

## DIVISION P16 ELECTRICAL WORKS

### P16.1 WATER SUPPLY FACILITIES

#### P16.1.1 High Voltage Switchgear (W10-1 Intake Facilities)

a. General

The electrical components of high voltage switchgear in Intake Pump Station shall consist of the following equipment. Equipment shall be designed using the following conditions and in accordance with the specification set forth hereinafter in this Section.

b. Equipment List (W10-1)

	<b>Item No.</b>	<b>Name</b>	<b>Tag No.</b>	<b>Quantity</b>
1	W10-EE-01	6kV Incoming Panel	W17 ICP01/02	2 sets
2	W10-EE-02	GPT Panel	W17 GPT01/02	2 sets
3	W10-EE-03	6kV Feeder Panel	W17 FDP01 to 08	8 sets
4	W10-EE-04	6kV Tie Breaker Panel	W17 TBP01	1 set
5	W10-EE-05	6kV Incoming Panel	W11 ICP01/02	2 sets
6	W10-EE-06	GPT Panel	W11 GPT01/02	2 sets
7	W10-EE-07	6kV Feeder Panel	W11 FDP01 to 04	4 sets
8	W10-EE-08	6kV Tie Breaker Panel	W11 TBP01	1 set
9	W10-EE-09	Raw Water Pump Panel	W11 RPP01 to 06	6 sets

c. Standard Accessories

Name Plate      Plastic plate, with engraved black letter on white background

Inboard Lighting    with lighting door switch

Door key

Isolation rubber mat

Withdrawing lifter

Spare parts

#### 1. 6kV Incoming Panel (W17 ICP01/02)

a. Purpose

To receive power from each existing transformer at 6kV, 3-phase and 50 Hz.

b. Quantity            : 2 sets

c. Specification (The quantities shall be for each panel)

Type                    Indoor, Self-supporting, Metal enclosed, IP20

Rated voltage	AC6kV
System highest voltage	AC7.2kV
Rated bus current	1250A
Withstand voltage	Lightning impulse 60kV Power-frequency 22kV
Control circuit voltage	AC220V (UPS)
Vacuum circuit breaker (VCB)	: 1 set
Type	Withdrawable, three-pole
Rated voltage	7.2kV
Rated current	1250A
Rated breaking current	25kA
Current transformer (CT)	: 3 sets
Voltage transformer (VT)	: 2 sets
Lightning arrester	: 3 sets
Nominal discharge current	5000A
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch	: 1 lot
Indication lamp	: 1 lot
Necessary accessories	: 1 lot

## **2. GPT Panel (W17 GPT01/02)**

### a. Purpose

To measure the bus voltage for measuring and protective device and to detect the grounding fault.

### b. Quantity : 2 sets

### c. Specification (The quantities shall be for each panel)

Type	Indoor, Self-supporting, Metal enclosed, IP20
Rated voltage	AC6kV
System highest voltage	AC7.2kV
Rated bus current	1250A
Withstand voltage	Lightning impulse 60kV Power-frequency 22kV

Control circuit voltage	AC220V (UPS)
Grounding potential transformer (GPT)	: 3 sets
Type	Withdrawable, three-pole
Rated voltage	6600 / 110 / 190/3 V
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch	: 1 lot
Indication lamp	: 1 lot
Necessary accessories	: 1 lot

### **3. 6kV Feeder Panel (W17 FDP01 to 08)**

a. Purpose

To distribute to each local sub-station at 6kV, 3-phase and 50 Hz.

b. Quantity : 8 sets

c. Specification (The quantities shall be for each panel)

Type	Indoor, Self-supporting, Metal enclosed, IP20
Rated voltage	AC6kV
System highest voltage	AC7.2kV
Rated bus current	1250A
Withstand voltage	Lightning impulse 60kV Power-frequency 22kV
Control circuit voltage	AC220V (UPS)
Vacuum circuit breaker (VCB)	: 1 set
Type	Withdrawable, three-pole
Rated voltage	7.2kV
Rated current	630A
Rated breaking current	25kA
Current transformer (CT)	: 2 sets
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch	: 1 lot
Indication lamp	: 1 lot
Necessary accessories	: 1 lot

**4. 6kV Tie Breaker Panel (W17 TBP01)**

## a. Purpose

To connect both busses of the dual power system and to arrange for the power line.

## b. Quantity : 1 set

## c. Specification

Type Indoor, Self-supporting, Metal enclosed, IP20

Rated voltage AC6kV

System highest voltage AC7.2kV

Rated bus current 1250A

Withstand voltage Lightning impulse 60kV

Power-frequency 22kV

Control circuit voltage AC220V (UPS)

Vacuum circuit breaker (VCB) : 1 set

Type Withdrawable, three-pole

Rated voltage 7.2kV

Rated current 1250A

Rated breaking current 25kA

Measuring instrument As shown on the drawings and the general specifications

Protective relay As shown on the drawings and the general specifications

Control switch : 1 lot

Indication lamp : 1 lot

Necessary accessories : 1 lot

**5. 6kV Incoming Panel (W11 ICP01/02)**

## a. Purpose

To receive power from primary sub-station at 6kV, 3-phase and 50 Hz.

## b. Quantity : 2 sets

## c. Specification (The quantities shall be for each panel)

Type Indoor, Self-supporting, Metal enclosed, IP20

Rated voltage AC6kV

System highest voltage AC7.2kV

Rated bus current 630A

Withstand voltage	Lightning impulse 60kV
	Power-frequency 22kV
Control circuit voltage	AC220V (UPS)
Vacuum circuit breaker (VCB)	: 1 set
Type	Withdrawable, three-pole
Rated voltage	7.2kV
Rated current	630A
Rated breaking current	25kA
Disconnecting switch (DS)	: 1 set
Rated voltage	7.2kV
Current transformer (CT)	: 3 sets
Voltage transformer (VT)	: 2 sets
Lightning arrester	: 3 sets
Nominal discharge current	5000A
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch	: 1 lot
Indication lamp	: 1 lot
Necessary accessories	: 1 lot

## **6. GPT Panel (W11 GPT01/02)**

### a. Purpose

To measure the bus voltage for measuring and protective device and to detect the grounding fault.

### b. Quantity : 2 sets

### c. Specification (The quantities shall be for each panel)

Type	Indoor, Self-supporting, Metal enclosed, IP20
Rated voltage	AC6kV
System highest voltage	AC7.2kV
Rated bus current	630A
Withstand voltage	Lightning impulse 60kV
	Power-frequency 22kV
Control circuit voltage	AC220V (UPS)

Grounding potential transformer (GPT)	: 3 sets
Type	Withdrawable, three-pole
Rated voltage	6600 / 110 / 190/3 V
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch	: 1 lot
Indication lamp	: 1 lot
Necessary accessories	: 1 lot

## **7. 6kV Feeder Panel (W11 FDP01 to 04)**

### a. Purpose

To distribute to Pump starter panels and LV transformer at 6kV, 3-phase and 50 Hz.

### b. Quantity : 4 sets

### c. Specification (The quantities shall be for each panel)

Type	Indoor, Self-supporting, Metal enclosed, IP20
Rated voltage	AC6kV
System highest voltage	AC7.2kV
Rated bus current	630A
Withstand voltage	Lightning impulse 60kV Power-frequency 22kV
Control circuit voltage	AC220V (UPS)
Vacuum circuit breaker (VCB)	: 1 set
Type	Withdrawable, three-pole
Rated voltage	7.2kV
Rated current	630A
Rated breaking current	25kA
Current transformer (CT)	: 2 sets
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch	: 1 lot
Indication lamp	: 1 lot
Necessary accessories	: 1 lot

**8. 6kV Tie Breaker Panel (W11 TBP01)**

## a. Purpose

To connect both busses of the dual power system and to arrange for the power line.

## b. Quantity : 1 set

## c. Specification

Type Indoor, Self-supporting, Metal enclosed, IP20

Rated voltage AC6kV

System highest voltage AC7.2kV

Rated bus current 630A

Withstand voltage Lightning impulse 60kV

Power-frequency 22kV

Control circuit voltage AC220V (UPS)

Vacuum circuit breaker (VCB) : 1 set

Type Withdrawable, three-pole

Rated voltage 7.2kV

Rated current 630A

Rated breaking current 25kA

Measuring instrument As shown on the drawings and the general specifications

Protective relay As shown on the drawings and the general specifications

Control switch : 1 lot

Indication lamp : 1 lot

Necessary accessories : 1 lot

**9. Raw Water Pump Panel (W11 RPP01 to 06)**

## a. Purpose

To start up and control the raw water pumps.

## b. Quantity : 6 sets

## c. Specification (The quantities shall be for each panel)

Type Indoor, Self-supporting, Metal enclosed, IP40

Rated voltage AC6kV

System highest voltage AC7.2kV

Rated bus current 630A

Withstand voltage	Lightning impulse	60kV
	Power-frequency	22kV
Control circuit voltage	AC220V (UPS)	
Motor starter	: 1 set (Direct on line starter)	
Adapted motor	280kW squirrel-cage motor	
Vacuum combination switch (VCS)	: 1 set	
	Type	Three-pole
	Magnetic contactor	: 1 set
	Rated voltage	AC6kV
	Rated capacity	200A
	Power fuse	: 3sets
	Rated voltage	AC7.2kV
	Breaking capacity	25kA
Power capacitor	: 1 set	
	Type	Molded type
	Rated voltage	AC6kV
	Capacity	100kVar
	Series reactor	Dry type 6%
Current transformer (CT)	: 2 sets	
Measuring instrument	As shown on the drawings and the general specifications	
Protective relay	As shown on the drawings and the general specifications	
Control switch	As shown on the drawings and the electrical operation diagram	
Indication lamp	As shown on the drawings and the electrical operation diagram	
Necessary accessories	: 1 lot	

**P16.1.2 Low Voltage Switchgear and Motor Control Center (W10-2 Intake Facilities)**

a. General

The electrical components of low voltage switchgear, motor control center and other control panels in Intake Pump Station shall consist of the following equipment. Equipment shall be designed using the following conditions and in accordance with the specification set forth hereinafter in this Section.

b. Equipment List (W10-2)

	Item No.	Name	Tag No.	Quantity
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1	W10-EE-10	400V Transformer Panel	W17 LTR01/02	2 sets
2	W10-EE-11	400V Feeder Panel	W17 LFP01	1 set
3	W10-EE-12	400V Transformer Panel	W11 LTR01/02	2 sets
4	W10-EE-13	400V Feeder Panel	W11 LFP01	1 set
5	W10-EE-14	UPS	W17 UPS01/02,	3 sets
6	W10-EE-15	Intake MCC & Auxiliary Relay Panel	W11 MCC01	1 set
7	W10-EE-16	Flow Control Panel	W13 FCP01	1 set
8	W10-EE-17	Intake Pump LOP	W11 LOP01 to 06	6 sets
9	W10-EE-18	Inflow Valve LOP	W11 LOP07	1 set
10	W10-EE-19	Isolation Valve LOP	W11 LOP08	1 set
11	W10-EE-20	Sump Drainage Pump LOP	W11 LOP09	1 set
12	W10-EE-21	Intake Substation LOP	W17 LOP01	1 set

### c. Standard Accessories

Name Plate Plastic plate, with engraved black letter on white background

Inboard Lighting with lighting door switch (except Local Operation Panel (LOP))

Door key

Spare parts

### **1. 400V Transformer Panel (W17 LTR01/02)**

#### a. Purpose

To step down voltage from 6kV to 380V at 3-phase, 4-wire and 50 Hz.

#### b. Quantity : 2 sets

#### c. Specification (The quantities shall be for each panel)

Type Molded, 3-phase, 4-wire, double wound, naturally cooled type to be built in metal enclosed switchgear, IP20

Rated capacity 100kVA

Rated voltage 6kV/380-220V

System highest voltage AC7.2kV

Method of connection HV winding Delta connection

LV winding Star connection, neutral solidly earthed

Magnetic contactor : 1set 250A

Measuring instrument As shown on the drawings and the general specifications

Protective relay As shown on the drawings and the general specifications

Control switch : 1 lot

Indication lamp	: 1 lot
Necessary accessories	: 1 lot

## **2. 400V Feeder Panel (W17 LFP01)**

### a. Purpose

To receive low voltage from transformer and to distribute to each low voltage panel or equipment

### b. Quantity : 1 set

### c. Specification

Type	Indoor, self-supporting, metal enclosed, IP20	
Rated insulation voltage	AC600V	
Rated current	600A	
Control circuit voltage	AC 220V	
Molded case circuit breaker (MCCB)	: 1-lot	As shown on the drawings
Measuring instrument	As shown on the drawings and the general specifications	
Protective relay	As shown on the drawings and the general specifications	
Control switch	: 1 lot	
Indication lamp	: 1 lot	
Necessary accessories	: 1 lot	

## **3. 400V Transformer Panel (W11 LTR01/02)**

### a. Purpose

To step down voltage from 6kV to 380V at 3-phase, 4-wire and 50 Hz.

### b. Quantity : 2 sets

### c. Specification (The quantities shall be for each panel)

Type	Molded, 3-phase, 4-wire, double wound, naturally cooled type to be built in metal enclosed switchgear, IP20	
Rated capacity	250kVA	
Rated voltage	6kV/380-220V	
System highest voltage	AC7.2kV	
Method of connection	HV winding	Delta connection
	LV winding	Star connection, neutral solidly earthed
Air circuit breaker	: 1set	4P 630A
Measuring instrument	As shown on the drawings and the general specifications	

Protective relay	As shown on the drawings and the general specifications
Control switch	: 1 lot
Indication lamp	: 1 lot
Necessary accessories	: 1 lot

#### **4. 400V Feeder Panel (W11 LFP01)**

a. Purpose

To receive low voltage from transformer and to distribute to each low voltage panel or equipment

b. Quantity : 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, IP20
Rated insulation voltage	AC600V
Rated current	600A
Control circuit voltage	AC 220V
Molded case circuit breaker (MCCB)	: 1-lot As shown on the drawings
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch	: 1 lot
Indication lamp	: 1 lot
Necessary accessories	: 1 lot

#### **5. UPS (W17 UPS01/02, W11 UPS01)**

a. Purpose

To supply power without short break switching when power failure happened.

b. Quantity : 3 set

c. Specification (The quantities shall be for each panel)

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Input voltage	380V 3-phase
Output voltage	220V single phase
Capacity	5kVA
Backup time	More than 30 minutes
Molded case circuit breaker (MCCB)	: 1-lot As shown on the drawings
Power supply method	Inverter continuous supply with no short break switching

Control switch	: 1 lot
Indication lamp	: 1 lot
Necessary accessories	: 1 lot

## **6. Intake MCC & Auxiliary Relay Panel (W11 MCC01)**

### a. Purpose

To drive and control the intake facilities as shown on the drawings. Manual operations of all electrical loads shall be done by hard relay.

### b. Quantity : 1 set

### c. Specification

Type	Indoor, self-supporting, metal enclosed, single face withdrawal, IP20 Form 3b (IEC 60439-1)
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Mounted device	As shown on the drawings and the electrical operation diagram
Indication lamp	As shown on the drawings and the electrical operation diagram
Necessary accessories	: 1 lot

## **7. Flow Control Panel (W13 FCP01)**

### a. Purpose

To drive and control the flow and surge control facilities.

### b. Quantity : 1 set

### c. Specification

Type	Indoor, self-supporting, metal enclosed, IP42
Control circuit voltage	AC 220V
Molded case circuit breaker (MCCB)	: 1-lot As shown on the drawings
Motor starter	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Mounted device	As shown on the drawings and the electrical operation diagram
Indication lamp	As shown on the drawings and the electrical operation diagram
Power outlet	3P 20A 380V : 1 set
Necessary accessories	: 1 lot

**8. Intake Pump Local Operation Panel (W11 LOP01 to 06)**

## a. Purpose

To operate raw water pump, suction valve, discharge valve.

## b. Quantity : 6 sets

## c. Specification (The quantities shall be for each panel)

Type Indoor, with stand, metal enclosed, IP42, moisture-proof

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Electric space heater : 1 set with a switch and thermostat

Power outlet 3P 20A 380V : 1 set, 2P 20A 220V : 1 set (W11LOP02/05 only)

Necessary accessories : 1 lot

**9. Inflow Valve Local Operation Panel (W11 LOP07)**

## a. Purpose

To operate inflow valves.

## b. Quantity : 1 set

## c. Specification

Type Indoor, wall-mounted, metal enclosed, IP42

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Necessary accessories : 1 lot

**10. Isolation Valve Local Operation Panel (W11 LOP08)**

## a. Purpose

To operate isolation valves.

## b. Quantity : 1 set

## c. Specification

Type Indoor, wall-mounted, metal enclosed, IP42

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Necessary accessories : 1 lot

**11. Sump Drainage Pump Local Operation Panel (W11 LOP09)**

## a. Purpose

To operate isolation valves.

b. Quantity : 1 set

c. Specification

Type Indoor, wall-mounted, metal enclosed, IP42, moisture-proof

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Electric space heater : 1 set with a switch and thermostat

Necessary accessories : 1 lot

## **12. Intake Substation Local Operation Panel (W17 LOP01)**

a. Purpose

To operate 11-sets of 6kV new VCB and 6-sets of existing 35kV OCB in the primary intake substation.

b. Quantity : 1 set

c. Specification

Type Indoor, self-supporting, metal enclosed, IP40

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Necessary accessories : 1 lot

### **P16.1.3 Instrumentation Facilities (W10-3 Intake Facilities)**

a. General

The electrical components of instrumentation in the Intake Pump Station shall consist of the following equipment. Equipment shall be designed using the following conditions and in accordance with the specification set forth hereinafter in this Section.

b. Equipment List (W10-3)

	<b>Item No.</b>	<b>Name</b>	<b>Tag No.</b>	<b>Quantity</b>
1	W10-EE-22	Raw Water Intake Flow	W11 IFM01	1 set
2	W10-EE-23	Pump Suction Water Level (Reservoir level)	W11 ILM01	1 set
3	W10-EE-24	Flow Control Valve Opening Degree	W11 IZM01	1 set
4	W10-EE-25	Sump Drainage Pit Level Switch	W11 ILS01	1 set
5	W10-EE-26	Instrumentation Panel for Intake	W11 INP01	1 set

c. Standard Accessories

Spare parts

**1. Raw Water Intake Flow (W11IFM 01)**

## a. Purpose

To measure the raw water intake flow and to be used for the automatic constant flow control.

## b. Quantity : 1 set

## c. Specification

Type	Ultrasonic type flow meter
Pipe line size	1100 mm
Measurement fluid	Raw water
Measurement range	0~14000 m <sup>3</sup> /hr
Accessories	Alarm setting device : 1 lot Isolator : 1 lot Arrester : 1 lot
Other necessary accessories	: 1 lot

**2. Pump Suction Water Level (Reservoir Level) (W11ILM 01)**

## a. Purpose

To measure the pump suction water level.

## b. Quantity : 1 set

## c. Specification

Type	Flange type level transmitter (Hydrostatic level transmitter)	
Measurement liquid	Raw water	
Measurement range	0~20 m	
Accessories	Distributor	: 1 lot
	Alarm setting device	: 1 lot
	Arrester	: 1 lot
	Stop valve	: 1 set (SUS304)
	Drain pipe	: 1 lot (SUS304)
Other necessary accessories	: 1 lot	

**3. Flow Control Valve Opening Degree (W11IZM 01)**

## a. Purpose

To measure the flow control valve opening degree and to be used for the automatic constant flow control.

- b. Quantity : 1 set
- c. Specification
- |                             |                                       |
|-----------------------------|---------------------------------------|
| Type                        | Mechanical (valve) standard equipment |
| Output signal               | 4~20 mA                               |
| Accessories                 | Isolator : 1 lot                      |
|                             | Arrester : 1 lot                      |
| Other necessary accessories | : 1 lot                               |

#### **4. Sump Drainage Pit Level Switch (W11ILS 01)**

- a. Purpose
- The automatic control of sump drainage pumps.
- b. Quantity : 1 set
- c. Specification
- |                              |                             |
|------------------------------|-----------------------------|
| Type                         | Electrode Type Level Switch |
| Measurement liquid           | Drainage                    |
| Number of rod                | : 4 pieces                  |
| Length of rod                | 1.5 m (Max)                 |
| Material of rod              | Stainless Steel, Type 304   |
| Other necessary accessories: | 1 lot                       |

#### **5. Instrumentation Panel for Intake (W11 INP01)**

- a. Purpose
- To mount indicators and setting devices for monitoring and control and to install auxiliary devices.
- b. Quantity : 1 set
- c. Specification
- |                       |   |
|-----------------------|---|
| Type                  | Indoor, with stand, metal enclosed, IP20                      |
| Mounted device        | As shown on the drawings and the electrical operation diagram |
| Indication lamp       | As shown on the drawings and the electrical operation diagram |
| Necessary accessories | : 1 lot   |

#### **P16.1.4 Monitoring and Control Facilities (W10-4 Intake Facilities)**

a. General

The electrical components of the monitoring and control facilities in the Intake Pump Station shall



consist of the following equipment. Equipment shall be designed using the following conditions and in accordance with the specification set forth hereinafter in this Section.

b. Equipment List (W10-4)

	<b>Item No.</b>	<b>Name</b>	<b>Tag No.</b>	<b>Quantity</b>
1	W10-EE-27	Intake PLC	W11 PLC01	1 set
2	W10-EE-28	Intake Monitoring System	W11 MON01	1 set
3	W10-EE-29	Radio Network System	W11 RNS01	1 set

c. Standard Accessories

Spare parts

**1. Intake PLC (W11PLC 01)**

a. Purpose

To transmit data and for automatic control. Details shall be shown on the drawings and the electrical operation diagram.

b. Quantity : 1 set

c. Specification

Type Indoor, self-supporting, metal enclosed, IP20  
 Processing function Sequential control, Instrumentation loop control  
 Data transmission line Ethernet  
 Input/Output capacities

	Digital I/O	Analog I/O	Pulse I
Total	250	5	5

Necessary accessories : 1 lot

**2. Monitoring System (W11MON 01)**

a. Purpose

To monitor intake facilities using an industrial computer.

b. Quantity : 1 lot

c. Specification

Data transmission line Ethernet  
 Computer Industrial computer : 1 lot  
 OS : Windows 2000  
 Display : More than 20 inches (500 mm)

Exclusive monitoring desks and chairs : 1 lot

## Monitoring items

	Digital I/O	Analog I/O	Pulse I
Total	250	5	5

Necessary accessories : 1 lot

### **3. Radio Network System (W11RNS 01)**

a. Purpose

To transmit data between Intake Pump Station and Water Treatment Plant for control and monitoring. And for voice communication between Intake Pump Station and Water Treatment Plant.

The data on Intake PLC (W11PLC01) shall be logged out and transferred to the PC in WTP through duplex radio communication. The data shall be monitored on the Monitoring System (W44MON01) in the monitoring room sequentially and continuously.

This system consists of 2 VHF frequencies and 4 channels of functions such as Monitoring (Up load), Remote control (Down load), Service Channel and Voice communication.

Antenna towers shall be provided to the WTP and the Intake pump station to communicate directly. In principle, connecting through a relay station shall not accept.

b. Quantity : 1 lot (The equipments shall be installed in the panel.)

c. Altitude Intake Pump Station : 409 m at GL  
Water Treatment Plant : 353 m at GL

d. Distance About 51 km

e. Frequency Receiving / Transiting  
405.475MHz / 413.725MHz : Voice communication  
405.575MHz / 413.775MHz : Data Communication

f. Aerial height WTP : 65 m from GL  
Intake : 35 m from GL

g. Specification

Base station : 2 sets

General

Frequency range : 400 to 430 MHz  
Frequency stability :  $\pm 1.5$  ppm  
Antenna impedance : 50 ohms (N-type)  
Power : 220V AC (UPS)

Receiver

Selectivity : 75 dB

Intermodulation	: 75 dB
Spurious rejection	: 80 dB
Image rejection	: 80 dB
Audio output	: 1 to 4W

**Transmitter**

RF output	: 25W
Maximum deviation	: ±5.0kHz
Modulation type	: Frequency Modulation
Audio distortion	: Less than 2.5% @ 1kHz
Spurious emissions	: 75dB

**Transmitting capacities**

	Digital I/O	Analog I/O	Pulse I
Total	250	5	6

Data transmission modem	: 2 sets
Telephone communication set	: 2 sets
Antenna and towers	: 1 lot
Necessary accessories	: 1 lot

**P16.1.5 Other work (W10-5 Intake Facilities)****a. General**

The electrical work necessary to make Intake Pump Station complete shall consist of the following. The work shall be designed using the following conditions and in accordance with the specification set forth hereinafter in this Section.

**b. Item List (W10-5)**

	Item No.	Name	Tag No.	Quantity
1	W10-EE-30	Wiring Work	W11 WIR01	1 lot

**1. Wiring Work (W11 WIR01)****a. Scope of work**

The works shall include but not be limited to, the following. The details shall be shown on the drawings and the general specification.

- i) Supply and install all wire and cable to new equipment.

- ii) Supply and install all trays, conduits, ducts, trench and other materials necessary to make wiring complete.
- iii) Supply and install all foundations and floor works for all panels.
- iv) Grounding work for the primary sub-station.
- v) Grounding work for the intake pump station.
- vi) Connect to existing cable by straight joint for the following lines.
  - 6kV main cable for No.1 and No.2 existing pump station lines.
  - 6kV main cable for No.1 and No.2 existing dike facilities lines.
- vii) Rewiring from existing high voltage breaker for control and monitoring.
- viii) Remove existing radio facilities from the existing pump station and reinstall it to the new pump station.
- ix) Remove existing disuse equipment if necessary.

#### **P16.1.6 High Voltage Switchgear (W30-1 WTP Facilities)**

##### a. General

The electrical components of the high voltage switchgear in the Water Treatment Plant shall consist of the following equipment. Equipment shall be designed using the following conditions and in accordance with the specification set forth hereinafter in this Section.

##### b. Equipment List (W30-1)

	<b>Item No.</b>	<b>Name</b>	<b>Tag No.</b>	<b>Quantity</b>
1	W30-EE-01	11kV Incoming Panel	W47 ICP01/02	2 sets
2	W30-EE-02	11kV Tie Breaker Panel	W47 TBP01	1 set
3	W30-EE-03	11kV Primary Transformer Panel	W47 PTP01/02	2 sets
4	W30-EE-04	35kV Incoming Panel	W47 ICP01	1 set
5	W30-EE-05	35kV Primary Transformer Panel	W47 PTP03	1 set
6	W30-EE-06	11/6kV Power Transformer	W47 PTR01	1 set
7	W30-EE-07	6kV Incoming Panel (1)	W47 ICP04 to 06	3 sets
8	W30-EE-08	GPT Panel (1)	W47 GPT01/02	2 sets
9	W30-EE-09	6kV Feeder Panel	W47 FDP01 to 06	6 sets
10	W30-EE-10	100kVar Power Capacitor Panel	W47 PCP01/04	2 sets
11	W30-EE-11	200kVar Power Capacitor Panel	W47 PCP02/05	2 sets
12	W30-EE-12	300kVar Power Capacitor Panel	W47 PCP03/06	2 sets
13	W30-EE-13	6kV Tie Breaker Panel (1)	W47 TBP02/03	2 sets
14	W30-EE-14	6kV Incoming Panel (2)	W47 ICP07/08	2 sets
15	W30-EE-15	GPT Panel (2)	W47 GPT03/04	2 sets
16	W30-EE-16	6kV Tie Breaker Panel (2)	W47 TBP04	1 set
17	W30-EE-17	No.4 Distribution Pump Panel	W47 DPP01	1 set

18	W30-EE-18	No.7 Distribution Pump Panel	W47 DPP02	1 set
19	W30-EE-19	No.8 Distribution Pump Panel	W47 DPP03	1 set
20	W30-EE-20	6kV VVVF Unit	W47 VVF01	1 lot

c. Standard Accessories

Name Plate Plastic plate, with engraved black letter on white background

Inboard Lighting with lighting door switch

Door key

Isolation rubber mat

Withdrawing lifter

Spare parts

**1. 11kV Incoming Panel (W47 ICP01/02)**

a. Purpose

To receive power from overhead line at 11kV, 3-phase and 50 Hz by duplex.

b. Quantity : 2 sets

c. Specification (The quantities shall be for each panel)

Type Outdoor, self-supporting, metal enclosed, rain-proof type, IP54

Rated voltage AC11kV

System highest voltage AC12kV

Rated bus current 630A

Withstand voltage Lightning impulse 90kV

Power-frequency 28kV

Control circuit voltage AC220V (UPS)

Vacuum circuit breaker (VCB) : 1 set (It is possible to alternate to SF6 gas filled type.)

Type Three-pole

Rated voltage 12kV

Rated current 630A

Rated breaking current 25kA

Disconnecting switch (DS) : 1 set

Rated voltage 12kV

Rated current 630A

Lightning arrester : 3 sets with disconnecting switch

Nominal discharge current 5000A

Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch	: 1 lot
Indication lamp	: 1 lot
Necessary accessories	: 1 lot

## **2. 11kV Tie Breaker Panel (W47 TBP01)**

### a. Purpose

To connect both busses of the dual power system and to arrange for the power line.

### b. Quantity : 1 set

### c. Specification

Type	Outdoor, self-supporting, metal enclosed, rain-proof type, IP54
Rated voltage	AC11kV
System highest voltage	AC12kV
Rated bus current	630A
Withstand voltage	Lightning impulse 90kV Power-frequency 28kV
Control circuit voltage	AC220V (UPS)
Vacuum circuit breaker (VCB)	: 1 set (It is possible to alternate to SF6 gas filled type.)
Type	Three-pole
Rated voltage	12kV
Rated current	630A
Rated breaking current	25kA
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch	: 1 lot
Indication lamp	: 1 lot
Necessary accessories	: 1 lot

## **3. 11kV Primary Transformer Panel (W47 PTP01/02)**

### a. Purpose

To supply the power to each transformer at 11kV, 3-phase and 50 Hz.

### b. Quantity : 2 sets

## c. Specification (The quantities shall be for each panel)

Type	Outdoor, self-supporting, metal enclosed, rain-proof type, IP54
Rated voltage	AC11kV
System highest voltage	AC12kV
Rated bus current	630A
Withstand voltage	Lightning impulse 90kV Power-frequency 28kV
Control circuit voltage	AC220V (UPS)
Vacuum circuit breaker (VCB)	: 1 set (It is possible to alternate to SF6 gas filled type.)
Type	Three-pole
Rated voltage	12kV
Rated current	630A
Rated breaking current	25kA
Current transformer (CT)	: 3 sets
Voltage transformer (VT)	: 2 sets
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch	: 1 lot
Indication lamp	: 1 lot
Necessary accessories	: 1 lot

**4. 35kV Incoming Panel (W47 ICP03)**

## a. Purpose

To receive power from overhead line at 35kV, 3-phase and 50 Hz.

## b. Quantity : 1 set

## c. Specification

Type	Outdoor, self-supporting, metal enclosed, rain-proof type, IP54
Rated voltage	AC35kV
System highest voltage	AC36kV
Rated bus current	630A
Withstand voltage	Lightning impulse 200kV Power-frequency 70kV
Control circuit voltage	AC220V (UPS)

Vacuum circuit breaker (VCB)	: 1 set (It is possible to alternate to SF6 gas filled type.)
Type	Three-pole
Rated voltage	36kV
Rated current	630A
Rated breaking current	25kA
Disconnecting switch (DS)	: 1 set
Rated voltage	36kV
Rated current	630A
Lightning arrester	: 3 sets with disconnecting switch
Nominal discharge current	5000A
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch	: 1 lot
Indication lamp	: 1 lot
Necessary accessories	: 1 lot

## **5. 35kV Primary Transformer Panel (W47 PTP03)**

### a. Purpose

To supply the power to transformer at 35kV, 3-phase and 50 Hz.

### b. Quantity : 1 set

### c. Specification

Type	Outdoor, self-supporting, metal enclosed, rain-proof type, IP54
Rated voltage	AC35kV
System highest voltage	AC36kV
Rated bus current	630A
Withstand voltage	Lightning impulse 200kV
	Power-frequency 70kV
Control circuit voltage	AC220V (UPS)
Vacuum circuit breaker (VCB)	: 1 set (It is possible to alternate to SF6 gas filled type.)
Type	Three-pole
Rated voltage	36kV
Rated current	630A
Rated breaking current	25kA



Current transformer (CT)	: 3 sets
Voltage transformer (VT)	: 2 sets
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch	: 1 lot
Indication lamp	: 1 lot
Necessary accessories	: 1 lot

#### **6. 11/6kV Power Transformer (W47 PTR01)**

a. Purpose

To step down voltage from 11kV to 6kV at 3-phase, 3-wire and 50 Hz.

b. Quantity : 1 set

c. Specification

Type Oil immersed, 3-phase, 3-wire, double wound, naturally air-cooled, outdoor, water proof type

Rated capacity 6300kVA

Rated voltage 11kV/6000V

Method of connection HV winding Star connection  
LV winding Delta connection

Measuring instrument As shown on the drawings and the general specifications

Protective relay As shown on the drawings and the general specifications

Control switch : 1 lot

Indication lamp : 1 lot

Necessary accessories : 1 lot

#### **7. 6kV Incoming Panel (1) (W47 ICP04 to 06)**

a. Purpose

To receive power from each transformer at 6kV, 3-phase and 50 Hz.

b. Quantity : 3 sets

c. Specification (The quantities shall be for each panel)

Type Indoor, self-supporting, metal enclosed, IP20

Rated voltage AC6kV

System highest voltage AC7.2kV

Rated bus current	1250A
Withstand voltage	Lightning impulse 60kV
	Power-frequency 22kV
Control circuit voltage	AC220V (UPS)
Vacuum circuit breaker (VCB)	: 1 set
Type	Withdrawable, three-pole
Rated voltage	7.2kV
Rated current	1250A
Rated breaking current	25kA
Current transformer (CT)	: 3 sets
Voltage transformer (VT)	: 2 sets
Lightning arrester	: 3 sets
Nominal discharge current	5000A
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch	: 1 lot
Indication lamp	: 1 lot
Necessary accessories	: 1 lot

## **8. GPT Panel (1) (W47 GPT01/02)**

### a. Purpose

To measure the bus voltage for measuring and protective devices and to detect the grounding fault.

### b. Quantity : 2 sets

### c. Specification (The quantities shall be for each panel)

Type	Indoor, self-supporting, metal enclosed, IP20
Rated voltage	AC6kV
System highest voltage	AC7.2kV
Rated bus current	630A
Withstand voltage	Lightning impulse 60kV
	Power-frequency 22kV
Control circuit voltage	AC220V (UPS)
Grounding potential transformer (GPT)	: 3 sets

Type	Withdrawable, three-pole
Rated voltage	6600 / 110 / 190/3 V
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch	: 1 lot
Indication lamp	: 1 lot
Necessary accessories	: 1 lot

## **9. 6kV Feeder Panel (W47 FDP01 to 06)**

### a. Purpose

To distribute to pump starter panels, existing pump station and LV transformer at 6kV, 3-phase and 50 Hz.

### b. Quantity : 6 sets

### c. Specification (The quantities shall be for each panel)

Type	Indoor, self-supporting, metal enclosed, IP20
Rated voltage	AC6kV
System highest voltage	AC7.2kV
Rated bus current	630A
Withstand voltage	Lightning impulse 60kV
	Power-frequency 22kV
Control circuit voltage	AC220V (UPS)
Vacuum circuit breaker (VCB)	: 1 set
Type	Withdrawable, three-pole
Rated voltage	7.2kV
Rated current	630A
Rated breaking current	25kA
Current transformer (CT)	: 2 sets
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch	: 1 lot
Indication lamp	: 1 lot
Necessary accessories	: 1 lot

**10. 100kVar Power Capacitor Panel (W47 PCP01/04)**

## a. Purpose

To improve power factor to be better than 95% automatically.

## b. Quantity : 2 sets

## c. Specification (The quantities shall be for each panel)

Type Indoor, self-supporting, metal enclosed, IP20

Rated voltage AC6kV

System highest voltage AC7.2kV

Rated bus current 630A

Control circuit voltage AC220V

Power capacitor : 1 set

Type Molded type (It is possible to alternate to SF6 gas filled type.)

Capacity 100kVar

Series reactor Dry type 6%

Vacuum combination switch (VCS): 1 set

Type Three-pole

Magnetic contactor : 1 set

Rated voltage AC6kV

Rated capacity 200A

Power fuse : 3sets

Rated voltage AC7.2kV

Breaking capacity 25kA

Measuring instrument As shown on the drawings and the general specifications

Protective relay As shown on the drawings and the general specifications

Control switch : 1 lot

Indication lamp : 1 lot

Necessary accessories : 1 lot

**11. 200kVar Power Capacitor Panel (W47 PCP02/05)**

## a. Purpose

To improve power factor to be better than 95% automatically.

## b. Quantity : 2 sets

## c. Specification (The quantities shall be for each panel)

Type	Indoor, self-supporting, metal enclosed, IP20
Rated voltage	AC6kV
System highest voltage	AC7.2kV
Rated bus current	630A
Control circuit voltage	AC220V
Power capacitor	: 1 set
Type	Molded type (It is possible to alternate to SF6 gas filled type.)
Capacity	200kVar
Series reactor	Dry type 6%
Vacuum combination switch (VCS)	: 1 set
Type	Three-pole
Magnetic contactor	: 1 set
Rated voltage	AC6kV
Rated capacity	200A
Power fuse	: 3 sets
Rated voltage	AC7.2kV
Breaking capacity	25kA
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch	: 1 lot
Indication lamp	: 1 lot
Necessary accessories	: 1 lot

**12. 300kVar Power Capacitor Panel (W47 PCP03/06)**

## a. Purpose

To improve power factor to be better than 95% automatically.

## b. Quantity : 2 sets

## c. Specification (The quantities shall be for each panel)

Type	Indoor, self-supporting, metal enclosed, IP20
Rated voltage	AC6kV
System highest voltage	AC7.2kV
Rated bus current	630A

Control circuit voltage	AC220V
Power capacitor	: 1 set
Type	Molded type (It is possible to alternate to SF6 gas filled type.)
Capacity	300kVar
Series reactor	Dry type 6%
Vacuum combination switch (VCS)	: 1 set
Type	Three-pole
Magnetic contactor	: 1 set
Rated voltage	AC6kV
Rated capacity	200A
Power fuse	: 3sets
Rated voltage	AC7.2kV
Breaking capacity	25kA
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch	: 1 lot
Indication lamp	: 1 lot
Necessary accessories	: 1 lot

### **13. 6kV Tie Breaker Panel (1) (W47 TBP02/03)**

a. Purpose

To connect both busses of the triple power system and to arrange for the power line.

b. Quantity : 2 sets

c. Specification (The quantities shall be for each panel)

Type	Indoor, self-supporting, metal enclosed, IP20
Rated voltage	AC6kV
System highest voltage	AC7.2kV
Rated bus current	630A
Withstand voltage	Lightning impulse 60kV
	Power-frequency 22kV
Control circuit voltage	AC220V (UPS)
Vacuum circuit breaker (VCB)	: 1 set
Type	Withdrawable, three-pole

Rated voltage	7.2kV
Rated current	1250A
Rated breaking current	25kA
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch	: 1 lot
Indication lamp	: 1 lot
Necessary accessories	: 1 lot

#### **14. 6kV Incoming Panel (2) (W47 ICP07/08)**

a. Purpose

To receive power from each feeder panel at 6kV, 3-phase and 50 Hz.

b. Quantity : 2 sets

c. Specification (The quantities shall be for each panel)

Type	Indoor, self-supporting, metal enclosed, IP20
Rated voltage	AC6kV
System highest voltage	AC7.2kV
Rated bus current	630A
Withstand voltage	Lightning impulse 60kV Power-frequency 22kV
Control circuit voltage	AC220V (UPS)
Vacuum circuit breaker (VCB)	: 1 set
Type	Withdrawable, three-pole
Rated voltage	7.2kV
Rated current	630A
Rated breaking current	25kA
Disconnecting switch (DS)	: 1 set
Rated voltage	7.2kV
Current transformer (CT)	: 2 sets
Voltage transformer (VT)	: 2 sets
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch	: 1 lot

Indication lamp : 1 lot

Necessary accessories : 1 lot

#### **15. GPT Panel (2) (W47 GPT03/04)**

a. Purpose

To measure the bus voltage for measuring and protective devices and to detect the grounding fault.

b. Quantity : 2 sets

c. Specification (The quantities shall be for each panel)

Type Indoor, self-supporting, metal enclosed, IP20

Rated voltage AC6kV

System highest voltage AC7.2kV

Rated bus current 630A

Withstand voltage Lightning impulse 60kV

Power-frequency 22kV

Control circuit voltage AC220V (UPS)

Grounding potential transformer (GPT) : 3 sets

Type Withdrawable, three-pole

Rated voltage 6600 / 110 / 190/3 V

Measuring instrument As shown on the drawings and the general specifications

Protective relay As shown on the drawings and the general specifications

Control switch : 1 lot

Indication lamp : 1 lot

Necessary accessories : 1 lot

#### **16. 6kV Tie Breaker Panel (2) (W47 TBP04)**

a. Purpose

To connect both busses of the triple power system and to arrange for the power line.

b. Quantity : 2 sets

c. Specification (The quantities shall be for each panel)

Type Indoor, self-supporting, metal enclosed, IP20

Rated voltage AC6kV

System highest voltage AC7.2kV

Rated bus current 630A



Withstand voltage	Lightning impulse 60kV
	Power-frequency 22kV
Control circuit voltage	AC220V (UPS)
Vacuum circuit breaker (VCB)	: 1 set
Type	Withdrawable, three-pole
Rated voltage	7.2kV
Rated current	630A
Rated breaking current	25kA
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch	: 1 lot
Indication lamp	: 1 lot
Necessary accessories	: 1 lot

#### **17. No.4 Distribution Pump Panel (W47 DPP01)**

a. Purpose

To supply the power to VVVF unit for No.4 distribution pump at 6kV, 3-phase and 50 Hz.

b. Quantity : 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, IP20
Rated voltage	AC6kV
System highest voltage	AC7.2kV
Rated bus current	630A
Withstand voltage	Lightning impulse 60kV
	Power-frequency 22kV
Control circuit voltage	AC220V (UPS)
Vacuum circuit breaker (VCB)	: 1 set
Type	Withdrawable, three-pole
Rated voltage	7.2kV
Rated current	630A
Rated breaking current	25kA
Current transformer (CT)	: 2 sets
Measuring instrument	As shown on the drawings and the general specifications

Protective relay	As shown on the drawings and the general specifications
Control switch	: 1 lot
Indication lamp	: 1 lot
Necessary accessories	: 1 lot

### **18. No.7 Distribution Pump Panel (W47 DPP02)**

a. Purpose

To start up and control No.7 distribution pump.

b. Quantity : 1 set

c. Specification

Type Indoor, self-supporting, metal enclosed, IP20

Rated voltage AC6kV

System highest voltage AC7.2kV

Rated bus current 630A

Withstand voltage Lightning impulse 60kV

Power-frequency 22kV

Control circuit voltage AC220V (UPS)

Motor starter : 1 set (Reactor starter)

Adapted motor 800kW squirrel-cage motor

Vacuum combination switch (VCS) : 1 set

Type Tthree-pole

Magnetic contactor : 1 set

Rated voltage AC6kV

Rated capacity 200A

Power fuse : 3sets

Rated voltage AC7.2kV

Breaking capacity 25kA

Current transformer (CT) : 2 sets

Measuring instrument As shown on the drawings and the general specifications

Protective relay As shown on the drawings and the general specifications

Control switch As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Necessary accessories : 1 lot

**19. No.8 Distribution Pump Panel (W47 DPP03)**

## a. Purpose

To start up and control for No.8 distribution pump.

## b. Quantity : 1 set

## c. Specification

Type Indoor, self-supporting, metal enclosed, IP20

Rated voltage AC6kV

System highest voltage AC7.2kV

Rated bus current 630A

Withstand voltage Lightning impulse 60kV

Power-frequency 22kV

Control circuit voltage AC220V (UPS)

Motor starter : 1 set (Reactor starter)

Adapted motor 520kW squirrel-cage motor

Vacuum combination switch (VCS): 1 set

Type Three-pole

Magnetic contactor : 1 set

Rated voltage AC6kV

Rated capacity 200A

Power fuse : 3sets

Rated voltage AC7.2kV

Breaking capacity 25kA

Current transformer (CT) : 2 sets

Measuring instrument As shown on the drawings and the general specifications

Protective relay As shown on the drawings and the general specifications

Control switch As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Necessary accessories : 1 lot

**20. 6kV VVVF Unit (W47 VVF01)**

## a. Purpose

To start up and control No.4 distribution pump and speed control by pressure and flow automatically.

- b. Quantity : 1 set
- c. Specification
- Type Indoor, self-supporting, metal enclosed, front maintenance type, IP20
- Cooling Air cooled by ventilation fans mounted on panels.
- Rated voltage AC6kV
- System highest voltage AC7.2kV
- Rated bus current 630A
- Control circuit voltage AC220V (UPS)
- Motor starter : 1 set (Inverter starter)
- Adapted motor 800kW squirrel-cage motor
- Input voltage 6kV 3-phase 50Hz
- Capacity 1200kVA
- Inverter power factor 95% or more
- Control method Multi-level sine wave PWM (Pulse Width Modulation) control
- Inverter configuration 6 cell-inverters connected serially per phase
- Voltage/Frequency characteristics
- Constant V/F control with sensor less vector control
- Main control function
- Automatic load reduction control during overload.
- Flying restart (Coasting motor can be smoothly restarted.)
- Specific frequency evasion function.
- Non stop operation during speed reference loss.
- Multiple Acc/Dcc rate setting.
- Main protective devices
- Current limit, Over current, Over voltage, Over load, Under voltage,  
Grounding fault, CPU error, Cooling fan abnormal, Temperature abnormal
- Operation board LCD display with control and setting key.
- Measuring instrument As shown on the drawings and the general specification
- Control switch As shown on the drawings and the electrical operation diagram
- Indication lamp As shown on the drawings and the electrical operation diagram
- Necessary accessories : 1 lot

**P16.1.7 Low Voltage Switchgear and Motor Control Center (W30-2 WTP Facilities)**

## a. General

The electrical components for the low voltage switchgear, motor control center and other control panels in Water Treatment Plant shall consist of the following equipment. Equipment shall be designed using the following conditions and in accordance with the specification set forth hereinafter in this Section.

## b. Equipment List (W30-2)

	<b>Item No.</b>	<b>Name</b>	<b>Tag No.</b>	<b>Quantity</b>
1	W30-EE-21	400V Transformer Panel	W47 LTR01/02	2 sets
2	W30-EE-22	Secondary Transformer Panel	W47 STP01/02	2 sets
3	W30-EE-23	400V Feeder Panel	W47 LFP01	1 set
4	W30-EE-24	UPS	W47 UPS01/02,	3 sets
5	W30-EE-25	Receiving Well & Chemical Facilities MCC	W44 MCC01	1 set
6	W30-EE-26	Water Treatment MCC	W44 MCC02	1 set
7	W30-EE-27	Pump Station MCC & Auxiliary Relay	W35 MCC01	1 set
8	W30-EE-28	Administration 400V Feeder Panel	W44 LFP01	1 set
9	W30-EE-29	Distribution Chamber LCP	W31 LCP01	1 set
10	W30-EE-30	Backwash Recovery Incoming Panel	W36 ICP01	1 set
11	W30-EE-31	Backwash Recovery Pump LCP	W36 BRP01 to 03	3 sets
12	W30-EE-32	Sludge Pump LCP	W36 SPP01	1 set
13	W30-EE-33	Sludge Thickener LCP	W37 STP01	1 set
14	W30-EE-34	Sludge Pump LCP	W37 SPP01	1 set
15	W30-EE-35	Discharge Pool LCP	W40 DPP01	1 set
16	W30-EE-36	Coagulant Transfer Pump LCP	W45 LCP01	1 set
17	W30-EE-37	Chlorination Distribution Panel	W45 CDP01	1 set
18	W30-EE-38	WTP Substation LOP	W47 LOP01	1 set
19	W30-EE-39	Inflow Valve LOP	W32 LOP01	1 set
20	W30-EE-40	Inflow Gate LOP	W32 LOP02	1 set
21	W30-EE-41	Inflow Gate LOP	W33 LOP01 to 06	6 sets
22	W30-EE-42	Sludge Collector LOP	W33 LOP07 to 12	6 sets
23	W30-EE-43	Sump Drainage Pump LOP	W33 LOP13/14	2 sets
24	W30-EE-44	Sampling Pump LOP	W33 LOP15	1 set
25	W30-EE-45	Air Compressor LOP	W33 LOP16	1 set
26	W30-EE-46	Filter Washing LOP	W34 LOP01 to 12	12 sets
27	W30-EE-47	Vacuum Pump LOP	W34 LOP13	1 set
28	W30-EE-48	Air Compressor LOP	W34 LOP14	1 set
29	W30-EE-49	Sampling Pump LOP	W34 LOP15	1 set
30	W30-EE-50	No.4 Distribution Pump LOP	W35 LOP01	1 set
31	W30-EE-51	Backwash Pump LOP	W35 LOP02	1 set

32	W30-EE-52	Distribution Pump -1 LOP	W35 LOP03	1 set
33	W30-EE-53	Distribution Pump -2 LOP	W35 LOP04	1 set
34	W30-EE-54	No.7, 8 Distribution LOP	W35 LOP05	1 set
35	W30-EE-55	Technical Water Pump LOP	W35 LOP06	1 set
36	W30-EE-56	Backwash Pump LOP	W35 LOP07/08	2 sets
37	W30-EE-57	Distribution Pump LOP	W35 LOP09 to 16	8 sets
38	W30-EE-58	Technical Water Pump LOP	W35 LOP17 to 19	3 sets
39	W30-EE-59	Sump Drainage Pump LOP	W35 LOP20	1 set
40	W30-EE-60	Backwash Recovery Pump LOP	W36 LOP01	1 set
41	W30-EE-61	Sludge Pump LOP	W36 LOP02	1 set
42	W30-EE-62	Sump Drainage Pump LOP	W36 LOP03	1 set
43	W30-EE-63	Sludge Thickener LOP	W37 LOP01	1 set
44	W30-EE-64	Sludge Pump LOP	W37 LOP02	1 set
45	W30-EE-65	Sump Drainage Pump LOP	W37 LOP03	1 set
46	W30-EE-66	Wastewater Discharge Pump LOP	W40 LOP01	1 set
47	W30-EE-67	Sump Drainage Pump LOP	W40 LOP02	1 set
48	W30-EE-68	Coagulant Pump LOP	W45 LOP01	1 set
49	W30-EE-69	Flocculant Pump LOP	W45 LOP02	1 set
50	W30-EE-70	Activated Carbon Pump LOP	W45 LOP03	1 set
51	W30-EE-71	Coagulant Control Valve LOP	W45 LOP04	1 set
52	W30-EE-72	Activated Carbon Blower LOP	W45 LOP05	1 set

c. Standard Accessories

Name Plate Plastic plate, with engraved black letter on white background

Inboard Lighting with lighting door switch (except Local Operation Panels (LOP))

Door key

Spare parts

**1. 400V Transformer Panel (W47 LTR01/02)**

a. Purpose

To step down voltage from 6kV to 380V at 3-phase, 4-wire and 50 Hz.

b. Quantity : 2 sets

c. Specification (The quantities shall be for each panel)

Type Molded, 3-phase, 4-wire, double wound, naturally cooled type to be built in metal enclosed switchgear, IP20

Rated capacity 1000kVA

Rated voltage 6kV/380-220V

System highest voltage AC7.2kV

Method of connection	HV winding	Delta connection
	LV winding	Star connection, neutral solidly earthed
Measuring instrument	As shown on the drawings and the general specifications	
Protective relay	As shown on the drawings and the general specifications	
Indication lamp	: 1 lot	
Necessary accessories	: 1 lot	

## **2. Secondary Transformer Panel (W47 STP01/02)**

### a. Purpose

To receive low voltage from transformer and to distribute to LV feeder panel by dual supply.

### b. Quantity : 2 sets

### c. Specification (The quantities shall be for each panel)

Type Indoor, self-supporting, metal enclosed, IP20

Rated insulation voltage AC600V

Rated current 1600A

Control circuit voltage AC 220V

Air circuit breaker (ACB) : 1 set

Type Withdrawable, 4-pole, motor operated

Rated current 1600A

Rated breaking current not less than 50kA (sym)

Current transformer (CT) : 3 sets Molded type

Voltage transformer (VT) : 2 sets Molded type

Measuring instrument As shown on the drawings and the general specifications

Protective relay As shown on the drawings and the general specifications

Control switch : 1 lot

Indication lamp : 1 lot

Necessary accessories : 1 lot

## **3. 400V Feeder Panel (W47 LFP01)**

### a. Purpose

To distribute to each low voltage panel or equipment

### b. Quantity : 1 set

### c. Specification

Type	Indoor, self-supporting, metal enclosed, IP20
Rated insulation voltage	AC600V
Rated current	1600A
Control circuit voltage	AC 220V
Molded case circuit breaker (MCCB)	: 1-lot As shown on the drawings
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch	: 1 lot
Indication lamp	: 1 lot
Necessary accessories	: 1 lot

#### **4. UPS (W47 UPS01/02, W44 UPS01)**

a. Purpose

To supply power without short break switching when power failure happened.

b. Quantity : 3 set

c. Specification (The quantities shall be for each panel)

Type	Indoor, self-supporting, metal enclosed, IP20
Input voltage	380V 3-phase
Output voltage	220V single phase
Capacity	5kVA
Backup time	More than 30 minutes
Molded case circuit breaker (MCCB)	: 1-lot As shown on the drawings
Power supply method	Inverter continuous supply with no short break switching
Control switch	: 1 lot
Indication lamp	: 1 lot
Necessary accessories	: 1 lot

#### **5. Receiving Well & Chemical Facilities MCC & Auxiliary Relay Panel (W44 MCC01)**

a. Purpose

To drive and control the receiving well and chemical facilities as shown on the drawings. Manual operations of all electrical loads shall be done by hard relay.

b. Quantity : 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, single face withdrawal, IP20
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## Form 3b (IEC 60439-1)

Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Mounted device	As shown on the drawings and the electrical operation diagram
Indication lamp	As shown on the drawings and the electrical operation diagram
Necessary accessories	: 1 lot

**6. Water Treatment MCC & Auxiliary Relay Panel (W44 MCC02)**

## a. Purpose

To drive and control the water treatment facilities as shown on the drawings.

Manual operations of all electrical loads shall be done by hard relay.

## b. Quantity : 1 set

## c. Specification

Type Indoor, self-supporting, metal enclosed, single face withdrawal, IP20

## Form 3b (IEC 60439-1)

Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Mounted device	As shown on the drawings and the electrical operation diagram
Indication lamp	As shown on the drawings and the electrical operation diagram
Necessary accessories	: 1 lot

**7. Pump Station MCC & Auxiliary Relay Panel (W35 MCC01)**

## a. Purpose

To drive and control the existing pump station as shown on the drawings.

Manual operations of all electrical loads shall be done by hard relay.

## b. Quantity : 1 set

## c. Specification

Type Indoor, self-supporting, metal enclosed, single face withdrawal, IP20

## Form 3b (IEC 60439-1)

Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications

Protective relay	As shown on the drawings and the general specifications
Mounted device	As shown on the drawings and the electrical operation diagram
Indication lamp	As shown on the drawings and the electrical operation diagram
Necessary accessories	: 1 lot

### **8. Administration 400V Feeder Panel (W44 LFP01)**

a. Purpose

To distribute to each low voltage panel and equipment in and around the administration building.

b. Quantity : 1 set

c. Specification

Type Indoor, self-supporting, metal enclosed, IP20

Rated insulation voltage AC600V

Rated current 600A

Control circuit voltage AC 220V

Molded case circuit breaker (MCCB) : 1-lot As shown on the drawings

Measuring instrument As shown on the drawings and the general specifications

Protective relay As shown on the drawings and the general specifications

Control switch : 1 lot

Indication lamp : 1 lot

Necessary accessories : 1 lot

### **9. Distribution Chamber Local Control Panel (W31 LCP01)**

a. Purpose

To receive power from LV feeder panel and to drive and control the distribution chamber facilities.

b. Quantity : 1 set

c. Specification

Type Indoor, self-supporting, metal enclosed, IP42, moisture-proof

Control circuit voltage AC 220V

Molded case circuit breaker (MCCB) : 1-lot As shown on the drawings

Motor starter As shown on the drawings and the general specifications

Protective relay As shown on the drawings and the general specifications

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp	As shown on the drawings and the electrical operation diagram
Power outlet	3P 20A 380V : 1 set
Necessary accessories	: 1 lot

#### **10. Backwash Recovery Incoming Panel (W36 ICP01)**

a. Purpose

To receive power from LV feeder panel and to distribute to each low voltage panel and equipment in the sludge treatment facilities.

b. Quantity : 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, IP40
Control circuit voltage	AC 220V
Molded case circuit breaker (MCCB)	: 1-lot As shown on the drawings
Protective relay	As shown on the drawings and the general specifications
Mounted device	As shown on the drawings and the electrical operation diagram
Indication lamp	As shown on the drawings and the electrical operation diagram
Power outlet	3P 20A 380V : 1 set
Necessary accessories	: 1 lot

#### **11. Backwash Recovery Pump Local Control Panel (W36 BRP01 to 03)**

a. Purpose

To drive and control backwash recovery pumps.

b. Quantity : 3 sets

c. Specification (The quantities shall be for each panel)

Type	Indoor, self-supporting, metal enclosed, IP40
Control circuit voltage	AC 220V
Molded case circuit breaker (MCCB)	: 1-lot As shown on the drawings
Motor starter	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Mounted device	As shown on the drawings and the electrical operation diagram
Indication lamp	As shown on the drawings and the electrical operation diagram
Necessary accessories	: 1 lot

**12. Sludge Pump Local Control Panel (W36 SPP01)**

## a. Purpose

To drive and control sludge pumps and sump drainage pumps.

## b. Quantity : 1 set

## c. Specification

Type Indoor, self-supporting, metal enclosed, IP40

Control circuit voltage AC 220V

Molded case circuit breaker (MCCB) : 1-lot As shown on the drawings

Motor starter As shown on the drawings and the general specifications

Protective relay As shown on the drawings and the general specifications

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Necessary accessories : 1 lot

**13. Sludge Thickener Local Control Panel (W37 STP01)**

## a. Purpose

To receive power from Backwash Recovery Incoming panel and to drive and control the sludge thickeners and sump drainage pumps.

## b. Quantity : 1 set

## c. Specification

Type Indoor, self-supporting, metal enclosed, IP40

Control circuit voltage AC 220V

Molded case circuit breaker (MCCB) : 1-lot As shown on the drawings

Motor starter As shown on the drawings and the general specifications

Protective relay As shown on the drawings and the general specifications

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Power outlet 3P 20A 380V : 1 set

Necessary accessories : 1 lot

**14. Sludge Pump Local Control Panel (W37 SPP01)**

## a. Purpose

To drive and control the sludge pumps.

- b. Quantity : 1 set
- c. Specification
  - Type Indoor, self-supporting, metal enclosed, IP40
  - Control circuit voltage AC 220V
  - Molded case circuit breaker (MCCB) : 1-lot As shown on the drawings
  - Motor starter As shown on the drawings and the general specifications
  - Protective relay As shown on the drawings and the general specifications
  - Mounted device As shown on the drawings and the electrical operation diagram
  - Indication lamp As shown on the drawings and the electrical operation diagram
  - Necessary accessories : 1 lot

#### **15. Discharge Pool Local Control Panel (W40 DPP01)**

- a. Purpose

To receive power from Backwash Recovery Incoming Panel and to drive and control the discharge pumps and sump drainage pumps.
- b. Quantity : 1 set
- c. Specification
  - Type Indoor, self-supporting, metal enclosed, IP40
  - Control circuit voltage AC 220V
  - Molded case circuit breaker (MCCB) : 1-lot As shown on the drawings
  - Motor starter As shown on the drawings and the general specifications
  - Protective relay As shown on the drawings and the general specifications
  - Mounted device As shown on the drawings and the electrical operation diagram
  - Indication lamp As shown on the drawings and the electrical operation diagram
  - Power outlet 3P 20A 380V : 1 set
  - Necessary accessories : 1 lot

#### **16. Coagulant Transfer Pump Local Control Panel (W45 LCP01)**

- a. Purpose

To receive power from Chemical MCC and to drive and control the coagulant transfer pumps.
- b. Quantity : 1 set
- c. Specification
  - Type Indoor, with stand, metal enclosed, IP52

Control circuit voltage	AC 220V
Molded case circuit breaker (MCCB)	: 1-lot As shown on the drawings
Motor starter	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Mounted device	As shown on the drawings and the electrical operation diagram
Indication lamp	As shown on the drawings and the electrical operation diagram
Power outlet	3P 20A 380V : 1 set
Necessary accessories	: 1 lot

### **17. Chlorination Distribution Panel (W45 CDP01)**

a. Purpose

To receive power from Administration LV Feeder Panel and to distribute power to the chlorination equipment.

b. Quantity : 1 set

c. Specification

Type Indoor, wall-mounted, metal enclosed, IP52

Control circuit voltage AC 220V

Molded case circuit breaker (MCCB) : 1-lot As shown on the drawings

Motor starter As shown on the drawings and the general specifications

Protective relay As shown on the drawings and the general specifications

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Necessary accessories : 1 lot

### **18. WTP Substation Local Operation Panel (W47 LOP01)**

a. Purpose

To operate 18-sets of VCB and 6-sets VCS in the WTP substation control room.

b. Quantity : 1 set

c. Specification

Type Indoor, self-supporting, metal enclosed, IP40

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Necessary accessories : 1 lot

**19. Inflow Valve Local Operation Panel (W32 LOP01)**

a. Purpose

To operate inflow valves.

b. Quantity : 1 set

c. Specification

Type Indoor, wall-mounted, metal enclosed, IP42

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Electric space heater : 1 set with a switch and thermostat

Necessary accessories : 1 lot

**20. Inflow Gate Local Operation Panel (W32 LOP02)**

a. Purpose

To operate inflow gates.

b. Quantity : 1 set

c. Specification

Type Indoor, wall-mounted, metal enclosed, IP42

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Electric space heater : 1 set with a switch and thermostat

Necessary accessories : 1 lot

**21. Inflow Gate Local Operation Panel (W33 LOP01 to 06)**

a. Purpose

To operate inflow gates.

b. Quantity : 6 sets

c. Specification (The quantities shall be for each panel)

Type Indoor, with stand, metal enclosed, IP42

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Electric space heater : 1 set with a switch and thermostat

Necessary accessories : 1 lot

**22. Sludge Collector Local Operation Panel (W33 LOP07 to 12)**

## a. Purpose

To operate sludge collectors.

## b. Quantity : 6 sets

## c. Specification (The quantities shall be for each panel)

Type Indoor, with stand, metal enclosed, IP42

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Electric space heater : 1 set with a switch and thermostat

Necessary accessories : 1 lot

**23. Sump Drainage Pump Local Operation Panel (W33 LOP13/14)**

## a. Purpose

To operate sump drainage pumps.

## b. Quantity : 2 sets

## c. Specification (The quantities shall be for each panel)

Type Indoor, wall-mounted, metal enclosed, IP42

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Electric space heater : 1 set with a switch and thermostat

Necessary accessories : 1 lot

**24. Sampling Pump Local Operation Panel (W33 LOP15)**

## a. Purpose

To operate sampling pumps.

## b. Quantity : 1 set

## c. Specification

Type Indoor, with stand, metal enclosed, IP42, moisture-proof

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Electric space heater : 1 set with a switch and thermostat

Necessary accessories : 1 lot



**25. Air Compressor Local Operation Panel (W33 LOP16)**

## a. Purpose

To operate air compressors.

## b. Quantity : 1 set

## c. Specification

Type Indoor, with stand, metal enclosed, IP42, moisture-proof

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Electric space heater : 1 set with a switch and thermostat

Necessary accessories : 1 lot

**26. Filter Washing Local Operation Panel (W34 LOP01 to 12)**

## a. Purpose

To operate filter washing.

## b. Quantity : 12 sets

## c. Specification (The quantities shall be for each panel)

Type Indoor, self-supporting, metal enclosed, IP42, moisture-proof

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Electric space heater : 1 set with a switch and thermostat

Necessary accessories : 1 lot

**27. Vacuum Pump Local Operation Panel (W34 LOP13)**

## a. Purpose

To operate vacuum pumps.

## b. Quantity : 1 set

## c. Specification

Type Indoor, with stand, metal enclosed, IP42, moisture-proof

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Electric space heater : 1 set with a switch and thermostat

Necessary accessories : 1 lot

**28. Air Compressor Local Operation Panel (W34 LOP14)**

a. Purpose

To operate air compressors.

b. Quantity : 1 set

c. Specification

Type Indoor, with stand, metal enclosed, IP42, moisture-proof

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Electric space heater : 1 set with a switch and thermostat

Necessary accessories : 1 lot

**29. Sampling Pump Local Operation Panel (W34 LOP15)**

a. Purpose

To operate sampling pumps.

b. Quantity : 1 set

c. Specification

Type Indoor, with stand, metal enclosed, IP42, moisture-proof

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Electric space heater : 1 set with a switch and thermostat

Necessary accessories : 1 lot

**30. No.4 Distribution Pump Local Operation Panel (W35 LOP01)**

a. Purpose

To operate No.4 distribution pump.

b. Quantity : 1 set

c. Specification

Type Indoor, wall-mounted, metal enclosed, IP42

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Operation board LCD display with control and setting key.

(VVVF standard application)

Necessary accessories : 1 lot

**31. Backwash Pump Local Operation Panel (W35 LOP02)**

a. Purpose

To operate existing backwash pumps.

b. Quantity : 1 set

c. Specification

Type Indoor, wall-mounted, metal enclosed, IP42

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Necessary accessories : 1 lot

**32. Distribution Pump -1 Local Operation Panel (W35 LOP03)**

a. Purpose

To operate existing No.1~ No.3 distribution pumps.

b. Quantity : 1 set

c. Specification

Type Indoor, wall-mounted, metal enclosed, IP42

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Necessary accessories : 1 lot

**33. Distribution Pump -2 Local Operation Panel (W35 LOP04)**

a. Purpose

To operate existing No.5 and No.6 distribution pumps.

b. Quantity : 1 set

c. Specification

Type Indoor, wall-mounted, metal enclosed, IP42

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Necessary accessories : 1 lot

**34. No.7, 8 Distribution Pump Local Operation Panel (W35 LOP05)**

a. Purpose

To operate No.7 and No.8 distribution pumps.

b. Quantity : 1 set

c. Specification

Type	Indoor, wall-mounted, metal enclosed, IP42
Mounted device	As shown on the drawings and the electrical operation diagram
Indication lamp	As shown on the drawings and the electrical operation diagram
Necessary accessories	: 1 lot

**35. Technical Water Pump Local Operation Panel (W35 LOP06)**

a. Purpose

To operate existing technical water pumps.

b. Quantity : 1 set

c. Specification

Type	Indoor, wall-mounted, metal enclosed, IP42
Mounted device	As shown on the drawings and the electrical operation diagram
Indication lamp	As shown on the drawings and the electrical operation diagram
Necessary accessories	: 1 lot

**36. Backwash Pump Local Operation Panel (W35 LOP07/08)**

a. Purpose

To operate backwash pumps, suction valves and discharge valves.

b. Quantity : 2 sets

c. Specification (The quantities shall be for each panel)

Type	Indoor, wall-mounted, metal enclosed, IP42
Mounted device	As shown on the drawings and the electrical operation diagram
Indication lamp	As shown on the drawings and the electrical operation diagram
Electric space heater	: 1 set with a switch and thermostat
Necessary accessories	: 1 lot

**37. Distribution Pump Local Operation Panel (W35 LOP09 to 16)**

a. Purpose

To operate distribution pumps, suction valves and discharge valves.

b. Quantity : 8 sets

c. Specification (The quantities shall be for each panel)

Type	Indoor, wall-mounted, metal enclosed, IP42
Mounted device	As shown on the drawings and the electrical operation diagram

Indication lamp	As shown on the drawings and the electrical operation diagram
Electric space heater	: 1 set with a switch and thermostat
Necessary accessories	: 1 lot

### **38. Technical Water Pump Local Operation Panel (W35 LOP17 to 19)**

a. Purpose

To operate technical water pumps, suction valves and discharge valves.

b. Quantity : 3 sets

c. Specification (The quantities shall be for each panel)

Type	Indoor, wall-mounted, metal enclosed, IP42
Mounted device	As shown on the drawings and the electrical operation diagram
Indication lamp	As shown on the drawings and the electrical operation diagram
Electric space heater	: 1 set with a switch and thermostat
Necessary accessories	: 1 lot

### **39. Sump Drainage Pump Local Operation Panel (W35 LOP20)**

a. Purpose

To operate sump drainage pumps.

b. Quantity : 1 set

c. Specification

Type	Indoor, with stand, metal enclosed, IP42
Mounted device	As shown on the drawings and the electrical operation diagram
Indication lamp	As shown on the drawings and the electrical operation diagram
Electric space heater	: 1 set with a switch and thermostat
Necessary accessories	: 1 lot

### **40. Backwash Recovery Pump Local Operation Panel (W36 LOP01)**

a. Purpose

To operate backwash recovery pumps.

b. Quantity : 1 set

c. Specification

Type	Indoor, with stand, metal enclosed, IP42
Mounted device	As shown on the drawings and the electrical operation diagram
Indication lamp	As shown on the drawings and the electrical operation diagram

- Electric space heater : 1 set with a switch and thermostat
- Necessary accessories : 1 lot

**41. Sludge Pump Local Operation Panel (W36 LOP02)**

- a. Purpose  
To operate sludge pumps.
- b. Quantity : 1 set
- c. Specification
  - Type Indoor, with stand, metal enclosed, IP42
  - Mounted device As shown on the drawings and the electrical operation diagram
  - Indication lamp As shown on the drawings and the electrical operation diagram
  - Electric space heater : 1 set with a switch and thermostat
  - Necessary accessories : 1 lot

**42. Sump Drainage Pump Local Operation Panel (W36 LOP03)**

- a. Purpose  
To operate sump drainage pumps.
- b. Quantity : 1 set
- c. Specification
  - Type Indoor, wall-mounted, metal enclosed, IP42
  - Mounted device As shown on the drawings and the electrical operation diagram
  - Indication lamp As shown on the drawings and the electrical operation diagram
  - Electric space heater : 1 set with a switch and thermostat
  - Necessary accessories : 1 lot

**43. Sludge Thickener Local Operation Panel (W37 LOP01)**

- a. Purpose  
To operate sludge thickeners.
- b. Quantity : 1 set
- c. Specification
  - Type Indoor, wall-mounted, metal enclosed, IP42
  - Mounted device As shown on the drawings and the electrical operation diagram
  - Indication lamp As shown on the drawings and the electrical operation diagram
  - Electric space heater : 1 set with a switch and thermostat

Necessary accessories : 1 lot

**44. Sludge Pump Local Operation Panel (W37 LOP02)**

a. Purpose

To operate sludge pumps.

b. Quantity : 1 set

c. Specification

Type Indoor, with stand, metal enclosed, IP42

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Electric space heater : 1 set with a switch and thermostat

Necessary accessories : 1 lot

**45. Sump Drainage Pump Local Operation Panel (W37 LOP03)**

a. Purpose

To operate sump drainage pumps.

b. Quantity : 1 set

c. Specification

Type Indoor, wall-mounted, metal enclosed, IP42

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Electric space heater : 1 set with a switch and thermostat

Necessary accessories : 1 lot

**46. Wastewater Discharge Pump Local Operation Panel (W40 LOP01)**

a. Purpose

To operate wastewater discharge pumps.

b. Quantity : 1 set

c. Specification

Type Indoor, with stand, metal enclosed, IP42

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Electric space heater : 1 set with a switch and thermostat

Necessary accessories : 1 lot

**47. Sump Drainage Pump Local Operation Panel (W40 LOP02)**

a. Purpose

To operate sump drainage pumps.

b. Quantity : 1 set

c. Specification

Type Indoor, wall-mounted, metal enclosed, IP42

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Electric space heater : 1 set with a switch and thermostat

Necessary accessories : 1 lot

**48. Coagulant Pump Local Operation Panel (W45 LOP01)**

a. Purpose

To operate coagulant pumps.

b. Quantity : 1 set

c. Specification

Type Indoor, wall-mounted, metal enclosed, IP52

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Electric space heater : 1 set with a switch and thermostat

Necessary accessories : 1 lot

**49. Flocculant Pump Local Operation Panel (W45 LOP02)**

a. Purpose

To operate flocculant pumps and mixers.

b. Quantity : 1 set

c. Specification

Type Indoor, wall-mounted, metal enclosed, IP52

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Electric space heater : 1 set with a switch and thermostat

Necessary accessories : 1 lot



**50. Activated Carbon Pump Local Operation Panel (W45 LOP03)**

a. Purpose

To operate activated carbon pumps.

b. Quantity : 1 set

c. Specification

Type Indoor, wall-mounted, metal enclosed, IP52

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Electric space heater : 1 set with a switch and thermostat

Necessary accessories : 1 lot

**51. Coagulant Control Valve Local Operation Panel (W45 LOP04)**

a. Purpose

To operate coagulant control valve.

b. Quantity : 1 set

c. Specification

Type Indoor, wall-mounted, metal enclosed, IP52

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Electric space heater : 1 set with a switch and thermostat

Necessary accessories : 1 lot

**52. Activated Carbon Blower Local Operation Panel (W45 LOP06)**

a. Purpose

To operate activated carbon blowers and Exhaust fan.

b. Quantity : 1 set

c. Specification

Type Indoor, wall-mounted, metal enclosed, IP52

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Electric space heater : 1 set with a switch and thermostat

Necessary accessories : 1 lot

**P16.1.8 Instrumentation Facilities (W30-3 WTP Facilities)**

## a. General

The electrical components of the instrumentation in the Water Treatment Plant shall consist of the following equipment. Equipment shall be designed using the following conditions and in accordance with the specification set forth hereinafter in this Section.

## b. Equipment List (W30-3)

	<b>Item No.</b>	<b>Name</b>	<b>Tag No.</b>	<b>Quantity</b>
1	W30-EE-73	Raw Water Distribution Flow	W31 IFM01/02	2 sets
2	W30-EE-74	Surface Wash Water Flow	W34 IFM01/02	2 sets
3	W30-EE-75	Distribution Flow	W35 IFM01	1 set
4	W30-EE-76	No.1 Distribution Flow for TET's	W35 IFM02	1 set
5	W30-EE-77	No.2 Distribution Flow for TET's	W35 IFM03	1 set
6	W30-EE-78	Distribution Flow (Technical Water)	W35 IFM04/05	2 sets
7	W30-EE-79	Recovery Water Flow	W36 IFM01	1 set
8	W30-EE-80	Wastewater Discharge Flow	W40 IFM01	1 set
9	W30-EE-81	Coagulant Dosing Flow	W45 IFM01	1 set
10	W30-EE-82	Reservoir Level	W30 ILM01 to 04	4 sets
11	W30-EE-83	Washing Drain Level	W36 ILM01	1 set
12	W30-EE-84	Discharge Pool Level	W40 ILM01	1 set
13	W30-EE-85	Inflow Pressure	W31 IPM01/02	2 sets
14	W30-EE-86	Distribution Pressure	W35 IPM01	1 set
15	W30-EE-87	Distribution Pressure (Technical)	W35 IPM02	1 set
16	W30-EE-88	Inflow Control Valve Opening Degree	W31 IZM01	1 set
17	W30-EE-89	Coagulant Control Valve Opening Degree	W45 IZM01	1 set
18	W30-EE-90	Temperature Meter	W30 ITM01	1 set
19	W30-EE-91	Chlorine Dosing System	W45 ICL01	1 lot
20	W30-EE-92	Sump Drainage Pit Level Switch	W33 ILS01/02	6 sets
21	W30-EE-93	Sampling Pump Level Switch	W33 ILS03	2 sets
22	W30-EE-94	Filter Level Switch	W34 ILS01 to 12	12 sets
23	W30-EE-95	Washing Drain Basin Level Switch	W36 ILS02	1 set
24	W30-EE-96	Discharge Pool Level Switch	W40 ILS02	1 set
25	W30-EE-97	Coagulant Tank Level Switch	W45 ILS01	1 set
26	W30-EE-98	Flocculant Tank Level Switch	W45 ILS02	1 set
27	W30-EE-99	Activated Carbon Tank Level Switch	W45 ILS03	1 set
28	W30-EE-100	Distribution Chamber Level Switch	W31 ILS01	1 set
29	W30-EE-101	Instrumentation Panel for Distribution Chamber	W31 INP01	1 set
30	W30-EE-102	Instrumentation Panel for WTP	W44 INP01	1 set
31	W30-EE-103	Instrumentation Panel for Distribution Pump Station	W35 INP01	1 set

32	W30-EE-104	PLC and Instrumentation Panel for	W36 INP01	1 set
33	W30-EE-105	In-plant Water Distribution Flow	W30 IFM01	1 set

## c. Standard Accessories

Spare parts

**1. Raw Water Distribution Flow (W31 IFM 01/02)**

## a. Purpose

To measure the raw water distribution flow and to use for the automatic pressure control.

## b. Quantity : 2 sets

## c. Specification (The quantities shall be for each panel)

Type Ultrasonic type flow meter

Pipe line size 1200 mm

Measurement fluid Raw water

Measurement range 0~8000 m<sup>3</sup>/hr

Accessories Alarm setting device : 1 lot

Isolator : 1 lot

Arrester : 1 lot

Other necessary accessories : 1 lot

**2. Surface Wash Water Flow (W34 IFM 01/02) (W34 LOP 16/17)**

## a. Purpose

To measure the surface wash water flow and to use for adjustment of flow.

## b. Quantity : 2 sets (The quantities shall be for each panel)

## c. Specification

Type Ultrasonic type flow meter

Pipe line size 350 mm

Measurement fluid Treated water

Measurement range 0~1000 m<sup>3</sup>/hr

Accessories Isolator : 1 lot

Arrester : 1 lot

Indicator panel (W34 LOP16/17)

Other necessary accessories : 1 lot

**3. Distribution Flow (W35 IFM 01)**

## a. Purpose

To measure the distribution flow and to use for automatic pump control.

## b. Quantity : 1 set

## c. Specification

Type Ultrasonic type flow meter

Pipe line size 1400 mm

Measurement fluid Treated water

Measurement range 0~15000 m<sup>3</sup>/hr

Accessories Isolator : 1 lot

Arrester : 1 lot

Other necessary accessories : 1 lot

**4. No.1 Distribution Flow for TET's (W35 IFM 02)**

## a. Purpose

To measure the distribution flow for TET's (thermal plant) and to use for automatic pump control.

## b. Quantity : 1 set

## c. Specification

Type Ultrasonic type flow meter

Size 300 mm

Measurement fluid Treated water

Measurement range 0~300 m<sup>3</sup>/hr

Velocity 0.14 ~1.20 m/s

Accessories Isolator : 1 lot

Arrester : 1 lot

Other necessary accessories : 1 lot

**5. No.2 Distribution Flow for TET's (W35 IFM 03)**

## a. Purpose

To measure the distribution flow for TET's (thermal plant) and to use for automatic pump control.

## b. Quantity : 1 set

## c. Specification

Type	Ultrasonic type flow meter
Size	600 mm
Measurement fluid	Treated water
Measurement range	0~2000 m <sup>3</sup> /hr
Velocity	0.35~1.80 m/s
Accessories	Isolator : 1 lot Arrester : 1 lot
Other necessary accessories	: 1 lot

#### **6. Distribution Flow (Technical Water) (W35 IFM 04/05)**

a. Purpose

To get the signals from the existing flow meter and to supply the power to the existing flow meter.

To indicate to instrumentation panel and central monitoring room.

b. Quantity : 2 sets

c. Specification (The quantities shall be for each panel)

Output	4~20 mA
Power	220V AC
Accessories	Isolator : 1 lot Arrester : 1 lot
Other necessary accessories	: 1 lot

#### **7. Recovery Water Flow (W36 IFM 01)**

a. Purpose

To measure the recovery water flow.

b. Quantity : 1 set

c. Specification

Type	Electromagnetic flow meter
Size	500 mm
Measurement fluid	Raw water
Measurement range	0~500 m <sup>3</sup> /hr
Velocity	0.35~1.80 m/s
Accessories	Isolator : 1 lot Arrester : 1 lot

Other necessary accessories : 1 lot

### **8. Wastewater Discharge Flow (W40 IFM 01)**

a. Purpose

To measure the recovery water flow.

b. Quantity : 1 set

c. Specification

Type Electromagnetic flow meter

Size 150 mm

Measurement fluid Wastewater water

Measurement range 0~200 m<sup>3</sup>/hr

Velocity 0.35~1.80 m/s

Accessories Isolator : 1 lot

Arrester : 1 lot

Other necessary accessories : 1 lot

### **9. Coagulant Dosing Flow (W45 IFM 01)**

a. Purpose

To measure the coagulant dosing flow and to use for automatic flow control.

b. Quantity : 1 set

c. Specification

Type Electromagnetic flow meter

Size 50 mm

Measurement fluid Raw water

Measurement range 0~100 l/min

Velocity 0.35~1.80 m/s

Accessories Isolator : 1 lot

Other necessary accessories : 1 lot

### **10. Reservoir Level (W30 ILM 01 to 04)**

a. Purpose

To measure the clear water reservoir level.

b. Quantity : 4 sets

c. Specification (The quantities shall be for each panel)

Type	Submersible hydrostatic type level meter	
Measurement liquid	Treated water	
Measurement range	0~6 m	
Accessories	Distributor	: 1 lot
	Alarm setting device	: 1 lot
	Arrester	: 1 lot
Other necessary accessories	: 1 lot	

### **11. Washing Drain Level (W36 ILM 01)**

a. Purpose

To measure the washing drain basin level and to use for automatic pump control.

b. Quantity : 1 set

c. Specification

Type	Flange type level transmitter (Hydrostatic level transmitter)	
Measurement liquid	Raw water	
Measurement range	0~5 m	
Accessories	Distributor	: 1 lot
	Alarm setting device	: 1 lot
	Arrester	: 1 lot
	Stop valve	: 1 set (SUS304)
	Drain pipe	: 1 lot (SUS304)
Other necessary accessories	: 1 lot	

### **12. Discharge Pool Level (W40 ILM 01)**

a. Purpose

To measure the discharge pool level and to use for automatic pump control.

b. Quantity : 1 set

c. Specification

Type	Flange type level transmitter (Hydrostatic level transmitter)	
Measurement liquid	Wastewater	
Measurement range	0~5 m	
Accessories	Distributor	: 1 lot
	Alarm setting device	: 1 lot

Arrester	: 1 lot
Stop valve	: 1 set (SUS304)
Drain pipe	: 1 lot (SUS304)
Other necessary accessories	: 1 lot

### **13. Inflow Pressure (W31 IPM 01/02)**

a. Purpose

To measure the inflow pressure and to use for automatic inflow pressure control.

b. Quantity : 2 sets

c. Specification (The quantities shall be for each panel)

Type	Diaphragm type pressure meter (Electric type pressure transmitter)	
Measurement liquid	Raw water	
Measurement range	0~1.0 MPa	
Accessories	Distributor	: 1 lot
	Alarm setting device	: 1 lot
	Arrester	: 1 lot
	Stop valve	: 1 set (SUS304)
	Drain pipe	: 1 lot (SUS304)
Other necessary accessories	: 1 lot	

### **14. Distribution Pressure (W35 IPM 01)**

a. Purpose

To measure the distribution pressure and to use for automatic constant pressure control and number of pumps control.

b. Quantity : 1 set

c. Specification

Type	Diaphragm type pressure meter (Electric type pressure transmitter)	
Measurement liquid	Clear water	
Measurement range	0~1.0 MPa	
Accessories	Distributor	: 1 lot
	Alarm setting device	: 1 lot
	Arrester	: 1 lot
	Stop valve	: 1 set (SUS304)
	Drain pipe	: 1 lot (SUS304)



Other necessary accessories : 1 lot

**15. Distribution Pressure (Technical) (W35 IPM 01)**

a. Purpose

To measure the distribution pressure of technical water.

b. Quantity : 1 set

c. Specification

Type Diaphragm type pressure meter (Electric type pressure transmitter)

Measurement liquid Raw water

Measurement range 0~1.0 MPa

Accessories Distributor : 1 lot

Alarm setting device : 1 lot

Arrester : 1 lot

Stop valve : 1 set (SUS304)

Drain pipe : 1 lot (SUS304)

Other necessary accessories : 1 lot

**16. Inflow Control Valve Opening Degree (W31 IZM 01)**

a. Purpose

To measure the inflow control valve opening degree and to use for automatic pressure control.

b. Quantity : 1 set

c. Specification

Type Mechanical (valve) standard equipment

Output signal 4~20 mA

Accessories Isolator : 1 lot

Arrester : 1 lot

Other necessary accessories : 1 lot

**17. Coagulant Control Valve Opening Degree (W45 IZM 01)**

a. Purpose

To measure the coagulant flow control valve opening degree and to use for automatic constant flow control.

b. Quantity : 1 set

## c. Specification

Type	Mechanical (valve) standard equipment
Output signal	4~20 mA
Accessories	Isolator : 1 lot Arrester : 1 lot
Other necessary accessories	: 1 lot

**18. Temperature Meter (W30 ITM 01)**

## a. Purpose

To measure outside air temperature.

## b. Quantity : 1 set

## c. Specification

Type	Resistance Thermometer
Overall accuracy	±0.1 degree C
Output signal	4~20 mA
Accessories	Isolator : 1 lot Arrester : 1 lot
Other necessary accessories	: 1 lot

**19. Chlorine Dosing System (W45 ICL 01)**

## a. Purpose

To use for automatic control and monitoring of the chlorine dosing facilities.

## b. Quantity : 1 lot

## c. Specification

This item shall consist of the following.

- i) Getting the signal of Chlorine cylinder weight from the mechanical equipment.
- ii) Giving the signal of Total inflow to the mechanical equipment.
- iii) Giving the signal of Pre chlorine dosing rate to the mechanical equipment.
- iv) Getting the signal of Pre chlorine dosing flow from the mechanical equipment.
- v) Giving the signal of Post chlorine dosing rate from the mechanical equipment.
- vi) Getting the signal of Post chlorine dosing flow from the mechanical equipment.
- vii) Getting the signal of Chlorine gas leakage flow from the mechanical equipment.

Accessories Isolator : 1 lot

Arrester : 1 lot

Other necessary accessories : 1 lot

**20. Sump Drainage Pit Level Switch (W33 ILS 01/02, W35 ILS 01, W36 ILS 01, W37 ILS 01, W40 ILS 01)**

a. Purpose

To use for the automatic control of sump drainage pumps.

b. Quantity : 6 sets

c. Specification (The quantities shall be for each panel)

Type Electrode Type Level Switch

Measurement liquid Drainage

Number of rod : 4 pieces

Length of rod 1.5 m (Max)

Material of rod Stainless Steel, Type 304

Other necessary accessories : 1 lot

**21. Sampling Pump Level Switch (W33 ILS 03, W34 ILS 13)**

a. Purpose

To use for the automatic control of sampling pumps.

b. Quantity : 6 sets

c. Specification (The quantities shall be for each panel)

Type Electrode Type Level Switch

Measurement liquid Drainage

Number of rod : 2 pieces

Length of rod 5 m (Max)

Material of rod Stainless Steel, Type 304

Other necessary accessories : 1 lot

**22. Filter Level Switch (W34 ILS 01 to 12)**

a. Purpose

To use for the automatic control of filtering and filter washing.

b. Quantity : 12 sets

c. Specification (The quantities shall be for each panel)

Type Electrode Type Level Switch

Measurement liquid	Raw water
Number of rod	: 4 pieces
Length of rod	5 m (Max)
Material of rod	Stainless Steel, Type 304
Other necessary accessories	: 1 lot

### **23. Washing Drain Basin Level Switch (W36 ILS 02)**

a. Purpose

To use for the automatic control of pumps.

b. Quantity : 1 set

c. Specification

Type	Electrode Type Level Switch
Measurement liquid	Raw water
Number of rod	: 2 pieces
Length of rod	5 m (Max)
Material of rod	Stainless Steel, Type 304
Other necessary accessories	: 1 lot

### **24. Discharge Pool Level Switch (W40 ILS 02)**

a. Purpose

To use for the automatic control of pumps.

b. Quantity : 1 set

c. Specification

Type	Electrode Type Level Switch
Measurement liquid	Wastewater
Number of rod	: 2 pieces
Length of rod	5 m (Max)
Material of rod	Stainless Steel, Type 304
Other necessary accessories	: 1 lot

### **25. Coagulant Tank Level Switch (W45 ILS 01)**

a. Purpose

To use for the automatic control of pumps.

b. Quantity : 1 set

## c. Specification

Type	Electrode Type Level Switch
Measurement liquid	Coagulant solution
Number of rod	: 2 pieces
Length of rod	4 m (Max)
Material of rod	Stainless Steel, Type 304
Other necessary accessories	: 1 lot

**26. Flocculant Tank Level Switch (W45 ILS 02)**

## a. Purpose

To use for the automatic control of pumps and mixer.

## b. Quantity : 1 set

## c. Specification

Type	Electrode Type Level Switch
Measurement liquid	Flocculant solution
Number of rod	: 2 pieces
Length of rod	4 m (Max)
Material of rod	Stainless Steel, Type 304
Other necessary accessories	: 1 lot

**27. Activated Carbon Tank Level Switch (W45 ILS 03)**

## a. Purpose

To use for the automatic control of Blowers.

## b. Quantity : 1 set

## c. Specification

Type	Electrode Type Level Switch
Measurement liquid	Activated carbon solution
Number of rod	: 2 pieces
Length of rod	4 m (Max)
Material of rod	Stainless Steel, Type 304
Other necessary accessories	: 1 lot

**28. Distribution Chamber Level Switch (W31 ILS 01)**

## a. Purpose

To get the alarm for an over flow of the Distribution chamber.

b. Quantity : 1 set

c. Specification

Type Electrode Type Level Switch

Measurement liquid Raw water

Number of rod : 2 pieces

Length of rod 4 m (Max)

Material of rod Stainless Steel, Type 304

Other necessary accessories : 1 lot

### **29. Instrumentation Panel for Distribution Chamber (W31 INP01)**

a. Purpose

To mount indicators and setting devices for monitoring and control and to install auxiliary devices.

b. Quantity : 1 set

c. Specification

Type Indoor, with stand, metal enclosed, IP42, moisture-proof

Mounted device As shown on the drawings and the electrical operation diagram  
PLC remote I/O unit

Indication lamp As shown on the drawings and the electrical operation diagram

Necessary accessories : 1 lot

### **30. Instrumentation Panel for WTP (W44 INP01)**

a. Purpose

To mount indicators and setting devices for monitoring and control and to install auxiliary devices.

b. Quantity : 1 set

c. Specification

Type Indoor, with stand, metal enclosed, IP20

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Necessary accessories : 1 lot

### **31. Instrumentation Panel for Distribution Pump Station (W35 INP01)**

a. Purpose

To mount indicators and setting devices for monitoring and control and to install auxiliary devices.

b. Quantity : 1 set

c. Specification

Type Indoor, with stand, metal enclosed, IP42

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Necessary accessories : 1 lot

### **32. PLC and Instrumentation Panel for Sludge Treatment Facilities (W36 INP01)**

a. Purpose

To mount indicators for monitoring and control and to install auxiliary devices.

To transmit data to PLC by remote I/O unit.

b. Quantity : 1 set

c. Specification

Type Indoor, with stand, metal enclosed, IP40

Mounted device As shown on the drawings and the electrical operation diagram

Indication lamp As shown on the drawings and the electrical operation diagram

Necessary accessories : 1 lot

### **33. In-plant Water Distribution Flow (W30 IFM 01)**

a. Purpose

To measure the in-plant water distribution flow.

b. Quantity : 1 set

c. Specification

Type Ultrasonic type flow meter

Size 450 mm

Measurement fluid Treated water

Measurement range 0~800 m<sup>3</sup>/hr

Velocity 0.35~1.50 m/s

Accessories Isolator : 1 lot

Arrester : 1 lot

Other necessary accessories : 1 lot

**P16.1.9 Monitoring and Control Facilities (W30-4 WTP Facilities)**

a. General

The electrical components of the monitoring and control facilities in the Water Treatment Plant shall consist of the following equipment. Equipment shall be designed using the following conditions and in accordance with the specification set forth hereinafter in this Section.

b. Equipment List (W30-4)

	<b>Item No.</b>	<b>Name</b>	<b>Tag No.</b>	<b>Quantity</b>
1	W30-EE-106	Substation PLC	W47 PLC01	1 set
2	W30-EE-107	WTP PLC	W44 PLC01	1 set
3	W30-EE-108	Pump Station PLC	W35 PLC01	1 set
4	W30-EE-109	Sludge Treatment Facilities PLC	W36 PLC01	1 set
5	W30-EE-110	Administration PLC-1	W44 PLC02	1 set
6	W30-EE-111	Administration PLC-2	W44 PLC03	1 set
7	W30-EE-112	Monitoring System	W44 MON01	1 set
8	W30-EE-113	Mimic Panel	W44 MIM01	1 set
9	W30-EE-114	ITV Monitoring System for WTP	W30 ITV01	1 set
10	W30-EE-115	ITV Monitoring System for Guard House	W30 ITV02	1 set

c. Standard Accessories

Spare parts

**1. Substation PLC (W47 PLC 01)**

a. Purpose

To transmit data to the Administration PLC and control of automatic control functions. Details shall be shown on the drawings and the electrical operation diagram.

b. Quantity : 1 set

c. Specification

Type Indoor, Self-supporting, Metal enclosed, Vermin-proof Type, IP20

Processing function Sequential control, Instrumentation loop control

Data transmission line Ethernet (Optical fiber cable)

Input/Output capacities

	Digital I/O	Analog I/O	Pulse I
Total	120		15

Necessary accessories : 1 lot



**2. WTP PLC (W44 PLC 01)**

## a. Purpose

To transmit data to the Administration PLC and control automatic control functions. Details shall be shown on the drawings and the electrical operation diagram.

## b. Quantity : 1 set

## c. Specification

Type Indoor, Self-supporting, Metal enclosed, Vermin-proof Type, IP20

Processing function Sequential control, Instrumentation loop control

Remote I/O unit : 1 set (for Distribution facilities)

Data transmission line Ethernet (Optical fiber cable)

Input/Output capacities

	Digital I/O	Analog I/O	Pulse I
Total	400	20	

Necessary accessories : 1 lot

**3. Pump Station PLC (W35 PLC 01)**

## a. Purpose

To transmit data to the Administration PLC and control automatic control functions. Details shall be shown on the drawings and the electrical operation diagram.

## b. Quantity : 1 set

## c. Specification

Type Indoor, Self-supporting, Metal enclosed, Vermin-proof Type, IP40

Processing function Sequential control, Instrumentation loop control

Data transmission line Ethernet (Optical fiber cable)

Input/Output capacities

	Digital I/O	Analog I/O	Pulse I
Total	250	15	

Necessary accessories : 1 lot

**4. Sludge Treatment Facilities PLC (W36 PLC 01)**

## a. Purpose

To transmit data to the Administration PLC and control automatic control functions. Details shall be shown on the drawings and the electrical operation diagram.

## b. Quantity : 1 set

## c. Specification

Type Indoor, Self-supporting, Metal enclosed, Vermin-proof Type, IP40

Processing function Sequential control, Instrumentation loop control

Data transmission line Ethernet (Optical fiber cable)

Input/Output capacities

	Digital I/O	Analog I/O	Pulse I
Total	100	5	

Necessary accessories : 1 lot

**5. Administration PLC-1 (W44 PLC 02)**

## a. Purpose

To collect data from local PLCs (Intake PLC to be included) and control monitoring system. Details shall be shown on the drawings and the electrical operation diagram.

b. Quantity : 1 set

## c. Specification

Type Indoor, Self-supporting, Metal enclosed, Vermin-proof Type, IP20

Processing function Sequential control, Instrumentation loop control

Data transmission line Ethernet (Optical fiber cable)

Input/Output capacities

	Digital I/O	Analog I/O	Pulse I
Total	1200	50	30

Necessary accessories : 1 lot

**6. Administration PLC-2 (W44 PLC 03)**

## a. Purpose

To collect data from local PLCs (Intake PLC to be excluded) and control monitoring system. Details shall be shown on the drawings and the electrical operation diagram.

b. Quantity : 1 set

## c. Specification

Type Indoor, Self-supporting, Metal enclosed, Vermin-proof Type, IP20

Processing function Sequential control, Instrumentation loop control

Data transmission line Ethernet (Optical fiber cable)

Input/Output capacities

	Digital I/O	Analog I/O	Pulse I
Total	1200	50	30

Necessary accessories : 1 lot

**7. Monitoring System (W44MON 01)**

a. Purpose

Monitoring System is composed of following items.

Industrial computer : 2 sets

Server computer 1 set

Printer 2 set

Two PLCs (W44PLC02/03) shall be the interface between the computers and the local PLCs to collect data. One PLC (W44PLC02) shall be duty, while the other (W44PLC03) shall be hot standby. Two PLCs have the same function.

Two computers shall be the man/machine interface to monitor the plant loads' status, failure and process values through a graphical interface. It is possible to monitor independently with these computers.

The server shall play a data processing role so that it can generate the required reports such as hourly, daily, monthly, and yearly reports, historical trend graphs, historical process running and historical alarms.

Details shall be shown on the drawings, the electrical operation diagram and the standard specification.

b. Quantity : 1 lot

c. Specification

Data transmission line Ethernet

Computer Industrial computer : 2sets

OS : Windows 2000

Display : More than 20 inches (500 mm)

CPU : Latest Intel Pentium processor

Server computer : 1 set

main internal storage with backup unit

large capacity auxiliary storage

Printer : 2 sets (for logging and announcement)

black-and-white laser printer

Exclusive monitoring desks and chairs : 1 lot

Monitoring items

	Digital I/O	Analog I/O	Pulse I
Total	1200	50	30

Necessary accessories : 1 lot

**8. Mimic Panel (W44 MIM 01)**

a. Purpose

To monitor the plant loads status, failure and process values through a graphical panel.

Details shall be shown on the drawings, the electrical operation diagram and the standard specification.

b. Quantity : 1 lot

c. Specification

Data transmission line Ethernet

Monitoring item

	Digital I/O	Analog I/O	Pulse I
Total	100	30	

Necessary accessories : 1 lot

**9. ITV Monitoring System for WTP (W30 ITV 01)**

a. Purpose

To monitor the plant by 4-sets of ITV cameras at the central monitoring room. Details shall be shown on the drawings.

b. Quantity : 1 lot

c. Specification

CCD color camera : 4 sets

Type 1/3-inch CCD color camera, moisture-proof

Picture element more than 41 M pixel

Lens Fixed : 1 set f=3.0mm

Zoom : 3 sets f=4.6~28mm Motor driven

Mount Fixed : 1 set

Motor driven : 3 sets

turn degree horizontality :90d, verticality :90d

Defroster : 4 sets with automatic thermo switch

Control Unit : 1 set

Main function	Remote control of lens and mount 4-pictures simultaneous display
Control board	: 1 set
Color monitor	: 1 set minimum 21-inch (500 mm)
Exclusive monitoring desks and chairs	: 1 lot
Necessary accessories	: 1 lot

#### **10. ITV Monitoring System for Guard House (W30 ITV 02)**

##### a. Purpose

To monitor the entrance gate and the yard by ITV cameras at Guard house. Details shall be shown on the drawings. The locations of installation shall be decided by instructions from ASA.

b. Quantity : 1 lot

##### c. Specification

CCD camera	: 4 sets
Type	CCD camera, water-proof
Picture element	more than 41 M pixel
Lens	Fixed : 1 set f=3.0mm
Mount	Fixed : 1 set
Defroster	: 1 set with automatic thermo switch
Control Unit	: 1 set
Color monitor	: 1 set minimum 14-inch (350 mm)
Necessary accessories	: 1 lot

#### **P16.1.10 Other work (W30-5 WTP)**

##### a. General

The electrical work necessary to make the Water Treatment Plant complete shall consist of the followings. The work shall be designed using the following conditions and in accordance with the specification set forth hereinafter in this Section.

##### b. Item List (W30-5)

	Item No.	Name	Tag No.	Quantity
1	W30-EE-116	Wiring Work for Substation	W30 WIR01	1 lot
2	W30-EE-117	Wiring Work for Water Treatment Facilities	W30 WIR02	1 lot
3	W30-EE-118	Wiring Work for Pump Station	W30 WIR03	1 lot
4	W30-EE-119	Wiring Work for Sludge Treatment Facilities	W30 WIR04	1 lot

**1. Wiring Work for Substation (W30 WIR01)**

## a. Scope of work

The works in this item shall include, but not be limited to, the following. The details shall be shown on the drawings and the general specification.

- i) New construction of the incoming poles (3 sets) and extension of 11kV overhead line (about 30m).
- ii) Removal of 2-sets of existing transformers.
- iii) Supply and install all wire and cable to new and removal equipment.
- iv) Supply and install all trays, conduits, ducts, trench and other materials necessary to make wiring complete.
- v) Supply and install all foundations and floor works for all panels.
- vi) Grounding work.
- vii) Dispose of existing disuse equipments if necessary.

Removal work and new construction of substation shall be done prior to other work to rehabilitate distribution pipe lines.

**2. Wiring Work for WTP Facilities (W30 WIR02)**

## a. Scope of work

The works in this item shall include, but not be limited to, the following. The details shall be shown on the drawings and the general specification.

- i) Supply and install all wire and cable to new equipment.
- ii) Supply and install all trays, conduits, ducts, trench and other materials necessary to make wiring complete.
- iii) Supply and install all foundations and floor works for all panels.
- iv) Grounding work.

**3. Wiring Work for Pump Station (W30 WIR03)**

## a. Scope of work

The works in this item shall include, but not be limited to, the following. The details shall be shown on the drawings and the general specification.

- i) Supply and install all wire and cable to new equipment.
- ii) Remove all wire, cable, tray, conduit, and renewed disuse equipments.
- iii) Supply and install all wire and cable to existing equipment (rewiring).
- iv) Supply and install all trays, conduits, ducts, trench and other materials necessary to make wiring complete.
- v) Supply and install all foundations and floor works for all panels.
- vi) Grounding work.

- vii) Dispose of existing disuse equipments if necessary.

**4. Wiring Work for Sludge Treatment Facilities (W30 WIR02)**

a. Scope of work

The works in this item shall include, but not be limited to, the following. The details shall be shown on the drawings and the general specification.

- i) Supply and install all wire and cable to new equipment.
- ii) Supply and install all trays, conduits, ducts, trench and other materials necessary to make wiring complete.
- iii) Supply and install all foundations and floor works for all panels.
- iv) Grounding work.

**DIVISION P16 ELECTRICAL WORKS****P16.2 SEWERAGE FACILITIES****P16.2.1 High Voltage Switchgear (S24-Sludge Treatment Building, S08- Blower House and S28-Electical House)**

## a. General

The electrical components of high voltage switchgear for the Sewage Treatment Plant shall consist of the following equipment. Equipment shall be designed using the following conditions and in accordance with the specification set forth hereinafter in this Section.

## b. Equipment List (S24, S08, S28)

	<b>Item No.</b>	<b>Name</b>	<b>Tag No.</b>	<b>Quantity</b>
1	S24-EE-01	6kV Incoming Panels	S24 HVP07, 09	2 sets
2	S24-EE-02	6kV Receiving Panels	S24 HVP06, 10	2 sets
3	S24-EE-03	GPT Panels	S24 GPT01/02	2 sets
4	S24-EE-04	6kV Feeder Panels	S24 HVP01-05, 12-15	8 sets
5	S24-EE-05	6kV Tie Breaker Panel	S24 HVP08	1 set
6	S24-EE-06	Transformer Primary Panels	S24 HVP05, 11	2 sets
7	S24-EE-07	6kV Static Capacitor Panels	S24 SCP01 to 06	6 sets
8	S08-EE-01	6kV Receiving Panels	S08 HVP01, 02	2 sets
9	S08-EE-02	GPT Panels	S08 GPT01/02	2 sets
10	S08-EE-03	Transformer Primary Panels	S08 HVP03, 05	2 sets
11	S08-EE-04	6kV Tie Breaker Panel	S08 HVP04	1set
12	S08-EE-05	Blower Panel	S08 BLP01 to 05	5 sets
13	S28-EE-01	6kV Receiving Panels	S28 HVP01, 02	2 sets
14	S28-EE-02	GPT Panels	S28 GPT01/02	2 sets
15	S28-EE-03	Transformer Primary Panels	S28 HVP03, 05	2 sets
16	S28-EE-04	6kV Tie Breaker Panel	S28 HVP04	1 set

## c. Standard Accessories

Name Plate          Plastic plate, with engraved black letter on white background

Inboard Lighting with lighting door switch

Door key

Isolation rubber mat

Withdrawing lifter

Spare parts



**1. 6kV Incoming Panel (S24 HVP07/09)**

## a. Purpose

To receive power from Astana Energo Services Substation at 6kV, 3-phase and 50 Hz.

## b. Quantity: 2 sets

## c. Specification (The quantities below shall be for each panel)

Type Indoor, Self-supporting, Metal enclosed, Vermin-proof Type

IP Numbers 20

Rated voltage AC6kV

System highest voltage AC7.2kV

Rated bus current 1200A

Withstand voltage Lightning impulse 60kV

Power-frequency 22Kv

Disconnection Switch (DS): 1 set

Type Fixed, three-poles

Rated voltage 7.2kV

Rated current 1200A

Rated withstand short circuit current 25kA

Mechanical interlock, functioning with the VCB equipment in the Receiving Panel, shall be provided.

Indication lamp : 1 lot

Necessary accessories: 1 lot

**2. 6kV Receiving Panel (S24 HVP06/10)**

## a. Purpose

To receive power from Astana Energo Services Substation in association with the incoming panel (S24 HVP09/10) at 6kV, 3-phase and 50 Hz.

## b. Quantity: 2 sets

## c. Specification (The quantities below shall be for each panel)

Type Indoor, Self-supporting, Metal enclosed, Vermin-proof Type

IP Numbers 20

Rated voltage AC6kV

System highest voltage AC7.2kV

Rated bus current 1200A

Withstand voltage	Lightning impulse 60kV
	Power-frequency 22kV
Control circuit voltage	AC220V (UPS)
Vacuum circuit breaker (VCB): 1 set	
Type	Withdrawable, three-poles
Rated voltage	7.2kV
Rated current	630A
Rated breaking current	25kA
Current transformer (CT): 3 sets	
Voltage transformer (VT): 2 sets	
Lightning arrester: 3 sets with disconnecting switch	
Nominal discharge current	5000A
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch:	1 lot
Indication lamp:	1 lot
Necessary accessories:	1 lot

### **3. GPT Panel (S24 GPT01/02)**

#### a. Purpose

To measure the bus voltage for measuring and protective device and to detect the zero-phase voltage.

#### b. Quantity: 2 sets

#### c. Specification (The quantities below shall be for each panel)

Type	Indoor, Self-supporting, Metal enclosed, Vermin-proof Type
IP Numbers	20
Rated voltage	AC6kV
System highest voltage	AC7.2kV
Rated bus current	630A
Withstand voltage	Lightning impulse 60kV
	Power-frequency 22kV
Control circuit voltage	AC220V (UPS)
Grounding potential transformer (GPT): 3 sets	

Type	Withdrawable, three-pole
Rated voltage	6600 / 110 / 190/3 V
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch:	1 lot
Indication lamp:	1 lot
Necessary accessories:	1 lot

#### **4. 6kV Feeder Panel (S24 HVP01 to 05, and 12 to 15)**

a. Purpose

To distribute power to each electrical room at 6kV, 3-phase and 50 Hz and connect the static capacitors.

b. Quantity: 8 sets

c. Specification (The quantities shall be for each panel)

Type	Indoor, Self-supporting, Metal enclosed, Vermin-proof Type
IP Numbers	20
Rated voltage	AC6kV
System highest voltage	AC7.2kV
Rated bus current	1250A
Withstand voltage	Lightning impulse 60kV Power-frequency 22kV
Control circuit voltage	AC220V (UPS)

Vacuum circuit breaker (VCB): 1 set

Type	Withdrawable, three-pole
Rated voltage	7.2kV
Rated current	630A
Rated breaking current	25kA

Current transformer (CT): 2 sets

Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch:	1 lot
Indication lamp:	1 lot
Necessary accessories:	1 lot

**5. 6kV Tie Breaker Panel (S24 HVP08)**

## a. Purpose

To connect both bus bars of the dual power system so that the power supply to the power feeders is adaptable during a-maintenance work or changing over receiving line.

## b. Quantity : 1 set

## c. Specification

Type Indoor, Self-supporting, Metal enclosed, Vermin-proof Type

IP Numbers 20

Rated voltage AC6kV

System highest voltage AC7.2kV

Rated bus current 1250A

Withstand voltage Lightning impulse 60kV

Power-frequency 22kV

Control circuit voltage AC220V (UPS)

Vacuum circuit breaker (VCB): 1 set

Type Withdrawable, three-pole

Rated voltage 7.2kV

Rated current 1250A

Rated breaking current 25kA

Measuring instrument As shown on the drawings and the general specifications

Protective relay As shown on the drawings and the general specifications

Control switch: 1 lot

Indication lamp: 1 lot

Necessary accessories: 1 lot

**6. Transformer Primary Panel (S24 HVP05/11)**

## a. Purpose

To feed power to transformer panels (S24 TRP01/02).

## b. Quantity: 1 set

## c. Specification

Type Indoor, Self-supporting, Metal enclosed, Vermin-proof Type

IP Numbers 20

Rated voltage AC6kV

System highest voltage	AC7.2kV
Rated bus current	1250A
Withstand voltage	Lightning impulse 60kV Power-frequency 22kV
Control circuit voltage	AC220V (UPS)
Vacuum circuit breaker (VCB): 1 set	
Type	Withdrawable, three-pole
Rated voltage	7.2kV
Rated current	1250A
Rated breaking current	25kA
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch:	1 lot
Indication lamp:	1 lot
Necessary accessories:	1 lot

## **7. Static Capacitor Panel (S24 SCP01 to 06)**

### a. Purpose

To improve power factor (S24 SCP01 to 06).

### b. Quantity: 6 sets

### c. Specification (The quantities below shall be per each panel)

Type	Indoor, Self-supporting, Metal enclosed, Vermin-proof Type
IP Numbers	20
Rated voltage	AC6kV
System highest voltage	AC7.2kV
Rated bus current	630A
Withstand voltage	Lightning impulse 60kV Power-frequency 22kV
Control circuit voltage	AC220V (UPS)
Vacuum contactor switch (VCS): 1 set	
Type	Withdrawable, three-pole
Rated voltage	AC6kV
Rated current	200A

Power fuse: 3sets

Rated voltage AC7.2kV

Breaking capacity 25kA

Static capacitors with 6% static reactor: 3 sets

Type Fixed, Molded, Three-phase

Rated voltage 7.2kV

Rated capacity 100kVA

Measuring instrument As shown on the drawings and the general specifications

Protective relay As shown on the drawings and the general specifications

Control switch: 1 lot

Indication lamp: 1 lot

Necessary accessories: 1 lot

## **8. 6kV Receiving Panel (S08 HVP01/02)**

### a. Purpose

To receive power from the sludge treatment building at 6kV, 3-phase and 50 Hz.

### b. Quantity: 2 sets

### c. Specification (The quantities below shall be for each panel)

Type Indoor, Self-supporting, Metal enclosed, Vermin-proof Type

IP Numbers 40

Rated voltage AC6kV

System highest voltage AC7.2kV

Rated bus current 630A

Withstand voltage Lightning impulse 60kV

Power-frequency 22kV

Control circuit voltage AC220V (UPS)

Vacuum circuit breaker (VCB): 1 set

Type Withdrawable, three-pole

Rated voltage 7.2kV

Rated current 630A

Rated breaking current 25kA

Current transformer (CT): 3 sets

Voltage transformer (VT): 2 sets

Lightning arrester:	3 sets with disconnecting switch
Nominal discharge current	5000A
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch:	1 lot
Indication lamp :	1 lot
Necessary accessories:	1 lot

### **9. GPT Panel (S08 GPT01/02)**

a. Purpose

To measure the bus voltage for measuring and protective device and to detect the zero-phase voltage.

b. Quantity: 2 sets

c. Specification (The quantities shall be for each panel)

Type	Indoor, Self-supporting, Metal enclosed, Vermin-proof Type
IP Numbers	40
Rated voltage	AC6kV
System highest voltage	AC7.2kV
Rated bus current	630A
Withstand voltage	Lightning impulse 60kV Power-frequency 22kV
Control circuit voltage	AC220V (UPS)

Grounding potential transformer (GPT): 3 sets

Type	Withdrawable, three-pole
Rated voltage	6600 / 110 / 190/3 V
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch:	1 lot
Indication lamp :	1 lot
Necessary accessories:	1 lot

### **10. Transformer Primary Panel (S08 HVP03/05)**

a. Purpose

To distribute power to transformer panels at 6kV, 3-phase and 50 Hz.

b. Quantity: 2 sets

c. Specification (The quantities shall be for each panel)

Type Indoor, Self-supporting, Metal enclosed, Vermin-proof Type

IP Numbers 40

Rated voltage AC6kV

System highest voltage AC7.2kV

Rated bus current 630A

Withstand voltage Lightning impulse 60kV

Power-frequency 22kV

Control circuit voltage AC220V (UPS)

Vacuum circuit breaker (VCB): 1 set

Type Withdrawable, three-pole

Rated voltage 7.2kV

Rated current 630A

Rated breaking current 25kA

Current transformer (CT): 2 sets

Measuring instrument As shown on the drawings and the general specifications

Protective relay As shown on the drawings and the general specifications

Control switch: 1 lot

Indication lamp : 1 lot

Necessary accessories: 1 lot

## **11. 6kV Tie Breaker Panel (S08 HVP04)**

a. Purpose

To connect both bus bars of the dual power system so that the power supply to the power feeders is adaptable during a maintenance work or changing over receiving line.

b. Quantity: 1 set

c. Specification

Type Indoor, Self-supporting, Metal enclosed, Vermin-proof Type

IP Numbers 40

Rated voltage AC6kV

System highest voltage AC7.2kV

Rated bus current 630A



Withstand voltage	Lightning impulse 60kV
	Power-frequency 22kV
Control circuit voltage	AC220V (UPS)
Vacuum circuit breaker (VCB): 1 set	
Type	Withdrawable, three-pole
Rated voltage	7.2kV
Rated current	630A
Rated breaking current	25kA
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch:	1 lot
Indication lamp :	1 lot
Necessary accessories:	1 lot

## **12. Blower Panel (S08 BLP01 to 05)**

### a. Purpose

To start up and control the blowers.

### b. Quantity: 5 sets

### c. Specification (The quantities below shall be for each panel.)

Type	Indoor, Self-supporting, Metal enclosed, Vermin-proof Type
IP Numbers	40
Rated voltage	AC6kV
System highest voltage	AC7.2kV
Rated bus current	630A
Withstand voltage	Lightning impulse 60kV
	Power-frequency 22kV
Control circuit voltage	AC220V (UPS)
Motor starter: 1 set	
Adapted motor	315kW squirrel-cage induction motor
Vacuum contactor switch (VCS): 1 set	
Type	:Fixed, three-pole
Rated voltage	AC 7.2kV
Rated current	200A

Power fuse: 3sets	
Rated voltage	AC7.2kV
Breaking capacity	25kA
Power capacitor	: 1 set
Type	Molded type
Rated voltage	AC6kV
Capacity	100kVar
Series reactor	Dry type 6%

Current transformer (CT) : 2 sets

Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch	As shown on the drawings and the electrical operation diagram
Indication lamp	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

### **13. 6kV Receiving Panel (S28 HVP01/02)**

a. Purpose

To receive power from the sludge treatment building at 6kV, 3-phase and 50 Hz.

b. Quantity: 2 sets

c. Specification (The quantities below shall be for each panel.)

Type	Indoor, Self-supporting, Metal enclosed, Vermin-proof Type
IP Numbers	20
Rated voltage	AC6kV
System highest voltage	AC7.2kV
Rated bus current	630A
Withstand voltage	Lightning impulse 60kV
	Power-frequency 22kV
Control circuit voltage	AC220V (UPS)
Vacuum circuit breaker (VCB)	: 1 set
Type	Withdrawable, three-pole
Rated voltage	7.2kV
Rated current	630A

Rated breaking current	25kA
Current transformer (CT)	: 3 sets
Voltage transformer (VT)	: 2 sets
Lightning arrester	: 3 sets with disconnecting switch
Nominal discharge current	5000A
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch	: 1 lot
Indication lamp	: 1 lot
Necessary accessories	: 1 lot

#### **14. GPT Panel (S28 GPT01/02)**

a. Purpose

To measure the bus voltage for measuring and protective device and to detect the zero-phase voltage.

b. Quantity: 2 sets

c. Specification (The quantities shall be for each panel)

Type	Indoor, Self-supporting, Metal enclosed, Vermin-proof Type
IP Numbers	20
Rated voltage	AC6kV
System highest voltage	AC7.2kV
Rated bus current	630A
Withstand voltage	Lightning impulse 60kV
	Power-frequency 22kV
Control circuit voltage	AC220V (UPS)
Grounding potential transformer (GPT)	: 3 sets
Type	Withdrawable, three-pole
Rated voltage	6600 / 110 / 190/3 V
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch	: 1 lot
Indication lamp	: 1 lot
Necessary accessories	: 1 lot

**15. Transformer Primary Panel (S28 HVP03/05)**

## a. Purpose

To distribute power to transformer panels at 6kV, 3-phase and 50 Hz.

## b. Quantity: 2 sets

## c. Specification (The quantities shall be for each panel)

Type	Indoor, Self-supporting, Metal enclosed, Vermin-proof Type
IP Numbers	20
Rated voltage	AC6kV
System highest voltage	AC7.2kV
Rated bus current	630A
Withstand voltage	Lightning impulse 60kV
	Power-frequency 22kV
Control circuit voltage	AC220V (UPS)
Vacuum circuit breaker (VCB)	: 1 set
Type	Withdrawable, three-pole
Rated voltage	7.2kV
Rated current	630A
Rated breaking current	25kA
Current transformer (CT)	: 2 sets
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch	: 1 lot
Indication lamp	: 1 lot
Necessary accessories	: 1 lot

**16. 6kV Tie Breaker Panel (S28 HVP04)**

## a. Purpose

To connect both bus bars of the dual power system so that the power supply to the power feeders is adaptable during maintenance work or changing over receiving line.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, Self-supporting, Metal enclosed, Vermin-proof Type
IP Numbers	20

Rated voltage	AC6kV
System highest voltage	AC7.2kV
Rated bus current	630A
Withstand voltage	Lightning impulse 60kV
	Power-frequency 22kV
Control circuit voltage	AC220V (UPS)
Vacuum circuit breaker (VCB)	: 1 set
Type	Withdrawable, three-pole
Rated voltage	7.2kV
Rated current	630A
Rated breaking current	25kA
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switch	: 1 lot
Indication lamp	: 1 lot
Necessary accessories	: 1 lot

### **P16.2.2 Low Voltage Switchgear and Motor Control Center (S02 to S28 -Sewage Treatment Plant)**

#### a. General

The electrical components of low voltage switchgear, motor control center and other control panels in the Sewage Treatment Plant shall consist of the following equipment. Equipment shall be designed using the following conditions and in accordance with the specification set forth hereinafter in this Section.

#### b. Equipment List

	Item No.	Name	Tag No.	Quantity
1	S24-EE-08	Transformer Panel	S24 TRP01/02	2 sets
2	S24-EE-09	Transformer Secondary Panel	S24 LVP01/02	2 sets
3	S24-EE-10	Low Voltage Feeder Panel	S24 LVP03	1 set
4	S24-EE-11	UPS	S24 UPS01/02	2 sets
5	S02-EE-01	Low Voltage Feeder Panel	S02LVP01	1 set
6	S08-EE-06	Transformer Panel	S08 TRP01/02	2 sets
7	S08-EE-07	Transformer Secondary Panel	S08LVP01	1 set
8	S08-EE-08	Low Voltage Feeder Panel	S08LVP02	1 set
9	S08-EE-09	UPS	S08UPS01	1 set

10	S11-EE-01	Low Voltage Feeder Panel	S11LVP01	1 set
11	S12-EE-01	Low Voltage Feeder Panel	S12LVP01	1 set
12	S28-EE-05	Transformer Panel	S28 TRP01/02	2 sets
13	S28-EE-06	Transformer Secondary Panel	S28LVP01/02	2 sets
14	S28-EE-07	Low Voltage Feeder Panel	S08LVP02S08LV	1 set
15	S28-EE-08	UPS	S28UPS01	1 set
16	S02-EE-02	Influent Pump Station MCC & Auxiliary Relav Panel	S02MCC01/S02 ΔRY01	1 set
17	S02-EE-03	Influent Pump Panels	S02 IPP01 to 05	5 sets
18	S02-EE-04	Temporary Influent Pump Panels	S02 TPP01 to 03	3 sets
19	S03-EE-01	Grit Chamber MCC & Auxiliary Relay Panel	S03MCC01/S03A RY01	1 set
20	S05-EE-01	Primary Sedimentation Tanks MCC & Auxiliary Relav Panel	S05MCC01/S05A RY01	1 set
21	S08-EE-10	Air Blower Facilities MCC & Auxiliary Relav Panel	S08MCC01/S08A RY01	1 set
22	S10-EE-01	Secondary Sedimentation Tanks MCC & Auxiliary Relav Panel	S10MCC01/S10A RY01	1 set
23	S11-EE-02	Return Sludge Pumps MCC & Auxiliary Relav Panel	S11MCC01/S11A RY01	1 set
24	S12-EE-02	Discharge Pump station MCC & Auxiliary Relav Panel	S12MCC01/S12A RY01	1 set
25	S12-EE-03	Discharge Pump Panels	S12 CPP01 to 05	5 sets
26	S12-EE-04	Temporary Discharge Pump Panels	S12 TPP01 to 03	3 sets
27	S21-EE-01	Gravity Thickener MCC & Auxiliary Relay Panel	S21MCC01/S21A RY01	1 set
28	S23-EE-01	Digester MCC & Auxiliary Relay Panel	S23MCC01/S23A RY01	1 set
29	S24-EE-12	Mechanical Thickener MCC & Auxiliary Relav Panel	S24MCC01/S24A RY01	1 set
30	S24-EE-13	Sludge Dewatering Unit MCC & Auxiliary Relav Panel	S24MCC02/S24A RY02	1 set
31	S24-EE-14	Utility Water Facilities MCC & Auxiliary Relav Panel	S24MCC03/S24A RY03	1 set
32	S27-EE-01	Boiler MCC & Auxiliary Relay Panel	S27MCC01/S27A RY01	1 set
33	S02-EE-05	Connection Gate Local Operation Panel	S02 LOP01	1 set
34	S02-EE-06	Fine Screen Local Operation Panel	S02 LOP02	1 set
35	S02-EE-07	Connection Valve Influent Pump Local Oneration Panel	S02 LOP03	1 set
36	S02-EE-08	Influent Pump Fine Screen Local Operation Panel	S02 LOP04 to 08	5 sets
37	S02-EE-09	Sump Drainage Pump Local Operation Panel	S02 LOP09/10	2 sets
38	S02-EE-10	Exhaust Fan Local Operation Panel	S02 LOP11	1 set
39	S02-EE-11	Intake Fan Local Operation Panel	S02 LOP12 to 14	3 sets
40	S03-EE-02	Inlet & Bypass Gate Local Operation Panel	S03 LOP01	1 set

41	S03-EE-03	Grit Pump & Collector Local Operation Panel	S03 LOP02/03	2 sets
42	S03-EE-04	Grit Scrubber Local Operation Panel	S03 LOP04	1 set
43	S03-EE-05	Outlet Gate Local Operation Panel	S03 LOP05	1 set
44	S03-EE-06	Scum Screen Local Operation Panel	S03 LOP06	1 set
45	S05-EE-02	Sludge Collector Local Operation Panel	S05 LOP01/02	2 sets
46	S06-EE-01	Primary Sludge Pump Local Operation Panel	S06 LOP01/02	2 sets
47	S06-EE-02	Suction Sludge & Delivery Valve Local Operation Panel	S06 LOP03/04	2 sets
48	S06-EE-03	Scum Pump & Suction Valve Local Operation Panel	S06 LOP05/06	2 sets
49	S06-EE-04	Sump Drainage Pump Local Operation Panel	S06 LOP07/08	2 sets
50	S06-EE-05	Exhaust Fan Local Operation Panel	S06 LOP09/10	2 sets
51	S08-EE-11	Blower Local Operation Panel	S08 LOP01 to 05	5 sets
52	S08-EE-12	Clear Water Supply Pump Local Operation Panel	S08 LOP06	1 set
53	S08-EE-13	Sump Drainage Pump Local Operation Panel	S08 LOP07	2 sets
54	S11-EE-03	Return Sludge Pump Local Operation Panel	S11 LOP01 to 05	5 sets
55	S11-EE-04	Waste Sludge Pump Local Operation Panel	S11 LOP06	1 set
56	S11-EE-05	Partition Valve Local Operation Panel	S11 LOP07	1 set
57	S11-EE-06	Sump Drainage Pump Local Operation Panel	S11 LOP08	1 set
58	S11-EE-07	Connection Valve A Local Operation Panel	S11 LOP09	1 set
59	S11-EE-08	Connection Valve B Local Operation Panel	S11 LOP10	1 set
60	S12-EE-05	Discharge Pump Local Operation Panel	S12 LOP01 to 05	5 sets
61	S12-EE-06	Connection Valve Local Operation Panel	S12 LOP06	1 set
62	S12-EE-07	Sump Drainage Pump Local Operation Panel	S12 LOP07/08	2 sets
63	S12-EE-08	Air Intake Fan Local Operation Panel	S12 LOP09/10	2 sets
64	S21-EE-02	Thickened Sludge Collector Local Operation Panel	S21 LOP01	1 set
65	S22-EE-01	Thickened Sludge Pump & Suction Valve Local Operation Panel	S22 LOP01	1 set
66	S22-EE-02	Sump Drainage Pump Local Operation Panel	S22 LOP02	1 set
67	S22-EE-03	Exhaust Fan Local Operation Panel	S22 LOP03	1 set
68	S23-EE-02	Sludge Pump Sludge Valve Local Operation Panel	S23 LOP01	1 set
69	S23-EE-03	Sump Drainage Pump Local Operation Panel	S23 LOP02	1 set
70	S24-EE-15	Thickener Polymer Facilities Local Operation Panel	S24 LOP01	1 set
71	S24-EE-16	Air Compressor Local Operation Panel	S24 LOP02	1 set
72	S24-EE-17	Waste Sludge Mixer Local Operation Panel	S24 LOP03	1 set
73	S24-EE-18	Waste Sludge Feed Pump Local Operation Panel	S24 LOP04	1 set
74	S24-EE-19	Thickened Sludge Mixer & Grinder Local Operation Panel	S24 LOP05	1 set

75	S24-EE-20	Thickened Sludge Pump Local Operation Panel	S24 LOP06	1 set
76	S24-EE-21	Dewatering Unit Polymer Facilities Local Operation Panel	S24 LOP07	1 set
77	S24-EE-22	Digested Sludge Mixer Local Operation	S24 LOP08	1 set
78	S24-EE-23	Sludge Feed Pump Local Operation Panel	S24 LOP09	1 set
79	S24-E-24	Waste Water Mixer & Pump Local Operation Panel	S24 LOP10	1 set
80	S24-EE-25	Sump Drainage Pump Local Operation Panel	S24 LOP11/12	2 sets
81	S24-EE-26	Water Elutriation Pump Local Operation	S24 LOP13	1 set
82	S24-EE-27	Desulfurizer Pump Local Operation Panel	S24 LOP14	1 set
83	S24-EE-28	Treated Water Valve Local Operation Panel	S24 LOP15	1 set
84	S24-EE-29	Odor Fan Local Operation Panel	S24 LOP16	1 set
85	S25-EE-01	Cake Hopper Local Operation Panel	S25 LOP01 to 03	3 sets
86	S25-EE-02	Cake Tripper Local Operation Panel	S25 LOP04 to 06	3 sets
87	S27-EE-02	Coal Grinder Local Operation Panel	S27 LOP01	1 set
88	S27-EE-03	Coal Boiler Local Operation Panel	S27 LOP02/03	1 set
89	S27-EE-04	Coal Conveyer Local Operation Panel	S27 LOP04	1 set
90	S27-EE-05	Ash Conveyer Local Operation Panel	S27 LOP05	1 set
91	S27-EE-06	Water Supply Pump Local Operation Panel	S27 LOP06	1 set
92	S27-EE-07	Soft Water Pump Local Operation Panel	S27 LOP07	1 set
93	S27-EE-08	Heating Pump Local Operation Panel	S27 LOP08	1 set
94	S27-EE-09	Exhaust Fan Local Operation Panel	S27 LOP09	1 set

c. Standard Accessories

Name Plate Plastic plate, with engraved black letter on white background

Inboard Lighting with lighting door switch (except Local Operation Panel (LOP))

Door key

Spare parts

**1. Transformer Panel (S24TRP01/02)**

a. Purpose

To step down voltage from 6kV to 380V at 3-phase, 4-wire and 50 Hz.

b. Quantity: 2 sets

c. Specification (The quantities shall be for each panel)

Type Molded 3-phase,4-wire, double wound, naturally cooled type, built in metal-enclosed switchgear

IP Numbers 20

Rated capacity 2000kVA

Rated voltage 6kV/380-220V



System highest voltage	AC7.2kV
Method of connection	HV winding          Delta connection
	LV winding          Star connection, neutral solidly earthed
Measuring instrument	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Indication lamps:	1 lot
Necessary accessories:	1 lot

## **2. Transformer Secondary Panel (S24 LVP01/02)**

### a. Purpose

To receive low voltage from transformer and to distribute to low voltage feeder panel

### b. Quantity: 2 sets

### c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
IP Numbers	20
Rated insulation voltage	AC600V
Rated current	3200A
Control circuit voltage	AC 220V
Molded case circuit breaker (ACB)	: 1 lot As shown on the drawings
Measuring instrument	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Control switches:	1 lot
Indication lamps:	1 lot
Necessary accessories:	1 lot

## **3. Low Voltage Feeder Panel (S24 LVP03)**

### a. Purpose

To receive low voltage from transformer and to distribute to each low voltage panel or equipment

### b. Quantity: 1 set

### c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
------	---

IP Numbers	20
Rated insulation voltage	AC600V
Rated current	600A
Control circuit voltage	AC 220V
Molded case circuit breaker (MCCB)	: 1 lot As shown on the drawings
Measuring instrument	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Control switches:	1 lot
Indication lamps:	1 lot
Necessary accessories:	1 lot

#### **4. UPS (S24 UPS01/02)**

a. Purpose

To keep supplying power without short break switching when power failure happens.

b. Quantity: 2 sets

c. Specification (The quantities shall be for each panel)

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Input voltage	380V 3-phase
Output voltage	220V single phase
Capacity	5kVA
Backup time	More than 30 minutes
Molded case circuit breaker (MCCB):	1-lot As shown on the drawings
Power supply method	Inverter continuous supply with no short break switching
Control switches:	1 lot
Indication lamps:	1 lot
Necessary accessories:	1 lot

#### **5. Low Voltage Feeder Panel (S02LVP01)**

a. Purpose

To receive low voltage from transformer and to distribute to each low voltage panel or equipment

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof	
IP Numbers	40	
Rated insulation voltage	AC600V	
Rated current	400A	
Control circuit voltage	AC 220V	
Molded case circuit breaker (MCCB)	: 1-lot As shown on the drawings	
Measuring instrument	As shown on the drawings and the general specifications	
Protective relays	As shown on the drawings and the general specifications	
Control switches:	1 lot	
Indication lamps:	1 lot	
Necessary accessories:	1 lot	

#### **6. Transformer Panel (S08TRP01/02)**

a. Purpose

To step down voltage from 6kV to 380V at 3-phase, 4-wire and 50 Hz.

b. Quantity: 2 sets

c. Specification (The quantities shall be for each panel)

Type	Molded 3-phase,4-wire, double wound, naturally cooled type, built in metal-enclosed switchgear	
IP Numbers	40	
Rated capacity	400kVA	
Rated voltage	6kV/380-220V	
System highest voltage	AC7.2kV	
Method of connection	HV winding	Delta connection
	LV winding	Star connection, neutral solidly earthed
Measuring instrument	As shown on the drawings and the general specifications	
Protective relays	As shown on the drawings and the general specifications	
Indication lamps:	1 lot	
Necessary accessories:	1 lot	

**7. Transformer Secondary Panel (S08 LVP01)**

## a. Purpose

To receive low voltage from transformer and to distribute to low voltage feeder panel

## b. Quantity: 1 set

## c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
IP Numbers	40
Rated insulation voltage	AC600V
Rated current	800A
Control circuit voltage	AC 220V
Air circuit breaker (ACB)	: 1 lot As shown on the drawings
Measuring instrument	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Control switches:	1 lot
Indication lamps:	1 lot
Necessary accessories:	1 lot

**8. Low Voltage Feeder Panel (S08 LVP02)**

## a. Purpose

To receive low voltage from transformer and to distribute to each low voltage panel or equipment

## b. Quantity: 1 set

## c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
IP Numbers	40
Rated insulation voltage	AC600V
Rated current	800A
Control circuit voltage	AC 220V
Molded case circuit breaker (MCCB)	: 1lot As shown on the drawings
Measuring instrument	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Control switches:	1 lot
Indication lamps:	1 lot

Necessary accessories: 1 lot

## **9. UPS (S08 UPS01/02)**

### a. Purpose

To supply power without short break switching when power failure happened.

### b. Quantity: 2 sets

### c. Specification (The quantities shall be for each panel)

Type Indoor, self-supporting, metal enclosed, vermin-proof

Input voltage 380V 3-phase

Output voltage 220V single phase

Capacity 5kVA

Backup time More than 30 minutes

Molded case circuit breaker (MCCB): 1 lot As shown on the drawings

Power supply method Inverter continuous supply with no short break switching

Control switches: 1 lot

Indication lamps: 1 lot

Necessary accessories: 1 lot

## **10. Low Voltage Feeder Panel (S11LVP01)**

### a. Purpose

To receive low voltage from transformer and to distribute to each low voltage panel or equipment

### b. Quantity: 1 set

### c. Specification

Type Indoor, self-supporting, metal enclosed, vermin-proof

IP Numbers 20

Rated insulation voltage AC600V

Rated current 100A

Control circuit voltage AC 220V

Molded case circuit breaker (MCCB): 1 lot As shown on the drawings

Measuring instrument As shown on the drawings and the general specifications

Protective relays As shown on the drawings and the general specifications

Control switches: 1 lot

Indication lamps:	1 lot
Necessary accessories:	1 lot

### **11. Low Voltage Feeder Panel (S12LVP01)**

a. Purpose

To receive low voltage from transformer and to distribute to each low voltage panel or equipment

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof	
IP Numbers	40	
Rated insulation voltage	AC600V	
Rated current	100A	
Control circuit voltage	AC 220V	
Molded case circuit breaker (MCCB):	1 lot	As shown on the drawings
Measuring instrument	As shown on the drawings and the general specifications	
Protective relays	As shown on the drawings and the general specifications	
Control switches:	1 lot	
Indication lamps:	1 lot	
Necessary accessories:	1 lot	

### **12. Transformer Panel (S28TRP01/02)**

a. Purpose

To step down voltage from 6kV to 380V at 3-phase, 4-wire and 50 Hz.

b. Quantity: 2 sets

c. Specification (The quantities below shall be for each panel)

Type	Molded 3-phase, 4-wire, double wound, naturally cooled type, built in metal-enclosed switchgear	
IP Numbers	20	
Rated capacity	1500kVA	
Rated voltage	6kV/380-220V	
System highest voltage	AC7.2kV	
Method of connection	HV winding	Delta connection
	LV winding	Star connection, neutral solidly earthed

Measuring instrument	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Indication lamps:	1 lot
Necessary accessories:	1 lot

### **13. Transformer Secondary Panel (S28 LVP01/02)**

a. Purpose

To receive low voltage from transformer and to distribute to low voltage feeder panel

b. Quantity: 2 sets

c. Specification (The quantities below shall be per each panel.)

Type	Indoor, self-supporting, metal enclosed, vermin-proof
IP Numbers	20
Rated insulation voltage	AC600V
Rated current	800A
Control circuit voltage	AC 220V
Air circuit breaker (ACB):	1 lot As shown on the drawings
Measuring instrument	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Control switches:	1 lot
Indication lamps:	1 lot
Necessary accessories:	1 lot

### **14. Low Voltage Feeder Panel (S28 LVP03)**

a. Purpose

To receive low voltage from transformer and to distribute to each low voltage panel or equipment

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
IP Numbers	20
Rated insulation voltage	AC600V
Rated current	2500A
Control circuit voltage	AC 220V
Molded case circuit breaker (MCCB):	1 lot As shown on the drawings

Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switches:	1 lot
Indication lamps:	1 lot
Necessary accessories:	1 lot

#### **15. UPS (S28 UPS01)**

a. Purpose

To supply power without short break switching when power failure happens

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Input voltage	380V 3-phase
Output voltage	220V single phase
Capacity	5kVA
Backup time	More than 30 minutes
Molded case circuit breaker (MCCB):	1 lot As shown on the drawings
Power supply method	Inverter continuous supply with no short break switching
Control switches:	1 lot
Indication lamps:	1 lot
Necessary accessories:	1 lot

#### **16. Influent Pump Station MCC & Auxiliary Relay Panel (S02 MCC01 & S02ARY01)**

a. Purpose

To drive and control the influent pump station facilities as shown on the drawings. Manual operation control circuits for all the plant loads shall be provided in the auxiliary relay panel.

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof single face withdrawable
IP Numbers	40
Forms	3b
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications



Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

### **17. Influent Pump Panels (S02 IPP01 to 05)**

a. Purpose

To drive and control the influent pumps.

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
IP Numbers	20
Control circuit voltage	AC 220V
Molded case circuit breaker (MCCB):	1 lot As shown on the drawings
Motor starters	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

### **18. Temporary Influent Pump Panels (S02 TPP01 to 03)**

a. Purpose

To drive and control the temporary influent pumps.

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
IP Numbers	20
Control circuit voltage	AC 220V
Molded case circuit breaker (MCCB):	1 lot As shown on the drawings
Motor starters	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram

Necessary accessories: 1 lot

**19. Grit Chamber MCC & Auxiliary Relay Panel (S03 MCC01 & S03 ARY01)**

a. Purpose

To drive and control the grit chamber facilities as shown on the drawings. Manual operation control circuits for all the plant loads shall be provided in the auxiliary relay panel.

b. Quantity: 1 set

c. Specification

Type Indoor, self-supporting, metal enclosed, vermin-proof single face withdrawal

IP Numbers 20

Forms 3b

Control circuit voltage AC 220V

Composed units As shown on the drawings and the general specifications

Protective relays As shown on the drawings and the general specifications

Mounted devices As shown on the drawings and the electrical operation diagram

Indication lamps As shown on the drawings and the electrical operation diagram

Necessary accessories: 1 lot

**20. Primary Sedimentation Tanks MCC & Auxiliary Relay Panel (S05 MCC01 & S05 ARY01)**

a. Purpose

To drive and control the grit chamber facilities as shown on the drawings. Manual operation control circuits for all the plant loads shall be provided in the auxiliary relay panel.

b. Quantity: 1 set

c. Specification

Type Indoor, self-supporting, metal enclosed, vermin-proof single face withdrawal

IP Numbers 20

Forms 3b

Control circuit voltage AC 220V

Composed units As shown on the drawings and the general specifications

Protective relays As shown on the drawings and the general specifications

Mounted devices As shown on the drawings and the electrical operation diagram

Indication lamps As shown on the drawings and the electrical operation diagram

Necessary accessories: 1 lot

**21. Air Blower Facilities MCC & Auxiliary Relay Panel (S08 MCC01 & S08 ARY01)**

a. Purpose

To drive and control the air blower facilities as shown on the drawings. Manual operation control circuits for all the plant loads shall be provided in the auxiliary relay panel.

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof single face withdrawal
IP Numbers	20
Forms	3b
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

**22. Secondary Sedimentation Tanks MCC & Auxiliary Relay Panel (S10 MCC01 & S10 ARY01)**

a. Purpose

To drive and control the secondary sedimentation tanks facilities as shown on the drawings. Manual operation control circuits for all the plant loads shall be provided in the auxiliary relay panel.

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof single face withdrawal
IP Numbers	20
Forms	3b
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram

Necessary accessories: 1 lot

**23. Return Sludge Pump House MCC & Auxiliary Relay Panel (S11 MCC01 & S11 ARY01)**

a. Purpose

To drive and control the return sludge pumps, the waste sludge pumps and the incidental valves as shown on the drawings. Manual operation control circuits for all the plant loads shall be provided in the auxiliary relay panel.

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof single face withdrawal
IP Numbers	20
Forms	3b
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

**24. Discharge Pump Station MCC & Auxiliary Relay Panel (S12 MCC01 & S12 ARY01)**

a. Purpose

To drive and control the discharge station facilities as shown on the drawings. Manual operation control circuits for all the plant loads shall be provided in the auxiliary relay panel.

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof single face withdrawal
IP Numbers	40
Forms	3b
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram

Indication lamps As shown on the drawings and the electrical operation diagram  
 Necessary accessories: 1 lot

## **25. Discharge Pump Panels (S12 CPP01 to 05)**

### a. Purpose

To drive and control the discharge pumps.

### b. Quantity: 1 set

### c. Specification

Type Indoor, self-supporting, metal enclosed, vermin-proof

IP Numbers 40

Control circuit voltage AC 220V

Molded case circuit breaker (MCCB): 1 lot As shown on the drawings

Motor starters As shown on the drawings and the general specifications

Protective relays As shown on the drawings and the general specifications

Mounted devices As shown on the drawings and the electrical operation diagram

Indication lamps As shown on the drawings and the electrical operation diagram

Necessary accessories: 1 lot

## **26. Temporary Discharge Pump Panels (S12 TPP01 to 03)**

### a. Purpose

To drive and control the temporary discharge pumps.

IP Numbers 20

### b. Quantity: 1 set

### c. Specification

Type Indoor, self-supporting, metal enclosed, vermin-proof

Control circuit voltage AC 220V

Molded case circuit breaker (MCCB): 1 lot As shown on the drawings

Motor starters As shown on the drawings and the general specifications

Protective relays As shown on the drawings and the general specifications

Mounted devices As shown on the drawings and the electrical operation diagram

Indication lamps As shown on the drawings and the electrical operation diagram

Necessary accessories: 1 lot

**27. Gravity Thickener MCC & Auxiliary Relay Panel (S21 MCC01 & S21 ARY01)**

## a. Purpose

To drive and control the gravity thickener station facilities as shown on the drawings. Manual operation control circuits for all the plant loads shall be provided in the auxiliary relay panel.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof single face withdrawal
IP Numbers	20
Forms	3b
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

**28. Digester MCC & Auxiliary Relay Panel (S23 MCC01 & S21 ARY01)**

## a. Purpose

To drive and control the digester facilities as shown on the drawings. Manual operation control circuits for all the plant loads shall be provided in the auxiliary relay panel.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof single face withdrawal
IP Numbers	20
Forms	3b
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

**29. Mechanical Thickener MCC & Auxiliary Relay Panel (S24 MCC01 & S24 ARY01)**

## a. Purpose

To drive and control the mechanical thickener facilities as shown on the drawings. Manual operation control circuits for all the plant loads shall be provided in the auxiliary relay panel.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof single face withdrawal
IP Numbers	20
Forms	3b
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

**30. Sludge Dewatering Unit MCC & Auxiliary Relay Panel (S24 MCC02 & S24 ARY02)**

## a. Purpose

To drive and control the sludge dewatering unit facilities as shown on the drawings. Manual operation control circuits for all the plant loads shall be provided in the auxiliary relay panel.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof single face withdrawal
IP Numbers	20
Forms	3b
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

**31. Utility Water Facilities MCC & Auxiliary Relay Panel (S24 MCC03 & S24 ARY03)**

## a. Purpose

To drive and control the utility water facilities as shown on the drawings. Manual operation control circuits for all the plant loads shall be provided in the auxiliary relay panel.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof single face withdrawal
IP Numbers	20
Forms	3b
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

**32. Boiler MCC & Auxiliary Relay Panel (S27 MCC03 & S27 ARY03)**

## a. Purpose

To drive and control the boiler facilities as shown on the drawings. Manual operation control circuits for all the plant loads shall be provided in the auxiliary relay panel.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof single face withdrawal
IP Numbers	20
Forms	3b
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot



**33. Channel Gate Local Operation Panel (S02 LOP01)**

## a. Purpose

To operate the channel gates.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**34. Fine Screen Local Operation Panel (S02 LOP02)**

## a. Purpose

To operate fine screens.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**35. Connection Valve Local Operation Panel (S02 LOP03)**

## a. Purpose

To operate Connection valves.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**36. Influent Pump Local Operation Panels (S02 LOP04 to 08)**

a. Purpose

To operate the influent pumps.

b. Quantity: 1 set

c. Specification

Type Indoor, with stand, metal enclosed, vermin-proof

Mounted devices As shown on the drawings and the electrical operation diagram

Indication lamps As shown on the drawings and the electrical operation diagram

Electric space heater: 1 set with a thermostat

Necessary accessories: 1 lot

**37. Sump Drainage Pump Local Operation Panel (S02 LOP09/10)**

a. Purpose

To operate the sump drainage pumps located at basement floor of the influent pump station.

b. Quantity: 2 sets

c. Specification (Quantities below shall be for each panel.)

Type Indoor, with stand, metal enclosed, vermin-proof

Mounted devices As shown on the drawings and the electrical operation diagram

Indication lamps As shown on the drawings and the electrical operation diagram

Electric space heater: 1 set with a thermostat

Necessary accessories: 1 lot

**38. Exhaust Fan Local Operation Panel (S02 LOP11)**

a. Purpose

To operate the exhaust fan.

b. Quantity: 1 set

c. Specification

Type Indoor, wall-mounted, metal enclosed, vermin-proof

Mounted devices As shown on the drawings and the electrical operation diagram

Indication lamps As shown on the drawings and the electrical operation diagram

Electric space heater: 1 set with a thermostat

Necessary accessories: 1 lot

**39. Intake Fan Local Operation Panel (S02 LOP12 to 14)**

## a. Purpose

To operate the intake fans.

## b. Quantity: 3 sets

## c. Specification (Quantities below shall be for each panel.)

Type	Indoor, wall-mounted, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**40. Inlet & Bypass Gate Local Operation Panel (S03 LOP01)**

## a. Purpose

To operate the inlet gate and the bypass gate.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**41. Grit Pump & Collector Local Operation Panel (S03 LOP02/03)**

## a. Purpose

To operate the grit pump and grit collector.

## b. Quantity: 2 sets

## c. Specification (Quantities below shall be for each panel.)

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**42. Grit Scrubber Local Operation Panel (S03 LOP04)**

## a. Purpose

To operate the grit scrubber.

## b. Quantity: 1 set

## c. Specification (Quantities below shall be for each panel.)

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**43. Outlet Gate Local Operation Panel (S03 LOP05)**

## a. Purpose

To operate the outlet gate.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**44. Scum Screen Local Operation Panel (S03 LOP06)**

## a. Purpose

To operate the scum screens.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**45. Sludge Collector Local Operation Panel (S05 LOP01/02)**

## a. Purpose

To operate the primary sludge collectors.

## b. Quantity: 2 sets

## c. Specification (Quantities below shall be for each panel.)

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**46. Primary Sludge Pump Local Operation Panel (S06 LOP01/02)**

## a. Purpose

To operate the primary sludge pumps.

## b. Quantity: 2 sets

## c. Specification (Quantities below shall be for each panel.)

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**47. Suction Sludge & Delivery Valve Local Operation Panel (S06 LOP03/04)**

## a. Purpose

To operate the primary suction sludge valves and the primary delivery valves.

## b. Quantity: 2 sets

## c. Specification (Quantities below shall be for each panel.)

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**48. Scum Pump & Suction Valve Local Operation Panel (S06 LOP05//06)**

## a. Purpose

To operate the scum pumps and suction valves.

## b. Quantity: 2 sets

## c. Specification (Quantities below shall be for each panel.)

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**49. Sump Drainage Pump Local Operation Panel (S06 LOP07//08)**

## a. Purpose

To operate the sump drainage pumps located at basement floor of the primary sludge pump house.

## b. Quantity: 2 sets

## c. Specification (Quantities below shall be for each panel.)

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**50. Exhaust Fan Local Operation Panels (S06 LOP09//10)**

## a. Purpose

To operate the exhaust fans.

## b. Quantity: 2 sets

## c. Specification (Quantities below shall be for each panel.)

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**51. Blower Local Operation Panels (S08 LOP01 to 05)**

## a. Purpose

To operate the blowers.

## b. Quantity: 5 sets

## c. Specification (Quantities below shall be for each panel.)

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**52. Clear Water Supply Pump Local Operation Panels (S08 LOP06)**

## a. Purpose

To operate the clear water supply pumps.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**53. Sump Drainage Pump Local Operation Panel (S08 LOP07)**

## a. Purpose

To operate the sump drainage pumps located at the basement of the blower house.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, wall-mounted, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**54. Return Sludge Pump Local Operation Panel (S11 LOP01 to 05)**

## a. Purpose

To operate the return sludge pumps and the relevant valves.

## b. Quantity: 1 set

## c. Specification

Type Indoor, with stand, metal enclosed, vermin-proof

Mounted devices As shown on the drawings and the electrical operation diagram

Indication lamps As shown on the drawings and the electrical operation diagram

Electric space heater: 1 set with a thermostat

Necessary accessories: 1 lot

**55. Waste Sludge Pump Local Operation Panel (S11 LOP01 to 06)**

## a. Purpose

To operate the waste sludge pumps and the relevant valves.

## b. Quantity : 1 set

## c. Specification

Type Indoor, with stand, metal enclosed, vermin-proof

Mounted devices As shown on the drawings and the electrical operation diagram

Indication lamps As shown on the drawings and the electrical operation diagram

Electric space heater : 1 set with a thermostat

Necessary accessories : 1 lot

**56. Partition Valve Local Operation Panel (S11 LOP01 to 07)**

## a. Purpose

To operate the partition valves located between the lower sludge channel and the return sludge pump house

## b. Quantity: 1 set

## c. Specification

Type Indoor, with stand, metal enclosed, vermin-proof

Mounted devices As shown on the drawings and the electrical operation diagram

Indication lamps As shown on the drawings and the electrical operation diagram

Electric space heater: 1 set with a thermostat

Necessary accessories: 1 lot



**57. Sump Drainage Pump Local Operation Panel (S11 LOP08)**

## a. Purpose

To operate the sump drainage pumps located at the basement floor of the return sludge pump.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, wall-mounted, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**58. Connection Valve A Local Operation Panel (S11 LOP09)**

## a. Purpose

To operate the connection valves located at the upstream side and the downstream side of the return sludge flow meter.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, wall-mounted, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**59. Connection Valve B Local Operation Panel (S11 LOP10)**

## a. Purpose

To operate the connection valve B located on the standby return sludge pipe.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, wall-mounted, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**60. Discharge Pump Local Operation Panel (S12 LOP01 to 05)**

## a. Purpose

To operate the discharge pumps and the relevant valves.

## b. Quantity: 5 sets

## c. Specification (Quantities below shall be for each panel.)

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**61. Connection Valve Local Operation Panel (S12 LOP06)**

## a. Purpose

To operate the connection valves.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**62. Sump Drainage Pump Local Operation Panel (S12 LOP07/08)**

## a. Purpose

To operate the sump drainage pumps located at the basement floor of the return sludge pump.

## b. Quantity: 2 sets

## c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**63. Air Intake Fan Local Operation Panels (S12 LOP09/10)**

## a. Purpose

To operate the air intake fans located at the basement 1 floor of the discharge pump station.

## b. Quantity: 2 sets

## c. Specification (Quantities below shall be for each panel.)

Type	Indoor, wall-mounted, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**64. Thickened Sludge Collector Local Operation Panel (S21 LOP01)**

## a. Purpose

To operate the thickened sludge collectors.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**65. Thickened Sludge Pump & Suction Valve Local Operation Panel (S22 LOP01)**

## a. Purpose

To operate the thickened sludge pumps and the relevant suction valves.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**66. Sump Drainage Pump Local Operation Panel (S22 LOP02)**

## a. Purpose

To operate the sump drainage pump located at the basement floor of the thickened sludge pump house.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, wall-mounted, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**67. Exhaust Fan Local Operation Panel (S22 LOP03)**

## a. Purpose

To operate the exhaust Fan located at the first floor of the thickened sludge pump house.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, wall-mounted, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**68. Sludge Pump & Sludge Valve Local Operation Panel (S23 LOP01)**

## a. Purpose

To operate the sludge pumps and the relevant valves located at the digester pump house.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof, explosion-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**69. Sump Drainage Pump Local Operation Panel (S23 LOP01)**

## a. Purpose

To operate the sump drainage pump located at the digester pump house.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, wall-mounted, metal enclosed, vermin-proof, explosion-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**70. Thickener Polymer Facilities Local Operation Panel (S24 LOP01)**

## a. Purpose

To operate the polymer dosing facilities for the mechanical thickeners.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, wall-mounted, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**71. Air Compressor Local Operation Panel (S24 LOP02)**

## a. Purpose

To operate the air compressors and the air dryer.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**72. Waste Sludge Mixer Local Operation Panel (S24 LOP03)**

## a. Purpose

To operate the waste sludge mixers.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**73. Waste Sludge Feed Pump Local Operation Panel (S24 LOP04)**

## a. Purpose

To operate the waste sludge feed pumps.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**74. Thickened Sludge Mixer & Grinder Local Operation Panel (S24 LOP05)**

## a. Purpose

To operate the thickened sludge mixers and the sludge grinder.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**75. Thickened Sludge Pump Local Operation Panel (S24 LOP06)**

## a. Purpose

To operate the thickened sludge pumps.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**76. Dewatering Unit Polymer Facilities Local Operation Panel (S24 LOP07)**

## a. Purpose

To operate the polymer dosing facilities for the dewatering units.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, self-support, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**77. Digested Sludge Mixer Local Operation Panel (S24 LOP08)**

## a. Purpose

To operate the digested sludge mixers.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**78. Sludge Feed Pump Local Operation Panel (S24 LOP09)**

## a. Purpose

To operate the sludge feed pumps.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**79. Waste Water Mixer & Pump Local Operation Panel (S24 LOP10)**

## a. Purpose

To operate the wastewater mixer and the wastewater pumps.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**80. Sump Drainage Pump Local Operation Panel (S24 LOP11/12)**

## a. Purpose

To operate the sump drainage pumps located at the basement floor of the sludge treatment building.

## b. Quantity: 2 sets

## c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot



**81. Elutriation Water Pump Local Operation Panel (S24 LOP13)**

## a. Purpose

To operate the elutriation water pumps.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**82. Desulfurizer Pump Local Operation Panel (S24 LOP14)**

## a. Purpose

To operate the desulfurizer pumps.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**83. Treated Water Valve Local Operation Panel (S24 LOP15)**

## a. Purpose

To operate the treated water valve.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**84. Odor Fan Local Operation Panel (S24 LOP16)**

## a. Purpose

To operate the odor fans.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**85. Cake Hopper Local Operation Panel (S25 LOP01 to 03)**

## a. Purpose

To operate the cake hoppers.

## b. Quantity: 3 sets

## c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**86. Cake Tripper Local Operation Panel (S25 LOP04 to 06)**

## a. Purpose

To operate the cake trippers

## b. Quantity: 3 sets

## c. Specification

Type	Indoor, wall-mounted, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**87. Coal Grinder Local Operation Panel (S27 LOP01)**

## a. Purpose

To operate the coal grinders.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, wall-mounted, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**88. Coal Boiler Local Operation Panel (S27 LOP02/03)**

## a. Purpose

To operate the coal boiler fans.

## b. Quantity: 2 sets

## c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**89. Coal Conveyer Local Operation Panel (S27 LOP04)**

## a. Purpose

To operate the coal conveyer.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, wall-mounted, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**90. Ash Conveyer Local Operation Panel (S27 LOP05)**

## a. Purpose

To operate the ash conveyer.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, wall-mounted, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**91. Water Supply Pump Local Operation Panel (S27 LOP06)**

## a. Purpose

To operate the water supply pumps.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**92. Soft Water Pump Local Operation Panel (S27 LOP07)**

## a. Purpose

To operate the soft water pumps.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**93. Heating Pump Local Operation Panel (S27 LOP08)**

a. Purpose

To operate the heating pumps.

b. Quantity: 1 set

c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**94. Exhaust Fan Local Operation Panel (S27 LOP09)**

a. Purpose

To operate the exhaust fan.

b. Quantity: 1 set

c. Specification

Type	Indoor, wall mounted, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**P16.2.3 Instrumentation Facilities (S02 to S28-Sewage Treatment Plant)**

a. General

The components of instrumentation for the Sewage Treatment Plant shall consist of the following equipment. Equipment shall be designed using the following conditions and in accordance with the specification set forth hereinafter in this Section.

b. Equipment List

	Item No.	Name	Tag No.	Quantity
1	S02-EE-12	Temporary Pump station Level Switch	S02 ILS01	1 set
2	S02-EE-13	Influent Pump Station Reservoir Level	S02 ILE11/21	2 sets
3	S02-EE-14	Influent Sewage Flow	S02 IFE01 to 04	4 sets
4	S02-EE-15	Sump Pit Level Switch	S02 ILS11/21	2 sets
5	S02-EE-16	Influent Sewage pH	S02 IPH01	1 set

6	S03-EE-07	Grit Pit Level Switch	S03 ILS11/21	2 sets
7	S03-EE-08	Grit Scrubber Level Switch	S03 ILS01	1 set
8	S05-EE-03	Scum Tank Level Switch	S05 ILS01 to 04	4 sets
9	S06-EE-06	Sump Pit Level Switch	S06 ILS01/02	2 sets
10	S06-EE-07	Primary Sludge Flow	S06 IFE11/21	2 sets
11	S06-EE-08	Primary Sludge Density	S07 IDE11/21	2 sets
12	S08-EE-14	Blower Flow	S08 IFE01 to 05	5 sets
13	S08-EE-15	Blower Pressure	S08 IPE01	1 set
14	S08-EE-16	Air Temperature	S08 ITE01	1 set
15	S08-EE-17	Clear Water Tank Level Switch	S08 ILS01	1 set
16	S08-EE-18	Sump Pit Level Switch	S08 ILS02	1 set
17	S08-EE-19	Clear Water Tank Temperature	S08 ITE02	1 set
18	S11-EE-09	Return Sludge Flow	S11 IFE01	1 set
19	S11-EE-10	Sump Pit Level Switch	S11 ILS01	1 set
20	S12-EE-09	Temporary Pump Station Level Switch	S12 ILS01	1 set
21	S12-EE-10	Discharge Pump Station Reservoir Level	S12 ILE01	1 set
22	S12-EE-11	Sump Pit Level Switch	S12 ILS11/21	2 sets
23	S12-EE-12	Discharge pH	S12 IPH01	1 set
24	S21-EE-03	Sump Pit Level Switch	S21 ILS01	1 set
25	S23-EE-04	Digester Level	S23 ILE01	1 set
26	S23-EE-05	Distribution Tank Level	S23 ILE11/21	2 sets
27	S23-EE-06	Digester Pressure	S23 IPE11/21	2 sets
28	S23-EE-07	Sump Pit Level Switch	S23 ILS01	1 set
29	S24-EE-30	Sludge Holding Tank Level	S24 ILE01/02	2 sets
30	S24-EE-31	Gravity Thickener Flow	S24 IFE01	1 set
31	S24-EE-32	Mechanical Thickener Flow	S24 IFE02 to 04	3 sets
32	S24-EE-33	Thickened Sludge Holding Tank Level	S24 ILE03/03	2 sets
33	S24-EE-34	Thickener Polymer Tank Level	S24 ILE05/06	2 sets
34	S24-EE-35	Digester Flow	S24 IFE05	1 set
35	S24-EE-36	Treated Water Tank Level Switch	S24 ILS01	1 set
36	S24-EE-37	Utility Water Tank Level Switch	S24 ILS02	1 set
37	S24-EE-38	Digested Sludge Holding Tank Level	S24 ILE07/08	2 sets
38	S24-EE-39	Digested Dewatering Sludge Density	S24 IDE01	1 set
39	S24-EE-40	Dewatering Unit Polymer Tank Level	S24 ILE09/10	2 sets
40	S24-EE-41	Digested Dewatering Sludge Flow	S24 ILE06 to 08	3 sets
41	S24-EE-42	Waste Water Tank Level Switch	S24 ILS03	1 set
42	S24-EE-43	Sump Pit Level Switch	S24 ILS04/05	2 sets
43	S25-EE-03	Cake Hopper Weight	S25 IWE011to 61	6 sets
44	S26-EE-01	Gas Holder Level	S26 ILE11/21	2 sets
45	S27-EE-10	Coal Boiler Level	S27 ILE11/21	2 sets

46	S27-EE-11	Coal Boiler Pressure	S27 IPE11/21	2 sets
47	S27-EE-12	Coal Boiler Temperature	S27 ITE11/21	2 sets
48	S27-EE-13	Condenser Level	S27 ILE01	1set
49	S27-EE-14	Condenser Temperature	S27 ITE01	1 set
50	S27-EE-15	Condenser Pressure	S27 IPE01	1 set
51	S02-EE-17	Instrumentation Panel for Influent Pump Station	S02 INP01	1 set
52	S08-EE-20	Instrumentation Panel for Blower House	S08 INP01	1 set
53	S11-EE-11	Instrumentation Panel for Return Sludge Pump House	S11 INP01	1 set
54	S12-EE-13	Instrumentation Panel for Discharge Pump Station	S12 INP01	1set
55	S24-EE-44	Instrumentation Panel for Thickening	S24 INP01	1 set
56	S24-EE-45	Instrumentation Panel for Dewatering	S24 INP02	1 set
57	S27-EE-16	Instrumentation Panel for Boiler House	S27 INP01	1 set
58	S28-EE-09	Instrumentation Panel for Electrical House	S28 INP01	1 set

### c. Standard Accessories

#### Spare parts

#### **1. Temporary Pump Station Level Switch (S02 ILS 01)**

##### a. Purpose

To sense the level in the temporary influent pump station and to control the temporary influent pumps automatically.

##### b. Quantity: 1 set

##### c. Specification

Type Float, micro switch type

Contacts enclosure: Fully submersible, protected to IP68

Number of contacts: 6

Measurement fluid Sewage

Accessories Stainless steel 304 suspension chain, a weight and PVC protection pipe

Other necessary accessories: 1 lot

#### **2. Influent Pump Station Reservoir Level (S02 ILE 11/21)**

##### a. Purpose

To measure the level in the influent pump station reservoir and to control the influent pumps automatically.

##### b. Quantity: 2 sets

## c. Specification

Type	Submersible hydrostatic type
Material of main component	
detection part:	stainless steel 316 or urethane resin
pressure receiving part:	stainless steel 316/316L, chloroprene rubber or silicon rubber
hollow cable:	PVC or polyurethane
Sensor enclosure:	Fully submersible, protected to IP68
Accuracy:	$\pm 0.5\%$ of FS
Measurement fluid	Sewage
Measurement range	0~10 m
Accessories	Stainless steel 304 suspension chain and PVC protection pipe Alarm setting device: 1 lot Isolator: 1 lot Arrester: 1 lot
	Other necessary accessories: 1 lot

**3. Influent Sewage Flow (S02 IFE 11/41)**

## a. Purpose

To measure the influent sewage flows and to record accumulated value.

## b. Quantity: 4 sets

## c. Specification

Type	Ultrasonic transit-time differential type
Applied pipe size:	
S02 ILE11 to 31:	700mm diameter.
S02 ILE41:	1200mm diameter.
Measurement fluid	Sewage
Measurement range	0~10 m/sec
Accessories	Alarm setting device: 1 lot Isolator: 1 lot Arrester: 1 lot
	Other necessary accessories: 1 lot



**4. Sump Pit Level Switch (S02 ILS 11/21)**

## a. Purpose

To control the sump drainage pumps automatically.

## b. Quantity: 2 sets

## c. Specification

Type	Electrode Type Level Switch
Measurement liquid	Drainage
Number of rod:	5 pieces
Length of rod	1.5 m (Max)
Material of rod	Stainless steel 304
Other necessary accessories: 1 lot	

**5. Influent Sewage pH (S02 IPH 01)**

## a. Purpose

To measure pH of the influent sewage in the Influent Pump Station.

## b. Quantity: 1 set

## c. Specification

Type:	Glass electrode, immersion type
Cleaning system:	Magnetic stirrer type
Temperature compensation function shall be equipped.	
Accuracy:	$\pm 0.15\text{PH}$
Measurement fluid	Sewage
Measurement range	0~14pH
Accessories	Isolator: 1 lot Arrester: 1 lot
Other necessary accessories: 1 lot	

**6. Grit Pit Level Switch (S03 ILS 11/21)**

## a. Purpose

To utilize the grit pit levels for interlocking signal to the grit pumps and the grit collectors.

## b. Quantity: 2 sets

## c. Specification

Type	Electrode Type Level Switch
Measurement liquid	Drainage
Number of rod:	2 pieces per set
Length of rod	1.5 m (Max)
Material of rod	Stainless steel 304
Other necessary accessories: 1 lot	

#### **7. Grit Scrubber Level Switch (S03 ILS 01)**

a. Purpose

To control the grit scrubbers automatically and to utilize the levels as the interlocking signals to the grit scrubber mixers.

b. Quantity: 1 set

c. Specification

Type	Electrode Type Level Switch
Measurement liquid	Sewage
Number of rod:	4 pieces
Length of rod	1.5 m (Max)
Material of rod	Stainless steel 304
Other necessary accessories: 1 lot	

#### **8. Scum Tank Level Switch (S05 ILS 01 to 04)**

a. Purpose

To control the scum pumps and the relevant suction valves automatically.

b. Quantity: 4 sets

c. Specification

Type	Electrode Type Level Switch
Measurement liquid	Sewage
Number of rod:	4 pieces per set
Length of rod	1.5 m (Max)
Material of rod	Stainless steel 304
Other necessary accessories: 1 lot	

#### **9. Sump Pit Level Switch (S06 ILS 01/02)**

a. Purpose

To control the sump drainage pumps automatically.

b. Quantity: 2 sets

c. Specification

Type Electrode Type Level Switch

Measurement liquid Sewage

Number of rod: 5 pieces per set

Length of rod 1.5 m (Max)

Material of rod Stainless steel 304

Other necessary accessories: 1 lot

#### **10. Primary Sludge Flow (S06 IFE 11/21)**

a. Purpose

To measure the primary sludge flow and to record accumulated value.

b. Quantity: 2 sets

c. Specification

Type Electromagnetic type

Diameter: 100mm

Measurement fluid Sewage

Material of main component

metering tube and flange: stainless steel 304

electrodes: stainless steel 316L

earthing ring: stainless steel 316L

lining: suitable for withstanding abrasion of the fluid

Measurement range 0~10 m/sec

Accuracy  $\pm 0.25\%$  of FS (0.3m/s to 10m/sec)

Accessories Isolator: 1 lot

Arrester: 1 lot

Other necessary accessories: 1 lot

#### **11. Primary Sludge Density (S06 IDE 11/21)**

a. Purpose

To measure the primary sludge density.

b. Quantity: 2 sets

## c. Specification

Type	Ultrasonic attenuation type
Material of main component	
pipe:	stainless steel 304
sensor:	stainless steel 316/316L
Diameter:	150mm
Measurement fluid	Sewage
Measurement range	0~10% SS
Installation:	Flange connection
Accessories	Isolator: 1 lot Arrester: 1 lot
Other necessary accessories:	1 lot

**12. Blower Flow (S08 IFE 01 to 05)**

## a. Purpose

To measure the blower flow and to record integrated value.

## b. Quantity: 5 sets

## c. Specification

Type	Orifice meter type (orifice plate pressure differential type)
Applied pipe diameter:	400mm
Measurement fluid	Air
Material of main component	
orifice plate:	stainless steel 316
orifice ring:	stainless steel 304
orifice flange:	stainless steel 304
differential pressure outlet:	stainless steel 304
manifold:	stainless steel 304
diaphragm:	stainless steel 316L
Measurement range	0~1000-200,000Pa (differential pressure)
Accuracy:	± 2.0~4.0% of FS
Accessories	Alarm setting device: 1 lot Isolator: 1 lot Arrester: 1 lot



Arrester: 1 lot

Other necessary accessories: 1 lot

**15. Clear Water Tank Level Switch (S08 ILS 01)**

a. Purpose

To control the clear water supply valve automatically.

b. Quantity: 1 set

c. Specification

Type Electrode Type Level Switch

Measurement liquid Clear water

Number of rod: 5 pieces per set

Length of rod 5.0 m (Max)

Material of rod Stainless steel 304

Other necessary accessories: 1 lot

**16. Sump Pit Level Switch (S08 ILS 02)**

a. Purpose

To control the sump drainage pump automatically.

b. Quantity: 1 set

c. Specification

Type Electrode Type Level Switch

Measurement liquid Sewage

Number of rod: 5 pieces per set

Length of rod 5.0 m (Max)

Material of rod Stainless steel 304

Other necessary accessories: 1 lot

**17. Clear Water Tank Temperature (S08 ITE 02)**

a. Purpose

To measure the water temperature in the clear water tank and to control return valve and drain valve automatically.

b. Quantity: 1 set

c. Specification

Type Resistance bulb type

Applied pipe diameter:	1100mm
Measurement fluid	Air
Material of main component	
protection pipe:	stainless steel 304
Measurement range	-20~+350
Class:	A (allowable difference $\pm 0.15+0.002t$ )
Nominal resistance:	Pt 100
Insertion length:	1500mm
Accessories	Alarm setting device: 1 lot
	Isolator: 1 lot
	Arrester: 1 lot
Other necessary accessories:	1 lot

#### **18. Return Sludge Flow (S11 IFE 01)**

a. Purpose

To measure the return sludge flow and to record accumulated value.

b. Quantity: 1 set

c. Specification

Type	Electromagnetic type
Diameter:	1000mm
Measurement fluid	Sewage
Material of main component	
metering tube and flange:	stainless steel 304
electrodes:	stainless steel 316L
earth ring:	stainless steel 316L
lining:	suitable for withstanding abrasion of the fluid
Measurement range	0~10 m/sec
Accuracy	$\pm 0.25\%$ of FS (0.3m/s to 10m/sec)
Accessories	Isolator: 1 lot
	Arrester: 1 lot
Other necessary accessories:	1 lot

**19. Sump Pit Level Switch (S11 ILS 01)**

## a. Purpose

To control the sump drainage pump automatically.

## b. Quantity: 1 set

## c. Specification

Type Electrode Type Level Switch

Measurement liquid Sewage

Number of rod: 5 pieces per set

Length of rod 5.0 m (Max)

Material of rod Stainless steel 304

Other necessary accessories: 1 lot

**20. Temporary Pump Station Level Switch (S12 ILS 01)**

## a. Purpose

To sense the level in the temporary discharge pump station and to control the temporary discharge pumps automatically.

## b. Quantity: 1 set

## c. Specification

Type Float, micro switch type

Contacts enclosure: Fully submersible, protected to IP68

Number of contacts: 6 sets

Measurement fluid Sewage

Accessories Stainless steel 304 suspension chain, a weight and PVC protection pipe

Other necessary accessories: 1 lot

**21. Discharge Pump Station Reservoir Level (S12 ILE02)**

## a. Purpose

To measure the level in the discharge pump station reservoir and to control the discharge pumps automatically.

## b. Quantity: 1 set

## c. Specification

Type Submersible hydrostatic type

Material of main component



detection part:	stainless steel 316 or urethane resin
Pressure-receiving part:	stainless steel 316/316L, chloroprene rubber or silicon rubber
hollow cable:	PVC or polyurethane
Sensor enclosure:	Fully submersible, protected to IP68
Accuracy:	$\pm 0.5\%$ of FS
Measurement fluid	Sewage
Measurement range	0~10 m
Accessories	Stainless steel 304 suspension chain and PVC protection pipe Alarm setting device:1 lot Isolator: 1 lot Arrester: 1 lot
Other necessary accessories:	1 lot

## **22. Sump Pit Level Switch (S12 ILS 11/21)**

### a. Purpose

To control the sump drainage pump automatically.

### b. Quantity: 2 sets

### c. Specification

Type	Electrode Type Level Switch
Measurement liquid	Sewage
Number of rod:	5 pieces per set
Length of rod	5.0 m (Max)
Material of rod	Stainless steel 304
Other necessary accessories:	1 lot

## **23. Discharge pH (S12 IPH 01)**

### a. Purpose

To measure pH of the treated water in the Discharge Pump Station.

### b. Quantity: 1 set

### c. Specification

Type:	Glass electrode, immersion type
Cleaning system:	Magnetic stirrer type
Temperature compensation function shall be equipped.	

Accuracy:	$\pm 0.15\text{PH}$
Measurement fluid	Sewage
Measurement range	0~14PH
Accessories	Isolator: 1 lot Arrester: 1 lot
Other necessary accessories: 1 lot	

#### **24. Sump Pit Level Switch (S21 ILS 01)**

a. Purpose

To control the sump drainage pump automatically.

b. Quantity: 1 set

c. Specification

Type	Electrode Type Level Switch
Measurement liquid	Sewage
Number of rod:	5 pieces per set
Length of rod	5.0 m (Max)
Material of rod	Stainless steel 304
Other necessary accessories: 1 lot	

#### **25. Digester Level (S23 ILE01)**

a. Purpose

To measure the level in the digester.

b. Quantity: 1 set

c. Specification

Type	Differential pressure type (Explosion-proof)
Material of main component	
Fluid-contacting diaphragm: stainless steel 316L	
Sensor enclosure:	Fully submersible, protected to IP67
Accuracy:	better than $\pm 0.25\%$ of FS
Measurement fluid	Thickened sludge
Measurement range	0~20 m
Installation	Flange fixed
Accessories	Alarm setting device : 1 lot

Isolator: 1 lot

Arrester: 1 lot

Other necessary accessories: 1 lot

## **26. Distribution Tank Level (S23 ILE11/21)**

### a. Purpose

To measure the level in the distribution tank for the digester and to control the thickened sludge pumps automatically.

### b. Quantity: 2 sets

### c. Specification

Type Submersible hydrostatic type

Material of main component

detection part: stainless steel 316L or urethane resin

Pressure-receiving part: stainless steel 316/316L, chloroprene rubber or silicon rubber

hollow cable: PVC or poly-urethane

Sensor enclosure: Fully submersible, protected to IP68

Accuracy:  $\pm 0.5\%$  of FS

Measurement fluid Thickened sludge

Measurement range 0~10 m

Accessories Stainless steel 304 suspension chain and PVC protection pipe

Alarm setting device: 1 lot

Isolator: 1 lot

Arrester: 1 lot

Other necessary accessories: 1 lot

## **27. Digester Pressure (S23 IPE 01)**

### a. Purpose

To measure the digested gas pressure in the digester.

### b. Quantity: 1 set

### c. Specification

Type Semi-conductor transmitter type (Explosion-proof)

Applied tank Digester tank

Measurement fluid Digested gas

Material of main component

Pressure-receiving diaphragm: stainless steel 316

Measurement range 0~100-200kPa

Accuracy: better than  $\pm 0.22\%$  of FS

Accessories Isolator: 1 lot

Arrester: 1 lot

Other necessary accessories: 1 lot

## **28. Sump Pit Level Switch (S23 ILS 01)**

a. Purpose

To control the sump drainage pump automatically.

b. Quantity: 1 set

c. Specification

Type Electrode Type Level Switch

Measurement liquid Sewage

Number of rod: 5 pieces per set

Length of rod 5.0 m (Max)

Material of rod Stainless steel 304

Other necessary accessories: 1 lot

## **29. Sludge Holding Tank Level (S24 ILE01/02)**

a. Purpose

To measure the level in the sludge holding tanks and to control the primary sludge pumps automatically.

b. Quantity: 2 sets

c. Specification

Type Differential pressure type

Material of main component

Fluid-contacting diaphragm: stainless steel 316L

Sensor enclosure: Fully submersible, protected to IP67

Accuracy: better than  $\pm 0.25\%$  of FS

Measurement fluid Primary sludge

Measurement range 0~10 m

Installation Flange fixed

Accessories	Alarm setting device: 1 lot
	Isolator: 1 lot
	Arrester: 1 lot
Other necessary accessories: 1 lot	

### **30. Gravity Thickener Flow (S24 IFE 01)**

a. Purpose

To measure the gravity thickened sludge flow and to record accumulated value.

b. Quantity: 1 set

c. Specification

Type	Electromagnetic type
Diameter:	150mm
Measurement fluid	Gravity thickened sewage
Material of main component	
metering tube and flange:	stainless steel 304
electrodes:	stainless steel 316L
earth ring:	stainless steel 316L
lining:	suitable for withstanding abrasion of the fluid
Measurement range	0~10 m/sec
Accuracy	$\pm 0.25\%$ of FS (0.3m/s to 10m/sec)
Accessories	Isolator: 1 lot
	Arrester: 1 lot
Other necessary accessories: 1 lot	

### **31. Mechanical Thickener Flow (S24 IFE 02 to 04)**

a. Purpose

To measure the waste sludge feed to the mechanical thickeners and to record accumulated values.

b. Quantity: 1 set

c. Specification

Type	Electromagnetic type
Diameter:	150mm
Measurement fluid	Gravity thickened sewage
Material of main component	

metering tube and flange:	stainless steel 304
electrodes:	stainless steel 316L
earth ring:	stainless steel 316L
lining:	suitable for withstanding abrasion of the fluid
Measurement range	0~10 m/sec
Accuracy	$\pm 0.25\%$ of FS (0.3m/s to 10m/sec)
Accessories	Isolator: 1 lot Arrester: 1 lot
Other necessary accessories: 1 lot	

### **32. Thickened Sludge Holding Tank Level (S24 ILE03/04)**

a. Purpose

To measure the level in the thickened sludge holding tanks and to control the thickened sludge pumps automatically.

b. Quantity: 2 sets

c. Specification

Type	Differential pressure type
Material of main component	
Fluid-contacting diaphragm:	stainless steel 316L
Sensor enclosure:	Fully submersible, protected to IP67
Accuracy:	better than $\pm 0.25\%$ of FS
Measurement fluid	Primary sludge
Measurement range	0~10 m
Installation	Flange fixed
Accessories	Alarm setting device : 1 lot Isolator: 1 lot Arrester: 1 lot
Other necessary accessories: 1 lot	

### **33. Thickener Polymer Tank Level (S24 ILE05/06)**

a. Purpose

To measure the level in the polymer tanks for the mechanical thickener and to control the tank mixers automatically.

b. Quantity: 2 sets

## c. Specification

Type	Ultrasonic type
Material of main component	
ultrasonic emission part:	stainless steel 316 with sensor enclosure protected to IP68
Inbuilt temperature compensation	
Accuracy:	better than $\pm 1.0\%$ of FS
Measurement fluid	diluted polymer
Measurement range	0~0.2-10 m
Accessories	Alarm setting device: 1 lot
	Isolator: 1 lot
	Arrester: 1 lot
Other necessary accessories:	1 lot

**34. Digester Flow (S24 IFE 05)**

## a. Purpose

To measure the mixed thickened sludge feeding flow to the digester and to record accumulated value.

## b. Quantity: 1 set

## c. Specification

Type	Electromagnetic type
Diameter:	125mm
Measurement fluid	Mixed thickened sludge
Material of main component	
metering tube and flange:	stainless steel 304
electrodes:	stainless steel 316L
earth ring:	stainless steel 316L
lining:	suitable for withstanding abrasion of the fluid
Measurement range	0~10 m/sec
Accuracy	$\pm 0.25\%$ of FS (0.3m/s to 10m/sec)
Accessories	Isolator: 1 lot
	Arrester: 1 lot
Other necessary accessories:	1 lot

**35. Treated Water Tank Level Switch (S24 ILS 01)**

## a. Purpose

To control the treated water valve automatically.

## b. Quantity: 1 set

## c. Specification

Type Electrode Type Level Switch

Measurement liquid Sewage

Number of rod: 5 pieces per set

Length of rod 5.0 m (Max)

Material of rod Stainless steel 304

Other necessary accessories: 1 lot

**36. Utility Water Tank Level Switch (S24 ILS 02)**

## a. Purpose

To utilize the detected level as the interlock signal to the water supply unit.

## b. Quantity: 1 set

## c. Specification

Type Electrode Type Level Switch

Measurement liquid Sewage

Number of rod: 5 pieces per set

Length of rod 5.0 m (Max)

Material of rod Stainless steel 304

Other necessary accessories: 1 lot

**37. Digested Sludge Holding Tank Level (S24 ILE07/08)**

## a. Purpose

To measure the level in the digested sludge holding tanks and to control the digester delivery valve automatically.

## b. Quantity: 2 sets

## c. Specification

Type Differential pressure type

Material of main component

Fluid-contacting diaphragm: stainless steel 316L





## Material of main component

ultrasonic emission part: stainless steel 316 with sensor enclosure protected to IP68

## Inbuilt temperature compensation

Accuracy: better than  $\pm 1.0\%$  of FS

Measurement fluid diluted polymer

Measurement range 0~0.2-10 m

Accessories Alarm setting device: 1 lot

Isolator: 1 lot

Arrester: 1 lot

Other necessary accessories: 1 lot

**40. Digested Dewatering Flow (S24 IFE 06 to 08)**

## a. Purpose

To measure the digested sludge feeding flow to the dewatering units and to record accumulated value.

## b. Quantity: 3 sets

## c. Specification

Type Electromagnetic type

Diameter: 125mm

Measurement fluid Mixed thickened sludge

## Material of main component

metering tube and flange: stainless steel 304

electrodes: stainless steel 316L

earth ring: stainless steel 316L

lining: suitable for withstanding abrasion of the fluid

Measurement range 0~10 m/sec

Accuracy  $\pm 0.25\%$  of FS (0.3m/s to 10m/sec)

Accessories Isolator: 1 lot

Arrester: 1 lot

Other necessary accessories: 1 lot

**41. Wastewater Tank Level Switch (S24 ILS 03)**

## a. Purpose

To control the wastewater pumps automatically.

b. Quantity: 1 set

c. Specification

Type Electrode Type Level Switch

Measurement liquid Sewage

Number of rod: 5 pieces per set

Length of rod 5.0 m (Max)

Material of rod Stainless steel (Type?)

Other necessary accessories: 1 lot

#### **42. Sump Pit Level Switch (S24 ILS 04/05)**

a. Purpose

To control the sump drainage pumps automatically.

b. Quantity: 2 sets

c. Specification

Type Electrode Type Level Switch

Measurement liquid Sewage

Number of rod: 5 pieces per set

Length of rod 5.0 m (Max)

Material of rod Stainless steel (Type?)

Other necessary accessories: 1 lot

#### **43. Cake Hopper Weight (S25 IWE11 to 61)**

a. Purpose

To measure the cake hopper weight.

b. Quantity: 6 sets

c. Specification

Type Load cell type

Sensing points: 3 or 4

Accuracy: better than  $\pm 5\%$  of FS

Necessary accessories: 1 lot

#### **44. Gas Holder Level (S26 ILE 11/21)**

a. Purpose

To measure the level in the digested gas holder.

b. Quantity: 2 sets

c. Specification

Type Mechanical float type level meter

Measurement fluid Digested gas

Measurement mechanism: displacement of the floating roof

Components: wire and a coupling to the tank roof, transmitting system with tape

Material of main component: suitable to the digested gas

Other necessary accessories: 1 lot

#### **45. Coal Boiler Level (S27 ILE11/21)**

a. Purpose

To measure the level in the coal boiler and to control the relevant valves automatically.

b. Quantity: 2 sets

c. Specification

Type Differential pressure type

Material of main component

Fluid-contacting diaphragm: stainless steel 316L

Sensor enclosure: Fully submersible, protected to IP67

Accuracy: better than  $\pm 0.25\%$  of FS

Measurement fluid Boiled water or steam

Measurement range 0~10 m

Installation Flange fixed

Accessories Alarm setting device: 1 lot

Isolator: 1 lot

Arrester: 1 lot

Other necessary accessories: 1 lot

#### **46. Coal Boiler Pressure (S27 IPE 11/21)**

a. Purpose

To measure the coal boiler pressure.

b. Quantity: 2 sets

c. Specification

Type Semi-conductor transmitter type

Measurement fluid	Digested gas
Material of main component	
Pressure-receiving diaphragm:	stainless steel 316
Measurement range	0~100-200kPa
Accuracy:	better than $\pm 0.22\%$ of FS
Accessories	Isolator: 1 lot
	Arrester: 1 lot
Other necessary accessories:	1 lot

#### **47. Coal Boiler Temperature (S27 ITE 11/21)**

a. Purpose

To measure the steam temperature in the coal boiler.

b. Quantity: 2 sets

c. Specification

Type	Resistance bulb type
Measurement fluid	Steam
Material of main component	
protection pipe:	stainless steel 304
Measurement range	-20~+350
Class:	A (allowable difference $\pm 0.15+0.002t$ )
Nominal resistance:	Pt 100
Insertion length:	150mm
Accessories	Isolator: 1 lot
	Arrester: 1 lot
Other necessary accessories:	1 lot

#### **48. Condenser Level (S27 ILE01)**

a. Purpose

To measure the level in the condenser.

b. Quantity: 1 sets

c. Specification

Type	Differential pressure type
Material of main component	

Fluid-contacting diaphragm: stainless steel 316L

Sensor enclosure: Fully submersible, protected to IP67

Accuracy: better than  $\pm 0.25\%$  of FS

Measurement fluid: Boiled water or steam

Measurement range: 0~10 m

Installation: Flange fixed

Accessories: Alarm setting device: 1 lot

Isolator: 1 lot

Arrester: 1 lot

Other necessary accessories: 1 lot

#### **49. Condenser Temperature (S27 ITE 01)**

a. Purpose

To measure the steam temperature in the generator.

b. Quantity: 1 set

c. Specification

Type: Resistance bulb type

Measurement fluid: Steam

Material of main component

protection pipe: stainless steel 304

Measurement range: -20~+650

Class: A (allowable difference  $\pm 0.15+0.002t$ )

Nominal resistance: Pt 100

Insertion length: 150mm

Accessories: Isolator: 1 lot

Arrester: 1 lot

Other necessary accessories: 1 lot

#### **50. Condenser Pressure (S27 IPE 01)**

a. Purpose

To measure the condenser pressure.

b. Quantity: 1 set

c. Specification

Type	Semi-conductor transmitter type
Measurement fluid	Digested gas
Material of main component	
Pressure-receiving diaphragm:	stainless steel 316
Measurement range	0~100-200kPa
Accuracy:	better than $\pm 0.22\%$ of FS
Accessories	Isolator: 1 lot
	Arrester: 1 lot

Other necessary accessories: 1 lot

#### **51. Instrumentation Panel for Influent Pump Station (S02 INP01)**

a. Purpose

To mount indicators for monitoring and to install auxiliary devices.

b. Quantity: 1 set

c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted device	As shown on the drawings and the electrical operation diagram
Indication lamp	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

#### **52. Instrumentation Panel for Blower House (S08 INP01)**

a. Purpose

To mount indicators for monitoring and to install auxiliary devices.

b. Quantity: 1 set

c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted device	As shown on the drawings and the electrical operation diagram
Indication lamp	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

#### **53. Instrumentation Panel for Return Sludge Pump House (S11 INP01)**

a. Purpose

To mount indicators for monitoring and to install auxiliary devices.

- b. Quantity: 1 set
- c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted device	As shown on the drawings and the electrical operation diagram
Indication lamp	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

#### **54. Instrumentation Panel for Discharge Pump Station (S12 INP01)**

- a. Purpose

To mount indicators for monitoring and to install auxiliary devices.

- b. Quantity: 1 set
- c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted device	As shown on the drawings and the electrical operation diagram
Indication lamp	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

#### **55. Instrumentation Panel for Sludge Thickening (S24 INP01)**

- a. Purpose

To mount indicators for monitoring and to install auxiliary devices.

- b. Quantity: 1 set
- c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted device	As shown on the drawings and the electrical operation diagram
Indication lamp	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

#### **56. Instrumentation Panel for Sludge Dewatering (S24 INP02)**

- a. Purpose

To mount indicators for monitoring and to install auxiliary devices.

- b. Quantity: 1 set
- c. Specification



Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted device	As shown on the drawings and the electrical operation diagram
Indication lamp	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

#### **57. Instrumentation Panel for Boiler (S27 INP01)**

a. Purpose

To mount indicators for monitoring and to install auxiliary devices.

b. Quantity: 1 set

c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted device	As shown on the drawings and the electrical operation diagram
Indication lamp	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

#### **58. Instrumentation Panel for Electrical House (S28 INP01)**

a. Purpose

To mount indicators for monitoring and to install auxiliary devices.

b. Quantity: 1 set

c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted device	As shown on the drawings and the electrical operation diagram
Indication lamp	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

#### **P16.2.4 Monitoring and Control Facilities**

a. General

The electrical components of monitoring and control facilities in the Sewage Treatment Plant shall consist of the following equipment. Equipment shall be designed using the following conditions and in accordance with the specification set forth hereinafter in this Section.

b. Equipment List

	Item No.	Name	Tag No.	Quantity
1	S24-EE-46	Monitoring System	S24 MON01	1 set
2	S24-EE-47	Sludge Treatment Building PLC	S24 PLC01	1 set
3	S02-EE-18	Influent Pump Station PLC	S02 PLC01	1 set
4	S08-EE-20	Blower House PLC	S08 PLC01	1 set
5	S11-EE-12	Return Sludge Pump House PLC	S11 PLC01	1 set
6	S12-EE-14	Discharge Pump Station PLC	S12 PLC01	1 set
7	S28-EE-10	Electrical House PLC	S28 PLC01	1 set

c. Standard Accessories

Spare parts

**1. Monitoring System (S24MON 01)**

a. Two personal computers (PC), one server, and two printers shall be installed in the Sludge Treatment Building monitoring room as main monitoring equipment.

b. Purpose

The PCs shall be the human-machine interface to monitor the plant loads status, failure and process values through a graphical interface at the central supervisory room. Furthermore, the interface shall enable values of pre-set cycles and operation time period for the primary sludge pumps and the waste sludge pumps to be set from the monitoring room.

The server shall play a data processing role so that it can generate the required reports, such as daily, monthly and yearly reports, historical trend graphs, and historical alarms.

c. Quantity: 1 lot

d. Specification

Data transmission line Ethernet

Computer Industrial computer : 3 sets

OS : Windows 2000

Display : More than 500 mm

Exclusive monitoring desks and chairs : 1 lot

Monitoring items

Digital I/O	Analog I/O	Pulse I
2320	60	8

Necessary accessories: 1 lot

**2. Sludge Treatment Building PLC (S24 PLC 01)**

a. Purpose

To transmit data and control automatic systems. Details are shown on the drawings and the electrical operation diagram.

- b. Quantity: 1 set
- c. Specification

Type Indoor, Self-supporting, Metal enclosed, Vermin-proof Type

Processing function Sequential control, Instrumentation loop control

Data transmission line Ethernet

Input/Output capacities

	Digital I/O	Analog I/O	Pulse I
Total	660	30	2

Necessary accessories

**3. Influent Pump Station PLC (S02 PLC 01)**

- a. Purpose

To transmit data and control automatic systems. Details are shown on the drawings and the electrical operation diagram.

- b. Quantity: 1 set

- c. Specification

Type Indoor, Self-supporting, Metal enclosed, Vermin-proof Type

Processing function Sequential control, Instrumentation loop control

Data transmission line Ethernet

Input/Output capacities

	Digital I/O	Analog I/O	Pulse I
Total	270	5	2

Necessary accessories : 1 lot

**4. Blower House PLC (S08 PLC 01)**

- a. Purpose

To transmit data and control automatic systems Details are shown on the drawings and the electrical operation diagram.

- b. Quantity: 1 set

- c. Specification

Type Indoor, Self-supporting, Metal enclosed, Vermin-proof Type

Processing function Sequential control, Instrumentation loop control

Data transmission line Ethernet

Input/Output capacities

	Digital I/O	Analog I/O	Pulse I
Total	580	20	2

Necessary accessories: 1 lot

**5. Return Sludge Pump House PLC (S11 PLC 01)**

a. Purpose

To transmit data and in charge of automatic control. Details shall be shown on the drawings and the electrical operation diagram.

b. Quantity: 1 set

c. Specification

Type Indoor, Self-supporting, Metal enclosed, Vermin-proof Type

Processing function Sequential control, Instrumentation loop control

Data transmission line Ethernet

Input/Output capacities

	Digital I/O	Analog I/O	Pulse I
Total	370	5	-

Necessary accessories: 1 lot

**6. Discharge Pump Station PLC (S12 PLC 01)**

a. Purpose

To transmit data and control automatic systems . Details are (?) shown on the drawings and the electrical operation diagram.

b. Quantity: 1 set

c. Specification

Type Indoor, Self-supporting, Metal enclosed, Vermin-proof Type

Processing function Sequential control, Instrumentation loop control

Data transmission line Ethernet

Input/Output capacities

	Digital I/O	Analog I/O	Pulse I
Total	230	5	-

Necessary accessories: 1 lot

**7. Electrical House PLC (S28 PLC 01)**

a. Purpose

To transmit data and control automatic systems . Details are referred to the drawings

and the electrical operation diagram.

b. Quantity: 1 set

c. Specification

Type Indoor, Self-supporting, Metal enclosed, Vermin-proof Type

Processing function Sequential control, Instrumentation loop control

Data transmission line Ethernet

Input/Output capacities

	Digital I/O	Analog I/O	Pulse I
Total	210	10	2

Necessary accessories: 1 lot

### **P16.2.5 Wiring and other work (S02 to S28)**

a. General

The electrical work necessary to make the Sewage Treatment Plant complete shall consist of the following. Details of each item shall be designed using the following conditions and in accordance with the specification set forth hereinafter in this Section.

b. Item List

	Item No.	Name	Tag No.	Quantity
1	S02-EE-19	Wiring Work for Influent Pump Station	S02 WIR01	1 lot
2	S02-EE-20	Removal Work for Influent Pump Station	S02 REW01	1 lot
3	S08-EE-21	Wiring Work for Blower House	S08 WIR01	1 lot
4	S08-EE-22	Grounding Work for Blower House	S08 GRD01	1 lot
5	S08-EE-22	Removal Work for Blower House	S08 REV01	1 lot
6	S11-EE-13	Wiring Work for Return Sludge Pump House	S11 WIR01	1 lot
7	S12-EE-15	Wiring Work for Discharge Pump Station	S12 WIR01	1 lot
8	S12-EE-16	Removal Work for Discharge Pump Station	S12 REW01	1 lot
9	S24-EE-48	Wiring Work for Sludge Treatment Building	S24 WIR01	1 lot
10	S24-EE-49	Grounding Work for Sludge Treatment Building	S24 GRD01	1 lot
11	S27-EE-17	Wiring Work for Boiler House	S27 WIR01	1 lot
12	S27-EE-18	Removal Work for Boiler House	S27 REW01	1 lot
13	S28-EE-11	Wiring Work for Electrical House	S28 WIR01	1 lot
14	S28-EE-12	Grounding Work for Electrical House	S28 GRD01	1 lot

c. Standard Accessories

Spare parts

**1. Wiring Work for Influent Pump station (S02 WIR01)**

a. Scope of work

The work for the Influent Pump Station shall include but not be limited to the following. The details are referred to the drawings and the general specification.

1. Supply and install all wire and cable to new equipment.
2. Supply and install all trays, conduits, ducts, trench and other materials necessary to make wiring complete.
3. Supply and install all foundations or floor works for all panels.
4. Re-terminate the existing cables below in the newly installed low voltage feeder panel
  - 1) the cable to the existing office
  - 2) the cable to the existing canteen
  - 3) the cable to the existing garage
  - 4) the cable to the existing lighting distribution board
  - 5) other cables to the necessary existing facilities

**2. Removal Work for Influent Pump Station (S02 REW01)**

a. Scope of work

The work for the Influent Pump Station shall include but not be limited to the following.

1. To remove the existing low voltage distribution panel and the low voltage switchgear located in the low voltage electrical room.
2. To remove the wiring facilities which are laid to the removed mechanical facilities.
3. To put the removed facilities within the premise of the Sewage Treatment Plant.

**3. Wiring Work for Blower House (S08 WIR01)**

a. Scope of work

The work for the Blower House shall include but not be limited to the following. The details are referred to the drawings and the general specification.

1. Supply and install all wire and cable to new equipments.
2. Supply and install all trays, conduits, ducts, trench and other materials necessary to make wiring complete.
3. Supply and install all foundations or floor works for all panels.
4. Re-terminate the existing cables below in the newly installed low voltage feeder panel
  - 1) the cable to the existing electrical house for the digester
  - 2) the cable to the existing lighting distribution board

- 3) the cable to the existing workshop
- 4) other cables to the necessary existing facilities

**4. Grounding Work (S08 WIR01)**

a. Scope of work

The work for the Blower House shall include but not be limited to the following. The details are referred to the drawings and the general specification.

1. Supply and install the grounding plate or the grounding rod which grounding resistance shall be less than 2 ohm.
2. Supply and install all the grounding wire and the supporting fixture.

**5. Removal Work for Blower House (S08 REW01)**

a. Scope of work

The work for the Blower House shall include but not be limited to the following.

1. To remove the existing low voltage distribution panel and the low voltage switchgear located in the low voltage electrical room.
2. To remove the existing High voltage switchgears located in the high voltage electrical room.
3. To remove the existing the low voltage switchgear and monitoring panels located in the 2<sup>nd</sup> floor electrical room.
4. To remove the wiring facilities which are laid to the removed mechanical facilities.
5. To put the removed facilities within the premise of the Sewage Treatment Plant.

**6. Wiring Work for Return Sludge Pump House (S11 WIR01)**

a. Scope of work

The work for the Return Sludge Pump House shall include but not be limited to the following. The details are shown on the drawings and the general specification.

1. Supply and install all wire and cable to new equipment.
2. Supply and install all trays, conduits, ducts, trench and other materials necessary to make wiring complete.
3. Supply and install all foundations or floor works for all panels.

**7. Wiring Work for Discharge Pump Station (S12 WIR01)**

a. Scope of work

The work for the Discharge Pump Station shall include but not be limited to the following. The details are shown on the drawings and the general specification.

1. Supply and install all wire and cable to new equipment.
2. Supply and install all trays, conduits, ducts, trench and other materials necessary to make wiring complete.

3. Supply and install all foundations or floor works for all panels
4. Re-terminate the existing cables below in the newly installed low voltage feeder panel
  - 1) the cable to the existing lighting distribution board
  - 2) other cables to the necessary existing facilities

#### **8. Removal Work for Discharge Pump Station (S12 REW01)**

a. Scope of work

The work for the Discharge Pump Station shall include but not be limited to the following.

1. To remove the existing low voltage distribution panel and the low voltage switchgear located in the low voltage electrical room.
2. To remove the wiring facilities which are laid to the removed mechanical facilities.
3. To put the removed facilities within the premise of the Sewage Treatment Plant.

#### **9. Wiring Work for Sludge Treatment Building (S24 WIR01)**

a. Scope of work

The work for the Sludge Treatment Building shall include but not be limited to the following. The details are shown on the drawings and the general specification.

1. Supply and install all wires and cables to new equipment.
2. Supply and install all trays, conduits, ducts, trench and other materials necessary to make wiring complete.
3. Supply and install all foundations or floor works for all panels.
4. 6 k V main cables as shown below.
  - (1) 6kV XLPE 120mm<sup>2</sup> 3-c 4 sets cables between AES and the Sludge Treatment building.
  - (2) 6kV XLPE 70mm<sup>2</sup> 3-c 2 sets cables between the Sludge Treatment building and the Blower House.
  - (3) 6kV XLPE 35mm<sup>2</sup> 3-c 2 sets cables between the Sludge Treatment building and the Electrical House.

#### **10. Grounding Work for Sludge Treatment Building (S24 WIR01)**

a. Scope of work

The work for the Return Sludge Treatment Building shall include but not be limited to the following. The details are shown on the drawings and the general specification.

1. Supply and install the grounding plate or the grounding rod which grounding resistance shall be less than 2 Ohm.



2. Supply and install all the grounding wire and the supporting fixture.

**11. Wiring Work for Boiler House (S27 WIR01)**

a. Scope of work

The work for the Boiler House shall include but not be limited to the following. The details are referred to the drawings and the general specification.

1. Supply and install all wire and cable to new equipment.
2. Supply and install all trays, conduits, ducts, trench and other materials necessary to make wiring complete.
3. Supply and install all foundations or floor works for all panels.

**12. Removal Work for Boiler House (S27 WIR01)**

a. Scope of work

The work for the Boiler House shall include but not be limited to the following. The details are referred to the drawings and the general specification.

1. To remove the wiring facilities which are laid to the removed mechanical facilities.
2. To put the removed facilities within the premise of the Sewage Treatment Plant.

**13. Wiring Work for Electrical House (S28 WIR01)**

a. Scope of work

The work for the Electrical House shall include but not be limited to the following. The details are shown on the drawings and the general specification.

1. Supply and install all wire and cable to new equipment.
2. Supply and install all trays, conduits, ducts, trench and other materials necessary to make wiring complete.
3. Supply and install all foundations or floor works for all panels.

**14. Grounding Work for Electrical House (S28 WIR01)**

a. Scope of work

The work for the Electrical House shall include but not be limited to the following. The details are shown on the drawings and the general specification.

1. Supply and install the grounding plate or the grounding rod which grounding resistance shall be less than 2 ohm.
2. Supply and install all the grounding wire and the supporting fixture.

**P16.2.6 Low Voltage Switchgear (S51 to S67-Intermediate Pump Stations)**

a. General

The electrical components of low voltage switchgear, motor control center and other control panels in the Intermediate Pump Stations shall consist of the following equipment.

Equipment shall be designed using the following conditions and in accordance with the specification set forth hereinafter in this Section. The low voltage switchgears and/or panels described hereinafter this section shall be assembled after the careful site survey in each pump station so that they are installed properly in the limited space in the related electrical room or the room adequate for the electrical panels.

The degree of protection for the low voltage switchgears set forth in this section shall be to IP40.

b. Equipment List

	Item No.	Name	Tag No.	Quantity
1	S51-EE-01	Transformer Secondary Panel	S51 LVP01	1 set
2	S51-EE-02	Low Voltage Feeder Panel	S51 LVP02	1 set
3	S51-EE-03	Sewage Pump Control Panels	S51 SPP01 to 04	4 sets
4	S51-EE-04	Pump Station Facilities Control Panel	S51 PCP01	1 set
5	S52-EE-01	No.1 & 2 Sewage Pump Control Panel	S52 SPP01	1 set
6	S52-EE-02	No.3 Sewage Pump & Others Control Panel	S52 SPP02	1 set
7	S53-EE-01	Transformer Secondary Panel	S53 LVP01	1 set
8	S53-EE-02	Low Voltage Feeder Panel	S53 LVP02	1 set
9	S53-EE-03	Sewage Pump Control Panels	S53 SPP01 to 05	5 sets
10	S53-EE-04	Pump Station Facilities Control Panel	S53 PCP01	1 set
11	S54-EE-01	Transformer	S54 ETR01	1 set
12	S54-EE-02	Low Voltage Feeder Panel	S54 LVP01	1 set
13	S54-EE-03	No.1 & 2 Sewage Pump Control Panel	S54 SPP01	1 set
14	S54-EE-04	No.3 Sewage Pump Control Panel	S54 SPP02	1 set
15	S54-EE-05	Pump Station Facilities Control Panel	S54 PCP01	1 set
16	S55-EE-01	Transformer	S56 ETR01	1 set
17	S55-EE-02	Transformer Secondary Panel	S55 LVP01	1 set
18	S55-EE-03	Low Voltage Feeder Panel	S55 LVP02	1 set
19	S55-EE-04	Sewage Pump Control Panels	S55 SPP01 to 04	4 sets
20	S55-EE-05	Pump Station Facilities Control Panel	S55 PCP01	1 set
21	S56-EE-01	Transformer	S56 ETR01	1 set
22	S56-EE-02	Transformer Secondary Panel	S56 LVP01	1 set
23	S56-EE-03	Low Voltage Feeder Panel	S56 LVP02	1 set
24	S56-EE-04	Sewage Pump Control Panels for No.1 to 3	S55 SPP01 to 03	3 sets
25	S56-EE-05	Sewage Pump Control Panels for No.4 and 5	S55 SPP04 /05	2 sets
26	S56-EE-06	No.6 & 7 Pump Control Panel	S55 SPP06	1 set
27	S56-EE-07	Pump Station Facilities MCC & Auxiliary Relav Panel	S56MCC01/S56A RY01	1 set
28	S56-EE-08	Inflow Valve Local Operation Panel	S56 LOP01	1 set
29	S56-EE-09	Fine Screen Local Operation Panel	S56 LOP02	1 set

30	S56-EE-10	Sewage Pump Local Operation Panels	S56 LOP03 to 05	3 sets
31	S56-EE-11	Sewage Pump Local Operation Panel	S56 LOP06	1 set
32	S56-EE-12	Connection Valve Local Operation Panel	S56 LOP07	1 set
33	S56-EE-13	Sump Drainage Pump Local Operation Panel	S56 LOP08/09	2 sets
34	S56-EE-14	Exhaust Fan Local Operation Panel	S56 LOP10	1 set
35	S56-EE-15	Intake Fan Local Operation Panel	S56 LOP11 to 13	3 sets
36	S57-EE-01	Transformer Secondary Panel	S57 LVP01	1 set
37	S57-EE-02	Low Voltage Feeder Panel	S57 LVP02	1 set
38	S57-EE-03	Sewage Pump Control Panels	S57 SPP01/02	2 sets
39	S57-EE-04	Sewage Pump Control Panel	S57 SPP03	1 set
40	S57-EE-05	Pump Station Facilities Control Panel -1	S57 PCP01	1 set
41	S57-EE-06	Pump Station Facilities Control Panel -2	S57 PCP02	1 set
42	S58-EE-01	Sewage Pumps & Fans Control Panel	S58 SPP01	1 set
43	S59-EE-01	Sewage Pumps & Fans Control Panel	S59 SPP01	1 set
44	S60-EE-01	Sewage Pumps & Fans Control Panel	S60 SPP01	1 set
45	S61-EE-01	Sewage Pumps & Fans Control Panel	S61 SPP01	1 set
46	S62-EE-01	Sewage Pumps & Fans Control Panel	S62 SPP01	1 set
47	S63-EE-01	Sewage Pumps & Fans Control Panel	S63 SPP01	1 set
48	S64-EE-01	Sewage Pumps Control Panel	S64 SPP01	1 set
49	S65-EE-01	Sewage Pumps Control Panel	S65 SPP01	1 set
50	S66-EE-01	Sewage Pumps Control Panel	S66 SPP01	1 set
51	S67-EE-01	Sewage Pumps Control Panel	S67 SPP01	1 set

## c. Standard Accessories

Spare parts

**1. Transformer Secondary Panel (S51 LVP01)**

## a. Purpose

To receive low voltage from transformer and to distribute to low voltage feeder panel

## b. Quantity: 1 set

## c. Specification

Type Indoor, self-supporting, metal enclosed, vermin-proof

Rated insulation voltage AC600V

Rated current 600A

Control circuit voltage AC 220V

Molded case circuit breaker (MCCB): 1 lot As shown on the drawings

Measuring instrument As shown on the drawings and the general specifications

Protective relays As shown on the drawings and the general specifications

Control switches:	1 lot
Indication lamps:	1 lot
Necessary accessories:	1 lot

## **2. Low Voltage Feeder Panel (S51 LVP02)**

### a. Purpose

To receive low voltage power from the transformer secondary panel and to distribute it to each low voltage panel or equipment

### b. Quantity: 1 set

### c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof	
Rated insulation voltage	AC600V	
Rated current	600A	
Control circuit voltage	AC 220V	
Molded case circuit breaker (MCCB)	: 1lot	As shown on the drawings
Measuring instrument	As shown on the drawings and the general specifications	
Protective relay	As shown on the drawings and the general specifications	
Control switches:	1 lot	
Indication lamps:	1 lot	
Necessary accessories:	1 lot	

## **3. Sewage Pump Control Panels (S51 SPP01 to 04)**

### a. Purpose

To drive and control the sewage pumps for the pump station No.1 as shown on the drawings.

### b. Quantity: 4 sets

### c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof	
Control circuit voltage	AC 220V	
Composed units	As shown on the drawings and the general specifications	
Protective relays	As shown on the drawings and the general specifications	
Mounted devices	As shown on the drawings and the electrical operation diagram	
Indication lamps	As shown on the drawings and the electrical operation diagram	
Necessary accessories:	1 lot	

**4. Pump Station Facilities Control Panel (S51 PCP01)**

## a. Purpose

To drive and control the pump station auxiliary facilities for the pump station No.1 as shown on the drawings.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

**5. No.1 & 2 Sewage Pump Control Panel (S52 SPP01)**

## a. Purpose

To drive and control No.1 and No.2 sewage pumps for the pump station No.2 as shown on the drawings.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

**6. No.3 Sewage Pump & Others Control Panel (S52 SPP01)**

## a. Purpose

To drive and control the pump station auxiliary facilities for the pump station No.2 as shown on the drawings.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

### **7. Transformer Secondary Panel (S53 LVP01)**

a. Purpose

To receive low voltage power from tow existing transformers and to distribute it to low voltage feeder panel

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Rated insulation voltage	AC600V
Rated current	600A
Control circuit voltage	AC 220V
Molded case circuit breaker (MCCB):	1 lot As shown on the drawings
Measuring instrument	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Control switches:	1 lot
Indication lamps:	1 lot
Necessary accessories:	1 lot

### **8. Low Voltage Feeder Panel (S53 LVP02)**

a. Purpose

To receive low voltage power from the transformer secondary panel and to distribute it to each low voltage panel or equipment

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Rated insulation voltage	AC600V
Rated current	600A

Control circuit voltage	AC 220V
Molded case circuit breaker (MCCB):	1 lot As shown on the drawings
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switches:	1 lot
Indication lamps:	1 lot
Necessary accessories:	1 lot

### **9. Sewage Pump Control Panels (S53 SPP01 to 05)**

a. Purpose

To drive and control the sewage pumps for the pump station No.3 as shown on the drawings.

b. Quantity: 5 sets

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

### **10. Pump Station Facilities Control Panel (S53 PCP01)**

a. Purpose

To drive and control the pump station auxiliary facilities for the pump station No.3 as shown on the drawings.

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram

Necessary accessories: 1 lot

### **11. Transformer Panel (S54ETR01)**

a. Purpose

To step down voltage from 10kV to 380V at 3-phase, 4-wire and 50 Hz.

b. Quantity: 1 set

c. Specification

Type	Oil immersed hermetically sealed, naturally cooled, double wound, core type	
Rated capacity	250kVA	
Rated voltage	10kV/380-220V	
System highest voltage	AC12kV	
Method of connection	HV winding	Delta connection
	LV winding	Star connection, neutral solidly earthed
Measuring instrument	As shown on the drawings and the general specifications	
Protective relays	As shown on the drawings and the general specifications	
Indication lamps:	1 lot	
Necessary accessories:	1 lot	

### **12. Low Voltage Feeder Panel (S54 LVP01)**

a. Purpose

To receive low voltage power from two existing transformers and to distribute it to each low voltage panel or equipment

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof	
Rated insulation voltage	AC600V	
Rated current	400A	
Control circuit voltage	AC 220V	
Molded case circuit breaker (MCCB)	: 1-lot As shown on the drawings	
Measuring instrument	As shown on the drawings and the general specifications	
Protective relay	As shown on the drawings and the general specifications	
Control switches:	1 lot	
Indication lamps:	1 lot	



Necessary accessories: 1 lot

### **13. No.1 & 2 Sewage Pump Control Panel (S54 SPP01)**

a. Purpose

To drive and control No.1 and No.2 sewage pumps for the pump station No.4 as shown on the drawings.

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

### **14. No.3 Sewage Pump Control Panel (S54 SPP02)**

a. Purpose

To drive and control No.3 sewage pump for the pump station No.4 as shown on the drawings.

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

### **15. Pump Station Facilities Control Panel (S54 PCP01)**

a. Purpose

To drive and control the pump station auxiliary facilities for the pump station No.4 as shown on the drawings.

b. Quantity: 1 set

## c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

**16. Transformer (S55ETR01)**

## a. Purpose

To step down voltage from 10kV to 380V at 3-phase, 4-wire and 50 Hz.

## b. Quantity: 1 set

## c. Specification

Type	Oil immersed hermetically sealed, naturally cooled, double wound, core type	
Rated capacity	400kVA	
Rated voltage	10kV/380-220V	
System highest voltage	AC12kV	
Method of connection	HV winding	Delta connection
	LV winding	Star connection, neutral solidly earthed
Measuring instrument	As shown on the drawings and the general specifications	
Protective relays	As shown on the drawings and the general specifications	
Indication lamps:	1 lot	
Necessary accessories:	1 lot	

**17. Transformer Secondary Panel (S55 LVP01)**

## a. Purpose

To receive low voltage power from the transformers and to distribute it to the low voltage feeder panel

## b. Quantity: 1 set

## c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Rated insulation voltage	AC600V

Rated current	400A
Control circuit voltage	AC 220V
Molded case circuit breaker (MCCB):	1 lot As shown on the drawings
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switches:	1 lot
Indication lamps:	1 lot
Necessary accessories:	1 lot

### **18. Low Voltage Feeder Panel (S55 LVP02)**

a. Purpose

To receive low voltage power from the transformers secondary panel and to distribute it to each low voltage panel or equipment

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Rated insulation voltage	AC600V
Rated current	600A
Control circuit voltage	AC 220V
Molded case circuit breaker (MCCB):	1 lot As shown on the drawings
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switches:	1 lot
Indication lamps:	1 lot
Necessary accessories:	1 lot

### **19. Sewage Pump Control Panels (S55 SPP01 to 04)**

a. Purpose

To drive and control sewage pumps for the pump station No.6 as shown on the drawings.

b. Quantity: 4 sets

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Control circuit voltage	AC 220V

Composed units	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

## **20. Pump Station Facilities Control Panel (S55 PCP01)**

### a. Purpose

To drive and control the pump station auxiliary facilities for the pump station No.6 as shown on the drawings.

### b. Quantity: 1 set

### c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

## **21. Transformer (S56ETR01)**

### a. Purpose

To step down voltage from 6kV to 380V at 3-phase, 4-wire and 50 Hz.

### b. Quantity: 1 set

Although two transformers exist in the pump station No.7, one of the existing transformers shall be replaced with a new transformer of 630 kVA under this project.

### c. Specification

Type	Oil immersed hermetically sealed, naturally cooled, double wound, core type	
Rated capacity	630kVA	
Rated voltage	6kV/380-220V	
System highest voltage	AC7.2kV	
Method of connection	HV winding	Delta connection
	LV winding	Star connection, neutral solidly earthed

Measuring instrument	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Indication lamps:	1 lot
Necessary accessories:	1 lot

## **22. Transformer Secondary Panel (S56 LVP01)**

a. Purpose

To receive low voltage power from the transformers and to distribute it to the low voltage feeder panel

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Rated insulation voltage	AC600V
Rated current	800A
Control circuit voltage	AC 220V
Air circuit breaker (ACB):	1 lot As shown on the drawings
Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switches:	1 lot
Indication lamps:	1 lot
Necessary accessories:	1 lot

## **23. Low Voltage Feeder Panel (S56 LVP02)**

a. Purpose

To receive low voltage power from two transformers and to distribute it to low voltage panels or equipment

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Rated insulation voltage	AC600V
Rated current	800A
Control circuit voltage	AC 220V
Air circuit breaker (MCCB):	1 lot As shown on the drawings

Measuring instrument	As shown on the drawings and the general specifications
Protective relay	As shown on the drawings and the general specifications
Control switches:	1 lot
Indication lamps:	1 lot
Necessary accessories:	1 lot

#### **24. Sewage Pump Control Panel (S56 SPP01 to 03)**

a. Purpose

To drive and control No.1, No.2 and No.3 sewage pumps for the pump station No.7 as shown on the drawings.

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

#### **25. Sewage Pump Control Panel (S56 SPP04 to 05)**

a. Purpose

To drive and control No.4 and No.5 sewage pumps for the pump station No.7 as shown on the drawings.

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

**26. No.6 & 7 Sewage Pump Control Panel (S56 SPP06)**

## a. Purpose

To drive and control No.6 and No.7 sewage pumps for the pump station No.7 as shown on the drawings.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

**27. Pump Station Facilities MCC & Auxiliary Relay Panel (S56 MCC01 & S56 ARY01)**

## a. Purpose

To drive and control the pump station facilities for the pump station No.7 as shown on the drawings. Manual operation control circuits for all the plant loads shall be provided in the auxiliary relay panel.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof single face withdrawal
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

**28. Inflow Valve Local Operation Panel (S56 LOP01)**

## a. Purpose

To operate the inflow valve.

## b. Quantity: 1 set

## c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**29. Fine Screen Local Operation Panel (S56 LOP02)**

a. Purpose

To operate fine screens.

b. Quantity: 1 set

c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**30. Sewage Pump Screen Local Operation Panels (S56 LOP03 to 05)**

a. Purpose

To operate the sewage pumps No.1 to No.3.

b. Quantity: 3 set

c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

**31. Sewage Pump Screen Local Operation Panel (S56 LOP06)**

a. Purpose

To operate the sewage pumps No.4 to No.7.

b. Quantity: 1 set

c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
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Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

### **32. Connection Valve Local Operation Panel (S56 LOP07)**

a. Purpose

To operate Connection valves.

b. Quantity: 1 set

c. Specification

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

### **33. Sump Drainage Pump Local Operation Panel (S56 LOP08/09)**

a. Purpose

To operate the sump drainage pumps located at basement floor of the pump station No.7.

b. Quantity: 2 sets

c. Specification (Quantities below shall be for each panel.)

Type	Indoor, with stand, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

### **34. Exhaust Fan Local Operation Panel (S56 LOP10)**

a. Purpose

To operate the exhaust fan.

b. Quantity: 1 set

c. Specification

Type	Indoor, wall-mounted, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram

Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

### **35. Intake Fan Local Operation Panels (S56 LOP11 to 13)**

a. Purpose

To operate the intake fans.

b. Quantity: 3 sets

c. Specification (Quantities below shall be for each panel.)

Type	Indoor, wall-mounted, metal enclosed, vermin-proof
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Electric space heater:	1 set with a thermostat
Necessary accessories:	1 lot

### **36. Transformer Secondary Panel (S57 LVP01)**

a. Purpose

To receive low voltage power from tow existing transformers and to distribute it to low voltage feeder panel

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Rated insulation voltage	AC600V
Rated current	600A
Control circuit voltage	AC 220V
Molded case circuit breaker (MCCB):	1 lot As shown on the drawings
Measuring instrument	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Control switches:	1 lot
Indication lamps:	1 lot
Necessary accessories:	1 lot

### **37. Low Voltage Feeder Panel (S57 LVP02)**

a. Purpose

To receive low voltage power from the transformer secondary panel and to distribute it to each low voltage panel or equipment

b. Quantity: 1 set

c. Specification

Type Indoor, self-supporting, metal enclosed, vermin-proof

Rated insulation voltage AC600V

Rated current 600A

Control circuit voltage AC 220V

Molded case circuit breaker (MCCB): 1 lot As shown on the drawings

Measuring instrument As shown on the drawings and the general specifications

Protective relay As shown on the drawings and the general specifications

Control switches: 1 lot

Indication lamps: 1 lot

Necessary accessories: 1 lot

### **38. Sewage Pump Control Panels (S57 SPP01/ 02)**

a. Purpose

To drive and control the sewage pumps No.1 to No.4 for the pump station No.10 as shown on the drawings.

b. Quantity: 2 sets

c. Specification

Type Indoor, self-supporting, metal enclosed, vermin-proof

Control circuit voltage AC 220V

Composed units As shown on the drawings and the general specifications

Protective relays As shown on the drawings and the general specifications

Mounted devices As shown on the drawings and the electrical operation diagram

Indication lamps As shown on the drawings and the electrical operation diagram

Necessary accessories: 1 lot

### **39. Sewage Pump Control Panels (S57 SPP03)**

a. Purpose

To drive and control the sewage pumps No.5 for the pump station No.10 as shown on the drawings.

b. Quantity: 2 sets

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

#### **40. Pump Station Facilities Control Panel –1 (S57 PCP01)**

a. Purpose

To drive and control the pump station auxiliary facilities for the pump station No.10 as shown on the drawings.

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

#### **41. Pump Station Facilities Control Panel –2 (S57 PCP02)**

a. Purpose

To drive and control the pump station auxiliary facilities for the pump station No.10 as shown on the drawings.

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications
Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram

Necessary accessories: 1 lot

#### **42. Sewage Pump & Fan Control Panel (S58 PCP01)**

a. Purpose

To drive and control the sewage pumps and the fans for the pump station No.11 as shown on the drawings.

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications.

A programmable logic controller, which shall have the software program of automatic operation, shall be equipped in this panel. Furthermore, an RS-232C card shall be mounted on the base plate of the PLC to play a role of interface to the radio communication device.

Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

#### **43. Sewage Pumps & Fan Control Panel (S59PCP01)**

a. Purpose

To drive and control the sewage pumps and the fans for the pump station No.15 as shown on the drawings.

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications.

A programmable logic controller, which shall have the software program of automatic operation, shall be equipped in this panel. Furthermore, an RS-232C card shall be mounted on the base plate of the PLC to play a role of interface to the radio communication device.

Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

#### **44. Sewage Pumps & Fan Control Panel (S60PCP01)**

a. Purpose

To drive and control the sewage pumps and the fans for the pump station No.16 as shown on the drawings.

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications.

A programmable logic controller, which shall have the software program of automatic operation, shall be equipped in this panel. Furthermore, an RS-232C card shall be mounted on the base plate of the PLC to play a role of interface to the radio communication device.

Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

#### **45. Sewage Pumps & Fan Control Panel (S61PCP01)**

a. Purpose

To drive and control the sewage pumps and the fans for the pump station No.16 as shown on the drawings.

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications.

A programmable logic controller, which shall have the software

program of automatic operation, shall be equipped in this panel. Furthermore, an RS-232C card shall be mounted on the base plate of the PLC to play a role of interface to the radio communication device.

Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

#### **46. Sewage Pump & Fan Control Panel (S62PCP01)**

a. Purpose

To drive and control the sewage pumps and the fans for the pump station No.17 as shown on the drawings.

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications.

A programmable logic controller, which shall have the software program of automatic operation, shall be equipped in this panel. Furthermore, an RS-232C card shall be mounted on the base plate of the PLC to play a role of interface to the radio communication device.

Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

#### **47. Sewage Pump & Fan Control Panel (S63PCP01)**

a. Purpose

To drive and control the sewage pumps and the fans for the pump station No.24 as shown on the drawings.

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
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Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications.
	A programmable logic controller, which shall have the software program of automatic operation, shall be equipped in this panel. Furthermore, an RS-232C card shall be mounted on the base plate of the PLC to play a role of interface to the radio communication device.
Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

#### **48. Sewage Pump Control Panel (S64PCP01)**

a. Purpose

To drive and control the sewage pumps for the pump station No.28 as shown on the drawings.

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications.
	A programmable logic controller, which shall have the software program of automatic operation, shall be equipped in this panel. Furthermore, an RS-232C card shall be mounted on the base plate of the PLC to play a role of interface to the radio communication device.
Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

#### **49. Sewage Pump Control Panel (S65PCP01)**

a. Purpose

To drive and control the sewage pumps for the pump station No.34 as shown on the drawings.



b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications.

A programmable logic controller, which shall have the software program of automatic operation, shall be equipped in this panel. Furthermore, an RS-232C card shall be mounted on the base plate of the PLC to play a role of interface to the radio communication device.

Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

#### **50. Sewage Pump Control Panel (S66PCP01)**

a. Purpose

To drive and control the sewage pumps for the pump station No.37 as shown on the drawings.

b. Quantity: 1 set

c. Specification

Type	Indoor, self-supporting, metal enclosed, vermin-proof
Control circuit voltage	AC 220V
Composed units	As shown on the drawings and the general specifications.

A programmable logic controller, which shall have the software program of automatic operation, shall be equipped in this panel. Furthermore, an RS-232C card shall be mounted on the base plate of the PLC to play a role of interface to the radio communication device.

Protective relays	As shown on the drawings and the general specifications
Mounted devices	As shown on the drawings and the electrical operation diagram
Indication lamps	As shown on the drawings and the electrical operation diagram
Necessary accessories:	1 lot

**51. Sewage Pump Panel (S67PCP01)**

a. Purpose

To drive and control the sewage pumps for the pump station IH as shown on the drawings.

b. Quantity: 1 set

c. Specification

Type Indoor, self-supporting, metal enclosed, vermin-proof  
 Control circuit voltage AC 220V  
 Composed units As shown on the drawings and the general specifications.

A programmable logic controller, which shall have the software program of automatic operation, shall be equipped in this panel. Furthermore, an RS-232C card shall be mounted on the base plate of the PLC to play a role of interface to the radio communication device.

Protective relays As shown on the drawings and the general specifications  
 Mounted devices As shown on the drawings and the electrical operation diagram  
 Indication lamps As shown on the drawings and the electrical operation diagram  
 Necessary accessories: 1 lot

**P16.2.7 Instrumentation Facilities (S51 to S67-Intermediate Pump Stations)**

a. General

The components of instrumentation for the Intermediate Pump Stations shall consist of the following equipment. Equipment shall be designed using the following conditions and in accordance with the specification set forth hereinafter in this Section.

b. Equipment List

	Item No.	Name	Tag No.	Quantity
1	S51-EE-05	Pump station Reservoir Level Switch	S51 ILS01	1 set
2	S51-EE-06	Sump Pit Level Switches	S51 ILS02/03	2 sets
3	S52-EE-03	Pump station Reservoir Level Switch	S52 ILS01	1 set
4	S52-EE-04	Sump Pit Level Switch	S52 ILS02	1 set
5	S53-EE-05	Pump station Reservoir Level Switch	S53 ILS01	1 set
6	S53-EE-06	Sump Pit Level Switch	S53 ILS02	1 set
7	S54-EE-06	Pump station Reservoir Level Switch	S54 ILS01	1 set
8	S54-EE-07	Sump Pit Level Switches	S54 ILS02/03	2 sets
9	S55-EE-06	Pump station Reservoir Level Switch	S55 ILS01	1 set

10	S55-EE-07	Sump Pit Level Switches	S55 ILS02/03	2 sets
11	S56-EE-16	Pump station Reservoir Level	S56 ILE01	1 set
12	S56-EE17	Sump Pit Level Switches	S56 ILS01/02	2 sets
13	S57-EE-07	Pump station Reservoir Level Switch	S57 ILS01	1 set
14	S57-EE08	Sump Pit Level Switches	S57 ILS02/03	2 sets
15	S58-EE-02	Pump station Reservoir Level Switch	S58 ILS01	1 set
16	S59-EE-02	Pump station Reservoir Level Switch	S59 ILS01	1 set
17	S60-EE-02	Pump station Reservoir Level Switch	S60 ILS01	1 set
18	S61-EE-02	Pump station Reservoir Level Switch	S61 ILS01	1 set
19	S62-EE-02	Pump station Reservoir Level Switch	S62 ILS01	1 set
20	S63-EE-02	Pump station Reservoir Level Switch	S63 ILS01	1 set
21	S64-EE-02	Pump station Reservoir Level Switch	S64 ILS01	1 set
22	S65-EE-02	Pump station Reservoir Level Switch	S65ILS01	1 set
23	S66-EE-02	Pump station Reservoir Level Switch	S66ILS01	1 set
24	S67-EE-02	Pump station Reservoir Level Switch	S67ILS01	1 set

c. Standard Accessories

Spare parts

**1. Pump Station Reservoir Level Switch (S51 ILS 01)**

a. Purpose

To sense the reservoir level in the pump station No.1 and to control the sewage pumps automatically.

b. Quantity: 1 set

c. Specification

Type	Float, micro switch type
Contacts enclosure:	Fully submersible, protected to IP68
Number of contacts:	6
Measurement fluid	Sewage
Accessories	Stainless steel 304 suspension chain, weight and PVC protection pipe

Other necessary accessories: 1 lot

**2. Sump Pit Level Switches (S51 ILS 02/03)**

a. Purpose

To control the sump drainage pump automatically.

b. Quantity: 2 sets

c. Specification (The quantities shall be for each panel)

Type	Electrode Type Level Switch
Measurement liquid	Drainage water
Number of rod:	5 pieces per set
Length of rod	5.0 m (Max)
Material of rod	Stainless steel 304
Other necessary accessories: 1 lot	

### **3. Pump Station Reservoir Level Switch (S52 ILS 01)**

a. Purpose

To sense the reservoir level in the pump station No.2 and to control the sewage pumps automatically.

b. Quantity: 1 set

c. Specification

Type	Float, micro switch type
Contacts enclosure:	Fully submersible, protected to IP68
Number of contacts:	5
Measurement fluid	Sewage
Accessories	Stainless steel 304 suspension chain, weight and PVC protection pipe

Other necessary accessories: 1 lot

### **4. Sump Pit Level Switch (S52 ILS 02)**

a. Purpose

To control the sump drainage pump automatically.

b. Quantity: 1 set

c. Specification

Type	Electrode Type Level Switch
Measurement liquid	Drainage water
Number of rod:	5 pieces per set
Length of rod	5.0 m (Max)
Material of rod	Stainless steel 304

Other necessary accessories: 1 lot

### **5. Pump Station Reservoir Level Switch (S53 ILS 01)**

a. Purpose

To sense the reservoir level in the pump station No.3 and to control the sewage pumps automatically.

b. Quantity: 1 set

c. Specification

Type	Float, micro switch type
Contacts enclosure:	Fully submersible, protected to IP68
Number of contacts:	5
Measurement fluid	Sewage
Accessories	Stainless steel 304 suspension chain, weight and PVC protection pipe

Other necessary accessories: 1 lot

#### **6. Sump Pit Level Switch (S53 ILS 02)**

a. Purpose

To control the sump drainage pump automatically.

b. Quantity: 1 set

c. Specification

Type	Electrode Type Level Switch
Measurement liquid	Drainage water
Number of rod:	5 pieces per set
Length of rod	5.0 m (Max)
Material of rod	Stainless steel 304

Other necessary accessories: 1 lot

#### **7. Pump Station Reservoir Level Switch (S54 ILS 01)**

a. Purpose

To sense the reservoir level in the pump station No.4 and to control the sewage pumps automatically.

b. Quantity: 1 set

c. Specification

Type	Float, micro switch type
Contacts enclosure:	Fully submersible, protected to IP68
Number of contacts:	5
Measurement fluid	Sewage
Accessories	Stainless steel 304 suspension chain, weight and PVC

protection pipe

Other necessary accessories: 1 lot

#### **8. Sump Pit Level Switches (S54 ILS 02/03)**

a. Purpose

To control the sump drainage pumps automatically.

b. Quantity: 2 sets

c. Specification (The quantities shall be for each panel)

Type	Electrode Type Level Switch
Measurement liquid	Drainage water
Number of rod:	5 pieces per set
Length of rod	5.0 m (Max)
Material of rod	Stainless steel 304

Other necessary accessories: 1 lot

#### **9. Pump Station Reservoir Level Switch (S55 ILS 01)**

a. Purpose

To sense the reservoir level in the pump station No.6 and to control the sewage pumps automatically.

b. Quantity: 1 set

c. Specification

Type	Float, micro switch type
Contacts enclosure:	Fully submersible, protected to IP68
Number of contacts:	5
Measurement fluid	Sewage
Accessories	Stainless steel 304 suspension chain, weight and PVC protection pipe

Other necessary accessories: 1 lot

#### **10. Sump Pit Level Switches (S55 ILS 02/03)**

a. Purpose

To control the sump drainage pumps automatically.

b. Quantity: 2 sets

c. Specification (The quantities shall be for each panel)

Type	Electrode Type Level Switch
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Measurement liquid	Drainage water
Number of rod:	5 pieces per set
Length of rod	5.0 m (Max)
Material of rod	Stainless steel 304
Other necessary accessories: 1 lot	

### **11. Pump Station Reservoir Level (S56 ILE 01)**

a. Purpose

To measure the reservoir level in the pump station No.7 and to control the sewage pumps automatically.

b. Quantity: 1 set

c. Specification

Type	Submersible hydrostatic type
Material of main component	
detection part:	stainless steel 316 or urethane resin
Pressure-receiving part:	stainless steel 316/316L, chloroprene rubber or silicon rubber
hollow cable:	PVC or polyurethane
Sensor enclosure:	Fully submersible, protected to IP68
Accuracy:	$\pm 0.5\%$ of FS
Measurement fluid	Sewage
Measurement range	0~10 m
Accessories	Stainless steel 304 suspension chain and PVC protection pipe
	Alarm setting device: 1 lot
	Isolator: 1 lot
	Arrester: 1 lot
Other necessary accessories: 1 lot	

### **12. Sump Pit Level Switches (S56 ILS 01/02)**

a. Purpose

To control the sump drainage pumps automatically.

b. Quantity: 2 sets

c. Specification (The quantities shall be for each panel)

Type	Electrode Type Level Switch
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Measurement liquid	Drainage water
Number of rod:	5 pieces per set
Length of rod	5.0 m (Max)
Material of rod	Stainless steel 304
Other necessary accessories: 1 lot	

### **13. Pump Station Reservoir Level Switch (S57 ILS 01)**

a. Purpose

To sense the reservoir level in the pump station No.10 and to control the sewage pumps automatically.

b. Quantity: 1 set

c. Specification

Type	Float, micro switch type
Contacts enclosure:	Fully submersible, protected to IP68
Number of contacts:	6
Measurement fluid	Sewage
Accessories	Stainless steel 304 suspension chain, weight and PVC protection pipe

Other necessary accessories: 1 lot

### **14. Sump Pit Level Switches (S57 ILS 02/03)**

a. Purpose

To control the sump drainage pumps automatically.

b. Quantity: 2 sets

c. Specification (The quantities shall be for each panel)

Type	Electrode Type Level Switch
Measurement liquid	Drainage water
Number of rod:	5 pieces per set
Length of rod	5.0 m (Max)
Material of rod	Stainless steel 304

Other necessary accessories: 1 lot

### **15. Pump Station Reservoir Level Switch (S58 ILS 01)**

a. Purpose

To sense the reservoir level in the pump station No.11 and to control the sewage pumps



automatically.

b. Quantity: 1 set

c. Specification

Type	Float, micro switch type
Contacts enclosure:	Fully submersible, protected to IP68
Number of contacts:	5
Measurement fluid	Sewage
Accessories	Stainless steel 304 suspension chain, weight and PVC protection pipe

Other necessary accessories: 1 lot

#### **16. Pump Station Reservoir Level Switch (S59 ILS 01)**

a. Purpose

To sense the reservoir level in the pump station No.15 and to control the sewage pumps automatically.

b. Quantity: 1 set

c. Specification

Type	Float, micro switch type
Contacts enclosure:	Fully submersible, protected to IP68
Number of contacts:	5
Measurement fluid	Sewage
Accessories	Stainless steel 304 suspension chain, weight and PVC protection pipe

Other necessary accessories: 1 lot

#### **17. Pump Station Reservoir Level Switch (S60 ILS 01)**

a. Purpose

To sense the reservoir level in the pump station No.17 and to control the sewage pumps automatically.

b. Quantity: 1 set

c. Specification

Type	Float, micro switch type
Contacts enclosure:	Fully submersible, protected to IP68
Number of contacts:	5
Measurement fluid	Sewage

Accessories                      Stainless steel 304 suspension chain, weight and PVC protection pipe

Other necessary accessories: 1 lot

#### **18. Pump Station Reservoir Level Switch (S61 ILS 01)**

a. Purpose

To sense the reservoir level in the pump station No.17 and to control the sewage pumps automatically.

b. Quantity: 1 set

c. Specification

Type                                  Float, micro switch type

Contacts enclosure:              Fully submersible, protected to IP68

Number of contacts:              4

Measurement fluid                Sewage

Accessories                      Stainless steel 304 suspension chain, weight and PVC protection pipe

Other necessary accessories: 1 lot

Other necessary accessories: 1 lot

#### **19. Pump Station Reservoir Level Switch (S62 ILS 01)**

a. Purpose

To sense the reservoir level in the pump station No.21 and to control the sewage pumps automatically.

b. Quantity: 1 set

c. Specification

Type                                  Float, micro switch type

Contacts enclosure:              Fully submersible, protected to IP68

Number of contacts:              4

Measurement fluid                Sewage

Accessories                      Stainless steel 304 suspension chain, weight and PVC protection pipe

Other necessary accessories: 1 lot

#### **20. Pump Station Reservoir Level Switch (S63 ILS 01)**

a. Purpose

To sense the reservoir level in the pump station No.24 and to control the sewage pumps automatically.

b. Quantity: 1 set

c. Specification

Type	Float, micro switch type
Contacts enclosure:	Fully submersible, protected to IP68
Number of contacts:	4
Measurement fluid	Sewage
Accessories	Stainless steel 304 suspension chain, weight and PVC protection pipe

Other necessary accessories: 1 lot

## **21. Pump Station Reservoir Level Switch (S64 ILS 01)**

a. Purpose

To sense the reservoir level in the pump station No.28 and to control the sewage pumps automatically.

b. Quantity: 1 set

c. Specification

Type	Float, micro switch type
Contacts enclosure:	Fully submersible, protected to IP68
Number of contacts:	4
Measurement fluid	Sewage
Accessories	Stainless steel 304 suspension chain, weight and PVC protection pipe

Other necessary accessories: 1 lot

## **22. Pump Station Reservoir Level Switch (S65 ILS 01)**

a. Purpose

To sense the reservoir level in the pump station No.34 and to control the sewage pumps automatically.

b. Quantity: 1 set

c. Specification

Type	Float, micro switch type
Contacts enclosure:	Fully submersible, protected to IP68
Number of contacts:	4
Measurement fluid	Sewage
Accessories	Stainless steel 304 suspension chain, weight and PVC protection pipe

Other necessary accessories: 1 lot

**23. Pump Station Reservoir Level Switch (S66 ILS 01)**

a. Purpose

To sense the reservoir level in the pump station No.37 and to control the sewage pumps automatically.

b. Quantity: 1 set

c. Specification

Type	Float, micro switch type
Contacts enclosure:	Fully submersible, protected to IP68
Number of contacts:	4
Measurement fluid	Sewage
Accessories	Stainless steel 304 suspension chain, weight and PVC protection pipe

Other necessary accessories: 1 lot

**24. Pump Station Reservoir Level Switch (S67 ILS 01)**

a. Purpose

To sense the reservoir level in the pump station IH and to control the sewage pumps automatically.

b. Quantity: 1 set

c. Specification

Type	Float, micro switch type
Contacts enclosure:	Fully submersible, protected to IP68
Number of contacts:	4
Measurement fluid	Sewage
Accessories	Stainless steel 304 suspension chain, weight and PVC protection pipe

Other necessary accessories: 1 lot

**P16.2.8 Monitoring and Control Facilities (S51 to S60)**

a. General

The electrical components of monitoring and control facilities for the Intermediate Pump Stations shall consist of the following equipment. The rehabilitated seventeen pump stations in this project will be finally monitored under an entire monitoring system that will be established by ASA in future. The master station for the entire monitoring system

will be installed in ASA headquarters. The radio communication system will be provided in future as transmission medium for the entire monitoring system. Equipment shall be designed using the following conditions and in accordance with the specification set forth hereinafter in this Section. The space for the radio device in the PLC panels listed below shall be reserved.

b. Equipment List

	Item No.	Name	Tag No.	Quantity
1	S51-EE-07	No.1 Pump Station PLC	S51 PLC01	1 set
2	S52-EE-05	No.2 Pump Station PLC	S52 PLC01	1 set
3	S53-EE-07	No.3 Pump Station PLC	S53 PLC01	1 set
4	S54-EE-08	No.4 Pump Station PLC	S54 PLC01	1 set
5	S55-EE-08	No.6 Pump Station PLC	S55 PLC01	1 set
6	S56-EE-18	No.7 Pump Station PLC	S56 PLC01	1 set
7	S57-EE-09	No.10 Pump Station PLC	S57 PLC01	1 set1

c. Standard Accessories

Spare parts

**1. No.1 Pump Station PLC (S51 PLC 01)**

a. Purpose

To collect field data and control the plant loads in the pump station No.1 automatically. Details are shown on the drawings and the electrical operation diagram.

b. Quantity: 1 set

c. Specification

Type Indoor, Self-supporting, Metal enclosed, Vermin-proof Type

Processing function Sequential control, Instrumentation loop control

Interface to the radio system RS-232C card

Input/Output capacities

Digital I/O	Analog I/O	Pulse I
100	6	2

Necessary accessories: 1 lot

**2. No.2 Pump Station PLC (S52 PLC 01)**

a. Purpose

To collect field data and control the plant loads in the pump station No.2 automatically. Details are shown on the drawings and the electrical operation diagram.

b. Quantity: 1 set

c. Specification

Type Indoor, Self-supporting, Metal enclosed, Vermin-proof Type

Processing function Sequential control, Instrumentation loop control

Interface to the radio system RS-232C card

Input/Output capacities

Digital I/O	Analog I/O	Pulse I
90	6	2

Necessary accessories: 1 lot

**3. No.3 Pump Station PLC (S53 PLC 01)**

a. Purpose

To collect field data and control the plant loads in the pump station No.3 automatically. Details are shown on the drawings and the electrical operation diagram.

b. Quantity: 1 set

c. Specification

Type Indoor, Self-supporting, Metal enclosed, Vermin-proof Type

Processing function Sequential control, Instrumentation loop control

Interface to the radio system RS-232C card

Input/Output capacities

Digital I/O	Analog I/O	Pulse I
130	6	2

Necessary accessories: 1 lot

**4. No.4 Pump Station PLC (S54 PLC 01)**

a. Purpose

To collect field data and control the plant loads in the pump station No.4 automatically. Details are shown on the drawings and the electrical operation diagram.

b. Quantity: 1 set

c. Specification

Type Indoor, Self-supporting, Metal enclosed, Vermin-proof Type

Processing function Sequential control, Instrumentation loop control

Interface to the radio system RS-232C card

Input/Output capacities

Digital I/O	Analog I/O	Pulse I
120	6	2

Necessary accessories: 1 lot

**5. No.6 Pump Station PLC (S55 PLC 01)**

## a. Purpose

To collect field data and control the plant loads in the pump station No.6 automatically. Details are shown on the drawings and the electrical operation diagram.

## b. Quantity: 1 set

## c. Specification

Type Indoor, Self-supporting, Metal enclosed, Vermin-proof Type

Processing function Sequential control, Instrumentation loop control

Interface to the radio system RS-232C card

Input/Output capacities

Digital I/O	Analog I/O	Pulse I
140	6	2

Necessary accessories: 1 lot

**6. No.7 Pump Station PLC (S56 PLC 01)**

## a. Purpose

To collect field data and control the plant loads in the pump station No.7 automatically. Details are shown on the drawings and the electrical operation diagram.

## b. Quantity: 1 set

## c. Specification

Type Indoor, Self-supporting, Metal enclosed, Vermin-proof Type

Processing function Sequential control, Instrumentation loop control

Interface to the radio system RS-232C card

Input/Output capacities

Digital I/O	Analog I/O	Pulse I
230	6	2

Necessary accessories: 1 lot

**7. No.10 Pump Station PLC (S57 PLC 01)**

## a. Purpose

To collect field data and control the plant loads in the pump station No.10 automatically. Details are shown on the drawings and the electrical operation diagram.

## b. Quantity: 1 set

## c. Specification

Type Indoor, Self-supporting, Metal enclosed, Vermin-proof Type

Processing function          Sequential control, Instrumentation loop control

Interface to the radio system          RS-232C card

Input/Output capacities

Digital I/O	Analog I/O	Pulse I
150	6	2

Necessary accessories: 1 lot

### **P16.2.9 Wiring and other work (S51 to S67 Intermediate Pump Stations)**

#### a. General

The electrical work necessary to make the Intermediate Pump Stations complete shall consist of the following. Details of each item shall be designed using the following conditions and in accordance with the specification set forth hereinafter in this Section.

#### b. Item List

	Item No.	Name	Tag No.	Quantity
1	S51-EE-08	Wiring Work for Pump Station No.1	S51 WIR01	1 lot
2	S51-EE-09	Removal Work for Pump Station No.1	S51 REW01	1 lot
3	S52-EE-06	Wiring Work for Pump Station No.2	S52 WIR01	1 lot
4	S52-EE-07	Removal Work for Pump Station No.2	S52 REW01	1 lot
5	S53-EE-08	Wiring Work for Pump Station No.3	S53 WIR01	1 lot
6	S53-EE-09	Removal Work for Pump Station No.3	S53 REW01	1 lot
7	S54-EE-09	Wiring Work for Pump Station No.4	S54 WIR01	1 lot
8	S54-EE-10	Removal Work for Pump Station No.4	S54 REW01	1 lot
9	S55-EE-09	Wiring Work for Pump Station No.6	S55 WIR01	1 lot
10	S55-EE-10	Removal Work for Pump Station No.6	S55 REW01	1 lot
11	S56-EE-19	Wiring Work for Pump Station No.7	S56 WIR01	1 lot
12	S56-EE-20	Removal Work for Pump Station No.7	S56 REW01	1 lot
13	S57-EE-10	Wiring Work for Pump Station No.10	S57 WIR01	1 lot
14	S57-EE-11	Removal Work for Pump Station No.10	S57 REW01	1 lot
15	S58-EE-03	Wiring Work for Pump Station No.11	S58 WIR01	1 lot
16	S59-EE-03	Wiring Work for Pump Station No.15	S59 WIR01	1 lot
17	S60-EE-03	Wiring Work for Pump Station No.16	S60 WIR01	1 lot
18	S61-EE-03	Wiring Work for Pump Station No.17	S61 WIR01	1 lot
19	S62-EE-03	Wiring Work for Pump Station No.21	S62 WIR01	1 lot
20	S63-EE-03	Wiring Work for Pump Station No.24	S63 WIR01	1 lot
21	S64-EE-03	Wiring Work for Pump Station No.28	S64 WIR01	1 lot
22	S65-EE-03	Wiring Work for Pump Station No.34	S65 WIR01	1 lot
23	S66-EE-03	Wiring Work for Pump Station No.37	S66 WIR01	1 lot
24	S67-EE-03	Wiring Work for Pump Station IH	S67 WIR01	1 lot



c. Standard Accessories

Spare parts

**1. Wiring Work for Pump station No.1 (S51 WIR01)**

a. Scope of work

The work for the Pump Station No.1 shall include but not be limited to the following. The details are referred to the drawings and the general specification.

1. Supply and install all wire and cable to new equipment.
2. Supply and install all trays, conduits, ducts, trench and other materials necessary to make wiring complete.
3. Supply and install all foundations or floor works for all panels.
4. Re-terminate the existing cables below in the newly installed low voltage feeder panel
  - 1) the cable to the existing lighting distribution board
  - 2) other cables to the necessary existing facilities

**2. Removal Work for Pump Station No.1 (S51 REW01)**

a. Scope of work

The work for the Pump Station No.1 shall include but not be limited to the following.

1. To remove the existing low voltage distribution panel and the low voltage switchgear located in the electrical room.
2. To remove the wiring facilities which are laid to the removed mechanical facilities.
3. To transfer the removed facilities to the ASA's open storage.

**3. Wiring Work for Pump station No.2 (S52 WIR01)**

a. Scope of work

The work for the Pump Station No.2 shall include but not be limited to the following. The details are referred to the drawings and the general specification.

1. Supply and install all wire and cable to new equipment.
2. Supply and install all trays, conduits, ducts, trench and other materials necessary to make wiring complete.
3. Supply and install all foundations or floor works for all panels.
4. Re-terminate the existing cables below in the newly installed low voltage feeder panel
  - 1) the cable coming from the two existing transformers.
  - 2) the cable to the existing lighting fixtures.
  - 3) other cables to the necessary existing facilities

**4. Removal Work for Pump Station No.2 (S52 REW01)**

a. Scope of work

The work for the Pump Station No.2 shall include but not be limited to the following.

1. To remove the existing low voltage distribution panel and the low voltage switchgear located in the low voltage electrical room.
2. To remove the wiring facilities which are laid to the removed mechanical facilities.
3. To transfer the removed facilities to the ASA's open storage.

**5. Wiring Work for Pump station No.3 (S53 WIR01)**

a. Scope of work

The work for the Pump Station No.3 shall include but not be limited to the following. The details are referred to the drawings and the general specification.

1. Supply and install all wire and cable to new equipment.
2. Supply and install all trays, conduits, ducts, trench and other materials necessary to make wiring complete.
3. Supply and install all foundations or floor works for all panels.
4. Re-terminate the existing cables below in the newly installed low voltage feeder panel
  - 1) the cable coming from the two existing transformers.
  - 2) the cable to the existing lighting fixtures.
  - 3) other cables to the necessary existing facilities

**6. Removal Work for Pump Station No.3 (S53 REW01)**

a. Scope of work

The work for the Pump Station No.3 shall include but not be limited to the following.

1. To remove the existing low voltage distribution panel and the low voltage switchgear located in the low voltage electrical room.
2. To remove the wiring facilities which are laid to the removed mechanical facilities.
3. To transfer the removed facilities to the ASA's open storage.

**7. Wiring Work for Pump station No.4 (S54 WIR01)**

a. Scope of work

The work for the Pump Station No.4 shall include but not be limited to the following. The details are referred to the drawings and the general specification.

1. Supply and install all wire and cable to new equipment.

The cable between the newly installed transformer secondary panel and the newly installed transformer shall be laid newly.

2. Supply and install all trays, conduits, ducts, trench and other materials necessary to make wiring complete.
3. Supply and install all foundations or floor works for all panels.
4. Re-terminate the existing cables below in the newly installed low voltage feeder panel
  - 1) the cable coming from the existing transformer.
  - 2) the cable to the existing lighting distribution board.
  - 3) other cables to the necessary existing facilities

**8. Removal Work for Pump Station No.4 (S54 REW01)**

a. Scope of work

The work for the Pump Station No.4 shall include but not be limited to the following.

1. To remove the existing low voltage distribution panel and the low voltage switchgear located in the low voltage electrical room.
2. To remove the wiring facilities which are laid to the removed mechanical facilities.
3. To transfer the removed facilities to the ASA's open storage.

**9. Wiring Work for Pump station No.6 (S55 WIR01)**

a. Scope of work

The work for the Pump Station No.6 shall include but not be limited to the following. The details are referred to the drawings and the general specification.

1. Supply and install all wire and cable to new equipment.

The cable between the newly installed transformer secondary panel and the newly installed transformer shall be laid newly.
2. Supply and install all trays, conduits, ducts, trench and other materials necessary to make wiring complete.
3. Supply and install all foundations or floor works for all panels.
4. Re-terminate the existing cables below in the newly installed low voltage feeder panel
  - 1) the cable coming from the existing transformer.
  - 2) the cable to the existing lighting distribution board.
  - 3) other cables to the necessary existing facilities

**10. Removal Work for Pump Station No.6 (S55 REW01)**

a. Scope of work

The work for the Pump Station No.6 shall include but not be limited to the following.

1. To remove the existing low voltage distribution panel and the low voltage switchgear located in the low voltage electrical room.

2. To remove the wiring facilities which are laid to the removed mechanical facilities.
3. To transfer the removed facilities to the ASA's open storage.

**11. Wiring Work for Pump station No.7 (S56 WIR01)**

a. Scope of work

The work for the Pump Station No.7 shall include but not be limited to the following. The details are referred to the drawings and the general specification.

1. Supply and install all wire and cable to new equipment.  
  
The cable between the newly installed transformer secondary panel and the newly installed transformer shall be laid newly.
2. Supply and install all trays, conduits, ducts, trench and other materials necessary to make wiring complete.
3. Supply and install all foundations or floor works for all panels.
4. Re-terminate the existing cables below in the newly installed low voltage feeder panel
  - 1) the cable coming from the existing transformer.
  - 2) the cable to the existing lighting distribution board.
  - 3) other cables to the necessary existing facilities

**12. Removal Work for Pump Station No.7 (S56 REW01)**

a. Scope of work

The work for the Pump Station No.7 shall include but not be limited to the following.

1. To remove the existing low voltage distribution panel and the low voltage switchgear located in the low voltage electrical room.
2. To remove the wiring facilities which are laid to the removed mechanical facilities.
2. To transfer the removed facilities to the ASA's open storage.

**13. Wiring Work for Pump station No.10 (S57 WIR01)**

a. Scope of work

The work for the Pump Station No.10 shall include but not be limited to the following. The details are referred to the drawings and the general specification.

1. Supply and install all wire and cable to new equipment.
2. Supply and install all trays, conduits, ducts, trench and other materials necessary to make wiring complete.
3. Supply and install all foundations or floor works for all panels.
4. Re-terminate the existing cables below in the newly installed low voltage feeder panel
  - 1) the cable coming from the two existing transformers.

- 2) the cable to the existing lighting distribution board.
- 3) other cables to the necessary existing facilities

**14. Removal Work for Pump Station No.10 (S57 REW01)**

a. Scope of work

The work for the Pump Station No.10 shall include but not be limited to the following.

1. To remove the existing low voltage distribution panel and the low voltage switchgear located in the low voltage electrical room.
2. To remove the wiring facilities which are laid to the removed mechanical facilities.
3. To transfer the removed facilities to the ASA's open storage.

**15. Wiring Work for Pump station No.11 (S58 WIR01)**

a. Scope of work

The work for the Pump Station No.11 shall include but not be limited to the following. The details are referred to the drawings and the general specification.

1. Supply and install all wire and cable to new equipment.
2. Supply and install all trays, conduits, ducts, trench and other materials necessary to make wiring complete.
3. Supply and install all foundations or floor works for all panels.
4. Re-terminate the existing cables below in the newly installed low voltage feeder panel
  - 1) the existing incoming cables from AES.
  - 2) the cable to the existing lighting distribution board or lighting fixtures.
  - 3) other cables to the necessary existing facilities
5. To remove the existing low voltage distribution panel and the low voltage switchgears.
6. To remove the wiring facilities which are laid to the removed mechanical facilities.
7. To transfer the removed facilities to the ASA's open storage.

**16. Wiring Work for Pump station No.15 (S59 WIR01)**

a. Scope of work

The work for the Pump Station No.11 shall include but not be limited to the following. The details are referred to the drawings and the general specification.

1. Supply and install all wire and cable to new equipment.
2. Supply and install all trays, conduits, ducts, trench and other materials necessary to make wiring complete.
3. Supply and install all foundations or floor works for all panels.

4. Re-terminate the existing cables below in the newly installed low voltage feeder panel
  - 1) the existing incoming cables from AES.
  - 2) the cable to the existing lighting distribution board or lighting fixtures.
  - 3) other cables to the necessary existing facilities
5. To remove the existing low voltage distribution panel and the low voltage switchgears.
6. To remove the wiring facilities which are laid to the removed mechanical facilities.
7. To transfer the removed facilities to the ASA's open storage.

**17. Wiring Work for Pump station No.16 (S60 WIR01)**

a. Scope of work

The work for the Pump Station No.16 shall include but not be limited to the following. The details are referred to the drawings and the general specification.

1. Supply and install all wire and cable to new equipment.
2. Supply and install all trays, conduits, ducts, trench and other materials necessary to make wiring complete.
3. Supply and install all foundations or floor works for all panels.
4. Re-terminate the existing cables below in the newly installed low voltage feeder panel
  - 1) the existing incoming cables from AES.
  - 2) the cable to the existing lighting distribution board or lighting fixtures.
  - 3) other cables to the necessary existing facilities
5. To remove the existing low voltage distribution panel and the low voltage switchgears.
6. To remove the wiring facilities which are laid to the removed mechanical facilities.
7. To transfer the removed facilities to the ASA's open storage.

**18. Wiring Work for Pump station No.17 (S61 WIR01)**

a. Scope of work

The work for the Pump Station No.17 shall include but not be limited to the following. The details are referred to the drawings and the general specification.

1. Supply and install all wire and cable to new equipment.
2. Supply and install all trays, conduits, ducts, trench and other materials necessary to make wiring complete.
3. Supply and install all foundations or floor works for all panels.
4. Re-terminate the existing cables below in the newly installed low voltage feeder

panel

- 1) the existing incoming cables from AES.
- 2) the cable to the existing lighting distribution board or lighting fixtures.
- 3) other cables to the necessary existing facilities
5. To remove the existing low voltage distribution panel and the low voltage switchgears.
6. To remove the wiring facilities which are laid to the removed mechanical facilities.
7. To transfer the removed facilities to the ASA's open storage

**19. Wiring Work for Pump station No.21 (S62 WIR01)**

a. Scope of work

The work for the Pump Station No.21 shall include but not be limited to the following. The details are referred to the drawings and the general specification.

1. Supply and install all wire and cable to new equipment.
2. Supply and install all trays, conduits, ducts, trench and other materials necessary to make wiring complete.
3. Supply and install all foundations or floor works for all panels.
4. Re-terminate the existing cables below in the newly installed low voltage feeder panel
  - 1) the existing incoming cables from AES.
  - 2) the cable to the existing lighting distribution board or lighting fixtures.
  - 3) other cables to the necessary existing facilities
5. To remove the existing low voltage distribution panel and the low voltage switchgears.
6. To remove the wiring facilities which are laid to the removed mechanical facilities.
7. To transfer the removed facilities to the ASA's open storage

**20. Wiring Work for Pump station No.24 (S63 WIR01)**

a. Scope of work

The work for the Pump Station No.24 shall include but not be limited to the following. The details are referred to the drawings and the general specification.

1. Supply and install all wire and cable to new equipment.
2. Supply and install all trays, conduits, ducts, trench and other materials necessary to make wiring complete.
3. Supply and install all foundations or floor works for all panels.
4. Re-terminate the existing cables below in the newly installed low voltage feeder panel

- 1) the existing incoming cables from AES.
- 2) the cable to the existing lighting distribution board or lighting fixtures.
- 3) other cables to the necessary existing facilities
5. To remove the existing low voltage distribution panel and the low voltage switchgears.
6. To remove the wiring facilities which are laid to the removed mechanical facilities.
7. To transfer the removed facilities to the ASA's open storage

**21. Wiring Work for Pump station No.28 (S64 WIR01)**

a. Scope of work

The work for the Pump Station No.28 shall include but not be limited to the following. The details are referred to the drawings and the general specification.

1. Supply and install all wire and cable to new equipment.
2. Supply and install all trays, conduits, ducts, trench and other materials necessary to make wiring complete.
3. Supply and install all foundations or floor works for all panels.
4. Re-terminate the existing cables below in the newly installed low voltage feeder panel
  - 1) the existing incoming cables from AES.
  - 2) the cable to the existing lighting distribution board or lighting fixtures.
  - 3) other cables to the necessary existing facilities
5. To remove the existing low voltage distribution panel and the low voltage switchgears.
6. To remove the wiring facilities which are laid to the removed mechanical facilities.
7. To transfer the removed facilities to the ASA's open storage

**22. Wiring Work for Pump station No.34 (S65 WIR01)**

a. Scope of work

The work for the Pump Station No.34 shall include but not be limited to the following. The details are referred to the drawings and the general specification.

1. Supply and install all wire and cable to new equipment.
2. Supply and install all trays, conduits, ducts, trench and other materials necessary to make wiring complete.
3. Supply and install all foundations or floor works for all panels.
4. Re-terminate the existing cables below in the newly installed low voltage feeder panel
  - 1) the existing incoming cable from AES.



- 2) the cable to the existing lighting distribution board or lighting fixtures.
- 3) other cables to the necessary existing facilities
5. To remove the existing low voltage distribution panel and the low voltage switchgears.
6. To remove the wiring facilities which are laid to the removed mechanical facilities.
7. To transfer the removed facilities to the ASA's open storage

**23. Wiring Work for Pump station No.37 (S66 WIR01)**

a. Scope of work

The work for the Pump Station No.37 shall include but not be limited to the following. The details are referred to the drawings and the general specification.

1. Supply and install all wire and cable to new equipment.
2. Supply and install all trays, conduits, ducts, trench and other materials necessary to make wiring complete.
3. Supply and install all foundations or floor works for all panels.
4. Re-terminate the existing cables below in the newly installed low voltage feeder panel
  - 1) the existing incoming cable from AES.
  - 2) the cable to the existing lighting distribution board or lighting fixtures.
  - 3) other cables to the necessary existing facilities
5. To remove the existing low voltage distribution panel and the low voltage switchgears.
6. To remove the wiring facilities which are laid to the removed mechanical facilities.
7. To transfer the removed facilities to the ASA's open storage

**24. Wiring Work for Pump station IH (S67 WIR01)**

a. Scope of work

The work for the Pump Station IH shall include but not be limited to the following. The details are referred to the drawings and the general specification.

1. Supply and install all wire and cable to new equipment.
2. Supply and install all trays, conduits, ducts, trench and other materials necessary to make wiring complete.
3. Supply and install all foundations or floor works for all panels.
4. Re-terminate the existing cables below in the newly installed low voltage feeder panel
  - 1) the existing incoming cable from AES.
  - 2) the cable to the existing lighting distribution board or lighting fixtures.

- 3) other cables to the necessary existing facilities
5. To remove the existing low voltage distribution panel and the low voltage switchgears.
6. To remove the wiring facilities which are laid to the removed mechanical facilities.
7. To transfer the removed facilities to the ASA's open storage