WATER SUPPLIES DEPARTMENT

STANDARD SPECIFICATION M-01-04

SUBMERSIBLE BOREHOLE PUMPS

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CONTENTS

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1. GENERAL

This Standard Specification shall be read in conjunction with the following WSD Standard Specifications:

EM-00-01	Inspection, Testing and Reporting
EM-00-03	General Requirements for Supply of Mechanical, Electrical and Instrumentation Plant and Equipment
EM-01-03	Pressure Gauges
E-51-05	Motors of 40 - 140 kW for Submersible Pump
E-51-06	Motors below 40 kW for Submersible Pump

2. TYPE AND CONSTRUCTION

The pump shall be of multistage, centrifugal type complete with suction strainer to be installed horizontally or vertically suitable for continuous operation in a totally submersed manner.

All rotating components must be balanced both statically and dynamically.

The pump motor and the associated power and control cables shall comply with WSD Standard Specifications E-51-05 or E-51-06 in accordance with motor power rating. The length of the cables shall be as specified in the above-mentioned Standard Specifications where applicable or otherwise modified in the Particular Specification.

3. DUTIES AND CHARACTERISTICS

The pump shall have stable characteristics and be capable of continuous operation within ±50% of the specified flowrate.

The pump shall be suitable for continuous operation under the minimum submergence as specified in the Particular Specification. For calculating

the available net positive suction head (NPSH) at the pump for any operating condition, the atmospheric pressure and vapour pressure of water shall be taken as 10 m and 0.3 m of water respectively. The curve of NPSH required by the pump shall be submitted for assessment after award of contract.

The pump motor shall be started with the delivery valve fully open. The operating speed of the pump shall not exceed 3,000 r.p.m. unless otherwise specified in the Particular Specification.

4. PUMP TESTS

All pump components subject to pressure shall be hydraulically tested to a pressure of not less than 1.5 times the sum of the maximum suction head and the zero flow head of the pump supplied for a period of not less than 10 minutes.

On completion of assembly at the Manufacturer's works, the pump shall be tested to BS EN ISO 9906 over the full range of its capacity to verify its compliance with the Specification the pump output, pumping head, efficiency and power absorbed. The tolerance factors applicable to pump test at duty flow and head and the corresponding pump efficiency shall be as follows:

Quantity	Shaft Power of Pump	
	$\leq$ 10 kW	> 10 kW
Flow rate, head and pump efficiency	According to Clause 4.4.2 of BS EN ISO 9906	According to Grade 2B as specified in Clause 4.4.1 of BS EN ISO 9906

For pumpsets having a motor rating of 40 kW or above, the above-mentioned tests shall be witnessed by an Independent Inspection Body (IIB) in accordance with WSD Standard Specification EM-00-01.

For pumpsets having a motor rating below 40 kW, the manufacturer's type test certificate in lieu of the works test certificate issued by an Independent Inspection Body (IIB) shall also be acceptable provided the Contractor can guarantee that the performance of the pump shall not be inferior to that shown on the test certificate and the pump components have undergone pressure test as specified above.

5. MATERIALS OF CONSTRUCTION

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

Item	Materials of Construction
Casing (Diffuser)	Stainless Steel to BS EN 10088 Designation 1.4301 / 1.4404
Casing Wear Rings (Neck Rings)	Nitrile Butadiene Rubber (NBR)
Impeller	Stainless Steel to BS EN 10088 Designation 1.4301 / 14404
Pump Shaft	Stainless Steel to BS EN 10088 Designation 1.4021 / 1.4057 / 1.4401
Shaft Sleeves (when required)	Stainless Steel to BS EN 10088 Designation 1.4301 / 1.4021

6. PUMP CASING

The pump casing shall be fitted with replaceable wearing rings (neck rings).

Flange or parallel threaded outlet shall be provided for connection between the pumpset and pipework at the delivery end of the pump. If a flange connection is provided, the bolt holes shall be drilled to BS EN 1092.

7. PUMP IMPELLERS

The impellers shall be designed with adequate strength to withstand all possible stresses imposed by the drive. The impellers shall be machined to close limits and shall be dynamically balanced.

8. SHAFT SEAL

The pump shall be fitted with mechanical seals suitable for use with a pressure greater than the sum of the closed valve head of the pump and the maximum suction head.

9. SUCTION STRAINER

The pump shall be fitted with a suction strainer to prevent large solid particles from entering the pump.

10. BEARINGS

Ball and roller type bearings shall be sealed, grease lubricated and protected from any ingress of dust and water. These bearings shall conform to the relevant BS, ISO or other equivalent standards and shall be readily obtainable in the market. Special bearings and Imperial bearings are not acceptable.

Water lubricated bearings shall be of materials compatible with the quality of water in contact.

11. NON-RETURN VALVE

A non-return valve with anti-blockage valve disc shall be built-in at the delivery of the pump, and shall be of simple construction. The materials of construction of the valve shall be suitable for the liquid in contact. The design of the non-return valve shall be suitable for the orientation (vertical or horizontal axis) of the pump as specified in the Particular Specification.

12. PRESSURE GAUGE

A bourdon tube pressure gauge of suitable range and graduated in both kPa and metres head of water complete with an isolating cock shall be supplied as loose item for installation at the delivery header on site. Static head correction is not required and the scale diameter shall not be less than 150 mm.

13. INFORMATION TO BE PROVIDED IN THE PARTICULAR SPECIFICATION

The following information shall be provided in the Particular Specification:

Clause in this Standard Specification	**Requirements to be specified in the Particular Specification**
Clause 3 Duties and Characteristics	The minimum submergence available for continuous operation of the pump.
Clause 11 Non-return Valve	Orientation (vertical or horizontal axis) of the pump.

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

Clause in this Standard Specification	**Alternative requirements that can be specified in the Particular Specification**
Clause 2 Type and Construction	Length of the power supply and control cables
Clause 3 Duties and Characteristics	Rotational speed of the pump.

- End of Specification -