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. Horizontal drilling units

- General operation techniques;
- Type of drilling units and basic selection criteria;
- Drill rig incl. head stock, thrust motor and drilling fluid pump;
- Drilling fluid mixing units, recycling units;
- Drill stems, bore heads;
- Control, location technique;
- Back reaming tools;
- Pull-back equipment.

C. 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;
- 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 / precaustions;

D. Project realization

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

E. Drilling fluids / fluids fluid circulation / disposal

- Drilling fluid types;
- Functions, fluid compositions (Bentonite, polymers);
- Measuring drill fluid parameters in the field (running time, density, sand contents, viscosity, thixotropy) with practical measurements in the drilling fluid laboratory;
- Selection criteria for drilling fluids.

Borehole hydraulics

- Basics of bore hole hydraulics;
- Cleaning the bore hole for horizontal drilling:
  - ⇒ Discharging ability;
  - ⇒ Sedimentation concept.

- Drilling fluid problems:
  ⇒ Back-flow cut-off;
  ⇒ Frac-outs.

Drilling fluid circulation / drilling fluid pumps

- Components in the fluid circulation;
- Drilling fluid equipment:
  ⇒ Set-up;
  ⇒ Mode of operation.
- Processing units:
  ⇒ set-up;
  ⇒ mode of operation.
- Drilling fluid pumps;
- Types, mode of operation, maintenance.

Disposal

- Disposal of soil and drilling fluid.

F. Drilling string

- Assembly and tasks;
- Drill stems (materials, technical parameters);
- Drill string connections (structures, requirements);
- Basic consideration of the forces within the bore string;
- Clamps and accessories (handling, maintenance);
- Care, maintenance, stem damage.

G. Drilling tools

- Drill heads;
  ⇒ Construction and mode of operation;
  ⇒ Field of application.
- Roller-cone bits:
  ⇒ Construction and mode of operation;
  ⇒ Field of application.

Back reamers

- Barrel reamers:
  ⇒ Design and mode of operation;
  ⇒ Fields of application;
- Flycutter:
  ⇒ Design and mode of operation;
  ⇒ Fields of application.

H. Location systems (Bore measurements)

- Transmitter-receiver system (walk-over technique):
  ⇒ Mode of operation, fields of application.
  ⇒ Knowledge about cause and effect of interference with signals
  ⇒ Ability to apply right technique in case of interference -
- Cable guided systems (wire-line technique):
  ⇒ Mode of operation, fields of application.

I. Pipe materials / pipe coating

- Investigation of the various pipe materials
  - ⇒ Polyethylene (HD-PE, PE-X)
  - ⇒ Steel
  - ⇒ Ductile and cast iron
- Basics of the technical standards and norms
- Sheathing, coating, lining
- Special handling features

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.