

3) Quarantine Operation Division

① Cargo terminal

Since it is predicted that there will be a substantial increase in the plant quarantine workload in the future, a cargo terminal should be constructed for greater operational efficiency. Exporters and importers of agricultural products who utilize the airport are to deliver their goods first to this cargo terminal, where such goods are to undergo a plant quarantine inspection. Treatment facilities are to be constructed around the cargo terminal so that the treatment services may be carried out efficiently.

② Treatment facilities

Such treatment facilities as a fumigation room, a fumigation testing room and a treatment room, as well as such ancillary facilities as a treatment preparation room and a treatment inspection room, should be constructed near the quarantine operation facilities. Under such an arrangement, it will be possible to directly utilize the treatment facilities for the treatment of export and import plants.

(2) Equipment

Based on the equipment plan worked out at the time of preparation of the previous basic design, it was decided to enhance the functions of the quarantine operation division and to limit the items of equipment to be installed in the inspection technology division's facilities to those which are essentially required. The major modifications made to the original equipment plan are as shown below.

- 1) Items of equipment whose functions are to be enhanced and those which are to be newly introduced.

- ① Enhancement of the functions of the 30m³ fumigation chamber

Hydrogen cyanide, in addition to methyl bromide, should be applicable in this chamber. The facility for phosphine fumigation should be provided other than this chamber.

- ② Enhancement of the functions of the methyl bromide fumigation equipment

The equipment's capacity should be enlarged from 0.5m³ to 1.0m³.

- ③ Introduction of low-temperature treatment chambers

Two low-temperature treatment testing equipment with a capacity of 1.0m³ are to be introduced.

- ④ Enhancement of the functions of the prefabricated refrigerator

The specifications of one of the prefabricated refrigerators should be changed so that it may be used as low-temperature treatment for fruit disinfestation (disinfestation at -1.5°).

- ⑤ Others

Those items of equipment which need to be installed in the treatment room and some items of equipment which need to be installed in the existing seaport/airport plant quarantine stations were added.

- 2) Canceled items of equipment

- ① Antiserum production equipment

In the original basic design, rabbits were to be kept for the purpose of producing antiserum. But it was decided to procure antiserum from outside organizations. As a result, the following items of equipment were canceled.

- Equipment required to raise rabbits and rabbit fixer
- Freeze-dryer
- Ultra-centrifuge
- Densitometer

② Equipment for use in Virological inspection/tissue culture

The virus purification room was integrated into the virological inspection room, the tissue culture room, the preparation room and the in-activation room were combined into a tissue culture room. As a result, center laboratory tables, the laboratory sinks, etc. were rearranged.

③ Fumigation biotoron room

In the previous basic design, fumigation tests were to be conducted in a prefabricated biotoron chamber. But it was decided to conduct fumigation tests in a fumigation testing chamber equipped with an air-conditioner.

④ Insectarium biotoron

It was decided to construct a chamber to keep large numbers of fruit flies in another building and to keep other insects in the insectarium. But at the same time it was decided to use an air-conditioner, not a biotoron, for temperature/humidity control.

⑤ Equipment for common use

The incubators, chemical balances and the like should be shared as much as possible.

4-2-5 Basic Principles of Implementation of the Cooperation

As a result of the above examination, the expected effects and the practicability of this project, as well as the implementing ability of the Sri Lankan side for this project have been confirmed. And the expected effects of the project matches Japan's grant aid system. Therefore, it is considered reasonable and advisable that this project should be implemented with grant aid from the Government of Japan. Thus, the outline of the project will be examined, and the basic design will be carried out on the premise that this project will be implemented with grant aid from the Government of Japan. As to the contents of the project, however, part of the previous basic design was modified, as described in "Examination of the Previous Basic Design."

4-3 Outline of the Project

4-3-1 Project Management System

Department of Agriculture of the Ministry of Agricultural Development and Research is the implementing organization for the project. After completion, the National Plant Quarantine Services will belong to the Seed Certification and Plant Protection Division of Department of Agriculture and will operate on an equal basis with the Central Agricultural Research Institute, and the Plant Genetic Resources Centre which are operating under the control of the Research Division of Department of Agriculture.

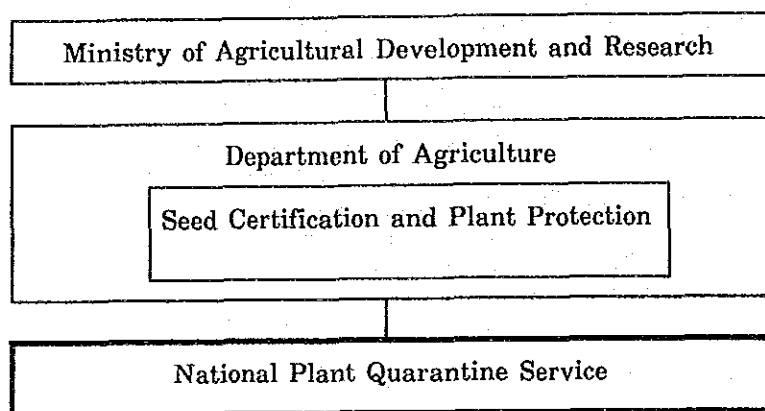


Fig. 4-1 Implementing Organization of the Project

The National Plant Quarantine Services' organization structure is as illustrated below.

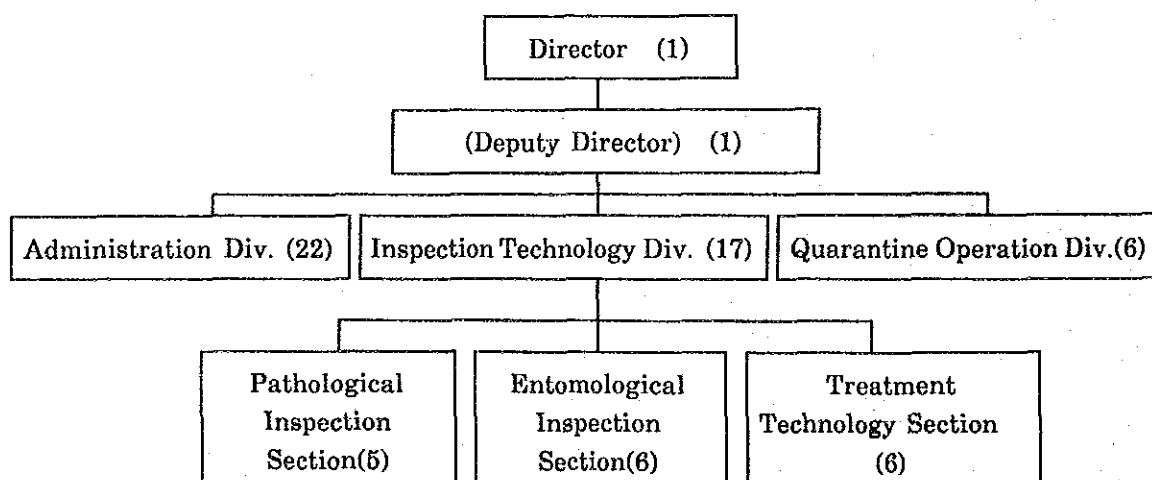


Fig. 4-2 Organization Structure

It is considered appropriate for it to start with a staff of 46, as shown in the following table.

Table 4-1 Personnel Plan

Division & Section		Position	Qualification	Staff Nos.	Total		
Administration Division		Director		1	23		
		Manager		1			
		Expert (1)	RO/AO	1			
		Expert (2)	AO	1			
		Clerk		3			
		Assistant		16			
Inspection Technology Division	Pathological Inspection Section	Head	RO	1	5		
		Expert	RO	1			
		Asst. Inspector	AI	1			
		Assistant	RA	2			
	Entomological Inspection Section	Head	RO	1	6		
		Expert	RO	1			
		Asst. Inspector	AI	2			
		Assistant	RA	2			
	Treatment Technology Section	Head	RO/AO	1	6		
		Expert	RO/AO	1			
		Asst. Inspector	AI	3			
		Assistant	RA	1			
	Quarantine Operation Division		Manager			6	
			Inspector (1)	AO	2		
			Inspector (2)	AI	4		
Total					46		

- (Note) RO : Research Officer (graduate BS, MS or Phd)
 AO : Agricultural Officer (graduate BS, MS or Phd, 2-year diploma and 15 year experience)
 AI : Agricultural Instructor (2-year diploma)
 RA : Research Assistant (high school & 1 year experience)

4-3-2 Service Plan

The National Plant Quarantine Services is to provide three types of services, namely, centralized administration of plant quarantine services in the country, precise inspection of exported and imported plants, and quarantine and treatment of export and import plants.

(1) Centralized Administration of Plant Quarantine Services

The National Plant Quarantine Services is to carry out the following services as the country's central organization for the administration of plant quarantine operations.

1) Operational management

It will carry out the nationwide administration of plant quarantine operations under the control of Plant Certification and Plant Protection Division of Department of Agriculture. It will also keep in contact with international plant quarantine organizations for operation coordination purposes.

2) Personnel management

It will manage the personnel of the plant quarantine stations at the country's nine seaports and airports as well as organizations involved in plant quarantine administration.

3) Research and survey

It will compile various statistical data related to plant quarantine and also collect and sort out related information. It will also offer the technical support to the Seed Certification and Plant Protection Division to enact plant quarantine-related laws and regulations for the purpose of improving the country's legal system in relation to plant quarantine services.

4) Training

It will organize training programs targeted mainly at its staff members. Its staff members and plant traders eligible for its training programs are as shown in the following table.

Table 4-2 Outline of the Training Programs

Trainees	Training program
Newly recruited staff members	In-service training in plant quarantine for newly recruited staff members
Middle-rank staff members/specialists	Training aimed at raising technical levels of middle-rank staff members and specialists
Quarantine officers	In-service training of plant quarantine officers working at seaport/airport plant quarantine station
Agricultural product exporter/importers	Training aimed at providing basic knowledge of plant quarantine to private agricultural product exporters and importers

(2) Precise Inspection of Export and Import Plants

The precise inspection services of export and import plants are to be conducted by the Inspection Technology Section. The services are offered in the following fields.

1) Pathological Inspection Section

① Pathological inspection

Separation and identification of pathogenic germs and bacteria are to be done in the following ways.

- Microscopic observation
- Antiserum inspection
- Bacteriophage inspection

② Virological inspection

Separation and identification of viruses or viroids are to be done in the following ways.

- Antiserum inspection
- Electrophoretic inspection

- Inoculation inspection
- Isolated cultivation inspection

③ Tissue culture

Tissue culture for breeding virus-free seedlings is to be conducted.

2) Entomological Inspection Section

① Entomological inspection

Identification and classification of insects and mites are conducted in the following ways.

- Morphology examination
- Physiological and ecological examination

② Nematological inspection

Identification and classification of nematodes are conducted in the following ways.

- Inspection by Baermann method, Fenwick method, etc.
- Examination of infestation with inoculation

③ Mass production

Mass production of fruit flies to be used for treatment test is to be conducted.

3) Treatment Technology Section

- ① Fumigation treatment
- ② Vapour heat treatment
- ③ Low temperature treatment

(3) Export/Import Plant Quarantine and Treatment

The National Plant Quarantine Services will be constructed on the premises of Katunayake Airport and will receive export and import agricultural products that are to pass the airport. For this reason, the facility is to take charge of the following export and import plant quarantine and treatment operations.

1. Plant quarantine inspection of the export plants and plant products received as well as issuance of certificates of plant quarantine
2. Treatment of small-quantity airborne export plants and plant products as well as issuance of certificates of plant quarantine
3. Incineration of rejected import plants and plant products
4. Isolation quarantine of import plants which need isolation quarantine
5. Field inspection of export plants

4-3-3 Project Site

As stated in the previous basic design study report, the project site is located at the western end of the premises of Katunayake Airport. The general condition of the project site is as described below (the same as described in the previous basic design study report).

(1) Location:

Katunayake, Gampaha District (at the western end of the premises of Katunayake Airport)

(2) Present Condition:

The site preparation work and the removal of the residents have been

completed. The project site measures about 200 meters from east to west and about 400 meters from north to south (about 8ha)

(3) Infrastructure:

① Electricity:

It is possible to receive electricity of up to 600kVA from an 11kV overhead power line of the Ceylon Electricity Board (CEB).

② Telephone:

It is possible to get connect a lead-in wire to the underground telephone cable laid along the road running in front of the project site.

③ Water supply:

No public water pipe is laid near the project site. Deep wells can be used as water supply sources. Since the well water is high in iron, however, it will be necessary to install a well water treatment device.

④ Drainage:

No public drainage pipe is laid near the project site. Since the Central Environmental Authority's regulations on the quality of discharged water will apply to the project site, it will be necessary to install septic tanks.

(4) Legal Controls

The project site is subject to legal controls under the International Air Traffic Control Law. The height restrictions range from 10 to 45 meters. A permit to use the project site for the implementation of this project has already been issued by the Department of Civil Aviation of the Ministry of Defense.

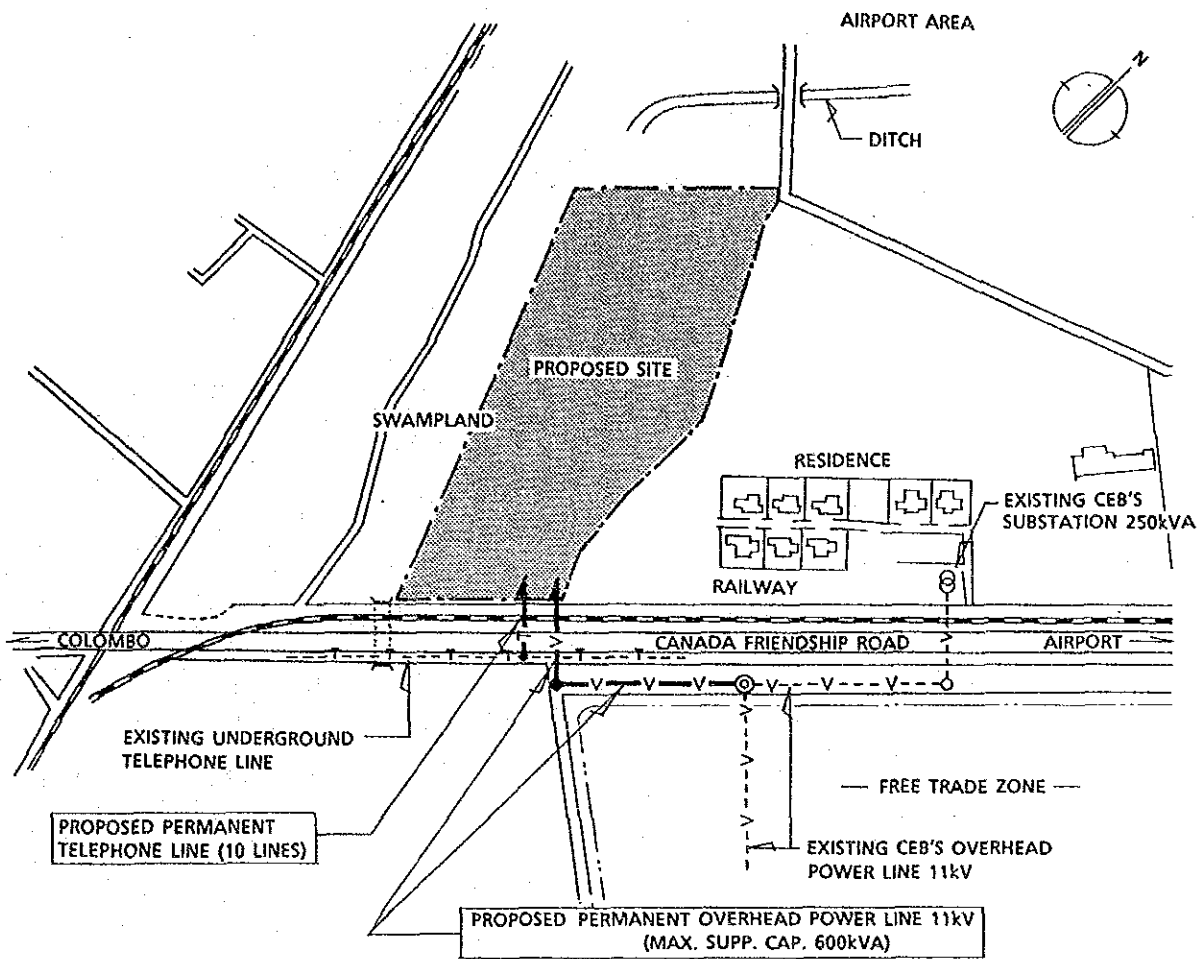


Fig. 4-3 Project Site

4-3-4 Outline of the Facilities and Equipment

It is considered appropriate to include the following facilities and equipment in this project in order to materialize the contents of this project.

(1) Outline of the Facilities

1) Main building approx. 4,055 m²

① Administration division

director's rm, deputy director's rm, administration office, experts' rm, quarantine operation rm, training rm, library, printing rm

② Inspection technology division

● Pathological inspection section

pathological inspection rm, virological inspection rm, tissue culture rm, staff rm

● Entomological inspection section

entomological inspection rm, nematological inspection rm, insectarium, fruit fly mass production rm, preparation rm, feed storage, staff rm

● Treatment technology section

fumigation rm, fumigation testing rm, treatment rm, treatment inspection rm, treatment preparation rm, storage, staff rm

● Common facilities

instrumental analysis rm, balance rm, chemical storage, common preparation rm, specimen rm, dark rm, document storage, staff rm

③ Quarantine operation division

● Quarantine facilities

cargo terminal, quarantine reception, inspection rm, staff rm

④ Others

canteen, electrical rm

2) Outdoor facilities approx 1,425 m²

glasshouse, net houses (3), soil sterilization house, compost house, workshop, storage, garage, guard house, fumigation shed

(2) Outline of the Equipment

The scope of the equipment to be procured under this project is as follows.

- 1) Equipment for use in the pathological inspection (of bacteria, filariae, etc.), the virological inspection, the entomological inspection, the nematological inspection and the development of inspection techniques
- 2) Equipment for use in the tissue culture for the production of virus-free seedlings
- 3) Equipment for use in the development of treatment techniques
- 4) Equipment for use in breeding large numbers of fruit flies
- 5) Equipment for use in the collection and processing of information, the training of staff members and clerical work
- 6) Equipment required to enhance the functions of the seaport/airport plant quarantine stations

Listed below are the specific items of equipment to be procured under this project.

- Equipment for pathological Inspection:
Equipment and apparatus for separation, identification and storage of bacteria/microplasms etc., Equipment and apparatus for inspection and storage of weeds seeds
- Equipment for Virological Inspection:
Equipment and apparatus for separation, identification, and purification of viruses/viroids, Equipment for storage of anti-serum
- Equipment for Entomological Inspection:
Equipment and apparatus for collection, rearing and identification of insects, Apparatus and instruments for preparation and storage of insect specimens, Soft X-ray apparatus
- Equipment for Mass production of fruit fly:
Equipment and apparatus for mass production of fruit fly
- Equipment for Nematological Inspection:
Equipment and apparatus for separation, rearing, identification and storage of nematodes specimens
- Equipment for Disinfestation:
Equipment for temporary storage of test materials, Equipment and apparatus for disinfestation tests, Equipment for disinfestation treatment
- Equipment for Tissue Culture:
Apparatus for thermotherapy, Equipment and apparatus for tissue culture
- Equipment for Inspection (Common-use):
Incinerator, Apparatus and instrument for meteorological observation,

Apparatus for dark room, Equipment and instruments for management of isolation field and glasshouse, Vehicle

- Equipment for Administration & Information:

Equipment for clerical work, Equipment for information management, Equipment for training

- Equipment for Plant Quarantine Station:

Equipment and apparatus for quarantine inspection

4-3-5 Maintenance and Management Plan

(1) Facility/Equipment Maintenance and Management System

The facility/equipment maintenance and management system is detailed in the previous basic design study report. Given below is a summary of its description included in the report.

1) Maintenance and management of the facilities

1. Building engineers responsible for the maintenance and management of the facilities will periodically inspect the facilities. At the same time, the maintenance and management budget should be secured.
2. The Ceylon Electricity Board will be responsible for the maintenance of the primary wiring, and the Sri Lanka Telecommunications Department for the maintenance of the telephone equipment. The emergency addresses and telephone numbers of these organization's staff members in charge should be kept and updated.

3. The facilities should be used continually to ensure sufficient ventilation. When a facility is damaged, it should be repaired immediately.

2) Maintenance and management of the equipment

① The user of the equipment should inspect and repair it properly.

The users of the equipment should clean the equipment every time they use it, lubricate it, if necessary, ensure supplies of expendables, and ascertain its safety, although the actual methods of doing these things may differ depending on the type of equipment. As a means to facilitate this procedure, it should be so arranged that the operation manual for each item of equipment will be supplied at the time of its delivery.

② The staff members in charge should inspect and maintain all items of equipment periodically.

③ In the case of electronic devices such as copiers and personal computers, maintenance contracts should be concluded with their suppliers so that after-sales services may be available whenever they are needed.

(2) Maintenance and Management Expenses

Here the maintenance and management expenses for the operation of the facilities to be borne by the Government of Sri Lanka are calculated tentatively. The expenditure items concerned are the personnel, facility operation and facility maintenance expenses. The income items concerned include the quarantine fee and treatment fee. At present, however, incomes from these fees are very small, and moreover, most of these incomes are transferred to the accounts of the higher organizations. For

these reasons, it is assumed here that there are no income items concerned.

The total maintenance and management expenses are as shown below.

Personnel expense	1,845,000 Rs
Facility operation expenses	1,025,000 Rs
Facility maintenance expenses	1,505,000 Rs
<hr/>	
Total	4,375,000 Rs

1) Personnel expenses 1,845,000 Rs

The personnel expenses estimated based on the figures included in the personnel plan for the project are as shown in the following table. The average monthly income for each position was estimated with reference to the salary structure by job classification, which was developed by the Salaries and Cadre Commission.

Table 4-3 Base Salaries

Position	Salary (Rs)	Staff Nos.	Total (Rs/month)
Director	8,000	1	8,000
Manager	4,600	3	13,800
Head	4,600	2	9,200
Expert : RD	3,500	4	14,000
Inspector : AO	3,000	2	6,000
Asst. Inspector : AI	2,100	10	21,000
Assistant : RA	1,640	5	8,200
Clerk	2,400	3	7,200
Assistant	1,400	16	22,400
Total		47	109,800 Rs/month

In calculating the annual personnel expenses, it is necessary to add the amount of the allowance to the base salary. To date, the ratio of

the allowance to the base salary has been about 40 percent. Thus, the annual personnel expenses are calculated as follows.

$$109,800 \text{ (Rs/month)} \times 12 \text{ (month)} \times 1.4 \div 1,845,000 \text{ Rs}$$

2) Facility Operation Expenses (Total 1,025,000 Rs)

The facility operation expenses were broken down into the following items.

Table 4-4 Facility Operation Expenses

Item	Expenses (Rs/year)
Electricity rates	940,000
Telephone charges	48,000
LP gas rates	18,000
Fuel expenses (Generator)	19,000
Total	÷ 1,025,000

The expenses shown in Table 4-4 were estimated as follows.

① Electricity Rates (940,000 Rs/Year)

As the planned equipment load is 470kW and considering additional load in the future, a 500 kVA transformer will be installed. The electricity rates were estimated on the assumption that the maximum power requirements will be about 40 percent of the capacity of the transformer, namely 200kVA.

Table 4-5 Estimated Power Consumption

Items	Load (Kw)	Power consumption
Lighting	60	$60\text{kW} \times 0.2 \times 8\text{h/day} \times 260\text{day/year} = 24,960 \text{ kWh/year}$
Air-conditioning / Ventilation	110	$110\text{kW} \times 0.2 \times 8\text{h/day} \times 260\text{day/year} = 45,760\text{kWh/year}$
Sanitary	20	$20\text{kW} \times 0.2 \times 24\text{h/day} \times 365\text{day/year} = 35,040\text{kWh/year}$
Quarantine equipment	260	(estimated in each item) = 84,200kWh/year
Others	20	$20\text{kW} \times 0.1 \times 8\text{h/day} \times 260\text{day/year} = 4,160\text{kWh/year}$
Total	470	194,000kWh/year

- Calculation of Electricity Charges

Basic fee (demand fee)	: $200\text{kVA} \times 140\text{Rs/kVA} \cdot \text{M} \times 12\text{M/Y} = 336,000\text{Rs/Y}$
Fixed fee	: $240\text{Rs/M} \times 12\text{M/Y} = 2,880\text{Rs/Y}$
Rates (unit rates)	: $194,000\text{kW/Y} \times 3.10\text{Rs/kWh} = 601,400\text{Rs/Y}$
Total	$940,280\text{Rs/Y} \doteq 940,000\text{Rs/Y}$

- ② Telephone Charges (48,000Rs/Y)

The telephone charges were estimated on the following assumptions.

- Thirty of the staff members will make five minutes/man·day telephone calls.
- Two of the staff members will make five minutes/man·day long distance telephone calls to Kandy.

Estimation of the telephone charges

- $30 \text{ staff} \times (3.7\text{Rs}/3 \text{ min} + 1.8\text{Rs}/2 \text{ min}) \times 260\text{D/Y} = 42,900\text{Rs/Y}$
 - $2 \text{ staff} \times (6.4\text{Rs}/3\text{min} + 3.6\text{Rs}/2 \text{ min}) \times 260\text{D/Y} = 5,200\text{Rs/Y}$
- Total $48,100\text{Rs/Y} \doteq 48,000\text{Rs/Y}$

- ③ LP Gas Rates (18,000Rs/Y)

LP gas consumption for each of the inspection rooms and the pantries are assumed as shown below.

- Burners for inspection rooms
15 units, estimated consumption: 500kcal/h/unit
- Gas range for pantries
2 units, estimated consumption: 4,000kcal/h/unit

- Demand rate for 9 hours/day:
20 percent for burners, 40 percent for gas ranges

LPG gas calorific value: 11,670kcal/kg

Unit price of LPG gas: 774Rs/40kg

Estimation of the LPG gas rates

- $15\text{units} \times 500\text{kcal/h/unit} \times 0.2 \times 9\text{h/D} \times 260\text{D/Y} = 3,510,000\text{kcal/Y}$
- $2\text{units} \times 4,000\text{kcal/h} \cdot \text{unit} \times 0.4 \times 9\text{h/D} \times 260\text{D/Y} = 7,488,000\text{kcal/Y}$

Total 10,998,000kcal/Y

$(10,998,000\text{kcal/Y} \div 11,670\text{kcal/kg}) \times (774\text{Rs}/40\text{kg}) \div = 18,000\text{Rs/Y}$

④ Fuel Expenses (19,000 Rs/Y)

Calculating assumption:

4-hour operation/month of the generator

Calculation

$150\text{kVA} \times 1.2\text{Rs/kVA} \times 0.165\text{kg/ps} \cdot \text{h} \times (1/0.87\text{kcal/l}) \times 4\text{h/M} \times 12\text{M/Y} \times 11.55\text{Rs/l}$
 $= 18,926\text{Rs/Y} \div = 19,000\text{Rs/Y}$

3) Facility Maintenance Expenses (Total 1,505,000 Rs)

① Maintenance expenses for the facilities (330,000 Rs/Y)

As maintenance expenses vary by the number of years after being built, the annual maintenance expense is calculated on the assumption of 60Rs/m²·year which is estimated as an average of the future 20 years.

$60\text{Rs/m}^2 \cdot \text{year} \times 5,500\text{m}^2 = 330,000\text{Rs/year}$

- ② Maintenance expense for utility equipment (495,000 Rs/Y)

Maintenance of sanitary equipment, air-conditioning equipment and electrical equipment includes replacement of parts and repair of equipment. The annual maintenance expense for utility equipment is calculated on the assumption of 90 Rs/m²·year.

$$90\text{Rs/m}^2 \cdot \text{year} \times 5,500\text{m}^2 = 495,000\text{Rs/year}$$

- ③ Maintenance expense for quarantine equipment (680,000 Rs/Y)

The cost of spare parts and consumables for quarantine equipment is estimated item by item separately.

$$(\text{maintenance expense}) = 680,000\text{Rs/Y}$$

4-4 Technical Cooperation

4-4-1 Contents of the Request for Technical Cooperation

The contents of the request for technical cooperation which were described by the Government of Sri Lanka at the stage of the supplementary basic design study are as summarized below.

(1) Dispatch of Japanese Experts

The Government of Sri Lanka requested the dispatch of Japanese experts to the following areas in the order of priority.

Areas which require the dispatch of experts for long term

1. Team leader (general management, plant quarantine)
2. Treatment technology (fumigation, vapor heat treatment, low-temperature treatment)
3. Entomology (classification, identification, etc.)
4. Plant pathology (virology)

Areas where the technology will be transferred in short term

1. Fruit fly mass production (3 to 6 months)
2. Low-temperature treatment (3 to 6 months)
3. Electrophoretic inspection (3 to 6 months)

(2) Training in Japan of the Counterparts

The Government of Sri Lanka requested the following training programs in Japan for the staff members.

1. Long-term training of the inspection section heads. (master's courses and doctorate courses)
2. Short-term training of the inspectors (microscopic inspection, equipment management, etc.)
3. Short-term training of the staff members in charge of maintenance and management of facilities/equipment

4-4-2 Examinations of Technical Cooperation

When this project is implemented, the projected comprehensive plant quarantine facility is to be owned by the Government of Sri Lanka. In order to attain its goals in the area of plant quarantine, however, it is imperative for the Government of Sri Lanka to make further efforts to establish a viable plant quarantine management system as soon as possible and to improve the quality of the country's plant quarantine technologies. Since it is judged to be urgently necessary to improve the technologies of the precision inspection and treatment, in particular, as soon as possible, there is a strong need for technical cooperation through the dispatch of Japanese experts to the country and the training in Japan of the staff members. The final contents and the method of the implementation of such technical cooperation are to be decided through other specified discussions on the basis of the contents of the Government of Sri Lanka's request for technical cooperation. In light of the contents of the basic design for the facilities and the proposed construction work schedule, however, it will be considered desirable to implement such technical cooperation under the following arrangement.

(1) Dispatch of Japanese Experts

Three types of Japanese experts -- namely, long term experts, short term experts and individual guidance experts -- can be dispatched to Sri Lanka.

1) Individual guidance experts

It will be effective if experts specializing in the following areas are dispatched to give guidance and advice for the establishment of new plant quarantine system, prior to the dispatch of long term experts. The time of dispatch will be before the completion of construction works.

- | | |
|---|------------|
| 1. Classification and identification of pests | one expert |
| 2. Fumigation | one expert |

A possibility of making the above two individual guidance experts continue to stay in Sri Lanka as experts under project type technical cooperation may be considered.

2) Long term experts under project type technical cooperation

The dispatch of experts as requested by the Government of Sri Lanka will be considered necessary because the areas in which these experts are to give guidance and advice are all very important elements of this project with the consideration of effective use of equipment provided and because Sri Lanka is in urgent need of technologies in these areas.

It will be desirable that these experts be dispatched to Sri Lanka after the completion of construction works and equipment works.

3) Short term experts under project type technical cooperation

Regarding the areas which the Government of Sri Lanka requested the dispatch of short term experts, since the long term Japanese experts under project type technical cooperation can be expected to cover and transfer the technology in the areas, an appropriateness of dispatch of short term Japanese experts in such specified areas may be carefully considered. When treatment tests are to be conducted as a step for the removal of ban on the export of specific agricultural products, however, it will be considered necessary to dispatch short term experts to give guidance on testing in the following specific areas.

1. Fruit fry mass production
2. Treatment damage testing

(2) Training in Japan of the Counterparts

1) Training of the plant quarantine operation managers

For the promotion of the effective use of equipment provided, it is considered desirable if a plant quarantine operation manager (the director, the deputy director or the manager of the inspection technology division) receives training in Japan for a short period of time, although such a plan is not included in the request made by the Government of Sri Lanka. The management of a comprehensive plant quarantine facility will be the first experience for the Sri Lankan plant quarantine operation managers. In this context, the inspection of the plant quarantine organization, the plant quarantine operation system, the plant quarantine facilities and the system for private organizations' cooperation in actual plant quarantine operations in

Japan will greatly contribute to the establishment of a viable plant quarantine system in Sri Lanka.

2) Training of the heads of the inspection sections

The Government of Sri Lanka requested a long-term training program in Japan for the heads of the inspection sections (two- to three-year master's courses and doctorate courses). Judging from the expected effects of the project and its objective, however, the training in Japan for the heads at the level shall be carefully examined by both governments. However, the inspection by the heads of the pathological inspection, entomological inspection and treatment technology section of the actual plant quarantine operations in Japan and their receiving in-service training in research and post-entry quarantine in Japan are expected to greatly contribute to the improvement in the plant quarantine technologies in Sri Lanka.

3) Training in Japan of the assistant inspectors and the staff members in charge of the maintenance and management of the facilities/equipment

The Government of Sri Lanka requested a short-term training program in Japan for the assistant inspectors and the staff members in charge of the maintenance and management of facilities/equipment. However, the implementation of this training shall be carefully examined with the consideration of the following matters.

1. Long-term Japanese experts will be able to train the assistant inspectors in the operation of the equipment and instruments during their stay in Sri Lanka.
2. The facilities and equipment to be supplied under this project do not include such items of equipment as electron microscopes which

require advanced maintenance technologies. Contractors and long-term Japanese experts will be able to give technical guidance and advice on the operation of the facilities and equipment to be supplied under this project to the staff members in charge of the facilities and equipment

This project will be contribute to the establishment of a new plant quarantine system in Sri Lanka. Therefore, it is considered effective if a technical cooperation is implemented together with the grant aid.

CHAPTER 5 BASIC DESIGN

CHAPTER 5 BASIC DESIGN

5-1 Design Policy

In formulating the facility and equipment plans for this project, a design policy similar to the one presented in the previous basic design study report is to be adopted. In this supplementary basic design study, the following points are added or presented as the factors to which special attention should be paid.

(1) Design Policies on the Scope of the Facilities and Equipment

This project is aimed at reinforcing Sri Lanka's plant quarantine system and thereby improving the efficiency of quarantine inspections mainly of plants and plant products imported into the country. In this project, on the other hand, special emphasis is placed on the improvement of the country's export quarantine system for agricultural products, especially the reinforcement of the treatment technology and facilities for export plants and plant products. Given such a policy of the Government of Sri Lanka, the scope of the facilities and equipment to be supplied under this project was determined as follows.

1. Facilities and equipment required to develop treatment technologies should be included in this project, and they should be put to practical use smoothly.
2. Inspection sections in the Inspection Technology Division should be integrated and operations common to the integrated sections should be expanded as much as possible so that the required facilities and equipment may be minimized.

- 3 The plant quarantine stations at Colombo Seaport and Katunayake Airport should be provided with equipment for use in communications with the projected facilities, as well as equipment for use in primary quarantine.

(2) Design Policies on Facilities Plan

The projected facilities should be designed in accordance with the following guidelines in light of Sri Lanka's natural conditions, the actual situation of the local construction industry and the project implementing organization's ability to maintain and manage the facilities.

1. The main building should lie on a southwest to northeast axis to prevent rainwater from blowing into the building.
2. Locally available building materials which are supplied in sufficient quantities should be used, and the projected facilities should be constructed by the use of local traditional methods of construction.
3. Effective use should be made of natural ventilation to minimize the energy cost, and of highly durable materials to minimize the cost of the maintenance and management of the facilities. This arrangement should minimize the project implementing organization's financial burden.
4. The construction works should be completed in one phase of 12 months.

(3) Design Policy for the Equipment Plan

- 1) Equipment plan should be drawn so as to ensure reliable inspection for safe importation of germplasms and steady development of technology

for disinfection of agricultural products to be exported or imported, as well as practical disinfection treatment for small amount of agricultural products brought into plant quarantine.

2) In addition to above, equipment, parts there of and expandables which are provided by this project should be selected based upon following policies, paying due attention to the expected technical cooperation to be extended by the Government of Japan for this project:

1. To enable Japanese experts to be sent to Sri Lanka transfer their technology to their counterparts at their full extent as efficiently as possible in a limited period.
2. To include such parts and expendables as of order-made equipment etc. in this plan, which are required for the sustaining operation during first five years, but not easy to procure spontaneously in short time.
3. To minimize the kinds and quantity of glasswares for general use and expendables including chemicals, which are able to be procured according to needs for the save of storage space and full utilization of them.

3) The equipment installation work is to be carried out in two phases for the following reasons.

1. If all the items of equipment are to be carried into the project site during the period of the construction work, they will have to temporarily stored somewhere in the project site before they are installed. If, on the other hand, they are to be installed before the completion of the construction work, it will cause inconveniences in various aspects of the construction work. In

addition, it will result in some of them being stolen or damaged. For these reasons, it is desirable that all the items of equipment should be carried into the project site and installed after the completion of the construction work.

2. In the case of large-sized items of equipment, however, if they are to be carried into the project site after the completion of the construction work, some facilities will have to be modified or destroyed so that they may be carried into the project site. There is also a possibility that the plumbing will be damaged.
3. The equipment installation work, therefore, should be carried out in two phases. During the first phase (term of work: 12 month period), those items of equipment which have to be installed during the period of the construction work because of the need to protect the plumbing against damage should be installed, and during the second phase (term of work: 9 month) all the other items of equipment should be installed.

5-2 Basic Plan

5-2-1 Facility Plan

(1) Layout Plan

The National Plant Quarantine Services can be divided broadly into four blocks -- the administration block, the inspection technology block, the quarantine operation block and the outdoor facility block. Given below is the outline of the layout plan for each block.

1) Administration Block

This block is to serve as the base for the nationwide plant quarantine administration in Sri Lanka, where operational control is conducted and relevant data and information are collected, sorted out and kept. This block is also to serve as the venue for training programs for the staff members and exporters/importers of agricultural products. In consideration of its functions as stated above, this block will have a main entrance, which is to be distinguished from an access road to the cargo terminal.

2) Inspection Technology Block

This block is intended for precision inspection of those plants which are judged to be subject to precise inspection as a result of their primary inspection at plant quarantine stations in seaports or in airports. It will be composed of inspection rooms very sensitive to vibrations and dust. Being closely related to the quarantine operation block operationally, its facilities should be so designed as to make it easy to maintain communications with those of the quarantine operation block, and should be located in isolation from

the other blocks in order to prevent pests from entering the other blocks.

3) Quarantine Operation Block

At this block, primary inspection of export plants and plant products will be conducted and certificates of plant quarantine will be issued. This block will also be used for the treatment of small quantity export plants. It will be located in a part of the project site which provides plant exporters and importers with direct access to its facilities. In designing its facilities, minute care should be taken to distinguish the access road from those to the other blocks. Since it is expected that the treatment and other facilities installed in this block will have to be expanded as the quantity of export plants and plant products handled increases, it will be necessary to secure open spaces around these facilities.

4) Outdoor Facilities

This block will be composed of small structures attached to the isolated field, such as glasshouses, net houses and soil sterilization house. These small structures should be connected to each other by means of outdoor passages so that vehicles may access them easily.

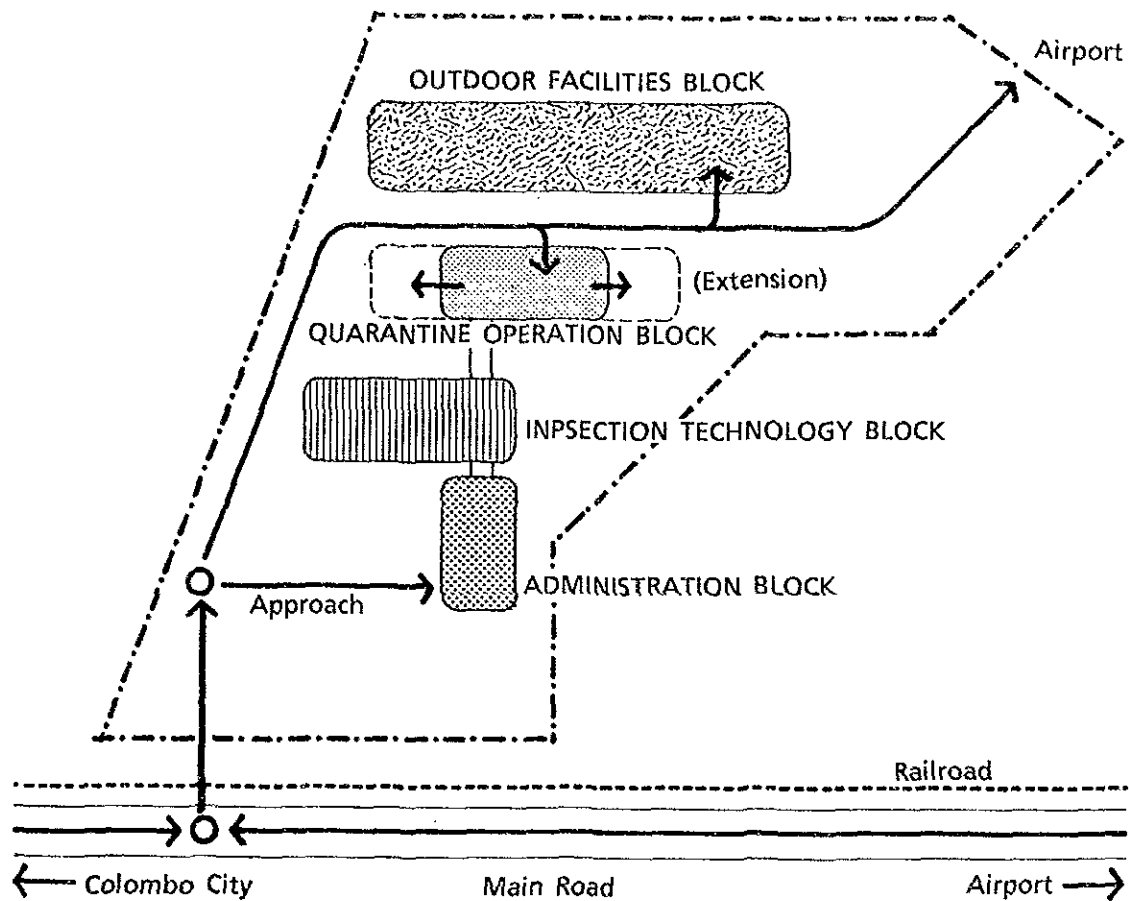


Fig. 5-1 Layout Plan of Facilities

(2) Architectural Plan

1) Determination of Module

The module, to provide consistency between the space design and the architectural techniques, is to be determined provided it is applicable to both the space design and architectural techniques. In other words, the module should be applicable to the common dimensions of each different space, while also applicable to the achievement of rationalization and economical efficiency of the material dimensions in construction. As a result of examining the dimensions of human bodies, movement and articles, a module of 60cm and a unit room space

of 6.0m×6.6m were adopted for the project. The 60cm module is a multiple of the 30cm, a basic dimension of construction materials. This means that this module can be expected to achieve economical efficiency in construction.

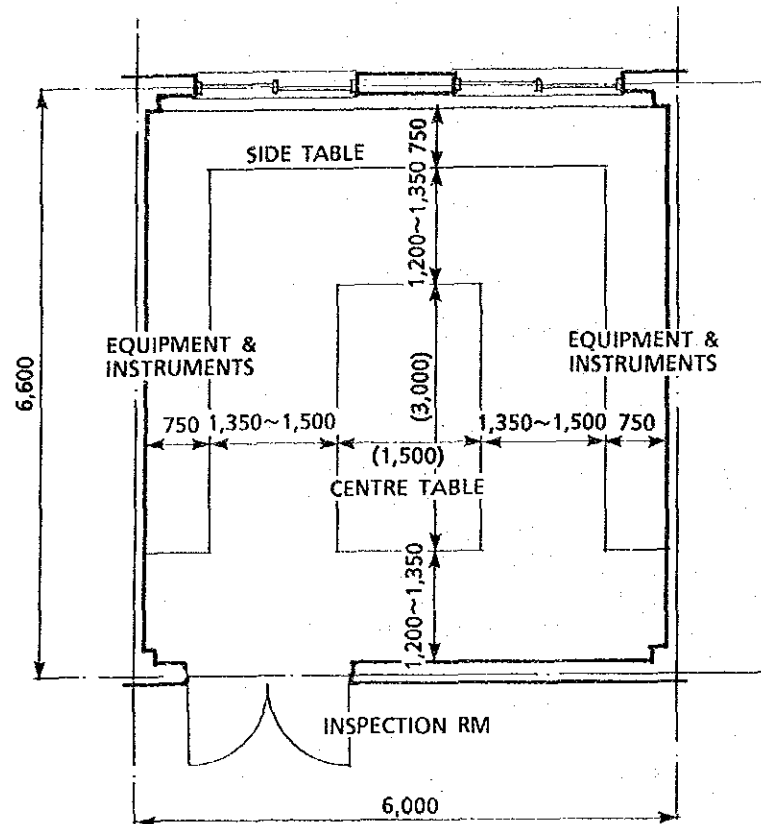


Fig. 5-2 Examination of Unit Room Space

2) Determination of the Room Size

The size of each room comprising the facility is to be determined based on the layout plan of the equipment and the number of its occupants. The area of each room shown in Table 5-1 is the actual area from the basic design drawing, which was worked out on the basis of the module.

Table 5-1 Scale of Rooms

ADMINISTRATION BLOCK

Room	Room Nos.	Area (m ²)	Note
Director's Rm	1	54	working and reception space
Deputy Director's Rm	1	27	working and meeting space
Secretary's Rm	1	18	for 1 secretary
Administration Office (1)	1	84	9 staff and discussion space
Reception	1	6	for 1 staff
Administration Office (2)	1	18	for 4 low-class staff
Quarantine Operation Rm	1	36	for 2 staff and working space
Training Rm	1	54	for max. 40 trainee
Ante Rm	1	18	waiting room for trainer
Meeting Rm	1	36	for visitor's meeting
Library	1	36	3,000 books and reading space
Printing Rm	1	24	by the layout of equipment
Expert's Rm	1	36	Expert leader with meeting space
Entrance Hall	1	120	waiting and reception
Storage	1	24	for documents
Corridor, Toilet, etc.		285	
sub-total		876 m ²	

INSPECTION TECHNOLOGY BLOCK

Room	Room Area	Area (m ²)	Note
Pathological Inspection Section			
Pathological Inspection Rm	1	80	by the layout of equipment
Virological Inspection Rm	1	80	by the layout of equipment
Tissue Culture Rm	1	80	by the layout of equipment
Entomological Inspection Section			
Entomological Inspection Rm	1	80	by the layout of equipment
Insectarium	1	40	by the layout of equipment
Fruit Fly Mas Production Rm	2	54	by the layout of equipment
Preparation Rm	1	35	working space
Feed Storage	1	19	by the layout of equipment
Nematological Inspection	1	60	by the layout of equipment
Common Facilities			
Instrumental Analysis Rm	1	80	by the layout of equipment
Balance Rm	1	20	by the layout of equipment
Chemical Rm	1	60	by the layout of equipment

Room	Room Area	Area (m ²)	Note
Common Preparation Rm	1	60	by the layout of equipment
Specimen Rm	1	60	by the layout of equipment
Dark Rm	1	20	by the layout of equipment
Document Storage	1	60	for documents
Storage	2	40	for miscellaneous goods
Rest Rm	1	20	for 2 beds
Division Head Rm	1	20	for the division head
Staff Rm	3	180	1 room (6~7) persons × 10m ² /persons
Canteen	1	94	for staff refreshing space
Corridor, Toilet, etc.		785	
sub-total		2,027 m ²	

QUARANTINE OPERATION BLOCK

Room	Room Nos.	Area (m ²)	Note
Quarantine Operation Division			
Cargo Terminal	1	238	for the cargo unloading
Quarantine Reception	1	36	reception counter & waiting space
Inspection Rm	1	36	by the layout of equipment
Division Head's Rm	1	36	for the division head
Staff Rm	1	20	for inspector 6 persons
Rest Rm	1	18	for 2 beds
Treatment Facility			
Treatment Rm	1	81	by the layout of equipment
Treatment Preparation Rm	1	54	by the layout of equipment
Treatment Inspection Rm	1	27	by the layout of equipment
Fumigation Rm	1	108	by the layout of equipment
Fumigation Testing Rm	1	36	by the layout of equipment
Cold Storage	1	36	by the layout of equipment
Storage	1	52	for miscellaneous goods
Electrical rm	1	102	
Corridor, Toilet, etc.		272	
sub-total		1,152 m ²	
Total		4,055 m ²	

OUTDOOR FACILITIES

Room	Room Nos.	Area (m ²)	Note
Isolated Field Facilities			
Glasshouse	1	150	w/ Air Conditioner
Net House	3	600	w/ Sprinkler
Soil Sterilization House	1	135	by the layout of equipment
Compost Shed	1	34	making and storing compost
Workshop	1	135	storage for field machinery
Fumigation Shed	1	54	storage for fumigation box
Garage	1	162	for 2 buses, 2 cars
Guard House	1	38	for 2 guards w/ bed room
Pump House (1)	1	60	for building
Pump House (2)	1	25	for field
Drainage Treatment House	1	27	by the layout of equipment
Elec. Meter Rm	1	5	by the layout of equipment
sub-total		1,425 m ²	
Total		5,480 m ²	

3) Floor Plan

As a result of the modifications made in this supplementary basic design study, the size of the entire facility will be smaller by about 10 percent than the one shown in the previous basic design study report. However, this facility is to consist of a same number of blocks as the previous basic design so that it may function efficiently and that each block may maintain its independence and at the same time may be closely related to the other blocks functionally. For this reason, the floor plan in this supplementary basic design study is based on the one shown in the previous basic design study report. The main building is to consist of three blocks (independent buildings), and three blocks are to be connected to one another by means of passage. The floor plan of each block is outlined below.

① Administration Block

The main task of the administration block is to control the staff members' and visitors' coming into and out of the entire facility, and is therefore to be provided with a main entrance. Since training facilities in this block will be utilized not only by the staff members but by exporters and importers, this block should be located in a place where the use of the training facilities will least affect operations at the other facilities. It should also be located in isolation from the inspection technology block so that there may be no entangled traffic lines.

② Inspection Technology Block

As in the previous basic design, rooms in this block are to be located along a cloister surrounding a small courtyard. Of this block's main facilities, the entomological inspection room whose floor needs to be washed with water and the instrumental analysis room which is closely related to the quarantine operation block functionally are to be located on the ground floor. The three staff rooms, each of which was to be attached to an inspection room in the previous basic design, are to be located close to one another. As a result of this arrangement, all the three staff rooms will function flexibly, making it easier to make modification based on an increase or decrease in the number of inspection officers.

③ Quarantine Operation Block

In this block, all the treatment facilities are to be located close to one another. Mainly for the purpose of improving the efficiency of export plant quarantine operations, a cargo terminal is to be constructed, around which plant quarantine-related facilities and

treatment facilities are to be located. Moreover, it is expected that the workload at these facilities will increase in the future, and therefore it is very likely that these facilities, particularly the cargo terminal and the treatment facilities, will be expanded in the future. In working out the floor plan for this block, it is necessary to take into account future facility expansion plans and to secure sufficient open spaces around this block. It should be noted that the workshop for field appliances, which was attached to this block in the previous basic design, is not included in the facilities for this block in this supplementary basic design study. It is located in the outdoor facility block, close to the isolated field.

4) Elevation/Section

The primary considerations in working out the elevation and section for this project were the prevention rainwater from blowing into the buildings, natural ventilation and the screening of direct sunlight. It is especially important to prevent rainwater brought by the monsoon blowing from northeast to southwest from blowing into the buildings. For this reason, eaves which are deep enough and balconies should be attached to the buildings. The project site is located close to the drainage open ditch of the airport's runway, and in addition, its ground level, after the completion of the site preparation work, is lower by about 1.5 meters than that of the road running in front of it. To cope with such a situation of the project site, the ground level of the spaces around the buildings should be higher by 50 centimeters than the rest of the project site, and the height of the first floor should be higher by 1.0 meter than that of the surrounding space, in order to prevent the buildings from being flooded. In consideration of the above-mentioned factors, therefore, it is

necessary to work out an elevation which makes it possible to use the generally accepted local methods of construction.

(3) Structural Plan

1) Outline of Structure

The buildings are planned practically and functionally independent by each block and will be connected by a roofed walkway. These buildings in the inspection technology block and in the administration block will have 2 stories while the plant quarantine operation block and the outdoor facilities block will have only one. The basic building span of 6.0m×6.6m with an exception of 6.0m×9.0m are adopted according to the occupancy.

2) Structural System

The structural system adopted for the project will be a reinforced concrete rigid frame structure in consideration of the scale of building, economic efficiency, natural conditions and situation of the construction industry in Sri Lanka. Each building is connected by a roofed walkway but structurally separated by expansion joints considering the differential settlement of the soil.

3) Foundation System

The foundation system will be planned in accordance with the subsoil investigation report of the proposed project site which was obtained from the Government of Sri Lanka. According to this report, the site has been reclaimed from an existing swamp with gravel sand with a

thickness of 1.5m. Original geological characteristics of the soil are as follows;

- | | | | |
|---|------------|--|---------------|
| ① | ~1.5m/2.0m | very soft black-gray clay with organic matters | N-value 0 |
| ② | 2.0m~5.0m | very loose to medium dense gray silty sand | N-value 0~8 |
| ③ | 5.0m~8.5m | stiff grayish red clay | N-value 10~15 |
| ④ | 8.5m~ | very dense gray silty sand | N-value 50~ |

Considering this data and scale and structural system of buildings, it is reasonable to adopt a pile foundation system using a very dense silty sand layer at 10.0m below the surface as a supporting layer.

Boring data and laboratory test results are attached in Appendix.

4) Dead Load and Live Load

① Deal load

The dead load shall be calculated in conformity with the actual weights of materials used in the design.

② Live load

The live load shall be in conformity with the Japan Building Standards. The Live Load for each occupancy is as tabulated in Table 5-2.

Table 5-2 Live Load for Each Occupancy

(Unit: kg/cm²)

Occupancy	Slab/Beam	Frame
Office / Meeting rm	300	180
Inspection rms	400	200
Workshop	500	300
Toilet	180	130
Library / Store	800	600
Canteen	300	180

4) Materials

Concrete : Ready-mixed concrete
Fc=210kg/cm² (4 week compression strength)

Reinforcing bars : under 16mm SD30A Ft=3,000 kg/cm²
over 19mm SD35 Ft=3,500 kg/cm²

Structural steel : SS41 F =2,400 kg/cm²

(4) Electrical Facilities Plan

1) Power supply system

The 11kV electric power supplied from CEB will be transformed to 400V-230V at the substation in the project site. The work to install an overhead 11kV power line up to the power receiving point (the boundary between the project site and the Canada Friendship Road) and the metering equipment for electricity charges (to be installed in the elec. meter shed) are included in the work to be carried out by the Government of Sri Lanka.

- Received power system 3-phase, 3-wire 50Hz 11kV
- Low-voltage power system 3-phase, 4-wire 50Hz 440V-230V

The power supply situation is unsatisfactory in the area surrounding the project site. The electric power often fails and has wide voltage fluctuations. In light of such a situation, a generator and an induction-type automatic voltage regulator (IVR) will be installed. The generator is to cover the biotron, incubators and growth cabinets which require continued power supply, and the emergency lighting, the fire hydrant pumps and the neutralization tank also need to be covered. A static type automatic voltage regulator (AVR) will be attached to each equipment which requires a more stable and more precise power source. The transformer (outdoor type, capacity: approx. 630kVA) will be installed on the roof of the elec. meter

shed's roof. The low-voltage main distribution board, the IVR and the generator will be installed in the electric room. Fig.5-3 shows the electric power supply diagram and the scope of work.

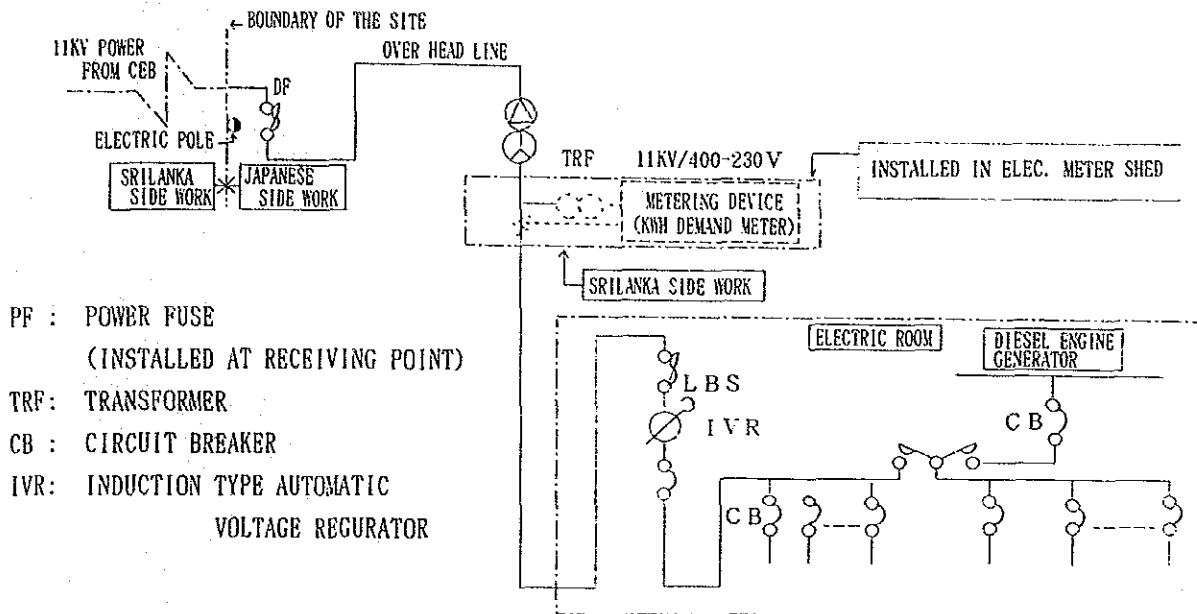


Fig. 5-3 Electric Power Supply Diagram

2) Socket outlet

The required number of socket outlets for supplying power to small electric appliances and quarantine equipment will be installed in each location. Socket outlets complying with BS standards (15A, three poles of which one is for grounding) will be used. A distribution panel for supplying power to the quarantine appliances and devices will, if necessary, be installed in each inspection room in order to facilitate the maintenance of the power.

3) Lighting fixtures

In principle, fluorescent lamps will be used, and the lighting fixtures will be of the surface mounted type. The figures in Table 5-3 indicate target illumination levels for each occupancy.

Table 5-3 Illumination Levels for Each Room

Room	Illumination Level (Unit: lux)
Office	200~300
Meeting Rm	150~250
Library	200~300
Pathological Inspection / Virological Inspection	300~400
Insectarium Rm	150~250
Fumigation Testing Rm	150~250
Preparation Rm	200~300

Although few operations will be carried out at night in the facilities, some pieces of equipment are designed to be operated around the clock. As a measure against power failures at night, therefore, emergency lighting to which power is supplied from a generator will be installed.

4) Telephone system

The telephone trunk line (central office line) will be led-in to the site from the Canada Friendship Road. The work to install the trunk line cable up to the MDF in the office room on the ground floor of the administration block is included in the work to be carried out by the Government of Sri Lanka. The number of trunk lines, including those for telephones and facsimile machines, will be 6 to 8. An electronic telephone exchange with a capacity of 10 trunk lines and about 60 extensions will be installed. An extension telephone will be installed in the following rooms; Director's room, Administration office room, Staff rooms, Meeting rooms, Library, Inspection rooms, etc.

5) Public address system

A public address system for general and emergency announcements will be installed. Its main units (amplifier, microphones, etc.) will be installed in the administration office room on the ground floor so that communications through this system may be coordinated in the administration office room.

6) Fire alarm system

Though there is no law applicable to the fire alarm system in Sri Lanka, an automatic fire alarm system will be installed in accordance with the instructions of the Fire Department of Airport & Aviation Services Ltd. In accordance with the Fire Department's advice, NFPA or BS will be adopted as the standards for the fire alarm equipment to be installed.

7) Lightning protection system

A lightning protection system will be installed on the main building and the elevated water tank.

(5) Air-conditioning/Ventilation Plan

In principle, the natural ventilation system shall be adopted. An air-cooled type air conditioner which is relatively easy to operate and maintain will be installed in the rooms where necessary.

1) Design temperature/humidity

① Design outdoor temperature

Dry bulb temperature 37.1°CDB

Relative humidity RH69%

(source: Sri Lanka Meteorological Agency Katunayake Observatory' Records for 1965 to 1980)

② Design indoor temperature

Dry bulb temperature 26°CDB

Relative humidity not specified

2) Air-conditioning system

An air-cooled separate type air-conditioner will be installed in each inspection room which requires air-conditioning due to equipment installed, and also in part of the meeting room and the director's room.

Table 5-4 Rooms with an Air-conditioner

Air-conditioning System	Rooms to be air-conditioned	
Air-cooled separate type air conditioner	<ul style="list-style-type: none"> ● Director's Rm ● Deputy Director's Rm ● Meeting Rm ● Experts' Rm ● Quarantine Operation Rm ● Annte Rm ● Training Rm ● Virological Inspection Rm 	<ul style="list-style-type: none"> ● Tissue Culture Rm ● Insectarium Rm ● Mass Production Rm (1), (2) ● Preparation Rm ● Instrumental Analysis Rm ● Fumigation Testing Rm ● Treatment Inspection Rm ● Part of Glasshouse

3) Ventilation system

In principle, a ceiling fan will be installed in each of the rooms where no air-conditioner is installed. Also, necessary number of mechanical ventilators for discharging bad smells, heat and the like will be installed as necessary.

(6) Water Supply and Sanitary Plan

1) Water supply system

As there is no public water pipe laid around the project site, well water will be used as the main water source. Two wells will be prepared, one to cover the main facilities and the other to cover the attached facilities, such as the isolated field and the glasshouse. According to the data on the quality of well water in the surrounding area, the well water is high in iron, ammonia and alkalis. It will be necessary, therefore, to treat the well water (flocculent precipitation and filtration, for example) to be supplied to facilities through an elevated water tank by gravity. The well water will be pumped up by the use of a deep well pump, and will be sent to a raw water tank via a sand remover unit. Then the well water will be treated with a water treatment device and stored in a treated water tank. The treated water will be pumped up to an elevated water tank, from which the treated water will be supplied to each of the main facilities. For sanitation reasons, the raw water tank and the treated water tank should be installed on the ground. Water will be supplied to the attached facilities such as the isolated field and the glasshouse through a pressure pump unit. The well water, pumped up with a deep well pump, will be stored in an underground water tank through a sand remover unit, and then will be supplied to each of the attached facilities with a pressure pump unit.

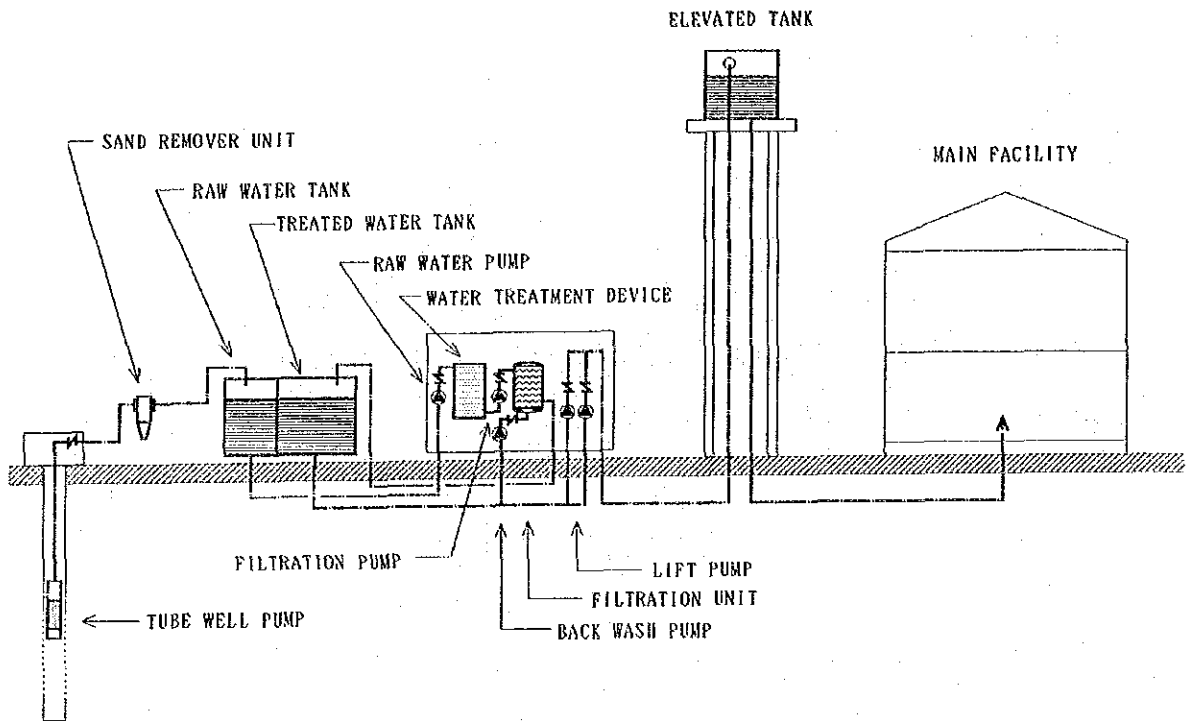


Fig 5-4 Water Distribution Diagram

2) Drainage System

As there is no public sewer pipe laid around the project site, a waste water treatment facility will be installed within the project site. As the project site and the surrounding area are swampland, it will be difficult to have all the rainwater sink into the ground during the rainy season. For this reason, part of the water treated within the project site will have to be discharged to the surrounding channel. In this case, however, it will be necessary to comply with the standards for the quality of effluents set by the Sri Lanka Central Environmental Authority (BOD: 30ppm; SS: 50ppm). Therefore, it will be necessary to install a sewerage treatment facility to treat waste water from the main facilities.

On the other hand, waste water from some of the laboratories will have to be neutralized in a neutralization tank. However, only water used for cleaning the appliances used in these laboratories should be

neutralized in the neutralization tank. Strong acids and alkalis, organic solvents and heavy metals should be collected and put in a container installed in each laboratory. They should never be discharged into the drainage system.

The treated water will be penetrated into the ground through a penetration pipe. As mentioned earlier, it will be very difficult to have all the rainwater penetrated into the ground during the rainy season. Therefore, overflow pipes should be laid to discharge water into the channel around the project site. Rainwater from the buildings can be discharged into the surrounding channel through a open ditch.

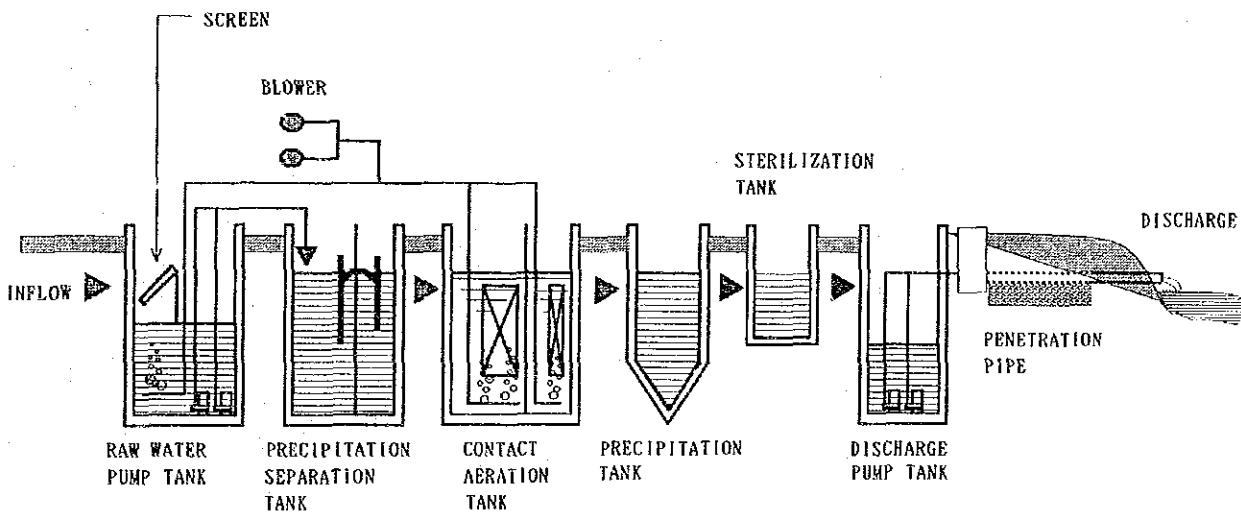


Fig. 5-5 Diagram of Sewerage Treatment Facility

3) Sanitary system

Sanitary equipment suited for the local customs will be installed. A water plug will be installed in each lavatory.

4) LP gas system

LP gas will be supplied to the pantry and some laboratories from gas cylinders by gas pipes.

5) Fire extinguishing system

In accordance with the directions of the Fire Department of Airport & Aviation Services Ltd., in principle, indoor fire hydrants and fire extinguishers will be installed. Some of the fire hydrants should be accompanied by an outlet connection for the use of firemen. A siamese connection for supplying water to these hydrants will be installed outdoors. A fire pump will be installed in the pump house. The fire pump will be actuated either with a pressure switch or with a fire alarm.

(7) Construction Materials Plan

Building materials which are functionally appropriate and durable and which are easy to clean, maintain and manage should be selected for this project. The following tables show the building materials selected for this project and the reasons for selecting them.

Table 5-5 Building Materials

Component	Materials	Remarks
Structure	Reinforced Concrete	Commonly used in Sri Lanka, Concrete is to be supplied by local ready mixed concrete suppliers. Reinforced bars are to be imported.
Walls	Bricks	Bricks are to be used for both exterior and interior walls. In this case, however, it is necessary to attach balconies or eaves to the exterior walls to protect the interior of the building against rainwater.
Floor slabs	Reinforced Concrete	Reinforced concrete is a strong and durable floor structural material. The roof slab of the top floor is to be coated with reinforced concrete.
Roof	Roofing Tiles (Flat Type)	Roofing tiles are commonly used in Sri Lanka. They are available in various shapes but flat type are unlikely to drop off.
Exterior Wall	Sprayed Acrylic Resin Paint on Mortar	Excels in weather resistance and durability can be maintained locally.
Doors and Windows	Windows: Colored Aluminum Sash	Exterior windows will be made of aluminum, which excels in both airtightness and watertightness.
	Doors: Lightweight Steel Doors	Lightweight steel doors are to be used because they excel in durability. Wooden doors are commonly used in Sri Lanka, but they are likely to be warped heavily by humidity and rainwater.

Table 5-6 Interior Finishing Materials

Room	Floor	Wall	Ceiling
Administration Office	Terrazzo tile	Sprayed paint	Acoustic ceiling tile
Training Rm	↑	↑	↑
Inspection Rms	Terrazzo tile or PVC-tile	↑	Paint on ceiling tile
Insectarium	Terrazzo tile	↑	↑
Staff Rms	PVC-tile	↑	acoustic ceiling tile
Cargo Terminal	Concrete w/harder	↑	Paint on concrete
Treatment Rm	↑	↑	↑
Inspection Rm	Terrazzo tile	↑	Paint on ceiling tile
Toilet	Mosaic tile	Semi-vitreous tile	↑
Corridor	Mortar washout	Sprayed paint	↑

5-2-2 Equipment Plan

The equipment to be installed in each inspection room was re-examined, and such modifications were made as the enhancement of the functions of the fumigation equipment, the introduction of low-temperature disinfection equipment, the enhancement of the functions of the quarantine and inspection equipment, and the cancellation of the anti-serum production equipment and the virological inspection/tissue culture equipment. As a result, such major items of equipment as are listed below were finally selected.

Table 5-7 The List of Main Equipment

Inspection Rm	Main Equipment	Qty	Specification
Pathological Inspection Rm	Safety cabinet	1	150(W)×80(D)×200(H)cm
	Fume food	1	150(W)×75(D)×210(H)cm
	Plant growth cabinet	1	120(W)×85(D)×100(H)cm
	Biological microscope w/camera	1	40×~1,000X
	Microtome, Freezing	1	-5°C~-30°C
	Profile projector	1	10X~50X
Biological Inspection Rm	Safety cabinet	1	150(W)×80(D)×200(H)cm
	Deep freezer	1	700ℓ, -20°C~-85°C
	ELISA set	1	Microplate reader, Dispenser, Sera washer etc.
	Controlled environmental chamber	1	20m ³ , 7~35°C, 55~85%RH
	High speed centrifuge	1	Max. 20,000rpm
Tissue Culture Rm	Plant growth cabinet	1	120(W)×85(D)×100(H)
	Phytochrome testing equipment	2	51(W)×46(D)×97(H)
	Fume food	1	150(W)×75(D)×210(H)
	Safety cabinet	1	150(W)×80(D)×200(H)
Entomological Inspection Rm	Soft X-ray apparatus	1	Output max. 60KVp, 5mA
Nematological Inspection Rm	Biological microscope w/camera	1	40x~1,00X, Tricular Type

Inspection Rm	Main Equipment	Q'ty	Specification
Treatment Rm	Vapor heat treatment equipment	2	1m ³ , 10~60°C, 50~95% RH
	Low temperature treatment equipment	2	1m ³
Fumigation Rm	Fumigation equipment, vacuum type	1	6m ³ , FAO standard special grade 30 m ³ , Methlebromide & Hydrogen cyanide
	Fumigation equipment, 30m ³ w/duct		
Fumigation testing Rm	Fumigation System for CH ₃ Br, 1m ³	2	1m ³
	Gas chromatograph	1	FID
Cold Storage	Prefabricated cold Rm, for low temperature treatment	1	treatment temp. -1.5°C
	Prefabricated cold Rm	1	270(W)×450(D)×256(H) 0~10°C
Fumigation Shed	Fumigation container	1	200(W)×600(P)×200(H)
Common Preparation Rm	Water Still	1	10ℓ/hr
	Ice maker	1	166kg/day
	Deep freezer	1	700ℓ, -20~25°C
Instrumental Analysis Rm	Fume hood	1	150(W)×75(P)×210(H)
	Spectrophotometer, IR	1	4,000~400cm, w/data processor
	Spectrophotometer, UV-vis	1	190~900nm, w/recorder
Dark Rm	Dark Rm equipment	1	Monochromatic enlarger
Quarantine operation Rm	Personal Computer	1	2MB RAM, 40MB Fixed Disk
Administration Office	Personal Computer	1	2MB RAM, 40MB Fixed Disk
Workshop	Hand tractor w/attachment	1	Two wheel type
Soil Sterilization Shed	Autoclave, large type	1	570ℓ, 105~135°C, 2.2kg/cm ²
	Steam generator	1	JIS grade boiler, Water softner
Garage	Pick up truck	1	2,300cc, Double cab type
	Vehicle, stationary type	2	3,100cc
Incinerator	Incinerator	1	Forced heating system, Secondary combustion system
Colombo Seaport Quarantine Station	Pick up truck	1	2,300cc, Double cab type

5-2-3 Basic Design

(1) Scale of Facilities

Table 5-8 Scale of Facilities

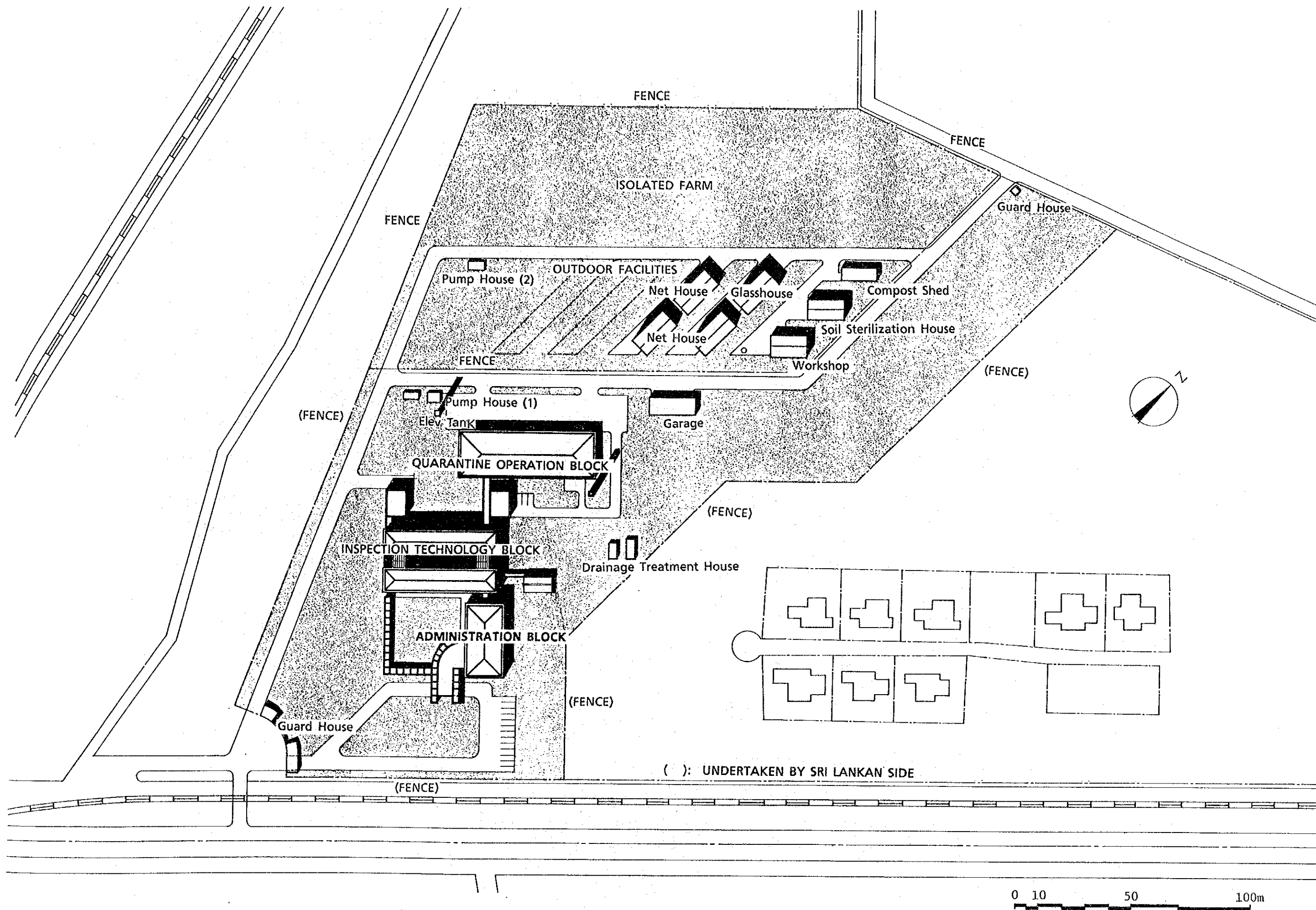
(unit m²)

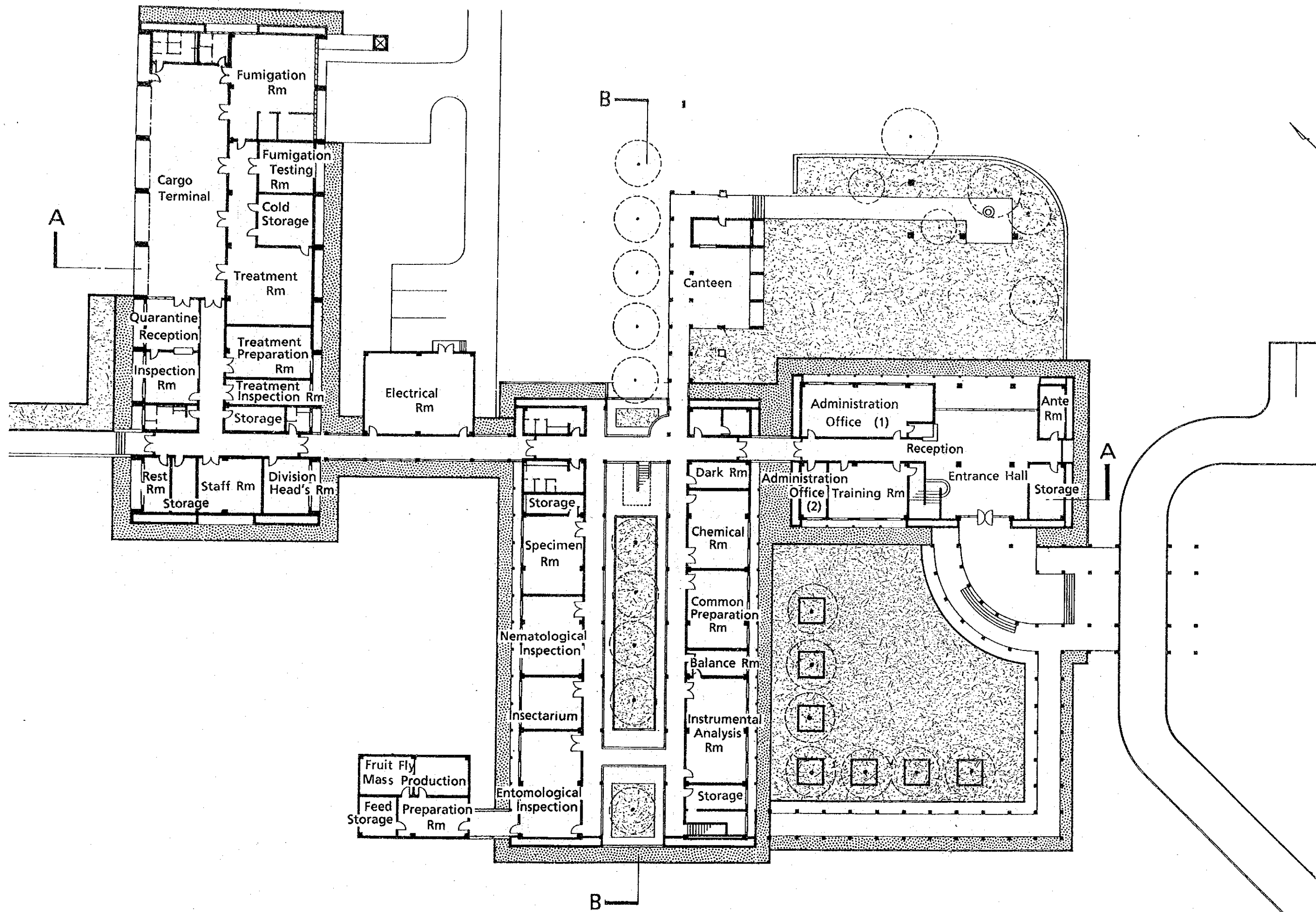
Building	Block	Gnd FL	1st FL	Total
Main Building	Administration Block	468	408	876
	Inspection Technology Block	1,127	900	2,027
	Quarantine Operation Block	1,152	—	1,152
	Sub-total	2,747	1,308	4,055
Outdoor Facilities	Isolated Field Facilities	1,108	—	1,108
	Others	317	—	317
	Sub-total	1,425	—	1,425
Total		4,172	1,308	5,480

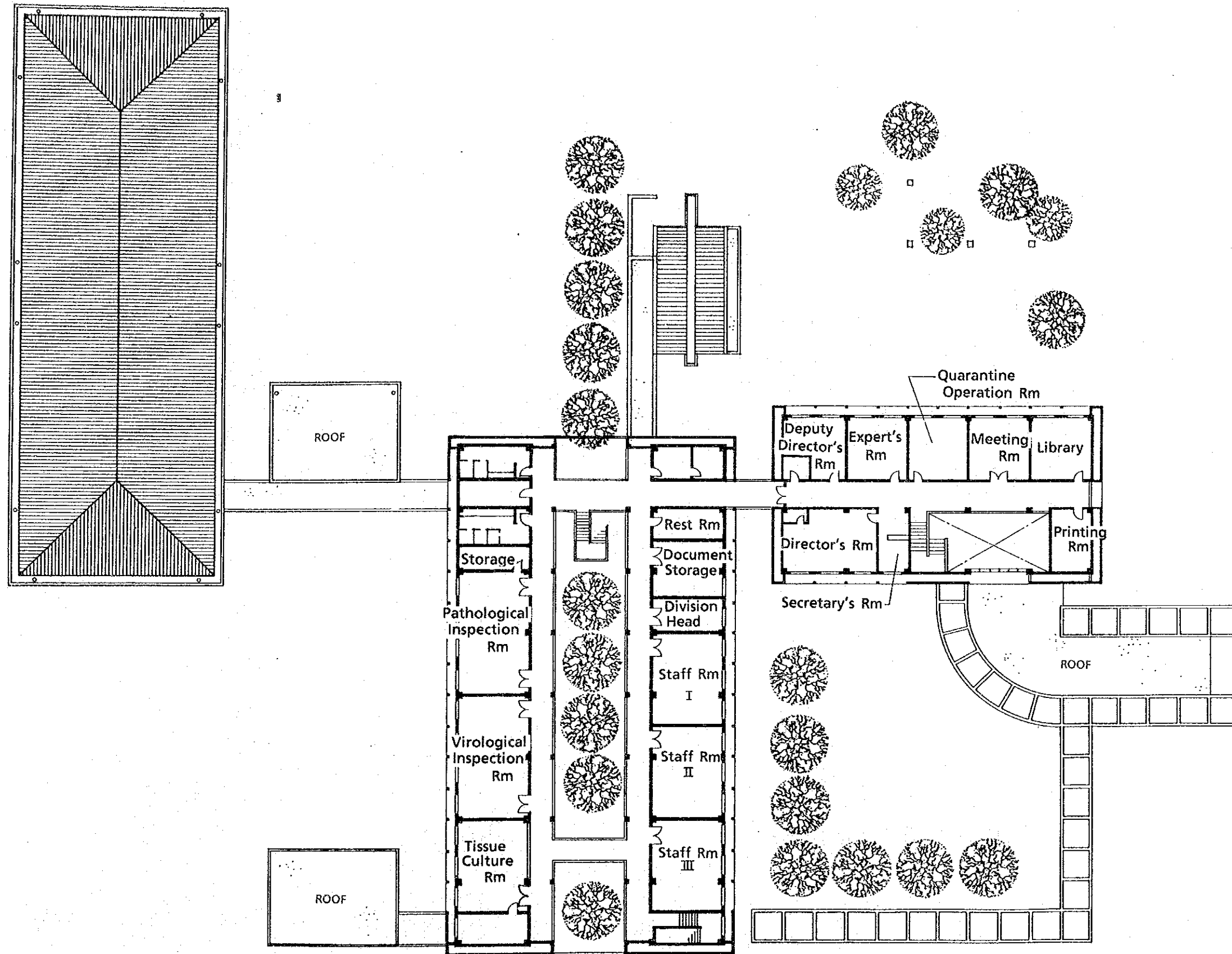
(Excluding Balcony and Piloti)

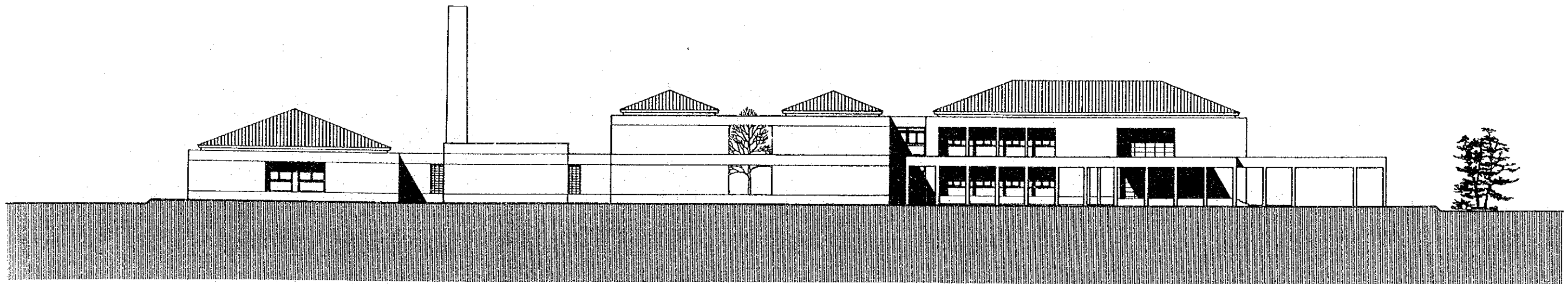
(2) Basic Design Drawings

1. Site Plan
2. Ground Plan
3. 1st Floor Plan
4. Elevation (1)
5. Elevation (2)
6. Section

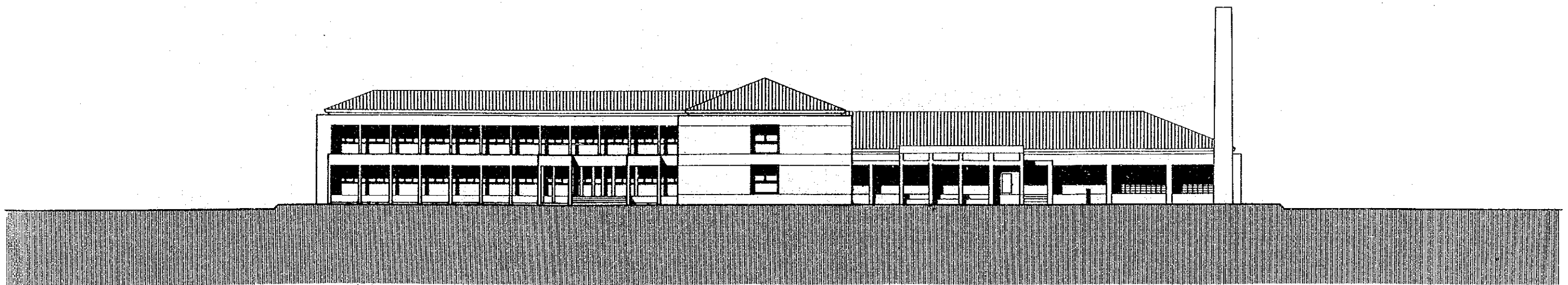




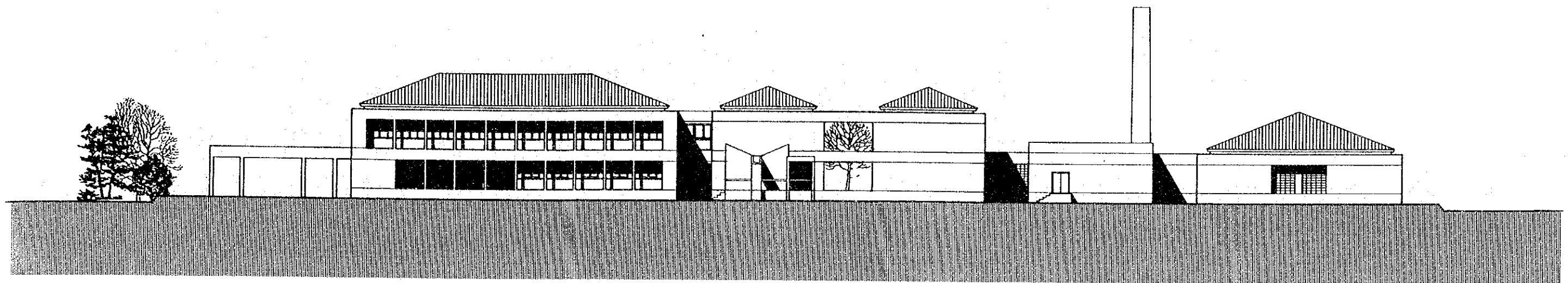




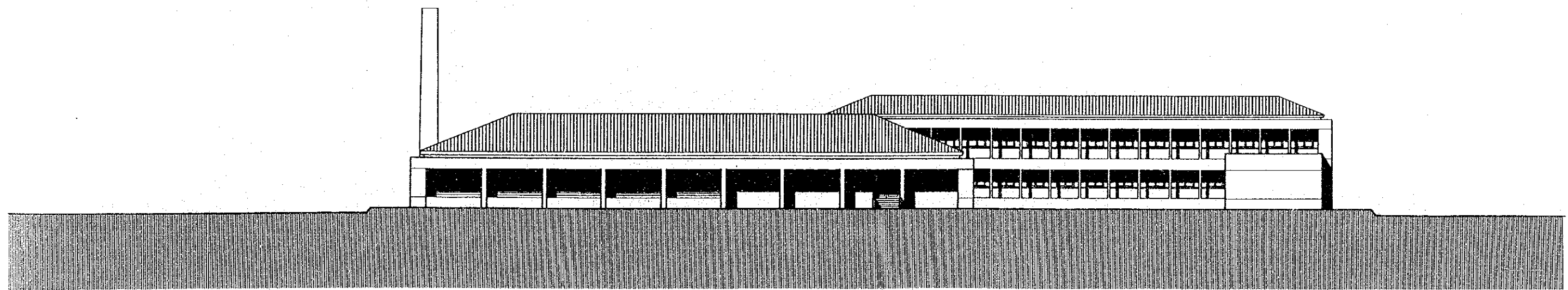
WEST ELEVATION



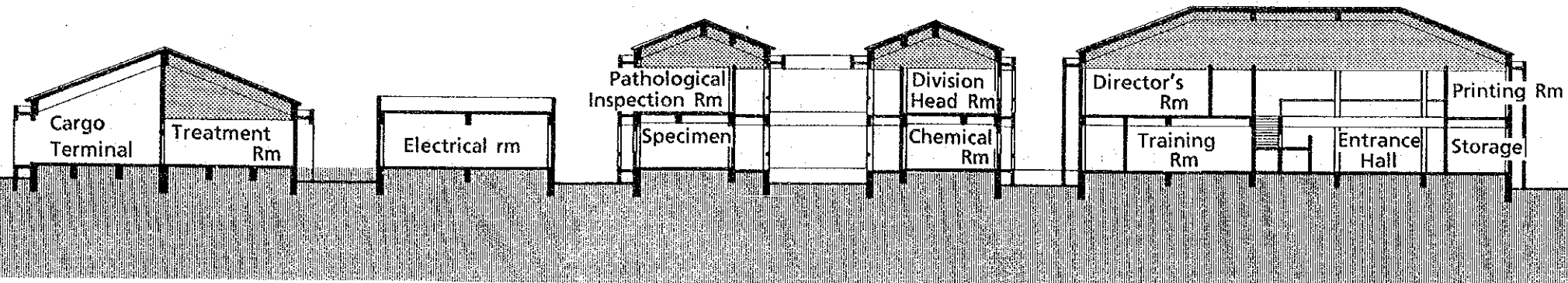
SOUTH ELEVATION



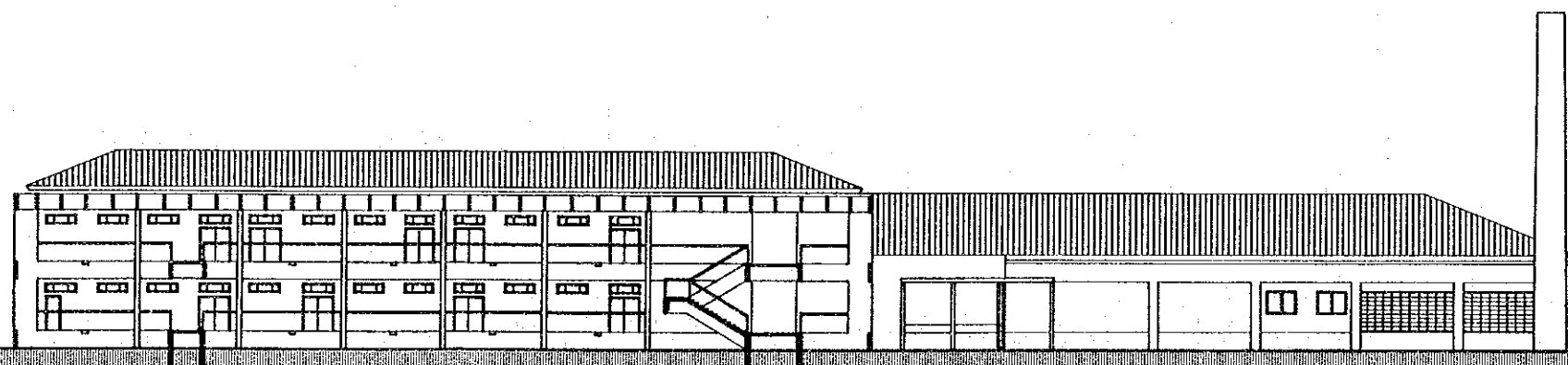
EAST ELEVATION



NORTH ELEVATION



A-A SECTION



B-B SECTION

5-3 Construction Plan

5-3-1 Construction Work Criteria

(1) Project Implementing System

This project is to be implemented by the Department of Agriculture, as the implementing organization, under the control of the Ministry of Agricultural Development and Research. The director of the Department of Agriculture will be a party to the consultant agreement, the construction contract and the bank arrangement concerning the construction of the planned facilities. The Deputy Director, Seed Certification and Plant Protection Division the Department of Agriculture, will be responsible for the coordination of the project implementation, including consultations on technical aspects of the contents of this project.

The Department of External Resources, under the control of the Ministry of Finance and Planning, will be responsible for all matters related to the grant aid from the Government of Japan. It will carry out all tasks to arrange for financial cooperation between the two governments. The Airport & Aviation Services Ltd. will provide a site for the project.

(2) Consultant for the Project

Immediately after the conclusion of the Exchange of Notes (E/N) on the implementation of the project between the Government of Japan and the Government of Sri Lanka, the Department of Agriculture will be required to conclude a consultant agreement with a Japanese consultant firm and obtain the verification from the Government of Japan. After the conclusion of such agreement, the consultant will prepare detailed design documents based on this supplementary basic design study report and carry out

necessary tender and construction supervision work.

(3) Contractors

Judging from the total project cost of the buildings and equipment, the building construction work and the equipment procurement/installation work should be contracted separately. The contractors for both works will be selected from qualified Japanese firms through an open tender. The Department of Agriculture, in principle, will conclude a construction contract and an equipment procurement/installation contract with the lowest tenderer in each work, and then obtain the verification from the Government of Japan. The selected contractors will be required to complete their respective works and deliver the facilities and the equipment to the Government of Sri Lanka by the date specified in the contract.

5-3-2 Situation of the Construction Industry in Sri Lanka

(1) Situation of the Construction Industry in Sri Lanka

1) Local consultants

In Sri Lanka, particularly in Colombo City, there are a number of consultant firms with 10 to 20 staff. Many of the staff of these consultant firms were educated abroad such as Great Britain, Australia, etc. and therefore excel in working out detailed design drawings and supervising construction work. They also have experience of taking charge of preparation of detailed design drawings in financial aid programs by foreign countries other than Japan.

Therefore, they have enough possibility to develop detailed design drawings for a project under the control of the Japanese Consultant.

2) Local contractors

The Central Engineering Consultancy Bureau and the construction section of each ministry handle both the design and construction of most of the large-scale construction works contracted out by the Government of Sri Lanka. On the other hand, many of the private contractors are small and participate in these public construction works and those contracted out by foreign-affiliated companies merely as subcontractors only to recruit local construction workers. As such, the local private contractors are unable to contract for an entire construction work. Due to the shortage of technicians and skilled workers, these contractors lack the ability to control quality, progress and materials. When utilizing the services of local private contractors under this project, the Japanese contractor will be required to place orders with a number of local contractors, according to the type and size of the work concerned, and at the same time to dispatch Japanese engineers to Sri Lanka to take charge of quality control as occasion demands.

3) Locally available construction materials

In Sri Lanka, general construction materials are either manufactured locally or imported. Therefore, in principle, it is possible to procure them locally. However, some of them are of poor quality and are supplied in limited quantities. It should also be noted that there are limited types, patterns and colors for a certain product. In the case of this project which requires prompt delivery of necessary quantities of products of high quality, it will be essential

to procure some necessary construction materials from Japan or third countries as occasion demands.

(2) Points to note in Construction

Judging from the condition of the project site and the local construction industry, the Japanese contractor should note the following points.

1. The project site is located in an area which is subject to height restrictions under the local air navigation law. It should be noted that restrictions will also be imposed on the height of the machinery for use in the temporary work. It will be necessary to have prior consultations with the Airport & Aviation Services Ltd. concerning the temporary work planned.
2. As the project site is to be accessed crossing a railway track during the construction work, satisfactory safety measures should be taken in conjunction with the transportation of machinery and materials to the project site.
3. As the project site was prepared by reclaiming swampland, its ground may be soft at first. It will be necessary, therefore, to have a clear grasp of the actual condition of the ground and to pay careful attention to the maintenance and inspection of the temporary roads and scaffolding.
4. There is a shortage of technicians and skilled workers as well as tools and utensils in Sri Lanka. For this reason, it will be essential to dispatch Japanese engineers, as occasion demands, to give technical guidance to the local construction workers.

5. The Government of Sri Lanka will be required to take prompt action for tax exemption and customs clearance of the construction machinery and materials imported into the country.

5-3-3 Construction Supervision Plan

(1) Contents of services

In accordance with the procedures of Japanese grant aid programs, the Japanese consultant firm will conclude a consultant agreement with the implementing organization of the Government of Sri Lanka. After concluding the agreement, the consultant will work out detailed design documents and supervise the construction work in compliance with the provisions of the consultant agreement. Construction supervision is aimed at ensuring that the construction work is being carried out in accordance with the design documents and providing direction, technical advice and coordination throughout the term of services from a fair point of view in order to ensure the proper implementation and quality of the construction work. The construction supervision service include the following.

1) Assistance in tendering

The consultant shall prepare the documents necessary for tendering the construction and the equipment procurement/installation work, and assist the Government of Sri Lanka in carrying out tasks related to the public announcement of invitation to tender, acceptance of applications, prequalification, distribution of documents to the tenderer, acceptance of tender, evaluation of the tender result, and awarding the contract to the successful tenderer.

2) Direction, advice and coordination to contractor

The consultant shall examine the progress and the scheme of construction, the construction machinery/material procurement plan and the equipment procurement/installation plan, and give the contractor direction, advice or coordination.

3) Examination and approval of working and production drawings

The consultant shall examine and approve the working drawings, production drawings and other relevant documents submitted by the contractor.

4) Confirmation and approval of construction machinery/materials and equipment

The consultant shall confirm the consistency of the construction machinery/materials and equipment between those which the contractor proposes to procure and those in the contract documents, and approve their adoption.

5) On-site inspection

The consultant shall be present at on-site inspections of the building components and equipment to ensure their quality and performance.

6) Reporting on progress of the construction work

The consultant shall grasp the actual conditions of the construction site and progress, and report to both Governments.

7) Completion inspection and test operations

The consultant shall inspect the facilities constructed and the equipment installed, and make a test run of each piece of equipment,

in order to ascertain that all the facilities and equipment are in compliance with the provisions of the contract documents, and shall give the Sri Lankan side the Inspection Certificate. The main advanced analytical instruments, in particular, shall be installed and adjusted by the manufacturer's engineers and their test runs shall be made with standard samples. The consultant shall ascertain that the results of the test runs are in compliance with the provisions of the contract documents.

8) Training in operation of the equipment

Some pieces of equipment installed under this project, such as the vapor heat treatment equipment, will require considerable operating skills as well as good knowledge of their maintenance and management. For this reason, it will be necessary to have the Sri Lankan engineers in charge receive on-site training in proper equipment operation and trouble-shooting techniques during the installation/adjustment/test-run period. The consultant shall give direction and advice concerning the training program.

(2) Construction supervision system

Judging from the scale of the project, it is advisable that, in carrying out the aforementioned tasks, the consultant dispatch an architect/engineer to Sri Lanka throughout the term of works. The consultant shall also dispatch the necessary number of engineers to the site as needed for inspection, direction and coordination, and at the same time establish a communication and backup system in Japan, which shall be managed by an engineer in charge. The engineer in charge of such a system shall report to the Japanese officials in

charge on the progress of the works, payment procedures, completion of the construction of the facilities and installation of the equipment, and any other relevant matters. Fig. 5-6 gives an outline of the proposed construction supervision system and the departments to be involved.

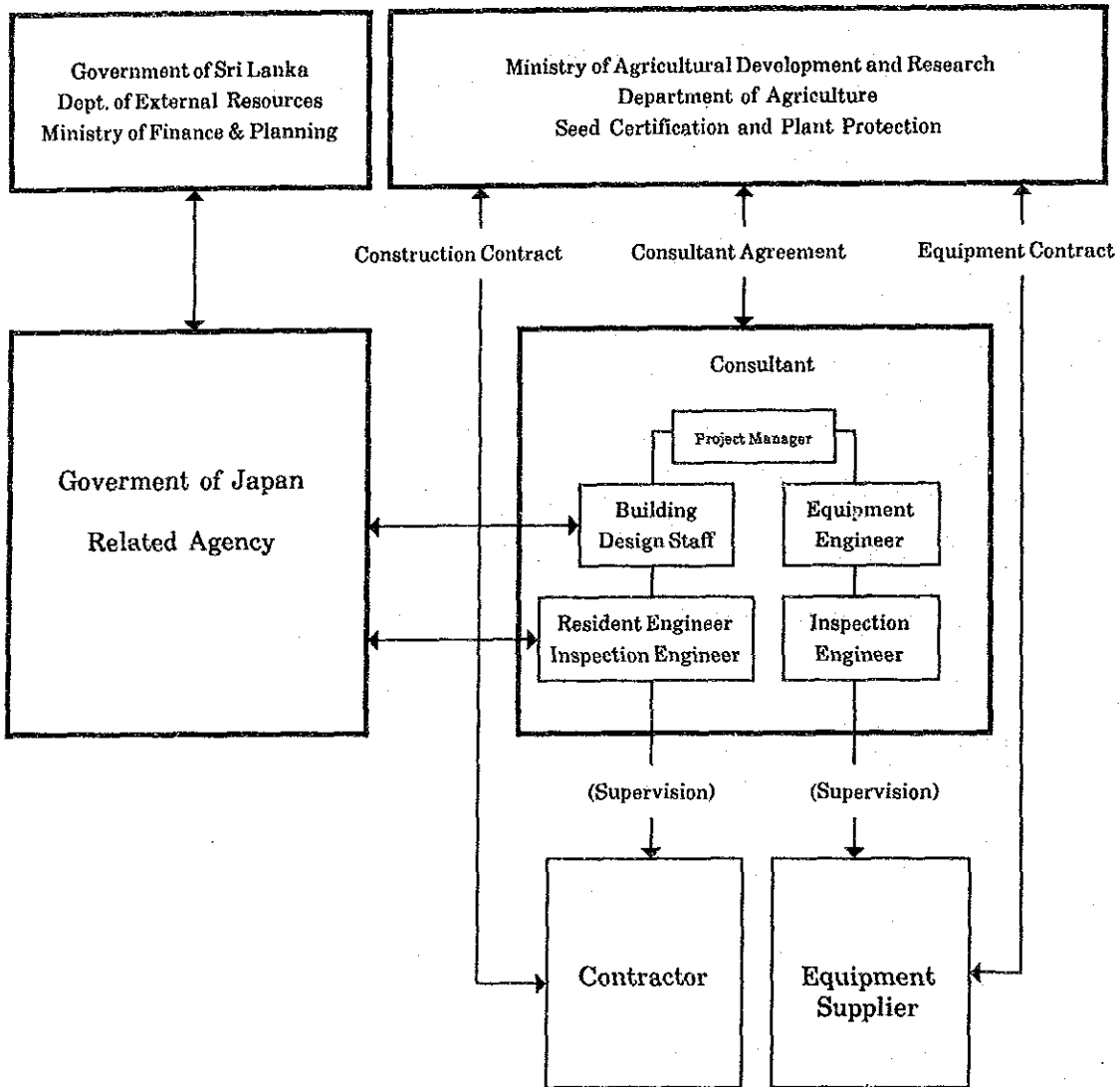


Fig. 5-6 Construction Supervision System

5-3-4 Appliance/Material Procurement Plan

(1) Appliance/Material Procurement Criteria

When procuring the appliances and materials for use in the construction of the facilities, the contractor should note the following points.

1) Local procurement

To facilitate the repair and management work after completion of the facilities, the appliances and materials used for the construction of the facilities should be procured locally wherever possible. In this case, each appliance or material should be ordered after confirming its current supply in order to evade delay in the construction work due to shortfalls in supply of these appliances and materials.

2) Imported appliances and materials

Those appliances and materials which are considered poor in quality or in short supply should be imported from Japan or third countries. In this case, the contractor will be required to keep in close contact with the Sri Lankan officials of the implementing organization of the project concerning their import and customs clearance, and to ensure that all the necessary procedures are followed without delay.

3) Unit prices of appliances and materials

The unit price for the import of an appliance or material (including the packing, transportation and insurance costs) should be compared with that for its local procurement. When the unit price for its local procurement is judged to be lower than or nearly equal to that for its importation, that will be one of the factors for the local procurement.

(2) Appliance/Material Procurement Plan

The main appliances and materials procurement plan for the construction work will be as follows.

Table 5-9 Materials Procurement

Works	Appliance/Material	Procurement			Remarks
		Local	Japan	Others	
Architectural Work	Cement	○			Unstable in supply but including imported cement, possible to procure locally.
	Sand	○			River sand available
	Gravel	○			Crushed stones available
	Reinforcing bar		○		Imported Re-bar available, but expensive.
	Form (Plywood)		○		Not produced locally
	Brick	○			For partition wall
	Concrete block	○			For partition wall
	Terrazzo tile	○			For floor finishing, not many varieties
	Ceramic tile	○			Produced locally, not many varieties
	Glass	○			Produced locally
	Roof tile	○			Commonly used for roof material, also poor in quality
	Timber			○	Short supply, also poor in quality
	Calcium silicated Board			○	Not produced locally
	Doors & Windows (Metal)			○	Not produced locally
	Doors & Windows (Wood)			○	Bad quality
hardwares			○	Not produced locally	
Paint	○			Easy maintenance	
Mechanical Work	Pump		○		Bad quality
	Fan		○		Not produced locally
	Air-conditioner		○		Not produced locally
	Apparatus for septic and neutrilization tank		○		Not produced locally
	Water treatment apparatus		○		Not produced locally
	Sanitary fittings		○		Not produced locally, imported ones available but expensive
	PVC pipe		○		No joints available, also poor quality
	Galvanized steel pipe		○		Imported ones available but hard to find its joints.
Electrical Work	Distribution panel		○		Not produced locally
	Lighting fixtures		○		Bad quality, small variety
	Telephone exchange		○		Not produced locally
	Paging system		○		Not produced locally
	Fire alarm system		○		Not produced locally
	Electric wire/cable		○		Bad quality, small quantity
	Wiring pipe		○		No joints available, also poor quality

(3) Quarantine Equipment Procurement Plan

In principle, the equipment for use in plant quarantine will be procured in Japan, with nothing from a third country. It is desirable, however, that the following pieces of equipment be procured in Sri Lanka for the reasons cited below.

1. Maintenance service system is established and possible to supply the consumable parts.

- Copiers
- Office computers
- Word processors

2. Availability of appropriate products with reasonable prices

- Planting pots for examination plants

There are many pieces of equipment for use in plant quarantine which are vulnerable to shocks, humidity and high temperature, so close attention should be paid to their packing and transportation. For those pieces of equipment, a strictly moisture proof packing method will be employed so that the equipment may withstand its transportation in a tropical zone.

5-3-5 Project Implementation Schedule

When the Exchange of Notes concerning the implementation of the project is concluded between the Government of Japan and the Government of Sri Lanka, the construction and equipment procurement/installation work will be implemented with the following procedures.

(1) Detailed Design Services

The consultant shall prepare the design documents such as detailed design drawings, specifications and tender documents based on the contents of the supplementary basic design study report after the conclusion of the

consultant agreement. The consultant shall also obtain approval on the above-mentioned documents from the Sri Lankan side after consultation with them. The time required for completing the procedure is estimated at three months.

(2) Tendering

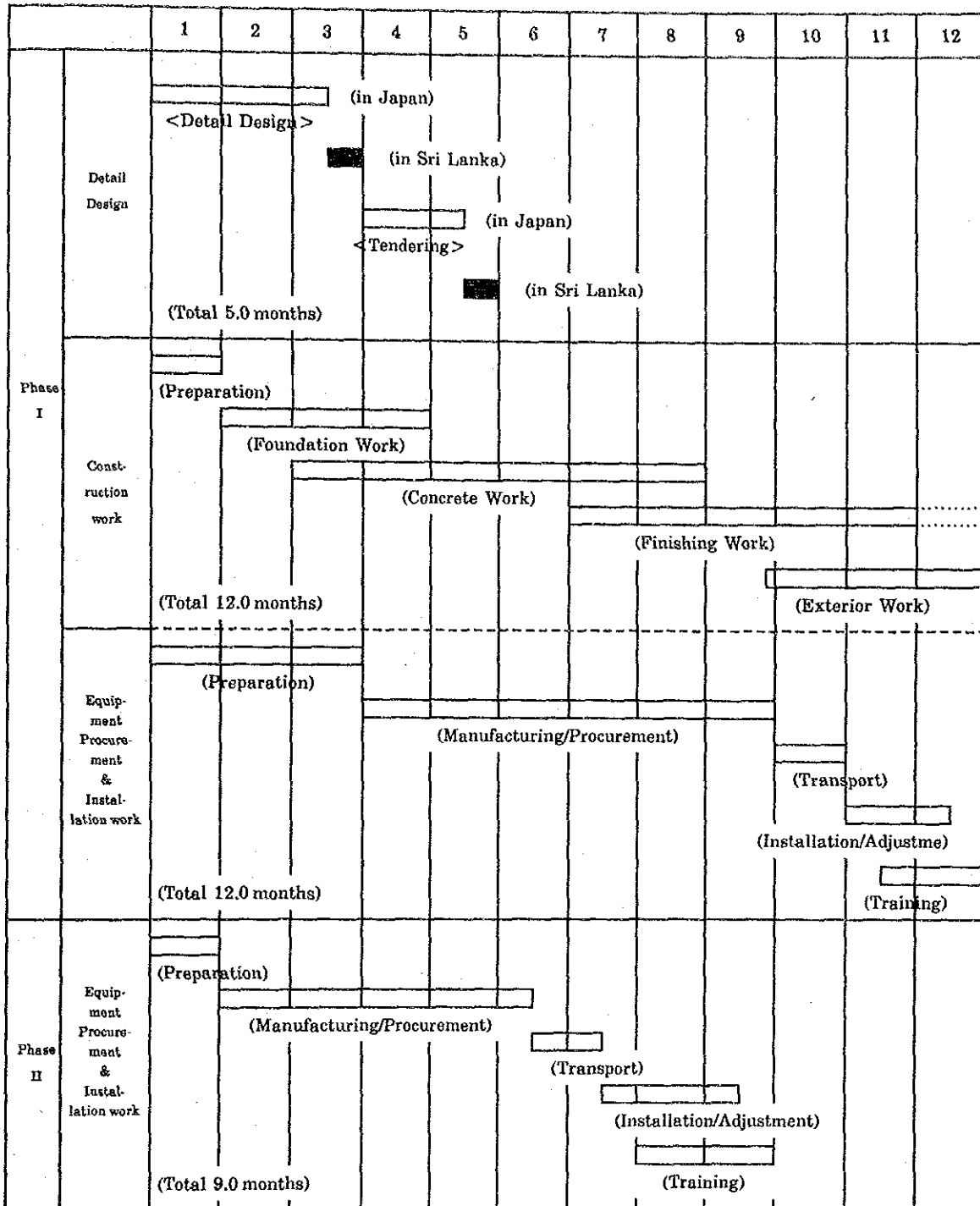
The contractors to take charge of the construction work and the equipment procurement/installation work will be selected separately by tender. The tender work includes tender announcement, prequalification, reception of tenders, evaluation of the tenders, designation of the contractors and conclusion of the contracts. The time required for completing this procedure is estimated at about two months.

(3) Construction Work and Equipment Work

Judging from the contents and scale of the work and the actual situation of the local construction industry, the implementation schedule will be consisted of two phases; for construction works in one phase (of 12 months) and for equipment works in two phases (the first phase of 12 months and the second phase of 9 months), to complete the entire project, provided the procurement of building appliances and materials and the customs clearance of imported articles proceed smoothly.

The overall implementation schedule from the conclusion of the Exchange of Notes to the completion of the project by considering the above-mentioned factors is as shown in Table 5-10.

Table 5-10 Implementation Schedule



5-3-6 Estimated Project Costs borne by Sri Lankan Side

(1) Scope of Work

This project is to be implemented through close cooperation between the Government of Japan and the Government of Sri Lanka within the framework of grant aid from the Government of Japan. It is reasonable for the Governments of the two countries to share the project between them as follows.

1) The work to be done by the Government of Japan

① Facilities

- Construction of the buildings described in this basic design study report
- Electrical, mechanical and sanitary installations

② Equipment

- Equipment procurement work
- Equipment installation work

③ Infrastructure

- Substation
- Water supply and drainage work within the premises
- Telephone exchange system

④ Outdoor structures

- Roads and parking lots within the premises
- Septic tanks
- Outdoor lighting

⑤ Other work related to the above work

- Transportation of equipment, appliances and materials from Japan to Sri Lanka
- Inland transportation of imported equipment, appliances and materials from ports of disembarkation to the project site

2) The work to be done by the Government of Sri Lanka

① Site and outdoor structures

- Securing the site for the project
- Removing existing structures, trees and so on from the project site and reclamation of site
- Construction of drainage channel around the project site and bridges to cross the channel to the site
- Construction of access roads to the project site
- Planting and construction of outdoor structures including fence, gate and a regulatory pond etc.

② Infrastructure

- Supply of electricity up to the site
- Installation of telephone line up to the telephone exchange

③ Preparatory work

- Provision of sites for temporary office, workshops and material storage places
- Installation of temporary electricity supply and telephones

④ Fixtures and furniture

- Fixtures, curtains, furniture, etc. other than those supplied by the Government of Japan

⑥ Procedural work and its expenses borne by the Sri Lankan side

- Banking arrangement expenses
- Tax exemption procedure expenses
- Prompt action related to customs clearance and inland transportation
- Necessary measures for exempting the Japanese nationals involved in the implementation of the project from customs duties, domestic taxes and other fiscal levies in accordance with the verified agreement
- Arrangement to expedite the acquisition of visas, customs clearance, and any other formalities that may be necessary for the entry of Japanese nationals involved in the implementation of the project
- Maintenance and management expenses for ensuring that the facilities constructed and the equipment installed are operated properly and effectively
- Expenses for the construction-related procedures

(2) Estimated Costs to be borne by the Government of Sri Lanka

1) Site preparation work

- Land reclamation and site preparation work 10,000,000 Rs
(completed by the Airport & Aviation Services Ltd.)
- Construction of access road 500,000 Rs

2) Infrastructure work

- Installation of electricity supply for the site 250,000 Rs
- Installation of telephone lines to the PBX 600,000 Rs

3) Building construction work	
- Subgate on airport side	200,000 Rs
4) Outdoor structure construction work	
- Preparation of surface soil on the site for the isolated farm	1,800,000 Rs
- Gates	650,000 Rs
- Planting	2,000,000 Rs
- Fence	4,800,000 Rs
5) Furniture & fittings	
- Curtains	1,000,000 Rs
<hr/>	
Total	21,800,000 Rs

It will be necessary to include in the total costs the following as part of the expenses to cover fees and taxes.

- Banking arrangement fee : 0.025 percent of the amount set forth
in the E/N
- Import duties : about 20 percent on average of CIF
prices

It is desirable that the Government of Sri Lanka prepare the budget for this project and conduct the construction with proper timing so that the entire project can be implemented smoothly and the facilities constructed may be utilized effectively.

