

Government of the People's Republic of Bangladesh  
Local Government Engineering Department  
Agargaon, Sher-e-Bangla Nagar, Dhaka-1207.

**Terms of Reference  
for  
Sub-soil Testing Work for Bridge**

Name of the Project: .....

Name of Work: .....

Road Identification No. : .....

Bridge Identification No. : .....

Road Name : .....

Bridge Location Chainage on Road Link : .....

Upazila : ..... District : .....

**Background of the Program:**

The Government of Bangladesh has received a loan from the World Bank (WB) toward the cost of the program titled "Program for Supporting Rural Bridges (SupRB)". The program will be implemented by the Local Government Engineering Department (LGED) through the Project Director's Office (PMU) and contract administration of civil works will be carried out by LGED District/Upazila offices. The program will be implemented in total 61 districts out of 64 districts of the country, except three hill districts at a cost of USD\$614million.

The program Components include (i) Major and minor maintenance of 85,000 meters of bridges, rehabilitation of 24,000 meters of bridges, Capacity Expansion (Widened) of 5000 meters of rural bridges, replacement or newly construction of 20,000 meters of bridges, technical, fiduciary, procurement, social and environmental capacity improvement of LGED including design and implementation of climate resilient bridges, and establishment and operationalize of Grievance Redress System (GRS).

The specific project will require the services of the firm that will conduct detailed subsoil investigation of selected bridges sites to rationalize structural design for each bridge.

**Objective:**

The basic objectives of soil test is to:

- Find out the sub-soil condition of the selected bridges
- Find out soil bearing capacity of bridge site;
- Ensure safe bridge design

The sub-soil investigation firm shall have good reputation. The firm shall have its own soil testing laboratory and a professional Geotechnical Engineer registered in the Bangladesh Professional Engineers Registration Board (BPERB), Institute of Engineers Bangladesh (IEB).

The Sub-soil Investigation work shall be carried out following Standard Practices as stated below:

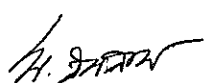
1. Prepare a work-plan showing the time schedule for conducting sub-soil investigation and submit the same to the Project Director and concerned Executive Engineer LGED.
2. Mobilize and start sub-soil investigation work with prior written information to Executive Engineer and Upazila Engineer.

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3. The sub-soil investigation equipment shall be checked by Upazila Engineer and Laboratory Technician. They will check dimension of Shelby tubes & functional capacity of auto release hammer, Liquid Limit of Bentonite Powder (LL>350) and the mix ratio (4%-6%) of Bentonite with water for preparation of Slurry.
4. The borehole layout plan should be shown in the Digital Topographical survey map in x, y, z Co-ordinate. The 'z' co-ordinate shall be in respect to SOB/PWD BM.
5. Conduct sub-soil investigation work using 100mm exploratory boring for SPT test and soil sample collection.
6. For single span Bridge at least two nos. and for multiple span Bridge at least three nos. bore-hole should be made.
7. Take at least 3 (Three) digital Photographs of each boring operation in presence of LGED's representatives and the firm's Engineer (Graduate Civil Engineer from Govt. accredited institution).
8. For each bore-hole, minimum depth of boring shall be 25m. if poor quality soil encountered (say SPT value<20) the depth shall be extended upto 35m or more. For soft soil regions the average SPT value for half of the bottom depth should be minimum 20.
9. Standard Penetration Test (SPT) shall be conducted in accordance with specified under ASTM D 1586. Normally SPT is taken @1.5m interval, but SPT must be taken @ 1m interval upto top 6m depth.
10. If clayey soil encountered at any depth during boring, undisturbed soil samples must be collected with the help of shelly tubes.
11. Soil sample collected by SPT spoon from each depth of the borehole must be divided into 02 (two) parts in sufficient quantity for laboratory test. One part must be preserved with proper tag in safe custody of the concerned Upazila Engineer (UE) and other part to be kept to the firm for performing laboratory tests.
12. The following laboratory tests must be carried out on the samples taken:
  - Unconfined compression for cohesive soil (C)
  - Direct shear ( $\phi$ )
  - Grain size analysis,
  - Natural Moisture Content,
  - Atterberg Limits
13. All boreholes shall be properly logged and drawn showing the thickness of each layer, the color, the type and visual description of each layer, depth below the surface, depth of water level etc. Classification of soils shall be made in accordance with AASHTO M145
14. Submit an electronic (soft) copy and two (2) hard copies of preliminary/draft **Soil Test Report**. The following information shall be included within the report.
  - Description of soil investigation work
  - Geological background of area investigated
  - Detailed description of the manner, in which the drillings, in-situ tests and laboratory tests have been carried out
  - Summary of investigation results
  - List of coordinates, elevation and depth of boreholes
  - Borehole location maps
  - Taking 3(Three) cross-sections of the channel/Khal (i) Along the center line of the proposed bridge alignment (ii) 15m ahead from the proposed bridge alignment at upstream and (iii) 15m ahead from the proposed bridge alignment at downstream. Spot levels on channel/Khal cross section to be taken at 3.0m intervals.
  - Borehole logs; Bore log shall Contain N-Value, soil type, Water table Level (RL), EGL (SOB/PWD BM) of Borehole Top, Date & time of commencement and completion of each borehole shall be mentioned clearly and duly signed by the Upazila Engineer or his representative.
  - Soil Profiles



- Photos of drilling and testing sites
- Soil Bearing Capacity, Pile bearing Capacity

15. A technical presentation by the firm may be required as per instruction by the competent authority of the department for review and comment.
16. On approval of the preliminary/draft report by the competent authority of the department, an electronic (soft) copy and three (3) hard copies shall be submitted covering all the information as required in preliminary/draft report with the modifications or additional data suggested by the department.

**Duration of the Assignment:**

The duration of the assignment may 15 days.

**Facilities to be provided by XEN, LGED:**

- Necessary data and information.
- Identification of location and area for the bridge.
- Necessary checking and inspection.
- All necessary co-operation and suggestion for the assignment.

**Submission requirment:**

- 1 copy draft report and 4 copies Final Soil Test report.

