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Testing Description

Purpose:

The purpose of testing is to analyze a particular item (hardware, software, process) to determine the differences between its requirements and actual behavior, and to evaluate the features and functionality of the given item to ensure it meets the needs of the user.

There are various phases to testing, each with a different emphasis and purpose. Testing should start at the lowest (smallest) possible item, and work towards testing the entire system as a whole (include business processes where applicable).

If the system includes COTS products, there may not be any unit testing of the COTS, but integration testing should be conducted to ensure that the various pieces of the COTS work correctly on the proposed system hardware. Interface testing is also important when utilizing COTS products.

Note: there may be cases where it is not possible or feasible to test a given requirement. In this case, other methods must be used to verify the intent of the requirement was met. When writing requirements, "testability" and specific test methods and expected results for testing the requirement should be considered.

Definitions:

- **Test Phases** - See [Test Phases](#).
- **Test Traceability** - Every test must verify a specific requirement(s) and the requirement(s) should be referenced in the appropriate test procedure. In some cases, multiple tests may be required before a requirement can be considered completely verified. Requirements traceability is also performed to ensure that all requirements have been completely tested. See also [Requirements Traceability](#).
- **Test Coverage** - Ensuring that sufficient breadth and depth of testing has been executed such that all the requirements (and all aspects of a requirement) and key functionality have been verified. Coverage often asks such things as:
 - Was the range of values for the inputs sufficient? Were "good/normal" and "bad" cases tested? How many error conditions were tested? Were unlikely (but possible) combinations checked? Were divide by zero calculations checked?
 - For requirements with multiple options, was each option tested? Was each option tested for "good" and "bad" cases?
 - If the requirement was a general requirement (e.g., all reports must be page numbered), how many tests specifically checked this requirement?

Process Relationships and Dependencies:

- [To the SID Lifecycle Framework](#) (the big picture)
- [To the Primary Processes](#)
- [To the Supporting Processes](#)

Process Details:

- [Test Strategies and Considerations](#)
- [General Process Steps](#) (for new systems and M&O)

- [Test Environments](#)
- [Test Exit Criteria - General](#)
- [Risks and Considerations](#)
- [Work Products and Deliverables](#)
- [Testing Standards](#) (to discuss in an RFP)

Tools:

- None at this time

References:

- IEEE Standard [829-1998](#), Standard for Software Test Documentation (link to pdf)
- IEEE Standard [1008-1987](#), Standard for Software Unit Testing (link to pdf)
- Software Program Managers Network (SPMN)
 - [Little Book of Testing, Volume I](#) (pdf)
 - [Little Book of Testing, Volume II](#) (pdf)

Samples:

- [Testing Responsibility Assignment Matrix](#) (MS Word)
- [Test Summary Matrix](#) (MS Word)


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[Test Main](#)

Test Phases

The following are the test phases used by SID:

- **Unit Testing** - Verifies individual hardware or software units, or small groups of related code unit. Emphasis on removal of basic coding errors.
- **Functional Testing** - Verifies small groups of modules that are functionally or logically related. Verifies interfaces between related modules and utility functions. This phase is optional, but recommended for complex processing areas.
- **Integration Testing** – Verifies functional groups, inter-function interfaces, critical external interfaces and user and business workflows and scenarios.
- **System Testing** – Verifies the complete, integrated system meets its objectives and requirements. All external interfaces are verified along with end-to-end business workflows.
 - **External Interface Testing** – Verifies the interfaces (data and control elements) with external systems. Usually requires special test environments and coordination.
- **Performance Testing** - Verifies the system meets the performance requirements and can handle "stress" and worst-case scenarios.
- **Regression Testing** – Re-execution of previously executed tests to ensure the test results are the same and that the recent changes have not degraded the system. Regression testing may be performed at the end of each test phase (after all fixes for that test phase have been incorporated), or as a separate test phase prior to Acceptance Testing.
- **User/Acceptance Testing** – Validates the complete, integrated system satisfies its acceptance criteria and meets the customer's expectations. Usually the users are responsible for executing the tests. May also involve verification of help desk functions, backup and recovery, business processes, training evaluations, etc. For new systems, the RFP/ITP and/or contract usually describe the high-level approach and procedures for acceptance testing, as well as the critical criteria for acceptance.
- **Pilot/Field Testing** - Verifies the system and business processes in the actual county environment under typical business conditions. May also involve verification of help desk functions and manual procedures. This phase is optional for M&O; for new systems, pilot/field testing is usually discussed in the RFP/ITP and/or contract.
- **Installation or Production Testing** – Verifies the installed system performs as expected in the user's environment (if acceptance or pilot testing was not performed at the user location). This is the final check-out of the system prior to retiring the existing system (if one exists), and/or turning responsibility for the system over to the user organization or Maintenance and Operations (M&O) staff. The system is used for processing actual business using "live" data and the new/modified business processes.


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Test Strategy

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When planning the project, it is important to consider the project's approach to testing and acceptance. The intent of the Test Strategy is to establish the framework for testing the system and work products delivered by the Contractor. The Strategy should identify the types of testing that you expect the Contractor to address in their proposals. The Strategy should also define the level of participation for the project office, users and Sponsor, and the responsibilities for all participants. (See also [Testing Description](#).)

The Test Strategy is used during the Planning and Procurement phases of a New Systems Acquisition to help the Project Office clarify expectations with the user, Sponsor and bidders. Prior to Contract Award, the State should prepare a [Test and Evaluation Plan](#) that describes the details of how the Project Office will evaluate the Contractor's work products, system, and testing activities and results. The Contractor may also prepare a [Master Test Plan](#) that describes their approach to all testing phases and the activities for which they are responsible. At a minimum, they should submit test plans for each phase with their high-level test approach documented in their Project Management or Software Development Plans.

The Test Strategy for M&O is similar to that for new systems, but includes a greater focus on regression testing and keeping the users informed of specific fixes or changes that were requested. The test process should be described in terms of the periodic release cycles that are part of the change control process. It should also describe a set of minimum tests to be performed when emergency fixes are needed (for instance, due to failed hardware or recovering from a database crash).

Typical test issues include:

Test Participation - Project Office Staff. The project office should participate in testing as soon as possible. This may not be possible if the contractor performs some or all of the development at a remote location. At a minimum, the project office should participate in System Testing and all subsequent test phases. Where possible, the project office should participate in Functional and Integration testing. If the State will be maintaining the system, then the M&O staff should participate in unit testing, if possible. In some cases, the project office staff may request the IV&V vendor to participate in or execute some of the test phases to ensure an un-biased third-party opinion on the status of the system.

Test Participation - User and Sponsor. Often the sponsor and user elect to not participate until Acceptance Testing. However, SID recommends that the User participate or at least observe System Testing, and that the User and Sponsor participate as testers during Acceptance Testing. The User and Sponsor should participate in any test that formally verifies a business requirement to ensure their needs have been addressed.

Test Environments. The Contractor usually provides the development and test environments, in addition to the production environment. How many environments, and which [test environments](#) can be co-located on the same hardware must be decided. If some of the development is being performed off-site, the RFP/ITP/contract should indicated which types of testing may be performed remotely and which must be performed on-site. Another consideration is whether the test environments are considered deliverables which will be retained by the State, or if the test environments remain the property of the Contractor.

Approach to Testing External Interfaces. Testing external interfaces is critical to ensuring a working system, and may help to identify performance issues before beginning production. Some external organizations have dedicated test environments, but most do not. Thus the Project Office must determine how to approach and coordinate testing of these interfaces. A tradeoff must be made about a reasonable level of confidence in the system/testing and the amount of risk the project is willing to accept, vs. the amount of work, coordination and ability of the external organization to participate in testing. The best approach is to include the external organization in the planning process early to determine what is and is not possible.

Approach to Testing COTS products. Although most COTS products are assumed to perform

correctly, there is some testing required to ensure that the COTS product correctly interfaces and supports the rest of the system. For any COTS other than the Operating System and DBMS, the outputs should be verified for typical and error cases. If data is being interchanged, then input and output formats should be verified for correctness. COTS testing should begin in parallel with Integration testing.

Scope of Acceptance Testing. The scope of acceptance testing may depend on what the Contractor is responsible for. Often testing needs to include the business processes, help desk functions (including knowledge base and procedures), backup and recovery, disaster recovery features, system administration tools, specialized hardware, M&O procedures, year-end and quarterly reports, and other user documentation.

Verification of Un-testable Requirements. In some cases, it may be difficult or impractical to test a given requirement. A method of verifying such requirements should be established. These un-testable requirements should be included in a test procedure/script(s) and verified during or just prior to Acceptance Test. The method of verification and appropriate witnesses and supporting documentation should be documented. Typical verification methods include code inspection, simulation using test tools, or, as a last resort, a certification letter from the contractor indicating they will be responsible for any damages resulting from failure of the requirement.

Criteria for Acceptance of the System. The criteria for acceptance is a critical decision that must be documented. Although not all criteria may be identified during the Planning phase, the majority should be documented as part of the RFP/ITP and/or contract. Acceptance criteria typically include (but are not limited to) satisfaction of all requirements (as stated in the RFP/ITP/contract and any associated change orders), approval of all deliverables, and satisfaction of all performance requirements. Some projects have required the system to be in production for a set period of time (to test system stability and its ability to satisfy the user's business needs) prior to conferring acceptance.

Pilot or Field Testing. The Project Office must decide if a pilot or field test (or several pilot/field tests) are warranted based on the type and complexity of the system being developed. The project should have an explicit, stated reason for conducting a pilot and a specific goal (e.g., verifying interfaces with other co-resident applications on the user's desktop). The type of user environment, volume of workload, types of work processed, location, and impact to day-to-day operations should be considered when choosing a pilot location. The outcomes of testing should also be considered: what happens if the pilot fails? what happens if it is successful? what constitutes "success" for the pilot?

Performance and Capacity Requirements/Testing. Performance and capacity testing is critical for any system. The Project Office must work with the User and Sponsor to identify the performance and capacity requirements and then to determine how to verify the requirements have been satisfied. Large amounts of data will be required, and responsibility for gathering or generating this data must be determined. Specific methods/formulas for measuring performance and capacity must be derived and reviewed to ensure that they are fair (often the Contractor does not have control over all of the network or the transmission lines; these should be factored out of the equation). Consideration should be given to when calculations and extrapolation of test results can be used in lieu of running a test, and when a test must be executed. Is the contractor allowed to use their own (company-owned) testing tools and environments, or must a third-party tool or testing service be used?


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Testing Process

[Test Main](#)

Process Details (for each phase):

Generally, the Test Manager is responsible for coordinating and/or performing the following steps.

1. Develop a [Test Plan](#) that describes the goals of this test phase and the methods that will be used to manage the testing effort.
2. Develop the [Test Design/Test Cases](#) that describe the types of tests and specific scenarios that will be executed to verify each requirement has been satisfied.
3. Develop the [Test Procedures](#) that describe the step-by-step actions to be taken, the inputs, and expected results and outputs for each test case.
4. Finalize the [Test Schedule](#) that describes the dates and sequencing of the test procedures. The schedule should account for test preparation and "clean-up" for each test procedure, particularly if the test environment requires any special configuration or special data setup. Typically, there are daily or weekly test status meetings with stakeholders and/or participants to discuss status and errors.
5. Develop or gather the necessary [Test Data](#) that will be required for each test. This may be a collection of electronic files, or actual paper documents that will be used in testing. Be sure that any sensitive data (such as social security numbers, or names) is marked and stored accordingly.
6. Begin building or loading and configuring the [test environment](#) for this test phase. This may include migrating code to the test environment, loading or configuring specific test tools, loading the database with the appropriate data, etc.
7. Conduct a Test Kickoff Meeting to discuss with stakeholders and test participants how testing will be managed, each individual's roles and responsibilities, and expectations for documentation, participation, time commitment and test schedule.
8. Verify that all preparations for testing have been completed. Refer to the [Test Preparation Checklist](#).
9. Execute the test procedures according to the Test Schedule. Record the results of each test and gather appropriate outputs to show proof of successful test completion, or specific errors/anomalies encountered. Collect any witness or observer logs and observations.
10. As tests complete or are cancelled, update the [Test Log](#) to indicate its status.
11. Record any errors/anomalies in the [Test Incident/Fault Log](#). Work with the development manager to ensure all incidents are analyzed. Results of the analysis should be presented at the Test Status Meetings, and re-tests scheduled or authorization to fix the problem given.
12. Conduct daily or weekly Test Status Meetings. At the meetings, review the status of recent tests (since the last test meeting), incidents/faults encountered and their disposition, status of fixes to be incorporated, status of re-tests, and any other test issues or status information. The test schedule should be reviewed and confirmed, or adjusted as needed.
13. When all tests are completed and no other re-tests are needed, prepare the [Test Summary Report](#). The summary should include a recommendation for either exit from the test phase, or re-execution of the test phase due to critical errors. The report should include or reference an analysis of [test and requirements traceability](#) (usually performed by IV&V or QA).
14. Conduct a Test Summary/Exit Meeting. See also [Phase Closeout Meeting](#).
 - o Discuss the results presented in the Test Summary Report.
 - o Discuss any concerns or issues remaining. Discuss any concerns or recommendations from QA, CM or IV&V.
 - o If appropriate, make Go/No-Go or Checkpoint Decision. Document decision in the meeting minutes.

- If the decision is to re-execute this test phase, the contractor should prepare a **Corrective Action Plan (CAP)** (MS Word) that describes how they will address the errors, the schedule for correction of errors and re-test, and the impacts to the remaining project milestones and activities.
- 15. Conduct a **Lessons Learned** session to collect ideas for improvement and correction.
- 16. Ensure all test phase documentation, files, and results are labeled and stored appropriately.

Common Risks and Considerations:

- **Poor Requirements** - Poorly written requirements will cause problems in testing. Be sure the true need of the user and the reason for the need are clearly understood.
- **Requirement Testability** - When writing the requirements, be sure to consider testability. When it is not possible to easily design a test, consider first what is the intent of the requirement? In some cases, other verification methods (such as code inspection or modeling) must be used instead of running an actual test on the system.
- **Schedule Compression** - Testing is often under-appreciated. Because it comes towards the end of the development phase, there is a tendency to continually compress the test schedule to make up for overruns during design and code. This seeming time savings will ultimately come back as more error reports and complaints from the user.
- **Stakeholder Participation** - Some projects have had trouble obtaining sufficient Sponsor and User staff to participate in testing efforts. Be sure to communicate the reason their participation is needed, amount of participation expected, and how their participation will help the project to succeed.
- **Test Staffing** - We recommend the project staff is involved early in the testing process, particularly if state staff will be performing the M&O of the system. However, often the budget does not allow for this early level of participation. If the staff cannot participate until later phases, they should at least review the summary reports from earlier test phases to understand some of the types of issues that have been found.
- **Testing of COTS** - When the solution entails mainly COTS products, there is a tendency to want to rush or skip testing. Testing is still required to ensure all parts interface together and to ensure that the COTS addresses the business needs of the user. For COTS, unit and functional testing may be skipped, but integration and system testing should still be performed.
- **External Interfaces** - Testing external interfaces requires strong coordination with other organizations over which the project has no control. Early planning and coordination is the best approach. Be sure to determine how the other organization will participate and if they will be hand verifying the data or actually running data through their system (either a test environment or the production environment during off-hours). While it is preferred that an actual test with their system be performed, often there are business constraints that prevent this. Be prepared with appropriate mitigation and contingency actions, as needed.
- **Performance and Stress Testing** - Performance and stress testing, while very important, can be difficult to setup. There are COTS tools available to help with these kinds of tests, but they can be expensive to buy or rent. The project should balance the amount of performance and stress testing required with the cost, level of risk to the project, and complexity and criticality of the system.
- **Acceptance** - Some projects perform Acceptance Testing before executing a Pilot. In this case, the system is essentially being verified in a controlled environment before being verified at a user location. It is important to clarify that "acceptance" under these circumstances means that the system appears to have incorporated all required functionality. Conferral of "acceptance" does not relieve the contractor from addressing problems found during the pilot.


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Test Documentation

Test Main

For a new system acquisition, the Project Office should prepare a [Test and Evaluation Plan](#) that describes the approach (including participation and expectations for the test phases) the project will use to verify the contractor's work products, the new system, and all deliverables. This information is also summarized (or referenced) in the RFP/ITP to describe to the bidders the project's expectations for testing, and in the project's Project Management Plan (PMP).

The project may require the Contractor to deliver a [Master Test Plan](#) that describes the sequence and approach for all testing phases and describes the general testing process at a high level. Otherwise, their high-level approach to testing should be described in either their Project Management Plan (PMP) or their Software Development Plan (SDP). In either case, the details for each test phase is usually described in separate test plans (e.g., Integration Test Plan, System Test Plan, Acceptance Test Plan, etc.).

[IEEE Standard 829-1998](#) (link to pdf) describes the types of test documentation and the expected contents and purpose. For more information on the contents of these documents, refer to the standard, the [Test Documentation Tree](#) (pdf) and [Example Test Documentation Hierarchy](#) (pdf). SID uses the following types of documentation based on the IEEE standard (where appropriate) **FOR EACH TEST PHASE:**

- **Test Plan** - Describes the approach to the test phase, the processes and responsibilities
- **Test Cases** - Describes the test procedures/scripts that will be used to test a particular piece of functionality
- **Test Procedures/Scripts** - Describes the specific steps and actions necessary to execute a specific test
- **Test Results Documentation** - Supporting materials generated during the course of the test that show outputs or actual results, such as printed reports, screen snapshots, batch processing logs, etc.
- **Test Summary Log** - Summary sheet listing all tests scheduled to be executed and their status
- **Test Fault/Incident Log** - Summary sheet listing all faults/incidents which occurred during testing and their disposition
- **Test Summary/Exit Report** - Report summarizing the test phase, activities and results. Used as part of a Text Exit Meeting
- **Minutes from Test Exit Meeting** - Minutes describing the discussion at the Test Exit Meeting, usually held to confirm next steps and, if appropriate, to make a Go/No-Go or Checkpoint Decision. Results and rationale for such decisions must be included in the minutes
- **Updated Requirements Traceability Matrix/Tool** - Updated matrix or tool showing which test procedures/scripts were used to verify which requirements and to ensure [requirements traceability](#) and testing coverage
- **Test Data** - Any data used during the test. All data should be kept to ensure that tests may be repeated if needed to re-create an error as well as for regression testing

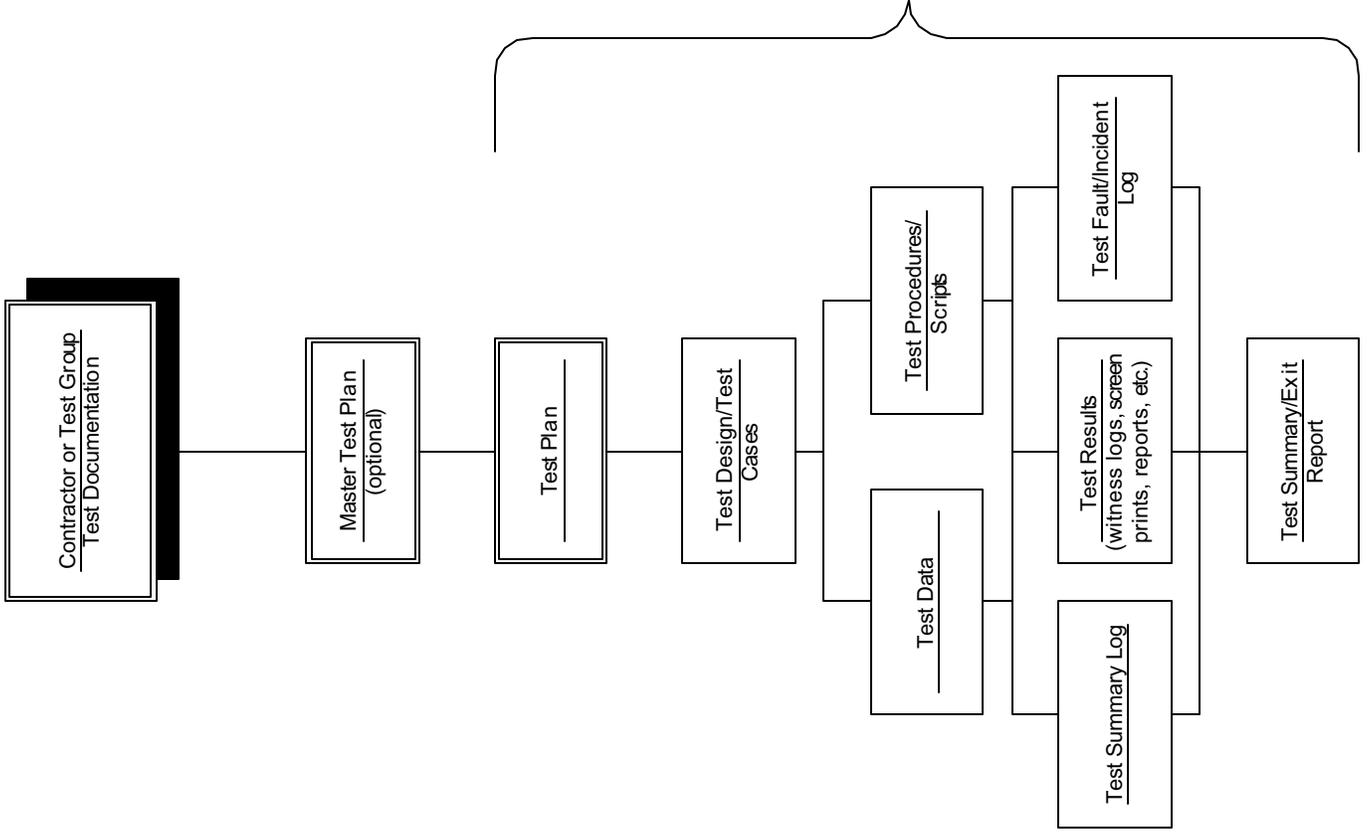
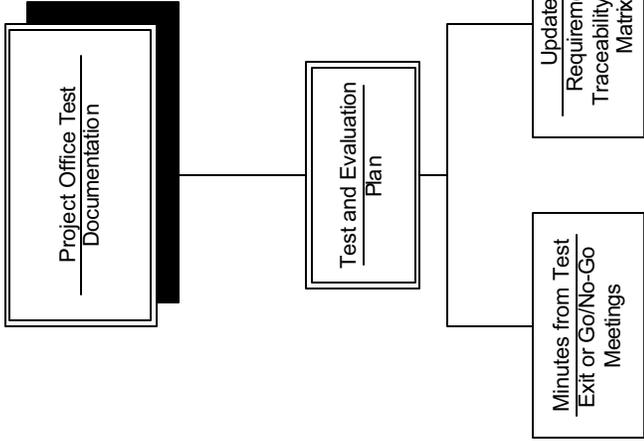
- **Test Schedule** - The anticipated schedule of tests. The schedule should indicate the date and time of each test, preparation and clean-up times for each test, test results analysis meetings (if appropriate), if tests are running in parallel the location of each test (by site, workstation, or office), test status meetings, and, if appropriate, test fault/anomaly discussion meetings. Sometimes a matrix or table is more useful and descriptive than an MS Project layout.
- **Lessons Learned** - Lessons learned should be collected at the end of each test phase, and used to improve testing procedures in the next phase and forwarded to the BPSG for inclusion in the division's repository

The following are test documents described by the standard have been tailored to meet SID's specific needs.

- **Test Design** - SID generally combines the test design into either the test plan or the test cases
- **Test Transmittal Report** - May be an appendix to the individual test plan, or may be a separate configuration management report such as a hardware/software inventory report that includes all appropriate code units, environmental files, scripts, and configuration or registry settings.

Samples

- [Test Documentation Tree](#) (pdf)
- [Example of Test Documentation Hierarchy](#) (pdf)
- [Test and Evaluation Plan](#)
- [Master Test Plan](#)
- [Test Summary/Exit Report](#)
- [System Test Plan](#)
- [Acceptance Test Plan](#)
- [Sample Test Log/Test Summary Log](#) (MS Excel)
- [Sample Test Fault Log](#) (MS Excel)
- [Sample Test Procedure](#) (MS Word)
- [Sample Test Incident/Fault Report](#) (MS Word)



EXAMPLE OF TEST DOCUMENTATION HIERARCHY

The following is an example of the differences in the level of detail between the various layers of test documentation. A sample requirement is shown below. The item in parentheses indicates a unique, requirement number used for traceability purposes.

Requirement: “The system shall produce the following types of printed reports detailing changes in financial status for a selected case (FINRPT-1), or selected individual (FINRPT-2). If the selected individual is involved in multiple cases, the system shall prompt the user to choose either a specific case or all cases for the data to be used in the report. (FINRPT-3)

- a . Support payments made to the State by the Payor (FINRPT-4)
- b . Payments made to the Payee by the State (FINRPT-5)
- c . Payments made to the Payee by the Payor (FINRPT-6)
- d . Overdue payments (greater than 45 days overdue) (FINRPT-7)
- e . Balance on the Payor’s account (FINRPT-8)
- f . Balance on the Payee’s account (FINRPT-9)

The format and fields for each of these reports are described in Appendix A.”

Test and Evaluation Plan (Project Office Responsibility)

Section x.x Verification of Financial Reports

Due to the critical nature of the financial reports (FINRPT-4 through FINRPT-9), these reports will be rigorously tested and reviewed for accuracy. After the contractor’s integration tests for the reports have been executed, the financial SMEs will perform data analysis of the test results from the printed reports. Totals generated on the reports will be hand-calculated to verify accuracy, and will be compared to the input data to ensure the calculations were correct. All interest calculations will be hand-verified to ensure rounding algorithms have been correctly implemented.

During the contractor’s system test, the financial SMEs will...

Test Plan (Contractor or Test Group Responsibility)

Section x.x Test Methodology

Verification of Printed Reports

All existing financial reports (FINRPT-6 through FINRPT-9) will be verified to ensure the data is correct. These reports will be executed on both the legacy and new systems, and the outputs compared to ensure the format and data are identical (except for the newly required fields of xxx, xxx, and xxx).

New financial reports (FINRPT-4 and FINRPT-5) will be verified by hand-calculating the fields on the report and comparing them to the contents of the database. Special attention will be paid to the calculations for computing interest, to ensure the rounding computation is correct.

For reports where there are known errors or problems, the new reports will be checked to ensure the problem was fixed in the new system. The specific scenario(s) that caused the error will be verified, as well as the general cases listed below.

At a minimum, the following types of cases will be tested for each report, for both the selection based on a case number and based on an individual's name:

- a . One payor, one payee
- b . Two payors, one payee
- c . One payor, two or more payees
- d

Section x.x Data Conversion Testing

After the legacy data has been converted to the new databases, a subset of tests will be executed to verify that the converted data is correct. The verification method will be the same as that described under Section x.x Verification of the New System, though the number of tests will be reduced. At a minimum, the following tests will be executed...

Test Design/Test Case (Contractor or Test Group Responsibility)

Section x.x Financial Reports

Features to Be Tested

For the Financial Reports (FINRPT-4 thru FINRPT-9), the following features will be tested:

- a . Selection of the reports from the menu
- b . Selection of a Payor
- c . Selection of a Case
- d . Calculation of Interest and Totals
- e . Correct Format and Content

Method of Verification

The test data will consist of the data converted from the legacy system. The data conversion process must have been completed and verified prior to performing these tests.

Legacy reports will be compared to the new reports to ensure...

Common errors will be checked including: divide by zero calculations, no payment data on file, ...

Financial SMEs will hand-calculate...

Pass/Fail Criteria

All calculations must be correct to 2 decimal places.

Interest calculations must be correct to 3 decimal places and must round correctly (round up if the least significant digit is 5 or greater).

Divide by zero errors must be handled by generation of an error message on the report and an error message displayed to the user requesting the report.

The format must meet the department standards as specified in xxxxx, including page numbers, header and footer information, and appropriate classification markings.

The system must prompt the user to select either the case number or an individual (by first and last name) upon which the report data will be retrieved. (FINRPT-1 and FINRPT-2)

If the selected individual is involved in multiple cases, (FINRPT-3)

The reports displayed the correct data when compared with the inputs from the database, and when compared to the legacy system reports.

FINRPT-4 y / n

FINRPT-5 y / n

FINRPT-6 y / n

...

List of Test Cases

Report A

Selected Case – One Payor, One Payee Case #xxxxxx

Selected Case – One Payor, Two Payees Case #xxxxxx

Selected Case – Two Payors, One Payee Case #xxxxxx

....

Selected Individual, Multiple Cases, All Case #xxxxxx

Selected Individual, Multiple Cases, specific case Case #xxxxxx

Report B

...

Inputs

Input	Case A	Case B	Case C
Case Number xxxx	proc 1		proc 1
Case Number xxx		proc 3	
Individual xxxxx xxx	proc 2	proc 4	...

Outputs

Outputs	Case A	Case B	Case C
xxxxxx	proc 1		proc 1
xxxxxx		proc 3	
xxxxxx	proc 2	proc 4	...

Test Environment Settings

Must be loaded with data for the following cases from the data conversion effort

xxxxx, xxxxx, xxxxx,

Must have printer installed

Must have Adobe Acrobat installed

....

Special Setup Procedures

None

Test Procedure (Contractor or Test Group Responsibility)

Setup Procedures

Verify data for the following cases were correctly loaded...

Verify the printer is online and accessible

Inputs

user login/passwords

xxxx

Expected Outputs

XXXXX

XXXXX

Procedure #1

1. Login into system as a general user, using the login/pwd provided.

Expected Result: System presents welcome message and displays the case management main menu

2. Select the
3. Select the Case Number button, and type Case Number xxxx into the text field. Press Enter when done.

Expected Results: System prompts user to select a case number, upon which to base the report (FINRPT-1). The user can enter a case number in the text box. After pressing enter, the system validates the case number is valid.

4. ...

Analysis of Results

1. Verify the following reports match the reports generated on the legacy system, using the same case data.
2. Verify the totals are correct. May be performed by the Financial SMEs.
3. Verify the format is correct. Refer to xxxxx for format requirements.
4.

Pass/Fail Criteria

1. Did the reports generated by the new system match the legacy system reports?
 - a. Report A.1 Y / N
 - b. Report A.2 Y / N
2. Are the totals for the reports correct?
 - a. Report A.1 Y / N
 - b. Report A.2 Y / N
3.

EXAMPLE OF TEST PHASES

The following is an example of how the focus of testing changes for each of the test phases. Using the requirement from above, the purpose/focus of the test for each phase is described.

Unit Test (for each report)

- Verify field sizes and number of decimal places are correct
- Verify font size, spacing, headers, footers, page numbers, report date, case header, and classification/sensitive markings are correct
- Verify positive, negative and zero dollar balances display correctly
- Verify common error messages print correctly on the report
- Verify multiple case Payor information displays correctly (i.e., with appropriate subheadings for each case, subtotals for each case, and the roll-up totals)
- Verify that the data on the report is correctly retrieved and calculated from data in the database
- Compare reports to legacy system reports
- Perform boundary and range-of-value testing to ensure all cases are handled (e.g., if the field is defined as having 5 numeric characters plus 2 decimal places, make sure the report correctly displays the values of \$99,999.99, \$0.00, and -\$99,999.99; also what happens if the database field is NULL or blank?).
-

Functional/Integration

- Verify each report can be selected from the print menu
- Verify that the report can be printed on each of the system printers
- Verify that the report can be sent to Adobe Acrobat to create a PDF file which can be saved to disk
- Verify that error messages are printed on the report and displayed on the user's workstation for confirmation
- Verify that the reports menu is displayed after each report is printed
- Verify that the user can select to print the reports for either a case or an individual
- ...

System

- Verify that the user can select the print menu and print a report from any of the following screens...
- Verify that when a payment is recorded, the updated information is reflected on the appropriate report
- Verify each report requirement has been satisfied and is incorporated in the system
- Verify that the reports are not accessible from the Internet
- Verify that the reports accessible on the intranet require a user id and password before any selections are made

External Interface

- N/A

Performance

- N/A

User Acceptance

- Verify all reports printed as part of the user business scenarios are correct. Verify the totals and formats are correct.

Pilot

- Verify all reports printed as part of the user business scenarios are correct. Verify the totals and formats are correct.

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Test Environments

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The number and types of test environments vary based on the type and complexity of the system. The following are the "typical" environments for SID projects. All environments (with the exception of Development) should model the actual production environment as much as possible.

Depending on the number of environments, configuration management can be a full time job and is a critical function. Hardware and software configurations, versions, and data must be rigorously managed to ensure validity of testing operations. Changes to the environment must always be coordinated with the Test Manager(s) and Configuration Manager prior to being made, and should be documented in a log book.

- Development - Used for code development and unit testing
- Integration - Used for functional and integration testing
- System - Used for system testing
- Performance - Used for performance and stress testing
- Regression - Used for regression testing
- Training - Not really a test environment, but included as another environment which must be managed
- Acceptance - Used for acceptance testing
- Production/Operational - The actual "live" environment. **NOT FOR TESTING**, but is the final step in the migration process

Some of the test environments may run on the same hardware as separate software and database regions. It is recommended that the following environments always be located on separate hardware.

- Development
- Acceptance
- Production/Operational

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Test Preparation Checklist

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The following are some of the criteria that should be considered prior to entering a testing phase. Each project will need to add their specific criteria for environment preparation and project specific pre-test approvals and signoffs.

1. Has the correct number and version of all system and test documentation been produced for use in testing (including user manuals, manual checklists, business processes/procedures, templates, forms, etc.)?
2. Have the appropriate tester/user accounts and passwords been enabled on the system? Have the correct user and network (shared folder) permissions and security been set?
3. If appropriate, has the baseline set of data and any system constants been loaded to the system?
4. If appropriate, has specific test training been performed to ensure test participants understand their responsibilities? Do the participants know who receives the completed test forms, results and checklists?
5. Has the appropriate system release been loaded to the system? If appropriate, have the icons/menu items been loaded to the desktop/menus?
6. If appropriate, have any system counters/sequence numbers/batch numbers been reset?
7. Has a full backup been performed to facilitate re-loading of the test environment in an expeditious manner?
8. Have any external interfaces been "prepped"? Have the corresponding organizations been included in the preparations and do they have a copy of the test schedule and procedures?
9. Has the test schedule been distributed to all participants and interested stakeholders? Have meeting notices for the test status meetings been sent?


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Test Exit Criteria

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The following represent general criteria that should be evaluated after testing is completed, to determine if the requirements for the test phase have been met. Additional criteria for the specific test phase should also be included. Where appropriate, these criteria feed into the Checkpoint or Go/No-Go Decision(s) at the end of the test phase.

- Have all the tests been executed at least once?
- Have all requirements been tested or verified?
- Has all test documentation (including results) been provided to the Librarian or Deliverable Monitor?
- Have all affected documents (such as user manuals, help files, design documents, etc.) been updated and submitted to the Deliverable Monitor/Librarian?
- Does the Configuration Manager have a complete record of all the changes made and the current configuration of the test environment?
- Does the Configuration Manager/Change Manager have a record of all test incidents and their disposition?
- Have all test incidents been analyzed or at least assigned for analysis?
 - What kind of incidents and how many of each were reported?
 - Test Procedure Error (test incorrectly written)
 - Test Data Errors
 - Tester/User Errors (typed wrong or misinterpreted procedure)
 - Test Environment or Configuration Errors
 - Code/Implementation Errors (code bugs)
 - Design Errors (system logic error)
 - Misinterpreted Requirement
 - New Requirement (must have - not previously identified)
 - Enhancements/"Nice-to-Haves"
 - The following types of errors should prevent exit from a test phase:
 - Errors in calculations, formulas or rounding
 - Any data corruption errors

- Incorrect data, or data recorded in the wrong field, account or database
- Significant performance errors (greater than 10% different that required)
- System crashes, instability or unpredictable errors
- Have the first four categories (procedure, data, user, environment errors) above been addressed and steps taken to avoid them in the future?
- Were there any critical or high priority incidents?
- Were there a large number of test incidents that indicate a need for additional testing before leaving this test phase?
 - Are the incidents clustered in a particular area, or distributed throughout the system?
- What is the impact of the incidents/faults that were found? Are there critical impacts which may affect the schedule?
- Is the system stable?
 - Has the appropriate level of CM been applied to the code, environment, and fixes?
 - Is the system "up" and operational most of the time, or are there unexplained crashes or shutdowns occurring?
- Have all test materials for the next test phase been prepared?
- If there were specific contract requirements for this test phase, have they been met?
- Have QA and/or IV&V submitted their reports on testing and provided a recommendation for exit?
- Do the Test Manager(s), Configuration Manager, QA, IV&V or Users have any outstanding issues?
- If the next phase is involves the public, media, or key stakeholders, is the project ready? Have the appropriate expectations and responsibilities been communicated? Is the project confident that the event will proceed as expected?


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Testing Standards

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Testing standards help to provide guidelines for minimum types of testing and test cases, and to ensure that all test materials are complete.

The RFP should identify for each **test phase**:

- **Test strategy** which describes the approach and expected participation during testing
- **Roles and responsibilities** (MS Word) for all test participants
 - In some cases, the **IV&V vendor** manages and/or performs system and/or acceptance testing to provide an impartial assessment of the system's usability and adequacy.
 - Note that the roles will vary slightly depending if the project is for a new system development or for continuing M&O, due to the difference in staffing and organization, and the stronger emphasis on regression testing.
- **Expectations for test documentation** content and preparation
- **Expectations for testing environments**
 - Number and type of separate test environments required
 - Who is responsible for providing the various environments
 - Who will be responsible for installing and managing the environments
 - What is the purpose and general configuration of each environment
 - Who will own the environments (i.e., are the environments are considered a development tool owned by the vendor, or a deliverable retained by the State after contract end)
- **Expectations for configuration management**
 - How will the test environments be managed and how will changes to the environments be tracked?
 - How will version control of the software units be maintained and how will fixes be introduced?
 - How will version control of the test documentation be maintained?
 - Who is responsible for collecting and maintaining the master copies of test documentation and results?
 - How will test data be managed (both electronic and paper)?
 - See also **Configuration Management**
- **Expectations for quality assurance**
- Specific exit criteria which must be met for the test phase to close. For general exit criteria, [click here](#).

References:

- IEEE **829-1998**, Standard for Software Test Documentation (link to pdf)
- IEEE **1008-1987** (R 1993), Standard for Software Unit Testing (link to pdf)

Samples and Supporting Materials:

- **Testing Responsibility Assignment Matrix (RAM)** (MS Word)
- **Test Summary Matrix** (MS Word)

Responsibility Assignment Matrix (RAM)¹

Test Type	Developer (may be contractor or State staff)	Testers (usually State staff, but may be contractor)	Project Configuration Mgr	Project Test Mgr	Project QA Mgr	Project Deliverable Mgr/ Librarian	Sponsor	User/ Counties	IV&V
Unit	- Primary responsibility for conducting tests	- Audit/observe testing or review test materials and results ²	- Review Prime's CM logs and test results or - Track version and code units where the verification takes place	- Review test mgmt activities and test documentation for completeness and correct process	- Review test activities and documentation for adherence to processes and standards	- Coordinate review of test materials - Store test deliverables and supporting documentation in project library	- None ³	- None	- Review test activities and documentation for adherence to processes and standards and for appropriate rigor, if appropriate
Unit Level Verification of Non-Testable Requirements	- Participate as needed	- Primary responsibility for verification	- Track version and code units where the verification takes place	- Coordinate verification of non-testable requirements	- Review test activities and documentation for adherence to processes and standards - Ensure verification methods are correctly applied and documented	- Store copies of test information	- Receive report on results and methods for verification of requirements - Sometimes report is delayed until system testing	None	- Review test activities and documentation for adherence to processes and standards and for appropriate rigor - Ensure the selected verification method is correct and appropriate for the type of requirement being verified

¹ This matrix is meant to indicate roles and groups who should participate, as appropriate. For instance, not all projects have a deliverable monitor; in this case, the project must determine procedurally who should ensure these activities are addressed. Likewise, not all projects have a Prime Contractor (such as M&O contracts), but instead perform and work with consultants to maintain the system. Depending on the size of the project, there may also be a technician assigned to each of the environments and a separate requirements manager to track verification and traceability.

² During the development for a new acquisition, the project's participation in Unit, Functional, Integration and System testing will vary. The roles, responsibilities and level of project participation will have been documented in the RFP/ITP or contract. During M&O, the project usually is involved from Functional testing forward.

³ In general, the Sponsor and User receive only high-level, verbal status until UAT. In many cases, the Sponsor has indicated they only want to hear about critical problems, and not general status if things are progressing on schedule. However, the Sponsor/User should be involved in all requirements verification to ensure the correct expectations have been met.

Test Type	Developer (may be contractor or State staff)	Testers (usually State staff, but may be contractor)	Project Configuration Mgr	Project Test Mgr	Project QA Mgr	Project Deliverable Mgr/ Librarian	Sponsor	User/ Counties	IV&V
Component or Module or Functional	- Primary responsibility for conducting tests	- Observe or review test materials and results	- Review Prime's CM logs and test results or - Track versions and code units	- Review test mgmt activities and test documentation for completeness and correct process	- Review test activities and documentation for adherence to processes and standards	- Coordinate review of test materials - Store test deliverables and supporting documentation in project library	- None	- None	- Review test activities and documentation for adherence to processes and standards and for appropriate rigor
Integration	- Participate or support test execution ⁴	- Participate, observe or review test materials and results - Participate in checkpoint decision	- Review Prime's CM logs and test results or - Track versions and code units - Participate in checkpoint decision	- Review test mgmt activities and test documentation for completeness and correct process - Coordinate with Project Mgr Checkpoint Decision	- Review test activities and documentation for adherence to processes and standards - Participate in checkpoint decision	- Coordinate review of test materials - Store test deliverables and supporting documentation in project library	-None	- None	- Review test activities and documentation for adherence to processes and standards and for appropriate rigor - Participate in checkpoint decision

⁴ For Integration, System, Performance and Regression testing, the primary responsibility for test execution varies depending on the type of project and contract. Either the Developers or Testers may have the primary responsibility or it may be a joint effort.

Test Type	Developer (may be contractor or State staff)	Testers (usually State staff, but may be contractor)	Project Configuration Mgr	Project Test Mgr	Project QA Mgr	Project Deliverable Mgr/ Librarian	Sponsor	User/ Counties	IV&V
System	- Participate or support test execution (see footnote 4)	- Participate, observe or review test materials and results	- Review Prime's CM logs and test results or - Track versions and code units	- Review test mgmt activities and test documentation for completeness and correct process - Coordinate with Project Mgr Go/No-Go Decisions	- Review test activities and documentation for adherence to processes and standards - Review or perform requirements traceability analysis to ensure all requirements have been tested	- Coordinate review of test materials - Store test deliverables and supporting documentation in project library	- None	- None ⁵	- Review test activities and documentation for adherence to processes and standards and for appropriate rigor - Review or perform requirements traceability analysis to ensure all requirements have been tested
Performance/Stress	- Participate or support test execution (see footnote 4)	- Prepare or assist with preparation of test plans and scripts - Participate, observe or review test materials and results	- Review Prime's CM logs and test results or -Track versions and code units	- Review test mgmt activities and test documentation for completeness and correct process	- Review test activities and documentation for adherence to processes and standards - Review test results to ensure performance requirements have been met	- Store test deliverables and supporting documentation in project library	- None ⁶	- None (see footnote 6)	- Review test activities and documentation for adherence to processes and standards and for appropriate rigor - Make recommendation about system scalability, growth and throughput

⁵ When there are multiple cycles of unit-integration-system-regression testing, the User may elect to participate in the "final" iteration of System and/or Regression testing to obtain an early look at the functionality (and for M&O, to ensure that the business need was completely and adequately addressed prior to acceptance testing).

⁶ If this is the only time that the performance/stress requirements will be tested, then the Sponsor and User should participate to ensure satisfaction of requirements. It is recommended that performance/stress tests be executed more than once: as a separate phase (as indicated here), as part of regression (if appropriate based on changes that were made), as part of User Acceptance, and at the actual county site (to verify what the user will actually experience).

Test Type	Developer (may be contractor or State staff)	Testers (usually State staff, but may be contractor)	Project Configuration Mgr	Project Test Mgr	Project QA Mgr	Project Deliverable Mgr/ Librarian	Sponsor	User/ Counties	IV&V
Regression	- Participate or support test execution (see footnote 4)	- Participate, observe or review test materials and results	- Review Prime's CM logs and test results or -Track versions and code units	- Review test mgmt activities and test documentation for completeness and correct process - Coordinate Go/No-Go Decision to enter UAT (see next row)	- Review test activities and documentation for adherence to processes and standards - Review test results to ensure sufficient testing has been performed	- Store test deliverables and supporting documentation in project library	- None	- None	- Review test activities and documentation for adherence to processes and standards and for appropriate rigor

Test Type	Developer (may be contractor or State staff)	Testers (usually State staff, but may be contractor)	Project Configuration Mgr	Project Test Mgr	Project QA Mgr	Project Deliverable Mgr/ Librarian	Sponsor	User/ Counties	IV&V
Decision to enter UAT		- Make recommendation about readiness for UAT	- Make recommendation about readiness for UAT	- Prepare and distribute preparatory materials regarding Acceptance Test conduct to all participants, especially Sponsor and User	- Make recommendation about readiness for UAT	- Store results and supporting materials about Go/No-Go Decision			- Make recommendation about readiness for UAT
User Acceptance	- Participate, as needed - Respond to test incidents - Participate in testing meetings	- Participate or observe testing - Assist with analysis of test incidents, as needed - Participate in testing meetings - Review test materials and results	- Track UAT configuration and any changes due to fixes - Participate in testing meetings - Make recommendation for Acceptance Decision	- Coordinate testing efforts and report to stakeholders on status - Lead test meetings - Track test incident status and disposition - Coordinate Acceptance Decision	- Review test activities and documentation for adherence to processes and standards - Make recommendation for Acceptance Decision	- Store test deliverables and supporting documentation in project library	- Execute tests and business workflows, as appropriate - Participate in test status meetings - Participate in Acceptance Decision	- Prepare test scenarios ⁷ - Execute tests and business workflows - Make recommendation for Acceptance Decision	- Review test activities and documentation for adherence to processes and standards and for appropriate rigor - Make recommendation for Acceptance Decision and on readiness for system rollout

⁷ It is HIGHLY recommended that the users prepare or actively assist with preparation of the test scenarios, to ensure that the system is tested using actual business cases. Project staff should supplement the user's test scenarios with additional test scenarios as necessary to ensure critical requirements are verified and the outcomes are reviewed by the User and Sponsor.

Test Type	Developer (may be contractor or State staff)	Testers (usually State staff, but may be contractor)	Project Configuration Mgr	Project Test Mgr	Project QA Mgr	Project Deliverable Mgr/ Librarian	Sponsor	User/ Counties	IV&V
Pilot	<ul style="list-style-type: none"> - Participate, as needed - Respond to test incidents - Participate in testing meetings 	<ul style="list-style-type: none"> - Participate or observe testing - Assist with analysis of test incidents, as needed - Participate in testing meetings - Review test materials and results 	<ul style="list-style-type: none"> - Monitor pilot configuration and any changes due to fixes - Participate in testing meetings 	<ul style="list-style-type: none"> - Coordinate testing efforts and report to stakeholders on status - Lead test meetings - Track test incident status and disposition - Coordinate Pilot Decision, if appropriate 	<ul style="list-style-type: none"> - Review test activities and documentation for adherence to processes and standards 	<ul style="list-style-type: none"> - Store test deliverables and supporting documentation in project library 	<ul style="list-style-type: none"> - Execute tests and business workflows, as appropriate - Participate in test status meetings - Participate in Pilot Decision, as appropriate 	<ul style="list-style-type: none"> - Execute tests and business workflows - Make recommendation for Pilot Decision, as appropriate 	<ul style="list-style-type: none"> - Review test activities and documentation for adherence to processes and standards and for appropriate rigor - Make recommendation for Pilot Decision, as appropriate


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Testing Relationships and Dependencies

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Relationship to the SID Lifecycle Framework:

Testing is applicable to both the New Systems Acquisition, M&O and Re-Procurement lifecycles. Most of the activities occur during the System Development phase, but early planning and coordination are critical. Refer also to [Test Strategies](#).

Relationship to the Primary Processes:

- **Initiation** - During the Initiation phase, the project and Sponsor should begin thinking about how the testing will be accomplished. The primary decision at this time is when and how much project staff will be involved with testing, so that adequate resources can be requested.
- **Planning** - During the Planning phase, the project and Sponsor should determine a basic approach to testing and roles and responsibilities (for the project, Sponsor, users and contractor), and establish the [testing standards](#) that will be included in the RFP/ITP. The project should document their approach in the [Project Management Plan/Master Project Plan](#). A more detailed [Test and Evaluation Plan](#) may be developed to describe specifically how the project will review, test and approve the contractor's system and work products.
- **Procurement** - The RFP/ITP should include the test strategy and standards that the contractor must abide by. It should set expectations for the contractor's testing efforts (including scope of testing) and indicate the anticipated roles and responsibilities for project, Sponsor, user and contractor.
- **System Development** - Once the requirements phase has been completed, test planning begins in earnest. The test phases, as described in the RFP/ITP, are conducted once the coding has been completed.
- **Implementation** - Pilot and/or acceptance testing (depending on the test methodology) are conducted at this time, and a final acceptance decision is made, based in part on the results of acceptance testing. Implementation should not commence until system testing (at a minimum) has been successfully completed.
- **M&O** - Testing occurs as part of the general change/version release cycle. Regression testing becomes more important to ensure changes do not adversely affect previously delivered functionality. Test data and procedures/scripts may be retained/recycled from the development phase to assist with regression testing. Periodic performance and/or capacity tests may be executed to monitor the system's performance profile and to help determine when hardware upgrades are needed.
- **Closeout** - During Closeout, the primary activity is the archiving of appropriate documentation and files.

Relationship to the Supporting Processes:

- **Project Management** - Project management oversees the testing efforts, regardless of approach.
- **Contract Management** - Specific test requirements or standards should be identified or referenced in the RFP/ITP and/or contract. For a new systems development, specific acceptance criteria (if known) may be discussed in the contract.
- **Configuration Management** - CM is critical during testing to ensure that the correct version of modules is being tested. CM is also needed for the testing environment(s) to ensure that all the modules/tests were tested under the same configurations and conditions (preferably mimicking the actual user's environment) that were agreed to. If custom (i.e., not COTS) test tools are being used, the CM and/or QA staff should ensure that the tools themselves have been tested and verified to produce correct results (to avoid skewing test results with the test tool). Test data sets may also be created and must be version controlled. The CM Manager must actively work hand-in-hand with the Test Manager during all test phases.
- **Requirements Management** - During testing, all of the requirements should be verified.

Requirements traceability should be established to all test procedures and the traceability should be verified by the IV&V vendor. In some cases, multiple tests may be required to verify a single requirement; thus detailed documentation of requirements verification should be kept, including version of the requirement tested, requirement and test name/number, test documentation version, system version that was tested, date, and time of the test that verified the requirement.

- **Issue Management** - Test issues and anomalies are often tracked in a separate tool from the project issue system (such as a tool that interfaces with the CM tool or other test tools), or given a specific category within the project issue system. Test issue status should be reported to the test team and management on a weekly basis (at a minimum), and escalation should occur, as needed.
- **Risk Management** - Testing risks and concerns should be identified in the Test and Evaluation Plan, Master Test Plan, and/or individual test plan for the test phase. Mitigation and contingency plans and triggers should be documented so that if a risk becomes more likely, the plans may be executed ASAP to minimize the impact to testing. See also **common testing risks**.
- **Quality Assurance** - A primary focus of QA during the testing phases is to ensure the appropriate amount of rigor has been applied and that adequate documentation has been prepared. The QA Manager should monitor testing and CM activities to ensure appropriate version control is being applied to the test environment, test procedures, test data, documentation and test results.
- **Process Improvement** - At the completion of each test phase, a lessons learned session should be conducted to identify ways to improve the testing process. Because there are a number of test phases, incorporation of lessons learned can reap substantial benefits.
- **Independent Verification and Validation** - An IV&V vendor may oversee and monitor the testing efforts or they may actually perform independent testing of the system. In the oversight role, emphasis is placed on appropriate rigor of testing, adequate CM (particularly version control), detailed documentation, and verification of requirements traceability. In the independent test role, emphasis is placed on rigorously testing the system to ensure stability, verification of requirements, and ability to meet user's business needs. An evaluation report would then be submitted to the project describing the results of testing and suggested next steps or concerns.

Test Type Summary Matrix

Test Type	Scope	Who Creates/-Writes the Tests	Who Performs the Test	Who Approves the Test Results	Type of Environment	Type of Data ¹	Emphasis of Test
Unit	Individual Code Units	Developer	Developer	Test Mgr, QA Mgr, CM Mgr, State Project Mgr IV&V and Dev Mgr make recommendation	Development	Artificial	<ul style="list-style-type: none"> • Every line of code • All error paths • Code inspection of non-testable paths
Component or Module or Functional	Groups of Code Units	Developer and/or Tester	Developer and/or Testers	Test Mgr, QA Mgr, CM Mgr, State Project Mgr IV&V makes recommendation	Development/ Test	Simulated or Real data	<ul style="list-style-type: none"> • Small groups of modules that are functionally related • Intra-module/intra-function interfaces
Integration	Functional Groupings	Developer and/or Tester	Developer and/or Testers	Test Mgr, QA Mgr, CM Mgr, State Project Mgr IV&V makes recommendation	Development/ Test	Real data	<ul style="list-style-type: none"> • Major functional areas • Inter-function interfaces • Basic business cases and workflows • Critical external interfaces (optional)
System or Qualification	Entire System, End-to-End	Developer and/or Tester	Testers	Test Mgr, QA Mgr, CM Mgr, State Project Mgr IV&V makes recommendation	System Test environment	Real data	<ul style="list-style-type: none"> • Entire System • Verify all requirements • Verify common error cases • Performance, capacity, throughout tests • External interfaces • Verify data conversion results and data load programs • User testing of business workflows feedback (if possible) • <u>Go/No-Go decision</u>: Ready to proceed to AT (if new system) or Regression (if existing system)

¹ Artificial – Data created to follow a code path or test specific test cases.

Simulated – Data created to model real data

Real - Data which was processed on the legacy system and is now being re-used for testing

Live – “Live” production data which is processed only on the new system

Test Type Summary Matrix

Test Type	Scope	Who Creates/-Writes the Tests	Who Performs the Test	Who Approves the Test Results	Type of Environment	Type of Data ¹	Emphasis of Test
Performance/ Stress	Performance Requirements and Stress the System	Testers, DBA, System Administrators	Testers	Test Mgr, QA Mgr, CM Mgr, State Project Mgr IV&V makes recommendation	Performance Testing environment	Real data	<ul style="list-style-type: none"> • Verify performance requirements such as response times, batch processing windows, simultaneous users, and throughput • Ensure system can handle peak loads plus more • <u>Go/No-Go decision</u>: Are performance requirements satisfied and sufficient growth capacity available?
Regression	Verify other areas of the system have not been adversely affected	Testers (often a subset of the System tests are used)	Testers	Test Mgr, QA Mgr, CM Mgr, State Project Mgr IV&V makes recommendation	Regression Testing environment	Real	<ul style="list-style-type: none"> • Ensure system performs as expected • Verify normal and critical workflows and processing paths • Verify user reports • <u>Go/No-Go decision</u>: Ready to proceed to AT
Acceptance	Typical User Scenarios	Users or Project Staff	Project Staff and/or Users	Test Mgr, QA Mgr, CM Mgr, State Project Manager, Sponsor, and Users IV&V makes recommendation	UAT Testing environment	Real	<ul style="list-style-type: none"> • Does the system address the users' needs? • May do formal regression testing of fixed errors from System testing for users (prior to AT beginning) • Workflow and business scenarios • Very visible to stakeholders, control agencies • <u>Go/No-Go decision</u>: User and Sponsor signoff of functionality; schedule pilot or production tests, if appropriate; (if appropriate) decision on vendor payment
Field or Pilot or Demonstration	Typical User Scenarios	Users or Project Staff	Users	Test Mgr, QA Mgr, CM Mgr, State Project Manager, Sponsor, and Users IV&V makes recommendation	Specific user environment (e.g., a particular county or regional office)	Real or Live	<ul style="list-style-type: none"> • Test system in a typical environment • Co-residency with other applications • Performance tests • External interface tests • Legacy system is still in place. Parallel operations are likely, and the results from the pilot would be compared to the legacy system outputs to verify correct processing • Usually performed in a subset of counties (always in LA county) • Very visible to stakeholders; may be a media event

Test Type Summary Matrix

Test Type	Scope	Who Creates/ Writes the Tests	Who Performs the Test	Who Approves the Test Results	Type of Environment	Type of Data ¹	Emphasis of Test
Production or Operational	Production Day-to-Day Business Work	None	Users	Sponsor, and Users	Production Environment	Live	<ul style="list-style-type: none"> • Final Check-out of implementation at a specific site • Performance tests • External interface tests