LR SOFTWARE CONFORMITY ASSESSMENT SYSTEM

Assessment Module GENPMS
Software Products for Planned Maintenance Schemes

2006

Lloyd's Register

LIFE MATTERS

FOREWORD

This document contains criteria for software certification through the Lloyd's Register Software Conformity Assessment system. It supersedes all previous publications on the subject. It should be read in conjunction with the system procedure SC94.

CONTENTS

1 INTRODUCTION

1.1 This document is intended for use as an assessment module in connection with the LR Software Conformity Assessment System. The assessment criteria are aimed at establishing that the software product, intended for use as part of a computerised planned maintenance scheme, has been developed and tested according to acceptable standards of software engineering practice. The practices are derived from the standards mentioned in section 2 below.

1.2 An executable copy of the completed software product along with copies of the software product description, the software user manual and the developers test planning, reporting and quality management system documentation, along with the software product's configuration, replication and maintenance records are to be submitted for assessment at LR's premises against the criteria herein.

1.3 Where it is not possible to execute the software product in a Windows based environment on a standard office personal computer, the assessment will be undertaken at the developer's or client's premises.

1.4 The assessment criteria are grouped in sections, beginning with section 3 which contains general criteria to be applied to any submitted document or record that is included in an inspection. The subsequent sections contain criteria for each of the inspections performed during an LR Software Conformity Assessment. Section 4 contains the criteria for specification inspection; section 5 contains criteria for system test inspection and section 6 contains criteria for replication, delivery and maintenance inspection.

2 INFORMATIVE REFERENCES

2.1 ISO 9001: 2000, Quality management systems – Requirements.

2.2 ISO/IEC 90003:2004 Software engineering - Guidelines for the application of ISO 9001:2000 to computer software.

2.3 ISO/IEC 25051:2006 Software engineering – Software product Quality Requirements and Evaluation (SQuaRE) – Requirements for quality of Commercial Off-The-Shelf (COTS) software product and instructions for testing.

2.4 ANSI/IEEE STD 829-1998, IEEE Standard for Software Test Documentation.

2.5 ISO 10007:2003 Quality management systems – Guidelines for configuration management.

2.6 Lloyd's Register ShipRight Machinery Planned Maintenance and Condition Monitoring Procedures - November 2004.

3 DOCUMENTATION

3.1 Principle

Documentation, files and other records submitted for LR Software Conformity Assessment are to provide objective evidence that the criteria for the assessment have been satisfied.

3.2 Criteria

3.2.1 Any terms, acronyms, abbreviations and notations are to be defined and are to have the same meaning throughout the document.

3.2.2 Items or concepts are to be referred to by the same name throughout the document.

3.2.3 All documents are to be free from internal inconsistencies, inconsistencies with other documents and are to present the information free from ambiguities.
3.2.4 Statements made in documentation are to be correct with reference to an authoritative source and testable or verifiable.
3.2.5 A change history is to be included in documentation or on attachments.
3.2.6 All documents and files are to be uniquely identified including version and or date.
3.2.7 All documents, files and records are to be clearly approved, signifying review and acceptance with the approval mechanism for computer files being made clear.

4 SOFTWARE PRODUCT SYSTEM SPECIFICATION

4.1 Principle

The software product is to satisfy the functional requirements specified herein. The software product description is to clearly and fully describe the product and its functionality. The user documentation is to provide all information required for the use of the software product.

4.2 Requirements Specification

The software product is to provide the following functionality:

4.2.1 The language used throughout the system is to be English.
4.2.2 Arrangements are to be made within the system for backing up data at regular intervals.
4.2.3 Access to the system for updating of the maintenance documentation and the maintenance programme shall only be permitted by the Chief Engineer or other authorised person(s).
4.2.4 The Software product is to provide the following functions:
4.2.4.1 A numbered index of machinery items, which includes all the Continuous Survey Machinery items on the "Master List of Surveyable items" and cross references to master list items.
4.2.4.2 Maintenance job descriptions for items included within the scheme.
4.2.4.3 Maintenance intervals for each item.
4.2.4.4 Reporting and recording procedures, that are to include:
a) Details of inspections and maintenance carried out on a specific item over a specified time interval.
b) The condition of the item as found.
c) Any repairs effected to the item.
d) A list of spare parts used.
4.2.5 Where the software product is intended to support the application of condition monitoring as part of a machinery planned maintenance scheme, the software product is to provide the following additional functionality:
4.2.5.1 The numbered index of machinery items is to indicate those items to be dealt with by preventive maintenance and those by condition based maintenance.
4.2.5.2 The reporting and recording procedures for machinery items dealt with by condition based maintenance are to include:
a) A description of the monitoring method used.
b) The frequency of monitoring.
c) The limiting values for an acceptable condition.
4.2.5.3 The reporting and recording procedures for vibration monitoring systems are to include:
a) The display of trends of overall vibration level over time.
b) The display of a Fast Fourier Transform frequency spectrum for each vibration signal.
4.2.5.4 Training for personnel undertaking measurements is to be provided that may form part of the software product.

4.3 Software Product Description

The product description is to:

4.3.1 Precisely identify the software product described by its name, a version and a date.

4.3.2 Contain the name and address (postal or web) of the supplier and at least one distributor if applicable.
4.3.3 Describe the intended functionality stated in the requirements specification.
4.3.4 Define the hardware and software operating environment for executing the software product.
4.3.5 State the provisions made for supporting the operation and maintenance of the software product.
4.3.6 Include information on data saving and restoring procedures.
4.3.7 Specify the type of user interface.
4.3.8 Provide information on the installation procedure.

4.4 Software User Documentation

The user documentation is to:

4.4.1 Contain all information necessary for the use of the software product.
4.4.2 Describe all the functions stated in the product description and all functions that the user can call.
4.4.3 Give guidance to backup and store the scheme data.
4.4.4 State all limitations given in the product description.
4.4.5 Define the minimum and maximum required disk space for installation.
4.4.6 Be understandable by the Chief Engineer and ships staff by using accepted marine industry terminology and style.
4.4.7 Provide the information necessary to learn how to use the software.
4.4.8 Include information on obtaining a printed copy when the user documentation is not provided in the printed form.
4.4.9 Provide a table of contents, or list of topics and an index.

5 SYSTEM TEST

5.1 Principle

The system tests are to demonstrate that the software requirements are satisfied.

5.2 Criteria

Test Planning and Specification

5.2.1 All functions and features described in the product description and user documentation are to be tested.
5.2.2 Each function and feature is to be the subject of at least one test case.
5.2.3 Test cases are to demonstrate conformity of the software product to the statements made in the product description and the user documentation.
5.2.4 The installation procedures and operational limits indicated in the product description and user documentation are to be the subject of test cases.
5.2.5 Completion criteria (goals) for test cases are to be specified and used for evaluating the conformity of the software product to the product description and user documentation.
5.2.6 The test plan is to specify the hardware and software configuration in which the tests are to be executed, that is to include all configurations mentioned in the software product description. Any tools required to test the software product are to be specified.
5.2.7 Test cases are to be documented to include the test objective, input data, expected results and the pass or fail criteria.
5.2.8 Test procedures are to be documented to include the necessary preparation actions required to execute the test and record the results and are to be sufficiently detailed to permit the test to be repeated.
5.2.9 Following correction, there is to be a procedure for re-testing of the functions or features concerned.
5.2.10 The test plan is to include criteria for determining whether testing as a whole passes or fails.
5.2.11 The software tested is to be identical to the software under assessment.

Test Reports and Results

An execution report is to be compiled that is to include:

5.2.12 An overall summary of the results of the test cases
5.2.13 Demonstration that all test cases have been executed according to the test plan.
5.2.14 A report for each test case that identifies the date of execution, the name and function of the tester(s), a list of found anomalies and references to the corresponding anomaly report(s).

Anomaly reports, where required, are to be compiled and are to include:

5.2.15 An overall summary of the anomalies found and, if any, the corrections and verifications by re-testing.
5.2.16 The report for each anomaly is to describe the anomaly, the point in the test case at which the anomaly occurred and the nature of the anomaly.
5.2.17 A correction section that is to demonstrate that all anomalies found have been corrected and is to include for each correction:
a) The identifier of the correction
b) Correction date.
c) Name of the corrector.
d) Identifier of the modification corresponding to the correction.
e) The possible impact of the correction.
f) Comments of the corrector.
5.2.18 A verification section that is to demonstrate that all corrected functions have the behaviour defined in the product description and user manual and is to include for all verifications:
a) The identifier of the verification.
b) Verification date.
c) Name of the verifier.
d) The test cases used for the verification.
e) Results of the verification.
5.2.19 The assessment of the execution report and anomaly report is to demonstrate that the functions and features of the software product were obtained.

6 REPLICATION, DELIVERY AND MAINTENANCE

6.1 Principle

The software product is to be replicated, delivered and maintained within the scope of an acceptable Quality Management System. Effective configuration management and a systematic and disciplined approach to the maintenance of the software product is to be demonstrated which is built on an effective change control system.

6.2 Criteria

Quality Management System

6.2.1 The quality management system adopted is to ensure that the provisions of ISO/IEC 90003:2004, *Software engineering – Guidelines for the application of ISO 9001:2000 to computer software*, or equivalent are incorporated. Where certification evidence of an acceptable quality management system is not available, LR will conduct an assessment at the developer's or client's premises.

6.2.2 The quality management plan for the software product is to identify and describe responsibilities and authorities related to the implementation and verification of the configuration management process at all stages in the software product's life cycle. The interfaces between differing activities involved in the configuration management process and the identification of the responsible authority for verifying implementation activities are to be defined.

Configuration Management

The configuration of the software product is to be planned and controlled with configuration records maintained that are to:

6.2.3 Identify the versions of each software item which constitute the specific version of the completed software product.
6.2.4 Identify the current build status of the software product.
6.2.5 Identify the modified parts of software items resulting from a change request.
6.2.6 Include an evaluation of the impact of a change request on the remaining configuration items and details of how the change is to be approved.
6.2.7 Include summary reports on the status of change requests and the implementation and verification of approved changes.

Replication and Delivery

Replication records for the software product are to identify:

6.2.8 The master and copies, including format, variant and version.
6.2.9 The type of media used and associated labelling.
6.2.10 The associated software product description and software user manual, licenses and release notes, including identification and packaging.
6.2.11 The verification of the correctness and completeness of delivered copies of the software product.
6.2.12 Measures taken to protect the software product from damage or corruption during delivery.

Maintenance

Maintenance of the software product is to be planned and controlled with maintenance records maintained that are to include:

6.2.13 The list of problem reports received and their current status.
6.2.14 The authority responsible for implementing corrective action.
6.2.15 The priorities assigned to corrective actions.
6.2.16 The results of corrective actions.
6.2.17 The methods used to advise purchasers of the software product of planned future changes.
6.2.18 Means taken to confirm that changes implemented will not introduce other problems.

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