GOVERNMENT OF WEST BENGAL
IRRIGATION & WATERWAYS DIRECTORATE
BURDWAN INVESTIGATION & PLANNING DIVISION
Purta Bhawan, 3rd Floor, Purba Burdwan - 713103

NOTICE INVITING BUDGETARY QUOTES

NIQ No. : WBIW/NHP/NIQ- 01 /2019-20

Memo No. 200/NHP-02/02 **Dated. 29.05.2019**

Sealed quotations for rates are hereby invited by the Executive Engineer, Burdwan Investigation & Planning Division,Irrigation & Waterways Directorate, Govt. of West Bengal, Purta Bhawan, 3rd Floor, Purba Burdwan – 713103 from the bonafide & resourceful agencies to ascertain unit rates [budget quotes] in connection to **"Supply, installation, testing, commissioning and maintenance of Real Time Data Acquisition System (RTDAS) with Telemetry of Irrigation and Waterways Department , GoWB , under National Hydrology Project (NHP) and integrate with State Data Center located at Kolkata , W.B." as per enclosed schedule.**

The Ministry of Water Resources (MoWR), Government of India (GoI) has initiated 'National Hydrology Project (NHP) in which 'Real Time Data Acquisition System (RTDAS)' has been planned for different River basins of West Bengal as one step forward for development of 'Hydrological Information System (HIS)' for surface water resources in the State. The RTDAS includes installation of Automated Rain Gauge Stations with INSAT, GSM /GPRS Telemetry, Automated River Gauge Stations with INSAT, GSM/GPRS Telemetry, Automated Reservoir Monitoring Systems with INSAT ,GPRS/GSM Telemetry for major Dams. Establishment of State Data Center have also been included in NHP for the purpose of proper Flood and Irrigation management within the State.

The key objectives of the RTDAS consist of the following ;

1. To supply & install new equipment, as per annexure – I, capable of providing measurements in Real Time Data at proposed RTDAS stations.
2. To provide real time Rain fall data, River water level (stage) ,River discharge, Reservoir water level ,River outflow discharge of various hydrological observation stations and weather stations for improved assessments of hydrologic conditions in different River basins in West Bengal.
3. To utilize a combination of INSAT, GSM & GPRS data communication system to relay data in real time.
4. To assure proper operation of RTDAS by provision of hydrological observation stations and weather stations and maintenance of same.
5. To provide extensive training to I&WD staff regarding operation of equipment in the event of operation and maintenance of RTDAS.
6. To establish Real Time Data Center.

Interested quotationers are required to download all documents related to this quotation papers and submit the same after satisfying the eligibility criteria as given below:

Eligibility Criteria of Bidders :

I- Financial Capability

The Bidder shall furnish documentary evidence so that it meets the following financial requirement(s):

A) <u>In case of individual Bidder</u>

i) Capacity to have a cash flow - The Bidder must provide a letter from a reputed bank stating the availability of liquid assets and/or credit facilities exclusively for this Contract only, of not less than INR 240 Lakhs or its equivalent amount in a freely convertible currency.

ii) The Minimum required annual turnover in respect of supply, installation and commissioning of goods for the successful Bidder in any two of the last five (5) years shall be of INR 1200 Lakhs or its equivalent amount in a freely convertible currency. Period of 5 years shall be reckoned from 31st march of financial year preceding the year in which bid is published.

iii) Further, bidder should be in continuous business of supplying and/ or after sale services of products similar to that specified in the 'Schedule of requirement' during the last 5 years prior to date of bid submission.

iv) Bidder shall furnish the legal status, place of registration and principal place of business of the company or firm or partnership, etc.;

v) Details of experience and past performance on equipment offered and on those of similar nature within the past seven years (Prior to the date of bid submission) and details of current contracts in hand and other commitments to be submitted by the bidder.

vi) The bidder should furnish a brief write-up, backed with adequate data, explaining his available capacity and experience (both technical and commercial) for the supply of the required equipment within the specified time of completion after the meeting all their current commitments.

vii) Reports on financial standing of the bidder such as profit and loss statements, balance sheets and auditor's report for the past three years, bankers certificate, etc.

viii) A firm can submit only one bid in the same bidding process, A bidder who submits or participates in more than one bid will cause all the bids in which the bidder has participated to be disqualified.

ix) Should possess GST Registration.

B) In case of Joint Venture (JV)

x) Capacity to have a cash flow: The Bidders must provide a letter from a reputed bank stating the availability of liquid assets and/or credit facilities exclusively for this Contract only, of no less than INR 240Lakhs or equivalent amount in a freely convertible currency collectively.

xi) In case of JV, the Minimum required annual turnover in respect of supply, installation and commissioning of goods for the successful Bidder in any two of the last five (5) years shall be of INR 1200Lakhs or its equivalent amount in a freely convertible currency collectively. Period of 5 years shall be reckoned from 31st march of financial year preceding the year in which bid is published. The lead partner must have minimum annual turnover of INR 840Lakhs or its equivalent amount in a freely convertible currency in any two of the last five (5) years while other partner must have minimum annual turnover of INR 360Lakhs or its equivalent in any two of the last five (5) years.

xii) Further, one member of Joint Venture should be in continuous business of supplying and after sale services of products similar to that specified in the 'Schedule of requirement' during the last 5 years prior to date of bid submission while other member should be in continuous business of supplying and after sale services of products similar to that specified in the 'Schedule of requirement' at least 1 year prior to date of bid submission.

xiii) All members of Joint Venture shall furnish the legal status, place of registration and principal place of business of the company or firm or partnership, etc.;

xiv) Details of experience and past performance of all members of Joint Venture on equipment offered and on those of similar nature within the past seven years (Prior to the date of bid submission) and details of current contracts in hand and other commitments.

xv) The lead member of Joint Venture should furnish a brief write-up, backed with adequate data, explaining their available capacity and experience (both technical and commercial) for the supply of the required equipment within the specified time of completion after the meeting all their current commitments.

xvi) Responsibilities in respect of lead firm as well as each of the Joint Venture members shall be clearly indicated in the JV agreement/ letter of intention.

xvii) The Joint Venture agreement shall not be cancelled or amended unilaterally without consent of the Purchaser and a statement to this effect should appear in the JV agreement;

xviii) Reports on financial standing of the each JV members such as profit and loss statements, balance sheets and auditor's report for the past three years, banker's certificate, etc.

xix) At least one member of Joint Venture should possess GST Registration.

II- Experience and Technical Capacity of Bidder

The Bidder shall furnish documentary evidence to demonstrate that it meets the following experience requirement(s):

i) Hydrological, Meteorological (ARS /AWLR /AWS) stations experience

A) In case of individual Bidder

The bidder must have supplied, tested and commissioned Hydro-Met stations with Satellite /GSM /GPRS based telemetry using equipment /sensors similar to the type specified in the Schedule and provided after sales service to the extent of at least 32stations (comprising of minimum 1 data logger and sensor at each station) in any two of the year during a period of last 7 years from the last date of submission of bid document and should be in use satisfactorily with no adverse report for at least one year preceding the date of bid opening.

B) In case of Joint Venture (JV)

The JV partners must have supplied, tested and commissioned the Hydro-Met stations with Satellite /GSM /GPRS based telemetry using equipment /sensors similar to the type specified in the Schedule to the extent of at least 32stations (comprising of minimum 1 data logger and sensor at each station) collectively in any two of the year during a period of last 7 years from the last date of submission of bid document. Out of which the one partner should have supplied, installed, commissioned and provided after sales service satisfactorily to the extent of at least minimum 22stations (comprising of minimum 1 data logger and sensor at each station) in any two year during a period of last 7 years from the last date of submission of bid document and other partner should have operated and maintained satisfactorily to the extent of at least minimum 10 stations (comprising of minimum 1 data logger and sensor at each station) in any two year during a period of last 7 years from the last date of submission of bid document .

ii) Manufacturer Authorization for Hydro-Met equipment

If the bidder /JV partners is/are not the manufacturer of the hydro-met equipment (i.e. listed in table-1), the bidder/JV shall furnish a legally enforceable authorization from manufacturer in the prescribed Form [Section-IV] assuring full guarantee and warranty obligations as per GCC and SCC for the goods offered;

If the bidder or JV partner, himself is a manufacturer of the hydro-meteorological equipment (listed in Table-1), then a self-authorization suffices.

Further, bidder or JV partners should furnish the documentary evidence from the manufacturer of the hydro-meteorological equipment to establish that the manufacturer has manufactured and supplied the quantity of the hydro-meteorological equipment as per Table-1 below in any two year during a period of last 7 years from the last date of submission of bid document.

Table-1 Compliance for equipment manufacturer

S No	Item	Total quantity to be supplied as per schedule of requirement	Minimum number of required quantity in any two of last seven years
1.	Automatic Rain gauge Sensor (ARG)	44	22
2.	Radar Water Level Sensor	58	29
3.	Air Temperature and Humidity Sensor	3	5
4.	Wind Speed and Direction Sensor	3	5
5.	Atmospheric Pressure Sensor	3	5

6.	Solar Radiation Sensor	3	5
7.	Automated pan evaporimeter Equipment	3	5
8.	2 AI Data loggers with Satellite / GSM / GPRStelemetry port	98	48
9.	8 AI Data loggers with Satellite / GSM / GPRS telemetry port	7	5
10.	INSAT/Satellite transmitter	105	54
11.	GPRS / GSM modem	105	54
12	Gate Position Sensor (Shaft Encoder Type)	27	14

III- The bidder should have after sales support in the region [within a radius of 500 km from the State Capital]. If bidder does not have any after sales support office within 500 km from state Capital at the time of bidding, he shall require to be establish the same within one month after successful award of contract [Applicable during IFB for execution]

IV- Even though the bidders meet the above qualifying criteria, they are subject to be disqualified if they have made misleading or false representations in the forms, statements and attachments submitted in proof of the qualification requirements; and/or record of poor performance such as, not properly completing the contract, inordinate delays in completion, litigation history, or financial failures etc. [Applicable during IFB for execution]

The intending quotationer should submit their quotation papers in respective formats enclosing self attested photocopies of valid Trade License , PAN , GST , IT and all required documents regarding credential as indicated above [sl. I & sl. II , under eligibility criteria of bidders] etc. as applicable.

Time schedule of quotation

1) Last date of receiving / uploading filled up quotation paper: **19.06.2019 up to 4:30 p.m.**

2) Date & time of opening quotation: **20.06.2019 after 12:30 p.m.**

Terms and Conditions:

1) The schedule of items and other documents are to be collected by the eligible quotationer free of cost from the office of the Burdwan Investigation & Planning Division,Irrigation & Waterways Directorate, Govt. of West Bengal, Purta Bhawan, 3rd Floor, Purba Burdwan - 713103 or Office of the Superintending Engineer, I& P.Circle–II, Jalasampad Bhawan (5th Floor),Salt Lake, Kolkata –700091 . The same may also be downloaded from web portals of I.&W.Deptt. GoWB **[www.wbiwd.gov.in]**

2) The intending agencies should submit budgetary quotes [including all documents related to credentials of bidders as desired] either e-mail to the following mail address or in closed envelop in tender box at ;

   i. Office of the Superintending Engineer, I & P. Circle – II, Jalasampad Bhawan (5th Floor), Salt Lake, Kolkata – 700091 / e-mail ID: seipc2iwd@gmail.com
   or
   ii. Office of the Executive Engineer, Burdwan Investigation & Planning Division, I & W Dte, Govt. of West Bengal, Purta Bhawan, 3rd Floor, Purba Burdwan – 713103 / e-mail ID: eebipd2012@gmail.com

3) **The intending quotationer should submit their rates after going through all technical specifications and observing all terms and conditions as enclosed with this quotation.**

4) The intending quotationer should submit their rates in a tabular format in excel sheet which has been uploaded. The quotationer should download the excel sheet, quotes their rate in Rupees (INR) both in numeric against each item, sign it and submit either scanned copy through e-mail or in closed envelop in tender box. Any correction in the rates must be duly signed by the quotationers and each page of the schedule are to be signed by the quotationer along with his seal.

5) No quotation paper will be accepted after expiry of date and time mentioned above.

6) Duly filled up sealed quotation with all desired documents is to be submitted / uploaded with a forwarding letter in respective letter heads to the office mentioned above.

7) Accepting Authority i.e. The Superintending Engineer, Investigation & Planning Circle-II, I.&W. Directorate, GoWB reserves the right to accept or reject any or all quotations without assigning any reasons whatsoever.

8) Informal/conditional / partly filled up quotation is liable to be summarily rejected.

9) **No Earnest Money Deposit [EMD] is required to be deposited for this quotation**.

10) **This rate is only to ascertain unit rates [budget quotes] for official purpose only hence no work order will be issued in favour of any agency against this quotation.**

Sd/-
(Somnath Kundu)
Executive Engineer
Burdwan Investigation & Planning Division

TECHNICAL SPECIFICATIONS

Introduction

Irrigation and Waterways Department (IWD), Govt. of West Bengal is entrusted with the surface water resources planning, development and management. A large number of major, medium and minor water resources development projects (reservoirs, barrages and weirs) have been constructed within West Bengal. However, although the reservoirs of Damodar Valley Project are situated within the neighboring State of Jharkhand, but their operations are mainly intended for flood and irrigation management in West Bengal. The other reservoirs like Kangsabati and Hinglow, are mainly envisaged to resolve the issues like irrigation and domestic uses and are operated with rigid schedules as single entities based on the historical hydro-meteorological Data and experience gained. These methods are often not adequate for establishing optimal operational decisions, especially where integrated operation of multiple reservoirs for flood management is contemplated. In addition, manual Data observation and transmission results in a considerable time lag, between Data observed in field and its communication to decision making level which sometime leaves little time, for proper flood and irrigation management.

The Ministry of Water Resources (MoWR), Government of India (GoI) has initiated 'National Hydrology Project (NHP)' (***www.indiawrm.org***) in which 'Real Time Data Acquisition System (RTDAS)' has been planned for different River basins of West Bengal as one step forward for development of 'Hydrological Information System (HIS)' for surface water resources in the State. The RTDAS includes installation of Automated Rainfall Stations with INSAT, GSM /GPRS Telemetry, Automated River Gauge Stations with INSAT, GSM /GPRS Telemetry, Automated Reservoir Monitoring Systems with INSAT ,GPRS/GSM Telemetry for major Dams along with establishment of State Data Center have also been included in NHP for the purpose of proper Flood and Irrigation management within the State.

The key objectives of the RTDAS consist of the following:

7. Install new equipment capable of providing measurements in real time at proposed RTDAS stations.
8. Provide the number of rainfall, River water level (stage) and River discharge, reservoir water level and outflow discharge and weather stations to provide improved assessments of hydrologic conditions in different River basins in West Bengal.
9. Utilize a combination of INSAT, GSM & GPRS Data communications to relay Data in real time.
10. Contract for station installation and maintenance to assure the proper operation of RTDAS.
11. Contract for extensive training for I&WD staff to fully understand the operation of the equipment in the event of operation and maintenance of RTDAS.
12. Establish real time Data Center.

1. General Technical Concept

The concept of implementation on which the present technical specifications and special conditions are based intends to acquire the state of art technology available for setting up automated Data Collection Platform (DCP), Data storage, processing and Data communication technologies with the requirements of high availability and sustainability required by such an important project. Emphasis is provided on a robust and reliable technology. The Data acquisition system will comprise of two segments, the Data acquisition segment and the Data communication segment. Data acquisition segment and Data communication segment co-operate automatically in an integrated manner to complete the cyclic function of Data collection. The Data acquisition segment comprises of sensor, Data acquisition controller/ Data logger and an integrated power controller. The Data communication segment comprises of the Data communication equipment at site, all intermediate components and the network controller / web server at Data Processing Center.

It is preferred that the rechargeable battery used at site gets uninterruptedly recharged by a solar panel attached to the system. Under the project, Data transmission has been proposed using **INSAT, GSM & GPRS** technology. Accordingly, the sites have been chosen verifying the coverage of Telecom network. This methodology has been chosen keeping in view its advantages over the other systems in respect of investment, maintenance and reliability. The Bidder shall ensure that the system remains operational even under extreme conditions of weather. The failure of transmission due to temporary disturbances in the network must be taken care of by providing adequate storage in the Data logger and ensuring subsequent relay immediately after the network is restored. Two-ways communication facility and event notification through SMS is highly desirable in the system to be provided by the Bidder. Uninterrupted Data recording must be guaranteed for long periods during which regular maintenance visits may not be possible.

Maintenance is an integral part of any system and a system that has the challenges of unattended operation in remote, exposed areas stresses the need for a well thought out approach to maintenance. The corrective maintenance will be required for Data collection issues, whether they may be component failures or due to environmental issues.

To minimize corrective maintenance and to increase the performance of the monitoring network, a well-organized preventative maintenance plan is highly recommended. The preventative maintenance is required for all system components

as well as the infrastructure in place to house the electronic Data collection components. It is recognized that the maintenance of a monitoring network is often grossly underestimated as well as underperformed task. This leads to reduced life expectancy of the equipment and possibly the collection of misleading Data during the period of operation. A strong maintenance plan will be the foundation for sustaining Purchaser's monitoring network operation over the expected lifetime of the technology, which is considered to be 10 years.

The State of West Bengal has proposed the Data communication will be GSM /GPRS and INSAT, which is based on the crucial nature of the Data and/or availability of INSAT.

The Technical Specifications consist of the installation of the RTDAS for the different River basins in West Bengal. This shall include the design, manufacture, factory testing, deliver to site, installation (including the associated interface wiring/termination), commissioning and site acceptance testing, supply of mandatory spares, training and documentation.

Data Collection Platforms (DCP), monitoring system hardware and shall interface and be fully integrated and tested with the Earth Receiving Station. The requirements are given below in respect of each major component of the system. The Bidder shall ensure that the fundamental requirements stated in this document are not compromised. Further details are also provided in Inspections and Tests.

The RTDAS should have the following monitoring systems for the Hydro-met network

- ARG with INSAT, GSM & GPRS Telemetry: 41 Nos.
- AWS with INSAT, GSM & GPRS Telemetry: 03Nos.
- AWLR- Radar Sensors with INSAT, GSM & GPRS Telemetry: 58 Nos. (Total AWLR is 56 nos +2 nos for Automated Reservoir Monitoring)
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- Gate sensor: 27nos.Data Centre equipment's establishment: 01 Nos.

General

Real Time Hydro-Met data acquisition network which will be implemented under this project provides key data required for forecasting Inflows into the Basin and other related activities. A Real Time Data Acquisition System (**RTDAS**) will consist of a telemetry network of Automatic rainfall stations, automated weather station and water levels along rivers/reservoirs which will be installed to provide inputs to the **RTDAS.** The concept of implementation on which the present technical specifications and special conditions are based intends to combine the advantages of modern Data Loggers, data storage, processing and data communication technologies with the requirements of high availability and sustainability required by such an important project. Preference will be given to robust, reliable technology. The real-time data acquisition system networks have the greatest possible reliability, thus minimizing the maintenance to the extent possible.

The sensors like Automatic Rain Gauge (ARG) sensor, Automatic Weather Station (AWS), Pan evaporimeter, Automatic Water Level Recorder (AWLR), Gate Sensors should be combined within a single station which will eliminate the costs of **INSAT, GPRS & GSM** communication and the recurring costs associated with these devices. This specifically means that it is encouraged to combine data from multiple instruments through the use of wired or wireless technology to minimize the number of **INSAT**, **GSM & GPRS** data transmission systems.

The Technical Specifications consists of the installation of the real time data acquisition system for the.(Ganga, Brahamaputra and Subarnarekha) River basins includes the design, manufacture, factory testing, deliver to site, installation (including the associated interface wiring/termination), knowledge transfers and other accessories, commissioning and site acceptance testing, supply of mandatory spares, training and documentation.

2.0Design Principles

The following basic principles have been applied to the design of the real time hydrological data acquisition system network for the**(**Ganga, Brahamaputra and Subarnarekha**) River basin**

- Installation of Water Level Recording Sensors which will have the primary function of measuring water levels at the installed locations Rivers (GD Stations / Reservoirs)
- Installation of gate sensors for measuring the gate position of reservoir gates, Reservoir data collection station/ network shall transmit this data as telemetered data in real time along with other AWLR sensors data.
- Installation of AWS with Hydro-meteorological Sensors which will have the primary function of measuring metrological data at the installed locations. Weather stations will be fully automated and transmit data in real time.

- Installation of Automatic Rain Gauge (ARG) Station with Tipping Bucket rain gauge (TBRG) Sensors which will have the primary function of measuring Rain fall data at the installed locations
- Recoded data at field stations will be transmitted through INSAT to Earth Receiving Stations (ERS) at New Delhi/Jaipur/Burla and from ERS toE-SWIS software for further processing. Simultaneously GSM/GPRS data from field stations will be communicated to the dedicated server computer provided at State Data Center (SDC) at Bidhannagar, Kolkata, and then from SDC to e-SWIS software at Delhi via internet for further processing. The processed data shall be transferred to the State Data Centre, at Bidhannagar, Kolkata via internet & e-SWIS cloud.
- Stations or sensors in close proximity to each other will be combined to reduce the number of reporting stations. This is especially important to save the recurring **INSAT, GSM &GPRS** charges.

3.0Scope of Work

1) Complete supply, installation, testing, commissioning of remote stations including associated civil works, sensors, data logger, software, hardware and ancillaries' equipment, solar panel, mounting poles, masts, towers, cables, electrical and network cabling, lightening arrestors, earthing etc. complete.

2) Technical design, supply, installation, testing, commissioning of the real time hydrological data collection network and establish data communications using **INSAT** telemetry between the remote stations and the Earth Receiving Station at New Delhi/Jaipur/Burla and GSM/GPRS between remote station to the dedicated computer server provided at Data Center Bidhannagar,Kolkata or at E-SWIS server. This includes, but is not limited to acquiring service, and maintaining all aspects of the service during the warranty period as well as the maintenance period.

3) Establish a GSM & GPRS receiving system along with all required data resection arrangement at State Data Centers, Kolkata to collect GSM & GPRS data. This shall include a required hardware & computer that will support the reception of the GSM & GPRS Data stream. This consists of acquiring all hardware and software, installation, configuration.

4) Providing server with monitor and 5 years data backup facility (8 TB), 55" LED Display, online 3KVA UPS and computer node, internet connection with requisite public IP address, firewalls and other required networking components with network wiring at state data centre, Bidhannagar, Kolkata that will support the reception of GSM, GPRS data directly from remote station & INSAT data from CWC ERS through Internet

5) Assure the collection, storage/backup and seamless flow of Real Time Data from all types of automated sensors to ERS at New Delhi and Bidhannagar.

6) Perform on-site assembly, start-up of the supplied goods.

7) Complete commissioning integration, testing &organization of the whole system. Bidder is responsible for, interfaces between the sensors and the DCP, DCP and transmission equipment and that between ERS, modelling centers &e-SWIS software, and ensure compatible data format as per bid document and trouble-free operation of system.

8) Provide operation & maintenance services during Five (5) years warranty period to include all components at the remote stations as well as all newly acquired equipment in the data center.

9) Provide installation and maintenance reports as required by the Purchaser and any delay is not acceptable in time schedule provided by supplier.

10) Supply on-site spares to repair any part of the remote stations upon determination of malfunction or failure. This includes, but is not limited to, DCP, sensors, batteries, solar panel and other accessories etc. required in seamless operation of the real time data acquisition system.

11) Supply detailed operation and maintenance manual for each component in the system and compile Knowledge and working supply type Manual for training purpose (including multimedia training kits).

12) Provide classroom and field trainings on the acquisition system to the sufficient number of personnel from **Irrigation & Waterways Department, West Bengal.** This includes operation and maintenance procedures. Training will have to be imparted at selected field locations as selected by the Purchaser.Provide formal and on-the-job training to purchaser's personnel at the plant & onsite.This includes startup, operation, maintenance and/or repair of the supplied goods. Course topics will include sensor calibration, data logger configuration, data downloading, data retrieval, collection, Trouble shooting, processing maintenance requirements and procedure for equipment configuration, installation, site testing and commissioning including training kit containing course material in soft and hard copies.

13) Onsite Calibration and validation of the installed system shall be performed on half yearly basis which shall be continuous process during the entire warranty period .This will include calibration of gate sensors to obtain

discharge passing through gates for dams/weirs and calibration of canals against water level to obtain discharge data.

14) All selected sites should conform to the extent practical to **WMO** guidelines. The purchaser will be responsible for obtaining permission to use property. River stage Reservoir Stage and weather data will be logged every 1 hour and transmit data based on a schedule set in the data logger (e.g. once an hour) and/or in case of GSM/GPRS communication the data transmission on an event (e.g. a measurement reaching programmed threshold values).

15) The remote stations (DCPs) shall store the data for at least one year.

16) To provide necessary facility to generate daily report of RTDAS data at specified time and in the specified format as prescribed by Engineer-in-charge

17) Bidder shall supply a detailed operation and maintenance manual for each appropriate unit of supplied good sand compile Knowledge and working supply type Manual for training purpose (including multimedia training kits).

18) To provide necessary facility to generate daily report of RTDAS data at specified time and in the specified format as prescribed by **Irrigation & Waterways Department, West Bengal**.

19) A guarantee by the manufacturer that all equipment being provided will have maintenance & Spare support for a minimum of ten years from the date of issuance of final acceptance certificate by engineer in charge including Warranty and Operation & Maintenance period;

4.0 General Features/ Specifications

i. It is imperative that all instrumentation, other equipment shall operate effectively with the DCP's and the DCP's in turn shall operate effectively with the satellite equipment and other systems of ERS. In addition, the input/output protocols of individual items of equipment (AWS, AWLR, ARG, DCP's, solar power arrangements, etc.) shall interface accurately. For this purpose, the interfaces between the sensors and the DCP, DCP and transmission equipment and that between ERS and modelling centers are ensured to be compatible and trouble free.

ii. The specific electrical, electronic and mechanical design parameters mentioned in case of individual sensors are indicative of a typical design and variations therein can be considered provided the output, resolution accuracy and ruggedness against environment are not compromised in any manner. In such cases where the supplier proposes to deviate from the specifications a full technical justification shall be provided. The Purchaser is not bound to accept such justification.

iii. It shall be the Suppliers responsibility to ensure that the installation is robust and shall continue to work in extreme weather conditions.

iv. Reliability of operation during normal and extreme weather conditions is imperative.

v. The sensors and all accessories and facilities shall be fully compatible with the data acquisition and transmission system. The sensors and DCP's shall form a complete automated data acquisition storage and transmission system.

vi. In case of any of the sensors, the equipment is supplied with certain optional features which are required to be ordered separately and are not included as a part of the offer; the same shall be clearly mentioned in the bid along with the functions of such features. The purchaser shall be provided with all necessary information which shall enable him to take an informed decision at the time of entering into the Contract as to the ordering any such feature or otherwise.

vii. The Bidder shall enclose technical literature with photographs in respect of all the sensors, datalogger and other equipment being quoted. The features which are mentioned in the literature but are not being quoted as a part of the current system shall be clearly brought out in the bid. In the event of failure of the Bidder to explicitly mention any such exclusion, it shall be taken as inclusion of all features mentioned in the bid as a part of the supply and the Bidder shall have to provide all such features/ accessories without claim of extra cost to the purchaser.

viii. Although all accessories and fixtures required for installation of the equipment & their specifications have been specified in technical specifications however, bidder shall ensure the satisfactory performance & functioning of RTDAS system complete, for this if any accessory or item s are required that shall be provided by bidder, the cost towards that is deemed to be included in the cost tendered by the bidder, no extra cost shall be paid to the bidder on this account.

ix. Bidders shall give general layout of all the installations including all civil works for types of stations and materials including that for the equipment at the time of bidding. Afterwards, the successful Bidder shall furnish

the details of all the mounting arrangements, including civil works. Indian Standard codes of practice shall be followed for all civil works and mounting arrangements.

x. The security arrangement provisions for sensors installed in the open ground like Chain-Link fencing, locking etc. shall be provided by the Bidder.

xi. Security of installed equipment's including theft and vandalism will be the responsibility of the Bidder till successful installation, commissioning, two stages of site acceptance testing.

xii. All fixings shall be non-corrodible.

xiii. The Bidder has to specify how the calibration will be carried out and has to use his own calibration equipment during the period of warranty.

xiv. Ensure that all software licenses and maintenance agreements are in the name of Purchaser and should seek full support and updates for such software for the duration of the **Warranty** Period. Also, all the software licenses should be valid for the design life of the system, that is 10 years from date of commissioning.

5.0EQUIPMENT ARRANGEMENT AT REMOTE STATIONS

5.1 Automated Water Level Recorder(AWLR) for River /Reservoir:

The Automatic Water Level Recorder (AWLR) station shall be equipped with all necessary equipment's and peripherals including the following:

i. Data Collection Platform (DCP) mounted inside an enclosure which will house the following items.
   - Data Logger with INSAT, GSM & GPRS Transmission facilities with built-in display.
   - Battery for power requirements
   - Pre-wiring and configuration.
   - Solar panel-based power supply system.
   - Antenna's (INSAT, GPS, GSM / GPRS) & required accessories

ii. Installation of suitable range of Non- contact type Water Level Radar sensor for Automatic Water Level Recorder (AWLR) station with all fittings, accessories and cables and conduits.

iii. At selected at stations, installation of Gate position sensor with all fittings, accessories and cables. Gate position sensor data shall be integrated with the AWLR datalogger and transmit.

iv. Mast / tripod to mount DCP at the site (alternatively, where walled enclosure or tower is available, same can be mounted on the same.

v. Mast / tripod for solar panel & INSAT antenna. (provided locally by the Bidder). Mast can be shared with the DCP mast also.

vi. Civil works for mast (provided locally by the Bidder).

vii. Conduit for cables GI Flexible conduits and HDPE pipe conduits.

viii. Power & signal cables with cable conduits.

ix. Grounding and lightning protection (provided locally by the Bidder)

x. All necessary hardware required for the system to operate properly.

5.2 Automatic Rain Gauge:

The Automatic Rain Gauge shall be equipped with all necessary equipment's and peripherals including the following:

i. Data Collection Platform (DCP) mounted inside an enclosure which will house the following items.
   - Datalogger with INSAT, GSM & GPRS facilities for transmission of data with built in display.
   - Battery for power requirements
   - Pre-wiring and configuration.

- Solar panel-based power supply system.
- Antenna's (INSAT, GPS, GSM / GPRS)& required accessories.

ii. Automatic Rain Gauge station will have Tipping Bucket Rain Gauge (TBRG) sensor with all fittings, accessories and cables.The rain gauge will be installed as per the WMO guidelines.

iii. Mast /tripod to mount DCP at the site (alternatively, where walled enclosure or tower is available, same can be mounted on the same).

iv. Mast/ tripod for solar panel & INSAT antenna. (provided locally by the Bidder)

v. Mast can be shared with the DCP mast also.

vi. Associated Civil works for installation of Rain Gauge(provided locally by the Bidder).

vii. Conduit for cables GI Flexible conduits and HDPE pipe conduits.

viii. Chain -Link fencing for ARS (5m * 5 m* 2 m height) and gate with lock if required(provided locally by the Bidder).

ix. Power & Signal cables with conduits.

x. Grounding and lightning protection(provided locally by the Bidder).

xi. All necessary hardware required for the system to operate properly.

xii. The installation should be made as per WMO guidelines at standard height.

5.3 Automatic Weather Stations (AWS) with Pan Evaporimeter:

The Automatic Weather Station (AWS) shall be equipped with all necessary equipment's and peripherals including the following:

i. Data Collection Platform (DCP) mounted inside an enclosure which will house the following items.
   - Datalogger with INSAT, GSM & GPRS facilities for transmission of data with built in display
   - Battery for power requirements
   - Pre-wiring and configuration.
   - Solar panel-based power supply system.
   - Antenna's (INSAT, GSP, GSM / GPRS)& required accessories.

ii. Installation of Rainfall, Wind Speed &Wind Direction, Air Temperature& Relative Humidity, Solar Radiation, Air pressure sensor and standard size PAN evaporation sensor with all fittings, accessories and cables.

iii. Wooden Platform for installation of PAN

iv. Civil works for installation of PAN

v. Triangular Tower of 10m height with guy rope support & required mounting hardware to mount DCP & required sensors as per WMO guidelines for meteorological equipment's.(provided locally by the Bidder)

vi. Tower can be shared with the DCP mast also Tower can be shared with the DCP, solar panel & INSAT antenna.

vii. Associated civil Works for 10m Tower and guy support (provided locally by the Bidder).

viii. Conduit for cables GI Flexible conduits and HDPE pipe conduits.

ix. Chain-Link fencing (10m * 10m*2m height) and gate with lock if required(provided locally by the Bidder)

x. Power cables with conduits.

xi. Grounding and lightning protection(provided locally by the Bidder)

xii. All necessary hardware required for the system to operate properly.

xiii. Installation should be made as per WMO guidelines at standard height.

5.4 Automated Pan Evaporimeter System

- It consists of Evaporation Pan Standard National Weather Service Class A type for measurement of water evaporation.

- It is used to determine the evaporation rate by measuring the changing water level in an evaporation pan. A standard National Weather Service Class an Evaporation Pan is to be used. The Evaporation gauge is connected to the pan using the stainless-steel pipe and fittings.
- Wooden Platform for installation of PAN
- Civil works for installation of PAN
- Evaporation Pan Gauge shall be integrated with the AWLR /AWS data logger.

5.5Shaft Encoders for Gate Positioning System

This category describes the requirement for sensors placed on gates such as spillway gates and irrigation outlets to measure gate openings. The measured gate opening will be used along with water elevation to determine accurate discharge passed through the gates.

Suitable sensors shall be provided for exact measurement & indication of position of spillway radial gates, intake gates & silt flushing gates. These sensors shall be equipped with suitable shaft couplings and electronic circuits to transmit the signals to the datalogger for indication & for further processing. All sensors are to be mounted in the outdoor locations. Hence, suitable protection class of the enclosures shall be ensured. Minimum IP65 protection class shall be provided. Suitable safe & reliable arrangements of coupling with the lifting motors of gates shall be provided. It shall be ensured that there is no slippage between the motor shaft & the transducers.

The reservoirs namely Hinglow and Kangsabati will be provided both with spillway gate sensors and irrigation outlet sensors.

Bidder shall be responsible for all civil works related to the installation of the sensor, though plans for civil works must be approved by the Purchaser prior to the acquisition, installation and commissioning of the sensor. Regardless of the sensor solution, the flows past the gates must be accurate to within 5% of the actual flow.

The Shaft encoders for indication of reservoir gate position shall be equipped with all necessary equipment's and peripherals including the following

i. Data Collection Platform (DCP) mounted inside an enclosure which will house the following items.
    - Datalogger with INSAT, GSM & GPRS facilities for transmission of data with built in display
    - Battery for power requirements
    - Pre-wiring and configuration.
    - Solar panel-based power supply system.
    - Antenna's (INSAT, GSP, GSM / GPRS)& required accessories.

ii. Shaft Encoder based Rotary position sensor with all fittings, suitable shaft couplings, accessories and cables and conduits.

iii. Mast/ tripod for DCP, solar panel & INSAT antenna.

iv. Conduit for cables GI Flexible conduits and HDPE pipe conduits.

v. Power & signal cables with cable conduits.

vi. Grounding and lightning protection

vii. All necessary hardware required for the system to operate properly.

5.6 TELEMETRY

The data communications employed on RTDAS network will use INSAT and GSM / GPRS radio communications. Both telemetry systems should work simultaneously for redundancy. It will be the responsibility of the bidder to confirm radio path and mobile network coverage. The bidder will be ultimately responsible for establishing data communication at all sites.

The bidder will provide all associated civil works related to the installation of the antenna, including cabling, wiring and other such infrastructure.

5.7 STATE DATA CENTER (SDC)

The State data center (SDC) is will be established at Data Centre Bidhannagar. The SDC will receive INSAT data from ERS at New Delhi/Jiapur/Burla through internet and cloud service of e- SWIS. The GSM/GPRS receiving station at

SDC will receive GSM/GPRS data directly from remote stations. Both the type of data will be stored in the same data base server at SDC. Necessary equipment such as, , Server for GSM &GPRS data reception, High End workstation / Computer system, 55" LED Display, etc. will be installed at State data center, Bidhannagar.. The system shall be able to accept coded SMS messages from manually operated remote stations and as a back-up to the RTDAS systems. The components include GPRS communication system and workstation for data collection /application /storage backup for the collection, quality. This infrastructure includes all networking devices to connect the equipment via INTRANET to the Web. The space needed for SDC will be provided by the purchaser.

5.8 GSM &GPRS Data Collection Station

- The GSM & GPRS data collection station shall be established at Bidhannagar.
- The GSM &GPRS data collection station will be able to interrogate the DCPs based on a schedule of the State's choice and as implemented by the bidder.
- The GSM &GPRS Data Collection Station will also be able to receive data sent by the remote RTDAS stations whether the data is sent via SMS text or over GPRS internet connectivity.
- In case of failure of INSAT telemetry of remote RTDAS sites, the provision for polling the data by GPRS telemetry so that missing of data is avoided.
- The bidder will provide all civil works related to the installation of the antenna, including cabling, wiring and other such infrastructure required to operate the GSM & GPRS Data collection station.

5.9INSTALLATION REQUIREMENTS FOR RTDAS

SITE PREPARATION AND INSTALLATION

- The purchaser will provide details of the installation sites before the scheduled installation date to allow the Bidder to perform site inspection and construction of suitable structures before the installation of the hardware.
- The location of antenna, sensors and related civil work will be decided by the respective Site Engineer-in-charge Depending on the site and river flow conditions.
- The Bidder should complete the required works at the site for proper installation of the equipment before receipt of the equipment.
- These are the basic guidelines for installation of RTDAS system however it may vary as per site conditions, in case of variation from installation guidelines stated below drawings shall be approved by engineer-in charge prior to the start of installation work

1. SPECIFICATIONS FOR INSTALLATION

i) Automatic Rainfall Station

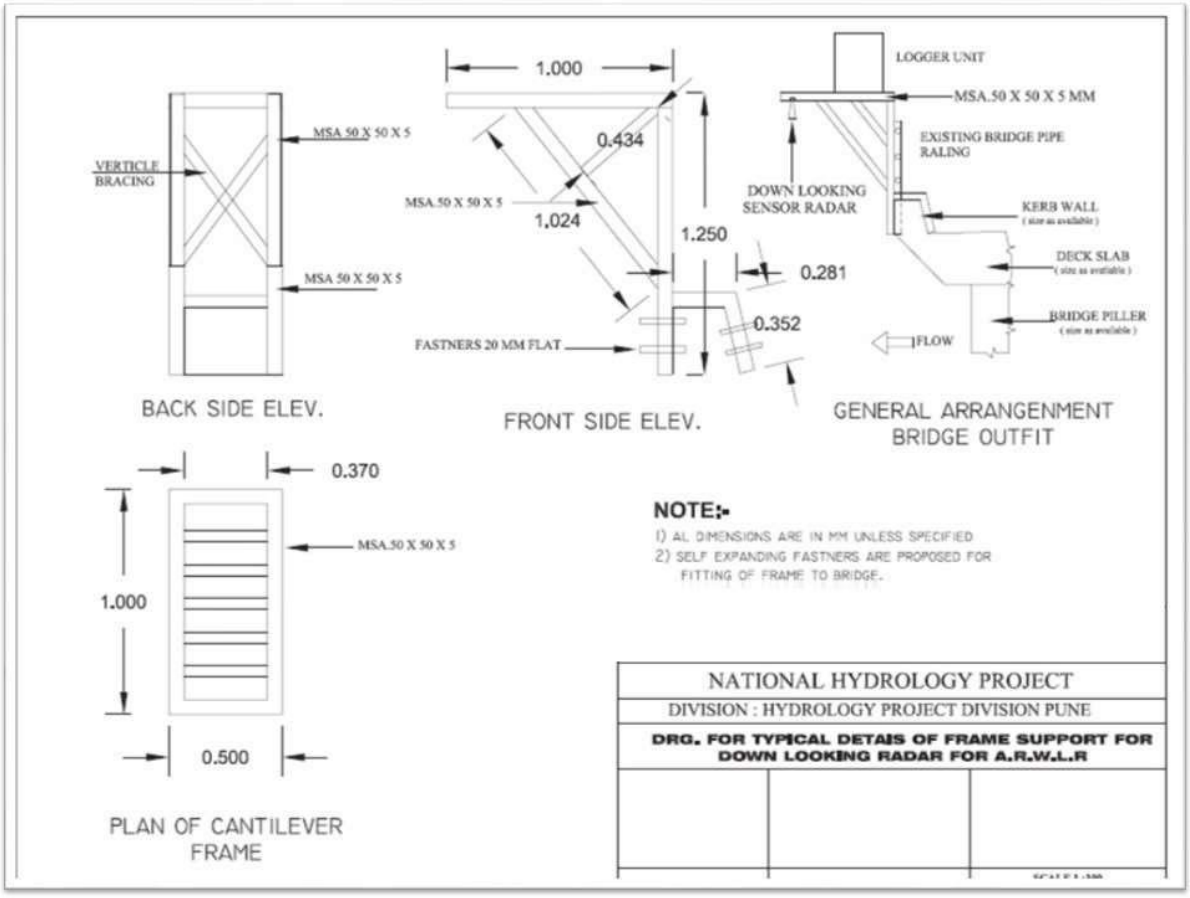
ARG stations will require a hardened enclosure on a structure (pipes, mast, and tower) to make the enclosure stable. The enclosure will be mounted 1.5 m above the ground. The rain gauge will be placed away from objects such that the rain gauge orifice is no closer than the 2 times the difference in height (top of the rain gauge to the top of the nearby objects) to other objects. Latest IS standards & WMO guidelines are required to be followed for ARG installation.

ii) Automatic Water Level Recorder (AWLR) for River and Reservoir

SAFETYREQUIREMENTS

- The sensor and its accessories should be protected from theft. The bidder is encouraged for minor modifications in installation of sensor and its accessories so as to minimize the chances of theft. Mortise lock is proposed to avoid theft. Due care must be taken while modifying the installations. In no case the basic principle and working of sensor is allowed to disturb.
- Radar sensors should be mounted such that they have a direct vertical shot to the water surface with no obstruction of their beams. Beam spread must be determined based on manufacturer's specification and the maximum expected distance to be measured at low flows. Consideration should be made in designing the mounting structure to allow for easy access to the instrument for maintenance
- Framework support to attach Radar sensor to Bridge Tower.

- Framework support made of fabrication of M.S. Angle 50mm x 50mm x 5mm with gusset plate 8mm thick (0.85m x 0.3m) including welding, riveting, anticorrosive paint, colour etc. complete as per FIG



iii) Automatic Weather Station

AWS stations will be placed in open fields and away from any obstructions which may disturb the measurements. WMO guidelines will be followed during the installation and precise site selection. The AWS stations will require a 10mts tower. The hardened enclosure will be attached to the tower at 1.5 m about the ground. Then Air Temperature/Relative humidity and Solar Radiation sensor will be mounted at ~1.5 m above the ground and sufficiently away from any objects that may produce long wave radiation. The wind speed/direction sensor will be place that the top of the 10 m tower. The rain gauge will be placed away from the tower, at least 3 m from the tower, and no closer than the 2 times the difference in height (top of the rain gauge to the top of the nearby objects) to other objects. .Latest IS standards & WMO guidelines are required to be followed for AWS installation.

iv) Specifications for Civil Works

Common Enclosure for Site

Area of the ARG and AWLR Station should be ideally 5m * 5m * 2m height. If a rare condition demands then even lesser area (5 m * 4 m) can be demarcated in consultation with officials.

Area for Automatic Weather Station (AWS) should be ideally 10m * 10m* 2m height, If a rare condition demands then even lesser area (8m * 8m) can be demarcated in consultation with officials.

The approach to the site should be made free of obstacles like bushes; trees etc. and a suitable cement path must be laid to approach the platform.

Following are the common specification for civil works for all the Telemetry sites.

Fencing for site

- The height of the fencing for the site must be 2 meters from the ground level.

- The fencing must be made over a Concrete foundation which is 230mmabove ground level.
- Fencing angle should be of size 40mm x 40mm x 6mm and pre-coated with red-oxide.
- The total length of the fencing angle should be 2.8 meters i.e. (2.0m above ground level + 0.8 m below ground level)
- Two MS angles must be used diagonally at each of the four corner angles of the site. The angles can be attached (with welding or the other appropriate means) from the middle of the existing corner angle to the ground. The depth of the support will remain the same as of main angle.
- The dimensions of the fencing angle foundation should be450mm x 450mm(length X width) and at a depth of 800mm. The foundation should be square shaped. Distance between each fencing angle should be 1.5 to 2 meters.

Chain-link

- Dimensions of GI Chain-link: 3 inches x 3 inches and of Gauge: 10 (3 mm diameter).
- GI chain-link mesh must be stretched and welded/fixed properly on the fencing angles.
- A pipe or angle must be fixed on the upper part of the fencing to have a neat finishing and at the same time to avoid loosening of the fencing over a period of time.
- The chain-link fencing should be fastened with the help of screws fitted on the fencing angles. Alternately it may be welded neatly at four equidistant positions of 0.5 m each.

Gate

- Dimensions: 1 m X 2 m (Width x Height) with locking facility
- The gate must be fabricated by MS Angle whose dimensions should be minimum 40mm x 40mm x 6mm
- Suitable locking facility with 3 keys for safety purposes is mandatory. Standard locks should be used.
- Gate and MS Angle must be well painted with white / silver colour.
- Gate should have proper support of MS angles with additional support of crossed MS angles. Alternately gate should be fixed with the support of RCC pillars.

Rain Gauge and WL sensor Foundation

- Rain gauge foundation must be of dimensions 450mm x 450mm (length x width) and 800mm deep.
- The rain gauge may be located so that it is at a minimum distance of 2 m away from obstructions on all four sides.
- The raised platform should be 230mm above the ground level.
- The orphic rim of rain gauge should be 1.0 to 1.2 meters above ground level.In the case of flood prone areas, the base plate on which the rain gauge is mounted should be placed 1.0 m above ground level. The location must be decided after discussion with Field Officer.

Mast Foundation

- Foundation Dimensions: 750mm X 750mm (length x width) and 1.2m deep. The raised platform of the foundation must be 300 mm above the ground level.
- The height of the mast should be minimum 3 meters above raised platform.

10mts Tower Foundation

- The 10m triangular tower foundation must be of dimensions 900mm X 900mm (length x width) and 1.5m deep. The raised platform of the foundation must be 300mmabove the ground level.
- Proper guy rope support (three Nos) with foundation (for 10mts Tower). The foundation for the Anchor Rod which holds the guy rope must be of dimensions 450mm X600mm(length x width) at the ground level and min 1.2mdeep
- The DCP, sensors and Antenna will be mounted on a 10-metertriangular tower, which should cater for fitments of assemblies for sensors, DCP, antenna and other accessories. The tower will have 3 sections of 3meter height and one top section of 1-meter height. The tower should be made of MS Pipe and should be light as well as robust enough to withstand weight of at least two persons (200 Kgs). This tower with complete accessories will be part of the supplies and will be galvanized to avoid rusting and long life in outdoor conditions.

Proportions for concrete foundations

- Concrete pillar foundations for the (RTDAS)mast/tripod/tower, fencing angle should be made in the volumetric mixing proportions as follows:
- Concrete foundation: 1 (Cement): 2 (Sand): 4 (Metal)
- Fine plastering: 1(Cement): 3 (Sand)
- Concrete Pillar must be cemented to achieve smooth finish above the ground level.
- After 8 hours, these foundations should be cured with water at least 3 times a day for four days.

Local Earthing

- Material required: Salt: 20 Kg; Charcoal: 20 Kg; Sand 100 Kg
- The lightning arrestor rod is made of copper which is mounted on the top most part of the RTDAS Mast / Tripod /tower.
- It should be of thickness 12 mm and of one-meter length with a connected copper wire of 6mm thickness (gauge). At the other end of copper wire is the Earthing rod of dimensions 15mm thickness and 1.8-meter length, which is buried into the ground.
- On the bottom of earthing rod, one copper plate of dimensions 300mm x 300mm should be connected. RTDAS Data logger enclosure should also be grounded with local earthing.
- A pit of 1200- 1500 mm depth, 600 x 600 mm wide at bottom (like a cone shaped pit) has to be dug.
- After leveling the bottom of the pit, uniform layer in the sequence of 150 mm of Salt + 150 mm Charcoal + 150mm Sand is filled. Such sequence is repeated 3 times till the earth pit is filled to the top. The copper earthing rod is placed in the center of the pit. The pit is closed and leveled.

Painting

- The tower, fencing angles, chain-link fencing and gate should be properly painted with one coat of red lead oxide primer & two coats of silver paint every year to avoid rusting.
- All concrete foundations shall be painted using white cement paint every year.

6.0 Technical Specification

6.1 Radar Type Water Level Sensor (0-35m)

Functional Requirement: To measure the water level

Design Requirements: The equipment offered should conform to the following technical Specifications:

Feature	Value
Site Conditions	
Ambient Temperature	From -5 to +60 Degree Celsius
Humidity	0 to 100 %
Altitude	0 to 2500 meter
Sensor	
Sensor Type	Microwave non-contact sensor
Range	35meters
Resolution	3 mm or better
Accuracy	0.02 % FSO
Output Interface	SDI-12 / RS-485 / 4-20mA
Power Supply	To be powered by Solar Panel provided by bidder with DCP
Beam angle	Less than 16degrees
General Features	
Housing Material	Corrosion Resistance (Stainless steel / Aluminum /PVC/UV stabilized ABS with metal casing)
Enclosure	The Sensor shall be easy to dismount and replace in the event of malfunction.
Tools	Complete tool kit for operation and routine maintenance
Manuals	Full Documentation and maintenance manual in English
Accessories	Sensor Mounting support, cables and other accessories as required
Protection	NEMA 4 or IP67 or better
Horizontal Mounting/Installation Arrangements	Above FRL, below a bridge girder wherever available otherwise horizontal cantilever arrangement from a mast/wall/pedestal to be provided
Radar Sensor should have inbuilt diagnostic feature & averaging function	

6.2 Automatic weather stations with PAN Evaporimeter

FUNCTIONAL REQUIREMENT: To measure the weather parameter

DESIGN REQUIREMENTS: The equipment offered should conform to the following technical Specifications:

Feature	Value
Site Conditions	
Ambient Temperature	From -5to +60^{o}C
Humidity	5 to 100 %
Altitude	0 to 2500 meter
Air Temperature Sensor	
Sensor Type	Platinum resistance or better or equivalent

Range	-5 to 60 Degree Celsius
Resolution	0.1ºC
Accuracy	Within ±0.2ºC in the entire working range
Response Time	10 secs or lesser
Relative Humidity Sensor	
Sensor Type	Capacitive/ Solid State Humidity Sensor
Range	0 to 100 %
Resolution	1%
Accuracy	±3% or better
Response time	10 secs or lesser
General	
Self-aspirated	To ensure continuous supply of air. Free from turbulence, water droplets and radiation
Power Supply	To be powered by solar power provided by bidder.
Accessories	All accessories for mounting the instrument at ~1.5mts height above the ground level e.g. special cross arm clamps or flag, if any shall be provided
Output Interface	SDI-12/ RS-485/ Analog
Wind Speed and Direction Sensor	
Sensor Type	Ultrasonic sensor (No moving Parts)
Range	0-60 m/s for speed and 0–360 degrees for direction or better
Resolution	0.1m/s for Speed; ±1 degree for Direction
Accuracy	Wind speed±2% ±0.1 m/s (up to 20 m/s) and ±3 % (for 20 to 60 m/s) Wind Direction ± 1º or better
Response time	Less than 1 second lag in operating range
Mounting	All accessories for mounting the instrument at 10mts height above the ground level, e.g. special cross arm clamps or flag if any shall be provided.
Output Interface	SDI-12 / RS-232/ RS-485
Air Pressure Sensor	
Sensor Type	Temperature Compensated
Range	600 to 1100 hPa
Resolution	± 0.1 hPa
Accuracy	±0.2hPa
Power Supply	To be powered by solar power provided by bidder
Output Interface	SDI-12 / RS-232/ RS-485
Solar Radiation Sensor	
Sensor Type	Silicon Pyranometer
Threshold	120 W/m2 of direct solar irradiance
Methodology	Alternate shading of sensor to account for sky radiation or Sunshine duration shall be computed in datalogger
Spectral Range	400nm to 1100 nm
Range	0-2000 W/Square meter
Resolution	1 W/Square meter
Accuracy (Including Temperature Compensation)	3% or better

General Features	
Material	Corrosion Resistance Metal (Stainless steel / Aluminum)
Tools	Complete tool kit for operation and routine maintenance
Manuals	Full Documentation and maintenance manual in English
Accessories	All accessories for mounting the instrument at ~1.5mts height above the ground level e.g. special cross arm clamps or flag, if any, shall be provided.
Output Interface	SDI-12/RS-485/4-20 mA/Analog
Evaporation- Pan specification	
Operating temperature	-5 to 60 degrees Celsius
Operating Humidity	5 to 100 %
Altitude	0 to 2500 meter
General Features	
Measurement	Evaporation Pan with water level sensor
Sensor Type	Shaft Encoder / ultrasound radar / Float & pulley type As Specified by IS:5973 which known as the modified Class A Pan evaporimeter
Diameter of the pan	1.2 m or more
Accuracy	± 1% FSO
Resolution	1mm
Power Supply	To be powered by solar power provided by bidder
Accessories	As required for complete installation of the sensors and equipment
Material	The pan is made of Copper or anti corrosive stainless-steel, tinned inside and painted white outside.
Covering	The top of the pan is covered with a hexagonal wire net of GI to protect water in the pan from birds
Platform	Rot resistance, timber treated with creosote or other effective Wood preservative
Measurement range	150mm
Output Interface	SDI-12 / RS-485 / 4-20 mA / Analog

6.3 Automatic Rain Gauge

FUNCTIONAL REQUIREMENT:

- Rainfall shall be measured using the tipping bucket method and shall be able to record cumulative rainfall.
- A spout filter shall prevent ingress of insects and debris.
- IMD/WMO certification is required.

Feature	**Value**
Site Conditions	
Ambient Temperature	From -5to +60 Degree C
Humidity	5 to 100 %
Altitude	0 to 2500 meter
Sensor	
Sensor Type	Tipping Bucket type with reed switch
Range	250 mm/h or better
Resolution	0.5 mm or better
Accuracy (Intensity)	2% or better, ± 2 mm
General Features	

Output Interface	SDI12/ RS-485 / 4-20 mA/Switching closure output
Power Supply	To be powered by solar power provided by bidder
Material	Corrosion Resistance Metal (Stainless steel/ Aluminum)
Enclosure	NEMA 4 or IP65
Tools	Complete tool kit for operation and routine maintenance
Manuals	Full Documentation and maintenance manual in English
Accessories	Sensor Mounting support, cables and other accessories as required
Certification	IMD/ WMO certification shall be provided.

Note: Bidder shall provide spout filter and bird cage to prevent ingress of insects and debris , And with Bubble Spirit Level and adjustable legs for horizontal alignment of tipping bucket mechanism

6.4Gate Position Measuring System(Shaft Encoder Type)

FUNCTIONAL REQUIREMENT: Gate sensors shall be installed on gates to measure gate opening.
DESIGN REQUIREMENTS: The equipment offered should conform to the following technical Specifications:

Feature	Value
Site Conditions	
Ambient Temperature	From -5 ºC to +60 ºC
Humidity	5 to 100 %
Altitude	0 to 2500meters
Sensor	
Sensor Type	Shaft Encoder based rotary optical/magnetic Absolute encoderposition sensor
Range	1-20 meters
Resolution	3 mm or less
Accuracy	0.025 % FSO
Output Interface	SDI-12 / RS-485 / 4-20 mA
Hardware/ Ports/accessories	Communication ports compatible with data logger,
General Features	
Power Supply	To be powered by Solar power system provided by bidder
Material	Corrosion Resistance Metal (Stainless steel or Aluminium)
Enclosure	Outdoor environment with corrosion resistant material Lockable (key) box provided by the supplier to be mounted on Gate sensor, with IP65 or better
Tools	Complete tool kit for operation and routine maintenance
Manuals	Full Documentation and maintenance manual in English
Accessories&Mounting	Wiring from sensor to Datalogger must be through HDPE/ GI Pipe Conducting and flexible metallic conduiting wherever applicable, Sensor mounting support/clamps, limit switches& cabling etc.
Process connections	through suitable coupling
Manufacturer's Calibration Certificate	Required

6.5 Data Logger with 8 AI channels

Feature	Value
Site Conditions	
Ambient Temperature	From -5 to +60 Degree C
Humidity	5 to 100 %
Altitude	0 to 2500meter
Sensor Interface	
Analogue Inputs	8-Analogue Input Channels 4 to 20 mA, 100% over range withstand (Analog input channels are required in datalogger, if any sensor offered by bidder requires Analog interface to integration with datalogger)
SDI Port	One SDI-12 Interface port
Serial Port for sensor interface	One RS-232 for sensor Interface One RS-485 for sensor Interface port
Pulse Input	1Input for Rain Gauge impulse
Input - Output Interfaces	
Data Transfer	USB stick option for Data transfer
Port for Configuration	One Serial Port (RS-232 /USB) for communication with Laptop for programming
Port for Telemetry	2 Ports for Communication with Telemetry (GSM,GPRS and INSAT) device Both telemetry systems should work simultaneously for redundancy.
Display Port	Port for connecting external display screen for data in running text
Computer Software	
Operating System	Windows software for system configuration / communication
Version	English language version
Licenses	All required licenses shall be included
Analog to Digital Converter	
Resolution	16 bit or better
Conversion Accuracy	± 1 LSB
Sample intervals	1 Sec to 24 hours (user scalable)
General Features	
Flash memory	Non-volatile Flash memory that can store one year of data. & expandable upto a minimum 1GB Via USB/SD Card.
Resolution	A/D resolution ≥16 bit
Recording Interval	Individual recording intervals for each sensor/parameter
Firmware Operating System	Multi-tasking operating system - must log data and transmit at same time
Display	Inbuilt Digital Display for viewing current data and setting values
Power Supply	Shall be powered by solar Power supply to be provided by bidder with DCP, low current drain (quiescent ≤10.0mA)
Battery Voltage	Monitoring of battery voltage level
Internal battery	Internal battery backup for clock, lithium battery, storage 2 years
Charge Controller	Internal or External
User Permissions	Different user levels, system of user rights / passwords, access restricted to unauthorized personnel
Internal clock	Internal clock with drift less than 1 second per Week
Keypad	For displaying or transferring data to memory stick, configuration of data logger and sensors
Real time clock	GPS synchronized & timing in IST format required

System integrity	System integrity check procedures
Enclosure	for wall-mounting in a shelter / enclosure with IP65 (NEMA 4 or equivalent) protection or better
Accessories	Serial cable + adaptor (if required). All accessories (fixing units, etc.) as required
Tools	complete tool kit for installation and routine maintenance giving full detail (number of pieces and type)
Manuals	full documentation and maintenance instructions in English (1 copy per station).
GSM /GPRS MODEM	
Ambient Site Conditions	
Operating Temperature	From -5 to +60^{0}C
Performance	Data Reception availability of 95% or better
Form factor	The GSM /GPRS modem should either be integral part of data logger specified above, or it should be supplied as independent unit compatible with supplied data logger
Specific Features	
Communication Direction	Utilize GPRS network for two-way connection with FTP, TCP/IP (INTERNET) connection and SMS
Transmission trigger	Data collection to be triggered by interrogation from Data Center, or by event-based transmission triggered by remote site
Power Saving	Ability to disable interrogation system in order to save power at remote site
Communication Protocol	Data transmission to execute HTTP Post, FTP, SMS to transmit and receiving data to the Data Center
Accessories	All associated equipment, including Antenna all cables and mounting hardware
Antenna features	
Frequency range	900 MHz: 824-960 MHz/1800MHz:1710-1880 MHz, 4G and better
Impedance	50 ohms
VSWR	≤ 2.0
Radiation	Omni-directional
Operating temperature	-5 to + 60 degrees Celsius
Connector	SMA or suitable RF connector adaptable to GSM/GPRS modem
Cable length	As required at site

6.6**Data logger with 2 AI channels**

Feature	**Value**
Site Conditions	
Ambient Temperature	From -5to +60 Degree C
Humidity	5 to 100 %
Altitude	0 to 2500meter
Sensor Interface	
Analogue Inputs	2-Analogue Input Channels 4 to 20 mA, 100% over range withstand (Analog input channels are required in datalogger, if any sensor offered by bidder requires Analog interface to integration with datalogger)

SDI Port	One SDI-12 Interface port
Serial Port for sensor interface	One RS-232 / RS-485 for sensor Interface port
Pulse Input	1 Input for Rain Gauge impulse
Input - Output Interfaces	
Data Transfer	USB stick option for Data transfer
Port for Configuration	One Serial Port (RS-232 /USB) for communication with Laptop for programming
Port for Telemetry	2 Ports for Communication with Telemetry (GSM,GPRS and INSAT) device Both telemetry systems should work simultaneously for redundancy.
Display Port	Port for connecting external display screen for data in running text
Computer Software	
Operating System	Windows software for system configuration / communication
Version	English language version
Licenses	All required licenses shall be included
Analog to Digital Converter	
Resolution	16 bit or better
Conversion Accuracy	± 1 LSB
Sample intervals	1 Sec to 24 hours (user scalable)
General Features	
Flash memory	Non-volatile Flash memory that can store one year of data. & expandable upto1GB Via USB/SD Card.
Resolution	A/D resolution ≥16 bit
Recording Interval	Individual recording intervals for each sensor/parameter
Firmware Operating System	Multi-tasking operating system - must log data and transmit at same time
Display	Inbuilt Digital Display for viewing current data and setting values
Power Supply	Shall be powered by solar Power supply to be provided by bidder with DCP , low current drain (quiescent ≤10.0mA)
Battery Voltage	Monitoring of battery voltage level
Internal battery	Internal battery backup for clock, lithium battery, storage 2 years
Charge Controller	Internal or External
User Permissions	Different user levels, system of user rights / passwords, access restricted to **unauthorized** personnel
Internal clock	Internal clock with drift less than 1 second per Week
Keypad	For displaying or transferring data to memory stick, configuration of data logger and sensors
Real time clock	GPS synchronized & timing in IST format required
System integrity	System integrity check procedures
Enclosure	for wall-mounting in a shelter / enclosure with IP65 (NEMA 4 or equivalent) protection or better
Accessories	Serial cable + adaptor (if required) for notebook connection. All accessories (fixing units, etc.) as required
Tools	complete tool kit for installation and routine maintenance giving full detail (number of pieces and type)
Manuals	full documentation and maintenance instructions in English (1 copy per station).
GSM/GPRS MODEM	
Ambient Site Conditions	
Operating Temperature	From -5 to +60^{o}C

Performance	Data Reception availability of 95% or better
Form factor	The GSM /GPRS modem should either be integral part of data logger specified above, or it should be supplied as independent unit compatible with supplied data logger
Specific Features	
Communication Direction	Utilize GPRS network for two-way connection with FTP, TCP/IP (INTERNET) connection and SMS
Transmission trigger	Data collection to be triggered by interrogation from Data Center, or by event-based transmission triggered by remote site
Power Saving	Ability to disable interrogation system in order to save power at remote site
Communication Protocol	Data transmission to execute HTTP Post, FTP, SMS to transmit and receiving data to the Data Center
Accessories	All associated equipment, including Antenna all cables and mounting hardware
Antennafeatures	
Frequency range	900 MHz: 824-960 MHz/1800MHz:1710-1880 MHz, 4G and better
Impedance	50 ohms
VSWR	≤ 2.0
Radiation	Omni-directional
Operating temperature	-5 to + 60 degrees Celsius
Connector	SMA or suitable RF connector adaptable to GSM/GPRS modem
Cable length	As required at site

6.8 Specifications for LED Running Text Display Unit

Functional Requirement: To be interfaced with datalogger to display the Hydro-Meteorological parameters test string

Design Requirements: LED Running Text Display unit should be used in Indoor and outdoor application and offered equipment should conform to the following technical Specifications:

Feature	Specification
Site Conditions	
Ambient Temperature	From -5 to +60 ^{o}C
Humidity	5 to 100 %
Altitude	0 to 2500 meter
General Features	
Size	4’ (W) X 7” (H) or better
Pixel Pitch	8 mm or narrower
Maximum brightness	2000 cd/m2 meter
Colour	Red / Amber
Viewing Distance	≥10m
Optimum View Angle	Horizontal 120°; Vertical 60°
Ingression proof	IP 65 or better
Text Lines	One Line display
Refresh rate	300 to 2000 hertz
Input Voltage	220 ± 20 Volt AC
LED life	50,000 hours or better
Communication Port	Digital port RS-485 or RS-232 (user settable)

	Display unit should be interface with display port of RTDAS datalogger to display the Hydro-Meteorological Data string in running text with user selectable speed.
Programming	Configuration Through software to be part of supply

7.0 Data Collection Platform

7.1 Functional Requirement

1. The system shall automatically collect the observations from attached sensors, process and store them into its memory and transmit through GSM /GPRS communication link to central station as per the preprogrammed measurement interval, and also system shall transmit hourly basis data of every full hour IST to the ERS through satellite at preprogrammed transmission time

2. The DCP shall also continuously monitor the status of the instruments, power supply and communication. In the event of failure of an instrument or disruption of any of the power sources, an alarm shall be sent back to the State data center.

3. The sensor's signal conditioning unit should be an integral part of the system.

4. The number of analog/ digital/ SDI-12 /RS-232 / RS-485 channels in the data logger must be compatible to the sensors being supplied and also for other battery monitoring systems

5. The System shall have provision to easily include and change the following information in field as mandatory requirements:

    - Unique station identification code.
    - Time of observationand Transmission.
    - Sensor identification
    - Data transmission time for INSAT & GSM/ GPRS communication
    - Programmable Sensor data measurement interval
    - Configuration of Measurement, logging & GPRS/GSM data transmission interval
    - Gain, offset, Datum parameterization for all sensors
    - Configuration of FTP server & mobile number of data center.

6. Parameterization & configuration of RTDAS stations remotely through GPRS/ GSM communication shall be available

7. The system shall have an integrated microprocessor-based data acquisition and storage system having adequate hardware configuration and software support to serve as an interface between sensors and the communication link to perform tasks as stated below.

8. Providing necessary electrical power to the sensors and conversion of electrical output signals from the sensors into engineering value based on calibration information stored in the memory. Full compatibility with all types of sensors provided in the package is mandatory.

9. Storage of observed data along with time for all the parameters in the memory. Memory capacity to retain at least 365 days data is required. Data shall be available even if the power supply to the system has failed (RAM Backup battery) for one year

10. The stored data shall be retrievable via serial port to a PC/ laptop or USB device. The downloaded data shall be provided in the prescribed format provided for GSM/GPRS in technical specifications

11. Full compatibility with all types of sensors provided in the packages shall be mandatory.

12. The system should be stand alone and all programming functions / setups to be carried out through system keypad and display independent of a PC / Laptop.

13. The system should be capable of continuous updating of the values of sensed parameters and post processing the instantaneous values into average values over a specified period of time for transmission to the DCP with earth receiving station.

14. Management of DCP transmitter to optimize the battery consumption

15. The system shall provide a complete health status of the battery, transmitter and other components

16. The system shall support the following functions:

- Easy programming set up.
- Multi-tasking capability.
- User friendly software programming.
- The system shall have self-diagnostic facility and be capable of displaying station ID / sensor ID code and messages of the display panel for general identification of the fault. It should have facility to monitor these code and other health status through an external laptop / PC.
- Setup shall be organized in a tree of menus and sub menus. Protection of setup parameters and data through password should be supported by the system. In addition, the DCP shall support the manual entry of data through keyboard and its display.
- Data including the setup and program files shall be transferable from the system via. serial port to PC and SD card or other suitable memory device and vice versa. The scripts / software for configuration of datalogger should be part of supply.
- Facility for Pooling of data via GPRS shall available in datalogger

17. The DCP shall be housed in a weather proof and temper proof housing of NEMA 4 or equivalent type enclosure of steel or fiber glass

18. DCP Should be supplied with Software for configuration and troubleshooting

19. The data logger shall be programmable locally in field via laptop / PC.

20. The DCP shall be located in a place specified by the Engineer-in-charge at each site and shall be generally one meter above Highest Flood Level (HFL) attained at that site. The DCP at each site shall be located in such a way it is easily approachable even in floods.

21. The surge suppression in form of fuse or other appropriate device shall be provided for all interfaces to protect the data logger from the surges emanating from the sensors.

22. Datalogger shall have a provision to display, store and transmit the water level with respect to MSL or with respect to zero level/bed level (user selectable).

23. The datalogger shall store data in memory, in case of GPRS/GSM communication failure. The data shall be transferred automatically once GPRS/GSM communication is retained. This will ensure no data loss during no communication also.

7.2 Technical Specification

7.2.1 INSAT Radio

FUNCTIONAL REQUIREMENT: To transmit data
DESIGN REQUIREMENTS: The equipment offered should conform to the following technical Specifications:

Feature	**Value**
Operating Temperature	From -5to +60^{0}C
Environment Relative Humidity	0 to 100 %
Career Frequency	402 – 403 MHz
Carrier Settability	In steps of 100Hz from 402.0 MHz to 403.0 MHz
Modulator	PCM/BPSK
Data coding	NRZ (L)
Output Power	3-10Watt, user settable
Data Bit Rate	4.8 kbps
Frequency Stability	
a.Long Term	Transmit frequency inaccuracy including aging of oscillator should not exceed ±400Hz per year. Oscillators/synthesizer should have provision to adjust for the long-term drift.
b. for temperature	±1ppm or better (-40 to +55 degrees Celsius)
Signal Bandwidth	6.0 KHz maximum or better
Power Stability	±1dB
Spurious	-60dB or better
Harmonics	-40dB or better
Antenna cable	LMR 400 grade or better
Performance	Data Reception availability of 99% or better

Form factor	The Transmitter should either be integral part of data logger specified above, or it should be supplied as independent unit compatible with supplied data logger
Operating Power	Switched 12V DC controlled by data logger
Yagi Antenna	
Polarization	LHCP or RHCP, switchable in field
Gain	Minimum 11 dbi or better
Center Frequency	402-403 MHz
Mounting	Proper mounting and Pointing arrangement for 360-degree azimuth and elevation adjustment
Operating Wind speed	250 kmph
Wind Survival	300 kmph
Material	Rust-proof and Oxidation-proof
Specific Features	
Satellite System	INSAT Radio System to be Used on the INSAT Satellite operated by ISRO
Certification	Certificate of acceptance required by ISRO or IMD as part of the bid package
Accessories	All associated equipment, including GPS,GPS Antenna, INSAT Antenna, all cables and mounting hardware

8.0 Transmitter & Antenna

The INSAT transmitter should be an internal or external component of DCU. It should have necessary hardware and software to receive data from the data logger and transmit in TDMA mode. The transmitter should have the capability to handle data transmission to the DRTs located on any of the INSAT series of satellites. The selection of frequency and mode of transmission shall be through software settings only. No hardware changes for switching from one satellite DRT to another are acceptable.

8.1 Antenna features

i. The tenderer shall ensure compatibility of the antenna in the entire system and also ensure achievement of objectives given in the telemetry link calculations to be provided by the tenderer.

ii. The antenna should not allow accumulation of rain water, there by degrading its performance.

iii. The antenna shall have a proper mounting and pointing arrangement suitable for transmission to any one of INSAT satellites-based DRTs (located anywhere in the geostationary arc from 45°E to 115°E longitude). The tenderer shall also provide suitable templates and fixtures/ tools for reorienting of the antenna towards any satellite by the field personnel as and when required.

iv. Proper lightning and surge protection shall be provided to protect all the equipment connected to the antenna from atmospheric hazards. This arrangement shall be in addition to the general arrangement already covered under general scope of the work.

v. Antenna to be designed with an optimum size so that it could be easily transported to remote and inaccessible places. Mounting of antenna should take care of Azimuth and Elevation changes. Systems have to operate in harsh and saline conditions and adaptable to tropical conditions.

vi. The following technical features shall be supplied by the tenderer in addition to the technical information being provided by him as part of the Tender.

a.	Polarization	:	LHCP and RHCP (Switchable in field)
b.	Gain	:	Minimum 11 dBi or better
c.	Center frequency	:	402.50 MHz
d.	3dB Beam width	:	40°
e.	VSWR	:	1.2: 1
f.	Impedance	:	50 ohms
g.	Axial Ratio	:	To be specified by tenderer
h.	Operating wind speed	:	250 kmph
i.	Wind Survival	:	300 kmph

j.	Material	:	Rust-proof and oxidation-proof for use in coastal and saline areas
k.	Connector type	:	Compatible
l.	Mounting	:	Should have engraved elevation angle marking
m.	Operating temperature	:	-10°C to +60°C
n.	Operating Relative Humidity	:	0 to 100% RH
o.	Weight	:	Light weight
p.	Size	:	Small, portable
q.	Operating rain rate	:	100 mm/hr and water proof
r.	Mounting /Installation arrangements		Mounting shall be done on a mast with sufficient foundation and structural strength

9.0 INSAT Communication System

9.1 Time Division Multiple Access (TDMA) Scheme

Each TDMA type of transmitting system shall have a unique GPS synchronized time of transmission which must be stamped on the body of the system by the manufacturer. The burst data format is shown in Fig (1). However, CRC is added to the data frame and half rate convolution coded. It is then appended with CR & BTR preamble and UW and transmitted in TDMA mode. Burst duration is 186 milli sec.

The TDMA frame format is shown in Fig (2). TDMA technique is an open loop system with timing derived from GPS receiver which is part of the RTDAS system. TDMA frame duration is one hour. The one hour frame is divided into 2 time windows, each of 30-minute duration. Each RTDAS system is assigned 1-second time slot in first 30-minute slot and the repeat transmission is after 30 minutes, which falls in the next time slot.

The one second frame is worked out taking into account the following details:

- 20 millisecond differential propagation delay over coverage area.
- RTC clock accuracy around 150 milliseconds per day – GPS receiver updates RTC once every twenty-four hours to conserve battery power of RTDAS system.
- GPS receiver accuracy of less than 1 microsecond
- Guard time required in the present burst receiver at Hub station.

9.2 Features of ISRO TDMA transmission

Features of ISRO TDMA transmission scheme are provided for general guidance. However international norms applicable for TDMA may be followed.

- Total number of RTDAS that could be accommodated in a single carrier is 1800.
- By including CRC in the data frame, data validity could be ensured.
- With preserving BCH coding of SID, data quality could be checked and valid data retrieved even for the bad CRC.
- By preserving present SID (Station Identification Code) structure of IMD, SID for all users of DRT could be standardized. The SID consists of 21bits (9 bits for user type, 2 bits for priority, and 10 bits for Platform ID)
- With Forward error correction convolution coding, better data quality is ensured.
- With one repeat transmission, reliability of data reception is improved.

1	CRC CODE GENERATION	Polynomial; CRC-CCITT-16 $X^{16}+X^{12}+X^{5}+1$
2	DATA SCRAMBLING	Polynomial: $1+X^{-1}+X^{-15}$ Initial State: 6959 (Hex)
3	CONVOLUTION ENCODING	Convolution Coding ½ Rate, Constraint Length K=7

		Polynomial: G1=133(Octal), G2=171(Octal)
4	HEADER DETAILS	CR: 192 Symbols (all '0's) BTR: 64 Symbols (all '1's) UW: 64 Symbols (07EA CDDA 4E2F 28C2 (Hex)) Note: UW transmitted with LSB first of every byte, starting from 07EA. (See Fig.1)
5	RF DATA ENCODING	Differential coding (NRZ-L) is done for the entire burst (Preamble and the convolution coded bits) before RF modulation.

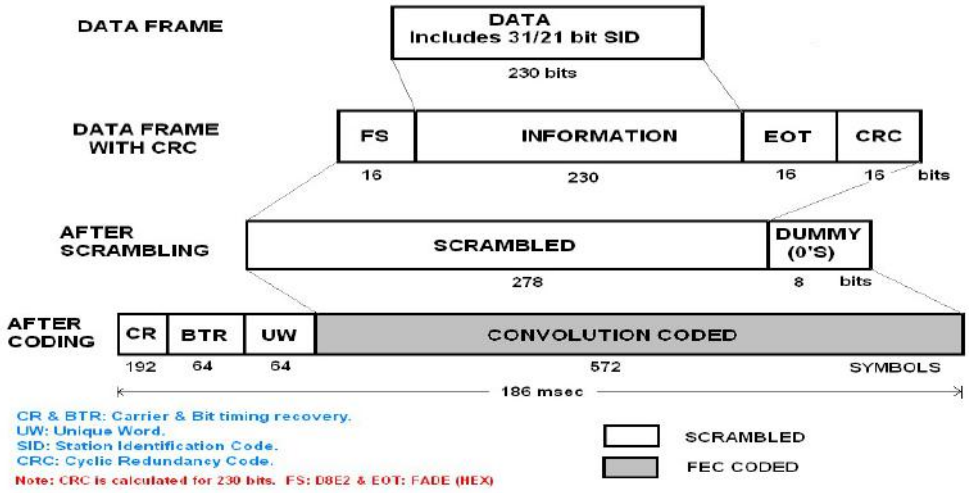


Fig. 1: Burst Transmission Format for TDMA Technique (4800 Symbols/sec.)

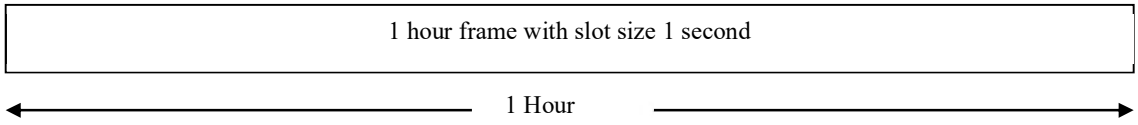


Fig. 2: TDMA Transmission Frame Format

Fig.1 may be referred to. CRC is calculated for 262 bits which include FS and EOT. It is then scrambled. 1byte, all '0's is added with the scrambled bits, after which the entire bits are convolution coded. Preamble (CR, BTR and UW) is appended with the convolution coded bits. The resulting bits are then differential coded and transmitted.

The system should have flexibility to accommodate more number of carrier channels by suitable changes in the TDMA transmission scheme.

More details will be provided at the time of the design review meeting which will be held with the successful bidder. However, it should be ensured by the bidder that the system configuration is flexible and accommodate all the proposed sensors without any additional cost.

9.3 INSAT DRT Specifications

For the purpose of data transfer from field AWLR/AWS/ARG units to CWC Earth Receiving Station at Delhi/Burla/Jaipur the Data Relay Transponder (DRT) on the

different INSAT / KALPANA-1 series of satellites shall be used and the specifications given below shall be treated as standard to be adhered by the offered telemetry system.

SATELLITE	**KALPANA-1 74^0 E**	**INSAT-3A 83^0E**	**INSAT-3D 82^0E**
RECEIVE FREQ. BAND	402.65 – 402.85Mhz	402.65 – 402.85Mhz	402.10 – 402.50Mhz
TRANSMIT FREQ. BAND	4500-4510Mhz band 4506.05Mhz	4500-4510Mhz band 4506.05Mhz	4500-4510Mhz band 4506.05Mhz
RECEIVE G/T	-19db/deg.K	-19db/deg.K	-19db/deg.K
MAX.EIRP	24dBW peak	24 dbW peak	24 dbW peak
C-BAND EIRP for RECEIVE FLUX DENSITY	2.0dBW for –146 dBW/m2	2.0 dbW for –146 dbW/m^2	2.0 dbW for –146 dbW/m^2
REC.POLARISATION	RHCP	LHCP	LHCP
TRANSMIT POL	LINEAR	LINEAR	LINEAR
FREQ.TRANSLATION ERROR	± 40Khz over life ± 6Khz over 1 month	± 40Khz over life ± 6Khz over 1 month	± 40Khz over life ± 6Khz over 1 month

Data Relay Transponder (DRT) onboard INSAT 3D will have a receiving frequency band of 402.3 MHz ± 200 KHz.

9.4 Channel Specifications for TDMA transmission format

Table below gives the present RTDAS parameters and their identification code used in the TDMA transmission format.

Sl.No.	Channel no.	Identification Code	Parameter
1	Cal1	C1:	Battery voltage (volts)
2	Cal2	C2:	Hourly rainfall
3	Cal3	C3:	Daily rainfall (rounded off to next higher integer). Reset at 08:00 IST
4	1	0000 (s00:)	Instantaneous sampled value of air temperature in deg C at the end of every full hour.
5	2.	1010 (s10:)	Snow Depth at end of every full hour
6	3	1011 (s11:)	Evaporation at end of every full hour
7	4	0100(s04:)	Wind speed (3-minute vector averaging prior to full hour).
8	5	0101(s05:)	Wind direction in degrees (3-minute vector averaging prior to full hour).
9	6	0110 (s06:)	Atmospheric pressure at end of every full hour
10	7	0111(s07:)	Instantaneous value of RH at the end of every full hour

11	8	1000 (s08:)	Water Level (Integer Part)
12	9	1001 (s09:)	Water Level (Decimal Part)
13	10	1110(s14:)	Duration of bright sunshine since last mid night. Reset to zero at mid night. (Global radiation will be transmitted in this slot instead of duration of sunshine.

9.5 GSM &GPRS Transmission format

Table below gives the GSM / GPRS data parameters and their identification code format which is required to transmit the data from datalogger to FTP server.

FORMAT:

&Station ID, Date and Time, Mobile Number, Battery, Water Level, Hourly Rainfall, Daily Rainfall, AirTemperature,SnowDepth,Evaporation,Windspeed,Winddirection,Atmosphericpressure,Humidity,Sunshine Duration

Example Data Spring:
&738D1E76,07/01/18 10:00,9849556430,13.5,26.347,1.5,15.5,-11.4,--,187,1.2,256,936.7,56,125

Sl.No.	Channel no.	Parameter
1	Station ID	Start of String should be '&" and Eight Characters Station ID provider by bidder
2	Date and Time	Measurement date and Time in DD/MM/YY HH:MM
3	Mobile Number	Mobile no of remote station SIM
4	Battery	Battery voltage at end of every full hour in Volts with 1 right digit
5	Water Level	Water level at end of every full hour in Mts. with 3 right digit
6	Hourly Rainfall	Hourly rainfall in mm. with 1 right digit
7	Daily rainfall	Daily rainfall (rounded off to next higher integer).in mm. with 1, right digit reset at 08:00 IST
8	Air Temperature	Instantaneous sampled value of air temperature in deg C with 1 right digit at the end of every full hour.
9	Snow Depth	Snow Depth at end of every full hour in Mts. with 3 right digit
10	Evaporation	Evaporation at end of every full hour in mm. with 0 right digit
11	Wind speed	Wind speed in knots with 1 right digit (3 minutes vector averaging prior to full hour).
12	Wind direction	Wind direction in degrees with 0 right digit (3 minutes vector averaging prior to full hour).
13	Atmospheric pressure	Atmospheric pressure at end of every full hour in hpa. with 1 right digit
14	Relative Humidity (RH)	Instantaneous value of RH at the end of every full hour in %. with 0 right digit
15	Solar Radiation / Sunshine Duration	Global Solar Radiation in W/m2 or sunshine Duration since last mid night. Reset to zero at mid night in number of minutes. (Global radiation will be transmitted in this slot instead of duration of sunshine)

Note:
1. If any sensor is not connected then it should transmit '--' characters in place of the sensor value.

2. Attached format is indicative, recommended for standardised data acquisition for development of unified Water Information System. In case bidder deviates from this format then bidder shall be responsible for integration of the data in E-SWIS without any manual intervention.

10.0 LIGHTNING Protection

The entire unit has to be adequately protected against lightning and build of static charges. The lightning rod should protrude 1 m above the highest point (Antenna) and should be placed in the center of the pole. The mast should be electrically grounded by following as per CPWD earthing procedures. As a part of the maintenance, the lightning equipment shall be inspected on a yearly basis for its conductivity and effectiveness. Such inspection shall be carried out in the pre-monsoon period and any faults noticed shall be rectified.

11.0 Earthing For Equipment

The electrical grounding for all other electronic and electrical equipment should be done by following standard CPWD procedure. The earthing for the equipment's should be done separately and should have a minimum distance of 2.5 meter from the earthing done for lightning rod. In no case both the earths should be done in the same earthing rod.

As a part of the maintenance, the earthing equipment shall be inspected on a yearly basis for its conductivity and effectiveness. Such inspection shall be carried out in the pre-monsoon period and any faults noticed shall be rectified.

12. SOLAR POWER SUPPLY WITH BATTERY BACKUP

12.1 Solar Power Supply

Solar Panel mounting hardware shall be designed to allow a great variety of attachment methods and accommodate a variety of mounting surfaces. They may be used to mount a module on a horizontal or vertical surface, on surfaces at angles between horizontal and vertical and on metal poles. Attachment methods include bolts, lag bolts, u – bolt brackets and stainless-steel hose clamps.

The Solar power supply shall be mounted on the roof of site buildings where existing. The Bidder shall supply a pole – mounted arrangement including a standard pole and necessary foundation and fixing arrangements.
The location of solar power installation shall be indicated by the concerned engineer – in – charge of each DCP.

In order to guard against frequent theft of solar panels the mounting device shall be so designed as to make the solar panel detachable as and when required. It is intended to store the solar panel during the night hours as well for longer durations in the non-monsoon period and the arrangement should be designed in such a way that the arrangement is sturdy and capable of handling frequent disconnecting and re connections.

The power supply shall primarily function through a set of sealed maintenance free rechargeable batteries capable of preventing deep discharge.

12.2 Batteries

The batteries required for the equipment above shall be maintenance free, rechargeable sealed batteries with the following features:

Overcharge and deep discharge protection
Leak-proof
Easy handling – no special shipping container required
Long service life
Excellent recharge ability

One battery pack shall be provided for each DCP. The batteries pack provided shall have adequate capacity to sustain the maximum sized DCP configuration of sensors and telemetry equipment for a period of 15days of continuous operation at the frequency of one observation per hour per sensor and one transmission per hour on a 24-hourly basis. This capacity shall be available If it not, battery pack should be replaced with new one free of cost.

The necessary housing and configuration of the batteries shall be furnished in detail by the Bidder.

The battery pack shall also include arrangements of charging through a standard 220 V AC domestic power supply outlet and also from solar panels established as above. The normal supply to the DCP equipment shall be from battery pack only.

The Power Supply Unit shall have audio and/or visual alarms for overcharging and deep discharging conditions. The charge level shall also be indicated on the front panel of the pack.
The sealed construction shall allow trouble-free, safe operation in any position. The battery case shall be high-impact, with sufficient resistance to shock, vibration, chemicals and heat.

12.3 Solar Power supply for DCP

Solar panel offered should confirm the following technical specifications:

Feature	Units
Battery	
Voltage	From 0 to +60 V / as compatible with DCP and all sensors
Type	Sealed maintenance free
Capacity	Based on site conditions and telemetry method, power supply system shall provide 15 days of backup to all equipment's being powered up by the solar panel
Solar Panel	
Size	Based on site conditions and telemetry method, power supply system shall provide 15 days of backup to all equipment's being powered up by the solar panel
Mounts	The mounts should be sturdy in design and detachable but should not move or rotate with wind. It should have a provision to adjust direction and elevation during installation for optimal solar power generation
Charger	Smart solar charger with protection shall be provided by the bidder
General	
The supplier should determine optimal size of solar panels and batteries such that the system should be operational for at least 15 days in absence of charging.	

12.4 Specification for Cabling and conduits.

i. The term cable shall always include necessary type of connectors at both the ends for connecting between two equipment. The connectors shall be properly anchored with protective sheathing of the cable in such a way that the loads due to pulling and twisting shall be borne by the protective sheathing and the conductors shall not be subjected to any stress.

ii. The connectors shall be so fixed on the individual components of the system that the metal/plastic connector shall always transfer the loads due to pulling and twisting directly to the protective body of the component and the internal interface cards/ connections shall not be subjected to any load.

iii. Laying of necessary data and power supply cables for connecting various components and embedding them or protecting them with necessary conduits shall be carried out as per directions of engineer-in-charge.

iv. Wherever the cables are to be laid indoors and the length of the individual cable run exceeds 1 meter, the cable shall be housed in a protective conduit made of electrical supply grade conduit of appropriate diameter and the conduit shall be fixed with the wall at a height not less than 1 meter above the floor surface. Whenever the indoor cable is required to cross the floor, it shall be housed in a HDPE pipe of 25 mm internal diameter and the pipe shall be fixed to the floor with suitable protective covering to avoid tripping of personnel using the area or disturbance to the pipe due to such movement.

v. Wherever cables are to run through open ground including the public road and pathways, the cable shall be armored/ shielded and shall be water ingress proof up to static water pressure of 5 kg/cm2. All joints made in cable shall also meet the water proofing criteria. In addition, the cable shall be protected by housing the same in 25 mm HDPE pipe/flexible metallic conduit embedded at a depth of not less than 1.0 meter below the ground surface with a warning brick on the same. A sketch of the cable layout with respect to the identifiable marks of the area shall be prepared and handed over to the Engineer-in-charge for each such cable run on completion of the work of cable laying operation.

vi. The joints in the cable connecting between the sensor and data collection unit shall be avoided by measuring the appropriate length of the cable required and attaching the same in one piece. If the cable joints become necessary, prior permission ofthe Engineer-in-charge shall be obtained before executing the same. The joint

fabricated through a splicing and jointing kit shall be stronger than the parent cable.

vii. The cable carrying data and electrical AC power shall be housed separately in different conduits separated by adequate distance to prevent leakage currents. The data cables shall also be laid out in such a way that the data integrity is not compromised due to mutual interference.

viii. Shielded (screened) cables shall be used for external Cabling, the power and control cables shall be generally as per IS 8130/34. For these cables, equivalent IEC/IS specifications are also acceptable

- All cables shall have stranded copper conductor of suitable cross section depending on load.
- The Communication cable/power cable shall be of shielded, twisted pair type.

These are minimum requirements. Bidder is free to propose improved cabling technology

13. Data Processing Hardware At Data Centre

The purchaser will provide room at Data processing center equipped with requisite furniture etc. The purchaser will also provide a Local Area Network.

The data collected at site from various DCPs will be stored and transmitted **through INSAT telemetry** every hour to Earth Receiving Station (ERS) of CWC, New Delhi /Jaipur /Burla. Also the GPRS & GSM data shall be simultaneously transmitted by DCP and shall be received by GPRS & GSM receiving station at State Data center Bidhannagar. Thereafter, both data shall be transmitted through internet to e-SWIS software for further processing in the form of reports/bulletins. The decoded and/or raw data along with reports /bulletins shall be sent to State Data Centre Bidhanagar through Internet and e-SWIS cloud. The necessary automated arrangement is to be made by bidder.

The Bidder shall provide one high end server with monitor and with online 3KVA UPS with power backup of 4 hour and one computer node at the Data Center, Bidhannagar. The all the consumables (including batteries) except cartridge papers shall be responsibility of the Bidder during the entire period of warranty.

The minimum specification of server, computer node is as below:

Hardware at state data center shall be provided by bidder which will mainly comprise of following major item:

a) Server with Monitor for reception of INSAT data transmitted through internet & GSM,GPRS data and Data storage of 8TB for 5 years
b) Computer Node (Workstation) with monitor report generation for operator
c) Necessary data switch, router and fire wall for maximum 8 mbps internet speed
d) 3KVA online UPS with 4 hours backup time
e) A3 Size Color printer
f) 55” LED display

13.1 Technical Specification:

The minimum specification of server, computer node are as below:

Data Center Computer Server		
No.	Item	**Technical Specification**
1	Form Factor	• Rack Mount Server
2	Processor	• Intel XEON or better (minimum 12 Core)
3	DIMM Memory	• Speed: 1600MT/s RDIMMS or better • 16 GB RDIMM, 1600MT/s, Low Volt, Dual Rank or similar
4	Hard Drive	• RAID 5 Software or Hardware Controller • 5 - 1TB 7.2K RPM Near-Line SAS 6Gbps 2.5in Hot-plug Hard Drive or similar
5	Network Adapter	• 1 Gb
6	Power Supply	• Dual, Hot-plug, Redundant Power Supply, 350W or similar
6	Electrical Supply	• 220V A/C
7	Devices	• Keyboard, • Mouse, • 22" monitor minimum
8	Software	• Windows Server 2012R2, latest MS office software &firewall system, with Good antivirusetc.
9	Accessories	• Power Cord • Rack Rail with cable management system • Power Points as needed • Computer Racks and related parts
10	Internet Connectivity	• Dual 1 Gbps Network port

13.2 Computer Node

Operating system	Windows 10 Home/Professional 64 bit
Chipset	Intel H270 and above or equivalent
Processor	Intel® Core™ i7-6700T with Intel® HD Graphics 530 (2.8 GHz, up to 3.6 GHz, 8 MB cache, 4 cores) and above or equivalent
Memory, standard	16GB DDR4and above or equivalent (RAM)
Hard drive description	1 TB 7200 rpm SATA or above
Display	58.42 cm(23) diagonal WLED-backlit (1920 x 1080). Touch-enabled (optional)
Optical drive	DVD-Writer
Network interface	Integrated 10/100/1000 Gigabit Ethernet LAN
Wireless	802.11b/g/n (1x1) and Bluetooth® 4.0 combo (Optional)
Port	4 USB 2.0; 2 USB 3.0; 1 headphone/microphone combo
Pointing device	USB wired/wireless optical mouse
Keyboard	USB wired/wireless standard keyboard
Pre-installed software	Preinstalled MS Office Lifetime with Good antivirus is preferred.

13.3 Printers Specifications

A3 size color printer shall be procured for State Data Center shall be procured from a reputed manufacturer.

i. A 3-color printer

ii. Functions: Print, Copy, Scan

iii. Printing Up to 20 page/minute

iv. Black & color printing: As fast as 9.5 sec per page

v. Recommended monthly page volume: 250 to 2000

vi. Processor speed: 600MHz

vii. Connectivity: e-Print capability

viii. Paper handling input, standard: 100 sheet input tray

ix. Paper handling output, standard: 100-sheet face-down bin

13.4 Display Unit (LED)

All display units shall be from reputed manufacturers

i) Screen Type: 55'' Screen LED backlight type.

ii) Display resolution: 1920 x 1080

iii) Colors: 256K colors

iv) Interfaces: 1 x Ethernet (RJ45) (max. 12Mbit/s) ,HDMI port,USB port 1 x USB Multimedia card / SD card slot combined.

v) Industrial Ethernet: 1 x Ethernet (RJ45)

vi) Protocols: Protocol (Ethernet) TCP/IP

vii) image formats Supported: JPEG, JPS, MPO

viii) Sound technology: Dolby digital

14. Training And Documentation

The Bidder is required to provide an extensive training programme for the system. Thetraining set forth in the following paragraphs is a minimum requirement and the bidder should propose any additional training that he considers critical for long term success of the system operations.

The Bidder is expected to provide an outline or table indicating the contents of each of the required courses. The table shall describe the specific topics to be covered for each day of the training period.

The Bidder is responsible for the salaries of the training instructors and all training materials. The costs of travel, transportation and per diem for the trainees shall be borne by the Purchaser.

Training shall be provided by the bidder in several phases. The training shall include both classroom and field trainings and will be continued during all five years. The bidder is required to have hydro-meteorological equipment specialists.

14.1 The Bidder shall provide trainings as training modules as part of the Tender given as under:

S. No.	Description	Numbers of training	Number of Participants per session
1	User Training Course for senior management. (one day)	3 (1 before/ during commissioning and2 during warranty)	10-15
2	Operation and Maintenance course (3 days). Course topics will include sensor calibration, data logger configuration, data downloading, data retrieval, collection, Trouble shooting, processing, maintenance requirements, and procedures for equipment configuration, installation, site testing and commissioning.	5 (2 before /during commissioning and 3during warranty period)	20-30

All aspects of the electrical, instrumentation and telemetry equipment being supplied shall be covered in the courses and full documentation shall be provided. The documentation and kits shall be got approved from purchaser in advance. The course shall provide detail documentation and shall ensure that the purchaser's personnel shall be able to modify settings/ parameters without reference back to the Supplier. The places / sites where this training will be held will be decided later by the purchaser.

The training course will take place as decided by the Purchaser. In case of formal training the Purchaser will provide classroom and other logistics. The Bidder will facilitate the professional and the training materiel. On-the-job training will be provided by the Bidder in conjunction with the installation of hydro-meteorological stations and during the course of maintenance as required.

14.2 TA/ DA of the trainees shall be borne by the purchaser.

14.3 Training kit containing course material in soft as well as hard copy shall be provided by the Bidder.

14.4 All logistical arrangement such as projector, training space etc. for training is to be made by purchaser.

15.0 Preventive Maintenance

The bidder shall be responsible for operation and maintenance of all stations /components of installations, commissioning, site acceptance and operation tests. All equipment maintenance cost, repairs, replacements and repairs to civil work shall be borne by the bidder during the warranty Period. The scope of O&M support would include all materials and services including replacement of components including batteries, mandatory spare parts required to ensure smooth and sustainable operations of the entire system. The bidder shall provide monthly maintenance reports during the course of maintenance. The bidder shall supply a Manual specifying all the faults experienced by the system together with an account of how such faults have been rectified.

The bidders shall ensure the following minimum visits at remote site for preventive maintenance. The bidder should take time stamped geo tagged photographs of the equipment during each maintenance visit(either scheduled or unscheduled visit). The photographs should show the condition of equipment before maintenance, during maintenance and after maintenance.

15.1 SCHEDULE SHOWING FREQUENCY OF SCHEDULED VISITS FOR ROUTINE AND PREVENTIVE MAINTENANCE

Sl. No.	Station Category	Minimum Preventive Visits	Remarks
1	Maintenance of data Server& allied equipment's in Data center	4	Every Quarter and also on need basis
2	Maintenance of Automated rainfall station (ARS) , **Evaporation- Pan** and (AWLR) Automated water level recorder Stations	4	One pre-monsoon, two in monsoon period and one in post monsoon and also on need basis
3	Maintenance of Automatic Weather Stations (AWS)&Gate position sensor	4	One pre-monsoon, two in monsoon period and one in post monsoon and also on need basis

15.2 Operation & Maintenance

Bidder shall provide at least one dedicated Service Engineer cum operator at the State Data Center for Operation of RTDAS system and ensure seamless data transfer from remote stations to ERS at Delhi/Jaipur/Burla& then to State data Center via internet & e-SWIS software and also GSM/GPRS data transmission as per technical specifications.

The Service Engineer shall have experience of working on Hydro met stations/ Instrumentation / SCADA system for period of at least 3 years and shall be well versed with Operation and Maintenance aspects of RTDAS systems.

Operation and Maintenance shall include free of cost repairs/ replacement of hardware and Software necessary to keep the system functional for the period of five years (warranty) from Date of Installation.

TECHNICAL RESPONSIVENESS FORM

Bidder shall furnish clause by clause commentary against the laid down technical specification and standards as per the format given below:

(A) Summary of Instructions

(i) Particulars of Manufacturer and local agent cum representative are to be given under rows Model and Address.

(ii) **All** entry boxes in column "**Specification and Standards as offered in by Bidder"** shall be filled-in accurately and comprehensively. Quantitative fields shall be filled in accurately. It is not acceptable to use 'Yes', No, Compliant or similar evading words. Following format is designed to help the Bidder to understand the requirements of the equipment being procured. The Bidder must describe in the format how his bid responds to the technical requirements of the equipment. Bidder to note that one or two-word responses (e.g. "Yes", "No" "will comply" or similar evading words) are normally not sufficient to confirm the responsiveness with the technical requirements, hence elaborate responses are sought from the bidders. **In case deviation on the following technical requirements of equipment is not as per the minimum criteria mentioned, the bids may be declared "non-responsive"**

(iii) Requested materials and information shall be enclosed with the bid and be unambiguously associated with instruments as offered in the bid

(iv) Negligence to comply with the instructions and requirements as stated above makes the bid liable to be rejected.

(v) Abbreviations: OD-Outer Diameter; ID-Inner Diameter; FS-Full Scale; Pa-Pascal (unit of pressure), RTDAS-Real time data acquisition system; DRS-Data Retrieval System, DCP- Data collection Platform, AWS- Automatic Weather Station, ARG- Automatic Rain Gauge, AWLR-Automatic Water Level Recorder.

(vi) Sample interval is the interval at which samples or sensor readings are taken. The recording /measurement interval defines the interval at which the data records are stored in memory. A data record can represent a single sample or the average of a number of samples. In particular the result of the wave suppression filter is a single record representing the average value of a number of samples.

B) Entries requiring special attention:

1) The proposed maintenance interval and the recommended spares as offered in the bid shall be based on instrument deployment history. The training proposal shall be based on experience in similar cases. Moreover, it shall consider the educational level and specialization of the trainees.

C) Bidder shall provide information in the formats given below:

i) Make/ Model/ Local Agent etc.:

Bidder	**AWLR make/ model**	**ARG make/model**	**AWS make/Model**	**Data Logger make/ model**	**Shaft encoder type Gate sensor make/model**	**Data Server make / Model**
Name / Complete Address/Website/Email	**Model:** **Manufacturer:** **Authorization:** Name: Place: Tel: Fax: E-mail: Web:	**Model:** **Manufacturer:** **Authorization:** Name: Place: Tel: Fax: E-mail: Web:	**Model:** **Manufacturer:** **Authorization:** Name: Place: Tel: Fax: E-mail: Web:	**Model:** **Manufacturer:** **Authorization:** Name: Place: Tel: Fax: E-mail: Web:	**Model:** **Manufacturer:** Name: Place: Tel: Fax: E-mail: Web:	**Model:** Name: Address: Tel: Fax: E-mail: Web:

ii)B Clause by Clause Commentary against laid down technical specifications:

1) Specifications of the RADAR Water Level Transmitter

Name of Goods-Its Features	Required Specifications and standards as per bidding document	Specification and standard as offered in by Bidder	Remarks
RADAR Level Sensor		**Make:** **Model:** Manufacturer Name, address, email, phone, website, fax	
Site Conditions			
Ambient Temperature	From -5 to +60 Degree Celsius		
Humidity	0 to 100 %		
Altitude	0 to 2500 meter		
Sensor			
Sensor Type	Microwave non-contact sensor		
Range	35meters		
Resolution	3 mm or better		
Accuracy	0.02 % FSO		
Output Interface	SDI-12 / RS-485 / 4-20mA		
Power Supply	To be powered by Solar Panel provided by bidder.		
Beam angle	Less than 16 degrees.		
General Features			
Material	Corrosion Resistance (Stainless steel / Aluminum PVC/ UV stabilized ABS with metal casing)		
Enclosure	The Sensor shall be easy to dismount and replace in the event of malfunction.		
Tools	Complete tool kit for operation and routine maintenance		
Manuals	Full Documentation and maintenance manual in English		
Accessories	Sensor Mounting support, cables and other accessories as required		
Protection	NEMA 4 or IP67 or better		
Horizontal Mounting/Installation Arrangements	Above FRL, Below a bridge girder wherever available otherwise horizontal cantilever arrangement from a mast/wall/pedestal to be provided		
Special Feature	Radar Sensor should have inbuilt diagnostic & averaging feature		

2) Automated weather station (AWS)sensors

Name of Goods-Its Features	Required Specifications and standards as per bidding document	Specification and standard as offered in by Bidder	Remarks
Site Conditions			
Ambient Temperature	From -5to +60^{o}C		
Humidity	5 to 100 %		

Altitude	0 to 2500 meter		
Air Temperature and Relative Humidity Sensor		**Make:** **Model:** Manufacturer Name, address, email, phone, website, fax	
Air Temperature Sensor			
Sensor Type	Platinum resistance or better or equivalent		
Range	-5 to 60 Degree Celsius		
Resolution	0.1ºC		
Accuracy	Within ±0.2ºC in the entire working range		
Response Time	10 sec or lesser		
Relative Humidity Sensor			
Sensor Type	Capacitive/ Solid State Humidity Sensor		
Range	0 to 100 %		
Resolution	1%		
Accuracy	±3% or better		
Response time	10 secs or lesser		
General			
Self-aspirated	To ensure continuous supply of air. Free from turbulence, water droplets and radiation		
Power Supply	To be powered by solar power provided by bidder.		
Accessories	All accessories for mounting the instrument at ~1.5mts height above the ground level e.g. special cross arm clamps or flag, if any shall be provided		
Output Interface	SDI-12/ RS-485/ Analog		
Wind Speed and Direction Sensor		**Make:** **Model:** Manufacturer Name, address, email, phone, website, fax	
Sensor Type	Ultrasonic sensor (No moving Parts)		
Range	0-60 m/s for speed and 0–360 degrees for direction or better		
Resolution	0.1m/s for Speed; ±1 degree for Direction		
Accuracy	Wind speed ±2% ± 0.1m/s (up to 20 m/s) and ±3%(for 20 to 60 m/s) Wind direction- ± 1ºor better		
Response time	Less than 1 second lag in operating range		
Mounting	All accessories for mounting the instrument at 10mts height above the ground level, e.g. special cross arm clamps or flag if any shall be provided.		
Output Interface	SDI-12 / RS-232/ RS-485		
Air Pressure Sensor		**Make:** **Model:** Manufacturer Name, address, email, phone, website, fax	
Sensor Type	Temperature Compensated		
Range	600 to 1100 hPa		
Resolution	± 0.1 hPa		

Accuracy	±0.2hPa		
Power Supply	To be powered by solar power provided by bidder		
Output Interface	SDI-12 / RS-232/ RS-485		
Solar Radiation Sensor		**Make:** **Model:** Manufacturer Name, address, email, phone, website, fax	
Sensor Type	Silicon Pyranometer		
Threshold	120 W/m2 of direct solar irradiance		
Methodology	Alternate shading of sensor to account for sky radiation or Sunshine duration shall be computed in datalogger		
Spectral Range	400nm to 1100 nm		
Range	0-2000 W/Square meter		
Resolution	1 W/Square meter		
Accuracy (Including Temperature Compensation)	3% or better		
General Features			
Material	Corrosion Resistance Metal (Stainless steel / Aluminum)		
Tools	Complete tool kit for operation and routine maintenance		
Manuals	Full Documentation and maintenance manual in English		
Accessories	All accessories for mounting the instrument at ~1.5mts height above the ground level e.g. special cross arm clamps or flag, if any, shall be provided.		
Output Interface	SDI-12/RS-485/ 4-20 mA/Analog		
Evaporation- Pan specification		**Make:** **Model:** Manufacturer Name, address, email, phone, website, fax	
Operating temperature	-5 to +60 degrees Celsius		
Humidity	5 to 100 %		
Sensor Type	Shaft Encoder / ultrasound radar / Float & pulley type As Specified by IS:5973 which known as the modified Class A Pan potentiometer		
Diameter of the pan	1.2 m or more		
Accuracy	± 1% FSO		
Resolution	1mm		
Power Supply	To be powered by solar power provided by bidder		
Accessories	As required for complete installation of the sensors and equipment		
Material	The pan is made of Copper or stainless steel sheet, tinned inside and painted white outside		
Covering	The top of the pan is covered with a hexagonal wire net of GI to protect water in the pan from birds		
Platform	Rot resistance, timber treated with creosote or other effective Wood preservative		

Measurement range	150 mm		
Output Interface	SDI-12 / RS-485 / 4-20 mA / Analog		

3. Automated Rain Gauge

Name of Goods-Its Features	Required Specifications and standards as per bidding document	Specification and standard as offered in by Bidder	Remarks
Automated Rain Gauge		**Make:** **Model:** Manufacturer Name, address, email, phone, website, fax	
Site Conditions			
Ambient Temperature	From -5to +60 Degree C		
Humidity	5 to 100 %		
Altitude	0 to 2500 meter		
Sensor			
Sensor Type	Tipping Bucket type with reed switch		
Range	250 mm/h or better		
Resolution	0.5 mm or better		
Accuracy	2% or better, ± 2 mm		
General Features			
Output Interface	SDI12/ RS-485 / 4-20 mA/Switch closure output		
Power Supply	To be powered by solar power provided by bidder		
Material	Corrosion Resistance Metal (Stainless steel/ Aluminum)		
Enclosure	NEMA 4 or IP65		
Tools	Complete tool kit for operation and routine maintenance		
Manuals	Full Documentation and maintenance manual in English		
Accessories	Sensor Mounting support, cables and other accessories as required		
Protection	Bidder shall provide spout filter and bird cage to prevent ingress of insects and debrisand with Bubble Spirit Level and adjustable legs for horizontal alignment of tipping bucket mechanism		
Certification	IMD/ WMO certification shall be provided.		

4.Specifications of Shaft Encoder type Gate Position Sensors(Shaft Encoder Type)

Name of Goods-Its Features	Required Specifications and standards as per bidding document	Specification and standard as offered in by Bidder	Remarks
Gate Position Sensors(Shaft Encoder Type)		**Make:** **Model:** Manufacturer Name, address, email, phone, website, fax	
Site Conditions			
Ambient Temperature	From -5 ºC to +60ºC		
Humidity	5 to 100 %		
Altitude	0 to 2500 meters		
Sensor			

Sensor Type	Shaft Encoder based rotaryoptical/magnetic Absolute encoderposition sensor		
Range	1-20 meters		
Resolution	3mm or less		
Accuracy	0.025 % FSO		
Output Interface	SDI-12 / RS-485 / 4-20 mA		
Hardware/ Ports/accessories	Communication ports compatible with data logger,		
General Features			
Power Supply	To be powered by Solar power system provided by bidder		
Material	Corrosion Resistance Metal (Stainless steel or Aluminium)		
Enclosure	Outdoor environment with corrosion resistant material Lockable (key) box provided by the supplier to be mounted on Gate /, with IP65 or better		
Tools	Complete tool kit for operation and routine maintenance		
Manuals	Full Documentation and maintenance manual in English		
Mounting	Wiring from sensor to Datalogger must be through HDPE/ GI Pipe Conducting and flexible metallic conduiting wherever applicable, Sensor mounting support/clamps, limit switches & cabling etc.		
Process connections	through suitable coupling		
Manufacturer's Calibration Certificate	Required		

5. Specifications of Data Logger with 8 AI channels

Name of Goods-Its Features	Required Specifications and standards as per bidding document	Specification and standard as offered in by Bidder	Remarks
Data Logger with 8 AI channels		**Make:** **Model:** Manufacturer Name, address, email, phone, website, fax	
Site Conditions			
Ambient Temperature	From -5to +60 Degree C		
Humidity	5 to 100 %		
Altitude	0 to 2500meter		

Sensor Interface			
Analogue Inputs	8-Analogue Input Channels 4 to 20 mA, 100% over range withstand (Analog input channels are required in datalogger, if any sensor offered by bidder requires Analog interface to integration with datalogger)		
SDI Port	One SDI-12 Interface port		
Serial Port for sensor interface	One RS-232 for sensor Interface One RS-485 for sensor Interface port		
Pulse Input	1Input for Rain Gauge impulse		
Input - Output Interfaces			
Data Transfer	USB stick option for Data transfer		
Port for Configuration	One Serial Port (RS-232/USB) for communication with Laptop for programming		
Port for Telemetry	2 Ports for Communication with Telemetry (GSM,GPRS and INSAT) device Both telemetry systems should work simultaneously for redundancy		
Display Port	Port for connecting external display screen for data in running text		
Computer Software			
Operating System	Windows software for system configuration / communication		
Version	English language version		
Licenses	All required licenses shall be included		
Analog to Digital Converter			
Resolution	16 bit or better		
Conversion Accuracy	± 1 LSB		
Sample intervals	1 Sec to 24 hours (user scalable)		
General Features			
Flash memory	Non-volatile Flash memory that can store one year of data and expandable upto minimum 1GB via. USB/SD card		
Resolution	A/D resolution ≥16 bit		
Recording Interval	Individual recording intervals for each sensor/parameter		
Firmware Operating System	Multi-tasking operating system - must log data and transmit at same time		
Display	Inbuilt Digital Display for viewing current data and setting values		
Power Supply	Shall be powered by solar Power supply to be provided by bidder with DCP, low current drain (quiescent ≤10.0mA)		
Battery Voltage	Monitoring of battery voltage level		
Internal battery	Internal battery backup for clock, lithium battery, storage 2 years		
Charge Controller	Internal or External		
User Permissions	Different user levels, system of user rights / passwords, access restricted to unauthorized personnel		

Internal clock	Internal clock with drift less than 1 second per Week		
Keypad	For displaying or transferring data to memory stick, configuration of data logger and sensors		
Real time clock	GPS synchronized & timing is required in IST format		
System integrity	System integrity check procedures		
Enclosure	for wall-mounting in a shelter / enclosure with IP65 (NEMA 4 or equivalent) protection or better		
Accessories	Serial cable + adaptor (if required for Notebook connection). All accessories (fixing units, etc.) as required		
Tools	complete tool kit for installation and routine maintenance giving full detail (number of pieces and type)		
Manuals	full documentation and maintenance instructions in English (1 copy per station).		
GSM /GPRS MODEM		**Make:** **Model:** Manufacturer Name, address, email, phone, website, fax	
Operating Temperature	From -5 to +60 ^{0}C		
Transmission System	GPRS/edge-based data transmission system		
Performance	Data Reception availability of 95% or better		
Form factor	The GSM /GPRS modem should either be integral part of data logger specified above, or it should be supplied as independent unit compatible with supplied data logger		
Specific Features			
Communication Direction	Utilize GPRS network for two-way connection with FTP,TCP/IP (INTERNET) connection and SMS		
Transmission trigger	Data collection to be triggered by interrogation from Data Center, or by event-based transmission triggered by remote site		
Power Saving	Ability to disable interrogation system in order to save power at remote site		
Communication Protocol	Data transmission to execute HTTP Post, FTP, SMS to transmit and receiving data to the Data Center		
Accessories	All associated equipment, including Antenna all cables and mounting hardware		
Antenna features			
Frequency range	900 MHz: 824-960 MHz/1800MHz:1710-1880 MHz, 4G and better		
Impedance	50 ohms		
VSWR	≤ 2.0		
Radiation	Omni-directional		
Operating temperature	-5 to + 60 degrees Celsius		

Connector	SMA or suitable RF connector adaptable to GSM/GPRS modem		
Cable length	As required at site		

6.Specifications of Data Logger with 2 AI Channel

Name of Goods-Its Features	Required Specifications and standards as per bidding document	Specification and standard as offered in by Bidder	Remarks
Data Logger with 2AI sensors		**Make:** **Model:** Manufacturer Name, address, email, phone, website, fax	
Site Conditions			
Ambient Temperature	From -5to +60 Degree C		
Humidity	5 to 100 %		
Altitude	0 to 2500meter		
Sensor Interface			
Analogue Inputs	2-Analogue Input Channels 4 to 20 mA, 100% over range withstand (Analog input channels are required in datalogger, if any sensor offered by bidder requires Analog interface to integration with datalogger)		
SDI Port	One SDI-12 Interface port		
Serial Port for sensor interface	One RS-232 / RS-485 for sensor Interface port		
Pulse Input	1 Input for Rain Gauge impulse		
Input - Output Interfaces			
Data Transfer	USB stick option for Data transfer		
Port for Configuration	One Serial Port (RS-232 /USB) for communication with Laptop for programming		
Port for Telemetry	2 Ports for Communication with Telemetry (GSM,GPRS and INSAT) device Both telemetry systems should work simultaneously for redundancy		
Display Port	Port for connecting external display screen for data in running text		
Computer Software			
Operating System	Windows software for system configuration / communication		
Version	English language version		
Licenses	All required licenses shall be included		
Analog to Digital Converter			
Resolution	16 bit or better		
Conversion Accuracy	± 1 LSB		
Sample intervals	1 Sec to 24 hours (user scalable)		
General Features			
Flash memory	Non-volatile Flash memory that can store one year of data and expandable upto minimum of 1 GB via. USB/SD card		

Resolution	A/D resolution ≥16 bit		
Recording Interval	Individual recording intervals for each sensor/parameter		
Firmware Operating System	Multi-tasking operating system - must log data and transmit at same time		
Display	Inbuilt Digital Display for viewing current data and setting values		
Power Supply	Shall be powered by solar Power supply to be provided by bidder with DCP, low current drain (quiescent ≤10.0mA)		
Battery Voltage	Monitoring of battery voltage level		
Internal battery	Internal battery backup for clock, lithium battery, storage 2 years		
Charge Controller	Internal or External		
User Permissions	Different user levels, system of user rights / passwords, access restricted to unauthorized personnel		
Internal clock	Internal clock with drift less than 1 second per Week		
Keypad	For displaying or transferring data to memory stick, configuration of data logger and sensors		
Real time clock	GPS synchronized & timing is required in IST format		
System integrity	System integrity check procedures		
Enclosure	for wall-mounting in a shelter / enclosure with IP65 (NEMA 4 or equivalent) protection or better		
Accessories	Serial cable + adaptor (if required for Notebook connection). All accessories (fixing units, etc.) as required		
Tools	complete tool kit for installation and routine maintenance giving full detail (number of pieces and type)		
Manuals	full documentation and maintenance instructions in English (1 copy per station).		
GSM /GPRS MODEM		**Make:** **Model:** Manufacturer Name, address, email, phone, website, fax	
Operating Temperature	From -5 to +60 ^{o}C		
Transmission System	GPRS/edge-based data transmission system		
Performance	Data Reception availability of 95% or better		
Form factor	The GSM /GPRS modem should either be integral part of data logger specified above, or it should be supplied as independent unit compatible with supplied data logger		
Specific Features			
Communication Direction	Utilize GPRS network for two-way connection with FTP, TCP/IP (INTERNET) connection and SMS		
Transmission trigger	Data collection to be triggered by interrogation from Data Center, or by event-based transmission triggered by remote site		

Power Saving	Ability to disable interrogation system in order to save power at remote site		
Communication Protocol	Data transmission to execute HTTP Post, FTP, SMS to transmit and receiving data to the Data Center		
Accessories	All associated equipment, including Antenna all cables and mounting hardware		
Antenna features			
Frequency range	900 MHz: 824-960 MHz/1800MHz:1710-1880 MHz, 4G and better		
Impedance	50 ohms		
VSWR	≤ 2.0		
Radiation	Omni-directional		
Operating temperature	-5 to +60 degrees Celsius		
Connector	SMA or suitable RF connector adaptable to GSM/GPRS modem		
Cable length	As required at site		

6 Specifications of LED Running Text Display Unit

Name of Goods-Its Features	Required Specifications and standards as per bidding document	Specification and standard as offered in by Bidder	Remarks
LED Running Text Display Unit		**Make:** **Model:** Manufacturer Name, address, email, phone, website, fax	
Site Conditions			
Ambient Temperature	From -5 to +60 ^{0}C		
Humidity	5 to 100 %		
Altitude	0 to 2500 meter		
Gen			
Size	4’ (W) X 7” (H) or better		
Pixel Pitch	8 mm or narrower		
Maximum brightness	2000 cd/m2 meter		
Colour	Red / Amber		
Viewing Distance	≥10m		
Optimum View Angle	Horizontal 120°; Vertical 60°		
Ingression proof	IP 65 or better		
Text Lines	One Line display		
Refresh rate	300 to 2000 hertz		
Input Voltage	220 ± 20 Volt AC		

LED life	50,000 hours or better		
Communication Port	Digital port RS-485 or RS-232 (user settable) Display unit should be interface with display port of RTDAS datalogger to display the Hydro-Meteorological Data string in running text with user selectable speed.		
Programming	Configuration Through software to be part of supply		

Specifications of INSAT Radio

Name of Goods-Its Features	Required Specifications and standards as per bidding document	Specification and standard as offered in by Bidder	Remarks
INSAT Transmitter Radio		**Make:** **Model:** Manufacturer Name, address, email, phone, website, fax	
Operating Temperature	From -5to +60^{0}C		
Environment Relative Humidity	0 to 100 %		
Career Frequency	402 – 403 MHz		
Carrier Settability	In steps of 100Hz from 402.0 MHz to 403.0 MHz		
Modulator	PCM/BPSK		
Data coding	NRZ (L)		
Output Power	3-10Watt, user settable		
Data Bit Rate	4.8 kbps		
Frequency Stability			
a) Long Term drift	Transmit frequency inaccuracy including aging of oscillator should not exceed ±400Hz per year. Oscillators/synthesizer should have provision to adjust for the long-term drift.		
for temperature	±1ppm or better (-40 to +55 degree Celsius)		
Signal Bandwidth	6.0 KHz maximum or better		
Power Stability	±1dB		
Spurious	-60dB or better		
Harmonics	-40dB or better		
Antenna cable	LMR 400 grade or better		
Performance	Data Reception availability of 99% or better		
Form factor	The Transmitter should either be integral part of data logger specified above, or it should be supplied as independent unit compatible with supplied data logger		
Operating Power	Switched 12V DC controlled by data logger		
Yagi Antenna		**Make:** **Model:** Manufacturer Name, address, email, phone, website, fax	
Polarization	LHCP or RHCP, switchable in field		
Gain	Minimum 11 dBi or better		
Center Frequency	402-403 MHz		
3dB Beam width	40°		

VSWR	1.2 : 1		
Impedance	50 ohms		
Axial Ratio	To be specified by tenderer		
Operating temperature	-5°C to +60°C		
Operating Relative Humidity	0 to 100% RH		
Size	Small, portable		
Operating rain rate	100 mm/hr and water proof		
Mounting	Proper mounting and Pointing arrangement for 360-degree azimuth and elevation adjustment		
Operating Wind speed	250 kmph		
Wind Survival	300 kmph		
Material	Rust-proof and Oxidation-proof		
Specific Features			
Satellite System	INSAT Radio System to be Used on the INSAT Satellite operated by ISRO		
Certification	Certificate of acceptance required by ISRO and / or IMD as part of the bid package		
Accessories	All associated equipment, including GPS, GPS Antenna, INSAT Antenna, all cables and mounting hardware		
TDMA Transmission Format	As specified in the table for channel specifications for TDMA transmission format		
GPRS / GSM transmission format	As specified in the table for GSM /GPRS communication format		

8. Specifications of Solar Power Supply System

Name of Goods-Its Features	Required Specifications and standards as per bidding document	Specification and standard as offered in by Bidder	Remarks
Battery		**Make:** **Model:** Manufacturer Name, address, email, phone, website, fax	
Voltage	From 0 to +60 V / as compatible with DCP and all sensors		
Type	Sealed maintenance free		
Capacity	Based on site conditions and telemetry method, power supply system shall provide 15 days of backup to all equipment's being powered up by the solar panel		
Solar Panel		**Make:** **Model:** Manufacturer Name, address, email, phone, website, fax	

Size	Based on site conditions and telemetry method, power supply system shall provide 15 days of backup to all equipment's being powered up by the solar panel		
Mounts	The mounts should sturdy in design and be detachable but should not move or rotate with wind. It should have a provision to adjust direction and elevation during installation for optimal solar power generation		
Charger	Smart solar charger with protection shall be provided by the bidder		

9. Specifications of Data Server

Name of Goods- Its Features	Required Specifications and standards as per bidding document	Specification and standard as offered in by Bidder	Remarks
Data Server with Monitor		**Make:** **Model:** Manufacturer Name, address, email, phone, website, fax	
Form Factor	Rack Mount Server		
Processor	Intel XEON or better (minimum 12 Core)		
DIMM Memory	• Speed: 1600MT/s RDIMMS or better 16 GB RDIMM, 1600MT/s, Low Volt, Dual Rank or similar		
Hard Drive	• RAID 5 Software or Hardware Controller5 - 1TB 7.2K RPM Near-Line SAS 6Gbps 2.5in Hot-plug Hard Drive or similar		
Optical drive	• DVD-Writer		
Network Adapter	1 Gb		
Power Supply	Dual, Hot-plug, Redundant Power Supply, 350W or similar		
Electrical Supply	220V A/C		
Devices	• Keyboard, • Mouse, 22" monitor minimum		
Software	Windows Server 2012R2, latest MS office software &firewall system, with Good antivirus etc.		
Accessories	• Power Cord • Rack Rail with cable management system • Power Points as needed Computer Racks and related parts		
Internet Connectivity	Dual 1 Gbps Network port		

10. Specification of Computer Node(Workstation)

Name of Goods- Its Features	Required Specifications and standards as per bidding document	Specification and standard as offered in by Bidder	Remarks
Computer Node with Monitor(Separate Make and model name for each require)		**Make:** **Model:** Manufacturer Name, address, email, phone, website, fax	
Operating system	Windows 10 Home/Professional 64 bit		
Chipset	Intel H270 and above or equivalent		

Processor	Intel® Core™ i7-6700T with Intel® HD Graphics 530 (2.8 GHz, up to 3.6 GHz, 8 MB cache, 4 cores) and above or equivalent		
Memory, standard	16GB DDR4and above or equivalent (RAM)		
Hard drive description	1 TB 7200 rpm SATA and above		
Display	58.42 cm(23) diagonal WLED-backlit (1920 x 1080). Touch-enabled (optional)		
Optical drive	DVD-Writer		
Network interface	Integrated 10/100/1000 Gigabit Ethernet LAN		
Wireless	802.11b/g/n (1x1) and Bluetooth® 4.0 combo (Optional)		
Port	4 USB 2.0; 2 USB 3.0; 1 headphone/microphone combo		
Pointing device	USB wired/wireless optical mouse		
Keyboard	USB wired/wireless standard keyboard		
Pre-installed software	Preinstalled MS Office Lifetime with Good antivirus is preferred.		

11. Specifications of A3 Size Color printer

Required Specification and Standards as per Bidding Document	**Specification and Standards as offered in by Bidder**	**Remarks**
A3 Size Color printer	**Make:** **Model:** Manufacturer Name, address, email, phone, website, fax	
Functions: Print, Copy, Scan		
Printing Up to 20 page/minute		
Black & color printing: As fast as 9.5 sec per page		
Tonner capacity : Up to 8000 pages printing		
Recommended monthly page volume: 250 to 2000		
Processor speed: 600MHz		
Connectivity: e-Print capability		
Paper handling input, standard: 100 sheet input trays		
Paper handling output, standard: 100-sheet face-down bin		

13 .Specifications of Industrial Grade Display Unit (LED)

Required Specification and Standards as per Bidding Document	**Specification and Standards as offered in by Bidder**	**Remarks**
55" Display Unit (LED)	**Make:** **Model:** Manufacturer Name, address, email, phone, website, fax	
Screen Type: 55'' Screen LED backlight type		

Display resolution: 1920 x 1080		
Colors: 256K colors		
Interfaces: 1 x Ethernet (RJ45) (max. 12Mbit/s), HDMI port, USB port 1 x USB Multimedia card / SD card slot combined		
Industrial Ethernet: 1 x Ethernet (RJ45)		
Protocols: Protocol (Ethernet) TCP/IP		
image formats Supported: JPEG, JPS, MPO		
Sound technology: Dolby digital		

Drawings

List of Drawings		
Drawing No.	**Name**	**Purpose**
1	Location of Proposed Rain Gauge Stations	Index Map
2	Location of Proposed River Gauge Stations	Index Map
3	Location of Major Reservoirs	Index Map
4	Typical Fencing Enclosure for ARG/AWS	Security Arrangement
5	Typical AWLR Support for River Bank	Installation Arrangement
6	Typical Solar Panel Support and AWLR Radar Support on Bridge	Installation Arrangement

Fig 1: Location of Proposed Rain Gauge Stations

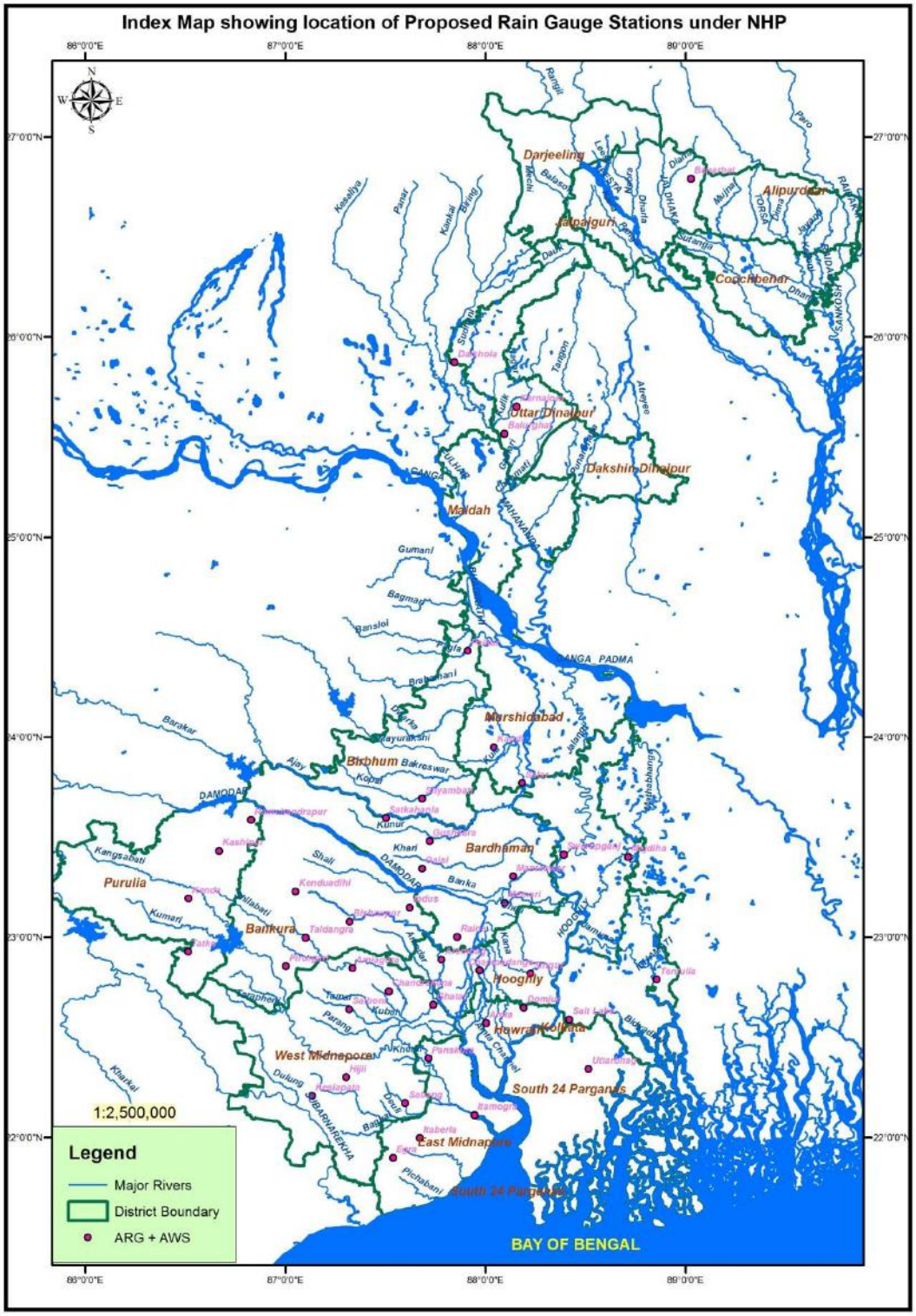


Fig 2: Location of Proposed River Gauge Stations

Index Map showing location of Proposed River Gauge Stations under NHP

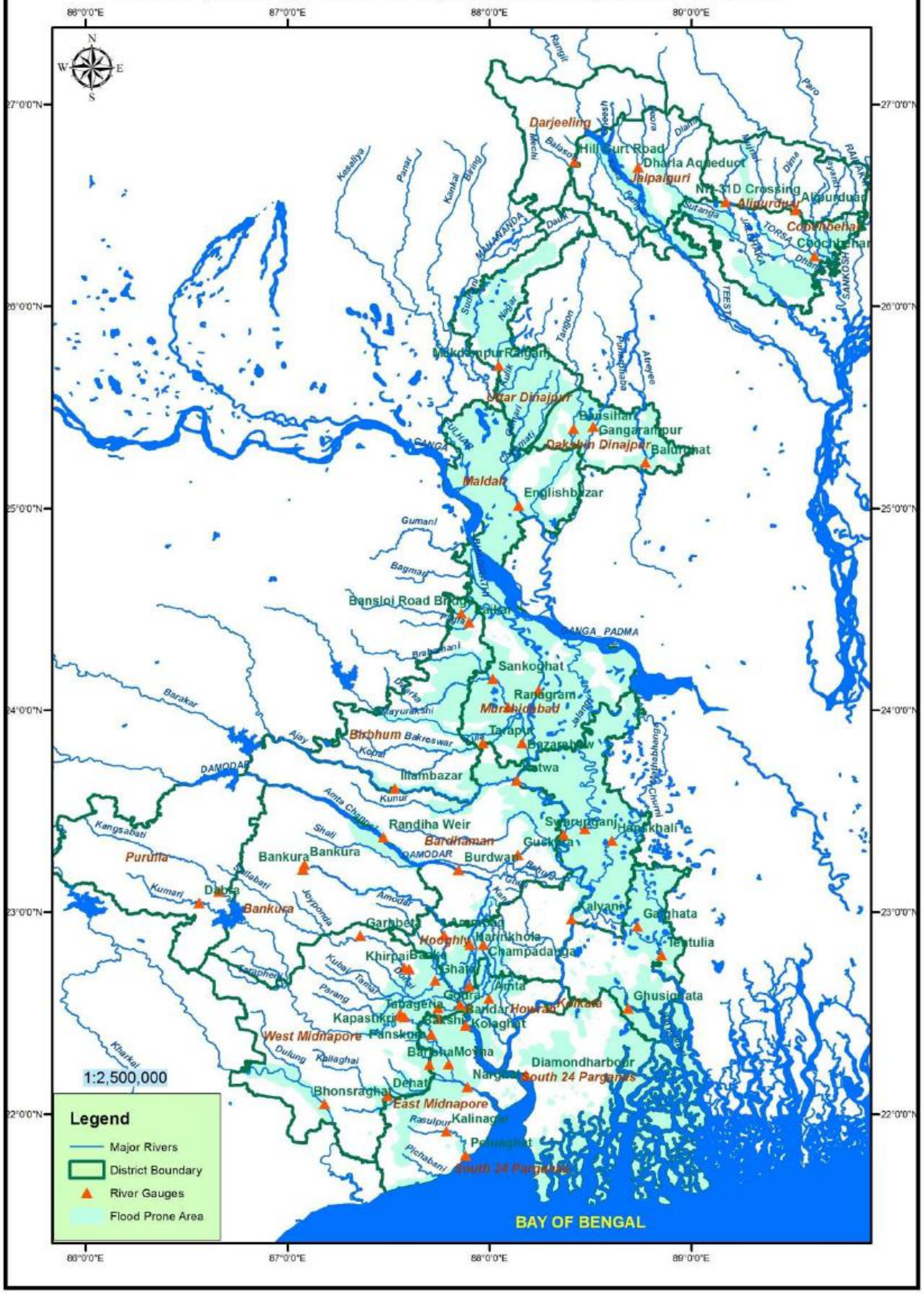
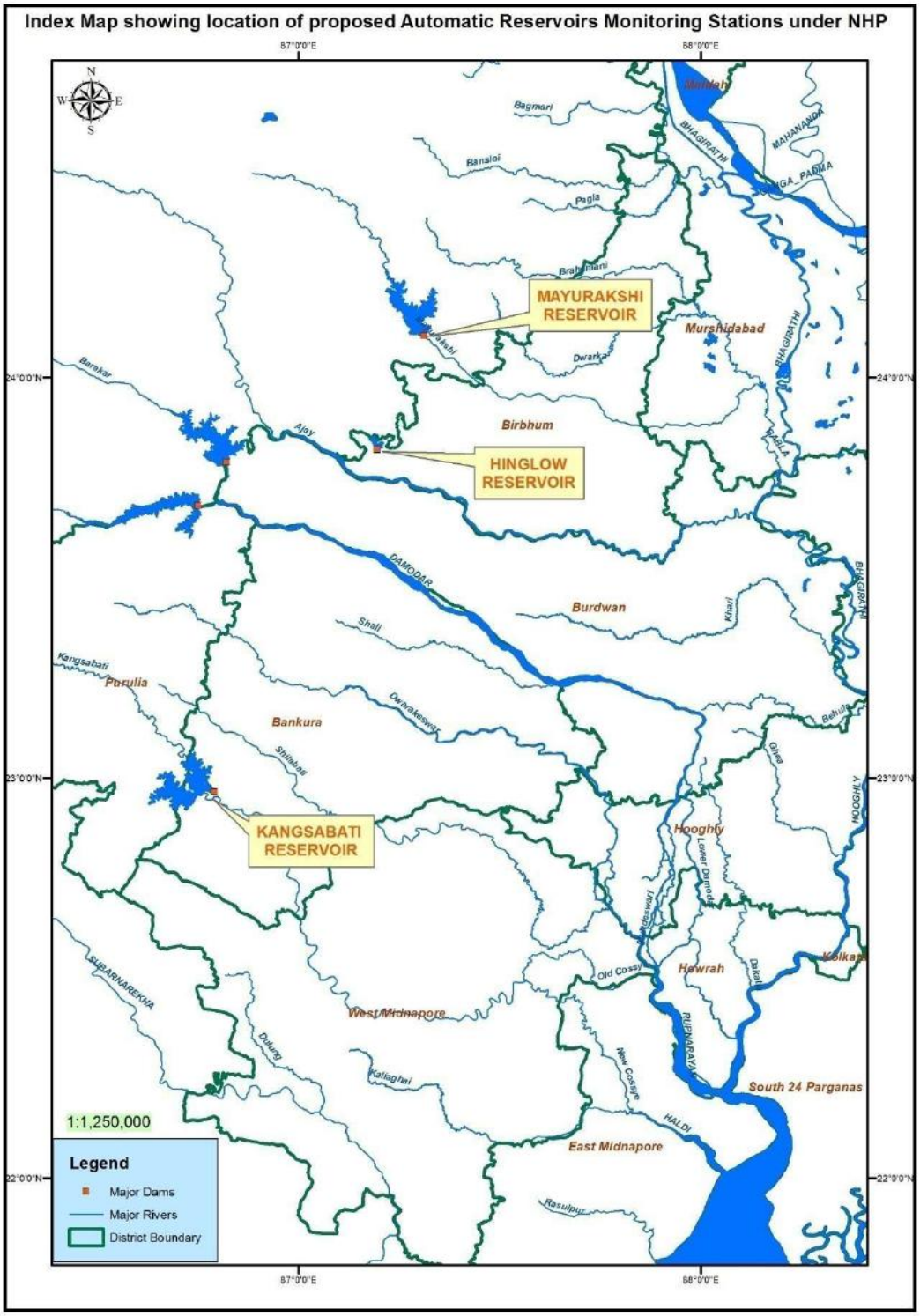


Fig 3: Location of Major Reservoirs



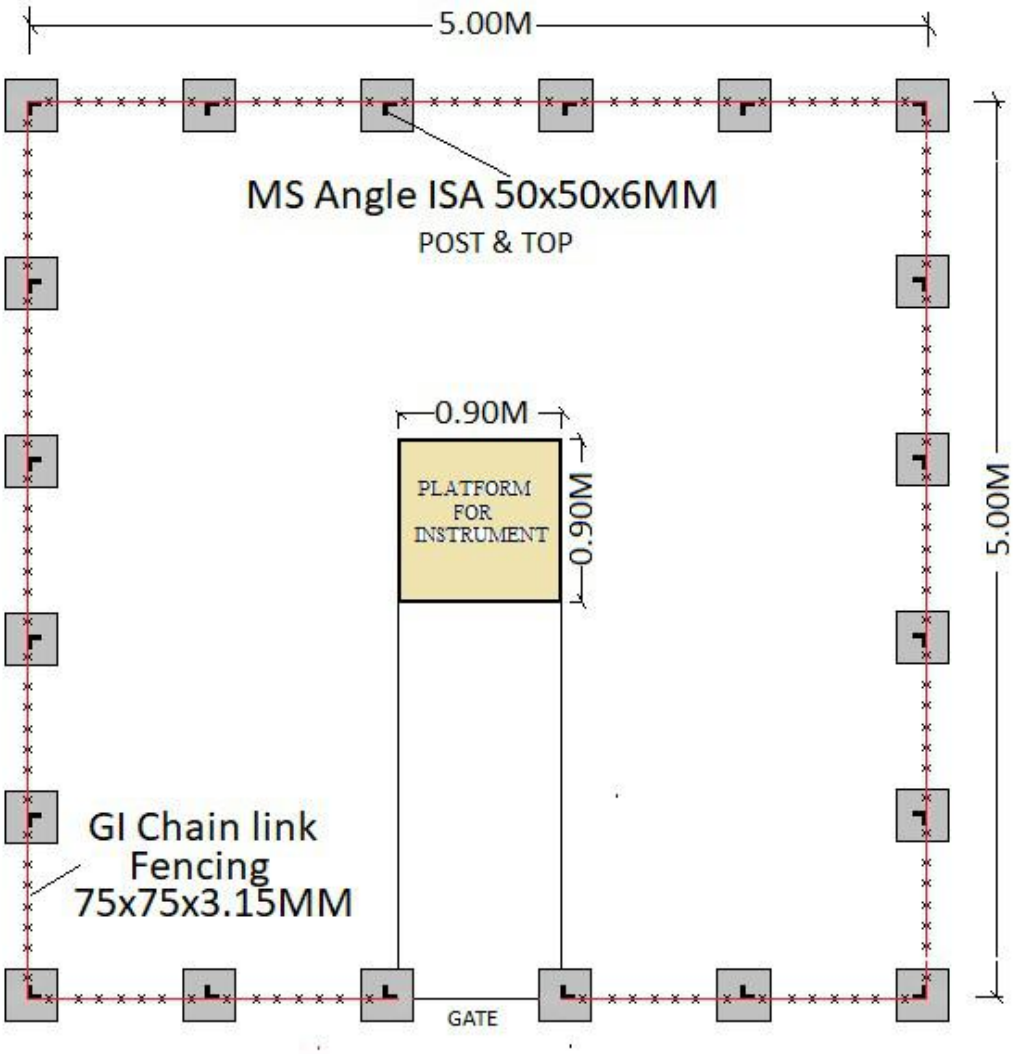


Fig 4: Typical Fencing Enclosure for ARG/AWS

(SIZE 5.00Mx5.00Mx1.00M)

Fig 5: Typical AWLR Support for River Bank

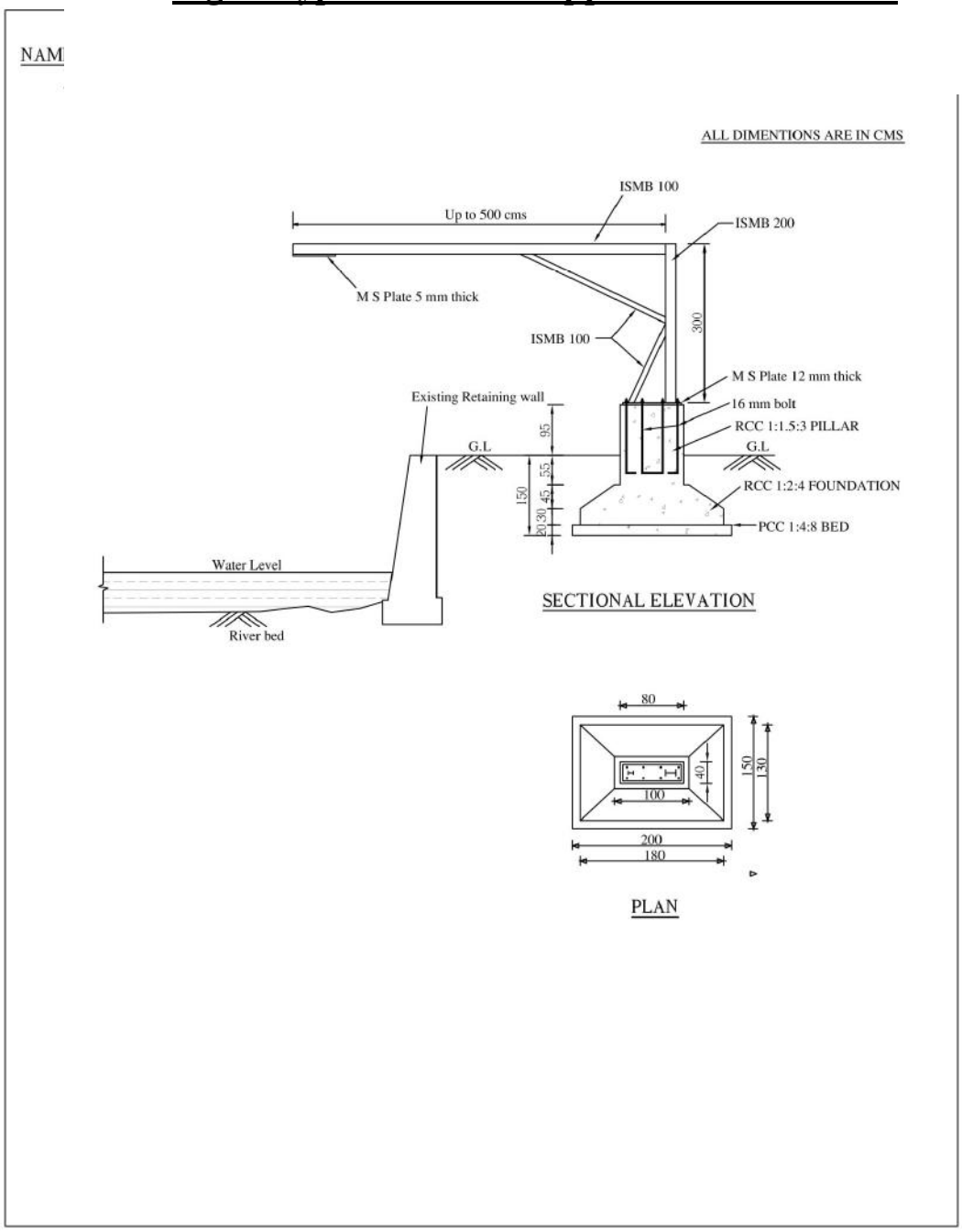
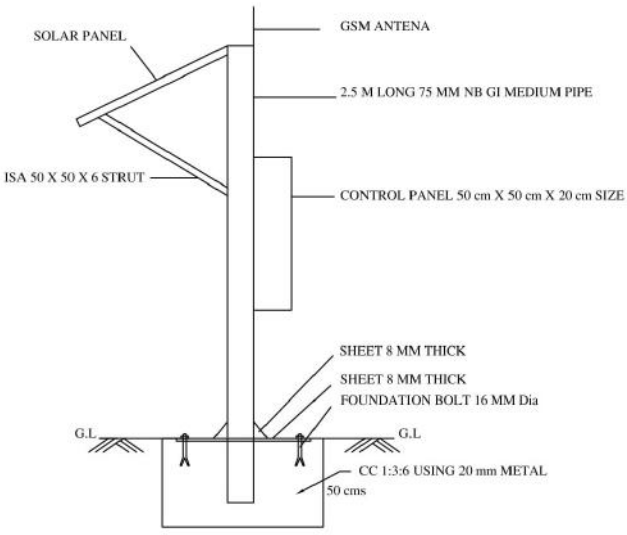
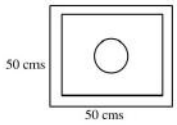


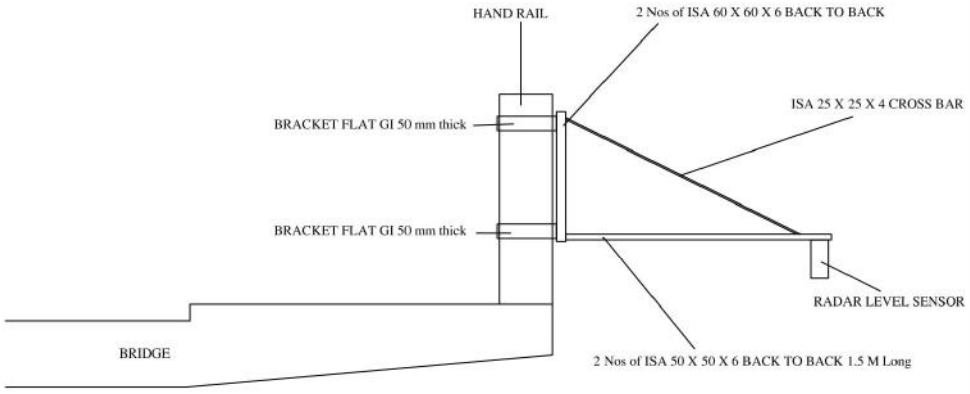
Fig 6: Typical Solar Panel Support and AWLR Radar Support on Bridge



CONTROL PANEL AND SOLAR PANEL FRAMING DETAILS



PLAN OF FOUNDATION



RADAR SENSOR FARMING TO BRIDGE DETAILS

Format for Quoting Rates for the work "Supply, installation, testing, commissioning and maintenance of Real Time Data Acquisition System (RTDAS) with Telemetry of Irrigation and Waterways Department , GoWB , under National Hydrology Project (NHP) and integrate with State Data Center located at Kolkata , W.B."

NIQ No. : WBIW/NHP/NIQ- 04 /2019-20

Name of Agency with Address :

A. PRICE SCHEDULE FOR SUPPLY OF GOODS AS PER SCHEDULE OF REQUIREMENT

Sl No.	Description of Work	Quantity	Unit	Unit Price EXW per line item including inland transportation , insurance and other services, including all incidental charges excluding GST required to convey the Goods to their final destination	Total GST payable per item
PRICE SCHEDULE FOR SUPPLY OF GOODS AS PER SCHEDULE OF REQUIREMENT					
1	**(ARG) RTDAS Station of I&WDWEST BENGAL**				
1a	Automated Rain Gauge (ARG) Stations Equipment set with necessary hardware as per technical specifications.	41	Nos.		
1b	Data Logger with 2 AI channels sensor input type, with INSAT, GSM& GPRS based telemetry includingantenna and all necessary equipment for data transmission as per technical specifications.	41	Nos.		
1c	Solar panel with all connectors, cables and conduit for cables as per technical specifications.	41	Nos.		
1d	Battery, charger regulator with all interconnecting connectors, cables for DCP as per technical specifications	41	Nos.		
1e	NEMA4X OR Equivalent Enclosure box to suit master unit equipment with locking, other ancillary equipment, fittings earthling, lightening arrestor with all connectors, cables and conduit for cables, mast to mount DCP, sensor mount complete as per technical specifications	41	Nos.		
2	**(AWS) RTDAS Station of I&WD WEST BENGAL**				
2a	Automated Rainfall Stations (ARS) Sensor Equipment set necessary hardware as per technical specifications.	3	Nos.		
2b	Air Temperature & Relative Humidity sensor, cable with Radiation shield, Equipment set necessary hardware as per technical specifications	3	Nos.		

2c	Wind speed & wind direction sensor and cable set necessary hardware as per technical specifications	3	Nos.		
2d	Atmospheric Pressure sensor and cable set necessary hardware as per technical specifications	3	Nos.		
2e	Solar Radiation sensor and cable set necessary hardware as per technical specifications	3	Nos.		
2f	Automated pan evaporimeterEquipment set necessary hardware as per technical specifications	3	Nos.		
2g	Data Logger with 8 AI channels with INSAT, GSM &GPRS based telemetry including antenna and all necessary equipment for data transmission as per technical specifications.	3	Nos.		
2h	Solar panel with all connectors, cables and conduit as per technical specifications	3	Nos.		
2i	Battery, charger regulator with all interconnecting connectors, cables for DCP as per technical specifications	3	Nos.		
2j	NEMA4X OR Equivalent Enclosure box to suit master unit equipment with locking, other ancillary equipment, fittings earthling, lightening arrestor with all connectors, cables and conduit for cables, 10mts tower with guy rope to mount DCP, sensor mount complete as per technical specifications	3	Nos.		
3	**(AWLR) RTDAS Station of I&WD WEST BENGAL**				
3a	Automated Water Level Recorder (non-contact RADAR) for River /Canal/Reservoir having 35m range with all necessary hardware as per technical specifications	56	Nos.		
3b	Data Logger with2 AI channels with INSAT, GSM& GPRS based telemetry including antenna and all necessary equipment for data transmission as per technical specifications.	56	Nos.		
3c	Solar panel with all connectors, cables and conduit as per technical specifications	56	Nos.		
3d	Battery, charger regulator with all interconnecting connectors, cables for DCP as per technical specifications	56	Nos.		
3e	NEMA4X OR Equivalent Enclosure box to suit master unit equipment with locking, other ancillary equipment, fittings earthling, lightening arrestor with all connectors, cables and conduit for cables, mast to mount DCP,sensor mount complete as per technical specifications	56	Nos.		
4	**(AWLR+ Gate Sensors) RTDAS Station of I&WD WEST BENGAL Hinglow Reservoir (Hinglow Dam)**				
4a	Automated Water Level Recorder(non-contactRADAR) for River /Canal/Reservoir having 35m range with all necessary hardware as per technical specifications	1	Nos.		

4b	Shaft Encoder based rotary position Type Gate Position Sensors for indication and monitoring of Spillway gates, Intake Gates, Silt flushing gates including cabling& conduits as per technical specifications	11	Nos.		
4c	Data Logger with 8 AI channels with INSAT, GSM &GPRS based telemetry including antenna and all necessary equipment for data transmission as per technical specifications	2	Nos.		
4d	Solar panel with all connectors, cables and conduit as per technical specifications	2	Nos.		
4e	Battery, charger regulator with all interconnecting connectors, cables for DCP as per technical specifications	2	Nos.		
4f	NEMA4X OR Equivalent Enclosure box to suit master unit equipment with locking, other ancillary equipment, fittings earthling, lightening arrestor with all connectors, cables and conduit for cables, mast to mount DCP, sensor mount complete as per technical specifications	2	Nos.		
4g	LED Running Text Display unit to be integrated with RTDAS datalogger to display the Hydro-met Data string in running text for indoor and outdoor application with cable, fixing arrangement, accessories complete as technical per specifications	1	Nos.		
5	**(AWLR+ Gate Sensors)RTDAS Station of I&WD WEST BENGAL Kangsabati Reservoir (Mukutmanipur Dam)**				
5a	Automated Water Level Recorder (non-contact RADAR) for River/Canal/Reservoir having 0-35m range with all necessary hardware as per technical specifications	1	Nos.		
5b	Shaft Encoder based rotary position Type Gate Position Sensors for indication and monitoring of Spillway gates/Intake Gates/ Silt flushing gates including cabling & integration with datalogger as per technical specifications.	16	Nos.		
5c	Shaft Encoder based rotary position Type Gate Position Sensors for indication and monitoring of Spillway gates/Intake Gates/ Silt flushing gates including cabling & integration with datalogger as per technical specifications.	1	Nos.		
5d	Data Logger with 8 AI channels with INSAT, GSM & GPRS based telemetry includingantennaandall necessary equipment for data transmission as per technical specifications.	2	Nos.		
5e	Solar panel with all connectors, cables and conduit as per technical specifications	3	Nos.		
5f	Battery, charger regulator with all interconnecting connectors, cables for DCP as per technical specifications	3	Nos.		

5g	NEMA4X OR Equivalent Enclosure box to suit master unit equipment with locking, other ancillary equipment, fittings earthling, lightening arrestor with all connectors, cables and conduit for cables, mast to mount DCP, sensor mount complete as per technical specifications	3	Nos.		
5h	LED Running Text Display unit to be integrated with RTDAS datalogger to display the Hydro-met Data string in running text for indoor and outdoor application with cable, fixing arrangement, accessories complete as technical per specifications	1	Nos.		
6	**Set of Data Center Equipment to collect and store the data received from proposed DCPs established across the state of West Bengal to the central data center located at Bidhannagar, Kolkata**				
6a	Server along with server rack, Monitorand 3 KVA online UPS as per technical specifications	1	Nos.		
6b	Computer Node (Workstation) along with Monitor and necessary accessories as per technical specifications	1	Nos.		
6c	IT Hardware which includes required Static IP, Router, Switch, firewall system and A3 colour printer as per technical specifications and necessary accessories.	1	Nos.		
6d	55" LED Display System as per technical specifications	1	Nos.		
6e	High speed synchronous internet connection (min. 8 mbps upload and 8 mbps download) for five years.	1	Nos.		
6f	GSM & GPRS data receiving system with all ancillary equipment, as per technical specifications.	1	Nos.		
B. PRICE AND COMPLETION SCHEDULE - RELATED SERVICES					
Sl No.	**Description of Work**	**Quantity**	**Unit**	**Unit price (excluding GST)**	**Total GST and other taxes payable per item**
SERVICES					
Installation of the systems including civil works which also include Performance and supervision of the on-site assembly and/or start-up of the supplied Goods					
S-1	**(ARG) RTDAS Station of I&WD WEST BENGAL**				
S-1a	Installation testing & Commissioning of Automated Rain Gauge (ARG) Stations Equipment set with necessary hardware including associated civil works as per technical specifications.	41	Nos.		

S-1b	Installation testing & Commissioning of Data Logger with 2 AI channels with INSAT, GSM & GPRS based telemetry including antenna and all necessary equipment for data transmission as per technical specifications.	41	Nos.		
S-1c	Installation testing & Commissioning of solar panel with all connectors, cables and conduit as per technical specifications	41	Nos.		
S-1d	Installation testing & commissioning of Battery, charger regulator with all interconnecting connectors, cables for DCP as per technical specifications	41	Nos.		
S-1e	Installation testing & commissioning of NEMA4X OR Equivalent Enclosure box to suit master unit equipment with locking, other ancillary equipment, fittings earthling, lightening arrestor with all connectors, cables and conduit for cables, mast to mount DCP, sensor mount complete as per technical specifications	41	Nos.		
S-1f	Installation of Chain link Fencing (5m*5m) *2m including associated civil works for independent ARG sensors (line item no. S-1) only, along with lockable gates for external protection of ARG and DCP at remote stations as mentioned in Schedule of Requirements.	41	Nos.		
S-2	**(AWS) RTDAS Station of I&WD WEST BENGAL**				
S-2a	Installation testing & Commissioning of Automated Rainfall Stations (ARS) Sensor Equipment set necessary hardware as per technical specifications.	3	Nos.		
S-2b	Installation testing & Commissioning of Air Temperature & Relative Humidity sensor, cable with Radiation shield, Equipment set necessary hardware as per technical specifications	3	Nos.		
S-2c	Installation testing & Commissioning of Wind speed & wind direction sensor and cable set necessary hardware as per technical specifications	3	Nos.		
S-2d	Installation testing & Commissioning of Atmospheric Pressure sensor and cable set necessary hardware as per technical specifications	3	Nos.		
S-2e	Installation testing & Commissioning of Solar Radiation sensor and cable set necessary hardware as per technical specifications	3	Nos.		
S-2f	Installation testing & Commissioning of Automated pan evaporimeter Equipment set necessary hardware as per technical specifications	3	Nos.		
S-2g	Installation testing & Commissioning of Data Logger with 8 AI channels with INSAT, GSM & GPRS based telemetry including antenna and all necessary equipment for data transmission as per technical specifications.	3	Nos.		

S-2h	Installation testing & Commissioning of solar panel with all connectors, cables and conduit for cables as per technical specifications	3	Nos.		
S-2i	Installation testing & commissioning of Battery, charger regulator with all interconnecting connectors, cables for DCP as per technical specifications	3	Nos.		
S-2j	Installation testing & commissioning of NEMA4X OR Equivalent Enclosure box to suit master unit equipment with locking, other ancillary equipment, fittings earthling, lightening arrestor with all connectors, cables and conduit for cables, 10mts tower with guy rope to mount DCP, sensor mount complete as per technical specifications	3	Nos.		
S-2k	Installation of Chain Link Fencing (10m*10m) *2m including associated civil works for independent AWS stations (line item no. S-2) only, along with lockable gates for external protection of AWS and DCP at remote stations as mentioned in Schedule of Requirements.	3	Nos.		
S-3	**(AWLR) RTDAS Station of I&WD WEST BENGAL**				
S-3a	Installation testing & Commissioning of Automated Water Level Recorder (non-contact RADAR) for River /Canal/Reservoir having 35m range with all necessary hardware including associated civil works & mounting arrangements as per technical specifications.	56	Nos.		
S-3b	Installation testing & Commissioning of Data Logger with 2 AI channels with INSAT, GSM & GPRS based telemetry including antenna and all necessary equipment for data transmission as per technical specifications.	56	Nos.		
S-3c	Installation testing & Commissioning of solar panel with all connectors, cables and conduit as per technical specifications	56	Nos.		
S-3d	Installation testing & commissioning of Battery, charger regulator with all interconnecting connectors, cables for DCP as per technical specifications	56	Nos.		
S-3e	Installation testing & commissioning of NEMA4X OR Equivalent Enclosure box to suit master unit equipment with locking, other ancillary equipment, fittings earthling, lightening arrestor with all connectors, cables and conduit for cables, mast to mount DCP, sensor mount complete as per technical specifications	56	Nos.		
S-4	**(AWLR+ Gate Sensors) RTDAS Station of I&WD WEST BENGAL Hinglow Reservoir (Hinglow Dam)**				

S-4a	Installation testing & Commissioning of Automated Water Level Recorder (non-contact RADAR) for River /Canal/Reservoir having 35m range with all necessary hardware including associated civil works& mounting arrangements as per technical specifications.	1	Nos.		
S-4b	Installation testing & Commissioning of Shaft Encoder based rotary position type, Gate Position Sensors for indication and monitoring of Spillway gates, Intake Gates, Silt flushing gates including cabling as per technical specifications.	11	Nos.		
S-4c	Installation testing & Commissioning of Data Logger 8 AI channels with INSAT, GSM & GPRS based telemetry including antenna and all necessary equipment for data transmission as per technical specifications.	2	Nos.		
S-4d	Installation testing & Commissioning of solar panel, charger regulator, batteries, earthing&lightening arrestor with all connectors, NEMA4X box to suit master unit with locking, cables and conduit for cables, mast & associated Civil works to mount DCP as per technical specifications.	2	Nos.		
S-4e	Installation testing & commissioning of Battery, charger regulator with all interconnecting connectors, cables for DCP as per technical specifications	2	Nos.		
S-4f	Installation testing & commissioning of NEMA4X OR Equivalent Enclosure box to suit master unit equipment with locking, other ancillary equipment, fittings earthling, lightening arrestor with all connectors, cables and conduit for cables, mast to mount DCP, sensor mount complete as per technical specifications	2	Nos.		
S-4g	Installation, Testing & Commissioning of LED Running Text Display unit to be integrated with RTDAS datalogger to display the Hydro-met Data string in running text for indoor and outdoor application with cable, fixing arrangement, accessories complete as technical per specifications	1	Nos.		
S-5	**(AWLR+ Gate Sensors)RTDAS Station of I&WD WEST BENGAL Kangsabati Reservoir (Mukutmanipur Dam)**				
S-5a	Installation testing & Commissioning of Automated Water Level Recorder (non-contact RADAR) for River /Canal/Reservoir having 35m range with all necessary hardware including associated civil works& mounting arrangements as per technical specifications.	1	Nos.		

S-5b	Installation testing & Commissioning of Shaft Encoder based rotary position type, Gate Position Sensors for indication and monitoring of Spillway gates, Intake Gates, Silt flushing gates including cabling as per technical specifications.	16	Nos.		
S-5c	Installation testing & Commissioning of Data Logger with 2 AI channels with INSAT, GSM & GPRS based telemetry including antenna and all necessary equipment for data transmission as per technical specifications.	1	Nos.		
S-5d	Installation testing & Commissioning of Data Logger 8 AI channels with INSAT, GSM & GPRS based telemetry including antenna and all necessary equipment for data transmission as per technical specifications.	2	Nos.		
S-5e	Installation testing & Commissioning of solar panel, charger regulator, batteries, earthing&lightening arrestor with all connectors, NEMA4X box to suit master unit with locking, cables and conduit for cables, mast & associated Civil works to mount DCP as per technical specifications.	3	Nos.		
S-5f	Installation testing & commissioning of Battery, charger regulator with all interconnecting connectors, cables for DCP as per technical specifications	3	Nos.		
S-5g	Installation testing & commissioning of NEMA4X OR Equivalent Enclosure box to suit master unit equipment with locking, other ancillary equipment, fittings earthling, lightening arrestor with all connectors, cables and conduit for cables, mast to mount DCP, sensor mount complete as per technical specifications	3	Nos.		
S-5h	Installation, Testing & Commissioning of LED Running Text Display unit to be integrated with RTDAS datalogger to display the Hydro-met Data string in running text for indoor and outdoor application with cable, fixing arrangement, accessories complete as technical per specifications	1	Nos.		
S-6	**Set of Data Center Equipment to collect and store the data received from proposed DCPs established across the state of West Bengal to the central data center located at Bidhannagar, Kolkata**				
S-6a	Installation testing & Commissioning of Server for data reception and storage along with server rack, Monitor and 3 KVA online UPS as per technical specifications	1	Nos.		
S-6b	Installation, Testing & Commissioning of Computer Node (Workstation) along with Monitor and necessary accessories as per technical specifications	1	Nos.		

S-6c	Installation testing & Commissioning of IT Hardware which includes required Static IP, Router, Switch, firewall system and A3 Size colour printer and necessary accessories as per technical specifications	1	Nos.		
S-6d	Installation testing & Commissioning of 55" LED Display System as per technical specifications	1	Nos.		
S-6e	Installation testing & Commissioning for high speed synchronous internet connection (min. 8 mbps upload and 8 mbps download) for Five years	1	Nos.		
S-6f	Installation testing & Commissioning of GSM & GPRS data receiving system with all ancillary equipments as per technical specifications	1	Nos.		
S-7	Operation & Maintenance and Comprehensive Warranty for RTDAS with Telemetry system as specified in Schedule of Requirement along with accessories, installed at designated locations within West Bengal and Data Center equipmentsafter final acceptance of RTDAS systems. This includes replacement of material / goods& consumable as & when required at bidders cost. The cost of Communication for GSM & GPRS telemetry for data transmission shall be borne by bidder. The license fee as applicable for DOT for INSAT transmission shall be borne by purchaser.	1	Nos.		
S-8	Training of the purchaser's personnel at the supplier's plant and/or/onsite in assembly, startup, operation, maintenance and/or repair of the supplied goods. Course topics will include sensor calibration, data logger configuration, data downloading, data retrieval, collection, Trouble shooting, processing maintenance requirements and procedure for equipment configuration, installation, site testing and commissioning including training kit containing course material in soft and hard copies as per technical specification	8	Nos.		

ANNEXURE - I

Details of Hydro-meteorological Equipment to be installed RIVER GAUGES							
Sl. No.	**Name of the Site**	**River/ Tributary**	**District / Taluka**	**Lattitude (N)**	**Longitude (E)**	**Type of site**	**Sensor Type**
1	Alipurduar	Kaljani	Alipurduar	26.48016	89.515881	Road Bridge	Radar
2	NH-31D Crossing	Mujnai	Alipurduar	26.51999	89.170432	Road Bridge	Radar
3	Coochbehar	Torsa	Coochbehar	26.25131	89.611339	Road Bridge	Radar
4	Dharla Aqueduct	Dharla	Jalpaiguri	26.69172	88.736939	Hydraulic Structure	Radar
5	Hill Curt Road	Mahananda	Darjeeling	26.71981	88.419856	Road Bridge	Radar
6	Raiganj	Kulik	Uttar Dinajpur	25.63602	88.122259	Road Bridge	Radar
7	Makdampur	Nagar	Uttar Dinajpur	25.70875	88.046213	Road Bridge	Radar
8	Balurghat	Atreyee	DakshinDinajpur	25.22824	88.772224	Road Bridge	Radar
9	Gangarampur	Punarbhaba	DakshinDinajpur	25.40579	88.513281	Road Bridge	Radar
10	Bansihari	Tangon	DakshinDinajpur	25.39597	88.416595	Road Bridge	Radar
11	Englishbazar	Mahananda	Malda	25.01494	88.144409	Road Bridge	Radar
12	Bankura	Dwarakeswar	Bankura	23.21286	87.076035	Road Bridge	Radar
13	Bankura	Gandheswari	Bankura	23.23707	87.084168	Road Bridge	Radar
14	Illambazar	Ajay	Birbhum	23.61514	87.531678	Road Bridge	Radar
15	Bansloi Road Bridge	Bansloi	Birbhum	24.47971	87.861192	Road Bridge	Radar
16	Paikar	Pagla	Birbhum	24.43635	87.898999	Road Bridge	Radar
17	Katwa	Ajay	PurbaBurdwan	23.65464	88.134791	Road Bridge	Radar
18	Burdwan	Damodar	PurbaBurdwan	23.21161	87.848477	Road Bridge	Radar
19	Randiha Weir	Damodar	PaschimBurdwan	23.37264	87.475325	Hydraulic Structure	Radar

20	Guskara	Kunur	PurbaBurdwan	23.2853	88.141147	Road Bridge	Radar
21	Champadanga	Damodar	Hooghly	22.84006	87.969621	Road Bridge	Radar
22	Arambag	Dwarakeswar	Hooghly	22.88708	87.775808	Road Bridge	Radar
23	Muchighata	Hurhura	Hooghly	22.63557	87.899648	Road Bridge	Radar
24	Amta	Amta Channel	Howrah	22.57375	87.99836	Road Bridge	Radar
25	Bakshi	Short Cut Channel	Howrah	22.53127	87.89757	Road Bridge	Radar
26	Bazarshow	Babla	Murshidabad	23.83958	88.161487	River Bank	Radar
27	Berhampore	Bhagirathi	Murshidabad	24.10042	88.244311	Road Bridge	Radar
28	Sankoghat	Dwarka	Murshidabad	24.15635	88.017066	Road Bridge	Radar
29	Ranagram	Dwarka	Murshidabad	24.01681	88.09336	Road Bridge	Radar
30	Tarapur	Kuia	Murshidabad	23.83941	87.968376	Road Bridge	Radar
31	Hanskhali	Churni	Nadia	23.35555	88.607073	Road Bridge	Radar
32	Swarupganj	Hooghly	Nadia	23.38526	88.367727	River Bank	Radar
33	Krishnanagar	Jalangi	Nadia	23.41368	88.4713	Road Bridge	Radar
34	Ghusighata	Bidyadhari	North 24 Parganas	22.52421	88.687412	Road Bridge	Radar
35	Gaighata	Jamuna	North 24 Parganas	22.93113	88.73246	Road Bridge	Radar
36	Tentulia	Ichamati	North 24 Parganas	22.78729	88.852451	Road Bridge	Radar
37	Barisha	Chandia	PaschimMedinipur	22.24551	87.703644	Road Bridge	Radar
38	Khukurdah	Durbachati	PaschimMedinipur	22.47394	87.750782	Road Bridge	Radar
39	Dehati	Kaliaghai	PaschimMedinipur	22.09097	87.495089	Road Bridge	Radar
40	Sal Dahari	Kangsabati	PaschimMedinipur	22.48888	87.558162	River Bank	Radar
41	Khirpai	Ketia	PaschimMedinipur	22.72052	87.602071	Road Bridge	Radar

42	Kapastikri	Old Cossye	PaschimMedinipur	22.49842	87.558884	River Bank	Radar
43	Tabageria	New Cossye	PaschimMedinipur	22.48415	87.579123	River Bank	Radar
44	Goura	Palashpai	PaschimMedinipur	22.54548	87.8545	Road Bridge	Radar
45	Bandar	Rupnarayan	PaschimMedinipur	22.66171	87.731618	River Bank	Radar
46	Banka	Shilabati	PaschimMedinipur	22.72764	87.577081	Road Bridge	Radar
47	Garhbeta	Shilabati	PaschimMedinipur	22.88616	87.361286	Road Bridge	Radar
48	Ghatal	Shilabati	PaschimMedinipur	22.66171	87.731618	Road Bridge	Radar
49	Narghat	Haldi	PurbaMedinipur	22.13545	87.890932	Road Bridge	Radar
50	Moyna	New Cossye	PurbaMedinipur	22.24822	87.79852	Road Bridge	Radar
51	Panskura	New Cossye	PurbaMedinipur	22.39588	87.712793	Road Bridge	Radar
52	Kalinagar	Rasulpur	PurbaMedinipur	21.91687	87.786026	Road Bridge	Radar
53	Petuaghat	Rasulpur	PurbaMedinipur	21.79546	87.881636	River Bank	Radar
54	Budhpur	Cossye	Purulia	22.53127	87.89757	Road Bridge	Radar
55	Dabra	Kumari	Purulia	22.57375	87.99836	Road Bridge	Radar
56	Diamond harbour	Hooghly	South 24-Pargans	22.19354	88.181347	River Bank	Radar

Details of Hydro-meteorological Equipment to be installed

RAIN GAUGES & AWS

Sl. No.	Name of the Site	River / Tributary	District / Taluka	Lattitude (N)	Longitude (E)	Sensor Type	Remarks
1	Banarhat	Jaldhaka	Jalpaiguri	26.794	89.02525	ARG	
2	Dalkhola	Mahananda	North Dinajpur	25.87623	87.844303	ARG	**New Site**
3	Karnajora	Kulik	North Dinajpur	25.65362	88.154161	ARG	**New Site**
4	Balurghat	Atreyee	South Dinajpur	25.51883	88.09345	ARG	
5	Bishnupur	Dwarakeswar	Bankura	23.08	87.32	ARG	**New Site**
6	Indus	Dwarakeswar	Bankura	23.15059	87.621309	ARG	
7	Kenduadihi	Dwarakeswar	Bankura	23.23027	87.050337	ARG	

8	Taldangra	Shilabati	Bankura	22.99966	87.099753	ARG	
9	Shyambati	Kopai	Birbhum	23.69451	87.681606	ARG	
10	Paikar	Pagla	Birbhum	24.43283	87.910331	ARG	
11	Satkahania	Ajay	PaschimBurdwan	23.5965	87.500395	ARG	
12	Memari	Behula	PurbaBurdwan	23.17333	88.095281	ARG	
13	Galsi	Damodar	PurbaBurdwan	23.34473	87.6825	**AWS**	
14	Manteswar	Khari	PurbaBurdwan	23.30618	88.136978	ARG	**New Site**
15	Gushkara	Kunur	PurbaBurdwan	23.48214	87.720728	ARG	
16	Raina	Mundeswari	PurbaBurdwan	23.00269	87.858034	ARG	
17	Champadanga	Damodar	Hooghly	22.83658	87.970381	ARG	
18	Arambag	Dwarakeswar	Hooghly	22.88998	87.779453	ARG	
19	Singur	Ghea	Hooghly	22.82061	88.224939	ARG	
20	Amta	Amta Channel	Howrah	22.57249	88.001253	ARG	
21	Domjur	Saraswati	Howrah	22.64985	88.191212	ARG	
22	Salar	Babla	Murshidabad	23.7718	88.183231	ARG	
23	Kandi	Mayurakshi	Murshidabad	23.95125	88.041917	ARG	
24	Swarupganj	Bhagirathi	Nadia	23.41538	88.390032	ARG	
25	Majdiha	Bhagirathi	Nadia	23.40403	88.712432	ARG	
26	Salt Lake	Bidyadhari	North 24 Parganas	22.59062	88.417589	**AWS**	**New Site**
27	Tentulia	Ichamati	North 24 Parganas	22.78975	88.854534	ARG	
28	Hijli	Kaliaghai	PaschimMedinipur	22.30277	87.303007	ARG	**New Site**
29	Sabang	Kaliaghai	PaschimMedinipur	22.17355	87.599134	ARG	
30	Ghatal	Rupnarayan	PaschimMedinipur	22.66413	87.738594	ARG	
31	Amlagora	Shilabati	PaschimMedinipur	22.84728	87.33489	ARG	
32	Chandrakona	Shilabati	PaschimMedinipur	22.73202	87.516456	ARG	**New Site**
33	Pirorgari	Shilabati	PaschimMedinipur	22.85626	87.001822	ARG	**New Site**
34	Salboni	Shilabati	PaschimMedinipur	22.64212	87.318483	ARG	**New Site**
35	Kesiapata	Subarnarekha	PaschimMedinipur	22.20889	87.133575	ARG	
36	Itamogra	Haldi	PurbaMedinipur	22.11329	87.945075	ARG	
37	Panskura	Kangsabati	PurbaMedinipur	22.39588	87.712793	ARG	
38	Egra	Pichabani	PurbaMedinipur	21.90002	87.537202	ARG	**New Site**
39	Itaberia	Rasulpur	PurbaMedinipur	21.99842	87.670433	ARG	**New Site**
40	Ramchandrapur	Damodar	Purulia	23.58685	86.826762	ARG	**New Site**

41	Kashipur	Dwarakeswar	Purulia	23.43414	86.667866	ARG	**New Site**
42	Kenda	Kangsabati	Purulia	23.19551	86.515855	ARG	**New Site**
43	Tatko	Kangsabati	Purulia	22.92909	86.512748	**AWS**	**New Site**
44	Uttarbhag	Sundarban	South 24 Parganas	22.34308	88.51474	ARG	

Proposed Automated Reservoir Monitoring Sites (AWLR, AWS)						
Sl. No.	**Name of the Reservoir**	**River / Tributary**	**Location**	**District**	**Latitude (N)**	**Longitude (E)**
1	Hinglow	Hinglow	Hinglow	Birbhum, West Bengal	23.822585	87.19398
2	Kangsabati	Kangsabati	Mukutmanipur	Bankura,West Bengal	22.965221	86.78653