



पनवेल महानगरपालिका

ता. पनवेल जि. रायगड



कार्यालय- आयुक्त मुख्यालय, २ रा मजला, देवाळे तलावाच्या
समोर, गोखले हॉलच्या शेजारी, पनवेल- ४१०२०६
दुरध्वनी क्र- ०२२-२७४५८०४०/४१/४२
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जा.क्र. पमपा/मल.वि./५०२३/०१,०२,०३,०४,०५,०६/६३/२०२४

दिनांक- ०४/०१/२०२४

जाहिर निविदा दरपत्रक सुचना

मा. आयुक्त, पनवेल महानगरपालिका खालील नमूद कामाचे अंदाजपत्रक बनविण्याकरीता खालील बाबींचे दर मागविण्यात येत आहे.

अ. क्र.	कामाचे नाव	कालावधी
१.	पनवेल महानगरपालिका क्षेत्रात सिडकोने विकसीत केलेल्या पनवेल नोडमधील (P-१), भुखंड क्रं.४०, सेक्टर-५, नवीन पनवेल (पुर्व) (SEWAGE)पंप हाऊसची आवश्यकतेप्रमाणे दुरुस्ती, सुधारणा व नुतनीकरण करणे आणि तीन वर्ष कालावधीकरीता परिचलन व देखभाल करणेबाबत.	
२.	पनवेल महानगरपालिका क्षेत्रात सिडकोने विकसीत केलेल्या पनवेल नोडमधील (P-२), भुखंड क्रं.१४, सेक्टर-२, नवीन पनवेल (पश्चिम) (SEWAGE)पंप हाऊसची आवश्यकतेप्रमाणे दुरुस्ती, सुधारणा व नुतनीकरण करणे आणि तीन वर्ष कालावधीकरीता परिचलन व देखभाल करणेबाबत.	
३.	पनवेल महानगरपालिका क्षेत्रात सिडकोने विकसीत केलेल्या पनवेल नोडमधील (P-३), भुखंड क्रं.२०, सेक्टर-५, नवीन पनवेल (पुर्व) (SEWAGE)पंप हाऊसची आवश्यकतेप्रमाणे दुरुस्ती, सुधारणा व नुतनीकरण करणे आणि तीन वर्ष कालावधीकरीता परिचलन व देखभाल करणेबाबत.	दिनांक- ०५/०१/२०२४ ते
४.	पनवेल महानगरपालिका क्षेत्रात सिडकोने विकसीत केलेल्या पनवेल नोडमधील भारतीय विद्यापीठ जवळ, सेक्टर- ०७, खारघर (SEWAGE)पंप हाऊसची आवश्यकतेप्रमाणे दुरुस्ती, सुधारणा व नुतनीकरण करणे आणि तीन वर्ष कालावधीकरीता परिचलन व देखभाल करणेबाबत.	दिनांक- १२/०१/२०२४ (८ दिवस)
५.	पनवेल महानगरपालिका क्षेत्रात सिडकोने विकसीत केलेल्या पनवेल नोडमधील सेक्टर-०९, खारघर (SEWAGE)पंप हाऊसची आवश्यकतेप्रमाणे दुरुस्ती, सुधारणा व नुतनीकरण करणे आणि तीन वर्ष कालावधीकरीता परिचलन व देखभाल करणेबाबत.	
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(P-1), भुखंड क्र.40, सेक्टर-5, नवीन पनवेल (पुर्व)

TECHNICAL SPECIFICATION OF PUMPS

LIST OF PUMPS: -

Sr. No.	Pump House	pump type	Qty.	Pump flow m ³ /hr	Head (MWC)	RPM	Application	Rate to be Quoted per Unit
1	P-1	Horizontal	2	378	21	1500	Sewage Pumping	
		Horizontal	2	612	21	1500	Sewage Pumping	

1. HORIZONTAL CENTRIFUGAL PUMPS

- i) This specification covers the minimum requirements for Horizontal Non-clog Centrifugal/ Horizontal Centrifugal Pumps.
- ii) Pumps shall be selected for the rated capacity v/s specified differential head. Pumps shall have a continuously rising and stable head capacity characteristic rising towards shut-off. Besides, the pump characteristic shall be such that at least fifteen (15) percent additional margin in capacity shall be available at design TDH of the pump. Pumps shall be suitable for parallel operation and the head capacity characteristics combined with its drives shall ensure equal load division at all times. The pump impeller shall have non- overloading characteristics to avoid motor overload during single pump operation.
- iii) Pumping unit and auxiliary equipment shall be of design proven in similar service and constructed for continuous full load duty.
- iv) The pump shall be in accordance with the latest BIS code or international code as applicable.
- v) Pumps shall operate at speeds well within the critical rpm. The rotor shall be dynamically balanced at the operating or runaway speed whichever is higher.
- vi) Pumps should not cavitate at the liquid inlet temperatures. Satisfactory hydraulic and mechanical performance of the equipment for the specified service shall be the responsibility of the vendor.
- vii) Impellers with minimum impeller diameter for casing model shall not be used. Impeller diameter corresponding to operating design conditions shall preferably be limited to 97.5% of maximum possible diameter of impeller at speed specified on the vendors' performance curve for the type of pump offered.
- viii) Pump head at shut off shall be within 120% of specified head.
- ix) Motor rating (excluding service factor) shall be suitable for end of curve operation of pump or shall be 125% of pump rated BkW whichever is higher. The motor shall be suitable for open discharge start-up.
- x) All the rotating parts including the impeller shall be statically and dynamically balanced.
- xi) Pumps shall run smoothly without undue noise and vibration. The noise level shall also be restricted to 85 dB(A). The combined vibration of pump and motor should be limited to 75 micron with the pump in operation at any load singly or in parallel.
- xii) Supplier shall clearly state the name/ composition of the materials used for the construction of the casing, impeller, shaft, bearings, wearing rings, etc. The bearings shall be self-lubricating type. The wearing rings provided on the casing and impeller shall be corrosion and erosion resistant and shall be easily renewable. Any arrangement, if required for pre-lubricating the bearings before starting the pumps/during the operation of the pumps shall also be mentioned and indicated clearly. Supplier shall clearly mention and indicate the MOC of different parts of the different pumps as per the service application requirement. Balance material of construction related to bearing, gland packing/mechanical seal, etc. MOC should be as per manufacturer's specification suitable for the service application.

Preferable material construction of	Sewage Transfer Pumps
Casing	Cast Iron IS 210 FG 260 / 1.5 to 2% Nickel
Impeller	CF8M
Shaft	SS410
Stuffing boxes	CI
Base plate	MS
Shaft sleeves	SS410
Coupling	CI

Balance material of construction related to bearing, gland packing etc. MOC should be as per manufacturer's specification.

- xiii) Each of the pump shall be provided with adjoined motor of adequate capacity. The motor KW shall be 115% over the normal power requirement.
- xiv) Pump and driver shall be connected by flexible coupling of reputed make. Coupling guards shall also be provided and supplied.
- xv) Casing and connecting flanges shall be designed for the maximum allowable working pressure and for a hydrostatic pressure of 1.5 times the maximum allowable pressure.
- xvi) Flanges for pump shall be of standard size and preferably conform to relevant BIS. For non standard size weld neck type companion flange of material similar to pump casing shall be furnished and the same should be highlighted / indicated in the offer.
- xvii) Impeller shall be of single piece construction.
- xviii) Shaft shall be provided with sleeves locked to the shaft. The sleeve material shall be suitable for wear resistance and corrosion resistance.
- xix) Impellers and shafts shall be interchangeable between similar pumps.
- xx) Radial bearing shall be of ball, roller or sleeve type and of manufacturer's standard design. Suitable thrust bearings shall be provided as required.
- xxi) Antifriction bearings shall be of standard type suitable for minimum 25000 hours, B-10 rating life for rated operating conditions, but not less than 16000 hours at maximum axial and radial loads at rated speed.
- xxii) Common base plate for pump and drive should be provided. Base plate shall be steel fabricated having sufficient rigidity to avoid vibration and distortion and shall be designed to facilitate proper grouting. The base plate shall be fully machined to receive the pump and driver. Base plate shall be cleaned inside and outside and coated with suitable anti corrosive paint.
- xxiii) The materials of construction shall be of best quality and type.
- xxiv) Castings used for any parts shall be sound, free of shrink or blow holes, scale, blisters etc.
- xxv) Material test certificates (chemical and mechanical properties) shall be supplied for all major parts.

2. Submersible Pumps

Sr. No.	Pump House	pump type	Qty.	Pump flow m3/hr	Head (MWC)	RPM	Application	Rate to be Quoted per Unit
1	P-1	Submersible	2	612	21	1500	Sewage Pumping	

This specification covers all submersible type pumps used in connection with wet wells. They may be connected in dry well mode or be fully submersible. In all cases, the following general criteria shall apply:

Design Requirements

- i) The total head capacity curve shall be continuously rising towards the shut off with the highest at shut off. The shut off head of the pump shall be at least 120% of the total head.

- ii) Pumps shall be suitable for single as well as parallel efficient operation at any point in between the maximum and minimum system resistance. The pump shall be capable of developing the required total head at rated capacity. When parallel operation is specified, the head rise shall be at least minimum 10 percent of the head at rated capacity. The manufacturer to be submitted the system resistance curve for parallel operating pumps.
- iii) The pumps shall be designed to handle solid sizes of up to 100 mm for handling raw sewage. Specific gravity of sewage is 1.05
- iv) Pumps shall run smooth without undue noise and vibration, Cavitation, oil or water leaks over the range of operation. To ensure free operation, all rotating components of pump shall be statically and dynamically balanced to BS 6861 / as per zone A & B of ISO 10816-1. Vibration level shall not exceed the levels given in BS 4675 and Noise level shall be limited to 85 dBA at 1.86 M at sites.
- v) The pump set shall be suitable for starting with discharge valve open and/or closed.
- vi) Pump sets shall be capable of withstanding accidental rotation in reverse direction and phase monitoring provision to give fault indication in case of phase reversal. Reverse rotation switch shall be provided
- vii) Pumps shall have a preferred operating region of 70-120 percent of best efficiency capacity of the furnished impeller. Rated capacity shall be within the region of 80- 110 percent of best efficiency capacity of the furnished impeller.
- viii) The pump shall be compatible with VFD and selected automation system.

Construction Features

The following general features shall apply to the manufacture of all submersible pumps;

- i) Pump shall be centrifugal, vertical spindle, non-clog, and wear resisting, single stage type.
- ii) Pump casing shall be of robust construction. Liquid passages shall be finished smooth and designed as to allow free passage of solids. The volute tongue shall be filed to a smooth rounded edge. Pump casing shall be conforming to relevant I.S and the internal surfaces shall be free from rough spots and must have central line discharge
- iii) Double Mechanical seals shall be provided to protect the motor from ingress of sewage along the shaft. The preliminary and secondary seals shall be oil-lubricated with tungsten carbide or silicon-carbide faces and they shall be equipped with an electrical monitoring system for seal failure detection.
- iv) Impeller shall be non-clog enclosed type with smooth blunt edges and large water ways so as to allow free passage of the large size solids. It shall be free from sharp comers and projections likely to catch and hold rags and stringy materials. The number of impeller vanes for pumps up to 1000 m³/hr shall be limited to two and shall be limited to three for the pumps higher than 1000 m³/hr. The impeller shall be properly balanced dynamically as well as statically. The impeller shall be properly machined for liquid passage. Enclosed impellers shall be adjustable. In such a case, the pump shall be designed to take care of the additional thrust produced. Impellers shall be surely fastened directly to the extended shaft of motor with keys, taper housings of lock nuts. The impeller shaft shall be made of stainless and it shall have a surface finish between 0.75microns or less. The shaft shall be straight within 0.125 mm for 3 meter length total dial indicator reading
- v) The critical speed of the rotor shall be at least 30% above the operating speed. Complete rotor shall be balanced dynamically as per ISO 9906
- vi) Pump sets shall have double bearings. The bearing life shall be minimum 100,000 hrs of operation. Bearing shall be of the anti-friction type. Bearing shall be capable of taking the static weight of the rotating parts and any thrust generated by the operation of the pump.
- vii) Each pump shall be complete with a cast iron delivery connection arrangement for fixing to the concrete floor of the suction well. The joint between the pump discharge flange and the delivery piping shall be made by merely lowering the pump into guide rails / rope from access level. It shall be provided with all necessary fixings for guiding the pumps during

lifting/lowering. Each pump shall be provided with a stainless-steel lifting chain conforming to BS 1663 and BS 4942.

- viii) The pump delivery size shall not be less than 200 mm.
- ix) Each pump shall be provided with an automatic coupling device for attaching the chain pulley block hook to the pump at low level, even whilst the pump is submerged, without the need for personnel to enter the well. This automatic coupling device shall easily and automatically couple and uncouple the hoist hook and be complete with necessary accessories. All links and cables shall be multi- stranded stainless steel.
- x) The pump guide rail assembly will have pedestal, bracket, delivery duck foot bend, guide rail pipe, upper guide rail holder complete. The pedestal and bracket shall provide automatic coupling between pump delivery and discharge bend.
- xi) Pumps shall be provided with SS steel lifting chains of suitable capacity. One end of the chain shall be adhered to the pump and the other end fixed near the upper bracket for guide rail/wire rope assembly by the mean of D-shackle. The chain shall give rings fixed at an interval about 1 m for engaging the hook of chain pulley
- xii) Efficiency of Pump shall not be less than 75%. Pump speed: 1,500 RPM (Maximum)
- xiii) Hydrostatic test shall be 1.5 X the shutoff head or twice the rated discharge head whichever is greater.
- xiv) When connected in dry-well mode, integrated cooling shall be provided wherein pumped liquid or coolant is circulated through cooling jacket for continuous operation of the pump motor set.

The power rating of the pump motor should be the larger of the following

- i) 115% of the power required (BKW) at the duty point.
- ii) 115% of the power input to the pump at duty point at a speed corresponding to the frequency of 48.5 Hz.
- iii) 110% of the maximum power required by the pump from zero discharge to run off point total head.

Materials of Construction of Pumps-

Pump casing	:	Cast Iron IS 210 FG 260
Impeller	:	CF8M
Shaft	:	Stainless Steel
Bush	:	Bronze
Impeller key & bolt	:	Stainless Steel
Lifting Chain	:	Stainless Steel
Guide Rail pipe	:	Stainless Steel
Eye Bolt	:	Stainless Steel :
Bearing Bracket	:	CI IS : 210 FG 260
Motor casing	:	CI IS : 210 FG 260
Fasteners and Foundation Bolts	:	Stainless Steel :
Casing wear ring	:	CI IS : 210 FG 260
O-ring	:	Nitrile rubber (NBR)

Shaft Seal

Type of seal	:	Double mechanical seal
Arrangement	:	Tandem
Seal on medium side	:	With elastomer bellows
Mechanical seal, pump side	:	Silicon carbide/NBR
Mechanical seal, bearing side	:	Silicon carbide/NBR

Monitoring Devices

Thermal winding protection	:	Bi metallic sensors in all three phase winding
Motor housing leakage monitoring	:	Moisture sensor
Junction box leakage monitoring	:	Moisture sensor
Mechanical seal leakage Detection	:	Moisture sensor
Bearing temperature monitoring	:	Bi Metallic sensor

Installation Arrangement

Type of installation	:	Wet well installation design for automatic connection to a permanently installed discharge elbow will neoprene seal to avoid metal to metal contact
Flange dimension to	:	EN 1092-2, PN 10
Claw	:	Bolted to the pump
Installation depth	:	As per data provided
Guide system	:	Stainless Steel
Lifting device	:	Stainless steel lifting chain
Length of lifting device	:	Suitable
Lifting loops	:	suitable
Installation accessories	:	Discharge bracket lifting chain, elbow, fasteners, claw guide bars Etc. complete.

Motor

Type	:	Squirrel cage induction motor
Motor efficiency	:	Premium efficiency motors according to IE3
Degree of protection	:	IP 68
Insulation class	:	H,
Coolant temp	:	</= 40 Deg. C
Temp rise limit	:	Class B
Starting mode	:	Direct on line/ frequency drive Star deltastarter/Soft starter / Variable
Rated voltage	:	3ph, 415 V
Rated frequency	:	50 Hz
Nominal speed	:	Less than 1500-rpm (Synchronise)
Motor casing	:	CI IS 210 IS FG 260
Main cable	:	IEC:60227, IEC:60228; IEC:60332; IS:1554 Complete with cable length as per requirement
Motor feature	:	For VFD application Vacuum Pressure Impregnated (VPI) or Inverter Grade Treatment(IGT). Insulated bearing with shaft grounding ring, as applicable.

* Material test certificates from Government approved metallurgical laboratory shall beformally submitted for all pumps by Suppliers / Contractors

Induction Motors (for Submersible Pumps)

The motor shall be squirrel cage type, three phase submersible motor for continuous duty with class 'H' insulation. Winding of the motor shall be impregnated by resin in order to achieve required thermal withstanding capacity. Motor shall have integral cable port and cable entry shall be sealed. There shall be thermal protection against overheating of motor –winding. The motor shall be designed for non-over loading characteristics. Motor shall be sealed against entry of pump liquid in the motor by using mechanical seal. Moisture sensor tripping unit shall be located inside in the motor chamber.

Performance and Characteristics

The submersible motor shall conform to IS: 9283: and the submersible cable shall conform to clause no. 4.4 of the IS: 9283:

Motors shall be capable of giving rated output without reduction in the expected life span when operated continuously under the following supply conditions:

Variation of supply voltage from rated motor voltage: $\pm 6\%$ Variation of supply frequency from rated frequency: $\pm 3\%$ Combined voltage and frequency variation: $\pm 10\%$

The starting current of motor shall not exceed 200% of rated full load current for star/delta starting and 600% of rated full load current for DOL starting, under any circumstances.

Motors shall be suitable for full voltage direct-on-line starting or star-delta starting or Soft starter or variable Frequency drive.

Motors shall be capable of starting and accelerating the load with the applicable method of starting, without exceeding acceptable winding temperatures, when the supply voltage is in the range 85% of the rated motor voltage to maximum permissible voltage.

The locked rotor current of the motor shall not exceed 600% of full load current (subject to tolerance as per the applicable standard) unless otherwise specified.

Motors shall be designed to withstand 120% of rated speed for two minutes without any mechanical damage in either direction of rotation.

The motor vibrations shall be within the limits specified in applicable standard unless otherwise specified for the driven equipment.

Except as mentioned herein, the guaranteed performances of the motor shall be met with tolerances specified in applicable standard, IS 9283.

The enclosure for motor shall be IP-68.

Protection against increase in stator winding temperature (150°C) bearing temperature, leakage in stator housing and terminal box shall be provided. Minimum three number thermistors in series are to be provided to sense the stator winding temperature. Sensors are to be provided to detect if leakage of sewage into the oil housing is above 30% concentration Bimetallic thermal switch to trip the motor against increase in temperature shall be provided.

The power rating of the motor shall be larger of the following: 115% of the power input to the pump at duty point at a speed corresponding to the frequency of 48.5 Hz.

Maximum Power input while operating single pump corresponding to the speed of 50 Hz.

For pumps that are run with variable frequency drive then System Curve shall be submitted along with Motor Curve for the entire operative range of RPM for approval. Submission of pump data sheet shall be tagged as Variable Frequency Drive /Normal Operation.

Submersible Cable

The umbilical cable between the control panel and the submersible pump shall comply with IEC:60227; IEC:60228; IS:1554 to cover the following requirements;

- i) The power cable shall be PVC insulated and PVC sheathed, flexible, 3.5 core type. The size of the conductor shall be adequate for continuous use under water and air. The half core shall be used for earthing.
- ii) The control cable shall be PVC insulated PVC sheathed, flexible, flat type and shall be adequate for continuous use under water and air. The control cable for stator winding temperature sensor (Thermistors) shall be 3 core x 2.5 sq. mm copper conductors and for bimetallic thermal switch 2 core x 2.5 sq. mm copper conductor shall be provided.
- iii) In case a joint is required to be made between the lead cable supplied with the motor and the user's cable connectors, a detailed procedure of cable jointing to make a watertight joint shall be provided by the manufacturer.

Earthing

- i) Earthing of the motor shall be done in accordance with the relevant provisions of IS:3043
- ii) For the purpose of earthing these motors, earthing connection may be made to discharge pipe.

Insulation

- i) Any joints in the motor insulation such as at coil connections or between slot and end winding sections shall have strength equivalent to that of the slot sections of the coil.
- ii) The insulation shall be given tropical and fungicidal treatment for successful operation of the motor in hot, humid and tropical climate. The tropicalizing treatment shall be as per the applicable standard.
- iii) The stator winding shall be made from high conductivity annealed copper conductor. PVC insulated winding wires conforming to IS: 8783: for wet type motors. The stator winding shall be of high conductivity annealed copper enameled insulated wires conforming to IS 4800 (Part - VII): for dry type motors.

Temperature Rise

The temperature-rise test of the motor shall be taken with the motor coupled to the suitable pump to give the full load output of the motor. When the various temperatures are stabilized, the set is stopped and the temperature-rise of the stator winding by the resistance method shall not exceed 35°C. During the test, the temperature of the cooling water may not exceed 45°C. As the cable resistance will also be substantial, it is necessary that while calculating the temperature rise by resistance method, due care is taken to account for the correct hot and cold resistance of windings.

Constructional Features (of the Electric Motor)

The motor shall be suitable for continuous use in fully or partially submerged condition. A built in cooling system if required shall allow the motor to operate continuously at its rated output regardless of whether the electric motor is submerged or not, by providing either external or internal cooling arrangement.

Terminal Box

Terminal box shall be of weatherproof construction to eliminate entry of water and suspended matter. The terminals shall be of the stud type with necessary plain washers, spring washers and check nuts. They shall be substantially designed for the current carrying capacity and shall ensure ample phase to phase and phase to ground clearance.

(P-2), भुखंड क्रं.14, सेक्टर-2, नवीन पनवेल (पश्चिम)

TECHNICAL SPECIFICATION OF PUMPS

List of Pumps: -

Sr. No.	Pump House	Existing pump type	Qty.	Pump flow m3/hr	Head (MWC)	RPM	Application	Rate to be Quoted per Unit
1	P-2	Vertical Type	3	800	22	1500	Sewage Pumping	
		Vertical Type	3	1200	22	1000	Sewage Pumping	

3. VERTICAL CENTRIFUGAL PUMPS.

- i) This specification covers the minimum requirements for vertical centrifugal pumps.
- ii) Pumps shall be selected for the rated capacity v/s specified differential head. Pumps shall have a continuously rising and stable head capacity characteristic rising towards shut-off. Besides, the pump characteristic shall be such that at least fifteen (15) percent additional margin in capacity shall be available at design TDH of the pump. Pumps shall be suitable for parallel operation and the head capacity characteristics combined with its drives shall ensure equal load division at all times. The pump impeller shall have non-overloading characteristics to avoid motor overload during single pump operation.
- iii) Pumping unit and auxiliary equipment shall be of design proven in similar service and constructed for continuous full load duty.
- iv) Pumps shall operate at speeds well within the critical rpm. The rotor shall be dynamically balanced at the operating or runaway speed whichever is higher.
- v) Pumps should not cavitate at the liquid inlet temperatures. Satisfactory hydraulic and mechanical performance of the equipment for the specified service shall be the responsibility of the vendor.
- vi) Impellers with minimum impeller diameter for casing model shall not be used. Impeller diameter corresponding to operating design conditions shall preferably be limited to 97.5% of maximum possible diameter of impeller at speed specified on the vendor's performance curve for the type of pump offered.
- vii) Pump head at shut off shall be within 120% of specified head.
- viii) Motor rating (excluding service factor) shall be suitable for end of curve operation of pump or shall be 115% of pump rated BkW whichever is higher. The motor shall be suitable for open discharge start-up.
- ix) All the rotating parts including the impeller shall be statically and dynamically balanced.
- x) Pumps shall run smoothly without undue noise and vibration. The noise level shall also be restricted to 85 dB (A). The combined vibration of pump and motor should be limited to 75 micron with the pump in operation at any load singly or in parallel.

MOC of the materials used for the construction of the casing, impeller, shaft, bearings, wearing rings, etc. The bearings shall be self-lubricating type. The wearing rings provided on the casing and impeller shall be corrosion and erosion resistant and shall be easily renewable. Any arrangement, if required for pre-lubricating the bearings before starting the pumps/during the operation of the pumps shall also be mentioned and indicated clearly. Supplier shall clearly mention and indicate the MOC of different parts of the different pumps as per the service application requirement. Balance material of construction related to bearing, gland packing/mechanical seal, etc. MOC should be as per manufacturer specification suitable for the service application

Preferable material of construction	Sump pump/drainage pump
Casing	CI
Impeller	CF8M
Shaft	SS 410
Stuffing boxes	CI
Base plate	MS
Shaft sleeves	SS 410
Coupling	CI

Balance material of construction related to bearing, gland packing etc. MOC should be as per manufacturer's specification.

- xi) Each of the pump shall be provided with adjoined motor of adequate capacity. The motor KW shall be 115% over the normal power requirement.
- xii) Pump and driver shall be connected by flexible coupling of reputed make. Coupling guards shall also be provided and supplied.
- xiii) Casing and connecting flanges shall be designed for the maximum allowable working pressure and for a hydrostatic pressure of 1.5 times the maximum allowable pressure.
- xiv) Flanges for pump shall be of standard size and preferably conform to relevant BIS. For non-standard size weld neck type companion flange of material similar to pump casing shall be furnished and the same should be highlighted / indicated in the offer.
- xv) Impeller shall be of single piece construction.
- xvi) Shaft shall be provided with sleeves locked to the shaft. The sleeve material shall be suitable for wear resistance and corrosion resistance.
- xvii) Impellers and shafts shall be interchangeable between similar pumps.
- xviii) Radial Bearing shall be of ball, roller or sleeve type and of manufacturer's standard design. Suitable thrust bearing shall be provided as required.
- xix) Antifriction bearings shall be of standard type suitable for minimum 25000 hours, B-10 rating life for rated operating conditions, but not less than 16000 hours at maximum axial and radial loads at rated speed.
- xx) Proper base plate for pump and drive should be provided. Base plate shall be steel fabricated having sufficient rigidity to avoid vibration and distortion and shall be designed to facilitate proper grouting. The base plate shall be fully machined to receive the pump and driver. Base plate shall be cleaned inside and outside and coated with suitable anti corrosive paint.
- xxi) The materials of construction shall be of best quality and type.
- xxii) Castings used for any parts shall be sound, free of shrink or blow holes, scale, blisters etc.
- xxiii) Material test certificates (chemical and mechanical properties) shall be supplied for all major parts.

(P-3), भुखंड क्रं.20, सेक्टर-5, नवीन पनवेल (पुर्व)

TECHNICAL SPECIFICATION OF PUMPS

Sr. No.	Pump House	Existing pump type	Qty.	Pump flow m3/hr	Head (MWC)	RPM	Application	Rate to be Quoted per Unit
1	P-3	Vertical Type	3	192	15	1500	Sewage Pumping	
		Vertical Type	2	378	15	1500	Sewage Pumping	

1. VERTICAL CENTRIFUGAL PUMPS.

- i) This specification covers the minimum requirements for vertical centrifugal pumps.
- ii) Pumps shall be selected for the rated capacity v/s specified differential head. Pumps shall have a continuously rising and stable head capacity characteristic rising towards shut-off. Besides, the pump characteristic shall be such that at least fifteen (15) percent additional margin in capacity shall be available at design TDH of the pump. Pumps shall be suitable for parallel operation and the head capacity characteristics combined with its drives shall ensure equal load division at all times. The pump impeller shall have non- overloading characteristics to avoid motor overload during single pump operation.
- iii) Pumping unit and auxiliary equipment shall be of design proven in similar service and constructed for continuous full load duty.
- iv) Pumps shall operate at speeds well within the critical rpm. The rotor shall be dynamically balanced at the operating or runaway speed whichever is higher.
- v) Pumps should not cavitate at the liquid inlet temperatures. Satisfactory hydraulic and mechanical performance of the equipment for the specified service shall be the responsibility of the vendor.
- vi) Impellers with minimum impeller diameter for casing model shall not be used. Impeller diameter corresponding to operating design conditions shall preferably be limited to 97.5% of maximum possible diameter of impeller at speed specified on the vendor's performance curve for the type of pump offered.
- vii) Pump head at shut off shall be within 120% of specified head.
- viii) Motor rating (excluding service factor) shall be suitable for end of curve operation of pump or shall be 115% of pump rated BKW whichever is higher. The motor shall be suitable for open discharge start-up.
- ix) All the rotating parts including the impeller shall be statically and dynamically balanced.
- x) Pumps shall run smoothly without undue noise and vibration. The noise level shall also be restricted to 85 dB (A). The combined vibration of pump and motor should be limited to 75 micron with the pump in operation at any load singly or in parallel.

MOC of the materials used for the construction of the casing, impeller, shaft, bearings, wearing rings, etc. The bearings shall be self-lubricating type. The wearing rings provided on the casing and impeller shall be corrosion and erosion resistant and shall be easily renewable. Any arrangement, if required for pre-lubricating the bearings before starting the pumps/during the operation of the pumps shall also be mentioned and indicated clearly. Supplier shall clearly

mention and indicate the MOC of different parts of the different pumps as per the service application requirement. Balance material of construction related to bearing, gland packing/mechanical seal, etc. MOC should be as per manufacturer specification suitable for the service application

Preferable material of construction	Sump pump/drainage pump
Casing	CI
Impeller	CF8M
Shaft	SS410
Stuffing boxes	CI
Base plate	MS
Shaft sleeves	SS410
Coupling	CI

Balance material of construction related to bearing, gland packing etc. MOC should be as per manufacturer's specification.

- xi) Each of the pump shall be provided with adjoined motor of adequate capacity. The motor KW shall be 115% over the normal power requirement.
- xii) Pump and driver shall be connected by flexible coupling of reputed make. Coupling guards shall also be provided and supplied.
- xiii) Casing and connecting flanges shall be designed for the maximum allowable working pressure and for a hydrostatic pressure of 1.5 times the maximum allowable pressure.
- xiv) Flanges for pump shall be of standard size and preferably conform to relevant BIS. For non-standard size weld neck type companion flange of material similar to pump casing shall be furnished and the same should be highlighted / indicated in the offer.
- xv) Impeller shall be of single piece construction.
- xvi) Shaft shall be provided with sleeves locked to the shaft. The sleeve material shall be suitable for wear resistance and corrosion resistance.
- xvii) Impellers and shafts shall be interchangeable between similar pumps.
- xviii) Radial Bearing shall be of ball, roller or sleeve type and of manufacturer's standard design. Suitable thrust bearing shall be provided as required.
- xix) Antifriction bearings shall be of standard type suitable for minimum 25000 hours, B-10 rating life for rated operating conditions, but not less than 16000 hours at maximum axial and radial loads at rated speed.
- xx) Proper base plate for pump and drive should be provided. Base plate shall be steel fabricated having sufficient rigidity to avoid vibration and distortion and shall be designed to facilitate proper grouting. The base plate shall be fully machined to receive the pump and driver. Base plate shall be cleaned inside and outside and coated with suitable anti corrosive paint.
- xxi) The materials of construction shall be of best quality and type.
- xxii) Castings used for any parts shall be sound, free of shrink or blow holes, scale, blisters etc.
- xxiii) Material test certificates (chemical and mechanical properties) shall be supplied for all major parts.

भारतीय विद्यापीठ जवळ, सेक्टर- 07, खारघर.

TECHNICAL SPECIFICATION OF PUMPS

LIST OF PUMPS: -

Sr. No.	Pump House	Existing pump type	Qty.	Pump flow m ³ /hr	Head (MWC)	RPM	Application	Rate to be Quoted per Unit
1	Sec- 07	Submersible	2	180	15	1500	Sewage Pumping	

1. SUBMERSIBLE PUMPS

This specification covers all submersible type pumps used in connection with wet wells. They may be connected in dry well mode or be fully submersible. In all cases, the following general criteria shall apply:

Design Requirements

- i) The total head capacity curve shall be continuously rising towards the shut off with the highest at shut off. The shut off head of the pump shall be at least 120% of the total head.
- ii) Pumps shall be suitable for single as well as parallel efficient operation at any point in between the maximum and minimum system resistance. The pump shall be capable of developing the required total head at rated capacity. When parallel operation is specified, the head rise shall be at least minimum 10 percent of the head at rated capacity. The manufacturer to be submitted the system resistance curve for parallel operating pumps.
- iii) The pumps shall be designed to handle solid sizes of up to 100 mm for handling raw sewage. Specific gravity of sewage is 1.05
- iv) Pumps shall run smooth without undue noise and vibration, Cavitation, oil or water leaks over the range of operation. To ensure free operation, all rotating components of pump shall be statically and dynamically balanced to BS 6861 / as per zone A & B of ISO 10816-1. Vibration level shall not exceed the levels given in BS 4675 and Noise level shall be limited to 85 dBA at 1.86 M at sites.
- v) The pump set shall be suitable for starting with discharge valve open and/or closed.
- vi) Pump sets shall be capable of withstanding accidental rotation in reverse direction and phase monitoring provision to give fault indication in case of phase reversal. Reverse rotation switch shall be provided
- vii) Pumps shall have a preferred operating region of 70-120 percent of best efficiency capacity of the furnished impeller. Rated capacity shall be within the region of 80- 110 percent of best efficiency capacity of the furnished impeller.
- viii) The pump shall be compatible with VFD and selected automation system.

Construction Features

The following general features shall apply to the manufacture of all submersible pumps;

- i) Pump shall be centrifugal, vertical spindle, non-clog, and wear resisting, single stage type.
- ii) Pump casing shall be of robust construction. Liquid passages shall be finished smooth and designed as to allow free passage of solids. The volute tongue shall be filed to a smooth rounded edge. Pump casing shall be conforming to relevant I.S and the internal surfaces shall be free from rough spots and must have central line discharge
- iii) Double Mechanical seals shall be provided to protect the motor from ingress of sewage along the

shaft. The preliminary and secondary seals shall be oil-lubricated with tungsten carbide or silicon-carbide faces and they shall be equipped with an electrical monitoring system for seal failure detection.

- iv) Impeller shall be non-clog enclosed type with smooth blunt edges and large water ways so as to allow free passage of the large size solids. It shall be free from sharp comers and projections likely to catch and hold rags and stringy materials. The number of impeller vanes for pumps up to 1000 m³/hr shall be limited to two and shall be limited to three for the pumps higher than 1000 m³/hr. The impeller shall be properly balanced dynamically as well as statically. The impeller shall be properly machined for liquid passage. Enclosed impellers shall be adjustable. In such a case, the pump shall be designed to take care of the additional thrust produced. Impellers shall be surely fastened directly to the extended shaft of motor with keys, taper housings of lock nuts. The impeller shaft shall be made of stainless and it shall have a surface finish between 0.75microns or less. The shaft shall be straight within 0.125 mm for 3 meter length total dial indicator reading
- v) The critical speed of the rotor shall be at least 30% above the operating speed. Complete rotor shall be balanced dynamically as per ISO 9906
- vi) Pump sets shall have double bearings. The bearing life shall be minimum 100,000 hrs of operation. Bearing shall be of the anti-friction type. Bearing shall be capable of taking the static weight of the rotating parts and any thrust generated by the operation of the pump.
- vii) Each pump shall be complete with a cast iron delivery connection arrangement for fixing to the concrete floor of the suction well. The joint between the pump discharge flange and the delivery piping shall be made by merely lowering the pump into guide rails / rope from access level. It shall be provided with all necessary fixings for guiding the pumps during lifting/lowering. Each pump shall be provided with a stainless-steel lifting chain conforming to BS 1663 and BS 4942.
- viii) The pump delivery size shall not be less than 200 mm.
- ix) Each pump shall be provided with an automatic coupling device for attaching the chain pulley block hook to the pump at low level, even whilst the pump is submerged, without the need for personnel to enter the well. This automatic coupling device shall easily and automatically couple and uncouple the hoist hook and be complete with necessary accessories. All links and cables shall be multi-stranded stainless steel.
- x) The pump guide rail assembly will have pedestal, bracket, delivery duck foot bend, guide rail pipe, upper guide rail holder complete. The pedestal and bracket shall provide automatic coupling between pump delivery and discharge bend.
- xi) Pumps shall be provided with SS steel lifting chains of suitable capacity. One end of the chain shall be adhered to the pump and the other end fixed near the upper bracket for guide rail/wire rope assembly by the mean of D-shackle. The chain shall give rings fixed at an interval about 1 m for engaging the hook of chain pulley
- xii) Efficiency of Pump shall not be less than 75%. Pump speed: 1,500 RPM (Maximum)
- xiii) Hydrostatic test shall be 1.5 X the shutoff head or twice the rated discharge head whichever is greater.
- xiv) When connected in dry-well mode, integrated cooling shall be provided wherein pumped liquid or coolant is circulated through cooling jacket for continuous operation of the pump motor set.

The power rating of the pump motor should be the larger of the following

- i. 115% of the power required (BKW) at the duty point.
- ii. 115% of the power input to the pump at duty point at a speed corresponding to the frequency of 48.5 Hz.
- iii. 110% of the maximum power required by the pump from zero discharge to run off point total head.

Materials of Construction of Pumps-

Pump casing	:	Cast Iron IS 210 FG 260
Impeller	:	CF8M
Shaft	:	Stainless Steel 410
Bush	:	Bronze IS 318 Gr. LT B
Impeller key & bolt	:	Stainless Steel

Lifting Chain	:	Stainless Steel
Guide Rail pipe	:	Stainless Steel
Eye Bolt	:	Stainless Steel
Bearing Bracket	:	CI IS : 210 FG 260
Motor casing	:	CI IS : 210 FG 260
Fasteners and Foundation Bolts	:	Stainless Steel
Casing wear ring	:	CI IS : 210 FG 260
O-ring	:	Nitrile rubber (NBR)

Shaft Seal

Type of seal	:	Double mechanical seal
Arrangement	:	Tandem
Seal on medium side	:	With elastomer bellows
Mechanical seal, pump side	:	Silicon carbide/NBR
Mechanical seal, bearing side	:	Silicon carbide/NBR

Monitoring Devices

Thermal winding protection	:	Bi metallic sensors in all three phase winding
Motor housing leakage monitoring	:	Moisture sensor
Junction box leakage monitoring	:	Moisture sensor
Mechanical seal leakage Detection	:	Moisture sensor
Bearing temperature monitoring	:	Bi Metallic sensor

Installation Arrangement

Type of installation	:	Wet well installation design for automatic connection to a permanently installed discharge elbow will neoprene seal to avoid metal to metal contact
Flange dimension to	:	EN 1092-2, PN 10
Claw	:	Bolted to the pump
Installation depth	:	As per data provided

Guide system	:	Stainless Steel
Lifting device	:	Stainless steel lifting chain
Length of lifting device	:	Suitable
Lifting loops	:	suitable
Installation accessories	:	Discharge bracket lifting chain, elbow, fasteners, claw guide bars Etc. complete.

Motor

Type	:	Squirrel cage induction motor
Motor efficiency	:	Premium efficiency motors according to IE2
Degree of protection	:	IP 68
Insulation class	:	H,
Coolant temp	:	</= 40 Deg. C
Temp rise limit	:	Class B
Starting mode	:	Direct on line/ frequency drive Star deltastarter/Soft starter / Variable

Rated voltage	:	3ph, 415 V
Rated frequency	:	50 Hz
Nominal speed	:	Less than 1500-rpm (Synchronise)
Motor casing	:	CI IS 210 IS FG 260
Main cable	:	IEC:60227, IEC:60228; IEC:60332; IS:1554 Complete with cable length as per requirement
Motor feature	:	For VFD application Vacuum Pressure Impregnated (VPI) or Inverter Grade Treatment(IGT). Insulated bearing with shaft grounding ring, as applicable.

* Material test certificates from Government approved metallurgical laboratory shall be formally submitted for all pumps by Suppliers / Contractors

Induction Motors (for Submersible Pumps)

The motor shall be squirrel cage type, three phase submersible motor for continuous duty with class 'H' insulation. Winding of the motor shall be impregnated by resin in order to achieve required thermal withstanding capacity. Motor shall have integral cable port and cable entry shall be sealed. There shall be thermal protection against overheating of motor –winding. The motor shall be designed for non-over loading characteristics. Motor shall be sealed against entry of pump liquid in the motor by using mechanical seal. Moisture sensor tripping unit shall be located inside in the motor chamber.

Performance and Characteristics

The submersible motor shall conform to IS: 9283: and the submersible cable shall conform to clause no. 4.4 of the IS: 9283:

Motors shall be capable of giving rated output without reduction in the expected life span when operated continuously under the following supply conditions:

Variation of supply voltage from rated motor voltage: $\pm 6\%$
Variation of supply frequency from rated frequency: $\pm 3\%$
Combined voltage and frequency variation: $\pm 10\%$

The starting current of motor shall not exceed 200% of rated full load current for star/delta starting and 600% of rated full load current for DOL starting, under any circumstances.

Motors shall be suitable for full voltage direct-on-line starting or star-delta starting or Soft starter or variable Frequency drive.

Motors shall be capable of starting and accelerating the load with the applicable method of starting, without exceeding acceptable winding temperatures, when the supply voltage is in the range 85% of the rated motor voltage to maximum permissible voltage.

The locked rotor current of the motor shall not exceed 600% of full load current (subject to tolerance as per the applicable standard) unless otherwise specified.

Motors shall be designed to withstand 120% of rated speed for two minutes without any mechanical damage in either direction of rotation.

The motor vibrations shall be within the limits specified in applicable standard unless otherwise specified for the driven equipment.

Except as mentioned herein, the guaranteed performances of the motor shall be met with tolerances specified in applicable standard, IS 9283.

The enclosure for motor shall be IP-68.

Protection against increase in stator winding temperature (150°C) bearing temperature, leakage in stator housing and terminal box shall be provided. Minimum three number thermistors in series are to be provided to sense the stator winding temperature. Sensors are to be provided to detect if leakage of sewage into the oil housing is above 30% concentration Bimetallic thermal switch to trip the motor against increase in temperature shall be provided.

The power rating of the motor shall be larger of the following: 115% of the power input to the pump at duty point at a speed corresponding to the frequency of 48.5 Hz.

Maximum Power input while operating single pump corresponding to the speed of 50 Hz.

For pumps that are run with variable frequency drive then System Curve shall be submitted along with Motor Curve for the entire operative range of RPM for approval. Submission of pump data sheet shall be tagged as Variable Frequency Drive /Normal Operation.

Submersible Cable

The umbilical cable between the control panel and the submersible pump shall comply with IEC:60227; IEC:60228; IS:1554 to cover the following requirements;

- i) The power cable shall be PVC insulated and PVC sheathed, flexible, 3.5 core type. The size of the conductor shall be adequate for continuous use under water and air. The half core shall be used for earthing.
- ii) The control cable shall be PVC insulated PVC sheathed, flexible, flat type and shall be adequate for continuous use under water and air. The control cable for stator winding temperature sensor (Thermistors) shall be 3 core x 2.5 sq. mm copper conductors and for bimetallic thermal switch 2 core x 2.5 sq. mm copper conductor shall be provided.
- iii) In case a joint is required to be made between the lead cable supplied with the motor and the user's cable connectors, a detailed procedure of cable jointing to make a watertight joint shall be provided by the manufacturer.

Earthing

- i) Earthing of the motor shall be done in accordance with the relevant provisions of IS:3043
- ii) For the purpose of earthing these motors, earthing connection may be made to discharge pipe.

Insulation

- i) Any joints in the motor insulation such as at coil connections or between slot and end winding sections shall have strength equivalent to that of the slot sections of the coil.
- ii) The insulation shall be given tropical and fungicidal treatment for successful operation of the motor in hot, humid and tropical climate. The tropicalizing treatment shall be as per the applicable standard.
- iii) The stator winding shall be made from high conductivity annealed copper conductor. PVC insulated winding wires conforming to IS: 8783: for wet type motors. The stator winding shall be of high conductivity annealed copper enamelled insulated wires conforming to IS 4800 (Part - VII): for dry type motors.

Temperature Rise

The temperature-rise test of the motor shall be taken with the motor coupled to the suitable pump to give the full load output of the motor. When the various temperatures are stabilized, the set is stopped and the temperature-rise of the stator winding by the resistance method shall not exceed 35°C. During the test, the temperature of the cooling water may not exceed 45°C. As the cable resistance will also be substantial, it is necessary that while calculating the temperature rise by resistance method, due care is taken to account for the correct hot and cold resistance of windings.

Constructional Features (of the Electric Motor)

The motor shall be suitable for continuous use in fully or partially submerged condition. A built in cooling system if required shall allow the motor to operate continuously at its rated output regardless of whether the electric motor is submerged or not, by providing either external or internal cooling arrangement.

Terminal Box

Terminal box shall be of weatherproof construction to eliminate entry of water and suspended matter. The terminals shall be of the stud type with necessary plain washers, spring washers and check nuts. They shall be substantially designed for the current carrying capacity and shall ensure ample phase to phase and phase to ground clearance.

सेक्टर-11, खारघर

TECHNICAL SPECIFICATION OF PUMPS

LIST OF PUMPS: -

Sr. No.	Pump House	Existing pump type	Qty.	Pump flow m ³ /hr	Head (MWC)	RPM	Application	Rate to be Quoted per Unit
1.	Sec-11	Submersible	3	850	15	1500	Sewage Pumping	
		Submersible	2	432	15	1500	Sewage Pumping	

1. Submersible Pumps

This specification covers all submersible type pumps used in connection with wet wells. They may be connected in dry well mode or be fully submersible. In all cases, the following general criteria shall apply:

Design Requirements

- i) The total head capacity curve shall be continuously rising towards the shut off with the highest at shut off. The shut off head of the pump shall be at least 120% of the total head.
- ii) Pumps shall be suitable for single as well as parallel efficient operation at any point in between the maximum and minimum system resistance. The pump shall be capable of developing the required total head at rated capacity. When parallel operation is specified, the head rise shall be at least minimum 10 percent of the head at rated capacity. The manufacturer to be submitted the system resistance curve for parallel operating pumps.
- iii) The pumps shall be designed to handle solid sizes of up to 100 mm for handling raw sewage. Specific gravity of sewage is 1.05
- iv) Pumps shall run smooth without undue noise and vibration, Cavitation, oil or water leaks over the range of operation. To ensure free operation, all rotating components of pump shall be statically and dynamically balanced to BS 6861 / as per zone A & B of ISO 10816-1. Vibration level shall not exceed the levels given in BS 4675 and Noise level shall be limited to 85 dBA at 1.86 M at sites.
- v) The pump set shall be suitable for starting with discharge valve open and/or closed.
- vi) Pump sets shall be capable of withstanding accidental rotation in reverse direction and phase monitoring provision to give fault indication in case of phase reversal. Reverse rotation switch shall be provided
- vii) Pumps shall have a preferred operating region of 70-120 percent of best efficiency capacity of the furnished impeller. Rated capacity shall be within the region of 80- 110 percent of best efficiency capacity of the furnished impeller.
- viii) The pump shall be compatible with VFD and selected automation system.

Construction Features

The following general features shall apply to the manufacture of all submersible pumps;

- i) Pump shall be centrifugal, vertical spindle, non-clog, and wear resisting, single stage type.
- ii) Pump casing shall be of robust construction. Liquid passages shall be finished smooth and designed as to allow free passage of solids. The volute tongue shall be filed to a smooth rounded edge. Pump casing shall be conforming to relevant I.S and the internal surfaces shall be free from rough spots and must have central line discharge
- iii) Double Mechanical seals shall be provided to protect the motor from ingress of sewage along the shaft. The preliminary and secondary seals shall be oil-lubricated with tungsten carbide or

silicon-carbide faces and they shall be equipped with an electrical monitoring system for seal failure detection.

- iv) Impeller shall be non-clog enclosed type with smooth blunt edges and large water ways so as to allow free passage of the large size solids. It shall be free from sharp comers and projections likely to catch and hold rags and stringy materials. The number of impeller vanes for pumps up to 1000 m³/hr shall be limited to two and shall be limited to three for the pumps higher than 1000 m³/hr. The impeller shall be properly balanced dynamically as well as statically. The impeller shall be properly machined for liquid passage. Enclosed impellers shall be adjustable. In such a case, the pump shall be designed to take care of the additional thrust produced. Impellers shall be surely fastened directly to the extended shaft of motor with keys, taper housings of lock nuts. The impeller shaft shall be made of stainless and it shall have a surface finish between 0.75microns or less. The shaft shall be straight within 0.125 mm for 3 meter length total dial indicator reading
- v) The critical speed of the rotor shall be at least 30% above the operating speed. Complete rotor shall be balanced dynamically as per ISO 9906
- vi) Pump sets shall have double bearings. The bearing life shall be minimum 100,000 hrs of operation. Bearing shall be of the anti-friction type. Bearing shall be capable of taking the static weight of the rotating parts and any thrust generated by the operation of the pump.
- vii) Each pump shall be complete with a cast iron delivery connection arrangement for fixing to the concrete floor of the suction well. The joint between the pump discharge flange and the delivery piping shall be made by merely lowering the pump into guide rails / rope from access level. It shall be provided with all necessary fixings for guiding the pumps during lifting/lowering. Each pump shall be provided with a stainless-steel lifting chain conforming to BS 1663 and BS 4942.
- viii) The pump delivery size shall not be less than 200 mm.
- ix) Each pump shall be provided with an automatic coupling device for attaching the chain pulley block hook to the pump at low level, even whilst the pump is submerged, without the need for personnel to enter the well. This automatic coupling device shall easily and automatically couple and uncouple the hoist hook and be complete with necessary accessories. All links and cables shall be multi- stranded stainless steel.
- x) The pump guide rail assembly will have pedestal, bracket, delivery duck foot bend, guide rail pipe, upper guide rail holder complete. The pedestal and bracket shall provide automatic coupling between pump delivery and discharge bend.
- xi) Pumps shall be provided with SS steel lifting chains of suitable capacity. One end of the chain shall be adhered to the pump and the other end fixed near the upper bracket for guide rail/wire rope assembly by the mean of D-shackle. The chain shall give rings fixed at an interval about 1 m for engaging the hook of chain pulley
- xii) Efficiency of Pump shall not be less than 75%. Pump speed: 1,500 RPM (Maximum)
- xiii) Hydrostatic test shall be 1.5 X the shutoff head or twice the rated discharge head whichever is greater.
- xiv) When connected in dry-well mode, integrated cooling shall be provided wherein pumped liquid or coolant is circulated through cooling jacket for continuous operation of the pump motor set.

The power rating of the pump motor should be the larger of the following

- i) 115% of the power required (BKW) at the duty point.
- ii) 115% of the power input to the pump at duty point at a speed corresponding to the frequency of 48.5 Hz.
- iii) 110% of the maximum power required by the pump from zero discharge to run off point total head.

Materials of Construction of Pumps-

Pump casing	:	Cast Iron IS 210 FG 260
Impeller	:	CF8M
Shaft	:	Stainless Steel 410
Bush	:	Bronze IS 318 Gr. LT B
Impeller key & bolt	:	Stainless Steel
Lifting Chain	:	Stainless Steel
Guide Rail pipe	:	Stainless Steel
Eye Bolt	:	Stainless Steel
Bearing Bracket	:	CI IS : 210 FG 260
Motor casing	:	CI IS : 210 FG 260
Fasteners and Foundation Bolts	:	Stainless Steel
Casing wear ring	:	CI IS : 210 FG 260
O-ring	:	Nitrile rubber (NBR)

Shaft Seal

Type of seal	:	Double mechanical seal
Arrangement	:	Tandem
Seal on medium side	:	With elastomer bellows
Mechanical seal, pump side	:	Silicon carbide/NBR
Mechanical seal, bearing side	:	Silicon carbide/NBR

Monitoring Devices

Thermal winding protection	:	Bi metallic sensors in all three phase winding
Motor housing leakage monitoring	:	Moisture sensor
Junction box leakage monitoring	:	Moisture sensor
Mechanical seal leakage Detection	:	Moisture sensor
Bearing temperature monitoring	:	Bi Metallic sensor

Installation Arrangement

Type of installation	:	Wet well installation design for automatic connection to a permanently installed discharge elbow will neoprene seal to avoid metal to metal contact
Flange dimension to	:	EN 1092-2, PN 10
Claw	:	Bolted to the pump
Installation depth	:	As per data provided
Guide system	:	Stainless Steel
Lifting device	:	Stainless steel lifting chain
Length of lifting device	:	Suitable
Lifting loops	:	suitable
Installation accessories	:	Discharge bracket lifting chain, elbow, fasteners, claw guide bars Etc. complete.

Motor

Type	:	Squirrel cage induction motor
Motor efficiency	:	Premium efficiency motors according to IE2
Degree of protection	:	IP 68
Insulation class	:	H,
Coolant temp	:	≤ 40 Deg. C
Temp rise limit	:	Class B
Starting mode	:	Direct on line/ frequency drive Star deltastarter/Soft starter / Variable
Rated voltage	:	3ph, 415 V
Rated frequency	:	50 Hz
Nominal speed	:	Less than 1500-rpm (Synchronise)
Motor casing	:	CI IS 210 IS FG 260
Main cable	:	IEC:60227, IEC:60228; IEC:60332; IS:1554 Complete with cable length as per requirement
Motor feature	:	For VFD application Vacuum Pressure Impregnated (VPI) or Inverter Grade Treatment(IGT). Insulated bearing with shaft grounding ring, as applicable.

* Material test certificates from Government approved metallurgical laboratory shall be formally submitted for all pumps by Suppliers / Contractors

Induction Motors (for Submersible Pumps)

The motor shall be squirrel cage type, three phase submersible motor for continuous duty with class 'H' insulation. Winding of the motor shall be impregnated by resin in order to achieve required thermal withstanding capacity. Motor shall have integral cable port and cable entry shall be sealed. There shall be thermal protection against overheating of motor –winding. The motor shall be designed for non-over loading characteristics. Motor shall be sealed against entry of pump liquid in the motor by using mechanical seal. Moisture sensor tripping unit shall be located inside in the motor chamber.

Performance and Characteristics

The submersible motor shall conform to IS: 9283: and the submersible cable shall conform to clause no. 4.4 of the IS: 9283:

Motors shall be capable of giving rated output without reduction in the expected life span when operated continuously under the following supply conditions:

Variation of supply voltage from rated motor voltage: $\pm 6\%$

Variation of supply frequency from rated frequency: $\pm 3\%$

Combined voltage and frequency variation: $\pm 10\%$

The starting current of motor shall not exceed 200% of rated full load current for star/delta starting and 600% of rated full load current for DOL starting, under any circumstances.

Motors shall be suitable for full voltage direct-on-line starting or star-delta starting or Soft starter or variable Frequency drive.

Motors shall be capable of starting and accelerating the load with the applicable method of starting, without exceeding acceptable winding temperatures, when the supply voltage is in the range 85% of the rated motor voltage to maximum permissible voltage.

The locked rotor current of the motor shall not exceed 600% of full load current (subject to tolerance as per the applicable standard) unless otherwise specified.

Motors shall be designed to withstand 120% of rated speed for two minutes without any mechanical damage in either direction of rotation.

The motor vibrations shall be within the limits specified in applicable standard unless otherwise specified for the driven equipment.

Except as mentioned herein, the guaranteed performances of the motor shall be met with tolerances specified in applicable standard, IS 9283.

The enclosure for motor shall be IP-68.

Protection against increase in stator winding temperature (150°C) bearing temperature, leakage in stator housing and terminal box shall be provided. Minimum three number thermistors in series are to be provided to sense the stator winding temperature. Sensors are to be provided to detect if leakage of sewage into the oil housing is above 30% concentration Bimetallic thermal switch to trip the motor against increase in temperature shall be provided.

The power rating of the motor shall be larger of the following: 115% of the power input to the pump at duty point at a speed corresponding to the frequency of 48.5 Hz.

Maximum Power input while operating single pump corresponding to the speed of 50 Hz.

For pumps that are run with variable frequency derive then System Curve shall be submitted along with Motor Curve for the entire operative range of RPM for approval. Submission of pump data sheet shall be tagged as Variable Frequency Drive /Normal Operation.

Submersible Cable

The umbilical cable between the control panel and the submersible pump shall comply with IEC:60227; IEC:60228; IS:1554 to cover the following requirements;

- i) The power cable shall be PVC insulated and PVC sheathed, flexible, 3.5 core type. The size of the conductor shall be adequate for continuous use under water and air. The half core shall be used for earthing.
- ii) The control cable shall be PVC insulated PVC sheathed, flexible, flat type and shall be adequate for continuous use under water and air. The control cable for stator winding temperature sensor (Thermistors) shall be 3 core x 2.5 sq. mm copper conductors and for bimetallic thermal switch 2 core x 2.5 sq. mm copper conductor shall be provided.
- iii) In case a joint is required to be made between the lead cable supplied with the motor and the user's cable connectors, a detailed procedure of cable jointing to make a watertight joint shall be provided by the manufacturer.

Earthing

- i) Earthing of the motor shall be done in accordance with the relevant provisions of IS:3043
- ii) For the purpose of earthing these motors, earthing connection may be made to discharge pipe.

Insulation

- iv) Any joints in the motor insulation such as at coil connections or between slot and end winding sections shall have strength equivalent to that of the slot sections of the coil.
- v) The insulation shall be given tropical and fungicidal treatment for successful operation of the motor in hot, humid and tropical climate. The tropicalizing treatment shall be as per the applicable standard.
- vi) The stator winding shall be made from high conductivity annealed copper conductor. PVC insulated winding wires conforming to IS: 8783: for wet type motors. The stator winding shall be of high conductivity annealed copper enamelled insulated wires conforming to IS 4800 (Part - VII): for dry type motors.

Temperature Rise

The temperature-rise test of the motor shall be taken with the motor coupled to the suitable pump to give the full load output of the motor. When the various temperatures are stabilized, the set is stopped and the temperature-rise of the stator winding by the resistance method shall not exceed 35°C. During the test, the temperature of the cooling water may not exceed 45°C. As the cable resistance will also be substantial, it is necessary that while calculating the temperature rise by resistance method, due care is taken to account for the correct hot and cold resistance of windings.

Constructional Features (of the Electric Motor)

The motor shall be suitable for continuous use in fully or partially submerged condition. A built in cooling system if required shall allow the motor to operate continuously at its rated output regardless of whether the electric motor is submerged or not, by providing either external or internal cooling arrangement.

Terminal Box

Terminal box shall be of weatherproof construction to eliminate entry of water and suspended matter. The terminals shall be of the stud type with necessary plain washers, spring washers and check nuts. They shall be substantially designed for the current carrying capacity and shall ensure ample phase to phase and phase to ground clearance.

सेक्टर-09, खारघर.

TECHNICAL SPECIFICATION OF PUMPS

LIST OF PUMPS: -

Sr. No.	Pump House	Existing pump type	Qty.	Pump flow m ³ /hr	Head (MWC)	RPM	Application	Rate to be Quoted per Unit
1	Sec- 09	Submersible	2	655	18	1500	Sewage Pumping	
		Submersible	4	1350	18	1500	Sewage Pumping	

1. Submersible Pumps

This specification covers all submersible type pumps used in connection with wet wells. They may be connected in dry well mode or be fully submersible. In all cases, the following general criteria shall apply:

Design Requirements

- i) The total head capacity curve shall be continuously rising towards the shut off with the highest at shut off. The shut off head of the pump shall be at least 120% of the total head.
- ii) Pumps shall be suitable for single as well as parallel efficient operation at any point in between the maximum and minimum system resistance. The pump shall be capable of developing the required total head at rated capacity. When parallel operation is specified, the head rise shall be at least minimum 10 percent of the head at rated capacity. The manufacturer to be submitted the system resistance curve for parallel operating pumps.
- iii) The pumps shall be designed to handle solid sizes of up to 100 mm for handling raw sewage. Specific gravity of sewage is 1.05
- iv) Pumps shall run smooth without undue noise and vibration, Cavitation, oil or water leaks over the range of operation. To ensure free operation, all rotating components of pump shall be statically and dynamically balanced to BS 6861 / as per zone A & B of ISO 10816-1. Vibration level shall not exceed the levels given in BS 4675 and Noise level shall be limited to 85 dBA at 1.86 M at sites.
- v) The pump set shall be suitable for starting with discharge valve open and/or closed.
- vi) Pump sets shall be capable of withstanding accidental rotation in reverse direction and phase monitoring provision to give fault indication in case of phase reversal. Reverse rotation switch shall be provided
- vii) Pumps shall have a preferred operating region of 70-120 percent of best efficiency capacity of the furnished impeller. Rated capacity shall be within the region of 80- 110 percent of best efficiency capacity of the furnished impeller.
- viii) The pump shall be compatible with VFD and selected automation system.

Construction Features

The following general features shall apply to the manufacture of all submersible pumps;

- i) Pump shall be centrifugal, vertical spindle, non-clog, and wear resisting, single stage type.
- ii) Pump casing shall be of robust construction. Liquid passages shall be finished smooth and designed as to allow free passage of solids. The volute tongue shall be filed to a smooth rounded edge. Pump casing shall be conforming to relevant I.S and the internal surfaces shall

be free from rough spots and must have central line discharge.

- iii) Double Mechanical seals shall be provided to protect the motor from ingress of sewage along the shaft. The preliminary and secondary seals shall be oil-lubricated with tungsten carbide or silicon-carbide faces and they shall be equipped with an electrical monitoring system for seal failure detection.
- iv) Impeller shall be non-clog enclosed type with smooth blunt edges and large water ways so as to allow free passage of the large size solids. It shall be free from sharp comers and projections likely to catch and hold rags and stringy materials. The number of impeller vanes for pumps up to 1000 m³/hr shall be limited to two and shall be limited to three for the pumps higher than 1000 m³/hr. The impeller shall be properly balanced dynamically as well as statically. The impeller shall be properly machined for liquid passage. Enclosed impellers shall be adjustable. In such a case, the pump shall be designed to take care of the additional thrust produced. Impellers shall be surely fastened directly to the extended shaft of motor with keys, taper housings of lock nuts. The impeller shaft shall be made of stainless and it shall have a surface finish between 0.75microns or less. The shaft shall be straight within 0.125 mm for 3 meter length total dial indicator reading
- v) The critical speed of the rotor shall be at least 30% above the operating speed. Complete rotor shall be balanced dynamically as per ISO 9906
- vi) Pump sets shall have double bearings. The bearing life shall be minimum 100,000 hrs of operation. Bearing shall be of the anti-friction type. Bearing shall be capable of taking the static weight of the rotating parts and any thrust generated by the operation of the pump.
- vii) Each pump shall be complete with a cast iron delivery connection arrangement for fixing to the concrete floor of the suction well. The joint between the pump discharge flange and the delivery piping shall be made by merely lowering the pump into guide rails / rope from access level. It shall be provided with all necessary fixings for guiding the pumps during lifting/lowering. Each pump shall be provided with a stainless-steel lifting chain conforming to BS 1663 and BS 4942.
- viii) The pump delivery size shall not be less than 200 mm.
- ix) Each pump shall be provided with an automatic coupling device for attaching the chain pulley block hook to the pump at low level, even whilst the pump is submerged, without the need for personnel to enter the well. This automatic coupling device shall easily and automatically couple and uncouple the hoist hook and be complete with necessary accessories. All links and cables shall be multi- stranded stainless steel.
- x) The pump guide rail assembly will have pedestal, bracket, delivery duck foot bend, guide rail pipe, upper guide rail holder complete. The pedestal and bracket shall provide automatic coupling between pump delivery and discharge bend.
- xi) Pumps shall be provided with SS steel lifting chains of suitable capacity. One end of the chain shall be adhered to the pump and the other end fixed near the upper bracket for guide rail/wire rope assembly by the mean of D-shackle. The chain shall give rings fixed at an interval about 1 m for engaging the hook of chain pulley
- xii) Efficiency of Pump shall not be less than 75%. Pump speed: 1,500 RPM (Maximum)
- xiii) Hydrostatic test shall be 1.5 X the shutoff head or twice the rated discharge head whichever is greater.
- xiv) When connected in dry-well mode, integrated cooling shall be provided wherein pumped liquid or coolant is circulated through cooling jacket for continuous operation of the pump motor set.

The power rating of the pump motor should be the larger of the following

- i) 115% of the power required (BKW) at the duty point.
- ii) 115% of the power input to the pump at duty point at a speed corresponding to the frequency of 48.5 Hz.

- iii) 110% of the maximum power required by the pump from zero discharge to run off point total head.

Materials of Construction of Pumps-

Pump casing	:	Cast Iron IS 210 FG 260
Impeller	:	CF8M
Shaft	:	Stainless Steel 410
Bush	:	Bronze IS 318 Gr. LT B
Impeller key & bolt	:	Stainless Steel
Lifting Chain	:	Stainless Steel
Guide Rail pipe	:	Stainless Steel
Eye Bolt	:	Stainless Steel
Bearing Bracket	:	CI IS : 210 FG 260
Motor casing	:	CI IS : 210 FG 260
Fasteners and Foundation Bolts	:	Stainless Steel
Casing wear ring	:	CI IS : 210 FG 260
O-ring	:	Nitrile rubber (NBR)

Shaft Seal

Type of seal	:	Double mechanical seal
Arrangement	:	Tandem
Seal on medium side	:	With elastomer bellows
Mechanical seal, pump side	:	Silicon carbide/NBR
Mechanical seal, bearing side	:	Silicon carbide/NBR

Monitoring Devices

Thermal winding protection	:	Bi metallic sensors in all three phase winding
Motor housing leakage monitoring	:	Moisture sensor
Junction box leakage monitoring	:	Moisture sensor
Mechanical seal leakage Detection	:	Moisture sensor
Bearing temperature monitoring	:	Bi Metallic sensor

Installation Arrangement

Type of installation	:	Wet well installation design for automatic connection to a permanently installed discharge elbow will neoprene seal to avoid metal to metal contact
Flange dimension to	:	EN 1092-2, PN 10
Claw	:	Bolted to the pump
Installation depth	:	As per data provided
Guide system	:	Stainless Steel
Lifting device	:	Stainless steel lifting chain
Length of lifting device	:	Suitable
Lifting loops	:	suitable
Installation accessories	:	Discharge bracket lifting chain, elbow, fasteners, claw guide bars Etc. complete.

Motor

Type	:	Squirrel cage induction motor
Motor efficiency	:	Premium efficiency motors according to IE2
Degree of protection	:	IP 68
Insulation class	:	H,
Coolant temp	:	≤ 40 Deg. C
Temp rise limit	:	Class B
Starting mode	:	Direct on line/ frequency drive Star deltastarter/Soft starter / Variable
Rated voltage	:	3ph, 415 V
Rated frequency	:	50 Hz
Nominal speed	:	Less than 1500-rpm (Synchronise)
Motor casing	:	CI IS 210 IS FG 260
Main cable	:	IEC:60227, IEC:60228; IEC:60332; IS:1554 Complete with cable length as per requirement
Motor feature	:	For VFD application Vacuum Pressure Impregnated (VPI) or Inverter Grade Treatment(IGT). Insulated bearing with shaft grounding ring, as applicable.

* Material test certificates from Government approved metallurgical laboratory shall beformally submitted for all pumps by Suppliers / Contractors

Induction Motors (for Submersible Pumps)

The motor shall be squirrel cage type, three phase submersible motor for continuous duty with class 'H' insulation. Winding of the motor shall be impregnated by resin in order to achieve required thermal withstanding capacity. Motor shall have integral cable port and cable entry shall be sealed. There shall be thermal protection against overheating of motor -winding. The motor shall be designed for non-over loading characteristics. Motor shall be sealed against entry of pump liquid in the motor by using mechanical seal. Moisture sensor tripping unit shall be located inside in the motor chamber.

Performance and Characteristics

The submersible motor shall conform to IS: 9283: and the submersible cable shall conform to clause no. 4.4 of the IS: 9283:

Motors shall be capable of giving rated output without reduction in the expected life span when operated continuously under the following supply conditions:

Variation of supply voltage from rated motor voltage: $\pm 6\%$
Variation of supply frequency from rated frequency: $\pm 3\%$
Combined voltage and frequency variation: $\pm 10\%$

The starting current of motor shall not exceed 200% of rated full load current for star/delta starting and 600% of rated full load current for DOL starting, under any circumstances.

Motors shall be suitable for full voltage direct-on-line starting or star-delta starting or Soft starter or variable Frequency drive.

Motors shall be capable of starting and accelerating the load with the applicable method of starting, without exceeding acceptable winding temperatures, when the supply voltage is in the range 85% of the rated motor voltage to maximum permissible voltage.

The locked rotor current of the motor shall not exceed 600% of full load current (subject to tolerance as per the applicable standard) unless otherwise specified.

Motors shall be designed to withstand 120% of rated speed for two minutes without any mechanical damage in either direction of rotation.

The motor vibrations shall be within the limits specified in applicable standard unless otherwise specified for the driven equipment.

Except as mentioned herein, the guaranteed performances of the motor shall be met with tolerances specified in applicable standard, IS 9283.

The enclosure for motor shall be IP-68.

Protection against increase in stator winding temperature (150°C) bearing temperature, leakage in stator housing and terminal box shall be provided. Minimum three number thermistors in series are to be provided to sense the stator winding temperature. Sensors are to be provided to detect if leakage of sewage into the oil housing is above 30% concentration Bimetallic thermal switch to trip the motor against increase in temperature shall be provided.

The power rating of the motor shall be larger of the following: 115% of the power input to the pump at duty point at a speed corresponding to the frequency of 48.5 Hz.

Maximum Power input while operating single pump corresponding to the speed of 50 Hz.

For pumps that are run with variable frequency derive then System Curve shall be submitted along with Motor Curve for the entire operative range of RPM for approval. Submission of pump data sheet shall be tagged as Variable Frequency Drive /Normal Operation.

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The umbilical cable between the control panel and the submersible pump shall comply with IEC:60227; IEC:60228; IS:1554 to cover the following requirements;

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- i) The control cable shall be PVC insulated PVC sheathed, flexible, flat type and shall be adequate for continuous use under water and air. The control cable for stator winding temperature sensor (Thermistors) shall be 3 core x 2.5 sq. mm copper conductors and for bimetallic thermal switch 2 core x 2.5 sq. mm copper conductor shall be provided.
- ii) In case a joint is required to be made between the lead cable supplied with the motor and the user's cable connectors, a detailed procedure of cable jointing to make a watertight joint shall be provided by the manufacturer.

Earthing

- i) Earthing of the motor shall be done in accordance with the relevant provisions of IS:3043
- ii) For the purpose of earthing these motors, earthing connection may be made to discharge pipe.

Insulation

- i) Any joints in the motor insulation such as at coil connections or between slot and end winding sections shall have strength equivalent to that of the slot sections of the coil.
- ii) The insulation shall be given tropical and fungicidal treatment for successful operation of the motor in hot, humid and tropical climate. The tropicalizing treatment shall be as per the applicable standard.
- iii) The stator winding shall be made from high conductivity annealed copper conductor. PVC

insulated winding wires conforming to IS: 8783: for wet type motors. The stator winding shall be of high conductivity annealed copper enamelled insulated wires conforming to IS 4800 (Part - VII): for dry type motors.

Temperature Rise

The temperature-rise test of the motor shall be taken with the motor coupled to the suitable pump to give the full load output of the motor. When the various temperatures are stabilized, the set is stopped and the temperature-rise of the stator winding by the resistance method shall not exceed 35°C. During the test, the temperature of the cooling water may not exceed 45°C. As the cable resistance will also be substantial, it is necessary that while calculating the temperature rise by resistance method, due care is taken to account for the correct hot and cold resistance of windings.

Constructional Features (of the Electric Motor)

The motor shall be suitable for continuous use in fully or partially submerged condition. A built in cooling system if required shall allow the motor to operate continuously at its rated output regardless of whether the electric motor is submerged or not, by providing either external or internal cooling arrangement.

Terminal Box

Terminal box shall be of weatherproof construction to eliminate entry of water and suspended matter. The terminals shall be of the stud type with necessary plain washers, spring washers and check nuts. They shall be substantially designed for the current carrying capacity and shall ensure ample phase to phase and phase to ground clearance.

GATE SCREEN

1) **Manual Screen**

'J' type SS 304 removable manual bar screen segment of following sizes suitable for the below mentioned channel opening, suitable for 3.0 m water head from IL of screen channel, consists of vertical rectangular flats/bars of size 50 mm wide & 10 mm thick vertically spaced at 40 mm clear bar spacing, inclination 90 degree to the horizontal plane, with 01 nos. manual rake/hand rake. Including: -One set. SS 304 side wall anchored guide frame of suitable size. (Consists of one LHS +RHS side guide frame member + bottom frame member).

- A. "J" type manually cleaned removable Trash Rack coarse bar screens shall be capable of performing the screening duties in storm water / waste water pumping stations/ river or barrage intake structures and in water and waste water treatment plants. These screens shall be suitable for operation in a flow having large and medium sized undefined floating waste coming with water. The screens shall be so constructed that there is no undue wear or deterioration during its operative life and so designed that the maintenance is kept to a minimum.
- B. These screens shall be supplied along with all accessories such as screen segment, guide frames, hand scraper assembly, lifting beam and all fasteners as required for erection/installation of the screen guide frame.

2. SPECIFICATIONS FOR SCREENS:

1) DESIGN & CONSTRUCTIONAL DETAILS:

- Screen segment consists of its sides, top & bottom frame members, back support stiffeners & vertical rectangular flats/bars of stainless steel.
- The screen shall move vertically up or down in SS guide channels that are either securely fixed to the sidewalls of the inlet chamber by means of suitably sized and spaced rag bolts/mechanical anchor fasteners or embedded in the two vertical side walls and bottom floor of the channel using grout as per actual site requirement.
- Side guide frame member will be suitable for anchoring on inner face of the two parallel vertical side walls using anchoring plates & mechanical anchor fasteners.
- Side guide frames from invert of screen opening/channel bottom level up to top of channel floor level.
- Bottom frame member will be suitable for anchoring at the bottom of the channel, using anchoring plates & mechanical anchor fasteners.
- The bars shall be of dimensions 10x50 i.e. 50 mm deep x 10mm thick vertically spaced at 40 mm clear average bar spacing at an inclination angle of 90 degree to the horizontal plane.
- Bottom member of guide frame shall remain flush with the bottom level of channel.
- "J" type perforated tray/bucket shall be bolted to the bottom of each screen segment.
- One no. manual cleaning rake/comb shall be offered for screen for each screen to manually clean the screen while screen segment is brought up / lifted up at top of channel level.
- The side of the screen shall have replaceable wear shoes of gunmetal.

Location	Dimensions	Quantity	Rate to be Quoted per Unit
P1- Panvel (E)	1500 mm W x 2000 mm H	1 Nos	
P2- Panvel (W)	2000 mm W x 2000 mm H	1 Nos	
P3- Panvel (E)	1400 mm W x 2000 mm H	1 Nos	
Sector 7- Kharghar	1100 mm W x 2000 mm H	1 Nos	
Sector 11- Kharghar	1700 mm W x 2000 mm H	1 Nos	
Sector 9 - Kharghar	1300 mm W x 2000 mm H	1 Nos	

2) Sluice Gate

Providing Cast Iron Sluice Gates manufactured & tested as per IS3042- 1965. Gates to be provided with brass seats and spindle of MS bright bar of required height to enable to operate the gate from operating slab of intake structure including GM nut bolts SS316 hardware, necessary wedges to be provided to achieve leak tightness, including operational wheel headstock, foundation material, labour etc. complete including taxes & duties, as per below mentioned sizes.

SPECIFICATIONS FOR WALL THIMBLE MOUNTED CAST IRON SLUICE GATES

A) GENERAL

The construction of cast iron sluice gates shall be strictly in accordance with the specifications mentioned hereunder.

The Sluice gates shall be capable of performing the isolation duties in water / waste water treatment plant & pumping stations for isolation of flow in & out of a closed conduit as well as in those applications where water head is more than the height of shutter / opening.

They shall be so constructed that there is no undue wear or deterioration during its operative life and so designed that the maintenance is kept to a minimum.

B) DESIGN & CONSTRUCTIONAL DETAILS

The sluice gates shall be manufactured generally as per IS- IS3042- 1965 Indian standard. The constructional features and details of components of the required gates are to be as under:

1. GATE FRAME:

- The gate frame will be made from cast iron and shall be sufficiently rigid to withstand the designated water head. The gate frame shall either be flat back type or flange back type to suit the designed head and site condition.
- Back flange of the gate aperture frame to be precisely machined flat and drilled to engage with the Cast iron wall thimble mounted on the wall.
- A rubber gasket will be provided between the wall thimble and the gate for ease in future dismounting of the gate for repairs / replacement and seal any leakage between the flange of frame and wall thimble.
- The gate frame of these sluice gates shall either be self-contained type or non-self-contained type depending upon site requirement. In case of non-self-contained gates, the frames shall have short length extension guides and shall be without yoke at their top.
- The length of extension guides in such cases shall be sufficient to engage at least half the overall vertical height of door when the gate is full open and shall be in accordance with the relevant provisions of IS-13349.
- In case of self-contained gates, the frames shall have full length extension guides and shall be provided with a yoke at their top. The length of extension guides in such cases shall be sufficient to engage the overall vertical height of door when the gate is full open position.

2. WALL THIMBLE:

- The Wall thimble will be made from cast iron for placement in the concrete wall. Its front flange will be machined, drilled and tapped to match with the frame flange.
- The cross section of the thimble shall be F shaped and the depth of thimble shall be maximum 300 mm long or lesser in case wall thickness is less than 300mm. Gates subjected to high unseating heads shall have thimble cross section shaped E.
- To permit entrapped air to escape as the thimble is being encased in concrete, cast holes of 40mm diameter shall be provided at the bottom of wall thimble in each entrapment zone.

3. GATE SLIDE / SHUTTER / DOOR:

- The gate slide / shutter / door will be made from cast iron and shall be sufficiently ribbed to withstand the designated water head.
- The gate slide / shutter will be provided with integral pocket to house the thrust nut used to connect the stem with the slide.

4. SEATING/SEALING FACES:

- **Materials:** These should be of Stainless steel or Bronze.
- **Fitment:** The facings shall be attached to Plain machined surfaces / rectangular grooves of gate frame and door, depending upon the applicable water head, and be secured in place using taper screws. The taper screws adopted for facings shall be of same material as that of the seat facings.
- The front faces of integral extension guides which can come in contact with the sealing faces of door while opening, shall also be fitted with sealing faces of the same material as that of the sealing faces on door. This is required to offer non corroding smooth sliding surfaces to the sealing faces of door/shutter during its vertical travel for opening and enhance the effective life of gate.
- **Finish:** The mating seating/sealing faces on the gate frame and door shall be precisely finished for proper contact. They should be so finished that the clearance or gap, if any, between the mating sealing faces, in gate closed position, does not exceed 0.1mm.

5. WEDGING DEVICES:

- The Sluice gates shall be provided with individually adjustable wedging devices to ensure forced contact between frame and shutter seat facings, when the gate is in closed position.
- The gates meant for seating head shall be provided only with side wedging devices.
- Gates meant for higher unseating head of sizes larger than 600 mm, shall be provided with side, top and bottom wedging devices or with side and top wedging devices and flush bottom closing arrangement as required.
- The wedging devices comprise of wedge brackets fitted on gate aperture frame and door.
- The wedge bracket on frame shall remain in fixed position and those on door shall be adjustable or vice versa.
- A sort of slot and tennon arrangement shall be provided on base of wedge brackets to prevent any tendency to shift.
- Provision shall be made to clamp the adjustable brackets firmly in adjusted position.
- The wedging devices shall be made of cast iron. If the wedges/wedge blocks of wedging devices are of Cast Iron, then these are to be lined with contacting faces of the same material as that of sealing faces attached to the gate frame and door.

C) CONVENTIONAL OR FLUSH BOTTOM CLOSING:

- The sluice gates shall be provided with conventional or flush bottom closure arrangement as required.
- The sluice gates provided with conventional bottom closing arrangement involve corrosion resistant metallic contacting sealing faces at the bottom sill of gate. In such cases, the invert of the gate is required to be kept above the floor of the channel / chamber by at least 200mm to 300mm depending upon the size and type of gate.
- In case of conventional closing gate, if the invert of the gate is kept at the same level as that of the channel/chamber floor, then there remains a slot or a groove at the invert of the gate. Debris, dirt etc. which may settle in this slot and may not allow the gate to close properly and this may give rise to heavy leakages while in operation. With a view to avoid this, in situations where the invert of the gate is to remain at the same level as that of the channel/floor, a Flush Bottom closing gate instead of Conventional Bottom Closing gate should be provided.
- Flush Bottom Closing shall involve a flexible rubber seal at the bottom of the gate, mounted either on the shutter or on the frame, ensuring that the sealing face remains flush with the floor.
- The cast iron bar fitted at the bottom of the frame is required to be embedded in the channel / chamber floor and for this a cut out / recess of ample dimensions is required to be provided beneath the waterway opening along the gate invert, while constructing the floor. The dimensions of this cut out shall be provided depending upon the feasibility to do so as per actual site conditions.
- This cut out/recess is to be later on filled up with removable asphalt or loose concrete mixed with sand/saw dust or vermiculate after putting the gate in position so that it is possible to break open this second stage grout for removal of the gate in future.

- The rubber seal employed shall be made of EPDM or Neoprene rubber and the rubber seal retainer bar as well as the fasteners for fitting the rubber seal and the retainer bar are of cast iron.

D) GATE OPERATING HEADSTOCK/LIFT MECHANISM :

- The operating headstocks shall be designed in such a manner as to permit the gate operation by a single person under the specified maximum operating head with an effort of less than 18kgs on the crank / handwheel.
- The headstock may be ungeared or geared type, as might be necessary to make it convenient for one person to open or close the gate as fast as practicable.
- Geared headstock shall be supplied with easily removable crank handle or handwheel with a radius not exceeding 375mm.
- All the gears of geared headstock shall be kept completely encased in cast iron housing to protect them from damage, dirt, dust, water etc. and other atmospheric effects and thus ensure their smooth operation. Grease nipples shall be provided at proper places for lubricating with grease.
- Headstock meant for mounting on operating platform shall be supplied with a pedestal/floor stand to provide a convenient operating height of approximately 900 mm. The pedestal of the headstock shall be provided with a covered window opening to enable cleaning and greasing of stem threads.

E) LIFTING SPINDLE/STEM :

- The sluice gates shall be supplied with Rising type lifting spindles/stems. The stem shall be provided with acme / square threading, length of threaded portion being about 400 mm more than the height of waterway opening. This much extra length is required to allow for a minor variation of approximately 100mm on either side of the specified height of operating platform.
- The design of stem will be done as per the provision in IS-13349.

F) STEM BLOCK / CONNECTING BLOCK / THRUST NUT :

- The rising type stem shall be connected to the door through a stem block/thrust nut housed in a ribbed pocket cast integral with the door.
- The bottom end of stem shall thread into the stem block and is locked in place by a set screw to prevent the stem from unscrewing.
- The Stem block shall be cast bronze or Gunmetal.

G) SAFETY STOP NUT :

- The stem shall be provided with a safety stop nut to prevent the chances of over closing of gate which may otherwise damage either the stem or the lifting platform.
- The stop nut shall be furnished with a set screw for setting it in a fixed position after the gate is installed.
- Upon installation the safety stop nut should be set in such a way that its bottom remains about 1 to 2 mm away from the top of headstock, in gate closed position.
- In case of stainless steel stem, the stop nut shall also be of stainless steel material of the same grade.

H) STEM/SPINDLE COUPLINGS:

- For ease in transportation and handling, maximum length of one piece stem shall be restricted within 5 meter length.
- Where the stem are required to be furnished in more than one piece, threaded stem couplings shall be furnished to interconnect different sections of the stem.
- The couplings shall have provision for pinning after inserting in the threaded end of the stem.
- In case of stainless-steel stem, the couplings shall also be of stainless steel material of the same grade.

I) STEM GUIDE BRACKETS

- Longer stems shall be provided with sufficient number of stem guides to prevent buckling of stem.

- The stem guide bracket to be provided shall be Adjustable Channel Type - wherein a separate stem guide is bolted on to the wall bracket.
- The stem guide shall be adjustable in the slots on wall bracket in a direction perpendicular to the face of wall. Wall bracket should also offers minor adjustment in the direction parallel to the wall.
- The stem guides shall have machine bored split journals to facilitate erection.
- The journal shall be lined with brass/gunmetal bush.

J) PIPE HOOD FOR STEM:

- A Pipe hood/Stem Cover shall be provided on the top of headstock in case of rising spindle/stem gates to cover the spindle threads for protection against damage, dirt, dust, water etc.
- It shall be made of transparent fracture resistant polycarbonate material. The pipe hood shall have vent holes to prevent condensation.

K) GATE OPENING INDICATING ARRANGEMENT:

- In case of manual operation, Gate opening indicating arrangement shall be provided to indicate the position of the shutter.

Location	Dimensions	Quantity	Rate to be Quoted per no.
P1- Panvel (E)	900 mm W x 900 mm H	4 Nos	
P2- Panvel (W)	1200 mm W x 1200 mm H	4 Nos	
P3- Panvel (E)	800 mm W x 800 mm H	4 Nos	
Sector 7- Kharghar	600 mm W x 600 mm H	4 Nos	
Sector 11- Kharghar	1000 mm W x 1000 mm H	4 Nos	

3) Mechanical Screen

"Multi-rake" Mechanical coarse bar Screen suitable for below mentioned channel dimensions SWD: 2000 mm, bar spacing: 20 mm, Bar size: 10 mm thick X 50 mm deep flat bars, Angle of inclination: 75 deg. to horizontal, MOC of screen: SS 304, Peak Flow per screen: 1 MLD, Vertical discharge height for accommodating conveyor: 750 mm. -Including control panel made of 2mm thick CRCA sheet for multi-rake screen & screw conveyor and E & H make Differential type level sensor suitable for 10 m sensing level.

Belt Conveyor

- Belt conveyor should be that belt or troughed belt having sufficient width to avoid spillage of collected material from belt surface
- Bell should be made of material which should be resistance to corrosion & abrasion, harsh chemicals.
- Speed of the belt should be moderate to carry out collected material & avoid erosion's, belt shall be maintenance free operation.
- The conveyor frame shall be made out of corrosion resistant SS material & supporting rollers shall be sturdy & made of non-corrosive material
- Drive system should be capable to drive the belt at full load condition & should be weather proof suitable for outdoor installed.
- Designed conveyor belt should be of such that in feed & discharge points should have smooth material flow on to & off the conveyor
- The control system should have all safety arrangements to avoid any wear & tear of belt i.e. quick stop emergency system.

- Belt should be complete with drive guard, cover's, electric local push buttons etc. for start stop operation

A) PURPOSE

- Mechanized screens should be suitable for installation in Sewage pumping stations for removal of floating wastes coming along with sewage. These screens should be capable to screen out most of the medium and large floating material such as plastic bags, floating debris, weeds, paper wastes, clothes and rags etc. which are generally clogging the impellers of the pumps installed downstream of the screens.
- The mechanical screen should be sturdy against full blockage from waste and high force of water acting on the complete mechanical screen, the design of mechanical screen should withstand all condition.
- The operation of the screen shall be automatic through the timer. An ultrasonic type differential level sensor shall also be provided to sense the head loss through the bar and give the signal to the traveling raking mechanism to start/stop its operation.
- A complete electrical control system shall be supplied with each screen and shall be mounted independently near to the screen installation. The system shall provide for total automatic operation of the screen with the feedback from the level controller.

B) GENERAL MATERIAL AND EQUIPMENT REQUIREMENTS

a) Fabrication and design features:

- i. Use power grinder to dull and produce smooth edges.
- ii. Use bolted field connections. Field welding will not be allowed.
- iii. Design all components for continuous 24 hours per day service.

b) The screen shall be so constructed so as to mechanically remove the waste from the bottom most portion of the bar using a traveling type multiple raking mechanism without shutting the water flow through the screen. The raking mechanism shall then travel up to the top of operating platform and automatically discharge the waste through a discharge chute.

c) The screen shall have protection against overload conditions, which otherwise might damage the equipment.

d) All screens shall be constructed and shipped as an integrated product comprising of frame structure and guides, rakes, dead plate, cog wheels / sprockets and chains, discharge chute & drive unit.

e) The screen shall be supplied factory assembled and duly tested at manufacturer's works before dispatch. This integrated and factory assembled screen shall involve minimum dismantling and assembly at site for erection.

f) Upon receipt at site the screen shall be installed resting on the channel floor and mechanically or chemically anchored to the parallel sidewalls of the channel (without making grooves in concrete or breaking open the concrete side walls and thereby weakening the civil structure) in a way that there are minimum chances of misalignment.

g) All parts shall be designed to withstand the stresses that will be imposed upon them during handling, shipping, erection and operation.

h) All stainless-steel fabricated materials will be pickled and passivated before dispatch to remove ferrous contamination, if any.

No	Parameter	P1	P2	P3	Sector 7	Sector 11	Sector 9
1	Average Flow/Screen in MLD.	6.2	33	2.5	2	35	25
2	Peak Flow/ Screen in MLD.	15.5	82.5	6.25	5	87.5	62.5
3	Max Sewage Water Depth in M for Screen.	900 mm	1200 mm	80 mm	600 mm	1000 mm	1300 mm
4	Invert Level of Main Incoming Pipe (BOP) to the Pumping Station from Platform Level (Channel Depth) in Meters.	7.3 m	6.5 m	8.1 m	7.9 m	13.5 m	9 m
5	Length Of Belt Conveyer	5.02 m	5.92	4.72	4.12	5.32	10
6	Sluice Gate Size	900 x 900 mm	1200 x 1200 mm	800 x 800 mm	600 x 600 mm	1000 x 1000 mm	1000 x 1300 mm
7	Water Head Above Centre Line Of Gates in Meters.	0.45	0.6	0.4	0.3	0.5	0.75
8	Distance From Centre Line of Gates in Meters.	6.85	5.9	7.7	7.6	13	8.25
9	Type Of Operation for Sluice Gates (Manual/Electric).	Electric	Electric	Electric	Electric	Electric	Electric
10	Width Of New Screen Chamber In Meters	1.51	1.96	1.36	1.2	1.2	1.3
11	Length Of New Screen Chamber in Meters.	4.44	4.22	3.85	3.82	6.1	Sector 9
Rate to be Quoted per unit							

अटी व शर्ती :-

- सीलबंद दरपत्रके दिनांक- ०५/०१/२०२४ ते दि. १२/०१/२०२४ रोजीपर्यंत दुपारी ३.०० वाजेपर्यंत पनवेल महानगरपालिकेच्या मलनिःस्सारण विभागात किंवा panvelcorporationswd@gmail.com या ई-मेलवर स्वीकारण्यात येतील.
- सदरचे दरपत्रक हे अंदाजपत्रक बनविण्यासाठी असून सदर कामांवर Manufacturer चा दावा (Claim) असणार नाही.
- Manufacturer ने दिलेले दरपत्रक स्विकारणाचे सर्व अधिकार पनवेल महानगरपालिकेकडे असतील याची नोंद घ्यावी.

SD/-
शहर अभियंता
पनवेल महानगरपालिका

प्रत माहितीस्तव :-

- माहिती फलककरीता