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Câbles de communication - Partie 2-20: Règles de conception communes et construction - Généralités

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Communication cables - Part 2-20: Common design rules and construction - General

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European foreword

This document (EN 50290-2-20:2016) has been prepared by a joint working group of the Technical Committees CENELEC TC 46X, "Communication cables", and CENELEC TC 86A, "Optical fibres and optical fibre cables".

The following dates are fixed:

• latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2017-07-22
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	2019-07-22

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 50290-2-20:2001.

1 Scope

EN 50290-2-X contains, in its various parts, the requirements for polymeric insulating, sheathing and covering materials that are used for metallic and optical fibre cables (Table 1).

Table 1 — Materials currently used in metallic and optical fibre communication cables (informative)

Standard	Application	Materials	
		Insulation/Buffer	Sheath
EN 50288 (excluding -7)	Multi element metallic cables (data cable)	PE, PP, FEP	PVC, HFFR-LS, FEP
EN 50288-7	Multi element metallic cables (instrument, fieldbus & control cable)	PVC, PE, PP, XLPE, PA	PVC, HFFR-LS ,
EN 50441	Indoor telecom	PVC, PE, PP,	PVC, HFFR-LS
EN 50407	Outdoor telecom	PE, PP	PE
EN 50117	Coaxial cables	PE, PP, FEP	PVC, HFFR-LS , PE, FEP
EN 60794	Optical fibre cables	PVC, PP, PBT, TPE, PA, HFFR-LS	PVC, PE, HFFR-LS, TPE

The materials to be used for EN standardised communication cables are not, and will not be, restricted only to those defined (Table 1). New materials for cables will be described in further parts of the series. The current structure of the EN 50290-2-NN series is outlined in Annex A.

Furthermore, the use of materials described in the EN 50290-2-NN series for other cable applications outside those defined (Table 1) is not prohibited, but it is strongly recommended that expert advice be taken before such use, or before any proposal for incorporation into another standard.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 50396:2005, *Non electrical test methods for low voltage energy cables*

3 Rounding rules

Cable parameters and measured results shall be reported and/or rounded using the rules outlined in EN 50396:2005, Annex B.

4 Polymer nomenclature

The common abbreviations used for polymeric materials are described in EN ISO 11469 and where appropriate have been adopted in the current series. Some additional abbreviations have been defined. The current list of polymers is outlined (Table 2).

Table 2 — Polymers used for Communication Cables (informative)

EN 50290-2-X abbreviation	EN ISO 11469 abbreviation	Material	Comments
PVC	PVC	Polyvinylchloride	Compound containing polymer, plasticiser and filler.
LLDPE, LDPE, MDPE, HDPE	PE-LLD, -LD, -MD, -HD	Polyethylene	
PP	PP	Polypropylene	
PA	PA-6, -12, -66	Polyamide (Nylon)	
SiR	FMQ	Silicone elastomer (rubber)	
PU	PU	Polyurethane	Under consideration
PBT	PBT	Poly(butylene terephthalate)	
TPE	TPA, TPC, TPO, TPS, TPU, TPV, TPZ	Thermoplastic elastomer	
FEP	E/PF	Fluorinated ethylene propylene	
HFFR-LS	na	Polyolefin based compound containing flame retardant additive	See Clause 8
XLPE	PE-X	PE - cross linked or crosslinkable	Silane, peroxide or exposure to e-beam (irradiation)

Some materials consist of a physical blend of different polymers. For the purpose of the current document series, the polymer type is categorised as that of the largest component. Thus a PP/PE blend of ratio 60/40 would be classified as a PP polymer.

5 Maximum operating temperature

The maximum operating temperature of telecommunication cables is based on thermal degradation, heat deformation characteristics and the thermal sensitivity of the dielectric properties. Most normal telecommunication cable applications define the maximum operating temperature as 60°C. This operating temperature can be a result of the external environment, conductor heating or a combination of both. The requirements and test methods may need to be reconsidered in the light of developing power over the Ethernet (POE) requirements. Unless stated otherwise all the materials described in EN 50288-2 are suitable for 70°C operating temperature.

For certain applications (EN 50288-7) higher operating temperatures are necessary (eg. PP, XLPE at 90°C, SiR, FEP >90°C). For these products the focus is more on the potential for thermal degradation.

Thermal degradation (ageing) performance can be demonstrated by techniques such as Arrhenius ageing (EN 60216) or by conventional heat ageing at elevated temperatures. Using the Arrhenius ageing protocol it is possible to predict the life expectancy (typically 20 000h) at a given operating temperature. However, the protocol requires experimental data to be generated at a range of temperatures; generally 30 – 100°C above the required operating temperature. This may be impossible for thermoplastic polymers (which melt typically at 110°C) due to melt deformation, conductor adhesion or changes in performance due to non oxidative causes (eg. (re)crystalisation). In such cases the operating temperature shall be justified by means of historical data on the application.

6 Quality assessment

The current series of documents defines tests, methods and values which are suitable for inclusion in quality assurance standards based on processes such as described in EN ISO 9001. Typically quality assurance processes may require:

- Technical Delivery Specifications. Compound test shall be carried out on granules, moulded plaques, extruded tapes or other suitable specimen produced from granules of compound. This data shall be provided by the compound supplier.

- Batch Quality Certificates. Compound test shall be carried out on granules or moulded plaques produced from granules of compound. This data shall be provided by the compound supplier.

- Type Approval statements. Compound test shall be carried out on cable samples produced from granules of compound. The compound supplier shall make an agreement with a cable maker to access such test data.

- Certificate of Conformity and other technical documents

The detailed definition of these documents is a matter for negotiation between the material supplier and the cable maker. The technical requirements shall be at least equivalent to the values specified in the current series. More demanding or narrower requirements shall be deemed to meet the values defined in the current series.

It is recognised that some tests are useful to monitor material quality and are carried out more frequently. Other tests are more linked to the intrinsic properties of the formulation and are rarely undertaken. Such tests are unsuitable to be included in any Batch Quality Certificate.

7 Usage of own reprocessable material

In principal clean material prepared from extruder purge and material resulting from the disassembly of cables can be reprocessed to the intended application after having been previously processed by the same manufacturer.

The key requirement is that careful production management is needed to ensure the cleanliness of such material. Contaminated material shall be scrapped

The exceptions to this rule are arising materials which contain reactive ingredients such as crosslinking systems and chemical foaming agents. Such materials shall not be reprocessed for the manufacture of new products.

8 Fire Hazard

Fire statistics demonstrate that the majority of fatalities resulting from fire are due to asphyxiation following exposure to incapacitating smoke. The topic is complex as often technologies which reduce the fire intensity result in an increase in effluent hazard. The complete combustion of most polymeric materials results in the formation of carbon dioxide and water which are not considered hazardous. However incomplete combustion will result in the formation of carbon monoxide which is a principal cause of asphyxiation.

Furthermore a product which gives a satisfactory performance in one fire scenario may be completely unsatisfactory in another scenario. The key factors are:

- Product loading/compartment volume/ventilation

- Intensity of fire source

- Product composition. Attributes relating to the yield of heat, smoke and specific chemicals

A number of investigations[1,2] of the potential hazard arising from cable fires have been published utilising hazard criteria derived from ISO 13571. In response to the perceived need for improved fire safety the cable industry[3] has developed cables offering a reduced yield of smoke and incapacitating gases. These cables are marketed using the acronym LFH and are produced using the appropriate HFFR-LS insulation and/or sheathing materials.

9 Health, Safety and Environmental (HSE) Regulation

The European regulation (EC) No 1907/2006 on Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) became effective as of June 1, 2007 and applies to the entire value chain of the chemical industry. Compliance with REACH requires a regulatory evaluation and registration or authorisation for chemical substances, which are manufactured in or imported to the European Economic Area. The materials described in EN 50290-2-X comply with all REACH legal obligations. Specifically the pre-registration shall have been completed for all the additives contained in the materials specified. In addition registration shall also have been completed or be proceeding. Obligations given by an inclusion of substances into the candidate list (substances of very high concerns - SVHC), as well as obligations in regard to Authorisation and Restriction of substances have to be fully observed.

The material complies with Directive 2011/65/EU (Restriction of the use of certain Hazardous Substances in electrical and electronic equipment - RoHS, repealing Directive 2002/95/EC). This Directive prohibits the use of lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyls (PBBs) and polybrominated diphenylethers (PBDEs), bis(2-ethylhexyl) phthalate (DEHP), butyl benzyl phthalate (BBP), dibutyl phthalate (DBP) and diisobutyl phthalate (DIBP) in certain of electronic products defined in the directive. The tolerated limits are < 0,1 wt% for Hg, Pb, Cr(VI), PBBs, PBDEs and phthalates and < 0,01 wt% for Cd.

The material complies with Regulation of the European Parliament and of the council (EC) No 850/2004 of 29 April 2004 on persistent organic pollutants (POPs). This Regulation prohibits production, placing on the market and use of substances subject to the Stockholm Convention on Persistent Organic Pollutants. The substances (Aldrin, Chlordane, Dieldrin, Endrin, Heptachlor, Hexachlorobenzene, Mirex, Toxaphene, Polychlorinated Biphenyls (PCB), DDT (1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane), Chlordecone, Hexabromobiphenyl and HCH (including lindane)) are listed in Annex I and shall not be produced or placed on the market on their own, in preparations or as constituents of articles.

All future editions of these requirements are to be applied.

[1] *Simulation of critical evacuation conditions for a fire scenario involving cables and comparison of two different cables*, Patrick van Hees, Daniel Nilsson and Emil Berggren, Department of Fire Safety Engineering and System Safety Lund University, Sweden , Report 3147, Lund 2010

[2] *Assessment of the impact of computed and measured fire environments on building evacuation using bench and real scale test data,* Robinson J E, Hull T R, Stec A A, Galea E R, Mahalingam A, Jia F, Patel M K, Persson H & Journeaux T, Interflam Conf. Proc., London 2007

[3] *http://www.europacable.com/home/low-fire-hazard-cables.html*