

TEST COVERAGE

In order to verify the above competencies, the test is aimed to evaluate the workers' knowledge in the following fields:

A. Basics of Mathematics / Natural Sciences;

- Units and their conversion
- Calculation of cross-section and volumes (i.e. annuli, pits)
- Basic of technical mechanics (power, torque, tension)
- Work, energy, capacity
- Basics of fluid mechanics (hydrostatic pressure, flow-rate, viscosity, pressure loss in fluids)

B. Project Basics;

- Location plans and terrain profiles;
- Basics of classification of soils and physical characteristics of subsoil;
- Basics of detection techniques like cable locator, GPR.
- Classification of the subsoil;
- Properties of coarse and fine soils;
- Rock Properties, Classification and mode of formation;
- Ground water conditions;
- Line installation plans (overhead lines, lines installed underground);
- Basics of bore path investigation (geo-radar);
- Practical training.
- Pollution hazards of drilling fluids and spoils with remedial measures / precautions;

C. Geophysical Investigation Techniques;

- Application Area of Geophysics;
- Geophysical investigation techniques and basic selection criteria;
- Principle of Geophysical investigation methods;
- Objectives of Geophysical investigation;
- Stages of Geophysical investigation;
- Demonstrations of Geophysical Techniques.

D. Project Realization;

- Job site set-up (mini/midi);
- Documentation of system basics;
- Daily job reports;

E. Reviewing Available Surface and Subsurface Information;

- Topographic Maps;
- Geologic Maps;
- Soils Maps;
- Aerial Photographs;
- Local Experience;
- Individual Site Mapping;
- Seismicity Maps;
- Mine Maps Geological maps and memoirs;
- Site Histories and Details of Adjacent Development.

F. Essential Information Required for a Trenchless Technology Project;

- Standard penetration values;
- Particle size distribution including presence of cobbles and boulders;
- Shear strength;
- Atterberg limits (liquid, plastic and shrinkage limits);
- Moisture content;
- Height and movement of water-table;
- Permeability;
- Presence of contaminated soils (hydrocarbons, etc)
- Identification and location of subsurface structures.

G. Geophysical Investigation Requirements;

- Determination of depth and thickness of geologic strata;
- Determination of perched water zones and depth of groundwater;
- Estimation of soil and rock composition;
- Location of fracture zones, faults, karst, and other hazards;
- Location of clay lenses and sand channels;
- Location of buried objects (metal and non-metal);
- Location of utilities, and backfilled areas;
- Assessment of ground response to changing natural conditions brought about by subsurface excavations;
- Assessment of any special construction problems with respect to the existing structures nearby;
- Presence of contaminated soils (hydrocarbons, etc).

H. Geophysical Tools for Sub Surface Investigations;

- Electrical Tomography:
 - ⇒ Equipments and mode of operation;
 - ⇒ Field of application.
- Seismic Techniques:
 - ⇒ Equipments and mode of operation;
 - ⇒ Field of application.
- Electromagnetic Methods:
 - ⇒ Equipments and mode of operation;
 - ⇒ Field of application.
- Ground Penetrating Radar:
 - ⇒ Components and mode of operation;
 - ⇒ Field of application.

I. Subsurface Survey:

- Electrical Tomography:
 - ⇒ Electrode configurations and spacing;
 - ⇒ Limitations of Electrical Tomography methods;
 - ⇒ Issues to be considered while selecting this method.
- Seismic Techniques:
 - ⇒ Types of Seismic Techniques and their applications;
 - ⇒ Arrangement of the geophone sensors;
 - ⇒ Limitations of the Seismic Techniques.
- Electromagnetic Methods:
 - ⇒ Types of EM methods;
 - ⇒ Spacing of the EM transmitter and receiver;

- ⇒ Configuration requirements of the EM receiver and transmitter coils;
- ⇒ Limitations of EM methods.
- Ground Penetrating Radar:
 - ⇒ Required range of antenna frequency to acquire subsurface information;
 - ⇒ Effect of electrical properties of the subsurface materials on GPR survey;
 - ⇒ Necessity of test surveys to predict the success of GPR;
 - ⇒ Method of traversing, spacing of the traverse lines and traverse rates for GPR survey;
 - ⇒ Influences on GPR survey.

J. Authority regulations / safety at work / environmental protection / work sheets;

- Responsible persons;
- Work safety;
- Water protection;
- Pollutant and noise emission;
- Regulations for handling dangerous materials and agents;
- Basics of working and civil laws for drilling operations (liability, negligence etc.);
- Regulatory guidelines;
- Relevant laws, rules and regulations;
- Work sheet standards.