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OF ITU

L.82
Amendment 1
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SERIES L: ENVIRONMENT AND ICTS, CLIMATE CHANGE, E-WASTE, ENERGY EFFICIENCY; CONSTRUCTION, INSTALLATION AND PROTECTION OF CABLES AND OTHER ELEMENTS OF OUTSIDE PLANT

Optical cabling shared with multiple operators in buildings

Amendment 1: New Appendix II

Recommendation ITU-T L.82 (2010) – Amendment 1

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Recommendation ITU-T L.82

Optical cabling shared with multiple operators in buildings

Amendment 1

New Appendix II

A new multifibre riser cable structure for FTTH MDU cabling: the Italian experience

Summary

Amendment 1 to Recommendation ITU-T L.82 (2010) adds a new appendix that describes a new cable structure designed and used in Italy to facilitate cable installation in vertical building risers of existing buildings in FTTH deployments.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T L.82	2010-07-29	15	11.1002/1000/10915
1.1	ITU-T L.82 (2010) Amd. 1	2014-12-05	15	11.1002/1000/12413

* To access the Recommendation, type the URL http://handle.itu.int/ in the address field of your web browser, followed by the Recommendation's unique ID. For example, http://handle.itu.int/11.1002/1000/11830-en.

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.

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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.

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Optical cabling shared with multiple operators in buildings

Amendment 1

New Appendix II

1) *Introduce a new appendix, Appendix II after Appendix I.*

Appendix II

A new multifibre riser cable structure for FTTH MDU cabling: the Italian experience

(This appendix does not form an integral part of this Recommendation.)

II.1 Introduction

This appendix describes a new cable structure designed and used in Italy to facilitate cable installation in vertical building risers of existing buildings in FTTH deployments.

II.2 Background

The "Brownfield" scenario (existing buildings) represents the most difficult case for optical fibre installation in Italy, due to the limited availability of telecommunication infrastructure (i.e., ducts from the basement to the dwelling units) and difficulties in obtaining householder authorization for new installations, especially for visible-cable solutions.

One of the most important constraints is the lack of space in the existing vertical infrastructures of multi-dwelling units (MDUs) that could already be crowded by other cables, such as metallic telecommunication cables, TV antennae or CATV coaxial cables and electrical cables. Small diameter ducts could also be an issue. Some examples are shown in the figures below.

Figure II.1 – Examples of existing infrastructures

A suitable riser cable in such an environment shall optimize the following aspects:

– fibre count/diameter ratio
– bending characteristics
– flexibility
– low friction between the inside fibres and the external sheath
– lightweight
– single fibre management and reliability.

It has to be noted that these kinds of properties are also useful for installation inside central offices and data centres, wherever the cable routing between different ODFs, located in different rooms, poses similar technical challenges; moreover, in this case, it is also important to consider the ease of management and reconfiguration, the coiling of extra lengths, etc. This is given here only as general information because central offices and data centres are outside the terms of reference of this Recommendation.

Taking into account the above items, a multifibre cable composed of reinforced single tight fibre cords, stranded together in a loose structure has been developed and used in Italy.

II.3 Multifibre cable

II.3.1 Structure

This cable is made up of a number of single fibre cords, assembled in a longitudinal loose structure (without helicoidal stranding), within an external low smoke zero halogen (LSZH) sheath.

The design of the sheath of this cable minimizes friction during installation in crowded existing ducts, as well as allowing individual fibres to be managed more easily; in particular, the fibres can slip down their respective pathways with ease.

The diameter of a 24-fibre cable should be 8.5 ± 0.5 mm. Also 12 and 8 fibre solutions are available.

The cable can be pre-connectorized in the factory.

II.3.2 Single fibre unit characteristics

The optical fibre used could comply with ITU-T G.657.A1 or ITU-T G.657.A2 fibres. The fibre is surrounded by:

– a 350 ± 50 μm diameter soft coating, easily stripped for splicing operations, that could be added to reinforce the fibre (especially suitable in the pre-connectorized configuration);

– an aramidic yarn strength member, to withstand the pulling forces during the drawing of the cable and while extracting fibres;

– a thermoplastic compound outer sheath of 850 – 900 μm diameter. The friction coefficient of the sheath is low enough to allow the fibre to slip to enable the extraction operation between floors.

The resulting single fibre cords are colour coded.

II.3.3 Cable fibre count and dimensions

The maximum 24-fibre cable diameter is 8.5 mm, with an external LSZH sheath which is 1.25 mm thick.

A structure with 36 fibres is also possible, extending the overall outer diameter to 9.5 mm.

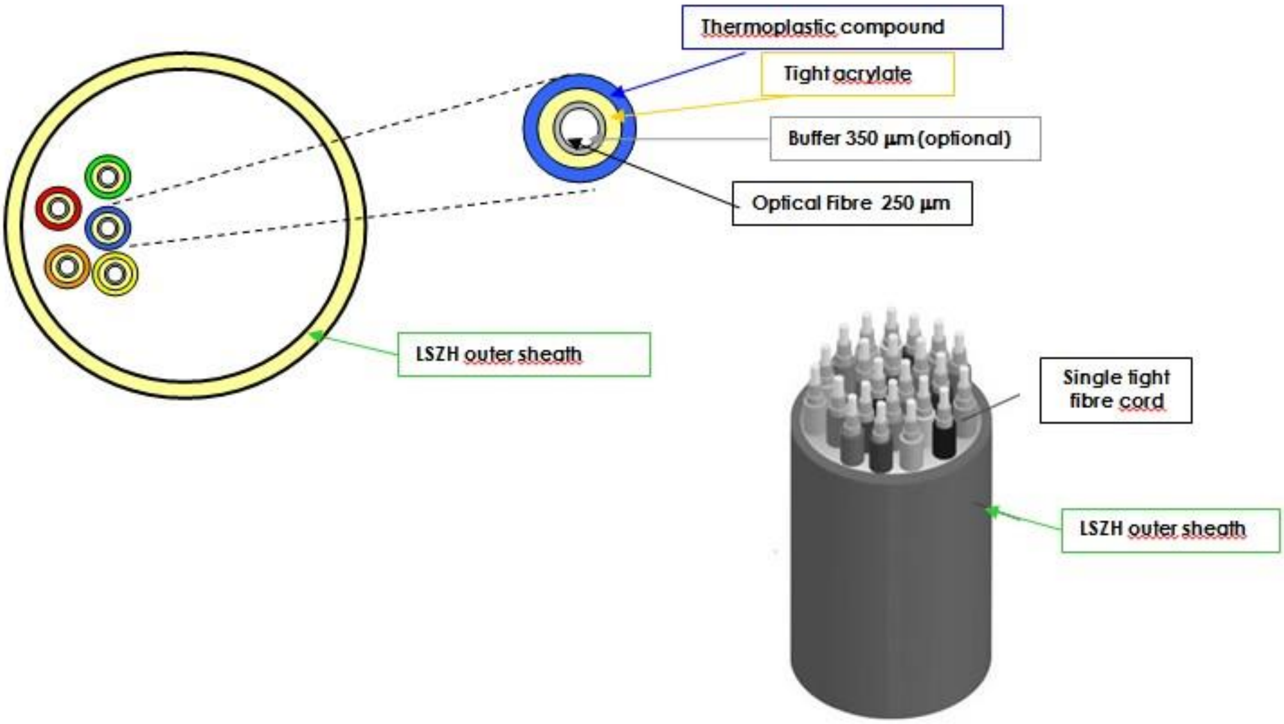

Figure II.2 – Single tight fibre cord and multifibre cable scheme

II.3.4 Connectorization

The cable can be connectorized with a variety of connectors, complying with [ITU-T L.36] and the relevant IEC standards, according to customer requirements.

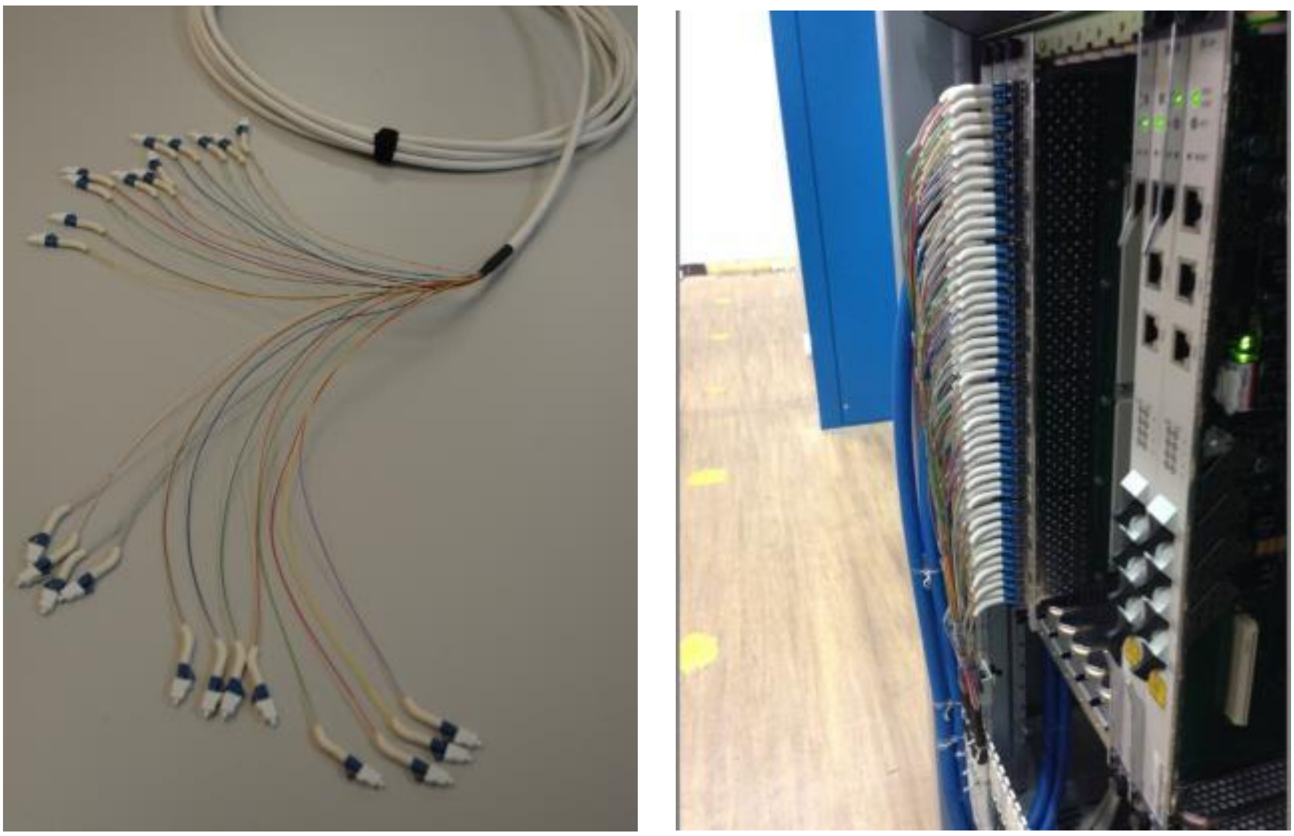

Figure II.3 – Examples of pre-terminated cables

II.4 Cable perfomance

The cable performance has been checked in accordance with IEC standards:

[b-IEC 60189-1] for dimensions (maximum diameter and External sheath thickness);

[b-IEC 60794-1-2] for mechanical tests (method E1 tensile test and attenuation changes, E3 crush, E11 bending, E4 percussion test, E5 stripping force stability of fibres, E10 kink) and environmental tests (F21 thermal cycles);

[b-IEC TR 62222] for fire behaviour (propagation, smoke density);

The connectorized solution has been checked in accordance with a set of test methods from [b-EN 61300-2] and [b-EN 61300-3].

II.5 Installation procedure

Complete solutions developed for FTTH MDU building cabling consist of a basement box, housing pre-connectorized splitters and cable terminations, the multifibre riser cable (with a number of fibres according to the total number of customers), and protection for the extracted fibres and for the splices at floors. Fibres are spliced to a horizontal drop cable to reach the customer wall outlet.

The steps necessary to extract fibres from the multifibre cable (Figure II.4) can be delicate and have to be followed accurately, in order not to damage the fibres:

- a window is opened (Figure II.6) in the sheath of the riser cable, using a calibrated tool (to avoid cutting fibres), at each floor (step n.1);
- a protection shell or small box (Figure II.7) is installed over the opened part of the cable and fixed to the cable, by means of a clamping system, starting from the lowest floor (step n.2);
- the fibres to be extracted at floor "n" (one fibre for each apartment) are identified in the cable at the upper "(n+x)" floor, by means of a colour code, and shall be cut (step n.3). The x value depends on the length of the fibre required at floor "n", in order to reach the appropriate point to host the fusion splice for the future customer connection;
- at floor "n", the fibres are pulled, extracting them for a length corresponding to the distance between the two floors (step n.4). After their extraction the fibres are cut, leaving only the required length necessary to make a fusion splice (about 1 m);
- each extracted fibre is inserted into a protection tube, fixed inside a shell, or in a suitable small box that could contain the splice (Figure II.7).

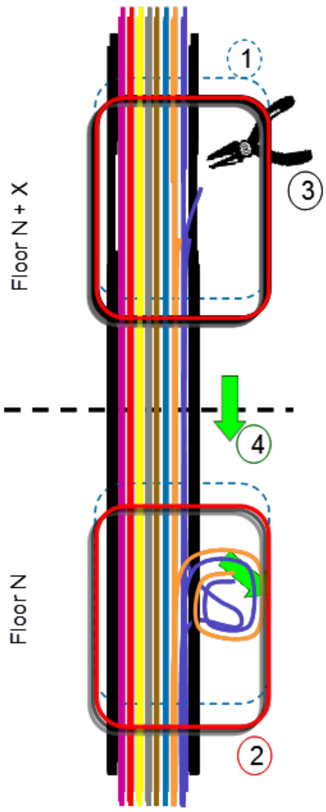

Figure II.4 – Example of fibres extraction procedure from the multifibre cable

In the following pictures some examples of the protection system at floor, for vertical cable and splice, are shown.

Figure II.5 – Riser cable installed in existing infrastructure

Figure II.6 – A window is open on the cable sheath

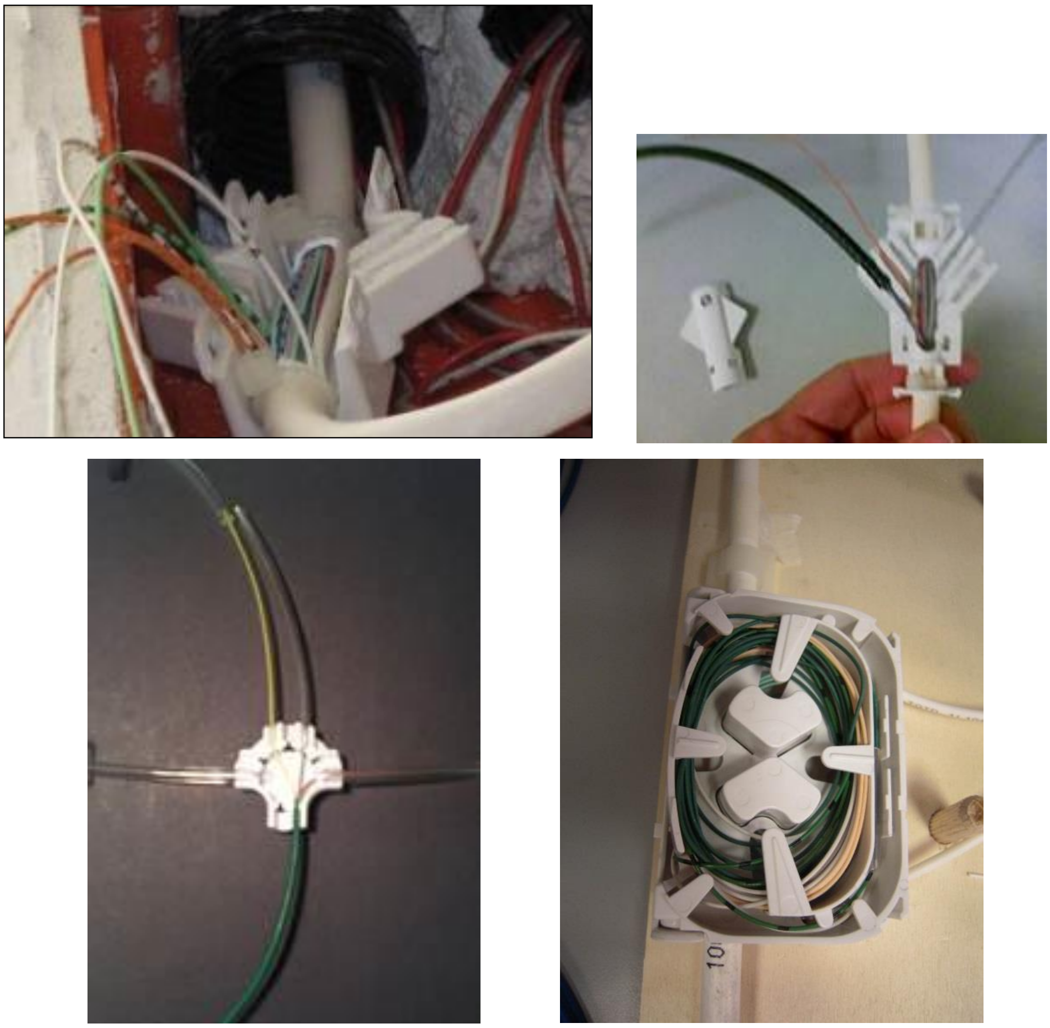

Figure II.7 – Installation of the fibre protection shell (left – different dimensions are available) with protection tubes or splice box (right)

II.6 Conclusions

After extensive trials, this riser cable solution has proved to be effective to tackle the challenges posed by FTTH installation in existing buildings, typical in the "European environment", where it is mandatory to use miniaturized solutions to reach the customer without copper removal.

Moreover, this cable construction has also proved promising for central office and data centre applications, reducing the volume of the cabling itself and at the same time allowing a more ordered routing inside the central office mechanical structures. This is given for general information because central offices and data centres is out of the terms of reference of this Recommendation.

2) *Add the following references to the bibliography*.

[b-IEC 60189-1] IEC 60189-1 (2007), *Low-frequency cables and wires with PVC insulation and PVC sheath – Part 1: General test and measuring methods*.

[b-IEC 60794-1-2] IEC 60794-1-2 (2013), *Optical fibre cables – Part 1-2: Generic specification – Cross reference table for optical cable test procedures*.

[b-IEC TR 62222] IEC TR 62222 (2012), *Fire performance of communication cables installed in buildings*.

[b-EN 61300-2.xx] IEC EN 61300-2.xx series of standards (in force), *Fibre optic interconnecting devices and passive components. Basic test and measurement procedures. Tests.xx*

NOTE – This refers to a series of EN norms, i.e., 61300-2-xx.

[b-EN 61300-3.xx] IEC EN 61300-3.xx series of standards (in force), *Fibre optic interconnecting devices and passive components. Basic test and measurement procedures. Examination and measurements.xx*

NOTE – This refers to a series of EN norms, i.e., 61300-3-xx.

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