

DIN EN 16602-70

ICS 49.140

Einsprüche bis 2016-05-04
Vorgesehen als Ersatz für
DIN EN 13291-3:2005-03

Entwurf

**Raumfahrtproduktsicherung –
Werkstoffe, mechanische Teile und Prozesse;
Englische Fassung FprEN 16602-70:2016**

Space product assurance –
Materials, mechanical parts and processes;
English version FprEN 16602-70:2016

Assurance produits des projets spatiaux –
Matériaux, composants mécaniques et procédés;
Version anglaise FprEN 16602-70:2016

Anwendungswarnvermerk

Dieser Norm-Entwurf mit Erscheinungsdatum 2016-03-04 wird der Öffentlichkeit zur Prüfung und Stellungnahme vorgelegt.

Weil die beabsichtigte Norm von der vorliegenden Fassung abweichen kann, ist die Anwendung dieses Entwurfes besonders zu vereinbaren.

Stellungnahmen werden erbeten

- vorzugsweise online im Norm-Entwurfs-Portal des DIN unter www.entwuerfe.din.de bzw. für Norm-Entwürfe der DKE auch im Norm-Entwurfs-Portal der DKE unter www.entwuerfe.normenbibliothek.de, sofern dort wiedergegeben;
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- oder in Papierform an den DIN-Normenausschuss Luft- und Raumfahrt (NL), 10772 Berlin (Hausanschrift: Burggrafenstr. 6, 10787 Berlin).

Die Empfänger dieses Norm-Entwurfs werden gebeten, mit ihren Kommentaren jegliche relevanten Patentrechte, die sie kennen, mitzuteilen und unterstützende Dokumentationen zur Verfügung zu stellen.

Gesamtumfang 78 Seiten

DIN-Normenausschuss Luft- und Raumfahrt (NL)

Nationales Vorwort

Dieses Dokument (FprEN 16602-70:2016) wurde vom Technischen Komitee CEN/CLC/TC 5 „Raumfahrt“ erarbeitet, dessen Sekretariat vom DIN (Deutschland) gehalten wird.

Das zuständige deutsche Normungsgremium ist der Arbeitsausschuss NA 131-06-02 AA „Interoperabilität von Informations-, Kommunikations- und Navigationssystemen“ im DIN-Normenausschuss Luft- und Raumfahrt (NL).

Dieses Dokument (FprEN 16602-70:2016) basiert auf ECSS-Q-ST-70C Rev.1.

Dieses Dokument ersetzt EN 13291-3:2003.

Dieses Dokument enthält unter Berücksichtigung des DIN-Präsidialbeschlusses 1/2004 nur die englische Originalfassung von FprEN 16602-70:2016.

Dieses Dokument wurde speziell zur Behandlung von Raumfahrtsystemen erarbeitet und hat daher Vorrang vor jeglicher Europäischer Norm, da es denselben Anwendungsbereich hat, jedoch über einen größeren Geltungsbereich (z. B. Luft- und Raumfahrt) verfügt.

Änderungen

Gegenüber DIN EN 13291-3:2005-03 wurden folgende Änderungen vorgenommen:

- a) Normnummer geändert;
- b) Bild 4-1, Ablaufdiagramm, neu aufgenommen;
- c) informativer Anhang A überarbeitet und geändert in Anhang E;
- d) neue normative Anhänge A bis D aufgenommen;
- e) neuer informativer Anhang F hinzugefügt;
- f) Norminhalt technisch überarbeitet;
- g) Norm redaktionell angepasst.

Nationaler Anhang NA (informativ)

Begriffe

3 Begriffe und Abkürzungen

3.1 Begriffe aus anderen Normen

- a) Für die Anwendung dieses Dokuments gelten die Begriffe nach ECSS-S-ST-00-01 und insbesondere die folgenden Begriffe:

- 1) Material.

3.2 Für diese Norm spezifische Begriffe

3.2.1

kritisches mechanisches Teil

mechanisches Teil, das entweder aufgrund bruchmechanischer und lebensdauerbezogener Aspekte besonders beachtet oder überwacht werden muss, das der Lieferant bisher nicht in dieser spezifischen Anwendung und Umgebung eingesetzt hat, das neu oder nicht qualifiziert ist, oder das bei einer früheren Anwendung zu ungelösten Problemen geführt hat

3.2.2

kritischer Prozess

Prozess, der für ein einzelnes Unternehmen neu oder für die betreffende Anwendung nicht verifiziert ist oder der bei einer früheren Anwendung zu ungelösten Problemen geführt hat

3.2.3

kritisches Material

Material, das für ein einzelnes Unternehmen neu oder für die betreffende Anwendung und Umgebung nicht validiert ist oder das bei einer früheren Verwendung zu ungelösten Problemen geführt hat

3.2.4

mechanisches Teil

Hardware-Teil, das nicht elektrisch, elektronisch oder elektromechanisch ist und das eine einfache elementare **Funktion** oder Teilfunktion so erfüllt, dass es als Ganzes im Vergleich zu erwarteten **Leistungsanforderungen** bewertet werden kann und nicht auseinandergenommen werden kann, ohne dadurch diese **Fähigkeit** einzubüßen

3.2.5

Prozess

mehrere in Wechselbeziehung oder Wechselwirkung stehenden Tätigkeiten, die ein Material oder Halbzeug in ein Halbzeug oder Endprodukt umwandeln

3.2.6

Genehmigungsantrag (en: request for approval)

RFA

Unterlage, mit der der Lieferant/Anwender bei der zuständigen Stelle beantragt, ein kritisches Material oder Teil zu verwenden oder einen kritischen Prozess anzuwenden

3.2.7

besonderer Prozess

Prozess, bei dem die Qualität des Endprodukts nicht ausschließlich durch Sichtprüfung vollständig sichergestellt werden kann

3.3 Abkürzungen

Für die Anwendung dieser Norm gelten die Abkürzungen nach ECSS-S-ST-00-01 und die folgenden Abkürzungen:

Abkürzung	Bedeutung	
AA	Aluminiumverband	(en: Aluminium Association)
AOCS	Lage- und Bahnregelungssystem	(en: attitude and orbit control system)
ATOX	Atomarer Sauerstoff	(en: atomic oxygen)
AISI	Amerikanisches Eisen- und Stahlinstitut	(en: American Iron and Steel Institute)
CDA	Kupferverband	(en: Copper Development Association)
CDR	kritisches Design-Review	(en: critical design review)
CFRP	kohlenstofffaserverstärkter Kunststoff	(en: carbon fibre reinforced polymer)
CI	Nummer der Konfigurationseinheit laut Projektdefinition	(en: configuration item number as per project definition)
DML	deklarierte Material-Liste	(en: declared material list)
DMPL	deklarierte mechanische Teileliste	(en: declared mechanical part list)
DPL	deklarierte Prozess-Liste	(en: declared process list)
DRD	Definition der Anforderungen an Unterlagen	(en: document requirements definition)
EEE	Elektronisch, Elektrisch, Elektromechanisch	(en: electrical, electronic and electromechanical)
ESA	Europäische Raumfahrtagentur	(en: European Space Agency)
ESMDB	Europäische Datenbank für Raumfahrtwerkstoffe	(en: European Space Materials Database)
GOX	gasförmiger Sauerstoff	(en: gaseous oxygen)
GSE	Bodendienstgerät	(en: ground support equipment)
LEO	niedrige Erddumlaufbahn	(en: low earth orbit)
LOX	flüssiger Sauerstoff	(en: liquid oxygen)
MIP	verbindlich vorgeschriebener Prüfpunkt	(en: mandatory inspection point)
MMPP	Materialien, mechanische Teile und Prozesse	(en: materials, mechanical parts and processes)
MMPDS	Entwicklung und Normung der Eigenschaften metallischer Materialien	(en: metallic materials properties development and standardisation)
MPCB	Untersuchungsausschuss für Material, mechanische Teile und Prozesse	(en: material, mechanical parts and processes control board)
NASA	National Aeronautics and Space Administration	
NCR	Nichtkonformitäten/Fehler-Bericht	(en: nonconformance report)
NRB	Nichtkonformitäts-Untersuchungsausschuss	(en: nonconformance review board)
PA	Produktsicherung	(en: product assurance)
PDR	vorläufiges Design-Preview	(en: preliminary design review)
PID	Prozess-Identifikationsdokument	(en: process identification document)
PMP	Teile, Materialien und Prozesse	(en: parts, materials, processes)
QR	Qualifikations-Review	(en: qualification review)
QRR	Qualifikations-Review-Bericht	(en: qualification review report)

Abkürzung	Bedeutung
RFA	Genehmigungsantrag (en: request for approval)
RFD	Abweichungsantrag (en: request for deviation)
SCC	Spannungsrissskorrosion (en: stresscorrosion cracking)

3.4 Nomenklatur

Für dieses Dokument gilt die folgende Nomenklatur:

- a) Das Wort „müssen“ (en: shall) wird in dieser Norm zur Formulierung von Anforderungen verwendet. Sämtliche Anforderungen werden durch das Wort „müssen“ ausgedrückt;
- b) Das Wort „sollten“ (en: should) wird in dieser Norm zur Formulierung von Empfehlungen verwendet. Sämtliche Empfehlungen werden durch das Wort „sollten“ ausgedrückt;

ANMERKUNG Es ist zu erwarten, dass während der Anpassung die Empfehlungen in diesem Dokument entweder in Anforderungen umgewandelt oder gestrichen werden.

- c) Die Wörter „dürfen“ (en: may) und „brauchen nicht“ (en: need not) werden in dieser Norm zur Formulierung der Zulässigkeit oder Unzulässigkeit verwendet. Sämtliche Zulässigkeiten werden über das Wort „dürfen“ ausgedrückt. Sämtliche Unzulässigkeiten werden über die Wörter „brauchen nicht“ ausgedrückt;
- d) Das Wort „können“ (en: can) wird in dieser Norm zur Formulierung von Fähigkeiten oder Möglichkeiten verwendet und stellt daher, wenn nicht durch eines der vorstehenden Worte begleitet, einen beschreibenden Text dar;

ANMERKUNG Beim ECSS haben „dürfen“ (en: may) und „können“ (en: can) völlig unterschiedliche Bedeutungen: „dürfen“ wird normativ (Zulässigkeit) und „können“ beschreibend verwendet.

- e) Zeitformen der Gegenwart und Vergangenheit werden in dieser Norm verwendet, um Tatsachenaussagen zu treffen und stellen daher einen beschreibenden Text dar.

— Leerseite —

January 2016

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Will supersede EN 13291-3:2003

English version

Space product assurance - Materials, mechanical parts and processes

Assurance produits des projets spatiaux - Matériaux,
composants mécaniques et procédés

Raumfahrtproduktsicherung - Werkstoffe,
mechanische Teile und Prozesse

This draft European Standard is submitted to CEN members for unique acceptance procedure. It has been drawn up by the Technical Committee CEN/CLC/TC 5.

If this draft becomes a European Standard, CEN and CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

This draft European Standard was established by CEN and CENELEC in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN and CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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European Foreword

This document (FprEN 16602-70:2016) has been prepared by Technical Committee CEN/CLC/TC 5 “Space”, the secretariat of which is held by DIN (Germany).

This document (FprEN 16602-70:2016) originates from ECSS-Q-ST-70C Rev.1.

This document is currently submitted to the Unique Acceptance Procedure.

This document will supersede EN 13291-3:2003.

This document has been developed to cover specifically space systems and will therefore have precedence over any EN covering the same scope but with a wider domain of applicability (e.g. : aerospace).

1

Scope

This Standard specifies the requirements and statements applicable to materials, mechanical parts and processes to satisfy the mission performance requirements.

This Standard also specifies the documentation requirements and the procedures relevant to obtaining approval for the use of materials, mechanical parts and processes in the fabrication of space systems and associated equipment.

This Standard covers the following:

- management, including organization, reviews, acceptance status and documentation control;
- selection criteria and rules;
- evaluation, validation and qualification, or verification testing;
- procurement and receiving inspection;
- utilization criteria and rules.

The relationship between activities and programme phases is defined in Annex E.

The provisions of this Standard apply to all actors involved at all levels in the production of space systems. These can include manned and unmanned spacecraft, launchers, satellites, payloads, experiments, electrical ground support equipment, mechanical ground support equipment, and their corresponding organizations.

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

2

Normative references

The following normative documents contain provisions which, through reference in this 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.

EN reference	Reference in text	Title
EN 16601-00-01	ECSS-S-ST-00-01	ECSS system - Glossary of terms
EN 16603-20-06	ECSS-E-ST-20-06	Space engineering - Spacecraft charging
EN 16601-80	ECSS-M-ST-80	Space product assurance - Risk management
EN 16602-10	ECSS-Q-ST-10	Space product assurance - Product assurance management
EN 16602-10-04	ECSS-Q-ST-10-04	Space product assurance - Critical-item control
EN 16602-10-09	ECSS-Q-ST-10-09	Space product assurance - Nonconformance control system
EN 16602-20	ECSS-Q-ST-20	Space product assurance - Quality assurance
EN 16602-40	ECSS-Q-ST-40	Space product assurance - Safety
EN 16602-70-01	ECSS-Q-ST-70-01	Space product assurance - Cleanliness and contamination and control
EN 16602-70-02	ECSS-Q-ST-70-02	Space product assurance - Thermal vacuum outgassing test for the screening of space materials
EN 16602-70-04	ECSS-Q-ST-70-04	Space product assurance - Thermal testing for the evaluation of space materials, processes, mechanical parts and assemblies
EN 16602-70-06	ECSS-Q-ST-70-06	Space product assurance - Particle and UV radiation testing of space materials
EN 16602-70-09	ECSS-Q-ST-70-09	Space product assurance - Measurements of thermo-optical properties of thermal control materials
EN 16602-70-21	ECSS-Q-ST-70-21	Space product assurance - Flammability testing for the screening of space materials
EN 16602-70-22	ECSS-Q-ST-70-22	Space product assurance - Control of limited shelf-life materials

EN 16602-70-29	ECSS-Q-ST-70-29	Space product assurance - Determination of offgassing products from materials and assembled articles to be used in a manned space vehicle crew compartment
EN 16602-70-36	ECSS-Q-ST-70-36	Space product assurance - Material selection for controlling stress-corrosion cracking
EN 16602-70-37	ECSS-Q-ST-70-37	Space product assurance - Determination of the susceptibility of metals to stress-corrosion cracking
EN 16602-70-71	ECSS-Q-ST-70-71	Space product assurance - Materials, processes and their data selection

Terms, definitions and abbreviated terms

3.1 Terms from other standards

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

3.2 Terms specific to the present standard

3.2.1 critical mechanical part

mechanical part that requires specific attention or control due to fracture mechanics aspects and limited-life aspects, or with which the supplier has no previous experience of using the mechanical part in the specific application and environment or that are new or non-qualified, or that has caused problems during previous use that remain unresolved

3.2.2 critical process

process new to an individual company or non-verified for the application in question or has caused problems during previous use that remain unresolved

3.2.3 critical material

material that is new to an individual company or non-validated for the particular application and environment, or that has caused problems during previous use that remain unresolved

3.2.4 mechanical part

piece of hardware which is not electrical, electronic or electromechanical, and which performs a simple elementary **function** or part of a function in such a way that it can be evaluated as a whole against expected requirements of **performance** and cannot be disassembled without destroying this **capability**

3.2.5 process

set of inter-related resources and activities which transforms a material or semi-finished product into a semi-finished product or final product

3.2.6 request for approval (RFA)

document with which the supplier or user asks the competent body for permission to use a critical material, part or process

3.2.7 special process

process where quality cannot be completely ensured by visual inspection of the end article only

3.3 Abbreviated terms

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

Abbreviation	Meaning
AA	Aluminium Association
AOCS	attitude and orbit control system
ATOX	atomic oxygen
AISI	American Iron and Steel Institute
CDA	Copper Development Association
CDR	critical design review
CFRP	carbon fibre reinforced polymer
CI	configuration item number (as per project definition)
DML	declared material list
DMPL	declared mechanical part list
DPL	declared process list
DRD	document requirements definition
EEE	electrical, electronic and electromechanical
ESA	European Space Agency
ESMDB	European Space Materials Database
GOX	gaseous oxygen
GSE	ground support equipment
LEO	low Earth orbit
LOX	liquid oxygen
MIP	mandatory inspection point
MMPP	Materials, mechanical parts and processes
MMPDS	Metallic Materials Properties Development and Standardisation
MPCB	Material, Mechanical Parts and Processes Control Board
NASA	National Aeronautics and Space Administration
NCR	nonconformance report
NRB	nonconformance review board
PA	product assurance
PDR	preliminary design review

Abbreviation	Meaning
PID	process identification document
PMP	parts, materials, processes
QR	qualification review
QRR	qualification review report
RFA	request for approval
RFD	request for deviation
SCC	stress-corrosion cracking

3.4 Nomenclature

The following nomenclature applies throughout this document:

- a. The word “shall” is used in this Standard to express requirements. All the requirements are expressed with the word “shall”.
- b. The word “should” is used in this Standard to express recommendations. All the recommendations are expressed with the word “should”.

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

- c. The words “may” and “need not” are used in this Standard 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”.
- d. The word “can” is used in this Standard 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 completely different meanings: “may” is normative (permission), and “can” is descriptive.

- e. The present and past tenses are used in this Standard to express statements of fact, and therefore they imply descriptive text.

General requirements

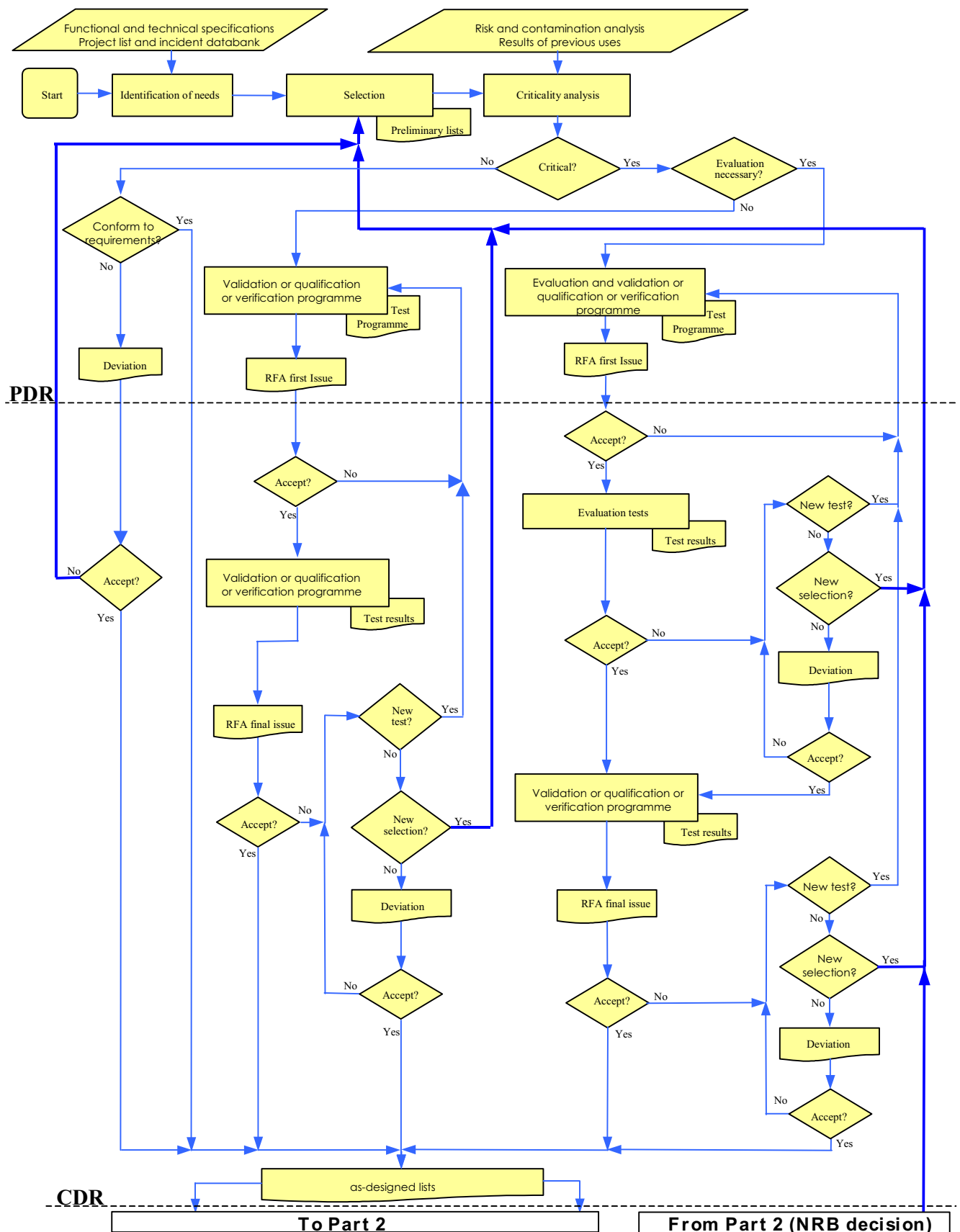
4.1 MMPP management requirements

4.1.1 Overview

The general MMPP activity within the framework of a project is summarized in Figure 4-1.

4.1.2 MMPP plan

- a. The supplier shall prepare, maintain and implement a MMPP plan, as part of the overall PA plan in conformance with DRD from Annex A of ECSS-Q-ST-10 and this Standard or as a separate document.
- b. The MMPP plan shall be submitted to the customer for approval.



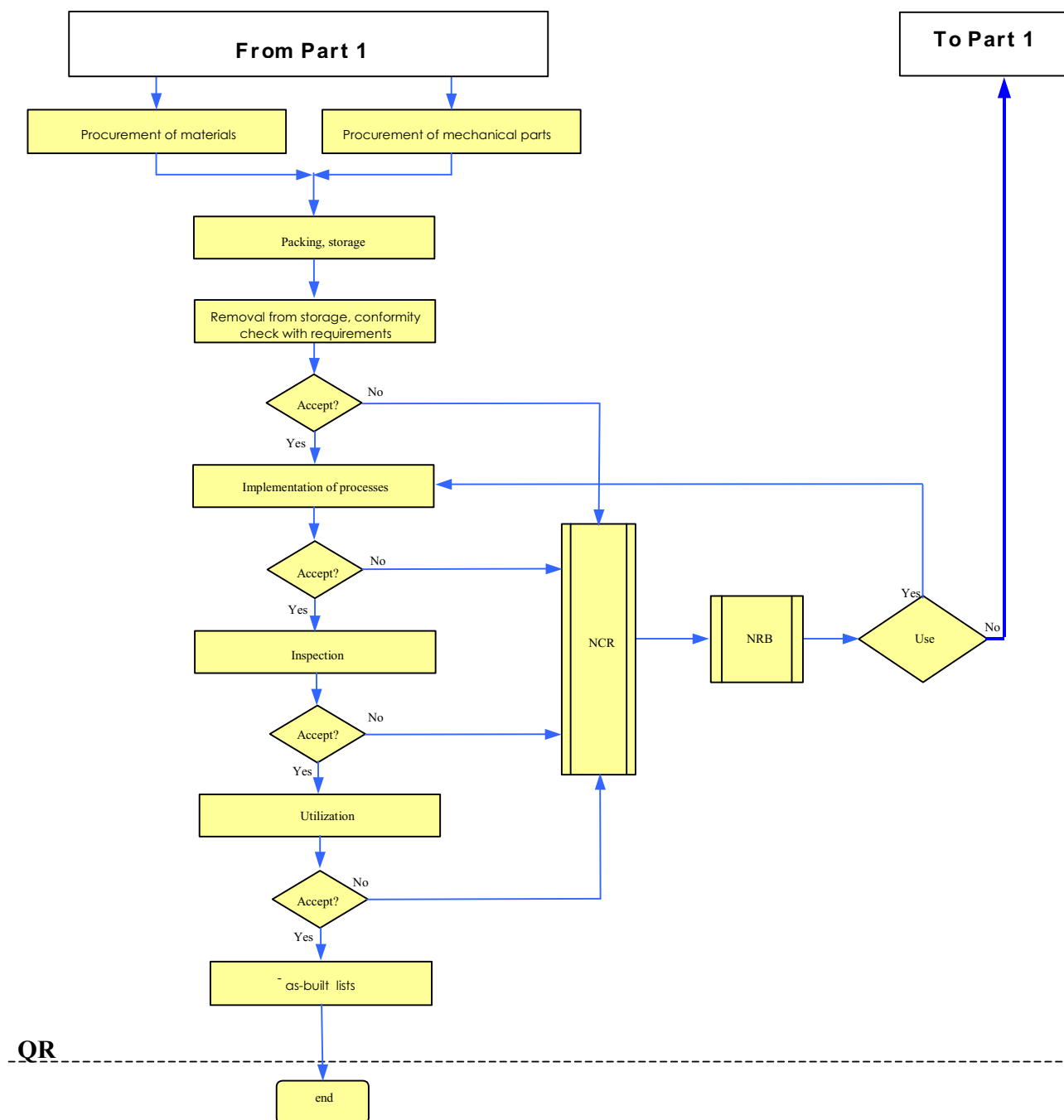


Figure 4-1: Materials, mechanical parts and processes flow chart (continued)

Table 4-1: Steps to be taken to get approval for materials, mechanical parts and processes (MMPP)

Phase	Materials		Mechanical parts		Processes	
	Step	Comments	Step	Comments	Step	Comments
Critical Analysis	1		1		1	
Evaluation (usually by test methods defined by ECSS standards)	2	Critical materials are tested, e.g. outgassing, SCC, flammability.	2	Mechanical parts are tested by, for example, vibration, thermal analysis, off-gassing and life test.	2	Critical processes are evaluated by testing "technology samples" including all, for example, electrical interconnection processes and painting, adhesive bonding, welding.
Verification	Not applicable		Not applicable		3	Verification tests usually defined in ECSS standards
Validation	3		Not applicable		Not applicable	
Qualification	Not applicable		3		Not applicable	
Approval		By RFA (Annex D) or DML		By RFA (Annex D) or DMPL/DPL		By RFA (Annex D) or DPL
NOTE 1 Project approval is always by means of the request for approval (RFA) form and the projects' declared materials list (DML), declared mechanical parts list (DMPL) and declared processes list (DPL). NOTE 2 The details for approvals of MMPP lists are contained in this Standard. NOTE 3 To summarize: Materials are validated. Mechanical parts are qualified. Processes are verified. In addition: Skills training schools are ESA-certified. Outside test or evaluation laboratories are certified by agency or company audits. Operators for special processes are trained, certified and monitored.						

4.1.3 MMPP Manager and MPCB

- a. << deleted >>
- b. << deleted >>
- c. The supplier shall appoint a MMPP manager.
- d. The MMPP Manager shall ensure that the Materials, Mechanical Parts and Processes used to manufacture a spacecraft or a launcher satisfy both the ground and flight functional requirements and constraints of the project.
- e. To obtain the validation status for materials and qualification status for parts and verification status for processes, the MMPP manager shall present to the customer activities which were performed in conformance with requirement 4.1.3d together with the results obtained.

- f. The MMPP manager shall organize Materials, Mechanical Parts and Processes Control Board (MPCB) at all suppliers with the task to review and approve the Materials, Mechanical Parts and Processes as specified in the Clauses 5, 6, and 7.
- g. The MPCB activity shall start not later than at PDR.
- h. The MMPP Manager shall agree with the customer on the MPCB's activities at PDR.
- i. Minimum tasks of the MPCB shall be as follows:
 - 1. Coordination of the initiation and approval of RFA's in conformance with DRD from the Annex D by involving the relevant technical discipline.
 - 2. Review and approval of test programme and related results.
 - 3. Review of preliminary Declared Materials, Mechanical Parts and Processes Lists and of any available evidence to support the approval, by the PDR.
 - 4. Review and approval of Declared Materials, Mechanical Parts and Processes Lists and of the evidence for the approval by the CDR.
 - 5. Review and approval of any change to the approved Declared Materials, Mechanical Parts and Processes Lists.

4.2 Management and consolidation of the activities

4.2.1 Overview

The relationship between materials and processes activities and programme phases is shown in Annex E.

4.2.2 Establishing and processing of lists

- a. Each supplier and sub-supplier shall establish, collect, review and deliver the declared materials, mechanical parts and processes lists including all the items intended for use in the flight equipment.
- b. The lists specified in 4.2.2a shall reflect the current design at the time of issue.
- c. The lists specified in 4.2.2a shall contain the materials, mechanical parts and processes used in the current design to:
 - 1. demonstrate compliance with all requirements of the programme;
 - 2. verify the results of equipment supplier activities;
 - 3. control and monitor the status of materials, mechanical parts and processes in conformance with programme milestones.

NOTE See Annex F.
- d. The following constraints should apply: