

IEEE Standard for Software Test Documentation

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IEEE Standard for Software Test Documentation

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Abstract: A set of basic software test documents is described. This standard specifies the form and content of individual test documents. It does not specify the required set of test documents.

Keywords: test case specification, test design specification, test incident report, test item transmittal report, test log, test plan, test procedure specification, test summary report

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Introduction

(This introduction is not part of IEEE Std 829-1998, IEEE Standard for Software Test Documentation.)

Purpose

The purpose of this standard is to describe a set of basic software test documents. A standardized test document can facilitate communication by providing a common *frame of reference* (e.g., a customer and a supplier have the same definition for a test plan). The content definition of a standardized test document can serve as a completeness checklist for the associated testing process. A standardized set can also provide a baseline for the evaluation of current test documentation practices. In many organizations, the use of these documents significantly increases the manageability of testing. Increased manageability results from the greatly increased visibility of each phase of the testing process.

This standard specifies the form and content of individual test documents. It does not specify the required set of test documents. It is assumed that the required set of test documents will be specified when the standard is applied. Annex B contains an example of such a set specification.

The readers of this standard are referred to Annex C for guidelines for using this standard to meet the requirements of IEEE/EIA 12207.1-1997, IEEE/EIA Guide for Information Technology—Software life cycle processes—Life cycle data.

Overview

The documents outlined in this standard cover test planning, test specification, and test reporting.

The test plan prescribes the scope, approach, resources, and schedule of the testing activities. It identifies the items to be tested, the features to be tested, the testing tasks to be performed, the personnel responsible for each task, and the risks associated with the plan.

Test specification is covered by three document types:

- A test design specification refines the test approach and identifies the features to be covered by the design and its associated tests. It also identifies the test cases and test procedures, if any, required to accomplish the testing and specifies the feature pass/fail criteria.
- A test case specification documents the actual values used for input along with the anticipated outputs. A test case also identifies constraints on the test procedures resulting from use of that specific test case. Test cases are separated from test designs to allow for use in more than one design and to allow for reuse in other situations.
- A test procedure specification identifies all steps required to operate the system and exercise the specified test cases in order to implement the associated test design. Test procedures are separated from test design specifications as they are intended to be followed step by step and should not have extraneous detail.

Test reporting is covered by four document types:

- A test item transmittal report identifies the test items being transmitted for testing in the event that separate development and test groups are involved or in the event that a formal beginning of test execution is desired.
- A test log is used by the test team to record what occurred during test execution.
- A test incident report describes any event that occurs during the test execution which requires further investigation.
- A test summary report summarizes the testing activities associated with one or more test design specifications.

Figure 1 shows the relationships of these documents to one another as they are developed and to the testing process they document.

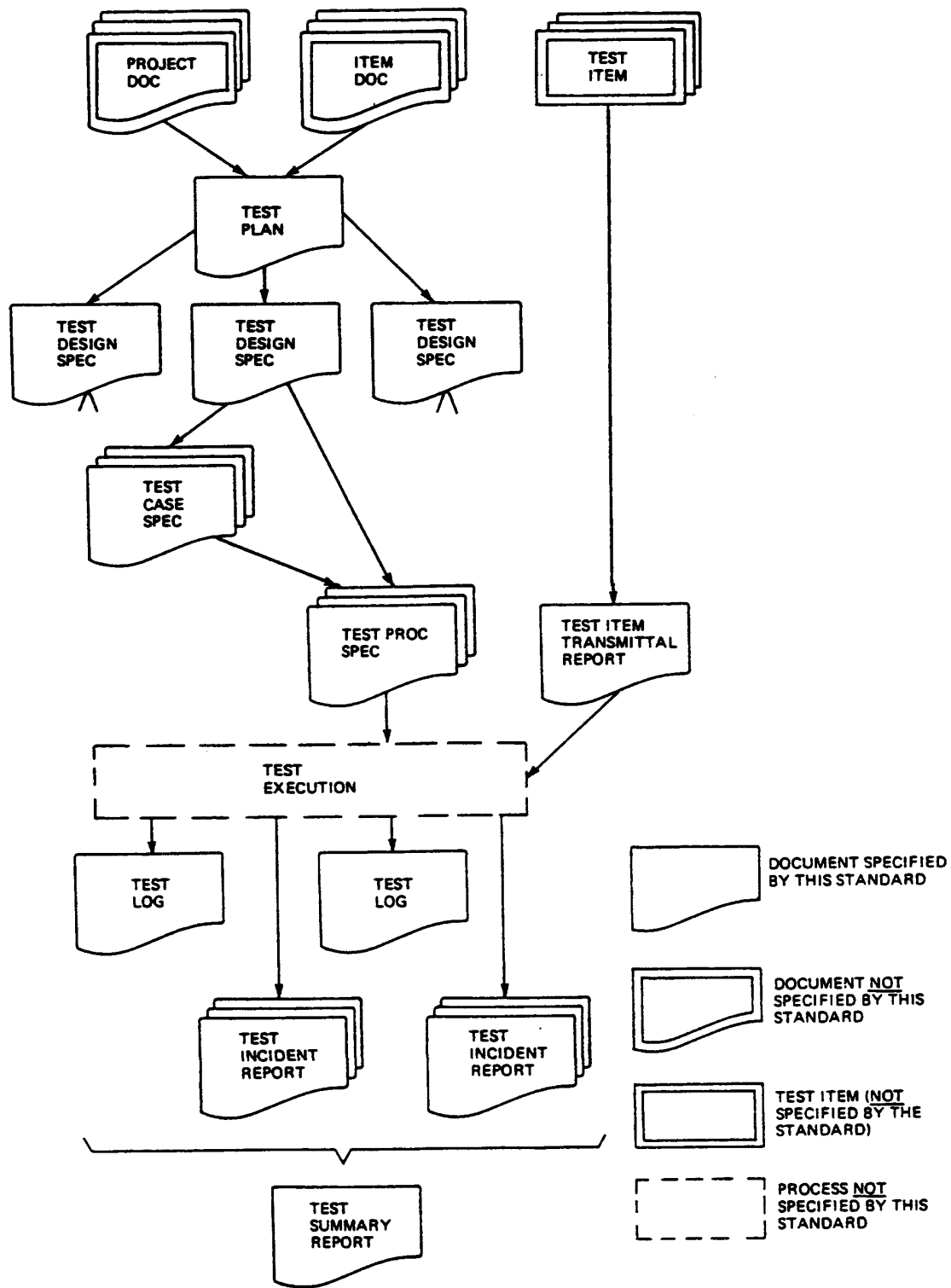


Figure 1—Relationship of test documents to testing process

Terminology

The words *shall*, *must*, and the imperative form identify the mandatory material within this standard. The words *should* and *may* identify optional material.

Annexes

The examples found in Annex A are meant to clarify the intent of the document descriptions found in the standard. Some suggestions about implementing and using the standard are in Annex B. Guidelines for compliance with IEEE/EIA 12207.1-1997 are provided in Annex C.

Audience

This standard should be of interest to software users and software procurement personnel; to development, test, and maintenance personnel; to operations and acquisition support managers; to software quality assurance personnel and auditors; and to participants in the legal system.

Participants

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Contents

1. Scope	1
2. References	2
3. Definitions	2
4. Test plan	3
4.1 Purpose	3
4.2 Outline	3
5. Test design specification	6
5.1 Purpose	6
5.2 Outline	6
6. Test case specification	7
6.1 Purpose	7
6.2 Outline	7
7. Test procedure specification	9
7.1 Purpose	9
7.2 Outline	9
8. Test item transmittal report	10
8.1 Purpose	10
8.2 Outline	11
9. Test log	11
9.1 Purpose	11
9.2 Outline	12
10. Test incident report	13
10.1 Purpose	13
10.2 Outline	13
11. Test summary report	14
11.1 Purpose	14
11.2 Outline	14
Annex A (informative) Examples	16
Annex B (informative) Implementation and usage guidelines	40
Annex C (informative) Guidelines for compliance with IEEE/EIA 12207.1-1997	41

IEEE Standard for Software Test Documentation

1. Scope

This standard describes a set of basic test documents that are associated with the dynamic aspects of software testing (i.e., the execution of procedures and code). The standard defines the purpose, outline, and content of each basic document. While the documents described in the standard focus on dynamic testing, several of them may be applicable to other testing activities (e.g., the test plan and test incident report may be used for design and code reviews).

This standard may be applied to commercial, scientific, or military software that runs on any digital computer. Applicability is not restricted by the size, complexity, or criticality of the software. However, the standard does *not* specify any class of software to which it must be applied. The standard addresses the documentation of both initial development testing and the testing of subsequent software releases. For a particular software release, it may be applied to all phases of testing from module testing through user acceptance. However, since all of the basic test documents may not be useful in each test phase, the particular documents to be used in a phase are *not* specified. Each organization using the standard will need to specify the classes of software to which it applies and the specific documents required for a particular test phase.

The standard does *not* call for specific testing methodologies, approaches, techniques, facilities, or tools, and does *not* specify the documentation of their use. Additional test documentation may be required (e.g., code inspection checklists and reports). The standard also does *not* imply or impose specific methodologies for documentation control, configuration management, or quality assurance. Additional documentation (e.g., a quality assurance plan) may be needed depending on the particular methodologies used.

Within each standard document, the content of each section (i.e., the text that covers the designated topics) may be tailored to the particular application and the particular testing phase. In addition to tailoring content, additional documents may be added to the basic set, additional sections may be added to any document, and additional content may be added to any section. It may be useful to organize some of the sections into subsections. Some or all of the contents of a section may be contained in another document which is then referenced. Each organization using the standard should specify additional content requirements and conventions in order to reflect their own particular methodologies, approaches, facilities, and tools for testing, documentation control, configuration management, and quality assurance.

This standard applies to documentation on electronic media as well as paper. Paper must be used for documents requiring approval signatures, unless the electronic documentation system has a secure approval annotation mechanism and that mechanism is used.

2. References

This standard shall be used in conjunction with the following publication.

IEEE Std 610.12-1990, IEEE Standard Glossary of Software Engineering Terminology.¹

3. Definitions

This clause contains key terms as they are used in this standard.

3.1 design level: The design decomposition of the software item (e.g., system, subsystem, program, or module).

3.2 pass/fail criteria: Decision rules used to determine whether a software item or a software feature passes or fails a test.

3.3 software feature: A distinguishing characteristic of a software item (e.g., performance, portability, or functionality).

3.4 software item: Source code, object code, job control code, control data, or a collection of these items.

3.5 test: (A) A set of one or more test cases, or (B) A set of one or more test procedures, or (C) A set of one or more test cases and procedures.

3.6 test case specification: A document specifying inputs, predicted results, and a set of execution conditions for a test item.

3.7 test design specification: A document specifying the details of the test approach for a software feature or combination of software features and identifying the associated tests.

3.8 test incident report: A document reporting on any event that occurs during the testing process which requires investigation.

3.9 testing: The process of analyzing a software item to detect the differences between existing and required conditions (that is, bugs) and to evaluate the features of the software item.

3.10 test item: A software item which is an object of testing.

3.11 test item transmittal report: A document identifying test items. It contains current status and location information.

3.12 test log: A chronological record of relevant details about the execution of tests.

3.13 test plan: A document describing the scope, approach, resources, and schedule of intended testing activities. It identifies test items, the features to be tested, the testing tasks, who will do each task, and any risks requiring contingency planning.

3.14 test procedure specification: A document specifying a sequence of actions for the execution of a test.

3.15 test summary report: A document summarizing testing activities and results. It also contains an evaluation of the corresponding test items.

¹IEEE publications are available from the Institute of Electrical and Electronics Engineers, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331, USA (www.standards.ieee.org/).

4. Test plan

4.1 Purpose

To prescribe the scope, approach, resources, and schedule of the testing activities. To identify the items being tested, the features to be tested, the testing tasks to be performed, the personnel responsible for each task, and the risks associated with this plan.

4.2 Outline

A test plan shall have the following structure:

- a) Test plan identifier;
- b) Introduction;
- c) Test items;
- d) Features to be tested;
- e) Features not to be tested;
- f) Approach;
- g) Item pass/fail criteria;
- h) Suspension criteria and resumption requirements;
- i) Test deliverables;
- j) Testing tasks;
- k) Environmental needs;
- l) Responsibilities;
- m) Staffing and training needs;
- n) Schedule;
- o) Risks and contingencies;
- p) Approvals.

The sections shall be ordered in the specified sequence. Additional sections may be included immediately prior to *Approvals*. If some or all of the content of a section is in another document, then a reference to that material may be listed in place of the corresponding content. The referenced material must be attached to the test plan or available to users of the plan.

Details on the content of each section are contained in the following subclauses.

4.2.1 Test plan identifier

Specify the unique identifier assigned to this test plan.

4.2.2 Introduction

Summarize the software items and software features to be tested. The need for each item and its history may be included.

References to the following documents, when they exist, are required in the highest level test plan:

- a) Project authorization;
- b) Project plan;
- c) Quality assurance plan;
- d) Configuration management plan;
- e) Relevant policies;
- f) Relevant standards.

In multilevel test plans, each lower-level plan must reference the next higher-level plan.

4.2.3 Test items

Identify the test items including their version/revision level. Also specify characteristics of their transmittal media that impact hardware requirements or indicate the need for logical or physical transformations before testing can begin (e.g., programs must be transferred from tape to disk).

Supply references to the following test item documentation, if it exists:

- a) Requirements specification;
- b) Design specification;
- c) Users guide;
- d) Operations guide;
- e) Installation guide.

Reference any incident reports relating to the test items.

Items that are to be specifically excluded from testing may be identified.

4.2.4 Features to be tested

Identify all software features and combinations of software features to be tested. Identify the test design specification associated with each feature and each combination of features.

4.2.5 Features not to be tested

Identify all features and significant combinations of features that will not be tested and the reasons.

4.2.6 Approach

Describe the overall approach to testing. For each major group of features or feature combinations, specify the approach that will ensure that these feature groups are adequately tested. Specify the major activities, techniques, and tools that are used to test the designated groups of features.

The approach should be described in sufficient detail to permit identification of the major testing tasks and estimation of the time required to do each one.

Specify the minimum degree of comprehensiveness desired. Identify the techniques that will be used to judge the comprehensiveness of the testing effort (e.g., determining which statements have been executed at least once). Specify any additional completion criteria (e.g., error frequency). The techniques to be used to trace requirements should be specified.

Identify significant constraints on testing such as test item availability, testing resource availability, and deadlines.

4.2.7 Item pass/fail criteria

Specify the criteria to be used to determine whether each test item has passed or failed testing.

4.2.8 Suspension criteria and resumption requirements

Specify the criteria used to suspend all or a portion of the testing activity on the test items associated with this plan. Specify the testing activities that must be repeated, when testing is resumed.

4.2.9 Test deliverables

Identify the deliverable documents. The following documents should be included:

- a) Test plan;
- b) Test design specifications;
- c) Test case specifications;
- d) Test procedure specifications;
- e) Test item transmittal reports;
- f) Test logs;
- g) Test incident reports;
- h) Test summary reports.

Test input data and test output data should be identified as deliverables.

Test tools (e.g., module drivers and stubs) may also be included.

4.2.10 Testing tasks

Identify the set of tasks necessary to prepare for and perform testing. Identify all intertask dependencies and any special skills required.

4.2.11 Environmental needs

Specify both the necessary and desired properties of the test environment. This specification should contain the physical characteristics of the facilities including the hardware, the communications and system software, the mode of usage (e.g., stand-alone), and any other software or supplies needed to support the test. Also specify the level of security that must be provided for the test facilities, system software, and proprietary components such as software, data, and hardware.

Identify special test tools needed. Identify any other testing needs (e.g., publications or office space). Identify the source for all needs that are not currently available to the test group.

4.2.12 Responsibilities

Identify the groups responsible for managing, designing, preparing, executing, witnessing, checking, and resolving. In addition, identify the groups responsible for providing the test items identified in 4.2.3 and the environmental needs identified in 4.2.11.

These groups may include the developers, testers, operations staff, user representatives, technical support staff, data administration staff, and quality support staff.

4.2.13 Staffing and training needs

Specify test staffing needs by skill level. Identify training options for providing necessary skills.

4.2.14 Schedule

Include test milestones identified in the software project schedule as well as all item transmittal events.

Define any additional test milestones needed. Estimate the time required to do each testing task. Specify the schedule for each testing task and test milestone. For each testing resource (i.e., facilities, tools, and staff), specify its periods of use.

4.2.15 Risks and contingencies

Identify the high-risk assumptions of the test plan. Specify contingency plans for each (e.g., delayed delivery of test items might require increased night shift scheduling to meet the delivery date).

4.2.16 Approvals

Specify the names and titles of all persons who must approve this plan. Provide space for the signatures and dates.

5. Test design specification

5.1 Purpose

To specify refinements of the test approach and to identify the features to be tested by this design and its associated tests.

5.2 Outline

A test design specification shall have the following structure:

- a) Test design specification identifier;
- b) Features to be tested;
- c) Approach refinements;
- d) Test identification;
- e) Feature pass/fail criteria.

The sections shall be ordered in the specified sequence. Additional sections may be included at the end. If some or all of the content of a section is in another document, then a reference to that material may be listed in place of the corresponding content. The referenced material must be attached to the test design specification or available to users of the design specification.

Details on the content of each section are contained in the following subclauses.

5.2.1 Test design specification identifier

Specify the unique identifier assigned to this test design specification. Supply a reference to the associated test plan, if it exists.

5.2.2 Features to be tested

Identify the test items and describe the features and combinations of features that are the object of this design specification. Other features may be exercised, but need not be identified.

For each feature or feature combination, a reference to its associated requirements in the item requirement specification or design description should be included.

5.2.3 Approach refinements

Specify refinements to the approach described in the test plan. Include specific test techniques to be used. The method of analyzing test results should be identified (e.g., comparator programs or visual inspection).

Specify the results of any analysis that provides a rationale for test case selection. For example, one might specify conditions that permit a determination of error tolerance (e.g., those conditions that distinguish valid inputs from invalid inputs).

Summarize the common attributes of any test cases. This may include input constraints that must be true for every input in the set of associated test cases, any shared environmental needs, any shared special procedural requirements, and any shared case dependencies.

5.2.4 Test identification

List the identifier and a brief description of each test case associated with this design. A particular test case may be identified in more than one test design specification. List the identifier and a brief description of each procedure associated with this test design specification.

5.2.5 Feature pass/fail criteria

Specify the criteria to be used to determine whether the feature or feature combination has passed or failed.

6. Test case specification

6.1 Purpose

To define a test case identified by a test design specification.

6.2 Outline

A test case specification shall have the following structure:

- a) Test case specification identifier;
- b) Test items;
- c) Input specifications;
- d) Output specifications;
- e) Environmental needs;
- f) Special procedural requirements;
- g) Intercase dependencies.

The sections shall be ordered in the specified sequence. Additional sections may be included at the end. If some or all of the content of a section is in another document, then a reference to that material may be listed in place of the corresponding content. The referenced material must be attached to the test case specification or available to users of the case specification.

Since a test case may be referenced by several test design specifications used by different groups over a long time period, enough specific information must be included in the test case specification to permit reuse.

Details on the content of each section are contained in the following subclauses.

6.2.1 Test case specification identifier

Specify the unique identifier assigned to this test case specification.

6.2.2 Test items

Identify and briefly describe the items and features to be exercised by this test case.

For each item, consider supplying references to the following test item documentation:

- a) Requirements specification;
- b) Design specification;
- c) Users guide;
- d) Operations guide;
- e) Installation guide.

6.2.3 Input specifications

Specify each input required to execute the test case. Some of the inputs will be specified by value (with tolerances where appropriate), while others, such as constant tables or transaction files, will be specified by name. Identify all appropriate databases, files, terminal messages, memory resident areas, and values passed by the operating system.

Specify all required relationships between inputs (e.g., timing).

6.2.4 Output specifications

Specify all of the outputs and features (e.g., response time) required of the test items. Provide the exact value (with tolerances where appropriate) for each required output or feature.

6.2.5 Environmental needs

6.2.5.1 Hardware

Specify the characteristics and configurations of the hardware required to execute this test case (e.g., 132 character × 24 line CRT).

6.2.5.2 Software

Specify the system and application software required to execute this test case. This may include system software such as operating systems, compilers, simulators, and test tools. In addition, the test item may interact with application software.

6.2.5.3 Other

Specify any other requirements such as unique facility needs or specially trained personnel.

6.2.6 Special procedural requirements

Describe any special constraints on the test procedures that execute this test case. These constraints may involve special set up, operator intervention, output determination procedures, and special wrap up.

6.2.7 Intercase dependencies

List the identifiers of test cases that must be executed prior to this test case. Summarize the nature of the dependencies.

7. Test procedure specification

7.1 Purpose

To specify the steps for executing a set of test cases or, more generally, the steps used to analyze a software item in order to evaluate a set of features.

7.2 Outline

A test procedure specification shall have the following structure:

- a) Test procedure specification identifier.
- b) Purpose;
- c) Special requirements;
- d) Procedure steps.

The sections shall be ordered in the specified sequence. Additional sections, if required, may be included at the end. If some or all of the content of a section is in another document, then a reference to that material may be listed in place of the corresponding content. The referenced material must be attached to the test procedure specification or available to users of the procedure specification.

Details on the content of each section are contained in the following subclauses.

7.2.1 Test procedure specification identifier

Specify the unique identifier assigned to this test procedure specification. Supply a reference to the associated test design specification.

7.2.2 Purpose

Describe the purpose of this procedure. If this procedure executes any test cases, provide a reference for each of them.

In addition, provide references to relevant sections of the test item documentation (e.g., references to usage procedures).

7.2.3 Special requirements

Identify any special requirements that are necessary for the execution of this procedure. These may include prerequisite procedures, special skills requirements, and special environmental requirements.

7.2.4 Procedure steps

Include the steps in 7.2.4.1 through 7.2.4.10 as applicable.

7.2.4.1 Log

Describe any special methods or formats for logging the results of test execution, the incidents observed, and any other events pertinent to the test (see Clauses 9 and 10).