REQUIREMENTS FOR THE QUALIFICATION OF

STANDARD ELECTRONIC COMPONENTS

FOR SPACE APPLICATION

ESCC Basic Specification No. 20100

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Pages 1 to 24

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space components
coordination group

Issue/Rev.	Date	Approved by	
		SCCG Chairman	ESA Director General or his Deputy
Issue 4	February 1999		

DOCUMENTATION CHANGE NOTICE

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.
		This Issue supersedes Issue 3 and incorporates all modifications defined in Revision 'A' to Issue 3 and the changes agreed in the following DCRs:-		
		Cover Page		None
		DCN		None
		Para. 6.3	: First sentence amended	21110
		Para. 6.4	: New Title and text added	21112
			: Existing paragraph renumbered as "6.4.1" and text amended	21110/ 21112
		Para. 6.4.2	: New paragraph added	21112
		Para. 9.1	: Existing text deleted and new text added	21121
		Chart II	: Chart amended	21121
		Chart IV	: Chart amended	21110
		Chart V	: Chart amended	21110
		Index to Appendices	: New index added	None
		Appendix 'B'	: Second clause and "title" amended and second signature block deleted	21121

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1. PURPOSE

This specification describes all aspects of the ESA/SCC qualification procedure and defines the requirements for the qualification and maintenance of qualification of standard electronic components for space application.

A standard electronic component is one which is fabricated from well understood and stable technologies according to an effective quality assurance system, usually confirmed by a history of continuous or frequent production runs, and for which widespread application data is available.

2. APPLICABLE DOCUMENTS

The following ESA/SCC specifications form part of, and shall be read in conjunction with, this specification. The relevant issues shall be those in effect on the date of commencement of the qualification of the component.

(a) ESA/SCC Basic Specification No. 13010, ESA/SCC Inspection Stamp Procedure for Certification of Inspection/Test Results.

(b) ESA/SCC Basic Specification No. 20200, Component Manufacturer Evaluation.

(c) ESA/SCC Basic Specification No. 22600, Requirements for the Evaluation of Standard Electronic Components for Space Application.

(d) ESA/SCC Basic Specification No. 22700, Requirements and Guidelines for the Process Identification Document (PID).

(e) ESA/SCC Basic Specification No. 22800, ESA/SCC Non-Conformance Control System.

(f) ESA/SCC Generic and Detail Specifications relevant to the component to be qualified.

3. INTRODUCTION

ESA/SCC qualification approval is a status given to electronic components which are manufactured, under controlled conditions, by an individual Manufacturer and which have been shown to meet all the requirements of this specification and the relevant ESA/SCC Generic and Detail specifications.

The formal qualification procedure consists essentially of three phases: the evaluation of the Manufacturer, the evaluation of the component and qualification testing of the component.

The procedure is performed in the above order and supervised throughout by a Qualifying Space Agency (QSA). The completion of any phase carries no guarantee that a subsequent phase, or procurement, will be initiated.

The evaluation of a Manufacturer is detailed in ESA/SCC Basic Specification No. 20200.

The requirements for the evaluation of a component forms the subject of ESA/SCC Basic Specification No. 22600.

This specification deals with the overall aspects of the ESA/SCC qualification philosophy, the qualification testing phase and subsequent quality conformance requirements.

The overall ESA/SCC qualification procedure is shown diagrammatically in Chart I; the overall qualification philosophy in Chart II and the individual aspects of qualification, extension, renewal, etc. in Charts III, IV and V.

For completeness and information only, the procurement options available for ESA/SCC-qualified components are shown in Chart VI.

4. REQUIREMENTS FOR THE QUALIFICATION OF A COMPONENT

4.1 APPLICATION FOR QUALIFICATION

To obtain qualification approval for a component, a Manufacturer shall first submit a formal application in the form shown in Appendix 'A' of this specification to the relevant Qualifying Space Agency. This application requires brief details of the component, the production and quality procedures to be applied and of the Manufacturer's organisation. Samples of the component, together with complete details of its electrical and mechanical characteristics and all existent test data shall also be forwarded. Where it is available, the Manufacturer shall also forward all existent information concerning his manufacturing organisation, the plan for quality assurance and a production flow chart.

The Manufacturer shall certify that the component will be in production for a certain number of years and that he is willing to undertake any actions arising from subsequent evaluation and qualification phases which are considered necessary for the proper qualification of the component.

4.2 REVIEW OF APPLICATION

The Qualifying Space Agency will review the application for qualification, perform a construction analysis of a sample of the components and appraise the initial documentation. If considered necessary, the Manufacturer may be requested to provide further samples and documents. When the submitted items are deemed to be satisfactory and the Qualifying Space Agency agrees to support the application, the evaluation phase will be initiated.

4.3 THE EVALUATION OF A MANUFACTURER

The purpose of the evaluation of a Manufacturer is to assess his capability, to ensure the adequacy of his organisation, plant and facilities, and to ascertain his fitness to supply components to the appropriate specifications for space application. This evaluation phase shall include, but not necessarily be limited to, a survey of:-

(a) The overall manufacturing facility and its organisation and management.

(b) The Manufacturer's system for inspection and manufacturing control.

(c) The production line used for the component to be qualified.

The evaluation of a Manufacturer shall be performed by a Qualifying Space Agency in accordance with the requirements of ESA/SCC Basic Specification No. 20200.

4.4 THE EVALUATION OF A COMPONENT

The purpose of the evaluation of a component is to decide in the most cost-effective manner, if there is sufficient justification to proceed to qualification testing of the component for space application, with a high level of confidence in the result. This evaluation shall include, but not necessarily be limited to:-

(a) The establishment of an evaluation test programme for the component.

(b) Evaluation testing of the component.

(c) Definition of any corrective actions that may be required and their implementation.

(d) A documentation review and the finalisation of information to be contained in a Process Identification Document (PID) for the component.

The evaluation of a component shall be performed in accordance with ESA/SCC Basic Specification No. 22600. For an ESA/SCC qualification, the evaluating authority will be the Qualifying Space Agency.

4.5 THE QUALIFICATION TESTING PHASE

During this phase, all documentation essential for the production and testing of a component is reviewed by the Qualifying Space Agency and a specified quantity of that component is subjected to a qualification test programme. The applicable requirements are specified in Section 5 of this document and the relevant ESA/SCC Generic and Detail specifications.

The latest issues and revisions of all applicable specifications shall be used together with any pertinent Documentation Change Requests (DCRs) that are approved and valid at the commencement of this phase.

5. QUALIFICATION TESTING

5.1 DOCUMENTATION REQUIREMENTS

5.1.1 Process Identification Document (PID)

A PID for the component to be qualified shall be prepared by the Manufacturer to the satisfaction of the Qualifying Space Agency. In terms of content, layout, configuration control, etc., the PID shall be in accordance with the requirements of ESA/SCC Basic Specification No. 22700.

5.1.2 Production and Test Schedule

Prior to commencing production of the qualification test lot, the Manufacturer shall compile a production and test schedule to the satisfaction of the Qualifying Space Agency. This schedule shall show by date and duration when important production and test activities are to take place, including all major processing operations and key points in production and testing, such as:-

(a) Start of manufacture.

(b) Critical process and inspection activities.

(c) Final encapsulation or sealing, or similar activity.

(d) Start and finish of all test groups specified in the relevant ESA/SCC Generic and Detail specifications.

N.B.
A "critical process" is a manufacturing stage which is identified during the component evaluation phase as being of particular importance for the quality of the finished product.

5.1.3 Support Documentation

A Production Flow Chart, Process Schedules and Inspection Procedures shall be provided in accordance with the requirements of ESA/SCC Basic Specification No. 20200.

5.2 PRODUCTION OF COMPONENTS FOR QUALIFICATION TESTING

The components required for qualification testing shall be produced strictly in accordance with the PID. The Qualifying Space Agency shall have the right to witness the manufacture of these components. The quantity of components required for qualification testing shall be as prescribed in Chart IV of the relevant ESA/SCC Generic Specification as the Qualification Test Lot.

5.3 QUALIFICATION TESTING (CHART III)

Qualification testing of the component shall be in accordance with the requirements for testing level 'B', and Para. 8.1 and Chart IV of the relevant ESA/SCC Generic Specification. If the Manufacturer is able to produce relevant and recent valid test data, the Qualifying Space Agency may accept these as replacing part, or all, of the test requirements of Chart IV of the relevant Generic Specification.

Changes to component specifications, that are approved during the course of the qualification

programme, shall be brought to the attention of the Manufacturer by the QSA and agreement reached on any further work to be performed. The Manufacturer shall propose, and the QSA shall decide upon, those additional tests and/or data required to comply with these approved changes.

Provided that prior and express authorisation has been given by the responsible Qualifying Space Agency, and the Manufacturer notified accordingly, the correctness of test data and documentation may be certified by a registered ESA/SCC Inspector. Such data and documents that have been reviewed and deemed correct will be endorsed with the ESA/SCC inspection stamp (see ESA/SCC Basic Specification No. 13010). The certification by an ESA/SCC Inspector will signify the conformance of items to the specified requirements, but shall not be interpreted as acceptance of the results.

The qualification testing may be performed at a Manufacturer's premises or any mutually agreed facility approved by the Qualifying Space Agency. The latter may require to witness some or all of the qualification tests.

5.4 QUALIFICATION TEST REPORT

On completion of the qualification testing, the Qualifying Space Agency will call for all relevant test data and documentation in the form of a qualification test report.

5.5 QUALIFICATION APPROVAL

The Qualifying Space Agency will review the qualification test report and any other reports or surveys compiled during the manufacture and testing of the qualification test lot. If these are satisfactory, the Qualifying Space Agency will formally request the approval of ESA for the qualification using the form given in Appendix 'C'.

5.6 DISPOSITION OF QUALIFICATION TEST LOT

The qualification test lot shall be adequately identified and its disposition shall be as directed by the Qualifying Space Agency.

6. MAINTENANCE OF QUALIFICATION

The maintenance of the validity of a qualification is the responsibility of the Manufacturer. He shall notify the Qualifying Space Agency immediately of any matter liable to affect the validity of the qualification or result in its lapse or loss.

6.1 QUALIFICATION VALIDITY PERIOD

A qualification, once established in accordance with the foregoing procedures, shall be valid for two years from the date of formal certification of approval, or such period as may be determined by the Qualifying Space Agency. In the case where a qualification may lapse during production and testing for an order, the Qualifying Space Agency will determine the procedure to be followed and advise the Manufacturer accordingly.

6.2 CONDITIONS FOR MAINTENANCE OF QUALIFICATION

The conditions for maintenance of a valid qualification are as follows:-

(a) The manufacture of components to ESA/SCC requirements shall be strictly in accordance with the production and control documentation approved by the Qualifying Space Agency's acceptance of the PID (see Para. 5.1.1). In the event of specification changes occurring during the validity period of a qualification, the QSA and the Manufacturer shall jointly agree any additional work necessary to maintain compliance with these amended specifications.

(b) Detailed records of each production lot of the qualified component shall be readily available to the Qualifying Space Agency.

(c) On receipt of an "Alert" from the Qualifying Space Agency concerning his qualified product, a Manufacturer shall, as a matter of urgency, carry out the necessary investigation and inform the Qualifying Space Agency of his findings and suggested corrective actions (see Para. 9.3).

6.3 EXTENSION OF QUALIFICATION VALIDITY (CHART IV)

A qualification validity may be extended if components have been produced, without concession or waiver, during the qualification validity period and test data equivalent to Lot Acceptance Level 1 testing is available.

The QSA will review the reports and test data, including failure analysis records, collected and presented in support of Qualification extension and determine whether the data package presented complies with the ESA/SCC specifications, including approved changes thereto, current at the date of submission of request for approval extension. If the results of the review are satisfactory, the Qualification validity will be extended for a further period of two years.

6.4 LAPSE OF QUALIFICATION

A qualification shall be considered to be lapsed from the day following the expiry date of the existing qualification certificate, if a certificate extending the approval has not been issued.

When a qualification has lapsed, all components manufactured in the period from the lapse date until the granting of a qualification extension or requalification shall be considered as unqualified and shall not bear the ESA/SCC Qualified Components Symbol.

6.4.1 Renewal after Lapse of Qualification (Chart V)

Following the lapse of a qualification, a renewal of qualification can be effected within a reasonable time period. Provided the Manufacturer can demonstrate that the original evaluation of the component is still valid, this renewal procedure shall comprise a destructive physical analysis of sample components, a Manufacturer audit and a survey of test records generated in the lapse period. If this survey shows that Manufacturer's data, equivalent to Lot Acceptance Level 1 is available and acceptable, the Qualifying Space Agency may take such data into consideration for the renewal of the qualification. Where such data is not available or not acceptable, the testing of a limited number of the components to Lot Acceptance Level 1 will be required for the renewal. Failure to satisfy the Qualifying Space Agency regarding the validity of the original evaluation of a component will necessitate a completely new qualification.

6.4.2 Notification of Lapse of Qualification

Within 6 months of a lapse of qualification, the QPL which is maintained electronically on the internet shall be updated at the Secretariat from information supplied by the Qualifying Space Agency, in the form of an explanatory statement added to the relevant QPL entry. Examples of the statements to be used are as follows:-

(a) Maintenance activities completed.

(b) Maintenance activities ongoing.

(c) Maintenance pending open non-conformance.

(d) No maintenance activities initiated.

(e) Will not be maintained. The qualification entry will be removed from the QPL by mm/yy.

Within 12 months of a lapse of qualification, a review shall be performed by the Qualifying Space Agency and a decision made as to whether a qualification extension/requalification can be made or not. This decision is to be immediately notified to the Secretariat who will take one of the following actions:-

(a) If qualification is to be maintained, a statement shall be added to the QPL entry of when maintenance is expected.

(b) If qualification is not to be maintained, a statement as to when the qualification entry will be removed from the QPL shall be added in the following form:-

"Qualification entry will be removed from the QPL by mm/yy."

N.B.
All qualifications which have been lapsed for longer than 18 months shall be automatically removed from the QPL by the Secretariat.

6.5 LOSS OF QUALIFICATION

Loss of qualification occurs and formal qualification approval will be withdrawn when a Manufacturer is no longer able to meet the original requirements pertaining to qualification.

7. QUALIFICATION BY SIMILARITY

If a component is similar to another, for which a qualification is valid, it may be qualified by similarity. The Manufacturer shall supply complete data concerning the similarity of the component for consideration by the Qualifying Space Agency. The latter will determine the extent of similarity and decide on the qualification requirements for that component.

8. QUALIFICATION OF A SERIES OF COMPONENTS

A series of components consists of a number of components which perform different or discrete circuit functions, but are derived from the same design rules, technology and assembly procedures, e.g. the 54L series of integrated circuits, a series of Zener diodes, etc. Such a series of components may be qualified in accordance with this specification by the evaluation of the component and qualification testing of a sample of components representative of the series. This sample shall embrace all of the technologies and procedures involved and adequately cover the range of functions available. For this type of qualification, the sample distribution and sample quantities will be indicated in the relevant ESA/SCC Generic and Detail specifications.

9. QUALITY CONFORMANCE REQUIREMENTS

9.1 CERTIFICATE OF CONFORMITY

A certificate of conformity shall be provided with each delivery or partial delivery of components.

The certificate may be the standard company certificate but must contain, as a minimum, the information given in appendix 'B' of this specification.

At the discretion of the Manufacturer, for qualified components, the certificate may also contain the ESA/SCC Qualified Components Symbol and/or the Valid Qualification Certificate number and date of expiry.

9.2 RECORDS

The Manufacturer shall maintain detailed records of each production lot of a qualified component and these shall be readily available to the Qualifying Space Agency. A record of all components found to be defective during testing by the Manufacturer shall be maintained.

When requested by the Qualifying Space Agency, the Manufacturer shall perform failure analysis to the depth necessary to identify such defects as due to design, poor process control, workmanship or mishandling, misuse, etc.

When requested by a customer, the Manufacturer shall undertake similar failure analyses of components failing while in use.

Any repetitive defect occurring during manufacture shall be brought immediately to the attention of the Qualifying Space Agency by the Manufacturer; failure to do so may lead to suspension of qualification approval.

9.3 'ALERT' PROCEDURE

The 'Alert' procedure is a procedure for urgently notifying the Qualifying Space Agency, for consideration of the impact on qualification approval, and other interested parties, of any problem concerning a test, material, part or process which could result in unsafe conditions or adversely affect a component's reliability. When any such problem is brought to the attention of a Manufacturer, he shall, as a matter of urgency, carry out the necessary action or investigation. Information about the problem, together with the Manufacturer's response, shall be circulated, as and if required, in any organisation using the qualified component.

9.4 ESA/SCC NON-CONFORMANCE CONTROL SYSTEM

In the case of non-conformance, the Chief Inspector shall initiate the Non-Conformance Control System in conformance with ESA/SCC Basic Specification No. 22800.

CHART I - ESA/SCC QUALIFICATION PROCEDURE

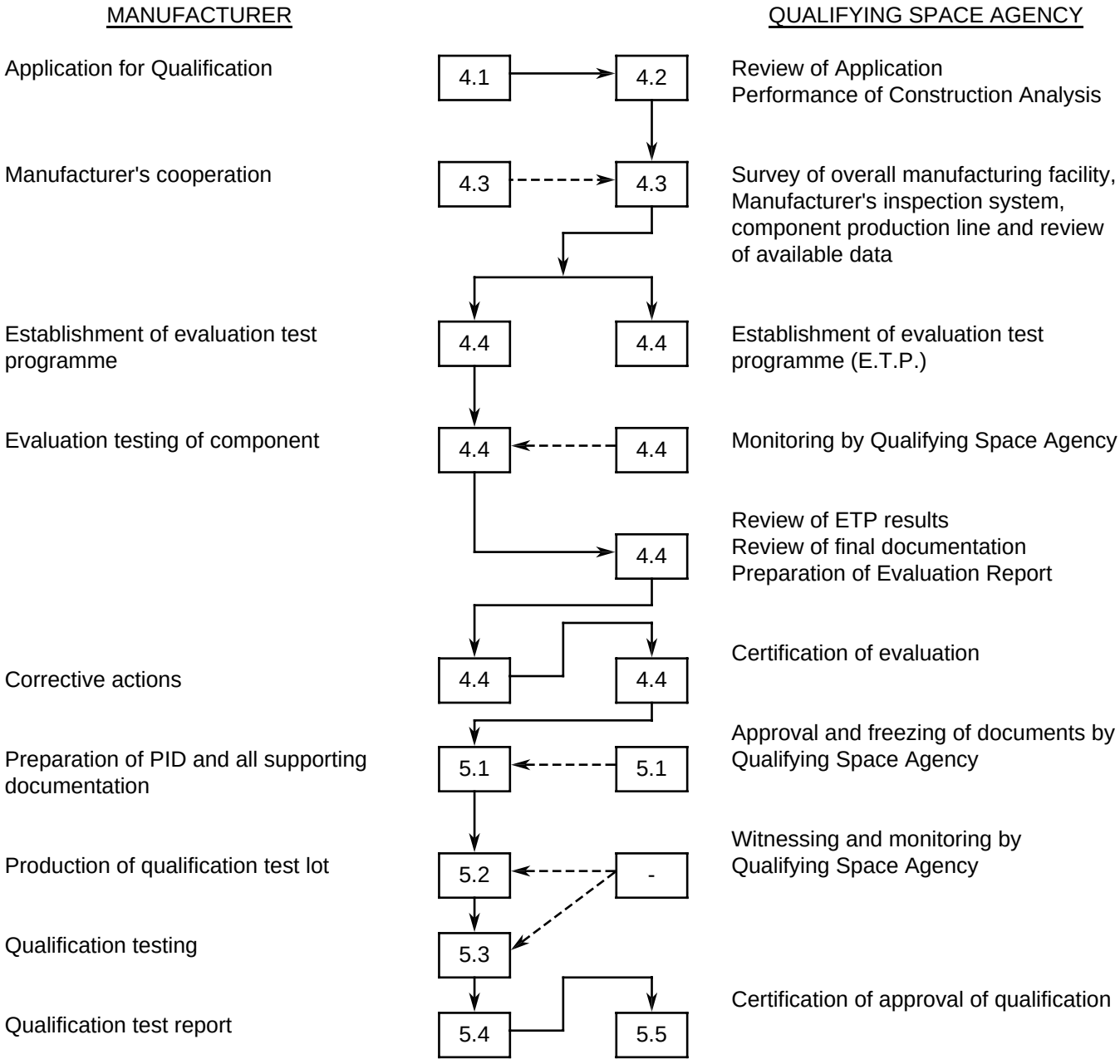


CHART II - ESA/SCC QUALIFICATION PHILOSOPHY

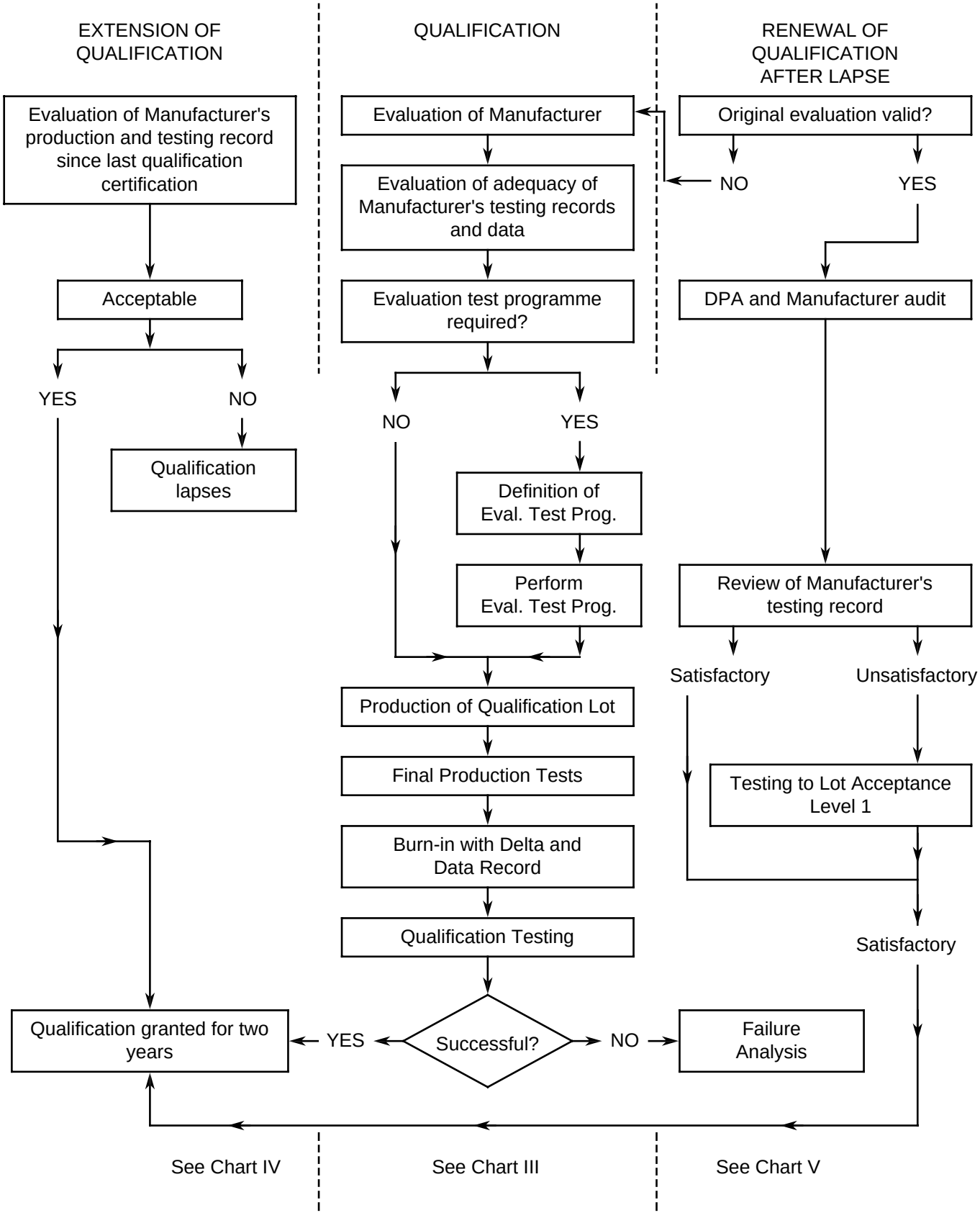


CHART III - QUALIFICATION

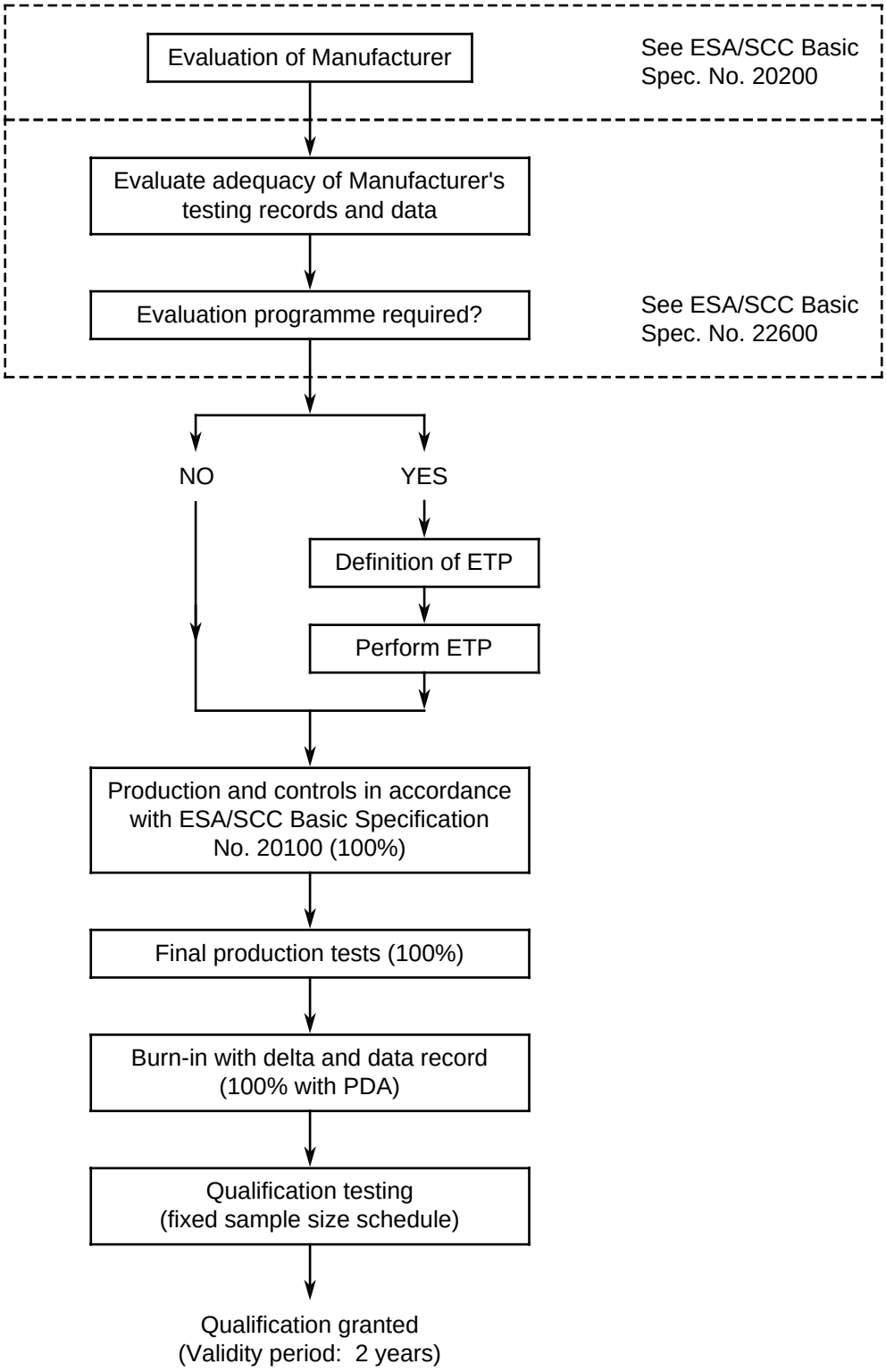


CHART IV - EXTENSION OF QUALIFICATION

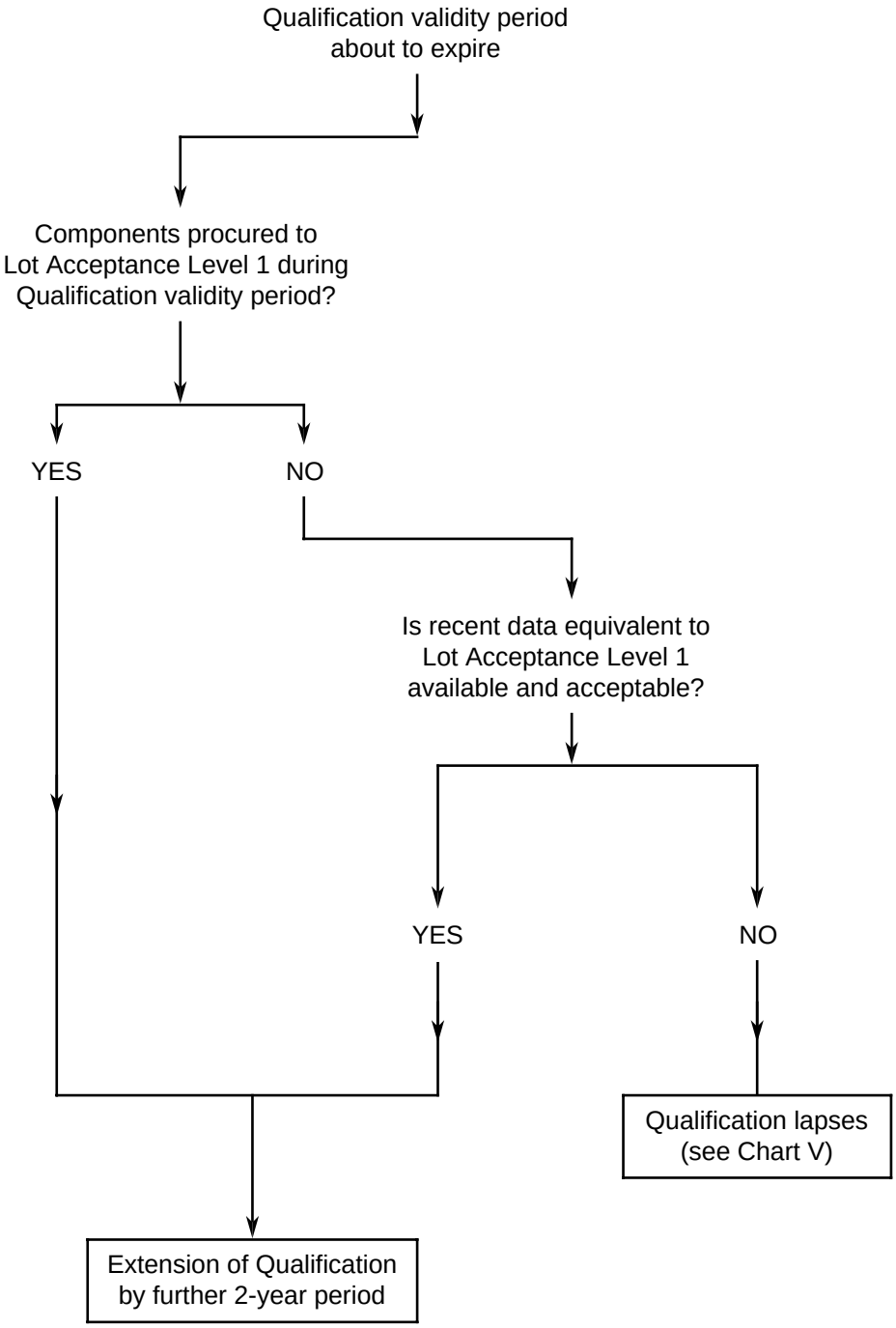
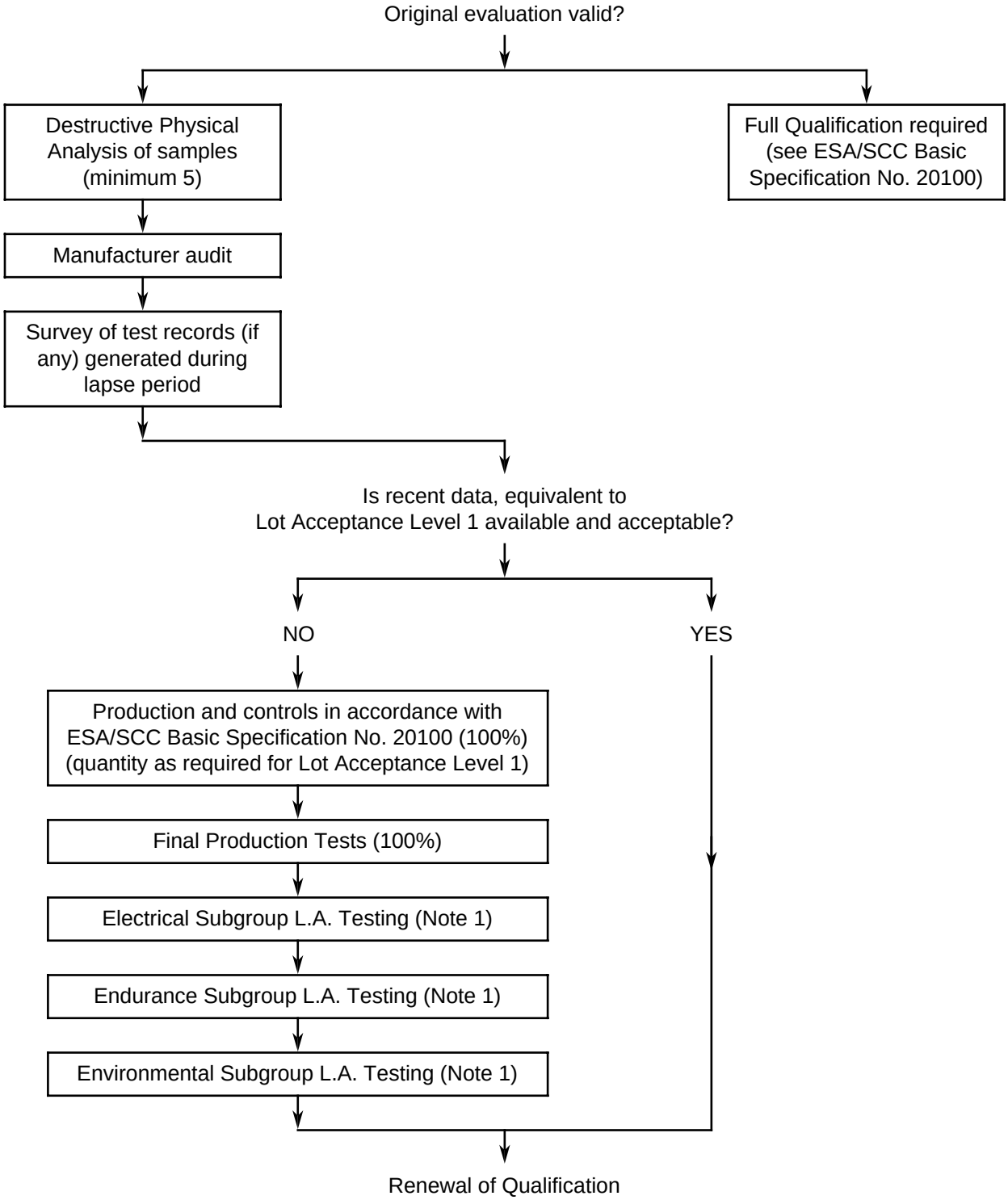


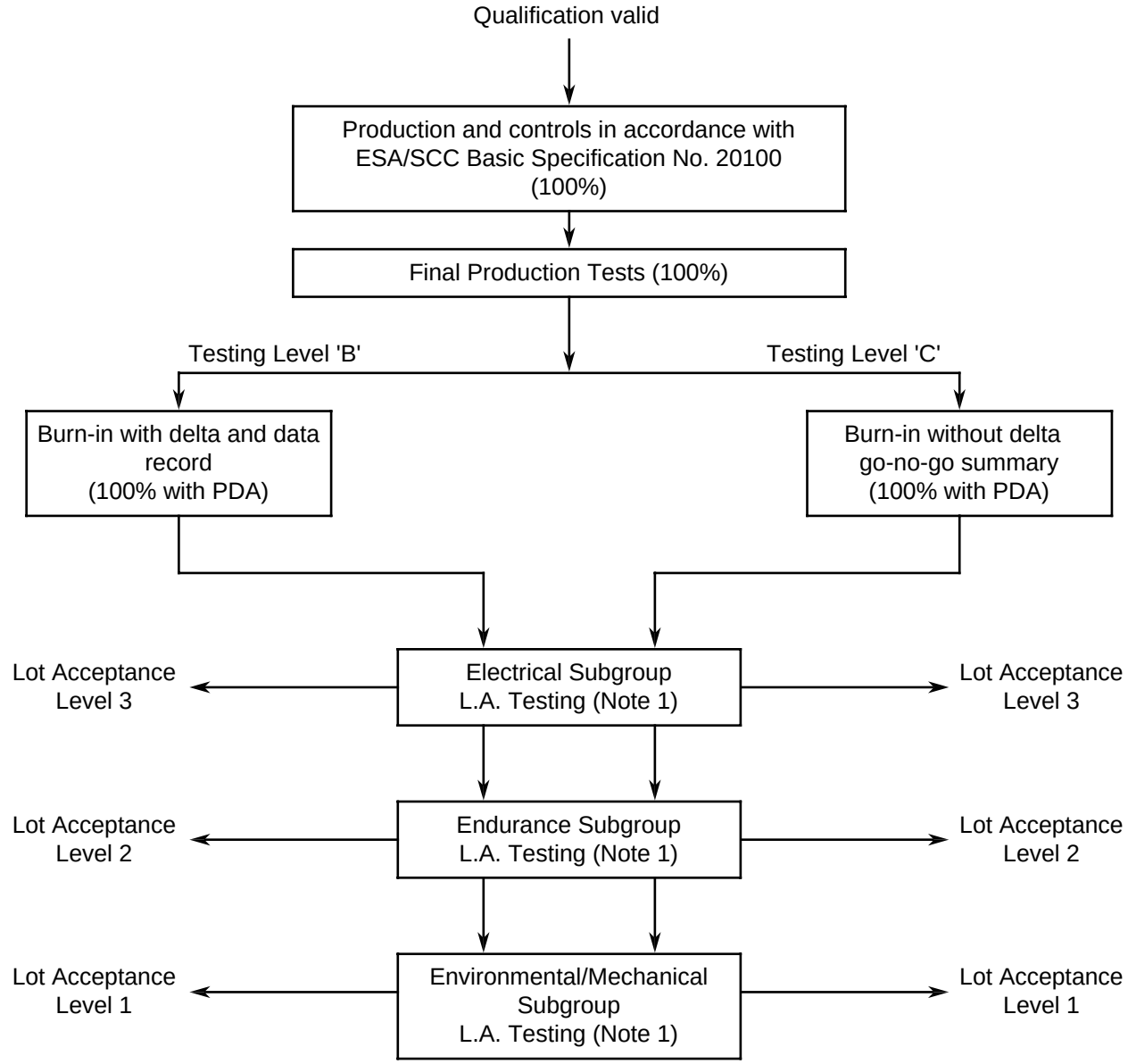
CHART V - RENEWAL OF QUALIFICATION AFTER LAPSE



NOTES

1. On a sample for which the allowable number of failures is specified.

CHART VI - PROCUREMENT



NOTES

1. On a sample for which the allowable number of failures is specified.

INDEX TO APPENDICES

APPLICATION FOR ESA/SCC QUALIFICATION

To:

(insert name and address of relevant Qualifying Space Agency)

We are interested in obtaining ESA/SCC qualification in accordance with ESA/SCC Basic Specification No. 20100 for the undermentioned component. Brief details and relevant documentation are forwarded herewith, and we request that you initiate the necessary action.

COMPONENT

Description:

Similar to:

Other details:

MANUFACTURER

Company:

Address:

Location of manufacture:

Contact for liaison:

ACCOMPANYING DOCUMENTATION (*)

O Management and Organisation
O Quality Assurance Plan
O Production Flow Chart
O Component Characteristics
O Test Data

Date:

Signature

Position

Note (*)

Please tick to indicate type of documentation forwarded.

CERTIFICATE OF CONFORMITY

Name of Company:

Address:

Component type:

Component number:

Lot identification:

Quantity:

Order number:

This is to certify that the above mentioned components fulfil the requirements of the following Generic and Detail specifications of the ESA/SCC Specification System:-

The components subject to this certificate of conformity were manufactured at our plant located at:-

Certified by:

_____ (Name)

Title: ESA/SCC Chief Inspector/Deputy chief Inspector (1)

Date:

NOTES

1. Delete as appropriate.

APPLICATION FOR SCCG QUALIFICATION APPROVAL

Page 1
Appl. No.

Component Title:

Name of Qualifying Space Agency: Date _____

Components (including series and families) submitted for Qual. App. 1

ESA/SCC COMP. NO.	VARIANTS	RANGE OF COMPONENTS	BASED ON	TEST VEHICLE/S	COMPONENT SIMILAR

Component Manufacturer 2

Location of manufacturing plant 3

SCC specifications used for Qualification 4

Generic:

Detail/s:

Qualification Report Reference and date 5

PID used for manufacturing Qualification Lot 6

Ref. No.:

Issue:

Rev.:

Date:

PID changes since start of Qualification 7

None ☐

Minor (*) ☐

Major (*) ☐

(*) Provide detail

Current PID Verified by _____ 8

Ref. No.: Name QSA Responsible

Issue: Date _____

Rev.:

Date:

Current Manufacturing facilities surveyed by: 9

_____ on _____

(Name of QSA responsible) Date

Satisfactory: Yes ☐ No ☐ Explain

Quality and Reliability Data 10

Evaluation testing performed Yes ☐ No ☐

Report Ref. No.: _____ date _____

Equivalent data:

(provide details)

Certification:

Failure analysis, DPA, NCCS: Yes ☐ No ☐
(supply data)

Ref. Nos. and purpose

Name of Qualifying Space Agency:

11

The undersigned hereby certifies on behalf of the Qualifying Space Agency - that the above information is correct; - that the appropriate documentation has been evaluated; - that full compliance to all ESA/SCC requirement is evidence except as stated in box 13; - that the reports and data are available at the QSA and therefore applies on behalf of _____ as Qualifying Space Agency for ESA/SCCG qualification status to be given to the component(s) listed herein.

Date:

_____

(Signature of the SCCG Representative of QSA)

Continuation of Boxes above:

12

Name of Qualifying Space Agency: Date _____

Non compliance to ESA/SCC requirements 13

No.	Specification	Paragraph	Non compliance

14

Additional tasks required to achieve full compliance for ESA/SCCG qualification or rationale for acceptability of non compliance:

Qualification Board Disposition: 15

Application Approval: Yes ☐ No ☐

Action/Remarks:

Date: _____

_____

QB Chairman Signature

NOTES ON THE COMPLETION OF THE APPLICATION FORM FOR SCCG QUALIFICATION APPROVAL

GENERAL

Whenever possible, all entries should be typed and in any case be suitable for legible reproduction by normal means.

ENTRIES

Form heading	shall indicate: - the title of the component as given in its Detail Specification or the name of the series or family; - the entering date; - the serial number and the suffix of the form.
Box 1	shall provide details given in table; in particular there shall be listed - the Variants or range of Variants; - the range of components by using the SCC code for values tolerances, etc,; the designation given in Detail Specification as 'based on'; under Test Vehicle enter either a cross or the specific characteristic capable to identify the component tested; - under component similar enter a cross.
Box 2 and 3	Manufacturer's name and location of plant where the components were manufactured and tested.
Box 4	Generic and Detail Specifications used during qualification programme.
Box 5	Reference to test report(s) submitted in support of application.
Box 6	Enter details to identify the PID that was applicable at the time the qualification lot was manufactured.
Box 7	If the PID was evolved after qualification lot manufacture, adequate details of such evolution shall be provided together with reasons for change. Major changes shall be clearly marked.
Box 8	The box serves to identify the current PID and the QSA that has verified it together with the date of this occurrence.
Box 9	This box can be completed only after a physical visit to the plant to confirm that the practices, procedures, materials, etc. used in manufacturing the components are as described in the PID. This survey shall be carried out in accordance with the requirements of ESA/SCC Basic Specification No. 20200 and its findings shall be recorded.
Box 10	Details entered shall be sufficient to evidence that an evaluation programme according to ESA/SCC Basic Specification No. 22600 has been performed and that the results thereof are summarised in the survey test reports. If the evaluation programme has not been carried out according to established ESA/SCC documents, the applicant QSA shall provide alternative data and declare its assessed degree of satisfactory compliance with the SCC basic requirements. Reference shall be made to the reports on Destructive Physical Analysis (DPA), Failure Analysis and Non Conformance (NCCS) issued during Evaluation and/or Qualification Phase.
Box 11	Enter the name of the QSA (CNES, DARA, ESTEC etc.) and the signature.
Box 12	To be used when there is a need to expand any of the boxes from 1 through 10. Identify Box affected and reference the Box 12 in the relevant Box. Box 12 can be broken down into 12a, 12b etc. if several Boxes have to be expanded.
Box 13	State non compliance with reference to specification(s) and paragraph(s). To simplify reference in Box 14 each non conformance shall be sequentially numbered. If relevant state 'None'.
Box 14	Any additional action deemed necessary by the QSA to bring the submitted data to a standard likely to be accepted by the ESA Qualification Board should be listed here or in the reason(s) to accept the nonconformance.
Box 15	All Qualification Board recommendations on the application itself, special conditions or restrictions, modifications of the QPL entry, letters to the Manufacturer, etc. shall be entered clearly in Box 15, signed by the Chairman, and dated with the date of the ratifying meeting of the ESA/SCC Qualification Board.