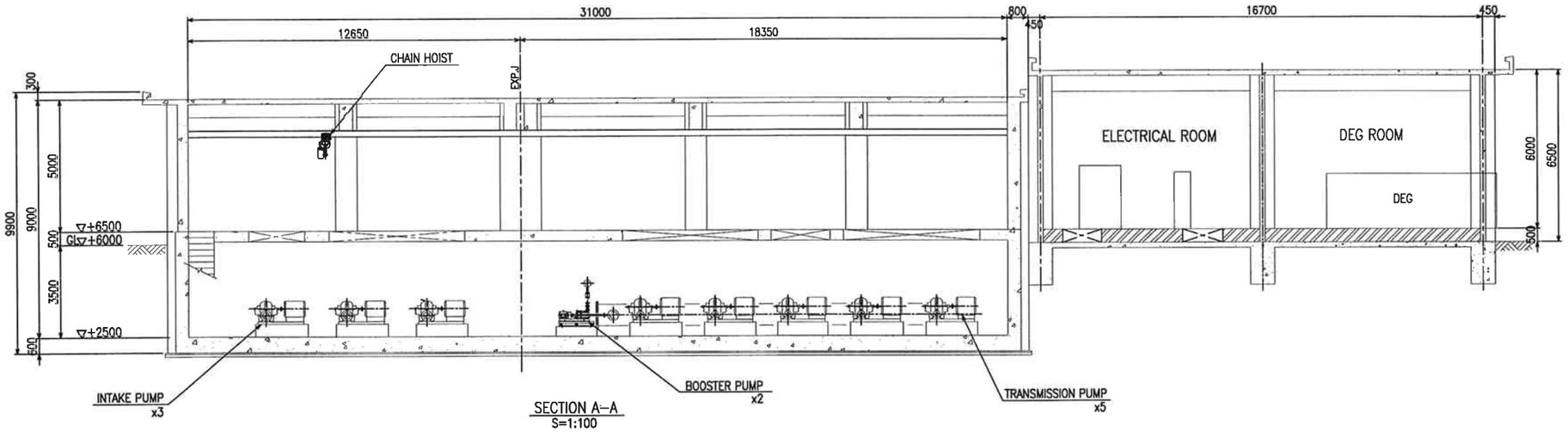

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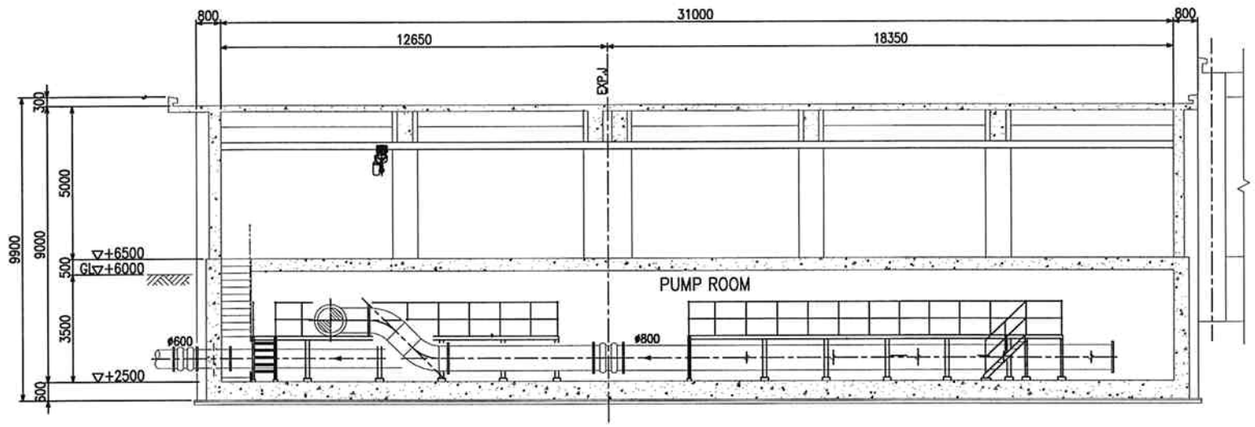

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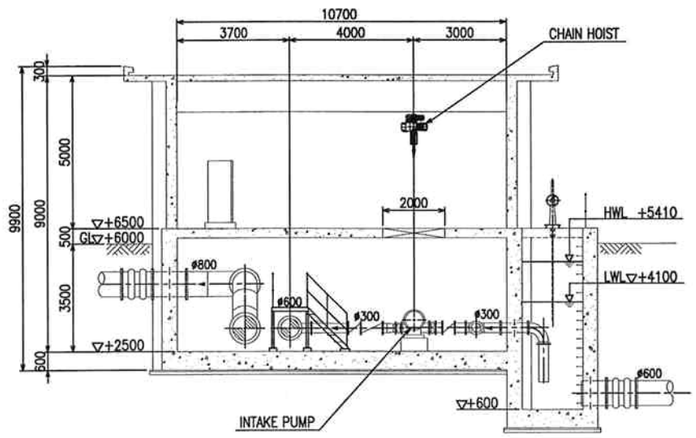

SECTION C–C
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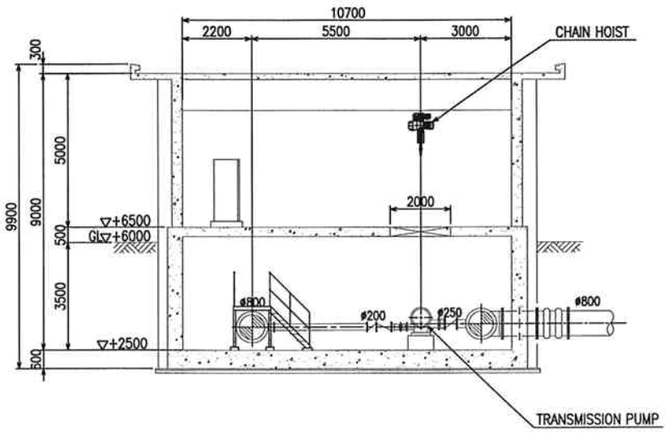
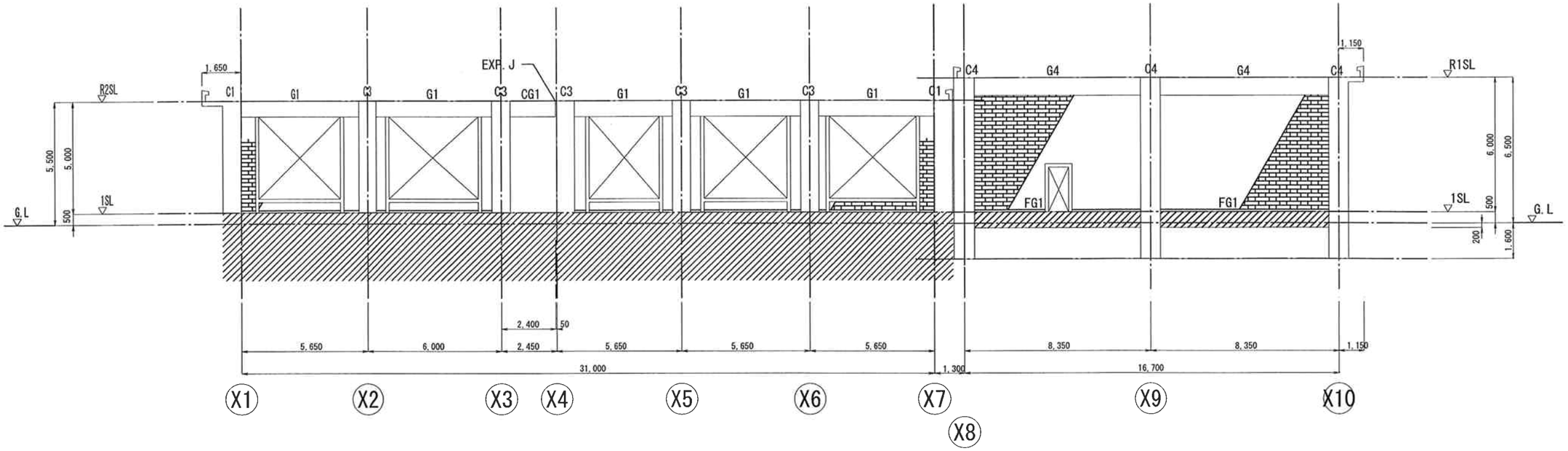


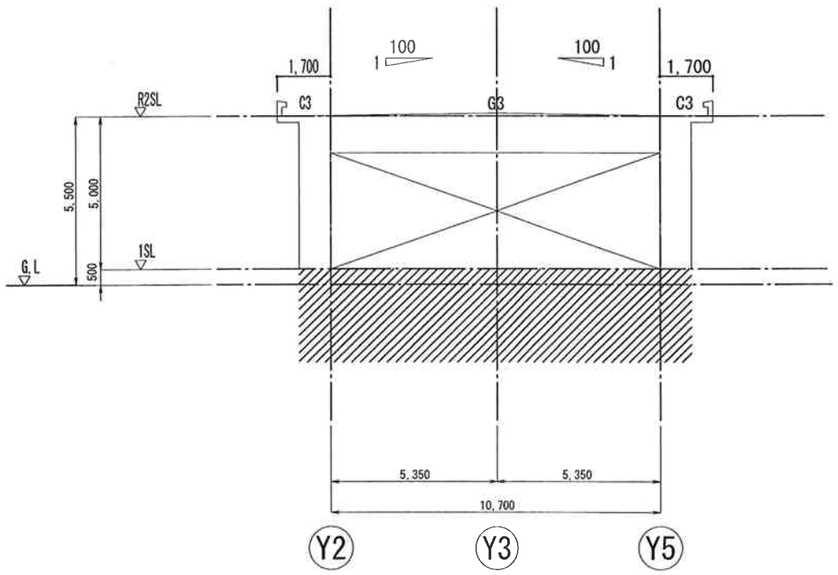
SECTION D–D
S=1:100

MKWP-14 Pump Station and Electrical Room(2/2)

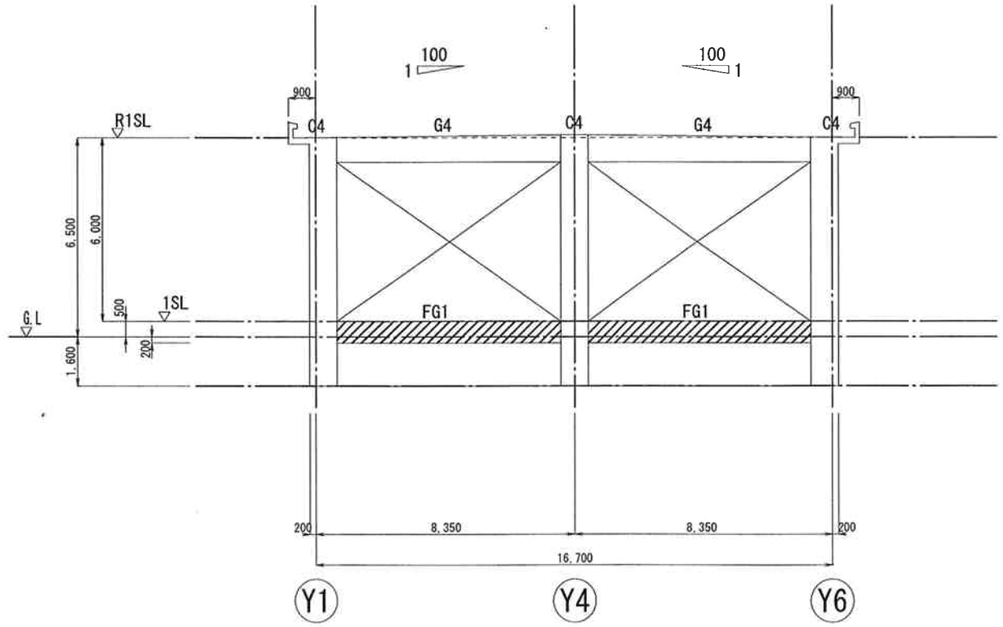


LINE Ⓨ2 FRAMEWORK ELEVATION S=1:200

LINE Ⓨ1 FRAMEWORK ELEVATION S=1:200

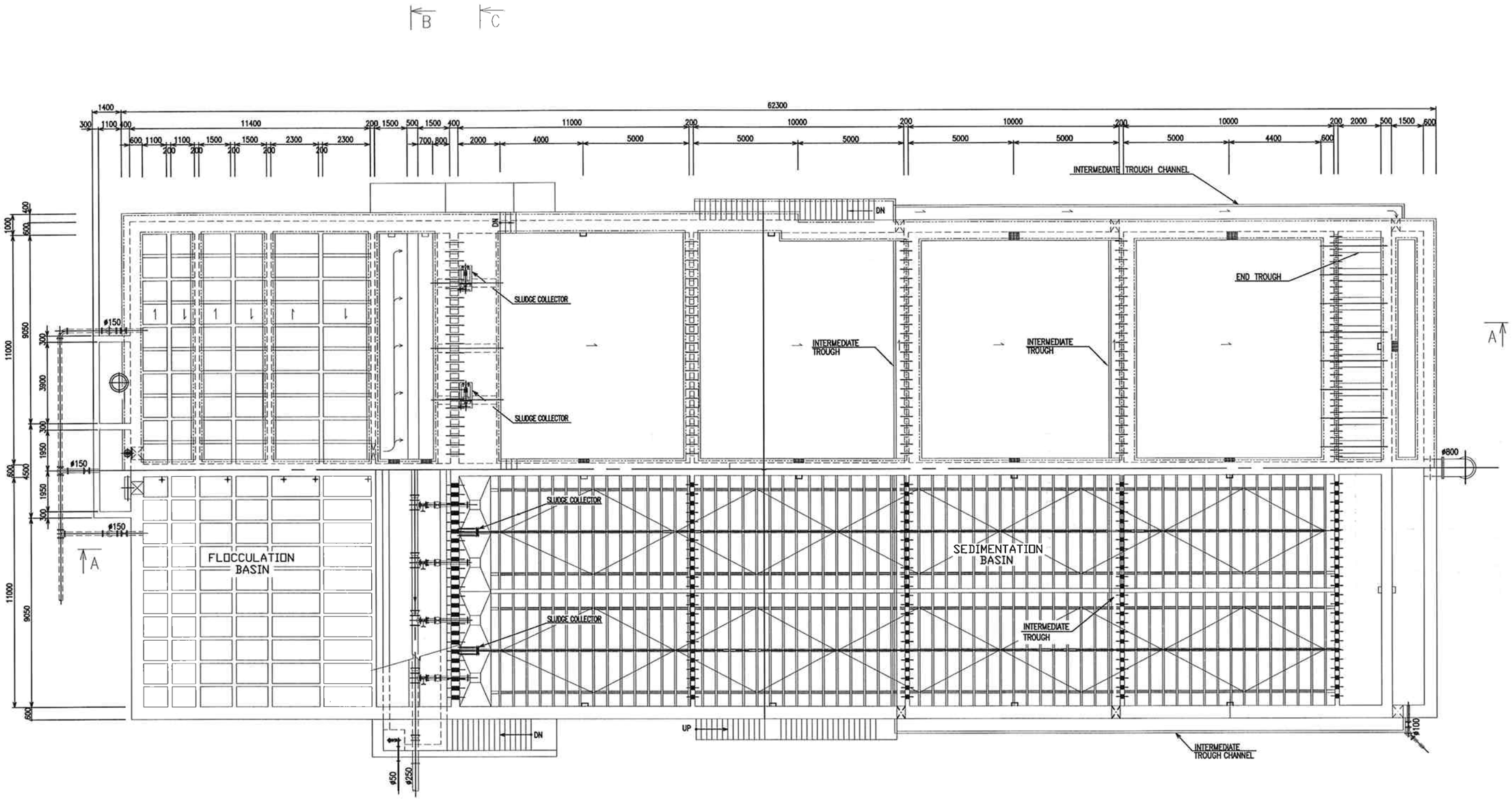


LINE Ⓧ4 ~ Ⓧ6 FRAMEWORK ELEVATION S=1:200



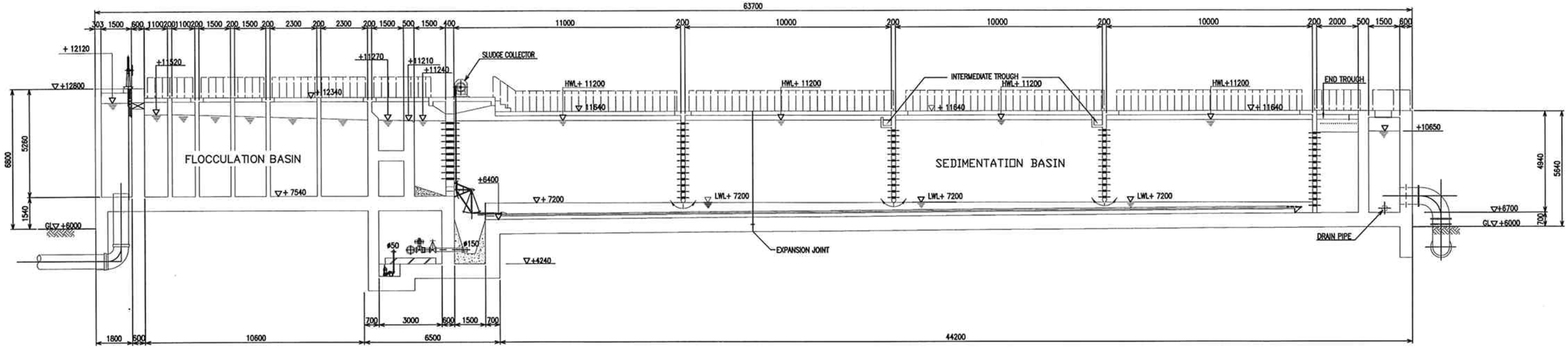
LINE Ⓧ8 FRAMEWORK ELEVATION S=1:200

MKWP-15 Building Plan of Pump Station and Electrical Room

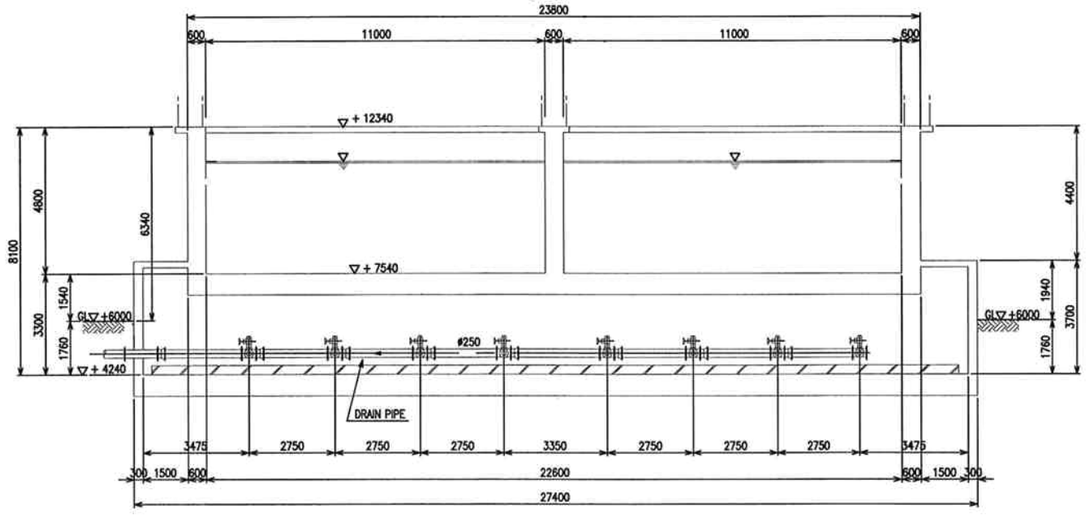


TOP PLAN
S=1:100

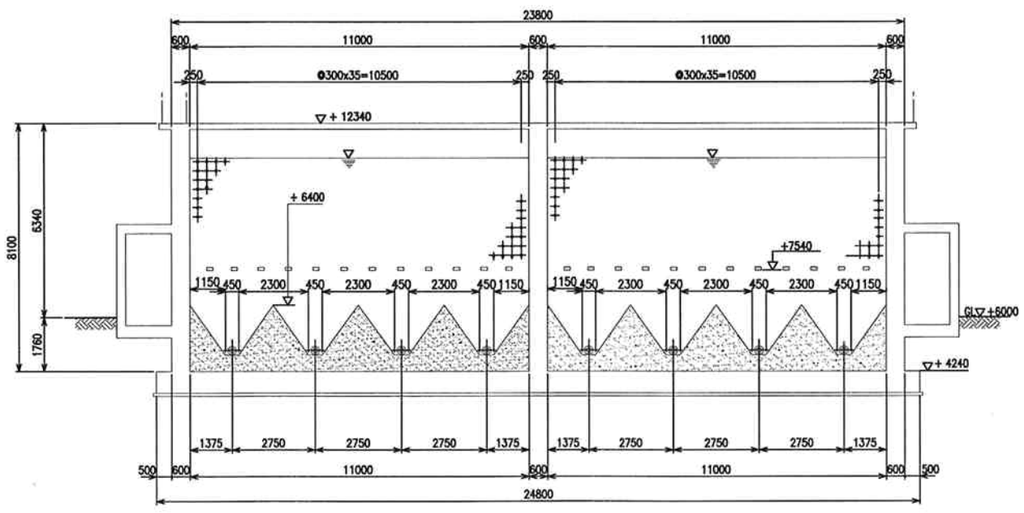
MKWP-16 Sedimentation Basin(1/2)



SECTION A–A
S=1:100

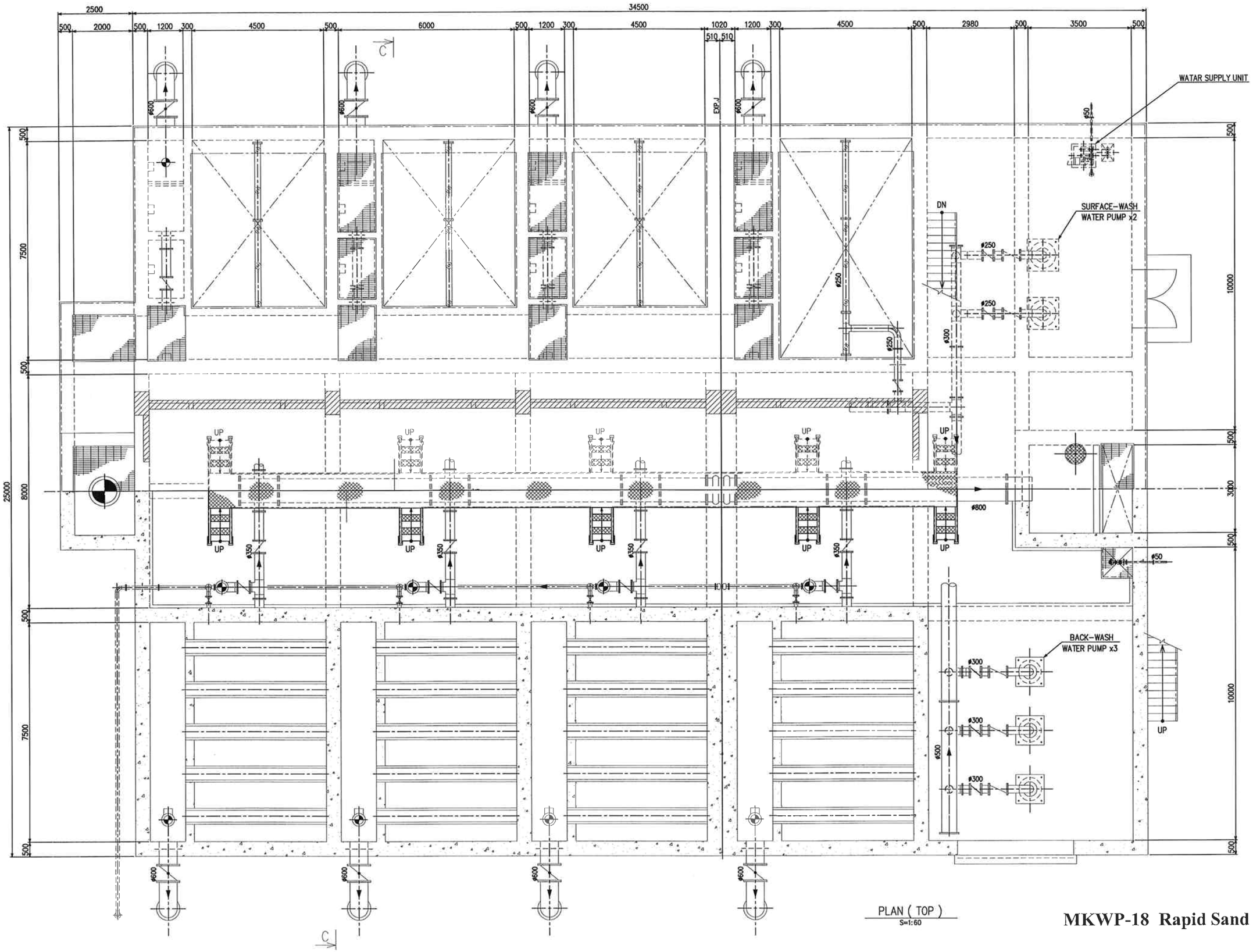


SECTION B–B
S=1:100

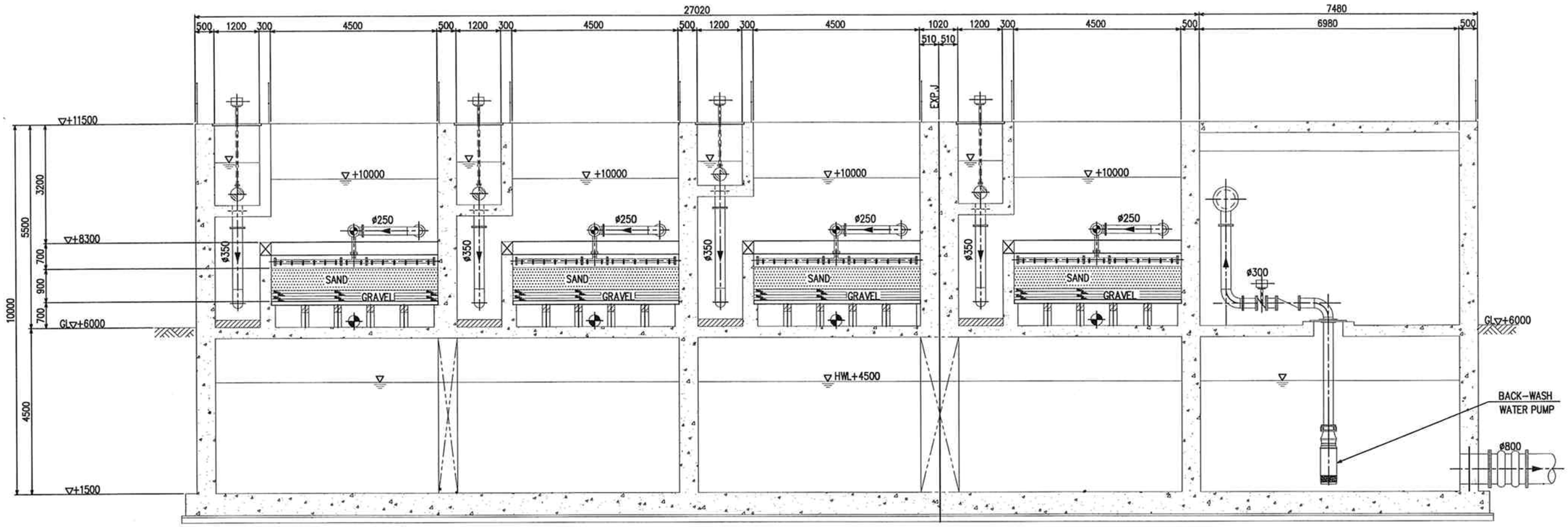


SECTION C–C
S=1:100

MKWP-17 Sedimentation Basin(2/2)



MKWP-18 Rapid Sand Filter(1/3)



A-A SECTION
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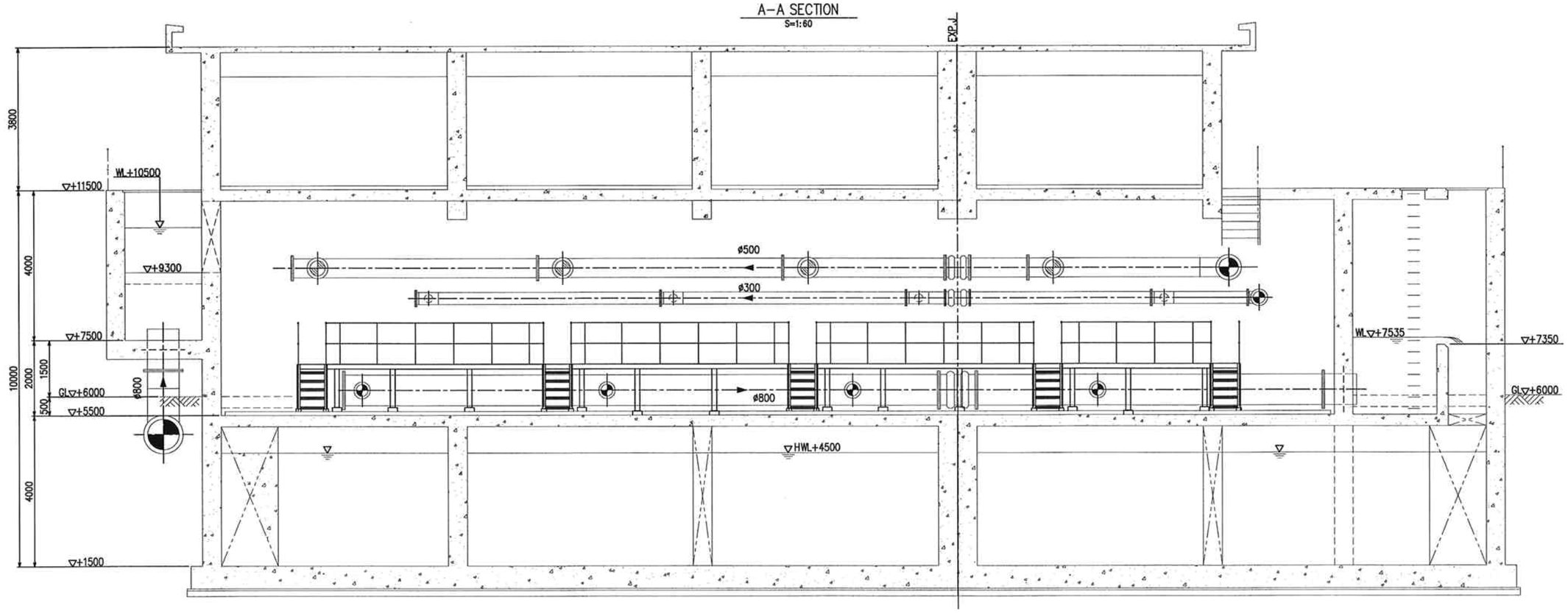

B-B SECTION
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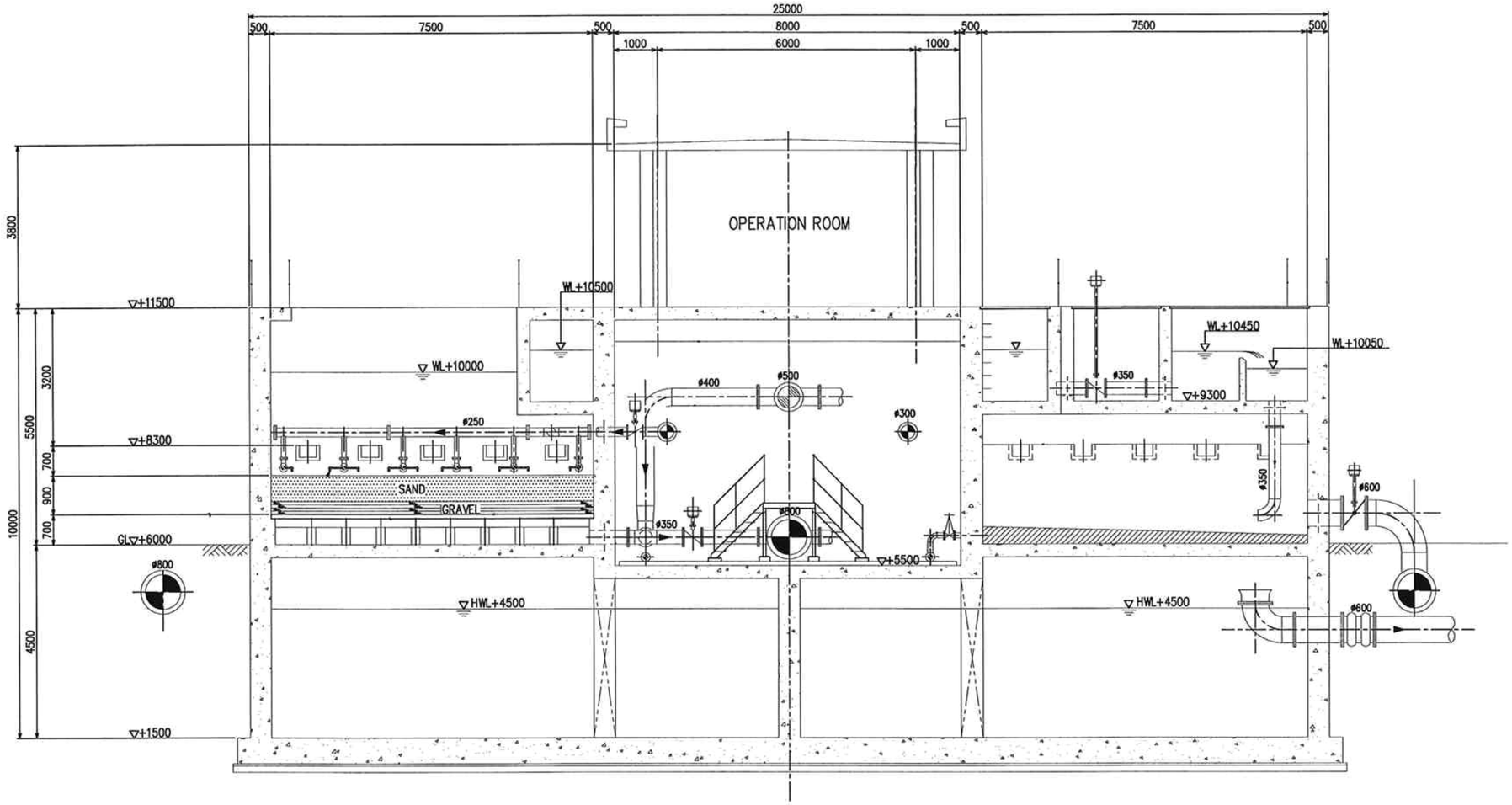
MKWP-19 Rapid Sand Filter(2/3)



C-C SECTION
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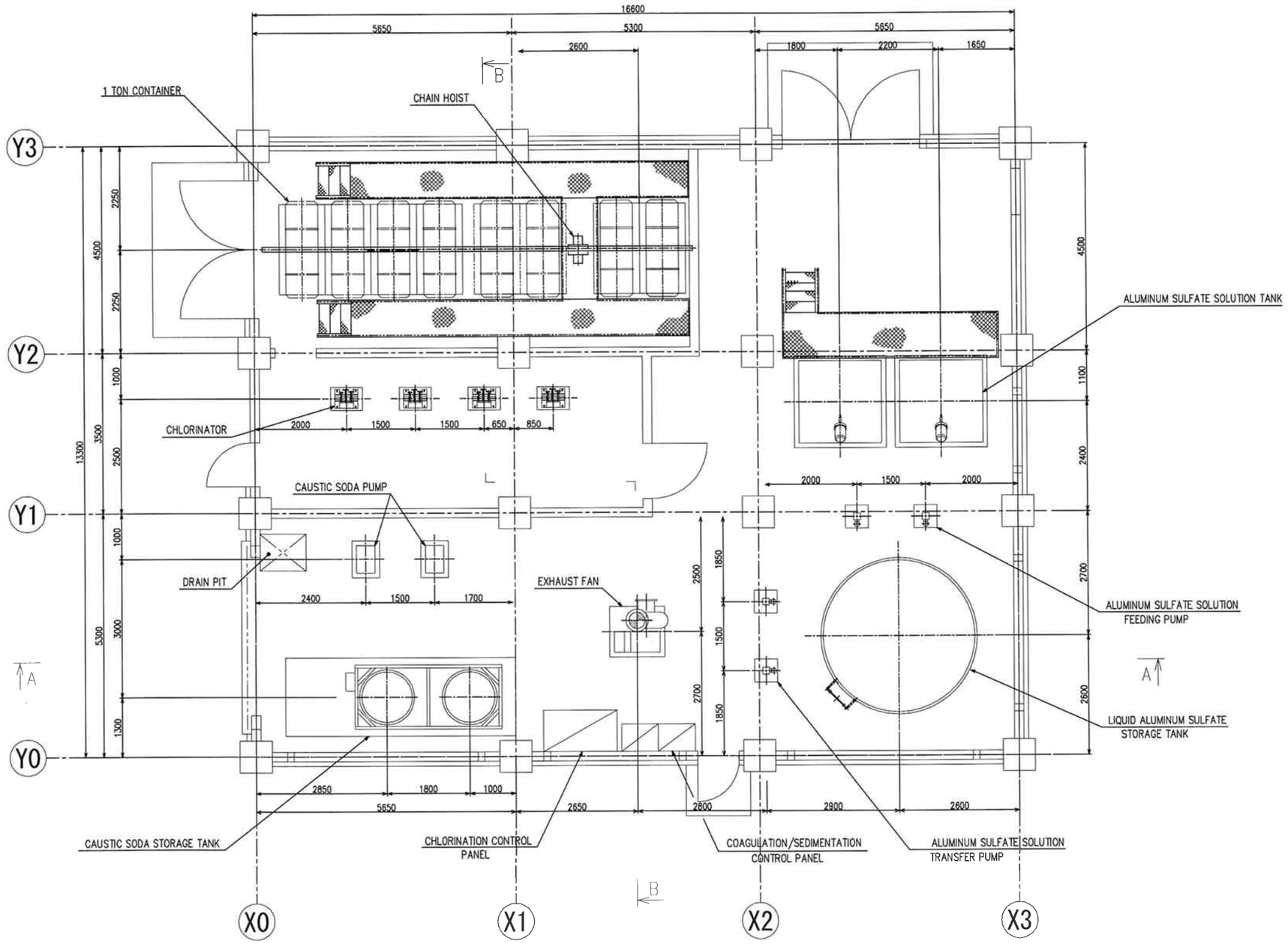
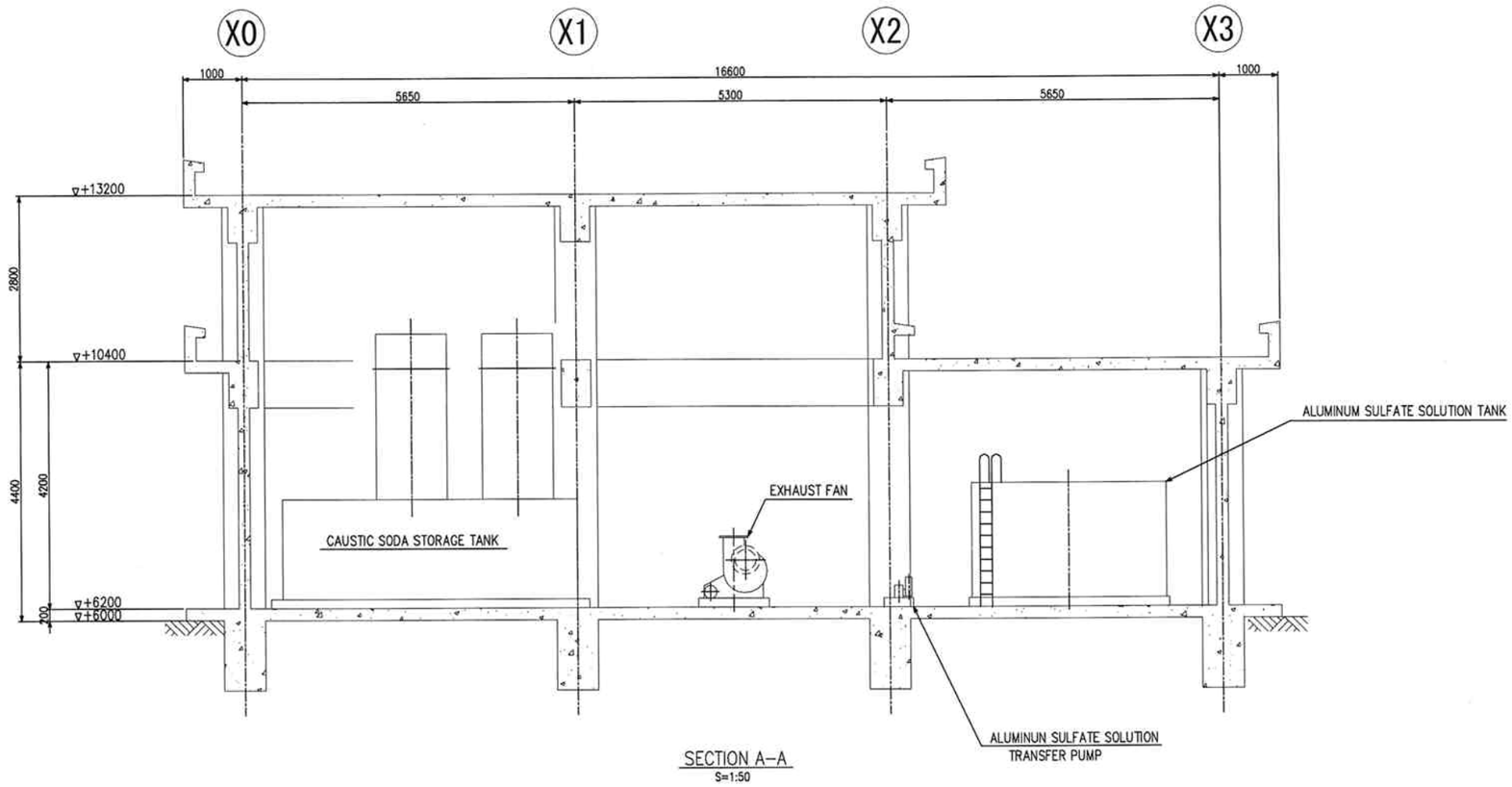
MKWP-20 Rapid Sand Filter(3/3)

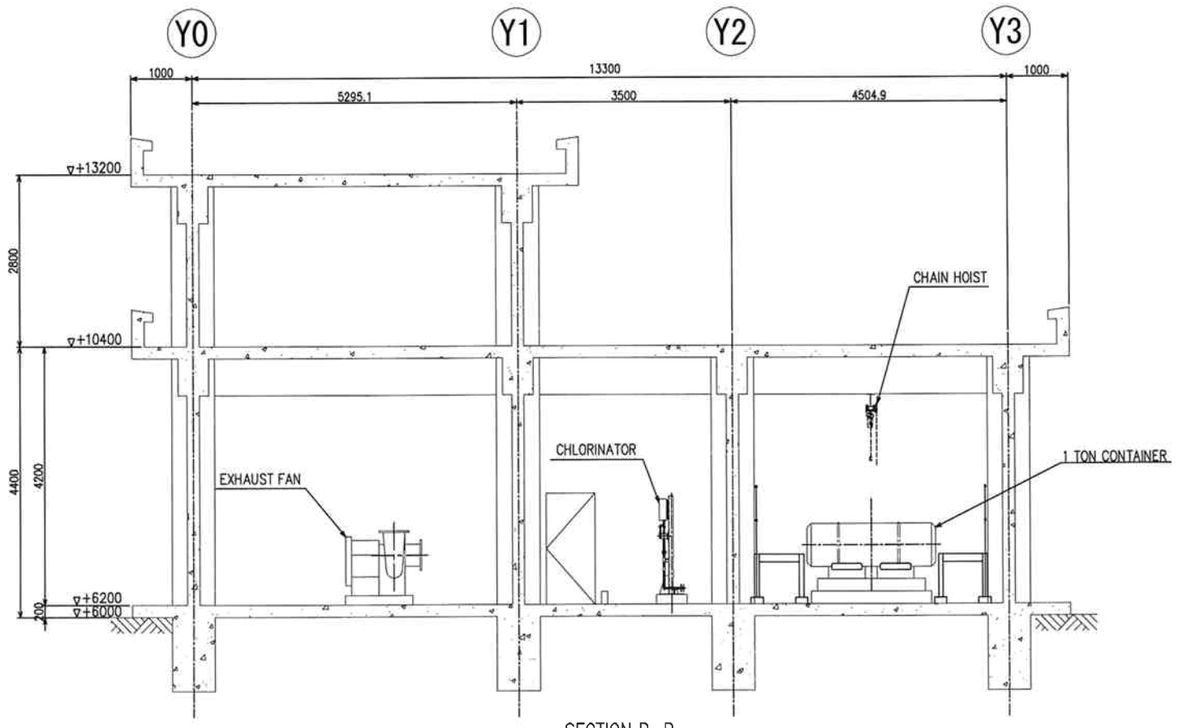


PLAN
S=1:50

MKWP-21 Chemical Dosing Building(1/2)



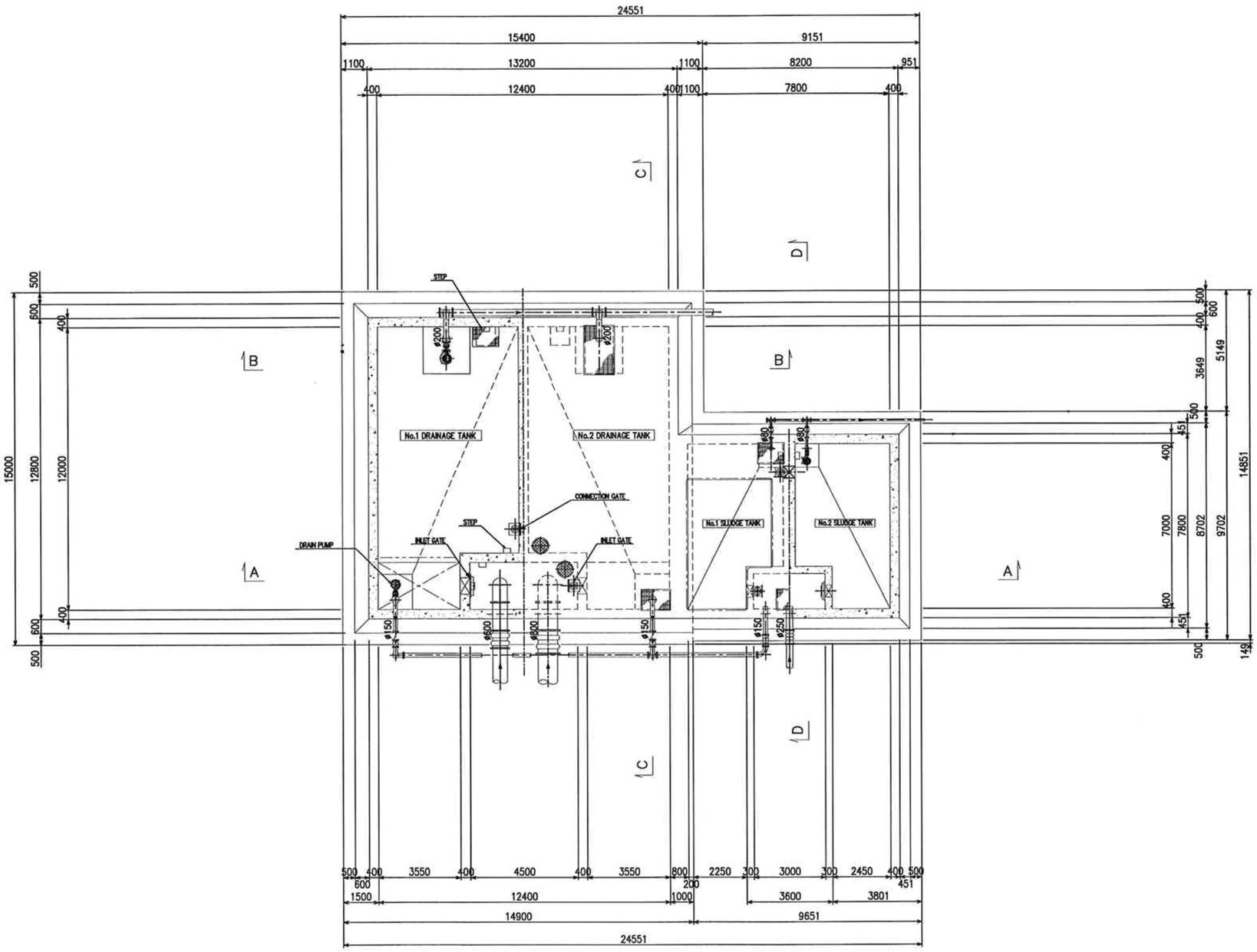
SECTION A–A
S=1:50



SECTION B–B
S=1:50

MKWP-22 Chemical Dosing Building(2/2)

PLAN
S=1:100



MKWP-23 Drainage Tank and Sludge Tank(1/2)

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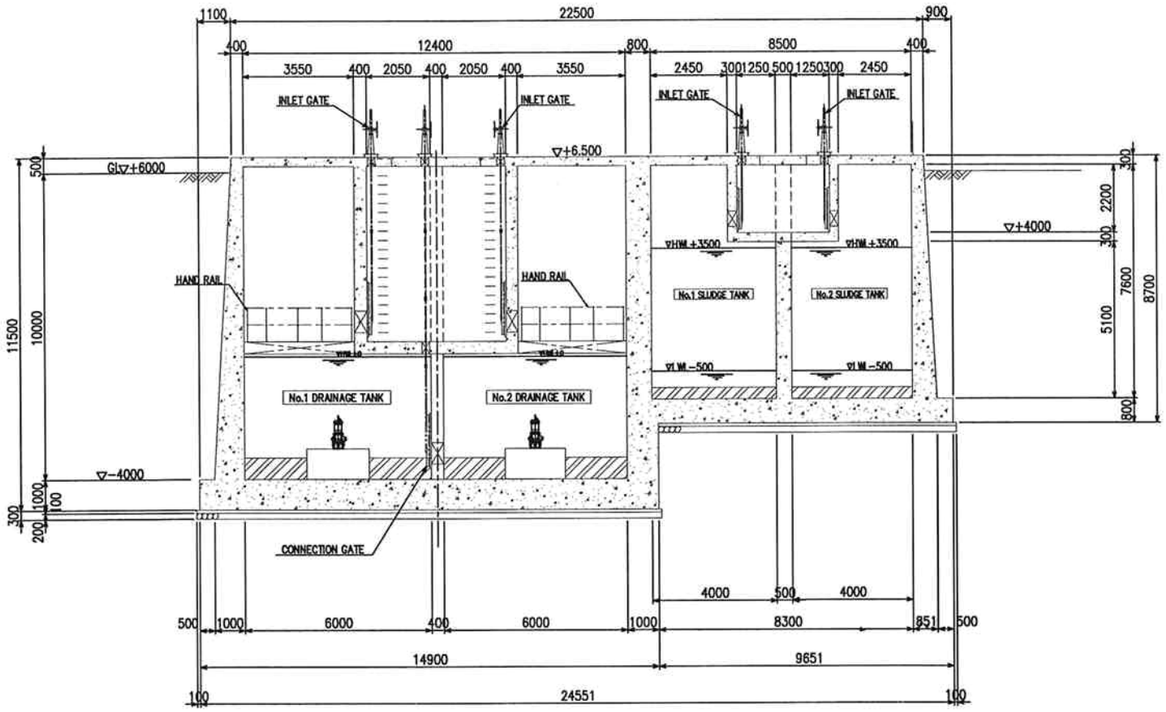
S=1:100



SECTION C–C
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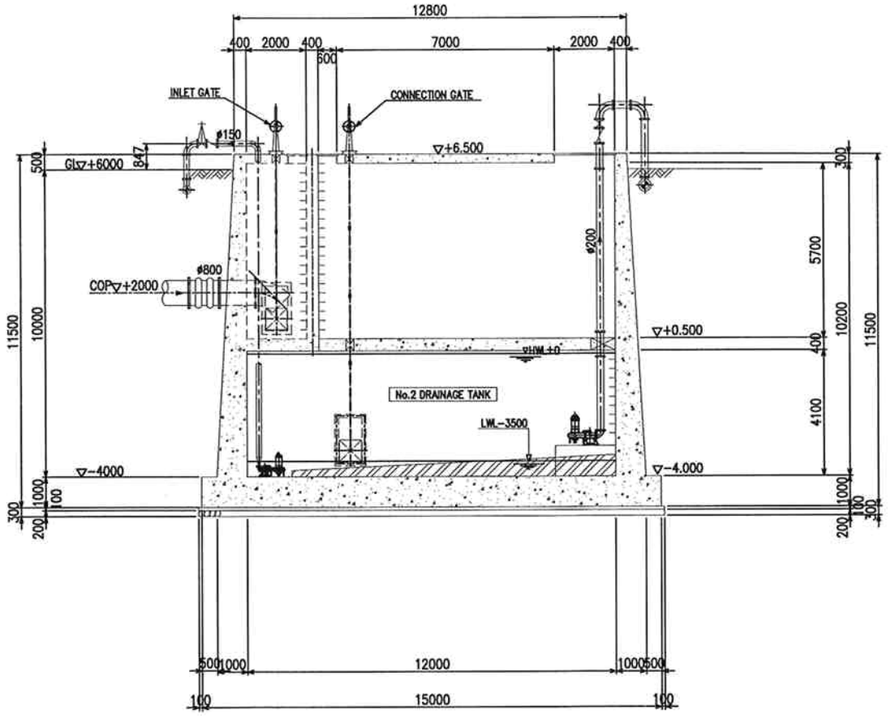

SECTION B–B
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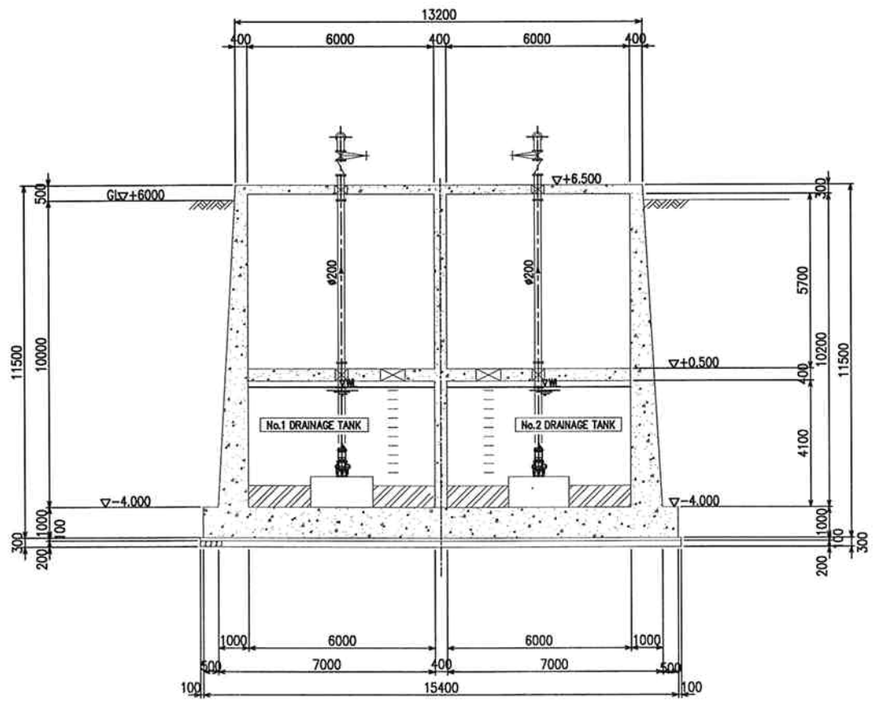
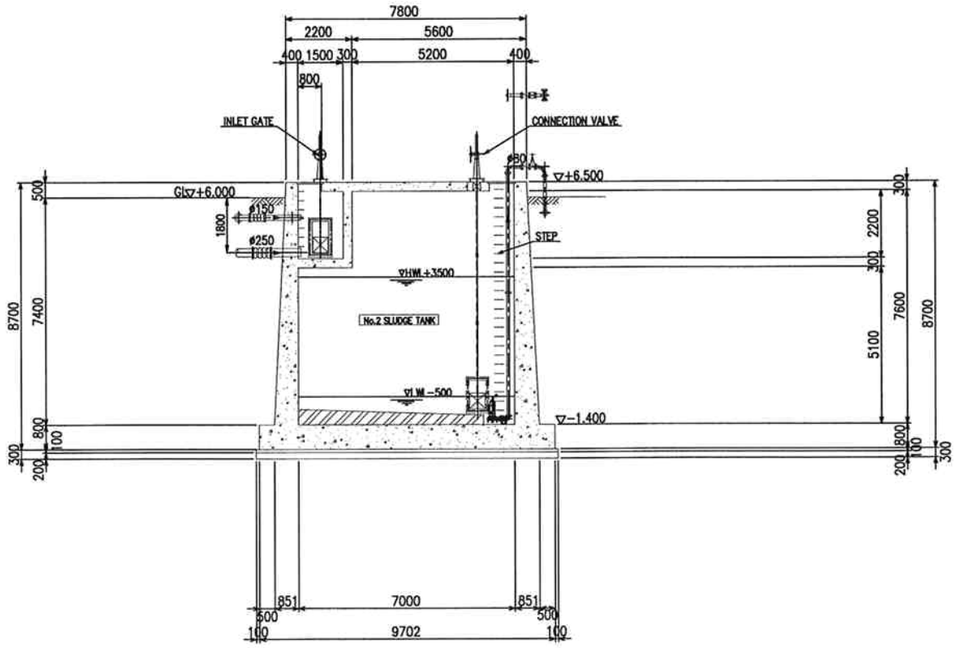
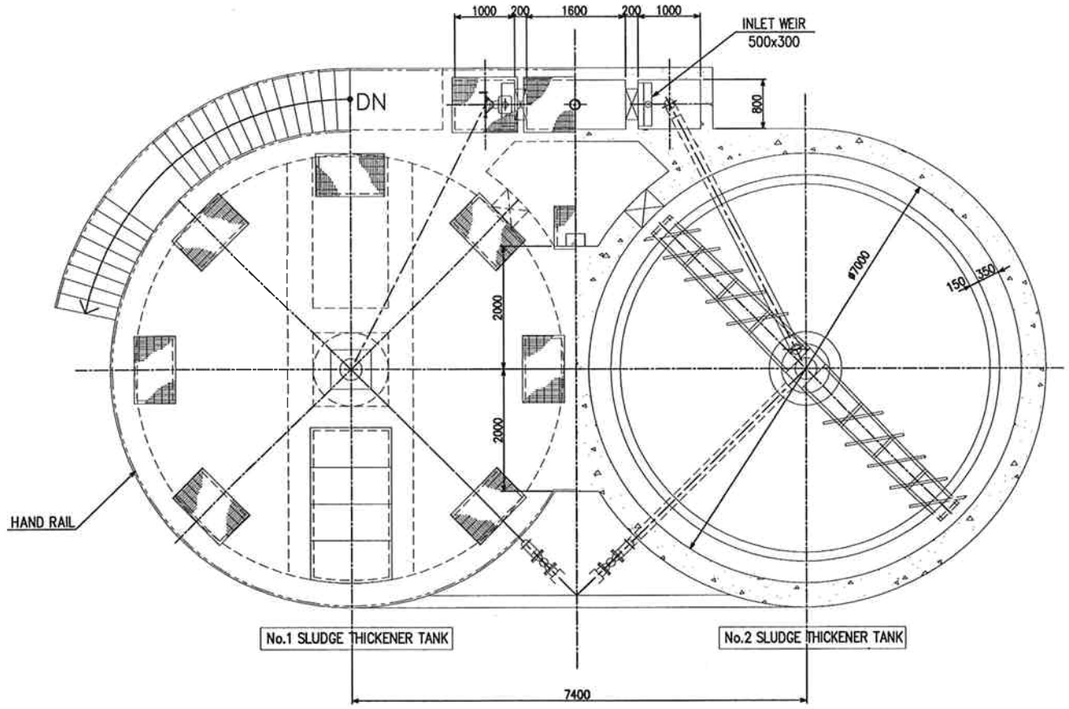
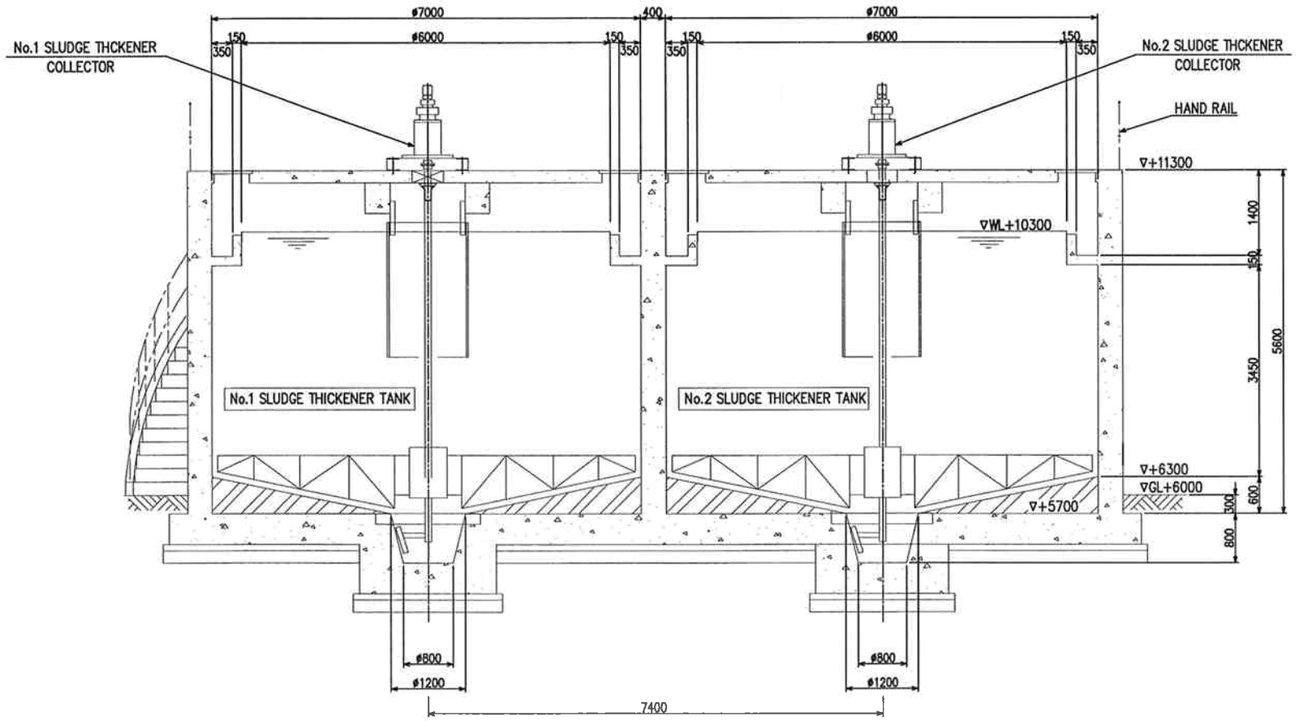


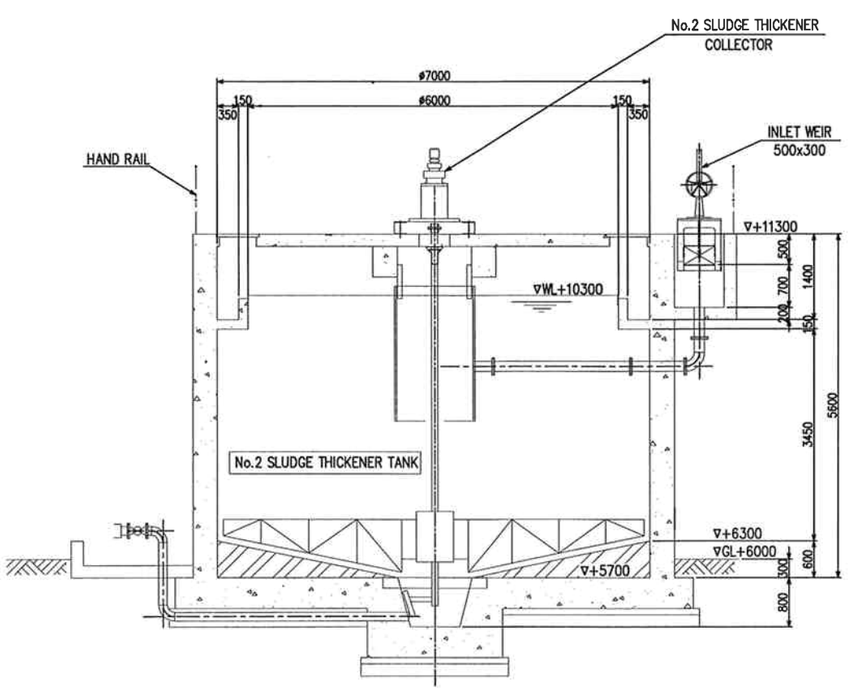
SECTION D–D
S=1:100



MKWP-24 Drainage Tank and Sludge Tank(2/2)







MKWP-25 Sludge Thickener

2.2.4 Implementation Plan

2.2.4.1 Implementation and Procurement Policy

The Project will be implemented under Japan's Grant Aid scheme. Therefore, after the Exchange of Notes between the both Governments, the Egyptian side and Japanese companies will execute contracts and conduct design, construction and procurement.
In consideration of the Japan's Grant Aid scheme, facility construction and equipment procurement, the following basic design policy is set for construction and procurement plans in the Project.

(1) Implementing Body

The Egyptian side's responsible and coordinating organization is the Ministry of Housing, Public Utilities and New Urban Communities. NOPWASD and GACWASD play the role as implementing organizations. Each role is listed below. NOPWASD is the contract party with the Japanese companies when the Project is implemented.

NOPWASD

Verification, coordination and arrangement of the scope and content of services rendered by and between Japanese and Egyptian governments.
Preparation and supply of the technical information required for designing WTP
Design, rehabilitation and construction of the facilities, for which the Egyptian side shall be responsible, such as construction/rehabilitation of water transmission and distribution networks (no less than 300mm in diameter) in the Project target area.

GACWASD

Management, operation and maintenance of the WTP and preparation and supply of the technical information concerning the management, operation and maintenance of the WTP

Management, operation and maintenance of the facilities, equipment and materials constructed and procured in the Project.
Design, rehabilitation and construction of the facilities, for which the Egyptian side shall be responsible, such as water transmission and distribution networks (less than 300mm in diameter) in the Project target area.

(2) Consultant

The Project is implemented under Japan's Grant Aid. Therefore, it is necessary to select contractors in an open tender and to set tender document for the selection of the contractors. Additionally, it is required to open an appropriate tender, conduct construction and procurement and supervise appropriate enforcement of the Grant Aid Scheme from the objective stance. Therefore, the Egyptian implementing organization NOPWASD shall make a contract with the consulting firm for design and supervision works of the Project including preparation of the design and the tender documents, assistance for opening the tender, supervision of the contract works and procurement management.

The selected consulting firm shall be required to be well-acquainted with the scheme of the Japan's Grant Aid and the component and concept concerning the design of the Project.

(3) Contractors for Construction and Procurement of Equipment and Materials

The contractors shall be selected in the open tender under the Japan's Grant Aid Scheme. The Egyptian side will be required to open a righteous tender with the entrusted consultant and select contractors. The contractors are required to satisfy the followings.

1) Contractor for Construction

The construction works shall be carried out in the different place in the social environment and backgrounds from those in Japan. Therefore, the contractor shall have enough experiences and capabilities to construct and complete the similar works outside Japan.

The contract is made for construction of the WTP. Thus, the contractor shall have the ability to construct similar WTP. It is necessary to establish a consortium in cooperation of a water treatment plant maker and construction contractor in order to select and install appropriate plant equipments for the Project.

In addition to the above, after completion of the Project, the contractor shall be required to render the after-service such as procurement of spare parts and response to the breakdown of equipment, which orders shall be requested by the Egyptian implementing agency. Hence the contractor shall be required to keep good contact with the Egyptian side after handing over the facilities, equipment and materials to the Egyptian side.

2) Equipment Procurement Contractors

Equipment and materials to be procured for the Project shall be required for proper management/maintenance of the new WTP. Since these equipments and materials are regarded as the essential facilities and equipments, the construction contractor shall commence its procurement of the equipment and material at the time of starting the construction works.

(4) Necessity for Dispatching Engineers

Basic labor forces can be procured in Egypt. However, engineers who have specialty in the area of sheet piling, formwork, steel bars, water proofing, etc. are required to be executed under the control of some skilled experts from the reasons as mentioned below. Some experts specified for civil engineering and building construction shall be dispatched from Japan.

- Because quick and smooth construction shall be required, the experts shall be requested to understand other construction works in parallel with their works and to arrange the preparatory works and supervise the local workers on the field. Especially since reinforced concrete will be the main work because the placing volume of concrete will amount to approximately 10,000 m^3 ,

will be the key portion of the Project and will have much effect on the project schedule, special experts who are enough skilled in formwork and reinforced concrete works shall be required.

- Technical transfer relating to materials, construction methods, finishing condition shall be given to the local workers through the construction period. Particularly because the project has a number of piping and tank construction works, technical transfer of accurate water proofing works and repair work may be transferred accordingly.
- Excavation depth reaches approximately GL -12m. Therefore, it is necessary to maintain the safety and the quality control of retaining works by proper sheeting and dewatering.

2.2.4.2 Implementation Conditions

(1) Facility Construction

Raw Water Intake facility shall be constructed in El Malah Canal, which is utilized as irrigation canal. Because the water intake facility will be constructed under the water, sheet piling, coffer dam and dewatering shall be required for securing safety of the works and preventing water intrusion.
6 to 12 m of excavation depth shall be required for the main facilities. Because the groundwater table may be shallow (GL-0.5 to 1 m), dewatering works shall be required. It is necessary to control groundwater inflow and conduct effective dewatering.

Due to the limitation of the project construction area, it may be hard to excavate with slope which shall stand for collapse and control of groundwater shall be required. Thus, sheet piling shall be necessary. The construction site is adjacent to apartments, and proper piling equipment and method shall be selected and adopted in order to avoid and minimize vibration and noise arising from the equipment

The volume of consumed concrete may amount to approximately 10,000 m^3. Because there is no ready-mixed concrete supplier near the project site, it is necessary to establish a temporary concrete plant on the site.

Cement, aggregates, steel bars, which are required for basic civil engineering and building construction works, may be procured in Egypt. Ductile cast iron straight pipe with more than 1000mm diameter, which is the material of water transmission/distribution pipeline, may be also procured in Egypt . However, equipments of water treatment plants and pump facility cannot be procured in the local market and, thus, shall be imported from Japan or other countries.

The necessary labor forces, construction machines, and fundamental construction materials may be available in Egypt. Yet, those construction companies, which are able to provide construction

specification and quantity in the Project, concentrate in the capital city of Egypt, Cairo. Hence, it is supposed the procurement of labor forces, construction materials, *etc*. will be provided in Cairo.

(2) Equipment Procurement

Equipment to be procured includes items, which are required for test operation and maintenance of the WTP. Therefore, the construction contractor shall procure these equipments in prior to the test operation, and after the test operation, inspection and maintenance of the facilities, may completely hand over the new WTP to the Egyptian side.

The equipment, which will be procured for the Project, shall be required for the operation and maintenance of the new WTP and will be utilized in its test operation. Therefore, the procurement of the equipment and materials shall be achieved before its test operation.

2.2.4.3 Scope of Works

(1) Facility Construction

Necessary works before completion of the facility construction and works/demarcation between Japan and Egypt are shown in Table 2.15.

Table 2.15 Work Demarcation for Facility Construction

Work Items	Japanese Side	Egyptian Side		Note
		NOPWASD	GACWASD	
1. Facility Construction				
(1) Securing the construction site		○		Completed
(2) Leveling of the land and removal/relocate the existing facilities/materials		○		Before Japanese work starts
(3) Treatment facility construction including: （From intake to connection point for water transmission main） • Water intake/conveyance facility • Raw water and transmission pump facility • Flocculation and sedimentation facility • Rapid sand filter • Drainage tank • Sludge drain tank, sludge thickener tank • Chemical dozing house • Electricity Room (including emergency generator)	○			Including civil engineering and building works, procurement of equipments, installation and trial operation
(4) Laying 11kV power cable		○		Before facility trial operation by the Japanese side
(5) Pavement of internal road for the plant		○		
(6) Outdoor Lighting		○		Before pavement of the road
(7) General drainage equipment（up to water collector）	○			
(8) General drainage equipment（after water collector）		○		After the completion of Japanese work
(9) Landscaping in the yard		○		After the completion of Japanese work
(10) Installation of fence and gate		○		After the completion of Japanese work
(11) Construction of guard house		○		After the completion of Japanese work
(12) Laying telephone line and installation of telephone		○		
(13) Fire extinguisher			○	
(14) Office furniture (desk, chair,etc.)			○	
(15) Provision of chloride and coagulant for trial operation and sterilization and water necessary for construction			○	For construction, sterilization and trial operation of the facility by the Japanese side
2. Transmission/Distribution Networks				
(1) Rehabilitation / construction of networks no less than 300mm in diameter		○		Before trial operation
(2) Rehabilitation /construction of networks less than 300mm in diameter			○	Before trial operation
3. Import and transportation of construction materials				
(1) Procurement of equipment and materials	○			
(2) Ocean Transportation	○			
(3) Unloading at Egyptian port	○			
(4) Custom clearance, tax exemption, storing in bonded ware house		○		When materials arrive in Egypt
(5) Inland transportation in Egypt	○			

Note: ○ indicates responsible works

(2) Equipment Procurement

Necessary works before completion of procurement, and work demarcation between Japan and Egypt are shown in Table 2.16. There is no procured equipment requiring installation in the Project.

Table 2.16 Work Demarcation for Equipment Procurement of Japan and Egypt

Work Item	Japan	Egypt		Note
		NOPWASD	GACWASD	
(1) Manufacturing and procurement of equipment • Spare parts for treatment plant • Treatment facility operation equipments (vacuum car) • Maintenance tools for treatment plant equipments	○			
(2) Shipping	○			
(3) Landing at Egyptian port	○			
(4) Custom clearance, tax exemption, storing in bonded ware house		○		When equipments and construction materials arrive in Egypt
(5) Inland transportation in Egypt	○			

Note: ○ indicates responsible works

2.2.4.4 Consultant Supervision

(1) Execution and Procurement Management Organization by the Contractors

1) Facility Construction

i) Contractors

It is necessary to tight up construction company and treatment plant maker because the constructing facility is water treatment plant. Additionally, the construction site is in Egypt, which is far from Japan. Therefore, Contractor's organization is shown as Figure 2.13.

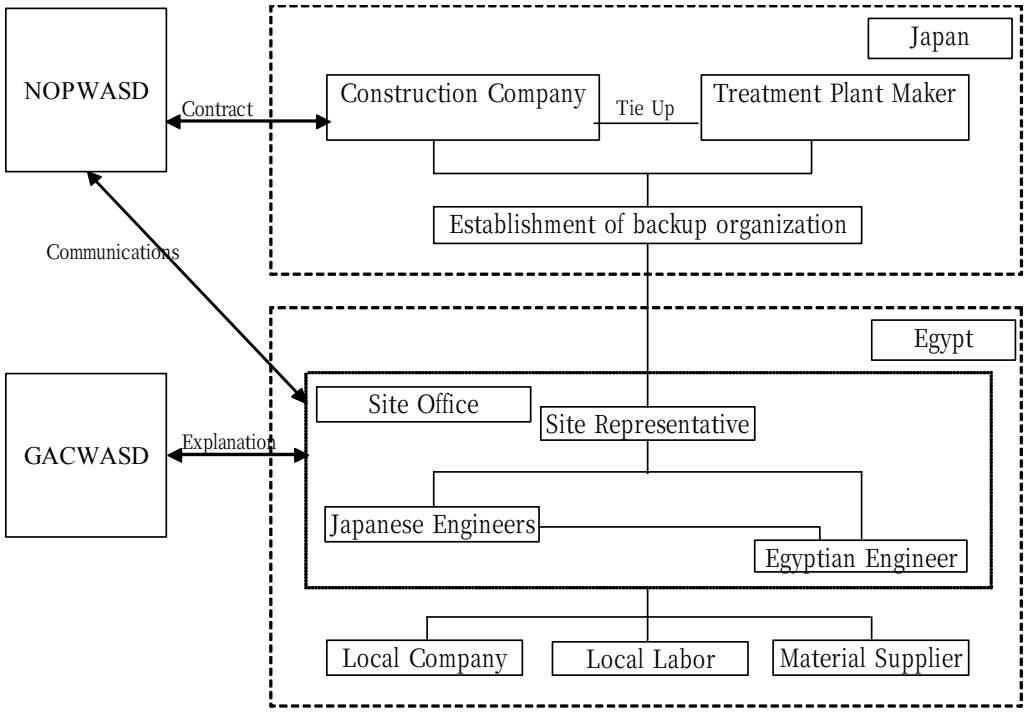


Figure 2.13 Organization Chart of Facility Construction Contractors

ii) Back-Up Structure in Japan

It is necessary for the contractors to establish a back-up structure in Japan for which arranging the total facility construction works such as civil engineering, construction, production of water treatment plant equipments, installation, *etc*. and technical and financial support.

iii) Site Office for Execution

The contractors are required to establish a site office for execution of works in order to implement civil and building works, and installation of the plant equipments. Thus, the contractors shall institute an execution management structure. This office will have responsibility for contracts with local cooperative companies, workers and material suppliers, and accomplishment the facility construction.

Although basic labor force and construction materials can be procured in Egypt, the followings imply the reason to apply Japanese engineers, who have extensive experience of facility construction in Japan's Grant Aid project, for management of schedule, quality control and safety.

All the work shall be completed within Japanese accounting system and Japan's Grant Aid Scheme. Therefore, schedule management shall be done with engineers who sufficiently understand the systems.

The Project also aims technical transfer concerning to management methods for implementation as one of the model constructions in Egypt. Therefore, the execution management of works shall embrace Japanese quality control and safety management systems.

- The techniques and execution management skills shall be transferred to the Egyptian side

implementation organization, cooperative companies and sub-contractors.

Because a number of facilities will be simultaneously constructed with various construction methods, facility construction shall be implemented with the Japanese management structure for execution of construction as shown in Table 2.17.

Table 2.17 Japanese Execution Management Structure

Type	Status	Persons	Tasks and Duration to Stay
Resident Representative	Whole Period	1	Discussion with the Egyptian organization and the consultant, confirmation and arrangement of construction scope and schedule, procedures such as construction permission, execution management: Stay from commencement to completion of the site work.
Chief engineer	Whole Period	Civil / building and Mechanical / electrical each 1	Assistant to the Resident Representative in the field of engineering and management for engineering matters: Stay for period of civil / building works and mechanical / electrical works respectively
Clerk manager	Whole Period	1	Field labor management, fund management, material procurement and transportation management, visa management: Stay from preparation to straighten construction
Civil engineer	Short Period	1	Schedule, quality control and safety management for civil engineering constructions (foundation, tank constructions, *etc*.) except equipment installation: Stay from the start of the construction till the completion
Building construction engineer	Short Period	1	Schedule, quality control and safety management for building facilities (central monitoring and administration building, chemical dozing house, *etc.*) except equipment installation: Stay during building construction works
Electricity equipment engineer	Short Period	1	Schedule, quality control and safety management for electricity equipment constructions concerning to buildings and treatment plants: Staying during electricity equipment construction works
Inspection and trial operation engineer	Short Period	1	Quality check as a water treatment plant and management and execution of trial operation: Staying during inspection and trial operation

In addition, the contractors shall employ local engineers for the works below. The local engineers shall carry on the execution of works in cooperation with the above mentioned Japanese engineers.

- Superintendence and management of local workers at each field under the supervision of the Japanese engineers.
- Detail discussions with organizations concerned, companies and subcontractors under the supervision of the Japanese engineers.
- Learning construction method as the main counterpart of the Japanese engineers.

2) Procurement of equipment and materials

Installation work is not required for the procured equipment and materials. Therefore, the contractors shall procure materials and equipments in Japan or other countries after concluding contracts and transport to the Project site. A field office may not necessary for management of

the procured equipment and materials, so the contractor's procurement management structure is as shown in Figure 2.14.

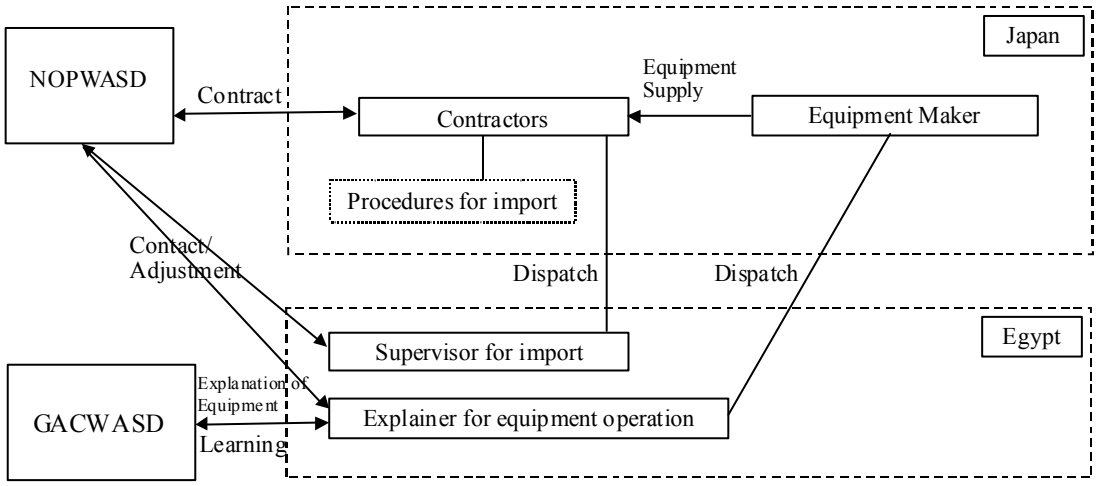


Figure 2.14 Contractor's Organization for Equipment Procure

(2) Consultant's construction management and procurement organization

The consultant is required to supervise the contractors' achieving "completion of the contract for the construction and equipment procurement within the schedule", "securing quality of construction and equipment in accordance with the contract documents" and "safety execution of work". The consultant has a role to verify and supervise the contractor's proper execution of construction and equipment procurement works under the Japan's Grant Aid Scheme on neutral ground. Figure 2.15 shows the consultant's stance for supervising the whole Project.

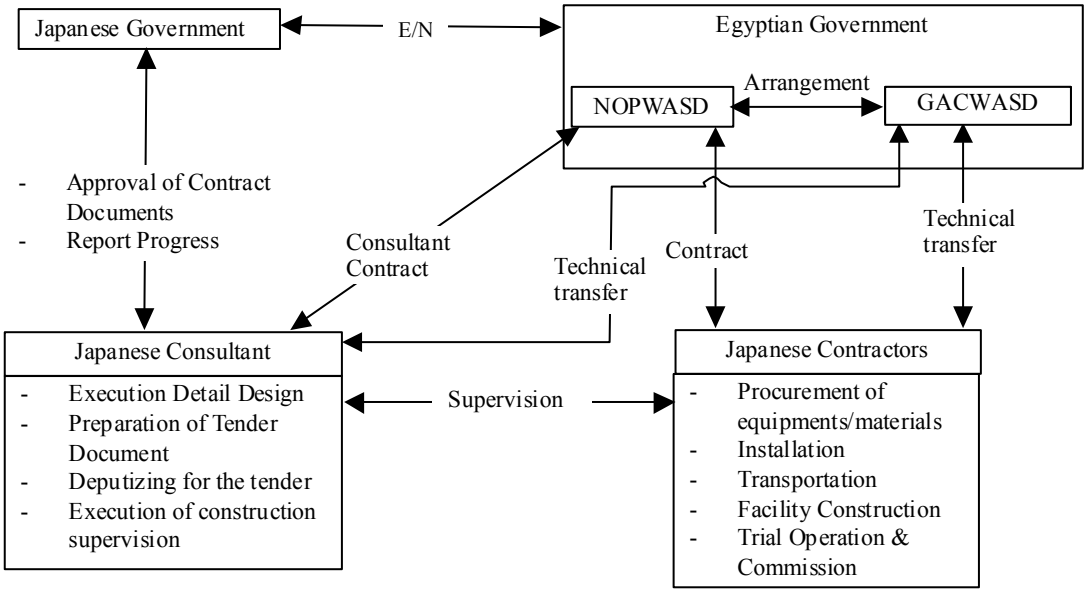


Figure 2.15 Consultant's Supervision

1) Main Contents of Consultant's Supervision

This section shows the main contents of consultant supervision.

The consultant shall be required to periodically prepare and submit a report concerning the progress of contract to NOPWASD, GACWASD and the Government of Japan and to discuss with them in terms of the progress when necessary. GACWASD is not the party involved in the contract. However, since GACWASD is the end user of procured facilities and equipments, it is important for the consultant to have a continuous contact and coordination with GACWASD, through the contract period.

i) Schedule Control

The consultant shall examine and approve schedule submitted by the contractors, compare the actual progress of the construction and equipment procurement, and give a notice to the contractor if a delay may be anticipated. When a delay occurs, the consultant shall examine and study the cause and its solution in collaboration with the contractor and give a suggestion or advice to the contractor who shall take necessary measures. The supervision of schedule consists of the followings.

Certification of payments

Records of installation and procurement of main equipments and construction materials

Records of putting engineers and workers in the Project

ii) Quality Control

The consultant shall check that the contractors secure the quality of facilities, construction work, equipments, etc. as described in the contract documents. If the quality is not anticipated to satisfy the requirements, the consultant shall give a notice to the contractors and request to take necessary modification, measures, etc. The followings shall be taken for quality control by the consultant..

Examination of equipment catalogue, specifications and shop drawings

Examination of the results of factory's test and inspection

Attending factory's test inspection

Inspection of the quantity of equipments before shipping

Examination of shop drawings, equipment installation manual,

Field inspection for compaction, bar arrangement, concrete strength, *etc*. during construction works

Field confirmation and instruction on execution work conditions and construction methods, *etc*.

Attending to trial operation for facilities and equipments and performance inspection

iii) Safety Control

The consultant shall check the appropriateness of the contractors' safety management plan and its practical procedures, and supervise the work to prevent any accident, calamity and accident to the third parties during the works. The following measures shall be taken for safety control

Confirmation of selection of manager in charge of safety control and preparation of safety control plan

by the contractor(s)

Approval of the prepared safety control plan and selected person who shall be responsible for safety control.
Confirmation of the actual procedures on safety control.
Confirmation of appropriateness on planned route of construction vehicles and safety precautions, and checking the actual observation of the precautions by the contractor.
Confirmation of welfare system and holidays and resting place for the workers.

2) Execution of works and supervision of procurement on the site

The consultant shall establish a necessary structure for execution of work and procurement supervisions for conducting execution and procurement supervisions, which pillars are schedule, quality control and safety managements. This leads to smooth implementation of the Project. Since supervision for execution of works and procurement is based on this Basic Design, it is necessary to build up a consistent structure through a series of the works of basic design, detail design and supervision for execution of works and procurement.

i) Supervision for execution of works and procurements in Egypt

It is important that the facility construction and equipment procurement is suitably carried out within the scheme of Japan's Grant Aid. Therefore, Japanese engineers who sufficiently understand the Japan's Grant Aid Scheme shall conduct supervision for execution of work and procurement. The expected structure of the Japanese engineers is shown in Table 2.18. The project leader, who orchestrates the whole Project including domestic works in Japan and the design engineers, shall occasionally verify the quality and direct the matters in attentions to the supervisors.

Table 2.18 Japanese Supervisors for Execution and Procurement

Type	Status	Person	Tasks and Duration to Stay
Resident Supervisor	Whole Period	1	Discussion with the Egyptian side and contractors, verification and arrangement of construction scope and schedule, total management of execution and procurement supervision. Stay from commencement to completion of the construction work.
Supervision for Structural Works	Short Period	1	Supervision for schedule, quality and safety of civil engineering and concrete works. Stay during civil engineering and structural works and if the number of supervisor is insufficient
Supervision for mechanical and electrical equipments	Short Period	Mechanical and electrical each 1	Supervision for schedule, quality and safety of mechanical and electrical equipment works. Stay during mechanical and electrical equipment works respectively

For the following works, the consultant shall employ local engineers and shall conduct

supervision for execution of work and procurement.

Supervision of facility construction on site under supervision of the Japanese engineers

Discussion of the details with relating organization, testing institutions and organizations, which issues design policy, *etc.* under supervision of the Japanese engineers.

Learning execution of works method as the main counterpart of the Japanese engineers.

ii) Supervision for execution of works and procurements in Japan

The Consultant is required to establish necessary organization and to deal the following supervising works in Japan.

- Confirmation of the contents of Contract, progress of the works and quality of construction works / equipment.
- Examination and/or instruction to solve the problem and / or to make countermeasures to troubles, which happens in the site.
- Support of the Consultant's site office / staff in technique and finance.

Especially, the following works requires forming an appropriate organization.

- Quality Confirmation for the equipment to be manufactured in Japan.
- Execution of pre-shipment inspection for the equipment to be exported from Japan.

2.2.4.5 Procurement Plan

(1) Materials and Equipments Procured for Facility Construction

1) Country for Procurement

The materials for facility construction shall be procured in the local market if specification, quality, quantity for supply, date of delivery, etc. are satisfied.

Those materials hindering specification, quality, quantity for supply, date of delivery, etc. are procured in Japan in accordance to the Japan's Grant Aid Scheme. However, if it is preferable to procure in respect to the price, etc., it is necessary to consider procurement in other countries.

Egypt has produced fundamental materials required for civil engineering and facility construction works. Therefore, it is anticipated that the quality and supply quantity of Egyptian goods are sufficient enough for the Project. On the other hand, local procurement of mechanical and electricity equipments for treatment plant equipment are difficult to satisfy the specification, quality and date for delivery of the Project. Therefore, import of these goods is necessary. Main materials and equipments for facility construction shall be procured in accordance to Table 2.19.

Table 2.19 Country for Procurement of Main Construction Materials

Item	Procurement		Note
	Egypt	Japan or Other Country	
Cement	○		
Sand and gravel including concrete aggregate	○		
Reinforcement bar	○		
Veneer board for formwork	○		
Bricks and concrete block	○		
Asphalt concrete	○		
Concrete pipe	○		
Ductile cast iron pipe (straight no less than D1000mm)	○		
Ductile cast iron pipe (more than 1000mm and fittings)		○	
Valves		○	
Mechanical and electrical equipments for water treatment plant		○	

Note: ○ indicates responsible works

2) Transportation of Materials and Equipments

i) Materials and equipments procured in Egypt

It is hard to procure the materials and equipments reassuring the specification, quality, quantity for supply, date of delivery, *etc.*, for the Project near the Project site for construction since the main industry in the area is textile and agriculture. Thus these materials and equipments shall be procured in the industrial area such as the Greater Cairo area and Alexandria. The procured goods shall be transported by land.

No issue for land transportation has been found as the main roads between the project site, and Greater Cairo area and Alexandria regarding the pavement condition and the width of the roads for transportation by large size trucks.

ii) Materials and equipments imported from other country

Materials and equipments procured in Japan or other countries shall be transported by sea to the Egyptian port. These goods shall be land transported to the Project site after landing and customs clearance.

The representative landing ports in Egypt are Alexandria and Suez. Regular service ship from Japan or other countries enter into the both ports. Both ports sufficiently equip unloading facility and can

be used in the Project. Moreover, the main road conditions such as pavement and width indicates adequate for transporting the goods after unloading to the Project site by large size trucks.

(2) Equipment Procurement

1) Country for Procurement

The equipments procured are operation and maintenance equipments for water treatment plant equipment and facility composed of mechanical and electrical devices. It is thorny to procured in Egypt due to the aspects of the specification, quality, quantity for supply, date of delivery, etc., for the Project. Therefore, these goods shall be procured in Japan based on the Japan's Grant Aid Scheme. However, if it is preferable to procure in respect to the price, etc., it is necessary to consider procurement in other country.

Countries for procuring the equipments are classified in Table 2.20.

Spare parts for water treatment plant equipments and maintenance tools such as specific exclusive tools shall be procured from facility construction contractors since these equipments and tools must meet the detail specification of constructing plant and equipments.

Table 2.20 Country for Procuring Equipments

Item	Country		Note
	Egypt	Japan or a Third Country	
Spare Parts for the Plant		○	
Maintenance Tools		○	
Water quality analytical instruments		○	
Operation equipment for the facility		○	

Note: ○ indicates responsible works

2) Transportation of Equipment

Materials and equipments procured in Japan or other countries shall be transported by sea to the Egyptian port. These goods shall be land transported to the Project site after landing and customs clearance. There is no issue found for sea and land transportation and unloading as the facility construction importing goods.

2.2.4.6 Quality Control Plan

(1) Facility Construction

For the main equipments and construction materials for the facilities in the Project, the followings are the important items for quality management in the Project.

- Reinforced concrete for civil engineering and building works

- Mechanical and electrical equipments for water treatment plant

1) Reinforced Concrete

Concrete is mixed and placed at the site. Thus, quality control shall be done at the site. It is required to inspect at each stage of a) the raw material for mixing, b) fresh concrete after mixing, c) reinforcing bars used, *etc*. The standard employed for supervision is the following Japan Industrial Standard (JIS) or equivalent Egyptian standard (ES).

- Concrete (including material) : JIS A5308
- Reinforcing bar : JIS G0303 / G0404

i) Material

Table 2.21 shows the main quality control items for material.

Table 2.21 Quality Control Items

Material	Frequency of inspection and time	Means for inspection	Specification
Cement	- Before use - Every 3,000m^3 of concrete placement - Each factory and brand	Confirmation of the result of inspection at laboratory	- Physical characteristics e.g. compressive stress - Chemical composition
Aggregate	- Before use - Every 3,000m^3 of concrete placement Each factory and brand	Confirmation of the result of inspection at laboratory	- Analysis of gradation - Organic and chemical analysis e.g. chlorides
Water	(If tap water is not used) - Before use - Every 3,000m^3 of concrete placement - Every water resources	Confirmation of the result of inspection at laboratory	- Turbidity - TDS - Chloride iron - Cement condensation time - Mortar compression strength
Reinforce. Bar	- Before use - Every 5 months or every 500 t (if achieved earlier) - Each factory	Confirmation of the result of inspection at laboratory	- Mechanical characteristics e.g. tensile strength - Chemical composition

ii) Concrete

In addition to the above material inspection, it is compulsory to continuously inspect the strength of concrete after mixing *etc*. and control the quality of concrete through the construction works. The followings are the essential main quality control standards relating to concrete and the fundamental rules.

Each result of 3 compression tests after 28 days of concrete placement shall show more than 85% of design standard strength and the average compression strength of the 3 test pieces is more than

the design standard strength.

The probability that the result of compression test lowers the design standard strength shall be less than 15%

Concrete slump before placement shall be within the following tolerance.

If the regulated slump is less than 5 cm	allowance ±1.0cm
If the regulated slump is more than 5 cm and less than 8 cm	allowance ±1.5cm
If the regulated slump is more than 8 cm	allowance ±2.5cm

Chloride ion content in concrete before placement shall be less than 0.30 kg/m^3

The frequency of quality inspection and sampling is every day if concrete is placed or every 150 m^3 of placement (if achieved) as a standard. The result of the test shall be kept in the control chart. The quality of concrete shall be grasped from the control chart and re-inspection and adjustment of proportion and materials of concrete shall be conducted if necessary.

iii) Formwork and Arrangement of Bars

It is required to inspect formwork and arrangement of reinforcing bars for every concrete placement. The inspection shall contain the followings in order that the placed concrete shall comply with the specification.

Size of formwork, diameter of iron bar, pitch of arrangement re-bar, cover, *etc*.

Condition of formwork support

Condition of iron bar unity

Condition of cleanness including removal of substance

2) Mechanical and Electricity Equipment of Treatment Plant

Mechanical and electricity equipments for the water treatment plant equipments are factory productions. Thus, the quality of the products is verified with the contractor's contract document and industrial standards applied for production. The industrial standards for equipment shall be international standards such as JIS, which are applied for the production. Equipment inspection shall be conducted at the production factory before transporting from the factory.

Moreover, test operation of the whole plant system shall be done after the completion of the facility. It is ultimately crucial to conduct quality inspection as a system through the whole facility's capacity and ability.

(2) Procurement of Equipment and Materials

The procured equipments and materials in the Project are factory productions. Thus, the above-mentioned methods, mechanical and electrical equipment of WTP, shall be applied for quality inspection.

2.2.4.7 Implementation Schedule

Construction and procurement for equipments in the Project will start after the approval by the Japanese government and Exchange of Notes (E/N) between Japan and Egypt, and 32 months are the expected period for completion of the new WTP. The target of the Project is the construction of the new WTP It is difficult to draw a term division plan corresponding to Japanese Financial Year. Therefore, a multi - year national debt system shall be applied for the Project.

It is necessary to conduct a Detailed Design Study (DD) at the precision to execute the specifications for the tender. The DD is composed of two field studies (study and discussion and verification of the contents) and design works in Japan. The expected DD period is approximately 4 months.

The construction and procurements for materials and equipments will be started after the DD and the contractor shall be decided. Approximately 25 months from the conclusion of the contract to the completion of the contract are expected including preparation, construction, inspection and trial operation.

Figure 2.16 shows the implementation schedule for Japanese works.

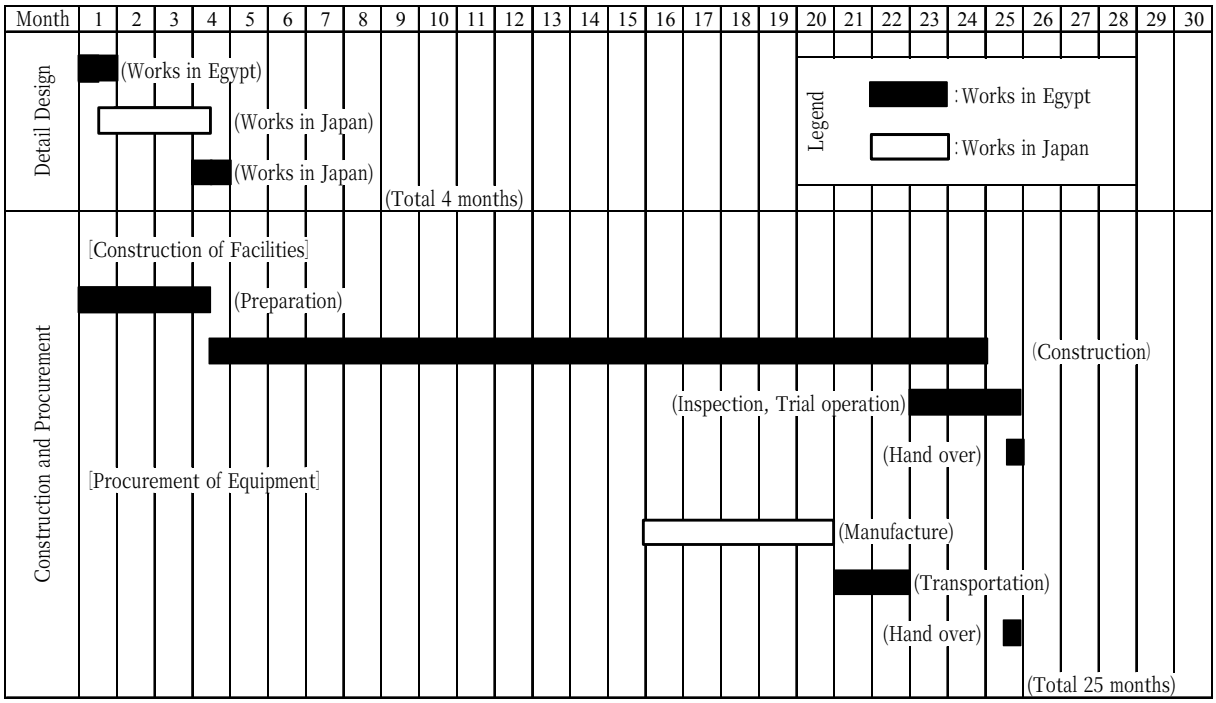


Figure 2.16 Implementation Schedule

2.3 OBLIGATION OF THE RECIPIENT COUNTRY

The Project is composed of Japanese cooperation and the works to be undertaken by the Egyptian side with their self-effort. The summary of the Egyptian obligation works is as the followings.

2.3.1 Works Undertaken by NOPWASD

1) To remove the existing facilities and materials from the planned construction site and to level the land prior to commencement of the construction by the Japanese side.

2) To remove the existing pipeline laid at the planned construction site prior to commencement of the construction by the Japanese side.

3) To provide 2 lines of 11kV electricity power supply to the facilities to be constructed prior to test and trial operation of the water treatment facilities/equipment to be constructed/installed by the Japanese side.

4) To provide telephone lines and instruments for the new water treatment facilities.

5) To construct wastewater discharge facilities after the water collecting pit to be constructed by the Japanese side.

6) To undertake fence, gates, outdoor lighting, pavement of internal roads and guard house in and around the site.

7) To execute the construction/rehabilitation work for water transmission/distribution pipelines (over 300mm in diameter) to/in each town/village within the Project Site prior to test and trial operation of the water treatment facilities/equipment to be constructed/installed by the Japanese side.

8) It shall procure and install measuring instruments for measuring flow and residual chlorine concentration in transmission and distribution pipes from the waster treament plant to be constructed by the Egyptian side.

9) It shall procure and install a terminal box for connecting signal cables from the above measuring instruments. Also, it shall implement cable works between the above measuring instruments and terminal box.

10) It shall procure and install equipment for conducting data processing based on signals monitored from each facility in the plant. Data processing equipment will be as follows:

    - Personal computer
    - Printer
    - Uninterrupted power supply
    - OS (Windows XP)
    - General purpose software (Office)

11) To undertake gardening and landscaping the water treatment plant site.

12) To take necessary procedures for issue of A/P required for payments to the Japanese Consultant and/or Contractor(s) and to bear the following commissions to a bank in Japan for the banking services based upon the Banking Arrangement.

- Advising commission of A/P
- Payment commission

13) To ensure prompt unloading and customs clearance of the goods for the Project at the port of disembarkation in Egypt.

14) To accord Japanese nationals whose services may be required in connection with the supply of products and services under the verified contract(s) such facilities as may be necessary for their entry into Egypt and stay therein for the performance of their works.

15) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Egypt with respect to the supply for the products and services under the verified contract(s). And to take necessary measures for such tax exemption.

16) To use and maintain properly and effectively all the facilities constructed, and equipment and materials provided under the Japan's Grand Aid.

17) To bear all the expenses, other than to be borne by the Grant Aid, necessary for construction of the facilities as well as for the transportation and installation of the equipment.

2.3.2 Works Undertaken by GACWASD

1) To execute the construction/rehabilitation work for water distribution pipelines (no more than 300mm in diameter) to/in each town/village within the Project Site prior to test and trial operation of the water treatment facilities/equipment to be constructed/installed by the Japanese side.

2) To provide necessary furniture, such as fire extinguisher, desks and chairs, for the new water treatment facilities.

3) To provide necessary water and chemicals, such as chloride (including cylinder) and coagulant, for trial operation and disinfection of the water treatment facilities.

4) To provide water quality analysis, which is necessary for adjustment and trial operation of water treatment facilities and is capable to be done by GACWASD.

5) To provide the future expansion spaces of New El Mahala El Kobra Water Treatment Plant and the existing sewer treatment plant in El Mahala El Kobra as temporally facilities yard for the Japanese side's construction work.

6) To provide the future expansion spaces of the existing sewer treatment plant in El Mahala El Kobra as surplus soil disposal yard for the Japanese side's construction work.

7) To provide necessary water for construction such as concrete mixing, concrete cooling, site cleaning etc. and for drinking in temporally office for the construction work.

8) To assign the engineers, staff and operators to receive the technical guidance such as explanation for operation and maintenance and Soft Component (technical and/or managerial assistance) for the proper operation and maintenance for the facilities to be constructed by the Japanese side.

9) To use and maintain properly and effectively all the facilities constructed, and equipment and materials provided under the Japan's Grand Aid.

2.4 Project Operation Plan

2.4.1 Basic Policy

For long-term effective use of the facilities constructed under the Project and stably and continuous water supply with reflecting the change in daily demand, operation and management of plant and protection of facility environment are indispensable. The Egyptian side should carry on suitable protection and maintenance of the facilities and the equipment derived from increase in reliability, safety and effectiveness for preserving the ability and the function of the facilities and the equipment, and constant water supply. Figure 2.17 shows the basic policy of maintenance of the facility in the project.

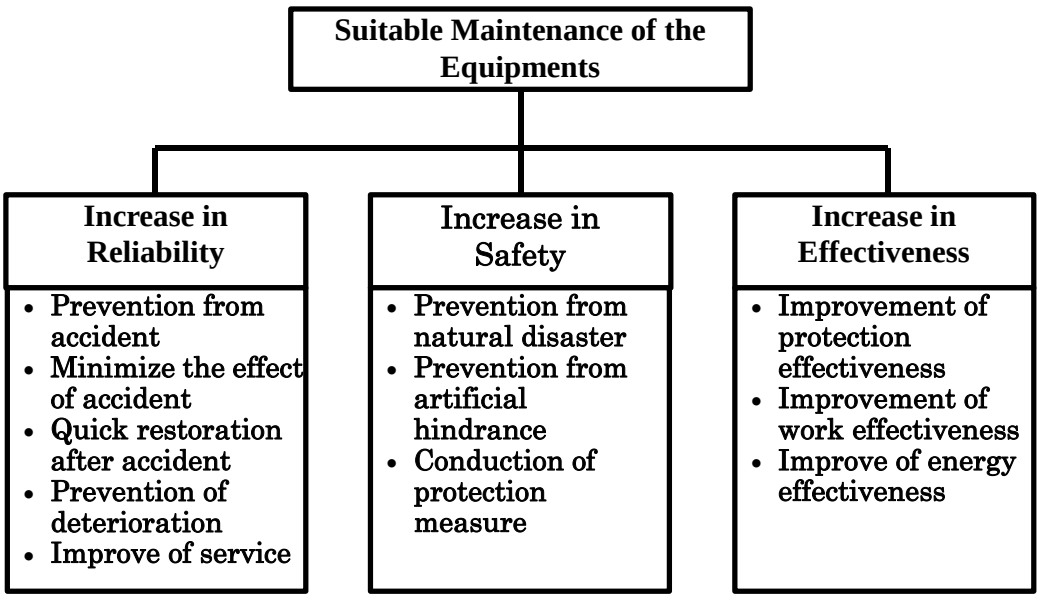


Figure 2.17 Basic Policy of Maintenance

The Contractors will give technical guidance on the operation and maintenance of newly procured equipment to GACWASD in the period of the contract. However, the consultant will conduct technical guidance on the systematic utilization of the water treatment facilities through the soft component.

2.4.2 Item for Regular Check

Based on the policy discussed above, the following points are the basic items GACWASD shall conduct for maintenance and management of the water treatment plant.

Operation Management: Carrying on operation and control under normal circumstance

Maintenance Management: Carrying on preserve, repair and prepare for that the facility, equipment and device show full ability for operation.

Table 2.22 shows the main items for operation and maintenance of the new water treatment plant.

Table 2.22 Main Items for Operation and Maintenance

Classification	Main management Item
Operation Management	i) Water Volume Management: Controlling the equipments and devices conforming to the target water volume ii) Water Quality Management: Analyzing the water quality at each treatment stage and arranging the quantity of chemical injection conforming to the target treated water quality. Additionally the record shall be arranged and analyzed in order to utilize the data for judging the water quality and management data.
Maintenance	i) Inspection Item: Inspecting and checking the facilities, equipments and devices with meters and naked eyes and repairing and maintaining faults or breakdowns. Additionally securing and protecting safety for chemical coagulant and a sterilizer, which are used in the water treatment process. ii) Prevention: Renewing the facilities, equipments and devices periodically depending on the importance and characteristics even without any breakdowns. This leads to a safe and secure operation since ensuring the reliability and safety over the facilities, equipments and devices may increase.

Classification Main management Item

GACWASD are required to carry on appropriate operation and maintenance of equipment according to operation and maintenance manuals of equipments supplied by the production makers. Table 2.23 and Table 2.24 indicate the standard checking items of the pump and the electricity receiving equipments as the main equipment for the water treatment facilities

Under the Project, the consultant will provide a number of manuals including management of water treatment plant and operation and maintenance for the new water treatment plant. GACWASD is required to utilize the manuals for analysis of operation record, establishing the management target, water quality control, etc. and makes an effective and appropriate operation of the whole plant.

Table 2.23 Standard Check List for Pump and Motor Equipments

Pump	Daily (during operation)	Record in operation diary (Transmission volume, Check with naked eyes, abnormal noise, Shaft temperature, leakage, pressure of inflow and outflow)
	Monthly	Stain of shaft oil Verification of shaft oil and its surface Temperature of shaft holder
	Every 3 months	Change of shaft oil Precision of the shaft centre Vibration and noise Supplementation of grease
	Every 6 months	Change of shaft holder grease Change of gland packing
	Every year	Dismantling check (abrasion of rotating parts, aperture of gliding parts, corrosion of inside, choking with substances, paint) Accessories and spares
Motor	Daily (during operation)	Record in operation diary (Electrical currency, Check with naked eyes, abnormal noise, Shaft temperature, leakage)
	Every 6 months	Change of shaft oil Vibration and noise Temperature of shaft
	Every year	Shaft holder Non conductance resistance value

Table 2.24 Standard Check for Electricity Receiving Equipment

Item	Content (Method)	Regular Inspection	Normal Inspection	Precise Inspection
Appearance	Open/Close display device, Display Condition	○	○	
	Abnormal Noise and odor	○	○	
	Hot Coloring at end points	○	○	
	Cracks, faults and stains of bushing and pipes	○	○	
	Rust on found case, hang base, *etc.*	○	○	
	Abnormal Temperature	○	○	
	Tightness of bushing end (mechanical check)	○	○	
Operation and control devices	Display condition of each equipment	○	○	○
	Rotation order		○	○
	Rust and stains of controlling box and its inside		○	○
	Oil change and cleanness		○	○
	Tightness of electricity wiring connection	○	○	○
	Open/close display condition		○	○
	Air and oil leakage (with air pressure, *etc.*)		○	○
	Pressure before and after operation (with air pressure, *etc.*)		○	○
	Operation meter condition		○	○
	Rust, deformation, damage on spring (repair)	○	○	○
	Abnormal pins for connection		○	○
	Spare electricity circuited breaker and relay		○	○
	Direct current controlling electricity	○		
Measurement and test	Non conductance resistance		○	○
	Contact resistance			○
	Heater snapper line		○	○
	Movement test for the relay		○	○

2.4.3 Spare Parts Purchase Plan

Spare parts are divided into (a) consumable parts which may be replaced periodically and (b) replacement parts or emergent spare parts, which are necessary for accidents, etc. for replacement. Thus, it is necessary that the Egyptian side shall purchase those main goods in accordance with the periodical inspection cycle as described before

2.4.4 Structure for Operation and Maintenance

GACWASD plans to bring the staffs for the new water treatment facilities by reshuffling from the existing facilities/organization. Therefore, there will not be any increase in the number of GACWASD staffs.

Table 2.25 shows the necessary structure of staffing at the new water treatment plant in the Project. GACWASD is required to arrange such organization for the Project.

Table 2.25 Persons required for the new water treatment plant of the project

Job Type	Necessary number for whole WTP	Existing number	Number to be added
General Manager for Water Treatment Plant	1	1	—
Engineer (three per shift, consisting of one chief, one mechanical and one electric)	3 x 3 shifts = 9	7	2
Technician (seven per shift, consisting three for pump, one for chemical dozing, one for sedimentation, one for filter and one for electric)	7 x 3 shifts = 21	14	7
Chemist（one per shift）	1 x 3 shifts =3	2	1
Clerk	1	0	1
Worker	5 x 3 shifts = 15	11	4
Total	50	35	15

Remark: 3 shift per day

2.5 Project Cost Estimation

2.5.1 Cost Estimation for the Project

The total Project cost is expected as 3.516 billion JPY if the Project is implemented. Breakdowns of the total cost, based on the work demarcation are shown in (1) and (2) below. However, this cost

estimation is provisional and would be further examined by the Government of Japan for the approval of the Grant. The share of the expense of Japan and Egypt, based on the work area, is estimated as the following. (3) shows the conditions applied for this estimation.

(1) Cost to be Borne by the Japanese Side

Estimated Project Cost: 2,414.7 million JPY

		Project Cost (million JPY)		
Facility Construction Sludge	Intake and Conveyance Facility	27.40	2,226.82	2,244.73
	Raw Water and Transmission Pump Facility	269.95		
	Flocculation and Sedimentation Facility	375.57		
	Filtration Units	726.05		
	Sludge	168.38		
	Sludge / Drain Tank, Thickener	177.49		
	Chemical Dosing House	481.98		
	Electricity Room			
Equipment Procurement		17.91		
Detail Design, Construction / Procurement Supervision, Soft Component		169.98		

(2) Cost to be Borne by the Recipient Side

Estimated Project Cost: 1,102.0 million JPY

Organization	Item	Project Cost(million JPY)	
NOPWASD	Reclamation of the Project Site	11.4	1,102.0
	Laying Electricity Line (10.5 kV) to the Water Treatment Plant	3.8	
	Construction and Rehabilitation of Water Transmission and Distribution Facility	1,086.8	

(3) Conditions

1) Estimation Point: September 2005

2) Exchange Rate: 1US$ = 109.53 JPY

(Average of the last 6 months from 31st August 2005)

1 LE = 19.01 JPY

(Average of the last 6 months from 31st August 2005)

3) Execution Period: Facility construction over three Japanese fiscal years

4) Others: The Project shall be implemented under the Japanese Grant Aid scheme.

2.5.2 Operation and Maintenance Cost Estimation

(1) Operation and Maintenance Cost estimation

The operation and maintenance cost of the new water treatment plant constructed in the project (not including expenses of the head office, etc.) is composed of cost for electricity, chemicals (chloride and aluminum sulphate), personnel expenses and purchase of spare parts for equipment.

Each expense is calculated under the following conditions and Table 3.31 shows the results.

1) Electricity : Annual electricity consumption × Average electricity tariff
2) Chemicals : Annual consumption × Price of chemicals
3) Spare Parts : Body Cost × 3%/year

It is estimated that an annual operation and maintenance cost of approximately 3,000,000 LE/year (including 40% for spare parts, etc.) will be required. This is equivalent to roughly 10% of the power cost and maintenance cost of GACWASD. In order to fund these additional expenses, it will be necessary either to increase the water tariff or continue to receive subsidies from Gharbeya Prefecture.

Table 2.26 Operation and Maintenance Cost for the Project

Item	Expected Expense							
1. Electricity		A	B	C	D (AxBxC)	E (Dx365day/year)	F	G (E x F)
		Volume (kW)	Unit for Operation (unit)	Operation Hours (hr/day)	Day Electricity Consumption (kWh/day)	Annual Electricity Consumption (kWh/year)	Electricity Charge (LE/kWh)	Annual Expenditure (LE)
	①Large size pump							
	Raw water intake pump	45	2	24	2,160	788,400		
	Sand surface washing pump	45	1	0.83	38	13,870		
	Back washing pump	35	2	0.83	58	21,170		
	Transmission pump	132	3	24	9,504	3,468,960		
	②Other equipment	88	1	24	2,112	770,880		
	Total				13,872	5,063,280	0.18	911,390
	Note: ① Operation Hours of transmission pump : 5 minute/basin/day x 10 basins = 50min/day (0.83hours/day) ② Volume of other equipments : [Total Volume (990kW=1100KVAx0.9) - Operation Volume of large size pump (665kW)] x Demand Rate (0.65) = (990-665) x 0.65 = approximately 210kW							
2. Chlorination		A	B	C (A x B)	D (C x365day/year)	E		F (D x E)
		Injection (kg/hr)	Operation Hours (hr/day)	Daily Consumption (kg/day)	Annual Consumption (Ton/year)	Price of Chloride (LE/Ton)		Annual Expenditure (LE)
	①Sum of pre-, mid- and post clorination	16	24	384	140	1400		196,000
3. Aluminium Sulphate		A	B (A x 365day/year)	C Aluminium Sulphate				D (B x C)
		Daily Consumption (kg/day)	Annual Consumption (Ton/day)	Price of Aluminium Sulphate (LE/ton)				Annual Expenditure (LE)
	① 14% Solid phase Aluminium Sulphate	660	241	775				186,775
	Note: The daily consumption is the expected value of the average consumption.							
4. Personnel Expenditure		A	B	C (A/B)	D			E
		Sum of Allowance (LE/year)	Total Number of (person)	Annual Average Allowance (LE/person・year)	Number of Employees at the new plant (person)			Sum of Annual Allowance
	①Income	37,800,000	5402	6,997	82			573,787
	Note: The total allowance is the number from planned total allowance of GACWASD in 2002/03							
5. Spare Parts		A	B					C (A x B)
		Expenditure	Ratio for Spare Parts Expenditure					Annual Expenditure
	①Spare Parts	40,000,000	0.03					1,200,000
Sum of Expenditure								3,067,952

2.6 Soft Component

(1) Background to Planning of the Soft Component

The target area currently receives water supply from the two existing water treatment plants (the new and old plants), compact units and wells. However, there is a shortage of supply to demand in the water distribution area, and water shortages are becoming more pronounced every year as the population increases. The Project aims to improve this water supply situation by expanding the new El Mahara El Kobra WTP and thereby increasing the supply of hygienic potable water and satisfying projected demand in the target area in the target year of 2010. In order to achieve this objective, water treatment facilities with capacity of 400 L/sec will be added to the new water treatment plant.

The new water treatment plant that contains the construction site for the Project is also home to existing water treatment facilities that were constructed under Phase-1 and 2 (200 L/sec) and Phase-3 (200 L/sec). Employees of GACWASD working at the treatment plant implement plant operation and maintenance, and there is a strong possibility that the same personnel will also operate the facilities to be constructed in the Project. In order for the Project water treatment facilities to fully display their functions and realize the Project objectives, it is considered important to accurately gauge the technical level of GACWASD and to reflect the findings in the facilities plan and maintenance plan of the Project. In the Field Survey, the JICA Study Team investigated the state of existing facilities in terms of structure, functions and capacity and confirmed the technical capacity of GACWASD to conduct operation and maintenance. As a result, it became clear that the existing maintenance technology includes a number of problems as described below, and carefully investigating and resolving these issues will make a major contribution to realizing the Project objectives. Accordingly, in addition to constructing facilities that comply with the abovementioned objectives, it is necessary to instruct the maintenance staff of GACWASD in technology for appropriately maintaining the facilities.

1) Problems

Figure 2.18 shows problems surrounding the operation and maintenance of the Project facilities in light of the current maintenance situation. As is shown in the diagram, current operation and maintenance problems boil down to the following two points and, unless some kind of improvement measures are taken, the same problems will recur in the operation and maintenance of the Project facilities.

① Lack of technology for managing water treatment processes

In the absence of adequate technology, the treatment plant has no means of conducting appropriate process management (chemical dosing in correct quantities) that corresponds to fluctuations in the quality (turbidity) and flow rate of raw water intake.

② Lack of data-based maintenance technology

Because the existing facilities are not equipped with measuring equipment, it is not possible to conduct data-based process management of the water treatment facilities and management of water transmission and distribution; indeed the technical foundation for this does not exist. In the Project, it is planned to introduce a monitoring system and implement effective facilities operation and maintenance based on data, however, this technology is currently lacking.

Causes behind these two central problems can be summed up as follows:

① Lack of technology for managing water treatment processes

- √ The plant personnel do not understand the items that require management in water treatment.
- √ Personnel are aware of the problems, but they do not have the experience or know-how to resolve them.
- √ Personnel have no awareness of water quality problems.
- √ Personnel do not understand whether problems exist or not.
- √ Personnel do not understand the proper control situation.

② Lack of data-based maintenance technology

- √ Personnel do not know how to interpret data.
- √ Personnel do not understand data totaling and processing methods.
- √ Personnel have no data processing experience.
- √ Accurate data are not collected.
- √ Measuring instruments are not installed (current issue).

The shortage of plant maintenance technology described above results in various issues that can be summed up as follows.

- ◆ Water quality is unstable and supplied water sometimes fails to comply with potable water standards.
- ◆ Excessive chemical dosing leads to unnecessary increases in chemical expenses.

- ◆ Planned management of pure water production according to seasonal demand fluctuations cannot be performed.
- ◆ Water transmission and distribution management according to hourly demand fluctuations cannot be performed.
- ◆ For the above reasons, the effects of water treatment cannot be displayed to residents, and the grant aid project effect will be diminished.

In order to avert and improve these negative outcomes, the Soft Component sets the following targets with a view to resolving the central problems currently faced by GACWASD and ensuring the appropriate operation and maintenance of water treatment facilities constructed in the Project (see Figure 2.19).

- ◆ Acquisition of water treatment management technology
- ◆ Acquisition of basic technology for conducting data-based operation and maintenance of the water treatment facilities

2) Approach

In order to realize the above objectives, the following two approaches shall be adopted (see Figure 2.20).

① Approach based on improving water treatment control technology

- √ The plant personnel understand the items that require management in water treatment.
- √ Personnel are aware of the problems, and they have the experience and know-how to resolve them.
- √ Personnel are aware of water quality problems.
- √ Personnel have increased awareness of water quality problems.
- √ Personnel understand the proper control situation.

② Approach based on improving data-based maintenance technology

- √ Personnel know how to interpret data.
- √ Personnel understand data totaling and processing methods.
- √ Personnel sit lectures and perform drills in data processing.
- √ Accurate data are collected in a monitoring system.
- √ The monitoring system is fully installed (it will be introduced as part of the Project facilities plan).

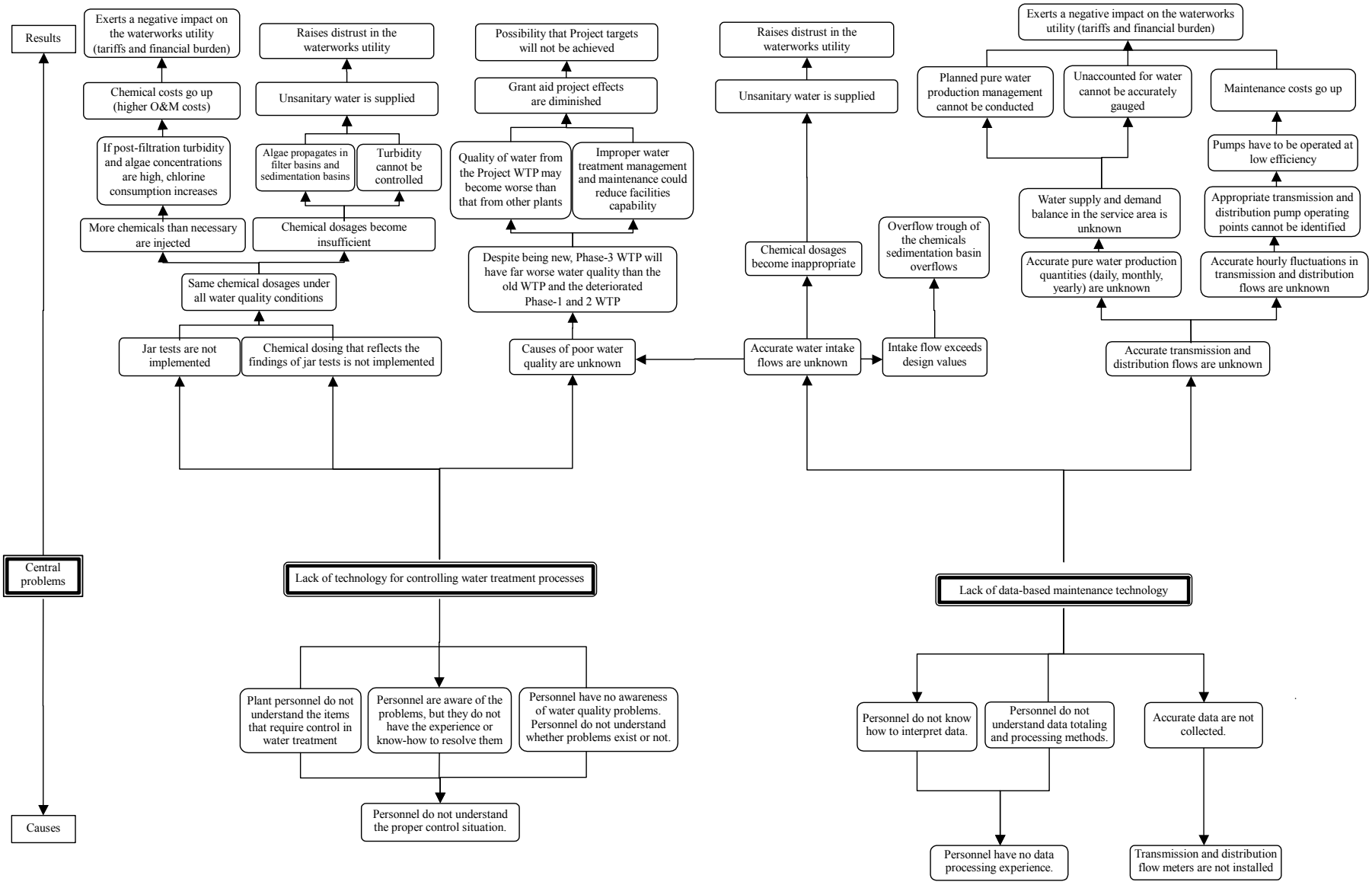


Figure 2.18 Problem Analysis – Problem Tree

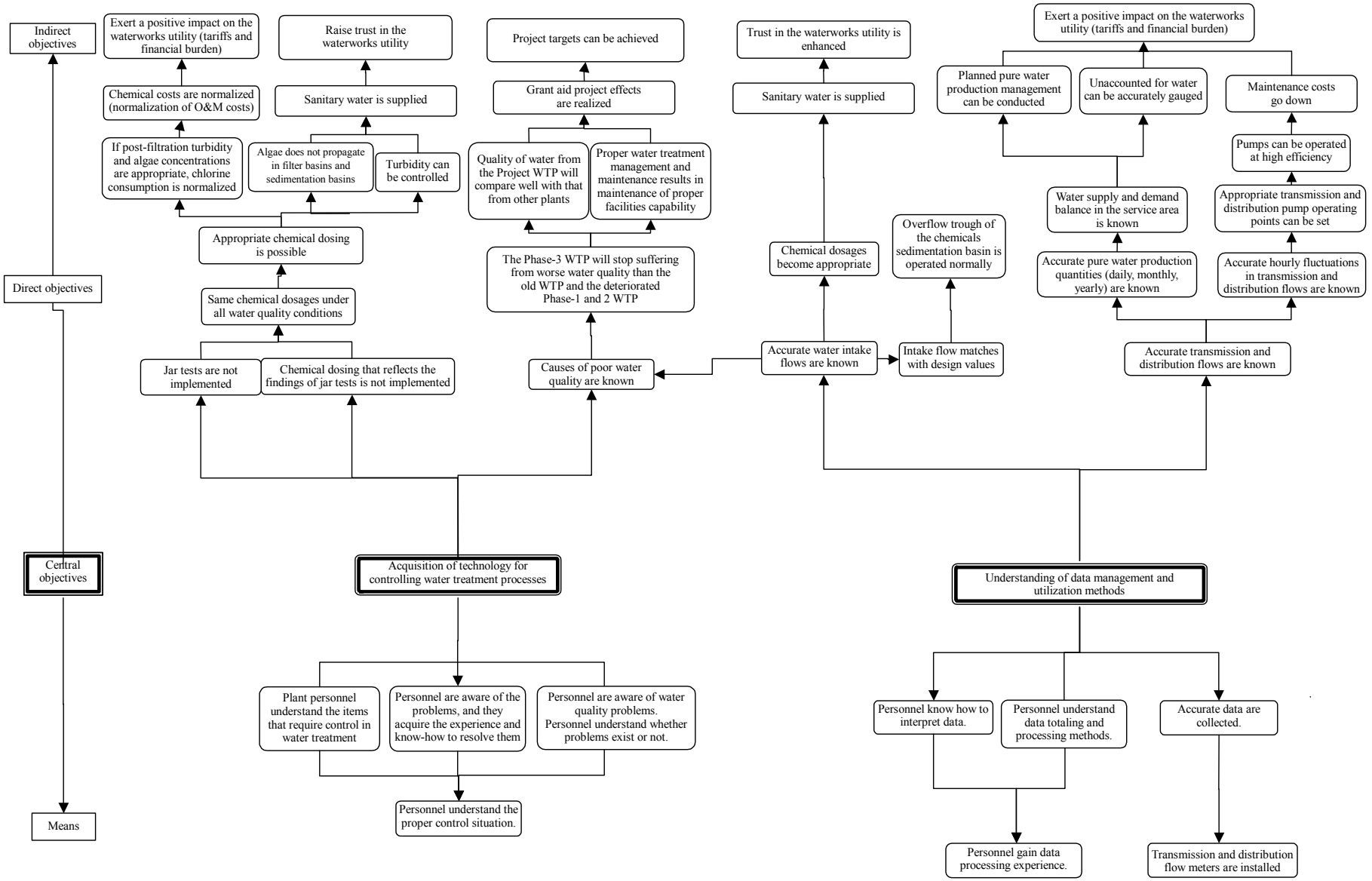


Figure 2.19 Problem Analysis – Problem Tree

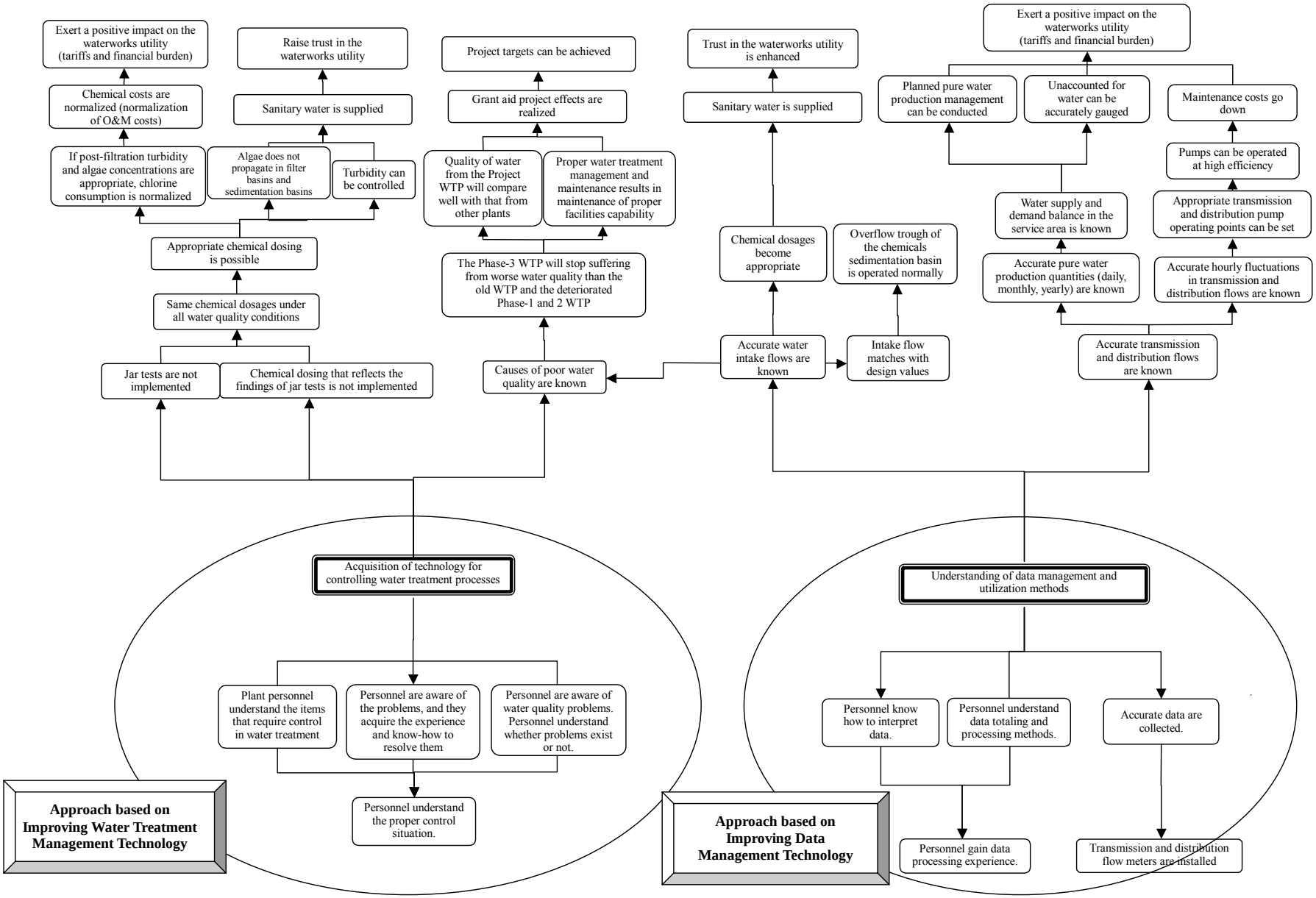


Figure 2.20 Approach for Solution

(2) Soft Component Targets

- ◆ By implementing the above two approaches, technology for operating and maintaining the Project facilities will be improved and the following targets will be achieved.
- ◆ Water quality will be stabilized and supplied water will always satisfy potable water standards.
- ◆ Excessive chemical dosing will be prevented and this will save on unnecessary chemical expenses.
- ◆ Planned management of treated water production according to seasonal demand fluctuations will become possible.
- ◆ Water transmission and distribution control according to hourly demand fluctuations will become possible.
- ◆ Residents will experience the Project effects and the effect of the grant aid project will be manifested.

(3) Soft Component Outputs

By introducing the Soft Component, the following direct outputs can be anticipated.

1) Improvement in water treatment process management technology

- √ Since it will be possible to inject appropriate quantities of chemicals (aluminum sulfate and chlorine) corresponding to fluctuations in raw water quality and flow, this will enable treated water that satisfies potable water standards to be supplied at all times.
- √ Since it will be possible to inject appropriate quantities of chemicals (aluminum sulfate and chlorine) corresponding to fluctuations in raw water quality and flow, excessive chemical dosing will be avoided and this will reduce needless chemical expenses.
- √ An additional five employees will have enhanced water treatment process management technology.

2) Improvement in data-based maintenance technology

- √ By accurately gauging water intake quantities, chemical dosing quantities (aluminum sulfate and chlorine) will be normalized and this will contribute to improving water treatment process management.
- √ By computer processing data obtained from the continuous measurement of water transmission and distribution flows in the Project facilities and overall water treatment plant, it will be possible to gauge transmission and distribution flows in existing facilities. This will make it possible to accurately gauge hourly fluctuations and daily fluctuations in water transmission and distribution flows from the plant as well as

monthly and yearly production volumes, and this will contribute to the compilation of plans for transmission and distribution control and pure water production.

- √ By accurately gauging the water supply and demand balance in the service area, basic data can be provided for use in formulating leakage countermeasures.
- √ Continuously measured data will be centrally managed on computer. This will help prevent data from being dispersed and will allow data to be easily utilized when needed.
- √ An additional five employees will have enhanced data processing and utilization technology.

In addition to direct outputs, the following indirect outputs can be anticipated.

- √ Through improving operation and maintenance technology, the Project effect will be enhanced.
- √ Treated water quality will be stabilized and this will earn the water supply utility greater trust from consumers.
- √ Since the technology transferred in the Soft Component will be horizontally deployed to existing facilities and the old water treatment plant, this will help improve plant maintenance technology throughout the whole target area.

(4) Method for Confirming Degree of Achievement

The degree of achievement of Soft Component outputs will be confirmed by the following method.

At the end of the training, the trainees will be given short tests to ascertain their level of advancement. Moreover, because the facilities will have been handed over and have started operation by the time the Soft Component is implemented, trainees will take part in practical training using actual data, and the level of achievement will be ascertained based on these results.

Table 2.27 Method for Confirming Degree of Achievement

Item	Method for Confirming Achievement	Achievement Indicator
Guidance in water treatment process management technology	Short tests	Accuracy of 70% or more
	Aluminum sulfate dosing rate and treated water turbidity in practical training	Determination of pass or failure by the Japanese consultants
Guidance in data-based maintenance technology	Short tests	Accuracy of 70% or more
	Outputs based on data processing using actual data	Determination of pass or failure by the Japanese consultants

(5) Soft Component Activities (Investment Plan)

Activities in the Soft Component are as follows. The detailed plan of activities is as shown in Table 2.28.

1) Soft Component Instructors

In the Soft Component, the Japanese consultants will act as instructors in conducting lecture-based training and practical training using the facilities constructed in the Project. Two Japanese consultants shall be assigned, one for each objective. The work contents of the Japanese consultants will be as follows.

① Japanese consultant in charge of water treatment process management technology

- √ Formulation of the training schedule
- √ Preparation of the training texts (manuals)
- √ Preparation of the water quality data management tool (MS-Excel)
- √ Implementation of lectures and practical training
- √ Overall assessment of the training outputs (report preparation)

② Japanese consultant in charge of data-based maintenance technology

- √ Basic design of application software
- √ Preparation of application software specifications
- √ Confirmation of application software actions
- √ Formulation of the training schedule
- √ Preparation of the training texts (manuals)
- √ Implementation of lectures and practical training
- √ Overall assessment of the training outputs (report preparation)

HMI (Human Machine Interface) for PLC, which is dedicated data processing package software for operation in the Windows environment, will be used to conduct data processing however, according to the conditions of use in the Project, it may be necessary to build new applications based on the standard module of this general purpose software. Local programmers will be employed to conduct this work under instruction from the Japanese consultants.

Table 2.28 Detailed Plan of Activities (1/2) - Guidance in Water Treatment Process Management Technology -

	Division	Contents of Activities		Breakdown of Activities	Instruction Manuals, etc. (tangible outputs)	Utilization Method	Necessary Input	
							Breakdown	Total
1	Preparation of training texts	A1	Preparation of training texts (English)	1) Training texts.	Training texts (English)	Work in Japan by Japanese consultants	5 man-days	10 man-days
				2) Preparation of questionnaire forms and short test problems	Questionnaire forms, short test problems		5 man-days	
		A2	Translation of A1 into Arabic		Training texts (Arabic)	Work by local support staff	(5 man-days)	(5 man-days)
2	Preparation for training	A3	Gauging of current technology levels and water treatment process problems		Results of questionnaire forms and workshops	Classroom and on-site (water treatment plant)	3 days	3 days
		A4	Preparation of water quality data inputting, viewing and projection formats		Training texts	Joint work with trainees in workshops	4 days	4 days
3	Training (lectures)	A5	Lectures in water treatment process theory and management techniques	1) Water quality control in water treatment plants as part of the public water supply system	Training texts	Classroom and on-site (water treatment plant) Targets: Treatment plant employees (personnel in charge of maintaining the Project facilities)	1 man-day	16 man-days
				2) Water treatment process technology and water quality problems in Japan			1 man-day	
				3) Monitoring items and control methods in water treatment processes			1 man-day	
				4) Theory of water treatment processes			1 man-day	
				5) Treatment and disposal of settled sludge and filter basin wastewater			1 man-day	
			Implementation of short tests		Marking and assessment of short tests		1 man-day	
	Training (practical)	A6	Practical training inwater quality control and water treatment process operation methods	1) Collection and computer inputting of water quality data	Instruction logs Training logs Outputs	Classroom training (new WTP) Targets: Treatment plant employees (personnel in charge of maintaining the Project facilities) Ditto	2 man-days	
				2) Water quality data inputting and viewing and interpretation of past water quality data			2 man-days	
				3) Water intake information and water treatment process management			2 man-days	
				4) Water intake information and water treatment process management			2 man-days	
				5) Management of settled sludge and filter wastewater treatment			2 man-days	
				6) Optimum water treatment processes in the Project and existing water treatment plants			2 man-days	
		A7	Local support staff			Training assistance	(28 man-days)	(28 man-days)
6	Training (report preparation)	A8	Preparation of the training results reports (Japanese and English)		Training results report (English) Training results report (Japanese)		3 man-days	3 man-days

Table 2.28 Detailed Plan of Activities (2/2) - Guidance in Data-based Maintenance Technology -

	Division	Contents of Activities		Breakdown of Activities	Instruction Manuals, etc. (tangible outputs)	Utilization Method	Necessary Input	
							Breakdown	Total
1	Preparation of application software	B1	Basic design	1) System analysis	Basic design document	Japanese consultants (work in Japan)	4 man-days	10 man-days
				2) System design			4 man-days	
				3) Flow chart preparation			2 man-days	
		B2	Preparation of design specification	1) Overall system summary	Design specification		2 man-days	10 man-days
				2) Specification of input functions			4 man-days	
				3) Specification of output functions			4 man-days	
		B3	Meeting with programmers (locally employed)		Meeting minutes	On-site	7 man-days	7 man-days
		B4	Creation of programs	1) Input window design	User manuals	Locally employed programmers	(6 man-days)	(60 man-days)
				2) Output window design			(8 man-days)	
				3) Programming (coding)			(4 man-days)	
				4) Programming (punching)			(2 man-days)	
				5) Debugging (plant)			(28 man-days)	
				6) Performance confirmation testing (plant)			(2 man-days)	
				7) Manual preparation			(10 man-days)	
		B5	Installation, testing, adjustment	1) Installation of software			(2 man-days)	(30 man-days)
				2) Incorporation setting of monitoring signals			(8 man-days)	
				3) Implementation testing			(10 man-days)	
				4) Software adjustment			(10 man-days)	
		B6	Construction of the data processing environment	1) Preparation of test data		Japanese consultants	2 man-days	7 man-days
				2) Functional check			5 man-days	
2	Preparation of training texts	B7	Preparation of training texts (English)	1) Training texts	Training texts	Work in Japan by Japanese consultants	5 man-days	10 man-days
				2) Preparation of questionnaire forms and short test problems	Short tests		5 man-days	
		B8	Translation of B7 into Arabic		Training texts (Arabic)	Work by local support staff	5 man-days	5 man-days
3	Training (lectures)	B9	(1) Outline explanation of the monitoring system ・Objectives ・System architecture ・Specifications of each measuring instrument		Training texts	Classroom training (new WTP) Targets: Treatment plant employees (personnel in charge of maintaining the Project facilities)	1 man-day	6 man-days
			(2) Explanation of data processing ・Input data ・Types and contents of output (information)				1 man-day	
			(3) Utilization of output (information) ・Utilization in water transmission and distribution management ・Utilization in water treatment process management ・Utilization in maintenance cost assessment ・Utilization in safety management (water quality) ・Utilization in assessing water supply and demand balance in the service area ・Utilization in leakage management				3 man-days	
			(4) Implementation of short tests		Marking and assessment of short tests		1 man-day	

	Division	Contents of Activities	Breakdown of Activities	Instruction Manuals, etc. (tangible outputs)	Utilization Method	Necessary Input	
4	Training (practical)	B10	(1) Practical drills in data processing ・Program operation for data processing ・Actual outputting of each item (information)	Instruction logs Training logs Outputs	Classroom training (new WTP) Targets: Treatment plant employees (personnel in charge of maintaining the Project facilities)	5 man-days	10 man-days
			(2) Practical drills in data utilization ・Utilization in water transmission and distribution management ・Utilization in water treatment process management ・Utilization in maintenance cost assessment ・Utilization in safety management (water quality) ・Utilization in assessing water supply and demand balance in the service area			5 man-days	
		B11	Local support staff		Training assistance	(21 man-days)	(21 man-days)
5	Training (report preparation)	B12	Preparation of the training results reports (Japanese and English)	Training results report (English) Training results report (Japanese)		3 man-days	3 man-days

Moreover, based on the findings of the field survey, since it is deemed difficult to communicate in English with staff of the water treatment plant, two translators (Arabic/English) shall be assigned to each field. Moreover, since it will be necessary to prepare the training texts in Arabic, the two translators will also be in charge of translating the English texts prepared by the consultants into Arabic.

2) Soft Component Trainees

The Soft Component trainees shall be personnel in charge of the actual operation and maintenance of facilities constructed in the Project, and it is assumed that they will have already participated in OJT conducted under the Project contract.

3) Soft Component Contents

The contents of activities in the Soft Component are as follows.

① Guidance in water treatment process management technology

The contents of guidance are as follows. Moreover, since lectures alone may not raise the trainees' motivation, lectures will be given them alternating with practical training every second day.

a. Preparation in Japan

Preparation of training texts (draft).

b. Accurate grasp of the current technical level and problems in water treatment processes (preparation)

Questionnaire forms will be handed out and workshops conducted in order to gauge the present technical levels of employees who will receive training and to identify problems in the existing and new water treatment processes.

c. Lecture on theory and control techniques of water treatment processes

The following basic theory concerning water treatment processes will be taught in lectures.

√ Water quality control in water treatment plants as part of the public water supply system
√ Water treatment process technology and water quality problems in Japan
√ Monitoring items and control methods in water treatment processes

√ Theory of water treatment processes:
  • Flocculation theory
  • Rapid filtration theory (including slow filtration)
  • Sterilization theory
√ Treatment and disposal of settled sludge and filter bed wastewater

d. Practical training in water quality control and water treatment process operation methods

√ Collection of water quality data and computer inputting
√ Water quality data inputting and viewing and interpretation of past water quality data
√ Water intake information and water treatment process management
√ Management of settled sludge and filter wastewater treatment
√ Optimum water treatment processes in the Project and existing water treatment plants

e. Preparation of standard form for inputting water quality data

Water quality data inputting and viewing formats for the water treatment plant (MS Excel) will be prepared in joint work with the trainees. Water quality data comprise the following contents:

√ Raw water quality, treated water quality, water quality in water treatment processes (2 points)
√ Chemical dosing quantities, chemical dosing rates, chemical costs
√ Quantity of treated sludge
√ Projected water quality and projected quantity of treated sludge

② Guidance in data-based maintenance technology

The training contents will be as follows.

a. Outline explanation of the monitoring system

Outline explanation of the objective and composition of the monitoring system to be constructed in the Project and the specification of system instruments, etc. will be given, in order to deepen the trainees' understanding of the monitoring system.

b. Guidance in data processing methods

It is assumed that the trainees acquire a certain degree of ability in data processing techniques via the OJT conducted by the sub-contractor. In this Soft Component, data processing using actual data will be implemented in order to ascertain and raise the trainees' level of achievement in this field. Table 2.29 and Table 2.30 show the specific contents of data inputting and outputting, and these contents will be provided as information directly useful for water treatment plant operation and maintenance. Moreover, the said information will target the water treatment facilities constructed under the Project, the overall water treatment plant, and the existing water treatment facilities. The input data and output contents in data processing are indicated below.

Table 2.29 Input Data Used in Data Processing

Target	Project facilities	Overall WTP
Water transmission and distribution flows (treated water production flow)	○	―
	―	○
Water intake flow	○	―
Amount of stored water (backwash water tanks)	○	―
Residual chlorine concentration	○	―
	―	○
Power consumption	○	―

Table 2.30 Output (Information) Contents from Data Processing

Target	Project facilities	Overall WTP	Existing facilities	Output contents
Water transmission and distribution flows (treated water production flow)	○	○	○	Forms (daily, monthly)
	○	○	○	Time-series graphs (tabulation)
Water intake flow	○	―	―	Forms (daily, monthly)
	○	―	―	Time-series graphs (tabulation)
Amount of stored water (backwash water tanks)	○	―	―	Time-series graphs (tabulation)
Residual chlorine concentration	○	○	○	Control charts (daily minimum, daily peak, daily mean)
	○	○	○	Time-series graphs (tabulation)
Water transmission and distribution flows (treated water production flow)	○	―	―	Forms (daily, monthly)

Note: Values for the existing water treatment facilities will be calculated in a program from data for the overall water treatment plant and Project water treatment facilities.

c. Technical guidance concerning information utilization

Technical guidance will be given on how to utilize the above information. Specific contents of instruction will be as follows.

- √ Explanation of the meaning of each item of information
- √ Utilization of water transmission and distribution information in water treatment plant water distribution management
- √ Utilization of water transmission and distribution information and water storage information in transmission and distribution pump operation
- √ Utilization of water intake information in water treatment process management (handled in the session instructing on improvement of water treatment process management)
- √ Utilization of residual chlorine concentration information in water quality management
- √ Utilization of water transmission and distribution information and power consumption information in calculating facility maintenance costs

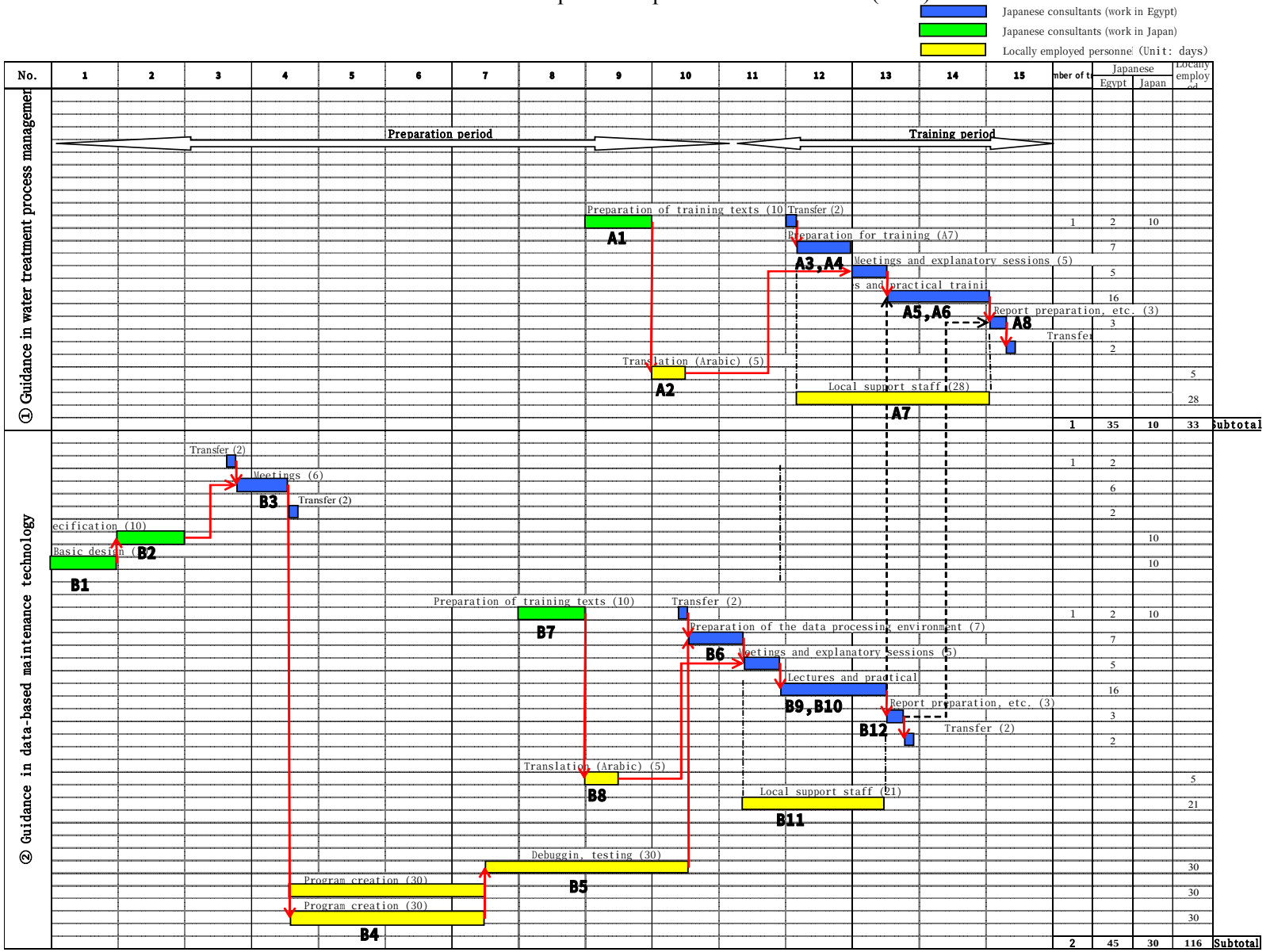
(6) Procurement of Soft Component Implementation Resources

Since the water treatment facilities and monitoring equipment to be constructed and installed in the Project will basically consist of items procured in Japan, it is appropriate to adopt direct support by Japanese consultants who are used to handling the said items.

(7) Soft Component Implementation Schedule

Since it will be necessary to implement the Soft Component (training) using the facilities constructed in the Project, it will need to be implemented before and after the handover of facilities to the Egyptian side. However, in the technical guidance concerning information utilization, since it will be necessary to create the data processing application software before the training begins, a period of around three months shall be assumed for this purpose. Table 2.31 shows the envisaged Soft Component implementation schedule (draft) in the Project.

Table 2.31 Soft Component Implementation Schedule (draft)



Note: Since this schedule is based on actual working days, it may differ slightly from the actual works schedule.
See the detailed activity plans for the detailed activity schedules.

(8) Soft Component Outputs

Table 2.32 shows the outputs of the Soft Component in the Project.

Table 2.32 Soft Component Outputs

Outputs	Remarks
Data processing application software	Basic design document Design specification User manual
Assessment report on understanding of trainees	Summary and assessment of the questionnaire forms and short tests given to the trainees
Soft Component completion report (English)	For submission to the implementing agency in Egypt: (according to the JICA Soft Component Guideline: April 2004)
Soft Component completion report (Japanese)	For submission to JICA (ditto)

(9) Soft Component Cost Estimation

Table 2.33 shows the rough cost estimation of the Soft Component in the Project.

Table 2.33 Soft Component Cost Estimation

Cost	Rough Amount (1000 yen)
Direct personnel expenses	2,666
Direct costs	7,305
Indirect costs	3,466
Rough total	13,437

(10) Obligations of the Implementing Agency in Egypt

1)

① Guidance in water treatment process management technology

As contained in the minutes, since there is an extremely strong desire for transfer of technology in water treatment process management among upper levels of GACWASD and NOPWASD, there is a very high potential (motivation) for implementation on the soft front. The trainees will need to have a relatively high level of motivation, however, it should be possible to secure this by altering the contents and level of the scheduled lectures and practical drills according to the skill levels and interests of each trainee as ascertained in the questionnaire forms in the preparation stage.

General purpose computers and software (MS-Excel) will be required to implement this technical guidance, however, since no special equipment will be needed, there should be no problem regarding implementation feasibility in hardware terms.

② Guidance in data-based water treatment facilities maintenance technology

The implementing agency in Egypt fully understands the importance of maintaining water supply facilities based on data, however, because many water supply facilities in Egypt do not possess monitoring systems, there is a common awareness that accurate data cannot be obtained and, as a result, problems exist in terms of maintenance. GACWASD, the operating agency in the Project, is also aware of this and strongly hopes for the monitoring system to be introduced. Accordingly, motivation is high and there is a strong possibility that this component will be implemented. Incidentally, since the prospective trainees have experience in conducting maintenance at the existing water treatment plant, they already have basic maintenance technology.

2) Impediments

No major impediments exist regarding both training items, however, the trainees will need to satisfy the following criteria. Moreover, key persons in charge of maintenance will need to sit both training courses.

√ Trainees must have basic computer operating skills.
√ Trainees must be able to use basic software (MS-Excel and MS-Word).
√ Trainees must have ample time to spare for lectures and practical drills (around 4 hours per day).

Moreover, the Egyptian side will need to prepare the following resources in order to implement the training.

√ Computer equipment, software, printers
√ Training venues

Moreover, in the guidance provided concerning data-based water treatment facilities maintenance technology, the Egyptian side will need to prepare the hardware environment consisting of computers, etc. that make up the monitoring system before the training starts. Accordingly, when getting ready for the training, the Egyptian side will need to work closely with the Japanese consultant in charge of preparing the data processing application software.

CHPATER 3 Project Evaluation and Recommendations

CHAPTER 3 PROJECT EVALUATION AND RECOMMENDATIONS

3.1. Project Effects

The following table3.1 summarizes the current conditions and problems facing the GACWASD water supply utility in the Project target area of El Mahara El Kobra District in Gharbeya Prefecture, as well as the countermeasures proposed in the Project (grant aid components and components to be implemented by the Egyptian side), and the anticipated effects of Project implementation.

Table3.1 Current Conditions and Problems and Project Countermeasures and Effects, etc.

Current Conditions and Problems	Project Countermeasures	Project Effects and Extent of Improvement
1. Water supply shortages Water supply from existing water treatment plants, small-scale basic treatment facilities and wells in El Mahara El Kobra is unable to keep pace with growing demand resulting from population expansion, leading to the occurrence of water shortages.	Obtain permission to utilize domestic water from the River Nile, construct a new water treatment facility (400 liters/second) inside the existing water treatment plant, and supply water to the target area. (Grant Aid component)	Stable water supply satisfying the water requirement of approximately 600,000 people in the target area in 2010, i.e. 100~215 LCD, can be secured.
2. Deterioration in quality of groundwater Groundwater in the Nile delta, where the Project target area is located, is deteriorating every year due to salination caused by excessive pumping and infiltration of agricultural wastewaters. In El Mahara El Kobra District, the scope over which groundwater quality fails to comply with the potable water standard is growing.	Close down wells that have particularly deteriorated water quality, rehabilitate existing wells, water treatment plants and basic water treatment equipment, and construct new water treatment facilities in order to comply with the potable water standard.	Supply of safe drinking water will be possible.
3. Deterioration and insufficient capacity of transmission mains and distribution pipes In the Project target area, some districts suffer from chronic water shortages or do not even receive public water supply at all.	Rehabilitate the water transmission mains and distribution pipes leading from the existing water treatment facilities, and also install new such facilities. (Egyptian scope of works)	Fair and stable supply of drinking water to residents of the target area will become possible.
4. Unstable and unsanitary water supply due to inefficient treatment processes Operation and maintenance based on accurate base data is not carried out.	Provide guidance on gathering accurate data and conducting operation and maintenance based on data.	Stable supply of sanitary drinking water to residents of the target area will become possible.

3.2. Recommendations

Issues that need to be improved and overcome by NOPWASD and GACWASD in future to ensure the sure implementation of the Project and the sustained operation and maintenance of facilities following completion are as indicated below.

(1) Works to be implemented by the Egyptian side:

NOPWASD and GACWASD should promptly secure the necessary budget and certainly implement the following tasks to ensure that the Project is smoothly implemented and the Project goals are achieved: 1) removal or relocation of buried structures and outdoor obstructions to the Project works on the new water treatment plant construction site, 2) ground leveling of the construction site, 3) laying of water transmission mains, and 4) installation of water distribution pipes, etc.

(2) Improvement of business management

Because the Government of Egypt pins water supply tariffs down as a policy goal, the water supply utility run by GACWASD runs up a loss every year and the system has to be financially supported by means of a budget allocation from Gharbeya Prefecture in addition to revenue from water tariffs. As a result of conducting the Basic Design Study, the following points were identified for improving the business situation:

① Enhancement of the water tariff collection rate through building of a water transmission and distribution system administering the whole prefecture;

② Upon establishing efficient organization and facilities operation, implementation of a water tariffs revision that covers facilities operation and maintenance costs and secures potential for autonomous financial development;

③ Effective utilization of facilities and improvement of the tariff collection rate through raising the maintenance technology of employees; and

④ Appropriate assignment of personnel and reduction of personnel costs through reviewing each waterworks facility and necessary manpower.

(3) Need for integrated operation with existing facilities

In this Basic Design Study, it is planned to provide a stable supply of sanitary potable water to residents of the target area through constructing a new water treatment plant in addition to operating the existing El Mahara El Kobra Old Water Treatment Plant, El Mahara El Kobra New Water Treatment Plant, small-scale basic water treatment facilities and well facilities. In order to make this possible, it is necessary to build a water transmission and distribution system that organically links all the said facilities.

In other words, because there is a mixture of large-scale high-pressure water transmission from the water treatment plants, medium-scale water transmission from numerous small-scale basic water treatment facilities, and small-scale low-pressure water supply from numerous pump stations, it will be necessary to provide pressure adjustment and install boosters or regulating reservoirs at connections to the distribution network in order to build a distribution system that enables integrated operation.