INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

L.28

(10/2002)

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

External additional protection for marinized terrestrial cables

ITU-T Recommendation L.28

ITU-T Recommendation L.28

External additional protection for marinized terrestrial cables

Summary

This Recommendation describes the external protection devices which can be utilized during/after the laying or during/after the reparation of Marinized Terrestrial Cables (MTC).

Source

ITU-T Recommendation L.28 was prepared by ITU-T Study Group 6 (2001-2004) and approved under the WTSA Resolution 1 procedure on 29 October 2002.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. 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 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.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. 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, 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.

CONTENTS

ITU-T Recommendation L.28

External additional protection for marinized terrestrial cables

1 Introduction

A marinized terrestrial cable is an underwater optical fibre cable, based on a conventional multi-fibre terrestrial cable core construction and protected to withstand the marine environment. It is designed for unrepeatered applications, that is, without underwater line amplifiers, hence without the need of power feeding for submerged equipment and has been tested for use in non-aggressive shallow waters, with a varying repair capability.

The difference with respect to a repeaterless submarine cable can be found in the definition given in ITU-T Rec. G.972.

Cables are designed with a predicted lifetime, taking into account either cable replacement or a certain number of repairs.

For shallow-water cables, the probability of failures is higher than for deep-water application due to environmental phenomena (for example, sea-wave motion, underwater earthquakes and landslides, etc.) and human activities affecting the seabed (for example, fishing, laying and maintenance of other services and cables).

In addition to the various armour usually adopted for the cable construction – for example Rocky Armour (RA), steel wire armouring such as single armour (SA) or double armour (DA), additional external protections could be adopted if needed. Such protections can be applied both approaching the coast in shallow water and on shore in the portion between the water edge and the Beach Joint, or along the cable route where external factors or seabed features could damage the cables.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

– ITU-T Recommendation G.972 (2000), *Definition of terms relevant to optical fibre submarine cable systems.*

– ITU-T Recommendation G.976 (2000), *Test methods applicable to optical fibre submarine cable systems.*

3 Burial and external protection devices

Burial and external protection devices have to be combined in the shore approach and in shallow water in relationship to the seabed feature and human activities. Cable external protection devices and or trenching have to be utilized in areas where some fishing activities or vessel/ship anchoring, etc., could damage the cable itself in spite of the protection already existing in the cable structure construction.

Therefore, where it is necessary to meet the predicted lifetime and the cable reliability requirements during or after the installation/reparation of cable, the following protection devices are adopted:

3.1) In the shore portion (generally defined between the Beach Joint and the 5 m water depth)

The cable should be protected with cast iron shells and buried at least 2-3 m.

In the beach up to the water edge, the cable, where necessary, should also be covered with concrete flat bricks and moored by chains to an anchor block or directly to the beach manhole if present.

If rocky bottom is present in the very shallow water portion, the cable should be anchored to the rock with crossed chains by using set pins. In the case of sand, concrete bags should also be used as extra protection to cover the cable and avoid grabbing or dragging along this section.

3.2) In the shallow water portion (generally defined between 5 m and 30-40 m water depth)

The burial depth, trenching method and external protection devices depend on seabed features and human activities in the interested marine area.

3.2.1) In case of soft bottom (for example, loose sand)

The cable should be buried at least 1 m (for example, by divers or by using jetting methods). In deeper water, along the cable route where possible or convenient, the burial should be performed using plowing or jetting machinery. Usually, due to its softness and loosing, the sand will naturally backfill the trench.

3.2.2) In case of hard bottom

If the hardness of the soil (for example, rocks, biotherm) does not allow burial, the cable should be protected and secured (for example, by means of cast-iron shells duly secured to the soil in order to avoid movements due to sea-wave motion). In areas where these shells are liable to be damaged, the articulated pipe formed by them should be protected by concrete-gravel bags clamped to each other.

Where several cables are foreseen to be concentrated in a rocky shore approach, more additional protection is needed to prevent damage between the cables due to the environment (e.g., friction effects, etc). This protection (commonly known as tube) is in the form of helically wound steel types/wires on each cable at the time of installation. The protection is needed for up to 100 m from the water's edge and in water depths up to 5 m. The pipes can be fixed and protected by mattresses and backfilled using same original rocks.

A proper combination of the above-mentioned methods should be applied when the seabed features change along this section.

Appendix I are shows some examples of possible external cable protection devices.

3.3) Other cable or marine service crossing

When a crossing is foreseen, the cable route and the cable protection, as well as the installation method, have to be determined by the parties concerned (owners of the plant). As a general rule, the crossings between cables shall be performed as near to a right angle (90 degrees) as possible. It is highly recommended that crossing angles minor of 45 degrees be avoided in order to ensure properly operational and maintenance activities. Moreover, cable crossing types shall be chosen to avoid as much as possible the risk of abrasion. For example, if an armoured cable has to be installed over an existing Light Weight (LW) cable, then special coverings shall be applied to armoured cables or special crossing methods have to be implemented where this situation is deemed unavoidable; on the contrary, if a LW cable has to be installed over an existing armoured cable, then it is advisable that a short length of armoured cable be adopted in correspondence with the crossing point.

In the case of a crossing of an already installed cable by gas pipelines, oil pipelines, power cables, etc., the cable should be suitably protected with devices (for example, mattresses or rock dumping) able to prevent any damage during the laying, maintenance and recovery operations of such plants. With this in mind, action should be coordinated between those responsible for the two services.

Similar protection devices should be adopted when a cable has to cross an already existing pipeline if:

– the pipeline carries warm substances (for example, oil ducts in the proximity of the wells), the temperature of which could modify or damage the external sheath or the tar protecting the steel wire armouring of the cable in proximity of the contact point between cable and pipeline;

– the contact between pipeline and cable could lead to the generation of corrosion due to galvanic currents if cathode protection is not used;

– mechanical friction between pipeline and cable, due to the water motion, could damage the cable.

Appendix I

Examples of external cable protection

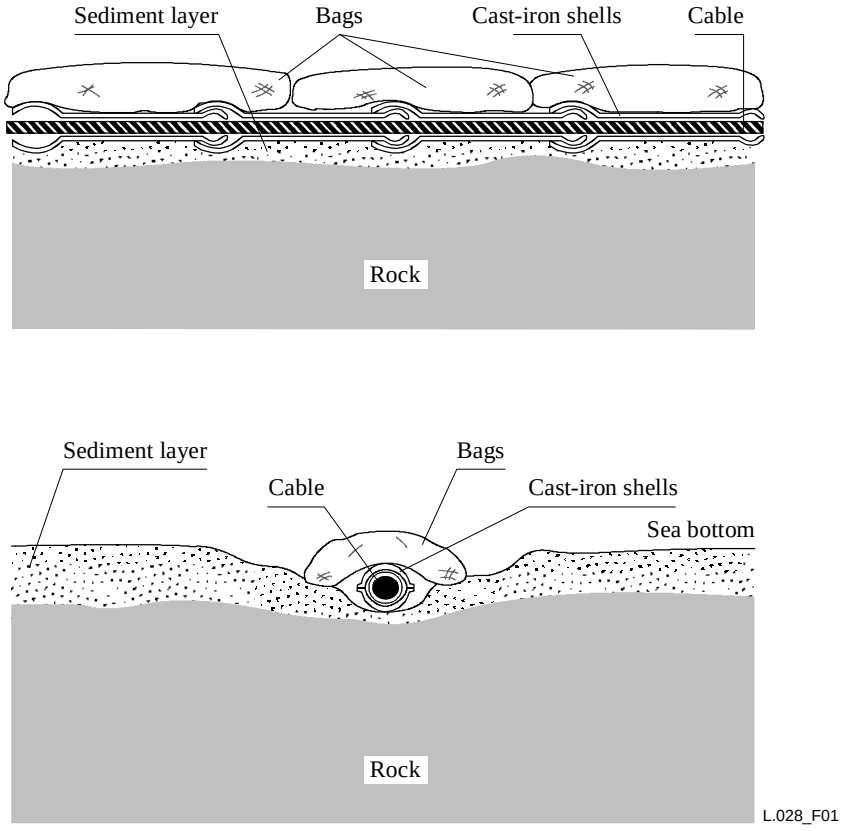

Figure I.1/L.28 – Cable protected with cast-iron shells and sand cement bags

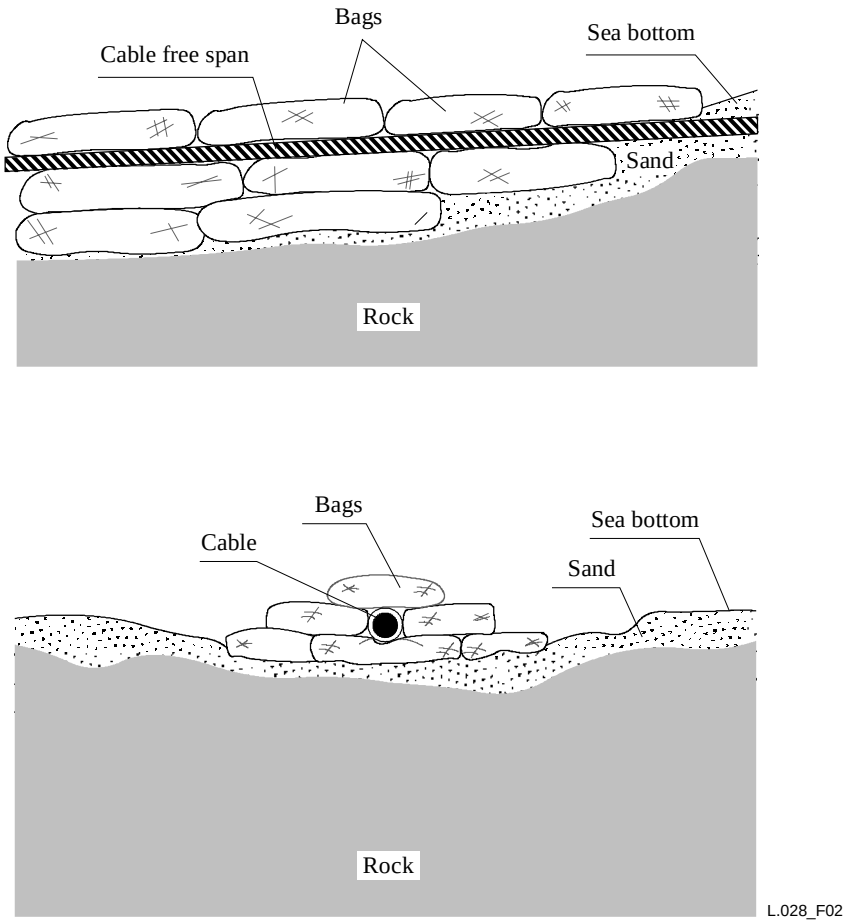

Figure I.2/L.28 – Protection performed by positioning sand-cement bags under, laterally and above the cable

Figure I.3/L.28 – Photo of an example of cable free span reduced using concrete bags

L.028_T04

Figure I.4/L.28 – Photo of an example of external cable protection using cast-iron shells and additional sand concrete bags

Appendix II

Bibliography

– ITU-T Handbook (2001), *Marinized Terrestrial Cables*.

SERIES OF ITU-T RECOMMENDATIONS

Series A	Organization of the work of ITU-T
Series B	Means of expression: definitions, symbols, classification
Series C	General telecommunication statistics
Series D	General tariff principles
Series E	Overall network operation, telephone service, service operation and human factors
Series F	Non-telephone telecommunication services
Series G	Transmission systems and media, digital systems and networks
Series H	Audiovisual and multimedia systems
Series I	Integrated services digital network
Series J	Cable networks and transmission of television, sound programme and other multimedia signals
Series K	Protection against interference
Series L	**Construction, installation and protection of cables and other elements of outside plant**
Series M	TMN and network maintenance: international transmission systems, telephone circuits, telegraphy, facsimile and leased circuits
Series N	Maintenance: international sound programme and television transmission circuits
Series O	Specifications of measuring equipment
Series P	Telephone transmission quality, telephone installations, local line networks
Series Q	Switching and signalling
Series R	Telegraph transmission
Series S	Telegraph services terminal equipment
Series T	Terminals for telematic services
Series U	Telegraph switching
Series V	Data communication over the telephone network
Series X	Data networks and open system communications
Series Y	Global information infrastructure and Internet protocol aspects
Series Z	Languages and general software aspects for telecommunication systems

23098

Printed in Switzerland
Geneva, 2003