APPENDIX A: COMPUTER PROGRAM TEST PLAN REQUIREMENTS

Table 21.4-A1 provides computer program test plan requirements. The text in *italicized print* should be used as guidance for all items marked as "Gr".

Table 21.4-A1 Computer Program Test Plan Requirements

No	Requirement	Apply by ML[1]			
		1	2	3	4
1.0 General Test Plan Requirements[6]					
1.01	Include or reference the test name, objective(s) and date.	R	R	R	*
1.02	Include or reference the test configuration *(including pre-test, during testing, and post-test configurations where appropriate).*	R	R	Gr[2]	*
1.03	Satisfy test prerequisites. Prerequisites include the following as applicable: calibrated instrumentation, appropriate and/or special equipment, trained personnel, condition of test equipment and the item to be tested, suitable environmental conditions, and provisions for data acquisition. Ensure suitability and readiness of equipment and/or algorithms used for simulated computer program test inputs/fault seeding.	R	R	R	*
1.04	Assure that suitable environmental conditions are satisfied during testing	R	R	R	*
1.05	Assure adequate instrumentation is available and used.	R	R	R	*
1.06	Assure appropriate tests and equipment are used (e.g., performance of 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 accomplish the required measurements for determining 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	Assure 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 *from, or approved by, the responsible design organization*.	R	R	Gr	*
1.11	Control the test. (This includes controlling changes during testing; includes as appropriate, 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 to fulfill 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 (DA) or FDAR, and others as required in the governing work control process (e.g., AP-341-504, *Temporary Modification Control*), prior to performing the test.	R	R	R	*

No	Requirement	Apply by ML[1]			
		1	2	3	4
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	*
1.19	When special process examinations/tests are performed (e.g., Nondestructive Examination (NDE) 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; 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 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	The process for obtaining a consent to waive specified hold points (testing, inspection and/or witness holds) or, make changes to the test plan, must be as described in applicable work control documents (e.g., field change, design change process, etc.) that govern configuration management for the item. If the waiver and/or change process is 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 prior to continuation of work beyond the designated hold point and ensure documentation of the consent.	R	R	R	*
1.25	As applicable, develop and prepare an approach to sampling. *When used, base sampling on standard statistical methods with approval from the responsible engineer for the item. Obtain support from the responsible engineer and/or quality assurance representative in development of the plan as required.* *When used for accepting commercial grade items and services, base sampling upon standard statistical methods with supporting engineering justification. Consider lot/batch/traceability, homogeneity, and the complexity of the item.* 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	*Demonstrate 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]*	R	R	Gr	*
1.27	*Where the test is intended to verify only specific design features, the other features of the design shall be verified by other means. Establish and verify scaling laws when tests are being performed on models or mockups.[4]*	R	Gr	Gr	*
1.28	*Perform error analysis, where applicable, on the results of model test work prior to the use of the final design.[4]*	R	Gr	Gr	*
2.0 Additional Test Plan Requirements for General Computer Program Testing[6]					
2.01	*Involve engineering, in accordance with the governing work control process, as applicable, in safety software inspection, including obtaining concurrence to the acceptability of safety software verification results.*	R	R	Gr	*

No	Requirement	Apply by ML[1]			
		1	2	3	4
2.02	*Obtain test requirements and acceptance criteria by the organization responsible for the use of the computer program.*	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	*Include criteria for establishing test cases.*	R	R	Gr	*
2.07	*Include requirements for testing logic branches.*	R	R	Gr	*
2.08	Include requirements for hardware integration.	R	R	R	*
2.09	Include anticipated output values.	R	R	R	*
2.10	Include acceptance criteria, reports, records, standard formatting, and conventions.	R	R	R	*
2.11	Demonstrate the adherence of the computer program to documented requirements.	R	R	R	*
2.12	*Evaluate technical adequacy through comparison of test results from alternative methods such as hand calculations, calculations using comparable proven programs, or empirical data and information from technical literature.[3]*	R	R	Gr	*
2.13	*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.[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	*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.[5]*	R	R	Gr	*
2.16	Provide for system software testing. *For new or revised software, evaluate, review, test, and accept 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 <u>Acceptance</u> Testing[7]					
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	*Demonstrate that the computer program does not degrade the system either by itself, or in combination with other functions or configuration items.*	R	R	Gr	*
3.06	Ensure that acceptance testing is performed and passed prior to approval of the computer program for use.	R	R	R	*

No	Requirement	Apply by ML[1]			
		1	2	3	4
3.07	Ensure that configuration items are identified and are under configuration change control prior to 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 prior to use.	R	R	R	*
3.11	*Provide for documentation and disposition of observations of unexpected or unintended results prior to test approval.*	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 to verify that a modified system (s) or system component (s) still meets specified software design requirements.	R	R	R	*

Notes:

[1] R = Required; Gr = Graded by using *italicized text* as guidance and non-italicized text as required; * = As required by ESM Chapter 15, *Commissioning* and the SRLM.

[2] Not used.

[3] Applies to Non-SSC software only.

[4] Applies to design verification testing only, reference NQA-1, Part I, Requirement 3, *Design Control*.

[5] Apply as required during testing to ensure that test results are valid.

[6] From NQA-1, Part I, Requirement 11, *Test Control.* 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.

[7] From NQA-1, Part II, Subpart 2.7, *Quality Assurance Requirements for Computer Software for Nuclear Facility Applications* 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.

[8] If the software is required to perform a Technical Safety Requirement (TSR) surveillance, demonstrate satisfactory execution of the surveillance as part of the acceptance test.