

**WATER SUPPLIES DEPARTMENT**

**STANDARD SPECIFICATION M-05-01**

**SUBMERSIBLE DEWATERING PUMPS**

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## **SUBMERSIBLE DEWATERING PUMPS**

### **1. GENERAL**

This Standard Specification covers both transportable and guide rail types of submersible dewatering pumps as hereinafter described. It shall be read in conjunction with the following WSD Standard Specifications:

EM-00-03	General Requirements for Supply of Mechanical, Electrical and Instrumentation Plant and Equipment
E-51-06	Motors below 40 kW for Submersible Pump

### **2. TYPE AND CONSTRUCTION**

The pump shall be of submersible centrifugal type of robust construction for handling a mixture of water and sand, sludge and other small solid particles. The pump shall be of non-clogging type impeller design, allowing free passage of solids up to the size as specified in the Particular Specification.

The pump motor shall comply with WSD Standard Specification E-51-06 unless otherwise specified in the Particular Specification.

### **3. DUTIES AND CHARACTERISTICS**

The flow rate, pumping head, minimum submergence for continuous operation and the maximum allowable continuous dry running period of the pump shall be as stated in the Particular Specification.

Manufacturer's type test certificate on the pump supplied shall be provided and the Contractor must guarantee that the performance of the pump shall not be inferior to that shown on the test certificate.

The operating speed of the pump shall not exceed 3,000 r.p.m. unless otherwise specified in the Particular Specification.

#### 4. PUMP PROTECTIONS

##### 4.1 Control and Monitoring Systems

The pump supplied shall be equipped with the following control and monitoring systems where applicable to protect the pump from being damaged under abnormal operation conditions:

Parts	Control / Monitoring Parameters	Transportable Type		Guide Rail Type	
		Requirement	Control / Monitoring Method	Requirement	Control / Monitoring Method
Motor/ Stator	Moisture	Optional	Integral <sup>1</sup> / External <sup>2</sup>	Optional	External <sup>2</sup>
Bearings	Thermal	Optional	Integral <sup>1</sup> / External <sup>2</sup>	Mandatory	External <sup>2</sup>
Seals	Leakage	Optional	Integral <sup>1</sup> / External <sup>2</sup>	Mandatory	External <sup>2</sup>

Note:

1. The pump shall be switched off automatically whenever the parameter being monitored exceeds its preset limit.
2. When the parameter being monitored exceeds the preset limit, a tripping signal shall be initiated to activate an alarm and/or cut off power supply to the pump, depending on the design of the external control system. The sensors and all necessary incidental devices housed in the pump to render the protection system fully functional shall be included.

#### 5. TRANSPORTABLE TYPE SUBMERSIBLE DEWATERING PUMPS

##### 5.1 General Design

The pump shall be designed for transportable application so that it can be put into operation readily without requiring installation of any fixtures or other accessories.

The pump shall have built-in switches and control circuits so that it can be energized by simply plugging the pump to an appropriate power supply system.

The pump shall be able to operate in vertical, horizontal or any inclined position without requiring any fixture to secure the pump. The pump shall have a handle for manual handling or eye bolts for lifting by suitable lifting gears where appropriate.

The discharge outlet of the pump shall be suitable for connection to flexible hose through the use of hose clip. However, elbow for screw threads or flange connection shall be supplied if such an option is specified in the Particular Specification.

The lower part of the pump shall be covered with stainless steel strainer with suitably sized mesh eyes to prevent ingress of large particles into the pump.

## 5.2 Materials of Construction

The pump and its accessories shall be manufactured from the following materials or other superior suitable materials:

Item	Materials of Construction
Motor Casing, Pump Chamber and Discharge Elbow	Aluminum Alloy of suitable grade
Outer Casing and Strainer	Stainless Steel to BS EN 10088 Designation 1.4401
Impeller	Stainless Steel to BS EN 10088 Designation 1.4408
Exposed Nuts and Bolts	Stainless Steel to BS EN 10088 Designation 1.4401
Pump Shaft	Stainless Steel to BS EN 10088 Designation 1.4057

If aluminum alloy is offered for pump and motor casing, and the specified pumping media is salt water, suitable metallic anodes shall be provided to protect the aluminum parts against galvanic corrosion.

All metal surfaces except those of stainless steel in contact with the pumped media shall be protected by factory applied coatings with paint finish on the exterior of the pump.

5.3 Shaft Seals

The pump shall employ two independent mechanical shaft seals running in an oil chamber. The lower seal shall be of silicon carbide or other superior materials suitable for operation at the pump operating speed under maximum pumping head.

5.4 Bearings

Ball and roller type bearings shall be well sealed and grease lubricated-for-life. These bearings shall have metric dimensions and conform to BS ISO 10317. Special bearings and imperial size bearings are not acceptable.

5.5 Integral Float Switch

Where specified in the Particular Specification, an integral float switch for automatic start and stop of pump based on pre-set water levels shall be provided. A rail mounted on the outer casing of the pump for setting the position of float switch shall be included.

The control system for automatic start and stop of pump based on water levels shall be an integral part of the pump without requiring external control circuitry.

**6. GUIDE RAIL TYPE SUBMERSIBLE DEWATERING PUMPS**

6.1 General Design

The pump shall be designed for stationary installation and be suitable for installation through a guide rail system so that the pump can be automatically connected to the pedestal discharge elbow by its own weight when it is being lowered into position. The pump shall be disconnected from the elbow simply by raising the pump with the lifting chain.

If free-standing mounting design is specified in the Particular Specification, a ground support stand and other suitable lifting facilities shall be supplied with the pump.

The pump shall be started and controlled through an external starter

panel to be supplied with the pump or by others as specified in the Particular Specification.

## 6.2 Materials of Construction

The pump and its accessories shall be manufactured from the following materials or other superior suitable materials:

Item	Materials of Construction
Casing	High Quality Grey Cast Iron to BS EN 1561 Designation EN-GJL-250
Impeller	Stainless Steel to BS EN 10088 Designation 1.4408
Pump Shaft	Stainless Steel to BS EN 10088 Designation 1.4057
Pedestal Discharge Elbow	High Quality Grey Cast Iron to BS EN 1561 Designation EN-GJL-250
Guide Rails	Stainless Steel to BS EN 10088 Designation 1.4401
Lifting Chain	
Hold Down Bolts, Washers, Nuts, Mounting Brackets and Exposed Nuts and Bolts	

All metal surfaces except those of stainless steel in contact with the pumped media shall be protected by factory applied coatings with paint finish on the exterior of the pump.

## 6.3 Shaft Seals

The pump shall employ two independent mechanical shaft seals operating in an oil chamber. The oil chamber shall be designed to prevent overfilling and to provide lubricating oil expansion capacity.

The lower seal shall prevent the pumping fluid from entering the oil chamber and the upper one for stopping the oil from entering the motor compartment. The sealing rings of the mechanical seals shall be of tungsten carbide or other superior materials suitable for the rotating speed and system pressure.

#### 6.4 Bearings

Ball and roller type bearings shall be well sealed and grease lubricated-for-life. These bearings shall have metric dimensions and conform to BS ISO 10317. Special bearings and imperial size bearings are not acceptable.

#### 6.5 Wire Rope and Clamps for Cables

Stainless steel wire rope and clamps with resilient felt shall be provided for the power and control cables. The clamps shall be used for holding the cables onto the wire rope by which the weight of the cables is to be evenly taken up. The stainless steel wire rope shall be held at high level for retrieval of the pump and cables altogether.

#### 6.6 Lifting Facilities for Fixed Installation

Where specified in the Particular Specification, a dedicated guide rail lifting system for raising and lowering of the pump shall be supplied. The system shall include, but not limited to, guide rails, pump pedestal discharge elbow, holding down bolts, lifting chain and all mounting brackets.

An attachment anchor shall be designed to the pump discharge flange for engaging to the connecting flange of the pedestal discharge elbow when the pump is lowered into position. The mating part of the pedestal discharge elbow and the discharge flange of the pump shall truly align and form a perfect match without the requirement of bolting. The weight of the pump shall be supported entirely by the pedestal without any part of pump being rest on the floor.

Sealing at the discharge connection shall be accomplished by metal to metal contact of machined surfaces or a suitable gasket. No leakage shall be allowed from the discharge connection during operation of the pump. When the pump is lifted, it shall be easily detached from the pedestal discharge elbow.

Lifting chain shall have safe working load of at least 50% greater than the weight of the pump. The lifting chain shall comprise closed lifting rings at its ends and at suitable intervals along the chain to facilitate lifting of the pump. The lifting ring at the lower end shall attach to the lifting eye or handle of the pump by means of shackle(s) whereas the upper ring shall normally be hung onto the guide rail

mounting bracket. Certificate of test and thorough examination of the lifting facilities in compliance with statutory requirements shall be supplied with the equipment.

Sizing calculation of the holding down bolts and installation drawing of the pedestal discharge elbow and guide rail lifting system shall be submitted for approval after award of the Contract.

## **7. MAINTENANCE TOOLS AND SPARES**

An itemised and priced list of recommended maintenance tools and spares for 1 year service shall be supplied.

## **8. INFORMATION TO BE PROVIDED IN THE PARTICULAR SPECIFICATION**

The following information shall be provided in the Particular Specification:

<b>Clause in this Standard Specification</b>	<b>Requirements to be specified in the Particular Specification</b>
Clause 2 <u>Type and Construction</u>	The maximum size of suspended solids in the fluid to be handled by the pump.
Clause 3 <u>Duties and Characteristics</u>	Flow rate, operating head and minimum submergence for continuous operation and the maximum allowable continuous dry running period of the pump.
Clause 4.1 <u>Control and Monitoring Systems</u>	The optional protections to be provided with the pump and their method of control and monitoring (i.e. integral / external).
Clause 6.6 <u>Lifting Facilities for Fixed Installation</u>	The provision of a dedicated guide rail lifting system with the pump.

The following information, if specified in the Particular Specification, shall take precedence over the respective requirements stated in this Standard Specification:

<b>Clause in this Standard Specification</b>	<b>Alternative requirements that can be specified in the Particular Specification</b>
Clause 3 <u>Duties and Characteristics</u>	Rotational speed of the pump.
Transportable Type Submersible Dewatering Pump	
Clause 5.1 <u>General Design</u>	Method of connection of pipe to the pump discharge outlet.
Guide Rail Type Submersible Dewatering Pump	
Clause 6.1 <u>General Design</u>	Mounting method of the pump (i.e. guide rail lifting system or free-standing mounting design).  The provision of an external starter panel for the pump.

## **9. INFORMATION REQUIRED IN THE MATERIAL SUBMISSION BY THE CONTRACTOR**

The following information shall be provided in the material submission for material approval / acceptance by the Engineer or the *Project Manager*.

<b>Item</b>	<b>Description</b>	<b>Details</b>
1	Technical Schedule of Submersible Dewatering Pump	Manufacturer Country of origin Model / Type Flow capacity at duty point(s) Total head at duty point(s) Efficiency at duty point(s) NPSH at duty point(s) Speed Materials of construction Discharge size
2	Technical Schedule of Pump Motor	Manufacturer Country of origin Model / Type Standard Starting method Rated voltage / frequency / phase Speed Rated power Full load motor efficiency Bearing type Full load current Starting current

		Insulation class
		Material of casing
		Cooling method
		Moisture detector
		Protective equipment / ETD
3		Compliance with Standard Specification M-05-01 and E-51-06
4		Compliance with Particular Specification
5	Pump Catalogue	Outline and sectional drawing of the pump, indicating the general dimensions, components and materials Pump performance curves, indicating the flow capacity, total head, efficiency, NPSH and the duty point(s)
6	Motor Catalogue	Data sheet and type test reports those specified in E-51-06
7	Certificates	Certificate of origin Type test certificate indicating the guaranteed performance in flow capacity, total head, efficiency and pressure test

- End of Specification -