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

Protection devices for through-cable penetrations of fire-sector partitions

ITU-T Recommendation L.32

(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.32

PROTECTION DEVICES FOR THROUGH-CABLE PENETRATIONS OF FIRE-SECTOR PARTITIONS

Summary

This Recommendation describes the protection of cables by means of incombustible materials and provides information on the classification and characteristics of the sealing materials. Appendix I contains examples of methods used to apply such systems in fire-sector barriers.

Source

ITU-T Recommendation L.32 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.

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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.

CONTENTS

Recommendation L.32

PROTECTION DEVICES FOR THROUGH-CABLE PENETRATIONS OF FIRE-SECTOR PARTITIONS

(Geneva, 1998)

1 Introduction

Recommendation L.22, "Fire protection", introduces the concept of partitioning a building into fire sectors. The elements of the structure which form the boundaries of a fire sector should have fire resistance in spite of through-cable penetration positions.

The fire resistance of the boundaries should be such as to ensure that the propagation of smoke and fire between fire sectors is avoided before the extinction system is activated.

In view of the large number of through-cable penetrations in the fire-sector boundaries of a telecommunication building, which diminish the effectiveness of the fire-extinction system, an appropriate strategy would consist in adopting passive smoke- and fire-control measures, such as sealing of through-cable penetration positions with fire-stopping materials or the use of cable management (protection) systems.

The type of cable management system will depend on the following factors:

– required fire-rating integrity time for walls or ceilings;
– construction of the fire-sector boundary;
– size of the cable opening;
– permanent sealing of cable penetrations;
– use of reusable/replaceable seals;
– use of inflammable pipes or ducts;
– number and arrangement of cables.

2 It is recommended:

1) that fire-stopping barriers be installed in telecommunication buildings to prevent the spread of fire and smoke through openings in fire-sector boundaries;
2) that the number of through-cable penetration positions be kept to a minimum through the design and management of the cabling network, and that "cable management systems" be used at the penetration positions;
3) that the minimum fire separation time between fire sectors be ≥ 60 minutes, and between higher-risk fire sectors – for example, transformer rooms, rectifier and mains power switching rooms, etc. – ≥ 120 minutes. These recommended requirements may be tested by the method given in standard ASTM E814 or by other nationally authorized methods;
4) that fire stopping materials and cable management systems which fulfil the following conditions be selected:
    a) they prevent the passage of smoke, flames and heat to adjacent unexposed fire sectors during the minimum specified period;
    b) they facilitate the installation of new or replacement cables while maintaining the original safety conditions;

c) they have rapid sealing properties whatever the shape of the penetration opening;

d) they will not modify the environmental conditions, and their chemical composition will not present any health hazard during installation of the fire-stopping barrier;

e) they are resistant to ageing;

f) they are chemically inert with respect to the cables;

g) they have good thermal stability;

h) they are anti-hygroscopic;

i) they have approval certificates from authorized laboratories guaranteeing conformity with the prescribed ratings in respect of correct values:

"F" – nominal value for flame transfer to the unexposed environment;

"T" – nominal value for heat transfer to the unexposed environment;

5) that material selected for cable management systems and fire-stopping devices be:

– *Intumescent*

When heated, they expand, thereby forming a thick coating which provides isolation from the fire. This reaction has the effect of isolating combustible materials from both heat and oxygen, producing diluting gases and reducing inflammable gases.

To obtain a perfect seal, the expansion should be restricted to filling gaps, with the aid of metal collars or thin steel flanges.

– *Sublimable*

When heated, they release non-combustible gases which dilute the oxygen in the vicinity of the protected surfaces, preventing the build-up of sufficient oxygen to feed combustion.

– *Ablative*

These materials produce an incombustible barrier. They are resistant to the transfer of heat and are flame inhibitors.

– *Endothermic*

Materials such as plaster or concrete, which have a high water content in their molecular composition. The heat energy produced by a fire is reduced by vaporization of the absorbed capillary humidity.

APPENDIX I

Examples of the use of fire-stopping materials and cable management systems for through-cable penetration of fire-sector barriers

I.1 Cable penetration through floor openings or grooves

Such openings provide cable access to electric panels, main distribution frames and computing equipment. They are often situated in awkward places, for example under control panels, in corners or beneath suspended floors. They may be up to 250 mm wide and of variable length to accommodate cables of different types and diameters.

I.1.1 Example 1 (see Figure I.1)

One sealing method consists in:

– covering the whole of the opening with a ceramic fibre plate with holes fitting tightly around each cable and held in position with galvanized steel clamps;

– applying a fire-stopping intumescent sealing putty over the ceramic fibre plate, and around each cable and around the perimeter of the opening.

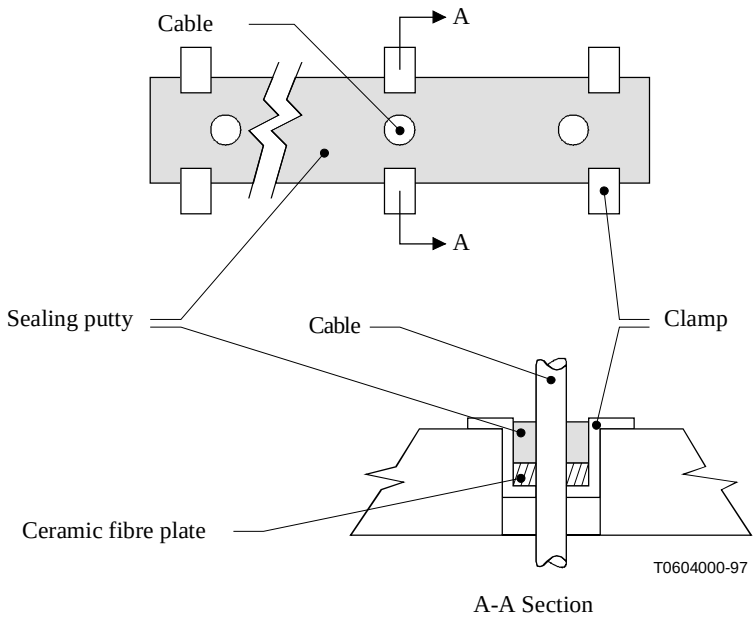

Figure I.1/L.32 – Example of ceramic fibre plate with intumescent putty

I.1.2 Example 2 (see Figure I.2)

The use of fire-prevention cushions as reusable/replacement seals for cable penetrations in fire-sector boundaries with thicknesses ≥ 150 mm or ≥ 75 mm (dry wall).

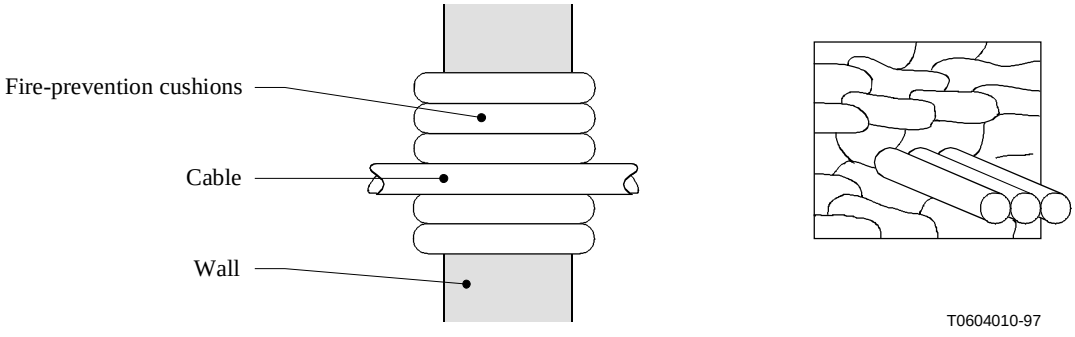

Figure I.2/L.32 – Example of the use of fire-prevention cushions

The cushions are overlapped and applied with a stretcher bond, such that each layer is displaced laterally with respect to the preceding layer. The opening is tightly sealed by pulling on the bags by the eyelets.

For ceiling penetrations, a grid covering the hole is fastened to the underside of the ceiling and the cushions are placed vertically on it.

I.2 Cable-tray penetration position

Cables running between the main distribution frame and switching room are generally carried on cable trays that pass through walls and floors.

I.2.1 Example 1 (see Figure I.3)

The opening is sealed on each side of the wall or floor using two pairs of composite metal plates, each pair being separated by intumescent material. The plates are cut for a tight fit with the cables and extend beyond the opening. They are placed on both sides of the opening and are fixed to the floor/wall. The space or gaps between the cables and between the plates and wall/floor surfaces are tightly caulked with an intumescent sealant.

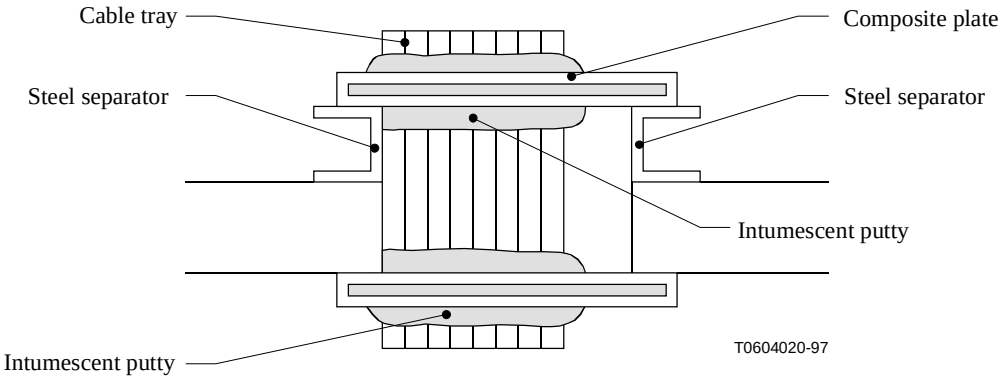

Figure I.3/L.32 – Cable management system for cable trays, using composite plates

I.2.2 Example 2 (see Figure I.4)

For permanent sealing of medium-sized cable penetrations which require frequent alterations to the cabling, fire-prevention bricks are used. These are preformed blocks of foam of intumescent material, but are unsuitable for exposure to weathering or UV radiation.

Under the cable tray the bricks are laid tightly together with joints overlapping and with alternative surfaces top and bottom. Other bricks are cut to fit snugly around the cable tray and cables. The rest of the opening is plugged with bricks, some of which will need to be cut to fit. Any remaining gaps between and around the cables are filled with intumescent putty.

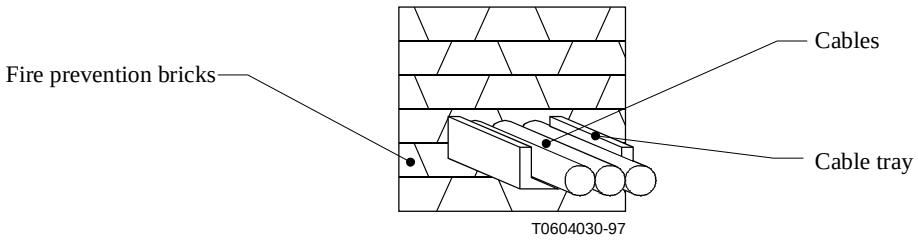

Figure I.4/L.32 – Example of the use of fire-prevention bricks

I.3 Penetration of tubing/cables through a fire-sector partition

The passage of cables through floors or walls of a fire-sector partition can be effected using PVC or metal tubing, which protects the cable from damage, both direct and during installation of the fire-stopping barrier.

I.3.1 Example 1 – For metal or PVC tubing up to 25 mm in diameter (see Figure I.5)

Metal or PVC tubing should be sealed by packing intumescent putty or caulking material between it and the cable(s). The inside space between the tubing and the wall/floor opening should also be caulked.

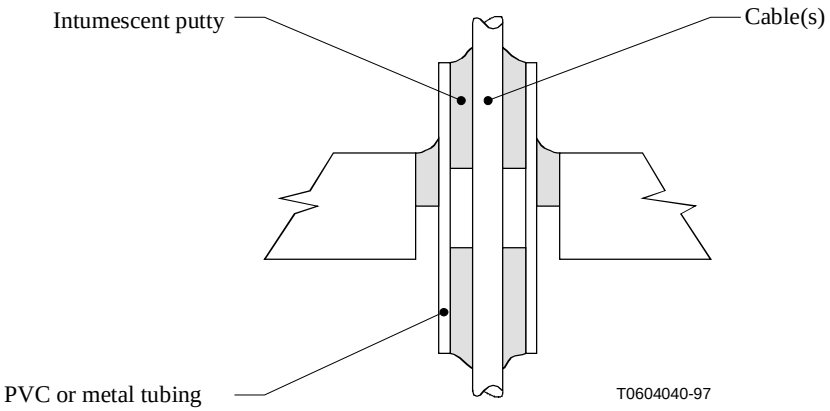

Figure I.5/L.32 – Method of sealing tubes up to 25 mm in diameter

I.3.2 Example 2 – For metal or PVC tubing of more than 25 mm in diameter (see Figure I.6)

Metallic or PVC tubing of more than 25 mm in diameter calls for the use of metal collars coated internally with intumescent putty which, when it expands, will completely plug the gap between the surface of the tubing and the collar.

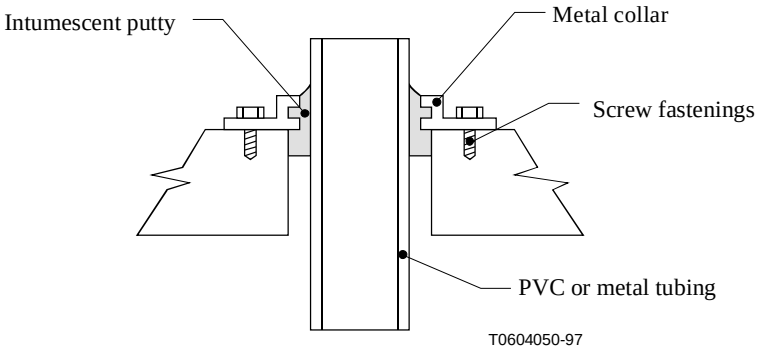

Figure I.6/L.32 – Method of sealing tubes exceeding 25 mm in diameter

I.3.3 Example 3 (see Figure I.7)

For the permanent sealing of single and bunched cables passing through small openings (200 cm^2 in walls or 130 cm^2 in floors) in partitions at least 150 mm thick.

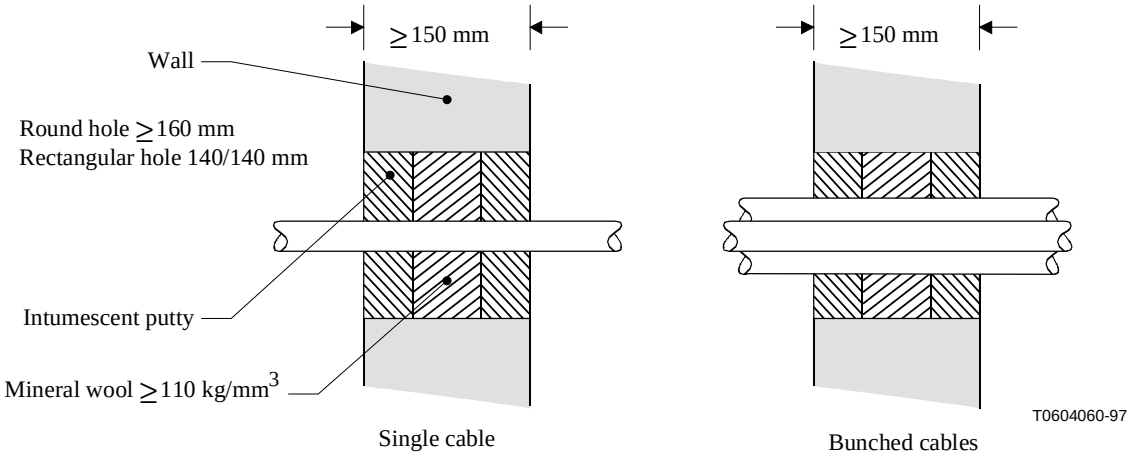

Figure I.7/L.32 – Method of sealing cables directly in a wall

I.4 Penetration of a fire-sector partition in a cable tunnel

An example of the passage of cables through a fire-sector partition in a cable tunnel is shown in Figures I.8 to I.10.

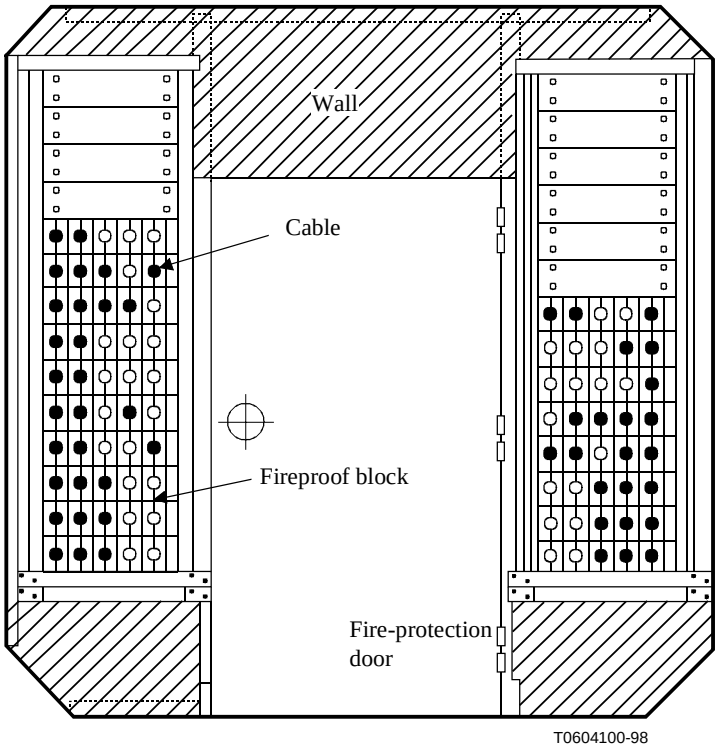

Figure I.8/L.32 – Cable penetration of a fire-sector partition in a cable tunnel

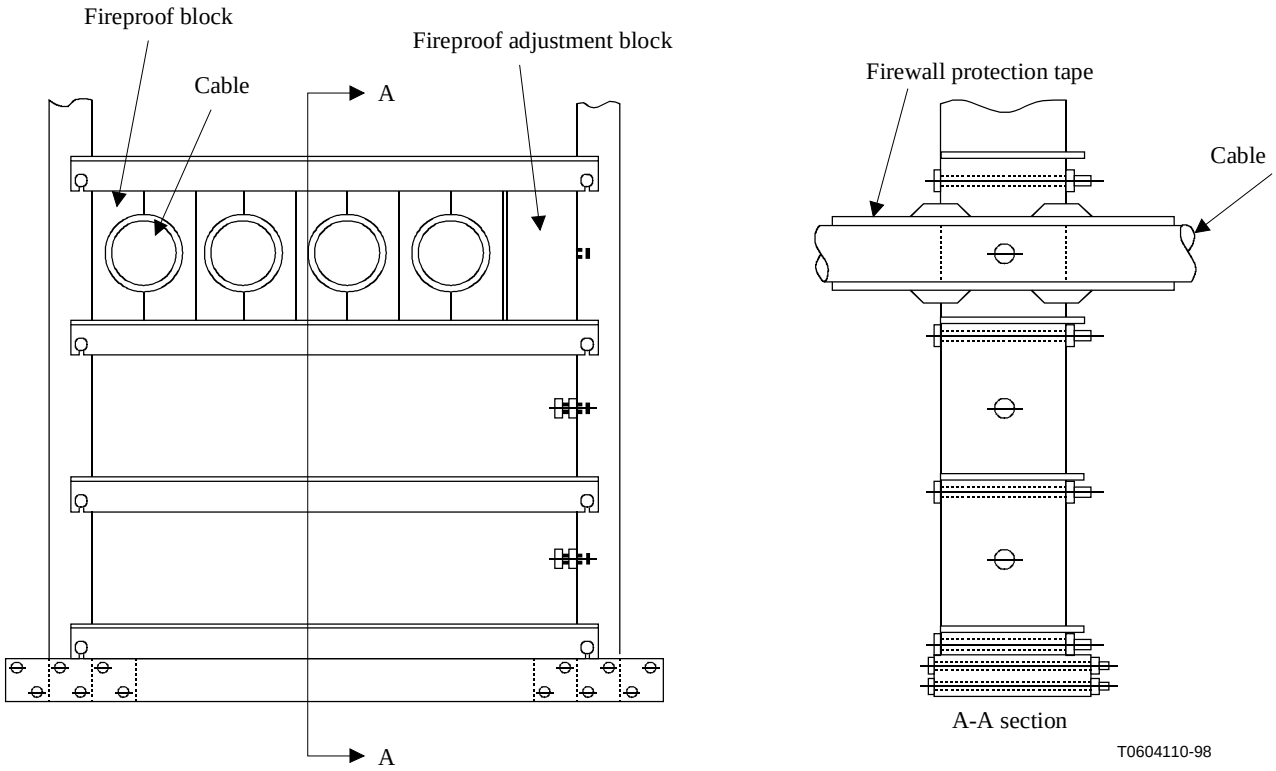

Figure I.9/L.32 – Details of the cable management system in a cable tunnel

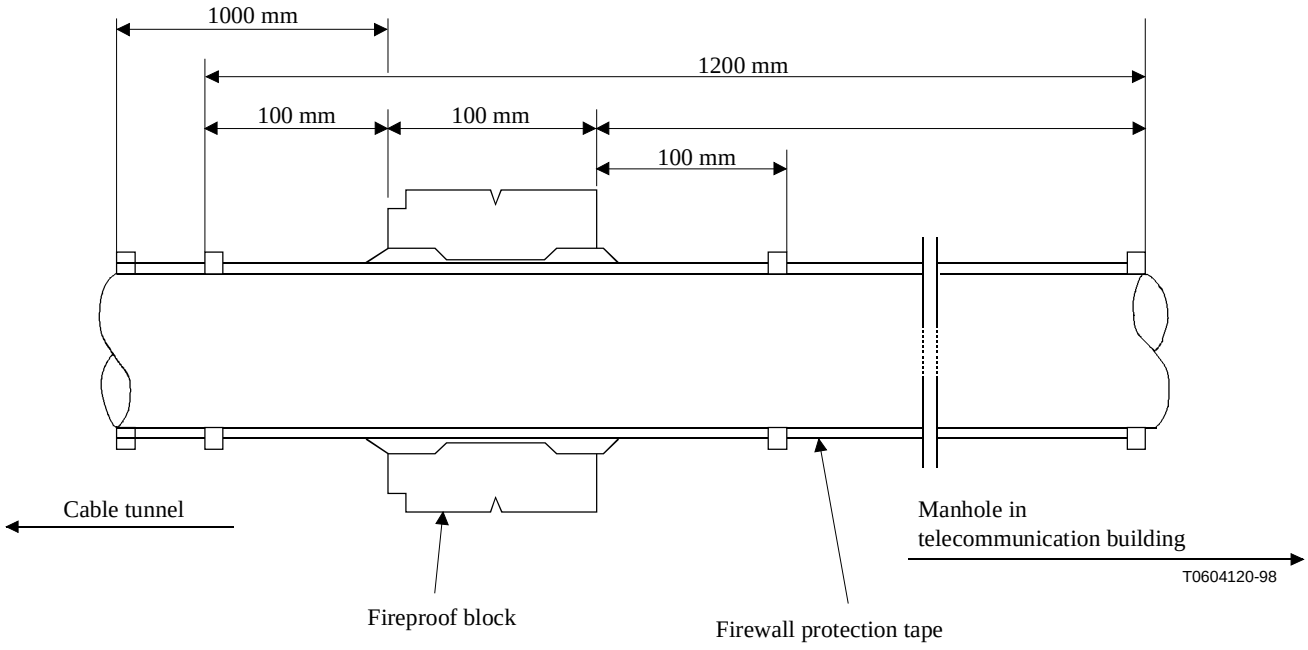

Figure I.10/L.32 – Details of the cable management system in a cable tunnel

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