

No.HSCC/D&E/2014

October'24<sup>th</sup> 2014

Sub.: HSCC (I) Ltd. invites sealed applications for empanelment of Consultant for  
Following Discipline / works

1. Architectural Consultants for preparation of concept plan & master plan, architectural, external development & landscaping planning and design and Project Report including follow up and obtaining all applicable local body & other statutory clearances including sanction of plans for various works in Delhi & other places in India.
2. Agency for Soil Investigation / Topographical, Geotechnical & Hydro Geological Survey works for various projects at Delhi & Other places in India..

A Notice Inviting Tenders for the subject works is enclosed herewith for approval and for publishing in the leading newspaper on DAVP rates:

The cost towards the NIT publication will be charged to HSCC. The draft NIT and tender documents are also enclosed herewith.

Submitted for approval please

(Raci Ranjan)  
Sr.Manager(Civil)

**DGM(Civil) :**

**Chief General Manager (Projects & D&E)**

## **NOTICE INVITING TENDER**

HSCC (I) Ltd. invites sealed applications for empanelment of Consultant for  
Following Discipline / works

1. Architectural Consultants for preparation of concept plan & master plan, architectural, external development & landscaping planning and design and Project Report including follow up and obtaining all applicable local body & other statutory clearances including sanction of plans for various works in Delhi & other places in India.
2. Agencies for doing Soil Investigation / Topographical, Geotechnical & Hydro Geological Survey works for various projects at Delhi & Other places in India..

Empanelment documents can be downloaded from HSCC's Web site [www.hsccltd.co.in](http://www.hsccltd.co.in) on any working day from 31.10.2014 to 17.11.2014 and to be submitted along with document fee of Rs. 1000/- and earnest money of Rs. 5000/- for each module in the form of DD/Pay order in favors of HSCC(I) Ltd., Noida payable at Noida. Last date of submission of complete document is on or before 15:00 hrs of 17.11.2014 in HSCC's office at Plot No. E - 6(A), Sector - I, Noida - 200301 (U.P.). HSCC reserves the right to accept or reject any application without assigning any reason or incurring any liability whatsoever. Prospective bidders are advised to regularly scan through HSCC web site as corrigendum/amendments etc., if any, will be notified on the HSCC web site and separate advertisement will not be made for this.

Dy.General Manager (Civil)

**Empanelment of Agencies for Soil/ Geotechnical Investigation , Hydro-geological & Topographical Survey for various works in Delhi & other places in India**

**Empanelment document**

*October, 2014*

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**Consultant:**

**HSCC (I) Ltd. E-6(A), Sector-1, NOIDA, U.P.-201301**

**Tel: (0120) 2542436, 2542437, 2542439**

**Fax: (0120) 2542447**

**Web Site: [www.hsccltd.co.in](http://www.hsccltd.co.in)**

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**NOTICE INVITING  
APPLICATION**

HSCC (I) Ltd. invites sealed applications for empanelment of Agencies for following Discipline / works

1. Soil/ Geotechnical Investigation , Hydro-geological & Topographical Survey for various works in Delhi & other places in India

Empanelment documents can be downloaded from HSCC's Web site [www.hsccltd.co.in](http://www.hsccltd.co.in) on any working day from 31.10.2014 to 17.11.2014 and to be submitted along with document fee of Rs. 1000/- and earnest money of Rs. 5000/- for each module in the form of DD/Pay order in favors of HSCC(I) Ltd., Noida payable at Noida. Last date of submission of complete document is on or before 15:00 hrs of 17.11.2014 in HSCC's office at Plot No. E - 6(A), Sector – I, Noida – 200301 (U.P.). HSCC reserves the right to accept or reject any or all application without assigning any reason or incurring any liability whatsoever. Prospective bidders are advised to regularly scan through HSCC web site as corrigendum/amendments etc., if any, will be notified on the HSCC web site and separate advertisement will not be made for this.

Dy.General Manager (Civil)

1.0 Name of work:

**Empanelment of Soil/ Survey Investigation for Soil Investigation, Topographical, and Geotechnical & Hydro-geological Survey for various works in Delhi & other places in India**

### **1.1 INSTRUCTIONS TO APPLICANTS**

Offers are hereby invited by HSCC from competent Soil/ Survey Investigation agencies. The offer shall be submitted in sealed covers marked **“Empanelment of Agencies for Soil Investigation, Topographical, Geotechnical & Hydro-geological Survey for various works in Delhi & other places in India**

” as detailed below:-

#### ENVELOPE MARKED NO.1

Shall contain document fee of Rs. 1000/- and earnest money of Rs. 5000/- for each module in the form of DD/Pay order in favours of HSCC(I) Ltd., Noida payable at Noida for each module (for which application is submitted) .

#### ENVELOPE MARKED NO. 2

Shall contain empanelment document and annexures duly filled in, signed and stamped and credentials of Agencies for Soil Investigation, , Geotechnical, Hydro-geological and Topographical Survey / documentary proof in support of qualifying criteria along with submittals as required.

Above two envelopes shall be sealed into third envelope where name of work, **module no. as per Table 1** for which application is submitted and name of firm submitting the Application and last date of submission of Application to be mentioned.

The last date of submission of Application is 17.11.2014 up to 1500 Hrs. The Applications shall be opened in the presence of the representatives of the bidders / applicant who wish to participate in Application opening at 1530 Hrs on same day i.e. 17.11.2014 in the office of HSCC (I) Ltd. at the following address:

**Dy.General Manager(c)**  
**HSCC (India) Ltd.**  
**E - 6(A), Sector -1, NOIDA, Uttar Pradesh.**  
**Pin- 201301.**

HSCC may select Soil/ Survey Investigation **from** applications through this empanelment and may form a panel. Decision of the HSCC, in this regard shall be final. HSCC is not bound to assign any reason thereof.

The panel of Soil/ Survey Investigation, once prepared, shall be valid for a period of 24 months from the date of empanelment. HSCC may extend the period of empanelment with mutual consent. The empanelled Agencies shall be considered for award of works on limited Application basis as and when required.

The applicants shall submit an affidavit duly notarized that they have not abandoned any work of Union Government/ State Governments/ PSU's etc. during the last 5 years. They shall also submit an affidavit that they have not been blacklisted, debarred, declared non performer or expelled by Union Government/ State Governments/ PSU's etc. during the last 5 years.

Even though the Applicants meet the above criteria, they are subject to be disqualified, if they have:

- made misleading or false representation in the form, statement and attachments submitted; /or
- Record of poor performance such as abandoning the work, not properly completing the contract, inordinate delays in completion, litigation history, or financial failures, etc. /or
- The performance of any applicant already worked/ working with HSCC is not found satisfactory./or
- found to have been black listed by the clients in any of the works carried out by them.

The competent authority to pre-qualify shall have the power to relax any condition/criterion for pre-qualification if it considers expedient to do so.

HSCC reserves the right to:

- (a) Reject or accept any application without assigning any reason or incurring any liability thereof
- (b) Cancel the empanelment process and reject all applications

HSCC reserves the right to enter into parallel rate contract(s) with one or more empanelled architectural consultant.

Prospective applicants are advised to regularly scan through HSCC website as corrigendum/amendments etc. if any, will be notified on the company's website and separate advertisement will not be made for it.

HSCC may increase /delete the empanelled architectural Agencies on the basis of requirement and performance of individual architectural consultant.

The empanelled consultant(s) from higher module number may be considered for taking the work of plot module of lower size.

HSCC shall not be bound to provide work to any empanelled architectural consultant and it has right to carry out such work in-house.

The EMD of empanelled architectural Agencies shall be retained with HSCC as security deposit for the empanelment period. No interest whatsoever shall be payable to them on the same. HSCC has a right to forfeit the security deposit if work done by the empanelled architectural consultant is not up to the satisfaction of HSCC. The EMD of applicants not empanelled shall be refunded in one month of finalization of empanelment.

The applicants shall submit the following documents along with their offer:

- i) Photo copy of Service Tax No. and PAN No.(As and when applicable).
- ii) In case of individual / partnership firms, Income Tax return for the last three years, i.e 2011-2012, 2012-2013, 2013-2014. In case of company, copy of Balance Sheet of last three years, i.e 2011-2012, 2012-2013, 2013-2014 with CA certification with his membership No.
- iii) Number of projects where similar works have been executed and completed in last seven years as per format provide in Annexure B
- iv) Duly filled Checklist at Annexure D
- v) Undertaking as per Annexure E

A contact person shall be made available /assigned to respond for any query. Detail of contact person to be given as under.

Name of Contact Person : \_\_\_\_\_  
Designation : \_\_\_\_\_  
Address : \_\_\_\_\_

Contact Tel. No. \_\_\_\_\_  
Fax No. \_\_\_\_\_  
Email address \_\_\_\_\_

Applications not complete in all respects and/or received without the cost of Application, earnest money, and conditional or not in accordance with our terms and conditions, will be summarily rejected. The decision of HSCC shall be final and binding in this regard. HSCC reserves the right to accept or reject any or all quotations without assigning any reason thereof and also take no responsibility for delay, loss or non-receipt of applications sent by post either way.

Thanking you.

Yours faithfully,

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Dy. General Manager (Civil)



## 2.0 Brief Description of works:

The works involve Soil Investigation, Topographical, Geotechnical and Hydro geological Survey Works in Delhi & other places in India having following indicative areas:

**Table-**

Module number *	Plot Area range (Module)	Minimum Average annual financial turnover (Rs)
1	1 to 10 Acares	5 lacs
2	11 to 25 Acares	10 lacs
3	26 to 50 Acares	15 lacs
4	51 to 100 above Acares	25 lacs

**\* Applicants may apply for any or all number of module(s) as per their eligibility and should clearly mention the module no.(s) applied for on the top of envelope no. 3**

### 2.1 Minimum Pre Qualifying Criteria

Pre-Qualification will be based on meeting all the minimum criteria for pre-qualification and other qualification criteria regarding the Applicant's work experience, personnel and equipment capabilities and financial position as demonstrated by the Applicant's responses in the forms attached to the Letter of Application.

- a) The applicant must be in existence as Soil/ Geotechnical Investigation & Hydro-geological, Topographical Survey Agencies at least last seven years ending last day of the month previous to the one in which applications are invited.
- b) The Applicant should meet the following minimum criteria for Pre Qualification:
  - (i) Average Annual Financial Turnover during the last three financial years i.e. 2011-2012, 2012-2013, 2013-2014 should be as specified at Table 1 above.
  - (ii) Experience of having successfully completed similar works during last 7 years ending last day of month previous to the one in which applications are invited should be either of the following :

Two \*similar completed works costing not less than the amount equal to 60% of the estimated cost.

or

One \*similar completed work costing not less than the amount equal to 80% of the estimated cost.

and

- (b) one completed work of any nature (either part of (iii)(a) or a separate one) costing not less than the amount equal to 40% of the estimated cost with some central/ state Government Organization/ Central Autonomous Body/s Central Public Sector Undertaking
- (c) Applicant shall have a demonstrable track record of rendering Architectural services for a Hospital or a medical college/institute project of the magnitude envisaged and shall have adequate professionals. The required details and CV's of such employees shall be provided as per Annexure C.

**\* Similar nature of work shall mean a project comprising of Soil Investigation, Topographical, Geotechnical & Hydro-geological Survey.**

- d) The applicant is required to submit documents in support of having executed similar work as a proof of meeting the above qualifying criteria.
- e) No Joint venture/ consortium shall be allowed.

Applicants having experience in similar nature of work and fulfilling the qualifying requirements mentioned above are hereby invited to submit their "Proposals" for participating in above said consultancy work.

HSCC (I) Limited, reserves the right to reject any or all the applications without assigning any reason or incurring any liability thereof. .

### 3.1 *Scope of work*

The Soil/ Survey Investigation **Agencies** shall provide consultancy services for various works in Delhi and other parts of India including neighbouring countries like Nepal, Bhutan, Myanmar, Afganistan, Zimbabwe, Zambia, Bangladesh, Sri Lanka, Laos, etc. on architectural matters of the project as defined below and shall be involved through the entire duration of the project till commissioning/handing over of the works. The Architectural Consultant shall be responsible for the following services for the works/ module:

The Scope of work is detailed as under: -

1. Carrying out topographical survey including transferring the level from nearest available permanent G.T.S. benchmark
2. Establishment and construction of 2 nos. bench mark/grid pillars & providing fencing around them including all labour and materials for excavation, foundation, brick work and concreting work and 12 mm thick M.S. plate of size 200 mm x 200 mm with 500 mm long M.S. flat 40 mm x 3 mm, 2 nos. welded with each plate grouting and marking centre points etc.). The reduced level with respect to M.S.L. shall be engraved on each plate of the bench mark pillars as well as corresponding reference be given on the Survey Plan. The drawing for the construction of Bench Mark is attached along with it and same to be used for the construction of Bench Mark.
3. Spot leveling of total area of land/plot by taking spot levels at 5 m center to center grid and contour intervals at 0.5 m.
4. To locate on the survey plan in A1/A0 sheet to the scale of 1:200 with all permanent & temporary structures along with existing storm, sewer & water line, power (HT & LT) & telecommunication lines/poles, trees of various girths, roads, water supply, sewer, drainage line and also any other important features etc. adjacent and within the total area of plot, if any.

5. Following field data shall be collected and supplied in the form of report and drawings by the agency: -
  - a) Direction of North.
  - b) Prevailing wind direction and speed.
  - c) Maximum, minimum, average, hourly, daily, monthly and annual rainfall for the last 10 years.
  - d) Daily maximum, minimum and average temperature for last ten years.
  - e) High Flood level near site
  
6. Existing water supply source data shall be collected and supplied as under:-
  - i) Location and alignment of potable water source with reference to area under survey along with size and residual pressure available in and around the project site boundary.
  - ii) Total water storage capacity in existing tanks & details of consumption per day.
  - iii) Feasibility to connect proposed water supply from existing main ring.
  
7. Existing Fire fighting system data shall be collected and supplied for areas in and around the project site boundary as under : -
  - i) Location and capacity of existing fire storage tank & fire pumps.
  - ii) Existing fire ring main – location, alignment, diameter, material of pipe, location of hydrants etc.
  - iii) Feasibility to connect fire line nearest to the proposed site.
  - iv) Local Bye-laws of the area.
  
8. Details about Sewer and storm water drain / nallah passing through/near the complex indicating the following details:-
  - i) Location and alignment of drain / nallah
  - ii) Invert level / L-Section of the drain / nallah indicating slope.
  - iii) Cross-section of the nallah / drain at suitable locations.

9. Location of the road near the site indicating its layout with reference to site. The crown levels (L-section) of road/railway at 20 m. interval along the alignment are to be indicated.
10. Details of Municipal/Public sewer line:
  - i) Location, material, diameter and alignment of the existing sewer lines running in and around the project site. Location for suggested outfall point for sewerage of the proposed Complex.
  - ii) Location of manholes with size, ground level and invert levels of sewer line running around/near the project site.
  - iii) Feasibility to connect proposed sewer with existing sewer line.
11. Details of the proposed approach road connecting main road to project site to be supplied as under: -
  - i) Alignment of the road
  - ii) L-Section of the road indicating ground levels at 10 m centre to centre between main road and entrance of project site.
  - iii) Cross-section of the road extending up to 10 m distance on both sides of centre of road with levels at 5m. c/c.
  - iv) Crown level of the main road at the junctions with the proposed approach road.
  - v) Details - such as L.S. & C.S., Bed level, H.F.L. etc. of the cross drainage, if any.
12. Details of the existing boundary wall, temporary and permanent structures, if any, inside the site including the following shall be collected and supplied: -
  - i) Cross section of the wall
  - ii) Part elevations and cross-section of the buildings also showing foundation.
  - iii) Length, width, height, area and no of stories of each building including details of materials used in construction.
  - iv) Location of existing trees (along with height and girth of the trees) and other permanent/ temporary structures.

- v) Electric overhead lines (LT/ HT), telephone lines.
  - vi) The agency shall submit colored photographs (about 25) showing the major features of the site and its surroundings.
13. All survey, grid levels shall be done by Total Station and contour plan shall be prepared on computer through digitization process and the soft copy shall be provided for the same immediately.
14. On completion of all fieldwork, collection of pertinent field data and preparation of drawings the agency shall submit a formal draft report containing all the information/field observations and drawings, in triplicate for review of Supervising Agency. Thereafter the agency shall visit to Supervising Agency's office for detail discussions on Supervising Agency's comments if any. After discussion with the Supervising Agency, the agency shall incorporate the agreed modifications in the draft report at their own cost and submit six copies of the detailed final report (plastic coated with spiral binding) and 6 sets of drawings (the drawings shall bear the logo of HSCC and the format of the same can be obtained from HSCC) along with a set of reproducible drawings and related floppy diskette/ CD. The agency shall also submit along with report a copy of field book in original or an authenticated copy of the same duly certified by Engineer.
15. Description and photos of general surrounding and plot and of the team while carrying out the work awarded.
16. Plot has to be cleared of all vegetation including shrubs, bushes, etc. whatsoever before start of the work and all removed vegetation to be thrown as per HSCC directives.
17. The any above is not relevant or not covered in the report to be specifically listed out in draft report and obtain the above from HSCC/Client. Otherwise agency has to provide the same without an extra cost or paid accordingly.
18. Payment shall be made for actual survey area but not to exceed the quantity in the Application document.

**B. GEOTECHNICAL INVESTIGATION AND REPORT SUBMISSION**

- 1.01 Detailed Geo-technical Investigation is to be carried out of the area of plot and submission of a detailed Geo-technical report which shall be the basis for the design and detailing of foundations for buildings and structures.
- 1.02 Item wise list of investigations to be conducted along with approximate estimated quantities are given at Schedule of Quantities against which the agency shall quote the rates in figures as well as in words. However, payment shall be made as per quantities actually executed.
- 1.03 The work shall include mobilisation of all necessary equipments, providing necessary engineering supervision and technical personnel, skilled and unskilled labour etc. as required to carry out the entire field as well as laboratory investigation, analysis and interpretation of data collected and preparation of a Geo-technical report.
- 1.04 The Agency shall make their own arrangements for locating the coordinates and positions of bore holes, trial pits, dynamic cone penetration tests and other field tests as per the drawings/sketches supplied to him and for determining the reduced levels (R.L's) at these locations with respect to the single bench mark indicated by the Engineer. Two established reference lines will be indicated to him.
- 1.05 All the field and laboratory data shall be recorded in the proforma recommended in Indian Standards codes. The Agency shall submit to the HSCC one copy of field borelogs and all the field records (countersigned by the Engineer) soon after the completion of each borehole/test.
- 1.06 The Agency shall interact with HSCC and get acquainted with the broad guidelines about the different types of structures envisaged and in assessing the load intensities on the foundations for the various structures of the project in

order to enable him to make specific recommendations for the depth, founding stratum, type of foundation and the allowable bearing pressure.

1.07 The Agency shall carry out all work meant within Para 1.01 of this specification even if not explicitly mentioned under the scope. All work shall be executed to the satisfaction of the Engineer.

#### 1.08 FIELD INVESTIGATIONS - SOIL

##### 1.08.1 BORING

a) Bore holes shall be taken at specified locations to obtain information about the subsoil profile, its nature and strength and to collect soil samples for strata identification and conducting laboratory tests. The sequence of boring shall be fixed with the approval of the Engineer and on ascertaining preliminary nature of subsoil profile, the Engineer shall reserve the right to increase or decrease the number of proposed Bore holes by any limit. However, as per Clause 1.02, payment shall be made as per actual quantities executed. The minimum diameter of the bore holes shall be 150 mm and boring shall be carried out in accordance with the provisions of IS: 1892.

b) All boreholes shall extend up to 15.0 to 30.0 Mtr. depths or depths shown on the construction drawings or as directed by the Engineer. The refusal criteria shall be strictly as per IS: 1892. When the boreholes are to be terminated in soil strata an additional Standard Penetration Test shall be carried out at the termination depth. No extra payment shall be made for carrying out Standard Penetration Tests. **The site data shall be made available to HSCC as and when each bore is completed either by fax/ courier/speed post/ hand delivery showing location of the borehole on the plan and the soil data along with visual description. The comments regarding the strata and the nature of variations shall also be included.**



c) On completion of the boreholes, the Agency shall backfill all the bore holes as directed by the Engineer. The boreholes shall not be back filled till verified by the Engineer. Arrangements shall be made by the agency to preserve the boreholes so that the depth can be verified.

#### 1.08.2 **PLATE LOAD TEST**

Plate load test shall be conducted to determine the allowable bearing pressure. A pit of size 2.0m square shall be excavated up to a depth of 2.0m deep from virgin soil. The size of plate should be of 0.75mX0.75m. It should be made of mild steel and 25 mm thick. Load shall be applied on this plate by means of hydraulic jack. The reaction to the jack shall be provided by means of loaded platform (kentledge). A seating load of 7 kN/m<sup>2</sup> shall be first applied which shall be released after some time. The load shall then be applied in increments of 20% of the estimated safe load or one-tenth of the ultimate load. The settlement shall be recorded at 1, 2.25, 4, 6.25,9,16 and 25 minutes and thereafter at hourly intervals to nearest 0.02mm. The test shall be conducted until failure or at least until the settlement of about 25mm has occurred. The specifications for the equipment and accessories required for performing this test, test procedure, field observation and reporting of results shall conform to IS: 1888-1982

#### 1.08.3 **SAMPLING**

##### 1.08.3.1 General

All the accessories required for sampling and the method of sampling shall conform to IS: 2132. All the disturbed and undisturbed samples collected in the field shall be classified at the site as per IS: 1498.

##### 1.08.3.2 Disturbed Sample

Disturbed soil samples shall be collected from bore holes at regular intervals. Jar samples weighing approximately 1 Kg. shall be collected in bore holes at 0.5 m below ground level and at every identifiable change of strata to supplement the boring records. Samples shall be immediately stored in air tight jars and shall fill the jar as far as possible.

Sufficient number of soil samples shall be collected. Disturbed soil samples shall be collected for field identification and conducting tests such as sieve analysis, index properties, specific gravity, chemical analysis,(chemical tests on undisturbed samples to be done so that representative chemical state of the total depth of the soil is obtained) etc. Undisturbed samples shall be collected to estimate the physical strength and settlement properties of the soil.

#### 1.08.3.3 Undisturbed Sample

In each borehole undisturbed sample shall be collected at every change of strata and depths of 1.0 m, 4.0 m, 7.0 m, 10.0 m, 13.0 m, 15.0 m and as directed by the Engineer. Undisturbed samples shall be of 100 mm dia and 450 mm length. Samples shall be collected in such a manner that the structure of the soils and its moisture content do not get altered.

The specifications for the accessories required for sampling and the sampling procedure shall conform to IS: 1892 and IS: 2132. Undisturbed sampling in sand shall be done using compressed air technique mentioned in IS: 8763.

#### 1.08.3.4 One of the methods shall be adopted for determining the ground water table in bore holes as per IS: 6935 and as per the instructions of the Engineer.

#### 1.08.3.5 a) Sub-soil water samples

Sub-soil water samples shall be collected for carrying out chemical analysis thereon. Representative samples of ground water shall be

collected when it is first encountered in boreholes before the addition of water to aid boring or drilling.

- b) Chemical analysis of water samples shall include determination of PH value; turbidity; sulphate; carbonate; nitrate and chloride contents; presence of organic matter and suspended

- c) Standard Penetration Test

This test shall be conducted in all types of soil deposits met within a bore hole to find the variation in the soil stratification by co-relating with the number of blows required for unit penetration of a standard penetrometer. This test shall be conducted at 1.50 m interval and every change of strata and as per the direction of the Engineer. The depth interval between the top levels of standard penetration test and next undisturbed sampling shall not be less than 1.0 m.

- d) Dynamic Cone Penetration Test

Dynamic cone penetration test shall be conducted to predict stratification, density, bearing capacity etc. of soils. The test shall be conducted by driving a standard size cone attached to the bottom of a string of drill rods. The test shall be conducted up to the specified depth or refusal whichever is earlier. Refusal shall be considered when the blow count exceeds 150 for 300 mm penetration. The specifications for the equipment and accessories required for performing this test, test procedure, field observation and reporting of results shall conform to IS : 4968, Part - II.

#### 1.08.4 Earth Resistivity of soil

Resistivity of soil /earth shall be measured at 2 locations as per instructions of the Engineer. Measurements shall be carried out as per IS-3043.

## 1.9 LABORATORY TESTING

### 1.9.1 Essential Requirements

- a) Tests indicated in the schedule of items shall be performed on soil, water and rock samples as per relevant IS codes.
- b) Laboratory tests shall be conducted using approved apparatus complying with the requirements of Indian Standards or other approved standards for this class of work. The tests shall be conducted at an approved laboratory.

### 1.9.2 Tests

Tests as indicated in this specification and as called for by the Engineer shall be conducted. These tests shall include but not be limited to the following: -

- a) Tests on Disturbed and Undisturbed samples: -
  - Visual and Engineering Classification
  - Sieve analysis and Hydrometer analysis
  - Liquid, Plastic and Shrinkage limits
  - Specific Gravity
  - Chemical Analysis
  - Swell pressure and free swell index determination (applicable only for black cotton soil)
  - Proctor Compaction Test
  
- b) Tests on undisturbed samples
  - Bulk density and moisture content
  - Relative density (for sand)
  - Unconfined compression test
  - Box shear test (in case of sand)
  - Tri-axial shear tests: (depending on the type of soil)

and field conditions on undisturbed or re-moulded samples).

- c) Unconsolidated undrained
- d) Consolidated undrained test with the measurement of Pore Water Pressure.
- e) Consolidated drained.
- f) Consolidation Test (In case of cohesive soil)

### 1.9.3 **Salient Test Requirement**

a) Chemical analysis of sub-soil shall include determination of pH value, carbonate, sulphate (both SO<sub>3</sub> and SO<sub>4</sub>), chloride and nitrate contents; organic matter; salinity and any other chemical harmful to the foundation material. The contents in soil shall be indicated as percentage (%).

b) Chemical analysis of sub-soil water sample include the determination of the properties such as colour, odour, turbidity, pH value and specific conductivity both at 25<sup>o</sup> C and chemical contents such as Carbonates, Sulphates (both SO<sub>3</sub> and SO<sub>4</sub>), Chlorides, Nitrates, Organic matter and any other chemical harmful to the foundation material. **The contents such as Sulphates, Saltpetre, etc. shall be indicated as ppm by weight.**

## 1.10 **REPORT**

### 1.10.1 **General**

a) On completion of all the field and laboratory work, the Agency shall submit a formal report containing Geological information of the region, procedure adopted for investigation, field observations, summarised test data, conclusion and recommendations. The report shall include detailed bore-logs, subsoil sections, field test results, laboratory observations and test results both in tabular as well as graphical form, practical results both in tabular as well as graphical form, practical and theoretical considerations for the interpretation of test results, the supporting calculations for the conclusions drawn, etc. Initially the Agency shall

submit three copies of the report in draft form for the Supervising Agency's review. The format of the cover page of the reports shall be got approved by the Engineer.

b) The Agency's qualified Geotechnical Engineer shall visit Supervising Agency's office for a detailed discussion on Supervising Agency's comments on his draft report. During the discussions, Supervising Agency shall decide as to the modifications that need to be done in the draft report. Thereafter the Agency shall incorporate in his report the agreed modifications and after getting the amended draft report approved, six copies of the detailed final report (in A4 size and spiral binding with plastic covers) shall be submitted along with one set of reproducible of the graphs, tables, etc.

c) The detailed final report based on field observation, in-situ and laboratory tests shall encompass theoretical as well as practical considerations for foundations for different types of structures envisaged in the area under investigation. The Agency shall acquaint himself about the type of structures, foundation loads and other information required from the Engineer.

#### 1.10.2 **Data to be furnished**

The report (in soft as well as hard copy) shall also include but not be limited to the following: -

a) A plot plan in A1/A0 sheet showing the locations and reduced levels of all field tests e.g. boreholes, trial pits, static cone penetration tests, dynamic cone penetration tests, plate load tests, etc., properly drawn to scale and dimensioned with reference to the established grid lines.

- b) A true cross section of **all individual boreholes and trial pits** with reduced levels and coordinates showing the classification and thickness of individual stratum, position of ground water table, various in-situ tests conducted and samples collected at different depths and the rock stratum, if met with.
- c) A set of longitudinal and transverse soil profiles connecting various boreholes in order to give a clear picture of the variation of the subsoil strata as per IS: 6065. (each soil profile to be submitted in separate sheets).
- d) Past observations and historical data, if available, for the area or for other areas with similar soil profile or with similar structures in the surrounding areas.
- e) Plot of Standard Penetration Test (N values both uncorrected and corrected) with depth for identified areas.
- f) Results of all laboratory tests summarised (i) for each sample and for each layer alongwith all the relevant charts, tables, graphs, figures, supporting calculations, conclusions and photographs of representative 'rock cores'.
- g) For all tri-axial shear tests stress vs strain diagrams as well as Mohr's circle envelopes shall be furnished. If back pressure is applied for saturation, the magnitude of the same shall be indicated. The value of modulus of elasticity, E shall be furnished for all tests alongwith relevant calculations.
- h) Soil resistivity Test results

i) For all consolidation tests, the following curves shall be furnished:-

$e$  vs  $\log p$

or  $e$  vs  $p$  and as per applicability

Compression vs  $\log t$  or

Compression vs square root of  $t$  (depending upon the shape of the plot for proper determination of co-efficient of consolidation).

The point showing the initial condition of the soil shall be marked on curves.

The procedure adopted for calculating the compression index from the field curve and settlement of soil strata shall be clearly specified. The time required for 50% and 90% primary consolidation along with secondary settlements, if significant, shall also be calculated.

### 1.10.3 **Recommendations**

Recommendations shall be given area wise duly considering the type of soil, structure and foundation in the area. The recommendations shall include but not be limited to the following:-

#### 1.10.3.1 **For shallow foundations**

The following shall be indicated with comprehensive supporting calculations.

- i. Net safe allowable bearing pressure for isolated footings and continuous strip footings of suitable sizes ( Varying from 1 to 4m ) at suitable foundation depth as per site condition below ground level considering both shear failure and settlement criteria, giving reasons for type of shear failure adopted in the calculations. Such Footings to be suggested for single storeyed buildings are proposed.
- ii. Net safe allowable bearing pressure for Raft Foundation at suitable foundation depth as per site condition below ground level considering both shear failure and settlement criteria, giving reasons for type of shear failure adopted in the calculations. Such



Footings to be suggested for Raft Foundation giving data for modulus of Sub grade Reaction .

iii. Rate and magnitude of settlement expected of the structure.

### 1.10.3.2 For Pile foundations

Since piling is envisaged at the existing site, the following shall be indicated with comprehensive supporting calculations:-

- a) Type of pile and reasons for recommending the same duly considering the soil characteristics.
- b) Suitable founding strata for the pile and the pile depth at respective locations.
- c) Estimated length of pile for 300 mm dia, 350 mm, 400 mm dia and 450 mm dia and any other diameter to be suggested by the investigating agencies.
- d) Type of pile- End bearing and/or Frictional resistance and whether bored cast-in-situ or Pre cast driven pile shall be indicated separately. The estimated pile capacity clearly identifying the end bearing and treated resistance capacities contributes in the total capacity.
- e) Magnitude of negative skin friction, if any, to be considered in pile design.

### **C. GROUND WATER / RAIN WATER HARVESTING**

The scope of work includes conducting Geo-physical and Geo-hydrological survey of the entire area and a study of the environmental conditions that may affect the fitness of the underground water source for domestic and non-domestic purpose. The total water requirement for the proposed site is approximately 2 lakh liters per day. The alternative sources of ground water i.e tube well and rain water-harvesting scheme be assessed scientifically. This also includes the assessment of the capacity and dependability of the different sources to meet water for project.

#### **The detailed scope of work will be as below:**

1. With the objective to meet total water requirement at least 4 points shall be subjected to vertical electrical sounding to ascertain suitability for locating tube wells with a depth range upto 150 meters or whatever suitable in and around project site. A/C or D/C (digital type) resistivity meter will be used for the study. The resistivity data so procured shall be analysed, computed and plotted on log-log graph paper with modules of 62.5 mm, smooth curves shall be drawn for each vertical electrical sounding. Geophysical interpretations of the curves drawn by computer and using auxiliary charts shall reveal the following information.
2. Full details of the existing underground sources of water, nature and extent aquifers, their depth and yield expected from tube well or open dug wells in entire campus.
3. Best point selection on the field for the tube well drilling. The same to be marked on overall plot plan with co-ordinate. The exact bench markings for individual wells suggested will be got done by your representative at site as directed by Engineer.
4. Apparent resistivity of existing sub-Geoelectrical layers and corresponding geology of the layer. Correlation of data with CGWB data.
5. Detailed design and specification for tube wells.
6. Recommended drilling depth and drilling techniques of each tube well.
7. Expected yield of tube well in (litre /hr) and rate of withdrawal.
8. Suggest number of tube wells required to meet total water requirement.
9. Recommended capacity (discharge, head) of submersible pump, pumping hrs for individual bore well, type of material and dia. of pipe for tube well.
10. Recommended spacing between the tube wells to avoid minimum interference.
11. Recommendations for functional utility of the bore wells/ dug wells.
12. Suggest method for improvement of bore well yield and quality of water.
13. Suggest scheme for piping network for interconnection of different tube wells.

14. Suggest rainwater harvesting scheme / ground water recharge method and maximum percolation rate through recharge pit.
15. Water quality Assessment

The quality of surface as well as Ground water is to be tested as per IS: 10500, (23 parameters) standards. The scope of water analysis is not limited to ascertaining potability or being semi-salty or salty. It should also include chemical and bacteriological tests. A range regarding percentage salt content shall be given which should be close to 90% of salt content once water is actually pumped out.

The study report shall also include the required Geo-electrical sections for the area, as well as samples of the curves used for matching.

16. Contents of the report.

A. The Geo-hydrological investigation report should have the following contents:

- a. Introduction
- b. Location of the Study Area
- c. Objectives of Ground Water studies
- d. Applied Methodologies
- e. Available basic Data
- f. Ground Water level
- g. Geology of the area
- h. Information and details of existing ground water sources.
- i. Delineation of potential ground water bearing zones
- j. Assessment of hydraulic parameters of aquifers
- k. Water producing capabilities of aquifers likely to be tapped for construction of tube wells/ Dug wells in liters/hour
- l. Correlation of the data obtained from site with data from CGWB etc.
- m. Number of tube wells/ dug wells to meet the water requirement of the project.
- n. Spacing between tube wells/ dug wells.
- o. Specification of tube wells/ dug wells and type of pump set, type of material and dia of pipe for tube well.
- p. Details of rain water harvesting scheme.
- q. Recommendations.

## Annexure A

**Hardware and Software Capabilities**

S.NO.	Particulars of Hardware device and authorized software detail	Quantity	Remarks

Authorized Signatory of Consultant with Seal

**Annexure B**

**Format for Submission of Experience:**

The information regarding the relevant experience of the Consultant should be provided in the format below. (Separate sheet for each project).

Project Name	
Location of Project	
Built Up Area	
Project Cost	
Current Status	
Name of the Concerned officer of client with mobile/Landline phone no.	
Address of client	
Date of commencement (month/year)	
Completion Date (month/year)	
Details of staff provided	
Description of services provided	
Supporting documents enclosed	Yes/No

Authorized Signatory of Consultant with Seal

**Annexure C**

**Format of Curriculum Vitae (CV)**

Name of Staff		
Profession		
Years with Firm		
Nationality		
Area of Specialization		
Proposed Position on Team		

**Key Qualifications**

Project Details	Degree of Responsibility/Experience

**Education (Self attested)**

Degree	Name of Institute	Year

**Experience**

Position Held	
Duration	
Location	
Type of activities performed	
Name of relevant projects handled	
Client References	

Authorized Signatory of Consultant with Seal

**Annexure D**

**Check List  
(On Consultant Letter Head)**

S.No.	Criteria	Requirements	Cross referencing/ page No.
1.	Average Turnover for last three years	As per Table 1	
2.	Experience	As per clause No. 2.1 of Qualifying Criteria	
3.	Personnel Capability	List of qualified and experienced personnel as per Annexure C.	
4.	Hardware & Software Capability	List as per Annexure A.	
5.	Financial Capability	As per Submittals.	
6.	List of Completed Projects	As per Submittals & Annexure B.	
7.	Empanelment Document fee. Details of receipt/ DD		
8.	EMD Details of DD		

Authorized Signatory of Consultant with Seal

**Annexure-E**

**(To be submitted on the letter head of the applicant)**

**UNDERTAKING**

I/We have read and understood the instructions and the terms and conditions contained in the Empanelment document. I/We do hereby declare that the information furnished in application and in the supplementary formats at Annexure 2-4 is correct of my/our knowledge and belief.

Signature of Applicant

Name(in Block letter)

Complete Postal Address:  
& Contact Number

Place:

Date:

Seal of Office

I/We have read the various items and conditions and the same are acceptable to me/us

Date:

Place:

Signature of the Consultant

Full Address:

Office Seal