

2) Basic Design Drawing

For both sites of Harhorin and undrkhan, following drawings are prepared:

	<u>Harhorin</u>	<u>Undrkhan</u>
a) Layout plan	Figure 4-07	Figure 4-17
b) Flow chart	Figure 4-08	Figure 4-18
c) Plan	Figure 4-09	Figure 4-19
d) Cross section · Elevation (1)	Figure 4-10	Figure 4-20
e) - " - (2)	Figure 4-11	Figure 4-21
f) - " - (3)	Figure 4-12	Figure 4-22
g) - " - (4)	Figure 4-13	Figure 4-23
h) - " - (5)	Figure 4-14	Figure 4-25
i) - " - (6)	Figure 4-15	Figure 4-26
j) - " - (7)	Figure 4-16	Figure 4-27

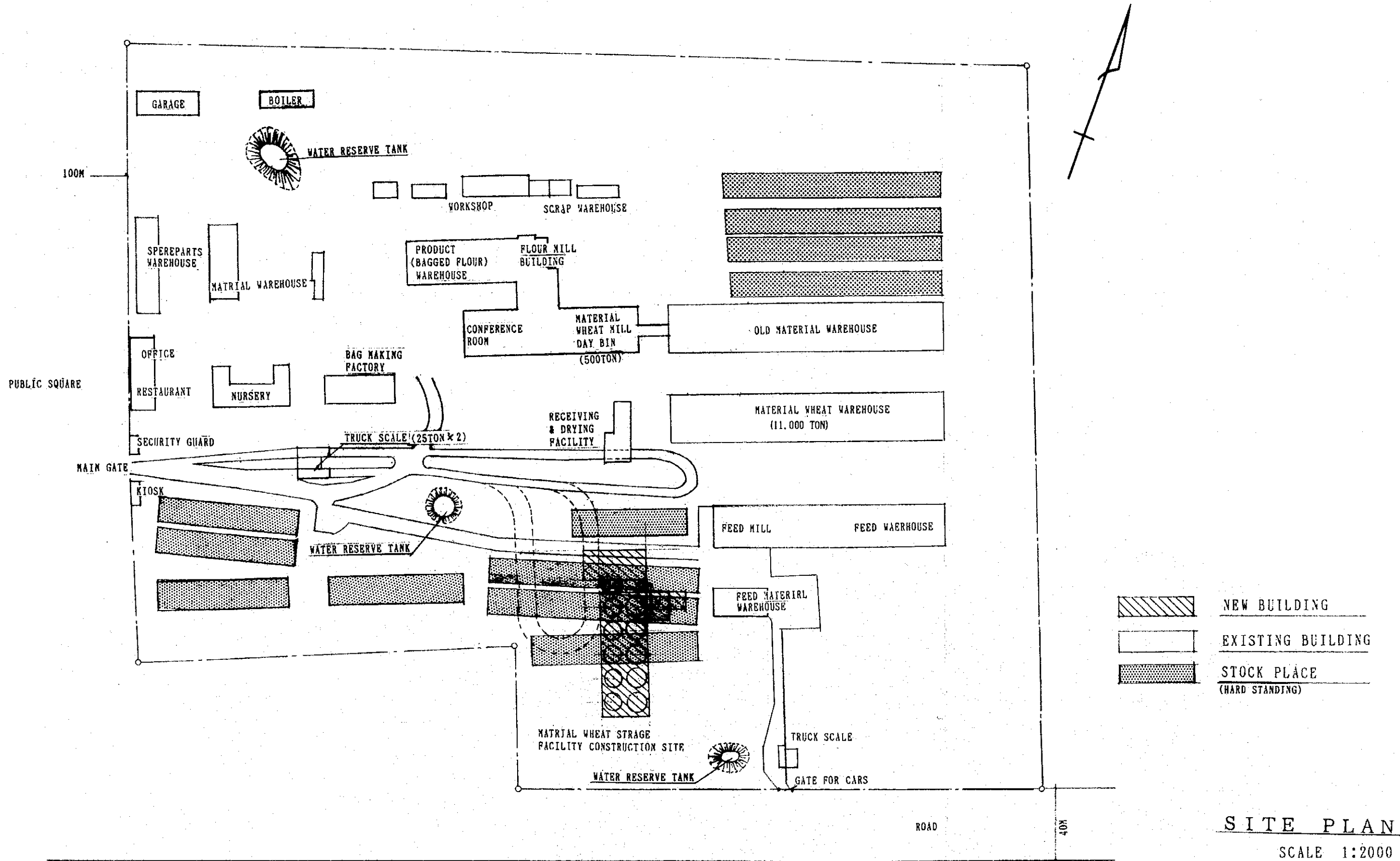
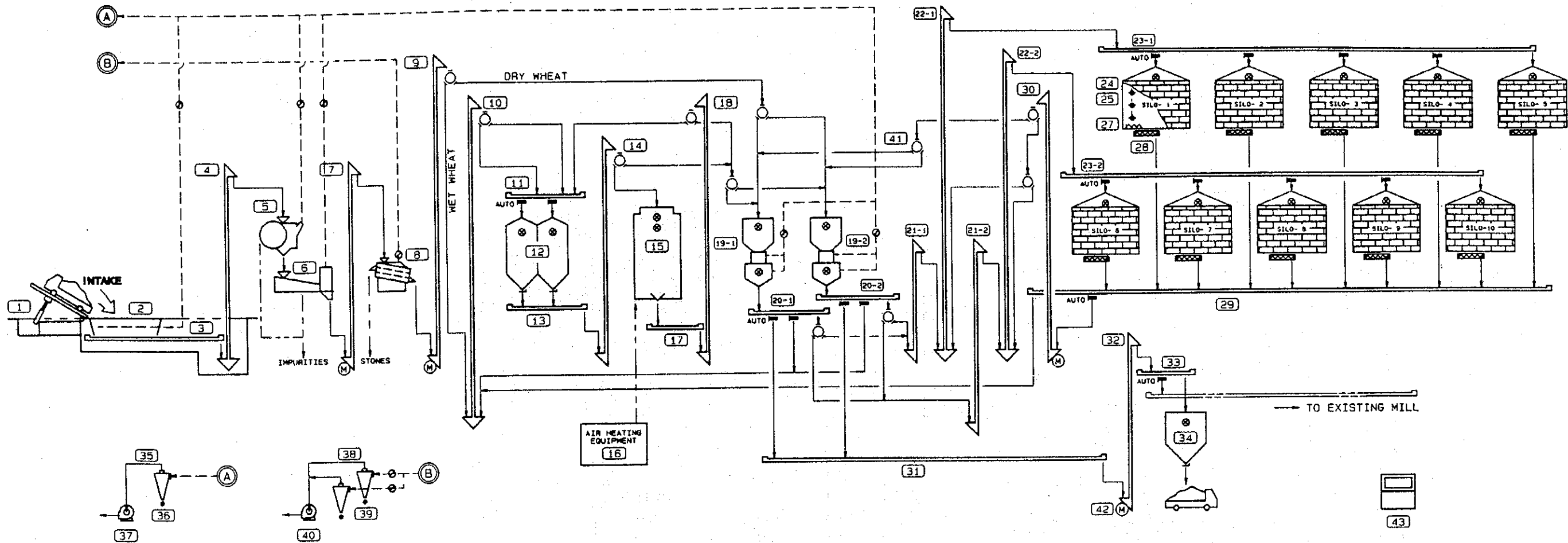


Figure 4-07 Layout plan

HARHORIN (カラコルム)



I/NO	DESCRIPTION	Q'TY	REMARKS	I/NO	DESCRIPTION	Q'TY	REMARKS	I/NO	DESCRIPTION	Q'TY	REMARKS	I/NO	DESCRIPTION	Q'TY	REMARKS
1	DUMPING DEVICE	1		15	DRYER	1		24	STORAGE SILO	10		38	CYCLONE	2	
2	INTAKE HOPPER	1		16	AIR HEATING EQUIPMENT	1		25	THERMOMETER	30		39	AIR LOCK VALVE	2	
3	CHAIN CONVEYOR	1		17	CHAIN CONVEYOR	1		26	NIL	-		40	DUST SUCTION FAN	1	
4	BUCKET ELEVATOR	1		18	BUCKET ELEVATOR	1		27	DISCHARGE AUGER	10		41	CHANGE VALVE	11	
5	REVOLVING SCREEN SEPARATOR	1		19-1	WEIGHER	1		28	DISCHARGE AUGER	10		42	MAGNET SEPARATOR	4	
6	SEPARATOR WITH ASPIRATOR	1		19-2	WEIGHER	1		29	CHAIN CONVEYOR	1		43	CONTROL PANEL	1	
7	BUCKET ELEVATOR	1		20-1	CHAIN CONVEYOR	1		30	BUCKET ELEVATOR	1					
8	DESTONER	1		20-2	CHAIN CONVEYOR	1		31	CHAIN CONVEYOR	1					
9	BUCKET ELEVATOR	1		21-1	BUCKET ELEVATOR	1		32	BUCKET ELEVATOR	1					
10	BUCKET ELEVATOR	1		21-2	BUCKET ELEVATOR	1		33	CHAIN CONVEYOR	1					
11	CHAIN CONVEYOR	1		22-1	BUCKET ELEVATOR	1		34	SHIPPING TANK	1					
12	RECEIVING TANK	2		22-2	BUCKET ELEVATOR	1		35	CYCLONE	1					
13	CHAIN CONVEYOR	1		23-1	CHAIN CONVEYOR	1		36	AIR LOCK VALVE	1					
14	BUCKET ELEVATOR	1		23-2	CHAIN CONVEYOR	1		37	DUST SUCTION FAN	1					

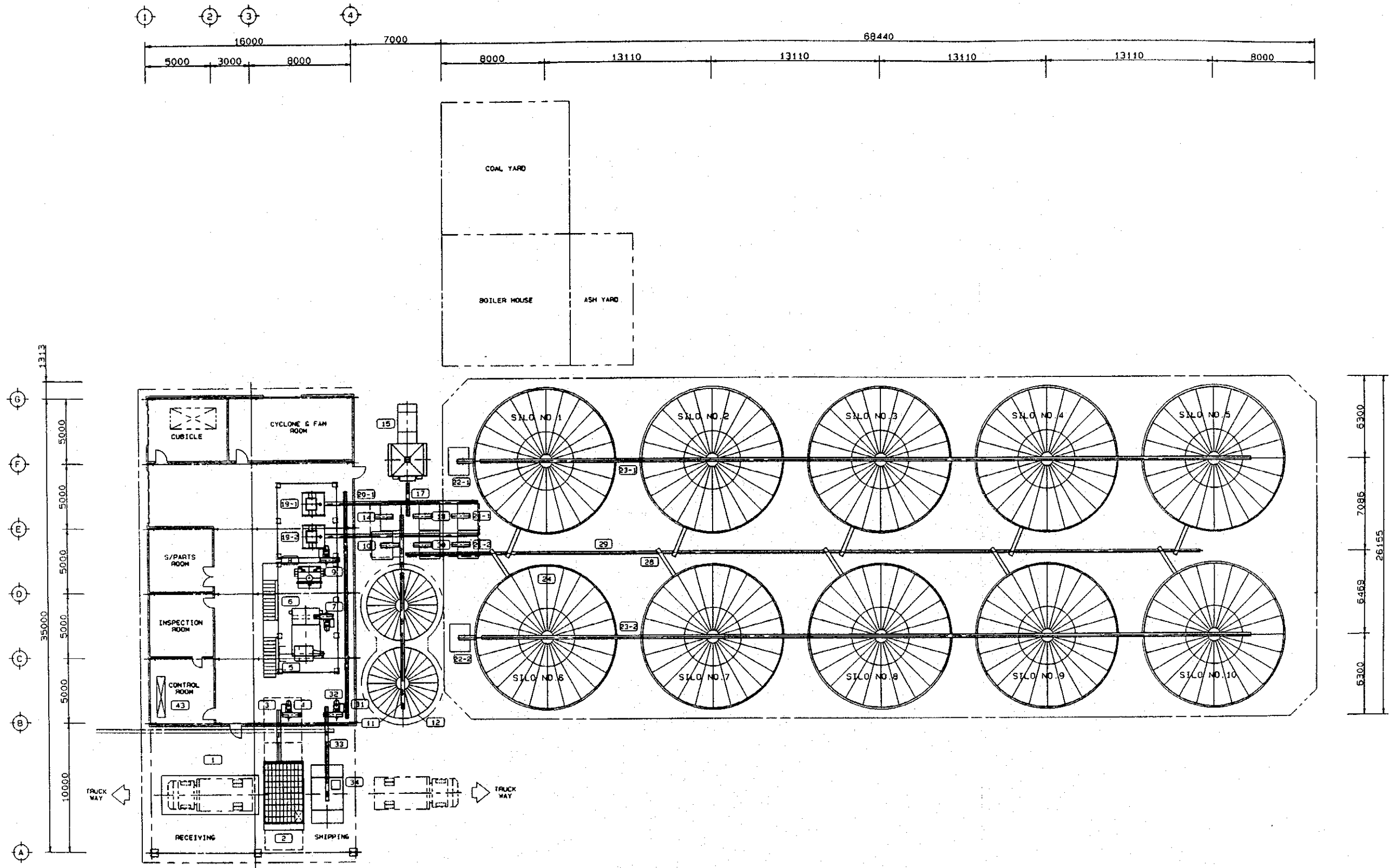
SYMBOL

	SHUTTER (AUTO.)
	SHUTTER (MANU.)
	LEVEL DETECTOR
	THERMOMETER
	DAMPER
	MAGNET SEPARATOR
	CHANGE VALVE

FLOW CHART

Figure 4-08 Flow chart

HARHORIN (カヲコルム)

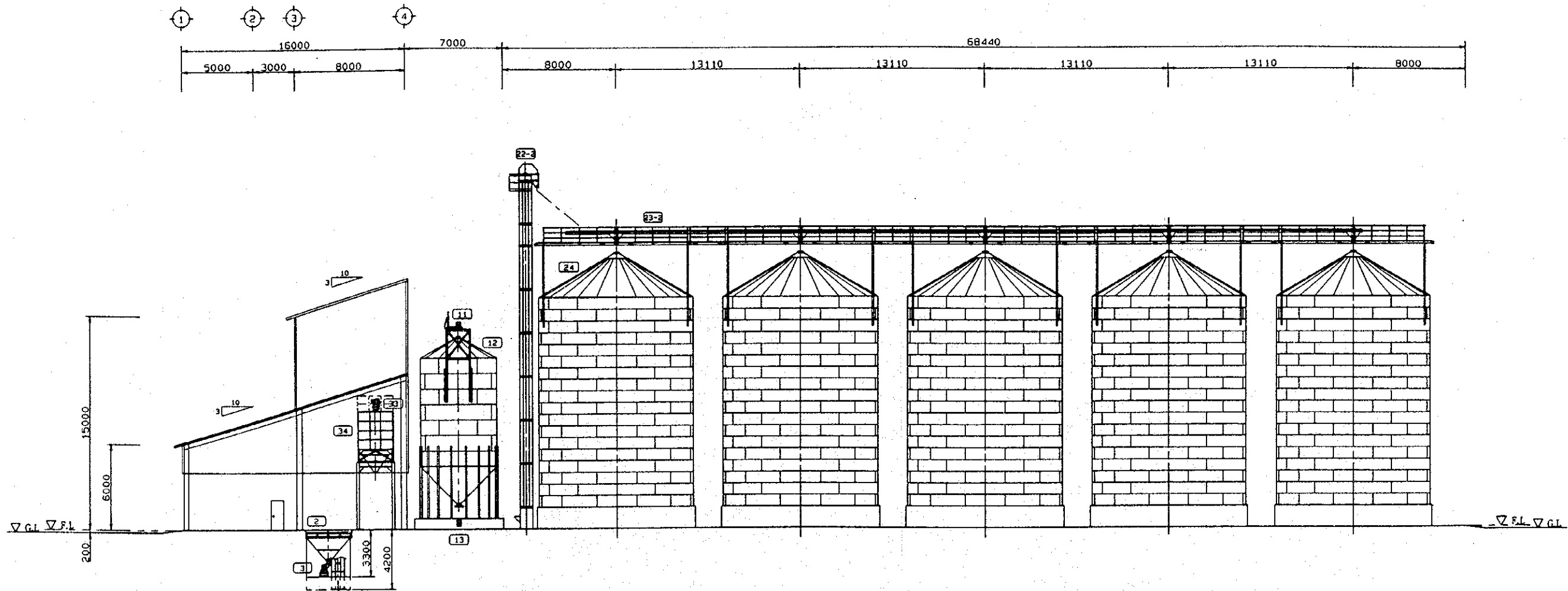


PLAN

SCALE 1:300

Figure 4-09 PLAN

HARHORIN (カヲコルム)

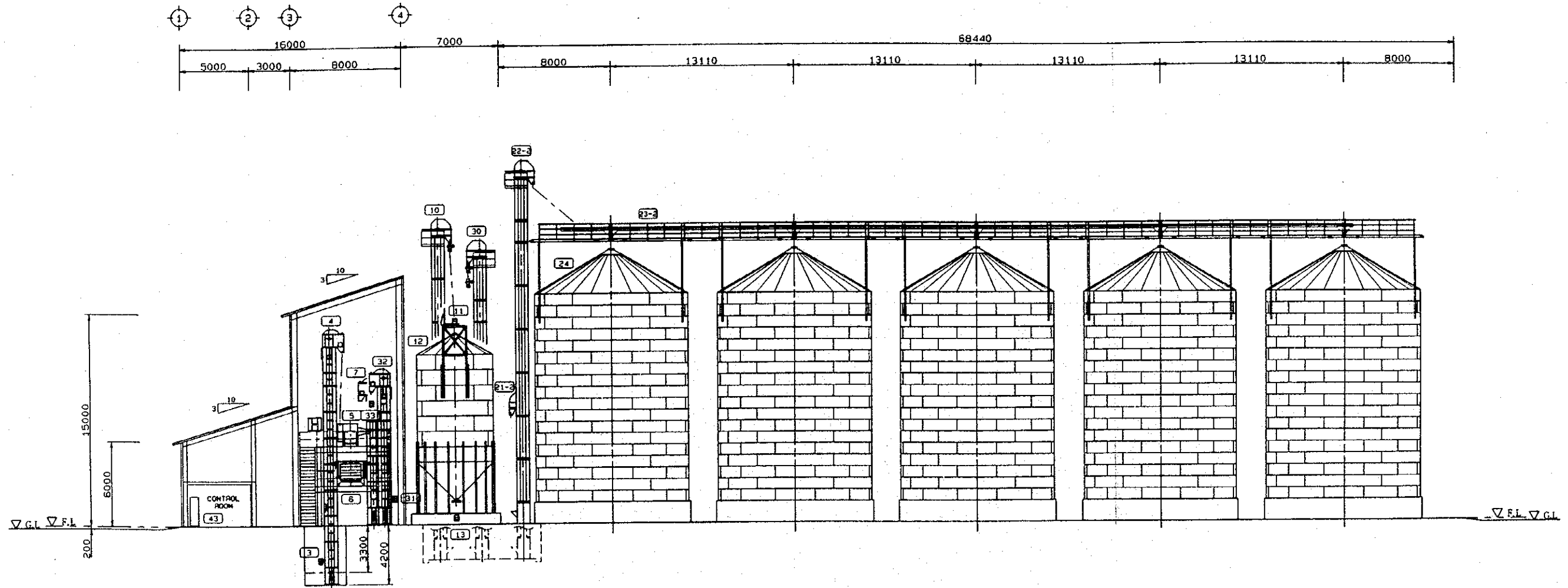


CROSS SECTION/ELEVATION(1)

SCALE 1:300

Figure 4-10 CROSS SECTION/ELEVATION (1)

HARHORIN (カヲホルム)

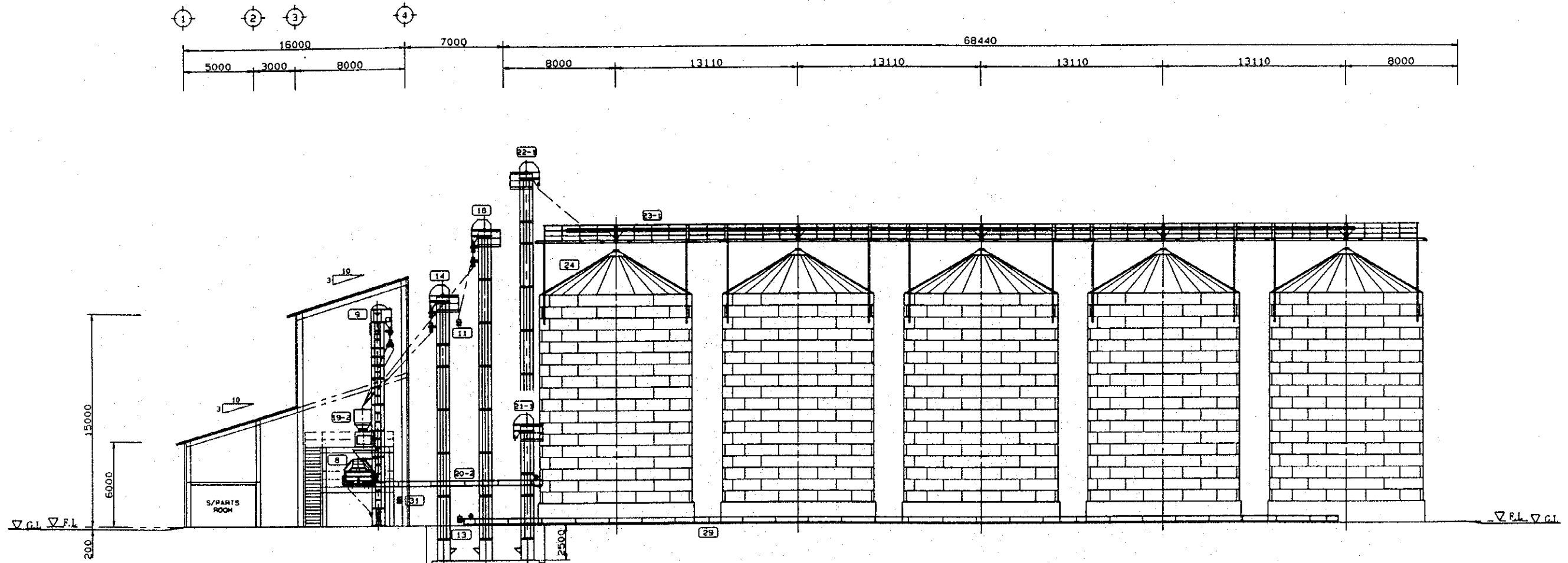


CROSS SECTION/ELEVATION(2)

SCALE 1:300

Figure 4-11 CROSS SECTION/ELEVATION (2)

HARHORIN (カウコム)

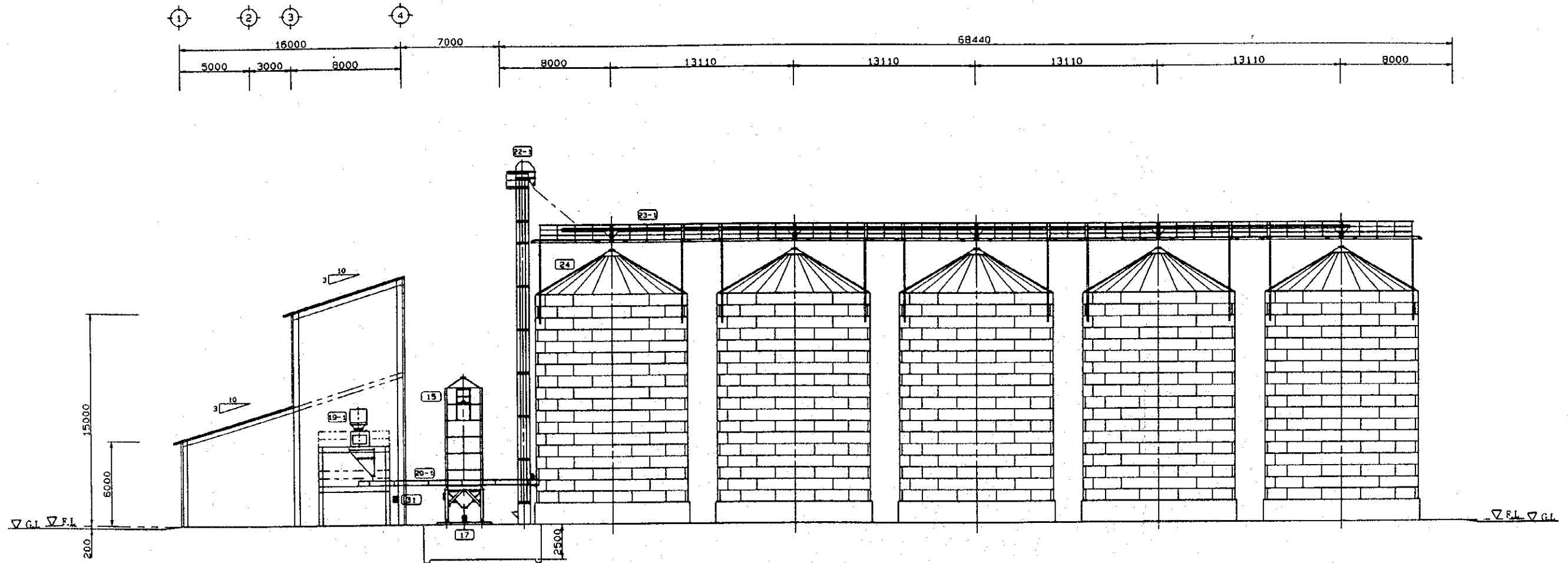


CROSS SECTION/ELEVATION(3)

SCALE 1:300

Figure 4-12 CROSS SECTION/ELEVATION (3)

HARHORIN (カヲルム)

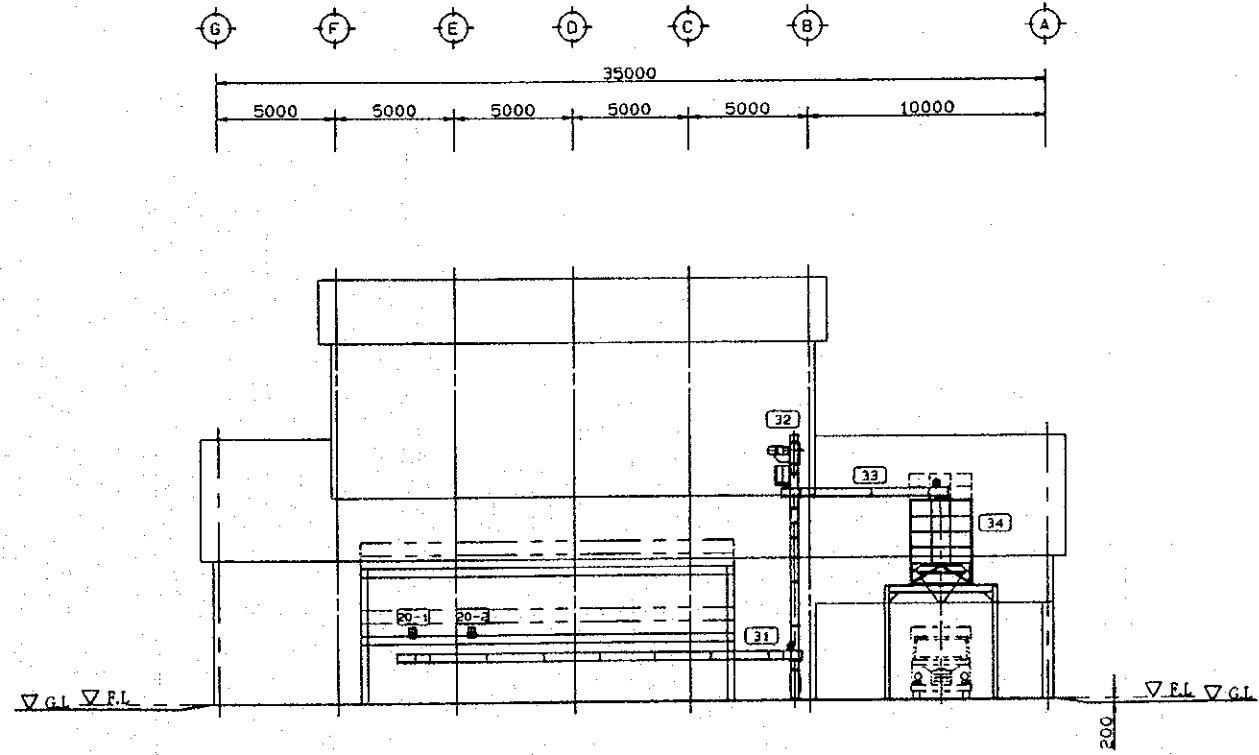
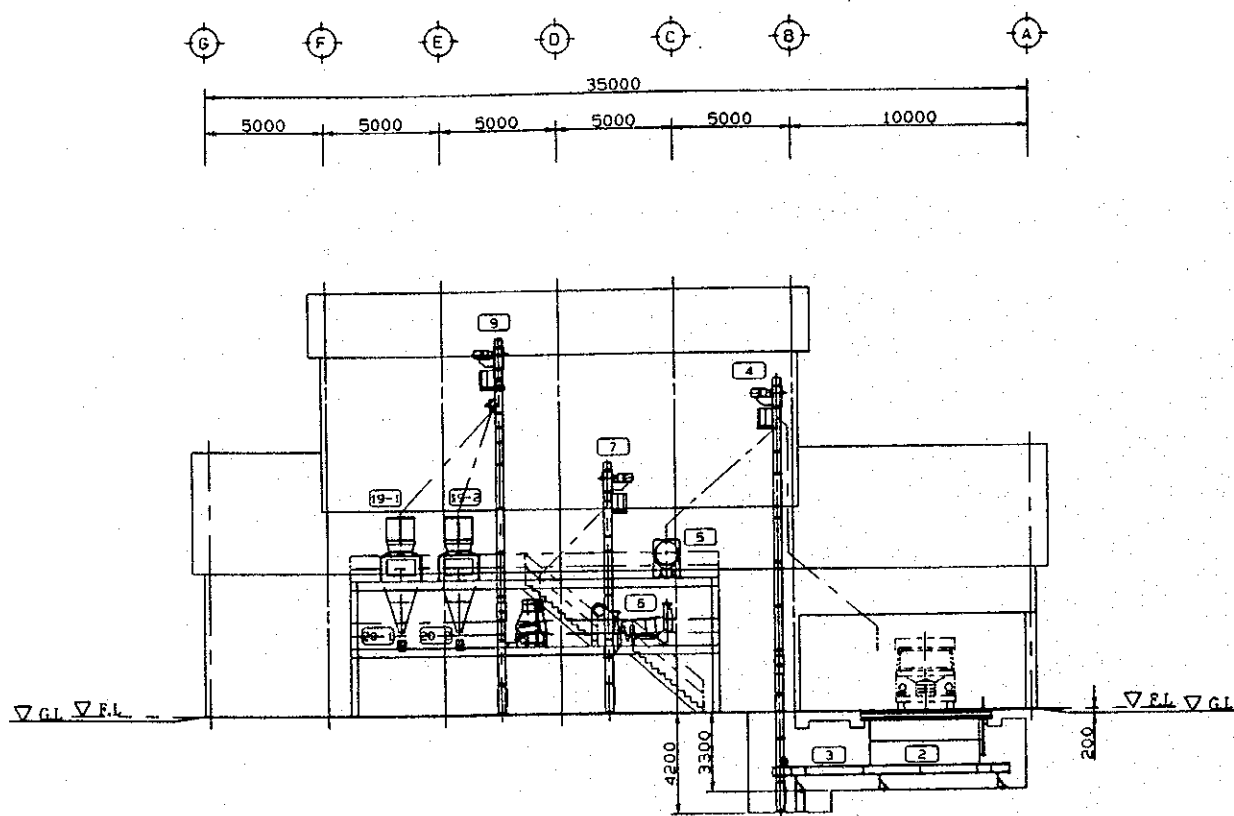


CROSS SECTION/ELEVATION(4)

SCALE 1:300

Figure 4-13 CROSS SECTION/ELEVATION (4)

HARHORIN (カラコルム)

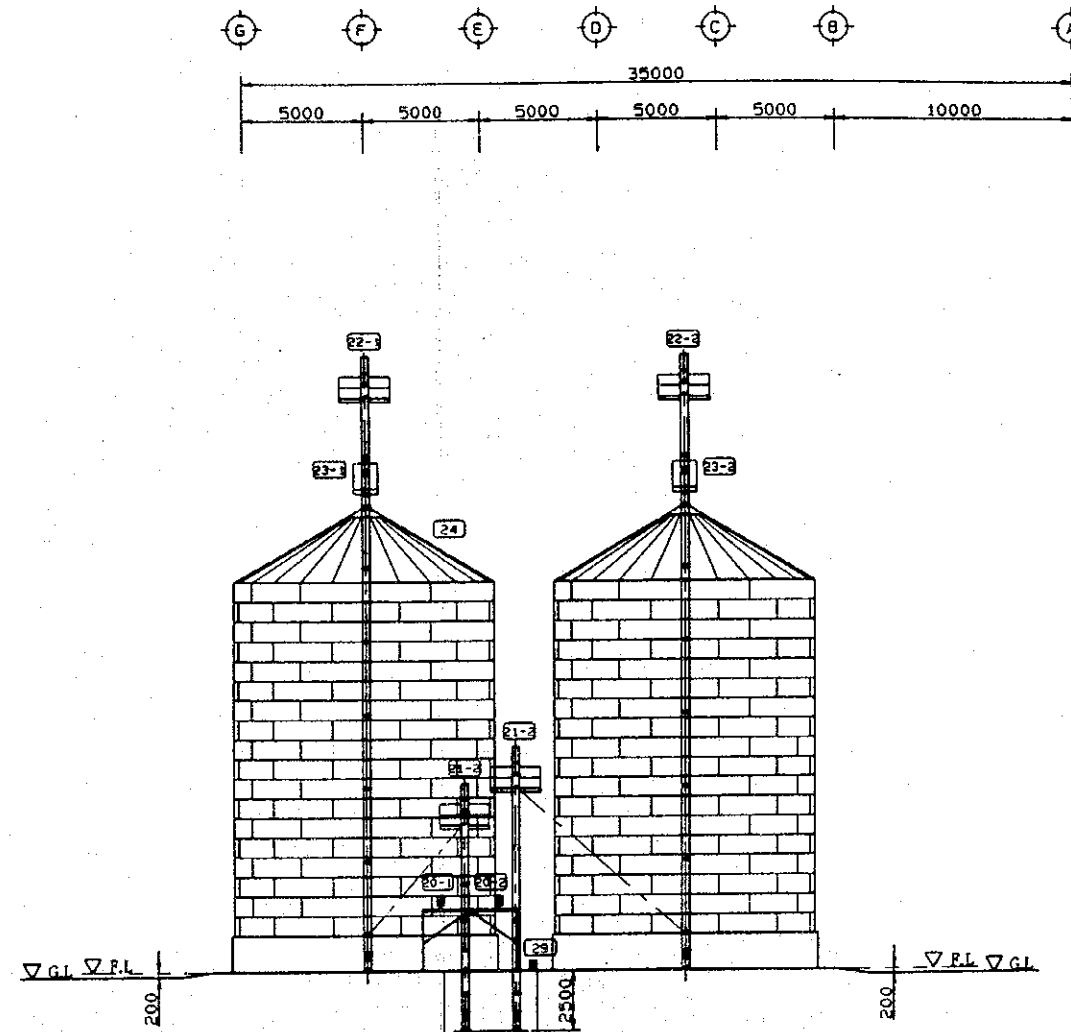
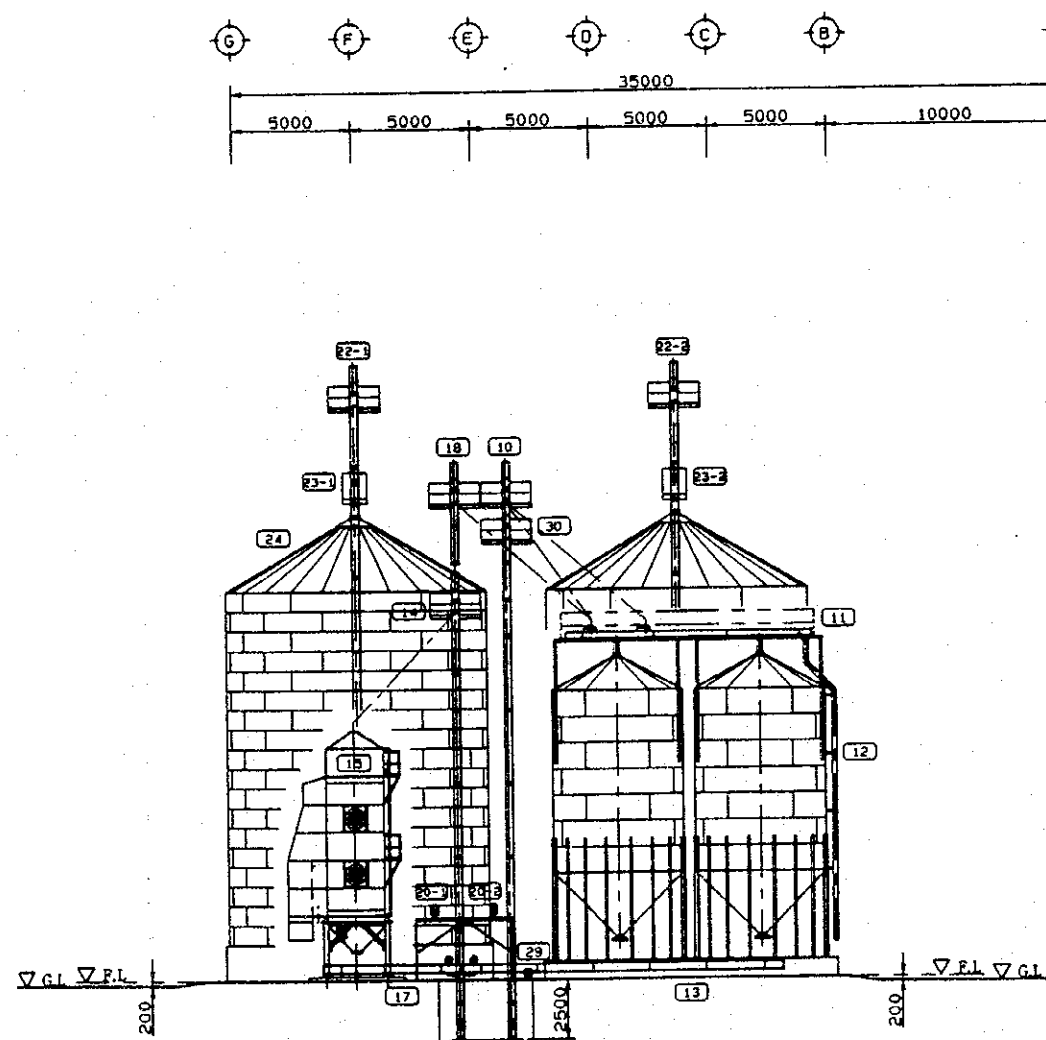


CROSS SECTION/ELEVATION(5)

SCALE 1:300

Figure 4-14 CROSS SECTION/ELEVATION (5)

HARHORIN (カヲルム)

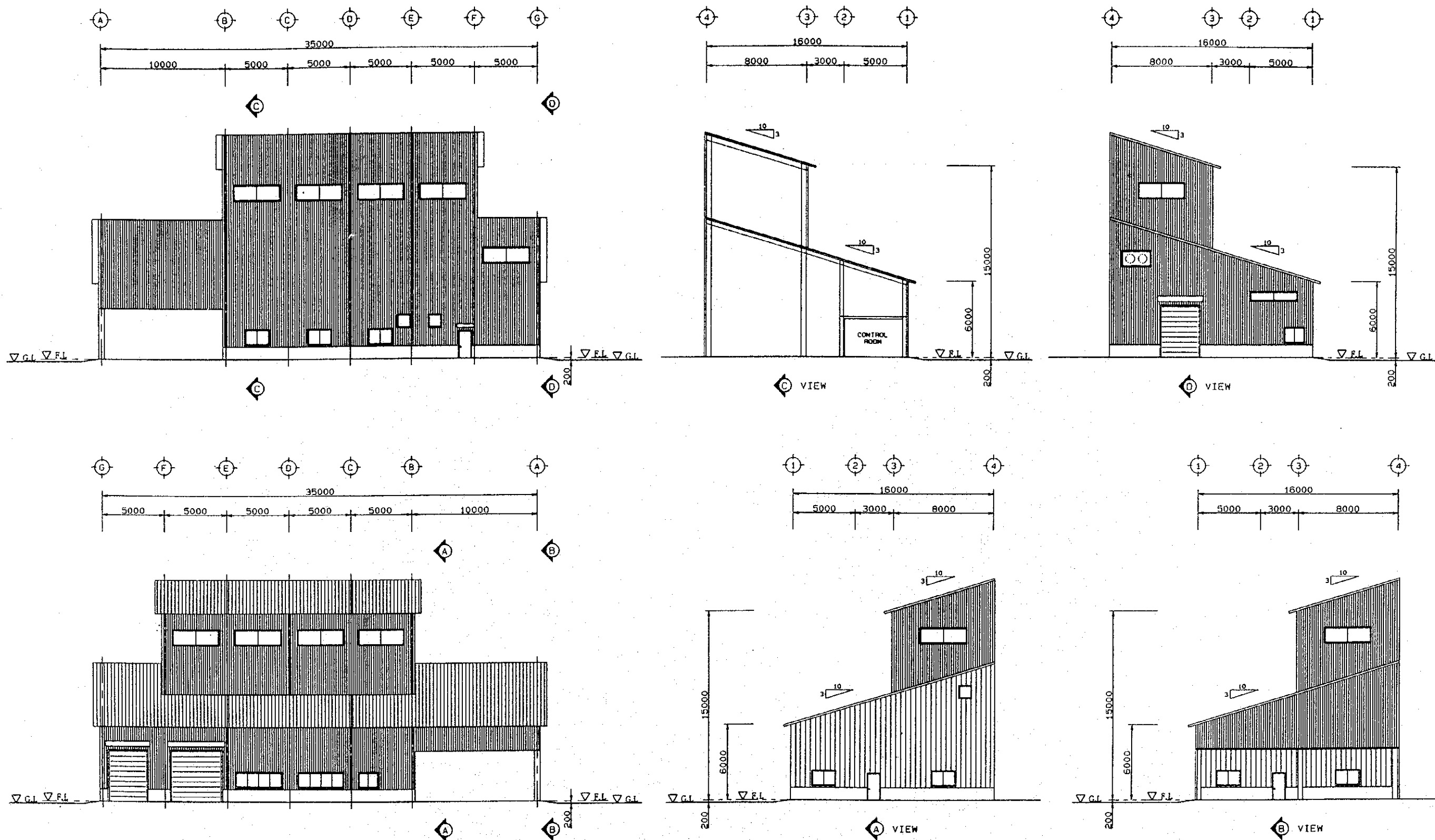


CROSS SECTION/ELEVATION(6)

SCALE 1:300

Figure 4-15 CROSS SECTION/ELEVATION (6)

HARHORIN (カヲルム)

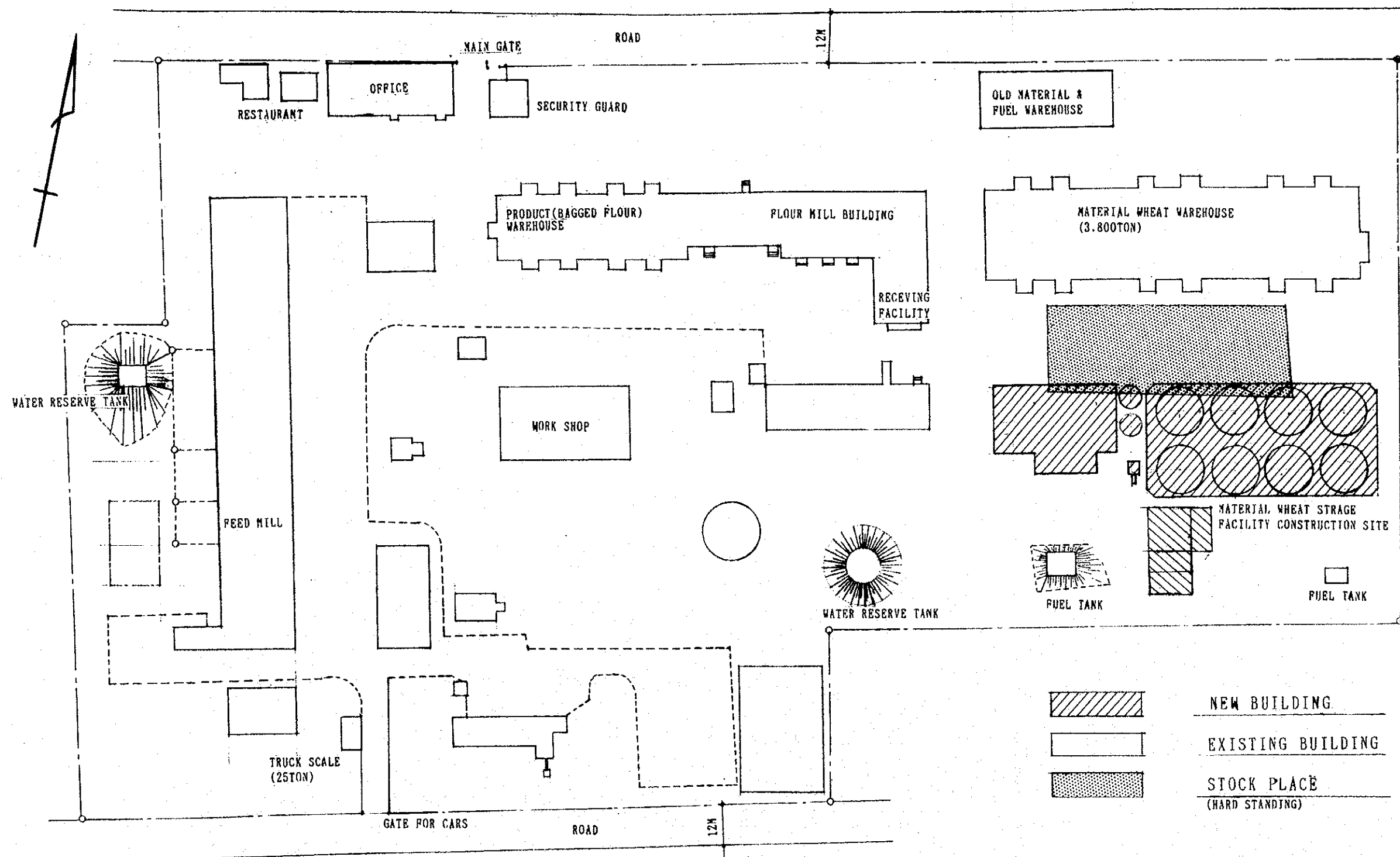


CROSS SECTION/ELEVATION(7)

SCALE 1:300

Figure 4-16 CROSS SECTION/ELEVATION (7)

HARHORIN (カヲコルム)

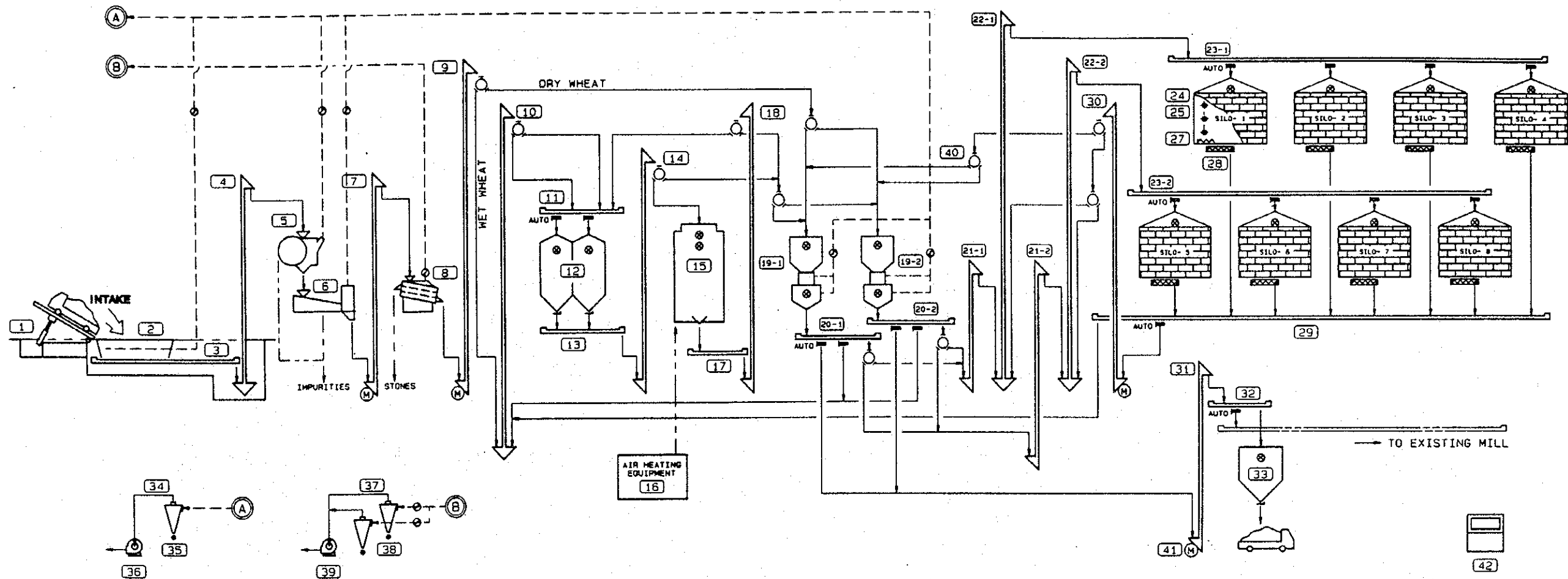


REGULAR HARD STANDING(8.000TON)
11KM FOR FROM THE SITE

SITE PLAN SCALE 1:1000

Figure 4-17 Layout plan

UNDORKHAAN (ウンドゥルハーン)



I/NO	DESCRIPTION	Q'TY	REMARKS	I/NO	DESCRIPTION	Q'TY	REMARKS	I/NO	DESCRIPTION	Q'TY	REMARKS	I/NO	DESCRIPTION	Q'TY	REMARKS
1	DUMPING DEVICE	1		15	DRYER	1		24	STORAGE SILO	8		38	AIR LOCK VALVE	2	
2	INTAKE HOPPER	1		16	AIR HEATING EQUIPMENT	1		25	THERMOMETER	24		39	DUST SUCTION FAN	1	
3	CHAIN CONVEYOR	1		17	CHAIN CONVEYOR	1		26	NIL	-		40	CHANGE VALVE	11	
4	BUCKET ELEVATOR	1		18	BUCKET ELEVATOR	1		27	DISCHARGE AUGER	8		41	MAGNET SEPARATOR	4	
5	REVOLVING SCREEN SEPARATOR	1		19-1	WEIGHER	1		28	DISCHARGE AUGER	8		42	CONTROL PANEL	1	
6	SEPARATOR WITH ASPIRATOR	1		19-2	WEIGHER	1		29	CHAIN CONVEYOR	1					
7	BUCKET ELEVATOR	1		20-1	CHAIN CONVEYOR	1		30	BUCKET ELEVATOR	1					
8	DESTONER	1		20-2	CHAIN CONVEYOR	1		31	BUCKET ELEVATOR	1					
9	BUCKET ELEVATOR	1		21-1	BUCKET ELEVATOR	1		32	CHAIN CONVEYOR	1					
10	BUCKET ELEVATOR	1		21-2	BUCKET ELEVATOR	1		33	SHIPPING TANK	1					
11	CHAIN CONVEYOR	1		22-1	BUCKET ELEVATOR	1		34	CYCLONE	1					
12	RECEIVING TANK	2		22-2	BUCKET ELEVATOR	1		35	AIR LOCK VALVE	1					
13	CHAIN CONVEYOR	1		23-1	CHAIN CONVEYOR	1		36	DUST SUCTION FAN	1					
14	BUCKET ELEVATOR	1		23-2	CHAIN CONVEYOR	1		37	CYCLONE	2					

S Y M B O L

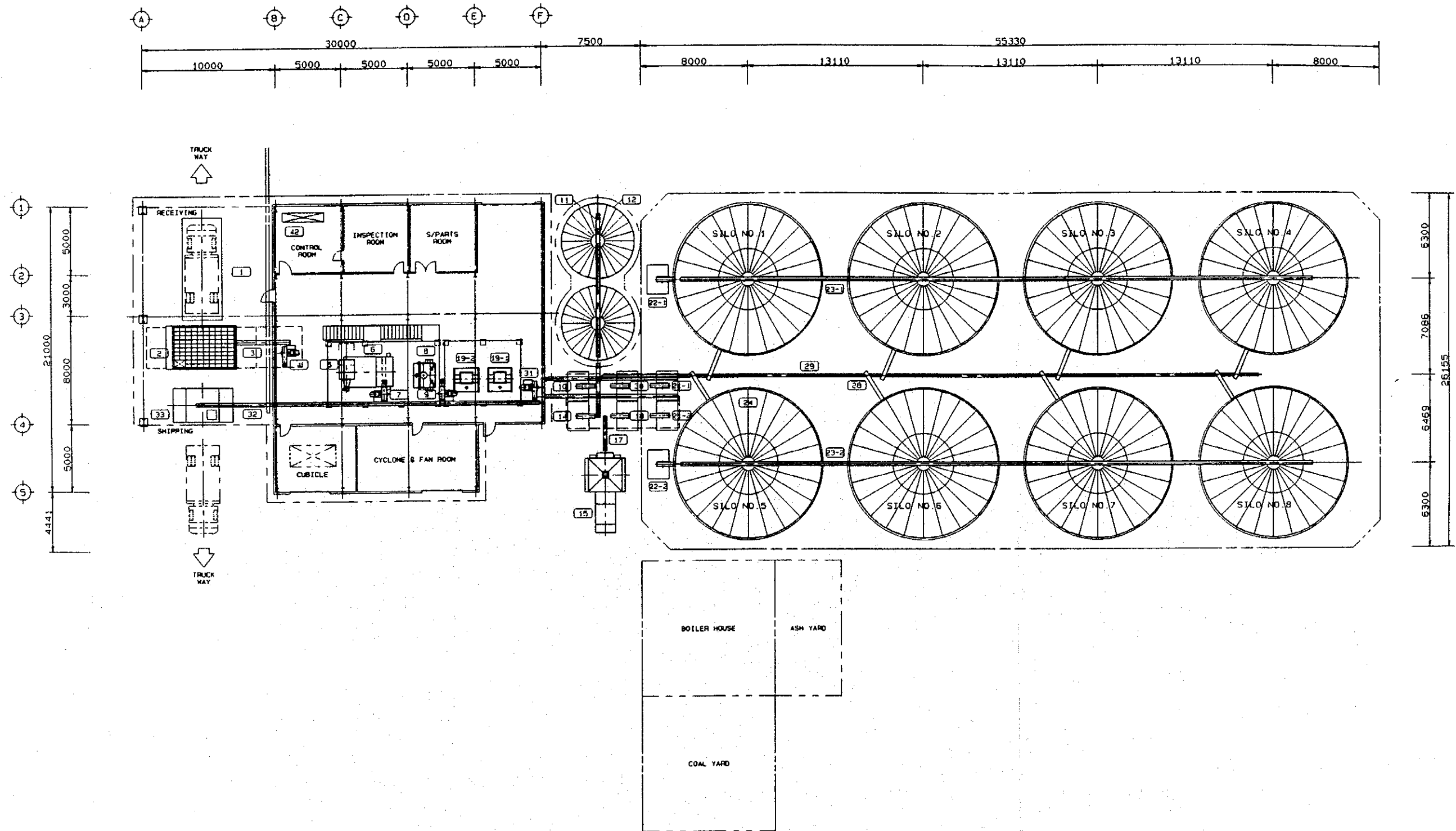
⊞	SHUTTER (AUTO)
⊞	SHUTTER (MANU.)
⊗	LEVEL DETECTOR
⊕	THERMOMETER
⊖	DAMPER
⊙	MAGNET SEPARATOR
⊚	CHANGE VALVE

FLOW CHART

SCALE 1:300

Figure 4-18 Flow chart

UNDORKHAAN (ウツクハーン)

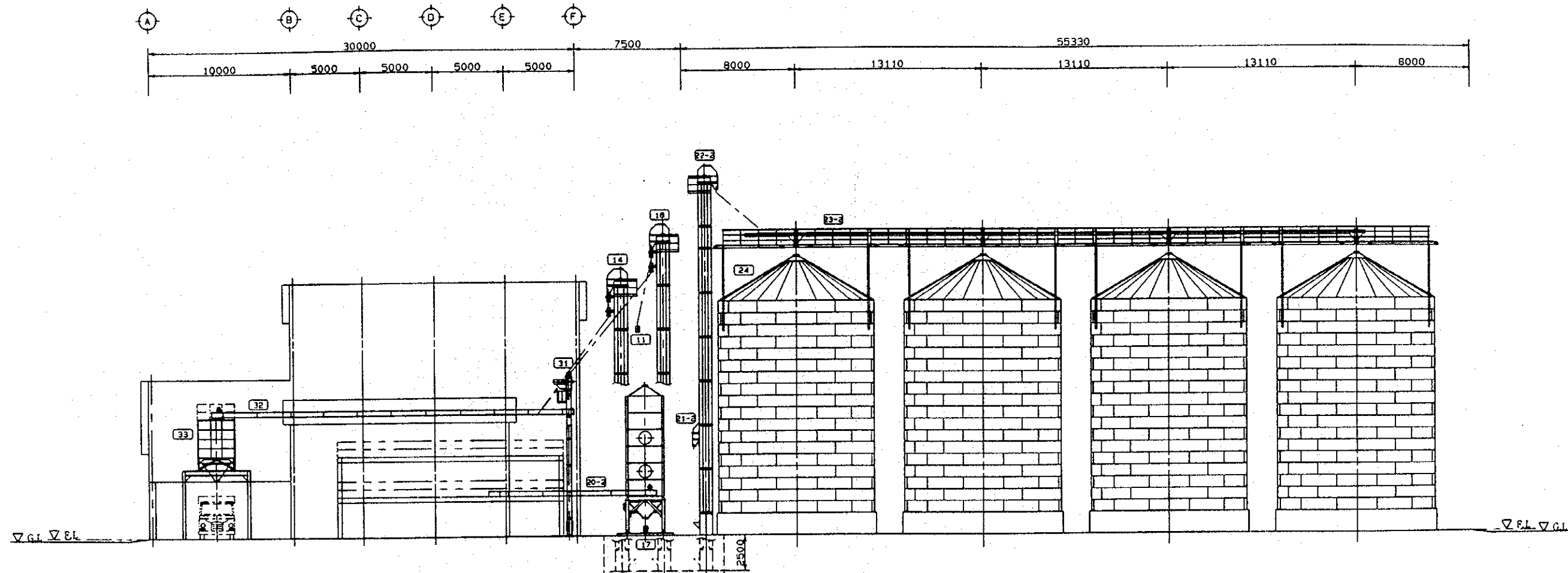


PLAN

SCALE 1:300

Figure 4-19 PLAN

UNDORKHAAN (ウントウルハーン)

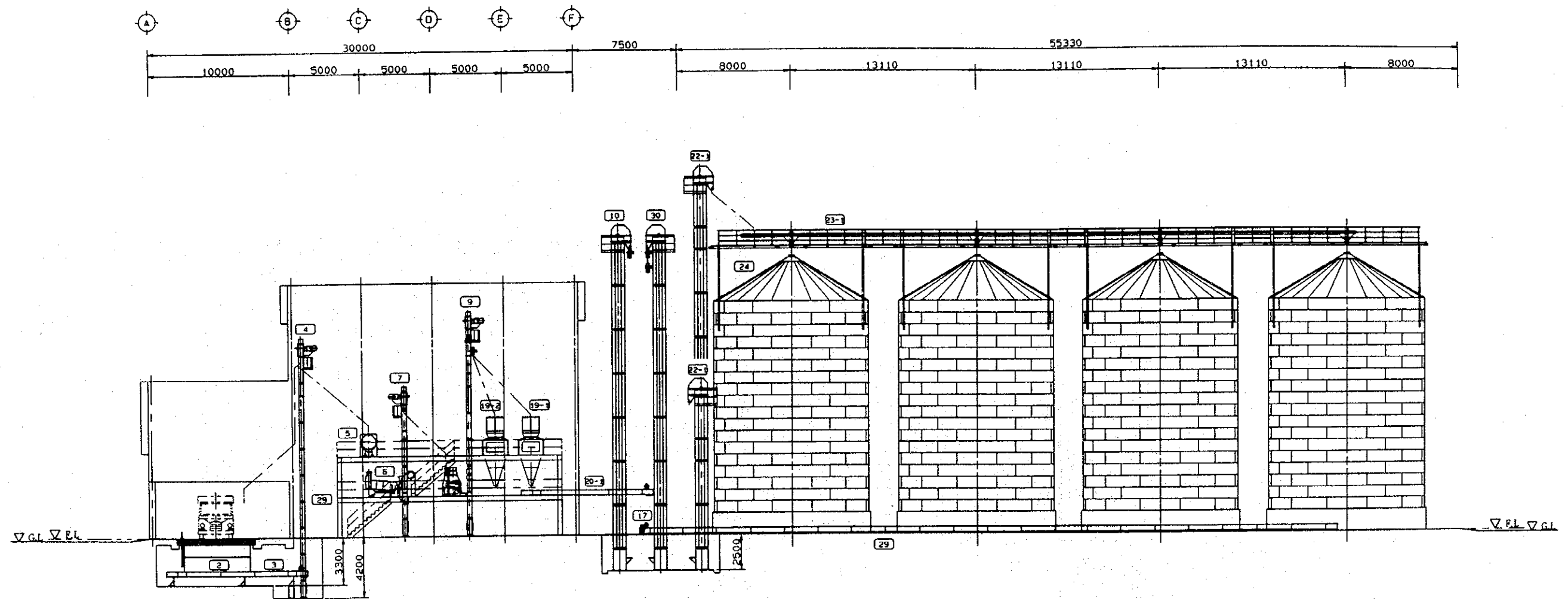


CROSS SECTION/ELEVATION(1)

SCALE 1:300

Figure 4-20 CROSS SECTION/ELEVATION (1)

UNDORKHAAN (ウツクハーン)

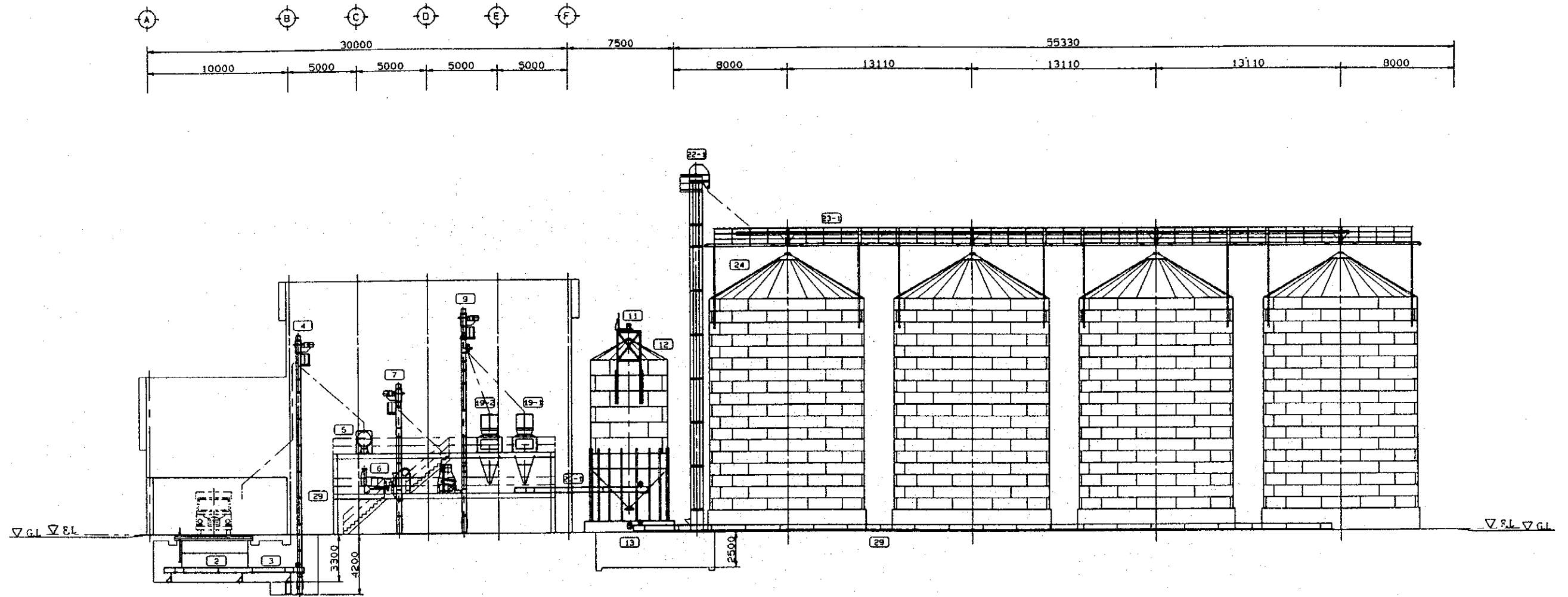


CROSS SECTION/ELEVATION(2)

SCALE 1:300

Figure 4-21 CROSS SECTION/ELEVATION (2)

UNDORKHAAN (ウツクハ-ン)

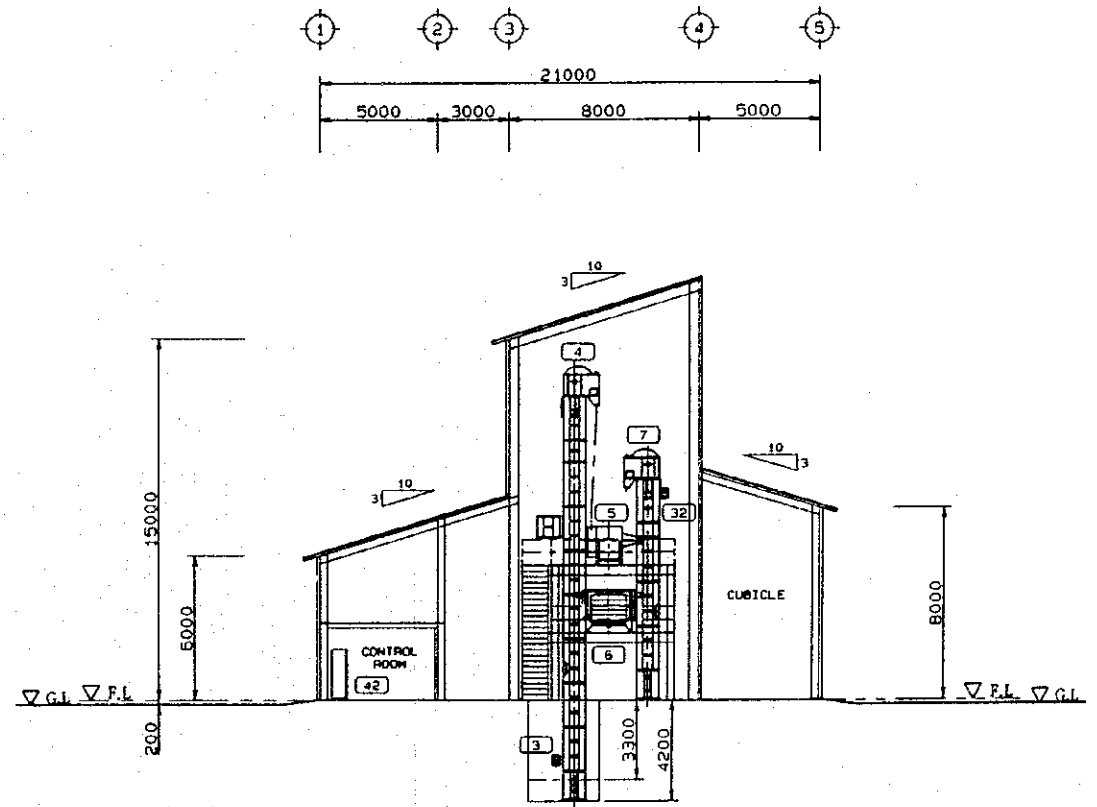
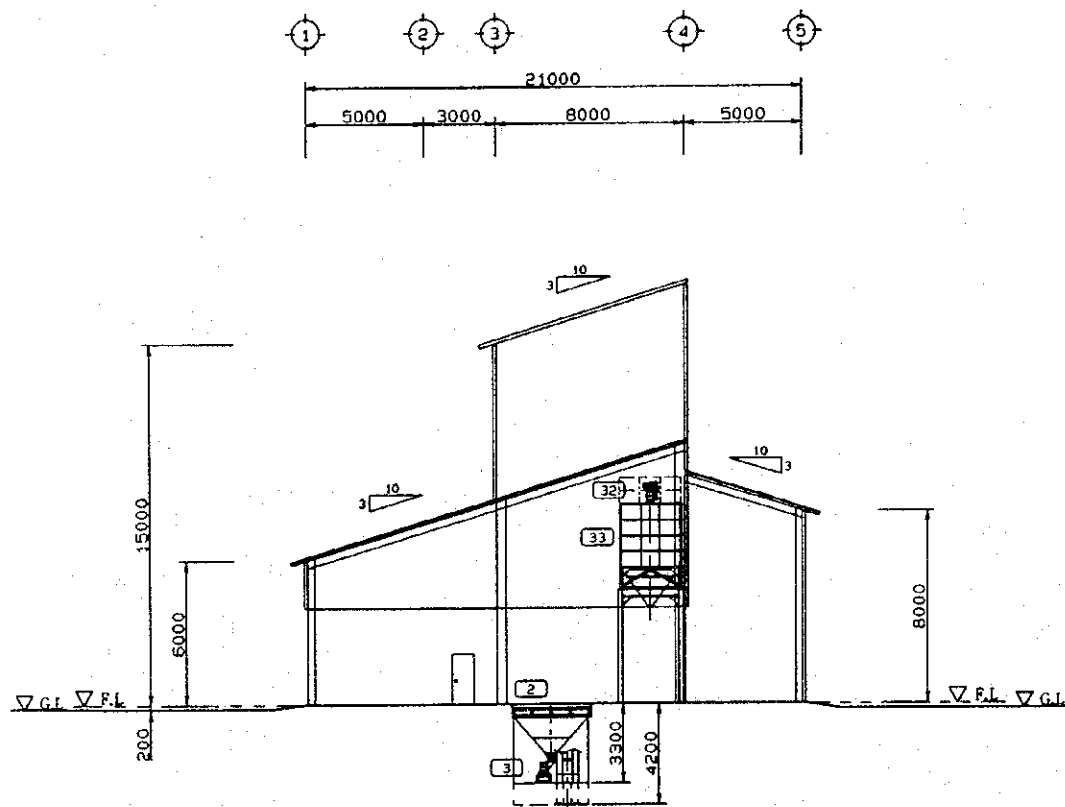


CROSS SECTION/ELEVATION(3)

SCALE 1:300

Figure 4-22 CROSS SECTION/ELEVATION (3)

UNDORKHAAN (ウツクハーン)

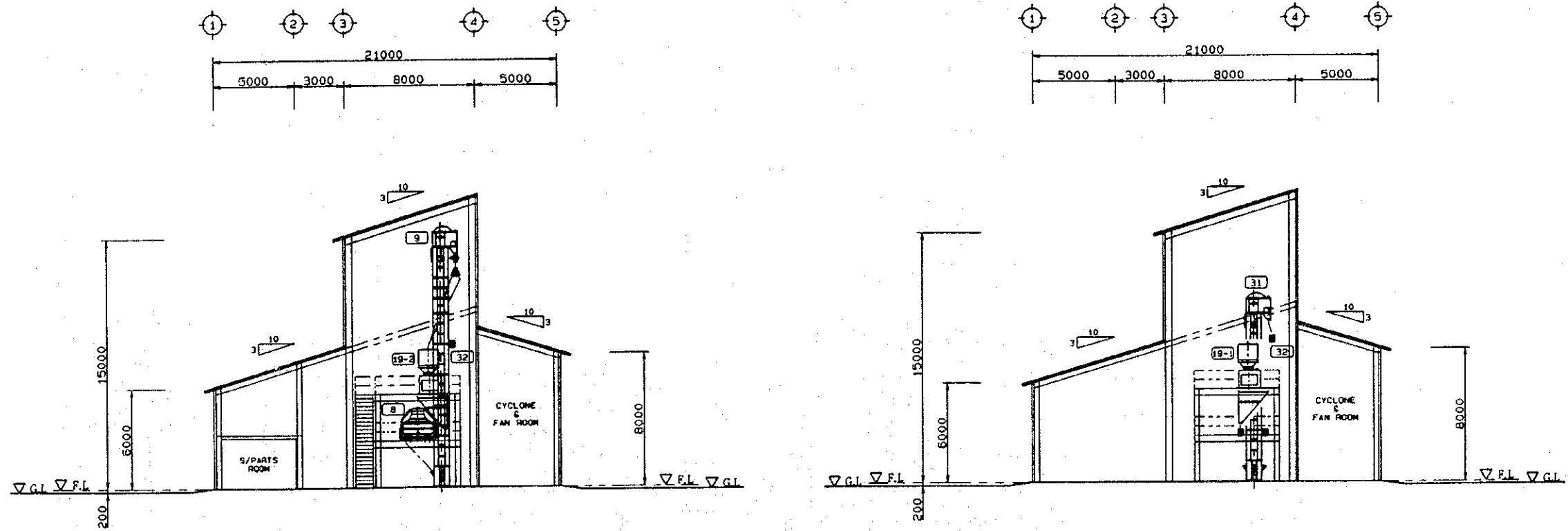


CROSS SECTION/ELEVATION(4)

SCALE 1:300

Figure 4-23 CROSS SECTION/ELEVATION (4)

UNDORKHAAN (ウト`カルハ-ン)

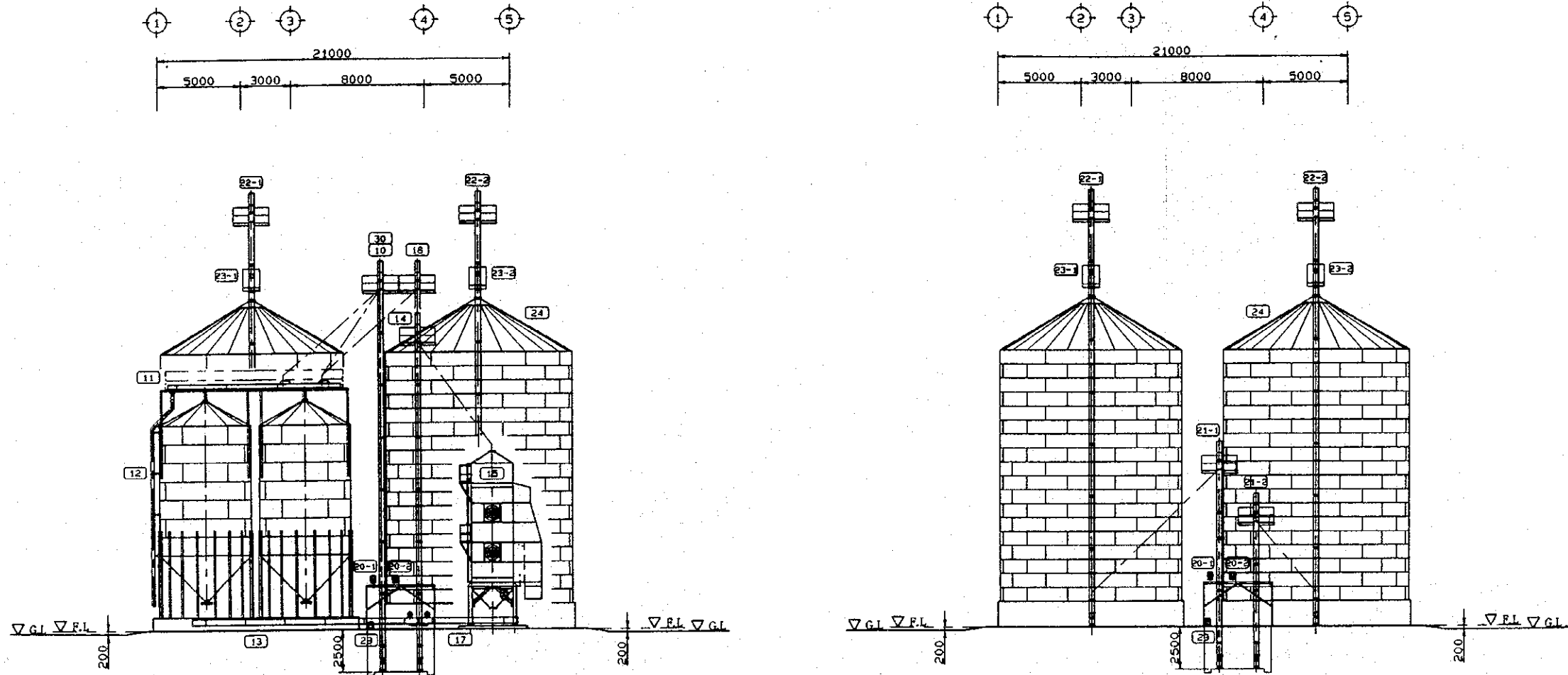


CROSS SECTION/ELEVATION(5)

SCALE 1:300

Figure 4-24 CROSS SECTION/ELEVATION (5)

UNDORKHAAN (ウツ`ウルハ-ン)

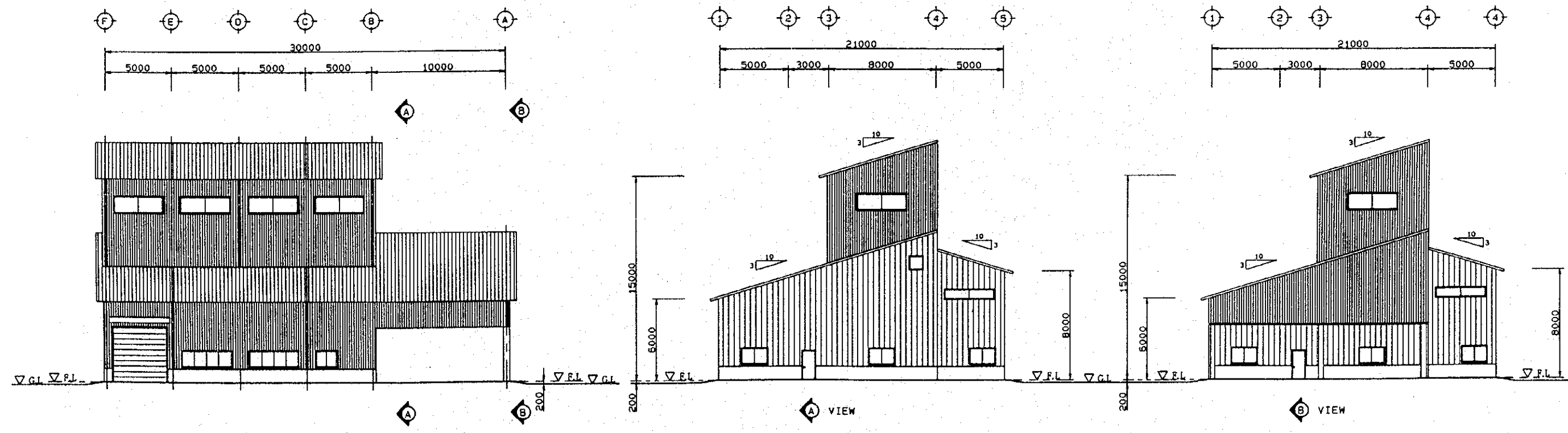
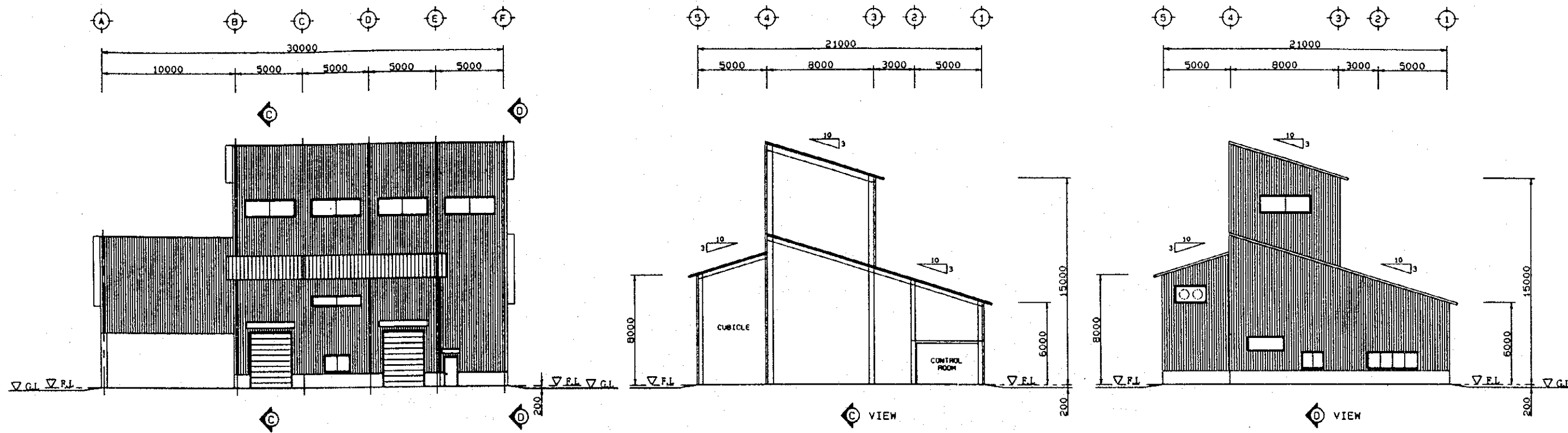


CROSS SECTION/ELEVATION(6)

SCALE 1:300

Figure 4-25 CROSS SECTION/ELEVATION (6)

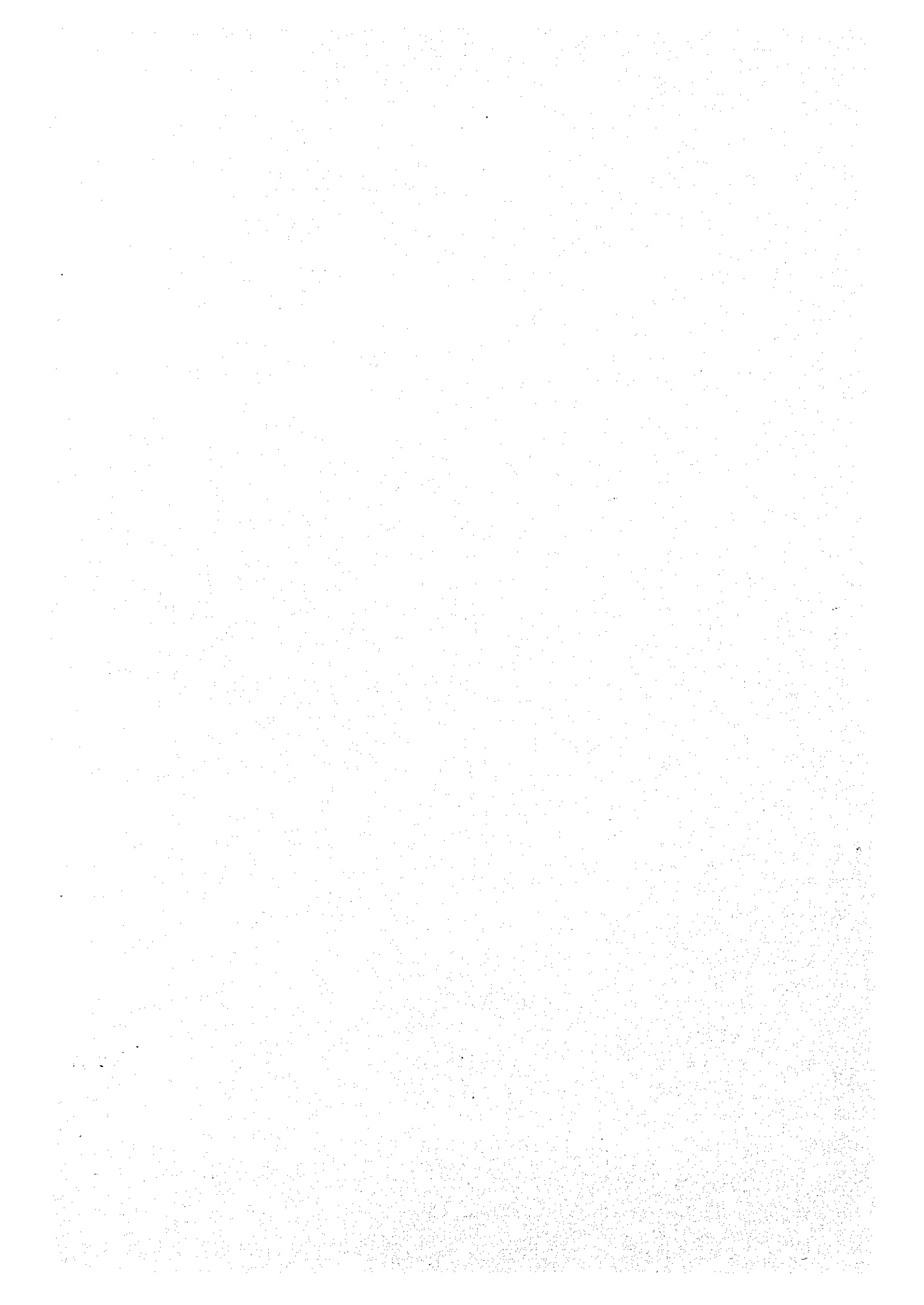
UNDORKHAAN (ウトウルクハーン)



CROSS SECTION/ELEVATION(7)
SCALE 1:300

Figure 4-26 CROSS SECTION/ELEVATION (7)

UNDORKHAAN (ウツクハーン)



4-6 Construction plan

4-6-1 Construction Policy

(1) Basic Policy on Construction

Both sites of Harhorin and Undrkhan are relatively better in infrastructure among the four sites studied at this time. But they are 340 - 360 km away from Ulaanbaatar and there are large portions of the roads not paved. Transportation of equipment and material will be an important factor to decide the whole work period. It is anticipated that unpaved roads may prove to be in a very bad condition in certain times due to rain and melted snow, works must be promoted considering these risks in transportation. Each site must prepare ample space for storing the equipment and material. And they must deliver items necessary to carry out the works before spring time when work will be started. Each site must take these necessary steps in order to carry out the work smoothly.

Labour is insufficient especially in local cities. It is necessary to obtain cooperation from each flour mill, and related local self-governing community, the Ministry of Food and Agriculture, etc. for securing necessary quantity and quality of the items for livelihood for personnel engaged in works including labours and Japanese engineers.

There is insufficient experience within the Mongolian staff and a low level of technique as the work include a variety of construction work. The technology transfer should be made through construction works, operation and adjustments of the facility. Through close contacts and discussions among owner, consultant, sub-contractors on the construction, material and equipment, work plans must be made for smooth processes so that the facility can be completed by the time of wheat harvest in the same year construction work start.

(2) Consultant

1) Consultant Contract

It is necessary for Mongol executing organization, the Ministry of Trade and Industry and Ministry of Food and Agriculture to conclude a consultant agreement with a Japanese consultant and obtain verification from the Japanese government immediately after conclusion of E/N on the grant aid assistance between the Mongolian government and the Japanese government.

After conclusion of the consultant agreement, the consultant shall make detailed design based on the basic design report, through discussions with the Ministry of Food and Agriculture, the flour mill and related organizations. And successively they shall prepare tendering procedures. Then they shall engage in design and construction work supervision.

2) Local Consultant

In Mongolia, there are several companies who can design buildings, supervise design works and the construction requirement around the city of Ulaanbaatar, all licensed by central government and have 5 - 10 staff members. (There were about 20 established at the time of shifting to market economy but weed out since). Most of the local engineers have been educated in Russia. Through privatisation of the former governmental organisations at the time of moving to a market economy, they have become independent. In Mongolia, the amount of work is rather limited and whenever they get some business, they are sharing the work with others. Depending on the case, they show two faces of design office and construction company at the same time. This should be considered when they work for projects under Japanese grant aid assistance.

At present, all of them have limited experience in actual works under a market-economy, especially understanding the work process management and reliability in actual management works are insufficient. It is difficult to expect them to carry on the supervision work on designed content and processes with proper consideration on the work period. It is however possible for them

to give advice on the design and specifications suited to climate conditions in Mongolia. Therefore, the signing of a relevant contract should be considered for a Japanese consultant with them in which they assist the consultant as sub-contractors in work supervision, applications and obtaining approvals from the government for the design and works in Mongolia and in design standard and specifications for cold climate based on their experience and the data they have.

(3) Constructors

1) Contractors

In this project, due to the characteristics of the grain storage facility, its function can be manifested fully only when the buildings and equipment are integrated. In the selection of work contractors (builder and equipment dealers) for grain storage facility construction, these characters of the facility must be considered fully. The contractor shall be selected by open tender from Japanese contractors with certain qualifications. Mongolian Ministry of Food and Agriculture shall conclude a construction contract with a lowest price bidder in principle from the qualified contractors by the open tender. And obtain verification from the Japanese government. The contractor, thus selected must complete the work by the data specified in the contract and deliver the facility and equipment to the Mongolian government.

2) Local Sub-contractors

Their ability to assume full responsibility for all the works of facility construction under this project is limited. Specialised technicians are lacking in Mongolia and there is a problem in the management of processes, quality and materials. However, they can be of service in the orderly procurement of materials and labours .

In this case, the work will be divided and orders would be given to several sub-contractors depending on the kind and amount of work. Since, the sub-contractors in Harhorin and Undrkhan are acquainted with the local conditions, they are expected to take part in the actual construction work.

3) Japanese Engineers

Labourer shortage in Mongolia, their insufficient experience in technical fields, low awareness in supervision and management of work period of equipment and material, etc. must be taken into consideration by Japanese engineers.

For construction work, not only a chief engineers but also engineers of foreman class should be dispatched to each site, a unit of work, a kind of work to smooth the work processes. For material processing, a chief engineer, deputy chief engineer who can help also in installations and adjustments of grain quality inspection equipment and a electric engineer must be sent accordingly.

(4) Executing System of Mongolia Side

There is a continuous flow in the stages of detailed design, construction work, operation after completion of work. Therefore, departments in charge in the Mongolian government and the staff members in charge should be the same for all of these stages. They should give optimum advice based on their experience for the maintenance, inspection, repair work, etc. after completion and hand over of the facility. In order to assist in the smooth work / management, it is necessary to organize a committee-like body during the period of construction work and clarify the responsibility for project implementation.

A post of chairman shall be held by the director of Crop. Machinery and Irrigation Department of the Ministry of Food and Agriculture. He shall judge important matters and give instructions to each person in charge for carrying out the construction work smoothly. He shall appoint someone from the Ministry of Food and Agriculture who shall supervise the technical aspect of the project implementation, give proper advice and make close contact with the flour mills. This staff member is desired to be the man in charge in the Ministry for facility management even after completion of the facility. He should be fully aware of the construction works and should be able to handle the facility. Based on these experiences, he shall be able to take proper measures against the problems in future.

Therefore, the project implementation body shall be organized in the Ministry of Food and Agriculture as shown in Figure 4-27 to enhance the effect of project implementation.

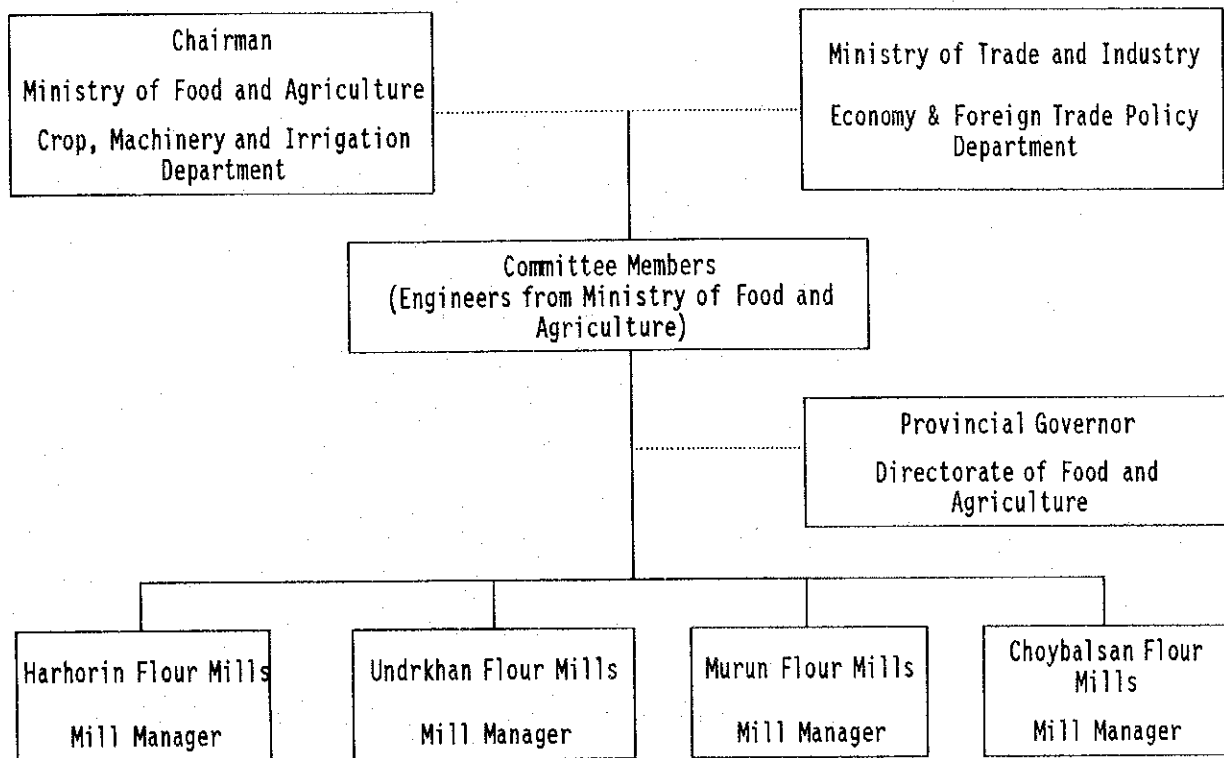


Figure 4-27 Executing System in Mongolia

4-6-2 Important Points in Construction Work

Both sites of Harhorin and Undrkhan are about 340 km - 360 km away from the first accumulation point of equipment and material, Ulaanbaatar. Attention must be paid with their transportation because road conditions are worse from spring to summer due to the melting of frozen earth and rain. Almost all of the national facilities were constructed by an engineering corps of the Mongolian army under the guidance of former Soviet Russia until moving to a market economy. Most of the buildings are of medium to low height, and are block or brick piling construction, plastered or of mortar finish. RC or steel framed buildings employ PC panels.

According to the conditions of the construction sites and natural conditions, items to be noted and discussed are as follows.

- Sites of construction for grain storage facilities at Harhorin and Undrkhan are vacant lots in the existing flour mill. However, entrance of trucks into the sites and the place for temporary keeping of materials and equipment for construction and matters directly related to construction works should be discussed well beforehand with the flour mill personnel.
- Make work plans suitable for cold climate. Avoid troubles of low temperature by concentrating concrete casting and painting works in May to September.
- There is no company leasing construction machinery. It is necessary therefore to secure machinery and equipment of minimum requirement such as wreckers, road rollers concrete mixer, etc. for construction works at the constructing company in the urban areas.
- Considering the quantity and risk of transportation, transportation of equipment and materials for construction including the ones procured locally must be planned as early as possible.
- Safety guidance to local workers is necessary together with the technical guidance to carry out the work smoothly as the safety consciousness among Mongol workers such as in the case of working on scaffolding that is not up to standard.
- It is necessary for the Mongolian government to make tax exemption and customs clearance procedures for imported equipment and materials for construction. This must be completed as quickly as possible.
- Take ample measures to prevent water leakage at pits for Undrkhan site as the water level is high.

4-6-3 Plan for Work Supervision

According to the procedures set out by the grant aid assistance program of the Japanese government, a Japanese consultant company shall conclude a consultant contract with the executing agency of this project, the Ministry of Trade and Industry and the Ministry of Food and Agriculture and carry out the detailed design work and supervision of the construction works. The purpose of the supervision of construction works is to make sure if the works is done exactly according to the design specifications and to promote the whole works based on the contents of the construction contract.

For this purpose, the consultant shall perform guidance and make proper advice during the construction period, standing on a fair position and as a technical advisor to the executing agency of the Mongol Government. The consultant shall perform his duty to improve the quality of the works.

Under this project, a grain storage facility shall be constructed at Harhorin and as emergency assistance to all four sites, wheat quality inspection equipment shall be supplied in its first phase. In its second phase work, a grain storage facility shall be constructed in Undrkhan. The construction work at Harhorin site in the 1st phase will be a model for 2nd phase. Even a small problem should not be overlooked. It should be analyzed carefully and the results shall be noted for future construction work.

(1) Work Supervision

Main duties in work supervision are as follows:

- 1) Applications for Work Permits and Approvals Necessary to Start the Construction Works and Assistance in Obtaining Those Permits and Approvals

Prepare necessary documents needed by the Mongol executing agency (owner) to apply permits or approvals to the Mongol Governmental Organizations (Urban Development Dept., etc.). Assist owner in getting the approvals or permits with the cooperation of local consultant/s.

2) Assistance in Tendering and Signing of Construction Contract

On behalf of the Mongol executing agency, the consultant shall make tendering documents, public announcement on tender, acceptance of applications for participating tender, qualification studies on bidders, distribution of tender documents (site explanations), tendering under presence of representatives from the Mongol executing organization (owner), acceptance of bids and price examinations in order to select a Japanese Company to construct the facility. After tendering, evaluate and assess the work details and technical specifications and shall make pertinent instructions and advices to the contractor.

3) Guidance, Advice and Adjustments

Examine the contents of procurement plans, work plans, processes for Construction Works and fabrication and installation works and give proper guidance, advice and any necessary adjustments to the contractors.

Also hold regular meetings and discussions at the site of constructions to confirm the progress and keep balance between the construction and assembling works.

4) Inspections and Approvals

Confirm consistency of equipment and materials to be procured by the contractors with the contents of the construction contract, and give approvals. Whenever necessary, attend the inspection of the manufacturing processes of parts for the construction works and materials and equipment for the grain storage facility and maintain quality.

5) Progress Reports

Grasping the construction processes and the situations of construction works, report on the progress of the work to both countries. Make monthly reports and submit to owner, flour mill, Embassy of Japan, JICA, etc. Hold regular process conferences. The results of reports shall be further discussed to make smoother work

processes.

6) Inspection on Piecework and Trial Operations

Confirm the content and inspect on the spot to give approvals of the bills to be submitted by the contractors for each stage of the construction and assembling work according to the work contract until completion. Shall conduct final test operations and completion inspections for facility, equipment and materials, confirm the consistency with the contents of the Contract and submit a "inspection completion report" to the Mongol executing organisation. The executing organization in return issue a "Work Completion Report".

7) Training on Operation, Inspections and Repair

- a) Except the grain quality inspection equipment, equipment and material under this contract are incorporated into the facility as parts of a consistent flow. It needs initial adjustment works referring to the conditions of equipment in the previous process and the one installed next. The workers of the flour mill have experiences in their existing machines and equipment but they need some practice in the operation of newly installed machines and equipment under this project.

They will need some training and knowledge of the new equipment for maintenance work also. In this case, it is necessary for the contractor to give some training on the operation and maintenance technology for the Mongol workers and engineers through the stages of installation, adjustments and trial operations until a operation guidance to be made at practical operations. The consultant shall give guidance and advises on these training programs.

- b) A lack of experience was noticed in the stock control at grain the storage facility and management of the whole flour mill, which are common for all four sites. There is a room for improvement. Therefore, the consultant shall make manuals of such software technology in Mongol and distribute them to mill management, mechanical engineers, analysis engineers, persons

related to this project in the Ministry of Food and Agriculture and the prefectural offices. Give lectures depending on the needs. However, since this project is implemented in two phases, any short comings found in the 1st phase shall be corrected and improved in the 2nd phase.

(2) Construction Supervision System

In order to promote the duties in the whole period, it is appropriate for the consultant to dispatch its engineer to Mongolia for the whole project implementation period from the middle of work preparation. Considering the scale of this project, distance from Ulaanbaatar and work period and the period when work is possible. At a time when border line between each work, building work and equipment work needs to be clear, necessary engineers including the ones specialised in equipment shall be dispatched to stay at site for inspection, guidance, adjustment, etc. In Japan, a person will be in charge of communication with Mongolia and give assistance as much as possible. The consultant shall make a proper report on necessary matters such as progress of project, payment procedures, completion ceremony, hand over, etc. to those related to this project in the Japanese Government.

Figure 4-28 shows work supervision system and related organizations.

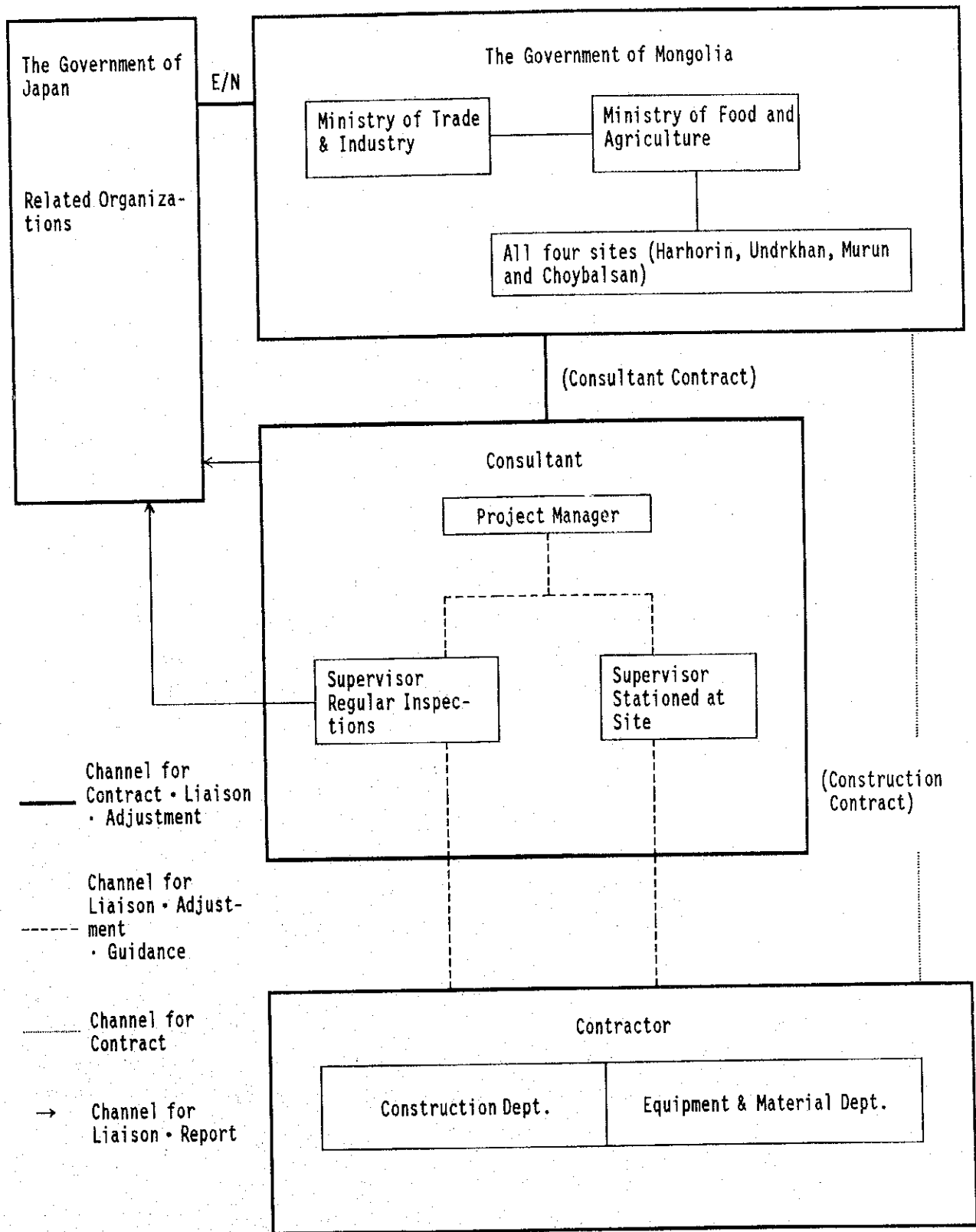


Figure 4-28 Work Supervising System

4-6-4 Procurement Plan for Equipment and Materials

(1) Procurement Policy for Equipment and Material

In the procurement, equipment and materials shall not be selected only by price factor. Especially, in the procurement of machinery and equipment, factors such as easiness of procurement, degree of difficulty and frequency of repair works, system of after-sales services and repair, accuracy in practical operation after completion of works, degree of propagation, etc. shall be considered.

Mongolia is situated between China and Russia. It is inevitable for her to be influenced socio-economically by these two countries. Although both countries are not the object areas of this study, not only the procurement of equipment and material from those countries can be considered but also recruitment of labour and engineers may also be considered.

The majority of the equipment is to be assembled at site. Therefore, there is a possibility that the function, appearance, proper fittings may be spoiled by shocks, pilferage, abrupt change of climate, etc. Prudent attention must be paid in packing and transportation.

1) Buildings

In principle, material that can be procured locally should be used. however, quality, standard and performance of the roof/wall materials and iron materials are not uniform. A local procurement of reliable quality is difficult, import shall be allowed.

Cement · reinforcing rods (Mongolimpex corporation) · sand · gravel can be procured locally. however, reliability in supplying a certain quantity by a certain date is low. Make plans to avoid risks in work schedule by procuring and transporting the materials early enough.

2) Electric Equipment

Most of the items shall be imported as it is difficult to procure locally same item in a large quantity.

3) Equipment for Plan

Machinery and equipment included in this project are not manufactured or sold in Mongolia. Therefore, they will be imported from Japan in principle. None of the items are used widely in Mongolia and can be repaired easily under good maintenance service system. None of the items can not be procured in Japan at present.

However, requested coal combustion grain dryers are not used in Japan, although this is no problem technically. It may be easier to procure abroad.

(2) Procurement Plan for Equipment and Materials

Where to procure the equipment and materials necessary for construction work is planned as shown in Table 4-32.

Table 4-32 Procurement Plan

Work Division	Equipment & Material	Procure from			Remark
		Mongolia	Japan	Third Country	
Building Construction	Main structure				Early procurement necessary Possible to secure river sand Possible to procure locally. Note: largely uneven size Possible to procure locally No local production of veneer, pieces of wood plate will do. Can use as partition Can produce locally Procure locally because quantity required is small. No local production ditto Because quantity required small, procure locally Local goods insufficient quality No local production ditto Procure locally for maintenance sake No local production Local products are of insufficient quality. Joints for piping are hard to get locally. No local production
	Cement	○			
	Sand	○			
	Gravel	○			
	Pebble stone	○			
	Reinforcing rods	○			
	Form	○			
	Brick	○			
	Concrete block	○			
	Terrazzo tile	○			
	Other tile	○			
	Glass	○			
	Long sheet metal		○		
	ALC · Sodium silicate plate		○		
	Wood	○			
	Hardware		○		
	Wood fittings		○		
	Metal fittings		○		
	Painting	○	○		
	(Equipment)				
Ventilation fan		○			
Sanitary equipment		○			
Pipes		○			
Pumps		○			
Shutter		○			
Machines & Equipment	For receiving process		○		
	For precleaning process		○		
	For drying process		○		
	For storage process		○		
	For weighing process		○		
	For conveying · operation · dust collection		○		
	Wheat inspection equipment		○		
Electric Works	Power receiving unit		○		
	Distributor		○		
	Lighting equipment		○		
	Fire alarm		○		
	Wiring materials		○		

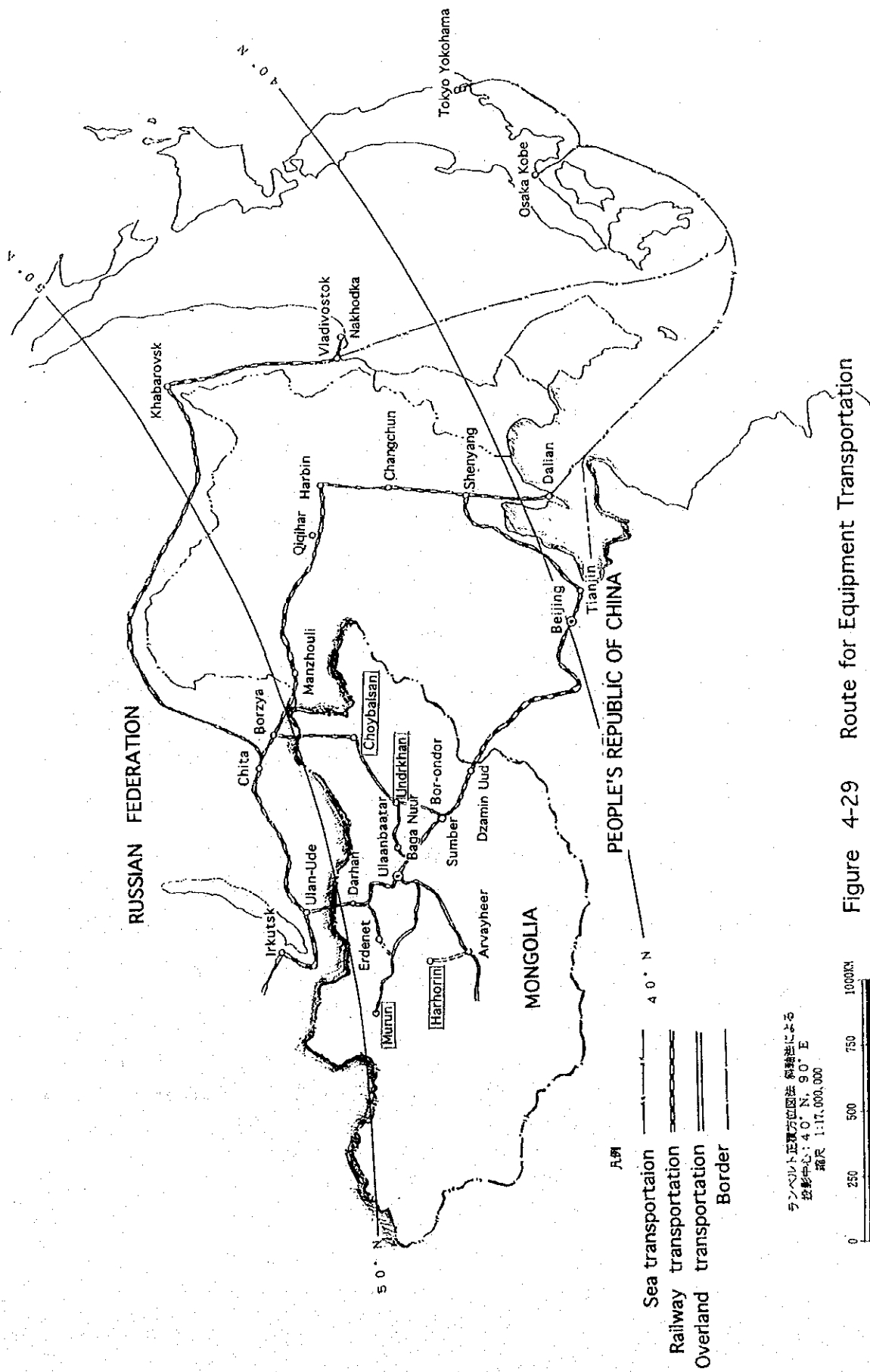


Figure 4-29 Route for Equipment Transportation

(3) Transportation from Japan

Branch lines from the Chinese and Siberian railways are pulled to the capital Ulaanbaatar and main coal shipping stations. Common transportation route from Japan to Mongolia is as shown in Figure 4-29.

For Harhorin, Undrkhan and Murun sites, the goods are transported by railway up to the first accumulation point in Mongolia. Then, from here, the goods will be carried by trucks to each site. For Choybalsan site, the goods can be transported by railway, through the Siberian railway system.

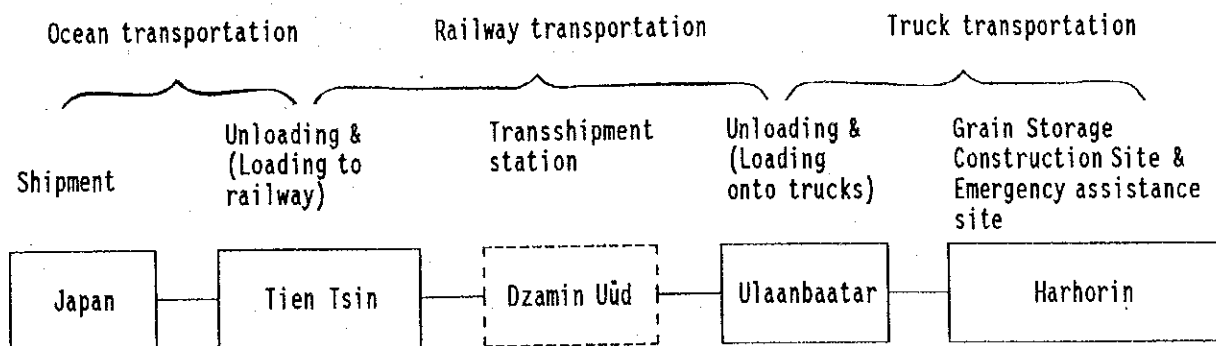
However, presently, customs clearance is complicated and the number of days required for transportation fluctuates considerably. It is difficult to make any plan. For JICA's resource survey project now being executed at about 40 km north of Choybalsan, the necessary equipment and materials are carried to Manzhouli near the border between China and Mongolia by railway, then from there trucks are used to carry the necessary goods to the project site.

After unloading the goods at Tien-Tsin, China, trans-shipment is necessary because of the difference in track gauge. The transshipment is made at Dzamin Uüd station situated on the border of two countries. This is a key station for import of Chinese goods or import of goods through China.

At present, 2nd phase construction work for "Project for improvement of transshipment facility at Dzamin Uud Station" is underway. The work is expected to be completed in September 1995. In the implementation of this project, efficient transportation by using this facility will be possible.

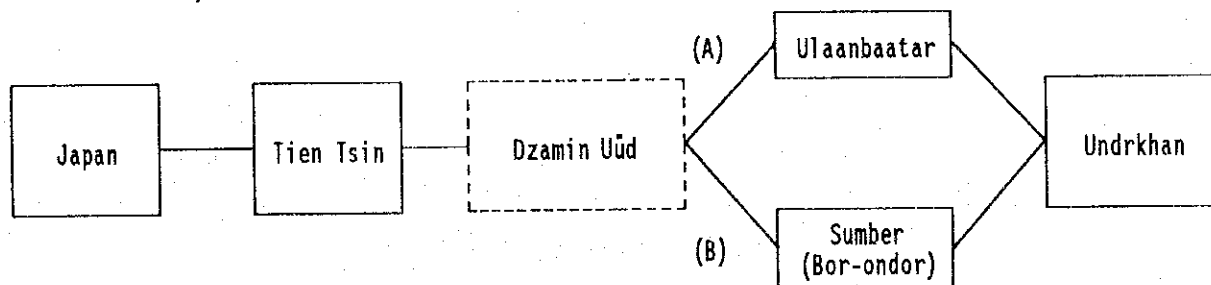
The transportation of goods from Japan to main stations in Mongolia takes about 35 days. To each site, it would take 7 - 14 days including the time taken for trans-shipment. The route to each site is shown as follows:

1) Harhorin Site



Up to 300 km from Ulaanbaatar, road is asphalt paved. The majority of the remaining road to the site will also be paved by the end of 1995.

2) Undrkhan Site



A) In the Phase-I of this project (first year), only the inspection equipment for wheat quality shall be supplied as emergency assistance. Volume of the goods is rather small. It is better to transport them with the cargo for Harhorin until Ulaanbaatar in order to avoid scattering. From Ulaanbaatar, the goods will be carried by trucks to the site. Only up to 60 km from Ulaanbaatar, the road is paved. The road is partly in a mountainous area and conditions are expected to worsen after rain.

B) In the Phase-II, volume of cargo is large, about 2,000 m³ for construction of the grain storage facility. It shall be planned to transship the cargo to trucks at Sumber station or Bor-ondor station, coal shipping stations about 210 km south of Ulaanbaatar. Then, carry the goods to site. From Sumber to Ulaanbaatar, it is about 200 km. Although the road is not paved, it is flat and will require 4 - 5 hours.

However, sufficient numbers of trucks not available at Sumber or Bor-ondor and it is necessary send from Ulaanbaatar and would be expensive in cost. Therefore, for both phases, ordinary (A) route would be adopted.

3) Murun and Choybalsan Site

Same as the route for Undrkhan, first Phase, trucks will be used for transportation from Ulaanbaatar or domestic cargo transportation services may be employed.

For locally procured items, most of the items except sands and gravel are produced at Urban areas of Ulaanbaatar or Darkhan. Therefore, same as the imported items, they can be transported from Ulaanbaatar or other cities to the site by trucks.

4-6-5 Execution Process

Implementation of this project was divided into two phases in two years. Table 4-28 shows planned contents of project and period for the detailed design and the construction work for each Phase.

Table 4-33 Contents of Project in Each Phase

Phase	Project Content	Detailed Design Period	Construction Period
Phase-I	<ul style="list-style-type: none"> • Procurement and Construction of grain storage facility at Harhorin. <li style="padding-left: 20px;">Grain storage: Silos capacity, 10,000 ton of wheat. <li style="padding-left: 20px;">Machine building: Including necessary equipment for receiving of wheat, precleaning, drying, weighing, etc. • Supply of wheat quality inspection equipment for 3 sites, Harhorin, Undrkhan, Murun. 	3.5 months	12 months

Phase-II	<ul style="list-style-type: none"> • Procurement and construction of grain storage facility at Undrkhan. Grain storage: Silos capacity, 8,000 ton of wheat. Machine building: Including necessary equipment for receiving of wheat, precleaning, drying, weighing, etc. • Supply of wheat quality inspection equipment for Choybalsan site. 	2.7 months	11.7 months
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After the signing of the "Exchange Note" by representatives of Mongolia and the Japanese government, the Ministry of Food and Agriculture, Mongol government, an executing agency of this project in Mongol shall conclude a consultant contract with a consultant company, who in turn obtain Japanese government approval.

Through the following processes, supply of the necessary equipment and materials and construction works shall be carried out.

(1) Detailed Design Work

The consultant shall make detailed design drawings, specifications of each equipment and facility, tender documents, etc. through discussions with the relative organisations in Mongolia. After completion of these works, the consultant shall explain the contents to the Mongol personnel and obtain approval on each design drawing and document. Periods required for this work is anticipated as 3.5 months for first Phase and 2.7 months for second Phase.

(2) Duties of Mongol Side

The works to be carried out by the Mongol government are shown in 「4-5-3 Basic plan, (2) "Construction work division" and in Appendix 5 "Contents of expense for work to be carried out by Recipient country", based on the results of discussions with the Mongol government, they must be carried out in time so that they will not affect the construction schedule. In the case of Harhorin, removal of the hard standings (at the site of

construction) and abandoned two warehouses adjacent to the construction site (to be used for temporary place to put materials and equipment for construction) must be completed before the start of construction works and before the equipment and materials arrive at the site.

Wiring works to power receiving unit of the grain storage facility and the wiring works for power source to supply electricity for wheat quality inspection equipments need to be completed 30 days before the trial operation of the facility and equipment start.

(3) Tendering

Each contractor for construction work, equipment fabrication and installation work shall be selected by tendering.

A series of works for tendering shall be done in the order of public notice on tender, explanation on sites, pre-qualification (P/Q), tender, examination of bids, nomination of work contractors, signing of work contract, verification of work contract by the Japanese government. It will all require about two months.

(4) Construction Works and Installation Works

If procurement of materials and equipment and construction works at the site are carried out smoothly, work period for the facility including installation of machinery and equipment is expected to take 12 months for first Phase and 11.7 months for second Phase, under the system of Japan's Grant Aid Scheme. The executing agency of the Mongol side shall perform its duties without hindering the progress of contracted works.

Therefore, project execution schedule from the time of signing E/N to the time of completion of the facility shall be as shown in Table 4-34.

Figure 4-34 Schedule of The Project for Construction of The Grain Storage in Mongolia (Phase I/II)

Item	Monthly order	1	2	3	4	5	6	7	8	9	10	11	12	
Phase I	Details design	[Site: Harhorin] [Site survey] [Supply of Equipment for Wheat inspection for 3 sites, Harhorin, Undrkhau & Nurun]	[Domestic work] [Site confirmation]										(Total 3.5 months)	
	Procurement & Construction	(Building)	[Work preparation] [Manufacturing/procurement] [Transportation]	[Ground reinforcement/foundation work] [Utility/inner/outer finish] [Adjustment]	[Skeleton work (machine's bldg., silo & others)] [Work for exterior]	[Installation/adjustment (Machine's bldg., etc.)] [Operation guidance]	[Installation/adjustment (Silo)] [Transportation]	[Installation/adjustment (Silo)] [Transportation]	[Installation/adjustment (Silo)] [Transportation]	[Installation/adjustment (Silo)] [Transportation]	[Installation/adjustment (Silo)] [Transportation]	[Installation/adjustment (Silo)] [Transportation]	[Installation/adjustment (Silo)] [Transportation]	(Total 12 months)
	Details design	[Site: Undrkhau] [Site survey] [Supply of Equipment for Wheat inspection for Choybalsan site]	[Domestic work] [Site confirmation]											(Total 2.7 months)
Phase II	Procurement & Construction	(Building)	[Work preparation] [Manufacturing/procurement] [Transportation]	[Ground reinforcement/foundation work] [Utility/inner/outer finish] [Adjustment]	[Skeleton work (machine's bldg., silo & others)] [Work for exterior]	[Installation/adjustment (Machine's bldg., etc.)] [Operation guidance]	[Installation/adjustment (Silo)] [Transportation]	[Installation/adjustment (Silo)] [Transportation]	[Installation/adjustment (Silo)] [Transportation]	[Installation/adjustment (Silo)] [Transportation]	[Installation/adjustment (Silo)] [Transportation]	[Installation/adjustment (Silo)] [Transportation]	[Installation/adjustment (Silo)] [Transportation]	(Total 11.7 months)
	Details design	[Site: Harhorin] [Site survey] [Supply of Equipment for Wheat inspection for 3 sites, Harhorin, Undrkhau & Nurun]	[Domestic work] [Site confirmation]											(Total 3.5 months)
	Procurement & Construction	(Building)	[Work preparation] [Manufacturing/procurement] [Transportation]	[Ground reinforcement/foundation work] [Utility/inner/outer finish] [Adjustment]	[Skeleton work (machine's bldg., silo & others)] [Work for exterior]	[Installation/adjustment (Machine's bldg., etc.)] [Operation guidance]	[Installation/adjustment (Silo)] [Transportation]	[Installation/adjustment (Silo)] [Transportation]	[Installation/adjustment (Silo)] [Transportation]	[Installation/adjustment (Silo)] [Transportation]	[Installation/adjustment (Silo)] [Transportation]	[Installation/adjustment (Silo)] [Transportation]	[Installation/adjustment (Silo)] [Transportation]	(Total 12 months)

4-7 Necessity of Making Manuals in Mongol

Publications in Mongol are extremely limited but literacy rate of Mongolian people is quite high (97.3%, World Tables 1988). Many understand Russian due to historical reason but few speaks language of other countries.

The government encourages education and extension of Mongol as a government policy. It is judged necessary to make manuals in Mongol for this project.

The results of discussion with a Mongol executing agency are as follows:

- Manuals to be made shall be for grain storage management (Inspection and analysis of grain quality, drying methods, grain quality control, stock control, reduction of storage losses of grains) and maintenance management of grain storage facility (Daily and regular inspection of machinery and equipment, operation method of machinery and equipment.)
- They must be based on actual conditions in Mongolia taking into consideration of all the existing literature, bills, slips, etc. used in Mongolia.
- To be of practical use, chief engineers, chief accountants, etc. in each mill shall participate in the writing of these manuals.
- For hardware, it shall include not only operation manuals and parts lists but also basic technology such as mechanical factors, etc.
- Manuals, pocket edition size shall be made.

4-8 Estimated Project Cost to be Borne by The Government of Mongolian

Estimated cost of construction under responsibility of the government of Mongolia are as follows:

(1) Harhorin Site

- | | |
|--|--------------|
| • Ground clearing works - Removal of hard standings at site and leveling | 3,120,000 TG |
| - Removal of abandoned flat warehouse | 1,664,000 TG |

	- Repair works of existing buildings (rain leaks, etc.)	1,248,000 TG
	- Repair works of existing Mechanized flat warehouse	3,500,000 TG
	- Supply of power line	1,800,000 TG
	- Supply of water pipeline joint	400,000 TG
• Facility	- Curtain, desk, chair	1,331,200 TG
 (2) Undrkhan Site		
• Ground clearing works	- Removal of hard standings at site and leveling	1,040,000 TG
	- Repair works (rain leaks, etc.) on existing works	1,248,000 TG
	- Supply of power line	1,800,000 TG
	- Supply of water pipeline joint	400,000 TG
• Facility works	- Curtains Clerical desks • Chairs	1,331,200 TG
	- Electricity supply works for wheat quality inspection equipment	124,800 TG
 (3) Murun Site		
• Facility works	- Electricity supply works for wheat quality inspection equipment	124,800 TG
 (4) Choybalsan Site		
• Facility works	- Electricity supply works for wheat quality inspection equipment	124,800 TG
<hr/>		
Total		19,256,800 TG (Abt. J¥4,63 mil.)

Besides the above, it is necessary to include commissions, taxes, etc.

such as below mentioned.

(5) Bank Commissions for Banking Arrangement

The government of Mongolia must budget for these works and execute the works at the appropriate time.

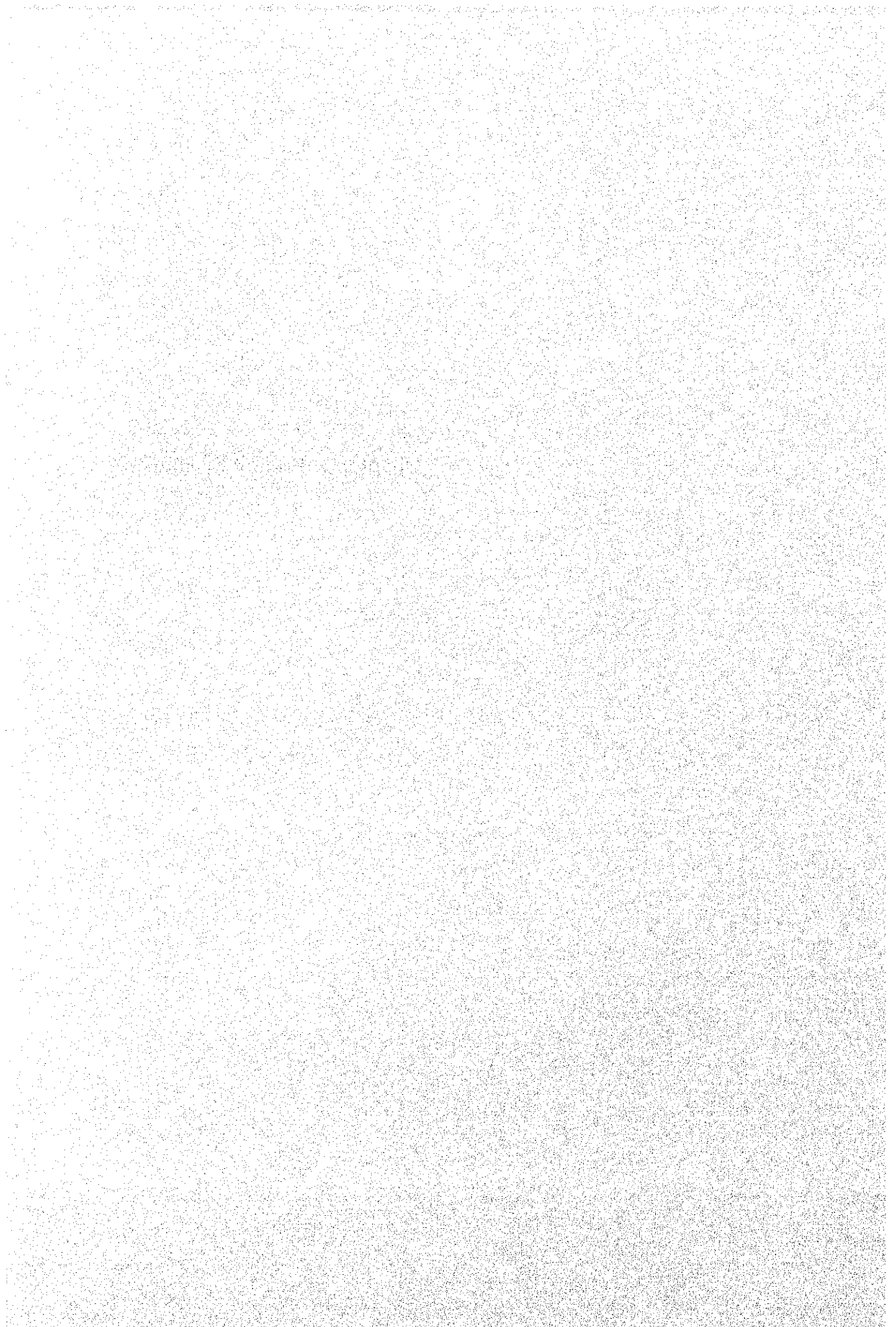
4-9 Relation with Technical Cooperations and Other Donors

The study mission confirmed that this project is not directly related with other assistance.

The technical cooperations after the completion of this facility is not requested yet. This is because the facility under this project is a part of existing flour mill. And maintenance and other management on hardware can be made by the existing organization and under their existing system. However, there is a room for improvement in the grain storage management centering on stock-control, quality control, etc.

Although there is no technical cooperation scheduled for this project, making manuals in Mongolian is expected. It is desirable to compile the manuals centering on grain storage management.

Chapter 5 Project Evaluation



Chapter 5 Project Evaluation

5-1 Effect

The purpose of grain storage facility construction is, in the broad sense, a rationalization of marketing, concretely speaking, it is a rationalization of storage management for the grain, object of storage, and its transportation. It is therefore a reduction of losses during storage and improvement and reduction of labour. Storage facility to be built under this project is not for commercial activity to get commission on the storage and transportation but to store wheat safely and supply it continuously and efficiently to the flour mills as harvesting and collection of wheat fluctuates yearly by the natural conditions.

For this purpose, the followings are cited as effects of storage facility construction.

- Rationalization of wheat storage and handling within the project area.
- Strengthen the business activities of flour mill, to which project facility belongs.
- To increase supply by reducing several percent of grain loss during open-piling.
- To improve wheat quality by introducing pre-cleaner, stoner and dryer as component parts of storage facility.
- To prevent quality deterioration of high moisture grain by reducing the storage period of such grains by introducing dryer.
- To save cost of labour and material needed by present open-piling storage method
- To establish model plants for other plans of construction by constructing optimum storage facility and yielding economic gains to the flour mills

Depending on the case, there would be large fluctuations in the grain loss during storage. However, there are always some loss. The losses occur

during open-piling is, as previously stated, observed to be several percent. Suppose the difference between the open-pile storage and that of new storage facility to be constructed is 5%, 900 ton of grain, 5% of 18,000 ton, a planned storage capacity of the project, will be saved and it is an indirect production increase. Present value of 900 ton wheat is about us\$ 90,000 (equals to about 9 million yen).

Direct beneficiary of this project is the flour mills concerned, then the farms who supply materials. Local inhabitants who consume wheat flour product produced by mills are also an indirect beneficiary.

The flour mills in the object area for this project study, supply the product to an area (aimags) of about 880,000 population, which is 40 % of whole nation. The area to which Harhorin flour mill supplies covers 5 aimags (prefecture), 413,400 population. The Undrkhan flour mill supplies to an area of 2 aimags with 117,500 population. Both flour mills together supply to 24 % of whole national population. Annual wheat flour consumption per capita (target) in Mongolia is 110 kg and equals to 164 kg of wheat. Designed capacity of Harhorin 10,000 ton covers consumption quantity by about 61,000 people. Undrkhan 8,000 ton equals to consumption quantity by about 49,000 people.

Effect and degree of improvement made possible by executing this project are compiled as follows :

Table 5-01 Effect and degree of improvement by execution of this project

Present condition and problems	Measures taken by this project	Effect and degree of improvement
Several percent of grains stored by open-piling is lost by snow, rain, birds and rodents. Quality deteriorates by water leakage	Eliminates the causes of loss by constructing silos and store wheat in the silos	Most of the quantity and quality losses will be eliminated
Lack of storage facility makes uncontrollable open yard piling	Construct silos with necessary capacity	Open yard piling can be eliminated for average quantity collected. If more than average year's collected, Open piling will be necessary temporarily

Additional expenses necessary for transportation within yard and for open-piling	Construct silo adjacent to flour mill and mechanically convey wheat directly to flour mill	Only small number of operator is necessary. Transportation within the yard will become unnecessary
A large ground will be necessary within a mill yard or in a separate place for open-pile storage	Silo will be constructed and connected to flour mill	Silos will be constructed within a flour mill yard. It requires only a small portion of area necessary for open piling.
Oil is necessary for dryers fuel, expensive and unstable in availability	Introduce a dryer that can use domestically produced coal as fuel	Problems of high cost and unstable supply are solved because there are many coal mines in Mongolia
Much impurities specially small stones are mixed causing damages in milling machines and poor quality of flour	Introduce precleaner and stoner as part of storage facility	Stones can be removed from materials
Position of weigher is not in right place of flour path. Accurate stock control is difficult	Make it possible to measure weight when grains are fed to silo and discharged from silos	Results of weighing are shown although not automatically. It is possible to keep records
Incomplete quality inspection equipment is causing poor accuracy of inspection	Supplement inspection equipment of minimum requirement	It will be possible to inspect by regulation and standards

5-2 Results of Verification on Project Justification

The capacity of the storage facility in this project is 18,000 ton, only 3.6% of the total wheat production of Mongolia, about 500,000 ton. Therefore, the effect must inevitably be limited. However, as stated above, it will influence many Mongol people. Since Harhorin site was the capital and cultural centre in the 13th century, many people must notice the existence of this facility because many sightseers are visiting the city from both home and abroad.

From what has been written so far, it is clear that not only a great effect is expected but also it contributes greatly to the betterment and welfare of the people of Mongolia. The appropriateness of executing this project with the grant aid assistance has been confirmed. Further studies were conducted on the personnel disposition, operating system, technical level of those who give maintenance services in Mongolian executing organization after this

project is completed, also possibility of securing a necessary budget by the Mongolian party. It has been confirmed that no problem exists. It is judged appropriate to execute this project with the grant aid assistance program of the Japanese government.

5-3 Recommendations

In Mongolia, due to abrupt change in the country's social system, production of staple food, wheat has been dropped. She must rely on imports to supplement the shortage. A great quantity of domestically produced wheat, material for flour milling, is however laid outdoors, and piled in an open yard.

It is inevitably causing a large loss. It is imperative to improve the situation. This project for construction of grain storage facility can contribute to the improvement in food self-sufficiency program, which is the national policy of Mongolia and also to stabilisation of its people's livelihood by constructing grain silos suitable for marketing and natural conditions of Mongolia and by reduction of grain loss during storage and rationalization of distribution.

In order to smoothly and efficiently execute this project the following are judged important:

- As this is a first facility construction project in Mongolia, it is feared that the infrastructure may pose some problems. Hence, the first site of construction should be Harhorin, then next should be the Undrkhan site in order to increase the possibility of carrying out the construction works.
- As the construction period is limited due to the long severe cold season, necessary procedures must be taken to be able to start the outdoor work immediately after March when the temperature rises, paying attention to whole schedule.
- Quickly carry out procedures such as conclusion of E/N, and successively consultant contract. Then, start detailed design works. This is necessary to complete the work safely and within the fiscal year period.

- In execution of this project, it will be necessary for Japanese engineers to stay at the project sites. The living circumstances in both sites are quite severe for Japanese. Kind consideration for adequate accommodations by the Mongolian party, and especially by the flour mill management is strongly requested.
- In flour mills at Murun and Choybalsan, both are object sites for this project study but construction works were deferred, shortage of storage facilities is basically same as Harhorin and Undrkhan. Therefore, construction of the storage facilities for these two sites was confirmed to be necessary.
- Existing storage facility in Harhorin is in a very poor condition, and it requires modification work. Designing of facility size for this site in this project was based on their modification works. Therefore, the Mongolian party must complete this modification work.