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| |  | | --- | | **1.0 document Review and approval** | | | | | | | | | |
| I have reviewed and approved this SWTP and I accept my responsibilities as described herein. | | | | | | | | |
| 1.1 Name  (last, first) | 1.2 Z Number | 1.3 Role | | | | | | 1.4 Review and Approval Signature and Date |
|  |  | [SD](#SO" \o "For Designed Software, P1040 requires that a Software Designer (SD) develop, review and approves SRL 1, 2 and 3 software. Where possible, the SD should be a SD other than the SD that designed the software.) | [SU RLM](#Other) | [SRLM](#SRLM" \o "Per P1040, the Software Owner Responsible Line Manager (SO RLM or SRLM) is responsible for V&V of SRL 1, 2, and 3 software.) | [SD RLM](#SRLM) | [TL](#SRLM) | [Other](file:///C:\Users\pdiepolder\AppData\Local\Microsoft\Windows\Temporary%20Internet%20Files\Content.Outlook\FUV1LXUP\R0A%20SWTP%20Template%203055%20as%20of%2006%2004%202018%201630.docx#Other) |  |
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| **2.0 REVISION HISTORY** | | |
| 2.1 Revision | 2.2 Date | 2.3 SWTP Revision Description and Reason for Revision |
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| **3.0 INTRODUCTION — PURPOSE, AUTHORITY AND APPLICABILITY** |
| 3.1 The purpose of this SWTP is to present the plan for successful **acceptance** testing of the subject software. The SWTP scope is for all aspects of the software, including support software (e.g., software tools and system software) and configuration items necessary for software execution. The SWTP scope is limited to the technical aspects of acceptance testing. The project management aspects, including scheduling, resource planning/allocation, quality assurance procedures, and risk management are addressed in the *(provide software project plan identifier (e.g., number) and title here)* (SWPP).  Acceptance testing is defined as 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. It is conducted to enable a customer to determine whether to accept the software and/or software system. Acceptance testing demonstrates that the computer program   * performs its intended functions adequately and correctly; * identifies differences between expected and actual results in the operating environment; * properly handles abnormal conditions and events as well as credible failures; * does not perform adverse unintended functions; * is reasonably usable; and * does not degrade the system either by itself, or in combination with other functions or configuration items.   This SWTP is envisioned to be used for the acceptance testing required for the initial use. It may be used in whole or in part for software changes as described in the software change document(s).  This SWTP is issued under the authority of the SRLM in accordance with the SWPP. As stated therein, an acceptance test plan, acceptance testing, and an acceptance test report (which includes results review and approval) are required prior to software approval for use.  The SRLM is responsible for managing and maintaining this SWTP. This SWTP applies to personnel as described in the SWPP and this SWTP.  This SWTP includes the following sections:   * Software Overview * Roles, Responsibilities, Accountability, and Authorities (R2A2) * Test Items * Test Deliverables * Test Prerequisites * Test Execution * Test Report (SWTR) * Attachment List * References   ***Note:*** Unless otherwise indicated, see the Software Baseline (SWBL) for current document revisions. |

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| **4.0 software overview** |
| 4.1 *(Provide 1–2 sentences summarizing what the software does and how it is used.)* (see the SWPP for additional software details) |

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| **5.0 Roles, responsibilities, Accountabilities and Authorities (R2A2)** | |
| 5.1 The acceptance test will be managed, planned, tested, reviewed, and approved by the personnel identified in Section 1 with the following responsibilities. | |
| SD | * Develops, reviews, and approves the SWTP * Obtains test requirements by the organization responsible for the use of the computer program. *(Provide representative software user organization.)* |
| SD RLM | * Reviews and approves test requirements and acceptance criteria (including test sampling/coverage methods); the SD RLM must be from the responsible software design organization that designed or developed the software * Identifies any additional test requirements and/or any necessary changes to the test plan |
| SRLM | * Reviews and approves the SWTP, including changes thereto * Reviews and approves the Software Test Report (SWTR) * Serves as the authorized person to waive and/or release hold points * Ensures test personnel are trained, qualified, and when required, certified to perform tests * Accepts or rejects the test (pass or fail); the SRLM serves as the software Acceptance Test Authority (per [P330-8](http://int.lanl.gov/policy/management-systems.shtml)) * Ensures reviews are performed by competent individuals or groups other than those who developed and documented the original software design * Ensures individuals familiar with the design detail and the intended use of the computer program review results |
| TL | * Schedules, coordinates, leads, and directs test activities including authorization to begin, suspend, retest, and complete testing in accordance with the SWTP * Develops, reviews, and approves the SWTR * Serves as the responsible authority for software test case (SWTC) results (evaluates test results, determines and documents SWTC test acceptability [i.e., test passes or fails]) * Ensures test records are traceable to the test items * Obtains training, qualification, and/or certification as required for testing |
| T | * Verifies and documents that test prerequisites were satisfied prior to testing * Performs test activities as directed by the TL * Reviews and approves SWTC results * Obtains training, qualification, and/or certification as required for testing |
| SQA SME | * Reviews the SWTP and SWTR for conformance to the SWPP and governing SQA programs (e.g., [P1040](https://int.lanl.gov/policy/information-management.shtml)); provides SQA expertise including that for sampling/coverage |
| DA or FDAR | * Provides concurrence (reviews and concurs with signature) to the acceptability of safety software verification results * Supports testing as required in this plan in accordance with the governing work control process. *(Provide document identifier (e.g., number) and title of governing work control processes, as applicable).* |
| SU RLM | * Provides and approves test requirements and acceptance criteria per P330-8 |
| Other | * *(Provide other R2A2 as required or enter “NA”)* |

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| **6.0 Test items** |
| 6.1 The items tested include the following computer program code, databases, documentation and interfacing/integrated hardware. These items must be under configuration control ***PRIOR*** to the start of acceptance testing. |

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| **7.0 Test Approach** | | |
| 7.1 Software Requirements Traceability Matrix (SWTM) | A fundamental tenet for this SWTP is that all testable requirements must have one or more software test cases (SWTCs) to demonstrate the requirement has been satisfied. See the *SWTM for (provide software name and SWTM document identifier and title here)*. One or more test cases have been assigned to each testable software requirement. | |
| 7.2 Software Test Cases (SWTCs) | SWTCs have been developed per the SWTM. The SWTCs are discrete documents that must be included in the Software Baseline (SWBL) and controlled in accordance with the governing document control procedure as per the SWTP. Each SWTC must specify the following:   * Sequence of steps for each test case * Required ranges of input parameters that will adequately cover the range of intended use and/or possible abnormal conditions. * Anticipated output values and the acceptance criteria (e.g., tolerances) * Information required by Attachment A (SWTC results template). Record test results on the template (hover mouse over fields for guidance) | |
| 7.3 Test Methods/Stages To Be Used (check all that apply) | Black box | In black box test methods, the test inputs can be generated and the outputs captured and completely evaluated from the outside of a test item (i.e., test cases are developed from the test item specification, only without looking at the code or design). |
| White box | A white box test method considers the internal structure of the software (e.g., attempts to reach all of the code). This commonly requires test support software. |
| Beta testing | A beta acceptance test (BAT) is an acceptance test performed in a simulated (i.e., beta) environment. It is completed prior to executing an acceptance test (in the actual operating environment) in order to minimize risk. |
| Other |  |
| 7.4 Test Rationale/Criteria | **Normal** Condition Testing. One test criterion is that the software satisfies the software requirements under normal operating conditions. Normal conditions are generally described as *(provide brief summary of normal conditions).*  **Abnormal** Condition Testing. Another test criterion is that the software satisfies requirements in abnormal events and/or conditions. These tests are designed to “break the software” based on  triggering events and/or conditions identified in a hazard analysis *(provide reference software hazard analysis document identifier (e.g., number) and title here),* and/or  industry accepted test strategies and techniques.  These abnormal events/conditions include the following:   * Abnormal Condition No. 1 *(Provide brief summary of abnormal conditions).* * Abnormal Condition No. 2 *(Provide brief summary of abnormal conditions).* | |
| 7.5 Test Coverage and Justification | Test coverage is an indication of the degree to which the test item has been reached, or “covered,” by the test cases. Ensure that testing adequately samples or covers enough of the code to demonstrate adequacy. Test coverage must be specified to ensure sufficiency of testing. The following minimum test coverage must be achieved through testing:   * *(add numeric value 1–100)*% of code (e.g., logic branches) tested * *(add numeric value 1–100)*% of testable requirements tested.   The justification for this coverage is *(provide justification for selected test coverage).* | |
| 7.6 Acceptance Criteria | All test cases must satisfy the acceptance criteria for each item in the associated SWTC. No exceptions. | |
| 7.7 Suspension Criteria | Suspend testing (including execution of a hold point as applicable) if/when the following criteria are met *(provide test suspension criteria here).* | |
| 7.8 Resumption Requirements | Resume testing (including release of hold points) when the following criteria are satisfied *(provide test resumption criteria here).* | |

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| **8.0 Test deliverables** |
| 8.1 Execution of this SWTP will result in the following deliverables: |
| 1. SWTP (this document) 2. SWTM 3. Revised SWBL (as required if changes are made to the SWBL during testing) 4. Completed SWTC Results (Records) Templates 5. Problem Reports (as required) 6. SWTR(s) (including test input files, test output files, test log, test condition detail) 7. Tested Computer Program Files (including configuration files and/or database files) |

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| **9.0 TEST PREREQUISITES** | |
| 9.1 R2A2 | The TL and T(s) must review R2A2s in Field 5 prior to testing. Document review and agreement. |
| 9.2 Training/  Qualification | The following training/qualification/certification must be satisfied by the TL and T(s) prior to performing testing: *(provide criteria here).* |
| 9.3 Environment | Ensure the setup for each item below is in place for the following prior to testing.   1. Hardware Setup/Integration *(describe setup here)* 2. Computer Program Setup *(describe setup here)* 3. Computer Program Tool Setup *(describe setup here)* 4. Computer Program Databases/Configuration Setup *(describe setup)* 5. Security (including Cybersecurity) Setup *(describe setup here)* 6. Safety Setup *(describe setup here)* 7. Communication/Notification Setup *(describe setup here)* 8. Condition Setup (e.g., Abnormal Condition 1) *(describe setup here)* 9. Documentation Setup *(describe setup here, including test templates)* 10. Other Facility-Specific Setup *(describe setup here)* |
| 9.4 Problem Reporting, Corrective Action & Change Process | During testing, use the following for problem reporting and corrective action, and as required, make changes during testing: *(describe and/or reference the problem reporting and corrective action process and the change process to be used during testing).* |
| 9.5 Test Metrics | Collect and document the following metric data as part of the test effort and summarize plan vs. actual in the SWTR:   1. Test Management Metrics—Actual vs. planned test schedule variance 2. Product Quality Metrics—Number of defects identified during testing. 3. Test Process Metrics—Number of test plan defects and/or required changes needed to complete testing. |
| 9.6 Other Prerequisites | *(Describe other prerequisites here or enter “NA”).* |
| 9.7 Pre-Test Verification/ Readiness Check | Verify that acceptance test prerequisites have been satisfied prior to testing and document the verification (test readiness). |
| 9.8 Execute BAT | Perform and document a BAT a minimum of one time showing that the acceptance test criteria were satisfied in a beta environment. Include the TL, T(s) and SRLM signatures on the BAT SWTR. Include the BAT SWTR in the acceptance test SWTR. |

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| **10.0 teSt execution** | | | |
| 10.1 Test Conditions, SWTCs, Sequence and Pass Frequency | Once the test prerequisites are satisfied, and as applicable authorization to begin testing is obtained, successfully execute the following SWTCs in the specified sequence the specified minimum number of times shown below. A successfully executed SWTC must result in a “test passed” result. | | |
| (a) Test Condition Name | (b) SWTCs and Sequence | (c) Min. times test must pass |
| Normal |  |  |
| Abnormal Cond. 1 |  |  |
| Abnormal Cond. 2 |  |  |
| 10.2 Test Process | 1. Test per this SWTP and the SWTC(s). 2. Perform preliminary evaluations to determine the validity of the test results and the appropriateness of continuing to test. 3. If a SWTC fails, document the failure on the SWTC Results Template (Attachment 1); if possible, complete the SWTC. 4. Review/evaluate test failures to determine the reason for the failure; if more than three failures occur, contact the SRLM for further direction (SWTP control point). 5. If a test failure is a result of the SWTC and/or SWTP design (i.e., is not a computer program and/or other computer program (e.g., database) file failure), revise the SWTC/SWTP per the document change process described in the SWPP and retest using the revised SWTC/SWTP. 6. If the test failure is a result of a computer program failure, modify the computer program per the change process and retest. 7. Test and document results until the acceptance criteria are satisfied and the test passes. Document SWTC test results, including metrics as applicable, per the SWTC instructions. Develop, maintain and include in the SWTR a test log to indicate the test status and demonstrate testing was performed as required. | | |

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| **11.0 test report (swtr)** | |
| 11.1 Prepare for Review | The TL shall compile test case results into a SWTR. Submit the SWTR for review per the document control process in the SWPP. |
| 11.2 Review, Comment, and Disposition Comments | For those individuals assigned roles in Field 5, review the SWTR in accordance with the document control process per the SWPP. As applicable, 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. Evaluate the adequacy of the system software and metrics. Evaluate conformance of the results with test requirements and acceptance criteria. Identify any additional test requirements and/or any necessary changes to the test plan. Document the review of   * The acceptance criteria specified in the SWTP and the SWTC(s), and * The verification and validation (V&V) criteria in Table 1c—V&V Tasks, Inputs, and Outputs, IEEE STD 1012-2012, *IEEE Standard for System and Software Verification and Validation*, Sections 9.7 (Activity: Software Acceptance Test V&V); and 9.8 (Activity: Software Installation and Checkout V&V).   Retain review criteria/tasks, comments (including acceptability or unacceptability for each review criteria/task), and comment dispositions as records per the SWPP.  For calculations used as part of reviews, prepare calculations per AP-341-605, *Calculations* procedure. Retain review comments, comment dispositions, and calculation records and include in the SWTR. |
| 11.3 Approve | Upon satisfactory disposition of comments, those assigned roles per Field 5 shall review and approve the SWTR. |

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| **12.0 ATTACHMENT lIST** | |
| 12.1 Attachment Number or Letter | 12.2 Attachment Title |
| A | Software Requirements Test Case (SWTC) Results Template |

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| **13.0 references** | |
| 13.1 Reference Identifier and Revision | 13.2 Reference Title |
| SWPP-XXX-XX | *Software Project Plan (SWPP) for (provide software name here).* |
| SWTM-XXX-XX, revision as per SWBL) | *Software Requirements Traceability Matrix (SWTM) for* *(provide software name here).* |
| XXX, revision as per SWBL | *(Provide problem reporting and corrective action procedure title here.)* |
| XXX, revision as per SWBL | *(Provide change procedure title here.)* |
| IEEE STD 1012-2012 | *IEEE Standard for System and Software Verification and Validation* |

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| |  | | --- | | **1.0 Test Review and approval** | | | | | | | | | | | | |
| 1.1 As the Responsible Test Acceptance Authority for evaluating SWTC results, I have analyzed and evaluated the test results to verify (a) completeness of results, (b) achievement of test objectives, and (c) conformance to the associated Software Test Plan (SWTP) and SWTC. I conclude the test has | | | | | | | | | | | [**Passed**](#_top) |
| [**Failed**](#_top) |
| 1.2 [Comments](#_top) (as applicable) | | | | | | | | | | | |
| 1.3 [Responsible Test Acceptance Authority](#_top) (*Name, Z# [if applicable], Organization, Signature, Date*) | | | |  | | | | | | | |
| 1.4 [The following have performed their roles per the associated SWTP and SWTC](#_top): | | | | | | | | | | | |
| 1.5 Name (last, first) | 1.6 Z Number | | 1.7 Role | | | | | | 1.8 Review and Approval Signature and Date | | |
| Tester (T) | | Test Leader (TL) | | SQA-SME | Other |  | | |
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| |  | | --- | | **2.0 test Description AND conditions** | | | | | | | | | | | | |
| 2.1 [Summary Test Description/Type of Test](#_top) (see Appendix 1 for details) | | | | | | | |  | | | |
| 2.2 [SWTP No. & Revision Used](#_top) | |  | | | | 2.3 [SWTC No. & Revision Used](#_top) | | | |  | |
| 2.4 [Items Tested](#_top) (e.g., software, software tools, system software, software versions, hardware, catalog no. etc. Include identification code for facility hardware (if used) per STD-342-100, Ch. 1, Section 200: | | | | | | | |  | | | |
| 2.5 [Date(s) of Test](#_top) | | | |  | | | | | | | |
| 2.6 [Measuring & Test Equipment (M&TE) Used](#_top) (include equipment number, description, calibration date, and calibration expiration date) | | | |  | | | | | | | |
| 2.7 [Simulation Models and/or Test Problems Used](#_top) (include revision) | | | | | | | |  | | | |
| 2.8 [Prerequisites (Including T and TL Agreement to R2A2) Were Verified Prior to Testing](#_top) | | | | Yes | | | | 2.9 [Name of Verifier](#_top) | |  | |
| 2.10 [Test Condition Used](#_top) (e.g., Abnormal 1) | | | |  | | | | | | | |
| |  | | --- | | **3.0 test input** | | | | | | | | | | | | |
| 3.1 [Summary Description of Test Input](#_top) (see Appendix 2 for details) | | | | | | |  | | | | |
| 3.2 [Test Input File(s) Name and Version](#_top) | | | |  | | | | | | | |

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| **4.0 test output** | | | | | | | | |
| 4.1 [Test output is summarized below](#_top). The detailed raw test output is provided in Appendix 3. | | | | | | | | |
| 4.2 [No](#_top). | 4.3 [Tested Characteristics](#_top) (e.g., functional requirement) | | 4.4  [Expected Result](#_top) | 4.5  [Test Result](#_top) | 4.6  [Acceptance Criteria](#_top) (e.g., tolerance) | 4.7  [Evaluation of Result](#_top), Comments | 4.8  [Conclusion](#_top) (*Pass or Fail*) | 4.9  [Disposition, and/or Action Taken](#Text2) |
| *1* | *Example Text: Open valve V-1 when Switch SW-1 is activated* | | *Valve opens within 1 second of SW-1 activation* | *Valve opened within 1.5 seconds of SW-1 activation* | *Valves opens within 1 to 3 seconds of when SW-1 is activated* | *Valve opened within the acceptance range of 1 to 3 seconds* | *Pass* | *None* |
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| **5.0 APPENDIX lIST** | | | | | | | | |
| 5.1 Appendix Number | | 5.2 Appendix Title | | | | | | |
| 1 | | [Test Condition Detail](#_top) | | | | | | |
| 2 | | [Detailed Test Input](#_top) | | | | | | |
| 3 | | [Detailed (Raw) Test Output](#_top) | | | | | | |

**GENERAL**

This template is provided to promote the successful and consistent implementation of the software acceptance test plan (SWTP) requirements of [P1040](https://int.lanl.gov/policy/information-management.shtml), *Software Quality Management*. It may also be used for [STD-342-100](http://engstandards.lanl.gov/index.shtml), *Engineering Standards Manual (Chapter 21, “Software”*), and/or other programs. ***Note:*** [P1040](https://int.lanl.gov/policy/information-management.shtml) invokes [P330-8](http://int.lanl.gov/policy/management-systems.shtml), *Inspection and Test* for general and software-specific test requirements.

This template is not mandatory. Other templates or formats may be used.

The governing program must be used in conjunction with this template for definitions, details and to ensure all applicable requirements are satisfied.

This template is based on American Society of Mechanical Engineers (ASME) NQA-1-2008/NQA-1A-2009, *Quality Assurance Requirements for Nuclear Facility Applications* as well as the Institute of Electrical and Electronics Engineers (IEEE) Std 829-2008, *Standard for Software and System Test Documentation*.

This template is intended for acceptance testing of safety software and risk significant software. It may be used for commercially controlled software and/or for other software testing (e.g., interim tests and/or in-use tests for the entire software lifecycle) if desired by the Software Owner Responsible Line Manager (SO RLM or SRLM are used interchangeably). If used for such purposes, tailor the procedure as appropriate based on the risk of failure or malfunction of the software.

The software designation—safety, risk significant, or commercially controlled software—and the Software Risk Level (SRL)[[1]](#footnote-1) must be known to complete this template. See P1040 and Form [2033](http://int.lanl.gov/tools/forms/numerical.shtml) (LANL Forms Center) to determine the designation and SRL.

Throughout this template, instructions require entering “NA” for fields that are not applicable. Other such designations are acceptable (e.g., “none” or “not applicable”).

If entering sensitive information (e.g., Unclassified Controlled Nuclear Information [UCNI]), ensure proper Derivative Classifier/Reviewing Official reviews are performed and appropriate markings applied.

Throughout the template, “must” or “shall” is used to indicate requirements. “Should” is used to indicate guidance and/or a best management practice.

Use the instructions below and the instructions embedded in the template that are denoted *(in blue, italicized text)*.

**i. HEADER INFORMATION**

|  |  |
| --- | --- |
| **Field** | **Entry Information** |
| Software name | Enter the software name in the upper right hand corner of the header after “Template For:” |
| Document identifier and revision | Enter the document identifier (e.g., number or letter) and revision for the SWTP per the SRLM’s document control process. |
| Effective date | Enter the date the SWTP takes effect (i.e., must be followed). This must be on or after the date of the last required review and approval in Field 1.4. It is acceptable to indicate “latest date per Field 1.4.” |
| Next review date | In accordance with the SRLM’s document control process, enter the date the document must be reviewed (at a minimum) to determine if the document must be revised. If a minimum document review frequency is not specified in the document control process, and/or a review frequency is not desired by the SRLM, enter “NA” for not applicable. |

**1.0 DOCUMENT REVIEW AND APPROVAL**

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| --- | --- |
| **Field** | **Entry Information** |
| 1.1 | Enter the name of those who must review and approve the SWTP. Hover your mouse over the blue, underlined role (e.g., SO) in Field 1.3 for [P1040](https://int.lanl.gov/policy/information-management.shtml) guidance. If additional reviewers and approvers to the minimum are desired by the SRLM (e.g., those responsible for test witnessing and/or releasing hold points), add the role title to the “Other” field and/or add more columns/rows as required. If not, leave Other field blank or enter “NA.” Note that one person may have multiple roles (i.e., in some cases the SRLM may also be the SU RLM and/or the SD RLM). |
| 1.2 | Enter the Z number (if applicable). Enter “NA” if not applicable. (Some persons involved with the software may not be a LANL employee or subcontractor with an issued Z number.) |
| 1.3 | Enter an “X” for each role the person is filling. One person may fill multiple roles except for those personnel performing an independent activity. If additional roles are desired, add the role in the fields entitled “Other” (e.g., additional users).  ***Note:*** Hover your mouse over the hyperlinked roles for guidance. |
| 1.4 | Enter the date and signature that the SWTP was reviewed and approved. Electronic signatures are acceptable. |

**2.0 REVISION HISTORY**

|  |  |
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| **Field** | **Entry Information** |
| 2.1 | As required, revise the SWTP per the governing document control procedure (i.e., make revisions, issue the revised document for review, review and comment, disposition comments and obtain signatures in Field 1 for the revised document). Enter the SWTP revision number (or letter). Retain prior revision numbers/letters. |
| 2.2 | Enter the date the revision took effect (effective date). |
| 2.3 | Enter (1) a summary description of SWTP revision and (2) the reason for the revision. |

**3.0 INTRODUCTION—PURPOSE, AUTHORITY AND APPLICABILITY**

| **Field** | **Entry Information** |
| --- | --- |
| 3.1 | Review and, as required, revise introductory text to ensure accuracy for the SWTP purpose, SWTP scope, authority, applicability and organization. |

**4.0 SOFTWARE OVERVIEW**

| **Field** | **Entry Information** |
| --- | --- |
| 4.1 | Revise text to provide an overview of what the software does and how it is used. For consistency, consider using the same summary description used in the SWPP. |

**5.0 ROLES, RESPONSIBILITIES, ACCOUNTABILITIES AND AUTHORITIES (R2A2)**

|  |  |
| --- | --- |
| **Field** | **Entry Information** |
| 5.1 | Customize (add, delete and/or modify) the text for the specific software. Ensure the minimum governing program (e.g., [P1040](https://int.lanl.gov/policy/information-management.shtml) [including [P330-8](http://int.lanl.gov/policy/management-systems.shtml)]) required roles are included. Note that for SRL-1 and SRL-2 software, individuals other than those who designed the software or computer program must verify and validate (V&V) the design adequacy.  As required, add responsibilities for other personnel to ensure successful test integration with affected facilities, programs and/or computer networks (e.g., Facility Operations/Engineering Personnel, Safety Basis personnel, Program/Process/Product Personnel, Network and Infrastructure Engineering). Delete roles/responsibilities that are not applicable (e.g., for off-the-shelf acquired software, delete the SD RLM role and associated responsibility text. |

**6.0 TEST ITEMS**

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| **Field** | **Entry Information** |
| 6.1 | Modify the text for the specific software. Identify the items that are the object of testing. This includes the computer files (e.g., executables as well as configuration files and/or databases, database conversion software), support software (e.g., system software), documentation (e.g., installation instructions, user instructions) and interfacing (integrated) hardware. Include the unique identifier (e.g., version/revision for software or for hardware, serial no.) of the items. If there are items that are related to testing but are specifically excluded from testing, list them.  For software versions, one may either reference the software baseline (SWBL) or list the items. If referencing the SWBL, verify the SWBL revision level of each item prior to testing. As necessary, make revisions to the SWBL prior to testing per the software project planning documentation to ensure the SWBL accurately describes the revision of items to be tested. |

**7.0 TEST APPROACH**

|  |  |
| --- | --- |
| **Field** | **Entry Information** |
| 7.1 | Modify the text for the specific software. Template [3056](http://int.lanl.gov/tools/forms/numerical.shtml), *Software Traceability Matrix* or similar document is recommended to assign, document and provide traceability of testable requirements in the requirements document(s) to one or more test cases. Develop software test cases per the SWTM.  ***Note:*** For those requirements that are not testable, code and/or documentation reviews must be performed (sometimes also referred to as inspections or static tests) as required by the SWPP to verify the requirement is satisfied. If not addressed elsewhere, the non-testable requirement scope may be included in the SWTP. |
| 7.2 | Modify the text for the specific software. Using the document control procedure identified in the SWPP, develop SWTCs in accordance with SWTP and include them in the SWBL. Base the test requirements and acceptance criteria upon specified requirements contained in the applicable design documents or other pertinent technical documents that provide approved requirements.  ***Note:*** Test results may be documented on Attachment A (the SWTC results template)or other methods (e.g., directly in the test case) as long as the information on Attachment A is documented. Hover your mouse over the fields in the attachment for guidance. |
| 7.3 | Select one or more of the test methods/stages that will be used. (Ref. IEEE STD 829-2008). Beta testing, (e.g., factory acceptance testing) is recommended where possible when testing in the actual operating environment may produce unsafe or otherwise unacceptable conditions (e.g., test defects during software ventilation system testing in an actual radiation operating environment could result in contamination). |
| 7.4 | Modify the text for the specific software. Describe the approach taken to demonstrate requirements are satisfied with respect to normal and, as required, abnormal conditions. Describe the events and/or conditions. Specify the parameters for each condition to sufficient detail that they can readily be achieved, measured, tested, and recorded without recourse to the test plan developer. At a minimum, conditions must represent normal operating conditions. Test abnormal conditions as required. See abnormal condition examples below:   * **A latent run-time error condition** is a condition where an error persists and causes the program to continually use random access memory (RAM). It may be tested to ensure the system doesn’t crash after the system is in operation for a long period of time (i.e., burn in). * **A database error condition** is a condition using a database with either the wrong type of data, incorrectly formatted data, or files too large to process. It may be tested to ensure the system does not crash and/or result in unsafe conditions when database errors are introduced or the database file is otherwise corrupted. |
| 7.5 | Modify the text for the specific software. Indicate the minimum coverage with respect to code tested and requirements tested. Address requirements for testing logic branches. Provide justification. |
| 7.6 | Modify the text to specify the criteria to be used to determine whether a test has passed or failed testing. This is referred to as acceptance criteria or pass/fail criteria. |
| 7.7 | Specify the criteria used to suspend all or a portion of testing. |
| 7.8 | Specify the criteria used to resume all or a portion of testing. Include the testing activities that must be repeated when testing is resumed. |

**8.0 TEST DELIVERABLES**

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| **Field** | **Entry Information** |
| 8.1 | Modify the text to identify deliverables produced by the test activity (documents, data, etc.). |

**9.0 TEST PREREQUISITES**

|  |  |
| --- | --- |
| **Field** | **Entry Information** |
| 9.1 | Modify the text to ensure that those performing testing (T and TL) review, agree, and document their agreement to the R2A2s prior to testing. |
| 9.2 | Modify the text to specify the training, qualification, and/or certification criteria that those performing testing (at a minimum the T and the TL) must satisfy to promote successful testing. Note that P330-8 requires certification in some applications. The criteria may be qualitative skill descriptions, (e.g., existing or new software user, degree of independence) and/or specific training criteria (complete UTrain course XYZ). Individuals independent of the software design team (those not involved in software development) are recommended for testing. |
| 9.3 | Modify the text as required. Specify the environment (configuration) required for testing. As necessary, address the environment required (a) before testing, (b) during testing, and (c) after testing to ensure safe and successful testing. If P1040 is used, see P330-8, Table 1 and Att. B. Interface and coordinate those that may be impacted by testing. When changes to the approved configuration of a facility are required for testing, obtain approval by the Facility Design Authority (DA) or Facility/Design Authority Representative (FDAR) and others as required in the governing engineering and/or other work control process (e.g., AP-341-504, *Temporary Modification Control)* prior to performing the test. If Using P1040, See Section 3.3.2.d, *Complete Other Test Readiness Activities* and 3.3.2.e, *Test Plan Aids.* In some cases, the test environment may be adequately described in other documents (e.g., the SWPP and/or software system description); referencing to those documents is acceptable if it adequately describes the test environment.  ***Note:*** Specifying the various environments (pre-test, during testing, and post-test) for embedded software in an operating facility is especially important to ensure testing occurs without imparting adverse impacts to the operating facility. |
| 9.4 | Modify the text as required. Specify the problem, reporting, and change processes that will be used during testing. Provide for documentation and disposition of observations of unexpected or unintended results prior to use. (See Attachment A). |
| 9.5 | If test metrics are used, modify the text to describe the metrics. If not used, enter “NA.”  Test metrics generally fall into three types: (1) test management metrics, (2) product quality metrics and (3) test process metrics. Test management metrics report the test progress against the SWTP (e.g., planned vs. actual metrics on test schedule progress, level of effort, cost, etc.). Product quality metrics provide insight into the quality of the software being tested and the effectiveness of the testing activities (e.g., defect rates). Test process metrics help evaluate the effectiveness/efficiency of testing activities (e.g., defects in the SWTP). |
| 9.6 | Provide other prerequisites as required to perform testing. If not applicable, enter “NA.” |
| 9.7 | Revise text to ensure that prerequisites are satisfied prior to testing. |
| 9.8 | Revise text as required to execute a BAT prior to an AT. If not applicable, enter “NA.” |

**10.0 TEST EXECUTION**

|  |  |
| --- | --- |
| **Field** | **Entry Information** |
| 10.1 | Modify the text as required to describe each test condition, SWTC and sequence for each test condition, and the minimum number of times the test must pass each test condition. If the SWTP scope is for the software lifecycle, address in-use testing (Ref. P330-8). |
| 10.2 | Modify the text as required to define and control the test process and to ensure testing is performed in accordance with the SWTP and the governing work control process. Develop the test to obtain necessary data with sufficient accuracy for evaluation and acceptance. Assure necessary monitoring is performed. Document and maintain test results. Address retesting for previously tested items that have been modified. Include testing for cybersecurity vulnerabilities as applicable. If P1040 is used, see and employ P330-8, Table 1, Section 3.3.3, Step 3: *Perform the Test,* and Att. B. |

**11.0 TEST REPORT (SWTR)**

|  |  |
| --- | --- |
| **Field** | **Entry Information** |
| 11.1 | Modify the text as required to describe the process for preparing the SWTR for review. |
| 11.2 | Modify the text as required to describe the process for reviewing the SWTR. Note per P330‑8:  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. For those computer programs used in design activities, assure that the computer program produces correct results. For those computer programs used for operational control, ensure demonstrated required performance over the range of operation of the controlled function or process. Evaluate the adequacy of the system software. |
| 11.3 | Modify the text as required to describe the process for approving the SWTR. |

**12.0 ATTACHMENT LIST**

| **Field** | **Entry Information** |
| --- | --- |
| 12.1 | List attachments as appropriate. Enter the attachment number or letter. |
| 12.2 | Provide attachment title. |

**13.0 REFERENCES**

| **Field** | **Entry Information** |
| --- | --- |
| 13.1 | List references as appropriate. Include the SWPP (or if using ESM Ch. 21, the Software Data Sheet [SWDS]). Enter the reference number and revision. |
| 13.2 | Provide title of reference. |

1. Per P1040, commercially controlled software does not have an SRL [↑](#footnote-ref-1)