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Optical Cable Pre-Construction Survey

Abstract
Pre-construction site survey is one of the most important steps in the engineering and placement of a new optical cable. During this survey the placing supervisor will be able to observe any unusual situations that require special attention.

Keywords
Stationary Reel Method, empty innerducts, sub-ducts, microducts, Intermediate-feed manholes

Introduction

One of the most important steps in the engineering and placement of a new optical cable is the pre-construction site survey. During this survey the placing supervisor will be able to observe any unusual situations that require special attention. The proposed placing route will be evaluated for its suitability to support the planned placing procedure. One of the main objectives of the survey is to discover all potential pit falls in the proposed placing operation so they may be compensated for in the final procedure used.

General Issues for All Pre-Construction Surveys

• If possible, select a right-of-way that contains existing telecommunications infrastructure

• Before any visit is made to a prospective construction site, an up-to-date plot plan shall be obtained showing the location of existing utilities that will affect the cable construction operation. The plot plan shall be noted with details characterizing each utility and phone numbers to call if there are problems.

• Select a route that provides easy access for workers, equipment, and materials.

• The placing right-of-w ay shall have a spacious and safe staging area convenient to the job site.

• The staging area shall be a location in which cable reels can be unloaded and stored prior to use. It shall also be a location at which fiber measurements can be made. It shall be secure from vandalism and theft.

• The job site shall be protected from both pedestrian and vehicular traffic.

• Splice locations shall be selected on the basis of their ability to serve as a good cable feed or cable pulling locations or as the location where fiber branching occurs.

• Placing operations in all types of plant (aerial, buried, and underground) is normally easier when done downhill. Try to configure the placing operation downhill.

• As optical cable is placed, care must be taken not to kink, distort, or crush the cable. The cable manufacturer's recommended minimum diameter shall be maintained, if no diameter is recommended, use the minimum diameter listed below for the cable.

Cable under no load, Minimum bend radius 15 × Cable Diameter
Cable under load, Minimum bend radius 20 × Cable Diameter

• All splices and locations where human contact may result in exposure to metallic components need to be properly bonded and grounded to an earth ground.

• Sufficient space must be provided around the start of the cable placement location (manhole, handhole, or pole) to provide a gentle transition for the cable being placed from the reel into the sub-duct system or onto its messenger strand. Usually 20 to 50 feet of unobstructed space shall be available at the stationary feed reel and pulling equipment for an unobstructed and smooth cable transition. sterlitetechnologies

• When pulling cable, the placing operation shall be arranged to have the cable enter the most difficult bends (bends with the largest included central angle) as early in the placing operation as possible. This will allow the cable placing loads to be as low as possible.

• New construction must follow the National Electric Safety Code; OSHA Safety Requirements; and state, local, and federal guidelines.

• All placing operations require constant high quality communications for the entire placing operation. Radios are the most common means of communications for placing operations. The pre-construction survey should ensure that the radios will work properly in the proposed construction area.

Underground and Buried Pre-Construction Survey

• If possible, select a conduit with empty innerducts, sub-ducts, or microducts already installed.

• Underground or buried utilities should be marked on the ground surface so the construction crew can easily determine where it is safe to dig. Most areas have a “Call Before You Dig” phone number to call for contractors to use to avoid damaging existing utilities during construction. 811 is the designated phone number to call before you dig that connects to your local one call center. Each state has different rules and regulations concerning digging.

• Intermediate manholes require considerable “rigging” to setup sheaves, quadrant blocks, or pulling frames to accommodate any direction changes in the route of cable placement that will assure the safety of the new cable. All of the items used to assist in safely making these directional changes need to be securely chained or tied in place. The pre-construction survey needs to include a visit to all locations where directional changes are anticipated to determine what equipment is required to be assured that there are appropriate tie down locations to support the equipment that will be used.

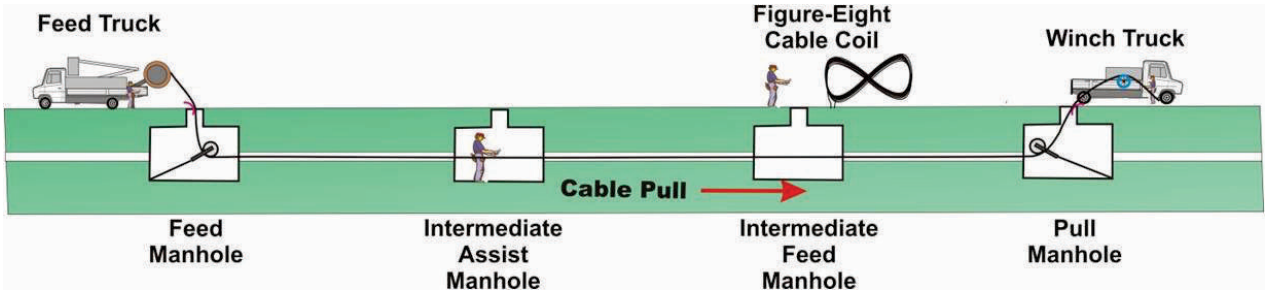

Figure 1 – Schematic Showing Different Types of Manholes

Intermediate-feed manholes are those manholes where cable is pulled to, then the remaining cable is pulled to (for use beyond the intermediate-feed manhole) and stored on the ground at these manholes, and finally the intermediate feed manhole becomes the location from which the stored cable is fed to the remainder of the conduit system to complete the cable placement. The pre-construction survey of these manholes must include an inspection of the manhole to be assured that the appropriate equipment is chosen and the appropriate tie downs are available to enable these manholes to function as feed manholes. In addition, there must be sufficient space on the ground surface adjacent to the manhole to store the cable for the second stage of the placement operation. A flat, secure space approximately 10m ×10m is required to store the cable in a figure-eight pattern.

Intermediate-assist manholes are those manholes near mid-span to provide an assist to the cable placing operation. The assist can either be a manual push assist or a mechanical push assist. More than one assist manhole can be used. It is possible to use mechanical assist equipment to place micro-duct cables that provide air pressure and a push force to assist the cable placement. Intermediate-assist manholes require considerable “rigging” to properly align the assist equipment with the sub-duct system. The pre-survey should visit all intermediate-assist sites to determine the appropriate equipment and if the appropriate tie downs are available.

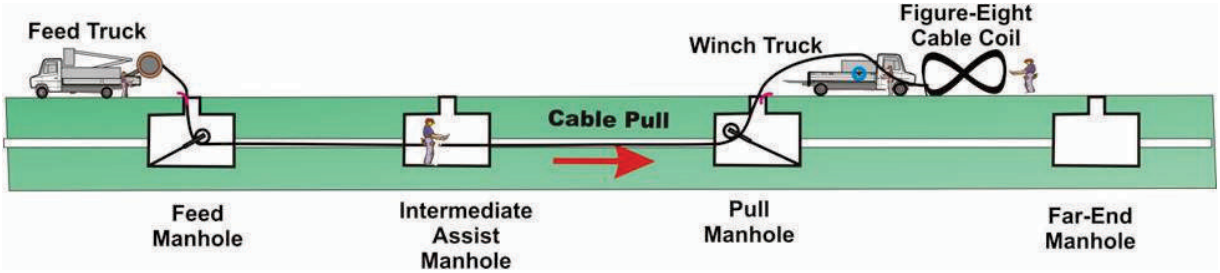

Figure 2– Long Cable Pull with Intermediate Assist Using Figure-Eight Cable Coil

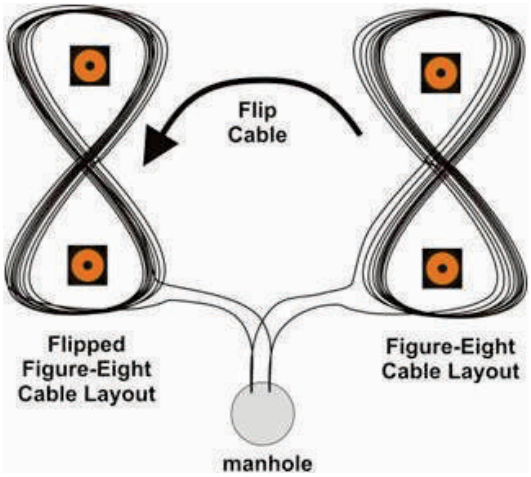

Figure 3– Storing Cable in Figure-Eight Pattern on the Ground Surface at Intermediate-Feed Manhole.

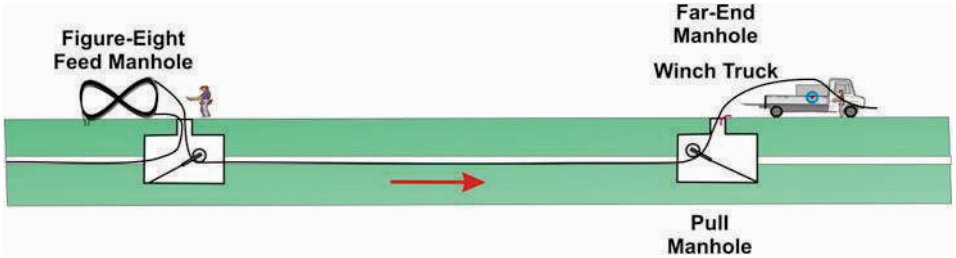

Figure 4– Completion of the Long Pull Using the Intermediate Figure-Eight Manhole as the Feed Manhole

• If placement is planned for buried plant, it may be necessary to dig exploratory holes along the right-of-way to sample the soil to be encountered

• Rocky soils and heavily cohesive soils may need to be pre-ripped in advance of plowing. It may also be necessary to use multiple tractor units arranged in tandem to provide sufficient power to plow the intended communications plant.

• Portions of the right-of-way that may need surface restoration need to be noted during the pre-construction survey.

• All locations where buried plant crosses obstructing facilities need to be visited during the pre-construction survey. Crossing utilities and roadways are usually traversed by tunneling; although with special planning secondary roads can be trenched. For plowed plant, the plowing operation is continued to a tunneling trench that runs parallel to the obstruction and is intended as support for the tunneling operation. Cable and ducting is unreeled and pulled through the tunnel under the obstruction into a tunneling trench at the far side of the obstruction. The plow train or trencher is moved to the opposite tunneling trench and placement can precede by hand feeding the cable and ducting into the plow or trench. It is recommended that a splice handhole or manhole be placed close to and on the far side of a crossing obstruction, allowing a trench to be dug from the tunneling trench to the splice location so that ducts and cables can be hand fed to the splice location.

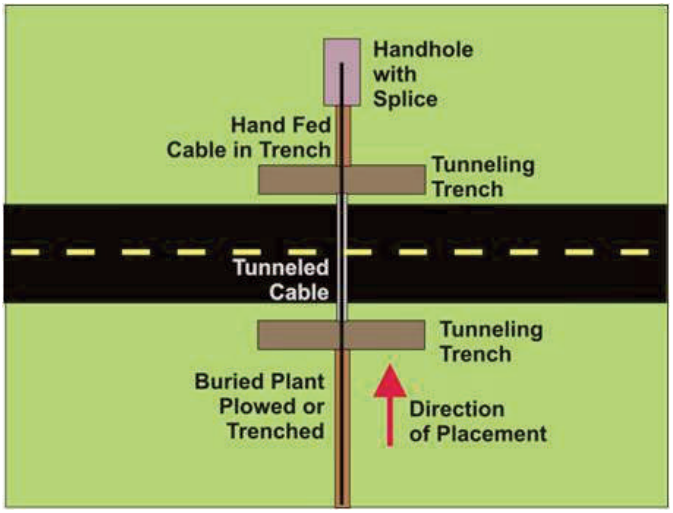

Figure 5– Tunneled Crossing Obstructions

• All anticipated splice locations need to be visited during the pre-construction survey.

• Travel the entire length of the right-of –way to look for features that may present a problem for the placing operation such as streams, gullys, trees, or any unrecorded structures.

Aerial Pre-Survey

The bulk of the information about an aerial placement job will be obta ined by the examination of past records on the same support structures and the visit to the job site on the route survey.

• If the cable is to be placed on structures that also support power transmission equipment, the safety practices of the power utility company must be followed in addition to those of the telecommunications company. National, state, and local requirements and the safety procedures of the power utility company shall take precedence over information contained in this document.

• The overall condition of the support structures should be determined as well as the location on the structures for the new plant should be confirmed.

• A staging location should be located and the right-of-way evaluated for access and the ability to complete the cable placement as planned.

• The hardware setup on the support structure should be determined and the guying system for the poles and support structures that exists must be evaluated for suitability with the new cable.

• Any vegetation issues needs to be determined and if possible corrected. Traffic problems need to be determined and any other situation that may require special action needs to be determined

• Select splice locations that fit the cable logistics, and provide a safe and convenient location for placing, splicing, and repair operations. The equipment and cable reels should be stored in a safe and secure location, safe from vandalism or theft..

• Each splice point should be provided with sufficient cable slack to enable the splice to be made on the ground following the company's normal splice procedures. After cable placement, approximately 2-3 meters of cable will be cut off each cable end to be assured that no fibers are encountered that were damaged from the placing operation.

• Normally an additional 15 to 30 meters of cable are required on the ground to make the splice. If this distance is to be determined more precisely, it is equal the height of the cable on the support structure plus the distance from the support structure to the location of the splice in its vehicle or tent. In addition, at least 5 meters of fiber must be added to make the splice. Company policy shall be followed to determine the amount of extra cable to store as slack cable to enable maintenance operations on the cable route. Cable should be ordered with sufficient

length to provide the slack required to make splices and to repair any cable that needs to be repaired.

• It is important to pick the proper location for the cable reel and winch.The Stationary Reel Method cable reel must be carefully aligned with the first sheave and positioned back about 50 to 60 feet from the first support structure. For cable mounted higher than 15 feet in the air, the cable reel shall be positioned approximately four times the distance back from the support as its height on the structure. As a rule of thumb, most aerial cable should have at least three aligned support structures before the first large misalignment is encountered.

The cable needs to be dead-ended to the support structure at each of the following points:

• At its ends
• Cable line misalignment 20°
Otherwise, if the cable line misalignment is less than 20° a tangent support can be used.

About STL - Sterlite Technologies Ltd

STL is a leading global optical and digital solutions company providing advanced offerings to build 5G, Rural, FTTx, Enterprise and Data Centre networks. The company, driven by its purpose of 'Transforming Billions of Lives by Connecting the World', designs and manufactures in 4 continents with customers in more than 100 countries. Telecom operators, cloud companies, citizen networks, and large enterprises recognize and rely on STL for advanced capabilities in Optical Connectivity, Global Services, and Digital and Technology solutions to build ubiquitous and future-ready digital networks.
STL's business goals are driven by customer-centricity, R&D and sustainability.

Championing sustainable manufacturing, the company has committed to achieve Net Zero emissions by 2030.
With top talent from 30+ nationalities, STL has earned numerous 'Great Place to Work' awards and been voted as the 'Best Organisation for Women'.

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