

**GOVERNMENT OF KARNATAKA
(Water Resources Department)**

**PROJECT: DAM REHABILITATION AND IMPROVEMENT PROJECT
PHASE –II (DRIP-II)**

REQUEST FOR BIDS NO.2021/22

REQUEST FOR QUOTATION (RFQ) / SHOPPING PROCEDURES

(Single Envelope For Non-Consultancy Services)

Name of Work: Underwater investigation of U/S face of KRS

Dam under DRIP Phase-2 in Krishnaraja sagara dam.

**Executive Engineer,
C.N.N.L., K.R.S. Division
Krishnarajasagara.**

March 2022

REQUEST FOR QUOTATIONS
Procurement of Non-Consulting Services under RFQ/Shopping Procedures
E-Procurement Notice

Employer: Government of Karnataka water resources department

Contract title: Underwater investigation of U/S face of KRS Dam under DRIP Phase-2 in Krishnaraja sagara dam.

RFQ No: *[insert RFQ reference number from Procurement Plan]*

Date: *[insert date when RFQ is issued to the market]*

Applicable Procurement Regulations Date: World Bank's Guidelines For Procurement Of Goods, Works, and Non-Consulting Services Under IBRD Loans and IDA Credits & Grants By World Bank Borrowers January 2011, Revised July 2014.

1. Government of India has received financing from the World Bank towards the cost of the **Dam Rehabilitation and Improvement Project (DRIP)** Project and intends to apply part of the proceeds of this credit to eligible payments under the contract for which this request for quotations is issued. **Government of Karnataka Water Resources Department** invites quotations from eligible bidders for procurement of the following non-consultancy services:

Sl. No.	Brief Description of the Non-Consultancy Services	Deliverables	Period of Completion
1	Underwater investigation of U/S face of KRS Dam under DRIP Phase-2 in Krishnaraja sagara dam.	As per ToR	2 Months

2. The Bidders may submit Quotations for all the items specified in ToR.
3. This Procurement notice includes the terms and conditions applicable to submission of quotations; criteria for qualification, evaluation, and for award of Contract for Non-Consultancy Services; and relevant forms to be filled by the bidders. Implementing Agency has not issued a separate RFQ document for procurement of these services. The Procurement notice will be displayed in the office of Executive Engineer, K.R. Sagara Division, K.R.Sagara, Srirangapatna Taluk, Mandya Dist. The same documents and forms to be filled etc. can be downloaded free of cost by logging on to the website www.waterresources.kar.nic.in & submit the duly quoted rates

quotation in sealed cover to the office of Executive Engineer, K.R. Sagara Division, K.R.Sagara, Srirangapatna Taluk, Mandya Dist. Any further information Or Clarification for the above said work including last date, opening date, technical specification Etc., can be obtained from below mentioned office (SIno. 5) during the office hours & in notice board. The last date for submission of quotation to the below office dated 20-04-2022 by 3.30 pm, opened the quotation by next day i.e, 21-04-2022 will be at 11.00 am.

4. If the Employer's office happens to be closed on the date of opening of the Quotations as specified, the Quotations will be opened on the next working day at the same time. Each Bidder shall submit only one quotation.

Validity of Quotation

Quotation shall remain valid for a period not less than 60 days after the deadline date specified for submission.

1. Evaluation of Quotation

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

- a) Are properly signed and
- b) Conform to the Terms & Conditions and Specifications.

The Quotation would be evaluated for all the item together.

2. Award of Contract

The Department 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.

- 2.1. Notwithstanding the above, the Department reserves the right to accept or reject any quotation and to cancel the Bidding process and reject all quotations at any time prior to the award of contract.
- 2.2. The Bidder whose Bid is accepted will be intimated to the Contractor by the Department prior to expiration of the quotation validity period.

3. Payment shall be made after the satisfactory completion for the work.

4. You are requested to provide your offer latest by 03:30 PM hours on 20-04-2022 . We look forward to receive your quotations and thank you for your interest in this event.

5. Other details can be seen in the RFQ document. The Employer shall not be held liable for any delays due to system failure beyond its control. A Bidder requiring any clarification of the RFQ Document may notify the Employer online email eekrdsn@gmail.com , aeenolsubdnkrs@gmail.com or may visit the office of the Employer at the address given below.

Office of the Executive Engineer,

CNNL, KRS Division ,

K.R.Sagara, Srirangapatna taluk

Mandya Dist.

Telephone : 91-82362 – 97234

e-mail : eekrdsn@gmail.com

Website : www.waterresources.kar.nic.in

RFQ No:
Date:
Date:
Date:

Terms and Conditions

1. **Eligibility:** A Bidder (a) shall not participate in more than one Quotation; (b) shall not have conflict of interest as defined in the Bank's Procurement Regulations; and (c) should not have been (i) temporarily suspended or debarred by the World Bank Group in compliance with the Bank's Anti-Corruption Guidelines and its Sanctions Framework
2. **Clarifications & Amendments:** If the Employer receives any request for clarification of this RFQ Document, it will upload its response together with any amendment to this document, on the e-procurement portal for information of all Bidders. Bidders should check on the above office notice board or website www.waterresources.kar.nic.in , for any amendments to the terms and conditions.

3. The Quotation shall comprise the following:

- (a) Letter of Quotation;
- (b) Confirmation that the offered Non-Consultancy Services conform to the required specifications/ ToR;
- (d) Evidence in accordance with Clause 6 establishing Bidder's qualifications to perform the contract, if its quotation is accepted;
- (e) Performance Statement of completion of similar Non-Consultancy Services made during the last 3 years, in the prescribed Format;
- (f) Complete address and contact details of the Bidder having the following information:

Name of Firm
Address for communication
Telephone No(s): Office
Mobile No.
Facsimile (FAX) No.
Electronic Mail Identification (E-mail ID)

- (g) Price Schedule (using the Schedule uploaded with the RFQ document) wherein the **total amount** shall be entered.

4. Quotation Prices

- a) The contract shall be for the entire scope of works **as specified in ToR**. Corrections, if any, can be carried out by editing the information before electronic submission.
- b) All duties, taxes and other levies payable shall be included in the total price.
- c) GST and any other taxes, which will be payable at the time of invoicing in connection with the Non-Consultancy Services, shall be shown separately. If these are only stated to be extra, such quotations are liable to be rejected.

Wherever these taxes are not shown, these will be assumed to have been included in the quoted price.

- 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.

5. Conformity of Non-Consultancy Services: NA

6. Qualification of the Bidder: (a) Bidder should have provided Non-Consultancy Services of similar type (& capacity) in any one of last 3 years. Details of services provided during the last 3 years shall be submitted in the specified Proforma. The minimum 5800 sqm of underwater investigation work done certificate in a year should be countersigned by not less than Executive Engineer/Engineer-in-charge/Project Manager of Government firms for eligibility of evaluation of bidder. The Bidder should have completed at least one underwater inspection works of dams with any Government division prior to bidding for this work. Documents of experience to be submitted in the form of work done and completion certificates. The contractor should submit an ROV OEM certificate or should have ownership certificate for the ROV.

7. Validity of Quotation: Quotation shall remain valid for a period not less than 60 days after the deadline date specified for submission.

8. Signing of Quotations: The name and position held by each person signing the quotation and related documents must be typed or printed below the signature.

9. Quotation Submission: The Letter of Quotation shall be filled, signed and scanned copies shall be submitted to the office of Executive Engineer, K.R. Sagara Division, K.R.Sagara, Srirangapatna Taluk, Mandya Dist.

10. Opening and Evaluation of Quotations: The Quotations will be opened on 21-04-2022 will be at 11.00 am. The Department will evaluate and compare the quotations determined to be substantially responsive i.e., which are properly signed and Conform to the Terms & Conditions and Specifications.

The Quotation would be evaluated for the entire item together.

11. The Employer shall examine the quotation to determine whether the quotation (a) has been properly signed (Clause 8); b) meets the eligibility criteria (Clause 1); (c) conforms to all terms, conditions, technical specifications, warranty/guarantee etc.; and (d) the bidder has accepted the delivery schedule (Employer's Requirement Form 1).

(a) Only Quotations that are substantially responsive to the RFQ document, and meet all Qualification Criteria shall qualify.

(b) The evaluation shall be based on the total price quoted for Non-Consultancy Services at project site, including GST and any other taxes, which will be payable **on the submission of deliverables**, at the time of invoicing.

12. Award of contract: The Employer 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.

- (a) Notwithstanding the above, the Employer 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.
- (b) The bidder whose quotation is accepted will be notified of the award of contract by the Employer prior to expiration of the quotation validity period. The terms of the accepted offer shall be incorporated in the Contract Agreement (sample form attached).

(c) Payment:

Conducting preliminary inspection with Remote Operated Vehicle (ROV) for identification of defects, critical areas of the dam U/S surface the work including all bellow aspects

1) 10% of Payment shall be made within fourteen (14) days after Signing of the Contract. For Mobilization of Divers, diving equipment, generator , compressor, KMB , manpower, pontoon, boat etc to carry out the underwater inspection against Bank Gaurantee.

2) 10% of payment shall be made against submission of Inception Report.

3) 70% of payment shall be made against inspection ,submission and approval of :

- Underwater detail inspection and survey with divers specially in critical areas/defects identified during ROV survey including jet water cleaning of defects like cracks, honeycomb, joints, cavity etc including measurements and mapping of the defects with Dam chainage and RL upto a water depth of 40 meters
- Submission of draft reports in soft and hard copies (3 sets)
- Submission of final report along with Auto-cad drawings showing the defects in 3m x 3 m as per actual chainage and RL of the Dam in hard and soft copies (3 sets)
- Submission on repair proposal based on the defects identified during inspection including repair methodology, material specification and detail BOQ

4) 10% of payment against approval of the final report and above mentioned submission in required three numbers of soft and three numbers of hard paper copies.

Payment of GST and other taxes payable for the services at the time of invoicing, although already included in the total cost, will be at actual or the rate/amount of these taxes specified in the Contract Agreement, whichever is lower.

- (d) Normal commercial warranty/ guarantee : NA

Quotation Forms

Letter of Quotation

The Bidder must prepare the Letter of Quotation on stationery with its letterhead clearly showing the Bidder's complete name and address. The italicized text is for Bidder's guidance in preparing these forms and shall be deleted from the final products.

RFQ No.: No/EE/KRSDN/K.R.S/PB-1/QTN : 117/2021-22 / DATED :19.03.2022

Our Reference: No..... Dated.....

To:

(Employer's name and address)

Subject: Quotation for Underwater investigation of U/S face of KRS Dam under DRIP Phase-2 in Krishnaraja sagara dam of srirangapatna Taluk of mandya District, Karnataka ,

Sir,

1. We, the undersigned, hereby submit our Quotation. In submitting our Quotation, we make the following declarations:

- (a) **No reservations:** We have examined and have no reservations to the RFQ Document;
- (b) **Conformity:** We offer to provide the following Non-Consultancy Services in conformity with the RFQ Document and in accordance with the Schedule of Requirements/ Terms of Reference (ToR)

[insert a brief description of the Non-Consultancy Services and Related Services];

- (c) The total price of our Quotation, including any unconditional discounts offered is:
Total price of the Quotation **Rs 33,00,000/- thirty three lakhs only** ***[insert the total price of the quotation including GST and any other taxes, which will be payable on the finished Non-Consultancy Services, in words and figures];***
- (d) **Commissions, gratuities and fees:** We have paid, or will pay the following commissions, gratuities, or fees with respect to the Bidding process or execution of the Contract: *[insert complete name of each Recipient, its full address, the reason for which each commission or gratuity was paid and the amount and currency of each such commission or gratuity. If none has been paid or is to be paid, indicate "none."]*
- (e) **Quotation Validity Period:** Our Quotation shall be valid for the period of 60 days, from the deadline fixed for the Quotation submission;
- (f) **Eligibility:** We meet the eligibility requirements and have no conflict of interest, we are not participating in more than one quotation in this bidding process, and we have not been temporarily suspended or debarred by the World Bank.
- (e) **Fraud and Corruption:** We hereby certify that we have taken steps to ensure that no person acting for us or on our behalf will engage in any type of corrupt, fraudulent, collusive, coercive, or obstructive practices.

Yours faithfully,

Authorized Signature

Name & Title of Signatory _____

In the capacity of *[insert legal capacity of person signing the Letter of Quotation]*

Name of Bidder _____

Address _____

Dated on _____ day of _____, _____ *[insert date of signing]*

FORMAT OF QUOTATION

SI No	Item Description	Approximate Quantity in Figures and in Words	Quoted Lump sum Price in Rs.	GST and similar other taxes applicable	*Total Lump sum Price - inclusive of discounts, all taxes and duties
1	2		(A)	(B)	(A)+(B)
1	Conducting preliminary inspection with Remote Operated Vehicle (ROV) for identification of defects, critical areas of the dam U/S surface the work including all bellow aspects	11611 sqm (eleven thousand six hundred and eleven sqm)			
	a) Mobilization of Divers, diving equipment, generator , compressor, KMB , manpower, pontoon, boat etc to carry out the underwater inspection				
	b) Underwater detail inspection and survey with divers specially in critical areas/defects identified during ROV survey including jet water cleaning of defects like cracks, honeycomb, joints, cavity etc including measurements and mapping of the defects with Dam chainage and RL upto a water depth of 40 meters				
	c) Submission of draft reports in soft and hard copies (3 sets)				
	d) Submission of final report along with Auto-cad drawings showing the defects in 3m x 3 m as per actual chainage and RL of the Dam in hard and soft copies (3 sets)				
	e) Submission on repair proposal based on the defects identified during inspection including repair methodology, material specification and detail BOQ				

Note:

1. Evaluation shall be done for all the items together
2. *Payment of GST and other taxes payable for the Non-Consultancy Services at the time of invoicing, although already included in the total cost, will be at actuals or the rate/amount of these taxes specified in the Letter of Award, whichever is lower.

We agree to provide the above Non-Consultancy Services in accordance with the technical specifications/ ToR for a total contract price (including all taxes and duties) of Rs. (Amount in figures) (Rs... amount in words) within the period specified in the Request for Quotations.

We hereby certify that we have taken steps to ensure that no person acting for us or on our behalf has engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices (as defined in the prevailing World Bank's sanctions procedures) in competing for or in performing the Contract.

Signature of Bidder

PROFORMA FOR PERFORMANCE STATEMENT*

Proforma for Performance Statement (for a period of last 3 years)

RFQ No. _____
_____ Hours

Date of opening _____ Time

Name of the Bidder _____

<u>Order placed by (full address of Employer)</u>	<u>Order No. and date</u>	<u>Description of Services</u>	<u>Value of order</u>	<u>Date of completion of delivery</u>	
				As per contract	Actual
1	2	3	4	5	6

*This proforma shall be deleted if requirement of Performance Statement is deleted in Clause 4.

Signature and seal of the Bidder

TERMS OF REFERENCE (ToR)

I. DESCRIPTION OF SERVICES

A. Background

The construction of K.R.S dam was commenced in the year 1911 and completed in the year 1931. It is located across “Cauvery River” near Kannambadi village in Srirangapatna taluk of Mandya District. The dam comes under Cauvery basin. The dam is located at longitude 76° 03' 30" E and latitude 12° 25' 30" N. The dam site is accessible by an approach road of length 14.48 km from Srirangapatna town which is situated on the state highway connecting Bangalore and Mysore. The dam site is also accessible from Mysore city by an approach road of length 19.80 km.

The dam has a total catchment area of 10880.63 sqkm consisting of 3229.58 sqkm intercepted by reservoirs on major rivers of Harangi (419.58 sqkm) and Hemavathy (2810 sqkm) reservoirs and 7651.05 sqkm independent. Mean annual rainfall in the catchment is 160.96 cm (63.37"). The average annual yield of 5352 mcum (189 tmc) available from the catchment is utilized for irrigation. The reservoir formed by the dam has a gross storage capacity of 1400 mcum (49.452 tmc) and live storage capacity of 1276 mcum (45.051 tmc) to facilitate irrigation to 78915 ha (195000 acres) of contemplated atchkat.

The dam as built is a Gravity dam constructed in stone masonry with surki mortar of length 2621 m (8600 ft) and has a maximum height of 44.66 m (146 ft) (TBL 754.32 m above MSL – Deepest foundation level 709.66 m above MSL) reckoned between top of the dam and the foundation in the lowest river bed portion and the bottom width of the dam at this level is 33.88 m (111 ft). The height of the dam reckoned from the lowest river bed level is 39.87 m (130 ft) (TBL 754.32 m – Lowest river bed level RL 714.45 m). The construction of the dam was completed in the year 1931 and is operating since then.

SAILENT FEATURES OF THE PROJECT

I. GENERAL

- | | |
|--|-------------------------------------|
| 1. Name of the Project | : Krishnarajasagara Dam |
| 2. Name of the River | : Cauvery |
| 3. Location | : Krishnarajasagara |
| 4. Latitude & Longitude | : 76 – 34'. 30" E & 12 – 20' . 30"N |
| 5. Basin/Sub Basin | : C-1 Upper Cauvery |
| 6. Status | |
| a. Completed | : Completed |
| b. Ongoing | : |
| 7. Copy of index map to be compulsorily given in scale 1:50,000 & 1:10,000 | : |

II. GEOPHYSICAL FEATURES

- | | |
|--|---|
| 1. Catchment Area (Sq.km) | : 10619 Sq Km |
| 2. Nature of Catchment | : The Malnad portion of the catchment is hilly and thickly wooded. It gets heavy rainfall mostly in the South-West monsoon. |
| 3. Mean & Annual rainfall in (Cm/inches) | : 160.96 Cms (63.37") |

- 4. Climate : 37.22⁰ C maximum
- 5. General characteristics in of soil in the command area : 55% of the area is of course and fine sandy loams and remaining 45% are red loams, chocolate brown loams, sandy clays and clay loams.
- 6. Geological features : Gneissic Granite with bands of horn-blend schist.
- 7. Average Yield at site (50% dependability) : 189 TMCft at 50% dependability
- 8. Slit discharge per year
 - a. Designed : Not available
 - b. Actual : 0.0003

III. TECHNICAL DETAILS

A. RESERVOIR

Capacities in MCUM/TMC

- 1. Gross storage capacity : 49.452 TMC
- 2. Dead storage capacity : 4.401 TMC
- 3. Live storage capacity : 45.051 TMC
- 4. Capacity at FRL : 38.04 M (124.80 feet)
- 5. Capacity at MDDL : 22.56 M (74.00 feet)
- 6. Reservoir Evaporation Losses : 5.6
- 7. Reservoir filling & depletion details
 - a. Filling Period : From June to September
 - b. Depletion Period : From October to May

Levels in Mts/Ft

- 1. Average River bed level : 714.45 M (2344 ft. MSL)
- 2. Lowest Foundation level : (-) 4.79m (15.72 ft) (709.66m above MSL)
- 3. Dead storage level : 60.00 ft.
- 4. Full reservoir level : 124.80 ft
- 5. Maximum reservoir level : 124.80 ft
- 6. Minimum Draw down level : 60.00 ft
- 7. Crest level : NO Spillway
- 8. Top of Dam level
 - a. Masonry Dam : 130.80 ft
 - b. Earthen Dam : NA
- 9. Top of parapet level : 133.30ft
- 10. Maximum water spread Area : 129.24 sq.km. (49.90 sq.miles)

B. STORAGE DAM

1. Type of Dam : Masonry
2. Length of Dam (Kms) : Total 2621 M
3. Maximum height of dam above deepest foundation level (Mts/Ft) : 39.63 M
4. Height of the dam above lowest river bed level (Mts/Ft) : 130.80 ft above river bed level
5. Top width of dam (Mts/Ft) : 4.419 M
6. Slopes in dam section
 - a. Earth dam (upstream) :
 - b. Earth dam (downstream) :
 - c. Over flow section upstream side :
 - d. Non over flow section upstream side :
7. Drainage gallery : NO Drainage Gallery Provided
 - a. Length :
Left side (Mts/Ft)
Right side (Mts/Ft)
 - b. Size (Mts/Ft) :
 - c. Floor level (Mts/Ft) :
8. Spillway
 - a. Type : No Spillway provided
 - b. Total length :
 - c. Discharge length :
 - d. Crest level : At Different Levels
 - e. No. of crest gates : Total 173 Vertical Gates.
 - f. Designed flood intensity : 3,50,000 cusecs.
 - g. Maximum flood lift : 2,13,115 Cusecs on 06/07/1961
 - h. Maximum discharging capacity : There is no overflow spillway. The floods are disposed off through 152 sluice gates situated at different elevation in the body of the dam. The gates are rectangular
Over spillway
 - i. Energy dissipating arrangements : Solid apron
9. River sluices
 - a. Number : There is no overflow spillway. The floods are disposed off through 152 Waste weir sluice gates & 21 irrigation sluice gates, Turbine sluice gates & Scouring sluice gates are situated at different elevation in the body of the dam. & The gates are rectangular
 - b. Location :
 - c. Size :
 - d. Sill level :
 - e. Discharging capacity : 3,45,868 Cusecs through Sluice Gates.

II. LIST OF SERVICES/JOB WORK

SI No	Item Description	Approximate Quantity in Figures and in Words
1	2	
1	<p>Conducting preliminary inspection with Remote Operated Vehicle (ROV) for identification of defects, critical areas of the dam U/S surface the work including all bellow aspects</p> <p>a) Mobilization of Divers, diving equipment, generator , compressor, KMB , manpower, pontoon, boat etc to carry out the underwater inspection</p> <p>b) Underwater detail inspection and survey with divers specially in critical areas/defects identified during ROV survey including jet water cleaning of defects like cracks, honeycomb, joints, cavity etc including measurements and mapping of the defects with Dam chainage and RL upto a water depth of 40 meters</p> <p>c) Submission of draft reports in soft and hard copies (3 sets)</p> <p>d) Submission of final report along with Auto-cad drawings showing the defects in 3m x 3 m as per actual chainage and RL of the Dam in hard and soft copies (3 sets)</p> <p>e) Submission on repair proposal based on the defects identified during inspection including repair methodology, material specification and detail BOQ</p>	11611 sqm (eleven thousand six hundred and eleven sqm)

Brief methodology: :

Method for underwater inspection of a Dam depends on type and extent of damage expected, inspection intensity level and type of inspection. The location of underwater elements must be identified, and a description of the underwater elements must be included in the inspection records. Selection of a particular method of inspection and inspection intensity level will determine the effectiveness of inspection.

Level of Inspections:

- Level I: Visual, tactile and preliminary inspection using latest technology by deploying Remote Operated Vehicle. This inspection is performed to determine the physical and functional condition of the structure, identifying any major changes. This type of inspection does not involve cleaning of any structural element and conducted much more rapidly than other types of inspections.

- Level II: Detailed inspection by engaging skilled team of divers and guided by an experienced team leader. It is a detailed visual inspection where inspection is carried out in grid pattern and by cleaning of marine growth, like algae / barnacles / sea grass / snails / oysters etc from the surface of the structure. In this inspection all types of defects are identified, measured and mapped with actual location.

Following results are expected from the inspections:

- Water depth sounding and scour around piers and abutments.
- Identification of defects, damages like spalling, corrosion, cracks, cavity, honeycomb, etc.

Level- I. Preliminary Underwater Survey with the help of R.O.V :

Level-I Preliminary Survey using Remotely Operated Vehicle (ROV) used to carry out preliminary survey to have a look around the structures and try to ascertain the general condition of structures. Level-I survey can be conducted by ROV.

Preliminary/Primary survey to be carried out by deploying Remote Operated Vehicle. R.O.V will move around the upstream surface of dam at a suitable distance to capture videography of the surface condition of the structure. The ROV will move vertically and horizontally from the top to identify the defects, damages on surface. The ROV will be operated from the boat, pontoon or from the riverbank. The data will be visible in the remote monitor and same will get recorded. The outcome of the inspection will provide a general impression of the condition of the surface of the Dam.

Level – II. Detailed Underwater Inspection by Diving team

The detail survey will be carried by engaging skilled divers, guided by an experienced team leader who will be above water. The diver's team along with underwater camera system and other diving equipment will inspect the entire surface of underwater sub-structure. The divers will inspect the surface in a grid manner. During underwater Survey and Inspection standard safety norms and rules will be followed.

The steps to be followed are:

- Arrange and fix RL and chainage for the element /s to be surveyed.
- Cleaning of the surface from marine growth, like algae / barnacles / sea grass / snails / oysters etc. for identifying each defect.
- Identification of defects, damages like spalling, corrosion, cracks, cavity, honeycomb.
- Checking the extent of defects by hammer test.
- Identify the type of defects along with 3D measurement of the defects (x, y and z) and mapping the obtained information based on actual co-ordinates.
- Communication with Surface team (team leader) and recording of the activities.
- Submission of report in hard and soft copy details of defects, size and location of the defects, photographs & videography and indication on rehabilitation measures.

The detailed methodology adapted to conduct the underwater inspection of substructures is as under:

High Pressure Jet Cleaning:

The entire area of sub structure which has to be inspected shall be cleaned using wire brush cleaning / high pressure jet pump, applied up to 100 -150 kg / sq.cm, for removal of barnacles and surface deposit. The objective of high-pressure jet pump cleaning is to remove the marine growth, barnacles and vegetation from the surface and expose the parent substrate for inspection and mapping of the distressed features. In the distressed portion selected cavities, joints and junctions shall also be cleaned using wire brush to inspect the size of cavities, joint conditions, condition of filling material, details of reinforcements, depth of erosion, etc. At times, depending on situation, dyes are used to gauge the extent of cavities.

Mapping:

The perimeter of each substructure is divided into equal sections of two meters each. Each section is called a chainage. The notation for the chainages starts from 0, 2, 4 and continue till the entire perimeter is covered and is designated as Rows. At every chainage point i.e., at 0, 2, 4, a vertical line, designated as G1, G2, Gn, is drawn using a nylon rope having Weight tied at the bottoms which are designated as Grids. The vertical rope has flags at intervals of 1 m each. Each flag is marked with respective level in m from the top. At every site the 0 level is maintained just above the water level. The distance between the zero level and pier cap or well cap, designated as R0, R1, R2, R m, is recorded to report the observations with reference to pier cap or well cap which would always remain above water.

This will enable in locating the distress reported in this report in future irrespective of the varying water levels. The arrangement is schematically shown below;

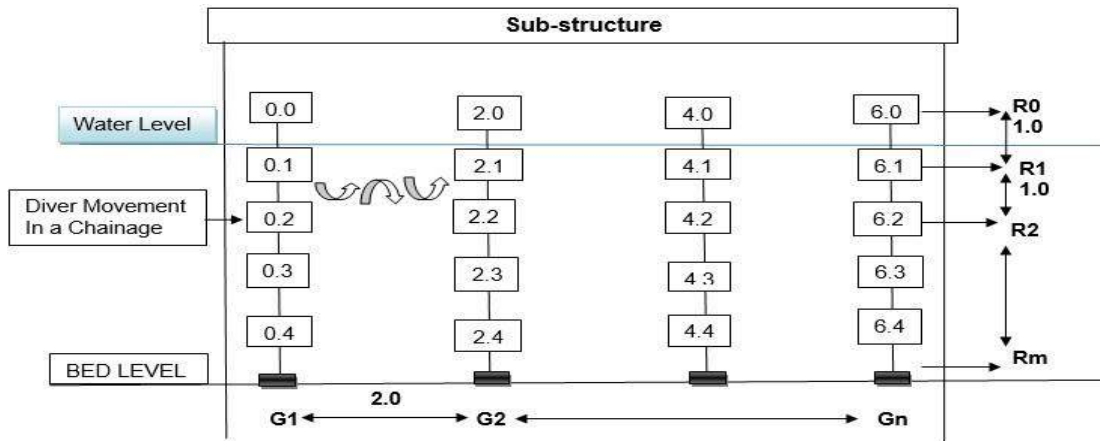


Fig-1, Schematic Grid Diagram

The close up videography of surface crack, cavities and structural damages shall be geo-tagged with dimensions (x, y and z) and will be reproduced on general arrangement plan or auto-cad drawing in hard and soft copy.

The videography and other data will be closely monitored by the Inspector

Inspection:

The diver starts from one chainage and moves up and down in the forward direction towards the next chainage. His movement would cover each grid of one chainage and one level. For example, the diver starts at 0 chainage, i.e., G1, and slowly moves towards Grid 2, i.e., G2, while having up and down motion to cover the zone, between Rows level 1m and 2 m, i.e., R1 and R2. Thus, diver covers the zone between each grid at a time.

The entire surface of the substrate is checked and inspected using swim by method. The diver with a camera inspects the surface thoroughly simultaneously showing it on the monitor with the help of CCTV camera held in his hands. The surface being shown on monitor is simultaneously observed by the engineers. In case, any clarification is sought by the engineer regarding the surface being shown the same is confirmed with the diver through the communication radio available with the diver. Where turbidity of water is very high with zero visibility the inspection is carried out using touch and feel method. The proceedings are recorded automatically on to a Hard Disk. The same is also recorded manually in preformatted report. In every chainage i.e., Grid after reaching the bottom the diver checks the bed up to a distance of 2' (600 mm) to 3' (900 mm) from the pier to ensure for any possible scour and erosion. The same is shown on the Video monitor to the engineers stationed on shore. The bed fillings or type of material is also checked and reported.

The methodology described above is customized and may change depending on the situation and type of structure.

Equipment Used

The equipment that are used and its brief description are given below.

- 1) **KMB18BHelmet:** The most important and safest helmet used by the diver universally is KMB helmet. The helmet has a facemask to protect the eyes and face from water. This enables dive to visualize without any problem under water. The hood keeps the helmet intact above the head. The Facemask has a demand regulator for supply of air to the diver. As the name, demand regulator, suggests the demand valve supplies only required amount of air to the diver. Also, present in the facemask is a communication device which allows the diver to communicate with the top surface engineer. The communication device has the headphones located at the sides and at the front is the microphone. The rest are two additional speakers provided at the sides of the hood. The set act as headphones and diver



receives the vocal messages from the top. The helmet protects the face from water and in case if there is ingress of water into the facemask, operating a free flow valve, provided at the side enables water to be drained out. Thus, this enables a diver a safe diving and inspection. **Diver's Radio:** The diver can be communicated and vice versa through hardwire radio normally termed as diver's radio. The radio can be connected to the KMB helmet through a connector. The radio can be used as round robin system. In round robin system either diver or tender can talk at a time. The diver would be given preference and tender presses a push button to speak to the diver. The entire communication with diver can be recorded to a Video recorder through a jack provided at the rear.



2) **Air Compressor:** The air supply to the diver would be provided using a LP compressor at the top. The compressor has a diesel driven engine and can generate an air pressure of minimum 100 psi. The compressor is connected to the KMB mask through air filter using umbilical pipes. The air filter is a cylindrical tank filled with coke and silica gel in layers. The tank has an inlet and outlet for air. The air from the compressor would be allowed through the inlet and outlet is connected to the diver's helmet. The purpose of the air filter is to filter the air making it free from moisture and other impurities.



3) **CCTV Video Equipment:** The video equipment consists of a waterproof camera attached to the monitor through a recording device. The picture shown by the diver can be watched live at the top. The camera would be enclosed in a clear water box to have better picture in places of zero visibility.

Schematic Block Diagram of Operation:

The schematic diagram showing various connections for conducting the inspection is given below:



Fig-2. Schematic Block Diagram of Operation

Carrying out digital underwater inspection and digital videography for identification of cavities, potholes or other structural damages on u/p face of the dam with ROV. The scope includes

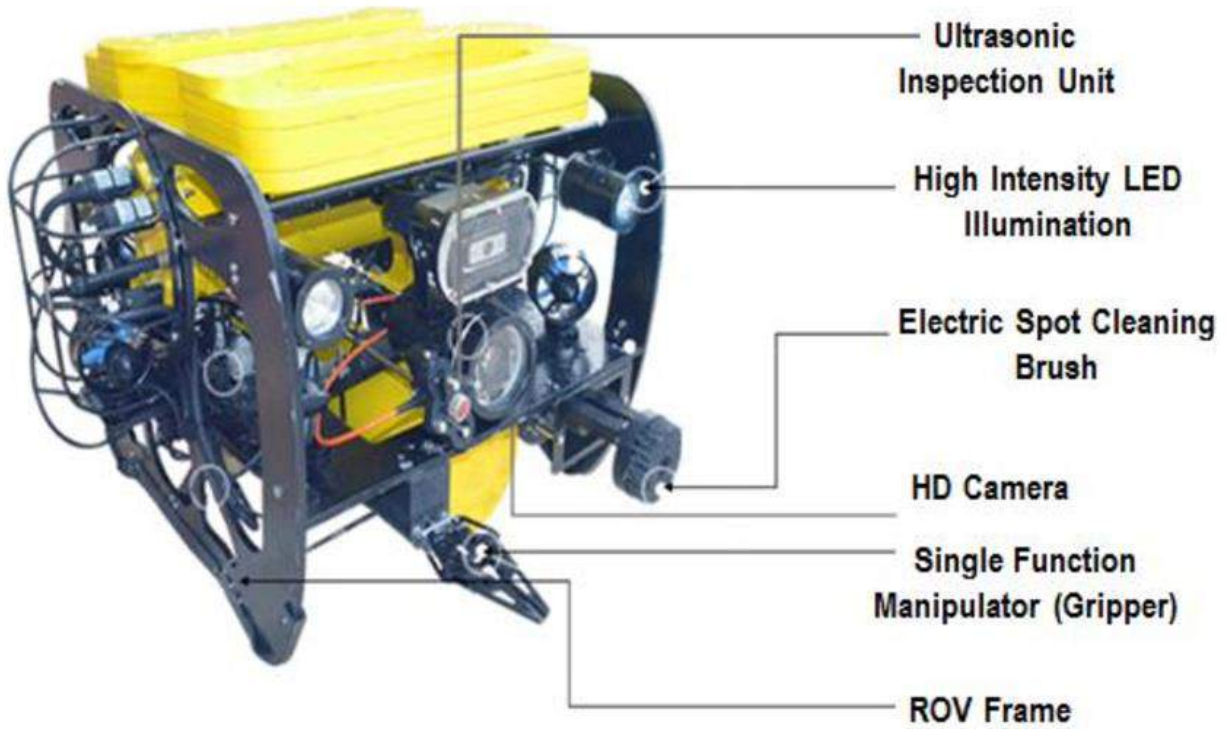
1. Live HD videography and photography as per scope using ROV.
2. General Investigation of Concrete Soundness or Damage Condition of Upstream Side of Dam Body .
3. The report shall consist of still photographs of critical cracks/ cavities/ spallings of the concrete surface of the dam
4. Mapping and tentative measurement of these defects (width x length) into tabular format in 3 x 3 grid.
5. Geo-Tagging of exact location of any identified defects (X-Y coordinates on a CAD (Computer Aided Design) diagram)
6. In case of turbid water, suitable hardware to be used with post processing image enhancement.
7. Safe working environment with zero risk to operators and equipment
8. For the execution of the survey work experienced professionals to be engaged.
9. All the above investigation must be shown in Upstream Dam elevation drawing of dam Mapping based on underwater photography and videography shall be submitted in 2 copies.
10. Digital photography to be produce of the work before start the work, during the work and after completion of work of different stages.
11. Post-inspection visual analysis of raw video including depth, position tagging and identification of any visible concerning points, processed HD videos in a DVD/ Flash Drive Processed Chart in a DVD / Flash Drive

Parameter of ROV :

Digital underwater survey
Visual Inspection in Ultra-low light vision
Visual and SONAR visual
Multi beam Sonar 3D scanning
Depth rating 305 meters
Operating Temperature -10 – 50 deg. C
Camera with Pan/Tilt Mechanism Navigation, Inspection & Ranging 1080p/30; 104 deg, 260° Total Range of View
Fully Dimmable, 6 lamps - 8,400 - 11,800 Lumens
Advanced autonomous stabilization. 6x Independent Control Infinitely Variable 100% Reversible.

An operating system designed with custom hardware and software; for control, integration, communication and enhanced operation.

Laser scanner and Grabber arm



III. Details of Key Personnel and Sub-consultants

LIST OF KEY PERSONELS

Position	Nos.	Relevant academic qualification	Minimum years of relevant work experience
Team Leader	1	BE (Civil)	15
Topographic Survey Woks			
B.E (civil engineering)	1	BE (Civil)	5
D.C.E. / L.C.E	2	Diploma (Civil)	5
CAD			
CAD draft man	2	Diploma (Civil)	5
Soil Testing lab			
M.E. (civil engineering)	1	M.E. (civil engineering)	10
D.C.E. / L.C.E	2	Diploma (Civil)	5
Non tech personal	5		3

OFFICE OF

LETTER OF AWARD

To:

M/s

Dear Sirs,

Sub:

Ref: Request for Quotation no..... dated

1. Your quotation no.....of(Date) for
has been accepted. You are requested to provide the following services at the rates quoted by you and specified against each as per the Terms of Reference (ToR) and terms & conditions specified hereunder:

Sl. No.	Description of Non-Consultancy Services	Specifications/ Deliverables	Quoted Lump sum Price in Rs.	GST and similar other taxes applicable	*Total Lump sum Price - inclusive of discounts, all taxes and duties		
					(A)	(B)	(A) +(B)
1	Underwater investigation of U/S face of KRS Dam under DRIP Phase-2 in Krishnaraja sagara dam	As per Terms of Reference (ToR)					

*GST and similar other taxes and duties applicable. Indicate each applicable tax separately.

2. Period of Completion:days from the date of issue of this Letter of Award.
3. Place of Services
4. Employer's Address:

- 5. GST and other taxes and duties, if any will be reimbursed at actual rates paid on the date of supply or the rate/amount shown in 1. above, whichever is lower.
- 6. Payment shall be made as per terms and conditions specified in RFQ.
- 8. Other terms and conditions are as under:
.....
.....

(Employer)

Date:

Place:

Name:

Designation:.....