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Optical Ground Wire Cables

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OPTICAL GROUND WIRE CABLES

TECHNICAL FIELD

The present invention relates to optical ground wire (OPGW) cables, and more particularly to the utilization of 200 micron optical fibers in OPGW cables to increase fiber count / density in existing designs and create more flexibility in increasing fiber counts in new designs.

BACKGROUND

OPGW cables are utilized in the utility industry for circuit grounding and telecommunications. Due to existing right of ways, utility companies can effectively and efficiently provide fiber access/broadband leasing to telecommunication companies. The optical fibers are designed and packaged into the ground wire that is typically part of any power transmission line. The ground wire in the transmission lines is used to ground or deflect any potentially damaging high voltage spikes created by, for example, lightning strikes. The voltage is passed to ground, preventing any interruption to power service. OPGW cables are designed to perform this task with the addition of providing a safe place to house optical fiber.

OPGW cables are designed taking into account short circuit, span length, sag allowance, weather conditions, fiber counts, etc. OPGW cables are designed to minimize size while meeting all other criteria to minimize the cost of the cable, accessories, and structures that support the cables. Considering the limited space allowed for optical fibers, there is a limit to how many optical fibers can be designed into these cables. This limit is a concern given the increased demand in bandwidth globally.

DETAILED DESCRIPTION

The invention in this disclosure is the utilization of 200 micron (um) nominal diameter single-mode or multi-mode optical fiber within OPGW cables to increase fiber count/density in existing designs and create more flexibility in increasing fiber counts in new designs. When utilizing 200 um optical fibers in place of traditional 250 um optical fibers it is possible to increase fiber counts/ fiber density, such as by up to or greater than 50%, in existing optical cores/structures for use in OPGW cables. When utilizing 200um fiber in new optical cores/structures, it is possible to increase fiber counts/ fiber density by up to or greater than 100%.

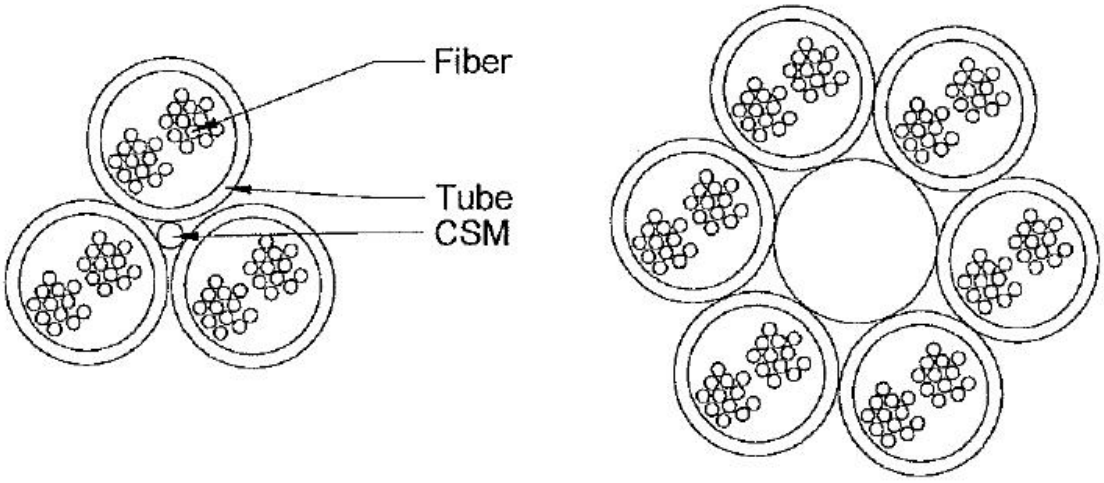
As one example, consider a 48 optical fiber pentacore construction. The traditional cable with 250um optical fibers utilizes three 2.4 millimeter (mm) outer diameter stainless steel tubes, each containing 16 optical fibers. The other two positions in the core are conductive elements. The construction per the invention with 200 um optical fibers utilizes two 2.4 mm outer diameter stainless steel tubes, each containing 24 optical fibers. This leaves three positions for conductive elements, potentially reducing the amount of conductive elements in the outer layer and/or reducing the strength members in the outer layer and/or reducing the weight of the cable.

As another example, consider a centracore construction. The traditional cable with 250 um optical fibers utilizes a 3.0 mm outer diameter tube which contains 24 fibers. The construction per the invention with 200 um optical fibers utilizes a 2.4 mm outer diameter tube for 24 fibers. This results in a smaller cable construction. Alternatively, the cable construction could remain unchanged, except that the construction could contain 32 fibers in the 3.0 mm outer diameter tube.

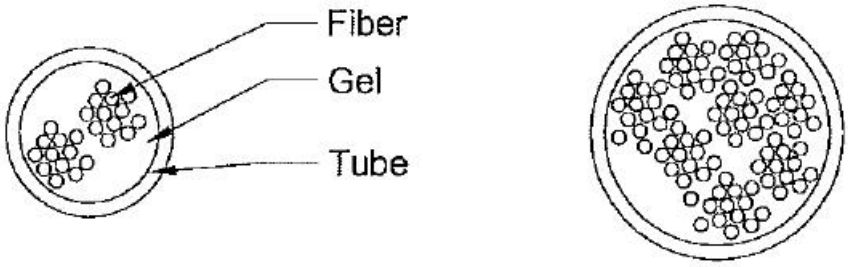
The result is a higher optical fiber density core that can be placed into existing OPGW cable structures and/or added flexibility in designing new high density OPGW cables. Utility companies will overwhelming accept these new designs due to minimal effects in existing design plans and structures and the huge added benefit in fiber counts and leasing revenues.

Examples of various optical cores and OPGW cable structures utilizing 200 um optical fibers are shown below in the Figures.

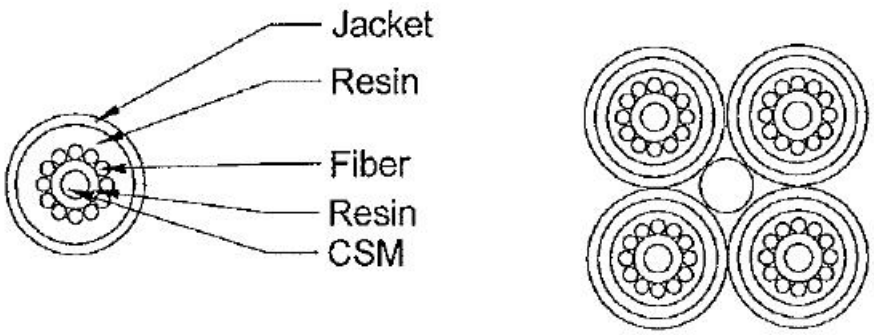
FIGURES



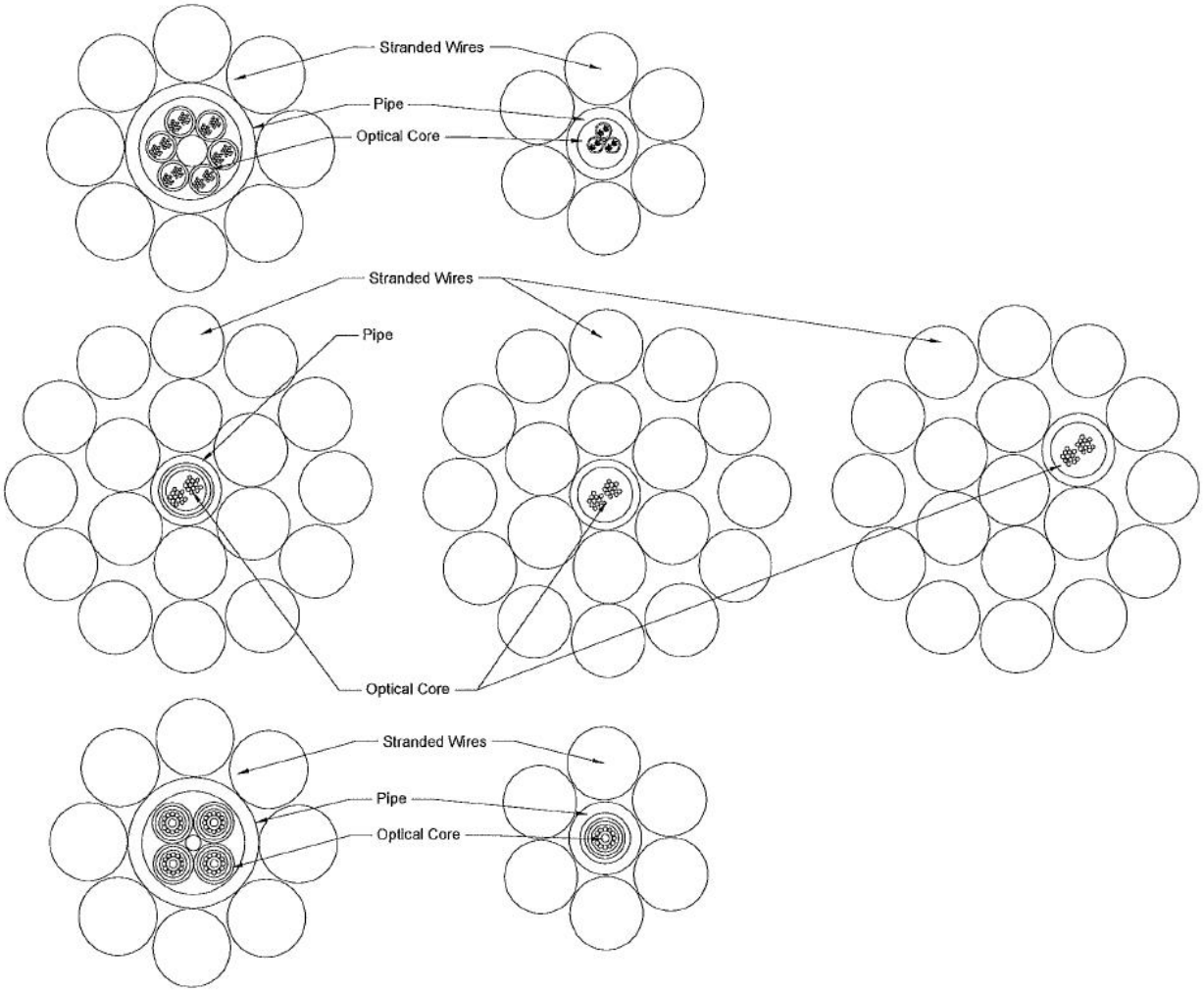
Loose Tube Optical Ground Wire Core (LT-OPGW) - This core typically consists of a central strength member surrounded by helixed tubes that are gel filled or dry blocked and made of plastic. This core is typically placed inside of an aluminum pipe or aluminum extrusion in the cable structure.



Stainless Steel Tube Optical Ground Wire Core - This core consists of a stainless steel tube that is gel filled or dry blocked and placed inside of an aluminum pipe or aluminum extrusion or used straight or helixed in the cable structure.



Tight Structure Optical Ground Wire Core - This core consists of one or many tight structure units. A tight structure unit consists of a center member that has fibers helixed around it encased in epoxies and silicones with an overall jacket. This core is typically placed inside of an aluminum pipe or aluminum extrusion in the cable structure.



Typical OPGW cable strctures which incorporate optical cores as discussed above.