EUROPEAN COOPERATION

ECSS

FOR SPACE STANDARDIZATION

ECSS

Drafting rules and template for ECSS Standards

Foreword

This Standard is one of the series of ECSS Standards intended to be applied together for the management, engineering and product assurance in space projects and applications. ECSS is a cooperative effort of the European Space Agency, national space agencies and European industry associations for the purpose of developing and maintaining common standards. Requirements in this Standard are defined in terms of what shall be accomplished, rather than in terms of how to organize and perform the necessary work. This allows existing organizational structures and methods to be applied where they are effective, and for the structures and methods to evolve as necessary without rewriting the standards.

This Standard has been prepared by the ECSS Executive Secretariat Working Group, reviewed by the ECSS Executive Secretariat and approved by the ECSS Technical Authority.

Disclaimer

ECSS does not provide any warranty whatsoever, whether expressed, implied, or statutory, including, but not limited to, any warranty of merchantability or fitness for a particular purpose or any warranty that the contents of the item are error-free. In no respect shall ECSS incur any liability for any damages, including, but not limited to, direct, indirect, special, or consequential damages arising out of, resulting from, or in any way connected to the use of this Standard, whether or not based upon warranty, business agreement, tort, or otherwise; whether or not injury was sustained by persons or property or otherwise; and whether or not loss was sustained from, or arose out of, the results of, the item, or any services that may be provided by ECSS.

Change log

<table>
<tr><td style="background-color:#ffffcc">

EXPECTED CONTENT

It is expected that the Change log includes a table with the changes between the previous published version of the standard and the present one, identifying the page and numbered item, and the change.

In the case of a complete re-edition of a document, a summary of the changes, both in the structure of the document and in the contents, is expected.

</td></tr>
<tr><td style="background-color:#ccffcc">

REQUIREMENTS

a. The change log shall provide traceability between the previous version of the published standard and the present one.

b. In case of a "Revision" of a Standard the Change log shall include the identification of all changes to requirements.

c. In the case of a first version, the change log shall state "First issue".

d. The Change log shall not contain requirements.

e. The layout of the change log shall be as in the present drafting rules.

</td></tr>
</table>

ECSS-D-00-01A 6 December 2010	First issue
ECSS-D-00-01B 1 June 2012	Second issue: Addition of Clause 5.2.8 for "Drafting rules for Revision of existing ECSS Standards"
ECSS-D-00-01B Rev.1 16 August 2012	Second issue, Revision 1 Correction of three broken cross-references is section 5.3.4 "Equations"
ECSS-D-00-01C 20 May 2014	Third issue • Addition of instructions to introduce a "Pre-tailoring" clause (see clause 6) • Clarification of drafting rules for Terms and definitions and abbreviated terms and symbols. Specifically concerning the "context" of a definition and the deviation of terms from existing definitions in ECSS. • Addition of clauses for "3.4 Conventions" and "3.5 Nomenclature" • Addition of clause "5.1.3.3.2 Informative annex "Deliverable documents per review"

Table of contents

EXPECTED CONTENTS	
	The table of contents is included for a quick reference to the contents of the standard. In includes the sections and clauses in the order that they appear in the standard, and then a list of Figures and a list of Tables.
REQUIREMENTS	
a.	The table of content shall include first all the sections and clauses in the order in which they appear in the standard, and then a list of Figures and a list of Tables.
b.	The table of contents shall be automatically (electronically) generated.
c.	The Table of Contents shall not contain requirements
d.	The layout of the table of contents shall be as in the present drafting rules.

Figures

Tables

Introduction

EXPECTED CONTENTS

Introduction is an optional element, and therefore this section can be deleted if not used.

The following are examples of subjects that can be included in the Introduction:

- Specific description on the technical content

- Reasons prompting the preparation or the update of the standard

- History of the standard

- Relation with other ECSS standards

REQUIREMENTS

a. The Introduction shall not contain requirements

b. The introduction, if present, shall:

1. not contain sub-sections and sub-headers,

2. have the layout of the "Introduction" of the present drafting rules.

The present document complements ECSS-D-00 Annex A "Drafting rules for ECSS documents".

The present document covers implementation rules for drafting ECSS standards, and therefore it is not a standard in itself. However, for matter of clarity, it has been drafted as a standard, and it is in full compliance with the drafting rules stated in itself. This approach permits to use the present document as a template to draft ECSS standards, and in many occasions the text here can be re-used as a boilerplate for ECSS standards.

For full consistency with this approach, when referring to itself from now on, the term "this standard" is used instead of "this document".

1
Scope

EXPECTED CONTENTS

The purpose of the Scope clause is to describe, in a few lines, the standard as a whole in such a way that the reader can assess if the standard is applicable or not to a particular case. The Scope clause does not intend to recreate an expanded version of the TOC, chapter by chapter.

With this view, only a brief description of the subject of the standard and statements of applicability are expected to appear in the Scope clause. Statements of applicability state explicitly in which kind of projects or situations the standard is applicable (and for which is not applicable).

Any other descriptive material can be included in the introduction, e.g. history of the standard, rationale behind its preparation or relationships with other standards.

REQUIREMENTS

a.   The Scope clause shall only describe:

1.   The subject of the standard and aspects covered by it

2.   The applicability of the standard

b.   The Scope clause shall not contain requirements

c.   The Scope clause shall have the layout of the "Scope" of the present drafting rules.

d.   At the end of the Scope, the following boilerplate text shall be stated:

"This standard may be tailored for the specific characteristics and constrains of a space project in conformance with ECSS-S-ST-00-02."

e.   If the standard provides a pre-tailoring table, the following boilerplate text shall be stated after the boilerplate text specified in d:

"To support the tailoring of this standard as specified in ECSS-S-ST-00-02, clause XX provides a pre-tailoring table per product type and project phase."

Where *XX* is the number of the clause "Pre-tailoring per product types and project phases".

The present template sets the actual layout and specifies the requirements for drafting ECSS standards.

It is applicable to all ECSS standards and their drafts, from WG drafts to publications.

It is not applicable to other ECSS documents (e.g. handbooks and technical memoranda).

Since these drafting rules are fully applicable to the development of any ECSS standard they are therefore not subject to tailoring. For this reason clause 6 "Applicability per product type and per project phase" states the complete applicability of the document to any product type and project phase. It is however provided to be used as a template for the drafting of standards.

2
Normative references

The purpose of the "Normative references" clause is to list the documents referred to in requirements. Availability of the documents referred to is, which are therefore necessary to apply the standard in drafting.

Documents called from non-normative parts of the standard are included in the Bibliography section. Documents not referred to in normative or descriptive parts of the standard are not listed in the "Normative references" clause or Bibliography section.

REQUIREMENTS

a. The "Normative references" clause shall include an introductory sentence containing the following boilerplate text:

"The following normative documents contain provisions which, through reference in the text, constitute provisions of this ECSS Standard. For dated references, subsequent amendments to, or revisions of any of these publications do not apply. However, parties to agreements based on this ECSS Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the publication referred to applies."

b. The "Normative references" clause shall list only the documents, which

1. in whole or in part, are made applicable by explicit references in normative statements (requirements, recommendations and permissions).

2. contain definitions made applicable to this standard (i.e. included in Clause 3.1 "Terms from other standards")

    NOTE   For example, in ECSS-S-ST-00-01.

c. Normative references to non-ECSS documents shall be dated, or the number of the version included.

d. Normative references to ECSS documents shall be undated.

e. The documents listed in "Normative references" shall be published and publicly available.

    NOTE   Publicly available does not necessarily mean available for free.

f. The Working Group shall inform the ECSS Executive Secretariat where the

referenced documents (with the exception of ECSS, ISO or EN) can be obtained.

g.   The "Normative references" clause shall not contain requirements.

h.   The "Normative references" clause shall have the layout of the "Normative references" of the present drafting rules.

The following normative documents contain provisions which, through reference in the text, constitute provisions of this ECSS Standard. For dated references, subsequent amendments to, or revisions of any of these publications do not apply. However, parties to agreements based on this ECSS Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the publication referred to applies.

ECSS-S-ST-00-01   ECSS system - Glossary of terms

ECSS-E-ST-10-02   Space engineering - Verification

3
Terms, definitions and abbreviated terms

3.1   Terms from other standards

<table>
<tr>
<td colspan="2">EXPECTED CONTENTS</td>
</tr>
<tr>
<td></td>
<td>The purpose of the "Terms from other standards" clause is to list the terms defined in other standards which are applicable to the standard being drafted.

There is always at least one standard whose terms are applicable to the standard being drafted: ECSS-S-ST-00-01 "ECSS system - Glossary of terms".</td>
</tr>
<tr>
<td colspan="2">REQUIREMENTS</td>
</tr>
<tr>
<td>a.</td>
<td>The "Terms from other standards" clause shall include:</td>
</tr>
<tr>
<td>1.</td>
<td>In the case that terms from ECSS-S-ST-00-01 are generally applicable, the sentence: "For the purpose of this Standard, the terms and definitions from ECSS-S-ST-00-01 apply"</td>
</tr>
<tr>
<td>2.</td>
<td>In the case that some particular terms of ECSS-S-ST-00-01 are specifically applicable:</td>
</tr>
<tr>
<td>(a)</td>
<td>The sentence "For the purpose of this Standard, the terms and definitions from ECSS-S-ST-00-01 apply, in particular for the following terms:", and</td>
</tr>
<tr>
<td>(b)</td>
<td>The list of the applicable terms (without including the definition itself).</td>
</tr>
<tr>
<td>b.</td>
<td>If terms from standards other than ECSS-S-ST-00-01 are also applicable, they shall be introduced with the sentence "For the purpose of this Standard, the following terms and definitions from <<Reference of the Standard>> apply:", followed by the list of applicable terms (without including the definition itself).</td>
</tr>
<tr>
<td>c.</td>
<td>The layout of the "Terms from other standards" clause shall be as in the present drafting rules.</td>
</tr>
<tr>
<td>d.</td>
<td>The "Terms from other standards" clause shall not contain requirements.</td>
</tr>
</table>

For the purpose of this Standard, the terms and definitions from ECSS-S-ST-00-01 apply, in particular for the following terms:

recommendation

requirement

standard

state of the art

tailoring

3.2 Terms specific to the present standard

EXPECTED CONTENTS

The purpose of the "Terms specific to the present standard" clause is provided to present the terms specific to the standard in drafting together with their definitions.

It is expected that the WG, during drafting of the standard, checks ECSS-S-ST-00-01 "ECSS system – Glossary of terms" for preventing inconsistencies between both documents and avoiding repetition of definitions.

In ECSS standards, a definition is not an explanation or a clarification. It is equivalent to the term it defines and it can replace the term in any sentence of the document without changing the meaning of the sentence (see Figure 3-1).

A first implication of this way of drafting definitions is that a definition is a single sentence. Any additional piece of information (e.g. examples and clarifications) can be added as a NOTE and stay separate from the definition itself.

A second implication is that both the term and the definition are written using lowercase letters (no capital letter), ending without full stop.
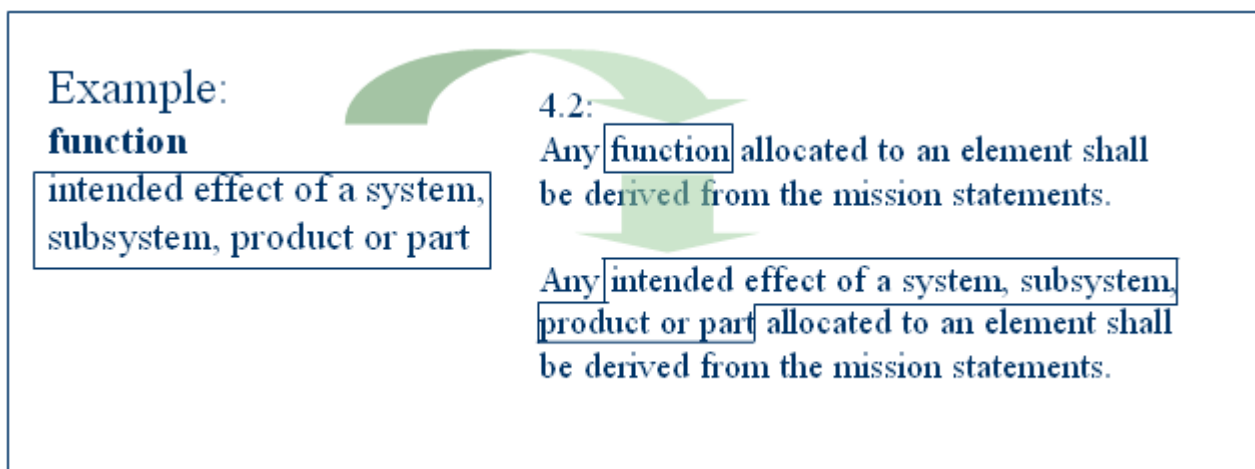
Figure 3-1: How to draft a definition

REQUIREMENTS

a. A term shall not be defined in the standard unless all the following conditions are met:

1. It is used in the standard.

2. As used in the standard, its definition differs from common definitions (as given in the Oxford English Dictionary), and

3. As used in the standard, the term is not defined in any other published ECSS standard.

NOTE This includes among others all the terms defined in ECSS-S-ST-00-01 "ECSS – Glossary of terms". Clause 3.1 "Terms from other standards" is provided to this end.

b. If a term that already exists in another ECSS standard (including in ECSS-S-ST-00-01), is defined in the standard under development because the meaning of the term in these two documents is different, then this fact shall be clearly stated in a NOTE accompanying the definition, reading:

NOTE This term is defined in the present standard with a different meaning than in *<Designation and name of the standard where the term is first defined>*. The term with the meaning defined herein is applicable only to the present standard.

c. The definition of each term shall be drafted in such a way that if the term is used in a sentence (e.g. in a requirement), it can be substituted by its definition without changing the meaning of the sentence.

NOTE See Figure 3-1 and the corresponding explanation in "expected contents" above for a detailed discussion and implications of this requirement.

d. If the singular of a term exists, the defined term and the definition shall be in singular.

e. Definitions shall be listed in alphabetic order.

f. When the same term is used with two different meanings, the context shall be indicated before the definition, between "< >".

NOTE For example:
3.2.23   objective
<CONTEXT: management>
goal to be accomplished
<CONTEXT: optics>
set of lenses that work as a single lens

g. When a definition includes words which meaning is not the common one (therefore either listed in clause 3.1 or defined in clause 3.2), these words shall appear in bold.

NOTE For example:
3.2.1   standard in drafting
standard to which the present rules are made applicable

> The word standard appears in bold because it is listed in clause 3.1.
>
> h. When synonymous terms are defined, one of them shall include the definition and a NOTE mentioning the existence of a synonymous term, and the other term shall refer to the previous one.
>
>> NOTE 1 For example:
>> **3.2 12 termination point**
>> see "**triple poin**t" (3.1.24)
>> …….
>> **3.2.24 triple point**
>> location, in a bonding application, where the local stress is multi-directional due to a geometric discontinuity
>>
>> NOTE 2 The term "termination point" is synonymous with the word "triple point".
>
> i. Abbreviation of the term may be included after the term, between brackets.
>
>> NOTE 1 For example:
>> **3.2.6 time synchronization cycle (TSC)**
>> time interval delimited by two Time Synchronization Messages
>>
>> NOTE 2 The inclusion of the abbreviation in the definition does not preclude it to be listed in "Abbreviated terms" (see 3.3).
>
> j. The layout of the "Terms specific to the present standard" clause shall be as in the present drafting rules.
>
> k. The "Terms specific to the present standard" clause shall not contain requirements.

3.2.1 expected response

<CONTEXT: document requirement definition (DRD)>

deliverable document which content is specified in a **DRD**

3.2.2 hanging clause

normative or descriptive clause without its own clause number referring to it univocally

> NOTE The text between the clause number 4.3.5 and clause 4.3.5.1 is a hanging clause and cannot be referenced to because, when referring to "clause 4.3.5" the whole clause including all subclauses is referred to:
>
> **4.3.5 Example of hanging clause**
> This text is a hanging clause, because it cannot be referred to (4.3.5 is the whole text, including 4.3.5.1 and 4.3.5.2).

4.3.5.1. Continuation of the example

This is not a hanging clause, because it can be referred to as "clause 4.3.5.1".

4.3.5.2. Finalization of the example

This is not a hanging clause, because it can be referred to as "clause 4.3.5.2".

3.2.3 standard in drafting

standard to which the present rules are made applicable

3.2.4 superfluous clause

normative or descriptive clause further subdivided in a single lower level clause

NOTE   The following is an example of superfluous text because the level 4 clause 7.3.5.1 can be omitted.

7.3.5   Example of superfluous clause

7.3.5.1 Continuation of the example

This is a wrong subdivision, because numbering it as 7.3.5.1 is not necessary. This text can be referred to as "7.3.5".

7.3.6 Other paragraph

This is not a hanging clause, because it can be unambiguously referred to as "clause 7.3.6".

3.3   Abbreviated terms and symbols

EXPECTED CONTENTS

The purpose of the "Abbreviated terms and symbols" clause is to include in a single list:

- the abbreviations used in the standard, and their expanded meaning

- The symbols used in the standard, and their meaning.

REQUIREMENTS

a.   The list of abbreviated terms and symbols shall be introduced by the following boilerplate sentence: *"For the purpose of this standard, the abbreviated terms and symbols of ECSS-S-ST-00-01 and the following apply:"*

b.   If an abbreviated term or a symbol is used in the standard, and its meaning is not included every time that the abbreviated term or the symbol is used, the term shall be listed in this clause 3.3.

c.   An abbreviation or a symbol shall not be included unless if it is used in the standard.

d.   The same abbreviated term or symbol shall not be used within a document for two different concepts.

e.   The abbreviated term or the symbol shall appear in bold, and the expanded meaning shall be written using lowercase letters (unless they are proper

names), and in regular.

> NOTE 1 In the case of abbreviated terms, it is sometimes argued that the use of uppercase letters in the expanded meaning highlights the correspondence with the abbreviation (e.g. XML is "eXtensible Mark-up Language"). Although valid for other documents (e.g. teaching books), the argument fails for standards, where the intention is to offer an abbreviated alternative to a long denomination, and not to demonstrate the suitability of the selected abbreviation.

> NOTE 2 The abbreviation does not need to be an extraction of letters from the term. For example: ISO is "Organization Internationale pour la Normalization".

f. The layout of the "Abbreviated terms and symbols" clause shall be as in the present drafting rules.

g. The "Abbreviated terms and symbols" clause shall not include requirements.

h. Abbreviated terms already listed in ECSS-ST-00-01 "ECSS system – Glossary of terms" may be repeated in the standard with the same meaning than in ECSS-S-ST-00-01.

i. Abbreviated terms already defined in ECSS-S-ST-00-01 shall not be used in the standard with a different meaning than in ECSS-S-ST-00-01, unless agreed by the ES or TA.

> NOTE The ES or TA agreement is based on a case-by-case justification provided by the WG.

j. If an abbreviated term already defined in ECSS-S-ST-00-01 is used in the standard with a different meaning than in ECSS-S-ST-00-01 in accordance with requirement 3.3.i, a NOTE shall be added reading:

> NOTE *This abbreviated term is defined in the present standard with a different meaning than in ECSS-S-ST-00-01 "ECSS – Glossary of terms". The abbreviated term with the meaning defined herein is applicable only to the present standard.*

For the purpose of this standard, the abbreviated terms and symbols from ECSS-S-ST-00-01 and the following apply:

Abbreviation	Meaning
C&CCP	cleaning and contamination control procedure
DRD	document requirements definition
ECSS	European Cooperation for Space Standardization
IS	international system of units
ITT	invitation to tender
SEP	system engineering plan
TA	ECSS Technical Authority

TBD	to be determined
WG	working group
WGCPA	WG convenor promotion article

3.4   Conventions

EXPECTED CONTENTS

The purpose of the "Conventions" clause is to explain the specific conventions used in the standard, if any.

This clause is not mandatory, and therefore it does not need to be included if it is unnecessary.

REQUIREMENTS

a.   If specific conventions not included in the present drafting rules are used within the standard, this conventions shall be explained in the present clause 3.4.

b.   If several conventions are explained, each one shall be included in a separate sub-clause within this clause 3.4.

c.   The layout of the "Conventions" clause shall be as in the present drafting rules.

d.   The "Conventions" clause shall not include requirements.

3.4.1   Text block colour convention

This drafting rules have been organized in the same way than a standard, and therefore can be used as a model to draft such a standard. For this reason, the clauses of this drafting rules correspond to the clauses to be included in a standard.

For the purpose of clarity and easy use, this drafting rules do not concentrate all the requirement applicable to all clauses and sections in Clause 5, but they present all the information corresponding to each clause in the clause itself, using the following colour convention:

- Yellow is used for descriptive material presenting the expected content of each clause.

- Green is used for the requirement applicable to each clause.

3.5   Nomenclature

EXPECTED CONTENTS

The purpose of the "Nomenclature" clause is explain the meaning of the formal words used to differentiate between descriptive and the different types of

normative provisions.		

REQUIREMENTS

a. The "Nomenclature" clause shall identify any specific linguistic usages that apply to the standard.

b. The "Nomenclature" clause shall include at least the boilerplate statement of the present drafting rules.

c. The "Nomenclature" clause shall have the layout of the present drafting rules.

d. The "Nomenclature" clause shall not include requirements.

EXAMPLE

As an example, the "Nomenclature" clause of this template is as follows:

3.5.1 Formal verbs

The following nomenclature apply throughout this document:

- The word "shall" is used in this document to express requirements. All the requirements are expressed with the word "shall".

- The word "should" is used in this document to express recommendations. All the recommendations are expressed with the word "should".

  NOTE   It is expected that, during tailoring, recommendations in this standard are either converted into requirements or tailored out.

- The words "may" and "need not" are used in this document to express positive and negative permissions respectively. All the positive permissions are expressed with the word "may". All the negative permissions are expressed with the words "need not".

- The word "can" is used in this document to express capabilities or possibilities, and therefore, if not accompanied by one of the previous words, it implies descriptive text.

  NOTE   In ECSS "may" and "can" have a complete different meaning: "may" is normative (permission) and "can" is descriptive.

- The present and past tense are used in this document to express statement of fact, and therefore they imply descriptive text.

4
Principles

EXPECTED CONTENTS	
	This clause contains descriptive text related to the subject of the standard.
EXAMPLE	
	The text of the present clause is an example of descriptive text presenting the principles used to understand the requirements.

4.1 Structure and organization of an ECSS standard

To make an ECSS standard appropriate and user friendly for ITTs and business agreements, the information is organized in such a way that the descriptive material is separated from the normative one. A mixture of requirements and descriptions is not appropriate, because it is difficult or time consuming to extract the requirements made applicable to the contract.

The objective of the descriptive material is only to support the requirements or to understand their context. Excess of descriptive material in comparison with the normative one is not accepted.

In ECSS standards, non-numbered statements (i.e. Change Log, Introduction) are called sections and numbered statements (i.e. Scope, Normative references) are called clauses. The more general level clause is Level 1.

The preferred structure for an ECSS standard is presented in Figure 4-1, i.e. three preliminary sections, a number of Clauses and Annexes, and two final sections.

Normally, Clause 4 is reserved to provide background information and to set the principles of the standardized solution adopted, while following clauses (e.g. 5, 6) are reserved for the requirements themselves. If a standard is well structured, a correspondence exists between the principles in clause 4 and the defined requirements in clause 5. This is the approach followed in this drafting template.

There are other approaches (see Table 4-1) to separate descriptive from normative material. They can be combined with the one described above. The following approaches are considered:

- Use of informative (i.e. descriptive) annexes, suitable for detailed descriptive material referring to a particular requirement or set of requirements.

- In each Level 2 clause (e.g. Clause 4.8), split descriptive and normative material into distinct Level 3 clauses, using the first Level 3 clause (e.g. 4.8.1)

as an descriptive overview, and the rest of Level 3 clauses (e.g. 4.8.2 to 4.8.n) as normative statements.

- Use of "NOTE" to provide additional information or examples to an individual requirement or set of requirements (see 5.2.6).

Change log Table of Contents Introduction	Preliminary sections
1. Scope 2 Normative references 3 Terminology and nomenclature 4 Principles 5 Requirements …. …. Last Clause: Pre-tailoring matrix per product type and project phase Annex A,B.. Normative annexes (DRDs) …. …. Annex N,… Informative annexes	Level 0 Clauses (including Annexes)
Bibliography	Final section
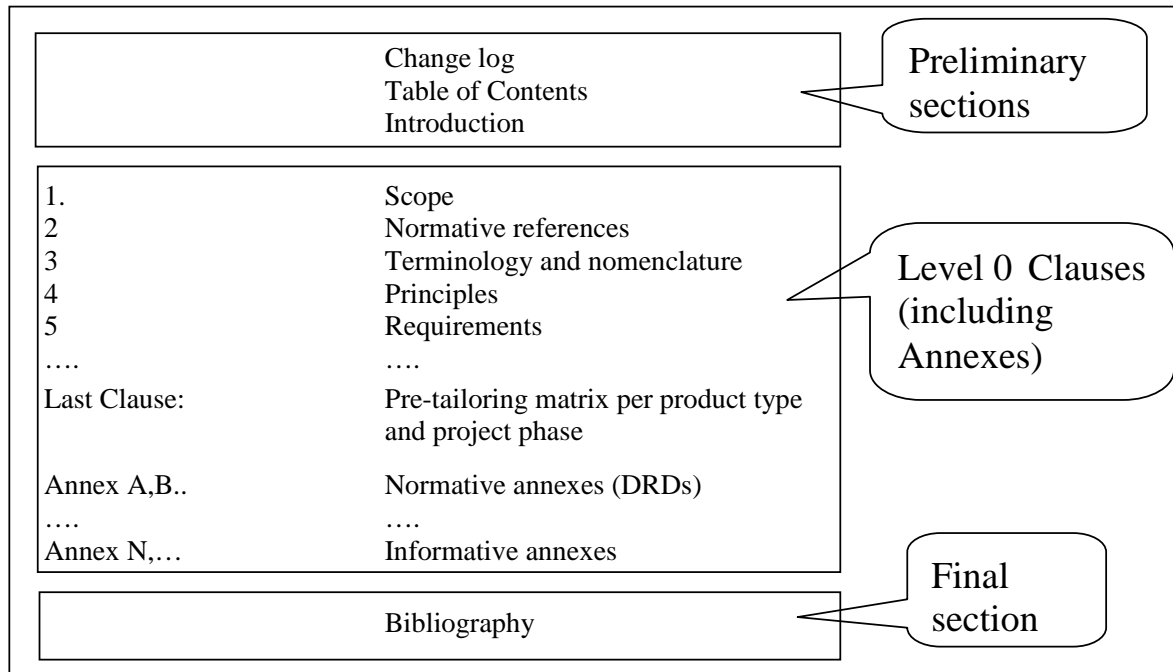
Figure 4-1: General structure of an ECSS standard showing all possible sections and clauses

Table 4-1: Complementary approaches to separate normative and descriptive material

#	Approach	Intended use	Example
1	Informative annex	Detailed descriptive material referring to a specific requirement or set of requirements	Annex C of the present document
2	Introductory clause	Present the descriptive material related to the requirements of a given clause	**4 Requirements** **4.1 Overview** This can be used to provide the descriptive material of the rest of clause 4. **4.2 xxxxxx** **…..** **4.n yyyyyy** Requirements are expressed in clauses 4.2 to 4.n..
3	NOTE	Extra piece of information related to a particular requirement or set of requirements	NOTE to 5.1.1.2.3.a

4.2　Tables, figures and equations

Tables, figures and equations can be used to:

a. Complement a requirement specified in the body text of the standard. In this case, the table, figure or equation is part of the requirement.
    For example, a requirement can be expressed as follows:
    "c.　　The dimensions shall be as in Figure 4-1."
    In such a case the figure, the table or the equation is part of a requirement stated in the body text of the standard, but it does not introduce in itself new requirements, implicitly or explicitly.

b. Summarize a requirement or set of requirements already specified in the body text. In this case, requirements in the body text are complete, and do not need to be complemented by the figure, table or equation, which is used only for illustrative or explanatory purposes.

c. Expand the information provided in a descriptive statement, or give it a clearer and more comprehensive form. In this case the table, figure or equation is also used only for illustrative or explanatory purposes.

Only figures, tables and equations in the case 4.2a are normative, because they are directly called from a requirement in the body text. Figures, tables and equations in the cases 4.2a and b are merely descriptive.

Since ECSS standards are for use in business agreements, tables, figures and equations which are not used for any of the above explained purposes are inappropriate in a standard. For example, figures and tables that summarize data or working practices are relevant in handbooks, not in standards.

4.3　Drafting rules for revision of existing ECSS Standards

Revisions of ECSS Standards are done to incorporate Change Requests, raised on the document, that were assessed and dispositioned by the TA and considered so important that their implementation is needed before the next issue of the document.

One problem arising from the implementation of Change requests is that the individual identifier of existing requirements can change. This can have a heavy impact on the stability of the system, since e.g. existing requirements can have been introduced in a requirements database. It is therefore important to maintain the traceability between original document and the revision and, as far as possible, to minimize possible changes of the original identifier of existing requirements.

Clause 5.2.8 presents requirements for this purpose. Also, superfluous clauses are permitted (see 5.1.1.2.2c) if future traceability needs are foreseen.

5
Requirements

<table>
<tr><td>

EXPECTED CONTENTS

This clause contains all the requirements of the standard.

</td></tr>
<tr><td>

REQUIREMENTS and EXAMPLE

The clauses below contain the normative material to elaborate requirements when drafting standards.

</td></tr>
</table>

5.1 Structure and organization of an ECSS standard

5.1.1 Structure of an ECSS standard

5.1.1.1 General structure and layout

a. From the elements of Figure 4-1, an ECSS standard shall include at least the following ones:

1. Preliminary sections: at least "Change log", and "Table of contents";

2. Level 1 clauses: at least "Scope", "Normative references", "Terms, definitions and abbreviated terms", and one or several clauses for "Requirements";

b. If the standard contains a pre-tailoring matrix per product type and project phase, it shall be the last clause of the standard.

> NOTE   See requirements for pre-tailoring in Clause 6.

5.1.1.2 Structure of clauses

5.1.1.2.1 Level of clauses

a. Level of clauses (normative or descriptive) higher than 5 shall not be used.

> NOTE   The descriptive or normative (i.e. requirements) text can be structured in up to five levels of clauses (from Level 1 to Level 5). Not all levels need to be used. Therefore, any clause other than Level 5 can (but need not), be subdivided in lower level clauses. Level 5 clauses cannot be further subdivided.

5.1.1.2.2 Hanging and superfluous clauses

a. Hanging (normative or descriptive) clauses shall not be used.

> NOTE   See 3.2.2 for the definition of hanging clause.

b. Except in the case specified in c., superfluous (normative or descriptive) clauses shall not be used.

> NOTE   See 3.2.4 for the definition of superfluous clause.

c. Superfluous clauses may be used as placeholders in normative clauses, to avoid a possible change of the identifier of one or several requirements in futures issues/reviews of the document.

> NOTE   The following superfluous clause 7.3.5.1 can be acceptable if it is known that clause 7.3.5 is going (or is very likely) to be further developed in several subclauses in future issues/reviews. In this way, requirement 7.3.5.1a number is maintain:
>
> **7.3.5   Example of acceptable superfluous clause**
>
> **7.3.5.1 Continuation of the example**
>
> a. Text of a requirement
>
> **7.3.6 Other paragraph**
>
> …

5.1.1.2.3 Titles

a. All clauses (normative or descriptive) shall have a title.

5.1.2   Organization of the information

5.1.2.1   Separation of normative and descriptive material

a. Descriptive material shall not be included in an ECSS standard, unless it supports the requirements, clarify them, or put them in context.

> NOTE   ECSS handbooks and guidelines are appropriate documents for descriptive material.

b. Descriptive material shall not introduce implicit or hidden requirements.

c. Descriptive material shall not modify the contractual obligations of existing requirements.

> NOTE   That means that if the descriptive material is removed all together from the standard, the actual contractual obligations remain the same.

d. Except in the case of NOTES specified in 5.2.6, descriptive and normative material shall be presented in separate clauses.

e. Level 2 clauses should not contain a combination of several descriptive and normative Level 3 clauses.

> NOTE   However, each Level 2 clause can have a unique introductory Level 3 clause.

5.1.2.2   Footnotes

a.   Footnotes shall not be used.

> NOTE   The reason is that footnotes create problems when transferring requirements into a database. Normal NOTES can be used for the same purpose.

5.1.2.3   Location of requirements in an ECSS standard

a.   Requirements, other than DRDs, shall be specified in the body text of the standard.

> NOTE   This implies that tables, figures and footnotes cannot contain requirements in themselves (see 5.3.3.1). However, requirements can refer to tables and figures (see further explanation in 4.2).

b.   If a requirement prescribes the mandatory content of a deliverable document this content shall be specified in a DRD.

> NOTE   See also Annex B.

c.   DRDs shall be specified as normative annexes.

> NOTE   Attention is drawn that 5.1.3.1c requires that DRDs (i.e. normative annexes) are located before any informative annex.

5.1.3   Annexes to a standard

5.1.3.1   Types of annexes

a.   Annexes to an ECSS standard shall be either normative or informative.

b.   The only possible normative annex shall be a DRD.

> NOTE 1   This requirement implies that any normative annex (i.e. DRD) is necessarily called from a requirement in the body text.

> NOTE 2   For requirements on DRDs, see Annex B.

c.   With the exception specified in 5.3.2.2b, normative annexes shall precede any other annex.

d.   With the exception specified in 5.3.2.2b, informative annexes shall follow normative annexes.

5.1.3.2   Normative annexes (DRDs)

a.   If DRDs are present in a standard, each DRD shall be a normative annex called from a requirement (or several requirements) in the body text.

> NOTE 1   See requirement B.1.1a.

> NOTE 2   Please note that, as specified in 5.1.3.1c, normative annexes (i.e. DRDs) are located before any informative annex.

b. If the standard specifies the scope and content of a document to be delivered, as part of a requirement, it shall be specified in a DRD.

c. DRDs shall only include requirements to the content of the expected response to the DRD.

>   NOTE 1   See also B.2.1.
>
>   NOTE 2   This requirement prevents to include in the DRD:
>
>   - Requirements on the format of the deliverable document (the expected response to the DRD).
>
>   - Requirements to the expected response to the DRD (e.g. the requirements to deliver the expected response, schedule, release authority update frequency, or number of copies). These are normally addressed in a Document Requirements List (DRL), Statement of Work or similar document, which lists all DRDs applicable to a project, together with their delivery requirements.
>
>   - Hidden or implied requirements. An example is to require to include the results of an analysis, where there is not any requirement in the body text of the standard to perform such an analysis.
>
>   NOTE 3   This requirement also prevents the use of expressions such as "The expected response shall analyse…", or any other expression requiring something else that including in the expected response information already available. Examples of proper expressions are "…shall include", "…shall report", "…shall summarize", and equivalent expressions.

d. The layout and elements of the DRD shall be as in the Annex B of the present drafting rules.

5.1.3.3   Informative annexes

5.1.3.3.1   General

a. Informative annexes shall not be part of a standard unless the information they provide is necessary to understand the requirements or to put them in context.

>   NOTE   For example, Annex C is introduced in this drafting rules to understand the implications of requirement 5.2.3d. and to help the users of this drafting rules to comply with it.
>
>   NOTE   For the location of informative annexes within the standard, see 5.1.3.1.

b. Informative annexes shall not contain normative provisions.

c. The layout of an informative annex shall be as in Annex C of the present drafting rules.

5.1.3.3.2   Informative annex "Deliverable documents per review"

a.   If the standard specifies the delivery of deliverable documents, the draft standard shall include an informative annex with a table with the document delivery per project review:

1.   Using the text in Annex A as a boilerplate

2.   Using the layout of Table A-1 as a template.

NOTE   If the standard in development is a Level 3 standard, this table is removed from the draft document by the ECSS Secretariat before publication, and moved to the corresponding Level 2 standard using the Change Request mechanism. This to ensure that each ECSS Level 2 standard collects all the deliverable documents in its discipline against their associated project reviews.

b.   The annex specified in 5.1.3.3.2a may precede the normative annexes (DRDs).

5.1.3.4   Designation of annexes

a.   Annexes shall be designated using capital letters of the Latin alphabet, beginning with A, after the word "Annex".

b.   The character of the annex (normative or informative) shall appear in parenthesis.

c.   The name of the annex shall follow the layout of this template.

d.   The numbering of clauses, tables, figures and equations of an annex shall be preceded by the letters assigned to the annex.

e.   The numbering shall start afresh with each annex.

5.2   How to draft requirements

5.2.1   General

a.   Requirements shall be stated using the verbal form "shall" ("shall not").

b.   Descriptive text shall not contain any "shall", "shall not" or other equivalent normative statement.

NOTE   For example: the use of "must", "will", "has to", "have to", "is required", "is mandatory", "is forbidden", "is to be", "are to be", "is necessary", "is needed", "may only", "the only allowable", and any other equivalent expression is not acceptable in any ECSS standard, both in normative and descriptive text.

c.   Recommendations shall be avoided in the normative part of ECSS standards.

d.   Recommendations shall be expressed using the verbal form "should" ("should not").

NOTE   The use of "is recommended", "is not recommended", "is preferred", "shall normally" and any other equivalent expression is forbidden.

5.2.2   Coverage of the requirements

a.   Except in the case specified in 5.2.2b. requirements shall be limited to the branch and scope of the standard.

NOTE   For example, an inappropriate requirement of "Pyrotechnics" (standard belonging to the Engineering branch) is "A safety analysis in accordance with ECSS-Q-ST-40 clause 6 shall be performed", because this is a general requirement on safety.

b.   If a requirement falls out of the branch or scope of the standard under drafting but is specific to the activity covered by the standard in drafting (and therefore not covered by any other ECSS standard), guidance shall be asked from the TA.

NOTE   As a result, the TA can decide to include the requirement in the present standard or not, and remove it from the following edition, if the requirement has been included in the meantime in the appropriate ECSS standard.

5.2.3   Characteristics of a requirement

a.   Requirements shall be clear, i.e. drafted in such way that can be understood by an expert who has not participated in the drafting of the standard.

b.   Requirements shall be unambiguous, i.e. drafted in such a way that can be interpreted only in one way.

c.   Requirements shall be concise, i.e. formulated in such a way that is not verbose or bombastic.

NOTE   The following is an example of a verbose requirement:
"Under no circumstance, action A shall be performed".
The correct formulation is:
"Action A shall not be performed".
In both cases the contractual obligation is exactly the same, but in the second case the sentence is simpler and more direct.

d.   Requirements shall be verifiable, i.e. drafted in such a way that can be verified by one of the verification methods defined in ECSS-E-ST-10-02 "Verification".

NOTE   Attention is drawn to the fact that one single non-verifiable normative statement can lead to a blocking situation when assessing the draft standard. Annex C provides additional guidance on sources of non-verifiability to be avoided.

e.   Requirements shall be uniquely identified

NOTE 1   For example, the individual identifier of the present requirement is "Requirement 5.2.3e".

NOTE 2   The following are two examples of appropriate solutions:

- One requirement per clause

  5.6.1   Title of 5.6.1

  a. The supplier shall perform Action A.

  5.6.2   Title of 5.6.2

  a. The supplier shall perform Action B.

- Several requirements in the same clause, individually identified by using a numbered list:

  5.6.1   Title of 5.6.1

  a.   The supplier shall perform Action A.

  b.   The supplier shall perform Action B.

Formatting requirements for numbered lists are presented in 5.2.4.

NOTE 3   An example of IMPROPER formulation is shown in Figure 5-1.

f.   Requirements shall be complete, i.e. formulated in such a way that is still understandable if put out of context.

g.   Requirements shall be single, i.e. addressing a specific need and not multiple needs.

NOTE   For example, the following formulation is improper because it expresses two needs:

The test probe shall weight 980±50 g and measure 20±2 cm.

h.   Requirements shall not be obvious, i.e. such that if they are suppressed, contractual obligations remain the same.

NOTE 1   The following are examples of obvious requirements :

"When dividing a function, it shall be divided into sub-functions"

"The requirements of the present standard shall be met"

If this requirement is suppressed, the requirement of the present standard shall still be met.

"The safety national regulation shall be strictly followed"

The requirement is unnecessary because in ANY case, the national regulation shall be followed.

NOTE 2   However, if the intention is to draw attention to an important issue, the statement can be introduced as a reminder in a NOTE, e.g. "It is important to note that the safety national regulations can be stricter than the requirements expressed in this standard".
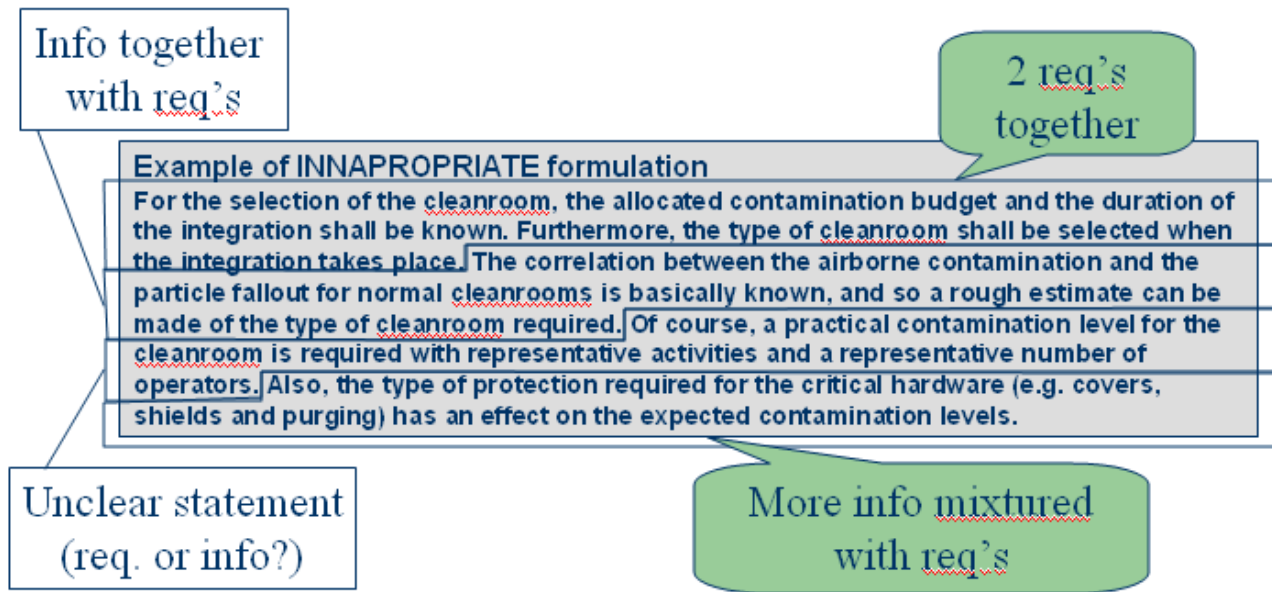
Figure 5-1: Example of improper requirement formulation

5.2.4 Individual identification of requirements by numbered lists

5.2.4.1 Levels and layout

a. When individual identification of requirements is performed using a numbered list, no more than three levels in the list shall be used.

b. The levels in the list shall be numbered using:

1. minor letters at the first level, followed by a dot.

2. Arabic numbers at the second level, followed by a dot.

3. minor letters between brackets at the third level.

> NOTE For example, an appropriate numbered lists is:
> a. Requirement a
> b. Requirement b
>   1. Element 1 of requirement b
>   2. Element 2 of requirement b
>   (a) Subelement (a) of element b.2
>   (b) Subelement (b) of element b.2
>   3. Element 3 of requirement b
> c. Requirement c.

5.2.4.2 Structure of a numbered list

a. When individual identification of requirements is performed using a numbered list, it shall

1. not contain requirements inside other requirements.

2. not include a (numbered or unnumbered) introductory sentence to the requirements.

NOTE 1   The following list is an example of IMPROPER formulation because requirements are contained within other requirements (a. is a requirement which in turn contain independent requirements 1, 2 and 3):

5.6.3   Test procedure

a.   The following procedure shall be followed:

    1.   Action A shall be performed

    2.   Action B shall be performed

    3.   Action C shall be performed

b.   When the process is finalized, it shall be verified that…

NOTE 2   The following list is an example of IMPROPER formulation because it includes a numbered sentence as introduction to the requirements:

5.6.3   Test procedure

a.   The test procedure is as follows:

    1.   Action A shall be performed

    2.   Action B shall be performed

    3.   Action C shall be performed

b.   When the process is finalized, it shall be verified that…

NOTE 3   The following list is an example of IMPROPER formulation because it includes an unnumbered sentence as introduction to the requirements:

5.6.3   Test procedure

The test procedure is as follows:

a.   Action A shall be performed

b.   Action B shall be performed

c.   Action C shall be performed

NOTE 4   The following list is the PROPER formulation of examples 1 and 2 above:

5.6.3   Test procedure

a.   The test procedure shall be as follows:

    1.   Perform action A

    2.   Perform action B

    3.   Perform action C

b.   When the process is finalized, it shall be verified that…

5.2.5   Formulation of a requirement

a.   Requirements shall be written using the following formulation:

       <<Obliged entity>> shall/shall not <<Obligation>>

       NOTE   For example, an inappropriate formulation is "The customer shall approve the SEP before implementation" because the customer is not the obliged entity (for example, he is not obliged to approved the SEP in the case that the SEP is not appropriate). The appropriate formulation is "The SEP shall be delivered to the customer for approval" or

"The supplier shall deliver the SEP to the customer for approval".

b. Requirements shall state the actual need.

> NOTE   For example, if the aim is to have a length of less than 10 cm, the appropriate requirement is "the length shall be inferior to 10 cm". An inappropriate formulation is "It shall be ensured that the length is inferior to 10 cm", because the real need is not to ensure anything, but to have a short item. Actually, they are two completely different requirements: the first one is a requirement on the product, and the second one is a requirement on the manufacturing process.

c. If the actual need can be expressed by using the active form of the verb, the passive form shall not be used.

d. Unless explicitly stated in the NWIP/TOR, requirements shall refer to the deliverable product, or to the process to be followed, nor to the organization.

> NOTE 1   For example, the following is an improper formulation: "The supplier shall be responsible for the implementation of the C&CCP", because the scope of the requirement is the organization. To meet the requirement, it is enough that someone in the organization has this responsibility formally assigned. The proper requirement is "The supplier shall implement the C&CCP".

> NOTE 2   The deliverable product can include deliverable documentation.

> NOTE 3   Exceptionally, ECSS standards can contain requirements to organizations, because no other way has been found to meet the needs. Therefore an ad-hoc and conscious decision has been made to follow this approach, and this has been explicitly stated in the TORs of the corresponding WG.

5.2.6   Notes to a requirement

a. The "NOTE" statement need not be used, but if used it shall not contain implicit or explicit requirements.

b. If the "NOTE" statements is used, it shall appear immediately after the individual requirement (or the set of requirements) that it is associated to.

> NOTE   Notes follow the text of requirement(s), but not titles or figures.

c. The "NOTE" statement shall not modify the contractual obligations stated in the requirements.

> NOTE 1   The "NOTE" statement is descriptive, which means that if removed, contractual obligations remain the same.

NOTE 2   More than one "NOTE" can be attached to the same requirement (or set of requirements). An example is the present NOTE.

d.   When a set of notes is attached all together to a requirement or set of requirements, they shall be numbered consecutively, every set of notes re-starting from "NOTE 1".

5.2.7   References from a requirement

5.2.7.1   External references

a.   When a requirement makes applicable another standard, it shall refer to the particular numbered paragraphs that are made applicable

b.   When a requirement makes applicable another standard, it shall:

1.   include the version or date of the referred standard, if this is not an ECSS standard,

2.   not include the version of the referred standard, if this is an ECSS standard.

NOTE   As specified in Clause 2 of the present template, the referred standard is listed in Clause 2 "Normative references". If the standard is referred to not from a requirement but from descriptive text, it is listed in the "Bibliography" section.

c.   Complete standards shall not be made applicable, unless:

1.   The referred standard specifies a process, which needs to be used by the standard in drafting.

NOTE   In this case, it makes no sense to import only part of the process.

2.   The standard in drafting is an extension of the referred standard.

NOTE   For example, in case of ECSS-E-ST-50-13C, which is an extension to MIL Standard 1553B, it is appropriate that it makes MIL 1553B fully applicable.

3.   The standard in drafting has been written in full coordination with the referred standard in such a way that they work together and one cannot be implemented without the other.

NOTE   It is important to understand that making a complete document applicable is a major limitation in the applicability of the present standard, because if the referred standard is not applicable or is tailored out in a particular case, the present standard is automatically tailored out too.

5.2.7.2 Internal references

a. References within the standards shall be made to numbered items (individual requirements, clauses, annexes, figures, tables or formulas), identified by their numbers.

> NOTE This requirement prevents general and vague references such as "as specified in the present standard", "as shown in the figures", "as specified below", or "as described in the following clauses".

b. Maximum level of nesting of internal references shall be 2.

c. References within the standard shall be implemented by using hyperlinks.

5.2.8 Drafting rules for revision of existing ECSS Standards

a. All changes between consecutive published revisions shall be done with revision tracking.

> NOTE For identification of the changes in the Change log see the requirement on page 3 "Change log".

b. Renumbering of existing requirements shall be avoided between revisions of an ECSS standard, by:

1. Replacing the deleted requirements with the text "<<deleted>>".

2. Replacing the requirements moved to another location within the Standard with the text "<<deleted – moved to *<<new requirement number>>*".

3. Adding the new requirements after the last requirement of the.

> NOTE This requirement 5.2.8b does not prevent renumbering of requirements between two different issues (e.g. between issues C and D). However, stability between issues is also a merit and recommended.

> NOTE 2 Rational for this set of requirements can be found in 4.3.

c. For the updated version, to be delivered to ES prior publication, all changes shall be highlighted with a comment stating the origin or reason for the change.

> NOTE The reason of this requirement is to keep traceability with the Change Request causing this modification. Examples of modified, deleted and added requirements including the identification is given in Figure 5-2.
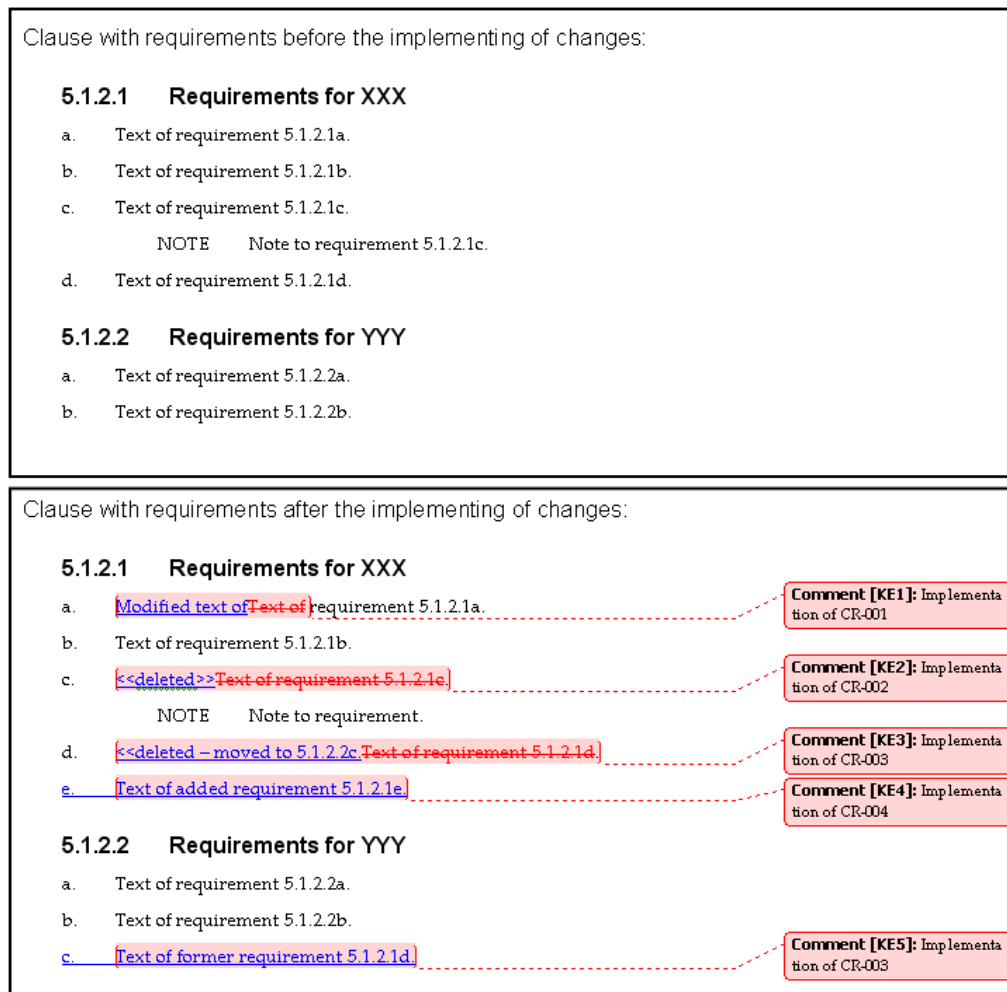
Figure 5-2: Example of modified, deleted and added requirements

5.3 Elements of a standard

5.3.1 Format

a. Draft standards shall be provided in electronic MS Word® format.

b. The drafting of the standards shall use the "Electronic template for ECSS standards", with the styles used as defined therein.

> NOTE The "Electronic template for ECSS standards" can be downloaded from the ECSS Websites as follows:
>
> - Browse to www.ecss.nl, and once logged in, click on "FOR STANDARD DEVELOPERS"
> - Click on "ECSS drafting templates for ECSS Standards and Handbooks"

5.3.2 Numbers, units and tolerances

5.3.2.1 Numbers

a. For numbers, the decimal sign shall be a decimal comma.

b. If a value less between -1 and +1 is written in decimal form, the decimal sign shall be preceded by a leading zero.

5.3.2.2 Units

a. ECSS standards shall use the units, multiples and submultiples of the International System of Units (SI-units).

  NOTE   This prevents, for example, the use of bar and mbar for the pressure, since in the SI-unit of pressure is Pa.

b. When stating values, the units in which values are expressed shall be indicated as follows:

  1. For degrees, minute and second (plane angles), immediately the numerical value without space.

  2. For any other unit, after the numerical value preceded by a space.

5.3.2.3 Tolerances

a. Tolerances shall be specified in an unambiguous way.

  NOTE   See the following examples:
  Example 1: 80 mm × 25 mm × 50 mm
  [NOT: 80 × 25 × 50 mm]
  Example 2: 80 μF ± 2 μF, or (80 F ± 2) μF
  [NOT: 80 ± 2 μF]
  Example 3: $80^{+2}_{-1}\,mm$
  [NOT $80\,mm\,^{+2}_{-1}$]
  Example 4: $80\,mm\,^{+20}_{-10}\mu m$
  Example 5: 5 kHz to 7 kHz, or (5 to 7) kHz
  [NOT: 5 to 7 kHz, or 5-7 kHz].

b. Tolerances stated in percent shall be expressed in a mathematical correct form.

  NOTE   See the following examples:
  Example 1: For a range, use "from 25 % to 27 %"
  [NOT: "from 25 to 27 %"]
  Example 2: For a central value, use "(25 ± 2) %"
  [NOT "25 ± 2 %"]

5.3.3 Tables and figures

5.3.3.1 Use of tables and figures

a. Tables and figures shall not contain requirements.

NOTE   Tables and figures can complement a requirement in the body text, illustrate requirements in the body text, or illustrate descriptive material, as explained in clause 4.2.

5.3.3.2   Reference to tables and figures

5.3.3.2.1   Caption

a.   Tables and figures shall have a caption.

b.   The caption of tables and figures shall include an identifier, followed by a blank space, and a title (with the layout of Table 4-1 and Figure 4-1 respectively).

c.   Except for annexes, the identifier of tables and figures shall be formed by the word "Table" or "Figure" respectively, followed by a dash ("-"), the number of the Level 1 clause, and a correlative number from 1 on, started afresh with each clause.

d.   For annexes, the identifier of tables and figures shall be formed by the word "Table" or "Figure" respectively, followed by the letter of the annex that they belong to, followed by dash ("-"), and a correlative number from 1 on, started afresh with each annex.

e.   The caption shall be positioned as follows:

1.   In tables, before the table.

2.   In figures, after the figure.

f.   The identifier shall be automatically generated through the use of a specific paragraph style.

5.3.3.2.2   Reference from the body text

a.   Tables, figures and equations shall be explicitly cross-referred to from the body text, by their identifier.

NOTE   This implies that if a table or figure is not referred to from the text, it is unnecessary for the understanding of the standard, and therefore it can be deleted. This requirement is very important to understand the (normative or informative) character of the table or figure.

b.   The explicit cross-reference specified in 5.3.3.2.2a. shall be implemented by using hyperlinks.

5.3.3.3   Notes to tables and figures

a.   Notes to tables and figures shall be located within the frame of the table or figure, at the end of the relevant table or immediately above the title of the relevant figure.

b.   Notes to tables and figures shall be of one of the following two types:

1.   Notes to the totality of the table or figure.

2.   Notes to particular elements of the table or figure.

c.   Notes to the totality of the table or figure shall be numbered with the word NOTE followed by a sequential Arabic number, from 1 on, afresh in each table or figure.

d.   Notes to particular elements shall be identified by a superscript minor letter from "a" on (afresh in each table or figure) in both, just after the calling element in the table or figure, and before the referred note at the end of the table or figure.

e.   Notes to tables and figures shall not contain requirements.

5.3.3.4   Formatting a table

a.   The first word in the heading of each column shall begin with a capital letter, and the rest shall not be capitalized.

b.   The units used in the columns of a table shall be indicated as follows:

1.   In the case that the units of all the columns are the same, with a statement placed above right-hand corner of the table.

NOTE   For example:

Dimensions in mm

Outside diameter	Inside diameter

2.   In any other case, at the bottom of each column heading.

NOTE   For example:

Type Linear density kg/m	Inside diameter mm

5.3.3.5   Presentation of figures

5.3.3.5.1   Representation

a.   Figures that are part of a requirement shall be in the form of technical drawings.

NOTE   If a figure is not integral part of a requirement (i.e. if it serves only to illustrate the requirement, or is descriptive, as specified in 4.2), both a technical drawing and a photography can be used.

b.   The units in which values are expressed shall be indicated.

5.3.3.5.2   Formatting

a.   The orientation on vertical dimension lines shall be such that they can be read from the right-hand side of the pages.

b. Inscriptions on drawings shall be such that, in printing size on A4 format, the height of the lower case characters should be not less than 1,4 mm (except in the case of indices and exponents).

5.3.3.6 Continuation of tables and figures

a. When a table of figure is continued through several pages, the caption shall be repeated over running pages together with the indication "(PART x/N)" in the next line.

b. For tables, the column headings shall be repeated over running pages.

c. For tables reaching the foot of a page to be continued on the following page, the frame shall be left open at the bottom (i.e. without lower horizontal line).

5.3.4 Equations

5.3.4.1 Presentation of equations

a. Equations shall be expressed in mathematically correct form, the variables being represented by letter symbols the meanings of which are explained in connection with the equations, unless they are listed in section 3.3.

b. The layout presented in Figure 5-3 shall be used for equations.

$$A = \sum_{n=1}^{t} A(x^n - \frac{x}{n}) \qquad\qquad [5\text{-}1]$$

where

A is the …

n is …

x is …

Figure 5-3: Layout of an equation

5.3.4.2 Caption of equations

a. Equations called from the text shall have a caption.

   NOTE   Equations which are not called from the text do not need to have a caption.

b. The caption of equations shall include the number of the Level "N" section where they appear, followed by a dash ("-"), and a correlative number, started afresh with each Level "N" section.

   NOTE   For example, let's assume that the first equation to be numbered appears in section 5.3.8. If the author decided to use "N=1" then the first equation is numbered [5-1]. If he decides to use "N=2" then the first equation is numbered [5.3-1]. If he decided to use "N=3" the number is [5.3.8-1]. .

c. The Level "N" specified in 5.3.4.2b should be the Level 1.

> NOTE   However, in long handbooks it can be practical and advisable to group the equations in lower level sections.

d. The caption shall be positioned to the right of the equation, with the following layout:

e. The caption of the equation shall be automatically generated.

5.3.4.3   Reference to equations from the text

a. When an equation is referred from the text, it shall be referred by its caption.

> NOTE   Unlike tables and figures, not all equations need to be referred from the text.

b. The cross-reference specified in 5.3.4.3a shall be implemented by using hyperlinks.

5.4   Documents to promote the standard

a. When the draft standard is approved for publication by the TA, the WG convenor shall write a promotion article for publication in the ECSS Website, in accordance with DRD in Annex B.

6
Pre-tailoring of the present standard

- Launch segment element and subsystem
- Ground segment element and subsystem
- Space segment equipment
- Launch segment equipment
- Ground segment equipment
- Ground support equipment
- Software

NOTE   It is crucial to adhere to the strict definitions of the above product types. To facilitates the work, the definitions in ECSS-S-ST-00-01 "ECSS – Glossary of terms" are included below.

(b)   The project phases defined in ECSS-M-ST-10 (phases 0+A, B, C, D, E and F).

4.   If the standard does not apply to one or several of the product types in Table 6-1, the following boilerplate NOTE will be added.

NOTE   This standard does not cover the following product type(s):

<<to be filled accordingly>>
Therefore, the related column in the matrix will not be filled.

Space system	System that contains at least a space, a ground or a launch segment
	NOTE Generally a space system is composed of all three segments and is supported by a supporting segment.
Space segment element and sub-system	Element within a space segment
	NOTE: A space segment element can be composed of several space segment elements e.g. a spacecraft is composed of a instruments, payload module and a service module.
	Or subsystem within a space segment
	NOTE: Examples are power, propulsion, data handling
Launch segment element and sub-system	Element within a launch segment
	NOTE: A launch segment element can be composed of several launch segment elements; e.g. a launcher is a launch segment element that is composed of several launch segment elements, such as stage, engine, upper part.
	Or subsystem within a launch segment
Ground segment element and sub-system	Element within a ground segment
	NOTE: A ground segment element can be composed of several ground segment elements; e.g. a ground station network is a ground segment element that can be composed of a set of ground stations and a communication network.
	Or subsystem within a ground segment
	NOTE: Examples are flight dynamics, voice and video communication
Space segment equipment	Equipment within a space segment
	NOTE: Examples are electronic unit, thrusters, battery
Launch segment equipment	Equipment within a launch segment
Ground segment equipment	Equipment within a ground segment limited to equipment especially developed to interface with space segment element or equipment on-the-shelf equipment are excluded
Software	Software covering the 4 software categories to be considered for its development phase, when the software is not installed in a hardware.
	Therefore, in the matrix, the column "Software" refers to the development of software, only in the case when the software is not installed in a hardware.

Figure 6-1: Product types definition

This clause presents the table for the pre-tailoring of the requirements of the present standard per space product type and project phase.

For the terminology and definitions of the product types see ECSS-S-ST-00-01 which is quoted in clause 3.1. Due to the importance of the precise meaning of these terms for the correct application of the present matrix, the user is advised to read the definitions in ECSS-S-ST-00-01 clauses 2.2.3 to 2.2.7

> NOTE   In the matrix, the column "Software" is for consideration in the development of software, only in the case when the software is not installed in a hardware..

The following table explain the conventions used in the pre-tailoring table.

Table 6-1: Definitions of the columns of the pre-tailoring matrix per product type

Column title	Description
Applicability status - General	There are eight product types, one per column. For the column "i" (i = 1 to 8) possible values are: • "A" when applicable, • "NA" when not applicable, or • "Xi" to be decided on a case by case basis, with explanation in column comments • $A^{(n)}$ when requirement is applicable with supplementary indications in the "Comment" column, being "n" a letter from "a" on, to univocally refer the comment.
Applicability status per space product type	A requirement is considered applicable for a product type if it is verified on this product type. It is possible to have a requirement applicable at various level of product (system, element, equipment and software) • If a requirement is verified only at one level, and the information transmitted to the upper level without any treatment, it will be considered applicable only at the level it was verified ("A" in the column where it is verified). • If a requirement is verified at one level, and also verified at the upper level, it will be considered applicable at both levels (an "A" in both columns).
Applicability status per project phase	The applicability per project phase are intended for support the selection of applicable requirements according to the programme phases. During phase A only few documents/requirements are actually applicable, however, it is during this phase that the future standards/requirements applicability to phase B/C/D/E should be defined. A larger set of standards can then be called up as reference documents for phase A while not made formally applicable."
Comments	The column "Comments" shall be used to explain the rationale for having not decided if applicable or not. It shall not be used to modify a requirement but it can provide clarification on specific conditions for the applicability of the requirement.

Table 6-2: Pre-tailoring matrix per "Space product types and project phases"

ECSS req. number	Space product types								Project phases						Comments
	Space system	Space segment element & sub-system	Launch segment element & sub-system	Ground segment element & sub-system	Space segment equipment	Launch segment equipment	Ground segment equipment	Software	0+A	B	C	D	E	F	
CLa	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
CLb	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
CLc	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
CLd	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
Cle	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
TOCa	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
TOCb	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
TOCc	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
TOCd	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
Ia	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
Ib	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
1a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
1b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
1c	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
1d	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
1e	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
2a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
2b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
2c	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
2d	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
2e	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
2f	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
2g	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
2h	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.1a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.1b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.1c	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.1d	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.2a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	

ECSS req. number	Space product types								Project phases						Comments
	Space system	Space segment element & sub-system	Launch segment element & sub-system	Ground segment element & sub-system	Space segment equipment	Launch segment equipment	Ground segment equipment	Software	0+A	B	C	D	E	F	
3.2b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.2c	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.2d	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.2e	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.2f	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.2g	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.2h	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.2i	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.2j	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.2k	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.3a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.3b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.3c	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.3d	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.3e	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.3f	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.3g	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.3h	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.3i	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.3j	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.4a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.4b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.4c	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.4d	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.5a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.5b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.5c	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
3.5d	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.1.1a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.1.1b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.1.2.1a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.1.2.2a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	

ECSS req. number	Space product types								Project phases						Comments
	Space system	Space segment element & sub-system	Launch segment element & sub-system	Ground segment element & sub-system	Space segment equipment	Launch segment equipment	Ground segment equipment	Software	0+A	B	C	D	E	F	
5.1.1.2.2b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.1.2.2c	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.1.2.3a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.1.2.3b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.1.2.3c	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.2.1a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.2.1b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.2.1c	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.2.1d	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.2.1e	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.2.2a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.2.3a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.2.3b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.2.3c	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.3.1a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.3.1b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.3.1c	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.3.1d	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.3.2a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.3.2b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.3.2c	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.3.2d	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.3.3.1a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.3.3.1b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.3.3.1c	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.3.3.2a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.3.3.2b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.3.4a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.3.4b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.3.4c	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.1.3.4d	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.1a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	

ECSS req. number	Space product types								Project phases						Comments
	Space system	Space segment element & sub-system	Launch segment element & sub-system	Ground segment element & sub-system	Space segment equipment	Launch segment equipment	Ground segment equipment	Software	0+A	B	C	D	E	F	
5.2.1b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.1c	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.1d	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.2a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.2b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.3a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.3b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.3c	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.3d	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.3e	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.3f	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.3g	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.3h	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.4.1a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.4.1b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.4.2a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.5a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.5b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.5c	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.5d	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.6a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.6b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.6c	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.6d	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.7.1a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.7.1b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.7.1c	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.7.2a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.7.2b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.7.2c	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.8a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.2.8b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	

ECSS req. number	Space product types								Project phases						Comments
	Space system	Space segment element & sub-system	Launch segment element & sub-system	Ground segment element & sub-system	Space segment equipment	Launch segment equipment	Ground segment equipment	Software	0+A	B	C	D	E	F	
5.2.8c	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.1a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.1b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.2.1a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.2.1b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.2.2a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.2.2b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.2.3a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.2.3b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.3.1a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.3.2.1a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.3.2.1b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.3.2.1c	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.3.2.1d	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.3.2.1e	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.3.2.1f	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.3.2.2a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.3.2.2b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.3.3a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.3.3b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.3.3c	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.3.3d	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.3.3e	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.3.4a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.3.4b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.3.5.1a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.3.5.1b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.3.5.2a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.3.5.2b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.3.6a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.3.6b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.3.6c	A	A	A	A	A	A	A	A	A	A	A	A	A	A	

ECSS req. number	Space product types								Project phases						Comments
	Space system	Space segment element & sub-system	Launch segment element & sub-system	Ground segment element & sub-system	Space segment equipment	Launch segment equipment	Ground segment equipment	Software	0+A	B	C	D	E	F	
5.3.4.1a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.4.1b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.4.1c	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.4.2a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.4.2b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.4.2c	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.4.2d	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.4.2e	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.4.3a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.3.4.3b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
5.4.a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
6a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
6b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
A.a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
A.b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
B.1.1a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
B.1.2a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
B.2.1a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
B.2.1b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
B.2.2a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
B.2.2b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
Bib.a	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
Bib.b	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
Bib.c	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
Bib.d	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
Bib.e	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
Bib.f	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
Bib.g	A	A	A	A	A	A	A	A	A	A	A	A	A	A	

Annex A (informative)
Document delivery per review

EXPECTED CONTENTS

It is expected that a draft standard requiring documents to be deliver (e.g. DRDs), includes this informative annex explaining in which project review the document needs to be delivered, and at which level of maturity.

If the standard is a Level 3 one, the present annex will be removed from the draft by the ECSS ES, and moved to the corresponding Level 2 standard, to be published in it at the first occasion. The intention is that every Level 2 standard includes a summary table with all deliverable documents in its discipline. For this reason, it is important to adhere to the boiled plate table per project review, even if some deliverables are not linked to project review (in this case, stating N/A). In this cases, additional information can be provided in Remarks.

REQUIREMENTS AND EXAMPLE

a. If a draft standard includes requirements requiring delivering of documents, it shall include an informative annex A, called "Document delivery per review", located before the DRDs.

b. The informative annex A "Document delivery per review" shall include:

1. The boilerplate text of this Annex A.

2. The Table A-1, indicating the need of delivering the document at each project review by stating:

   (a) "N/A" if the document is not linked to any project review, stating then in "Remarks" when the document is expected.

   (b) A dash ("-") if the document is linked to project reviews, but no need to deliver the document at a given project review.

   (c) An "P" if an preliminary version of the document is expected at a given project review.

   (d) A "C" if a complete version of the document is expected at a given project review

   (e) An "U" if subsequent updates of the complete document are expected at a given project review

Table A-1 presents the project reviews at which different issues of the deliverable documents are expected.

Table A-1: Deliverable documents per project review

| Document title | ECSS document | DRD ref. | Reviews | | | | | | | | | | | | | Remarks |
			MDR	PRR	SRR	PDR	CDR	QR	AR	ORR	FRR	LRR	CRR	ELR	MCR	
WG convenor promotion article (WGCPA)	ECSS-D-00-01	Annex B	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Delivery of the WGCPA is expected just after publication of the standard

LEGEND: P = Preliminary version N/A = Not applicable (Delivery of the document not linked C = Complete version to project reviews) U = Update - = No delivery necessary	General Notes

Annex B (normative)
WG convenor promotion article (WGCPA)
– DRD

B.1   DRD identification

B.1.1   Requirement identification and source document

EXPECTED CONTENTS
The "Requirement identification and source document" clause ensures that the DRD is called from a requirement in the standard
REQUIREMENTS
a.   The "Requirement identification and source document" clause shall include a back reference to the requirement specifying the generation of the expected response to the DRD.

ECSS-D-00-01 "Drafting rules and template for ECSS standards", requirement 5.4a.

B.1.2   Purpose and objective

EXPECTED CONTENTS
The "Purpose and objective" clause provides information on the context of the deliverable document to be produced in accordance with the DRD.
REQUIREMENTS
a.   The "Purpose and objective" clause shall describe only the purpose and objective of the deliverable document.

The purpose of the WG convenor promotion article (WGCPA) is to promote the use of the standard in the ECSS community through a short text (typically between half a page and one page) understandable by engineers whose expertise falls out of the scope of the standard.

The article is included in the ECSS Newsletter, which in turn is published on the ECSS Website.

B.2 Expected response

B.2.1 Contents

EXPECTED CONTENTS
The "Contents" clause is to include the required content of the document to be delivered (i.e. the information to be included). It is not expected that this clause requires the structure of the document, or the organization of the information within the document.

REQUIREMENTS
a. The "Contents" clause shall include the content of the expected response to the DRD (i.e. the information to be provided in the expected response).
b. If the "Contents" clause propose an organization of the information to be provided in sections, it shall state clearly that this organization is not mandatory.

NOTE   An example of an <u>improper</u> formulation is:

    <6>   System design and implementation
    This section shall describe the technical approach…

because it implies the use of a section 6 for system analysis in the expected response.

In a DRD called e.g. "Communication system baseline definition (CSBD) DRD", an example of proper requirement is:

    <6>   System design and implementation
    The CSBD shall describe the technical approach…

because it specifies the requirement to describe the technical approach in the CSBD (i.e. the expected response), without imposing to do it in any specific section.

<1> **Scope and purpose of the standard**

a.   The WGCPA shall describe the scope and purpose of the standard to be promoted.

b.   The WGCPA shall explain the situation before the standard, and the problems solved through the publication of the standard.

<2> **Context of the standard**

a.   The WGCPA shall include a brief history of the standard, if the standard is an evolution from previous versions, or from other (ECSS or non-ECSS) existing documents.

b.   The WGCPA shall summarize the relationships between the standard and other (ECSS and non-ECSS) standards.

<3> **Contribution to the standard**

a.   The WGCPA shall include a description of the spectrum of experts who have contributed to the standards, in terms of

1.   expertise

2.   coverage of the industrial spectrum (i.e. Agencies, Industries, Universities, Users)

3.   size of involved organizations

<4> **Additional information**

a.   The WGCPA shall include any detail or extra information that can contribute to promote the standard.

B.2.2   Special remarks

EXPECTED CONTENTS
The purpose of the "Special remarks" clause is to state additional information on the deliverable document, such as: • Media or delivery options. • Combination of the deliverable document with the response to other DRDs
REQUIREMENTS
a.   Any additional information (other than the one specified in B.1.1, B.1.2 and B.2.1) for the completeness of the DRD, shall be included in the "Special remarks" clause. b.   If no additional information is provided, "None." shall be stated.

The WCCPA can be delivered as part of other documents to be delivered by the WG.

> NOTE   For example, as part of the WG end of business report.

Annex C (informative)
Non-verifiable requirements

C.1 Overview

Requirement 5.2.3d specifies the verifiability of all the normative statements included in an ECSS standard. Non-verifiable normative statements can lead to a blocking situation when assessing the draft standard. The reason is that their use in business agreements leads to a quick increase in costs without tangible benefit, since compliance with the requirements cannot be ensured.

This Annex C provides additional information and guidance on sources of non-verifiability to be avoided in requirements, and provide some practical examples of specific cases.

Note that the present Annex is applicable to requirements, not to descriptive material.

C.2 Assessing the verifiability of requirements

A requirement is verifiable if and only if there is a finite and cost-effective process that can be used to provide objective evidence of whether or not the as-built system meets the requirement.

There are several elements of this definition which deserve further attention:

- "if and only if" implies that otherwise the requirement is non-verifiable.

- The process referred above (called verification) is finite and cost-effective. Many times, the preferred method of verification is direct observation (i.e. test or inspection), but sometimes cost-effectiveness makes this method inappropriate.

- For the requirement is considered verifiable if and only if the above verification process provides objective evidence and therefore the result of the process does not need any subjective assessment (i.e. it is completely independent of the person assessing the result).

Consequently, a verifiable requirement states an action which correct implementation can be verified by examination, analysis, test, or demonstration (methods of verification are specified in ECSS-E-ST-10-02 "Verification"). Therefore, to ensure that the requirement is verifiable, do the following intellectual exercise as you write it:

- Anticipate how to verify it, e.g. put yourself in the situation that verification of the requirement is your responsibility, and that it is your duty to describe the method to verify it.

- Make sure that the requirement (implicitly or explicitly) contains the objective criteria for acceptance (pass/no-pass criteria). Objective criteria mean that the criteria are independent of the person or entity performing the verification.

If you cannot answer the two questions in the bullets the requirement is not verifiable, and it is therefore inappropriate in an ECSS standard until reworded in a verifiable way.

Example of verifiable requirements are:

"The length shall be 20 cm ±1 cm". The objective criteria for acceptance is explicitly stated in the requirement itself (20 cm ±1 cm).

"The length shall be agreed with the customer". The requirement is verifiable as far as the agreement is documented.

C.3 Sources of non-verifiability

C.3.1 General

The following are sources of non-verifiability:

- Subjectivity (see C.3.2)

- Imprecise situations or conditions (see C.3.2.2)

- Requirements specifying intellectual actions (see C.3.3)

- Hidden or future requirements (see C.3.4)

- Imprecise references (see C.3.5)

C.3.2 Subjectivity

C.3.2.1 Subjective requirements

Subjectivity is one of the main sources of non-verifiable requirements. Subjective statements are those specifying non-quantified properties, or degrees of excellence needing a subjective assessment.

Normally, ambiguous statements are expressed by adjectives (e.g. short, quick), some verbs (e.g. maximize, optimize) and adverbs (e.g. sufficiently). Examples of ambiguous and subjective statements are:

"The weight shall be as low as possible"
"The consumption shall be minimized"
"The personnel shall be adequately qualified".

In subjective requirements it is not possible to determine the method of verification, or the successful criteria for acceptance, or both.

The following is a non-exhaustive list of subjective words frequently found in draft standards where it is easy to determine the method of verification, but the successful criteria for acceptance is undetermined:

- Relevant, important
- Optimize, minimize, maximize
- Rapid, quickly, slow
- User-friendly
- Easy
- Soon, early
- Timely
- Short, long, light, heavy, thin, thick (qualifiers without quantification)
- Enough, sufficient (adjectives)
- Typical, typically
- As … as possible
- The …est possible, the most … possible

The following is a non-exhaustive list of subjective words frequently found in draft standards where both the method of verification and the successful criteria of acceptance are undetermined:

- Appropriate, appropriately
- Suitable, suitably
- Proper, properly
- Adequate, adequately
- Enough, sufficient, sufficiently (adverbs)

Subjective requirements normally express goals or objectives from which real implementation requirements should be derived. For example, when requiring that "The supplier's personnel shall be adequately qualified", it is shown that qualification of personnel is an issue, but it is not stated what is expected from the supplier to satisfy this need. Note that the supplier is never going to claim that "the personnel shall be inadequately qualified". The argument between customer and supplier is not on this subject, but in the meaning of "adequately". This is what the standard is intended to clarify.

C.3.2.2 Subjective situations and conditions

Some requirements are verifiable ones, but they are conditioned to the occurrence of non-verifiable subjective situations.

The following is a non-exhaustive list of words and expressions (familiarly called deprecators) related to imprecise situations frequently found in draft standards that can lead to blocking situations:

- If/as required
- If relevant
- If specified
- Unless otherwise required, ..specified
- If appropriate
- If applicable

- If needed, if necessary
- If possible, if feasible
- If (economically) justified

C.3.3 Requirements specifying intellectual actions

C.3.3.1 Objectives and goals in requirements

The result of an action can be verified, the objective or motto of the action cannot. Therefore, requirements on objectives or aims are always non-verifiable.

The following is a non-exhaustive list of words frequently found in draft standards that can lead to blocking situations:

- Objective
- Aim
- Goal
- Intention
- Purpose

The following is an example of such a requirement:

"The goal shall be to have the CIL defined before…".

The appropriate requirement in this case is:

"The CIL shall be defined before…".

C.3.3.2 Considerations in requirements

It is appropriate that a requirement specifies the result of an intellectual action (e.g. a documented analysis), but not the performance of the intellectual action itself.

The following is a non-exhaustive list of subjective words frequently found in draft standards that can lead to blocking situations:

- Consider
- Take into account
- Account for

The following are requirements expressing ambiguous considerations:

- "The supplier shall consider…".
  Consider means to "think about carefully". Thinking is an intellectual action that cannot be verified.
- "The analysis shall take into account…".
  "To take into account" is a very weak requirement. If a calculation does not include at all the effect of a given variable, the calculator can still claim that he has taken it into account, but he has neglected due to a given consideration or excuse. Therefore, the requirement is also non-verifiable. The right requirement in such cases is "The analysis shall include the effect of the shock impact, multiplied by a factor of 0,95 or higher".

C.3.3.3 Attention in requirements

To pay attention is also a non-verifiable intellectual action.

Requirements referring to the concept of attention or care are usually recommendations to the person performing the contract, but not contractual obligations. Therefore, they are normally more appropriate for a handbook than for a standard.

The following is a non-exhaustive list of subjective words frequently found in draft standards that can lead to blocking situations:

- Attention

- Care, careful

- (Extreme) caution.

C.3.4 Hidden or future requirements

Many requirements cannot be verified because they include additional implicit requirements not explicitly stated, or requirements to be determined in the future, and therefore unknown at the time of signing the contract. This type of requirements is invalid "per-se" in a contract.

The following is a non-exhaustive list of sentences frequently found in draft standards that can lead to blocking situations:

- Include but not limited

- May require

- May be required, may be specified

A common case of this category is "regulating by example". Examples are good as such, i.e. to clarify the requirements, not to modify them, or even worse, to be part of the requirements.

An absolutely unacceptable formulation is:

"The analysis shall include the electrical charge due to e.g. the plume effect,…"

In this example it is absolutely unclear what is required to include in the analysis.

C.3.5 Imprecise references

Many requirements are non-verifiable because they specify compliance with other documents not identified at the time of the business agreement.

The following is a non-exhaustive list of sentences frequently found in draft standards that can lead to blocking situations:

- As specified in the tables, in the figures (in which one?)

- As specified in the regulations

- As required by the national rules

- In accordance with approved standards (approved by whom?)

- In compliance with recognized standards (recognized by whom?)

- As per an international standard (from any country or international organization?)

- In accordance with the best engineering practices

C.4 Summary

Table C-1 summarizes the non-exhaustive list of words to be avoided in defining the obligation stated in normative statements, presented so far.

Table C-1: Inappropriate words in defining the obligation stated in normative statements

Relevant, important
Optimize, minimize, maximize
Rapid, quickly, slow
User-friendly
Easy
Soon, early
Timely
Short, long, light, heavy, thin, thick (qualifiers without quantification)
Enough, sufficient (adjectives)
Typical, typically
As … as possible
The …est possible, the most … possible
Appropriate, appropriately
Suitable, suitably
Proper, properly
Adequate, adequately
Enough, sufficient, sufficiently (adverbs)
If/as required
If relevant
If specified
Unless otherwise required, ..specified
If appropriate
If applicable
If needed, if necessary
If possible, if feasible
If (economically) justified
Objective
Aim
Goal
Intention
Purpose
Consider
Take into account
Account for
Attention
Care, careful
(Extreme) caution.
Include but not limited
May require
May be required, may be specified

As specified in the tables, in the figures (in which one?)

As specified in the regulations

As required by the national rules

In accordance with approved standards (approved by whom?)

In compliance with recognized standards (recognized by whom?)

As per an international standard (from any country or international organization?)

In accordance with the best engineering practices

Annex D (informative)
Check list of terms

Table D-1 list a number of terms to be avoided in ECSS standards. If an alternative term can be used instead, it is also listed. The table can be used as a check-list in helping to avoid the most common mistakes when drafting ECSS standards.

Table D-1: Check list of terms

Term to be avoided	Possible alternatives to be considered
and/or	to be either 'or' *or* 'and' – not both [usually 'or']
ise (spelling within a word)	ize [Note: 'exercise' = correct spelling. See also separate list of 'ise' words]
isa (spelling within a word)	iza
conform with [comply to]	comply with *people* [conform to *product*]
validate a process [verify a product]	verify a process [validate a product]
foresee	plan *or* anticipate *or* expect
Annex (within text)	annex [no capital letter]
etc.	'e.g.' *or* 'such as' *or* 'for instance'
document	standard – unless it **is** a 'document'! [if an ECSS Standard – capital 'S']
specification	standard – unless it **is** a 'specification'
will	are [*or* 'shall'] Note: 'will' has deprecated use for future events = an event that cannot be controlled
are [is to]	shall
has [have been]	is
is	shall be
may [can] (may = permission)	can [may] (can = possibility)
need	'requirement' [noun] *or* 'require' [verb]
required	applicable
could	can
is *or* are preferred	should be used

Table D-1: Check list of terms

Term to be avoided	Possible alternatives to be considered
may be permitted	may be used
will permit	may
must, must not	shall, shall not
it is preferred, advisable, desirable	should
it is proposed	should
will be identical	are identical
is responsible	shall
are required	shall be used
is to be	shall
is cause for	shall be cause for
[if] [when] [as] necessary	avoid use
[if] [when] [as] applicable	avoid use
typically	Avoid use - subjective - can be misinterpreted
ideally	Avoid use - subjective - can be misinterpreted
preferably	Avoid use - subjective - can be misinterpreted
generally, usually, normally	Avoid use - subjective - can be misinterpreted
have to be	Avoid use - subjective - can be misinterpreted
are considered	Avoid use - subjective - can be misinterpreted
goal	Avoid use - subjective - suggest use 'objective'
included but not limited to	Avoid use - subjective - can be misinterpreted
[if] [when] [as] relevant	Avoid use - subjective - can be misinterpreted
[if] [when] [as] appropriate	Avoid use - subjective - can be misinterpreted
[if] [when] [as far as] possible	Avoid use - subjective - can be misinterpreted
[if] [when] [as] practical	Avoid use - subjective - can be misinterpreted
[if] [when] [as] suitable	Avoid use - subjective - can be misinterpreted
[if] [when] [as] adequate	Avoid use - subjective - can be misinterpreted
optimize *or* minimize *or* maximize	Avoid use - subjective - can be misinterpreted
rapid *or* slowly	Avoid use - subjective - can be misinterpreted
quick *or* slow	Avoid use - subjective - can be misinterpreted
easy *or* difficult	Avoid use - subjective - can be misinterpreted
great *or* small	Avoid use - subjective - can be misinterpreted
clean *or* dirty	Avoid use - subjective - can be misinterpreted

Table D-1: Check list of terms

Term to be avoided	Possible alternatives to be considered
sufficient *or* enough	Avoid use - subjective - can be misinterpreted
satisfactory	Avoid use - subjective - can be misinterpreted
extreme	Avoid use - subjective - can be misinterpreted
user friendly	Avoid use - subjective - can be misinterpreted
'sub-clause' (*OED*)	'clause' (ISO Part 3)
procedure [process]	in the process of [a procedure is followed]
analyze [US spelling]	analyse [OED spelling]

Bibliography

EXPECTED CONTENTS	
	The purpose of this section is to list the documents that are called in the document but not from a requirement. Documents not referred to in normative or descriptive text are not listed in Normative references or Bibliography.
REQUIREMENTS	
a.	The "Bibliography" section shall list only documents called in the non-normative text of the standard.
b.	If one document is called from both normative and non-normative text, it shall be listed only in "Normative references".
c.	Each reference shall be dated, or the number of the version included.
d.	A document listed in bibliography shall be published and publicly available.
e.	Publicly available does not necessarily mean available for free.
f.	The Working Group shall inform the ECSS Executive Secretariat where the referenced documents (with the exception of ECSS, ISO or EN) can be obtained.
g.	The "Normative references" clause shall not contain requirements.