Application Notes

Grounding of Metallic Component of Cable

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Abstract

Fiber optic cable for any given application is designed considering installation and environmental constraints and requirements of existing/newer communications and remote networks.

Any cable that includes any conductive metal must be properly grounded and bonded in conformance with the comprehensive references to the National Electrical Code (NEC), ANSI and IEEE and NFPA Standards for safety. Proper grounding and bonding is required for the safe and effective dissipation of unwanted electrical current, and specifically for personal and site safety.

Typically, fiber-optic systems do not carry electrical power, but the metallic components of a conductive cable are capable of transmitting current. This would occur if a metallic piece of the cable were to come into contact or close proximity with electrical current from sources such as exposed wiring, faulty electrical systems, lightning or other events. This creates the potential for the occurrence of several hazards, such as electrical shock, fire, damage to electronics and Communication system failures resulting in downtime.

Introduction

Armored cables or composite/Hybrid cables consisting of any metallic part are often installed in a network for added mechanical protection, traceable purpose or for power transmission which in cumulative provides extra protection for the optical fiber with added reliability for the network, lessening the risk of downtime and cable damage due to rodents, construction work and minimizing the requirement of other cables in case of composite cables. This also includes figure 8 Aerial Self-Supported cables containing and metallic messenger or cables attached to a steel strand.

Metallic Components in a cable provides a tough protective covering for cables, transmission of power to remote equipments or tracing the cable with metal detectors. During some fiber-optic installations there is a need to provide extra protection for the cable due to the installation environment. That environment may be underground or in buildings with congested pathways. Installing an armored fiber-optic cable in these scenarios would provide extra protection for the optical fiber and added reliability for the network, lessening the risk of downtime and cable damage due to rodents, construction work, weight of other cables and other factors.

Some of the types of metallic cables are mentioned below:

1. Corrugated Steel Tape
A second type of metallic armor is steel tape. Steel tape covering is wrapped around the cable and then covered with the outer sheathing. It is found in outdoor cables and offers extra mechanical and rodent protection

2. Wire-Braid Armor
Wire-braid armor, is used when light and flexible protection is needed. Wire braid is constructed much like fibrous braid. The metal is woven directly over the cable as the outer covering. The metal used in this braid is galvanized steel, bronze, copper, or aluminum. Wire-braid armor is mainly for where flexible protection is required like shipboard.

3. Wire Armor
Wire armor is a layer of wound metal wire wrapped around the cable. Wire armor is usually made of galvanized steel and can be used over the inner sheath It can be used with the sheath as a buried cable where moisture is a concern, or without the sheath when used in buildings.

4. Composite Wire
These cables contain both fibers and electrical conductors where fiber is used for data communication and conductor for transmitting power for remote equipments such as remoting wireless antennas or CCTV cameras.

5. Traceable Wire
The cable can be traced thought the metal detector and located inside duct or direct buried

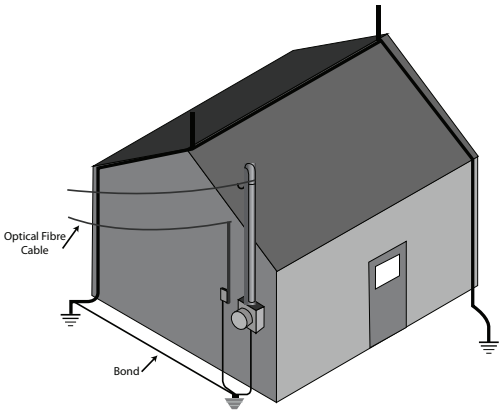
6. Aerial cables (Figure 8). Including cable lashed to a metallic strand.
Messenger is usually made of galvanized steel and can be incorporated together with the cable sheath for aerial self-supported application. Cable can be also attached (Lashed) to a metallic wire/strand.

Why Bond and Ground ?
Proper grounding and bonding is required for the safe and effective dissipation of unwanted electrical currentand it promotes personal and site safety. Typically, fiber-optic systems do not carry electrical power, but the metallic components of a conductive cable are capable of transmitting current. This would occur if a metallic piece of the cablesuch as the interlocking or corrugated armorwere to come into contact or close proximity with electrical current from sources such as exposed wiring, faulty electrical systems, lightning or other events. This creates the potential for the occurrence of several hazards, such as electrical shock, fire, damage to electronics and system failures resulting in downtime.

How to Bond and Ground
Bonding is the permanent joining of metallic parts to forman electrically conductive path that will ensure electrical continuity and the capacity to conduct safely any currentlikely to be imposed.

Grounding is connecting to a common point which is connected back to the electrical source. It may or may not be connected to earth. Earthling is a common term used referring to the connection of the equipment and facilities grounds to Mother Earth. This is a must in a lightning protection systemsince earth is one of the terminals in a lightning stroke. When all the components of a system are properly bonded together and grounded to the earth, the risk associated with electrical current harming personnel or damaging property and equipment is reduced.

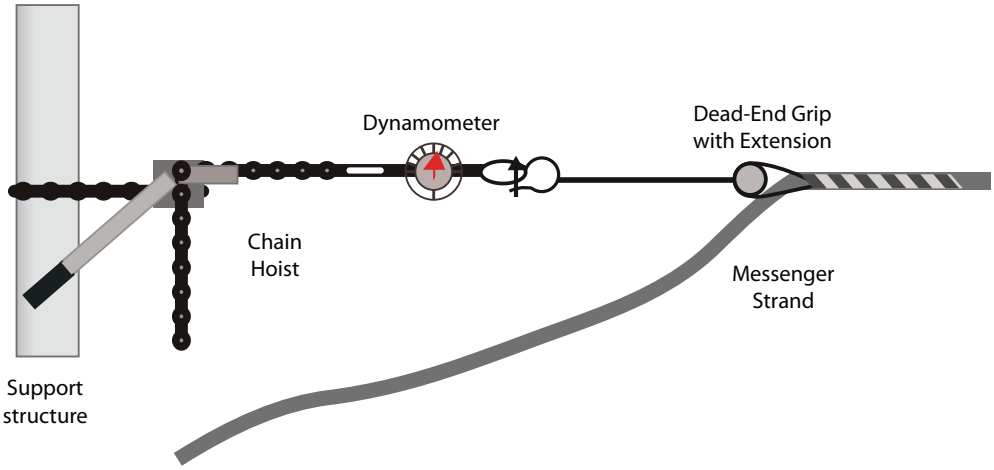
Lightning is an electrical discharge within clouds, fromcloud to cloud, or from cloud to the earth. Lightning protection systems are required to safe guard against damage or injury caused by lightning or by current sinduced in the earth from lightning. Lightning is the nemesis of communication stations and other signal circuits.. Lightning protection systems offer protection against both direct and indirect effects of lightning. The direct effects are burning, blasting, fires and electrocution. The indirect effects are the miss-operation of control or other electronic equipment due to electrical transients.The major purpose of lightning protection systems is to conduct the high current lightning discharges safely into the Earth.



Equipment and building protection is provided by low impedance grounding and bonding between electrical services, protective devices, equipment and other conductive objectsso that faults or lightning currents do not result in hazardous voltages within the building. Also, the proper operation of over current protective devices is frequently dependent upon low impedance fault current paths.

The first step is to conduct the strike to ground safely through purpose designed down conductors by connecting the cable armor to a bonding or grounding electrode conductor. This can be accomplished right after the cable is accessed, and the armor is exposed. A bonding conductor or jumper is a short length of conductor, made of either copper or another corrosion-resistant conductive metal that maintains electrical conductivity between two metal objects. This stranded or solid wire can be insulated, covered or bare. The bonding conductor can be attached to the armor by the use of a listed clamp, lug or connector. Once the clamp is installed, vinyl tape can be applied around the clamp and exposed armor to protect the installer and the fiber from any sharp edges where the armor is exposed.

For Aerial cable,the suspension strand at the pole shall be made electrically continuous throughout its entire length and shall be bonded to other bare cable suspension strands, and on the same pole grounded by connection to ground leads at locations specified by the OSP Engineer. Where the strand is to be grounded to a multi-grounded neutral on a pole which does not carry a vertical pole ground wire, a #6 AWG bare copper wire shall be left coiled and taped to permit it to be extended up the pole and connected to the multi-ground.



For the conductive fibre-optic cable to be fully grounded, the bonding conductor from the cable needs to be bonded to the intersystem bonding termination or another accessible location. The intersystem bonding termination is the device that connects the bonding conductors to the building's grounding electrode and ultimately, to earth. Typically this is accomplished by connecting the bonding conductor to a dedicated path back to the telecommunications main grounding busbar (TMGB) or the telecommunications grounding busbar (TGB). The dedicated path can be a direct run or created by attaching to a rack or cabinet's bonding system that bonds the rack or cabinet back to the TMGB or TGB.

Summary

Design and installation of electrical grounding systems is one of the most important aspect and following correct bonding and grounding procedures is important when working with any cables though it is fiber optic cable. Bonding and grounding of the armour or any other metallic component is essential to protect equipment and minimize the risk of unwanted electrical current that could potentially harm personnel, property or equipment.

Additional Information

If there are additional questions on this topic or other fibre optic issues, please contact Sterlite Tech at:

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