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Industry Implementation of International Standard ISO/IEC 12207 : 1995

(ISO/IEC 12207) Standard for Information Technology—

Software life cycle processes— Life cycle data

April 1998

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IEEE/EIA 12207.1-1997

(A Joint Guide Developed by IEEE and EIA)

IEEE/EIA Guide

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Abstract: ISO/IEC 12207 provides a common framework for developing and managing software. IEEE/EIA 12207.0 consists of the clarifications, additions, and changes accepted by the Institute of Electrical and Electronics Engineers (IEEE) and the Electronic Industries Association (EIA) as formulated by a joint project of the two organizations. IEEE/EIA 12207.1 provides guidance for recording life cycle data resulting from the life cycle processes of IEEE/EIA 12207.0.
Keywords: acquisition process, audit, configuration management, development process, maintenance process, operation process, quality assurance, supply process, tailoring process, validation, verification

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Introduction

(This introduction is not a part of IEEE/EIA 12207.1-1997, Guide for ISO/IEC 12207, Standard for information technology—Software life cycle processes—Life cycle data.)

This guide provides guidance on life cycle data resulting from the processes of IEEE/EIA 12207.0. It describes the relationship among the following: the content of the life cycle data information items, references to documentation of life cycle data in IEEE/EIA 12207.0, and sources of detailed software product information.

This part of IEEE/EIA 12207 provides guidelines for recording life cycle data of IEEE/EIA 12207.0. Where text has been quoted from IEEE/EIA 12207.0, that text is enclosed in a box, for ease of identification.

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Information technology—Software life cycle processes—Life cycle data

1 Scope

This guide provides guidance for recording life cycle data resulting from the life cycle processes of IEEE/EIA 12207.0.

NOTE—For informative references, see annex A.

2 Normative references

The following standards contain provisions that, through reference in this text, constitute provisions of this guide. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this guide are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards. When the following standards are superseded by an approved revision, the revision shall apply. This guide shall be used in conjunction with the following publications:

IEEE/EIA 12207.0-1996, *Information technology—Software life cycle processes.*[1]

IEEE Std 610.12-1990, *IEEE Standard Glossary of Software Engineering Terminology* (ANSI).

ISO 8402: 1994, *Quality management and quality assurance—Vocabulary.*[2]

3 Definitions

For the purposes of this guide, the definitions given in IEEE/EIA 12207.0, ISO 8402, and IEEE Std 610.12 apply, in the order cited in this clause.

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[1] This joint standard is available from the Institute of Electrical and Electronics Engineers, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331, USA and from the Electronic Industries Association, 2500 Wilson Blvd., Arlington, VA 22201-3834, USA.

[2] ISO publications are available from the ISO Central Secretariat, Case Postale 56, 1 rue de Varembé, CH-1211, Genève 20, Switzerland/Suisse. ISO publications are also available in the United States from the Sales Department, American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036, USA.

4 Life cycle data

4.1 Overview

Many of the clauses in IEEE/EIA 12207.0 require life cycle data to be produced. This guide assumes an organization has implemented an IEEE/EIA 12207.0 compliant process(es). Based on the organization's compliance to IEEE/EIA 12207.0, life cycle data will be generated. Further guidance on life cycle data may be found in guidance to 5.1.2.2 of IEEE/EIA 12207.2. The life cycle data information results from the execution of the activities and tasks of the standard. The clauses of IEEE/EIA 12207.0 do not, however, dictate the content, location, format, or media to be used to record the data. IEEE/EIA 12207.1 provides guidance on what data might be recorded. When choosing appropriate data to be recorded, readers should also determine where within the organization's or project's records the data should be recorded. This guide lists other standards and guides readers might consult for helpful suggestions on choosing appropriate data records, data formatting, and data packaging.

This guide defines the life cycle data of IEEE/EIA 12207.0 by relating the tasks and activities defined in IEEE/EIA 12207.0 with the following kinds of documentation: description, plan, procedure, record, report, request, and specification. Table 1 lists the life cycle data information items of IEEE/EIA 12207.0. Clause 5 provides generic content guidelines for the seven kinds of documentation listed above. Clause 6 provides specific content guidelines for the life cycle data information items that typically occur during acquisition or regulatory oversight of a software product. References that may be used to obtain details for a presentation view of data are listed in table 1.

The information item content descriptions in clause 6 consist of the information item name followed by four keywords and commentary:

  6.x   Name of information item.

  6.x.1   <u>Purpose</u>: A brief description of the information item.

  6.x.2   <u>IEEE/EIA 12207.0 reference</u>: A listing of the task(s) in IEEE/EIA 12207.0 that define and use the information item.

  6.x.3   <u>Content</u>: An itemized listing of the minimum content elements that should be considered in constituting the information item.

  6.x.4   <u>Characteristics</u>: A declaration of life cycle data characteristics that should be considered in the preparation and use of the information item.

For information on documentation planning, see ISO/IEC 6592 and ISO/IEC TR 9294.[3]

4.2 Life cycle data objectives

Annex H of IEEE/EIA 12207.0 describes the basic principles to be considered in preparing data during the execution of the software life cycle processes of IEEE/EIA 12207.0.

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[3] See annex A.

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4.2.1 Purpose of software life cycle data

H.1 Purpose of software life cycle data

The life cycle data should support the following actions:

    a)   Describe and record information about a software product during its life cycle;

    b)   Assist usability and maintainability of a software product;

    c)   Define and control life cycle processes;

    d)   Communicate information about the system, software product or service, and project to those who need it;

    e)   Provide a history of what happened during development and maintenance to support management and process improvement;

    f)   Provide evidence that the processes were followed.

GUIDANCE:

Additionally, the life cycle data should support the following actions:

    g)   Assist the software logistics planning (i.e., replication, distribution, installation, training) for a software product;

    h)   Provide data change history.

4.2.2 Operations on software life cycle data

H.2 Operations on software life cycle data

The life cycle data should be supported by the following operations:

    a)   Create;

    b)   Read;

    c)   Update;

    d)   Delete.

GUIDANCE:

Additionally, life cycle data should be supported by the following operations:

    e)   Archive;
    f)   Distribute;
    g)   Transition (transfer of data and ownership/usage rights).

4.2.3 Characteristics of software life cycle data

H.3 Characteristics of software life cycle data

The life cycle data should adhere to the following characteristics:

a) <u>Unambiguous</u>: Information is unambiguous if it is described in terms that only allow a single interpretation, aided, if necessary, by a definition.

b) <u>Complete</u>: Information is complete if it includes necessary, relevant requirements and/or descriptive material, responses are defined for the range of valid input data, and terms and units of measure are defined.

c) <u>Verifiable</u>: Information is verifiable if it can be checked for correctness by a person or tool.

d) <u>Consistent</u>: Information is consistent if there are no conflicts within it.

e) <u>Modifiable</u>: Information is modifiable if it is structured and has a style such that changes can be made completely, consistently, and correctly while retaining the structure.

f) <u>Traceable</u>: Information is traceable if the origin of its components can be determined.

g) <u>Presentable</u>: Information is presentable if it can be retrieved and viewed.

GUIDANCE:

1—Additionally, life cycle data should adhere to the following characteristics:

h) <u>Secure and private</u>: Information is secure and private if there is controlled access to the information.
i) <u>Protected</u>: Information is protected if there is persistence in data backup and protection from loss or damage.
j) <u>Accurate</u>: Information is accurate if it is correct and adequate.

2—"Unambiguous" and "Presentable" imply having the characteristic of being understandable by intended users.

3—"Consistent" should include consistency between related data and conformity of data.

4.2.4 Basic types of software life cycle data

H.4 Basic types of software life cycle data

The life cycle data should contain content in the following areas:

 a) Requirements data: Expected functionality, operational context, performance constraints and expectations, basis for qualification testing, and key decision rationale.

 b) Design data: Architecture, algorithms, design constraints, mapping to requirements, and key decision rationale.

 c) Test data: Test strategy and criteria, cases (what to test), procedures (how to carry out tests), test results, and key decision rationale.

 d) Configuration data: Configuration description, build instructions, reference to source code, reference to object code, data integrity approach, description of development environment, and key decision rationale.

 e) User data: Software overview, system access information, commands and responses, error messages, operational environment, and key decision rationale.

 f) Management data: Management plans, status reports, management indicators, criteria and key decision rationale, and contract and other procurement information.

 g) Quality data: Quality plans and procedures, corrective action status, root cause analysis, product quality characteristics and process measurement data, and criteria and key decision rationale.

GUIDANCE:

1—For H.4 c), Test Data should include "mapping to requirements."

2—For H.4 e), User Data should include "help systems, training material, and operational logs."

3—For H.4 f), Management Data should include "management and technical risks."

4.2.5 Presentation form of software life cycle data

H.5 Presentation form of software life cycle data

The presentation form of life cycle data should

 a) Be appropriate to support the purpose of the life cycle data;

 b) Support the retrieval and review of data of a software item during its life cycle;

 c) Support the basic operations on data of a software item during its life cycle;

 d) Be selected subject to concurrence of the users of the data.

NOTE—In preparing or finalizing the contract, the acquirer should specify the requirements for data delivery, taking into account the maintenance strategy. Some of the choices are

 1) Raw data—Repositories of the development tools such as CASE tools, databases, file systems, and other tool repositories.

 2) On-line publishing systems—Data assembled and formatted for presentation by systems such as: word processors, World Wide Web publishing and display systems, SGML viewers.

 3) Hard copy print—Traditional paper document form.

4.3 Information item matrix

The following information item matrix, table 1, identifies the information item (i.e., output or artifact) that IEEE/EIA 12207.0 requires or recommends to be produced as part of the life cycle process, activity, or task. Table 1 contains the name of the information item(s), the corresponding IEEE/EIA 12207.0 clause number citing documentation of life cycle data, the kind of documentation to be produced (as described in clause 5 of this guide), the IEEE/EIA 12207.1 clause containing specific content guidelines, and available standards/guides/technical reports published by IEEE, ISO/IEC JTC1/SC7, and other organizations. The references are provided to assist the users of the guide in formulating information items. Some of the references provide examples of information items; others address related topics.

NOTES

1—The standards/guides/technical reports listed in the References column of table 1 were developed by various standards groups at different times and according to different underlying principles of software development. Consequently, many of the references will not completely satisfy the generic or specific information item content guidelines in clauses 5 and 6. Care must be exercised when using the references to identify missing, conflicting, or unnecessary information not called for by this guide.

2—Throughout IEEE/EIA 12207.0, there is reference to "the contract" and a "Request For Proposal" (RFP). Table 1 includes some information items that would typically be part of "the contract" and the "Request For Proposal" (e.g., Acceptance strategy and conditions), but the full contents of these items are beyond the scope of this guide. Some of the key information items that are not included in the table include Statement of Work, Contract Data Requirements List, Contract Line Items, and Contract Clauses.

Table 1—Information item matrix

Information item(s)	IEEE/EIA 12207.0 Clause	Kind of documentation	IEEE/EIA 12207.1 Clause	References (See annex A.)
Acceptance strategy and conditions record	5.1.1.9	Record (5.4)	—	IEEE 1062
Acquisition plan	5.1.1.8	Plan	6.1	ASTM E731, E1206, IEEE 1062
Acquisition requirements record	5.1.2.1	Record (5.4)	—	IEEE 1062, 1220
Audit agenda record	6.7.1.4	Record (5.4)	—	—
Audit procedure	6.7.1.4	Procedure (5.3)	—	—
Change request	5.4.4, 5.5.1, 6.2.3	Request	6.2	—
Concept of operations description	5.1.1.1	Description	6.3	IEEE 1362, EIA/IEEE J-STD-016 F.2.1. Also see ISO 5806, 5807, 8631, 8790, and 11411 for guidance on use of notations.
Concept/need determination record	5.1.1.1	Record (5.4)	—	IEEE 1062, 1220
Database design description	5.3.5.3, 5.3.6.3, 5.3.7.1	Description	6.4	IEEE 1016, EIA/IEEE J-STD-016 G.2.3
Detailed design evaluation record	5.3.6.7	Record	6.6	—
Development process plan	5.3.1.4	Plan	6.5	ASTM E622, E1340, EIA/IEEE J-STD-016 E.2.1, IEEE 1074, 1074.1

Table 1—Information item matrix *(Continued)*

Information item(s)	IEEE/EIA 12207.0 Clause	Kind of documentation	IEEE/EIA 12207.1 Clause	References (See annex A.)
Documentation evaluation record	5.3.9.3	Record	6.6	—
Documentation plan	6.1.1.1	Plan (5.2)	—	ASTM E627, E919, IEEE 1063, ISO/IEC 6592, 9294
Executable object code record	5.3.7	Record	6.7	—
Historical data record	7.3.3.2	Record (5.4)	—	IEEE 730.1
Joint review agenda record	6.6.1.3	Record (5.4)	—	—
Joint review procedure	6.6.1.3	Procedure (5.3)	—	—
Joint review results documentation record	6.6.1.5	Record (5.4)	—	IEEE 1028
Maintenance interaction procedure	5.4.1.3	Procedure (5.3)	—	—
Maintenance plan	5.5.1.1	Plan (5.2)	—	EIA/IEEE J-STD-016 E.2.4, IEEE 1219
Maintenance procedure	5.5.1.1	Procedure (5.3)	—	—
Maintenance process plan	5.5	Plan	6.8	IEEE 1219, EIA/IEEE J-STD-016 E.2.4
Management process plan	7.1.2.1	Plan (5.2)	—	IEEE 1058.1
Migration plan	5.5.5.2	Plan (5.2)	—	IEEE 730.1, EIA/IEEE J-STD-016 E.2.4, E.2.3
Migration plan report	5.5.5.3	Report (5.5)	—	IEEE 730.1, 1062
Modification records	5.5.3.1	Record (5.4)	—	—
Modification request	5.5.2.4	Request	6.2	—
Operation process plan	5.4	Plan	6.9	EIA/IEEE J-STD-016 E.2.4, J.2.3, J.2.4
Organizational processes record	7.3.1.1	Record (5.4)	—	—
Policy record— Line of responsibility must be clearly documented	7.1.1	Record (5.4)	—	ISO 9001, 9000-3
Problem categories description	6.8.1.1	Description (5.1)	—	IEEE 1044, 1044.1
Problem report and problem resolution report	6.8	Report	6.10	IEEE 1044, IEEE/EIA 12207.2 annex J
Problem resolution procedure	5.4.1.2, 5.5.1.2	Procedure (5.3)	—	—
Process assessment procedure	7.3.2.1	Procedure (5.3)	—	—
Project management plan	5.2.4.3, 5.2.4.4, 5.2.4.5	Plan	6.11	IEEE 1012, 1058.1, 1059, 1074, 1074.1, 1220, 1228, EIA/IEEE J-STD-016 E.2.1, ISO/IEC: 9126, 12119, SEI Continuous Risk Management Guidebook
Quality cost data record	7.3.3.3	Record (5.4)	—	ISO 9001

Table 1—Information item matrix *(Continued)*

Information item(s)	IEEE/EIA 12207.0 Clause	Kind of documentation	IEEE/EIA 12207.1 Clause	References (See annex A.)
Retirement plan	5.5.6.1	Plan (5.2)	—	IEEE 730.1, 1219
Retirement plan report	5.5.6.2	Report (5.5)	—	IEEE 730.1, 1219
Review of requirements in RFP record	5.2.1.1	Record (5.4)	—	ISO 9001, 9000-3
Software acquisition decision rationale record	5.1.1.6	Record (5.4)	—	IEEE 1062
Software architecture description	5.3.5.1, 5.3.5.6	Description	6.12	IEEE 1016, 1016.1, EIA/IEEE J-STD-016 G.2.4. Also see ISO/IEC 5806, 5807, 6593, 8631, 8790, and 11411 for guidance on use of notations
Software architecture evaluation record	5.3.5.6	Record	6.6	—
Software code and test results evaluation record	5.3.7.5	Record	6.6	—
Software configuration index record	6.2	Record	6.13	EIA/IEEE J-STD-016 I.2.2
Software configuration management interaction procedure	5.5.1.3	Procedure (5.3)	—	—
Software configuration management plan	6.2.1.1	Plan	6.14	IEEE 828, 1042, ISO 10007
Software configuration management records	6.2	Record	6.15	IEEE 828, 1042, ISO 10007
Software design description	5.3.6.1, 5.3.6.7	Description	6.16	IEEE 1016, 1016.1, EIA/IEEE J-STD-016 G.2.4, MIL-STD-961D. Also see ISO/IEC 5806, 5807, 6593, 8631, 8790, and 11411 for guidance on use of notations
Software development standards description	5.3.1.4	Description	6.17	—
Software engineering methods/procedures/ tools description	5.3.1.3	Description (5.1)	—	—
Software installation results record	5.3.12.2	Record (5.4)	—	IEEE 730.1
Software installation plan	5.3.12.1	Plan (5.2)	—	IEEE 730.1, EIA/IEEE J-STD-016 E.2.3
Software integration audit report	5.3.9.4	Report (5.5)	—	IEEE 730.1
Software integration evaluation record	5.3.8.5	Record	6.6	None
Software integration plan	5.3.8.1, 5.3.8.5	Plan	6.18	IEEE 829, EIA/IEEE J-STD-016 E.2.2
Software interface design description	5.3.5.2, 5.3.6.2	Description	6.19	IEEE 1016, EIA/IEEE J-STD-016 G.2.2
Software life cycle model description	5.2.4.2, 5.3.1.1	Description (5.1)	—	IEEE 1074

Table 1—Information item matrix *(Continued)*

Information item(s)	IEEE/EIA 12207.0 Clause	Kind of documentation	IEEE/EIA 12207.1 Clause	References (See annex A.)
Software product description	5.3.1.2.e, 6.2.2.1	Description (5.1)	—	EIA/IEEE J-STD-016 I.2.1, MIL-STD-961D
Software quality assurance plan	6.3.1.3	Plan	6.20	IEEE 730, 730.1, ISO 9000-3, 9001, 10005
Software quality assurance records	6.3	Record	6.21	IEEE 730.1, ISO 9000-3, 10005
Software requirements description	5.1.1.4, 5.3.4.1, 5.3.4.2	Description (See Note for 6.22.1 of this guide)	6.22	IEEE 830, EIA/IEEE J-STD-016 F.2.3, F.2.4, MIL-STD-961D. Also see ISO/IEC 5806, 5807, 6593, 8631, 8790, and 11411 for guidance on use of notations.
Software requirements evaluation record	5.3.4.2	Record	6.6	—
Software verification results report	6.4	Report	6.23	IEEE 1012, 1059
Source code record	5.3.7.1, 5.3.7.5, 5.3.9.5, 5.3.11.4, 5.3.13.2	Record	6.24	—
Subcontractor management procedure	5.2.5.4	Procedure (5.3)	—	—
Supplier selection record—Proposal evaluation criteria, Requirements compliance weighting	5.1.3.1	Record (5.4)	—	IEEE 1058, 1062, ISO 9001, 9000-3
System architecture and requirements allocation description	5.3.3.1, 5.3.3.2	Description	6.25	IEEE 1233, 1362, 1471, EIA/IEEE J-STD-016 G.2.1. Also see ISO/IEC 5806, 5807, 6593, 8631, 8790, and 11411 for guidance on use of notations
System architecture evaluation record	5.3.3.2	Record	6.6	—
System evaluation record	5.3.11.2	Record	6.6	—
System qualification test evaluation record	5.3.10.3	Record	6.6	—
System qualification test audit results record	5.3.11.3	Record (5.4)	—	IEEE 829, ISO/IEC 12119
System requirements specification	5.1.1.2, 5.3.2.1, 5.3.2.2	Specification	6.26	IEEE 1220, 1233, EIA/IEEE J-STD-016 F.2.2, MIL-STD-961D. Also see ISO/IEC 5806, 5807, 6593, 8631, 8790, and 11411 for guidance on use of notations
System requirements evaluation record	5.3.2.2	Record	6.6	—

Table 1—Information item matrix *(Continued)*

Information item(s)	IEEE/EIA 12207.0 Clause	Kind of documentation	IEEE/EIA 12207.1 Clause	References (See annex A.)
System test and evaluation criteria record	5.5.3.2.a	Record (5.4)	—	IEEE 730.1, 829, ISO/IEC 12119
Tailoring decisions record	Annex A	Record (5.4)	—	—
Test or validation plan	5.3.5.5, 5.3.6.5, 5.3.6.6, 5.3.7.4, 5.3.7.5, 6.5	Plan	6.27	IEEE 829, EIA/IEEE J-STD-016 F.2.4, H.2.1, ISO/IEC 12119
Test or validation procedures	5.1.5.1, 5.3.7.1, 5.3.8.1, 5.3.8.4, 5.3.8.5, 5.3.10.2, 6.5	Procedure	6.28	IEEE 829, EIA/IEEE J-STD-016 H.2.1, ISO/IEC 12119
Test or validation results report	5.3.7.2, 5.3.8.2, 5.3.9.1, 5.3.10.1, 5.3.11.1, 5.3.13.1, 6.5	Report	6.29	IEEE 829, EIA/IEEE J-STD-016 H.2.2, ISO/IEC 12119
Training materials and records	7.4.2.1, 7.4.3.1	Record (5.4)	—	ASTM E625
Training plan	7.4.1.1	Plan (5.2)	—	EIA/IEEE J-STD-016 E.2.3, ASTM E625
User assistance requests record	5.4.4.1	Record (5.4)	—	IEEE 1219
User documentation description	5.3.4.1, 5.3.5.4, 5.3.6.4, 5.3.7.3, 5.3.8.3, 5.3.8.5, 5.3.9.2	Description	6.30	IEEE 1063, EIA/IEEE J-STD-016 J.2.1, J.2.2, ISO 9127, ISO/IEC: 6592, 9294
Validation plan	6.5.1.4	Plan (5.2)	—	IEEE 1012, 1059, ISO/IEC 9126, 12119
Verification plan	6.4.1.5	Plan (5.2)	—	IEEE 1012, 1059

4.4 Compliance

One may use IEEE/EIA 12207.1 as a guide or as a standard. When used as a standard, there are two ways to claim compliance with IEEE/EIA 12207.1. One may claim that an individual document or group of documents complies with the requirements of IEEE/EIA 12207.1 (see 4.4.1 of this guide), or one may claim that an organization's processes comply with the requirements of IEEE/EIA 12207.1 (see 4.4.2 of this guide). In both cases, compliance does not require adherence to any particular document format.

4.4.1   Document compliance

One may claim that a particular document or group of documents complies with one or more of the information items described in rows selected from table 1. To be compliant, the document or group of documents shall satisfy the characteristics summarized in the selected rows of the table. In particular, the document or group of documents shall
   a)   Contain all of the information required by the clauses of IEEE/EIA 12207.0 listed in column 2 of the selected rows.
   b)   Satisfy all of the requirements of the generic content guideline (the "kind" of document as specified in clause 5 of IEEE/EIA 12207.1) designated by column 3 of the selected rows. To satisfy these requirements, the document or group of documents shall achieve the purpose described in the corresponding generic content guideline and shall contain all of the information recommended by the corresponding generic content guideline.
   c)   Satisfy all of the requirements of the clause of IEEE/EIA 12207.1 designated by column 4 of the selected rows. To satisfy these requirements, the document or group of documents shall achieve the purpose described in the corresponding clause of IEEE/EIA 12207.1 and shall contain all of the information recommended by the corresponding clause of IEEE/EIA 12207.1;
   d)   Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide).

NOTE—The references provided in column 5 of table 1 are only advisory.

4.4.2   Organizational process compliance

An organization may claim that one or more organizational processes comply with IEEE/EIA 12207.1 by documenting that those processes would produce documents or document groups complying with the corresponding rows of table 1. For this use, it is presumed that the organization has already made a claim of compliance with one or more processes of IEEE/EIA 12207.0 in accordance with annex F of that standard; that claim of compliance implies that the organizational processes satisfy the requirements of a set of clauses of IEEE/EIA 12207.0. A row of table 1 is selected if one of the cross-references appearing in column 2 of the table corresponds to a clause of IEEE/EIA 12207.0 satisfied by the organizational process(es). The claim of compliance shall be documented by designating which organizational template(s), information model(s), or other procedures contain the requirements sufficient to prescribe the production of documents or document groups compliant with the selected rows (see 4.4.1 of this guide).

5 Generic information item content guidelines

The verb "include" used in this clause indicates (1) the information is present or (2) a reference to the information is listed.

5.1 Description—generic content guidelines

5.1.1   Purpose: Describe a planned or actual function, design, performance, or process.

5.1.2   A description should include
  a) Date of issue and status;
  b) Scope;
  c) Issuing organization;
  d) References;
  e) Context;
  f) Notation for description;
  g) Body;
  h) Summary;
  i) Glossary;
  j) Change history.

5.2 Plan—generic content guidelines

5.2.1   Purpose: Define when, how, and by whom specific activities are to be performed, including options and alternatives, as required.

5.2.2   A plan should include
  a) Date of issue and status;
  b) Scope;
  c) Issuing organization;
  d) References;
  e) Approval authority;
  f) Planned activities and tasks;
  g) Macro references (policies or laws that give rise to the need for this plan);
  h) Micro references (other plans or task descriptions that elaborate details of this plan);
  i) Schedules;
  j) Estimates;
  k) Resources and their allocation;
  l) Responsibilities and authority;
  m) Risks;
  n) Quality control measures;
  o) Cost;
  p) Interfaces among parties involved;
  q) Environment/infrastructure, including safety needs;
  r) Training;
  s) Glossary;
  t) Change procedures and history.

5.3 Procedure—generic content guidelines

5.3.1   Purpose: Define in detail when and how to perform certain jobs, including needed tools.

5.3.2   A procedure should include
  a) Date of issue and status;
  b) Scope;
  c) Issuing organization;
  d) References;
  e) Approval authority;
  f) Relationship to other procedures;
  g) Macro references (policies or laws that give rise to the need for this procedure);
  h) Micro references (other procedures or task descriptions that elaborate details of this procedure);
  i) Inputs and outputs;

j) Ordered description of the steps to be taken by each participant;
k) Glossary;
l) Change history.

5.4 Record—generic content guidelines

5.4.1 Purpose: Describe the materials an organization retains (e.g., quality records, legal records, fiscal records, historical records).

5.4.2 A record should include
  a) Date recorded;
  b) Scope;
  c) Subject;
  d) Issuing organization;
  e) References;
  f) Date/time frame;
  g) Body;
  h) Glossary.

5.5 Report—generic content guidelines

5.5.1 Purpose: Describe the results of activities such as investigations, assessments, and tests.

5.5.2 A report should include
  a) Date of issue and status;
  b) Scope;
  c) Issuing organization;
  d) References;
  e) Summary;
  f) Introduction;
  g) Context;
  h) Message;
  i) Contributors;
  j) Body;
  k) Conclusions and recommendations;
  l) Bibliography;
  m) Glossary;
  n) Change history.

5.6 Request—generic content guidelines

5.6.1 Purpose: Record information needed to solicit a response.

5.6.2 A request should include
  a) Date of initiation;
  b) Scope;
  c) Subject;
  d) Originator of request;
  e) Identification of requested item, service, or response;
  f) Detailed description of requested item, service, or response, including suspense date;
  g) Justifications.

5.7 Specification—generic content guidelines

5.7.1 Purpose: Specify a required function, performance, or process (e.g., requirements specification).

5.7.2 A specification should include
  a) Date of issue and status;
  b) Scope;
  c) Issuing organization;
  d) References;
  e) Approval authority;
  f) Body;

g) Delivery instructions;
h) Assurance requirements;
i) Conditions, constraints, and characteristics;
j) Glossary;
k) Change history.

6 Specific information item content guidelines

"Content" guidelines serve as a checklist that can be satisfied by the organization's content mapping, templates, information models, etc. The verb "include" used in this clause indicates (1) the information is present or (2) a reference to the information is listed.

An established hierarchy of plans should be prescribed and a mechanism developed for resolving conflicts between items in any two or more plans. Ideally, there should be only one master schedule for the entire suite of plans identified in clause 6 relating to a single project; schedule information given in specific plans should relate to this master schedule by activities rather than calendar dates to allow for schedule variation without requiring change to each plan.

Some information is duplicated across multiple information items, for example, input/output and computer resource information. The Software Development Standards Description, 6.17, may include the type of information and level of detail to be provided in each information item where duplications exist.

6.1   Acquisition plan

6.1.1   Purpose: Define the technical and managerial processes necessary to satisfy acquisition requirements.

6.1.2   IEEE/EIA 12207.0 reference: 5.1.1.8.

6.1.3   Content: The acquisition plan should include
   a) Generic plan information (see 5.2 of this guide) for the following activities:
      1) Acquisition process initiation;
      2) Request-for-proposal [-tender] preparation;
      3) Contract preparation and update;
      4) Supplier monitoring;
      5) Acceptance and completion.
   b) Requirements for the system;
   c) Planned employment of the system;
   d) Type of contract to be employed;
   e) Responsibilities of the organizations involved;
   f) Support concept to be used;
   g) Risks considered as well as methods to manage the risks.

6.1.4   Characteristics: The acquisition plan should
   a) Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide).

NOTE—Further information on acquisition plan contents (e.g., definition of project acquisition process, relationship of project acquisition process to organization's acquisition process, description of software measurement plan) may be found in IEEE/EIA 12207.2 guidance for 5.1.1.8.

6.2   Change request or modification request

6.2.1   Purpose: Identify and record the implementation of a change or modification in a software item.

6.2.2   IEEE/EIA 12207.0 reference: 5.4.4, 5.5.1, 5.5.2.4, 6.2.3.

6.2.3   Content: The change or modification request should include
   a) Generic request information (see 5.6 of this guide);
   b) Justification for and nature of change, including
      1) New or modified capability(ies)/function(s) or other change(s) needed;
      2) Priority(ies) of change(s);
      3) Assumptions/constraints that affect change(s);
      4) Change to correct software error;
      5) Impact to schedules, cost, products, and test.
   c) Originator of change request;
   d) Information regarding receipt, recording, and tracking change request from the users;
   e) Configuration control of change request, including
      1) Identification and recording of change request;
      2) Analysis and evaluation of change;
      3) Approval or disapproval of change request;

4) Verification of the implementation and release of modified system.

6.2.4 Characteristics: The change or modification request should
a) Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide).

NOTE—Some organizations have found it convenient to combine Change Request (6.2) and Problem Report (6.10).

6.3 Concept of operations description

6.3.1 Purpose: Describe, in users' terminology, how the system should operate to meet the users' needs for the system.

6.3.2 IEEE/EIA 12207.0 reference: 5.1.1.1.

6.3.3 Content: The concept of operations description should include
a) Generic description information (see 5.1 of this guide);
b) Description of current situation or system;
c) Justification for and nature of changes;
d) Concepts for the proposed system;
e) Operational scenarios;
f) Summary of impacts;
g) Analysis of the proposed system;
h) Priorities, assumptions, constraints, advantages, limitations, alternatives, and trade-offs considered.

6.3.4 Characteristics: The concept of operations description should
a) Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide).

6.4 Database design description

6.4.1 Purpose: Describe the design of a database, that is, a collection of related data stored in one or more computerized files in a manner that can be accessed by users or computer programs via a database management system (DBMS). May also describe the software units used to access or manipulate the data. Used as the basis for implementing the database and related software units.

6.4.2 IEEE/EIA 12207.0 reference: 5.3.5.3, 5.3.6.3, 5.3.7.1.

6.4.3 Content: The database design description should include
a) Generic description information (see 5.1 of this guide);
b) Database overview and identification;
c) Design of the database, including descriptions of applicable design levels (e.g., conceptual, internal, logical, physical);
d) Reference to design description of software used for database access or manipulation;
e) Rationale for database design.

6.4.4 Characteristics: The database design description should
a) Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide);
b) Define types of errors that are not specified in the software requirements and the handling of those errors.

6.5 Development process plan

6.5.1 Purpose: Define the objectives, standards, and software life cycle models to be used in the software development processes.

6.5.2 IEEE/EIA 12207.0 reference: 5.3.1.4.

6.5.3 Content: The development process plan should include
a) Generic plan information (see 5.2 of this guide) for the following activities:
1) Development process implementation;
2) System requirements analysis;
3) System architectural design;
4) Software requirements analysis;
5) Software architectural design;

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6) Software detailed design;
7) Software coding and testing;
8) Software integration;
9) Software qualification testing;
10) System integration;
11) System qualification testing;
12) Software installation;
13) Software acceptance support.
b) Specific standards, methods, tools, actions, reuse strategy, and responsibility associated with the development and qualification of all requirements, including safety and security.

6.5.4   Characteristics: The development process plan should
a) Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide).

NOTE—The development process plan may be part of the Project Management Plan in 6.11.

6.6   Evaluation records

6.6.1   Purpose: Provide a record of the evaluation performed on results of the software development activities. Enable the acquirer to assess the evaluation and its results.

6.6.2   IEEE/EIA 12207.0 reference: 5.3.2.2, 5.3.3.2, 5.3.4.2, 5.3.5.6, 5.3.6.7, 5.3.7.5, 5.3.8.5, 5.3.9.3, 5.3.10.3, 5.3.11.2.

6.6.3   Content: An evaluation record should include
a) Generic record information (see 5.4 of this guide) for one or more of the tasks listed in 6.6.2.

6.6.4   Characteristics: An evaluation record should
a) Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide).

6.7   Executable object code record

6.7.1   Purpose: Provide the transformed version of source code (executable object code) that is directly usable by the central processing unit of the target computer and is, therefore, the software that is loaded into the hardware or system.

6.7.2   IEEE/EIA 12207.0 reference: 5.3.7.

6.7.3   Content: The executable object code record should include
a) Generic record information (see 5.4 of this guide);
b) A label that can be traced to configuration identifier and may be inspected;
c) Results transformed from source as specified in software configuration index;
d) Data integrity check data.

NOTE—An item of executable code may contain software from more than one source code item.

6.7.4   Characteristics: The executable object code record should
a) Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide).

6.8   Maintenance process plan

6.8.1   Purpose: Define the objectives, standards, and procedures to be used in the software maintenance process.

6.8.2   IEEE/EIA 12207.0 reference: 5.5.

6.8.3   Content: The maintenance process plan should include
a) Generic plan information (see 5.2 of this guide) for the following activities:
1) Maintenance process implementation;
2) Problem and modification analysis;
3) Modification implementation;
4) Maintenance review/acceptance;
5) Migration;

6) Software retirement.
b) Specific standards, methods, tools, actions, procedures, and responsibility associated with the maintenance process.

6.8.4 Characteristics: The maintenance process plan should
a) Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide).

NOTE—The planning process may include planning for installation, transition, task dependencies, coordination with associate developers, and management of computer resource utilization. Further information on these topics may be found in EIA/IEEE J-STD-016-1995 annex E.

6.9 Operation process plan

6.9.1 Purpose: Define the objectives, standards, and procedures to be used in the operation process.

6.9.2 IEEE/EIA 12207.0 reference: 5.4.

6.9.3 Content: The operation process plan should include
a) Generic plan information (see 5.2 of this guide) for the following activities:
1) Operation process implementation;
2) Operational testing;
3) System operation;
4) User support.
b) Specific standards, methods, tools, actions, procedures, and responsibility associated with the operation of software.

6.9.4 Characteristics: The operation process plan should
a) Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide).

6.10 Problem report and problem resolution report

6.10.1 Purpose: Provide a means for identifying and recording the resolution to software anomalous behavior, process noncompliance with plans and standards, and deficiencies in life cycle data.

6.10.2 IEEE/EIA 12207.0 reference: 6.8.

6.10.3 Content: The problem report and problem resolution report should include
a) Generic report information (see 5.5 of this guide);
b) Identification of the software item or software configuration item and/or the software life cycle process in which the problem was observed;
c) Description of the problem to enable problem resolution;
d) Description of the corrective action taken to resolve the reported problem;
e) Originator of report, and originator's assessment or urgency;
f) Date problem discovered;
g) Status of problem.

6.10.4 Characteristics: The problem report and problem resolution report should
a) Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide).

NOTE—Some organizations have found it convenient to combine Change Request (6.2) and Problem Report (6.10).

6.11 Project management plan

6.11.1 Purpose: Define the technical and managerial processes necessary to satisfy project requirements.

6.11.2 IEEE/EIA 12207.0 reference: 5.2.4.3, 5.2.4.4, 5.2.4.5

6.11.3 Content: The project management plan should include
a) Generic plan information (see 5.2 of this guide) for managing the project;
b) Project organizational structure showing authority and responsibility of each organizational unit, including external organizations;
c) Engineering environment (for development, operation or maintenance, as applicable), including test environment, library, equipment, facilities, standards, procedures, and tools;

d) Work breakdown structure of the life cycle processes and activities, including the software products, software services and nondeliverable items to be performed, budgets, staffing, physical resources, software size, and schedules associated with the tasks;

e) Management of the quality characteristics of the software products or services (Separate plans for quality may be developed.);

f) Management of safety, security, privacy, and other critical requirements of the software products or services (Separate plans for safety and security may be developed.);

g) Subcontractor management, including subcontractor selection and involvement between the subcontractor and the acquirer, if any;

h) Quality assurance;

i) Verification and validation, including the approach for interfacing with the verification and validation agent, if specified;

j) Acquirer involvement (i.e., joint reviews, audits, informal meetings, reporting, modification and change, implementation, approval, acceptance, access to facilities);

k) User involvement (i.e., requirements setting exercises, prototype demonstrations and evaluations);

l) Risk management (i.e., the management of the areas of the project that involve technical, cost, and schedule risks);

m) Security policy (i.e., the rules for need-to-know and access-to-information at each project organizational level);

n) Approval required by such means as regulations, required certifications, proprietary, usage, ownership, warranty and licensing rights;

o) Means for scheduling, tracking, and reporting;

p) Training of personnel;

q) Software life cycle model;

r) Configuration management.

6.11.4 Characteristics: The project management plan should

a) Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide).

NOTE—The planning process may include planning for installation, transition, task dependencies, coordination with associate developers, and management of computer resource utilization. Further information on these topics may be found in EIA/IEEE J-STD-016-1995 annex E.

6.12 Software architecture description

6.12.1 Purpose: Describe the software item-wide design decisions and the software item architectural design.

6.12.2 IEEE/EIA 12207.0 reference: 5.3.5.1, 5.3.5.6.

6.12.3 Content: The software architecture description should include

a) Generic description information (see 5.1 of this guide);

b) System overview and identification;

c) Software item architectural design, including

1) Software architecture general description;

2) Software component definition;

3) Identification of software requirements allocated to each software component;

4) Software component concept of execution;

5) Resource limitations and the strategy for managing each resource and its limitation.

d) Rationale for software architecture and component definition decisions, including database and user interface design.

6.12.4 Characteristics: The software architecture description should

a) Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide).

6.13 Software configuration index record

6.13.1 Purpose: Contain or reference, for a software item, the executable software, source files, and compilation, build, and modification procedures. The software configuration index identifies the configuration of the software product.

6.13.2 IEEE/EIA 12207.0 reference: 6.2.

6.13.3 Content: The software configuration index record should identify
   a) Generic record information (see 5.4 of this guide);
   b) Software product;
   c) Executable object code;
   d) Each software item;
   e) Software life cycle data that defines the software product;
   f) Archive and release data;
   g) Instructions for building the executable object code, including, for example, the instructions and data for compiling and linking and the procedures used to recover the software, perform software regeneration, testing, or modification;
   h) Data integrity checks for the executable object code.

   NOTE—A software configuration index may contain one software item or a set of software items.

6.13.4 Characteristics: The software configuration index record should
   a) Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide).

6.14 Software configuration management plan

6.14.1 Purpose: Define the software configuration management activities to be performed during the life cycle of the software. Describe the responsibilities and authorities for accomplishing the planned software configuration management activities. Identify the required coordination of software configuration management activities with other activities of the project. Identify the tools and the physical and human resources required for the execution of the plan.

6.14.2 IEEE/EIA 12207.0 reference: 6.2.1.1.

6.14.3 Content: The software configuration management plan should include
   a) Generic plan information (see 5.2 of this guide) for the following activities:
       1) Configuration management process implementation;
       2) Configuration identification;
       3) Configuration control;
       4) Configuration status accounting;
       5) Configuration evaluation;
       6) Release management and delivery.
   b) Relationship with organizations such as software development or maintenance.

6.14.4 Characteristics: The software configuration management plan should
   a) Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide).

6.15 Software configuration management records

6.15.1 Purpose: Provide evidence of the accomplishment of software configuration management activities.

6.15.2 IEEE/EIA 12207.0 reference: 6.2.

6.15.3 Content: The software configuration management records should include
   a) Generic record information (see 5.4 of this guide) for the following activities:
       1   Configuration management process implementation;
       2) Configuration identification;
       3) Configuration control;
       4) Configuration status accounting;
       5) Configuration evaluation;
       6) Release management and delivery.

6.15.4 Characteristics: The software configuration management records should
   a) Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide).

6.16 Software design description

6.16.1 Purpose: Describe the design of a software item. (The software design description and the software architecture provide the detailed design needed to implement the software.) May be supplemented by software item interface design and database design.

6.16.2 IEEE/EIA 12207.0 reference: 5.3.6.1, 5.3.6.7.

6.16.3 Content: The software item design description should include
- a) Generic description information (see 5.1 of this guide);
- b) Description of how the software item satisfies the software requirements, including algorithms and data structures;
- c) Software item input/output description;
- d) Static relationships of software units;
- e) Concept of execution, including data flow and control flow;
- f) Requirements traceability:
  - 1) Software component-level requirements traceability;
  - 2) Software unit-level requirements traceability.
- g) Rationale for software item design;
- h) Reuse element identification.

6.16.4 Characteristics: The software item design description should
- a) Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide);
- b) Define types of errors that are not specified in the software requirements and the handling of those errors.

6.17 Software development standards description

6.17.1 Purpose: Identify the methods and standards to be used in performing the activities of the software development process.

6.17.2 IEEE/EIA 12207.0 reference: 5.3.1.4.

6.17.3 Content: The software development standards description should include
- a) Generic description information (see 5.1 of this guide);
- b) Description of methods used to allocate system requirements, to develop the software requirements, architecture, and design, and to implement the source code and executable object code;
- c) Notations used to describe the system requirements and architecture;
- d) Notations used to describe the software requirements, architecture, design modules, design limitations, and code, including identification of the programming language(s) or subset used and reference to the definition of the language syntax, control and data behavior, and side-effects;
- e) Naming conventions for requirements, design, and source code, including source code, executable object code files, and data;
- f) Methods of design and coding and constraints on design and code constructs and expressions, including design and code complexity restrictions and quality criteria for assessing requirements and design data and code;
- g) Presentation conventions and content standards for requirements data, design data, source code, and test data;
- h) Description of methods and tools used to develop safety monitoring software (if applicable);
- i) Description of the methods and tools used to define traceability between system requirements, system architecture, software requirements, software architecture, design, code, and test elements;
- j) Description of methods, tools, and standards for testing.

6.17.4 Characteristics: The software development standards description should
- a) Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide).

6.18 Software integration plan

6.18.1 Purpose: Define the activities necessary to integrate the software units and software components into the software item.

6.18.2 IEEE/EIA 12207 reference: 5.3.8.1, 5.3.8.5.

6.18.3 Content: The software integration plan should include
   a) Generic plan information (see 5.2 of this guide) for integrating the software;
   b) Test requirements;
   c) Test procedures;
   d) Test data;
   e) Test responsibilities;
   f) Test schedule.

6.18.4 Characteristics: The software integration plan should
   a) Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide).

6.19 Software interface design description

6.19.1 Purpose: Describe the interface characteristics of one or more system, subsystem, hardware item, software item, manual operation, or other system component. May describe any number of interfaces.

6.19.2 IEEE/EIA 12207.0 reference: 5.3.5.2, 5.3.6.2.

6.19.3 Content: The software item interface design description should include
   a) Generic description information (see 5.1 of this guide);
   b) External interface identification;
   c) Software component identification;
   d) Software unit identification;
   e) External-software item interface definition (e.g., source language, diagrams);
   f) Software item-software item interface definition (e.g., source language, diagrams);
   g) Software component-software component interface definition (e.g., source language, diagrams).

6.19.4 Characteristics: The software item interface design description should
   a) Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide);
   b) Define types of errors that are not specified in the software requirements and the handling of those errors.

6.20 Software quality assurance plan

6.20.1 Purpose: Define the software quality assurance activities to be performed during the life cycle of the software. Describe the responsibilities and authorities for accomplishing the planned software quality assurance activities. Identify the required coordination of software quality assurance activities with other activities of the project. Identify the tools and the physical and human resources required for the execution of the plan.

6.20.2 IEEE/EIA 12207.0 reference: 6.3.1.3.

6.20.3 Content: The software quality assurance plan should include
   a) Generic plan information (see 5.2 of this guide) for software quality assurance;
   b) Quality standards, methodologies, procedures, and tools for performing the quality assurance activities (or their references in organization's official documentation);
   c) Procedures for contract review and coordination thereof;
   d) Procedures for identification, collection, filing, maintenance, and disposition of quality records;
   e) Resources, schedule(s), and responsibilities for conducting the quality assurance activities;
   f) Selected activities and tasks from supporting processes such as Verification, Validation, Joint Review, Audit, and Problem Resolution.

6.20.4 Characteristics: The software quality assurance plan should
   a) Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide).

6.21 Software quality assurance records

6.21.1 Purpose: Provide evidence of the accomplishment of quality assurance activities.

6.21.2 IEEE/EIA 12207.0 reference: 6.3.

6.21.3 Content: The software quality assurance records should include

a) Generic record information (see 5.4 of this guide) for the following activities:
1) Quality assurance process implementation;
2) Product assurance;
3) Process assurance;
4) Assurance of quality systems.

6.21.4 Characteristics: The software quality assurance records should
a) Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide).

6.22 Software requirements description

6.22.1 Purpose: Specify the requirements for a software item and the methods to be used to ensure that each requirement has been met. Used as the basis for design and qualification testing of a software item.

NOTE—If the software is a stand-alone system, then the "kind" of document changes from a "description" to a "specification."

6.22.2 IEEE/EIA 12207.0 reference: 5.1.1.4, 5.3.4.1, 5.3.4.2.

6.22.3 Content: The software requirements description should include
a) Generic description information (see 5.1 of this guide);
b) System identification and overview;
c) Functionality of the software item, including
1) Performance requirements;
2) Physical characteristics;
3) Environmental conditions.
d) Requirements for interfaces external to software item;
e) Qualification requirements;
f) Safety specifications, including those related to methods of operation and maintenance, environmental influences, and personnel injury;
g) Security and privacy specifications, including those related to compromise of sensitive information;
h) Human-factors engineering (ergonomics) requirements, including those for
1) Manual operations;
2) Human-equipment interactions;
3) Constraints on personnel;
4) Areas that need concentrated human attention and are sensitive to human errors and training.
i) Data definition and database requirements, including installation-dependent data for adaptation needs;
j) Installation and acceptance requirements of the delivered software product at the operation site(s);
k) Installation and acceptance requirements of the delivered software product at the maintenance site(s);
l) User documentation requirements;
m) User operation and execution requirements;
n) User maintenance requirements;
o) Software quality characteristics;
p) Design and implementation constraints;
q) Computer resource requirements;
r) Packaging requirements;
s) Precedence and criticality of requirements;
t) Requirements traceability;
u) Rationale.

6.22.4 Characteristics: The software requirements description should
a) Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide);
b) Describe any function using a notation that has well-defined syntax and semantics;
c) Define no requirements that are in conflict with each other;
d) Use standard terminology and definitions throughout the document;
e) Define each unique requirement once to prevent inconsistent updates;
f) Uniquely identify each requirement.

6.23 Software verification results report

6.23.1 Purpose: Provide a record of the verification performed on a software item, a software system or subsystem, or other software-related item. Enable the acquirer to assess the verification and its results.

6.23.2 IEEE/EIA 12207.0 reference: 6.4.

6.23.3 Content: The software verification results report should include
- a) Generic report information (see 5.5 of this guide);
- b) System identification and overview;
- c) Overview of results, including
  - 1) Identification of item(s) verified;
  - 2) Date(s) of verification.
- d) Detailed results, including
  - 1) Problems encountered;
  - 2) Verification criteria used.
- e) Verification results;
- f) Rationale for decisions.

6.23.4 Characteristics: The software verification results report should
- a) Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide).

6.24 Source code record

6.24.1 Purpose: Provide all software instructions developed in order to implement the design of a software item. Provide any instructions for generating the object code from the source code and for linking and loading the data.

6.24.2 IEEE/EIA 12207.0 reference: 5.3.7.1, 5.3.7.5, 5.3.9.5, 5.3.11.4, 5.3.13.2.

6.24.3 Content: The source code record should include
- a) Generic record information (see 5.4 of this guide);
- b) Identification of the software, including the name and date of revision and/or version, as applicable.

6.24.4 Characteristics: The source code record should
- a) Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide).

6.25 System architecture and requirements allocation description

6.25.1 Purpose: Describe the architectural design of a system or subsystem.

6.25.2 IEEE/EIA 12207.0 reference: 5.3.3.1, 5.3.3.2.

6.25.3 Content: The system architecture description should include
- a) Generic description information (see 5.1 of this guide);
- b) System overview and identification;
- c) Hardware item identification;
- d) Software item identification;
- e) Manual operations identification;
- f) Concept of execution;
- g) Rationale for allocation of hardware items, software items, and manual operations.

6.25.4 Characteristics: The system architecture description should
- a) Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide);
- b) Document the allocation of system requirements.

6.26 System requirements specification

6.26.1 Purpose: Specify the requirements for a system or subsystem and the methods to be used to ensure that each requirement has been met. Used as the basis for design and qualification testing of a system or subsystem.

6.26.2 IEEE/EIA 12207.0 reference: 5.1.1.2, 5.3.2.1, 5.3.2.2.

6.26.3 Content: The system requirements specification should include
     a) Generic specification information (see 5.7 of this guide);
     b) System identification and overview;
     c) Required states and modes;
     d) Requirements for the functions and performance of the system;
     e) Business, organizational, and user requirements;
     f) Safety, security, and privacy protection requirements;
     g) Human-factors engineering (ergonomics) requirements;
     h) Operations and maintenance requirements;
     i) System external interface requirements;
     j) System environmental requirements;
     k) Design constraints and qualification requirements;
     l) Computer resource requirements:
         1) Computer hardware requirements;
         2) Computer hardware resource requirements, including utilization requirements;
         3) Computer software requirements;
         4) Computer communications requirements.
     m) System quality characteristics;
     n) Internal data requirements;
     o) Installation-dependent data requirements;
     p) Physical requirements;
     q) Personnel, training, and logistics requirements;
     r) Packaging requirements;
     s) Precedence and criticality of requirements;
     t) Rationale.

NOTE—At the system level, the constraints on computer resources listed in item l) should be specified consistent with the degree of risk identified. The details of the resource requirements may be listed in supporting documents (e.g., system architecture and requirements allocation description, software requirements description, software architecture description).

6.26.4 Characteristics: The system requirements specification should
     a) Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide).

6.27 Test or validation plan

6.27.1 Purpose: Describe plans for qualification testing of software items and software systems. Describe the software test environment to be used for the testing, identify the tests to be performed, and provide schedules for test activities.

6.27.2 IEEE/EIA 12207.0 reference: 5.3.5.5, 5.3.6.5, 5.3.6.6, 5.3.7.4, 5.3.7.5, 6.5.

6.27.3 Content: The test or validation plan should contain
     a) Generic plan information (see 5.2 of this guide);
     b) Test levels;
     c) Test classes;
     d) General test conditions;
     e) Test progression;
     f) Data recording, reduction, and analysis;
     g) Test coverage (breadth and depth) or other methods for assuring sufficiency of testing;
     h) Planned tests, including items and their identifiers;
     i) Test schedules;
     j) Requirements traceability;
     k) Qualification testing environment, site, personnel, and participating organizations.

6.27.4 Characteristics: The test or validation plan should
     a) Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide);
     b) Conform to test standards.

6.28 Test or validation procedures

6.28.1 Purpose: Describe the test preparations, test cases, and test procedures to be used to perform qualification testing of a software item or a software system or subsystem. Enable the acquirer to assess the adequacy of the qualification testing to be performed.

6.28.2 IEEE/EIA 12207.0 reference: 5.1.5.1, 5.3.7.1, 5.3.8.1, 5.3.8.4, 5.3.10.2, 6.5.

6.28.3 Content: The test or validation procedures should include
    a) Generic procedure information (see 5.3 of this guide);
    b) Identification of test author;
    c) Identification of test configuration;
    d) Test objectives, requirements, and rationale;
    e) Test preparations (hardware, software, other) for each test;
    f) Test descriptions including
        1) Test identifier;
        2) Requirements addressed;
        3) Prerequisite conditions;
        4) Test input;
        5) Expected test results;
        6) Criteria for evaluating results;
        7) Instructions for conducting procedure.
    g) Requirements traceability;
    h) Rationale for decisions.

6.28.4 Characteristics: The test or validation procedures should
    a) Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide);
    b) Conform to test standards.

6.29 Test or validation results report

6.29.1 Purpose: Provide a record of the qualification testing performed on a software item, a software system or subsystem, or other software-related item. Enable the acquirer to assess the testing and its results.

6.29.2 IEEE/EIA 12207.0 reference: 5.3.7.2, 5.3.8.2, 5.3.8.5, 5.3.9.1, 5.3.10.1, 5.3.11.1, 5.3.13.1, 6.5.

6.29.3 Content: The test or validation results report should include
    a) Generic report information (see 5.5 of this guide);
    b) System identification and overview;
    c) Overview of test results, including
        1) Overall assessment of the software tested;
        2) Impact of test environment.
    d) Detailed test results, including
        1) Test identifier;
        2) Test summary;
        3) Problems encountered;
        4) Deviations from test cases/procedures.
    e) Test log;
    f) Rationale for decisions.

6.29.4 Characteristics: The test or validation results report should
    a) Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide).

6.30 User documentation description

6.30.1 Purpose: Record the planning and engineering information created during the development process that is of use to the users of the software product or service.

6.30.2 IEEE/EIA 12207.0 reference: 5.3.4.1, 5.3.5.4, 5.3.6.4, 5.3.7.3, 5.3.8.3, 5.3.8.5, 5.3.9.2.

6.30.3 Content: The user documentation description should include
    a) Generic description information (see 5.1 of this guide);
    b) Content in user-specified format.

NOTE—IEEE/EIA 12207.0 is based on users' defining their requirements for user documentation. Hence, it provides little guidance on content for user documentation.

6.30.4 Characteristics: The user documentation description should
   a) Support the life cycle data characteristics from annex H of IEEE/EIA 12207.0 (see 4.2 of this guide).

Annex A
(informative)
References

A.1 Information presentation

ASTM E622-94, *Guide for Developing Computerized Systems.*[4]

ASTM E625-87 (R1992), *Guide for Training Users of Computerized Systems.*

ASTM E627-94, *Guide for Documenting Computerized Systems.*

ASTM E731-96, *Guide for Selection and Acquisition of Commercially Available Computerized Systems.*

ASTM E919-96, *Specification for Software Documentation for a Computerized System.*

ASTM E1206-87 (R1992), *Guide for Computerization of Existing Equipment.*

ASTM E1340-96, *Guide for Rapid Prototyping of Computerized Systems.*

EIA/IEEE J-STD-016:1995, *Standard for Information Technology—Software Life Cycle Processes—Software Development: Acquirer-Supplier Agreement.*[5]

IEEE P1362, *Draft Guide for Information Technology—System Definition—Concept of Operations Document* (Draft 2.5 dated February 1996).[6]

IEEE Std 730-1989, *IEEE Standard for Software Quality Assurance Plans* (ANSI).[7]

IEEE Std 730.1-1995, *IEEE Guide for Software Quality Assurance Planning* (ANSI).

IEEE Std 828-1990, *IEEE Standard for Software Configuration Management Plans* (ANSI).

IEEE Std 829-1983 (Reaff 1991), *IEEE Standard for Software Test Documentation* (ANSI).

IEEE Std 830-1993, *IEEE Recommended Practice for Software Requirements Specifications* (ANSI).

IEEE Std 1012-1986 (Reaff 1992), *IEEE Standard for Software Verification and Validation Plans* (ANSI).

IEEE Std 1016-1987 (Reaff 1993), *IEEE Recommended Practice for Software Design Descriptions* (ANSI).

IEEE Std 1016.1-1993, *IEEE Guide to Software Design Descriptions* (ANSI).

IEEE Std 1028-1997, *IEEE Standard for Software Reviews* (ANSI).

IEEE Std 1042-1987 (Reaff 1993), *IEEE Guide to Software Configuration Management* (ANSI).

IEEE Std 1044-1993, *IEEE Standard Classification for Software Anomalies* (ANSI).

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[4] ASTM publications are available from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, USA.

[5] EIA/IEEE J-STD-016: 1995 is available from Global Engineering, 1990 M Street NW, Suite 400, Washington, DC, 20036, USA. It is also available from the Institute of Electrical and Electronics Engineers, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331, USA.

[6] This IEEE standards project was not approved by the IEEE Standards Board at the time this publication went to press. For information about obtaining a draft, contact the IEEE.

[7] IEEE publications are available from the Institute of Electrical and Electronics Engineers, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331, USA.

IEEE Std 1044.1-1995, *IEEE Guide to Classification for Software Anomalies* (ANSI).

IEEE Std 1058.1-1987 (Reaff 1993), *IEEE Standard for Software Project Management Plans* (ANSI).

IEEE Std 1059-1993, *IEEE Guide for Software Verification and Validation Plans* (ANSI).

IEEE Std 1062-1993, *IEEE Recommended Practice for Software Acquisition* (ANSI).

IEEE Std 1063-1987 (Reaff 1993), *IEEE Standard for Software User Documentation* (ANSI).

IEEE Std 1074-1995, *IEEE Standard for Developing Software Life Cycle Processes* (ANSI).

IEEE Std 1219-1992, *IEEE Standard for Software Maintenance* (ANSI).

IEEE Std 1220-1994, *IEEE Trial-Use Standard for Application and Management of the Systems Engineering Process* (ANSI).

IEEE Std 1228-1994, *IEEE Standard for Software Safety Plans* (ANSI).

IEEE Std 1233-1996, *IEEE Guide for Developing System Requirements Specifications* (ANSI).

ISO 9000-3:1997, *Quality management and quality assurance standards—Part 3: Guidelines for the application of ISO 9001:1994 to the development, supply, installation and maintenance of computer software.*[8]

ISO 9001:1994, *Quality system—Model for quality assurance in design, development, production, installation and servicing.*

ISO 9127:1988, *Information processing systems—User documentation and cover information for consumer software packages.*

ISO 10005:1995, *Quality management—Guidelines for quality plans* (formerly ISO/DIS 9004-5).

ISO 10007:1995, *Quality management—Guidelines for configuration management.*

ISO/IEC 6592:1998*, Information Processing Guidelines for the documentation of computer-based application systems.*

ISO/IEC 9126:1991, *Information technology—Software product evaluation—Quality characteristics and guidelines for their use.*

ISO/IEC 12119:1994, *Information technology—Software packages—Quality requirements and testing.*

MIL-STD-961D, 22 March 1995, *DoD Standard Practice, Defense Specifications.*[9]

SEI Continuous Risk Management Guidebook.[10]

A.2 Documentation planning

ASTM E627-94, *Guide for Documenting Computerized Systems.*

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[8] ISO and ISO/IEC publications are available from the ISO Central Secretariat, Case Postale 56, 1 rue de Varembé, CH-1211, Genève 20, Switzerland/Suisse. ISO publications are also available in the United States from the Sales Department, American National Standards Institute, 11 West 42nd Street, 13th Floor, New York, NY 10036, USA.

[9] MIL publications are available from Customer Service, Defense Printing Service, 700 Robbins Ave., Bldg. 4D, Philadelphia, PA 19111-5094, USA.

[10] This document is available from Carnegie Mellon University, Pittsburgh, PA.

ASTM E919-96, *Specification for Software Documentation for a Computerized System.*

ISO/IEC 6592:1998*, Information Processing Guidelines for the documentation of computer-based application systems.*

ISO/IEC TR 9294:1990*, Information technology—Guidelines for the management of software documentation.*

A.3 Notation

ISO 5806:1984, *Information processing—Specification of single-hit decision tables.*

ISO 5807:1985, *Information processing—Documentation symbols and conventions for data, program and system flowcharts, program network charts and system resources charts.*

ISO 6593:1985, *Information processing—Program flow for processing sequential files in terms of record groups.*

ISO 8790:1987, *Information processing systems—Computer system configuration diagram symbols and conventions.*

ISO/IEC 8631:1989, *Information technology—Program constructs and conventions for their representation.*

ISO/IEC 11411:1995, *Information technology—Representation for human communication of state transition of software.*