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SERIES L: CONSTRUCTION, INSTALLATION AND PROTECTION OF CABLES AND OTHER ELEMENTS OF OUTSIDE PLANT

Installation of Optical Fibre Ground Wire (OPGW) cable

ITU-T Recommendation L.34

(Previously CCITT Recommendation)

ITU-T L-SERIES RECOMMENDATIONS

CONSTRUCTION, INSTALLATION AND PROTECTION OF CABLES AND OTHER ELEMENTS OF OUTSIDE PLANT

For further details, please refer to ITU-T List of Recommendations.

ITU-T RECOMMENDATION L.34

INSTALLATION OF OPTICAL FIBRE GROUND WIRE (OPGW) CABLE

Summary

The Recommendation refers to Optical Fibre Ground Wire Cable (OPGW) installation. It deals with the factors that should be considered in determining the characteristics of this type of cable, the apparatus that should be used, the precautions that should be taken in handling the reels and the method that should be used to string the cable and joint it.

Source

ITU-T Recommendation L.34 was prepared by ITU-T Study Group 6 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on the 9th of October 1998.

FOREWORD

ITU (International Telecommunication Union) is the United Nations Specialized Agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the ITU. The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

INTELLECTUAL PROPERTY RIGHTS

The ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. The ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, the ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

Recommendation L.34

INSTALLATION OF OPTICAL FIBRE GROUND WIRE (OPGW) CABLE

(Geneva, 1998)

Introduction

Optical fibres are particularly suitable for use as transmission media by means of the aerial power lines in high-voltage networks.

Some of the advantages of optical fibres are:

- low attenuation (long distance between repeaters);
- large bandwidth (high transmission capacity);
- immunity to electromagnetic influences;
- no cross-talk.

For these reasons, they are widely used in high-voltage power lines. There are several types of cable and installation technology.

Among them, OPGW cable technology is specifically designed for high-voltage power line installations. This technology has the advantage of using a necessary cable (ground wire) for communications also.

OPGW has the advantage of using the ground wire of a power line also for communications. However, users of OPGW need to be aware that if the cable fails it may not be repaired quickly. Therefore, an alternative routing for the optical circuits needs to be considered.

These cables consist of a nucleus containing optical fibres and an armour generally composed of one or more layers of aluminium wire, Aldrey metallic wire, steel wire or aluminium-coated steel wire. The additional features of these cables compared to others types of cable are basically as follows:

- greater tensile strength;
- protection of fibres against excessively high temperatures when high current densities occur in the cable.

considering

– that OPGW cables are widely used in high-voltage aerial power lines;

– that their installation is basically different from that of other types of cable;

– that the installation companies may need basic guidelines for installation procedures and methods,

it is recommended

1) that the following factors should be considered in determining the type of cable, maximum tension and the installation plan:
   - maximum short-circuit current through the cable;
   - disconnection time of a short-circuit to earth;
   - sag of the phase conductors;
   - spans;
   - positions in relation to poles;
   - maximum wind speed;

– maximum ice load;

– other aspects such as: risk of atmospheric discharge, fire, discharge of bird-shot, saline fog, aggressive chemical agents in the atmosphere.

2) that the following installation materials and equipment should be used:

– Anchoring units: Used to lash the cable to the poles where necessary, they should be able to withstand installation tensions even under the worst working conditions envisaged (wind, ice) without damaging the cables or affecting their useful life.

– Suspension units: Placed on poles which do not have a cable anchorage to support them. Their characteristics should be the same as those of the anchoring units.

– Vibration suppressors: Used to absorb vibrations produced by the wind.

– Pole clamp element: Used to fasten the cables and splice cases to the poles.

– Payoff reel with a brake in the spin axis: Used to maintain a certain tension in the cable to be installed.

– Cable grips with anti-rotational device: Used to attach the OPGW cable to the pulling rope.

– Sheaves: Located at the poles and used to guide the pulling rope and the cable during the installation procedure:

  To prevent damage to cable during installation, a minimum sheave diameter is needed. That diameter depends on the type of cable, the tension applied to it and the degree of deflection (typically 25 times the diameter of the cable or as recommended by the cable manufacturer).

– Capstan: Used to pull the draw rope.

– Splice cases: Used to house the fibre splices.

3) that the following precautions should be taken when handling the reels:

– Always keep in a vertical position with the ends secured.

– Inspect following transportation to ensure that no damage has occurred.

– Protect reels from bumps and falls.

– Always turn in the direction indicated on the reel.

– Take care to ensure that the ends of the cable are sealed as required to keep out the damp.

4) that the tension method should be used to string the cable:

This is a universal method that can be used in all cases. The procedure is as follows:

– After selecting the tension span, position the stringing equipment in such a way that the cable exit angle is as small as possible in relation to the ground.

– Position the stringing sheaves on the poles.

– If the pulling cable has not been installed, it should be installed in the usual way. The breaking strength of the pulling rope should be greater than the maximum stringing tension. In all cases, the direction of the lay of the pulling cable should be the same as that of the cable to be strung.

– Position the cable grip with anti-rotational device between the pulling cable and the OPGW.

– If necessary, depending on the instructions of the cable manufacturer, an anti-rotational device should be attached to the cable.

- Position the pulling cable on the capstan and start to pull.
- During the stringing operation, sufficient mechanical tension should be maintained to prevent the cable from touching the ground or any other obstacle. Control the speed and maximum tension of stringing so that the recommended values are not exceeded.
- Once the cable has been strung, lash to the first pole, ensuring that the requisite length of cable is left for splicing.
- Place the cable under tension and continue positioning all the suspension or anchoring units in such a way that the corresponding stringing tension of the cable is maintained. In all these operations, the recommended minimum bending radius should be respected.
- When all the lashings are in place, attach the ends to the poles at the beginning and end of the span using clamping elements.
- Repeat the operation for the remaining spans until the whole route has been completed.

5) that the following should be borne in mind in splicing:

Structure-mounted splice cabinet technology is widely used. With this method, once the cable ends are available and prepared for splicing, the splices should be carried out and housed in accordance with the instructions given by the cable and splice case manufacturers. When splicing takes place on the ground, the splice case is subsequently raised to the appropriate height on the pole, the cable being wound and fastened in such a way that the minimum bending radii indicated by the manufacturer are respected.

Midspan splicing technology involving a special splice case to support stringing tensions offers the advantage of allowing the use of random length reels without waste of cable. However, the difficulties presented by this technology in terms of delays in the stringing operation, difficulty of access to the case itself for maintenance, and the need for specially designed splice cases have hitherto discouraged its widespread use.

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