

**National Technology Centre for Ports Waterways and Coast (NTCPWC)**

**Department of Ocean Engineering, IIT Madras**

**INVITATION FOR BID**

**Name of work: "Geotechnical Investigations alongside the existing South Coal Berth at Cochin Port Trust, Cochin, Kerala."**

For and on behalf of IC & SR, IIT Madras, sealed tenders "Two Bid System" are invited under for the following work being executed by IIT Madras:-

1)	Description:	<b>"Geotechnical Investigations in the alongside of the existing South Coal Berth at Cochin Port Trust, Cochin, Kerala."</b>
2)	Specification No.	OED/2020/GTI/NTCPWC/SASA/001 dated 30.04.2020
3)	Estimated cost of tender (ECPT)	<b>Rs. 15,00,000/-</b>
4)	Earnest Money Deposit:	<b>Rs. 75,000/-</b> in the form of DD drawn in favour of The Registrar IIT Madras Chennai issued by any Commercial or Nationalized bank. The DD shall be placed only in the only in the technical bid failing which the tender shall be summarily rejected.
5)	Pre Bid meeting	<b>05 May 2020 at 3.00 PM (through online) NTCPWC, CONFERENCE ROOM</b>
6)	Last date for Submission of Bid:	<b>2.00 PM IST on 21 May 2020</b>
7)	Date & Place of Opening of Tender (Technical bid only )	<b>3.00 PM IST on 21 May 2020 NTCPWC, New Academic complex-6th Floor, IIT, Madras, Chennai-36.</b>  If the due date fixed for submission / opening of the tender happens to be a holiday, the tender shall be opened at the same time on the next working day.  On the day of opening only the main cover and the Technical Bids will be opened in the presence of the tenderers who wish to participate and the financial bids of all the bidders will be kept in a cover unopened and sealed.



8)	Validity of offer:	90 days from the date of opening.
9)	Method of submission of tender:	Two bid system (Technical and Financial bid)
10)	Technical Clarification to be obtained from:	Email.: <a href="mailto:ntcpwc@iitm.ac.in">ntcpwc@iitm.ac.in</a>
11)	Cost of Tender document	Nil
12)	Tender Inviting Authority:	Prof. S.A.Sannasiraj, Project Coordinator, NTCPWC, 606, 6 <sup>th</sup> floor, NAC Building, Indian Institute of Technology, Madras, Chennai 600 036.
13)	<b>Important Instructions</b>	<b>Bidders shall note that their offer should be only quoted in the BoQ attached to the tender and should be without any alterations, additions or deletion. In case the BoQ is found to be altered , the tender will be considered as defective and is liable to be rejected</b>

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**SECTION -I**  
**INSTRUCTION TO BIDDERS**

**1.1 General:**

Sealed competitive bids under "Two bid system" are invited for the **“Geotechnical Investigations in the alongside of the South Coal Berth at Cochin Port Trust, Cochin, Kerala”**.

**1.2 Scope of work:**

Detailed scope of work is elaborated under Section-III of this document

**1.3 Cost of Tender document : Nil**

**1.3.1 Estimated cost of Tender : Rs. 15,00,000/-**

**1.4 EARNEST MONEY DEPOSIT (EMD) : 75,000/- (Rupees seventy five thousand only)** in the form of DD drawn in favour of “The Registrar, IIT Madras, Chennai” issued by any Nationalized / or commercial bank. The D.D shall be submitted along with the technical bid only. Failing which the tender shall be summarily rejected.

**1.5 Schedule date for Receipt and Opening of Bids:**

a) Last date and time for receipt of bids: **2.00 PM IST on 21 May 2020**

b) Date and time for opening of bids : **3.00 PM IST on 21 May 2020**

**Note: If the above due date falls on a holiday, the schedule times for (a) & (b) above shall be the same time on the subsequent working day.**

**1.6 Submission of Tender:**

**1.6.1** Tender should be furnished in sealed cover, super-scribed as **“Geotechnical Investigations in the alongside of the South Coal Berth at Cochin Port Trust, Cochin, Kerala”** and forwarded to Prof.S.A.Sannasiraj, Project Coordinator, NTCPWC, 606, 6th floor, NAC building, IIT Madras, Chennai - 36.

**1.6.2** The Bidders have the option of submitting the bid either by Registered post or by Courier or in person, and it shall be ensured that the bids are received at the office of the employer indicated above, on the date and time indicated in the Sl.No.1.5 above.

**1.6.3** Bids submitted by Telex/ Fax/ Telegram/e-mail etc. will not be accepted.

**1.7 Opening of Tender**

The tenders will be opened at 3.00 PM IST on **21 May 2020**, at the address mentioned in sl.no 6- Invitation to bid on the due date and time mentioned in the pre paragraph, in the presence of the tenderers who wish to participate in the tender opening. If the due date for tender opening happens to be a holiday, the tenders will be opened on the next working day at the same time.

On the day of opening, the main cover and the cover containing the technical bid alone shall be opened and the financial bids of all the tenderers who submitted their bid, shall be placed in a separate cover and sealed in the presence of Tenderers who participated in the Tender opening. The financial bids of only those Tenderers whose Technical offers have been accepted, will be opened at a later date under intimation to the successful bidders and also after hosting in the website. The financial bids of the bidders who fail to qualify in Technical evaluation will be returned unopened.

The representatives of the Bidders, attending the opening of tenders, should be duly authorized by the participating firm, whom they represent.

If any tenderer has doubt about the meaning of any portion of this tender and/or wish to seek any further clarifications on this Tender, they may address the Tender Inviting authority at least three days prior to the scheduled date of opening of the tender. Clarifications sought after this deadline will not be entertained.

### **1.8 Tender Inviting Authority**

Prof. S.A.Sannasiraj  
Project Coordinator  
NTCPWC  
606, 6<sup>th</sup> floor, NAC building,  
IIT Madras,  
Chennai- 600 036, Tamil Nadu

**SECTION – II**  
**COMMERCIAL AND TECHNICAL CONDITIONS**

**2.1 GENERAL**

The scope of services shall be as detailed in Section - III of this tender

**2.2 LOCATION**

The project site is at and alongside the South Coal berth at Cochin Port Trust, Kochi, Kerala, India

**2.3 COMPLETENESS OF TENDER**

All information in the bid shall be in ENGLISH only. All corrections, over typing etc. in the tender should be attested.

Tenderers are advised to send their bids sufficiently early so as to ensure that the tenders reach this office in time. Tenders though posted in time but received after the due date and time will not be considered.

The Bids submitted by the Tenderers shall be complete in all respects. The tenderers are required to furnish all details called for, under various schedules along with relevant supporting documents, wherever required, for consideration by NTCPWC. The tenders not containing the complete details as required in this document are liable to be rejected.

**2.4 PRICE**

Tenderers shall quote a FIRM price only. They shall quote rates and amounts separately for each item in the respective schedule as prescribed in the Bill of Quantities.

**2.5 VALIDITY OF TENDER**

Tenders should be valid for a period of **Ninety (90) days** from the date of tender opening. In case any bidder who quotes only a shorter validity period than that called for, their offer will be liable for rejection. In exceptional circumstances, the authority may solicit the bidder's consent to extend the period of the validity. The request and response there to in such cases shall be made in writing (including mail).

**2.6 PERFORMANCE BANK GUARANTEE**

The successful bidder shall submit Performance Bank guarantee for an amount equivalent to 5% of the value of the contract. The performance Bank Guarantee shall be furnished as per the format attached.

ONLY AFTER SUBMISSION OF PERFORMANCE SECURITY, WORK ORDER/PURCHASE ORDER WILL BE ISSUED.

In case the successful bidder wishes to submit Bank Guarantee (BG) towards performance obligations viz. Performance Bank Guarantee, the BG should be routed through Beneficiary bank to the end user bank. The Bank Guarantee

should remain valid for a period of sixty days beyond the date of completion of all contractual obligations of the contractor.

## **2.7 PAYMENT TERMS:-**

### **2.7.1 Payment towards Mobilization and Demobilization charges**

***Bidders are advised that initially, payment for item no 1 of the BoQ will be restricted to an amount say (A) worked out as 15% of the (Overall quoted value minus the Lump sum quoted for Item No. 1), irrespective of the Lump sum amount quoted by them.***

70% of the amount (A) shall be released upon mobilization of all the boring equipment and successful completion of a minimum of two boreholes.

The balance amount out of the Lump sum quoted under item no.1, in excess of (A) will be released only after demobilization of all equipment and satisfactory completion of the work ordered including submission of all relevant reports..

Only offers conforming to the above terms of payment will be processed further. In the event of any deviation from the specified payment terms, the Authority/Employer may reject the offers.

## **2.8 Schedule of Submission of Report:**

- Submission of Draft report: 3 days after completion of last borehole; however intermediate reports are to be submitted on the specific direction of the Employer.
- Submission of Final Report: within 3 days from the date of acceptance of the draft report with or without comments

## **2.9 FORCE MAJEURE**

**2.9.1** Neither the Contractor nor the Purchaser shall be considered in default in the performance of its obligations hereunder if such performance is prevented or delayed for any causes beyond the reasonable control of the party affected, such as war, hostilities , revolution, riot, civil commotion, epidemic, major fires, explosions, floods, earthquakes or because of any law, order, proclamatory regulations or ordinance of Government or because of any act of God, provided notice in writing of such cause with necessary evidence that the obligation under the Contract is thereby affected or prevented or delayed, is given within 14 days from the happening of the event and in any case it is not possible to serve the notice within 14 days period, then within the shortest possible period without delay. In case the Force Majeure conditions extend beyond a continuous period of 6 months, the Employer shall be entitled to decide the further course of action including revisions to the terms of Contract, if any.

As soon as the cause of Force Majeure has been removed, the party whose ability to perform its obligation has been affected shall notify the other party the actual delay occurred on account of such activities.



**2.9.2** Although the time for completion of work shall be suitably extended (not exceeding the period during which the work was stopped on account of Force Majeure clause), such extension shall not result in any financial claim by the Contractor against the Employer or any account of such a delay for any other reason whatsoever.

## **2.10 TAXES**

The price quoted shall be firm and shall be inclusive of fuel and other consumables and exclusive of taxes and/or GST as applicable. However, the bidder shall incorporate the **elements of “Duties and Taxes”/GST separately and the said taxes** shall be either paid by IIT-M directly or reimbursed at actuals to the contractor. Necessary income tax will be deducted at source on each bill as per the regulations in force. If the Institution is exempted from payment of income tax, the documentary evidence for the same has to be furnished.

## **2.11 LIQUIDATED DAMAGES:-**

If the contractor fails to complete the work, within the period specified by the NTCPWC and / or the contractor deserted the work or delayed the work for reasons solely attributable to them, the NTCPWC shall levy the liquidated damage (not by way of penalty) at the rate of 0.5% of the total contract value per week or part thereof subject to maximum of 10% of overall contract value. If the work has been abandoned or quality of the boat supplied is not upto the satisfaction of the NTCPWC, the NTCPWC shall also reserve its rights to terminate the contract after giving 10 days notice , in addition of levying the Liquidated damage and forfeiting the performance Bank Guarantee. The decision of the NTCPWC in this regard is final and binding on the contractor.

## **2.12 JURISDICTION FOR LEGAL PROCEEDINGS**

No suit or any proceedings in regard to any matter arising in any respect under this contract shall be instituted in a Court Save in the City Civil Court of Chennai or the Courts of Small Causes at Chennai. It is agreed that no other courts shall have jurisdiction to entertain any suit or proceedings even though part of the cause of action might arise within their jurisdiction. In case any part of cause of action arises within the jurisdiction of any of the courts in Tamil Nadu and not in the courts in the Chennai City, it is agreed to between the parties that such suits or proceedings shall be instituted in a court within Tamil Nadu and no other court outside Tamil Nadu shall have jurisdiction, even though any part of the cause of action might arise within the jurisdiction of such courts.

The bidders shall also furnish an undertaking, as per schedule furnished in Annexure-I, in a non-judicial stamp paper of value Rs.100/- confirming to their agreement to the conditions of this Tender.

## **2.13 ARBITRATION**

Arbitration is not applicable to this contract.

## **2.14 SPECIAL CONDITIONS**

### **2.14.1 PRE QUALIFICATION ELIGIBILITY CRITERIA:**

- The bidder should have completed at least one work of similar nature of value not less than Rs. 12 Lakhs or Two works of similar nature of value not less than Rs. 9 lakhs or three works of similar nature of value not less than Rs 6 lakhs, during the previous seven years ending 31.03.2020.
- Originals of the work orders and satisfactory completion certificates for the contracts listed for eligibility, duly signed by the tender accepting authority or Notarized copies of such documents, shall be enclosed with the Technical Bid.

Note: “Similar Work” means execution of geotechnical investigations in water depths of atleast 6m or more.

- The bidder shall also provide proof of availability of all equipment required for carrying out the marine boring works and also furnish an undertaking that this equipment is available for immediate mobilization.

### **2.14.2 Completion period of project: 45 days**

The following schedule (reckoned from date of receipt of work order) shall be strictly complied with

- Mobilization & Commencement of first borehole : 7 days
- Completion of all 5 bore holes : 40 days
- Submission of draft report : within 3 days from completion of all boreholes
- Submission of final report : Within 2 days from the date of acceptance of the draft report with or without comments.

## **2.15 ACCEPTANCE OF TENDER CONDITIONS**

The tenderers should clearly indicate their acceptance or otherwise of the following terms and conditions.

- All terms of payment.
- Terms of Liquidated damages for delay in completion of work.
- Validity of tender.

If no indication is given by the tenderer in his offer, the tenderer is deemed to have accepted all the terms and conditions of the Employer mentioned in the tender documents.

All information in the bid shall be in ENGLISH only. All corrections, over typing etc. in the tender should be duly attested.

Tenderers are advised to forward/send their bids sufficiently early so as to ensure that their bids reach this office in time. Tenders though posted in time but delayed in transit by post will not be considered for further processing, if received after the due date and time.

## **2.16 DEVIATIONS IN TENDER**

Offers which conform to the specification without any deviation will be preferred. If the tenderer wishes to deviate from any of the terms and conditions, the same shall be mentioned clearly; acceptance or otherwise of the deviations shall be at the sole discretion of the Employer.

## **2.17 DISCRETIONARY RIGHT OF NTCPWC, IIT MADRAS**

NTCPWC has the right

- To accept the whole or any part of the tender or partition of the quantity offered or reject it in full without assigning any reason.
- To relax or waive any of the conditions stipulated in the tender specification as deemed necessary in the best interest of the project for good and sufficient reasons.
- To revise the quantum of works/completion period of work of any or all the items covered by this enquiry during the pendency of contract and
- To terminate the contract in between the agreed stipulated period.

## **2.18 EVALUATION AND COMPARISON OF TENDER OFFERS**

- The evaluation of the Tender will be done as per IIT Madras guidelines for IC & SR.
- The evaluation shall include contract value of works with applicable sales/service tax, etc., but excluding GST.
- In case of discrepancy between the prices quoted in words and in figures, the lower of the two shall be considered.

**SECTION – III**  
**TECHNICAL SPECIFICATION**  
**SCOPE OF SERVICE**

**TITLE OF THE PROJECT WORK**

**“Geotechnical Investigations in the alongside of the South Coal Berth at Cochin Port Trust, Cochin, Kerala”**

**3.1 Introduction**

National Technology Centre for Ports, Waterways and Coasts (NTCPWC), IIT Madras, Chennai intends to conduct field study for the Geotechnical Investigations in the alongside of the existing South Coal Berth at Cochin Port Trust, Cochin, Kerala.

**3.2 Objectives & Scope**

The project scope is to conduct Geotechnical investigations alongside in the South Coal Berth in Cochin Port Trust, Cochin, Kerala involving execution of 5 (five) marine Boreholes up to a depth of (-) 70 m CD or upto the refusal level (with the prior approval of Engineer In charge) whichever is earlier and submit Reports on the investigations based on laboratory analysis of soil samples as specified elsewhere in this document. The location map of the South Coal Berth are shown in Fig1.

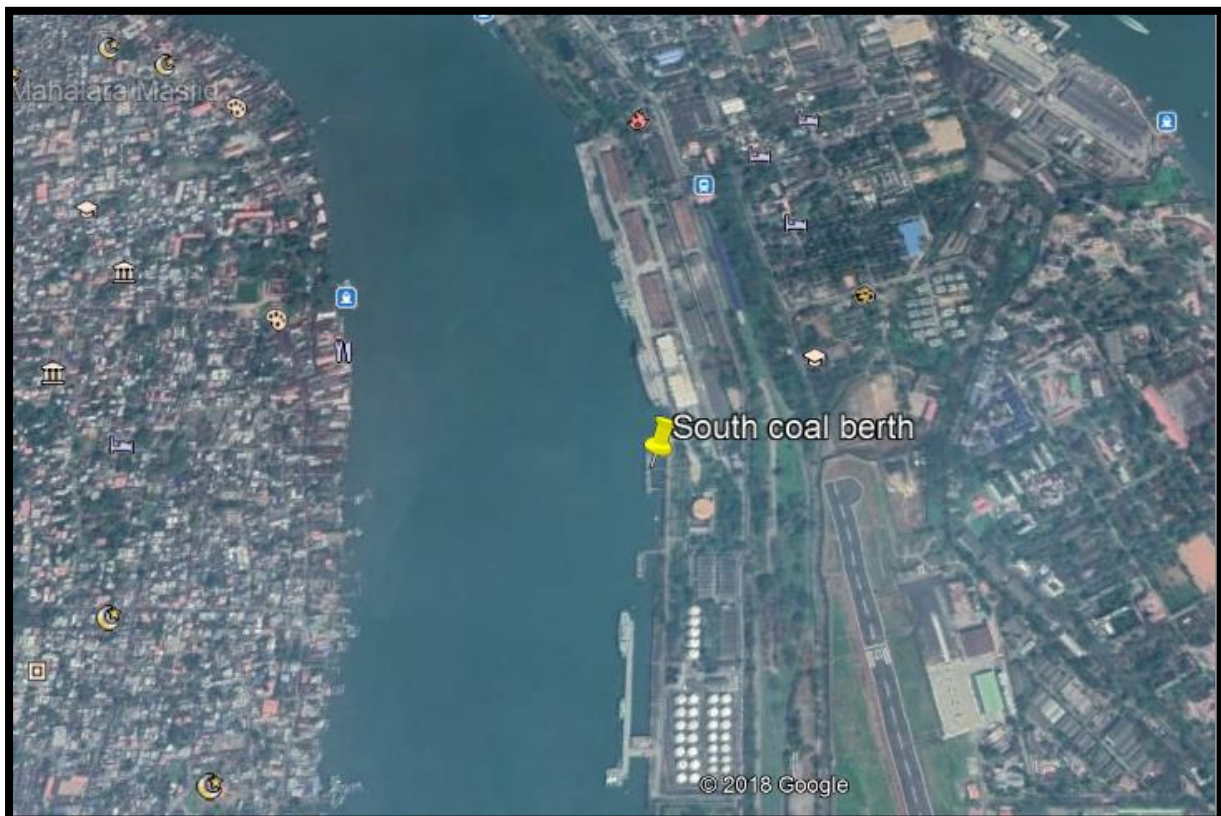


Fig 1. Location map of South Coal Berth, Cochin Port Trust, Kerala

### 3.2.1 Scope of Work

Geotechnical Investigation alongside the South Coal Berth in Cochin Port Trust, Cochin, Kerala are for identifying the sub bottom layers seabed, soil and rock types, determining the in-situ physical and mechanical properties of the materials and sampling of materials for laboratory tests to find out soil parameters as a part of structural design of the above berth. The total number of borehole proposed is 5 as indicated in Fig. 2 and depth of the boreholes is 70m below the existing sea bed level. The average water depth at the proposed locations of the boreholes is (-)11 m below CD.



Fig 2. Tentative Borehole location alongside South Coal Berth at Cochin Port Trust

**NOTE:** The Geotechnical investigation shall be carried out in marine environment by mobilizing suitable boring equipment, personnel and all other necessary machinery including floating platform/pontoon, hydraulic rigs, transportation, shifting of equipment from location to location for boreholes, etc., carrying out the borehole investigation alongside the South Coal Berth at Cochin Port Trust. The mobilized system shall be capable of handling men, equipment and machinery for drilling and it shall have sufficient space for drilling operation. The working platform shall provide a stationary work place such that the boring operation is smooth.

### **3.3 General**

The work which comprises drilling minimum 100 mm dia boreholes up to 70 m depth below the South Coal Berth of Cochin Port Trust shall include mobilization of necessary equipment, providing necessary qualified technical personnel, skilled and unskilled labour, and such others as required to carry out field investigations and tests, laboratory tests and analysis & interpretation of data and results and preparation of a detailed soil profile report as directed by the Engineer.

#### **3.3.1 Codes and Standards**

All works shall be carried out strictly in accordance with the technical specifications unless otherwise approved or instructed by the Engineer or his representative in writing. The latest editions of one or more of the followings BIS codes of practice and guidelines to achieve best possible result. The list provided below is not exhaustive.

- IS: 1892 - Code of practice for Site Investigations for foundations
- IS: 2131 - Method of Standard Penetration Test for soils
- IS: 2132 - Code of Practice for thin walled tube sampling of soils
- IS: 10108 - Code of practice for sampling of soils by thin wall sampler with stationary piston
- IS:1498 - Classification and identification of soil for general engineering Purposes
- IS: 1888 - Method of load tests on soils
- IS : 2720 (Part I to XXXXI)- Method of test for soils
- IS : 4434 - Code of practice for In Situ Vane Shear Test for soils.
- IS : 4968 (Part I to III) - Method of sub-surface sounding
- IS : 5249- Method of Test for determination of In situ dynamic properties of soils
- IS : 5529 - Code of practice for In situ permeability tests
- IS : 5313 - Guidelines for core drilling observations
- IS : 4078 - Code of practice for indexing and storage of drill cores
- IS : 8763 - Guide for undisturbed sampling of sands and sandy soils
- IS : 10042 - Code of practice for site investigations for foundation in gravel boulder deposits.

- IS : 2809 - Glossary of terms relating to soil engineering
- IS : 2810 - Glossary of terms relating to soil dynamics
- IS : 7422 (Part I to IV) - Symbols and abbreviations for use in geological maps, sections and sub- surface exploratory logs.
- IS : 6935 - Determination of water level in a borehole.

### **3.3.2 Objective**

The primary objective of this soil investigation is to ascertain the type of sub-strata such as soil, rock, etc., and their characteristics throughout the depth of each borehole. All the tests that are considered necessary in the opinion of the Engineer shall be conducted. Any additional tests/works, change in the number, location and type of specified tests, change in the diameter, depth of boreholes, samples to be collected etc., shall be carried out as directed by the Engineer.

### **3.3.3 Field Tests**

As mentioned earlier, boreholes shall be taken down to a depth of 8 M below the existing bed level for each borehole. The tentative locations of the boreholes are shown in the below drawing. The exact location of each borehole at which the soil samples collected shall be mentioned with respect to the Northing & Easting Co- ordinates. The contractor shall set out the location of each bore in consultation with the Engineer (or) his representative during execution.

### **3.3.4 STANDARD PENETRATION TEST (SPT)**

#### **3.3.4.1 General**

The test shall be carried out as per the latest version of IS:2131. The provisional locations are shown in drawing for the information and guidance of the Tenderer. SPT shall be carried out in the boreholes at 2 m intervals or at each change of strata/layer. The spacing shall be reduced appropriately for their inner strata.

#### **In-situ Vane Shear Tests (VSTs)**

In-situ vane shear tests shall be conducted in soft to firm clays, sensitive clays and clayey strata which are highly susceptible to sampling disturbances.

The tests shall be conducted in accordance with IS: 4434. For vane testing instruments that do not read the torque directly a calibration curve to convert the readings to Newton meter of torque shall be provided. These calibration curves shall be checked periodically.

#### **3.3.4.2 Diameter of Boreholes**

The minimum diameter of the boreholes is 100 mm and the contractor shall provide and use modern drilling equipment capable of satisfying the following requirements:

- equipment capable of taking 450 mm x 100 mm dia undisturbed samples from cohesive soil
- equipment capable of taking 100 mm minimum dia undisturbed continuous samples from soils other than rock

The boreholes shall be of sufficient dimensions so as to obtain such samples and cores and to enable the specified in-situ tests to be carried out. The diameters specified shall be obtainable at all the depths.

#### **3.3.4.3 Equipment**

The equipment for conducting SPT shall conform to IS: 2131 and IS: 9640. Following points may be particularly observed:

- a. The equipment used shall be rotary drill (calyx type) and heavy-duty shell and auger capable of making a borehole of minimum 150 mm dia. The drilling rods shall be standard 'A' selection with 41 mm outer dia and square threaded ends;
- b. The drilling rods shall not have any bends, the inside shall be clean without any blockages and should maintain verticality, when connected together or with any test equipment;
- c. The cutting edge of the standard penetration spoon and disturbed sampling tube shall be free from any bends/damage and shall have dimensions as per specifications. The undisturbed sampling tube shall have minimum of 100 mm dia and area ratio shall be within 10% for soft clay and 15% for other soil types. The undisturbed tube connector shall have a non-return ball valve and slush tube. Cutting shoes shall be clean, sharp and without burred edges; and



- d. The hosepipe and swivel shall be in good condition with proper joints to ensure no leakage and effective circulation of bentonite slurry.

#### **3.3.4.4 Drilling Methods**

Boreholes may be sunk to the required level by shell and auger method or by rotary drilling method or by any other method approved by the Engineer. Drilling by wash boring method or by percussion method shall not be allowed under any circumstances. Where the advance of a shell and auger borehole is obstructed by cobbles, boulders or a layer of hard cemented or other tough material, the use of chisel may be adopted to penetrate these strata. Use of chisel shall be permitted in strata where SPT-N value is greater than 100 blows per 30 cm of penetration. If the advancement of boring by chiseling is less than 20 Cm. in 4 hours time, borehole shall be advanced by coring.

In case, obstruction(s) in the form of bedrock, boulder, concrete, brickwork, timber or other natural or man-made object is/are encountered, which prevents further progress in boring by shell and auger method or by rotary, auger method, the Contractor shall attempt to break-through by chiseling, if approved by the Engineer. If little or no progress is made by chiseling, under suitable instructions from the Engineer, the contractor can use rotary coring method to drill through and obtain cores of the obstruction, in which case the cores shall have a diameter of not less than stated in the particular specifications. If the boring shows that the obstructions are bedrock, the rotary core drilling shall be continued to the depth required by the Engineer and to the diameter specified to prove the continuity and engineering characteristics of the formation. If the obstruction is found to be a boulder, ledge of a rock or other object underlain by soil, the contractor shall consult with the Engineer and confirm the use of the following lines of action:

- a. chisel out the cored borehole through obstruction, sufficient to allow shell and auger boring, in situ sampling and testing to continue below the obstruction;
- b. continue the boring by rotary core drilling to the required depth of the borehole at the diameters referred to in the particular specification. Then the contractor shall consult with the Engineer as

to whether or not it is necessary to obtain undisturbed samples of the soils in a nearby borehole at the levels beneath the obstruction; and

- c. abandon the borehole and drill another one nearby to obtain the necessary samples.

Note:

- In case of rocky stratum, the Triple Tube Core Barrel shall be used to extract samples.
- The quoted rate should cover the use of the Triple Tube Core Barrel for the sample.

In no case, any drilling mud or other material other than clean water should be introduced into the boreholes at depths where permeability tests are required. In case of rotary drilling, the stabilization shall be achieved by bentonite slurry of approved quality as approved by the Engineer.

During drilling operations, care shall be taken to avoid the risk of piping and any unnecessary disturbance to the material at the bottom of the hole. All precautions to ensure the identification of soils penetrated and the recovery of all samples shall be observed. At the beginning and end of each shift, the time of the day, depth of borehole, depth of casing and water level shall be recorded. Any abnormal loss or inflow of water shall also be recorded. The tenderer shall submit full details of the main items of equipment, he proposes to use for the work and the proposed drilling method.

#### **3.3.4.5 Casing**

A casing pipe of suitable dia depending upon the borehole dia and minimum 1.5 to 2 m length shall be provided at top to prevent caving in of the soil in all boreholes. The contractor shall ensure that casings are of suitable size and are inserted in such a manner as to render them recoverable.

The bottom of the casing shall always be maintained near the bottom of the hole not more than 150 mm below the bottom of the borehole and casing shall never be driven below any level at which sampling or testing is to be commenced, until the sampling or testing at that level has been completed.

The casing shall be driven or pushed under static force. If very stiff soil or cemented strata is encountered, which is capable of maintaining the borehole without casing pipe, boring can be done beyond that level with the prior approval of the Engineer's representative.

Casing shall not be removed from any hole until written permission is given by the Engineer's representative. This permission is normally given on completion of the borehole.

The rates for boring shall include, the supply, insertion and recovery of casing and any damage, loss or delay caused by difficulty or failure in insertion or recovery of the casing.

#### **3.3.4.6 Rejection of Boreholes:**

In case, any borehole cannot be completed according to the specifications, because it has been drilled off line or caving in has occurred or because tools are jammed in the hole or for any other reasons, the Engineer may order the work to be discontinued at the location and the hole to be drilled at a nearby location to be designated by the Engineer, a fresh in which case no payment will be made by the Port for the rejected borehole.

However, should a borehole be prematurely terminated due to the presence of an obstruction, whereby the process of boring and sampling cannot be normally continued, a new bore hole shall be drilled at a location not more than 10 m away from the original location or as the Engineer's representative may decide.

Provided the Engineer's representative has been properly informed of any such situation and has given instruction for the borehole to be repeated. Payment shall be made for such prematurely terminated bore hole also to the extent executed.

#### **3.3.4.7 Borehole Depth:**

All the boreholes shall be drilled to the required depth of 70m below existing sea bed level as directed by the Engineer's representative.

### **3.4 Reporting**

The reduced level of each investigation point shall be obtained and reported. Other information like highest/lowest water levels, max flood

water level etc., if relevant shall be noted. All depths shall be recorded in meters and levels shall be indicated with reference to the Chart Datum (CD). Logs of all boreholes shall be given on standard forms, providing narrative and graphical description of soils and soil strata in accordance with the relevant BIS codes details of samples taken and an account of all observations and field tests.

During drilling operations, the excavated soil from auger or the wash sample (in case of rotary drill) shall be continuously inspected by the contractor and the level of change in strata be recorded to nearest 5 cm level.

The following requirements shall be complied with in producing the final borehole logs:

- i) The logging of the soil layer penetrated shall be based on IS : 1892
- ii) All boreholes shall show:
  1. Borehole number;
  2. Date of boring;
  3. Type and diameter of boring;
  4. Diameter and depth of casing;
  5. Description of soil layers and the levels of its boundaries;
  6. Description of rock layers if any, and state of weathering and the levels of its boundaries;
  7. Description of all discontinuities including sheared zones, jointing, joint spacing and joint inclination;
  8. Percentage core recovery;
  9. The levels and results of all in-situ testing and
  10. A record of drillers' observations on progress of boring, rate of penetration, method of coring, type of bit and speed of rotation of bit.

### **3.5 SOIL SAMPLING**

#### **3.5.1 General**

In general soil samples shall be collected at every 2 m or at the change of strata. (Disturbed or undisturbed or specified in situ test results) sample or in- situ test shall be attempted at beginning of each soil layer. The type

of sample and the depth at which collected, shall be marked in respective logs of the boreholes with levels of sampling.

### **3.5.2 Sample Size and Frequency of Sampling:**

The number of samples to be collected for each test and their frequency shall be as per relevant IS specification.

### **3.5.3 Disturbed Soil Sampling:**

Only the cuttings from auger (when it is operated above GWT and without addition of water) and SPT spoon samples shall be collected as disturbed samples. Washed samples from rotary boring or auger samples below GWT shall not be collected.

A minimum quantity of 1.5 Kg. of soil sample shall be collected in a thick polyethylene bag and the bag shall be squeezed to remove the excess air in the bag and the mouth sealed by heat welding or tied air tight with thread/rubber bands. To the extent possible the natural moisture content of the sample shall be determined at site itself immediately after extraction. A stove with sand bath vessel may be used in place of oven for determination of moisture content in the field.

### **3.5.4 Undisturbed Soil Sampling:**

Undisturbed samples of 100 mm dia by 450 mm length, at two numbers, in each borehole, within cohesive materials. These samples shall be taken from the bottom of the borehole, which has to be carefully cleaned before taking the sample. Undisturbed sampling techniques shall conform to the provision made in IS : 8763 and IS : 2132.

In all cases of undisturbed sampling within boreholes, care shall be taken to ensure that the borehole water level is maintained at or above the existing GWT. An adequate water supply shall be provided at each borehole for this purpose.

The sampler tube shall be preferably forced into the bottom at a steady rate by jacking or with a block and tackle or by a similar approval method. The method of advancing the sampler and tube shall be indicated by the contractor and shall be approved by the Engineer's representative. In case

of using SPT hammer for lowering the sampling tube, the number of blows required for full penetration shall be recorded.

After removing the cutting shoe and the adapter if any, with the disturbed material they contain, the visible ends of the sample shall be trimmed of any disturbed soil and subsequently tested at the top and bottom ends by pocket penetrometer. Immediately thereafter both ends shall be coated with just molten micro crystal line wax in at least

3 layers of thickness 15 mm. Any space remaining in the ends of the sample tube shall be solidly filled with damp material approved by Engineer's representative and the ends of the sample tubes shall be protected from adverse effects of the weather including excessive heat, direct exposure to the sun or drying conditions during storage.

### **3.5.5 Labelling and Packing**

All disturbed and undisturbed samples shall immediately be labelled. Labelling shall be done with indelible ink and the labels shall be durable such that deterioration with the time does not occur.

Labels shall show the following information:

- Job and number of contract;
- Date of sampling;
- Reference number of the borehole;
- Reference number of the sample as designated in bore hole record;
- Depth of top and bottom of sample below bed level; and
- Brief description of material of sample.

The contractor shall be responsible for packing of samples and their transportation to the laboratory in such a manner that all undisturbed samples arrive in the laboratory in an undisturbed state.

## **3.6 LABORATORY TESTING**

### **3.6.1 General:**

The following tests are envisaged but actual testing need not be limited to these tests. The contractor shall furnish the testing program for the laboratory testing. The samples shall be tested in a laboratory, approved by the Engineer's representative. The Contractor at his own cost shall furnish test certificates demonstrating the suitability and correct calibration of all the testing equipment that is to be used for conducting the testing issued by the Indian Institute of Technology, Chennai or any other similar Institute of National repute, approved by the Engineer. The contractor shall produce these certificates before commencement of laboratory testing for Engineer's representative.

### **3.6.2 Soil Tests:**

#### **3.6.2.1 Classification of Tests:**

The following tests shall be carried out on the samples obtained from the boreholes:

- i) Determination of moisture content as per IS:2720 Part II;
- ii) Determination of Atterberg limits as per IS : 2720 Part V;
- iii) Determination of unit weight and specific gravity of soil particles as per IS : 2720 Part III, Section 1 & 2;
- iv) Determination of particle size distribution both by Sieve analysis and by hydrometer analysis as per IS : 7220 Part IV; and
- v) Shrinkage factors as per IS : 2720 Part VI.

#### **3.6.2.2 Chemical Tests:**

The following tests shall be carried out on the samples obtained from the boreholes:

- i) Determination of organic matter content as per IS : 2720 Part XXI;
- ii) Determination of total sulphate content as per IS : 2720 Part XXVII;

- iii) Determination of Calcium Carbonate content as per IS : 2720 Part XXIII; and
- iv) Determination of the pH value as per IS : 2720 Part 26.

#### **3.6.2.3 Compaction Tests**

Determination of the maximum and minimum dry densities.

#### **3.6.2.4 Engineering Properties Tests**

- i. Shear strength parameters from consolidated un drained test with measurement of pore pressure as per IS : 2720 Part XII;
- ii. Consolidated drained test as per IS : 2720 Part XI;
- iii. Unconfined compression test as per IS: 2720 Part X;
- iv. Consolidation properties as per IS : 2720 Part XV; and
- v. Swell Index of soils and swelling pressure of soils as per IS : 2720 Part XXXX and XXXXI.

#### **3.6.2.5 Compatibility and Strength:**

Water content and dry density relation using heavy compaction as per IS 2720 Part VIII. Laboratory determination of CBR as per IS : 2720 Part XVI.

#### **3.6.2.6 Water Tests:**

The following tests shall be conducted on water samples collected from boreholes and surface storage points:

- i) Chemical analysis and determination of pH value as per IS : 2720 Part XXVI;
- ii) Determination of Calcium Carbonate Content as per IS : 2720 Part XXIII; and
- iii) Determination of total soluble sulphates and chlorides as per IS: 2720 Part XXVII.

### **3.7 General Procedures and Reporting**

The above mentioned tests shall be executed and reported in accordance with relevant latest version of IS codes and guidelines. In case of non-availability of IS codes for particular testing procedures, relevant BS codes may be followed as approved by Engineer's representative.



The laboratory tests must be carried out by an ISO certified laboratory, which needs to be approved by the Engineer's representative. Results of the laboratory testing shall be plotted on standard forms. Each form shall contain records of one test only with the exception of grain size distribution curves of which not more than 2 curves from consecutive samples from one borehole may be plotted. The plasticity Index shall be plotted against the liquid limit on the plasticity chart of Casagrande. These plots shall be used for classification of soils and the borehole logs. When laboratory tests are carried out on only a part of a soil sample, the remainder of the soil in the sample tube or container shall be resealed as soon as possible and retained until disposal as instructed by Engineer's representative.

**SECTION - IV****4.1 Bill of Quantities and Rates.**

Item No.	Description of Services	Unit	Qty	Rates (in Rs)		Amount (in Rs)
				Figures	Words	
1	<p>Mobilisation and demobilisation of all the equipment/plant at site for the execution of the proposed geotechnical investigation works, setting up site organisation, shifting of all the Plant/equipment, men and materials from one borehole location to the next borehole location including accurate positioning, erection/ dismantling of rig all as directed including the costs of staff and labour and all other services, etc complete.</p> <p>Note:</p> <ul style="list-style-type: none"><li>• Bidders are advised that initially, payment for item no 1 of the BoQ will be restricted to an amount say (A) worked out as 15% of the (Overall quoted value minus the Lump sum quoted for Item No. 1), irrespective of the Lump sum amount quoted by them.</li><li>• 70% of the amount (A) shall be released upon mobilization of all the boring equipment and successful completion of a minimum of two boreholes.</li><li>• The balance amount out of the Lump sum quoted under item no.1, in excess of (A) will be released only after demobilization of all equipment and satisfactory completion of the work ordered including submission of all relevant reports.</li></ul>	Lump sum	LS			
2	Shifting and positioning necessary boring equipment at each borehole location for marine boreholes of not less than 100mm dia with shell and auger or rotary	Nos.	5			

Item No.	Description of Services	Unit	Qty	Rates (in Rs)		Amount (in Rs)
				Figures	Words	
	drill rig as per relevant specifications including all labour, tools & equipment, tackles etc. complete.					
3 (a)	<p>Making Marine Boreholes of dia not less of 100 mm for a depth of 70 m below the existing Sea bed level with shell and auger or rotary drill rig in all soils as per relevant specifications including boring all labour, tools &amp; equipments, tackles etc complete.</p> <p>Note:</p> <ul style="list-style-type: none"> <li>• In case of rocky stratum, the Triple Tube Core Barrel shall be used to extract samples.</li> <li>• The quoted rate should cover the use of the Triple Tube Core Barrel for the sample.</li> </ul>	Nos.	5			
3 (b)	<p>Rebate for not drilling borehole to the stipulated level of 70m below the existing bed level at each borehole location.</p> <p>Note:</p> <p>Bidders shall not quote the rate for this item. The rebate will be derived on Pro-rata basis from the quoted rate for item 3(a) for the shortfall in depth.</p>	Rm				
4.	Providing necessary equipment and conducting standard penetration test at every 2m depth or at every change of stratum whichever occurs earlier in disturbed soil as specified all details as per relevant specifications including all labour, tools, tackles and equipment etc., complete.	Nos.	20			
5.	Taking disturbed soil samples from every borehole at every 2m depth or at every change of stratum whichever occurs earlier all details as per relevant specifications including all labour, tools, tackles	Nos.	20			

Item No.	Description of Services	Unit	Qty	Rates (in Rs)		Amount (in Rs)
				Figures	Words	
	and equipment etc., complete.					
6.	Taking two number of undisturbed soil samples from every bore hole in cohesive soil layers, all details as per relevant specifications including all labour, tools, tackles and equipment etc complete.	Nos.	10			
7.	Taking Water Samples at 4m intervals from every borehole to determine Sulphate and Chloride Contents of Water.	Nos.	10			
8.	Taking Soil Samples at 4m intervals from every borehole to determine Sulphate, Chloride and Organic Matter Contents of soil samples	Nos.	10			
	<b>LABORATORY TEST</b>					
	The rates for all laboratory tests mentioned hereunder shall include cost of all labour, tools, tackles, equipments, transport, fuel etc all as per relevant specifications and as directed.					
9.	To determine Liquid and Plastic Limit	Nos.	10			
10.	To carry out Particle Size Analysis both by Sieve and Hydrometer	Nos.	10			
11.	To determine Specific Gravity of soil.	Nos.	10			
12.	To carryout Consolidation Test	Nos.	10			
13.	To carryout Direct Shear Test.	Nos.	10			
14.	To carry out Biaxial Compression Test including Determination of Moisture Content and Density of each specimen.					
A	Un Drained (quick)Test	Nos.	10			
B	Drained Test	Nos.	10			
15.	To carry out Constant Head Permeability Test on Coarse-Grained soil.	Nos.	10			
16.	To carry out Variable Head Permeability Test on fine grained soil.	Nos.	10			

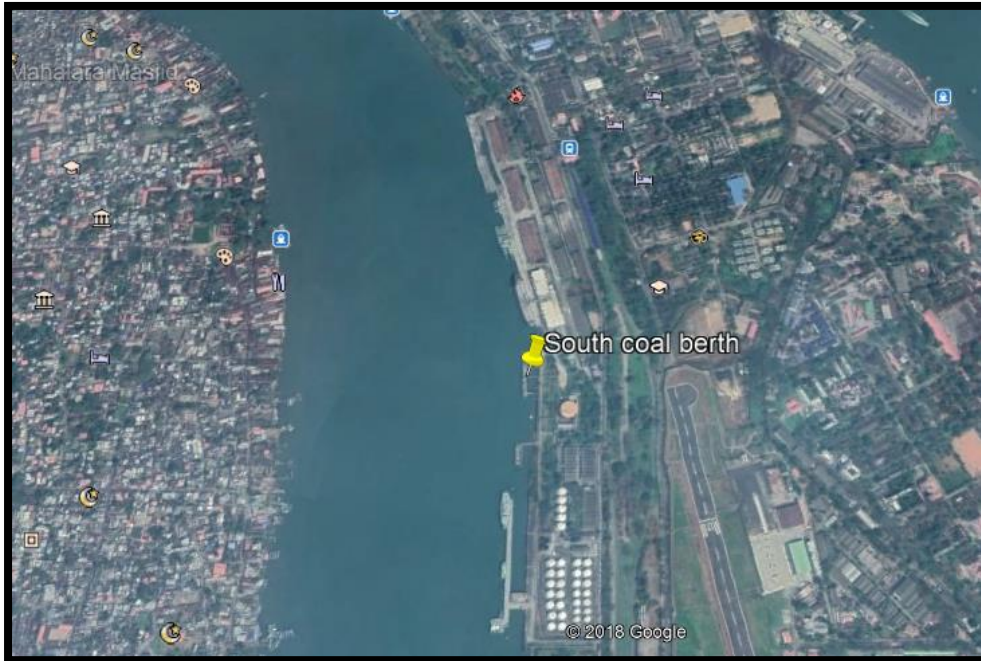
Item No.	Description of Services	Unit	Qty	Rates (in Rs)		Amount (in Rs)
				Figures	Words	
17.	To determine Sulphate and Chloride Contents of Water samples taken at 4m intervals	Nos.	10			
18.	To determine Sulphate, Chloride and Organic Matter Content of Soil Samples taken at 4m intervals	Nos.	10			
19.	Data compilation and submission of Soil investigation report	Lump sum	LS			
	<b>Total</b>					
	<b>Add applicable GST @ .....%</b>					
	<b>Grand Total (Quoted Price + GST)</b>					

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## SECTION - V

### DRAWINGS

#### 1. LAYOUT OF SOUTH COAL BERTH (Fig 1.)



#### 2. LOCATION OF BORE HOLES (FIG 2.)



**ANNEXURE-I**

**UNDERTAKING TOWARDS JURISDICTION FOR LEGAL PROCEEDINGS**

**(NON JUDICIAL STAMP PAPER VALUE RS.100/-)**

This undertaking executed at..... on this..... (Date)..... (Month) Two thousand and ..... by M/s ..... Registered under Companies Act, 1956 having its registered office at ..... hereinafter called the contractor (which expression shall where the context so admits mean and include its successors in office) and in favour of Indian Institute of Technology Madras, Chennai- 36. Hereinafter called the purchaser (which expression shall where the context so admits means and includes its successors if Office and assigns).

WHEREAS a contract for the supply of .....has been awarded in favour of the contractor under the Purchase order No.....dated.....

AND WHEREAS in accordance with the terms of the above Purchase order, the contractor has to furnish un undertaking to the effect that no suit or any proceedings in regard to any matter arising in any respect under this contract shall be instituted in any matter in any respect under this contract shall be instituted in any court other than in the High court, Madras of District court at ..... or Sub-court at .....or at the District Munsif court at ..... as the case may be.

IN CONSIDERATION of the Board having agreed to accept the undertaking the contractor hereby undertakes that no suit or any proceedings in regard to any matter arising in respect of this contract shall be instituted in any court, save in the High court, Madras or District court at.....or sub court at ..... or at the District Munsif court at .....as the case may be it is agreed that no other court shall have jurisdiction to entertain any suit or proceedings, even though, part of the cause of action might arise within their jurisdiction. In case any part of the cause of action might arise within the jurisdiction of any other Courts in Tamil Nadu and rest within the jurisdiction of Courts outside the State of Tamil Nadu, then it is agreed to between the parties that such suits on proceedings shall be instituted in a court within the State of Tamil Nadu and no other Court outside the State of Tamil Nadu shall have jurisdiction.





## ANNEXURE-II

### **PROFORMA OF PERFORMANCE BANK GUARANTEE**

#### FORM OF PERFORMANCE GUARANTEE

(To be Typed on Non-Judicial Stamp paper Value not less than ₹100)

In consideration of the Indian Institute of Technology Chennai-36 (hereinafter called "IITM") having offered to accept the terms and conditions of the proposed agreement between IITM and ..... (hereinafter called "the said contractor(s)" for the work "Geotechnical Investigations alongside the existing South Coal Berth at Cochin Port Trust, Cochin, Kerala". (hereinafter called "the said agreement")having agreed to production of an irrevocable Bank Guarantee for Rs.....(Rupees..... only @5% of the value of the contract) as a security/guarantee from the contractor(s) for compliance of his obligations in accordance with the terms and conditions in the said agreement.

1. We.....(Indicate The name of bank) (hereinafter referred to as the "Bank") hereby undertake to pay to the Government an amount not exceeding Rs ..... (Rupees.....only @5% of the value of contract) on demand by the IITM

2. We ..... do hereby undertake to pay the amounts due and payable (indicate the name of the Bank) under this Guarantee without any demur, merely on a demand from IITM stating that the amount claimed is required to meet the recoveries due or likely to be due from the said contractor(s). Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the Bank under this Guarantee. However, our liability under this Guarantee shall be restricted to an amount not exceeding Rs..... (Rupees.....only @5% of the value of contract)

3. We, the said Bank, further undertake to pay to the IITM any money so demanded notwithstanding any dispute or disputes raised by the contractor(s) in any suit or proceeding pending before any Court or Tribunal relating thereto, our liability under this present being absolute and unequivocal. The payment so made by us under this bond shall be a valid discharge of our liability for payment thereunder, and the contractor(s) shall have no claim against us for making such payment.

4. We ..... (Indicate the Name of Bank) further agree that the Guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said agreement, and it shall continue to be enforceable till all the dues of the IITM under or by virtue of the said agreement have been fully paid, and its claims satisfied or discharged, or till the Engineer-in-charge, on behalf of the IITM, certifies that the terms and conditions of the said agreement have been fully and properly carried out by the said contractor(s), and accordingly discharges this guarantee.

5. We ..... (indicate the name of the Bank) further agree with the IITM that the IITM shall have the fullest liberty without our consent, and without affecting in any manner our obligations hereunder, to vary any of the terms and conditions of the said agreement or to extend time of performance by the said contractor(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the IITM against the said contractor(s), and to forbear or enforce any of the terms and conditions

relating to the said agreement, and we shall not be relieved from our liability by reason of any such variation or extension being granted to the said contractor(s) or for any forbearance, act of omission on the part of the IITM or any indulgence by the IITM to the said contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have effect of so relieving us.

6. This Guarantee will not be discharged due to the change in the constitution of the Bank or the contractor(s).

7. We ..... (Indicate the name of the Bank).lastly undertake not to revoke this Guarantee except with (indicate the name of the Bank) the previous consent of the IITM in writing.

8. This Guarantee shall be valid up to one month from the acceptance of Final Report unless extended on demand by the Government. Notwithstanding anything mentioned above, our liability against this Guarantee is restricted to Rs ..... (Rupees .....only @5% of the value of contract) , and unless a claim in writing is lodged with us within six months of the date of expiry or extended date of expiry of this Guarantee all our liabilities under this Guarantee shall stand discharged.

Dated the .....day of.....

For .....

**Tender Inviting Authority:**

**Prof. S.A.Sannasiraj,**

**Project Coordinator,NTCPWC,**

**606, 6<sup>th</sup> floor, NAC Building,**

**IIT Madras, Chennai – 36.**