

5-2-3 Structural Design

(1) Outline

Site	Building	Superstructure	Substructure
Rapajur	Grain storage No.1 - No.5	Steel frame structure External wall: reinforced brick	Ground floor: Slab on grade Reinforced conc- rete footing
	Office building	Reinforced concrete structure External wall: reinforced brick	Ditto
	Guardhouse	Reinforced concrete structure External wall: reinforced brick	Ditto
	Rice mill plant	Steel frame structure External wall: reinforced brick	Ditto
	Parboiled rice plant	Steel frame structure External wall: reinforced brick	Ditto
	Parboiled paddy storage	Steel frame structure External wall: reinforced brick	Ditto
	Boiler house, Generator house	Reinforced concrete structure External wall: reinforced brick	Ditto
	Husk hut	Steel frame structure	Ditto
	Parboiled paddy sun-drying yard		Slab on grade
Dangadhi	Warehouse No.1 - No.4	Steel frame structure External wall: reinforced brick	Ground floor: Slab on grade Reinforced concrete footing
	Office building	Reinforced concrete structure External wall: reinforced brick	Ditto

Site	Buildine	Superstructure	Substructure
Mahendranagar	Warehouse	Steel frame structure External wall: reinforced brick	Ground floor: Slab on grade Reinforced concrete footing
	Office building	Reinforced concrete structure External wall: reinforced brick reinforced brick	Ditto
	Guardhouse	Reinforced concrete structure External wall: reinforced brick	Ditto

## (2) Structural Design Concept

As there are no regulations or standards in Nepal regarding structural design, the Indian Building Code will apply with respect to structural design.

The concept as to the structural design is basically the same as that of Japan, except for the external forces such as wind pressure and earthquake inherent to the district. Structural performance that may be required in the district would be sufficiently satisfied if calculation standards of the Architectural Institute of Japan or Building Standards Act are applied. For this reason, the structural design of this project will be in accordance with the building standards of Japan.

## (3) Allowable Stress

As mentioned before, Japanese standards will apply with respect to the allowable stress of the materials listed below.

Allowable Stress (kg/cm<sup>2</sup>)

Material	Standard	Long term allowable stress			Short term allowable stress		
		Comp- ression	Ten- sile	Shear	Comp- ression	Ten- sile	Shear
Concrete	FC=180 (4 wks compression strength)	60	-	6	120	-	9
Reinforc- ing bar	SR24 (JIS)	1,600	1,600	-	2,400	2,400	-
	SD30 (JIS)	2,000	2,000	-	3,000	3,000	-
Structural steel	SS41 (JIS)	2,600	2,600	900	2,400	2,400	1,350

(Note) The short term allowable stress is to be used to design members against the combined stress of normal gravity loads and wind load (or seismic load).

Through test pits, soundings, interviews and on-site inspections, the bearing capacity of the soil of the Rajapur district has been determined to be 8.0 t/m<sup>2</sup>, due to its silty sand consistency. The bearings capacity of the soil of Dangadhi and Manendranagar is 12.0 t/m<sup>2</sup>, also due to its silty sand matrix. In this area there is a rock layer at a depth of 2.0 - 2.5 m.

(4) Load

1) Dead Load

Unit weight of the principal materials are shown below. The weight of structural material, finishing material and other equipment are to be calculated individually.

* Concrete	2.3 t/m <sup>3</sup>
* Reinforced concrete	2.4 t/m <sup>3</sup>
* Mortar	2.0 t/m <sup>3</sup>
* Steel frame	7.85 t/m <sup>3</sup>
* Brick	1.9 t/m <sup>3</sup>

## 2) Live Load

The live load for special applications such as storage buildings and mill buildings should be calculated taking actual conditions into consideration, while the live load for general purpose applications is to be taken from the regulations of Japan's Building Standards Act. Some of the typical items are shown below.

Application	for slabs, and purlings	for beams	for frame members and footings	for earthquake
Steel frame roof	30	30	10	0
Concrete roof	100	100	60	40
Office	300	300	180	80
Grain storage	2,760	2,760	2,500	-
Machine room	500	500	240	130

## 3) Wind Load

The wind load is as calculated below.

$$P = c \times q$$

$p$ : wind pressure ( $\text{kg/m}^2$ )  
 $c$ : coefficient of wind  
 $q$ : velocity pressure ( $\text{kg/m}^2$ )

As there is no observation station for wind velocity in the district of Terai, the velocity pressure is calculated on a presumed maximum wind velocity.

$$q = 1/2 \times \rho \times v^2$$

$q$ : velocity pressure ( $\text{kg/m}^2$ )  
 $\rho$ : air density ( $\text{kg sec}^2/\text{m}^4$ )  
 $v$ : wind velocity (m/sec)

here, if  $v$ : 35 m/sec,  $\rho = 0.125 \text{ sec}^2/\text{m}^4$

$$q = 1/2 \times 0.125 \times 35^2 = 80 \text{ kg/m}^2$$

80  $\text{kg/m}^2$  is to be the design velocity pressure. In Japan, the velocity pressure would usually be in the range of 120  $\text{kg/m}^2$  to 150  $\text{kg/m}^2$ , if the height is in the range of 4 m to 6 m.

But in the Terai district which has no typhoons or cyclones, the value  $80 \text{ kg/m}^2$  appears reasonable.

#### 4) Earthquake Load

Nepal has no regulations for earthquake resistant design and again depends upon the Indian Standard Code for design. This indicates that the district Terai belongs to Zone IV and that its seismic coefficient is 0.08 due to the ground condition of soft soil. Some special buildings for accommodating essential services shall be designed for one and half times the seismic coefficient specified above.

$$Q = CW \quad Q: \text{ design shear force}$$

C: shear force coefficient

$$C = I \times C \quad C: \text{ standard shear force coefficient } 0.08$$

I: application coefficient 1.5

that is,

$$C = 1.5 \times 0.08 = 0.12$$

$$Q = 0.12 W$$

In the article "A Proposal for Earthquake Resistant Design of Buildings in Nepal" by S. N. Rathi; Assistant Engineer, Ministry of Public Works, Transport & Communication, Building Department, HMG of Nepal (Refer to the study report of World Earthquake Engineering Academy held in December, 1964.) a concept similar to the above is disclosed.

According to "The Study Report on Building Engineering", dated February, 1980, by the Research Institute for Buildings, Ministry of Construction of Japan, the earthquake load is presumed as follows:

The map of earthquake hazard zones, which was based upon the statistics of the past 50 years, indicates that the acceleration rate to the surface of the earth is approx. 50. Therefore, the responded acceleration value of a single storey building would be 125 gals at the maximum, which is approx. 2.5 times of that of the earth surface. In this case sharing

coefficient is as follows:

$$C = 125/980 = 0.13$$

Therefore, the shear force coefficient of 0.12, which is taken from the aforementioned Indian Standard Code, can be reasonably adopted for design.

#### 5-2-4 Utilities Plan

##### (1) Electric Installation

###### 1) Rajapur

###### a) Installation of Main Electricity Lines

Electric power is to be supplied by means of an aerial electric power line to respective buildings from a low voltage power distribution panel to be installed at the electric power generator room.

Type of electricity                      3 phase and 4 line type,  
400 - 230V, 50 Hz

###### b) Electric Lighting and Outlets Installation

Fluorescent lamps are to be used mostly, and the intensity of illumination is to be determined as follows:

Offices	200 - 300 lux
Drying yard	150 - 200 lux
Mill operation	150 - 200 lux
Storage	passageways only

\* Each office and room shall be provided with duplex outlets.

###### c) Power Installation for Mechanisms

Control panels are to be installed, where necessary, to supply power load to mechanisms. The panels will also be used for process control.

Type of electricity - 3 phase and 3 line type, 400V, 50 Hz

d) Installation of Lightning Rods

The plants and warehouses shall be provided with lightning rods as protection against lightning strikes. The lightning rods are to be installed according to JIS A4201-1981.

2) Dangadhi

a) Installation of a Power Line

A power line is to be drawn aerially from the low voltage power line (3 phase and 4 line type, 400/230V) running along the front road to the low voltage power distributing panel installed in the office building.

Type of electricity to be received - 3 phase and 4 line  
type, 400 - 230V,  
50 Hz

Installed capacity:

Office building	- 2.5 KVA
Warehouses	- 18.8 KVA
Others	- 1 KVA

(Total - 22.3 KVA)

b) Installation of Main Electricity Lines

Electric power is to be supplied aerially to respective office/warehouses from the low voltage power distributing panel installed in the office building.

Type of electricity

Office	- 3 phase and 4 line type, 400 - 230V, 50 Hz
Warehouse	- 3 phase and 4 line type, 400 - 230V, 50 Hz
Others	- Single phase and 2 line type, 230V, 50 Hz

c) Installation of Lighting

Fluorescent lamps are to be used mostly, and the intensity of illumination is to be determined respectively as follows:

Office - 200 - 300 lux  
Storage - passageways only

\* Each office and room shall be provided with duplex outlets.

### 3) Mahendranagar

#### a) Installation of a Power Line

A power line is to be drawn aerially from the low voltage power line running over the front road to the low voltage power distributing panel to be installed at the office building.

Type of electricity to be received - Single phase and 2 line type, 230 V, 50 Hz

Installed capacity:

Office building - 2.5 KVA  
Warehouses - 4.7 KVA  
Others - 1 KVA  
(Total - 8.2 KVA)

#### b) Installation of Main Electricity Lines

Electric power is to be supplied aerially to respective office/warehouses from the low voltage power distributing panel installed in the office building.

Type of electricity - Single phase and 2 line type, 230V, 50 Hz

#### c) Installation of Lighting

Fluorescent lamps are to be used mostly, and the intensity of illumination is to be determined respectively as follows:

Offices - 200 - 300 lux  
Storage - passageways

\* Each office and room shall be provided with duplex outlets.



(2) Water Supply, Sanitary and Drainage Plan

1) Rajapur

a) Water Supply Facilities

A well (15m deep) shall be dug within the site. With the water stored in a low storage tank, it shall then pass through the elevated tank, and supplied to the parboiled rice plant and other buildings by means of a gravity system. The quantity of water to be supplied shall be as follows:

For parboiled rice plant:	30,000 ℓ/day
For personnel:	30 men x 100 ℓ/men·day
	= 3,000 ℓ/day
	total 33,000 ℓ/day

b) Sewage Facilities

A septic tank and an underground osmosis system shall be installed for domestic sewage. An osmosis system shall be used for sewage water disposal from the parboiled rice plant as well, and this waste shall be disposed of in a pool within the site.

2) Dangadhi

a) Water Supply Facilities

A well (15m deep) shall be dug within the site, and the water supplied to the office building by a deep well pump. The planned amount to be supplied is as follows:

8 men x 100 ℓ/men·day = 800 ℓ/day

b) Sewage Facilities

A septic tank and an underground osmosis system shall be installed for domestic sewage.

### 3) Mahendranagar

#### a) Water Supply Facilities

Public city water shall be supplied to the office building.  
The planned amount to be supplied is as follows:

$$8 \text{ men} \times 100 \text{ } \ell/\text{men}\cdot\text{day} = 800 \text{ } \ell/\text{day}$$

#### b) Sewage Facilities

A septic tank and an underground osmosis system shall be installed for domestic sewage.

### 5-2-5 External Work Plan

#### (1) Passageways on the Premises

Cargo trucks owned by NFC have a 10-ton capacity, while the trucks which NFC usually rents have an 8-ton capacity. The roads on the premises shall be determined based upon the minimum turning radius required for a 10-ton truck and its ability to park with its back end close to the shipping/receiving dock.

The roads shall be paved with asphalt pitch.

#### (2) Drainage for Rainwater

The Terai is a wide, flat plain and drainage has not yet been developed. Rainwater either is absorbed into the ground or evaporated. Therefore, when lands are covered by an structure or paved road, water disposal facilities are required. Because foodgrain storage must be free from the effects of moisture, rainwater should be disposed of as quickly as possible.

The area around warehouses including paved areas shall be sloped and contoured to handle surface drainage. Excess drainage shall be directed to water disposal facilities.

Local methods of handling drainwater is through constructed brick channels placed to pick up excess water from paved areas and surrounding site. The disposal facility is simply a pit dug into

the ground where excess water is directed. The pits are usually a result of the soil being dug and used elsewhere as fill.

The size of pit required for this disposal is to be determined by the balance between the amount of infiltration, storage and evaporation and the amount of rainwater expected.

1) Drained rainwater disposal in Rajapur

The site requires filling and there appears no suitable place nearby where earth can be removed for this use, and there is no vehicle in which to transport it other than bullockcarts. This will be very costly. For this site, there will be no way other than to make pits along the periphery of the site for the drainwater disposal.

Fill for the site can be accomplished using the soil obtained from digging the pits.

2) Drained rainwater disposal in Dangadhi

There is an existing continuous pit along the frontage road adjacent to the site, which was made during construction of the road. As it is a continuous pit and there is no rainwater source other than the paved road, there appears sufficient disposal capacity for the site.

3) Drained rainwater disposal in Mahendranagar

There is an existing continuous pit along the road to the west of the site which was made during the construction of the road. Both building area and pavement run off will not be so large as to cause a problem if the pit is used for drainage.

(3) Other External Works

1) Fence

The premises shall be enclosed by fences for security purpose to prevent unwanted persons from entering. According to the local construction custom, the fence is to be made of bricks

with its top being sloped and barbed wire entanglements attached.

2) Outdoor Lighting

A minimum amount of outdoor lighting shall be provided on the external wall of the building. The upper position of the opening for shipping and receiving are suggested.

3) Drying Area for Parboiled Rice

The area shall be paved with concrete, and raised approx. 20 cm higher than the surrounding ground. The concrete shall be finished by steel trowel and a pitch of 1/100 shall be provided. The concrete shall be hard mixture. As to the area required, refer to "The Plant Plan".

5-2-6 Plan for Equipment

The materials and equipment to be procured consist of typical storage equipment, a rice mill scheduled to be attached to the storage in Rajapur.

(1) Plan for Typical Storage Materials and Equipment

The materials and equipment for each storage include general cargo-work equipment for agricultural products, storage tools, fumigation materials, weighing instruments, inspection instruments and selected cleaning tools, as shown by Table 5-2-6(1).

(2) Plan for Rice Mill Attached to Storage in Rajapur

The rice mill attached to a storage in Rajapur consists of the Rice Milling Plant and Rice.

a) Basic Design of Rice Milling Plant

The target annual volume of rice milling is 2,400 tons at best, with an annual operating period from December to May, 150 annual operating days and 8 daily operating hours. There-

Table 5-2-6(1) Plan of Equipment for Proposed Storages

No.	Item	Quantity			Total	Specifications
		Rajapur	Dangadhi	Mahendranagar		
<b>A. Fumigation</b>						
A- 1	Fumigation Sheet	24 sheets	16 sheets	16 sheets	56 sheets	18 x 12 m
- 2	Sand Bag (Sand Snakes)	2 rolls	2 rolls	2 rolls	6 rolls	0.1m width x 200m length/roll
- 3	Sheet Crip	48 dzs	32 dzs	32 dzs	112 dzs	
- 4	Gas Mask	5 pcs	5 pcs	5 pcs	15 pcs	for hydrogen phosphate
- 5	Gas Absorption Can	10 "	10 "	10 "	30 "	"
- 6	Gas Concentration Detector	1 set	1 set	1 set	3 sets	"
- 7	Tube for Gas Concentration Detector	3 boxes	2 boxes	1 box	6 boxes	"
- 8	Gas-proof Clothing	5 sets	5 sets	5 sets	15 sets	coat and trousers,boots,gloves
- 9	Ladder	6 sets	4 sets	1 set	11 sets	aluminum made, 7m length
<b>B. Warehouse Management</b>						
B- 1	Power Sprayer	1 set	1 set	-	2 sets	tank capacity more than 10litter
- 2	Hand Sprayer	2 sets	1 "	1 "	4 sets	"
- 3	Pallet	1,320 pcs	960 pcs	240 pcs	2,520 pcs	pre-pressure type wooden made, 1.8 x 0.85 x 0.1m
- 4	Grain Thermometer	30 "	20 "	5 "	55 "	dial display
- 5	Hygrometer	6 "	4 "	1 pc	11 "	wet and dry bulb
- 6	Wheel Barrow	12 "	8 "	2 "	22 "	max. loading cap. 250 kg
- 7	Platform Scale	6 "	4 "	1 "	11 "	max. weighing cap. 500 kg, sensitivity 200g
- 8	Sieve Set	1 set	1 set	1 set	3 sets	2 pcs/set
- 9	Winnower	1 "	1 "	1 "	3 "	manual operation
-10	Broom	12 pcs	8 pcs	2 pcs	22 pcs	with long handle
<b>C. Inspection</b>						
C- 1	Moisture Meter	3 sets	2 sets	1 set	6 sets	electric resistance type
- 2	Table Spring Scale	1 pc	1 pc	1 pc	3 pcs	weighing cap. 2kg,sensitivity 5g
- 3	Beam Scale	1 "	1 "	1 "	3 "	weighing cap.200g,sensitivity0.1g
- 4	Grain Trier	10 pcs	6 pcs	1 "	17 "	single type
- 5	"	2 "	2 "	1 "	5 "	double type
- 6	Sample Divider	1 set	1 set	1 "	3 sets	Cap. 3kg
- 7	Sieve Set	1 "	1 "	1 "	3 "	for wheat, round hole, 5pcs/set
- 8	"	1 "	1 "	1 "	3 "	for rice, slot hole, "
- 9	Grain Shape Tester	1 pc	1 pc	1 "	3 pcs	measuring range 0-10 mm
-10	Seed Sample Pan	50 pcs	50 pcs	50 pcs	150 "	round type
-11	"	50 "	50 "	50 "	150 "	square type
-12	Magnifier	1 pc	1 pc	1 pc	3 "	x7
-13	Mirror Plate	1 "	1 "	1 "	3 "	
-14	Grain Crack Inspector	1 "	1 "	1 "	3 "	for 50 kernels
-15	NMG Reagent	1 box	1 box	1 bc	3 boxes	25g/bottle
-16	Test Paddy Husker	2 pc	2 pc	1 pc	5 pcs	manual operation
-17	"	1 set	-	-	1 set	power driven
-18	Test Rice Polisher	1 "	-	-	1 "	"
-19	Test Broken Rice Separater	1 "	-	-	1 "	"

fore, the capacity for processing paddy is 2 tons per hour.

Storages attached to a rice mill are required for paddy and milled rice. The storage in Rajapur to be built under this project (proposed capacity of 5,500 tons) should be used jointly for raw paddy connecting lines. A part of the rice mill plant may be used for milled rice as a provisional space prior to shipment.

The machines are driven by electric motors which are controlled by central board. Power is generated by diesel generator.

The cleaning process of the rice mill plant may be jointly used with the parboiled plant in order to save investment costs of the plants. Both plants should be designed to have a larger capacity for the cleaning process, to reduce problems during operation.

Multi-passes milling process is adopted to reduce the incidence of broken rice during the rice milling process and to improve the yield of sound milled rice. The layout of a tier-type process will be studied for the purpose of economy.

Japan-made rice milling machines are said to stick while milling parboiled rice. Attention should be given to this aspect.

Broken rice is not currently separated from unbroken rice. The incorporation of a simple fine-broken rice separation device may improve the grade of milled rice as commodities.

The flowchart, major machines and the layout of a rice mill are shown by Figure 5-2-6(2), Table 5-2-6(3), Figure 5-2-6(4) and Figure 5-2-6(5) respectively.

#### b) Basic Design for Rice Parboiling Plant

Parboiled rice has merits such as the improved yield of milled rice, durability for longer storage, and nutrition. Therefore, the processing of parboiled rice should be promoted through the quality improvement of conventional parboiled rice.

Fig. 5-2-6(2)

Flow Chart of Rice Mill Plant

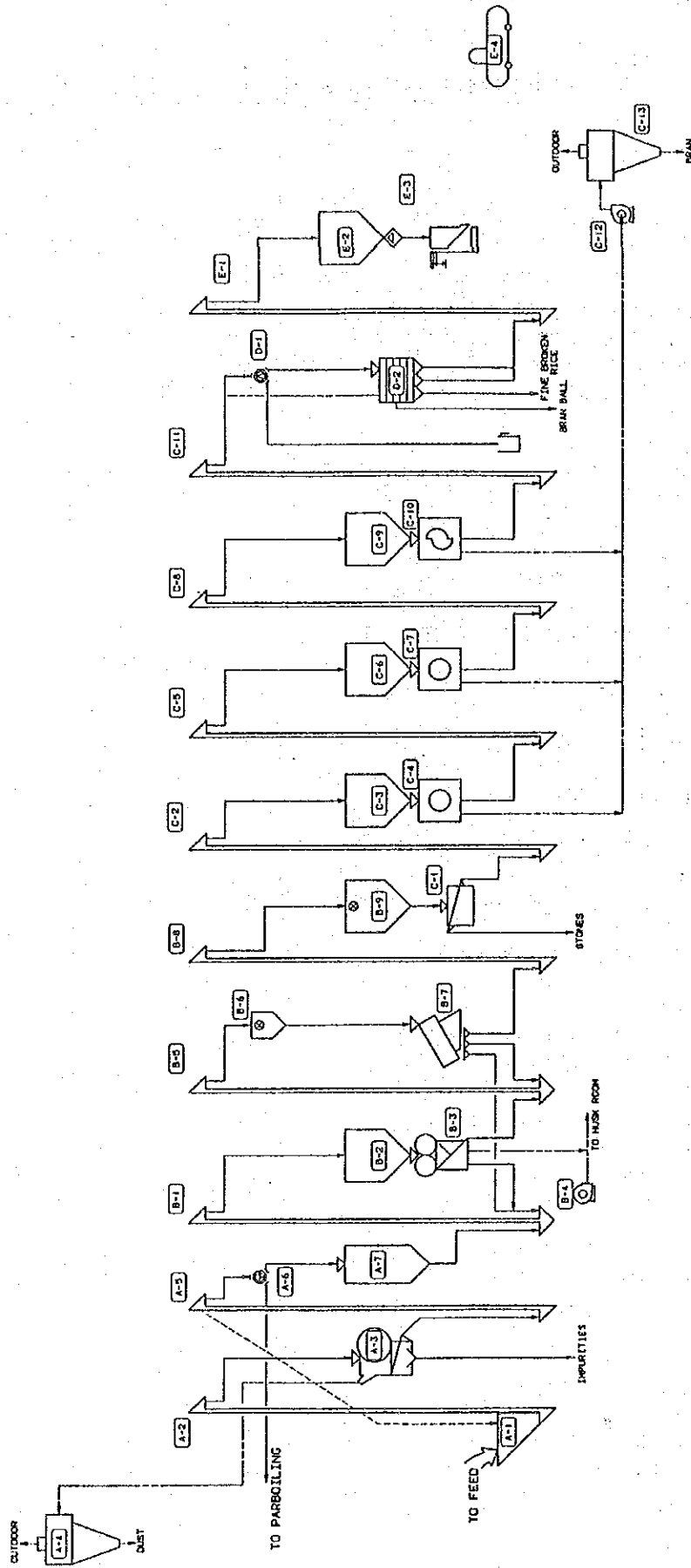


Table 5-2-6(3)

COMPONENTS MACHINES OF RICE MILLING UNIT

I/NO.	DESCRIPTION	KW-P	Q'TY	REMARKS
A	RECEIVING & CLEANING SECTION			
A - 1	RECEIVING HOPPER		1	
- 2	BUCKET ELEVATOR	0.4	1	
- 3	PADDY CLEANER	2.2, 0.75	1	
- 4	DUST COLLECTING CYCLONE		1	
- 5	BUCKET ELEVATOR	0.4	1	
- 6	2-WAY CHANGE VALVE		1	
- 7	CONTROL TANK		1	10 TON
B	HUSKING SECTION			
B - 1	BUCKET ELEVATOR	0.4	1	
- 2	CONTROL TANK		1	
- 3	PADDY HUSKER WITH ASPIRATOR	7.5	1	
- 4	HUSK BLOWING FAN	3.7	1	
- 5	BUCKET ELEVATOR	0.4	1	
- 6	CONTROL TANK		1	
- 7	PADDY SEPARATOR	0.75	1	
- 8	BUCKET ELEVATOR	0.4	1	
- 9	CONTROL TANK		1	
C	RICE WHITENING SECTION			
C - 1	STONER	0.75	1	
- 2	BUCKET ELEVATOR	0.4	1	
- 3	CONTROL TANK		1	
- 4	RICE WHITENING MACHINE	15.0	1	
- 5	BUCKET ELEVATOR	0.4	1	
- 6	CONTROL TANK		1	
- 7	RICE WHITENING MACHINE	15.0	1	
- 8	BUCKET ELEVATOR	0.4	1	
- 9	CONTROL TANK		1	
-10	RICE WHITENING MACHINE	15.0	1	
-11	BUCKET ELEVATOR	0.4	1	
-12	BRAN SUCTION FAN	5.5	1	
-13	BRAN COLLECTING CYCLONE		1	
D	CLEANING SECTION			
D - 1	2-WAY CHANGE VALVE		1	
- 2	ROTARY SIFTER	0.4	1	
E	PACKING SECTION			
E - 1	BUCKET ELEVATOR	0.4	1	
- 2	CONTROL TANK		1	
- 3	SCALE SHUTTER SET		1	
- 4	COMPRESSOR	0.4	1	



Fig. 5-2-6(4)

LAYOUT OF RICE MILL PLANT (TOP VIEW)

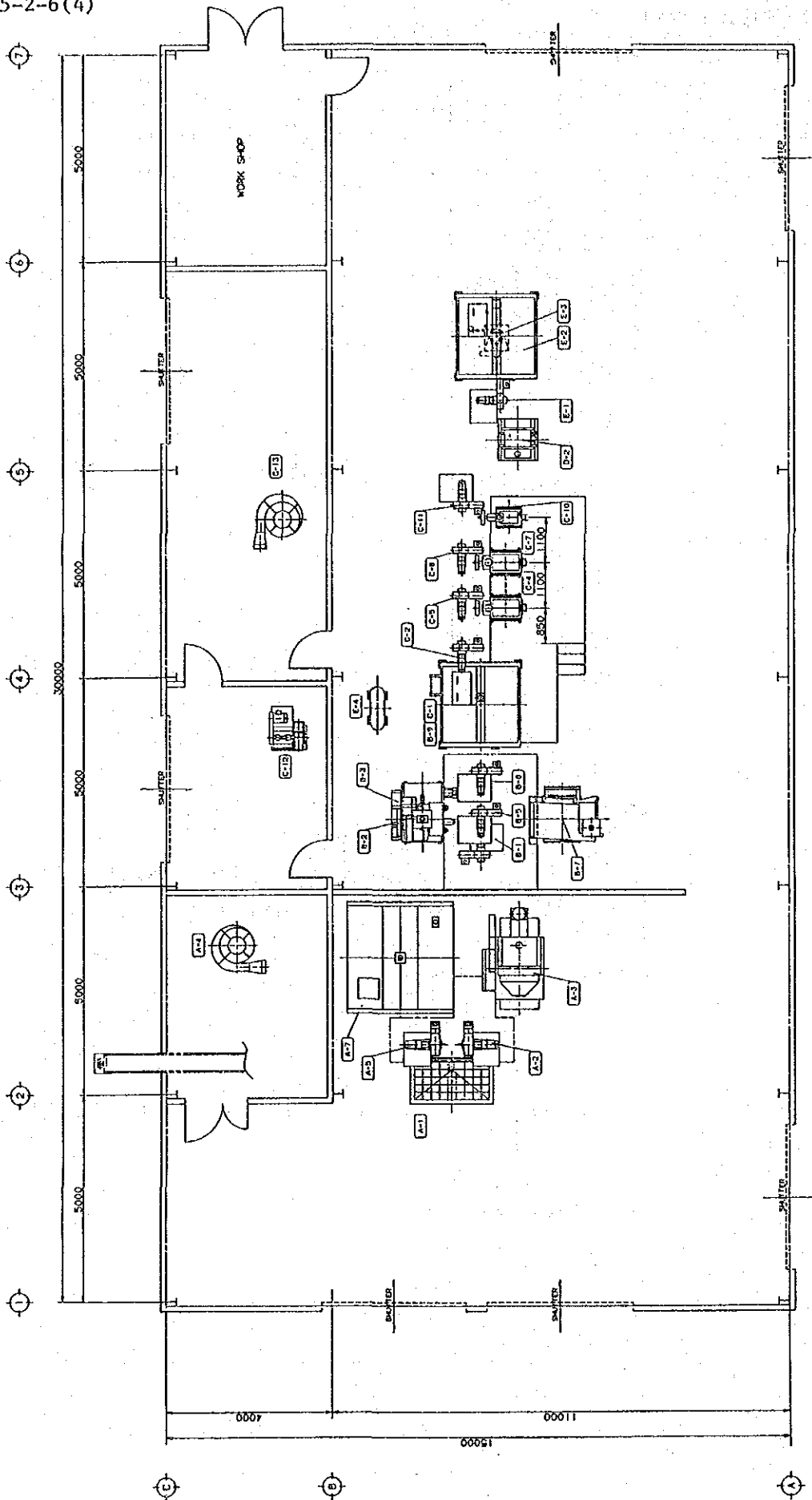
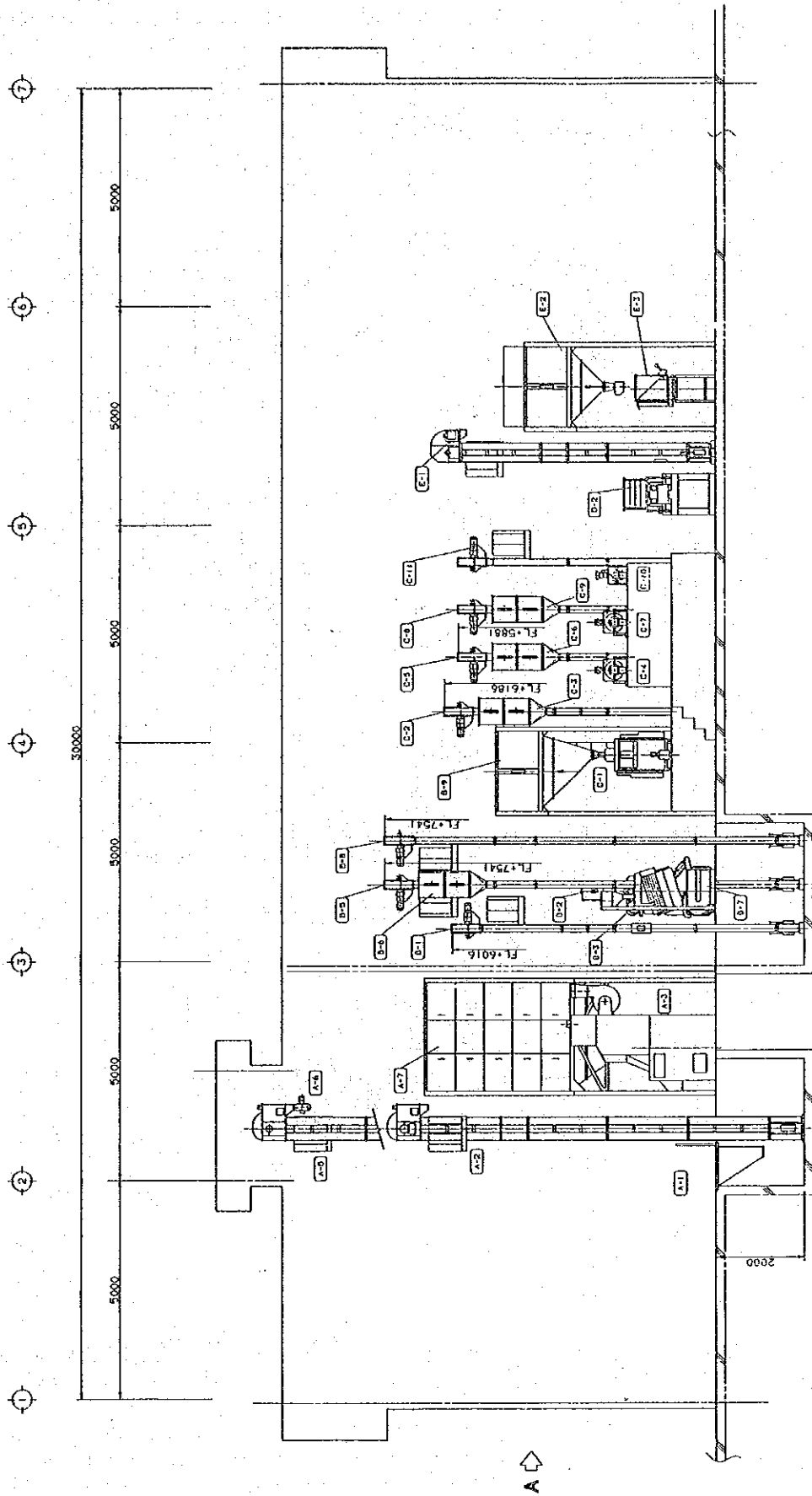


Fig. 5-2-6(5)

LAYOUT OF RICE MILL PLANT (ELEVATION)



The maximum annual amount of processing parboiled rice is 2,000 tons and the maximum daily amount is 20 tons. The operating period is in the dry season between December and May.

Raw paddy is selected to prevent odor and discoloration of products and to improve their quality. (Removal of foreign materials; selection of immature rice.) The selection plant may be used jointly with the rice mill plant for the purpose of economy.

Hot water is used for the paddy soaking process. Batch-type is adopted for the soaking and steaming process under normal atmospheric pressure, which is conducted in the same steel bin.

Drying is conducted by exposure to the sun.

The area required for the proposed sun drying station is as follows:

$$20 \text{ ton/day} \times 3 \text{ days}^* \div 0.05 \text{ m (average thickness of dry paddy)} \div 0.9 \text{ (ratio of effective dry area)} \doteq 2.666 \text{ m}^2$$

$$* (\text{MC40} - 18\%) \div 0.9\% \text{ (average rate of moisture reduction by drying per hour)} \div 8 \text{ hr/day (dry hour)} \doteq 3 \text{ days}$$

The drying station has a concrete floor with a gradual concave slope for drainage. The concave pitch is about 5 m and the height is about 0.2 m.

Paddy burning boiler may be adopted, for the soaking and steaming processes which need thermal energy.

The tempering of paddy during the manufacturing process of parboiled rice is required as follows; after being steamed, the paddy is about 35 to 40% of moisture content. This moisture content should be reduced to about 14%, which is suitable for rice milling and storage. However, quick drying should be avoided because it may cause tension within the rice granule and crack the grain of rice resulting in broken rice. Therefore, after the moisture content is reduced to about 20%

through initial drying, threshed paddy in bulk is left for tempering in the storage, then the moisture content is reduced to about 14% through the final drying. After the final drying, ample tempering should equalize the moisture content among rice granules prior to rice milling. To cool by the natural release of heat the temperature of the grain which has risen by drying may lead to the improvement of milled rice yield and quality. Therefore, the tempering process is essential, and requires storage space.

A storage for drying threshed paddy is planned for construction to provide space for such tempering, as a temporary depot of paddy on a rainy day.

Tempering space:

$$20 \text{ tons/day} \times 10 \text{ days} + H1.0 \text{ m} + 0.5 \text{ (spec. gravity)} = 400$$

Temporary depot of threshed paddy on a rainy day:

$$20 \text{ tons/day} \times 2 \text{ days} + H0.2 \text{ m} = 200 \text{ m}^2$$

The tempering space and the place for a rainy day may be jointly used. Therefore, the area of approx.  $400 \text{ m}^2$  may be sufficient. Then the floor space for the storage for drying paddy should be  $400 \text{ m}^2$ . The roof of the storage may be set low to allow the handling of paddy in bulk, but the inside of the storage should be well ventilated because the high temperature paddy with high moisture content are temporarily stored.

The flowchart of the parboiled rice manufacturing process, layout, process time chart and a list of major machines are shown by Figure 5-2-6(6), Figure 5-2-6(8), Figure 5-2-6(9) and Table 5-2-6(7).

c) Plan of Expenses for Maintaining and Operating Equipment

The expenses for controlling and maintaining a storage include labor, inspection, fumigation and lighting. As receiving inspections are handled by qualified NFC officials, no additional inspection expenses

are required. The equipment required for inspection will be provided under this project. Fixed labor expenses relating to loading and unloading from a storage may be reduced by the NFC officials supervising the operation undertaken by private companies. Insecticides and other consumption goods are currently used for pest control, so it would not be difficult to obtain them. Materials and equipment for fumigation are provided under this project. Power sources are required for lighting, but not for air conditioning, because the storage is to remain in normal temperature.

Maintenance and control of a rice mill plant and a parboiled plant require such expenses, beside labor, repair, water, electricity, heating, and other supporting materials.

Fig. 5-2-6(6)

Flow Chart of Parboiled Rice Plant

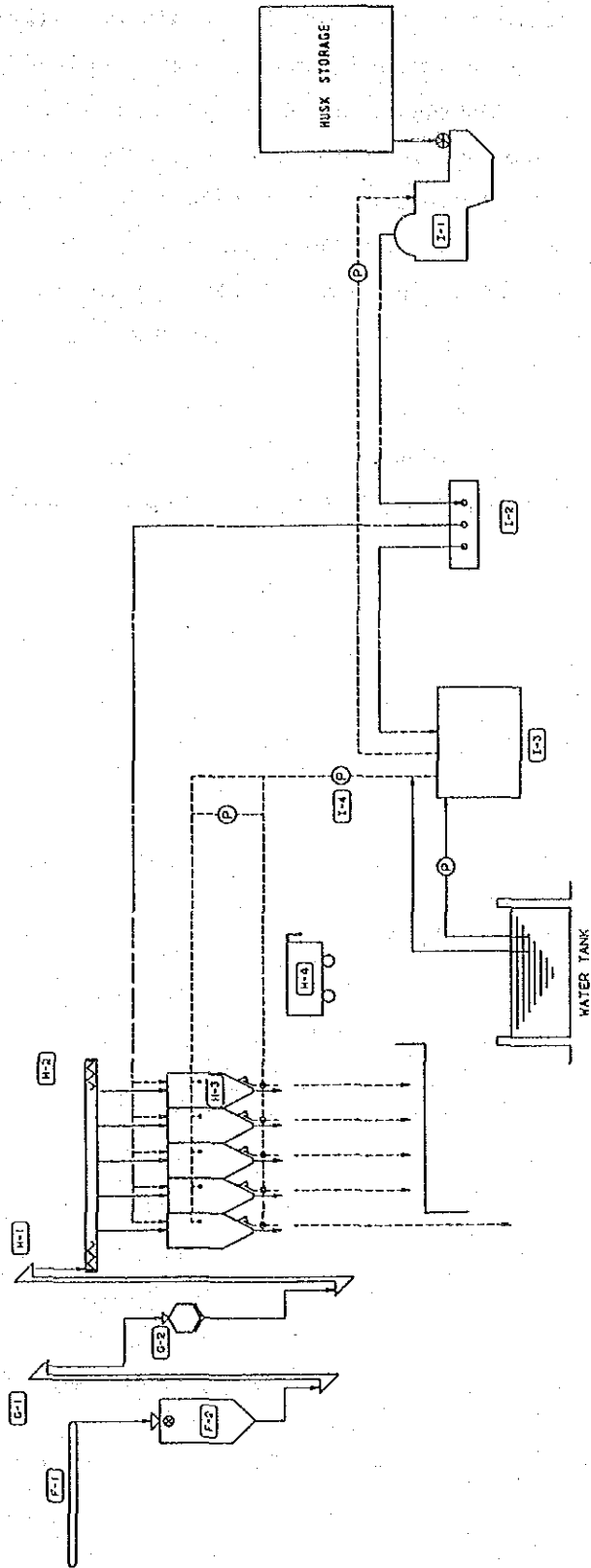


Table 5-2-6(7)

PARBOILED RICE PLANT

I/NO.	DESCRIPTION	KW-P	Q'TY	REMARKS
F	CONTROL TANK SECTION			
F - 1	BELT CONVEYOR	1.0	1	
- 2	CONTROL TANK		1	10 TON/EACH
G	PADDY CLEANING SECTION			
G - 1	BUCKET ELEVATOR	0.4	1	
- 2	THICKNESS GRADER	0.75	1	
H	PARBOIL SECTION			
H - 1	BUCKET ELEVATOR	0.4	1	
- 2	SCREW CONVEYOR	0.75	1	
- 3	SOAKING TANK		5	2 TON/EACH
- 4	WAGON		4	
I	HUSK BOILER SECTION			
I - 1	HUSK FIRED BOILER	0.75, 1.5	1	
- 2	STEAM HEADER		1	
- 3	HOT WATER TANK		1	
- 4	WATER PUMP	1.5 x 4	4	

Fig. 5-2-6(8)

LAYOUT OF PARBOILED RICE PLANT

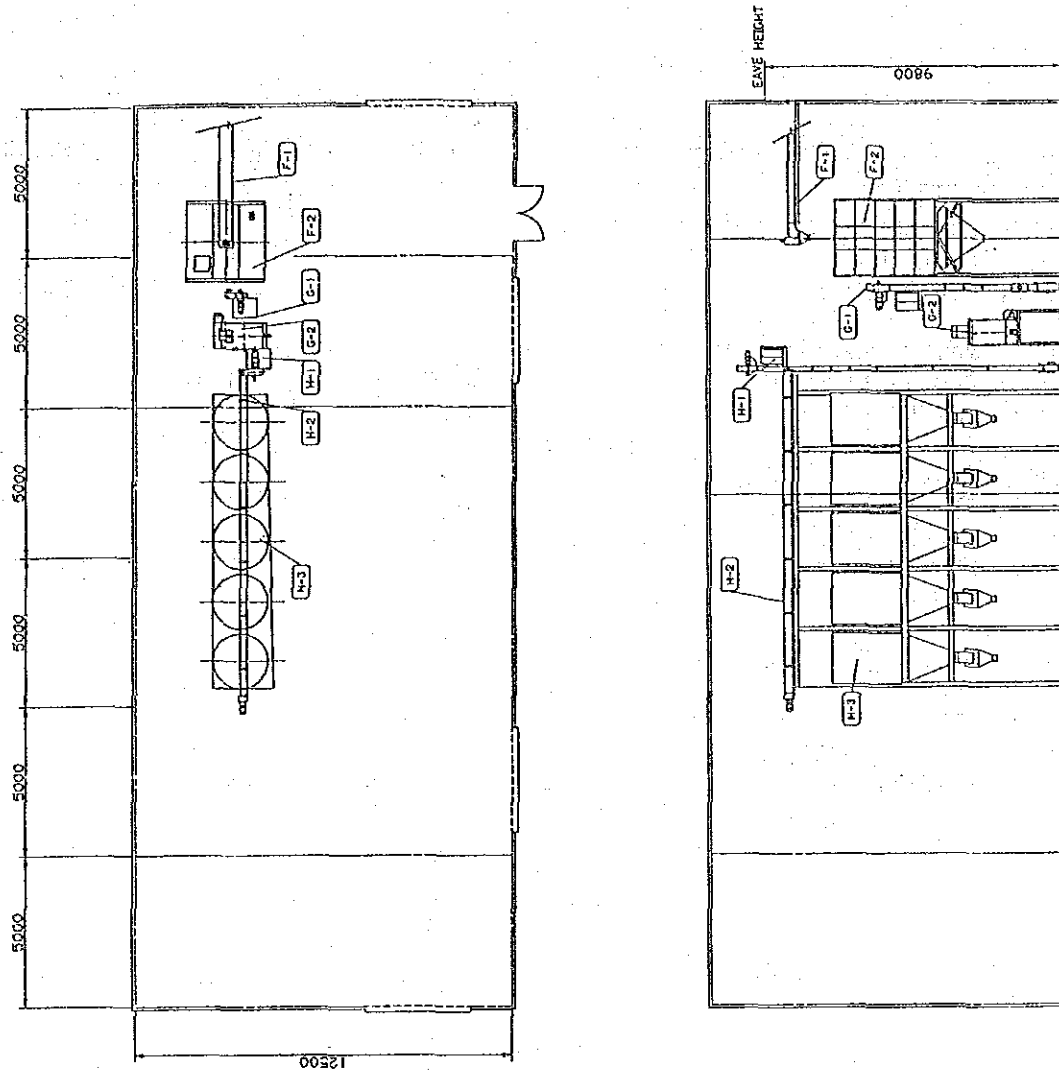
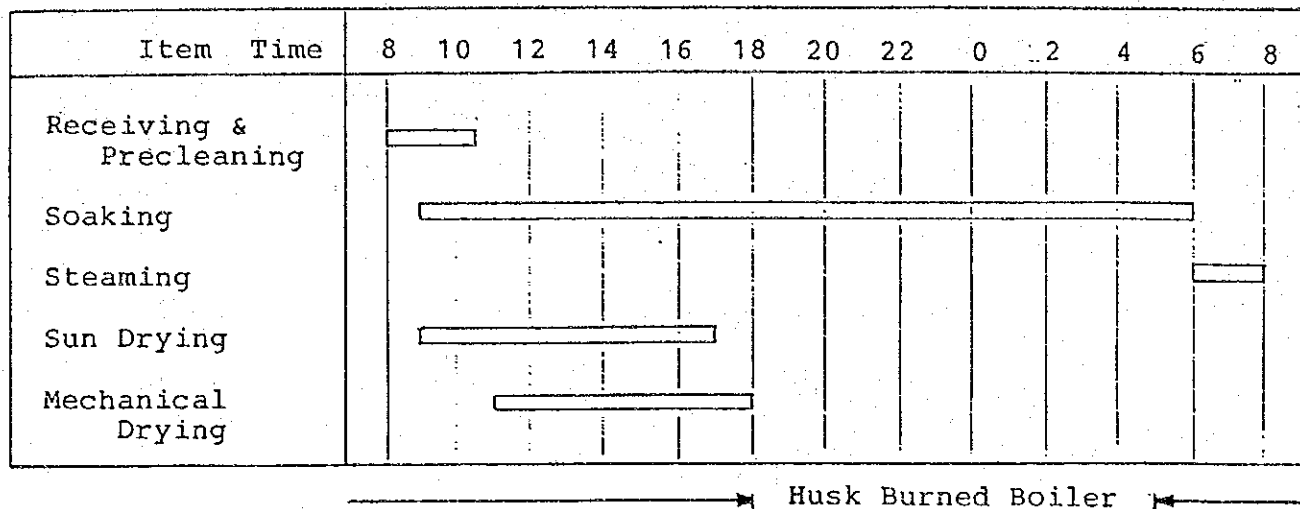




Fig. 5-2-6 (9)

WORK SCHEDULE



NEPAL Storage Project

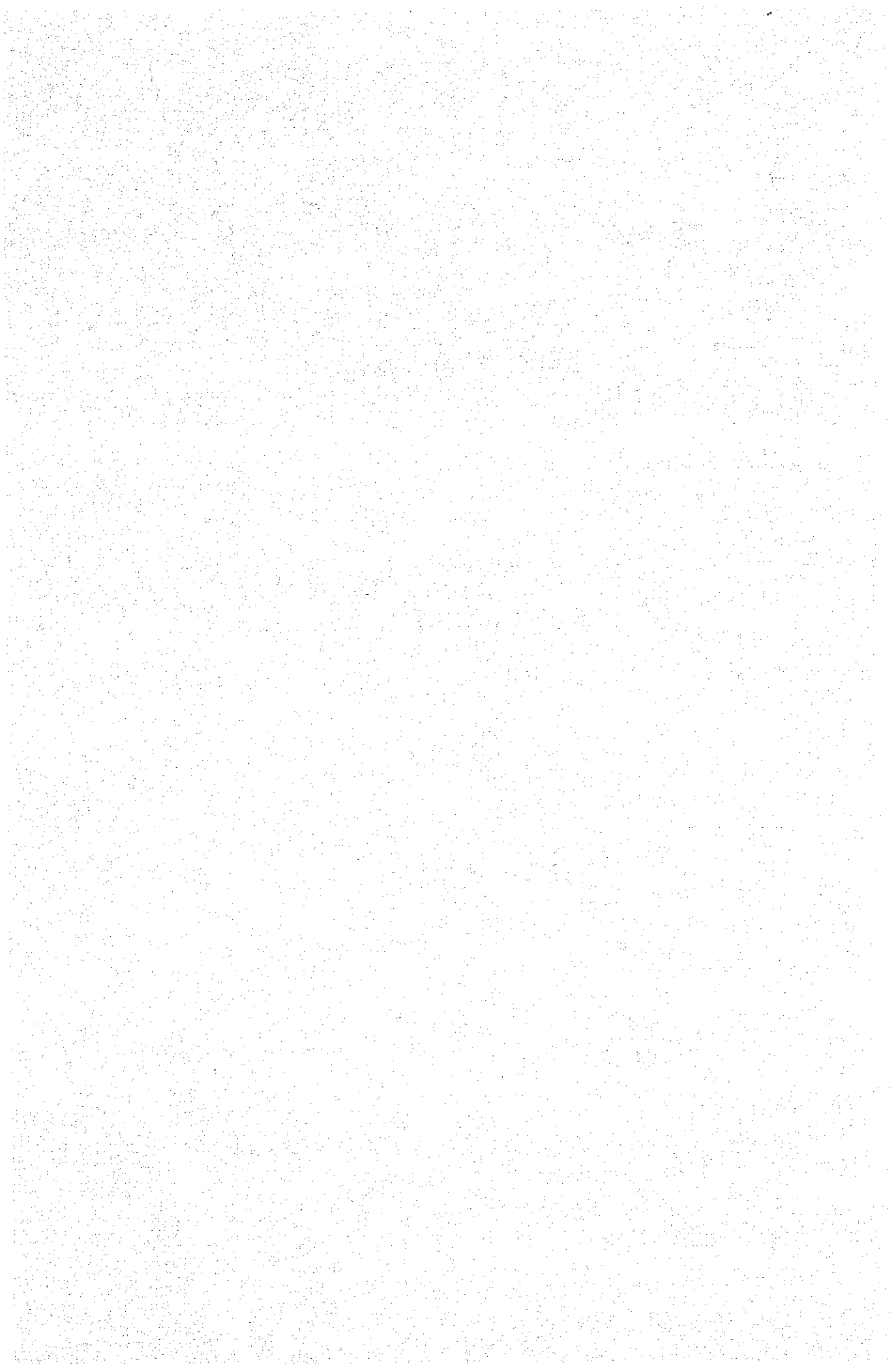
Basic Design Condition ( parboiling Process )

Processing Capacity

- Receiving & Precleaning: 8 ton / Hr
- Soaking : 20 tons ( 2 tons each x 5 )  
4 - 18 Hours
- Steaming : 1/4 Hour
- Sun Drying : 2 or 3 Days
- Mechanical Drying : 7 Hours ( 0.6 % / Hr )  
18 % - 14 %



## 5-2-7 BASIC DESIGN DRAWINGS



Floor Area

(m<sup>2</sup>)

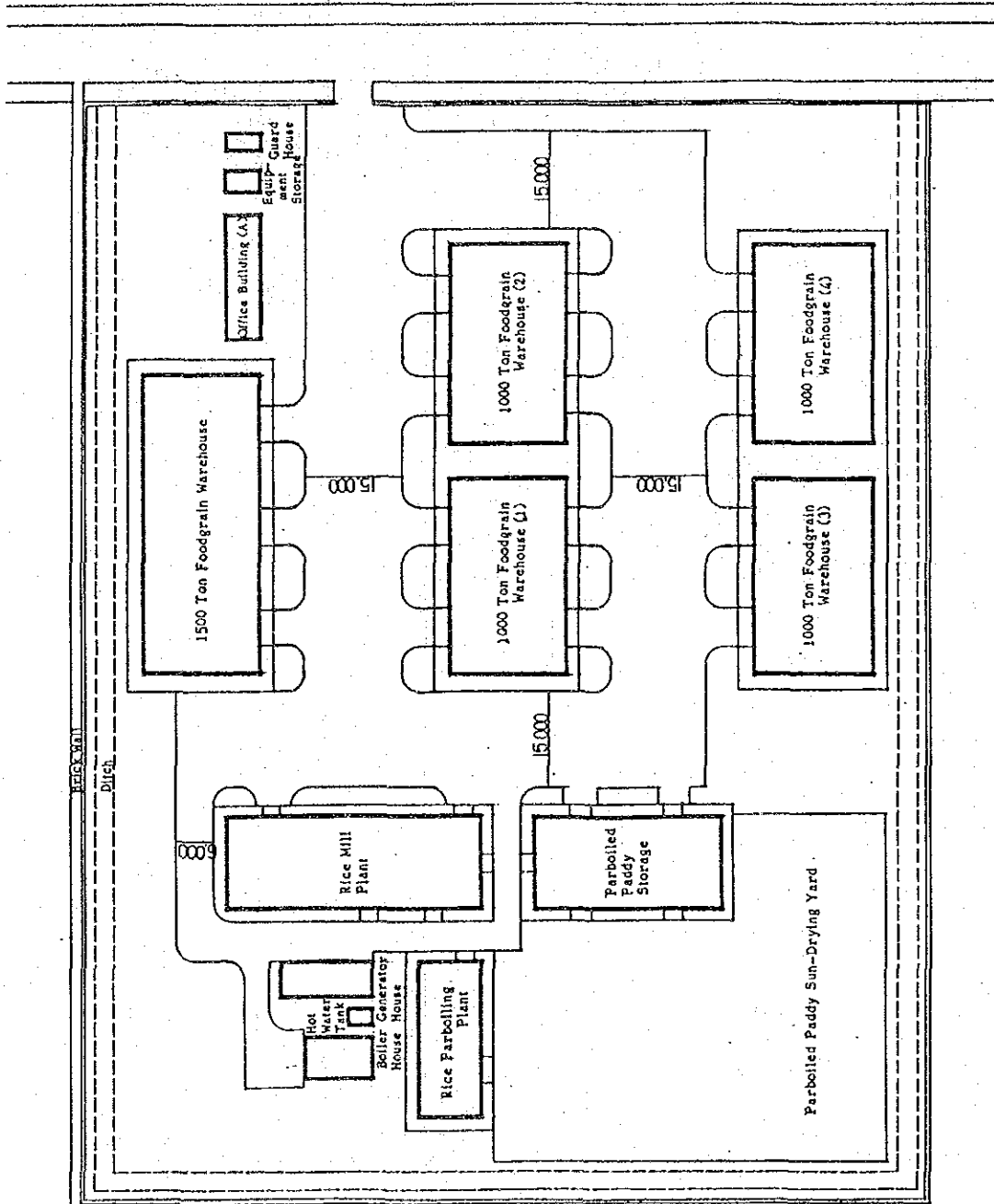
Site	Building	Room	Room's Floor Area	Building's Floor Area
Rajapur	1,000 Ton Foodgrain Warehouse (1) - (4)	Storage	2,436.96	2,436.96
	1,500 Ton Foodgrain Warehouse	Storage	902.97	902.97
	Office Building	Chief's Room	12.00	
		Office Room	30.00	
		Technician's Room	12.00	
		Laboratory	24.00	
		W.C. & Others	42.00	120.00
	Equipment Storage	Storage	24.00	24.00
	Guard House	Office Room	7.50	
		Bedroom & Others	7.50	15.00
Rice Mill Plant	Receiving & Cleaning Room	130.00		
	Husking, Whitening & Packing Room	165.00		
	Bran Room	20.00		
	Fan Room	20.00		
	Dust Collecting Room	20.00		
	Workshop & Spareparts Room	20.00		

Site	Building's Name	Room's Name	Room's Floor Area	Building's Floor Area
		Working Room	225.00	600.00
	Rice Parboiling Plant	Receiving & Separating Room	100.00	
		Parboiling Room	150.00	250.00
	Parboiled Paddy Storage	Storage	450.00	450.00
	Boiler House	Boiler Room	77.00	
		Husk Storage	77.00	154.00
	Generator House	Generator Room	90.00	90.00
	Sub-total			5,042.93
Bangadhi	1,000 Ton Foodgrain Warehouse (1) - (4)	Storage	2,436.96	2,436.96
	Office Building (B)	Office Room	24.50	
		Technician's Room & Laboratory	24.00	
		W.C. & Others	39.00	87.50
	Equipment Storage	Storage	24.50	24.50
	Sub-total			2,548.96

Site	Building's Name	Room's Name	Room's Floor Area	Building's Floor Area
Mahendranagar	1,000 Ton Foodgrain Warehouse	Storage	609.24	609.24
	Office Building (B)	Office Room	24.50	
		Technician's Room & Laboratory	24.00	
		W.C. & Others	39.00	87.50
	Equipment Storage	Storage	24.50	24.50
	Guard House	Guardman's Room	7.50	
		Bedroom & Others	7.50	15.00
	Sub-total		736.24	

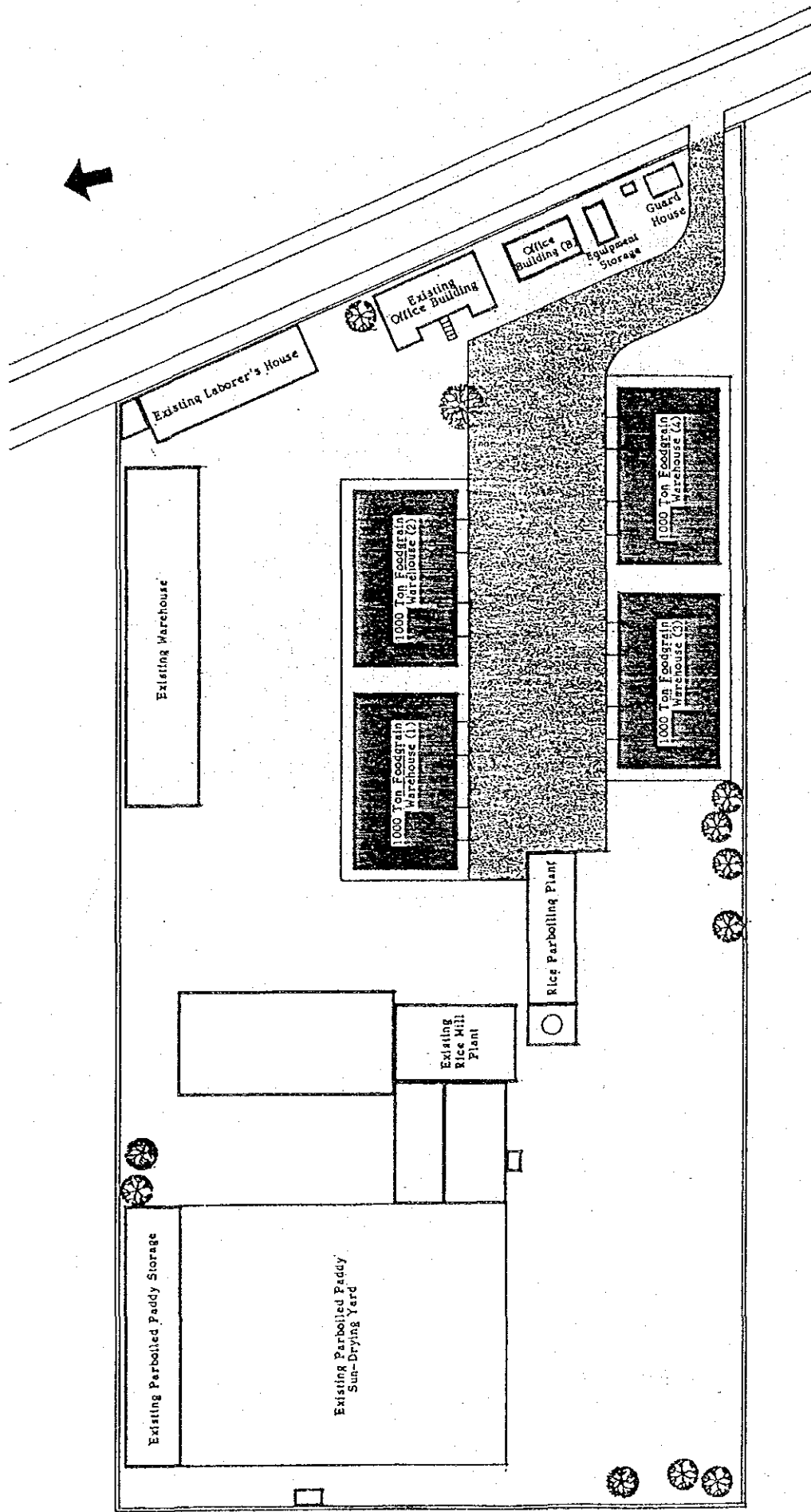
8,328.13

Total



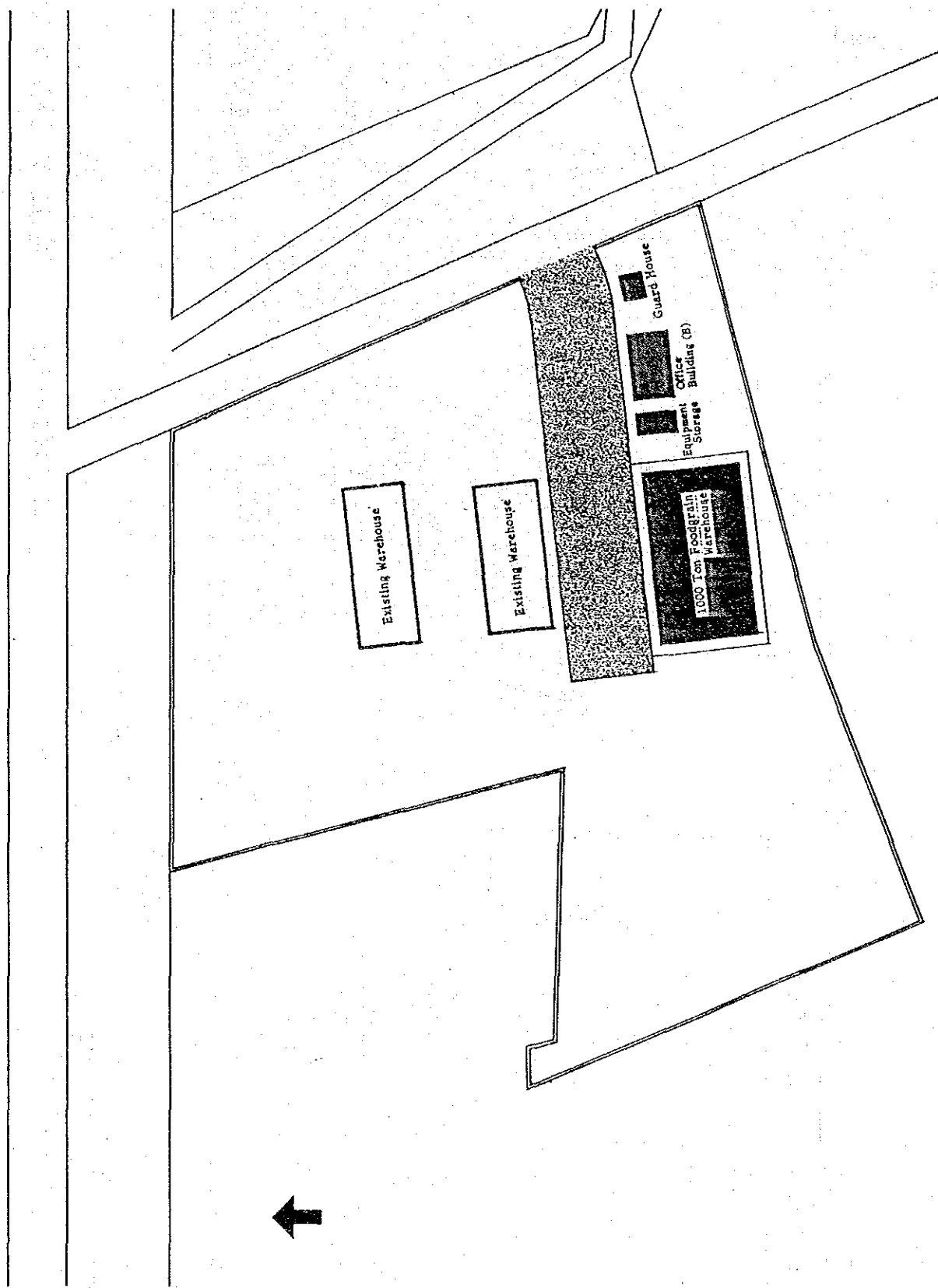
**RAJAPUR PLOT PLAN 1**



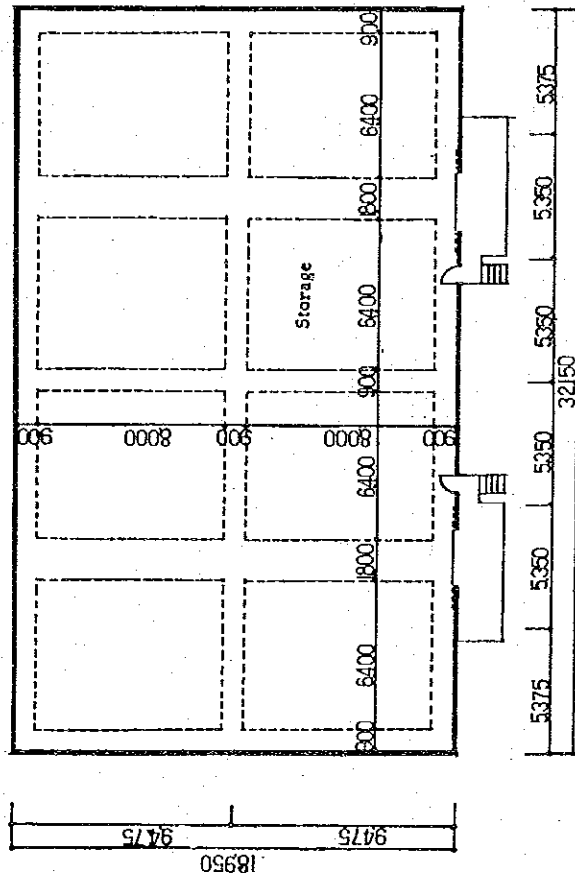


**DANGADHI PLOT PLAN 2**





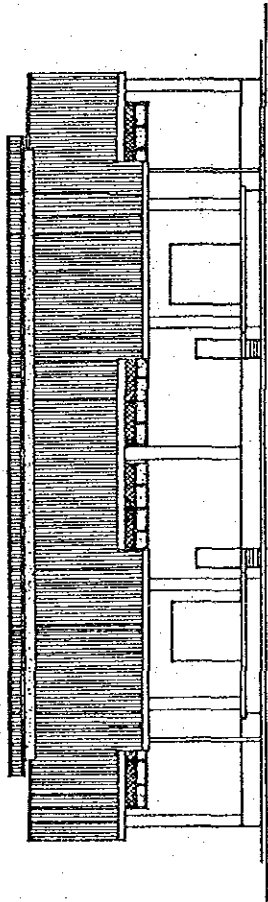
**MAHENDRANAGAR PLOT PLAN 3**



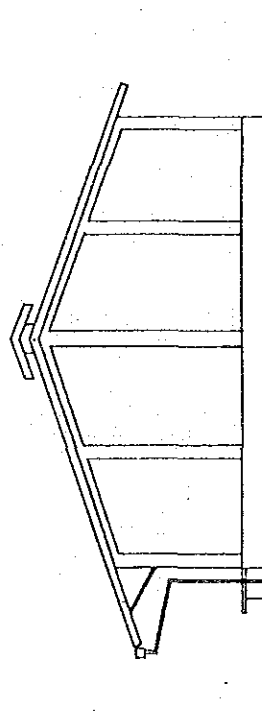
FLOOR PLAN

1000 TON FOODGRAIN WAREHOUSE 4

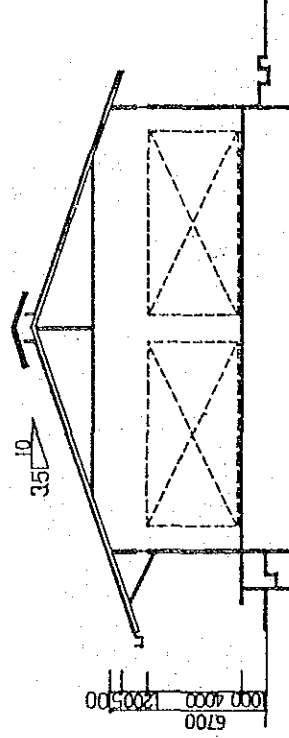




FRONT ELEVATION



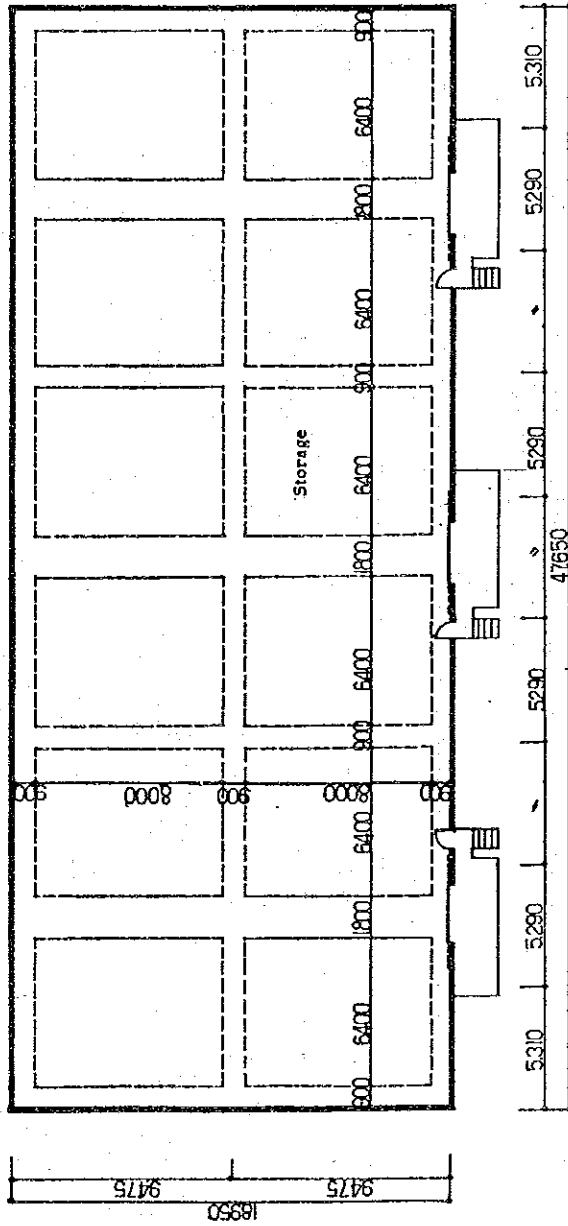
SIDE ELEVATION



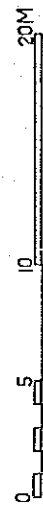
SECTION



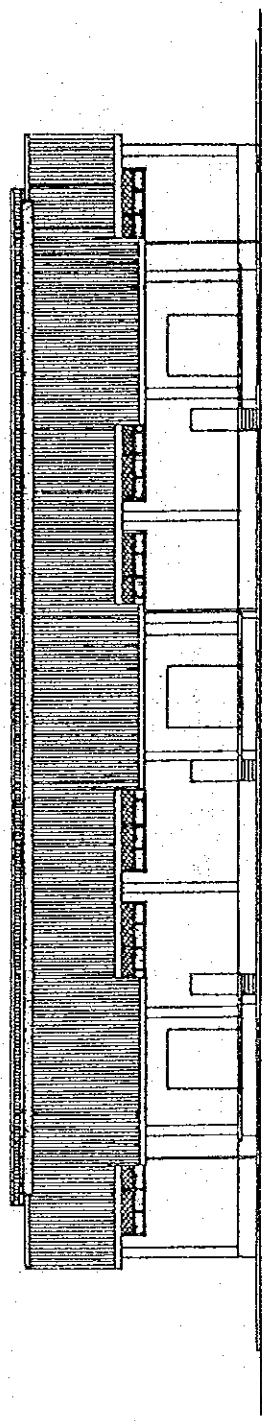
1000 TON FOODGRAIN WAREHOUSE 5



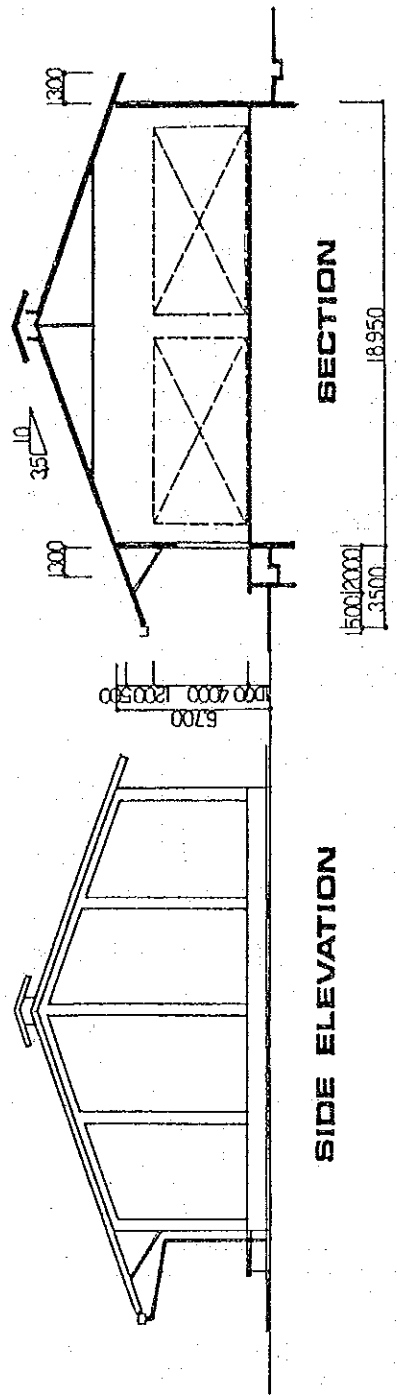
FLOOR PLAN



1500 TON FOODGRAIN WAREHOUSE 6



FRONT ELEVATION



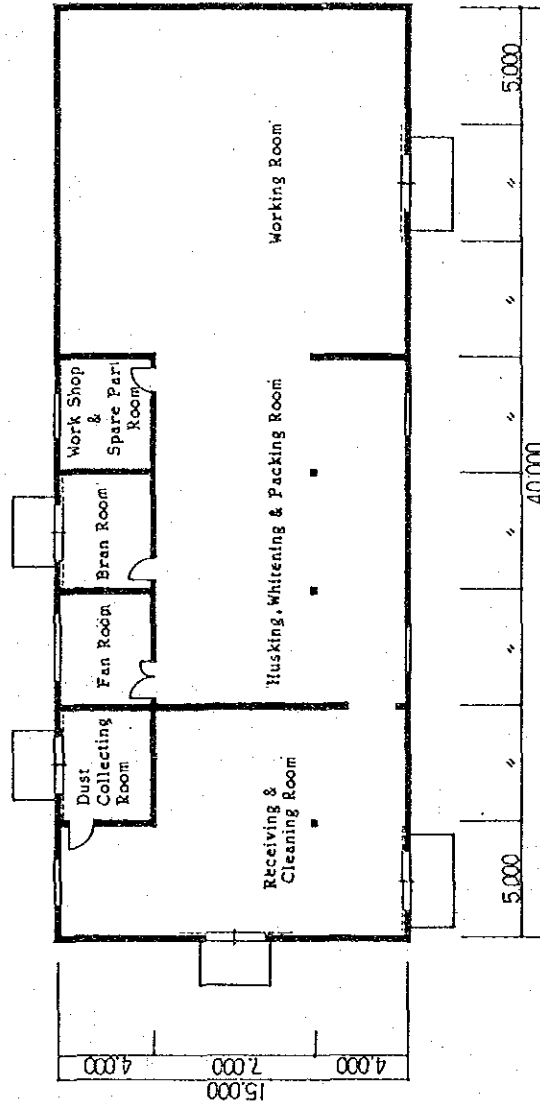
SIDE ELEVATION

SECTION



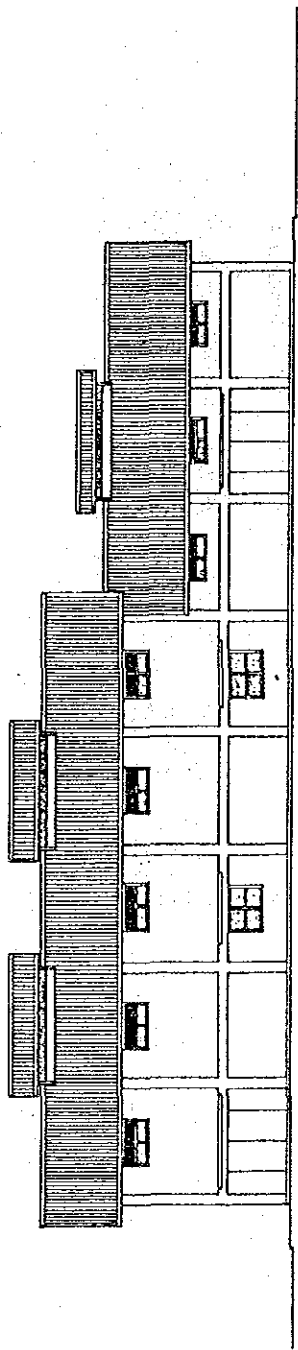
1500 TON FOODGRAIN WAREHOUSE 7

# RICE MILL PLANT 8

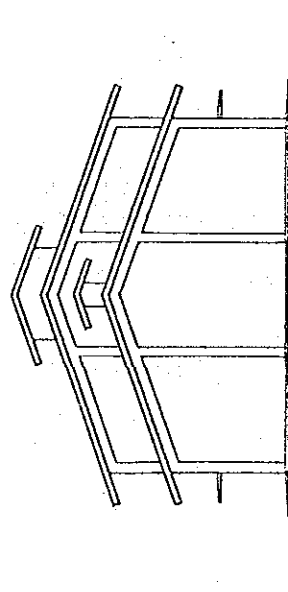


FLOOR PLAN

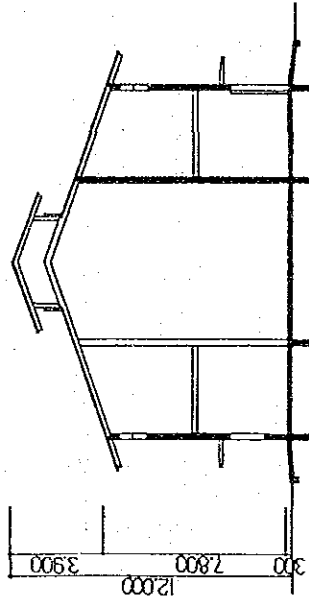




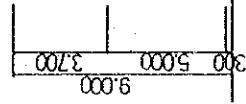
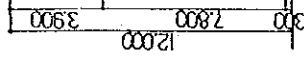
FRONT ELEVATION



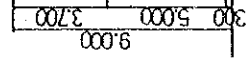
SIDE ELEVATION



SECTION 1

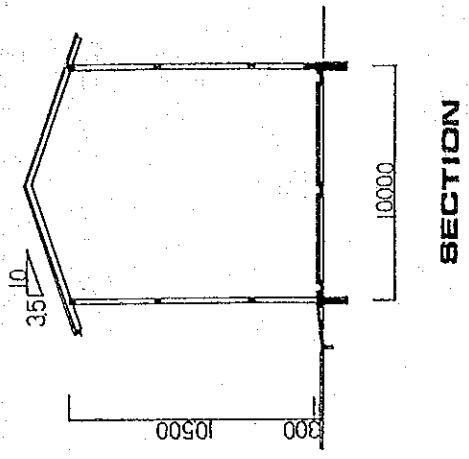


SECTION 2

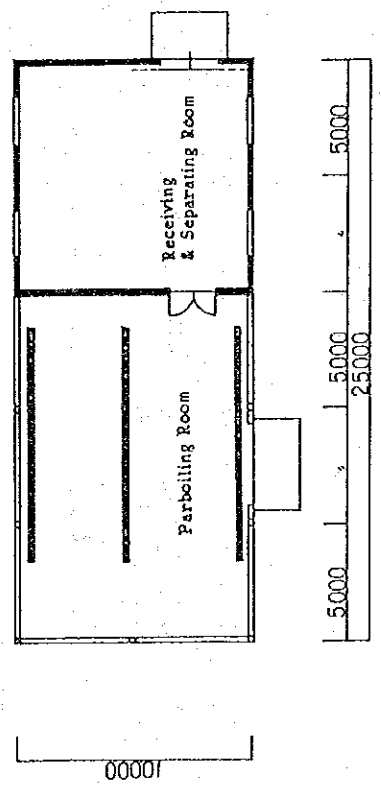


RICE MILL PLANT 9

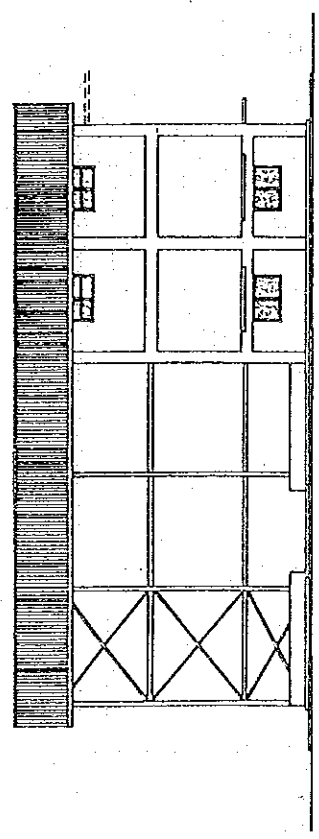




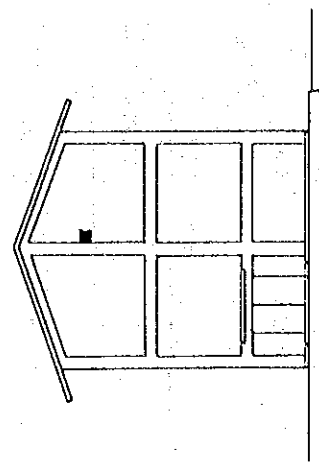
**SECTION**



**FLOOR PLAN**



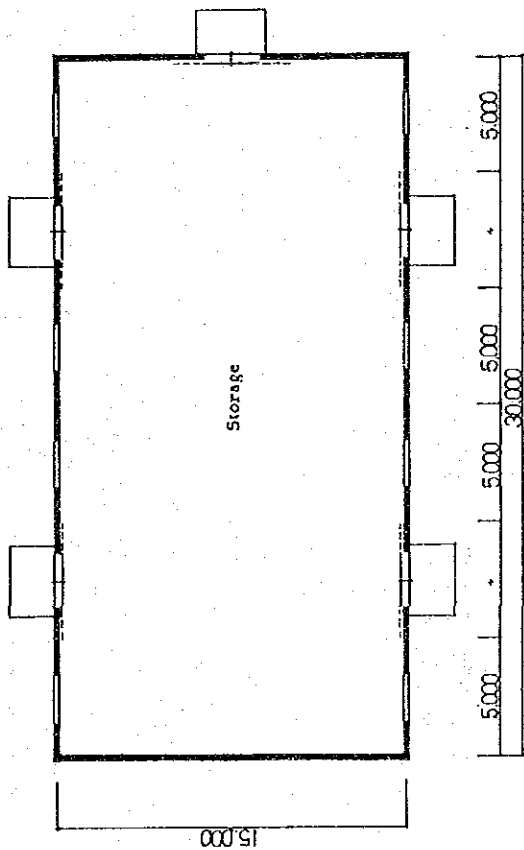
**FRONT ELEVATION**



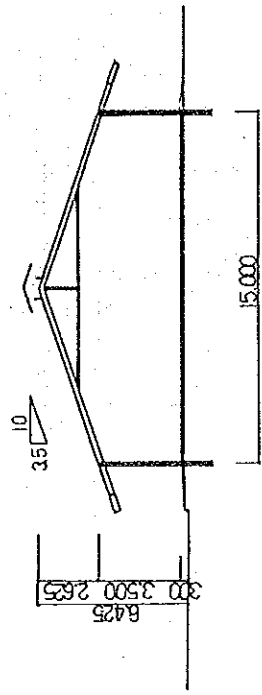
**SIDE ELEVATION**



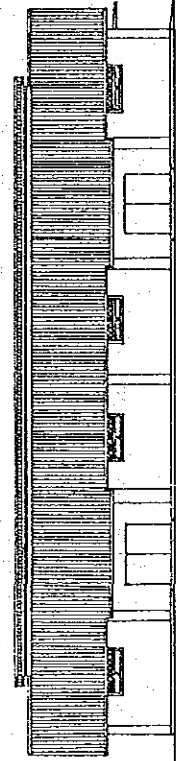
**RICE PARBOILING PLANT 10**



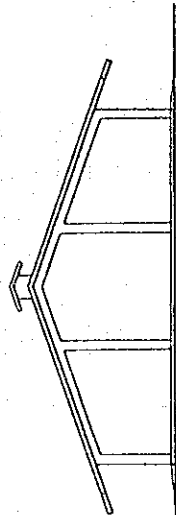
FLOOR PLAN



SECTION



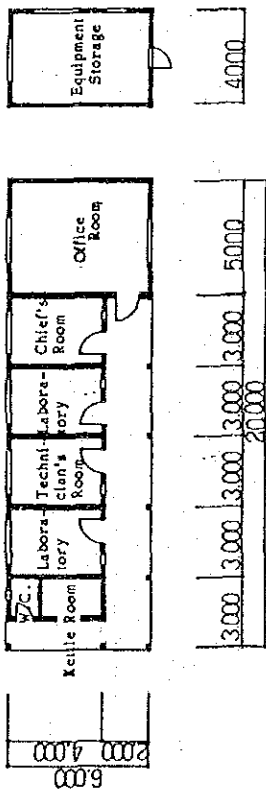
FRONT ELEVATION



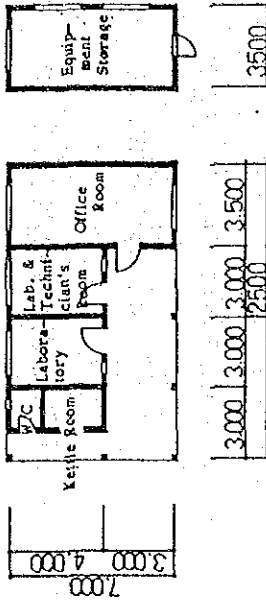
SIDE ELEVATION



PARBOILED PADDY STORAGE 11



**FLOOR PLAN**



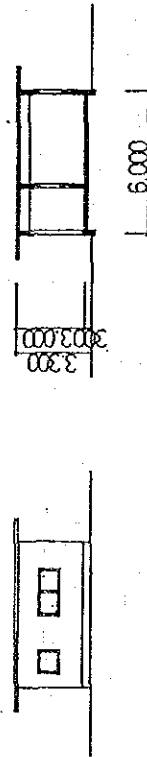
**FLOOR PLAN**



**FRONT ELEVATION**

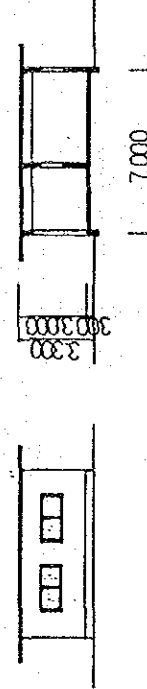


**FRONT ELEVATION**



**SIDE ELEVATION**

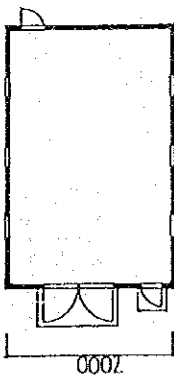
**OFFICE BUILDING (A)**



**SIDE ELEVATION**

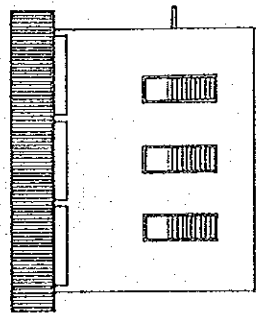
**OFFICE BUILDING (B)**

**OFFICE BUILDING 12**

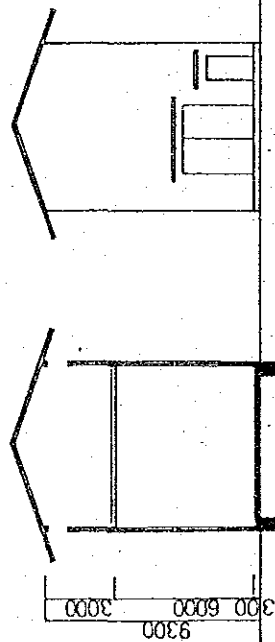


11000

FLOOR PLAN



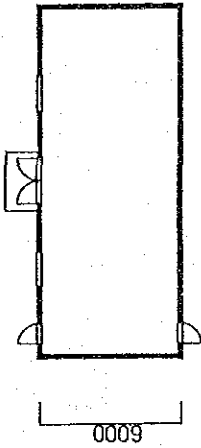
FRONT ELEVATION



SECTION

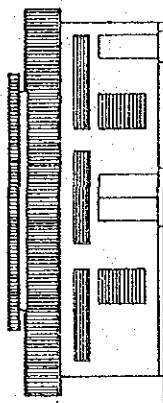
SIDE ELEVATION

BOILER HOUSE

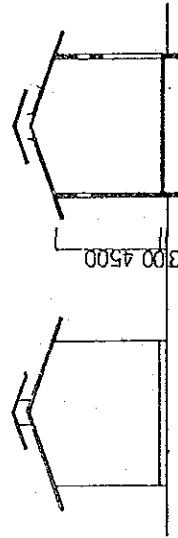


15000

FLOOR PLAN



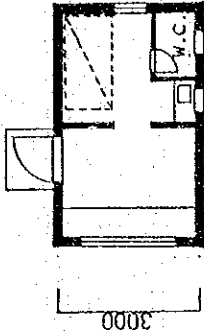
FRONT ELEVATION



SIDE ELEVATION

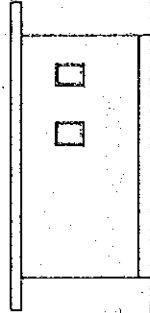
SECTION

GENERATOR HOUSE

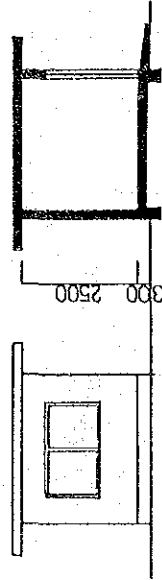


2500 2500 5000

FLOOR PLAN



FRONT ELEVATION



SIDE ELEVATION

SECTION

GUARD HOUSE

MISCELLANEOUS HOUSES 13

## 5-3 Implementation

### 5-3-1 Organization of Execution Bodies

#### (1) Responsible Body

The project will be executed by NFC under the power of MOS.

The Deputy General Manager of NFC will take responsibility for the project, while the signer who executes the Consultant Contract and the Construction Contract will be decided through further discussions held within NFC. Further, the Zonal Chief of Nepalganj will be in charge of the construction site at Rajapur; the Zonal Chief of Dangadhi in charge of Dangadhi's site, and the Branch Chief of Mahendranagar in charge of Mahendranagar's site.

Responsibility for the execution of the Nepal side works therefore falls to this organization as well.

The Ministry of Finance, will on behalf of HMG of Nepal, execute the Exchange of Notes with the government of Japan, and assist NFC on legal and other procedural matters required.

#### (2) Consultant

As soon as the Exchange of Notes is done by and between the two governments, the consultant of Japan shall make the Consultant Contract with NFC in accordance with the grant aid cooperation systems of Japan.

Based upon the contract, the consultant shall proceed with the service as follows:

Phase 1 - Detail design phase:

Detail design drawings, specifications and other technical information required.

Phase 2 - Tender phase:

The assistance necessary to select a contractor and to enter a contract with the Contractor.

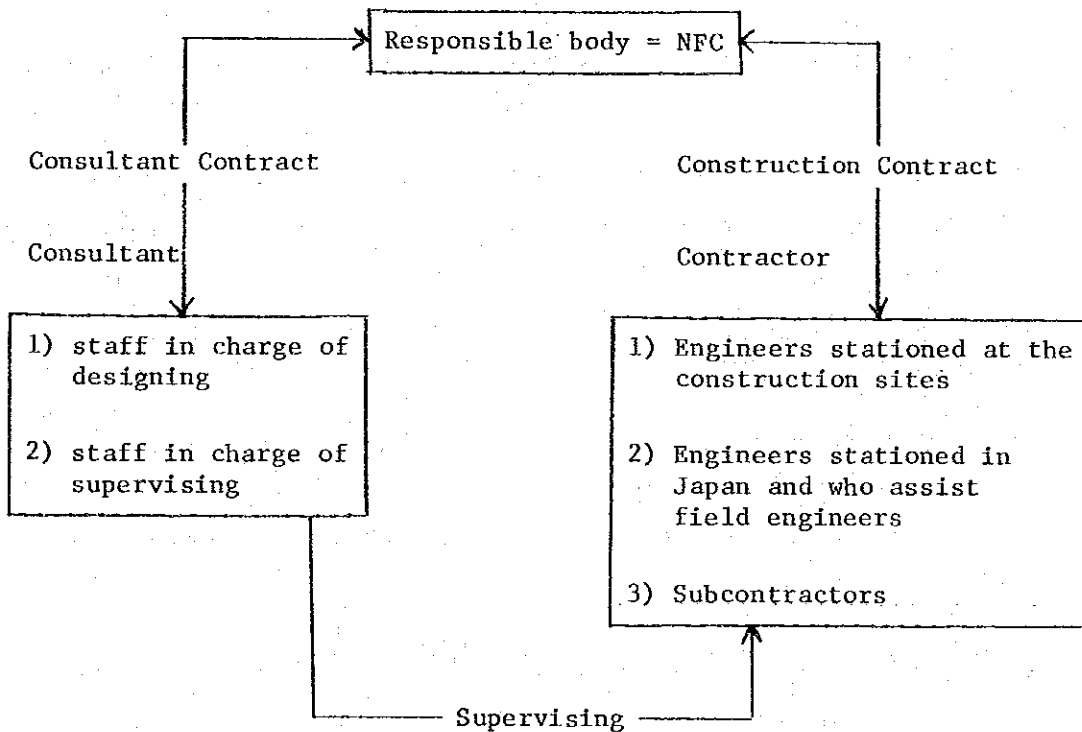
Phase 3 - Construction Work phase:

Supervising of the construction works.

(3) Contractor

Construction works will be executed by a Japanese contractor, who will be selected through the tender system. The period of the construction shall be in accordance with the contract. Upon completion of the construction works, the assets will be transferred to NFC.

Fig. 5-3-1: Organization for the Execution of the Project



Setup for Project Execution

NFC, the responsible body for the project, and the consultant in charge of designing and supervising and the contractor in charge of the works shall perform in accordance with the above organization.

5-3-2 Scope of Works

(1) Works borne by the Japanese side

1) Rejapur

- a) Buildings: four 1,000-ton warehouses, a 1,500-ton warehouse, an office building, a guardhouse, a rice mill plant, a parboiled rice plant and auxiliary buildings for the plants
- b) Utilities: power generator, electrical installation, water supply installation, sanitary installation, sewage drainage, lightning rods.
- c) External structures:  
Pavement on the premises, drainage for rainwater, parboiled rice drying yard, wall around the premises
- d) Equipment: Equipment for foodgrain storage, Equipment for rice milling plant, Equipment for parboiled rice plant.

2) Dangadhi

- a) Buildings: four warehouses each with 1,000 ton capacity and an office building
- b) Utilities: electric installation for lighting, installation of water supply, sanitary installation, sewage drainage
- c) External structures:  
pavement on the premises, drainage for rainwater
- d) Equipment: Equipment for foodgrain storage

### 3) Mahendranagar

- a) Building: one 1,000 ton warehouse, an office building and a guardhouse
- b) Utilities: electrical installation for lighting, water supply installation, sanitary installation, sewage drainage.
- c) External structures:  
pavement on the premises, drainage for rain-water, wall around the premises.
- d) Equipment: Equipment for foodgrain storage

- (2) The works to be borne and the measures to be undertaken by the Nepalese side

The following items shall be furnished by the Nepalese side and all expenses thereto supplied by same.

- To furnish the consultant and the contractor with all information necessary for the construction.
- To secure the lands required.
- To ensure tax exemption and prompt customs clearance at points of disembarkation in Nepal and assist prompt internal transportation therein of the products purchased under the Grant.
- To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Nepal with respect to the supply of the products and services under the verified contracts.
- To accord Japanese nationals whose services 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 Nepal and stay therein for the performance of their work.
- To bear the maintenance and operational costs for the facilities to be built and the equipment to be installed.



- To fill the land of the Rajapur site to the specified level.
- To install electric lines into Dangadhi and Mahendranagar sites.
- To install city water supply pipe to the site of Mahendranagar.
- To execute works for other buildings, utilities, external structures, equipment other than those to be borne by the Japanese side.
- To cooperate in getting approval for installing short wave communication facilities between each site and Kathmandu for work management purpose.
- To provide positive cooperation if any difficulty arises in the customs clearance for the importing of materials and equipment to Rajapur.

### 5-3-3 Work and Supervision Plan

#### (1) Construction Management

The key factors in the execution and management of this construction work are the following:

- The project sites are separated into three locations. The distance between Dangadhi and Mahendranagar is about one hour and fifty minutes by car, but it takes a whole day to reach Rajapur either from Dangadhi or Nepalganj because of the bad road conditions.
- All transportation is disrupted during the rainy season except the Indian routes between Dangadhi and Mahendranagar and the airway between Kathmandu and Dangadhi. There are notorious groups of robbers and thieves (Dacoit) along a part of the Indian routes.
- Kathmandu is the only communication base with points outside of the country. Therefore, it is necessary to conduct importing matters in Kathmandu and to obtain various approvals and permits there as well. Arrangements with NFC such as meetings on work progress must also be done in Kathmandu.

- Because of the large scale of this project, there are no adequate Nepalese subcontractors around the project sites capable of handling the work. It is therefore necessary to bring-in subcontractors from Kathmandu.

Under this circumstances, the following two fundamental management methods are essential to the works.

- a) Dangadhi and Mahendanagar sites shall be managed as one group, and Rajapur as another. Each group shall have its site office and engineers so as to enable each of them to execute the works independently.
- b) A main management office shall be set up in Kathmandu, and various arrangements for importation and manpower recruitment, and preparation of shop drawings and decision making on the works shall be done here. In this main office, an agent of the contractor who is responsible for the project shall be stationed.

A short wave, radio communication facility will be necessary to communicate among the offices. Permission from the authorities concerned must be obtained to set up radio facilities. NFC will cooperate with the contractor on this procedure.

The sites will for the most part be isolated each other during the rainy season. This period will be about five months, during which the work will have to be continued, because the work period is short, necessitating needed materials and labourers being brought into the sites prior to the rainy season. Possible problems which may occur due to this situation must be looked into carefully. Further, thorough preparations should be made beforehand to avoid problems such as personnel becoming ill, unanticipated work problems, or matters concerning visas for steady access to and from India.

Furthermore, it is essential to have special staff exclusively in charge of securing the supply and transport of imported materials and equipment.

## (2) Procurement

### 1) Construction Materials

The following items are the only materials which are produced in the Nepalese Terai:

- a) Sand, gravel (crushed stones)
- b) Bricks
- c) Timber, concrete form materials, and logs

Trade with towns and cities in Indian Terai is more active than that with cities in Nepal. So ordinary procurement of materials other than the domestic products are made in India. Therefore, products for maintenance will be procured in India. It is necessary to consider this situation when making a design and a procurement plan. In Terai, it is possible to procure cement made in India, Thailand and Korea. Korean cement is reputed to have stable quality. It is essential under these conditions to obtain products made in or imported through India, such as:

- a) Indian products: paint, glass, electric materials, plumbing materials, corrugated zinc-plated steel sheets, etc.
- b) Imported product via India: cement

It is better to import steel products directly from Japan in view of quality and cost. The specifications and supply conditions of the corrugated zinc-plated iron sheets, electric and plumbing materials, and paints must be studied further.

Regarding the electric and plumbing materials, in some cases, Japanese products are economical, taking procurement management costs into consideration. So, it is better to import them from Japan. These products should be exchangeable with Indian made products for maintenance purposes.

Therefore, the following items a) and b) shall be imported from Japan, and as to item c), d) and e), the decision whether

they should be Japanese or Indian shall be subject to further study.

- a) steel bars and steel structural frame
- b) steel door, and steel window frames, etc.
- c) corrugated zinc-plated steel sheets
- d) paint
- e) electric and plumbing materials

Concrete mixtures can be obtained in the Terai.

Construction machines for road works are obtainable and are by all means necessary, but transporting them into Rajapur area is anticipated to be difficult. A survey on the routes for the transportation and some temporary works may possibly be required.

## 2) Subcontractors and Labourers

All local construction companies in the area are ranked as C class in the registration rank of the Ministry of Works, and the level of workers skill and efficiency are low grade. So, they cannot be employed as a subcontractor, when considering the large scale of the works. Skilled workers from a construction company in Kathmandu which is ranked A class shall be employed. It is possible to recruit non-skilled workers in the Terai through the subcontractors, depending on the type of work. Skilled and efficient Indian workers can be recruited, however this is regarded as a procurement from a third party country and should not be counted on. The contractor must recruit engineers who work at staff for the contractor in Kathmandu.

## 3) Equipment

As described in the Equipment Plan (5-2-4), there are two kinds of equipment. One type is for storage functions, and the another is for the rice milling plant and parboiled rice plant.

Most of the machines are available in Japan, however, because such equipment as wooden pallets, canning materials, materials for furnace, etc. are bulky, resulting in high transportation costs, it is better to procure locally, including from India.

As already described, the transportation conditions in the area are not good.

Especially the transportation of heavy and bulky cargo is difficult. So the scale of one pack is limited in weight and in bulk.

### (3) Transportation Plan

#### 1) Sea Transportation

Calcutta port in India is the ordinary destination for sea cargo for Nepal, and it will take three weeks for the transportation from Japan. Departures are concentrated at the end and beginning period of every month.

#### 2) Unloading and Customs Clearance (Calcutta)

Calcutta port has Nepal Transit Warehouse which is a branch office for the customs authority of HMG of Nepal. The necessary procedures of this office will be followed by customs clearance on the India side.

There is a derrick of Calcutta port which can handle about 10 to 15 tons. However, since the unloading is usually done by human labour, it is necessary to package the goods in strong durable boxes or crates. When planning the transportation schedule, it is important to take into consideration a possible delay of unloading during the rainy season. It is necessary to provide two or three weeks for unloading and clearance during the dry season.

#### 3) Inland Transportation in Indian Territory

There are two types of transportation in Indian territory from Calcutta -- by truck and by railroad. Although railway costs

are lower, robberies are more frequent, so it is difficult to estimate the cost. In this circumstance, transportation costs are estimated based on the truck routing. The truck route is about 1,200 to 1,400 kilometres to the project sites, requiring 7 to 10 days.

4) Customs Clearance into Nepal and Domestic Transportation Routes

The cargo is to enter Rajapur via Katerriyaghat, Dangadhi via Gauriphanta, and Mahendranagar via Banbasa. Each of these points has a customs office. As described in the outlines of the area in Chapter 4, the bridge over the Karnali River which reaches Katerniyanghat in India was washed away in the recent past, necessitating the use of an alternative route in entering Rajapur in case the restoration is delayed. Four or five other routes are under consideration at this moment, and it should be a future concern to study the merits and domestic of each route and work out countermeasures against any possible problems. They are:

- a) To enter the country at Dangadhi or Nepalganj and transport for long distance in Nepalese territory.
- b) To enter and pass the customs office at Sati (Kailali) through Tikonia in India and find a route to Rajapur.
- c) In the same way, to find a route from Tikonia to Rajapur through the Indian territory.
- d) To enter the country taking the road along the east bank of the Karnali River and pass the customs clearance with the help of MOS.

Sometimes it takes several weeks to clear the Nepalese customs clearance, waiting all the cargo which has been cleared by Nepal Transit Warehouse at Calcutta at the same period are collected for the clearance here.

In order to avoid this, it is necessary to obtain a TP (transit pass) issued for each truck by Nepal Transit Warehouse at Calcutta.

#### 5) Transportation Period

To summarize the above, two months will be required to transport goods from Japan to the sites. This would be the case during the dry season, and it will most likely take longer during the rainy season. If the restoration of the aforementioned bridge on the India side is not yet completed, it would be impossible to enter Rajapur during the rainy season because of the swelling of the river.

#### 6) Others

It is possible to procure products from Delhi in India as well as Calcutta. Since the road conditions are good on the Indian side, a transportation plan can be made based on the information described above.

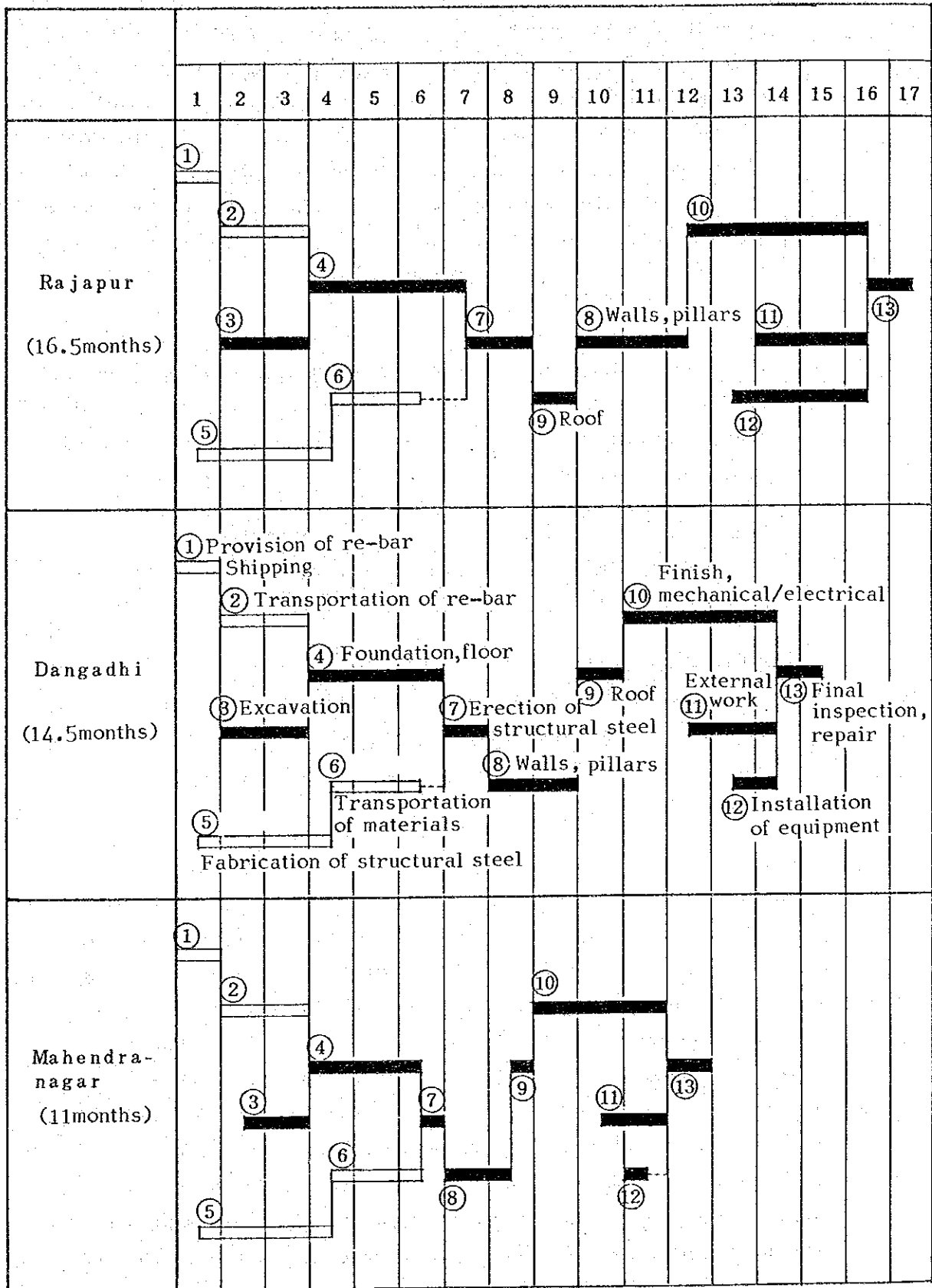
Each site needs a truck for carrying materials and equipment, and the type of the truck should be decided with additional consideration to the transportation of the staff and labourers.

Special consideration should be made for the fact that all transportation must be carried out solely by this truck with the delta island where Rajapur is located.

#### (4) Work Schedule

The main point of the work schedule is that the concrete of the first floor should be completed by the middle of June when the rainy season starts, and that the transportation of most of the construction materials should be accomplished by that time. Three months will be needed from the time the reinforced concrete work of the foundation is started to the time of the floor concrete being finished. The steel bars are to be imported from Japan. It takes one month from the signing of the construction contract to the date of shipping, and two more months for transportation, or a total of 3 months. Therefore, the main point of the work schedules is to finish the construction contract six months before the middle of June. If these requirements are not met, the contractor must seek other way which might be more difficult and

Fig. 5-3-3 Construction Work Schedule





expensive.

After finishing the floors, the steel frame work period is 0.5 - 1.5 months; brick wall and concrete pillar work, 1.5 - 2.5 months; roof, 0.5 - 2 months; finish, utilities, external works and installation of equipment, 3 - 4 months, and the period to make a trial run of the mill plant will also be required.

It transportation to Rejapur is stopped during the rainy season and the restoration of the bridge over the Karnali is completed, it will be necessary to take additional time for the work.

The work schedules have been arranged as in Fig. 5-3-3 in consideration of the conditions of each site.

As for the total period of the work,

Rajapur:	16.5 months plus period for trial run
Dangadhi:	14.5 months
Mahendranagar:	11 months

#### (5) Supervision

The consultant's services can be divided into two stages, one being detail design and other, supervision. The contents of supervision services are as follows.

##### 1) Services to precede signing of the construction contract

- On behalf of NFC, invite tenderers, examine applicants qualifications, advice NFC on selecting tenderers.
- On behalf of NFC, collect tenders, and if necessary, negotiate with tenderers on behalf of NFC, examine and evaluate the itemized estimates and the work execution plans submitted by the tenderers, and advice NFC on appointing a successful tenderer.
- Take part in the negotiation on the contents of the construction contract, and advise both parties to sign the construction contract in conformity with the systems of the grant aid cooperation of Japan.

## 2) Supervision Services in Japan

It is appropriate for this project to maintain overall control of the works in Japan and send experts of each speciality to the project sites whenever needed.

The details of the services which will be conducted in Japan are as follows:

- Overall control of the work process
- Approval of the work execution plan, contractor's engineers, materials, equipment, makers, subcontractors and so on
- Preparation of color scheme
- Services for design modification
- Check and tests on materials and equipment which should be done in Japan

## 3) Supervision Services in Kathmandu

The details of the services entrusted to the supervising engineers dispatched to Kathmandu are as follow:

- To give the contractor tentative approval on items that will require immediate approval of the consultant such as the work execution plan, materials for use, makers and subcontractors and so on.
- To coordinate the requests from both NFC and the contractor
- To make a monthly report on the work progress and report it at monthly meetings.
- To check and approve shop drawings.
- To make reports on the tests and inspections required.
- To prepare and keep the instruction documents for the contractor on the works and keep records of the meetings, tests, checks, and inspections.

#### 4) Supervision Services at Each Site

- To be present at tests.
- To inspect and confirm the completion of the required works in accordance with the payment schedule.
- To check materials and equipment when they are delivered to the sites.
- To instruct slight changes in design which do not affect the contract sum and solve the problems of works.

#### 5) Supervision of Equipment

The equipment to be used in storage processing shall be installed at their designated places and shall be subject to trial operation to confirm their performances.

After the installation of the rice milling plant and parboiled rice plant equipment, and non-loading trial run shall be performed. The machines shall then be loaded with materials and a second trial run shall be operated. As a general practice of plants of this sort, considerable time will be needed for smooth running, because fine adjustments and minor modifications may be necessary. Therefore, a sufficient lead time should be planned for this purpose. NFC is also requested to provide a sufficient amount of unhulled rice grain for the trial run. In this process, directions will be given on the operation to the NFC's operators.

The installation, trial run and training will be provided by the contractor, while the consultant maintains supervision and control.

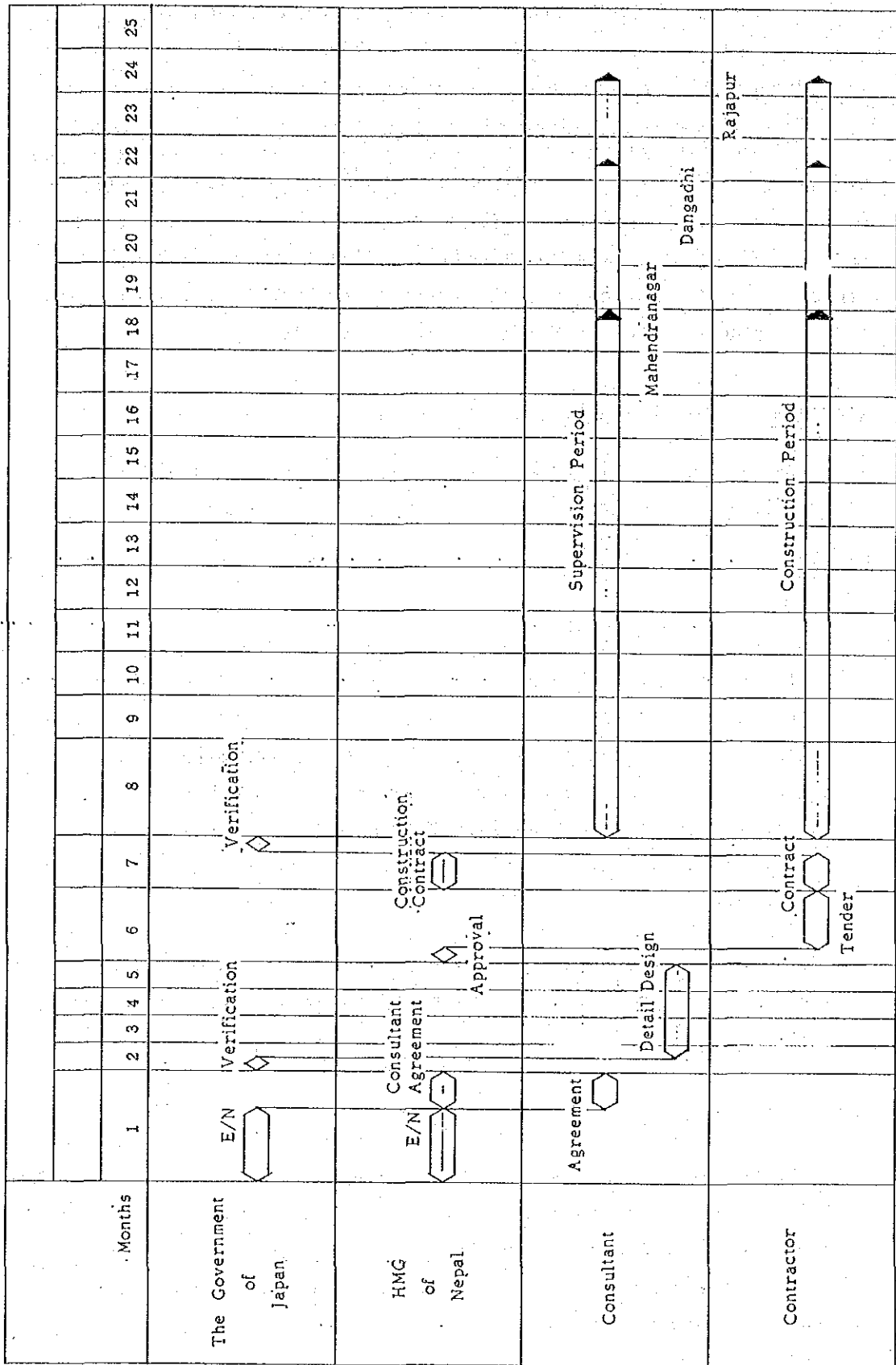
#### 5-3-4 Schedule of the Project Implementation

This project commences upon the Exchange of Note (E/N) between the two countries, and undergoes the following processes: Conclusion of the consultant contract; its verification by the government of Japan; detail design; selection of the contractor; conclusion of the construction contract; its verification by the government of Japan; construction work; completion and transfer of the buildings and equipment.

#### 5-3-5 Cost to be borne by Nepalese side

1) Filling at Rajapur site	:Rs	270,000
2) Installation of the electric lines into Dangadhi and Mahendranagar sites	:Rs	9,000
3) Installation of the city water supply pipe into Mahendranagar site	:Rs	14,000
		<hr/>
	Rs	293,000

Fig. 5-3-4 Schedule of the Project Implementation



## Chapter 6 PREPAREDNESS FOR OPERATION AND MANAGEMENT

### 6-1 Management

All the facilities are used for the operations of the tasks that NFC is in charge of. The storage and the plants at Rajapur will be operated by an organization which will be newly set up and will be under the control of the Zonal Office in Napelganj. The storage at Dangadhi and Mahendranagar will belong to the Zonal Office of Dangadhi and the Branch Office of Mahendranagar respectively.

### 6-2 Recruitment of Staff and Workers

The necessary staff are listed in 3-5. "Operation and Staffing Plan". They will be recruited in the following manner.

#### (1) Rejapur

At the present time, Rejapur Depot has a 4-member staff consisting of a store chief (Grade 4), and an accountant (Grade 3), and two guardmen (Grade 1). Thirty two staff are required for the facilities here and twenty eight will have to be recruited. Of these, a rice mill chief, a purchase accountant, 2 store keeper and 2 technicians will be transferred from other offices of NFC. Therefore, 21 people will have to be newly recruited as operators and labourers.

NFC has received the technicians of ex-REC mills when it was liquidated, so there is no problem in transferring them to the Rajapur mill.

#### (2) Dangadhi

The new storage is used for the operation of the Zonal office here. There necessary staff are a total of eight. Present staff of the office will be engaged in the operation. However, a staff, a store keeper, will have to be transferred from another office of NFC and added.

(3) Mahendranagar

As in the case of Dangadhi, the staff in the present branch office will be engaged in the operation of the facility so there is no need for recruiting new staff.

6-3 Costs for Maintenance and Management

The following items are taken into account for maintenance and management:

1) Personnel cost	226,200 (Unit Rs/Year)
2) Costs for maintenance and repair of facilities	650,000
3) Costs for water and energy	484,600
4) Costs for expendables and parts	558,200
5) Other administration expenses	66,000
<hr/>	
Total	1,985,000

Approx. Rs 1,985,000 are estimated to be required per year.

(1) Personnel expenses per month (Unit: Rs)

The parenthesis stand for those newly hired personnel

Positions	Grade	Salary	Rajapur person/cost	Dangadhi person/cost	Mahendranagar person/cost
Rice Mill Chief	8	1,480	1/1,480		
Store Chiefs	5	865		1/865	1/865
Store Keepers	4	700	3/700		
Store Keepers	3	595		1/595	1/595
Accountants	3	595	1/195	1/595	1/595
Purchase Assistants	3	595	1/595	1/595	1/595
Technicians	5	945	2/1,890	1/945	1/945
Operators	3	595	4/2,380 (4/2,380)		
Labours	1	460	17/7,826 (17/7,826)		
Guards	1	460	2/920 (1/460)	2/920	2/920
Peons	1	460	1/460 (1/460)	1/460	1/460
<b>Total</b>			18,246 (11,126)	4,975	4,975
<b>Making the No. round</b>			18,250 (11,200)	5,000	5,000



(2) Costs for maintenance and repair of facilities per year

It is desirable that the following amount of money will be deposited into a fund each year for the purpose of covering the costs for works whenever they are needed for maintenance and repair.

(Unit: Rs)

1) Rajapur	400,000
2) Dangadhi	200,000
3) Mahendranagar	50,000
<hr/>	
Total	650,000

(3) Costs for water and energy per month (Unit: Rs)

	Rajapur	Dangadhi	Mahendranagar
Water supply	0	0	30
Electric power	0	300	53
Fuel & lubrication oil	40,000	0	0

(4) Each expense item of parts and expendables commonly used for the said plants is described as follows:

Repair expenses

Expenses for repair and the purchase of parts are considered. As annual repair expenses are in proportion to expenses for installing facilities, the ratio of repair expenses may be calculated. According to Rice Center in Japan, the ratio is about 2% per year. Under this project, parts for one year will be provided to the plants by aid. The durable life of wooden pallets used on storage floors is 6 to 7 years. 15% of the price is appropriated for renewal and repair. The price of procuring pallets locally is 190 Rs.

Water, Electricity and Lighting

Water is obtained from private wells. The maximum volume of water required for the manufacturing of parboiled rice is about 30 m<sup>3</sup>

per day. The suitability of sources for boiler water is subject to further study.

Electric power should be generated privately because none is provided externally.

Fuel includes husks for the boiler, and diesel oil and lubricating oil for power generation. A substantial amount of husks are provided as a by-product of rice mills. At the time of the survey, the oil prices in Katmanz were 10.88 Rs per liter for gasoline, 5.50 Rs for kerosene oil and 5.65 Rs for diesel oil. The fuel consumption of a generator under this project is about 40 liters per hour.

Steamed heat from the sun or boilers is used for the drying process of manufacturing parboiled rice.

#### Chemical expenses

Aluminum phosphide  $\text{PH}_3$  for fumigation and marachion for spray disinfection within a storage may be obtained locally. The price of  $\text{PH}_3$  is 7 to 8 Rs per 10 tablets (30 g), as previously mentioned and 9 g is used per ton of stored grain. Fumigation is supposed to be conducted three times a year. Sheets and other materials for fumigation are provided under this project.

#### Sub-material expenses

Jute bags (23 Rs) and yarn are required.

#### (5) Other administration expenses per month

These expenses include travelling expenses, communication expenses, office supplies, vehicles expenses, etc. As the office works at Dangadhi and Mahendranagar are expected to increase, the expenses will become larger. It is safe to assume that the expenses will be approx. 20% of the personnel expenses.

(Unit: Rs)

Rajapur	3,500
Dangadhi	1,000
Mahendranagar	1,000
Total	5,500

(6) Costs for maintenance and management per year (Unit: Rs)

	Rajapur	Dangadhi	Mahendranagar	Total
Personnel expenses	219,000	7,200	-	226,200
Costs for maintenance and repair	400,000	200,000	50,000	650,000
Costs for water and energy	480,000	3,600	1,000	484,600
Costs for expendables and parts	394,000	131,200	33,000	558,200
Other administration expenses	42,000	12,000	12,000	66,000
Total	1,535,000	354,000	96,000	<u>1,985,000</u>

## Chapter 7 EVALUATION

Nepal was self-sufficient in foodgrains with a surplus for export. The situation, however, has changed due to the low growth rate of foodgrain production which has not kept pace with the rapid increase of the population. It has developed to the situation that serious shortages in foodgrain supply occur in years of a poor crop. As a country having no significant industry other than the agriculture, with a prospect of this situation being worse in the future, the increase of foodgrain productivity has become the nation's greatest concern.

### 7-1 Effectiveness of the project

Concrete examples of effect obtained through this project can be described as follows:

1. At the project areas, considerable losses are incurred due to the poor storage conditions, which could be saved by improved warehouses. Although no statistics are available at this point, this fact is readily admitted by the people concerned.
2. The rice milling facilities to be built at Rajapur are expected to directly contribute to a 20 to 30% reduction in the cost of transportation from the area.
3. The warehouses of an improved quality will allow long-term storing, enabling NFC to perform the foodgrain operation more flexibly and advantageously with positive long range prospects.

Seen from the overall operation of NFC, this project is evaluated as follows:

According to the plan, NFC's foodgrain storage capacity is expected to increase from 3,200 tons to 7,200 tons in Dangadhi, from 2,000 tons to 3,000 tons in Mahendranagar and from 0 ton (With the exception of 200 tons storage on a rental basis) to 5,000 tons in Rajapur. Therefore, NFC's capabilities of foodgrain collection will increase by 125% to a total of approx. 10,300 tons in Dangadhi, by 50%

to a total of approx. 4,300 tons in Mahendranagar, and by a great extent to approx. 7,900 tons in Rajapur. These collection capabilities account for 15 - 20% of the total distribution amount in the respective area. These capabilities will enable NFC to fulfill needs for facilities necessary in the planned districts to carry out distribution to foodgrain deficit areas, stock against crisis, and the floor price policy as an incentive to farmers.

## 7-2 On Materializing the Project

### (1) On the preparedness on the Nepalese side

The site in Mahendranagar has already been acquired, and as to Dangadhi site, the transfer of ex-REC facilities to NFC is informed to be 99% certain. The action to purchase the land in Rajapur should be initiated from now on. Japanese side intention for the project and the required site area are to be confirmed beforehand at the time of draft reporting. The budget for the purchase expense has already been prepared. Construction of rice milling facilities call for more site area than originally expected, rendering matters as yet unconfirmed on the landowner's intentions. However, considering the eagerness of both MOS and NFC for having these milling facilities, a solution will be reached even if any problems should arise concerning the acquisition.

Land filling is required for the Rajapur site, the budget for it will be included in the fiscal year 1985/86 which starts from July. Concerning the relationship with the work period, there should be no problem including the budget for filling in the next fiscal 1985/86, if the work at the Rajapur site will not start within the Japanese fiscal year 1985.

The costs for installation of city water and electricity supplies to the site will also be included in the fiscal year 1985/86. These are necessary only in Mahendranagar. The amount of the costs being relatively small, this will pose no problem.

### (2) On Recruiting personnel and organizational structure

Concerning Dangadhi and Mahendranagar, there will be no organizational problems because the facilities are to be used by the offices which currently exist there. However, recruiting only one more personnel for Dangadhi is required, which can be acquired through transfer within NFC.

There will be no organizational problems at Rajapur as it will operate under the administration of Nepalganj Zonal office. Regarding required personnel, workers will be newly recruited, and the

staff will be transferred from other offices of NFC. There will be no problem in acquiring them. Attention should be paid upon recruiting engineers and technicians in charge of maintaining machinery, and this point will be discussed in next "(3) On Administration and Maintenance".

(3) On Administration and Maintenance

Regarding personnel expenses, there is no need to hire new workers other than for the rice milling operation at Rajapur. There are no foreseeable problem on this point as the operation is expected to create profits.

Regarding the maintenance of the buildings, the mission members had the impression that repairs on the existing facilities have never been done. This was also described as a problem in the report (Sept. 1984) of the Food Security Review Mission by FAO. It was also advised in the report that a maintenance budget of Rs 75/ton (storage capacity) be prepared annually. Under these circumstances, there may exist the possibility of unsatisfactory results concerning NFC's taking responsibility for the maintenance on the building facilities.

Machinery to be used in the rice mill are Japanese made, while the ex-REC engineers and technicians to be employed in the plants are used to the machines made in India. A training of the maintenance of Japan-made machines is thus required. NFC has shown a full understanding concerning the supply of expendables and spare parts and acquisition of the required budget.

Regarding water and energy expenses, these expenses are not large and should be saved as much as possible. Regarding the fuel costs for the plants operation, this also raises no problem, as the rice mill will be operated at profit.

(4) Operation funds of NFC

With accumulated debts amounting to over Rs 450 million, the financial conditions of NFC are not in a healthy condition. In the 'Basic Principles of the 7th 5-year plan' however, a will to

enforce the floor rice policy is indicated and it is also stated that "HMG will make a guarantee when NFC procure required funds for this purpose". So there seems no problem in acquiring necessary funds to carry out its current operation.

Regarding subsidies, among the costs required for distribution to the deficit area, a portion of the transportation costs are subsidized by HMG. However, the subsidy has become a financial burden on the national treasury as a result of its continued increase for years. In "the Basic Principles of the 7th Plan", it is stated that the subsidy system should be reviewed from a fiscal point of view. It should be understood, therefore, that the subsidy system will be curtailed in the future, and this will work as a brake against a situation where NFC will have to greatly increase the amount of distribution to the deficit area.

As seen above, even though no pressing problem exist in obtaining funds for operation, the accumulated debt is rising yearly, and may well restrict NFC's operations in the future. HMG, therefore, is required to take measures for the betterment of NFC's financial conditions.



### 7-3 Appropriateness of the Project

Owing to difficult conditions of Nepal, such as poor transportation infrastructure, geographical drawback, indivility with the Indian market, and market control by Indian merchants, it is viewed that governmental support is indispensable in facilitating foodgrain distribution, instead of leaving it up to the market mechanism. In addition, the problem on the self-sufficiency for the food, which has recently been focused upon, has given rise to the strong request for governmental cooperation in increasing agricultural productivity. Under these circumstances, HMG faces the vital task of effectuating the floor price. NFC, which will actually execute this task, therefore carries a heavy responsibility.

Although it is acceptable for NFC to make profits through its operation, NFC actually suffers management difficulties due to its large debts, in the mounting criticism against the burden upon the treasury.

Although not yet audited, NFC's accumulated debts are estimated to amount to approx. Rs 450 million at the end of this fiscal year 1983/84. This amount reaches 4.2 times of the paid-up capital of Rs 108 million. Ratio of the floating debts against fix debts is 4 : 1.

In such a financial conditions, it is impossible to build costly facilities by its own resources, and it is also very difficult even by the funds from international monetary agencies with the lowest interest.

Taking the importance of NFC's undertakings into consideration, and on the other hand, the financial difficulty it faces, it is concluded that this project has a great significance, when executed as a grant aid cooperation of Japan, and the project plan is highly appropriate for the cooperation.

## Chapter 8 Recommendations

The following recommendations are proposed for the prompt execution of the project and the effective utilization of the facilities to be established.

### (1) On the Project Execution

#### 1) Prompt execution of various procedures

The progress of construction works before the start of the rainy season has a great influence upon completion of the whole work. Further, the work schedule up to the rainy season is very tight. Promptness is therefore essential in carrying out the necessary procedures prior to the start of the works, i.e., the arrangements to be made between the two governments, the contracts, etc.

#### 2) Cooperation of HMG for the work

Difficulties are anticipated during the construction work concerning communications, customs clearance and acquisition of visas to India.

Cooperation of HMG would be beneficial, and requested, if the contractor runs into any of these difficulties.

#### 3) Nepalese side preparation

It is essential that the acquisition of the lands and the works by the Nepalese side shall keep pace with the construction work schedule.

The cooperation on the Nepalese side is highly requested.

### (2) High Utilization of the Facilities

In Chapter 6 a recruiting plan for required staff and an estimate of prospective maintenance and administration costs are indicated. Recruiting the required staff and obtaining the necessary budget,

it is desirable that efforts are exerted for the long-range and effective use of the facilities.

(3) Concerning the Management of NFC

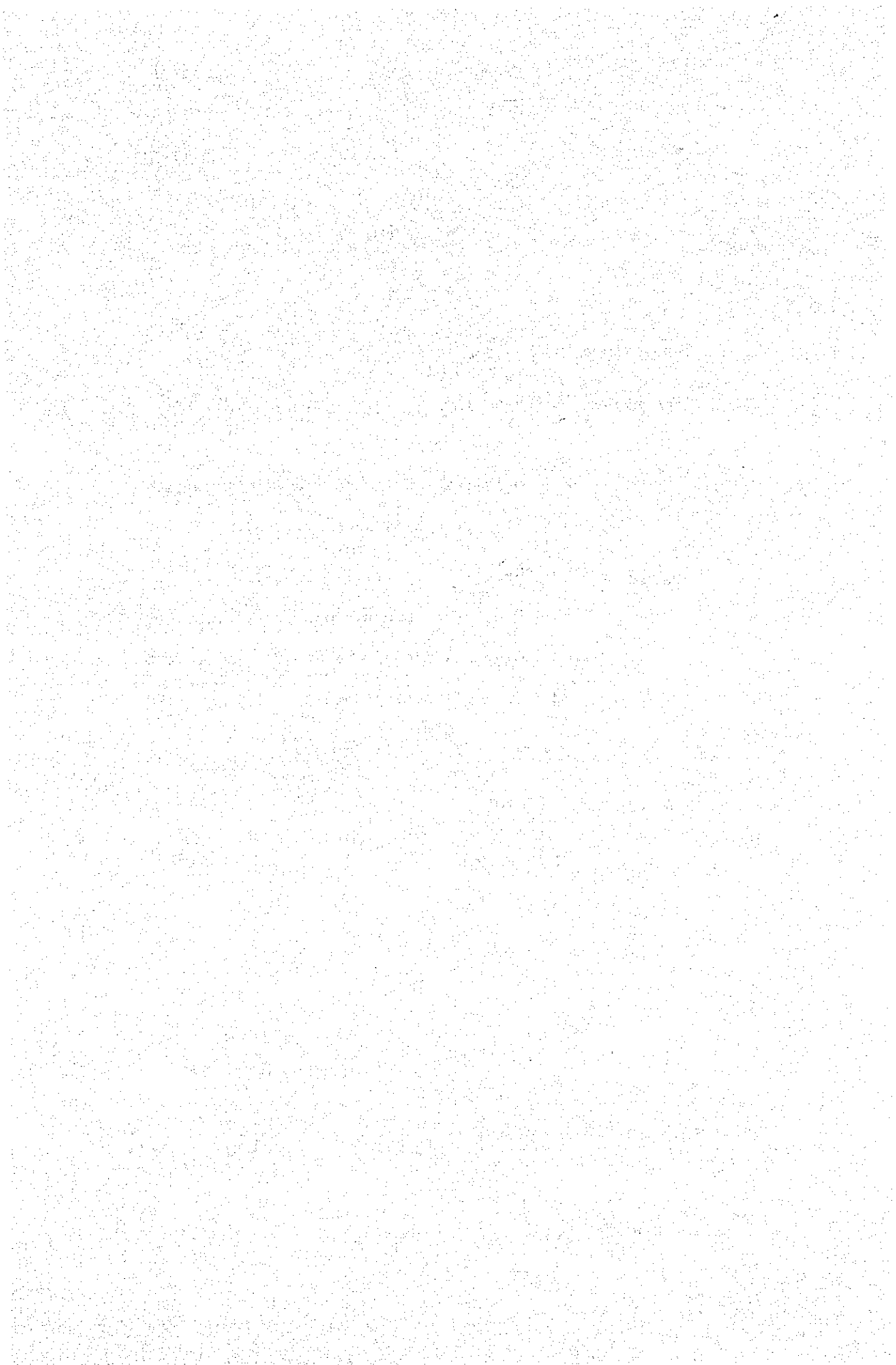
With accumulated debts amounting to approx. 450 million (1983/84), the future financial state of NFC is anticipated to grow more difficult. As an organization executing the government policy, NFC cannot place first priority upon obtaining profits in making management decisions. It is understandable that NFC's management efforts towards betterment of its financial state are limited. However, it can be anticipated that increasing financial burdens will restrict the future activity of NFC.

Therefore, it is highly desirable that HMG will take necessary measures for the betterment of NFC's financial state before these burdens would reach its limit.

On the other hand, it is essential that NFC reduce its management and operational costs through invigorating its manpower and efficient utilization of its resources. Though limited as a public corporation, NFC is hoped to make as much effort in its management as possible, in order to cope with future difficulties.



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I-1. MINUTES OF DISCUSSIONS  
ON  
THE CONSTRUCTION PROJECT  
OF  
FOODGRAIN STORAGE

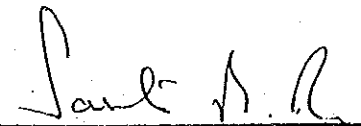
In response to the request made by His Majesty's Government of Nepal for a Grant assistance for The Construction Project of Foodgrain Storage (hereinafter referred to as " the Project "), the Government of Japan has sent, through Japan International Cooperation Agency (hereinafter referred to as " JICA "), the basic design study team, headed by Mr. Takeshi SAITO, Director, Import Department, Chiba Food Agency Office, Ministry of Agriculture, Forestry & Fisheries, from February 24th to March 20th, 1985. The study team has carried out field survey, held a series of discussions and exchanged views with the authorities concerned of the Project.

As a result of the study and discussions, both parties have agreed to recommend to their respective Governments to examine the results of the survey attached herewith towards the realization of the Project.

Kathmandu, March 10th 1985.



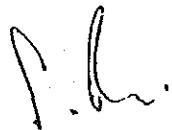
Takeshi SAITO  
Leader, Japanese Study Team  
JICA



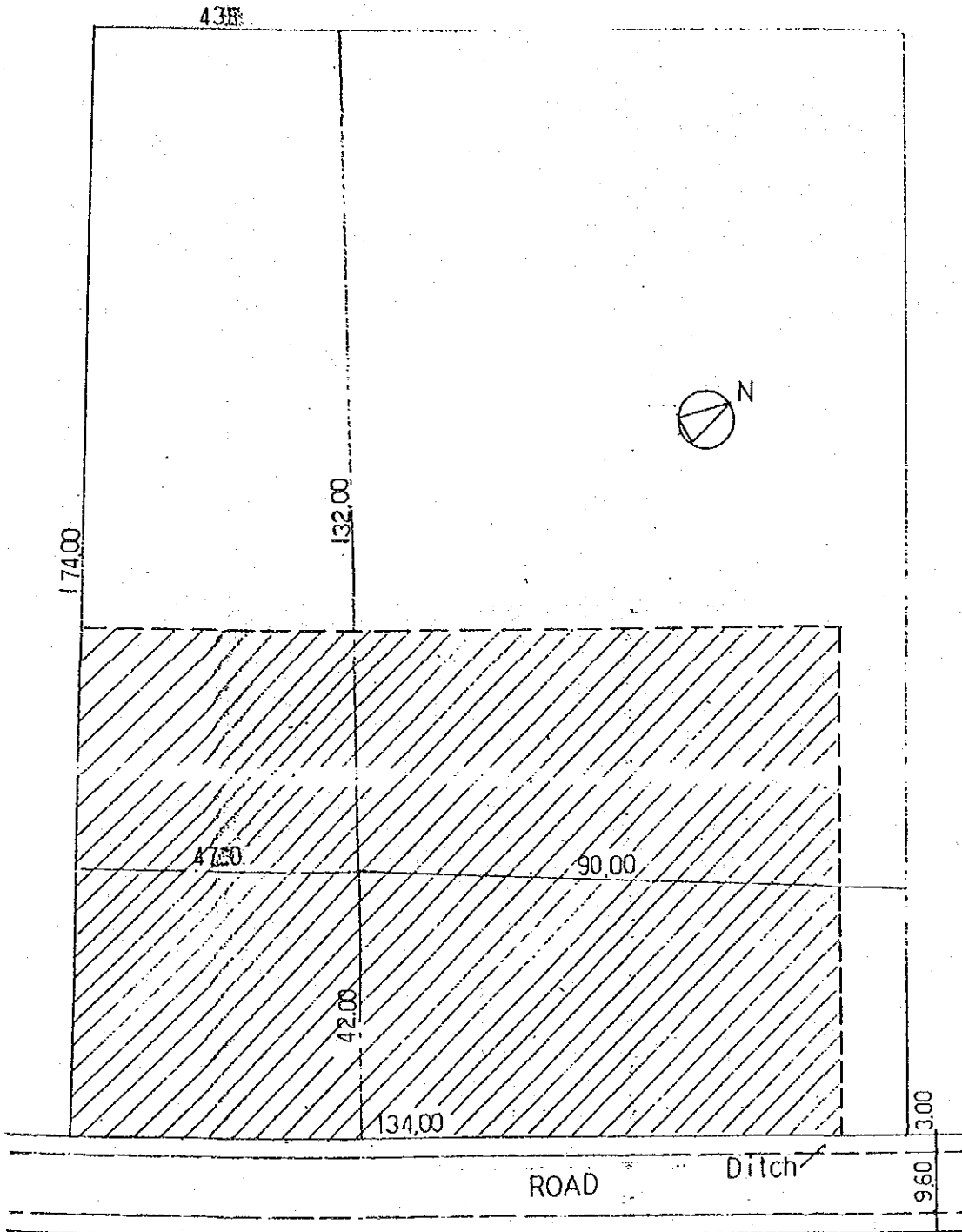
S. B. Rai  
Secretary  
Ministry of Supplies

- ATTACHMENT -

1. The objective of the Project is to provide Grain Storage with appropriate storage capacity and equipment in Rajapur, Dangadhi, and Mahendranagar for Nepal Food Corporation ( N.F.C.).
2. The proposed sites of the Project will be acquired after receiving the draft of the final report through JICA by His Majesty's Government of Nepal (hereinafter referred to as " the Project site ") as attached in ANNEX - 1.
3. The Japanese Study Team will convey to the Government of Japan the desire of His Majesty's Government of Nepal that the former takes necessary measures to co-operate in implementing the Project and provides necessary facilities and other items as listed in ANNEX - 2 within the scope of Japanese economic cooperation in Grant Form.
4. His Majesty's Government of Nepal has understood Japan's Grant Aid system explained by the Team which includes a principle of use of a Japanese consultant firm and Japanese general contractor for implementation of the Project.
5. His Majesty's Government of Nepal will take necessary measures as listed in ANNEX - 3 on condition that Grant Assistant by the Government of Japan is extended to the Project.





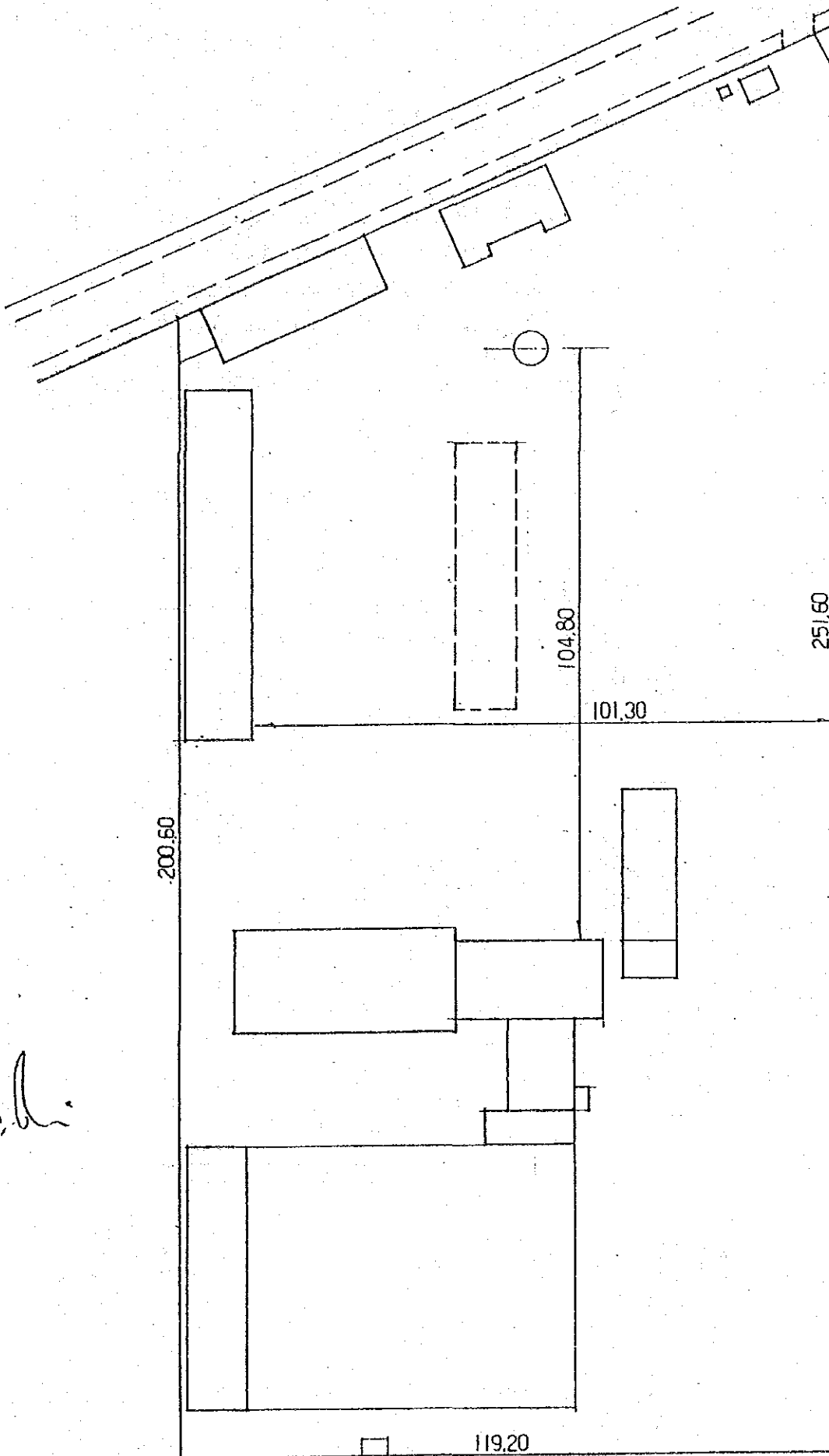


RAJAPUR PROPOSED SITE scale 1:1,000

( Site area : 1 ha )

*J. B.*

*S.*  
*P. h.*



DHANGADHI PROPOSED SITE IN SETI, MAHAKALI RICE MILLS  
scale 1:1,000



MAHENDRANAGAR PROPOSED SITE scale 1 : 2500

No.1 site has priority over No. 2 site .

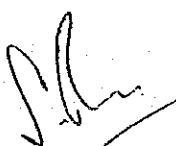
The following items are desired by His Majesty's Government of Nepal as a Grant Assistance of Japan.

1. Buildings for

- a) Foodgrain Storage
- b) Management and Operation

2. Equipment for

- a) Inspection and Quality Control
- b) Storing and Handling
- c) Others.



ANNEX - 3

Following arrangements will be required to be taken by His Majesty's Government of Nepal;

1. To carry out site preparation such as clearing, filling, leveling and access road before commencement of construction work.
2. To provide facilities to the proposed sites; of electricity, water supply, drainage, and communication lines.
3. To ensure tax exemption and prompt customs clearance at points of disembarkation in Nepal and assist prompt internal transportation therein of the products purchased under the Grant.
4. To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Nepal with respect to the supply of the products and services under the verified contracts.
5. To accord Japanese nationals whose services 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 Nepal and stay therein for the performance of their work.
6. To maintain and use properly and effectively the facilities constructed and equipment purchase under the Grant.
7. To undertake incidental civil works such as gardening, fencing, gates, guard house, garage, and exterior lighting.
8. To furnish general furniture for the facilities.

I-2. Organization of the Study Team (Phase I)

Mr. Takeshi Saito:  
Team Leader

Director, Import Dept.  
Chiba Food Agency Office  
Ministry of Agriculture, Forestry  
& Fisheries (MAFF)

Mr. Minami Nagai:  
Project Coordinator

Basic Design Div.  
Grant Aid Dept.  
Japan International Cooperation Agency  
(JICA)

Mr. Eiichi Yabumae:  
Architectural Planner

Ishimoto Architectural &  
Engineering Firm, Inc.

Mr. Isamu Yamazaki:  
Grain Marketing Researcher

Ishimoto Architectural &  
Engineering Firm, Inc.  
(Overseas Merchandise Inspection  
Co., Ltd.)

Mr. Yoshiki Umehara:  
Architectural Designer

Ishimoto Architectural &  
Engineering Firm, Inc.

I-3. List of Counterparts (Phase I)

Ministry of Supplies

Mr. Santa Bahadur Rai	Secretary
Mr. Hari Mohan Prasad Shrestha	Joint Secretary

Nepal Food Corporation

Mr. Surya Bahadur Sen Oli	General Manager
Mr. Ram Prasad Joshi	Deputy General Manager
Mr. Prem Prasad Neupane	Senior Officer, IDA Grain Storage Project
Mr. Lakendra Bahadur Shahi	Zonal Manager, Nepalganj
Mr. Badri Prasad Sharma	Zonal Manager, Dhangadhi
Mr. Lal Bahadur Kunwar	Food Officer, Dhangadhi
Mr. Ganesh Bahadur Chand	Branch Manager, Mahendranagar
Mr. J. P. Thapa	Zonal Chief, Bhairahawa
Mr. T.K.P. Panicker	Construction Engineer, Central office, Kathmandu
Dr. Alfred G. Scherer	Marketing and Management Adviser, Food and Agriculture Organization of the United Nations

Ministry of Finance

Mr. Heet Singh Shrestha	Additional Secretary
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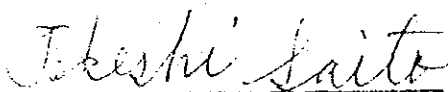
II-1. MINUTES OF DISCUSSIONS

THE DRAFT FINAL REPORT OF THE BASIC DESIGN STUDY  
ON  
THE CONSTRUCTION PROJECT OF FOODGRAIN STORAGE  
IN  
THE KINGDOM OF NEPAL

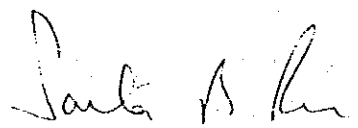
The Government of Japan has sent, through Japan International Cooperation Agency (JICA), a Basic Design Study Team to the kingdom of Nepal from 28 May to 6 June 1985 for the purpose of presenting and explaining the Draft Final Report of the Basic Design Study on The Construction Project of Foodgrain Storage.

After a series of discussions between the Team and the Nepalese authorities concerned, both parties confirmed the following results attached herewith ( ATTACHMENT ).

Kathmandu 3rd June 1985



(Mr. Takeshi Saito)  
Leader  
Basic Design Study Team  
JICA

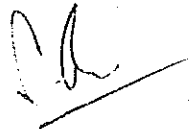


(Mr. S. B. Rai)  
Secretary  
Ministry of Supplies



ATTACHMENT

1. Both parties agreed to reconfirm the Minutes of Discussions which was mutually signed on 10 March 1985.
2. The Nepalese authorities concerned have agreed in principle to the Draft Final Report, with amendments as discussed.
3. The Nepalese authorities concerned have accepted Japan's grant aid system and the arrangement to be taken by the Nepalese side for realization of the Project.
4. The Final Report ( 10 copies in English ) will be submitted to the Nepalese side by the end of July 1985.

A handwritten signature in dark ink, consisting of a stylized, cursive name followed by a horizontal line underneath.

II-2. Organization of the Study Team (Phase II)

Mr. Takeshi Saito:  
Team Leader

Director, Import Dept.  
Chiba Food Agency Office  
Ministry of Agriculture, Forestry  
& Fisheries (MAFF)

Mr. Michimasa Numata:  
Project Coordinator

First Basic Design Div.  
Grant Aid Planning & Survey Dept.  
Japan International Cooperation Agency  
(JICA)

Mr. Eiichi Yabumae:  
Architectural Planner

Ishimoto Architectural &  
Engineering Firm, Inc.

Mr. Isamu Yamazaki:  
Grain Marketing Researcher

Ishimoto Architectural &  
Engineering Firm, Inc.  
(Overseas Merchandise Inspection  
Co., Ltd.)

May 31, 1985

II-3. List of Counterparts (Phase II)

(Ministry of Supplies)

Mr. S. B. Rai - Secretary, MOS  
Mr. Hari Mohan Shrestha - Joint Secretary  
Mr. Arjun Yonzan - Section Officer (food)

(NFC)

Mr. Surya Bahadur Sen Oli - General Manager  
Mr. Ram Prasad Joshi - Deputy General Manager  
Mr. Madan Mohan Pradhan - Div. Chief, Planning Division  
Mr. Gopal Prasad Shrestha - Div. Chief, Construction Division  
Mr. Prabhat Chandra Pandey - Asst. Div. Chief, Trade Division

(Food Technologist)

Mr. Prem Prasad Neupane - Senior Officer, IDA Grain Storage Project  
Mr. Stefan P. - Consultant CUM, Chief Engineer,  
IDA Grain Storage Project, NFC

(Ministry of Finance)

Mr. Heet Singh Shrestha - Additional Secretary, Foreign Aid Division  
Mr. Tulsi Neupane - Under Secretary  
(incharge of Food Grain Storage Project)





JICA