$$H = (Q/1.84 / B)^{2/3}$$

Where:

Q : treated capacity (305,000 cu.m/d/18/24/60/60 = 0.196 cu.m/sec)

B : weir length (3.6 m)

$$= (0.196/1.84 / 3.6)^{2/3} = 0.1 \text{ m}$$

4-3-2 Design of Replacement of Major Existing Facilities

Based on the field survey conducted from June 16 to August 14, 1992, of which results are shown in Appendix 5-1, the rehabilitation plan is summarised as shown in Appendix 6. The following is the detailed design of the replacement of major existing facilities/equipment.

(1) Old Intake Pump Station (Mechanical)

a. Suction Valve

Due to deterioration and malfunction, the existing suction valve for No. 2 and No. 3 pumps are to be replaced by the following valves:

Quantity	:	2 sets
Type	:	manually operated gate valve
Size	:	700 mm
Materials	:	casing cast iron
		valve cast iron

b. Main Pump

Due to deterioration, defective vibration is observed. The existing No. 2 and No. 3 pumps are to be replaced by the following pumps:

Quantity	:	2 sets
Type	:	vertical shaft double suction centrifugal pump
Capacity	:	3,860 cu.m/hr x 24 m

Size	:	700 mm x 600 mm	
Materials	:	casing	cast iron
		impeller	BC
		shaft	chromium molybdenum steel

c. Motor

Due to deterioration, defective noise is observed. The existing No. 2 and No. 3 motors are to be replaced by the following motors:

Quantity	:	2 sets
Type	:	squirrel cage induction motor
Capacity	:	400 v x 340 kw x 8 p
Protection	:	open type drip proof motor

d. Check Valve

Due to deterioration and malfunction, the existing check valves are to be replaced by the following valves:

Quantity	:	2 sets
Type	:	swing
Size	:	700 mm
Materials	:	casing cast iron
		valve cast iron

e. Delivery Valve

Due to deterioration and malfunction, the existing No. 2 and No. 3 delivery valves are to be replaced by the following valves:

Quantity	:	2 sets	
Type	:	manually operated butterfly valve	
Size	:	700 mm	
Materials	:	casing	cast iron
		valve	cast iron

f. Drain Pump

Due to deterioration and malfunction, the existing drain pump is to be replaced.

Quantity	:	1 set
Type	:	submersible
Size	:	50 mm
Capacity	:	300 l/min x 15 m x 1.5 kw

g. Piping

In connection with the replacement of mechanical equipment, the existing piping and fitting are to be replaced.

(2) New Intake Pump Station (Mechanical Items)

Due to deterioration and malfunction, those existing valves, drain pump, piping and fitting are to be replaced by the following items:

a. Suction Valve

Quantity	:	4 sets	
Type	:	manually operated gate valve	
Size	:	500 mm x 1 set	
Materials	:	casing	cast iron
		valve	cast iron

b. Check Valve

Quantity	:	4 sets	
Type	:	swing	
Size	:	600 mm	
Materials	:	casing	cast iron
		valve	cast iron

c. Delivery valve

Quantity	:	4 sets

Type	:	manually operated butterfly valve with head stock
Size	:	600 mm
Materials	:	casing cast iron valve cast iron

d. Drain Pump

Quantity	:	1 unit
Type	:	submersible
Size	:	50 mm
Capacity	:	300 l/min x 15 m x 1.5 kw

e. Piping

Quantity	:	L.S.

(3) Distribution Chamber

To secure the function for distribution and flow measurement, a distribution chamber is to be constructed as follows:

a. Distribution Chamber

Quantity	:	1 receiving, 1 measuring, 4 distribution, 1 overflow chamber
Dimensions	:	10.8 m x 13.7 m x 11.8 m depth
Structure	:	Reinforced concrete

b. Outlet Penstock

Quantity	:	5 units
Type	:	manually operated out screw type weir gate (cast iron)
Size	:	1,000 mm x 1,000 mm

c. Inlet Valve

Quantity	:	2 sets
Type	:	manually operated butterfly valve
Size	:	1,000 mm
Materials	:	casing cast iron
		valve cast iron

d. Piping : L.S.

(4) Sedimentation Facilities

1) Centrifloc

a. Sludge Scraper

Due to aging, submerged parts are corroded, the existing sludge scrapers are to be replaced by the following scrapers:

Quantity	:	2 units
Type	:	circular type
Dimensions	:	ϕ39.6 m x 7.16 m depth

Note: The existing driving units are functionable and not to be replaced.

b. Sludge Withdrawal Valve

The existing valves, which are out of order, are to be replaced by the following valves:

Quantity	:	2 sets
Type	:	motor operated eccentric valve
Size	:	150 mm
Motor	:	0.2 kw

c. Sludge Recirculation Pump

The following sludge recirculation pumps are to be installed to improve the formation of sludge blanket.

Quantity : 2 sets
Type : horizontal sludge pump
Size : 150 mm
Capacity : 120 cu.m/hr x 5 m x 5.5 kw
Note: Pump house is to be constructed.

d. Drain Pump

The following drain pumps are to be installed to secure drainage in the sludge drainage valve pit.

Quantity : 2 sets
Type : submersible
Size : 50 mm
Capacity : 300 l/min x 15 m x 1.5 kw

e. Piping

Related piping is to be replaced or installed in connection with the above replacement.

2) Pretreater

a. Sludge Recirculation Pump

The existing pumps are removed. The following pumps are to be installed.

Quantity : 2 units
Type : horizontal sludge pump
Size : 400 mm
Capacity : 1,500 cu.m/hr x 2 m x 22 kw
Note: Pump house is to be constructed in the Project.

b. Sludge Withdrawal Valve

The existing valves, which is out of order, are to be replaced by the following valves at the ground level, taking consideration for

easy operation.

Quantity	:	2 sets
Type	:	motor operated eccentric valve
Size	:	150 mm
Motor	:	0.2 kw

c. Drain Pump

Drainage pumps are to be installed in the sludge drainage pit.

Quantity	:	2 sets
Type	:	submersible pump
Size	:	50 mm
Capacity	:	300 l/min x 15 m x 1.5 kw

d. Piping

Related piping is to be replaced or installed in connection with the above replacement.

(5) Filter

1) Filter No. 1 - No. 12

a. Inflow Weir

A filtration rate control system is to be reconstructed from the existing outlet flow rate controller, which are presently out of order, to inlet rate control device of inflow weirs, taking into consideration easy maintenance and reliability.

Quantity	:	12 sets
Dimensions	:	3.6 m length
Materials	:	stainless steel

b. Washwater Trough

The following washwater troughs are to be constructed to discharge washwater effectively:

Quantity	:	96 pcs (8 pcs/filter x 12 filters)
Dimensions	:	500 mm x 400 mm
Materials	:	RC

c. Underdrains (Nozzle)

Damaged nozzles are to be replaced together with sealing of underdrain board.

Quantity	:	1,400 pcs.
Materials	:	ABS resin

d. Filter Media

Due to deterioration, the filter media is to be replaced as follows:

Effective size	:	0.9 mm
Uniformity coefficient:		1.5>
Depth	:	900 mm

Specification of the filter media has been decided by the pilot scale plant experiment.

e. Valve

Due to deterioration and malfunction, the actuators of the filter control valves item 1 to 4, referred to Table 4-3-2, are to be repaired and the filter control valves item 5 and 6, referred to Table 4-3-2, are to be provided with each filter No.1 to No.12. The existing effluent valves and venturi tubes are then to be removed.

Table 4-3-2 Filter Control Valve(No.1 - No.12)

Item No.	Description	Type	Size	Quantity	Remarks
1	Inflow valve	Air operated butterfly	800	12	Repair
2	Washwater discharge valve	Air operated butterfly	800	12	Repair
3	Washwater inflow valve	Air operated butterfly	600	12	Repair
4	Air score valve	Air operated butterfly	300	12	Repair
5	Effluent valve	Air operated butterfly	450	12	Improvement
6	Effluent control valve	Butterfly valve controlled by float	450	12	Improvement

f. Backwash Flow Meter

Existing flow meter which is out of order is to be replaced by the following meter.

Quantity : 1 set
Type : orifice type
Size : 600 mm
Materials : stainless steel

g. Backwash Flow Rate Control Valve

The following valve is to be installed to ensure the backwash flow rate.

Quantity : 1 set
Type : manually operated butterfly valve
Size : 600 mm

h. Ventilation Fan

The following ventilation fans are to be installed at the pipe

gallery to exhaust harmful vapored chlorine.

Quantity	:	2 sets
Type	:	in-line type
Size	:	400 mm
Capacity	:	20 cu.m/min x 12 mm Aq. x 0.4 kw

i. Piping

Related piping is to be installed in connection with the following

- replacement of valves
- air supply piping for valve control
- repair of air scoring piping
- siphon piping
- manometre for the detection of head loss
- remove of sweeping water pipe

2) Filter No. 13 - No. 18

a. Level Controller

The existing level controllers, which are out of order, are to be replaced by the following controllers.

Quantity	:	6 sets
Type	:	float valve

b. Valve

Due to malfunction, the existing filter control valves are to be replaced as shown in Table 4-3-3.

c. Air Compressor

Due to malfunction, the existing air compressors are to be replaced by the following equipment.

Quantity : 2 sets

Type : pressure switch type

Capacity : 1,250 l/min x 7 kg/sq.cm x 11 kw

Table 4-3-3 Filter Control Valve (No.13 - No.18)

Description	Type	Size	Quantity	Remarks
Effluent valve	Air operated butterfly valve	450	6	Replacement
Air score valve	Air operated butterfly valve	250	6	Replacement
Wash-water discharge valve	Air operated butterfly valve	400	6	Replacement
Backwash Influent Valve	Air operated butterfly valve	400	6	Replacement

d. Air Dryer

Due to out of order, the existing air dryers are to be replaced by the following equipment.

Quantity : 2 units

Type : air cooled dehumidifier

Capacity : 1,650 l/min x 9.5 kg/sq.cm.

e. Orifice plate for Backwash Flow Meter

Due to out of order, the existing flow meter is to be replaced by the following equipment.

Quantity : 1 set

Type : orifice type

Size : 600 mm

Materials : stainless steel

f. Level Meters for Backwash Tank

Level meter is to be installed to detect the volume of backwash water.

Quantity : 2 sets
Type : float type

g. Piping

Related piping is to be replaced and/or installed in connection with the following:

- replacement of valves
- air supply piping for valve control
- repair of air scoring piping

(6) Chemical Feed Facilities

1) Alum

All existing facilities except for the solution tank should be replaced by the following new alum feeding system, which is composed of a head tank, a constant level tank, distribution tanks, and piping. Alum solution prepared in the existing alum tanks is transferred to the head tank which is to be installed at the new distribution chamber by the alum feed pumps.

Before the alum solution is distributed to each feeding point through the distribution tank, alum is kept in the constant level tank to prevent the fluctuation of the alum solution level.

a. Mixer

Quantity : 4 sets
Type : vertical mixer
Motor : 7.5 kw

b. Solution Tank (existing)

Anti-acid painting is to be painted.

c. Alum Feed Pump

Alum feed pumps are to be installed to transfer alum solution from the existing solution tank to a new head tank.

Quantity	:	2 sets
Type	:	horizontal centrifugal pump
Size	:	80 mm x 50 mm
Capacity	:	0.6 cu.m/min x 10 m x 3.7 kW

d. Head Tank

Head tank is to be installed to store alum solution at the new distribution chamber.

Quantity	:	1 tank
Dimensions	:	1.5 m x 1.5 m x 1.5 m depth
Capacity	:	3 cu.m
Materials	:	stainless steel

e. Constant Level Tank

Constant level tanks are to be installed at the new distribution chamber to keep constant alum solution level.

Quantity	:	2 tanks
Dimensions	:	600 mm x 900 mm x 600 mm depth
Materials	:	stainless steel

f. Distribution Tank

Distribution tank is to be installed at the new distribution chamber to feed alum solution to each feeding point.

Quantity	:	2 tanks
Dimensions	:	600 mm x 900 mm x 600 mm depth
		900 mm x 900 mm x 600 mm depth
Materials	:	stainless steel

Note : Feed rate could be controlled by manual operation with flow meter.

g. Hoist

Quantity	:	1 unit
Type	:	electrical operated monorail type
Capacity	:	0.5 ton x 12 m head
Motor	:	1.1 kw, 0.4 kw

h. Valve and Piping

Related valve and piping are to be installed in connection with the following:

- alum solution transfer
- dilution water
- removal of the existing valves and piping

2) Lime

All existing facilities except for solution tank are to be replaced by the following new lime feed system composed of mixer, transfer pump, feeder, piping and lime dust washing equipment.

a. Mixer

Quantity	:	8 sets (2 sets/tank)
Type	:	vertical type
Motor	:	3.7 kw

b. Lime Feed Pump

Quantity	:	4 sets
Type	:	horizontal centrifugal pump
Size	:	100 mm x 80 mm
Capacity	:	1 cu.m/min x 10 m x 5.5 kw

c. Lime Feeder

Lime feeders that function as metering and re-mixing are to be

installed nearby the feeding points.

Quantity	:	3 units
Type	:	mechanical agitation type
Capacity	:	9 cu.m x 2 units, 3 cu.m x 1 unit
Motor	:	0.75 kw

d. Lime Dust Washing Equipment

Current lime loading system causes lime dust which is a serious health hazard. To solve this problem, the following lime dust washing system is to installed:

- Washing Tank
  - Quantity : 1 tank
  - Material : steel
- Dust Collection Fan
  - Quantity : 1 set
  - Motor : 0.75 kw
- Dust Collecting Duct
  - Quantity : L.S.
  - Material : PVC
- Solution Tank Cover
  - Quantity : for the existing 4 tanks
  - Dimension : 2.5 m x 7 m
  - Material : GRP

e. Valve and Piping

Related valve and piping are to be installed in connection with the following.

- lime feed
- dilution water
- dust collecting
- removal of the existing valves and piping

(7) Chlorine

Six units out of the existing 8 units of chlorinators are to be replaced due to deterioration. Two units are for pre-chlorination including one unit of standby.

An additional two units are for post-chlorination, while the existing two units of chlorinators are used as standby for post-chlorinators.

a. Chlorinator

Quantity	:	4 sets
Type	:	self-standing cabinet type
Capacity	:	75 kg/hr x 2 sets (Pre)
		20 kg/hr x 2 sets (Post)

b. Pressured Water Pump

Quantity	:	2 sets
Type	:	horizontal centrifugal pump
Size	:	125 mm
Capacity	:	1.5 cu.m/min x 40 m x 18.5 kw

c. Chlorine Cylinder scale

Quantity	:	1 set
Type	:	load cell type with indicator
Capacity	:	0 ~ 1 ton

d. Crane

Due to deterioration, the existing lifting device for hoist is to be replaced by the following crane:

Quantity	:	1 set
Type	:	motor operated type
Capacity	:	2 ton x 12 m head
Motor	:	1.8 kw, 0.4 kw.

e. Hoist

Due to deterioration, the existing hoist is to be replaced by the following equipment.

Quantity	:	1 set
Type	:	motor operated monorail type
Capacity	:	2 ton x 12 m head
Motor	:	1.8 kw, 0.4 kw

f. Valve and Piping

Related valve and piping are to be replaced in connection with the following:

- pressured water
- chlorine solution feed
- chlorine gas

(8) Transmission Facilities

1) Kolonnawa

a. Main Pump

Due to deterioration, the existing pumps are to be replaced by the following pumps.

Quantity	:	3 sets
Type	:	vertical double suction centrifugal pump
Size	:	300 mm x 200 mm, 350 mm x 250 mm
Capacity	:	640 cu.m/hr x 45 m, 1,280 cu.m/hr x 45 m
Materials	:	casing cast iron
		impeller BC
		shaft chrome molybdenum steel

b. Motor

In connection with the replacement of the main pumps, the motors are to be replaced.

Quantity	:	3 sets
Type	:	squirrel cage induction motor
Capacity	:	110 kw x 4 p x 400 V, 220 kw x 4 p x 400 V
Protection	:	open type dripproof motor

c. Check Valve

In connection with the increase of pump capacity, the existing check valve of 250 mm is to be replaced by the following valve.

Quantity	:	1 set
Type	:	swing type
Size	:	400 mm
Materials	:	casing cast iron
		body cast iron

d. Delivery Valve

The existing deteriorated valves are to be replaced by the following valves:

Quantity	:	3 sets
Type	:	manual operated butterfly valve with head stock
Size	:	250 mm x 2 set, 400 mm x 1 set
Material	:	casing cast iron
		body cast iron

e. Floor Drainage Pump

The existing deteriorated floor drainage pumps are to be replaced by the following pumps:

Quantity	:	2 sets
Type	:	submerged pump

Size : 50 mm

Capacity : 300 l/min x 15 m x 1.5 kw

f. Piping

In connection with the replacement of the main pumps and valves, necessary piping are to be replaced.

2) Dehiwala

a. Main Pump

In connection with the New Ambatale Water Treatment Expansion Project, the following No. 4 main pump is to be installed.

Quantity	:	1 set
Type	:	horizontal double suction centrifugal pump
size	:	600 mm x 450 mm
Capacity	:	2,898 cu.m/hr x 42.67 m
Materials	:	casing cast iron
		impeller BC
		shaft chrome molybdenum steel

b. Motor

In connection with the expansion of main pump No. 4, the following motor is to be installed:

Quantity	:	1 set
Type	:	squirrel cage induction motor
Capacity	:	400 V x 440 K\kw x 8 p
Protection	:	open type dripproof motor

c. Check Valve

In connection with the expansion of main pump No. 4, the following check valve is to be installed.

Quantity	:	1 set
Type	:	swing type
Size	:	600 mm
Materials	:	casing cast iron
		body cast iron

d. Delivery Valve

In connection with the expansion of main pump No. 4, the following delivery valve is to be installed.

Quantity	:	1 set
Type	:	inner screw manual operated gate valve
Size	:	600 mm
Materials	:	casing cast iron
		body cast iron

e. Vacuum Pump

The existing deteriorated pumps are to be replaced by the following pumps:

Quantity	:	2 sets
Type	:	water sealing type
Maximum Vacuum	:	-700 mmHg
Motor	:	3.7 kw x 4 p

f. Piping

In connection with the above replacement, piping is to also be replaced.

(9) Electrical Facilities

1) Old Intake Pump Station

a. Low Tension Panel

The existing deteriorated panels are to be replaced by new low tension panel provided with ACB together with circuit breaker, meter and protective relay. Related wiring and cable are to also be replaced.

Quantity	:	400 v power receiving panel x 1
		400 v feed panel x 3
Type	:	indoor use metal enclosed self-standing type

b. Motor Starter Panel for Pump No. 2

In connection with the replacement of the main pump and motor, the deteriorated pump starter is to be replaced by the following reactor type of starter. Related wiring and cable are to also be replaced.

Quantity	:	400 v motor starter panel x 1
Type	:	indoor use metal enclosed self-standing type

c. Motor Starter Panel for Pump No. 3

In connection with the replacement of the main pump and motor, the deteriorated pump starter is to be replaced by the following reactor type of starter. Related wiring and cable are to also be replaced.

Quantity	:	400 v motor starter panel x 1
Type	:	indoor use metal enclosed self-standing type

d. Control Panel for Floor Drainage Pump

The existing control panel is to be replaced by the following

panel.

Quantity	:	1 panel
Type	:	standing type for indoor use

2) New Intake Pump Station

a. Control Panel for Drain Pump

In connection with the replacement of pump, the existing control panel is to be replaced by the following panel.

Quantity	:	1 panel
Type	:	standing type for indoor use

3) Treatment Plant

a. Control Panel for Centrifloc and Local Operation Panel

The existing deteriorated control panel for centrifloc is to be replaced in the chemical house. The local operation panel is to be replaced near sludge recirculation pump.

Quantity	:	1 control panel for Centrifloc
Type	:	indoor use metal enclosed self-standing type
Quantity	:	local operation panel x 2
Type	:	standing type for outdoor use

b. Control Panel for Pretreater and Local Operation Panel

The existing malfunctioning control panel for Pretreater is to be replaced in the chemical house. The local operation panel is to be replaced near sludge recirculation pump.

Quantity	:	1 control panel for pretreater
Type	:	indoor use metal enclosed self-standing type
Quantity	:	local operation panel x 2
Type	:	standing type for outdoor use

c. Control Panel for Filter

Due to obsolescence, the existing control panels are to be replaced by the following panels.

Quantity : 4 panels (No. 1 - No. 12)
2 panels (No. 13 - No. 18)
Type : indoor use desk type
Note : No. 13 - No. 18 control panels are to be installed above the pipe gallery where a new control room is to be provided in the Project.

d. Magnetic Valve Box for Filter

Due to bad ambient condition, valve boxes are corroded and malfunctioning. These are to be replaced in the operation room and installed in the box.

Quantity : 4 boxes (No. 1 - No. 12)
2 boxes (No. 13 - No. 18)

e. Distribution Panel for Filter

Due to bad ambient condition, the panel is corroded and malfunctioning. A new compressor, air dryer and ventilation fan are to be installed. Accordingly, the existing panel is to be replaced in the operation room by the following panel.

Quantity : 1 panel
Type : standing type for indoor use

f. Operation Panel for Ventilation Fan

In connection with the installation of ventilation fan, the following panel is to be installed.

Quantity : 1 panel
Type : standing type for indoor use

g. Wiring and Piping of Instrumentation

Due to corrosion, the existing wiring support is to be replaced by aluminum cable duct and tray. Piping for instrumentation is also to be replaced.

4) Control Panel for Chemical Equipment

a. New Control Panel Room

In view point of safety, it is undesirable that the existing control panels are installed in the same room together with laboratory equipment. Therefore, new control panels are provided independently at the next room of the existing laboratory in which sufficient space is available.

b. Distribution Panel for Chemical Building

In connection with the replacement of mechanical portion and lighting facilities, the existing distribution panels, receiving 400 v power supply from the Dehiwala distribution panel, are to be replaced.

Quantity	:	400 v power receiving panel x 1
		400 v power distribution panel x 1
Type	:	indoor use metal enclosed self-standing type

c. Control Panel for Chemical Facilities

In connection with the replacement of mechanical portion, the existing control panels are to be replaced in new control panel room.

Quantity	:	control panel for alum x 1
		control panel for lime x 1
		control panel for chlorine x 1
Type	:	indoor use metal enclosed self-standing type

d. Local Operation Panel for Lime Tank

In connection with the installation of new chemical feed system, the following local operation panels are to be installed.

Quantity	:	local operation panel for lime tank x 4
Type	:	self-standing type outdoor use

e. Push Button Switch Box for Chemical Equipment

In connection with the replacement of mechanical portion, the following push button aluminum die cast switch boxes are to be re placed.

Quantity	:	1 box for mixer for alum tank
		1 box for alum feed pump
		1 box for mixer for lime tank
		1 box for exhaust fan for lime
		1 box for lime feed pump
		1 box for chlorine pressured water pump
Type	:	standing type for indoor use

5) Dehiwala

a. High Tension Panel

Electricity for the treatment plant and Dehiwala pump station distribute 11 kV to the high tension panel located at the Dehiwala pump station through the Mulleriyawa substation.

The panels, breaker and DC power supply device installed 27 years ago, are malfunctioning and are to be replaced by a new one with VCB type of breaker.

Quantity	:	11 kv power receiving panel x 1
		11 kv power distribution panel x 4
		DC power supply device x 1
Type	:	indoor use metal enclosed self-standing type

b. Low Tension Panel

Due to the malfunction of the existing low tension panel, the low tension power supply to the water treatment facilities and main pump for Dehiwala are to be replaced by the following panel which are provided with sufficient instrument and protective relays.

Quantity	:	400 v power receiving panel x 2
		400 v feeder panel x 4
Type	:	indoor use metal enclosed self-standing type

c. Motor Starter Panel for Dehiwala No. 3 Pump

Due to malfunction, starter panel is to be replaced together with cable except for cable of motor and wiring of starting resister which is still available.

Quantity	:	400 v motor starter panel for pump x 1
Type	:	indoor use metal enclosed self-standing type

d. Motor Starter Panel for Dehiwala No. 4 Pump

In connection with the installation of mechanical portion, the following panel is to be installed.

Quantity	:	400 v motor starter panel for Dehiwala No. 4 pump x 1
Starting Method	:	440 kw reactor
Type	:	indoor use metal enclosed self-standing type

e. Control Panel for Vacuum Pump

In connection with the replacement and installation of mechanical portion, the existing panel is to be replaced by the following panels.

Quantity : 1 panel
Type : standing type for indoor use

f. Wiring

The existing corroded wiring support is to be replaced by an aluminum cable duct and tray. The wiring for the sedimentation tank power supply is to be improved from the overheadline to underground wiring. The existing paper insulation sealed 11 kV cable for the Dehiwala is deteriorated. These cables are to be replaced by 11 kV CV cable. The low tension volt cable is to also be replaced by 600 V CV cable.

6) Kolonnawa

a. Lower Tension Power control Panel for Kolonnawa

Three (3) units of pumps are to be replaced, out of which one pump capacity is to be changed from 110 kw to 220 kw. Then, 400 v low tension control panel is to be replaced and the existing ACB panel for power receiving is to be removed.

Quantity : 400 v power receiving panel x 1
400 v motor starter panel for pump x 3
auxiliary panel for lighting x 1
Starting method: 110 kw reactor (2 panels)
220 kw reactor (1 panel)
Type : indoor use metal enclosed self-standing type

b. Control Panel for Floor Drainage Pump

The existing control panels are to be replaced by the following:

Quantity : 1 panel for Kolonnawa pump station
1 panel for new pump station
Type : standing type for indoor use

7) Instrumentation Facility

a. Level Meter for Ambatale Distribution Tower

To improve pump operation, the following level meter are to be installed.

Quantity : 1 transmitter of electronic differential meter
1 meter
1 panel for source

b. Level Meter for Filter No. 1 to No. 12

Due to corrosion and malfunction, the existing level meters are to be replaced by the following meters.

Quantity : 12 sets
Type : level switch of electronic rod

c. Level meter for Alum Tank

In connection with the installation of mechanical portion, the following level meter is to be installed.

Quantity : 1 set
Type : level switch of electronic rod

d. Level Meter for Drainage Tank of Centrifloc and Pretreater

In connection with the installation of mechanical portion, the following level meters are to be installed.

Quantity : 4 sets
Type : level switch of electronic rod

e. Flow Meter for Filter No. 1 to No. 12

The existing malfunctioning flow meters are to be replaced by the following meter:

Quantity	:	L.S.
Type	:	type for parshall flume (local indication only)

f. Flow Meter for Filter No. 13 to No. 18

The existing malfunctioning flow meters are to be replaced.

Quantity	:	L.S.
Type	:	Venturi meter

g. Level Meter for Clear Water Tank (Dehiwala Pump Station)

The existing malfunctioning flow meter is to be replaced.

Quantity	:	L.S.
Type	:	float type

8) Lighting Facilities

Lighting facilities at process sites (indoor and outdoor) are heavily deteriorated. These are to be replaced.

Quantity

Indoor	:	fluorescent light and mercury light (L.S.) 3 distribution panel
Outdoor	:	mercury light (L.S.) 1 distribution panel

9) Lightning Facilities

Due to meteorological condition, lightning facilities are to be installed.

Quantity : lightning rod for the existing buildings and overhead earth lines.

10) Others

a. Treatment Plant Laboratory Equipment

The following laboratory equipment for process water quality control are to be provided.

Quantity : Jar tester, pH meter, miscellaneous (L.S.)

b. Central Laboratory Equipment

To reinforce monitoring of the quality of the raw water source, miscellaneous laboratory equipment are to be provided.

Quantity : L. S.(miscellaneous)

c. Maintenance Tool

Necessary tools accompanied with the replacement of facilities/ equipment are to be provided for day-to-day operation and maintenance.

Quantity : L.S.

d. Truck with Crane

To reinforce maintenance works for the Ambatale plant, the following truck with crane are to be provided.

Quantity : 1
Type : 4 ton truck with crane

e. Spare Parts for the Kalatuwawa/Labugama Plants

To follow up the former project conducted in 1985, necessary spare

parts for the Kalatuwawa/Labugama Plants are to be provided.

f. Communication Equipment

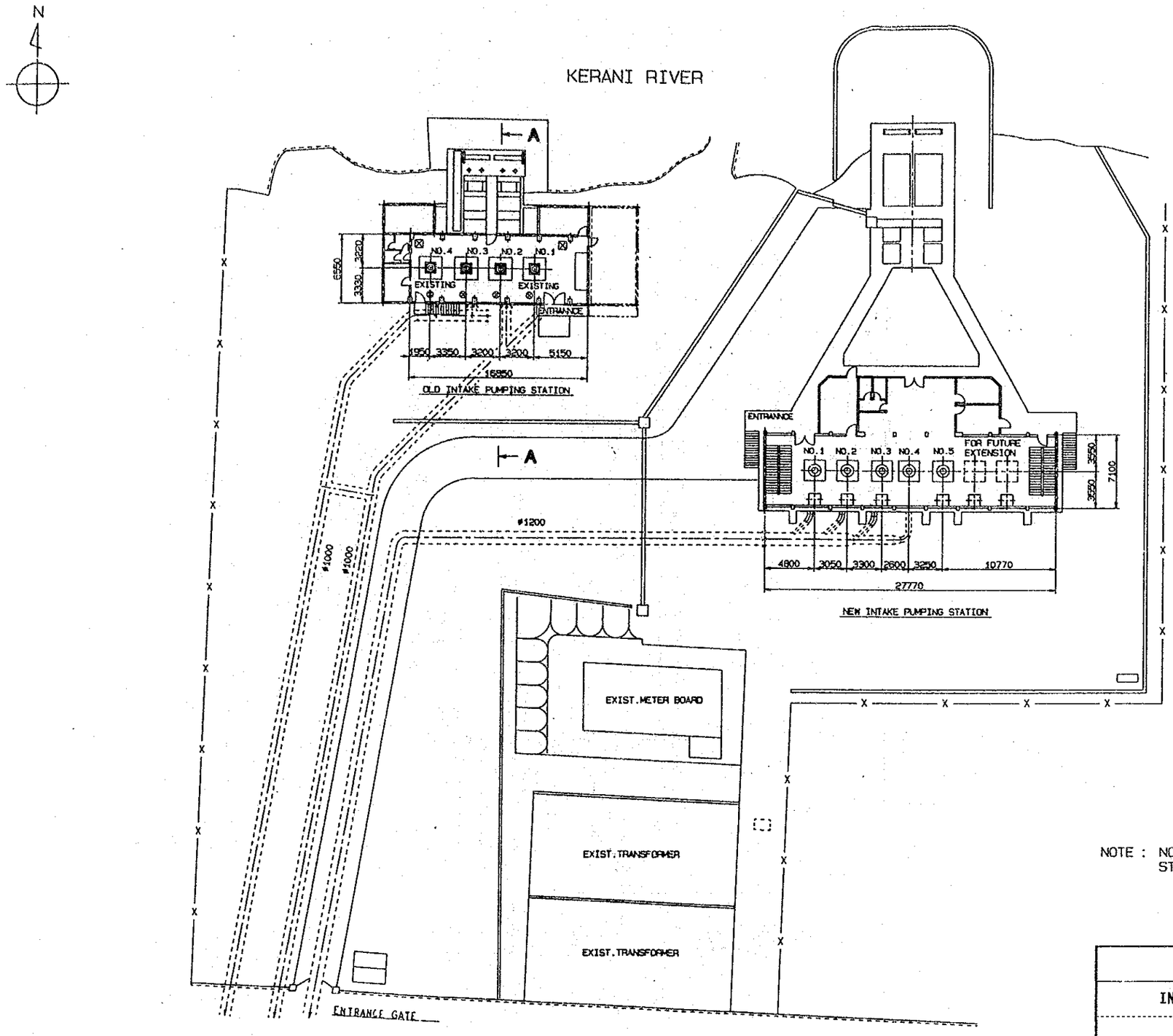
The existing communication system for Ambatale Plant is deteriorated, and malfunctioning that it causes much inconvenience to the plant staff. The following communication equipment are to be provided to improve operation and maintenance procedures of the Plant.

	Quantity/Type
Telephone System	: 1 - electronic type exchanger provided with 10-external circuits and 90-internal circuits. 90 - handset L.S. - terminal box L.s. - arrester
Radio System	: A master station is to be installed at the Ambatale Plant and 10 slave stations are to be installed at reservoirs and/or distribution towers

4-3-3 Basic Design Drawing

The basic design is presented in the following drawing:

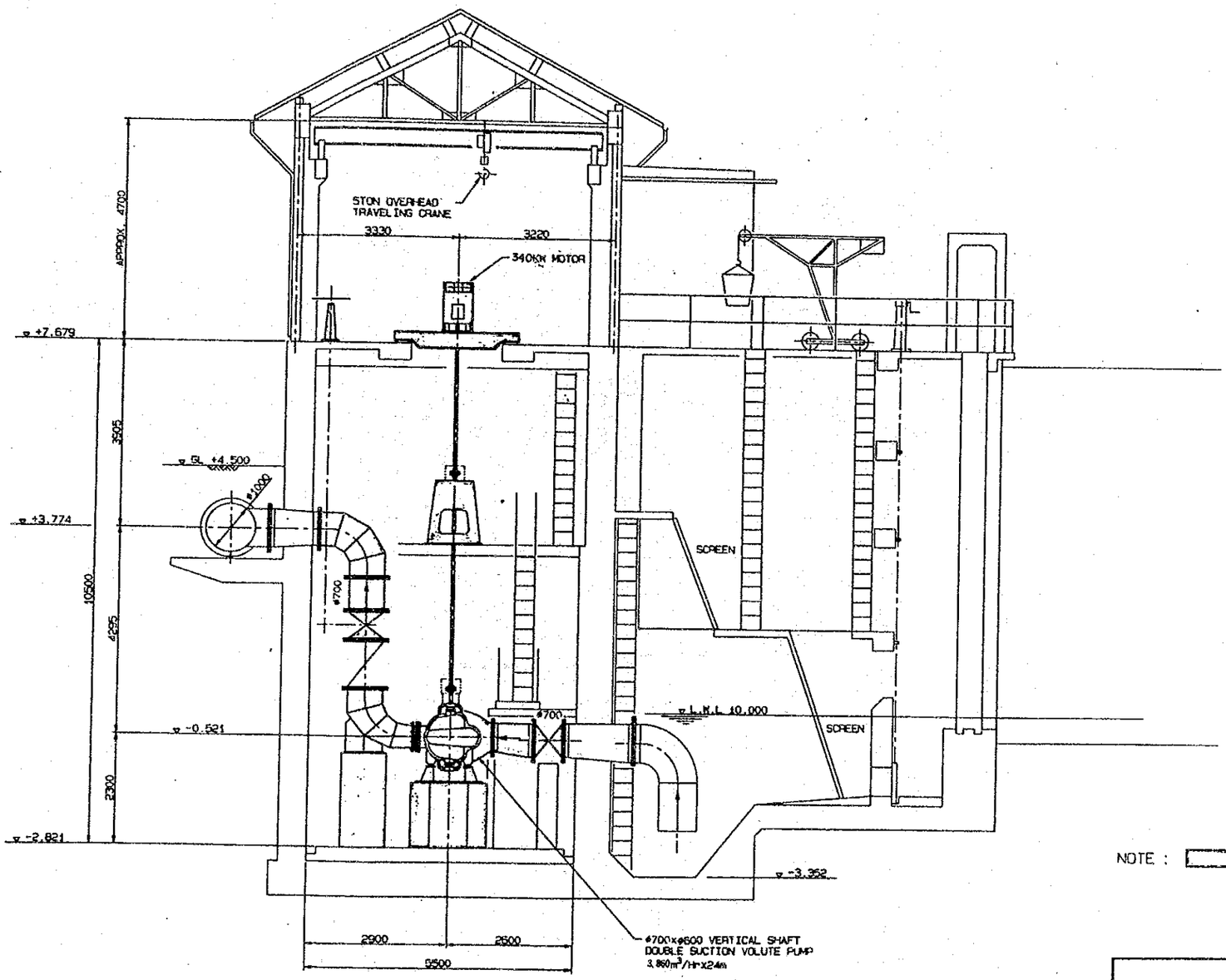
Title	Drawing No.
Intake Pumping Station (1/2)	M - 1
Intake Pumping Station (2/2)	M - 2
General Layout	M - 3
Hydraulic Profile	M - 4
General Flow Diagram (1/2)	M - 5
General Flow Diagram (2/2)	M - 6
Distribution Chamber (1/2)	M - 7
Distribution Chamber (2/2)	M - 8
Sludge Recirculation Pump	M - 9
Filter	M - 10
Filter Trough	M - 11
Chemical Room	M - 12
Kolonnawa Pumping Station (1/2)	M - 13
Kolonnawa Pumping Station (2/2)	M - 14
Dehiwara Pumping Station (1/2)	M - 15
Dehiwara Pumping Station (2/2)	M - 16
Alum Mixer	M - 17
Lime Mixer	M - 18
Single Line Diagram (1)	E - 1
Single Line Diagram (2)	E - 2
Single Line Diagram (3)	E - 3
Single Line Diagram (4)	E - 4
Single Line Diagram (5)	E - 5
Single Line Diagram (6)	E - 6
Single Line Diagram (7)	E - 7
Location Plan of Electrical Facilities Intake Pumping Station	E - 8
Location Plan of Electrical Facilities Water Treatment Plant	E - 9
Location Plan of Electrical Facilities Dehiwara Pumping Station	E - 10
Location Plan of Electrical Facilities Kolonnawa Pumping Station	E - 11
Electrical Panels (1)	E - 12
Electrical Panels (2)	E - 13
Electrical Panels (3)	E - 14
Electrical Panels (4)	E - 15



PLAN
(S=1/200)

NOTE : NO.2 & NO.3 PUMPS FOR OLD INTAKE PUMPING STATION SHALL BE REPLACED.

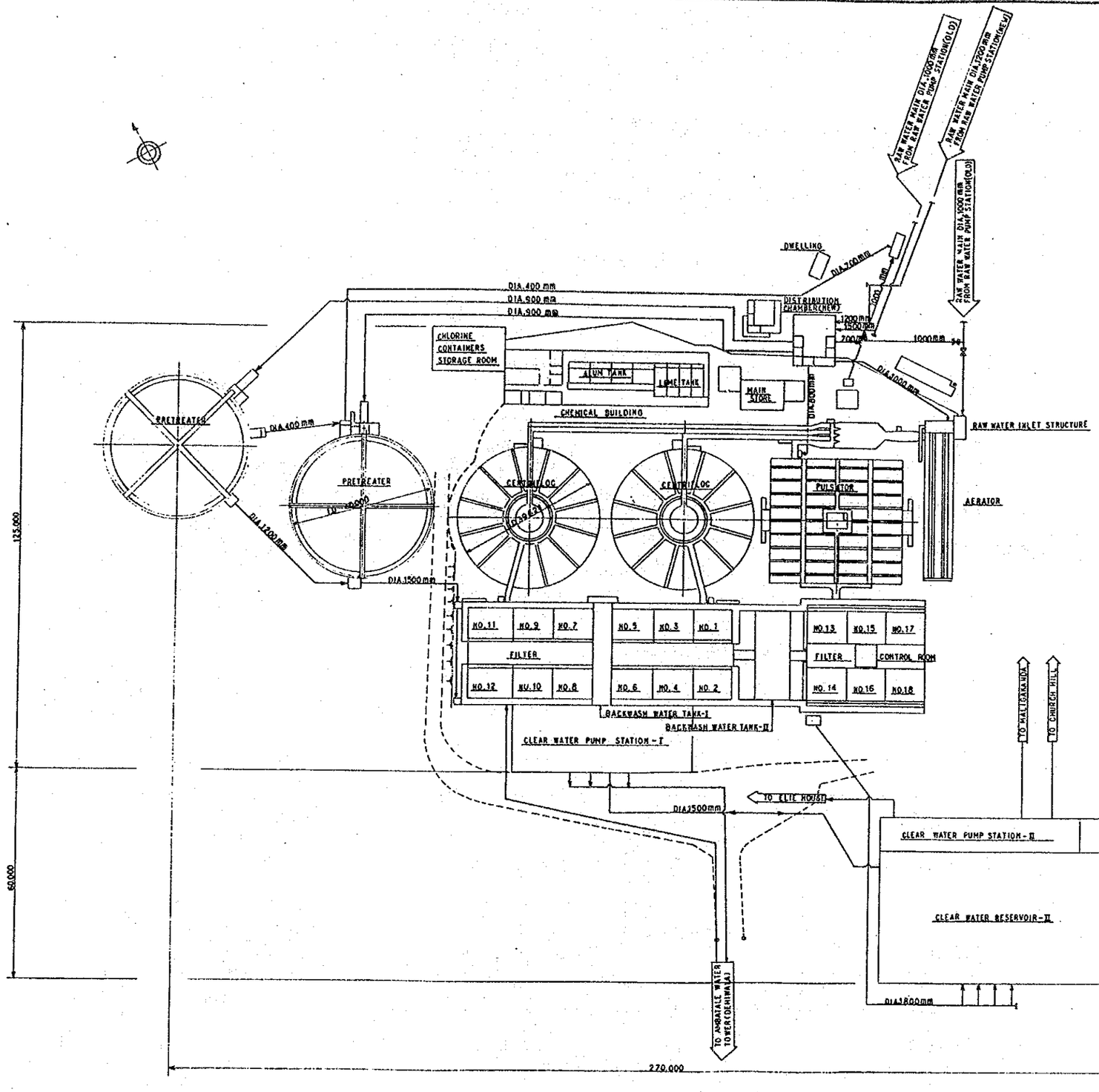
TITLE	DRWG. NO.
INTAKE PUMPING STATION (1/2) 取水ポンプ場	M－1
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	



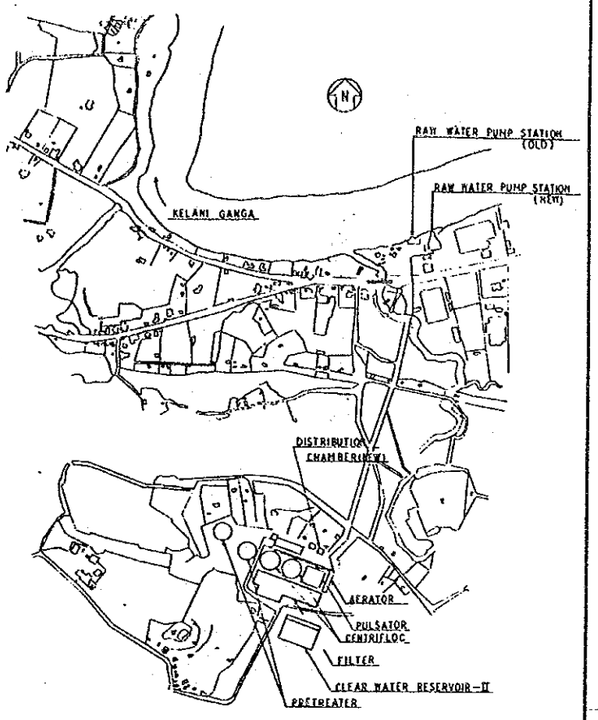
NOTE : ▭ SHOWS EQUIPMENT TO BE REPLACED.

SECTION **A A**
(S=1/50)

TITLE	DRWG. NO.
INTAKE PUMPING STATION (2/2) 取水ポンプ場	M－2
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	

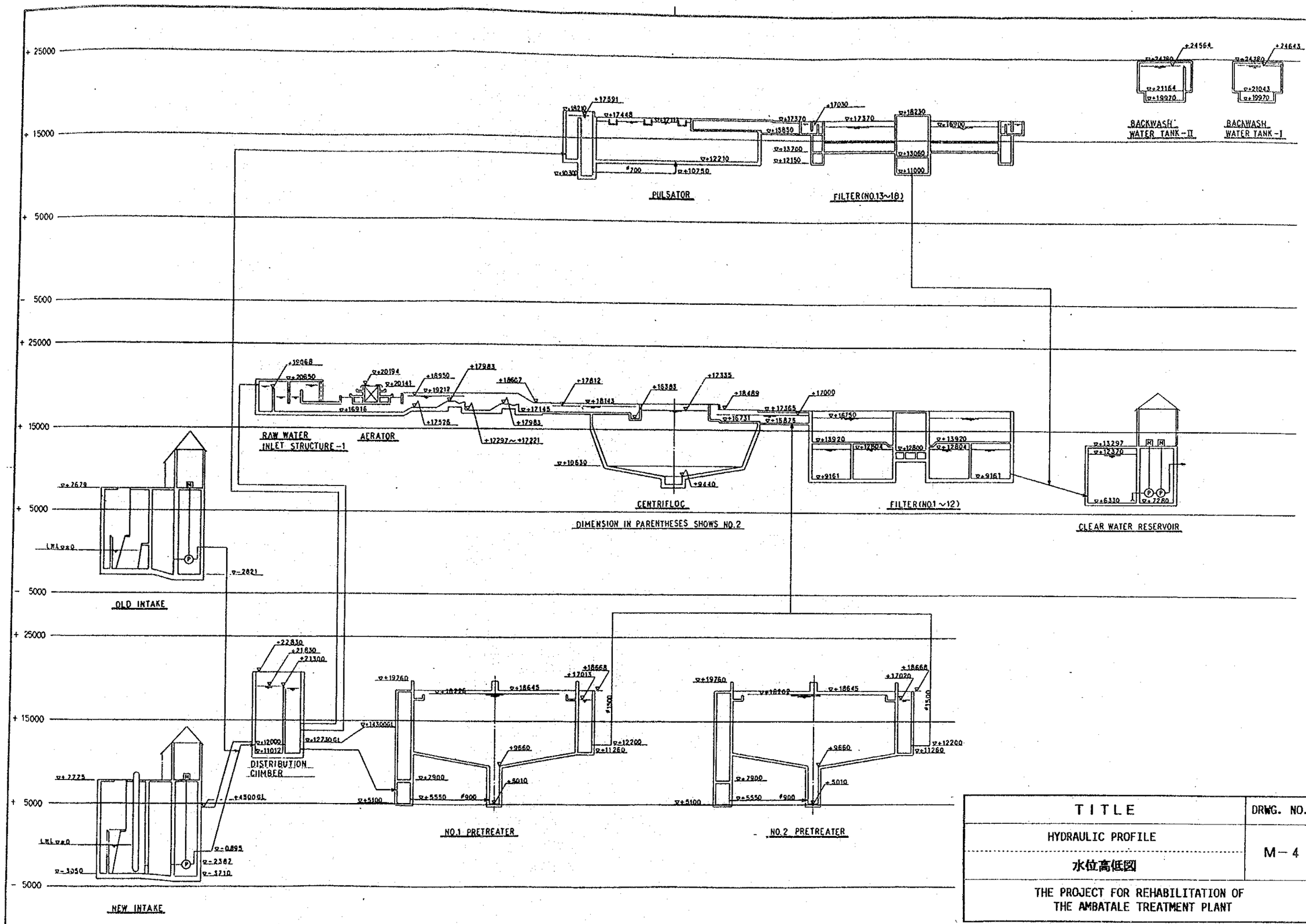


SITE PLAN S=1:600

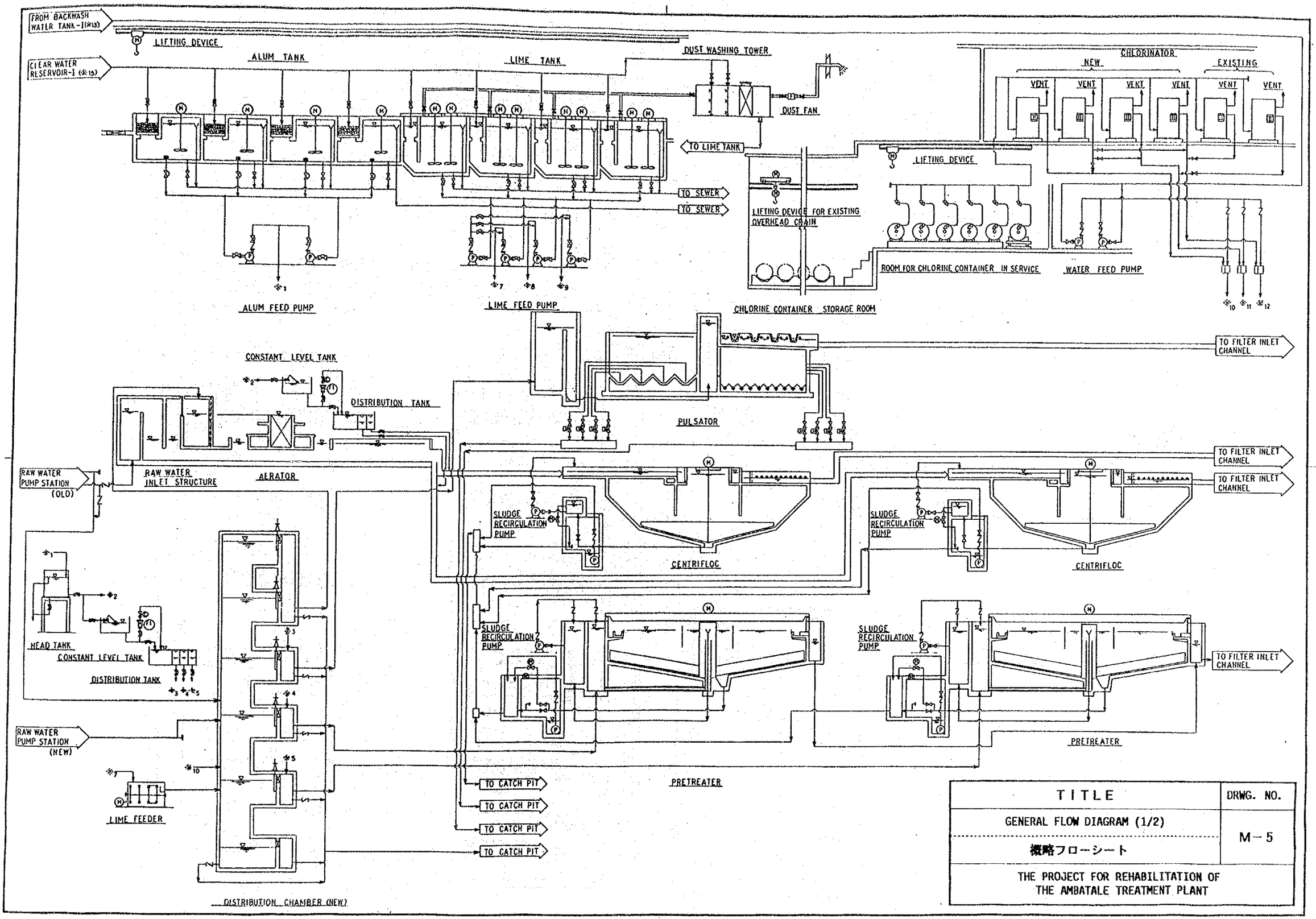


LOCATION MAP

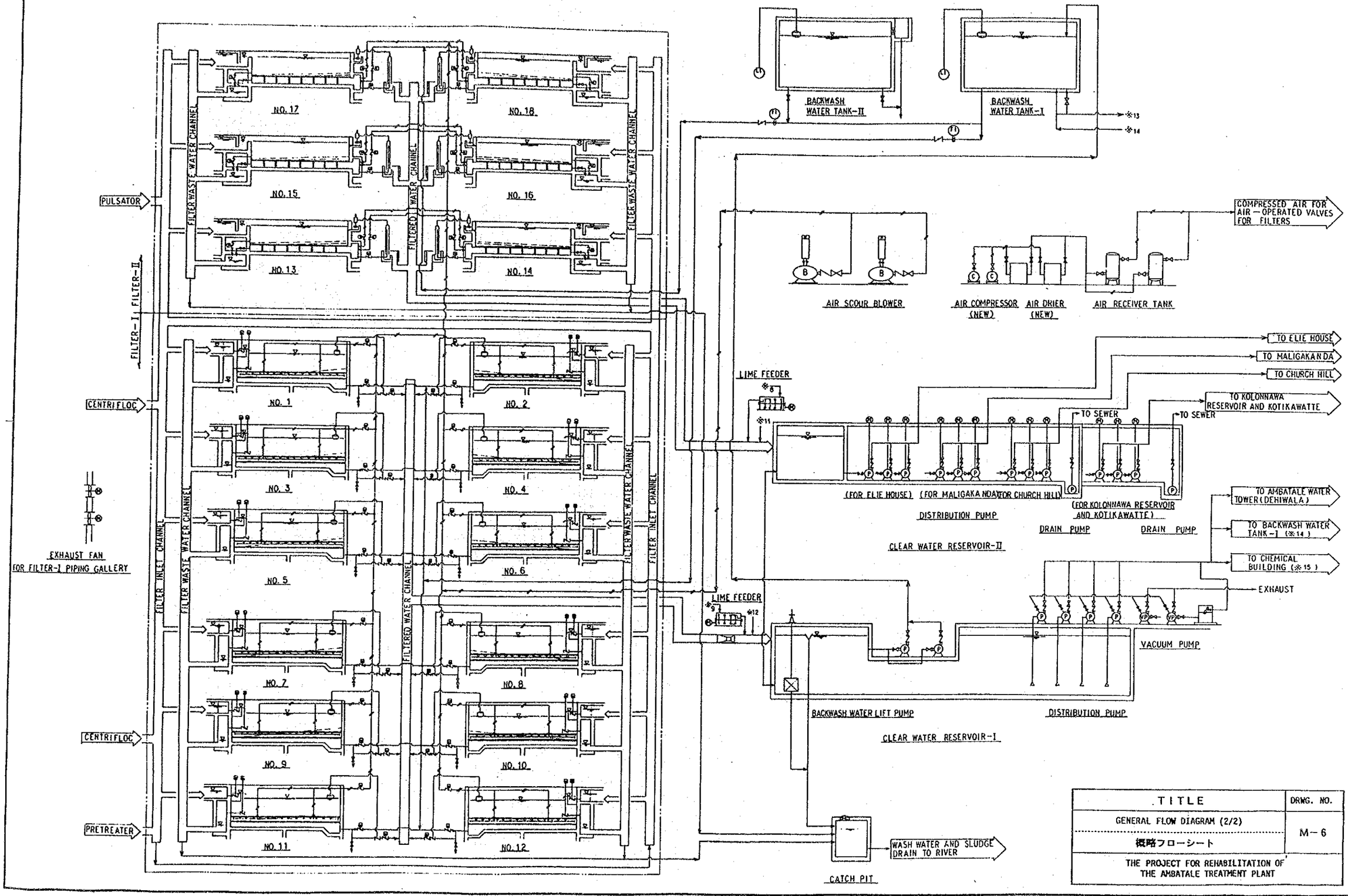
TITLE	DRWG. NO.
GENERAL LAYOUT 全体配置図	M－3
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	



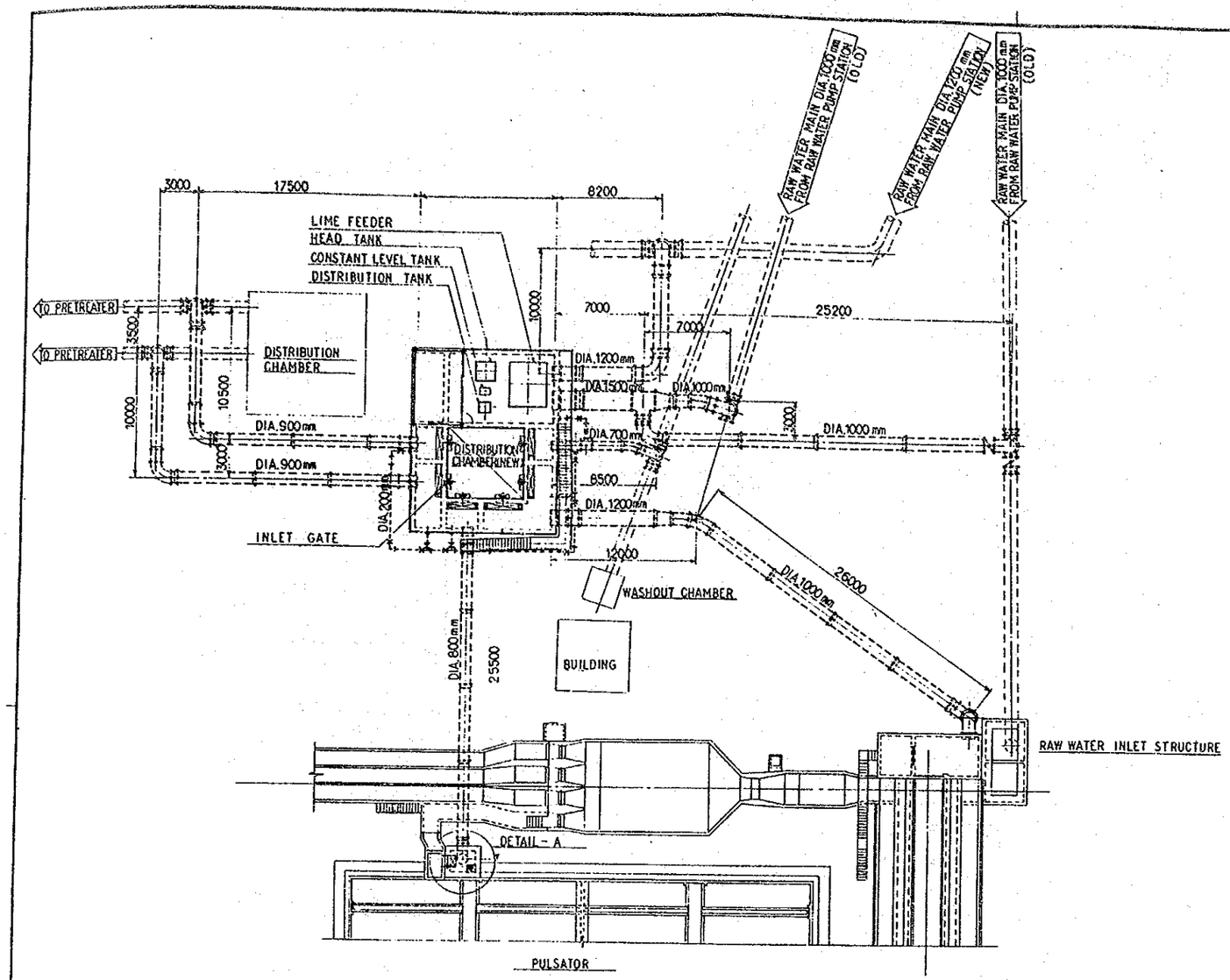
TITLE	DRWG. NO.
HYDRAULIC PROFILE 水位高低図	M－4
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	



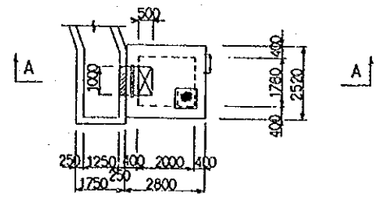
TITLE	DRWG. NO.
GENERAL FLOW DIAGRAM (1/2)	M－5
概略フローシート	
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	



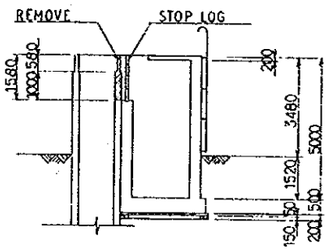
TITLE	DRWG. NO.
GENERAL FLOW DIAGRAM (2/2) 概略フローシート	M－6
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	



PLAN S = 1/200

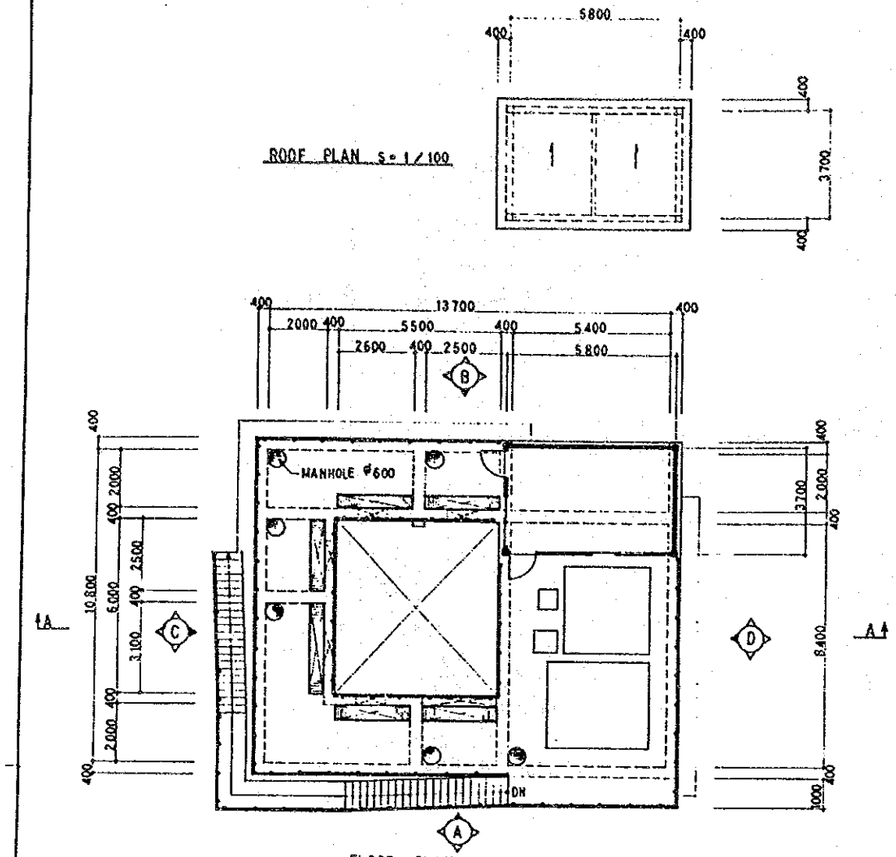


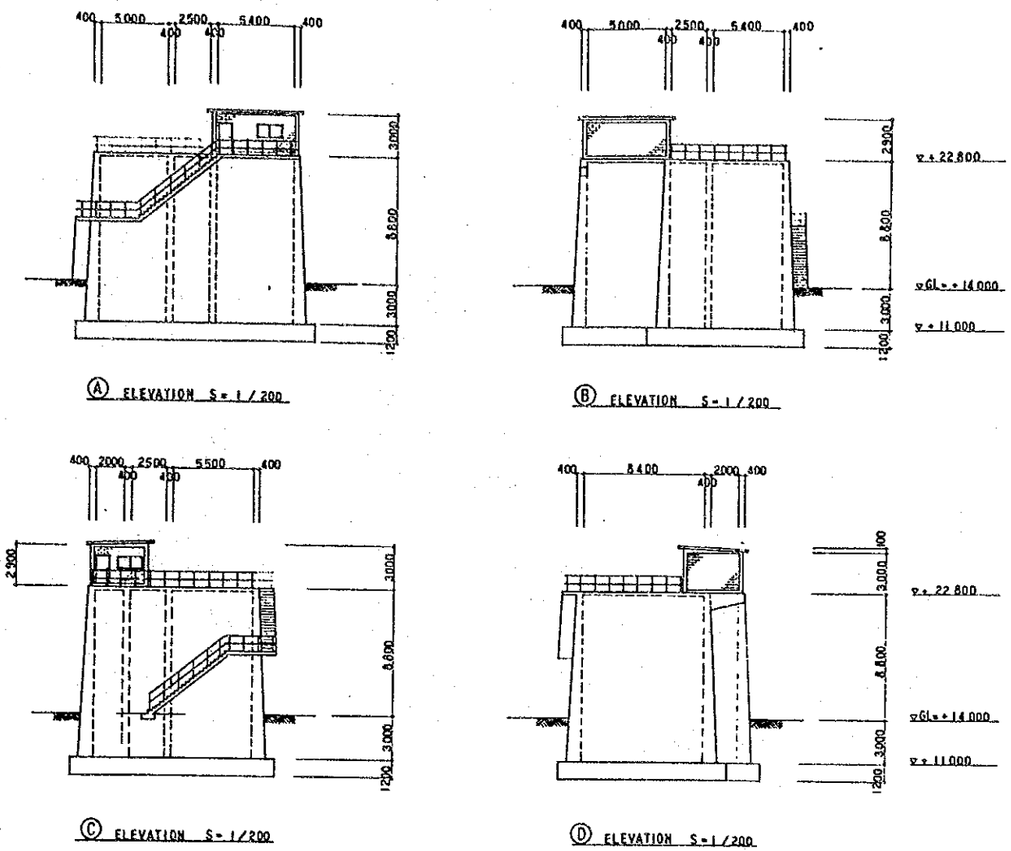
DETAIL - A INLET CHAMBER FOR PULSATOR S = 1/100

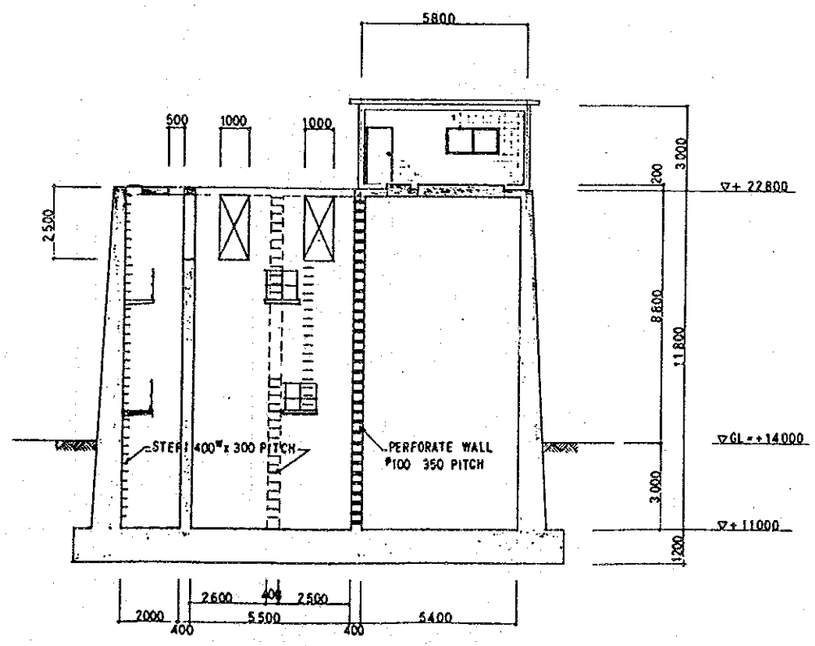


SECTION A — A S = 1/100

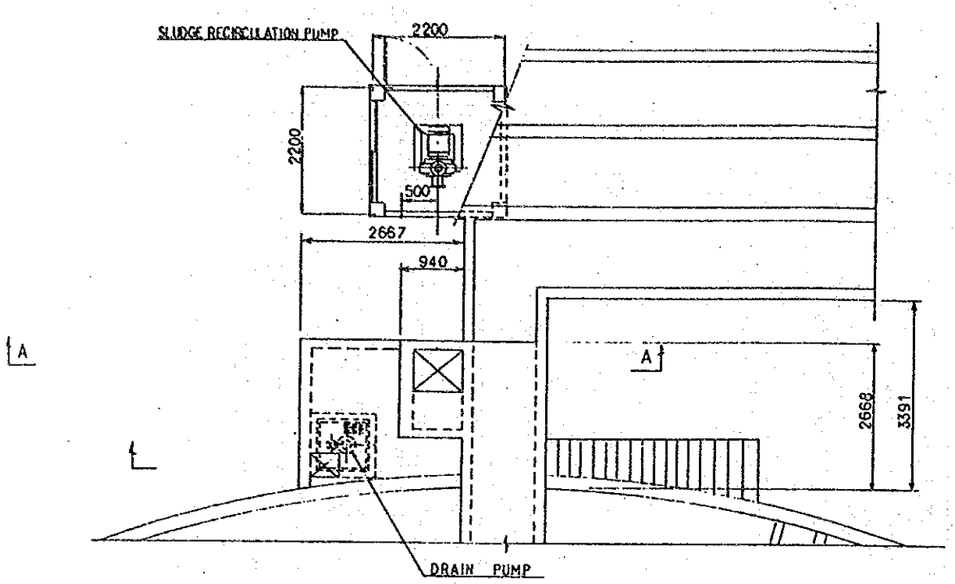
TITLE	DRWG. NO.
DISTRAIBUTION CHAMBER (1/2) 分水槽	M — 7
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	



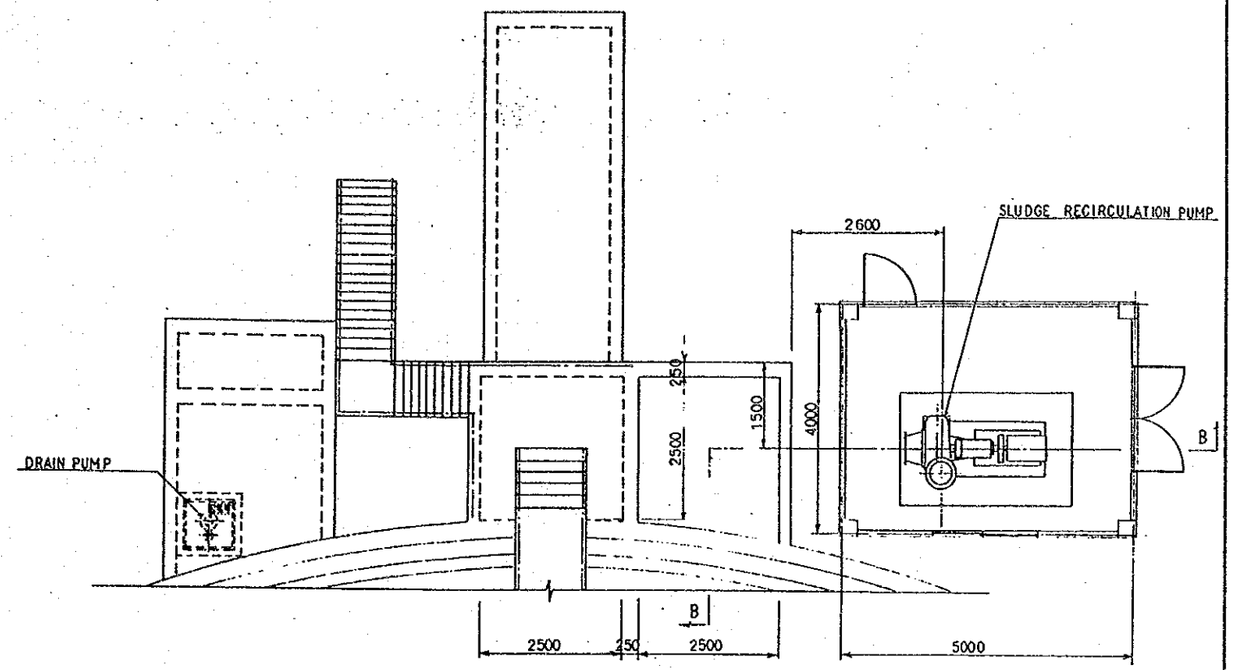




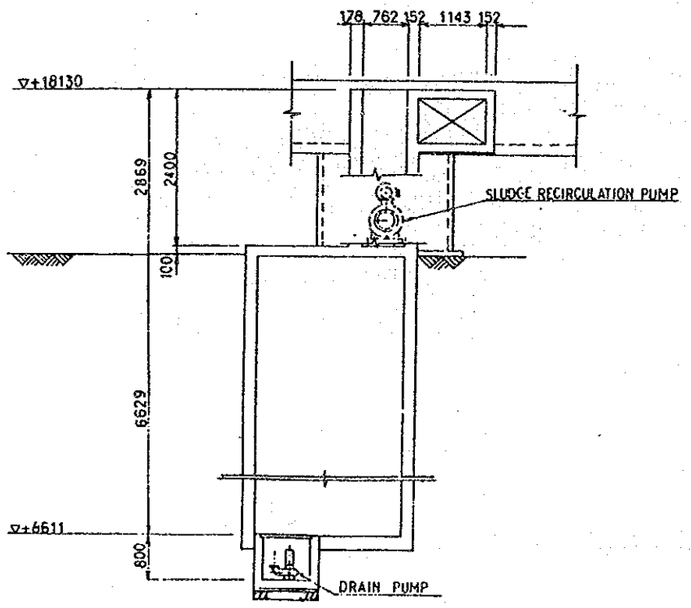
TITLE	DRWG. NO.
DISTRAIBUTION CHAMBER (2/2)	M-8
分水槽	
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	



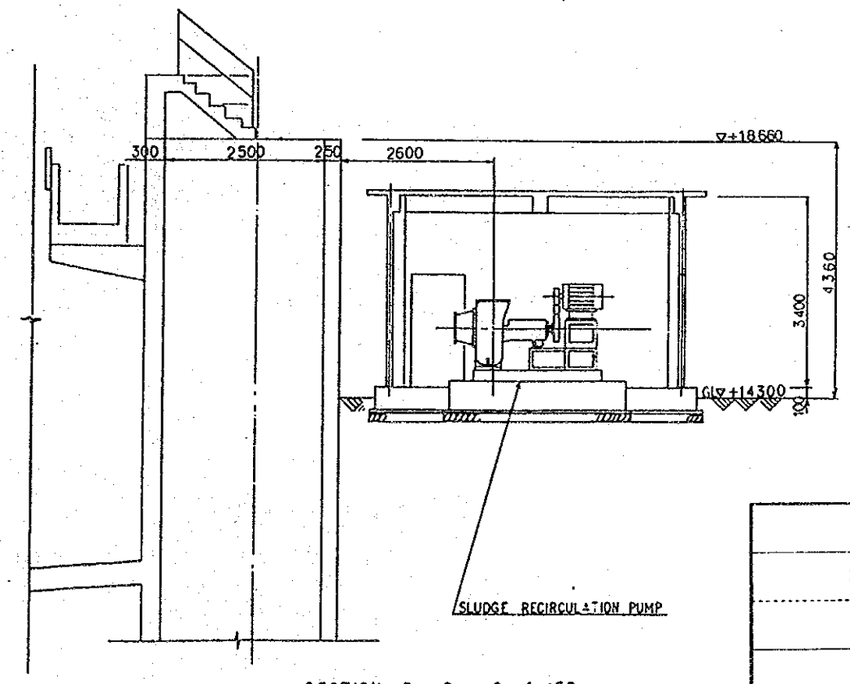
PLAN OF CENTRIFLOC S = 1/50



PLAN OF PRETREATER S = 1/50

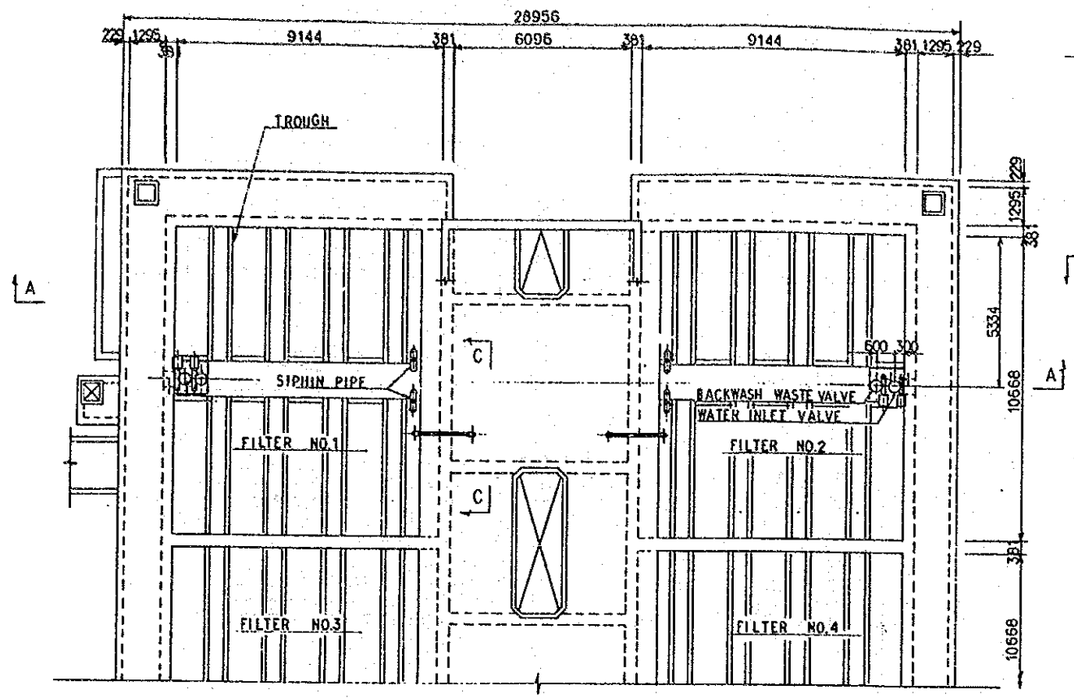


SECTION A – A S = 1/50

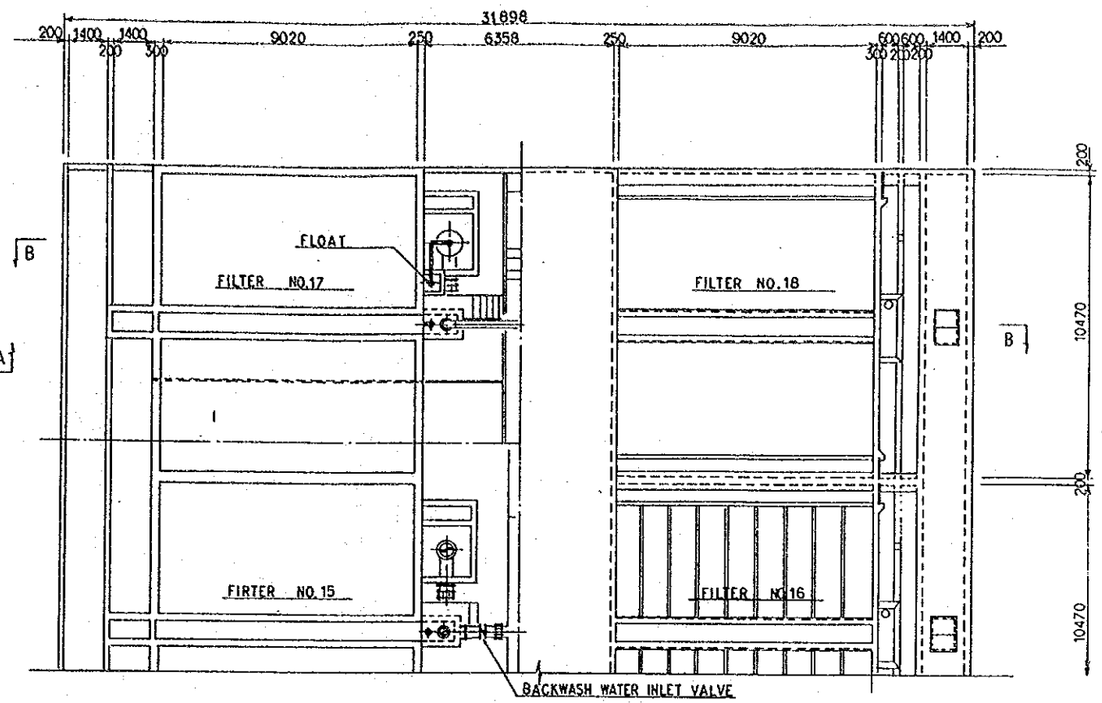


SECTION B – B S = 1/50

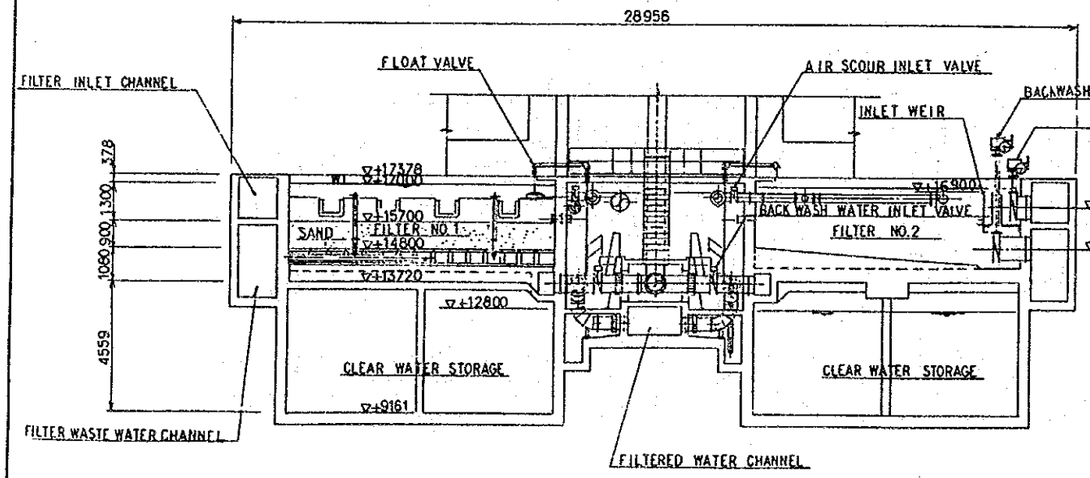
TITLE	DRWG. NO.
SLUDGE RECIRCULATION PUMP 汚泥循環ポンプ	M – 9
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	



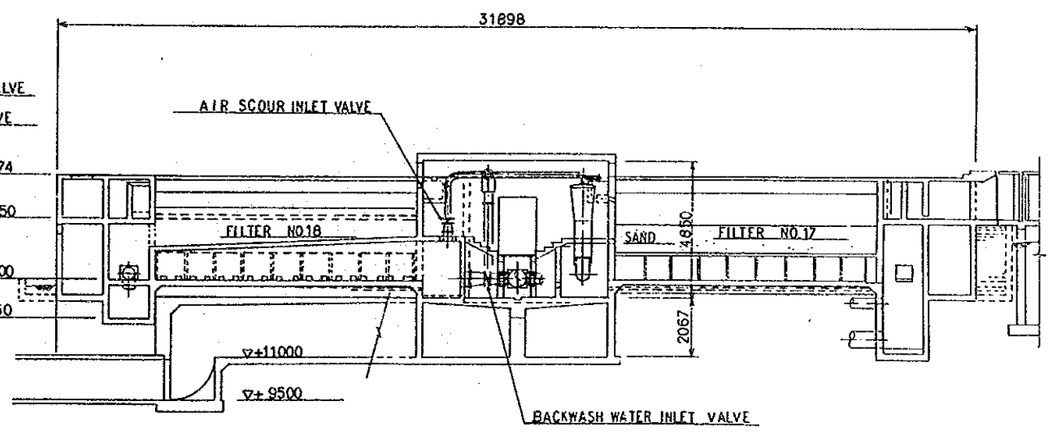
PLAN OF FILTER(1~12) S=1/100



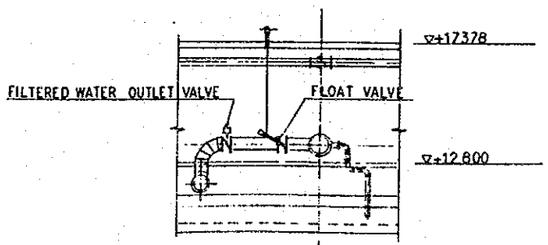
PLAN OF FILTER(13~18) S=1/100



SECTION A — A S=1/100

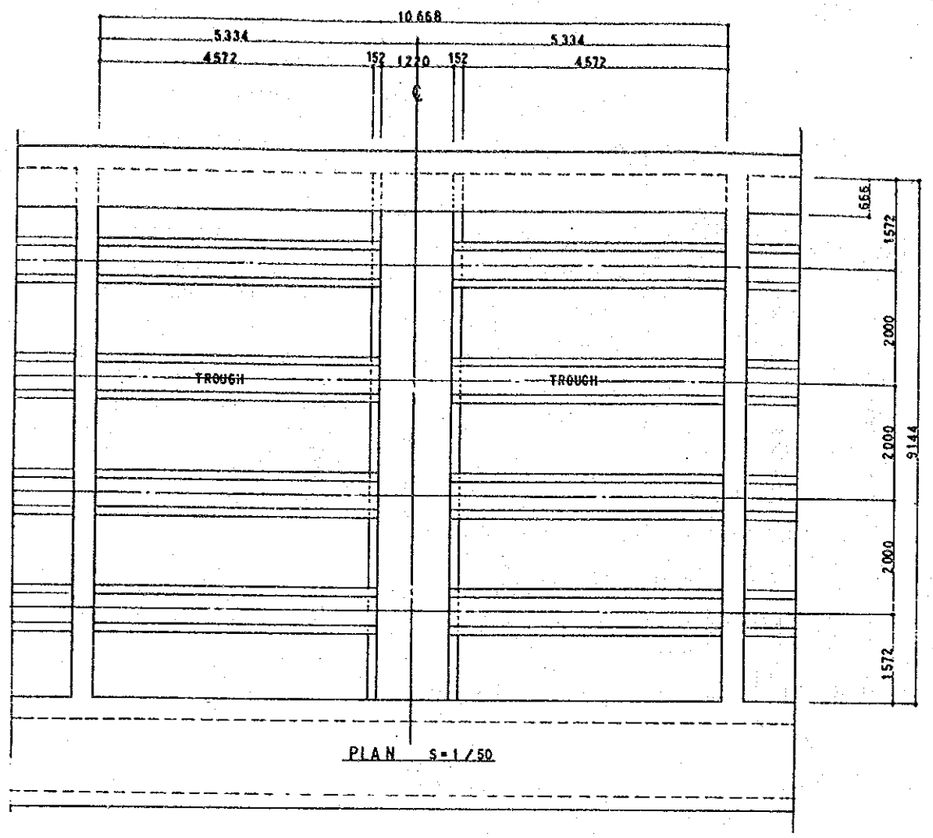


SECTION B — B S=1/100

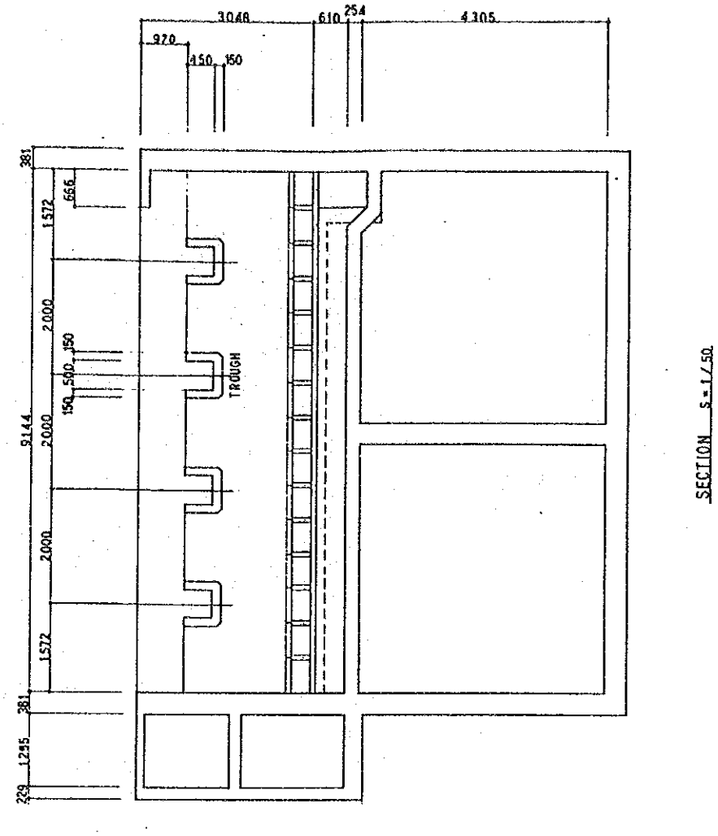


SECTION C — C S=1/100

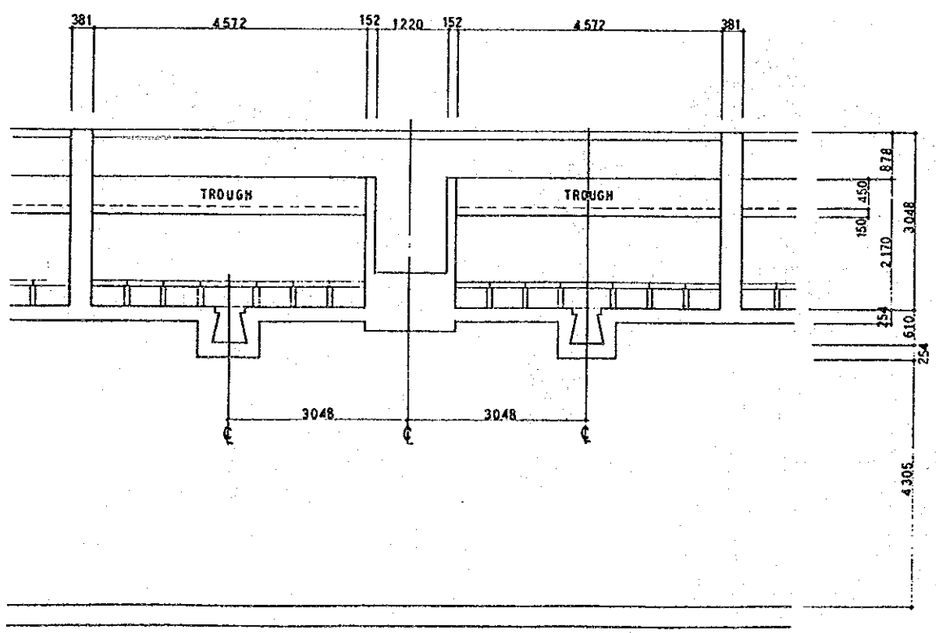
TITLE	DRWG. NO.
FILTER ろ過池	M−10
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	



PLAN S=1/50

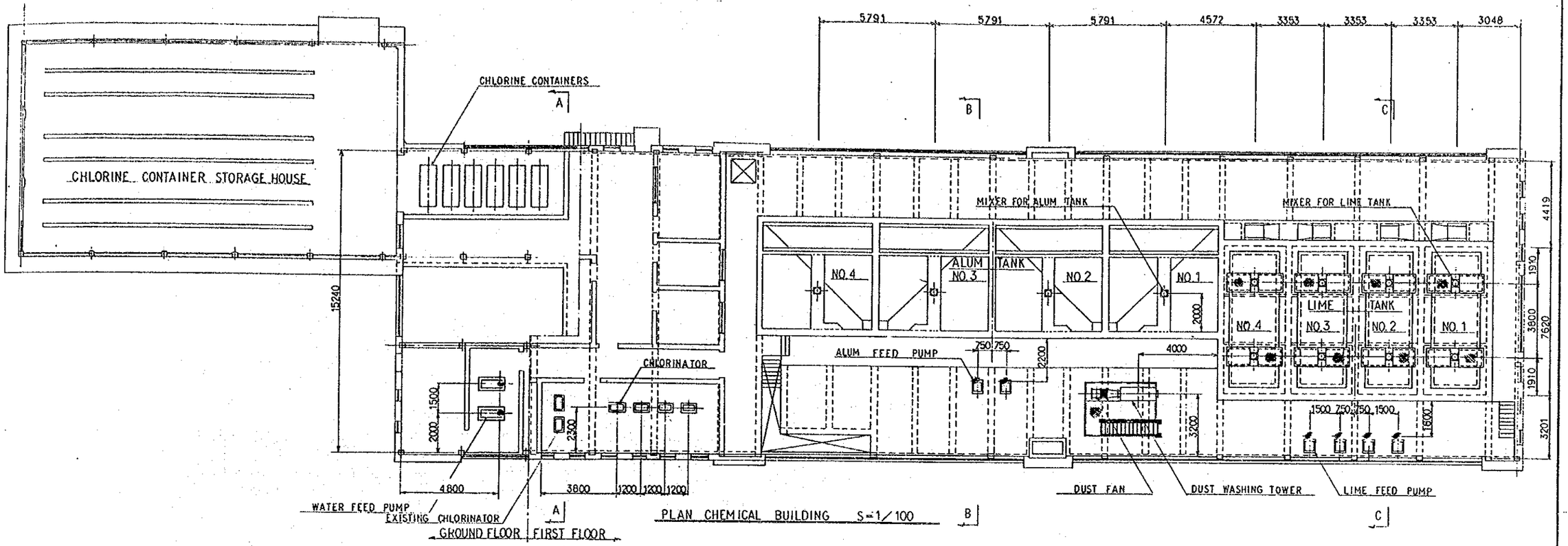


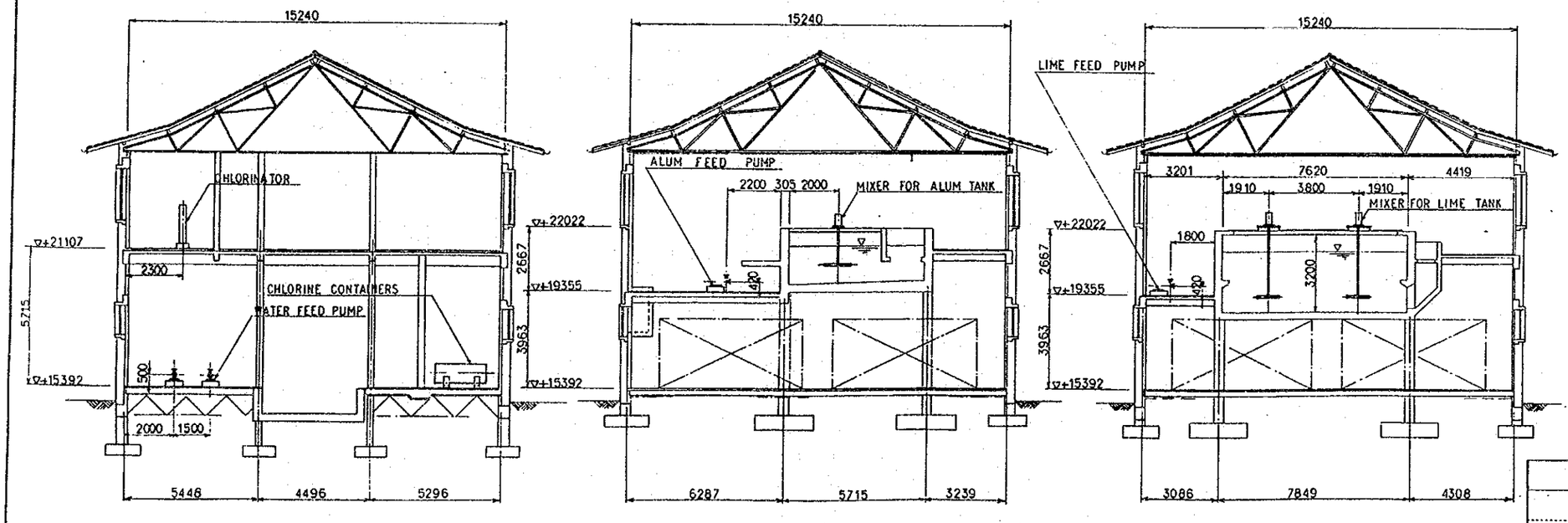
SECTION S=1/50



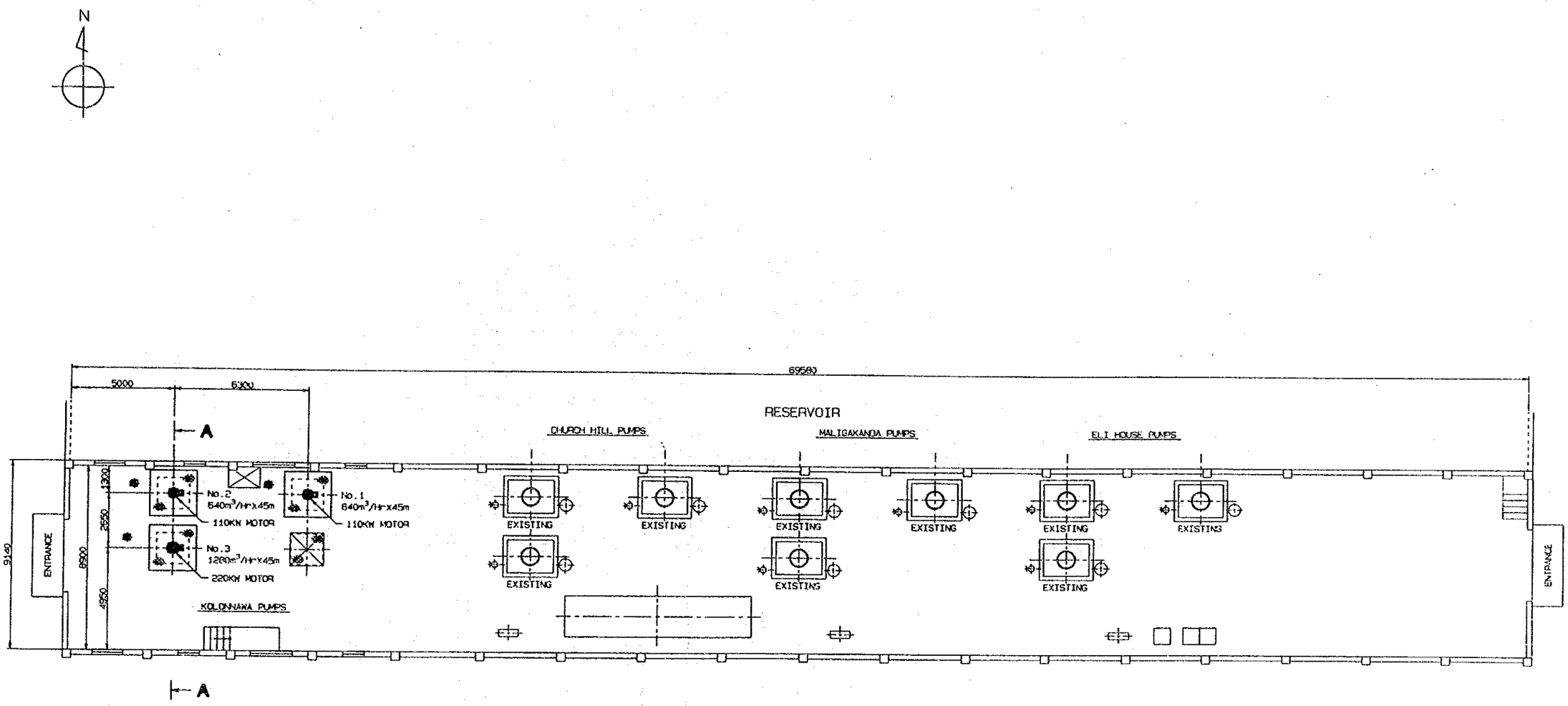
SECTION S=1/50

TITLE	DRWG. NO.
FILTER TROUGH	M−11
ろ過池トラフ	
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	





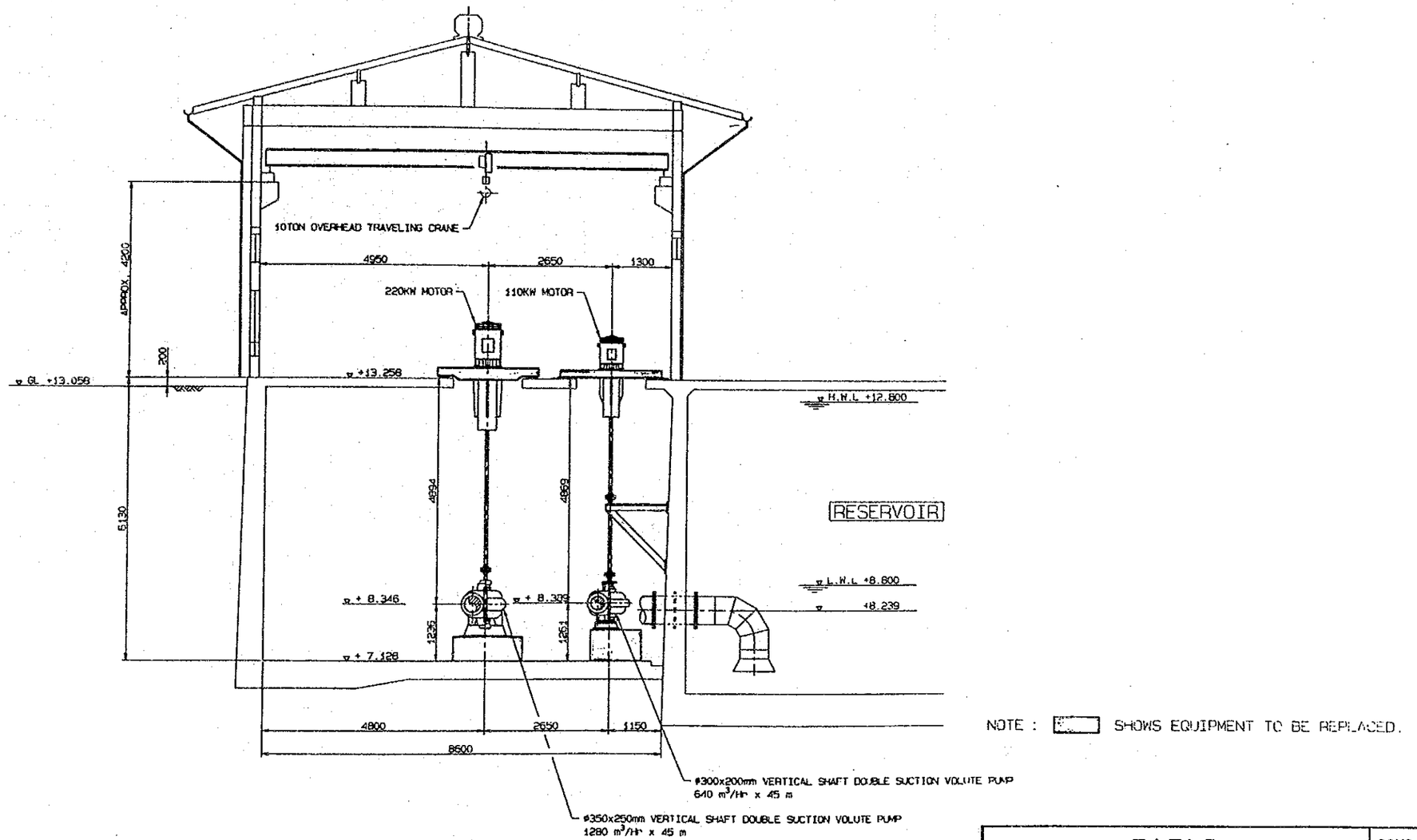
TITLE	DRWG. NO.
CHEMICAL ROOM 薬注室	M--12
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	



PLAN
(S=1/100)

NOTE : 3 SETS OF KOLONNAWA PUMPS SHALL BE REPLACED.

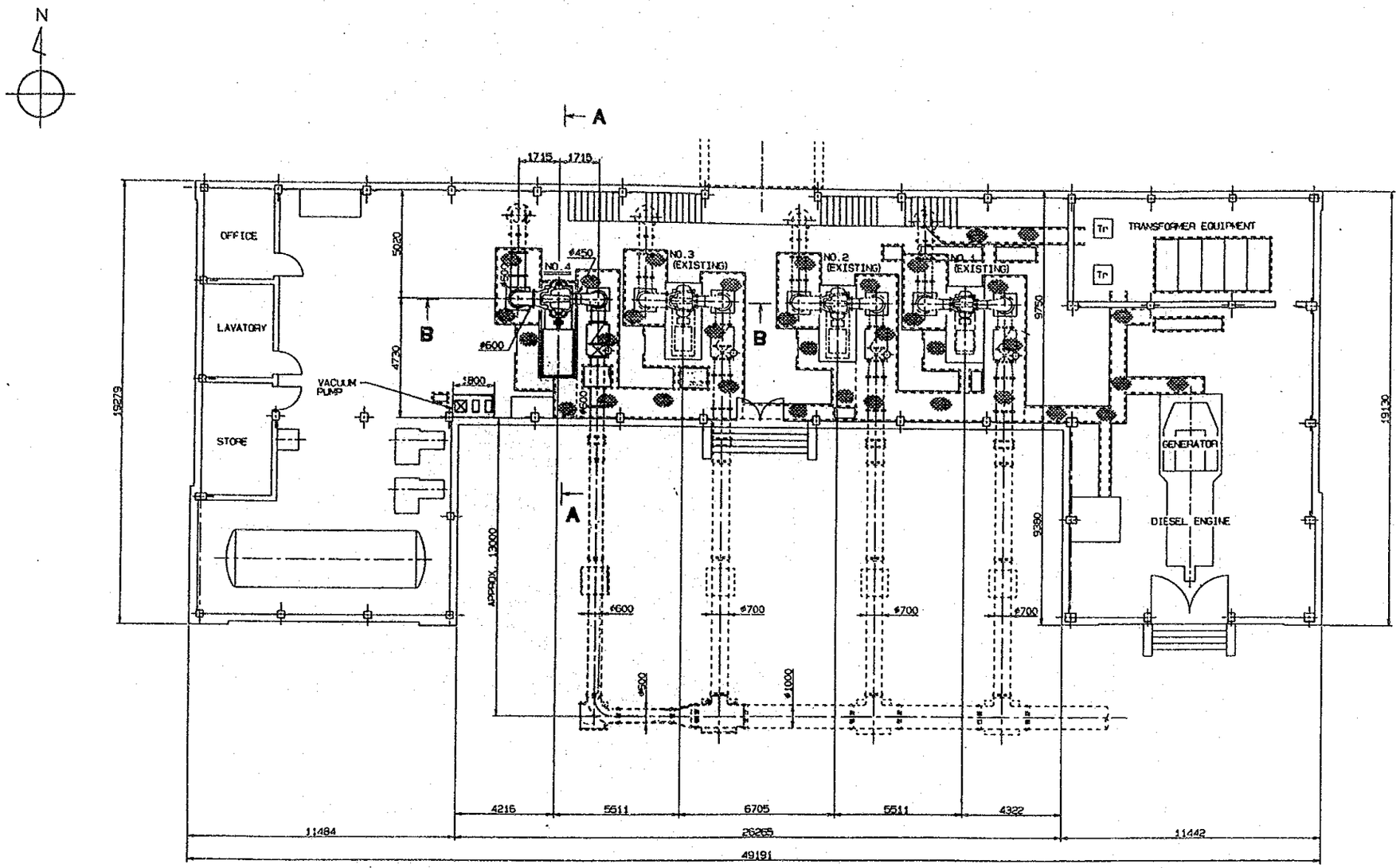
TITLE	DRWG. NO.
KOLONNAWA PUMPING STATION (1/2) コロナワ系ポンプ場	M−13
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	



SECTION **A A**
(S=1/50)

NOTE : ▭ SHOWS EQUIPMENT TO BE REPLACED.

TITLE	DRWG. NO.
KOLONNAWA PUMPING STATION (2/2) コロナワ系ポンプ場	M−14
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	

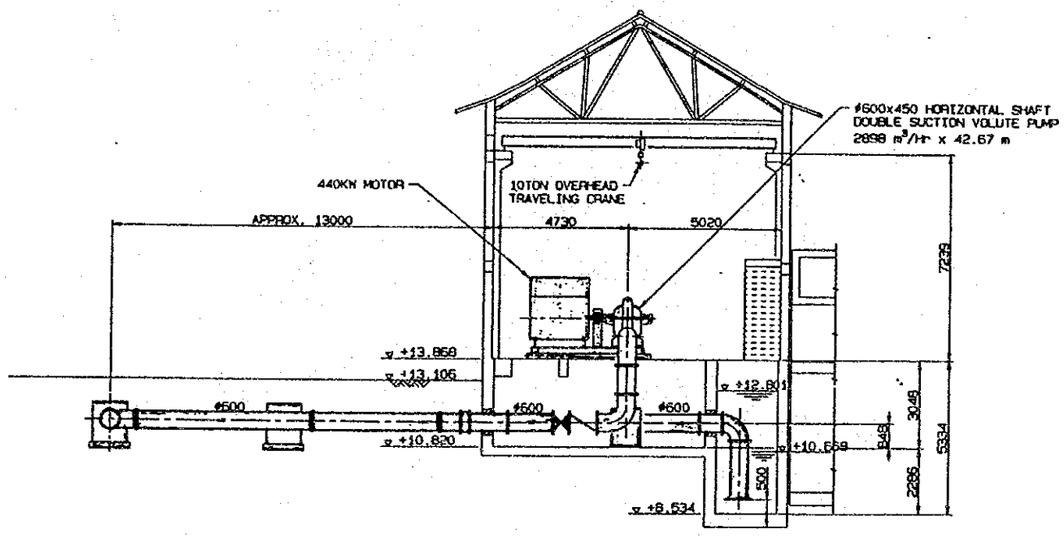


P L A N
(S=1/100)

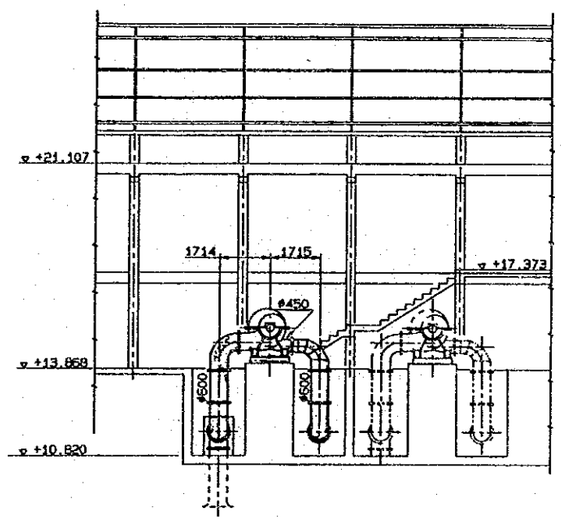
NOTE1 : NO.4 PUMP SET SHALL BE NEWLY INSTALLED.

NOTE2 : ▨ SHOWS EQUIPMENT TO BE REPLACED.

TITLE	DRWG. NO.
DEHIWALA PUMPING STATION (1/2) デヒワラ系ポンプ場	M−15
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	



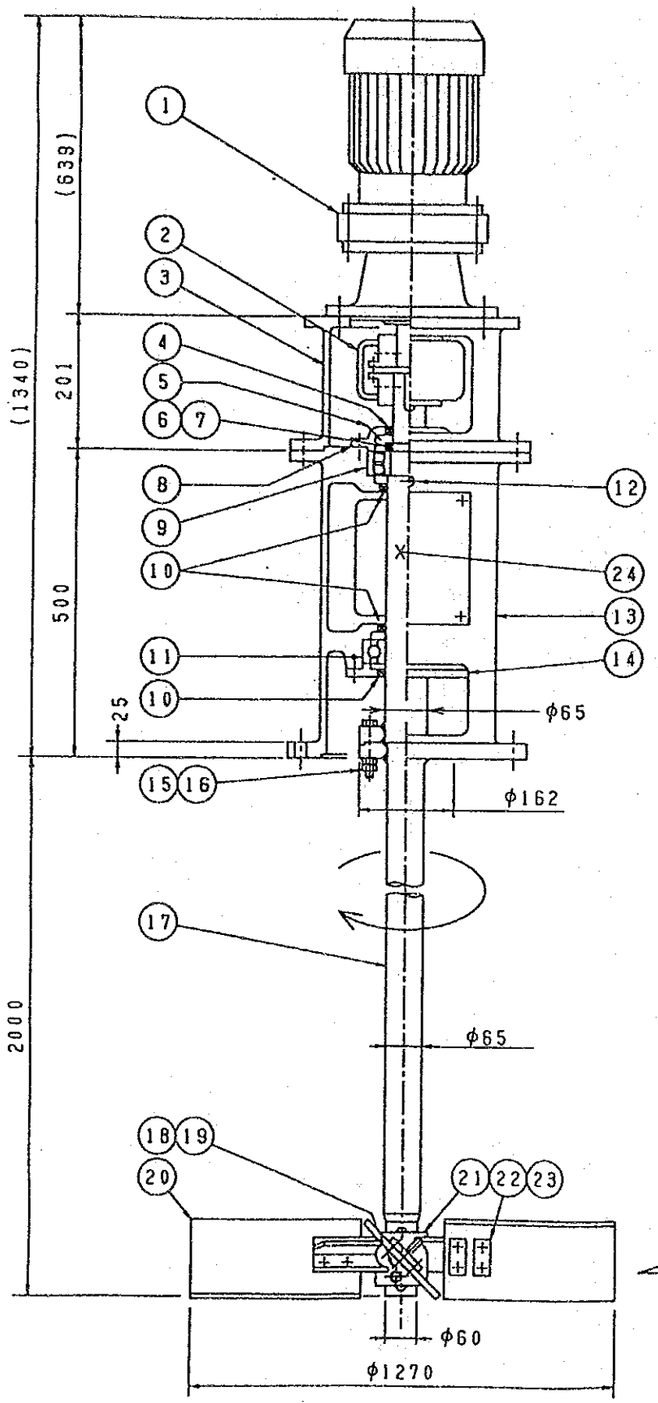
SECTION **A A**
(S=1/100)

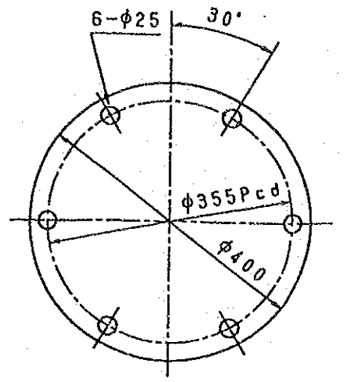


SECTION **B B**
(S=1/100)

NOTE : SHOWS EQUIPMENT TO BE REPLACED.

TITLE	DRWG. NO.
DEHIWALA PUMPING STATION (2/2) デヒワラ系ポンプ場	M−16
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	





JIS10°250A APPLY
MOUNTING FLANGE DIMENSION

PART NO.	NAME	MAT'L	Q'TY UNIT	NOTE
1	CYCLO REDUCER		1	
2	CHAIN COUPLING	S45C	1	6022
3	MOUNTING ADUPTER	FC200	1	
4	OIL SEAL	NBR	1	SC50689
5	GREASE DRAIN		1	
6	BEARING NUT	S20C	1	AN11
7	BEARING WASHER	SPCC	1	AW11
8	OIL SEAL COVER	FC200	1	
9	BEARING	SUJ2	1	21311E
10	OIL SEAL	NBR	3	SC658210
11	BEARING	SUJ2	1	6313-2NSL
12	GREASE NIPPLE	S15C	1	PT 1/8
13	BODY	FC250	1	
14	OIL SEAL COVER	SS400	1	
15	BOLT	SUS	6	M12
16	NUT	SUS	12	M12 DOUBLE NUT
17	AGITATOR SHAFT	SUS	1	
18	SET BOLT	SUS	2	M12
19	NUT	SUS	2	M12
20	BLADE	SUS	4	
21	IMPELLER HUB	SCS	1	
22	BOLT	SUS	16	M12
23	WASHER	SUS	8	
24	OUT PUT SHAFT	S25C	1	
25				
26				
27				
28				
29				
30				

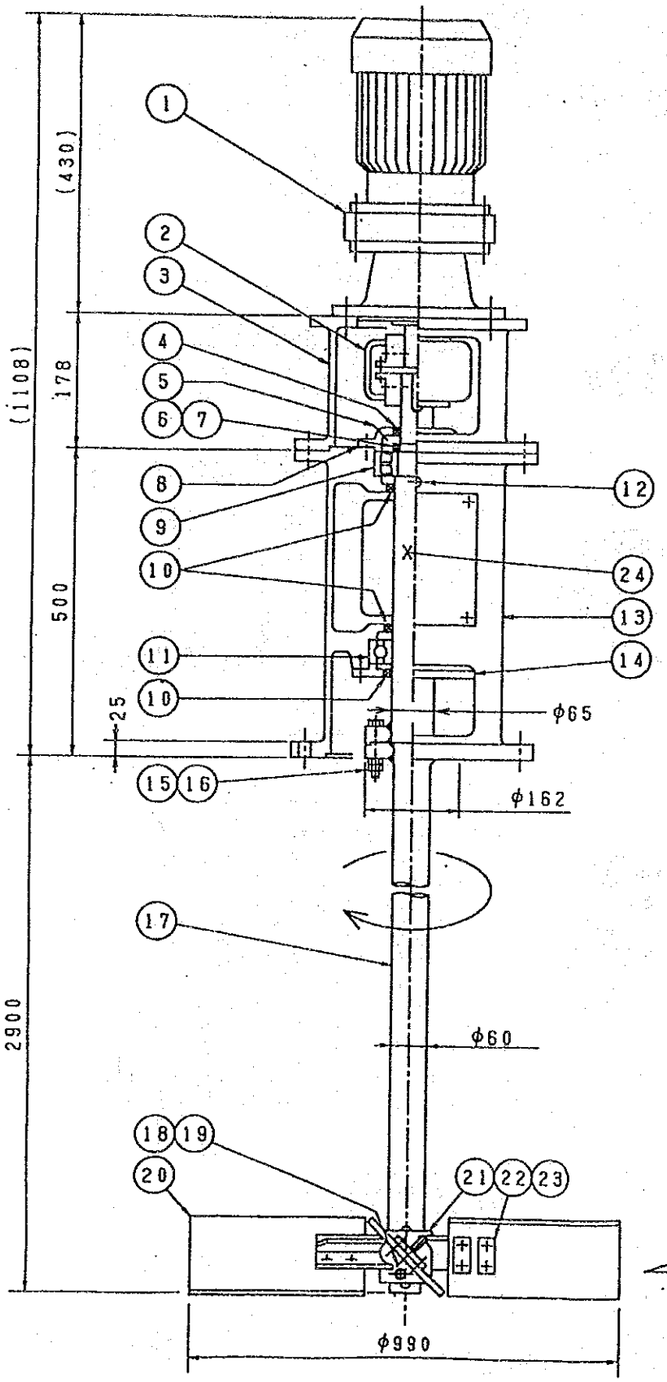
DRIVE UNIT INFORMATION

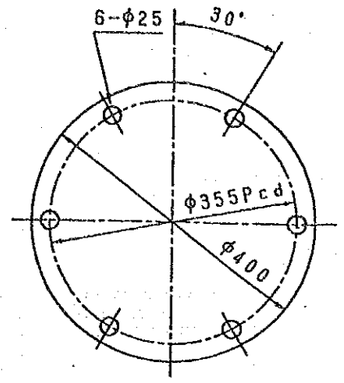
TYPE&SIZE: NB4-65			
MOTOR: 7.5 KW 4 P 1500 RPM 400 V 50 H, 3 φ			
ENCLOSURE: FAN-COOLED, OUT DOOR		FRAME SIZE: VM10-216	
OUTPUT SPEED: 71 RPM	RATIO: 1/21	ROTATION: CW LOOKING DOWN	
APPROX, WT, : 290 kg (Including Motor)			
PAINTING: Munsell value			

IMPELLER INFORMATION

TYPE: 4-45° PUDDLE			MAT'L: SUS		
DIA, : φ1270	NO, of BLADE: 4		NO, of STAGE: 1		

TITLE	DRWG. NO.
ALUM MIXER 硫酸バンド撹拌機	M-17
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	





JIS10*250A APPLY
MOUNTING FLANGE DIMENSION

PART NO.	NAME	MAT'L	Q'TY UNIT	NOTE
1	CYCLO REDUCER		1	
2	CHAIN COUPLING	S45C	1	6018
3	MOUNTING ADUPTER	FC200	1	
4	OIL SEAL	NBR	1	SC50689
5	GREASE DRAIN		1	
6	BEARING NUT	S20C	1	AN11
7	BEARING WASHER	SPCC	1	AW11
8	OIL SEAL COVER	FC200	1	
9	BEARING	SUJ2	1	21311E
10	OIL SEAL	NBR	3	SC658210
11	BEARING	SUJ2	1	6313-2NSL
12	GREASE NIPPLE	S15C	1	PT 1/8
13	BODY	FC250	1	
14	OIL SEAL COVER	SS400	1	
15	BOLT	SUS	6	M12
16	NUT	SUS	12	M12 DOUBLE NUT
17	AGITATOR SHAFT	SUS	1	
18	SET BOLT	SUS	2	M12
19	NUT	SUS	2	M12
20	BLADE	SUS	4	
21	IMPELLER HUB	SCS	1	
22	BOLT	SUS	16	M12
23	WASHER	SUS	8	
24	OUT PUT SHAFT	S25C	1	
25				
26				
27				
28				
29				
30				

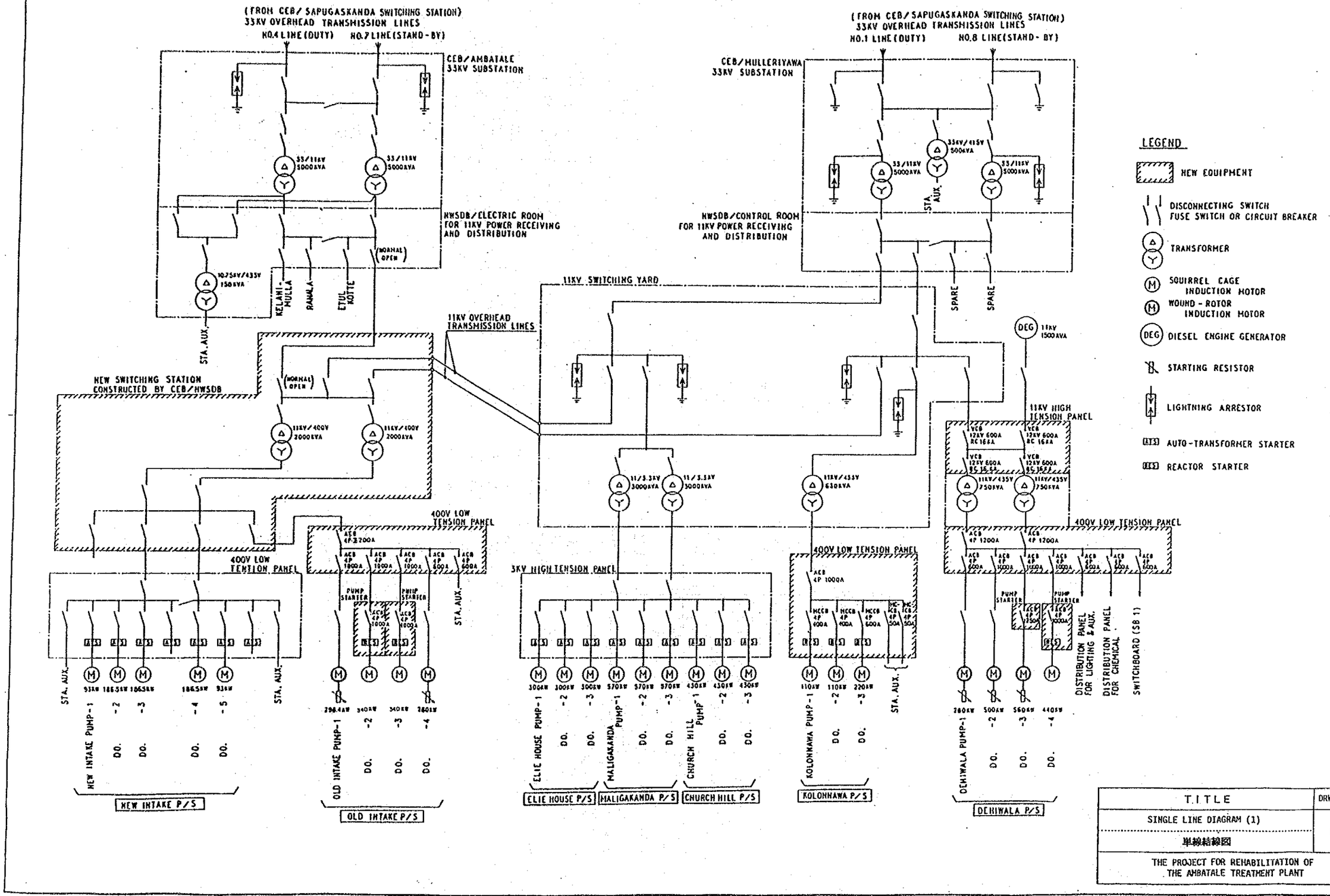
DRIVE UNIT INFORMATION

TYPE&SIZE: NB4-65			
MOTOR: 3.7 kW 4 P 1500 RPM 400 V 50 Hz 3 φ			
ENCLOSURE: FAN-COOLED, OUT DOOR		FRAME SIZE: VM5-211	
OUTPUT SPEED: 71 RPM	RATIO: 1/21	ROTATION: CW LOOKING DOWN	
APPROX. WT.: 196 kg (Including Motor)			
PAINTING: Munsell value			

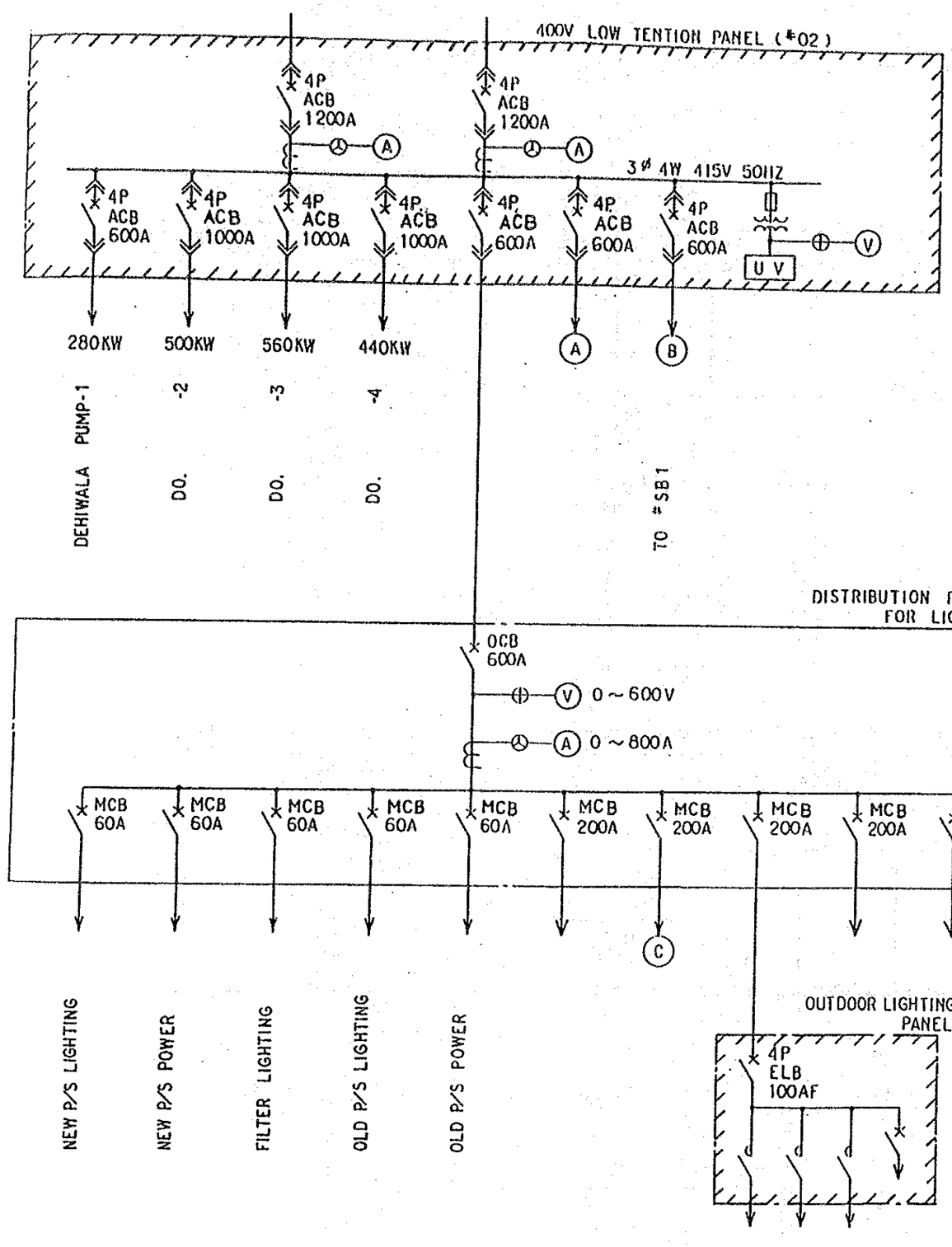
IMPELLER INFORMATION

TYPE: 4-45° PUDDLE			MAT'L: SUS		
DIA.: φ990	NO. of BLADE: 4		NO. of STAGE: 1		

TITLE	DRWG. NO.
LIME MIXER 消石灰攪拌機	M-18
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	



TITLE	DRWG. NO.
SINGLE LINE DIAGRAM (1) 単線結線図	E-1
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	



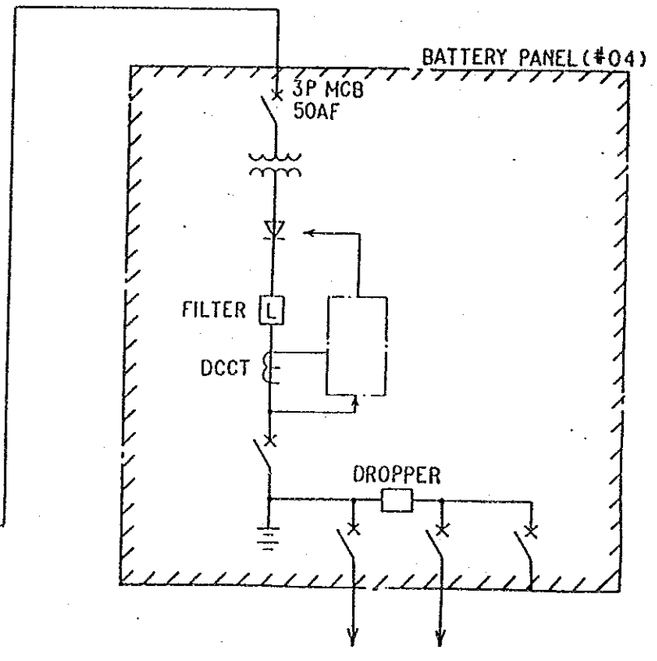
LEGEND

: NEW EQUIPMENT

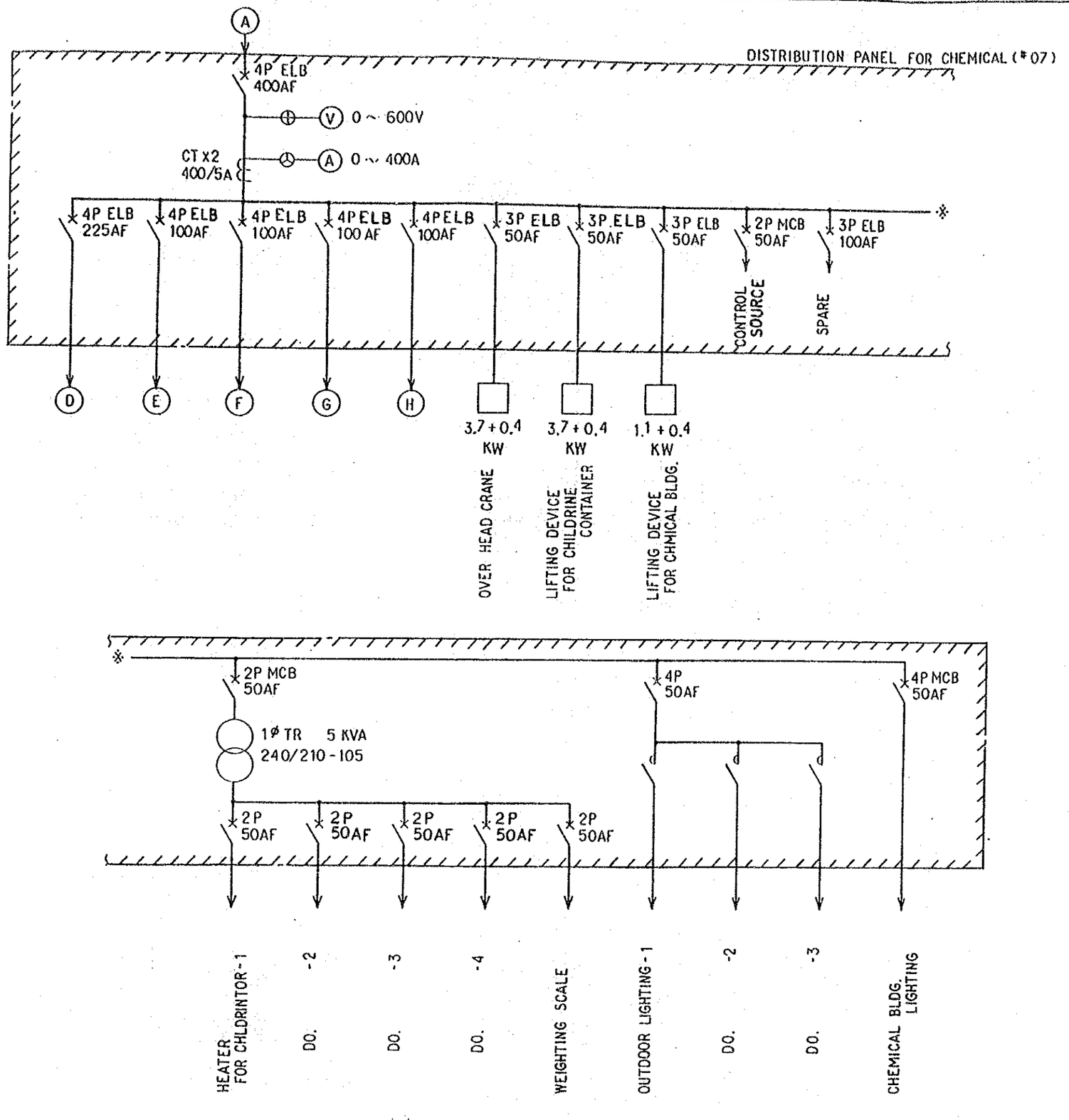
D O L : DIRECT ON LINE STARTER (ONLY FORWARD)

F R : DO. (FORWARD — REVERSE)

人-△ : STAR — DELTA STARTER



TITLE	DRWG. NO.
SINGLE LINE DIAGRAM (2) 単線結線図	E — 2
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	



LEGEND

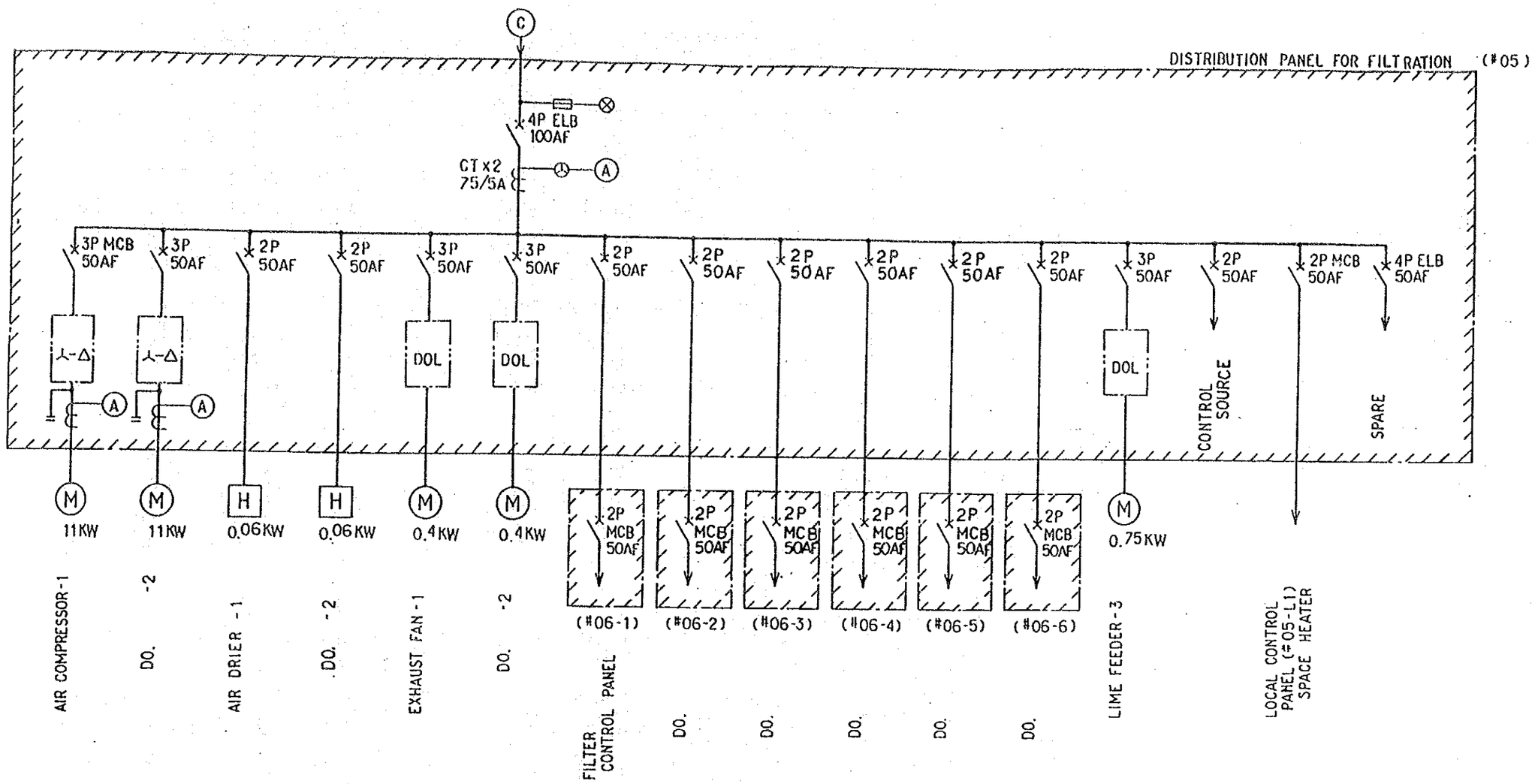
: NEW EQUIPMENT

D O L : DIRECT ON LINE STARTER (ONLY FORWARD)

F R : DO. (FORWARD — REVERSE)

Y - Δ : STAR — DELTA STARTER

TITLE	DRWG. NO.
SINGLE LINE DIAGRAM (3)	E — 3
単線結線図	
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	



LEGEND

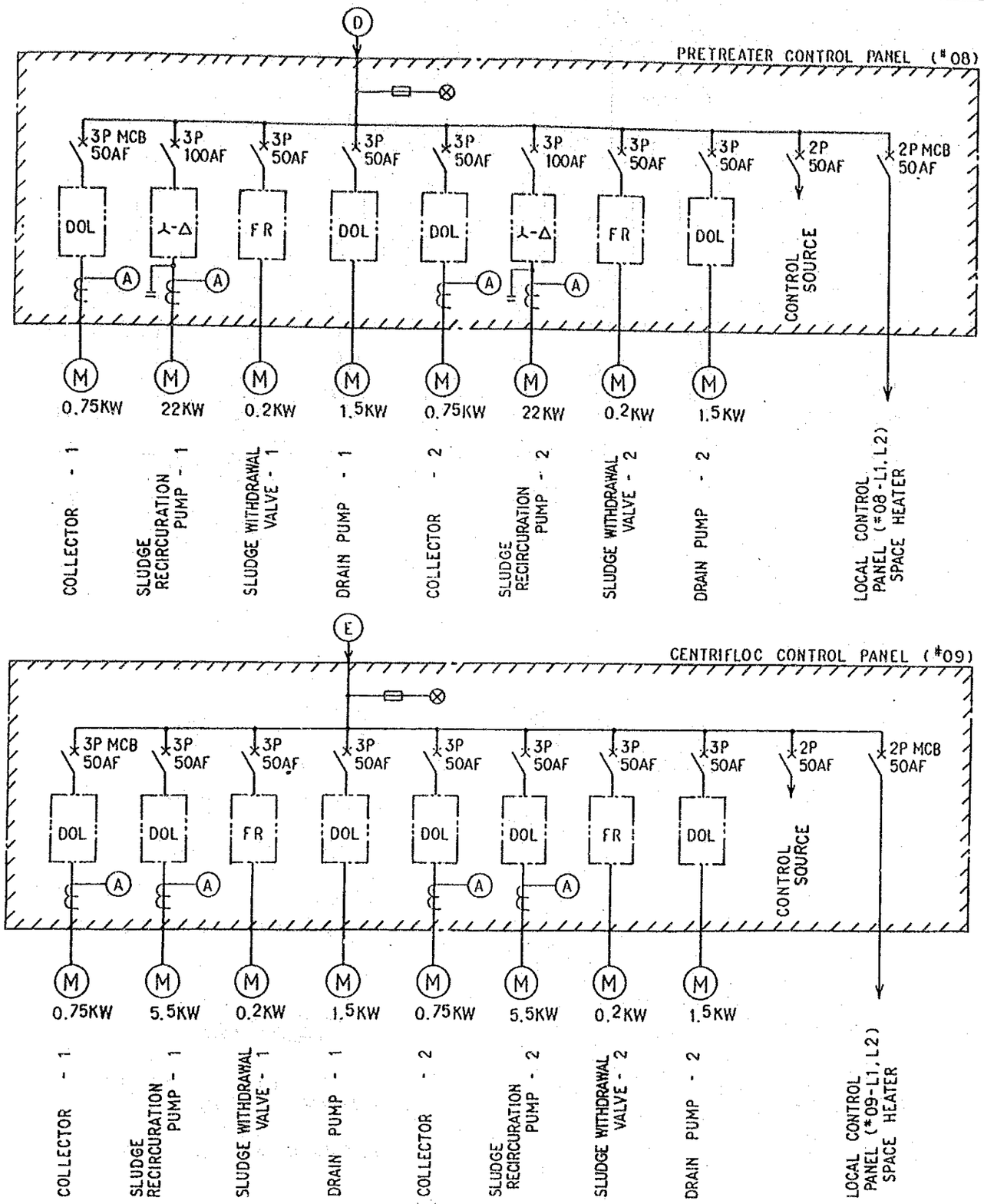
: NEW EQUIPMENT

DOL : DIRECT ON LINE STARTER (ONLY FORWARD)

FR : DO. (FORWARD — REVERSE)

人-△ : STAR — DELTA STARTER

TITLE	DRWG. NO.
SINGLE LINE DIAGRAM (4) 単線結線図	E — 4
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	



LEGEND

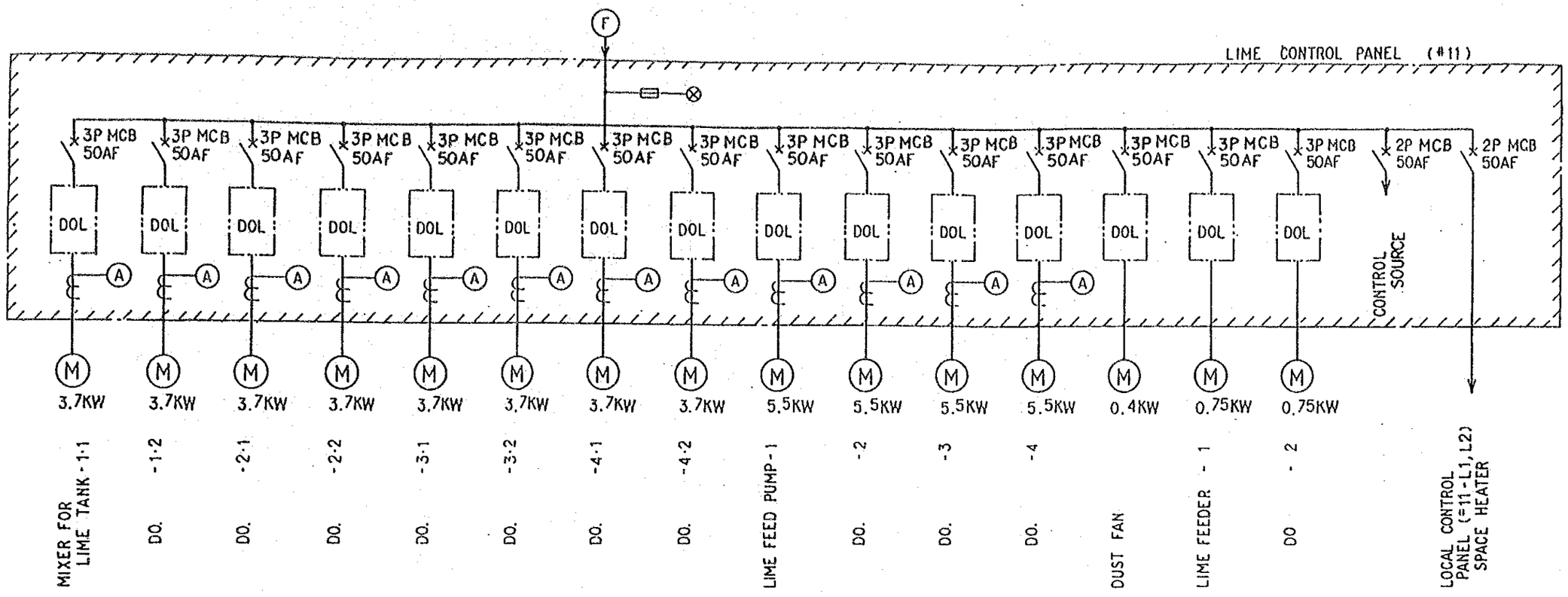
: NEW EQUIPMENT

DOL : DIRECT ON LINE STARTER (ONLY FORWARD)

FR : DO. (FORWARD — REVERSE)

ス-Δ : STAR — DELTA STARTER

TITLE	DRWG. NO.
SINGLE LINE DIAGRAM (5) 単線結線図	E — 5
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	



LEGEND

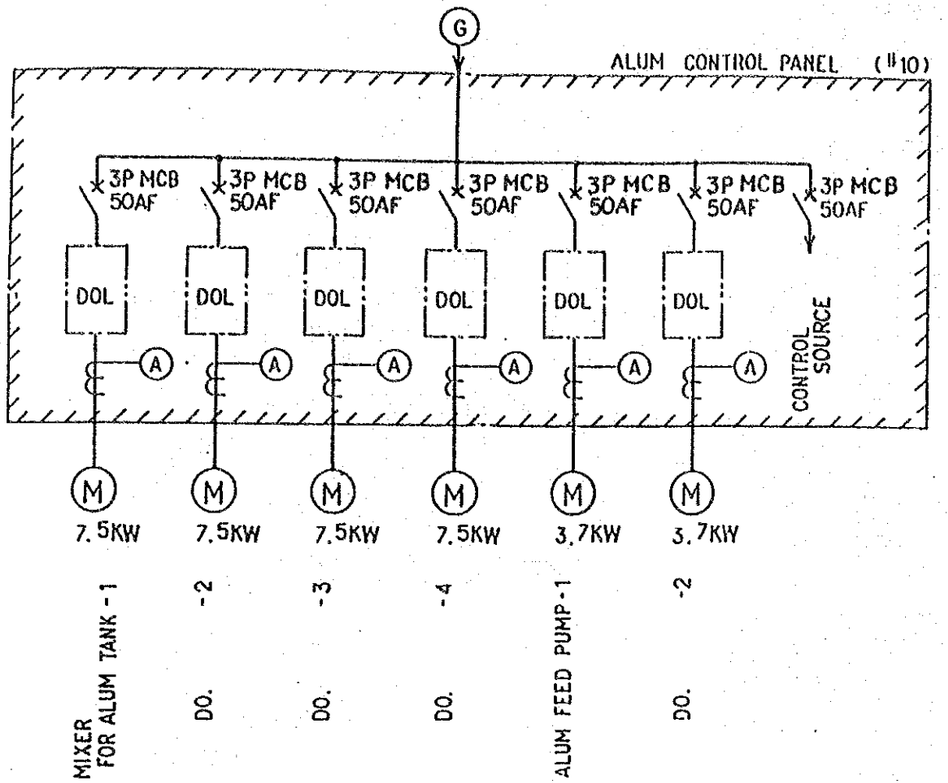
: NEW EQUIPMENT

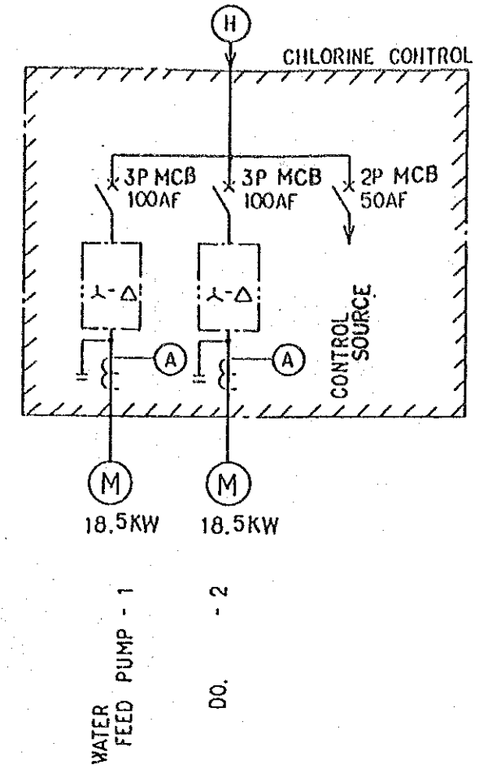
DOL : DIRECT ON LINE STARTER (ONLY FORWARD)

F R : DO. (FORWARD — REVERSE)

人-△ : STAR — DELTA STARTER

TITLE	DRWG. NO.
SINGLE LINE DIAGRAM (6)	E — 6
単線結線図	
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	

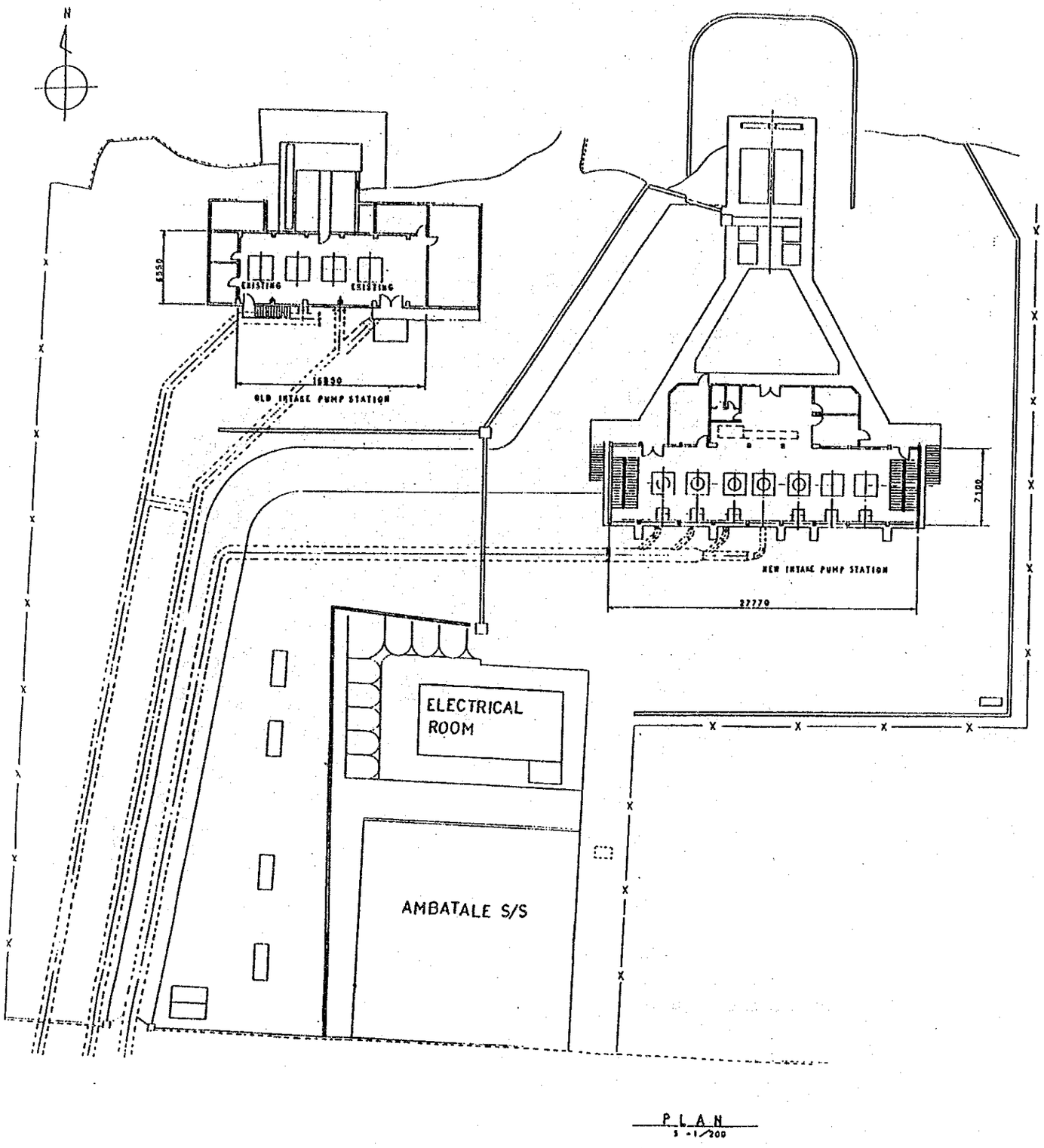




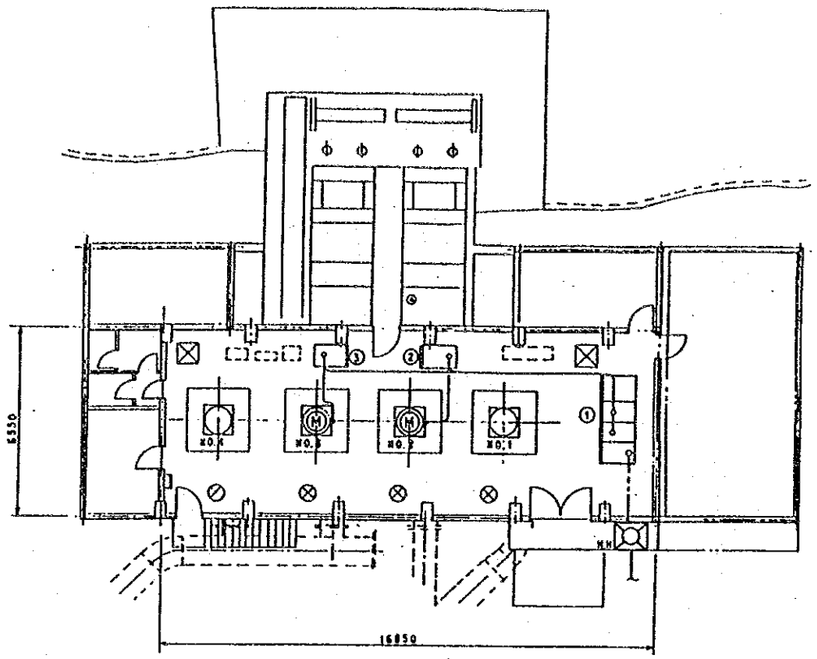
LEGEND

- : NEW EQUIPMENT
- DOL : DIRECT ON LINE STARTER (ONLY FORWARD)
- F.R : DO. (FORWARD — REVERSE)
- : STAR — DELTA STARTER

TITLE	DRWG. NO.
SINGLE LINE DIAGRAM (7) 単線結線図	E — 7
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	



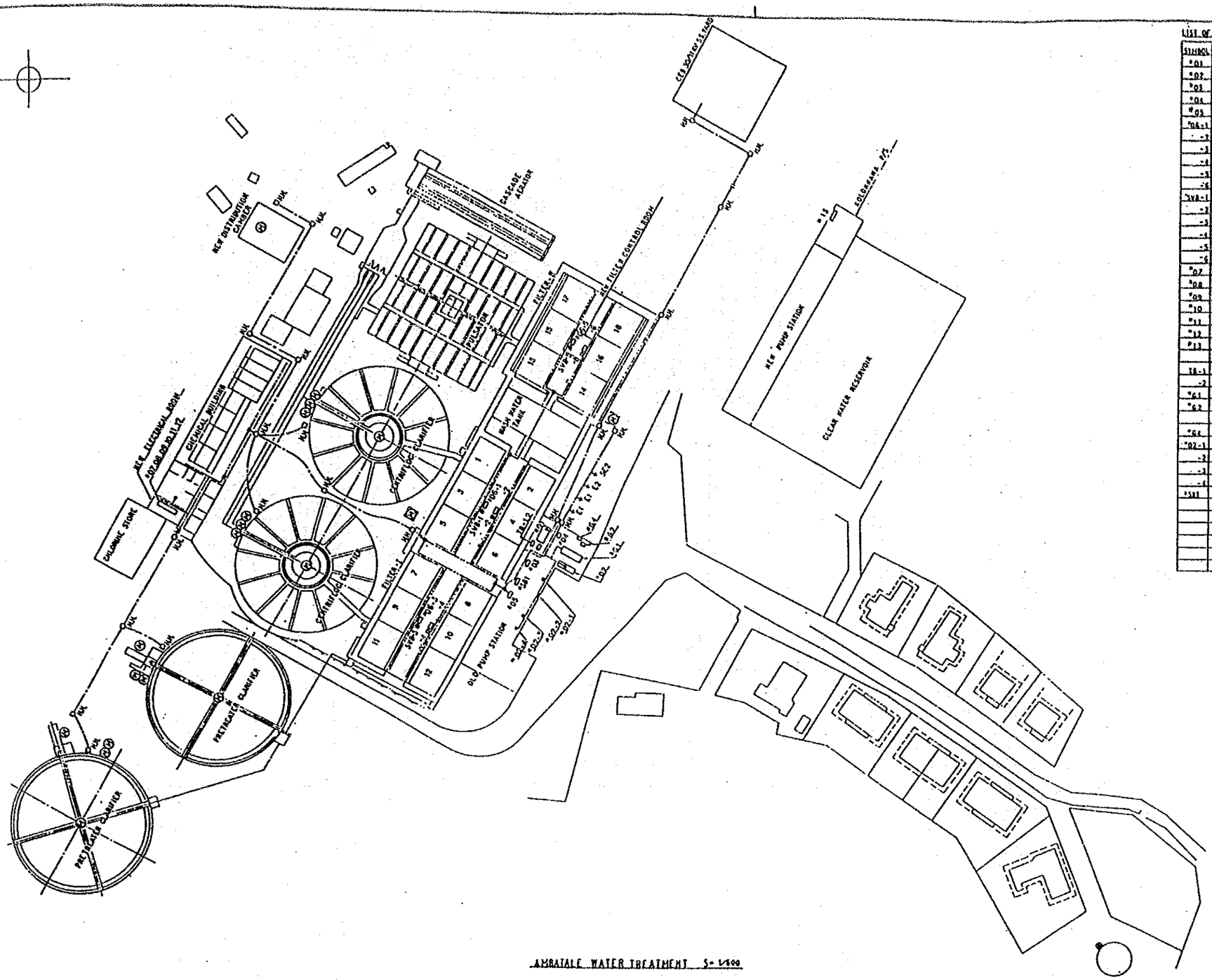
PLAN
S = 1/200



OLD INTAKE PUMP STATION
S = 1/100

SYMBOL	DESCRIPTION	REMARKS
①	400V LOW TENSION PANEL	
②	NO.2 PUMP PANEL	
③	NO.3 ↓	

TITLE	DRWG. NO.
LOCATION PLAN OF ELECTRICAL FACILITIES IN INTAKE PUMPING STATION 取水場電気機器配置図	E－8
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	



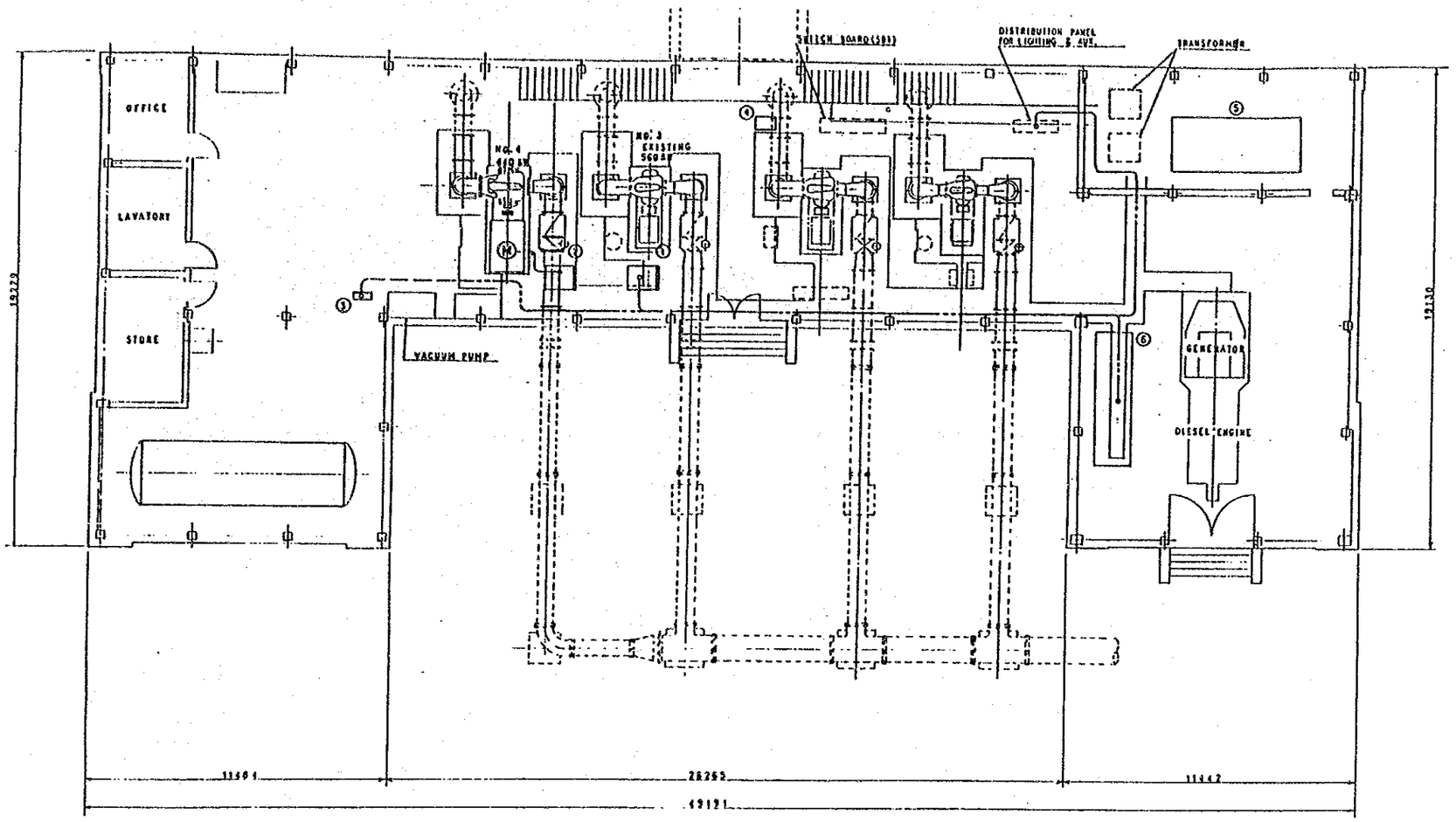
AMBATALE WATER TREATMENT S=1/500

LIST OF PANEL

SYMBOL	DESCRIPTION	REMARK
*01	11kV HIGH TENSION PANEL	NEW
*02	400V LOW TENSION PANEL	
*03	DISTRIBUTION PANEL FOR LIGHTING AUX	
*04	BATTERY PANEL	NEW
*05	DISTRIBUTION PANEL FOR INTERRATION	
*06-1	FILTER CONTROL PANEL -1	
-2	FILTER CONTROL PANEL -2	
-3	FILTER CONTROL PANEL -3	
-4	FILTER CONTROL PANEL -4	
-5	FILTER CONTROL PANEL -5	
-6	FILTER CONTROL PANEL -6	
*VA-1	SOLENOID VALVE PANEL -1	
-2	SOLENOID VALVE PANEL -2	
-3	SOLENOID VALVE PANEL -3	
-4	SOLENOID VALVE PANEL -4	
-5	SOLENOID VALVE PANEL -5	
-6	SOLENOID VALVE PANEL -6	
*07	DISTRIBUTION PANEL FOR CHEMICAL	
*08	PRETREATER CONTROL PANEL	
*09	CENTRIFLOC CONTROL PANEL	
*10	ALUM CONTROL PANEL	
*11	LIME CONTROL PANEL	
*12	CHLORINE CONTROL PANEL	
*13	400V LOW TENSION PANEL	
TR-1	200KVA TRANSFORMER	
-2	200KVA TRANSFORMER	
*61	A.C. GENERATOR	
*62	ACG PANEL	
*63	ACG BATTERY CHARGER	
*02-1	DEHUMALA PUMP -1	
-2	DEHUMALA PUMP -2	
-3	DEHUMALA PUMP -3	
-4	DEHUMALA PUMP -4	NEW
*SB	SWITCH BOARD	

NOTE
NEW B/S : ELLE HOUSE, HALIGAMA, CHURCH HILL
OLD B/S : DEHUMALA

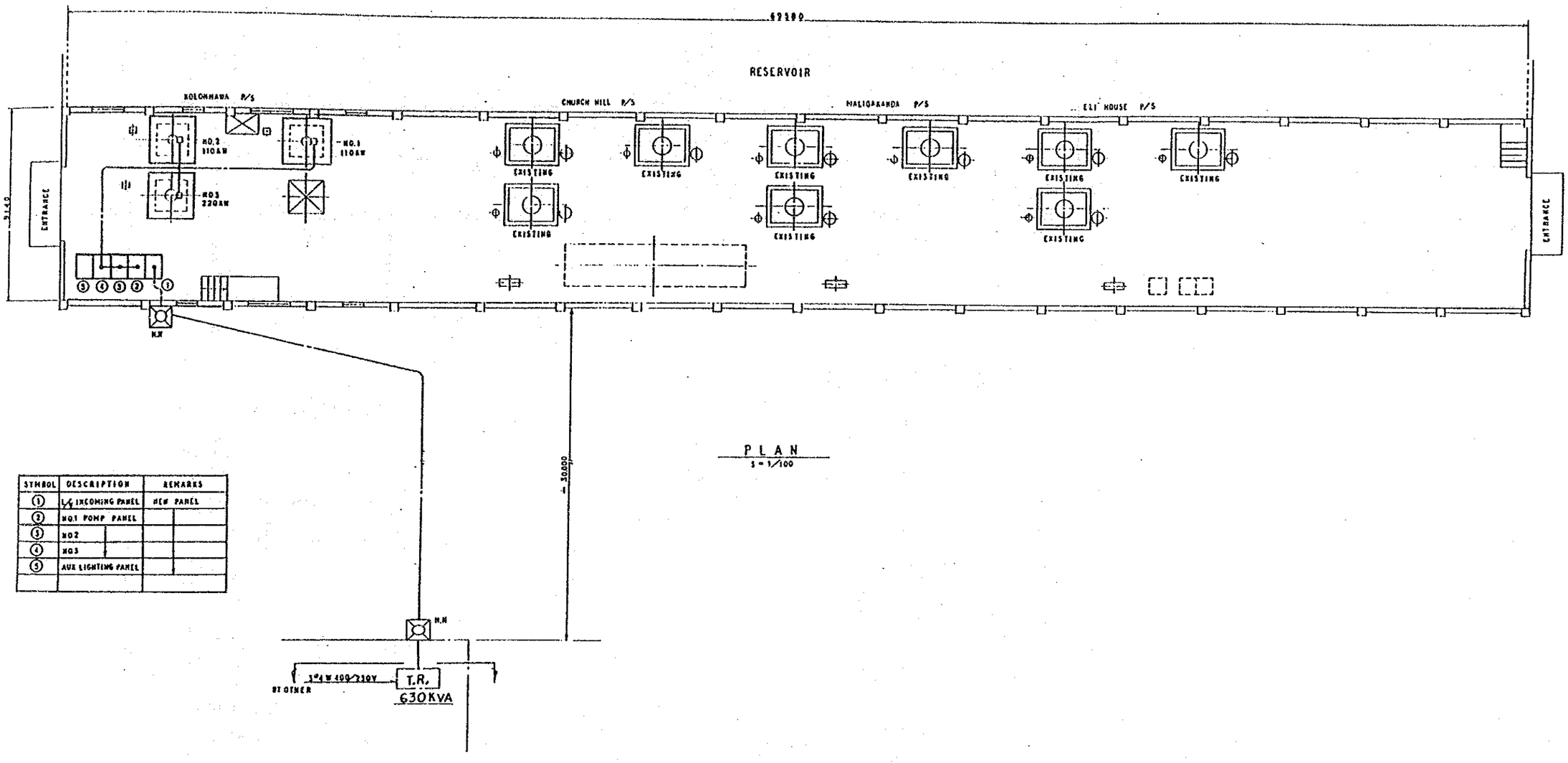
TITLE	DRWG. NO.
LOCATION PLAN OF ELECTRICAL FACILITIES IN WATER TREATMENT PLANT 浄水場電気機器配置図	E－9
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	



SYMBOL	DESCRIPTION	REMARKS
①	NO.3 POMP PANEL	
②	NO.4 〃	
③	VACUUM PUMP PANEL	
④	DISTRIBUTION PANEL FOR FILTERATION	
⑤	HIGH TENTION PANEL	
⑥	400V LOW TENTION PANEL	

PLAN
S = 1/100

TITLE	DRWG. NO.
LOCATION PLAN OF ELECTRICAL FACILITIES IN DEHIWALA POMPING STATION デヒワラポンプ場電気機器配置図	E－10
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	

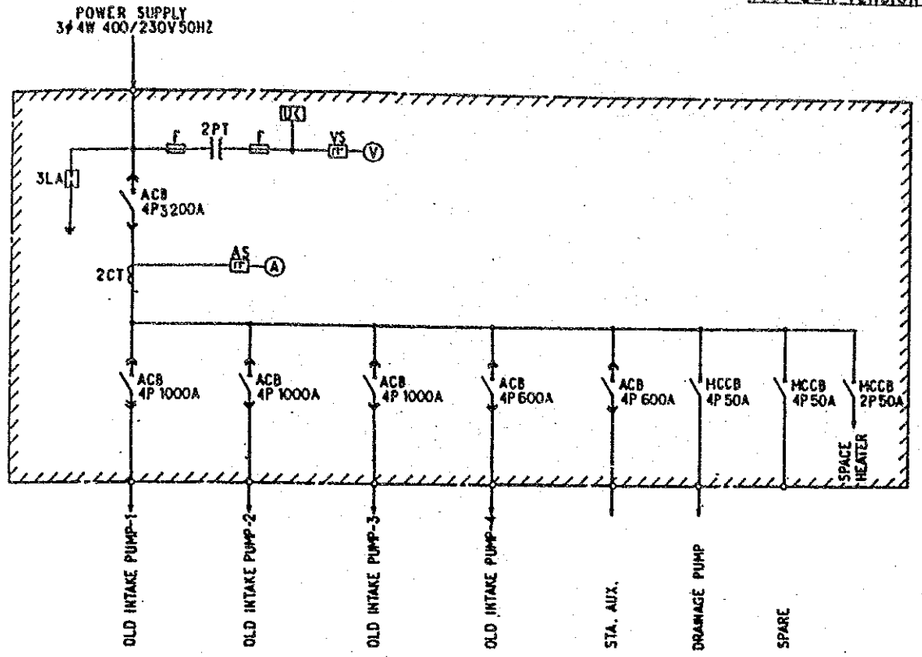


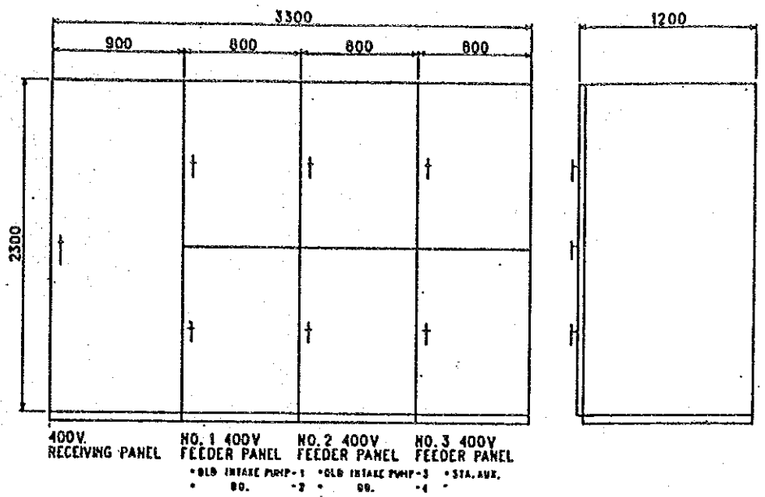
SYMBOL	DESCRIPTION	REMARKS
①	INCOMING PANEL	NEW PANEL
②	NO1 POMP PANEL	
③	NO2	
④	NO3	
⑤	AUX LIGHTING PANEL	

PLAN
S = 1/100

TITLE	DRWG. NO.
LOCATION PLAN OF ELECTRICAL FACILITIES IN KOLONNAWA POMPING STATION コロナワポンプ場電気機器配置図	E −11
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	

400V LOW TENSION PANEL IN OLD INTAKE P/S





LEGEND

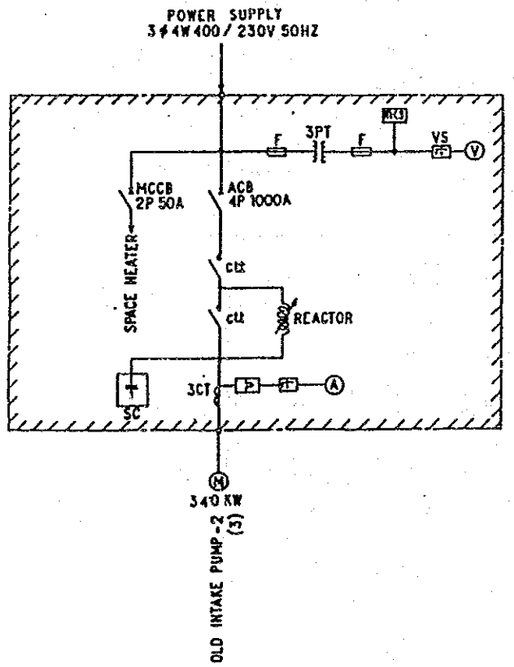
ACB	AIR CIRCUIT BREAKER
A	AMMETER
AS	AMMETER CHANGEOVER SWITCH
CT	CURRENT TRANSFORMER
CLC	ELECTRO-MAGNETIC CONTACTOR
COSΦ	POWER FACTOR METER
F	FUSE
HZ	FREQUENCY METER
LA	LIGHTNING ARRESTOR
M	MOTOR
MCCB	MOLDED CASE CIRCUIT BREAKER
m<3	OPEN PHASE RELAY
PT	POTENTIAL TRANSFORMER
SC	STATIC CONDENSER
SR	SERIES REACTOR
u<	UNDERVOLTAGE RELAY
V	VOLTMETER
VS	VOLTMETER CHANGEOVER SWITCH
	THERMAL RELAY
	OVERLOAD RELAY
	NEW EQUIPMENT

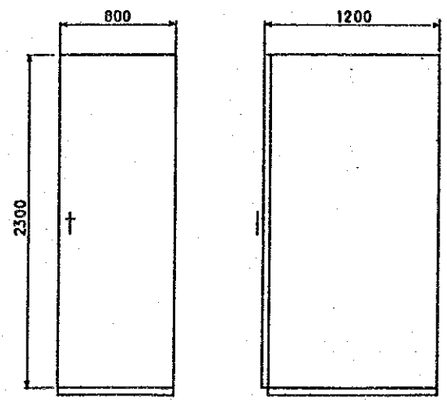
DRAINAGE PUMP CONTROL PANEL

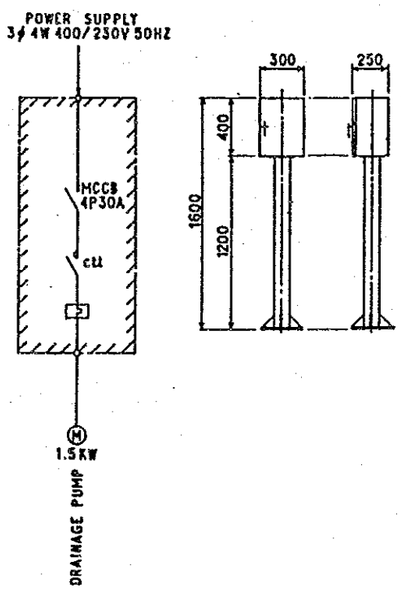
Q'TY : 2 UNIT (1-FOR OLD INTAKE P/S, 1-FOR NEW INTAKE P/S)

OLD INTAKE PUMP-2(3) STARTER

Q'TY : 2 UNIT

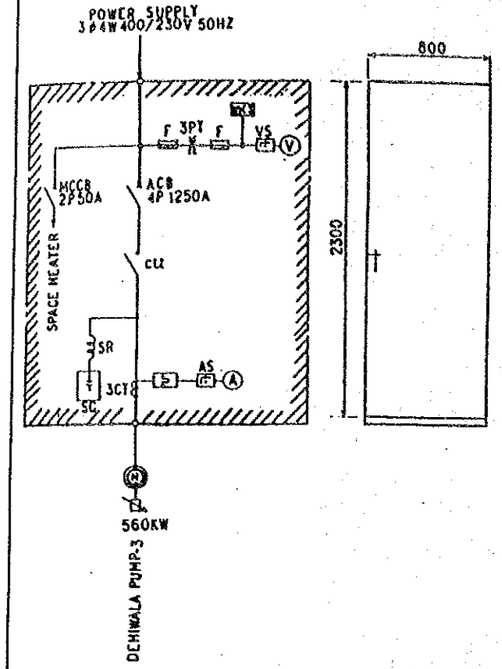




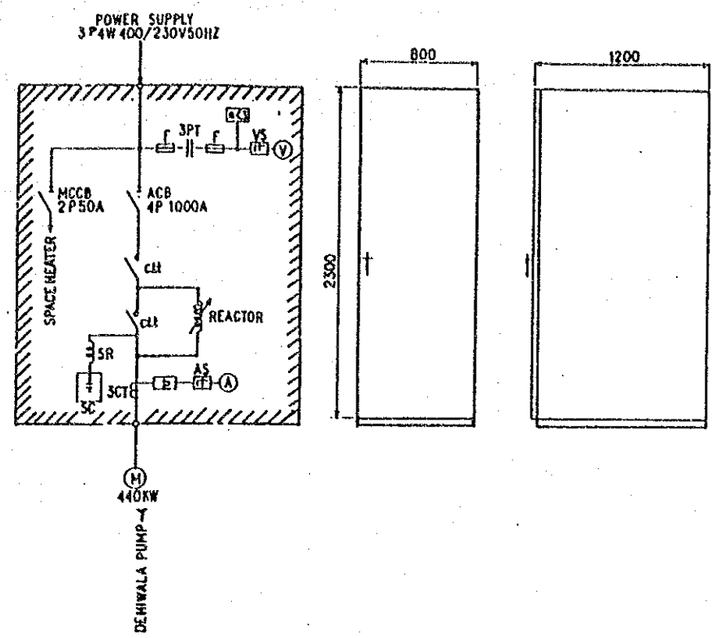


TITLE	DRWG. NO.
ELECTRICAL PANELS (1) 盤外形図	E－12
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	

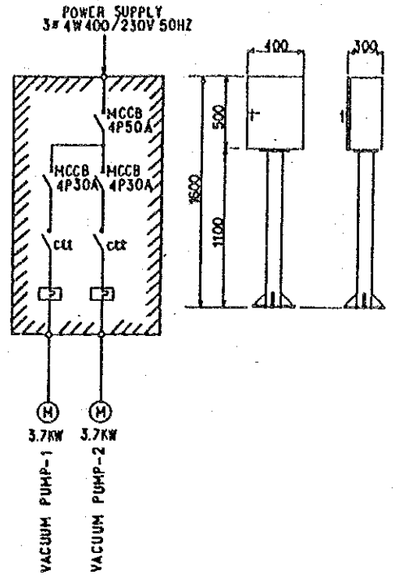
DEHIWALA PUMP-3 STARTER



DEHIWALA PUMP-4 STARTER



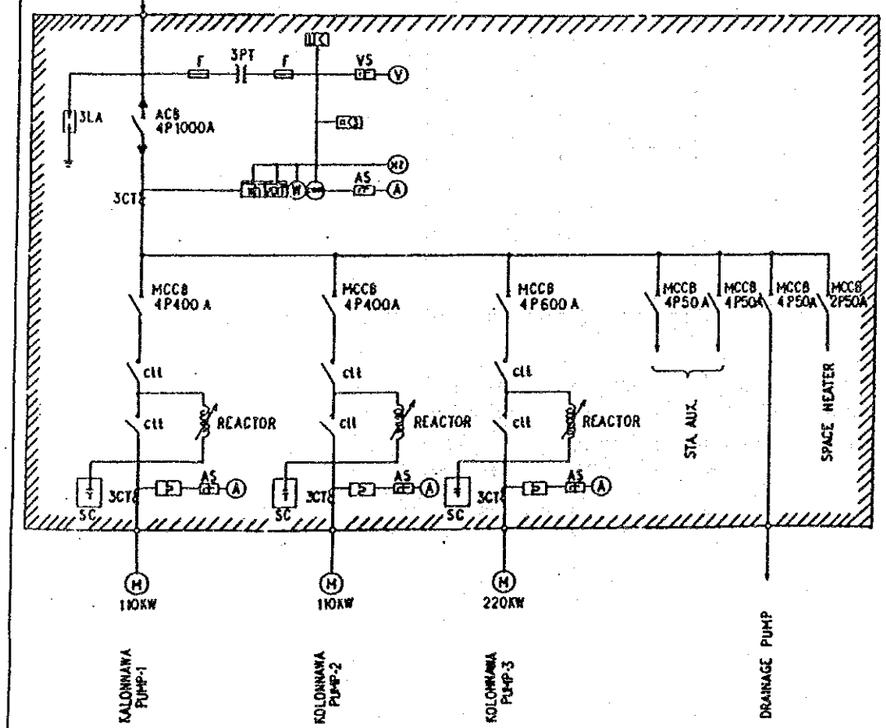
VACUUM PUMP CONTROL PANEL IN DEHIWALA P/S

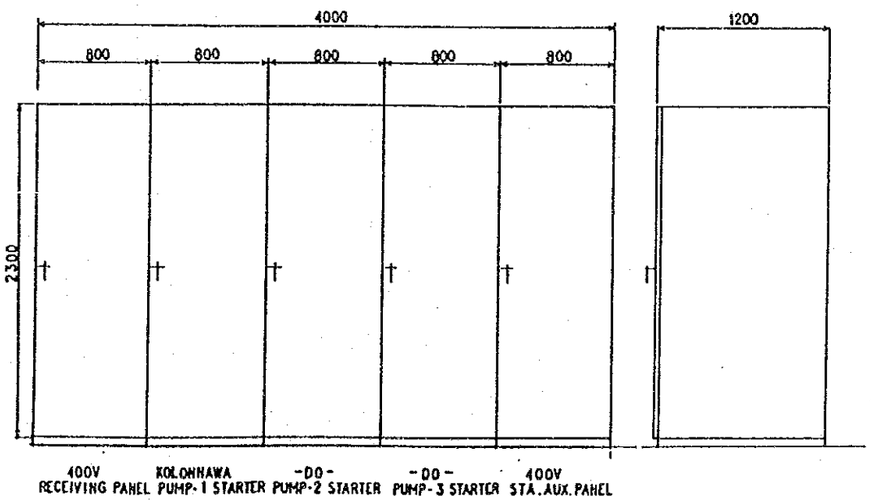


LEGEND

ACB	AIR CIRCUIT BREAKER
A	AMMETER
AS	AMMETER CHANGEOVER SWITCH
CT	CURRENT TRANSFORMER
CLT	ELECTRO-MAGNETIC CONTACTOR
COSφ	POWER FACTOR METER
F	FUSE
HZ	FREQUENCY METER
LA	LIGHTNING ARRESTOR
M	MOTOR
MCCB	MOLDED CASE CIRCUIT BREAKER
mc3	OPEN PHASE RELAY
PT	POTENTIAL TRANSFORMER
SC	STATIC CONDENSER
SR	SERIES REACTOR
uc	UNDERVOLTAGE RELAY
V	VOLTMETER
VS	VOLTMETER CHANGEOVER SWITCH
varh	VAR-HOUR METER
W	WATT METER
Wh	WATT-HOUR METER
	THERMAL RELAY
	OVERLOAD RELAY
	NEW EQUIPMENT

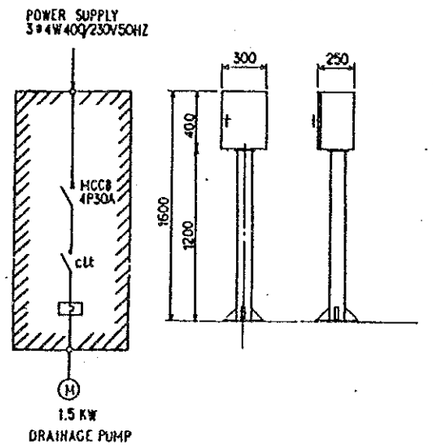
400V LOW TENSION PANEL IN KOLONNAWA P/S



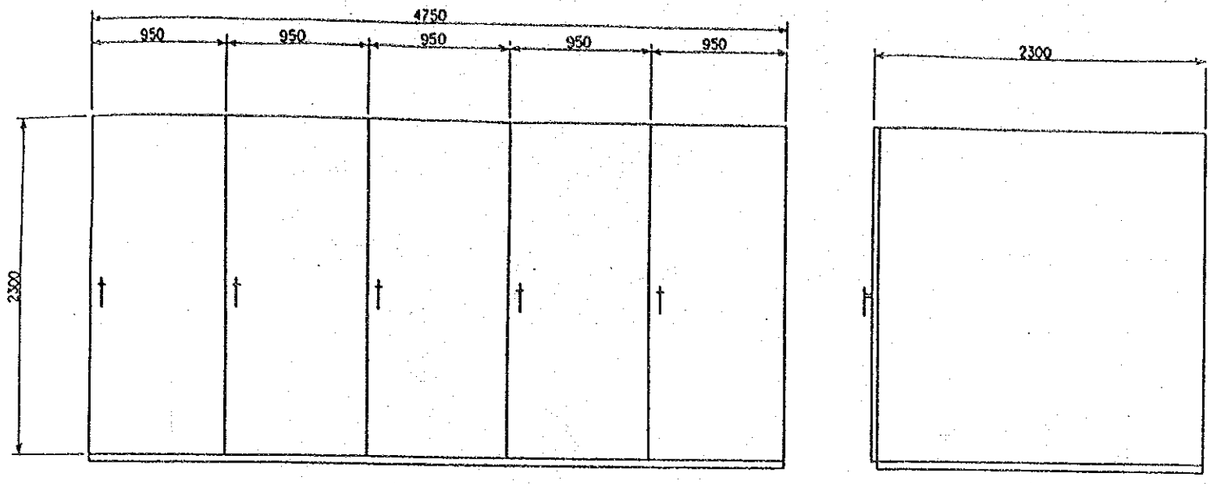


DRAINAGE PUMP CONTROL PANEL

Q'TY: 2UNIT (1: FOR KOLONNAWA P/S, 1: FOR ELIE HOUSE/MALIGAKANDA CHURCH HILL P/S)

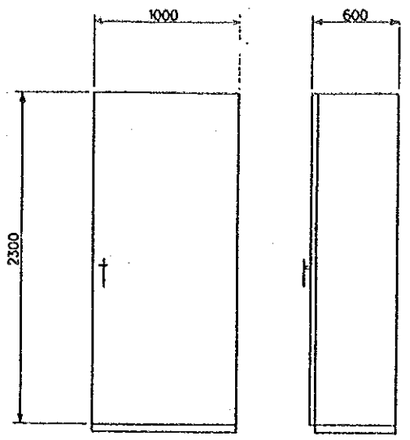


TITLE	DRWG. NO.
ELECTRICAL PANELS (2)	E－13
盤外形図	
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	

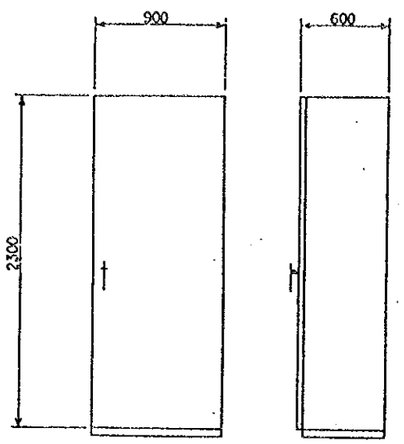


11KV RECEIVING PANEL	11KV GENERATOR INCOMING PANEL	11KV PT/LA PANEL	NO.1 TRANSFORMER PRIMARY PANEL	NO.2 TRANSFOMER PRIMARY PANEL

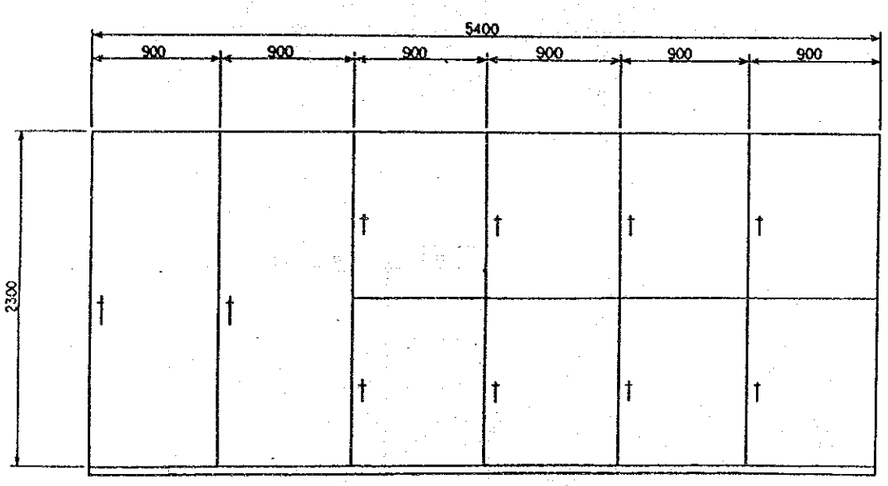
11KV HIGH TENTION PANEL (#01) (S=1/20)



BATTERY PANEL (#04) (S=1/20)

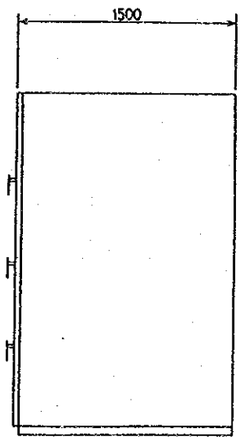


DISTRIBUTION PANEL
FOR FILTERRATION (#05) (S=1/20)

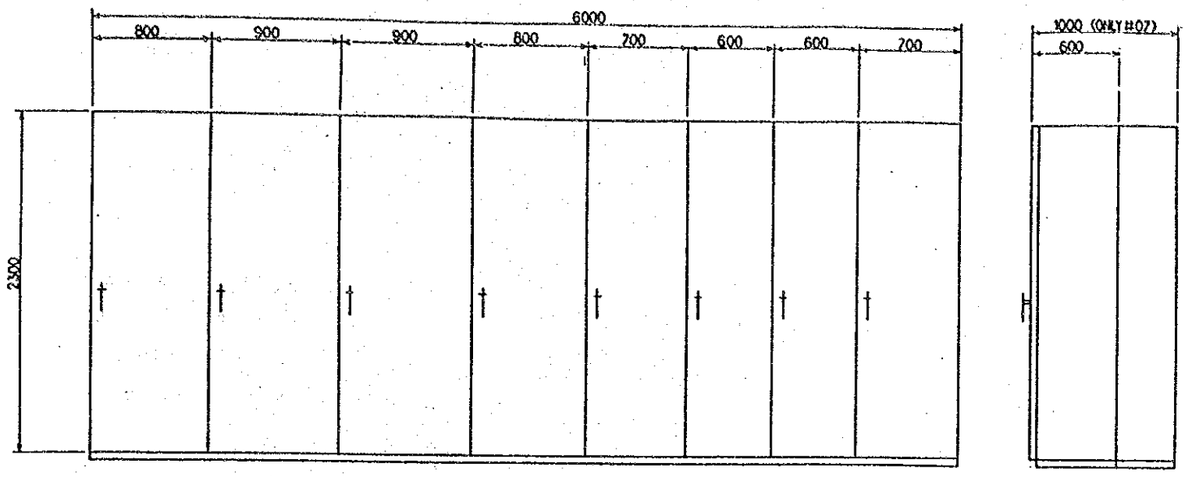


NO.1 400V RECEIVING PANEL	NO.2 400V RECEIVING PANEL	NO.1 400V FEEDER PANEL	NO.2 400V FEEDER PANEL	NO.3 400V FEEDER PANEL	NO.4 400V FEEDER PANEL
		・S8 1 ・BLACK MCC	・CHEMCAL BLDG. ・DEHIWALA P-1	・DEHIWALA P-3 ・DEHIWALA	・DEHIWALA P-4 ・(VACANT)

400V LOW TENTION PANEL (#02) (S=1/20)



TITLE	DRWG. NO.
ELECTRICAL PANELS (3) 盤外形図	E－14
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	



_DISTRIBUTION PANEL _FOR CHEMICAL __(#07)

PRETREATER CONTROL PANEL (#08)

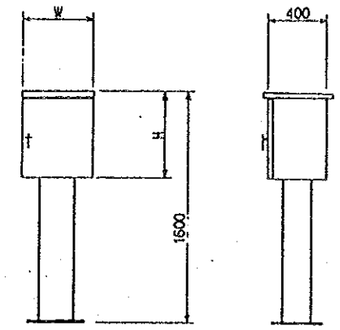
CENTRIFLOC CONTROL PANEL (#09)

ALUM CONTROL PANEL (#10)

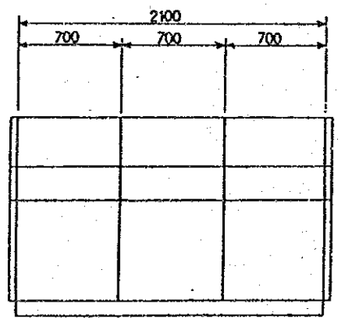
LIME CONTROL PANEL (#11)

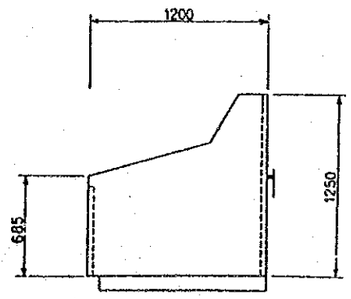
CHLORINE CONTROL PANEL (#12)

__(S=1/20)

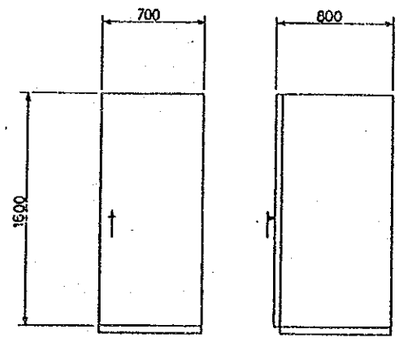


_LOCAL CONTROL PANEL (S=1/20)





FILTER CONTROL PANEL (#06-1～06-6) (S=1/20)



SOLENOID VALVE PANEL (#SVB-1～#SVB-6) (S=1/20)

MARK OF PANEL	NAME OF PANEL	DIMENSION (W) x (H)	Q'TY	NAME OF OPERATING LOAD
#11-L1	LIME FEEDER -1	500 x 600	1	FEEDER FEED PUMP (ONLY:OFF)
-L2	DO. -2	DO.	1	
#05-L1	DO. -3	DO.	1	
#08-L1	PRETREATER -1	500 x 800	1	COLLECTOR RECIRCURATION PUMP WITHDRAWAL VALVE DRAIN PUMP
-L2	DO. -2	DO.	1	
#09-L1	CENTRIFLOC -1	DO.	1	DO.
-L2	DO. -2	DO.	1	

TITLE	DRWG. NO.
ELECTRICAL PANELS (4)	E—15
盤外形図	
THE PROJECT FOR REHABILITATION OF THE AMBATALE TREATMENT PLANT	

4-4 Implementation Plan

4-4-1 Implementation Policies and Conditions

NWSDB will be the agency responsible for the implementation of the Project under the supervision of MHC. The implementation system is shown in Fig. 4-4-1.

For the smooth implementation of the Project, a Project Team should be organised exclusively as the counterparts of the consultants and the supervision engineers. It would be the Plan and Design Department that ordinarily takes charge of the detailed design until the Project tendering. The Construction Department, on the other hand, supervises construction work.

The Project Team would take charge of the following roles:

i) Management of the Project

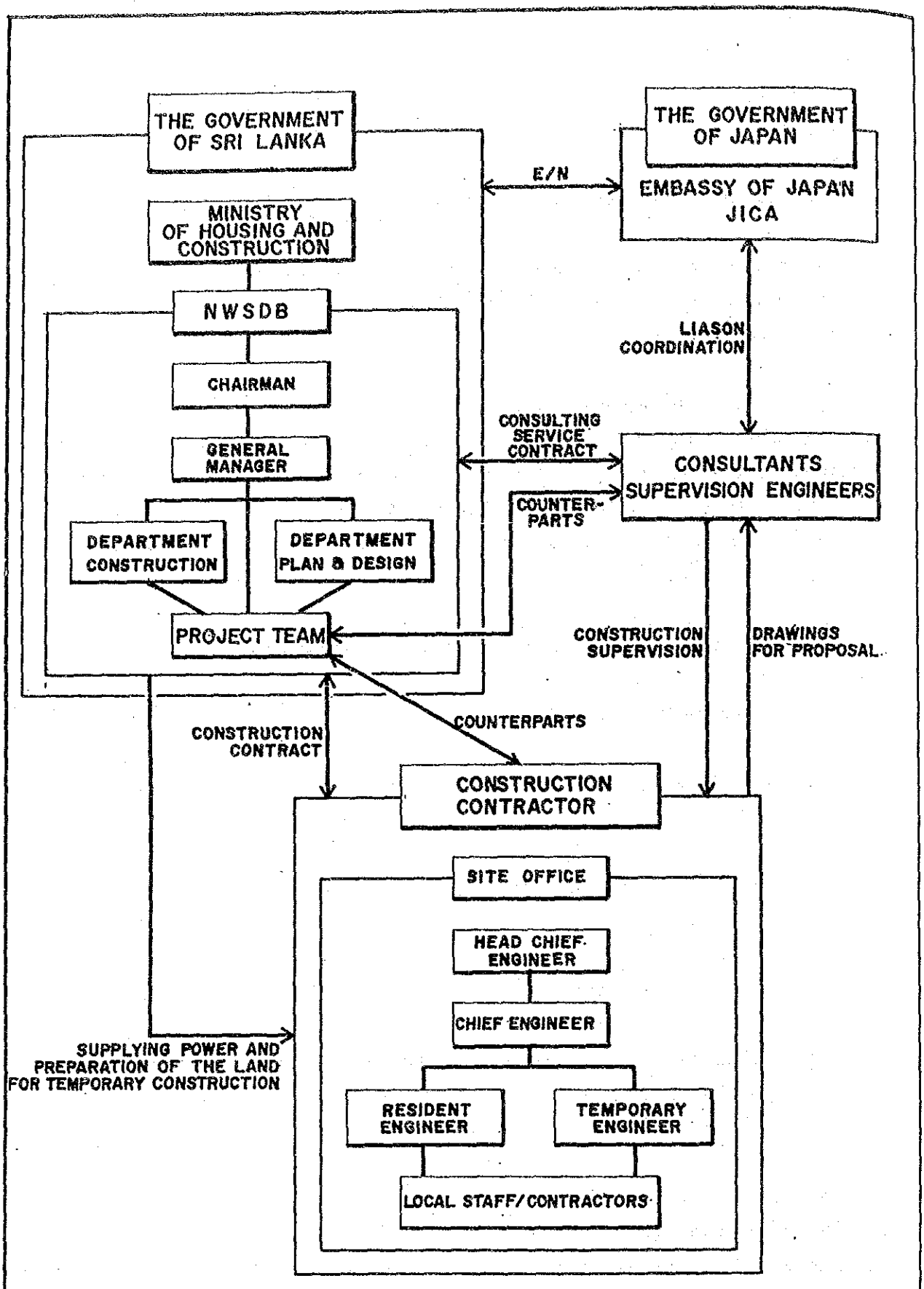
ii) Coordination with NWSDB (Department of Plan & Design, Construction, etc.)

iii) Coordination with organisation of the Government of Sri Lanka concerned.

iv) Coordination of the detailed design work and tendering procedure.

v) Implementation of additional examination and investigation by Sri Lankan counterparts in cooperation with the consultants and supervising engineers, if necessary.

The implementation of Japan's Grant Aid is extended in accordance with the Notes Exchanged (E/N) for the Project between the Government of Sri Lanka and the Government of Japan. Banking arrangement (B/A) between the Government of Sri Lanka and an authorised Japanese foreign exchange bank is concluded in accordance with the Notes.



ORGANISATION CHART FOR IMPLEMENTATION OF THE PROJECT

FIGURE NO. 4.4.1

After B/A, a consultancy contract for detail design and supervisory services is concluded between the government of Sri Lanka and a Japanese consulting firm. The Government of Japan checks whether the consulting contract is eligible under the Grant Aid Programme and verifies it.

Then, contract for the implementation of the Project is concluded between the Government of Sri Lanka and a selected Japanese construction firm. The government of Japan checks and verifies the contract for the implementation of the Project as same manner as consultancy services.

The preparation of the detailed design, the provision for assistance to NWSDB on tendering and the Project construction supervision will be provided by a Japanese consulting company.

Almost of the rehabilitation works are replacement of facilities. It is recommended that the Project construction should be undertaken by a water treatment facility manufacturer.

During the construction period, resident engineers headed by a head chief engineer will be fully assigned to the Japanese construction contractor to supervise the overall rehabilitation works (see Figure 4.4.1). Engineers on specific fields of expertise such as pumps, valves, electrical control panels, instrumentation and laboratory equipment will assist on a short term basis for equipment installation and test operation.

The Project, under the Japanese Grant Aid Programme, is planed to be implemented continuously in three fiscal years of Japan.

4-4-2 Implementation Method

The Project is an rehabilitation of the existing water treatment plant. The construction method and construction schedule should be ascertained so as to minimise the period of water interruption and bad influence to treated water quality due to the implementation of the Project, especially in the construction of the new distribution chamber.

The project construction schedule should be planed taking into account that the rainy season falls on April to June and September to November every year so as to avoid influence to concrete placing for the construction of the new distribution chamber and the troughs for filters. It should also be taken into account that every fullmoon day is a national holiday.

The sea transportation for cargo from Japan takes about one month to the Colombo Port. The cargo will then be transported to Ambatale which takes 20 km by inland transportation. Therefore, packing for those facilities/equipment which are to be transported from Japan should be durable.

4-4-3 Construction and Supervision Plan

(1) Detailed Design

The detailed design will proceed after the E/N between the Government of Japan and the Government of Sri Lanka. Such a detailed design for the Project will be prepared based on the Basic Design. The detailed design prepared by the consultant will be approved by NWSDB.

(2) Tendering

Contract documents for the Project which will be prepared by the consultant will be approved by NWSDB. The consultant will assist NWSDB in making the tender announcement, pre-qualifying tenderers, accepting tender applications from tenderers, and evaluating the tenderers. After selecting a successful Japanese contractor, NWSDB will enter into a contract agreement with the contractor.

(3) Construction Supervision

The consultant will evaluate and approve the tender documents submitted after tendering by the selected contractor and will assist NWSDB with the procurement of Project materials and equipment in order to start the Project construction as early as possible.

The consultant will hold a series of meetings with NWSDB officials and the contractor prior to the commencement of the Project construction works and witness for the shipments of Project materials and equipment to be transported to the Project site, and will provide the contractor with instruction related to the construction works.

The consultant will also supervise the Project's construction schedule, be responsible for quality control, and exert an effort to complete the Project's construction on its scheduled completion date.

4-4-4 Procurement Plan

The methods of procurement of materials necessary for the Project have been studied by comparing Sri Lankan and Japanese procurement methods as mentioned below. The summary of procurement plan is presented in Table 4-4-1.

(1) Cement

Ready mixed concrete is available in Sri Lanka and the price of cement is lower than importing it from Japan. Therefore, Sri Lankan made cement is acceptable.

(2) Reinforcing Rod

Reinforcing rod, which conforms to worldwide standard are locally available at reasonable prices. Therefore, reinforcing rod made in Sri Lanka shall be adopted.

(3) Aggregate and Bricks

Aggregate and bricks are locally available and their prices are reasonable. Then, aggregate and bricks made in Sri Lanka shall be adopted.

(4) Filter Sands

Good quality filter sand is available locally near Greater Colombo. The

price of sand is reasonable. Therefore, the local filter sand shall be adopted.

(5) **Plywood Forms**

For this Project, plywood forms will be used for the concrete structure holdings for the Distribution Chamber. Plywood from Sri Lanka is not consistent and demand for the construction purposes is small since most structures in Sri Lanka are made of bricks. Therefore, plywood processed in Japan shall be used.

(6) **Pump**

Small sized or general purpose type of pumps are available in Sri Lanka and some pumps to be used in the Project would be small sized. However, since reliability on delivery time and quality of steel materials have not been confirmed, pumps made in Japan shall be adopted.

(7) **Valve**

The valves, most of which are imported are locally available. However, the specifications are limited and some specifications required for the Project are not available. Therefore, the valve made in Japan shall be adopted.

(8) **Water Treatment Facilities/Equipment**

The water treatment facilities/equipment to be used for the Project are very special and must be manufactured according to the shop drawings. There are no locally manufactured water treatment facility available. Therefore, facilities/equipment made in Japan shall be adopted.

(9) **Cast Iron Pipe**

There are no manufacturers for cast iron pipes in Sri Lanka. Therefore, cast iron pipes made in Japan shall be adopted.

(10) **Pipes (PVC)**

PVC pipes are manufactured in Sri Lanka. However, the specifications are limited and are of varying quality. Its availability in large quantities is very limited in the market, which would adversely influence the construction schedule. Therefore, pipes (PVC) made in Japan shall be adopted.

(11) **Instrument**

Most parts of the instrumentation are imported and have different standards. The availability is very limited in the market due to low production rate. Therefore, instruments made in Japan shall be adopted.

(12) **Electric Equipment**

The electric equipment to be used for the Project are very special and must be manufactured according to the shop drawings. Therefore, the locally available ones cannot be used.

(13) **Construction Machines**

Construction machines, such as concrete mixers, cranes, trucks etc. are available in the local lease market and their quality is judged to be in good condition. Therefore, construction machines shall be supplied from the local market.

(14) **Construction Tools**

The construction tools, such as transformer, welding machine, water pump etc. in the local lease market are not reliable. Tools shall be supplied from Japan.

(15) **Laboratory Equipment, AV Equipment**

Laboratory and AV equipment to be used in the Project are the standard ones. They are available locally through agents. Therefore, those

equipment are to be purchased in Sri Lanka.

(16) Truck with Crane

There are no manufacturers of truck with crane in Sri Lanka. Therefore, those made in Japan shall be adopted.

(17) Special Maintenance Tools

Special maintenance tools for the facilities/equipment to be purchased in Japan are not available in Sri Lanka. Therefore, those made in Japan shall be adopted.

Table 4-4-1 Summary of Material Procurement

Item	Procure in Japan	Procure in Sri Lanka
Cement		x
Reinforcing rod		x
Aggregate and bricks		x
Filter sand		x
Plywood forms	x	
Pump	x	
Water treatment facilities/equipment	x	
Cast iron pipe	x	
PVC pipe	x	
Valve	x	
Instrument	x	
Electrical equipment	x	
Construction machine	x	
Construction tool	x	
Laboratory & AV equipment		x
Truck with crane	x	
Special maintenance tools	x	

4-4-5 Implementation Schedule

(1) Construction Schedule

A construction schedule has been prepared as shown in Table 4-4-2, taking into account the rainy season falls in April to June and September to November. Outdoor works such as earth works and concrete placing will be avoided during this season.

(2) Construction Period

The construction period is determined to be a total of 35 months as shown in Table 4-4-2.

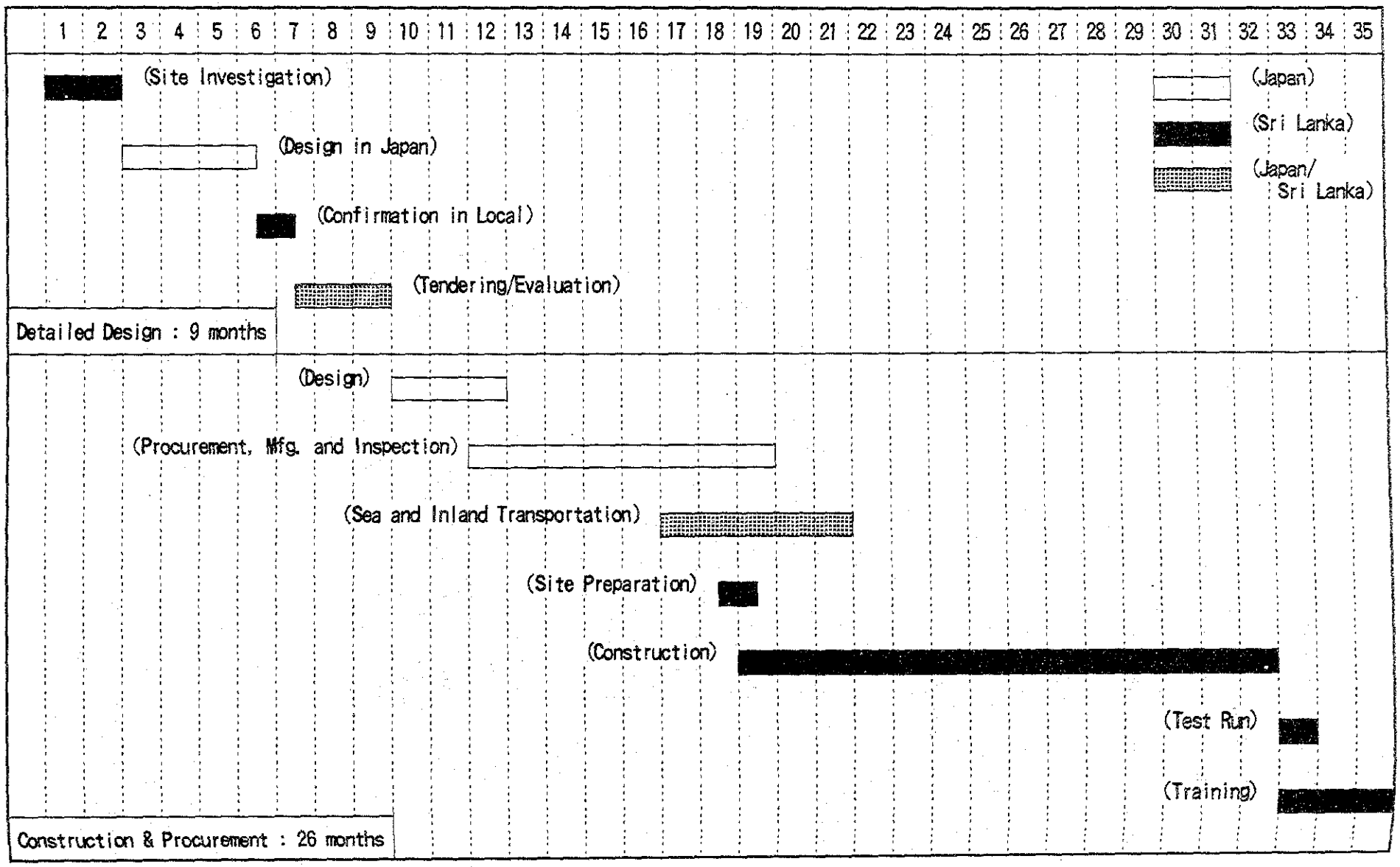
4-4-6 Scope of Works

This section describes the scope of work necessary for the implementation of the Project. Table 4-4-3 shows the scope of work to be undertaken by each Government.

Table 4-4-3 Scope of Work to be Undertaken by Each Government

Item No.	Description	To be Covered by Sri Lanka	To be Covered by Japan
1	To clear, level the site	x	
2	The distribution of electrical line to the site	x	
3	To construct gates and fences in and around the site	x	
4	Procurement of project materials		x
5	Transportation of project materials		x
6	Installation of project materials		x
7	Test operation		x
8	Construction supervision		x
9	O&M of the facilities after commissioning	x	
10	O&M of the equipment after commissioning	x	

Table 4-4-2 Project Implementation Schedule



CHAPTER 5

PROJECT EVALUATION AND CONCLUSION

CHAPTER 5 PROJECT EVALUATION AND CONCLUSION

5-1 Effects

The following shall be the direct effects to the Plant operation with the implementation of the Project.

1) To be able to distribute raw water properly to the five sedimentation tanks

The present problems caused by uneven and improper distribution of raw water in the sedimentation process will be solved. The presently deteriorated quality of the treated water will be improved and safe potable water will be supplied.

2) To be able to improve the sedimentation process

In improving the sedimentation process, the sludge circulation facilities and sludge withdrawal facilities will function better. The O&M of the sedimentation tanks will be easier which will eliminate the fluctuation of the settled water quality. Sludge scraping ensures that the sludge will be removed and the settled solids will be separated from other particles in due course of the settling. Consistent sludge removal ensures settled water quality and sufficient filter run and its treatability.

3) To be able to improve filtration process

Inflow weir to be installed at each inlet of filters will equalise inflow rate hydraulically. This will improve the quality of filtered water in compliance with the Sri Lankan drinking water standard. The present O & M difficulties due to the deteriorated operation valves will be solved by the automatic operation. Likewise, such problems caused by the differences of the operator's ability and judgment will be eliminated. The replacement of deteriorated filter media ensure the stable operation of filtration process and the washwater troughs which will be constructed to ensure improved

backwash effect.

4) To be able to feed appropriate rate of chemicals

At present, optimum chemical dosage is initiated by Jar Test. This however, can not be reflected immediately in the actual operation of the chemical feeding facilities. After the rehabilitation, each chemical feed facility will be recovered and operated in connection with the flow measurement at the new distribution chamber, improving treated water.

The direct effects to the Plant will be reflected to the residents of Greater Colombo as follows:

5) The improvement of the treated water quality and the treatment capacity of the Plant will be restored to the designed production capacity of 288,500 cu.m/d which is approximately 20% higher productivity than the present production capacity of 245,500 cu.m/d.

6) The above qualitative and quantitative effects will benefit more than 640,000 persons in the service area of 165 sq.km, approximately 40% of Greater Colombo population presently supplied water from the Plant.

5-2 Conclusion

The Plant, constructed initially in 1962, was expanded twice to reach its present scale. Some of the facilities/equipment have been used over 30 years and have deteriorated so much since its construction. However, due to the shortage of budget of the organisation concerned, only small scale replacements have been done. Difficulties have been encountered in operating the plant effectively such that the deterioration of water supply reached serious proportions.

This Project aims at improving treated water quality of the Plant, meeting the policies of both the CORPORATE PLAN and the GC Master Plan Update. Its benefits will be felt by the entire GC service area where 1.6 million people live. The implementation of the Project therefore is

expected to contribute to the improvement of the living and health conditions of the residents in GC.

Furthermore, combined with other on-going projects, the Ambatale treatment plant rehabilitation project brings much improvement of water supply condtion for GC.

5-3 Recommendation

It is recommended that Sri Lankan side should implement the following measures to ensure maximisation of the Project's effects and benefits:

A. Before the implementation of the Project

1) To secure necessary budget from the Government of Sri Lanka.

2) To organise a promotion committee of the Project in order to coordinate the Project smoothly.

3) To install chlorinators at the reservoirs, necessary for residual chlorine control by the end of the Project.

4) To make efforts on public relations to the consumers who have overhead tanks or underground sumps in their premises to improve the sanitary conditions of distributed water in order to minimise the risk of contamination.

B. During the implementation of the Project

5) To implement those expansion works for the distribution systems which are described in the section 3-2-3 to accelerate the effects of the Project.

6) To organise a Project Team exclusively for the Project consisting of several expert engineers on planning, construction and O&M to take part in the detailed design period through the construction period reflecting such results into the future O&M system.

7) To clear the site especially where the new distribution chamber is to be constructed, and reconstruct the wall which may be damaged during the construction of distribution chamber.

C. **After the implementation of the Project**

8) To improve the collection efficiency of water revenue where the budget for O & M of the Plant will come from.

9) To secure budgetary scheme for the future rehabilitation works of the Plants.

10) To implement preventive O & M regularly.

11) To secure budgetary scheme sufficiently for the O & M.

12) To implement training for the officials concerned with O & M.

13) To develop institutional and supervisory responsibility for each facility and equipment.

14) To implement raw water source control in order to secure good quality of raw water in the application of the existing treatment process.

15) To secure appropriate storerooms to keep spare parts and tools purchased under the Grant Aid at the Plant, including Labugama, Kalatuwawa, and Ambatale.