

TESTING PERFORMANCE AID

1. GENERAL

1.01 Purpose: This performance aid outlines the test-related work for a system development effort. It provides a suggested approach for satisfying the recommendations outlined in Part 3 of Section 007-233-300. It describes the goals, tasks, and activities involved with testing within the Total System Development (TSD) framework. It does *not* provide detailed methods or tools for performing test-related tasks.

1.02 Whenever this appendix is reissued, the reason for reissue will be stated in this paragraph.

1.03 Use: This performance aid can be used for the testing of all new information systems and for the maintenance testing of existing systems. It can be used for systems of any size, complexity, and type. The principles are the same. Only the resources and the skills required for their application vary.

This performance aid may be tailored to best fit the circumstances of each project.

1.04 Audience: This performance aid is designed to assist people assigned to those functional roles which have a major impact on testing (eg, system design, testing, and testing support). The successful completion of tasks indicated in the performance aid requires experience and training in the area of testing. This appendix can be used by project managers and other personnel who want a better understanding of test-related work. It also will be useful for the development of work plans.

1.05 Documentation of Results: It is recommended that information resulting from performing each group of test-related activities be documented and filed under a set of categories called developmental components, described in Developmental Documentation Specifications, Section 007-227-310.

NOTICE

Not for use or disclosure outside the
Bell System except under written agreement

**TESTING ACTIVITIES PERFORMANCE AID
FEASIBILITY PHASE**

Phase Description: Define informational and operational needs and develop conceptual alternatives that will satisfy those needs. Transform ideas and broad problem statements into system objectives. Establish the scope of the effort necessary to build the system by determining the schedule, budget, and staffing requirements.

Testing Overview: Develop general testing concepts and rough estimates of costs. Review initial system objectives, service objectives, and performance specifications. Identify resource requirements for testing (eg, people, facilities, and time). In general, ensure that adequate procedures can be developed to test the entire system.

TESTING GOALS	TESTING TASKS	TESTING ACTIVITIES
<p>A. Ensure from the beginning of the system development effort that information necessary for effective testing is developed.</p>	<p>1. Evaluate data collected and materials developed to identify if potential test criteria are included.</p>	<p>a. Examine user needs for ranges of performance (eg, accuracy, security, timeliness, etc).</p> <p>b. Examine system objectives for statements of performance criteria.</p> <p>c. Note omissions or inconsistencies and reconcile.</p>
<p>B. Ensure that testing considerations are planned and funded for the proposed system development effort.</p>	<p>1. Identify appropriate testing organization and staffing requirements needed for each system alternative.</p>	<p>a. Determine types of testing to be performed.</p> <p>b. Determine whether test group should be within or outside the project team.</p> <p>c. Establish responsibilities of all groups associated with testing, including establishing the user department's participation. Determine degree of user participation.</p>
	<p>2. Make initial estimates of testing resource requirements (computer and people).</p>	<p>a. Estimate required test facilities hardware, software, testing aids, and physical space.</p> <p>b. Determine schedules for ordering required hardware and facilities for testing.</p> <p>c. Estimate test time and resource requirements (include people and computer time).</p>

**TESTING ACTIVITIES PERFORMANCE AID
FEASIBILITY PHASE (Contd)**

TESTING GOALS	TESTING TASKS	TESTING ACTIVITIES
<p>B. Ensure that testing considerations are planned and funded for the proposed system development effort. (Contd)</p>	<p>2. Make initial estimates of testing resource requirements (computer and people). (Contd)</p>	<p>d. Identify general test data base requirements.</p> <p>e. Provide broad ranges of the testing effort costs.</p> <p>f. Establish tentative schedule for testing functions.</p> <p>g. Document the results of activities a. through f. as part of Developmental Estimates. (See Section 007-227-310, paragraph 2.12.)</p>
<p>C. Assure accuracy and completeness of Feasibility Phase Products.</p>	<p>1. Plan for and perform walk-throughs of Feasibility Phase Products.</p>	<p>a. Determine products requiring walk-throughs such as:</p> <ul style="list-style-type: none"> ● System Objectives ● System Model ● System Input/Output Description. <p>(See Feasibility Phase Component Checklist in Section 007-227-310.)</p> <p>b. Establish team for walk-throughs.</p> <p>c. Perform actual walk-throughs. (See Appendix 2.)</p> <p>d. Document and distribute results to impacted groups.</p>

**TESTING ACTIVITIES PERFORMANCE AID
DEFINITION PHASE**

Phase Description: Define in detail the informational and functional requirements of the new system. These requirements present the factual framework within which the system must be built. Specify the required outputs, necessary inputs to produce outputs, data processing requirements, and control and reliability requirements. These requirements will be reflected in the system specifications.

Testing Overview: Determine testing requirements for personnel and facilities.

TESTING GOALS	TESTING TASKS	TESTING ACTIVITIES
A. Ensure that personnel who will be responsible for testing have sufficient background and knowledge.	1. Determine the need for training of those involved with testing.	a. Identify training requirements for: <ul style="list-style-type: none"> ● Application concepts ● Testing techniques ● Tools. b. Establish a training schedule.
B. Ensure that organizations impacted by testing are informed.	1. Communicate testing requirements to appropriate groups.	a. Determine requirements for testing involvement by users, project team members and support groups (eg, Change Management, Quality Assurance). b. Inform these groups of forecasted requirements for testing in their respective areas.
C. Assure accuracy and completeness of Definition Phase Products.	1. Plan for and perform walk-throughs.	a. Determine products needing walk-throughs such as: <ul style="list-style-type: none"> ● System Requirements ● Constraints ● Function Description. (See Definition Phase Component Checklist in Section 007-227-310.) b. Establish teams for walk-throughs. c. Perform walk-throughs. (See Appendix 2.) d. Document and distribute results to impacted groups.

**TESTING ACTIVITIES PERFORMANCE AID
PRELIMINARY DESIGN PHASE**

Phase Description: Design the general architecture of the system. Expand the information developed in the preceding phases to the point where the system's functions can be allocated to humans or machines. After function allocation, further develop the details of the manual and machine functions along two parallel, interacting paths. Perform design reviews that focus on the operational, technical, and economic characteristics of the system.

Testing Overview: Develop a testing strategy to assure that the system will be totally tested.

TESTING GOALS	TESTING TASKS	TESTING ACTIVITIES
<p>A. Ensure that Preliminary Design Products are specific enough to be tested.</p>	<p>1. Review development components produced during the Definition Phase.</p>	<p>a. Review the proposed system's requirements, concentrating on the following developmental components:</p> <ul style="list-style-type: none"> ● System Output, Input, and Data Requirements ● Function Structure and Description ● System Control Requirements ● System Reliability Requirements. <p>b. Resolve questions concerning incomplete or inaccurate information which may impact the testing function.</p>
	<p>2. Review Design Specifications.</p>	<p>a. Participate in walk-throughs to be sure the design specifications contain specific and measurable criteria for unambiguous testing (eg, service objectives, accuracy, speed, volume, etc).</p> <p>b. Review detailed specifications as input to test plan development. Review specifications for such items as:</p> <ul style="list-style-type: none"> ● Inputs ● Outputs ● Data base or file structure ● System work flows ● Backup and recovery procedures ● System control and error processing procedures ● Manual work modules

**TESTING ACTIVITIES PERFORMANCE AID
PRELIMINARY DESIGN PHASE (Contd)**

TESTING GOALS	TESTING TASKS	TESTING ACTIVITIES
<p>A. Ensure that Preliminary Design Products are specific enough to be tested. (Contd)</p>	<p>2. Review Design Specifications. (Contd)</p>	<ul style="list-style-type: none"> ● Performance aids ● Program and module function ● Network design ● Personnel Subsystem/Computer Subsystem (PSS/CSS) interface specifications ● Response time ● Availability.
<p>B. Ensure that a means to track is in place.</p>	<p>1. Establish a test status tracking system to provide an effective means to observe and control test activities.</p>	<p>a. Determine requirements for a tracking system.</p> <p>b. Determine whether a tracking system should be manual or mechanized.</p> <p>c. Develop plans to build or obtain a tracking system.</p>
<p>C. Assure development of high quality system test plans.</p>	<p>1. Develop an overall system test plan.</p>	<p>a. Develop general test objectives for each level of testing (Unit, Integration, and System).</p> <p>b. Determine for each level of testing what type of testing will be performed (Verification, Validation, Certification).</p> <p>c. Develop an overview of the testing to be performed. Include a general description of strategies and techniques to be used.</p> <p>d. Identify test sites.</p> <p>e. Establish overall schedule for testing.</p> <p>f. Estimate resource types and quantities for each level of testing. Items to be included are:</p> <ul style="list-style-type: none"> ● Personnel ● Facilities and equipment ● Hardware and software ● Communication and transportation networks.

**TESTING ACTIVITIES PERFORMANCE AID
PRELIMINARY DESIGN PHASE (Contd)**

TESTING GOALS	TESTING TASKS	TESTING ACTIVITIES
C. Assure development of high quality system test plans. (Contd)	1. Develop an overall system test plan. (Contd)	g. Prepare test data base requirements. Determine: <ul style="list-style-type: none"> ● Structure and content ● Description of use ● Means for creation and maintenance. h. Document results of activities a. through g. in the System Test Plan. (See Section 007-227-310, paragraph 4.16.)
	2. Evaluate overall system test plan.	a. Distribute test plan (Project Manager, Audit, Project Team, User Representatives). b. Hold reviews (walk-through, desk top). c. Resolve discrepancies, if any. d. Finalize test plan.
D. Assure accuracy and completeness of Preliminary Design Phase Products.	1. Plan for and perform walk-throughs.	a. Determine products needing walk-throughs such as: <ul style="list-style-type: none"> ● Input/Output Specifications ● PSS/CSS Interface Specifications ● System Conversion Requirements. (See Preliminary Design Phase Component Checklist in Section 007-227-310.) b. Establish teams for walk-throughs. c. Perform walk-throughs. (See Appendix 2.) d. Report results of walk-throughs to impacted groups.

**TESTING ACTIVITIES PERFORMANCE AID
DETAIL DESIGN PHASE**

Phase Description: Complete the design of the manual and machine functions. Develop specifications for practices, training, and computer programs required for the operation of the system. Develop specifications for testing plans. Develop initial conversion plans.

Testing Overview: Complete the detailed PSS and CSS Unit, Integration, and System Test Plans.

TESTING GOALS	TESTING TASKS	TESTING ACTIVITIES
<p>A. Ensure that test plans will identify any differences between the system to be implemented and the system's requirements and design specifications.</p>	<p>1. Prepare test plans for:</p> <ul style="list-style-type: none"> ● PSS Unit Testing ● CSS Unit Testing ● Integration Testing ● System Testing ● Conversion Testing ● Acceptance Testing. <p>(See Appendix 3 for Test Plan Guidelines.)</p>	<p>Note: The activities below should be performed for each level of testing (Unit, Integration, System) with the appropriate type of testing environment (Verification, Validation, Certification).</p> <ol style="list-style-type: none"> a. Define the performance standards to be verified by each level of testing. b. List all the products to be tested (PSS work modules and instructions, cathode-ray tube (CRT) displays, CSS modules and programs, etc) and the objectives for each test. c. Prepare a general description of the techniques to be used. d. Identify test cases for each level of testing. Test cases should include: <ul style="list-style-type: none"> ● Objectives ● Number ● Type ● Dependencies. e. Define scheduled start and completion dates for each level of testing. f. Identify detailed resource requirements. <ul style="list-style-type: none"> ● People ● Equipment/material. g. Design test data base. <ul style="list-style-type: none"> ● Inputs ● Sample data base.

**TESTING ACTIVITIES PERFORMANCE AID
DETAIL DESIGN PHASE (Contd)**

TESTING GOALS	TESTING TASKS	TESTING ACTIVITIES
<p>A. Ensure that test plans will identify any differences between the system to be implemented and the system's requirements and design specifications. (Contd)</p>	<p>1. Prepare test plans for:</p> <ul style="list-style-type: none"> ● PSS Unit Testing ● CSS Unit Testing ● Integration Testing ● System Testing ● Conversion Testing ● Acceptance Testing. <p>(See Appendix 3 for Test Plan Guidelines.) (Contd)</p>	<p>h. For the system tests, prepare a brief description of any differences between the testing environment and the ultimate operating environment.</p> <ul style="list-style-type: none"> ● Include assumptions about the validity of the testing environment ● Include a list of any conditions which testing won't validate. <p>i. Document results of activities a. through h. in the Test Plan Components. (See Section 007-227-310, paragraphs 5.06, 5.21, 5.35, 5.36.)</p>
<p>B. Ensure all necessary resources are ready for testing.</p>	<p>1. Complete testing preparations.</p>	<p>a. Develop or acquire testing aids, software, and facilities.</p> <p>b. Assign personnel to the testing function.</p> <ul style="list-style-type: none"> ● Test administrator ● PSS/CSS designers ● Users. <p>c. Train personnel involved with testing.</p> <ul style="list-style-type: none"> ● Testing aids, tools ● Hardware software techniques ● System applications. <p>d. Monitor development of test data base and methods of use.</p> <p>e. Prepare test status reporting system.</p> <p>f. Establish administrative procedures and assign roles for conducting testing.</p>

**TESTING ACTIVITIES PERFORMANCE AID
DETAIL DESIGN PHASE (Contd)**

TESTING GOALS	TESTING TASKS	TESTING ACTIVITIES
C. Assure accuracy and completeness of Detail Design Phase Products.	1. Plan for and perform walk-throughs.	a. Determine products needing walk-throughs. <ul style="list-style-type: none"> ● Program and Position Specifications ● PSS/CSS Verification Test Plans ● System Validation Test Plans ● System Certification Test Plans. (See Detail Design Phase Checklist in Section 007-227-310.) b. Establish teams for walk-throughs. c. Perform walk-throughs. (See Appendix 2.) d. Report results of walk-throughs to impacted groups.

**TESTING ACTIVITIES PERFORMANCE AID
IMPLEMENTATION PHASE**

Phase Description: Construct system components and test individually and together. Build the system according to the plans developed in the previous phase. Select required operational software and code the machine executable programs. Test the system to ensure that it meets its objectives and performance specifications. Complete detailed conversion plans. Conduct design reviews to evaluate the test results.

Testing Overview: Prepare test instructions for all tests. Perform Unit, Integration, and System testing. Evaluate, document, and distribute the results of the tests conducted.

TESTING GOALS	TESTING TASKS	TESTING ACTIVITIES
<p>A. Ensure that the tests are complete and usable.</p>	<p>1. Complete development of test cases for:</p> <ul style="list-style-type: none"> ● PSS Unit Testing ● CSS Unit Testing ● Integration Testing ● System Testing ● Conversion Testing ● Acceptance Testing. 	<p>For each test case, the following activities should be performed and documented:</p> <ol style="list-style-type: none"> a. Review the item being tested (eg, modules, position, subsystem, etc). b. Review and refine objectives of the test. <i>Note:</i> Include criteria by which the results of the test can be measured. c. Define the conditions upon which the test is dependent. <ul style="list-style-type: none"> ● Data conditions ● Environment ● Relationships/interfaces with other tests. d. Define techniques and procedures to be used to conduct the test. e. Create the test data. f. Define test analysis procedures and expected results. g. Identify resources required for the tests. h. For the system and acceptance test instructions, include the system performance specifications. i. Prepare the Test Instructions (see Section 007-227-310, paragraphs 6.01 through 6.04) based on the results of activities a. through h.

**TESTING ACTIVITIES PERFORMANCE AID
IMPLEMENTATION PHASE (Contd)**

TESTING GOALS	TESTING TASKS	TESTING ACTIVITIES
<p>B. Ensure that the testing identifies any differences between the system to be implemented and the system's design specifications.</p>	<p>1. Perform PSS and CSS Unit Tests.</p>	<p>a. Perform tests for each test case detailed in the CSS and PSS unit test plans.</p> <p>b. Identify any special conditions or allowances which were made and their impact on test results.</p> <p>c. Compare actual versus expected results.</p> <p>d. Analyze deviations from expected results and identify the problem.</p> <p>e. Identify any unanticipated performance and resource usage deficiencies.</p> <p>f. Determine any actions to be taken as a result of the test.</p> <ul style="list-style-type: none"> ● Modify rerun test ● Refer to PSS/CSS developer. <p>g. Document test results and update tracking system.</p> <p>h. Provide test status reports as scheduled.</p> <p>i. Document Test Results (see Section 007-227-310, paragraphs 6.23 and 6.24) based on the results of activities a. through h.</p> <p>Note: These steps are performed iteratively until the test objectives are met.</p>
	<p>2. Perform Integration, System, and Conversion Tests.</p>	<p>a. Perform tests for each test case as detailed in the related test plans.</p> <p>b. Identify any special conditions or allowances which were made and their impact on test results.</p>

**TESTING ACTIVITIES PERFORMANCE AID
IMPLEMENTATION PHASE (Contd)**

TESTING GOALS	TESTING TASKS	TESTING ACTIVITIES
<p>B. Ensure that the testing identifies any differences between the system to be implemented and the system's design specifications. (Contd)</p>	<p>2. Perform Integration, System, and Conversion Tests. (Contd)</p>	<p>c. Compare actual versus expected results.</p> <p>d. Analyze deviations from expected results and identify the problem.</p> <p>e. Identify any unanticipated performance and resource usage deficiencies.</p> <p>f. Determine any actions to be taken as a result of the test.</p> <ul style="list-style-type: none"> • Modify/rerun test • Refer to PSS/CSS developer. <p>g. Document test results and update tracking system.</p> <p>h. Provide test status reports as scheduled.</p> <p>i. Document Test Results (see Section 007-227-310, paragraph 6.25) based on the results of activities a. through h.</p> <p>Note: These steps are performed iteratively until the test objectives are met.</p>
	<p>3. Maintain test data base.</p>	<p>a. Update test data base to reflect data, environmental, or specification changes as they occur.</p>

**TESTING ACTIVITIES PERFORMANCE AID
CONVERSION PHASE**

Phase Description: Install the new system in its actual operating environment and test using real data. If the new system is replacing an existing one, the old system is phased out and the new system is phased in. Create or convert records to new forms and train system personnel. Review the cost and time incurred for project development and system performance testing from an operational and cost/benefit standpoint.

Testing Overview: Perform Acceptance Test. Evaluate, document, and distribute the results of the test.

TESTING GOALS	TESTING TASKS	TESTING ACTIVITIES
<p>A. Ensure that the testing identifies any differences between the system to be implemented and the system's design and performance requirements.</p>	<p>1. Perform Acceptance Tests.</p>	<p>a. Perform tests according to system performance specifications.</p> <p>b. Identify any special conditions, or allowances which were made and their impact on test results.</p> <p>c. Compare actual versus expected results.</p> <p>d. Analyze deviations from expected results and identify the problem.</p> <p>e. Determine any actions to be taken as a result of the test.</p> <ul style="list-style-type: none"> ● Modify/rerun test ● Refer to PSS/CSS developer. <p>f. Document test results and update tracking system.</p> <p>g. Provide test status reports as scheduled.</p> <p>h. Document Test Results (see Section 007-227-310, paragraph 7.01) based on the results of activities a. through g.</p> <p>Note: These steps are performed iteratively until the test objectives are met.</p>

**TESTING ACTIVITIES PERFORMANCE AID
MAINTENANCE STAGE**

Description: As a system enters the maintenance stage of its life cycle, enhancements are proposed and errors are detected. The system is maintained, corrected, or improved in this stage. Maintenance testing is required as part of the system's change management process.

Testing Overview: Maintain adequate testing resources. Perform preventive maintenance. Develop testing procedures consistent with functions outlined in earlier life cycle phases.

TESTING GOALS	TESTING TASKS	TESTING ACTIVITIES
A. Ensure development of a comprehensive maintenance testing program.	1. Develop maintenance testing strategy.	a. Review existing project's testing strategy and testing procedures for application in the maintenance stage. b. Determine overall objectives. c. Review release schedules. d. Outline testing strategy including organizational considerations (eg, user, interface and support groups). e. Develop regression testing program to expose adverse effects of changes on other components. f. Determine tracking and reporting system requirements.
	2. Identify resource requirements.	a. Determine test facilities (eg, computer, terminal, and communications). b. Develop strategy for allocating test times, including test schedule control. c. Analyze current test data base and determine future requirements. d. Determine testing personnel requirements. e. Provide estimates of cost.

**TESTING ACTIVITIES PERFORMANCE AID
MAINTENANCE STAGE (Contd)**

TESTING GOALS	TESTING TASKS	TESTING ACTIVITIES
<p>A. Ensure development of a comprehensive maintenance testing program. (Contd)</p>	<p>3. Develop testing procedures.</p>	<p>The activities below should be performed for <i>each</i> release.</p> <ul style="list-style-type: none"> a. Review proposed enhancements and maintenance changes for impact on testing. b. Determine testing requirements for each enhancement or maintenance change. c. Determine static testing requirements (eg, walk-throughs, code inspections, etc). d. Determine test data base enhancements. e. Define start and completion dates for each level of testing (unit, integration, system). f. Develop test plans including regression test requirements for enhancements and maintenance changes. g. Develop test cases.
	<p>4. Perform Testing.</p>	<ul style="list-style-type: none"> a. Perform the same activities as outlined for the initial development of the system. (See Implementation and Conversion Phases in this performance aid.)