

GOVERNMENT OF PUNJAB
DEPARTMENT OF IRRIGATION, PUNJAB, CHANDIGARH
HYDROLOGY PROJECT PHASE-II

Dated: 09-12-2013

Bid No.102/Out./DWLR/2013-14

Dear Sirs,

Sub: Invitation for Quotations for Supply, Installation (including civil works), Testing and commissioning of 1 no. Digital Water level Recorder (DWLR) measuring minimum 0 to 45m water column including Telemetry System complete in all respects at Ranjit Sagar Dam under Hydrology Project-II.

1. You are invited to submit your most competitive quotation for the supply and installation of the equipment as under:-

i) **Goods:**

Sr. No.	Brief description of goods	Specification	Qty.	Time of completion	Place of delivery/Installation	Installation requirement if any
A	Pressure transducer with delrin of stainless or equivalent (including data logger and DRS cable) measuring minimum 0 to 45 mtr.watercolumn.	Equipment must conform to approved specifications i) DWLR(Pressure Type, SW) issued by CWC vide 10.005 version 5, dated 28-7-2009 attached as Annexure-I ii) Telemetry specifications attached as Annexure-II	1No. (One)	Three Months	Ranjit Sagar Dam ShahpurKandi near Pathankot	
B	Cable 150 mtrfor DWLR.					
C	<u>Accessories</u> All accessories for water level station includes NEMA-4 enclosure, battery, solar charging and telemetry system.					
D	Software for data downloading and storage for Telemetry system. (Computer and data receiving system will be provided by the Department.)					
E	Installation and commissioning.					

ii) Civil Works:

Sr. No.	Description of Item	Specifications	Time of completion	Place of delivery/Installation	Installation requirement if any
A	Earth work excavation in foundations of bridges, culverts, buildings including handling of material with combined lead of 15mt, dressing of bed & sides, Stacking excavated soil clear from the edge of excavation & Subsequent filling around complete in all respects.	All civil works are to be carried out as per approved drawings and PWD specifications complete in all respects.	Three Months	Ranjit Sagar Dam ShahpurKandi near Pathankot	Complete installation including civil works, testing and commissioning of 1 No. DWLR at Ranjit Sagar Dam site as per approved drawings.
B	Providing, reinforced cement concrete M-20 with cement @ 360kg per cum mechanically batch mixed using batch type concrete mixer as per ISI.1791 and vibrated by needle vibrator but excluding steel reinforcement centering and shuttering in foundation and plinth.				
C	Providing & laying Cement conc. 1:2:4 with stone ballast or shingle complete in all respect as per instructions of engineer in-charge.				
D	Providing & laying Cement conc. 1:4:8 with 20mm gauge stone ballast complete in all respect as per instructions of engineer in-charge.				
E	Providing & laying conglomerate floor 50mm thick Cement conc. Topping 1:2:4 as per drawing complete in all respects.				
F	Shuttering for precast and plain or R.C.C. Blocks etc complete in all respects.				
G	Providing & Laying cold twisted deformed (ribbed/Tor steel) Bars Fe 500 grade as per IS 1786-1985 for R.C.C. work where not included in the complete rate of R.C.C. including bending, binding & placing in position complete in all respects.				
H	Providing & fixing 10 gauge welded mesh of 25mmx25mm size fixed on steel glazing with M.S. flat 20mmx6mm bedding complete in all respects including painting two coats with synthetic enamel paint & Priming coat.				

I	Supplying & laying steel work fixed independently without connecting plates including cutting, hoisting and fixing in position for tees angles and channels complete in all respects.				
J	Providing & laying M.S square tube of size 91.5mmx91.5mmx4.5mm and 50mmx50mmx2.6mm for equipment guard including cutting, hoisting, Welding and fixing in position as per drawing complete in all respects.				
K	Providing and laying, jointing fixing and testing 25mm internal dia G.I. Pipe B-class including cost of specials such as tees, bends, sockets, elbows etc. testing, cutting, threading inside building complete in all respects				
L	Providing & applying priming coat with ordinary quality metal primer on new steel or iron work including preparation of surface complete in all respects.				
M	Providing & Painting two coats excluding priming coat with ready-mix ordinary quality paint for metallic surface in all shades on steel or iron work complete in all respects.				

2. Government of India has received a Loan (LN No. 4749-IN) from the International Bank for Reconstruction and Development in single currency equivalent to US\$ **104.98** million approximate towards the cost of the **Hydrology Project Phase-II** and it is intended that part of the proceeds of this loan will be applied to eligible payments under the contracts for which this invitation for quotations is issued.

3. **Bid Price**

- a) The contract shall be for the full quantity as described above. Corrections, if any, shall be made by crossing out, initialing, dating and re writing.
- b) All taxes and other levies payable on the raw materials and components shall be included in the total price.
- c) Sales tax in connection with the sale shall be shown separately.
- d) The rates quoted by the bidder shall be fixed for the duration of the contract and shall not be subject to adjustment on any account.
- e) The Prices shall be quoted in Indian Rupees only.
- f) Custom duty exemption certificate under Govt. notification no. **84/97** is to be provided by the purchaser at the time of the contract

4. i) Each bidder shall submit only one quotation.
- ii) The bidder should be a manufacturer/Authorized Representative who must have supplied the equipment (s) similar to the type specified in the Quotation up to at least 1 No. Digital Water Level Recorder (DWLR) Pressure Type, (SW) including commissioning in any one of the last 3 years.

5. **Validity of Quotation**

Quotation shall remain valid for a period not less than **2 months** after the deadline date specified for submission.

6. **Evaluation of Quotations**

The Purchaser will evaluate and compare the quotations determined to be substantially responsive i.e. which

- (a) are properly signed ; and
- (b) Conform to the terms and conditions, and specifications.

The Quotations would be evaluated for all the item together.

Sales tax in connection with sale of goods shall not be taken into account in evaluation.

7. **Award of contract**

The Purchaser will award the contract to the bidder whose quotation has been determined to be substantially responsive and who has offered the lowest evaluated quotation price.

7.1 Notwithstanding the above, the Purchaser reserves the right to accept or reject any quotations and to cancel the bidding process and reject all quotations at any time prior to the award of contract.

7.2 The bidder whose bid is accepted will be notified of the award of contract by the Purchaser prior to expiration of the quotation validity period. The terms of the accepted offer shall be incorporated in the purchase order.

7.3 The bidder has to deposit performance security for an amount of **30%** of the contract price in form of Bank Guaranty drawn in favour of **Senior Hydrologist, Surface Hydrology Division, SCO 3021-22, IInd Floor, Sector 22-D, Punjab. Chandigarh** within 10 days of the award of the contract before signing of contract.

8. **Payment terms:**
- i) **70%** of contract price shall be paid on receipt of goods and upon submission of all the related documents.
 - ii) Remaining **30%** of the contract price on successful installation, testing and execution of civil works complete in all respects and after receipt of satisfactory report from the end user.
 - iii) The expenditure on this project will be met from the funds to be released to the Department by the Government of Punjab, Department of Finance under the Hydrology Project Phase-II scheme.
 - iv) The Department of Public Works, Irrigation Branch shall not be responsible for non-release or delayed release of funds by the Department of Finance. No interest shall be paid for delayed payment.
9. Comprehensive warranty/ guarantee for **3 years** shall be applicable to the supplied goods. The period of corrections of defects during this period either rectification or replacement of the defective part/equipment is ten days.
10. For bid evaluation purpose the cost of **3 years** maintenance service charge after the warranty period of 3 years should be quoted as per format provided. The security for AMC will be 10% of the contract price.
11. **Liquidity Damages:**
- If the work is not completed within contract period the liquidity damages will be 0.1% per week and maximum deduction will be 10% of contract price.
12. You are requested to provide your offer latest by **3.00 PM** on **18-12-2013**
13. We look forward to receiving your quotations and thank you for your interest in this project.

Senior Hydrologist,
Surface Hydrology Division,
SCO No. 3021-22, IInd Floor,
Sector 22-D, Chandigarh.
Tel. No. 0172-2701962,
E-mail-seniorhydrologist@gmail.com

FORMAT OF QUOTATION

1. Goods:

Sr. No.	Description Goods	Specifications	Qty.	Unit	Quoted Unit Rate in Rs.	Total Amount	
						In Figures	In Words
A	Pressure transducer with delrin of stainless or equivalent (including data logger and DRS cable) measuring minimum 0 to 45 mtr.watercolumn.		one				
B	Cable 150 mtr. for DWLR.						
C	<u>Accessories</u> All accessories for water level station includes NEMA-4 enclosure, battery, solar charging and telemetry system.		one				
D	Software for data downloading and storage for Telemetry system. (Computer and data receiving system will be provided by the Department.)		one				
E	Installation and commissioning.		one				
	Total						
	Sales Tax						

2. Civil Works:

Sr. No.	Description of Item	Unit	Qty	Quoted Unit Rate in Rs.	Total Amount	
					In figures	In words
A	Earth work excavation in foundations of bridges, culverts, buildings including handling of material with combined lead of 15mt, dressing of bed & sides, Stacking excavated soil clear form the edge of excavation & Subsequent filling around complete in all respects.	Cum	3.65			
B	Providing, reinforced cement concrete M-20 with cement @ 360kg per cum mechanically batch mixed using batch type concrete mixer as per ISI.1791 and vibrated by needle vibrator but excluding steel reinforcement centering and shuttering in foundation and plinth.	Cum	0.708			
C	Providing & laying Cement conc. 1:2:4 with stone ballast or shingle complete in all respect as per instructions of engineer in-charge.	Cum	0.748			

D	Providing & laying Cement conc. 1:4:8 with 20mm gauge stone ballast complete in all respect as per instructions of engineer in-charge.	Cum	0.65			
E	Providing & laying conglomerate floor 50mm thick Cement conc. Topping 1:2:4 as per drawing complete in all respects.	Cum	0.226			
F	Shuttering for precast and plain or R.C.C. Blocks etc complete in all respects.	Sqm	9.29			
G	Providing & Laying cold twisted deformed (ribbed/Tor steel) Bars Fe 500 grade as per IS 1786-1985 for R.C.C. work where not included in the complete rate of R.C.C. including bending, binding & placing in position complete in all respects.	Qtl	0.58			
H	Providing & fixing 10 gauge welded mesh of 25mmx25mm size fixed on steel glazing with M.S. flat 20mmx6mm bedding complete in all respects including painting two coats with synthetic enamel paint & Priming coat.	Sqm	11.89			
I	Supplying & laying steel work fixed independently without connecting plates including cutting, hoisting and fixing in position for tees angles and channels complete in all respects.	Qtl.	0.47			
J	Providing & laying M.S square tube of size 91.5mmx91.5mmx4.5mm and 50mmx50mmx2.6mm for equipment guard including cutting, hoisting, Welding and fixing in position as per drawing complete in all respects.	Kg.	204.8 1			
K	Providing and laying, jointing fixing and testing 25mm internal dia G.I. Pipe B-class including cost of specials such as tees, bends, sockets, elbows etc. testing, cutting, threading inside building complete in all respects	Rmt	140			
L	Providing & applying priming coat with ordinary quality metal primer on new steel or iron work including preparation of surface complete in all respects.	Sqm	8.34			
M	Providing & Painting two coats excluding priming coat with ready-mix ordinary quality paint for metallic surface in all shades on steel or iron work complete in all respects.	Sqm	8.34			

Gross Total Cost 1+ 2 = Rs.....

1. Installation of equipment's along with associated civil works shall be carried out only in presence of qualified service engineer of the Supplier and Authorized representative of **Senior Hydrologist, Surface Hydrology Division, SCO 3021-22, IInd Floor, Sector 22-D, Punjab. Chandigarh.**
2. All civil works are to be carried out as per approved drawings and PWD specifications complete in all respects.
3. The civil work of equipment guard for installation of the equipment is to be carried out as per enclosed sanction drawings.
4. The civil work for laying of cable passing through G.I. Pipe and starting from the equipment to going upto submerged pressure transducer, a indicative drawing is attached and a supplier has to submit his own drawing and get it approve form the department before carrying out work at site.

5. Civil Works quantities can vary as per site conditions.
6. Any other item used in installation of civil works should be covered in above items.
7. All taxes i.e. Income Tax, Sale Tax, Cess, VAT etc. if any will be deducted at the prevailing rates from the bill of supplier.

List Of BIS Standards for Civil Works:

A list of relevant BIS (the Indian Standard Specification) that are applicable to the associated civil works is given below. All references to BIS means the relevant Bureau of Indian Standard Codes with all amendments published up-to the date.

- a. Code of Practice for Plain and Reinforced Concrete IS 456:2000
- b. Steel for general structural purposes- Specification IS 2062:1999
- c. High Strength deformed steel bars and wires for concrete reinforcement Specification IS 1786:2008
- d. Indian code of practice for construction in steel IS 800:2007

- Note:*
1. *Excavation in foundation should be as per Punjab P.W.D. Specification and instructions of Engineer-in-charge.*
 2. *Curing required will be done by contractor at his own cost.*
 3. *Water for any work i.e. R.C.C., C.C.1:2:4, C.C.1:4:8 etc. to be used will be provided by the contractor at his own cost*
 4. *Wire mesh should be square type 25mm*25mm of 3.15mm dia. and of minimum weight 4.9kg per square meter*
 5. *Any other work involved for civil works for which IS Code is not given, then relevant IS code, latest Punjab PWD specification and instructions of Engineer-in-charge should be followed.*
 6. *Welding rods and welding set for fabrication should be provided by contractor at his own cost.*

Price Schedule for Annual Maintenance contract after Warranty period:

A	B	C	D			E
Sr. No.	Item description	Quantity	Annual maintenance & repair cost for 1No. DWLR Rs:/Year			Total maintenance charges for 3 years in Rupees
			Year 4	Year 5	Year 6	
1	Post Warranty comprehensive maintenance contract	1 No. DWLR				

We agree to supply the above goods and complete installation of the equipment in accordance with the technical specifications for a total contract price of Rs. (Rs:.....) within the period specified in the Invitation for Quotations.

We also confirm that the normal commercial warrantee/guarantee of **3 years** shall apply to the offered goods.

We hereby certify that we have taken steps to ensure that no person acting for us or on our behalf will engage in bribery.

Signature of Supplier

DWLR, PRESSURE TYPE (SW)

Approval Date: 28 July 2009

Version: 5

Purpose

The Digital Water Level Recorder (DWLR) is to record readings of water level versus time in rivers, lakes, reservoirs. Optionally, the actual level reading could be shown on a LCD display.

Conditions and requirements

- The instrument shall be of such a design that it operates reliably and accurately under the prevailing environmental conditions.
- The instrument shall be easy to operate and maintain.
- All materials on the instrument exterior shall be non-corrosive.
- The recorder zero shall be adjustable to zero of gauge.
- A pressure sensor shall measure the water level, directly (immersed).
- The method of pressure measurement shall compensate for the effects of ambient air-pressure, by application of a vented gauge pressure sensor or other compensation method.
- The instrument shall have a short settling time, i.e. rated accuracy shall be reached quickly after (re-) installation and there shall be no need to wait on site or even return later for re-adjustment to accommodate for initial settling drift. It should be noted that the instrument regularly will be recovered for maintenance and inspection.
- The instrument shall not need a stilling well for wave and turbulence suppression but shall have a wave suppression filter implemented in software.
- All batteries associated with the DWLR, i.e. the batteries for normal operation and the backup batteries, shall be easily replaceable by the local operator ideally using batteries readily available in India.
- During battery replacement, the instrument settings and data shall be retained.
- The instrument shall be supplied with the accessories as needed for effective deployment.
- The instrument shall have an expected technical lifetime of not less than 10 years.
- The instrument shall be capable to operate at least 6 months without any servicing.
- Calibration data and test certificates shall be part of the delivery for each DWLR.
- The DWLR shall support adjustable specific gravity over a range of 0.9 to 1.03.
- The water level readings shall be recorded in data logger memory.
- Data retrieval and other communications shall be possible through a Data Retrieval System (DRS), i.e. a Palm top Computer or a Laptop Computer (not included in the scope of the DWLR supply) loaded with dedicated software.
- For communication with the DRS, an RS232C serial/a USB 2.0 or better interfaces shall be available with optional additional IrDA or Bluetooth technology.
- The delivery shall include compatible cables for connecting the DWLR to the USB port of the DRS.
- For some DWLR implementations, interface adapters, are needed to communicate with the DRS. Any necessary adapters, including manuals, software, cables and all other required accessories shall accompany each DRS, both for communication between DWLR and DRS and between DWLR and PC.
- The communication between DWLR and DRS and PC shall be suitable for the cable lengths involved.
- An error monitoring communication protocol shall be used. The protocol shall ascertain error free data exchange between DWLR and DRS/PC. The protocol shall function in both directions. Commands, programs, water level records and all other data are exchanged under control of the protocol and data may only be accepted if they are error free.

- The communication protocol shall be based on packetwise data exchange; the packets shall be accompanied by a CRC code for checking at the receiving end. Defective or not received packets shall be retransmitted upon request by the receiving end.
- The DWLR shall be capable to measure the voltage of the internal battery(ies).
- A simple and accurate tool to assess remaining battery lifetime shall be made available. The tool shall enable proper planning of battery replacement without risk of data loss due to battery depletion. The tool may be implemented in the DWLR or alternatively, in the DRS. The operator may be prompted to enter specific parameters.
- Operator's and maintenance manuals, related to the type and model of the instrument, shall be part of the delivery.
- Comprehensive operators and maintenance training for respectively field observers and instrument specialists shall be part of the delivery.
- The proper functioning of each instrument shall be demonstrated at delivery.

Specifications

The purchaser may execute his judicious discretion in the choice of configuration and options.

1. Pressure sensor

sensor type vented gauge pressure sensor
measuring range **0 to 45 m water column (e.g. 0 to 10 or 0 to 20m)**
asper Schedule of Requirements

The Schedule of Requirements gives the number to be quoted for and their associated ranges and is attached to this document. The Bidders shall specify for the closest standard range of the offered product with respect to the required measuring range. The quoted ranges shall be equal or larger than the required range.

Accuracy

overall accuracy 0.1% Full Scale
temperature coefficient <0.01% Full Scale/°C (on water level reading including 50m suspension cable)
long term stability 0.1% Full Scale/year
reproducibility 0.05% Full Scale

Note: Overall accuracy, long term stability and reproducibility include pressure sensor, suspension cable and data logger. Stability shall also cover the longitudinal cable properties, e.g. elongation and creep of the suspension cable at the cable length specified in the Schedule of Requirements.

The temperature coefficient covers all the combined temperature effects on pressure sensor, data logger (zero and scale) and suspension cable.

The vendor shall specify the temperature effect on: sensor reading (zero and scale effects), cable length and data logger. The instrument shall maintain the specified **overall accuracy** over a temperature fluctuation of at least 10°C, i.e. whatever the actual temperature coefficient, the overall error shall not exceed the accuracy specifications as given under the item 'overall accuracy'.

In case of a separate sensor, the electronics unit shall be field exchangeable without affecting the level reading beyond the rated system accuracy and such without any requirement for adjustments to the electronics, e.g. for zero and/or span control. Adjustment in software settings to accommodate for a sensor replacement is acceptable.

overload pressure 2 times Full Scale
 Overload pressure is the maximum pressure the sensor can sustain without effect on calibration upon return to the rated measuring range.

burst pressure >3 times Full Scale

Loading a sensor beyond the burst pressure most likely results in puncture or collapse of the sensor membrane(s). Water may invade into the electronics compartment, damage the instrument severely, and destroy recorded data.

over-voltage protection on supply and sensor wires
All pressure sensors suspended on a cable shall have a built-in protection against over-voltage in addition to an over-voltage scheme on the associated data logger electronics.

2. Datalogger

resolution of measurement 12 bit A/D converter or **Digital Signal with at least 1 mm resolution.**

measuring interval pre-set at 1 hour, adjustable from 10 minutes to 24 hours.

The measuring interval shall be user adjustable; recordings shall be executed at 'integer times'. Example, if the measuring interval is 30 minutes, then recording should take place at: 00h00, 00h30, 01h00, etc. The first record after initiation of the instrument, should be made at the first instant of 00 or 30 minutes in the hour.

settling time < 30 minutes after submersion at the time of installation.

Upon installation, after submersion, the DWLR including pressure sensor and electronics adjust to the changed temperature, pressure and cable tension; the water level readings shall settle to the required accuracy within the specified settling time.

wave attenuation filter

The wave attenuation filter, which is implemented in software is defined by two controls, viz.:

- **sampling interval in seconds, e.g.** 1 to 10 seconds
- **averaging number, e.g.** 1 to 240 samples

The instrument should at least be capable to take the average of 30 or more samples collected over a period of 30 seconds or more. Only the average value is recorded.

date day, month, year in the following format: DD/MM/YYYY with leading zero's (01/03/2001 for 1st of March 2001)

time hh:mm:ss (0 to 23 hours, 0 to 59 minutes, 0 to 59 seconds) with leading zero's (08:05:07)

The specification given above is only valid for the way date and time are represented to the user and does not apply to the way the datalogger handles these.

recording capacity minimum of 20,000 water level readings.

The recorded data shall also contain an instrument serial number and/or station identification code and information on date and time of recorded water level readings. The serial number shall be uniquely attached to the data logger. The station identification code shall be uniquely attached to the datalogger at installation and shall not be added after data retrieval by user interference. The memory shall have a ring organisation (endless loop). The memory shall be protected against accidental erasure by a password or equivalent.

error marking error code, i.e. -99.999

Out of range data and errors shall be clearly and unambiguously marked and be distinguishable from valid data. The error mark is an impossible value, which cannot be generated by valid measurements.

recording resolution 0.001 m or better

memory type non-volatile memory is preferable. Volatile memory (RAM) shall be protected from data loss by a Lithium backup battery. The main battery capacity shall be sufficient to retain memory contents more than one year after main power disconnection (removal of the supply batteries).

Lithium batteries

power supply built-in standard Lithium batteries, like AA, CorD size ideally readily available in India.

OR

Alkaline batteries

power supply built-in standard Alkaline batteries, like AA, CorD size ideally readily available in India.

Preferably, the batteries are kept inside a separate enclosure, above the maximum water level. Alternatively, batteries may be kept inside the datalogger enclosure. However, wherever the batteries are kept, they shall be easily replaceable, in the local workshop by the local technicians, ideally using batteries readily available in India.

The delivery shall include sufficient batteries for at least one year of operation under the following conditions:

- a recording interval of 30 minutes
- the DWLRs will have the wave suppression filter enabled taking the average of 30 samples at an interval of 1 second.
If the sampling interval can only be set to less than 1 second, then the average over 30 seconds shall be calculated.
If the sampling interval can only be set to more than 1 second, then the average over 30 samples shall be calculated.
- regular access of the DWLRs for data retrieval and monitoring purposes which may affect the power autonomy

remaining battery lifetime indication on DRS and/or calculation scheme
data offload power use capacity for ≥ 6 full data offloads per annum of rated battery capacity, e.g. if rated battery capacity is 5 years then ≥ 30 full offloads shall be supported in that 5 years.
communication interface USB 2.0 or better at DRS/PC end with optional additional IrDA or Bluetooth technology.

The communication hardware between DWLR and DRS and PC shall be suitable for the cable lengths involved. In case of online monitoring is required, it should support at GPRS interface.

operating temperature 0 to 60°C.
 The operating temperature range specification applies to all components of the DWLR, like: sensor, cable, datalogger, batteries, etc.

built-in clock time keeping better than 1 minute per month
displayed timer resolution 1 second
over-voltage protection on all i/o lines, regardless mode of connection during deployment
 Built-in over-voltage protection is required on the electronics unit, in particular on all external connections, e.g. sensor supply and signal (also on optional sensors, e.g. for water quality), external power supply and data communication interface.

water level indicator LCD display with 1 mm resolution (optional)

3. Enclosure for pressure sensor and datalogger

The sensor electronics, data logger, electronics, batteries and all other electrical components shall be contained in one or more protective enclosures. The enclosure(s) shall comply with the following specifications.

All DWLR materials and combination thereof shall be corrosion proof.

Submerged enclosure

Integrated pressure sensor and datalogger The pressure sensor and dataloggers shall be contained in a single enclosure which will be submerged.

dimensions outer diameters shall be less than 75 mm, length < 0.6 m
material Delrin or stainless steel (AISI 316) or equivalent
mass sufficient to keep suspension cable taut, ≥ 1.25 kg on flexible cable and ≥ 2.5 kg on stiff cable
operating temperature 0 to 50°C
ingress protection enclosure and cable assembly shall have IP68 protection to a minimum of 100 m water column or 2 times the rated measuring range, whichever is larger

OR

In-well enclosure

Submerged pressure sensor and data logger for mounting in a protection pipe, but above water	
dimensions	outer diameters shall be less than 75mm, length < 0.6m
material	Delrin or stainless steel (AISI 316) or equivalent
mass (pressure sensor)	sufficient to keep suspension cable taut, ≥ 1.25 kg on flexible cable and ≥ 2.5 kg on stiff cable
ingress protection	enclosure and cable assembly shall have IP65 protection
operating temperature	0 to 60°C
humidity	100%
submerged parts	IP68 protection for permanent suspension at a maximum depth of 2 times the rated measuring range

4. Cable

The design of the support for the water level recorder depends on the site-specific conditions. The engineer in charge shall provide details on support and housing in collaboration with the bidder. Preferable, the cable is of a detachable type for increased operational flexibility. The vent tube inlet at the above water section of the cables shall be fitted with a moisture blockage system.

The cables shall have the following features:

- strength members for good longitudinal stability of the cable
- incorporated vent tube for barometric air-pressure compensation of the vented gauge pressure sensor
- a moisture blocking system on the vent tube based on a hydrophobic filter and desiccators, to prevent accumulation of moisture and condensation of water in the vent tube and in the sensor
- desiccant capacity shall be adequate for at least 6 months of unattended operation under worst case environmental conditions. For each instrument, two desiccant replacements shall be part of the delivery. The desiccants shall be field replaceable.
- optionally, as an extra protection, a flexible bag moisture blocking may be added.
- good flexibility
- the electrical wires shall have sufficient conductivity to allow for extension of the cable upto 150m without degrading accuracy, stability and data communication
- cable screen, to be connected to the data logger ground terminal to minimize electrical interference
- a cable suspension bracket allowing the DWLR to be adjusted to the required depth, in a stable and reproducible manner
- the cable shall be of such a design that the suspension forces on the suspension bracket are passed to the integrated strength member to benefit from the strength member's longitudinal stability.
- A perforation of the cable jacket shall not result in ingress of water into the sensor and/or electronics compartment. For that, the cable shall be moulded to the sensor and/or electronics compartment. In case a detachable connector is used, then the connector shall act as a water blockage.

Quantitative specifications

conductor	tinned copper wires with insulation like nylon or PTFE (Teflon),
insulation thickness ≥ 0.5 mm	
vent tube	Nylon, PTFE or equivalent, inner diameter ≥ 1 mm and ≤ 2 mm, thickness minimum 0.4 mm
strength members	stainless steel, Kevlar or equivalent to keep the sensor at the correct suspension depth, while using a depth adjustable suspension clamp on the cable at the top of the well.
temperature coefficient	$< 15 \times 10^{-6} / ^\circ\text{C}$ (longitudinal)
cable screen	braid of 36 AWG tinned copper or similar effective material
outer jacket	Surlyn, Polyurethane, PTFE (Teflon) or similar
jacket thickness	1 mm or more
cable size	outer diameter 7 to 12 mm
cable length	150m as per Schedule of Requirements

5. DRS software

The DRS software shall support functions for conversion of the collected data into ASCII (text) tables, and for efficient visualisation of the time series in tabular and graphical form.

- Graphical axes shall be generated automatically and be manually adjustable. Units along the axes shall not be awkward but intuitive and easily understandable.
- All axes shall have sufficient graduation.
- The labels along the time axis shall be insensible time intervals, i.e. hh:mm for relatively short periods and dates, e.g.: DD/MM/YYYY, for long periods. The same applies for the level axis.
- The unit-labels shall not cover each other.
- To enhance readability, adequate grid lines, both along time and level axes, shall be generated automatically by the graphics functions, approximately 5 grid lines per axis.
- The grid lines shall also be user adjustable.
- The user interface shall support efficient functions to select and visualise a subset of the time series, e.g. as a single day or several days somewhere out of many weeks of data.
- Efficient window functions shall be available to visualise the data in the required resolution, i.e. the level scale shall be user adjustable.
- Software that can only display sample counts or total duration or does not support axis and grid adjustment is not permitted.
- The DRS software shall support error-free transfer of the retrieved data to a PC.
- Not that in particular, the graphics capabilities are a major reason to apply a palm top or Laptop computer as DRS.

6. PC Software

- PC software shall be part of the delivery and will be used in the office, e.g. on a desktop PC.
- The PC software shall efficiently and reliably transfer the collected data from the DRS to a PC environment.
- The PC software shall have functions for conversion of the collected data into ASCII (text) tables.
- The PC software shall have functions for conversion of the collected data into ASCII (text) files. The tabular data will be imported by other software packages, e.g. for analysis and presentation in a spreadsheet and for storage in a database.
- The export file format is specified in Chapter 7.
- The PC software shall support the same and more tabular and graphical presentation functions as specified under DRS software.

7. Standard DWLR text file format

The text file is the intermediated data representation that is used for loading of the data into the hydrological databases system.

- The PC based software shall have a facility to generate a text file with water level data in the standardized format.
- The text file formatting function may be part of the standard proprietary PC software. Alternatively, the function may be implemented in a separate, MS-Windows XP/Vista based program.
- The text file facility shall be easy to use.
- Only SI-units shall be presented, i.e. m and °C for levels and temperature respectively.
- Non-SI units like feet, inches, °F are not permitted.
- The text files shall have a section with header lines.
- The header lines shall precede the data lines.
- The header lines shall contain instrument serial number, reference level that was used to convert from pressure head into water level, applied specific gravity.
- In case as software wave attenuation filter is implemented, the averaging number and the sampling interval shall be presented in the header.
- The header may contain other data such as measuring range, station ID, installation depth, top of casing reference relative to MSL, station co-ordinates and similar data.
- For each specific instrument make and model, the number of the header lines must be fixed, i.e. all instruments of that make and model shall always generate the same number of header lines, in the same format.
- The contents of the header lines is for use by the operator but will not be automatically assessed by the Data Entry Software (SW/GWDES).
- All header lines shall be terminated by a <CR><LF> sequence.
- The data shall be organized in columns
- column 1: date in dd/mm/yyyy

- Leading zero's shall be included, i.e. 06 February 2001 will be expressed as 06/02/2001. The </> character may be omitted, then the format becomes ddmmyyy.
- column 2: time in hh:mm:ss
Time shall be expressed in 24 hours. The AM/PM representation is not permitted.
Leading zero's shall be included, i.e. 6 o'clock in the morning shall be represented by 06:00:00.
The <:> character may be omitted, then the format becomes hhmmss.
- column 3: water level in meters with millimeter resolution, e.g. 49.640m.
- column 4: in case temperature is measured then temperatures shall be expressed in °C with 0.1°C resolution, e.g. 32.8°C.
- Alternative data sequences are not permitted.
- If a parameter can be negative, then a character position for the minus sign shall be reserved.
- The column separator shall be one of the following: <space>, <tab>, <comma>, or <semicolon>.
- Only one type of separator may be applied.
- End-of-line is indicated by <CR><LF> sequence.
- All data lines shall comply with this column format, empty lines or intermediate partly filled lines, e.g. with date and/or time only, are not permitted.
- All columns shall be complete, i.e. each field in a column shall always contain data. If no temperature data are measured, then column 4 may be omitted.
- Erroneous or missing water level data shall be indicated by -99.999.
- Erroneous or missing temperature data shall be indicated by -99.9.

Examples of data lines:	30/05/1998	11:00:00	9.875	28.7
	30/05/1998	12:00:00	-99.999	28.7
	30/05/1998	13:00:00	9.989	-99.9
	30/05/1998	14:00:00	10.380	28.8
	30/05/1998	15:00:00	10.800	28.7

The four columns contain date, time, water level and temperature data respectively.

Accessories

- tools and spares
- signal, power and communication cables as required for all normal user operations
- 220VAC ±25%, 47 to 53 Hz, charger for NiCd, NiMH or Li-ion battery pack

Consumables

- batteries
- desiccator for the hydrophobic filter and electronics
- replacement hydrophobic filters
- replacements for the (optional extra) moisture blockage bag

Specifications for Telemetry system

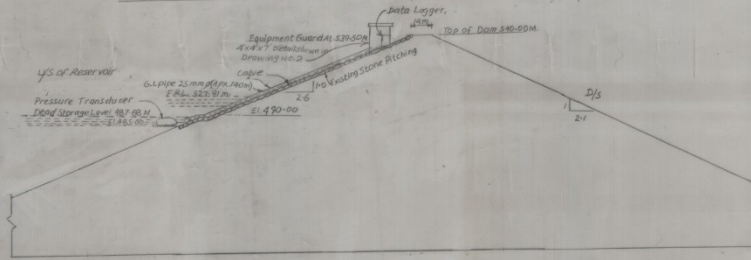
- The remote station (sensor and data logger) should support a GSM/GPRS based data transmission system with at least one month power backup.
- The transmission system (GSM/GPRS modem and antenna) should be integrated with the sensor and data logger.
- The system and any external connectors should be watertight (IP65 or better) and impact resistant;
- The system must be power-supplied by standard lithium batteries for operation time of minimum one year by one set of batteries and/or solar-powered (one transmission per day, up to 24 measurements per day). The system should minimise power consumption.
- The remote station shall send the data with the help of GSM/GPRS modem interfaced to the data logger in a format compatible for decoding at the GSM/GPRS server.
- In addition, as and when the remote station is queried by the GSM/GPRS Server at any time to take samples of water level readings, the same shall also be done and information be provided to the server for onward availability to the users.
- An alarm notification must be sent by the system via SMS to four mobile phone numbers through suitable means of communication in case of a preset event condition occurring e.g. maximum water level exceeded, minimum battery voltage reached, etc.
- Data download / retrieval from remote PC via GSM/GPRS network compatible to 900MHz and 1800MHz (Quad Band) under software control.

INDICATIVE DRAWING FOR INSTALLATION OF DWLR AT RANJIT SAGAR DAM

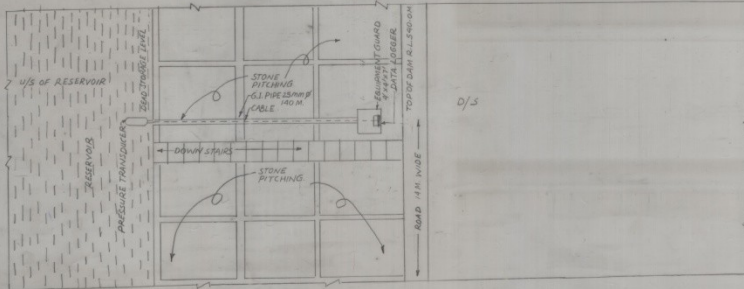
DRAWING NO-1

NOTE

1. The length of G.I. pipe can vary as per actual site condition



SECTION (NOT TO SCALE)



PLAN (NOT TO SCALE)

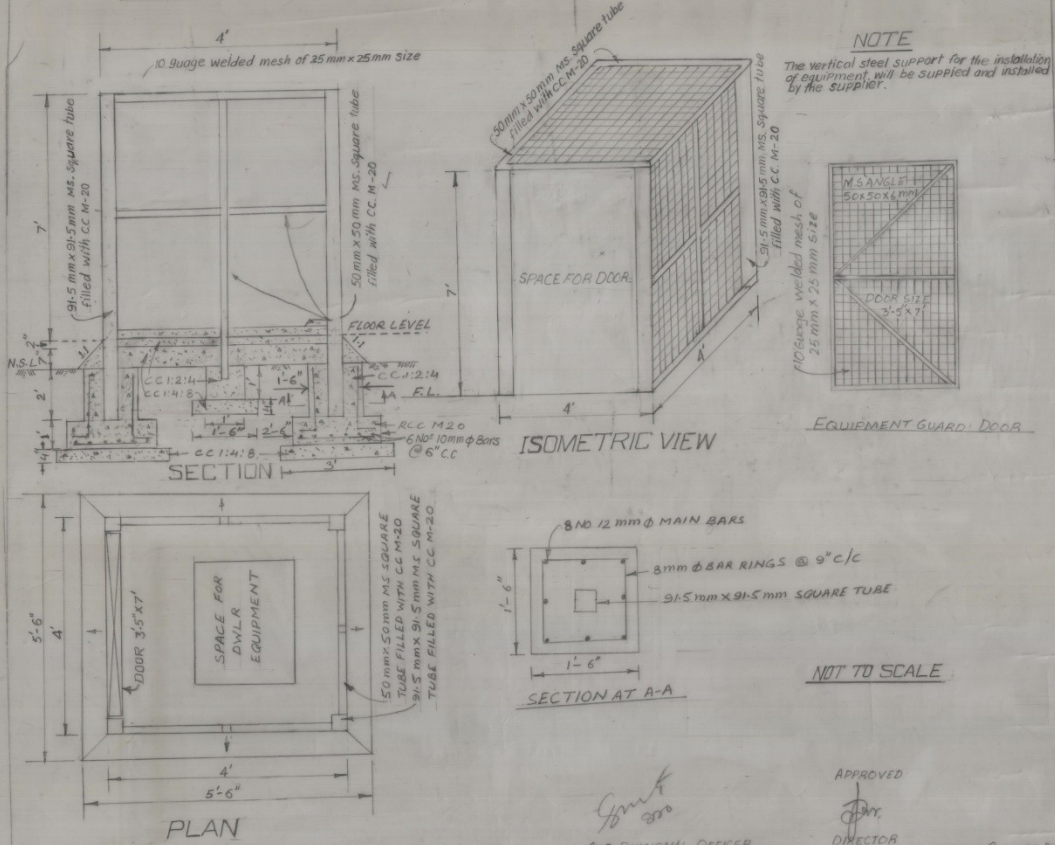
JUNIOR HYDROLOGIST.
SURFACE HYDROLOGY SUB DIVN
CHANDIGARH

SENIOR HYDROLOGIST.
SURFACE HYDROLOGY DIVN. PB.
CHANDIGARH.

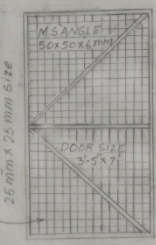
DIRECTOR,
PLANNING & DESIGN STUDIES DTE,
PUNJAB, CHANDIGARH.

DRAWING SHOWING EQUIPMENT GUARD FOR THE INSTALLATION OF D.W.L.R.

DRAWING NO-2



NOTE
The vertical steel support for the installation of equipment will be supplied and installed by the supplier.



EQUIPMENT GUARD DOOR

NOT TO SCALE

Pathankot
SUB DIVISIONAL OFFICER
DISCHARGE SUB DIVN. No. 2
MOHALI

STN
SUB DIVISIONAL OFFICER
DISCHARGE SUB DIVN. No. 1
PATHANKOT

Singh
SUB DIVISIONAL OFFICER
DISCHARGE SUB DIVN. No. 3
JALLANDHAR

SUBMITTED
Mishra
SENIOR HYDROLOGIST
SURFACE HYDROLOGY DIVISION
PUNJAB, CHANDIGARH

APPROVED
Jain
DIRECTOR
PLANNING & DESIGN STUDIES DTE
PUNJAB, CHANDIGARH

SANCTIONED
Ch
CHIEF ENGINEER, WATER RESOURCES
IRRIGATION WORKS, PUNJAB,
CHANDIGARH 2/10/12