CHAPTER 5
MAINTENANCE SYSTEM OF VARIOUS FACILITIES

CHAPTER 6
PRIORITY PROGRAMS/PROJECTS

6.1 Priority Programs and Projects

6.1.1 Seed Multiplication and Provision Project

I. Background

1. Present State of Agriculture

Agriculture plays an extremely important role in the economy of Mongolia. About 30% of the country's workers are employed in this industry, and farm products provide 40% of the value of its exports. The animal husbandry sector accounts for about 70% of the industry, while the remaining 30% is field husbandry.
Land for field husbandry was provided by a Food Production Increase Program implemented from 1958 to 1960. Cultivated fields occupy about 1.3 million hectares, or approximately 1% of the entire 1.566 million square kilometers of Mongolia. An additional 125 million hectares of natural grassland are used for grazing domestic animals. With between 30% and 40% of the cultivated land lying fallow at any one time, every year approximately 800,000 hectares of crops are harvested.

The principal crops are grains (mainly wheat), feed grains, potatoes, vegetables (cabbages, onions, turnips, carrots, garlic, and tomatoes), and fruit. The unit yields are low: 1 ton of wheat and 10 tons of potatoes per hectare respectively. The wheat and feed grains are generally cultivated using natural rain water, but the vegetables, fruit, and 10% of the potatoes are irrigated.
The field husbandry districts are in the north-central and north-eastern parts of the country. This means it is concentrated in the prefectures of Tov, Selenge, Bulgan, Hentii, and Dornod. About 70% of the wheat, feed grains, and potatoes are grown in the prefectures of Tov, Selenge, and Bulgan with 80% of the fruit and vegetables cultivated in Tov and Selenge Prefectures.

The collapse of the system linking the former Soviet Union and the countries of Eastern Europe has, beginning in 1989, reduced the amount of economic and technical aid provided to Mongolia. One result has been a shortage of seeds and other basic production materials and the deterioration of irrigation facilities and other parts of the agricultural infrastructure, which have in turn, brought a sharp drop in agricultural productivity.

2. Problems Hampering Seed Production

In the past, the country imported between 80% and 90% of its supply of wheat and vegetable seeds, which are the basic material needed for agricultural production. For this reason, the most urgent task for Mongolia is to build-up its domestic seed production. To obtain the seeds the country's farmers require, the following goals must be achieved.

[1] Guaranteeing a stable supply of food (particularly of wheat and vegetables) for the people.
[2] Selection, improvement, and propagation of seeds suited to the cold climate of Mongolia.
[3] Provision of the infrastructure (seed propagation nurseries, irrigation facilities, etc.) for the stable domestic production of seeds and seed stock storage facilities.
[4] Improvement of the seed selection, packaging, and distribution system needed to distribute high quality seeds.
[5] Increased production of vegetables to meet domestic demand.

3. The Need For and Importance of the Seed Propagation Project

Production of wheat, the most important agricultural product in Mongolia, has fallen since 1990, creating serious problems, particularly for city dwellers. One of the reasons for this slump in production has been a shortage of seeds and the increased use of poor quality seeds.

Diversification of people's food requirements has resulted in the city-dweller's demand for vegetables rising every year. But the actual quantity consumed per person still stands between 15 and 20 kilograms, which is less than 1/4 of the required intake of 80 kilograms recommended by the FAO. More than 70% of vegetable seeds are imported from Russia and China, but it is difficult for Mongolia to obtain the quantities it needs because of their high cost.

The Plant Science aan Agricultural Research Institute (PSARI)is the only organization in Mongolia carrying out an integrated program encompassing research on wheat and vegetable seed stocks, their production, improvement, and cultivation. But its functions have deteriorated sharply because of the dilapidated condition of its irrigation facilities and separation machinery.

The vegetable seed supply situation cannot be improved without the provision of hothouse equipment needed for seeds and seedling propagation, nurseries provided with irrigation facilities, and stock seed selection and storage facilities. To

satisfy the rising demand for wheat, potatoes, and vegetables, the MOFA hopes to establish plans to resolve these problems and improve the seed picture.

4. Agriculture and Seed Propagation

In Mongolia, wheat, vegetable, and potato seeds are produced at the PSARI, but the continuing deterioration of its facilities has reduced both the quantity and the quality of the seeds it produces.

It supplies only about 20% of the seeds required throughout Mongolia, so almost all of the seeds used are imported. But the demand for vegetables and the desire of farmers to grow them are both climbing steadily.

For the above reasons, the Seed Propagation Project is a top priority project.

5. Reason for Requesting Assistance

Since PSARI was founded in 1960 with technical and financial support from the Soviet Union and countries of Eastern Europe, it has conducted research on cultivation technology and seed production, but because of a shortage of production materials and the suspension of its supplies, its production has dropped sharply. Causes of these problems include the effect of the switch over to a democratic system in 1980 on the economy and state of technology in Mongolia.

Mongolia, which is already receiving technical and financial assistance from Japan in many fields, is eager for this plan to include provisions for assistance with seed propagation, an area in which Japanese technology is advanced.

II. Objectives and Outline of the Project

1. Project Goals

The project goals are to upgrade the maintenance of and improve the production facilities at PSARI where wheat and vegetable seed research and production are conducted. This institute is now researching, improving, and producing seeds suited to Mongolia for a total of 13 varieties of wheat and vegetables. The wheat seeds are raised on an existing 200 hectare nursery, while vegetable seeds are cultivated on 76 hectares of land (existing 31 hectares plus 45

hectares of new land).

(1) Short-term Goals

[1] Increase wheat and vegetable production by stabilizing seed supplies and by providing higher quality seeds.
[2] Stabilization of both supplies and prices by providing improved wheat and vegetable production technology.
[3] Reduce expenditures of foreign currency by cutting seed imports.

(2) Mid-term Goals

[1] Systematization and propagation of breeder's stock, foundation stock, and quality certified seed stocks.
[2] Production of seeds suited to the climate, soil, and other natural conditions of Mongolia.
[3] Improvement of agricultural technology through the strict selection of high quality seeds and the introduction of biotechnology.
[4] Provide the people with healthy nutrition by producing more vegetables.

Wheat is the stable food in Mongolia, but it is not self-sufficient in this product because of the effect of declining yields caused by a shortage of seeds and by fluctuations in the weather. The Research Institute staff are working hard to improve varieties and to produce superior seeds, but their success has been limited as a result of the deterioration of their facilities and delays in repairing their research equipment. Insufficient supplies and unsatisfactory distribution of good seeds is a major cause of the decline in the production of wheat.

Vegetable demand is rising continuously as a consequence of the growth of the urban population and a desire of the people to eat a healthier diet. Domestic supplies of vegetable seeds are limited and the country is heavily dependent on imports, but imported seeds are not well suited to the climate of Mongolia, and provide low unit yields. The Research Institute supplies 20% of the country's vegetable seed demand, but its facilities are old and out-of-date.

Consequently, the implementation of this project will make a big contribution to increasing production of wheat and vegetables.

2. Detailed Description of the Facilities, Equipment, and Materials Requested.

See Table 6.1.1.1 and Table 6.1.1.2.

3. Details of the Project

These are included in Chapter 6.1 of this report, but an outline follows.

[1] Improvement of nurseries used to propagate seeds: Rehabilitation of irrigation systems (wheat: 200ha, vegetables: 45ha, seed production water supply facilities, water channels, and pumping stations).

[2] Laboratory facility reinforcement

[3] Buildings: Hothouses, net houses, seed storage barns, seed selection buildings, office space, etc.

[4] Equipment: Seed selection machinery, agricultural machinery, farm tools, transport vehicles, etc.

[5] Others: Engineering services

The following assistance has been planned in order to enhance the effectiveness of the financial assistance and to reinforce the research infrastructure.

[1] Short-term despatch of specialists

[2] Acceptance of trainees.

Note: Seed growing will be done on a 45 acre field.

Cabbage (early and late maturing), carrots, etc.....14ha

Onions, garlic, green onions, sugar beets, leeks, etc...14ha

Potatoes.....14ha

Fruit trees..... 3ha

4. Benefits and Public Nature of the Project

(1) Direct beneficiaries:

Number of Beneficiaries

Approx. 1,000 vegetable growers (2,000 hectares)

Approx. 2,000 wheat growers (1,000 hectares)

Beneficiary Region:

Primarily wheat and vegetable growing areas in Tov and Selenge.

(2) Indirect Beneficiaries

560,000 persons or 80% of the 700,000 residents of the principal cities (Ulaan Baator, Darkhan, Erdenet, etc.)

(3) Land Area Benefitting From the Project

Vegetable Production Fields: 2,000ha

Wheat Production Fields: 100,000ha

(4) Economic and Social Benefits

a. Present Conditions

Wheat seed have to be renewed every 4 or 5 years. Quality assured seeds are

distributed by the Research Institute, but because of the decrepit condition of its irrigation systems and a shortage of agriculture equipment and seed selection machinery, its seed productivity is down. This drop in the production of wheat seeds has effected wheat production throughout Mongolia by reducing the germination rate of the seeds that have been planted.

And regardless of the rising demand for vegetables, 70% of the seeds, which constitute the basic material required for agricultural production, are imported, so it is difficult for vegetable growers associations and ordinary farm households to obtain the seeds they need. And because imported seeds are not well suited to Mongolia's climate, the production levels obtained using these seeds are not high. As a consequence, vegetable producers are looking forward to the Research Institute increasing the amount of seeds it distributes.

b. Anticipated Effects of the Project

The rehabilitation and improvement of the wheat and vegetable seed production facilities and the upgrading of facility management will increase seed production volumes. This will eliminate annual shortages of wheat while an increase in vegetable production will contribute to the improvement of the nutritional level of the entire population.

(5) Public Characteristics

Increased production of wheat and vegetable seeds will not only benefit specific regions and social classes; it will be a boon to all of the nation's producers and consumers. Consequently, it is sure to bring both economic and social benefits to Mongolia.
Seeds are the basic material required for agricultural production, so larger production of improved seeds will improve and expand production technology. And by preserving native Mongolian stock seeds at the same time as it improves seeds, the project will make an extremely important contribution to the preservation of the world's resources and its environment.

(6) The implementation of the Seed Propagation Project will result in the following production of seeds.

A) Seed Production
Seed production after implemention of the Seed Propagation Project

a. Unrefined Vegetable Seeds

Early cabbage	400kg
Late cabbage	50
Garlic	5
Turnip	1,200
Long onions	1,000
Caraway	60
Table beets	100
White radish	30
Lettuce	20
Leek	2
Red turnip	300
Stem lettuce	10
Chinese artichoke	200

b. Refined and Packaged Vegetable Seeds

Carrots	3000kg
Cucumber	300
Onions	2,400

c. Wheat Seeds 225 to 270
Total wheat production of 300 to 360 tons,
1.5 to 1.8 tons/hectare, cultivated land of 200 hectares.

d. Barley Seeds 15
Total cultivated land: 10ha, Unit Yield: 1.5t/ha

e. The seed potato production is described below.

(Source:PSARI)

B) Seed Potato Propagation Plans

More than 500 tons of stock seed will be produced at PSARI by 1999. These will be sold on the wholesale market to seed potato farms, propagated for 1 or 2 years on remote fields, and quality assured seed potatoes will be produced.

In order to produce 500 tons of stock seed, it will be necessary to plant 15,000 apical meristem culture plantlets and propagate 120,000 small tubers. This will require the construction of 650m² of glass-enclosed hothouses at a cost of 7385.77(000.0tu).

Seed potatoes will be produced in accordance with the following plan.

Seed Potato Propagation Plan

Year	Seed Potato Grade	Procedures	Production sites
		Mutiply shoot tip culture to produce 15,000 plantlets	In vitro
		Transplant 15,000 plantlets to produce 120,000 microtubers	Green house
1	Super-super elite	Multiply microtubers in 2 ha to produce 30t super-super elite seed potatoes	Elite seed unit at PSARI
2	Super elite	Multiply the super super elite seeds in 10 ha to produce 130t super elite seed potatoes	do
3	Elite	Multiply the super elite seeds in 42 ha to produce 500t elite seed potatoes	do
4	First and Second	Multiply the elite seeds in 165 ha to produce 2,500t 1st and 2nd seeds	Specialized seed potato farm
5	Certified	Multiply the seeds in 260 ha to produce 4,000t seed potatoes	

(Source:PSARI)

c. Protecting Seed Potatoes from Diseases

The rooting tissue cultures in the test tubes is planted in the hothouse. Each parent body is tested for viruses to remove infected roots. Later infected removed during the growth and development process, and Virus transmitting insects are roots are also removed. The seed potatoes are inspected by a committee made up of representatives of the MOFA, PSARI, and seed potato farm technology specialists.

Table 6.1.1.1 Facilities for The Seed Multiplication Project

Items to Improve		Quantity		Details of Facilities to Improve
Buildings	Wheat Storage Barns	1	180m²	Brick Building
	Seedling Storage House	2	480m²	Root Crop Storage House 240m², Certificated Seed Storage House 240m²
	Greenhouse	9	1,190m²	Green House 450m², Vinyl house 400m², Net House 340m²
	Seed Selection Work House	1	500m²	Seed Storage Cases, Seed Selection Appratas 2sets
	Office Building	1	100m²	Sterlization, Packing System 1 set
Field Facility	Experimental Field	1	245ha	Irrigation Water Channel 2.3km and others
	Sprinkler Irrigation Facilities		245ha	Intake Gate 2 (Pump 4 sets), Pipe Line 1620m, Sprinkler System
Machineries	Tractors	1	100HP	Including Attachment
	Harvester	1	75HP	
	Field Managing Machines	5		Cultivator(12HP) 2, Sprayer 2, Forklift 1
	Vehicle	3		Land Cruiser 1, 2ton-Truck 1, 4ton-Truck 1
Experimental Apparatus etc.	Experimental Apparatus	1		Clean Bench, Incubater Unit, Ultracentrifuger Spectrophotmeter etc.
	Education,Training Apparatus	1		Personal computer, Video player etc.
	Office Supplies			Desk, Chair, Locker etc.

Table 6. 1. 1. 2 Required Costs of Facilities Improvement for the Seed Multiplication ProJect

(Unit : US$)

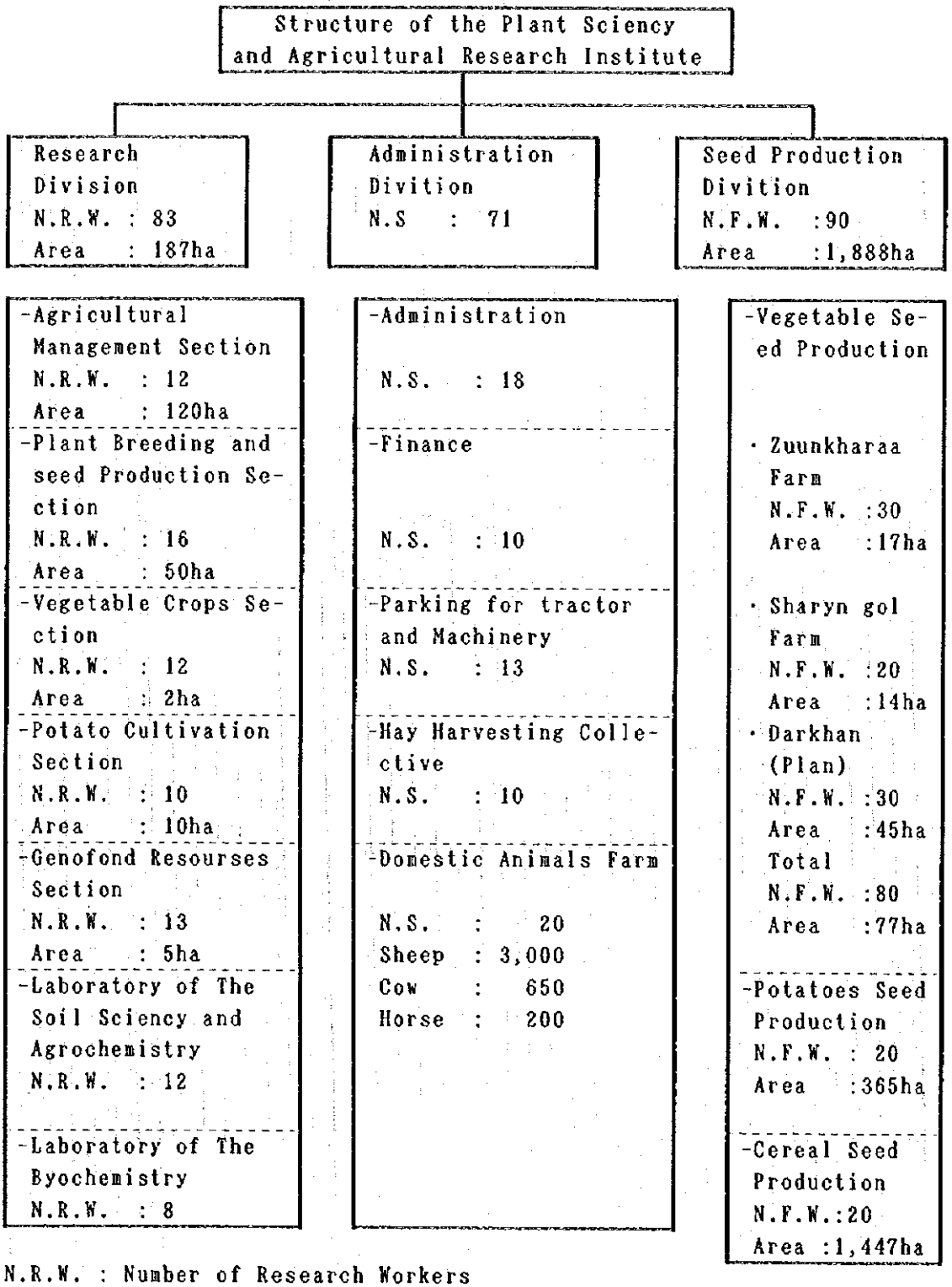
Items to imprved		Quantity		Unit Price	Cost	Remarks
Buildings	Wheat Storage Barns	1	180 m²	1820	327,000	
	Seedling Storage	2	480 m²	1820	872,000	
	Glass greenhouse		450 m²	1790	807,000	
	Vinyl greenhouse		400 m²	202	81,000	
	Net greenhouse		340 m²	409	139,000	
	Seed Selection Work Shop	1	500 m²	1820	909,000	Include
	Selectors	1			2,751,000	Seed storage
	Offces	1	100 m²	1820	182,000	case
	Sub Total				6,068,000	Selectors
Land to be	Testing and Research	1 set	245ha		362,000	
	Nurseries	1 set				
Developed	Sprinkler Irrigation		245ha		1,833,000	
	Facility					
	Sub Total				2,195,000	
Machinery	Tractors	1 set		68000	68,000	
	Harvesters	1 set		122000	122,000	
	Control Machinery				149,000	
	Land cruiser	1 set		31000	31,000	
	2-ton truck	1 set		29000	29,000	
	4-ton truck	1 set		39000	39,000	
	Sub Total				438,000	
Testing		1 set			513,200	Look at
Equipment		1 set			48,700	Table6.1.1.2
Office equipment		1 set			41,400	
Sub Total					9,304,300	
Others Costs	Engineering Service	(6068+2195)*15%+				
		1041*5%		1291.5	1,291,500	
	Contingencies	(9304+1291.5)*10%		1059.6	1,059,600	
		(6068+2195+1291.5)				
		*10%		1165.5	1,165,500	
Total					12,820,900	

Table 6.1.1.3 Machineries and Equipments

Items	Machineries and Equipments	Price	Use for
Equipments for meristem culture	Clean bench CCV-1300E(Nittusei co.)	¥1,450,000	Extract growing point meristem tissue Transplant the tissue on the culture medium
	Stereoscopic microscope M-913(Sansyo)	100,000	Extract growing point meristem tissue Transplant the tissue on the culture medium
	Autoclave ASV-3022(Sansyo)	530,000	Preparation of medium Sterilization of experimental tools
	Hot-air sterilization NDS-450D (Eyela)	230,000	Sterilization of experimental tools
	pH meter HM-40V(Sansyo)	250,000	Preparation of medium
	Magnetic stirrer RCN-3D(Eyela)	55,000	Preparation of reagent
	Incubater unit LPH-1P-NC-2 (Nihonikakiki co.)	19,000,000	Nursing of plantlets Temperature control (7～35℃) Illumination、Shelves
	Water distilizer GS-200(Sansyo)	498,000	Preparation of reagent and medium Washing out of experimental tools
	Medicinal showcase RC-M501(Sansyo)	525,000	Storage of samples and reagents
	Medical freezer RS-MT25(Sansyo)	200,000	Storage of reagents
Equipments for ELISA test	Ultracentrifuger CP65β(Nittusei Co.)	8,400,000	Preparation of samples
	Roter Angle type P65A P30A2 Swing type 28S	 1,050,000 1,150,000 1,940,000	Preparation of samples
	Microplate reader MTP-120(korona Dennki Co.)	1,200,000	Virus diagnosis
	Spectrophotmeter U-3210(Nittsei Co.)	2,300,000	Measurement of virus concentration
Sub-total Other Expense Total		38,878,000 7,775,600 46,653,000	 38,878,000×0.2

Machineries and Equipments with higher price are listed for potato meristem culture and ELISA test.

Figure 6.1.1.1 Organization of the Plant Science and Agriculture Research Institute



N.R.W. : Number of Research Workers
N.S. : Number of Staffs
N.F.W. : Number of Field Workers

Figure 6.1.1.2

Seed Multiplication & Distribution System(Example)

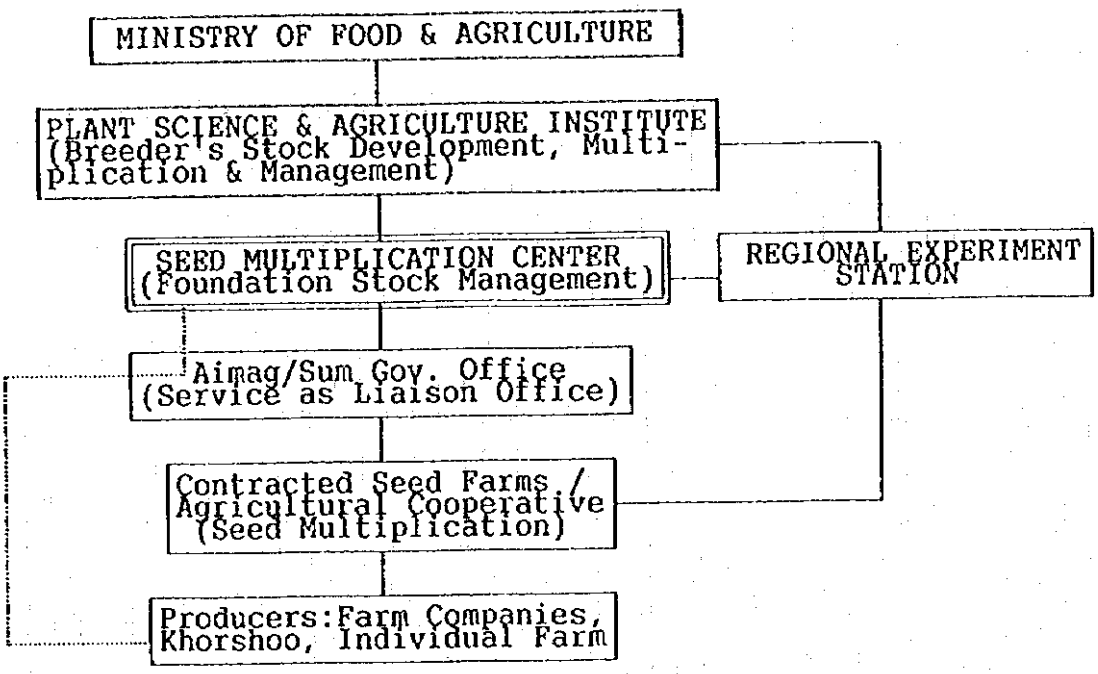
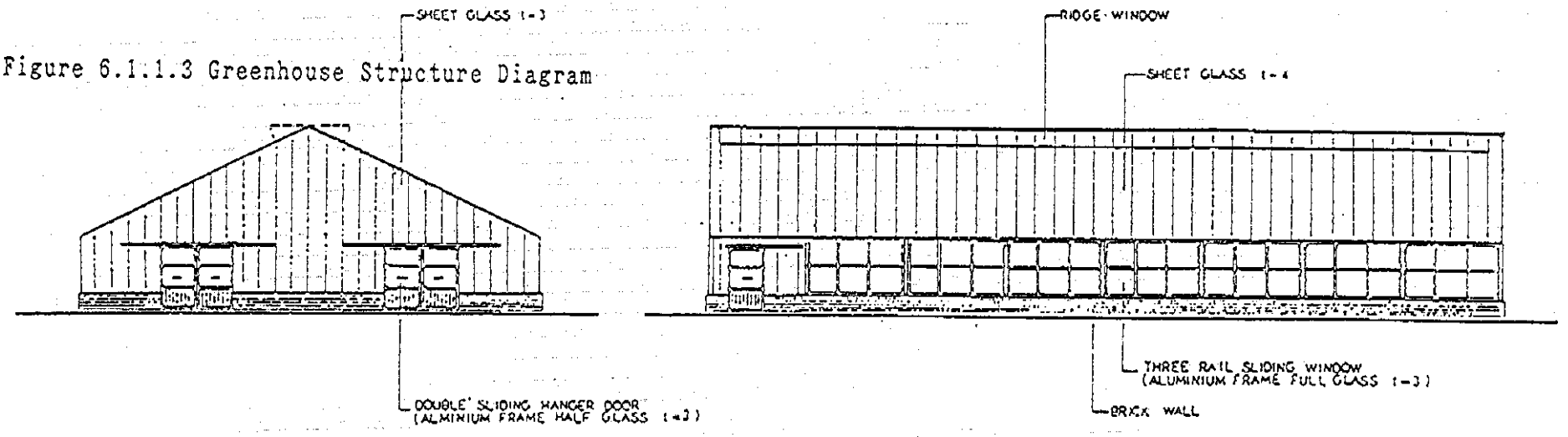
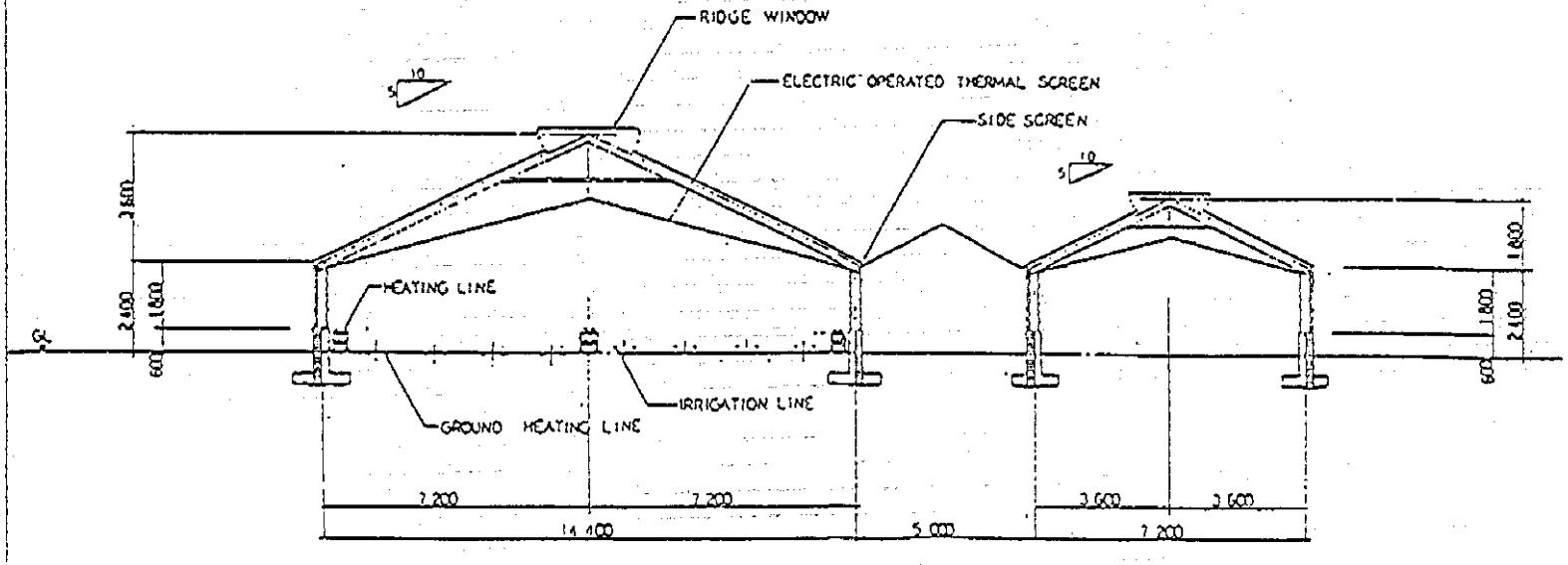


Figure 6.1.1.3 Greenhouse Structure Diagram

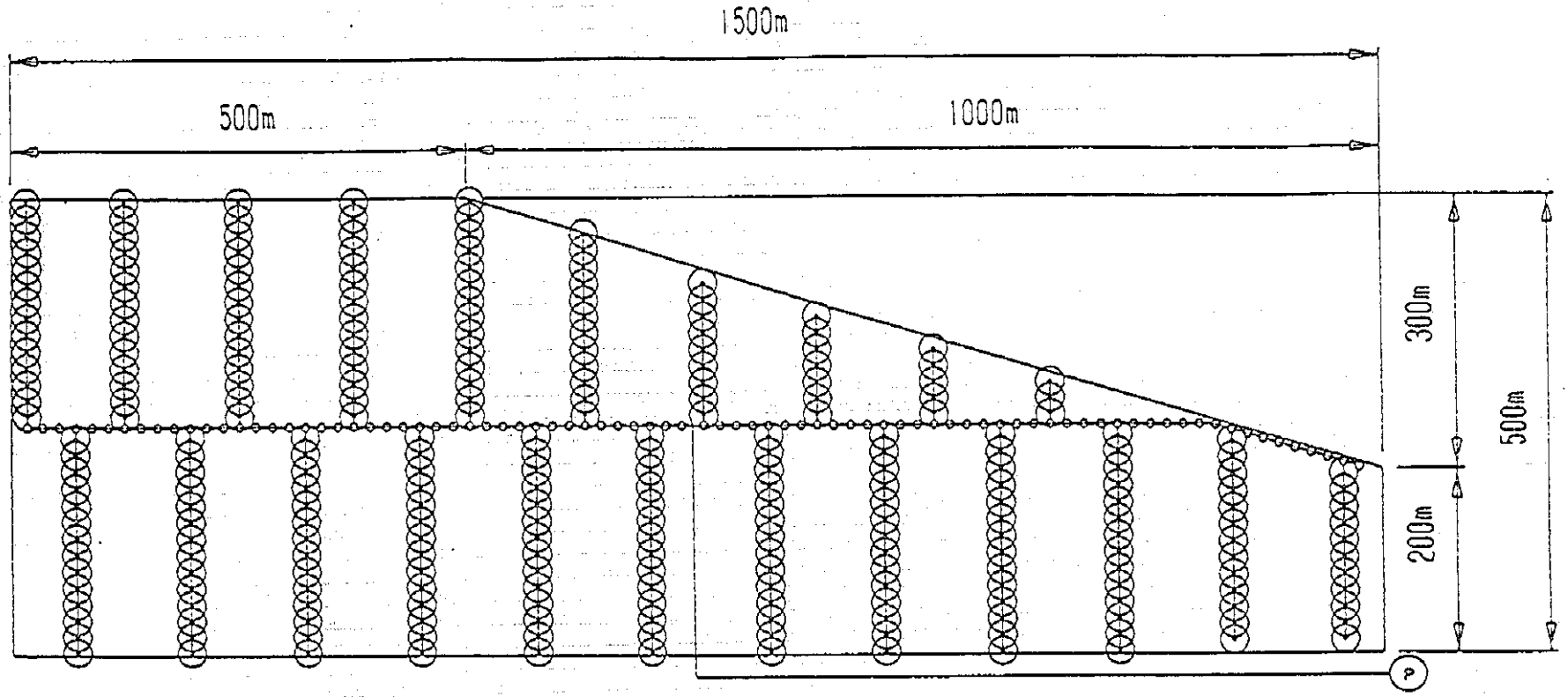




SECTION

ELEVATION . SECTION	1/100

Figure 6.1.1.4 Irrigation Facility Location Map



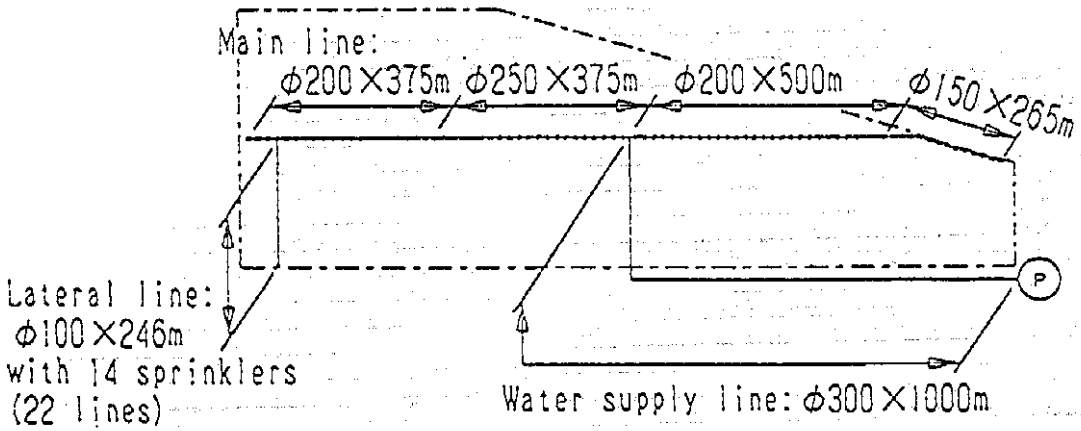


Table 6.1.2.1 Irrigated Agriculture Technology Development Project Costs

(Unit : US$)

Items to be improved		Quality		Unit Price	Costs	Remarks
Buildings	Main Building	1	660 m²	@590	389,400	
	Trainees Dormitory	1	216 m²	@590	127,400	
	Repair Shop	1	216 m²	@430	92,900	
	Garage	1	288 m²	@400	115,200	
	Warehouse	1	216 m²	@400	86,400	
Sub total					811,300	
Farmland	Experimental Farmland	1 set	100ha	@1100	110,000	
	Farmland of Project Center	1 set	50ha	@1100	55,000	
Sub total					165,000	
Pumping Facility	Pumping facilities for the Project Center	1 set			83,000	Shed : 23,000 Pump System : 0.15t/s*2, @30,000*2
Machinery	Agricultural Machinery	1 set			100,000	
	Vehicles	2		35,000	70,000	
	Tools	1 set			16,700	
Testing Equipment	Soil quality testing device	1 set			100,000	
	Civil engineering testing device	1 set			100,000	
Education and Training Equipment		1 set			40,600	
Office equipment		1 set			34,500	
Sub total					461,800	
Engineering Service		1 set			182,000	
Contingencies		1 set			357,600	
Total					2,060,700	

Notes:Cost of Buildings, Farmland Development, and Shed for Pump System are estimated by using local prices.
Others are done by useing prices of goods which will be transported from Japan.

Table-6.1.3.1 RIAH Technology Development Project Cost (Unit : US$)

Improvement/Facility		Quantity		Unit Price	Amount	Remarks
Buildings	Farrowing barn	1	486m^2		146,400	
	Fattening barn	1	506m^2		108,400	Repairs of existing facility
	Hen barn	1	486m^2		146,400	
	Hatching barn	1	488m^2		102,900	Repairs of existing facility
	Cow barn	1	375m^2		110,200	
	Bunker Silo	1	168m^3		13,800	
	Office	1	420m^2		211,000	
	Machine Storehouse	1	200m^2		80,900	
	Compost yard	1	162m^2		51,400	
	Urine tank	3	210m^3	3,900	11,700	
	Fattening barn	1	457m^2		69,800	Repairs of existing facility
	Paddock	1			4,100	
	Attached Facility	1			34,400	Water pipes,electric wiring
	Pumps	1			100,000	
	Processing Facility	1	578m^2		69,800	Repairs of existing facility
Subtotal					1,261,200	
Machinery	Machinery	1			400,200	Tractor,Harvester,Mower,etc.
	Vehicles	2		42,000	84,000	Jeep type 4WD
	Repair Equipment	1			14,300	Welder,High-speed cutter,etc.
Equipment	Pig-raising	1			398,900	Pig pen fencing,Heaters,etc.
	Chicken-raising	1			85,100	Cages,Feeders,Incubators,etc.
	Cow-raising	1			189,500	Milking machine,Bulk cooler,etc.
	Feed-producing	1			22,600	Feed blender,Grain grinder,etc.

Improvement/Facility		Quantity		Unit Price	Amount	Remarks
Testing & Research Equipment	Testing/Measurement Processing	1 1			95,900 1,237,700	Alkit,Egg measurement,etc. Meat 173,800, Milk 1,063,900
Training Equipment		1			48,700	Video camera,Television set, OHP set,Slide projector, etc.
Office Equipment		1			41,400	Copiers,PC set,etc.
Livestock	Breeding Livestock	1			11,300	Cow 10, Sow 20, Chick 1,000
Sub-total					2,629,600	
Total					3,890,800	

Table-6.1.3.2

Calculation of required agricultural machinery for RIAH

1. Fodder production area

	Dairy		Beef		Total
Grassland	65	+	83	=	148 ha
Fodder crop	28	+	-	=	28 ha
Total	93	+	83	=	176 ha

2. Operation process

(1) Hay making

Reaping (Mower) → Gathering (Rake) → Packing (Hay baler) → Transport (Truck)

(2) Silage making

Reap/cutting (Harvester) → Transport (Truck) → Repression (Tractor)

(3) Fodder crop management

Manuring (Manure spr.) / Slurring (Slurry spreader) → Cultivating (Disc harrow) → Seeding (Seed drill) → Fartilizing (Broadcaster)

3. Caluculation of required number

Operation	Machinery	Scale	Work Efficiency			Field effic.	Field Work unit	Work hour /day	Fieldwork hr		Field work /day	Total work area	Tot. work days	Work area /day	Requ-ired number
			Width	Work speed	Work unit				Work effic.	actual hour					
			m	km/hr	ha/hr	%	ha/hr	hr	%	hr	ha/day	ha	day	ha	
Cultivat.	Disc harrow	3.6m	3.60	7.0	2.52	80	2.02	8.0	85	6.8	13.74	28	20	1.4	1
Fertiliz.	Broadcaster	500L	4.00	7.0	2.80	70	1.96	8.0	80	6.4	12.54	56	40	1.4	1
Seeding	Seed drill	24line	3.60	5.0	1.80	60	1.08	8.0	80	6.4	6.91	28	20	1.4	1
Reap/cut.	Harvester	2.4m	2.40	7.0	1.68	70	1.18	8.0	80	6.4	7.55	28	20	1.4	1
Transport	Truck		2.40	7.0	1.68	70	1.18	8.0	80	6.4	7.55	28	20	1.4	1
Reaping	Mower	2.4m	2.40	7.0	1.68	80	1.34	8.0	85	6.8	9.11	148	10	14.8	2
Gathering	Rake	4.0m	4.00	7.0	2.80	70	1.96	8.0	80	6.4	12.54	148	10	14.8	2
Packing	Hay baler	4.0m	4.00	5.0	2.00	70	1.40	8.0	80	6.4	8.96	148	10	14.8	2
Manuring	Manurspred.	3.0t	4.00	5.0	2.00	70	1.40	8.0	80	6.4	8.96	28	10	2.8	1
Slurring	Slurry sp.	2000L	4.00	5.0	2.00	70	1.40	8.0	80	6.4	8.96	28	20	1.4	1
	Tractor	70PS													2

Table-6.1.3.3 Outline of Farming Plan by sector

Section	Dairy	Pig	Poultry	Cattle Fattening	Remarks
Livestock	Cow 20 head Calf 14 // Heifer 16 // Total 50 //	Sow 30 head Boar 3 // Pigling 137 // Fattening 168 // Total 338 //	Hen 1,500 head Hatching 300 // Chick 1,000 // Total 2,800 //	Fattening 50 head Total 50 //	
Fodder	Forage 14ha A.grassland 14ha N.grasslamd 65ha			N.grassland 83ha	A : Artificial N : Natural
Facility	Cow barn 375m^2 Bunker silo 168m^3 Compost yard 162m^2 Paddock 1	Farrowing barn 486m^2 Fattening barn 506m^2	Hen barn 486m^2 Hatching barn 488m^2	Fattening barn 457m^2 Paddock 1	Includes farm machinery
Main Products	Milk 60 t 4 heads 9 heads	Fattening Pig 360 head Gilt 60 head	Egg 300,000 piece Chick 10,000 head	Fattening cattle 95 head	
Farm business (1,000Tg)					
Gross income	8,310	6,090	19,808	7,100	
Expenditures	6,661	4,872	16,837	6,600	
Profit	1,649	1,218	2,971	500	
Main roles	①Fodder production tech ②Feeding tech ③Compost tech ④Heifer supply	①Feeding tech ②Reproduction tech ③Fattening tech ④Gilt supply	①Feeding tech ②Feed processing tech ③Chick supply	①Feeding tech ②Fattening tech	①Farm management tech ②Products processing tech ③Education and training of livestock tech.

Table-6.1.3.4 Farm Income Trial Calculation by Sector (RIAM Project)

(1) Dairy Farm Sector (Cow 20 heads) (Unit : 1000TG)

Section	Item	Amount	Details of Culculation
Gross Income	Milk Selling	5,700	20 heads×3,000L×0.95×100TG
	Cattle Selling	734	Heifer 3 heads×68,000TG, Bull Steer 7 heads×50,000TG, Culled cattle 4 heads×45,000TG
	Other Selling	0	
	Total	6,434	
Expenditure	Cost of feed	1,659	Formula feed 1,638kg×20 heads×40,000TG, Hay 1,010kg×20 heads×9,800TG, Other(Sub-total×10%)
	Electricity etc	883	63,100TG (actual data)×0.7×20 heads
	Seed purchase	285	28.5ha×200kg/ha×50TG
	Fertilizer cost	85	28.5ha×3,000TG/ha
	Sanitary cost	134	20 heads×6,700TG
	Depreciation cost	1,120	Buildings 14,003,100TG, Depreciation rate ave. 4.2%, Machineries 3,804,000TG, Depreciation rate ave.14.1%
	Repairs cost	216	Buildings 14,003,100TG×1%, Machineries 3,804,000TG×2%
	Labor cost	878	1×25,000TG×12 month×1.2+1×21,000TG×12 month×1.2+3×15,000TG×12 month×1.2
	Other cost	643	6,434,000TG×0.1
	Loan interest	191	4,783,000TG×8%×1/2
	Total	6,094	
Profit		340	

(2) Pig Farm Sector (Sow 30 heads)

(Unit : 1000TG)

Section	Item	Amount	Details of Calculation
Gross Income	Fat.Pig Selling	10,121	fattening Pig 349 heads×29,000TG
	Gilt Selling	2,940	Breeding Gilt 70 heads×42,000TG
	Culled Pig Selling	263	13 heads×20,300TG
	Total	13,324	
Expenditure	Cost of feed	6,192	Sow 30 heads×960kg×40,000TG、Fattening pig 420 heads×300kg×40,000TG
	Electricity etc.	375	Sow 30 heads×12,500TG (actual data)
	Breeding Pig	393	Boar 3 heads×61,000TG、Sow 5 heads×42,000TG
	Sanitary cost	266	13,324,000TG×0.02
	Depreciation cost	2,264	Buildings 32,521,000TG, Depreciation rate ave. 4.1%, Machineries 8,300,000TG, Depreciation rate ave. 11.2%
	Repairs cost	491	Buildings 32,521,000TG×1%, Machineries 8,300,000TG×2%
	Labor cost	1,396	1×25,000TG×12 month×1.2, 2×21,000TG×12 month×1.2, 2×15,000TG×12 month×1.2
	Other cost	799	13,324×0.06
	Loan interest	396	9,912×0.08×1/2
	Total	12,572	
Profit		752	

(3) Poultry Farm Sector (Hen 1,500 heads, Hatching Hen 300 heads) (Unit : 1000TG)

Section	Item	Amount	Details of Calculation
Gross Income	Normal Egg Selling	8,554	Hen 1,500 heads×0.70×60G×365 day=22,995Kg Normal Egg 22,995Kg×0.93×400TG/Kg
	Other Egg Selling	450	Broken Egg 22,995Kg×0.07×280TG/Kg
	Culledhen Selling	655	1,800 heads×0.80×0.70×650TG
	Breeding Chick 〃	3,090	300 heads×216 eggs/year×1/2×0.65×0.70×0.70×300TG
	Total	12,749	
Expenditure	Cost of feed	5,800	Hen 72.3t×60,000TG, raising chick 11.2t×63,000TG, Additives (Sub-total×0.15)
	Electricity etc.	1,025	Fuel 3,185,000TG×1.8÷27.9=205, Electricity 12,700,000TG×1.8÷27.9=820 ～(actual data)
	Chick purchase	840	1,500 heads×0.8×500TG, 300 heads×0.8×500TG×2
	Sanitary cost	254	12,749,000TG×0.02
	Depreciation cost	806	Buildings 11,051,800TG, Depreciation rate ave. 5.8%, Machineries 1,494,000TG, Depreciation rate ave. 11.2%
	Repairs cost	155	Buildings 11,051,800TG×0.01～0.02、Machineries 1,494,000TG×0.02
	Labor cost	1,094	1×25,000TG×12 month×1.2, 1×21,000TG×12 month×1.2, 2×15,000TG×12 month×1.2
	Other cost	1,274	12,749,000TG×0.10
	Loan interest	417	10,442,000TG×0.08×1/2
	Total	11,665	
Profit		1,084	

(4) Cattle Fattening Farm Sector (Cattle 50 heads)

(Unit : 1000TG)

Section	Item	AMOUNT	Details of Calculation
Gross Income	Fat.Cattle Selling	8,330	50 heads×0.98×170,000TG (450Kg×0.56=252Kg →670TG/Kg)
	Other Selling	0	
	Total	8,330	
Expenditure	Cost of feed	3,927	Formula feed 1,825kg×50 heads×40,000Tg、Hay 500kg×50 heads×9,800Tg
	Steer purchase	2,500	Steer 50 heads 50,000Tg
	Sanitary cost	111	50 heads×6,700Tg×1/3
	Depreciation cost	375	Buildings 9,754,000TG, Depreciation rate ave. 3.8%
	Repairs cost	97	Buildings 9,754,000TG×0.01
	Labor cost	302	1×21,000TG×12 month×1.2
	Other cost	416	8,330,000TG×0.05
	Loan interest	294	7,353,000TG×0.08×1/2
	Total	8,022	
Profit		308	

Table-6.1.3.5 Unit Price for Farm Income Trial Calculation

Income (Tg.)					Expenditures (Tg.)				
Item	Section	Unit	Price	Remarks	Item	Section	Unit	Price	Remarks
Milk		kg	100		Formula Feed	Cattle, Pig	kg	40	
Egg	Normal	〃	400		〃	Chicken	kg	60	Hen 60,Chicken 63
	Other	〃	280		Wheat Bran		ton	35	
Livestock	Cattle	Head	50,000	Heifer 68,000	Hay		1	9,800	
(Live)	Fatd.Cattle	〃	170,000		Gasoline		1	126	
	Horse	〃	40,000		Light Oil			151	
	Sheep	〃	12,000						
	Goat	〃	10,000		Seed	Wheat	kg	50	
	Fatd.Pig	〃	29,000			Barley	kg	47	
	Culled Cattl	〃	45,000			Oats	kg	47	
	Culled Pig	〃	20,300						
	Culled Hen	〃	650		Fartilizer		ha	3,000	
Wool		kg	340		Chick		Head	500	
Cashmere		〃	11,500		Breeding Pig	Male	〃	61,000	
Camel Wool		〃	400			Female	〃	42,000	
Leather	Cattle	sheet	6,500						
	Horse	〃	2,500		Wages	Managing	Month	25,000	
	Sheep	〃	2,400			Specialist	〃	21,000	
	Goat	〃	2,200			Working	〃	15,000	
Breed Chick		Head	300						
Breed Pig		〃	42,000						

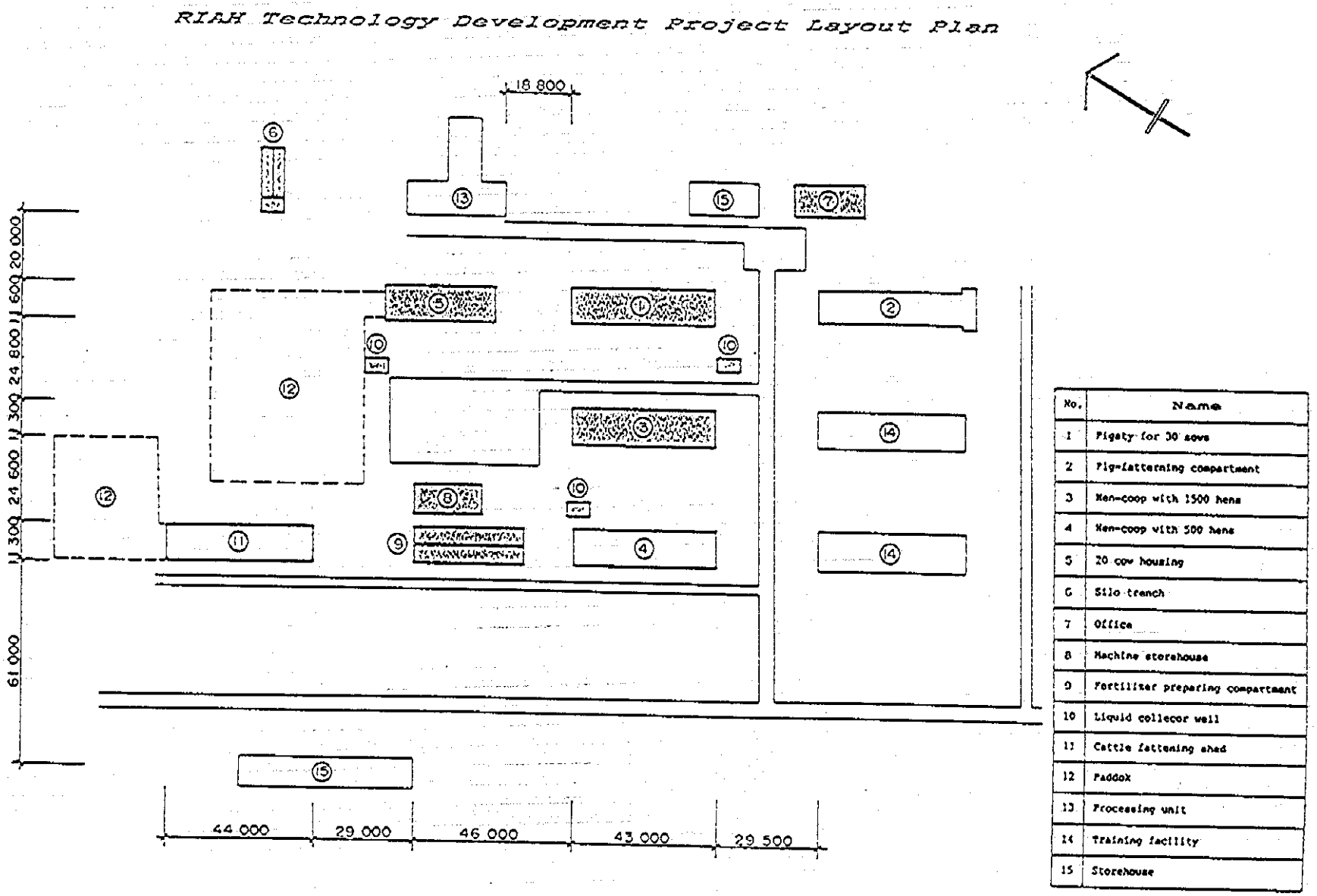
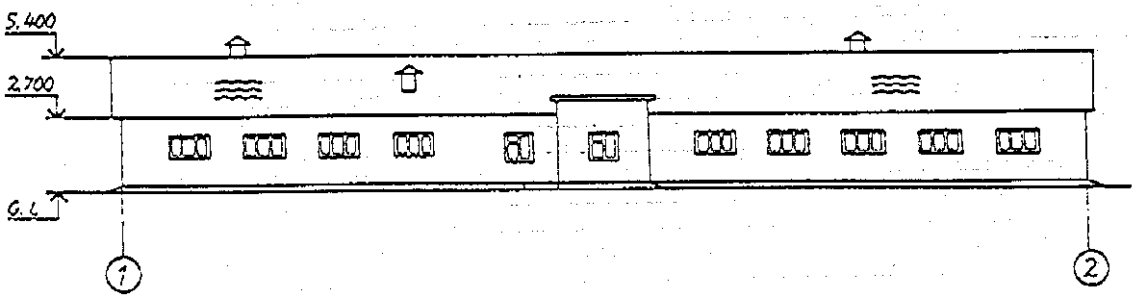


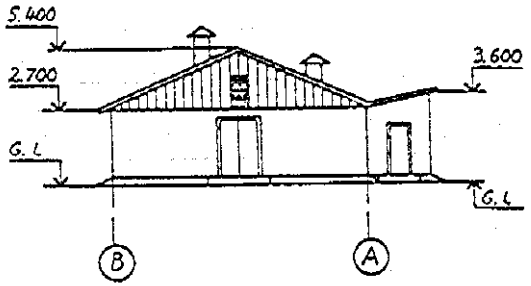
Figure-6.1.3.1 RIAH Technology Development Project Layout Plan

Pigsty for 30 sows.

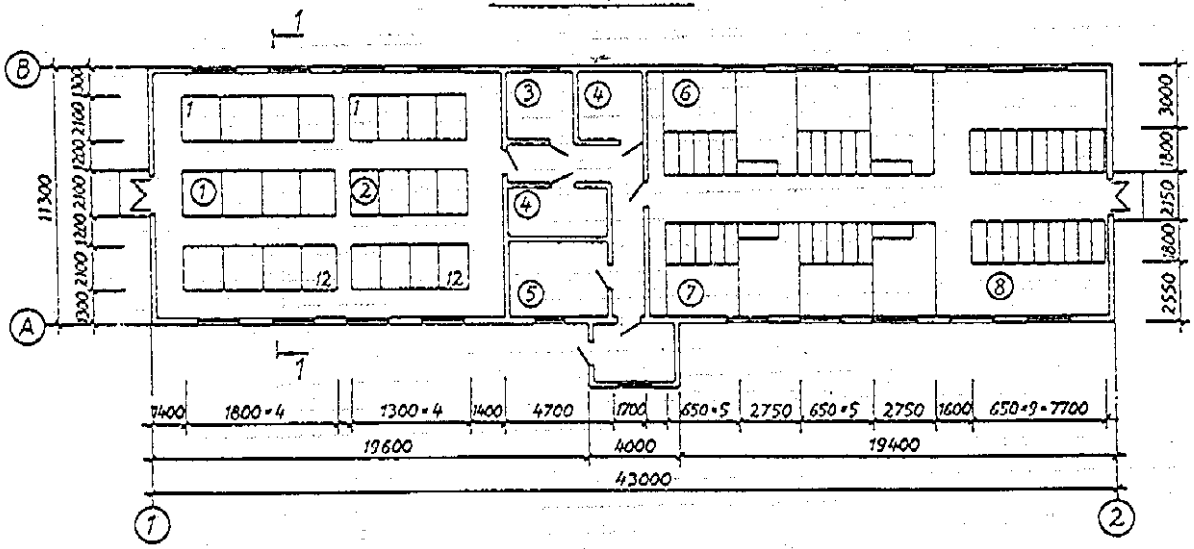
Front - view 1-2



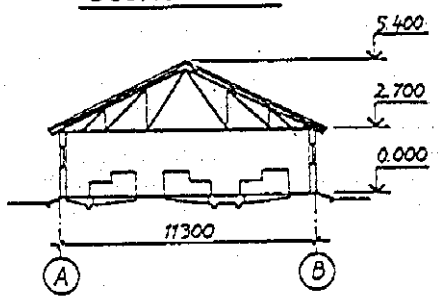
Side - view B-A



Floor plan



Section 1-1



Difinition of compartments

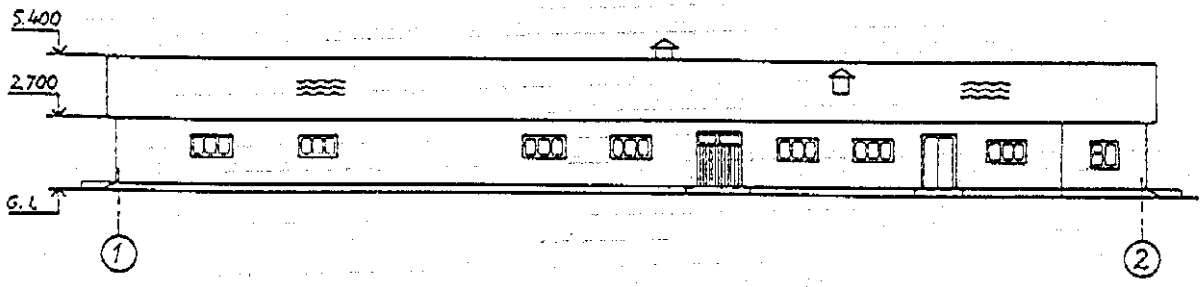
1. Farrowing compartment
2. Sucking - pig compartment
3. Office
4. feed shed
5. Heating room
6. Young sow compartment
7. Insemination compartment
8. Pregnant sow compartment

M1:200

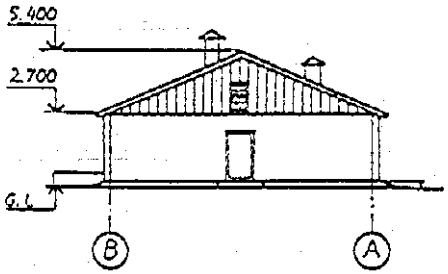
Figure-6.1.3.2 Pig Farrowing/Pregnant Sow Barn Construction Plan

Pig - fattening compartment.

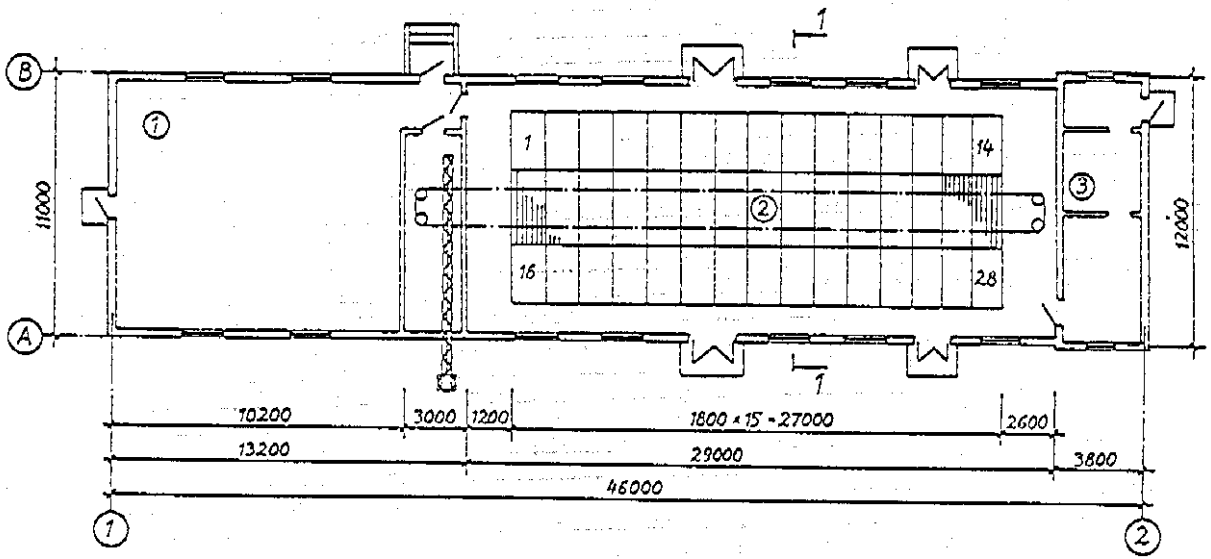
Front - view 1-2



Side - view B - A



Floor plan



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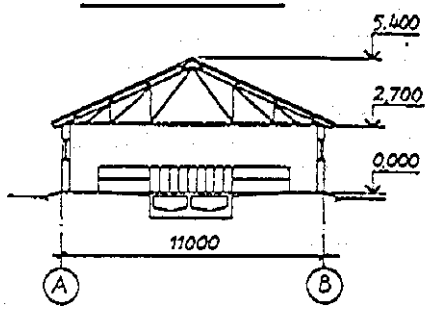


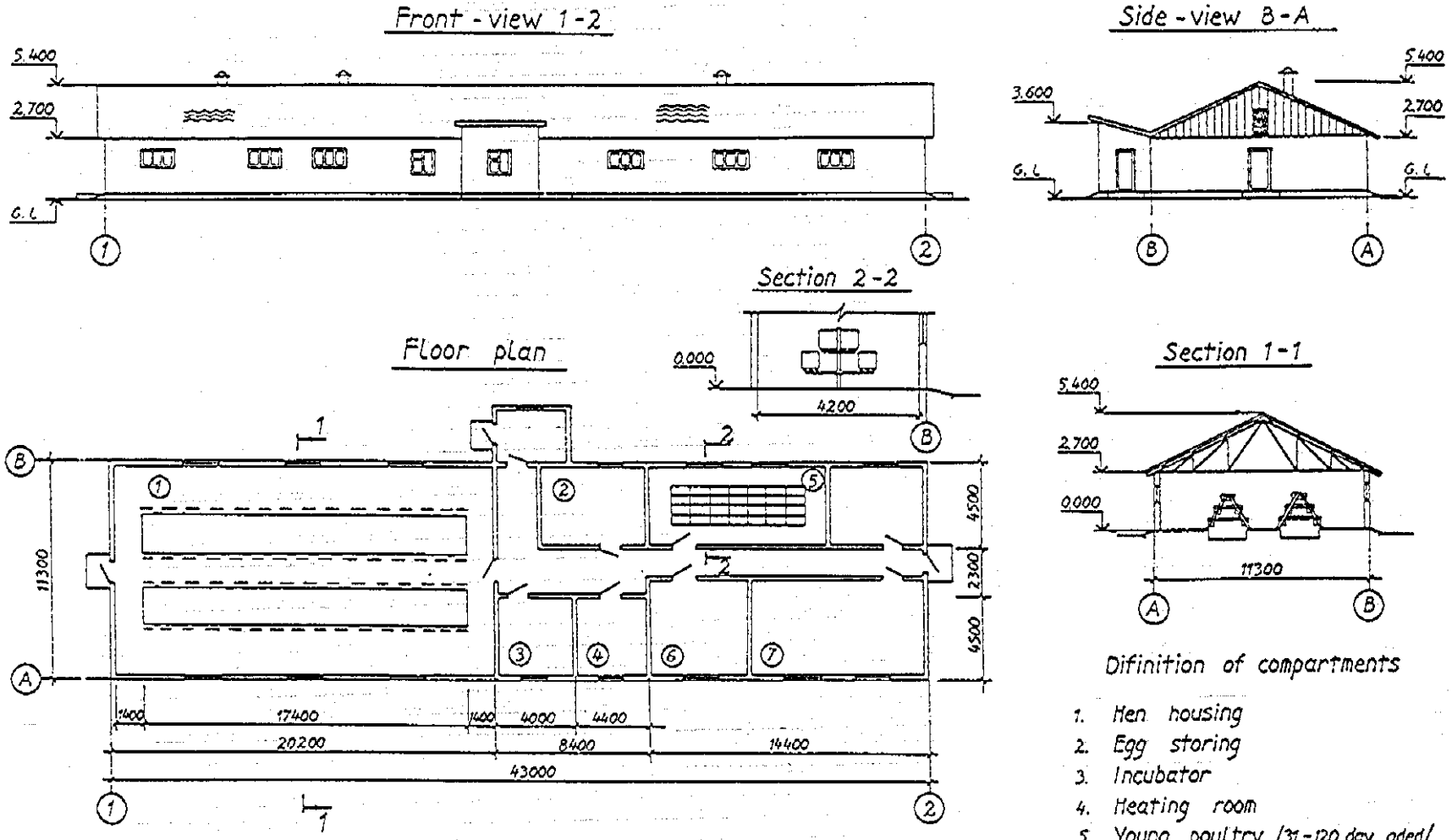
Difinition of compartments

1. Fodder - mixing room
2. Pig - fattening compartments
3. Heating room

M1 : 200

Figure-6.1.3.3 Pig Fattening Barn Construction Plan

Hen - coop with 1500 hens.



Difinition of compartments

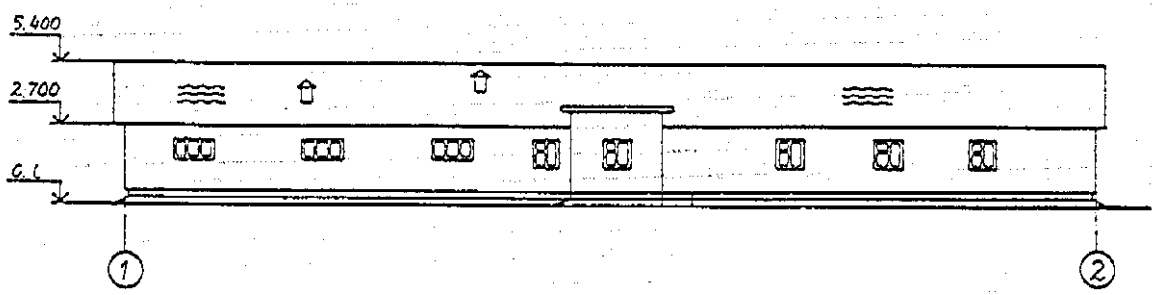
1. Hen housing
2. Egg storing
3. Incubator
4. Heating room
5. Young poultry /31 - 120 day aded/
6. Young poultry /0 - 30 day aded/
7. Fodder storade

M1 : 200

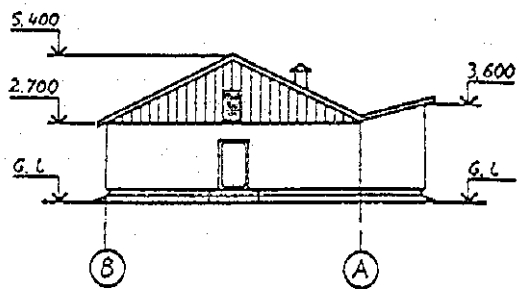
Figure-6.1.3.4 Egg Laying Barn Construction Plan

Hen - coop with 500 hens

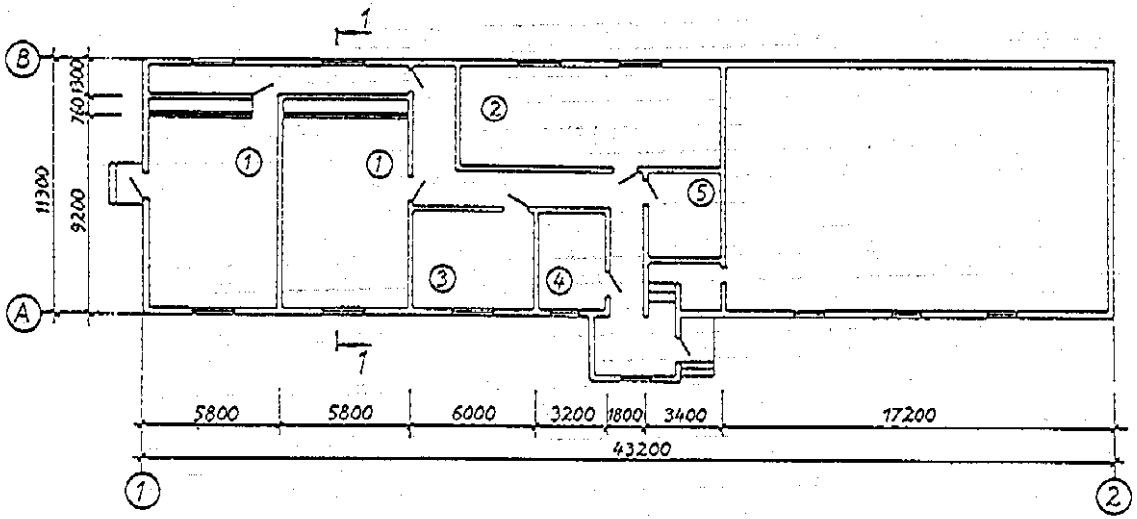
Front - view 1 - 2



Side - view B - A



Floor plan



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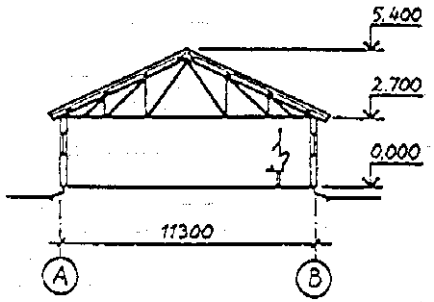


Difinition of compartments

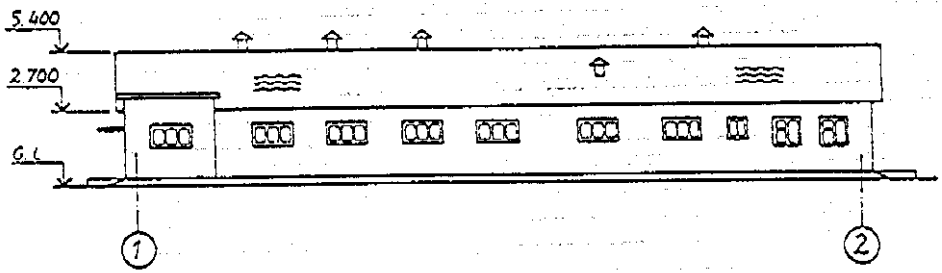
1. Egg - Laying compartment.
2. Young hens /31 - 120 day aded/
3. Female chickens /0 - 30 day aded/
4. Heating room
5. Fodder storade

M1 : 200

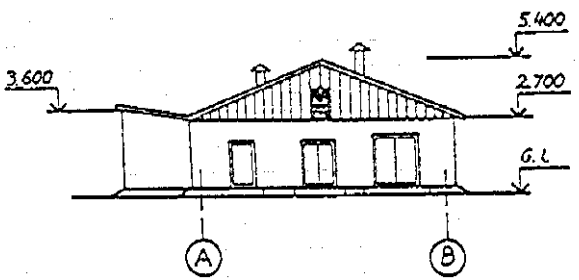
Figure-6.1.3.5 Hatching Barn Construction Plan

20 cow housing

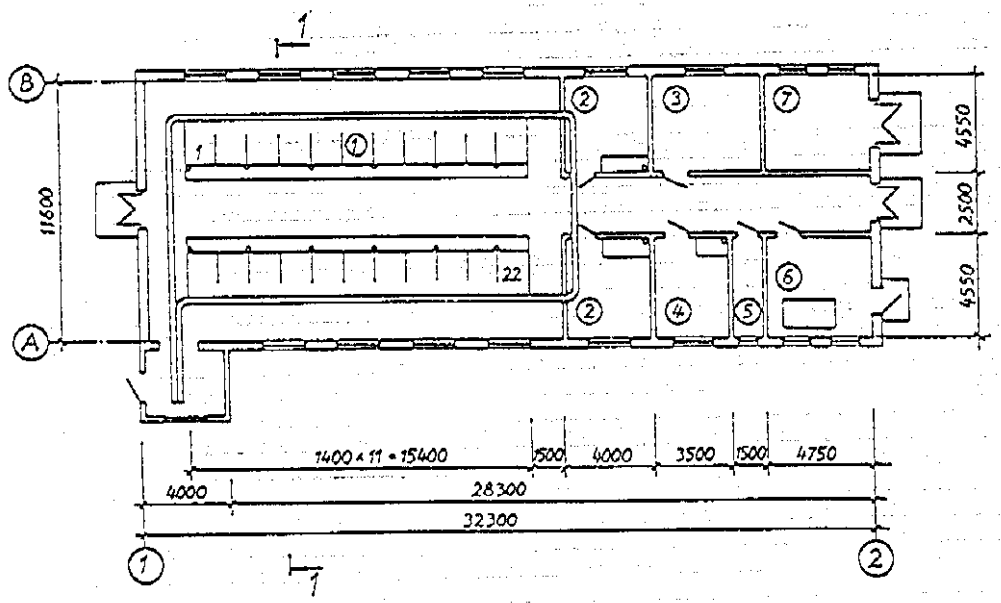
Front - view 1 - 2



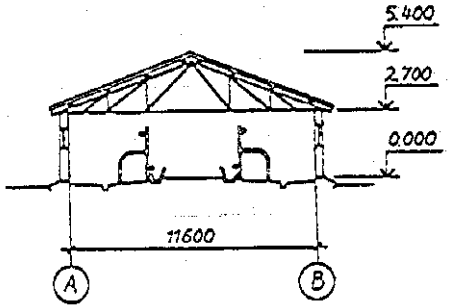
Side - view A - B



Floor plan



Section 1 - 1



Difinition of compartments

1. Cow housing
2. Young - cattle housing
3. Fodder - mixing room
4. Calving compartment
5. Calf - suekling compartment
6. Milk - producing room
7. Heating room

M1 : 200

Figure-6.1.3.6 Cow Barn Construction Plan

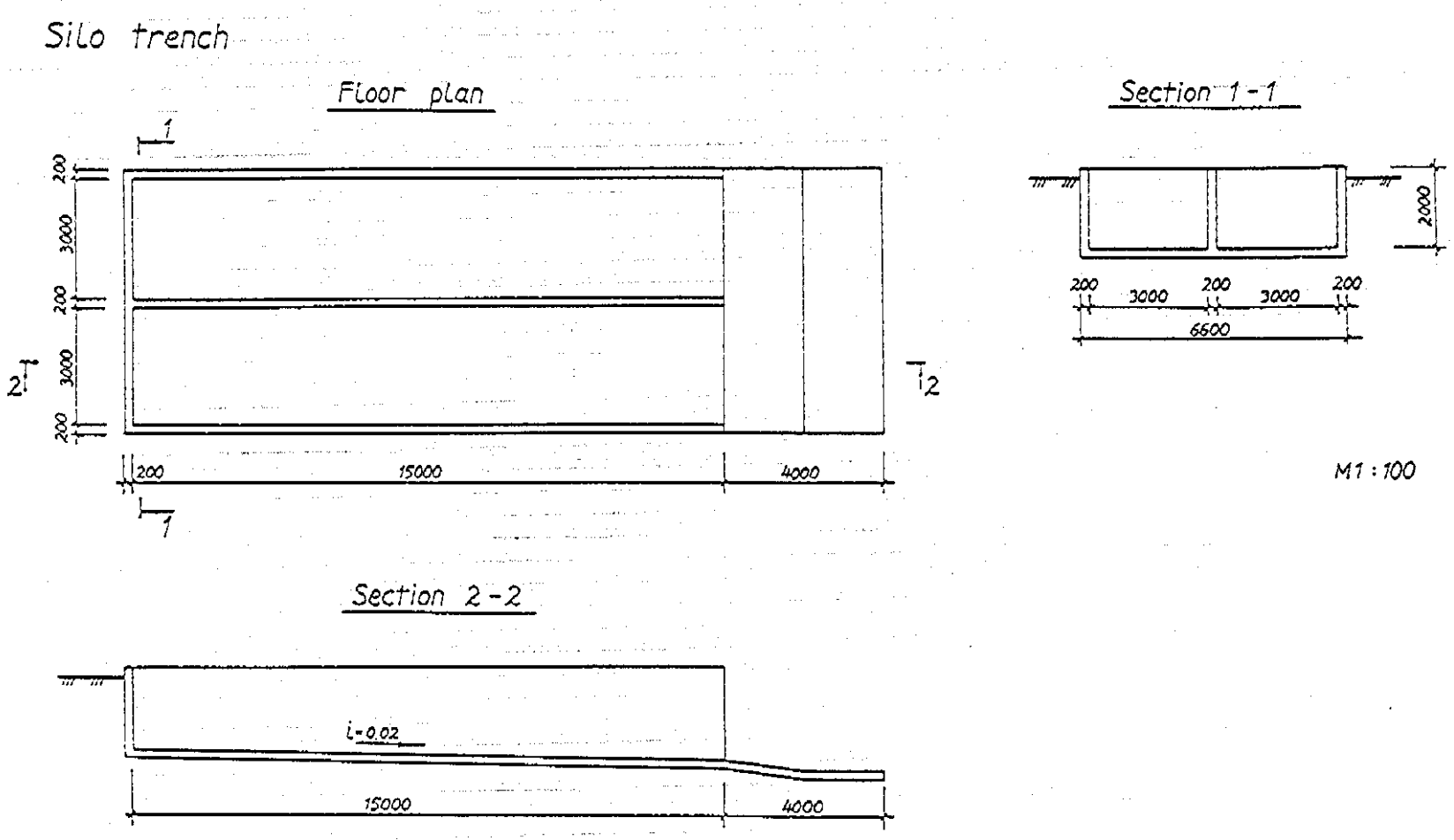
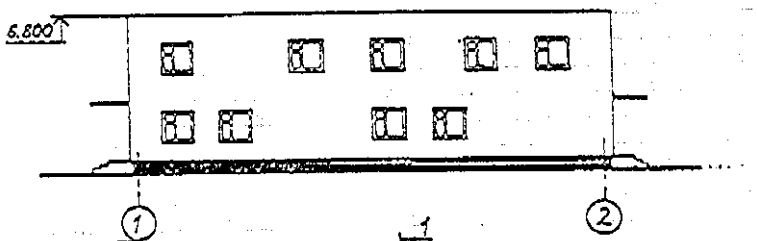


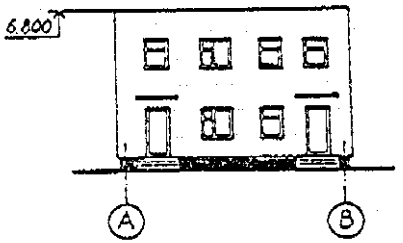
Figure-6.1.3.7 Bunker Silo Construction Plan

Office

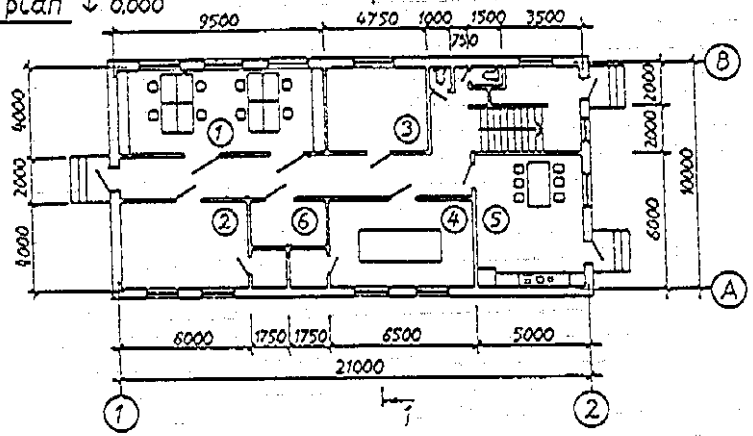
Front - view 1 - 2



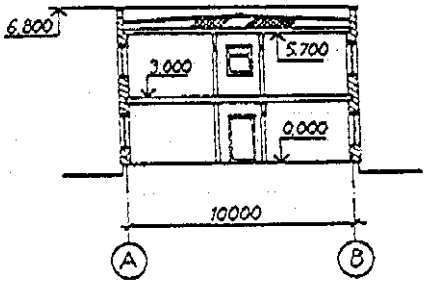
Side - view A - B



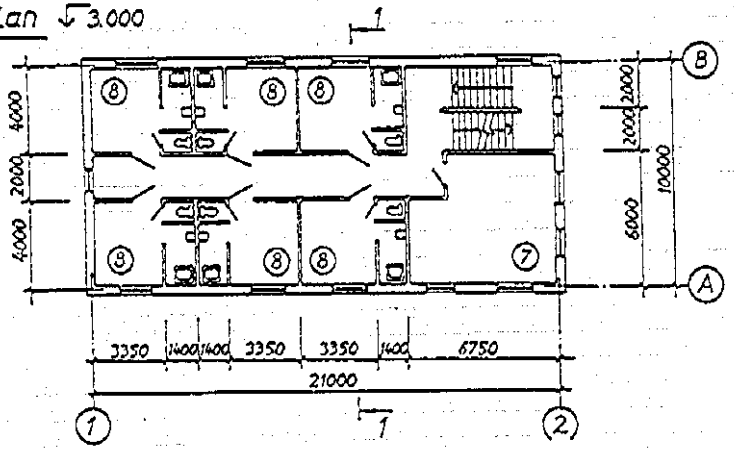
Floor plan ↓ 0.000



Section 1 - 1



Floor plan ↓ 3.000



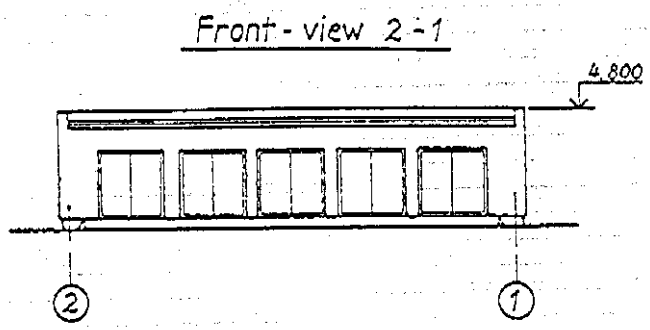
Difinition of compartments

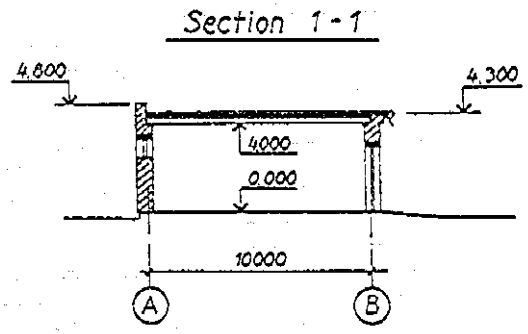
1. Teeting room
2. Laboratory
3. Personal computer
4. Teeting hall
5. Canteen
6. Warehouse
7. Lobby
8. Personnel room

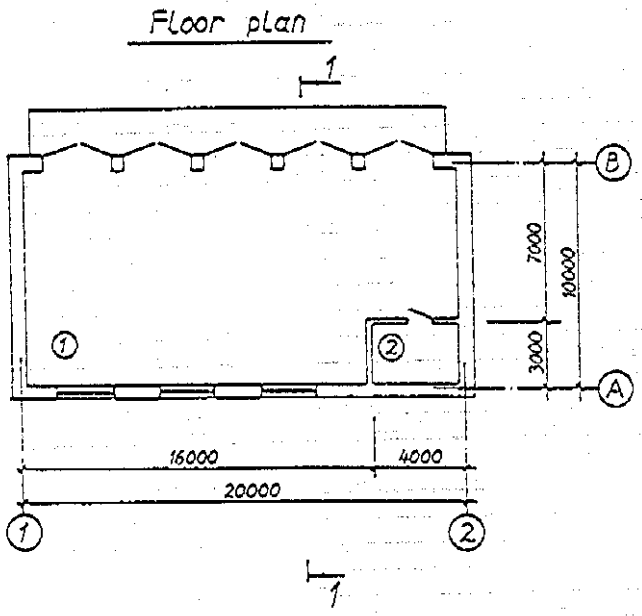
M1 : 200.

Figure-6.1.3.8 Office Construction Plan

Machine storehouse







Difinition of compartments

1. Machine storehouse
2. Spare - part storehouse

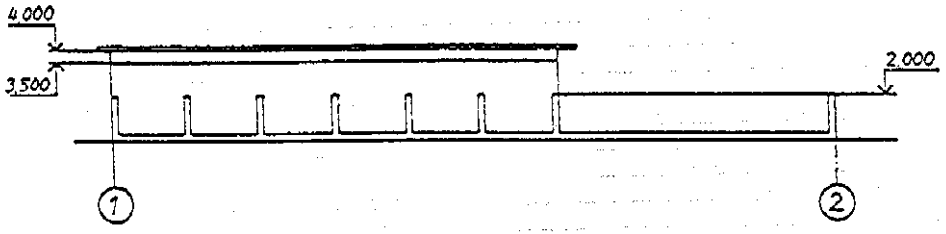
M1 : 200.

Figure-6.1.3.9 Machine Storehouse Construction Plan

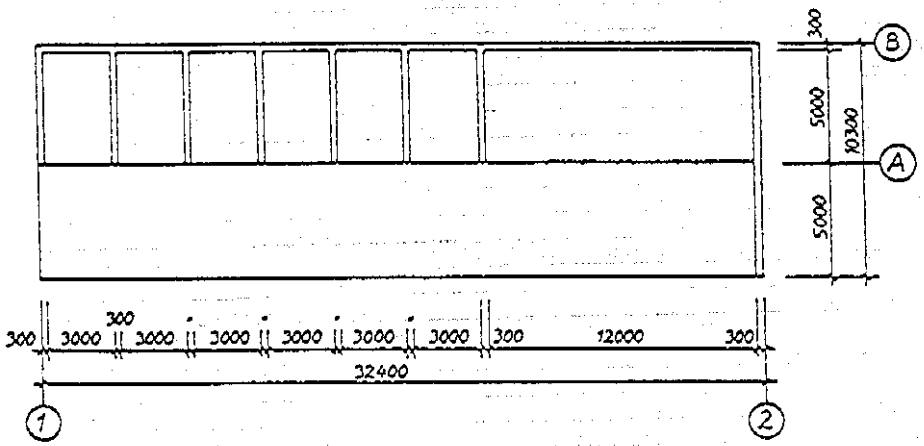
Fertilizer preparing compartment.

M1 : 200

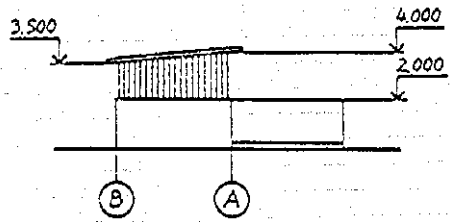
Front - view 1 - 2



Floor plan



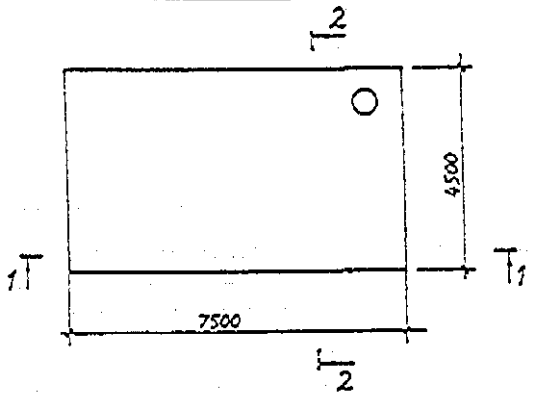
Side - view



Liquid collecor well.

Floor plan

M1 : 100



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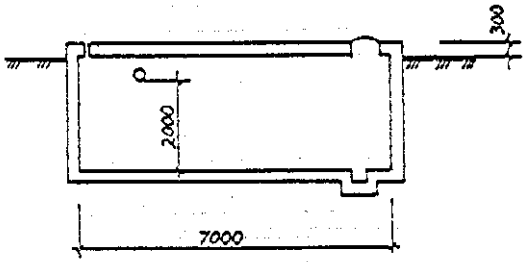


Section 2 - 2

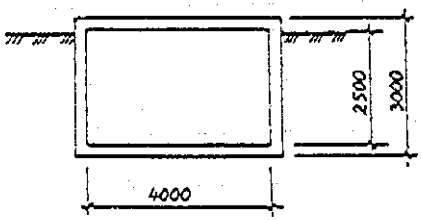


Figure-6.1.3.10 Compost yard and Urine Tank Construction Plan

Table 6.1.4.1 Herder's Water Supply Improvement Project costs

Item	Amount	Unit	Unit price (US$)	Sum of money (US$)	Remark
(1)Water Resource Study					
Gathering and Analysis of Existing Data -s of Existing Data	1	Set		100,000	Computer processing,etc.
Test Boring survey	50	Location	4,205	210,250	H=-100m
Test Boring survey	100	Location	916	91,600	H=-30m
Mobile Boring Machine	1	Set		2,620,000	Spare car,spare parts,etc.
Fuel for the above	1	Set		30,000	
Geophysical Exploration Equipment	1	Set		330,000	Including accessories and spare parts
Total				3,381,850	
				3,382,000	
(2)Improvement of Facilities					
Deep Well Pumps	45	Set	82,500	3,712,500	H=-100m
Pump sheds	45	Location	6,794	305,730	
Well drilling	45	Location	17,484	786,780	Rotary boring
S.Total				4,805,010	
Wind-powered pump	6	Set	174,000	1,044,000	H=-100m
Well drilling	6	Location	17,484	104,904	Rotary boring
Improvement of well surroundings	6	Location	124	744	
Well facilities	6	Location	3,096	18,576	
S.Total				1,168,224	
Total				5,973,234	
				5,973,000	
(3)Provision of Shallow Wells					
Hand pumps	100	Set	16,229	1,622,900	H=-30m
Well drilling	100	Location	7,386	738,600	Percussion boring
Improvement of well surroundings	100	Location	124	12,400	
Total				2,373,900	
				2,374,000	
(4)Water Supply Facilities	151	Location	2,356	355,756	Concrete precast products
				356,000	
(5)Maintenance Association					
Buildings					Existing county boildings will be borrowed (office and conference hall)
Management vehicles	3	Set	50,000	150,000	Small trucks,pickup trucks
Repair tools	3	Set	20,000	60,000	Tools,welders,etc.
Office Equipment	3	Location	10,000	30,000	Desks,chairs,lockers,and other office equipment
Total				240,000	
G.Total				12,325,000	

Fig.6.1.4.1(1) Water facility shed related design drawings

Plan for individual structured building of the pacture pumping station with of ballastic concrete and assembly blocks

Part-1

Fig.6.1.4.1(2) Water facility shed related design drawings

Explanatory note

In elaboration process of the plan for individual structured building has been left structure and position of a equipment in the wooden building, as before, and has been selected the distance between axis of walls 4.5 m.

All requirements in connection with the application frame, technological order, anti-fire and sanitation actions, exploitation of the plan should be the same as requirements of wooden building of the posture pumping station.

Preparation process of assembly blocks.

In order to make ballastic concrete block are needed such materials as water, cement as linking material and two kind of filling materials as ceramicists and tufa. By investigations should be established physical and mechanical properties of a filling materials, and their size of fraction, concentration of dry mixture, the ratio of water and cement, the rate of influence of condensing and pressing methods to properties of concrete. As the result of mentioned above investigation must be made thermo-isolation and durable blocks with marks of 35, 50, 75, 100 and volumetric weight up to 1.20 - 1.50 tonne per cub. m.

To make best ballastic concrete blocks should be the biggest size of fraction 40 mm, percentages of concentration of dry mixture with respect to total weight of filling materials are 0-5 mm - 30%, 5-10 mm - 25%, 10-20 mm - 25%, 20-40 mm - 20%, the ratio of water and cement 0.7-0.8, viscosity of solution 45 sec, duration of concrete mixture 3-4 minutes, condensing time 20-30 sec.

The weight of absorbed water by assembly block should be less than 30% of total weight of block.

Weight of single assembly block with holes of 35th mark must be no more than 39 kg, 50th mark - 40 kg, 75th mark 41.5 kg, 1000th mark - 45 kg.

In order to determine moisture content of the assembly block, it is needed to take 2 samples with each weight no more than 100 g, and determine weight of samples separately. Then samples should be dried out until weight of each sample becomes constant. After that moisture content can be determined by the following formula:

$$W = \frac{Q_1 - Q_2}{Q_1} \cdot 100\%;$$

Where:

Q_1 - Fresh weight of sample before drying, g

Q_2 - Dry weight of sample after drying, g

Volumetric weight of the ballastic concrete can be determined in dry and wetted conditions by following formula:

$$\gamma_x^S = \gamma_x^S - \frac{\gamma_x^S \cdot W}{100}; \quad kg/m^3$$

Where:

γ_x^S - Volumetric weight of wetted concrete, kg

W - Moisture content, %

Normal portion of ballastic concrete with ceramicists's filling material per 1 cub.m

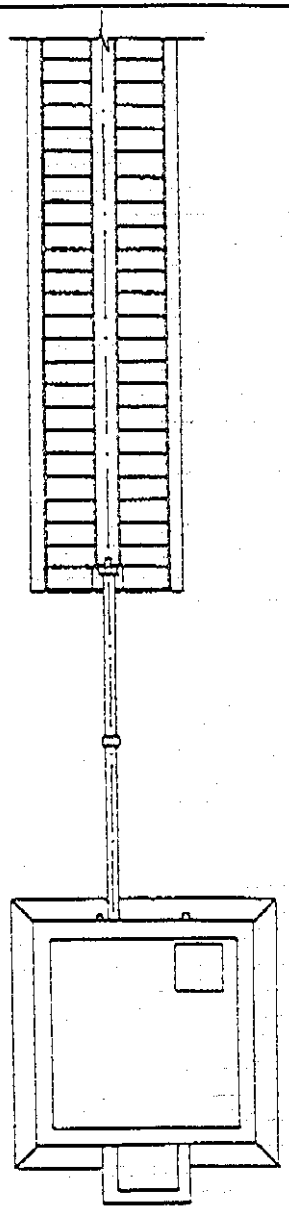
Material	Unit	Mark	
		50	75
Cement M-300	kg	350	400
Water	l	181	205
ceramicists	kg	557	557

Normal portion of ballastic concrete with tufa's filling material per 1 cub.m

Material	Unit	Mark	
		50	75
Cement M-300	kg	300	350
Water	l	213	213
Tufa	kg	1573	1573

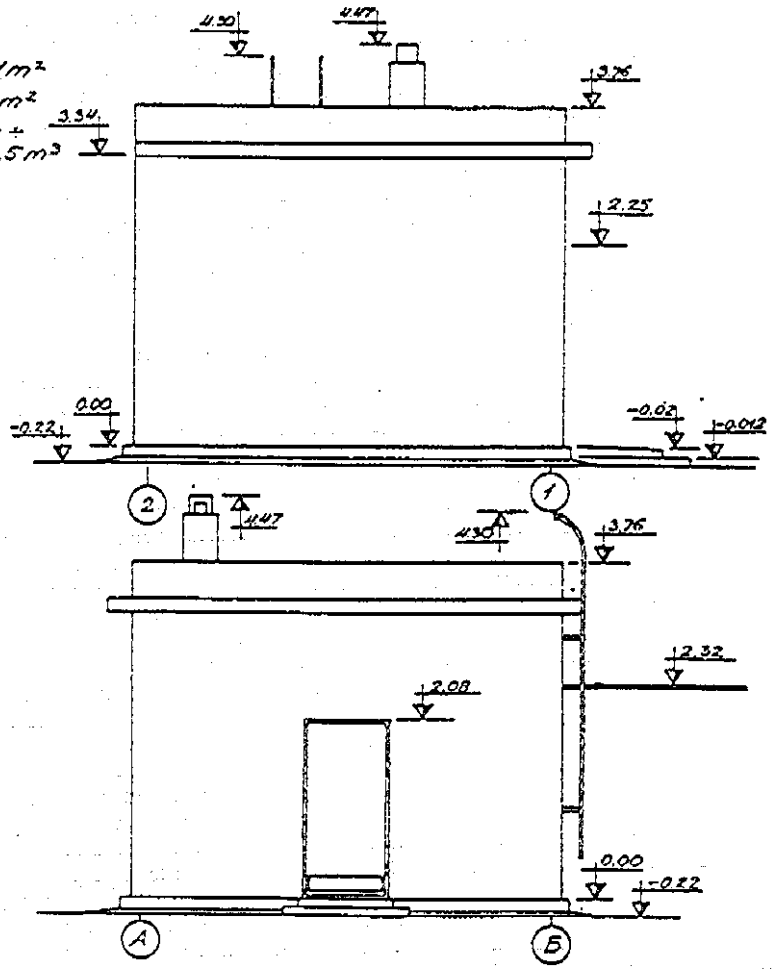
To make, transport and store the assembly blocks must follow State Standard - 3064-81.

Fig.6.1.4.1(3) Water facility shed related design drawings



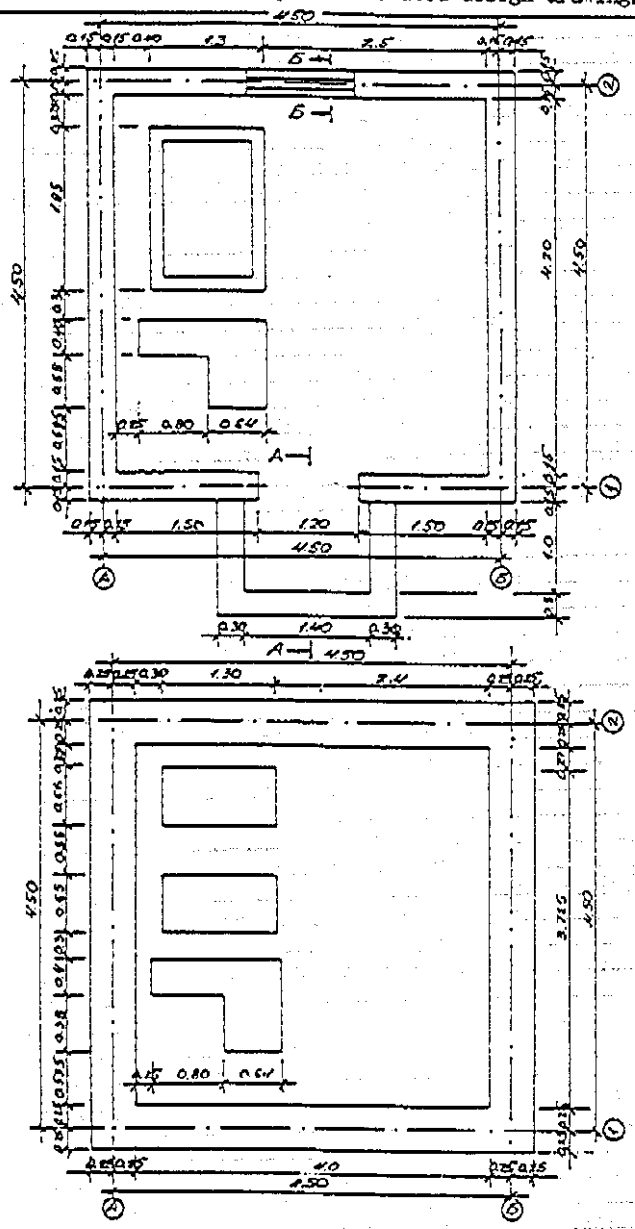
Technical characteristics of pump station

1. a square (an area) for building of pump-station - 39 m²
2. useful square of the building - 17.64 m²
3. capacity of the building - 52.92 m²
4. capacity of water-reservoir - 2.75 ÷ 3.5 m³
5. height of the building - 4 m

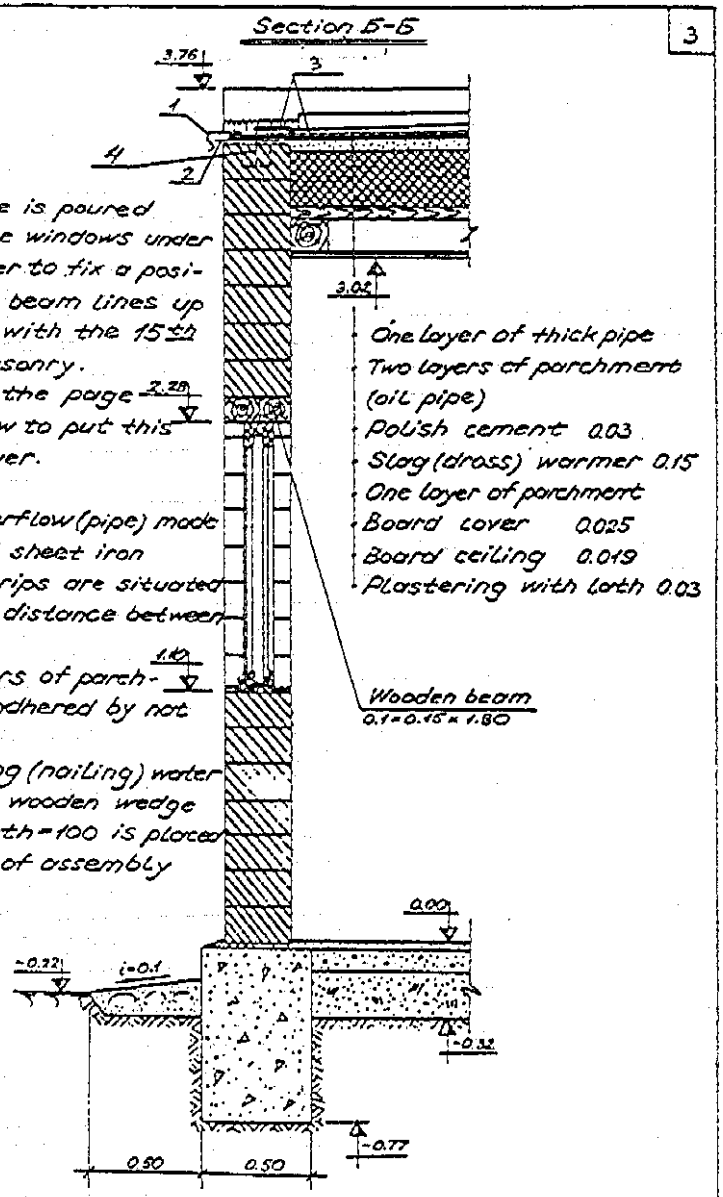


The facades of the building of pump station with walls of assembly blocks. General plan of the building of pump station with walls of basaltic concrete assembly blocks.

Fig.6.1.4.1(4) Water facility shed related design drawings



The constructions of foundation and walls of the building with walls of assembly blocks.



Binding (joint) a window and wall of the building with walls of assembly blocks.

Fig.6.1.4.1(5) Water facility shed related design drawings

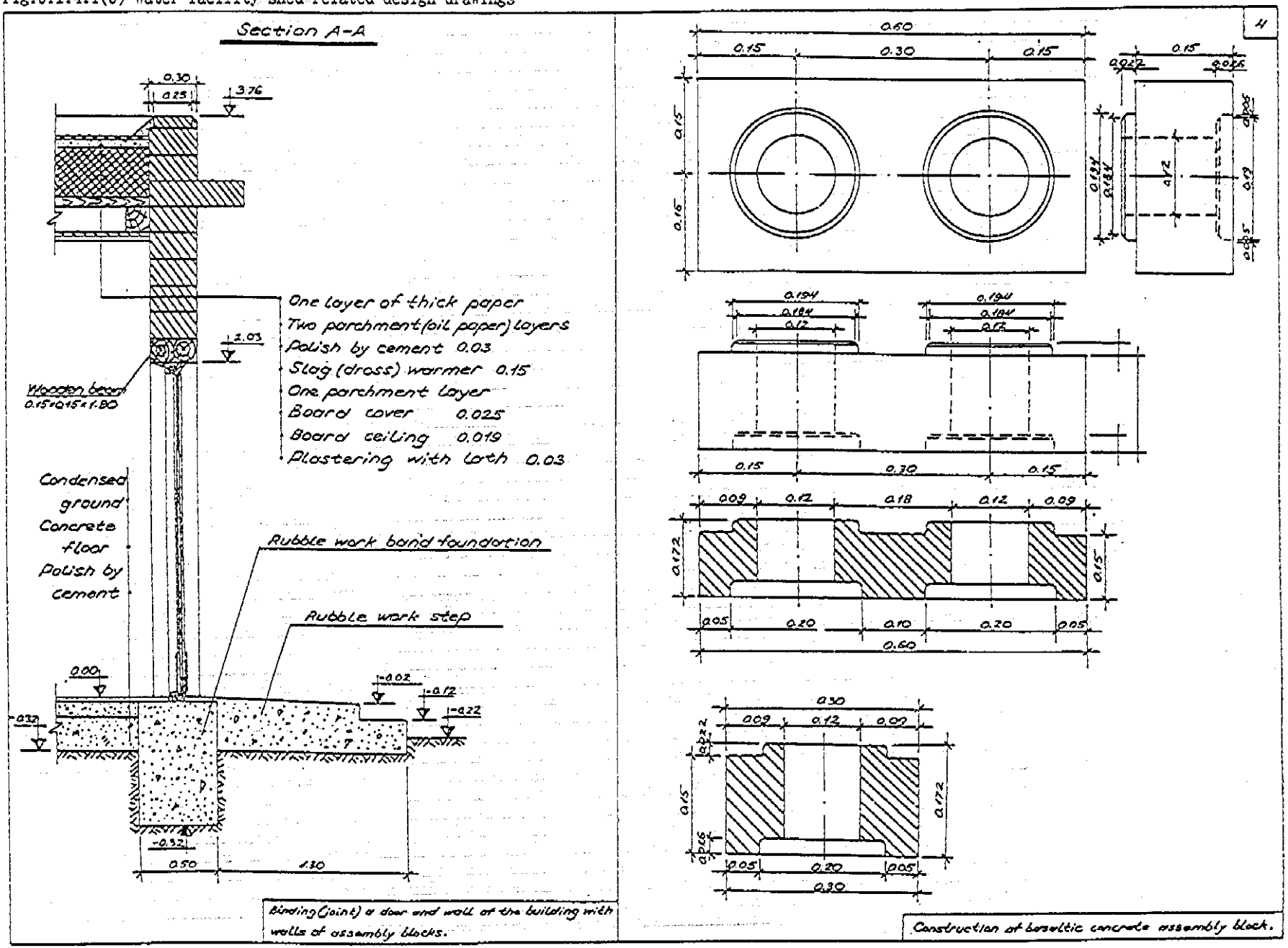


Fig.6.1.4.1(6) Water facility shed related design drawings

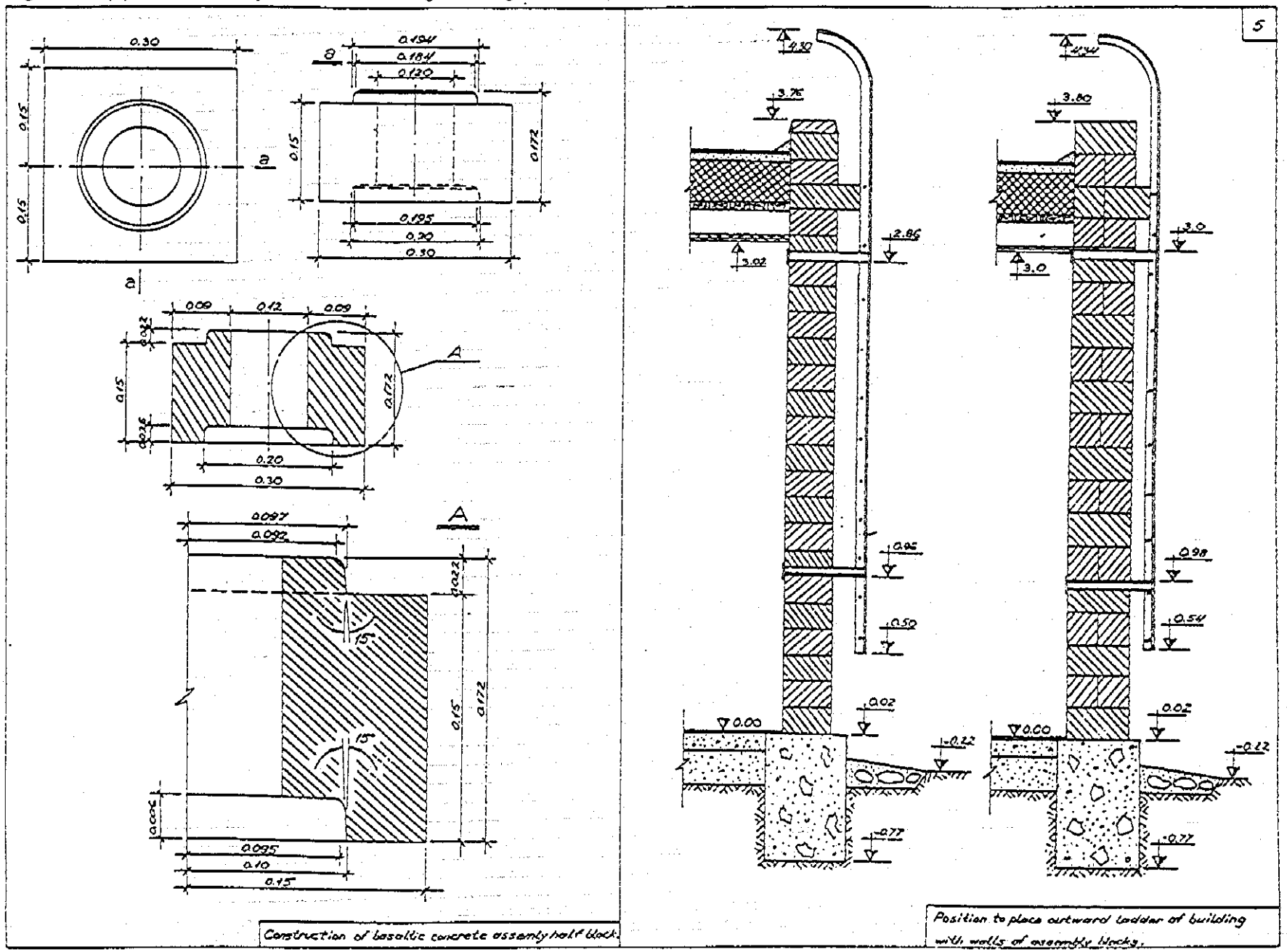


Fig.6.1.4.1(7) Water facility shed related design drawings

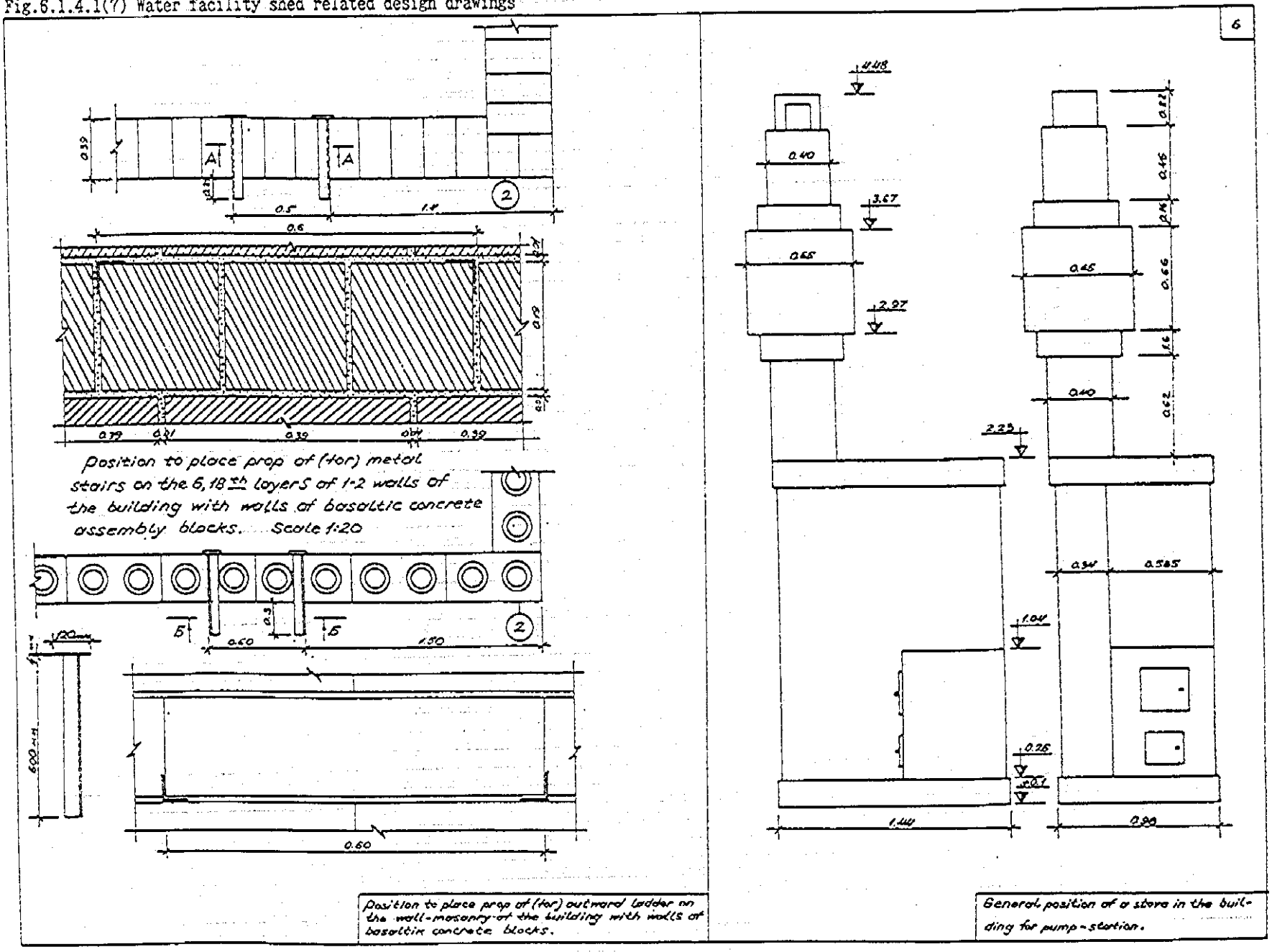
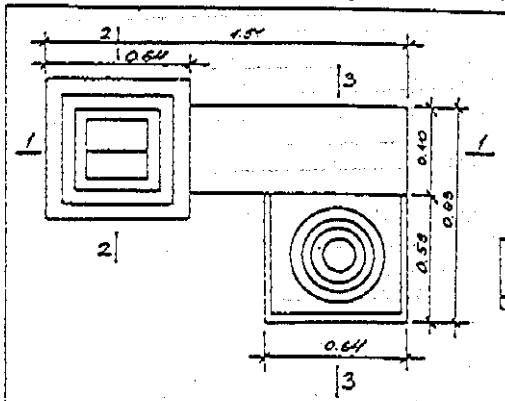
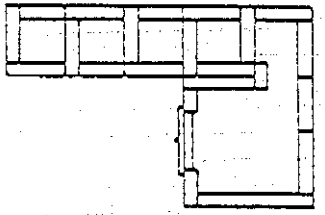


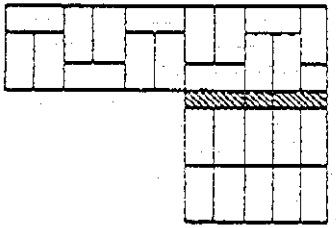
Fig.6.1.4.1(8) Water facility shed related design drawings



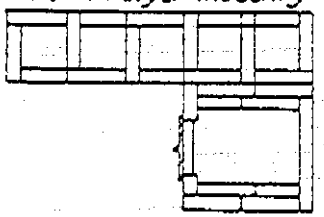
The 7th layer masonry



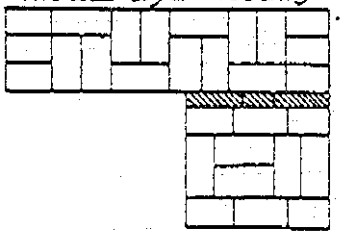
The 1st layer masonry



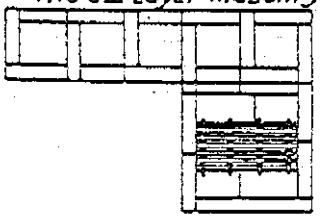
The 4th layer masonry



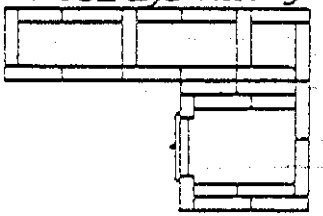
The 2nd layer masonry



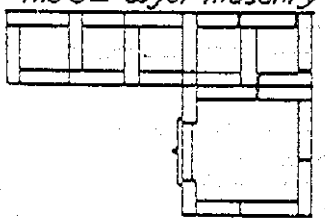
The 5th layer masonry



The 3rd layer masonry



The 6th layer masonry

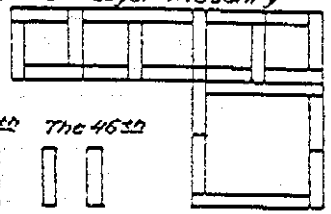


Construction masonry of a stove in the building for pump-station.

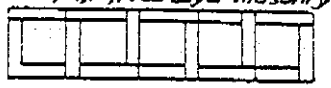
7

The 9,11,13,15th layer masonry

The 8th layer masonry



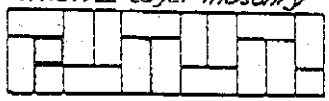
The 10,12,14,16th layer masonry



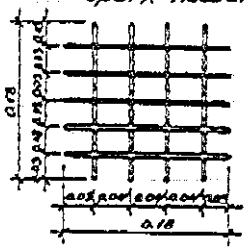
The 47th

The 46th

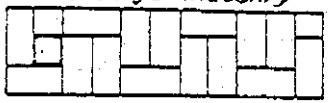
The 17th layer masonry



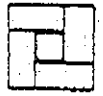
Spork holder



The 18th layer masonry

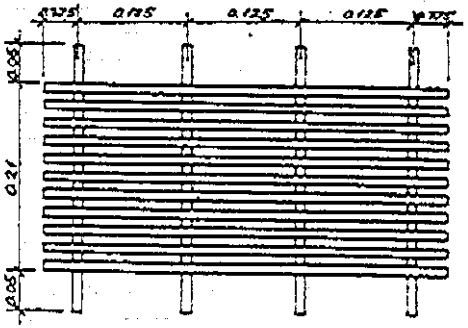


The 19,21,23,25, 41,43,45th

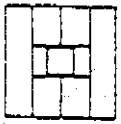


The 20,22,24,26 40,42,44th

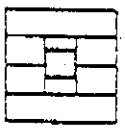
Stove-net



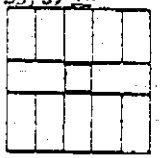
The 27,39th



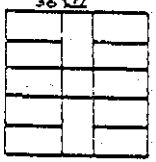
The 28,38th

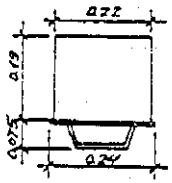


The 29,31,33, 35,37th



The 30,32,34, 36th





Desckription

1. Spork-holder is plaited by steel wire.
2. Bar of stove draught is made from sheet metal with thick 1.5÷2 mm and is placed on the 14th layer of masonry in the end of draught.
3. Stove-net is made from reinforced steel wire.

Construction of stove-means and stove masonry of the building for pump-station.

Fig.6.1.4.1(9) Water facility shed related design drawings

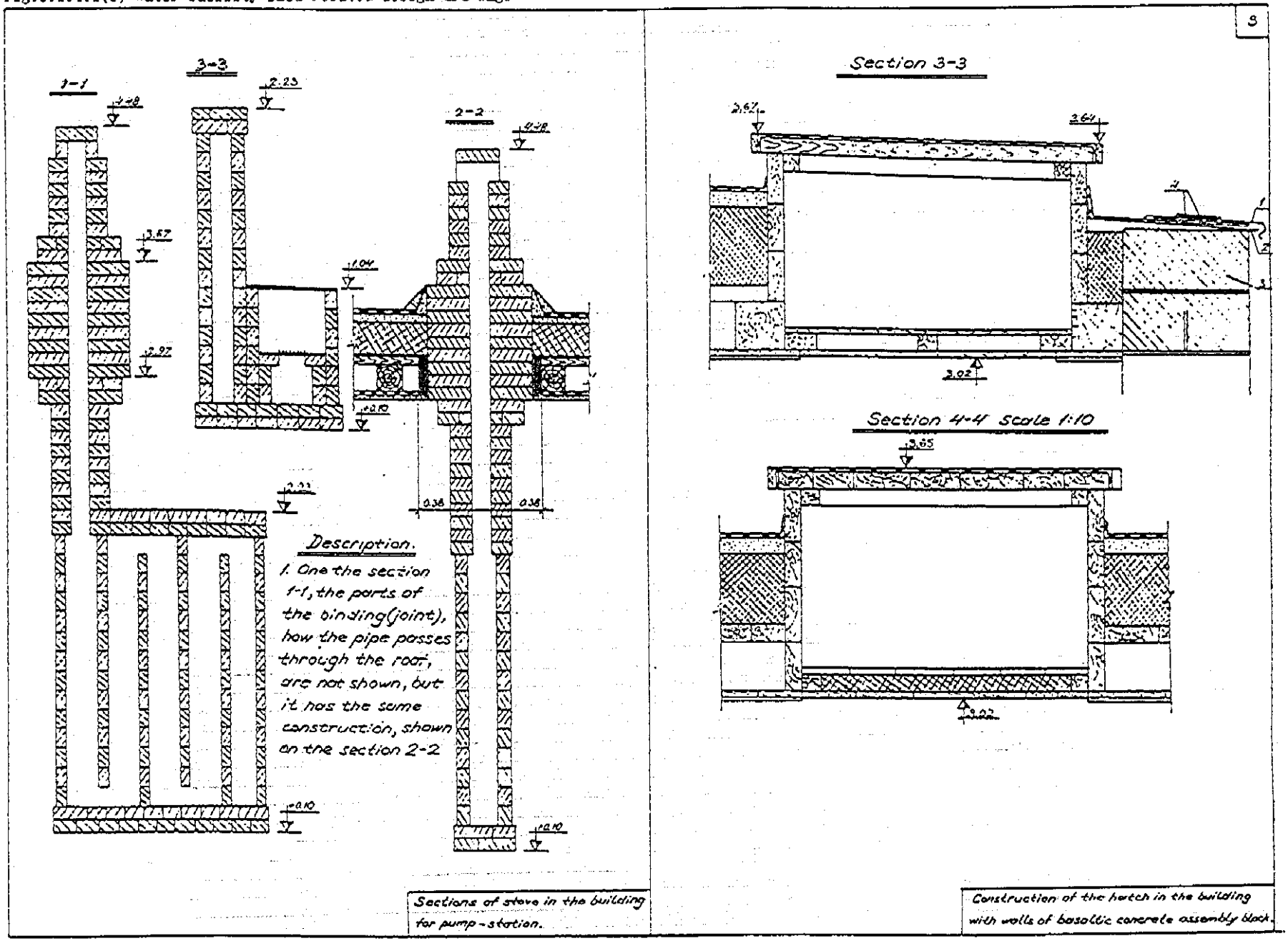


Fig.6.1.4.1(10) Water facility shed related design drawings

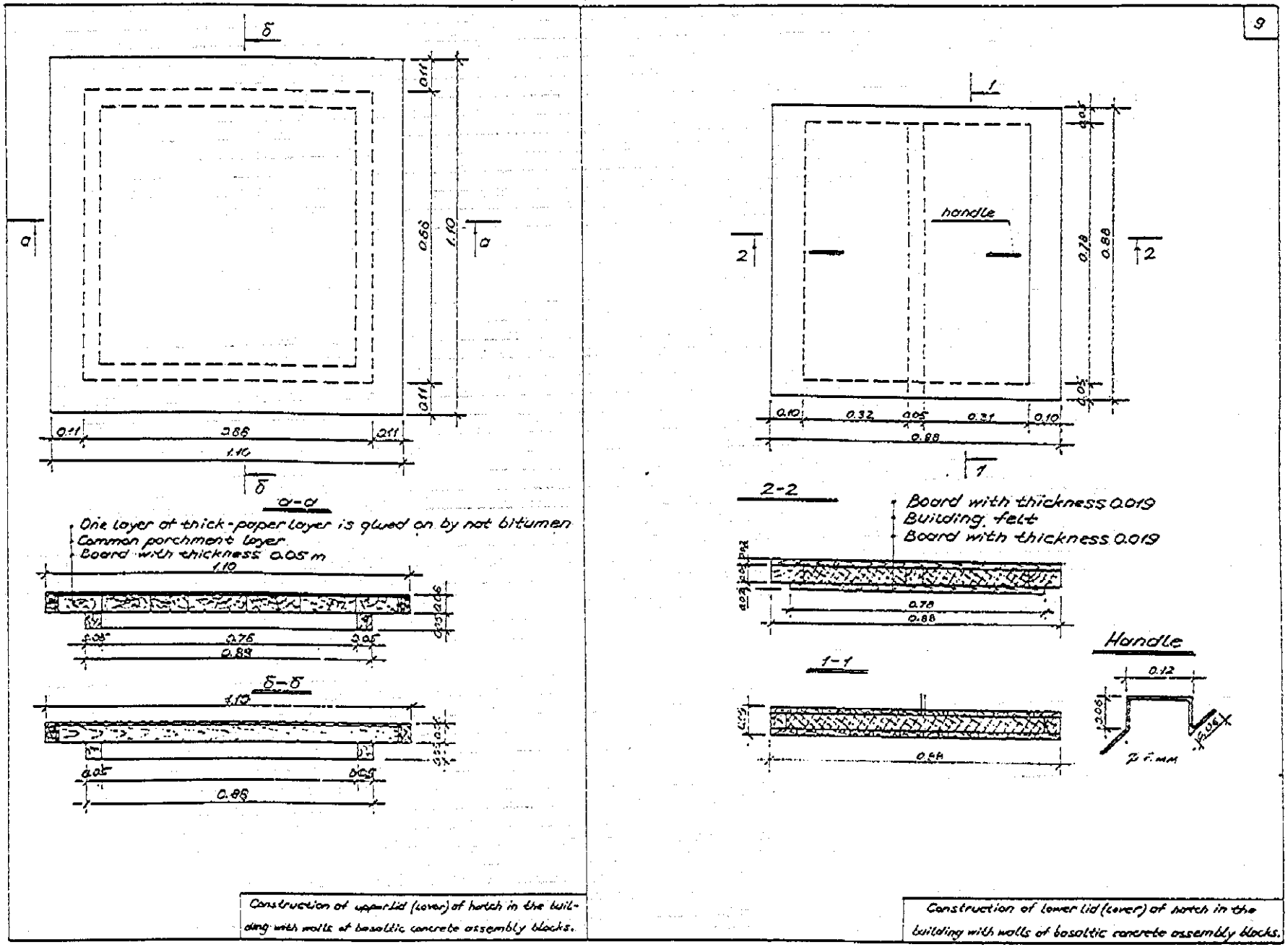


Fig.6.1.4.1(11) Water facility shed related design drawings

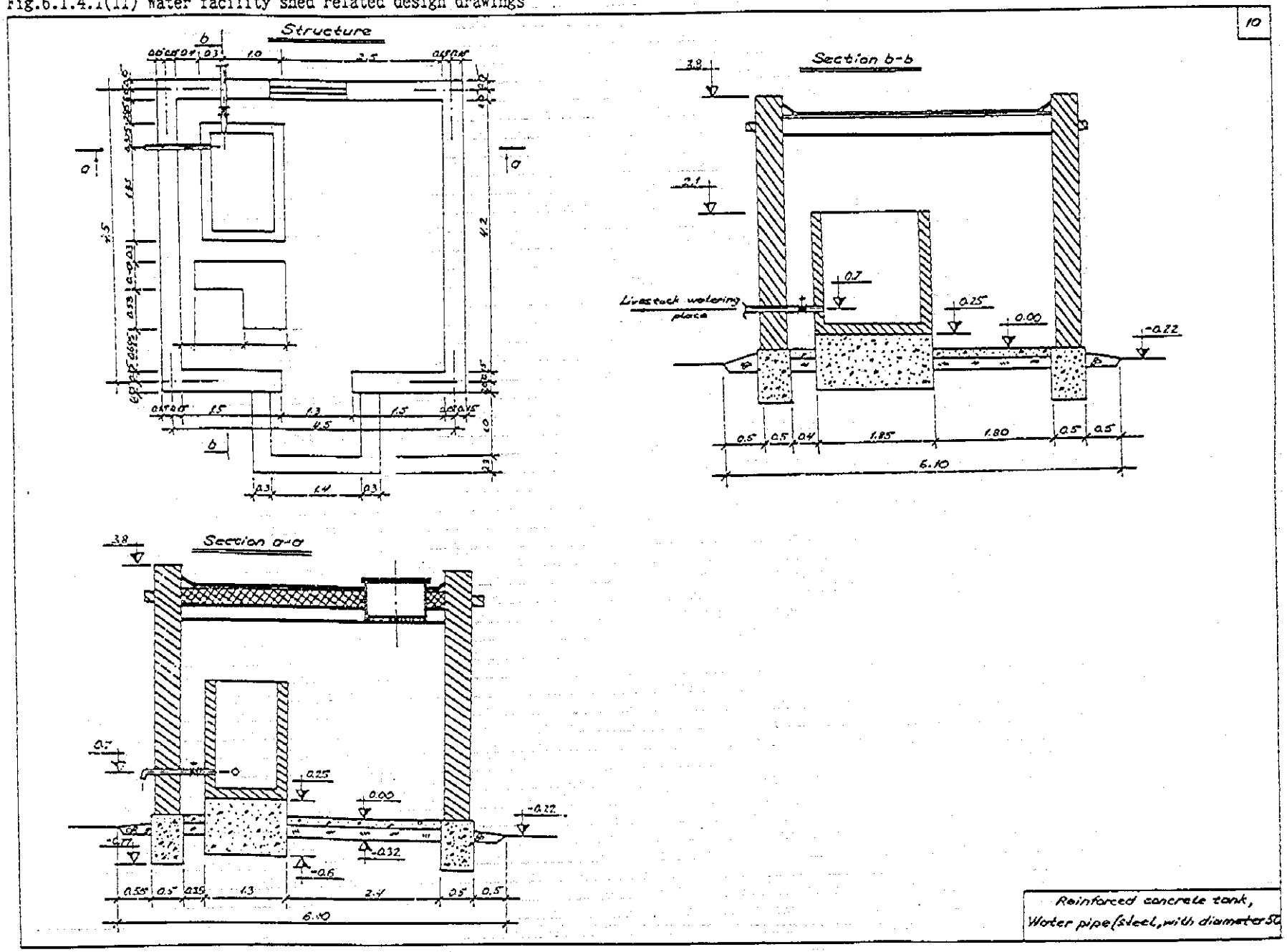


Fig.6.1.4.2(1) Water facility wind powered pump related design drawings

Manual for installation of wind driving unit „CY-3Φ" and water lifting devices at shallow wells constructed by using mechanism

Part-2

Fig.6.1.4.2(2) Water facility wind powered pump related design drawings

Explanatory notes

It is planned that the water-raising wind units would be experimented on the eastern and southern aimags (provinces) which include into the zone with intensive wind (annual average velocity of wind is 3÷5 meter/sec). In the result of held basic research work to determine exactly dependence of effectiveness (efficiency) of the water-raising wind units and the force of wind, it is necessary to work out new working drawings according to the cadastre of wind power.

During the experiment of wind units of type CY-3Ø, the capacity of the water reservoir equal to 80m³ which reflected in project to supply 2-3 flocks in the settlements this reflected that the water reservoir is made from metal and warmed around all of sides by 40 sm thich of ashes, and outword walls made from stones, rock bricks, ashes and basaltic blocks. Also it toon into consideration (account) that the pipe for transmitting water to reservoirs and from reservoirs to wells, are placed parallel a distance between them 10-15 sm. Lided part of the transmining tube to water live-stock (cattle) will be prepared in two variation and made (produced) completely in water supply equepments factory and maintenance depot. The static level of shaft short pipe well where wind units will equip (fit out) is less than 15sm and the spring of the well has more than 0.5 liters/sec water resourse.

A work to build the well and to assamble the water-raising units typ HB-3 will be executed according to the water prospecting and seience research institute.

The wind unit CY-3Ø is based on the concrete fundation and consists of the main parts like proping tower, binding parts, revolving fulcrum, reduction gear, tail, brakes and is operated when the wind velocity is 3÷17 meters/sec.

When the wind velocity is more than 17 m/sec the units stop themselves (automatically). When no wind or wind velocity less than for operating the units, it is necessary to assemble an auxiliary equipment to the well.

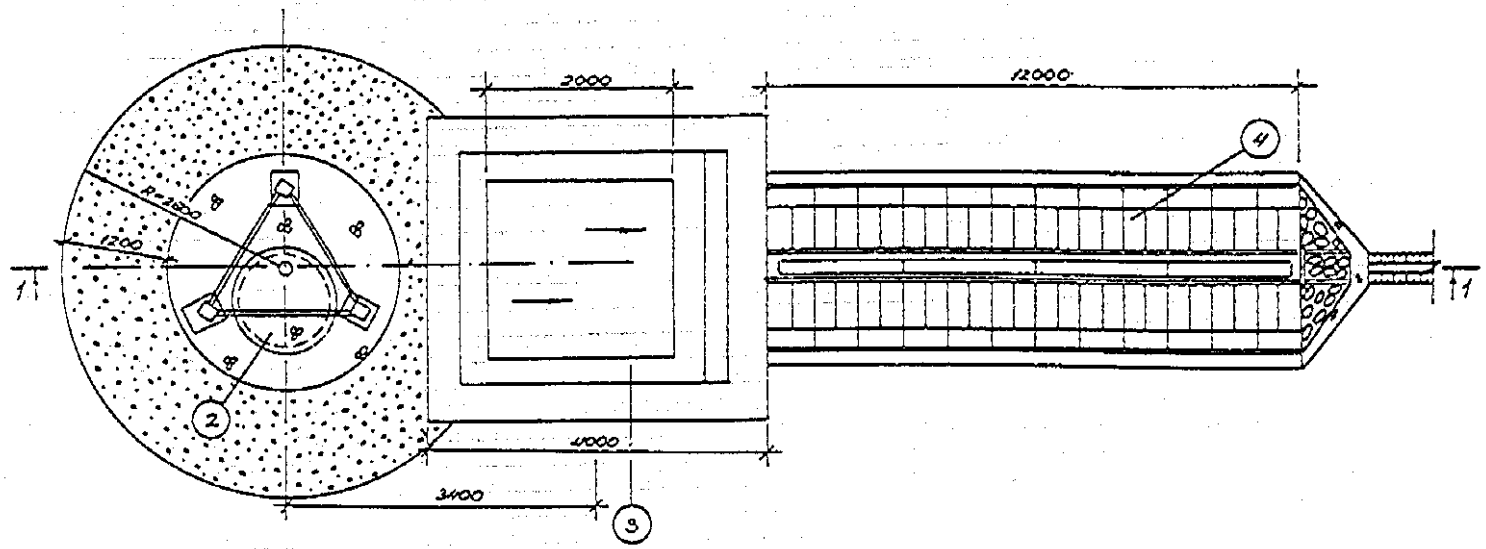
During all the stages of assembling the units safety precaution instruction has to be executed exactly.

According to the technical standard on assembling work is conducted the following:

- to dig a pit for foundation of wind units and pour in the foundation. During this work it is necessary to check up and regulate exactly an axis of water raising pipe in the short pipe well units.
- after fixing concrete foundation the feet of the wind units are fixed immovably by the ancher screws, the tower is put horizontal position by the hinge side and separated from the foundation and binding parts, revoling fulcrum, reduction gear, blades, tail, brakes are assembled.
- after assembling the wind units in the horizontal position the wind units are stood up with the help of steel rope and metal prop fixed on the foundation:
- after fixing the wind units on the foundation the water-raising tubes are assembled to the units.

Fig.6.1.4.2(3) Water facility wind powered pump related design drawings

STRUCTURE



List of drawings

Page number	Name of a drawings
N1	Description of drawings
N2	General view of wind driving unit installation, structure, cross section
N3	Basement structure of wind driving unit, cross section, specification
N4	Installation of wind driving unit in a shallow tube well, cross section
N5	Installation of wind driving unit in a shallow shaft well, cross section
N6	Reservoir in a house, structure, cross section, specification
N7	Wind driving unit, scheme for assembling
N8	Work volume in the installation of wind driving unit

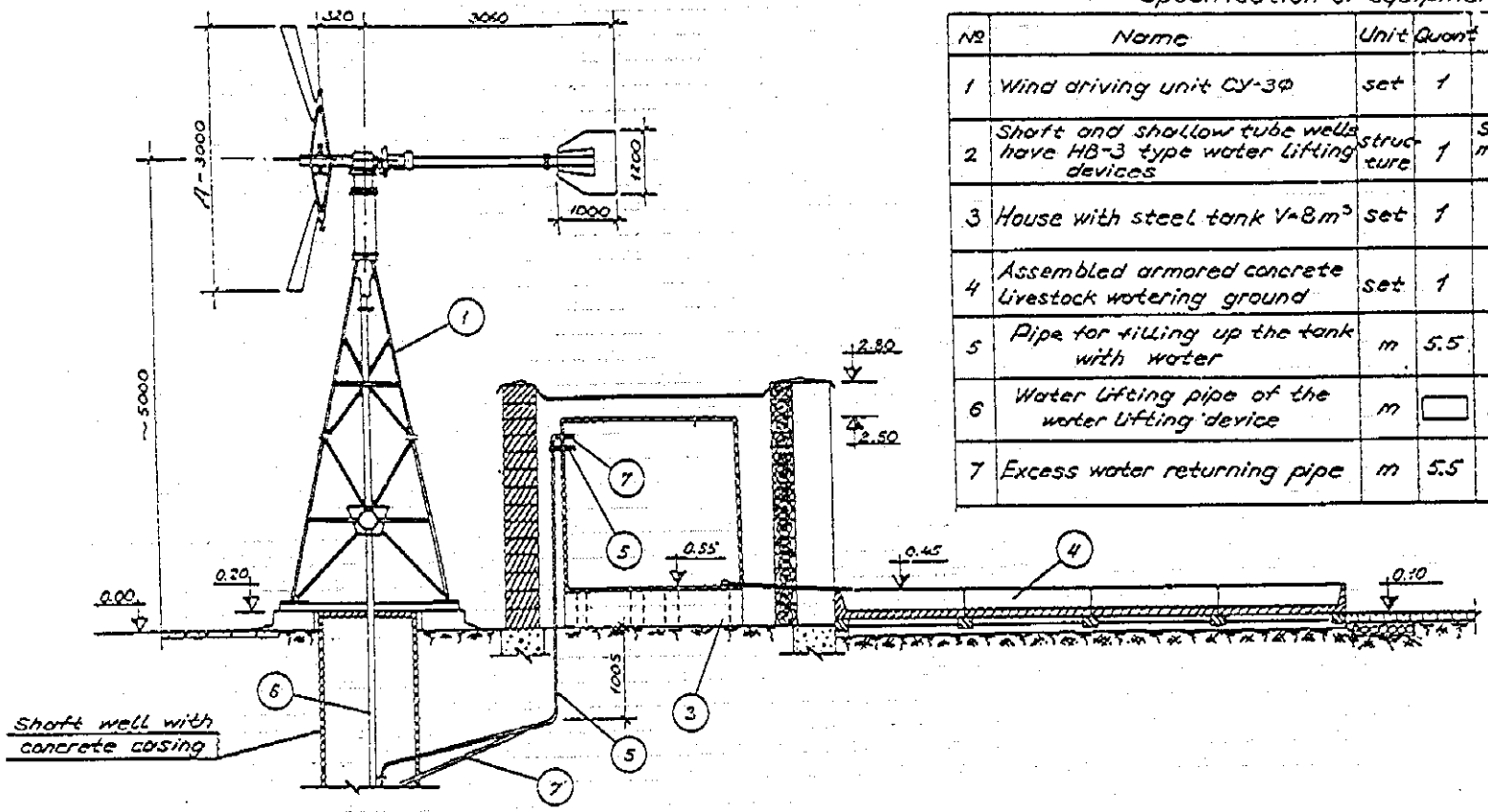
Description

1. Dimensions at this drawings shown in mm
2. Near the mouth of the well, between the radius R=2.5 m and r=1.2 m (from the center of the wind driving unit) should be done a ring of masonry with cement.

Structure

Fig.6.1.4.2(4) Water facility wind powered pump related design drawings

Cross-section 1-1



Specification of equipment

№	Name	Unit	Quant	Remarks
1	Wind driving unit CY-3Φ	set	1	Pages 3,7
2	Shaft and shallow tube wells have HB-3 type water lifting devices	structure	1	See the well mouth part from pages 4,5
3	House with steel tank V=8m³	set	1	Page 6
4	Assembled armored concrete livestock watering ground	set	1	
5	Pipe for filling up the tank with water	m	5.5	Page 6
6	Water lifting pipe of the water lifting device	m		Pages 3,7
7	Excess water returning pipe	m	5.5	Pages 3-7

Description

1. Dimensions ort this drawings shown in mm
2. The ground surface was chosen as the relative altitude ±0.00 m ··· and shown here in meters

Cross-section

Fig.6.1.4.2(5) Water facility wind powered pump related design drawings

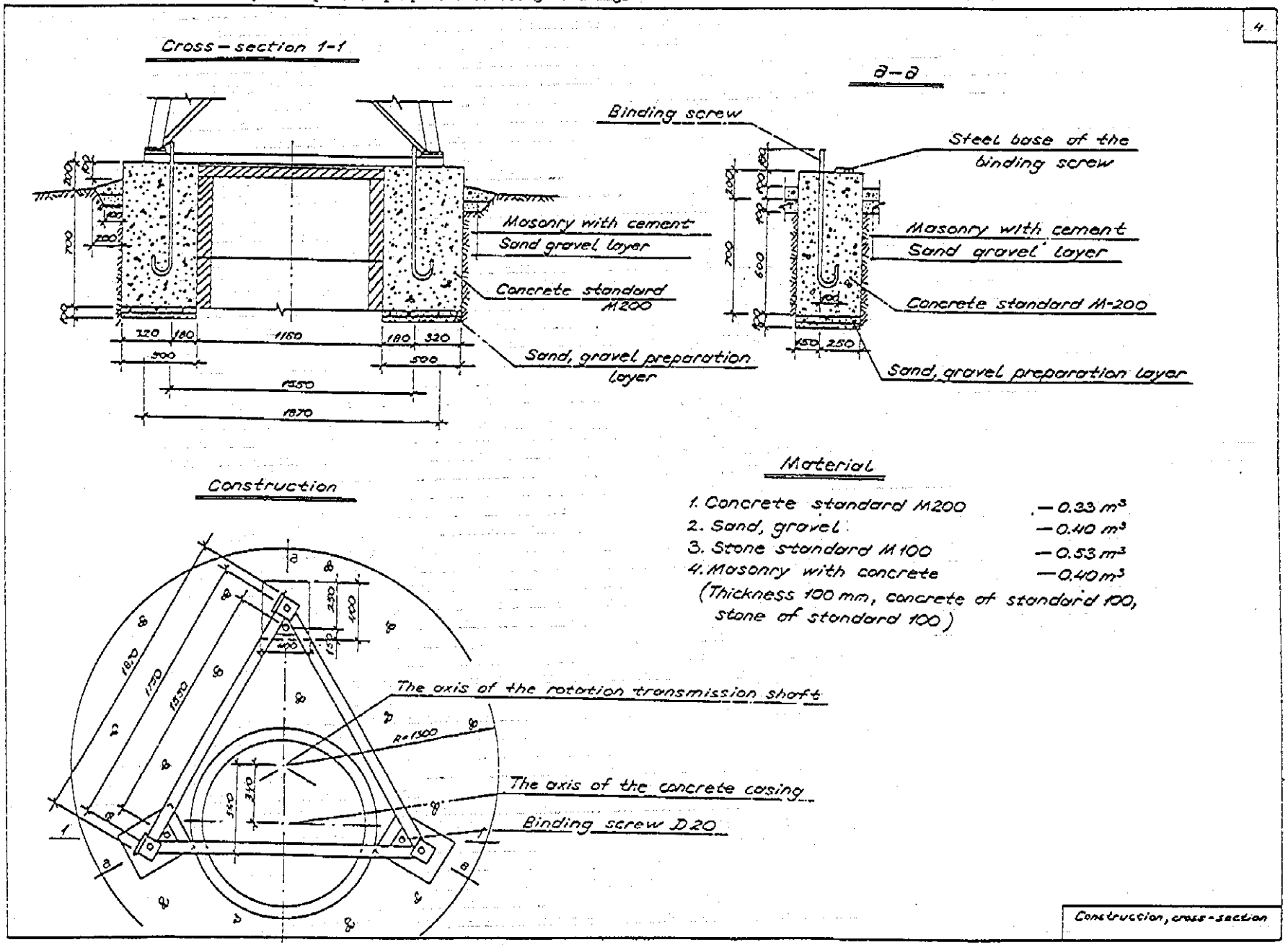
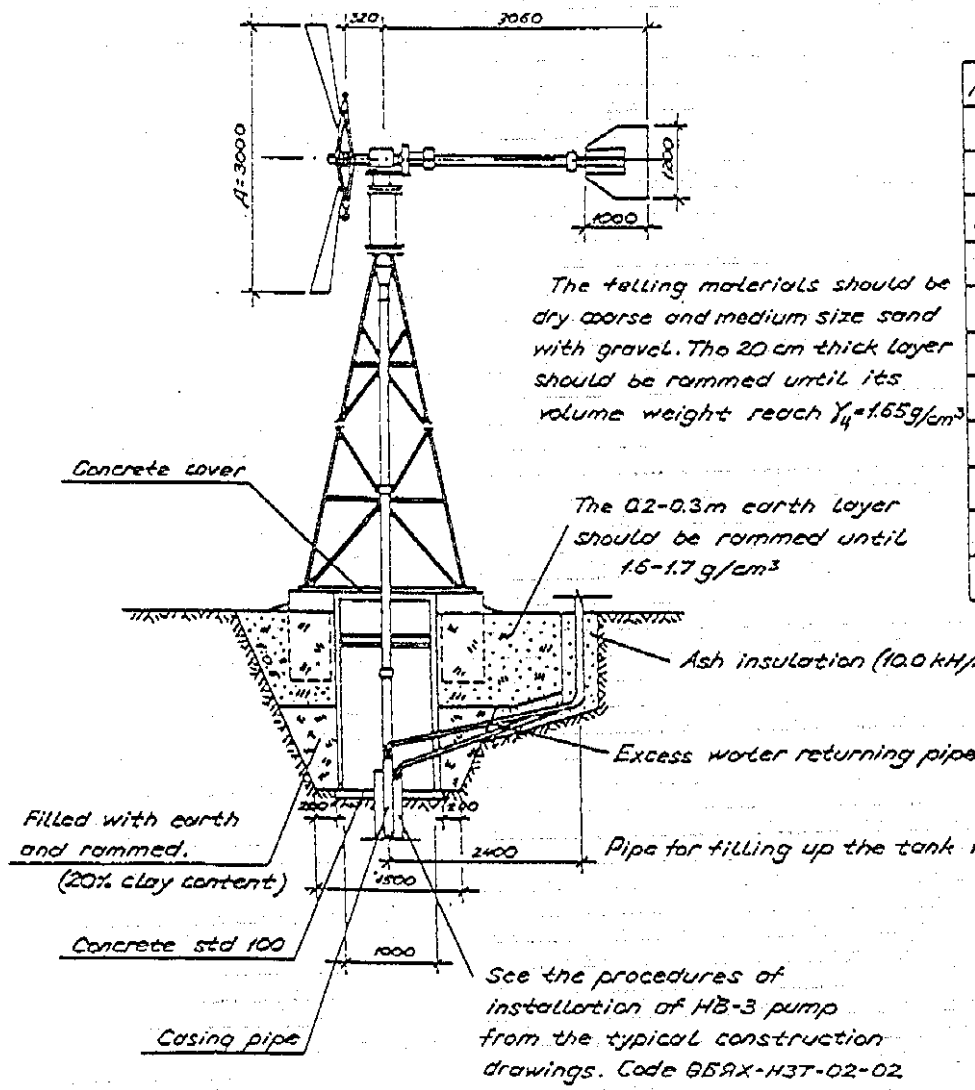


Fig.6.1.4.2(6) Water facility wind powered pump related design drawings



The telling materials should be dry coarse and medium size sand with gravel. The 20 cm thick layer should be rammed until its volume weight reach γ_4=1.65 g/cm³

Information on the exploitation

№	Names	Unit	Quality
1	Diameter of propeller blades	m	3.0
2	Number of blades of the propeller	piece	12
3	Rotation speed (estimated)	rot/min	120
4	Operational wind velocity	m/s	3-17
5	Minimum wind velocity for operation	m/s	3
6	Maximum depth of water table	m	15
7	Capacity (8 m/s – 0.46 l/s – 0.37 kW	kW	0.37
8	Total weight	kg	70.0
9	Wind driving unit have automatic and manual stop	–	–
10	Wind driving unit designed for use HB-3 water lifting devices	piece	1
11	The distance between the surface and axis of the propeller	m	5

The productivity of wind driving water lifting device m³/h

Water table(m)	Wind velocity m/s				
	3.0	3.5	4.0	5.0	6.0
10-15					2.0
15-20					

Description

1. The dimensions in mm and altitude in m
2. See the insulation cap and well mouth constructions from the typical construction drawings of the shallow tube well.

Structure CY-3Φ

Fig.6.1.4.2(7) Water facility wind powered pump related design drawings

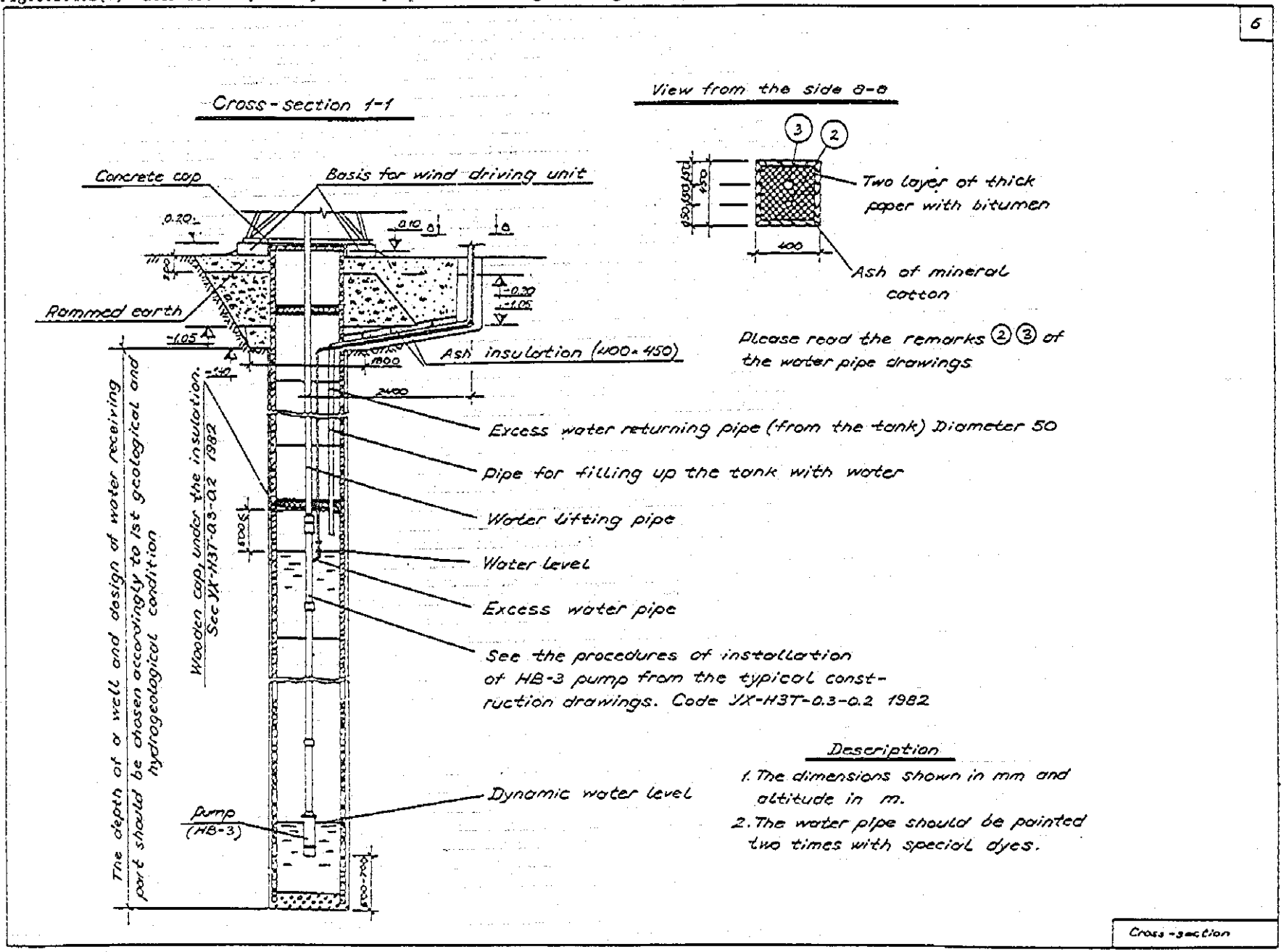


Fig.6.1.4.2(8) Water facility wind powered pump related design drawings

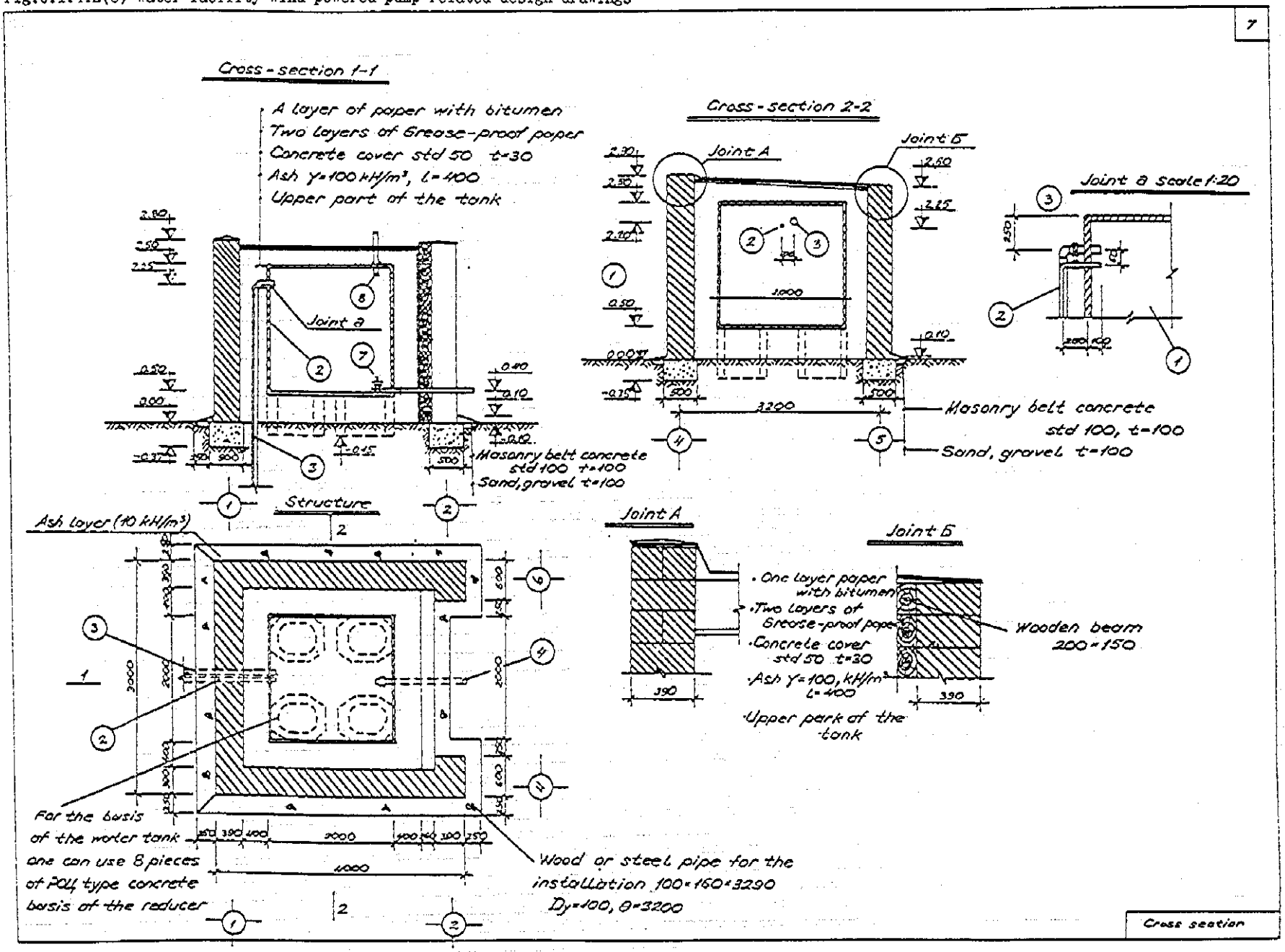


Fig.6.1.4.2(9) Water facility wind powered pump related design drawings

Specification of a house with steel water tank

№	Name	Type Model	Unit	Quant	Weight kg	Remarks
1	Water tank V=8m³		piece	1	865	The water tank is produced together with the water outlet pipe for livestock watering ground and its valve.
2	Water pipe, d=25mm, t=4	ГОСТ 3262-75	mm	3	8.7	
3	Excess water pipe, d=50, t=40	ГОСТ 3262-75	mm	5	30.8	
4	Pipe for livestock watering ground	ГОСТ 3262-75	mm	1.5	9.24	
5	Muff D_y=35	ГОСТ 3265-75	pieces	2		
6	Flonge D_y=30	ГОСТ 12829-67	pieces	6	7.4	
7	Water outlet valve	НСБ-113Т-01-02	piece	1		
8	Ventilation pipe	ГОСТ 3262-75	piece	1		
9	Basis for water tank basis for reducer	УСТ 2154-75	piece/m³	8	0.4	
10	Wooden beam	УСТ 391-77	piece	14	1.2	
11	Ash block	УСТ 631-77-75	m³	12.5		
12	Concrete foundation	Concrete std 75 Shone std 200	m³	1.58		
13	Grease-proof paper	ГОСТ 2697-69	m³	17.4		
14	Paper with bitumen	ГОСТ 20983-76	m³	5.8		
15	Sorted ash		m³	13.5		

Description

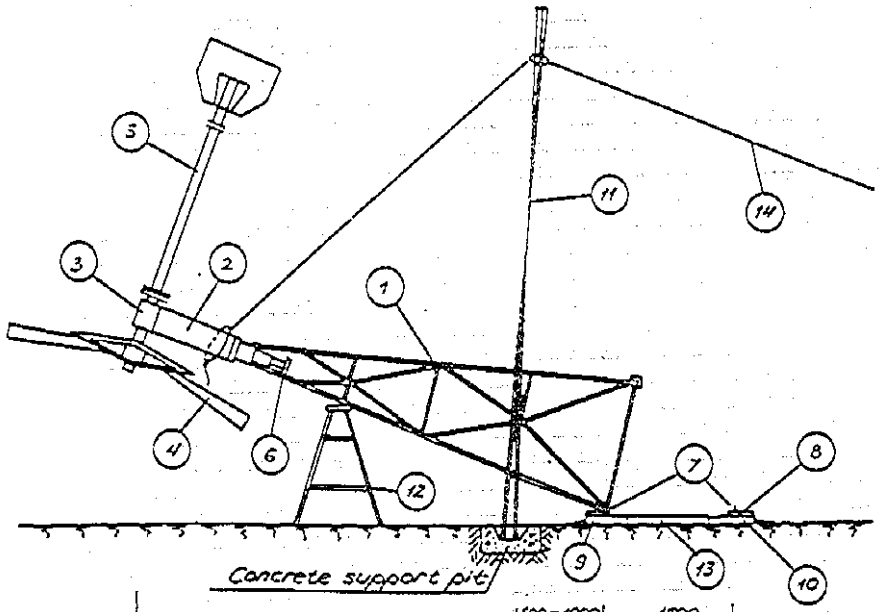
1. The dimensions shown in mm and altitude in m.
2. Read this drawings together with page № 2, 4, 5 and 6.
3. The valve for the water outlet into the livestock watering has a rope and they are have to be produced together as one set.
4. This wind water lifting device can operate from 15 April to 15 October without any heating.

Specification of a house with steel water tank

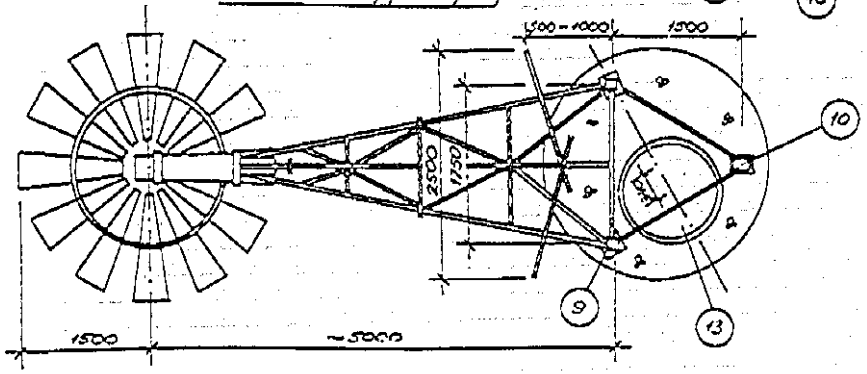
Fig.6.1.4.2(10) Water facility wind powered pump related design drawings

9

Assemble scheme



Concrete support pit



Specification for the installation of a wind driving unit

№	Components	Unit	Quant
1	The match of a wind driving unit two pieces connected with flanges	piece	1
2	Rotating support of the unit	piece	1
3	The reducer of the unit	piece	1
4	The propellers of the unit	piece	1
5	Tail part of the unit	piece	1
6	Flange for connection of the wind driving unit with pump	piece	1
7	The binding bolts for fixing of the unit to its basis	piece	3
8	The fixing bolts of the basis d=20	piece	3
9	Hinge connection of the wind driving unit to the match	piece	2
10	Concrete foundation for the wind unit 200 (1100×300×900)	piece	3
11	Support pipe for installation of the unit d=20, L=5500	piece	2
12	Support for installation of the unit	piece	1
13	Shaft or shallow tube well with HB3 pump	piece	1
14	Steel rope	m	

1. Dimensions shown in mm
2. Read this drawings together with pages 2, 4

Assemble shame

Fig.6.1.4.3(1) Water facility manual pump related design drawings

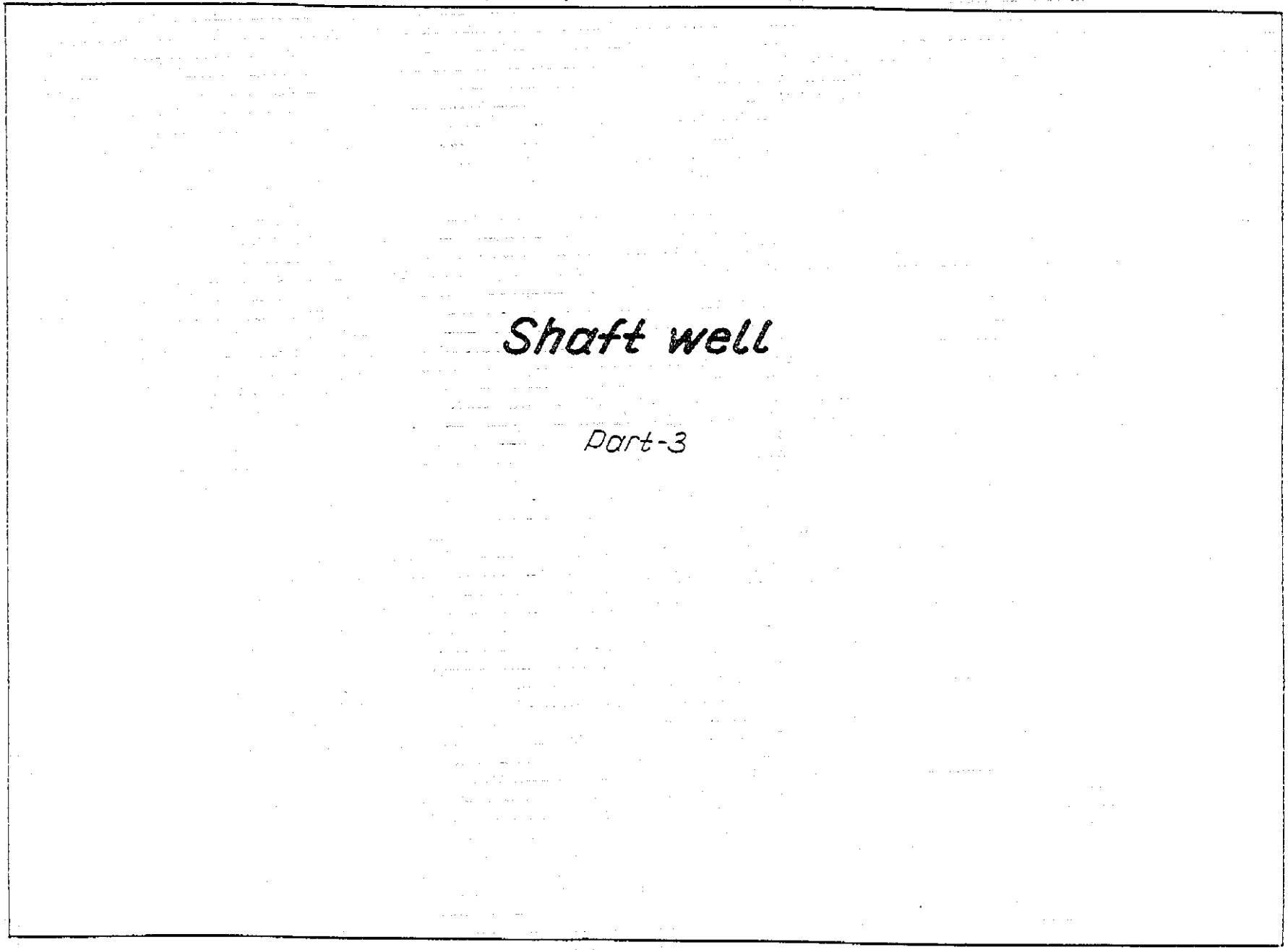


Fig.6.1.4.3(2) Water facility manual pump related design drawings

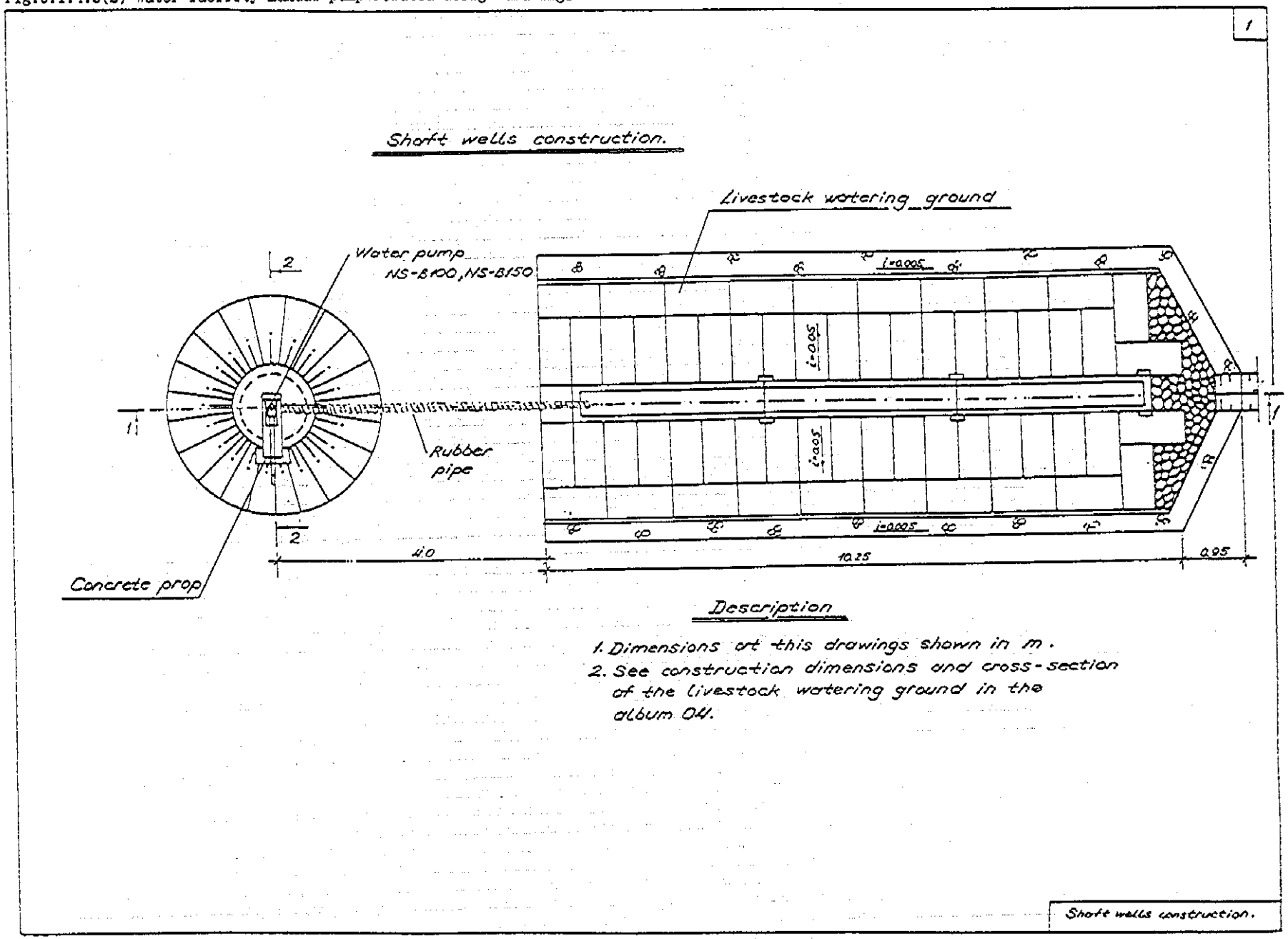


Fig.6.1.4.3(3) Water facility manual pump related design drawings

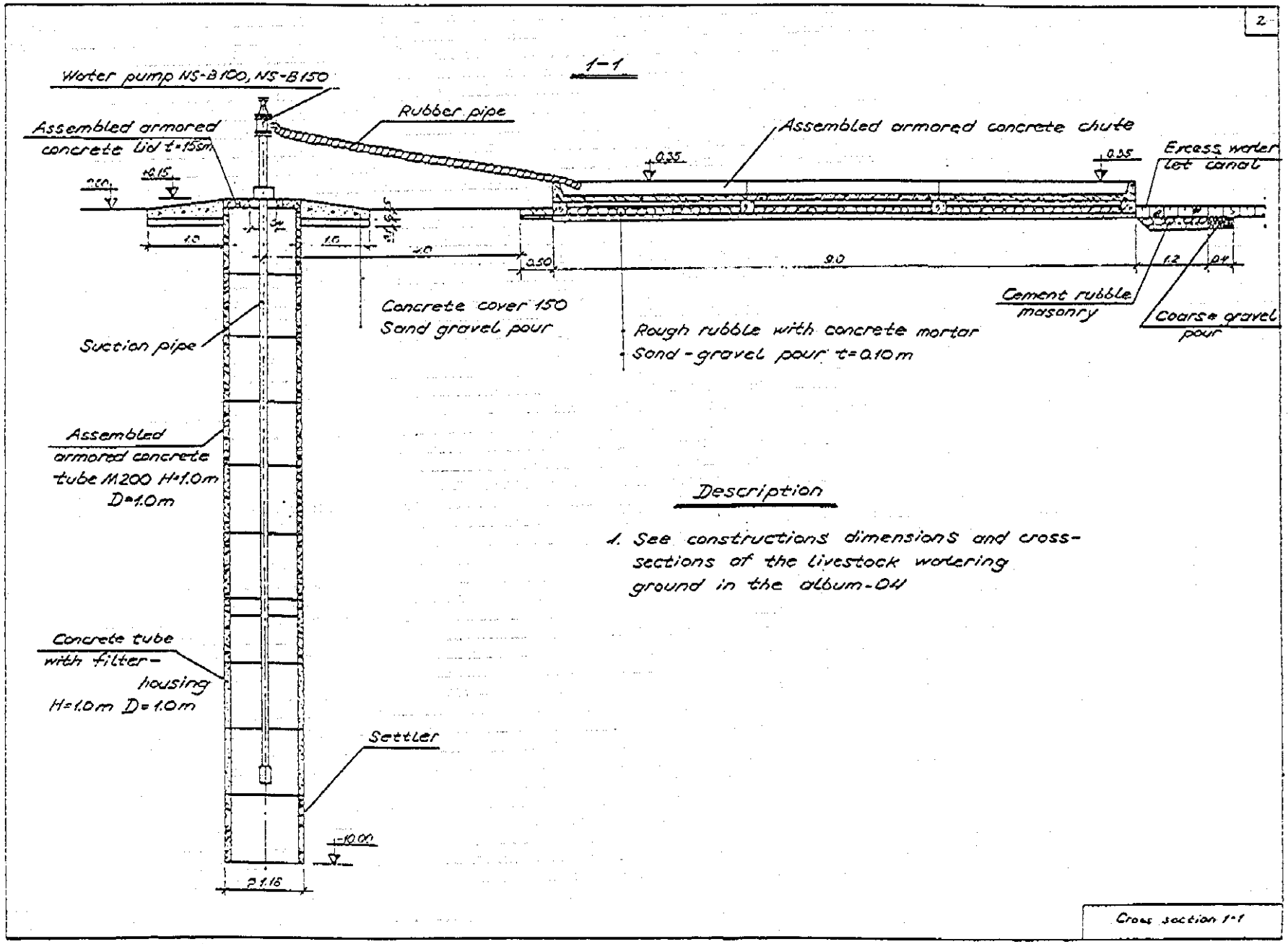
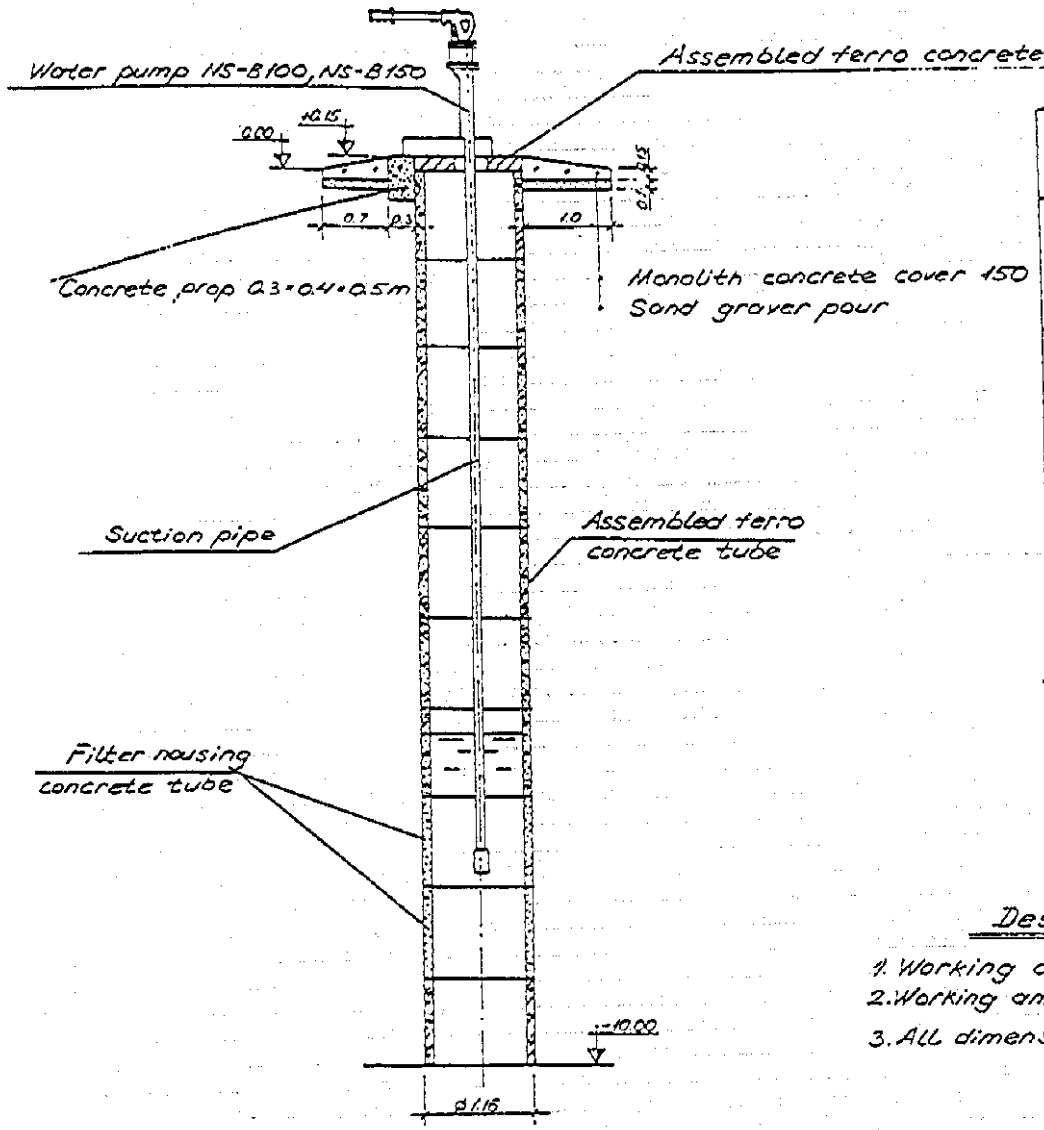


Fig.6.1.4.3(4) Water facility manual pump related design drawings

2-2



Working amount

№	Item		unit	amount
1	Earth moving work	by mechanism	m/m³	10/11
		hundwork	m³	2.8
2	Levelling work		m²	3.2
3	Assembling armored concrete tube		pieces/m³	8/2.33
4	Assembling tube with filter housing		pieces/m³	2/0.58
5	Bitumen insulation, 2 layers		m²	29.1
6	Assembled armored concrete lid		pieces/m³	1/0.19
7.	Monolith concrete		m³	2.8
9	Sand grover pour		m³	1.0

Description

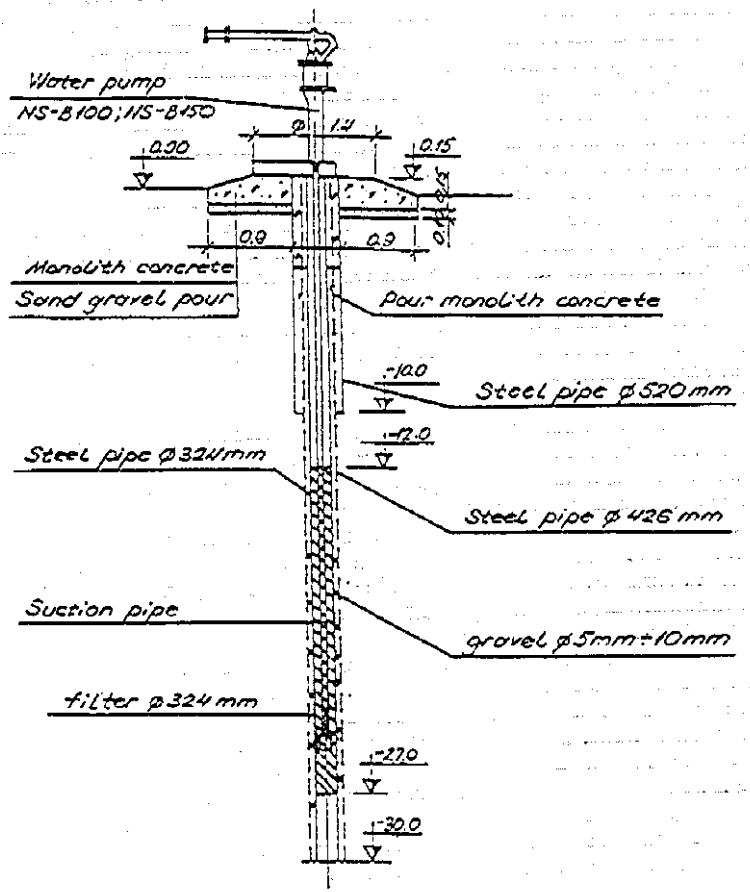
1. Working amount is given per 10m well tube.
2. Working amount for livestock watering ground is not given
3. All dimensions given in „m"

Cross-section 2-2

Fig.6.1.4.3(5) Water facility manual pump related design drawings

Cross-section of short pipe well

4



Works volume

№	Item		unit	amount
1	Earth moving work	by mechanism	m/m^3	30/6.0
		handwork	m^3	1.04
2	Steel pipe ø520 mm		m	10
3	Steel pipe ø426 mm		m	30
4	Steel pipe ø324 mm		m	15
5	Filter (steel pipe) ø324 mm		m	15
6	Steel pipe ø426 mm		m	30
7	Gravel ø5÷10 mm		m^3	6.0
8	Monolithic concrete M150		m^3	1.26
9	Sand gravel pour t=10 sm		m^3	0.62

Description

1. Working amount is given per short pipe well with depth 30m
2. Livestock watering place is situated on distance 4m from axle of well. See work volume in album 4
3. All dimetision given in „m"

Cross-section.

Fig.6.1.4.4(1) Water facility supply equipment related design drawings

Livestork watering place

Part-4

Fig.6.1.4.4(2) Water facility supply equipment related design drawings

Explanatory note

A choise of design for watering-place depends on the type of given water-point, its capacity and number of livestock.

A watering-place at length 9 meters is built for drilled, mine short pipe wells, equiped by HB-3M water raising units which are watered about 2000 small livestock (sheep and goats) or a few big livestock.

For watering, more than 2000 small livestock or 200-400 big livestock 12 meters length, more than above mentioned animals or good spouting out and basic wells, 25 meters length watering-place we have to take into consideration the following factors:

1. to build the watering-place along the dominant direction of wind from water-point
2. to take into account, that leftovers water seuds away from water-trough by itselfs curre
3. position of watering-place doesnot be flooded and doesnot have hollow to fix water.

If it is indespensable to build the watering-place on the above mentioned locotion (condition), we have to take additional (supplementary) measures.

4. in dependence on design, form and size of water-points building, the watering-place is situated some different distance from the water-point. According to the hygienic demond the watering-place doesnot be situated nearer than 4 meters. distance from the water-point.

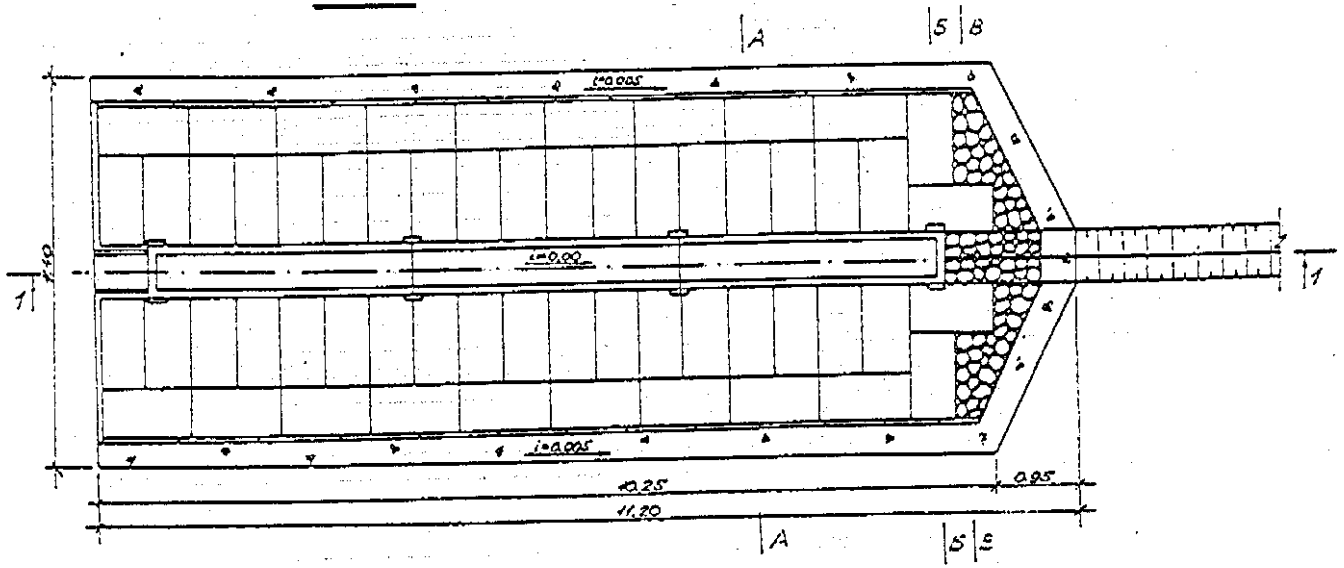
According to the drought-project the watering place has to be built with high quality.

It is possible to flow away water, when welding between reinforced concrete articles, tripping of sandy, preparatory and surface soil are carried out incompletely. In utilizing process, it is necessary to clean regularly litter durty waste of animals, to do constantcy ordinary (routine) repairs and to channal for leftovers water from water-trough, and to clean fixed ice in the channals and water-trough in the winter time.

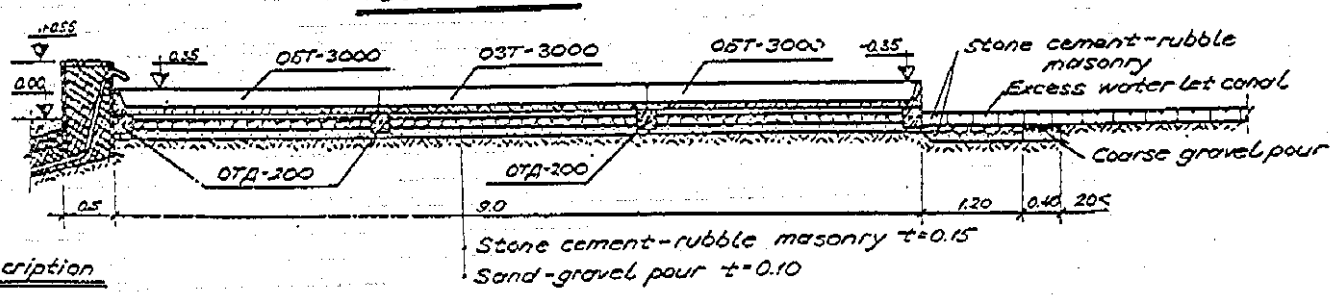
Explanatory note

Fig.6.1.4.4(3) Water facility supply equipment related design drawings

Plan.



Section 1-1



Description

ОБТ – Reinforced concrete troy with closed end
ОТД – Reinforced concrete support
ОЗТ – Reinforced concrete troy without end

General plan

Fig.6.1.4.4(4) Water facility supply equipment related design drawings

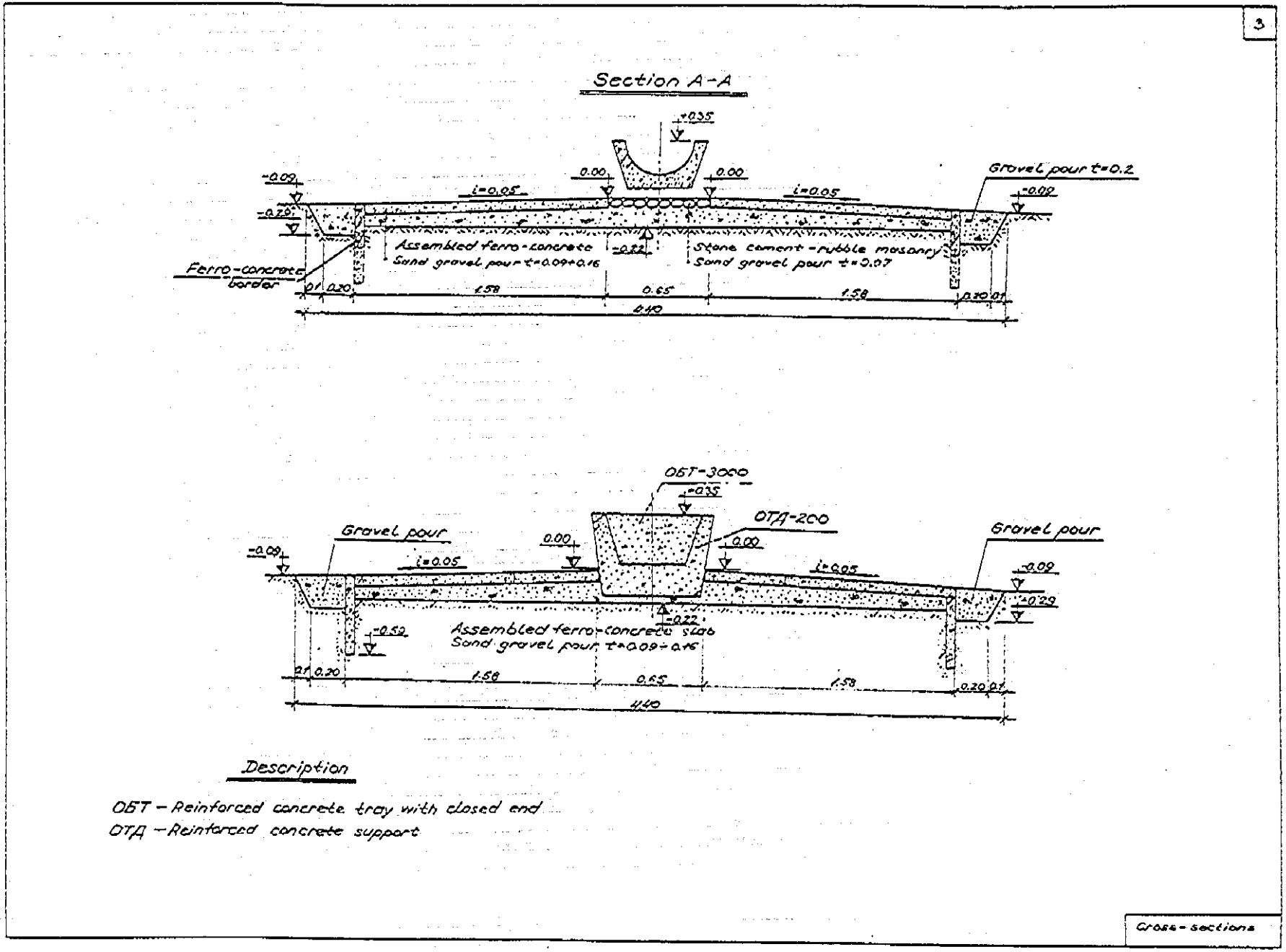
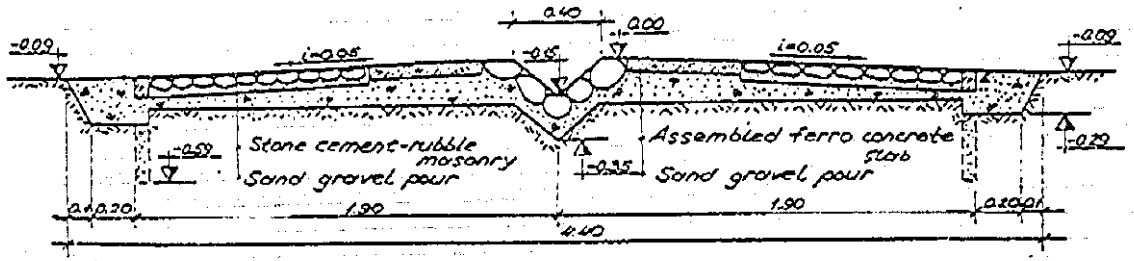


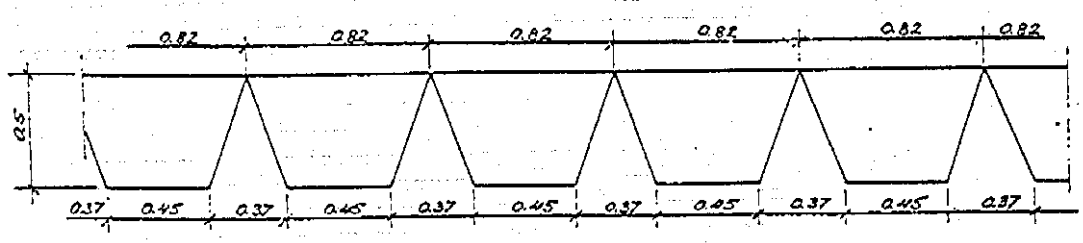
Fig.6.1.4.4(5) Water facility supply equipment related design drawings

4

Section B-B



Assembled ferro-concrete slab X-3 masonry on livestock watering ground



Assembled ferro-concrete items for 9 m water trough with assembled ferro-concrete surfacing ground

№	Items	Amount	Weight per one kg	All weight kg	Volume per one m^3	All volume m^3
1	Chute with barrier 05T-3000	2	455.0	910.0	0.182	0.364
2	Chute with out barrier 03T-3000	1	442.0	492.0	0.177	0.177
3	Concrete prop 0ТД-200	4	90.0	360.0	0.035	0.144
4	Assembled ferro concrete slab X-4	58	72.0	4176	0.03	1.74
5	Assembled ferro concrete slab X-3	32	45.0	1440	0.010	0.58
6						

Cross-sections

Table-6.1.5.1 Milk Production Increasing Project Cost

(Unit : US$)

(1) Milk Producers Association

Improvement/Facility		Quantity		Unit Price	Amount	Remarks
Buildings	Association Office	1	420㎡		42,000	Repair of existing facility
	Cooler Stations	5	301㎡	28,700	143,500	Milk storage room,Office room,etc.
Equipment	Milk inspection	1			20,000	Milk fat separator,Alcohol teser,etc
	Radio equipment	1			4,900	Key station
	AI equipment	3		3,000	9,000	Liquid nitrogen container,etc.
	Milk Storage	5		199,300	996,500	Bulk cooler,Generator,Scales,etc.
Vehicles	Milk lorry	5		115,200	576,000	Capacity for 6,000l
	Jeep	2		45,000	90,000	4WD(with mobile radio equipment)
Office Equip.		1			29,100	Copier,PC set,Desks,Lockers,etc.
Total					1,911,000	

(2) Core Dairy Farms

Improvement/Facility		Quantity		Unit Price	Amount	Remarks
Buildings	Insulation work	1	15 farms		1,335,800	Improvement of cold resistance,etc.
	Compost yard	1	15 farms		1,284,300	New construction
Equipment	Milking machine	1	12 farms		1,364,800	Bucket type milking machine
	Bulk cooler	1	12 farms		1,093,300	Bulk cooler
Machinery	Fodder production		15 farms	168,100	2,521,500	Tractor,Harvester,Mower,Baler,etc.
	EI equipment		15 farms	3,000	45,000	Liquid nitrogen container,etc.
Total					7,644,700	

Table-6.1.5.2 Improvement Facilities of Core Dairy Farm

(1) Improvement Plan

Dairy Farm	Cow Heads	Insulation Work	Compost Yard	Milking Machine	Bulk Cooler	Machinery	AIKit
Shine Zam	600	3	3	3	10,000	1	1
Biluut	200	1	1	1	4,000	1	1
Shar Khooloi	600	3	3		10,000	1	1
Davaanbulag	400	2	2		8,000	1	1
Artsat	400	2	2	2	8,000	1	1
Bayanbulag	200	1	1	1	4,000	1	1
Tsagaan Erdene	200	1	1	1	4,000	1	1
Tsatsral	400	2	2	2	8,000	1	1
Erdenetolgoi	200	1	1	1	4,000	1	1
Bayanbadrah	200	1	1	1	4,000	1	1
Bayantolgoi	200	1	1	1	4,000	1	1
Khairkhan	200	1	1	1	6,000	1	1
Orgil	200	1	1	1	6,000	1	1
Delgerekh	600	3	3	3	10,000	1	1
Dul	200	1	1		4,000	1	1
Total	4800	24	24	18	94,000	15	15

(2) Consturuction Cost (Unit:$)

Dairy Farm	Insulation Work	Compost Yard	Miliking Machine	Bulk Cooler	Machinery	AIkit	Total
Shine Zam	166,740	127,800	103,630	243,340	168,100	3,000	812,610
Biluut	55,580	63,900	103,630	107,340	168,100	3,000	501,550
Shar Khooloi	166,740	127,800			168,100	3,000	465,640
Davaanbulag	111,160	127,800		136,000	168,100	3,000	546,060
Artsat	111,160	127,800	103,260		168,100	3,000	513,320
Bayanbulag	55,580	63,900	103,260	107,340	168,100	3,000	747,180
Tsagaan Erdene	55,580	63,900	103,260	107,340	168,100	3,000	474,180
Tsatsral	112,880	127,800	103,260		168,100	3,000	515,040
Erdenetolgoi	55,580	63,900	103,260	147,340	168,100	3,000	474,180
Bayanbadrah	55,580	63,900	103,260	147,340	168,100	3,000	474,180
Bayantolgoi	55,580	63,900	103,260	147,340	168,100	3,000	474,180
Khairkhan	55,580	63,900	103,260	147,340	168,100	3,000	474,180
Orgil	55,580	63,900	103,260	147,340	168,100	3,000	474,180
Delgerekh	166,740	127,800	207,360	243,340	168,100	3,000	916,340
Dul	55,580	63,900		107,340	168,100	3,000	397,920
Total	1,335,800	1,284,300	1,364,800	1,093,300	2,521,500	45,000	7,644,700

Table－6.1.5.3

Calculation of required agricultural machinery for Dairy Farm(200-cow)

1. Fodder production area

Grassland	160 ha
Fodder crop	285 ha
Total	445 ha

2. Operation process

(1) Hay making

Reaping (Mower) → Gathering (Rake) → Packing (Hay baler) → Transport (Truck (Horse cart))

(2) Silage making

Reap/cutting (Harvester) → Transport (Truck (Horse cart)) → Repression (Tractor)

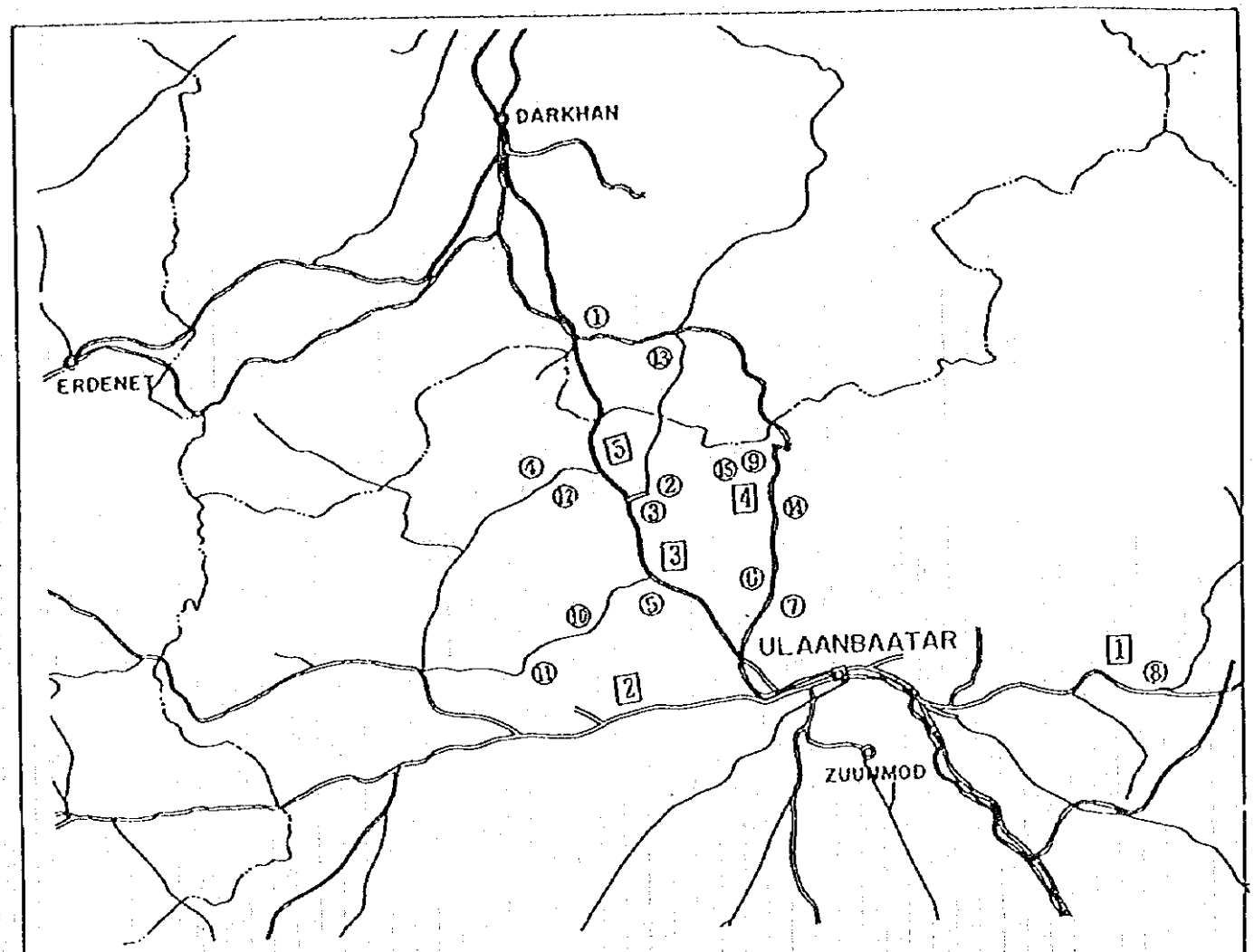
(3) Fodder crop management

Manuring (Manure spreader) → Cultivating (Disc harrow) → Seeding (Seed drill) → Fartilizing (Broadcaster)

3. Caluculation of required number

Operation	Machinery	Scale	Work Efficiency			Field effic.	Field Work unit	Work hour /day	Fieldwork hr		Field work /day	Total work area	Tot. work days	Work area /day	Requ-ired number
			Width	Work speed	Work unit				Work effic.	actual hour					
			m	km/hr	ha/hr	%	ha/hr	hr	%	hr	ha/day	ha	day	ha	
Cultivat.	Disc harrow	3.6m	3.60	7.0	2.52	80	2.02	8.0	85	6.8	13.74	285	20	14.3	2
Fertiliz.	Broadcaster	500L	4.00	7.0	2.80	70	1.96	8.0	80	6.4	12.54	570	40	14.3	2
Seeding	Seed drill	24line	3.60	5.0	1.80	60	1.08	8.0	80	6.4	6.91	285	20	14.3	3
Reap/cut.	Harvester	2.4m	2.40	7.0	1.68	70	1.18	8.0	80	6.4	7.55	285	20	14.3	2
Transport	truck		2.40	7.0	1.68	70	1.18	8.0	80	6.4	7.55	285	20	14.3	2
Reaping	Mower	2.4m	2.40	7.0	1.68	80	1.34	8.0	85	6.8	9.11	160	10	16.0	2
Gathering	Rake	4.0m	4.00	7.0	2.80	70	1.96	8.0	80	6.4	12.54	160	10	16.0	2
Packing	Hay baler	4.0m	4.00	5.0	2.00	70	1.40	8.0	80	6.4	8.96	160	10	16.0	2
Manuring	Manurspred.	3.0t	4.00	5.0	2.00	70	1.40	8.0	80	6.4	8.96	285	20	14.3	2
	Tractor	70PS													4

Milk Production Increasing Project Location Map



Selected Dairy Farm

Farm Name	Heads of Cow & Breed		Farm Name	Heads of Cow & Breed	
	Capacity	Breed		Capacity	Breed
①Shine Zam	800	Simmental	⑨Erdenetolgoi	400	Alatau
②Shar Khooloi	800	Holstein	⑩Khairkhan	400	Simmental
③Davaanbulag	400	Holstein	⑪Orgil	400	Simmental
④Artsat	800	Holstein	⑫Bayanbulag	400	Holstein
⑤Tsagaan Erdene	400	Holstein	⑬Biluut	800	Steppe Red
⑥Delgerekh	800	Holstein	⑭Bayanbadrah	400	Alatau
⑦Dul	400	Holstein	⑮Bayantolgoi	400	Alatau
⑧Tsatsral	400	Simmental			

① ~ ⑮	Dairy Farm
[1]~[5]	Cooler Station

Figure-6.1.5.1 Milk Production Increasing Project Location Map

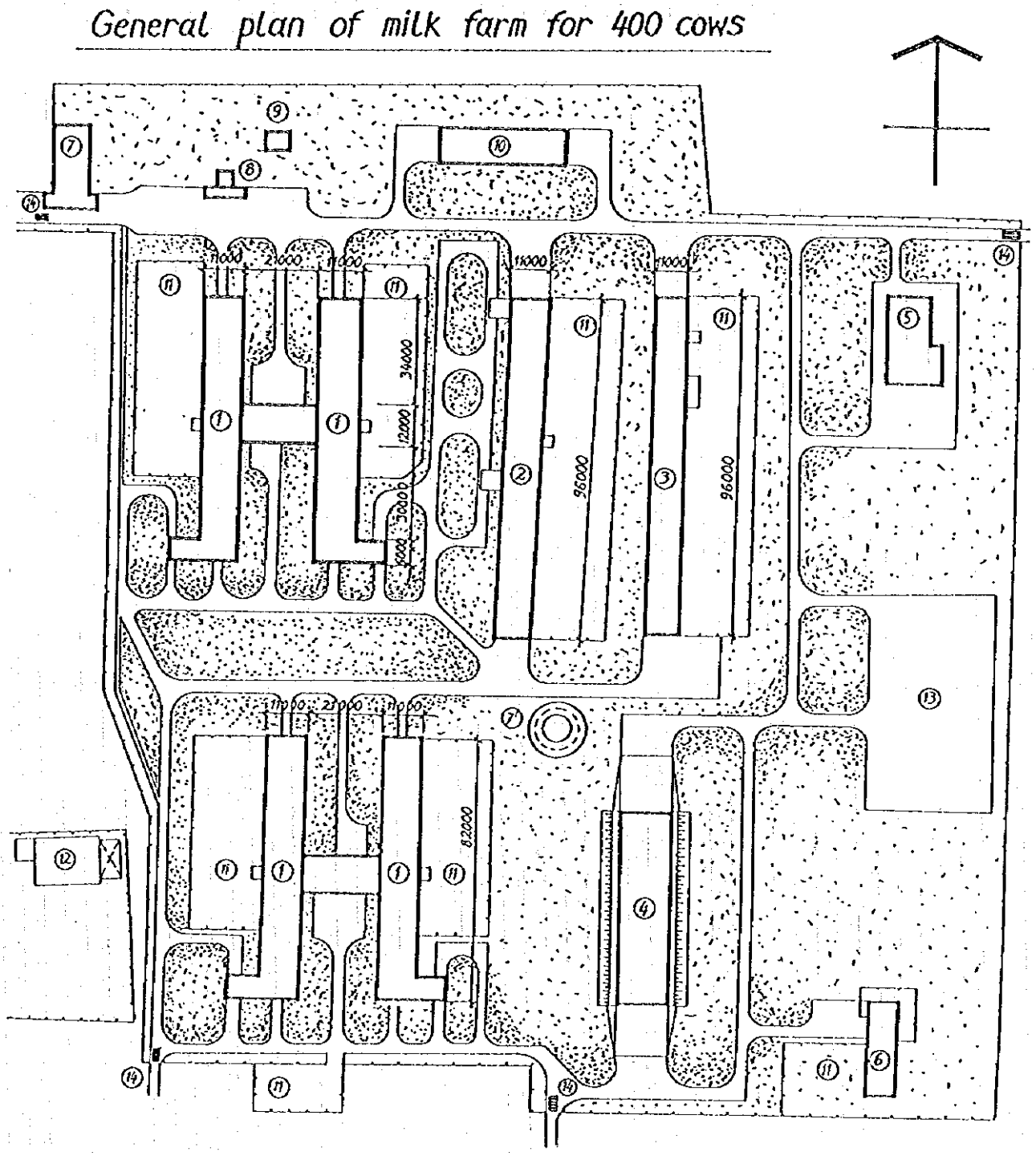
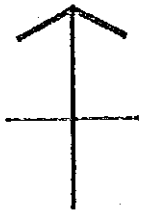


Figure-6.1.5.2 General Plan of Dairy Farm (Cow 400 heads: 100 heads×4)

General plan of milk farm for 400 cows.



Name of object

1. Construction for 200 cows together with milk block
2. Building for young calves
3. Service an supply
4. Veterinary service
5. Scale for weighing trucks with freight.
6. Hay storing
7. Silo trench
8. Silo trench
9. Gorage for tractors
10. Squaire for sunny days
11. Bathing
12. House for bulls
13. Sanitation squaire
14. Steem heating stove
15. Hay squaire

M1:1000

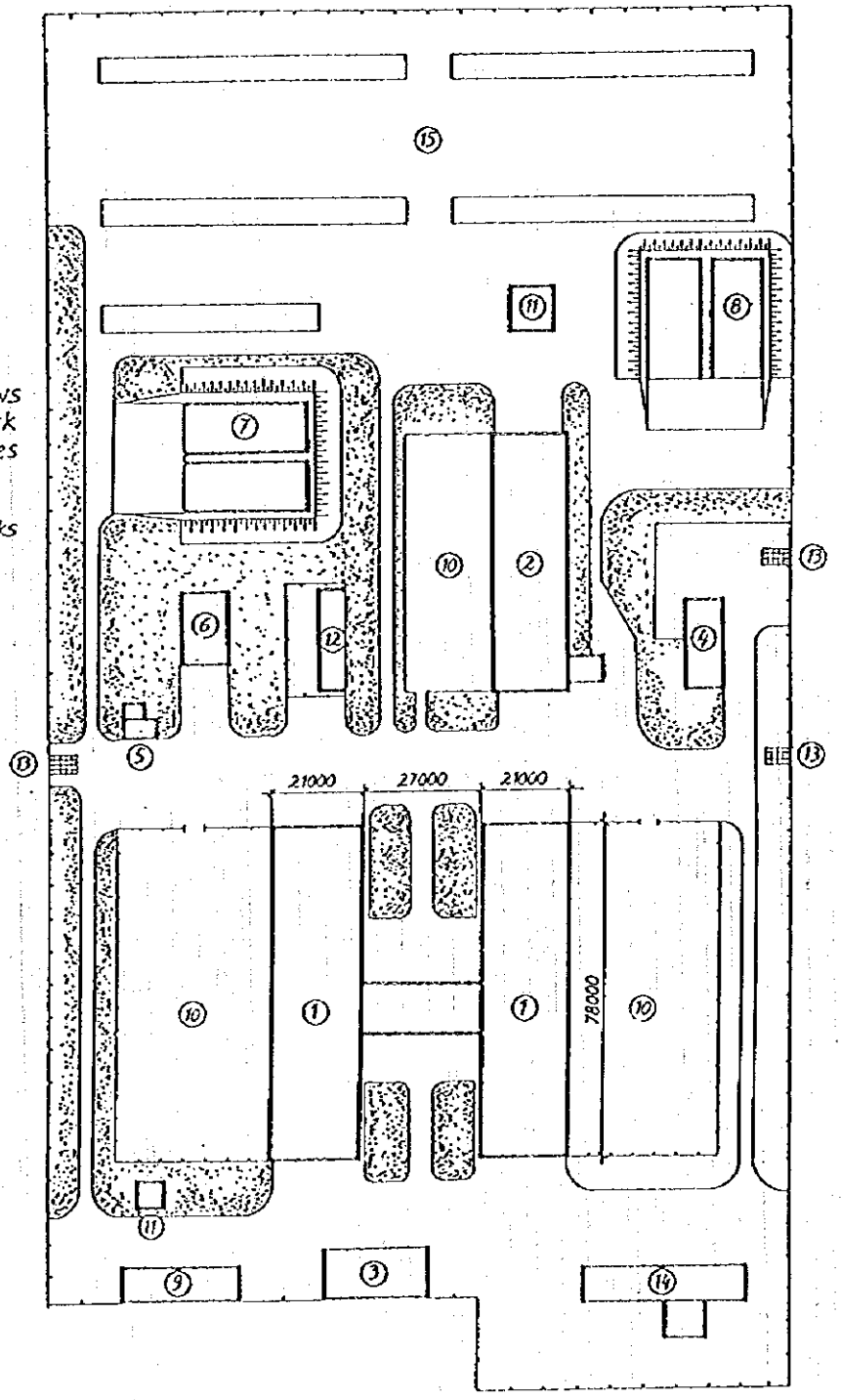


Figure-6.1.5.3 General Plan of Dairy Farm (Cow 400 heads: 200 heads×2)

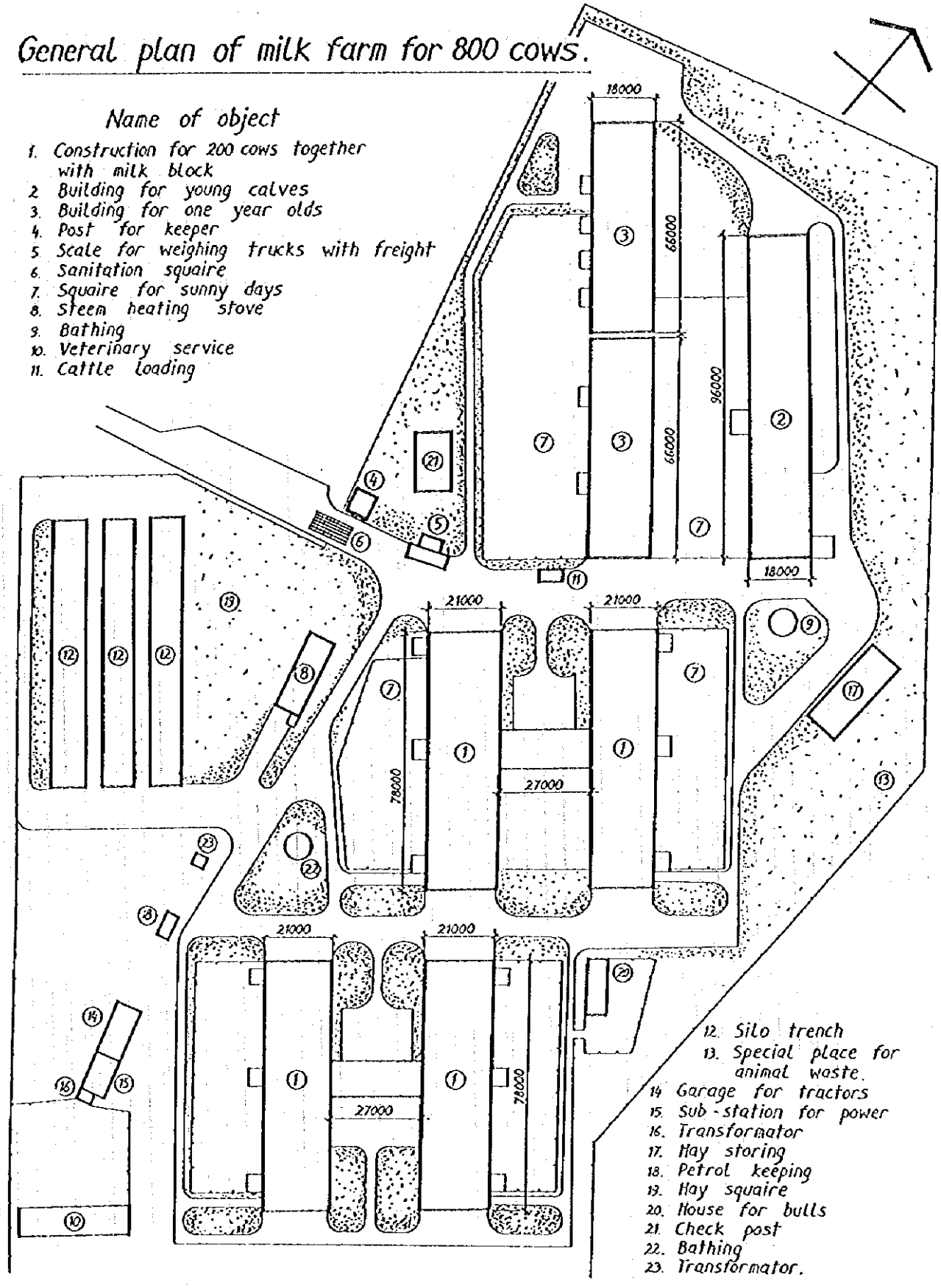
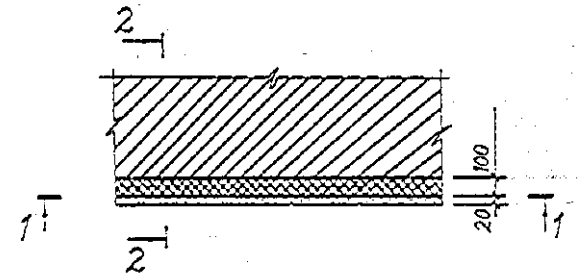
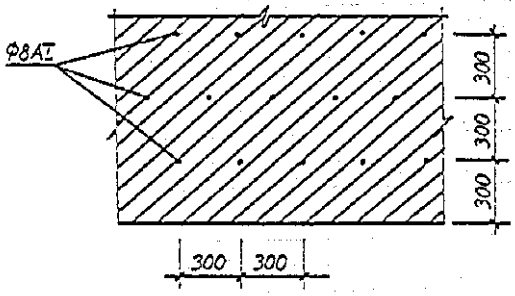


Figure-6.1.5.4 General Plan of Dairy Farm (Cow 800 heads: 200 heads×4)

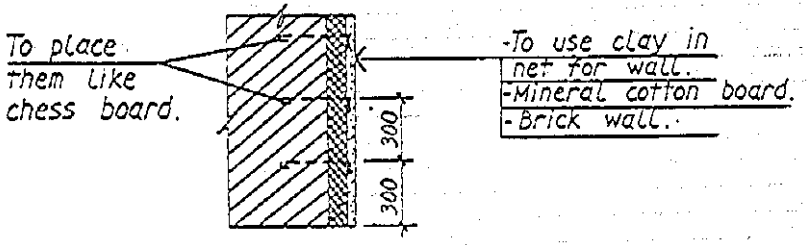
To make warm the brick wall



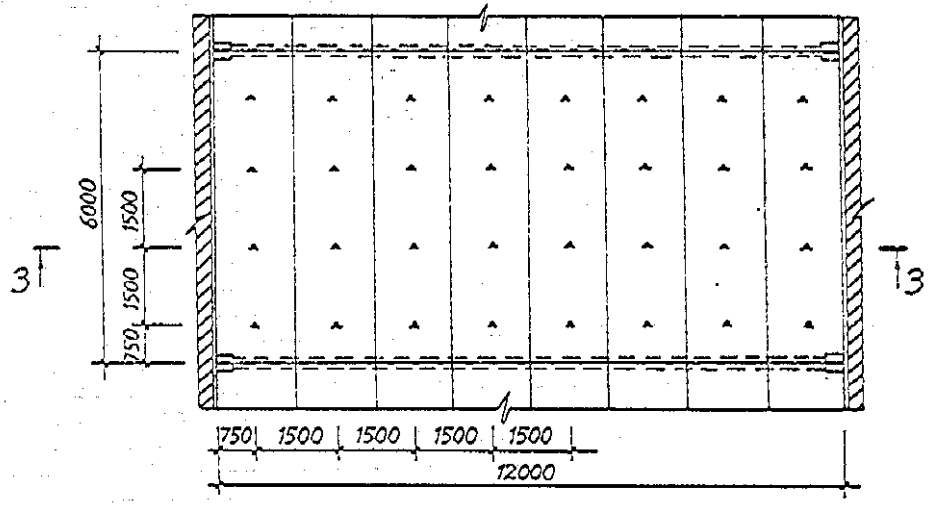
1 - 1



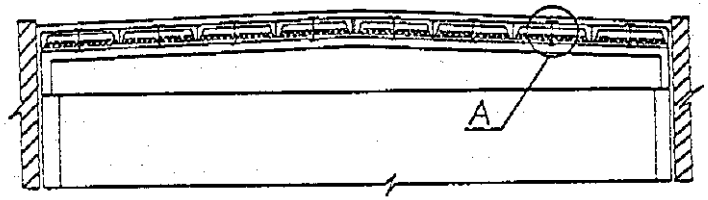
2 - 2



To make warm the congrete ceiling



3 - 3



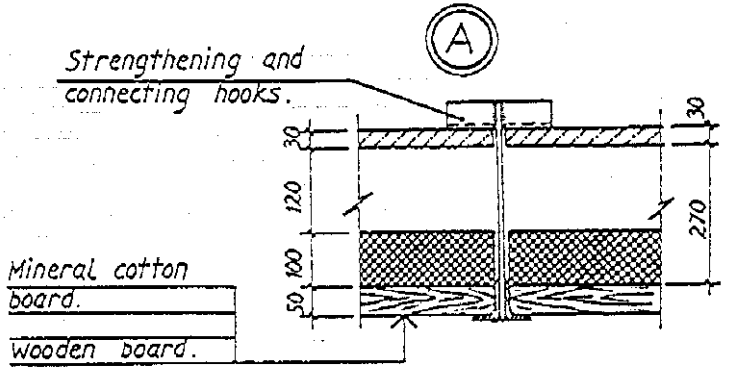


Figure-6.1.5.5 Construction Plan for an Insulation Work of the Barns

Fertilizer preparing compartment.

M1:200

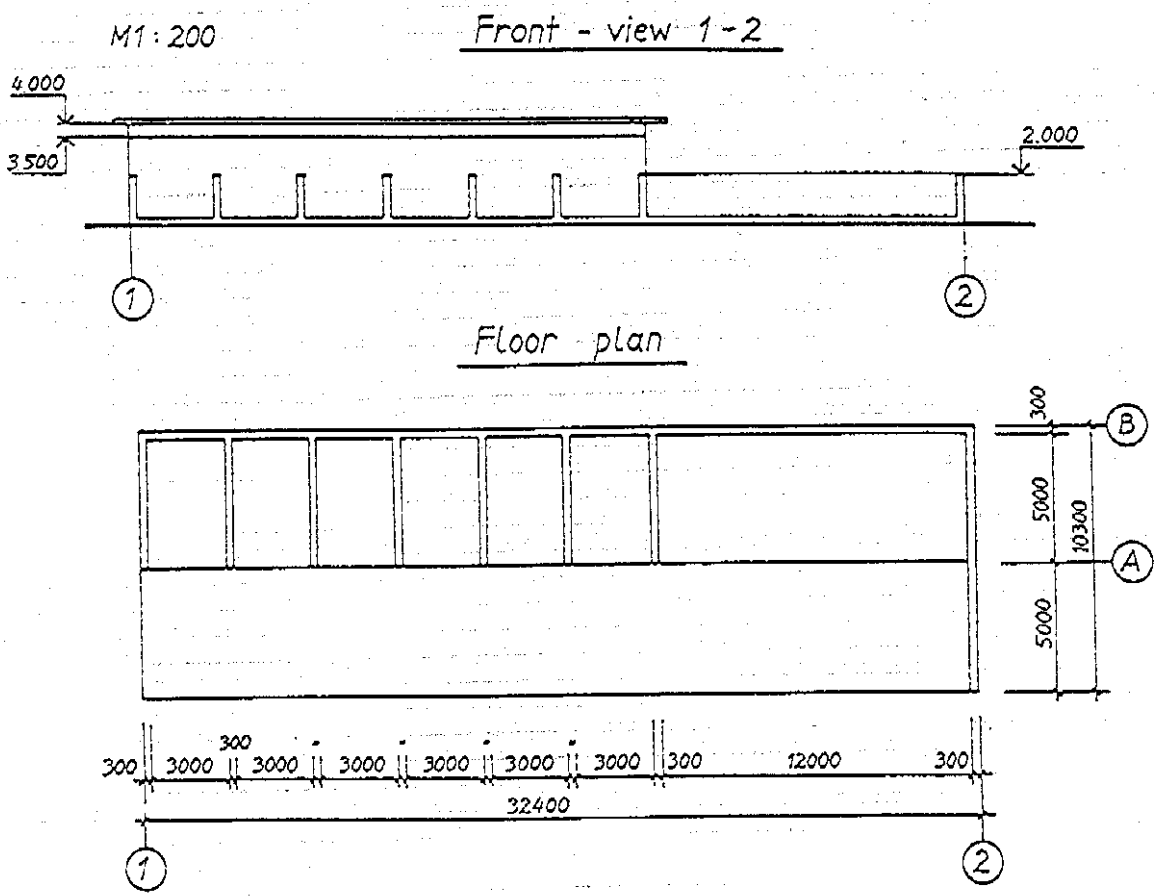
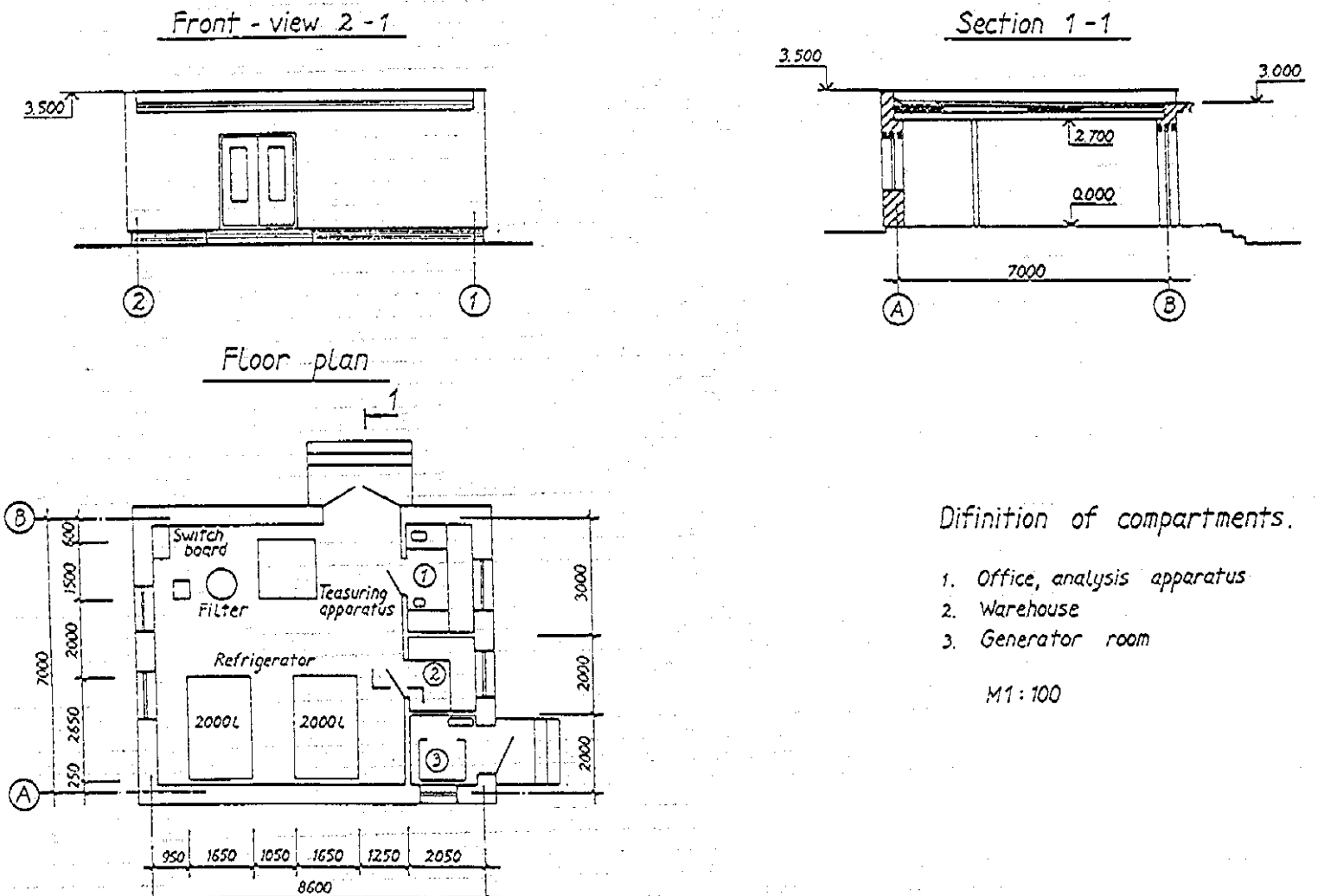


Figure-6.1.5.6 Construction Plan for a Compost Yard

Milk - storing block.



Difinition of compartments.

1. Office, analysis apparatus
2. Warehouse
3. Generator room

M1 : 100

Figure-6.1.5.7 Construction Plan for a Cooler Station

Figure-6.1.5.8 Problem Analysis for the Milk Production Increasing Project

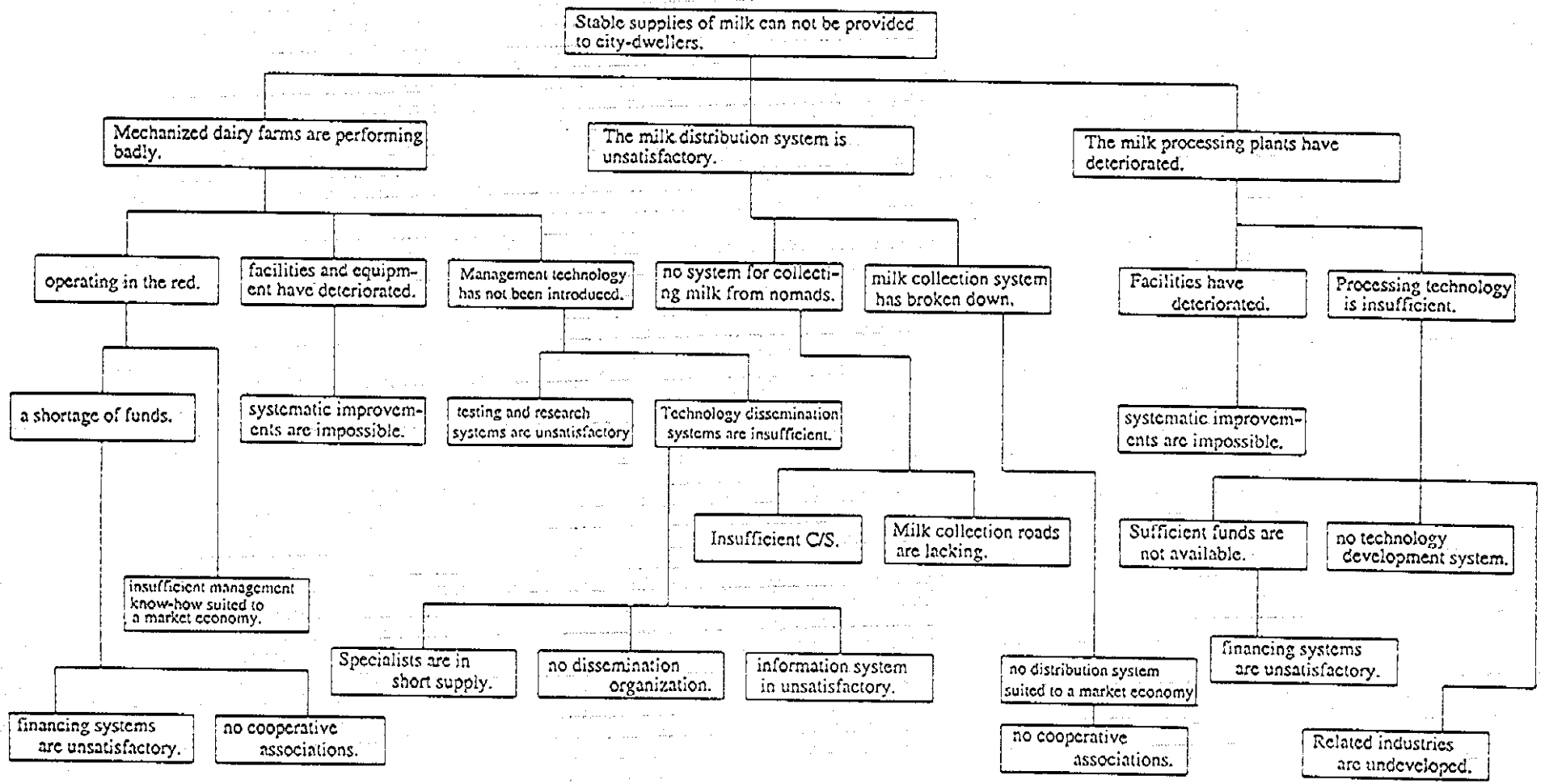
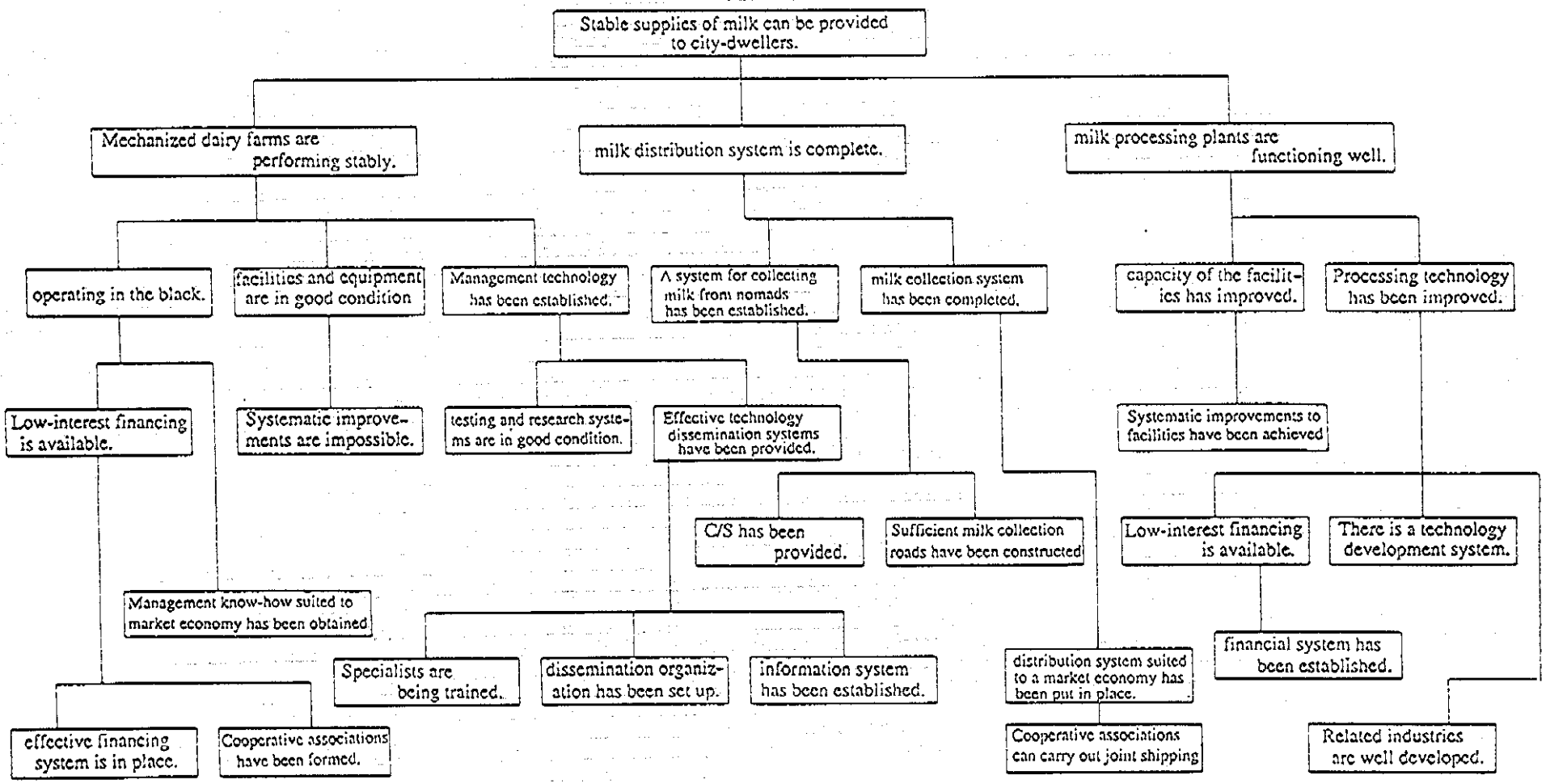


Figure-6.1.5.9 Objectives Analysis for the Milk Production Increasing Project



6.1.7 Construction Work Systems in Mongolia

1. Introduction

It is necessary to calculate the project costs in order to plan the implementation of the priority projects. Before calculating the project costs, an interview survey of concerned organizations was conducted in order to clarify the nature of the design, estimation, and execution systems provided in Mongolia for use when the national government conducts projects such as the construction of irrigation systems, roads, wells and other infrastructure facilities, as well as barns, processing facility structures, offices, etc. The results are described below.

2. Recent Trends

Confusion in Mongolia caused by the switch from a planned to a market economy has reduced investment in the country. This has been accompanied a fall in the amount of construction undertaken, with many technical experts leaving the construction field for other industries. The number of projects now in progress stands at about 50% of the past peak figure.

If the value of the production of construction materials in 1989 is assumed to equal 100, it now stands at 45. The building construction field is now flat, but with the enactment of the Law Concerning Foreign Investment in 1993, foreign investment in Mongolia began, indicating a future recovery. The construction industry is scheduled for rehabilitation in 1996 with the help of funds from the Asia Development Bank.

Under communist rule, every step from design to execution was carried out as a government project through a well-established construction system. With this system now split up and privatized, it is necessary to provide a qualification system to rank the capabilities of both companies and individuals.
A bidding system for construction contracts was introduced in March 1993, and committees are set up to handle bidding whenever a contract is completed with a foreign or a domestic company.

3. Design and Estimation

Design work is arranged by signing a contract with the City of Ulan Bator, a prefectural government, or with a specialized design company. Prefectures handle only small jobs.
Mongolia's first design standards were established in 1960 based on Russian standards. In the 1980s, these were partially modified at the same time as the Russian standards were revised, but basically the original standards are still in force. There are no standard design methods, except in the case of schools, hospitals, and some agricultural buildings, but because the construction of many of these facilities has been supported by assistance from foreign countries, there was assumed to be little need to establish unique standards suited to the natural conditions of Mongolia.

Estimation is the job of the company doing the design work. The estimation criteria, which were established by the Ministry of Infrastructure Development based on Russian standards in 1961, have remained in force without any significant revisions. The structure of construction costs is shown in Figure 6.1.7.1 And Table 6.1.7.1 presents a detailed breakdown of construction costs for ordinary construction.

The unit prices used for estimations are determined through consultations between the Ministry of Finance and the Ministry of Infrastructure Development in accordance with market trends. But following the switch-over to a market economy, the market is fluctuating wildly and prices are not fixed. The estimation personnel investigate unit prices at the factories of the suppliers. Under present circumstances, estimation are usually based on 1990 unit prices, with the computed direct construction costs multiplied by a price fluctuation factor to compensate for changes. The unit price of materials is similar in all prefectures, but when the cost of transporting materials from the factories where they are produced is included, the final price can double.

The organization carrying out a project and the party contracted to perform the design and estimation work both study the finished estimate. Then the estimation is submitted to a group of specialists in the Ministry of Infrastructure Development. After they have examined it, the estimate is finalized.

The standards for the design and estimation work are the property of the Building Construction Research Department at the Ministry of Infrastructure Development, and are not available to individuals.

4. Certification of Qualifications

After the 30 design organizations that existed in Mongolia in 1991 were split up into a total of 120 design offices including some managed by individuals, the country required a qualification system to rank these new companies and individuals according to their design capabilities. Companies have been issued qualifications since 1990, but according to government decision No. 260 of 1994, at least 30% of the employees of a company must be qualified for the company to be certified. In response to this decision, the issuance of qualifications to individuals began in 1995 (in accordance with government decision No. 35 and an Order of the Minister of Infrastructure Development). A total of 320 individuals have been certified under this system. To obtain this qualification, an applicant must pass a test administered by the Ministry of Infrastructure Development (held twice a year).

Turning to the construction company scene, there are now 330 companies in Mongolia, and they too have required certification of their qualifications since 1995 (in accordance with government decision No. 35 and Ministerial Notification No. 170).

Because these qualification certification systems have only been established recently, they are in need of improvement, and a government-ordered review is now in progress. The following are the qualifications which now require certification.

(Building Design)

Design qualifications in this category are not ranked, and about 40 persons are now certified as qualified building designers. The tests now administered examine the applicants' abilities in key 6 areas.

(Ordinary Civil Engineering Design)

Surveying qualifications are included among design qualifications. Designers are ranked at four levels from first class to fourth class

designer. First class and second class designers have to pass a government-administered examination. Third and fourth class designers can obtain certification based on their academic background and number of years of experience. Only first and second class designers may establish their own design company.

(Estimation)

The Ministry of Infrastructure Development recently ordered that certification is necessary to do estimation work. Two ranks of estimators are certified: first class and second class estimators.

5. Building Construction Materials

Mongolia is capable of supplying about 50% of the building construction materials it needs from its own plants. There are now 177 factories in Mongolia turning our building construction materials of various kinds, but most of these factories can not fully fill their roles because of a shortage of capital. In 1988 and 1989, when building construction material production in Mongolia peaked, these plants were operating at 78% capacity. But in 1995, their operating rates are down to between 35% and 39%. And material prices have more than doubled since that peak period. The country plans to build roads, irrigation systems, and electric power generators with the assistance of the Asia Development Bank. The Ministry of Infrastructure Development has prepared a material production and supply plan covering the period up to 2005 so that it will be possible for these projects to be completed.

A trading company will stock all the needed imported materials. This imported material, which will be transported to Mongolia by rail, must be ordered from Russia and China about a month before it is needed. Right now, work is underway on the expansion of warehouses which have been provided at zemenudo (Chinese border) and arutanburuga (Russian border) in preparation for an increase in the volume of imported materials. The importing of materials from China has been increasing for 3 or 4 years now, but as a legacy of the old Soviet system, large quantities continue to come in from Russia.

Quality control of building construction materials will continue to be performed in accordance with Russian standards as shown in Figure

6.1.7.2, but it is doubtful whether or not this control will be done strictly according to these standards.

Table 6.1.7.2 shows the state of production of principal building construction materials in Mongolia.

6. Construction Machinery

Cranes, excavation equipment, dump trucks, and similar construction machinery is available, but its deteriorated condition causes frequent break-downs, and it has to be repaired. It is sufficient for small-scale work, but it is doubtful if it is up to a large project.

7. Contracts

The Council of Ministers makes final decisions concerning contracts for design and estimation work whenever an order is placed either domestically or internationally. But because orders are placed with domestic companies only in the case of design and estimation of agriculture related projects, in many cases the contracts are offered to designated contractors. The value of contracts is governed by Ministry of Infrastructure Development standards based on the scale of each project, but in many cases, the final value is determined through negotiations between the contractor and the ministry.

A system of bidding for construction work contracts was introduced in March 1995. The bidding system is operated in the following manner (See Figure 6.1.7.3)

First the organization placing the order submits design drawings to the Ministry of Infrastructure and Development. The Ministry then uses television and the newspapers to announce bidding for the project. Next a committee is formed with 13 members including the Director of the Building Construction and Building Construction Materials Production Bureau of the Ministry of Infrastructure Development, other experts, and representatives of the company ordering the construction work. The contractors that wish to offer bids submit applications to the National Development Board. Then a list of expected bidders is prepared and

submitted to the committee. The members of the committee study the list to clarify the bid price, budget, and characteristics of the contractors, then selects the contractor by secret ballot from among those qualified to take part in the bidding. Depending on specific conditions, the bid accepted may be higher or may be lower than the estimated price.

But in fact, in many cases, the contract is offered to a contractor selected from those on a previously prepared list at a meeting of the Council of Ministers without any public announcement of the contract. And when a project is particularly small, the matter can be settled by a direct phone call.

8 Execution

The execution is supervised in one of two ways. In some cases, it is done either by the Building Construction and Technology Utilization Bureau or by personnel despatched by the bureau to supervise the execution. In other cases, the execution is supervised directly by the client. The latter method is the one most commonly applied. Supervisory personnel are certified as qualified supervisors in recognition of their academic background and work history, but the representatives of the Building Construction and Technology Utilization Bureau are selected in accordance with the National Management Law . Because many clients do not have experts in this field, the supervisory work is now contracted to groups specializing in construction work and supervision. These groups are formed by design company technical specialists with expertise in various related areas. The MOFA used to have a 40-member specialized group of this kind (Mongolian technical experts: 30, Foreign experts: 10), but it has been disbanded, and only 3 Mongolian experts remain.

The supervisor of the construction work remains on call to supervise the work throughout the construction period. If any doubtful point is encountered during the work, the designers are called to clear up the matter. And if an accident occurs during the construction work, personnel are sent from the Building Construction and Technology Utilization Bureau of the Ministry of Infrastructure Development to investigate the cause of the accident.

The execution of the supervision work is performed in accordance with Russian standards.

The final inspection is done by experts from the Sanitation Bureau (Ministry of Welfare), Fire Safety Bureau (Interior Ministry), the Building Construction and Technology Utilization Bureau (Ministry of Infrastructure Development), and the Environmental Protection Bureau (Ministry of Nature and the Environment), designers, and representatives of the client.
Standards have been established governing inspection methods and items to be inspected during the final inspections.

9. Related Laws, Regulations, Etc.

Various legal and regulatory restrictions apply to the planning and design of roads and other facilities. These include those enacted by the national government and others established by regional governments. The following are the principal laws and regulations.

[1] The Natural Resource Exploitation Law
[2] The Land Law
[3] The Natural Environment Law
[4] Cultural Property Preservation Law
[5] Forest Law

The provisions of the Land Law apply to the execution of construction work, but the construction of agricultural facilities is not restricted legally to any great degree, excepting the provisions of the Natural Environment Law.
And the national reference points used as the basis for survey work in Mongolia were set in each county between 1950 and 1960 with the assistance of Russia. This data is maintained at the National Measurement Center of the National Development Board, but their cooperation is not required in order to use the data.

10. Conclusion

More Efficient Estimation

A estimation method which clearly accumulates work costs from the foundation up is not used in Mongolia. To do an accumulation it would be necessary to read through many volumes of standards. This is believed

to be the case because the method used is based on hand calculation . Accurate and efficient estimation work would be possible by using computers. Research organizations must study ways to establish an improved estimation system in the future.

Provision of the Necessary Design Organizations

Although design work in Mongolia partially conforms to Mongolian standards, almost all standards applied are Russian in origin. But because the country's climatic, soil, and other conditions differ from those of Russia, it is necessary to modify the Russian standards to suit Mongolian conditions. In order to obtain and build up a broad range of technological information, it will be necessary to establish fully functioning research organization, train technical experts, and conduct technical exchange programs not only with Russia, but with other neighboring countries.

Improvement of Building Construction Capabilities

The building construction industry has to obtain new construction machinery because that which it has now has deteriorated and no longer functions properly. The industry must upgrade its domestic construction capabilities, including the improvement of its stock of construction machinery, in preparation for the anticipated investment of foreign capital and an increase in the number of large-scale construction projects implemented. Whenever roads or other infrastructure items or barns are to be constructed in Mongolia, two problems which must be the subjects of the most thorough studies are dealing with the severe weather conditions that appear in the winter months and obtaining construction machinery. Because the periods during which construction can be conducted are restricted by these severe winter conditions, the work must be properly supervised and use made of construction methods that shorten construction periods.

Improving Mongolia's Ability to Supply its Own Building Materials

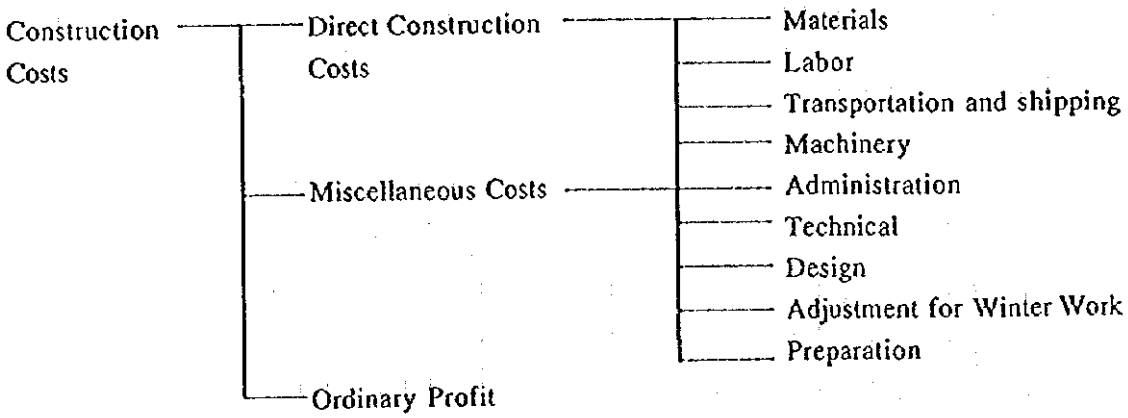
It is difficult for contractors to obtain the building materials they need. Building construction materials are transported by truck to construction sites from factories located at scattered locations

throughout the country. The poor condition of the highways in Mongolia mean that it takes a long time to receive these materials and the material loss is very high. An efficient supply of building materials can not be provided until the factories which produce them have been rehabilitated, transport routes improved, and either factories are opened or materials supply centers are established in key regions. And because quality control standards have been established for building materials, quality control must be thoroughly implemented and technology improved so that high quality products can be supplied.

Nurturing Skilled Workers

And in conclusion, it has been pointed out that the rapid switch to a market economy has been followed by a shortage of experienced workers and a decline in people's willingness to work, so steps must be taken to develop an experienced work force with high-level skills.

Figure 6.1.7.1 Structure of Construction Costs



Note 1: Fuel costs are included in machinery costs.

Note 2: Drivers' salaries and fuel costs are included in transportation and shipping costs.

Note 3: Taxes are included in direct construction costs.

Table 6.1.7.1 Breakdown of Construction Costs

Construction Costs	Distribution Ratio (%)			
	Irrigation Facilities	Roads	Wells	Barns
Direct Construction Costs	78.3%	79.6%	85.6%	91.8%
Materials	60.6%	5.8%	32.3%	75.4%
Domestically Produced Materials	3.5%	5.8%	13.5%	61.8%
Imported Materials	57.1%	-%	18.8%	13.6%
Equipment Ownership	5.4%	28.0%	26.4%	5.1%
Domestically Manufactured Equipment Ownership	-%	-%	-%	-%
Imported Equipment Ownership	5.4%	28.%	26.4%	5.1%
Fuel and Lubricants	7.0%	37.1%	13.7%	6.6%
Domestically Produced Fuel and Lubricants	-%	-%	%	-%
Imported Fuel and Lubricants	7.0%	37.1%	13.7%	6.6%
Labor	5.3%	8.7%	13.2%	4.7%
Unskilled Labor	4.0%	1.0%	10.9%	3.3%
Skilled Labor	-%	-%	0.9%	-%
Machinery Operators	1.3%	7.7%	1.4%	1.4%
Foreign Technical Experts	-%	-%	-%	-%
Indirect Construction Costs	21.7%	20.4%	14.4%	8.2%
Administrative and Miscellaneous Costs	18.5%	17.4%	10.5%	7.0%
Taxes and Subsidies	3.2%	3.0%	3.9%	1.2%
Totals	100.0%	100.0%	100.0%	100.0%

Note: Foreign Technical Experts are considered to be unpaid in the construction estimates because they are provided with the assistance of the government.

Table 6.1.7.2 State of Production of Principale Building Materials

Material	State of Production
Crushed Stone & Gravel	Quality and quanity differ from district to district. There are crushed stone,gravel,and sand washing and processing facilities at Ulaanbaatar and Darkhan.
Ready-mix Concrete	There are four suppliers in Ulaanbaatar,but the quality of their product is not consistent.
Secondary Concrete Products	Concrete factories were constructed in each prefecture in the 1970s with Russian support.Precast technology is used,but there are doubts about the quality of the products.
Steel Reinforcing Rods	There is a factory in Hotouru in Selenge Aimag.There was a factory operated jointly with a japanese company,but funding problems forced it to close in August 1995. Although rods are domestically manufactured, some are imported from Russia.
Pipes	They are imported from Russia.
Electrical Materials	They are imported from Russia.
Asphalt Mixtures	A plant has been constructed in Baruunharaa in Selenge Aimag to supply material for national roads. Although there is natural asphalt in Mongolia, in can not be used as a road surface finishing material. Asphalt needed for this purpose is imported from Russia.
Cement	Factories are located in Darkhan and Hotouru. A new factory is scheduled to be south part of the Gobi District.
Fuel	They are imported from Russia.

Figure 6.1.7.2 Quality Control Flow Chart

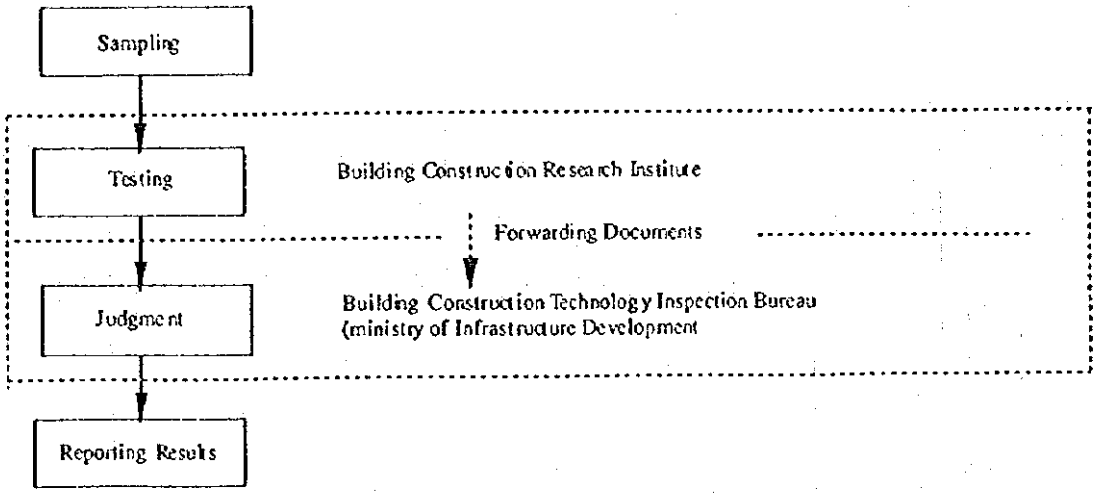


Table 6.1.7.2 shows the state of production of principal building construction materials in Mongolia.

Figure 6.1.7.3 Bidding Procesure Flow Chart

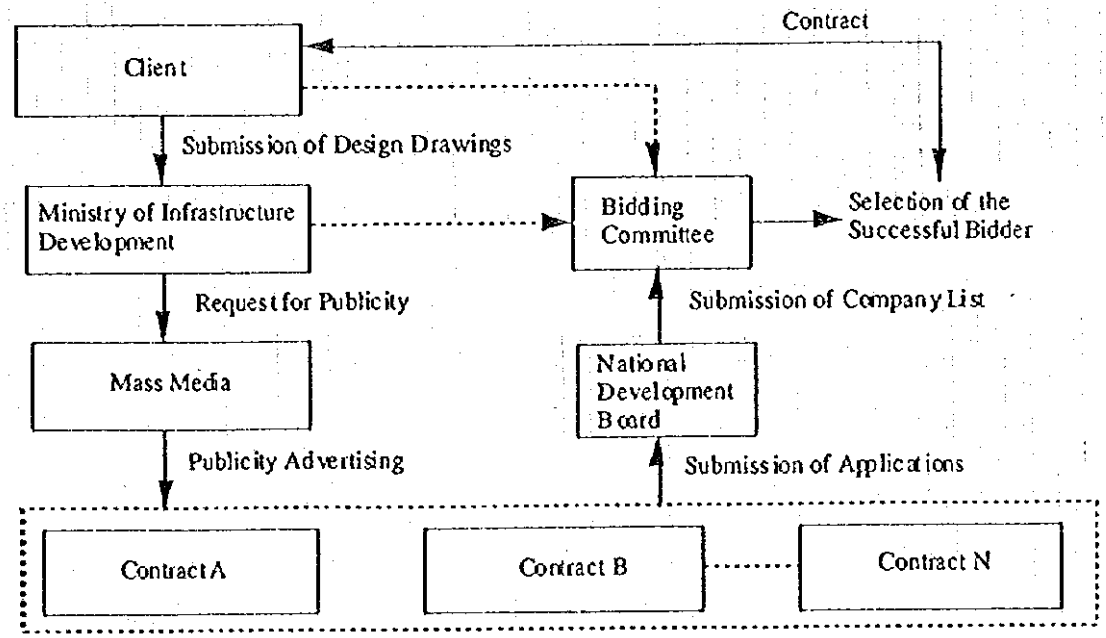


Table 6.2.1 Project Description

Project Description (PD) Form

Form 1

1. Study Title (Project Name)

The Master Plan Study on Integrated Agricultural and Rural Development in Central Region in Mongolia

2. Background Information and Objectives of Project

The central region is an important bace for the production of food ,both agricultural and livestock to the metoropolitan area. However,since the former Soviet Union has subststially withdrawn economic and techical assistance,agricultural production in Monglia has plummted due to a shortage of facilities,spare parts and production materials,resulting in an unstable supply of food for the people.

The objectives of the Study area to formulate a master plan on the agricultual and rural development for central region in the Mongolia which are located in the Aimag of Tov,Darkhanuul,Selenge,Orhon,Bulgun and Ovorhangai and the city of Ulaanbaatar,an area of 235,000km^2.

3. Brief Description of Project

Outline of Project Area	:	Northem part is forest and steppe of forest.Southern part is steppe.
Beneficiaries & Benefited Area	:	1,135,500 persons(City:830,900,Village:299,600) 23,565,000ha. Farm Land:787,000ha. Cultivated Land:418,500ha.Grass Land:18,606,000ha.Forest:3,527,000ha.
Major Project Components	:	Agricultulal Development(Improvement of Irrigation facilities,study of Irrigation system, Development of new Irrigation Area,Improve of Distributive Facilities,Introduction of New techniques for a rise of yield per hectare),Development of Livestock(Dairy Farming,pig and poultry farming,Maintenance passture land and glass resources,Agro.and Animal products Marketing & processing(Collection and Shipping cargo,Processing,Distribution system and so on facilities maintenance and improvement,Preparation of Rural infrastructure(Farm Road,Watter Supply,Small-scale Hydroelectric Power Generation),Impreovement of Faem management,Supporting system of farmer,Examination,Research and Extention service maintenance system
Executing Agencies	:	Minstry of Food and Agricultual
Environmental Agencies Concerned	:	Minstry of Nature and Environment

4. Major Components and Development Scale of Project

(1) Main Project Components (Development activity)	(2) Type of Project: New Project	(2) Type of Project: Rehabilitation	(3) Scale of Project: Area, etc.	(3) Scale of Project: Dimensions of major facilities	(4) Remarks
a. Irrigation	☒	☒	25,000 ha.	Small Scale Dam, Farm Pond, Head Works Pump, Irrigation Canal, Sprinkler	
b. Drainage	☐	☐	- ha.		
c. Land clearing & leveling	☐	☒	unfixed ha.	Wind Break, Protection soil loss	
d. Sea/swamp reclamation	☐	☐	- ha.		
e. Land consolidation	☐	☒	51,400 ha.	Farm Road	
f. New land settlement	☐	☐	- households		
g. Dam and reservoir	☐	☒	Number of reservoirs reservors;	Reservoir area ha. Storage capacity m^3	
h. Substantial changes in farming system	☒	☒	5,000 ha.	Name of new crops rape seed, suger beet	
i. Other	☒	☒	Well 151place	Small scale flour milling, Feed facilties, Sugar refining Oil refining, Well	

Table 6.2.2 Site Description

Site Description (SD) Form - 1/2

Form 2

1 Study Title (Project Name)
The Master Plan Study on Integrated Agricultural and Rural Development in Central Region in Mongolia

2 Present Socio-economic Status of Project Area

(1) Land ownership and land use, etc. : A new law concerning the land system will be promulgated on April 1, 1995. An urban resident can own up to 0.05 hactare of land to build on and up to 0.5 ha of land for a household vegitable garden. Such ownership is valid for a maximum period of 60 years and can be extended once for 40 years at the longest. Farm land is leased for 5 to 25 years. Land development is decided by the goverment. Forest land can be used as the pasture accrding to relevant law and regulations.

(2) Economic activities in and around the project area : In the capital city of Ulaanbaatar economic activity flourishes revolving around a coalfueled thermal power plant and light industries such as food industrial complex and livestock processing factories.Darkhan and Erdenet have developed as industrial and mining cities.Rural region has two types of population :farmers who seasonally migrate within a county for grassland graze livestock.

(3) Customs (riparian rights, water rights etc.) : The area for grazing is allotted by the county head according to the practice.

(4) Host people or community : Since the planned economy had taken root in the country, many nomads no longer migrated and became factory workers in cities or employees of state farms. Those who led nomadic life were state workers in charge of pasturage. Since the country's changover into market economy, the gravitation of population towards cities has been accelerated.

(5) Public health conditions : There are contagious disease such as hepatitis and pest that is carried by marmots.

(6) Population :

(7) Other : All the social economic functions center in Ulaanbaatar, which has hindered the development of local economy.There is gap in social and economic power between urban and rural areas.

3 Natural Conditions of Project Area

(1) Climate : The region has a climate peculiar to the steppe extending from the Russian boarder in the north to the Gobi Desert.

(2) Topography : The capital city of Ulaanbaatar, situated at 1,300 meters above the sea level, forms the boundary between northern and southern landforms of the country. Towards the north a high undulating plateau expands to the Russian boarder at 600m above the sea; towards the south the landform changes from flat grassland to desert.

(3) Hydrology and drainage conditions : The Orhon River's tributaries are used for irrigation in the neighboring areas including the northern part of Ovolhangai. The Orhon River and disappear and the Serenge River flow into Lake Baikal. Rivers in the south dry up and disappear into the Gobi Desert even in a rain season.

(4) Soils : The land used for cultivation has mostly carbonated powdery black and brown soil.

(5) Vegetation : The northwest and northeast parts of the region are mostly the forest land; towards the south vegetation becomes less.

(6) Rare species or fragile ecology : The government protects endangered species of wild fauna and flora and seven preserves totaling 1,560,000hectares.

(7) Other : The region stretches long from north to south comprising natural and deserts.

Site Description (SD) Form - 2/2

Form 2

4 Environmentally Sensitive Areas in Project Site or Vicinity

Environmentally Sensitive Area	Applicable or Not					
	In Project Area			Vicinity of Project Area		
	Appl.	N.A	Unknown	Appl.	N.A	Unknown
Area under specific designation						
S1. Habital of fauna flora listed in CITES	☐	☐	☒	☐	☐	☒
S2. Wetland designated under the Ramsar Convention	☐	☒	☐	☐	☒	☐
S3. Heritage sites listed in the World Heritage Convention						
S4. National parks, nature reserves, etc.	☒	☐	☐	☒	☐	☐
S5. Other( )	☐	☐	☐	☐	☐	☐
Socioeconomically sensitive areas						
S6. Areas inhabited by indigenous peoples, ethnic minorities, nomads, etc.	☒	☐	☐	☒	☐	☐
S7. Historical remains, cultural assets, aesthetic sites	☒	☐	☐	☒	☐	☐
S8. Area likely to suffer from significant negative economic impact	☐	☐	☒	☐	☐	☒
S9. Other( )	☐	☐	☐	☐	☐	☐
Environmentally sensitive natural land						
S10. Arid and semi-arid lands (including savanna, rangeland, etc.)	☒	☐	☐	☒	☐	☐
S11. Tropical rain forest and wildlands	☐	☒	☐	☐	☒	☐
S12. Wetlands or peat lands	☒	☐	☐	☒	☐	☐
S12.1 Wetlands	☒	☐	☐	☒	☐	☐
S12.2 Peat lands	☐	☐	☒	☐	☐	☒
S13. Coastal zones	☐	☒	☐	☐	☒	☐
S13.1 Mangrove forests	☐	☒	☐	☐	☒	☐
S13.2 Coral reefs	☐	☒	☐	☐	☒	☐
S14. Mountainous, steep-sloped, erodible or devastated lands	☒	☐	☐	☒	☐	☐
S15. Closed water bodies such as lakes, swamps or reservoirs	☒	☐	☐	☒	☐	☐
S16. Other( )	☐	☐	☐	☐	☐	☐

5 Other Information

5)Remarks and examples of important effects on the environment brought about by the development of the surveyed region, its vicinity and similar areas:

a)Pasturage has been damaging vegetation in the outskirts of cities and around wells, which has led to erosion. There is a sign of deterioration in the natural grassland due to the increased traffic on the unpaved roads.

b)A few saline deposits are found at the high water level in some underground water.

c The government is preparing to ratify the Washington Convention.

d The exact number of endangered species is not known yet. It is necessary to investigate the area affected by the industrial activity and the buffer zones.

Table 6.2.3 Screening Checklist

Checklist for Joint Screening (1)

Form 6

1 Study Title (Project Name) :The Master Plan Study on Integrated agricultural and Rural Development in central in Mongolia

2 Name of Country : Mongolia

3 Criteria for Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) in Recipient Country

Main Project Components (Development Activity)	Type of Project (Type of Activity)	Development Scale: Initial Environmental Examination (IEE)	Environmental Impact Assessment(EIA)
Irrigation	New project	N.A ha or more	N.A ha or more
	Rehabilitation	N.A ha or more	N.A ha or more
Drainage	New project	N.A ha or more	N.A ha or more
Land clearing & levelling	-ditto-	N.A ha or more	N.A ha or more
Sea/swamp reclamation	-ditto-	N.A ha or more	N.A ha or more
Land consolidation	-ditto-	N.A ha or more	N.A ha or more
New land settlement	-ditto-	N.A households or more	N.A households or more
Dam and reservoir	-ditto-	Reservoir area: N.A ha or more Storage capacity: N.A m^3 or more	Reservoir area: N.A ha or more Storage capacity: N.A m^3 or more
	Rehabilitation	Reservoir area: N.A ha or more Storage capacity: N.A m^3 or more	Reservoir area: N.A ha or more Storage capacity: N.A m^3 or more
Substantial chnages in farming system	New project	N.A ha or more	N.A ha or more
Other		N.A ha or more	N.A ha or more

4 Area under Specific Designation

Environmentally Sensitive Area	Applicable or Not: In Project Area Appl.	In Project Area N.A	In Project Area Unknown	Vicinity of Project Area Appl.	Vicinity of Project Area N.A	Vicinity of Project Area Unknown
a. Habitat of fauna and flora listed in CITES	☒	☐	☐	☒	☐	☐
b. Wetland designated in Ramsar Convention	☐	☐	☒	☐	☐	☒
c. Heritage sites under the world Heritage Convention	☐	☒	☐	☐	☒	☐
d. National park, nature reserve, etc.	☒	☐	☐	☒	☐	☐
e. Other( )	☐	☐	☐	☐	☐	☐

Note:It should be noted that there may be cases where a final decision to abandon a particular development study is reached through field survey and discussion with concerned officials in the recipient country, if (i) the project area is located within one of the areas of specific designation in (4) above, or (ii) the results of screening indicated that the peoject will have a range of significant and adverse environmental impact.

Checklist for Initial Screening (2)

Form 3

5 Checklist for Initial Screening

Environmental Issues	Potential SEI	Evaluation	Evaluation Bases
I. Social Environment			
1. Socio-economic Issues The Project significantly affects socio-economic activities in and around the Project site, such as daily human life, economic activities, transportation, community, institution, and customary practices.	1. Planned residential settlement 2. Involuntary resettlement 3. Substantial changes in way of life 4. Conflict among communities or peoples 5. Impact on native peoples 6. Population increase 7. Drastic change in population composition 8. Changes in bases of economic activities 9. Occupational change and loss of job opportunity 10. Increase in income disparities 11. Adjustment and regulation of water or fishing (riparian) rights 12. Changes in social and institutional structures 13. Changes in existing institutions and customs	(Yes) No Unknown	
2. Health and Sanitary Issues The Project significantly affects hygiene in and around the Project area or induces water-related diseases.	1. Increased use of agrochemicals 2. Outbreak of endemic diseases 3. Spreading of epidemic diseases (schistosomiasis, malaria, onchocerciasis, elephantiasis) 4. Residual toxicity of agrochemicals 5. Increase in domestic and other human waters	(Yes) No Unknown	
3. Cultural Asset Issues Some historically, culturally, aesthetically or scientifically important assets may be located in the Project site.	1. Impairment of historic remains and cultural assets 2. Damage to aesthetic sites	(Yes) No Unknown	
II. Natural Environment			
4. Biological and Ecological Issues Some habitats for rare species or ecologically sensitive areas are located in the Project or surrounding areas.	1. Changes in vegetation 2. Negative impacts on important or indegenous fauna and flora (extinction of or decrease in species) 3. Degradation of ecosystems with biological diversity 4. Proliferation of exotic and/or hazardous species 5. Destruction of wetlands and peatlands 6. Encroachment into tropical rainforests and wildlands 7. Destruction or degradation of mangrove forests 8. Degradation of coral reefs	(Yes) No Unknown	
5. Soil and Land Resources The Project significantly induces land devastation, soil erosion, soil contamination, ect.	1. Soil erosion 2. Soil salinization 3. Degradation of soil fertility 4. Soil contamination by agrochemicals and others 5. Devastation or desertification of land 6. Devastation of hinterland 7. Ground subsidence	(Yes) No Unknown	
6. Hydrology and Air and Water Quality The Project significantly affects hydrological regime of river, lake and swamp, groundwater hydrology, and air or water quality.	1. Changes in surface water hydrology 2. Changes in groundwater hydrology 3. Inundation and flooding 4. Sedimentation 5. Riverbed degradation 6. Impediment of inland navigation 7. Water contamination and deterioration of water quality 8. Water eutrophication 9. Salt water intrusion 10. Changes in temperature of water 11. Air pollution	(Yes) No Unknown	
7. Landscape and Mining Resources The Project significantly affects landscape or mining resources.	1. Damage to landscape 2. Impediment of mining resource exploitation	Yes No (Unknown)	
Overall Evaluation:		(Yes) No Unknown	

Evaluation Bases

I.1 Social-Economic Issues

Probably nomadic lifestyle will change and the disparity in income will expand.

I.2 Health and Sanitary Issues

Due to the cool climate, there is no serious contagious disease or endemic. However, it is possible that the environment will be affected by the disposal of livestock's excrement and industrial waste.

I.3 Cultural Asset Issues

The subject region has historic relics and spectacular sights.

II.4 Biolobical and Ecological Issues

The region has no large marsh, tropical forest, mangrove or coral reef, but has some areas where there are endangered species but no human activity.

II.5 Soil and Resources

Many phenomena, such as erosion, saline water and deteriorating soil, show a probability that some spots in the southern area, for example, around wells, will turn into deserts.

II.6 Hydrology and Air and Water Quality

Underground water is the main resource but is not plenty.

Table 6.2.4 **Checklist for Joint Scoping (1)** Form 7

1) Applicable development activities:
Irrigation; Drainage; Land clearing and leveling; Sea/swamp reclamation; Land consolidation; New land settlement; Dam and reservoir, or Substantial change in farming system

2) Applicable development type:
New project or Rehabilitation

3) Applicable environmentally sensitive area:
Arid and semi-arid lands; Tropical rain forest; Wildlands; Wetlands; Peat lands; Coastal zones; Mangrove forests; Coral reefs; Mountainous, steep sloped, erodible, or devastated lands; or Closed water bodies in the upstream or downstream

(Irrelevant items in the above are deleted)

I. Social Environment

Category of Environmental Impact	Evaluation of SEI 1/ A	B	C	D	Evaluation Base 2/
1. Socio-economic Issues					
(1) Social Issues					
1. Planned residential settlement				○	
2. Involuntary resettlement				○	
3. Substantial changes in way of life		○			
4. Conflict among communities and peoples				○	
5. Impacts on native peoples		○			
6. Other					None
(2) Demographic Issues					
1. Population increase		○			
2. Drastic change in population composition				○	
3. Other					None
(3) Economic Activities					
1. Changes in bases of economic activities		○			
2. Occupational change and loss of job opportunity		○			
3. Increase in income disparities		○			
4. Other					None
(4) Institutional and Custom Related Issues					
1. Adjustment and regulation of water or fishing (riparian) rights				○	
2. Changes in social and institutional structures		○			
3. Changes in existing institutions and customs		○			
4. Other					None
2. Health and Sanitary Issues					
1. Increased use of agrochemicals			○		
2. Outbreak of endemic diseases			○		
3. Spreading of epidemic diseases			○		
4. Residual toxicity of agrochemicals				○	
5. Increase in domestic and other human wastes		○			
6. Other					None
3. Cultural Asset Issues					
1. Impairment of historic remains and cultural assets			○		
2. Damage to aesthetic sites			○		
3. Other				○	
					None

1/ Applicable columns with the following impact degree are marked with "○"
A: The subject SEI is unquestionably induced by the Project
B: The subject SEI is likely to be induced by the Project
C: There is no possibility of the subject SEI being induced by the Project
D: The SEI is not fully known

2/ Potential impact, etc., are filled in referring to Appendix A. "Significant Environmental Impacts and Issues"

Checklist for Joint Scoping (2)

Form 7

1) Applicable development activities:
Irrigation; Drainage; Land clearing and leveling; Sea/swamp reclamation; Land consolidation; New land settlement; Dam and reservoir, or Substantial change in farming system

2) Applicable development type:
New project or Rehabilitation

3) Applicable environmentally sensitive area:
Arid and semi-arid lands; Tropical rain forest; Wildlands; Wetlands; Peat lands; Coastal zones; Mangrove forests; Coral reefs; Mountainous, steep sloped, erodible, or devastated lands; or Closed water bodies in the upstream or downstream

(Irrelevant items in the above are deleted)

II. Natural Environment

Category of Environmental Impact	Evaluation of SEI 1/ A	B	C	D	Evaluation Base 2/
4. Biological and Ecological Issues					
1. Changes in vegetation		○			
2. Negative impacts on important or indigenous fauna and flora		○			
3. Degradation of ecosystems with biological diversity		○			
4. Proliferation of exotic and/or hazardous species			○		
5. Destruction of wetlands and peatlands			○		
6. Encroachment into tropical rain Forests and wildlands.			○		
7. Destruction or degradation of mangrove forests			○		
8. Degradation of coral reefs			○		
9. Other					None
5. Soil and Land Resources					
(1) Soil Resources					
1. Soil erosion		○			
2. Soil salinization		○			
3. Degradation of soil fertility		○			
4. Soil contamination by agrochemicals and others			○		
5. Other					None
(2) Land Resources					
1. Devastation or desertification of land		○			
2. Devastation of hinterland		○			
3. Ground subsidence			○		
4. Other					None
6. Hydrology and Air and Water Quality					
(1) Hydrology					
1. Changes in surface water hydrology		○			
2. Changes in groundwater hydrology		○			
3. Inundation and flooding		○			
4. Sedimentation		○			
5. Riverbed degradation			○		
6. Impediment of inland navigation			○		
7. Other					None
(2) Water Quality and Temperature					
1. Water contamination and deterioration of water quality			○		
2. Water eutrophication			○		
3. Salt water intrusion			○		
4. Change in temperature of water			○		
5. Other					None
(3) Atmosphere					
1. Air pollution					
2. Other					None
7. Landscape and Mining Resources					
1. Damage to landscape			○		
2. Impediment of mining resources exploitation					None

1/ Applicable columns with the following impact degree are marked with "○"
A: The subject SEI is unquestionably induced by the Project
B: The subject SEI is likely to be induced by the Project
C: There is no possibility of the subject SEI being induced by the Project
D: The SEI is not fully known

2/ Potential impact, etc., are filled in referring to Appendix A. "Significant Environmental Impacts and Issues"