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TRENCHLESS TECHNOLOGY MICROTUNNELING

Khandeshe A.B.[1], Ambhore S.A.[2], Kawade S.R.[3], Jaybhaye D.P.[4], Supekar G.S.[5]

[1, 2, 3, 4,] *Civil Engineering, Jaihind Polytechnic, Kuran*

Abstract — *Trenchless technology stands for sub-surface construction works where trenches or no continues trenches are required to be done. The technology helps in installing, repairing and replacing of water pipes, gas and petroleum pipes and telecommunication cables without disrupting the traffic, normal life style and has minimal impact on economic activity in congested areas and to the environment. This includes a wide variety of methods, materials and equipment capable of doing large scale works using tunnel boring machine or even small scale work like laying of pipes with or without the entry of workers. The method has also proven to be very useful for the army installations. This method will prove to be every economic and time saving and will become a boon to a third world and highly populated country like India.*

Keywords- *trenchless; shaft; microtunneling; conduits.*

I. INTRODUCTION

Trenchless technology refers to a variety of underground construction methods that require minimal trenching or surface disruption. Trenchless methods do require sinking one or several shafts, but eliminates the need for continuous open trenches. Trenchless methods are attractive solutions in areas where difficult ground conditions exist, high groundwater table, or urban settings with highly congested infrastructure render open trench excavation highly undesirable. Such settings may include pipeline routings under a river, an airport, heavily travelled roadways, or railroad line.

In India, trenchless technologies are of particular interest. Continued population growth in many of India's cities has necessitated the development of strong water and sewerage networks, many of which can be constructed using trenchless methods. These development efforts are being lead by central and state government schemes such as the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) – an effort supported by the World Bank, Asian Development Bank, and Japanese Bank of International Cooperation.

This paper presents an overview of the trenchless projects in India; descriptions of several common trenchless methods; some basic criteria for selecting which trenchless method to use; and additional considerations for a project using a trenchless technology, such as shaft design and the execution of a successful geotechnical investigation program.

II. HISTORY OF TRENCHLESS TECHNOLOGY

Micro tunneling was developed by the Japanese in the early 1970's to replace open severs in urban areas with underground gravity sewers. The first micro tunneling project in the U.S occurred in south Florida in 1984. This was a 600 foot crossing with 72" pipes.

Even that knowledge at the time was rather bookish. During the last decade, Indian trenchless markets have seen a substantial growth in the population of drilling rigs – in fact, the population grew from non-existence to the current total of more than 400 operating units. Underground technologies have not developed continuously. For several thousands of years, excavation was carried out with crude hand tools and hard rocks were fractured by fire or by wetting wooden wedges to expand them in holes or cracks in the rocks. The use of gunpowder for rock excavation introduced a revolution in the technology of rock excavation and in the types of projects that could be accomplished.

III. HISTORY OF TRENCHLESS TECHNOLOGY IN INDIA

The city of Mumbai is the first Indian city to adopt micro tunneling and pipe jacking technology to install sewers. The Municipal Corporation of greater Mumbai recently awarded Rs. 34 crores worth micro tunneling contract to an international contractor. The contractor, funded by the World Bank, as part of the Mumbai sewage disposal project, is to install approximately 3700 mm of sewers of diameters ranging from 350 mm to 1400 mm in various parts of the city. The contractor was awarded through International Competitive Bidding (ICB) process.

The near future may bring additional innovations of this caliber but even in the absence of major innovations in technique, there will be a period of continued refinement of these still relatively new techniques. There are needs to improve the range of applicability of techniques, to solve problems that retard the adoption of the techniques and to improve productivity in the use of the techniques. Many of these refinements in trenchless

and other underground technologies will be driven by better theoretical understanding, better materials, and technology improvements outside the direct field of underground engineering - in computer methods, in sensor development, in miniaturization, in artificial intelligence, and in materials technology. Over time, the impact of these continued developments will be large but individual developments may be less noticeable.

1. Need of Project

These problems often give rise to related health and environmental impacts. The oldest underground utility services are usually found close to the surface.

Fig.No:- 3.1. Use of Trenchless Technology

The provision and maintenance of safe and efficient utility services requires more environmentally sound technologies and approaches to ensure public support. Trenchless Technologies, which minimize the requirement for surface excavation, can significantly reduce the environmental impacts of underground utility service installation, maintenance and repair. By minimizing surface disruption, traffic congestion is significantly reduced thereby reducing air and noise pollution.

2. Purpose of Selection of Micro-Tunneling

This micro-tunneling is done under a railway crossing, at Jogeshwari, Mumbai. If open trenching is to be done then we have to stop the traffic of the trains, especially Local train are run an maximum time difference of 4 Minutes. So it is not possible to stop those or done the work in between, so rail way department has taken a design to connect the two pipe lines by micro tunneling.

3 Case study

The micro tunneling is the method of pipe driving without any open cut/trench, in this techniques diameter of driven pipe is less than 70 inches. That means no man entry is allowed or required. The following case study is taken to understand the mechanisms and technique applied.

4. Labour Cost

Sr .No.	Type Of Labour	No. Of Labour	Wages/Day (Rs.)	Total (Rs.)
1	Skilled labour	8	600	4800
2	Mechanic	2	2000	4000
3	Electrician	1	800	800
4	Helper	2	300	600
5	Crane Operator	2	800	1600
6	Pump Operator	1	750	750
			Total Cost/day	12,500 Rs./day

IV. THE METHODOLOGY OF TRENCHLESS TECHNOLOGY

1. Horizontal Auger Boring (HAB)
2. Pipe Ramming
3. Pipe Jacking
4. Horizontal Directional Drilling (HDD)
5. Microtunneling
6. Pipe Bursting

V. CONCLUSION

Micro tunneling and pipe jacking technology has now been widely adopted by many countries to install sewers and others utilities in there built up cities. The remote controlled micro tunneling and pipe jacking operation offers an excellent method to install deep sewers in heavily built up and congested city areas without digging up roads or causing disruption to traffic and other amenities.

The method offers fasters installation of sewers in city areas. The method is expected to benefit most the developing countries to expedite the provision of long overdue public health facilities to their citizens living in congested city areas.

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