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AURORA H2020

D1.4
Quality Assurance Management Plan

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Signature Control

Written	Checked	Approved Configuration Management	Approved Quality Assurance	Approved Project Management
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Date and Signature	Date and Signature	Date and Signature	Date and Signature	Date and Signature

Signature not needed if electronically approved by route

Changes Record

Rev	Date	Author	Affected section	Changes
1	2021-01-29	A. López	All	Initial issue

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1 INTRODUCTION

1.1 Purpose

The AURORA Quality Assurance Management Plan (QAMP) describes the quality assurance, safety, reliability, maintainability, software and test assurance activities undertaken from the design conception to assurance of the AURORA Tool suite products. The QAMP aims to ensure that the design and the deliveries are compliant with the relevant project requirements and covers all the activities performed at the premises of the Partners of the Consortium involved in any of these activities.

1.2 Scope

The target of this plan is to ensure that the delivered products conform to the planned quality objectives, and it is addressed to every item (documents, HW, SW, COTS, etc.) during their lifetime. It describes in detail the overall Quality Assurance programme implementation under the scope of AURORA project.

The following Product Assurance (PA) disciplines form a part of this plan:

- Product Assurance management
- Quality Assurance

This PA plan is in-line with the in-house Quality Assurance Plan of SENER Aeroespacial. The Consortium Partners are responsible for the Plan application to development, integration and test activities under their responsibility, reporting the status for overall evaluation and coordination to the PA Manager.

This document shall also serve as a master planning and control document for the quality assurance and configuration control. It provides an overview of the plans in this respect to be adopted by each Consortium Partner for the execution of the activities. The document is an output from the T1.2 activity included in the WP1.

2 RELATED DOCUMENTATION

The following documents in the latest issue/revision form a part of this document.

2.1 Applicable documents

AD #	Title	Project Reference	Issue	SAE Code	Rev
[AD1]	AURORA Grant Agreement	GA number 101004291	-	-	-

Table 2-1, Applicable documents

2.2 Reference documents

RD #	Title	Reference	Issue	SAE Code	Rev
[RD1]	Software Quality Assurance Procedure	AE/BK/P-2.01	5	Doc-00061518	5
[RD2]	Space engineering Software	ECSS-E-ST-40	C	-	-
[RD3]	Space Software Product Assurance	ECSS-Q-ST-80	C	-	-

Table 2-2, Reference documents

2.3 Acronyms

Acronym	Description
AD	Applicable Document
COTS	Commercial Off The Shelf
GA	Grant Agreement
HW	Hardware
N/A	Not Applicable or Available
NRB	Non-conformance Review Board
PA	Product Assurance
QA	Quality Assurance
RD	Reference Document
SW	Software
TRB	Test Review Board

Table 2-3, Acronyms

2.4 Terms and definitions

N/A

3 PRODUCT ASSURANCE MANAGEMENT

3.1 SENER Aeroespacial Product Assurance Policy

The Quality, Environment and Safety policy of SENER Aeroespacial, (hereinafter SENER AE) is intended to ensure that all projects, processes and activities performed by the company are implemented with due quality, in an environmentally friendly manner and under appropriated conditions of safety.

SENER AE will pay special attention to the compliance to customer requirements as well as internal procedures, standards and regulations in each field of its activities.

SENER AE will implement improvement and prevention mechanisms in the field of quality in order to accomplish early identification of potential problems.

Activities of verification and validation will be performed in order to achieve the objectives and fulfil the requirements of the project.

3.2 Organization

The PA manager is the prime authority for quality evaluation. However, highly technical quality evaluation tasks may be delegated to other personnel.

The Product Assurance manager will report to the project manager and to the head of the Quality section. She/He will nevertheless have a clearly established independence in the project organisation and right of access to the head of quality assurance to report any discrepancy that might arise.

She/He has the responsibility of all the PA activities related with the project, maintaining a functional line of communication with SENER AE's project manager, project engineers and customer representatives for all the aspects related to quality.

At the point of this document issue, the PA Manager appointed by SENER AE is Mr. Alfonso López.

3.3 Responsibilities

- Management:
  - communication with consortium PA representatives for the project;
  - communication with project manager and project engineers;
  - management of the SENER AE PA activities;
  - co-ordinate and conduct audits (if required);
  - attend and participate in the project meetings;
  - control all PA services and functional supports to the customer, subcontractor and suppliers;
- Documentation:
  - maintenance and updating of SENER AE's PA plan (if required);
  - implementation of the PA plan and procedures;
  - preparation of the PA documentation for the project;
  - PA periodic reporting (if required);
  - review and evaluate customer inputs and data deliveries concerning to QA requirements;
  - ensure that contents of PA documentation and related products are compatible with the customer requirement;
- Test and process inspection:
  - administrate and control the requests for approval, non-conformances, deviations, waivers and failures;
  - provide support and inputs to design, configuration management, project management, fabrication, assembly, integration and tests;
  - adapt applicable standards or request the release of new procedures or develop tools according to project needs;

3.4 Resources

Personnel performing specific assigned tasks are selected based on project requirements in terms of education, experience on business domain and knowledge of the methods and tools required on the particular process on which they are involved.

The project manager joint to the area manager are in charge of identifying the needs on the assign personnel and to provide the means and time to accomplish the planning with due quality.

3.5 Reporting

PA Manager will report the PA progress as part of the project management reports.

All PA related communications between SENER AE and the consortium should be directed through the respective project manager, project PA coordinator and related WP leaders with copy to the project manager.

The complete address for all communications related with this project is the following:

SENER AEROESPACIAL, S.A.

Severo Ochoa, 4

Tres Cantos, 28760

Telephone +34 91 8077000 switchboard

The name of the contact person for all communications related with this project is terms of PA topics is the following:

	Name	Telephone (direct)	Mail address
Project Manager	Ana Isabel Rodríguez	T: +34 608 75 44 88	ana.rodriguez@aeroespacial.sener
Project PA	Alfonso López	T: +34 918 07 84 85	alfonso.lopez@aeroespacial.sener
System Engineering Manager	Víctor Gómez	T: +34 918 07 73 71	victor.gomez@aeroespacial.sener

3.6 Project Reviews

PA Manager, as part of the technical monitoring process, will participate in the preparation of a formal programme of reviews at different stages of the work. Each review will be supervised in order to check the compatibility of the design with the specified requirements.

3.7 Program audits

SENER AE's internal audits (if necessary) will be carried under planned and controlled QA system and it will be available for review at SENER AE premises. They will be performed by QA personnel not involved in the project.

3.8 Right of access

All facilities and documentation used and produced in all disciplines of the project including the one related to manufacturers, suppliers and subcontractors will be open to inspection and evaluation by customer representatives. These representatives will be provided with reasonable assistance in the performance of their work.

3.9 Alert System

The consoritium will maintain an alert notification system to the AURORA Executive Board in the event of failures of any item that could occur during project execution, constituting a lesson learned subject of interest for general knowledge.

An alert shall be issued only when all the following criteria are met:

- If the item with the observed failure/problem has multiple applications, which may impact more than one project
- If the observed failure/problem has occurred in the application of an item within its specified design usage limitations
- If the failure/problem is not an isolated case.

3.10 Risk management

Risk analysis and risk monitoring will be carried out in the AURORA project in order to prevent the foreseeable risks and allow recovery from any deviation from the project's plan.

The AURORA Executive Board is responsible for maintaining a recording track of identified project risks in risk management reports, and for ensuring that associated risk management actions are completed on time and recorded.

The Work Package Leaders and the Technical Manager are responsible for identifying new risks in technical areas that will be reported.

The PA Manager will also identify and consider other management associated risks and to conduct or delegate any agreed actions.

3.11 PA documentation

All the events, actions and tasks relating to the PA programme will be fully planned and documented throughout the preparation of the requested PA documentation.

The PA Manager will prepare and update the different PA documents in accordance with PA project requirements.

The PA Manager will ensure that:

- The technical documentation is prepared and managed in accordance with the requirements;
- Only the correct issues of documents for the work being performed are available to the personnel;

All other issues are promptly removed from the points of issue or use.

4 CONFIGURATION MANAGEMENT

Configuration Management (CM) activities will be implemented throughout the entire life cycle of the project, in order to meet the internal requirements and manage the configuration of the product in a controlled and traceable manner.

4.1 Organization

SENER Aeroespacial will appoint a Project Configuration Manager to be responsible for all the configuration management tasks during the contract execution.

She/he will act as the single-point contact for all matters relating to configuration management reporting directly to the Project Manager (for all the configuration management activities) as well as to the PA Manager (to support the 'verification of the configuration' for the pertinent project milestones).

Configuration Manager is responsible for carrying out the following main activities:

- Configuration Identification
- Configuration Control
- Configuration Status Accounting
- Verification of Configuration

In this section, we will give an overall picture of each of the previously mentioned activities. Each partner will be able to control their documents internally in their organizational systems, but SENER CM is responsible to manage the project configuration activities and to easy the collaborative work.

Configuration Manager has to establish a close relationship with the Designers, mainly at the beginning of the project, in order to identify the whole set of components at the right decomposition level.

4.1.1 Configuration identification

Configuration identification is the process by which configuration items are identified, defined and documented. The identification of Configuration Items allows the configuration versioning and the configuration control management of a product.

This identification is unique and remains unchanged during the product life cycle.

Configuration item types can be the following:

- Documents
- HW identification
- SW files (source code, data, executable, etc.) generated along the development
- Commercial Tools used during the project life cycle (Compilers, linkers, editors, test tools, etc.)
- Storage Media

Initially, the list of project deliverables is specified in [AD1] for all the Work Packages. The Deliverable number shall be included with the title of the deliverable (e.g. D1.4 Quality Assurance Management Plan).

A common project identifier shall be allocated for each deliverable and additional project documentation, with the following definition:

AUR-XXX-YYY-ZZZZ

where:

- XXX is the company name (SAE, N7S, ESC, UPM)
- YYY is three or two letters for document type (e.g. PL, RP, SOW, MDL…) The complete list is under CM
- ZZZZ is a sequential number for the document type, allocated by the SENER CM

Example given: AUR-SAE-PL-0001, this document.

The list with the project documentation and allocated identifiers is managed by the SENER CM and shared in the collaborative framework. Refer to section 4.2.1.

4.1.2 Configuration Control

SENER Aeroespacial Configuration Manager is responsible for the following tasks for the formal project configuration control:

- Control of the formal issue of all Configuration Items and their media.
- Control of all changes to the Configuration Items and associated documentation
- Maintain the computer based Configuration Item database.
- Ensure correct marking, storage and handling of configuration items
- Maintain comprehensive records of all configured items.

4.1.3 Configuration Status Accounting

Configuration status accounting will consist of identifying the configuration status of all documents, files and tools necessary for the product maintenance.

4.1.4 Verification of Configuration

Configuration Manager is responsible for the following tasks:

- Verify that configuration documents are in agreement with configured items.
- Verify the correct implementation of configuration procedures specific for the project (version notation, file names, etc).

4.2 Document Configuration and Control Management

4.2.1 Document Configuration Control Tool

Configuration Manager will establish and maintain an information/documentation system throughout the lifetime of the project that shall always provide up-to-date information on all aspects of the project and shall be reported to all project participants.

For this purpose, SENER Aeroespacial has its own internal documentation management tool for information/documentation management in all our business environments. In addition, the project has available the following library to be used as the Consortium collaborative workspace.

https://seneraero.sharepoint.com/sites/AURORALibrary

This resource is complemented with an "AURORA Library" team in the MS Teams platform, which provides of fast communication channels and meetings rooms to the Consortium partners.

This collaborative framework allows reviewing the working documents and reporting the project documentation list.

4.2.2 Document Release

The following figure provides the document release process:

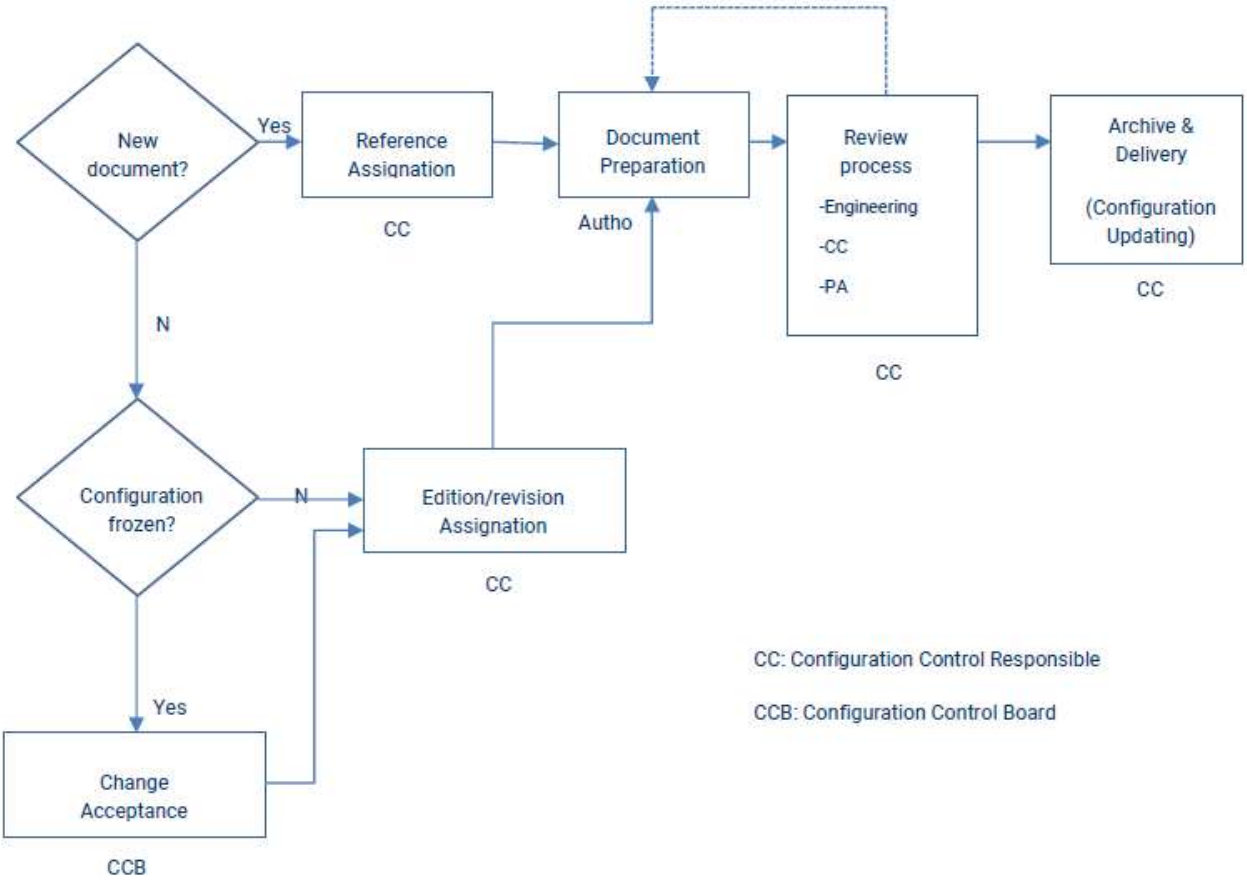

Figure 4-1: Document Release Process

4.3 SW Configuration Control Management

4.3.1 SW Identification

The deliverable SW items are initially identified in the [AD1]. These SW items might be composed by one or more SW components.

4.3.1.1 Types of SW components

There are three main types of SW Components, or low-level items:

- Source Items created by the development team (source code, scripts, etc.).
- Tools such as compilers, linkers, validation facilities ...
- Derived (and intermediate) items generated by processing source items with tools (object code, results)

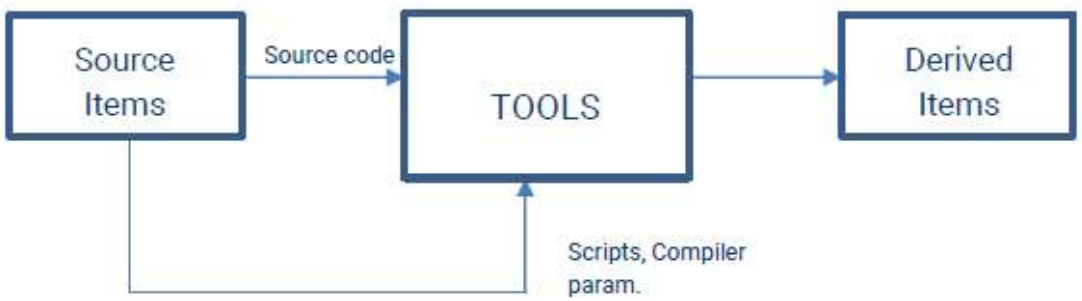

Figure 4-2: Main types of SW components

Source items will be kept under configuration control, which is the minimum to generate the final SW files.

Tools used for developing and testing purposes as well as all the source files associated to a SW release will be identified in the corresponding SW release document.

4.3.1.2 SW files identification

A SW Component is a Software Configuration Item.

The identification of Configuration Items allows the configuration versioning and the configuration control management of a software product.

4.3.1.3 SW release identification for AURORA project

A tag release shall be created each time a milestone, delivery, key point or formal test run takes place. This will keep the consistency between the release code version on repository and the one that has been frozen and identified in the corresponding SW release document.

4.3.2 SW Configuration control

SW source files will be kept and tracked using a SW configuration control tool based on Git, as it is GitLab. This Git repository shall be accessible for all the Consortium partners. The issue tracking and continuous integration capabilities will be good assets for the repository setup.

With these features, each partner will be able to control its SW development cycle and SW changes with relation to the same and shared repository, where all the partners can collaborate and commit the SW resources.

4.3.2.1 SW release

The following figure provides the SW Code release process:

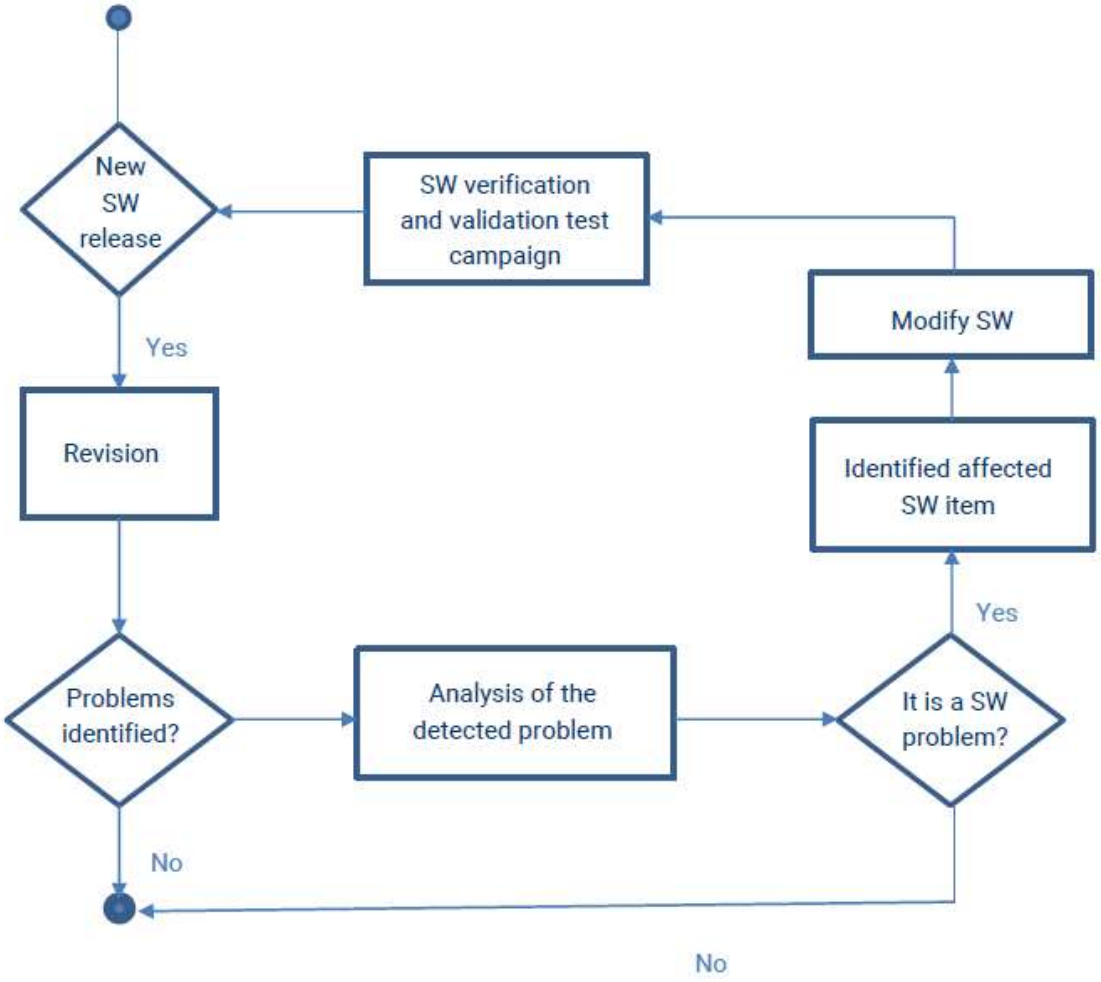

Figure 4-3: Main types of SW components

Each SW release shall include the following information:

- Source code.
- SW release document. This document identifies the version of the SW release as well as all the necessary tools. It also gives information about the changes carried out from last to current version.

The SW Product will be delivered with all documentation data, procedures and tools that allow installation, and acceptance.

4.3.2.2 SW Control Change Management

Software Problem Reports shall be raised to record problems in the released software version and/or in the associated documentation.

In case a modification of SW is needed, reason of change and affected SW configuration item should be properly identified in the corresponding SW release document of next SW version.

Software Problem Reports shall be closed by referring to the verification activity being carried out to demonstrate that the identified problem is solved.

4.3.3 SW Configuration Status Accounting

Software configuration file (or SW release document) shall identify the configuration status of all documents, files and tools necessary for the SW maintenance.

5 QUALITY ASSURANCE

This activity will be performed to ensure the implementation of all Quality Assurance activities throughout all project phases.

The QA activities and requirements will be fully observed during the project in order to obtain the quality required.

The [AD1] defines Key Performance Indicators (KPIs) to chart and measure the project progress for each WP. The KPIs analysis reports are covered by the AURORA General Assembly (GeA), issued every 6 months.

The KPIs are classified in:

- Management: for the project/WP to quantify the progress, the budget, the quality, and the effectiveness
- Technical: for each WP/product to quantify the progress, the effectiveness, the completeness, the correctness, the maintainability, testability…
- Impact: in this case, it is fully covered by the D7.2 Communication Plan

As the product metrics, specially the related ones with the implementation, are dependant on the WP design and solution, the WP leaders are responsible to propose the metrics to the executive board and to measure them. Then, they will be analysed y reported and the achieved quality will be assessed and controlled during the project life.

5.1 Design verification

Specifications related to technical requirements and processes will be submitted to an internal design review achieved by the different disciplines involved.

PA manager will verify that all the documentation has been submitted to reviews and verifications and comply with the specified project requirements. PA manager will be authorised to refuse the documents that do not comply with this procedure.

5.1.1 Design reviews

The design reviews have been defined and scheduled in the GA [AD1]:

- System Requirements Review (SRR)
- SW Preliminary Design Review (SW Review in the GA)
- Critical Design Review (CDR)
- Code Generator Test Phase Review
- CBI Test Phase Review
- Tool-set SW Review
- Acceptance Review (AR) with Final Presentation

The aim of the design reviews is:

- Evaluate capability of current design to meet applicable requirements
- Identify risks and define mitigation actions
- Ensure that design is conceptually correct
- Inspections and test criteria
- Performance and/or tolerance acceptance limits
- Review the test results
- Assess the 'ability to manufacture' the proposed design (by analysing the 'manufacturing tolerance analysis' w.r.t. design tolerances)
- Acceptance/rejection criteria

The results of design reviews will be documented and considered as quality records.

Design documents will be verified to ensure compliance with applicable requirements.

Traceability will be checked to ensure all applicable requirements have been incorporated into the design.

5.2 Testing

Validation of design will be carried out according to specific test plans and test procedures. Validation test results will be considered as quality records.

PA manager will verify that all the necessary activities related to the verification and validation of the product are carried out according to client requirements and internal standards and procedures.

The consortium will establish and implement inspections during test activities. QA will approve the tests and will be responsible for the following functions:

- verify that the test specimen is ready for test;
- ensure that the technical documents are valid;
- ensure that test equipment is that being specified;
- ensure the calibration of equipment;
- ensure that tests documentation is adequately maintained;
- record of all non-conformities;
- approve the results of the test;
- stop testing when safety of personnel is in jeopardy or if damage to an item or to an associated test equipment is possible;
- quality releases, if everything is correct.

5.2.1 Test plan

The consortium will produce test plans defining the test programme to be applied to different test activities in the project and how these test programmes will be implemented.

The test plans will be supported by written procedures to describe the specific test processes.

The test plans will be reviewed by PA Manager to verify Product Assurance requirements.

The test plans will be submitted to the Project Coordinator for approval.

5.2.2 Test procedure

Test procedures will be readily available to test personnel and located at the applicable place of test.

A test engineer and test assistant will conduct tests.

Test procedures will include the following information:

- identification of test article to be tested;
- objective of the test;
- applicable documents;
- participants required;
- instrumentation and test equipment to be used;
- method of measuring;
- conditions of the test (environmental, etc.);
- operations with potential hazard to personnel or equipment will be clearly
- identified and the safety precautions provided;
- test sequence;
- detailed step-by-step procedure;
- parameters to be verified;
- failure criteria and allowable tolerances;
- criteria for acceptance/rejection of the test;
- data record forms;

- responsibilities;
- procedure variation sheet;
- non-conformity list, produced during test execution;
- sign-off sheet.

The test procedures will be submitted to the Project Coordinator for approval.

5.2.3 Test Reports

All records and data generated during test performance will be documented in test reports.

Test reports will be the as run test procedures fulfilled step by step which will be signed by the test engineer. Test procedures will be signed in the applicable sign-off sheet at the end of test by the test engineer responsible of the test, by the test assistant, by other participants as required and by the SENER AE QA representative.

Complete traceability and calibration status of test equipment will be included on test reports.

Test reports will show the results obtained, the specified values, the test report number, and the number of any non-conformity report produced and the final evaluation. Moreover, summary of test results and conclusions based on results will be included.

Any test result, which fails to meet the requirements of the appropriate specification or drawing, is deemed to constitute a failure.

The test engineer will then investigate the failure and raise a non-conformity report, if required, and no further test activity will take place until the non-conformity report has been processed.

Non-conformity will be dealt with as described after in this PA plan.

The test reports will be reviewed by project PA manager to certify that the article tested is in accordance with the requirements.

The test results will be evaluated by a test review board (TRB) integrated by project manager, design, test engineer, project PA manager and customer representatives.

5.3 Non conformances, Deviations/Waivers and Failures

The consortium will establish and maintain deviations/waivers, non-conformity and failures management system in order to identify non-compliant/non-conforming items.

The internal non-conformance review board (NRB) will classify non-conformities as major or minor depending on their severity.