



# Indian Society for Trenchless Technology

TTOQP 10

Operator

Level Structure Pneumatic/Static Pipe Bursting

## **Trenchless Technology Operator Qualification Programme**

Trade Skill Evaluation at Competency level – 1

<b>COMPETENCE:</b>	TTOQP 10	PNEUMATIC/STATIC PIPE BURSTING
<b>BASIC COMPETENCE</b>	BC 10.1	BASIC OPERATOR

### **Background**

Pipe bursting technique, which can be pneumatic, hydraulic expansion or static pull, is the most cost effective and preferred trenchless technique for the replacement of defective or overloaded gas, water and sewer pipelines with a new pipeline in the same location. In pipe replacement, the defective pipeline is burst, generally by brittle fracture and the fragments are forced into the surrounding ground or removed through the new pipeline that is pulled in. The technique being highly specialized requires suitably trained or qualified operator to operate machinery, instrument, or other equipment.

We propose competency standards for Qualifications of operators in this document. Persons desirous of operating Pneumatic/Static Pipe Bursting machines need to display the minimum qualifications for the pipe replacement 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 operator. At no point of time any machine owner/operator would permit non-certified or persons with expired certificates to operate the Pneumatic/Static Pipe Bursting 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 Pneumatic/Static Pipe Bursting 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 understand maps, plans and reports on existing networks such as GPR report.
- Ability to determine geometry, size and depth of pipe, ground conditions and condition of the existing pipe
- Ability to understand general description of the method and sequence of operations.
- Ability to assess the design needs of the insertion/receiving and lateral connection pits.
- Ability to evaluate the measures adopted to protect existing utilities and risks associated with the selected method of bursting.
- Capacity to assemble and set up pipe bursting equipment correctly under varying job site conditions.



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- Ability to select the type and capacity of bursting equipment for the proposed work.
- Ability to anticipate problems in machine.
- Ability to carry out common maintenance and problem solving measurements independently.

### MINIMUM PERFORMANCE STANDARDS

While executing the Pneumatic/Static Pipe Bursting 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 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 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.



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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 Pipe Bursting machines independently:

1. Reading and writing in vernacular language.
2. Ability to conduct area and volume calculations.
3. Understanding about required precautions in pipe bursting
4. Understanding about the methods of spoil storage and disposal
5. Possession of knowledge of various basic norms;
6. Possession of knowledge of basic electrical hazard prevention methods;
7. Awareness about basic operator's manual for Pipe Bursting 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. Pipe Bursting units

- General operation techniques;
- Type of Pipe Bursting units and basic selection criteria;
- Pipe puller and expander;
- Pipe Fusion method;
- Pipe lubrication system;

### 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 and remedial measures / precautions;

### D. Project realization

- Pipeline failures and performance requirements;
- Consequences of pipeline failure and management of failure;
- Defects identification and evaluation of the causes;
- Pipeline material specifications;
- Pipeline failure detection & location techniques;
- Job site set-up;
- Documentation of system basics;
- Daily job reports.

### E. Pipe lubrication

- Fluid types;
- Functions and compositions;
- Measuring lubricating fluid requirements;
- Selection criteria;
- Lubrication plant.

### F. Entry and exit pits

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- Sizing pits;
- Location of the pits;
- Groundwater control methods;
- Lateral earth, groundwater and surcharge pressure considerations;
- Entry and exit seal requirements.

## G. Pipe material & design considerations

### Pipe materials;

- Host pipe material
- Replacement pipe materials
  - ⇒ HDPE pipe
  - ⇒ MDPE pipe
  - ⇒ Cast iron pipe
  - ⇒ Vitrified clay pipe, and
  - ⇒ Reinforced concrete pipe
- Basics of the technical standards and norms
- Special handling features

### Pipe Design considerations;

- Degree of upsizing required
- Depth of existing pipeline
- Length of Bursting
- Need for bypassing
- Ground conditions
- Groundwater conditions
- Surrounding utilities

## H. Pipe Bursting tools

- Pneumatic Tool
  - ⇒ Construction and mode of operation;
  - ⇒ Field of application.
- Static Tool
  - ⇒ Construction and mode of operation;
  - ⇒ Field of application.
- Lateral Tool
  - ⇒ Construction and mode of operation;
  - ⇒ Field of application.
- Winch;
  - ⇒ Construction and mode of operation;
  - ⇒ Field of application.
- Expander;
  - ⇒ Construction and mode of operation;
  - ⇒ Field of application.
- Air Compressor
  - ⇒ Construction and mode of operation;
  - ⇒ Field of application.
- Guide Head
  - ⇒ Construction and mode of operation;
  - ⇒ Field of application.

## I. Recording and monitoring



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- Distance
- Machine thrust
- Inclination and position
- Rate of installation

### **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.