

TECHNICAL SPECIFICATION

Electric energy supply networks – General aspects and methods for the
maintenance of installations and equipment

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRIC ENERGY SUPPLY NETWORKS – GENERAL ASPECTS AND METHODS FOR THE MAINTENANCE OF INSTALLATIONS AND EQUIPMENT

FOREWORD

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Technical Specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 63060, which is a Technical Specification, has been prepared by IEC technical committee 8: System aspects of electrical energy supply.

The text of this Technical Specification is based on the following documents:

Enquiry draft	Report on voting
8/1470/DTS	8/1488/RVDTS

Full information on the voting for the approval of this Technical Specification can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- transformed into an International Standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

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INTRODUCTION

Maintenance (MA) and maintenance support provide an important contribution to ensure the reliability of components and electric installations throughout their operating life cycle. The correct functionality, performance, and reliability will be achieved by providing the necessary maintenance in conjunction with adequate design, construction, maintainability and installation quality, and by their proper usage. Other parameters besides maintenance affect the safe, secure, and reliable operation of electricity networks. For example: network topology, spare parts, new investment, technology, network conditions, know-how, staff, etc. The option(s) used is/are the responsibility of the company.

The extent and type of maintenance and maintenance support correspond to the type of equipment and installations, their constitution and required availability, as well as other factors such as operational and environmental condition, and operating experience.

Inappropriate, irregular or missing maintenance could lead to premature functional failures which reduce the availability of equipment and installations, could lead to consequential damage, and shorter asset life cycles. Functional failures can lead to operational consequences and need to be assessed accordingly. Safety aspects have to be considered at all times.

The purpose of this document is to describe, in general terms, the management methods, processes, and techniques with regard to the maintenance of installations and equipment, which are necessary to achieve public safety, reliable operation, and acceptable reliability for installations and equipment.

In this document, the term “network operator” and “system operator” are used for the network owner, asset manager, and maintenance provider.

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ELECTRIC ENERGY SUPPLY NETWORKS – GENERAL ASPECTS AND METHODS FOR THE MAINTENANCE OF INSTALLATIONS AND EQUIPMENT

1 Scope

This document provides guidance to develop maintenance requirements of installations and equipment in electric power networks. It is primarily meant for the operators of electric power networks, particularly those of public power supplies, including High-Voltage DC transmission (HVDC). This scope does not include:

- railway networks,
- installations of end consumer networks,
- installations for electric power generation.

Crises handling, e.g. in emergency situations, is not within the scope of this document.

NOTE Consumer networks (e.g. networks of chemical companies, traffic lights and street lighting) are installations which are not used to distribute electric energy to further consumers. The main scope covers public networks, but the general recommendations can be applied to other networks.

2 Normative references

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There are no normative references in this document.

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3 Terms and definitions

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For the purposes of this document the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1 maintenance

combination of all technical and managerial actions intended to retain an object in, or restore it to, a state in which it can perform as required

[SOURCE: IEC 60050-192:2015, 192-06-01, modified – In the definition, "item" has been replaced with "object".] [1] ¹

3.2 maintenance concept maintenance policy

definition of the maintenance objectives, line of maintenance, indenture levels, maintenance levels, maintenance support, and their interrelationships

¹ Numbers in square brackets refer to the Bibliography.

Note 1 to entry: The maintenance concept provides the basis for maintenance planning, determining supportability requirements, and developing logistic support.

[SOURCE: IEC 60050-192:2015, 192-06-02] [1]

3.3

corrective maintenance

maintenance carried out after fault detection to effect restoration

[SOURCE: IEC 60050-192:2015, 192-06-06, modified – Note 1 to entry has been deleted.] [1]

3.4

preventive maintenance

maintenance carried out to mitigate degradation and reduce the probability of failure

[SOURCE: IEC 60050-192:2015, 192-06-05, modified – The second term and Note 1 to entry have been deleted.] [1]

3.4.1

condition-based maintenance

preventive maintenance based on the assessment of physical condition

Note 1 to entry: Condition-based maintenance is derived from the analysis and determination of parameters which characterize the deterioration of the object

[SOURCE: IEC 60050-192:2015, 192-06-07, modified – Note 1 to entry has been changed.] [1]

3.4.2

periodic maintenance

time-based maintenance

maintenance carried out in accordance with a specified time schedule

Note 1 to entry: Periodic maintenance may identify the need for some corrective maintenance action.

[SOURCE: IEC 60050-192:2015, 192-06-12, modified – The terms defined have been changed.] [1]

3.5

reliability-centred maintenance

RCM

systematic method for determining the respective maintenance actions and associated frequencies, based on the probability and consequences of failure

Note 1 to entry: RCM studies may be conducted at any indenture level of a system.

Note 2 to entry: Data used may be derived from analysis (e.g. FMECA) and experience (e.g. FRACAS).

Note 3 to entry: RCM studies may provide feedback to initiate modifications of design or procedures to effect improvements.

[SOURCE: IEC 60050-192:2015, 192-06-08] [1]

3.6

maintenance task

maintenance action

sequence of elementary maintenance activities

EXAMPLE Fault localization, fault diagnosis, repair, and function checkout.

Note 1 to entry: Maintenance can be completely divided into the following tasks:

- inspection;
- routine maintenance;
- overhaul;
- repair;
- improvement.

[SOURCE: IEC 60050-192:2015, 192-06-11, modified – Note 1 to entry has been added.] [1]

3.6.1

inspection

activities to determine and assess the actual condition of an object, including the determination of the causes of wear and deriving the necessary conclusions for future use

Note 1 to entry: The term "condition determination" is described in detail in Clause B.1.

3.6.1.1

operational inspection

on-site inspection

activities carried out by pure visual observation with the aim of checking the recognizable condition of the object from outside

Note 1 to entry: Operational inspections are to be understood as checks to fulfil the legal duty to maintain safety. The inspection may be made by car or from the air (surveying flying).

Note 2 to entry: Operational inspection is the simplest form of inspection.

3.6.1.2

visual inspection

activities carried out by observation with the human senses and by recording simple condition variables

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Note 1 to entry: Obvious function defects are recorded.

Note 2 to entry: Observation with the human senses can include simple tools like cameras and drones.

3.6.1.3

online monitoring

continuous or periodic detection, under energized condition, to verify that the parameters of an object lie within formulation limits

3.6.1.4

function check

action to confirm that an object is able to perform the required function

3.6.1.5

condition investigation

activities carried out by defined measurements, which can be a routine measurement or specific test, to make an assessment of the actual condition of the considered equipment

Note 1 to entry: Diagnostic indicators that may be used for the condition investigation can be derived from the operational experience that is the analysis of fault situations and causes of faults.

Note 2 to entry: Condition investigation within the scheduled inspection ensures that occurring defects can be detected and corrected at components.

3.6.2

routine maintenance

regular or repeated simple preventive maintenance activities

Note 1 to entry: Routine maintenance may include for example cleaning, tightening of connections, replacement of connectors, checking liquid levels, lubrication, etc.

Note 2 to entry: Activity to delay the degradation of the existing degree of wear. The degree of wear is the reserve of the possible functional compliances under specified conditions which an object does possess due to the construction as well as service activities.

[SOURCE: EN 13306:2010, 8.5] [2]

3.6.3 overhaul

comprehensive set of preventive actions carried out, in order to maintain the required level of performance of an object

Note 1 to entry: Overhaul may be performed at prescribed intervals of time or number of operations.

Note 2 to entry: Overhaul may require a complete or partial dismantling of the object.

[SOURCE: EN 13306:2010, 8.6] [2]

3.6.4 repair

direct action taken to effect restoration

Note 1 to entry: Repair includes fault localization (IEV 192-06-19), fault diagnosis (IEV 192-06-20), fault correction (IEV 192-06-21), and function checkout (IEV 192-06-22).

[SOURCE: IEC 60050-192:2015, 192-06-14] [1]

3.6.5 improvement

combination of all technical, administrative and managerial actions, intended to ameliorate the reliability and/or the maintainability and/or the safety of an object, without changing the original function

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Note 1 to entry: Improvements can be useful if, for example, operating experience and inspection results identify systematic problems that demonstrate that the previous function security is not sufficient.

[SOURCE: EN 13306:2010, 8.12] [2]

3.7 failure

termination of the ability of an object to perform a required function

Note 1 to entry: After failure the object has a fault, which may be complete or partial.

Note 2 to entry: "Failure" is an event, as distinguished from "fault", which is a state.

[SOURCE: EN 13306:2010, 5.1] [2]

3.8 reliability

ability to perform as required, without failure, for a given time interval, under given conditions

Note 1 to entry: Reliability is used only for general descriptions in non-quantitative terms.

[SOURCE: IEC 60050-192:2015, 192-01-24, modified – The notes to entry have been deleted and a new note to entry has been added.] [1]

3.9 functional security

defined degree of reliability and reserve of wear of an object

3.10 maintenance object object

particular equipment, particular installation or a group of equipment or installations which in general are considered jointly with respect to the maintenance plan

EXAMPLE The equipment of a switching bay at a specific location.

3.11 maintenance object type

particular equipment, particular installation or a group of equipment or installations which in general are considered jointly with respect to the maintenance concept or inspections

EXAMPLE Power transformers with certain properties, such as, size, design, manufacturer, and age.

3.12 maintainability

ability to be retained in, or restored to a state to perform as required, under given conditions of use and maintenance

[SOURCE: IEC 60050-192:2015, 192-01-27, modified – The notes to entry have been deleted.] [1]

3.13 maintenance support

provision of resources to maintain an object

[SOURCE: IEC 60050-192:2015, 192-01-28, modified – In the definition, "item" has been replaced with "object".] [1]

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3.14 testability

degree to which an object can be tested

[SOURCE: IEC 60050-192:2015, 192-09-20, modified – In the definition, "item" has been replaced with "object".] [1]

3.15 reserve of wear

<of an object> ability to withstand a cumulative deterioration caused by the stresses imposed without losing its function while in use

Note 1 to entry: Stresses can be mechanical, electrical, etc.

4 General aspects of maintenance and maintenance management

The availability and power quality of a network is influenced by several criteria, e.g. topology of the network, specification of components, maintenance, availability of spare parts, service know-how, environmental condition, application, etc. In consequence, the network operator has to consider which criterion (or criteria) is most influential to the performance of the network. During installations' design, the maintenance and the maintenance support should be considered in connection with the functionality and maintainability of power networks.

The network operator has to decide whether all required tasks for maintenance and maintenance support can be self-performed, or partly or fully commissioned to external contractors. A clear definition of aims and responsibilities for maintenance and maintenance support is important and has to be documented.