Chapter 2
Cable Standards

ABSTRACT

The various standards institutions in the world publish the standards specifications of underground power cables, circuit breakers, isolators and other substation equipment. Standards have been published on various types of cables. These standards provide the guideline to the manufacturers and users regarding the following: Constructional details, conditions of service, ratings, terms and definitions, vocabulary, tests to be performed, standard test procedures, methods of evaluation of the test results, guidelines for selection, erection and maintenance.

2.1 STANDARDS

The standards are generally drafted for a wider application and they generally do not cover specific cases. IEC (International Electro-Technical Commission) recommendations are generally accepted all over the world and the IS (Indian Standards) specifications are generally based on IEC. All standards apply to cables, accessories and regulations of underground power cables. Reference standards specify Waveforms of voltages to be used for various tests, Precision of measuring instruments and Parameters for analyzing test results. The most common used standard authority for electrical equipment and cables is IEC (International Electro-technical Commission). It is used as a basic of National Standards such as UK standards, IS standards and other standards over the world .Furthermore the IEC standards represent a consensus of national opinions and hence take several years both to prepare initially and for agreement to be reached on amendments. Also it will be interested to include standards from other countries, these tend to be even more numerous, e.g. in USA where in addition to national standards for materials and components there is widespread use by industry at large of cable standards issued by Underwriters Laboratories (UL) Association of Edison Illuminating Companies (AEIC), Insulated Power Cables Engineering Association (IPCEA) and National Electrical Manufacturers Association (NEMA).

Testing according to standards means of evaluating quality level of each cable system component individually and in combination prior to selection and installation International Standards specifies procedures for each type. Various standards are applicable to testing of cables, and cable accessories. Test sequence specified by each standard includes initial electrical tests followed by Load cycle test (lasting

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several days, even weeks) followed by Electrical tests to determine electrical, mechanical properties after tests Additional tests to evaluate non-electrical properties of conductor, insulation screens, armoring and outer sheath . Most commonly are initiated by cable manufactures, carried out in their own laboratories. Sometimes they are ordered by customers to ensure that their products meet finer specification requirements. Cable manufacturers also take up tests independently as a basis for a new development or enhancements of their product range. Details about cables standards are found in Al-Khalidi & Kalam, A. (2006), Earle, C., Rusty, B., & Victor, D. A. (2011) and List of IEC standards (2015).

2.2 (IEC) INTERNATIONAL ELECTRO-TECHNICAL COMMISSION OF UNDERGROUND POWER CABLES

IEC 60228. (1979) “Conductors of insulated cables”
IEC 6038. (1979) “Standard voltage”
IEC60229. (1982) “Tests on cable over sheaths which have special protective function”
IEC60230. (1966) “Impulse tests on cables and their accessories”
IEC60233. (1974) “Tests on hollow insulators for use in electrical equipment”
IEC 60332. (1979) “Tests on electric cables under fire condition”
IEC 6071. (2008) “Insulation coordination”
IEC 60270. (2000) “Partial discharge measurement”
IEC 60287. (1982) “Electric cables - Calculation of the current rating”
IEC 60331. (1970) “Fire resisting of electric cables”
IEC 60364. (2009) “Electrical installations of buildings”
IEC 60332. (1979) “Tests on electric cables under fire conditions”
IEC 60502. (2005) “Power cables with extruded insulation and their accessories for rated voltage from 1 kV (Um=1, 2 kV) up to 30 kV (Um=36 kV)”
IEC 60840. (2011) “Power cables with extruded insulation and their accessories for rated voltage above 30 kV (Um=36 kV) up to 150 kV (Um=170 kV). Test methods and requirements”
IEC 60853. (2012) “Calculation of the cyclic and emergency current rating of cables”
IEC 61443. (1999) “Short-circuit temperature limits of electric cables with rated voltages above 30 kV (Um=36 kV)”
IEC 62067. (2011) “Power cables with extruded insulation and their accessories for rated voltage above 150 kV (Um=170 kV) up to 500 kV (Um=550 kV). Test methods and requirements”
IEC 60141. (1993) “Test on oil filled and gas pressure cables and accessories”
IEC 60141-1. (1993) “Part 1: Oil-filled, paper insulated, metal-sheathed cables and accessories for alternating voltage up to and including 400kVAmendment 1 (1995)”
IEC 60840. (1988) “Test for power cables with extruded insulation for rated voltage above 30 kV (Um=36 kV) up to 150kV (Um=170kV).Amendment 2(1993)”
IEC 62067. (2011) “Test for power cables with extruded insulation for rated voltage above 150 kV (Um=170 kV)”
IEC 60245. (2003) “Rubber insulated cables of rated voltage up to and including 450/750 volt”
IEC 60541. (1976) “Comparative information on IEC and North American flexible cord type”
IEC 60702. (2002) “Mineral insulated cables and their terminations with rated voltage not exceeding 750 volt”