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ITU-T

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OF ITU

L.22

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

Fire protection

ITU-T Recommendation L.22

(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.

FOREWORD

The ITU-T (Telecommunication Standardization Sector) is a permanent organ of the International Telecommunication Union (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 (Helsinki, March 1-12, 1993).

ITU-T Recommendation L.22 was prepared by ITU-T Study Group 6 (1993-1996) and was approved by the WTSC (Geneva, 9-18 October 1996).

NOTES

1. In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

2. The status of annexes and appendices attached to the Series L Recommendations should be interpreted as follows:

- an *annex* to a Recommendation forms an integral part of the Recommendation;
- an *appendix* to a Recommendation does not form part of the Recommendation and only provides some complementary explanation or information specific to that Recommendation.

CONTENTS

Recommendation L.22

FIRE PROTECTION

(Geneva, 1996)

1 General

Taking into account the serious damage that can occur when fires break out and the importance of fire prevention to the security, service provision and economics of communication systems, there are several aspects that should be considered, such as:

- reduction of the fire-load coefficient;
- division of the building into compartments (fire sectors) to reduce and delay the spread of fire;
- fire statistics.

2 Reduction of the fire-load coefficient

For a fire to start, develop and spread, three factors must take place simultaneously:

- the existence of sufficient quantity of combustible materials (combustible charge);
- the presence of oxygen;
- the temperature to produce ignition of the materials.

From the three factors described above, the most important is the amount of combustible materials in the building. Building designers and Administrations can exert significant control on the use of combustible materials which will be of benefit for fire prevention by reducing the fire-load that would feed the fire. If the extra combustible charge from decorative items and soft furnishings is added, the amount of combustible material (fire-load) reaches a limit which could be dangerous in the event of a fire. For example, in most telecommunication buildings the fire-load is formed by:

- plastic and natural or synthetic wood elements used for floors, dividing walls, partitions, cabinets and suspended ceilings;
- materials of organic origin such as paints, papers and textiles;
- insulating materials, ducts, plastic or rubber equipment parts;
- decorative items and furnishings such as curtains, upholstery and combustible foam padding, carpets, pictures, books and writing materials.

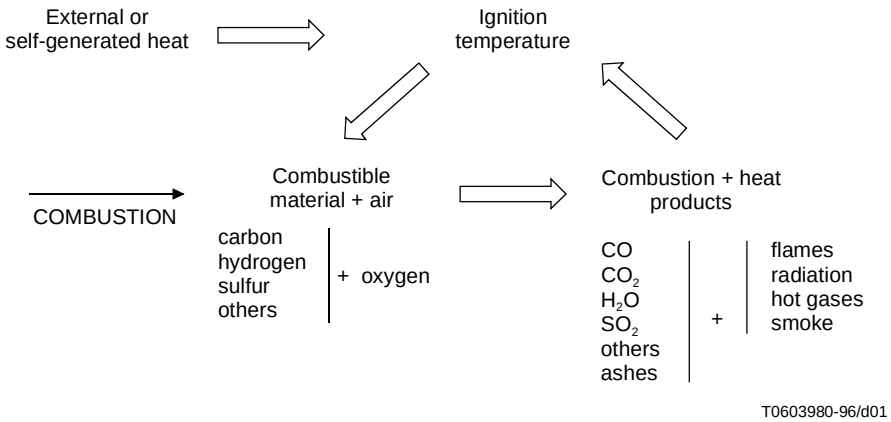

FIGURE 1/L.22 – Combustion process

Exothermic reactions

$$C + 1/2\ O_2 \rightarrow CO + 28.8\ kcal$$
$$CO + 1/2\ O_2 \rightarrow CO_2 + 68.4\ kcal$$
$$H_2 + 1/2\ O_2 \rightarrow H_2O + 57.6\ kcal\ (vapour)$$
$$S + O_2 \rightarrow SO_2 + 78.1\ kcal$$

2.1 Fire-load coefficient

In order to quantify the fire-load, that is, the total quantity of heat given off by all the materials which will burn in a fire, the fire-load coefficient "g" should be calculated for each fire sector (compartment), applying the formula:

$$g = \frac{\sum (G_i \cdot H_u)}{A} = \frac{\sum Q_i}{A}$$

where:

Gi	is the weight of each combustible material expressed in kg
Hu	is the specific heat of each combustible material expressed in Mcal/kg
ΣQi	is the sum of all the heat quantities in a fire sector expressed in Mcal
A	is the fire sector area expressed in m^2

3 Creation of fire sectors

Combustion is an oxidation process which, once initiated, keeps going when combustible materials are heated over their ignition temperature and continue to receive enough oxygen through the air supply. This creates a thermal exchange by conduction, radiation and convection to surrounding materials that encourages the fire to spread. By dividing the building into compartments to form fire sectors, the fire can be contained or delayed from spreading. The compartments are created using partitions of high-performance fire-stopping elements which are difficult to ignite. The degree of fire resistance of the partition elements will depend on the size of the compartments and their use, for example, as offices or storage areas.

4 Fire statistics

Fires are isolated catastrophes affecting a limited number of people and buildings at any one time. Once the fire has broken out, every effort is applied to fighting the fire with the activation of various systems and devices, such as detection systems, alarm systems, extinguisher systems and fire-fighting personnel.

When the fire has been controlled and extinguished, investigations are started to find the possible causes of the fire. The reports produced by the Administration can be turned into fire statistics. These can be taken into account in the design of new buildings and procedures to reduce the outbreaks of fire.

5 It is recommended that

5.1 Fire-loads

In addition to the materials excluded by national legislation, the use of materials which, when ignited, produce an emission of gases:

– that are toxic and harmful to people;

– that are corrosive to telecommunication equipment;

should be reduced as much as possible.

The fire-load coefficient for each fire sector should be minimized, choosing materials for the building and its installations taking into consideration:

– ease of ignition;

– ability to spread fire;

– smoke emission;

– gas corrosiveness;

– gas toxicity.

Materials that are easy to ignite and which produce large quantities of smoke should not be used.

Wherever possible, materials should be used which are marked with internationally-adopted terminology and/or symbols for different flammability and heat transfer conditions:

F Flame transference rating.

H Heat transference rating.

5.2 Fire sectors

To reduce the spread of fire, the building should be divided into fire isolated compartments (fire sectors) (see Annex A). The elements of the structure forming the boundaries of the fire sector should have fire resistance. The degree of fire resistance will depend on the use of each compartment. Fire sector partitions should be made from a combination of non-combustible, self-extinguishing and/or fire-resistant materials.

All entry and exit doors in the partition walls of a fire sector should be self-closing and should be made from materials having a fire resistance at least equal to that of the partitions forming the boundaries of the fire sector.

In compartments (fire sectors) with high risk, such as fuel storage tank rooms, special precautions need to be taken. The prevention of the spread of mobile burning substances and a longer fire containment time for the compartment may be necessary.

Vertical service shafts should be either an individual fire sector or should form part of other fire sectors by partitioning them at each concrete floor with a barrier of fixed or removable elements to provide a specified time of fire resistance (for example, at least 30 minutes).

Ventilation and air-conditioning ducts and shafts should be equipped with the necessary devices to partition them at the places where they penetrate fire sector partitions.

Cable chambers should contain duct seals around cables entering the building to prevent flammable and other gases from penetrating the building.

Where cables penetrate a fire section partition, fire-stopping materials should be used which are easily applied or replaced during future cable installations.

5.3 Escape routes

Escape routes, except through rooms, should be clad with finish materials which limit the surface spread of flame, which do not generate toxic gases and which minimize the generation of smoke.

Doors within the building should be fitted with self-closing devices to prevent the spread of smoke and fire.

Doors which are normally closed should be designed to allow their opening, in the direction of escape, with a quick and easy movement.

5.4 Fire statistics

Each Administration should gather reports on fire breakouts in their telecommunication buildings. The report on each fire should be given in a form that allows analysis of damage and arising consequences, building topology, the performance of fire detection, prevention and extinguishing systems, the performance of staff and the fire service and any other useful feature worth considering.

Administrations should promote the best possible collection of information in order to have better and deeper knowledge and understanding of the causes of fire, the damage inflicted and the effect of building features on the spread of fire. Data obtained in this way should be evaluated and classified for future incorporation and/or modification of the Fire Security Code of each Administration.

5.5 Disaster recovery plan

A hazard assessment of the deposits produced by a fire together with the precautions necessary for their safe removal should be made.

An assessment of the extent of the fire damage should be made in order to decide whether the equipment should be partially or completely replaced. Fire-damaged equipment may function in the short term but then become increasingly unreliable.

Arrangements should be made to provide a temporary service for emergency and other essential services. Consideration should be given to providing a temporary service for non-essential customer requirements.

Annex A

An example of the division of a building into fire sectors

Whole building

Each floor

Each basement floor

Air-conditioning rooms

Battery rooms

Cable chambers

Cable ducts

Chimneys (smokestacks)

Combustible materials storage rooms

Telecommunication equipment rooms

Elevator machinery rooms

Elevator shafts

Entrance halls and stairways

Evacuation routes

Garages

Garbage chutes and rooms

Generator rooms

Kitchens

Offices

Pumping equipment rooms

Rectifier and main power switching rooms

Rest rooms

Store rooms

Transformer rooms

Appendix I

United Kingdom experience

I.1 Building construction

The Building Regulations – Fire safety covering:

B1 – Means of escape

B2 – Internal fire spread (linings)

B3 – Internal fire spread (structure)

B4 – External fire spread

B5 – Access and facilities for the fire service

I.2 Emergency lighting

British Standard (BS) 5266: Part 1

Emergency lighting – Part 1 – Code of practice for the emergency lighting of premises other than cinemas and certain other specified premises used for entertainment.

I.3 Fire safety signs

British Standard (BS) 5499: Part 1

Fire safety signs, notices and graphic symbols – Part 1 – Specification for fire safety signs.

Appendix II

Argentinian experience

IRAM are the initials of National Institute of Rationalization and Materials – Member of ISO (International Organization for Standardization) – COPANT (Panamerican Commission of Technical Rules).

CÓDIGO DE EDIFICACIÓN DE LA CIUDAD DE BS.AS.

LEY DE HIGIENE Y SEGURIDAD EN EL TRABAJO No. 19587, Decreto Reglamentario 351/79.

NORMA IRAM 3570:1963	PUERTAS CONTRA INCENDIO, DE MADERA Y METÁLICAS.
NORMA IRAM 3598:1989	PROTECCIÓN CONTRA INCENDIOS. Prescripciones generales.
NORMA IRAM 3652:1992	PROTECCIÓN CONTRA INCENDIOS. Prescripciones generales para centros de procesamiento de datos.

Appendix III

Japanese experience

Japanese Standards relating to Water Supply for Fire Fighting

Fire Law Enforcement Ordinances:	Clause 27

Japanese Standards relating to Required Installations for Fire Fighting Activities

Smoke exhaust installations

Fire Law Enforcement Ordinances:	Clause 28
Fire Law Enforcement Regulation:	Clauses 29 and 30
Building Standards Law:	Clause 126, Articles 2 and 3

Coupled water sprinkler installations

Fire Law Enforcement Ordinances:	Clause 28, Article 2
Fire Law Enforcement Regulation:	Clause 30, Articles 2 and 3

Coupled water pipe

Fire Law Enforcement Ordinances:	Clause 29
Fire Law Enforcement Regulation:	Clause 31

Emergency electricity outlet installations

Fire Law Enforcement Ordinances:	Clause 29, Article 2
Fire Law Enforcement Regulation:	Clause 31, Article 2

Radio communications support installations

Fire Law Enforcement Ordinances:	Clause 29, Article 3
Fire Law Enforcement Regulation:	Clause 31, Point 2 of Article 2

Appendix IV

United States experience

IV.1 Building construction

United States model building codes: in the United States, there are several different building codes. Different codes are adopted in different areas of the country. The three major building codes are:

- national building code;
- standard building code;
- uniform building code.

IV.2 Fire prevention

United States model fire prevention codes: in the United States, there are several different fire codes. Different codes are adopted in different areas of the country. The three major fire prevention codes are:

- national fire prevention code;
- standard fire prevention code;
- uniform fire code.

IV.3 Fire system installation and related codes

United States National Standards: National Fire Protection Association (NFPA) – National Fire Codes.

IV.4 Telecommunications Equipment Fire Resistance Standards

United States National Standards: American National Standards Institute (ANSI) Standard T1.307, Fire Resistance Criteria.

Summary of Fire Safety Regulations in the United States

In the United States, little fire protection is federally mandated. Employers are required to provide a safe working environment, but the protection from fire is not specified.

Regulations are mandated by state or local jurisdictions. Rather than actually writing the codes from beginning to end, most jurisdictions elect to adopt one of the three model code series. A series includes building, plumbing, mechanical, and fire prevention regulations. The three model code series are:

1) The National Code series which, among others, includes the National Fire Prevention Code and National Building Code developed and published by the Building Officials and Code Administrators (BOCA).

2) The Standard Code series which, among others, includes the Standard Fire Prevention Code and Standard Building Code developed and published by the Southern Building Code Congress International (SBCCI).

3) The Uniform Code series which, among others, includes the Uniform Fire Code and the Uniform Building Code developed and published by the International Fire Code Institute (IFCI).

Membership in these organizations is open, but voting privileges on code changes and related issues are reserved for registered building and fire officials.

The National Code series is adopted in the north-east and part of the mid-west of the United States. The Standard Code series is adopted by the south-eastern states of the United States. The Uniform Code series is adopted by almost all of the states west of the Mississippi River.

The three model code organizations are moving towards developing one code. A joint organization has been created called the International Code Council (ICC) with the responsibility of developing one unified code. The Board of the ICC is made up of 12 seats with four allotted to each of the model code organizations.

So far, the ICC has developed and published a unified Model Plumbing Code which is now available for adoption. They have plans to come out with unified Model Mechanical, Building and Fire Prevention Codes by the year 2000.

Other organizations also develop and publish standards and codes. These are available for adoption by the Model Code Organizations or by the States directly. The one that develops the fire prevention and protection standards and codes is the National Fire Protection Association (NFPA).

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