

# Inspection And Testing Manual For Submersible Pump Sets



## About EESL



**ENERGY EFFICIENCY SERVICES LIMITED**  
A JV of PSUs under the Ministry of Power

Efficiency Services Limited (EESL), a Joint Venture of Company of Public Sector Undertaking (PSU) of Ministry of Power to facilitate implementation of energy efficiency projects. It is registered under the companies Act, 1956 on 10 December 2009 and the commencement of business certificate was obtained on 11 February 2010. EESL functions as an Energy Service Company (ESCO), as Consultancy Organization and as a Resource Centre.

## About CLASP



CLASP is an international 501© 3 non-profit organization headquartered in Washington DC, USA, with the mission to improve the energy and environmental performance of the appliances & equipment we use every day, accelerating our transition to a more sustainable world. CLASP has been supporting the development and implementation of appliance standards and labeling programs in India since its inception in 1999.

**Supported by:**

**MacArthur**  
**Foundation**

CLASP acknowledges the funding support from MacArthur Foundation for preparation of this manual.

**Inspection And Testing  
Manual For  
Submersible Pump Sets**





सौरभ कुमार  
प्रबंध निदेशक  
**Saurabh Kumar**  
Managing Director

एनर्जी एफिशिएंसी सर्विसेज लिमिटेड  
(भारत सरकार, विद्युत मंत्रालय के सार्वजनिक क्षेत्र के उपक्रमों का संयुक्त उद्यम)  
**ENERGY EFFICIENCY SERVICES LIMITED**  
(A Joint Venture of PSUs of Ministry of Power, Govt. of India)



### Foreword

Energy Efficiency Services Limited (EESL) is a publicly owned energy services company with the mission of delivering energy efficiency across India. Established in 2009, EESL is promoted by Ministry of Power, Government of India as a Joint Venture company of four Central Power Sector undertakings viz NTPC Ltd. PFC, REC and Power Grid.

EESL is set up to create and sustain markets for energy efficiency in the country. EESL works closely with Bureau of Energy Efficiency (BEE) and is leading the market related activities of the National Mission for Enhanced Energy Efficiency (NMEEE), one of the eight national missions under the Prime Minister's National Action Plan on Climate Change

Based on the success of *Unnat Jyoti by Affordable LEDs for All (UJALA)*, the world's largest LED programme for domestic consumers, EESL has established itself as a super Energy Service Company (ESCO). EESL and UJALA have paved the way for large-scale energy efficiency implementation in India. It has shown government stakeholders that energy efficiency can deliver multiple benefits within a short time period to all sectors, and importantly, with limited or no costs to the government. Recognising the potential for replication with other high efficient appliances and equipment to trigger investment, innovation and best-in class manufacturing, EESL is expanding its programs to scale up deployment of energy efficient appliances such as energy efficient fans, air conditioners, induction motors and agricultural pumps for which demand is projected to grow significantly.

The success of bulk procurement & distribution program is based on a robust quality assurance framework and build credibility of the program amongst consumers such that it provides a level playing field for the participants, and deliver the projected energy savings.

Quality assurance is a key element to all aspects of energy efficiency programs: program design, implementation and evaluation. It provides a framework to ensure program standards are met and closes the feedback loop in order to assess and improve program processes. To ensure that the products procured through EESL's program meet the quality standards, EESL, in partnership with CLASP, has developed 'Inspection and Quality Assurance Manuals' for its bulk procurement programs. This manual provides stepwise guidelines, and defines the quality assurance criteria and inspection process that include the relevant test methods, sampling criteria, schedule of tests and levels of control at the manufacturers' end. This is to ensure compliance of the procured products with the requirements prescribed by EESL, thereby building credibility of the program and ensuring the quality of the product.

EESL is making every effort toward this, and the inspection and testing manual is a key milestone in that direction. It reflects our commitment and sincerity in ensuring that only quality products are procured and delivered to the consumers.

I would like to commend & congratulate CLASP and EESL teams for their efforts in the development of this manual. I am convinced that this manual will be integral to EESL's quality assurance program and demonstrate our commitment and sincerity in ensuring the procurement of quality products.

(Saurabh Kumar)

Date: 23.07.19

#### ऑफिस / Office :

ग्राउंड फ्लोर, कोर-3, एनएफएल बिल्डिंग,  
स्कोप कॉम्प्लेक्स, लोधी रोड, नई दिल्ली - 110003  
Ground Floor, Core - III, NFL Building,  
SCOPE Complex, Lodhi Road, New Delhi - 110003  
दूरभाष / Phone: 91-11-45801262 फ़ैक्स / Fax 011-45801265

#### रजिस्टर्ड ऑफिस / Registered Office

चौथा तल, सेवा भवन,  
आर0 के0 पुरम, नई दिल्ली-110066  
4th Floor, Sewa Bhawan,  
R. K. Puram, New Delhi - 110066  
वेबसाइट / Website : www.eeslindia.org



## ACKNOWLEDGEMENT

EESL would like to acknowledge the contribution by CLASP team for their technical leadership and support towards the development of this manual. We would especially like to thank P. K. Mukherjee, Senior Advisor for his technical expertise and Dr. Archana Walia, Director, India Program for her leadership in this endeavour. The technical and program teams at EESL and CLASP worked collaboratively and diligently to put together and shape the manual.

We would also like to recognise the sincere efforts of the following individuals, whose contributions have been pivotal to the development of the manual:

### **CLASP**

Dr. Archana Walia

P. K. Mukherjee

Neha Dhingra

PVN Kishore

### **EESL**

S. P. Garnaik

Girja Shankar

Ashish Jindal

## Table of Contents

1.	SCOPE.....	2
2.	REFERRED STANDARD.....	2
3.	DEFINITIONS .....	2
4.	UNITS .....	5
5	QUALITY CONTROL MEASURES BY THE MANUFACTURER .....	5
6	INFORMATION TO BE FURNISHED BY THE PURCHASER/BUYER .....	9
7	INFORMATION TO BE FURNISHED BY THE MANUFACTURER OR THE SUPPLIER.....	11
8	STAGES OF INSPECTION AND CONTROL .....	12
9	COMPLAINT REDRESSAL .....	19
10	PRODUCTION PLAN .....	19
11	TEST METHOD AND ITS REQUIREMENTS .....	19
12	TEST REPORT PROFORMA FOR SUBMERSIBLE MOTORS AND SUBMERSIBLE PUMPSETS .....	19
	ANNEX A .....	20
	ANNEX B 1 .....	23
	ANNEX B 2 .....	25
	ANNEX B 3 .....	27



# MANUAL FOR TESTING AND INSPECTION OF SUBMERSIBLE PUMP SETS

## 1. SCOPE

**1.1** This manual highlights the key elements essential for the field inspection officers to ensure the quality for submersible pump-sets procured by EESL in compliance with the requirements laid out in the tender/bid document, thereby building credibility of the program and ensuring the quality of the product.

This manual specifies guidelines for the bid evaluation, pre-delivery, and post-delivery/verification inspection including the sampling methodology in carrying out the type, acceptance and routine tests of submersible pump-sets commonly used in bore wells, tube wells and open wells for handling clear, cold water, rated voltage up to and including 415V for three phase and 240 V for single phase, 50 Hz ac, and rated output not exceeding 22 kW and 2.2 kW for three phase and single phase respectively for application in agriculture, water supply etc. covered under the scope of IS 8034. This manual also prescribes the levels of control at the manufacturers end for specifies the performance requirements for submersible pump-sets.

Stepwise guidelines for the inspection of submersible pump-sets are given in Annex A of this manual.

## 2. REFERRED STANDARD

**2.1** The following standards shall be referred while using this manual:

<i>IS No</i>	<i>Title</i>
1885 (Part 35)	Electrotechnical Vocabulary Part 35 Rotating Machines
2223	Dimension of Flange Mounted AC Induction Motors
2500 : (Part 1)	Sampling Procedure for Inspection by Attributes, Part 1 Sampling Plan Indexed by Acceptance Quality Limit (AQL) For Lot by Lot Inspection
3073	Assessment of Surface Roughness
4029	Guide for Testing Three Phase Motors
5120	Technical Requirements for Roto-Dynamic Special Purpose Pumps
7572	Guide for Testing Single Phase AC and Universal Motors
8034	Submersible Pump-Sets
IS/ISO 9001	Quality Management System- Requirements
9283	Motors for Submersible Pump-Sets-Specification
11346	Code of Acceptance Tests for Agricultural and Water Supply Pumps

## 3. DEFINITIONS

All definitions given in IS 1885(Part 35), IS 8034, IS 9283 and IS 5120 shall apply. Some of the important definitions relevant to this manual are given below:

### 3.1 Velocity Head

This is the kinetic energy per unit weight of liquid handled at a given section.

### **3.2 Static Suction Head**

When the liquid level in an open vessel is above the pump datum, static suction head is the difference in elevation between the pump datum and the liquid level in the suction vessel.

### **3.3 Total Suction Head (h)**

Suction head exists when the total suction head is above atmospheric pressure head. This is equal to the static suction head minus the friction and entrance losses in suction pipeline. Total suction head as determined on test bed is the reading of a suction gauge at the suction nozzle of the pump corrected to pump datum plus velocity head at the point of measurement.

### **3.4 Static Delivery Head**

When the pump discharges into an open vessel, the static delivery head is the difference in elevation between the pump datum and the highest point of delivery.

### **3.5 Total Delivery Head**

This is the sum total of the static delivery head and the friction and exit losses in the delivery pipeline. The total delivery head, as measured on the test bed is the reading of the pressure gauge at the discharge of the pump corrected to pump datum plus the velocity head at the point of measurement.

### **3.6 Total Head**

This is the measure of the energy increase per unit mass of liquid imparted to it by the pump and is, therefore, the algebraic difference of the total delivery head and the total suction head.

### **3.7 Net Positive Suction Head (NPSH)**

This is the total suction head of liquid in meters, absolute, determined at the pump suction nozzle and corrected to pump datum less the vapour pressure head of the liquid at pumping temperature, at the suction nozzle in meters absolute.

### **3.8 Specific Speed**

Specific speed is a term used for classifying pumps based on their performance and dimensional proportions regardless of their actual size or the speed at which they operate. It is the speed expressed in revolutions per minute of an imaginary pump geometrically similar in every respect to the actual pump consideration and capable of raising 75 kg of water per second to a height of one meter.

### **3.9 Driver Input**

The power input to the prime mover expressed in kilowatts.

### **3.10 Pump Input**

The power applied at pump shaft expressed in kilowatts.

### **3.11 Pump Output**

The liquid power delivered by the pump expressed in kilowatts.

### **3.12 Pump Efficiency**

The ratio of the pump output to the pump input.

### **3.13 Overall Efficiency**

The ratio of the pump output to the driver input.

### **3.14 Static Water Depth**

It is the depth of water level below the ground level when the pump is not in operation.

### **3.15 Rated Voltage**

Voltage or voltage range specified in the relevant standard or assigned by the manufacturer or responsible vendor.

### **3.16 Rated Frequency**

The rated frequency shall be 50 Hz.

### **3.17 Lot**

The number of pumps of the same size, type and duty point offered for inspection at one time shall constitute a lot.

### **3.18 Sampling**

The selection of a portion of a lot with a view to taking a decision about the quality of the lot on the basis of results obtained by inspecting the selected portion.

### **3.19 Sample Size**

The number of pumps selected for inspection and/or testing from a lot.

### **3.20 Type test**

Tests carried out to prove conformity with the requirement of the relevant specification. These are intended to prove the general qualities and design of the given type of a product.

### **3.21 Acceptance test**

Tests carried out on samples taken from a lot for the purpose of acceptance of the lot.

### **3.22 Routine test**

Routine tests are intended to check the quality of the individual test unit. These tests are done to ensure the reliability of test objects and consistency of the material used in their manufacture, which are likely to vary during production.

### **3.23 Verification test**

Verification tests are the evaluation of whether or not a product, service, or system complies with a regulation, requirement, or imposed conditions.

## **4. UNITS**

### **4.1 Volume**

The standard units for volume shall be:

- a) Litre, and
- b) Cubic meter

### **4.2 Rate of Flow**

The standard units for expressing rate of flow shall be:

- a) Litres per minute,
- b) Litres per second, and
- c) Cubic meters per hour

### **4.3 Head**

The standard unit for expressing head shall be the meter.

## **5 QUALITY CONTROL MEASURES BY THE MANUFACTURER**

The manufacturer shall exercise suitable levels of control as described in 5.1 to 5.6 below.

### **5.1 In House Test Laboratory**

The manufacturer shall have the requisite test facilities in house, which shall be suitably equipped and staffed where different tests specified in the relevant standard shall be carried out in accordance with the test methods prescribed in the standard.

### **5.2 Maintenance of Test Records**

The manufacturer shall maintain all records of tests, inspection and calibration. All testing equipment and measuring instruments shall be periodically checked and calibrated and records of such checks/calibration shall be maintained. Copies of any records and other connected papers that may be required by the EESL representatives shall be made available during the visit at the manufacturing premises.

### **5.3 Quality System in the Organization**

The manufacturer should implement proper Quality Management System in their organization in accordance with IS/ISO 9001 as applicable to various day-to-day activities of the organization.

#### **5.4 Marking on the Product**

The marking on the submersible pump-sets shall be furnished in a permanent and legible manner on either the product where it is accessible and visible and/or packaging or product data sheet/leaflet. The information on the meters shall be in accordance with clause 16.1 of IS 8034.

In addition, the meters shall carry BEE star label and/or BIS certification mark licence.

Any other additional information may be provided on the rating plate subject to agreement between the manufacturer and EESL. Following information shall be furnished on the nameplate affixed to each submersible pump-set:

- a) Manufacturer's name or trade mark (if any)
- b) Model;
- c) Serial No;
- d) Number of stages;
- e) Bore size, Min;
- f) Head, at nominal duty point;
- g) Discharge, at nominal duty point;
- h) Overall efficiency;
- i) Motor rating (kW);
- j) Rated speed (rpm);
- k) Maximum current (amp);
- l) Rated voltage (v) or voltage range with variation;
- m) Rated frequency (Hz);
- n) Connection star/delta;
- o) Type of duty (whether continuous or not);
- p) Delivery size;
- q) Head range for non-overloading requirements; and
- r) BIS standard mark and BIS Licence number, if any and/or BEE star label

#### **5.5 Raw Materials and Components**

As far as possible, each consignment of the raw material and components should be accompanied by a test certificate certifying its conformity to the relevant Indian Standard wherever exists or else each lot of raw material shall be checked for its conformity as per the relevant standard, if any.

#### **5.6 Sampling and Frequency of Testing**

The manufacturer shall carryout all the tests specified in IS 8034. The number of samples to be subjected to various tests and the frequency of testing including the action that are required to be taken by the manufacturer in case of failure of sample in any of the test or tests are given in Table 1 for submersible motors and Table 2 for submersible pump-sets. The tests, as specified in Table 1 and 2 and the levels of control specified therein, shall be carried out on the entire production of the factory.

**Table 1**  
**Sampling and Frequency of Testing**

S. No.	Test Requirements	Test Methods		No. of samples	Frequency of Testing
		Clause	Reference Standards		
1	General Construction	5.1 to 5.3	IS 9283	Each motor	-
2	Earthing	5.4	-do-	-do-	-
3	Finish of Bearings	5.5 4	-do- IS 3073	One Rotor/shaft/sleeve	One sample per week
4	Balancing of Rotor	5.6	IS 9283	Each Rotor	-
5	Dimensions	7	-do-	One Motor	One sample per day
6	Shaft Extension run out, concentricity of mounting, and face run out	4	IS 2223	One Rotor Shaft	-do-
7	Terminal markings	13	IS 9283	Each motor	-
8	High Voltage test	20	-do-	-do-	-
9	Insulation resistance before & after HV test	21	IS 9283	Each Motor	-
10	No load running of Motor and reading of current and voltage	8.1	IS 4029 or IS 7572	-do-	-
11	Locket rotor reading of Voltage, Current and Power input	8.3 8.2	IS 4029 IS 7572	-do-	-
12	Reduced voltage running up test at no-load (for 3 phase motors only)	16.2 (e)	IS 9283	-do-	-
13	Leakage Current Test at rated voltage	23	-do-	-do-	-
14	Measurement of Stator Resistance	7	IS 4029 or IS 7572	One Motor	One sample per week
15	Full load reading of voltage, current power input and Slip	8.8 8.4	IS 4029 IS 7572	-do-	-do-

S. No.	Test Requirements	Test Methods		No. of samples	Frequency of Testing
		Clause	Reference Standards		
16	Performance characteristics	17	IS 9283	-do-	-do-
17	Momentary Overload Test	18.1	IS 9283	As per agreement with purchaser	-
18	Temperature rise test	19	IS 9283	One motor	One sample per week
19	Speed	22	IS 9283	One motor	-do--
20	Efficiency	12.1	-do-	-do-	-do-
21	Power Factor	12.2	-do-	-do-	-do-

**NOTE 1:** The tests given in Table 1 are applicable when motor is manufactured in house. In case of motors procured from outside sources, each consignment of the motors shall be accompanied by a test certificate about its conformity with as per IS 9283. In such cases or if the motor carries BIS certification mark, the testing of motors specified in Table 1 is not required to be carried out by the pump manufacturer.

**NOTE 2:** For performance other than at rated voltage, the performance values shall be checked as per the guidance given in note 3 under clause 17 of IS 9283.

**NOTE 3:** Momentary overload and sustained overload test shall be carried out as per the mutual agreement with the purchaser.

**Table 2**  
**Sampling and Frequency of Testing**

S. No.	Test Requirement	Test Methods		No. of samples	Frequency of Testing
		Clause	Reference Standards		
1	Material of construction of various parts (Mechanical test)	6.2	IS 8034	3	One sample per week
2	Impeller balancing	6.4.2	IS 8034	-	Each impeller
3	Pump shaft or protecting sleeve surface finish	6.4.1	-do-	Three	One sample per week
4	Hydrostatic Test	9.1	-do-	-	Each pump set
5	Maximum Outside Diameter of	11.2	-do-	One	One sample per day

	submersible pump set				
6	Temperature rise test at reduced voltage	7.1.1.2	-do-	One	-do-
7	Pump Test and Verification of Guarantees	8 14.1	IS11346 IS 8034	one	-do-
8	Direction of Rotation	10	IS 8034	-	Each pump sets
9	Guarantee of Performance	15	-do-	One	One sample per week
10	Minimum Efficiency	15.2.2	-do-	-do-	-do-
11	Submersible cable	8	IS 9283	-do-	-do-

**NOTE:** In case of pump set, motor shall be tested for all routine tests as per clause 16.2 of IS 9283 and type tests except full load test, performance characteristics, momentary overload and vibration test as specified in clause 16.1 of IS 9283. The frequency of tests and the number of samples to be tested shall be in accordance with Table 1 of this manual.

In case the manufacture does not have requisite test facilities for any of the tests shown in Table 1 and 2 above, the same may be tested from any independent NABL accredited test labs except for the tests, which are to be carried out on each submersible pump.

In case of failure of any motor or pump-sets in respect of tests carried out on each pump-sets, cause of failure shall be identified and corrective action shall be taken to remove the non-conformity.

In the case of failure of any sample, in respect of the tests conducted on each lot manufactured, double the number of samples shall be taken for testing and no failure in those samples shall be permitted. Otherwise, the lot shall be rejected. After corrective actions two consecutive lots shall be tested as per the sample size and frequency indicated in the Table 1 and Table 2 for motors and pump-sets respectively and then original frequency shall be restored if both the samples pass.

## **6 INFORMATION TO BE FURNISHED BY THE PURCHASER/BUYER**

**6.1** When enquiring or ordering submersible pump-sets to the prescribed standard as specified in the contract, the following information in addition to those given in clause 12 of IS 8034 may be furnished by EESL to the suppliers/manufacturers:

*General information:*

- a) Name of the purchaser;
- b) Address of the purchaser;
- c) Name of the contact person and the contact details;
- d) BIS certification Mark on the product and the copy of licence document;
- e) In case of BEE star labeled product, relevant documents relating to approval of model registration;



- f) Total number of submersible pumps required; and
- g) Location where the meters required to be supplied.

*Technical information*

- a) Name of the purchaser;
- b) Address of the purchaser;
- c) Installation site;
- d) Number of pumps required;
- e) Spare parts required;
- f) Pump operating conditions:
  - i) Capacity in l/min, l/s or m<sup>3</sup>/h
  - ii) Number of poles of motor
  - iii) Total head, alternatively, sketch of the pipeline giving information, such as static delivery pipe diameter and length, distance between point of discharge pipe fittings and valves used, etc., may be given
  - iv) Total depth of casing pipe
  - v) Static water depth
  - vi) Tube well capacity at predicted draw down
- g) Description of the well:
  - i) Installation of the pump in:
    - Open well
    - Tube well
    - Open well with a boring and
    - Others
  - ii) Minimum inside diameter of the tube well or casing pipe
  - iii) Total depth of open well/deep well
  - iv) Total depth of casing pipe
  - v) Static water depth
  - vi) Well developed to...l/ min at...meter draw-down
- h) Site conditions:
  - i) Height above mean sea level in meters, and
  - ii) Details of quality of water with respect to all characteristics as given in clause 4 of IS 8034.
- j) Power supply:
  - i) Type of supply (single-phase/three-phase)
  - ii) Frequency (Hz)
  - iii) Voltage (V) and
  - iv) Variation in voltage/frequency
- k) Accessories (state whether the following items are required):
  - i) Sluice valve
  - ii) Reflux valve
  - iii) Pressure gauge
  - iv) Rising main pipe and delivery bend/elbow

- v) Type of installation stages in the entire system
- vi) Water level indicator
- vii) Voltage stabilizer
- viii) Automatic starting and stopping device (optional)
- ix) Starter-direct on the line or star-delta or indicate starting method
- x) Voltmeter
- xi) Ammeter
- xii) Single phasing preventers
- xiii) Water level guard and
- xiv) Low voltage protector.

## **7 INFORMATION TO BE FURNISHED BY THE MANUFACTURER OR THE SUPPLIER**

EESL may ask the manufacturer/supplier to furnish the following information while supplying the submersible pump-sets complying with the relevant standard specified in the contract.

- a) Name of the manufacturer;
- b) Address of the manufacturer;
- c) Organization structure;
- d) Location of different manufacturing units, if manufacturing is done at more than one locations;
- e) Name and contact details of the responsible person in each units;
- f) Details of the testing personnel;
- g) Availability of complete test facilities at the manufacturing premises;
- h) List of test equipment, measuring instruments and their accuracy class;
- i) Details of calibration of each equipment/measuring instruments including their validity period;
- j) Whether any arrangements made with any outside test labs where test facilities for any particular test (s) are not available with the manufacturer;
- k) Whether the manufacturers lab is accredited by NABL and if yes what is the scope of accreditation and its validity;
- l) Accreditation of outsourced lab and the validity period;
- m) Declaration in uncertainty in measurement; and
- n) Whether the product (s) covered are BIS certified. If BIS certified what is the validity of the licence and the varieties/types covered in the licence.

### *Additional Information*

EESL may ask the manufacturer/supplier to furnish the following information while supplying the pump-set complying with the relevant standard specified in the contract.

- a) Type designation of pump and submersible motor;
- b) Details of pump:

- i) Method of lubrication (normally the parts of the submersible pump-set are lubricated by the pumped liquid itself. If any other type of lubrication is adopted, it shall be indicated)
  - ii) Minimum bore well diameter in mm
  - iii) Number of stages
  - iv) Outside diameter of the bowl, the maximum diameter of the pump fitted with non-return valve and maximum overall diameter of the pump-set including the cable guard, mm
  - v) Discharge .....l/s
  - vi) Total head ..... m
  - vii) Speed .... rpm
  - viii) Overall efficiency at duty point..... percent and
  - ix) Minimum submergence at duty point..... m
- c) Details of motor:
- i) Rating .....kW
  - ii) Type.....in accordance with IS 9283
  - iii) Details of power supply
  - iv) Number of poles of motor and
  - v) Maximum current at rated voltage and frequency
- d) Accessories:
- i) Suitable starter
  - ii) Main switches
  - iii) Ammeter and voltmeter
  - iv) Pressure gauge
  - v) Water level indicating relays
  - vi) Automatic starting and stopping device
  - vii) Reflux valve and sluice valve and
  - viii) Erection clamps and special spanners, if any
- e) Additional information to be furnished with the supply, if required.
- i) Performance curves:
    - Discharge vs head curve
    - Discharge vs overall efficiency
    - Discharge vs current
  - ii) Instructions for installation and maintenance and
  - iii) Weight of the pump motor together in kg and that of cables in kg/m length.

## **8 STAGES OF INSPECTION AND CONTROL**

The inspection activities shall be undertaken in three different stages as follows:

Stage 1 – Bid Evaluation through document verification and Type Testing

Stage 2 – Production/Pre-Delivery

Stage 3 – Post-Delivery/Verification Testing

The detail procedure in respect of all the above three stages are described in 8.1 to 8.3.

## 8.1 Bid Evaluation

Bid evaluation shall comprise of type test certificate and the verification of relevant documents. Manufacturers or bidders shall submit a declaration about the product details supported by type test certificate from an independent third party NABL accredited laboratory against the specified test standard. During the bidding phase, the pre-qualification of any manufacturer or bidder shall be based on verification of the documents and test certificates submitted. In case of any change in any design parameter, the complete type test shall be repeated. The manufacturer shall submit the type test report along with other necessary supporting documents while submitting their bid, which are subject to evaluation and scrutiny by EESL.

All the necessary information submitted by the bidder, as confirmation and declaration of quality should comply with the prescribed guidelines of EESL and the stipulation of the prescribed test standard. In case of non-compliance in any of the parameter, the bid shall be rejected.

### 8.1.1 Type Test

Manufacturer and/or the bidder shall get their product tested on two samples in an independent accredited laboratory or in the manufacturers own lab accredited by NABL.

Before commencement of the tests, the submersible pump-sets shall be visually examined including the components, parts and their assembly, constructions, mechanical hazards, marking provision of suitable terminals for supply connections, earthing and the effectiveness of screws and connection. The external surface finish shall be even and free from finishing defects. The submersible pump-sets shall be subjected to the following type test as given in Table 3 for motors and Table 4 for pump-sets.

**Table 3**  
**List of Type Test for Bid-Evaluation (Submersible Motors)**

S. No.	Test Requirements	Clause Reference as per IS 9283	Test Methods	
			Clause	Reference Standards
1	General Construction	5.1	5.1 to 5.3	IS 9283
2	Earthing	5.2	5.4	-do-
5	Dimensions	7	7	-do-
6	Shaft Extension run out, concentricity of mounting, and face run out	7.2.1	4	IS 2223
7	Terminal markings	13	13	IS 9283
8	High Voltage test	20	20	-do-
9	Insulation resistance before & after HV test	21	21	-do-

S. No.	Test Requirements	Clause Reference as per IS 9283	Test Methods	
			Clause	Reference Standards
10	No load running of Motor and reading of current and voltage	8.1	8.1	IS 4029 or IS 7572
11	Locket rotor reading of Voltage, Current and Power input	8.3	8.3	IS 4029
		8.2	8.2	IS 7572
12	Reduced voltage running up test at no-load (for 3 phase motors only)	16.2 e)	16.2 (e)	IS 9283
13	Leakage Current Test at rated voltage	23	23	-do-
14	Measurement of Stator Resistance	7	7	IS 4029 or IS 7572
15	Full load reading of voltage, current power input and Slip	8.8	8.8	IS 4079
		8.4	8.4	IS 7572
16	Performance characteristics	17.1	17	IS 9283
17	Momentary Overload Test	18	18.1	-do-
18	Temperature rise test	19	19	-do-
19	Speed	22	22	-do-

**Table 4**  
**Lis of Type Tests for Bid Evaluation (Submersible Pump-sets)**

S. No.	Test Requirement	Clause Reference as Per IS 8034	Test Methods	
			Clause	Reference Standards
1	Material of construction of various parts (Mechanical test)	6.2	6.2	IS 8034
2	Impeller balancing	6.4	6.4.2	IS 8034
3	Pump shaft or protecting sleeve surface finish	6.4	6.4.1	-do-
4	Hydrostatic Test	9	9.1	-do-
5	Maximum Outside Diameter of submersible pump set	11.2	11.2	-do-
6	Temperature rise test at reduced voltage	7.1.1	7.1.1.2	-do

S. No.	Test Requirement	Clause Reference as Per IS 8034	Test Methods	
			Clause	Reference Standards
7	Pump Test and Verification of Guarantees	8	8	IS11346
		14.1	14.1	IS 8034
8	Direction of Rotation	10	10	IS 8034
9	Guarantee of Performance	15	15	-do-
10	Minimum Efficiency	15.2.2	15.2.2	-do-
11	Submersible cable	8	8	IS 9283

### 8.1.2 Document Verification

The following documents shall be submitted by the manufacturers/bidders for verification and scrutiny by EESL. A detail scrutiny of the documents listed below is essential to verify the authenticity and validity of each documents submitted.

- a) Copy of valid BIS certification marks Licence, if the product carries BIS certification mark;
- b) Document relating to BEE approval for star rating label;
- c) Type test report in original from a NABL accredited testing laboratory as per IS 9283 for motors and IS 8034 for pump-sets;
- d) Copy of test certificates of important raw materials and components, wherever applicable;
- e) Copy of valid NABL certificate of accreditation of manufacturers lab and independent lab; and
- f) Warranty certificate for guarantee of performance of minimum as prescribed by EESL.

### 8.2 Production/Pre-Delivery Inspection

The production/pre-delivery inspection shall be carried out by EESL or their authorized representatives. The sample shall be supplied free of cost by the manufacturer. The testing charges for all the type tests shall be borne by EESL. The schedule of test for pre-delivery inspection prior to shipment from the manufacturer's premises or their warehouse shall comprise of the following:

- a) Type test
- b) Acceptance test
- c) Routine Test

The production/pre-delivery inspection shall be carried out at the manufacturer's premises on samples selected at random from their finished stock or their warehouse.

To ensure the production of quality products in a continuous manner, verify the proper levels of control in the manufacturing process by the manufacturer. These include presence of an in house accredited test facility, trained and competent testing personnel, maintenance of test records,

inspection and calibration, proper Quality Management System measures in accordance with IS/ISO 9001.

### **8.2.1** *Type Test*

For the purpose of type tests, two samples of submersible pump-sets of each type and design shall be selected from the lot offered. Sample drawn for type tests shall be tested at a NABL approved manufactures or third party test lab.

The tests given in the Table 3 for motors and Table 4 for pump-sets as given below shall constitute the type tests and shall be carried out on the selected samples for type tests. The sample shall be representative of a manufacturer's production selected from the finished stock at the manufacturers end or in their warehouse.

Before commencement of the type tests, the pump-sets shall be visually examined including the components, parts and their assembly, constructions, mechanical hazards, marking provision of suitable terminals for supply connections including the provisions for earthing. The external surface finish shall be even and free from surface defects.

The samples shall successfully pass all the type tests for proving conformity with the requirements of the standard. If the sample fails in any of the type tests, EESL at its discretion, may call for fresh samples not exceeding twice the original number and subject them again to all tests or to the test (s) in which failure (s) had occurred. No failure is permitted in the repeat test.

The type test report shall also contain the nameplate or rating plate particulars of the submersible pumps for purposes of identification.

Type test may be waived off in case tender document originally lays out the requirement of BIS certification mark, if any.

### **8.2.2** *Acceptance Test*

To ensure the quality of products supplied by the manufacturer, acceptance test shall be carried out by EESL on each lot offered for inspection.

Samples shall be selected at random to ensure proper representation of a lot from the factory or their warehouse/stockyard for necessary testing in the manufacturers own lab duly accredited by NABL in the presence of EESL representatives. The method employed for random selection should be in accordance with IS 4905 to ensure proper representation of a lot. The sample size and acceptance quality level (AQL) shall be as laid down in IS 2500 (Part 1).

The samples selected from the lot shall be checked for any visual defects including the components, parts and their assembly, constructions, mechanical hazards, marking provision of suitable terminals for supply connections including the provisions for earthing as well as the external surface finish for any surface defects.

In case of failure of sample in any of the tests specified in the standard/inspection manual, reject the lot and send a written communication to the manufacturer. The manufacturer may after rectifying the necessary corrective measures can reoffer the lot for inspection.

Three inspection levels, I, II and III, are given in Table 1 of IS 2500 (Part 1) for general use. Unless otherwise specified, level II shall be used. Level I may be used when less discrimination is needed level III when greater discrimination is required.

Table 1 of IS 2500 (Part 1) provides the information about the lot size and corresponding inspection level. For the purpose of lot inspection by EESL, single sampling plan with normal or tightened or reduced inspection as given in Table 2A, 2 B and 2 C of IS 2500 (Part 1) may be followed. The different level of AQL specifying the acceptance and rejection number of the lot as given in Tables 2 A to 2 C shall be at the discretion of EESL.

Special levels, S-1, S-2, S-3 and S-4 given in Table 1 of IS 2500 (Part 1) may also be used where relatively small sample sizes are necessary and larger sampling risks can be tolerated.

**NOTE:** A third party inspecting agency can be employed for inspection of the lot offered by the manufacturers and submit test reports in the prescribed format as given in Annex B and duly approved by EESL for scrutiny and approval.

The nature of tests and the relevant test standard for the acceptance tests for submersible pump sets are given in Table 5.

**Table 5**  
**List of Acceptance Test for Pre-Delivery Inspection (Submersible Pump Sets)**

S. No.	Test Requirements	Clause Reference as per IS 9283	Test Methods	
			Clause	Reference Standards
1	Earthing	5.2	5.4	-do-
2	Terminal markings	13	13	IS 9283
3	High Voltage test	20	20	-do-
4	Insulation resistance before & after HV test	21	21	-do-
5	No load running of Motor and reading of current and voltage	8.1	8.1	IS 4029 or IS 7572
6	Locket rotor reading of Voltage, Current and Power input	8.3	8.3	IS 4029
		8.2	8.2	IS 7572
7	Reduced voltage running up test at no-load (for 3 phase motors only)	16.2 e)	16.2 (e)	IS 9283
8	Leakage Current Test at rated voltage	23	23	-do-



S. No.	Test Requirements	Clause Reference as per IS 9283	Test Methods	
			Clause	Reference Standards
9	Measurement of Stator Resistance	7	7	IS 4029 or IS 7572
10	Full load reading of voltage, current power input and Slip	8.8 8.4	8.8 8.4	IS 4079 IS 7572
11	Performance characteristics	17.1	17	IS 9283
12	Momentary Overload Test	18	18.1	-do-
13	Temperature rise test	19	19	-do-
14	Speed	22	22	-do-
15	Direction of Rotation	10	10	IS 8034
16	Submersible cable	8	5.3	IS 9283
17	Hydrostatic Test	9	9.1	IS 8034

### 8.2.3 Routine Tests

In case production routine tests are to be repeated at the time of procurement, then where agreed to between EESL and the manufacturer, the tests may be carried out at the manufacturer's works; alternatively, the tests may be repeated at the place specified by EESL provided that all the arrangements for tests are made by EESL at the specified place.

Routine tests are the tests that would be conducted on each unit after completion at the manufacturer's work.

The following shall constitute the routine tests.

S. No.	Test Requirements	Clause Reference as per IS 9283	Test Methods	
			Clause	Reference Standards
1	Earthing	5.2	5.4	-do-
2	Insulation resistance	21	21	-do-
3	No load running of Motor and reading of current and voltage	8.1	8.1	IS 4029 or IS 7572
4	Speed	22	22	-do-
5	Direction of Rotation	10	10	IS 8034

### 8.3 Post Delivery Inspection/Verification Testing

For verification testing, the sample shall be drawn from open market or manufacturer's warehouse/stockyard. EESL shall bear the cost of the sample as well as the cost of testing.

Verification tests shall cover all the type tests for submersible pump tests as mentioned in Table 3 and Table 4 of this manual. The type testing shall be carried out in an independent test laboratory.

## **9 COMPLAINT REDRESSAL**

Whenever a complaint is received after the submersible pump sets have been delivered/used and the complaint is proved to be genuine and the warranty period (where applicable) has not expired, the defective goods or their components shall be replaced or repaired free of cost by the manufacturer. The final authority to judge the conformity of the product to the relevant standard specified in the contract shall be with EESL. In the event of any damages caused by the submersible pump or claim filed by the user against the supply made by the manufacturer as per the contract and also non-compliance of the product to the relevant standard specified in the contract, entire liability arising out of such non-compliant product shall be with the manufacturer and EESL shall not in any way be responsible in such eventualities.

The manufacturer shall give a guarantee for the soundness of construction and performance of the submersible pumps, and shall be responsible for putting right any manufacturing defects free of charge for a period of 12 months right from the date of sale or date of installation whichever is later. Such repairs or replacements of defective parts shall be carried out at manufacturer's works, or his authorized agent at site or at service shop.

## **10 PRODUCTION PLAN**

The manufacturer shall provide advance information about their production plan and readiness of the lot to be offered for inspection to EESL.

## **11 TEST METHOD AND ITS REQUIREMENTS**

The method of tests and its requirements shall be in accordance with IS 8034 and IS 9283.

## **12 TEST REPORT PROFORMA FOR SUBMERSIBLE MOTORS AND SUBMERSIBLE PUMPSETS**

The test report format given in Annex B1 to B 4 shall be used by the manufacture, testing laboratory or EESL while submitting their test reports.

# **Annexures**



## ANNEX A

### STEPWISE GUIDELINES FOR THE INSPECTION OF SUBMERSIBLE PUMP-SETS

#### 1. Introduction

This inspection manual elaborates the quality assurance process for submersible pump-sets procured by EESL. This will ensure compliance of the procured products with the requirements laid out in the tender document, thereby building credibility of the program and ensuring the quality of the product.

To ensure procurement of quality products, proper inspection should be carried out by EESL. The inspection activities are divided in three different stages:

Step 1 – Bid Evaluation before finalization of the bid

Step 2 – Production/Pre-Delivery

Step 3 – Post-Delivery/Verification Testing

#### 2. Bid Evaluation

For bid evaluation, manufacturer shall submit the test report from an NABL accredited lab against the relevant standard along with other necessary supporting documents (show the list in red below) while submitting their bid. The test report should include type tests on safety and performance.

All the necessary information submitted by the bidder should comply with the prescribed guidelines of EESL and relevant test standard. In case of non-compliance in any of the parameter, the bid shall be rejected.

- a) Copy of valid BIS certification marks License, if the product carries BIS certification mark;
- b) Type test report in original from a NABL accredited testing laboratory as per the relevant standard;
- c) Copy of test certificates of important raw materials and components;
- d) Copy of valid NABL certificate of accreditation of the test lab issuing the test certificate/report; and
- e) Warranty certificate for guarantee of performance of minimum number of years prescribed by EESL.

#### 2. Prerequisite for Inspection at the manufacturers premises

Before undertaking the inspection, the EESL inspecting officers should ensure the following:

- a) Opening meeting with the concerned officials and the testing and quality control personal to discuss and planning to undertake the required task
- b) Visit to the test laboratory to check the following:
  - Availability of requisite test facilities as per the prescribed standard and its workability
  - Calibration detail and the validity of each instruments and test equipment

- Verification of test records and other relevant records related to in process quality control including the manual and procedure for ISO 9001 certification
- Verification of testing facilities at the production line if applicable

After ensuring the compliance of all the requirements mentioned above, the inspecting officers shall draw samples for acceptance and type tests from the lot offered for inspection by the manufacturers. For acceptance tests the sampling plan and AQL shall be as per IS 2500 (Part 1). Routine tests shall be carried out on the entire lot.

After the completion of all the tests as per the specified standard, the test report shall be prepared on the prescribed format as given in Annex B of this manual. The test reports shall be signed by the inspecting officer from EESL and the authorized person from the manufacture.

### **3. Production/ Pre-Delivery Inspection**

The field-inspecting officer shall draw samples at random from the finished stock of the lot offers. The number of samples for acceptance tests shall be as laid down in IS 2500 (Part 1) using a suitable AQL.

The production/pre-delivery inspection shall be carried out by field inspecting personnel from EESL or their authorized representatives at the manufacturer's premises on samples selected at random from their finished stock or their warehouse for testing. The sample shall be supplied free of cost by the manufacturer. The manufacturer shall provide advance information about their production plan and readiness of the lot to be offered for inspection to EESL. Pre dispatch inspection tests include type, acceptance and routine tests.

Before commencement of the type tests, the submersible pump-sets shall be visually examined including the components, parts and their assembly, constructions, mechanical hazards, marking provision of suitable terminals for supply connections including the provisions for earthing. The external surface finish shall be even and free from surface defects.

#### **3.1 Type Tests**

The sample selection for type testing shall be based on random sampling. The number of samples for type testing shall be two drawn from the finished stock of the lot offered by the manufacturer/supplier. Sample drawn for type tests shall be sent to an NABL approved test labs. The testing charges for all the type tests shall be borne by EESL.

The samples shall successfully pass all the type tests for proving conformity with the requirements of the standard. If the sample fails in any of the type tests, EESL at its discretion may call for fresh samples not exceeding twice the original number and subject them again to all tests or to the test in which failure had occurred. No failures are permitted in the repeat test. EESL may waive off the type test on the lot offered by the supplier/manufacturers in case the submersible pup-sets carries BIS certification mark and/or BEE energy efficiency level. The list of type tests shall be as given in Table 3 for submersible motors and Table 4 for submersible pump-sets.

### **3.2 Acceptance Tests**

To ensure the quality of products supplied by the manufacturer, acceptance test shall be carried out by EESL on each lot offered for inspection. The manufacturer shall supply, free of charge, the samples from the factory or their warehouse/stockyard for necessary testing in the manufacturers' accredited lab in presence of EESL representatives.

Samples shall be selected at random from the lot offered by the manufacturers/supplier from the finished stock using IS 4905 to ensure proper representation of a lot. The sample size and acceptance quality level (AQL) shall be as per IS 2500 (Part 1). In the absence of test facilities for any particular test, the testing personnel deputed by EESL shall draw the samples from the manufacturing premises or from manufacturers ware house/stockyard and send the same to an NABL approved test labs for the required tests.

In case of failure of sample in any of the tests specified in the standard/inspection manual, the lot shall be rejected and a written communication to this effect shall be made to the manufacturer. The manufacturer may after rectifying the necessary corrective measures can reoffer the lot for inspection.

A third party inspecting agency can be employed by EESL for inspection of the lot offered by the manufacturers and submit test reports in the prescribed format given in the inspection manual.

The list of acceptance tests shall be as given in Table 7 of this manual.

### **3.3 Routine Test**

In case production routine tests are to be repeated at the time of procurement, then where agreed to between EESL and the manufacturer, the tests may be carried out at the manufacturer's works; alternatively, the tests may be repeated at the place specified by EESL provided that all the arrangements for tests are made by EESL. The routine tests shall be carried out on each submersible pump-sets from the lot offered for inspection. In case of failure in any of the tests, the sample under tests shall be either rejected or reworked/rectified and retested.

The list of routine tests is given in section 8.2.3 of this manual.

## **4. Post Delivery Inspection/Verification Testing**

Verification testing is a vital crosscheck mechanism to ensure quality products reach the end users/consumers post-delivery. For verification testing, the sample shall be drawn from open market or manufacturer's warehouse/stockyard. EESL shall bear the cost of the sample as well as the cost of testing in an independent NABL accredited lab. The verification testing shall include all the type tests specified in IS 9283 for submersible motor and IS 8034 for submersible pump-sets Table 3 for submersible motors and Table 4 for submersible pump-sets in an NABL accredited lab. The samples shall successfully pass all the type tests for proving conformity with the requirements of the standard. If the sample fails in any of the type tests, EESL at its discretion, shall draw the sample may call for fresh samples not exceeding twice the original number and subject them again to all tests or to the test in which failure had occurred. No failures are permitted in the repeat test. In case of failure of samples in repeat testing, EESL shall take appropriate action against the manufacturers.

## ANNEX B 1

### TEST REPORT PROFORMA FOR SUBMERSIBLE MOTORS AND SUBMERSIBLE PUMPSETS

The test report for the motor testing shall be on prescribed format as given below.

1 Name and address of the manufacturer

---

2 Name of the Purchaser \_\_\_\_\_ Test Certificate No.

---

3 Purchase Order No. \_\_\_\_\_ Order Acceptance No. \_\_\_\_\_

#### A. SUBMERSIBLE MOTORS

##### 1 Name Plate Data

- a) Motor S. No.
- b) Voltage \_\_\_\_\_ Volts
- c) Output \_\_\_\_\_ kW
- d) Frequency \_\_\_\_\_ Hz
- e) Speed \_\_\_\_\_ rpm Current \_\_\_\_\_ amp
- f) Bore Well Size \_\_\_\_\_ mm

##### 2 TESTS

The details test results in accordance with IS 9283 shall be reported on the prescribed format given in Table C1 of this Annex.

Test conducted on Motor No. \_\_\_\_\_ Approved By

Tested by:

On:

Date:

#### B. SUBMERSIBLE PUMPS

##### 1 Name Plate Data

- a) Manufacturer's name or trade mark (if any)
- b) Model,
- c) Serial No
- d) Number of stages;
- e) Bore size, Min;



- f) Head, at nominal duty point;
- g) Discharge, at nominal duty point;
- h) Overall efficiency;
- i) Motor rating (kW);
- j) Rated speed (rpm);
- k) Maximum current (amp);
- l) Rated voltage (v) or voltage range with variation;
- m) Rated frequency (Hz);
- n) Connection star/delta;
- o) Type of duty (whether continuous or not);
- p) Delivery size;
- q) Head range for non-overloading requirements; and
- r) BIS standard mark and BIS License number, if any.

In addition, pump sets may carry a separate BEE star label.

## **2 TESTS**

The details test results in accordance with IS 9283 shall be reported on the prescribed format given in Table C2 of this Annex.

## **3 Performance Test and Verification of Guarantee**

The details test results shall be reported on the prescribed format given in Table C3 of this Annex.

Result: Pass/Fail

Test conducted on Motor No. \_\_\_\_\_ Approved By

Tested by:

On:

Date:

**ANNEX B 2**

**TEST REPORT OF SUBMERSIBLE PUMP SETS AS PER IS 9283**

Srl. No.	Nature of Test	Reference Test Standard (IS)	Clause Reference	Verification for test records/test certificate	Remarks (Pass/Fail or Satisfactory/Unsatisfactory/Observed Value)			
1	Construction	9283	5.1					
2	Submersible Cable	-do-	5.3					
3	Provision for Earthing	-do-	5.4					
4	Finish of Bearing	-do-	5.5					
5	Balancing of Rotor	-do-	5.6					
6	Measurement of Speed	-do-	6.4					
7	Dimension	-do-	7.1 and 7.2					
8*	Temperature rise test	-do-	9.1 and 19					
	<i>Loading Condition</i>							
		Volts	Amps	Watts	Load	Percentage Slip	Power Factor	Efficiency
	No Load							
	Full Load							
	<i>Conditions of Test</i>							
		Hours Run (H)	Line Voltage V	Line Current A	Input watts kW	Calculated Output kW	Temperature Rise ° C	
	At Rated Voltage*							
	At 85 Percent of Rated Voltage*							
9	Breakaway Torque and Starting Current (Clause 16.1 e) and 16.3 of IS 9283)							
	Breakaway Torque (Locked) with Voltage Applied				Breakaway Starting Current (Locked Rotor) and Power Input (Locked Rotor) with Volts Applied			

	V		Kg.m	V	W	A
S. No.	Nature of Test	Reference Test Standard (IS)	Clause Reference	Verification for test records/test certificate	Remarks (Pass/Fail or Satisfactory/Unsatisfactory/Observed Value)	
10	Measurement of Stator Resistance	9283	16.1 e)			
11	No load Test	-do-	16.1 d) and 16.3 c)			
12	Full Load Test	-do-	16.1 g)			
13	Reduced Voltage Running Test	-do-	16.1 e) and 16.3 e)			
14	Performance Test *	-do-	17			
15	Power Factor	-do-	12.2			
16	Efficiency	-do-	12.1			
17	Terminal Marking	-do-	13			
17	Overload Test					
	Momentary Overload*	-do-	18.1			
	Sustained Overload	-do-	18.2			
18	High Voltage Test	-do-	20			
19	Insulation Resistance Test	-do-	21			
20	Measurement of Speed	-do-	22			
21	Leakage Current	-do-	23			

**\*NOTE:** In case of submersible pump sets, motors need not be subjected to the following test specified in relevant clause of IS 9283

- a) Full load test {16.1g}
- b) Performance test {16.1 h)},
- c) Momentary overload Test {16.1 m)}
- d) Temperature rise at rated voltage and reduced voltage {16.1 j)} and {16.1 k)}

### ANNEX B 3

#### TEST REPORT OF MOTORS FOR SUBMERSIBLE PUMP SETS AS PER IS 8034

S. No.	Nature of Test	Reference Test Standard (IS)	Clause Reference	Verification for test records/test certificate	Remarks (Pass/Fail or Satisfactory/Unsatisfactory/Observed Value)
1	Material and Construction	8034	6.21		
2	Design Features of Components for Pump	-do-	6.3		
3	Requirements for Components	8034 11723	6.4 6.3		
4	Temperature Rise Test	8034	7.1.1		
5	Submersible Cable	-do-	8		
6	Hydrostatic Test	-do-	9		
7	Direction of Rotation	-do-	10		
8	Guarantee				
	Guarantee of Workmanship and Material	-do-	15.1		
	Guarantee of Performance	-do-	15.2		
9	Verification of Guarantee	-do-	15.3		

## ANNEX B 4

### TEST REPORT ON PERFORMANCE FOR SUBMERSIBLE PUMP SETS

Pump Set Record Sheet										Sheet Number								
										Graph Number								
Nature of test - Performance test as per IS 8034																		
Pump type . . . . . Pump S1No., . . . . .								Motor rating . . . . .kW/HP..... Motor S1No.....-										
Suction ..... mm Delivery ..... ...rnm								Voltage . . . . . Full load current, Amps . . . . .-										
Material of the impeller								Meter constant: Ax .....kWx .....Rated frequency. ....										
Suction lift measured by: Hg manometer vacuum gauge notch/volumetric tank/Flowmeter								Capacity measured by - Vee-										
Delivery head measured by: Hg manometer/pressure gauge One								Class of accuracy of measuring instrument -										
S. No	Frequency, Hz	Delivery gauge reading, m	Gauge distance, Z.m	Velocity head correction, m	Total head, m	Head over notch, (in case of v-notch)	Volume l/time(s)(in case of volumetric tank)	Discharge l/s	Current, A	Wattmeter reading		Motor input (IP) kW	Pump Input (LP), kW	Overall efficiency, (%)	Performance converted at rated frequency			
										W <sub>1</sub>	W <sub>2</sub>				H, m	Q, m	IP, kW	
Pump certified for:										Date .....				Tested by.....				
i) Total Head in m .....										Remarks.....								
ii) Discharge in l/s .....																		
Frequency .....																		
iii) Overall efficiency percent . . . .																		
Motor input, kW .....																		
iv) Head range in m.....																		
H . . . . . Q.. . . . . Guarantee factor .....																		

Overall efficiency at duty point, percent .....  General requirements – Satisfactory/Unsatisfactory	
---	--





## **Contact us**

Energy Efficiency Services Limited  
NFL Building, 5th & 6th Floor,  
Core - III, SCOPE Complex,  
Lodhi Road, New Delhi - 110003

Email: [info@eesl.co.in](mailto:info@eesl.co.in)  
Phone: +91 || 45801260

Website: [www.eeslindia.org](http://www.eeslindia.org)

Join the conversation #EnablingMore

[f](#) EESLIndia [t](#) @EESL\_India [v](#) Energy Efficiency Services Limited

Follow the impact of our programmes real time on the dashboards  
UJALA : [ujala.gov.in](http://ujala.gov.in) | SLNP : [slnp.eeslindia.org](http://slnp.eeslindia.org) | BEEP : [eeslbeep.com](http://eeslbeep.com)  
MEEP : [meep.eeslindia.org/dashboard/](http://meep.eeslindia.org/dashboard/)