DIVISION P15 MECHANICAL WORKS

P15.2 SEWERAGE FACILITIES

a. Design Condition

(1) Design Flow

The design flows of the major components are as given in the following table:

	M^3/day	m^3/hour	m^3/min	m^3/sec
Design Average Daily Flow	136,000	5,666.7	94.44	1.574
Maximum Flow	200,000	8,333.3	138.89	2.315

(2) Influent Sewage Characteristics

The characteristics of the influent sewage are to be considered as follows:

Constituent	Characteristics	Primary Sedimentation		Design Characteristics		Total Removal Rates
		Removal Rates	Effluent	Removal Rates	Effluent	
BOD	170mg/l	30%	119mg/l	83.2%	20mg/l	88%
SS	210mg/l	40%	125mg/l	84.1%	20mg/l	90%

b. Rehabilitation Work

The rehabilitation work of the sewage treatment plant shall be executed without interference to the operation and rated treatment capacity of the existing facilities. Therefore, rehabilitated facilities shall be taken over by the Employer immediately upon completion of the work. Several cases for rehabilitation method in the procedure are as follows:

(1) Construction of temporary facilities; Temporary pumping facilities are provided at first, and then rehabilitation work is commenced for the following facilities.

- Inlet Pump Station
- Effluent Discharge Pump Station

(2) New facilities are constructed prior to rehabilitation:

- Primary Sedimentation Tank
- Blowers

- Secondary Sedimentation Tank

(3) One of the existing facilities is firstly rehabilitated, then others will be rehabilitated:

- Gravity Thickeners
- Digesters
- Boilers

(4) No temporary, preparatory, and sequential work required:

- Facilities other than described above will be rehabilitated and taken over and utilized after completion of whole rehabilitation work.

P15.2.1 Inflow Tank Facility (S01)

a. General

The mechanical components of the inflow tank 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 of Inflow Tank Facility

Tag Number	Name	Item Number	Quantity
S01-MG-01	Inlet Chamber Gate	S01-MM-01	: 1 unit
S01-MG-02	Bypass Gate	S01-MM-02	: 1 unit
	Piping	S01-MM-03	: Lot
	Steel Works	S01-MM-04	: Lot
	Other Necessary Works	S01-MM-05	: Lot

1. Inlet Chamber Gate (Refer to Standard Specification – Section 15.13.7)

a. General

The gate shall be installed at the outlet of the inlet chamber to divert the flow to the temporary pump station.

b. Specification

Type	: Electric Motor Sluice Gate
Quantity	: 1 unit
Dimension	: Dia. 1400mm
Motor output	: 2.2kW

2. Bypass Gate (Refer to Standard Specification – Section 15.13.7)

a. General

The gate shall be installed at the outlet of the inflow tank and shall divert the flow to the influent pump station and the temporary pump station.

b. Specification

Type	: Electric Motor Sluice Gate
Quantity	: 1 unit
Dimension	: Dia. 2000mm
Motor output	: 5.5kW

P15.2.2 Influent Pump Station Facility (S02)

a. General

The mechanical components of Influent 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 of Influent Pump Station Facility

Tag Number	Name	Item Number Quantity
S02-MG-11 to 31	Channel Gate	S02-MM-04: 3 units
S02-MS-11 to 31	Fine Screen	S02-MM-02: 3 units
S02-IP-10 to 30	Influent Pump A	S02-MM-06: 2units (1 standby)
S02-IP-11/21	Influent Pump B	S02-MM-07: 2 units
S02-MV-12 to 32	Suction Valve A	S02-MM-15: 2 units (1 standby)
S02-MV-42/52	Suction Valve B	S02-MM-16: 2 units
S02-CV-10 to 30	Check Valve A	S02-MM-09: 2 units (1 standby)
S02-MV-11 to 31	Delivery Valve A	S02-MM-10: 2 units (1 standby)
S02-CV-21/22	Check Valve B	S02-MM-12: 2 units
S02-MV-41/51	Delivery Valve B	S02-MM-13: 2 units
S02-MV-13 to 43	Connection Valve	S02-MM-18: 4 units
S02-MC-01	Bridge Crane	S02-MM-20: 1 unit
S02-TP-11 to 31	Temporary Pump	S02-MM-22: 3 units
S02-DP-01/02	Sump Drainage Pump	S02-MM-23: 2 units
S02-HH-01	Hoist Block (Container)	S02-MM-25: 1 unit
S02-HH-02	Hoist Block	S02-MM-26: 1 unit
S02-SC-11 to 31	Screen Container	S02-MM-29: 3 units (3 standbys)
S02-EF-01	Exhaust Fan	S02-MM-30: 1 unit
S02-IF-01	Air Intake Fan (1)	S02-MM-32: 1 unit
S02-IF-02	Air Intake Fan (2)	S02-MM-33: 1 unit
S02-IF-03	Air Intake Fan (3)	S02-MM-34: 1 unit
	Removal of Existing Inlet Gate	S02-MM-01: 1 unit
	Removal of Existing Fine Screen	S02-MM-03: 3 units
	Removal of Existing Channel Gate	S02-MM-05: 3 units
	Removal of Existing Influent Pump	S02-MM-08: 5 units

Removal of Existing Check Valve	S02-MM-11: 5 units
Removal of Existing Delivery Valve	S02-MM-14: 5 units
Removal of Existing Suction Valve	S02-MM-17: 5 units
Removal of Existing Connection Valve	S02-MM-19: 4 units
Removal of Existing Bridge Crane	S02-MM-21: 1 unit
Removal of Existing Sump Drainage Pump	S02-MM-24: 2 units
Removal of Existing Hoist Block (Container)	S02-MM-27: 1 unit
Removal of Existing Hoist Block	S02-MM-28: 1 unit
Removal of Existing Exhaust Fan	S02-MM-31: 1 unit
Removal of Existing Air Intake Fan (1)	S02-MM-35: 1 unit
Removal of Existing Air Intake Fan (2)	S02-MM-36: 1 unit
Removal of Existing Air Intake Fan (3)	S02-MM-37: 1 unit
Piping	S02-MM-38: Lot
Steel Works	S02-MM-39: Lot
Other Necessary Works	S02-MM-40: Lot

1. Channel Gate (Refer to Standard Specification – Section 15.13.7)

a. General

The gate shall be installed at the inlet of the influent pump station and shall be capable of stopping and controlling the incoming sewage flow.

b. Specification

Type	: Motor Driven
Quantity	: 3 units
Dimension	: W 1.68m x Depth 2.0m
Motor output	: 0.4kW

2. Fine Screen

a. General

The screen shall remove fine materials like fiber, sticks, rags and other inclusions and coarse suspended substances contained in the influent sewage. The equipment shall comprise a main body frame, drive unit, rake, chain, shaft, sprocket and screen. It shall be used to remove, continuously scrape, and discharge suspended solids in the influent sewage. The suspended solids shall be discharged into a container or conveyor.

b. Design Condition

(1) The standard speed of rake shall be approx. 2 - 3.6 m/min.

c. Fabrication

(1) Drive unit

(a) The drive unit shall comprise a reduction gear directly connected to with the motor. The drive unit shall transmit the power by means of direct connection with shaft or gear chain.

(b) The reduction gear shall be installed on the outside of the frame cover.

(c) The drive steel roller chain shall be covered with a stainless steel cover. The cover shall be constructed such that it can be removed and maintained easily.

(d) The sprocket wheel for the drive unit and the output shaft shall be made of cast iron.

(2) Frame

(a) The frame shall be made of rolled steel with epoxy coating or made of stainless steel. It shall be assembled sturdily by welding or with nuts and bolts. It shall be free from deviation or bending caused by welding.

(b) The guide rail for the chain, which attaches and transports the scraping rake, shall be installed on the side frame. The side frame shall be constructed such that it can scrape and discharge the screenings without blockage.

(c) The screw take up shall be installed at the upper portion of the frame, in order to stress the chain for scraping. The adjustment screw of the screw take up shall be made of stainless steel.

(3) Cover, Chute and Apron

(a) The frame above the floor level shall be covered with a stainless steel cover to prevent odor. A stainless steel type 304 plate shall be used for the cover.

(b) The cover shall be constructed such that it can be inspected and maintained easily. It shall be provided with a front inspection door, etc. in order to remove and maintain the rake or the chain for scraping. It shall have sufficient strength for its configuration.

(c) A part of the cover shall be used as the chute. The chute shall be constructed such that the discharged screenings can be introduced smoothly into the container or conveyor.

(4) Chain for scraping, sprocket wheel

(a) The chain for scraping shall be bush roller sprocket chain, etc. The strength of the chain shall be designed to safely endure unilateral loads. It shall be made of stainless steel.

(b) The sprocket wheel shall be made of wear resistance material such as stainless steel or the equivalent material or superior to cast iron. Material other than stainless steel shall be induction hardened.

(c) The submersible bearing shall be of high wear resistance bush made of aluminum bronze or oil less bearing, etc. The submersible bearing shall be provided with stopping device to block surrounding sewage.

(5) Rake, Wiper

The teeth, which shall suit the spacing of bar screen shall be attached to the rake in order to scrape the screenings effectively. The rake shall be constructed such that it can drop the screenings

completely by virtue of its reverse motion. The rake shall be adjusted accurately.

(6) Screen

The vertical angle of the fine screen shall be 60 degrees.

d. Materials

(1) Frame

Rolled steel with epoxy coating or Stainless Steel

(2) Chain

(a) Roller chain for transmission of power : Stainless Steel

(b) Bushed roller chain for scraping : Special steel or Stainless steel

(3) Sprocket wheel

(a) For transmission of power : Carbon steel or Stainless steel casting or stainless steel

(b) For scraping : Stainless steel or Stainless steel casting or Stainless steel (with induction hardened tip)

(c) Shaft : Stainless steel

(d) Rake : Stainless steel

(e) Screen : Stainless steel

(f) Anchor bolt : Stainless steel

e. Protection Equipment

(1) Electrical protection

An over current detector with instantaneous element shall be provided if in case the mechanical protection is not provided.

f. Accessories (per Unit)

(a) Anchor bolts and nuts x 1 set

(b) Cover against odor x 1 set

g. Execution

Refer to various sub-sections in Section 15.1.

h. Specification

Type	: Mechanically Cleaning Bar Screen
Quantity	: 3 units
Dimension	: W 1.68m x Depth 2.0m
Clear spacing between bars	:6.0 mm
Motor output	: 0.75kW

3. Influent Pump A (Refer to Standard Specification – Section 15.11.6)

a. General

The influent pumps convey sewage from the sewer to the treatment processing plant. These pumps may be either large-capacity or small-capacity pumps. Type A here includes the large-capacity pumps.

b. Specification

Type	: Vertical Shaft Volute Type Mixed Flow Pump
Quantity	: 2 units (1 standby)
Discharge capacity	: 54m^3/min
Total head	: 15m
Motor output	: 200kW
Efficiency	: not less than 80 percent at duty point
Installation	: indoor
Motor encl. protection	: IP 44
Wet well water levels	: HWL +339.60 m amsl
	: LWL +337.85 m amsl
Pump room floor level	: +337.50 m amsl
Motor room floor level	: +341.50 m amsl

c. The intermediate bearing unit shall be supplied by the pump manufacturer and the pump manufacturer shall have experience of furnishing units of the same configuration. At the time of shop test, pumps may be operated directly coupled with motor without the above intermediate power transmission facilities.

d. The pump manufacturer shall substantiate quoted efficiency with at least one owner's certificate and corresponding test record of specific speed similar to the specified pump with suction diameter of not less than 800 mm.

e. The Contractor shall provide the supporting steelwork for the pump motors. The steelwork shall be removable for direct access to the lower levels. The entire access hole in the ground floor slab shall be provided with sectionalised, removable covers of checker plate steelwork and necessary supports designed for the equipment supplied.

f. The pump manufacturer shall substantiate manufacturing and supplying of pumps and motors with the following conditions satisfactorily completed outside of home country during last 5 years.

i) Vertical shaft volute type mixed flow pump of similar capacity and head with floating shaft and intermediate bearing unit.

ii) Vertical shaft volute type mixed flow pump efficiency at lower speed and capacity than specified.

g. The pump manufacturer shall carry out surge analysis on the pipelines on the basis of data of rotating element, characteristic of reflux valve and the pipelines to ensure no damages caused due to the surge. If any protection methods required for the surge, the methods shall be proposed by the pump manufacturer for the engineer's approval along with report of surge analysis. The pump manufacturer shall have experience of surge analysis of similar discharge capacity of the pump and the similar

length of transmission pipelines.

4. Influent Pump B (Refer to Standard Specification – Section 15.11.6)

a. General

The influent pumps convey sewage from the sewer to the treatment processing plant. Type B here includes comparatively small-capacity pumps.

b. Specification

Type	: Vertical Shaft Volute Type Mixed Flow Pump
Quantity	: 2 units
Discharge capacity	: $27m^3$/min
Total head	: 15m
Motor output	: 110kW
Efficiency	: not less than 77 percent at duty point
Installation	: indoor
Motor encl. protection	: IP 44
Wet well water levels	: HWL +339.60 m amsl
	: LWL +337.85 m amsl
Pump room floor level	: +337.50 m amsl
Motor room floor level	: +341.50 m amsl

c. The intermediate bearing unit shall be supplied by the pump manufacturer and the pump manufacturer shall have experience of furnishing unit of the same configuration. At the time of shop test, pump may be operated directly coupled with motor without the above intermediate power transmission facilities.

d. The pump manufacturer shall substantiate quoted efficiency with at least one owner's certificate and corresponding test record of specific speed similar to the specified pump with suction diameter of not less than 500 mm.

e. The Contractor shall provide the supporting steelwork for the pump motors. The steelwork shall be removable for direct access to the lower levels. The entire access hole in the ground floor slab shall be provided with sectionalised, removable covers of checker plate steelwork and necessary supports designed for the equipment supplied.

f. The pump manufacturer shall substantiate manufacturing and supplying of pumps and motors with the following conditions satisfactorily completed outside of home country during last 5 years.

i) Vertical shaft volute type mixed flow pump of similar capacity and head with floating shaft and intermediate bearing unit.

ii) Vertical shaft volute type mixed flow pump efficiency at lower speed and capacity than specified.

g. The pump manufacturer shall carry out surge analysis on the pipelines on the basis of data of rotating element, characteristic of reflux valve and the pipelines to ensure no damages caused due to the surge. If any protection methods required for the surge, the methods shall be proposed by the pump manufacturer for the engineer's approval along with report of surge analysis. The pump manufacturer shall have experience of surge analysis of similar discharge capacity of the pump and the similar

length of transmission pipelines.

5. Suction Valve A (Refer to Standard Specification – Section 15.13.2)

a. General

The valves shall be installed to control the flow in the conveyance system.

b. Specification

Type	: Motorized Gate Valve
Dimension	: Dia. 800mm
Quantity	: 2 units (1 standby)
Motor output	: 3.7kW

6. Suction Valve B (Refer to Standard Specification – Section 15.13.2)

a. General

The valves shall be installed to control the flow in the conveyance system.

b. Specification

Type	: Motorized Gate Valve
Dimension	: Dia. 500mm
Quantity	: 2 units
Motor output	: 1.5kW

7. Check Valve A (Refer to Standard Specification – Section 15.13.5)

a. General

The check valves shall be installed to control the flow in the conveyance system.

b. Specification

Type	: Swing Type Check Valve with Dashpot
Dimension	: Dia. 700mm
Quantity	: 2 units (1 standby)

8. Delivery Valve A (Refer to Standard Specification – Section 15.13.4)

a. General

The valves shall be installed to control the flow in the conveyance system.

b. Specification

Type	: Motorized Butterfly Valve
Dimension	: Dia. 700mm
Quantity	: 2 units (1 standby)

Motor output : 0.75kW

9. Check Valve B (Refer to Standard Specification – Section 15.13.5)

a. General

The check valves shall be installed to control the flow in the conveyance system.

b. Specification

Type : Swing Type Check Valve with Dashpot

Dimension : Dia. 450mm

Quantity : 2 units

10. Delivery Valve B (Refer to Standard Specification – Section 15.13.4)

a. General

The valves shall be installed to control the flow in the conveyance system.

b. Specification

Type : Motorized Butterfly Valve

Dimension : Dia. 450mm

Quantity : 2 units

Motor output : 0.4kW

11. Connection Valve (Refer to Standard Specification – Section 15.13.2)

a. General

The valves shall be installed to control the flow in the conveyance system.

b. Specification

Type : Motorized Gate Valve

Dimension : Dia. 800mm

Quantity : 4 units

Motor output : 3.7kW

12. Bridge Crane (Refer to Standard Specification – Section 15.12.4)

a. General

The crane shall be used for installation, assembly, maintenance and checking of the pump system and other equipment and apparatus installed in this facility.

b. Specification

Type : Electrically operated

Capacity : 5 ton

Quantity : 1 unit

Motor output : (4.6 + 0.75 + 0.4 x 2) kW

13. Temporary Pump (Refer to Standard Specification – Section 15.11.3)

a. General

Temporary Influent Pump shall be installed to support the sewage treatment process in the cases when existing influent pump station is undergoing repairing works.

b. Specification

Type : Removable Submersible Pump

Discharge capacity : $25m^3$/min

Total head : 16m

Quantity : 3 units

Motor output : 110kW

14. Sump Drainage Pumps (Refer to Standard Specification – Section 15.11.1)

a. General

The pump shall be installed in the drain pits to drain out the miscellaneous water accumulating in drain pit.

b. Specification

Type : Removable Submersible Pump

Discharge capacity : $0.3m^3$/min

Total head : 15m

Quantity : 2 units

Motor output : 1.5kW

15. Hoist Block (Container) (Refer to Standard Specification – Section 15.6.5)

a. General

The crane shall be used for installation, assembly, maintenance and checking of the pump system and other equipment and apparatus installed in this facility.

b. Specification

Type : Electrically operated

Capacity : 2.0 ton

Quantity : 1 unit

Motor output : 1.5kW

16. Hoist Block (Refer to Standard Specification – Section 15.12.3)

a. General

The crane shall be used for installation, assembly, maintenance and checking of the pump system and other equipment and apparatus installed in this facility.

b. Specification

Type	: Geared Trolley Chain Block
Capacity	: 2.0 ton
Quantity	: 1 unit

17. Screen Container

a. General

The container shall be provided to store and transport the screenings and shall be mobile.

b. Design Condition

The container shall be constructed such that it can be lifted and lowered by lifting equipment at any time.

The container shall have sufficient strength and rigidity to endure the fully filled condition of screenings.

c. Fabrication

(1) The container shall be square in plan and its bottom shall be a porous plate, etc. for drainage.

(2) The container shall be lifted individually.

(3) The handcart shall have casters with stopper for the manual removal with fully filled container.

d. Materials

Container main body : Stainless steel type 304 or GRP

e. Accessories (per Unit)

Lifting hook x 1 set

f. Execution

Refer to various sub-sections in Section 15.1.

g. Specification

Type	: Container
Capacity	: 1.0m^3
Quantity	: 3 units (3 standbys)

18. Exhaust Fan

a. General

Exhaust fans shall be installed to ventilate the screen chamber.

b. Design Condition

(1) The fan shall be constructed to reduce vibration and noise and endure continuous operation on 24 hours per day basis.

(2) The fan shall be designed to have an adequate allowance for both airflow and wind pressure and shall meet the following conditions.

(a) Air flow: As specified under the set conditions of 30°C , 0.1MPa (1 atm) and 90% RH.

(b) Wind pressure: With a sufficient allowance to cover duct loss and deodorization equipment loss.

(c) Motor: With a sufficient allowance to prevent overloading under varying air temperature, relative humidity, etc.

c. Fabrication

(1) The fan shall be a single-suction turbo fan. The impeller shall be made of corrosion resisting material (GRP) and be well balanced in rotation to reduce noise and vibration and be highly efficient.

(2) The impeller shall have wall thicknesses with enough strength to endure the specified wind pressure.

(3) The shaft shall be made of carbon steel and the sleeve used in the portion, which comes into contact with the gas, shall be made of GRP.

(4) The casing shall be made of corrosion-resisting material (GRP) and be constructed to be sturdy.

(5) The portion of the casing through where the shaft penetrates shall be sealed to prevent odor leakage.

(6) The fan motor shall be installed on the common base and the fan shall be driven by V-belts.

(7) The suction side and the discharge side of the fan shall be provided with respective vibration-preventing joints.

(8) In the bottom portion of the casing, a water drain valve shall be provided and be piped to the destination of discharge.

(9) A common base shall be provided with a vibration isolator device (such as vibration isolator spring).

(10) The shaft shall be protected with a cover and the oil supply port of the bearing shall be separated sufficiently from the shaft.

(11) Motor specifications shall be totally enclosed fan-cooled type and continuous rating.

d. Materials

(a) Impeller : Glass fiber reinforced plastic (GRP)

(b) Shaft : Carbon steel

(c) Casing : Glass fiber reinforced plastic (GRP)

(d) Common base : Rolled steel or cast iron

e. Accessories (per Unit)

(a) Cover x 1 set

(b) Vibration isolator joint x 1 set

(c) Common base x 1 set

(d) Vibration isolator device x 1 set

(e) Manometer x 1 set

f. Execution

Refer to various sub-sections in Section 15.1.

g. Specification

Type : Centrifugal Fan

Air flow capacity : 60m^3/min

Pressure : 0.15kpa

Quantity : 1 unit

Motor output : 0.75kW

19. Air Intake Fan (1) (Refer to Particular Specification – Section 15.2.2.18)

a. General

The intake fan shall be installed to provide air intake to the underground screen chamber.

b. Specification

Type : Centrifugal Fan

Air flow capacity : 60m^3/min

Pressure : 0.15kpa

Quantity : 1 unit

Motor output : 0.75kW

20. Air Intake Fan (2) (Refer to Particular Specification – Section 15.2.2.18)

a. General

The intake fan shall be used to provide air intake to the motor room.

b. Specification

Type : Centrifugal Fan

Air flow capacity : 260m^3/min

Pressure : 0.15kpa

Quantity : 1 unit

Motor output : 3.7kW

21. Air Intake Fan (3) (Refer to Particular Specification – Section 15.2.2.18)

a. General

The intake fan shall be used to provide air intake to the underground pump room.

b. Specification

Type : Centrifugal Fan

Air flow capacity : $60m^3$/min

Pressure : 0.15kpa

Quantity : 1 unit

Motor output : 0.75kW

P15.2.3 Grit Chamber Facility(S03)

a. General

The grit chamber shall operate on the vortex principle. The grit chamber consists of upper removal chamber and lower grit storage hopper. The grit removal unit shall have an axial flow propeller to make a toroidal flow path in the removal chamber. The following mechanical components/equipment shall be included in the grit chamber facility. Equipment shall be designed using the following conditions and in accordance with the design specifications set forth hereinafter in this Section.

b. Equipment List of Grit Chamber Facility

Tag Number	Name	Item Number	Quantity
S03-MG-01/02	Inlet Gate	S03-MM-01	: 2 units
S03-MG-03	Bypass Gate	S03-MM-02	: 1 unit
S03-GC-01/02	Grit Collector	S03-MM-03	: 2 units
S03-GP-01/02	Grit Pump	S03-MM-04	: 2 units
S03-MG-04/05	Grit Chamber Outlet Gate	S03-MM-05	: 2 units
S03-GS-01	Grit Scrubber	S03-MM-06	: 1 unit
S03-HC-11 to 41	Grit Container	S03-MM-07	: 2 units (2 standbys)
S03-SS-01	Scum Screen	S03-MM-08	: 1 unit
	Piping	S03-MM-09	: Lot
	Steel Works	S03-MM-10	: Lot
	Other Necessary works	S03-MM-11	: Lot

1. Inlet Gate (Refer to Standard Specification – Section 15.13.7)

a. General

The gate shall be installed at the inlet of the grit chamber and shall be capable of stopping and controlling the incoming sewage flow.

b. Specification

Type	: Electric Motor Sluice Gate
Quantity	: 2 units
Dimension	: W 1.2m x H 1.0m
Motor output	: 1.5kW

2. Bypass Gate (Refer to Standard Specification – Section 15.13.7)

a. General

The gate shall be installed at the inlet of the grit chamber for emergency discharge.

b. Specification

Type	: Electric Motor Sluice Gate
Quantity	: 1 unit
Dimension	: Dia. 1500mm
Motor output	: 2.2kW

3. Grit Collector

a. General

The grit collector shall be installed in the grit chamber to be used for collecting and assembling the grits to the center of chamber while mixing.

The grit collector shall be complete with the following equipment, gear motor, gear head, air bell, propeller drive tube, etc, and shall be constructed taking the properties of the grit into consideration to transport the grit satisfactorily.

b. Design Conditions

(1) The equipment shall be sufficiently safe with respect to the grit scraper load and the startup load, shall be free from vibration, heat generation, abnormal noise, etc, and shall endure continuous operation.

(2) The various parts of the machine shall have adequate strengths and wall thickness to corrosion and wear.

c. Fabrication

(1) The grit collector shall be used in subsurface condition. It shall be made entirely of stainless steel which shall be corrosion resistant and wear resistant.

(2) The arrangement size and shape of grit collector shall be determined with adequate consideration to suit the shape of the grit chamber so that the grit collection shall be done efficiently.

(3) The drive unit shall use a motor cyclo-reducer to transmit the power safely and positively.

d. Materials

(a) Air bell : Stainless steel type 304

(b) Drive Tube : Stainless steel type 304

(c) Paddle and Paddle Hub : Stainless steel type 304

(d) Foundation bolt and nut : Stainless steel type 304

e. Protection Equipment

(1) Mechanical protection equipment

Protection equipment for overload protection

(2) Electrical protection equipment

Over-current detector for overload protection (electrical work)

f. Accessories

Anchor bolt 1 set

g. Execution

Refer to various sub-sections in Section 15.1.

h. Specification

Type	: Vortex Type
Quantity	: 2 units
Dimension	: Dia. 2000mm
Motor output	: 1.5kW

4. Grit Pump

a. General

The pump shall be used for pumping grit, and shall be firmly structured to withstand continuous duty. The Pump shall be capable of smooth operation with low-vibration and low-noise levels, and especially shall be designed to prevent cavitation. The vacuum priming system shall be located adjacent to the grit pump in a weatherproof enclosure.

b. Design Condition

Grit shall be removed from the bottom by grit chamber.

c. Fabrication

(1) Shaft

The shaft shall be stainless steel type 304 through a mechanical seal to eliminate corrosion and abrasive rust particles. Carbon steel shafts are not acceptable.

(2) Impeller

The impeller shall produce a turbine-like flow pattern within the casing, generating flow.

(3) Pump

The pump shall have an adaptor providing a large water reservoir above the impeller to provide positive exclusion of air from the impeller.

The pump shall be sealed against leakage by a single mechanical seal constructed so as to be automatically drained and primed each time the pump is drained and primed. Water, which shall lubricate the mechanical seal shall be automatically drained from around the seal if the pump loses prime; in order to allow the pump and the seal to be drained, thereby preventing freezing and breakage of the seal during power outages in freezing temperatures.

d. Seal

The seal shall be of carbon and ceramic materials with the mating surface lapped to a flatness tolerance of one light band. The rotating ceramic shall be held in the mating position with the stationary carbon by a stainless steel spring.

e. Materials

Materials used for each pump part shall be as follows.

(a) Main Shaft : Stainless steel type 304

(b) Impeller : Ni-Hard – High nickel iron

(c) Seal Housing : Bronze

f. Execution

Refer to various sub-sections in Section 15.1.

g. Specification

Type	: Discharge Pump
Quantity	: 2 units
Discharge capacity	: 0.5m^3/min
Total head	: 8m
Motor output	: 3.7kW

5. Grit Chamber Outlet Gate (Refer to Standard Specification – Section 15.13.7)

a. General

Grit chamber outlet gate shall be installed to stop the flow.

b. Specification

Type	: Electric Motor Sluice Gate
Quantity	: 2 units
Dimension	: Dia. 1200mm
Motor output/Power requirement	: 1.5kW

6. Grit Scrubber (Refer to Standard Specification – Section 15.12.5)

a. General

Grit scrubber shall clean and separate grit conveyed by the grit pumps.

b. Specification

Type	: Screw Grit Conveyer + Separation Tank with Mixer
Quantity	: 1 unit
Separation capacity	: 2.0m^3/hr
Motor output/Power requirement	: 1.5kW (conveyer), 2.2kW x 2 (mixer)

7. Grit Container (Refer to Particular Specification -Section 15.2.17)

a. General

The container shall be installed at the outlet of the grit collector for storage of sand, fiber, sticks and other inclusions and coarse suspended substances contained in the influent sewage.

b. Specification

Type	: Container
Quantity	: 2 units (2 standbys)
Volume	: 1.0m^3

8. Scum Screen

a. General

Scum screen separates scum conveyed from the primary sedimentation tanks. The scum may include materials like grease, oil, plastics and soap.

The apparatus shall comprise a casing, screen, scraper, drive unit, etc. It shall be of a structure to forcibly scrape off impurities and scum attached to the screen by turning the cylindrical screen by the drive unit.

b. Design Condition

(1) The apparatus shall provide excellent resistance to corrosion and wear, as the handled fluid is sewage or scum containing drainage.

c. Fabrication

(1) Driving device

(a) The driving device shall be equipped with an adjustable speed cycloid reducer or a planetary gear reducer. The screen driving method shall be either by means of a reducer coupled to the motor or by means of roller chains.

(b) The exposed sections of the reducer and chains shall be provided with covers.

(2) Casing

(a) The casing shall be of a watertight structure that permits overflow.

(b) The casing shall be made of rolled steel or stainless steel, and shall be provided with an inspection window as required, to permit inspection of the interior.

(3) Screen

(a) The screen shall be of a cylindrical type made of stainless steel, and shall be of a structure that rotates smoothly.

(b) The screen shaft shall be made of stainless steel and shall provide sufficient strength.

(4) Scraper

(a) The scraper shall be made of stainless steel, and it shall be capable of smoothly and efficiently scraping away impurities and scum attached to the screen.

(b) The blades of the scraper shall be made of a material grade that provides excellent durability and wear resistance.

d. Materials

(a) Casing : Rolled steel or Stainless steel type 304

(b) Screen : Stainless steel type 304 or equivalent

(c) Scraper : Stainless steel type 304 or equivalent

e. Accessories (per Unit)

(a) Anchor bolts and nuts x 1 set

f. Execution

Refer to various sub-sections in Section 15.1.

g. Specification

Type	: Automatic Disc Screen
Quantity	: 1 unit
Separation capacity	: 0.5m^3/min or above
Clear spacing between bars	: 3.0mm
Motor output/Power requirement	: 0.4kW

P15.2.4 Primary Sedimentation Tank Facility (S05)

a. General

The mechanical components of the primary sedimentation tank facility 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 of Primary Sedimentation Tank Facility

Tag Number	Name	Item Number	Quantity
S05-HW-01 to 08	Distribution Tank Weir	S05-MM-01	: 8 units
S05-SC-01 to 06	Sludge Collectors (Replacement)	S05-MM-04	: 6 units

S05-SC-07/08	Sludge Collectors (Installation)	S05-MM-03 : 2 units
S05-MV-01 to 08	Suction Sludge Valve	S05-MM-05 : 8 units
S05-SP-01 to 04	Primary Sludge Pump	S05-MM-06 : 2 units (2 standbys)
S05-SP-05 to 08	Scum Pump	S05-MM-10 :2units(2 standbys)
S05-MV-11/41	Suction Scum Valve	S05-MM-11 : 4 units
S05-MV-51/61	Delivery Valve	S05-MM-08 : 2 units
S05-HH-01	Hoist Block	S05-MM-12 : 1 unit
S05-DP-01/02	Sump Drainage Pump	S05-MM-09 : 2 units
S05-EF-01/01	Exhaust Fan	S05-MM-14 : 2 units
	Removal of Existing Distribution Tank Weir	S05-MM-02 : 6 units
	Removal of Existing Primary Sludge Pump	S05-MM-07 : 4 units
	Removal of Existing Hoist Block	S05-MM-13 : 1 unit
	Removal of Existing Exhaust Fan	S05-MM-15 : 2 units
	Piping	S05-MM-16 : Lot
	Steel Works	S05-MM-17 : Lot
	Other Necessary Works	S05-MM-18 : Lot

1. Distribution Tank Weir (Refer to Standard Specification – Section 15.13.8)

a. General

The adjustable weir shall comprise the adjustable weir leaf, a spindle, an open-close device, etc. It shall be installed in the water treatment facility for the purpose of water stopping and influent flow adjustment.

The adjustable weir shall be constructed to be watertight on three sides. It shall be opened and closed by manual operation. Its spindle shall be of outside screw type.

b. Specification

Type : Adjustable Weir

Quantity : 8 units

Dimension : W 0.9m

2. Sludge Collector (Replacement) (Refer to Particular Specification-Section 15.2.4.3)

a. General

The metal structure of the existing sludge collectors shall be repaired and repainted. The drive unit of the collector shall be replaced in whole. The tires shall be made of synthetic rubber.

b. Specification

Type : Circumference Drive (Replacement)

Quantity : 6 units

Dimension : Dia. 28m x WD 3.5m

Motor output/Power requirement : 1.5kW

3. Sludge Collector (Installation)

a. General

The sludge collector shall be installed in the new primary sedimentation tanks, and shall be able to scrape sludge, settled at the bottom of the tank, towards the central sludge pit.

The primary sedimentation tank scraper shall comprise drive unit, main shaft, feed well, steel bridge, rake, etc. The drive unit shall move on the peripheral sidewall top with the synthetic rubber tires on the lane made of steel plate. The turning force for the collector shall be given from the drive unit through the main shaft to the rake arm.

b. Design Condition

(1) The equipment shall be sufficiently sized for the scraper load and startup time load, be free from vibration, overheating, abnormal sound, etc. during operation, and shall withstand continuous operation.

(2) Each portion of the equipment shall have ample strength and wall thickness for corrosion and abrasion.

(3) The peripheral speed shall be about 2 to 3 m/min.

c. Fabrication

(1) Drive unit

(a) The unit shall comprise motor, cycloid reduction gear or planetary reduction gear or gear and chain, etc. to transmit the power safely and positively. The speed shall be reduced to the predetermined scraping speed. The main shaft shall be turned through a coupling and bearing stand.

(b) The bearing shall be able to support the load of the scraper main body sufficiently and accommodate any vibration due to turning.

(c) The cover for the exposed chain shall be made of steel plat with epoxy coating or stainless steel plate.

(2) Rake and rake arm

(a) The rake shall be mounted firmly to the rake arm. Rakes shall overlap each other not to leave areas of the tank floor unscraped.

(b) Under the rake, a replaceable adjusting blade shall be mounted and the clearance to the tank bottom shall be adjustable.

(c) The rake arm shall have two blades (auxiliary blades may be provided). It shall be constructed of steel truss structure of steel material and shall have adequate strength for bending loads, etc.

(d) The clearance to the rake thickener bottom surface shall be not more than about 50 mm at the mid point of the blade and rubber shall be mounted to the blade end.

(3) Feed well

(a) The feed well shall be mounted firmly to the tank wall by means of supports. It shall reduce the flow speed promptly and provide suitable conditions for settling.

(b) The feed well shall be made of stainless steel.

(c) The feed well shall be provided with a small baffle and window to enable the scum in the feed well to be discharged through the window.

(4) Main shaft and bearing

The main shaft shall be suspended from the bearing stand and have a sufficient allowance for torsional loads. The bearing shall be a rolling bearing constructed to support thrust loads.

(5) Oil supply equipment

(a) The drive unit shall be constructed for ease of supplying and checking the oil .

(b) A grease nipple shall be provided at a position for ease of oil supply.

(c) The motor specifications shall be outdoor totally enclosed fan-cooled type and continuous rating.

d. Materials

(a)	Blade	: Rolled steel or equivalent
(b)	Submerged bolt and nut	: Stainless steel type 304
(c)	Rake and rake arm	: Rolled steel
(d)	Main shaft	: Carbon steel pipe for pressure service or Carbon steel tube for machine structural purposes
(e)	Feed well	: Rolled steel with epoxy coating or stainless steel
(f)	Feed well support	: Rolled steel
(g)	Baffle plate	: Rolled steel or equivalent
(h)	Bracket for baffle plate	: Rolled steel or equivalent
(j)	Tire	: Freeze-proof synthetic rubber or equivalent

e. Protection Equipment

(1) Mechanical protection equipment

Protection equipment for overload protection

(2) Electrical protection equipment

Overcurrent detector for overload protection

(Scope of electrical equipment work)

f. Accessories

(a) Anchor bolt x 1 set

(b) Drive unit and chain cover x 1 set

g. Execution

Refer to various sub-sections in Section 15.1.

h. Specification

Type	: Circumference Drive
Quantity	: 2 units
Dimension	: Dia. 28m x WD 3.5m
Motor output/Power requirement	: 1.5kW

4. Suction Sludge Valve (Refer to Standard Specification – Section 15.13.5)

a. General

These valves shall be installed to facilitate the removal of primary sludge from the bottom of the primary sedimentation tanks.

b. Specification

Type	: Motorized Eccentric Valve
Quantity	: 8 units
Dimension	: Dia 150mm
Motor output/Power requirement	: 0.4kW

5. Primary Sludge Pump (Refer to Standard Specification – Section 15.11.4)

a. General

These pumps shall be installed to remove primary sludge from the bottom of the primary sedimentation tanks and to transfer the sludge to the thickeners.

b. Specification

Type	: Non-Clogging Sludge Pump
Quantity	: 2 units (2 standbys)
Discharge capacity	: 1.0m^3/min
Total head	: 9.0m
Motor output/Power requirement	: 5.5kW

6. Scum Pump (Refer to Standard Specification – Section 15.11.4)

a. General

These pumps shall be installed to transmit scum to the grit chamber from the scum pit.

b. Specification

Type	: Non-Clogging Sludge Pump
Quantity	: 2 units (2 standbys)

Discharge capacity : 0.5m^3/min

Total head : 12.0m

Motor output/Power requirement : 3.7kW

7. Suction Scum Valve (Refer to Standard Specification – Section 15.13.2)

a. General

The valve shall be installed to control the flow of scum to the grit chamber from the scum pit.

b. Specification

Type : Motorized Sluice Valve

Quantity : 4 units

Dimension : Dia 100mm

Motor output/Power requirement : 0.2kW

8. Delivery Valve (Refer to Standard Specification – Section 15.13.2)

a. General

The valve shall be installed to control the flow of primary sludge to the gravity thickener from the primary sedimentation tank.

b. Specification

Type : Motorized Valve

Quantity : 2 units

Dimension : Dia 150mm

Motor output/Power requirement : 0.4kW

9. Hoist Block (Refer to Standard Specification – Section 15.12.3)

a. General

The device shall be installed to hoist or unload equipment and material.

b. Specification

Type : Geared Trolley Chain Block

Capacity : 1.0 ton

Quantity : 1 unit

10. Sump Drainage Pump (Refer to Standard Specification – Section 15.11.1)

a. General

The pump shall be installed to empty the sump to avoid flooding in the pump room.

b. Specification

Type	: Submersible Sewage Pump
Quantity	: 2 units
Capacity	: 0.1m^3/min
Total head	: 15m
Motor output/Power requirement	: 0.75kW

11. Exhaust Fan (Refer to Particular Specification – Section 15.2.2.18)

a. General

The fan shall be installed to ventilate the screen chamber.

b. Specification

Type	: Centrifugal Fan
Quantity	: 2 units
Air Flow Capacity	: 12.0m^3/min
Pressure	: 0.15kpa
Motor output/Power requirement	: 0.2kW

P15.2.5 Blower House Facility (S08)

a. General

The mechanical components of the blower house facility 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 of Blower House Facility

Tag Number	Name	Item Number Quantity
S08-AB-01 to 05	Air Blower	S08-MM-01: 3 units (2 standbys)
S08-MV-01 to 05	Delivery Valve	S08-MM-05: 3 units (2 standbys)
S08-AF-01 to 05	Air Filter	S08-MM-03: 3 units (2 standbys)
S08-WP-01/02	Clear Water Supply Pump	S08-MM-07: 1 unit (1 standby)
S08-MC-01	Hoist Block	S08-MM-09: 1 unit
S08-DP-01	Sump Drainage Pump	S08-MM-11: 1 unit
S08-WT-01	Clear Water Tank	S08-MM-13: 1 unit
	Removal of Existing Air Blower	S08-MM-02: 7 units
	Removal of Existing Air Filter	S08-MM-04: 7 units

Removal of Existing Delivery Valve	S08-MM-06: 7 units
Removal of Existing Clear Water Supply Pump	S08-MM-08: 3 units
Removal of Existing Hoist Block	S08-MM-10: 1 unit
Removal of Existing Sump Drainage Pump	S08-MM-12: 1 unit
Removal of Existing Clear Water Tank	S08-MM-14: 1 unit
Piping	S08-MM-15: Lot
Steel works	S08-MM-16: Lot
Other Necessary Works	S08-MM-17: Lot

1. Air Blower

a. General

The multistage turbo blower shall be connected directly to the electric motor. The forced lubrication of bearings shall be conducted by the special lubricating equipment. Air for the blower shall be dried prior to entering the blower. The Inlet valve controls the volume of air.

b. Design Conditions

The value of each manufacturing items shall be indicated in a special specification report, however, the design condition of the actual specification report shall be as follows.

(1) Application : Drainage purification

(2) Type : Direct multistage turbo blower

(3) Gas handled : Air

(4) Inhale air temperature : -20°C ~ 35°C

(5) Operation : Continuous

(6) Air volume : set condition 20°C, 101.3 kPa (1atm), 65% RH

(7) Suction pressure : -1.0 ~ -2.0 kPa (About -100 ~ about -200 mm Aq)

(8) Discharge pressure : 49 ~ 69 kPa (20 degree C)

(9) Number of Blower rotations : 3000 to 3600 RPM (Contemporary)

(10) Number of operated units : 1 or more

c. Efficiency

The value of each specification item shall be indicated in a special specification report. However, the common specifications and their limits shall be as follows.

(1) Plant efficiency test of air volume, exhaust pressure, efficiency ratio, and movement power shall be conducted and satisfy the relevant code.

(2) Air volume adjustment limit

(a) Set condition Specific exhaust pressure

(b) Efficiency Inlet valve adjustment 30 ~ 100%

(3) Noise

(a) Set condition without sound proof cover, machine side 1.5 m, above floor 1.0 m

(b) Noise level Below 85 db including electric motor 1 number.

d. Fabrication

(1) Casing

Casing shall be made of cast iron with the structure of easy disassembling work of impeller. The air duct inside shall be smoothed to minimize loss of air due to friction and eddy. Labyrinth seal shall be provided to prevent leak loss where the shaft passes through the internal diaphragm and the casing.

(2) Impeller

Impeller shall employ carbon steel with ample strength for safety during high-speed operation. Boss and metal caps shall be made of forged steel or carbon steel. Impeller shall be made of special Aluminum alloy cast metal.

(3) Main shaft

The main shaft shall be made of carbon steel and polished to perfect roundness. The shaft shall allow smooth operation without vibration and strain.

(4) Bearing

The bearing shall be horizontally split into two halves. The bearing box shall be made of cast iron. The bearing metal shall be of good quality cast iron or carbon steel with added white metal, having sufficient surface area. Lubrication of the bearing shall be by a pressurized lubrication system and the forced oil supply shall be pumped from a lubrication oil pump.

(5) Shaft stage and thrust bearing

Blower shaft shall be connected directly to the electric motor by flexible coupling, which has strong power transmission and the cover shall be used to prevent the danger. A balance disk shall be provided at the rear of the final-stage impeller to almost balance axial thrust. The slight remainder of axial thrust shall be eliminated by thrust bearings to hold the impellers at their specified positions.

(6) Common Base

The base shall be cast iron or steel, which shall be able to bear the required loads. The lower part of the base shall be provided with the anti-vibration rubber. The anti vibration rubber shall be long lasting and able to provide the necessary damping effect.

(7) Lubrication system

The lubrication system shall supply lubrication oil to the oil pump, lubrication cooling vessel, and electric motor bearing, and finally restore to the oil tank. The main oil supply pump shall have the capacity to prevent burning damage to the bearing etc of the blower at the time of power cuts. An oil tank shall be provided on the base, and shall comprise steel plate having a thickness of more than 6 mm with gas elimination, inspection mouth etc.

(a) Oil passing vessel 2 sets

Fluid Lubrication oil

(b) Oil filter

Oil filter shall be of electrical capacitance type, the starting temperature can be more than 5 ~ 10 degree C in small time.

(c) Oil pressure control valve 1 set

(d) Safety valve (Including internal shape of pump) 1 set

(e) Type of lubrication box valve 1 set

(f) Gold net (Oil return line) 1 set

(g) Others 1 set

e. Protection Equipment

Adequate protection devices including pressure gauges, thermometers etc shall be installed in the blower. Specification of meters shall be in accordance to the electric equipment construction manual. Thermometer's real form shall be R/I conversion type.

Sensor	Sensor part	Spot indication	Tangent point	Number of volume	
Pressure meter	Sucking pressure	O		1	Meter board
	Exhaust pressure	O		1	Meter board
	Oil supply pressure	O		1	Meter board
					(Blower supply pressure)
					Machine side
	Oil pressure control	O		1	
Pressure switch					Machine side
Or	Oil supply pressure		Meter 3	2	Machine side
Quantity flow switch	Oil pressure control		2	1	
Dial thermometer	Or Oil quantity control				
					Meter board
Level switch	Sucking air	O		1	Meter board
	Exhaust air	O		1	Meter board
	Bearing temperature	O	2	2	Machine side
	Oil tank	O	2	1	(In case of special oil supply)
Temperature switch					Machine side
Flow relay	Oil supply		2	1	(In case of special oil supply)

					Machine side (In case of special oil supply)
Cylindrical thermometer	Cool water		2	1	Machine side (In case of special oil supply)
Limit switch	Oil exit and entrance of Cooling vessel	O		2	Machine side
	Water exit and entrance of Cooling vessel	O		2	
	Sucking valve or Inlet valve		1	1	

f. Execution and tests

The general items shall be tested in accordance with the machine construction manual and the specification. The pressure bearing test of the casing shall be conducted jointly. In the testing, the Contractor shall take the precautionary measures to protect all staff of the Employer, the Engineer and the Contractor, and third party from physical injury.

g. Specification

Type : Multistage Turbo Blower

Quantity : 3 units (2 standbys)

Air Flow Capacity : 255m^3/min

Pressure : 50kpa

Power requirement : 315kW

2. Delivery Valve (Refer to Standard Specification – Section 15.13.2)

a. General

The delivery valve shall be used to stop and/or to control the air flow to the multi-turbo blower automatically.

The valve shall comprise open/close valve and electric actuators

b. Specification

Type : Motorized Gate Valve

Quantity : 3 units (2 standbys)

Dimension : Dia 400mm

Motor output/Power requirement : 0.75kW

3. Air Filter

a. General

The air filter shall be used to minimize the clogging of the diffuser aeration system. This shall be automatic, fixed volume, air discharge type equipment.

b. Fabrication

(1) Dry air filter shall be automatic volume controlled air discharge type.

(2) Filtering media shall be of glass fiber roll and equipment shall pack a roll of the filter media. The filtering media surface shall be renewed by rewinding automatically with the indication on an increased pressure differential or shall be on a fixed time interval.

(3) Length of filtering media roll shall be above 20 m, and it shall be re-wound by the motor drive.

(4) The velocity of passing through the media shall be below 2.5 m/s.

c. Material

(1) Main body Rolled steel

(2) Filtering Media Glass fiber roll

d. Other associated material

(1) Filter 10 sets

e. Specification

Type : Automatic Air Filter

Quantity : 3 units (2 standbys)

Capacity : 255m^3/min

Motor output/Power requirement : 0.2kW

4. Clear Water Supply Pump (Refer to Standard Specification – Section 15.5.2)

a. General

The pump shall supply clear water to cool down the blower.

b. Specification

Type : Volute Pump

Quantity : 1 unit (1 standby)

Capacity : 0.3m^3/min

Total head : 20m

Motor output/Power requirement : 2.2kW

5. Hoist Block (Refer to Standard Specification – Section 15.12.14)

a. General

The overhead crane system shall be used for the installation, assembly, maintenance and check of the blower and, other equipment. All hoist-up and hoist-down motions shall be motor-driven and operated by means of push-button switches hanging down from the crane to the operating floor.

b. Specification

Type	: Motor Trolley Hoist
Capacity	: 5.0 ton
Quantity	: 1 unit
Motor output/Power requirement	: 4.6kW, 0.75kW, 0.75kW x 2

6. Sump Drainage Pump (Refer to Standard Specification – Section 15.11.1)

a. General

The pump shall be used to discharge sewage from the pipe gallery, etc. It shall have a minimum bore diameter of 50 mm.

b. Specification

Type	: Submersible Sewage Pump
Quantity	: 1 unit
Capacity	: 0.1m^3/min
Total head	: 7m
Motor output/Power requirement	: 0.4kW

7. Clear Water Tank

a. General

The tank shall be made of PVC and shall comprise tank main body, air pipe, electrical level gauge, direct reading level gauge, ladder, manhole, etc.

b. Design Condition

The dimension shall comply with the height and shape of the allocated space at 1F of blower house. Specification

c. Fabrication

(1) A manhole shall be provided to check the inside of tank.

(2) A ladder shall be provided at the tank.

d. Materials

(a)	Main body	: PVC
(b)	Ladder	: Rolled steel

e. Accessories

(a) Foundation bolts and nuts 1 set

(b) Air exhaust pipe 1 set

(c) Manhole (approx. dia.500mm) 1 set

(d) Air vent pipe 1 set

f. Execution

Refer to various sub-sections in Section 15.1.

g. Specification

Type : PVC Tank

Type : PVC Tank

Capacity : 5.0m3

Quantity : 1 unit

P15.2.6. Secondary Sedimentation Tank Facility (S10)

a. General

The mechanical components of the secondary sedimentation tank facility 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 of Secondary Sedimentation Tank Facility

Tag Number	Name	Item Number	Quantity
S10-HW-01 to 12	Return Sludge Inlet Weir	S10-MM-01	: 12 units
S10-HW-13 to 24	Distribution Tank Weir	S10-MM-03	: 12 unit
S10-SC-01 to 10	Sludge Collectors (Replacement)	S10-MM-06	: 10 units
S10-SC-11/12	Sludge Collectors (Installation)	S10-MM-05	: 2 units
	Removal of Existing Return Sludge Inlet Weir	S10-MM-02	:10 units
	Removal of Existing Distribution Tank Weir	S10-MM-04	:10 units
	Piping	S10-MM-07	: Lot
	Steel Works	S10-MM-08	: Lot
	Other Necessary Works	S10-MM-09	: Lot

1. Return Sludge Inlet Weir (Refer to Standard Specification – Section 15.13.8)

a. General

The adjustable weir shall comprise the adjustable weir leaf, a spindle, an open-close device, etc. The adjustable weir shall be constructed to be watertight on three sides. It shall be opened and closed by manual operation. Its spindle shall be of outside screw type.

b. Specification

Type	: Adjustable Weir
Quantity	: 12 units
Dimension	: W 0.6m

2. Distribution Tank Weir (Refer to Standard Specification – Section 15.13.8)

a. General

The adjustable weir shall comprise the adjustable weir leaf, a spindle, an open-close device, etc. The adjustable weir shall be constructed to be watertight on three sides. It shall be opened and closed by manual operation. Its spindle shall be of outside screw type.

b. Specification

Type	: Adjustable Weir
Quantity	: 12 units
Dimension	: W 0.9m

3. Sludge Collector (Replacement) (Refer to Particular Specification-Section 15.2.6.4)

a. General

The metal structure of the existing sludge collectors shall be repaired and repainted. The drive units of the collectors shall be completely replaced Tires shall be made of synthetic rubber.

b. Specification

Type	: Circumference Drive (Replacement)
Quantity	: 10 units
Dimension	: Dia. 28m x WD 3.5m
Motor output/Power requirement	: 1.5kW

4. Sludge Collector (Installation)

a. General

The secondary sedimentation tank scraper shall comprise drive unit, main shaft, feed well, steel rake, suction pipe etc. The drive unit shall move on peripheral sidewall top with the synthetic rubber tires on the lane made of steel plate.. The turning force shall be given from the drive unit through the main shaft to the suction pipes. The sludge on the tank floor shall be sucked up continuously by means of the rake mounted to the suction pipe and be conveyed by gravity to the sludge pit provided at the center of the tank

b. Design Condition

(1) This equipment shall be sufficiently sized for the scraper load and startup time load, be free from vibration, overheating, abnormal sound, etc. during operation, and shall withstand continuous operation.

(2) Each portion of the equipment shall have ample strength and wall thickness for corrosion and abrasion.

(3) The peripheral speed shall be about 2 to 3 m/min.

c. Fabrication

(1) Drive unit

(a) This unit shall comprise motor, cycloid reduction gear or planetary reduction gear or gear and chain, etc. to transmit the power safely and positively. The speed shall be reduced to the predetermined scraping speed. The main shaft shall be turned through coupling and bearing stand.

(b) The bearing shall be able to support the load of the scraper main body sufficiently and accommodate any vibration due to turning.

(c) The cover for the exposed chain shall be made of steel plate with epoxy coating or stainless steel plate.

(2) Rake and suction pipe

(a) The rake shall be attached to the suction pipe to send settled sludge by gravity to the sludge pit though the suction pipe.

(b) Under the rake, a replaceable adjusting blade shall be mounted and the clearance to the tank bottom shall be adjustable.

(c) The clearance to the rake thickener bottom surface shall be not more than about 50 mm at the mid point of the blade and rubber shall be mounted to the blade end.

(3) Feed well

(a) The feed well shall be mounted firmly to the tank wall by means of supports. It shall reduce the flow speed promptly and provide suitable conditions for settling.

(b) The feed well shall be made of stainless steel.

(c) The feed well shall be provided with a small baffle and window to enable the scum in the feed well to be discharged through the window.

(4) Main shaft and bearing

(a) The main shaft shall be suspended from the bearing stand and have a sufficient allowance for torsional loads. The bearing shall be a rolling bearing constructed to support thrust loads.

(5) Oil supply equipment

(a) The drive unit shall be constructed for ease of supplying and checking the oil.

(b) A grease nipple shall be provided at a position for ease of oil supply.

(c) The motor specifications shall be outdoor totally enclosed fan-cooled type and continuous rating.

d. Materials

(a) Blade : Steel or equivalent

(b) Submerged bolt and nut : Stainless steel

(c) Rake : Steel

(d) Suction pipe : Steel pipe

(e) Main shaft : Carbon steel pipe for pressure service or Carbon steel tube for machine structural purposes

(f) Feed well : Rolled steel with epoxy coating or stainless steel

(g) Feed well support : Rolled steel

(h) Baffle plate : Rolled steel or equivalent

(i) Bracket for baffle plate : Rolled steel or equivalent

(j) Drive unit : Rolled steel or equivalent

(k) Tire : Freeze-proof synthetic rubber or equivalent

e. Protection Equipment

(1) Mechanical protection equipment

Protection equipment for overload protection

(2) Electrical protection equipment

Overcurrent detector for overload protection

(Scope of electrical equipment work)

f. Accessories

(a) Anchor bolt x 1 set

(b) Drive unit and chain cover x 1 set

g. Execution

Refer to various sub-sections in Section 15.1.

h. Specification

Type : Circumference Drive (Installation)

Quantity : 2 units

Dimension : Dia. 28m x WD 3.5m

Motor output/Power requirement : 1.5kW

P15.2.7. Return Sludge Pump House Facility (S11)

a. General

The return sludge pump station house facility 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 of Secondary Sedimentation Tank Facility

Tag Number	Name	Item Number	Quantity

S11-SP-01 to 05	Return Sludge Pump	S11-MM-01	: 3 units (2 standbys)
S11-SP-06/07	Waste Sludge Pump	S11-MM-02	: 1 unit (1 standby)
S11-MV-01 to 05	Delivery Valve	S11-MM-03	: 3 units (2 standbys)
S11-MV-06 to 10	Suction Valve	S11-MM-04	: 3 units (2 standbys)
S11-MV-11 to 14	Partition Valve	S11-MM-05	: 4 units
S11-CV-01 to 05	Check Valve	S11-MM-06	:5 units
S11-MC-01	Bridge Crane	S11-MM-07	: 1 unit
S11-DP-01/02	Sump Drainage Pump	S11-MM-08	: 1 unit (1 standby)
S11-MV-15/16	Connection Valve A	S11-MM-09	: 2 units
S11-MV-17	Connection Valve B	S11-MM-10	: 1 unit
	Piping	S11-MM-11	: Lot
	Steel Works	S11-MM-12	: Lot
	Other Necessary Works	S11-MM-13	: Lot

1. Return Sludge Pump (Refer to Standard Specification – Section 15.11.6)

a. General

The pump shall transfer the sludge from the effluent channel of activated sludge in aeration tank into the aeration tank.

b. Specification

Type	: Vertical Shaft Volute Type Mixed Flow Pump
Quantity	: 3 units (2 standbys)
Discharge capacity	: $32m^3$/min
Total head	: 6m
Motor output	: 55kW
Efficiency	: not less than 78 percent at duty point
Installation	: indoor
Motor encl. protection	: IP 44
Wet well water levels	: HWL +345.08 m amsl
Pump room floor level	: +340.70 m amsl
Motor room floor level	: +346.00 m amsl

c. The intermediate bearing unit shall be supplied by the pump manufacturer and the pump manufacturer shall have the experience of furnishing unit of the same configuration. At the time of shop test, pumps may be operated directly coupled with motor without the above intermediate power transmission

facilities.

d. The pump manufacturer shall substantiate the quoted efficiency with at least one owner's certificate and corresponding test record of specific speed similar to the specified pump with suction diameter of not less than 600 mm.

e. The Contractor shall provide the supporting steelwork for the pump motors. The steelwork shall be removable for direct access to the lower levels. The entire access hole in the ground floor slab shall be provided with sectionalised, removable covers of checker plate steelwork and necessary supports designed for the equipment supplied.

f. The pump manufacturer shall substantiate manufacturing and supplying of pumps and motors with the following conditions satisfactorily completed outside of home country during last 5 years.

(1) Vertical shaft volute type mixed flow pump of similar capacity and head with floating shaft and intermediate bearing unit.

(2) Vertical shaft volute type mixed flow pump efficiency at lower speed and capacity than specified.

g. The pump manufacturer shall carry out surge analysis on the raw water transmission pipelines on the basis of data of rotating element, characteristic of reflux valve and the raw water transmission pipelines to ensure no damages caused due to the surge. If any protection methods required for the surge, the methods shall be proposed by the pump manufacturer for the engineer's approval along with report of surge analysis. The pump manufacturer shall have experience of surge analysis of similar discharge capacity of the pump and the similar length of transmission pipelines.

2. Waste Sludge Pump (Refer to Standard Specification – Section 15.11.4)

a. General

The pump shall transfer the sludge from the effluent channel of activated sludge into the storage tank in the sludge dewatering building.

b. Specification

Type	: Non-Clog Sludge Pump
Quantity	: 1 unit (1 standby)
Discharge capacity	: 4.7m^3/min
Total head	: 12m
Motor output	: 22kW

3. Delivery Valve (Refer to Standard Specification – Section 15.13.2)

a. General

The delivery valve shall be used to stop and/or to control the sludge flow. The valve shall comprise open/close valve and electric actuators

b. Specification

Type	: Motorized Gate Valve
Quantity	: 3 units (2 standbys)
Dimension	: Dia. 500mm
Motor output	: 0.75kW

4. Suction Valve (Refer to Standard Specification – Section 15.13.2)

a. General

The suction valve shall be used to stop and/or to control the sludge flow. The valve shall comprise open/close valve and electric actuators

b. Specification

Type	: Motorized Gate Valve
Quantity	: 3 units (2 standbys)
Dimension	: Dia. 600mm
Motor output	: 1.5kW

5. Partition Valve (Refer to Standard Specification – Section 15.13.4)

a. General

The valve shall be installed at the pipeline to seal the water and to adjust the flow.

b. Specification

Type	: Motorized Butterfly Valve
Quantity	: 4 units
Dimension	: Dia. 900mm
Motor output	: 3.7kW

6. Check Valve (Refer to Standard Specification – Section 15.13.5)

a. General

The check valves shall be installed to control the flow in the conveyance system.

b. Specification

Type	: Swing Type Check Valve with Dashpot
Quantity	: 5 units
Dimension	: Dia. 500mm

7. Bridge Crane (Refer to Standard Specification – Section 15.12.4)

a. General

The overhead crane system shall be used for the installation, assembly, maintenance and check of the pump system and other equipment. All, or part of traverse, travel, hoist-up and hoist-down motions shall be motor-driven and operated by means of push-button switches hanging down from the crane to the operating floor.

b. Specification

Type	: Electrically Operated
Quantity	: 1 unit
Capacity	: 5.0 ton
Motor output	: (4.6 + 0.4 x 2 + 0.75) kW

8. Sump Drainage Pump (Refer to Standard Specification – Section 15.11.1)

a. General

The pump shall be used to discharge the sewage from the pipe gallery, etc.

b. Specification

Type	: Removable Submersible Pump
Quantity	: 1 unit (1 standby)
Discharge capacity	: 0.3m^3/min
Total head	: 10m
Motor output	: 1.5kW

9. Connection Valve A (Refer to Standard Specification – Section 15.13.2)

a. General

The valve shall be installed at the pipeline to seal the water and to adjust the flow.

b. Specification

Type	: Motorized Gate Valve
Quantity	: 2 units
Dimension	: Dia. 1100mm
Motor output	: 5.5kW

10. Connection Valve B (Refer to Standard Specification – Section 15.13.2)

a. General

The valve shall be installed at the pipeline to seal the water and to adjust the flow.

b. Specification

Type	: Motorized Gate Valve
Quantity	: 1 unit
Dimension	: Dia. 1200mm
Motor output	: 7.5kW

P15.2.8. Discharge Pump Station Facility (S12)

a. General

The mechanical components of the discharge pump station facility 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 of Discharge Pump Station Facility

Tag Number	Name	Item Number	Quantity
S12-MG-01	Inlet Chamber Gate	S12-MM-01	: 1 unit
S12-CP-01 to 03	Discharge Pump A	S12-MM-02	: 2 units (1 standby)
S12-CP-04/05	Discharge Pump B	S12-MM-03	: 2 units
S12-CV-01 to 03	Check Valve	S12-MM-08	: 2 units (1 standby)
S12-MV-01 to 03	Delivery Valve A	S12-MM-11	: 2 units (1 standby)
S12-CV-04/05	Check Valve	S12-MM-09	: 2 units
S12-MV-04/05	Delivery Valve B	S12-MM-12	: 2 units
S12-MV-06 to 08	Suction Valve A	S12-MM-05	: 2 units (1 standby)
S12-MV-09/10	Suction Valve B	S12-MM-06	: 2 units
S12-MV-11 to 14	Connection Valve	S12-MM-14	: 4 units
S12-MC-01	Bridge Crane	S12-MM-16	: 1 unit
S12-DP-01/02	Sump Drainage Pump	S12-MM-17	: 1 units (1 standby)
S12-TP-01 to 03	Temporary Pump	S12-MM-19	: 3 units
S12-IF-01	Air Intake Fan A	S12-MM-20	: 1 unit
S12-IF-02	Air Intake Fan B	S12-MM-22	: 1unit
	Removal of Existing Discharge Pump	S12-MM-04	: 5 units
	Removal of Existing Suction Valve	S12-MM-07	: 5 units
	Removal of Existing Check Valve	S12-MM-10	: 5 units
	Removal of Existing Delivery Valve	S12-MM-13	: 3 units
	Removal of Existing Connection Valve	S12-MM-15	: 4 units

Removal of Existing Bridge Crane	S12-MM-16	: 1 unit
Removal of Existing Sump Drainage Pump	S12-MM-18	: 2 units
Removal of Existing Air Intake Fan A	S12-MM-21	: 1 unit
Removal of Existing Air Intake Fan B	S12-MM-23	: 1 unit
Piping	S12-MM-24	: Lot
Steel Works	S12-MM-25	: Lot
Other Necessary Works	S12-MM-26	: Lot

1. Inlet Chamber Gate (Refer to Standard Specification – Section 15.13.7)

a. General

The gate shall be installed at the inlet of the discharge pump station and shall be capable of stopping and controlling the treated water.

b. Specification

Type	: Electric Motor Sluice Gate
Quantity	: 1 unit
Dimension	: Dia1500mm
Motor output/Power requirement	: 3.7kW

2. Discharge Pump A (Refer to Standard Specification – Section 15.11.6 and Particular Spec. 15.2.2.3)

a. General

Discharge pumps shall drain treated water into Taldykol Reservoir located near the sewage treatment plant. These pumps shall be able to discharge a large capacity of effluent.

b. Specification

Type	: Vertical Shaft Volute Type Mixed Flow Pump
Quantity	: 2 units (1 standby)
Discharge capacity	: $54m^3$/min
Total head	: 15m
Motor output/Power requirement	: 200kW
Efficiency	: not less than 80 percent at duty point
Installation	: indoor
Motor encl. protection	: IP 44
Wet well water levels	: HWL +341.70 m amsl
	: LWL +340.75 m amsl

Pump room floor level	: +339.50 m amsl
Motor room floor level	: +343.50 m amsl

3. Discharge Pump B (Refer to Standard Specification – Section 15.11.6 and Particular Spec. 15.2.2.3)

a. General

Discharge pumps shall drain treated water into Taldykol Reservoir located near the sewage treatment plant. These pumps shall be able to discharge a large capacity of effluent.

b. Specification

Type	: Vertical Shaft Volute Type Mixed Flow Pump
Quantity	: 2 units
Discharge capacity	: $27m^3$/min
Total head	: 15m
Motor output/Power requirement	: 110kW
Efficiency	: not less than 77 percent at duty point
Installation	: indoor
Motor encl. protection	: IP 44
Wet well water levels	: HWL +341.70 m amsl
	: LWL +340.75 m amsl
Pump room floor level	: +339.50 m amsl
Motor room floor level	: +343.50 m amsl

4. Check Valve (Refer to Standard Specification – Section 15.3.5)

a. General

The check valves shall be installed to control the flow in the conveyance system.

b. Specification

Type	: Swing Type Check Valve with Dashpot
Quantity	: 2 units (1 standby)
Dimension	: Dia. 700mm

5. Delivery Valve A (Refer to Standard Specification – Section 15.13.4)

a. General

The delivery valve shall be used to stop and/or to control the sludge flow. The valve shall comprise open/close valve and electric actuators

b. Specification

Type	: Motorized Butterfly Valve
Quantity	: 2 units (1 standby)
Dimension	: Dia. 700mm
Motor output/Power requirement	: 0.75kW

6. Check Valve (Refer to Standard Specification – Section 15.3.5)

a. General

The check valves shall be installed to control the flow in the conveyance system.

b. Specification

Type	: Swing Type Check Valve with Dashpot
Quantity	: 2 units
Dimension	: Dia. 450mm

7. Delivery Valve B (Refer to Standard Specification – Section 15.13.4)

a. General

The delivery valve shall be used to stop and/or to control the sludge flow. The valve shall comprise open/close valve and electric actuators

b. Specification

Type	: Motorized Butterfly Valve
Quantity	: 2 units
Dimension	: Dia. 450mm
Motor output/Power requirement	: 0.4kW

8. Suction Valve A (Refer to Standard Specification – Section 15.13.2)

a. General

The suction valve shall be used to stop and/or to control the sludge flow. The valve shall comprise open/close valve and electric actuators

b. Specification

Type	: Motorized Gate Valve
Quantity	: 2 units (1 standby)
Dimension	: Dia. 800mm
Motor output/Power requirement	: 3.7kW

9. Suction Valve B (Refer to Standard Specification – Section 15.13.2)

a. General

The suction valve shall be used to stop and/or to control the sludge flow. The valve shall comprise open/close valve and electric actuators

b. Specification

Type	: Motorized Gate Valve
Quantity	: 2 units
Dimension	: Dia. 500mm
Motor output/Power requirement	: 1.5kW

10. Connection Valve (Refer to Standard Specification – Section 15.13.2)

a. General

The valve shall be installed at the pipeline to seal the water and to adjust the flow.

b. Specification

Type	: Motorized Gate Valve
Quantity	: 4 units
Dimension	: Dia. 800mm
Motor output/Power requirement	: 3.7kW

11. Bridge Crane (Refer to Standard Specification – Section 15.12.4)

a. General

This bridge crane shall be used to hoist equipment, material and others for maintenance.

b. Specification

Type	: Electrically operated
Quantity	: 1unit
Capacity	: 5.0 ton
Motor output/Power requirement	: (4.6 + 0.75 + 0.4 x 2) kW

12. Sump Drainage Pump (Refer to Standard Specification – Section 15.11.1)

a. General

These pumps shall drain out miscellaneous used water from the pump pit.

b. Specification

Type	: Removable Submersible Pump
Quantity	: 1 unit (1 standby)

Discharge capacity	: 0.3m^3/min
Total head	: 10.0m
Motor output/Power requirement	: 1.5kW

13. Temporary Pump (Refer to Standard Specification – Section 15.11.3)

a. General

These pumps shall drain treated water while the existing discharge pump station is undergoing repairing process.

b. Specification

Type	: Removable Submersible Pump
Quantity	: 3 units
Discharge capacity	: 25m^3/min
Total head	: 15m
Motor output/Power requirement	: 110kW

14. Air Intake Fan A (Refer to Particular Specification – Section 15.2.2.18)

a. General

These fans shall be used to intake air into the underground motor room.

b. Specification

Type	: Centrifugal Fan
Quantity	: 1 unit
Air flow capacity	: 260m^3/min
Pressure	: 0.15kpa
Motor output/Power requirement	: 3.7kW

15. Air Intake Fan B (Refer to Standard Specification – Section 15.16.2)

a. General

These fans shall be used to intake air into the underground pump room.

b. Specification

Type	: Centrifugal Fan
Quantity	: 1 unit
Air flow capacity	: 60m^3/min
Pressure	: 0.15kpa
Motor output/Power requirement	: 0.75kW

P15.2.9 Gravity Thickener Facility (S21)

a. General

The mechanical components of the gravity thickener facility 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 of Sludge Thickener Facility

Tag Number	Name	Item Number	Quantity
S21-HW-01/02	Inlet Weir	S21-MM-01	: 2 units
S21-GS-01/02	Sludge Thickener Collector	S21-MM-03	: 2 units
S21-SP-01/02	Thickened Sludge Pump	S21-MM-05	: 1 unit (1 standby)
S21-MV-01/02	Suction Sludge Valve	S21-MM-07	: 2 units
S21-DP-01	Sump Drainage Pump	S21-MM-08	: 1 unit
S21-HH-01	Hoist Block	S21-MM-10	: 1 unit
S21-EF-01	Exhaust Fan	S21-MM-12	: 1 unit
	Removal of Existing Inlet Weir	S21-MM-02	: 2 units
	Removal of Existing Sludge Thickener Collector	S21-MM-04	: 2 units
	Removal of Existing Thickened Sludge Pump	S21-MM-06	: 2 units
	Removal of Existing Sump Drainage Pump	S21-MM-09	: 1 unit
	Removal of Existing Hoist Block	S21-MM-11	: 1 unit
	Removal of Existing Exhaust Fan	S21-MM-13	: 1 unit
	Piping	S21-MM-14	: Lot
	Steel Works	S21-MM-15	: Lot
	Other Necessary works	S21-MM-16	: Lot

1. Inlet Weir (Refer to Standard Specification – Section 15.13.8)

a. General

The inlet weir shall control the quantity of sewage flowing into the gravity thickener.

b. Specification

Type	: Adjustable Weir
Quantity	: 2 units
Dimension	: W 500mm x H 500mm

2. Thickener Sludge Collector

a. General

The gravity thickeners shall comprise center drive unit, main shaft, feed well, steel bridge rake, etc. The turning force shall be provided from the drive unit through the main shaft to the rake arm so that the sludge on the thickener bottom may be scraped continuously by the rake mounted to the rake arm to the sludge pit provided at the center of the thickener. In order to stop the emission of odor, GRP covers with metal supporting structure shall be provided on the tanks.

b. Design Condition

(1) The equipment shall be sufficiently sized for to the scraper load and startup time load, be free from vibration, heating, abnormal sound, etc. during operation, and shall withstand continuous operation.

(2) Each portion of the equipment shall have ample strength and wall thickness to corrosion and abrasion.

(3) The peripheral speed shall be about 2 to 3 m/min.

c. Fabrication

(1) Drive unit

(a) The unit shall comprise motor, cycloid reduction gear or planetary reduction gear or gear and chain, etc. and transmit the power safely and positively. The speed shall be reduced to the predetermined scraping speed. The main shaft shall be turned through a coupling and bearing stand.

(b) The bearing shall be able to support the load of the scraper main body sufficiently and accommodate any vibration due to turning.

(c) The cover for the exposed chain shall be made of steel plat with epoxy coating or stainless steel plate.

(2) Rake and rake arm

(a) The rake shall be mounted firmly to the rake arm. Rakes shall overlap each other so as not to leave areas of the tank floor unscraped.

(b) Under the rake, a replaceable adjusting blade shall be mounted and the clearance to the thickener bottom shall be adjustable.

(c) The rake arm shall have two blades (auxiliary blades may be provided). It shall be constructed of steel truss structure and shall have adequate strength for bending loads, etc.

(d) The clearance to the rake thickener bottom surface shall be not more than about 50 mm at the mid point of the blade and rubber shall be mounted to the blade end.

(3) Feed well

(a) The feed well shall be mounted firmly to the thickener wall by means of supports. It shall reduce the flow speed promptly and provide suitable conditions for settling.

(b) The feed well shall be made of stainless steel.

(c) The feed well shall be provided with a small baffle and windowto enable the scum in the feed well to be discharged through the window.

(4) Main shaft and bearing

(a) The main shaft shall be suspended from the bearing stand and have a sufficient allowance for torsional loads. The bearing shall be a rolling bearing constructed to support thrust loads.

(5) Oil supply equipment

(a) The drive unit shall be constructed for ease of supplying and checking oil.

(b) A grease nipple shall be provided at a position for ease of oil supply.

(c) The motor specifications shall be outdoor totally enclosed fan-cooled type and continuous rating.

(6) GRP cover

(a) The metal structure on the tank shall support the weight of GRP cover, surcharge on the cover and other loads.

(b) Refer to the drawing for recommendable structure and layout of cover.

(c) The GRP cover shall cover the whole area of the tank with airtight seals.

(d) An inspection window (30cm rectangular) shall be furnished in each GRP cover piece.

d. Materials

(a)	Blade	: Rolled steel or equivalent
(b)	Submerged bolt and nut	: Stainless steel
(c)	Rake and rake arm	: Rolled steel
(d)	Main shaft	: Carbon steel pipe for pressure service or Carbon steel tube for machine structural purposes
(e)	Feed well	: Rolled steel with epoxy coating or stainless steel
(f)	Feed well support	: Rolled steel
(g)	Baffle plate	: Rolled steel or equivalent
(h)	Bracket for baffle plate	: Rolled steel or equivalent

e. Protection Equipment

(1) Mechanical protection equipment

Protection equipment for overload protection

(2) Electrical protection equipment

Overcurrent detector for overload protection

(Scope of electrical equipment work)

f. Accessories

(a)	Anchor bolt	x 1 set
(b)	Drive unit and chain cover	x 1 set

g. Execution

Refer to various sub-sections in Section 15.1.

h. Specification

Type	: Center Drive Scrapper
Quantity	: 2 units
Tank dimension	: Dia. 20.0m x WD 3.5m
Motor output	: 0.75kW

3. Thickened Sludge Pump (Refer to Standard Specification – Section 15.11.4)

a. General

The pump shall transfer the thickened sludge from the gravity thickener into the thickened sludge storage tank.

b. Specification

Type	: Non-clog Type Sludge Pump
Quantity	: 1 unit (1 standby)
Discharge flow	: 1.0m^3/min
Total head	: 5m
Motor output	: 3.7kW

4. Suction Sludge Valve (Refer to Standard Specification – Section 15.13.5)

a. General

The valve shall be installed at the sludge draw-off pipeline, and shall be capable of opening and closing in the automatic operation of the pump.

b. Specification

Type	: Motorized Eccentric Valve
Quantity	: 2 units
Dimension	: Dia. 150mm
Motor output	: 0.2kW

5. Sump Drainage Pump (Refer to Standard Specification – Section 15.11.1)

a. General

The pump shall lift up the sewage collected in the floor drain pit.

b. Specification

Type	: Submersible Sewage Pump
Quantity	: 1 unit
Discharge capacity	: 0.1m^3/min
Total head	: 7m

Motor output : 0.4kW

6. Hoist Block (Refer to Standard Specification – Section 15.12.3)

a. General

The chain block shall be used for installation, maintenance and checking of equipment, apparatus and materials. It shall be of manual operation type and all of hoist and traverse motions shall be manually operated.

b. Specification

Type : Geared Trolley Chain Block

Capacity : 1.0 ton

Quantity : 1 unit

7. Exhaust Fan (Refer to Particular Specification – Section 15.2.2.18)

a. General

The fan shall be installed to ventilate in the sludge pump room.

b. Specification

Type : Centrifugal Fan

Quantity : 1 unit

Air flow capacity : $12m^3$/min

Motor output/Power requirement : 0.2kW

P15.2.10 Digester & Pump House Facility (S23)

a. General

The mechanical components of the digester facility 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 of Digester & Pump House Facility

Tag Number	Name	Item Number Quantity
S23-SP-01/02	Sludge Pump	S23-MM-01: 1 unit (1 standby)
S23-DP-01	Sump Drainage Pump	S23-MM-04: 1 unit
S23-DF-01	Desulfuriser	S23-MM-03: 1 unit
S23-IF-01/02	Exhaust Fan	S23-MM-09: 1 unit (1 standby)
S23-IF-04 to 07	Inhabitation Fan	S23-MM-07: 2 units (2 standbys)
S23-MV-01 to 05	Sludge Valve	S23-MM-06: 5 units
	Removal of Existing Sludge Pump	S23-MM-02: 2 units
	Removal of Existing Sump Drainage Pump	S23-MM-05: 1 unit

Removal of Existing Inhabitation Fan	S23-MM-08: 2 units
Removal of Existing Exhaust Fan	S23-MM-10: 2 units
Piping	S23-MM-11: Lot
Steel Works	S23-MM-12: Lot
Other Necessary Works	S23-MM-13: Lot

1. Sludge Pump (Refer to Standard Specification – Section 15.11.4)

a. General

The pump shall be installed for the transfer of sludge.

b. Specification

Type	: Non-Clog Type Sludge Pump
Quantity	: 1 unit (1 standby)
Discharge capacity	: 5.5m^3/min
Total head	: 12m
Motor output	: 22kW

2. Sump Drainage Pump (Refer to Standard Specification – Section 15.11.1)

a. General

The pump shall be used to discharge the sewage held in the pipe gallery, etc.

b. Specification

Type	: Submersible Sewage Pump
Quantity	: 1 unit
Discharge capacity	: 0.3m^3/min
Total head	: 15m
Motor output	: 1.5kW

3. Desulfurizer

a. General

The desulfurizer shall comprise a lower gas charging section, upper water spray room for the filler charging, etc. It shall be used to eliminate hydrogen sulfide from the digestion gas by contact with washing water.

b. Design Condition

(1) The apparatus shall provide high efficiency elimination hydrogen sulfide from the digestion gas using wash water. In addition, it shall minimize pressure losses in the tower.

(2) The apparatus shall a structure that provides excellent corrosion resistance to the digested gas. Furthermore, it shall fully take weather resistance and earthquake resistance into account.

c. Fabrication

(1) The main body shall be of a cylinder made of steel sheets, and shall comprise a gas-liquid contact section, water spray device, gas inlet/outlet pipes, etc.

(2) Either ceramics or synthetic resin shall be used as filler for the gas-liquid contact section. In addition, the filler shall be of a form to effectively minimize pressure loss and to facilitate gas-liquid contact.

(3) The filling chamber shall equally distribute the gas.

(4) The washing-water diffuser shall be capable of equally spraying water in the tower, and the material used shall be of a quality to prevent corrosion by the gas.

(5) The washing water shall be collected into the water tank at the bottom and then be discharged to the outside of the system through overflow piping. The overflow piping shall be of sufficient bore so that the water level in the column will not rise. Furthermore, the overflow piping shall not allow leakage of the gas to the exterior by the use of a U-pipe or the like.

(6) The equipment shall permit easy access to the filler via a manhole or the like.

d. Materials

(a) Main body : Rolled steel or equivalent

(b) Filler : Ceramics, synthetic resin or equivalent (based on manufacturer's standard)

(c) Washing water pipe : Steel pipe or equivalent

(d) Drain pipe : Steel pipe

(e) Valves : Cast iron or equivalent

(f) Bolts and nuts : Stainless steel

e. Accessories (per Unit)

(a) Gas piping and valves x 1 set

(b) Washing water piping and valves x 1 set

(c) Filler x 1 set

(d) Foundation bolts and nuts x 1 set

(e) Others as required x 1 lot

f. Execution

Refer to various sub-sections in Section 15.1.

g. Specification

Type : Water Spray Type

Quantity : 1 unit

Treatment capacity : 460m^3/hr

4. Exhaust Fan (Refer to Particular Specification – Section 15.2.2.18)

a. General

The fan shall be installed to ventilate the digester pump room.

b. Specification

Type	: Centrifugal Fan
Quantity	: 1 unit (1 standby)
Air flow capacity	: 90m^3/min
Motor output/Power requirement	: 5.5kW

5. Inhalation Fan (Refer to Particular Specification – Section 15.2.2.18)

a. General

The fan shall be installed to ventilate the digester pump room.

b. Specification

Type	: Centrifugal Fan
Quantity	: 2 units (2 standbys)
Air flow capacity	: 40m^3/min
Motor output/Power requirement	: 1.5kW

6. Sludge Valve (Refer to Standard Specification – Section 15.13.1)

a. General

The valve shall be installed at the sludge pump discharge pipe line to stop or adjust the flow.

b. Specification

Type	: Motorized Gate Valve
Quantity	: 5 units
Dimension	: Dia. 250mm
Motor output	: 0.4kW

P15.2.11 Sludge Treatment Building Facility (S24)

a. General

The mechanical components in sludge treatment building facility 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 of Sludge Treatment Building Facility

Tag Number	Name	Item Number	Quantity
S24-PT-01/02	Polymer Tank	S24-MM-05	: 2 units
S24-PF-01/02	Polymer Feeder	S24-MM-04	: 2 units
S24-PP-01 to 03	Polymer Feeder Pump	S24-MM-06	: 2 units (1 standby)
S24-AC-01/02	Air Compressor	S24-MM-10	: 1 unit (1 standby)
S24-AD-01	Air Dryer	S24-MM-11	: 1 unit
S24-SM-03/04	Thickened Sludge Mixer	S24-MM-07	: 2 units
S24-SP-01/02	Thickened Sludge Pump	S24-MM-08	: 1 unit (1 standby)
S24-HH-01 to 03	Hoist Block	S24-MM-12	: 3 units
S24-SG-01	Sludge Grinder	S24-MM-09	: 1 unit
S24-SM-01/02	Waste Sludge Mixer	S24-MM-01	: 2 units
S24-SP-03 to 05	Waste Sludge Feed Pump	S24-MM-02	: 2 units (1 standby)
S24-MT-01 to 03	Mechanical Thickener	S24-MM-03	: 2 units (1 standby)
S24-SM-05/06	Digested Sludge Mixer	S24-MM-13	: 2 units
S24-SP-06 to 08	Sludge Feed Pump	S24-MM-14	: 2 units (1 standby)
S24-DM-01 to 03	Dewatering Machine	S24-MM-15	: 2 units (1 standby)
S24-PT-03/04	Polymer Tank	S24-MM-17	: 2 units
S24-HH-04	Hoist Block	S24-MM-22	: 1 unit
S24-HH-08/09	Hoist Block	S24-MM-24	: 2 units
S24-PF-03/04	Polymer Feeder	S24-MM-16	: 2 units
S24-PP-04 to 06	Polymer Feed Pump	S24-MM-18	: 2 units (1 standby)
S24-HH-05 to 07	Hoist Block Dewatering	S24-MM-23	: 3 units
S24-PC-01 to 08	Polymer Container	S24-MM-19	: 8 units
S24-SM-07	Sewage Mixer	S24-MM-20	: 1 unit
S24-SP-09/10	Sewage Pump	S24-MM-21	: 1 unit (1 standby)
S24-DP-01 to 04	Sump Drainage Pump	S24-MM-25	: 2 units (2 standbys)

S24-OP-01 to 03	Water Elutriation Pump	S24-MM-29	: 2 units (1 standby)
S24-SU-01/02	Treated Water Supply Unit	S24-MM-30	: 1 unit (1 standby)
S24-VP-01/02	Desulfuriser Pump	S24-MM-31	: 1 unit (1 standby)
S24-AS-01	Strainer Odor Scrubber	S24-MM-33	: 1 unit
S24-SU-03/04	Water Supply Units	S24-MM-32	: 1 unit (1 standby)
S24-AS-02	Strainer Grit Scrubber	S24-MM-34	: 1 unit
S24-AS-03	Strainer Desulfuriser	S24-MM-35	: 1 unit
S24-CV-01	Treated Water Valve	S24-MM-36	: 1 unit
S24-BS-01/02	Scrubber	S24-MM-26	: 2 units
S24-EX-01/02	Odor Fan	S24-MM-27	: 1 unit (1 standby)
S24-HS-01	Mist Separator	S24-MM-28	: 1 unit
	Piping	S24-MM-37	: Lot
	Steel works	S24-MM-38	: Lot
	Other Necessary works	S24-MM-39	: Lot

1. Polymer Tank

a. General

The tank shall be used to dissolve the polymer supplied by the polymer feeder to a constant concentration and feed the solution to the dewatering equipment. It shall be a vertical tank and shall comprise tank main body, mixer, manhole, various level gauges, etc.

b. Design Condition

The capacity, dimensions, etc. shall comply with the Particular Specification.

c. Fabrication

(1) The tank shall be a welded structure of steel plate and the tank internal surface shall be painted with tar epoxy resin for corrosion resistance.

(2) The tank shall be provided with a removable cover to prevent chemical scattering, and also with a vent pipe.

(3) The tank shall be provided with necessary mounting seats for overflow pipe, etc.

(4) The motor-driven mixer shall be belt speed reducing type of 2-stage propeller type and shall be constructed to endure continuous operation free from vibration, etc. The mixer shall be at the center or at a position off the center according to the tank configuration (angular or circular).

(5) The mixer shall be prevented from operating under dry conditions.

(6) The tank shall be constructed to seal gas and splashes from the area where the agitator shaft drive passes through.

d. Materials

(a) Main body : Rolled steel + internal surface tar epoxy painting or stainless steel

(b) Mixer frame : Rolled steel or stainless steel

(c) Mixer shaft : Stainless steel

(d) Blade : Stainless steel

(e) Belt cover : Rolled steel

e. Accessories (per Unit)

(a) Foundation bolt and nut x 1 set

(b) Air vent pipe x 1 set

(c) Mixer x 1 unit

(d) Direct reading level gauge x 1 unit

f. Execution

Refer to various sub-sections in Section 15.1.

g. Specification

Type : Vertical Cylindrical Tank

Quantity : 2 units

Capacity : 7.0m^3

Power requirement : 3.7kW

2. Polymer Feeder

a. General

The equipment shall be used for the continuous constant-rate supply of water and chemical for the preparation of a constant concentration in the polymer dissolution tank. It shall comprise acceptance hopper, weighing device, feeder main body, adjustable speed drive unit, mixer, dry air supply device, feed water supply device, etc.

b. Design Condition

The maximum and minimum values of the quantity of chemical to be used shall be calculated, and the equipment shall be manufactured to precisely supply that calculated range. The specific gravity of chemical shall be 0.4 to 1.0.

c. Fabrication

(1) The equipment shall be constructed to be resistant to factors affecting the supply precision even with variations in powder pressure in the hopper.

(2) The supply rate shall be adjustable through the adjustable speed reducer of the drive unit and the supply range shall be covered sufficiently.

(3) The equipment shall be constructed to inhibit powder outflow with flushing.

(4) The acceptance hopper shall have the total capacity of its effective capacity plus 5% minimum.

(5) A throw chute for chemical shall be provided.

(6) The equipment shall be constructed to be effective for humidity shutoff, and as a rule, dry air shall

be supplied.

(7) The chemical throwing portion shall be constructed to inhibit lumps from forming.

d. Materials

(a) Acceptance hopper :Stainless steel or PVC

(b) Weighing device (powder contact portion) : Stainless steel or equivalent

(c) Mixer : Stainless steel (important parts) or clear resin

e. Accessories (per Unit)

(a) Common base	x 1 set
(b) Feed water motor-driven ball valve	x 1 unit
(c) Flow meter (area type or direct-reading type)	x 1 unit
(d) Flow adjusting valve	x 1 unit
(e) Dry air electromagnetic valve and manual valves	x 1 set
(f) Air regulator, air mist separator, air filter	x 1 each
(g) Feed water, dry air piping (machine side 1m)	x 1 set
(h) Powder level gauge (if necessary)	x 1 unit

f. Execution

Refer to various sub-sections in Section 15.1.

g. Specification

Type	: Constant Chemical Feeder
Quantity	: 2 units
Discharge capacity	: 2000cc/min
Motor output	: 0.4kW

3. Polymer Feed Pump (Refer to Standard Specification – Section 15.11.5)

a. General

The pump shall be used to supply dissolved chemical to dewatering equipment.

b. Specification

Type	: Progressive Cavity Pump with variable speed gear
Quantity	: 2 units (1 standby)
Discharge capacity	: 0.8 ~ 2.7m^3/min
Total head	: 20m
Power requirement	: 1.5kW

4. Air Compressor

a. General

This shall be used for supplying compressed air to chemical supply equipment and air roll valve. The air compressor shall be provided with an air tank and be used for air-operated valve, etc.

b. Design Condition

The maximum pressure shall be 0.69 to 0.93 MPa. The control differential pressure shall be 0.15 MPa min. The air compressor shall be a no-oil supply type.

c. Fabrication

(1) The air compressor shall be a reciprocating type, and shall be driven by the crankshaft by motor direct-coupling or through V-belts and V-pulleys from the motor. In the case of belt drive, front and back sides of the pulley shall be covered with a metal cover.

(2) The air tank shall be a horizontal cylindrical type and shall be provided with air inlet/outlet pipe mounting seats, pressure gauge mounting seats, drain pipe mounting seats, and other necessary apparatus.

d. Materials

(a) Air tank : Rolled steel

e. Protection Equipment

Safety valve and unloading device or pressure switch type

f. Accessories (per Unit)

(a) Unloading device or pressure switch	x 1 set
(b) Suction silencer (with filter)	x 1 set
(c) V-belt and V-pulley and their covers (belt-drive only)	x 1 set
(d) Air tank	x 1 set
(e) Pressure gauge	x 1 set
(f) Safety valve	x 1 set

g. Execution

Refer to various sub-sections in Section 15.1.

h. Specification

Type	: Control Switch Type
Quantity	: 1 unit (1 standby)
Discharge capacity	: 600NL/min
Pressure	: 0.83MPa
Power requirement	: 5.5kW

5. Air Dryer

a. General

To obtain dry air, an air dryer shall be provided to remove humidity in the compressed air from the air compressor.

b. Design Condition

The air dryer shall have high efficiency dehumidification, and shall be sturdily constructed to endure continuous operation.

c. Fabrication

(1) The air dryer shall be of the refrigeration type.

(2) The air dryer shall be provided with mounting seats for air inlet and outlet pipes, pressure gauge, temperature meter, automatic drain trap and other required devices.

(3) The protection device shall be provided to keep the constant dew point even with variations in the compressed air volume.

(4) Air refrigeration shall be by direct refrigeration method.

(5) In principle, refrigeration of the refrigerant shall be adopted as the air cooling method. However, a water cooling method can be adopted for large-scale refrigeration.

(6) The motor shall be a totally enclosed fan-cooled type and of continuous rating.

d. Materials

(a) Shell of heat exchanger : Stainless steel

e. Execution

Refer to various sub-sections in Section 15.1.

f. Specification

Type	: Refrigerating Type
Quantity	: 1 unit
Discharge capacity	: 600NL/min
Power requirement	: 0.2kW

6. Thickened Sludge Mixer

a. General

The mixer shall be used for mixing inside the sludge storage tank to prevent sludge settling.

b. Design Condition

(1) The mixer shall be manufactured to endure internal tank level variations sufficiently.

(2) The mixer shall be of fixed type.

c. Fabrication

(1) The drive unit shall be vertical speed reducer, direct-coupled type.

(2) Blades and main shaft shall have excellent corrosion resistance, and the blade shall be constructed in a shape free from easy entangling.

(3) The mixer shall be constructed to endure dry operation.

(4) Bolts to be used in the liquid contact portion shall be made of stainless steel and shall be provided with locking.

(5) Blades shall be provided in two stages.

(6) Structurally, the lower bearing shall not be considered.

d. Materials

(a) Main shaft : Stainless steel

(b) Blade : Stainless steel

e. Accessories (per Unit)

(a) Foundation bolt and nut x 1 set

f. Execution

Refer to various sub-sections in Section 15.1.

g. Specification

Type : Vertical Propeller Mixer

Dimension : Dia 1,500mm

Quantity : 2 units

Motor output : 7.5kW

7. Thickened Sludge Pump (Refer to Standard Specification – Section 15.11.4)

a. General

The pump shall be transfer thickened sludge from the thickened sludge tank to the digesters.

b. Specification

Type : Non-Clog Sludge Pump

Quantity : 1 unit (1 standby)

Discharge capacity : 1.0m^3/min

Total head : 22m

Motor output : 11kW

8. Hoist Block (Refer to Standard Specification – Section 15.12.3)

a. General

The chain block shall be used for the installation, maintenance and checking of equipment, apparatus and the materials.

b. Specification

Type	: Geared Trolley Chain Block
Capacity	: 2.0 ton
Quantity	: 3 units

9. Sludge Grinder

a. General

The grinder shall comprise a casing, shafts, a comminuting portion, a drive unit, etc. and shall be installed in the influent water channel or sludge piping to crush and finely cut the inclusions contained in the influent sewage.

b. Design Condition

(1) The machine shall crush and finely cut the inclusions contained in the sewage to those sizes that do not interfere with the operation of the sewage pump.

(2) The comminuting portion shall be made of materials and shall be constructed such that it shall not wear out prematurely and shall be designed for long use.

(3) For the strength of various portions, a sufficient safety factor shall be taken.

c. Fabrication

(1) The machine shall be constructed so that the 2-shaft type rotary cutting portion is driven through a vertical motor direct-coupled type speed reducer.

(2) The casing shall be good quality cast iron of considerable mechanical strength as well as corrosion and abrasion resistance.

(3) The cutting portion shall be made of special steel having excellent wear resistance and be constructed to permit easy replacement.

d. Materials

(a) Casing : Cast iron

(b) Cutting portion : Abrasion resistant material

(c) Shaft : Carbon steel or chromium-molybdenum steel or equivalent

e. Protection Equipment

(1) Electrical protection

The over current detector shall be provided against overload. (Instantaneous function type)

The reversible rotation shall be equipped for discharging in overload.

f. Accessories (per Unit)

(a) Foundation bolts and nuts x 1 set

g. Execution

Refer to various sub-sections in Section 15.1.

h. Specification

Type	: In-Pipeline Type
Quantity	: 1 unit
Capacity	: 1.5m^3/min
Motor output	: 3.7kW

10. Waste Sludge Mixer (Refer to Particular Specification – Section 15.2.11.6)

a. General

The mixer shall be used for mechanical agitation to prevent sludge settling in the sludge holding tank.

b. Specification

Type	: Vertical Propeller Mixer
Dimension	:Dia.2,000mm
Quantity	: 2 units
Motor output	: 7.5kW

11. Waste Sludge Feed Pump (Refer to Standard Specification – Section 15.11.5)

a. General

The pump shall feed waste sludge to the mechanical thickener.

b. Specification

Type	: Progressive Cavity Pump with variable speed gear
Quantity	: 2 units (1 standby)
Discharge flow	: 34 to 104m^3/hr
Total head	: 20m
Motor output	: 30kW

12. Mechanical Thickener

a. General

The thickener shall thicken waste sludge transferred from the secondary sedimentation tanks by mechanical force.

b. Design Condition

(1) The screw press shall rotate at a normal low speed and shall have sufficient strength to handle the cake pressure generated.

(2) Performance of the thickener shall meet the following requirements:

(a) The sludge is generated from the activated sludge treatment process of domestic sewage.

(b) The sludge will be the waste activated sludge extracted from the secondary sedimentation tank.

c. Fabrication

The unit shall comprise an outer cylinder-type screen, screw shaft, bearing, base, safety cover and trough, cleaning device, driving motor and local control panel.

(1) Screw press main body

The main body shall comprise an outer cylinder-type screen and screw shaft. The outer cylinder-type screen shall be made of a perforated steel plate. The screw shaft shall be of an integrated construction composed of an inclined-shape shaft and screw impeller. In addition, a cone-shaped compressor shall be provided at the thickened sludge discharge section to give pushing pressure.

(2) Base

The base, made of steel plate, shall be constructed as a common base for the screw press main body and the drive motor so that it can withstand the mechanical force generated.

(3) Bearing

The bearing shall have sufficient strength to withstand continuous operation at a low load.

(4) Odor-protection cover and trough

The odor-protection cover shall be constructed to facilitate internal inspection and repair, and to ensure good sealing to prevent moisture or odor leak to the outside. The trough shall be of a construction to permit smooth drain of the filtrate, etc.

(5) Washing device

The cleaning device shall be provided with nozzles to wash the unit while turning the outer cylinder-type screen after completion of each thickening operation term. The device shall be of a simple construction to minimize nozzle plugging and to facilitate maintenance.

(6) Coagulation device

The device shall be provided to mix the coagulant efficiently with the forwarded sludge. The apparatus shall be constructed to forward the sludge smoothly to the screw press main body. The coagulation device shall be equipped with an agitator, etc. for mixing.

(7) Rotation device

In response to the characteristic of the contents being processed, rotation of the screw shaft at a low speed shall be possible concurrent to the variable speed. The motor shall be of a squirrel-cage three-phase induction motor, totally-enclosed type. Rating shall be of a continuous rating, and insulation shall be Class F or other equal approved class. Further, inverter drive shall be the standard, and inverter control unit shall be included in the device.

(8) Power control panel

Control with the power control panel shall be limited to the screw press main body and coagulation device.

The panel shall be of an indoor self-supporting type.

d. Materials

(a) Outer cylinder : Stainless steel type 304

(b) Screen : Stainless steel type 304

(c) Screw shaft, impeller : Stainless steel type 304

(d) Frame base : Stainless steel type 304

(e) Cleaning pipe : Steel pipe

(f) Odor-prevention cover : Stainless steel type 304, synthetic resin

(g) Trough : Stainless steel type 304

(h) Cake chute : Stainless steel type 304

(i) Power control panel : Rolled steel

e. Protection Equipment

The driving motor shall be provided with a detection device for overload protection.

f. Accessories (per Unit)

(a) Fixing bolts and nuts	x	1 lot
(b) Coagulation device	x	1 unit
(c) Power control panel	x	1 set
(d) Special overhaul tools (if necessary)	x	1 set (common for all Units)

g. Execution

Refer to various sub-sections in Section 15.1.

h. Specification

Type : Screw Press Thickener

Quantity : 2 units (1 standby)

Capacity : 75m^3/hr (3m^2)

Motor output : (1.5 + 0.75 + 0.75) kW

13. Digested Sludge Mixer (Refer to Particular Specification 15.2.11.6)

a. General

The mixer shall mix the digested sludge prior to mechanical dewatering.

b. Specification

Type : Vertical Propeller Mixer

Dimension : Dia.2,000mm

Quantity : 2 units

Motor output : 7.5kW

14. Sludge Feed Pump (Refer to Standard Specification – Section 15.11.5)

a. General

The pump shall feed the thickened sludge to the sludge-dewatering unit.

b. Specification

Type	: Progressive Cavity Pump with Variable Speed Gear
Quantity	: 2 units (1 standby)
Discharge capacity	: 7.5 to 23m^3/hr
Total head	: 20m
Power requirement	: 7.5kW

15. Dewatering Unit

a. General

The sludge-dewatering unit shall be installed in the sludge treatment building to dewater the digested sludge. The apparatus shall be used for the continuous dewatering process of sewage sludge, and comprise a screw press main body, coagulation device and power control panel.

b. Design Condition

(1) The screw press the rotate at a normal low speeds and shall have sufficient strength to handle the waste sludge pressure generated.

(2) Performance of the dewatering unit shall meet the following requirements:

(a) The sludge shall be processed in the digester prior to dewatering.

(b) Sludge digester shall be operated by thermophilic method.

(c) Original sludge for the digester is both mechanically thickened waste sludge from secondary sedimentation tank and primary sludge.

c. Fabrication

The unit shall comprise an outer cylinder-type screen, screw shaft, bearing, base, safety cover and trough, cleaning device, driving motor and local control panel.

(1) Screw press main body

The main body shall comprise an outer cylinder-type screen and screw shaft. The outer cylinder-type screen shall be made of a perforated steel plate. The screw shaft shall be of an integrated construction composed of an inclined-shape shaft and screw impeller. In addition, a cone-shaped compressor shall be provided at the sludge cake discharge section to give pushing pressure to the sludge cake.

(2) Base

The base, made of steel plate, shall be constructed as a common base for the screw press main body and the drive motor so that it can withstand the mechanical force generated.

(3) Bearing

The bearing shall have sufficient strength to withstand continuous operation at a low load.

(4) Odor-protection cover and trough

The odor-protection cover shall be constructed to facilitate internal inspection and repair, and to ensure good sealing for prevention of moisture or odor leak to the outside. The trough shall be of a construction to permit smooth drain of the filtrate, etc.

(5) Washing device

The cleaning device shall be provided with nozzles to wash the unit while turning the outer cylinder-type screen after completion of each thickening operation term. The device shall be of a simple construction to minimize nozzle plugging and to facilitate maintenance.

(6) Coagulation device

The device shall be provided to mix the coagulant efficiently with the forwarded sludge. The apparatus shall be constructed to forward the mixed sludge smoothly to the screw press main body. The coagulation device shall be equipped with an agitator, etc. for mixing.

(7) Rotation device

In response to the characteristic of the contents being processed, rotation of the screw shaft at a low speed shall be possible concurrent to the variable speed. The motor shall be of a squirrel-cage three-phase induction motor, totally-enclosed type. Rating shall be of a continuous rating, and insulation shall be Class F or other equal approved class. Further, inverter drive shall be the standard, and inverter control unit shall be included in the device.

(8) Power control panel

Control with the power control panel shall be limited to the screw press main body and coagulation device.

The panel shall be of an indoor self-supporting type.

d. Materials

(a)	Outer cylinder	: Stainless steel type 304
(b)	Screen	: Stainless steel type 304
(c)	Screw shaft, impeller	: Stainless steel type 304
(d)	Frame base	: Stainless steel type 304
(e)	Cleaning pipe	: Steel pipe
(f)	Odor-prevention cover	: Stainless steel type 304, synthetic resin
(g)	Trough	: Stainless steel type 304
(h)	Cake chute	: Stainless steel type 304
(i)	Power control panel	: Rolled steel

e. Protection Equipment

The driving motor shall be provided with a detection device for overload protection.

f. Accessories (per Unit)

(a)	Fixing bolts and nuts	x 1 lot
(b)	Coagulation device	x 1 unit
(c)	Power control panel	x 1 set
(d)	Special overhaul tools (if necessary)	x 1 set (common for all Units)

g. Execution

Refer to various sub-sections in Section 15.1.

h. Specification

Type	: Screw Press Type
Quantity	: 2 units (1 standby)
Thickening Capacity	: 450kg/hr
Power requirement	: 3.7kW + 1.5kW

16. Polymer Tank (Refer to Particular Specification – Section 15.2.11.1)

a. General

The tank shall be used for the dissolution of the polymer supplied by the polymer feeder to the specified concentration and store the solution in it.

b. Specification

Type	: Vertical Cylindrical Tank
Quantity	: 2 units
Capacity	: $10m^3$
Power requirement	: 5.5kW

17. Hoist Block (Refer to Standard Specification – Section 15.12.3)

a. General

The chain block shall be used for installation, maintenance and check of equipment.

b. Specification

Type	: Geared Trolley Chain Block
Capacity	: 3.0 ton
Quantity	: 1 unit

18. Hoist Block (Refer to Standard Specification – Section 15.12.3)

a. General

The chain block shall be used for installation, maintenance and check of equipment.

b. Specification

Type	: Geared Trolley Chain Block
Capacity	: 0.5 ton
Quantity	: 2 units

19. Polymer Feeder (Refer to Particular Specification – Section 15.2.11.2)

a. General

The equipment shall be used for the temporary storage of polymer and the continuous constant –rate supply of water and chemical to the polymer-dissolving tank.

b. Specification

Type	: Constant Chemical Feeder
Quantity	: 2 units
Supply capacity	: 4000cc/min
Motor output	: 0.4 kW

20. Polymer Feed Pump (Refer to Standard Specification – Section 15.11.5)

a. General

The pump shall feed the polymer solution at constant-rate to the sludge-dewatering unit.

b. Specification

Type	: Progressive Cavity Pump with variable speed gear
Quantity	: 2 units (1 standby)
Diameter	: Dia. 65mm
Discharge capacity	: 1.5 to 4.8m^3/hr
Total head	: 20m
Power requirement	: 2.2kW

21. Hoist Block (Refer to Standard Specification – Section 15.12.3)

a. General

The chain block shall be used for installation, maintenance and checking of equipment.

b. Specification

Type	: Geared Trolley Chain Block
Capacity	: 3.0 ton
Quantity	: 3 units

22. Polymer Container

a. General

The tank shall be a vertical tank and shall comprise tank main body, air pipe, electrical level gauge, direct reading level gauge, ladder, manhole, etc. It shall be used to store the coagulant.

b. Design Condition

The capacity shall comply with Particular Specification.

c. Fabrication

(1) The tank shall be made of corrosion resistant material.

(2) The tank shall be constructed such that the coagulant can be directly fed from tank lorry.

(3) A manhole shall be provided to check the inside of tank.

(4) A weir for coagulant overflow shall be provided around the tank.

(5) A ladder shall be provided at the tank.

d. Materials

(a) Main body : Polyethylene

(b) Ladder : Rolled steel

e. Accessories (per Unit)

(a) Foundation bolts and nuts x 1 set

(b) Air exhaust pipe x 1 set

(c) Manhole (approx. dia.500mm) x 1 set

(d) Air vent pipe x 1 set

f. Execution

Refer to various sub-sections in Section 15.1.

g. Specification

Type : Polymer Container

Quantity : 8 units

Capacity : 1.0m^3

23. Sewage Mixer (Refer to Particular Specification – Section 15.2.11.6)

a. General

This mixer shall mix wastewater from sludge treatment equipment in the tank.

b. Specification

Type : Vertical Propeller Mixer

Dimension : Dia.2, 000mm

Quantity : 1 unit

Motor output : 7.5kW

24. Sewage Pump (Refer to Standard Specification – Section 15.11.4)

a. General

The pump shall lift up the wastewater to the grit chamber.

b. Specification

Type : Non-Clog Sludge Pump

Quantity : 1 unit (1 standby)

Discharge capacity	: 3.0m^3/min
Total head	: 15m
Power requirement	: 22kW

25. Sump Drainage Pump (Refer to Standard Specification – Section 15.11.1)

a. General

The pump shall drain the sump at B1 floor in the sludge treatment building.

b. Specification

Type	: Submersible Sewage Pump
Quantity	: 2 units (2 standbys)
Discharge capacity	: 0.3m^3/min
Total head	: 10m
Motor output	: 1.5kW

26. Water Elutriation Pump (Refer to Standard Specification – Section 15.5.2)

a. General

The units shall supply treated water to the odor control unit.

b. Specification

Type	: Volute Type Pump
Quantity	: 2 units (1 standby)
Discharge capacity	: 0.17m^3/min
Total head	: 25m
Motor output	: 3.7kW

27. Treated Water Supply Unit

a. General

The unit shall be a pressure tank combined with horizontal centrifugal pumps. The tank shall be installed to store pressurized water to accommodate variations of the water usage.

b. Design Conditions

(1) This unit shall be constructed to produce minimum vibration and noise and to sustain a long and continuous operation.

(2) The tank shall be a product conforming to the applicable laws and regulations.

(3) The pressure tank shall have sufficient capacity considering the frequency of motor startup.

(4) Pump operation shall be automatic parallel and alternate operation in accordance with the tank internal pressure.

(5) The suction of the horizontal centrifugal pump shall be forced suction.

(6) The quantity of pumps to be mounted in the feed water pump unit shall be two as standard.

c. Fabrication

(1) The pump shall be sturdy and shall have a wall thickness with adequate allowance for wear and corrosion.

(2) The tank shall be an air make-up type tank and shall have sufficient strength.

(3) The control panel shall comprise a control circuit for automatic operation and a drive-power circuit.

d. Materials

Materials shall be as follows.

(1) Horizontal centrifugal pump

(a) Casing : Cast iron

(b) Impeller : Bronze casting or cast iron

(c) Shaft : Stainless steel

(d) Motor : Totally enclosed fan-cooled type and continuous rating

(2) Tank

Rolled steel or equivalent

e. Accessories (per Unit)

(a) Common base	x 1 set
(b) Foundation bolt and nut	x 1 set
(c) Coupling and cover	x 1 set
(d) Pressure gauge or compound pressure gauge	x 1 set
(e) Pressure switch	x 1 set
(f) Control panel	x 1 set

f. Execution

Refer to various sub-sections in Section 15.1.

g. Specification

Type	: Pressure Tank Type
Quantity	: 1 unit (1 standby)
Discharge capacity	: 0.3m^3/min
Total head	: 25m
Motor output	: 3.7kW

28. Desulfuriser Pumps (Refer to Standard Specification – Section 15.5.2)

a. General

The pump shall feed water to desulfurization equipment as elutriation usage.

b. Specification

Type	: Volute Pump
Quantity	: 1 unit (1 standby)
Discharge capacity	: 6.1m^3/min
Total head	: 23m
Motor output	: 45kW

29. Strainer for Odor Scrubber

a. General

An automatic washing strainer shall be installed to remove inclusions contained in the secondary treated sewage supplied under pressure by the treated water pump.

b. Design Condition

(1) The mesh width of the strainer shall be about 35 mesh (0.4mm).

(2) The design pressure shall be 1.0 MPa.

c. Fabrication

(1) The backwash portion shall be screen rotation type or backwash nozzle rotation type, and the rotating body shall be rotated through the speed reducer from the motor by the rotating shaft fixed at the upper bearing.

(2) The opening portion of the strainer shall be in a shape suited especially for removing fibrous substances.

(3) The casing shall be made of cast iron or rolled steel.

(4) Automatic washing in accordance with timer setting (variable) and differential pressure shall be possible.

(5) The automatic wash equipment shall be of self-washing type and the automatic valve shall be operated by an air cylinder or motor.

(6) The control panel shall comprise an operation panel and a relay panel to control the interlocking circuit between the main body and the backwash valve. The operation panel and the relay panel may be constructed integral with each other.

(7) The connection flange shall be in accordance with JIS 10K or equivalent.

d. Materials

(a) Casing : Cast iron or rolled steel

(b) Strainer : Synthetic resin or stainless steel type 304

(c) Shaft :If the shaft has a submerged sliding portion, it shall be made of stainless steel type

304 or provided with sleeve (stainless steel).

(d) Liquid contact portion bolt and nut: Stainless steel type 304

e. Accessories (per Unit)

(a)	Automatic backwash equipment	x 1 set
(b)	Differential pressure switch	x 1 set
(c)	Pressure gauge (diaphragm type)	x 1 set
(d)	Backwash valve	x 1 set
(e)	Small piping around the equipment	x 1 set
(f)	Control panel (outdoor wall mounted type)	x 1 set

f. Execution

Refer to various sub-sections in Section 15.1.

g. Specification

Type	: Automatic Backwashing Type
Quantity	: 1 unit
Discharge capacity	: 0.34m^3/min
Motor output	: 0.4kW

30. Water Supply Unit

a. General

The unit shall be a pressure tank combined with horizontal centrifugal pumps. The tank shall be installed to store pressurized water to accommodate variations of the water usage.

b. Specification

Type	: Pressure Tank Type
Quantity	: 1 unit (1 standby)
Discharge capacity	: 2.2m^3/min
Total head	: 40m
Motor output	: 15kW

31. Strainer Grit Scrubber (Refer to Particular Specification – Section 15.2.11.29)

a. General

The automatic washing strainer shall remove inclusions contained in the secondary treated sewage supplied under pressure by the treated water pump.

b. Specification

Type	: Automatic Backwashing Type

Quantity : 1 unit

Discharge capacity : 0.3m^3/min

Motor output : 0.4kW

32. Strainer Desulfurizer (Refer to Particular Specification – Section 15.2.11.29)

a. General

The automatic washing strainer shall remove inclusions contained in the secondary treated sewage supplied under pressure by the treated water pump.

b. Specification

Type : Automatic Backwashing Type

Quantity : 1 unit

Discharge capacity : 6.1m^3/min

Motor output : 0.4kW

33. Treated Water Valve (Refer to Standard Specification – Section 15.13.4)

a. General

The valve shall control the water flow to the treated water tank.

b. Specification

Type : Motorized Butterfly Valve

Quantity : 1 unit

Dimension : Dia. 400mm

Motor output : 0.4kW

34. Scrubber

a. General

The scrubber shall be installed at the side of the sludge treatment building, and shall be capable of removing highly concentrated odor coming out from the sludge dewatering facility and the thickening facility.

It deodorizes the gas by decomposing odor constituents by passing the gas through a charged-layer bearing microorganisms. The apparatus shall comprise deodorizing tower main body, water spraying device, manometer, etc.

b. Design Condition

(1) The concentration of the gas, which is the object of deodorization, and the treated gas concentration shall correspond to specifications outlined in the Particular Specification.

(2) The mean empty tower flow velocity shall be about 0.05 - 0.3 m/s and space speed SV shall be about 50 - 400 L/hr., varying appropriately to the odor conditions.

(3) The cartridge to be charged shall be of a material grade and structure that easily bears microorganisms.

(4) A water-spraying device shall be provided to prevent drying caused by evaporation of moisture from the cartridge, to replenish moisture to the carrier, and to wash off sulfuric acid ion to be generated through deodorizing reaction.

c. Fabrication

(1) The tower main body shall be of a rectangular type (horizontal multi-stage type). The sections in the tower for introduction and discharge of gas shall be of a chamber structure so as to prevent eccentric flow of gas. Furthermore, the tower main body shall provide sufficient strength to hold the cartridge.

(2) The tower main body shall be made of GRP. Furthermore, it shall provide sufficient strength against carrier weight (moistened state).

(3) The tower main body shall be provided with gas duct mounting seats, inspection holes, carrier bring-in and taking-out ports, required nozzles and others.

(4) The water-spraying device shall comprise motor-operated valve, piping, water spray nozzles, etc., and its main portions shall be of material grades that take corrosion resistance into account. Furthermore, water spray nozzles shall be of a layout and structure that permit equal water spraying over the carrier.

(5) Clean water or treated water shall be used for water spraying, and it shall be possible to perform water spraying in intermittent or continuous running using a timer, or the like. However, water supply equipment for water spraying, such as pump, shall not be included in the apparatus.

(6) Platform, staircases, ladders, handrails, etc. for inspection of the apparatus shall be provided as required.

d. Materials

(a)	Tower main body	: GRP
(b)	Cartridge	: Synthetic resin (polyethylene) or equivalent
(c)	Spray nozzle	: PVC or stainless steel
(d)	Water spray and chemical piping	: PVC or steel pipe
(e)	Inspection platform	: Rolled steel
(f)	Bolts and nuts	: Stainless steel or GRP

e. Accessories (per Unit)

(a)	Control	
(b)	Manometer or pressure gauge	x 1 set
(c)	Drain pipe	x 1 lot
(d)	Anchor bolts and nuts	x 1 lot

f. Execution

Refer to various sub-sections in Section 15.1.

g. Specification

Type	: Biological Scrubber
Quantity	: 2units

Capacity : $90m^3$/min

Motor output : 0.75kW

35. Odor Fan (Refer to Particular Specification – Section 15.2.2.18)

a. General

The exhaust fan shall be installed at the inlet of the scrubber.

b. Specification

Type : Centrifugal Fan

Quantity : 1 unit (1 standby)

Capacity : $90m^3$/min

Pressure : 2.5kPa

Motor output : 5.5kW

36. Mist Separator

a. General

The mist separator shall be installed at the inlet of the exhaust fan, and shall be capable of removing dust in the gas.

The mist separator shall be used for separating and eliminating the mist in the gas sucked in by the exhaust fan. The apparatus shall comprise casing, mist- separating element, washing water spray nozzles, etc.

b. Design Condition

(1) The apparatus shall be of a structure that fully takes weather resistance and corrosion resistance into account because of outdoor installation.

(2) The apparatus shall be of a structure to minimize pressure loss, and measures that prevent occurrence of plugging, etc. even when the gas contains dust is treated.

c. Fabrication

(1) The apparatus shall comprise casing as well as mist-separating element, washing-water spray nozzles, etc. incorporated in the casing. It shall be of a structure that is capable of efficiently eliminating mist, which is contained in the blown gas, as it collides against and attaches to the element.

(2) The casing shall be made of a material grade, such as synthetic resin or steel sheet that take into account weather resistance and corrosion resistance because of outdoor installation. Furthermore, the casing shall also provide the strength to withstand vibration.

(3) The mist-separating element shall be made of synthetic resin or steel sheets. It shall be of a structure to provide low resistance and low pressure loss.

(4) The washing-water spray nozzles and tubing shall be made of a material, such as PVC or steel piping, that takes into account corrosion resistance.

d. Materials

(a) Casing : Synthetic resin or Rolled steel

(b) Element : Synthetic resin or Rolled steel

(c) Washing water spray nozzles and piping : PVC or steel pipe

(d) Bolts and nuts : Stainless steel

e. Accessories (per Unit)

(a) Anchor bolts and nuts x 1 lot

f. Execution

Refer to various sub-sections in Section 15.1.

g. Specification

Type : Mist Separator

Quantity : 1 unit

Capacity : 180m^3/min

P15.2.12. Hopper House Facility (S25)

a. General

The mechanical components in the hopper house facility 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 of Gas Holder Facility

Tag Number	Name	Item Number	Quantity
S25-CC-01 to 03	Cake Conveyor	S25-MM-01	: 2 units (1 standby)
S25-CH-01 to 06	Cake Hopper	S25-MM-02	: 4 units (2 standbys)
S25-CT-01 to 03	Cake Tripper	S25-MM-03	: 2 units (1 standby)
	Piping	S25-MM-04	: Lot
	Steel works	S25-MM-05	: Lot
	Other Necessary Works	S25-MM-06	: Lot

1. Cake Conveyor (Refer to Standard Specification – Section 15.12.2)

a. General

The sludge cake conveyor shall convey the sludge from the sludge-dewatering unit to the sludge cake hopper.

b. Specification

Type : Belt Conveyor

Quantity : 2 units (1 standby)

Dimension : W 600mm x L 19m

Power requirement : 1.5 kW

2. Cake Hopper

a. General

The hopper shall be used for the storage of sludge sent from the sludge-dewatering unit.

The hopper shall be provided to store, and further to discharge from the bottom. It shall comprise hopper main body, frame, checking walkway, stairway, open-close gate, motor-driven open-close units, etc.

b. Design Condition

Prevention of arching phenomenon shall be considered. The hopper shall be manufactured to have a total capacity of nominal capacity (m3) plus 5%.

c. Fabrication

(1) The hopper shall be a welded structure of steel plate and shaped steel, and its frame shall be mounted firmly to the concrete foundation by means of foundation bolts.

(2) Opening and closing of the gate shall be by cut-gate method. Drive shall be hydraulic or pneumatic or motor driven.

(3) The hopper shall be able to indicate the weight by means of a load cell type weight detector. For each hopper, four detecting elements and an instrument panel (V/I converter, indicator) shall be provided as accessories. However, the instrument panel may be a composite with the local control panel.

(4) Under the hopper, a movable drain receiving trough shall be provided in a position not interfering with passage of the carrying vehicle. Drainpipes also shall be installed.

(5) In the case of a floor installation type hopper, an opening between the hopper and the foundation shall be covered with checkered steel plates.

(6) The local control panel shall be self-standing type.

d. Materials

(1) Main body, frame, walkway, and stairway : Rolled steel

e. Protection Equipment

(1) Mechanical protection equipment

Speed reducer built-in torque limiter

(2) Electrical protection equipment

An over-current detector with instantaneous converter shall be provided in case the mechanical protection is not provided.

f. Accessories (per Unit)

(1) Frame x 1 set

(2) Open-close device x 1 set

(3) Walkway, stairway (if necessary) x 1 set

(4) Foundation bolt and nut x 1 set

(5) Weight detector x 1 set

(6) Discharge side skirt (made of rubber or fabric vinyl) x 1 set

(7) Water cutting trough x 1 set

(8) Oil (if necessary) x 1 can

g. Execution

Refer to various sub-sections in Section 15.1

h. Specification

Type	: Motor Driven Cut Gate Type
Quantity	: 4 units (2 standbys)
Effective capacity	: $15m^3$
Motor output	: 2.2kW x 2

3. Cake Tripper

a. General

The cake tripper shall be used to change the transmission point of the sludge cake in the hopper house. This is attached to the cake conveyor and comprise drive unit, frame and tripper blade.

b. Fabrication

(a) Tripper shall traverse up and down by means of a drive unit. The structure shall prevent belt clogging and the sludge cake dropping out.

(b) Rubber shall be attached to the top of tripper blade.

c. Materials

(a) Frame	: Steel
(b) Tripper Blade	: Steel, Rubber
(c) Cake Shute	: Stainless steel

d. Execution

Refer to various sub-sections in Section 15.1.

e. Specification

Type	: Motor Driven
Quantity	: 2 units (1 standby)
Motor output	: 0.4kW

P15.2.13 Gas Holder Facility (S26)

a. General

The gas holder shall be used for storing the digestion gas produced from the digester after de-sulfurization and for supplying the gas to the gas combustor unit under constant pressure. The apparatus is an anhydrous gas storage tank, and shall comprise a bottom, shell lower section, seal membrane, piston, etc.

b. Design Condition

(1) The apparatus shall be of a structure that provides weather resistance and wind resistance.

(2) Since the apparatus is a holder for combustible gas, it shall be of airtight structure so that no gas leakage will occur through welded parts, sealing membrane, etc. Furthermore, since the stored gas is of a strong corrosive nature, a material that takes corrosion resistance into account shall be used to coat the tank interior surface.

c. Fabrication

(1) The tank shall comprise bottom plates, body, top roof, movable piston, seal diaphragm that connects preceding components, equalizer, staircase, etc.

(2) The tank shall be of such a mechanism that when the tank is empty the piston, still on the bottom plates, becomes afloat when gas is filled in the airtight space from the lower body and the gas internal pressure reaches the specified level.

(3) Concurrent alignment of the piston motion shall take place automatically with the equalizer.

(4) When the gas pressure in the gas exceeds the specified level, the surplus gas shall be discharged through the gas safety unit, which is mentioned in the Section 484. Furthermore, the tank shall be provided with a negative pressure preventing mechanism so that no negative pressure will be produced when the tank is dried up.

(5) Access means such as manhole for repair and inspection shall be provided as required.

(6) The tank shall be of such a structure that the condensate produced in the tank can be drained through a drain valve.

(7) The line for gas supply to the combustor shall be provided with gas filter, flame arrester and sediment trap.

(8) A local indicating type capacity meter shall be provided to check the gas volume in the tank.

(9) A staircase to access to the tank top roof shall be provided, and the top roof and staircase shall be provided with handrails.

d. Materials

(a)	Side plate	:	Rolled steel
(b)	Bottom plate	:	Rolled steel
(c)	Piston deck	:	Rolled steel
(d)	Roof plate	:	Rolled steel
(e)	Sealing device	:	Synthetic rubber or equivalent
(f)	Balance weight	:	Rolled steel
(g)	Wire rope	:	Stainless steel

e. Accessories (per Unit)

(a)	Safety valve	x 1 unit
(b)	Gas inlet nozzle and valve	x 1 set
(c)	Gas outlet nozzle and valve	x 1 set

(d) Seal pot and valve x 1 set

(e) Deck support x 1 set

(f) Gas pressure adjust block x 1 set

(g) Local indicating pressure gauge x 1 set

(h) Local indicating capacity meter x 1 set

(i) Inlet gas emergency shutoff valve x 1 unit

(j) Outlet gas emergency shutoff valve x 1 unit

(k) Gas filter x 1 unit

(l) Flame arrester x 1 unit

(m) Sediment Trap (if necessary) x 1 unit

(n) Others and required x 1 lot

f. Execution

Refer to various sub-sections in Section 15.1.

g. Specification

Type : Wet Type Gas Holder

Quantity : 1 unit

Treatment capacity : 1300m^3

P15.2.14. Boiler House Facility (S27)

a. General

The mechanical components in the boiler house facility 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 of Boiler House Facility

Tag Number	Name	Item Number	Quantity
S27-CB-01/02	Coal Boiler	S27-MM-01	: 1 unit (1 standby)
S27-CG-01/02	Coal Grinder	S27-MM-03	: 1 unit (1 standby)
S27-CO-01	Coal Conveyor	S27-MM-05	: 1 unit
S27-AO-01	Ash Conveyor (1)	S27-MM-07	: 1 unit
S27-AO-02	Ash Conveyor (2)	S27-MM-09	: 1 unit
S27-SP-01/02	Water Supply Pump	S27-MM-12	: 1 unit (1 standby)
S27-HS-01/02	Water Softening Unit	S27-MM-14	: 1 unit (1 standby)
S27-SP-03/04	Soft Water Pump	S27-MM-16	: 1 unit (1 standby)

S27-WT-01	Clear Water Tank	S27-MM-11 : 1 unit
S27-WW-01	Generator	S27-MM-18 : 1 unit
S27-SP-05/06	Heating Pump	S27-MM-20 : 1 unit (1 standby)
S27-HE-01	Heat Exchanger	S27-MM-22 : 1 unit
S27-EF-01	Exhaust Fan	S27-MM-24 : 1 unit
	Removal of Existing Coal Boiler	S27-MM-02 : 2 units
	Removal of Existing Coal Grinder	S27-MM-04 : 2 units
	Removal of Existing Coal Conveyor	S27-MM-06 : 1 unit
	Removal of Existing Ash Conveyor (1)	S27-MM-08 : 1 unit
	Removal of Existing Ash Conveyor (2)	S27-MM-10 : 1 unit
	Removal of Existing Water Supply Pump	S27-MM-13 : 2 units
	Removal of Existing Water Softening Unit	S27-MM-15 : 2 units
	Removal of Existing Soft Water Pump	S27-MM-17 : 2 units
	Removal of Existing Generator	S27-MM-19 : 1 unit
	Removal of Existing Heating Pump	S27-MM-21 : 2 units
	Removal of Existing Heat Exchanger	S27-MM-23 : 1 unit
	Removal of Existing Exhaust Fan	S27-MM-25 : 1 unit
	Piping	S27-MM-26 : Lot
	Steel Works	S27-MM-27 : Lot
	Other Necessary Works	S27-MM-28 : Lot

1. Coal Boiler

a. General

Coal boilers shall be replaced in the existing boiler house in order to supply steam as a heat source for digesting sludge in the digester and seal water in the gasholder. They also supply hot water to the heating system in various buildings through a heat exchanger in the boiler house. The boiler shall use coal and anthracite as fuel. The existing coal boiler is double-drum type fire tube steam boiler

b. Design Condition

(1) The equipment shall generate steam in the water tube inside the combustion chamber by burning coal continuously.

(2) The equipment shall be of a structure that provides both heat resistance and pressure resistance.

(3) Pipelines in the equipment shall be of air/watertight structure so that no steam/water leakage will occur through welded parts, sealing membrane, etc.

(4) Combustion chamber and water tube shall be explosion proof.

(5) Walk way shall be provided to make maintenance work for high place.

(6) Coal shall be supplied from 2nd floor to the feeder

(7) As for the other condition, refer to the specification of DKBR-4-13PM3-RPK for the existing Russian made boiler in the STP.

c. Fabrication

(1) The boiler shall be installed safely within the existing boiler house.

(2) The boiler shall locate the water tubes outside the combustion chamber.

(3) The boiler shall have the effective heat insulation inside the steel plate cladding.

(4) Coal ash shall be removed from the bottom of combustion chamber to ash conveyer.

(5) Access means such as manhole for repair and inspection shall be provided as required.

(6) A staircase to access to the boiler top shall be provided, and the top and staircase shall be provided with handrails.

(7) Welded parts shall have no defect by X-ray inspection.

d. Materials

(a)	Outer skin	:	Steel
(b)	Heat insulation	:	Glass wool or equivalent
(c)	Grate	:	Cast iron

e. Accessories (per Unit)

(a)	Air heater	x 1 set
(b)	Ventilator	x 1 set
(c)	Smoke exhauster	x 1 set
(d)	Furnace device	x 1 set
(e)	Deck support	x 1 set

f. Execution

Refer to various sub-sections in Section 15.1.

g. Specification

Type	: Water tube coal boiler
Quantity	: 1 unit (1 standby)
Capacity	: 4.0 ton-steam generation/hr
Fan Motor output	: 11kW

2. Coal Grinder

a. General

Coal grinder shall grind coal to the suitable size for the feeder and grate of the boiler.

b. Materials

(a)	Main body with bearing housing	: Cast iron
(b)	Driven shaft	: Alloy steel or stainless steel
(c)	Crusher/Cutter	: Abrasion-proof alloy steel
(d)	Bearings	: Cylindrical roller

c. Specification

Type	: Two Axis Grinder
Quantity	: 1 unit (1 standby)
Dimension	: Dia. 300mm x L 1.5m
Power requirement	: 11 kW

3. Coal Conveyor

a. General

The belt conveyor shall transport grinded coal to feeder and shall comprise bucket drive unit, guide rail and bucket.

b. Design Conditions

The conveyor shall not scatter coals at the transportation, and the climbing velocity shall be about 10 m/min.

c. Fabrication

(1) Drive unit

(a) The drive unit shall use a motor-direct coupled cyclo reducer, planetary gear reducer, etc. and the power shall be transmitted to the winding drum.

(b) Around the drive unit, checking walk galleries and hand rails shall be provided, as necessary.

(c) The winding drum shall be provided with a safety cover.

(d) The motor shall be provided with an electromagnetic brake.

(2) Guide rail

(a) The guide rail shall be made of shape steel and steel plates in combination.

(b) The guide rail shall be mounted firmly to the hopper frame and the concrete floor not to be distorted by up- and down-motion of buckets. The joint portion shall be finished smooth enough to ensure smooth passage of guide rollers.

(c) The guide rail shall be well balanced as a whole against external force or vibration given during operation and shall be constructed such that the substance charged in the bucket falls at an approximate central part of the hopper.

(d) In the highest portion of the guide rail, fixing roller shall be provided.

(e) Along the guide rail, a protection cover of stainless steel or rolled steel shall be mounted.

(f) The guide rail shall be constructed such that the bucket can be removed during repair.

(3) Bucket

(a) The bucket shall be made of steel plates and constructed to have an adequate strength. The guide roller shall be made of carbon steel or cast steel.

(b) The conveyor shall be constructed such that, in the event of power service interruption during the bucket rising or lowering, the brake is applied immediately and the load is held safely.

(c) Stopping of the bucket at upper limit or lower limit shall be accomplished by limit switch. The limit switch shall be of water resisting type. Limit switches for over-winding prevention, slack prevention and irregular winding prevention shall be provided.

d. Materials

Materials shall be as follows.

(a) Guide rail : Rolled steel

(b) Bucket : Rolled steel

(c) Wire rope : Steel

(a) Anchor bolt x 1 set

e. Specification

Type	: Skip hoist belt conveyor
Quantity	: 1 unit
Dimension	: Tilt 10m x Level 28m
Power requirement	: 22 kW (the same with existing)

4. Ash Conveyor (1) (Refer to Standard Specification – Section15.12.2)

a. General

The belt conveyor shall be used to transport ash to ash conveyor (2).

b. Specification

Type	: Belt Conveyor
Quantity	: 1 unit
Belt Material	: Heat Resistance
Dimension	: W 400mm x L 28m
Power requirement	: 1.5 kW

5. Ash Conveyor (2) (Refer to Standard Specification – Section15.12.2)

a. General

The belt conveyor shall be used to transport ash to yard out of boiler house.

b. Specification

Type : Belt Conveyor

Quantity : 1 unit

Belt Material : Heat Resistance

Dimension : W 400mm x L 31m

Power requirement : 1.5 kW

6. Water Supply Pump (Refer to Standard Specification – Section 15.5.2)

a. General

The unit shall supply clear water to water-softening unit from water tank.

b. Specification

Type : Volute Pump

Quantity : 1 unit (1 standby)

Discharge capacity : 0.2m^3/min

Motor output : 5.5kW

7. Water Softening Unit

a. General

The equipment shall be installed to soften clear water before supplying to the heating pipeline network. Softening shall be done by ion exchange by passing through the ion exchange resin under the pressure of 2.5 –3.5 kg/cm2. The ion exchange resin shall be regenerated by regeneration process periodically. Water level indicator, pressure gauge and thermometer shall be furnished.

b. Materials

Materials shall be as follows.

(a) Ion exchange cylinder : Stainless steel

(b) Regeneration tank : Polyethylene

c. Accessory

(a) Anchor bolt x 1 set

d. Specification

Type : Ion exchange resin

Quantity : 1 unit (1 standby)

Ion exchange resin : Globular shape, diameter less than 1mm, 200 l

Ion exchange rate : 3 – 10.0 m3/hr

Resin regeneration tank : 200 l

Power requirement : 0.2 kW

8. Soft Water Pump (Refer to Standard Specification – Section15.5.3)

a. General

Pumps shall be a horizontal, end suction top vertical discharge, multi-stage centrifugal pump, directly connected to the motor with flexible coupling and complete with shaft seals and bearings.

b. Specification

Type	: Multistage Pump
Quantity	: 1 unit (1 standby)
Discharge capacity	: 2.2m^3/min
Motor output	: 45kW

9. Clear Water Tank (Refer to Particular Specification – Section 15.2.5.7)

a. General

The tank shall be a PVC tank and shall comprise tank main body, air pipe, electrical level gauge, direct reading level gauge, ladder, manhole, etc.

b. Specification

Type	: PVC Tank
Quantity	: 1 unit
Capacity	: 10m^3

10. Condenser

a. General

This shall be used to cool the steam to water for recycling in the heating system. Excess steam and steam outflow from heat exchanger shall be introduced to the equipment. Softened water shall be supplied to fill the shortage of the water in the system.

b. Specification

Type	: Condenser
Quantity	: 1 unit
Capacity	: 12m^3

11. Heating Pump (Refer to Standard Specification – Section15.5.2)

a. General

The unit shall supply hot water to the facilities that need hot water.

b. Specification

Type	: Volute Type Pump
Quantity	: 1 unit (1 standby)
Discharge capacity	: 0.9m^3/min

Motor output : 11kW

12. Heat Exchanger

a. General

This shall be installed to exchange the heat energy between hot steam and water in the double-layered pipe unit with high efficiency in the counter current. The unit shall be heat-retention structure with the lagging such as glass wool.

b. Materials

Materials shall be as follows.

(a) Main body : Stainless steel

(b) Outer skin : Rolled steel

(c) Insulation : Glass wool

c. Accessory

(a) Anchor bolt x 1 set

d. Specification

Type : Double-layered counter current heat exchanger

Quantity : 1 unit

13. Exhaust Fan (Refer to Standard Specification – Section 15.10.2)

a. General

The exhaust fan shall be installed at the outlet of ash conveyor (2) to absorb dusty air inside.

b. Specification

Type : Propeller Fan

Quantity : 1 unit

Motor output : 0.75kW

DIVISION P15 MECHANICAL WORKS

P15.3 INTERMEDIATE PUMP STATIONS

a. General

The seventeen (17) intermediate pump stations (hereinafter PS) subject to rehabilitation are shown in the table below with each location.

No	Station No.	Location (address)
1.	PS No.1	Beginning of the Abai Ave., the district of the "Moskvich" cooperative
2.	PS No.2	Geroi Krasnodona Str.
3.	PS No.3	Beisekova-Orenburskaya Str.
4.	PS No.4	Ugolnaya Str. – overpass No.2
5.	PS No.6	District of the "Koktal" settlement
6.	PS No.7	"Molodezhnyi" micro-district
7.	PS No.10	"Agromash" Plant – railway-carriage repair plant
8.	PS No.11	Hospital, Abylai-Khan Ave. 3/3
9.	PS No.15	"Tselinnyi"micro-district
10.	PS No.16	Skladskaya Str. 11
11.	PS No.17	"Block 72", beginning of the Moskovskaya Str.
12.	PS No.21	"Prigorodnyi" settlement
13.	PS No.24	Moskovskaya Str. 21/1
14.	PS No.28	"Avtomatika" industrial workshop
15.	PS No.34	PDU settlement – Astrakhansky settlement
16.	PS No.37	Kotovsky Str.
17.	PS No.IH	Isolation hospital

Rehabilitation with the replacement of equipment shall be carried out thirteen (13) PS (No.1 to No.13 on the table). Four new pump stations shall be constructed with manhole type pump stations (No.14 to No.17).

The mechanical components of the seventeen (17) Intermediate Pump Stations shall consist of the following equipment. Details of equipment shall be designed using the following conditions on the table below and in accordance with the specification set forth hereinafter in this Section.

Removal of equipment subject to rehabilitation shall be done prior to replacement for the thirteen (13) PS for rehabilitation. Removal work shall be undertaken carefully to enable later reuse. Removed all the equipment, wires and pipelines shall be transported to the place designated by ASA.

Replacement work shall include all the plumbing, fittings and installation of small valves such as suction valves, check valves and back wash valves as necessary.

Design Conditions for the Intermediate Pump Stations

Related drawing	Pump Station	Structure(m)		Exisisting (m^3/hr)				Rehabilitation(m^3/hr)				
		Dia.	Dep	Capacity	Duty	Standby	Nominal	Capacity	Duty	Standb	Total	Head
S56	**7**	24	10.6	3500	0	2	2,500				5,700	
				1600	1	1		1600	2	1		11.0
				800	1	0		800	2	0		11.0
				450	2	0		450	2	0		11.0
S51	**10**	16	8.0	800	0	1	400				1,350	
				450	2	2		450	3	2		11.0
	1	16	9.8	800	1	2	9,600	800	2	2	1,600	10.0
				450	1	0						
	3	16	7.8	650	2	2	1,750	800	3	2	2,400	9.0
				450	1	0						
	4	12	7.8	800	0	1	400				900	
				450	1	3		450	2	1		7.0
	6	12	4.9	1600	1	2	2,800	1600	2	2	3,200	10.0
				800	1	0						
	2	9	7.7	450	1	1	700	450	2	1	900	7.0
				368	1	0						
S58	**11**	6	6.5	144	1	0	180				228	
				114	0	1		114	2	1		8.0
	15	6	6.5	250	1	0	250	250	2	1	500	11.0
				114	0	1						
	16	6	7.3	114	1	1	100	80	2	1	160	24.0
	21	6	6.4	250	1	1	250	200	1	1	200	19.0
	24	4	6.9	80	1	0	80	80	1	1	80	15.0
	17	3	5.1	114	1	1	114	250	1	1	250	18.0
S64	**28**	2.5	5.0	50	1	0	50	50	1	1	50	28.0
	34	2.5	4.0	50	1	0	50	50	1	1	50	15.0
	37	2.5	5.0	50	1	0	50	50	1	1	50	14.0
	IH	2.5	7.1	50	1	0	50	50	1	1	50	15.0

Note: The number of "related drawing" on the table corresponds to that of D/D drawing

The pump manufacturer shall substantiate the quoted efficiencies with at least one owner's certificate and corresponding test record of specific speed similar to the specified pump with suction diameter of not less

than 100 mm.

The pump manufacturer shall substantiate manufacturing and supplying of pumps and motors with the following conditions satisfactorily completed outside of home country during last 5 years.

1. Horizontal centrifugal pump of similar capacity and head; Horizontal centrifugal pump with quoted pump efficiency at lower speed and capacity than specified.
2. Vertical centrifugal pump of similar capacity and head.
3. Vertical centrifugal pump with quoted pump efficiency at lower speed and capacity than specified
4. Submersible pump of similar capacity and head.
5. Submersible pump with quoted pump efficiency at lower speed and capacity than specified.

The pump manufacturer shall carry out surge analysis on the pipelines on the basis of data of rotating element, characteristic of reflux valve and the pipelines to ensure no damages caused due to the surge. If any protection methods required for the surge, the methods shall be proposed by the pump manufacturer for the engineer's approval along with report of surge analysis.

P15.3.1 PS No. 1 (S51)

a. Equipment List of PS No.1

Tag Number	Name	Item Number	Quantity
S51-MV-01	Inflow Valve	S51-MM-01	: 1 unit
S51-MS-01	Fine Screen	S51-MM-02	: 1 unit
S51-SP-01 to 04	Sewage Pump	S51-MM-03	: 4 units (2 standby)
S51-SG-01	Screenings Grinder	S51-MM-04	: 1 unit
S51-DP-01/02	Sump Drainage Pump	S51-MM-05	: 2 units
S51-HH-01/02	Hoist Block (3t)	S51-MM-06	: 2 units
	Removal of sewage pump	S51-MM-07	: 3 units
	Removal of sewage pump	S51-MM-08	: 1 unit
	Removal of drain pump	S51-MM-09	: 2 units
	Installation of mechanical rakes	S51-MM-10	: 1 unit
	Installation of mechanical crushing machine	S51-MM-11	: 1 unit
	Removal of the hoisting devices	S51-MM-12	: 2 units
	Removal of the suction pipeline	S51-MM-13	: 4 units
	Removal of the pressure pipeline	S51-MM-14	: 20 m
	Removal of the pressure sewer	S51-MM-15	: 20 m

Removal of discharge pipes	S51-MM-16	: 60 m
Removal of valve	S51-MM-17	: 4 units
Removal of the back-pressure valve	S51-MM-18	: 4 units
Removal of valves	S51-MM-19	: 4units
Removal of valves	S51-MM-20	: 4units
Removal of the bubbling pipeline	S51-MM-21	: 45 m
Removal of the bubbling valve	S51-MM-22	: 2 units
Removal of the ventilation	S51-MM-23	: 1 unit
Removal of the inflow valve	S51-MM-24	: 1 unit
Removal of Exhaust Fan	S51-MM-25	: 1 unit
Removal of Air intake Fan	S51-MM-26	: 1 unit
Installation of Exhaust Fan	S51-MM-27	: 1 unit
Installation of Air intake Fan	S51-MM-28	: 1 unit
Piping	S51-MM-29	: Lot
Steel works	S51-MM-30	: Lot
Other Necessary Works	S51-MM-31	: Lot

1. Inflow Valve (Refer to Standard Specification-Section 15.13.2)

a. General

The valves shall be installed to control or to stop the inflow

b. Specification

Type	: Motorized Gate Valve
Dimension	: Dia. 600mm
Quantity	: 1 unit
Motor output	: 1.5 kW

2. Fine Screen (Refer to Particular Specification-Section 15.2.2.2)

a. General

This screen shall be installed to remove coarse materials like fiber, sticks, rags and other materials and coarse suspended substances contained in the influent sewage.

b. Specification

Type	: Mechanically Cleaning Bar Screen
Quantity	: 1 unit
Dimension	: W 0.6m x Depth 0.6m

Clear spacing between bars :25 mm

Motor output : 1.5kW

Special Materials : Body Seat : Stainless Steel Type 304

Disc Seat : Aluminum Bronze

c. Fabrication

i) The screen shall be manufactured with flat bar made of stainless steel type 304. The barsshall be equally spaced with spacers and shall be tightened and assembled together by means of through-bolts, which shall have screws at both ends.

ii) The screen shall be mounted to the guide rails. The guide rails shall be fixed by means of anchor bolts at both ends to the wall of Pump Station.

3. Sewage Pump (Refer to Standard Specification-Section 15.11.4)

a. General

The sewage pumps lift up and deliver sewage to the connecting sewer or pressure line.

b. Specification

Type : Horizontal Shaft Volute Type Mixed Flow Pump

Quantity : 4units (2 standby)

Discharge capacity : $14m^3/min$

Total head : 10.0m

Motor output : 90kW

Efficiency : not less than 74 percent at duty point

NPSHA (minimum) : approx. +2 m

Max. noise level : 85 dB(A) at 1.0 m

Driving method : direct drive through coupling from motor at B1 floor

Installation : indoor

Motor encl. protection : IP 44

Wet well water levels : HWL +336.83 m amsl

: MWL +336.20 m amsl

Wet well bottom level : +334.33 m amsl

WL at discharge or highest point along the pressure line : +341.40 m amsl

Pressure line : 600 mm and 800mm diameter, approx. 700 m long

4. Screening Grinder (Refer to Standard Specification-Section 15.2.11.9)

a. General

The screenings grinder grinds screenings down to protect pump equipment before discharging into

reservoir.

b. Specification

Type	: Motorized overlapping double axis layered cutter type
Capacity	: 0.4m3/hr
Quantity	: 1 unit
Motor output	: 7.5 kW

5. Sump Drainage Pumps (Refer to Standard Specification-Section 15.11.1)

a. General

This pump shall be installed in the pits and shall be used to drain water accumulated in the sump.

b. Specification

Type	: Submersible Drain Pump
Quantity	: 2 units
Discharge capacity	: 0.3m^3/min
Total head	: 15m
Motor output	: 1.5kW

6. Hoist Block (Refer to Standard Specification-Section 15.12.3)

a. General

This hoist block shall be used for installation, assembly, maintenance and checking of the equipment.

b. Specification

Type	: Geared Trolley Chain Block
Capacity	: 3.0 ton
Quantity	: 2 units

P15.3.2 PS No. 2 (S52)

a. Equipment List of PS No.2

Tag Number	Name	Item Number Quantity
S52-SP-01 to 03	Sewage Pump	S52-MM-01: 3 units (1 standby)
S52-SG-01	Screenings Grinder	S52-MM-02: 1 unit
S52-DP-01	Sump Drainage Pump	S52-MM-03: 1 unit
S52-HH-01	Hoist Block (2t)	S52-MM-04: 1 unit
	Removal of sewage pumps	S52-MM-05: 2 units

Removal of sewage pumps	S52-MM-06: 1 unit
Removal of drain pumps	S52-MM-07: 1 unit
Installation of the mechanical crushing machine	S52-MM-08: 1 unit
Removal of the hoisting devices	S52-MM-09: 1unit
Removal of the suction pipeline	S52-MM-10: 3 units
Removal of the pressure pipeline	S52-MM-11: 10 m
Removal of discharge pipes	S52-MM-12: 30 m
Removal of suction valves	S52-MM-13:3 units
Removal of back pressure valves	S52-MM-14: 3 units
Removal of the pressure pipeline	S52-MM-15: 3 units
Removal of the pressure sewer valves	S52-MM-16: 3 units
Removal of the bubbling pipeline	S52-MM-17: 1 unit
Removal of the ventilation	S52-MM-18: 1 unit
Removal of the inflow valve	S52-MM-19: 1 unit
Removal of Exhaust Fan	S52-MM-20: 1 unit
Removal of Air Intake Fan	S52-MM-21: 1 unit
Installation of Exhaust Fan	S52-MM-22: 1 unit
Installation of Air Intake Fan	S52-MM-23: 1 unit
Piping	S52-MM-24: Lot
Steel Works	S52-MM-25: Lot
Other Necessary works	S52-MM-26: Lot

1. Sewage Pump (Refer to Standard Specification-Section 15.11.4)

a. General

The sewage pumps lift up and deliver sewage to the connecting sewer or pressure line.

b. Specification

Type	: Horizontal Shaft Volute Type Mixed Flow Pump
Quantity	: 3units (1 standby)
Discharge capacity	: 7.5m^3/min
Total head	: 7.0m
Motor output	: 55kW
Efficiency	: not less than 74 percent at duty point
NPSHA (minimum)	: approx. +2 m

Max. noise level	: 85 dB(A) at 1.0 m
Driving method	: direct drive through coupling from motor at B1 floor
Installation	: indoor
Motor encl. protection	: IP 44
Wet well water levels	: HWL +342.11 m amsl
	: MWL +341.08 m amsl
Wet well bottom level	: +339.73 m amsl
WL at discharge	: +344.65 m amsl
Pressure line	: 1000 mm diameter, approx. 500 m long

2. Screening Grinder (Refer to Particular Specification-Section 15.2.11.9)

a. General

The screenings grinder grinds course and fine matters to protect pump equipment before flowing into reservoir.

b. Specification

Type	: Motorized overlapping double axis layered cutter, submersible type
Capacity	: 0.4m3/hr
Quantity	: 1 unit
Motor output	: 7.5 kW

3. Sump Drainage Pumps (Refer to Standard Specification-Section 15.11.1)

a. General

This pump shall be installed in the pits.

b. Specification

Type	: Submersible Drain Pump
Quantity	: 1 unit
Discharge capacity	: 0.3m^3/min
Total head	: 15m
Motor output	: 1.5kW

4. Hoist Block (Refer to Standard Specification-Section 15.12.3)

a. General

This hoist shall be used for installation, assembly, maintenance and checking of the pump.

b. Specification

Type : Geared Trolley Chain Block

Capacity : 2.0 ton

Quantity : 1 units

P15.3.3 PS No. 3 (S53)

a. Equipment List of PS No.3

Tag Number	Name	Item Number Quantity
S53-MV-01/02	Inflow Valve	S53-MM-01: 2 units
S53-MS-01/02	Fine Screen	S53-MM-02: 2 units
S53-SP-01 to 05	Sewage Pump	S53-MM-03: 5 units (2 standby)
S53-SG-01/02	Screenings Grinders	S53-MM-04: 2 units
S53-DP-01/02	Sump Drainage Pump	S53-MM-05: 2 units
S53-HH-01	Hoist Block (3t)	S53-MM-06: 1 unit
S53-HH-02	Hoist Block (1t)	S53-MM-07: 1 unit
	Removal of sewage pump	S53-MM-08: 4 units
	Removal of sewage pumps	S53-MM-09: 1 unit
	Removal of drain pumps	S53-MM-10: 2 units
	Installation of the mechanical rakes	S53-MM-11: 2 units
	Installation of the mechanical crushing machine	S53-MM-12: 1 unit
	Removal of the hoisting devices	S53-MM-13: 2 units
	Removal of the suction pipeline	S53-MM-14: 5 units
	Removal of the pressure pipeline	S53-MM-15: 25 m
	Removal of the pressure sewer	S53-MM-16: 25 m
	Removal of suction valves	S53-MM-17: 5 units
	Removal of the back-pressure valve	S53-MM-18: 5 units
	Removal of pressure pipeline valves	53-MM-19: 5 units
	Removal of pressure sewer valves	S53-MM-20: 4 units
	Removal of the bubbling pipeline	S53-MM-21: 50 m
	Removal of the ventilation	S53-MM-22: 1 unit
	Removal of the inflow valve	S53-MM-23: 2 units
	Removal of exhaust fan	S53-MM-24: 1 unit

Removal of air intake fan	S53-MM-25: 1 unit
Installation of exhaust fan	S53-MM-26: 1 unit
Installation of air intake fan	S53-MM-27:1 unit
Piping	S53-MM-28: Lot
Steel Works	S53-MM-29: Lot
Other Necessary works	S53-MM-30: Lot

1. Inflow Valve (Refer to Standard Specification-Section 15.13.2)

a. General

. The valves shall be installed to control the flow.

b. Specification

Type	: Motorized Gate Valve
Dimension	: Dia. 600mm
Quantity	: 2 units
Motor output	: 1.5 kW

2. Fine Screen (Refer to Particular Specification-Section 15.2.2.2)

a. General

This screen shall be installed to remove coarse materials like fiber, sticks, rags and other inclusions and coarse suspended substances contained in the influent sewage.

b. Specification

Type		: Mechanically Cleaning Bar Screen
Quantity		: 2 units
Dimension		: W 0.6m x Depth 0.6m
Clear spacing between bars		:25 mm
Motor output		: 1.5kW
Special Materials :	Body Seat	: Stainless Steel Type 304
	Disc Seat	: Aluminum Bronze

c. Fabrication

i) The screen shall be manufactured with flat bar made of stainless steel type 304. The bars shall be equally spaced with spacers and shall be tightened and assembled together by means of through-bolts, which have screws at both ends.

ii) The screen shall be mounted to the guide rails. The guide rails shall be fixed by means of anchor bolts at both ends to the wall of Pump Station.

3. Sewage Pump (Refer to Standard Specification-Section 15.11.4)

a. General

The sewage pumps lift up and deliver sewage to the connecting sewer or pressure line.

b. Specification

Type	: Horizontal Shaft Volute Type Mixed Flow Pump
Quantity	: 5units (2 standby)
Discharge capacity	: 14m^3/min
Total head	: 9.0m
Motor output	: 90kW
Efficiency	: not less than 74 percent at duty point
NPSHA (minimum)	: approx. +2 m
Max. noise level	: 85 dB(A) at 1.0 m
Driving method	: direct drive through coupling from motor at B1 floor
Installation	: indoor
Motor encl. protection	: IP 44
Wet well water levels	: HWL +340.68 m amsl
	: MWL+339.78 m amsl
Wet well bottom level	: +338.18 m amsl
WL at discharge	: +342.3 m amsl
Transmission main	: 500 mm diameter x2, approx. 300m long

4. Screening Grinder (Refer to Particular Specification-Section 15.2.11.9)

a. General

The screenings grinder grinds fine screenings down to protect pump equipment before discharging into reservoir.

b. Specification

Type	: Motorized overlapping double axis layered cutter type
Capacity	: 0.4m3/hr
Quantity	: 2 units
Motor output	: 7.5 kW

5. Sump Drainage Pumps (Refer to Standard Specification-Section 15.11.1)

a. General

This pump shall be installed in the drain pits and shall be used to drain water accumulated in the sump.

b. Specification

Type	: Submersible Drain Pump
Quantity	:1 unit
Discharge capacity	: 0.3m^3/min
Total head	: 15m
Motor output	: 1.5kW

6. Hoist Block (Refer to Standard Specification-Section 15.12.4)

a. General

This crane shall be used for installation, assembly, maintenance and checking of the pump system.

b. Specification

Type	: Motor driven hoist
Capacity	: 3.0 ton
Quantity	: 1 unit

7. Hoist Block (Refer to Standard Specification-Section 15.12.3)

a. Specification

Type	: Geared Trolley Chain Block
Capacity	: 1.0 ton
Quantity	: 1 unit

P15.3.4 PS No. 4 (S54)

a. Equipment List of PS No.4

Tag Number	Name	Item Number Quantity
S54-MV-01	Inflow Valve	S54-MM-01: 1 unit
S54-MS-01	Fine Screen	S54-MM-02: 1 unit
S54-SP-01 to 03	Sewage Pump	S54-MM-03: 3 units (1 standby)
S54-SG-01	Screenings Grinder	S54-MM-04: 1 unit
S54-DP-01/02	Sump Drainage Pump	S54-MM-05: 2 units
S54-HH-01	Hoist Block (2t)	S54-MM-06: 1 unit

Removal of sewage pumps	S54-MM-07: 1 unit
Removal of sewage pumps	S54-MM-08: 4 unit
Removal of drain pumps	S54-MM-09: 2 unit
Installation of the mechanical rakes	S54-MM-10: 1 unit
Installation of the mechanical crushing machine	S54-MM-11: 1 unit
Removal of the hoisting devices	S54-MM-12: 1 unit
Removal of the suction pipeline	S54-MM-13: 5 unit
Removal of the pressure pipeline	S54-MM-14: 10 m
Removal of the pressure sewer	S54-MM-15: 8 m
Removal of suction valves	S54-MM-16: 3 unit
Removal of the back-pressure valve	S54-MM-17: 2 unit
Removal of pressure pipeline valves	S54-MM-18: 2 unit
Removal of pressure sewer valves	S54-MM-19: 4 unit
Removal of the bubbling pipeline	S54-MM-20: 80 m
Removal of the ventilation	S54-MM-21: 1 unit
Removal of the inflow valve	S54-MM-22: 1 unit
Removal of exhaust fan	S54-MM-23: 1 unit
Removal of air intake fan	S54-MM-24: 1 unit
Installation of exhaust fan	S54-MM-25: 1 unit
Installation of air intake fan	S54-MM-26:1 unit
Piping	S54-MM-27: Lot
Steel Works	S54-MM-28: Lot
Other Necessary works	S54-MM-29: Lot

1. Inflow Valve (Refer to Standard Specification-Section 15.13.2)

a. General

The valves shall be installed to control the flow in the conveyance system.

b. Specification

Type	: Motorized Gate Valve
Dimension	: Dia. 800mm
Quantity	: 1 unit
Motor output	: 1.5 kW

2. Fine Screen (Refer to Standard Specification-Section 15.14 .2)

a. General

This screen shall be installed to remove coarse materials like fiber, sticks, rags and other inclusions and coarse suspended substances contained in the influent sewage.

b. Specification

Type		: Mechanically Cleaning Bar Screen
Quantity		: 1 unit
Dimension		: W 1.2m x Depth 1.2m
Clear spacing between bars		:6.0 mm
Motor output		: 1.5kW
Special Materials :	Body Seat	: Stainless Steel Type 304
	Disc Seat	: Aluminum Bronze

c. Fabrication

i) The screen shall be manufactured with flat bar made of stainless steel type 304. The bars shall be equally spaced with spacers and shall be tightened and assembled together by means of through-bolts, which shall have screws at both ends.

ii) The screen shall be mounted to the guide rails. The guide rails shall be fixed by means of anchor bolts at both ends to the wall of Pump Station.

3. Sewage Pump (Refer to Standard Specification-Section 15.11.4)

a. General

The sewage pumps lift up and deliver sewage to the connecting sewer or pressure line.

b. Specification

Type	: Horizontal Shaft Volute Type Mixed Flow Pump
Quantity	: 3units (1 standby)
Discharge capacity	: 7.5m^3/min
Total head	: 7m
Motor output	: 55kW
Efficiency	: not less than 74 percent at duty point
NPSHA (minimum)	: approx. +2 m
Max. noise level	: 85 dB(A) at 1.0 m
Driving method	: direct drive through coupling from motor at B1 floor
Installation	: indoor
Motor encl. protection	: IP 44

Wet well water levels	: HWL +346.78 m amsl
	: MWL +345.85 m amsl
Pump room floor level	: +344.18 m amsl
WL at discharge	: +349.00 m amsl
Transmission main	: 500 mm diameter, approx. 60 m long

4. Screening Grinder (Refer to Particular Specification-Section 15.2.11.9)

a. General

The screenings grinder grinds to fine screenings down to protect pump equipment before discharging into reservoir.

b. Specification

Type	: Motorized overlapping double axis layered cutter type
Capacity	: 0.4m3/hr
Quantity	: 1 unit
Motor output	: 7.5 kW

5. Sump Drainage Pumps (Refer to Standard Specification-Section 15.11.1)

a. General

This pump shall be installed in the drain pits and shall be used to drain water accumulated in the sump.

b. Specification

Type	: Submersible Drain Pump
Quantity	: 2 units
Discharge capacity	: 0.3m^3/min
Total head	: 15m
Motor output	: 1.5kW

6. Hoist Block (Refer to Standard Specification-Section 15.12.3)

a. General

This crane shall be used for installation, assembly, maintenance and checking of the pump system.

b. Specification

Type	: Geared Trolley Chain Block
Capacity	: 2.0 ton
Quantity	: 1 unit

P15.3.5 PS No. 6 (S55)

a. Equipment List of PS No.6

Tag Number	Name	Item Number	Quantity
S55-MV-01 to 04	Inflow Valve	S55-MM-01	: 4 units
S55-SP-01 to 04	Sewage Pump	S55-MM-02	: 4 units (1 standby)
S55-DP-01/02	Sump Drainage Pump	S55-MM-03	: 2 units
S55-HH-01	Hoist Block (5t)	S55-MM-04	: 1 unit
	Removal of sewage pumps	S55-MM-05	: 3 units
	Removal of sewage pumps	S55-MM-06	: 1 unit
	Removal of drain pumps	S55-MM-07	: 2 units
	Removal of the hoisting devices	S55-MM-08	: 1 unit
	Removal of the suction pipeline	S55-MM-09	: 4 units
	Removal of the pressure pipeline	S55-MM-10	: 20 m
	Removal of suction valves	S55-MM-11	: 4 units
	Removal of pressure pipeline valves	S55-MM-12	: 7 units
	Removal of the ventilation	S55-MM-13	: 1 unit
	Removal of the inflow valve	S55-MM-14	: 4 units
	Removal of exhaust fan	S55-MM-15	: 1 unit
	Removal of air intake fan	S55-MM-16	: 1 unit
	Installation of exhaust fan	S55-MM-17	: 1 unit
	Installation of air intake fan	S55-MM-18	: 1 unit
	Piping	S55-MM-19	: Lot
	Steel Works	S55-MM-20	: Lot
	Other Necessary works	S55-MM-21	: Lot

1. Inflow Valve (Refer to Standard Specification-Section 15.13.2)

a. General

The valves shall be installed to control the flow in the conveyance system.

b. Specification

Type : Motorized Gate Valve

Dimension : Dia. 600mm

Quantity : 4 units

Motor output : 1.5 kW

2. Sewage Pump (Refer to Standard Specification-Section 15.11.4)

a. General

The sewage pumps lift up and deliver sewage to the connecting sewer or pressure line.

b. Specification

Type	: Horizontal Shaft Volute Type Mixed Flow Pump
Quantity	: 4units (2 standby)
Discharge capacity	: $27m^3$/min
Total head	: 10m
Motor output	: 55kW
Efficiency	: not less than 74 percent at duty point
NPSHA (minimum)	: approx. +2 m
Max. noise level	: 85 dB(A) at 1.0 m
Driving method	: direct drive through coupling from motor at B1 floor
Installation	: indoor
Motor encl. protection	: IP 44
Wet well water levels	: HWL +341.87 m amsl
	: MWL +341.57 m amsl
Pump room floor level	: +339.37 m amsl
WL at discharge	: +344.55 m amsl
Transmission main	: 600 mm diameter x2, approx. 800 m long

3. Sump Drainage Pumps (Refer to Standard Specification-Section 15.11 .1)

a. General

This pump shall be installed in the drain pits and shall be used to drain water accumulated in the sump..

b. Specification

Type	: Submersible Drain Pump
Discharge capacity	: $0.3m^3$/min
Total head	: 15m
Quantity	: 2 units
Motor output	: 1.5kW

4. Hoist Block (Refer to Standard Specification-Section 15.12.4)

a. General

This crane shall be used for installation, assembly, maintenance and checking of the pump system. installed.

b. Specification

Type : Motor Driven Hoist

Capacity : 5.0 ton

Quantity : 1 unit

P15.3.6 PS No. 7 (S56)

a. Equipment List of PS No.7

Tag Number	Name	Item Number	Quantity
S56-MV-01	Inflow Valve	S56-MM-01	: 1 unit
S56-MS-01/02	Fine Screen	S56-MM-02	: 2 units
S56-SP-01 to 06	Sewage Pump	S56-MM-03	: 6 units (2 standby)
S56-MV-02/03	Motor driven Valve	S56-MM-04	: 2 units
S56-MV-04	Motor driven Valve	S56-MM-05	: 1 unit
S56-MV-05/ 06	Motor driven Valve	S56-MM-06	: 2 units
S56-SG-01/02	Screenings Grinder	S56-MM-07	: 2 units
S56-DP-01/02	Sump Drainage Pump	S56-MM-08	: 2 units
S56-MH-01/02	Hoist Block (5t)	S56-MM-09	: 2 units
	Removal of sewage pumps	S56-MM-10	: 2 units
	Removal of sewage pumps	S56-MM-11	: 2 units
	Removal of sewage pumps	S56-MM-12	: 1 unit
	Removal of sewage pumps	S56-MM-13	: 2 units
	Removal of drain pumps	S56-MM-14	: 2 units
	Installation of the mechanical rakes	S56-MM-15	: 2 units
	Installation of the mechanical crushing machine	S56-MM-16	: 1 unit
	Removal of the hoisting devices	S56-MM-17	: 1 unit
	Removal of the suction pipeline	S56-MM-18	: 4 units
	Removal of the pressure pipeline	S56-MM-19	: 250 m
	Removal of the pressure discharge sewer	S56-MM-20	: 20 m

Removal of suction valves	S56-MM-21	: 2 units
Removal of the back-pressure valve	S56-MM-22	: 3 units
Removal of motor valves	S56-MM-23	: 2 units
Removal of motor valves	S56-MM-24	: 2 units
Removal of motor valves	S56-MM-25	: 2 units
Removal of the bubbling pipeline	S56-MM-26	: 80 m
Removal of the bubbling valve	S56-MM-27	: 50 m
Removal of the ventilation	S56-MM-28	: 1 unit
Removal of the inflow valve	S56-MM-29	: 1 unit
Removal of exhaust fan	S56-MM-30	: 1 unit
Removal of air intake fan	S56-MM-31	: 1 unit
Installation of exhaust fan	S56-MM-32	: 1 unit
Installation of air intake fan	S56-MM-33	: 1 unit
Removal of air intake fan	S56-MM-34	: 1 unit
Installation of air intake fan	S56-MM-35	: 1 unit
Removal of air intake fan	S56-MM-36	: 1 unit
Installation of air intake fan	S56-MM-37	:1 unit
Piping	S56-MM-38	: Lot
Steel Works	S56-MM-39	: Lot
Other Necessary Works	S56-MM-40	: Lot

1. Inflow Valve(Refer to Standard Specification-Section 15.13 .2)

a. General

The valves shall be installed to control the flow in the conveyance system.

b. Specification

Type	: Motorized Gate Valve
Dimension	: Dia. 1000mm
Quantity	: 1 units
Motor output	: 3.7 kW

2. Fine Screen (Refer to Particular Specification-Section 15.2.2.2)

a. Standard

This screen shall be installed to remove coarse materials like fiber, sticks, rags and other inclusions and coarse suspended substances contained in the influent sewage.

b. Specification

Type		: Mechanically Cleaning Bar Screen
Quantity		: 2 units
Dimension		: W 1.0m x Depth 1.0m
Clear spacing between bars		:25 mm
Motor output		: 1.5kW
Special Materials :	Body Seat	: Stainless Steel Type 304
	Disc Seat	: Aluminum Bronze

c. Fabrication

i) The screen shall be manufactured with flat bar made of stainless steel type 304. The bars shall be equally spaced with spacers, and shall be tightened and assembled together by means of through-bolts, which have screws at both ends.

ii) The screen shall be mounted to the guide rails. The guide rails shall be fixed by means of anchor bolts at both ends to the wall of Pump Station.

3. Sewage Pump (Refer to Standard Specification-Section 15.11 .6)

a. General

The sewage pumps lift up and deliver sewage to the connecting sewer or pressure line.

b. Specification

Type 1	: Vertical Shaft Volute Type Mixed Flow Pump
Quantity	: 2units
Discharge capacity	: $27m^3$/min
Total head	: 11m
Motor output	: 165kW
Efficiency	: not less than 74 percent at duty point
NPSHA (minimum)	: approx. +2 m
Max. noise level	: 85 dB(A) at 1.0 m
Driving method	: direct drive through coupling from motor at 1 floor
Installation	: indoor
Motor encl. protection	: IP 44
Wet well water levels	: HWL +340.62 m amsl
	: MWL +339.44 m amsl
Pump room floor level	: +336.62 m amsl
WL at discharge	: +342.13 m amsl

Transmission main : 800 mm diameter x2, approx. 800 m long

4. Sewage Pump (Refer to Standard Specification-Section 15.11.4)

a. General

The sewage pumps lift up and deliver sewage to the connecting sewer or pressure line.

b. Specification

Type 2	: Horizontal Shaft Volute Type Mixed Flow Pump
Quantity	: 2units
Discharge capacity	: 14m^3/min
Total head	: Refer to 3.
Motor output	: 90kW
Efficiency	: not less than 74 percent at duty point
NPSHA (minimum)	: approx. +2 m
Max. noise level	: 85 dB(A) at 1.0 m
Driving method	: direct drive through coupling from motor at B1 floor
Installation	: indoor
Motor encl. protection	: IP 44
Wet well water levels	: Refer to 3.
Pump room floor level	: Refer to 3.
WL at discharge	: Refer to 3.
Transmission main	: Refer to 3.

5. Sewage Pump (Refer to Standard Specification-Section 15.11.4)

a. General

The sewage pumps lift up and deliver sewage to the connecting sewer or pressure line.

b. Specification

Type 3	: Horizontal Shaft Volute Type Mixed Flow Pump
Quantity	: 2units
Discharge capacity	: 7.5m^3/min
Total head	: Refer to 3.
Motor output	: 55kW
Efficiency	: not less than 74 percent at duty point
NPSHA (minimum)	: approx. +2 m

Max. noise level	: 85 dB(A) at 1.0 m
Driving method	: direct drive through coupling from motor at B1 floor
Installation	: indoor
Motor encl. protection	: IP 44
Wet well water levels	: Refer to 3.
Pump room floor level	: Refer to 3.
WL at discharge	: Refer to 3.
Transmission main	: Refer to 3.

6. Motor Driven Valve (Refer to Standard Specification-Section 15.13 .2)

a. General

The valves shall be installed to control the flow in the conveyance system.

b. Specification

Type	: Motorized Gate Valve
Dimension	: Dia. 400mm
Quantity	: 2 units
Motor output	: 0.37 kW

7. Motor Driven Valve (Refer to Standard Specification-Section 15.13 .2)

a. General

The valves shall be installed to control the flow in the conveyance system.

b. Specification

Type	: Motorized Gate Valve
Dimension	: Dia. 500mm
Quantity	: 1 units
Motor output	: 0.75 kW

8. Motor Driven Valve (Refer to Standard Specification-Section 15.13 .2)

a. General

The valves shall be installed to control the flow in the conveyance system.

b. Specification

Type	: Motorized Gate Valve
Dimension	: Dia. 800mm
Quantity	: 2 units

Motor output : 1.5 kW

9. Screening Grinder (Refer to Particular Specification-Section 15.2.11.9)

a. General

The screenings grinder grinds fine screenings down to protect pump equipment before discharging into reservoir.

b. Specification

Type : Motorized overlapping double axis layered cutter type

Capacity : 0.4m3/hr

Quantity : 2 units

Motor output : 7.5 kW

10. Sump Drainage Pumps (Refer to Standard Specification-Section 15. 11.1)

a. General

This pump shall be installed in the drain pits and shall be used to drain water accumulated in the sump..

b. Specification

Type : Submersible Drain Pump

Quantity : 2 units

Discharge capacity : $0.3m^3$/min

Total head : 15m

Motor output : 1.5kW

11. Hoist Block (Refer to Standard Specification-Section 15.12 .4)

a. General

This crane shall be used for installation, assembly, maintenance and checking of the pump system.

b. Specification

Type : Motor Driven Hoist

Capacity : 5.0 ton

Quantity : 2 unit

P15.3.7 PS No. 10 (S57)

a. Equipment List of PS No.10

Tag Number	Name	Item Number	Quantity
S57-MV-01	Inflow Valve	S57-MM-01	: 1 unit
S57-MS-01	Fine Screen	S57-MM-02	: 1 unit

S57-SP-01 to 05	Sewage Pump	S57-MM-03	: 5 units (2 standby)
S57-SG-01	Screenings Grinder	S57-MM-04	: 1 unit
S57-MV-02 to 05	Pressure Sewer Valve	S57-MM-05	: 4 units
S57-HH-01/02	Hoist Block (3t)	S57-MM-06	: 2 units
	Removal of sewage pump	S57-MM-07	: 1 unit
	Removal of sewage pump	S57-MM-08	: 4 units
	Removal of drain pumps	S57-MM-09	: 2 units
	Installation of the mechanical rakes	S57-MM-10	: 1 unit
	Installation of the mechanical crushing machine	S57-MM-11	: 1 unit
	Removal of the hoisting devices	S57-MM-12	: 2 units
	Removal of the suction pipeline	S57-MM-13	: 4 units
	Removal of the pressure pipeline	S57-MM-14	: 20 m
	Removal of the pressure sewer	S57-MM-15	: 25 m
	Removal of the discharge pipeline	S57-MM-16	: 30 m
	Removal of suction valves	S57-MM-17	: 5 units
	Removal of the back-pressure valve	S57-MM-18	: 5 units
	Removal of pressure pipeline valves	S57-MM-19	: 5 units
	Removal of pressure sewer valves	S57-MM-20	: 4 units
	Removal of the ventilation	S57-MM-21	: 1 unit
	Removal of the inflow valve	S57-MM-22	: 1 unit
	Removal of exhaust fan	S57-MM-23	: 1 unit
	Removal of air intake fan	S57-MM-24	: 1 unit
	Installation of exhaust fan	S57-MM-25	: 1 unit
	Installation of air intake fan	S57-MM-26	: 1 unit
	Piping	S57-MM-27	: Lot
	Steel Works	S57-MM-28	: Lot
	Other Necessary works	S57-MM-29	: Lot

1. Inflow Valve (Refer to Standard Specification-Section 15.13.2)

a. General

. The valves shall be installed to control the flow in the conveyance system.

b. Specification

Type : Motorized Gate Valve

Dimension : Dia. 800mm

Quantity : 1 unit

Motor output : 1.5 kW

2. Fine Screen (Refer to Particular Specification-Section 15.2.2.2)

a. General

This screen shall be installed to remove coarse materials like fiber, sticks, rags and other inclusions and coarse suspended substances contained in the influent sewage.

b. Specification

Type : Mechanically Cleaning Bar Screen

Quantity : 1 unit

Dimension : W 0.8m x Depth 0.8m

Clear spacing between bars :6.0 mm

Motor output : 1.5kW

Special Materials : Body Seat : Stainless Steel Type 304

Disc Seat : Aluminum Bronze

c. Fabrication

i) The screen shall be manufactured with flat bar made of stainless steel type 304. The bars shall be equally spaced with spacers, and shall be tightened and assembled together by means of through-bolts, which shall have screws at both ends.

ii) The screen shall be mounted to the guide rails. The guide rails shall be fixed by means of anchor bolts at both ends to the wall of Pump Station.

3. Sewage Pump (Refer to Standard Specification-Section 15.11.4)

a. General

The sewage pumps lift up and deliver sewage to the connecting sewer or pressure line.

b. Specification

Type : Horizontal Shaft Volute Type Mixed Flow Pump

Quantity : 5units (2 standby)

Discharge capacity : $7.5m^3$/min

Total head : 11m

Motor output : 55kW

Efficiency : not less than 74 percent at duty point

NPSHA (minimum) : approx. +2 m

Max. noise level : 85 dB(A) at 1.0 m

Driving method	: direct drive through coupling from motor at B1 floor
Installation	: indoor
Motor encl. protection	: IP 44
Wet well water levels	: HWL +347.38 m amsl
	: MWL +346.40 m amsl
Pump room floor level	: +344.78m amsl
WL at discharge	: +349.33m amsl
Transmission main	: 500 mm and 400mm diameter, approx. 1600 m long

4. Screening Grinder (Refer to Particular Specification-Section 15.2.11.9)

a. General

The screenings grinder facilitates to fine screenings down to protect pump equipment before discharging into reservoir.

b. Specification

Type	: Motorized overlapping double axis layered cutter type
Capacity	: 0.4m3/hr
Quantity	: 1 unit
Motor output	: 7.5 kW

5. Pressure Sewer Valve (Refer to Standard Specification-Section 15.13.2)

a. General

The valves shall be installed to control the flow in the conveyance system.

b. Specification

Type	: Motor driven gate Valve
Dimension	: Dia. 600mm
Quantity	: 4 units
Motor output	: 0.75 kW

6. Sump Drainage Pumps (Refer to Standard Specification-Section 15.11.1)

a. General

This pump shall be installed in the drain pits and shall be used to drain water accumulated in the sump..

b. Specification

Type	: Submersible Drain Pump
Discharge capacity	: 0.3m^3/min

Total head : 15m

Quantity : 2 units

Motor output : 1.5kW

7. Hoist Block (Refer to Standard Specification-Section 15.12.3)

a. General

This crane shall be used for installation, assembly, maintenance and checking of the pump system. installed in this building facility.

b. Specification

Type :Geared Trolley Chain Block

Capacity : 3.0 ton

Quantity : 2 units

P15.3.8 PS No. 11 (S58)

a. Equipment List of PS No.11

Tag Number	Name	Item Number	Quantity
S58-SP-01 to 03	Sewage Pump	S58-MM-01	: 3 units (1 standby)
S58-HH-01	Hoist Block (2t)	S58-MM-02	: 1 unit
	Removal of sewage pump	S58-MM-03	: 1 unit
	Removal of sewage pump	S58-MM-04	: 1 unit
	Removal of the hoisting devices	S58-MM-05	: 1 unit
	Removal of the suction pipeline	S58-MM-06	: 2 units
	Removal of the pressure pipeline	S58-MM-07	: 7 m
	Removal of the pressure pipeline	S58-MM-08	: 7 m
	Removal of suction valves	S58-MM-09	: 2 units
	Removal of the back-pressure valve	S58-MM-10	: 2 units
	Removal of pressure pipeline valves	S58-MM-11	: 3 units
	Removal of the bubbling pipeline	S58-MM-12	: 45 m
	Removal of the ventilation	S58-MM-13	: 1 unit
	Removal of the inflow valve	S58-MM-14	: 1 unit
	Removal of exhaust fan	S58-MM-15	: 1 unit
	Removal of air intake fan	S58-MM-16	: 1 unit
	Installation of exhaust fan	S58-MM-17	: 1 unit

Installation of air intake fan	S58-MM-18	:1 unit
Piping	S58-MM-19	: Lot
Steel Works	S58-MM-20	: Lot
Other Necessary works	S58-MM-21	: Lot

1. Sewage Pump (Refer to Standard Specification-Section 15.11.4)

a. General

The sewage pumps lift up and deliver sewage to the connecting sewer or pressure line.

b. Specification

Type	: Horizontal Shaft Volute Type Mixed Flow Pump
Quantity	: 3units (1 standby)
Discharge capacity	: 1.9m^3/min
Total head	: 8.0m
Motor output	: 15kW
Efficiency	: not less than 74 percent at duty point
NPSHA (minimum)	: approx. +2 m
Max. noise level	: 85 dB(A) at 1.0 m
Driving method	: direct drive through coupling from motor at B1 floor
Installation	: indoor
Motor encl. protection	: IP 44
Wet well water levels	: HWL +346.15 m amsl
	: MWL +345.25 m amsl
Pump room floor level	: +344.20 m amsl
WL at discharge	: +348.22 m amsl
Transmission main	: 250 mm diameter x2, approx. 700 m long

2. Hoist Block (Refer to Standard Specification-Section 15.12.3)

a. General

This crane shall be used for installation, assembly, maintenance and checking of the pump system. installed.

b. Specification

Type	: Geared Trolley Chain Block
Capacity	: 1.0 ton
Quantity	: 1 unit

P15.3.9 PS No. 15 (S59)

a. Equipment List of PS No.15

Tag Number	Name	Item Number	Quantity
S59-SP-01 to 03	Sewage Pump	S59-MM-01	: 3 units (1 standby)
S59-HH-01	Hoist Block (1t)	S59-MM-02	: 1 unit
	Removal of sewage pump	S59-MM-03	: 1 unit
	Removal of sewage pump	S59-MM-04	: 1 unit
	Removal of the hoisting devices	S59-MM-05	: 1 units
	Removal of the suction pipeline	S59-MM-06	: 2 units
	Removal of the pressure pipeline	S59-MM-07	: 10 m
	Removal of the pressure pipeline	S59-MM-08	: 6 m
	Removal of the discharge pipeline	S59-MM-09	: 1 unit
	Removal of suction valves	S59-MM-10	: 2 units
	Removal of the back-pressure valve	S59-MM-11	: 2 units
	Removal of pressure pipeline valves	S59-MM-12	: 2 units
	Removal of pressure pipeline valves	S59-MM-13	: 1 unit
	Removal of the bubbling pipeline	S59-MM-14	: 45 m
	Removal of the bubbling valve	S59-MM-15	: 1 unit
	Removal of the ventilation	S59-MM-16	: 1 unit
	Removal of the inflow valve	S59-MM-17	: 1 unit
	Removal of exhaust fan	S59-MM-18	: 1 unit
	Removal of air intake fan	S59-MM-19	: 1 unit
	Installation of exhaust fan	S59-MM-20	: 1 unit
	Installation of air intake fan	S59-MM-21	:1 unit
	Piping	S59-MM-22	: Lot
	Steel Works	S59-MM-23	: Lot
	Other Necessary works	S59-MM-24	: Lot

1. Sewage Pump (Refer to Standard Specification-Section 15.11.4)

a. General

The sewage pumps lift up and deliver sewage to the connecting sewer or pressure line.

b. Specification

Type	: Horizontal Shaft Volute Type Mixed Flow Pump
Quantity	: 3units (1 standby)
Discharge capacity	: 4.2m^3/min
Total head	: 11.0m
Motor output	: 30kW
Efficiency	: not less than 74 percent at duty point
NPSHA (minimum)	: approx. +2 m
Max. noise level	: 85 dB(A) at 1.0 m
Driving method	: direct drive through coupling from motor at B1 floor
Installation	: indoor
Motor encl. protection	: IP 44
Wet well water levels	: HWL +343.39 m amsl
	: MWL +342.49 m amsl
Pump room floor level	: +341.44 m amsl
WL at discharge	: +344.99 m amsl
Transmission main	: 250 mm diameter, approx. 100 m long

2. Hoist Block (Refer to Standard Specification-Section 15.12.3)

a. General

This crane shall be used for installation, assembly, maintenance and checking of the pump system. installed.

b. Specification

Type	: Geared Trolley Chain Block
Capacity	: 1.0 ton
Quantity	: 1 unit

P15.3.10 PS No. 16 (S60)

a. Equipment List of PS No.16

Tag Number	Name	Item Number	Quantity
S60-SP-01 to 03	Sewage Pump	S60-MM-01	: 3 units (1 standby)
S60-HH-01	Hoist Block (1t)	S60-MM-02	: 1 unit
	Removal of sewage pump	S60-MM-03	: 2 units

Removal of the hoisting devices	S60-MM-04	: 1 units
Removal of the suction pipeline	S60-MM-05	: 2 units
Removal of the pressure pipeline	S60-MM-06	: 20 m
Removal of the discharge pipes	S60-MM-07	: 2 units
Removal of suction valves	S60-MM-08	: 2 units
Removal of the back-pressure valve	S60-MM-09	: 2 units
Removal of pressure pipeline valves	S60-MM-10	: 4 units
Removal of the bubbling pipeline	S60-MM-11	: 45 m
Removal of the bubbling valve	S60-MM-12	: 1 unit
Removal of the ventilation	S60-MM-13	: 1 unit
Removal of the inflow valve	S60-MM-14	: 1 units
Removal of exhaust fan	S60-MM-15	: 1 unit
Removal of air intake fan	S60-MM-16	: 1 unit
Installation of exhaust fan	S60-MM-17	: 1 unit
Installation of air intake fan	S60-MM-18	: 1 unit
Piping	S60-MM-19	: Lot
Steel Works	S60-MM-20	: Lot
Other Necessary works	S60-MM-21	: Lot

1. Sewage Pump (Refer to Standard Specification-Section 15.11.4)

a. General

The sewage pumps lift up and deliver sewage to the connecting sewer or pressure line.

b. Specification

Type	: Horizontal Shaft Volute Type Mixed Flow Pump
Quantity	: 3units (1 standby)
Discharge capacity	: 1.4m^3/min
Total head	: 24.0m
Motor output	: 11kW
Efficiency	: not less than 74 percent at duty point
NPSHA (minimum)	: approx. +2 m
Max. noise level	: 85 dB(A) at 1.0 m
Driving method	: direct drive through coupling from motor at B1 floor
Installation	: indoor

Motor encl. protection	: IP 44
Wet well water levels	: HWL +346.36 m amsl
	: MWL +345.65 m amsl
Pump room floor level	: +344.43 m amsl
WL at discharge	: +349.95 m amsl
Transmission main	: 150 mm diameter, approx. 1000 m long

2. Hoist Block (Refer to Standard Specification-Section 15.12.3)

a. General

This crane shall be used for installation, assembly, maintenance and checking of the pump system. installed in this building facility.

b. Specification

Type	: Geared Trolley Chain Block
Capacity	: 1.0 ton
Quantity	: 1 unit

P15.3.11 PS No. 17 (S61)

a. Equipment List of PS No.17

Tag Number	Name	Item Number	Quantity
S61-SP-01/02	Sewage Pump	S61-MM-01	: 2 units (1 standby)
S61-HH-01	Hoist Block (1t)	S61-MM-02	: 1 unit
	Removal of sewage pumps	S61-MM-03	: 2 unit
	Removal of the hoisting devices	S61-MM-04	: 1 unit
	Removal of the suction pipeline	S61-MM-05	: 2 units
	Removal of the pressure pipeline	S61-MM-06	: 8 m
	Removal of suction valves	S61-MM-07	: 2 units
	Removal of the back-pressure valve	S61-MM-08	: 2 units
	Removal of pressure pipeline valves	S61-MM-09	: 3 units
	Removal of metal deck	S61-MM-10	: 12 m2
	Removal of the bubbling pipeline	S61-MM-11	: 45 m
	Removal of the bubbling valve	S61-MM-12	: 1 unit
	Removal of the ventilation	S61-MM-13	: 1 unit
	Removal of the inflow valve	S61-MM-14	: 1 unit

Removal of exhaust fan	S61-MM-15	: 1 unit
Removal of air intake fan	S61-MM-16	: 1 unit
Installation of exhaust fan	S61-MM-17	: 1 unit
Installation of air intake fan	S61-MM-18	: 1 unit
Piping	S61-MM-19	: Lot
Steel Works	S61-MM-20	: Lot
Other Necessary works	S61-MM-21	: Lot

1. Sewage Pump (Refer to Standard Specification-Section 15.11.4)

a. General

The sewage pumps lift up and deliver sewage to the connecting sewer or pressure line.

b. Specification

Type	: Horizontal Shaft Volute Type Mixed Flow Pump
Quantity	: 2units (1 standby)
Discharge capacity	: 4.2m^3/min
Total head	: 18.0m
Motor output	: 18.5kW
Efficiency	: not less than 74 percent at duty point
NPSHA (minimum)	: approx. +2 m
Max. noise level	: 85 dB(A) at 1.0 m
Driving method	: direct drive through coupling from motor at B1 floor
Installation	: indoor
Motor encl. protection	: IP 44
Wet well water levels	: HWL +343.73 m amsl
	: MWL +343.00 m amsl
Pump room floor level	: +341.78 m amsl
WL at discharge	: +346.90 m amsl
Transmission main	: 200 mm diameter, approx. 310 m long

2. Hoist Block (Refer to Standard Specification-Section 15.12.3)

a. General

This crane shall be used for installation, assembly, maintenance and checking of the pump system. installed in this building facility.

b. Specification

Type : Geared Trolley Chain Block

Capacity : 1.0 ton

Quantity : 1 unit

P15.3.12 PS No. 21 (S62)

a. Equipment List of PS No.21

Tag Number	Name	Item Number	Quantity
S62-SP-01/02	Sewage Pump	S62-MM-01	: 2 units (1 standby)
S62-DP-01	Sump Drainage Pump	S62-MM-02	: 1 unit
S62-HH-01	Hoist Block (1t)	S62-MM-03	: 1 unit
	Removal of sewage pump	S62-MM-04	: 2 units
	Removal of drain pumps	S62-MM-05	: 1 unit
	Removal of the hoisting devices	S62-MM-06	: 1 unit
	Removal of the suction pipeline	S62-MM-07	: 2 units
	Removal of the pressure pipeline	S62-MM-08	: 10 m
	Removal of suction valves	S62-MM-09	: 2 units
	Removal of the back-pressure valve	S62-MM-10	: 2 units
	Removal of pressure pipeline valves	S62-MM-11	: 3 units
	Removal of the bubbling pipeline	S62-MM-12	: 45 m
	Removal of the bubbling valve	S62-MM-13	: 1 unit
	Removal of the ventilation	S62-MM-14	: 1 unit
	Removal of the inflow valve	S62-MM-15	: 1 unit
	Removal of exhaust fan	S62-MM-16	: 1 unit
	Removal of air intake fan	S62-MM-17	: 1 unit
	Installation of exhaust fan	S62-MM-18	: 1 unit
	Installation of air intake fan	S62-MM-19	: 1 unit
	Piping	S62-MM-20	: Lot
	Steel Works	S62-MM-21	: Lot
	Other Necessary works	S62-MM-22	: Lot

1. Sewage Pump (Refer to Standard Specification-Section 15.11.4)

a. General

The sewage pumps lift up and deliver sewage to the connecting sewer or pressure line.

b. Specification

Type	: Horizontal Shaft Volute Type Mixed Flow Pump
Quantity	: 2units (1 standby)
Discharge capacity	: 3.3m^3/min
Total head	: 19.0m
Motor output	: 25kW
Efficiency	: not less than 74 percent at duty point
NPSHA (minimum)	: approx. +2 m
Max. noise level	: 85 dB(A) at 1.0 m
Driving method	: direct drive through coupling from motor at B1 floor
Installation	: indoor
Motor encl. protection	: IP 44
Wet well water levels	: HWL +343.66 m amsl
	: MWL +342.98 m amsl
Pump room floor level	: +341.76 m amsl
WL at discharge	: +352.20 m amsl
Transmission main	: 250 mm diameter, approx. 900 m long

2. Sump Drainage Pumps (Refer to Standard Specification-Section 15.11.1)

a. General

This pump shall be installed in the drain pits and shall be used to drain water accumulated in the sump..

b. Specification

Type	: Submersible Drain Pump
Quantity	: 1 unit
Discharge capacity	: 0.3m^3/min
Total head	: 15m
Motor output	: 1.5kW

3. Hoist Block (Refer to Standard Specification-Section 15.12.3)

a. General

This hoist shall be used for installation, assembly, maintenance and checking of the pump system. installed.

b. Specification

Type : Geared Trolley Chain Block

Capacity : 1.0 ton

Quantity : 1 unit

P15.3.13 PS No. 24 (S63)

a. Equipment List of PS No.24

Tag Number	Name	Item Number	Quantity
S63-SP-01/02	Sewage Pump	S63-MM-01	: 2 units (1 standby)
S63-HH-01	Hoist Block (1t)	S63-MM-02	: 1 unit
	Removal of sewage pumps	S63-MM-03	: 1 unit
	Removal of the hoisting devices	S63-MM-04	: 1 unit
	Removal of the suction pipeline	S63-MM-05	: 2 unit
	Removal of the pressure pipeline	S63-MM-06	: 12 m
	Removal of the discharge pipes	S63-MM-07	: 10 m
	Removal of suction valves	S63-MM-08	: 2 units
	Removal of the back-pressure valve	S63-MM-09	: 2 units
	Removal of pressure pipeline valves	S63-MM-10	: 2 units
	Removal of the ventilation	S63-MM-11	: 3 units
	Removal of the inflow valve	S63-MM-12	: 1 unit
	Removal of exhaust fan	S63-MM-13	: 1 unit
	Removal of air intake fan	S63-MM-14	: 1 unit
	Installation of exhaust fan	S63-MM-15	: 1 unit
	Installation of air intake fan	S63-MM-16	: 1 unit
	Piping	S63-MM-17	: Lot
	Steel Works	S63-MM-18	: Lot
	Other Necessary works	S63-MM-19	: Lot

1. Sewage Pump (Refer to Standard Specification-Section 15.11.4)

a. General

The sewage pumps lift up and deliver sewage to the connecting sewer or pressure line.

b. Specification

Type	: Horizontal Shaft Volute Type Mixed Flow Pump
Quantity	: 2units (1 standby)
Discharge capacity	: 1.3m^3/min
Total head	: 15.0m
Motor output	: 11kW
Efficiency	: not less than 74 percent at duty point
NPSHA (minimum)	: approx. +2 m
Max. noise level	: 85 dB(A) at 1.0 m
Driving method	: direct drive through coupling from motor at B1 floor
Installation	: indoor
Motor encl. protection	: IP 44
Wet well water levels	: HWL +344.91 m amsl
	: MWL +344.36 m amsl
Pump room floor level	: +343.01 m amsl
WL at discharge	: +349.90 m amsl
Transmission main	: 100 mm diameter, approx. 50 m long

2. Hoist Block (Refer to Standard Specification-Section 15.12.3)

a. General

This hoist shall be used for installation, assembly, maintenance and checking of the pump system.

b. Specification

Type	: Geared Trolley Chain Block
Capacity	: 1.0 ton
Quantity	: 1 unit

P15.3.14 PS No. 28 (S64)

a. Equipment List of PS No.28

Tag Number	Name	Item Number	Quantity

S64-SP-01/02	Sewage Pump	S64-MM-01	: 2 units (1 standby)
S64-SC-01/02	Screenings Container	S64-MM-02	: 2 units
	Piping	S64-MM-03	: Lot
	Steel Works	S64-MM-04	: Lot
	Other Necessary works	S64-MM-05	: Lot

1. Sewage Pump (Refer to Standard Specification-Section 15.11.2)

a. General

The sewage pumps lift up and deliver sewage to the connecting sewer or pressure line.

b. Specification

Type	: Submersible non-clog Type Voltex flow Pump
Quantity	: 2units (1 standby)
Discharge capacity	: 1.3m^3/min
Total head	: 28.0m
Motor output	: 11kW
Efficiency	: not less than 74 percent at duty point
NPSHA (minimum)	: approx. +2 m
Installation	: inside manhole
Motor encl. protection	: IP 68
Wet well water levels	: HWL +355.50 m amsl
	: LWL +353.60 m amsl
WL at discharge	: +357.7 m amsl
Transmission main	: 150 mm diameter, approx. 1400 m long

2. Screenings Cage

a. Standard

A screenings cage shall be installed to intercept course material in the sewage for the pump equipment of manhole type pump station. The cage shall be lifted out from the manhole for cleaning and maintenance work.

b. Specification

Type	: Box shape with chain
Quantity	:2 units (1spare)
Material	: Stainless steel mesh ϕ5mm, type 316

P15.3.15 PS No. 34 (S65)

a. Equipment List of PS No.34

Tag Number	Name	Item Number	Quantity
S65-SP-01/02	Sewage Pump	S65-MM-01	: 2 units (1 standby)
S65-SC-01/02	Screenings Container	S65-MM-02	: 2 units
	Piping	S65-MM-03	: Lot
	Steel Works	S65-MM-04	: Lot
	Other Necessary works	S65-MM-05	: Lot

1. Sewage Pump (Refer to Standard Specification-Section 15.11.2)

a. General

The sewage pumps lift up and deliver sewage to the connecting sewer or pressure line.

b. Specification

Type	: Submersible non-clog Type Voltex flow Pump
Quantity	: 2units (1 standby)
Discharge capacity	: 0.84m^3/min
Total head	: 15.0m
Motor output	: 7.5kW
Efficiency	: not less than 74 percent at duty point
NPSHA (minimum)	: approx. +2 m
Installation	: inside manhole
Motor encl. protection	: IP 68
Wet well water levels	: HWL +342.50 m amsl
	: LWL +341.75 m amsl
WL at discharge	: +342.50 m amsl
Transmission main	: 150 mm diameter, approx. 1560 m long

2. Screenings Cage

a. General

A screenings cage shall be installed to intercept course material in the sewage flow to protect the pump equipment in manhole type pump stations. The cage shall be lifted out from the manhole for cleaning and maintenance work.

b. Specification

Type	: Box shape with chain

Quantity :2 units (1spare)

Material : Stainless steel mesh φ5mm, type 316

P15.3.16 PS No. 37 (S66)

a. Equipment List of PS No.37

Tag Number	Name	Item Number	Quantity
S66-SP-01/02	Sewage Pump	S66-MM-01	: 2 units (1 standby)
S66-SC-01	Screenings Container	S66-MM-02	: 2 units
	Piping	S66-MM-03	: Lot
	Steel Works	S66-MM-04	: Lot
	Other Necessary works	S66-MM-05	: Lot

1. Sewage Pump (Refer to Standard Specification-Section 15.11.2)

a. General

The sewage pumps lift up and deliver sewage to the connecting sewer or pressure line.

b. Specification

Type : Submersible non-clog Type Voltex flow Pump

Quantity : 2units (1 standby)

Discharge capacity : 0.84m^3/min

Total head : 14.0m

Motor output : 18.5kW

Efficiency : not less than 74 percent at duty point

NPSHA (minimum) : approx. +2 m

Installation : inside manhole

Motor encl. protection : IP 68

Wet well water levels : HWL +343.60 m amsl

: LWL +342.85 m amsl

WL at discharge : +344.10 m amsl

Transmission main : 100 mm diameter, approx. 200 m long

2. Screenings Cage

a. General

A screenings cage shall be installed to intercept course material in the sewage for the pump equipment of manhole type pump station. The cage shall be lifted out from the manhole for cleaning and

maintenance work.

b. Specification

Type	: Box shape with chain
Quantity	:2 units (1spare)
Material	: Stainless steel mesh φ5mm@25mm, type 316

P15.3.17 PS No. IH (S67)

a. Equipment List of PS No. IH

Tag Number	Name	Item Number	Quantity
S67-SP-01/02	Sewage Pump	S67-MM-01	: 2 units (1 standby)
S67-SC-01/02	Screenings Container	S67-MM-02	: 2 units
	Piping	S67-MM-03	: Lot
	Steel Works	S67-MM-04	: Lot
	Other Necessary works	S67-MM-05	: Lot

1. Sewage Pump (Refer to Standard Specification-Section 15.11.2)

a. General

The sewage pumps lift up and deliver sewage to the connecting sewer or pressure line.

b. Specification

Type	: Submersible non-clog Type Voltex flow Pump
Quantity	: 2units (1 standby)
Discharge capacity	: 0.84m^3/min
Total head	: 15.0m
Motor output	: 7.5kW
Efficiency	: not less than 74 percent at duty point
NPSHA (minimum)	: approx. +2 m
Installation	: inside manhole
Motor encl. protection	: IP 68
Wet well water levels	: HWL +351.6 m amsl
	: LWL +350.85 m amsl
WL at discharge	: +354.1 m amsl
Transmission main	: 100 mm diameter, approx. 160 m long

2. Screenings Cage

a. General

Screenings cage shall be installed to intercept course material in the sewage flow to protect the pump equipment in manhole type pump stations. . The cage shall be lifted out from the manhole for cleaning and maintenance work.

b. Specification

Type	: Box shape with chain
Quantity	:2 units (1spare)
Material	: Stainless steel mesh ϕ5mm@25mm, type 316