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Southern California Rapid Transit District

METRO RAIL PROJECT

TEST PROGRAM PLAN

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TEST PROGRAM PLAN

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1.0 INTRODUCTION

1.0 INTRODUCTION

The Southern California Rapid Transit District (SCRTD) Metro Rail Project is in the construction phase. Contracts have been awarded for the construction of fixed facilities and the procurement of system equipment for the initial construction segment, termed Minimum Operable Segment-1 (MOS-1). Throughout construction of the Metro Rail system and during start-up operations, a comprehensive test program will be implemented and will encompass tests of fixed facilities and system equipment required by contract or otherwise specified by the SCRTD; system integration and pre-revenue tests prescribed by the SCRTD; and all safety-related tests. The test program is designed to ensure that:

- Material, equipment, facilities, and software provided under the various procurement and construction contracts conform to requirements
- Equipment, facilities, software, and personnel function effectively together to provide safe and dependable service.

This Metro Rail Test Program Plan (TPP) provides a framework for achieving Metro Rail test program objectives in a coherent and organized manner. The TPP:

- Identifies the test program organization and defines the authorities and responsibilities of program participants (see Chapter 2.0)
- Establishes the process for managing test program activities, including the planning, coordinating, performance, monitoring, and documenting of fixed facility tests, system equipment tests, and system start-up tests (see Chapters 3.0 through 5.0)
- Defines the administrative requirements of the test program (see Chapter 6.0).

The TPP specifies a standardized approach for managing and accomplishing test program activities. It does not delineate the detailed procedures required to conduct each test. Specific test requirements, such as instrumentation set-up, equipment operation, troubleshooting

responsibilities, test responsibilities, and test budget, will be addressed during the development of each test procedure.

1.1 TEST CATEGORIES

Each Metro Rail fixed facility or system equipment element must undergo tests from its design through completion and operation. Furthermore, tests must be conducted to ensure that Metro Rail operates as a unified system. After the Metro Rail system becomes operational and prior to the start of revenue service, certain start-up tests must be performed to verify the adequacy of Metro Rail personnel training and to verify the reliability and safety of the system. The tests which are required throughout the construction phase and during start-up operations fall into the following categories:

- Design qualification tests
- Production verification tests
- Construction inspection tests
- Installation verification tests
- Acceptance tests
- System integration tests
- System pre-revenue tests
- Demonstration tests.

A brief description of each test category is provided below.

Design Qualification Tests are conducted at the material, component, or subsystem level during contractor engineering on each Metro Rail element to demonstrate compliance with contract specifications. Examples of design qualification tests are: smoke and flammability tests of new material, traction motor/gear unit design tests, dynamometer tests, vehicle mock-up inspection, switchgear design tests, and amplifier frequency response tests. These tests are generally performed at the contractor's facilities or at independent laboratories.

Production Verification Tests are in-process acceptance or factory acceptance tests that are conducted at the material, component, assembly, or subsystem level during production of Metro Rail system equipment and equipment for fixed facilities. These tests ensure that the equipment is manufactured in accordance with the approved design and that the quality of production is in accordance with accepted workmanship standards. Examples of production verification tests are: composition tests of lubricants, high potential/*megonm* tests, equipment wiring continuity tests, and substation transformer, TV

monitor, and relay rack factory acceptance tests. Production verification tests are performed at the contractor's facilities or independent laboratories.

Construction Inspection Tests are in-process acceptance tests conducted to ensure that supplied materials meet specified standards, that fixed facilities are constructed in accordance with approved design, and that the quality of construction is in accordance with specified workmanship standards and industry codes. Examples of construction inspection tests are: asphalt concrete paving inspection, concrete composition tests, and field paint tests. The construction inspection tests are performed at the Metro Rail construction site, at independent laboratories, or at the manufacturer's facilities.

Installation Verification Tests are in-process acceptance tests conducted at the subsystem or assembly level during the installation of each Metro Rail element. These tests ensure that the on-site installation is in accordance with the approved design and that the quality of installation is in accordance with accepted workmanship standards. Examples of installation verification tests are: station wiring continuity tests, escalator and elevator installation clearance checks, and train control room wiring checks. These tests are performed at the Metro Rail site.

Acceptance Tests are conducted at the subsystem level to verify that the performance of each Metro Rail element and subsystem/assembly contained therein is in compliance with the specification requirements. Some production verification tests may be repeated as acceptance tests to verify proper operation of the element after installation. Examples of acceptance tests are: passenger vehicle running tests, train control room local panel operation tests, substation voltage tests, and station equipment operation tests. These tests are performed at the Metro Rail site and are a prerequisite to the start of Metro Rail system integration tests.

System Integration Tests are conducted at the system level to ensure that Metro Rail elements function properly together. Examples of system integration tests are tests involving interfaces such as passenger vehicles/station/tunnel clearances, wayside equipment and automatic train control, and station power and substations. These tests are conducted at the Metro Rail site.

System Pre-Revenue Tests are conducted at the Metro Rail system level during the pre-revenue phase to simulate revenue service operations during normal and abnormal

conditions, including emergencies, and to verify proper training of SCRTD personnel. System pre-revenue tests involve all elements of the Metro Rail system.

Demonstration Tests are conducted at the subsystem level beginning with the system pre-revenue phase and continuing into the revenue service phase to demonstrate the reliability of individual elements. Examples of demonstration tests are: passenger vehicle, fare collection, and train control reliability tests.

The titles used to identify test categories vary somewhat among Metro Rail Project documents. Exhibit 1-1 provides examples of the test category titles specified in Metro Rail contract documents and indicates their relationship to the TPP test categories specified above. To the greatest extent possible, test program participants should use TPP test category titles to standardize terminology and facilitate test program monitoring.

1.2 RELATIONSHIP TO THE SAFETY CERTIFICATION PROGRAM

The Metro Rail safety certification program documents that all safety requirements in design criteria and specifications are achieved, and that the safety content of plans, procedures, and training materials are systematically reviewed. While the safety certification program and the test program are managed as separate programs, they complement and reinforce each other and must be coordinated in the area of safety-related tests.

The Metro Rail TPP and safety-related test procedures are identified as elements that must receive Certificates of Compliance under the safety certification program.¹ Therefore, the SCRTD Safety Certification Review Team must approve the safety content of the TPP and relevant test procedures and recommend to SCRTD senior management that they be certified.

As the test program proceeds, the Safety Certification Review Team must verify that all safety-related tests are successfully completed and, among other things, that all identified hazards are resolved. As these activities are completed, they must be reviewed and documented by the Review Team as part of the certification process.

1 SCRTD Metro Rail Project, Safety Certification Plan, Rev. 1.1, June 1988.

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EXHIBIT 1-1
Examples of Test Categories From Contract Documents
and Their Relation to TPP Test Categories

TPP TEST CATEGORY	TEST CATEGORIES IDENTIFIED IN CONTRACT DOCUMENTS		
	Vehicle Specification A650	Main Shop Building Specification A112	Traction Power Specification A631
1. Design Qualification Tests	Qualification Test	Not Applicable	
2. Production Verification Tests	Acceptance Test Maintainability Demonstration Test	Factory Tests	Field Quality Control Test
3. Construction Inspection Tests	Not Applicable	Inspection Field QC Tests	Not Applicable
4. Installation Verification Tests	Not Applicable	Operational Tests Field QC Tests	Installation Verification Test
5. Acceptance Tests	Vehicle Acceptance Test Vehicle Performance Test	Acceptance Tests	Operation Verification Test Field Acceptance Testing
6. System Integration Test	System Integration Test	Not Applicable	Start-up Testing
7. System Pre-Revenue Test	None Identified	Not Applicable	None Identified
8. Demonstration Test	Reliability Demonstration Test	Not Applicable	None Identified

2.0 TEST PROGRAM ORGANIZATION

2.0 TEST PROGRAM ORGANIZATION

The organization for managing the Metro Rail test program includes personnel from the SCRTD Systems Design and Analysis Office and the SCRTD Construction Management Office, and from two consultant organizations -- the Construction Management Consultant and the Systems Engineering and Analysis Consultant. Exhibit 2-1 depicts the test program organization and shows the administrative and functional relationship of program participants.

The following sections of this chapter describe the roles and responsibilities of test program participants. Because testing is a complex and vitally important element in preparing the Metro Rail system for revenue service, all program participants must work actively, cooperatively, and continuously toward the achievement of program objectives.

2.1 SCRTD

Within SCRTD, key participants in the Metro Rail test program are drawn from the Construction Management Office and the Systems Design and Analysis Office. Primary responsibility for test program management rests with the Systems Design and Analysis Office.

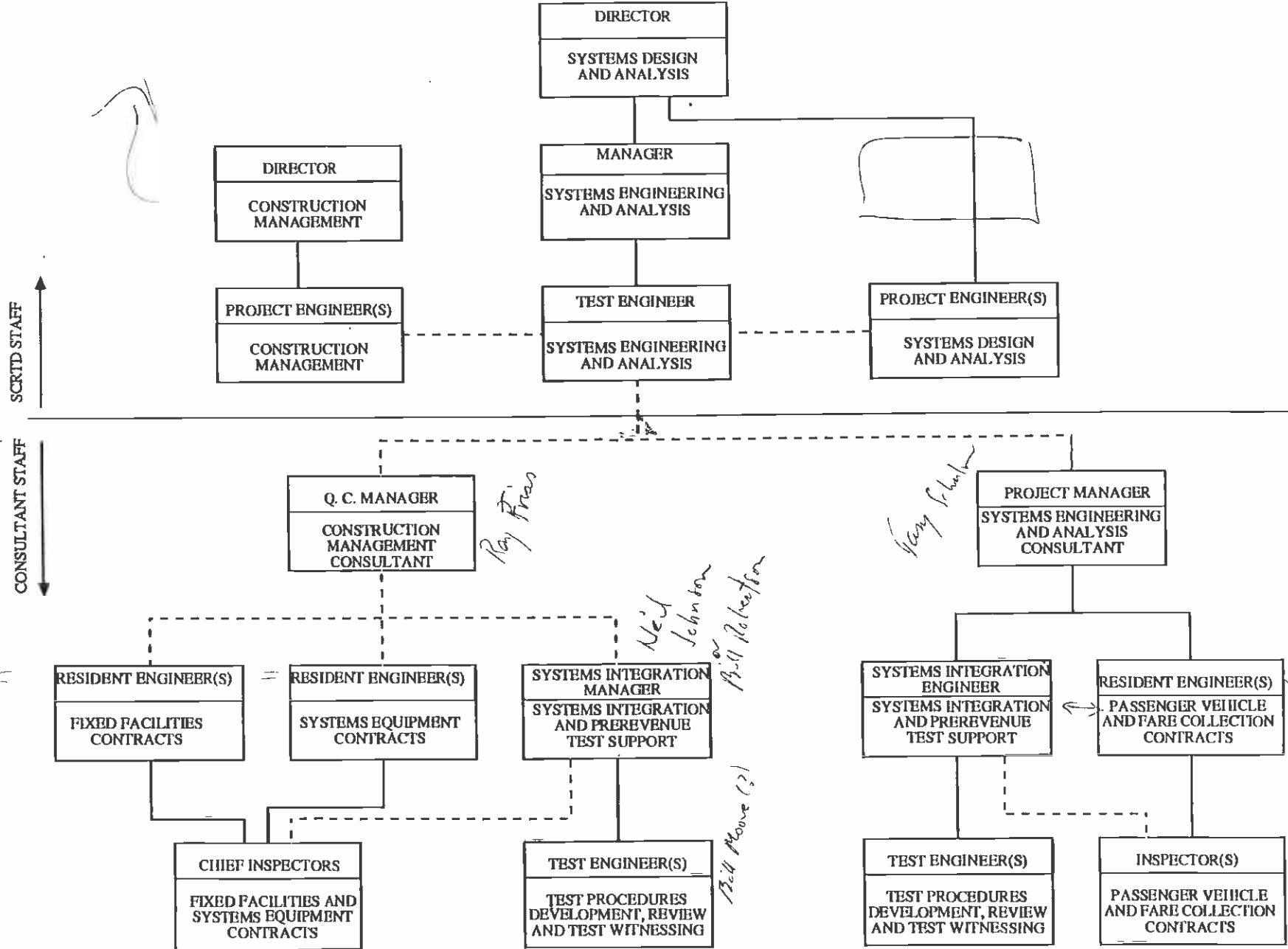
The Director of Systems Design and Analysis is responsible for systems design, systems engineering and analysis, and systems safety and assurance efforts, including:

- Management of train control, communications, traction power, passenger vehicle, and fare collection equipment procurements
- Overall management of Metro Rail testing and activation
- Direction of the Systems Engineering and Analysis (SE&A) Consultant and appropriate direction of the Construction Management (CM) Consultant's assigned procurement activities.

*No longer true
we checked this in
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Within the Systems Design and Analysis Office, the Manager of Systems Engineering and Analysis is responsible for directing the efforts of the Test Engineer.

EXHIBIT 2-1
Test Program Organization



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The Director of Construction Management is responsible for Metro Rail construction-related activities and all procurement activities except for train control, communications, traction power, passenger vehicles and fare collection equipment. His responsibilities include:

- Management of assigned procurement and all construction activities
- Review of and recommendation for approval of progress and final payments to contractors
- Administration of testing, start-up, and activation activities for facilities and assigned system equipment contracts
- Appropriate direction of the CM Consultant's efforts.

The Director of Systems Design and Analysis and the Director of Construction Management designate, for each of their assigned contracts, a Project Engineer to represent the SCRTD in overall management of the contract. The Project Engineers coordinate with consultant Resident Engineers in monitoring contract performance. In addition, the Project Engineers coordinate with the SCRTD's Test Engineer in providing required support to test program activities.

The Test Engineer, who reports to the Manager of Systems Engineering and Analysis, is responsible for coordinating and managing Metro Rail test program activities. In fulfilling his responsibilities, the Test Engineer coordinates with SCRTD and consultant program participants to ensure that all required tests are identified and are conducted, verified, and documented in accordance with approved plans and schedules. The Test Engineer, in conjunction with the CM or SE&A Consultants, assesses the sufficiency of test activities and must balance test requirements against scheduling and cost constraints. The Test Engineer must be cognizant of all aspects of the test program and be able to address and resolve any problems that occur. The Test Engineer does not assume line responsibilities which presently reside with SCRTD Project Engineers or consultant Resident Engineers.

Examples of the duties to be performed by the Test Engineer include:

- Review and approval of test plans for fixed facility and system equipment contracts, and compilation of list of required tests

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line responsibilities is needed for sys. int test
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f.f. provide test plans →

- Monitoring of the status of test procedures for fixed facility and system equipment contracts, and review and approval of completed procedures
- Identification of system integration and pre-revenue test requirements and development of test plan and procedures
- Review and approval of test requests for additional noncontractual tests
- Direction of system integration and pre-revenue test performance
- Submittal of appropriate materials to the Safety Certification Review Team for safety review
- Coordination with SCRTD's Program Control Office and consultant staff in scheduling and arranging tests - system integration / pre-rev.
- Monitoring and control of test schedules - syst. mt.
- Coordination of the monitoring, documenting, and reporting of all tests
- Review, distribution, and filing of all test reports.

The Test Engineer coordinates with SCRTD Project Engineers to ensure the availability of SCRTD facilities, equipment, and personnel resources during testing. The Test Engineer also coordinates with and is supported by personnel from the CM and SE&A Consultants, the roles and responsibilities of which are described below.

2.2 CONSTRUCTION MANAGEMENT CONSULTANT

The CM Consultant is responsible for the management of all transit facility construction and the procurement of all equipment, except passenger vehicles and fare collection equipment. The CM Consultant's scope of work also includes the enforcement of safety, security, and quality assurance requirements on assigned contracts, and for the provision of support for system testing and start-up. The CM Consultant is PDCD, a joint venture formed by the Ralph M. Parsons Company; Dillingham Construction, Inc.; and De Leuw Cather & Company.

The CM Consultant designates a Resident Engineer to manage each fixed facility and assigned system equipment contract. The Resident Engineers are supported by Chief

Inspectors and Inspectors during inspection and test activities. In addition, the CM Consultant designates a Systems Integration Manager to provide system integration and pre-revenue test planning support. Within the CM Consultant's organization, the QC Manager is responsible for coordinating with Resident Engineers and the Systems Integration Manager to ensure consistency in meeting test program objectives. The QC Manager is the primary point of contact between the CM Consultant and SCRTD's Test Engineer.

*How has
been
happening?*

The Resident Engineers of the CM Consultant are responsible for conducting the appropriate review and surveillance on their assigned contracts to verify that:

- All required tests are identified and documented
- Tests follow approved and current test procedures
- Test are performed in accordance with the Metro Rail Project schedule.

The Resident Engineers direct the efforts of the Chief Inspectors and Inspectors in test performance and witnessing. If the Resident Engineers determine that there are deviations from approved test plans or procedures during test performance, they have contractual authority to enforce appropriate corrective action.

The Systems Integration Manager of the CM Consultant is responsible for providing support for system integration and pre-revenue testing conducted at the Metro Rail site under the guidance of SCRTD's Test Engineer, except for fare collection equipment and passenger vehicle testing. The System Integration Manager assists the Test Engineer in:

- Establishing test requirements
- Developing test procedures and related documentation
- Establishing schedules and documenting the status of tests
- Verifying test prerequisites, such as the availability of support personnel, equipment, and facilities
- Implementing tests
- Witnessing tests, as appropriate

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- Coordinating with Resident Engineers to obtain necessary support for test activities
- Ensuring that responsibility for corrective action for test failures is assigned and accepted, and following up to verify correction.

2.3 SYSTEMS ENGINEERING AND ANALYSIS CONSULTANT

The SE&A Consultant is responsible for operations and maintenance planning; safety, security, and system assurance support; management information system development; systems design special studies; and system test planning. The SE&A Consultant has been assigned responsibility for managing the procurement of passenger vehicles and fare collection equipment. The SE&A Consultant is Booz, Allen & Hamilton Inc.

The SE&A Consultant designates a Resident Engineer to manage each of the passenger vehicle and fare collection equipment procurement contracts. The Resident Engineers are supported by Inspectors during inspection and test activities. In addition, the SE&A Consultant designates a Systems Integration Engineer to provide systems integration and pre-revenue test planning support. Within the SE&A Consultant's organization, the Project Manager is responsible for coordinating with Resident Engineers and the Systems Integration Engineer to ensure consistency in meeting test program objectives. The Project Manager is the primary point of contact between the SE&A Consultant and SCRTD's Test Engineer.

*Duplicate
Neil Johnson
Very bureaucratic*

Resident Engineers of the SE&A Consultant are responsible for conducting the appropriate reviews and surveillance on their assigned contracts to verify that:

- All required tests are identified and documented
- Tests follow approved and current test procedures
- Tests are performed in accordance with the Metro Rail Project schedule.

The Resident Engineers direct the efforts of Inspectors in test performance and witnessing. If the Resident Engineers determine that there are deviations from approved test plans or procedures during test performance, they have contractual authority to enforce appropriate corrective action.

The Systems Integration Engineer is responsible for providing support for system integration and pre-revenue

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R.E.S.*

testing of passenger vehicles and fare collection equipment conducted at the Metro Rail site under the guidance of SCRTD's Test Engineer. The Systems Integration Engineer assists the Test Engineer in:

- Establishing test requirements
- Developing test procedures and related documentation
- Establishing schedules and documenting the status of tests
- Verifying test prerequisites, such as the availability of support personnel, equipment, and facilities
- Implementing tests
- Witnessing tests, as appropriate
- Coordinating with Resident Engineers to obtain necessary support for test activities
- Ensuring that the responsibility for corrective action for test failures is assigned and accepted, and following up to verify correction.

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3.0 FIXED FACILITY TESTING PROCESS

3.0 FIXED FACILITY TESTING PROCESS

Chapter 3.0 describes the testing process for fixed facilities. The CM Consultant's Resident Engineers are responsible for the test management of fixed facility contracts. As illustrated in Exhibit 3-1, the steps in the testing process are:

- Prepare test plans
- Review and approve test plans
- Prepare test procedures
- Review and approve test procedures
- Schedule, perform, and document tests
- Review and evaluate test data
- Repeat tests, if necessary
- Report test completion.

The following sections discuss the steps in the fixed facility testing process. This process is applicable to safety-related and other fixed facility tests identified as critical. The process for routine tests of fixed facilities is less complex and is covered in Metro Rail quality assurance/quality control procedures.¹

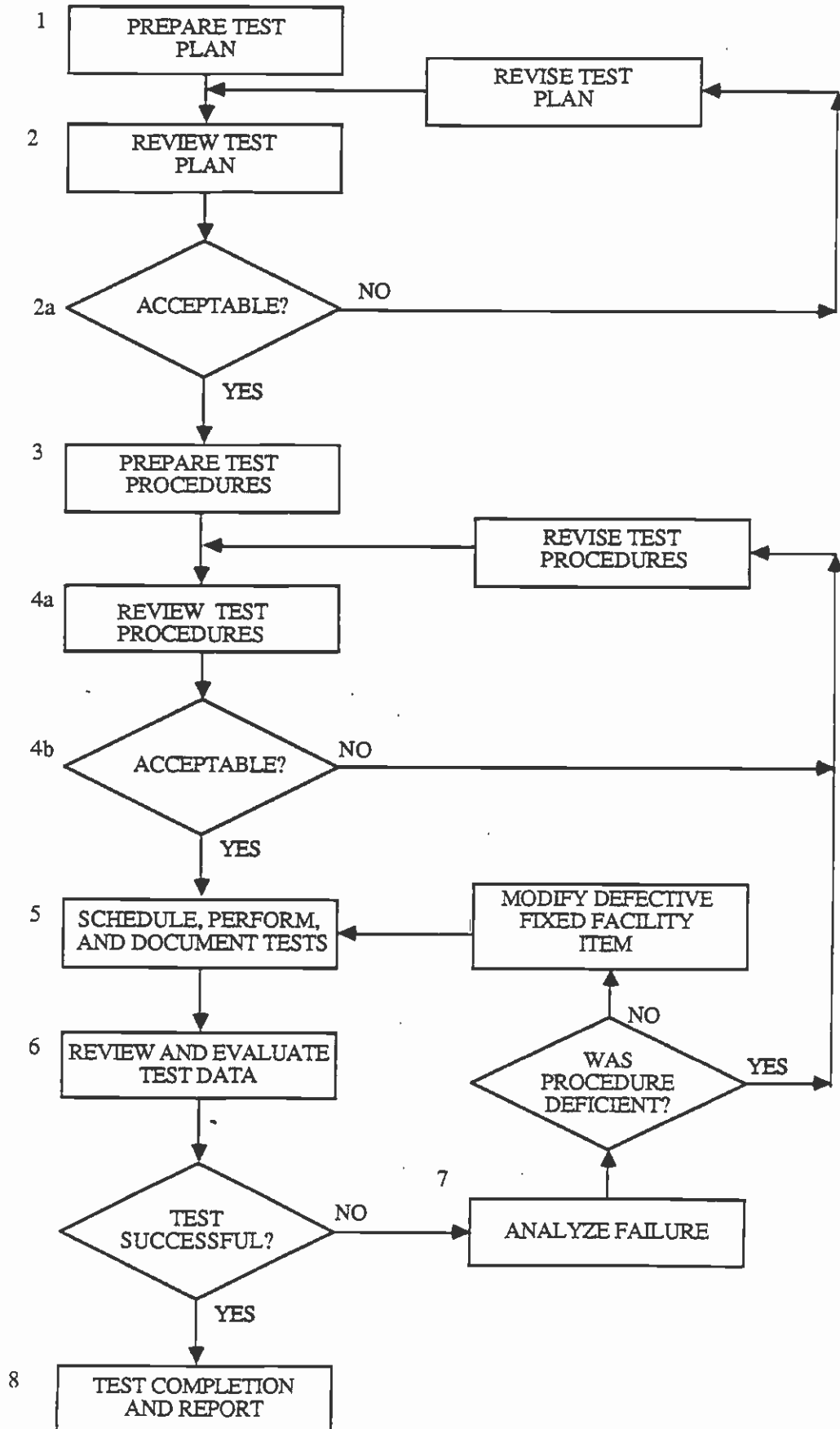
3.1 PREPARE TEST PLANS

The first step in the fixed facility testing process is to identify test requirements for each Metro Rail fixed facility element and document those requirements in a test plan. The contract specifications include requirements that the contractor or the CM consultant perform certain testing on fixed facilities constructed for the SCRTD. The tests are required to:

- Substantiate design requirements
- Verify compliance with codes and standards
- Verify that the fixed facility is acceptable to the SCRTD
- Ensure uniform construction quality.

1 See PDCD Los Angeles Metro Rail Project, QA/QC Procedures Manual, September 1985, as revised.

EXHIBIT 3-1
Fixed Facility Testing Process



Contract specifications may identify testing requirements in the areas of:

- Design qualification testing
- Production verification testing
- Construction inspection testing
- Acceptance testing.

The CM Consultant's Resident Engineers are responsible for ensuring that all required tests are identified. Each Resident Engineer reviews his or her assigned contract, identifies required tests, and prepares a test plan for the contract that documents test requirements and includes a preliminary test schedule.

3.2 REVIEW AND APPROVE TEST PLANS

The test plan is distributed for CM Consultant staff review, including review and approval by the QC Manager. The plan is then submitted to the SCRTD's Director of Construction Management and to the SCRTD's Test Engineer. The Test Engineer distributes the plan to other appropriate SCRTD and consultant staff for technical review. Once any comments have been resolved and the plan approved by the Test Engineer, the Test Engineer assigns a test control number to each test in the plan and uses the plan information to compile a master list of test requirements. (See Chapter 6.0, Exhibit 6-3, for the format for listing required tests.) Test requirements are grouped in the list under the heading of each contract shown in Exhibit 3-2. Typical test requirements for fixed facility contracts are shown in Appendix A.

The Test Engineer returns the approved test plan through the CM Consultant's QC Manager to the Resident Engineer.

3.3 PREPARE TEST PROCEDURES

Once the test plan has been approved, the Resident Engineer is responsible for ensuring that procedures are available for each test. The majority of fixed facility tests are governed by construction industry codes for which standard test procedures exist. Test procedures must be prepared by the contractor or the CM Consultant, as appropriate, only for special test requirements or for those tests that are modifications of standard test requirements. The Resident Engineer ensures that each test procedure includes such information as the test objective, success/failure parameters, equipment and instrumentation to be used, test set-up, test methodology,

EXHIBIT 3-2
List of Fixed Facility Contracts for MOS-1

CONTRACT NO.	CONTRACT DESCRIPTION
A111	Santa Fe Avenue Restoration
A112	Main Shop Building Construction
A116	Yard Site Security Fencing
A117	Yard Site Lighting
A118	Yard Site Landscaping
A119	Track Relocation
A121	Maintenance of Way Shop Building Modification
A123	Demolition of Structure on Santa Fe Avenue
A124	Ducommun and Jackson Streets Restoration
A130	Yard Leads and Transfer Zone
A133	Union Station Replacement Baggage Handling Facilities Modification
A134	Demolition of Structure on Vignes Street
A135	Union Station and Crossover Construction Stage I
A136	Union Station and Crossover Construction Stage II
A138	Union Station Site Work
A139	Union Station Site Landscaping
A141	Line Section Union Station to 5th/Hill and Civic Center Station Construction Stage I
A145	5th/Hill Station Construction Stage I; Utility
/A145A	Relocation and Vault Modification
A146	Line Section 5th/Hill Station to 7th/Flower Station
A147	Civic Center Station Construction Stage II
A157	5th/Hill Station Construction Stage II
A162	Demolition of Structure on South Figueroa Street
A165	7th/Flower Station Construction Stage I
A167	7th/Flower Station Construction Stage II
A171	Line Section, 7th/Flower to Wilshire/Vermont
A172	Demolition of Structure on West 7th Street
A173	Demolition of Structures on Alvarado Street
A175	Wilshire/Alvarado Station Construction Stage I
A185	Wilshire/Alvarado Site Work Restoration
A186	Wilshire/Alvarado Site Landscaping
A187	Wilshire/Alvarado Station Construction Stage II
A610	Trackwork Installation/Yard Storage Area Civil
/A115	Sitework

data evaluation procedure, sequence of test steps, test duration, and the type of report or data to be issued.

The CM Consultant's QC Manager and Resident Engineers coordinate closely to ensure that test procedures are submitted to the Test Engineer in a timely manner for review and comment. To this end, each Resident Engineer maintains a test procedures status log. The test procedures status log is periodically updated by the Resident Engineer, and copies are provided to the SCRTD's Test Engineer for inclusion in a systemwide log to ensure that the test program remains within schedule.

3.4 REVIEW AND APPROVE TEST PROCEDURES

Once test procedures have been developed, they are subjected to the same review and approval cycle described in Section 3.2. In addition, for safety-related tests, the test procedures are submitted to the Safety Certification Review Team for review and recommendation for certification. Following approval of test procedures, the Test Engineer notifies the Resident Engineer, through the CM Consultant's QC Manager, to finalize the test schedule and proceed with fixed facility tests.

3.5 SCHEDULE, PERFORM, AND DOCUMENT TESTS

Upon approval of the test procedures, tests are performed and documented in accordance with the approved testing schedule. The testing schedule is developed from test plan schedules and is governed by contractual requirements and milestones. The CM Consultant, in consultation with the Test Engineer, maintains monthly schedules for fixed facility tests and provides copies to the Test Engineer. (See Chapter 6.0, Exhibit 6-4, for schedule format.) Any changes to approved monthly test schedules affecting Level III milestones must be subjected to the SCRTD's formal change control process.

The Resident Engineers managing the fixed facility contracts have the responsibility for ensuring that all tests are performed on schedule and in accordance with approved test procedures. The Resident Engineers also have responsibility for enforcing corrective actions for any deviations from approved test plans and procedures during test performance. The CM Consultant contracts with independent testing laboratories to conduct those tests that are needed in addition to the tests performed by the contractor or CM Consultant. The SCRTD Test Engineer may witness selected tests and provide independent verification of test performance and completion.

As described in Section 3.3, each test procedure identifies success/failure parameters, test duration, and the sequence of test steps. As each test step is successfully accomplished, test data sheets are annotated. If the test is successfully concluded, the test data sheets are so annotated. If the test is unsuccessful, the cause of the test failure is analyzed, and the test is repeated. Tests are rescheduled and reaccomplished as described in Section 3.7.

Approved test procedures and associated annotated data sheets are available at the conclusion of each fixed facility test for review and determination that the test was successfully completed.

3.6 REVIEW AND EVALUATE TEST DATA

Based on the complexity of the test subject, data gathered during the performance of the test may require a detailed review. Review, evaluation, and approval of the test data are conducted by the Test Engineer with support from the CM Consultant. The CM Consultant's Resident Engineers have the responsibility for informing contractors of test approval or disapproval.

3.7 REPEAT TESTS

A repeat test is required when the element being tested does not pass all of the success criteria/parameters identified in the approved test procedures. In the event of a test failure, the cause is analyzed by the contractor and cognizant Resident Engineer. To successfully complete the test, the fixed facility element being tested, the test set-up, the test procedures, or a combination of these items may have to be modified. Modifications are documented and are subjected to the SCRTD's change control process if they affect a design parameter or specification requirement. If test procedures must be modified, the entire development, review, and approval cycle described in Sections 3.3 and 3.4 must be repeated.

A decision must also be made as to whether the test needs to be repeated in full or whether only that part impacting the failed parameter must be repeated. This decision depends on the criticality of the failure. The responsibility for making this recommendation rests with the CM Consultant's Resident Engineer.

The Resident Engineer prepares a statement describing the extent to which the test needs to be repeated, and the schedule and contractual impacts of repeating the test.

Do we want this?
This is not
Check My Review
PE
Manual

The Test Engineer reviews the statement and gives his approval to finalize the schedule and repeat the test.

*Check
RE Manual*

3.8 REPORT TEST COMPLETION

Upon successful test completion, the Resident Engineer submits a test report, including a copy of approved test procedures and associated annotated data sheets, through the QC Manager to the SCRTD's Test Engineer. The Test Engineer maintains a master record of all tests conducted on the Metro Rail Project.

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4.0 SYSTEM EQUIPMENT TESTING PROCESS

4.0 SYSTEM EQUIPMENT TESTING PROCESS

Chapter 4.0 describes the testing process for system equipment. The SE&A Consultant's Resident Engineers are responsible for test management of passenger vehicle and fare collection equipment contracts; the CM Consultant's Resident Engineers are responsible for test management of all other system equipment contracts. As illustrated in Exhibit 4-1, the steps in the testing process are:

- Prepare test plans
- Review and approve test plans
- Prepare test procedures
- Review and approve test procedures
- Schedule, perform, and document tests
- Review and evaluate test data
- Repeat tests, if necessary
- Report test completion.

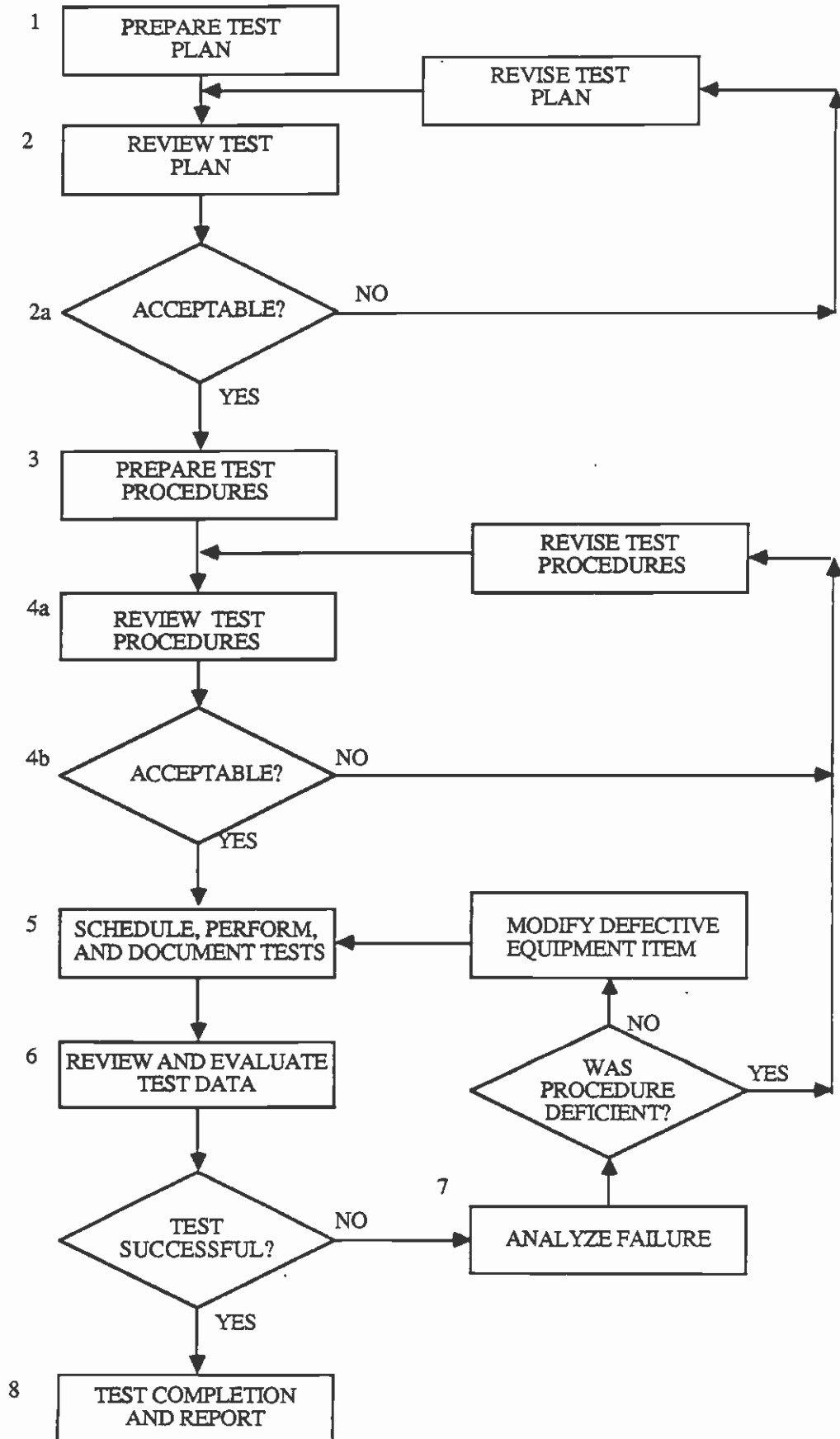
The following sections discuss the steps in the system equipment testing process.

4.1 PREPARE TEST PLANS

The first step in the system equipment testing process is to identify test requirements for each Metro Rail element and document those requirements in a test plan. The contract specifications include requirements that the contractor perform certain testing on equipment delivered to the SCRTD. The tests are required to:

- Substantiate design and performance characteristics
- Ensure operational compatibility among all components
- Verify compliance with codes and standards
- Verify that the equipment is acceptable to the SCRTD
- Ensure uniform production quality.

EXHIBIT 4-1
System Equipment Testing Process



Contract specifications identify testing requirements in the areas of:

- Design qualification testing
- Production verification testing
- Installation verification testing
- Acceptance testing
- Demonstration testing.

The Resident Engineers of the CM Consultant and the SE&A Consultant are responsible for ensuring that all contractually required tests are identified. Each contractor, if required by the contract terms and conditions, and the cognizant Resident Engineer review the contract, identify the required tests, and document them in a test plan for that contract. Test requirements are governed by the contractually required deliverables identified in contract documents.

The test plan includes a testing sequence. An example of the testing sequence format is shown in Exhibit 4-2. The testing sequence is developed from the identified test requirements and is designed to:

- Ensure that tests and prerequisite activities are performed in an orderly and logical sequence
- Identify important milestones and those tests or activities that must be monitored closely
- Provide a baseline to develop a schedule for test performance
- Ensure coordination with overall Metro Rail Project schedules.

The contractors for system equipment contracts, or the CM Consultant or SE&A Consultant, are responsible for preparing the testing sequence. The SCRTD must ensure that the requirement for developing the testing sequence is specified in contract documents or is clearly delegated to the consultants.

4.2 REVIEW AND APPROVE TEST PLANS

Following satisfactory review by CM or SE&A Consultant staff, the test plan is submitted to the SCRTD Test Engineer. The Test Engineer distributes the plan to ~~appropriate SCRTD and consultant staff for review.~~ Once any comments have been resolved, the Test Engineer approves the test plan. The testing sequence included in the approved test plan provides a baseline for developing

Treat Test Plan as any other submitted for R/C.

EXHIBIT 4-2
Sample Testing Sequence

Test Category:	Train Control Installation Verification	Revision: 0																							
Contract No.:	A620	Page 2 of 4																							
Prepared By:	Approved By:																								
TEST ITEM	TEST SEQUENCE IN WEEKS																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
WILSHIRE/ALVARADO ROOM			S/B	x		R/W	x												R/R	x					
7TH/FLOWER ROOM			S/B	x		R/W	x												R/R	x					
5TH/HILL ROOM					S/B	x		R/W	x										R/R	x					
CIVIC CENTER ROOM					S/B	x		R/W	x															R/R	x
UNION STATION ROOM								S/B	x		R/W	x												R/R	x
OCC ROOM								S/B	x		R/W	x													

Legend: S/B = Static and breakdown testing
 R/W = Room to wayside testing
 R/R = Room to room testing

• = Start of testing
 x = Completion of testing

a schedule for testing. Any changes to the approved base-line testing sequence affecting Level III milestones are subjected to the SCRTD's formal change control process.

The Test Engineer assigns a test control number to each test in the plan and uses the plan information to compile a master list of test requirements. (See Chapter 6.0, Exhibit 6-3, for the format for listing required tests.) The test requirements are grouped under the heading of each contract shown in Exhibit 4-3. A preliminary list of test requirements for selected system equipment contracts is included in Appendix B.

The Test Engineer returns the approved test plan to the Resident Engineer.

4.3 PREPARE TEST PROCEDURES

Once the test plan has been approved, the cognizant Resident Engineer notifies the contractor to prepare the contractual test procedures. The formats for contractual procedures are governed by the requirements in the contract specification documents. Each test procedure includes such information as the test objective, success/failure parameters, equipment and instrumentation to be used, test set-up, test methodology, test data evaluation procedure, sequence of test steps, test duration, and the type of report or data to be issued.

The cognizant Resident Engineer coordinates closely with the contractor to ensure that test procedures are delivered in a timely manner for review and comment. To this end, the Resident Engineer maintains a test procedures status log. The test procedures status log is periodically updated by the Resident Engineer, and copies are provided to the SCRTD's Test Engineer for inclusion in a systemwide log to ensure that the test program remains within schedule.

Are these logs being kept?

4.4 REVIEW AND APPROVE TEST PROCEDURES

Once test procedures have been developed by a contractor, they are submitted to the cognizant Resident Engineer and are subjected to the same review and approval cycle described in Section 4.2 for test plans. In addition, safety-related test procedures are submitted to the Safety Certification Review Team for review and recommendation for certification. The SCRTD must ensure that contract documents specify an adequate period of time for review and approval of procedures following their submittal and prior to test performance.

EXHIBIT 4-3
List of System Equipment Contracts for MOS-1

<u>CONTRACT NO.</u>	<u>CONTRACT DESCRIPTION</u>
A612	Contact Rail
A615	Protective Coverboard
A616	Direct Rail Fasteners
A620	Automatic Train Control
A630	Traction Power Equipment Procurement
A631	Traction Power Equipment Installation
A640	Communications
A650	Passenger Vehicles
A671	Locomotive
A672	Flat Cars
A675	Crane for Flat Car
A680	Operational Graphics
A710	Escalators
A720	Elevators
A730	Shop Equipment (Fixed)
A732	Wheel Truing Machine
A735	Shop Equipment (Freestanding/Portable)
A740	Ventilation Equipment
A745	Air Handling Equipment
A760	Signs and Graphics
A770	Rubber-Tired Vehicles
A775	Mobile Emergency and Maintenance Equipment
A780	Shop and Station Furniture
A785	Fire Suppression Equipment
A790	First Stores and Consumables
A795	Uninterruptible Power Supplies
H840	Fare Collection

Following approval of test procedures, the Test Engineer notifies the cognizant Resident Engineer, who in turn informs the contractor to finalize the test schedule and proceed with test performance.

4.5 SCHEDULE, PERFORM, AND DOCUMENT TESTS

Upon approval of the test procedures, tests are performed and documented in accordance with the approved testing schedule. The testing schedule is developed by the contractor from the testing sequence and is governed by contractual requirements and milestones. The Resident Engineers managing the system equipment contracts are responsible for ensuring that contractors develop appropriate test schedules. The CM and SE&A Consultants, in consultation with the Test Engineer, maintain monthly test schedules for their contracts, and are responsible for forwarding copies of the schedules to the Test Engineer. (See Chapter 6.0, Exhibit 6-4 for schedule format.) Any changes to the approved monthly test schedules affecting Level III milestones must be subjected to SCRTD's formal change control process.

The Resident Engineers are responsible for ensuring that all system equipment tests are performed on schedule and in accordance with approved test procedures. The Resident Engineers also have responsibility for enforcing corrective actions if test performance deviates from approved test plans or procedures. The SCRTD Test Engineer may witness selected tests and provide independent verification of test performance and completion.

As described in Section 4.3, each test procedure identifies success/failure parameters, test duration, and the sequence of test steps. As each test step is successfully accomplished, test data sheets are annotated. If the test is successfully concluded, the test data sheets are so annotated. If the test is unsuccessful, the cause of the test failure is analyzed, and the test is repeated. Tests are rescheduled and reaccomplished as described in Section 4.7

Approved test procedures and associated annotated data sheets are available at the conclusion of each system equipment test for review and determination that the test was successfully completed.

4.6 REVIEW AND EVALUATE TEST DATA

Based on the complexity of the test subject, data gathered during the performance of the test may require a detailed review. Review, evaluation, and approval of the

test data are conducted by the Test Engineer with support from the CM or SE&A Consultant, as appropriate. The cognizant Resident Engineer is responsible for informing the contractor of test approval or disapproval.

4.7 REPEAT TESTS

A repeat test is required when the element being tested does not pass all of the success criteria/parameters identified in the approved test procedures. In the event of a test failure, the cause is analyzed by the contractor and cognizant Resident Engineer.

To successfully complete the test, it may be necessary to modify the element being tested, the test set-up, test procedures, or a combination of these items. Modifications are documented and are subjected to the SCRTD's change control process if they affect a design parameter or specification requirement. If test procedures must be modified, the entire development, review, and approval cycle described in Sections 4.3 and 4.4 must be repeated.

Also, a decision must be made as to whether the test needs to be repeated in full, or whether only the part impacting the failed parameter must be repeated. This decision depends on the criticality of the failure. The responsibility for making this recommendation rests with the cognizant Resident Engineer.

The contractors or the Resident Engineers of the CM Consultant or SE&A Consultant prepare a statement describing the extent to which the test needs to be repeated, and the ~~schedule and contractual impacts of repeating the test.~~ The Test Engineer reviews the statement and gives his approval to finalize the schedule and repeat the test.

4.8 REPORT TEST COMPLETION

Upon successful test completion, the Resident Engineer submits a test report, including a copy of approved test procedures and associated annotated data sheets, to the SCRTD's Test Engineer. The Test Engineer maintains a master record of all tests conducted on the Metro Rail Project.

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5.0 SYSTEM INTEGRATION AND PRE-REVENUE
TESTING PROCESS

5.0 SYSTEM INTEGRATION AND PRE-REVENUE TESTING PROCESS

Chapter 5.0 describes the system integration and pre-revenue testing process. The SCRTD's Test Engineer is responsible for test management. The Test Engineer directs the efforts of the SE&A Consultant's Systems Integration Engineer and the CM Consultant's Systems Integration Manager in test planning, test procedure development, and test performance. The Test Engineer also receives support from the SCRTD's Project Engineers and the CM and SE&A Consultants' Resident Engineers in coordinating the availability of facilities, equipment, and personnel during system integration and pre-revenue testing. As illustrated in Exhibit 5-1, the steps in the testing process are:

- Identify test requirements
- Review and approve test requirements
- Prepare test plan and procedures
- Review and approve test plan and procedures
- Schedule, perform, and document tests
- Review and evaluate test data
- Repeat tests, if required
- Report test completion.

The following sections discuss the steps in the system integration and pre-revenue testing process.

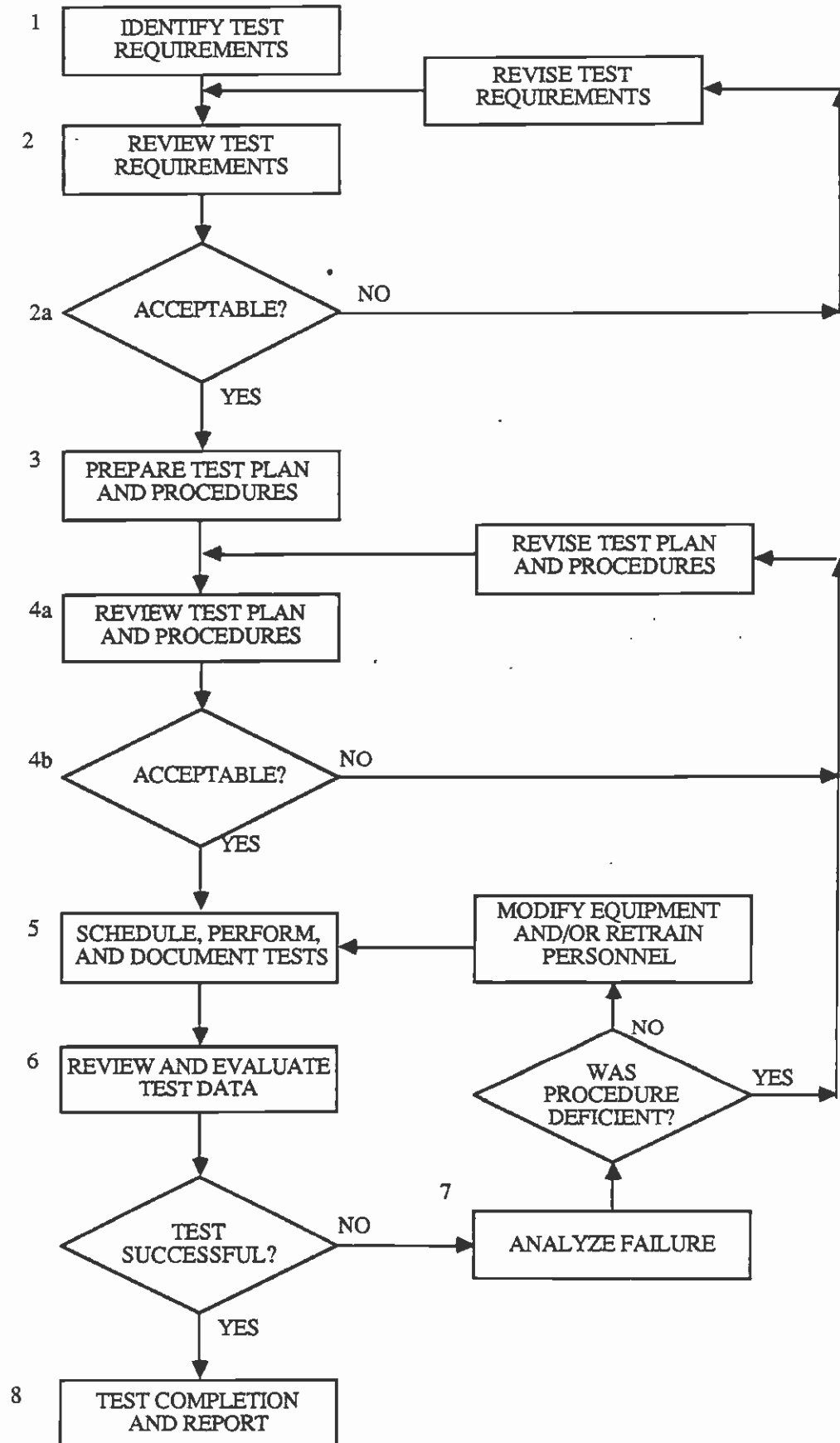
5.1 IDENTIFY TEST REQUIREMENTS

In addition to the testing that is explicitly defined in contract specification documents, it is necessary to identify tests that are designed to verify:

- Features of a system or subsystem that are not verified by contractual tests
- Compatibility of equipment and/or facilities supplied by more than a single contractor
- Operating procedures developed for use under normal, abnormal, and emergency conditions.

These noncontractual tests are necessary for the successful start of Metro Rail revenue service. Development and performance of noncontractual tests are the

EXHIBIT 5-1
 System Integration and Pre-Revenue Testing Process



responsibility of the SCRTD. Contractors providing facilities and equipment involved in a noncontractual test are obligated only to ensure that the configuration of the equipment and facilities is maintained throughout the test at the final acceptance status and that the equipment functions properly. The majority of the noncontractual tests fall into two categories:

- System integration tests
- System pre-revenue tests
 - Normal operations
 - Abnormal operations
 - Emergency situations.

Noncontractual tests are identified and developed by the SCRTD Test Engineer with support from the SE&A Consultant's Systems Integration Engineer and the CM Consultant's Systems Integration Manager, and with appropriate advice from affected contractors and Resident Engineers.

The Test Engineer documents identified test requirements in a master list. (See Chapter 6.0, Exhibit 6-3, for the format for listing tests.) A preliminary list of system integration and pre-revenue tests is included in Appendix C. The Test Engineer will complete the preliminary list and update it periodically.

5.2 REVIEW AND APPROVE TEST REQUIREMENTS

The Test Engineer distributes the list of test requirements to appropriate SCRTD and consultant staff for review and comment. Following resolution of comments, the Test Engineer submits the list to the Manager of Systems Engineering and the Director of Systems Design and Analysis for review and approval.

Requests to perform any additional tests which are not already included in the master list of noncontractual tests are submitted in writing to the SCRTD Test Engineer using the Noncontractual Test Request (see Chapter 6.0, Exhibit 6-1). The Test Engineer reviews the Noncontractual Test Request and forwards it to the Manager of Systems Engineering and Analysis and the Director of Systems Design and Analysis for review and approval.

Upon approval, each test requirement is assigned a test control number by the Test Engineer.

5.3 PREPARE TEST PLANS AND PROCEDURES

For noncontractual test requirements that have received the necessary approval, the SCRTD's Test Engineer is required to prepare the necessary plan and procedures with support from the SE&A Consultant's Systems Integration Engineer and the CM Consultant's Systems Integration Manager.

The test plan for noncontractual test requirements includes such information as the purpose of the test; the test location; required equipment, facilities, and personnel; test duration; and a testing sequence. The testing sequence for systems integration and pre-revenue tests is developed from the approved test requirements and is updated continually as the test program proceeds and additional tests are requested. The purpose of the testing sequence is to:

- Ensure that tests and prerequisite activities are performed in an orderly and logical sequence
- Identify important milestones and those tests or activities that must be monitored closely
- Provide a baseline to develop a schedule for test performance.

The actual calendar date for performing noncontractual tests is determined by the Test Engineer as part of the preparation of a monthly testing schedule.

The responsibility for developing the testing sequence for noncontractual tests rests with the Test Engineer. The Test Engineer prepares the test sequence with assistance from the Systems Integration Engineer, Systems Integration Manager, and the Resident Engineers of the CM and SE&A Consultants.

Each test procedure for noncontractual tests describes test objective, success/failure parameters, equipment and instrumentation to be used, test set-up, methodology, data evaluation procedure, sequence of test steps, and the type of report or data to be issued. The format for noncontractual test procedures is shown in Exhibit 6-2 of Chapter 6.0.

The Test Engineer coordinates closely with SCRTD Project Engineers and consultant Resident Engineers to ensure that the test plan and procedures are distributed in a timely manner for review and comment. To this end, the Test Engineer maintains a test procedures status log,

either as part of the list of test requirements or as a separate document. The test procedures status log is periodically updated by the Test Engineer.

5.4 REVIEW AND APPROVE TEST PLAN AND PROCEDURES

Once the test plan and procedures have been developed, they are subjected to the same review and approval cycle described in Section 5.2. In addition, any safety-related test procedures are submitted to the Safety Certification Review Team for review and recommendation for certification.

Once approved, the testing sequence included in the test plan provides a baseline for developing a schedule for testing. Any changes to the approved baseline testing sequence affecting Level III milestones are subjected to the SCRTD's formal change control process.

5.5 SCHEDULE, PERFORM, AND DOCUMENT TESTS

System integration and pre-revenue tests are conducted in accordance with schedules developed by the Test Engineer using information from the approved testing sequence. The Test Engineer maintains the monthly schedules in a format shown in Exhibit 6-4. The schedules are updated on a monthly basis. Any changes to approved monthly test schedules affecting Level III milestones are subjected to the SCRTD's formal change process.

The Test Engineer has operational responsibility for carrying out system integration and pre-revenue tests according to the approved plan, procedures, and schedule. The Test Engineer coordinates with other departments such as Transportation, Equipment Maintenance, and Facilities Maintenance to schedule the necessary resources. The Test Engineer must ensure that:

- The test can be run safely at the scheduled time and location
- Contractual tests which can or should be run concurrently or in sequence do not conflict with the schedule of system integration and pre-revenue tests
- All cognizant personnel are notified of the system integration and pre-revenue tests.

As described in Section 5.3, each test procedure identifies success/failure parameters, test duration, and

the sequence of test steps. As each test step is successfully accomplished, test data sheets are annotated. If the test is successfully concluded, the test data sheets are so annotated. If the test is unsuccessful, the cause of the test failure is analyzed and the test is repeated. Tests are rescheduled and reaccomplished as described in Section 5.7.

Approved test procedures and associated annotated data sheets are available at the conclusion of each test for review and determination that the test was successfully completed.

5.6 REVIEW AND EVALUATE TEST DATA

Based on the complexity of the elements being tested, the data gathered during the test may require a detailed review. Review, evaluation, and approval of the test data are conducted by the Test Engineer with assistance from the Systems Integration Manager and the Systems Integration Engineer. The Test Engineer then determines if the test was successfully completed.

5.7 REPEAT TESTS

A repeat test is required when the elements being tested do not pass all of the success criteria/parameters identified in the approved test procedures. In the event of a test failure, the cause is analyzed by the Test Engineer with the assistance of the Systems Integration Manager and the Systems Integration Engineer. To successfully complete the test, it may be necessary to modify personnel training programs, the test set-up, equipment, procedures, or a combination of these items. Modifications are documented, and are subjected to the SCRTD's change control process if they affect a design parameter or if they have cost or schedule impacts. If test procedures must be modified, the entire development, review, and approval cycle described in Sections 5.3 and 5.4 must be repeated.

Also, a decision must be made as to whether the test needs to be repeated in full, or whether only that part impacting the failed parameter must be repeated. This decision depends on the criticality of the failure. The responsibility for making this decision rests with the Test Engineer.

The Test Engineer prepares a statement describing the extent to which the test needs to be repeated, and the budget and schedule impacts of repeating the test. The Director of Systems Design and Analysis reviews the

statement and, if found satisfactory, gives approval to repeat the test.

5.8 REPORT TEST COMPLETION

Upon successful test completion, a test report, including a copy of approved test procedures and associated annotated data sheets, is maintained by the Test Engineer. The Test Engineer maintains a master record of all tests conducted on the Metro Rail Project.

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6.0 TEST PROGRAM ADMINISTRATION

6.0 TEST PROGRAM ADMINISTRATION

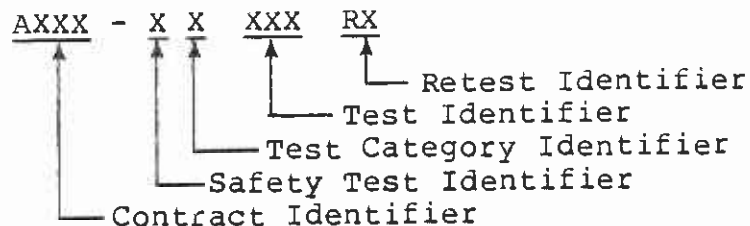
Test program administrative requirements are described in this chapter. These include:

- Test numbering system
- Fixed facility and system equipment test documentation requirements
- System integration and pre-revenue test documentation requirements
- Test program status documentation requirements.

Because the test program involves several hundred contractual tests for the contracts shown in Exhibits 3-2 and 4-3 and a large volume of noncontractual tests, a computerized system is necessary for information processing. The automated Document and Material Control System (DMCS) developed by the CM Consultant is to be used for logging, posting, scheduling, and reporting on test program milestones and for all test documentation filing and retrieval functions. At the conclusion of the test program, DMCS will provide the SCRTD with organized files of all test program documentation.

6.1 TEST NUMBERING SYSTEM

Each test requirement is assigned a test control number to enable its status to be tracked on DMCS from initial approval, through test procedure preparation, and through test performance and completion. The test numbering system provides a unique number for each individual test performed during the program. The test control number is composed of the following identifiers:



Each of these identifiers is briefly described in the following paragraphs.

Contract Identifier (Positions 1, 2, 3, and 4). These are the alphanumeric characters identifying each contract that are shown in Exhibits 3-2 and 4-3. Noncontractual tests are assigned a zero in positions 2, 3, and 4.

Safety Identifier (Position 5). A single alpha character indicates if the test is safety related:

N	Non-safety
S	Safety-related

Test Category Identifier (Position 6). A single alpha character indicates the category of the test, as follows:

Q	Design qualification test
V	Production verification test
C	Construction inspection test
I	Installation verification test
A	Acceptance test
S	System integration test
P	Pre-revenue test
D	Demonstration test

Test Identifier (Positions 7, 8, and 9). Within each test category, a three-character numeric entry sequentially identifies each test. The numbers run from 001 to 999.

Retest Identifier (Positions 10 and 11). The letter "R" is entered in position 10, and a single numeric character is entered in position 11. The initial test will carry the number 0. Each subsequent retest will carry the next increasing number.

The Test Engineer is responsible for assigning test control numbers to all approved contractual and noncontractual test requirements.

6.2 FIXED FACILITY AND SYSTEM EQUIPMENT TEST DOCUMENTATION

The formats of test plans, test procedures, and test results for contractual tests of fixed facilities and system equipment are governed by the requirements specified in contract documents. These formats are likely to vary from one contract to another. Specific documentation related to fixed facility and system equipment testing will be developed by Resident Engineers as part of the test plans for their contracts.

6.3 SYSTEM INTEGRATION AND PRE-REVENUE TEST DOCUMENTATION

System integration and pre-revenue testing requires the following documents:

- Noncontractual Test Request
- Noncontractual Test Procedure.

The Noncontractual Test Request is used to document required noncontractual tests not previously identified in the master list of system integration and pre-revenue tests. Such a request may be initiated by any Metro Rail Project participant. The Noncontractual Test Request format is shown in Exhibit 6-1. All participants are encouraged to initiate a Noncontractual Test Request whenever they believe a test is needed. The form is designed for ease of completion, so that a proposed test can be evaluated and approved/disapproved before large amounts of staff work are committed. The Test Engineer provides guidance, if necessary, in completing the form. Following approval of the request, the noncontractual test is added to the master list of system integration and pre-revenue test requirements.

The Noncontractual Test Request format may also be used by the Test Engineer in developing a detailed test plan for all approved system integration and pre-revenue test requirements. In such a case, the Test Engineer is responsible for ensuring that each item on the Noncontractual Test Request is developed in sufficient detail to fully describe the test requirement. Additional pages should be used if necessary.

A detailed procedure for conducting each system integration and pre-revenue test is developed following approval of each test requirement. A Noncontractual Test Procedure format is shown in Exhibit 6-2. The Test Engineer is responsible for ensuring that each item on the Noncontractual Test Procedure is adequately developed to conduct the test. Additional pages should be used if necessary.

6.4 TEST PROGRAM STATUS DOCUMENTATION

Test program status is monitored with the following documents:

- Master list of test requirements for contractual (fixed facility and system equipment) tests and for noncontractual (system integration and pre-revenue) tests



NONCONTRACTUAL TEST REQUEST

Page ___ of ___

Revision ___

Date _____

PROPOSED TEST TITLE:

TEST PURPOSE:

PREREQUISITE TESTS:

TEST LOCATION:

FACILITIES/EQUIPMENT REQUIRED:

PERSONNEL INVOLVED:

TEST DURATION:

FREQUENCY:

APPROXIMATE COST:

REMARKS:

REQUESTED BY:

Name: _____ Organization: _____ Phone: _____

APPROVED BY:

Test Engineer _____ Date _____ Director, Systems Design & Analysis _____ Date _____

Manager, Systems Engineering & Analysis _____ Date _____ ASSIGNED TEST NUMBER



NONCONTRACTUAL TEST PROCEDURE

Test Number

Page ___ of ___
Revision ___
Date _____

TEST TITLE:

OBJECTIVE:

SUCCESS/FAILURE CRITERIA: *(Use additional pages as necessary)*

TEST METHODOLOGY/SEQUENCE OF STEPS: *(Use additional pages as necessary)*

TEST EQUIPMENT/INSTRUMENTATION: *(Use additional pages as necessary)*

TEST DURATION:

DATA EVALUATION PROCEDURE: *(Use additional pages as necessary)*

TEST REPORTING DOCUMENTATION: *(Use additional pages as necessary)*

PREPARED BY: Name: _____ Organization: _____

APPROVED BY:

Test Engineer Date

Director, Systems Design & Analysis Date

Manager, Systems Engineering and Analysis Date

Chairman, Safety Certification Review Team Date

- Test procedures status log for contractual and noncontractual tests
- Schedules for contractual and noncontractual tests
- Progress reports.

The Test Engineer is responsible for maintaining master lists of contractual and noncontractual tests to be performed during the Metro Rail test program. Once test requirements for either contractual or noncontractual testing are identified and approved, they are entered on the appropriate master list. The lists are updated periodically to reflect current test requirements.

Test procedures status logs are maintained by the Test Engineer to track the development of procedures for each approved test requirement. The Test Engineer is responsible for developing the status log for noncontractual tests; the log for contractual tests is compiled by the Test Engineer from individual status logs prepared for each contract by Resident Engineers. The logs are updated periodically to reflect the current status of procedure development. A combined format for a master list of tests and a test procedures status log is shown in Exhibit 6-3.

The Test Engineer maintains monthly schedules for contractual and noncontractual tests, with input from the CM and SE&A Consultants. A format for the monthly schedule is shown in Exhibit 6-4. The monthly test schedules are used to plan, implement, and monitor operational activities during the test program. The schedules are dynamic documents that are updated and corrected continually as testing proceeds. However, the monthly test schedules support overall Metro Rail Project schedules, and any changes to the test schedules affecting Level III mile-stones are subjected to the SCRTD's formal change control process.

Detailed schedules should be maintained for the current month, with schedules for the following two months being developed as information becomes available. The monthly schedules depict the:

- Test number and test title
- Projected and actual start and completion dates.

The Test Engineer receives information on contractual test status and schedules from the Resident Engineers of the CM and SE&A Consultants.

EXHIBIT 6-3

Master List of Metro Rail Test Requirements

Contract No:

Master List of Metro Rail Tests

Sheet ___ of ___

Contract:

Revision ___

Prepared By : _____

Approved By: _____

Date _____

Item	Test Number	Test Title	Reference Specification	Test Frequency	Safety Test yes/no	Test Group	Scheduled Completion Date	Current Status
1	A000AD000R0	Operation of Local Train Control and Traction Power Panels	12.10.1.2	random test	NO	SEAC	12-12-88	on hold

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Format for Monthly Schedule

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Contract No.:	MONTHLY SCHEDULE	
Contract:		Revision _____
Prepared by: _____	Approved by: _____	Date _____

ITEM	TEST NUMBER	TEST TITLE	DAY OF MONTH																															
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
	A000AD000R0																																	

6-8

△ Earliest Start Date	▲ Actual Start Date	_____ Minimum Duration
▽ Latest Start Date	● Actual End Date	----- Maximum Duration

Progress reports are prepared to inform senior managers of the SCRTD and other Metro Rail Project participants of the status of the test program and to enable a timely review of all testing-related issues and resolution of any problems. The Test Engineer, with input from the CM and SE&A Consultants, prepares progress reports at the end of each calendar month and a final report just prior to the start of revenue service.

Monthly progress reports advise managers of the following information:

- Tests completed during the report month
- Test requirements identified
- Tests expected to be completed the following month
- Significant problems encountered and progress made
- Other appropriate information.

Monthly reports are prepared by the middle of the month following the report month.

The final report on the test program is prepared immediately prior to the beginning of revenue service to describe the overall status of testing at that time. The final report includes such information as:

- Summary of the test program's history, achievements, and problems
- Description of the current status of the test program, including a summary of remaining test requirements and operational restrictions
- List of recommended actions that should be taken to complete the test program.

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