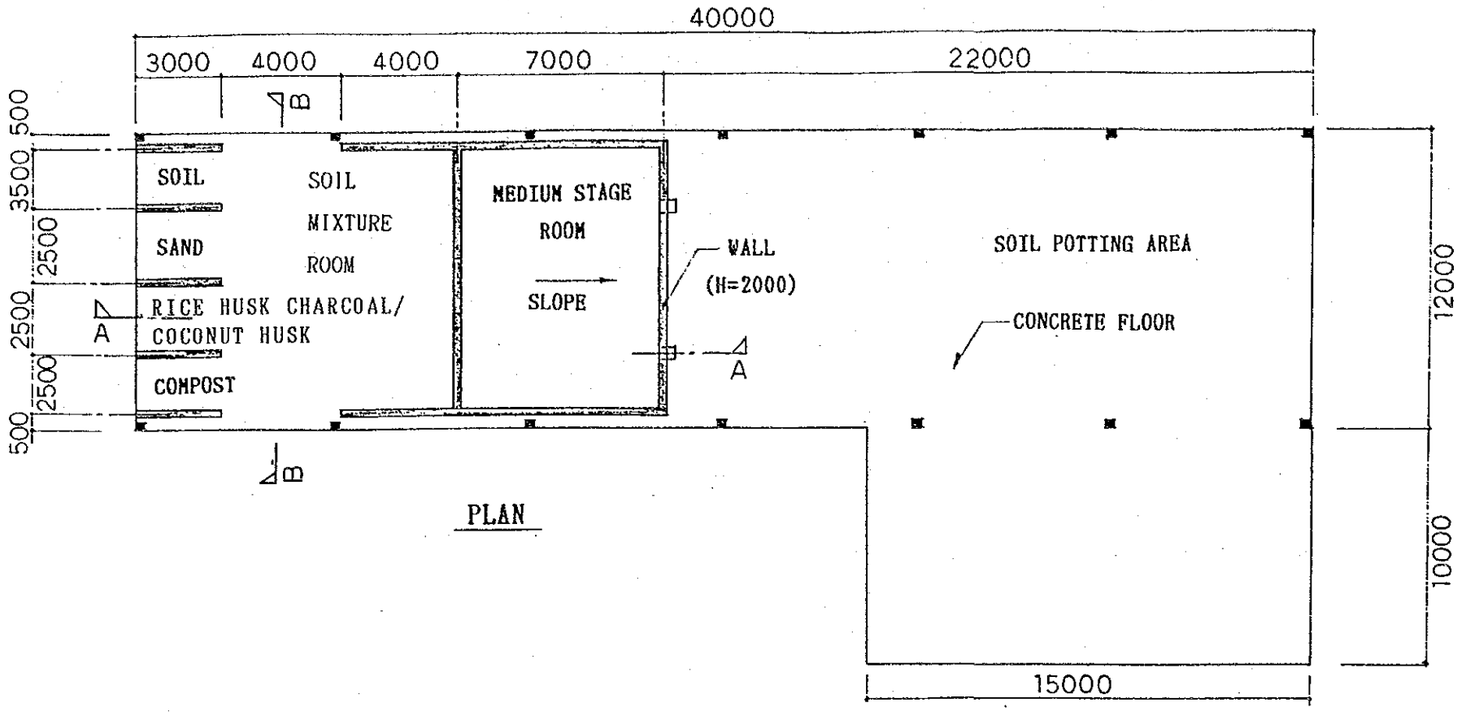


SECTION S-1:200

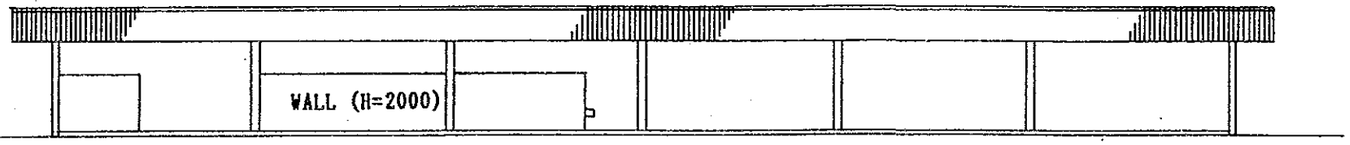


HIKO BOX STAND-DETAIL S-1:50

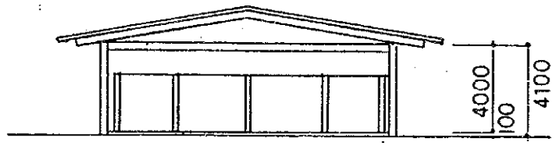
VINYL HOUSE



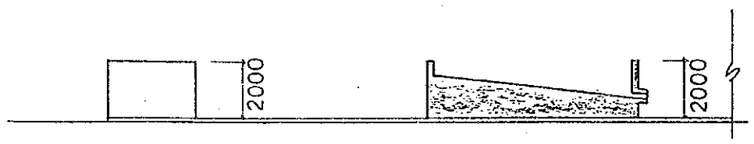
PLAN



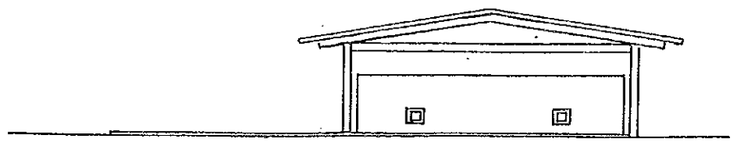
FRONT ELEVATION



B-B SECTION



A-A SECTION

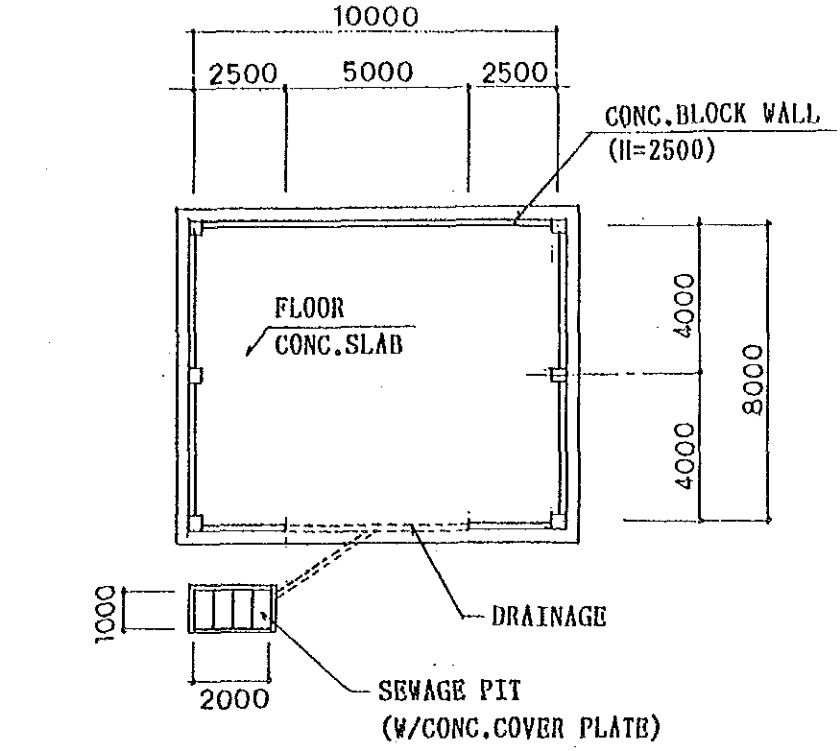


SIDE ELEVATION

SCALE 1:200

POTTING HOUSE

THE PROJECT FOR THE ESTABLISHMENT OF
LARGE-SCALE NURSERY CENTERS IN THE NORTHEAST OF THAILAND



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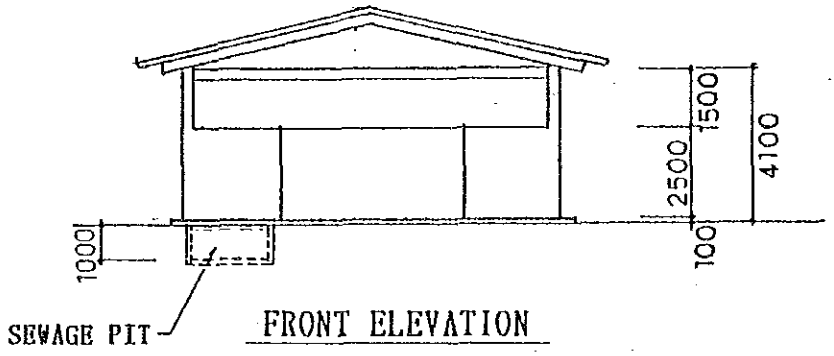
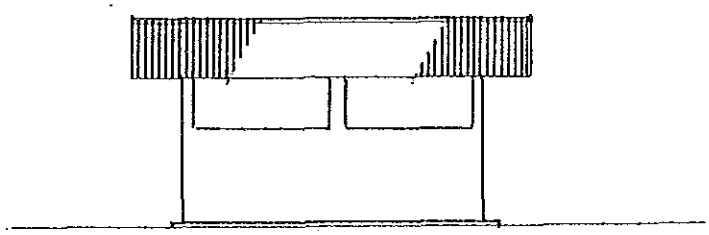


FRONT ELEVATION

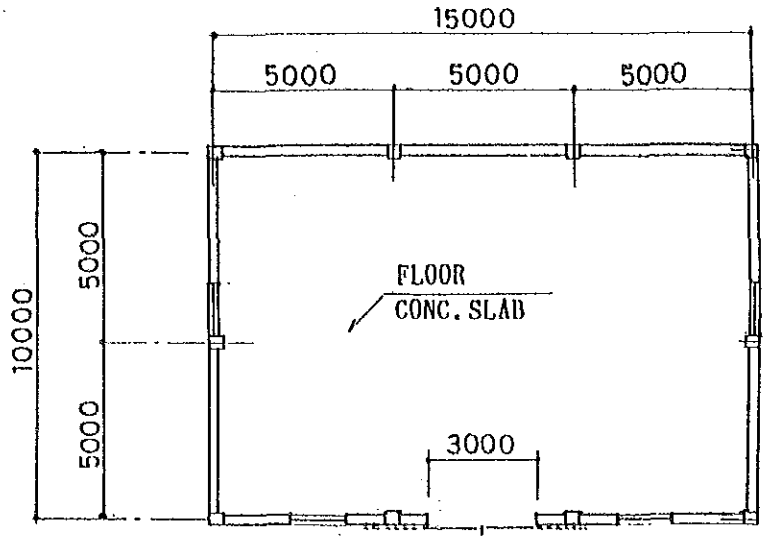


SIDE ELEVATION

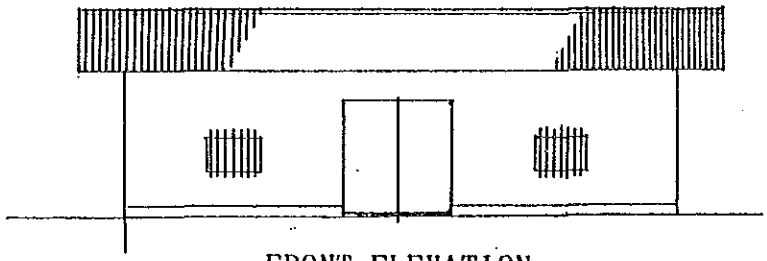
SCALE 1:200

COMPOST HOUSE

THE PROJECT FOR THE ESTABLISHMENT OF LARGE-SCALE NURSERY CENTERS IN THE NORTHEAST OF THAILAND



PLAN



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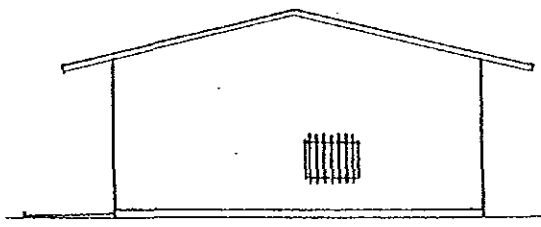
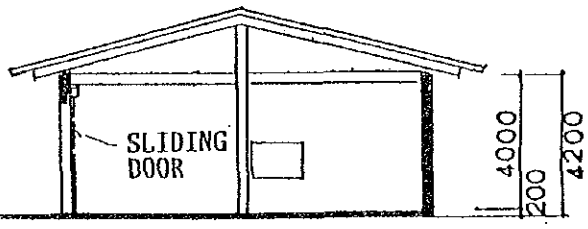


SIDE ELEVATION



SECTION

SCALE-1:200

STORAGE HOUSE

THE PROJECT FOR THE ESTABLISHMENT OF LARGE-SCALE NURSERY CENTERS IN THE NORTHEAST OF THAILAND

4-4 Implementation Plan

In case the Project is implemented under Japan's grant aid program, the implementation plan should be as follows.

4-4-1 Implementation Guidelines

After the signing of the Exchange of Notes, the government of Thailand will conclude a consulting agreement with a Japanese consultant firm, and in compliance with the provisions of the agreement, the detailed design of the facilities and equipment will be implemented. After completion of the detailed design documents, a Japanese contractor and corporation selected through a tender will construct the facilities and procure and install the equipment and tools.

In drafting the implementation plan it is necessary to take into consideration the scales and particulars of the facilities and the local climatic conditions, in addition to the fact that the construction sites are located separately in four regions. Moreover, it is also necessary to take into consideration the following points in order to complete the construction work within the scheduled period.

1) In case it is necessary to undertake the construction work simultaneously at two separate sites, several engineers specializing in the same field should be dispatched so that the construction work can be divided between two groups in order to observe the scheduled period of construction work.

2) Since the rainy season in Thailand lasts for 5 months between May and October, the implementation plan for foundation work should be prepared so as to avoid this season.

3) With regards to the construction work to be implemented by the Thai side, site preparation (including clearing and stump extraction), installation of power supply and telephone line, etc. for use in the construction work should be completed before the Japanese side starts with its construction work.

4) During the implementation of detailed design, the commencement time of each work item shared by each side should be made clear and should be mutually understood in advance.

5) While most of the materials for construction can be procured, the equipment of the machinery and experimentation will be imported from Japan. In order

to assure smooth custom clearance, it is necessary to establish a system which shall be covered by the Thai side through the Royal Forest Department (RFD).

4-4-2 Construction Conditions and Implementation Method

Investment boom in construction is rising in the capital sphere of Thailand, and prices of construction materials such as cement and so forth have risen conspicuously. Most of the construction materials used for the Project can be locally procured, but in case orders for massive quantities are issued, imposition of limits to the supplyable quantity is conceivable on account of the effect of the construction boom. Furthermore, as a longer than forecasted period of time may be required for obtaining the delivery of materials, control system for a safe work schedule needs to be worked out on the basis of careful studies made on the order time and delivery methods.

Labor population is moving into the capital in conspicuous numbers from the northeastern region of Thailand searching for employment opportunities. Therefore the securing of skilled workers in the provincial cities is reportedly more difficult. In the farming areas, massive numbers of laborers are employed for farming during the rainy season, but conversely, unemployed workers tend to increase during the dry season. For the Project such seasonally unemployed workers will be effectively utilized to promote progress of work, because of the need for completing the foundation work and soil - related work during the dry season.

4-4-3 Construction and Supervisory Plan

For the project implementation, one architect is expected to be permanently stationed at the construction site to control and supervise construction works. Moreover, according to the progress of works civil engineer and nursery experts are supposed to be dispatched to the site as short term supervisors. Supervisors are required to check whether or not works are carried out in accordance with drawings and specifications and also to provide technical advice and direction to the contractor in the course of construction. Other main works are summarized as follows.

1) Examination and approval of construction drawings as well as shop drawings

2) Confirmation and approval of construction equipment and materials

3) Report on work progress to the authorities concerned in both governments

4) Inspection of completed facilities and supplied equipment

5) Taking necessary procedure for payment and completion of works to be handed over

4-4-4 Procurement Plan

Since almost all construction materials are locally available, There will basically be no procurement from Japan and other third countries. As for pumps and air-conditioners, Japanese products are easily available in Thailand through the manufacturers agents stationed in Bangkok. Imported products are generally a bit expensive, but it is more advantageous to procure materials in Thailand in terms of after-care services.

Road network is well prepared in Thailand so that a few routes may be considered to transport construction equipment and materials from Bangkok to the site. As each project site is close to the provincial capital, some materials can be obtained if large orders are not required.

4-4-5 Implementation Schedule

After the conclusion of the Exchange of Notes (E/N), a contract will be signed between the Thai government and a competent Japanese consulting firm for detailed design and supervisory services. Detailed design, construction and equipment procurement are properly undertaken in accordance with the implementation schedule shown in Table 4-4-1. In consideration of a number of construction sites involved and the scale of nursery facilities it is desirable that the project is to be undertaken in two phases.

(1) Detailed Design

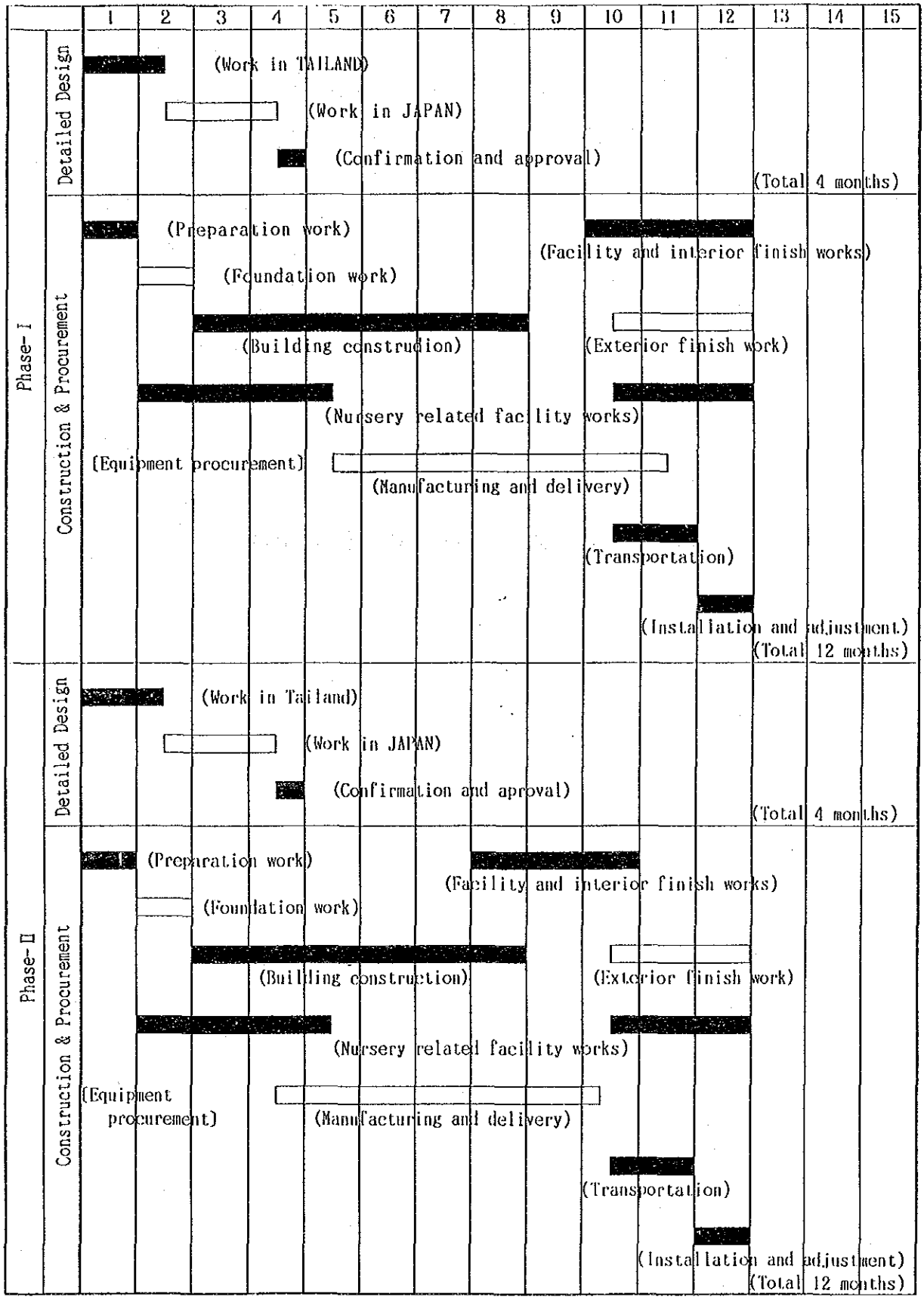
After signing the contract for consulting services, detailed design work will start subject to the verification of the contract by the Japanese government. Based on basic design, field survey will be conducted to determine and confirm the location and scale of each facility, then as a result of the data collected in the course of the field survey, domestic work will be carried out in order to

prepare drawings as well as tender document. A series of discussions are expected to be held in Bangkok with the concerned authorities in order that the document required for tendering is to be approved by the Thai government. The period required for detailed design work will be 4 months for each phase.

(2) Construction and Equipment Procurement

After signing the contract for construction, construction work will commence subject to the verification of the contract by the Japanese government. The construction period is estimated to last for 12 months for each phase taking into consideration the time interrupted by rain and the volumes of work to be carried out in two different locations. Machinery and equipment are scheduled to be supplied to the site when building facilities are nearly completed. The total period required from the time of order to the time of delivery is estimated to be 6 months. Furthermore, 45 days shall be accounted for transportation and customs clearance, and another 30 days for setting up and adjustment.

Table 4-4-1 Implementation Schedule



4-4-6 Scope of Works

(1) Responsibilities of the Japanese Side

1) Administrative Facilities

- Office and Training Building
- Work Shop
- Garage
- Generator House
- Oil Tank Base

2) Nursery Facilities

- Closed Nursery / Germination House
- Vinyl House (Only for Mahasarakham Nursery Center)
- Open Nursery
- Potting House
- Compost House
- Storage House
- Seed Solar Dryer

3) Other Facilities

- Water Intake
- Water Supply

4) Exteriors

- Road (Access Road and Work Road)
- Outside Light
- Drainage

5) Equipment

- Materials and Tools

- Machinery

(2) Responsibilities of the Thai Side

1) Site Preparation

- Removal of obstacles

- Leveling of ground

2) Infrastructure

- Power supply

- Telephone supply

3) Construction

- Dormitory for trainees

- Rest House

- General dormitory

- Labour House

- Guest House

- Garage

4) Exteriors

- Gate

- Fence

5) Others

- Furniture

- Equipment and furnishings

CHAPTER 5

PROJECT EVALUATION AND CONCLUSION

Chapter 5 Project Evaluation and Conclusion

(1) Effect of the Project

1) It is certain that the Project will produce a remarkable effect through the activities of the Integrated Reforestation and Extension Project in the Northeast of Thailand, such as the production and distribution of seedlings, the establishment of demonstration plantation, extension and training as the bases of these activities. Accordingly, the four Large-scale Nursery Centers will make a big contribution toward the Greening of E-san Project.

2) According to the Greening of E-san Project, it is necessary to undertake reforestation of 2,340,000 ha. during the 30 years between 1991 and 2020. However, the production of seedlings is in absolute shortage that it is unable to meet the current demand for seedlings in the rural villages. The productions and distribution of seedlings through the Large-scale Nursery Centers established under the Project is considered highly important for securing sufficient quantities of seedlings to break through the existing bottle neck obstructing supply of seedlings.

3) The establishment of a demonstration plantation aims at conservation basis and economic basis in addition to other demonstrations such as agro-forestry plantation or a model community forest. Therefore, as measures for rural inhabitants, synergistic effect will be expected among other activities.

4) In order to promote reforestation in the northeastern region, it would be necessary to set up and reinforce the extension organization and to improve the rural inhabitant's awareness and knowhow of reforestation through training. Therefore, the implementation of various training courses at the Large-scale Nursery Centers is expected to bring out a lot of rural inhabitants who will contribute highly to reforestation in the Northeastern region.

5) The project type technical cooperation will reinforce the effect of the Project by implementing the activities focused on extension and training using the Mahasarakham Large-scale Nursery Center as a central base and other three Large-scale Nursery Centers as development bases, while making efficient use of the facilities and equipment provided by the Project in cooperation with JOCV.

6) The Project will contribute greatly not only towards achieving the objectives of the Greening of E-san Project through reforestation in the Northeast of Thailand, but also toward the so-called global environment conservation.

(2) Conclusion

1) Evaluation

The Project is adjudged highly significant since it is deemed necessary for effective implementation of the Integrated Reforestation and Extension Project in the Northeast of Thailand. The capacity of the executing agency in the management of the facilities and equipments provided can be confirmed, and accordingly, the Project can be executed through the technical cooperation planned in connection with the Project.

2) Recommendations

The following suggestions are presented with a view to expediting the implementation of the Project and ensuring the smooth and effective operation of the nursery centers.

- Prompt completion of the Necessary Procedures.

As the Project will be implemented in accordance with the principles of Japan's grant aid program, there are certain time limits involved such as the need to complete the construction works within a definite period of time. It is essential, therefore, that the necessary procedures for the exchange of notes, consultant agreement, construction contract and other contracts, relative to the procurement of equipment shall be completed promptly.

- Smooth Implementations of Construction Work to be undertaken by the Thai side.

It is necessary that the Thai side shall complete its responsible works, particularly the site preparation work and the power line installation work before the Japanese side starts its construction work.

- Securing Budget and Personnel

In order to implement smoothly and effectively the activities of the Nursery Centers, it is necessary to secure an ample budget and sufficient personnel including the required lecturers.

- Construction of Dormitory for Trainees

Although a dormitory for trainees in each Nursery Center is indispensable to the training which is one of the important activities of the Integrated Reforestation and Extension Project in the Northeast of Thailand, the

construction of such a facility will not be included to the Project according to the policy of Japan's Grant Aid. It is desirable, therefore, that the Thai side should secure its own budget for the construction of these dormitories and complete the construction work in parallel with the implementation of the Project.

〔APPENDIX〕

〔Appendix〕

1. Members of the Study Team

(1) Basic Design Study (I)

①	Yoshihiro KOYANAGI	Leader/ Senior Officer on Forest Products Trades, Wood Distribution Division, Forest Policy Planning Department, Forestry Agency
②	Masayuki IWASA	Seedlings Production/ Director of Civilculture Division Management Department, Asahikawa Regional Forestry Office, Forestry Agency
③	Shinya SUZUKI	Grant Aid Planner/ Grant Aid Division, Economic Cooperation Bureau, Ministry of Foreign Affairs
④	Ken'ichi SHISHIDO	Project Coordinator/ First Basic Design Study Division, Grant Aid Planning and Survey Department, JICA
⑤	Hitoshi KATO	Chief Consultant/ Kokusai Kogyo Co., Ltd.
⑥	Kiyoshi FUJII	Nursery Specialist/ Kokusai Kogyo Co., Ltd.
⑦	Yoshio NAKANO	Architectural Designer/ Kokusai Kogyo Co., Ltd.
⑧	Kazuyoshi KAGEYAMA	Facilities Planner/ Kokusai Kogyo Co., Ltd.
⑨	Susumu SHIMURA	Materials and Equipment Planner/ Kokusai Kogyo Co., Ltd.

(2) Basic Design Study (II) (Consultation on Draft Report)

①	Kuniaki KATO	Leader/ Auditor, Administration Department, Forestry Agency
②	Ken'ichi SHISHIDO	Project Coordinator/ First Basic Design Study Division, Grant Aid Planning and Survey Dept. JICA
③	Hitoshi KATO	Chief Consultant/ Kokusai Kogyo Co., Ltd.
④	Yoshio NAKANO	Architectural Designer/ Kokusai Kogyo Co., Ltd.
⑤	Susumu SHIMURA	Materials and Equipment Planner/ Kokusai Kogyo Co., Ltd.
⑥	Shin'ichi MATSUNAGA	Cost Estimation/ Kokusai Kogyo Co., Ltd.

2. Survey Schedule

(1) Basic Design Study (I)

Date	Schedule and Remarks
1 Jan. 13 (Sun)	Lv. Tokyo, Ar. Bangkok
2 14 (Mon)	Courtesy call on Embassy of Japan, JICA Office, DTEC and RFD Submission and Explanation of Inception Report and Questionnaires to RFD
3 15 (Tue)	Meeting with RFD
4 16 (Wed)	Lv. Bangkok, Ar. Khonkaen
5 17 (Thu)	Lv. Khonkaen, Ar. Ubonratchathani Survey of the proposed project site Yasothon
6 18 (Fri)	Lv. Ubonratchathani, Ar. Nakhonratchasima Survey of the proposed project site Nakhonratchasima
7 19 (Sat)	Inspection of Sakaerat Field Station (The Research & Training in Re-Afforestation Project) Lv. Nakhonratchasima, Ar. Bangkok (Messrs. Koyanagi, Iwasa, Suzuki, Shishido, Kato, Nakano and Shimura — A group) Lv. Nakhonratchasima, Ar. Udonthani (Messrs. Fujii and Kageyama — B group)
8 20 (Sun)	Team Meeting (A group)
9 21 (Mon)	Survey of the proposed project site (Udonthani) (B group)
9 21	Team Meeting and Meeting with RFD (A group) Cont. survey Lv. Udonthani, Ar. Yasothon (B group)
10 22 (Tue)	Meeting with RFD (A group) Cont. survey (B group)
11 23 (Wed)	Signing of Minutes of Discussions Reporting to Embassy of Japan and JICA Office (A group) Cont. survey (B group)

12	24 (Thu)	Lv. Bangkok, Ar. Tokyo (Messrs. Koyanagi, Iwasa, Suzuki and Shishido) Lv. Bangkok, Ar. Nakhonratchsima (Messrs. Kato, Nakano and Shimura — A' group) Cont. survey Lv. Yasoton, Ar. Nakhonratchasima (B group)
13	25 (Fri)	Survey of the proposed project site Nakhonratchasima (A' and B group)
14	26 (Sat)	-do-
15	27 (Sun)	-do-
16	28 (Mon)	-do-
17	29 (Tue)	Lv. Nakhonratchasima, Ar. Khonkaen Survey of the proposed project site (Mahasarakham)
18	30 (Wed)	Cont. survey
19	31 (Thu)	-do-
20	Feb. 1 (Fri)	-do-
21	2 (Sat)	Cont. survey Team Meeting
22	3 (Sun)	Lv. Khonkaen, Ar. Udonthani (A' group) Lv. Khonkaen, Ar. Bangkok (B group)
23	4 (Mon)	Survey of the proposed project site Udonthani (A' group) Data arrangement (B group)
24	5 (Tue)	Cont. survey (A' group) Data arrangement (B group)
25	6 (Wed)	Lv. Udonthani, Ar. Ubonratchatani Survey of the proposed project site Yasothon (A' group) Lv. Bangkok, Ar. Tokyo (B group)
26	7 (Thu)	Cont. survey

27	8 (Fri)	Cont. survey Lv. Ubonratchathani, Ar. Bangkok
28	9 (Sat)	Data arrangement
29	10 (Sun)	-do-
30	11 (Mon)	Meeting with RFD
31	12 (Tue)	Data arrangement
32	13 (Wed)	Meeting with RFD
33	14 (Thu)	Data arrangement
34	15 (Fri)	Meeting with RFD Reporting to Embassy of Japan and JICA Office
35	16 (Sat)	Lv. Bangkok, Ar. Tokyo

(2) Basic Design Study (II) (Consultation on Draft Report)

Date	Schedule and Remarks
1 May 12 (Sun)	Lv. Tokyo, Ar. Bangkok
2 13 (Mon)	Courtesy Call on Embassy of Japan, JICA, DTEC and RFD Explanation of Draft Report to RFD
3 14 (Tue)	(Team Leader) Lv. Bangkok, Ar. Khonkaen Survey of the proposed project site Mahasarakham Lv. Khonkaen, Ar. Bangkok (Other Team Members) Discussion with RFD
4 15 (Wed)	Discussion with RFD
5 16 (Thu)	Discussion with RFD Signing of Minutes of Discussion
6 17 (Fri)	Reporting to Embassy of Japan and JICA Office Lv. Bangkok
7 18 (Sat)	Ar. Tokyo

3. Member List of Concerning Parties in the Recipient Country

1) Department of Technical and Economic Cooperation

Mr. Apinan Patiyanon	Director of External Cooperation Division III
Ms. Montana Thammachote	Programme Officer (Japanese Section)
Mr. Vudhisit Viryasiri	Staff of Japan Sub-division, Division III
Mr. Tomikazu Inagaki	JICA Expert on Technical Cooperation Coordination

2) Royal Forest Department, Ministry of Agriculture and Cooperative

Mr. Phairot Suvanakorn	Dorector-General of RFD
Dr. Thanit Yingvanasiri	Director of Silviculture Division
Mr. Paisan Kuwaliarat	Chief of Reforestation and Forest Improvement Sub-division
Mr. Pravit Chittachumnong	Staff of Silviculture Research Sub-division
Mr. Sompong Paktoop	Staff of Reforestation and Forest Improvement Sub-division
Mr. Suthep Laohadet	Project Director of IREP (Integrated Reforestation and Extension Project)
Mr. Anan Sorn-ngai	Field Project Director of IREP and Chief of Mahasarakham Nursery Center

Mr. Veerasak Chuntaprasit	Machanical Engineer of National Forest Land Management
Mr. Takoengphon Kumphlanon	Architect of National Forest Land Management
Mr. Suthat Thirawat	Staff of Reforestation and Forest Improvement Sub-division
Mr. Virot Deerasvises	Staff of Reforestation and Forest Improvement Sub-division
Mr. Chamlong Uthaiwattanadet	Staff of Reforestation and Forest Improvement Sub-division
Mr. Phichaya Yangyuen	Staff of Reforestation and Forest Improvement Sub-division
Miss Nittaya Handechanon	Staff of Reforestation and Forest Improvement Sub-division
Miss Anuch Siripornnoppakhun	Staff of Reforestation and Forest Improvement Sub-division
Miss Ruenruedee Phoncheangsa	Staff of Reforestation and Forest Improvement Sub-division

3) Khon Kaen Regional Forest Office, RFD

Mr. Jalun Mitreestit	Director of Khon Kaen RFO
Lt. Kanok Wonnasiri	Chief of RFIS(Reforestation and Forest Improvement Section)

Mr. Pirat Kenvises	Assistant Chief of RFIS
Mr. Chitsanu Wongnonti	Chief of Sum Khan and Dong Lan Demonstration Plantation Unit

4) Mahasarakham Nursery Center, RFD

Mr. Viroj Deeratviset	Assistant Chief of MNC(Mahasarakham Nursery Center)
Mr. Chusake Tangsiripaiboon	Chief of DMPDPU(Dong Mae Pate Demonstration Plantation Unit)
Mr. Pradit Ruengnarab	Chief of Extention and Training Unit, MNC
Mr. Ma-air Jae-do	Chief of Roiet Province Nursery Sub-center
Miss Malinee Koosakulrat	Assistant Chief of DMDPU
Mr. Charat Chuayna	Chief of Planning Unit, MNC

5) Khon Kaen University

Mr. Chalong Buaphan	Assistant Proffesor (Hydrogeologist), Department of Geotechnology, Faculty of Technology

6) Nakhon Ratchasima Regional Forest Office, RFD

Mr. Weera Affanatho	Chief of FLMS(Forest Land Management Section)

Mr. Chardehai Yoskrai	Assistant Chief of RFIS
Mr. Theera Koupvahit	Forest Officer of FLMS

7) Nakhon Ratchasima Nursery Center, RFD

Mr. Somporn Chaicharus	Chief of NNC(Nakhon Ratchasima Nursery Center)
Mrs. Suwunnee Chareonkolgit	Assistant Chief of NNC in Charge of Administration
Mr. Apisit Simsiri	Chief of Demonstration Plantation Unit 1 of NNC
Mr. Sumet Siriluk	Chief of Demonstration Plantation Unit 2 of NNC
Mr. Cha-um Cha-umphol	Assistant Chief of NNC in Charge of Nursery Technique
Miss Nantiya Ouysawadi	Office Staff of NNC

8) Sakaerat Field Station, RFD

Mr. Vikhan Anphanulak	Chief of Sakaerat Field Station

9) *Udonthani Regional Forest Office, RFD*

Mr. Manit Eamsunpang	Director of Udonthani RFO

Mr. Sanan Siriwatanakan	Deputy Director of Udonthani RFO
Mr. Pactoon Jencharoenphand	Chief of Thomphakha Demonstrstion Plantation Unit

10) Udonthani Nursery Center, RFD

Mr. Anusit Methavaraluk	Chief of UNC (Udonthani Nursery Center)
Mr. Teerasri Srihabundit	Chief of Administration Unit, UNC
Mr. Suthep Pavaresvitayaral	Chief of Nursery and Plantation Unit, UNC
Mr. Somdet Champee	Chief of Planning and Extension Unit, UNC

11) Ubon Ratchathani Regional Forest Office, RFD

Mr. Boonkuer Poodklong	Chief of FLMS
Mr. Sathit Ritthivudh	Chief of Forest Survey Section
Mr. Viriya Kateehararut	Forest Technician of Silviculture Section
Mr. Sathorn Kotemongkol	Chief of Forest Development Unit (Srisaket No. 3)
Mr. Vaehira Ounaehak	Chief of Wildlife Sanctuary Phanom Dongrak

12) Yasothon Nursery Center, RFD

Mr. Wallop Waewichit	Chief of YNC (Yasothon Nursery Center)

Mr. Tumnoon Akarapin	Chief of Planning, Nursery and Plantation Unit, YNC
Mr. Likit Takong	Chief of Administration and Trainning Unit, YNC
Mr. Silapha Somyapakdee	Chief of Extension Unit, YNC

4. Minutes of Discussions

(1)Basic Design Study(I)

MINUTES OF DISCUSSIONS
BASIC DESIGN STUDY ON THE PROJECT FOR
THE ESTABLISHMENT OF LARGE-SCALE NURSERY CENTERS
IN THE NORTHEAST OF THAILAND

In response to the request of the Government of the Kingdom of Thailand and based on the results of the Preliminary Survey for the Integrated Reforestation and Extension Project in the Northeast of Thailand (hereinafter referred to as "the I.R.E.Project"), the Japan International Cooperation Agency (JICA) decided to implement the Basic Design Study on the Project for the Establishment of Large-scale Nursery Centers in the Northeast Thailand (hereinafter referred to as "the Project") and sent the study team, headed by Mr. Yoshihiro Koyanagi, Senior Officer on Forest Products Trade, Wood Distribution Division, Forest Policy Planning Department, Forestry Agency, from January 13 to February 16, 1991.

The team had a series of discussions with the authorities concerned of the Government of the Kingdom of Thailand and conducted a field survey in the Project sites.

As a result of the discussions and field survey, both parties confirmed the main items described in the attached sheets. Based on these items, the team will proceed with the works and prepare the Basic Design Study Report on the Project.

Bangkok, January 23, 1991

Yoshihiro Koyanagi
Leader
Basic Design Study Team
JICA

Phairot Suvanakorn
Director-General
Royal Forest Department
Ministry of Agriculture
and Cooperatives

ATTACHMENT

1.Title of the Project

The title of the Project is "the Project for the Establishment of Large-scale Nursery Centers in the Northeast of Thailand" as a part of the I.R.E. Project.

2.Objective of the Project

The objective of the Project is to establish four(4) Large-scale Nursery Centers in the Northeast of Thailand in order to effectively achieve the following objectives of the I.R.E.Project.

(1) To prevent natural disasters, improve environmental conditions and up-grade the quality of people's life through expansion of reforestation activities and strengthening of social forestry extension.

(2) To increase the production of good quality seedlings to meet the demand of both governmental and private sectors.

(3) To establish demonstration forests and model community forests in order to accelerate tree planting activities in the Northeast Region.

(4) To improve reforestation techniques through the training of man power both governmental and private, the latter also enlisting "grass-roots' level" workers including women.

3.Project sites

The Project sites are located in four(4) regional forest areas, MAHASARAKHAM, NAKHON RATCHASIMA, UDONTHANI and YASOTHON, shown in the attached site map, Annex I.

4.Executing agency

The Royal Forest Department of the Ministry of Agriculture and Cooperatives is responsible for the administration of the Project.

Y.K.

5. Components of the Project

(1) Components of the Project requested by the Government of Thailand are described in Annex I.

However, the final components of the Project may differ from the above items, in accordance with the results of further study in both Thailand and Japan.

(2) Major points of mutual understanding on the components are as follows;

a) Domitory should be costructed by the Thai side. However, the Thai side strongly requested that the construction of one domitory at MAHASARAKHAM Nursery Center was included to the Japan's Grand Aid.

b) Rest house should be constructed by the Thai side.

c) As for water supply system of the proposed nursery, the introduction of sprinkler system should be considered only for germination nursery and glass house.

d) Equipment and tools to be covered by the Japan's Grant Aid should be limited to the reasonable level for the efficient implementation of the Project

e) As for tissue culture laboratory, it is not appropriate to include its facilities and equipment to the Project.

f) Facilities and equipment of laboratory should be limited to the test purpose for the production of the seedlings instead of research and development purpose.

6. Grant Aid system of the Government of Japan

(1) The Government of the Kingdom of Thailand has understood the system of the Japan's Grant Aid explained by the team.

(2) The Government of the Kingdom of Thailand will take the necessary measures, described in Annex II for the smooth implementation of the Project, on condition that the Japan's Grant Aid is extended to the Project.

Y. K.

7. Schedule of the Study

(1) JICA will prepare the Draft Final Report in English and dispatch a mission in order to explain it in the middle of May, 1991.

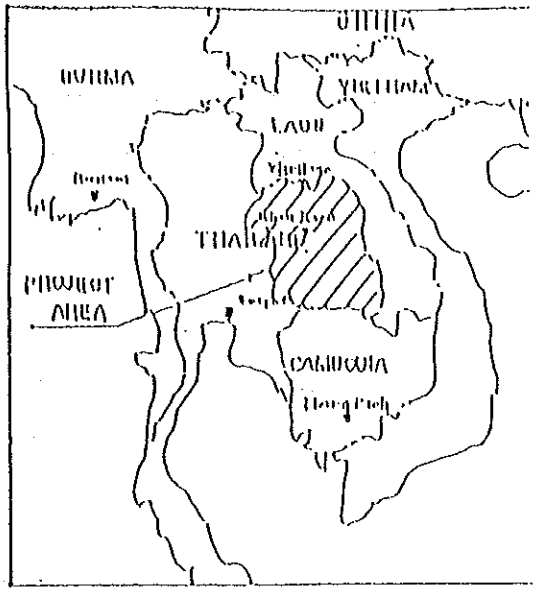
(2) In case that the contents of the Draft Final Report is accepted in principle by the Government of the Kingdom of Thailand, JICA will complete the Final Report and send it to the Government of the Kingdom of Thailand by the end of July, 1991.

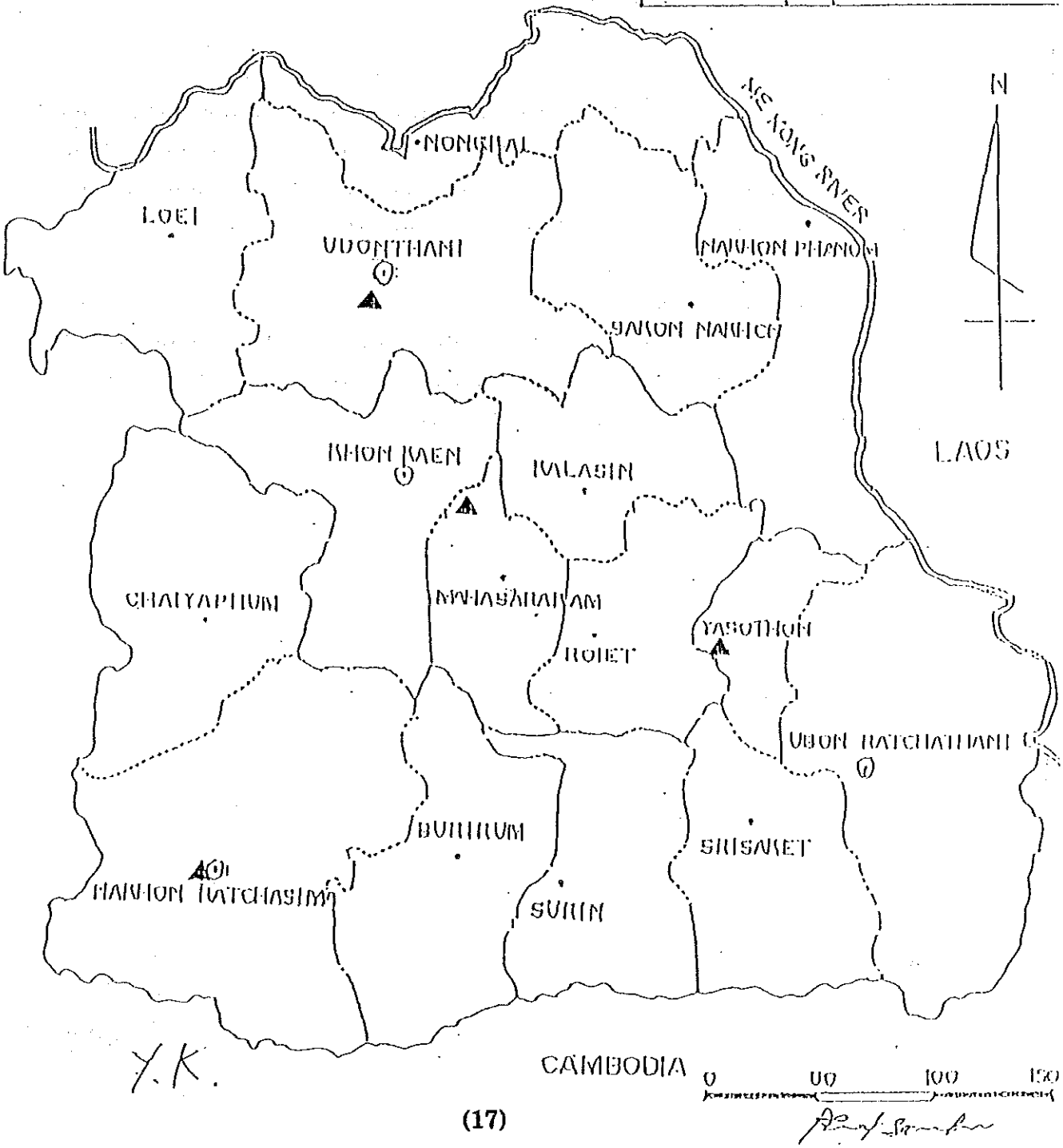
Y. K.

SITE MAP

-LEGEND-

- REGIONAL FOREST OFFICE BOUNDARY
- PROVINCE BOUNDARY
- REGIONAL FOREST OFFICE
- PROVINCE CAPITAL
- PROJECT SITE





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Annex I

COMPONENTS OF THE PROJECT REQUESTED BY THE GOVERNMENT OF THE KINGDOM OF THAILAND

1.Main Building

MAHASARAKHAM Nursery Center

- Main Office and Training Building

NAKHON RATCHASIMA, UDONTHANI and YASOTHON Nursery Centers

- Main Office Building with Training Part

2.Domitory

Four(4) Nursery Centers

3.Facilities

Open Nursery, Germination Nursery(Closed Nursery), Knock-down Nusery, Glass House, Storage, Potting House, Compost house, Work-shop, Garage, Cafeteria, Rest House, Other Facilities (Water Supply System, Generator House)

4.Equipment and Tools

Equipment and Tools for Nursery Work, Demonstration Plantation, Transportation, Administration, Laboratory For Mass-production, Extension and Training

Annex Ⅱ

MEASURES TO BE TAKEN BY THE GOVERNMENT OF THE KINGDOM OF THAILAND

1.To acquire and prepare the land required for the Project implementation.

2.To ensure the land or right-of-way necessary for construction of the temporary access roads from the existing rural roads to the proposed construction site.

3.To allow transportation of vehicles, machinery and construction equipment on the existing natinal and rural roads.

4.To exempt import duties and incidental expenses and to take necessary measures for customs clearance of the materials, equipment and spare parts brought to Thailand for the implementation of the Project. These exemptions shall be subject to the existing Thai rules and regulations which are applicable to similar grant aid projects.

5.To assume commissions to the Japanese foreign exchange bank for banking services based on the banking arrangement as follows:

(1) Advising commission of authorization to pay

(2) Payment comission

6.To accord Japanese nationals, whose services may be required in connection with the supply of products and services under the verified contracts, such facilities as may be necessary for their entry into and stay in Thailand for the performance of their work.

7.To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Thailand with respect to the supply of products and services under the

Y.K.

verified contracts.

8.To bear all expenses, other than those to be borne by the Japan's Grant Aid, necessary for the implementation of the Project.

9.To fully maintain the facilities which are constructed under the Japan's Grant Aid in cooperation with relevant authorities concerned.

10.To supply the following items;

(1) articles of comsumption such as stationary, fertilizer, etc.

(2) items to be procured easily in Thailand and considered as local components

(3) general furniture

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(2)Basic Design Study(Ⅱ)(Consultation on Draft Report)

MINUTES OF DISCUSSIONS
THE BASIC DESIGN STUDY
ON THE PROJECT FOR THE ESTABLISHMENNT
OF LARGE-SCALE NURSERY CENTERS
IN THE NORTHEAST OF THAILAND
(CONSULTATION ON DRAFT REPORT)

In January 1991, the Japan International Cooperation Agency (hereinafter referred to as JICA) dispatched the Basic Design Study Team on the Project for the establishment of large-scale nursery centers in the northeast Thailand (hereinafter referred to as the Project), and through a series of discussions, field survey in here, and technical examination of the results in Japan, has designed the appropriate plan for the Project and prepared the Draft Report of the Basic Design Study.

In order to explain and to consult on the components of the Draft Report, JICA sent a team, headed by Mr.Kuniaki Kato, Auditor, Administration Department, Forestry Agency from May 12nd to 18th, 1991.

As a result of the discussions, both parties confirmed the main items described on the attached document.

Bangkok, May 16th, 1991

加藤國昭

Mr. Kuniaki Kato
Leader,
Draft Report Explanation Team,
Japan International Cooperation Agency

Phairot Suvanakorn

Mr. Phairot Suvanakorn
Director-General,
Royal Forest Department,
Ministry of Agriculture and Cooperatives

ATTACHMENT

1. Components of Draft Report

The Government of Thailand has agreed and accepted in principle the components of the Draft Report proposed by the team. JICA will complete the Final Report considering the following comments by the Thai side;

1) One truck for transportation, one pick-up truck (small) and one pick-up truck (4WD) for each center should be added to the project, while about 15 units of Knock-down nursery for each center will be replaced by the Thai side with the temporary nursery.
2) The main building of Nakhon Ratchasima should face to the southeast taking account of local tradition.
3) Air-conditioners should be installed for a meeting room at Mahasarakham nursery center and meeting & seminar rooms at the other 3 centers, while the finish of the buildings except for the main building should be reviewed.

2. Domitory

The team has explained that the construction of domitory could not be included in the Project in accordance with the policy for Japan's Grant Aid though it is neccesary for training activities. Therefore, the Thai side should consider on the construction of the domitory by its own budget.

3. Japan's Grant Aid System

(1) The Government of Thailand has understood the system of Japan's Grant Aid explained by the team.
(2) The Government of Thailand will take the necessary measures, described in Annex, for smooth implementation of the Project on condition that the Grant Aid assistance by the Government of Japan is extended to the Project.

4. Further schedule

JICA will complete the Final Report in accordance with the confirmed items, and send it to the Government of Thailand by the end of July 1991.

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ANNEX Undertakings by the Government of Thailand

1. To aquire and prepare the land required for the implementation of the project.

2. To ensure the land or right of way neccesary for construction of the temporary accessroads from the existing rural roads to the proposed construction sites.

3. To allow transpotation of vehicles, machinery and construction equipment on the existing national and rural road.

4. To exempt import duties and incidental expenses and to take neccesary measures for custom clearance of the materials,equipment and spare parts brought to Thailand for the implementation of the Project. These exemptions shall be subject to the existing Thai rules and regulations which are applicable to similar grant aid projects.

5. To assume commissions to the Japanese foreign exchange bank for banking services based on the banking arrangement as follows:
   (1) Advising commission of authorization to pay
   (2) Payment commision

6. To accord Japanese nationals, whose services may be required in connection with the supply of products and services under the verified contracts, such facilities as may be neccesary for their entry into and stay in Thailand for the performance of their works.

7. To exempt Japanese nationals from custom duties, internal taxes and other fiscal levies which may be imposed in Thailand with respect to the supply of products and services under the verified contracts.

8. To bear all expenses, other than those to be borne by the Japan's Grant Aid, necesssary for implementaion of the Project.

9. To fully maintain the facilities which are constructed under the Japan's Grant Aid in cooperation with relevant authorities concerned.

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