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

Protection of telecommunication cables and plant from biological attack

ITU-T Recommendation L.46

(Formerly CCITT Recommendation)



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ITU-T Recommendation L.46

Protection of telecommunication cables and plant from biological attack

Summary

This Recommendation describes biological attacks and countermeasures for protection of telecommunication cables. It deals with the kinds of biological attack, weakness of cables, features of damage, and considers alternative ways of protecting the plant including dependence on cable position.

Source

ITU-T Recommendation L.46 was prepared by ITU-T Study Group 6 (1997-2000) and approved by the World Telecommunication Standardization Assembly (Montreal, 27 September – 6 October 2000).

FOREWORD

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 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.

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Protection of telecommunication cables and plant from biological attack

1 Scope

There is evidence that the outside of the plant can be damaged from biological attack. Some attacks are localized to particular environments which nurture certain types of infestation. Sometimes movement of the plant away from these areas is enough to avoid damage. More typically, the plant is shielded against attack by preventing penetration of pests some of which are listed in clause 2.

2 The kinds of biological attacks

It is known that cable damage may be caused by:

- mammals, squirrels, mice, rats, moles, gophers and other rodents;
- birds like woodpeckers and cockatoos;
- insects such as termites, ants, beetles, wasps and caterpillars;
- micro-organisms like bacteria, fungus and/or moulds.

3 Types of damage experienced

From an investigation of the damage sustained it is possible to determine the type of pest involved. Typical features of damage are given below.

3.1 Mammals (e.g. squirrels, rats, mice and gophers)

Vertical chiselling of incisors on the edge of irregular holes is typical of the damage caused by rodents.

Spherical or cylindrical holes with smooth walls are characteristic for the attack of moles. The animals are often found in the hole.

3.2 Insects

3.2.1 Termites and ants

Irregular holes that may extend over the whole circumference, looking as though the sheath has been peeled off, are typical of termites and ants.

A mat appearance, to a surface that has been chewed over, is typical of termite gnawing, because they dig and lever upward with their short squat mandibles. Scratch marks and a transverse assault on the cable are characteristic of the ant, which has long, sharp mandibles and adopts a cutting action. In the early stages, the attack is characterized by local gatherings of numerous, small, individual holes.

Ants and termites can give off an acidic secretion that is corrosive to lead.

3.2.2 Beetles, larvae and other insects

Horizontal traces of mandibles of different shapes on the edges of the holes, are indications of attacks by insects and larvae. Circular bores are typical of larvae and beetles. Depending on the angle at which they penetrate the sheath, they may look circular or elongated with a width equal to the diameter of the bore.

3.3 Birds

Irregular nibbles by beaks on the edge of and around irregular holes, are signs of attacks by birds.

NOTE – Earwigs, spiders, pupas and other animals, often invade junction boxes and other open spaces. If the ventilation holes are big enough, even bird-nests, squirrel-nests and mice-nests can be found in the boxes. The debris these animals (in 3.1 to 3.3) produce from their excrements, also contribute to the breakdown of the insulation of connectors and terminal blocks.

3.4 Micro-organisms

Deterioration of the mechanical properties of cellulose fibres and elasticized polymers, is characteristic of attacks by fungi and bacteria. These attacks depend on the material and its manufacturing process.

Local aeration corrosion cells can be produced by the attachment of barnacles, which are tight enough to exclude oxygen. These cells can be the result of bacterial metabolism in a polluted environment.

4 Type of protection

4.1 Positioning of plant in certain locations

Attacks on telecom plants may be confined to certain areas where the conditions allow the pests to thrive. If it is possible to re-route the plant away from these areas, instances of attack and plant damage can be avoided.

Examples of particular environments and the type of biological attacker found in them are shown in Table 1.

Table 1/L.46 – Typical environment for pests

Environment	Pest
Breeding places in rubber estates	Insects
Willow, cascara, scrub oak areas and old trees	Olive beetles
Telecom plant in contact with plants (vegetable) – cable drums-poles-wood debris-bamboo-roots	Insects and larvae
Dry rotting tree roots and wood debris	Termites
Above ground Up to 1.5 m in hard soil Deeper in soft soil	Ants
Polluted soil and water creating anaerobic conditions	Bacterial metabolism
Overhead	Squirrels and birds

4.2 Elimination of the pest

Where it is not possible to re-site the plant one possible action could be to eliminate the pests such as insects and rodents using chemicals or poisons.

It should be noted that some chemicals and poisons are useful as a countermeasure for biological attacks, but they sometimes can also be a danger to humans and cause environmental pollution. Therefore, very careful handling is required when using any chemical method to prevent biological attacks. Also, materials' safety data and other specifications should be referred to before they are

used. Poisons and chemicals should be stored safely in accordance with the supplier's recommendations.

Some chemicals are useful as a deterrent. These chemicals do not work as poisons but they repel the attacker. For example, some chemicals are sprayed on the cable surface and leave a special smell as a deterrent.

4.3 Protection of telecom plant

Another option for protection of the plant is to shield it by the use of protective materials around the plant in order to prevent access. Examples of the way to prevent access of the pests are given in Table 2.

Table 2/L.46 – External measures for protection against pests

Action	Pest
Application of screens over ventilation opening	Squirrels, rodents and birds
Steel net over cable	Squirrels
Tightening of fittings in junction boxes, blocking with epoxy resin casting in small boxes	Ants, insects and beetles
Compact into hard soil around cables and joints	Ants and insects
Cables in small diameter duct to prevent entry	Rats and mice
Galvanized iron guards around the cables as they emerge from the ground	Rodents, ants and insects
Chemical repellents sprayed on telecom plant or spread around it	Insects, spiders and wasps
Covering/repair of damaged duct	Rats

4.4 Cable construction

Cables with sheaths of lead, polyethylene, polyvinylchloride, neoprene and other polymers are all susceptible to attacks. Examples of cable constructions that offer protections are given in Table 3.

Table 3/L.46 – Cable construction for protection against pests

Protection	Pest
Steel wire, fibreglass or aramid armouring	Squirrels and rodents
Steel sheath or steel tape laminate	Birds
Polyamide sheath	Ants and termites
Helical steel or brass tape	Birds (woodpeckers) and termites
Helical steel (0.2 mm) lapping with bituminous compound flooding	Contact with plants induce beetle and larvae attack

Aluminium tape offers limited protection, especially thin foil (e.g. 0.1 mm) that is easy to penetrate. Therefore, the thickness of aluminium tape should be considered carefully.

Cables with steel armouring and/or dielectrical armouring such as fibreglass do not suffer any damage of this type as long as the armour is intact. Discontinuity in the armor leads to damage from beetles and larvae. Openings in the steel armour may have their origin in imperfect splicing and careless repairs, wrinkles and mechanical damage or by corrosion.