GOVERNMENT OF INDIA

Krishna Godavari Basin Organisation
Central Water Commission

SUPPLY, INSTALLATION, TESTING, COMMISSIONING AND MAINTENANCE OF AUTOMATIC DATA ACQUISITION AND REAL TIME DATA TRANSMISSION SYSTEM AT 15 STATIONS IN KRISHNA GODAVARI BASIN ORGANIZATION

TENDER NO.: UGD/NIT/2012-2013/Telemetry/01, Dated 04.02.2013

COST OF TENDER DOCUMENT: Rs. 1000/- + S.T (12.36%)

Certified that this tender document contains 71 Pages.

Executive Engineer,
Upper Godavari Division,
Hyderabad

Ph: 040-23308648
Fax: 040-23308648

Important Note:- **(i) BIDDER SHOULD SUBMIT THIS DOCUMENT IN ORIGINAL DULY SIGNED ON EACH PAGE.**

(ii)THE BIDDER SHOULD READ ALL THE INSTRUCTIONS IN THE DOCUMENT THOROUGHLY BEFORE SUBMITING THE TENDER AND ADHERE TO THE DATES GIVEN.

GOVERNMENT OF INDIA

Krishna Godavari Basin Organisation
Central Water Commission

TENDER FOR THE WORK OF SUPPLY, INSTALLATION, TESTING, COMMISSIONING AND MAINTENANCE OF AUTOMATIC DATA ACQUISITION AND REAL TIME DATA TRANSMISSION SYSTEM AT 15 STATIONS IN KRISHNA GODAVARI BASIN ORGANIZATION

Tender No.	**:UGD/NIT/ 2012-2013/Telemetry/01**
Estimated Cost	**: Rs1,69,00,000**
Earnest Money	**: Rs 3,50,000**
Last Date of Receipt of Application for Issue of Tender Document	**: 27-02-2013 16:00 hrs**
Last Date for Issue of Tender Document	**: 28 -02-2013 16:00 hrs**
Pre-bid conference	**: 20.02.2013 14.00 hrs**
Last Date & Time for Submission of Tender	**: 04-03-2013 15:00 hrs**
Date & Time of Opening of Tender	**: 04-03-2013 16:00 hrs**
Cost of Tender Document	**: Rs1000/- +(S.T.@12.36%)**

GOVERNMENT OF INDIA
CENTRAL WATER COMMISSION
Upper Godavari Division,
Hyderabad

Item Rate Tender for Supply, Installation, Testing, Commissioning and Maintenance of Automatic Data Acquisition System and Real Time Data Transmission System at 15 Remote Stations in Krishna Godavari Basin Organization for automatic acquisition of hydro- meteorological data through sensors, its transmission in real time basis for processing at Modelling Centres complete with hardware, software and other peripherals along with a comprehensive warranty of two years and maintenance for two years after the expiry of the warranty period.

DATE FOR OPENING OF TENDER 1600 HOURS ON 04-03-2013.

OFFICER INVITING TENDER

Executive Engineer,
Upper Godavari Division, CWC,
Hyderabad

List of Contents

CHECK LIST

Please tick the appropriate column.

SL. NO.	DOCUMENT	ENCLOSED	
		YES	NO
1.	Covering Letter of Bidder		
2.	Original Tender Document including Schedule of Quantities and Financial Tender Format duly signed on each page		
3.	Earnest Money Deposit in form of Demand Draft		
4.	Whether Unit Rate of Items quoted in both Figure and Words		
5.	Whether Gross Amount of Tendered Value quoted in both Figure and Words		

(Press Notice for News Papers)

NOTICE INVITING TENDER

The Executive Engineer, Upper Godavari Division, Central Water Commission, Hyderabad on behalf of President of India invites sealed item rate Tenders on two envelope system for following work:-
NIT No. UGD/NIT/2012-13/Telemetry/01, Dated 04 - 02-2013.
Name of Work: Supply, installation, testing, commissioning and maintenance of automatic data acquisition and real time data transmission system at 15 Stations in Krishna Godavari Basin Organization for automatic acquisition of hydro-meteorological data through sensors, its transmission in real time basis for processing at Modelling Centres including all necessary systems complete with hardware, software and other peripherals along with a comprehensive warranty of two years and maintenance for two years after the expiry of the warranty period.
Estimated Cost: Rs. 1,69,00,000/-, Earnest Money: Rs.3,50,000/-, Time of completion: 180 days.
The tender forms and other details can be obtained from the O/o EE, UGD, CWC, Hyderabad on payment *of Rs.1000 /- + ST @12.36%*. The last date of receipt of application to purchase tender form will be 27.02.2013 up to 16.00 hrs. Other detail/information can be seen on Website http://www.eprocure.gov.in and http://www.kgbo-cwc.ap.nic.in

(Press Notice for Website)

The Executive Engineer, Upper Godavari Division, Central Water Commission, Hyderabad on behalf of President of India invites sealed item rate Tenders on two envelope system from approved and eligible contractors for the following work:-

S. No.	NIT No.	Name of Work & Location	Estimated cost put to tender	Earnest Money	Time of Completion	Last date & time		Time & date of submission & opening of tender
						Receipt of application	Issue of tender document	
1	2	3	4	5	6	7	8	9
1	UGD/NIT/2012-13/Telemetry/01 ,dated 04 - 02-2013	Supply, installation, testing, commissioning and maintenance of automatic data acquisition and real time data transmission system at 15 Stations in Krishna Godavari Basin Organization for automatic acquisition of hydro-meteorological data through sensors, its transmission in real time basis for processing at Modelling Centres including all necessary systems complete with hardware, software and other peripherals along with a comprehensive warranty of two years and maintenance for two years after the expiry of the warrant y period.	Rs. 1,69,00,000/-	Rs.3,50,000/-	180 days.	27.2.2013, 16.00 hrs	28.2.2013, 16.00 hrs	04.03.2013,15.00hrs & 04.03.2013, 16.00 hrs

The tender forms and other details can be obtained from the O/ o EE, Upper Godavari Division, CWC, Hyderabad on payment of Rs.1000 /- + S T @12.36% or downloaded and fee paid as per clause 12 of NIT of Tender document.

GOVERNMENT OF INDIA
CENTRAL WATER COMMISSION

NOTICE INVITING TENDER

Item rate tenders are invited on behalf of the President of India from the eligible experienced manufacturers, their authorized dealers/ representatives, Indian representative of foreign manufacturers having sufficient experience of carrying out similar works for **Supply, Installation, Testing, Commissioning and Maintenance of Automatic Data Acquisition System and Real Time Data Transmission System at 15 remote stations in Krishna Godavari Basin Organisation, Central Water Commission** for automatic acquisition of hydro-meteorological data through sensors, its transmission in real time basis for processing at Modelling Centres with hardware, software and other peripherals along with a comprehensive warranty of two years and maintenance for two years after the expiry of the warranty period. The work is estimated to cost Rs. 16900000/- (**Rupees One hundred and sixty nine lakh only**). This estimate, however, is tentative and indicative for guidance.

1. Only original Indian manufacturers, their authorized dealers/ representatives, Indian representative of foreign manufacturers having sufficient experience acting singly or in consortium with other such manufacturers/ dealers, having sufficient experience of similar works, shall be allowed to quote for the works. Similar works are defined as the works of supply, installation, testing, commissioning and maintenance of automatic data acquisition sensors for collection of hydro-meteorological data and its transmission in real time basis through satellite. The bidder shall be required to produce proof from the appropriate authorities of having satisfactorily completed similar works during the last ten years (ending on the last day of the month previous to the one in which the tenders are invited), where the systems installed by them are working satisfactorily in at least two alluvial river basins/ sub-basins for two years. Such works could be inspected. The bidder shall have to fulfill the following criteria of satisfactory execution of works as given below;

   1.1. Three similar works, each of value not less than 40% of the estimated cost,

   Or,

   1.2. Two similar works, each of value not less than 60% of the estimated cost,

   Or,

   1.3. One similar work of value not less than 80% of the estimated cost put to tender, during the last ten years (ending on the last day of the month previous to the one in which the tenders are invited), where the systems installed by them are working satisfactorily in at least two alluvial river basins/ sub-basins for two years.

   And,

   1.4. Having annual turnover equivalent of Indian Rs. 50 Lakhs each during last consecutive three years. Copies of audited balance sheets of the company shall be provided with the technical tender.

   And,

   1.5. Having successfully and satisfactorily maintained automatic data acquisition system and real time data transmission system for at least two years during last ten years.

   1.6 Prospective bidders should ensure that they fulfill the eligibility criteria before purchasing of the tender documents. **However, the issue of tender document does not mean that bidder meets all the qualifying requirements which may also be examined in detail, if necessary, after opening the tender during evaluation. In case, if any bidder was found to be not meeting the specified qualifying requirements, his/ her tender would be summarily rejected.**

2. Prospective bidder may apply in single or in a consortium with other partners each one being EITHER an Original Equipment Manufacturer (OEM) or an Authorized Agent/ representative/ subsidiary having sales and full service facilities located in India. For authorized dealers, the submission of a certificate from the OEM being represented by him shall be obligatory. Prospective bidders may quote for both or any one of the items for Tables A1 & A2 alongwith Tables B & C. The Lowest Bidder will be finalized separately for Table A1 and A2.

3. In case of a consortium, a copy of the agreement between various partners will be submitted with the tender clearly identifying the parts and components of the system for which the concerned partner is responsible for execution. However, each of the partners of the consortium will be jointly responsible for execution and completion of the works.

4. One of the partners of the consortium will be identified as a lead partner and will be authorized to execute the contract with the department. All financial transactions and liabilities shall rest with the lead partner.

5. The qualifying criteria will be applicable to each of the partners of the consortium with scope of works limited to the extent for which the concerned partner is responsible as a member of the consortium.

6. In case of consortium of manufacturers, authorized dealers, contractors for the major components of the works such as satellite based real time data transmission (telemetry) etc. the qualifying criteria will be applicable to each partner separately for the specific component of the project for which the partner will be directly responsible.

7. Agreement shall be drawn with the successful tenderer on prescribed Form CPWD-8 which is available as Government of India Publication. Tenderer shall quote his rates as per various terms and conditions of the said form, which will form part of the agreement.

8. The time allowed for carrying out the works will be **180 days** from the 15th day after the date of written orders to commence the works.

9. **The site for the work is available.**

10. Receipt of applications for issue of tender forms will be stopped by **16:00 hrs. on 27-02-2013.** Issue of tender forms will be stopped by16:00 hrs. on 28-02-2013.

11. Tender documents consisting of specifications, the schedule of requirements of the various items of work to be executed and the set of conditions of contract to be complied with by the contractor whose tender may be accepted and other necessary documents can be examined in the office of the *Executive Engineer, Upper Godavari Division, CWC, Hyderabad* between hours of 10:00 A.M to 05:00 P.M. everyday except on second Saturday of the month, Sundays and Public Holidays. Tender documents, excluding standard form, will be issued from his office, during the hours specified above, on payment of Rs.1000/- + ST @12.36% through A/c payee Demand Draft drawn in favour of *Executive Engineer, Upper GodavariDivision, CWC, Hyderabad*. Tender forms requested by post will be dispatched by speed post/ registered post on payment of an extra amount of Rs.250/-.

12. The bidder downloading the tender document from website shall enclose the cost of tender document i.e. Rs.1000/- + ST@12.36% in the form of A/C payee Demand Draft (non - refundable) drawn on any scheduled bank in favour of the *Executive Engineer, Upper Godavari Division, CWC, Hyderabad* payable at Hyderabad in a separate envelope along with the tender document at the time of submission. ***However, the bidder who has opted to download the tender document and utilize the same for submitting his/ her bid may note that their firm meets the eligibility requirements as specified in para 1 above. In case, the bidder was found to be not meeting the specified qualifying requirements during evaluation and after opening of the tenders, his/ her tender would be summarily rejected.***

13. Tenders in two bid system, one sealed cover containing Technical bid comprise of original tender form issued by the department or downloaded from website duly filled in along with Earnest Money Deposit (EMD) in relevant form, complete documentary evidences towards the claim of experience, turnover and completion certificates of works completed by them etc. as proof of bidder satisfying prescribed eligibility requirements to be placed in a sealed envelope superscribed Envelope 1 and the other sealed cover containing Financial Bid comprise of Table A1,A2, B & C marked as Envelope 2 and both the covers placed in another sealed Envelope with name of work and due date of opening written on the Envelope will be received by the Executive Engineer, Upper Godavari Division, CWC, 11-4-648, Room No.316, 3rd Floor, K.G.Bhavan, A.C.Guards, Hyderabad – 500 004 up to 1500 hrs on 04.03.2013 and Technical bid will be opened by him or his authorized representative in his office on the same day at 16.00 hrs. Financial bid shall be opened only of the bidders whose Technical bids are found acceptable. The date and time shall be fixed subsequently and intimated to the Technically qualified bidders in advance.

14. The tender shall include all the relevant technical literature, brochures and other documents supporting the technical competence of the offers and shall indicate by proper cross referencing with such supporting documents as to how the specification requirements are being met by their offer. Any additional information requested by the department during the course of evaluation of the tender shall be supplied within the time limits set by the department. **The bidder whose material specifications do not meet the required specifications shall be summarily rejected and no claims what so ever shall be entertained in this regard. The rejected tenders will not be evaluated further. The bidder found submitting false documents, the EMD of the bidder shall be forfeited and the bidder blacklisted for a period of three years from participating in any tender of Govt. of India.**

15. The tender shall be accompanied by **Earnest Money**, (unless exempted) of **Rs 3,50,000/-** as Demand Draft drawn on a Scheduled Bank in favour of *Executive Engineer, Upper Godavari Division, CWC, Hyderabad*. Contractor exempted from depositing earnest money in individual cases, shall attach with the tender an attested copy of the letter exempting him from depositing earnest money and shall produce the original when called upon to do so. **If the tender is not accompanied with specified earnest money the tender will be summarily rejected and action as per clause 1.6 above will be taken.**

16. The description of the work is given in Technical Specification.

17. Detailed information pertaining to the works will be open for inspection by the bidder at the office of the above-mentioned officer. Tenderers are advised to inspect and examine the locations where the telemetry system is to be installed and their surroundings and satisfy themselves before submitting their tenders as to the nature of the ground and sub-soil (so far as is practicable), the form and nature of the site, the means of access to the site, the accommodation they may require and in general shall themselves obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect their tender. A bidder shall be deemed to have full knowledge of the site whether he inspects or not and no extra charges consequent on any mis-understanding or otherwise shall be allowed. The tenderer shall be responsible for arranging and maintaining at his own cost all materials, tools & plants, water, electricity access, facilities for workers and all other services required for executing the work unless otherwise specifically provided for in the contract documents. Submission of a tender by a tenderer implies that he has read this notice and all other contract documents and has made himself aware of the scope and specifications of the work to be done and other factors having a bearing on the execution of the work.

18. The competent authority on behalf of President of India does not bind itself to accept the lowest or any other tender, and reserves its right to reject any or all of the tenders received without the assignment of any reason. The competent authority on behalf of President of India reserves to himself the right of accepting the whole or any part of the tender and the tenderer shall be bound to perform the same at the rate quoted.

19. All tenders, in which any of the prescribed conditions are not fulfilled or are incomplete in any respect are liable to be rejected and action as per clause 1.6 above will be taken.

20. Canvassing whether directly or indirectly, in connection with tenders is strictly prohibited and the tenders submitted by the contractors who resort to canvassing will be liable to rejection.

21. The tenderer shall not be permitted to tender for works in the CWC Circle (responsible for award and execution of contracts) in which his near relative is posted as Divisional Accountant or as an officer in any capacity between the grades of Superintending Engineer and Assistant Engineer (both inclusive). He shall also intimate the names of persons who are working with him in any capacity or are subsequently employed by him and who are near relatives to any Gazetted officer in the Central Water Commission or in the Ministry of Water Resources. Any breach of this condition by the tenderer would render his tender liable to be rejected and action as per clause 1.6 above will be taken.

22. No Engineer of Gazetted rank or other Gazetted officer employed in Engineering or Administrative duties in an Engineering Department of the Government of India is allowed to work as a contractor for a period of one year after his retirement from Government service, without the previous permission of the Government of India in writing. This contract is liable to be cancelled if either the contractor or any of his employees is found any time to be such a person who had not obtained the permission of the Government of India as aforesaid before submission of the tender or engagement in the contractor's service.

23. The tender for the works shall remain open for acceptance for a period of **Ninety days** from the date of opening of tenders. If any tenderer withdraws his tender before the said period or makes any modifications in the terms and conditions of the tender which are not acceptable to the department, then the Government shall, without prejudice to any other right or remedy, be at liberty to forfeit 50% of the said earnest money as aforesaid. Also, if the Contractor does not accept the Work order with in specified time limit, 100 % EMD will be forfeited and the work shall be offered to the next lowest bidder if he agrees to match L1 price.

24. This Notice Inviting Tender shall form a part of the contract document. The successful tenderer / contractor, on acceptance of his tender by the Accepting Authority, shall, within 15 days from the stipulated date of start of the work, sign the contract consisting of:-

    a) The notice inviting tender, all the documents including General Conditions and Special Conditions of contract, technical specifications, forms the tender as issued at the time of invitation of tender and acceptance thereof together with any correspondence leading thereto.

    b) Standard C.P.W.D.Form-8.

    c) Integrity pact as per C.P.W.D form

27. A Pre – bid conference will be held at **14:00 hrs on 20-02-2013** in the office of the **Chief Engineer**, Krishna Godavari Basin Organization, 11-6-648, KG Bhavan, AC GUARDS,Hyderabad-500004. The representatives of the tenderer who have purchased the tender documents and their associates (not exceeding a group of 4 persons) shall be eligible to participate in the conference and take part in the discussions. A potential tenderer may send, by **15:00 hrs. of 15-02-2013**, the issues in writing on which clarifications are required. All the queries and clarifications required them will be submitted in writing duly signed preferably prior to the convening of the conference and in any case not later than 1 hour after the conclusion of the conference. Only written requests will be responded in the amendments/ clarifications issued by the department after the pre-bid conference. All responses to the clarifications will be supplied to all the bidder without identifying the individual tenderer who raised the request. For the bidders purchasing the tender documents subsequent to the issue of the clarifications, the same shall be supplied with the tender documents and no additional queries/ clarifications will be entertained. The clarifications issued shall be treated as amendments to the tender requirements.

    In this conference, the clarifications, if any, required by any prospective bidder on the tender documents would be discussed. If, for any reason, whether at its own initiative or in response to a clarification requested by the prospective bidder, the department modifies the tender documents by an amendment, the same will be sent to all prospective tenderer who have received the tender document.

Executive Engineer,
Upper Godavari Division,
CWC,Hyderabad

ADDITIONAL TERMS AND CONDITIONS

1) A prospective bidder requiring any clarification of the tender documents may notify the department in writing, which should reach the Executive Engineer-in-Charge at least 15 (fifteen) days before the closing date. Written copies of the department's response (including an explanation of the query) will be sent to all prospective bidder and this shall form part of the tender document.

2) At any time prior to the deadline for submission of tenders, the department may, for any reason, whether at its own initiative or in response to a clarification requested by a prospective bidder, modify the tender documents by amendment in writing, which will be binding on all the bidder.

3) The tender prepared by the bidder, as well as all correspondence and documents relating to the tender exchanged by the bidder and the department shall be written in English language. Supporting documents and printed literature furnished by the bidder may be in another language provided they are accompanied by an accurate translation of the relevant passages in the English language in which case, for purposes of interpretation of the tender, the translation in English Language shall govern.

4) All corrections/ cuttings in the tender document shall be initialed by the bidder.

5) The tender prepared by the bidder shall comprise the following components:

   a) Technical specifications of the offered equipment's along with comparative statement specifying how the specification of equipments (which shall also include the brand name and manufactures details for each component) proposed to be supplied shall meet the specifications required in the tender documents. The statement shall clearly indicate variations, if any, with the term and conditions of the tender document.
   b) Documentary evidence to establish that the bidder is eligible to tender and is qualified to perform the contract if the tender is accepted:
   c) Documentary evidence to establish that the goods and ancillary services to be supplied by the bidder are as per specifications and conform to the tender documents. The documentary evidence of conformity of the goods and services to the tender documents may be in the form of literature, drawings and data, and shall consist of:

      i) A detailed description of the essential technical and performance characteristics of the goods.
      ii) A list giving full particulars, including available sources and current prices of spare parts, special tools, etc. necessary for the proper and continuing functioning of the goods for a period of fifteen years, following commencement of the use of the goods by the Department, and
      iii) An item-by-item comments on the department's technical specifications demonstrating substantial responsiveness of the goods and services to those specifications or a statement of deviations and exceptions to the provisions of the technical specifications.
      iv) For purposes of the comments to be furnished, the bidder shall note that standards for workmanship, material and equipment designated by the department in its technical specifications are intended not only to be descriptive but also restrictive. The bidder may substitute alternative standards provided it demonstrates, to the department's satisfaction, that the substitutions ensure substantial equivalence to those.

   d) Earnest Money Deposit in prescribed form; and
   e) Original tender with schedule of quantities Financial Tender Format duly completed and bearing signatures of the bidder under their seal.
   f) The Bio-data of the Engineers/ Technicians in-charge of the work during execution as well as maintenance.
   g) "Only such equipments or its upgrades shall be used which are working satisfactorily at least for the last two years". The bidder will furnish the definite proof to this effect from the user.

6) The prices quoted shall be F.O.R. Destination and inclusive of all duties and taxes including custom duty, octroi, VAT, service tax, entry and other taxes etc and no additional amount on the quoted prices shall be paid on account of such duties, taxes and octroi etc.

7) Prices quoted by the bidder shall remain fixed during the validity period of the Contract and shall not be subject to variation on any account. A tender submitted with an adjustable price quotation or conditionalities is liable to be treated as non-responsive and rejected.

8) Prices shall be quoted in Indian Rupees only.

9) During evaluation of tenders, the department may, at its discretion, ask the bidder for a clarification of its tender or ask for field/ office demonstration of the equipment, for which no charges shall be paid to the bidder. The request for clarification and the response shall be in writing and no change in prices or substance of the Tender shall be sought, offered or permitted.

10) Tenders from agents/ dealers, without proper authorisation from the manufacturer, shall be treated as non-responsive.

11) Arithmetical errors will be rectified on the following basis. If there is a discrepancy between the unit price and the total price that is obtained by multiplying the unit price and quantity, the unit price shall prevail and the total price shall be corrected. If there is a discrepancy between words and figures, the amount in words will prevail. If the contractor does not accept the correction of errors, its tender will be rejected.

12) The department will evaluate and compare tender which have been determined to be substantially responsive. Non-responsive tenders shall be rejected and will not be evaluated.

13) The evaluation for determining the lowest tender shall include:

a) The cost of equipment including the taxes, octroi, levies etc. as applicable at final destination and installation, testing, commissioning, maintenance and training and any other services essential for completion of works;
b) Cost of essential spares/ consumables as specified in Technical specifications para 16.0, required for running & maintenance of all the equipments for two years; and
c) Cost of Annual Maintenance Contract for all the equipment including replacement of defective material for next two (2) years beyond warranty period.

14) The bidder shall not contact the Department on any matter relating to its tender, from the time of the tender opening to the time the Contract is awarded. If the Tenderer wishes to bring additional information to the notice of the Department, it should do so in writing.

15) An affirmative determination will be a prerequisite for award of the work to the contractor.

16) The department, at the time of award of contract, reserves the right to increase or decrease the quantity of goods and services originally specified in the Schedule of Quantities & Financial Tender Format without any change in unit price or other terms and conditions.

17) Attention of the tenderers is drawn to the Clause 1 and Clause 1(A) of General Conditions of Contract under CPWD Forms 7/8 regarding the deduction of security deposit.

CPWD-8

GOVERNMENT OF INDIA
CENTRAL WATER COMMISSION

STATE : Andhra Pradesh
CIRCLE : Godavari Circle, CWC, Hyderabad
DIVISION : Executive Engineer, Upper Godavar Division, CWC, Hyderabad
ORGANISATION : Krishna Godavari Basin Organization, CWC, Hyderabad

Tender & Contract for Works

Tender for the work of for **supply, installation, testing, commissioning and maintenance of automatic data acquisition and real time data transmission system at 15 Stations in Krishna Godavari Basin Organization** on turnkey basis for automatic acquisition of hydro-meteorological data through sensors, its transmission in real time basis and processing at Modelling Centres complete with hardware, software and other peripherals along with a comprehensive warranty of two years and maintenance for eight years after the expiry of the warranty period.

(i) To be submitted by 1500 hours on 04-03-2013 to Executive Engineer, Upper Godavari Division, CWC, Hyderabad.
(ii) To be opened in presence of tenderer(s) or their authorized representatives who may be present at 1600 hours on 04-03-2013 in the office of *Executive Engineer, Upper Godavari Division, CWC, Hyderabad*.

Issued to _____
(Contractor)

Signature of officer issuing the documents _____

Designation: *Executive Engineer, Upper Godavari Division, CWC, Hyderabad*

Date of Issue _____

TENDER

I/We have read and examined the Notice Inviting Tender, Schedule A, B, C, D, E & F. Specifications applicable, Drawings & Designs, General Rules and Directions, General Conditions and Special Conditions of Contract, Schedule of Rate & other documents and Rules referred to in the conditions of contract and all other contents in the tender document for the work.

I/We hereby tender for the execution of the work specified for the President of India within the time specified in Schedule 'F', viz., schedule of quantities and in accordance in all respects with the specifications, designs, drawings and instructions with such materials as are provided for, by, and in respects in accordance with, such conditions so far as applicable.

I/We agree to keep the tender open for **Ninety (90)** days from the due date of submission thereof and not to make any modifications in its terms and conditions.

A sum of **Rs.3,50,000/-** is hereby forwarded as Demand Draft of a Scheduled Bank as earnest money. If I/ We, fail to commence the work specified, I/we agree that the said President of India or his successors in office shall without prejudice to any other right or remedy, be at liberty to forfeit the said earnest money absolutely; otherwise the said earnest money shall be retained by him towards security deposit to execute all the works referred to in the tender documents upon the terms and conditions contained or referred to therein and to carry out such deviations as may be ordered, upto maximum of the percentage mentioned in Schedule 'F'.

I/we have already furnished security to the President of India in lieu of earnest money and have

deposited with the Executive Engineer,, *Upper Godavari* Division, CWC, Hyderabad a lump sum security of
Rs _____as earnest money in individual cases & I/We, therefore claim exemption in terms of the Bond executed by me/us and bearing no._____ dt.__/__/__ against the necessity of depositing earnest money in respect of the above tender for work. I/We agree that should the President of India or his successors in office decide to forfeit earnest money mentioned for this work, unless a sum equal to the earnest money is paid by us forthwith, the competent authority, for President of India may at his option recover it out of the deposit and in the event of deficiency, out of any other money due to me/us under this contract or otherwise.

I/We hereby declare that I/we shall treat the tender documents drawings and other records connected with the work as secret/ confidential documents and shall not communicate information/ derived there from to any person other than a person to whom I/ we am/ are authorised to communicate the same or use the information in any manner prejudicial to the safety of the State.

I/ We agree that should I/ we fail to commence the work specified in the above memorandum, an amount equal to the amount of the earnest money mentioned in the form of invitation of tender shall be absolutely forfeited to the President of India and the same may at the option of the competent authority on behalf of the President of India be recovered without prejudice to any other right or remedy available in law out of the deposit in so far as the same may extend in terms of the said bond and in the event of deficiency out of any other money due to me/ us under this contract or otherwise.

Dated.....

Signature of Contractor
Postal Address

Witness:

Address:

Seal

Occupation:

ACCEPTANCE

The above tender (as modified by you as provided in the letters mentioned hereunder) is accepted by me for and on behalf of the President of India for a sum of Rs. _____ (Rupees _____)

The letters referred to below shall form part of this contract Agreement:
i)
ii)
iii)

For & on behalf of President of India
Signature.....
Designation.....

Dated.....

SCHEDULES

SCHEDULE 'A'- Schedule of quantities (Enclosed at **Table 1**)

SCHEDULE 'B' – Not applicable

SCHEDULE 'C' - Not applicable

SCHEDULE 'D' – Additional Conditions of Contract and Technical specifications.

SCHEDULE 'E' - Not Applicable

SCHEDULE 'F'
Reference to General Conditions of Contract as applicable for Tenders invited under CPWD Form 7/8.

Name of work: Supply, installation, testing, commissioning and maintenance of automatic data acquisition and real time data transmission system at 15 Stations in Krishna Godavari Basin Organization on turnkey basis for automatic acquisition of hydro-meteorological data through sensors, its transmission in real time basis and processing at Modelling Centres including all necessary systems complete with hardware, software and other peripherals along with a comprehensive warranty of two years and maintenance for two years after the expiry of the warranty period.

i	Earnest money:	Rs.3,50,000/-
ii	Performance guarantee	**5% of contract value**
iii	Security Deposit	**5% of contract value**
	General Rules & Directions:	
	Officer inviting tender	*Executive Engineer, Upper Godavari Division,Hyderabad*
	Definitions:	Additional definitions as per conditions of contract clause 1
2(v)	Engineer-in-Charge	*Executive Engineer, Upper Godavari Division, CWC, Hyderabad* unless otherwise specified during the currency of the contract.
2(viii)	Accepting Authority:	Superintending Engineer, Godavari Circle, Hyderabad
2(x)	Percentage on cost of materials and labour to cover all overheads and profits.	Not Applicable
2(xi)	Standard Schedule of Rates	Not Applicable
2(xii)	Department:	Central Water Commission
9(ii)	Standard CPWD Contract Form	CPWD Form-8 as amended from time to time
	Clause 1	
i	Time allowed for submission of Performance Guarantee from date of issue of letter of acceptance	30 Days (No extensions to be granted)
ii	Maximum allowable extension beyond the period (provided in i) above	Nil

	Clause 2	
	Authority for fixing Compensation under clause 2	Superintending Engineer, GC, Hyderabad
	Clause 2 A	
	Whether Clause 2 A is applicable	No
	Clause 5	
	Number of days from date of issue of letter of acceptance for reckoning date of start	15 Days
	Milestones	None
	Time allowed for execution of work	180 Days
	Clause 6 & 6A	As per Clause No.14 of Special conditions of contract.
	Clause 7 Payment on intermediate certificate	Separate procedure as defined at clause No. 16 in Special Conditions of Contract
	Clause 10 A	Not applicable
	Clause 10 B(ii)	Not applicable
	Clause 10C(a)	Not applicable
	Clause 10 C(c)	Not applicable
	Clause 11 Specifications to be followed for execution of work	Enclosed Scope of Work and Technical Specifications
	Clause 12	As per rule
	Clause 16	As per clause 7, 12, 21, 22 & 23 of Special Conditions of contract. The sub-standard work shall not be accepted.
	Clause 18	Not applicable

	Clause 36		
	Minimum qualifications & experience required for Principal Technical Representative	a) For works with estimated cost put to tender more than	
		Rs. 10 Lakhs	Graduate engineer retired AE
		less than Rs. 10 lakhs for Civil work	Recognised Diploma Holder
		for Elect/Mech works	Recognised Diploma Holder
		Discipline to which the Principal Technical Representative should belong	Elect.
		Minimum experience of works	5 Years
	Recovery to be effected from the contractor in the event of not fulfilling provision of clause 36	Rs. 20,000/- per month for Graduate Rs. 15,000/- per month for diploma holder	
	Clause 42	Not applicable	

SPECIAL CONDITIONS OF CONTRACT

Table of Clauses

1. Definition:

1.1. In this Contract, the following terms shall be interpreted as indicated

"**The Contract**: means the agreement entered into between the CWC and the Contractor, as recorded in the Contract Form signed by the parties, including all amendments, attachments and appendices thereto and all documents incorporated by reference therein.

"The Contract Price" means the price payable to the Contractor under the Contract for the full and satisfactory performance of its contractual obligations.

"The Goods" means all of the equipment, machinery and/ or other materials which the Contractors are required to supply to the CWC under the contract.

"The Services" means those services ancillary to the supply of the Goods, such as transportation and insurance, and any other incidental services, such as installation, commissioning, provision of technical assistance, training, warranty, annual maintenance and other such obligations of the Contractor covered under the contract for successful commissioning of the network and satisfactory performance of the commissioned network.

"The Department/Customer/Department" means Central Water Commission through *Executive Engineer, Upper Godavari Division, CWC, Hyderabad* and any other specifically designated Officers of Central Water Commission purchasing the Goods.

"The Tenderer/Bidder/Contractor" means the individual or firm/ agency/consortium supplying the Goods and Services under this contract.

"The project Site" where applicable, means the place or places named in Conditions of Contract.

"Remote Station" as listed in the schedule of requirements where the sensors, data logger and transmission facilities are to be installed.

"Modeling Centre" the office locations where the data of specific basin or part thereof is to be received using a VSAT network.

"Day" means calendar day.

"Organisation" shall mean Krishna Godavari Basin Organization.

2. Applications: These conditions shall supercede/ modify the General Conditions of the Contract.

3. Governing Language

3.1 The Contract shall be written in the English language. The version of the Contract written in the specified language shall govern its interpretation. All correspondence and other documents pertaining to the Contract which are exchanged by the parties shall be written in the same language.

4. Standards

4.1 The Goods supplied under this Contract shall conform to the standards mentioned in the Technical Specifications, and, when no applicable standard is mentioned, to the latest Bureau of Indian Standards. The latest may be defined as Standard issued two months prior to issue of Tender document.

5. Use of Contract Documents and Information Inspection and audit by the Government of India

5.1 The contractor shall not, without the CWCs prior written consent, disclose the contract, or any provision thereof, or any specification, plan, drawing, pattern, sample or information furnished by or on behalf of the department in connection therewith, to any person other than a person employed by the Contractor in the performance of the Contract. Disclosure to any such employed person shall be made in confidence and shall extend only so far as may be necessary for purposes of such performance.

5.2 The contractor shall not, without the Department's prior written consent, make use of any document or information enumerated in Clause 5.1 except for purposes of performing the contract.

5.3 Any document, other than the contract itself, enumerated in Clause 5.1 shall remain the property of the department and shall be returned (all copies) to the department on completion of the Contractor's performance under the contract if so required by the department.

5.4 The contractor shall permit the authorised representative of the Department to inspect the contractor's accounts and records relating to the performance of the contractor and to have them audited by auditors appointed by the Department, whenever required.

6. Patent Rights: The contractor shall indemnify the department against all third party claims of infringement of patent, trademark, or industrial design rights arising from use of the Goods or any part thereof.

7 Inspections and tests

7.1 The department or its representative shall have the right to inspect and/ or test the Goods to confirm their conformity to the contract specifications at no extra cost to the department. The goods proposed to be supplied and commissioned shall be accompanied with their technical specifications which shall clearly specify inspections and tests required to confirm the conformity of goods to the contract specifications. The department shall notify the contractor in writing, in a timely manner, of the identity of any representatives retained for the purposes of tests and inspections, if required. TA/ DA of the inspection team will be borne by the department.

7.2 The inspections and tests may be conducted on the premises of the Contractor and/ or its subcontractor(s) and/ or at point of delivery and/ or at the Good's final destination. All reasonable facilities and assistance, including access to drawings and production data, shall be furnished to the inspectors at no charge to the department for carrying out the inspections.

7.3 Should any inspected or tested Goods, fail to conform to the specifications, the department may reject the Goods and the contractor shall replace the rejected Goods.

7.4 The department's right to inspect, test and, where necessary, reject the goods before or after the goods' installation at remote station shall in no way be limited or waived by reason of the Goods having previously been inspected, tested, and passed by the department or its representative at any point. Nothing shall in any way release the Contractor from any warranty or other obligations under this contract.

7.5 The inspection of the Goods shall be carried out to check whether the Goods are in conformity with the technical specifications attached to the contract agreement and shall be in line with the inspection/ test procedures laid down in the Technical Specifications. Complete hardware and software as specified in the contract should be supplied, installed and commissioned properly by the contractor prior to commencement of acceptance tests.

7.6 In the event of the hardware and software failing to pass the acceptance test, a period not exceeding two weeks will be given to rectify the defects and clear the acceptance test, failing which the department reserves the rights to get the equipment replaced by the contractor at no extra cost to the department.

7.7 Before the goods and equipment are taken over by the Department, the Contractor shall supply operation and maintenance manuals together with drawings of the goods, civil works and equipment. These shall be in such detail as will enable the Department to operate, maintain, adjust and repair all parts of the works/ equipments as stated in the technical specifications.

7.8 The manuals and drawings shall be in the ruling language (English) and in such form and numbers as stated in the Technical specifications

7.9 Unless and otherwise agreed, the goods and equipment shall not be considered to be completed for the purpose of taking over until such manuals and drawings have been supplied to the Department.

7.10 For the System software & other Software's, the Contractor shall provide complete and legal documentation of hardware, all sub-systems, operating systems, compiler, system software and the other software. The Contractor shall also provide licensed software for all software products, whether developed by it or acquired from others. The contractor shall also supply listing and codes of all softwares forming part for successful completion of services under this contract. The contractor shall also indemnify the department against any levies/ penalties on account of any default in this regard.

7.11 **Acceptance Certificates**: On successful completion of acceptability test, receipt of deliverables etc, and after the department is satisfied with the working on the system, the acceptance certificate will be issued as under:

7.12 Acceptance Certificate for a Remote station shall be issued on successful completion of site acceptance tests specified at 14.5 of the Scope of Work and Technical Specifications by the Engineer in charge or his designated representative.

7.13 The training as specified in the Technical specifications for each hardware and software component installed shall be provided to the personnel designated by the Department to enable them to effectively operate the total system. The training shall be conducted on the dates mutually agreed upon.

8 Transportation & Delivery

8.1 The Contractor is required under the Contract to transport the Goods to a specified place of destination defined as project site. Transport of Goods to such place of destination including insurance, shall be arranged by the Contractor, and the related cost shall be included in the Contract Price.

8.2 Arrangement for secure storage of the goods at designated location near the project site prior to installation shall be responsibility of the Contractor. The Department may, if available, provide such unsecured accommodation as may be available for the purpose on a specific request from the contractor.

8.3 Delivery of the Goods shall be made by the Contractor in accordance with the terms specified by the Department in the letter of Award.

8.4 Contractor shall be responsible till the entire stores ordered for supplied in good condition at destination and are installed, tested and commissioned satisfactorily as per decision of Engineer-in-Charge.

9 Site preparation and installation

i. The contractor shall perform site inspection to ascertain the ground conditions and carry out construction of structures as specified in the technical specification before the installation of the hardware.

ii. The location of telemetry tower and sensors for river and rainfall will be decided by the Engineer - in - Charge depending on the site and river flow conditions.

iii. The contractor should preferably, complete the required civil works at the site for proper installation of the equipment before supplying the equipments at the site.

10. Incidental Services

The contractor shall be required to provide any or all of the following services:

a. Performing on-site assembly, start-up processes required for installation and commissioning of the supplied goods and their supervision;

b. Furnishing of appropriate hardware, system design and programming services required for development and/ or maintenance of the supplied goods;

c. Supply of detailed operations and maintenance manual for each appropriate unit of commissioned goods/ equipments;

d. Maintenance of all the equipment through vigorous supervision including repair and/ or replacement of defective material for next Two (2) years beyond warranty period so as to ensure that performance of system is not compromised as per satisfaction of engineer-in-charge. However, provision of maintenance services shall not relieve the Contractor of any warranty obligations under this Contract;

e. Software updates and bug fixing services for the software originally developed by the Contractor during the period of warranty and subsequent maintenance. For the third party software packages supplied the updates shall be provided during the warranty period.

f. Training of the CWC personnel in assembly, start-up, operation, maintenance and/or repair of the supplied Goods at the remote stations as per the training schedule to be approved by CWC.

g. The travel, boarding, lodging and other payment to his staff for erection, installation and maintenance at the sites shall be the responsibility of the Contractor.

11. Spare parts

11.1 The Contractor is required to provide any or all of the following materials, notifications and information pertaining to spare parts manufactured or distributed by the Contractor.

a) Supply of essential/ mandatory spares/ consumables, as the Department may decide to purchase from the Contractor and as specified in Technical specifications para 16.0, required for running & maintenance of all the equipments for two years. This decision shall not relieve the Contractor of any warranty obligations under the Contract;

b) In the event of termination of production of the spare parts ;

i. Advance notification to the Department of the pending termination, in sufficient time, to permit the Department to procure needed requirements; and

ii. Following such termination, furnishing at no cost to the Department, the blue prints, drawings and specifications of the spare parts, if requested.

11.2 The Contractor shall carry sufficient inventories to assure ex – stock supply of consumables and spares to the Department for the entire period of the contract including warranty period. Contractors shall ensure the availability of after-sales service for a period of at least fifteen years including warranty period.

12. Warranty and Maintenance Service

12.1 The Contractor shall warrant that the goods supplied under the contract are new, unused, of the most recent or current models and that they incorporate all recent improvements in design and materials unless provided otherwise in the Contract. The contractor further warrants that all Goods supplied and all civil works undertaken under this Contract shall have no defect, arising from design, materials or workmanship (except when the design and / or material is required by the Department's specifications) or from any act or omission of the Contractor, that may develop under normal use of the supplied Goods in the field conditions prevailing.

12.2 Without limiting the generality of the foregoing, the contractor shall further warrant that:

- That the Hardware and Software will not be abnormally end or provide invalid or incorrect results as a result of date data, specifically including date data which represents or references different centuries or more than one century.

- That the Hardware and Software will manage and manipulate data involving dates, including single century formulas and multi-century formulas, and will not cause an abnormally ending scenario within the application or generate incorrect data.

12.3 This warranty shall remain valid for twenty four (24) months from the date of signing of the Acceptance Certificate. The contractor shall, in addition, comply with the performance guarantees specified under the contract. If, for reasons attributable to the contractor, these guarantees are not attained in whole or in part, the contractor shall, make such changes, modifications, and/ or addition to the goods or any part specified in the contract at its own cost and expense and to carry out further performance tests in accordance with Clause 7. Failure on part of contractor to ensure such performance guarantees shall make the contractor liable for deficiency in providing services and attract penal action, thereof, in form of deduction of payment towards the warranty periods.

12.4 The maintenance services to be provided by the contractor under this contract shall be for entire system complete, including all completed civil/ mechanical works, supplied telemetry equipment/ system, all accessories like cable etc and attachments of the equipments/ systems installed at Remote Stations and the software installed at ERS and Modelling centres including providing of all required consumables, additional spare parts, repair of the defective equipment or units/parts thereof, orientation of antenna whenever required due to any change(s) in position of the satellite during the warranty period of two year and maintenance period of 2 years. *The maintenance period is likely to continue beyond 2 years during subsequent Five Year Plan periods (beyond 12th Five Year Plan period) of Government of India. Accordingly the financial bids have been requested from the bidder in Financial Tender Format (item not to be used for evaluation), which may be implemented as per the decision of the competent authority during subsequent Five Year Plan periods.*

12.5 For the remaining remote stations, which have not been accepted as a part of the acceptance certification, the Annual Maintenance services shall be provided for the balance part of the block period of the Annual Maintenance Contract in which the station completes its warranty period on a pro-rata payment basis. Thereafter, such stations shall be incorporated in the group of the remote stations for the successive blocks of the Annual maintenance contract.

12.6 Contractor shall set up a site office at Modelling Centre location, Hyderabad equipped with all requisite infrastructural facilities at his own cost and notify its office and residential addresses to the Engineer-in-charge, to handle the complaints within 15 days from the date of signing this contract.

12.7 The department shall promptly notify the contractor in writing of any claims arising under this warranty/ AMC.

12.8 The department shall notify Contractor of any errors and malfunctions, which occur and noticed when equipment are in use, by fax/ telephone/ e-mail/ special messenger directly or through his Service Engineer(s) at his office address during normal working hours or at their residence after normal office hours and/ or on holidays.

12.9 The Contractor shall ensure proper functioning of all equipment installed at remote stations and satisfactory data transmission from all remote stations and data receipt at modeling center/ CFCR Delhi through Earth Receiving Station, Delhi by V-SAT System utilizing the spare parts available at Hyderabad during AMC period and by providing additional spare parts for which no additional cost will be paid by the Customer.

12.10 The authorized representative of Engineer-in-Charge shall provide free access to the sites where the defect has occurred. E.g. Remote Station equipment may be under lock & key for which the authorized representative of Engineer-in-Charge shall make sure that free access to such sites are made available for necessary actions at contractors end. He will also arrange for the security clearance, wherever required in advance to ensure that contractor's engineers get the access to site immediately.

12.11 Contractor shall be responsible for, providing & replacement of consumable items such as DCP batteries, batteries of UPS, cables, tubes, silica gel connectors and other similar items.

12.12 Contractor shall also be responsible for providing round the clock watch and ward services at all remote station locations where automatic sensors for data acquisition have been installed during the installation period until final acceptance. The contractor has to ensure that standing instructions/ rules and regulations of Government of India/ State government towards provision of minimum wages, ESI, employees insurance, provident fund etc are strictly followed while providing staff towards watch and ward of the remote stations. The department shall be kept indemnified from any claim or issue arising out of non-fulfillment of rules and regulations and eventuality thereof. The department shall be kept fully informed through documentary evidences (in form of quarterly returns) in respect of payments made towards employees insurance, PF, minimum wages etc.

12.13 Periodical routine services viz., pre-monsoon and post-monsoon services and bi-monthly services shall be provided by the Contractor.

12.14 Changes required for realigning the system at central stations and remote stations due to the change in operating satellite for this project shall be done by the Contractor at his own cost.

12.15 Equipment required to undertake any changes in alignment will be arranged by Contractor.

12.16 It is expected that the average downtime (during life time of equipment/ system) of an item will be less than half of the maximum downtime (i.e. defined as number of days for which an item of equipment is not usable because of inability of the contractor to repair it). The maximum downtime for any item is taken as 36 days while annual maximum downtime is taken as 9 days. In case an item is not usable beyond the stipulated maximum annual downtime the contractor will be required to arrange for an immediate replacement (with equipment of similar specifications) of the same till it is repaired. Failure to arrange for the immediate repair/ replacement will be liable for penalty of Rs. 6000/- per day per item which shall be recovered from the security deposit/ performance guarantee. The non usability of an item beyond stipulated maximum annual downtime will not be applicable during flood season starting w.e.f. 15 June to 15 October every year.

12.17 The maximum response time for a complaint from any of the destination specified in the schedule of requirements i.e. time required for contractors maintenance engineers to restore the data acquisition from the remote station after a request sms/ fax/ e-mail is made or letter is written shall not exceed 72 hours. Upon receipt of such notice, the Contractor shall, visit the site and repair or replace the defective Goods or parts thereof, without cost to the Department within 72 hours.

12.18 A remote site shall be treated as faulty if it fails to respond or transmits erroneous data during three consecutive pre-programmed observation cycles usually of one hour each. The decision of Engineer-in-Charge about errors in data shall be final and binding. If a remote site continues to remain "fail" for more than 6 hours in excess of the maintenance time schedule of 72 hours. The contractor is liable to pay penalty @ Rs. 6000/- per day/ remote site. The Day for the purpose of penalty shall be taken as failure period of 24 hours or part thereof for a particular remote site.

The above penalty @ Rs. 6000/- per day/ remote site shall be applicable in the monsoon period (15^{th} May to 15^{th} October) only and beyond the monsoon period the penalty shall be 50% of the above rates.

12.19 The Contractor shall, at his own cost, carry out repair of the defective equipment or parts removed from the site of installation, to the satisfaction of the engineer-in-charge and return the equipment after satisfactory repair within 90 days from the date of written complaint/ request made. However contractor has to ensure that the remote station as well as the telemetry system remain fully operational through its satisfactory response and/ or transmission of data as per clause 12.17 above. All charges towards collection, transportation of defective equipment, return of equipment after repair including cost of repair defective equipment or parts thereof, shall be borne by the Contractor.

12.20 If the contractor fails to replenish the spares or return the equipment after satisfactory repairs within 90 days from date of complaint made, this will be considered as failure of Remote Stations and a penalty @ Rs. 6000/- per Day/ item shall be applicable.

12.21 The mandatory as well as recommended spares/ equipment which department has opted for purchase is given in schedule of requirement (Table – 1) and it shall be given free access to contractor to be used as standby. Excluding the above mentioned spares/ equipment maintained by the Department any import/ purchase of any of such components as required during the maintenance, the same shall also be the sole responsibility of the contractor. If the contractor fails to repair the equipment/ spare due to non availability of the spare/ technological changes the same may be replaced by the contractor with equivalent equipment/ spare of same specification and reputed make with prior permission of Engineer-in- charge and the costs involved in this process shall be borne by the contractor. Non-returning of the defective spares/ equipment after due repair within stipulated time as specified above shall attract the penalty as per clause-12.19 of this contract

12.22 If the contractor, having been notified, fails to remedy the defect(s) within the time specified in Clauses 12.16 & 12.18 the department may proceed to take such remedial action as may be necessary, at the contractor's risk and expense as specified in clause 12.17 & 12.19 and without prejudice to any other rights which the department may have against the contractor under the contract.

12.23 If the Contractor fails to rectify the defects or fails to return the equipment after satisfactory repair within the permitted time frame, he shall be liable to pay the penalty at the rates indicated in clauses 12.19 of this contract. The period of penalty shall be calculated from the time effective from the time of expiry of the time schedule allowed for fault rectification/ return of the equipment after satisfactory repair.

12.24 The amount of penalty as indicated in the above clauses will be subject to maximum 25% of the tendered amount. The amount of penalty will be recovered from running bills/ amount withheld [Clause 15.v]/ Security Deposit/ Performance Guarantee during warranty. The Department may also proceed to take such remedial action as may be necessary, at the Contractor's risk and expense and without prejudice to any other rights which the Department may have against the Contractor under the Contract.

12.25 The authority to decide and review the penalty shall be Superintending Engineer, Godavari Circle,CWC, Hyderabad.

13. The Annual maintenance charges shall be quoted for a block of two consecutive years for the entire period following warranty period of two years.

14. Measurement

14.1 The Engineer-in-charge or his authorized representative shall acknowledge the receipt of Goods subject to further verification and settlement at the time of installation at site by way of signing the delivery challan in triplicate and shall handover two copies of the same to Contractor.

14.2 The Contractor shall transport required goods for installation at project site and shall unpack and get the individual components, equipments, consumables and spares verified in terms of their numbers and quantities by the Engineer-in-charge or his authorized representative.

14.3 The Contractor shall carry out all civil, mechanical, electrical and fabrication work at work site and give a written notice of having completed these works to the satisfaction of engineer-in-charge for joint verification by engineer-in-charge or his authorized representative within 15 days of completion of works. Based on joint verification, Engineer-in-charge or his authorized representative shall get the quantities of major items of work recorded in the measurement books thereafter.

14.4 The Contractor shall also demonstrate performance of the installation as a whole at the work site in a mutually agreed manner so as to enable consignee to fill up the check list provided by the Engineer-in-charge for ensuring acceptable performance of the project site.

14.5 The Engineer-in-charge shall issue an acceptance certificate in respect of each of the project site on demonstration by the Contractor towards satisfactory acquisition of the data by the DCU from all the sensors and satisfactory storage of the same in internal memory. The performance of the solar panel and battery pack shall also be included in the acceptance certificate.

14.6 The Engineer-in-charge shall issue a completion certificate in respect of each site on demonstration of satisfactory acquisition, transmission and receipt of data from all the remote stations of the Organisation at Modeling Center server for the Organisation for a continuous period of 7 days and completion of all training modules for the organization and handover of all documentation.

14.7 The records generated under para 14 shall be used by Engineer-in-Charge for releasing the payments against such measurements as per Stages provided in the payment clause.

15 Payment

The method and conditions of payment to be made to the Contractor under this Contract shall be strictly as per clauses of General Conditions of Contract.

(i) Payment will be made in Indian Rupees only. The payment will be released through a crossed account payee cheque/ draft in favour of the Contractor drawn on Hyderabad.

(ii) Payments shall be made in running account (R/A) bills as per GCC payment terms on satisfactory completion of works/ services at following milestones;

(a) Ist Running Bill on successful completion of civil works at the site for proper installation of the equipment as per clause 9.iii of Special Conditions of the contract.

(b) IInd Running Bill of amount equivalent 60% payment of the items related to supply of goods shall be made on receipt of *goods* by the consignee on production of the delivery challans and after successful completion of 1st stage of Site acceptance Test as per Clause 14.4 of Scope of Work and Technical Specifications. In case of part supply, the amount to be paid under this clause, shall be decided on pro-rata basis and decision of Engineer-in-Charge in this regard shall be final and binding on the contractor.

(c) IIIrd Running Bill for Balance payment (including balance 40% of supply items as withheld in 15(ii)b above) shall be made after successful completion of Modelling Centre Level Acceptance Test as per Clause 14.5 of Scope of Work and Technical Specifications. The payment shall be released in respect of only those stations (only after completion of works/ services for at least 80% of proposed Remote/ Telemetry Stations for entire Krishna Godavari Basin Organisation) which are included in the acceptance certificate of the organization. The payment for the stations which are accepted subsequent to the issue of acceptance certificate shall be released on issue of acceptance certificate for the station concerned.

(d) The cost of annual maintenance contract shall be paid in equal quarterly installments after successful maintenance of the system against a certificate to this effect from engineer-in-charge during the quarter.

(e) The Annual maintenance charges during any block shall be payable on pro-rata basis on the basis of actual quantities of components being covered under AMC.

(v) **Deductions from the bill**:

(a) Security Deposit shall be deducted as per Clause 1 and Clause 1(A) of General Conditions of the Contract (GCC) under CPWD Forms 7/8 from each running bill.

(b) The goods and services under this contract are high value and technology driven items which will be providing invaluable data base for flood forecast formulation purposes. Therefore it is important to ensure that equipments commissioned under the contract perform satisfactorily over entire life of equipments. Accordingl y, in addition to GCC conditions, an amount equivalent to 15% of total contract amount excluding AMC charges shall be pledged in form of bank guarantee in favour of *Executive Engineer, Upper Godavari Division, CWC, Hyderabad* /deducted from each running bill .The bank guarantee(s)/amount so deducted shall be released @5% after end of each year during warranty and annual maintenance period (i.e. after 1st year, IInd year during warranty and after Ist year of AMC). In case of default and/or deficiency of services, the bank guaranteed shall be encashed by the Department. It will be responsibility of contractor to ensure that bank guarantee is revalidated in favour of Department during the duration of contract.

(c) The Income tax as applicable shall be deducted at source from the bill.

(d) Sales Tax as applicable shall be deducted at source from the bill.

(e) Certificate on account of taxes payable/ paid to the Government shall be given to the contractor. No other certificates for claiming any other tax exemptions will be given.

16 Prices

Prices payable to the contractor as stated in the contract shall be firm and not subject to adjustment during the performance of the contract. Prices quoted shall be inclusive of all taxes and duties levied at the country of import or in India.

17 Change Orders

17.1 The Department may at any time, by a written order given to the Contractor, make changes within the general scope of the contract in any one or more of the following:

i. Drawings, designs, or specifications, where Goods to be furnished under the contract are to be specifically manufactured for the Department;

ii. The method of shipment or packing;

iii. The place of delivery; and / or

iv. The Services to be provided by the Contractor.

v. If any such change causes an increase or decrease in the cost of or the time required for, the contractor's performance of any provisions under the contract, an equitable adjustment shall be made in the Contract Price or delivery schedule, or both as per clause of GCC, and the Contract shall accordingly be amended. Any claims by the Contractor for adjustment under this clause must be asserted within thirty (30) days from the date of the Contractor's receipt of the Department's change order.

18 Contract Amendments: Subject to Clause 17, no variation in or modification of the terms of the Contract shall not be made except by written amendment signed by the parties.

19 Assignments

The contractor shall not assign, in whole or in part, its obligations to perform under this Contract, except with the Department's prior written consent.

20 Sub-contracts

20.1 The Contractor shall notify the Department in writing of all sub-contracts awarded under this contract if not already specified in the tender. Such notifications, in the original tender or later, shall not relieve the contractor from any liability or obligation under the contract.

20.2 Sub-contracts must comply with the provisions of Clause 3 of General Conditions of Contract (GCC).

21 Delays in the contractor's Performance

21.1 Delivery of the Goods and performance of Services shall be made by the Contractor in accordance with the time schedule prescribed by the Department in the Schedule of Requirements.

21.2 If at any time during performance of the Contract, the Contractor or its sub-contractor(s) should encounter conditions impeding timely delivery of the Goods and performance of Services, the Contractor shall promptly notify the department in writing of the fact of the delay, its likely duration and its cause(s). As soon as practicable after receipt of the Contractor's notice, the department shall evaluate the situation and may at its discretion extend the Contractor's time for performance, with or without liquidated damages as per Clause of GCC, in which case the extension shall be ratified by the parties by amendment of the Contract.

21.3 Except as provided under Clause 24, a delay by the Contractor in the performance of its delivery obligations shall render the Contractor liable to the imposition of liquidated damages pursuant to Clause 22 unless an extension of time is agreed upon pursuant to Clause 21.2 without the application of liquidated damages.

22 Liquidated Damages

Subject to Clause 24, if the Contractor fails to deliver any or all of the Goods or to perform the Services within the period(s) specified in the Contract, the department shall, without prejudice to its other remedies under the Contract, deduct from the Contract Price, as liquidated damages, a sum equivalent to the percentage specified of the delivered price of the delayed Goods or unperformed Services for each week or part thereof delay until actual delivery or performance, upto a maximum deduction of the percentage specified. Once the maximum is reached, the department may consider termination of the Contract pursuant to Clause 23. The applicable rate is 1.5% per month and the maximum deduction is 10% of the contract price.

23 Termination for Default

23.1 The Department, without prejudice to any other remedy for breach of contract, by written notice of default sent to the Contractor, may terminate this Contract in whole or in part.

i. if the Contractor fails to deliver any or all of the Goods within the period(s) specified in the Contract, or within any extension thereof granted by the Department pursuant to Clause 22.2;
ii. if the Contractor fails to perform any other obligation(s) under the contract.

iii. if the Contractor, in the judgment of the Department has engaged in corrupt or fraudulent practices in competing for or in executing the Contract.

For the purpose of this clause:

"Corrupt practice" means the offering, giving, receiving or soliciting of any thing of value to influence the action of a public official in the procurement process or in contract execution.

"fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Department, and includes collusive practice among Tenderers (prior to or after tender submission) designed to establish tender prices at artificial non-competitive levels and to deprive the Department of the benefits of free and open competition.

23.2 In the event the Department terminates the Contract in whole or in part, pursuant to Clause 24.1, the Department may procure, upon such terms and in such manner as it deems appropriate, Goods or services similar to those undelivered and the contractor shall be liable to the Department for any excess costs for such similar Goods or Services. However, the contractor shall continue performance of the Contract to the extent not terminated.

24 Force Majeure

24.1 Not withstanding the provisions of Clause 21, 22 and 23, the Contractor shall not be liable for forfeiture of performance security liquidated damages or termination for default, if and to the extent that, its delay in performance or other failure to perform the obligations under the Contract is the result of an event of Force Majeure.

24.2 For purposes of this Clause, "Force Majeure" means an event beyond the control of the Contractor and not involving the Contractor's fault or negligence and not foreseeable. Such events may include but are not restricted to wars or revolutions or civil commotions, fires, epidemics, quarantine restrictions, freight embargos and flood causing water level rises beyond Highest Flood Level (HFL) recorded at the sites.

24.3 If a Force Majeure situation arises, the Contractor shall promptly notify the Department in writing of such condition and the cause thereof. Unless otherwise directed by the Department in writing, the Contractor shall continue to perform its obligations under the contract as far as reasonably practical, and shall seek, all reasonable alternative means for performance not prevented by the force Majeure event.

25 Termination for Insolvency

The Department may at any time terminate the Contract by giving written notice to the Contractor if the Contractor becomes bankrupt or otherwise insolvent. In this event, termination will be without compensation to the Contractor, provided that such termination will not prejudice or affect any right of action or remedy which has accrued or will accrue thereafter to the Department.

26 Termination for Convenience:

26.1 The Department, by written notice sent to the Contractor, may terminate the Contract, in whole or in part, at any time for its convenience. The notice of termination shall specify that termination is for the Department's convenience, the extent to which performance of the Contractor under the Contract is terminated, and the date upon which such termination becomes effective.

27 Resolution of disputes

27.1 The department and the Contractor shall make every effort to resolve amicably by direct informal negotiation any disagreement or dispute arising between them and or in connection with the Contract.

27.2 If, after thirty (30) days from the commencement of such informal negotiations, the Department and the Contractor have been unable to resolve amicably a Contract dispute, either party may require that the dispute be referred for resolution to the formal mechanisms specified. These mechanisms may include, but are not restricted to, conciliation mediated by a third party, adjudication in an agreed national forum.

27.3 Settlement of disputes

The rules of procedure for arbitration proceedings pursuant to settlement of disputes shall be as follows:

(a) In case of dispute or difference arising between the Department and contractor relating to any matter arising out of or connected with this agreement, such disputes or difference shall be settled in accordance with the Arbitration and Conciliation Act, 1996. The Chief Engineer, Krishna Godavari Basin Organisation, Central Water Commission shall function as Arbitrator.

(c) Arbitration proceedings shall be held at Hyderabad and the language of the arbitration proceedings and that of all documents and communications between the parties shall be English.

(d) The decision of the Arbitrator shall be final and binding upon both parties. The cost and expenses of Arbitration proceedings will be paid as determined by the Arbitrator. However, the expenses incurred by each party in connection with the preparation, presentation etc. of its proceedings as also the fees and expenses paid to the Arbitrator shall be borne by each party itself.

28 Applicable Law

28.1 The contract shall be interpreted in accordance with the laws of the India.

29 Notices

29.1 Any notice given by one party to the other pursuant to this Contract shall be sent to the other party in writing or facsimile or email and confirmed in writing to the other party's address specified.

29.2 A notice shall be effective when delivered or on the notice's effective date, whichever is later.

29.3 The contractor is responsible for managing the activities of its personnel or sub-contracted personnel and will hold itself responsible for any misdemeanors.

29.4 The Contractor will treat as confidential all data and information about the Department, obtained in the execution of his responsibilities, in strict confidence and will not reveal such information to any other party without the prior written approval of the Department.

29.5 Contractor may be required to work in under-water condition for construction of termination block. For the purpose, the contractor shall make arrangement for local diversion of water and dewatering of pool so created.

29.6 The Department reserves the right to terminate the contract in full or in part with one month prior notice.

SCOPE OF WORKS AND TECHNICAL SPECIFICATIONS

1.0 GENERAL

The Technical Specification covers the contract for the installation of telemetry system in Krishna Godavari Basin Organization, Hyderabad including existing/ new Earth Receiving Station, which shall be able to receive data from INSAT/Kalpana1 data relay transponder as well as DRT of future INSAT systems, instrumentation and associated Data Collection Units (DCU's). This shall include the design, manufacture, factory testing, delivery to site, installation (including the associated interface wiring/ termination), commissioning and site acceptance testing, supply of mandatory spares, training and documentation. DCU's, Monitoring system hardware / software shall interface and be fully integrated and tested with the existing Earth Receiving Station (ERS). The functional requirements are given below in respect of each major component of the system. The contractor shall ensure that the fundamental requirements enunciated hereunder are not compromised.

2.0 SCOPE OF WORK AND OVERVIEW OF THE SYSTEM

Krishna Godavari Basin Orgainisation, Central Water Commission has a network of 108 existing remote stations established in 1999, 2005, 2011 where data is collected automatically using sensors based equipments at certain discrete intervals. This data is transmitted on real time basis to 1/2 Earth Receiving Station located at Jaipur (in PRBS Mode)/New Delhi (in TDMA Mode), which was established in 99/2011. The Earth Receiving Station is being maintained by M/s Suton India Ltd/ESTL since 99/2011 who has developed/ configured and commissioned requisite softwares for receipt and processing of data. The data at Earth Receiving Stations is further transmitted on real time basis to the Modelling Centres located at UYD(New Delhi), LYD(Agra), CD(Jaipur), SHD(Shimla), HGD(Dehradun), MGD1(Lucknow), MGD2(Lucknow), MGD3(Varanasi), MGD4(Patna), MGD5(Patna), DD(Asansol), UBD(Debrugarh), MBD(Guwahati), LBD(Jalpaiguri), MD(Burla), ERD(Bhubaneshwar), ND(Bhopal), TD(Surat), MD(Gandhinagar), LGD(Hyderabad), LKD(Hydearbad), LTSD(Kurnool), FFM(CWC HQ) through V-Sat system installed by HCL/Essel Shyam where it is utilised for formulation of flood forecasts by Central Water Commission.

During the FY:2012-13, Central Water Commission proposes to establish sensor technology based automatic data acquisition system at 15 number of remote stations located in Krishna Godavari Basin Organization under Upper Godavari Division, Hyderabad. The data shall be collected on real time basis at these remote stations and transmitted to existing Earth Receiving Stations at New Delhi in TDMA mode. The data will be further transmitted from Earth Receiving Station to FFM & Modelling Centres of CWC located at Hyderabad.

This may involve utilization of existing telemetry network/ existing V-SAT system of CWC installed in FFM Dte & LGD/LKD, Hyderabad as well as storage of data in the existing servers at CWC HQ & Modelling Centres at Hyderabad. The contractor presently shall be required to provide any or all of the following services:

i. Supply, installation, testing, commissioning of automatic data acquisition and satellite based real time data transmission (telemetry) network at 15 remote stations in Krishna Godavari Basin Organization and its associated systems including all necessary civil, mechanical, electrical works.

ii. Integration of commissioned real time data acquisition network with the existing telemetry network of CWC installed in FFM Dte & LGD/LKD, CWC, Hyderabad. This may include receiving of data at the existing Earth Receiving Station of CWC at New Delhi and transmission of data received to existing Modeling Center of CWC at FFM (CWC HQ) & Modeling Centers at Hyderabad in the existing servers through V-SAT systems. All necessary configurations shall be made by the contractor in this regard without entering into conflict with any existing software or systems. If required necessary software shall be developed by the contractor for this purpose for data base management in consultation with Engineer-in-charge. Entire responsibility of ensuring smooth flow of data from remote stations to Modeling Centres during the entire period of contract shall lie with the contractor and contractor shall not be allowed to dilute his responsibility on any account in this respect.

iii. Performing on-site assembly, start-up processes required for installation and commissioning of the supplied goods and their supervision.

iv. Obtaining clearances and necessary approvals/ permissions from various Govt. agencies for supply of goods and for operation of all the satellite transmission/ wireless equipment. CWC shall be providing necessary assistance for obtaining such clearances as and when requested b y the contractor. However entire responsibility for obtaining the necessary clearances, approvals/ permissions shall lie with the contractor only.

v. Supply of detailed operations and maintenance manual for each appropriate unit of commissioned goods/ equipments;

vi. Supply of essential/ mandatory spares/ consumables as specified in Technical specifications para 16.0, required for running & maintenance of all the equipments for two years;

vii. Training of the CWC personnel at the remote stations and at the Modelling Centre as per the training schedule to be approved by CWC.

viii. Provision of Warranty services after handover of the entire system for a period of 2 years.

ix. Maintenance of all the equipment through vigorous supervision including repair and/ or replacement of defective material for next two (2) years beyond warranty period so as to ensure that performance of system is not compromised as per satisfaction of engineer-in-charge. However, provision of maintenance services shall not relieve the Contractor of any warrant y obligations under this Contract.

2.1 Classification of Remote Stations

Remote stations are to be established as listed below.

Sl No	Station Name	District/State	River	Sensors
1	Sri Sailam Dam	Kurnool / Andhra Pradesh	Krishna	Radar level and Rain fall
2	Prakasham barrage	Krishna / Andhra Pradesh	Krishna	Radar level and Rain fall
3	Arujnwad	Kolhapur / Maharashtra	Krishna	Bubbler Type and Rain fall
4	Halia	Nalgonda / Andhra Pradesh	Halia / Krishna	Bubbler Type and Rain fall
5	N S Dam	Nalgonda / Andhra Pradesh	Krishna	Radar level and Rain fall
6	Sri Ram Sagar	Nizamabad / Andhra Pradesh	Godavari	Radar level and Rain fall
7	Jaikwadi Dam	Aurangabad / Maharashtra	Godavari	Radar level and Rain fall
8	Singur Dam	Medak / Andhra Pradesh	Manjira/Godavari	Radar level and Rain fall
9	Nizam Sagar Dam	Nizamabad / Andhra Pradesh	Manjira /Godavari	Radar level and Rain fall
10	Lasur	Aurangabad / Maharashtra	Shivnala/Godavari	Bubbler Type and Rain fall
11	Kiwaibalenga	Kondagaon/ Chattisgarh	Bawardhi/Indravathi/ Godavari	Bubbler Type and Rain fall
12	Sonarpal	Bastar / Chattisgarh	Markandi/Narangi/ Indravathi/Godavari	Bubbler Type and Rain fall
13	Dhond	Pune / Maharashtra	Bhima / Krishna	Bubbler Type and Rain fall
14	P D Jurala Project	Mahbubnagar / Andhra Pradesh	Krishna	Radar level and Rain fall
15	Vijayawada	Krishna / Andhra Pradesh	Krishna	Radar level and Rain fall

Note:- The Station names and Sensors listed are tentative. Some of the sites may be deleted /new ones added and / or type of sensors changed as per the site conditions and availability of land / permission of State Govt. concerned.

Each station shall have appropriately configured Data Collection Unit (DCU) alongwith necessary communication facilities.
Each station shall be fully automatic and shall only require routine maintenance and inspection. Readings of various parameters (such as water level and rainfall) shall be automatically transmitted to the specified Earth Receiving Stations at predefined intervals.

2.2 Functional Description of Remote Stations

2.2.1 Rainfall Stations

The rainfall inputs are very important in flood forecasting as they indicate the formation of the flood wave in the catchment. The station shall collect the rainfall data and transmit as per the schedule without fail. Rainfall station shall have the rain gauge connected to the data acquisition and transmission setup.

2.2.2 Rainfall and River Water Level Stations

Remote field gauging stations are essential to determine the real time flood wave propagation in a river system. Normally, the water levels at the gauging sites are measured and reported once every clock hour following IST. The measurements have to be carried out at a uniform accuracy through the range of minimum to the maximum expected river water levels for the specific site. Generally, all the gauging stations will also measure rainfall. The sensors may be at a single location or at a distance apart connected through Radio or any other appropriate technology.

2.3 Functional Description of Earth Receiving Station (ERS)

One number Earth Receiving Station (ERS) has already been installed at New Delhi in the office premises of Executive Engineer(Upper Yamuna Division), Kalindi Bhawan, B 5, Tara Crescent Road, Qutub Institutional Area, New Delhi 16. The ERS is working in TDMA mode and receiving the data from various types of stations in the network and sending the same to respective modeling centers as configured by the users. The ERS computer will also be connected in a closed user group established through a VSAT network in CWC.

2.4 Functional Description of Modelling Centres

The Modelling Centers will receive hourly data on real time basis from the Earth Receiving Station (ERS) through VSAT, store all data on a server and shall be able to provide required data on demand for formulating flood forecast. It shall be able to transmit flood forecasts and other information formulated at Divisional and sub - Divisional control rooms as per requirement. Modelling centers are equipped with Flood forecasting software packages for formulation of the flood forecasts and the data file received shall be directly usable by the package.

The contractor shall integrate data received from remote sites with the existing softwares/RDBMS as available in the existing modeling centres for receipt of data in useful format in the center without disturbing the data receipt of existing sites. All necessary software development and supply shall be provided by the contractor.

Custom computer applications will be required for the assembly of the data from the ERS into the database server located at the same centre and assembly and transmission of the basin specific sub-set of data to the concerned Modelling Center Server through the VSAT link. The transmission frequency will match with a specified time lag between the collection of the data at the ground station and the transmission through the VSAT link. Bidder will have to provide appropriate computer software for the purpose at the ground station as well as the modelling center wherever required.

The data collected by the ERS from various DCUs will be decoded and stored in a database on the ERS server. The database structure shall be designed by the contractor in such a way that all the information received from any DCU, including error messages and alarms etc. is stored in the database at ERS. The collected data shall also be organized in separate files one each for every modelling center pertaining to every hour and shall be transmitted by VSAT based network to the concerned Modelling center server.

Another package operating at the modelling center server will store the received data in a local RDBMS and will also prepare a data file for the flood forecasting software implemented at the modelling center for issue of flood forecast.

The bidder will have to provide the data in a CSV file with a known layout and also integrate the same in a database located at the modelling center.

The software modules proposed shall be demonstrated for the desired performance to the entire satisfaction of the purchaser. For the purpose of bidding, the contractor will submit a framework of the development that they want to undertake and include key screen shots of the forms and dialogs indicating the approach proposed.

All systems shall be free from errors caused by misinterpretation of any times and dates. All dates will use the Gregorian calendar.

The contractor shall supply a full interactive online help and tutorials for the package provided by them. In addition, a full documentation for maintenance of the software code shall also be provided.

3.0 EQUIPMENT ARRANGEMENT AT REMOTE STATIONS

3.1 Rainfall Station

The rain fall station shall be equipped with all necessary equipments and peripherals including the following

- Data collection Unit mounted inside an enclosure which will house the following items.
  - Data Logger with integrated INSAT transmitter with built-in display.
  - Battery (supplied by the contractor) for power requirements.
  - Pre-wiring and configuration.
  - Solar panel charger regulator.
  - Connector interfaces with surge suppression on all channels as well as INSAT transmitter.
- Mast (tripod)/Tower to mount DCU at the site (alternatively, where walled enclosure is available, same can be mounted on the same.
- Mast (tripod)/Tower for solar panel & INSAT antenna. Mast/Tower can be shared with the DCU mast also.
- Conduit for raingauge (provided by the contractor).
- Civil works for mast/tower and raingauge (provided by the contractor).
- Wire-mesh fencing and gate with lock (provided by the contractor)
- Mounting stand for rain gauge (provided by the contractor) and antenna cables.
- Power cables.
- Grounding and lightning protection (provided by the contractor) All necessary hardware required for the system to operate properly.
- For some locations where area is likely to be flooded the department may request installation of the assembly on a raised platform/tower top to be provided as a part of supply.

3.2 River Gauging Station

River gauging station shall be equipped with all necessary equipments including radar sensor/ bubbler and tubing as well as all peripherals. All the arrangements specified for rainfall

station would be provided for this type of station also. In addition, the following shall be provided.

For Bubbler type:

- Conduit (HDPE) for carrying the bubbler tubing into the river channel duly embedded underground.
- Termination block of RCC construction with the foundations taken below the scour depth for the river at the site.
- Additional termination blocks at intermediate heights where a multiple installation of the gauging equipment is planned.
- Clamps and fixing arrangements for conduit and tubing shall preferably run along the bridge piers or other concrete structures where available.

For Radar type:

- Mounting / Installation Arrangement shall be above HFL below a bridge girder wherever available otherwise on a cantilever projection from a mast or pedestal made of structural steel or RCC with sufficient strength.

4.0 INSTRUMENTATION AND DATA ACQUISITION HARDWARE AND SOFTWARE

4.1 General Specification/ features

i. It is imperative that all instrumentation, other equipment shall operate effectively with the DCU's and the DCU'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 (gauges, DCU's, solar power arrangements etc) shall interface accurately. For this purpose, the interfaces between the sensors and the DCU, DCU and transmission equipment and that between ERS and modelling centers are ensured to be robust, 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 Department 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. The system is meant to provide real time inputs for formulation of flood forecasts and occurrence of floods can be presumed to be accompanied with extreme weather conditions. Therefore, reliability of operation during normal and extreme weather conditions is imperative and an essential requirement.

v. The sensors and all accessories and facilities shall be fully compatible with the data acquisition and transmission system. The sensors and DCU 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 may be required to be ordered separately and may not be included as a part of the offer; the same shall be clearly mentioned in the Tender along with the functions of such features. The department 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 contractor shall enclose technical literature in respect of all the sensors 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 Tender. In the event of failure of the contractor to explicitly mention any such exclusion, it shall be taken as inclusion of all features mentioned in

the Tender as a part of the supply and the contractor shall have to provide all such features/ accessories without claim of extra cost to the department. No such claims will be entertained by department.

viii. All accessories and fixtures required for installation of the equipment shall be treated as a part of the supply for each type of sensors.

ix. Contractors shall give general lay out of all the installations including all civil works for types of stations and materials including that for the equipment at the time of Tendering. Afterwards, the successful tenderer shall furnish the details of all the mounting arrangements including civil works. Variations in typical designs shall be submitted with drawing and design calculations and shall have to be got approved from the concerned Engineer – in – charge before commencement of works and any changes suggested by the Engineer – in – charge shall be agreed to. Recent Indian Standard Codes of Practice shall be followed for all civil works and mounting arrangements. The latest may be defined as Standard issued two months prior to issue of Tender document.

x. The security arrangement provisions for sensors installed in the open ground like wire-mesh fencing, locking etc. shall also be provided by the contractor.

xi. All fixings shall be non-corrodible.

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

xiii. Wherever the DCU or any of the instruments is mounted at a height of 2 metres or higher from floor or ground level, collapsible aluminum ladders of good quality shall be provided.

4.2 Rainfall Measurements

i. Rainfall shall be measured using the tipping bucket method and shall be able to record cumulative rainfall.
ii. The rain gauge shall be of such a design that it operates reliably and accurately under the prevailing environmental and weather conditions.
iii. It shall be noted that some sites are prone to cyclonic winds.
iv. The rain gauge shall be easy to operate and maintain.
v. The rain gauge shall be supplied with the accessories as needed for effective deployment.
vi. All materials on the rain gauge, regardless of the protective layer(s), shall be non-corrosive and of stainless steel body. (e.g. galvanised or paint coated iron is not acceptable).
vii. Sheet material shall not be part of the rain gauge.
viii. The bucket design shall be inherently symmetrical, e.g. of moulded thermoplastic material.
ix. All materials on the rain gauge that are exposed to sunlight shall be certified UV radiation resistant.
x. The rain gauge shall be sturdy and shall withstand exposure to extreme climatic conditions.
xi. The rain gauge shall withstand attack by fungi, insects, rodents and other small creatures. Wind screens for rain gauges are not required.
xii. The rain gauge shall have a smooth and permanent surface finish to minimise evaporation losses.
xiii. The height of the rain gauge shall be small enough to allow the collector opening to be installed at standardised heights in compliance with IMD standards.
xiv. The minimum expected operational lifetime shall be 15 years without loss of functioning.
xv. All openings of the rain gauge except the collector shall be covered with net to protect against entry of insects.
xvi. Appropriate surface treated and corrosion proof mounting bolts with nuts and washers shall be supplied.
xvii. The rain gauge shall have leg adjusters to set the rim horizontally, which shall be tested so using spirit levels.
xviii. A spout filter shall prevent ingress of insects and debris.
xix. A certified calibration test document shall be part of the delivery.

xx. IMD certification is required.

4.2.1 Tipping bucket Rain gauge specification

Base material	:	Cast metal-thermo plastic, FRP or Equivalent
Collector material	:	Thick metal, FRP or Equivalent
Rim material	:	Gun metal/ brass of Equivalent
Collecting funnel	:	200 mm internal diameter
Bucket size	:	0.5 mm equivalent rainfall
Range	:	0 – 100 mm
Resolution	:	0.5 mm
Accuracy	:	$\pm$50% of resolution
Rainfall intensity	:	upto 1000 mm/hr.
Tip detector	:	reed switch
Output	:	pulsed output to DCU

4.3 Water Level Measurements

The river level shall be monitored by using the specified equipment.

i. The gauge shall be of such a design that it operates reliably and accurately under the prevailing environmental and weather conditions.
ii. The proposed equipment shall be rugged and water proof design.
iii. The proposed equipment shall be designed for reliable low maintenance operation. High level of reliability will be demanded from the equipment.
iv. The output of the gauges shall be accurate to the extent of the nearest centimeter.
v. The minimum expected operational life time shall be 15 years without loss of functioning.
vi. Wherever the range of water depths to be measured are not explicitly specified in the tender, the range shall be taken as 0 to 30 m in case of installation for all the river gauging stations.
vii. Solar array with regulator, charger and batteries shall be part of assembly.
viii. All instrumentation including power connections as required at each location. The best available information on the availability of power within the vicinity is indicated.
ix. In case of no possibility of co-locating the raingauge/ weather measurement arrangements and the radar assembly, any necessary cable/ wireless data transmission systems from river gauge sites to nearby rain gauge/ master DCU sites shall be provided. These shall be constructed in accordance with the Technical Specifications. The department's representatives will supervise the quality of all the components including the civil works.

4.3.1 Bubbler Type Water Level Sensor

The bubbler shall have a mercury free and nitrogen free bubbler apparatus designed for low maintenance water level measurement.

The signal converter shall be supplied in an IP55 indoors and to IP65 outdoors-minimum polycarbonate enclosure and shall comprise a base unit and a programming device. Local LCD display shall be used to indicate key programming features, settings and output conditions.

Power	;	8-16VDC
Outputs	:	SDI-12 or Serial RS-232
Accuracy	:	0.1% at full scale
Resolution	:	0.0001 psi
Temperature range	:	-25 ^{0}C to + 60^{0}C
Humidity	:	0-100% Non-condensing
Range	:	0-50 psi or 30 Meter Range

4.3.2 Radar Type Water Level Sensor

Measuring Range	:	as per Annexure 1 & 2
Accuracy	:	$\pm$ 3mm
Beam Angle of antenna	:	10 to 15^0
Operating Temperature	:	-10^0 to 55^0
Operating Relative Humidity	:	0 to 100%
Rotation Range of mounting		
(a) Lateral Axis	:	$\pm 90^0$
(b) Longitudinal Axis	:	$\pm 15^0$
Type of protection with horizontal mounting	:	IP 67
Mounting / Installation Arrangement	:	Above HFL below a bridge girder wherever Available otherwise on a cantilever projection from a mast or pedestal made of structural steel Or RCC with sufficient strength.

5.0 DATA COLLECTION UNIT AND TRANSMISSION EQUIPMENT

5.1 Datalogger with Integrated INSAT Transmitter Specifications

5.1.1 The system shall automatically collect the observations from attached sensors, process the same and store them into its memory as per the pre programmed procedure at every full hour IST and data shall be transmitted to the INSAT-DRT in TDMA mode. Details of TDMA mode are provided in para 5.3.

5.1.2 The DCU shall also continuously monitor the status of the instruments, power supply and communications. In the event of failure of an instrument or disruption of any of the power sources, an alarm shall be sent back to the ERS.

5.1.3 The number of analog/ digital/ SDI channels in the data logger must be compatible to the sensors being supplied & sensors to be added in future and also for other monitoring systems for battery, solar panel etc.

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

5.1.5 The system shall have provision to easily include and change the following information as mandatory requirements:

- Unique station identification code.
- Time of observation.
- Sensor identification.

5.1.6 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.

5.1.7 Providing necessary electrical power to the sensors and conversion of electrical output signals from the sensors into engineering values based on calibration equations stored in the memory. Full compatibility with all types of sensors provided in the packages shall be mandatory.

5.1.8 Storage of observed data along with time for all the parameters in the memory. Memory capacity to retain at least 180 days data is required. Data shall be available even if the power supply to the system has failed (RAM Backup battery) for one year.

5.1.9 The stored data shall be retrievable via serial port to a PC/ laptop and a PCMCIA card or any other compact and commercially available solid state memory device.

5.1.10 The system should be stand-alone and all programming functions/ set-ups to be carried out through system keypad and display independent of a PC/ Laptop.

5.1.11 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 DCU earth receiving station.

5.1.12 Management of data transmission to DCU earth receiving station through satellite, which shall include formatting of transmitted data with necessary preambles, station ID codes, parity checks etc. as per transmission methodology for transmission through satellite channel, scheduling and operating the DCU transmitter automatically.

5.1.13 Management of DCU transmitter to optimize the battery consumption.

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

5.1.15 The health data shall be stored as a log record and shall be capable of being retrieved and displayed when required.

5.1.16 The system shall have in-built sensor simulation system options to conduct tests on the system for field installation, two-point calibration/ re-calibration and maintenance of the sensors.

5.1.17 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 codes and messages on the display panel for general identification of the fault.It should have facility to monitor these codes and other health status through an external lap top/ PC.
- Setup shall be organised 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 DCU shall support the manual entry of data through keypad and its display.
- Data including the setup and program files shall be transferable from the system via a serial port to PC and SD card or other suitable memory device and vice versa.

5.1.18 The DCU shall be housed in a weather proof and tamper proof housing of NEMA 4 type enclosure of steel or fibre glass. In case of steel enclosure the housing shall have 16 gauge steel body and 14 gauge door, external mounting feet, seams continuously welded, rolled lip around door to exclude liquids, oil resistant gasket, hasp and staple for padlocking, grey polyester powder coating inside and outside. In case of fibre glass enclosure the housing shall have moulded fiber glass reinforced material, resist corrosion, seamless foam-in-place gasket, detachable mounting feet, moulded drip seals, type 216 stainless steel, quarter turn latch.

5.1.19 Electronics units should have EMI protection and enclosed in IP65 enclosure.

5.1.20 The DCU shall be located in a place specified by the Department at each site and shall be generally one metre above Highest Flood Level (HFL) attained at that site. The DCU at each site shall be located in such a way it is easily approachable even in floods.

5.1.21 The data logger shall be programmable locally via laptop/ PC.

5.1.22 There will be only one type of DCU with specification as given in this para at all sites.

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

5.1.24 The DCU, satellite transmitter, antenna have to be IMD certified.

5.1.25 Numerical Specifications

I.	Slots / Ports		PCMCIA and USB
II.	Data Memory		4 MB minimum
III.	Operating Temperature		-10^0 C to $+55^0$ C
IV.	Power Consumption		2 mA quiescent
V.	Analog inputs		4 to 20 mA,100% over-range withstand
VI.	Analog to digital converter		
	Resolution	:	16 bit or better
	Conversion Accuracy	:	+ 1 LSB
VII.	System clock:		
	Stability Long-term	:	1 ppm/year or better
	Stability (Temperature)	:	3 ppm or better from -10°C to 55°C
VIII.	Battery Backup (internal)	:	Lithium Battery, storage: 2 years
IX.	Real-Time Clock	:	GPS synchronized
X.	Watchdog Timer	:	System Reset upon microprocessor failure
XI.	Sample Intervals	:	1 sec. to 24 hr. in 1 second increments (user selectable)
XII.	Keypad		1 no.(6 buttons)
XIII.	Visual display	:	16 Character X 2 lines or more, alphanumeric LED/LCD to operate in temp. range -10°C to +55°C
XIV.	<u>Power Supply:</u>		
	a) Battery	:	Single 12V chargeable maintenance-free battery 100 AH capacity
	b) Charge controller	:	Internal or External

5.1.26 Integrated Satellite INSAT Transmitter/Logger features

i.	Carrier Frequency Band	:	402.0 MHz - 403.0 MHz Carrier frequency 402.658 MHz
ii.	Carrier Settability	:	In steps of 100 Hz from 402.0 MHz to 403.0 MHz
iii.	Modulator	:	PCM/BPSK
iv.	Data bit rate	:	4.8 KBPS (User selectable)
v.	Data coding	:	NRZ(L)
vi.	Frequency stability:		
	a) Long term	:	Transmit frequency inaccuracy including aging of oscillator should not exceed ± 400 Hz per year. Oscillator/synthesizer should have provision to adjust for the long term drift
	b) for temperature	:	± 1 ppm or better (-10 to +55^{o}C)
vii.	Signal Bandwidth	:	6.0 KHz maximum or better
viii.	Output Power	:	10 W (settable)
ix.	Power Stability	:	±1 dB
x.	Spurious	:	-60 dB or better
xi.	Harmonics	:	-40 dB or better
xii.	Operating Temperature	:	-10°C to +55°C
xiii.	Relative Humidity	:	0 to 100% RH for out door equipments
xiv.	Operating power	:	Switched 12V D.C controlled by data logger.
	Mounting/Installation Arrangements		Shall be housed in a whether proof and tamper proof NEMA 4 type enclosure of steel or fibre glass and mounted on wall enclosures wherever possible otherwise shall be mounted on a mast or tripod made of structural steel with sufficient foundation and structural strength.

5.2 Transmitter & Antenna

The INSAT transmitter should be an internal component of DCU. It should have necessary hardware and software to receive data from the datalogger and transmit in TDMA mode as in para 5.3. The transmitter should have the capability to handle data transmission to the DRTs located on any of the INSAT series of satellites as given under para 5.4. 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.

5.2.1 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^{o}
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 +55°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

5.3 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. 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 (1). TDMA technique is an open loop system with timing derived from GPS receiver which is part of DCU. TDMA frame duration is one hour. The one hour frame is divided into 6 time windows, each of 10 minute duration. Each DCU is assigned 1-second time slot in any of the 10-minute slot and the repeat transmission is after 10 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 1 millisecond per day - GPS receiver updates RTC once every twenty four hours to conserve battery power of DCU.
- GPS receiver accuracy of less than 1 microsecond.
- Guard time required in the present burst receiver at Hub station.

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 DCU 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.
5	RF DATA ENCODING	Differential coding (NRZ-L) is done for the entire burst (Preamble and the convolution coded bits) before RF modulation.

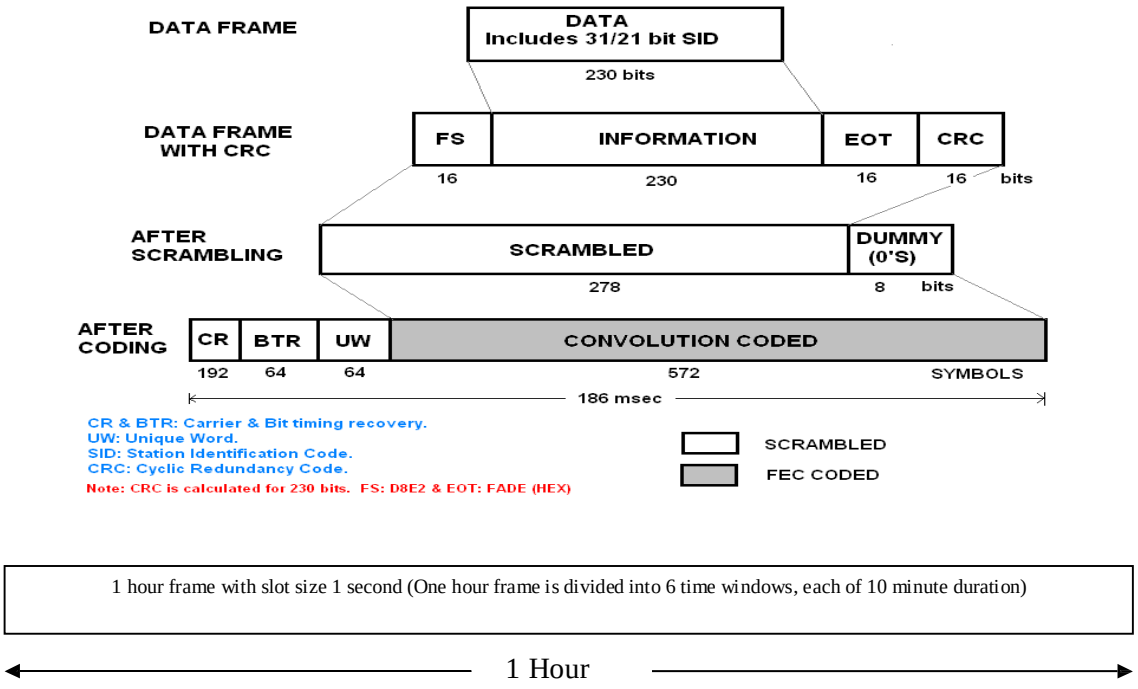


Fig. 1: TDMA Transmission Frame Format

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.

Additional details, if required, will be provided at the time of the design review meeting which will be held with the successful tenderer. However, it should be ensured by the tenderer that the system configuration is flexible and accommodate more than 30 sensors without any additional cost.

5.4 INSAT DRT Specifications

For the purpose of data transfer from field DCU to Data Receiving Earth Station at New Delhi, 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.

5.5 Channel Specifications for TDMA transmission format

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

Sl.No.	Channel No.	Identification Code	Parameter
1.	1	0000 (:0)	Instantaneous sampled value of air temperature in deg C at the end of every full hour UTC.
2.	2.	0001(:1)	Water level sampled at end of every full hour IST
3.	4	0100(:4)	Wind speed in knots (3 minute vector averaging prior to full hour UTC).
4.	5	0101(:5)	Wind direction in degrees (3 minute vector averaging prior to full hour UTC).
5.	7	0111(:7)	Instantaneous value of RH at the end of every full hour UTC.
6.	10	1110(:14)	Duration of bright sunshine since last 20 UTC. Reset to zero at 20 UTC. (Global radiation will be transmitted in this slot instead of duration of sunshine.
7.	Cal1	:C1	Battery voltage (volts)
8.	Cal2	:C2	Hourly rainfall (rounded off to next higher integer).

5.6 Lightning Protection and Maintenance Inspections

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 centre of the pole. The mast should be electrically grounded following CPWD earthing procedures.

Maintenance Inspections: 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.

5.7 Earthing For Equipment and Maintenance Inspections

The electrical grounding for all other electronic and electrical equipment should be done by following standard CPWD procedure. The earthing for the equipments should be done separately and should

have a minimum distance of 2.5 metre from the earthing done for lightning rod. In no case both the earths should be done in the same earthing rod.

Maintenance Inspections: 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.

6.0 SOLAR PANEL ASSEMBLY WITH BATTERY BACKUP

6.1 Solar Panel Assembly

Solar Panel mounting hardware 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 or wooden poles. Attachment methods include bolts, lag bolts, U – bolt brackets and stainless steel hose clamps and /or embedded in concrete.

The Solar panel assembly shall be mounted on the roof of site buildings where existing. The contractor shall optionally supply a pole – mounted arrangement including a standard pole and necessary foundation and fixing arrangements.

The location of solar panel assembly shall be approved by the concerned engineer – in – charge of each DCU.

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.

6.2 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 rechargeability

One battery pack shall be provided for each DCU. The batteries pack provided shall have adequate capacity to sustain the maximum sized DCU configuration of sensors and telemetry equipment.

The necessary housing and configuration of the batteries shall be furnished in detail by the tenderer / contractor.

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 DCU equipment shall be from battery pack only.

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.

Maintenance Inspections: As a part of the maintenance, the batteries shall be inspected on a yearly basis. Such inspection shall be carried out in the pre-monsoon period and any faults noticed shall be attended immediately.

7.0 SPECIFICATIONS OF EXISTING EARTH RECEIVING STATION EQUIPMENTS

7.1 Details of Earth Receiving Station Antenna

i.	Reflector size	:	3.8 metres
ii.	Reflector type	:	Solid fibre glass material
iii.	Mount Design	:	Polar mount/ any other suitable design (TBS)
iv.	Feed Mount	:	Prime focus feed
v.	Feed type	:	Linear
vi.	Input frequency (for feed)		4.5 to 4.8 GHz
vii.	G/T	:	31.7 dB /°K
viii.	Operating frequency	:	4500- 4800 MHz
ix.	Gain	:	$\geq$43 dB
x.	Polarization	:	LHCP / RHCP selectable
xi.	Elevation Adjustment Range	:	0-90°(Coarse & fine adjustment) Angles to be engraved on the antenna
xii.	Azimuth Adjustment Range	:	0-360°(Coarse & fine adjustment) Angles to be engraved on the antenna
xiii.	Wind loading : a) Operational	:	100 KMPH or better
xiv.	b) Survival	:	175 KMPH or better
xv.	Operating rainfall rate	:	100mm/hr and water proof.

7.2 Features of LNA

Frequency range	:	4500 – 4800 MHz
Bandwidth	:	300 MHz(typical)
Noise temperature (Ambient Temp. 25°C)	:	$\leq$50 °K (45 °K typical)
Gain	:	$\geq$ 60 dB
Gain ripple	:	Not more than ±0.5 dB (Over entire 300 MHz pass band)
Max. RF input	:	-50 dBm composite
Max. RF input with no damage	:	0 dBm CW in pass band
Input / Output VSWR (4.5 GHz to 4.8 GHz)	:	1.2 : 1
Operating Temperature	:	-10 to 55 ^{o}C
Humidity	:	0-100 per cent with condensation

7.3 Features of Synthesized Down Converter

The general features are listed below.

RF input	:	4500 – 4800 MHz
IF output range	:	Compatible to Demodulator Input (May be 100-180 MHz)
RF input level	:	-55 dBm typical
IF output level	:	+20 dBm at 1 dB compression
Frequency stability over time	:	+/- 1 x 10^{-9} / day
Frequency stability over temperature	:	+/- 1 x 10^{-8} / day

8.0 Data Processing at ERS

The DCU data transmitted by KALPANA-1 or any of the INSAT satellites in extended C-band will be received at the Earth Station to be located in CWC, New Delhi. The demodulated data stream in digital form along with a synchronous clock, should be available for input to the data processing system. There will be eight or more DCU carrier frequencies on which different streams of DCU data shall be received simultaneously in the earth station from various DCU operating in the available 200 KHz (in the case of Kalpana-1/ INSAT-3A and 400 KHz bandwidth (in the case of INSAT-3D) of DRT capable of supporting a large number of DCU.

The earth station demodulator/ DSP receiver and ERS data processing equipments should be able to receive, process and disseminate data from eight or more carrier frequencies simultaneously from more than 5000 DCU by just defining certain parameters in the configuration file of the ERS. The configuration file should be programmable to change any of the available carrier frequency in the whole of the DRT frequency band. Suitable options may be provided to receive data in separate files for different carrier frequencies and process them separatel y.

8.1 General features

8.1.1 The system design shall provide for adequate redundancy and ensure uninterrupted DCU data processing in the event of any possible single point failures in the processing equipment.

8.1.2 The system design should take into account the requirement of simultaneous processing of DCU data from all stations. As stated above, this will be possible by receiving data simultaneousl y from a number of carriers operating in the DRT band.

8.1.3 Provision of suitable bit synchronizer in the DCU data processing chain.

8.1.4 Capability to perform frame synchronization of the incoming streams of digital data using a suitable Frame Synchronization and Decommutation Unit (FSDU). Diagnostic checks should be provided for end-to-end checking of bit error rates of the DCU link. Detection of frame synchronization should also be accompanied by a suitable indication on display device.

8.1.5 Capability to check DCU message length, Start of Frame, End of Transmission (EOT) code etc. and reject/ delete message not agreeing with the specified transmission format. If another "Start of Frame" occurs before EOT, that particular DCU data may be rejected and suitable message indicating "Collisions" may be echoed on system terminal.

8.1.6 Capability for amendment of number of DCU stations and their parameters stored in the DCU station configuration file.

8.1.7 Check for errors in the station ID based on BCH code and parity errors in the sensor data stream.

8.1.8 Check whether the DCU messages received correspond to the allotted 10 minute transmission window and select only one best DCU message out of the three received. Parity check of data

bits has to be done. Data to be accepted if parity check is alright, otherwise data may be called invalid and rejected.

8.1.9 Out of the messages accepted for a particular station every hour, the values of hydro-meteorological parameters are to be compared with each of those received in that hour and identical ones are to be displayed. Any random data needs to be rejected.

8.1.10 Check for BCH Code and apply standard code for forward error correction. The code used for error corrections and the precise methodology proposed to be adopted for this, together with software used, should be included in the Tender offer.

8.1.11 If for a particular station and time more than three messages are received, the station ID and the time of observation should be reported.

8.1.12 Data corresponding to the best DCU message for each hour of observation and for each station is to be converted into hydro-meteorological parameters corresponding to the station name, time of observation, and sensor values.

8.1.13 The derived meteorological parameters are to be compared with corresponding values of previous hour(s) and / or preset limits. Those found to be beyond the tolerance limits should be flagged and be available for operator's interventions/ correction/ deletion. Suitable flags to be provided on operator's console for intervention in case any error is detected in the incoming message. The present threshold limits have to be based on surface meteorological normals for various parameters which will be provided by the department at the time of implementation of the project to the selected vendor.

8.1.14 The final output of DCU data should be formatted, and/ or printed on a printer and also stored on appropriate data base for next 4-8 weeks.

8.1.15 If all messages received from a DCU have parity errors, this may be reported in the summary.

8.1.16 The processing software should have capability to derive a number of standard statistical functions (to be provided by the department) with the processed data for each parameter, for R&D/ quick analysis of data quality.

8.1.17 Capability to monitor the number of messages received from the individual DCU stations and to provide an hourly summary/ daily summary of missing and received messages parameter-wise on operator's command in the form of engineering print out.

8.1.18 Provision of a suitable DCU data simulator in the processing system for quick checking of all functionalities of the data processing sub-systems. Capability to extract all the hydro-meteorological parameters or to select any particular meteorological parameters from the processed data stored on the data base disk along with the latitude/ longitude information.

8.1.19 Capability to generate suitable reports on hard copy device indicating:

i) DCU which report more than 3 messages in 10 minutes time-slot.

ii) DCU transmitting data in non-scheduled time windows.

iii) Daily/ Monthly transmission reports for all DCU enabled for monitoring.

iv) Monthly/ Seasonal rainfall reports for all DCU.

8.1.20 If data of a particular sensor is received out of range or with parity errors, the software should be such that data is still processed, and that the data for erratic sensor alone is not transmitted to the users and suitable report is generated on the hard-copy terminal for operator's action.

8.1.21 Facility to block data of any one or more DCU from transmission to the users as and when required due to any reason.

8.1.22 Facility to block data of any one or more sensors for selected stations from transmission to the users as and when required due to problem in sensors at few stations.

8.1.23 Facility to print 24 hours statistics for each DCU giving details of total number of messages received, number of messages valid/ invalid, number of errors, data quality etc.

8.1.24 Facility to selectively stop the processing of DCU data of any particular station/ stations if found to be behaving erratically.

8.1.25 Facility to report error messages on operator console and store in a log for detailed examination.

The software module shall include a wide range of error messages, to provide information in respect of various error conditions as detailed below. The errors listed below are the minimum and the tenderer shall describe various other errors also that can be tapped and displayed by the software offered.

- Last Receipt of data.
- Garbage data.
- Data with improper format.
- Overflow of data.
- Protocol analysis.
- Receipt of data from another channel.
- Invalid parameters.
- Transmission and radio frequency interference related problems.
- Parity error related problems.

9.0 Archival

Necessary software for archival and retrieval of all processed DCU data is to be provided by the contractor. Full details of the analysis of CD ROMs/ DATs / DLTs etc., for recording 24 hours of data from all CWC-DCUs, shall be included in the tender offer. Archival should be of finally processed, edited and corrected data sets with all the auxiliary information required to identify the data sets. Full details of error characteristics of the data should also be archived.

Data archival from data base to the tapes / CD ROMs may be once in a month. Format should be of standard type for ease of use by various users.

10.0 Software deliverables

10.1 The supply shall be inclusive of complete software modules running on the system for provision of complete functionality as described above. The supplier shall mention all the modules which are available along with their costs for selection of any one or more of them. The essential modules which are obligatory for a standard system performance shall be indicated separately.

10.2 The system shall have appropriate operating system software to provide password protection of different levels for system setting and data downloading operations etc.

10.3 The software shall support and include a suitable application like Oracle for management of the database.

10.4 The system shall include software for the following facilities:

- Setting up station parameters, importing data files, provision to edit or modify existing set up of receiver ground station.

- *Network Management:* The facility for detailed analysis of working status of field stations and sensors. GIS base graphical output shall be provided.

- *Data Management:* The package shall manage the data received from the DCU and provide facilities for display, graph, and printouts in various formats.

- *Trouble shooting:* Test and Troubleshoot a Receiver Ground Station System including analysis of protocols and initialization of calibration and health checking.

- *Data Translation:* Translation of downloaded data files into standard ASCII, RDBMS formats.

- *Data Plotting:* To generate surface meteorological charts and analysed charts.

- *Tutorial:* An online tutorial shall be available for access by the users. It should include a step-by-step procedure for familiarizing with all the features of the software package.

10.5 Facility to develop/ find out station ID for all AWS stations (BCH code or any standard forward error correcting code) in binary as well as hexadecimal code.

10.6 Facility to find out DCU antenna azimuth/ elevation for a particular sub-satellite point.

10.7 Software for maintenance/ servicing/ data retrieval schedule for all DCU stations (upkeep of meta data of DCU station).

11. Civil Works For Housing DCU and Associated Instrumentation

All civil and accommodation works shall be provided including safe, secure (as required at each location), weatherproof enclosures for equipment, bases and foundations, all fixings and supports (above and below river water level) (all fixings to be non- corrodible), suitable animal proof security fencing and lockable gateway to gauge sites, security fittings and fixtures at all gauge DCU sites and any necessary cable/ wireless data transmission systems from river gauge sites to nearby rain gauge sites.

12. DATA PROCESSING HARDWARE AT MODELLING CENTERS

The department will provide room/ modelling centre equipped with requisite furniture and nodes alongwith V-SAT Connectivity in the modelling center. The department will also provide a Local Area Network connecting the modelling center server with the other nodes on the network for flood forecasting purposes.

13. DATA MANAGEMENT

The data collected by the ERS from various DCUs will be transmitted and stored in a database on the server in Modelling Center, CWC(HQrs), New Delhi/Hyderabad every hour. The database structure shall be designed by the contractor in such a way that all the information received from any DCU, including error messages and alarms etc. is stored in the database at Modelling Center, CWC(HQrs), New Delhi/Hyderabad.

Another package operating at the modelling center server will store the received data in a local RDBMS and will also prepare a data file for the flood forecasting software implemented at the modelling center for issue of flood forecast.

The tenderer will have to provide the data in a CSV file with a known layout and also integrate the same in a database located at the modelling center.

The software modules proposed shall be demonstrated for the desired performance to the entire

satisfaction of the department. For the purpose of tendering, the contractor will submit a framework of the development that they want to undertake and include key screen shots of the forms and dialogs indicating the approach proposed.

All systems shall be free from errors caused by misinterpretation of any times and dates. All dates will use the Gregorian calendar.

The contractor shall supply a full interactive online help and tutorials for the package provided by them. In addition, a full documentation for maintenance of the software code shall also be provided.

14. TESTING AND ACCEPTANCE

14.1 Factory Acceptance Testing

The contractor shall specify factory acceptance tests in respect of each component of the system namely sensors, DCUs and it's major sub-assemblies wherever relevant as a part of the technical Tender. The contractor shall also mention the acceptability ranges of the test parameters for acceptance at factory level. The programme for factory acceptance testing shall also be intimated in advance.

The Department or its representative shall have the right to inspect and/ or to test the Goods to confirm their conformity to the contract specifications at no extra cost to the Department. However, TA/ DA of the inspection team will be borne by the Department. The Department shall notify the Supplier in writing in a timely manner of the identity of the representatives retained for these purposes.

Factory Acceptance Test results shall be retained as part of the project QA record and the same shall be supplied to the department.

After successful completion of Factory Acceptance Tests for any section of the Works, the Department shall approve that section of the Works for delivery to site. Any such approval shall in no way relieve the Supplier of any of his obligations under the Contract.

The factory acceptance testing shall include the complete system being fully tested using simulation techniques where applicable to demonstrate its compliance with the specification. The test shall allow for the connection of analogue inputs, digital inputs etc. to enable the overall performance and suitability of the software to be tested.

The department, at its discretion may waive off the witnessing of the tests but the records of the tests shall be provided duly authenticated by the contractor.

14.2 System Integration Testing

The contractor shall specify System integration tests proposed to be carried out as a part of the technical Tender. The tests shall be such that the performance of the system as a whole commencing from the sensors and extending to the data decoding at Earth Station gets involved in the test plan. The System integration tests may be carried out after completion of factory acceptance of the individual component. All those components that do not pass the system integration tests and undergo modifications shall be passed again through factory acceptance testing before using them for repeat system integrating tests

If any software errors are found, they shall be recoded and the code shall be amended. The test shall then be repeated.

System Integration Test results shall be retained as part of the project QA record and shall be made available to the Department for his inspection if he so requires. If any errors are found in the Test Procedure or Result Sheets, they shall be corrected and resubmitted to the Department for

approval.

14.3 Site Acceptance Protocol

In order to facilitate the site acceptance of the system by the site – in – charges, the Contractor should give a list of deliverables for each site to the respective sites as well as to the headquarters. The list shall be verified by the site – in – charge and accordingly will give a verification report whether all deliverables have been delivered properly at the site. The contractor should preferably, complete the required civil works at the site for proper installation of the equipment before supplying the equipments at the site.

For site acceptance test, the supplier should give a check – list of all components and their functions. This check list shall be decided in consultation with the department. This check list shall indicate the tests to be conducted at the site and the results that are expected for each and every component that are to be installed at the site. This check list will have to be provided to each and every site one month before the installation begins.

14.4 Site Acceptance Tests (SAT) for Remote Stations

The acceptance test will be conducted by the department or any other person nominated by the department, at its option. Site acceptance test shall be carried out in two stages. The first stage of acceptance will be based on preliminary inspection of the equipment supplied with respect to the required and supplied components such as sensors, DCU with the weatherproof enclosures, batteries (charger/ regulator), gauge apparatus with enclosures and sensors, INSAT transmitter, INSAT satellite antennae, solar panel and mounting hardware, including all associated accessories.

Second stage of site testing shall be undertaken for a period of 7 days following successful completion of witnessed commissioning to prove the equipment and the interconnecting cable installation and ensure that all operators are fully conversant with the equipment and calibration procedures, methods of operation and all facilities provided by software. During the period of 7 days, there shall be no occurrence of any malfunction in any component necessitating replacement or repairs. No malfunction, partial or complete failure of any part of hardware or excessive heating of motors or other electro-mechanical equipment or bugs in the software should occur. All the software should be complete and no missing modules/ sections will be allowed. The supplier shall maintain necessary log in respect of the results of the tests to establish to the entire satisfaction of the department, the successful completion of the test specified. An average data acquisition efficiency of 99.5% for the duration of test period shall be considered as satisfactory. The testing schedule will be agreed to by both the parties during performance of contract. In this stage a regular comprehensive check of functioning of all the components will be made. On conclusion of site acceptance, all relevant documentation pertaining to the site shall be handed over by the supplier to the representative of the department.

14.5 Modelling Centre Level Acceptance Tests

Modelling Centre Level acceptance tests shall involve successful receiving of remote station data at the modelling centre's server. It shall include (hardware and software), data dissemination software, RDBMS and database indicating their full implementation as specified and trouble free operation of all modules for a period of another 7 days. This shall involve demonstration of non-interference with existing software packages already installed at the modelling station, if any.

After establishing above, the system shall be tested for completeness by demonstrating trouble free real time receipt of data from all the stations installed for a sustained period of another 15 days operating on 24 X 7 basis and incorporation of the data into the data base set up at the modelling centre.

15 Documentation

Detailed operating and maintenance manuals for the control system and other equipment supplied

under the contract shall be provided. Four copies of draft manuals are to be provided prior to factory acceptance testing for approval and 2 copies each of the final manuals have to be given to each modelling centres prior to final hand over.

The manuals shall detail in full the equipment supplied under this contract, including test certificates, and the software section shall be comprehensive and in sufficient detail to allow personnel to easily modify any setting or operational parameter.

The provision of all documentation is essential and shall be specific to the contract.

16 Spare parts

Contractor shall provide a list of recommended spares. Spare should be such which cover most common fault and does not require replacement of complete assembly.

The number of spare parts are fixed on the basis of ensuring a minimum availability at each basin organisation for rapid swapping in case of a major malfunction which can not be rectified at the site.

17 Specification for Cabling and connecting

i. The term cable shall always include necessary type of connectors at both the ends for connecting between two equipments. 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 metre, 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 metre above the floor surface. Whenever the indoor cable is required to cross the floor, it shall be housed in a Galvanised Iron pipe of 12.5 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 armoured and shall be water ingress proof upto static water pressure of 5 kg/cm^2. All joints made in cable shall also meet the water proofing criteria. In addition, the cable shall be protected by housing the same in 12.5 mm galvanised iron pipe embedded at a depth of not less than 1.5 metre 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 department 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 of the department 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 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.

18 CONSTRUCTION REQUIREMENTS AND WORKMANSHIP

18.1 Materials

18.1.1 Storage handling and use of materials

Materials and components shall be handled in such a manner as to avoid any damage or contamination, and in accordance with all applicable recommendations of the manufacturers.

18.1.2 Bricks

Bricks, blocks and tiles shall be regular and uniform in shape and colour, and all of a similar size to the respective type.

18.1.3 Cement

Cement shall be factory produced by a reputable manufacturer, and stored in dry conditions until required.

18.1.4 Mortar

i. Mortar shall be mixed only as and when required in the proportions of 1 part cement to 3 parts sand, with fresh, clean and clear water, until its colour and consistency are uniform. It shall be conveyed fresh as required for use, and used within 20 minutes of mixing.

ii. Fine aggregates for mortar shall be washed natural sand or crushed natural stone, of a diameter of between 1 mm and 3 mm.

18.1.5 Timber

All timber used in the permanent works shall be new, and free from bows or warps or significant knots.

18.1.6 Ferrous metalwork

Ferrous metalwork exposed to the outside shall be treated with a continuous coating of bituminous primer over the whole exposed area. Where the metalwork is of a decorative nature, it shall be primed and painted with a paint suitable for external use.

18.1.7 Nut and bolts

i. Bolt lengths shall be sufficient to ensure that nuts are full-threaded when tightened in their final position, with two threads showing.

ii. Where bolting is incompatible with the material being fixed, suitable isolation washers and sleeves shall be used.

iii. Washers shall be provided under the head of the bolt and under the nut.

18.1.8 Natural stone

Natural stone shall be of durable quality, uniform in texture, and free from iron bands, spots, sandholes, flaws, shakes and other imperfections which would adversely affect its strength or appearance. The dimensions of stones shall be adequate for proper coursing and bonding.

18.2 Excavation, Backfilling and Reinstatement

18.2.1 Excavation

i. The Supplier shall carry out his operations in such a manner as to avoid damage to, or deterioration of, the formation of excavations.

ii. The sides of excavations shall be adequately supported at all times.

iii. The Supplier shall be responsible for the disposal off site of all surplus excavated material, but no excavated material suitable for re-use shall be removed from the site. No surplus material shall be disposed of on the site.

iv. The Supplier shall not allow water to lie anywhere on the site. Where water is encountered in excavation operations, it shall be disposed of to a suitable area away from the works and so as not to inconvenience others. Any temporary sumps which are constructed for dewatering shall be backfilled at the end of operations, with material similar to that excavated

18.2.2 Trenches

i. Trenches in rock for pipes up to 100 mm nominal bore shall be excavated to provide a minimum clearance of 100 mm around the outside of the pipe barrels and joints. For pipes with nominal bores exceeding 100 mm, the minimum clearance shall be 200 mm.

ii. Trenches for pipes shall be excavated to a sufficient depth to ensure a minimum cover of 500 mm to the top of the pipes. For pipes carrying water under pressure, or for pipes laid with a water load above, this depth shall be increased to 900 mm.

iii. Where trench excavations encounter obstructions in the ground conditions (eg hard rock or major tree roots), the obstruction shall be bypassed by a separate trench enabling a straight line, or minimum suitable radius, between the pipe source and destination locations. The original trench shall be backfilled in a similar manner to other excavations as per the specification below.

18.2.3 Backfilling

i. Backfilling shall, where practicable, be undertaken immediately the specified operations preceding it have been completed. Backfilling shall not, however, be commenced until the works to be covered have achieved a strength sufficient to withstand all loading imposed thereon.

ii. Backfilling shall be undertaken in such a manner as to avoid uneven loading or damage.

iii. Filling material to the permanent works shall be of a granular type, without clay or siltatious material (a well assorted mixture of grain size between 2 mm and 40mm diameter), deposited in 300 mm layers and compacted at each layer.

iv. Backfilling to a highway surface shall be compacted and completed such that the finished surface is of a level flush and comparable to the adjoining area, after any settlement has occurred. Where the surrounding surface is of a bituminous (tarmac) type, the backfilling shall be finished with similar.

v. Where the excavations have been supported and the supports are to be removed, these, where practicable, shall be withdrawn progressively as backfilling proceeds, in such a manner as to minimise the danger of collapse, and all voids formed behind the supports shall be carefully filled and compacted.

18.2.4 Reinstatement

i. Kerbs, channels and edgings disturbed by the works shall be re-laid with existing units, provided they are not damaged. Where existing units are not suitable for re-use, the Supplier shall provide replacement units of similar texture, colour, type and quality, consistent with those adjacent.

ii. The frames of all manholes and surface boxes shall be reinstated by bedding and haunching in mortar as specified. Chamber or frame tops shall be flush with the existing surface on all sides.

iii. On completion of work in unpaved land, the Supplier shall break up the surface of all land affected, to a depth of at least 300 mm, and clear stones and extraneous material greater than 50 mm in size before placing and raking topsoil of at least 300 mm in depth, to the finished surface level.

iv. The utmost care shall be taken to protect trees, crops and significant shrubs in the vicinity of the site area. Any that are damaged or killed shall be replaced with a new plant, or plants, of a similar species and type, in the area of the original.

v. Any existing services of pipes or cables shall be avoided if possible. Where temporary removal is required, the service shall be turned off, and an accurate location of the point or points of interception marked. The Supplier shall record these positions, depths, pipe and cable diameters and types of construction, and shall reinstate them to their previous standard, following construction of the new works. Backfill shall be to the standard specified above.

vi. The Supplier shall ensure that all pipes, whether new or reinstated, shall be clear of debris upon completion of the works.

vii. Embankments and other areas of fill shall be formed of suitable materials capable of normal compaction to form stable fill, deposited and compacted evenly as soon as practicable after excavation, in a maximum of 300 mm layers.

18.3 Concrete, formwork and reinforcement

18.3.1 <u>Concrete</u>

i. The cementitious content of any concrete shall be between 350 kg/m3 and 400 kg/m3, with a maximum free water / cementitious content ratio of between 0.45 and 0.50. The mix and strength

of such concrete shall not be inferior to M20.

ii. Calcium chloride or admixtures containing calcium chloride shall not be used in the production of concrete.

iii. The nominal size of concrete aggregate shall be from 6mm to 20 mm.

iv. The Supplier shall not permit any cement to come into contact with water at a temperature above 60 degrees Celsius.

v. The concrete shall be mixed only as and when required, to a uniform colour and consistency.

vi. Workability of fresh concrete shall be such that the concrete can be handled and placed without segregation, and, after compaction, can completely fill the formwork and surround all reinforcement and ducts.

vii. The quantity of water used shall not exceed that required to produce a concrete with appropriate workability to be placed and compacted in the required location. Water used in the concrete mix shall be fresh, clean and clear.

18.3.2 Formwork

i. Formwork shall be sufficiently rigid and tight to prevent loss of mortar from the concrete and to maintain the correct position, shape and dimensions of the finished work. It shall be so constructed as to removable from the cast concrete without shock or damage.

ii. The forms shall be capable of producing a consistent quality of surface.

iii. Where holes are required in forms to accommodate projecting reinforcement fixing devices or other built-in items, precautions shall be taken to prevent loss of mortar matrix.

iv. Formwork shall give access for the preparation of joint surfaces before the concrete has hardened. v. Top formwork shall be provided to slopes 30 degrees of more from the horizontal.

vi. The Supplier's method of constructing formwork shall allow for props to soffit forms to remain in position until the formwork is struck.

vii. Formwork shall be removed without shock to, or disturbance of, the concrete.

viii. Formwork to vertical or sloping surfaces shall not be removed until the concrete strength shall be sufficient to meet any wind loading upon the concrete likely to arise at the time when the formwork is removed. This shall be a period of least 2 days.

ix. The formwork for elevated slabs and beams shall remain in place for a minimum of 7 days.

x. All concrete surfaces shall have a fair finish, formed by formwork which is designed to produce a hard smooth surface with true, clean arises. Only minor surface blemishes shall be permitted and there shall be no staining or discolouration. Any projections shall be removed and the surfaces made good. For finishes to surfaces not formed by formwork, the concrete shall be levelled and screeded with a wooden trowel, following which a fair finish shall be formed with firm pressure from a steel trowel, to produce a dense, smooth, uniform surface free from trowel marks.

xi. If any blemishes to the finished surface appear, they shall be made good with fresh, specially prepared cement and fine aggregate paste, whilst the concrete is still green where possible. After the concrete has been properly cured the faces shall be rubbed down to produce a smooth and even surface, making every effort possible to match the colour of the concrete.

18.3.3 Reinforcement and other built-in items

i. Reinforcement and other built in items (such as pipes and sleeves) shall be firmly supported in position and of sufficient strength to secure against displacement during the concrete pour.

ii. Non-structural connections for the positioning of reinforcement and other built in items shall be made with tying wire or other fixing device. Precautions shall be made to ensure that projecting end of tying wire or other fixing device or clips do not encroach into the concrete cover.

iii. All reinforcement and other built items shall be clean and free of rust or other debris bonding.

iv. Reinforcement shall be of HYSD/TMT variety manufactured by SAIL or its subsidiaries. Cover to all reinforcement shall be 50 mm.

v. Tie bolts for formwork shall be of the high tensile variety and shall be cast directly into the concrete. Only tie bolts which avoid embedding any metal parts permanently within 50 mm of the concrete surface shall be permitted. Voids remaining after the removal of all, or part of each tie bolt shall be filled flush with the surrounding concrete using a freshly prepared cement and fine aggregate paste. All such voids shall be prepared by removing surface laitance prior to filling to

ensure bond is achieved.

18.3.4 Placing of concrete

i. The interiors of all formwork shall be thoroughly cleaned out before any concrete is placed. The faces of the forms in contact with the concrete shall be clean and treated with a suitable releasing agent, where possible.

ii. Each batch of concrete shall be continuously and thoroughly compacted in its final position within 20 minutes of mixing. Sufficient compaction shall take place until the expulsion of air has virtually ceased, and in a manner which does not promote segregation of the ingredients, in order to avoid surface blemishes.

iii. Concrete to each discrete section shall be placed in one pour, or in a continuous fashion such that fresh concrete shall not adjoin concrete which has been in place for more than 30 minutes. If this does occur, concreting to this section shall be stopped until the placed concrete has set, but not hardened, and a construction joint shall be formed.

iv. The surface of any set concrete against which new concrete is to be cast, otherwise known as a construction joint, shall be free from water or loose debris and shall be roughened to the extent that the large aggregate is exposed but not disturbed. The joint surface shall be cleaned immediatel y before the fresh concrete is placed against it.

v. All measures shall be taken to keep the temperature of fresh concrete below 32 degrees Celsius, and to prevent excessive evaporation of surface water. This shall include placing, and constantly keeping moist with cold water, hessian (or similar coarse weave natural material) and spraying the surface with curing agents to aid temperature escape, as soon after the formwork had been removed as possible.

vi. Where a kicker is used, it shall be at least 70 mm high and shall be incorporated with the previous concrete.

vii. Concrete shall not be allowed to taper off to a thickness of less than 50 mm. Vertical joints shall be formed against a stop board suitably notched to accommodate the reinforcement. The top surface of each lift of concrete shall be straight and level, unless described otherwise in the contract.

18.3.5 Tolerance for concrete structures

Concrete structures in the final work shall have no abrupt irregularities which are, to an extent, observable by eye. Subject to retaining the required concrete cover to reinforcement, other deviations from the surfaces described in the contract shall not deviate from line, level, vertically, cross sectional dimension or length by more than 10 mm.

18.4 Construction of pipe work

The cable runs along the ground for connecting the sensors to the DCU shall be made through the pipes of HDPE. The material and manufacturing quality of the pipes shall be as per relevant Indian Standards.

18.5 General

i. Suitable measures shall be taken to prevent extraneous material from entering pipes, and to anchor each pipe to prevent flotation or other movement before the Works are complete

ii. Pipeline marker tape shall be laid between 100 mm and 300 mm above the pipe.

18.5.1 Pipe bedding and covering

i. In case of laying pipes for carrying the air tubing for the bubbler gauge, care should be taken to embed the pipe at a depth below the general profile of the river bank slope such that the same shall not be exposed on account of rainfall/ drainage induced gully erosion in the monsoons. Such depths shall be determined by the site in charge and the representative of the contractor.

ii. For making horizontal runs of embedded pipes, crossing open ground and/ or walk ways frequented by traffic or cattle, a layer of warning bricks shall be laid over the pipe before filling up the trench.

iii. Bedding for pipes shall be constructed by spreading and compacting granular bedding material of

at least 100 mm thick over the full width of the pipe trench. After the pipes have been laid, additional material shall be placed and compacted equally on each side of the pipe. Where practicable, this shall be done in sequence with the removal of the trench supports.

iv. Bedding, haunching and fill material to pipe or cabling work shall be of a granular type, without clay or siltatious material (a well assorted mixture of grain size between 2 mm and 40 mm diameter).

v. After completion of the relevant operations, fill material shall be placed and compacted over the full width of the trench in layers not exceeding 150 mm before compaction, to a finished thickness of 250 mm above the crown of the pipes. Thereafter, layers shall be filled and compacted in 300 mm thicknesses, to 300 mm from the surrounding ground surface level. Topsoil shall then be placed to a level flush with the surrounding ground surface.

18.5.2 Pipe jointing

i. Pipe jointing surfaces and components shall be kept clean and free from extraneous matter until the joints have been made or assembled. Care shall be taken to ensure that there is no ingress of grout or other extraneous material into the joint annulus after the joint has been made.

ii. Where pipes with flexible joints are required to be laid to curves, the deflection at any joint as laid shall not exceed three quarters of the maximum deflection recommended by the manufacturer.

iii. Fusion welding joints in high density and medium density polythene shall be made only between pipes having the same physical characteristics. No fusion joints between pipes from dissimilar materials shall be made. When solvent welding HDPE pipes are jointed outside the trench, they shall not be lowered into place until the period recommended by the manufacturer for complete setting of the joints has elapsed. A pipe section containing a completed weld shall achieve the same strength characteristics as the parent pipe.

iv. Flanged joints shall be properly aligned before any bolts are tightened.

v. For weld jointing of steel pipes, the ends of the pipes shall be cut and prepared, and be free from fins, planar defects, tears and other surface defects, prior to welding. Cleaning to base metal shall extend for at least 25 mm from the end of the pipe on both internal and external faces.

vi. For cement mortar joints, the spigot of the pipe shall be entered into the socket of the last pipe laid until it bears on the back face of the socket, and it shall be centered in the socket. Two turns of tarred yarn shall then be caulked into the back of the socket and cement mortar shall be pressed into the joint to fill the socket and shall be bevelled off at 45 degrees from the outside edge of the socket.

18.5.3 Pipe protection

i. Where concrete surrounds are provided to pipes, they shall be supported on precast setting blocks, the top face of each block being covered with two layers of compressible packing.

ii. Where pipes with flexible joints are used, any concrete protection shall be interrupted over its full cross section of each pipe by a shaped compressible filler.

iii. Plastic pipes shall be wrapped with a layer of plastic sheeting before being surrounded by any concrete.

iv. Ferrous pipes shall be protected by a continuous coating of bitumen primer over the whole area to be protected.

18.5.4 Pipe cutting

Pipes shall be cut by a method which provides a clean, square profile, without splitting or fracturing the pipe wall, and which causes minimal damage to any protective coating.

18.5.5 Manholes

Manholes shall be constructed with steps, ladders or slabs aligned correctly, and of sufficient size to permit unrestricted access to workers.

19 TRAINING AND DOCUMENTATION

19.1 The contractor shall provide trainings as training modules as part of the Tender given as under:

S.No.	Module Name	No. of training	Target Group	No. of officer/staff	Duration in Weeks
1	Remote Station Management and Maintenance including trouble shooting of sensors at Site and Calibration of sensors	2	EE's/AE's/JE's/ HM staff/ Wireless staff W/C staff	10	1
2	Training for Operation and management of software and hardware for data dissemination and management	2	EE's/AE's/JE's/ HM staff/ Wireless staff W/C staff	10	1

Note: Training shall be provided in the alternate years at location as decided by the engineer-in-Charge.

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 department in advance. The course shall provide detail documentation and shall ensure that the Departments personnel shall be able to modify settings/ parameters without reference back to the Supplier. The places / sites where this training is to be given will be decided later by the Department for each basin organization.

19.2 TA/ DA of the trainees shall be borne by the department.

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

19.4 All logistical arrangement have to be ensured by the contractor.

SCHEDULE OF QUANTITIES

TABLE 1

S. No	Name of item	Quantity															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	Supply, installation, testing and commissioning of automatic rain fall sensors (tipping bucket type) complete with accessories.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15
2	Supply , installation, testing and commissioning of real time (satellite based) data communication system and data logger with display unit with all equipment and accessories such as satellite transmitter , power supply unit including solar panel , charge regulator , batteries , lightening arrester and earth system in NEMA4 enclosure with all connectors and cables including integration of the system with earth receiving stations.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15
3	Supply, installation, testing and commissioning of bubbler type water level sensors with all accessories.	-	-	1	1	-	-	-	-	-	1	1	1	1	-	-	6
4	Supply, installation, testing and commissioning of Radar type water level sensors with a measuring range as mentioned in Annexure-1 & 2 with all accessories on deck of the existing bridge as per technical specifications and directions of engineer-in-charge.	1	1	-	-	1	1	1	1	1	-	-	-	-	1	1	9

5	Construction of concrete tower for fixing of the Data logger, rain gauge, bubbler and other accessories as per drawing at Annexure -3 and construction of termination block for fixing of the bubbler nozzle including laying of conduit pipe up to concrete tower on which bubbler is to be installed including all clamping as per the direction of Engineer-in-Charge as per drawing at Annexure -4	-	-	1	1	-	-	-	-	-	1	1	1	1	-	-	6
6	Construction of Barbed wire fencing of 1.5mx1.5m size and 1.2 meter height supported on 75mmx75mmx6mm angle iron steel erected on CC foundation duly embedded in ground and painted with lockable gateway for the enclosure of Sensor	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	15
7	Integration of Remote sites and modeling centers with ERS including all necessary software and hardware																Job
8	Annual Comprehensive Maintenance of the system for 2 years after 2 years of warranty																Job
9	Spare parts during AMC Period:																
9i	INSAT Transmitter																2
9ii	Satellite Antenna																2
9iii	Solar panel assembly																15
9iv	Rain gauges with its accessories																2
9v	Sensor for Water level																2

TABLE – 2

Details of Hardware and Software available in Existing Modelling Centres

A. Modelling Centres at Hyderabad/New Delhi/FFM Directorate, CWC, New Delhi	
1.	Server HP –Proliant ML 7450
2.	Operating System: Windows 2003 Server R2 Enterprise x64 edition service Pack 1
3.	Backend Database – Oracle 10G
4.	Front End Data viewer and Decoder - XConnect Software
5.	VSAT link GIlat provided by HCL Comnet Ltd. Between i) ERS,Delhi, Jaipur, Burla & LGD/ LKD Hyd ii) ERS, Delhi and FFM Directorate, Delhi
B. Additional Server and V-Sat available at FFM Directorate, CWC, N. Delhi	
6.	Server -Tyrone
7.	Operating System – Windows 2008 Standard Service Pack 1
8.	Back end Data Base – Presently in MS- Access to be modified to Oracle – 10 G
9.	Front End - Aqua met Data Viewer Version 1.8 and Aqua met Decoder Version 1.8
10.	VSAT- Link Star S2A provided by ESTL, Noida between ERS, Delhi and FFM Dte.

FINANCIAL TENDER FORMAT

The rates may be given in Indian Rupees only.

TABLE-A1

S. No	Name of item		Qty	Unit	Rate		Amount
					In Fig	In Word	
1	Supply, installation, testing and commissioning of automatic rain fall sensors (tipping bucket type) complete with accessories.		15	Nos.			
2	Supply installation ,testing and commissioning of real time (satellite based) data communication system and data logger with display unit with all equipment and accessories such as satellite transmitter , power supply unit including solar panel , charge regulator , batteries , lightening arrester and earth system in NEMA4 enclosure with all connectors and cables including integration of the system with earth receiving stations.		15	Nos.			
3	Supply, installation, testing and commissioning of bubbler type water level sensors with all accessories		6 (As per site conditions)	Nos.			
	Up to 200 m length						
	Over 200 m and up to 500 m length						
4	Supply, installation, testing and commissioning of Radar type Water level sensors for the locations mentioned in Annexure – 1, with all accessories on deck of the existing bridge as per technical specifications and directions of engineer-in-charge.	**Measuring Range in metres**					
		Up to 15	5	Nos.			
		Up to 30	2	Nos.			

5	Construction of concrete tower for fixing of the Data logger, rain gauge, bubbler and other accessories and construction of termination block for fixing of the bubbler nozzle including laying of conduit pipe up to concrete tower on which bubbler is to be installed including all clamping as per the direction of Engineer-in-Charge. (Drawings enclosed at Annexure – 3 & 4, which may be taken as reference. However, Engineer-in-Charge may alter the same as per site conditions.)	6	Nos.			
6	Construction of Barbed wire fencing of 1.5mx1.5m size and 1.2 meter height supported on 75mmx75mmx6mm angle iron steel erected on CC foundation duly embedded in ground and painted with lockable gateway for the enclosure of Sensor	15	Nos.			
7	Integration of Remote sites and modeling centers with ERS including all necessary software and hardware	1	Job			
8	Annual Comprehensive Maintenance of the system for 2 years after 2 years of warranty	1	Job			
9	Spare parts during AMC Period:					
9i	INSAT Transmitter	2	Nos.			
9ii	Satellite Antenna	2	Nos.			
9iii	Solar panel assembly	15	Nos.			
9iv	Rain gauges with its accessories	2	Nos.			
9v	Sensor for water level	2	Nos.			

FINANCIAL TENDER FORMAT

The rates may be given in Indian Rupees only.

TABLE-A2

S. No	Name of item	Measuring range in metres	Qty	Unit	Rate		Amount
					In Fig	In Word	
1	Supply, installation, testing and commissioning of Radar type Water level sensors for the locations mentioned in Annexure – 2, with all accessories on deck of the existing bridge as per technical specifications and directions of engineer-in-charge.	>30	2	No			

FINANCIAL TENDER FORMAT

The rates may be given in Indian Rupees only.

Table-B

Comprehensive Annual Maintenance Charges

S.No.	Item	Unit	Qty	Rate for Block of 2 years	Amount
1	Remote Station including all equipment, accessories, civil, mechanical and fabrication works	Per station	15		
2	Modeling centre along with VSAT Terminals- in case of new modeling centre)	Per Modelling Centre	1		
	Total comprehensive maintenance charges (in words and figures)				

Table-C

Comprehensive Annual Maintenance Charges for next 6 years beyond normal contract period as per SCC Condition no. 12.4

(Not to be used for evaluation purpose)

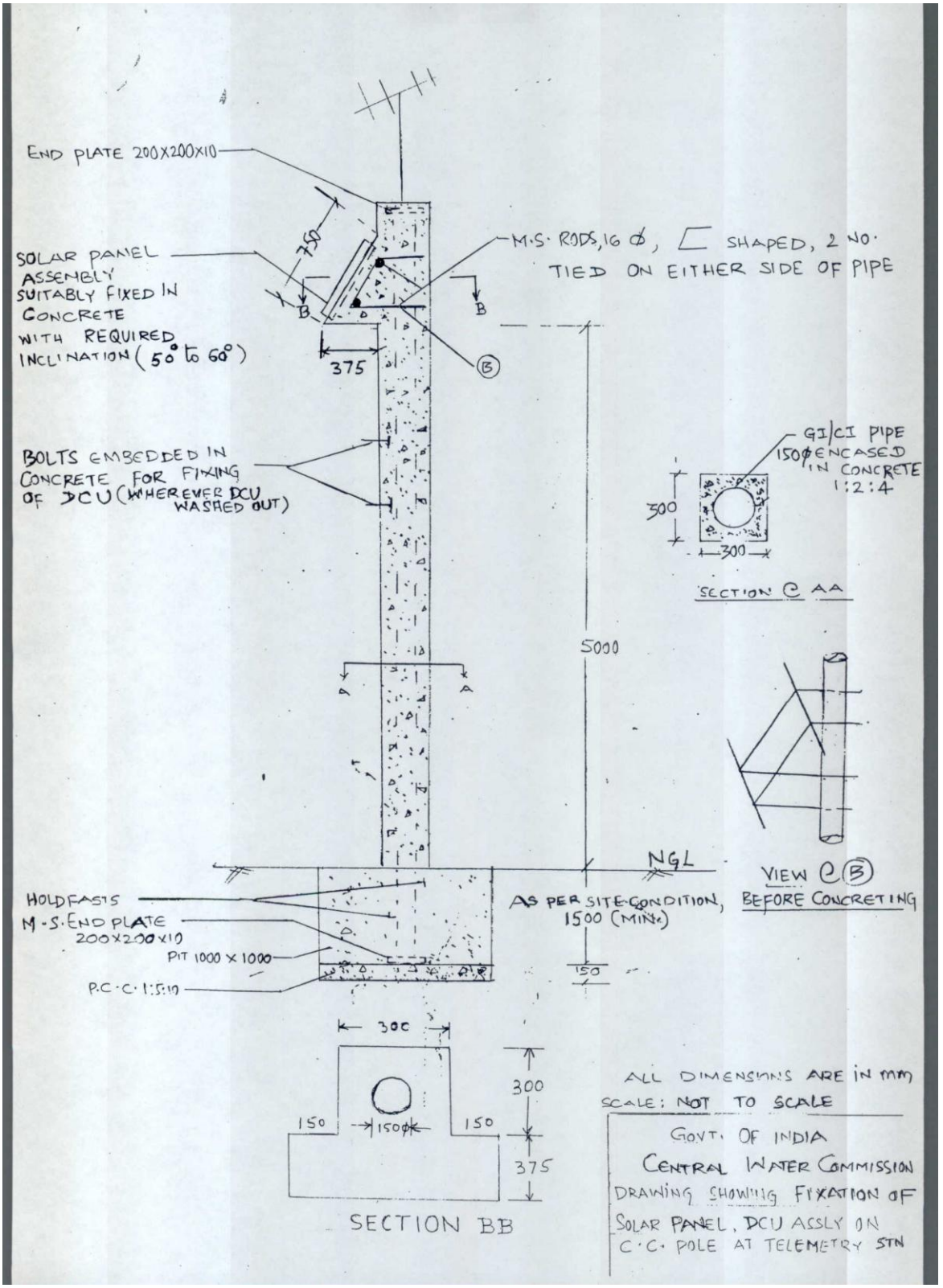
S.No.	Item	Unit	Qty	Rate for Block of Ist 2 years	Rate for Block of IInd 2 years	Rate for Block of IIIrd 2 years
1	Remote Station including all equipment, accessories, civil, mechanical and fabrication works	Per station	15			
2	Modeling centre along with VSAT Terminals- in case of new modeling centre)	Per Modelling Centre	1			
	Total comprehensive maintenance charges (in words and figures)					

Annexure -1

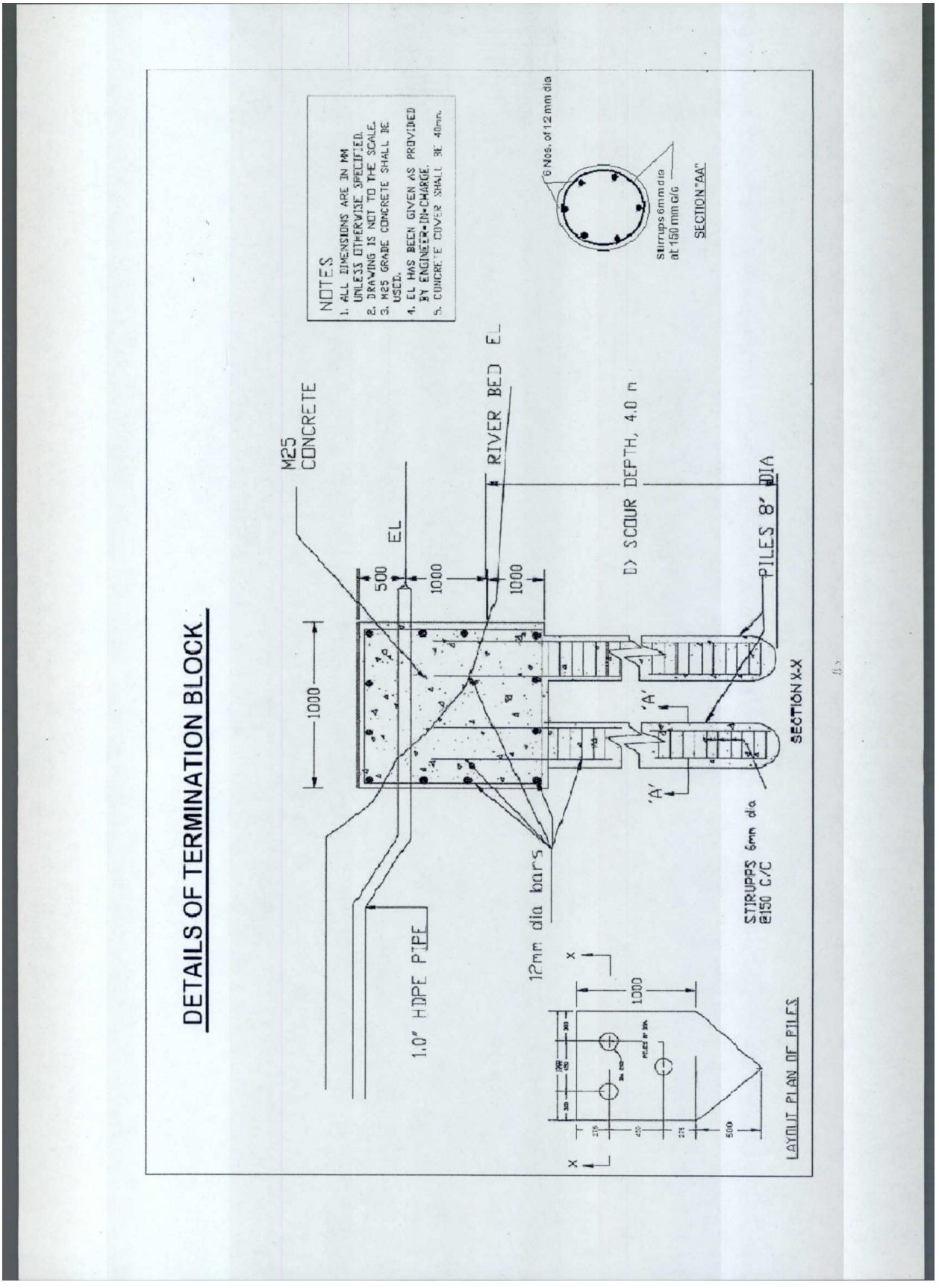
Sl . No	Station Name	District/State	River	Sensors	Max. Range of sensor in metres
1	Prakasham barrage	Krishna / Andhra Pradesh	Krishna	Radar level and Rainfall	9.00
2	Sri Ram Sagar	Nizamabad / Andhra Pradesh	Godavari		16.00
3	Jaikwadi Dam	Aurangabad / Maharashtra	Godavari		10.00
4	Singur Dam	Medak / Andhra Pradesh	Manjira		10.00
5	Nizam Sagar Dam	Nizamabad / Andhra Pradesh	Manjira		11.00
6	P D Jurala Project	Mahbubnagar / Andhra Pradesh	Krishna		11.00
7	Vijayawada	Krishna / Andhra Pradesh	Krishna		19.00

Annexure -2

Sl . No	Station Name	District/State	River	Sensors	Max. Range of sensor in metres
1	Sri Sailam Dam	Kurnool / Andhra Pradesh	Krishna	Radar level and Rainfall	32.00
2	Nagarujuna Sagar Dam	Nalgonda / Andhra Pradesh	Krishna	Radar level and Rainfall	31.00



Drawing for Telemetry Concrete Tower


DETAILS OF TERMINATION BLOCK
NOTES
1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2. DRAWING IS NOT TO THE SCALE.
3. M25 GRADE CONCRETE SHALL BE USED.
4. EL HAS BEEN GIVEN AS PROVIDED BY ENGINEER-IN-CHARGE.
5. CONCRETE COVER SHALL BE 40mm.
M25 CONCRETE
1000
500
EL
1000
1000
RIVER BED EL
D SCOUR DEPTH, 4.0 m
PILES 8' DIA
1.0" HDPE PIPE
12mm dia bars
STIRUPS 6mm dia @150 C/C
'A'
'A'
SECTION X-X
6 Nos. of 12 mm dia
Stirrups 6mm dia at 150 mm c/c
SECTION "AA"
X
X
1000
500
LAYOUT PLAN OF PILES