**Acceptance Testing Procedures for**

**Digital Water Level Recorder (DWLR)**

**Technical Assistance and Management Consultancy (TAMC)**

**Document Control**

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**Acronyms and Abbreviations**

ARG Automatic Rain Gauge

AWLR Automatic Water Level Recorder

BBMB Bhakra Beas Management Board

CGWB Central Ground Water Board

CHP Customer Hold Point

CMC Consultancy Monitoring Committee

COC Certificate for Conformity

CPCB Central Pollution Control Board

CPMU Central Project Management Unit

CWC Central Water Commission

CWPRS Central Water and Power Research Station

DCP Data Collection Platform

DRS Data Retrieval System

DVC Damodar Valley Corporation

DWLR Digital Water Level Recorder

ERS Earth Receiving Stations

eSWIS Online Surface Water Information System

FEWS Flood Early Warning System

GOI Government of India

GPRS General Packet Radio Service

GSM Global System for Mobile Communications

GW Groundwater

IA Implementing Agencies

ID Inner Diameter

IMD India Meteorological Department

IP Ingress protection

ISO Indian Standard Organization

ISRO Indian Space Research Organization

M&E Monitoring and Evaluation

MIS Management information Systems

MoWR, RD & GR Ministry of Water Resources, River Development & Ganga Rejuvenation

MWL Maximum Water Level

NABL National Accreditation Board for Testing & Calibration Laboratories

NESAC North-East Space Application Centre

NIH National Institute of Hydrology

NHP National Hydrology Project

NLSC National Level Steering Committee

NPMU National Project Management Unit

NRSC National Remote Sensing Centre

NWIC National Water Informatics Centre

OD Outer Diameter

OEM Original Equipment Manufacturer

Pa Pascal (unit of pressure)

PIP Project Implementation Plan

RTDAS Real Time Data Acquisition System

SCADA Supervisory Control and Data Acquisition

SoI Survey of India

SPMU State Project Management Unit

TBRG Tipping Bucket Rain Gauge

UT Union Territory

WB World Bank

WRD Water Resources Department

WRIS Water Resources Information Systems

# General Considerations

## Introduction

This document describes the procedures to be followed for acceptance testing for Digital Water Level Recorder (DWLR) installed under the National Hydrology Project.

The inspection of the DWLR shall be carried out to check whether the DWLR systems are in conformity with the approved Technical Specifications and shall be in line with the inspection and test procedures laid down in the Technical Specifications and the General Conditions of the contract. The following test procedure shall be applied for the inspection and testing of equipment.

After manufacturing and integration of all DWLR equipment, the vendor shall test and inspect / test all equipment and prepare the summary test report in conformity with the contract specifications. The vendor has to send this test report to the Purchaser along with his letter seeking for the inspection of DWLR equipment. Upon receipt of the test reports and calibration certificates, the purchaser or its representative shall decide to conduct the pre-dispatch inspection /test of any or part or all the equipment /Goods prior to issue of dispatch clearance.

In cases where the supplies are received from abroad, the purchaser may waive the pre-dispatch inspection. However, the inspection and dispatch clearance by the Purchaser or the waiver thereof shall be prejudice the right of the Purchaser. The purchaser can also inspect the equipment/goods on receipt at final destination for their conformity to contract specifications.

If the equipment fails to meet the contract specifications during inspection, whether at pre-dispatch stage or upon receipt at final destination, the supplier shall take immediate steps to remedy the deficiency or replace the defective equipment to ensure that all supplies meet with the specifications specified in the contract.

For pre-dispatch inspection testing the following tests will be conducted on a 5% sample of DWLR systems from a lot limited to 60 systems. Depending upon the quality and the results, the sample percentage may be reduced or increased by 2% (3% to 7%) with mutual understanding. If sample size less than specified above, minimum 2 samples to be tested.

## Test instruments required

The following instruments are required for testing the DWLR equipment:

|  |  |  |
| --- | --- | --- |
| **SN** | **Instruments Name** | **Range and Resolution** |
| 1 | Power Supply Unit | 0 to 18 V (adjustable) with 5Amp. |
| 2 | Digital Multimeter | Minimum 4½ digit Digital Multimeter with feature for voltage and current measurement |
| 3 | Measurement Tape | 10 mtrs with resolution of 1mm |
| 4 | Water Level Sounder (Measurement Tape) | Minimum up to 20 mtrs with resolution of 1 mm |
| 5 | Test Jig | As per the standard test procedure |

## Reports prior to Pre-dispatch Acceptance Testing

The following are the documents that are required to be made available by the vendor during pre-dispatch acceptance testing and the checks to be performed.

1. **List of Equipment**

The list of DWLR equipment shall include all the manufacturer’s details, make and model number and serial number of all equipment (i.e. data logger, GSM & GPRS modem, sensors etc.) to be supplied under the project as per Form-1 - List of DWLR Equipment. If the DWLR system is an integral system (i.e. data logger and sensors are non-detachable) than only DWLR system details mention above will suffice. The make, model numbers and photographs of all equipment are to be checked with the proposed / quoted equipment in the vendor’s proposal. Any deviation observed is to be noted in the remark column of List of DWLR Equipment (Form-1).

1. **Factory Test and Calibration Certificates**

The Manufacturer’s Factory Test and Calibration Certificates are required for all DWLR equipment (i.e. data logger, GSM & GPRS modem and sensors). This Factory Test reports and Calibration Certificates of DWLR equipment should comprise of measurement range, accuracy, resolution, power consumption, operating temperature and humidity range etc.

**Test and calibration documents:**

* 1. Vender shall provide the comprehensive Method Statement on the applied calibration and in-factory test procedures. The Method Statement should define the test and calibration methods applied on the instruments and the components thereof. The Method Statement shall also include, for each calibrated product, an audit trail to national standards on all instruments and facilities used for testing and calibration. The Audit Trail Report shall associate the calibration of the reference instruments and test equipment to the national calibration standards.
  2. If the Supplier or Manufacturer is not in a position to deliver an Audit Trail Report to the national standards, the Manufacturer shall explain what the quality standards are and how they are maintained and monitored.
  3. Conditions during calibration, such as room temperature, equipment & facilities being used, shall be included in the test & calibration documents.
  4. The test and calibration documents shall contain the data generated during calibration and testing, including:
* Calibration data supplied by the Manufacturer of pressure sensor
* Calibration and test data of the data-logger electronics
* Calibration data on overall DWLR calibration, i.e. comprising both pressure sensor and electronics.
* Data on hysteresis test, temperature tests, zero stability test, scale stability test
* Temperature cycling of sensor and electronics

1. **Environmental Tests** (for two DWLR Systems)

* Temperature Test over entire specified temperature range of 0ºC to +60ºC
* Humidity Test at +40ºC, 95% RH for 4 hours
* Spray test on enclosure(s), connectors and cables

The environmental tests should be carried out on a sample of **two (2)** DWLR integrated systems (i.e. the complete system integrated with data logger, GSM & GPRS modem and sensors).

1. **Integration and Burn-in Test**

The Burn-in Test will be carried out on all the DWLR systems for 72 Hours in the natural temperature conditions.

The Burn-in Test should be carried on the integrated DWLR system (i.e. the complete system integrated with the datalogger, GSM & GPRS modem and sensors). To start the test, switch ON the power supply. The datalogger of the DWLR system will read data as the data input from sensor dipped in the fixed water depth. The same data shall log into the datalogger memory with 1 Hour measurement interval. The DWLR will transmit the logged data and the same data parameters will be measured and noted in the test report.

1. **Manuals and Guidelines**

The manuals shall meet the requirements on style and clarity, completeness, preciseness, detail and accessibility. This includes:

* System manual, including the details of Atmospheric Pressure correction to be applied on the non-vented water level reading should be fully documented
* Operation, Maintenance and Service manuals,
* Observation guideline, and
* Training handouts.

The Vendor also is required to provide the details of the procedure followed during the manufacturing /integration of DWLR systems, like inward inspection of all the raw materials including the sensors, datalogger, modems and all other components. The vendor also should provide the inspection report of internal quality inspection at various assembly stages, testing stage and integration stages to get the quality product.

**List of pre-dispatch acceptance tests for DWLR systems:**

1. **Integrated functional test for DWLR System**
2. Power consumption and Power Supply Test
3. DWLR Datalogger Functional Test
4. Integrated functional test for DWLR sensors
5. GSM & GPRS Functional Test
6. **Integration and Burn-in Test**
7. Transmission link testing
8. Accuracy tests on clock
9. Cable creep and elongation test
10. **Autonomy: Two autonomy tests shall be conducted:**
11. **Battery autonomy test:** To execute the test, the instrument is set to a fast data collection interval and the capacity, i.e. the number of samples, is established by a continuous process of data collection until the batteries are depleted. The test shall be executed on new batteries. In this context, the batteries are deemed depleted when the instrument stops functioning because the battery voltage watch-dog function detects a too low battery voltage or the normal operation of the instrument stops.
12. **Memory capacity verification:** The memory is filled at the highest data- recording rate and the volume of collected data is verified against the bid specification. This test could be combined with the battery autonomy test and the samples are taken at a high rate to minimize the test duration.
13. **Sensors:** Manufacturer’s calibration test results of the sensors for the cross reference
14. **Data Logger:** Manufacturer’s functional and interfaces Test report for the cross reference.

# Pre-dispatch Acceptance Test for DWLR System

## Integrated functional test for DWLR System

An integrated DWLR system which consists of a DWLR datalogger integrated with Battery, GSM & GPRS telemetry modem, Atmospheric Pressure Sensor, Non-venter Water level and Temperature sensor etc. The Data Collection Platform (DCP) is the heart of a DWLR system and needs to be tested thoroughly. Hence the vendor should conduct all possible tests to ensure the best quality and consistent working of the DCP. During the testing benchmark-level checks will be conducted as per the Test Data Record (Form-2A)

**Data logger functional test**

1. Observe and check the DWLR System (Data logger, GSM & GPRS Modem and Sensors) test report certified by the manufacturer as per his standard format. This Factory Test and Calibration Certificate should be as per the requirements in terms of accuracy, measurement range, operating temperature and humidity range mentioned in the contract document.

**Visual Inspection:**

1. All the parts of DWLR system are visually checked for damage, e.g. on cables, sensor and housing and note this reading in the Test Data Record (Form-2A).
2. Check for non-removable identification codes (e.g. serial number, make, manufacturer and measuring range) for all parts of DWLR system. Note this data (make, model, serial number etc.) in Test Data Record (Form-2A).

**Power consumption Test Procedure**

1. Make the connections with the datalogger and GSM & GPRS Modem and Sensors.
2. Remove the internal battery and connect the external power supply. Before connecting the external power supply, set the required voltage on power supply and connect to the power supply to the DWLR system.
3. With the help of a digital multi-meter, measure input voltages at DWLR System and note this reading in the Test Data Record (Form-2A).
4. Connect the current meter in series with the power supply and measure the DWLR Quiescent mode current. Also measure the current during measurement and data transmission mode and note this reading in the Test Data Record (Form-2A).
5. Connect the power supply in reverse polarity and check whether the DWLR system takes current. If it is a shunting diode it will take more current. If it is a series diode it will not take any current. Note the observation in the Test Data Record (Form-2A).
6. Remove the external power supply connection and connect the internal battery.

**General Inspection:**

1. Check the datalogger physically and verify the Sensor interfacing ports (e.g. SDI-12, RS-485, 4-20 mA or compatible with data logger), Port for PC / Laptop interface etc. provided to the DWLR datalogger. Note the observations in the Test Data Record (Form-2A).
2. Check the Time synchronisation and time format of the DWLR datalogger and note the observation in the Test Data Record (Form-2A).
3. Check the size and Type of the Internal Memory for Data storage. For this the vendor shall give a demonstration as per his standard test procedures and provide documentary proof (like technical datasheet of the particular module/component used in the datalogger) Note the observations in the Test Data Record (Form-2A).
4. Check the provision for setting configuration parameters like Station ID code, Measurement Interval, Gain, Offset & Datum (for sensors), Transmission time/Slot for GSM/ GPRS, FTP server configuration, mobile number of data center, etc. using Laptop & GSM/GPRS telemetry. Note the observations as ‘Yes’ else ‘No’ in the Test Data Record (Form-2A).
5. Check the sensor reading (Battery, Uncompensated Water Level, Compensated Water level, Water Temperature, Atmospheric Pressure, Electrical Conductivity etc.) in live data and logged data and note the observation in the Test Data Record (Form-2A).
6. Observe and check the whether the Atmospheric Pressure sensor is provided as an internal or external module. The vendor needs to provide the Factory Test and Calibration Certificates as per the required accuracy, measurement range, operating temperature and humidity range mentioned in the contract document.
7. Check whether Atmospheric Pressure correction is applied on the non-vented water level reading and also confirm whether the Correction procedure is fully documented in user manual, Note the observation in the Test Data Record (Form-2A),

## GSM & GPRS modem functional test

1. Observe and check the whether the GSM & GPRS modem is provided as an internal or external module. The vendor needs to provide the Factory Test and Calibration Certificates as per the required accuracy, measurement range, operating temperature and humidity range mentioned in the contract document.
2. Check all the parameters mentioned in the Test Data Record (Form-2A) and note the observation.
3. Check GSM & GPRS Transmission Data string Format, it should be Standard CSV format. The field for the Station ID, Date and Time, Mobile Number, Battery and sensor data should be same as specified in technical Specification. Note the GSM & GPRS Transmission Data string in the Test Data Record (Form-2A)
4. Also download the Logged data from DWLR data logger through PC / Laptop communication port and Check downloaded Data string Format, it should be Standard CSV format. The field for the Station ID, Date and Time, Mobile Number, Battery and sensor data should be same as specified in technical Specification. Note the downloaded Data string in the Test Data Record (Form-2A)

## Transmission Link Testing

1. Connect all the sensors (Non-Vented Water Level Sensor, Water Temperature Sensor, Atmospheric Pressure Sensor, Electrical Conductivity Sensor etc.) to the DWLR Data logger. Put Non-Vented Water Level Sensor, Water Temperature Sensor, Electrical Conductivity Sensor inside the water of fix water column.
2. Set all required configuration in data logger related sensors and communication system. And also set the measurement and Transmission cycle as minimum as possible (15 min.)
3. Start transmission of the data through GSM / GPRS telemetry and note the observations in the form for Transmission Link Testing (Form-2B).

## Pre-dispatch Acceptance Test for DWLR Sensors

**Non-vented Water Level and Temperature Sensor**

1. Observe and check the test report certified by the manufacturer for Non-vented Water Level Sensors as per the manufacturer’s standard format. This Factory Test and Calibration Certificate should be as per the requirements in terms of accuracy, measurement range, operating temperature and humidity range mentioned in the contract document.
2. Check the sensor calibration parameters like Sensor Type, Measurement Range and Resolution for water level and water temperature sensor as per the manufacturer’s Factory Test and Calibration Certificate and datasheet. Note the observation in the DWLR Sensor Test Data Record (Form-3).
3. Check the sensor housing material, it should be Stainless steel (SS-316) or other better corrosion resistant material and Ingress Protection for sensor and datalogger, note the observation in the DWLR Sensor Test Data Record (Form-3).
4. Check the sensor output interface used for the datalogger interface and note the observation in the DWLR Sensor Test Data Record (Form-3).
5. **Lab Testing of DWLR system** with Non-vented Water Level Sensor as per the general steps given below.
   1. Take two complete DWLR Systems with all sensors integrated with data loggers.
   2. Put both DWLR systems including sensors in pressure chamber. If pressure chamber is not available then take airtight (hermetic sealed) box with arrangement to increase or decrease pressure. And connect PC / Laptop for monitoring the live & recorded sensor (Battery, Uncompensated Water Level, Compensated Water level, Water Temperature, Atmospheric Pressure, Electrical Conductivity etc.) reading.
   3. At room temperature and normal air pressure, set / configure the DWLR setting for zero water level reading (after pressure correction) and note the sensor (Battery, Uncompensated Water Level, Compensated Water level, Water Temperature, Atmospheric Pressure, Electrical Conductivity etc.) reading in the DWLR Sensor Test Data Record (Form-3).
   4. Close the pressure chamber / airtight (hermetic sealed) box. Increase / decrease the air pressure inside the pressure chamber / airtight box at approximately 600-mbar, 800-mbar, 950-mbar, 1050-mbar etc. note the sensor (Battery, Uncompensated Water Level, Compensated Water level, Water Temperature, Atmospheric Pressure, Electrical Conductivity etc.) reading in the DWLR Sensor Test Data Record (Form-3).

As result of this test, the Compensated Water level reading should be Zero at all the pressure levels, whereas the Uncompensated Water Level and Atmospheric Pressure sensor reading should very as per the test condition.

(Note – The pressure inside the pressure chamber should be within 450 to 1100-mbar, otherwise Atmospheric pressure sensor may damage)

* 1. Open the pressure chamber / airtight (hermetic sealed) box, and keep only Data logger with Atmospheric pressure sensor inside the pressure chamber / airtight box take and put Water Level sensor with cable outside. Close the pressure chamber / airtight (hermetic sealed) box. Increase / decrease the air pressure inside the pressure chamber / airtight box at approximately 600-mbar, 800-mbar, 950-mbar, 1050-mbar etc. note the sensor (Battery, Uncompensated Water Level, Compensated Water level, Water Temperature, Atmospheric Pressure, Electrical Conductivity etc.) reading in the DWLR Sensor Test Data Record (Form-3).

As result of this test, the Uncompensated Water level reading should be same at all the pressure levels, whereas the Compensated Water Level and Atmospheric Pressure sensor reading should very as per the test condition.

(Note – The pressure inside the pressure chamber should be within 450 to 1100-mbar, otherwise Atmospheric pressure sensor may damage)

1. **Field Testing of DWLR system** with Non-vented Water Level Sensor as per the general steps given below.
2. Take two complete DWLR Systems with all sensors integrated with data loggers. Tightly tie both Non-vented Water Level Sensor and its cable with the help of cable ties, such that the sensor will be at same level. Also fix starting end of measuring tape with WL sensor for measurement of sensor position from the top of borewell.
3. Fix both DWLR water level sensors along with measuring tape inside the borewell. If borewell is not available then vertical pipe of 8 to 10 mts height and 6” diameter filled with water can be use as borewell.
4. Lower the sensors just above the water surface (do not touch to water surface). The sensors should be mounted in such a way that sensor cable should be vertical with no obstruction. Configure the two DWLR system and set the zero water level with MSL level (any test MSL value).
5. Measure the distance of water level from top of the borewell. Note the observation in the DWLR Sensor Test Data Record (Form-3).
6. Lower both DWLR water level sensors at the different depth of water level (around 0.5mts, 3mts, 5mts, 7mts and 10mts below Water surface level). And observe the measuring tape reading

**Measuring tape reading = WL from top of borewell + Sensor position under water**

Note the measuring tape reading and sensors reading in the DWLR Sensor Test Data Record (Form-3).

1. Interchange the water level sensors and data loggers with each other and repeat the reading (without making any change in the datalogger settings). The reading in the both conditions should be same.
2. Repeat steps (e) and (f) for different under water sensor position and note the observation in the DWLR Sensor Test Data Record (Form-3).
3. **Cable creep and elongation test**
4. To test the creep and elongation of the electrical cum suspension cable some vertical open space is required, e.g. a stairwell can be used for this purpose. However, it is important that the cable is protected against touch to avoid interference with the measurements. The cable is loaded with 4-5 times weight of cable and sensor.
5. The length of cable under tests shall be as long as possible, i.e. 10 m or more, to get the best accuracy of the tests. The lowest point is suspended to about 0.15 m above the floor.
6. The gap between lowest point and floor is monitored against time. Initially readings are taken every 30 minutes for 12 hours, subsequently the reading interval may be increased to 6 hours. The cable test shall be executed during 7 days. Resolution of measurement should be 1 mm or better.
7. The result is to be presented in mm length change per meter suspended cable length. Only one cable is to be tested. Note the observation in the DWLR Sensor Test Data Record (Form-3).

# Site Acceptance Test for DWLR Stations

In order to facilitate the site acceptance of the system by the staff in –charge of the site, the vendor should give a list of deliverables for each site to the respective site staff as well as to the Engineer-in-charge of the project. The list shall be verified by the respective staff incharge of the site and accordingly the staff will give a verification report whether all components have been delivered properly at the site. The vendor should complete the required civil works at the site for proper installation of the equipment before supplying the equipment to the site.

For the site acceptance test, the vendor shall give a check–list of all components and their functions. This checklist shall be prepared in consultation with the purchaser. This checklist shall indicate the tests to be conducted at the site and the results that are expected for each and every component that is to be installed at the site.

The following checklist has to be provided to each site.

* The Vendor should provide complete details including the make, model and serial number / ID of each equipment to be installed at each site.
* Check the installation of the sensors. The location / depth of the sensors and the related civil works should be decided depending on the site conditions in consultation with the respective staff incharge of the sites and the Engineer-in-charge.
* DWLR and their accessories should be protected to minimize the chances of theft without compromising the basic principle and working of the sensors. Due care must be taken when modifying the installations. Under no circumstance the basic principle and working of the sensors shall be disturbed. Provisions for easy access to the instrument for maintenance are to be made.
* DWLR Water level sensors should be configured to provide correct data on water level. The zero setting can be an arbitrary benchmark. The actual configuration against MSL is required in the next stage during the final acceptance.
* All sensors should be connected to a datalogger with proper cabling and conducting. The wires and conduits should be properly tied and covered.
* All testing and calibration certificates, user manuals and other documentation as applicable for the equipment should be supplied to the relevant Engineer-in-charge.

# Acceptance Test for State Data Centre

The acceptance test for the State Data Centre will be conducted by the Purchaser or any other person nominated by the Purchaser, at his choice.

At the commissioning and final acceptance testing stage the data centre must fulfill all conditions mentioned in the Technical Specifications. The final acceptance testing stage will start with the final commissioning of the data centre as no remote DWLR station can be accepted unless the data centre equipment like server, GSM & GPRS receiver, software, etc. is fully functional and starts receiving data from remote stations.

The following checklist will be applied for the acceptance testing of the State Data Centre:

* The server with a monitor and other equipment must be properly installed and configured with all usernames, passwords, firewalls and network configurations.
* The High Speed internet connection of 8 MBPS must be properly installed, configured and working.
* The printer and workstation are to be installed and configured for the network including all necessary software, genuine operating system, Microsoft Office license and antivirus.
* The data from remote sites is being received via GSM and GPRS to the State Data Center and then to the e-SWIS system.
* All software should be complete, and no missing modules/ sections will be allowed.
* A full time person is to be appointed for managing the data centre and the DWLR system.
* The operators must be fully conversant with the equipment and calibration procedures, methods of operation and all facilities provided.
* The trainings as mentioned in the Technical Specification for the commissioning period are to be completed.
* The Data Centre acceptance test shall demonstrate the successful receiving of remote stations data at the State Data Center server. It shall include the data dissemination software indicating its full implementation as specified and trouble free operation of all modules for a period of 7 days operating on a 24 X 7 basis. An average data acquisition efficiency of 90% for the duration of the test period shall be considered as satisfactory.

# Final Acceptance Test

The remote sites can be tested, commissioned and accepted in batches of at least 20% of the total number of sites. The data centre is commissioned along with the first batch of stations when the following conditions are met:

* Remote DWLR station must have completed the first level site acceptance test.
* The water level stations are calibrated against MSL and providing correct data. The zero setting against the bed level or any other local benchmark will not be accepted
* The telemetry system using GSM & GPRS are properly installed and tested.
* Days of continuous data is received at the data centre using GSM / GPRS based telemetry for at least 90 % of the up-time. During a period of Seven (07) days, there shall be no occurrence of any malfunction in any component necessitating replacement or repairs. No malfunction, partial or complete failure of any part of the hardware or excessive heating of the equipment or other electro-mechanical malfunction or bugs in the software shall occur.
* All relevant documentation pertaining to the sites shall be handed over by the vendor to the Engineer-in-charge.
* The data shall be checked for correctness and validated using defined procedures. Wherever available, data shall be checked against manual observations.
* The Station IDs, Data Transmission time slots, SIM card Details and license, etc. for the sites are to be in place.

# APPENDICES

1. List of DWLR Equipment (Form-1)
2. Forms for Performance Testing
   1. Integration Test Data Record For Data Collection Platform (Form-2A
   2. Transmission Link Testing (Form-2B)
   3. Non-vented Water Level and Water Temperature Sensor (Form-3)

## List of DWLR Equipment (Form-1)

| **SN** | **Item** | **Qty** | **Manufacturer Details** | | **Make and Model** | **Remark** (if any deviation in make / model / photographs of DWLR Equipment w.r.t quoted equipment) |
| --- | --- | --- | --- | --- | --- | --- |
| **1** | DWLR Data loggers |  | Name Address |  |  |  |
| Phone  Fax |  |
| Email Website |  |
| **2** | GSM & GPRS Modem  (only for external part of data logger) |  | Name Address |  |  |  |
| Phone  Fax |  |
| Email Website |  |
| **3** | Atmospheric Pressure Sensor  (only for external part of data logger) |  | Name Address |  |  |  |
| Phone  Fax |  |
| Email Website |  |
| **4** | Non-Vented Water Level & Water Temperature Sensor |  | Name Address |  |  |  |
| Phone  Fax |  |
| Email Website |  |
| **5** | Electrical Conductivity Sensor  (If required & only for external part of Water level Sensor) |  | Name Address |  |  |  |
| Phone  Fax |  |
| Email Website |  |

**Note:** Vender to attach the list of DWLR equipment with the Serial No and Manufacturer Details and equipment photographs.

**Integration Test Data Record for**

## DWLR System (Form-2A)

|  |  |
| --- | --- |
| **Test Description : Integration Test** | |
| **DCP Model No. :** | **Date :** |
| **DCP Serial No :** | **Customer :** |

| **SN** | **Parameter** | | | **Observations / Measured Reading** | | | | **Specifications** | **Remark** (OK / Not OK) |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1** | **DWLR Datalogger** | | | | | | |  |  |
| **Make-** | | **Model-** | | **Sr. No.-** | | |
| a | DWLR Battery Voltage | | | Volt. | | | |  |  |
| b | DWLR Battery Capacity | | | mAH. | | | |  |  |
| c | DWLR Quiescent Current | | | mA | | | |  |  |
| d | Current at Measurement cycle | | | mA | | | |  |  |
| e | Current at GSM/GPRS data transmission | | | mA | | | |  |  |
| **2** | **Datalogger Function Test** | | | | | | |  |  |
| a | Interface Port with DWLR Data logger | Water Level & Temp. Sensor | |  | | | | SDI-12, RS-485,4-20 mA or compatible with data logger |  |
| Atm. Pressure Sensor | |  | | | |
| GSM & GPRS interface | |  | | | | Internal / External (Specify Type) |
| Port for PC / Laptop interface | |  | | | | USB/ RS-232 interface |
| b | Analogue Inputs (in case Sensor port is Analog) | | | Resolution | | |  | Min 16 bit |  |
| Accuracy | | |  | ± 1 LSB or 1mm |  |
| c | DWLR Time Format | | | IST / GMT / Other | | | | In IST format |  |
| d | Memory Size and Type | | |  | | | | Non-volatile flash |  |
| e | Data logger Housing Protection | | |  | | | | IP-65 or equivalent |  |
| f | Surge protection device for all interfaces of data logger | | | Yes / No | | | |  |  |
| g | **Provision for setting configurations Parameters** | | | **Using  Laptop /PC** | | **Using  GSM/GPRS** | |  |  |
| Station ID code | | |  | |  | | 8 Characters |  |
| Measurement Interval | | |  | |  | | 5, 10, 15, 30, 60 min, 2, 3, 4, 12, 24 Hrs |  |
| Gain (for Individual sensor) | | |  | |  | |  |  |
| Offset (for Individual sensor) | | |  | |  | |  |  |
| Datum (for Individual sensor) | | |  | |  | |  |  |
| Tx. time for GSM/ GPRS | | |  | |  | | (MM:SS) format |  |
| FTP server Configuration | | |  | |  | | User ID, Password |  |
| Mobile number of data centre | | |  | |  | | 10 digit Mobile number |  |
| h | **Observed Sensor Data** | | | **Sensor Name** | | | **Live Sensor Data** | **Lagged Sensor Data** |  |
| Water Level (Uncorrected) | | |  |  |  |
| Water Level (Corrected) | | |  |  |  |
| Water Temperature | | |  |  |  |
| Atmospheric. Pressure | | |  |  |  |
| Electrical Conductivity | | |  |  |  |
| **3** | **Atmospheric Pressure Sensor** Internal / External | | | | | | |  |  |
| **Make-** | | **Model-** | | **Sr. No.-** | | |
| a | Atmospheric Pressure correction is applied on the non-vented water level reading | | | | Yes / No | | |  |  |
| b | Correction procedure should be fully documented in user manual | | | | Yes / No | | |  |  |
| **4** | **GSM & GPRS Modem** Internal / External | | | | | | |  |  |
| **Make-** | | **Model-** | | **Sr. No.-** | | |
| a | Communication Protocol for Data transmission (As per the Factory test result) | | | GPRS -- | | | | HTTP Post or FTP |  |
| GSM -- | | | | SMS to transmit data |
| b | Frequency range (As per the Factory test result) | | |  | | | | 3G & 4G  and Better |  |
| c | Interrogative Transmission of logged data | | |  | | | | Triggered by Data Centre & event based |  |
| d | Pooling of data via GPRS telemetry | | |  | | | | Retrieval Data should be in standard GSM / GPRS format mentioned in bid /contract document |  |
| e | Automatic data transfer once GSM /GPRS network retain | | |  | | | |  |
| f | GSM & GPRS Transmission Data Format | | | **Transmission Data Format :--** | | | | Standard CSV format (as specified in technical Specification) |  |
| g | PC / Laptop Download Data Format | | | **Download Data String :--** | | | |  |
| h | Test & Calibration Certificate | | |  | | | | Factory Test Report |  |
| **Tested by** | | | | | | | **Verified by** | | |

## Transmission Link Testing (Form-2B)

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **TEST DESCRIPTION :** | | | | | | | | | | | |
| **SERIAL NO :** | | | | **MODEL NO. :** | | | | **CUSTOMER :** | | | |
| **DATE :** | | | | **Time : From** | | | | **To** | | | |
| **Value at** | **1St Transmission** | | **2nd Transmission** | | | **3rd Transmission** | | | **4th Transmission** | | **Remark** |
| **Data logger  transmitted Data** | **GSM / GPRS  Received Data** | **Data logger  transmitted Data** | | **GSM / GPRS  Received Data** | **Data logger  transmitted Data** | **GSM / GPRS  Received Data** | | **Data logger  transmitted Data** | **GSM / GPRS  Received Data** |
| **Station ID** |  |  |  | |  |  |  | |  |  |  |
| **Time Code** |  |  |  | |  |  |  | |  |  |  |
| **Mobile Number** |  |  |  | |  |  |  | |  |  |  |
| **Battery** |  |  |  | |  |  |  | |  |  |  |
| **Water Temperature** |  |  |  | |  |  |  | |  |  |  |
| **Corrected Water Level** |  |  |  | |  |  |  | |  |  |  |
| **Atmospheric Pressure** |  |  |  | |  |  |  | |  |  |  |
| **Electrical Conductivity** |  |  |  | |  |  |  | |  |  |  |
| **Tested by** | | | | | | **Verified by** | | | | | |

**DWLR Sensor Test Data Record for**

## DWLR Sensor Testing (Form-3)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Test Description : Integration Test for Non-vented Water Level & Temperature Sensor** | | | | | | | | | | | | | | | | |
| Customer : | | | | | | | | | | Date : | | | | | | |
| Sensor Make : | | | | | | | | | | Datalogger Make : | | | | | | |
| Sensor Model No. : | | | | | | | | | | Datalogger Model No. : | | | | | | |
| **Sensor-A** Serial No. : | | | | | | | | | | **Datalogger –A** Serial No. : | | | | | | |
| **Sensor-B** Serial No. : | | | | | | | | | | **Datalogger –B** Serial No. : | | | | | | |
| **Sr.** | **Parameter** | | | | **Observations / Measured Reading** | | | | | | | | | **Specifications** | | **Remark (OK / Not OK)** |
| **1** | Sensor Type | | | |  | | | | | | | | | Non-vented | |  |
| b | Range (As per data sheet) | | | |  | | | | | | | | | As per Requirement | |  |
| c | Resolution | | | |  | | | | | | | | | 3 mm or better | |  |
| d | Output Interface used for Data logger interface | | | |  | | | | | | | | | SDI-12 / RS485 /  4-20mA | |  |
| f | Sensor Housing Material | | | |  | | | | | | | | | SS-316 or better | |  |
| e | Ingress Protection for sensor | | | |  | | | | | | | | | IP68 or better | |  |
| **2** | **Lab Testing of DWLR system** (Whole DWLR system with sensor inside the Pressure Chamber) | | | | | | | | | | | | | | |  |
| **Sensors Parameters** | | **Normal Pressure** | | | **@ 600-mbar** | | | **@ 800-mbar** | | | | **@ 950-mbar** | | **@ 1050-mbar** |  |
| a | Battery | |  | | |  | | |  | | | |  | |  |  |
| b | Uncompensated Water Level | |  | | |  | | |  | | | |  | |  |  |
| c | Compensated Water level | |  | | |  | | |  | | | |  | |  |  |
| d | Water Temperature | |  | | |  | | |  | | | |  | |  |  |
| f | Atmospheric Pressure | |  | | |  | | |  | | | |  | |  |  |
| e | Electrical Conductivity | |  | | |  | | |  | | | |  | |  |  |
| **3** | **Lab Testing of DWLR system** (Data logger & Atm. Pressure Sensor inside Pressure Chamber) | | | | | | | | | | | | | | |  |
| **Sensors Parameters** | | **Normal Pressure** | | | **@ 600-mbar** | | | **@ 800-mbar** | | | | **@ 950-mbar** | | **@ 1050-mbar** |  |
| a | Battery | |  | | |  | | |  | | | |  | |  |  |
| b | Uncompensated Water Level | |  | | |  | | |  | | | |  | |  |  |
| c | Compensated Water level | |  | | |  | | |  | | | |  | |  |  |
| d | Water Temperature | |  | | |  | | |  | | | |  | |  |  |
| f | Atmospheric Pressure | |  | | |  | | |  | | | |  | |  |  |
| e | Electrical Conductivity | |  | | |  | | |  | | | |  | |  |  |
| **4** | **Field Testing of DWLR system** | | | | | | | | | | | | |  | |  |
| **a** | Water Level Sensor Reading in datalogger | | | | | | | | | | | | |  | |  |
| **Sensor Depth** | | | **WL reading in Datalogger** | | | | | | | | **Actual measured Depth reading** | | Accuracy of the reading should be within ± 0.2% of actual Water level or less than ± 5mm  (at least test up to 10mts.) | |  |
| **Sensor-A** | | | | **Sensor-B** | | | |
| Around ~ 0.5mts. | | | mts | | | | mts | | | | mts | |
| Around ~ 3mts. | | | mts | | | | mts | | | | mts | |
| Around ~ 7mts. | | | mts | | | | mts | | | | mts | |
| Around ~ 10mts. | | | mts | | | | mts | | | | mts | |
| b | Water Level Sensor Reading by **interchanging** datalogger | | | | | | | | | | | | |  | |  |
| **Sensor Depth** | | | **WL reading in Datalogger** | | | | | | | | **Actual measured Depth reading** | | Accuracy of the reading should be within ± 0.2% of actual Water level or less than ± 5mm  (at least test up to 10mts.) | |  |
| **Sensor-A** | | | | **Sensor-B** | | | |
| Around ~ 0.5mts. | | | mts | | | | mts | | | | mts | |
| Around ~ 3mts. | | | mts | | | | mts | | | | mts | |
| Around ~ 7mts. | | | mts | | | | mts | | | | mts | |
| Around ~ 10mts. | | | mts | | | | mts | | | | mts | |
| **5** | **Cable creep and elongation test** | | | | | | | | | | | | |  | |  |
| **Date & Time** | **Distance to Ground Level** | | | | | **Date & Time** | | | | **Distance to Ground Level** | | | The distance to ground level should be within ± 0.2 mm within the period of 24 hours.  (at least test up to 10mts.) | |  |
|  | Cm | | | | |  | | | | Cm | | |
|  | Cm | | | | |  | | | | Cm | | |
|  | Cm | | | | |  | | | | Cm | | |
|  | Cm | | | | |  | | | | Cm | | |
|  | Cm | | | | |  | | | | Cm | | |
|  | Cm | | | | |  | | | | Cm | | |
|  | Cm | | | | |  | | | | Cm | | |
|  | Cm | | | | |  | | | | Cm | | |
|  | Cm | | | | |  | | | | Cm | | |
|  | Cm | | | | |  | | | | Cm | | |
|  | Cm | | | | |  | | | | Cm | | |
|  | Cm | | | | |  | | | | Cm | | |
| **6** | Test & Calibration Certificate | | | | | |  | | | | | | | Factory Test Report | |  |
| **Tested by** | | | | | | | | | | **Verified by** | | | | | | |