

3.4 Basic Design

3.4.1 Basic design policies

The results of the preliminary site surveying conducted by the study team found that the area of the No.2 site as currently indicated, at only about 1.4 ha, is considerably less than the 2 ha which was originally mentioned by the Ministry of Public Health. It was also noted that from a little to the southeast of the center of the site, there is a hollow which extends as much as 6 meters below the height of the road in front of the site. If a building were constructed on this depression, both the costs to be borne by the Government of Laos for site preparation works and those to be borne by the Japanese government for building foundation works would become excessive. Therefore, no buildings should be erected on this area. Furthermore, if, as explained by the Government of Laos during the preliminary site inspection, the areas of land adjoining the northeast edge of the site can be acquired from their private owners and the Tobacco Company, the original proposed area of 2 ha will be obtained. In consideration of the above two points, the study team recommends most strongly to the Government of Laos that the areas adjoining the site on its eastern side be acquired. The basic design will be proposed including these areas in the site.

The basic policies were established for the design of the facilities in the new center in consideration of the climatic conditions in Laos, the condition of raw materials used in production, and the procurement situation for construction materials and equipment as well as the labor situation.

- (1) The facilities shall be matched to the conditions of drug manufacture in Laos and shall be capable of continuous operation.

- (2) The scope, scale and specifications of the buildings and facilities shall accord with the necessary production functions, shall be limited to a suitable extent, shall be as economic as possible and shall be simply and clearly designed.
- (3) The facilities shall take GMP considerations into account within the context suitable for the present situation in Laos and shall follow manufacturing functions.
- (4) Due consideration shall be given in the operation, maintenance and management of the facilities to keep costs for materials, labor and energy as low as possible.
- (5) In consideration of the conditions of construction materials and equipment, the labor situation and the climatic conditions in Laos, outdoor operations on site during the rainy season shall, as far as possible, be avoided by making extensive use of prefabricated structures wherever possible.

This means that components and equipment are manufactured and prepared in Japan, then assembled erected, installed and adjusted on site excluding those parts of the construction such as the building foundations which must necessarily be performed on site, and materials from third countries. Consideration shall also be given during this process to guaranteeing the quality of the building and facilities as a pharmaceutical plant.

3.4.2 Facility planning

(1) Site layout

The site abuts on to a main road (Thadua Road), and is like an irregular trapezoid having a frontage of 115 m and a depth of 160 m. The site drops away from a height at the front on the road down a gentle incline to the rear.

In the center of the site is a drop of about 1.5 m, and a deep hollow is a little to the southeast of the center.

After analyzing both these conditions of the site and the functions of each facility, the facilities have been positioned according to the following basic principles.

- (i) The buildings shall be so designed as to express their functions as clearly as possible and as to give a concise impression.
- (ii) The crude drug manufacturing facilities, because of the properties of the raw material plants, shall be located independently in a separate building so as not to influence the other drug production facilities.
- (iii) In addition to the crude drug building dealt with above, the facilities shall be separated into the administration building (including the quality control section), manufacturing building and utility building so that each section will be able to adequately fulfill its respective function, and to facilitate operation, maintenance and management by giving due consideration to the respective function, operation and management.
- (iv) An open area shall be established between the buildings and the road in front of the site so as to maintain the

function of the facilities and to secure clear visibility from the main road.

In accordance with the above principles, the Administration Building and Manufacturing Building are to be located parallel to the main road on the inner side of the open area and the open area shall also function as a parking lot.

An in-site road is to be provided around the Administration Building and the Manufacturing Building to handle the flow of traffic engaged in transportation of raw materials and finished products and in maintenance of the facilities. The crude drug building is to be located on this road at the back. Provision will also be made so that plants that are the raw materials for crude drugs can be transported in directly from the road on the eastern side. The utility building is to be located at a point central to the other three buildings to facilitate maintenance and management, and furthermore so that initial construction costs are not excessive. Rain water and residential waste water on the site is to be drained away by using the aforementioned depression and the Water Treatment Facilities for soil water and waste water from the production processes are also to be located as close as possible to this depression.

(2) Buildings

(i) Floor planning

a) Administration Building

The administration building comprises the administration zone and the quality control zone. The general administration rooms are to be located on the production building side from the main entrance which fronts on to the open area, while the quality control rooms are to be positioned

on the opposite side.

b) Manufacturing Building

The infusion zone, ampoule zone and tablet zone, all of which require roughly the same building functions, are to be located together in one building. This measure will improve efficiency of the facilities and achieve more efficient use of space by joint use of common sections.

The common area is to be located on the approach side, and the various rooms for drug production are to be located according to the manufacturing process and the interchangeable inspection and packing areas are to be located together as far as possible as a means of efficient use of space when the amount of work for each zone changes.

c) Crude drug building

This building is composed of:

1. Production operations rooms where crude drugs are treated and processed.
2. A storage for raw materials and temporary storage of finished products.
3. An exterior working area for sorting, classification, preliminary treatment, unloading and unpacking of raw materials.

These various spaces are to be positioned in accordance with the flow of the manufacturing process.

d) Utility Building

This is the center for supplying electricity, water and so on to each facility in each building. The layout of this building is to follow the functions performed such as the water supply treatment room, electric room, maintenance workshop and dressing room.

(ii) Materials and specifications for construction

In consideration of the local conditions of construction materials, construction machinery and labor, and in order to guarantee the performance of the buildings required by their function as a pharmaceuticals development center, the prefabricated method is to be adopted and as far as possible, materials are to be supplied as components.

Furthermore, the variety of processes and materials are to be kept to a minimum and conscious efforts will be made to achieve a simple and integrated design by these measures.

a) Main structure

In consideration of the need to keep the construction period as short as possible, to facilitate the construction process, to achieve accuracy during construction and to keep the overall costs as low as possible, the superstructure of the buildings is to be steel structures.

b) Exterior finish

The windows for lighting and visitors' observation in the processing rooms in the Manufacturing Building are aluminum fixed windows as a means of dust prevention and minimizing of energy. The roofings are long-size folded color-coated steel sheets considering torrential rain in the rainy season and in addition, minimizing of the building volume.

1. Administration Building and Manufacturing Building

Roofs: Folded steel plate, vinyl-coated

Walls: Vinyl-coated steel sheet panels

Floors: Reinforced concrete slabs with mortar trowel finish

Doors and windows: Steel doors and aluminum windows

2. Crude Drug Building and Utility Building

Roofs: Folded steel plates, vinyl-coated

Walls: Corrugated asbestos cement sheeting

Floors: Reinforced concrete slabs with mortar trowel finish.

Doors and windows: Steel doors and aluminum windows

c) Interior finish

The floors including base boards of the principal rooms in the Administration Building and Manufacturing Building are of seamless PVC sheet so as to maintain cleanness by washing with water and also to facilitate the construction.

The partitions in the Administration Building and Manufacturing Building are prefabricated panels and these panels in the sterile air-conditioning zones are sealed with caulking at their joints. The ceilings in the sterile air-conditioning zones are asbestos cement boards with joint caulking, whereas the ceilings in other rooms are incombustible plaster boards.

1. Production and processing rooms.

Ceilings: Incombustible plaster boards or asbestos cement boards with paint finish

Walls: Channel stud solid partition system, vinyl-coated steel sheets.

Floors and baseboards: Seamless PVC sheet

Doors: Steel doors

(iii) List of rooms and area

a) Administration Building

Zoning	Room name	Area(m ²)	
Administration zone	Office room No.1	15	
	Office room No.2	16	
	Office room No.3	32	
	Meeting room	62	125 (Sub-total)
Quality control zone	Physico-chemical assay room	68	
	Analysis room	27	
	Preparation room	36	
	Anteroom	7	
	Test material storage	8	
	Sterility test room	23	169 (Sub-total)
General use	Corridors, etc.	44	44 (Sub-total)
			338 (Total)

b) Manufacturing Building

Zoning	Room name	Area (m ²)	
Tablet zone	Weighing room and Milling room	39	
	Granulating room and Preparation room	38	
	Tabletting room	24	
	Coating room	34	
	Bottle washing room	25	
	Storage	38	
	Cartoning room	91	289 (Sub-total)
Infusion zone	Raw material storage	28	
	Bottle washing room	33	
	Weighing room incl. anteroom	26	
	Gowning room No.1	11	
	Gowning room No.2	11	
	Anteroom	22	
	Filling room	66	
	Sterilization room	16	
	Labelling & cartoning room	106	319 (Sub-total)
Ampoule zone	Ampoule washing room	40	
	Drying & sterilization room	18	
	Sterile solution room	18	
	Weighing room incl. anteroom	20	
	Gowning room No.3	11	
	Gowning room No.4	11	
	Anteroom	13	
	Filling room	28	
	Sterilization room	15	
		Labelling & cartoning room	105
Other areas	Water treatment room	54	
	Air-conditioning room	63	
	Locker rooms	96	
	Toilets		
	Corridor	16	311 (Sub-total)
			1198 (Total)

c) Crude Drug Building

Zoing	Room name	Area (m ²)	
Crude drug zone	Processing room	33	
	Extraction room	49	
	Concentration room	65	
	Storage	147	294 (Sub-total)
Exterior working area		(146)	(146) (Sub-total)
			294 (Total)

(3) List of buildings and facilities

The items and area of the buildings and facilities which have been planned for this project are as follows.

(i) Building and floor area

a. Administration Building	338 m ²
b. Manufacturing Building	1198 m ²
c. Crude Drug Building	294 m ²
d. Utility Building	300 m ²
e. Waste Water Treatment Plant	1 set
Total floor area	2130 m ²

(ii) Exterior Facilities

- a. In-site roads
- b. Raw water reservoir
- c. Septic tanks
- d. Elevated water tank
- e. Drain ditches

(4) Structural design

All the buildings (excluding one part of the exterior facilities) are single-storied steel structures by reason of the local availability of materials, construction skills, the conditions of construction machinery and the limits imposed on the construction period by the state of materials, transportation during the rainy season and the obstacles to outdoor work during that period.

Since Laos has no records of earthquakes in the past and because all the main buildings are single-storied steel structures, no provision has been made in the design for horizontal forces due to earthquakes.

The horizontal forces to be considered in the design are wind loads which are derived from data observed on the region.

(i) Frame design

The main structure is of steel construction. In order to avoid restriction of partition layout due to the frames, as far as possible, rigid frames are to be used without wall-bracings.

Roofings are of folded steel sheet construction, with roof bracings to guarantee the rigidity of the roof framings.

(ii) Floor

The floor shall be of reinforced concrete slabs to prevent damage arising from future differential settlement.

(iii) Type of foundations

Judging from the results of the soil investigation by boring conducted on commission by the Lao Ministry of Construction observations of the conditions on site and of the nearby earth-working site, and on the basis of the results of measurements with the cone penetration meter, the foundations will be designed as direct foundations borne by the gravel layer at the depth of from 1.0 m to 1.5 m. In this case, the minimum soil bearing capacity will be taken as 10 t/m².

(iv) Building regulations and design standards

No regulations and standards currently exist in Laos in relation to structural design. Buildings have been designed by the standards of France which was the old regime or the standards of the donor countries such as the U.S, the Soviet Union in cases where the buildings are related to foreign aids.

At present the Lao Ministry of Construction is attempting to establish independent Lao design standards by referring to these foreign standards used in the past as a norm. The data for the enactment of these standards are still unclear, however.

Under these conditions, the Lao Ministry of Construction has agreed to adopt the Japanese standards for the current project because the procurement of materials and the fabrication of the construction elements will be made in Japan by reason of the local conditions of materials, equipment and construction capabilities.

Therefore, the various Japanese standards are to be applied.

with partial revisions by adjusting the design loads to the local conditions of external forces.

(v) Structural materials

a) Steel structures

Steel structures are to be fabricated in Japan with steel materials of JIS standards because procurement of steels or fabrication of the structure in a third country (principally Thailand) would give little benefit and because in some instances there would be unavoidable obstacles arising from the conditions of prohibited exports to Laos from Thailand. The round steel bars for reinforced concrete are also to be supplied from Japan and conform to JIS standards.

b) Concrete

The cement for concrete used in the project is to be normal Portland cement produced in Thailand. Because cement made in Thailand conforms to JIS standards, the mixture is to be based on Japanese standards while considering the local conditions of aggregate and the climatic conditions. The compressive strength of concrete is to be 180 kg/cm² in consideration of the conditions of the local aggregate.

(5) Building facilities

Because Laos has no criteria for equipment or disaster prevention, the design of equipment is to use Japanese standards as reference, and be adjusted to suit the local conditions. The design of the building services for the manufacturing zone is to take GMP consideration into account.

Since virtually all of the equipment for utility has been imported from abroad, the design is to stress reliability, dura-

bility, safety and ease of operation in the equipment in order to reduce replacement of parts during operation.

(i) Water supply system

A public water system along Thadua Road is due for completion and to start supplying water in April 1984.

This town water supply is to be used since the water supply pipes have adequate supply capacity for the project. Since the quality of the water supply has a rather high degree of turbidity (refer to water quality table) and is therefore unsuitable for direct supply, a filter unit is to be installed downstream from the raw water reservoir.

The water is lifted into an elevated water tank by a pump, and then supplied to the various locations where necessary by a gravity water supply system.

Deionized water filtered by a deionizing unit is supplied to the necessary places in the production and testing zones. Refer to the water supply flow diagram.

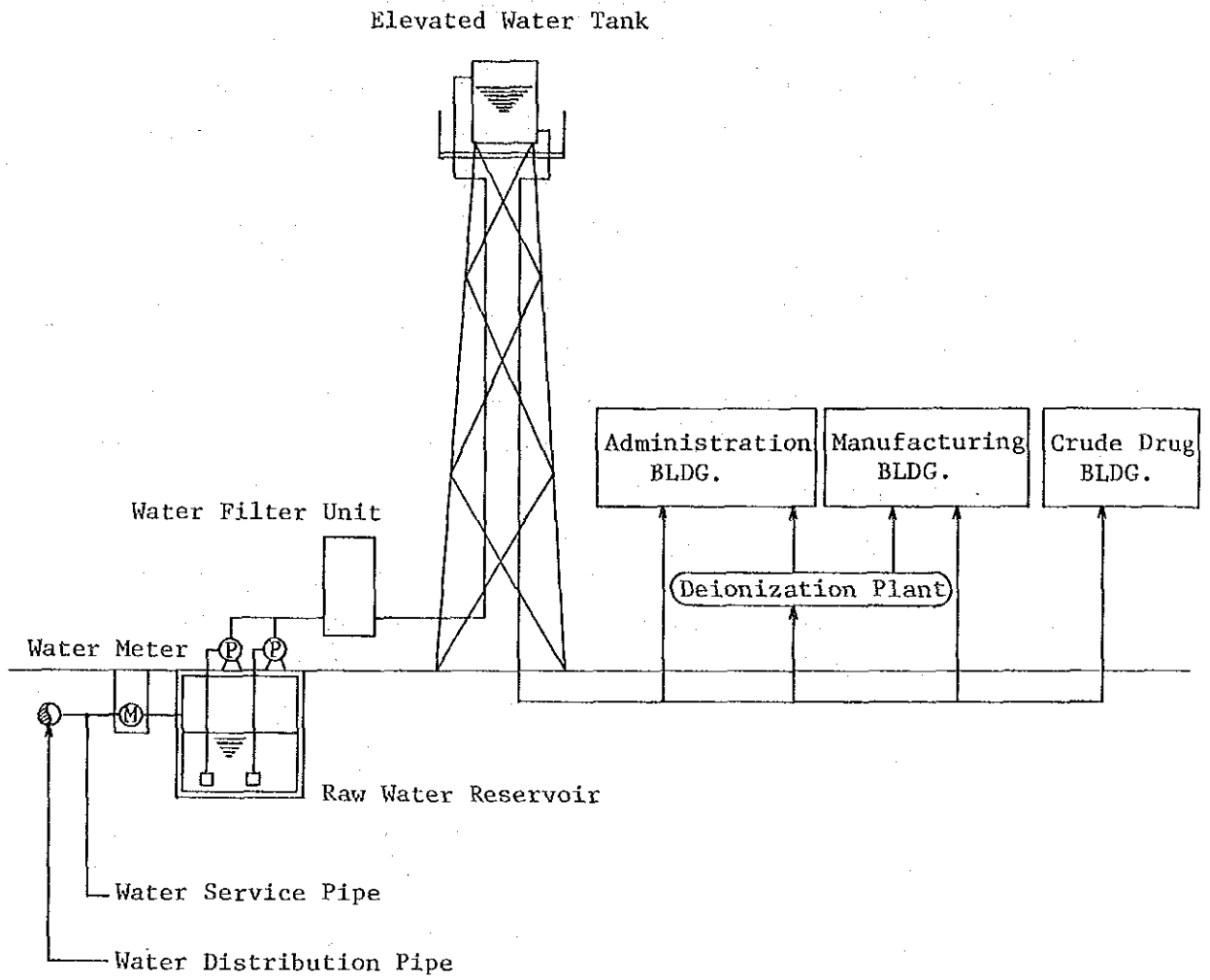


FIG. 3 WATER SUPPLY FLOW DIAGRAM

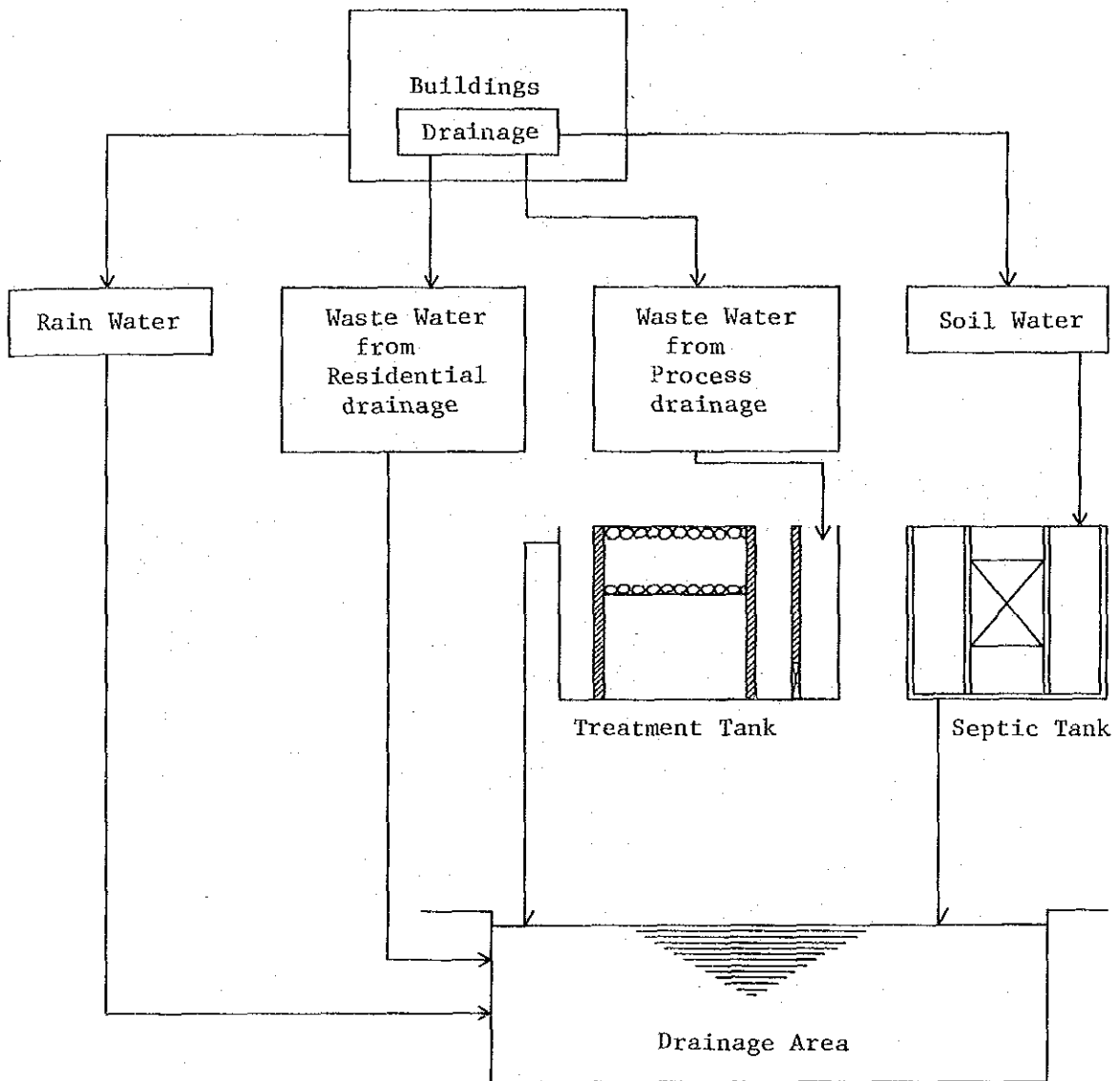
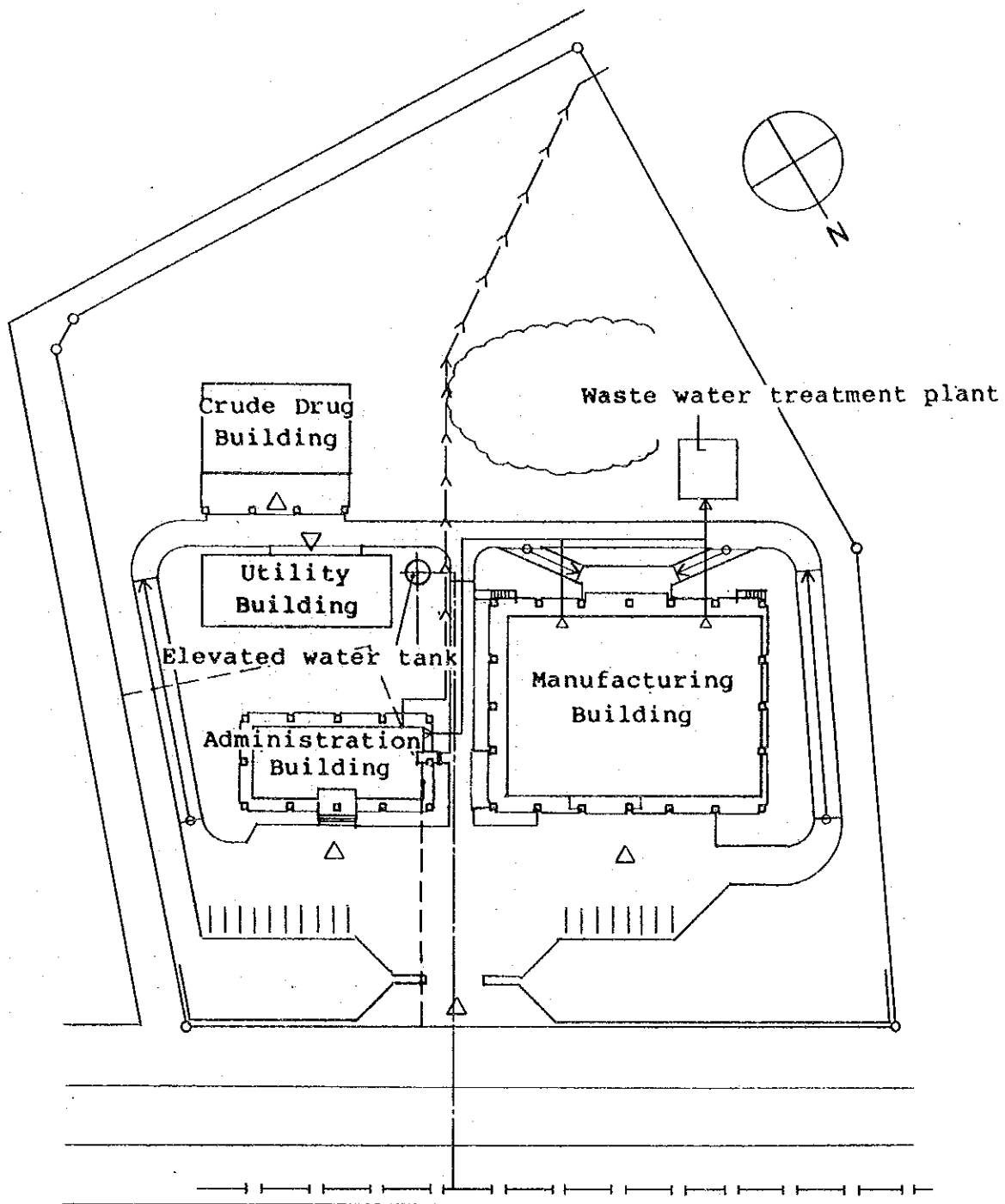


FIG. 4 DRAINAGE FLOW DIAGRAM



Site Layout

- Process Water Drainage
- >-> Soil Water Drainage
- - - Water Service
- | -| Water Distribution Pipe

FIG. 5 WATER SUPPLY AND DRAINAGE FLOW PLAN

(ii) Drainage system

The drainage system comprises four circuits, for rain water, residential waste water, waste water from the production processes and for soil water. The system is illustrated in the drainage flow diagram.

Rain water and residential waste water is drained into the depression on the southern side of the site through pipes or ditches. Consideration is being given to seepage of waste water from the production processes into the soil after it has been detained and sedimented in the storage tank. Soil water will be drained into the rain water circuit after being treated in the septic tanks.

(iii) Fire protection system

Fire extinguishers are to be installed in necessary locations and at least one fire extinguisher is to be installed at an interval of less than 30 m.

(iv) Gas supply equipment

Since there is no town gas supply in Laos, propane gas is to be supplied where necessary from outdoor gas cylinders.

(v) Air-conditioning and ventilation system

a) Sterile zone for infusion and ampoule production

Such air-conditioning is to be provided where a high degree of cleanliness is needed in the filling room and the weighing room in the production zone so as to regulate the temperature and humidity and to clean the air with air filters. In the ampoule washing room and the bottle washing room in the infusion zone air-conditioning for regulating the tempe-

perature and humidity and cleaning the air is to be provided.

b) Tablet zone

Air will be supplied into the granulating room and tabletting room by air-conditioners to control the temperature and humidity through air filters.

c) Crude drug zone

In the extraction room and the concentration room, cooling is to be performed by an air-cooled packaged air-conditioner, and the air is to be supplied through air filters. The storage will be mechanically ventilated.

d) Administration zone

Window-type air-conditioners or split-type air-conditioners are to be installed in the common areas such as the offices and the physico-chemical assay room. The sterility test room and its preparation room are to have air-conditioners for regulating the temperature and humidity and air-filters for cleaning the air. This system is illustrated in the air-conditioning zoning plans in Figs. 6, 7 and 8.

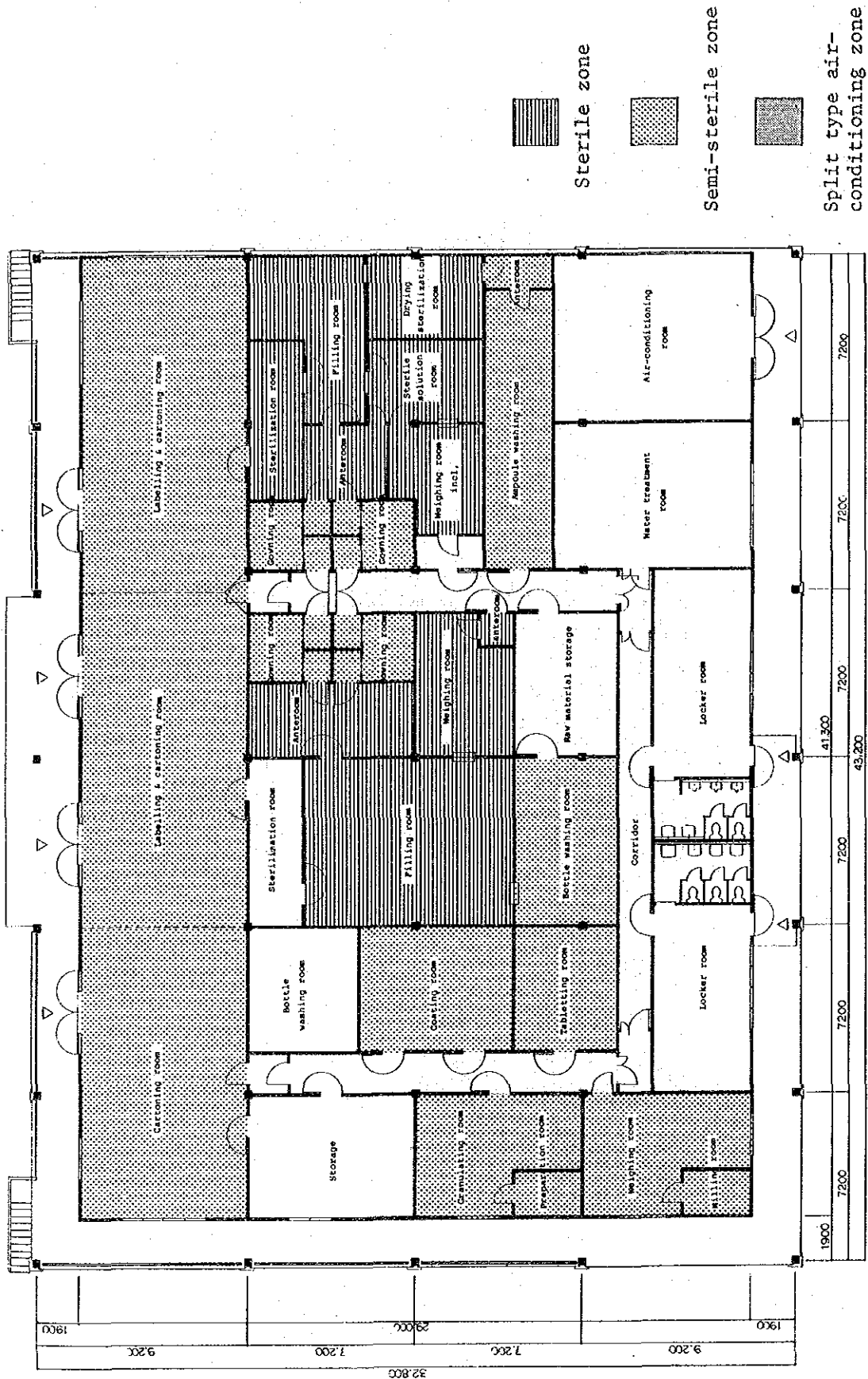


FIG. 6 AIR CONDITIONING ZONING PLAN

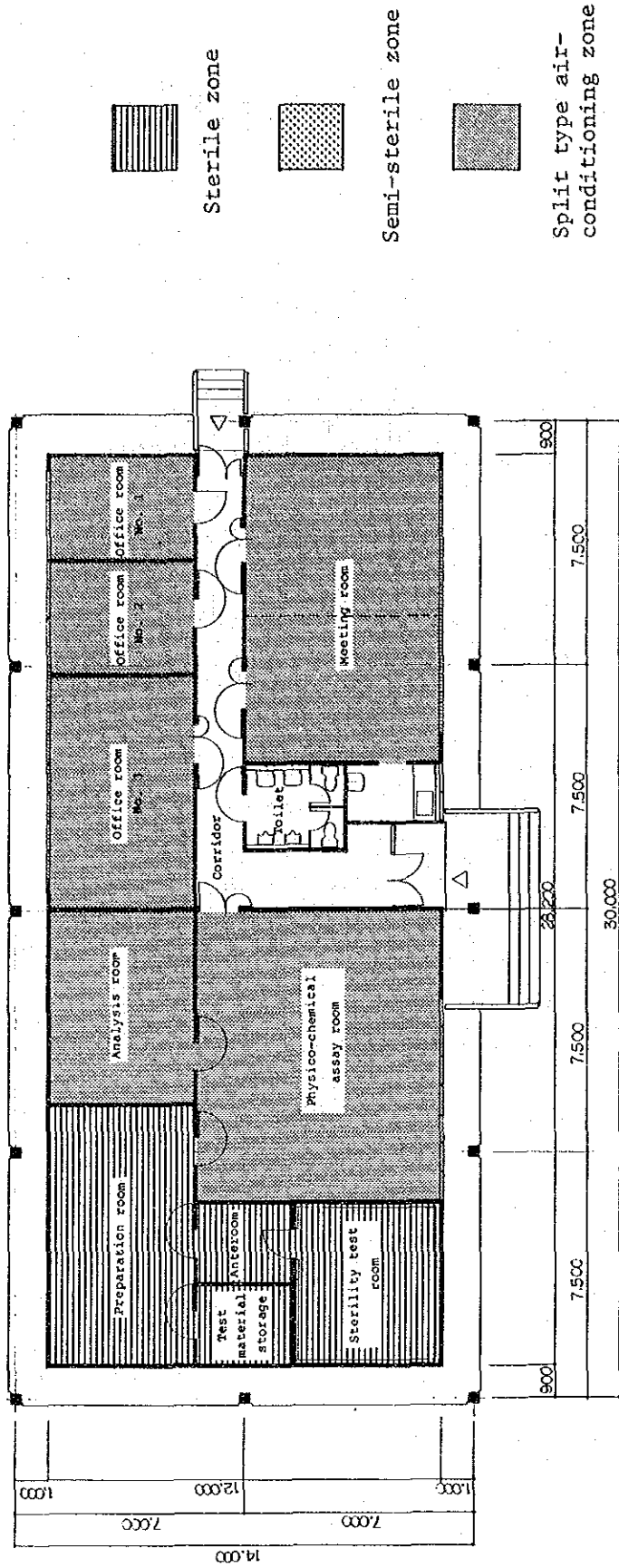
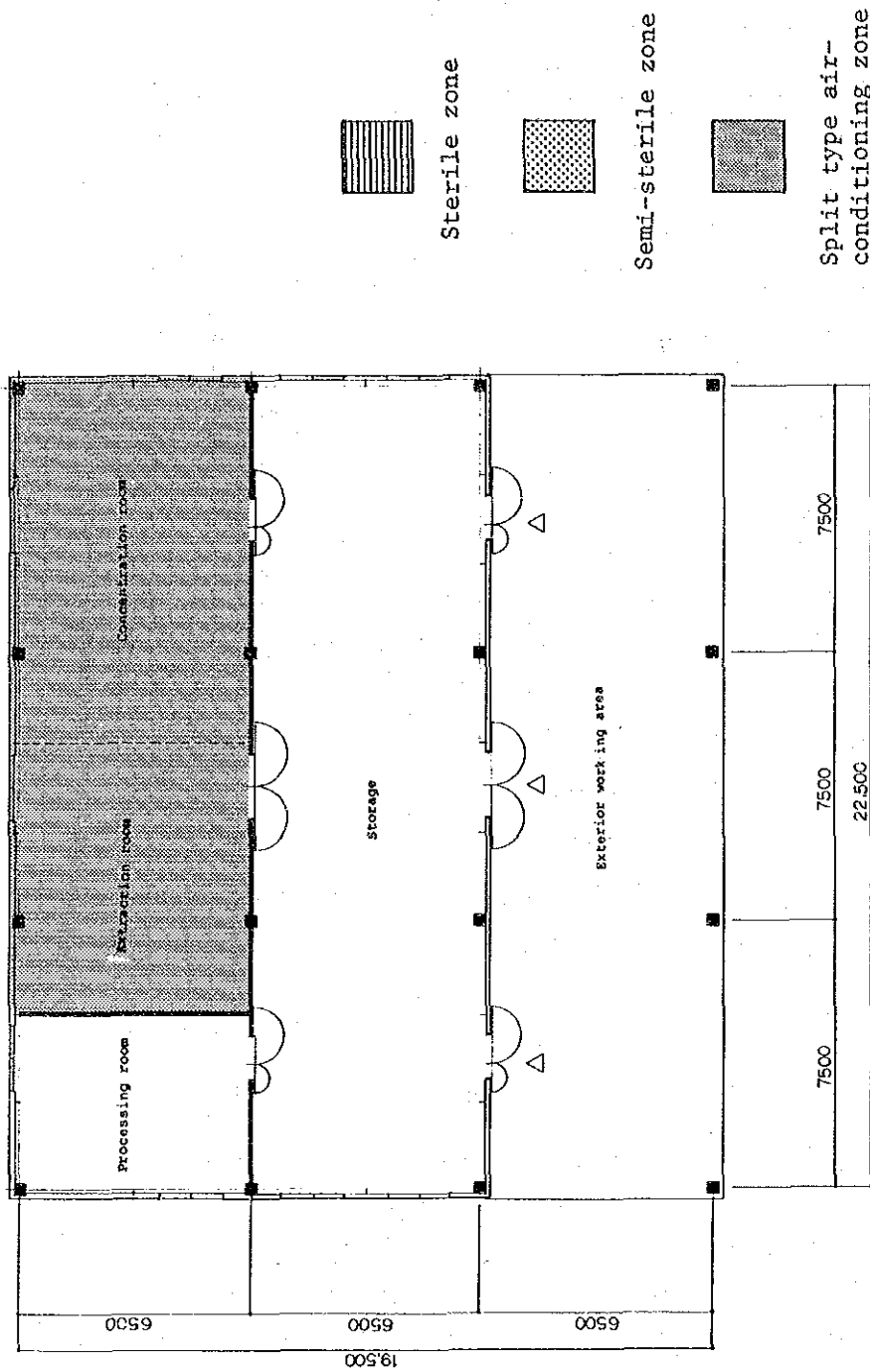


FIG. 7 AIR CONDITIONING ZONING PLAN



CRUDE DRUG BUILDING

FIG. 8 AIR CONDITIONING ZONING PLAN

(vi) Electric power supply system

a) Power receiving equipment

A 22KV supply will come from the Electric Company to the northeast of the site and will be received by a substation installed on the site. The electric power distribution plan is illustrated in Fig. 9.

Received voltage	3 ϕ , 3W, 22KV, 50 Hz
Distributed voltage	3 ϕ , 3W, 400V, 50 Hz
		3 ϕ , 4W, 400/230V, 50 Hz

Power factor improvement equipment and watt-hour meters are also to be installed.

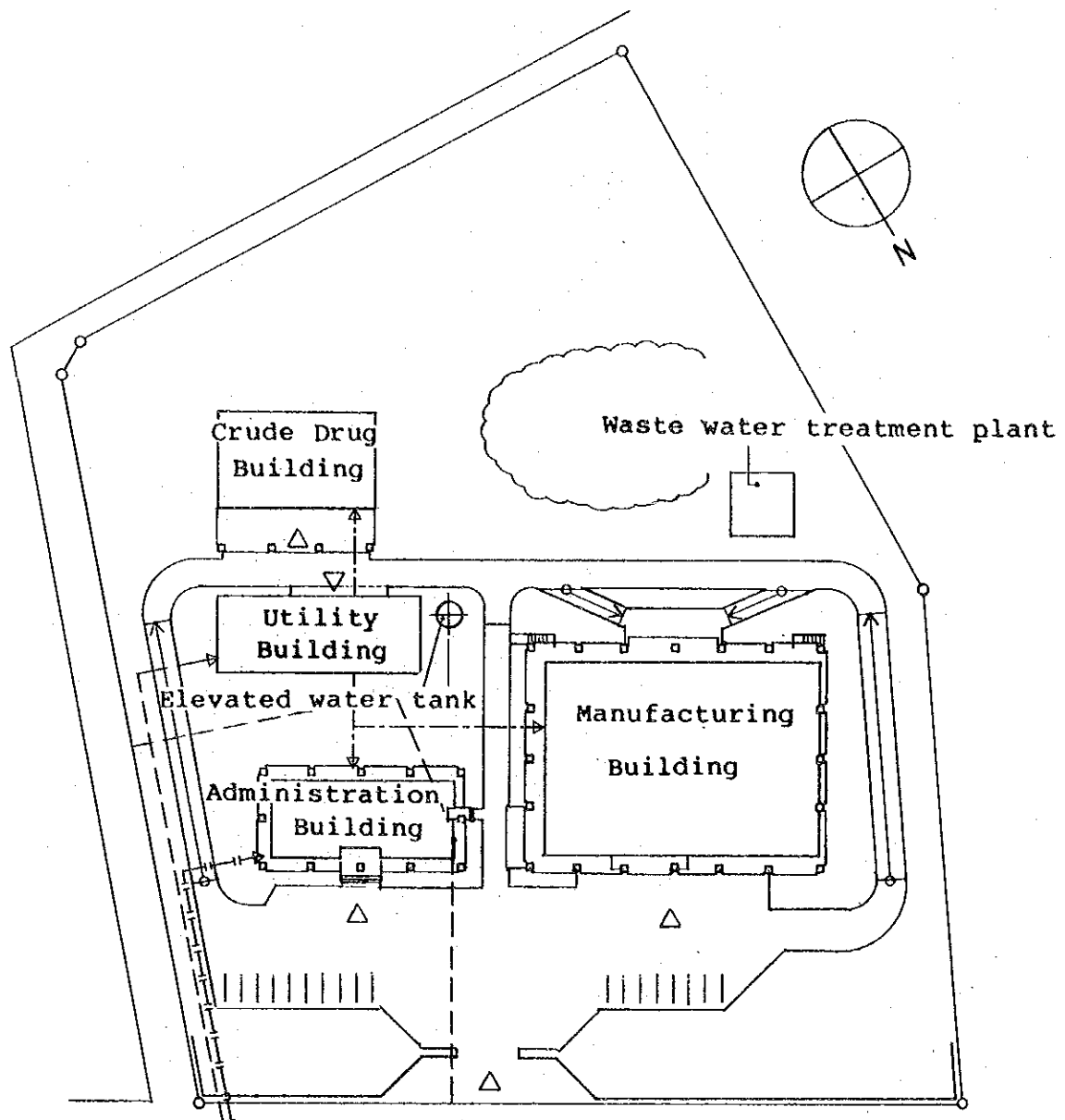
b) Power generation equipment

An emergency generator is to be installed to supply power to the production facilities during power failures as follows

1. Primary power supply for the mixing machines and sterile room air-conditioning.
2. Power supply for drying machines and thermostat units during power failures.
3. Power supply for emergency lighting.

c) Main power distribution system

Power is to be supplied from the distribution board in the electric room to the distribution boards for lighting and distribution boards for equipment installed in the various buildings. The main power distribution circuits are illustrated in Fig. 10. The specifications are as follows



Site Layout - - - - High Voltage Trunk
 - - - - Power Supply Line
 - - - - Telephone Trunk

FIG. 9 ELECTRIC POWER SUPPLY AND TELEPHONE SERVICE RECEIVING SYSTEM

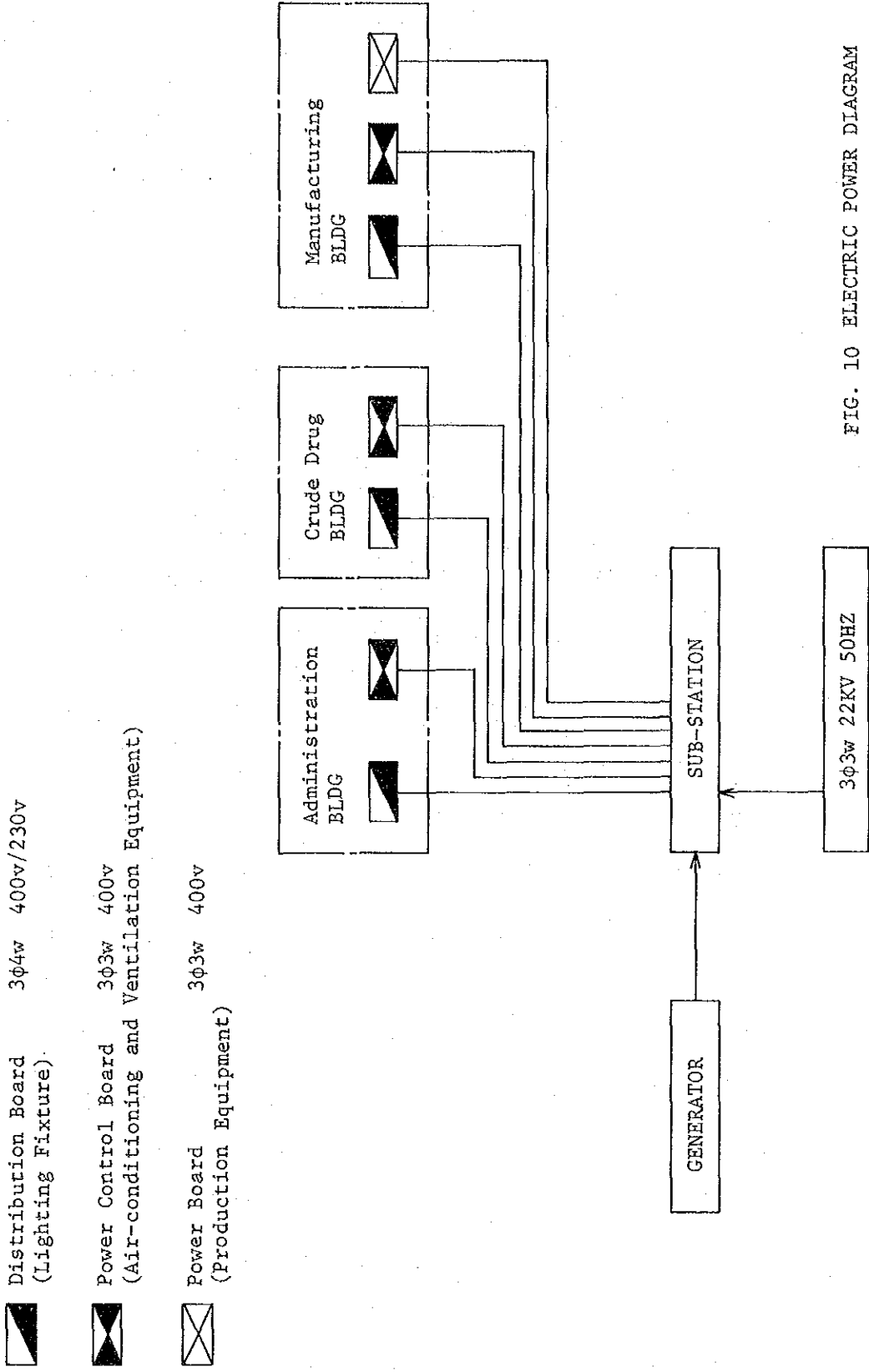


FIG. 10 ELECTRIC POWER DIAGRAM

1) Distribution boards for lighting

3 ϕ , 4W, 400/230V, 50 Hz

1 ϕ , 2W, 100V, 50 Hz

2) Distribution boards for equipment

3 ϕ , 3W, 400V, 50 Hz

d) Power supply system for equipment

Power distribution boards are to be installed in each building to supply power to the water supply, air-conditioning and ventilation equipment, and to the production facilities. These boards are to be connected to the respective equipment with conduits and cables. The electrical systems are as follows:

1) For water supply, air-conditioning and ventilation:

3 ϕ , 3W, 400V, 50 Hz

2) For production facilities:

3 ϕ , 3W, 400V, 50 Hz

e) Lighting fixtures and receptacles

The necessary lighting fixtures and receptacles are to be installed in each building. The main source of lighting is fluorescent bulbs, with incandescent bulbs in some areas. The electrical system for both the lighting fixtures and receptacles is: 1 ϕ , 2W, 230V, 50 Hz. The specification for lighting are as follows.

Manufacturing building

Drug production areas: 300 - 700 Lx

Non-production areas: 200 - 300 Lx

Crude drug building

Drug production areas: 300 - 700 Lx

Storages:	200 Lx
Administration building	
Offices, general areas:	300 - 500 Lx
Laboratories:	500 - 700 Lx

f) Telephone system

The telephone system is to be taken off the aerial telephone lines (on which the number of circuits is due to be increased) on the Electric Company's poles on the northeast of the site. In the offices, a main telephone terminal box is installed with a telephone exchange unit.

Telephone terminal boxes are to be installed in each building for connection to the main telephone terminal box, and conduits and cables connect these with the telephone outlet boxes installed in necessary locations. Also in important locations, 48 V common-battery telephone receivers are installed.

g) Fire Alarm Equipment

Alarm bells and alarm buttons are to be installed in all the principal locations in each building. An automatic fire alarm system is to be installed only in the Manufacturing Building.

3.4.3 Production equipment and quality control instruments

(1) Crude drug zone

The equipment in this zone will be for production of raw materials for preparation by drying and grinding, extraction, refining and drying.

(2) Infusion zone

Sterile infusion prepared in this zone will be at most to amount of the yearly 150,000 liters of four items specified in the request. The equipment consists of a standard set of equipment for filling 500 and 1,000 ml bottles and for their sterilization, as well as the production facilities for distillation of water which is used jointly with the ampoule zone.

(3) Ampoule zone

The facilities consist of a standard integrated production system for washing, drying and sterilizing of the ampoules and filling, sealing, sterilization, printing, sorting and packaging of infusions, for the production of injection at most for the requested production of three million ampoules for most of the seven items requested.

(4) Tablet zone

These facilities are to be capable of producing the requested yearly output of 100 million tablets for most of the 15 items requested. The facilities consist of standard integrated equipment for weighing of raw materials, mixing, granulating, drying, fine granulating, tableting, drying, sorting and packaging.

(5) Quality control zone

This independent zone is to carry out appropriate quality evaluations of the raw materials used in the production processes and of the products resulting from those processes and is equipped with instruments for physical, chemical and microbiological testing related to raw material and product

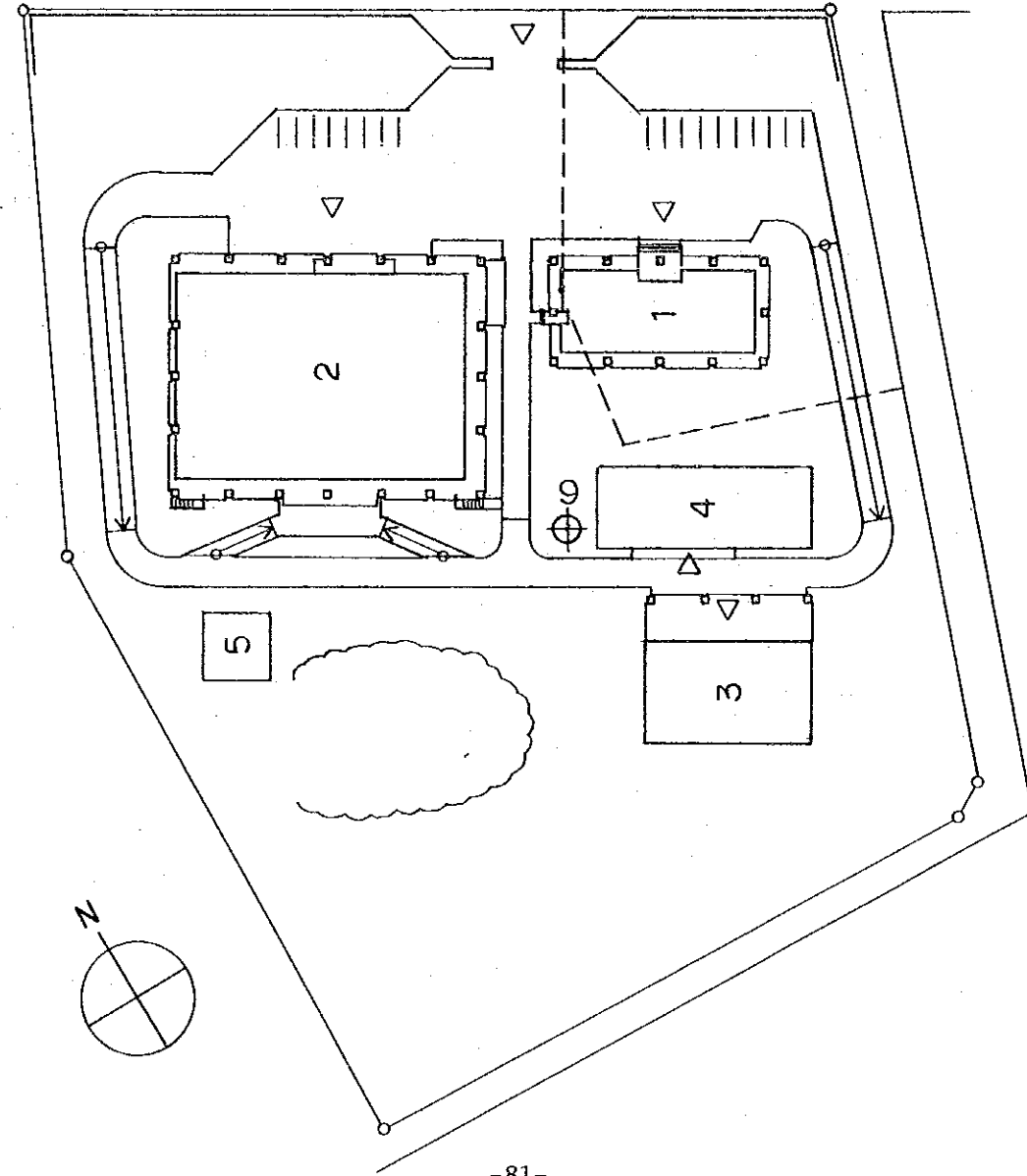
quality controls.

(6) Infrastructural equipment

This equipment produces the basic deionized water as the raw water for distillation for injection and produces as the raw water for distillation for tablets. This equipment also produces ultra-filtered water for tablet production.

3.4.4 Basic design drawings

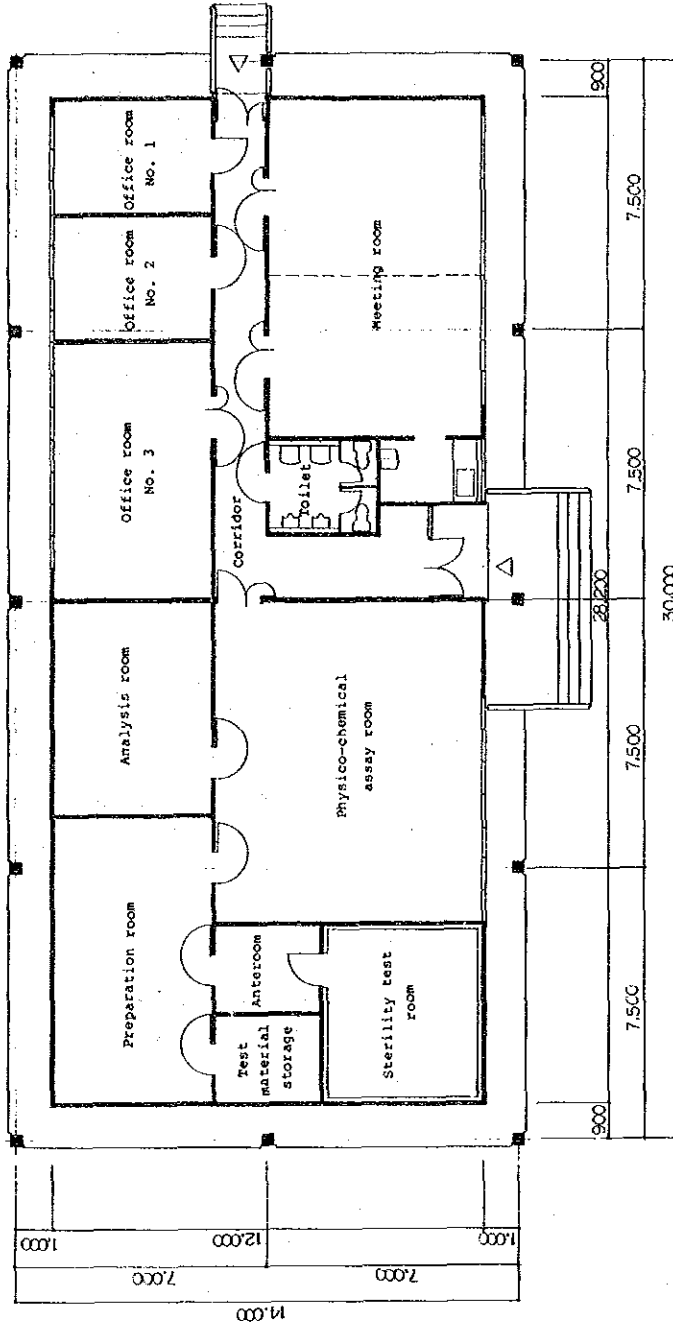
1. Site Layout
2. Administration Building, Plan
3. Administration Building, Elevations and Sections
4. Manufacturing Building, Elevations and Sections
5. Crude Drug Building, Plan
6. Crude Drug Building, Elevations and Sections
7. Utility Building, Plan
8. Utility Building, Elevations and Sections



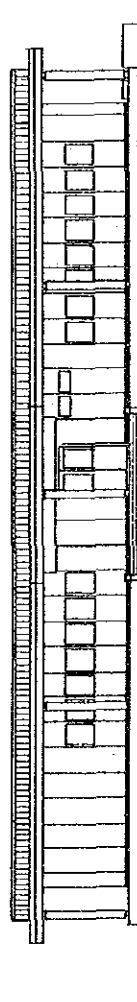
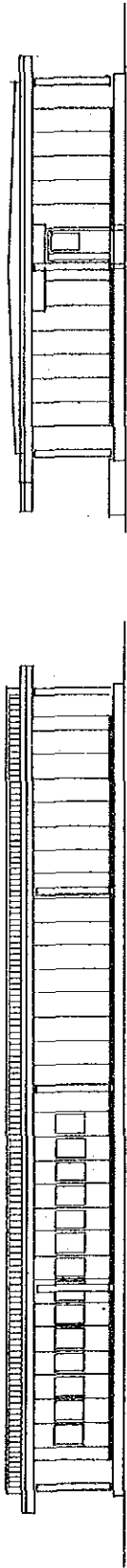
1. Administration Building	338 m ²
2. Manufacturing Building	1198 m ²
3. Crude Drug Building	294 m ²
4. Utility Building	300 m ²
5. Waste water treatment plant	
6. Elevated water tank	2130 m ²

SITE LAYOUT S 1:1000

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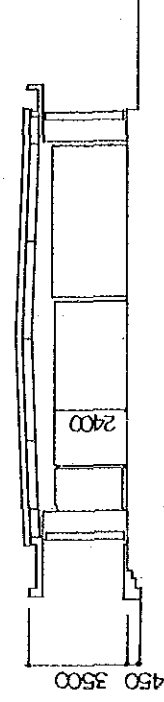


ADMINISTRATION BUILDING PLAN S 1:200



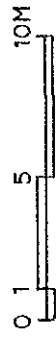
ELEVATION

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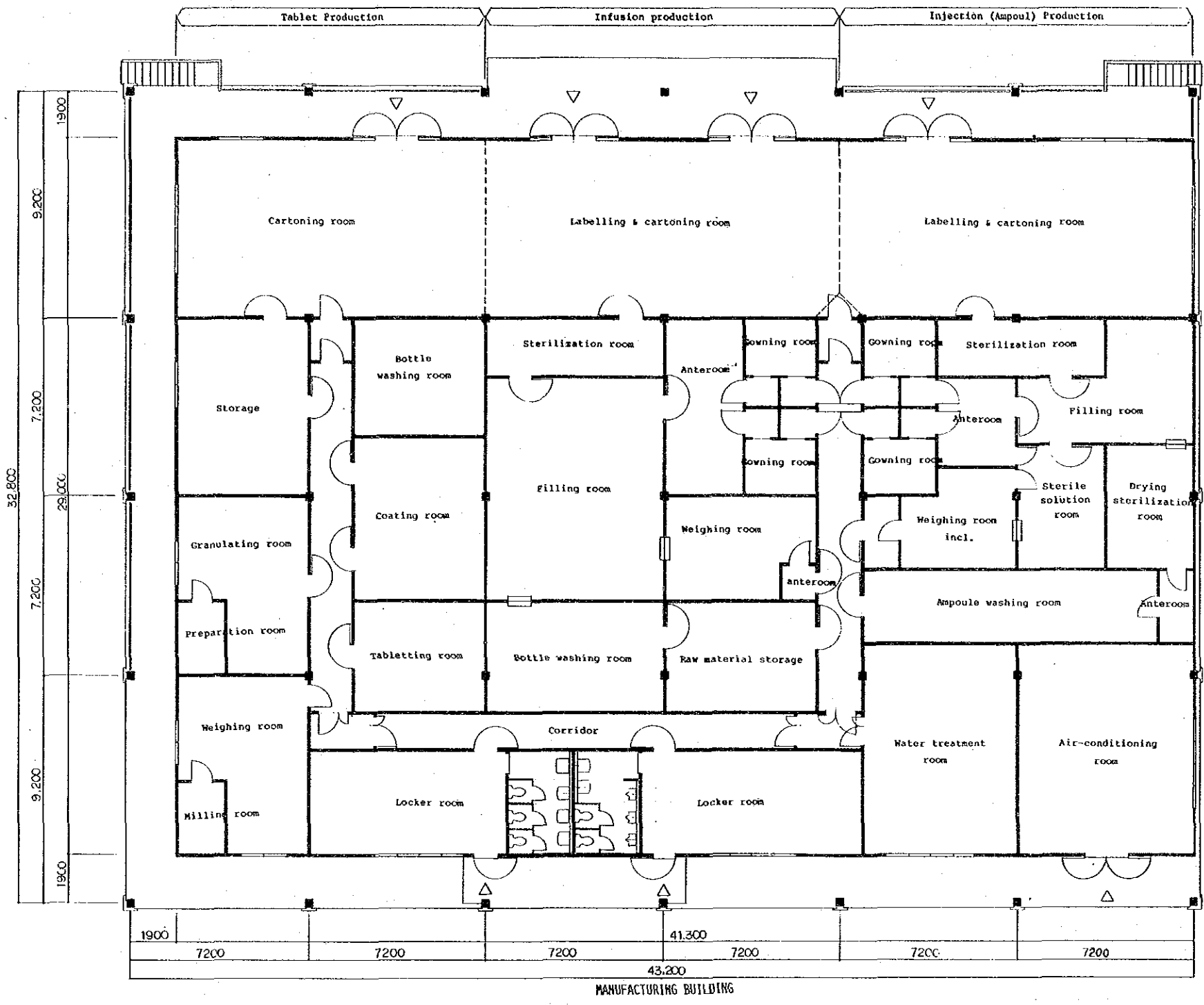


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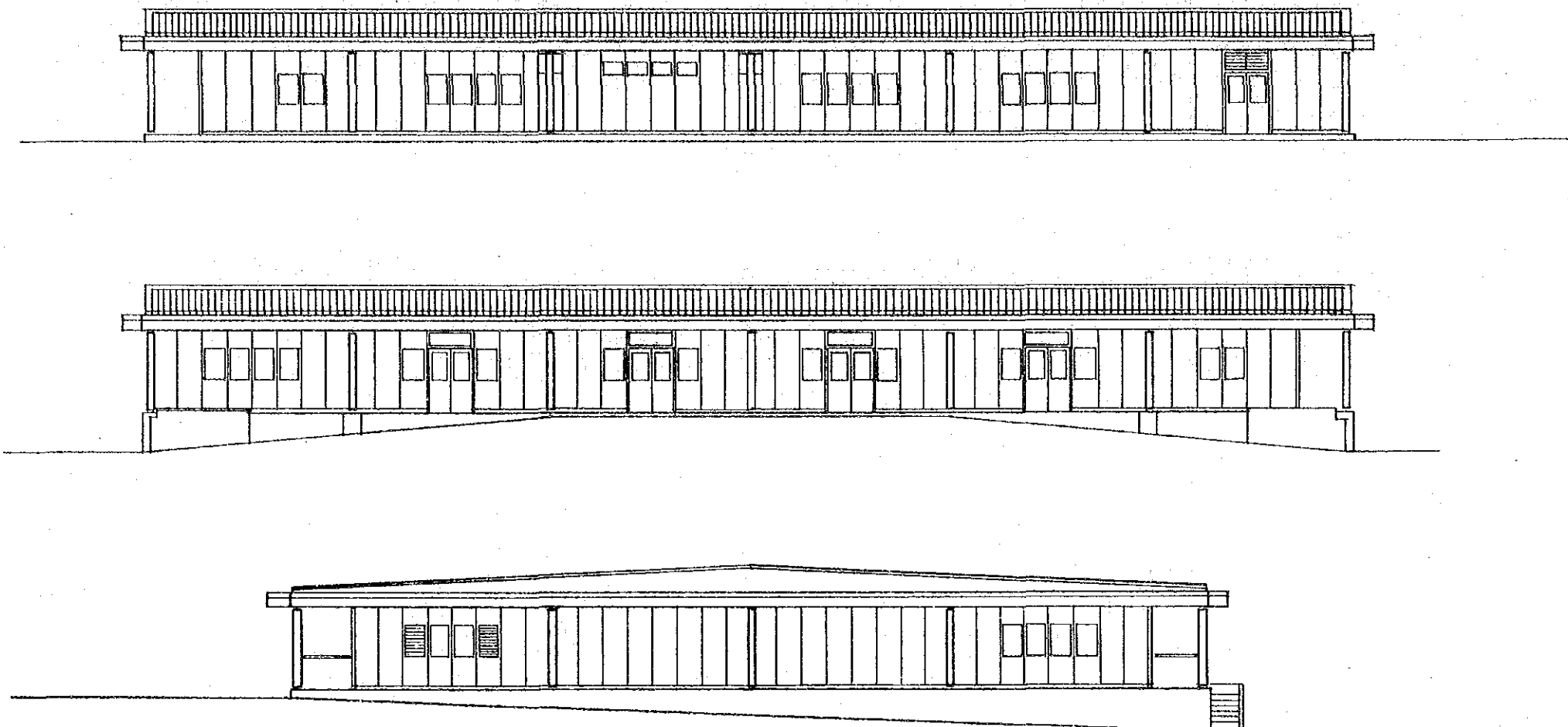
SECTION



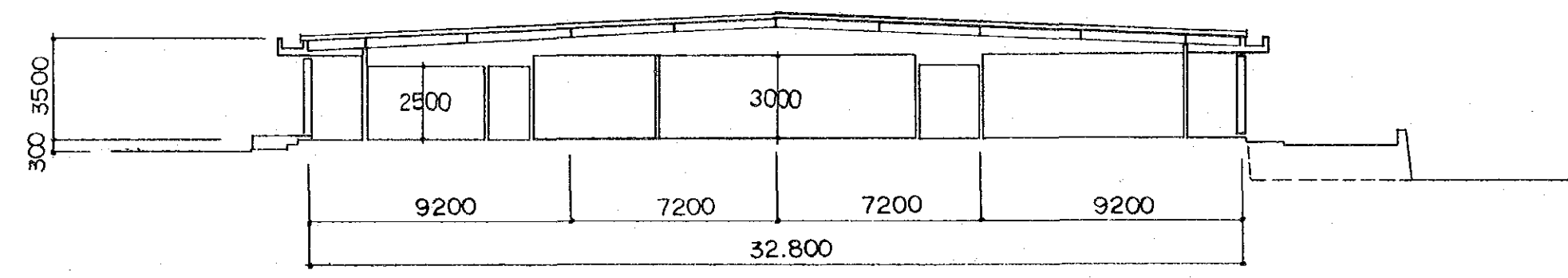
ADMINISTRATION BUILDING



MANUFACTURING BUILDING PLAN S 1:200

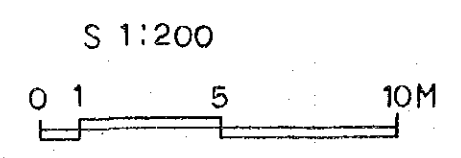


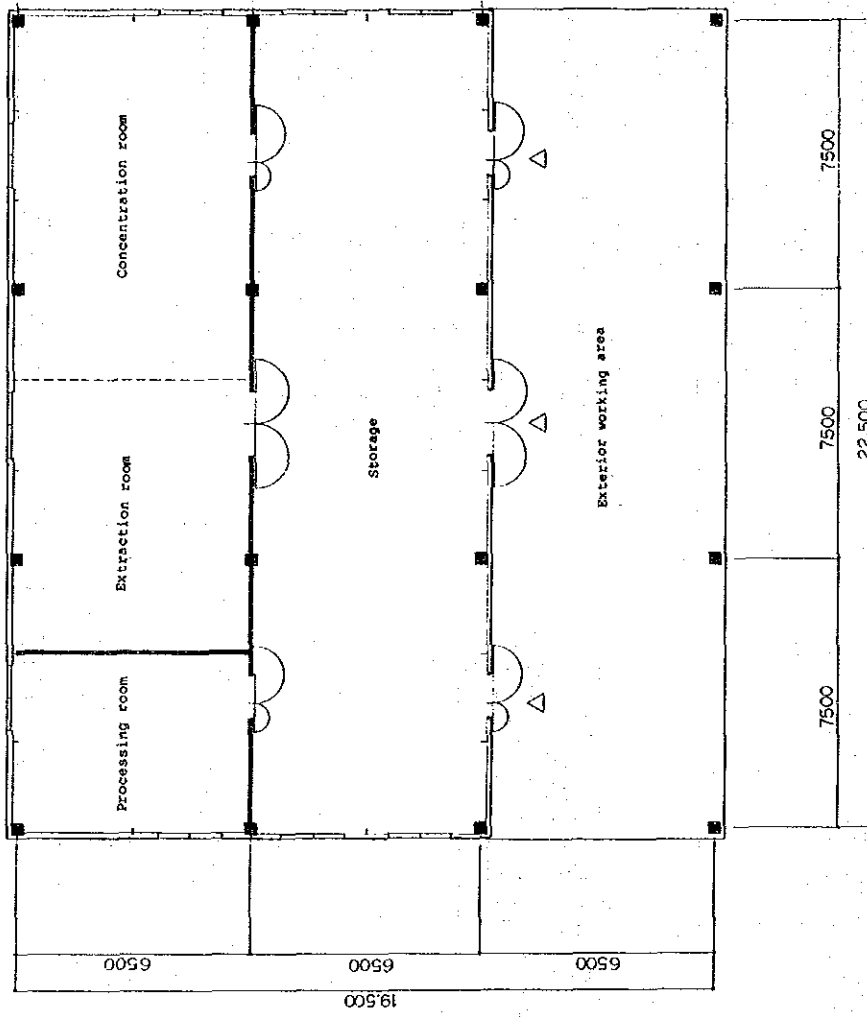
ELEVATION



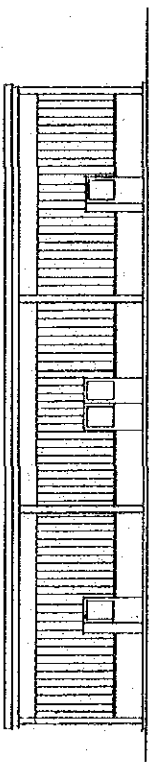
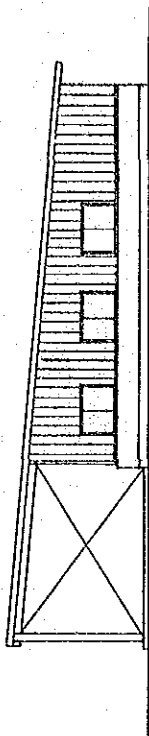
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MANUFACTURING BUILDING

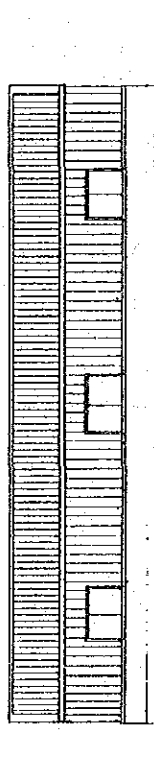
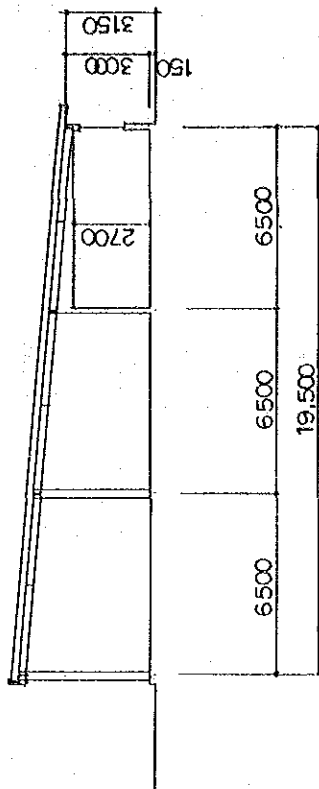




CRUDE DRUG BUILDING PLAN S 1:200



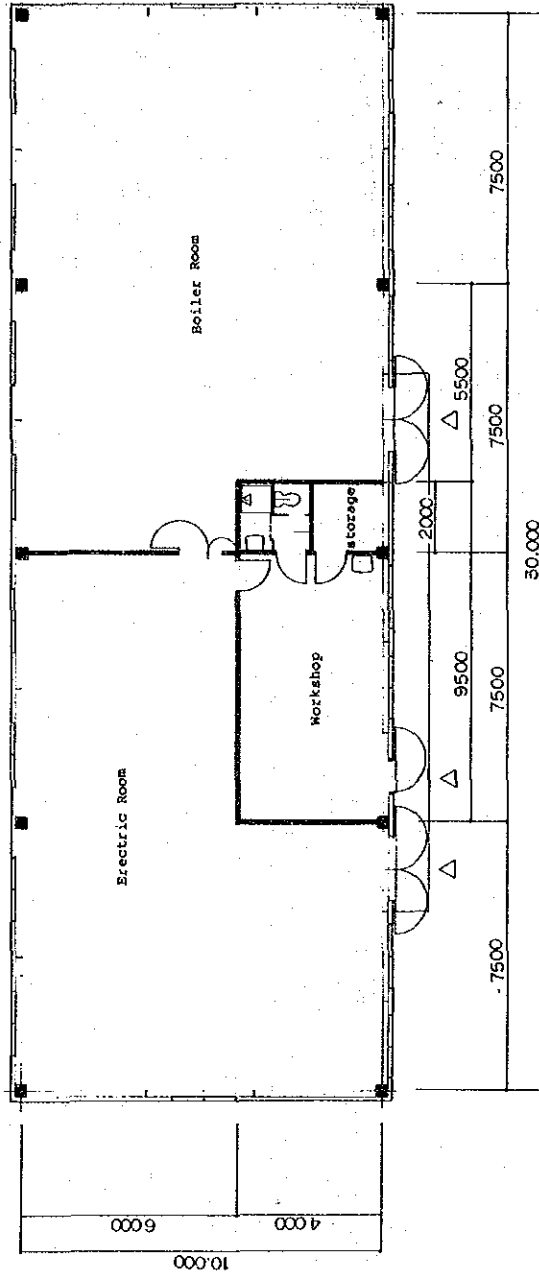
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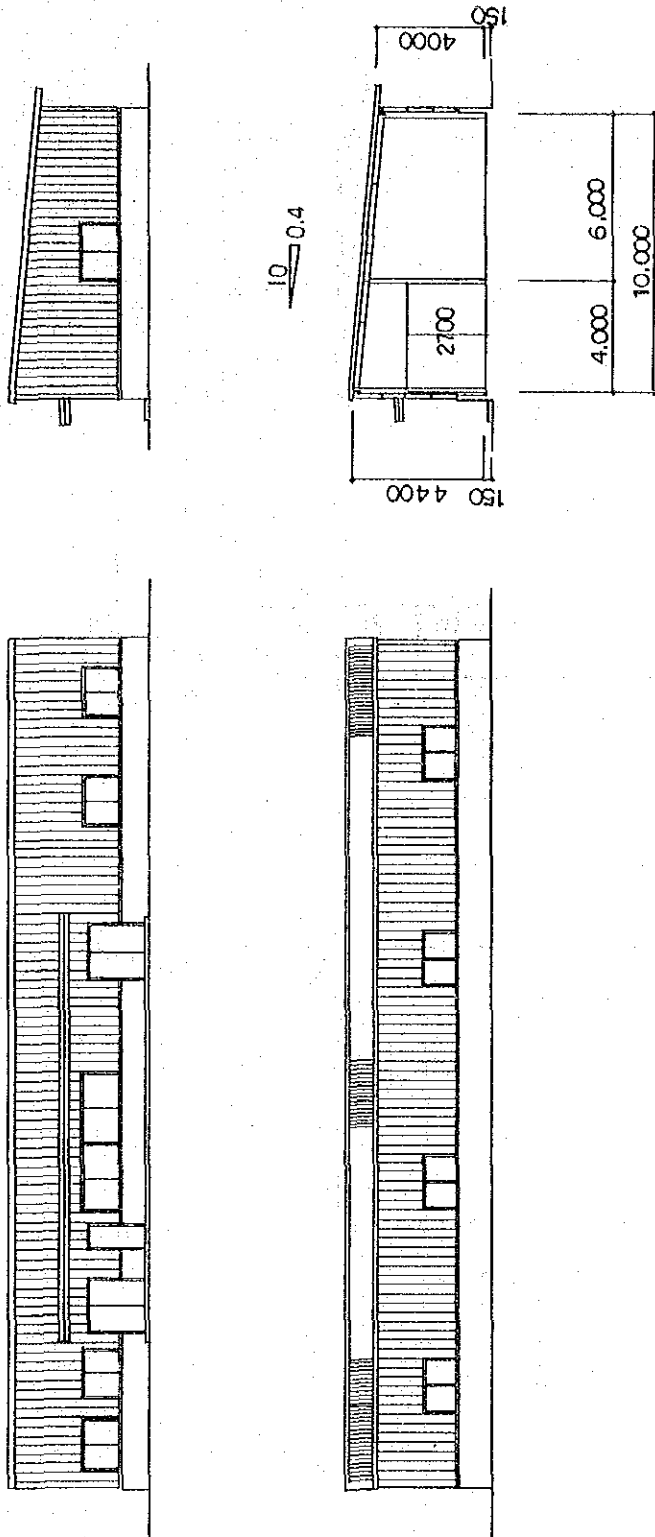
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CRUDE DRUG BUILDING

7



UTILITY BUILDING PLAN S 1:200



3.4.5 List for production equipment and quality control instruments

(1) Crude drug production equipment

Raw material handling devices	1 set
Chopper/pulverizer	1
Extractor	1
Distillation unit	1
Condensing unit	1
Centrifugal separator	1
Intermediate tank	1
Drying unit	1
Instruments and apparatus for testing and controls	1

(2) Infusion production equipment

Distilled water system	1
Preparation equipment and tank	4
Washing machine	1
Drying and sterilizing oven	3
Rubber stopper washing, sterilizing and drying machine	1
Filling and sealing machine	2
Autoclave	2
Inspection apparatus (for liquid)	1
Inspection apparatus (for finished products)	1
Balance	3
Cap sealere	1
Pressure tank	1
Prefilter for liquid	2
Final-filter for liquid	4
Instruments and apparatus for testing and controls	1

(3) Ampoule production equipment

Ampoule washing machine	1 set
Ampoule drying oven	1
Filtration device	2
Dissolution tank	3
Apparatus drying oven	1
Filling and sealing machine	1
Inspection apparatus (for process control)	1
Inspection apparatus (for ampoules)	1
Printing machine	1
Autoclave	1
Instruments and apparatus for testing and controls	1

(4) Tablet production equipment

Atomizer	1
Pony-Mixer (granulator)	1
Power mill	2
Tableting machine	1
Dedusting device	1
Fluid-bed dryer	1
Sieving machine	1
Coating and polishing machine	1
Electric drying oven	1
Preparation tank	1
Balance	2
Instruments and apparatus for testing and controls	1

(5) Quality control instruments

Potentiometric titration apparatus	1
Paper chromatograph	1
Thin layer chromatograph	1
Gas chromatograph	1

Spectrophotometer	1 set
Melting point measuring device	1
Moisture titration device	1
Hardness tester	1
Disintegrator	1
Refracto meter	1
Visco meter	1
Densi meter	1
Polarimeter	1
pH-meter	1
Analytical balance	1
Microscope (Binocular)	1
Centrifugal separator	1
Thermostat	1
Rotary evaporator	1
Water bath	1
Standard sieves	1
Refrigerator / Freezer	1
Ultra-sonic washing machine	1
Clean bench	1
Autoclave	1
Incubator	2
Draft chamber	1
Universal shaker	1
Vacuum pump	1
Drying oven	1
Mantle heater	1
Mufflfurnace	1
Glass utensil	1

(6) Equipment for common use

Purified water and ultrafiltration Facilities	1
Instrument and apparatus for quality control	1

3.5 Outline of Costs

3.5.1 Conditions of Estimation

Laos is proceeding with the establishment of a socialist economic structure, for this purpose, construction projects within the country are to use the Public Construction Company which is under the direct jurisdiction of the Ministry of Construction. This Public Construction Company is also to be used as the sub-contractor for the project.

The costs for the principal materials and labor when the Public Construction Company is used are listed in Appendix 9. For these purposes, the official exchange rate of the local currency (Kip) to the U.S. dollar was used, that is U.S.\$1 = 35 kip.

3.5.2 Scope of Work

- (1) Items whose cost should be borne by the Government of Japan
 - i) Structure, finishes and utilities for the Administration Building, Manufacturing Building, Crude Drug Building and Utility Building.
 - ii) Production equipment and quality control instruments.
 - iii) Utility connections from the Utility Building to the Administration Building, Manufacturing Building and Crude Drug Building.
 - iv) Waste water treatment facilities
 - v) Incinerator
 - vi) Septic tank
 - vii) In-site road and parking lot

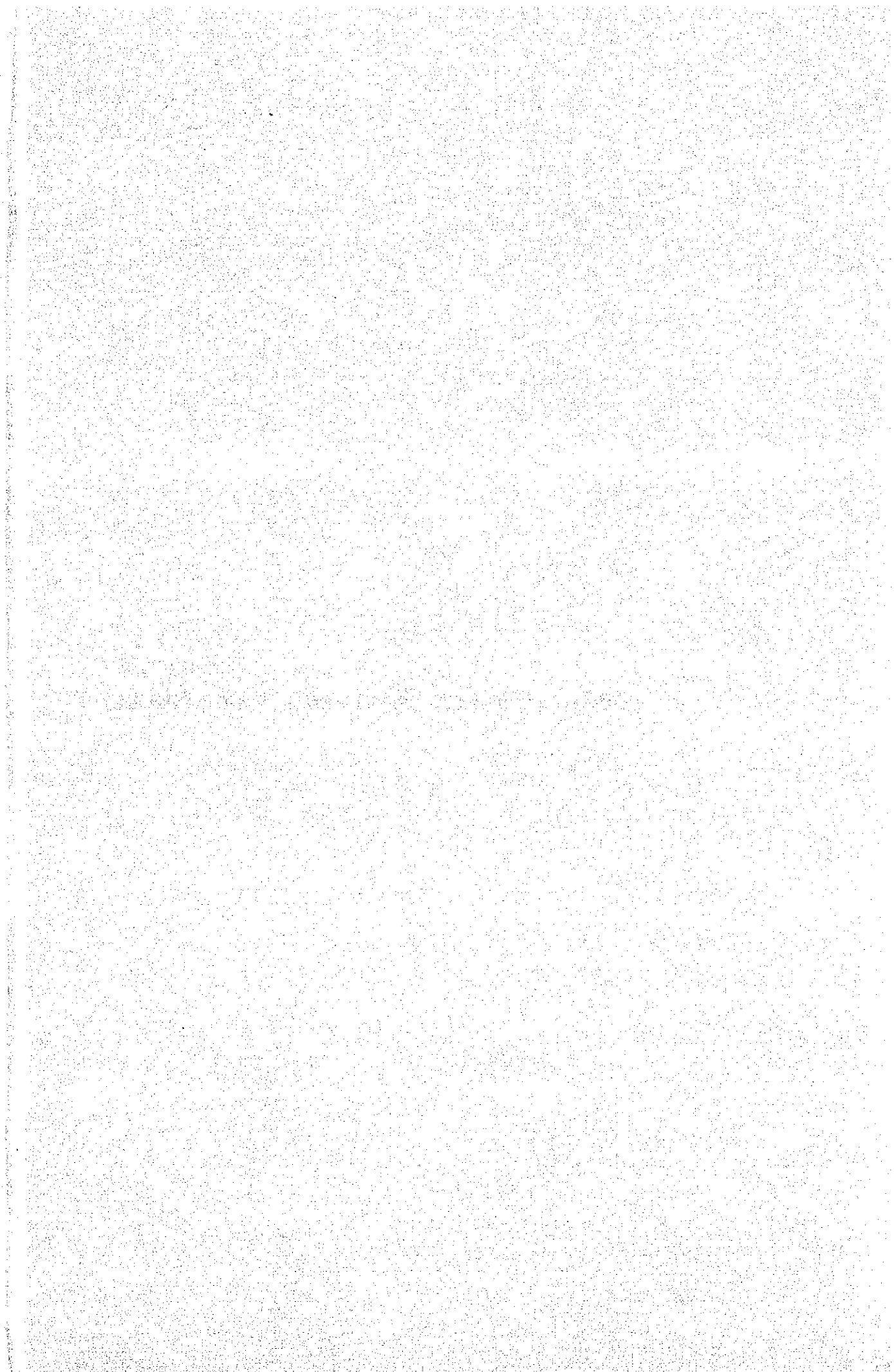
(2) Items whose cost should be borne by the Government of Laos

- i) Site preparation works including removal of trees, and levelling of land, etc.
- ii) Gate and fence
- iii) Landscaping
- iv) Supply of electric power and water, and telephone line to the site
- v) Furniture, curtains, carpets and the like

3.5.3 Estimated Cost Borne by the Government of Laos

i) Site preparation work	20,000,000 yen
ii) Gate-fence work	13,000,000 yen
iii) Landscaping	5,200,000 yen
iv) Electric power supply, water supply and telephone works	2,500,000 yen
	<hr/>
Total	40,700,000 yen

CHAPTER 4
ORGANIZATION FOR IMPLEMENTATION OF PROJECT



CHAPTER 4 : ORGANIZATION FOR IMPLEMENTATION OF THE PROJECT

4.1 Principal Undertakings

4.1.1 Operating organization

The project for the Pharmaceutical Development Center in Laos is to be executed under the auspices of the Ministry of Public Health as a main element of the First Five Year Plan for Economic and Social Development.

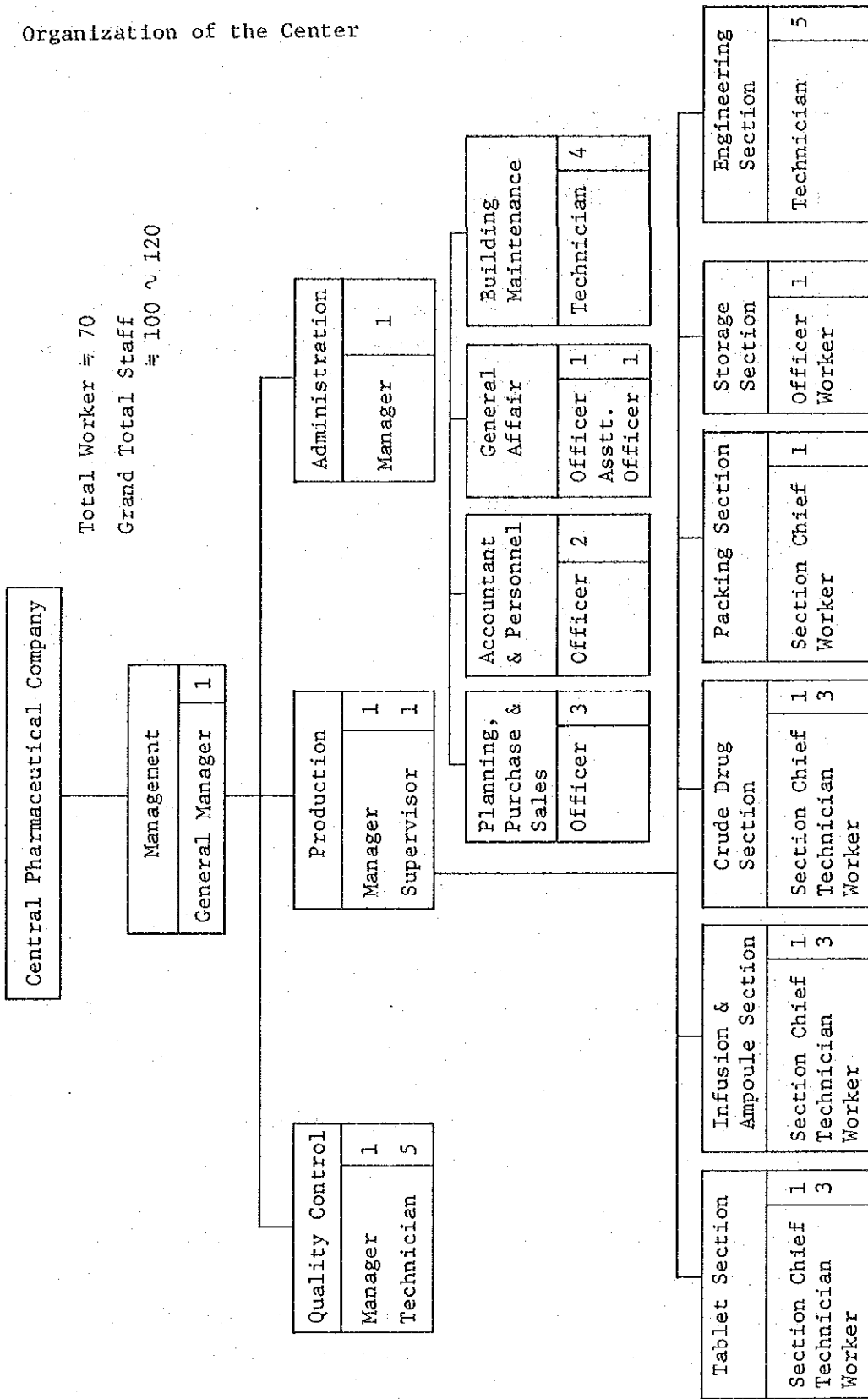
The execution of the construction project for the new center, as well as its operation upon completion, is to be the responsibility of the Central Pharmaceutical Company, the drug manufacturing and distribution agency which is under the direct jurisdiction of the Ministry of Public Health. The Pharmaceutical Development Center is to be a section in the Central Pharmaceutical Company and the following organization is to be established to perform the running of the new center.

4.1.2 Plan for training and placement of necessary personnel

The management personnel for the new center are to be dispatched from the Ministry of Public Health. Some of the necessary drug production technicians and skilled workers are to be transferred to the new center from the existing No.2 pharmaceutical factory. The remaining technicians necessary for the center are to be obtained from personnel currently studying abroad as well as from those students due to graduate from the pharmacology department of the Vientiane Medical College in 1986.

It is also desirable, however, that new technicians employed from the outside and new graduates from the pharmacology department be given on-the-job training at the existing No.2 factory prior to the start of operation of the new center.

Organization of the Center



4.2 Plan for Undertaking of Construction

The construction of the new center is to be undertaken by companies of Japanese nationality selected by tender from among several companies which have plentiful overseas construction experience and which have the capability to see this project through to its completion.

Local sub-contractors are to be limited to the Construction Company attached to the Construction Ministry of Laos in accordance with government policy.

Some obstacles are encountered in Laos to overland transportation of goods and earthworks during the rainy season from May to October due to the high concentration of rainfall. It is therefore necessary that on-site works, particularly earthworks, be performed during the dry season as far as possible.

Adequate arrangements should also be made in advance to deal with the fact that aggregate (gravel and sand) can only be collected during the dry season in Laos.

Because of the local conditions of materials procurement, most of the major components are to be prefabricated in Japan and assembled on site. Considering the technical proficiency of local labor in such site work (erection) and that workers in Laos have little experience of the prefabricated construction methods to be used, skilled supervisors of foreman class will need to be dispatched from Japan.

4.3 Scope of Construction

The division between the works to be undertaken by the Japanese side and those to be undertaken by the Laotian side is indicated in 3.5.2.

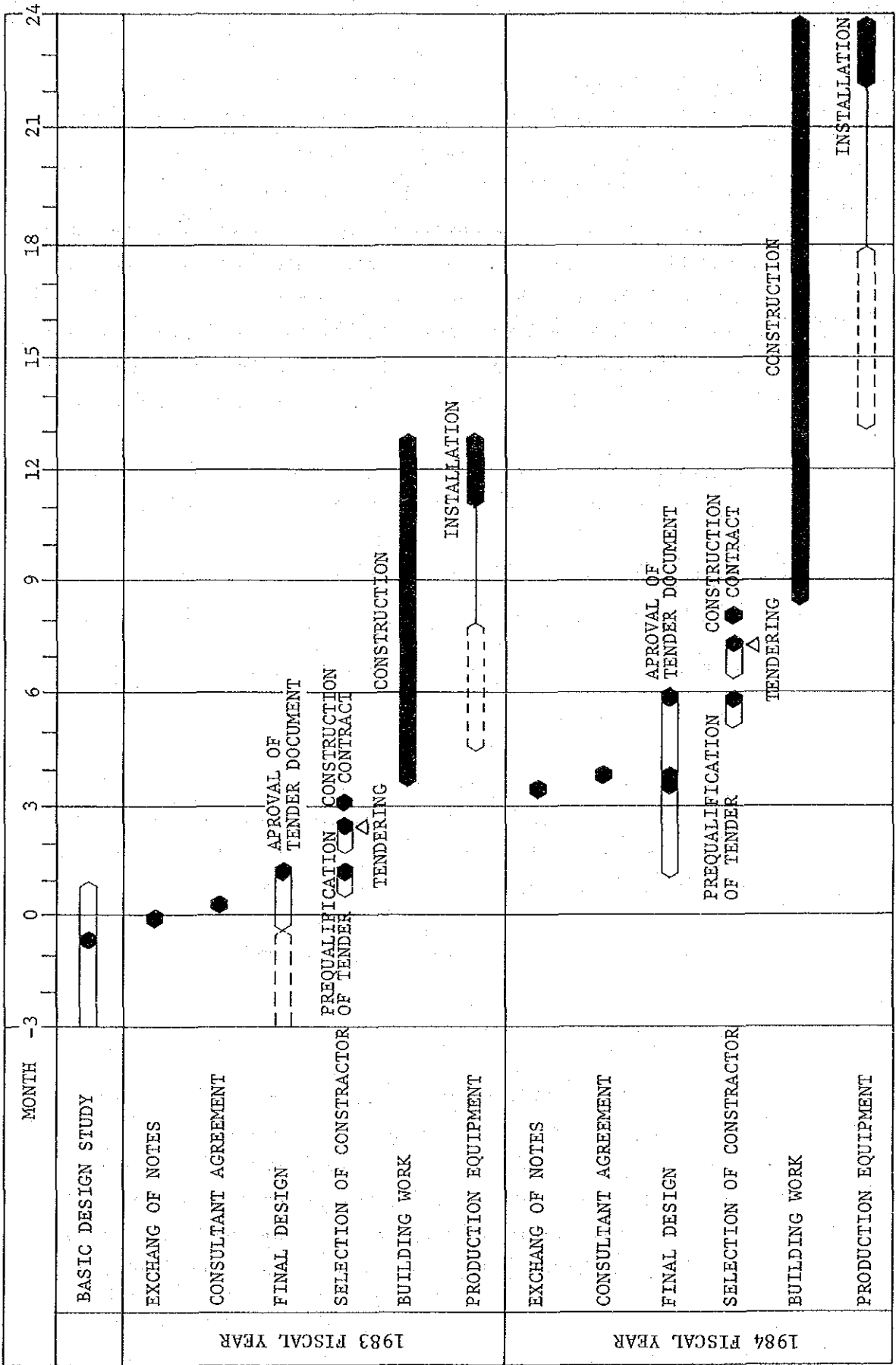
In regard to the work responsible by the Laotian side, site preparation (site levelling etc.) and gate-fence works should be performed before the start of any construction works by the Japanese side, works for the laying of power, water and telephone supply lines should be performed before the start of site work, and landscaping should be carried out after the completion of the construction works by the Japanese side but before the start of use of the center.

4.4 Work Schedule

The Administration Building, Crude Drug Building, Utility Building and the related facilities are to be constructed in the fiscal year of 1983. While the Manufacturing Building and the related facilities are to be constructed in the fiscal year of 1984.

The details of the work schedule for the construction of the new center are illustrated in the following chart.

WORK SCHEDULE THE PHARMACEUTICAL DEVELOPMENT CENTER IN LAO PEOPLE'S DEMOCRATIC REPUBLIC



4.5 Operation and Management Plan

4.5.1 Operation and management plan

A stable supply of raw materials is the primary indispensable condition for ensuring that the new center operates smoothly and to obtain a stable supply of high-quality drugs. Of equal importance is the normal operation of the building facilities, their proper maintenance, running and inspection, and the periodic maintenance and inspection of the production equipment.

The following specialist technicians are necessary to perform routine operating checks of the facilities and equipment:

Electrical equipment control technicians:	2
Mechanical equipment control technicians:	2
Drug production equipment control technician:	1
Total	5

Furthermore, periodic inspections and repair of the buildings and equipment by a facilities management specialist from the Central Pharmaceutical Company are essential in order that they can be in good condition for long-term use.

4.5.2 Estimation of Cost for Operation and Management

(1) Personnel expenses

The total personnel for the operation of this center are the sum of the number of personnel described in 4.1.2 and 4.5.1. In regard to the personnel expenses for this center, the pay-system for the national personnel (All the personnel for this center are national personnel) is a complicated one including not only cash wages but also

wages in kind. The study team was not able to obtain a clear basis for estimation during this on-site survey. For these reasons, it is difficult to make an estimation for the personnel expenses for the new center.

(2) Operation and maintenance

The expenses for electric power (almost all of the energy source is electric power) and water which comprise a large part of the operation and maintenance expenses are shown below.

Operation and maintenance expenses per year

a) Electric power

The electric power for production equipment has not been decided yet.

Lighting	60KW x 8 hours x 250 days = 120,000 KWH
Air-conditioning	275KW x 8 hours x 250 days = 550,000 KWH
Water supply and boiler	1,190KW x 8 hours x 250 days = 2,380,000 KWH
	<hr/>
Total	3,050,000 KWH

$$3,050,000 \text{ KWH} \times 0.4 \text{ kip} = 1,220,000 \text{ kip}$$

$$1,220,000 \text{ kip} \times 240 \text{ yen/35 kip} = 8,365,714 \text{ yen}$$

b) Water supply

Residential water $4,75 \text{ m}^3 \times 8 \text{ hours} \times 250 \text{ days} =$
 $9,500 \text{ m}^3$

Water for air-conditioning $124 \text{ m}^3 \times 8 \text{ hours} \times 250 \text{ days} =$
 $7,440 \text{ m}^3$

Total $16,940 \text{ m}^3$

$16,940 \text{ m}^3 \times 3.5 \text{ kip} = 59,290 \text{ kip}$

$59,290 \text{ kip} \times 240 \text{ yen}/35 \text{ kip} = 406,559 \text{ yen}$

CHAPTER 5
EVALUATION OF PROJECT

CHAPTER 5 : EVALUATION OF PROJECT

The current project can be expected to produce the following significance and effects for Laos whose current fundamental goals are to establish the foundations for a socialist economy and to improve the standard of living of the country's citizens.

5.1 The Significance for Expansion of Domestic Pharmaceutical Production

The supply of drugs in Laos is in the unnatural state of relying to a major extent on aid provided by various foreign countries and on imports outside the government control. For this reason, the supply of essential drugs which have a low retail profit is left to chance. This fact constitutes an obstacle to improving the conditions of public health in Laos. The construction of this new center will not only increase the level of domestically produced drugs, which are small at present, but also, by heightening the proportion of domestic production, will reduce the current dependence on foreign aid and extra-regulatory imports which produces many cases when necessary drugs are unavailable. Furthermore, by switching from the import of finished drugs to the import of raw materials, a contribution will be made to improving the foreign exchange situation in Laos. These various effects and benefits are very great.

5.2 Effects and Benefits of Higher Quality of Drugs

The construction of the new center and its accompanying technical cooperation centered on quality control techniques will significantly improve the current situation of quality control for drugs in Laos whereby even the specified amounts of principal constituents are not often measured when produced. As a result of these improvements, the quality of drugs produced in Laos will be higher and it should be possible to produce drugs regulated according to

international GMP criteria.

5.3 Effects and Benefits for plans to Improve Public Health Care

A major component of the First Five Year Plan for Social and Economic Development established by the Government of Laos is the improvement of public health care, in particular activities against contagious diseases, improvements to basic health care services and improvements to regional hospitals. However, shortages of essential drugs which play a leading role in the cure of disease represent a large obstacle to the successful execution of these policies. The construction of the new center will lead to an improvement in the supply of drugs which, in turn, should make a large contribution to attaining the goals of the plans for health-care improvements described above.

5.4 Effects of the Use of Domestically Produced Resources

Although Laos is blessed with a plentiful natural environment, in many cases the daily necessities mainly rely on imports without utilizing domestic resources because of delayed social and economic development. The situation is the same in the area of drugs. Although there exist numerous traditional medicinal plants which have been used since old times, these are not used adequately because no systematic research is being undertaken. Construction of the new center will mean that raw materials are produced which can be used in research into the effective use of these medicinal plants, and in the manufacture of drugs.

On the other hand, in the area of chemical drugs, while Laos has its own plentiful supplies of relatively good quality water, items such as distillates for injections have depended on imports simply because production facilities have been inadequate. The construction of this center should also produce outstanding improvements in this area by expanding domestic production.

5.5 Effects and Benefits in Improving Distribution System for Domestically Produced Drugs

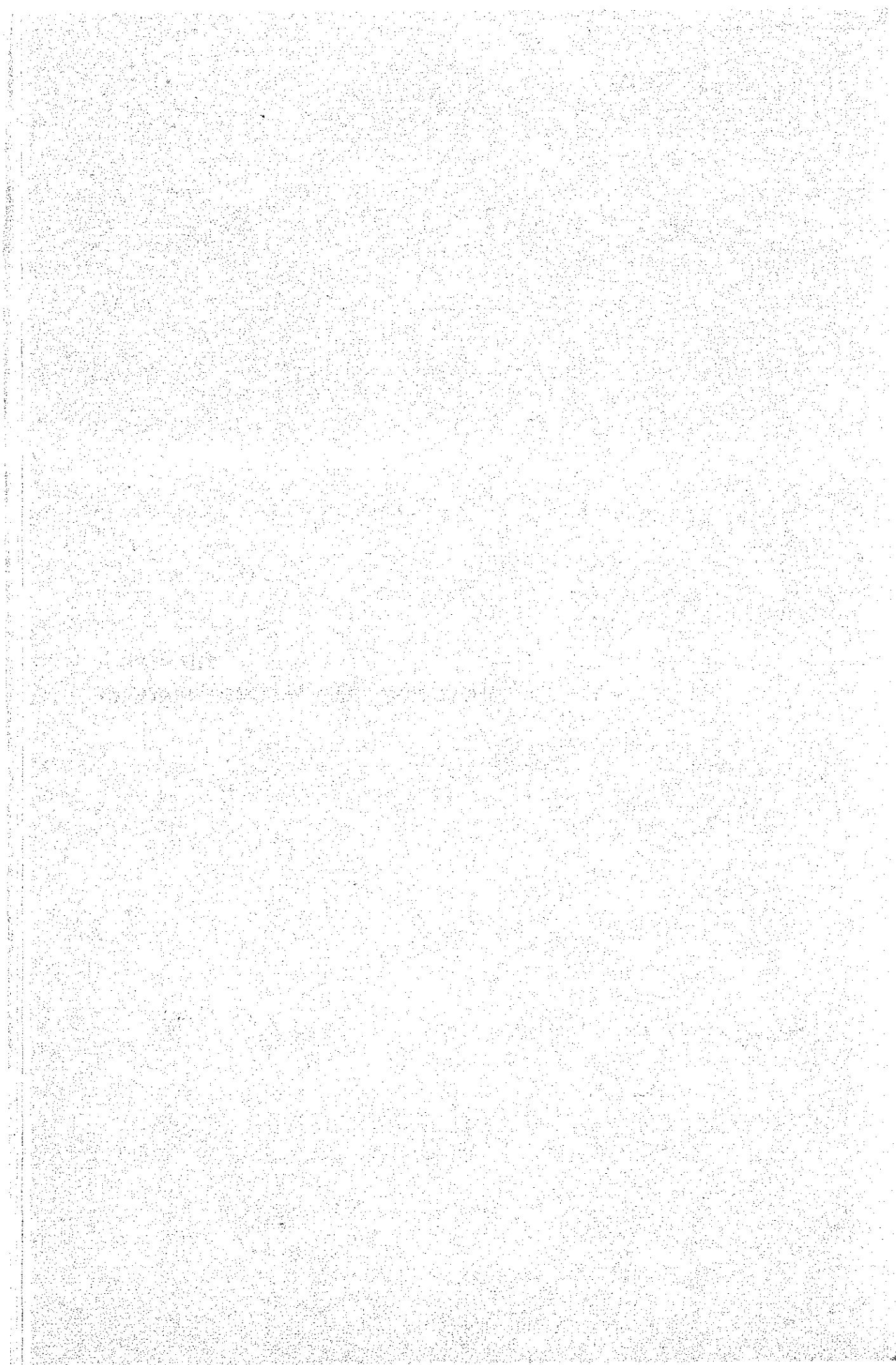
The government of Laos is making energetic efforts to improve the systems for production and distribution of drugs with the goal of smooth distribution and stable supply. While the construction of the new center will cause a direct improvement in the production facilities for drugs, it will also make a large contribution to improving the drug distribution system by such measures as labeling domestically produced drugs in the country's own language as a part of the distribution improvement activities.

5.6 Effect on Securing Trained Pharmacologists

While it has been said that there is a shortage of trained personnel, in fact, at present within Laos such persons trained in drugs and drug production as do exist have not had the opportunity to fully extend their capabilities. The new center will provide an opportunity for these persons to work, at the same time as offering a place where graduates from the newly established pharmacology department at Vientiane Medical College will be able to engage in new activities. The new center will become the national center of activities for persons trained in drugs and drug production and will have a impact on the training of new personnel.

As just described, the national significance of the construction of this Pharmaceuticals Development Center will be a large one with respect to establishing economic foundations within Laos and to raising the national standard of living. The full benefits of this project are incalculable. In consideration of these points, the project seems highly appropriate, timely and deeply meaningful, and the expectations of the Government of Laos towards the project are very great.

CHAPTER 6
CONCLUSIONS AND RECOMMENDATIONS



CHAPTER 6 : CONCLUSIONS AND RECOMMENDATIONS

The effects to be gained by execution of the project have been outlined in the previous chapter. The "Pharmaceutical Development Center" whose construction is proposed by this project is an indispensable element in the improvement of the environment in which the people of Laos live and in the maintenance of their health. Accordingly, it is judged to be most appropriate that the project should be carried out utilizing the grant-in-aid of the Government of Japan.

The first essential condition to the effective use of the Pharmaceutical Development Center and to its smooth operation after its construction is completed is a stable supply of raw materials. For Laos, where the supply of all raw materials depends on imports, the securing of a stable supply of imports requires that a sufficient plan necessary to their procurement be drafted. The next points necessary to the smooth operation of the center involve securing of technicians and skilled workers and the proper maintenance and management of the facilities.

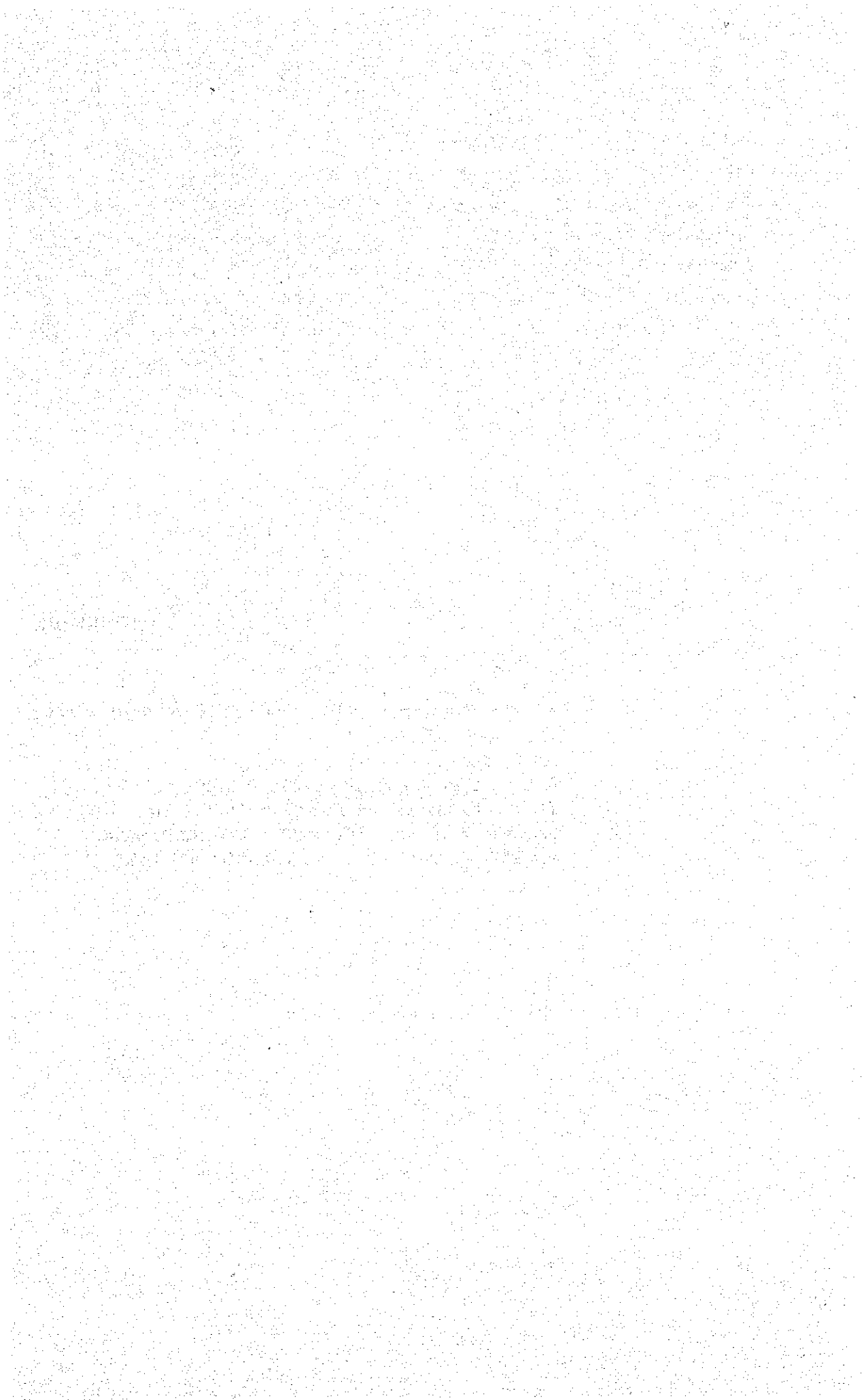
The Lao Government is already giving consideration to these points. Nonetheless, the Basic Design Study Team hopes that the Government of Laos will, hereby again, concentrate its full efforts on drafting a sufficient plan to establish a stable supply of raw materials, on obtaining the necessary personnel and on securing a budget sufficient for the maintenance and operation of the center.

It is also most desirable that new technicians and workers employed for the center be given training as early as possible at the existing No.2 pharmaceutical factory. Japanese technical cooperation is essential to the smooth operation of the new center, to the production of high-quality drugs and in the production of items not previously manufactured in Laos. The most desirable form for this cooperation is the long-term dispatch of specialists covering quality control and development of dispensation. When, for unavoidable reasons, such a system is not possible, specialists should be dispatched at least until the oper-

ation of the center is proceeding normally, and supervision should be made of processes for new items not formerly manufactured in Laos. At the same time, the proposed Lao staff for the new center should be sent to Japan for training before the start of operations of the new center. Recommendations shall be made to the Japanese Government so that the measures necessary for this technical cooperation can be executed as swiftly as possible.

APPENDIX

- 1. MINUTES OF DISCUSSION**
- 2. MEMBERS OF THE STUDY TEAM**
- 3. LIST OF OFFICIALS CONCERNED OF THE GOVERNMENT OF LAOS**
- 4. SCHEDULE OF SURVEY**
- 5. METEOROLOGICAL DATA**
- 6. ADMINISTRATION SCHEME OF THE CENTER**
- 7. ORGANIZATION OF MINISTRY OF PUBLIC HEALTH**
- 8. LIST OF REQUESTED ITEMS AND QUANTITIES OF DRUGS**
- 9. LIST OF COST FOR PRINCIPAL MATERIALS AND LABOR**



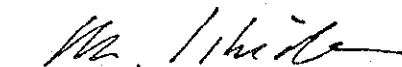
Minutes of Discussions
on
Basic Design Study
for
the Establishment Project
of
the Pharmaceutical Development Centre
in
Lao People's Democratic Republic

In response to the request made by the Government of the Lao People's Democratic Republic, the Government of Japan has sent, through the Japan International Cooperation Agency (JICA) which is an official Agency implementing the technical cooperation of the Government of Japan, a team headed by Mr. Minoru Ishida, Second Economic Cooperation Division, Economic Cooperation Bureau, Ministry of Foreign Affairs to conduct a basic design study on the Establishment Project of the Pharmaceutical Development Centre (the Project) for 20 days from 9th to 28th October 1983.

The team carried out field survey, had a series of discussions and exchanged views with the authorities concerned of the Government of the Lao People's Democratic Republic.

Both parties confirmed the result of the study attached herewith and have agreed to recommend to their respective Governments and the authorities concerned to examine the result of the survey toward the realization of the Project.

19th October 1983



Mr. Minoru Ishida
Leader, Japanese Study Team

Mr. PHETSANA CHOUMMAVONG
Director, Pharmaceutical
Factory N°2,
Ministry of Public Health

ATTACHEMENTS

1. The objective of the Project is to contribute to the improvement of medical care by the Government of the Laos through formulating and producing the essential drugs as well as implementing research and development activities of crude drugs utilizing indigenous raw materials.
2. The Laos side has requested the items which would be formulated in the Centre.
The items that will be formulated in the Centre are listed in Annex I.
The drugs will be supplied to public hospitals and other public health institutions especially at the basic level through the Central Pharmaceutical Company under the administration of the Ministry of Health.
3. The Laos side has assured the team that the Project will be operated, maintained and administrated effectively by the Ministry of Health.
The administration scheme of the Centre is shown in Annex II.
4. The proposed site of the Project is the land to be acquired by the Government of the Laos in Thadeua Road 8Km, Vientiane.
The Laos side has assured the team that the necessary steps for acquiring the land will be taken before the end of January 1984.
The proposed site is shown in Annex III.
5. Proposed organization set up for the Centre is shown in Annex IV.
6. The team emphasized that it is strongly expected for the Government of the Laos to assign relevant manpower and to guarantee sufficient activities for smooth implementation of the Project.
7. The Government of the Laos will take necessary measures on condition that the grant assistance by the Government of Japan is extended to the Project.
 - (1) to provide data and information necessary for design and construction,
 - (2) to secure land necessary for construction,
 - (3) to carry out site preparation such as clearing, filling and leveling before commencement of construction works.
 - (4) to provide other items listed in Annex V.
 - (5) to ensure prompt unloading, tax exemption, customs clearance at port(s) of disembarkation in Laos and prompt internal transportation therein of the products purchased under the grant.

- (6) to exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Laos with respect to the supply of the products and services under the verified contracts
- (7) to accord Japanese national whose service may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into Laos and stay therein for the performance of their work
- (8) to maintain and use properly and effectively the facilities constructed and equipment under the grant.

8. Outline of the Centre will be summarized as Annex VI.

Annex I

Liste de Médicaments demandés à produireI. Traitement des plantes médicinales :

Capacité : 60 Tonnes de plantes brutes par an.

II. Section des Injectables :

A. <u>Liquides à perfusion</u>		: 150.000 Litres par an
1. Dextrose	5%	: 60.000 - " -
2. NaCl	0,9%	: 40.000 - " -
3.*Dextrose 5%+ NaCl	0,9%	: 40.000 - " -
4.* NaHCO ₃	1,4%	: 10.000 - " -
B. <u>Ampoules Injectables</u>		: 3.000.000 ampoules par an
1. Eau distillée 2ml		: 2.000.000 - " -
2. Quinine bichlorhydrate 600 mg/2ml		: 300.000 - " -
3. Sulfate atropine 0,25mg/1ml		: 200.000 - " -
4. Chlorhydrate d'Heptaminol 0,313g/5ml		: 70.000 - " -
5.*KCl	10%/20ml	: 30.000 - " -
6.*Vitamine C	500mg/5ml	: 200.000 - " -
7.*Procaine	1 à 2%/2ml	: 200.000 - " -

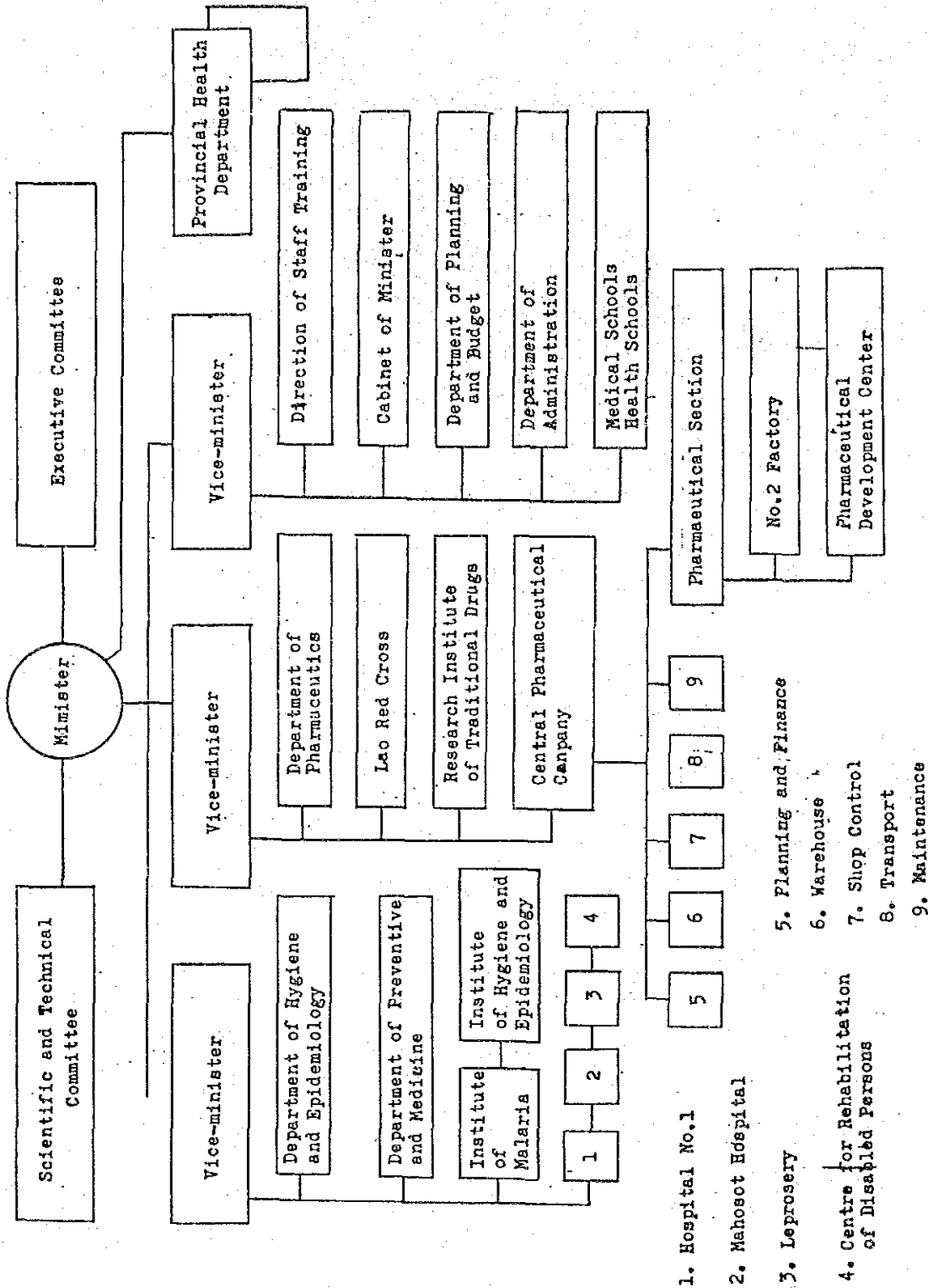
III. Tablettes : : 100.000.000 Tablettes par an

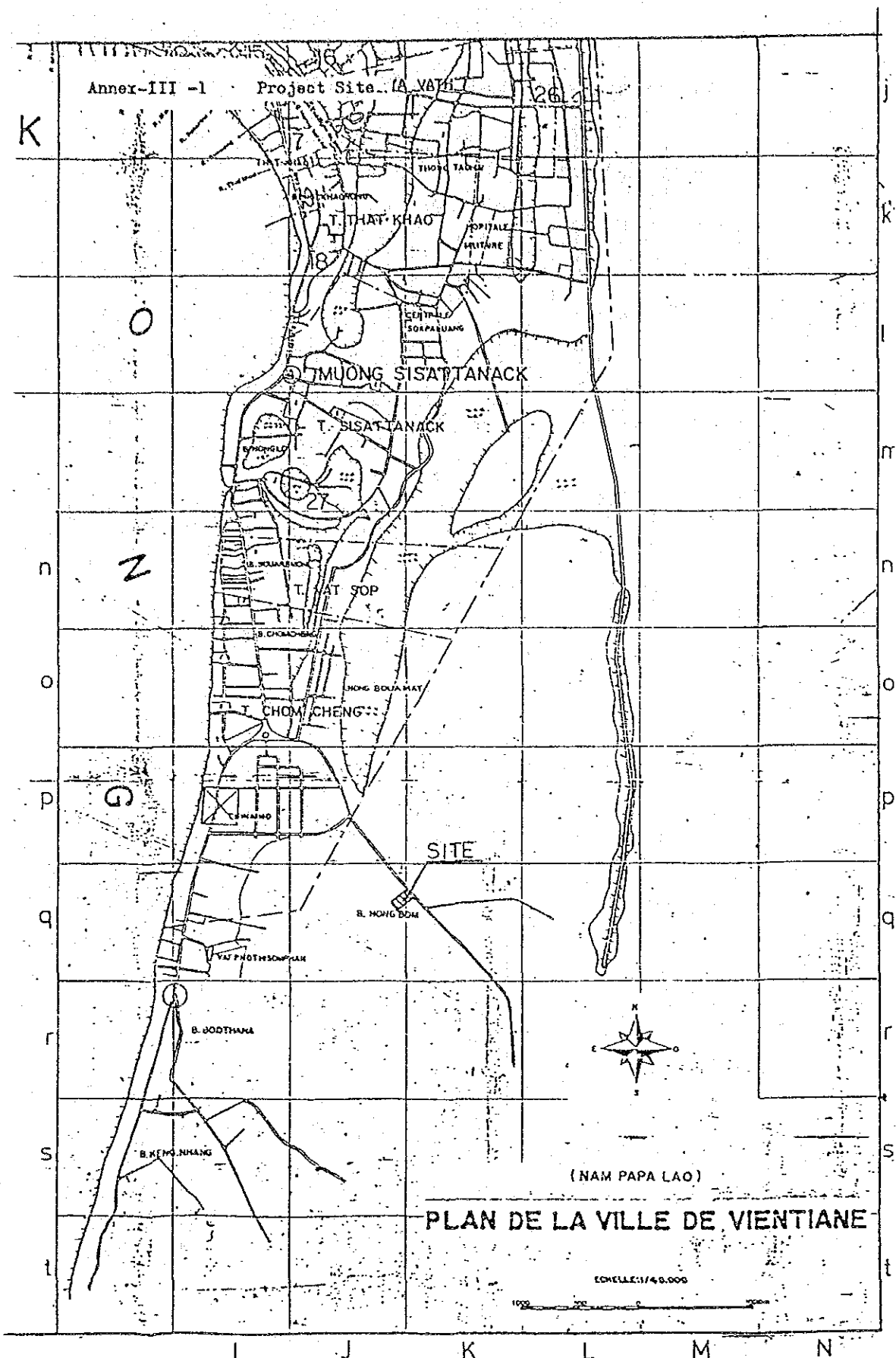
1. Chloroquine	100mg	: 25.000.000 - " -
2.*Pyriméthamine	25mg	: 5.000.000 - " -
3. Trisulfa	500mg	: 10.000.000 - " -
4. Sulfaguamide	500mg	: 15.000.000 - " -
5. Berbérine	50mg	: 3.000.000 - " -
6.*Caesalpinéa sapan	100-200mg	: 1.000.000 - " -
7.*Charbon	500mg	: 5.000.000 - " -
8.*Elixir parégorique	100-200mg	: 1.000.000 - " -
9. Aspirine	500mg	: 5.000.000 - " -
10.*Paracétamol	500mg	: 5.000.000 - " -
11.*Analgine	500mg	: 5.000.000 - " -
12. Antitussif		: 5.000.000 - " -
13. Antiacide	500mg	: 5.000.000 - " -
14. Vitamine B1	100mg	: 5.000.000 - " -
15.*Vitamine C	500mg	: 5.000.000 - " -

*... This mark shows medicines which have never been produced in Laos.

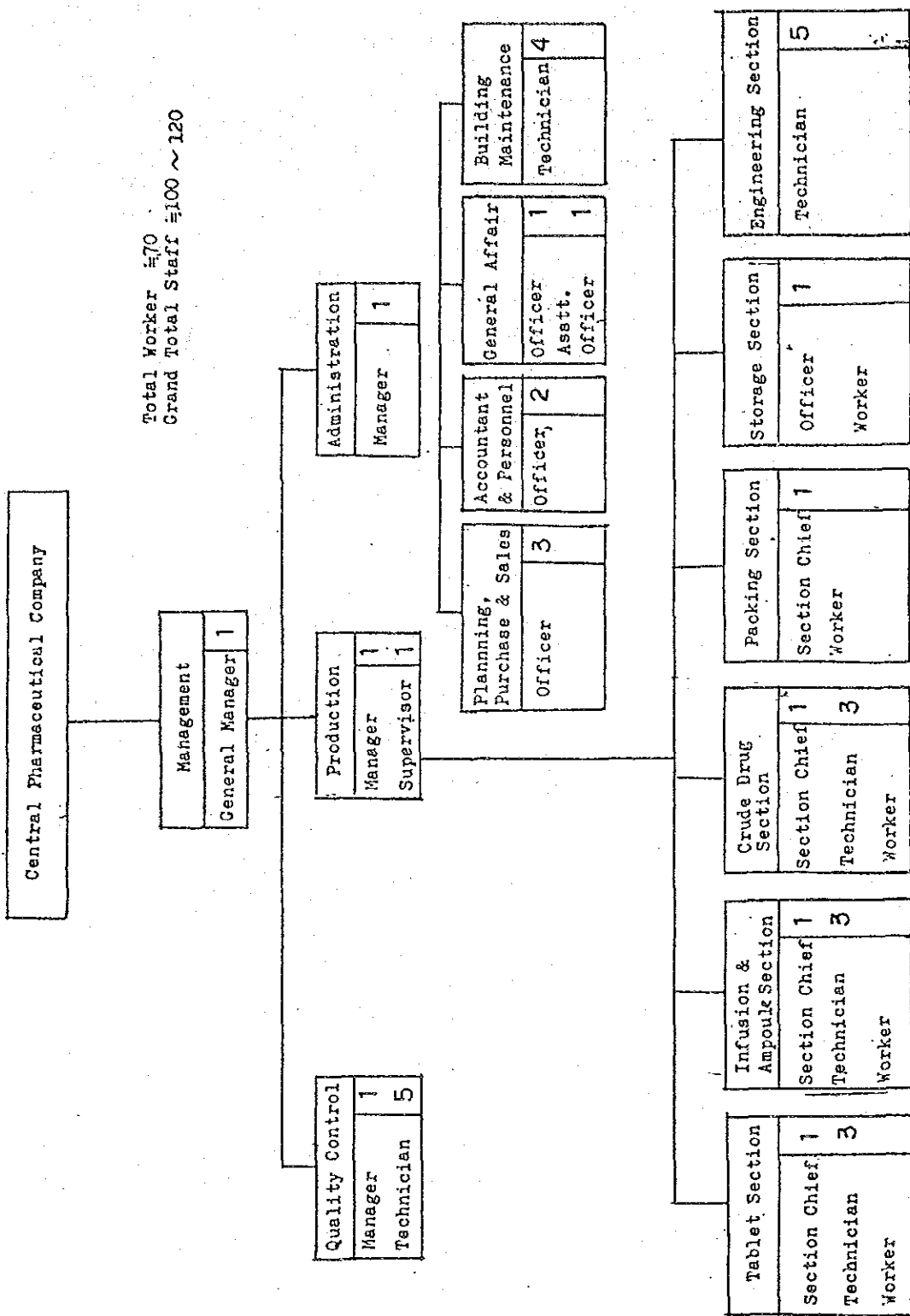
Annex-II The Administration Scheme of the Centre

MINISTRY OF PUBLIC HEALTH





Annex-IV Organization of the Centre



Annex V.

Items whose cost will be borne by the Government of Laos

1. Water supply mains to the Project Site
2. External drainage from the Project Site
3. Electrical power main line to the Project Site
4. Telephone lines and equipment
5. Exterior Facilities and Landscaping
6. Provision of space necessary for such construction as temporary office, working area, stock yards and others
7. Furniture, carpet, curtains and other furnishings
8. Maintenance and Operation cost and expenses

Annex VI

Items required for the implementation of the Project-whose cost will be borne by the Government of Japan.

A. Buildings

- . Administration Section
- . Crude Drug Section
- . Tablet Section
- . Infusion Section
- . Ampoule Section
- . Quality Control Section
- . Packaging Section
- . Storage Section
 - . Raw Medical Plant Receiving and Stacking Storage
 - . Raw Material Storage
 - . Product Storage (Short Term)
- . Others

B. Equipments

- . Crude Drug Plant
- . Tablet Plant
- . Infusion Plant
- . Ampoule Plant
- . Quality Control Equipments
- . Packing Equipments
- . Fork lift
- . Others

MINUTES OF DISCUSSIONS
ON
THE DRAFT REPORT OF THE BASIC DESIGN STUDY
ON
THE ESTABLISHMENT PROJECT
OF
PHARMACEUTICAL DEVELOPMENT CENTER

The Government of Japan has sent, through the Japan International Cooperation Agency (JICA), a Basis Design Study Team to the Lao People's Democratic Republic from 5, February to 17, February for the purpose of presenting and explaining the draft of the final report of the Basic Design Study (the Report) on the Establishment Project of Pharmaceutical Development Center.

The team held meetings with officials concerned of the Pharmaceutical Development Center to explain and to discuss the Report. As result of the discussions, both parties have agreed as follows:

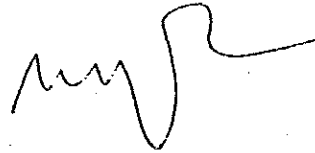
1. Lao side principally has agreed to the basic design proposed in the Draft Final Report
2. Lao side noted, however, that the production amount proposed in the Draft Final Report seems to be lower than Lao side proposal and requested that the production amount could adapt as much as possible to the Lao proposal. Lao side also requested that Japanese side should study carefully the possibility in order to adapt architectural features to the Lao conditions. Lao side further requested that its proposal could be considered at the stage of detailed design.
3. The mission took note of the Lao side proposal and expressed that its proposal will be carefully considered at the stage of detailed design within the framework of grant aid system.

4. The Final Report (10 copies in English) on the project will be submitted to the Laos Government by the end of April 1984.
5. The Basic Design Study Team and the Laos Government have both understood and confirmed the measures to be undertaken by both parties for the project.

11th, February, 1984
Vientiane



Mr. Minoru ISHIDA
Leader of the Mission



Mr. PHETSANA CHOUMMANIVONG
Director, Pharmaceutical
Factory N°2,
Ministry of Public Health



APPENDIX - 2a

Members of the Study Team for Basic Survey

Mr. Minoru ISHIDA	Team Leader	Second Economic Cooperation Division., Economic Cooperation Bureau, Ministry of Foreign Affairs
Dr. Hideo FUKUDA	Quality Control Expert	National Institute of Hygenic Science, Ministry of Health and Welfare
Mr. Yasuo WATANABE	Pharmaceutical Formulation Expert	The Federation of Pharmaceutical Manufacturers's Associations of Japan
Mr. Ikuo TANAKA	Pharmaceutical Formulation Expert	The Federation of Pharmaceutical Manufacturers's Association of Japan
Mr. Minami NAGAI	Project Coordinator	Basic Design Div., Grant Aid Dept., JICA
Mr. Hiroshi ITO	Architectural Planner	Daiken Architects & Engineers
Mr. Kyoichi KITAMURA	Architectural Designer	Daiken Architects & Engineers
Mr. Hideo TERAO	Facilities Engineer	Daiken Architects & Engineers
Mr. Akira TAKAHASHI	Cost Estimator & Construction Planner	Daiken Architects & Engineers
Mr. Shigehiko YOSHIKAWA	Interpreter	Daiken Architects & Engineers

APPENDIX - 2b

Members of the Study Team for Explanation of Report

Mr. Minoru ISHIDA	Team Leader	Second Economic Cooperation Division, Economic Cooperation Bureau, Ministry of Foreign Affairs
Mr. Yasuhide FURUSAWA	Quality Control Expert	Planning Division, Pharmaceutical Affairs Bureau, Ministry of Health and Welfare
Mr. Minami NAGAI	Project Coordinator	Basic Design Div., Grant Aid Dept., JICA
Mr. Shigeyuki TAKEI	Pharmaceutical Formulation Expert	The Federation of Pharmaceutical Manufacturers' Associations of Japan
Mr. Hiroshi ITO	Architectural Planner	Daiken Architects & Engineers
Mr. Hideo TERAO	Facilities Engineers	Daiken Architects & Engineers
Mr. Shigehiko YOSHIKAWA	Interpreter	Daiken Architects & Engineers

APPENDIX - 3

List of Officials concerned of the Government of Laos

Dr. Ponemek DALALOY	Vice-ministret de la Santé de la RDPL
Dr. Phine Phenh PHOLSENA	Directeur du Department des Pharmacies
Dr. Souvanh PHINTH	Directeur de la compaonie phamaceutique
Mr. Phetsana CHOUMMANIVONG	Chef de la Fabrique pharmaceutique No.2
Mr. Savengvong DOVANGSAVANH	Pharmacien Chef du projet de construction du centre pharmaceutique offert par le japon
Dr. Chanphone NONGKHONVILAY	Directeur adjoint du Department de la planification et des finances du Ministre de la Santé
Mr. Souphone	Directeur adjoint Depart de relation économique internationale (coute de plan)
Mr. Souchay	Departement II. Ministère des affaires étrangères
Mr. Saisana	Ministre de la construction

APPENDIX - 4a

Schedule of Basic Design Survey

Date	Day	Activity
10/9	Sun	Departure from Tokyo and arrival in Bangkok
10/10	Mon	Leaving from Bangkok and arrival in Vientiane Visit to Japanese Embassy
10/11	Tue	First meeting with representatives of the Government of Laos Field survey of the proposed site No.2 Visit and survey of an existing pharmaceutical plant
10/12	Wed	Visit and survey of Setthathirat Hospital, a warehouse of the Central Pharmaceutical Company Field survey of the proposed site No.1 and No.4 Visit and survey of the Crude Drug Institute Field survey of the proposed site No.2
10/13	Thu	Second meeting with the representatives of the Government of Laos Discussion within the Japanese Study Team
10/14	Fri	Third and fourth meeting with the representatives of the Government of Laos Discussion of the Minutes of Meeting within the Japanese Study Team
10/15	Sat	Visit of Deputy Minister of Construction. Mr. Sengkham Phinith Visit of the Construction Company Visit and survey of the construction site of a plywood factory Preparation of the draft of the Minutes of Meeting
10/16	Sun	Meeting within the study team

Date	Day	Activity
10/17	Mon	Meeting with the officials concerned of the Ministry of Public Health Discussion of the draft of the Minutes of Meeting with the representatives of the Government of Laos Arrival of two members of the Study Team
10/18	Tue	Site surveying of the proposed site No.4 Survey of Port Thanaleng Discussion of the Minutes of Meeting with the representatives of the Government of Laos
10/19	Wed	Visit of the State Planning Committee Discussion of drugs to be formulated by the experts of pharmaceuticals both sides Site surveying of the proposed site No.2 Meeting with the Water Supply Company Signing of the Minutes of Meeting
10/20	Thu	Leaving from Vientiane of the members of the Study Team except the Consultant Meeting with the Electric Company and the Water Supply Company
10/21	Fri	Meeting with the Telephone Company and the Construction Company Survey of the situation of construction materials in Laos
10/22	Sat	Meeting with the Construction Ministry about the soil investigation of the project site
10/23	Sun	Meeting within the study team
10/24	Mon	Leaving from Vientiane and Arrival in Bangkok
10/25	Tue	Survey of construction materials (items and price) in Thailand Visit and survey of construction sites

Date	Day	Activity
10/26	Wed	Survey of materials for utility, items and price, in Thailand Visit and survey of the factory of a steel fabricator
10/27	Thu	Survey of transportation from Bangkok to Vientiane (price, regulations, etc.) at the Transport Corporation and Shipping Company
10/28	Fri	Leaving from Bangkok and arrival in Tokyo

APPENDIX - 4b

Schedule of Explanation of Report

Date	Day	Activity
2/5	Sun	Departure from Tokyo and arrival in Bangkok
2/6	Mon	Leaving from Bangkok and arrival in Vientiane Visit of the State Planning Committee Visit of Minister of Public Health
2/7	Tue	First meeting with representatives of the Government of Laos (Explanation of Report) Discussion within the Japanese Study Team
2/8	Wed	Second meeting with the representatives of the Government of Laos
2/9	Thu	Field survey of the site Visit and survey of Mahosot Hospital Visit and survey of the existing pharmaceutical plant
2/10	Fri	Third meeting with the representatives of the Government of Laos Meeting within the study team
2/11	Sat	Fourth meeting with the representatives of the Government of Laos and signing of the Minutes of Meeting Leaving from Vientiane of the members of the Study Team except the Consultant
2/12	Sun	Meeting within the study team
2/13	Mon	Meeting with the officials concerned of the Ministry of Public Health
2/14	Tue	Meeting with the officials concerned of the Ministry of Public Health
2/15	Wed	Meeting with the officials concerned of the Ministry of Public Health
2/16	Thu	Visit to Japanese Embassy Leaving from Vientiane and Arrival in Bangkok
2/17	Fri	Leaving from Bangkok and arrival in Tokyo

APPENDIX 5 Meteorological Data

REPUBLIQUE DEMOCRATIQUE POPULAIRE LAO
 PAIX INDEPENDANCE UNITE ET SOCIALISME

MINISTRE DE L'AGRICULTURE DE
 L'IRRIGATION DE LA COOPERATIVE

 ວ. ລາວ ມີ ສູນ ມາ ມີ ວ. ກໍ
 (ວຽກງານ)

Vientiane

Direction de la Météorologie

et de l'Hydrométéorologie

Mois

Année I II III IV V VI VII VIII IX X XI XII Total Annuelle

1971	NT	7.3	13.9	34.1	1294.0	1275.9	1289.4	1226.4	1163.4	1103.5	0.8	18.2	1426.9
72	NT	6.8	36.8	1167.6	1115.6	1312.8	1246.1	1306.7	1166.3	1184.4	8.2	5.8	1521.1
73	NT	NT	37.0	36.4	1308.3	1200.7	1298.6	1263.9	1361.3	25.7	0.0	NT	1531.9
74	NT	1.6	36.7	97.4	1100.5	1159.2	1255.7	1368.4	1187.1	92.6	29.7	0.2	1529.1
75	23.5	26.3	13.2	121.8	1347.0	1473.9	1177.5	1430.4	1289.4	1194.4	8.5	0.0	2006.9
76	NT	23.0	119.9	1126.9	1121.7	1167.3	1167.6	1403.1	1416.7	76.7	NT	NT	1614.9
77	15.2	NT	35.1	69.0	1151.9	1231.0	1211.1	1174.8	1190.3	26.5	16.5	22.8	1144.2
78	1.6	17.8	51.1	145.9	1328.4	1254.9	1254.6	1293.6	1381.4	1128.9	28.5	NT	1986.7
79	NT	21.0	0.1	61.8	1344.7	1333.3	1150.1	1117.8	1253.1	119.2	NT	NT	1301.1
1980	NT	18.6	68.8	61.0	1319.5	1611.0	1461.5	1342.9	1353.4	54.7	0.0	NT	2291.4
81	NT	0.3	19.6	1124.2	1311.1	1238.5	1635.0	1210.0	1224.8	1117.8	40.5	0.0	1921.8
82	NT	6.1	60.8	69.6	1239.3	195.4	1253.8	1484.0	1319.5	90.2	22.2	0.6	1629.3
83	53.1	5.7	9.0	58.1	97.6	1243.8							

REPUBLIQUE DEMOCRATIQUE POPULAIRE LAO
PAIX INDEPENDANCE DEMOCRATIE UNITE PROSPERITE

MINISTERE DE L'AGRICULTURE DES
FORETS ET DE L'IRRIGATION

Service National de la météoro-
logie et de l'hydrométéorologie.

Vientiane : 17.57°N/102°34'E
Altitude : 170 m

RADIATION SOLAIRE

MOIS	HEURE	1	2	3	4	5	6	7	8	9	10	11	12
I	31	11-12	8-21	492.6	0.731	671.4	425.14	485	38.3	0.720			
II	31	11-61	7-58	454.8	0.652	754.3	440.59	522	35.1	0.749			
III	31	12.05	6.88	412.8	0.570	843.8	450.03	553	37.0	0.765			
IV	30	12.53	7.43	445.8	0.593	900.0	492.85	601	40.3	0.800			
V	31	12.98	6.52	391.2	0.562	918.7	451.80	615	39.7	0.790			
VI	30	13.17	5.25	315	0.398	916.7	392.06	620	39.7	0.785			
VII	31	13.07	4.80	288	0.366	916.7	373.02	615	38.4	0.780			
VIII	31	12.70	4.27	256.2	0.336	893.5	348.12	583	36.8	0.765			
IX	30	12.24	5.32	319.2	0.435	850.0	382.24	563	38.0	0.775			
X	31	11.75	7.28	436.6	0.619	775.8	436.25	550	38.5	0.780			
XI	30	11.33	8.03	401.2	0.707	583.6	422.82	510	35.7	0.750			
XII	31	11.06	8.25	495	0.746	647.3	512.04	488	34.0	0.735			

h h Dures d'insolation mesurés par l'héliographe corrigés: 1959-1972.

H : Heures et dixièmes d'heures calculés d'après les tables paklet et tables d'angot. (Dures astronomiques du joins 11.)

$\frac{h}{H}$: Insolation relative %

IGA : Radiation qui revait attendre le sol (cal/cm2/minutes).

IG : IGA (0.18 + 0.62 $\frac{h}{H}$) pour 0.94 cal/cm2/minutes).

IG-D : Rayonnement direct et diffus avec thermomètre noir (mesures actinométriques).

REPUBLIQUE DEMOCRATIQUE POPULAIRE LAO
 PAIX INDEPENDANCE UNITE ET SOCIALISME

MINISTRE DE L'AGRICULTURE DE
 L'IRRIGATION ET DE COOPERATIVE

Vientiane

ສາມາດ ສຳ ຄຳ ຈຳ ກວດ
 (ລະ ດັບ ສະ ພາ ລະ ກຳ) (max and min)

Direction de la Météorologie
 et de l'Hydro-météorologie
 RELATIVE HUMIDITY (%)

Année	MOIS																						
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII											
1971	136	137	137	190	150	194	160	196	162	196	165	196	155	195	148	193	135	195	140	194			
72	137	138	140	190	143	193	151	196	157	194	163	195	159	194	155	193	151	190	149	191			
73	139	141	139	182	137	181	145	189	158	192	154	195	155	195	168	192	153	191	147	188	142	189	
74	140	143	144	186	149	189	153	190	159	192	160	193	167	194	159	193	157	192	153	188	147	190	
75	154	141	188	142	186	137	178	156	193	157	191	156	190	192	160	193	152	190	148	188	139	187	
76	135	139	188	141	185	152	190	160	193	157	193	159	192	163	193	160	195	156	193	148	187	144	184
77	147	140	181	139	181	145	190	149	191	150	189	159	193	160	193	158	194	152	192	144	187	143	192
78	143	148	187	141	190	149	189	160	193	161	194	165	194	162	196	196	151	193	147	192	143	192	
79	142	142	191	136	186	144	186	156	192	164	195	156	193	163	195	160	195	146	190	138	185	140	191
1980	139	141	186	136	179	142	186	153	191	163	195	162	194	163	194	165	195	152	192	159	179	146	191
81	142	140	143	187	139	148	190	156	192	160	193	164	195	162	193	158	193	156	192	150	188	144	188
82	142	194	146	192	144	188	148	190	149	190	155	190	164	195	165	194	156	195	150	193	144	193	
83	151	194	144	191	140	186	142	185	154	192	162	194	162	194	162	194	162	194	162	194	162	194	162

REPUBLIQUE DEMOCRATIQUE POPULAIRE LAO
 PAIX INDEPENDANCE UNITE ET SOCIALISME

MINISTRE DE L'ARCHICULTURE DE
 L'IRRIGATION ET DE COOPERATIVE

Vientiane

Handwritten note:
 115/30/24.95 (m/s)

Direction de la Météorologie
 et de L'Hydrometeorologie

WIND SPEED

Moisi	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII												
1971	ISE	16	IE	16	INE	16	IW	111	IE	17	IS	15	IW	17	IN	18	IN	16	IW	14	IE	10	INE	15
72	IE	15	IE	15	IS	115	IN	118	ISW	115	IE	18	IN	125	IE	19	IE	113	INE	143	IE	131	IE	16
73	IE	14	INNE	13	INE	111	INW	113	IW	116	IW	114	IW	110	ISE	110	IE	115	IWSE	115	IESE	16	IESE	10
74	IESE	17	IS	110	IW	130	IW	129	ISSE	122	IW	125	IS	120	IN	120	IS	114	IN	116	IE	110	SE	15
75	IE	17	INNW	119	ISE	129	IN	129	IW	120	IE	115	ISW	112	SS	118	ISE	115	ISW	115	IE	110	ISE	15
76	IE	15	IN	115	IW	127	IN	118	IW	110	IS	119	IW	110	ISE	118	IS	117	IE	116	IN	118	INE	17
77	IN	18	IE	110	IE	112	IN	113	ISE	120	IS	110	INW	113	IESE	113	IN	116	INE	113	IE	111	IE	19
78	IE	110	IN	118	IW	114	INE	117	IN	122	IS	112	IS	118	ISE	112	IE	119	INE	112	IE	131	IE	111
79	IE	110	IS	114	IN	120	IS/SE	115	IN	113	IW	117	IN	113	IW	119	IS	113	IE	15	IE	198	IE	6
1980	N	15	IS	118	INV	116	IN	120	ISW	130	ISE	116	IN	115	IESE	118	INE	110	INE	116	INE	151	INE	17
81	IE	15	IW	115	IW	129	IW	133	IN	121	IW	114	IN	118	IS	110	INW	110	IN	110	IN	191	IN	16
82	INW	16	IE	116	INW	110	ISW	112	IW	115	IS	115	IS	110	ISSE	110	INE	119	IN	117	IE	161	INE	18
83	SE	13	13	IN	16	IN	18	1W	115	113	1W	137	1W	110	11	11	11	11	11	11	11	11	11	11

REPUBLIQUE DEMOCRATIQUE POPULAIRE LAO
 PAIX INDEPENDANCE UNITE ET SOCIALISME

MINISTRE DE L'AGRICULTURE DE
 L'IRRIGATION ET DE COOPERATIVE

Direction de la Météorologie
 et de l'Hydro-météorologie

STATION DE :

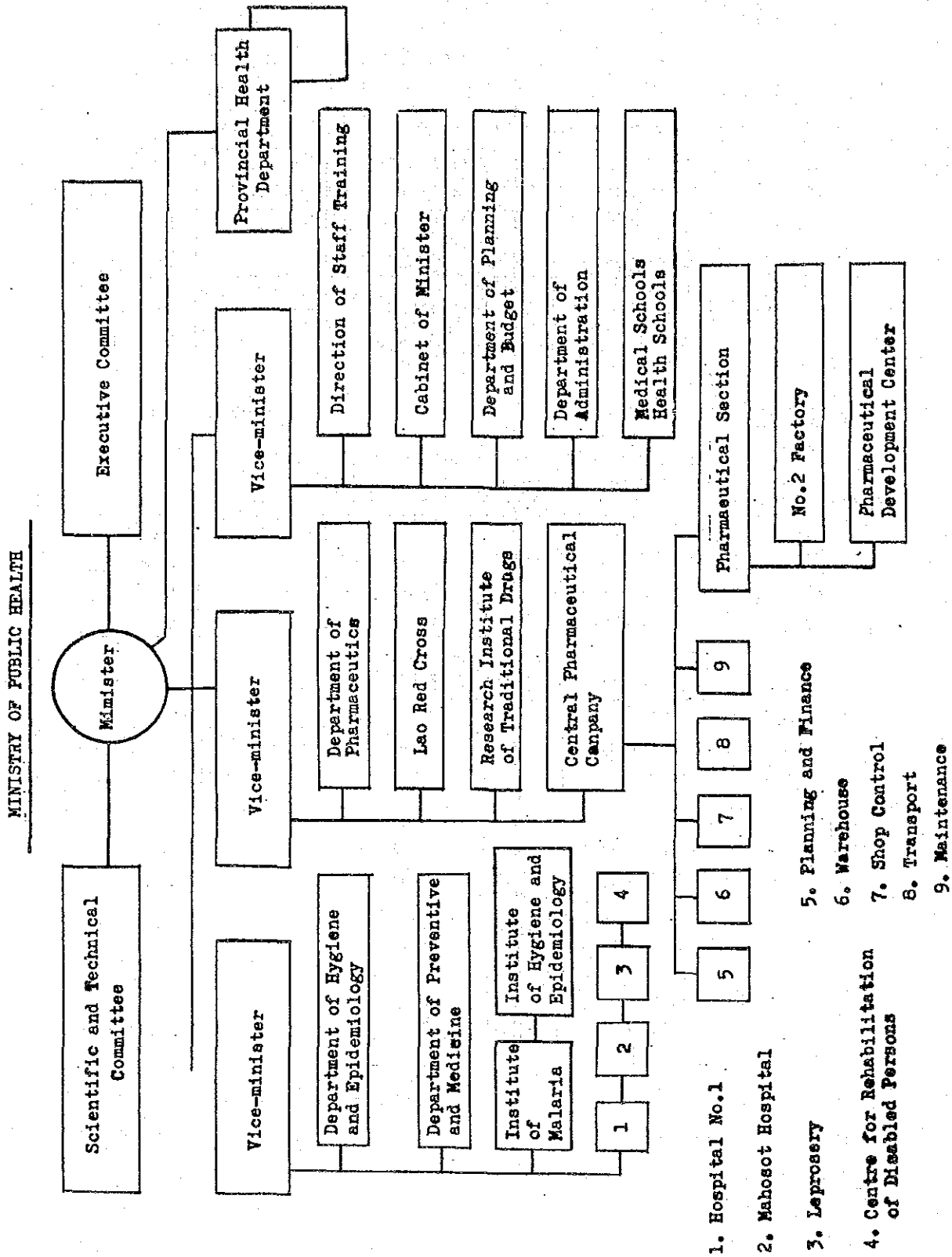
Vientiane

Station : ວິສາມາດ ວັດ ຕຳ ພື ວິ ວັດ

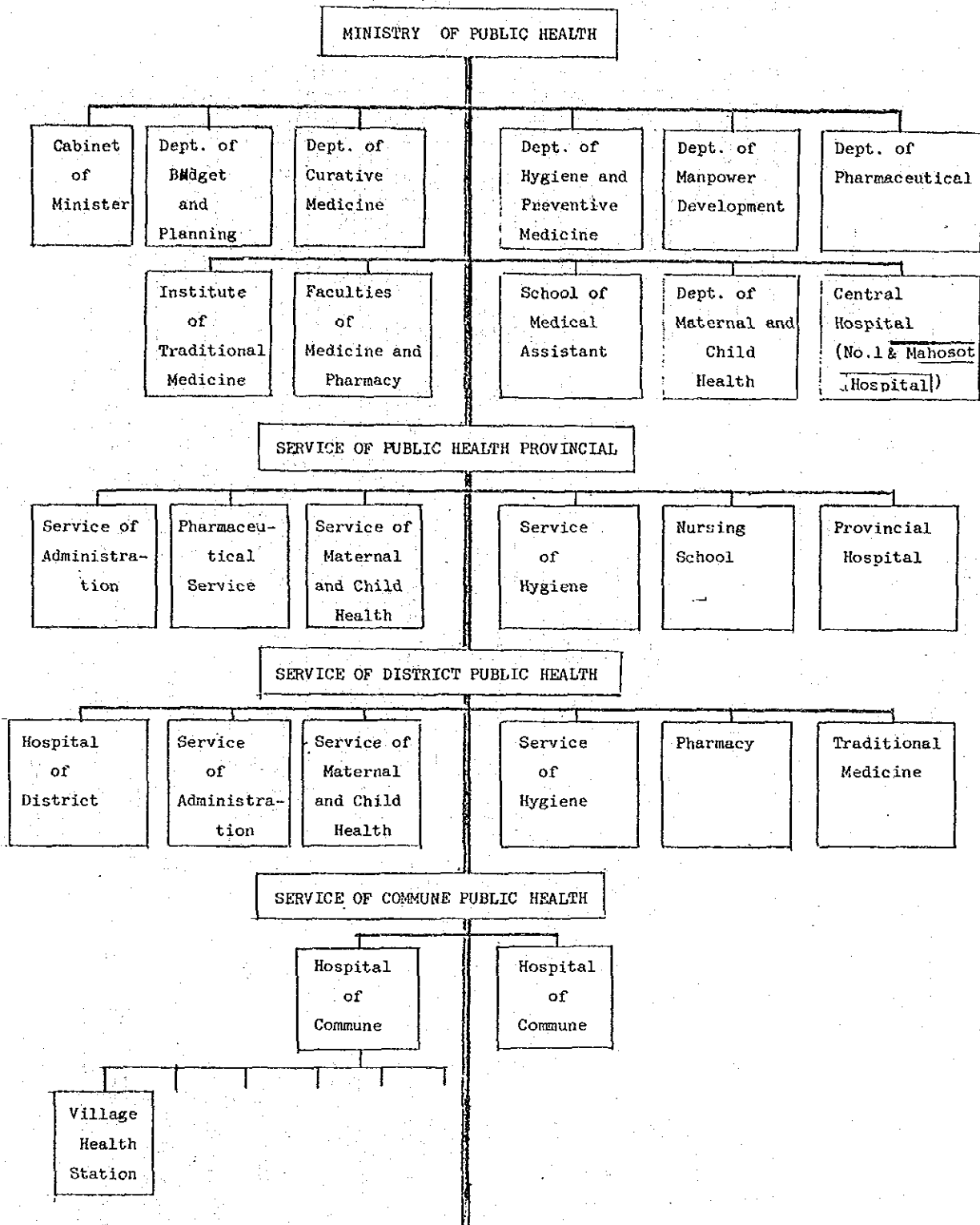
(ວິ ອາດ ພື ພື ພື ພື)

TEMPERATURE

Mois Année	I		II		III		IV		V		VI		VII		VIII		IX		X		XI		XII			
	max °C	min °C	max °C	min °C	max °C	min °C	max °C	min °C	max °C	min °C	max °C	min °C	max °C	min °C	max °C	min °C	max °C	min °C	max °C	min °C	max °C	min °C	max °C	min °C		
1971	33.0	13.1	33.6	14.0	36.5	21.5	37.5	22.0	37.5	23.2	37.5	22.8	37.5	23.2	37.5	22.7	37.5	22.7	37.5	22.7	37.5	22.7	37.5	22.7	37.5	
72	33.2	15.5	34.3	14.2	35.8	21.2	37.0	22.9	37.6	22.6	35.6	23.7	37.7	22.1	33.4	23.0	33.7	22.2	33.5	22.2	33.5	22.2	33.5	22.2	33.5	
73	33.3	16.2	36.3	13.5	37.3	21.9	37.3	22.7	35.6	22.9	35.5	23.0	34.7	21.7	33.4	23.2	32.7	17.7	33.4	23.2	32.4	12.6	32.5	07.6	33.2	
74	32.1	10.7	37.5	14.2	35.8	20.2	36.8	22.5	35.0	23.4	34.3	22.5	34.9	22.9	33.8	22.8	33.6	21.6	33.2	22.8	33.2	12.6	32.5	07.6	33.2	
75	31.6	10.4	34.6	20.1	37.8	21.0	40.0	22.3	36.0	23.5	34.0	22.8	34.5	22.8	33.5	22.8	33.6	21.5	33.1	22.5	33.1	11.7	32.5	05.3	22.8	
76	29.8	13.0	35.1	16.8	36.6	20.3	38.0	18.9	34.9	21.8	34.9	22.8	34.8	22.9	33.5	22.9	34.6	21.9	32.9	23.0	32.9	13.3	31.9	12.9	32.4	
77	32.7	13.9	34.8	14.0	37.8	20.3	37.9	24.8	32.0	24.0	37.5	22.0	35.9	23.0	34.5	21.8	33.9	20.2	33.0	23.0	33.0	15.1	32.1	14.6	32.2	
78	32.7	15.1	33.6	12.8	36.7	20.0	38.4	21.2	35.8	23.4	34.8	22.8	34.9	23.0	33.0	22.7	33.6	15.3	32.6	23.0	32.6	15.9	32.2	11.8	31.8	
79	34.3	15.2	36.7	19.1	37.9	22.3	38.5	22.0	36.5	22.3	34.3	22.5	34.3	23.0	33.6	23.0	34.0	18.6	33.1	23.0	32.6	14.4	22.6	12.7	31.2	
1980	33.3	15.2	34.4	18.2	37.2	18.5	40.3	21.0	36.5	23.0	35.0	22.6	35.0	23.2	34.0	23.0	32.4	18.7	33.9	23.9	18.7	32.5	13.7	32.7		
81	31.9	16.6	37.0	18.7	37.6	20.5	37.8	22.1	36.2	22.1	33.6	22.0	33.9	23.0	35.0	22.4	34.0	21.0	34.1	34.1	18.4	33.1	11.8	30.3		
82	31.5	14.8	35.8	20.5	37.7	18.8	37.6	23.0	34.8	23.7	35.2	23.3	34.1	22.7	34.4	22.5	34.5	21.8	33.0	34.5	18.8	32.1	07.1	31.0		
83	30.2	16.4	34.0	17.0	38.2	22.5	41.5	23.8	34.1	22.2	36.8	22.7	35.7													



APPENDIX 7 Organization of Ministry of Public Health



APPENDIX 8 List of Requested Items and Quantities of Drugs

Liste de Médicaments demandés à produire

I. Traitement des plantes médicinales :

Capacité : 60 Tonnes de plantes brutes par an.

II. Section des Injectables :

A. Liquides à perfusion : 150.000 Litres par an

1. Dextrose	5%	:	60.000	- " -
2. NaCl	0,9%	:	40.000	- " -
3.*Dextrose 5%+ NaCl	0,9%	:	40.000	- " -
4.* NaHCO ₃	1,4%	:	10.000	- " -

B. Ampoules Injectables : 3.000.000 ampoules par an

1. Eau distillée 2ml		:	2.000.000	- " -
2. Quinine bichlorhydrate 600 mg/2ml		:	300.000	- " -
3. Sulfate atropine 0,25mg/1ml		:	200.000	- " -
4. Chlorhydrate d'Heptaminol 0,313g/5ml		:	70.000	- " -
5.*KCl	10%/20ml	:	30.000	- " -
6.*Vitamine C	500mg/5ml	:	200.000	- " -
7.*Procaïne	1 à 2%/2ml	:	200.000	- " -

III. Tablettes : 100.000.000 Tablettes par an

1. Chloroquine	100mg	:	25.000.000	- " -
2.*Pyriméthamine	25mg	:	5.000.000	- " -
3. Trisulfa	500mg	:	10.000.000	- " -
4. Sulfaguanidine	500mg	:	15.000.000	- " -
5. Berbérine	50mg	:	3.000.000	- " -
6.*Caesalpinéa sapan	100-200mg	:	1.000.000	- " -
7.*Charbon	500mg	:	5.000.000	- " -
8.*Elixir parégerique	100-200mg	:	1.000.000	- " -
9. Aspirine	500mg	:	5.000.000	- " -
10.*Paracétamol	500mg	:	5.000.000	- " -
11.*Analgin	500mg	:	5.000.000	- " -
12. Antitussif		:	5.000.000	- " -
13. Antiacide	500mg	:	5.000.000	- " -
14. Vitamine B1	100mg	:	5.000.000	- " -
15.*Vitamine C	500mg	:	5.000.000	- " -

*... This mark shows medicines which have never been produced in Laos.

APPENDIX 9 List of Cost for Principal Materials and Labor

No ລ/ດ	Description ລາຍການ ວັດສະດຸ	Unit : ມິວໝວຍ :	Price /unit ລາຄາໝວຍ	Remarks ໝາຍ /ໝດ
1.	ຫີມແກ່ (graves)	ມ ³ ມ ³	410 K	/ ຕິດລະດັບຕາມຕໍ່ ກຳລັງປັບຕາ 8 ຫ້າງໄປ ຈຶ່ງກຳໜົດ Jacquelin terrain de construction
2.	ຊາຍ (Sable)	" ມ ³	300	
3.	ໄມ້ແຮບ (Bois)	:	:	
	- ເນື້ອແຂງ (Bois dur)	ມ ³ ມ ³	10.834	} ຊາງຢູ່ ໂຮງເລື່ອງ Prix vendus dans la serise
	- ເນື້ອແຂງ ປະສົມ (Bois dur mixte)	" ມ ³	8.375	
	- ເນື້ອອອນ (Bois doux)	" ມ ³	7.880	
4.	ໄມ້ຂາວ (chaux blanche)	ໂຕໝ ກ່ອນ	4.500	/ ຕິດລະດັບຕາມຕໍ່ ກຳລັງ. Jacquelin terrain de construction
5.	ຫີມອອນ (cailloux marbés)	" ກ່ອນ	7.500	
:	:	:	:	:
:	:	:	:	:

- ແຮງງານ :
1. ນາງຊ່າງ ລະດັບນ້ຳ, ລຸກງານ, ລີອະລະກອນ (chapeurs) 50/ ມື້ (8 ຈຳໂນງ)
 2. ນາງຊ່າງ ລະດັບສອງ 2^e classe 300/ ມື້ (jour)
 3. ນາງຊ່າງ ລະດັບສາມ 3^e - u - 250/ ມື້
 4. ກຳມະກອນ ມີວິຊາແຕ່ ເລັກນ້ອງ (ouvriers pen multiples) 200/ ມື້
 5. ກຳມະກອນ (ouvriers simples) 150/ ມື້

ໝາຍ /ໝດ : ລາຄາ ວັດສະດຸ ແລະ ລາແຮງງານ ສຳລັບປີ 1983 ອາດຈະມີການ ປ່ຽນແປງ ໃນພາກ
ຕ່າງໆ. (Ces prix pourront être modifiés)

JICA