

Recommendation L.11

JOINT USE OF TUNNELS BY PIPELINES AND TELECOMMUNICATION CABLES,
AND THE STANDARDIZATION OF UNDERGROUND DUCT PLANS

The CCITT,

considering

- (a) that many countries are interested in the joint use of tunnels and are aware of the advantages, disadvantages and specific dangers they hold out;
- (b) that the rules governing this type of ducting vary significantly from country to country;
- (c) that the importance of the joint use of tunnels increases with density of population and shrinking green spaces, i.e. in large towns;

recommend

that administrations who in future will be interested in this type of installation, follow the rules described in this Recommendation.

1. General considerations

Duct tunnels and trenches are constructions containing one or generally more ducts belonging to different networks. Inspectable tunnels include one or more gangways for initial assembly work and subsequent control, maintenance and repair operations. A tunnel without standing room designed for crawling should have a clear internal height of at least 0.8 m. Duct gangways may not be entered.

The above principles apply to inspectable tunnels, and apply by analogy to tunnels with crawling room only.

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APIX-64-E

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AP IX-64-E

- Ducts, Network, Dimension (cross-section), Power (capacity), Material, Protection against corrosion, Number, Distribution priority, Duct routing, Compatibility with other ducts, State of ducts, Repairs, Overhaul, Replacement, Reserves, Extensions, Emergency ducts, Provisional installations, Connections to buildings;
- Roadway, Road width, Pavement width, Green strip, Traffic density, Surface water drainage, Superstructure;
- Subsoil, Type of ground, Groundwater level, Existing ducts, Existing underground constructions;
- Schedules, Beginning of works, Duration of works (stages), Start- up.

devices should be provided at appropriate locations.

High temperatures may occur in tunnels containing heat evolving ducts. Care should be taken to maintain physiologically acceptable environmental conditions in order to avoid any impairment to health during work or inspections. For the telecommunication cables, see 3.3.2.

considered in the light of CCITT Recommendation L.1 [1] Metal components (pillars, racks or supports) should be preferably be made of hot galvanized steel. In some cases, cathodic protection may be applied.

(see section 5).

- Protection against thermal load

Since telecommunications cables are vulnerable to thermal load, thermal conditions in tunnels must be taken into account. This applies especially for optical cables.

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APIX-64-E

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APIX-64-E

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APIX-64-E

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APIX-64-E

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APIX-64-E

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APIX-64-E

6. Standardization of plans for underground ducts in tunnels used jointly for pipelines and telecommunication cables

6.1 Introduction

This paragraph describes the graphic representation of underground ducts in joint trenches or tunnels.

The graphic representation of underground ducts in joint tunnels is standardized in several countries, and we shall therefore confine ourselves to a general presentation in this document. The management of the network concerned is responsible for updating plans and documents.

Plans must contain all particulars required for the operation, maintenance and extension of underground ducts, as well as for their protection and maintenance in working order during repairs.

6.2 Terminology

The term "underground duct" is defined in this document to mean a vector for the distribution of a fluid, connecting the place of production with the place of consumption or drainage. It covers pipelines for electricity as well as telecommunication cables.

6.3 Field of application

Underground duct plans form part of a general information system. These ducts, whether situated in public or in private areas, constitute public networks for distribution and drainage and for the protection of the environment.

6.4 Rules applicable to underground duct plans

Scope of information

Underground duct plans must contain, for the benefit of their users, complete and up-to-date information on:

- the characteristics of the various ducts,

- their location and level,
- their network connections.

Characteristics

Plans must contain all the particulars required for the operation, maintenance and extension of underground ducts, as well as for their protection and maintenance in working order during repairs; they must correspond to the particular features of each network.

Location and level

It should be possible from the plans to determine the position of ducts and duct components accurately, to transpose it to other documents and to relate it unequivocally to official survey points. Measurements must be taken in conformity with current surveying rules.

Network connections

It should be possible to determine from the plans how ducts are connected to the network to which they belong. Overall plans or diagrams will often be required.

6.5 Basic plan

Special rules

The basic plan provides the basic reference for underground duct plans. Its purpose is to map the layout of areas where ducts are situated.

Contents

The basic plan essentially contains information on:

- fixed points (triangulation points, base points, levelling points);
- property limits, frontiers;
- buildings;
- types and boundaries of crops.

6.6 Duct or network plans

Types of plan

The network plan contains references to all the equipment and telecommand devices of a distribution or drainage network. Network plans are of the following types:

- drainage water,
- electricity,

- telecommunication installations,
- district heating,
- gas,
- collective antenna installations,
- water.

Special rules

Every duct or network plan must meet the operational requirements of the network concerned. The following rules shall apply:

- it must contain all legally required information;
- for ducts, it must give information on their development, construction, operation and maintenance;
- it must contain instructions for use in the event of breakdown or malfunction;
- it must supply operators and third parties with information on the location and level of ducts.

Contents

A duct plan generally comprises the following data:

Geometric data:

- Duct location
- Duct level

Duct data:

- Fluid transported
- Managing enterprise
- Function
- Type and content
- Profile
- Dimensions
- Material
- Operational condition

- Construction or duct components
- Identification

Auxiliary installation data:

- Protective devices

Scales

The choice of scale depends on the density of ducts. The scale of the duct plan should correspond, if possible, to that of the basic plan drawn up in accordance with the survey.

The following scales are recommended: 1:100, 1:200, 1:250 or 1:500 according to the concentration of buildings in the area.

6.7 Preparation of plans

Definition

By preparation of plans and data management the capture, updating, processing and representation of all data relating to underground ducts is understood. Any information system for underground ducts can thus be run either manually or by computer.

Surveys

Principles:

Whenever ducts are laid or altered, their location and, if necessary, their level should be surveyed.

If excavations reveal ducts which were hitherto unknown or the location of which had been uncertain, these ducts must be surveyed. This rule also applies to ducts located by detection.

Accuracy

Location:

The accuracy of the points used to locate ducts must comply with land survey rules.

Survey methods

One of the following survey methods must be used:

- polar coordinates,
- orthogonal coordinates,
- distance resection,
- prolongations.

Procedure for preparing plans

- Single-plan system:

The basic plan and duct data should appear on the same medium. Ducts have to be copied onto the basic plan.

- System of separate superimposable plans:

With this system, each level of data appears on a separate sheet. The basic plan, duct data and network data can appear as different data levels.

Representation

Ducts are represented graphically by means of conventional signs described in special standards.

Writing

Writing must be clearly legible and uniform and must be suitable for reduction and reproduction.

6.8 Use data processing systems

General analysis

A very large volume of data on underground ducts needs to be captured, stored, updated, processed and reproduced, and they have to be extractable in different combinations. It is therefore advisable to use computer techniques, since this is the only way of establishing an integrated system of information on underground ducts. Such a system can meet various requirements, such as combining different data levels by the automatic process of separate superimposable plans; it can also produce extracts (plans, lists etc.) with a differentiated content.

An underground duct information system has to be designed as a continuous sequence of operations, including data capture in the field or in the office, memorizing and processing, and the printouts of plans and lists.

6.9 Keeping plans up to date

Updating

Duct plans cannot fulfil their purpose unless they are constantly updated. The following principles should be observed:

- data on new or modified ducts must be collected and processed as soon as work is completed;
- basic plans must be kept up to date.

Access to localization data

Localization documents should be available for consultation at any time between the completion of duct laying and the entry of data in the plan.

6.10 Model plan

Content

The model plan in Annex 3 shows distribution duct pipelines in addition to transport duct tunnels.

Graphic representation

The tunnels and pipelines should be drawn to scale, corresponding in width to the internal diameter of the tubes.

Representation of ducts

So many ducts and cables are usually either hung, laid or fixed inside tunnels that it is not possible to represent each duct individually. They are therefore represented as cross-sections of the tunnel, which are placed next to the pipeline or on separate sheets with an indication of their location.

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AP IX-64-E

Branches, splices, spurs and other details are entered either on the plans or in special files. The distribution ducts for the different fluids should be indicated by conventional signs.

BIBLIOGRAPHY

- [1] Recommendation L.1 "Construction, installation and protection of telecommunication cables in public networks".

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APIX-64-E

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