

## B03: Rodent protection

### BACKGROUND

Optical cables may be attacked by several species of rodents e.g. rats (*Rattus norvegicus*), water voles (*Arvicola terrestris*) (in Northern Europe) or gophers (in North America). Also other animals may attack cables e.g. termites, woodpeckers (aerial cables in USA) or arctic foxes (in Greenland).

In most cases cables with a standard PE sheath may be installed without any special protection and survive in many years without any damage. In other cases the local conditions are so that unprotected cables may be attacked and damaged.

Due to their relatively small diameter optical cables are more exposed to rodent attack than traditional telecommunication cables. Internationally a vast number of rodent tests have been made on optical cables with different grades and types of rodent protections. Three main conclusions can be drawn from those investigations:

- If the rodent tests are organised under aggravating circumstances only cables with steel armouring gives 100 % protection, this is because these materials are much harder than the teeth of the rodents.
- Also dielectric armour composed of rigid elements (FRP/GRP) with physical and dimensional characteristics carefully selected have proved to be effective under severe conditions.
- Under more relaxed circumstances other means of rodent protection are sufficient, included just to keep the diameter of the cable above a certain figure.

In order to qualify the rodent protection test has been made in order to investigate the merits of different protection means. The figure shows a result of such a test. Only the 3 cables to the left have survived the test, cables with steel armour or dielectric rigid elements (FRP/GRP).



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### TYPES OF RODENT PROTECTION OFFERED BY DRAKA

#### PA 12 (POLYAMIDE 12) OUTER SHEATH

A thin (0.5 mm) outer sheath of PA 12 has been used by Draka Denmark for more than 10 years: Almost 10.000 km of cable has been installed using this type of rodent protection, our experience shows us that this protection is effective under normal conditions in Northern Europe.

The PA 12 outer sheath gives the cables, in addition the rodent protection, a termite protection and a hard smooth surface, which makes the cables easier to draw in ducts. Standard colour of the PA 12 sheath is orange. Optionally this sheath is available in the following other colours: black, blue, red, green, yellow.

The hardness of the PA12 grade used is above 70 Shore D.

#### PP (POLYPROPYLENE OUTER SHEATH)

A thin (0.5 mm) outer sheath of PP has been used by Draka Denmark in the recent years. This rodent protection method has been tested by the Danish Pest Infestation Laboratory, and been found effective. The effectiveness of the PP sheath is due to its hard surface; it is almost as hard as PA 12. The hardness of the PP grade used is 66 Shore D.

#### GLASS YARNS

In recent years the use of glass yarns for rodent protection has become more and more popular.

Draka has developed cables with glass yarns as rodent protection. These cables have been proven to be effective against attacks from small rodents in a test carried out by an independent laboratory.

The function of glass yarns differs from the other rodent protection principles. The glass yarns protects because the rodents, although they can easily penetrate the glass yarns, they don't do it because they find it unpleasant to gnaw the glass yarns.

#### FRP ELEMENTS

This is dielectric armour composed of rigid elements (FRP/GRP) with physical and dimensional characteristics carefully selected.

Flat FRP elements are stranded around the cable core, typically in a construction with double sheathing and the armour between the sheaths.

This means of rodent protection provides the same 100 % protection as steel tape, and in addition the cables becomes dielectric (non-metallic), an advantage because the cables becomes immune towards lightning and towards induced voltage e.g. along electric railways and lines.

#### STEEL

Steel tape or wires are the rodent protection remedy, which is regarded 100 % effective.

#### CORROSION PROTECTED AND COATED STEEL TAPE

The tape is corrosion protected and with a polymer coating

During the cable manufacturing process the tape is corrugated in order to give the cable better bending performance. The corrugated tape is folded around the cable core with an overlap.

This rodent protection gives a 100 % effective protection. The cable is of relatively lightweight, and has a good flexibility.

As standard the tape is 0.155 mm thick. The corrosion protection is a surface layer of chromium and chromium oxide. The chromium and chromium oxide makes the surface very corrosion resistant. On both sides of the tape it is further coated with a 0.055 mm thick polymer coating. A common trade name for this material is Zetabon™.

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### STEEL WIRES

This is metallic armour of galvanized soft steel wire, applied between inners and outer sheath. Available dimensions of the wires are  $\varnothing 0.6$  mm and  $\varnothing 1.0$  mm.

Steel wire armour is often used for heavy duty applications. Compared to steel tape armouring, the steel wire armoured cable possess a higher tensile strength and is more flexible than the steel tape armoured cable. It may often have less crushing strength and is more heavy cables.

The steel wire armour provides 100% rodent protection like steel tape and FRP elements.

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