Trenchless Technology Operator Qualification Programme

Trade Skill Evaluation at Competency level – 1

COMPETENCE:	TTOQP 3	PIPE RAMMING
BASIC COMPETENCE	BC 3.1	BASIC OPERATOR

Background

Pipe ramming is a trenchless method for installation of steel pipes or casings, in which a pneumatic tool is used to hammer the pipe or the casing into the ground while the excess soil from creating the borehole is removed to the surface. The pipe ramming method requires a high degree of operator skill. The operator must decide whether the pipe face should be left open or closed, what size of bands to use on the inside and/or outside of the casing, how to remove the spoils, what type of lubricant should be used, and what lengths of pipe should be rammed that would provide proficient line and grade alignment so as to avoid damaging any existing utilities. The operator must be able to recognize the existing utilities that have been located and whether or not these utilities should be exposed.

We propose competency standards for Qualifications of operators in this document. Persons desirous of operating Pipe Ramming machines need to display the minimum qualifications in order to 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 operator. At no point of time any machine owner/operator would permit non-certified or persons with expired certificates to operate the Pipe Ramming 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 Pipe Ramming 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 pipe ramming unit correctly under varying job site conditions.
- Ability of selecting the suitable spoils removal methods.
- Ability to calculate the required jacking force, minimum pipe dimensioning and buckling safety of the pipe.
- Ability to ascertain the effect of kinetic energy on the material structure of the pipe.
- Ability to anticipate problems in machine.

- Ability to carry out common maintenance and problem solving measurements independently.

MINIMUM PERFORMANCE STANDARDS

While executing the Pipe Ramming 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 Pipe Ramming 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 spoils coming out of the bore 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 Pipe Ramming 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 Ramming units

- General operation techniques;
- Type of Ramming units and basic selection criteria;
- Spoil removal system;
- 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 / precaustions;

D. Project realization

- 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. Spoil removal methods

- Compressed Air
- Water Jetting
- Auger
- Pipe Shovel

G. Shaft design and construction

- Sizing shafts;

- Shaft excavation support methods;
- Groundwater control methods;
- Lateral earth, groundwater and surcharge pressure considerations;
- Launching and exit seal requirements.

H. Ramming pipe material & design considerations

Pipe material consideration;

- Pipe yield strength
- Wall thickness of the pipe
- Pipe dimensioning
- Buckling safety of the pipe
- Basics of the technical standards and norms
- Special handling features

Pipe Design considerations;

- Route layout
- Depth of installation
- Pipe end and overcut
- Ground condition

I. Ramming tools

- Cradle with air cushion
  - ⇒ Construction and mode of operation;
  - ⇒ Field of application.
- Pneumatic Hammer or Pipe Ram Device;
  - ⇒ Construction and mode of operation;
  - ⇒ Field of application.
- Air Compressor or Pneumatic / Hydraulic power source:
  - ⇒ Construction and mode of operation;
  - ⇒ Field of application.
- Ramming Cones or Collets;
  - ⇒ Construction and mode of operation;
  - ⇒ Field of application.
- Cutting shoe;
  - ⇒ Construction and mode of operation;
  - ⇒ Field of application.

J. Recording and monitoring

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

K. 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.