

Maintainability of equipment —

**Part 3: Guide to maintainability
verification, and the collection, analysis
and presentation of maintainability
data**

Committees responsible for this British Standard

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- AEA Technology
- Association of Consulting Engineers
- Association of Project Managers
- British Gas plc
- British Railways Board
- City University
- Civil Aviation Authority
- Consumers' Association
- Cranfield Information Technology Institute
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National foreword

This Part of BS 6548 has been prepared under the direction of the Quality, Management and Statistics Standards Policy Committee. It is identical with IEC 706-3:1987 *Guide on maintainability of equipment — Part 3: Sections 6 and 7. Verification and collection, analysis and presentation of data*, published by the International Electrotechnical Commission (IEC).

Three Parts of this standard have been published and these may be summarized as follows.

Part 1: Guide to specifying and contracting for maintainability. This Part introduces the concept of maintainability and provides guidance on the definition of maintainability requirements and on the programmes needed to achieve them.

Part 2: Guide to maintainability studies during the design phase. This Part provides guidance on studies which should be carried out during the design phase and on the relationship of these studies to maintainability and maintenance support tasks. The purpose of the studies is to assist design decision making, to predict the quantitative maintainability characteristics of an item and to help in the evaluation of alternative design options.

Part 3: Guide to maintainability verification and the collection, analysis and presentation of maintainability data. This Part provides guidance on the various aspects of verification necessary to ensure that specified maintainability requirements have been met and outlines suitable procedures and test methods. Guidance is also given on the collection, analysis and presentation of maintainability data.

Further Parts are envisaged in order to provide guidance on other techniques of maintainability management. At present three further Parts are in the process of being drafted, and these are as follows.

Part 4: Guide to maintenance and maintenance support planning. This Part will provide guidance on the tasks for planning maintenance and maintenance support that should be performed during the system acquisition phase in order that availability objectives are met in the operational phase. The interrelationships with reliability and maintainability programmes will also be described.

Part 5: Guide to diagnostic testing. This Part will provide guidance on the consideration of testability characteristics during the design and development of equipment. It will assist in determining effective test procedures as an integral part of operation and maintenance.

Part 6: Guide to statistical methods for maintainability evaluation. This Part will provide guidance on statistical methods for use when allocating maintainability requirements to the various parts of a system, and when carrying out maintainability demonstrations and evaluations.

Guidance on many studies closely related to maintainability is also contained in the various Parts of BS 5760 *Reliability of systems, equipment and components*.

Many terms used in this standard are defined in BS 4778 *Quality vocabulary* Section 3.1 *Guide to concepts and related definitions*.

Cross-references

International standard	Corresponding British Standard
IEC 271 ^a	BS 4778 <i>Quality vocabulary</i> Section 3.2: <i>Glossary of international terms</i> (Technically equivalent)

^a IEC 271 is not listed as a normative reference but is quoted in the text. The definitions in IEC 271 are reproduced in IEC 50 (191):1990, with which BS 4778-3.2 is identical.

References to sections of IEC 706

The various Parts of IEC 706 each contain one or more sections. References to these sections are sometimes made in the text. The sections are reproduced in the Parts of BS 6548 as follows.

IEC 706 section number and title	Corresponding Part of BS 6548
Section 1 <i>Introduction to maintainability</i>	BS 6548-1
Section 2 <i>Maintainability requirements in specifications and contracts</i>	BS 6548-1
Section 3 <i>Maintainability programme</i>	BS 6548-1
Section 4 <i>Diagnostic testing</i>	Planned for publication in BS 6548-5
Section 5 <i>Maintainability studies during the design phase</i>	BS 6548-2
Section 6 <i>Maintainability verification</i>	BS 6548-3
Section 7 <i>Collection, analysis and presentation of data related to maintainability</i>	BS 6548-3
Section 8 <i>Maintenance and maintenance support planning</i>	Planned for publication in BS 6548-4
Section 9 <i>Statistical methods for maintainability evaluation</i>	Planned for publication in BS 6548-6

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Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 14, 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 Scope

This guide on maintainability is intended to make recommendations for the standardization of maintainability practices and to stimulate ideas in the maintainability field. This guide will assist users in defining maintainability requirements and associated programmes. Suppliers will gain an understanding of the requirement for achieving and verifying maintainability objectives.

Section 6. Maintainability verification

This section describes the various aspects of verification necessary to ensure that the specified maintainability requirements (see Publication 706-1, Section 2) have been met, and provides suitable procedures and test methods. While maintainability verification as such should be a mandatory part of any maintainability programme (see Publication 706-1, Section 3), each individual case requires appropriate methods to be carefully selected in order to ensure overall cost-effectiveness.

2 Definitions of terms

Definitions of terms used in this section of the guide are given in IEC Publication 271.

In addition, the following specific terms are used:

2.1

maintainability verification

monitoring actions, inspections or both for the purpose of determining compliance by the contractor with the maintainability requirements specified for an item

2.2

maintainability demonstration

activity performed on individual items or samples to indicate concurrence with a specific maintainability requirement and/or to generate maintainability data

2.3

customer selected equipment

a portion of the item under consideration which has been specially selected by the customer

NOTE Generally the supplier has no control over the maintainability of this portion, but he should consider it in the design of the item. Cooperation between customer and supplier is clearly desirable.

3 Objective

The objective is to verify that both qualitative and quantitative maintainability requirements have been met within the specified performance limitations. This includes verification that the defined maintenance activity has restored the equipment to the specified performance level. The verification is applicable to hardware, software and maintenance facilities.

Maintainability verification is a process of assessing the results of maintainability experience. This assessment can begin as soon as data and results are available and may continue throughout the project and extend into field use.

This is further expanded with respect to:

- qualitative maintainability requirements, see Sub-clause 5.2.2;
- quantitative maintainability requirements, see Sub-clause 5.2.3.

Experimental demonstration is described in Sub-clause 5.2.4.

4 Maintenance support concepts influencing maintainability verification

When performing maintainability verification, it should be borne in mind that the following maintenance support elements have a decisive influence on the effectiveness of the maintenance process:

- maintenance facilities;
- test support equipment;
- material support;
- maintenance personnel and training;
- technical documentation and manuals;
- transportation, handling, and storage conditions.

Section 8 contains further details.

5 Verification

5.1 General

5.1.1 Basic principles

Maintainability verification is understood to be a continuous process of generating, collecting and evaluating maintainability-related data as they become available in the course of project development, and comparing results with specified maintainability requirements.