

Reliability of systems, equipment and components —

Part 14: Guide to formal design review

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Quality Management and Statistics Standards Policy Committee (QMS/-) to Technical Committee QMS/23, upon which the following bodies were represented:

- AEA Technology
- Association of Consulting Engineers
- Association of Project Managers
- British Gas plc
- British Railways Board
- British Telecommunications plc
- City University
- Civil Aviation Authority
- Consumers' Association
- Cranfield Institute of Technology
- Department of Trade and Industry (Standards Policy Unit)
- Design Council
- EEA (Association of Electronics, Telecommunications and Business Equipment Industries)
- Electricity Association
- Electronic Components Industry Federation
- Federation of Small Businesses
- GAMBICA (BEAMA Ltd.)
- Institute of Quality Assurance
- Institute of Risk Management
- Institution of Electrical Engineers
- Institution of Mechanical Engineers
- Institution of Plant Engineers
- Mercury Communications Limited
- Ministry of Defence
- National Computing Centre Ltd.
- Railway Industry Association of Great Britain
- Royal Institution of Chartered Surveyors
- Safety and Reliability Society
- Society of British Aerospace Companies Limited
- Society of Environmental Engineers
- Society of Motor Manufacturers and Traders Limited
- University of Technology, Loughborough

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National foreword

This Part of BS 5760 has been prepared under the direction of the Quality, Management and Statistics Standards Policy Committee. It is identical with IEC 1160:1992 *Formal design review* published by the International Electrotechnical Commission (IEC).

BS 5760 provides comprehensive guidance on many aspects of reliability management. Eleven Parts of this standard have been published and these may be summarized as follows:

- *Part 0: Introductory guide to reliability.* This Part provides guidance to senior management and non-specialists on the importance of reliability and explains how measures to achieve reliability should be integrated with other aspects of project management.
 - *Part 1: Guide to reliability and maintainability programme management.* This Part discusses the essential features of a comprehensive reliability and maintainability programme to produce reliable and maintainable products.
 - *Part 2: Guide to the assessment of reliability.* This Part contains guidance on quantitative and statistical aspects of reliability, including reliability modelling, the provision of data, and the concepts of redundancy and simulation.
 - *Part 3: Guide to reliability practices: examples.* This Part contains authentic practical examples illustrating the principles established in Parts 1 and 2 of BS 5760.
 - *Part 4: Guide to specification clauses relating to the achievement and development of reliability in new and existing items.* This Part provides detailed guidance on the specification of reliability.
 - *Part 5: Guide to failure modes, effects and criticality analysis (FMEA) and (FMECA).* This Part gives guidance on the application of these techniques.
 - *Part 6: Guide to programmes for reliability growth.* This Part describes procedures to expose and remove weaknesses in hardware and software items in order to achieve acceptable reliability in a product. It explains basic concepts, management and test procedures and describes techniques for analysis and correction of failures.
 - *Part 7: Guide to fault tree analysis.* This Part gives guidance on the application of fault tree analysis which may be used to identify factors affecting the reliability, performance and safety characteristics of a system.
 - *Part 9: Guide to the block diagram technique.* This Part describes the use of the block diagram technique for modelling and evaluating the reliability of both elementary and more complex systems. The extension of the method to calculate availability is also outlined.
 - *Part 10: Guide to reliability testing.*
 - *Section 10.1 General requirements.* This Section provides guidance on general principles, procedures and considerations for reliability testing in the laboratory and in the field.
 - *Section 10.3 Compliance test procedures for steady-state availability.* This Section provides guidance on techniques for availability performance testing, under defined conditions, of frequently maintained items.
- NOTE Further Sections of Part 10 based on other Parts of IEC 605 and related IEC standards are planned.
- *Part 14: Guide to formal design review.* This Part provides guidelines for planning and conducting design reviews. It includes details of the specific contributions to be made by various specialists but much of the guidance given is widely applicable and is relevant to the general conduct of design reviews.

Further Parts of BS 5760 are envisaged in order to provide guidance on other techniques of reliability management. At present four further Parts are in the process of being drafted, and these are as follows:

- *Part 8: Guide to the assessment of reliability of systems containing software.*¹⁾ This Part will provide guidance on the assessment of reliability of systems containing software.
- *Part 11: Guide to the collection of reliability, maintainability, availability and maintenance support data from the field.*
- *Part 12: Guide to the presentation of reliability, maintainability and availability predictions.*
- *Part 13: Guide to preferred test conditions for equipment reliability testing.*

Guidance on specific aspects of maintainability is provided in the various Parts of BS 6548 *Maintainability of equipment*.

Cross-references

International standard	Corresponding British Standard
	BS 4778 <i>Quality vocabulary</i>
IEC 50 (191):1990	Part 3 <i>Availability, reliability and maintainability terms</i> Section 3.2:1991 <i>Glossary of international terms</i> (Identical)
ISO 8402:1986	Part 1:1987 <i>International terms</i> (Identical)

Additional information. The International Electrotechnical Commission is currently preparing supplementary text for inclusion in IEC 1160 with which this standard is identical. The additional clauses will cover contributions to design review by environmental, human factors and legal matters specialists. It is envisaged that an amendment will be issued to incorporate the additional clauses into this Part.

NOTE When adopting the text of the international standard the following typographical error was discovered. In clause 1, line 2, delete “and for” and substitute “and/or”.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 18, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

¹⁾ Currently published as a Draft for Development, DD 198:1991

Introduction

The objective of conducting design reviews during the development cycle is to ensure that products or services satisfy specified dependability, life, safety, endurance, environment, electromagnetic compatibility, and performance requirements at a minimum cost and are deliverable within a prescribed schedule.

Design review enhances the development of products or processes through cost reduction, delivery schedule improvements, and better quality, performance and safety. It can be employed by both supplier and customer.

Design review is an advisory activity. It is intended primarily to provide synergistic verification of the work of the development team, and only secondarily to provide input to the creative process. Design review should thus be considered a refining procedure and not a creative one.

Design reviews, regardless of frequency or depth cannot replace good product definitions, design specifications, design and engineering. Used as a control process, design review can provide the necessary verification of the successful completion of the design effort at a given time.

Design review should not be confused with day-to-day management of a project. The manager of the project carries the design responsibility and the final decisions should be his/hers. Design review is an independent activity, and, when properly done, increases confidence that design and engineering activities were carried out with due regard to all pertinent requirements throughout the product life cycle.

1 Scope

This International Standard makes recommendations for the implementation of design review procedures as a means of stimulating product and for process improvement. It includes guidelines for planning and conducting design reviews and specific details concerning contributions by reliability, maintenance, maintenance support and availability specialists. This International Standard also includes subclauses on contributions by other specialists dealing with related subjects such as quality, environment, safety (product and user), human factors, and legal matters.

In addition to the common understanding of “product”, it is expedient to include other aspects, e.g. hardware and software, catalogue listings, specifications describing the item, shipping package, installation and assembly, instructions and operating manuals, labels and warnings, maintenance, spare parts lists, warranties, sales brochures and advertising literature.

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 editions of the normative documents listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 50 (191):1990, *International Electrotechnical Vocabulary (IEV) — Chapter 191: Dependability and quality of service*.

ISO 8402:1986, *Quality — Vocabulary*.

3 Definitions

For the purpose of this International Standard the terms and definitions of IEC (50)191:1990 apply together with the following additional definitions.

3.1

(formal) design review

a formal and independent examination of an existing or proposed design for the purpose of detection and remedy of deficiencies in the requirements and design which could affect such things as reliability performance, maintainability performance, maintenance support performance requirements, fitness for the purpose and the identification of potential improvements

NOTE Design review by itself is not sufficient to ensure proper design. [IEV 191-17-13]

3.2

action item

a question to be resolved before the design review is completed

3.3

recommendation

a specific proposal to change a product, process or schedule, to be acted upon or formally rejected before the design review is completed

design can relate to a product, process or procedure

4 Application of formal design review

Every organization should adopt a comprehensive design review programme as presented in this International Standard, or else tailor a more limited one involving specific needs.

The design review should be incorporated into the overall operating procedures and integrated with product safety, electromagnetic compatibility, quality and reliability programmes.

Limitations of size and resources of the organization, project value, product benefits, risks and complexity, all influence the review process. In smaller organizations, it may be necessary to supplement staff with personnel from suppliers, consultants and other outside advisors.

5 Management of the process

5.1 Policy statement

Each organization, e.g. corporation, plant, division, agency, project, as appropriate, should issue a policy statement governing the practice of design reviews authorized by the chief operating officer of the organization.

The policy statement should include the following:

- design review should be conducted for all new products, processes and applications, and for revisions to existing products and manufacturing processes which would affect function, performance, safety, dependability, electromagnetic compatibility, ability to cost or other characteristics affecting the product or process, users, observers or the population at large;
- design reviews should be conducted at appropriate intervals to consider changes in technology which may affect the specified characteristics.

A senior member of management should be responsible for executing the policy on design review and implementing the policy statement by developing specific procedures and practices in accordance with this International Standard.

5.2 Precautions

Care should be taken to prevent the design review process from dictating the ultimate design by directing the detailed engineering work. Decisions are made every day which bear on the product or process under review. If each decision were subjected to an independent review, the review team would, in essence, design the product, requiring an excessive time. Conversely, if the first design review occurred only just before production, its benefit would be questionable. At that point, no corrective action could be taken, short of stopping the project because of a critical problem with potentially catastrophic consequences.

6 Design reviews during life cycle phases

6.1 Types

This International Standard adopts the philosophy that an appropriate type of design review should be conducted before taking any major decisions.

To achieve the desired objectives, design reviews should be held at several decision points, or “milestones”, during the product life cycle phases. The various types are listed in Table 1.

A separate review for the disposal phase is normally not applicable. Disposal considerations should be covered during PDR, FDR, MDR and UDR.

Table 1 — Types of formal design reviews

Life cycle phase	Type of design review	Acronym	Subclause
Concept and definition	Preliminary	PDR	6.3.1
Design and development	Detailed	DDR	6.3.2
	Final	FDR	6.3.3
Manufacturing and installation	Manufacturing	MDR	6.3.4
	Installation	IDR	6.3.5
Operation and maintenance	Use	UDR	6.3.6
Disposal	Normally not applicable		—

6.2 General objectives

The principal objective of a design review programme is to ensure that the product requirements are correct and met, and will result in a reliable, useful and saleable product. Particularly, the design review process is designed to ensure:

- the product meets specified requirements cost-effectively;
- the product satisfies customer needs;