European Space Components Coordination

REQUIREMENTS FOR THE

TECHNOLOGY FLOW QUALIFICATION

OF ELECTRONIC COMPONENTS

FOR SPACE APPLICATION

ESCC Basic Specification No. 25400

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1. PURPOSE

This specification describes all aspects of the ESCC qualification procedure for Technology Flows used to produce electronic components for space applications. In this approach to qualification a Manufacturer's defined Technology Flow is evaluated, certified and qualified, after which it can be added to the ESCC Qualified Manufacturer's List (ESCC QML). The defined Technology Flow includes not only all the manufacturing processes to be employed, but also the complete quality management programme designed to ensure the quality of the manufactured components. Any components made within the boundaries of that qualified flow and meeting all the requirements of the applicable ESCC Generic and Detail Specifications, can be included on the ESCC QML as qualified parts.

The procedures and requirements defined herein are suitable for Technology Flows incorporating effective quality assurance systems and well understood and stable technologies which are used to produce both standard and non-standard electronic components. A standard electronic component will have a history of continuous or frequent production runs and widespread application data available, while a non-standard electronic component will have design features which are tailored to a particular requirement and will generally be required for a short time and in small quantities.

2. APPLICABLE DOCUMENTS

2.1 ESCC SPECIFICATIONS

The following ESCC Specifications form part of, and shall be read in conjunction with, this specification. The relevant issues shall be those in effect at the date of the commencement of the Technology Flow qualification.

- No. 20100, Requirements for the Qualification of Standard Electronic Components for Space Application.
- No. 20200, Component Manufacturer Evaluation.
- No. 21300, Terms, Definitions, Abbreviations, Symbols and Units.
- No. 21500, Calibration System Requirements.
- No. 22600, Requirements for the Evaluation of Standard Electronic Components for Space Application.
- No. 22700, Requirements and Guidelines for the Process Identification Document (PID).
- No. 22800, ESCC Non-conformance Control System.
- No. 23000, Requirements for the Extension of Qualification Approval of Standard Electronic Components for Space Application.
- No. 24600, Minimum Quality System Requirements.
- No. 24900, Minimum Requirements for Controlling Environmental Contamination of Components.
- ESCC Generic and Detail Specifications for the Relevant Technologies.

2.2 OTHER (REFERENCE) DOCUMENTS

The following documents are also applicable to the extent specified herein. The relevant issues shall be those in effect at the date of the commencement of the Technology Flow qualification.

- EIA-557-A, Statistical Process Control Systems.

3. TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS

The terms, definitions, abbreviations, symbols and units specified in ESCC Basic Specification No. 21300 shall apply. In addition, the following shall apply:-

Abbreviations

EIA	Electronic Industries Association
ESCC	European Space Components Coordination
ESCIES	European Space Components Information Exchange System
QM	Quality Management
ESCC QML	Qualified Manufacturer's List
SEC	Standard Evaluation Component or Circuit
SPC	Statistical Process Control
TCV	Technology Characterisation Vehicle
TRB	Technology Review Board

Definitions

ESCC Qualified Manufacturer's List	That list which defines and specifies the certified and qualified Technology Flow of a Manufacturer from which ESCC QML components may be procured, and which also lists any component types which the ESCC Executive has approved and qualified.
Plan	A concrete set of actions with methods and schedule to achieve a programme.
Programme	A sequence of actions which is designed to fulfil a specific purpose.
Special test structures	A general term covering standard evaluation components, technology characterisation vehicles and parametric monitors. **NB:** Some component technologies employ alternative terms for the special test structures which they use, but with identical or similar meanings. These will be defined or explained in the relevant ancillary Basic Specifications.
Standard evaluation component (or circuit)	A special component (or circuit) designed to demonstrate fabrication process quality for the Technology Flow. The SEC may be designed solely for its role as a quality and reliability monitoring vehicle or it may be a product intened for commercial use.
Technology Review Board	A board of experts within a Manufacturer which has full responsibility for all areas related to a Technology Flow which is qualified or undergoing qualification.
Technology Characterisation Vehicle	A special test structure designed for characterising a technology's susceptibility to known or potential failure mechanisms.
Technology Flow	That specific manufacturing line covering design, fabrication, packaging/assembly and test in a given technology from which a Manufacturer designs, builds and tests components. The definition of such a Technology Flow must also include all relevant quality management requirements. Once a Manufacturer's Technology Flow has been certified and qualified by the ESCC Executive, it is listed in the ESCC Qualified Manufacturer's List.

Technology Flow certification	The recognition by the ESCC Executive of evidence that the manufacturing line defined for the Technology Flow is capable of producing components of high quality which are compliant with the requirements of this document.
Technology Flow qualification	The recognition by the ESCC Executive of evidence that the Manufacturer has demonstrated the certified manufacturing line's capabilities by producing, at the first attempt, components compliant with the requirements of this document and the relevant Generic and Detail Specifications.

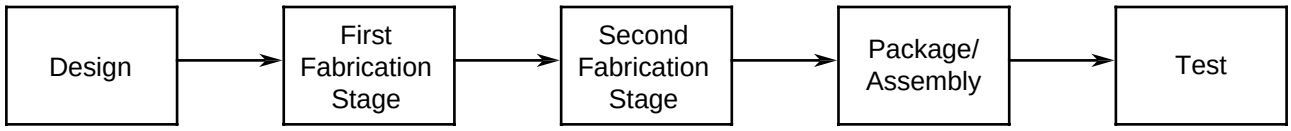
4. INTRODUCTION

ESCC Technology Flow qualification is the status granted to a Manufacturer's specified Technology Flow after successful completion of an evaluation, certification and qualification programme as defined herein and in any other referenced documents for the particular technology.

The generic Technology Flow qualification philosophy, leading to ESCC QML listing, is a process by which a Manufacturer acquires a manufacturing line or Technology Flow certification and qualification. The process of certification is the recognition of evidence by the ESCC Executive that the manufacturing line is capable of producing components of high quality and compliant with the requirements of this specification.

Qualification is the actual demonstration of the certified manufacturing line capabilities by producing "first pass" components compliant with the requirements of this specification and the device specification. Ongoing monitoring techniques will be used to maintain qualified Technology Flow status. The manufacturing line consists of facilities and procedures appropriate to accomplish the design, fabrication, assembly, packaging and testing of components (see Figure 1) and each block can be individually reviewed, but must be certified as a complete flow.

FIGURE 1 - THE ESCC QML MANUFACTURING LINE



Technology Flow qualification allows the Manufacturer and Technology Flow to be added to the ESCC QML. It also covers the status of, and allows the inclusion in the ESCC QML of, any component type which is both:

- Manufactured using, and within the boundaries defined for, a qualified Technology Flow.
- Defined by, and meets the requirements of, the relevant ESCC Detail and Generic Specifications.

By concentrating on the Technology Flow used to produce components it allows the Manufacturer to make maximum possible use of existing generic technology based data and reduces the testing necessary on completed components.

4.1 PHILOSOPHY

The foundation of generic Technology Flow (or ESCC QML) qualification is the instillment of Quality Management (QM) within the manufacturing environment. QM requires that all levels of management and non-management are actively involved in the commitment to quality. Also a Technology Review Board (TRB), see Para. 4.3, must be established by the Manufacturer to control, stabilise, monitor and improve the qualified Technology Flow. The TRB shall develop a quality management programme that outlines how the manufacturing operation for a given technology is controlled, monitored and improved throughout its entire "life cycle". Key aspects of this programme are:

- The establishment of statistical process control.
- Field failure return programmes.

- Corrective action procedures.
- Quality improvement.

and any other approaches required to control and improve product quality and reliability. These requirements are detailed in this specification.

An important feature of QM is that it does not stop once the Manufacturer is ESCC QML listed. The device specification will identify in-process or post production screens which ESCC QML listed devices must be capable of meeting. These screens can be reduced or changed by the Manufacturer's TRB when gathered reliability data on the technology indicates that such changes maintain or improve the established quality and reliability of the components. The philosophy of generic Technology Flow qualification incorporates the idea that high quality and reliability components can be obtained without excessive testing if the processes are properly monitored and controlled at each step of the manufacturing line.

Manufacturers listed on the ESCC QML will be able to produce qualified components without a mandatory need for extensive end-of-manufacturing qualification testing and periodic quality conformance inspections on each device design. The reduction in the end-of-manufacturing testing will be replaced by in-line monitoring and testing and Statistical Process Controls (SPC). Also, for some component types, surrogate devices such as the SEC will be used to assess the technology's reliability. Introduction of this methodology shifts the emphasis from the end of individual device type qualification to process (technology) certification and qualification. This will potentially accelerate the insertion cycle of high quality and reliable component types.

4.2 QUALIFICATION REQUIREMENTS

The formal qualification requirements consist essentially of the following main phases:-

(a) Definition of the Technology Flow.

(b) Set-up and definition of a Quality Management Programme and Plan including the establishment of a TRB.

(c) Evaluation of Technology Flow:
- Establishing an Evaluation Test Programme and Plan.
- Carrying out an Evaluation Test Programme.

(d) Qualification of Technology Flow:
- Establishing a Qualification Test Programme and Plan.
- Review of the Evaluation Test Programme results and the proposed Qualification Test Programme.

(e) Certification of Technology Flow:
- Full on-site audit of the Manufacturer to validate quality management and Technology Flow.
- Granting of ESCC QML Certification.

(f) Qualification of Technology Flow:
- Carrying out the Qualification Test Programme.
- Granting of the ESCC QML Qualification.

(g) Listing of qualified component types.

The ESCC QML certification and qualification procedure for the Technology Flow is shown in Charts 1(a) and 1(b). The charts show the overall procedure in detail and also show the respective responsibilities of the Manufacturer and ESCC Executive. Although the charts show all steps in the qualification flow as being performed sequentially, the Manufacturer and the ESCC Executive can agree to perform parts of the flow in parallel in order to reduce the overall qualification time scale. All steps must still be performed however and there is a risk that the results of any steps performed out of sequence might be later invalidated by other results.

4.3 TECHNOLOGY REVIEW BOARD (TRB)

4.3.1 GENERAL

The adoption of a ESCC QML approach to qualification approval places increased responsibilities on the Manufacturer. This is because the ESCC QML system defined herein is based on the principle that the design and manufacturing processes are the key to producing high reliability components and only the Manufacturer has the necessary detailed knowledge of his processes to be able to define what can be produced, how it must be produced and how its quality can be demonstrated. The Manufacturer is therefore responsible for defining much of what is defined by the ESCC Executive in a more traditional qualification system, while the ESCC Executive's responsibilities cover defining what must be addressed by the Manufacturer and then approving the Manufacturer's proposals.

To ensure the proper and effective co-ordination and control of all the Manufacturer's responsibilities related to a qualified Technology Flow, the Manufacturer shall create a special board for this purpose. For every Technology Flow which is proposed for qualification the Manufacturer must establish a Technology Review Board (TRB) with full and clearly defined responsibilities for controlling and co-ordinating all technical and quality matters related to the proposed flow. This board must be established as soon as any qualification is applied for and must be maintained for as long as components are manufactured using the qualified Technology Flow.

If a Manufacturer has more than one qualified Technology Flow there can be a separate TRB for each flow, or a single TRB can be responsible for more than one flow.

The responsibilities, organisational structure and duties of the TRB form part of the Manufacturer's quality management programme and must be fully defined in the quality management plan.

4.3.2 ORGANISATIONAL STRUCTURE OF THE TRB

A Manufacturer defines his own TRB structure, but it shall be capable of ensuring that all responsibilities are fulfilled and effective communication is established and maintained among representatives of device design, technology development, element fabrication, assembly, testing, production and quality assurance. The TRB is intended to be a cross functional technical group and its members shall have the responsibility and authority to make decisions and the resources to implement these decisions. The TRB may include members from outside of the Manufacturer's organisation.

Details of the membership of the TRB, together with any specific individual responsibilities which they have within the TRB, must be documented by the Manufacturer. This information, together with a functional organisation chart for the TRB and written procedures governing its operations, must be made available to the ESCC Executive. The ESCC Executive must in all cases be supplied with the name(s), address(es) and telephone number(s) of the designated contact person(s) on the TRB. If any other relevant ESCC specifications require the Manufacturer to have a nominated Chief Inspector then the Chief Inspector must be a TRB member and must also be a contact person on the TRB.

The TRB itself and any meetings or discussions which it holds, can be formally or informally structured, but written records must always be made of any deliberations and decisions which it makes and these must be made available to the ESCC Executive.

4.3.3 DUTIES AND RESPONSIBILITIES OF THE TRB

The TRB shall perform, as a minimum, the following duties in relation to the qualified Technology Flow and components produced using it and shall hold whatever meetings are necessary to effectively perform these duties.

(a) Establishing all basis documents:

- Description and definition of Technology Flow and boundaries, including flow charts.
- Quality management plan detailing the quality management programme developed by the TRB.
- Evaluation test plan.
- Qualification test plan.
- Organisation and procedures for the TRB.

(b) Accepting overall responsibility for the Technology Flow:

- Maintenance of all certified and qualified processes.
- Process change control.

(c) Devising or approving specific objectives, methods, etc. where needed:

- Method or procedure to verify correlation between special test structures and the actual product.
- Method of monitoring quality and reliability of products from the qualified Technology Flow.
- Measurable objectives covering quality improvement.
- Tests or verifications which are needed to prove any proposed design and construction changes.
- Selection of which component types should be used to qualify a new technology family.

(d) Monitoring and reviewing all relevant inputs, activities and results:

- Impact on the Technology Flow of the Manufacturer's overall business plans.
- Impact on the Technology Flow of changes in key TRB or Management personnel
- Product design changes, material changes and process changes.
- Statistical process control data.
- Evaluation test data.
- Qualification test data.
- Reliability test data:
  - Parametric monitor test results.
  - Technology characterisation vehicle test results.
  - Standard evaluation component test results.
  - Screening failure analysis results.
- Field return failure analysis data.
- Progress towards meeting measurable quality improvement objectives.
- Qualification status of the Technology Flow, including identification of when (partial) re-evaluation, re-certification or re-qualification is necessary as a result of changes in the Technology Flow.
- Qualification status of component types produced using the Technology Flow.

(e) Taking appropriate actions in areas under TRB responsibility:

- Initiate and take responsibility for corrective actions where any testing shows a quality or reliability problem.
- Establish improved test plans where existing tests are shown to be unnecessary, inefficient or ineffective.
- Propose repeat assessment when Technology Flow changes have invalidated any part of the original evaluation, certification or qualification.
- Initiate and take responsibility for non-conformance control reporting and actions.
- Initiate and take responsibility for failure analyses.
- Initiate and take responsibility for component alerts.

(f) Maintaining records:

- Test results relevant for certification and qualification.
- In-process control data.

- Changes made to the Technology Flow.
- Components produced using the qualified Technology Flow.
- Minutes of meetings.
- Deliberations and decisions reached by the TRB.
- Actions taken by the TRB.

(g) Reporting to the ESCC Executive:

- Periodic status report (as a minimum annual reports are requested):
  - TRB meeting minutes and decisions.
  - Production summaries of ESCC QML products.
  - TCV and SEC test data summaries.
  - Customer returns, analysis results and corrective actions.
  - Changes, additions and improvements in design, fabrication, assembly or test processes.
  - Changes to the facility, process equipment or test equipment.
  - Proposed new ESCC QML qualifications of a test flow or component type.
  - Changes to quality and reliability monitoring procedures.
  - Forecasted improvement initiatives.
  - Overall current status of ESCC QML Technology Flow qualifications.
  - Overall current status of ESCC QML component type qualifications.
- Notification and request for approval of proposed changes and corrective actions:
  - Changes in design, fabrication, assembly or test processes.
  - Changes in materials.
  - Changes in the TRB organisation.
  - Changes in the TRB review procedures.
  - Changes in documents previously submitted to ESCC Executive.
  - Need for any (partial) re-evaluation, re-certification or re-qualification.

5. TECHNOLOGY FLOW AND BOUNDARIES

5.1 TECHNOLOGY FLOW DEFINITION

The Manufacturer shall prepare a Technology Flow Definition to define, in a comprehensive manner, the scope and extent of the Technology Flow for which certification and qualification is sought. It shall cover design processes, fabrication processes, assembly processes, the package and in-process testing and control and it shall also specify the plant or plants were the processes are to be carried out. The definition shall clearly delineate all necessary boundaries, such that there can be no uncertainties regarding the extent of what is to be certified and qualifed and deciding whether specific component types will be covered.

The definition document shall be included in a detailed pre-validation data package submitted to the ESCC Executive for approval as part of the Technology Flow evaluation and shall contain commercially insensitive information suitable for publication in the ESCC QML.

More detailed information on what must be addressed in the Technology Flow definition is given in the appropriate ESCC No. 25400 series ancillary Basic Specification covering the relevant technology (see Para. 14).

5.2 PROCESS IDENTIFICATION DOCUMENT (PID)

A PID for the Technology Flow to be approved shall be prepared by the Manufacturer to the satisfaction of the ESCC Executive. In terms of content and configuration control, the PID shall fulfil the

requirements of ESCC Basic Specification No. 22700. It shall be updated, as necessary, during the course of the qualification exercise such that at the completion of qualification it accurately identifies all the processes used in the qualified Technology Flow.

The PID shall include a Technology Flow Description for publication in the ESCC QML.

In preparing the PID the Manufacturer may use extensive references to any in-house documentation describing his processes as long as the relevant issues are clearly identified and subject to an acceptable control system.

5.3 SPECIAL TEST STRUCTURES

Any special test structures shall be fully documented in the PID. They shall be manufactured and tested in accordance with the requirements of Para. 6.10.

6. QUALITY MANAGEMENT PROGRAMME

6.1 GENERAL

For each Technology Flow proposed for qualification a Quality Management (QM) Programme shall be developed and implemented by the Manufacturer and be documented in a QM Plan. The TRB shall be responsible for developing, approving and maintaining the QM Plan which, as a minimum, shall address the elements described for a Quality System in ESCC Basic Specification No. 24600 and in the following paragraphs.

The QM Plan shall be included in a detailed pre-validation data package submitted to the ESCC Executive for approval as part of the Technology Flow evaluation.

In some of the described areas, a final definition of the QM Programme requirements and procedures might not be possible until after the relevant data and documents have been reviewed by the ESCC Executive.

6.2 INDEX OF CERTIFIED BASELINE DOCUMENTS

This shall list all specification, plan or procedure titles together with their document and issue numbers, which make up the Manufacturer's Technology Flow certification programme. It shall form the baseline to which the Manufacturer will be certified after a satisfactory ESCC Executive audit and shall be introduced in the PID for the Technology Flow.

6.3 CONVERSION OF CUSTOMER REQUIREMENTS

This shall define a system for converting all external requirements for new ESCC QML listed component types into in-house requirements. As a minimum the system shall cover:

- Determining if the certified and qualified Technology Flow covers all of the requirements.
- Requirements for a part specification.
- Determining if additional SEC, TCV or special test structures or tests are required.
- Lot traveller requirements.
- Screening requirements.
- Periodic testing and inspection procedures.
- Part marking.
- Rework procedures.

6.4 QUALITY IMPROVEMENT PROGRAMME

This shall define and document the specific procedures to be followed by the Manufacturer to assure continuous improvement in quality and reliability of the processes and of the components being produced. It shall include, as a minimum, details of documented programmes for QA self-audit and yield improvement.

6.5 CALIBRATION PROGRAMME

This shall define and document all of the Manufacturer's procedures for ensuring that only correctly and fully calibrated equipment can be used at any stage during the Technology Flow as specified in ESCC Basic Specification No. 21500.

6.6 TRAINING AND CERTIFICATION PROGRAMME

This shall define and document all of the Manufacturer's procedures for ensuring that only fully trained and certified personnel are used for any activities which form part of the Technology Flow and that sufficient fully trained and certified personnel are always available as required in ESCC Basic Specification No. 24600.

6.7 CLEANLINESS AND ATMOSPHERIC CONTROLS PROGRAMME

This shall define and document all of the Manufacturer's procedures for ensuring that, during all activities which form any part of the Technology Flow, the general level of cleanliness and the atmospheric conditions are sufficient to prevent any degradation of the finished product as required by ESCC Basic Specification No. 24900.

6.8 SUB-CONTRACTOR CONTROL PROGRAMME

This shall define and document the Manufacturer's procedures for ensuring that all activities within the Technology Flow which are sub-contracted to, and performed by, external bodies are controlled to the same levels as the Manufacturer's own activities.

6.9 FAILURE ANALYSIS PROGRAMME

This shall establish the procedures that the Manufacturer applies to test and analyse sufficient failed parts to determine each failure category from all stages of manufacturing and the field. This programme should also identify corrective actions or specify the use of a corrective action plan based on the findings of the failure analysis as required in ESCC Basic Specification No. 24600.

6.10 PROCESS CAPABILITY AND RELIABILITY ASSESSMENT PROGRAMME

This shall define Manufacturer's statistical process control programme within the manufacturing process using the requirements of EIA-557-A as a guidline. It shall include goals, plans of implementation, in-line process monitors and SPC measuring points which include location and procedure number on applicable flow charts.

The programme shall also establish the details of which special test structures are to be used for test purposes. It shall also establish the test frequency and methods of test and criteria for evaluating the test results. The Manufacturer's assessment of possible reliability risks associated with his Technology Flow and components manufactured using it shall also be addressed. Finally the correlation between special test structures and the actual components shall be addressed. This programme shall be documented in a Process Capability and Reliability Assessment Plan as described in the relevant ancillary specification.

6.11 CORRECTIVE ACTION PROGRAMME

This shall define the specific steps followed by the Manufacturer to correct any process which is out of control or found to be defective.

6.12 CHANGE CONTROL PROGRAMME

This shall establish the procedures to be followed by the Manufacturer in addressing changes to the defined Technology Flow as required in ESCC Basic Specification No. 24600, Para. 6.5. It shall include a requirement that all changes are documented as to the reason for the change together with data supporting the change, including reliability data as appropriate. In addition, it shall address the clarification of changes as major or minor and the resultant necessary actions. For any major change which merits consideration for re-evaluation, re-certification or re-qualification, the TRB should review the relevant data and make a proposal to the ESCC Executive, with supporting justification, as to whether re-assessment is needed.

6.13 EVALUATION TEST PROGRAMME

This shall establish the testing which the Manufacturer proposes to perform on the specified Technology Flow to verify its quality and suitability for space class components. The initial proposal might require later modification as a result of the analysis of any existing data intended to support the suitability of the technology for qualification.

The requirements given in ESCC Basic Specification No. 22600 and the relevant ancillary specification can be used as a baseline guide for generating a suitable test programme.

6.14 QUALIFICATION TEST PROGRAMME

This shall establish the testing which Manufacturer proposes to perform on actual components, manufactured using the specified Technology Flow, in order to verify his ability to produce space quality components. The initial proposal might require later modification on the basis of the results of the evaluation or Manufacturer's audit. It shall also clearly identify any testing proposed for components manufactured, using the specified Technology Flow, which could be considered as screening and which should therefore be performed on all components manufactured using that flow, even after qualification.

The requirements given in ESCC Basic Specification No. 20100 and in the applicable Generic Specification can be used as a baseline guide for generating a suitable test programme.

6.15 VALIDITY OF QUALIFICATION

This shall define the period for which qualification remains valid together with requirements for extension or renewal of qualification. It shall also include details of any periodic testing which is considered necessary. The requirements given in the applicable Generic Specification can be used as a baseline for this.

7. EVALUATION OF TECHNOLOGY FLOW

7.1 GENERAL

The evaluation of a Technology Flow shall verify that the chosen technology and quality procedures are suitable for the manufacture of high reliability components for space applications. The evaluation shall also help to determine whether realistic and appropriate boundaries have been set for the Technology Flow and shall give a high level of confidence in a positive result to the subsequent Manufacturer Audit and Qualification Test Programme. The evaluation of a Technology Flow shall include but not be limited to:

- The review of existing data and/or test results from components and/or test structures manufactured using the Technology Flow.
- The establishment of an Evaluation Test Programme.
- Acceptance of the Evaluation Test Programme by the ESCC Executive.
- The implementation of the Evaluation Test Programme using suitable components or test structures.
- The establishment of a Qualification Test Programme based on the evaluation of the Technology Flow.
- Self-validation of the Manufacturer's data, documentation and facilities through TRB audit.
- Preparation of comprehensive pre-validation data/documentation package and submission to the ESCC Executive for review and acceptance.
- Review of the pre-validation data/documentation package by the ESCC Executive, identification and completion of any corrective actions and acceptance by the ESCC Executive.

7.2 REVIEW OF EXISTING DATA

The Manufacturer shall review all data pertaining to the capabilities of the proposed Technology Flow

and the components made using it, in relation to quality, reliability and producibility. As a minimum, this shall cover all test and related data obtained from components or special test structures manufactured using processes included in the Technology Flow. The purpose of this review shall be to determine the suitability of the data for evaluating the Technology Flow for space qualification and to identify any additional data which is required for this purpose.

7.3 EVALUATION TEST PROGRAMME DEFINITION

Based on the initial Evaluation Test Programme given in the Quality Management Plan and on the review of existing data, a final Evaluation Test Programme shall be established by the Manufacturer. This shall cover building devices or special test structures, performing tests and running software benchmarks, as necessary, to demonstrate the suitability of the manufacturing process for space class components. The tests shall be designed to generate any additional data which is needed to evaluate the capability of the Technology Flow with regard to space qualification, including the identification of necessary screening tests. Specific requirements to be addressed by the Manufacturer and tailored to the particular component technology will be found in the relevant ancillary Basic Specification specified in Para. 14 of this specification, as applicable. If such documents are not yet available, the existing requirements for the Evaluation of Standard Components shall be used as a guideline together with the corresponding Evaluation Test Programme for the particular component type or family given in ESCC Basic Specification No. 22600 and the appropriate ancillary Basic Specification.

The final Evaluation Test Programme shall be documented in an evaluation test plan which shall also record those areas where suitable data has already been generated. This evaluation test plan shall be submitted to the ESCC Executive for review and agreement. It shall be the responsibility of the TRB to determine when such tests are to be implemented as part of the Process Capability and Reliability Assessment Programme defined in Para. 6.10 of this specification.

7.4 EVALUATION TEST PROGRAMME PERFORMANCE

The Manufacturer shall perform evaluation testing in accordance with the agreed evaluation test plan and produce documented Evaluation Test results. The Evaluation Test results should be available for review by the ESCC Executive before performing an on-site audit.

7.5 ESTABLISHING THE QUALIFICATION TEST PROGRAMME

After completion of the Evaluation Test Programme the Manufacturer shall review all available data to decide whether it provides evidence that the Technology Flow is capable of producing components of high quality and compliant with the requirements of this specification. If this review is satisfactory, the Manufacturer shall then establish a Qualification Test Programme based on the initial programme given in the Quality Management Plan. The qualification test programme shall be documented in a qualification test plan.

The qualification test plan shall specify all the necessary test vehicles, tests and test sequences, test conditions, sample sizes, and accept/reject criteria for qualifying the Technology Flow. The test vehicles can be components selected from the Manufacturer's standard range, or can be special test components designed and manufacturered specifically for qualification test. At least two different types of test vehicle shall be included in the qualification test programme. All test standards must be fully described by suitable in-house Test Documents and, if these are not already available, new draft documents must be prepared by the Manufacturer.

7.6 SELF VALIDATION

The TRB shall review the data and documentation which will be supplied to the ESCC Executive to determine if they meet the requirements given in this specification and are likely to meet the ESCC Executive's expectations.

As a minimum the documentation shall consist of:

(a) Technology Flow Definition.

(b) PID.

(c) Quality Management Plan including the Evaluation and Qualification Test Plans.

(d) Evaluation test report.

(e) Data supporting the suitability for Qualification of the Technology Flow.

The TRB shall also review all of the design, manufacturing, assembly and test facilities which the ESCC Executive might inspect during the on-site audit and determine whether they appear satisfactory.

Any Manufacturer applying for Technology Flow qualification is expected to establish and maintain continuous liaison with the ESCC Executive; this should be used to gain an understanding of what the ESCC Executive will be looking for in the pre-validation data package review and in the on-site audit.

If any areas of non-compliance are found, the TRB shall take all appropriate steps to rectify them.

7.7 PREPARATION OF PRE-VALIDATION DATA PACKAGE FOR REVIEW BY THE ESCC EXECUTIVE

The Manufacturer shall prepare a detailed data/documentation package containing all of the data and documentation previously reviewed by the Manufacturer during self-validation and listed in Para. 7.6 (a) to (d), together with the documented results of that self-validation and any additional data and documentation which were identified as necessary. The package shall also contain general information on the Manufacturer's organisation, systems and facilities. The purpose of the package is to supply the ESCC Executive with adequate objective evidence to evaluate the capabilities of the Manufacturer and the defined Technology Flow and to justify performing an on-site validation audit of the Manufacturer.

If the Manufacturer has already been the subject of a successful ESCC evaluation or qualification and any of the previously submitted information is still valid and applicable, it is sufficient for the Data Package to refer to this earlier information at the appropriate point.

8. CERTIFICATION OF TECHNOLOGY FLOW

8.1 GENERAL

Certification of the Technology Flow means that the ESCC Executive has recognised that there is acceptable evidence that the Manufacturer's defined Technology Flow, in conjunction with the TRB and the QM plan, is capable of producing high quality components compliant with the requirements of this specification. The evidence studied and evaluated by the ESCC Executive shall include, but not necessarily be limited to, the following:-

(a) The evaluation data and documentation supplied by the Manufacturer in the pre-validation package.

(b) The results of an on-site audit of the Manufacturer designed to validate, as a minimum, the following areas of the Manufacturer's facility:

- Management
- TRB
- Quality Assurance
- Design
- Manufacturing
- Assembly and package
- Environmental/mechanical test
- Electrical test

8.2 PRE-VALIDATION DATA PACKAGE REVIEW

The evaluation data and documentation pre-validation package shall be as described in Para. 7.7 together with any additional requirements given in the applicable ancillary Basic Specification to this specification. The contents of the package must meet all of the specific requirements given in this specification, any relevant ancillary Basic Specification, any other documents referenced in this specification and the Manufacturer's own Quality Management Plan. In addition, the information contained in the package must clearly demonstrate that the Manufacturer has an implemented and effectively functioning quality management programme including self-auditing, and an established TRB with fully defined organisation, duties and responsibilities. The information shall also allow identification of any critical areas together with associated supporting records and documentation, prior to the on-site audit.

When the package is completed, the Manufacturer shall submit it to the ESCC Executive for review. If any deficiencies are found, the ESCC Executive shall notify the Manufacturer of these in order to allow corrections to be made. If it is considered to be useful, the ESCC Executive shall make a pre-audit visit to the Manufacturer to review, clarify or discuss any necessary matters.

8.3 MANAGEMENT AND TECHNOLOGY VALIDATION (ON-SITE AUDIT)

This is an evaluation of the Manufacturer designed to assess the adequacy of the organisation, plant and facilities, and his fitness to provide electronic components suitable for space applications. The exercise shall be performed in accordance with the requirements of ESCC Basic Specification No. 20200, but it is essential that the ESCC Executive also pays particular attention to the additional requirements given in this specification and any applicable ancillary Basic Specification.

Additional and important requirements for an on-site Technology Flow qualification audit are the assessment and validation of the Manufacturer's commitment to quality, the effectiveness of the Manufacturer's TRB, design system, QM system and programme and his use of special test structures.

These must not only meet all of the specific requirements given in this specification and any applicable ancillary Basic Specification, but must also demonstrate a definite capability to produce components of the required quality and performance. To meet these requirements the Manufacturer must make available during the audit all data, documentation, personnel, etc. which he has identified as demonstrating the suitability for certification of his Technology Flow, but he should not restrict himself to only those items specifically mentioned in this specification and other referenced documents.

The Manufacturer shall make available to the ESCC Executive all data needed to support quality management policy and procedures and allow access to all relevant management and quality department personnel. All TRB minutes shall be available for inspection and TRB personnel shall be available for discussions. ESCC Executive access to manufacturing and testing facilities and operators will be required, including any outside Europe. For first time certification, on-site validation reviews of the Manufacturer's design, fabrication, assembly, and test facilities will be required. After the initial qualification is accomplished, the Manufacturer may add other design, fabrication, assembly and/or test facilities on completion of the appropriate qualification testing, TRB approval and ESCC Executive approval. The ESCC Executive reserves the right to perform on-site reviews of any facilities/technologies that the Manufacturer plans to add to his ESCC QML listing.

Validation of Sub-contractors is the responsibiltiy of the Manufacturer, but the process used by the Manufacturer to validate Sub-contractor's facilities shall be reviewed during the initial Manufacturer validation process. The ESCC Executive also has the right to visit Sub-contractors to verify that the Manufacturer's validation process is effective. With the approval of the ESCC Executive, a Technology Flow certified Manufacturer can also use facilities that belong to another Manufacturer without further validation, if these facilities have already been granted approval by the ESCC Executive for the manufacture of ESCC QML listed products.

During the audit, the ESCC Executive must ensure that all areas which are relevant to the production of high quality components capable of meeting the necessary performance requirements are assessed in detail and in depth. Of particular importance are the Manufacturer's commitment to quality, the TRB, the design system and the QM system, all of which are crucial to the production of qualified components once certification has been granted. If the ESCC Executive has any corrective actions regarding anything seen during the on-site audit the Manufacturer shall be notified of these corrective actions and the area of concern agreed, before the completion of the audit.

8.4 GRANTING OF CERTIFICATION

If the results of the ESCC Executive review of the prevalidation packge are such that it meets all of the requirements of Para. 8.2, the results of the on-site audit are such that all of the requirements of Para. 8.3 are met and there are no outstanding corrective actions resulting from the review or audit which are still to be implemented, then the ESCC Executive shall grant the Manufacturer certification of the Technology Flow proposed for qualification.

9. QUALIFICATION OF TECHNOLOGY FLOW

9.1 QUALIFICATION TEST PLAN

Once the Technology Flow is certified, the qualification test plan described in Para. 7.5 shall be updated in accordance with any changes agreed between the Manufacturer and ESCC Executive during the evaluation or certification phases. It shall then be resubmitted to the ESCC Executive for approval, together with a proposed schedule for performing all of the activities described in the plan.

9.2 QUALIFICATION TEST VEHICLES

The Manufacturer shall normally produce, using the certified Technology Flow, a minimum of two types of qualification test vehicle, as documented in the qualification test plan submitted during the certification process.

The qualification test vehicles shall be such as to be representitive of the total range of actual devices which can be produced by the Technology Flow and which the Manufacturer wishes to qualify and supply for space application. For some Technology Flows which are used for individual non-standard components, a single type of qualification test vehicle must be clearly identified and justified by the Manufacturer in his Qualification Test Plan and be approved by the ESCC Executive. Each qualification test vehicle should operate and perform in compliance with the appropriate Generic and Detail Specifications and, if applicable, should be manufactured in a package type which is suitable for space use and which will not induce additional failures. Before qualification testing, the qualification test vehicles should be subjected to any screening which has been identified as necessary to ensure the required performance of components manufactured using the defined Technology Flow.

9.3 QUALIFICATION TEST PERFORMANCE

The Technology Flow qualification testing shall be performed in accordance with the requirements of the approved qualification test plan. The ESCC Executive shall have the right to witness the testing and to review the test data. The testing may be performed at the Manufacturer's premises or at any mutually agreed facility approved by the ESCC Executive and identified in the PID for the Technology Flow.

9.4 QUALIFICATION TEST REPORT

On completion of the Technology Flow qualification testing programme, the Manufacturer shall collect all relevant data and documentation in the form of a qualification test report. This report shall be sent to the ESCC Executive for review.

9.5 DISPOSITION OF THE QUALIFICATION TEST LOT AND DATA

The components of the qualification test lot shall be kept together and shall be clearly identified as being the qualification test lot. The final disposition of the qualification test lot and of all data and documentation generated shall be as agreed between the Manufacturer and the ESCC Executive, but they shall be retained for a minimum of 5 years.

9.6 GRANTING OF QUALIFICATION

The ESCC Executive shall perform a detailed review of the Technology Flow qualification test report. If this is found to meet all of the requirements defined in the Manufacturer's approved Qualification Test Plan and if there are no outstanding corrective actions to be implemented resulting from the certification or qualification, the ESCC Executive shall grant the Manufacturer qualification of the Technology Flow and shall apply for ESA approval and listing on the ESCC QML.

10. LISTING IN THE ESCC QML

When a Technology Flow is initially qualified it shall, with ESA approval, be listed in the ESCC QML, together with the qualification test vehicles used to perform qualification testing if these are standard component types intended for further production.

The Manufacturer can submit requests to the ESCC Executive that other component types be added, with ESA approval, to the ESCC QML. When requesting the addition of a new component type to the

ESCC QML the Manufacturer must supply a certificate of compliance which, as a minimum, certifies that:

- The component type is manufactured entirely within the boundaries of the certified and qualified Technology Flow using only certified and qualified processes.
- The component type uses a package type which was covered by the original certification and qualification, or which is otherwise qualified fo space use.
- The component type is capable of meeting all of the functional and test requirements given in the applicable Generic and Detail Specifications.

If no suitable Detail Specification exists, the Manufacturer shall also supply a new draft Detail Specification in ESCC format.

The ESCC Executive shall have the right to request the Manufacturer to supply additional detailed supporting information if required.

The validity of the listings and their renewals are explained in Para. 11.4.

11. PROCEDURES FOR THE GRANTING OF TECHNOLOGY FLOW QUALIFICATION

11.1 REQUEST FOR QUALIFICATION

To obtain qualification for a Technology Flow the Manufacturer shall submit a formal application, as shown in Appendix 'A', to the relevant ESCC Executive. As a minimum the application shall contain:

- A summary description of the overall Technology Flow and its boundaries.
- A preliminary detailed Technology Flow Definition and Process Identification Document.
- A preliminary Quality Management Plan.
- A description of the Manufacturer's organisation.
- A description of the manufacturing, inspection and test facilities.

If the Manufacturer has already been the subject of a successful ESCC evaluation or qualification and any of the previously submitted information is still valid and applicable, it is sufficient for the application to refer to this earlier information at the appropriate point.

The ESCC Executive will review the application and the delivered documents. If it is considered necessary, the Manufacturer may be requested to provide further information. When the submitted items are deemed to be satisfactory and the ESCC Executive agrees to support the qualification, the Manufacturer will be requested to proceed with establishing the detailed documentation and starting the necessary testing.

11.2 QUALIFICATION CERTIFICATE

When the ESCC Executive has reviewed the pre-validation data package, audited the Manufacturer on-site, reviewed the qualification test report and has found everything to be satisfactory, the ESCC Executive shall formally request ESA qualification and listing of the Technology Flow on the ESCC QML. This shall be done using the form shown in Appendix 'B'.

ESA will review the request and if it is found to be acceptable will make the formal ESCC QML listing of the Technology Flow and issue a qualification certificate.

11.3 ESCC QML LISTING

When ESA has approved qualification of a Manufacturer's Technology Flow it shall be listed in the ESCC QML. In the ESCC QML the Technology Flow and its boundaries shall be described (in non-confidential information) in enough detail to give an understanding of any components manufactured using the Technology Flow.

Any component types which ESCC has approved as being manufactured using the Technology Flow and also meeting the Generic and Detail Specification requirements, including the qualification test vehicles (if these are standard component types intended for further production), may also be listed in

the ESCC QML.

Technology Flow and component descriptions in the ESCC QML shall include full details of all deviations from the baseline requirements given in this specification and in the appropriate Generic and Detail Specifications. This information shall be updated whenever any changes proposed by the Manufacturer's TRB is approved by the ESCC Executive.

The full information given in the ESCC QML for any component shall also be made available to potential Users and Procurers via the ESCIES website.

11.4 VALIDITY OF QUALIFICATION

11.4.1 General

The maintenance of the Technology Flow qualification is the responsibility of the Manufacturer. He shall notify the ESCC Executive immediately of any matter liable to affect the validity of the qualification or result in its lapse or loss.

11.4.2 Conditions for Validity

For a qualification to remain valid the following conditions, where appropriate, must be fulfilled for the Technology Flow or for components manufactured using that flow:

- The manufacture of components to ESCC requirements shall be fully and only within the qualified Technology Flow and strictly in accordance with the production and control documents approved by the ESCC Executive in the PID.
- Any changes which the Manufacturer has made to the Technology Flow have been approved by the TRB and have not been rejected by the ESCC Executive.
- If there has been an extended shutdown of the ESCC QML certified/qualified line, the TRB must have carried out an assessment and ensured that the process was still capable when production was restarted.
- Detailed records of each component type and test structure, including detailed information about each production lot, shall be available for the ESCC Executive's review.
- On receipt of an alert from the ESCC Executive concerning the qualified Technology Flow or a component type manufactured using the Technology Flow, the Manufacturer shall, as a matter of urgency, carry out the necessary investigations and inform the ESCC Executive of the findings and suggested corrective actions.

11.4.3 EXTENSION OF VALIDITY

The Technology Flow qualification may be extended if:

- Any changes to the Technology Flow and PID have been approved by the ESCC Executive.
- All periodic tests defined in the Quality Management Plan and approved by the ESCC Executive, have been successfully performed.

If components having parameters which cover the Technology Flow boundaries or part of them have been manufactured using the Technology Flow, tests on these may be substituted for tests on any special Technology Flow test structures.

All relevant documentation, including records of components manufactured, shall be available for review by the ESCC Executive.

The ESCC Executive will decide whether an on-site revalidation review is required based on the Manufacturer's TRB reports, customer feedback and any other indications of the Manufacturer's maintenance of the Technology Flow qualification system.

11.5 LOSS OR SUSPENSION OF QUALIFICATION

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

qualification.

The Manufacturer's TRB shall always notify the ESCC Executive of any fault likely to affect the qualification. If any aspect of the Technology Flow becomes deficient, the qualification approval may either be suspended or allowed to continue with the approval of the ESCC Executive provided that the release of components is restricted to the remaining areas of the Technology Flow not affected by the deficiency. The qualification approval shall be withdrawn:-

(a) If the deficiency is not corrected within three months.

(b) At the Manufacturer's request.

When the qualification approval is restricted or suspended, the ESCC QML shall be modified accordingly.

11.6 REDUCTION, EXTENSION AND CHANGE

When a Manufacturer wishes to reduce, extend or change his qualified Technology Flow or its boundaries, it is the responsibility of his TRB to decide whether the reduction, extension or change is minor or major and the responsibility of the ESCC Executive to approve this decision. A major change is a change which affects the quality, reliability, fit or function of components manufactured using the Technology Flow.

In the case of a major change the Manufacturer shall support the change with testing on components or test structures as defined in the established and approved Quality Management and Qualification Test Plans.

In the case of a minor change the Manufacturer will record the change and notify the ESCC Executive.

The PID shall be updated accordingly as required in ESCC Basic Specification No. 22700.

12. QUALITY CONFORMANCE REQUIREMENTS

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

12.2 RECORDS

The Manufacturer shall maintain detailed records of each production lot of a qualified component and these shall be made readily available for inspection by the ESCC Executive. A record of all components found to be defective during testing by the Manufacturer shall be maintained.

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

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

Any repetitive defect occuring during manufacture shall be brought immediately to the attention of the ESCC Executive by the Manufacturer. Failure to do so may lead to suspension of qualification approval.

12.3 ALERT PROCEDURE

The 'Alert' procedure is a procedure for urgently notifying the ESCC Executive, 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 such a problem is brought to the attention of the Manufacturer, he shall, as a matter of

urgency, carry out any 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.

12.4 ESCC NON-CONFORMANCE SYSTEM

In the case of non-conformance, the TRB shall initiate the Non-Conformance Control system in conformance with ESCC Basic Specification No. 22800.

13. PRINCIPAL REQUIREMENTS FOR THE QUALIFICATION OF PARTICULAR TECHNOLOGIES

Ancillary Basic Specifications numbered in the ESCC 254XXXX series, to be read in conjunction with this specification, define additional Technology Flow qualification requirements for a particular technology and supplement the requirements in the relevant ESCC Generic Specification.

They typically address the following topics:-

(a) Technology Flow and boundaries

(b) Quality Management Plan including:

- Special test structures
- Evaluation Test Plan
- Qualification Test Plan

(c) On-site validation audit.

Furthermore, these ancillary specifications can address deviations from the requirements of this Basic Specification when technology specific adaptations need to be considered to reflect common manufacturing and testing practices employed for space level components.

14 ANCILLARY SPECIFICATIONS

When an ancillary Basic Specification in the ESCC No. 25400 series has been issued covering a generic component type, then it forms an essential part of this document and its use is mandatory for that component type.

The following ancillary specifications in the ESCC No. 25400 series have been issued for use in conjunction with this specification:-

- No. 2549000, Requirements for the Technology Flow Qualification of Monolithic Microcircuits.

CHART 1(a) - TECHNOLOGY FLOW CERTIFICATION AND QUALIFICATION FLOW

(PREPARATORY ACTIONS AND EVALUATION PHASE)

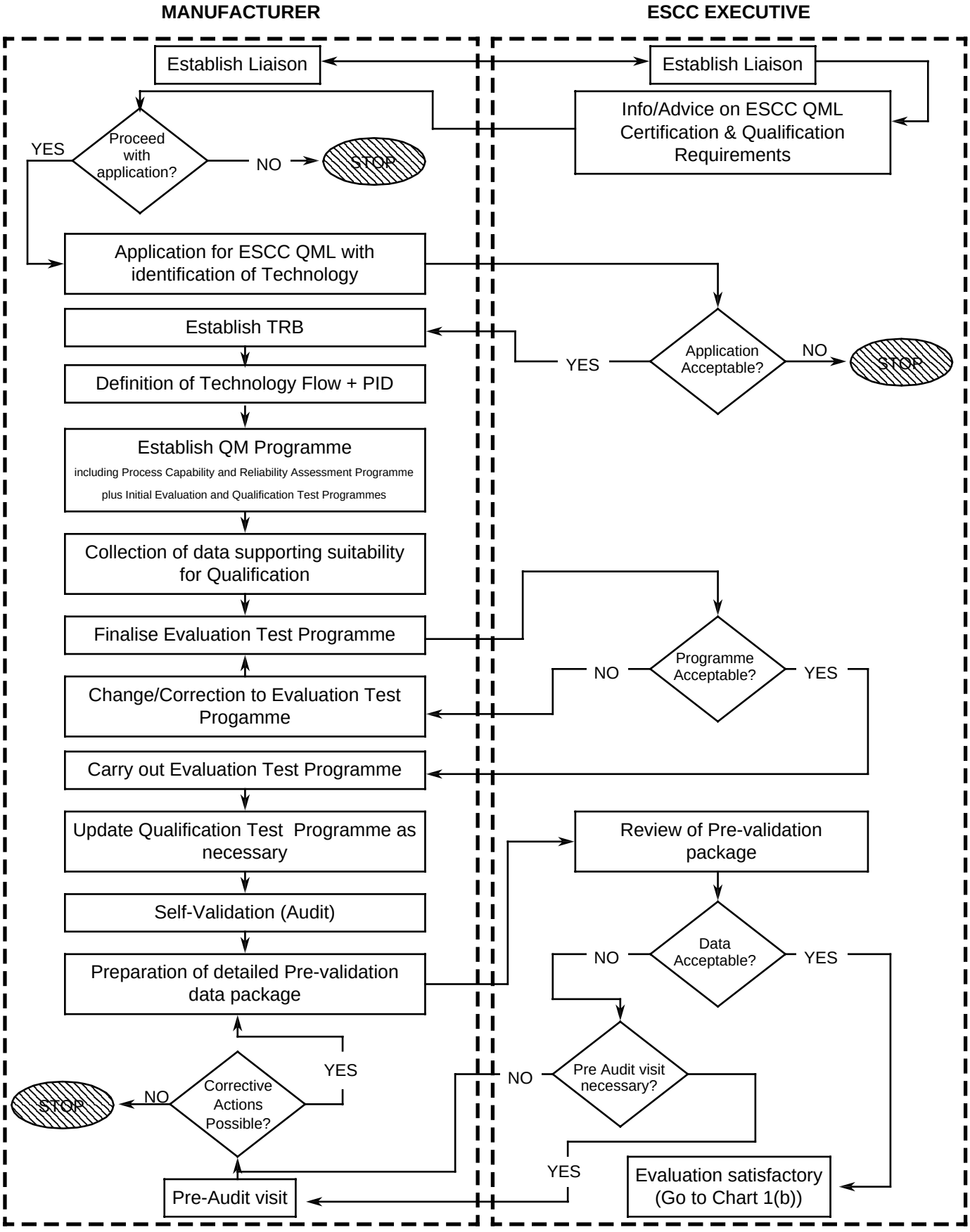
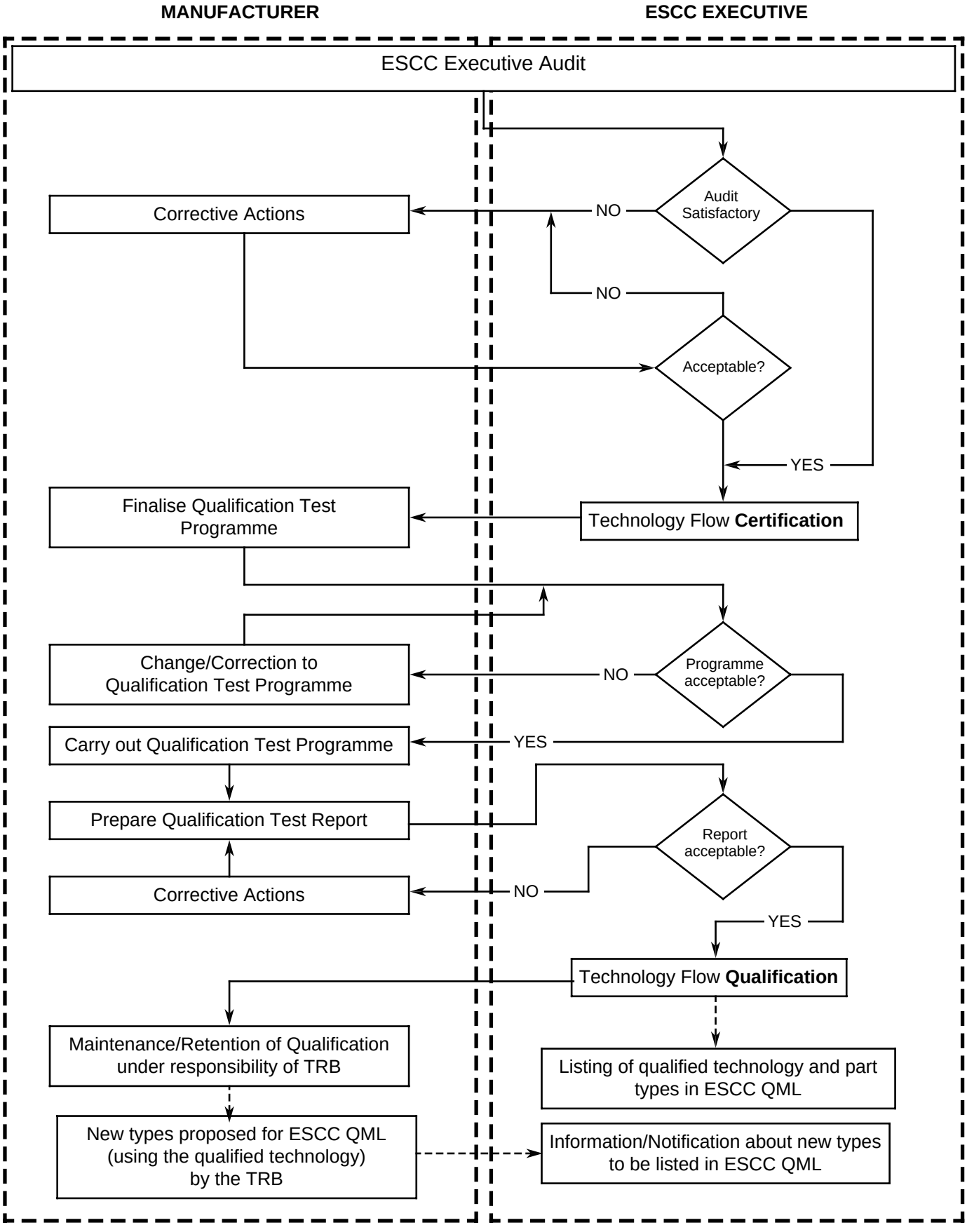


CHART 1(b) - TECHNOLOGY FLOW CERTIFICATION AND QUALIFICATION FLOW

(CERTIFICATION AND QUALIFICATION PHASES)



INDEX TO APPENDICES

APPLICATION FOR ESCC TECHNOLOGY FLOW QUALIFICATION

To: ESCC EXECUTIVE

We are interested in obtaining ESA qualification in accordance with ESCC Basic Specification No. 25400 for the undermentioned technology flow. Brief details and relevant documentation are forwarded herewith and we request that you initiate the necessary action.

TECHNOLOGY FLOW AND BOUNDARIES

Definition:

Similar flows:

Other details:

MANUFACTURER

Company:

Address:

Location of manufacture:

Contact for liaison:

ACCOMPANYING DOCUMENTATION (1)

- ◯ Overall description of Technology Flow and boundaries
- ◯ Technology Flow Definition
- ◯ Quality management plan
- ◯ Management and organisation
- ◯ Manufacturer's facilities

Signature

Title:

Date:

NOTES

1. Please tick to indicate type of documentation forwarded.

ESCC	APPLICATION FOR TECHNOLOGY FLOW QUALIFICATION APPROVAL TECHNOLOGY FLOW: Date:	Page 1 Appl. No.

Technology Flow submitted for qualification 1

Summary Description of Technology Flow	Detailed Tech. Flow Descrip. No.	Based on Technology	Test Structures	Components Proposed for Qualification
	Attached as Appendix 1			

Component Manufacturer 2	Location of manufacturing plant(s) 3	ESCC specifications 4

Report Reference and date 5	PID used for manufacturing 6
	Ref. No.: Issue: Rev.: Date:

PID changes since start of Capability Approval 7

None ☐

Minor* ☐ * provide detail.

Major* ☐

Current PID Verified by _____ 8

Ref. No.:

Issue:

Rev.:

Date:

Name Qualifying Authority Responsible

Date: _____

Current Manufacturing facilities and systems audited by: 9

_____ _____ _____

Name Qualifying Authority Responsible | Date | Report Reference No.

Satisfactory: Yes ☐ No ☐ Corrective actions closed out: Yes ☐ No ☐ N/A ☐

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. No's and purpose:

11

The undersigned hereby certifies on behalf of the ESCC Executive - that the above information is correct; - that the appropriate documentation has been evaluated; - that full compliance to all ESCC requirements is evidenced except as stated in Box 13; - that the reports and data are available at the ESCC Executive, who therefore applies on behalf of _____ as Qualifying Authority for ESCC Technology Flow Qualification Approval status to be given to the Technology Flow defined herein.

Date:

_____

(Signature of the ESCC Executive Expert)

12

Continuation of Boxes above:

13 Non-compliance to ESCC requirements

No.	Specification	Paragraph	Non-compliance

14 Additional tasks required to achieve full compliance for ESCC Technology Flow Qualification or rationale for acceptability of non-compliance:

15 Qualification Board Disposition:

Application Approval: Yes ☐ No ☐

Action/Remarks:

Date:

QB Chairman Signature

NOTES ON THE COMPLETION OF THE APPLICATION FORM FOR ESCC TECHNOLOGY FLOW 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 Technology Flow as given in the detailed Technology Flow description - the entering date; - the serial number and the suffix of the form.
Box 1	Shall provide a summary descriptive statement of the Technology Flow - the number of the detailed Technology Flow description - the basic technology type covered by the Technology Flow - the test structures specification numbers or identification numbers - any component types which were included in the initial qualification testing and are to be listed. **N.B.** The detailed Technology Flow description shall be attached as an Appendix.
Box 2 and 3	Manufacturer's name and location of plant(s) where the Technology Flow is situated.
Box 4	Generic and Detail Specifications (including issue and date)used during Technology Flow qualification approval.
Box 5	Reference to test report(s) submitted in support of the application for Technology Flow qualification approval.
Box 6	Enter details to identify the PID that was applicable at the time of manufacturing of samples used in the Technology Flow qualification testing.
Box 7	If the PID has been changed during or after Technology Flow qualification testing, adequate details shall be provided together with the reasons for the change. Major changes shall be clearly identified.
Box 8	The box serves to identify the current PID and that the ESCC Executive has verified it together with the date of this verification.
Box 9	The box can be completed only after a physical visit to the Manufacturer to confirm that the practices, procedures, materials, etc. used in manufacturing the components are as described in the PID and that the TRB and any other systems required by the Quality Management Plan have been established and maintained. This audit shall be carried out in accordance with the requirements of ESCC Basic Specification No. 20200 and the appropriate ancillary Basic Specification to ESCC Basic Specification No. 25400 and the results shall be formally recorded. The report number shall be referenced.
Box 10	Details entered shall be sufficient to evidence that an evaluation programme according to ESCC Basic Specification No. 25400 has been performed and that the results thereof are summarised in the survey and test reports. If the evaluation programme has not been carried out according to established ESCC Specifications, the Manufacturer shall provide alternative data and declare the assessed degree of satisfactory compliance with the ESCC requirements. Reference shall be made to any reports on Destructive Physical Analysis (DPA), Failure Analysis and Non-conformance (NCCS) issued during the evaluation and/or qualification testing.
Box 11	Enter the name of the ESCC Executive expert,the signature and date.
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 ESCC Executive to bring the submitted data to a standard likely to be accepted by the ESA Qualification Board should be listed herein or the reason(s) to accept the non-conformance.
Box 15	All Qualification Board recommendations on the application itself, special conditions or restrictions, modifications of the ESCC QML 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 Qualification Board.

CERTIFICATE OF CONFORMITY

Name of Company:

Address:

Component type:

Component number:

Lot identification:

Quantity:

Order number:

Range of delivered serial numbers:

This is to certify that the above mentioned components fulfil the requirements of the following Generic and Detail Specifications of the ESCC Specification System:-

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

Certified by:

_____ (Name)

Title: ESCC Chief Inspector/Deputy Chief Inspector (1)

Date:

NOTES

1. Delete as appropriate