

ANSI/IEC/ASQ D60300-3-1-1997

***Dependability management Part 3: application guide—
Section 1: analysis techniques for dependability:
Guide on methodology***

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Approved as an American National Standard by:

American Society for Quality



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AMERICAN NATIONAL STANDARD

Dependability Management—Part 3: Application Guide— Section 1: Analysis Techniques for Dependability: Guide on Methodology

Approved as an American National Standard by:
American Society for Quality

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Dependability Management

Part 3: Application guide

Section 1: Analysis techniques for dependability: Guide on methodology

Foreword

- 1) The formal decisions or agreements of the IEC on technical matters, prepared by Technical Committees on which all the National Committees having a special interest therein are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.
- 2) They have the form of recommendations for international use and they are accepted by the National Committees in that sense.
- 3) In order to promote international unification, the IEC expresses the wish that all National Committees should adopt the text of the IEC recommendation for their national rules in so far as national conditions will permit. Any divergence between the IEC recommendation and the corresponding national rules should, as far as possible, be clearly indicated in the latter.

This International Standard has been prepared by IEC Technical Committee No. 56: Dependability.

The text of this standard is based on the following documents:

Six Months' Rule	Report on Voting
56(CO)138	56(CO)146

Full information on the voting for the approval of this standard can be found in the Voting Report indicated in the above table.

Annex A is for information only.

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Introduction

Dependability analysis techniques are used for the review and prediction of the reliability, availability, maintainability and safety measures of a system.

Dependability analyses are conducted mainly during the concept and definition phase, the design and development phase, and the operation and maintenance phase at various system levels and degrees of detail in order to evaluate and determine the dependability measures of a system or an installation. They are also used to compare the results of the analysis with specified requirements.

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Section 1: Analysis techniques for dependability: Guide on methodology

1 Scope

This International Standard gives a general overview of commonly used dependability analysis procedures. It describes the usual methodologies, the advantages and disadvantages, data input and other requirements for the various techniques.

This guide is an introduction to the available methodology and is intended to provide the analyst with the necessary information in order to choose the analysis method most appropriate to the system. Available IEC standards, providing details, are indicated in table 2.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60050(191): 1990, *International Electrotechnical Vocabulary, Chapter 191: Dependability and quality of service*.

IEC 60812: 1985, *Analysis techniques for system reliability—Procedure for failure mode and effects analysis (FMEA)*.

IEC 61025: 1990, *Fault tree analysis (FTA)*.

IEC 61078: 1991, *Analysis techniques for dependability—Reliability block diagram method*.

3 Definitions

Terms and definitions are in accordance with Chapter 191 of the International Electrotechnical Vocabulary.

In addition, the following definitions are applicable for this standard:

3.1 system: Item on the highest level considered in the analysis.

3.2 component: Item on the lowest level considered in the analysis.

3.3 allocation: A procedure applied during the design of an item intended to apportion the requirements for performance measures for an item to its subitems according to given criteria.

NOTE—"System" may be replaced by "sub-system," etc., as applicable.

ANSI/IEC/ASQ D60300-3-1-1997**4 General**

The analysis methods allow the evaluation of qualitative characteristics and estimation of measures (e.g. failure rate, MTTF, MTBF, reliability, steady state availability) which describe the predicted long-term operating behaviour of a system. In order to perform a systematic and reproducible system analysis, use of a consistent procedure is essential.

However, no single dependability analysis method is sufficiently comprehensive and flexible to deal with all the possible model complexities required to evaluate the features of practical systems (hardware and software, complex functional structures, various technologies, repairable and maintainable structures, etc.). It may be necessary to consider several additional analysis methods to ensure proper treatment of complex or multi-functional systems.

5 Basic approach to system dependability analysis

Specific procedures for analysis are contained in the standards describing each analysis method. General procedures, approaches and requirements are described hereinafter.

5.1 General procedure

The procedure consists of the following steps (as applicable):

Step 1

List all system reliability and availability requirements, characteristics and features, together with environmental and operating conditions, and maintenance requirements. Define the system to be analyzed, its modes of operation, the functional relationships to higher levels and to interfacing systems or processes.

Step 2

Define system fault, fault criteria and conditions based on system functional requirements, expected operation and operating environment. Software performance should also be considered.

Step 3

When numerical results are required, it is recommended to carry out an allocation based on a preliminary design (assignment of a portion of the total permitted system failure rate or unavailability to each sub-system).