ISSN NO: 2769-996X
Date of Publication: 07-05-2023

Modern Methods of Deployment of Underground Communication Networks

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Annotation: Underground communication networks play a crucial role in today's world as they facilitate communication and data transfer between different locations, including homes, businesses, and government entities. To deploy these networks, modern methods are being used that are faster, more efficient, and more cost-effective than traditional methods. This article discusses the modern methods used for deploying underground communication networks, including microtrenching, directional boring, and horizontal directional drilling. The article also presents the results of deploying these methods and discusses their advantages and limitations.

Keywords: Underground communication networks, modern deployment methods, microtrenching, directional boring, horizontal directional drilling.

Underground communication networks are essential in today's world to facilitate communication and data transfer between different locations. These networks consist of various cables and wires that transmit signals from one point to another. Deploying underground communication networks is a complex task that requires significant planning and execution. Traditional methods of deployment involve digging trenches, which can be time-consuming and costly. However, modern methods have emerged that are faster, more efficient, and more cost-effective. This article discusses the modern methods used for deploying underground communication networks and their benefits.

Modern methods of deploying underground communication networks include microtrenching, directional boring, and horizontal directional drilling.

Microtrenching is a method that involves cutting a narrow trench of about 25mm to 50mm in width and 150mm to 300mm in depth using specialized equipment. The trench is then filled with a sealing compound to protect the cables. Microtrenching is fast, efficient, and minimizes disruption to traffic and pedestrians. It is also cost-effective, as it requires less excavation and restoration work.

Directional boring is another modern method of deploying underground communication networks. This method involves drilling a borehole horizontally underground to create a path for the cables. Directional boring is less disruptive than traditional trenching methods, and it can be used to install cables in congested areas where traditional trenching methods would not be practical. Directional boring is also faster and more cost-effective than traditional trenching methods.

Horizontal directional drilling is a method that involves drilling a borehole underground, but in a curved direction. This method is used when a straight borehole is not practical due to obstacles such as buildings or rivers. Horizontal directional drilling is more complex than other methods and requires specialized equipment and skilled operators. However, it is a highly efficient and cost-effective method of deploying underground communication networks.

Deployment of underground communication networks involves several steps, including planning, design, installation, and testing. Here is a general overview of the process:

1. Planning: The first step in deploying an underground communication network is to determine the project's goals and requirements. This includes assessing the terrain, identifying potential obstacles, and considering factors such as cost, time, and resources. A detailed project plan should be created to ensure that all aspects of the deployment are properly coordinated.
2. Design: Once the project plan has been developed, the network design can be created. This involves determining the type and amount of cable needed, as well as the specific equipment required for the

ISSN NO: 2769-996X
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installation. The design should take into account factors such as distance, bandwidth requirements, and potential interference.

3. Installation: With the design in place, the actual installation can begin. Depending on the chosen deployment method, this may involve trenching, drilling, plowing, or another method. The cables and equipment are carefully installed, taking care to ensure that everything is properly grounded and protected.
4. Testing: Once the installation is complete, the network must be tested to ensure that it is functioning properly. This includes checking for signal strength, verifying connectivity, and identifying any potential issues. Any necessary adjustments can be made at this stage to ensure that the network is working as intended.
5. Maintenance: After the network is up and running, ongoing maintenance is required to ensure that it continues to function optimally. This includes regular inspections, repairs, and upgrades as needed[1].

Overall, deploying an underground communication network requires careful planning, precise execution, and ongoing maintenance to ensure that it is functioning correctly and meeting the needs of the project.

There are several modern methods of deploying underground communication networks, depending on the specific needs of the project and the available resources. Some of these methods include:

1. Trenching: This is a traditional method that involves digging trenches in the ground and laying communication cables inside them. The trenches can be dug by hand or with heavy equipment, and the cables are usually protected with a layer of sand or gravel to prevent damage.
2. Horizontal Directional Drilling (HDD): HDD is a method of installing communication cables underground without the need for trenches. It involves drilling a hole underground and then pulling a cable through the hole. HDD is useful when there are obstacles, such as roads or buildings, that make trenching difficult.
3. Microtrenching: Microtrenching involves cutting narrow trenches in the ground and laying communication cables inside them. This method is faster and less disruptive than traditional trenching, making it a popular choice in urban areas.
4. Plowing: Plowing involves using a machine to cut a shallow trench in the ground and lay communication cables inside it. This method is faster than traditional trenching but is not suitable for all types of soil.
5. Jetting: Jetting involves using a high-pressure water jet to create a narrow hole in the ground and then pulling a cable through the hole. This method is suitable for soft soils and can be used to install communication cables quickly and efficiently[2].

Overall, the choice of deployment method will depend on a variety of factors, including the specific needs of the project, the terrain, and the available resources.

The deployment of modern methods of underground communication networks has resulted in faster and more efficient deployment, reduced disruption to traffic and pedestrians, and cost savings. Microtrenching has been successful in urban areas where space is limited, and directional boring has been successful in congested areas. Horizontal directional drilling has been successful in areas with obstacles such as rivers and buildings.

While modern methods of deploying underground communication networks offer significant advantages, they also have limitations. For example, microtrenching may not be suitable for areas with high traffic or areas with hard surfaces such as concrete. Directional boring may not be practical in areas with rock formations or hard soil, and horizontal directional drilling may not be practical in areas with existing infrastructure such as gas or water pipelines.

Conclusions And Suggestions:

[1] D. Dekker, D. Hainsworth and W. McKeague, "Requirements for UndergroundCommunications", *Proc. 1996 Mining Technology Conference*, Fremantle, WesternAustralia, pp. 102-109, Sep. 1996.

[2] *Private Digital Cordless PBX Adjunct System*, Voxson International Pty Ltd, Pinkenba, Australia 1997

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Modern methods of deploying underground communication networks are faster, more efficient, and more cost-effective than traditional methods. However, each method has its limitations, and careful consideration must be given to the site-specific conditions when selecting a method. Future research can explore new technologies that can overcome the limitations of current methods, such as developing new equipment that can drill through hard surfaces or soil. Additionally, more research is needed to evaluate the long-term durability and reliability of underground communication networks deployed using modern methods.

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