

Quality Clause Q6R

Software & Firmware - Deliverable & Non-Deliverable

The latest issue of this document is the version on the Lockheed Martin website:
<https://www.lockheedmartin.com/en-us/suppliers/business-area-procurement/aeronautics/quality-requirements/clauses.html>.

Note: For the purposes of this quality clause, firmware is “the combination of a hardware memory device and computer instructions and/or digital data load that reside as read-only software on a device that a computing system can read. The software cannot typically be readily modified under program control. The executable programs and data that are embedded in hardware devices (i.e., firmware) are considered to be included in this definition [of software].”*

Requirements

The term “software” shall be understood to include firmware, as firmware is defined above. Lockheed Martin Aeronautics’ intent is that firmware shall be developed with the same design rigor as software.

- A. Seller shall define, implement and maintain a software development plan acceptable to Buyer that includes a defined life cycle and documentation of the product specifications, its design, the coding and testing, the product verification, metrics, and the product review cycles. Seller shall produce a software development and testing schedule commensurate with the complexity of the software development.
- B. Seller shall define, implement and maintain a Software Quality Management System (SQMS) acceptable to Buyer and documented either as part of Seller’s Quality Management System or separately in a Software Quality Plan (SQP), organized in Seller’s format, regardless whether the SQP is contractually defined as an SDRL.
- C. Seller’s SQP shall define software quality planning, processes and metrics intended to ensure software development requirements are met. The SQP shall include software quality activities to be performed for standalone or embedded deliverable, non-deliverable, & support software associated with this Purchase Order, in relation to the software development tasks that include:
 - i. software requirements definition
 - ii. software design,
 - iii. software coding,
 - iv. software unit and integration testing,
 - v. verification testing,
 - vi. product and documentation reviews,
 - vii. metrics and trending,
 - viii. safety,
 - ix. security,
 - x. records archival and retrieval,
 - xi. change management,
 - xii. requirements traceability, and
 - xiii. release processes
- D. The Seller’s SQP shall include specifics regarding the Seller’s management support of SQMS and the resources provided to the software quality employees involved, including their training, tools, security clearances, if needed, and program access.

* SAE AS9115, Quality Management System – Requirements for Aviation, Space & Defense Organizations - Deliverable Software (Supplement to 9100:2016)

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- E. Seller shall include in its SQP definitions of all internal and independent reviews and audits to be performed, the metrics to be captured, and the resulting records to be archived, in order to ensure Seller compliance with contractual requirements and applicable standards.
- F. Seller shall establish and maintain, as part of its SQMS, processes for evaluation of each non-deliverable software item used, whether in the automated manufacturing of deliverable hardware or in the qualification or acceptance of deliverable software or hardware. Seller shall ensure these processes provide for the following:
1. Required functions of the non-deliverable software are defined, in writing, and objective evidence exists prior to the intended use of such software, that such software performs the required functions.
 2. The non-deliverable software is placed under internal configuration control prior to its use, and such internal configuration control is maintained throughout its use.
- G. Seller shall review and meet SAE standards AS 91151 and ARP 9005A2, as appropriate to their software quality processes. At a minimum, Seller's infrastructure shall include the elements and processes identified below in subsections 1 – 7. Each element shall be defined and visible, with artifacts of compliance that are readily verifiable:
1. Software development tools and utilities, including host computer and support software;
 2. Software verification tools and utilities, including test equipment, test software, vulnerability scanners, code scanners, and fuzzers;
 3. Equipment, tools and utilities for product and documentation archival and storage, replication, change management, configuration management, software loading and verification, transmittal, disaster recovery protection, and software quality;
 4. Equipment, tools, and software programs used to automate, control, monitor, or measure production processes, validated prior to final release and maintained.
 5. Integrity verification tools and utilities (e.g., virus protection/checking, digital signatures, security hash algorithms, and checksums or cyclic redundancy checks);
 6. Equipment and software needed to meet retention requirements; and
 7. Security for software environments against attacks (e.g., malicious code, enumeration, fingerprints, worms, viruses, backdoors, and spyware).
- H. If Seller subcontracts any software or support software, including test software, the Seller shall flow down these Q6R requirements or their equivalent to its Sub-Tiers and require that Sub-Tiers flow the same to their Sub-Tiers, to ensure the degree of management discipline and documentation required of the Seller is maintained at each subsequent sub-tier level.
- I. Buyer and Buyer's customer shall have access to Seller's and Seller's Sub-Tiers' personnel, facilities, procedures, metrics, and objective evidence involved in the project in order to conduct in-process assessments, inspections, and surveillances of the software development and testing processes, internal procedures, supporting functions (e.g., Software Quality, Software Configuration Management/Configuration Management, Safety, Security) and applicable documentation.

¹ AS 9115, Quality Management System – Requirements for Aviation, Space & Defense Organizations – Deliverable Software

² ARP 9005A, Aerospace Guidance for Non-Deliverable Software

J. Buyer's assessments and/or inspections shall be permitted of any and all Ground Based and Airborne Systems, regardless whether the development is defined as a software development process or a hardware development process or whether the Programmable Logic Device is considered to be software, hardware, firmware, Complex Electronic Hardware, Field Programmable Gate Arrays, Application Specific Integrated Circuits, a subsystem, or other.