

Fig. 2-7 Dhaka Type Storage
Designed by PWD

| OFFICE OF THE EXECUTIVE ENGINEER P.W.D. DESIGN DIVISION II Dacca | | | | |
|---|--|--|------------------------|-------------------------|
| SCALE AS SHOWN | DRAWING NO C.P.F.0/131/81 | DATE 18-8-81 | DRAWN BY MAHMUD ALI | TRACED BY MAHMUD ALI |
| SHEET NO 1 | PROJECT TITLE:- MODIFIED 1000 TONS CAPACITY Dacca TYPE FOOD STORAGE GODOWN (HAVING 19'-0" PLINTH TO CEILING HEIGHT) | | | ARCHITECTS DRG. NO |
| 2 | | | | DATE |
| 3 | DRAWING TITLE:- PLAN, ELEVATION & SECTION | | | |
| 4 | | | | |
| MD. HURUL ISLAM ASSISTANT ENGINEER P.W.D. DESIGN DIVISION II Dacca | S.M. RAHAN ISIBIBI EXECUTIVE ENGINEER P.W.D. DESIGN DIVISION II Dacca | MD. WALIUL ISLAM SUPERINTENDING ENGINEER P.W.D. DESIGN CIRCLE Dacca | | |

2.5 Disasters and Their Impact on Foodgrain Supply and Demand

Bangladesh is hit by such natural disasters as droughts, floods, cyclones and tidal bores almost every year. Droughts and floods in particular cause substantial damage to foodgrain production, adversely affecting the foodgrain supply plan. The following disasters are those which caused a reduction of foodgrain production by more than one million tons in recent years.

1979 Drought (March - May)

production reduced by 1.1 million tons

In January, 1979, the government foodgrain inventory level was 0.85 million tons. The demand by the PFDP to supply 1.83 million tons necessitated the urgent import of 1.17 million tons, strongly reminding the government of the requirement for a national security reserve.

1984 Flood (February - June)

production reduced by 1.36 million tons

The inventory over July and August was 0.75 million tons and the market prices of foodgrain shot up by 20%, forcing the government to make record breaking imports of 2.59 million tons.

1987 Flood (June)

production reduced by 1.33 million tons

Flood damage actually occurred twice, from June to July and from August to September. In addition to crops being washed away, the efficiency of foodgrain transportation was severely damaged due to the breakdown of the communication network. Foodgrain prices sharply rose by more than 20% on the previous year. The government released 2.53 million tons (of which 1.77 million tons were imported and 44% was for non-monetized distribution channels) and stabilised market prices by increasing open market sales.

1988 Long Rain, Flood and Cyclone (May - November)

production reduced by 2.69 million tons

The inventory level stood at 0.98 million tons at the beginning of the term (July). The emergency situation was overcome by systematic import and domestic procurement efforts. Nevertheless, the import reached an all time high of 2.92 million tons (of which 1.14 million tons were funded without relying on foreign assistance).

1991 Disaster: Cyclone and Tidal Bore (April)

- 1) The great cyclone which hit Bangladesh on April 29, 1991 caused the deadliest damage of the century to the country with violent storms accompanying a wind velocity as fast as 62.5m/sec and a tidal bore as high as 7 - 13m above the mean sea level. The total damage to the 196 government foodgrain storage facilities is estimated to be Taka 700 million (approximately ¥2.7 billion), including those at the Chittagong silo (fixed type unloader damaged), the Haliashahar CSD and the Dewanhat CSD. In addition, substantial damage was caused to the stored rice, wheat and salt, etc. due to wetting.
- 2) At the time of the disaster, the government's foodgrain storage level was low at 825,000 tons (270,000 tons of rice and 555,000 tons of wheat). Since all the milling facilities in the damaged areas were either destroyed or put out of order, rice was allocated to the victims of the disaster as emergency food relief. The rice stock level in the disaster areas, particularly in the Noakhali, Feni, Chittagong and Cox's Bazar Districts was extremely low. The crisis situation was overcome through the emergency shipment of 55,000 tons of rice in May from such CSDs as Dinajpur and Bogra in the north and Khulna and Barisal in the southwest. The release from the Dhaka CSD and Tejgaon CSD also helped to alleviate the critical food situation.
- 3) Despite this release of a large amount of rice for disaster relief purposes, there appears to have been no urgent requirement for emergency imports due to the exceptionally high level of domestic procurement of 167,000 tons in May and 215,000 tons in June, made possible by the bumper harvest in the north.

2.6 Outline of National Development Plan

The Government of Bangladesh has so far introduced five Economic Development Plans, starting from the 1st 5 Year Plan (fiscal 1973/74 - 1977/78) with one 2 Year Plan (fiscal 1978/79 - 1979/80) being inserted between the normal 5 Year Plans in order to improve the country's economic infrastructure as well as the standard of living of the people. At present, the 4th 5 Year Plan (fiscal 1990/91 - 1994/95), devised on the basis of the 20 Year Perspective Plan 1990 - 2010 which was announced in 1990, is in progress with emphasis on the following development targets.

- 1) Acceleration of economic growth (an annual GDP growth rate of 5% during the 5 year period is anticipated).
- 2) Alleviation of poverty and the generation of employment opportunities through human resources development.
- 3) Promotion of self-support, self-reliance efforts.

In the 4th 5 Year Plan, overcoming the constraints on economic growth and the expansion of economic development efforts are called for as strategic components to achieve the above objectives so that an annual average GDP growth rate of 6 - 8% can be achieved in the 5th Plan.

The concrete target in the 4th Plan is an annual GDP growth rate of 5%. It is understood that growth rates of 3.6% for the agricultural sector and 9.1% for the manufacturing sector must be achieved to meet the overall target of 5%. The planned development expenditure is Taka 672.3 billion (1989/90 price level) with Taka 407.3 billion going to the public sector and the remaining Taka 265 billion going to the private sector. The planned investment by sector is shown in the following table.

(Unit: 10 million Taka)

| Sector | Public Sector Allocation (%) | Private Sector Allocation (%) | Total Allocation (%) |
|---|------------------------------|-------------------------------|----------------------|
| Agr. Water Resources & Rural Development | 11,021 (27.06) | 7,212 (27.21) | 18,233 (27.12) |
| Industry | 4,180 (10.26) | 4,360 (16.46) | 8,540 (12.70) |
| Electricity, Oil, Gas & Natural Resources | 8,350 (20.50) | — | 8,350 (12.42) |
| Transport & Communications | 6,810 (16.72) | 3,180 (12.00) | 9,990 (14.87) |
| Physical Planning, Housing & Water Supply | 1,241 (3.05) | 6,214 (23.45) | 7,455 (11.09) |
| Education & Religious Affairs | 2,401 (5.89) | 888 (3.35) | 3,289 (4.89) |
| Health | 1,067 (2.62) | 181 (0.68) | 1,248 (1.86) |
| Population Control & Family Planning | 1,710 (4.19) | 108 (0.41) | 1,818 (2.70) |
| Social & Economic Infrastructure | 548 (1.35) | 27 (0.10) | 575 (0.86) |
| Science & Technology | 76 (0.19) | — | 76 (0.11) |
| Manpower & Labour | 76 (0.19) | — | 76 (0.11) |
| Public Administration | 130 (0.32) | — | 130 (0.19) |
| Regional Allocation | 3,120 (7.66) | 36 (0.14) | 3,156 (4.69) |
| Trade & Others | — | 4,294 (16.20) | 4,294 (6.39) |
| Total | 40,730 (100.00) | 26,500 (100.00) | 67,230 (100.00) |

Note: Figures in brackets refer to the percentage of total expenditure.

The Government of Bangladesh gives priority to the achievement of improved food management (mainly rice and wheat) and food security as the basic requirements to satisfy the targets of the current 5 Year Plan which anticipates the domestic production of rice and wheat to increase by 19.3% from 18.46 million tons in fiscal 1989/90 to 22.03 million tons in fiscal 1994/95, the target year of the Plan. The government procurement is expected to increase from the current half million ton level to the one million ton level by the end of the Plan period. In line with the anticipated increase of foodgrain supply, the Plan calls for the creation of a national security reserve of 600,000 tons (equivalent to three months' demand) to ensure a new high nutritional standard for the public. The development of an additional storage capacity of one million tons (600,000 tons by new storages and 400,000 tons by rehabilitated storages) is also expected to take place during the Plan period to increase the overall storage capacity from the current 1.87 million tons to 2.5 million tons.

2.7 Contents of the Request

2.7.1 Background of the Request

The annual food supply by the Government of Bangladesh to Dhaka MA which has an estimated population of more than 6.5 million has been some 0.2 - 0.25 million tons in recent years, of which some 40% consists of rice from the north and some 60% consists of wheat imported via Chittagong Port.

Approximately one-third and two-thirds of this government foodgrain are delivered to and temporarily stored at the Dhaka CSD (storage capacity of 7,500 tons) and the Tejgaon CSD (storage capacity of 33,200 tons) respectively before distribution for consumption. Since neither of these depots has sufficient storage capacity, extremely high annual turnovers are recorded, i.e. 7 - 16 turnovers for the Dhaka CSD and 5 - 8 turnovers for the Tejgaon CSD. Such tight operation is not capable of fully responding to the emergencies caused by frequent floods and transport strikes. At these two CSDs, the actual storages are 40 - 50 years old except for those which were constructed by the Japanese grant aid in recent years and, therefore, are not suitable for the long-term storage of foodgrain. Both CSDs face difficulties in expanding their facilities due to their location in urban areas and the worsening traffic situation (serious traffic congestion) has made transportation in and out of the CSDs particularly difficult in recent years.

To solve these difficulties, the Government of Bangladesh planned the Project to construct 50,000 ton class foodgrain storages (equivalent to three months' demand) in Tarabo Municipality (located south of Dhaka) and Tongi Municipality (located north of Dhaka) and requested the Government of Japan's provision of grant aid for the construction of these storages as well as ancillary facilities. The initial request was followed by an urgent request via the diplomatic channel by the Government of Bangladesh, appealing for the Government of Japan's early decision to construct the foodgrain storages at Tongi Municipality.

2.7.2 Contents of the Request

The contents of the request made by the Government of Bangladesh are the construction of 50 new storages with a storage capacity of 1,000 tons each and ancillary facilities and the provision of the necessary equipment to establish a new CSD in Tongi Municipality which is located north of Dhaka.

CHAPTER 3

PROJECT AREA OF THE STUDY

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3.1 Project Area

The Project area is provisionally called Dhaka Foodgrain Distribution Area (Dhaka FDA) which consists of Dhaka MA, which is the subject area for distribution from the Dhaka and Tejgaon CSDs, and Tongi Municipality area where the new CSD site (the Project site) is planned.

The Dhaka MA has flat land of some 145km² and consists of 14 Upazilas (acting as administrative areas). While no accurate population figure is available, the Dhaka Municipal Corporation puts it at over 6.5 million. The Tongi Municipality, located north of the Dhaka MA, has an area of some 31km² and an estimated population of some 300,000.

While the road network in Dhaka MA is generally good, the narrow streets in the densely populated Old Dhaka are very crowded. The traffic flow in the new wider streets is often hampered by numerous man-pulled carts called rikisha. The Bangladesh Railway line starts from Narayanganji, some 15km south of Dhaka MA, and runs through the center of Dhaka MA. It branches off to the north and to the east (towards Chittagong) in Tongi Municipality. There is a water passage from Chittagong, a sea port city, to Dhaka MA via Shahbazpur River, Megna River and Buriganga River. The first two rivers are southern edge of Dhaka MA and is used to transport cargoes by ships and barges to the north via the western edge of Dhaka MA where its name changes to Turag River. Tongi River runs through Tongi Municipality but can only be used for transportation purposes during a limited period of the year due to the generally low water flow.

3.2 Supply and Demand Situation of Foodgrain

3.2.1 Foodgrain Demand in Dhaka FDA

(1) Demand Based on Rationing

In order for all ration card holders (1.99 million) to receive the stipulated ration amount, the monthly and annual requirements are estimated to be some 24,000 tons and some 290,000 tons respectively. The actual rationing is below these levels as some people decline the monetized rations. These people, however, apply for rations when the supply situation becomes tight. Consequently, the above figures can be treated as showing the potential demands. These figures do not include open market sales (some 10% of the total supply on nationwide basis) which are conducted for price stabilization.

Table 3-1 Demand Based on Rationing

| | (Unit: tons) | | |
|-----------|---------------|----------------|---------------|
| | Weekly Demand | Monthly Demand | Annual Demand |
| Rice | 1,844 | 8,000 | 95,900 |
| Wheat | 2,800 | 12,100 | 145,600 |
| Sub-Total | 4,644 | 20,100 | 241,500 |
| Others | 968 | 4,200 | 50,200 |
| Total | 5,612 | 24,300 | 291,700 |

(2) Demand Based on Actual Delivery Records of Existing CSDs

The delivery records of the Dhaka CSD and the Tejgaon CSD are attached as Appendix 6-A of this report. Table 3-2 shows the average delivery of food (rice, wheat and sugar, etc.) of these two CSDs for the period between fiscal 1985/86 and fiscal 1989/90.

Table 3-2 Demand Based on Actual Delivery Records

| | (Unit: tons) | |
|----------------|-------------------|-----------------|
| | Year | Month |
| Rice and Wheat | 214,000 (235,000) | 18,000 (20,000) |
| Food Total | 248,000 (272,000) | 21,000 (23,000) |

Note: Figures in brackets show the expected demand in the Dhaka FDA following the construction of a new CSD in Tongi Municipality equivalent to a 10% increase of the demand in Dhaka.

Since the Government of Bangladesh restricts general sales, particularly open market sales, when the foodgrain inventory level becomes low, the delivery does not necessarily indicate the size of the demand. For the sake of the present discussion, the delivery for which accurate data are available is considered as the demand size.

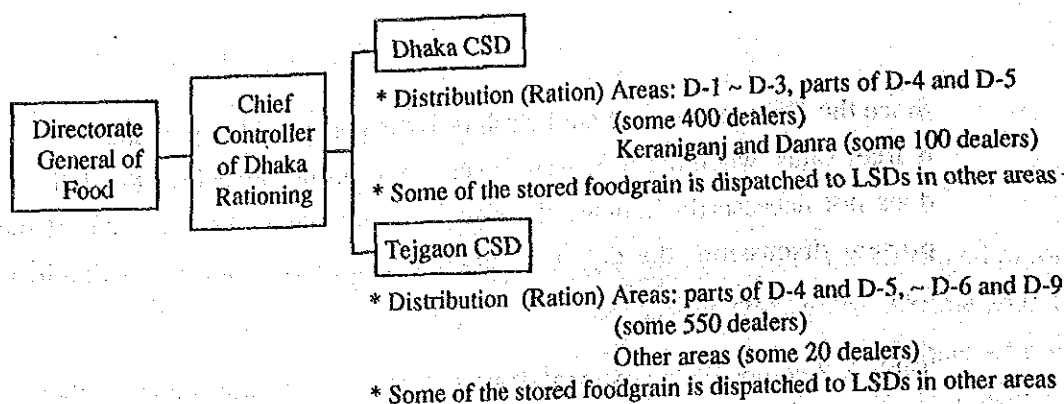
Table 3-3 compares the national demand (delivery) for foodgrain with that for Dhaka, showing that Dhaka MA accounts for some 10% of the national demand. The fact that the demand for foodgrain distribution in Dhaka MA is more than its proportional figure based on the population ratio can probably be explained by the concentration of those eligible for statutory rationing in six large cities including Dhaka MA, and also by the concentration of those eligibles for priority rationing (military and civil servants) in Dhaka MA.

Table 3-3 National and Dhaka MA's Demands for Foodgrain Distribution

| | (Unit: 1,000 tons) | | | | | |
|----------------------|--------------------|---------|---------|---------|---------|---------|
| | 1985/86 | 1986/87 | 1987/88 | 1988/89 | 1989/90 | Average |
| National Demand (A) | 1,541 | 2,120 | 2,503 | 2,941 | 2,164 | 2,254 |
| Dhaka's Demand (B) | 172 | 217 | 236 | 257 | 188 | 214 |
| Relative Ratio (B/A) | 11.2 | 10.2 | 9.4 | 8.7 | 8.7 | 9.5 |

3.2.2 Food Distribution System under PFDP

Rationing, which forms the core of the public food distribution system, is conducted on the basis of its own distribution (ration) areas (different from administrative areas) by dividing Dhaka MA into 9 sub-areas (D-1 - D-9) as shown in Fig. 4-1. The current number of ration card holders is said to be 1.99 million with 380,000 households. Actual distribution takes place at the Dhaka CSD and the Tejgaon CSD in the following manner.



The transportation of imported foodgrain to these two CSDs is made via Buriganga River which connects Chittagong with the north to the Dhaka CSD or via railway from Chittagong to the Tejgaon CSD. As a result, these two CSDs have the following specific systems of foodgrain transportation to their respective sites.

Dhaka CSD ... Domestic Rice : transported from the main producing area some 370km north of Dhaka by mainly barge (80%) and also by truck (20%)

Imported Wheat : transported from Chittagong by ship (50%) and from the Narayanganj silo by truck (50%)

Tejgaon CSD ... Domestic Rice : transported from the north by railway/ferry (55%) and by truck/ferry (45%)

Imported Wheat : transported from Chittagong by railway (60%) and from the Narayanganj silo by truck (40%)

3.2.3 Foodgrain Distribution in Private Sector

Rice distribution in Bangladesh is, in principle, free except that subject to rationing and open market sale under PFDP. Accordingly, a substantial part of rice distribution in Dhaka MA is in the hands of the private sector. In the case of government stored wheat, mainly imported wheat, it is allocated to flour mills on a quota basis except the amount set aside for rationing. Once sold by the government, wheat is subject to free trading. There are two wholesale rice markets and one wholesale wheat market in Dhaka MA as listed on the next page in addition to some 50 small and some 50 medium scale markets dealing with rice and Atta (ground wheat).

Badamtali Rice Market (rice)..... some 250 dealers
Mahammedpur Agriculture Market (rice).....70 - 100 dealers
Monlvibazar (wheat)

The business size of all these dealers is small. A relatively large dealer at the Badamtali Rice Market has an inventory level of some 100 tons (equivalent to one or two day's trading). Delivery to the markets is only permitted at night (from 20:00 to 04:00) due to the general congestion of the roads. The scale of purchase by a retailer is said to be 1 - 5 bags (85kg per bag) each time.

CHAPTER 4

EXAMINATION OF PROJECT CONTENTS

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4.1 Objectives of the Project

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Approximately one-third and two-thirds of this government foodgrain are delivered to and temporarily stored at the Dhaka CSD (storage capacity of 7,500 tons) and the Tejgaon CSD (storage capacity of 33,200 tons) respectively prior to distribution for consumption. As both of these depots do not have sufficient storage capacity, extremely high annual turnovers are recorded, i.e. 7 - 16 turnovers for the Dhaka CSD and 5 - 8 turnovers for the Tejgaon CSD. Such tight operation is incapable of properly responding to the emergencies resulting from frequent floods and transport strikes. The actual storages at these two CSDs are 40 - 50 years old except for those which were constructed by the Japanese grant aid in recent years and, therefore are unsuitable for the long-term storage of foodgrain. In addition, it appears unlikely that the performance of these storages will improve even if they are partially rehabilitated. Both CSDs face difficulties in expanding their facilities due to their location in urban areas and the worsening traffic situation (serious traffic congestion) has made transportation in and out of the CSDs particularly difficult in recent years.

The present Project intends the development of a long-term foodgrain storage capacity by the construction of a new CSD with 35 storages of 1,000 ton capacity each in Tongi Municipality which is located north of Dhaka MA as part of the foodgrain storage improvement plan for Dhaka FDA in order to solve the problems faced by the existing CSDs in the area. The Project also intends to contribute to the establishment of a security reserve and to price stabilization. Consequently, although the Project envisages the construction of a new CSD, it can be deemed as the rehabilitation project for the existing CSDs in terms of both qualitative and quantitative aspects to compensate the decreased storage capacity of those storages which were already dismantled or of which use has been suspended due to deterioration of the buildings.

4.2 Examination of Contents of the Request

4.2.1 Viability and Necessity of the Project

The viability of constructing a new CSD in Tongi Municipality is examined below.

- (1) On the supply side, while the annual domestic production of rice and wheat fluctuates depending on the weather, there is a basic trend of increase with Boro rice which offers a reliable yield playing a central role. Accordingly, the domestic foodgrain procurement of the government has been increasing each year. Together with the prospect that a substantial volume of wheat will be imported for some time to come until a self-sufficiency of food supply has been achieved, the supply of foodgrain to the Dhaka FDA for both immediate consumption and strategic reserve purposes will be secured.
- (2) With regard to the distribution of government foodgrain through different channels, the number of the recipients of the statutory rationing will remain constant as no new ration cards have been issued since 1974. The volume of monetized rationing is expected to decline because of the policy to reduce the price difference between the government price and the market price. In contrast, the open market sales for price stabilisation is expected to show a large increase. As the population of Dhaka MA has been rapidly increasing, from 3.44 million in 1981 to 6.5 - 7 million today, the importance of government foodgrain is expected to continue, not only for daily consumption but also for emergency purposes.
- (3) Although some of the storages at the existing CSDs in Dhaka MA have been rehabilitated, the overall storage capacity now stands at 40,700 tons (including some 3,000 tons for items other than foodgrain, such as sugar), a decrease of 6,000 tons from the previous level. Despite the strong need for an increased storage capacity, such an increase has been hampered by land and transportation constraints, necessitating the construction of a new CSD to increase the storage capacity and to diversify the supply bases.
- (4) The new Tongi CSD to be constructed under the Project is expected to have the following roles/functions and, therefore, its construction is deemed viable.

- 1) The population of Tongi Municipality is currently some 300,000 but is expected to rapidly increase in the future due to the sprawling of Dhaka MA. As a result, the Tongi CSD will form its own distribution (ration) area, incorporating part of the Tejgaon CSD distribution (ration) area and suburban Tongi Municipality area as shown in Fig. 4-1.
- 2) The burden on the existing Dhaka CSD and Tejgaon CSD will be reduced as the Tongi CSD will replace these two CSDs in supplying large dealers handling 100 tons or more which channel foodgrain to flour mills and for relief purposes.
- 3) As storages constructed by Japanese grant aid enjoy a high performance, the Tongi CSD can maintain a security reserve equivalent three months' demand or so to prevent much seasonal price fluctuation and to act as an emergency supply base for bad crop years of disaster relief.
- 4) There will be no two step transportation to the Dhaka CSD and Tejgaon CSD to avoid transportation loss and cost increases except in emergency cases.
- (5) The Project site for the Tongi CSD is adjacent to the Tongi industrial district and not far from the trunk road between Dhaka and Mymensingh. Tongi is also located at the turning point of the railway route from Dhaka to Chittagong or Mymensingh and the Tongi CSD can use inexpensive railway transportation. In all, the locational conditions of the Project site are outstanding.

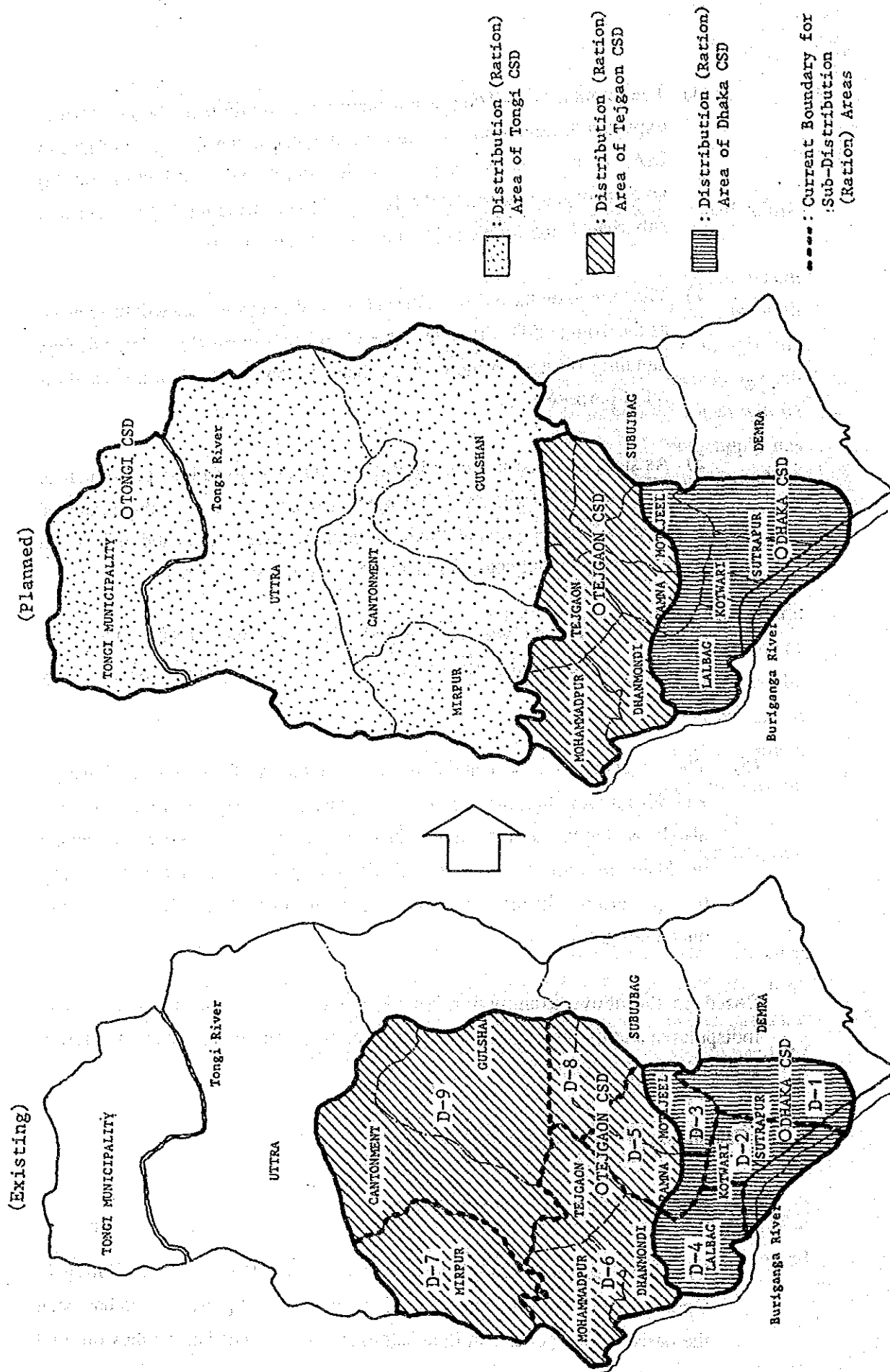
Based on the above examination results, the viability of the Project appears indisputable and the Project is expected to greatly contribute to a stable foodgrain supply for the Dhaka FDA.

4.2.2 Calculation of Required Storage Capacity

(1) National Policy on Foodgrain Stock

The Government of Bangladesh announced the National Food Policy in October, 1987, the first comprehensive national food policy which has been the basis of food policies in Bangladesh ever since. The basic policy on food

Fig. 4-1 Distribution (Ration) Area of Each CSD in Dhaka FDA



stock, stipulated in the National Food Policy, is in line with the World Bank recommendations made in fiscal 1980/81 and is outlined below.

The stock level as of the beginning of fiscal 1990/91 is 1.5 million tons to guarantee the foodgrain supply envisaged by PFDP which intends the achievement of a stable foodgrain supply and price stabilization. 600,000 tons (equivalent to three months' demand for the off-crop season between July and October) of this 1.5 million tons are the security reserve for emergency use. The breakdown of the 1.5 million ton stock is as follows.

| | |
|------------------|----------------|
| Total Stock | 1,500,000 tons |
| Dead Stock | 150,000 tons |
| Security Reserve | 600,000 tons |
| Normal Stock | 750,000 tons |

While the 1.5 million ton stock level is the target level, it was temporarily achieved in fiscal 1988/89 as shown in Table 4-1. As such, the figure appears to be practical.

Table 4-1 Changes of Opening Stock by Fiscal Year

| (Unit : 1,000 tons) | | | | | | | |
|---------------------|---------|---------|---------|---------|---------|---------|---------|
| Fiscal | 1984/85 | 1985/86 | 1986/87 | 1987/88 | 1988/89 | 1989/90 | 1990/91 |
| Rice | 90 | 466 | 353 | 238 | 644 | 332 | 818 |
| Wheat | 710 | 542 | 623 | 513 | 854 | 577 | 330 |
| Total | 800 | 1,008 | 976 | 751 | 1,498 | 909 | 1,148 |

(2) Size of Security Reserve

1) Security Reserved Based on PFDP

Dhaka FDA, the Project area, is the capital of Bangladesh and its largest city with an estimated population of more than 6.5 million. The food situation in Dhaka FDA immediately affects other parts of the country, signifying the extreme importance of the area vis-a-vis the socioeconomy

of the country. Since Dhaka FDA is a huge consumption area with little local food production, it appears appropriate for the area to have a food stock which is equivalent to three months' demand* as in the case of the security reserve target under PFDP.

* The "Establishment of Security Reserve" and "Establishment of 2.5 Million Ton Foodgrain Storage Capacity" called for in the 4th 5 Year Plan are based on the World Bank recommendation for a 1.5 million ton foodgrain stock (of which 600,000 tons are a security reserve) made in the 1979 World Bank report entitled "Bangladesh: Food Policy Issue". The above 600,000 ton security reserve was calculated by the World Bank as the required foodgrain supply for the off-crop season from July to October.

Apart from a security reserve, the World Bank also recommended 150,000 tons of dead stock and 750,000 tons of normal stock. However, Dhaka FDA's enjoyment of this extraordinarily high stock level appears problematic. In addition, it may be difficult to maintain such a high stock level for a huge consumption area like Dhaka MA. In the present Project, therefore, the calculation of the required stock capacity is based on a three months' demand equivalent.

2) Emergency Foodgrain Supply Simulation for Dhaka FDA

The following simulation study was conducted on the emergency foodgrain supply for the Dhaka FDA using the preconditions given below.

(Preconditions)

- | | | |
|-------------------------------|---|---|
| a) Normal Monthly Demand | : | a |
| b) Normal Initial Stock Level | : | a (based on past records) |
| c) Acceptance | | |
| Normal month | : | a |
| Disaster hit month | : | 1/2 a (delayed transportation due to road and railway damage) |

Second month following disaster : $1\frac{1}{2}$ a (restoration of transportation)

Third month following disaster : $1\frac{1}{2}$ a (partial arrival of imported relief food)

Fourth month following disaster : 2 a (full-scale arrival of imported relief food)

Note: Food imports are said to require 4 months from the signing of an agreement to arrival of the food at an importing port. Another month is required for domestic transportation.

d) Delivery

Normal month : a

Disaster hit month : 2 a (difference between actual volumes of October, 1985 and July, 1988; payable and free distribution)

Second month following disaster : $1\frac{1}{2}$ a (payable and free distribution)

Third month following disaster : $1\frac{1}{2}$ a (release for price stabilization)

Fourth month following disaster : a

| | 1st Month | 2nd Month | 3rd Month | 4th Month |
|---------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|
| Initial Stock Level | a (3a) | $-1\frac{1}{2}$ a ($1\frac{1}{2}$ a) | $-1\frac{1}{2}$ a ($1\frac{1}{2}$ a) | $-1\frac{1}{2}$ a ($1\frac{1}{2}$ a) |
| Acceptance | $1\frac{1}{2}$ a ($1\frac{1}{2}$ a) | $1\frac{1}{2}$ a ($1\frac{1}{2}$ a) | $1\frac{1}{2}$ a ($1\frac{1}{2}$ a) | 2 a (2 a) |
| Delivery | 2 a (2 a) | $1\frac{1}{2}$ a ($1\frac{1}{2}$ a) | $1\frac{1}{2}$ a ($1\frac{1}{2}$ a) | a (a) |
| End Stock Level | $-1\frac{1}{2}$ a ($1\frac{1}{2}$ a) | $-1\frac{1}{2}$ a ($1\frac{1}{2}$ a) | $-1\frac{1}{2}$ a ($1\frac{1}{2}$ a) | $1\frac{1}{2}$ a ($2\frac{1}{2}$ a) |

Note: Figures in brackets show the corresponding values when a three months' demand equivalent security reserve is held.

In the above table, a negative end stock level may never occur in practice. However, close examination of the monthly initial stock levels at Dhaka CSD and Tejgaon CSD for the last five years reveals considerable samples where the stock fell below the operational level. At the Dhaka CSD, the stock level fell below 500 tons in one month for rice and 23 months for wheat (two months with no stock at

all). Similarly, at the Tejgaon CSD, the stock level fell below the 1,000 ton level in eight months for wheat (the lowest level recorded was 15 tons).

The above simulation results and the findings on the actual stock level indicate that it is absolutely essential stock a three months' demand equivalent (which ensures a stock level of one months' demand at the end of the term in the simulation).

(3) Required Stock

- 1) The monthly food demand in the Dhaka MA (average for five years) is estimated to be 20,000 tons (rice and wheat) as described in 3.2.1 (2). Given the required storage period of three months as discussed above, the required stock is 60,000 tons.

$$20,000 \text{ tons} \times 3 \text{ months} = 60,000 \text{ tons}$$

The 60,000 tons are equivalent to 10% of the required nationwide stock of 600,000 tons and this ratio corresponds to the demand ratio of Dhaka MA (10%). This figure is deemed highly feasible as stock levels of 59,000 tons and 53,000 tons were recorded in June and July, 1988 respectively.

- 2) In general, some 10% of the foodgrain stock is defined as dead stock. This dead stock should also be considered in the present Project as the trade inventory is not accounted for and also as there is no guarantee that the required stock level will be available at a specific CSD during an emergency due to the diversification of stock at three CSDs. A possible difference between the rice and wheat stock levels also necessitates the inclusion of dead stock in the present calculation. The required stock volume inclusive of dead stock is, therefore 66,000 tons.

$$60,000 \text{ tons} \times 110\% = 66,000 \text{ tons}$$

(4) Required Storage Capacity and Shortage

- 1) In general, the maximum inventory ratio vis-a-vis the storage capacity is believed to be 80%. A higher inventory ratio than this results in failure to comply with the First Come, First Go principle which is the main basis

of storage management and insufficient fumigation (the fumigant cannot effectively penetrate the stock without certain space). Consequently, the minimum storage capacity required and the minimum shortage of the storage capacity based on the requirement to store the 66,000 tons described in (3) - 2) above are calculated as follows:

Minimum Storage Capacity : $66,000 \text{ tons} \div 80\% = 82,500 \text{ tons}$
Required

Minimum : $82,500 \text{ tons} - 37,700 \text{ tons}$ (existing storage capacity)

Shortage of : $44,800 \text{ tons}$

Storage Capacity : $\div 45,000 \text{ tons}$

2) The planned storage period under the Project is three months which is considerably longer than the past performance of 1 - 2 months, necessitating fumigation during this period. Lot fumigation is more popular than storage wide fumigation in Bangladesh, partly because of the need to save on the expensive fumigant cost. In view of the use of the lot fumigation method, it is necessary to lower the inventory ratio to achieve satisfactory fumigation results. Assuming a new inventory ratio of 70%, the storage capacity required and the shortage of the storage capacity are now as follows.

Storage Capacity Required : $66,000 \text{ tons} \div 70\% = 94,300 \text{ tons}$

Shortage of Storage : $94,300 \text{ tons} - 37,700 \text{ tons}$

Capacity : $= 56,600 \text{ tons}$

$\div 57,000 \text{ tons}$

(5) Design Storage Capacity for the Project

It appears desirable to decide the required storage capacity to be provided under the Project on the basis of the shortage of the storage capacity described in (4) - 2) above while also taking the following requirements into consideration.

1) Diversified Location of CSDs

The diversified location of the CSDs to a certain extent is desirable so that any emergency can be efficiently dealt with. The original request of the Government of Bangladesh to construct two new CSDs to the north and south of Dhaka MA was based on this rationale.

2) Diversified Location of CSDs for Efficient Foodgrain Distribution

There are currently some 500 and 570 dealers at the Dhaka CSD and Tejgaon CSD respectively buying rice and/or wheat from the government stock. 20 - 30% of them at the Dhaka CSD and 10 - 15% at the Tejgaon CSD still use pushcarts (maximum loading capacity of approximately 1,000kg) to move the foodgrain out of the site. It is impossible for these dealers to travel a long distance to obtain foodgrain. This present state of foodgrain transportation necessitates the diversification of CSDs.

3) Diversified Incoming Transportation

While the railway is expected to play a crucial role in the transportation of foodgrain to the Tongi CSD, the rolling stock owned by the Bangladesh Railways capable of transporting foodgrain declined from 19,719 wagons in fiscal 1984/85 to 18,461 wagons in fiscal 1988/89. As a result, the competent authorities for foodgrain distribution are currently finding it difficult to secure the necessary railway transportation capacity. It is therefore, undesirable to plan the intensive use of the railway. A viable alternative is shipping which can generally survive floods and offers a lower freight cost (70% of the railway charge). Given this argument, it may be unavoidable to construct a new CSD to the south of Dhaka MA where ship transportation is possible in the future.

4) The Dhaka CSD was not originally constructed for the long-term storage of foodgrain. Its relocation may be necessary in the near future in view of the degree of deterioration and the difficulty in traffic movement around it.

Based on the above argument, it appears appropriate to determine the storage capacity of the planned Tongi CSD at 35,000 tons (35 storages) which

includes half of the storage capacity shortage calculated in (4) - 2) above and the replacement of the current storage capacity of the Dhaka CSD. This storage capacity must be achieved through the efficient use of the available land at the planned site by designing the optimum facility layout.

$$\begin{aligned} \text{Storage Capacity Shortage} &: 57,000 \text{ tons} + 2 = 28,500 \text{ tons} \\ &28,500 \text{ tons} + 6,500 \text{ tons (Dhaka CSD)} \\ &= 35,000 \text{ tons} \end{aligned}$$

4.2.3 Preliminary Evaluation of Effects of Increased Storage Capacity

(1) Foodgrain Storage Capacity in Dhaka FDA

With the completion of the new Tongi CSD (storage capacity of 35,000 tons), the foodgrain storage capacity of the government in Dhaka FDA will increase from the present 40,700 tons to 75,700 tons. The storage capacity will almost double if only that for rice and wheat is considered.

| | | | | |
|------------------|--------------|--------------------|-----------------------|--------------------|
| Dhaka CSD | Total | 7,500 tons | Foodgrain Only | 6,500 tons |
| Tejgaon CSD | Total | 33,200 tons | Foodgrain Only | 31,200 tons |
| <u>Tongi CSD</u> | <u>Total</u> | <u>35,000 tons</u> | <u>Foodgrain Only</u> | <u>35,000 tons</u> |
| Total | | 75,700 tons | | 72,700 tons |

Note: Some rationing items other than rice and wheat which are stored at the Dhaka CSD and Tejgaon CSD will also be stored at the Tongi CSD but this likelihood is not considered in the above table in view of convenience.

(2) Length of Foodgrain Storage

The storage capacity described in (1) above is based on the assumption that the effective storage ratio is 70%. Consequently, the actual stock will be 51,000 tons which is equivalent to 2.5 months' demand inclusive of 10% dead stock.

$$\begin{aligned} \text{Stock} &: 72,700 \text{ tons} \times 0.7 = 50,900 \text{ tons} \approx 51,000 \text{ tons} \\ \text{Demand} &: 20,000 \text{ tons} \times 1.1 \text{ (inclusive of dead stock)} \\ &= 22,000 \text{ tons} \\ \text{Length of Storage} &: 51,000 \text{ tons} \div 22,000 \text{ tons} = 2.3 \text{ months} \\ &\approx 2.5 \text{ months} \end{aligned}$$

The results of the simulation described in 4.2.2 (2) - 1) using the above figures are shown below. Here, approximately one month's demand equivalent stock can be maintained even if a disaster occurs.

| | 1st Month | 2nd Month | 3rd Month | 4th Month |
|---------------------|---------------|-------------------|-------------------|-------------|
| Initial Stock Level | a (2 1/2 a) | -1/2 a (a) | -1/2 a (a) | -1/2 a (a) |
| Acceptance | 1/2 a (1/2 a) | 1 1/2 a (1 1/2 a) | 1 1/2 a (1 1/2 a) | 2 a (2 a) |
| Delivery | 2 a (2 a) | 1 1/2 a (1 1/2 a) | 1 1/2 a (1 1/2 a) | a (a) |
| End Stock Level | -1/2 a (a) | -1/2 a (a) | -1/2 a (a) | 1/2 a (2 a) |

Note: Figures in brackets show the corresponding values when a two and half months' demand equivalent stock is held.

(3) Storage Utilization Rate

The increased storage capacity in Dhaka DFA will enable the maintenance of approximately 2.5 months' demand equivalent stock. As a result, the annual turnover at each storage in Dhaka DFA will be reduced to approximately 5 times which is a big improvement on 7 times (average during last 5 years), in turn calculated on the basis of 100% stock level throughout the year. The increased storage capacity will, therefore, facilitate a stable foodgrain supply and a reduction of the storage loss through the implementation of appropriate storage management.

(4) Benefits for Local Inhabitants

The foodgrain stock in the Dhaka DFA is generally intended for rationing use except that for open market sales to stabilize market prices. Assuming emergency supply to the total population of the Dhaka DFA (7 million, of which children account for 2.5 million) of the required amount (16oz = 450g/day/adult, half for a child), the Tongi CSD will be capable of providing 10 days' supply of rice and wheat. Some 20 days' supply will be secured by the three CSDs in Dhaka DFA.

(Supply Capacity of Tongi CSD)

(Estimated Actual Stock) (Daily Demand)

$$35,000 \text{ tons} \times 0.7 \div (450\text{g} \times 4.5 \text{ million} + 225\text{g} \times 2.5 \text{ million})$$

$$= 9.5 \approx 10 \text{ days}$$

(Total Supply Capacity of 3 CSDs in Dhaka FDA)

51,000 tons + (450g x 4.5 million + 225g x 2.5 million)

$\div 2600 \div 1000 = 19.7 \approx 20$ days

4.2.4 Examination of Requested Facilities and Equipment

(1) Examination of Requested Facilities

1) Construction of 1,000 Ton Class Foodgrain Storages

At present, the foodgrain storages in use in Bangladesh can be classified as 500 ton class Dhaka type storages, 1,000 ton class Dhaka type storages and their improved types. The storages constructed by the grant aid of the Government of Japan belong to the improved 1,000 ton class Dhaka type. Compared to the conventional Dhaka type, the improved type has a better storage performance and is highly evaluated by government officials in Bangladesh (see Table 4-2 for comparison of storage types). Strong hope has been expressed in relation to the present Project for the maintenance of the performance of the previously constructed improved type of storage. A storage capacity of 1,000 tons which was adopted for Phase IV of the Japanese assistance is still deemed appropriate in view of the followings:

- a) The unit construction cost is less than that for the 500 tons class.
- b) While storages aiming at facilitating smooth procurement must be scattered around the country (size is immaterial) to achieve higher efficiency, the Tongi CSD which will act as a supply base for a large consumption area will receive large lots from local CSDs, LSDs and silos. A 1,000 ton class storage is required to smoothly deal with such large lots.
- c) As the practice of assigning workers to specific storages has already been established in the case of the 1,000 ton class storage, this practice can be immediately employed for the new storages.

Table 4-2 Comparison of Storage Types

| | Items | Dhaka Type | Japanese Standard Type |
|---------------------------------------|--|--|---|
| General Specifications | <p>Storage capacity Floor size</p> <p>Building height (Upto roof slab top) (Upto roof slab bottom)</p> <p>Floor height</p> | <p>1,000 tons 30.48m x 24.38m (100 feet x 80 feet)</p> <p>GL + 6.818m FL + 5.791m (19 feet)</p> <p>GL + 0.914m (3 feet)</p> | <p>1,000 tons 30.0m x 24.0m</p> <p>GL + 6.810m FL + 5.791m (19 feet)</p> <p>GL + 0.900m</p> |
| Structure | <p>Main structure Exterior walls Foundation</p> | <p>Reinforced concrete Brick masonry Independent footing</p> | <p>Reinforced concrete Brick masonry Continuous footing combined with independent footing</p> |
| Finish | <p>Roof Interior & exterior walls Floor Ceiling</p> | <p>Lime terracing Mortar with distemper Trowelled concrete finish Mortar</p> | <p>Lime terracing Mortar with vinyl paint Trowelled concrete finish Concrete with vinyl paint</p> |
| Storage Performance | <p>Floor damp-proofing Ventilation</p> <p>Dunnage</p> <p>Pest control Heat insulation</p> | <p>Polyethylene sheet Natural ventilation through windows</p> <p>Wooden dunnage or bamboo</p> <p>None Lime terracing</p> | <p>Polyethylene sheet Natural ventilation through windows</p> <p>Wooden dunnage</p> <p>Insect nets, screen doors Lime terracing</p> |
| Conditions for Structural Calculation | <p>Concrete strength Steel bar tensile strength Steel bar tensile strength Bearing capacity of soil</p> <p>Seismic coefficient Wind load</p> | <p>2,000 psi (140kg/cm²) 1,800 psi (1,265kg/cm³) 1,600 lbs/sft (8.2 tons/m2)</p> | <p>180kg/cm² MS 1,265kg/cm² SD 2,000kg/cm² 6 tons/m²</p> <p>K = 0.05 66m/sec</p> |

2) Construction of Ancillary Facilities

a) Office Building

The provision of a office building for general administration, accounting and other types of work relating to the acceptance and delivery of foodgrain to and from the Tongi CSD is deemed essential.

b) Equipment Storage

The provision of a storage to store fumigant and operation and maintenance equipment, etc. is deemed essential.

c) Workers' Toilet

The provision of toilet facilities for external workers engaged in the movement of foodgrain in and out of the storage is deemed essential.

d) Substation

The voltage of the main power line will be 11KV and the distribution voltage on the site will be 400V/230V, necessitating the provision of a substation on the site.

e) Truck Scale House

The provision of a truck scale house for the inspection of foodgrain weight transported to and from the Tongi CSD is deemed essential.

f) Check Post

A check post, the main function of which is to check transport trucks and others entering and leaving the site, is required for security reasons.

g) Sentry Posts

Sentry posts should be introduced as part of the security arrangements in the site.

h) External Work

- Internal Roads

The construction of internal roads from the gate to each storage is deemed essential for the efficient management of the storages in view of the use of heavy trucks for the transportation of foodgrain in and out of the site.

- Internal Paving

Paving on the site, especially in such areas as the parking area for trucks, pushcart parking area and drying yard, etc, is deemed essential in view of the likelihood of unpaved areas becoming muddy during the rainy season.

- Security Walls

Security walls of the existing CSDs (3m high) is higher than the walls of the Dhaka Prison (2.5m high) and is topped with barbed wire (some 30cm wide). As such strict security is required to prevent armed robbery which occurred in the past, the provision of such walls are deemed essential for the safe management of the new CSD.

(2) Examination of Requested Equipment

While the original request made by the Government of Bangladesh for grant aid did not refer to any equipment, the basic design study team was strongly requested during the field study to include weighing machines (truck scales and platform scales), storage management equipment (grain thermometers, hygrothermometers, grain moisture meters and fumigating equipment, etc.) and office equipment (typewriters and cabinets, etc.)

The examination results of the necessity to provide such equipment are given below.

(Truck Scales)

The Ministry of Food owns 200 trucks for the transportation of government foodgrain. However, this fleet is said to deal with only 5% of the amount handled by the government. Accordingly, the bulk of the transportation is commissioned to private carriers, necessitating weight inspection to prevent theft. All the existing CSDs have one or two truck scales.

(Quality Control Equipment)

According to the result of a survey conducted by EUREKA (Bangladesh) Ltd. in 1985, in turn commissioned by the Ministry of Food (finances by the USAID) on foodgrain loss during storage at CSDs and LSDs, some 54% of the total loss is caused by pests. As the new Tongi CSD plans to store foodgrain for longer periods than previously (upto three months), pest control will be more important than at present in view of the serious damage caused by pests. It is, therefore, essential that the Tongi CSD be provided with quality control equipment, such as grain thermometers, hygrothermometers, grain moisture meters and fumigating equipment, etc.

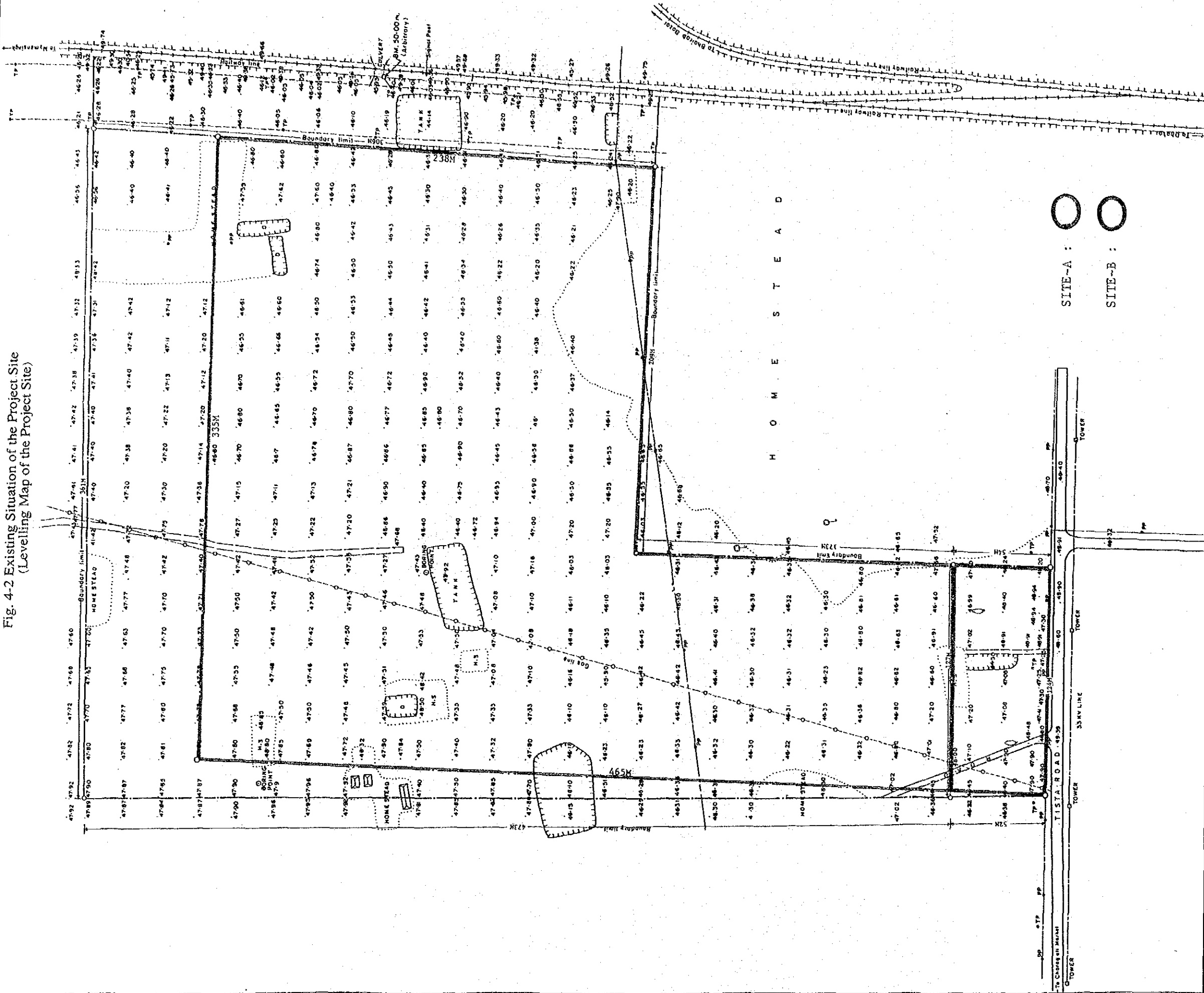
(Office Equipment)

Since the planned Tongi CSD is a new faculty, it should be equipped with such office equipment as typewriters and a safe, etc. which are provide for other CSDs.









(3) Land Acquisition (See Fig. 4-2)

The Government of Bangladesh is proceeding with the land acquisition of 99,580m² (Site-A) for the construction of the Tongi CSD under the Project. At present, the application has been processed upto Stage 7 in Fig. 4-3 and has now reached the stage for public notification by the Deputy Commissioner of Dhaka following authorisation by the Central Land Acquisition Committee (CLAC) through the Ministry of Food and the Deputy Commissioner. The Project Concept Paper (PCP) which provides the basis for the approval or disapproval of the construction project in question and also for the subsequent budgetary appropriation was submitted to the Executive Committee of the National Economic Council (ECNEC, a consultative organization for the President) in June, 1991 by the Ministry of Food. Approval of the PCP will pave the way for budgetary appropriation and will enable the completion of the land acquisition by February, 1992 (see Appendix 4 - Minutes of Discussions). With regard to the 6,520m² site (Site-B) along Tista Road which forms part of the Project site, this is owned by the Dhaka Improvement Trust (DIT), a state organization, and the process to transfer the jurisdiction of this site from the DIT to the Ministry of Food is currently in progress in accordance with the acquisition process for private land.

Fig. 4-2 Existing Situation of the Project Site
(Levelling Map of the Project Site)



LEGEND:

- | | | |
|---|---|---------------------------|
| 1. Tinshed, Mut. |  | |
| 2. Road; Harried, Unenclosed, Brits. paved... |  | |
| 3. Railway line, Boundary limit. |  | |
| 4. Tank, Ditch, Cucking. |  | |
| 5. Gas line. |  | |
| 6. Power line; Telephone & Telegraph line. |  | |
| 7. Bench mark (B.M.), Spot height. |  | ... B.M. 50.00 ... 4.9-40 |
| 8. Trees, Tori palm, Banana & Others. |  | |

NOTES:

NOTE.

Arbitrary BM height 50.00 metre taken from south-west corner of railway culvert as shown on the map.

Area surveyed by per Mautz map. . . . 13-450 hectares.

Actual surveyed area upto DIT road at the south end

Railway line of the east. . . . 14,994 hectares.

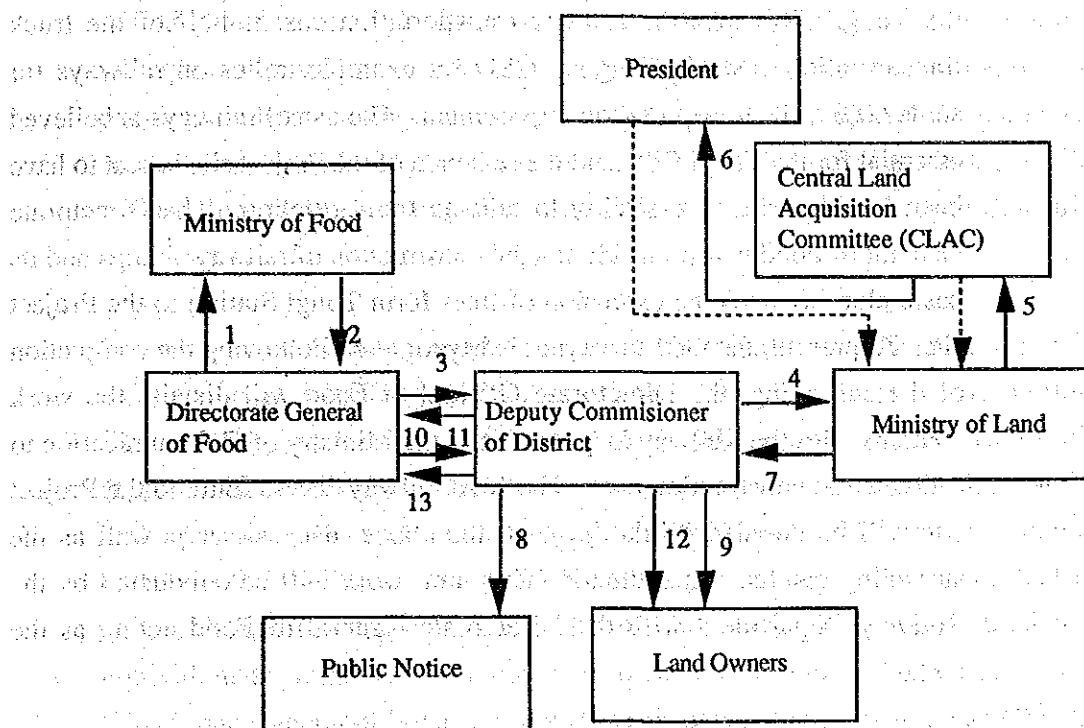
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**SURVEY PLAN FOR THE PROJECT
FOR CONSTRUCTION OF FOODGRAIN
STORAGES IN TONGI.**

Surveyed by: BANGLADESH SURVEY ORGANISATION LTD
46, ROAD NO. 5, DHANBOWDI R/A, DHAKA-1205

APRIL - 1931
Succeeded by: Ali Asger

Fig. 4-3 Land Aquisition Procedure (1982 Ordinance)



1. Proposal for Land Acquisition
2. Approval by Ministry of Food
3. Submission of Application for Land Acquisition
4. Request for Approval by Ministry of Land
5. Approval by CLAC
6. Approval by President
7. Issuance of Government Order Regarding Approval
8. Public Notification
9. Notice to Individual Land Owners
10. Claim of Land Acquisition Expenses
11. Remittance of Land Acquisition Expenses
12. Payment to Land Owners
13. Handing Over of Title of Acquired Land

(4) Construction of Railway Sidings

Both railways and trucks can be used for the transportation of foodgrain to the Tongi CSD. As the railway transportation cost is half of the truck transportation cost, the Tejgaon CSD for example, relies on railways for some 60% of its transportation requirement. The use of railways is believed essential for the Tongi CSD and the selection of the Project site is said to have been based on its accessibility to railway transportation. The Directorate General of Food is responsible for the construction of railway sidings and its basic plan involves the extension of lines from Tongi Station to the Project site. At present, detailed surveying is in progress. Following the completion of the surveying, the Directorate General of Food will discuss the work contents with the Railway Department of the Ministry of Communication to estimate the construction cost. The final railway access route to the Project site will be decided on the basis of the above discussions as well as the surveying results. The actual construction work will be conducted by the Railway Department with the Directorate General of Food acting as the owner.

4.2.5 Examination of Project Implementation Body and Management System

The Project will be implemented by the Directorate General of Food under the supervision of and with coordination by the Ministry of Food. The organizations of the Ministry of Food and Directorate General of Food are given in Fig. 2-4 and Fig. 2-5 respectively. These two agencies have long acted as the competent agencies for the development of facilities, mostly with foreign aid. The "Development" of the Ministry of Food is responsible for the preparation of facility development (improvement) projects and proceeding with the necessary arrangements while the "Planning Cell" is responsible for the administration of these projects and coordination with other ministries and agencies. The "Inspection, Development and Technical Services" of the Directorate General of Food is responsible for conducting the practical work.

The operation and maintenance of the storages will, upon the completion of their construction, be conducted by the "Movement, Storage and Silo" under the supervision of the Additional Director General of Food. The direct operation and management responsibility, however, will rest with the manager of the Tongi CSD.

According to the plan of the Directorate General of Food, the assignment of 134 staff members is planned for the operation and maintenance of the Tongi CSD. This figure is given on the basis of adding those responsible for transportation, delivery and personnel affairs to those in such traditional fields as storage management, quality control and accounting. The maintenance situation at the existing foodgrain storages, however, suggest the importance of daily maintenance work. Since the above plan does not allocate full-time engineers for such daily maintenance work, three engineers (each responsible for general repairs, electricity and machinery maintenance) should be appointed.

The actual operation and maintenance cost of the Directorate General of Food for existing storages for fiscal 1988/89 was Taka 417 million (approx. ¥1.55 billion). The estimated annual cost to run the Tongi CSD consists of Taka 1.39 million (approx. ¥5.14 million) for the maintenance cost of 35 storages, auxiliary facilities and equipment, Taka 1.83 million (approx. ¥6.77 million) for the personnel cost and Taka 0.78 million (approx. ¥2.91 million) for the operation cost (electricity charge, telephone charge, municipal tax and land tax). As the above total cost is equivalent to some 1.0% of the overall operation and maintenance cost, the Directorate General of Food considers the cost of running the new Tongi CSD to be well within its financial capability.

In view of the present operation and maintenance situation of the Tejgaon CSD which should resemble those of the Tongi CSD, the above staffing level should ensure the smooth operation of the Tongi CSD.

Based on the above positive findings of the examination of the Project feasibility and viability, together with the confirmation of the capability of the counterpart to implement the Project and also based on the fact that the expected effects of the Project meet the criteria for Japanese grant aid, the implementation of the Project with such grant aid is deemed appropriate. As a result, the Project contents are further examined below to initiate the basic design on the premise that Japanese grant aid is made available.

4.3 Outline of the Project

4.3.1 Implementation Body and Management System

(1) Implementation Body

The implementation body for the Project will be the Directorate General of Food under the Ministry of Food.

(2) Management System and Personnel Plan for Tongi CSD

The operation and maintenance of the newly constructed storages will be conducted by the Tongi CSD. Since the Project envisages the construction of new foodgrain storages by the Japanese grant aid on newly purchased land unlike the past rehabilitation or additional construction of storages, the entire CSD organization must be newly established under an appropriate personnel plan. The organization and system of the Tejgaon CSD, the operation size and requirements of which are similar to those of the Tongi CSD, have been referred to in planning the management system and personnel plan for the Tongi CSD. Following review of the management system and personnel plan prepared by the Bangladesh side (see 4.2.5), it has been decided to add technical engineers (civil engineer, electrical engineer and mechanical engineer) to ensure the smooth operation and maintenance at the CSD.

As shown in Fig. 4-4, the organization of the Tongi CSD will be headed by a manager with four separate chains of command, i.e. Security, Inspection for Godowns, Technical Inspection and Check Post Inspection. In addition, the manager will directly control Establishment Section, Movement Section, Delivery Order Section, Stock Section and Account Section. The staffing level of each section and the general relationship between the storage management work and each section are shown in Fig. 4-5. The work flow of acceptance/delivery of foodgrain is shown in Fig. 4-6. The total manpower to run the Tongi CSD will be 137 as shown in Table 4-3. Many of the senior staff will be transferred from other CSDs, LSDs and the Directorate General of Food although there will be new recruits in line with the master personnel plan of the Ministry of Food.

Fig. 4-4 Organization Chart of Tongi CSD

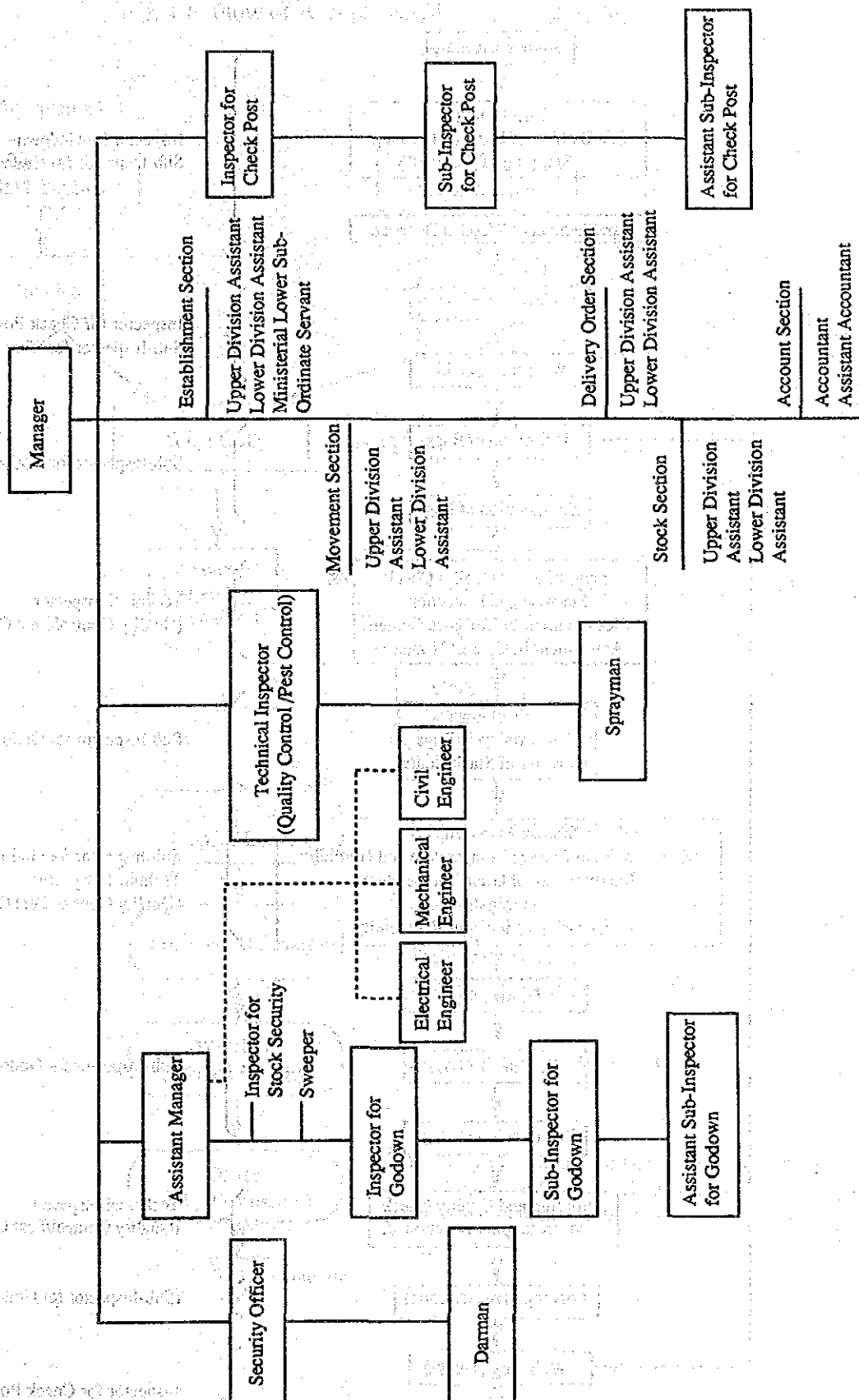


Fig. 4-5 Flow of Foodgrain Storage Management

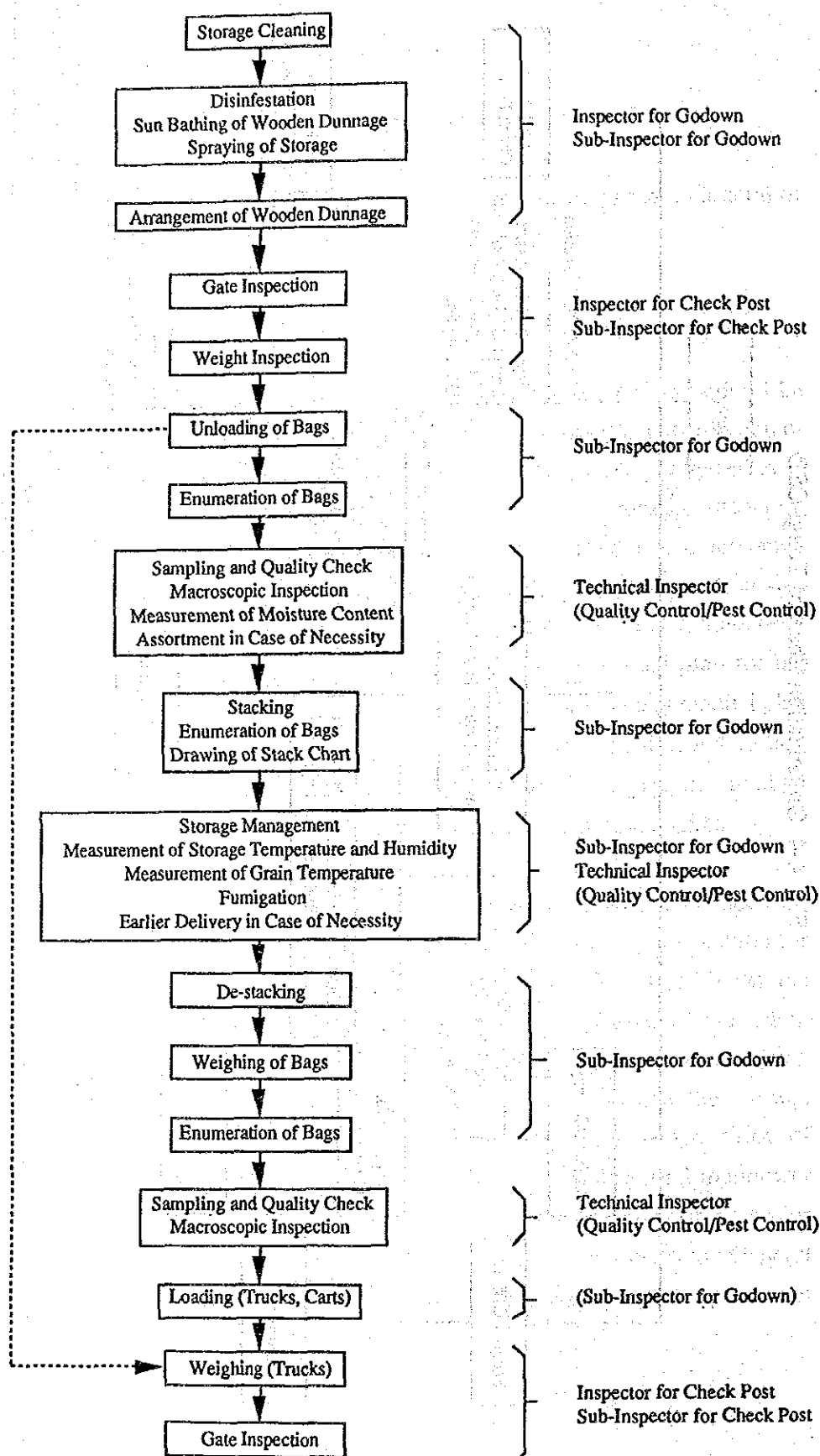


Fig. 4-6 Flow of Acceptance / Delivery of Foodgrain

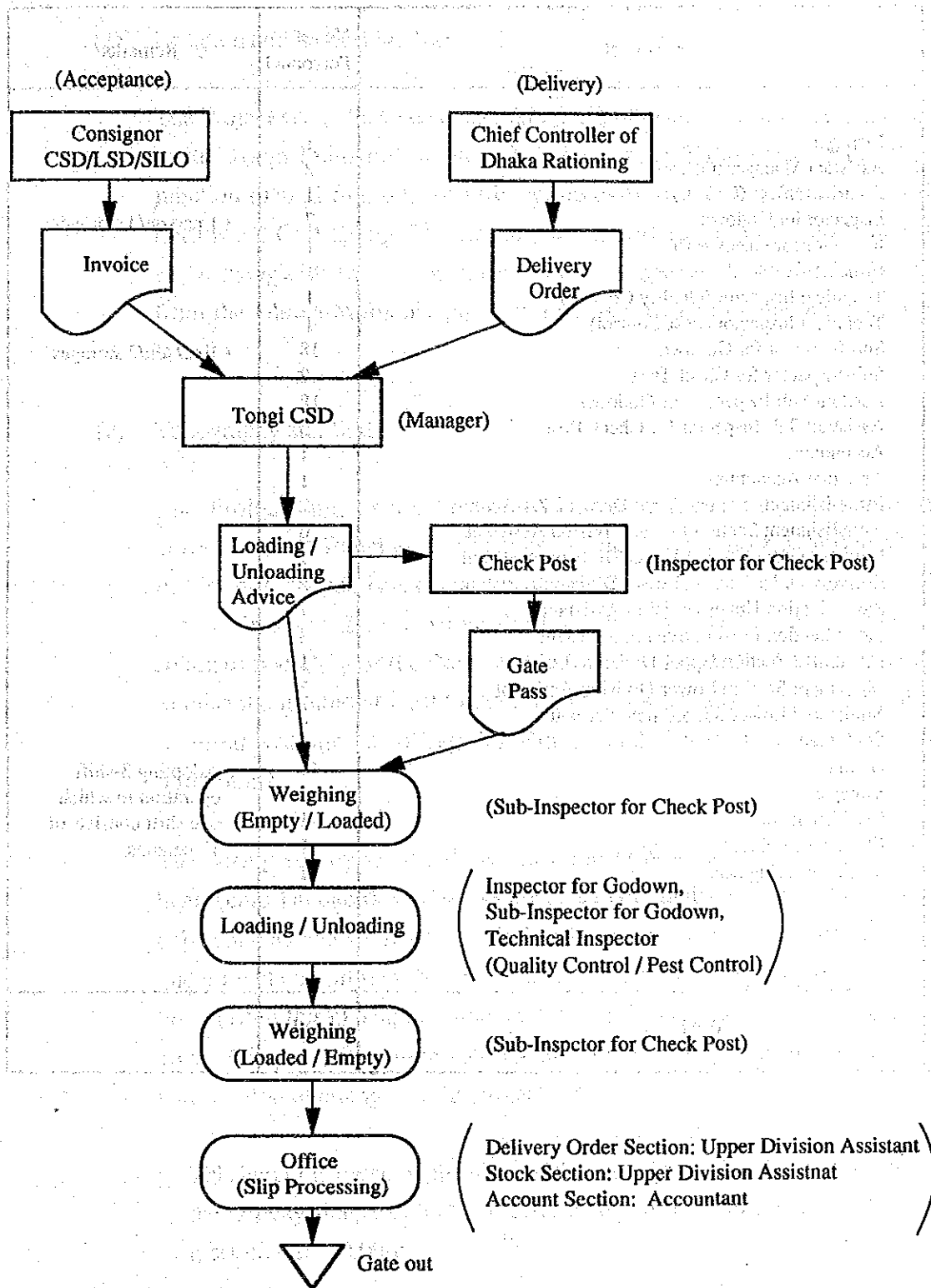


Table 4-3 Layout of Personnel

| | Personnel | No. of Personnel | Remarks |
|-----|---|------------------|-----------------------|
| 1. | Manager | 1 | |
| 2. | Assistant Manager (Officer) | 2 | |
| 3. | Security Officer (Officer) | 1 | |
| 4. | Inspector for Godown | 7 | • 1 person/5 storages |
| 5. | Inspector for Check Post | 1 | |
| 6. | Inspector for Stock Security | 1 | |
| 7. | Technical Inspector (Quality Control) | 1 | |
| 8. | Technical Inspector (Pest Control) | 1 | |
| 9. | Sub-Inspector for Godown | 18 | • 1 person/2 storages |
| 10. | Sub-Inspector for Check Post | 2 | |
| 11. | Assitant Sub-Inspector for Godown | 18 | |
| 12. | Assistant Sub-Inspector for Check Post | 3 | |
| 13. | Accountant | 1 | |
| 14. | Assistant Accountant | 1 | |
| 15. | Establishment Section Upper Division Assistant | 2 | |
| 16. | Establishment Section Lower Division Assistant | 6 | |
| 17. | Delivery Order Section Upper Division Assistant | 1 | |
| | Delivery Order Section Lower Division Assistant | 2 | |
| 18. | Stock Section Upper Division Assistant | 1 | |
| | Stock Section Lower Division Assistant | 3 | |
| 19. | Movement Section Upper Division Assistant | 1 | |
| | Movement Section Lower Division Assistant | 3 | |
| 20. | Ministerial Lower Subordinate Servant | 3 | |
| 21. | Sprayman | 4 | |
| 22. | Darman | 40 | • Adopting 3-shift |
| 23. | Sweeper | 10 | operation in which |
| 24. | Civil Engineer | 1 | one shift consists of |
| 25. | Electrical Engineer | 1 | 12 persons. |
| 26. | Mechanical Engineer | 1 | |
| | Total | 137 | |

4.3.2 Location and Land Situation of Project Site

(1) Location and Area (Fig. 4-2)

The Project site is located some 18km north of central Dhaka MA and is next to the Tongi industrial district. It is also some 700m north of the Tongi junction (Tongi Station) for railway routes from the Sylhet District in the northwest, Chittagong Port (an important port for import/export) and the Mymensingh District in the north. Access of some 800m to the Project site from the Dhaka-Mymensingh trunk road is provided by the 6m wide Tista Road.

(2) Topography and Soil

The Project site, acquisition of which is currently in progress by the Government of Bangladesh, is almost rectangular (465m x 335m) as shown in Fig. 4-2. It gently slopes towards the east and south. On average, the ground is some 2.85m below the level of Tista Road which forms the southern boundary of the Project site. In view of past floods, it is necessary to raise the ground at least to the level of Tista Road (EL 49.50m*) and the required volume of filling for Site-A and Site-B is estimated to be 346,360m³.

The boring survey results show the value of N to be over 5 in the surface layer (upto 1m deep) and 10-48 not less than 2m deep. The soil consists of coherent clay and silt layers and its bearing capacity is sufficiently large. The unconfined compression test revealed that the bearing capacity of the surface layer (1.5m thick) is approximately 8 tons/m², a typical value for the Dhaka area. Adequate caution in land reclamation should prove sufficient for the construction of storages at the Project site.

* This height is given on the basis of the assumption that the crown height of the railway sleepers along the eastern edge of the Project site is the bench mark for EL 50.00m.

(3) Flood Water Level

The Project site is currently used as paddy fields and its elevation is lower than the surrounding areas. The field survey found that floods reach the level of the adjacent Tista Road during the rainy season.

(4) Situation of Infrastructure

1) Electricity

A high tension line (11KV) runs along Tista Road and electricity to the Project site can be supplied from this line.

2) Water Supply

At present, the area does not have a public water supply system and any water supply in the near future must rely on wells. It appears necessary to dig a well of 100m in depth in order to obtain the necessary amount and quality of drinking water based on evidence provided on wells in local factories.

3) Water Discharge

The area lacks either a public drainage facilities or a river where waste water can be discharged. In general, a tank is introduced and any overflow is discharged to the neighboring paddy fields.

4) Telephone

The existing telephone line runs along Tista Road and its extension to the Project site is feasible.

5) Gas

Although the main gas supply pipeline from Dhaka to the north runs through the Project site, direct connection to this pipeline is not feasible. Gas supply to the Project site must be arranged with a gas distribution station in the vicinity.

4.3.3 Outline of Facilities and Equipment

Examination of the contents of the request of the Government of Bangladesh finds the provision of the following facilities and equipment appropriate provided that the Project is implemented by Japanese grant aid.

(1) Foodgrain Storages - 1,000 ton class storages 35

(2) Ancillary Facilities

1) Office Building 1

2) Equipment Storage 1

3) Workers' Toilet 2

4) Substation 1

5) Truck Scale House 1

6) Check Post 1

7) Sentry Posts 11

8) External Work

a) Internal Roads

b) Internal Paving

c) Security Walls

(3) Storage Management Equipment

1) Weighing Machines (truck scales, platform scales) 1 set

2) Storage Equipment (ladders, catwalk, hand hooks, etc.) 1 set

3) Quality Control Equipment (hygrothermometers, grain thermometers, etc.) 1 set

4) Pest Control Equipment (power sprayers, fumigation sheets) 1 set

5) Office Equipment (desks and chairs, typewriters, safe, etc.) 1 set

4.3.4 Operation and Maintenance Plan

(1) Operation and Maintenance System

The operation and maintenance of the Tongi CSD will be entrusted to the "Movement, Storage and Silo" under the supervision of the Additional

Director General of Food and the day-to-day operation and maintenance will be conducted by the manager of the CSD. The organization of the Tongi CSD will be headed by the manager with four separate chains of command, i.e. Security, Inspection of Godowns, Technical Inspection and Check Post Inspection, as shown in Fig. 4-4. In addition, the manager will directly control Establishment Section, Movement Section, Delivery Order Section, Stock Section and Account Section. The total manpower required to run the Tongi CSD is 137 as shown in Table 4-3.

(2) Maintenance Plan

1) Facilities

Preventive maintenance is important to prolong the life of any building. Since the speed of building deterioration of a foodgrain storage is faster than in the case of other types of buildings, early maintenance is essential. As a result, the provision of three full-time engineers, i.e. civil engineer (responsible for building maintenance), electrical engineer (responsible for electrical systems) and mechanical engineer (responsible for plumbing work), appears essential.

(Foodgrain Storages)

| | | |
|--|---|---------------|
| Painting of exterior walls | : | every 5 years |
| Painting of interior walls and ceiling | : | every 7 years |
| Painting of steel fixtures | : | every 4 years |
| Floor repair | : | as necessary |
| Repair of mortar of interior and exterior walls | : | as necessary |
| Daily inspection of electrical equipment (lighting and others) | | |

(Office Building and Other Ancillary Facilities)

| | | |
|--|---|---------------|
| Painting of exterior walls | : | every 6 years |
| Painting of interior walls and ceiling | : | every 8 years |
| Painting of steel fixtures | : | every 5 years |
| Repair of mortar of interior and exterior walls | : | as necessary |
| Daily inspection of electrical equipment (lighting and others) | | |
| Daily inspection of plumbing equipment (pump and others) | | |

(2) Storage Management Equipment

| | |
|--------------------------|--|
| Truck scale | : lubrication of moving sections once a year |
| Platform scale | : lubrication of moving sections once a year |
| Fire extinguishing agent | : refilling every 5 years |

(3) Operation and Maintenance Cost

The annual operation and maintenance cost consists of the personnel cost, facility operation cost and facility and equipment maintenance cost as shown below. Although the maintenance cost (for repair work, etc.) for the storages, office buildings and other ancillary facilities and equipment does not necessarily occur every year as described in (2) above, the estimated average annual cost is given here for convenience.

| | |
|--|--|
| 1) Personnel Cost (basic wage) | <u>Taka 1,825,000 (approx. ¥6,771,000) /year</u> |
| 2) Operation Cost | <u>Taka 784,000 (approx. ¥2,908,000) /year</u> |
| a) Electricity | Taka 250,000 (approx. ¥927,000) /year |
| b) Telephone | Taka 84,000 (approx. ¥312,000) /year |
| c) Municipal Tax | Taka 150,000 (approx. ¥556,000) /year |
| d) Land Tax | Taka 300,000 (approx. ¥1,113,000) /year |
| 3) Maintenance Cost | <u>Taka 1,386,416 (approx. ¥5,137,000) /year</u> |
| a) Foodgrain Storages | Taka 1,302,661 (approx. ¥4,832,000) /year |
| Interior Painting (vinyl paint) | Taka 554,300 (approx. ¥2,056,000) /year |
| Exterior Painting (vinyl paint) | Taka 475,755 (approx. ¥1,765,000) /year |
| Steel Fixtures Painting (oil paint) | Taka 210,306 (approx. ¥780,000) /year |
| Floor Repair (mortar) | Taka 16,100 (approx. ¥60,000) /year |
| Repair of Exterior/Interior Walls (mortar) | Taka 32,000 (approx. ¥119,000) /year |

| | | | |
|---|------|--------|--------------------------|
| Repair of Lighting Equipment, etc. | Taka | 14,000 | (approx. ¥52,000) /year |
| b) Office Building and other Ancillary Facilities | Taka | 71,085 | (approx. ¥258,000) /year |
| Interior Painting (vinyl paint) | Taka | 24,716 | (approx. ¥92,000) /year |
| Exterior Painting (vinyl paint) | Taka | 18,274 | (approx. ¥68,000) /year |
| Steel Fixtures Painting (oil paint) | Taka | 9,573 | (approx. ¥30,000) /year |
| Repair of Exterior/Interior Walls (mortar) | Taka | 2,300 | (approx. ¥9,000) /year |
| Repair of Lighting Equipment, etc. | Taka | 2,100 | (approx. ¥7,000) /year |
| Repair of Water Supply Equipment, etc. | Taka | 14,122 | (approx. ¥52,000) /year |
| c) Equipment | Taka | 12,670 | (approx. ¥47,000) /year |
| Fire Extinguishing Agent (6kg/extinguisher x 35) | Taka | 12,670 | (approx. ¥47,000) /year |

TOTAL Taka 3,995,416 (approx. ¥14,816) /year

CHAPTER 5

BASIC DESIGN

CHAPTER 5 BASIC DESIGN

5.1 Design Policies

5.1.1 Policies for Natural Conditions

- (1) The mean monthly temperature in Dhaka reaches its highest level in summer of 35°C in April and its lowest level of 11.7°C in January during the dry season. Temperature as well as humidity control for the new storages will be made by natural ventilation through opening and closing windows and doors and no forced ventilation by mechanical means will be adopted. A space of at least 1.5m will be maintained between the ceiling and the top end of the foodgrain pile to avoid adverse effects of the rising room temperature on the stored foodgrain.
- (2) Although wind direction does not usually constitute an important building design factor, it is desirable in the present case that the doors face likely winds due to the adoption of the natural ventilation method. Since the southern wind is considered to be the prevailing wind for the Project site, doors are designed to be on the south and north ends of the storages. The wind velocity used for the structural calculation is 66m/sec as in the case of previous foodgrain storage construction projects.
- (3) The design of a foodgrain storage must try to minimize building exposure to direct sunlight to suppress the temperature rising inside. In the case of the present Project, the storages will be constructed with minimum space between them to reduce the area exposed to the sun while ensuring appropriate natural ventilation for each storage.
- (4) While Bangladesh is not located on a seismic belt, one or two earthquakes are felt every year. The conventionally adopted seismic coefficient (K) is 0.1 for northern Bangladesh and 0.05 for southern Bangladesh. The Project will adopt 0.05 as the K value as in the case of previous foodgrain storage construction projects.
- (5) The average ground level of the Project site is some 2.85m below the area's general flood water level. Therefore, it is necessary to set the design ground level at 3m above the existing ground level to prevent damage due to floods and filling work to raise the ground will be required.

5.1.2 Policies for Local Construction Conditions

Most small local buildings are made of brick masonry while a reinforced concrete rigid frame structure is commonly used with brick walls when the building size becomes relatively large (and high). This reinforced concrete rigid frame structure will be employed for the planned storages.

With regard to the foundation work, as the local cost of piling work is almost double that of a spread foundation, the latter will be employed for the Project. In the case of concrete materials, the use of brick chips will be considered as coarse aggregate for parts of the blinding concrete, foundation concrete and concrete slabs on earth, etc. as the procurement of gravel and crushed stone may take a long time, adversely affecting the progress of the work. A low compressive strength of concrete (180kg/cm^2) will be introduced in view of the quality control capability of the local construction companies.

5.1.3 Policies for Local Contractors and Local Materials

(1) Local Contractors

Successful project implementation will depend on the active cooperation of the local contractors. Several contractors have reasonable experience in participating in similar Japanese projects in the past as subcontractors and, therefore, the Project intends the use of these contractors.

(2) Construction Equipment, Materials and Labour Recruitment

Much of the construction equipment and materials will be procured in Bangladesh as long as the performance is acceptable to keep the construction cost to a minimum. That construction equipment which is not available in Bangladesh will be imported in the most cost efficient manner.

1) Equipment and materials to be Locally Procured

The main items to be procured locally are as follows.

| | |
|------------------|--|
| Aggregate | : gravel, crushed stone, brick chips, sand |
| Cement | : domestically produced or imported |
| Reinforcing Bars | : domestically produced |
| Bricks | : domestically produced |
| Paint | : imported |
| Forms | : wood or steel |

Aluminum Window Frames : domestically produced

Ceiling Fans : domestically produced

2) Equipment to be Imported

Steel Fixtures : domestically produced products have poor
airtightness

Transformer : no suitable product is available domestically

Incoming Panel : no suitable product is available domestically

Water Pump : domestic products are faulty

5.1.4 Policies for Maintenance

(1) Equipment Maintenance

Equipment and materials which can be easily repaired locally at low cost will be selected.

1) The procurement of machines and electrical equipment will be kept to a minimum.

2) The latest instruments with a high performance but also a high repair cost as well as a long repair time will be avoided in favour of those which can be easily repaired locally.

3) The level of equipment input will be kept to a minimum.

(2) Maintenance Plan

As stated earlier, preventive maintenance is the best prescription to prolong building life. The average life of a storage tends to be shorter than that of other buildings, probably because of the handling of heavy items inside and also the relatively careless attitude of workers there believing that the building is a mere storage. To counteract such a tendency, frequent maintenance work is strongly recommended.

1) Exterior walls : repainting every 5 years

2) Interior walls and ceiling : repainting every 7 years

3) Steel fixtures : repainting every 4 years

regular cleaning of floor rails

4) Mortar on interior and exterior walls : when necessary

5.1.5 Policies for Scopes and Levels of Storage and Equipment to be Provided

(1) Storage Design

The Government of Japan has already conducted four basic design studies in the past in association with the foodgrain storage construction programme. Each time, the types and specifications of the foodgrain storages were reviewed and the existing storages constructed by Japanese grant aid enjoy an excellent reputation for storage performance among the officials of the Government of Bangladesh. In principle, the present Project will construct the standard type storage basically adopted by the Phase IV project as explained in 4.2.4 (1)-1) to which the Government of Bangladesh has already given its consent. Nevertheless, during the field study on existing CSDs and consultations with the counterpart, there was a suggestion to increase the number of high windows for both better ventilation and lighting. Since the inclusion of additional windows in the building design is technically feasible, this suggestion has now been accepted.

(2) Selection of Storage Management Equipment

The following principles have been adopted for the selection of equipment taking the request of the Government of Bangladesh, the equipment in use at the existing CSDs (Dhaka CSD and Tejgaon CSD) and the assumed operating situation of the planned CSD into full consideration.

- 1) In view of the fact that the planned CSD will be a completely new CSD, a comprehensive range of equipment which is essential for the smooth and effective operation of the planned CSD and its foodgrain storages will be provided.
- 2) Such labour saving transportation equipment as belt conveyors and forklifts will not be provided in view of both the labour and energy conditions prevailing in Bangladesh.
- 3) Equipment with parts and consumables difficult to be procured locally are excluded from the equipment plan so as to ensure full and efficient use of it saving operation and maintenance cost.
- 4) Durability with a low maintenance cost and less likelihood of breakdown will be the main criterion in the selection of equipment rather than convenient features.

5.1.6 Implementation Schedule

In determining the implementation schedule for the Project, the conditions of the local construction industry, including labour conditions and equipment/material supply conditions, must be fully taken into consideration. Moreover, the weather conditions cannot be ignored in that any earth work during the rainy season, i.e. from June to October, must be avoided. It is, therefore, imperative to include two dry seasons in the total construction period.

5.2 Basic Plans

5.2.1 Site and Layout Plans

The use of the Project site in the most efficient manner to accommodate the required storage capacity of 35,000 tons (35 storages) determined in 4.4.2 and the railway sidings results in the site plan shown in Fig. 5-1.

With regard to road access to the site, the trunk internal road runs north-south from Tista Road. On the left-hand side of this trunk road, an external parking area for the trucks, an internal parking area for trucks and a drying yard are located in this order from the site entrance. A parking area for pushcarts and a office building are located on the right-hand side. The storages are located further inside the site on both sides of the two railway sidings and a road is created to encircle the group of storages so that each storage has access to railway and road transportation. As a storage cannot be constructed above the underground gas pipeline which cuts across the storage site, a workers' toilet and an equipment storage are located here to make efficient use of the space above the pipeline. A tank will be located at the far side of the storage site to facilitate drainage.

The main axis of the storages runs north-south to maximize the ventilation effect of the prevailing wind in Bangladesh in view of the planned adoption of natural ventilation for these storages.

With the adoption of the above layout plan, the required site area can be 106,100m² (planned area of acquisition by the Government of Bangladesh). The volume of filling is roughly estimated to be 346,360m³ assuming the raising of the ground to the Tista Road level.

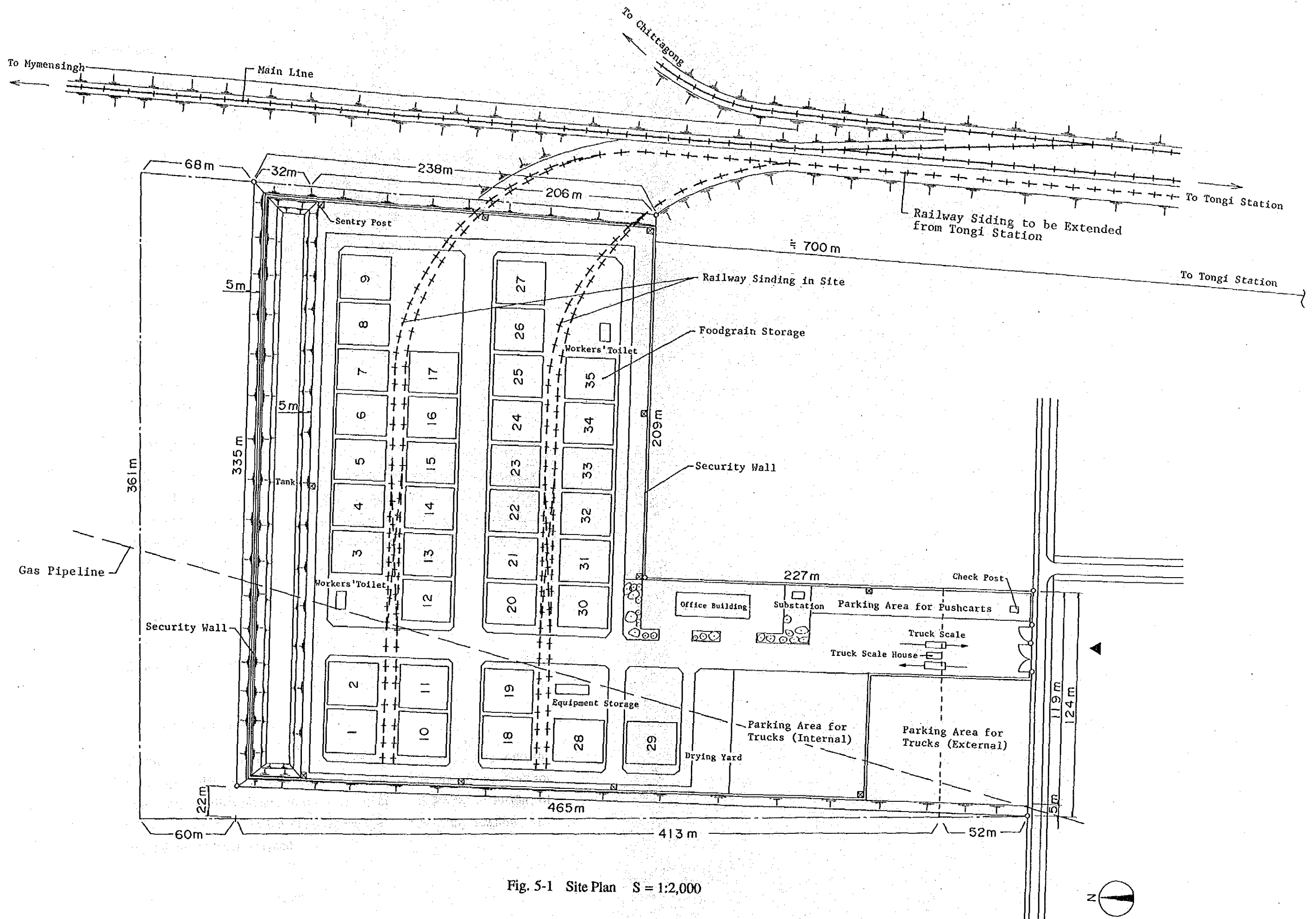
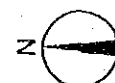


Fig. 5-1 Site Plan S = 1:2,000



5.2.2 Facility Plan

(1) Foodgrain Storages

1) Floor Plan

It has been decided to adopt the floor plan for the standard foodgrain storage which was originally prepared in Phase IV as described in 4.2.4 (1)-1). While there are two types of floor plans for this standard type storage with different locations of the entrance, the type with the entrance on the gable side has been selected in view of the site shape and the efficient use of the available land.

2) Dimensions (Each Storage)

Storage Capacity : 1,000 tons
Floor Area : 720m² (30m x 24m)
Floor Height : GL + 0.9m
Building Height : GL + 6.81m

3) Structural Plan

Unlike those storages constructed during the previous phases, the storages at the Tongi CSD will be constructed on about 3m high filling. Accordingly, the foundations will be made extra deep to ensure building safety. The foundations, columns, beams and roof slab will be made of reinforced concrete while the exterior walls will be made of brick masonry. The load conditions are given below.

Seismic Coefficient : $K = 0.05$
Wind Load : 66m/sec
Bearing Capacity of Soil : 6 tons/m² (as the result of the unconfined compression test)

4) Storage Performance Plan

During the field survey on existing CSDs and consultations with the counterpart, there was a suggestion to increase the number of windows for both better ventilation and storage performance. Since the inclusions of additional windows in the building design is technically feasible, this suggestion has been accepted.

5) Finish

Roof : lime terracing
Interior and Exterior Walls : trowelled mortar with paint finish

(2) Office Buildings

1) Floor Plan

Of the 137 employees of the Tongi CSD, 53 will be office workers. Assuming a required floor area of 9m²/person (due to the lack of relevant provisions in Bangladesh, the minimum requirement of the Japanese provision, i.e. 9-11m²/person, is adopted), a total office floor area of 480m² is required. In addition to offices, a storage, a meeting room and toilets will be provided. An additional 97m² (1 span) will be added to provide space to conduct the handling of delivery notes with dealers and others as well as to provide waiting space.

2) Dimensions

Floor Area : 579.6m² (42m x 13.8m)
Floor Height : GL + 0.6m
Building Height : GL + 3.9m

3) Structure

Reinforced Concrete (Walls : brick masonry)

4) Finish

Interior and Exterior Walls : trowelled mortar with paint finish

5) Fixtures

Lighting Fixtures, Ceiling Fans, Water Supply/Drainage, Interphones

(3) Equipment Storage

A storage for chemicals and the equipment required for the operation and maintenance of the Tongi CSD will be constructed.

A chemical storage of some 30m² is required to store fumigants and insecticides, etc. Additional floor space of some 70m² is required for the

storage of operation and maintenance equipment and this equipment storage will store power sprayers, fumigation sheets and spare parts, etc.

1) Dimensions

Floor Area : 105m² (15m x 7m)

Building Height : GL + 3.5m

2) Structure

Brick Masonry (roof slab: reinforced concrete)

3) Finish

Interior and Exterior Walls : trowelled mortar with paint finish

4) Fixtures

Lighting Fixtures, Shelves for Chemical Agents, Ceiling Fans

(4) Workers' Toilet

Each storage will have some 20 workers, totalling 700 workers for the 35 storages. Assuming that the toilet facilities are used by some 30% (based on Septic Tank Construction Standards), the number of potential users is approximately 200. 8 urinals and 4 closets (Building Facility Guidelines suggest one urinal / 30 persons and one closet / 60 persons) will be installed in the 2 buildings for the convenience of workers.

1) Dimensions

Floor Area : 27.3m² (10.5m x 2.6m) x 2 = 54.6m²

Building Height : GL + 3.0m

2) Structure

Brick Masonry (roof slab : reinforced concrete)

3) Finish

Exterior Walls : trowelled mortar with paint finish

Interior Walls : trowelled mortar with paint finish and partial tiling

Floor : tiled

4) Fixtures

Lighting Fixtures, Water Supply / Drainage, Septic Tank (for 100 people x 2)

(5) Substation

1) Dimensions

Floor Area : 28m² (7m x 4m)

Building Height : GL + 3.6m

2) Structure

Brick Masonry (roof slab : reinforced concrete)

3) Finish

Interior and Exterior Walls : trowelled mortar with paint finish

4) Fixtures

Lighting Fixtures, Floor Pit

(6) Truck Scale House

A floor area of some 20m² is required to accommodate two meter gauges of the truck scales, 2 desks, lockers and working space.

1) Dimensions

Floor Area : 20m² (4m x 5m)

Building Height : GL + 3.0m

2) Structure

Brick Masonry (roof slab : reinforced concrete)

3) Finish

Interior and Exterior Walls : trowelled mortar with paint finish

4) Fixtures

Lighting Fixtures, Ceiling Fan, Interphone

(7) Check Post

A check post will be constructed by the gate to house the guards whose job is to check the grain transport vehicles entering and leaving the site for security reasons. A counter and a toilet will be installed inside the check post.

1) Dimensions

Floor Area : 20m² (5m x 4m)

Height : GL + 3.3m

2) Structure

Brick Masonry (roof: slab reinforced concrete)

3) Finish

Internal and : trowelled mortar with paint finish

External Walls

Floor : trowelled mortar

4) Facilities

Lighting Fixtures, Ceiling Fan, Interphone

(8) Sentry Posts

11 sentry posts will be constructed along the site perimeter where guards will conduct security work.

1) Dimensions

Floor Area : 2.25m² (1.5m x 1.5m) / post

Height : GL + 2.8m

2) Structure

Brick Masonry

3) Finish

Internal and : trowelled mortar with paint finish

External Walls

4) Facilities

Lighting Fixtures, Interphone

(9) External Work

1) Internal Roads

Road Width : The internal roads must be wide enough to allow heavy truck and pushcart, etc. traffic. The design road widths are 25m for the entrance to the access road, 15m for the remainder of the access road and 7m for other roads.

Paving : asphalt paving on double brick layers covered with brick chips

Road Area : 19,550m²

Side Ditches : brick masonry with mortar finish, 0.45m wide and 2,025m long

2) Internal Paving

Paving Method : bricks (asphalt paving for drying yard)

Area

- internal parking area for trucks : 6,000m²
- parking area for pushcarts : 1,950m²
- drying yard : 1,650m²
- others (around office building and storages) : 5,500m²

Total : 15,100m²

3) Security Walls

Structure : brick masonry with reinforced concrete columns at 2m intervals

Height : 3m

Length : 1,664m

5.2.3 Water Supply and Drainage Plans

(1) Water Supply Plan

There is currently no water supply system available which can be used by the Tongi CSD. Water must be obtained by digging a well (some 100m deep) and pumping the water to an elevated water tank for gravity type water supply installed on the roof of the office building. The casing diameter of the well will be 150mm while the submerged pump diameter will be 40mm with a pumping volume of 100 l/min and a head of 50m.

(2) Water Drainage Plan

Water drainage will be conducted in three channels, i.e. rainwater, waste water and sewage. The rainwater and the waste water will be drained out of the tank via side ditches. The sewage treated by septic tanks will be discharged to the tank.

The sizes of the septic tanks will be 2m long x 4m wide x 2m deep of the office building and 3m long x 4m wide x 2m deep for the workers' toilet.

5.2.4 Electrical Equipment Plan

(1) Power Service Entrance and Substation

The receiving point will be laid at the southeastern corner of the site and power supply to the substation will be made via the underground power cable.

Incoming Voltage : 3 ϕ - 3W 11KV 50Hz

Distribution Voltage : 3 ϕ - 4W 400/230V 50Hz

(2) Main Power Feeder Equipment

Electric power will be supplied from the switchboard (substation) to distribution boards, power control boards and power boards located at strategic positions on the site. The distribution voltages will be as follows.

Distribution Board : 3 ϕ - 4W 400/230V 50Hz

Power Control Board : 3 ϕ - 3W 400V 50Hz

(3) Power Equipment

Piping and wiring will be made to supply electric power from the power control boards to the water supply equipment with the following specifications.

Power supply to water supply equipment : 3 ϕ - 3W 400V 50Hz

(4) Power Outlet Equipment

The necessary power outlets will be installed for all the storages as well as for ancillary facilities. Lighting will be mainly provided by fluorescent lamps with incandescent lamps playing a supplementary role. The power supply specifications for the lighting fixtures and outlets will be 1 ϕ , 2W, 230V and 50Hz.

(5) Interphone

The following interphone system will be introduced for the communication network incorporating the office building, truck scale house, check post and sentry posts.

- dual access interphone with 10 connections
- 10 pushbutton telephone-type interphones

5.2.5 Main Building Material Plan

The foodgrain storages which were constructed under Japanese grant aid projects in the past have a superior storage performance, especially in terms of airtightness, and enjoy an excellent reputation among Bangladesh officials. Strong desire has been expressed for the maintenance of such superior storage vis-a-vis the storages to be constructed under the present Project. Therefore, it has been decided to adopt the specifications for the Japanese standard type storage used in the Phase IV project for the roof, interior and exterior walls, ceiling and fixtures, etc. for the Tongi CSD.

Lime terracing on the roof is a local construction method which promises good waterproofing as well as thermal insulation effects. The use of vinyl paint ensures better airtightness than distemper and can have a significant impact on the storage performance.

The specifications for the ventilation windows and netted windows and doors to prevent insects from entering which were used for the foodgrain storages constructed under Japanese grant aid projects also have an excellent reputation and have been adopted by rehabilitation programmes implemented by the Government of Bangladesh and foreign aid organizations.

5.2.6 Storage Management Equipment Plan

The items for storage at the Tongi CSD are bagged rice (85kg/bag) and wheat (75kg/bag) which are transported for consumption from other government storages. Equipment required in general for acceptance/delivery operation, storage management and operation of the CSD includes loading machines, weighing machines, storage equipment, quality control equipment, pest control equipment and office equipment. Since labour can be procured abundantly and economically in Bangladesh, loading machines for labour saving are excluded from the equipment plan. As for the quantities of the equipment, it is decided so as to be, in principle, installed in every storage, taking the customary practice to assign workers to a specific storage into consideration.

Followings are the explanations and quantities for introduction of such equipment.

(1) Weighing Machines

1) Truck Scale

The foodgrain to be handled by the Tongi CSD will be packed into bags and acceptance/delivery will be based on weight. Since a large proportion of the transportation work will be commissioned to private transporters, the use of truck scales is essential for the swift acceptance or delivery of large quantities of grain without problems. It is estimated that 100 - 200 trucks must be weighed daily, necessitating the provision of two truck scales to weigh incoming and outgoing trucks respectively.

2) Platform Scale

The net weight per bag is 85kg for rice and 75kg for wheat. However, actual weigh per bag varies significantly. As acceptance/ delivery is based on weight, the use of platform scales is necessary to handle small quantities. One platform scale should be provided for each storage as the frequent removal of a platform scale adversely affects weighing accuracy despite the heavy weight (approximately 250kg).

(2) Storage Equipment

1) Ladder

Storage workers are required to climb up the stacks to inspect the number of stacked bags, to check room temperature and foodgrain temperature, to distribute fumigant and to place fumigation sheets, etc. As these types of work are conducted very often, a ladder should be provided for each storage.

2) Catwalk

A catwalk creates a passageway for workers carrying foodgrain bags for stacking on top of existing stacks. In general, a catwalk is made of strong wood in one piece and at least two boards will be required for each storage.

3) Hand Hook

A hand hook assists the firm grip of workers carrying foodgrain bags for stacking. At least 10 hooks will be required for each storage.

4) Sieve

Sieves are required to screen the foodgrain when a bag is damaged or when foodgrain is mixed with foreign matters. 3 types of sieves, i.e. for paddy, rice and wheat, should be provided for each storage.

5) Fire Extinguisher

Although fire is not usually used within a storage, fire can still occur due to various causes. One fire extinguisher should be provided for each storage.

(3) Quality Control Equipment

1) Hygrothermometer

It is useful to keep the temperature and humidity of storages as low as possible to prevent damages by pests. It is, therefore, recommended to close or open diligently doors and ventilation windows of storages according to the management of them. Two hygrothermometers should be provided for each storage.

2) Grain Thermometer

When there is an outbreak of pests among stored foodgrain, the foodgrain temperature rises due to the respiration of the pests. This phenomenon enables the early detection of such an outbreak and the prevention of serious damage to the foodgrain by checking the foodgrain temperature. Since the foodgrain temperature must be checked at the top, middle and bottom of the grain stack, 12 gauges are required for each storage to cover 4 lots.

3) Grain Moisture Meter

A high grain moisture content makes the foodgrain more liable to damage by pests and, therefore, the moisture content of all foodgrain purchased or imported must be checked. If the checked value is found to be above a certain level, the grain in question is rejected for storage. The standard moisture content, however, varies depending on the type of foodgrain and the actual content fluctuates during transportation or storage due to moisture absorption. In view of this likelihood, accepted foodgrain must be classified based on the moisture content reading and the necessary measures should be taken in accordance with the checked value during the storage period.

At present, the general shortage of moisture meters means their prior allocation to such CSDs located in Santahar and Mymensingh, etc. and LSDs engaged in the procurement of domestic crops and both the Dhaka CSD and the Tejgaon CSD lack moisture meters. Nevertheless, one grain moisture meter should be provided for each storage of the Tongi CSD in view of the planned storage over a longer period of time than at other CSDs.

4) Grain Probe

A grain probe is used to obtain a foodgrain sample from a bag in order to check the foodgrain quality and two probes should be provided for each storage.

5) Sampling Pan

A foodgrain sample taken by a grain probe is placed on a sampling pan for quality testing. 10 plates should be provided for each storage.

(4) Pest Control Equipment

1) Power Sprayer

A power sprayer is required to spray insecticide to sterilize the inner side of a storage and wooden dunnage before the acceptance of foodgrain in order to prevent outbreaks of pests. One power sprayer should be provided for every 10 storages.

2) Fumigation Sheet

Fumigation sheets are used to cover an entire stack to exterminate pests inside the foodgrain bags with fumigant. Clips are used to connect more than one sheet together and sand bags are used to prevent the leakage of fumigant from the joints between sheets and between sheets and floor.

(5) Office Equipment

1) Office Desk and Chair

All desks and chairs for the 4 officers and the 49 senior staff members will be procured locally.

2) Typewriter

Three typewriters with English keyboards as well as three additional typewriters with Bengalese keyboards will be procured locally.

3) Calculator

Small calculators using either an AC power source or with integral solar batteries will be procured to avoid the use of dry cells.

4) Key Locker

A key locker will be installed to centrally control all keys for the storages and ancillary facilities.

5) Safe

As the Tongi CSD will handle cash and important stickers, etc., a safe will be provided.

6) Cabinet

Cabinets to store important records relating to foodgrain acceptance/delivery and accounting, etc. should be lockable and will be procured locally.

Table 5-1 gives a list of the storage management equipment to be procured.

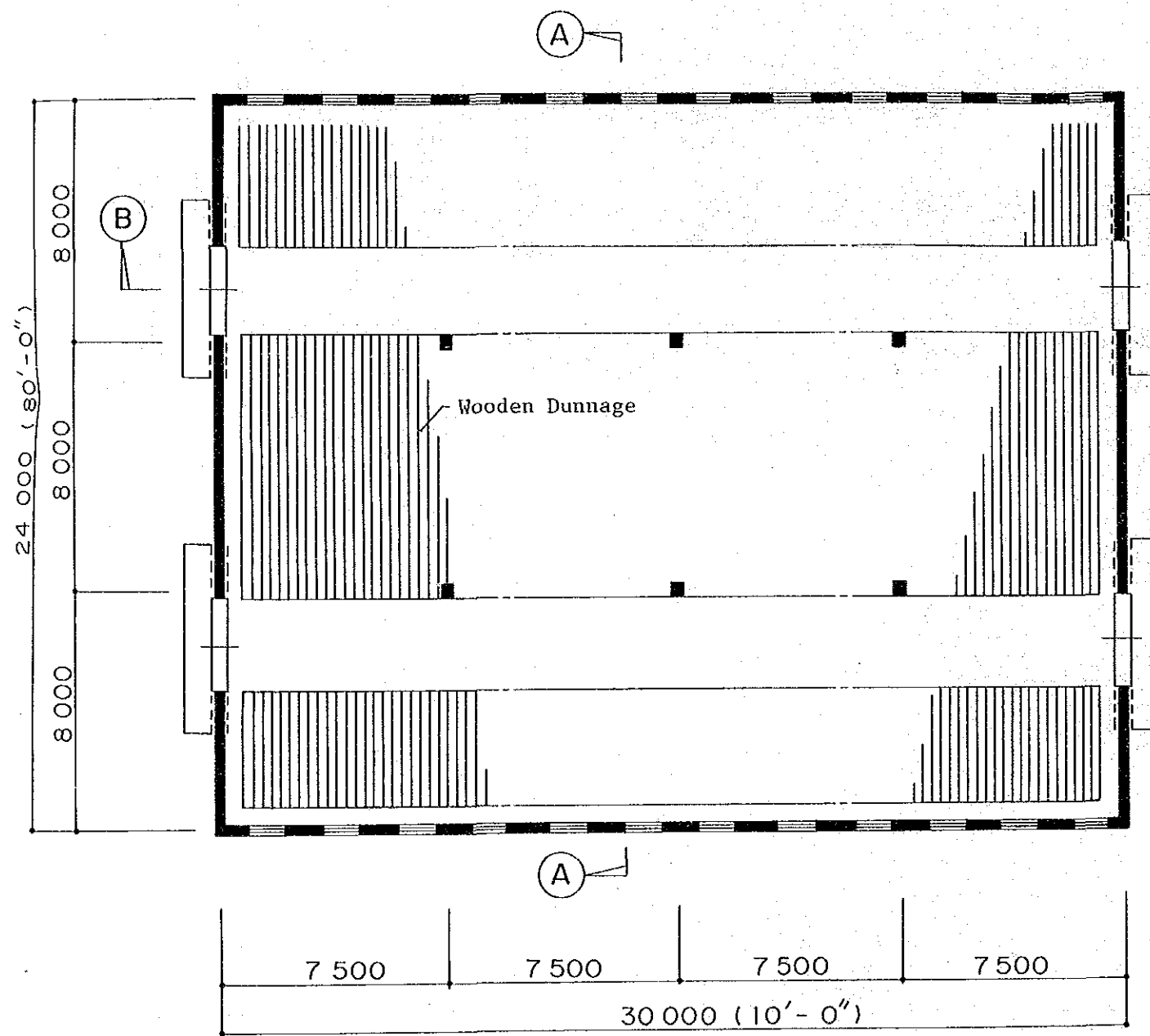
Table 5-1 List of Storage Management Equipment

| Item | Specifications | Quantity |
|------------------------------|---|----------|
| 1) Weighing machines | | |
| a) Truck scale | Mechanical (dial gauge type) | 2 |
| b) Platform scale | Mechanical (dial gauge type) | 35 |
| 2) Storage equipment | | |
| a) Ladder | Aluminium; 7m long; stretch type | 35 |
| b) Catwalk | Wood | 70 |
| c) Hand hook | For handling gunny grain bags | 350 |
| d) Sieve | φ30 - 50cm x D 10cm; 3 different mesh sizes | 35 sets |
| e) Fire extinguisher | | 35 |
| 3) Quality control equipment | | |
| a) Hygrothermometer | Wall mounting type | 70 |
| b) Grain thermometer | Bimetal type | 420 |
| c) Grain moisture meter | Electric resistance type; AC230V; 50Hz | 35 |
| d) Sampling probe | For gunny grain bags (long and short) | 70 |
| e) Sampling pan | Small | 350 |
| 4) Pest control equipment | | |
| a) Power sprayer | Back-carrying type; tank capacity 10 - 20 l; 2 cycle engine | 4 |
| b) Fumigation sheet | 15m x 18m x 0.3mm; vinyl chloride with Woven linen thread | 35 |
| 5) Office equipment | | |
| a) Desk and chair | | 53 sets |
| b) Typewriter | For English and Bengalese | 3 each |
| c) Calculator | | 10 |
| d) Key locker | Steel (storage of 100 keys) | 1 |
| e) Safe | Fire-proof; dial type; 100 l capacity | 1 |
| f) Cabinet | Steel | 10 |

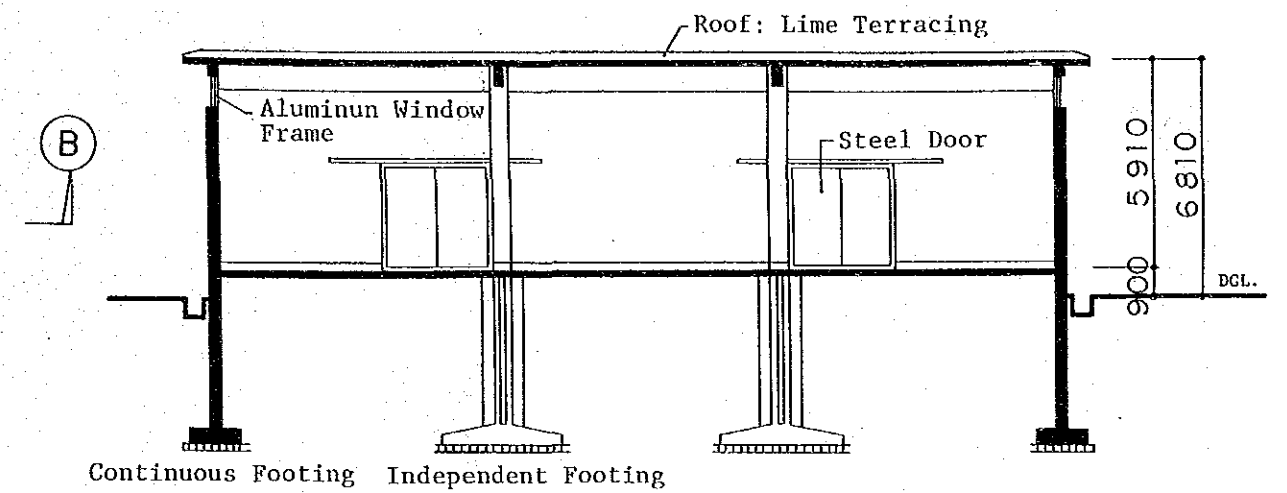
5.2.7 Basic Design Drawings

Basic Design Drawings consists of the following:

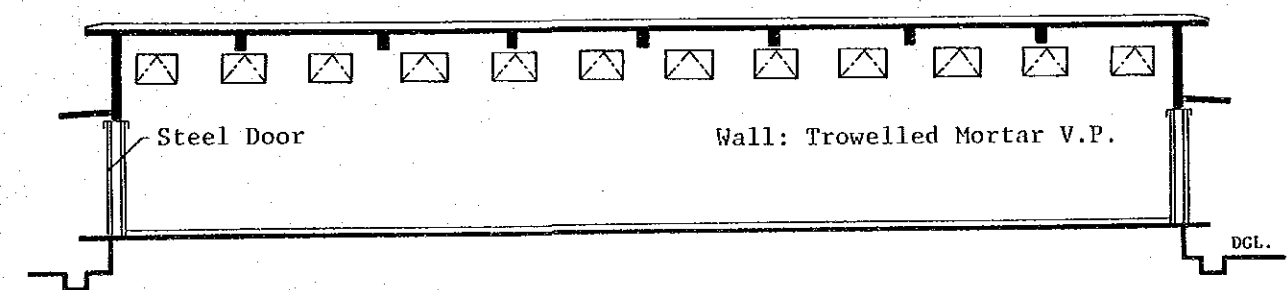
| <u>Drawing No.</u> | <u>Title of Drawing</u> |
|--------------------|--|
| 1. | Plan and Section of Foodgrain Storage |
| 2. | Plan, Elevation and Section of Office Building |
| 3. | Plan and Elevation of Equipment Storage |
| | Plan and Elevation of Worker's Toilet |
| 4. | Plan and Elevation of Substation |
| | Plan and Elevation of Truck Scale House |
| | Plan and Elevation of Check Post |
| | Plan and Elevation of Sentry Post |



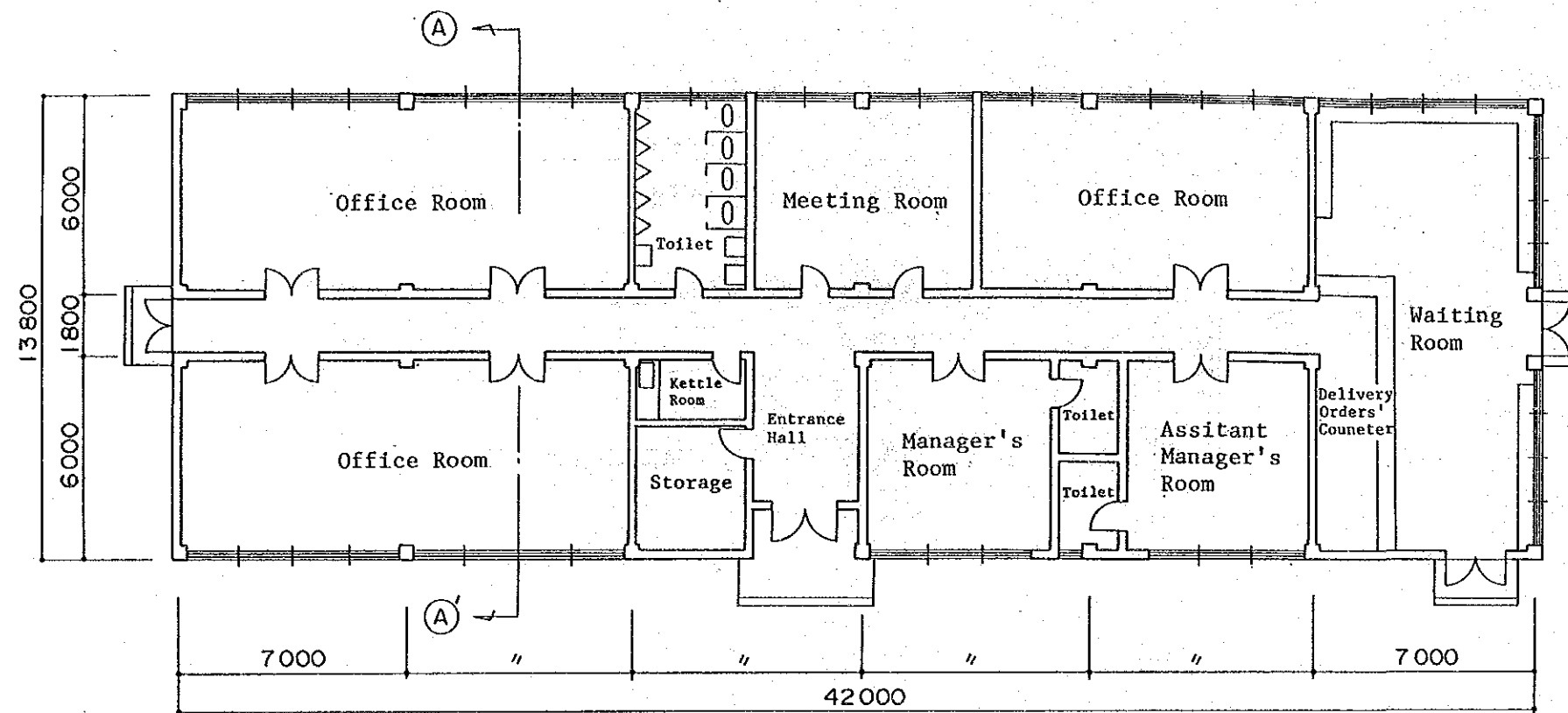
PLAN OF FOODGRAIN STORAGE S = 1:200



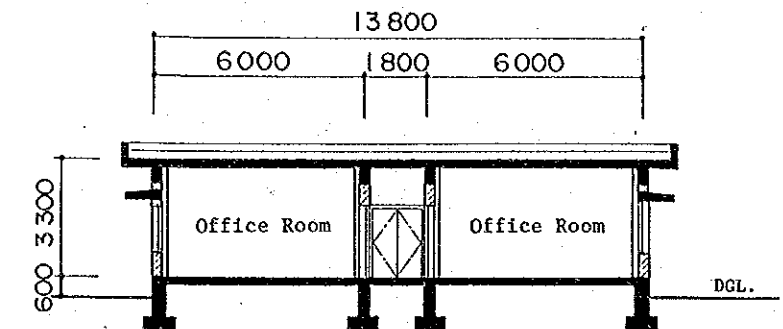
A - A SECTION S = 1:200



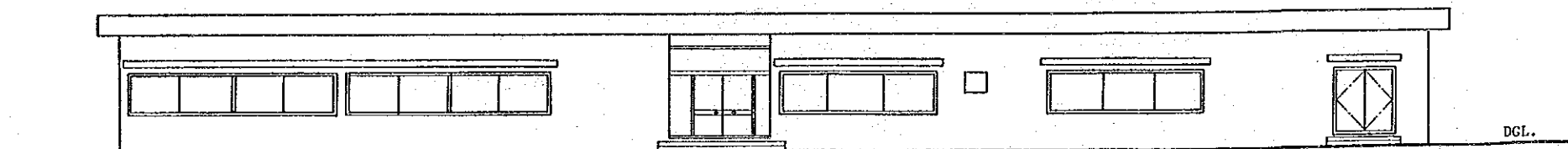
B - B SECTION S = 1:200



PLAN S = 1:200



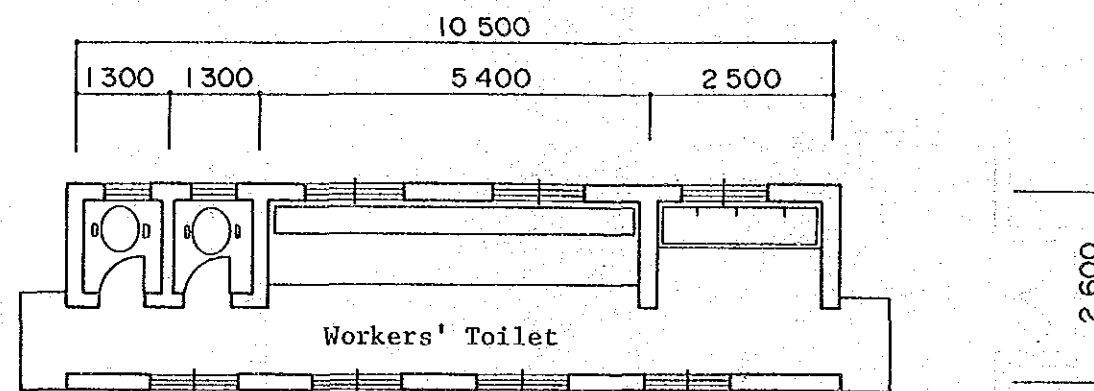
① - ①' SECTION S = 1:200



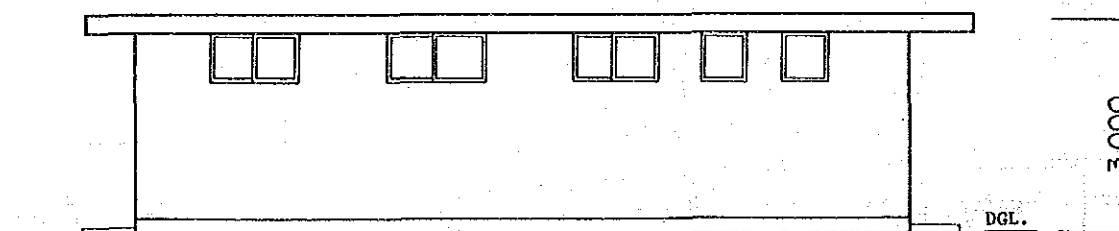
ELEVATION S = 1:200

OFFICE BUILDING

DRAWING NO. 2

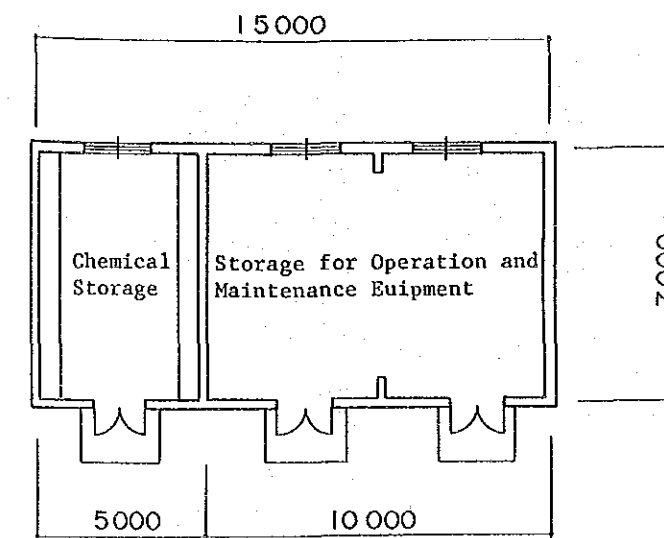


PLAN S = 1:100

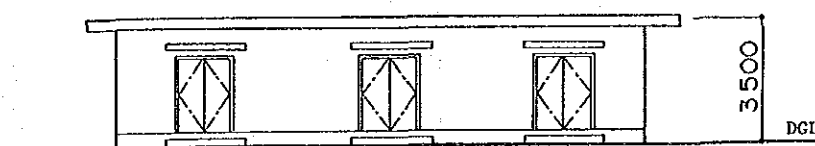


ELEVATION S = 1:100

WORKERS' TOILET



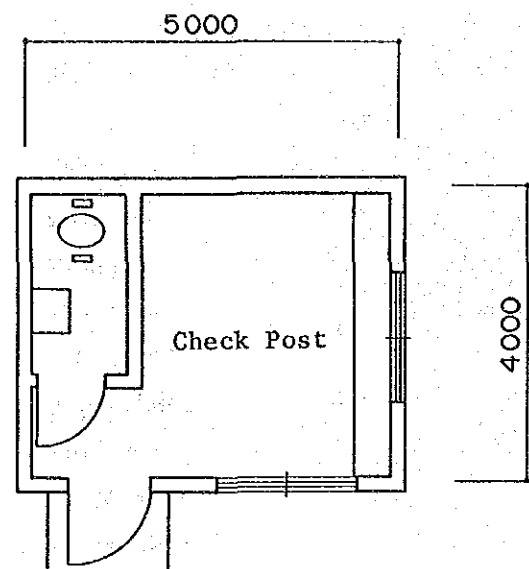
PLAN S = 1:200



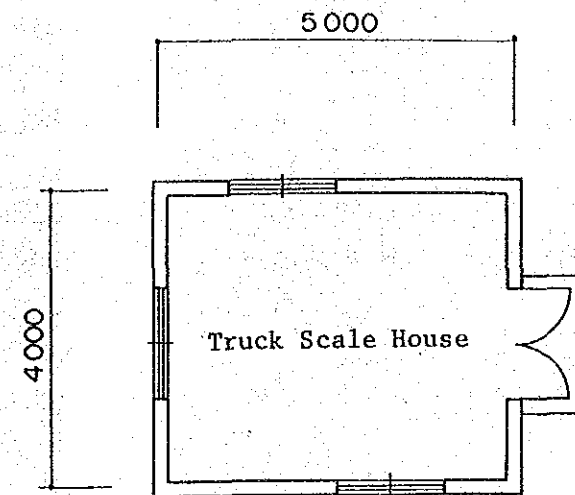
ELEVATION S = 1:200

EQUIPMENT STORAGE

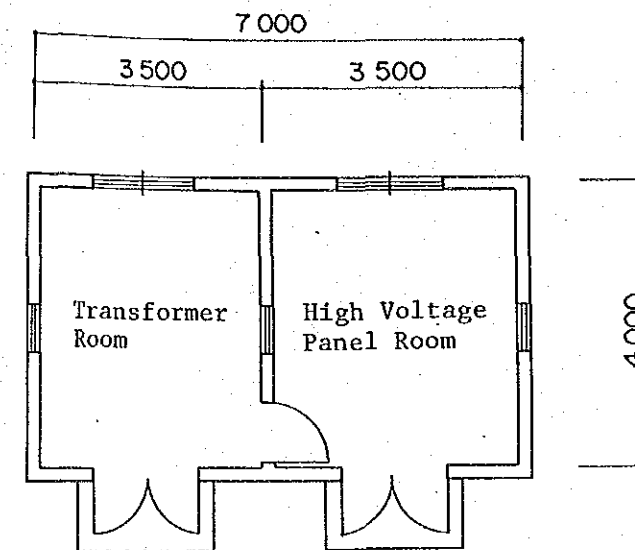
DRAWING NO. 3



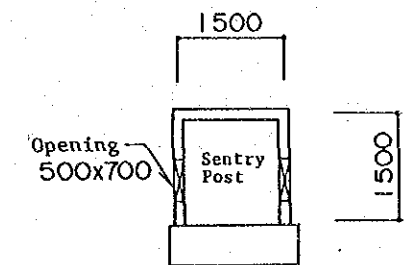
PLAN S = 1:100



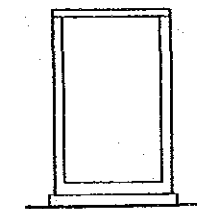
PLAN S = 1:100



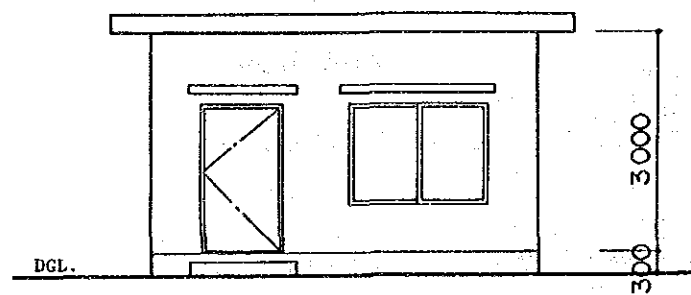
PLAN S = 1:100



PLAN S = 1:100

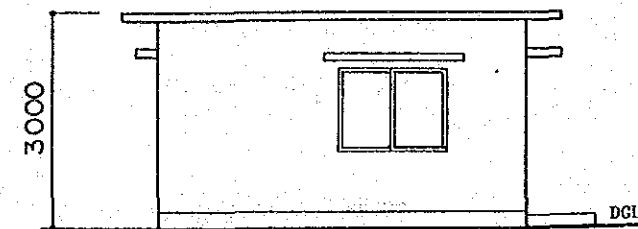


ELEVATION S = 1:100



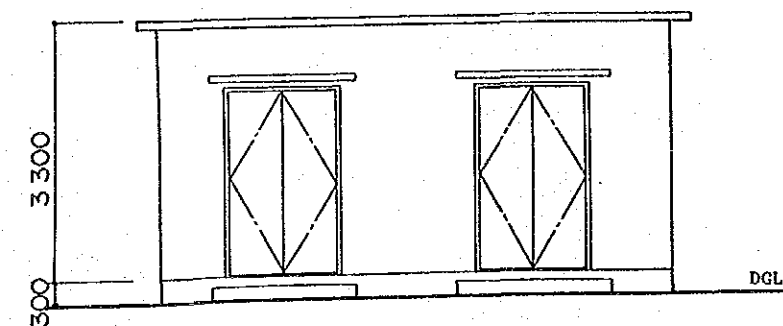
ELEVATION S = 1:100

CHECK POST



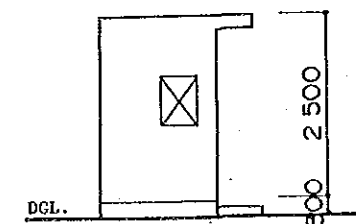
ELEVATION S = 1:100

TRUCK SCALE HOUSE



ELEVATION S = 1:100

SUBSTATION



ELEVATION S = 1:100

SENTRY POST

DRAWING NO. 4

