

**Trenchless Technology Operator Qualification Programme**

## Trade Skill Evaluation at Competency level – 1,

**COMPETENCE:**  
**BASIC COMPETENCE**TTOQP 4  
OFCD, LDS, MDS, HDSHDD OPERATOR  
BASIC OPERATOR**Background**

Horizontal Directional Drilling Machines provide state-of-art solutions for developing subsurface piped networks in several inaccessible/Sensitive locations where open cut pipe laying is not feasible/advisable. This inaccessibility in turn leads to working under direction & dimensions constraints and mistakes are costly beyond job and may lead to disruption of public utility. Further such machines, being sophisticated and state-of-art may also get subjected to stresses beyond their design capacities if handled improperly. The obvious outcome will be damages to machines of varying degrees. The need therefore is to put structure and regulate operations of drilling machines and permit the operations only by the qualified persons.

We propose competency standards for Qualifications of operators in this document. Persons desirous of operating these machines need to display the minimum qualifications in order to handle cable and pipe installation successfully and reliably. Indian Society for Trenchless Technology, the apex organization to promote the application of Trenchless Technology under its Trenchless Technology Operator Qualification Programme is conducting this process in India and other South Asian Nations.

Any operator of these machines needs to undertake the prescribed competency tests at defined intervals to get the certification as a qualified driller. At no point of time any machine owner/operator would permit non-certified or persons with expired certificates to operate the drilling machines.

**PRIOR ACHIEVEMENT EVIDENCE**

Persons undergoing this certification should have a Degree/Diploma in Civil, Electrical, Mechanical or Trenchless Engineering from any recognized institution or 10th + 4 years relevant experience.

**PERFORMANCE STANDARD**

Qualified candidate should be able to display competence in the following sections of HDD works:

- Ability to consider the most important basics of jobsite preparation when planning the complete project.
- Awareness of general safety precautions and ability to use them at site.
- Awareness of electrical safety precautions and ability to use them at site.
- Ability to decide clear bore path depending on location and depth of existing utilities.
- Ability to understand maps, plans and reports on existing networks such as GPR report.
- Capacity to assemble and set up the drill unit correctly under varying job site conditions.
- Ability of selecting the suitable bore method and drilling fluid technique in correspondence with the soil conditions.
- Ability to plan the bore, set up the bore and finally drill the pilot hole.
- Ability to apply the drilling head location technique and its functions successfully.
- Ability to assemble and disassemble the down-hole tools and maintaining them.
- Ability to select the backreaming technique in correspondence with the soil conditions and the pipes.
- Ability to anticipate problems in machine.
- Ability to carry out common maintenance and problem solving measurements independently.

**MINIMUM PERFORMANCE STANDARDS**

While executing the drilling operations the operators need to display the following minimum qualifications:

**1. Safety during work**

- i. General precautions necessary for safety of structure and operators;
- ii. General precautions necessary for safety of machine;
- iii. Necessary Aids for safety are used without fail;

**2. Read working drawings / Sketches and proceed with work**

- i. Given a set of drawings / sketch requirement of machine and related tooling worked out and the scope of work understood;
- ii. The work is executed as per drawings / sketches;

**3. Knowledge and use of equipment and tooling**

- i. Proper identification of equipment tools.
- ii. Proper parking/storage of equipment and tooling;
- iii. Proper use of consumables;
- iv. Proper use of tools.

**4. Knowledge of machine operating procedure and sequence**

- i. Machine is properly connected to desired power points and all related accessories are connected properly.
- ii. Voltage, frequency, current potential, and polarity are checked.

**5. Knowledge about defects, their remedy and acceptance limit**

- i. Identified the defects of machine.
- ii. Remedy to the defects is known.
- iii. Acceptance limit as per standard code is known.

**PERFORMANCE EVIDENCE**

1. Helmet, Hand Shields, Safety Goggles, Gloves etc. are used.
2. Operator's health is fit before he goes to job.
3. The machine operator identified the proper tools for work.
4. The machine operator knows the use of specific tool.
5. For a set of approved bore plan drawings comprising type, size and location of all machine tools demonstrated for all requirements as per performance criteria.
6. The work is done as per demand of drawings.
7. Operator knows how to make machine ready for use.
8. Proper earthing is provided.
9. Proper polarity is confirmed.
10. Loose connections are checked.
11. All the defects in different type of machine are clearly identified.
12. Possible remedy to the defects identified is given.

13. Variation allowed as per codes are very well known.

## **SUPPLEMENTARY (KNOWLEDGE) EVIDENCE**

In addition to the prior achievement evidence a trainee needs to display the following supplementary knowledge evidence for the course completion and being permitted to operate the HDD Machines independently:

1. Reading and writing in vernacular language.
2. Ability to conduct area and volume calculations.
3. Understanding about drilling fluid mix.
4. Understanding about different types of cuttings coming out of the drill holes and actions needed to avoid related accidents.
5. Possession of knowledge of various basic construction norms;
6. Possession of knowledge of basic electrical hazard prevention methods;
7. Awareness about basic operator's manual for HDD machines required for site works.

## 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 / precautions;

### 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.