Trenchless Project Supervision

The Indian Society for Trenchless Technology (IndSTT) has come out with a Manual of Trenchless Project Supervision to provide necessary inputs for project supervision works. **Prof Niranjan Swarup** discusses the importance of the requirement of project supervision and provides necessary inputs to the reader.

Requirement of sub-surface constructions, both in urban as well as rural areas, is growing rapidly. Depending on the size requirements, tunneling/trenchless technology, or conventional cut open excavation, or their any combination are the primary construction methodologies employed to construct or maintain structures below the ground surface.

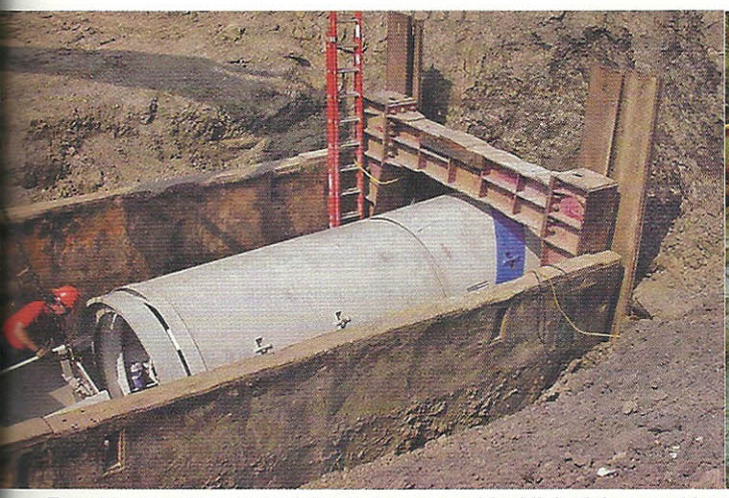
Trenchless technology is defined as a family of construction techniques for developing or maintaining subsurface utility networks without excavating continuous trenches and scores over conventional construction methodologies due to their automation, precision, speed of works, and reduced destructions. As techniques help in avoiding excavation of continuous trenches, impediments like road surface damage, longer work durations, congestion and traffic diversion, generation of excavation wastes and other similar construction related problems are avoided. Without these techniques, project owners would face more difficulties, should the open cut processes or conventional construction methods are employed for construction works and therefore the advantage. The technology is state-of-the-art and utilises remotely controlled equipment or processes to develop or maintain structures. These attributes necessitates adequate supervisory intervention in such construction activities, and their absence, naturally may lead to structural failures and damages to other structures and roads, defeating the very purpose of using trenchless, in the first place. It is therefore important that appropriate supervisory interventions must be made while utilising these techniques.

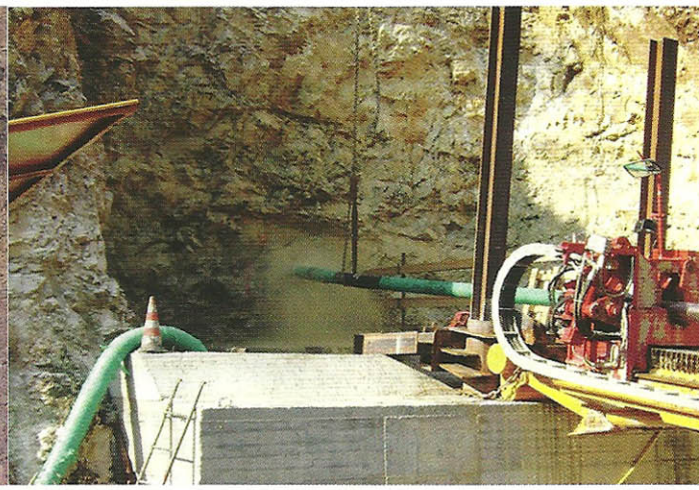
A failed trenchless project would lead to damages to surrounding structures.

Trenchless technology

Trenchless technology can be defined as a set of techniques or construction methodologies that can be used to develop, maintain, or manage subsurface utility networks without excavating continuous trenches. These techniques are generally of three types, technique to create cavities in ground, techniques to line the subsurface cavities so that they do not collapse, and techniques to replace the existing linings. These technique groups are termed as new installation techniques, rehabilitation or renewal techniques, and replacement techniques. On ground these techniques are applied with the assistance of techniques that help in seeing through the ground, collectively called Subsurface Utility Engineering.

Trenchless project works comprise of a combination of installation and construction activities of buried structures. Such combination of works is termed as the scope of work. Each element of the scope of work has a definite role in the overall scheme of future activities of the structure under construction. Primary aim of project work is to deliver results in conformity to the work scope and to ensure that, trenchless project supervision is necessary.





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Project supervision

Trenchless project supervision is the most critical link of the trenchless project execution chain. Supervision involves activities related to planning, direction and coordination of onsite activities that result in turning the drawings and specifications into realty. This job is highly complex and requires extensive knowledge and skills, both about applied technique as well as general construction process to get the project executed successfully.

Sub-surface space offers immense opportunities for housing public utilities like pipes, appurtenances, and related structures and any failed or malfunctioned trenchless project, in turn, will have the propensity to fritter away a majority of such opportunities. Project supervision, therefore is one of the most important activities set in the life cycle of any subsurface structure. It comprises of five different action groups aimed at planning, organising, motivating, coordinating and controlling the project works. As these groups provide immense opportunities for managing the project, the supervisor becomes the most important professional at project site. His actions are aimed at implementing the project with an assured quality level and within a stipulated budget. He has to manage the work-scope, related risks, staff, communications and the procurement activities. His supervisory actions need to be adequate as the quality of the structures hall only be as good as was the supervision.

In case, if any one portfolio, out of the above five, is inadequate, irreparable damages to the structure or even the project failure can happen. One reason is the continuous nature of some of the technique elements or work phases. Such elements, once initiated, need to be properly concluded for an appropriate phase completion. In case of improper conclusion or sudden work stoppage, the resultant structure can be defective.

Trenchless project failure

All trenchless projects comprise of various elements with inherent complexities and have to be executed is a specific manner. Any deviation from the designed values in any element can lead to an ill constructed or faulty structure or failures at times. Owing to their complexities, success of many of the trenchless projects becomes doubtful unless the complete supervision process is followed objectively and in entirety.

Trenchless techniques are versatile state-of-art techniques, which maximize the utilization of subsurface space. Its unregulated use, however, can damage the surrounding structure around the utility. Causes of such could be any one or more of the following:

- Selection of Incorrect technique;
- Inadequate site and/or soil investigation;
- Inaccurate subsurface interpretation;
- Unforeseen ground conditions;
- Damaging existing utilities;
- Usage of under-capacity equipment;
- Inadequate temporary works;
- Failure to adhere to the specifications; and
- Inappropriate or bad workmanship.

To avoid such damages necessary measures for removing the identified anomalies during the complete project process must be adopted. It should be kept in mind that the project process starts from the stage a technology is selected and concludes only after the defect liability period is concluded and the suggested care has to be taken all through this process.

Failure results

A failed trenchless project would lead to damages to surrounding structures and other appurtenances. Signs of this damage, at time, may be visible upon occurrence, but many a times they may not be visible immediately. They would be seen only after a considerable time has passed and the damages, both direct as well as consequential, have grown substantially. For an example, if a sewer or drainage line gets pierced by the drilling machine the overlying road may not collapse immediately. It may take a while before the damaged pipeline gives way and collapses due to imposed loads. Road cave-ins during monsoons are one of the pertinent signs of such failures. In such cases there can be a possibility that the soil surrounding the damaged pipeline would initially get moist and then be pushed in the buried pipeline due to the loading from the road above. The resulting voids then, in turn, lead to such cave-ins. It is actually like having a time

bomb ticking under our roads which would explode after a sufficient time lag from the trenchless project date and lead to immense damages. Remember, we applied trenchless to avoid the same cave-in, but in this case the road structure not only collapsed, the failure also included a failed sewer line, and maybe we might have some more adjacent utilities at the cave-in location like water lines or cables which also might be damaged.

Current situation

Trenchless technology, being a new entrant of construction engineering sector, has a limited sensitisation with the industry stakeholders today, leave aside full knowledge of the activities. This under-sensitisation in turn leads to works being executed with inadequate supervisory interventions today. If we fail in developing the utilities properly, we would be creating Time-Bombs in place of project work locations. Choice is ours, do we want to do that or do we want to supervise the project properly. As an engineer our choice should be the later and in order to do so we need adequate guidelines.

Manual of trenchless project supervision

IndSTT, in order to provide basic guidelines, has published the Manual of Trenchless Project Supervision to assist the project owners and their supervisory engineers in their quest for a successful trenchless project. The manual aims to provide inputs for the project team transforming the project documents into a physical facility. It provides guidelines for different trenchless technique projects so that the reader can cultivate necessary proficiencies for supervisory activities. With growing complexities, technical expectations for project supervisors are also growing and the manual provides guidelines for the following inputs for a successful projects:

- Project implementation
- Quality assurance
- Cost control
- Work scope management
- Risk management
- Staff management
- Communications
- Procurements

IndSTT has also structured a related training program on the manual so that project engineers can use the manual properly and supervise projects successfully. The trenchless project supervisor, representing the service provider or trenchless contractor, plays a key role by directing and coordinating all activities at the projectsite to implement the planned work program and this program is designed to assist him in the desired areas of project supervision.

Conclusion

Trenchless projects are challenging and require appropriate supervisory control. Failures of several trenchless projects have been attributed to bad supervisory control as success depends on proper supervision of activities. As trenchless project activities need to conform to sound engineering practices, only thorough supervisory intervention ensures the desired results. Trenchless technology is relatively a new field of construction engineering with inputs from many core engineering branches and activities require proper sensitization of the complete work scope. To cater to this requirement, IndSTT has recently published the Manual of Trenchless Project Supervision and the interested readers could communicate to IndSTT for the manual and related training on the usage of the manual. EI

The technology utilises remotely controlled equipment or processes to develop or maintain structures.

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