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No. RW/NH-33054/35/89-DO II *Dated the 5th June, 1990.*

To,

Chief Engineers of State/UT, PWDs (dealing with NHs and other Centrally Financed Schemes), Director General (Works), CPWD, Director General, Border Roads, Chairman, National Highway Authority.

Subject: Soil/sub-surface investigations for road and bridge works on National Highways and under other Centrally sponsored schemes - Entrusting to prequalified geo-technical consultants.

It has been seen that a large number of highway projects are being adversely affected due to improper soil investigations resulting in unreliable and inaccurate soil data. In order to ensure that the geo-technical data collected at the time of investigations for road and bridge projects are representative and reliable, the Ministry felt it necessary to prepare a Panel of Prequalified Geo-technical Consultants. Keeping this in view, the Ministry invited applications from experienced geo-technical consultants through a questionnaire issued to firms known for their capability and expertise, and also through an open advertisement in the leading newspapers. The Ministry appointed a Screening Committee to look into the applications received, who have recommended pre-qualification of the following firms under each of the categories mentioned below:

Categories (a) and (b) For road projects, high embankment design, soft ground treatment and minor bridges

(i) ENGICON India Pvt. Ltd., Calcutta.
(ii) RITES, New Delhi.
(iii) HAQ Consultants, Jaipur.
(iv) National Soil Testing and Research Laboratories, Chandigarh.
(v) F.S. Engineers (P) Ltd., Madras.
(vi) AFCONS, Bombay.
(vii) Soil Rock & Foundations Engineering, New Delhi.
(viii) Continental Consultants, Calcutta.
(ix) Consulting Engineering Services (India) Pvt. Ltd., New Delhi.
(x) Geo-technical Consultants Pvt. Ltd. New Delhi.
(xi) Inter Continental Consultants and Technocrats Pvt. Ltd. New Delhi.

Category (c) For major bridges

(i) RITES, New Delhi.
(ii) F.S. Engineers (P) Ltd. Madras.
(iii) AFCONS, Bombay.
(iv) Consulting Engineering Services (India) Pvt. Ltd. New Delhi.

2. A supplementary list of Government Institutions capable of handling geo-technical investigations for the highway sector is also given at Appendix I. The State/U.T. PWDs could consider entrusting the geo-technical investigation work to one of these institutions in their respective regions subject to the provisio that adequate infrastructure to carry out the investigations meeting the requirements of the specific work is available with them and they are in a position to take up such works satisfying the prescribed targets for completion.

3. The present prequalification of the above mentioned geo-technical consultants for different categories of work will be in force upto March 1992.

4. The quotations for future geo-technical investigation work for road and bridge works on National Highways and under other centrally sponsored schemes may be taken only from the geo-technical consultants prequalified in para 1 above. However, such works could also be entrusted to Government institutions listed in Appendix I, subject to the proviso mentioned in para 2 above.

5. Before calling for quotations for any geo-technical investigation work, the terms of reference detailing the scope of work, the preferred method of testing, sampling procedure, type and number of samples to be taken, engineering parameters required for design and construction, the target for completion and essential equipment both field and laboratory required to be deployed on the work must be clearly specified. The State/U.T. PWDs should also supervise the method and the quality of investigation work through experienced Departmental

Officers (with the help of check list as given at Appendix 2 which is not job specific but suggestive only) or by engaging experienced supervision consultants. The check list can be modified as required depending upon the nature of investigations. This will also depend on the TOR for the investigations. A list of suggested essential laboratory and field equipment which the consultants should possess is given at Appendix 3 and should be insisted upon by including the same in the tender documents.

6. A record about the performance of the geo-technical consultants covering aspects like adequacy of laboratory and field equipment deployed, expertise of personnel, quality of investigations, reliability of data collected, completion time, etc. should be maintained and this Ministry kept periodically informed particularly with regard to any unsatisfactory performance.

7. The contents of this letter may please be brought to the notice of all officers in your Department dealing with works on National Highways and under other Centrally Sponsored Schemes.

Appendix 1 to Ministry's Circular No. RW/NH - 33054/35/89 - DO II Dated 5-6-90

LIST OF GOVERNMENT INSTITUTIONS CAPABLE OF HANDLING GEOTECHNICAL INVESTIGATIONS FOR THE HIGHWAY SECTOR

1. Central Soil & Materials Research Station
   Olof Palme Marg, Hauz Khas, New Delhi - 110016.
2. Central Water & Power Research Station
   Pune - 411024, Maharashtra.
3. Central Road Research Institute,
   Mathura Road, New Delhi - 110020.
4. Maharashtra Engineering Research Institute
   Dindori Marg, Nasik - 400004, Maharashtra.
5. Gujarat Engineering Research Institute,
   Race Course, Vadodara - 390007, Gujarat.
6. Highway Research Station,
   Guindy, Madras - 600025.
7. Andhra Pradesh Engineering Research Laboratories,
   Himayetsagar, Hyderabad - 500030.
8. Karnataka Engineering Research Station,
   Krishnarajasagar, Karnataka - 571607.
9. Soil Mechanics & Research Division,
   Chepauk, Madras - 600005.
10. U.P. Irrigation Research Institute,
    Roorkee - 247667 (U.P.)
11. Central Building Research Institute,
    Roorkee. U.P.
12. River Research Institute,
    West Bengal, 2nd Floor, 11-A, Mirja Ghalib Street,
    Calcutta - 700087 (W. Bengal)
13. Irrigation Research
    Narmada Bhavan, Tulsi Nagar Qtrs. 1250,
    Bhopal - 462005 (M.P.)
14. Kerala Engineering Research Institute,
    Peechi - 680653 (Kerala)
15. Irrigation & Power Research Institute,
    Amritsar-143001 (Punjab)
16. Department of Civil Engineering
    Indian Institute of Science, Bangalore - 560012.
17. Department of Civil Engineering,
    Indian Institute of Technology,
    Hauz Khas, New Delhi - 110016.
18. Department of Civil Engineering,
    Indian Institute of Technology,
    Powai, Bombay - 400078.
19. L.B.S. Centre for Science & Technology
    Extra Police Road, Nandavanan,
    Trivandrum - 695033.
20. Department of Civil Engineering,
    Motilal Nehru Regional Engineering College,
    Allahabad - 211004.

Appendix - 2 to Ministry's Circular No. RW/NH - 33054/35/89 DO II Dated the 5-6-90.

CHECK LIST FOR SUPERVISORS

The following is the check list to be used by the personnel deputed for supervising geotechnical investigation works:

Name of Work and location :

Date of starting :

Dated of completion :

Indicate YES or NO by marking √ or x against each question listed below:

A. Field work

A 1. Investigation for Embankment Soil

A 1.1 Has borrow area plan been prepared?

A 1.2 Has the thickness of the over burden been estimated?

A 1.3 Has the accessibility of the source been examined at site?

A 1.4 Has the quantity of soil from borrow areas after due allowance for compaction and wastages been estimated?

Whether the estimated quantity is 50 more than the required quantity?

A. 1.5 Has the side wall of the test pit or exposed surface been trimmed to remove weathered or mixed soil?

A 1.6 Has the trimmed surface of wall of the test pit been examined to determine :

- Thickness
- Classification
- Description

of each stratum of material?

Has the above information been recorded on log form?

A 1.7 Have the representative samples been collected from each stratum?

A 1.8 Have the sample number and depth been marked on the log from?

A 1.9 Has the care been taken to prevent inclusion of materials from other strata while sampling an individual soil stratum?

A 1.10 Whether water table encountered? If so, whether water table level been recorded?

A 1.11 Has the field sample number been recorded?

A 1.12 Has the test pit or hole number been recorded?

A 1.13 Has the location of test pit or hole been recorded?

A 1.14 Has the name/number/other identification of the area been mentioned?

A 1.15. has the depth interval of sample collection been indicated?

A 1.16 Has the purpose of sample collection been mentioned?

A 1.17 Has the description of the collected sample indicated on the sack/container?

A 1.18 Have the duplicate identification tags (one outside and one inside of the container) been provided?

A 2 **Sub soil**

A 2.1 Have the location and spacing of bore holes been planned atleast at 30m interval for foundation of bridges?

A 2.2 Has the possible depth of exploration been estimated?

A 2.3 Has the method of drilling (preferably Rotary drilling) been adopted followed as per IS : 1892-1962 ?

A 2.4 Whether water table encountered, if so the level has been observed and recorded?

A 2.5 Have Standard Penetration tests been conducted at desired intervals as per IS : 2131-1963.

A 2.6 Have Dynamic cone penetration tests been conducted around drill holes as per IS : 4968 Part I-1976 where required in the scope of the work?

A 2.7 Have permeability tests been conducted in drill holes at desired intervals as per

- IS : 5529-Part I - 1969 (Tests in overburden)
- IS : 5529 - Part II - 1973 (Tests in bed rocks)

Where required in the scope of works?

A 2.8 Where required in the scope of work has the disturbed samples from SPT sampler been preserved for laboratory tests?

A 2.9 Have the undisturbed samples using thin walled samplers been collected at regular intervals as per IS : 2132-1972 ?

A 2.10 Have the collected undisturbed samples been waxed/sealed properly so as to reduce vibrations to a minimum during shipment?

A 2.11 Has care been taken in making the undisturbed samples as 'top' and bottom for proper orientation?

A 2.12 Has recovery ratio been determines and recorded?

A 2.13 Has care been taken to see atleast on or two drill holes drilled upto 5m into the bed rock for the bridge works?

A 2.14 Has in-situ vane Shear test on soft subsoil conducted as per IS : 4434-1976 (Borrow area soil and sub soil)?

B. Laboratory work:

B. 1 Has the Mechanical or particle size analysis been done as per IS : 2720 Part IV-1975?

B. 2. Have the listed consistency limits tests been performed as per the relevant IS codes?

* Liquid limit IS : 2720-Part V-1970
* Plastic limit IS : 2720-Part V-1970
* Shrinkage limit IS : 2720-Part VI-1972.

B. 3. Has the Natural dry density/moisture content (for cohesive soils) been determined as per IS : 2720 Part XXIX-1975 ?

B. 4. Have the following Triaxial shear tests on undisturbed remoulded. samples been conducted?

* Unconsolidated undrained without measurement of pore pressure as per IS : 2720 part XI - 1970 (on all samples)
* Consolidated Undrained tests with pore pressure measurement as per IS : 2720 Part XII-1975 where reqd.

B. 5. Have the one dimensional consolidation tests been conducted as per IS : 2720 - Part XV - 1965 ?

B. 6. Have the GBR tests on subgrade material been conducted as per : IS 2720 - Part XVI - 1965 ?

B. 7. Has the moisture content dry density relationship for borrow area soil determined as per IS : 2720 Part VII or VIII as prescribed?

B. 8. Has the rock core samples been tested for crushing strength, classification and characteristics of rock as indicated in cl. 704.1 (iv) App.I, IRC: 78-1983?

Appendix - 3 to Ministry's Circular No. RW/NH - 33054/35/89 DO II Dated the 5-6-90

SOIL/SUB-SURFACE INVESTIGATIONS FOR ROAD AND BRIDGE WORKS ON NATIONAL HIGHWAYS.

A. LIST OF EQUIPMENT (FIELD)

1.	100 mm(4") dia & 75 MM (3") dia post hole Augers with accessories.		
	* Motorised 30m	:	2 Nos.
	* Hand Operated 10m	:	4 Nos.
2.	Equipment for conducting DOPT & SPT with accessories	:	2 Sets
3.	Deep drilling/Field tests		
	* Standards drilling machine (Acker - Rotary Type) with accessories for drilling upto 100 m including water pumps of capacity 30 gallons/min.	:	2 Sets
4.	Samplers for collection of undisturbed & disturbed samples.		
	* SPT Sampler	:	10 Nos.
	* Brass tube samplers (38 mm dia)	:	200 Nos.
	* Core cutter samplers (100 mm dia)	:	100 Nos.
	* Piston tube samplers	:	10 Nos.
	Thin walled tube sampler		
	(100 mm dia)	:	100 Nos.
	(75 mm dia)	:	50 Nos.
5.	Field Vane Shear	:	2 Nos.
6.	Accessories for field permeability test (Packers, water meters, Pump of capacity about 90 liters/minute etc.)	:	1 Set
7.	Electric Sounding probe (Water level probe)	:	2 Nos.
8.	Stop Watches	:	2 Nos.
9.	Plate load testing equipment with accessories.	:	1 Set

B. LIST OF EQUIPMENT (LABORATORY)

1.	Equipment for conducting Mechanical Analysis Test		
	* Sieve Shaker with provision for accommodating 20 test bottles.	:	1 No.
	* Set of sieves (BIS)	:	1 Set
	* Measuring jars of 1000cc capacity	:	2 Nos.
	* Pipette of 25 ml.	:	3 Nos.
	* Porcelain dishes	:	50 Nos.
	* Electric Oven	:	1 No.
	* Thermometer 50. C	:	3 Nos
	* Stop Watch	:	2 Nos.
2.	Equipment for Limit Analysis		
	* Casagrande's liquid limit device		
	* Motorise/Manual.	:	1 No.
	* Cone penetrometer	:	1 No.
	* Shrinkage limit apparatus (if required)	:	4 Sets
	* Glass plate (50cm x 50cm)	:	1 No.
	* Moisture tin (50 mm dia. X 12 mm ht.) with cover	:	25 Nos.
3.	Apparatus for conducting specific gravity test (50 ml)	:	6 Sets.
4.	Sample extruder (preferably motorised) for different sizes samples.	:	1 No.
5.	pH meter	:	1 No

6.	Balance		
	* Electronic Balances of different capacities		
	* 10 kg	:	1 No.
	* 5.kg	:	1 No.
	* 800 gm.	:	1 No.
	* 200 gm.	:	1 No.
7.	Moisture balance	:	2 Nos.
8.	CBR apparatus	:	2 Sets
9.	Shear Testing Machine		
	* Direct shear	:	1 Set
	* Triaxial shear testing machine with facilities: for pore pressure measurements/back pressure saturation (when required). (Sample size 38 mm X 76 mm)	:	4 Sets.
10	One 3 Gang Consolidometer or 3 Oedometers for testing 60 mm dia soil samples.	:	1 Set, 3 Nos.
11.	Standard Proctor Compaction Equipment		
	* Automatic/Manual	:	1 Set
12.	Laboratory Permeability Apparatus (with 6 permeability moulds)	:	1 Set