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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB 50217-2018

Replacing GB 50217-2007

Standard for design of cables of electric power engineering

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Table of Contents

1 General

1.0.1 This standard is formulated in order to make the design of power engineering cables advanced in technology, economical and reasonable, safe and applicable, and convenient for construction and maintenance.

1.0.2 This standard applies to the selection and laying design of 500kV and below power cables and control cables in new construction, expansion and reconstruction of power projects such as power generation, power transmission and transformation, and power distribution.

This standard does not apply to the following environments. underground mines; environments for manufacturing, applying or storing gunpowder, explosives and primers, fuzes and pyrotechnics production; water, land and air transportation vehicles; nuclear island parts of nuclear power plants.

1.0.3 In addition to this standard, the cable design for power engineering shall also comply with the current relevant national standards.

2.0.1 Flame retardant cables

Cables with specified flame-retardant properties (such as flame-retardant properties, smoke density, smoke toxicity, corrosion resistance).

2.0.2 fire resistant cables

Cables with specified fire resistance properties (such as line integrity, smoke density, smoke toxicity, corrosion resistance).

2.0.3 Metallic-plastic composite water barrier

The water-blocking layer is composed of a thin metal sleeve such as aluminum or lead foil sandwiched in a plastic layer and a special composite tape is surrounded along the longitudinal direction of the cable.

2.0.4 thermal resistance

The thermal network analysis method is used to calculate the current carrying capacity of the cable, and the physical quantity defined by the thermal Ohm's law of the one-dimensional heat dissipation process is used.

2.0.5 Auxiliary ground wire

Configure a wire parallel to the high-voltage AC single-core power cable line, grounded at both ends to form a loop for the induced current.

2.0.6 direct burying

The cable is laid into the underground trench with a cushion layer along the bottom of the trench and a covering layer on the cable, and the laying method is to add a protective plate and then bury the floor.

2.0.7 Shallow channel

A covered trough structure that accommodates a small number of cables without brackets.

2.0.8 Manhole

It is specially used for accommodating accessories such as cable joints or covered pit-type cable structures required for pulling cables.

2.0.9 Cable building

A general term for structures such as cable trenches, shallow grooves, pipes, tunnels, interlayers, vertical (inclined) wells and working wells that are specially used for laying cables or placing accessories.

2.0.10 Flexible fixed slip fixing

A fixing method that enables the cable to change its axial angle along the fixed position or move slightly laterally with thermal expansion and cold contraction.

2.0.11 rigid fixing rigid fixing

A clamping and fixing method that prevents the cable from being displaced with thermal expansion and contraction.

2.0.12 Snaking of cable

According to the requirements of quantitative parameters, the axial thermal stress of the cable can be reduced or the free expansion and contraction can be increased so that the cable is laid in a serpentine shape.

3.1.1 Copper conductors shall be used for power cables used in the following situations.

1 Motor excitation, important power supply, mobile electrical equipment, etc. need to be connected to circuits with high reliability;

2 Vibrating places, working environments with explosion hazards or corrosion to aluminum;

3 fire-resistant cables;

4 Arranged close to high-temperature equipment;

5 crowded places;

6 Conventional islands of nuclear power plants and auxiliary facilities related to production.

3.1.2 Except that the products only have copper conductors and the article 3.1.1 of this standard determines that copper conductors should be used, the cable conductor material can be copper conductors, aluminum or aluminum alloy conductors. Aluminum alloy conductors should not be used for cables with a voltage level above 1kV.

3.1.3 The cable conductor structure and performance parameters shall comply with the current national standards "Electrical Copper Round Wire" GB/T 3953, "Electrical Round Aluminum Wire" GB/T 3955, "Cable Conductor" GB/T 3956, "Cable Conductor Aluminum alloy wire" GB/T 30552 and other regulations.

3.2 Insulation level of power cables

3.2.1 The phase-to-phase rated voltage of the power cable conductors in the AC system shall not be lower than the working line voltage of the circuit used.

3.2.2 The selection of the rated voltage between the power cable conductor and the insulation shield or the metal sheath in the AC system shall comply with the following regulations.

1 The neutral point is directly grounded or through a low-resistance grounding system, and the grounding protection action does not exceed 1min to remove the fault, and it should not be lower than 100% of the working phase voltage of the operating circuit;

2 For the power supply system where the single-phase ground fault may exceed 1min, the operating phase voltage of the operating circuit should not be lower than 133%; when the single-phase ground fault may last for more than 8h, or when the safety requirements of the

generator circuit are high, 173% should be used % of the working phase voltage of the used loop.

3.2.3 The withstand voltage level of the cables in the AC system should meet the requirements for system insulation coordination.

3.2.4 The insulation level of DC transmission cables should be able to withstand the withstand voltage assessment of polarity reversal, DC and impact superposition, etc.; XLPE insulated cables should have the ability to suppress the accumulation of space charges and the formation of local high field strength, etc. to adapt to DC electric field operation characteristics.

3.3.1 The selection of power cable insulation type should meet the following requirements.

1 Under the conditions of working voltage, working current and its characteristics and environmental conditions, the cable insulation life should not be less than the expected service life;

2 It should be selected according to factors such as operational reliability, construction and maintenance convenience, maximum allowable working temperature and cost;

3 It should meet the requirements of fire resistance and flame retardancy of cables;

4 It should meet the requirements of environmental protection.

3.3.2 The insulation type selection of commonly used power cables shall meet the following requirements.

1 Low-voltage cables should use XLPE or PVC extruded insulation types. When environmental protection requires, PVC insulated cables should not be used;

2 High-voltage AC cables should use cross-linked polyethylene insulation type, or self-contained oil-filled cables;

3 500kV AC submarine cable line can choose self-contained oil-filled cables or XLPE insulated cables;

4 High-voltage DC transmission cables can use non-drip impregnated paper insulation, self-contained oil-filled types and XLPE insulation types suitable for HVDC cables, and ordinary XLPE insulation types should not be used.

2 When there are reinforcing layers such as copper strips in both the radial direction and the longitudinal direction, the allowable height difference shall be 80m; when it is used for important circuits, it should be 60m.

3.4.3 When laying directly buried, the selection of cable sheath should meet the following