

Appendix A. Computer Program Test Plan Requirements

Appendix A provides computer program test plan requirements in addition to those above (e.g., in Subsection 4.2, which also addresses plan development role). The text in italicized print should be used as guidance for all items marked as “Gr.” (Requirements 21-0527 – 0545)

No.	Requirement	Apply by ML ¹			
		1	2	3	4
1.0 General Test Plan Requirements ²					
1.01	Include or reference the test name, objective(s), and date.	R	R	R	*
1.02	Include or reference the test configuration (<i>including pre-test, during testing, and post-test configurations where appropriate</i>).	R	R	Gr ³	*
1.03	Satisfy test prerequisites. Prerequisites include the following as applicable: calibrated instrumentation, appropriate and special equipment, trained personnel, the condition of the test equipment and the item to be tested, suitable environmental conditions, and provisions for data acquisition. Ensure the suitability and readiness of equipment and algorithms used for simulated computer program test inputs/fault seeding.	R	R	R	*
1.04	Ensure that suitable environmental conditions are satisfied during testing.	R	R	R	*
1.05	Ensure that adequate instrumentation is available and used.	R	R	R	*
1.06	Ensure that appropriate tests and equipment are used (e.g., a pneumatic leak test may be required because a hydrostatic leak test could damage the item). Select measuring and test equipment based on the type, range, accuracy, and tolerance needed to assess conformance to specified requirements.	R	R	R	*
1.07	Provide for traceability of measuring and test equipment to the test.	R	R	R	*
1.08	Ensure that necessary monitoring is performed.	R	R	R	*
1.09	Specify characteristics to be tested.	R	R	R	*
1.10	Obtain test requirements and acceptance criteria <i>from or approved by the responsible design organization</i> .	R	R	Gr	*
1.11	Control the test. (This requirement includes controlling changes during testing and, as appropriate, comprises software design verification, factory acceptance, site acceptance, and in-use tests.)	R	R	R	*
1.12	Control tests under appropriate environmental conditions using the tools and equipment necessary to conduct the test in a manner that fulfills test requirements and acceptance criteria.	R	R	R	*
1.13	Develop/specify test methods to obtain necessary data with sufficient accuracy for evaluation and acceptance.	R	R	R	*
1.14	Base test requirements and acceptance criteria upon specified requirements contained in the applicable design documents or other pertinent technical documents that provide approved requirements. Ensure acceptance criteria are specific, unambiguous, measurable, and attainable.	R	R	R	*
1.15	Document and maintain test results.	R	R	R	*
1.16	When changes to an approved configuration management SSC of an operating facility are required for testing purposes, obtain approval by the facility design authority or FDAR and others as required in the governing work control process (e.g., AP-341-504 , <i>Temporary Modification Control</i>) before performing the test.	R	R	R	*
1.17	When identification and traceability requirements are specified in requirements documents, design the test to satisfy the requirements.	R	R	R	*
1.18	When post-installation testing is planned, mutually establish post-installation test requirements and acceptance documentation with the item purchaser and supplier.	R	R	R	*

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1.19	When special process examinations/tests are performed (e.g., nondestructive examination, such as radiographic testing, magnetic particle testing, ultrasonic testing, liquid penetrant testing, electromagnetic testing, neutron radiographic testing, leak testing, acoustic emission testing, and visual testing), address the applicable requirements of STD-342-100, Engineering Standards Manual, Chapter 13, Welding, Joining & NDE , and P330-5, Special Processes .	R	R	R	*
1.20	Perform testing in accordance with the governing work control process and the test plan and address applicable health, safety, environmental, and security requirements associated with the testing. Ensure post-configuration conditions meet post-configuration test plan requirements, including approvals as required.	R	R	R	*
1.21	Evaluate the conformance of test results with test requirements and acceptance criteria.	R	R	R	*
1.22	Identify those responsible for accepting the test(s).	R	R	R	*
1.23	Within applicable work control documents (e.g., field change, design change) that govern configuration management for the item, describe the process for obtaining consent to waive specified hold points (testing, inspection, witness holds, or a combination of these) or to make changes to the test plan. If the waiver and change processes are not addressed in the governing work control process, then address the waiver process, including obtaining consent from authorized personnel, in the test plan.	R	R	R	*
1.24	Obtain consent to waive hold points before work continues beyond the designated hold point. Document the consent.	R	R	R	*
1.25	As applicable, develop and prepare an approach to sampling. <i>When sampling is used, base it on standard statistical methods with approval from the responsible engineer for the item. Obtain support from the responsible engineer, quality assurance representative, or both in development of the plan as required. When sampling is used for accepting commercial-grade items and services, base it upon standard statistical methods with supporting engineering justification. Consider lot/batch/traceability, homogeneity, and the complexity of the item.</i> If sampling is performed, document the sampling method and the approval of the method by the responsible engineer. When less than 100% sampling is used, draw samples at random.	R	R	Gr	*
1.26	<i>Demonstrate the adequacy of performance under conditions that simulate the most adverse design conditions, with operating modes and environmental conditions considered in determining the most adverse conditions.⁴</i>	R	R	Gr	*
1.27	<i>Where the test is intended to verify only specific design features, verify the other features of the design by other means. Establish and verify scaling laws when tests are performed on models or mockups.⁴</i>	R	Gr	Gr	*
1.28	<i>Perform error analysis, where applicable, on the results of model test work before using the final design.⁴</i>	R	Gr	Gr	*
2.0 Additional Test Plan Requirements for General Computer Program Testing²					
2.01	<i>Involve engineering, in accordance with the governing work control process and as applicable, in safety software inspection, including obtaining concurrence with the acceptability of safety software verification results.</i>	R	R	Gr	*
2.02	<i>Obtain test requirements and acceptance criteria from the organization responsible for the computer program's use.</i>	R	R	Gr	*
2.03	Include required tests, test sequence, and frequency.	R	R	R	*
2.04	Include required ranges of input parameters.	R	R	R	*
2.05	Identify the stages at which testing is required.	R	R	R	*
2.06	<i>Include criteria for establishing test cases.</i>	R	R	Gr	*
2.07	<i>Include requirements for testing logic branches.</i>	R	R	Gr	*
2.08	Include requirements for hardware integration.	R	R	R	*
2.09	Include anticipated output values.	R	R	R	*

Section SOFT-V&V: Software Verification and Validation

Rev. 2, 02/11/2026

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2.10	Include acceptance criteria, reports, records, standard formatting, and conventions.	R	R	R	*
2.11	Demonstrate the computer program's adherence to documented requirements.	R	R	R	*
2.12	<i>Evaluate technical adequacy through the comparison of test results against results from alternative methods, such as hand calculations, calculations using comparable proven programs, or empirical data and information from technical literature.</i> ⁵	R	R	Gr	*
2.13	<i>For software design verification testing, demonstrate the capability of the computer program(s) to provide valid results for test problems encompassing a range of documented permitted usage.</i> ⁴	R	R	Gr	*
2.14	For those computer programs used for operational control, demonstrate required performance over the range of operation of the controlled function or process.	R	R	R	*
2.15	<i>For computer programs in which computer program errors, data errors, computer hardware failures, or instrument drift can affect required performance, prescribe and perform periodic in-use manual or automatic self-check tests.</i> ⁶	R	R	Gr	*
2.16	For system software testing (new or revised software), evaluate, review, test, and accept the software for use. Place system software under configuration change control. Evaluate system software changes for impact on the software product to determine the required level of retesting.	R	R	Gr	*
3.0 Additional Test Plan Requirements for Computer Program Acceptance Testing⁷					
3.01	Include the process of exercising or evaluating a system or system component by manual or automated means to ensure that it satisfies the specified requirements and to identify differences between expected and actual results in the operating environment.	R	R	R	*
3.02	Demonstrate that the computer program adequately and correctly performs all intended functions (i.e., specified software design and operating requirements). ⁸	R	R	R	*
3.03	Demonstrate that the computer program properly handles abnormal conditions and events, as well as credible failures. As applicable, include cybersecurity vulnerability testing.	R	R	Gr	*
3.04	Demonstrate that the computer program does not perform adverse unintended functions.	R	R	R	*
3.05	<i>Demonstrate that the computer program does not degrade the system either by itself or in combination with other functions or configuration items.</i>	R	R	Gr	*
3.06	Ensure that acceptance testing is performed and passed before the computer program's approval for use.	R	R	R	*
3.07	Ensure that configuration items are identified and are under configuration change control before starting acceptance testing.	R	R	R	*
3.08	Ensure that acceptance testing is planned, performed, and passed for all software design requirements.	R	R	Gr	*
3.09	Ensure that acceptance testing ranges from a single test of all software design requirements to a series of tests performed during computer program development. (Performance of a series of tests provides assurance of correct translation between activities and proper function of individual modules.)	R	R	R	*
3.10	Include a comprehensive acceptance test that is performed in the operating environment before use.	R	R	R	*
3.11	<i>Provide for the documentation and disposition of observations regarding unexpected or unintended results before test approval.</i>	R	R	Gr	*
3.12	For acceptance testing of changes to a computer program, provide for selective retesting to detect unintended adverse effects introduced during changes to the computer program. Provide assurance that the changes have not caused unintended adverse effects in the computer program and verify that a modified system(s) or system component(s) still meets specified software design requirements.	R	R	R	*

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<p>Notes:</p> <p>¹ R = required; Gr = graded by using <i>italicized text</i> as guidance and non-italicized text as required; * = as required by ESM Chapter 15, <i>Commissioning</i>, the SRLM, or both</p> <p>² From NQA-1 Part I Requirement 11, <i>Test Control</i>. As applicable, general test plan requirements apply to testing of items as graded (items that include computer programs or do not include computer programs). Additional test plan requirements for general computer program testing apply to formal interim computer program tests and computer program acceptance tests as graded.</p> <p>³ Not used.</p> <p>⁴ Applies to design verification testing only; reference NQA-1 Part I Requirement 3, <i>Design Control</i>.</p> <p>⁵ Applies to non-SSC software only.</p> <p>⁶ Apply as required during testing to ensure that test results are valid.</p> <p>⁷ From NQA-1 Part II Subpart 2.7, <i>Quality Assurance Requirements for Computer Software for Nuclear Facility Applications</i>, and associated guidance. As applicable, additional test plan requirements for computer program acceptance testing apply to acceptance testing of computer programs in addition to requirements under Headings 1 and 2 in this table, as graded in the table.</p> <p>⁸ If the software is required to perform a technical safety requirement surveillance, demonstrate satisfactory execution of the surveillance as part of the acceptance test.</p>					