

Australian Standard[®]

Design review



This Australian Standard® was prepared by Committee QR-005, Dependability. It was approved on behalf of the Council of Standards Australia on 16 June 2008. This Standard was published on 28 July 2008.

The following are represented on Committee QR-005:

- AirServices Australia
 - Australian Chamber of Commerce and Industry
 - Australian Electrical and Electronic Manufacturers Association
 - Australian Industry Group
 - Australian Nuclear Science & Technology Organisation
 - Australian Organisation for Quality
 - Certification Interests (Australia)
 - Department of Defence (Australia)
 - Energy Networks Association
 - Engineers Australia
 - The University of New South Wales
-

This Standard was issued in draft form for comment as DR 08028.

Standards Australia wishes to acknowledge the participation of the expert individuals that contributed to the development of this Standard through their representation on the Committee and through the public comment period.

Keeping Standards up-to-date

Australian Standards® are living documents that reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued.

Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments that may have been published since the Standard was published.

Detailed information about Australian Standards, drafts, amendments and new projects can be found by visiting **www.standards.org.au**

Standards Australia welcomes suggestions for improvements, and encourages readers to notify us immediately of any apparent inaccuracies or ambiguities. Contact us via email at **mail@standards.org.au**, or write to Standards Australia, GPO Box 476, Sydney, NSW 2001.

Australian Standard[®]

Design review

First published as AS IEC 61160—2008.

COPYRIGHT

© Standards Australia

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher.

Published by Standards Australia GPO Box 476, Sydney, NSW 2001, Australia

ISBN 0 7337 8837 8

PREFACE

This Standard was prepared by the Standards Australia Committee QR-005, Dependability.

The objective of this Standard is to provide guidance on planning and conducting a design review during design and development, as a means of verifying that design input requirements are being met. Includes specific guidance on contributions by specialists in reliability, maintenance, maintenance support, availability and the life cycle of a product or system.

This Standard is identical with, and has been reproduced from IEC 61160, Ed.2 (2005), *Design review*.

As this Standard is reproduced from an International Standard, the following applies:

- (a) Its number does not appear on each page of text and its identity is shown only on the cover and title page.
- (b) In the source text 'this International Standard' should read 'this Australian Standard'.
- (c) A full point should be substituted for a comma when referring to a decimal marker.

The terms 'normative' and 'informative' are used to define the application of the annex to which they apply. A normative annex is an integral part of a standard, whereas an informative annex is only for information and guidance.

CONTENTS

	<i>Page</i>
INTRODUCTION	iv
1 Scope	1
1.1 General	1
1.2 Application	2
1.3 Types of application	2
2 Normative references	3
3 Terms and definitions	3
4 Management of the design review process	4
4.1 General recommendations	4
4.2 Documentation requirements	4
5 Management responsibility	4
5.1 Top management	4
5.2 Design manager	5
5.3 Management review	5
6 Design review process	5
6.1 General	5
6.2 Planning for the design review	7
6.3 Design review personnel	8
6.4 Preparation of input package	10
6.5 Meeting notification and agenda	10
6.6 Conduct of meeting	11
6.7 Design review minutes	12
6.8 Actions and recommendations	13
6.9 Follow-up and completion of action items and recommendations	13
Annex A (informative) Example of design stages and type of design review	14
Annex B (informative) Example of objectives for design review at different stages of a design's development	15
Annex C (informative) Example of design review panel attributes	17
Annex D (informative) Example of design review meeting topics	18
Annex E (informative) Example of team member responsibilities	20
Annex F (informative) Example design review checklists questions	21

INTRODUCTION

The dependability of a product is enhanced through implementation of necessary disciplines during the design and development phases of a product's life cycle. Like other technical and engineering disciplines, a design review needs to be properly managed in order to achieve its objectives.

Properly implemented, design reviews enhance the potential for delivering a product of the required dependability, quality, performance, safety and potential for reduction in costs and delivery schedule. Both supplier and customer can utilize it.

A design review is an advisory activity. It is intended primarily to provide verification of the work of the design development team, and to provide recommendations, where possible, to improve the product or process and its realization. Thus design reviews should be considered as a confirmation and refining procedure and not a creative one.

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

Design reviews should not be confused with day-to-day management of a design project. The design manager carries the responsibility for the design and the final decisions for the response to a design review's actions and recommendations. Design reviews when properly conducted, increase confidence that design and development activities were carried out with due regard to all pertinent requirements for a product throughout its life cycle.

The application of this standard needs to be tailored to the needs of the design and development project or task in question and the organization preparing the design.

STANDARDS AUSTRALIA

Australian Standard

Design review

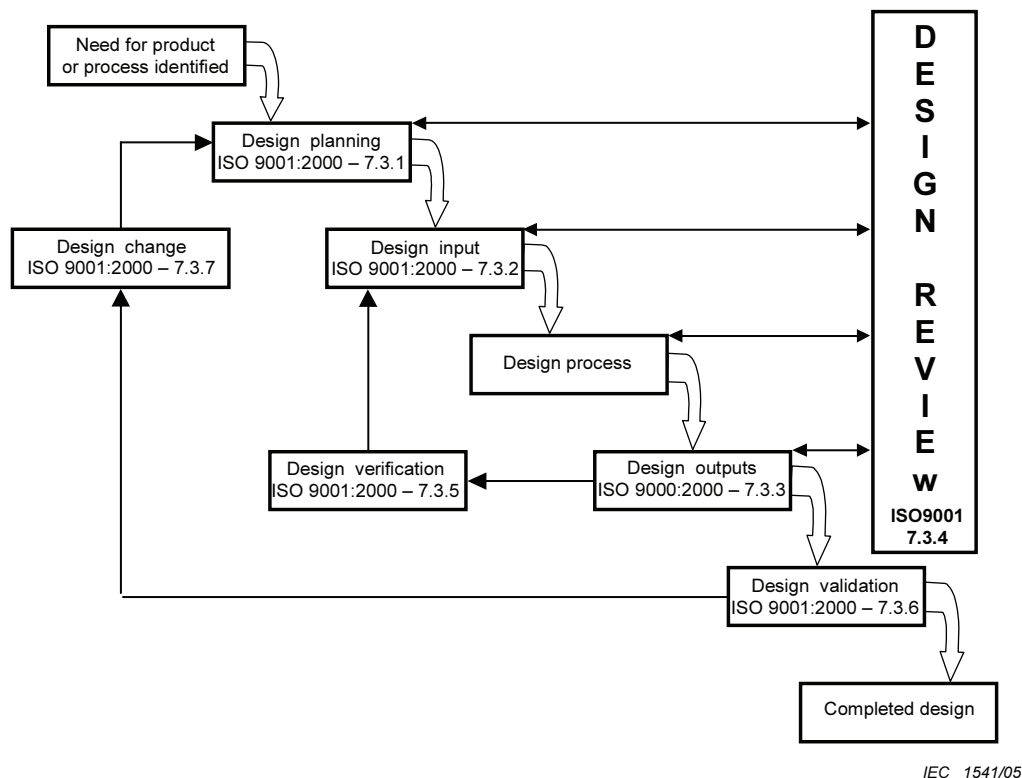
1 Scope

1.1 General

This International Standard makes recommendations for the implementation of design review as a means of verifying that the design input requirements have been met and stimulating the improvement of the product's design. The intention is for it to be applied during the design and development phase of a product's life cycle.

It provides guidelines for planning and conducting a design review and specific details concerning contributions by specialists in reliability, maintenance, maintenance support and availability.

The process for design and development is outlined in Figure 1 and requirements for management of the design and development process overall are given in ISO 9001:2000. The stages at which the design review or reviews are to be held should be determined during the development of the plan for the design.



NOTE Reference to the clauses of ISO 9001:2000 is for information only.

Figure 1 – Design and development process

The objectives of a design review include:

- assessing whether the proposed solution meets the design input requirements that include, but are not limited to: specified general performance requirements, dependability, lifecycle costs, safety, endurance, environment, electromagnetic compatibility, human factors;
- assessing whether the proposed solution is the most robust, efficient and effective solution to achieve the product requirements;
- providing recommendations as required for achieving the design input requirements;
- assessing the status of the design in terms of the completeness of the drawings and specifications;
- assessing the evidence to support the verification of the design performance;
- proposing improvements.

Design review facilitates assessment of the status of the design against the input requirements, identification of opportunities for improvement and guides the design manager towards appropriate action. It accelerates maturing of the product by reducing the time needed to stabilize design details, and allows product realization to proceed without frequent interruptions. Design review can also stimulate early product improvement.

1.2 Application

The stage or stages at which a design review is to be performed should be determined in the design and development planning stage of a project or a design task. Influencing factors should include customer requirements, regulatory requirements, the size and complexity of the product, the use to which the product is to be put, and the consequences of failure.

The cost to correct deficiencies in a design and the potential consequences increase as the design nears completion. Also, as the design progresses towards completion, so the flexibility to implement a change to correct a deficiency or to optimize the design decreases.

Each organization undertaking design and development should adopt either a comprehensive design review programme as presented in this standard, or tailor a more limited one to meet specific product and/or process needs.

The design review should be incorporated into the organization's overall management system and, as applicable, each project's schedule.

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

1.3 Types of application

There are two types of application: either an in-house created requirement for a new design, or a design requirement from an external source. In the case of the latter, the risk of a misunderstanding is much greater. Any misunderstanding could become a contractual issue and design review meetings with the client will be of primary importance to ensure that the emerging design meets the client's requirements.

A design review should be held:

- prior to order acceptance to ensure that the scope of work is established together with all the parameters that need to be met for an acceptable design;

- prior to detail design to ensure that the members of the design team have first-hand knowledge of all detail requirements. Interface provisions should be established and a list of defining documentation scheduled for submission and approval between the parties;
- at suitable points during detail design to review all interface provisions and agree on the test procedures for verifying that the design meets contract requirements.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

IEC 62198:2001, *Project risk management – Application guidelines*

3 Terms and definitions

For the purposes of this document the terms and definitions of IEC 60050(191) apply, together with the following additional definitions.

3.1

action item

question to be resolved by the design manager or nominated person

3.2

review

activity undertaken to determine the suitability, adequacy and effectiveness of the subject matter to achieve established objectives

[ISO 9000:2000, definition 3.8.7]

3.3

design and development

set of processes that transforms requirements into specified characteristics or into the specification of a product, process or system

NOTE 1 The terms “design” and “development” are sometimes used synonymously and sometimes used to define different stages of the overall design and development process.

NOTE 2 A qualifier can be applied to indicate the nature of what is being designed and developed (e.g. product design and development or process design and development).

[ISO 9000:2000, definition 3.4.4]

3.4

design review

planned, documented independent review of an existing or proposed design

NOTE 1 Objectives include evaluation of the design's capability to fulfil the specified requirements, identify any actual or potential deficiencies, proposing enhancements.

NOTE 2 **Design review** by itself is not sufficient to ensure proper design.

NOTE 3 The design can be for a product or process.

NOTE 4 The design review can be achieved by means of a meeting or other documented process.

3.5

design manager

person responsible for the product or process' design and development

NOTE For the purposes of this standard, the term “design manager” is used. In practice, other titles are used for this function depending on the organization's size and structure, and/or the contractual arrangements.

3.6**verification**

confirmation, through the provision of objective evidence, that specified requirements have been fulfilled

[ISO 9000:2000, definition 3.8.4]

3.7**validation**

confirmation, through the provision of objective evidence, that the requirements for a specified intended use or application have been fulfilled.

[ISO 9000:2000, definition 3.8.5]

4 Management of the design review process**4.1 General recommendations**

The organization should establish and maintain a management system to direct and control those design review activities that are part of the organization's overall management system.

For designs reviews this should include:

- a) identifying the functions and activities needed for the organization's design reviews;
- b) establishing the design review objectives and plan to achieve these objectives during design planning;
- c) ensuring timely implementation of the design review activities during all applicable design phases;
- d) assessing the criteria and methods for performance assessment, evaluation and acceptance of the product;
- e) providing resources and information necessary to achieve required design reviews;
- f) monitoring the design review activities and, measuring and analysing the results for continual improvement.

4.2 Documentation requirements

The management system documentation for design review should include:

- a) documented commitment and objectives for design review;
- b) documented procedures for management of the design review process;
- c) records arising from the design review activities;
- d) records of completion of action items and recommendations.

5 Management responsibility**5.1 Top management**

Top management of the design organization should communicate and demonstrate its commitment to the design review process to all personnel involved.

Achieving this includes:

- defining the management responsibilities and authorities for design review;
- ensuring the required resources for design reviews are available.

5.2 Design manager

The design manager's responsibilities should include but not limited to:

- developing and implementing a design plan that includes the points at which design reviews are required;
- selecting an independent suitably experienced person to chair the design review meeting or meetings, as applicable, or otherwise defined;
- preparing and providing the design data required for each scheduled design review's input package;
- ensuring that actions and recommendations arising from a design review meeting are responded to and completed in a timely manner.

NOTE For external designs, the contract may define requirements for some of these.

5.3 Management review

At planned intervals, top management should review its procedures and practices for design reviews to ensure their continuing suitability, adequacy and effectiveness. This can be carried out as a part of an organizational management review process. The design review records can be analysed for opportunities for process improvement.

6 Design review process

6.1 General

Design reviews require careful planning, organization and reporting. This clause provides a framework for implementation of the design review process itself. Specific details will depend on the product and the type of design review (see Annex A).

Care should be taken to prevent the design review from dictating the ultimate design. Decisions are made everyday which bear on the design of the product or process under review. If each decision is subjected to an independent review, the review team would, in essence become the designer with the potential for increased development time and costs. Conversely, if the first design review occurred only just before production or use, its benefit could be questionable as there may be little opportunity to influence the situation without a significant time or cost penalty.

The process for design review is outlined in Figure 2. The stages at which design reviews are held should be established during the development of the design plan. In determining the stage or stages at which a design review is to be held, factors to be taken into account include:

- a) The size and complexity of the product. For example:
 - is it a simple design or a minor upgrade;
 - is it a product involving multiple systems;
 - is it a complex system?
- b) What would be the impact of a delay in delivery or failure of the product? Project risk management tools given in IEC 62198 can be utilized in assessing this.

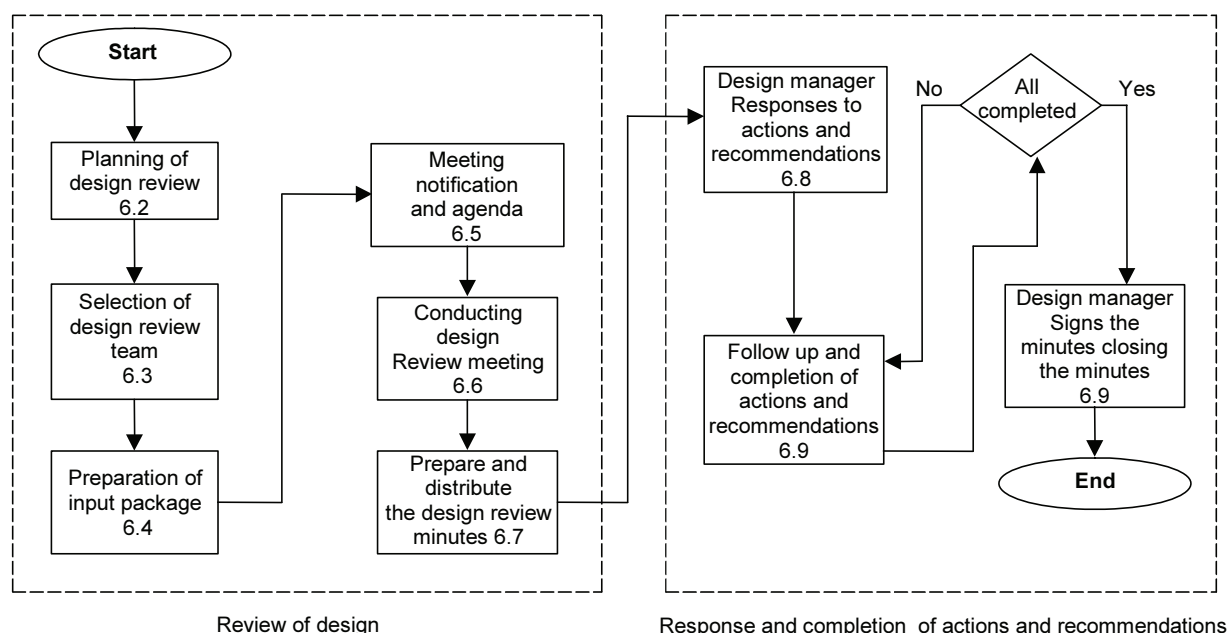
The most critical design stage will be the conceptual design. This is usually carried out in support of a submission for authorisation to proceed with a design project or to enable a proposal to be submitted to a client. The major objective will be to verify the design feasibility, estimate the cost and to plan its execution.

The design feasibility or risk can be ranked as follows:

www.standards.org.au

- customized design based on the selection from a range of proven components and materials;
- design that involves the use of an unproven component, material or subcontractor;
- design based on the interpolation of existing experience;
- design based on the extrapolation of existing experience;
- a completely new design or application of unproven technology.

Designs that have a high risk will require more design reviews as a measure of risk management. In the case of a new design to be released for series production the detail design could be considered to be that of a prototype. The need for an intensive design review of the results of prototype testing will be critical for deciding on the features needed to ensure a reliable final design. In extreme cases it could even result in a decision for abandonment.



IEC 1542/05

NOTE Numbers refer to the applicable clause in this standard.

Figure 2 – Design review process

The principal objectives of a design review are to provide confidence that the product's requirements have been identified and can be met in an efficient and effective manner, and will result in a dependable and useful product. In particular, the objectives of a design review include, but are not limited to:

- the product meets specified requirements in a cost-effective manner;
- the design and development plan includes the strategy for confirming and demonstrating that performance requirements can be met;
- the design satisfies customer and interfacing requirements;
- the product and its elements, as required, can be safely and economically disposed of;
- required design, manufacturing and installation methods are being utilized;
- costs have been optimized after considering all product requirements;
- scheduling considerations are taken into account;
- recommendations are provided for improvement of design;
- components are used within their specified performance and stress ratings;
- earlier recommendations have been addressed;