

Southern California Rapid Transit District

METRO RAIL PROJECT

PROJECT MANAGEMENT PLAN
FOR
MOS-1 CONSTRUCTION

FINAL DRAFT

REVISION 1

MARCH 1989

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INTRODUCTION

INTRODUCTION

This Project Management Plan is designed to provide a framework for administering design and construction of Minimum Operable Segment-1 (MOS-1) of the Downtown Los Angeles to San Fernando Valley Metro Rail Project. The plan has been developed in accordance with the requirements of the Full Funding Contract between the Southern California Rapid Transit District and the Urban Mass Transportation Administration. The plan defines the management responsibilities and roles of project staff; identifies the interactions among project staff and between project staff and other agencies and organizations; and specifies the general procedures and management tools that will be used to ensure effective project control and successful project completion.

This Project Management Plan provides an overview of management requirements rather than a comprehensive specification of the detailed procedures needed to meet those requirements. Detailed definitions of procedures, criteria, and standards are contained in the project documents referenced in this plan. The requirements of these referenced documents are incorporated within the scope of the plan and will be followed by project personnel in implementing the plan. As additional procedures are developed, they will be incorporated in plan revisions.

The plan consists of 13 chapters:

- 1.0 Project Background and System Description
- 2.0 Management Organization, Approach, and Responsibilities
- 3.0 Design Management
- 4.0 Real Estate Management
- 5.0 Systems/Systemwide Equipment Procurement Management
- 6.0 Construction Management
- 7.0 Program Control
- 8.0 Configuration Management

9.0 Test Management

10.0 Value Engineering

11.0 System Safety and Assurance

12.0 Maintenance of the Plan

13.0 Reference Documents

The plan will be revised and updated as applicable.

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1.0 PROJECT BACKGROUND AND SYSTEM DESCRIPTION

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1.0 PROJECT BACKGROUND AND SYSTEM DESCRIPTION

This chapter provides an overview of the project's background and planning decisions and briefly describes the MOS-1 system.

1.1 PROJECT BACKGROUND

The Metro Rail Project, undertaken by the Southern California Rapid Transit District (SCRTD), will have a significant role in the future development of the Los Angeles region. As part of the 1976 Regional Transportation Development Program, Metro Rail is designed to help solve the increasing transportation problems of Los Angeles' high-density urban center--the regional core.

The Metro Rail Project began in 1977, when SCRTD initiated an in-depth analysis of 11 transit alternatives for the regional core. Concurrently, a comprehensive environmental impact analysis was conducted to examine the effects of each alternative on the affected communities. In September 1979, the SCRTD Board of Directors selected its preferred alternative--an 18-mile rail rapid transit line extending from the central business district through the Wilshire Boulevard area to Fairfax Avenue, and then north through Hollywood to the San Fernando Valley.¹

Preliminary engineering on the 18-mile Metro Rail Project began in June 1980. During the preliminary engineering phase, alternative configurations and designs were investigated, major design and engineering issues were resolved, and cost estimates were produced. The decisions reached during this phase are documented in a series of 12 Metro Rail milestone reports:

1. Preliminary System Definition and Operating Plan (August 1982)
2. System Design Criteria (August 1982)
3. Route Alignment Alternatives (February 1983)

1 See U.S. Department of Transportation, Urban Mass Transportation Administration, in conjunction with SCRTD, Alternatives Analysis/Environmental Impact Statement/Report, April 1980.

4. Station Location Alternatives (February 1983)
5. Right-of-Way Acquisition and Relocation Policies and Procedures (September 1982)
6. Land Use and Development Policies (January 1983)
7. Safety, Fire/Life Safety, Security and Systems Assurance (March 1983)
8. Systems and Subsystems (May 1983)
9. Supporting Services Plan (March 1983)
10. Fixed Facilities (September 1983)
11. Preliminary Cost Estimate (December 1983)
12. System Plan (February 1984).

Simultaneous with the preliminary design work, an extensive analysis was conducted of the possible impacts of the project on communities along the Metro Rail alignment.²

During final design, baseline design documents were established (see Chapter 3.0) and pre-construction planning was conducted. Items critical to the construction phase were studied, and plans were developed to expedite procurement and construction activities, including:

- Construction procedures incorporating safety requirements for tunneling in gassy ground due to the possible presence of methane gas
- Manuals and procedures covering quality assurance/control, safety/security, and other critical requirements
- Liaison and coordination with utility companies and various other public agencies, and execution of Master Agreements
- Computerized project control systems to monitor costs and schedules

2 U.S. Department of Transportation, Urban Mass Transportation Administration, in conjunction with SCRTD, Final Environmental Impact Statement, Los Angeles Rail Rapid Transit Project: Metro Rail, December 1983.

- A configuration control/claims control system to maintain contract integrity, monitor interfaces between contracts, and process claims as expeditiously as possible
- A comprehensive community relations plan and an equal opportunity plan
- Constructibility and claims avoidance reviews of construction contracts to minimize potential claims and thereby minimize cost growth
- A comprehensive bid solicitation procedure
- Seismic studies
- Continuation of Work Agreement to minimize work interruptions and cost over-runs.

Construction of the Metro Rail system will, because of funding limitations, be accomplished in stages. The initial construction segment includes the yard and shops area and a main-line segment from Union Station to the intersection of Wilshire Boulevard and Alvarado Street. This segment, termed Minimum Operable Segment-1 (MOS-1), is described in the following section of this chapter. Environmental assessments on MOS-1 were conducted in 1984 and 1986,³ and final design of MOS-1 was essentially completed as of June 30, 1986. Construction of MOS-1 is scheduled to begin in September 1986.

Extensions to the MOS-1 system will be made incrementally as funding permits. The Metro Rail system was originally planned to follow a route along Wilshire Boulevard through the Fairfax district and Hollywood to the San Fernando Valley. However, concerns about the safety of tunneling through the Fairfax area resulted in a Federal law requiring the SCRTD to reconfigure the alignment to avoid potential methane gas areas as identified by the City Task Force. Six candidate alignments were

3 U.S. Department of Transportation, Urban Mass Transportation Administration, in conjunction with SCRTD, Environmental Assessment: Los Angeles Rail Rapid Transit Project, Union Station to Wilshire/Alvarado, August 1984; and Comments and Responses on the Environmental Assessment for the Los Angeles Rail Rapid Transit Project, Union Station to Wilshire/Alvarado, October 1984. See also U.S. Department of Transportation, Urban Mass Transportation Administration, Re-Evaluation of Environmental Record, June 1986.

assessed for serving the Wilshire Corridor and connecting the MOS-1 line with North Hollywood.⁴ In July 1988, the SCRTD Board of Directors selected its preferred alternative: a subway route extending west on Wilshire to Western Avenue, and north on Vermont Avenue to Hollywood Boulevard, west on Hollywood to Highland Avenue, and then through the Santa Monica Mountains to North Hollywood (see Exhibit 1-1).

1.2 MOS-1 SYSTEM DESCRIPTION

The 4.4-mile MOS-1 alignment, shown in Exhibit 1-2, comprises a yard and shops area and a main-line route served by five stations. The main-line route will begin at Union Station, where it will turn southwest and run through the central business district along Hill Street. Turning on 7th Street, the route will head toward the west side of downtown, pass the Harbor Freeway, and continue to the Wilshire/Alvarado Station, where the line will terminate. The main line will be entirely in subway, with line segments constructed by tunneling machines and stations and crossovers excavated by cut-and-cover construction techniques. Three double crossovers will be included in the main-line portion of MOS-1: one on each side of Union Station, and one on the east side of the Wilshire/Alvarado Station.

Additional subway and surface track will connect the main line with the yard, southeast of Union Station. MOS-1 will include all yard and shop facilities planned for the full system, except for a portion of the yard storage tracks and some shop equipment that will be installed as warranted by system extension and fleet expansion.

MOS-1 will include five stations. Four of the stations will be of a double-ended design with two mezzanines; the fifth station, Wilshire/Alvarado, will be of a single-center-mezzanine design. The station at 7th/Flower will be the transfer point between the Long Beach-Los Angeles light rail system and the Metro Rail system. The stations have been designed for unattended operations; however, some stations may be attended at certain times of day.

4 U.S. Department of Transportation, Urban Mass Transportation Administration, in conjunction with SCRTD, Final Supplemental Environmental Impact Statement/Subsequent Environmental Impact Report, Los Angeles Rapid Transit Project: Metro Rail, November 3, 1988.

EXHIBIT 1-1
 Metro Rail System Alignment

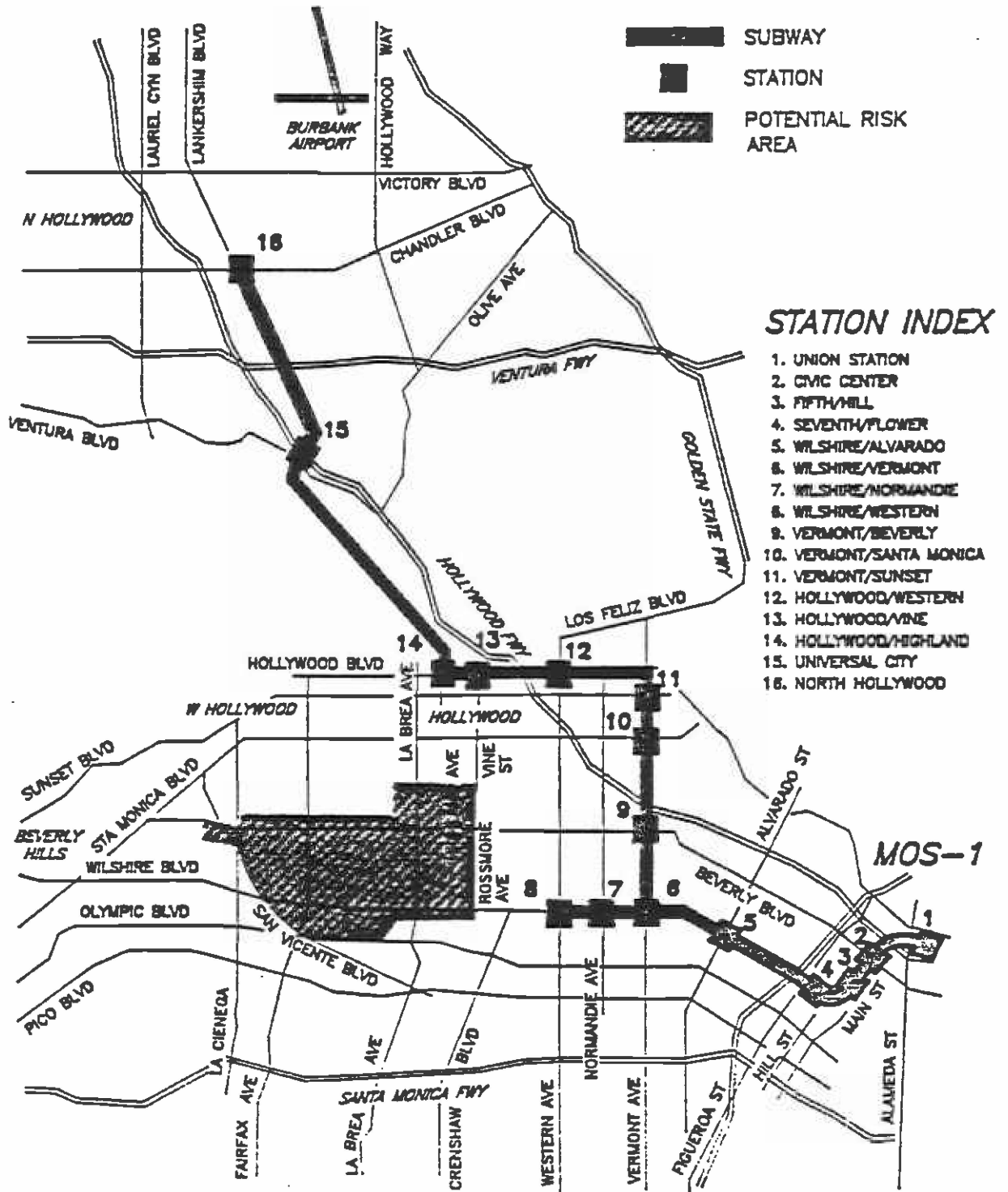
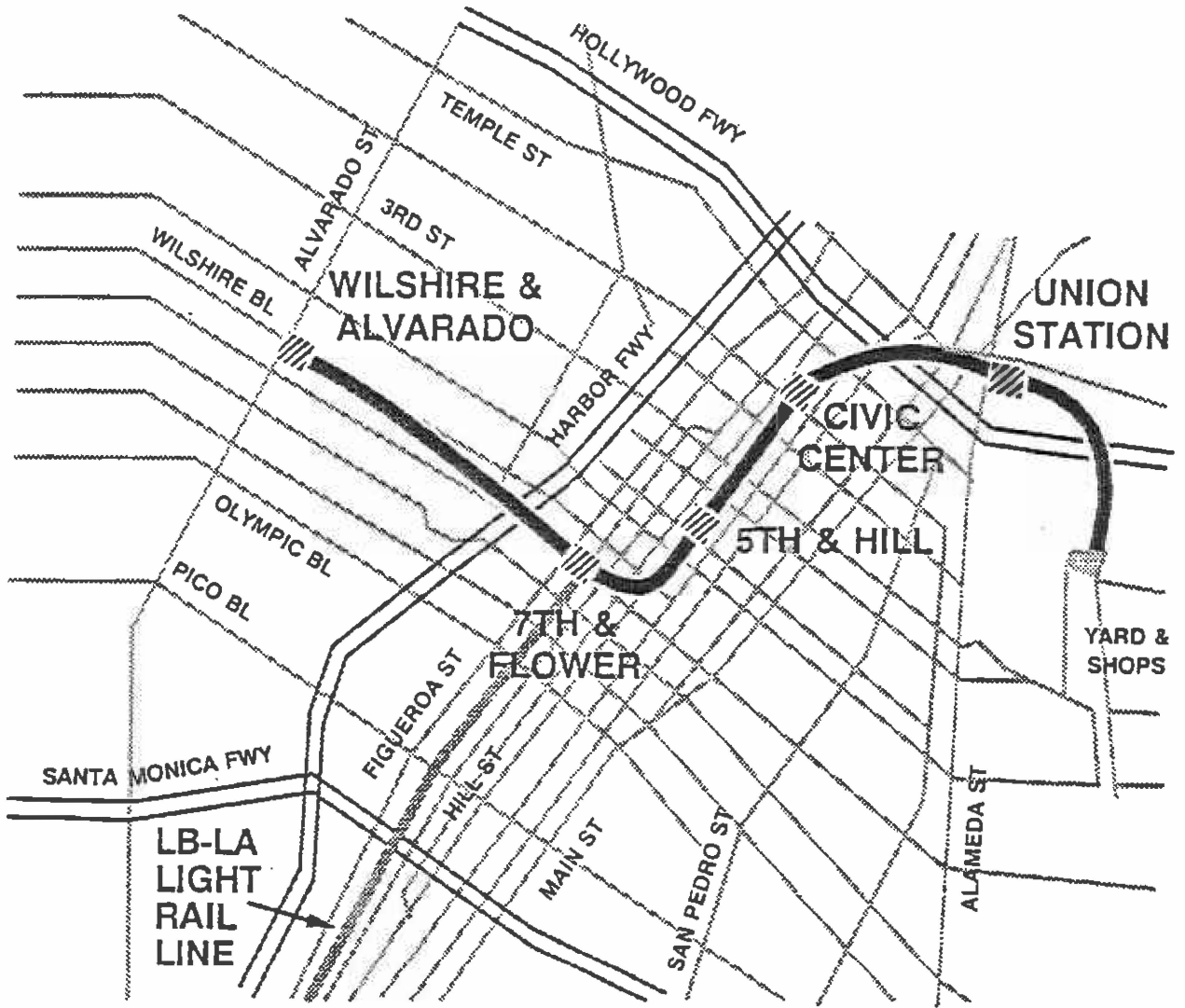


EXHIBIT 1-2
MOS-1 Alignment



A barrier-free, self-service fare collection system will be implemented on a trial basis for MOS-1. Each station mezzanine will contain automated ticket vending machines. Fare Inspectors will rove the system and conduct random checks of the validity of patrons' fare media. The fare structure for MOS-1 will be based on a single zone; however, the fare collection equipment will have a multi-zone capability to accommodate travel to light rail destinations as well as expansion of the Metro Rail system. Escalators, stairs, and elevators will provide normal vertical circulation between surface, mezzanine, and platform levels of Metro Rail stations.

The vehicles for the system will be stainless steel, standard gauge, 75-foot-long rail cars which will be configured in dependent pairs. They will be capable of operating at speeds up to 70 miles per hour and will operate on 750 VDC power supplied via third rail. Present plans call for trains on the MOS-1 system to consist of four vehicles, although the system is being designed to accommodate a maximum train length of six vehicles. Each single vehicle will have a capacity of 59 seated passengers plus space for one wheelchair, up to 109 standing passengers at normal loads, and 160 standing passengers at crush loads.

Trains will have automatic train protection equipment to ensure safe speed and separation of trains. Automatic train operation equipment will also be included to regulate train speed and provide precision station stopping and train berthing verification for trains operating on the main line. System operation will be centrally controlled from the Rail Control Center, located in the yard, using communication links with facilities and trains involving telephones, radios, closed-circuit televisions, and data transmissions.

Ridership on MOS-1 by the year 2000 is projected to be approximately 54,000 per day.⁵ An estimated two-thirds of these passengers will transfer to or from SCRTD buses serving the five Metro Rail stations. Maximum passenger loading on MOS-1 during peak hours will be from Union Station in the morning and to Union Station in the evening. The 24-hour loading pattern, however, shows relatively constant loadings on each of the links, with the heaviest travel volume occurring on the link between the Wilshire/Alvarado and 7th/Flower Stations.

5 Source: Keith L. Killough, SCRTD Memorandum, "Station-to-Station Trip Volumes--MOS-1 Option," October 3, 1984.

2.0 MANAGEMENT ORGANIZATION, APPROACH,
AND RESPONSIBILITIES

2.0 MANAGEMENT ORGANIZATION, APPROACH, AND RESPONSIBILITIES

This chapter describes the organizational structure of the SCRTD and of the Metro Rail Project team and identifies SCRTD's general approach to management of the Metro Rail Project. The chapter also describes the responsibilities and authorities of Metro Rail Project staff and of other SCRTD departments, and outlines the relationship between SCRTD and the outside agencies involved in the project.

2.1 ORGANIZATION AND APPROACH

The SCRTD has responsibility for operating transit service within the Los Angeles area and for the design, construction, and operation of heavy rail rapid transit and the operation of light rail systems. The SCRTD is governed by state law and is administered by a Board of Directors, which is delegated authority to appoint the General Manager.

The General Manager is responsible for carrying out Board policies and direction and for overall management of the SCRTD, including the Metro Rail Project. The organization of the SCRTD is shown in Exhibit 2-1.

Within the SCRTD, responsibility for all transit facilities projects, including the Metro Rail Project, is centralized within the Transit Systems Development (TSD) Department. Reporting directly to the General Manager, the Assistant General Manager for Transit Systems Development has overall responsibility for the management, coordination, and control of Metro Rail Project staff and activities. He is supported by the TSD Directors of Program Control, Rail Facilities Engineering, Systems Design and Analysis, Construction Management, Systems and Construction Safety, and Real Estate and Development, and their staffs. To assist in administering the Metro Rail Project, TSD has retained the services of four consultant organizations: a General Consultant; a Systems Engineering and Analysis Consultant; a Construction Management Consultant; and an insurance consultant, the District Insurance Administrator. The TSD Department and its consultants constitute the core Metro Rail Project team, as shown in Exhibit 2-2. In addition, the project team includes Metro Rail committees established to provide expertise in specific project areas; these committees

EXHIBIT 2-1
Organization of SCRTD

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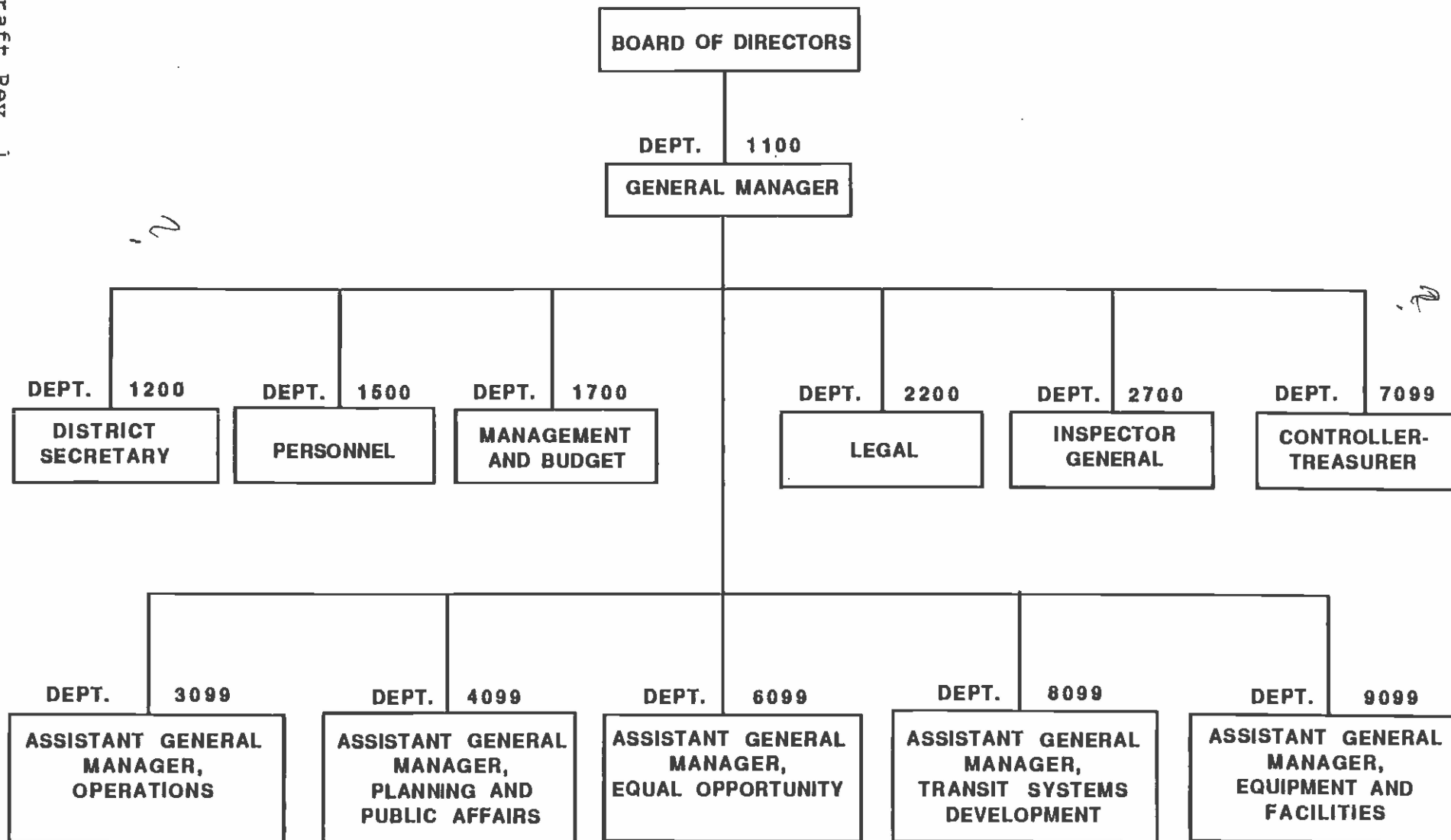
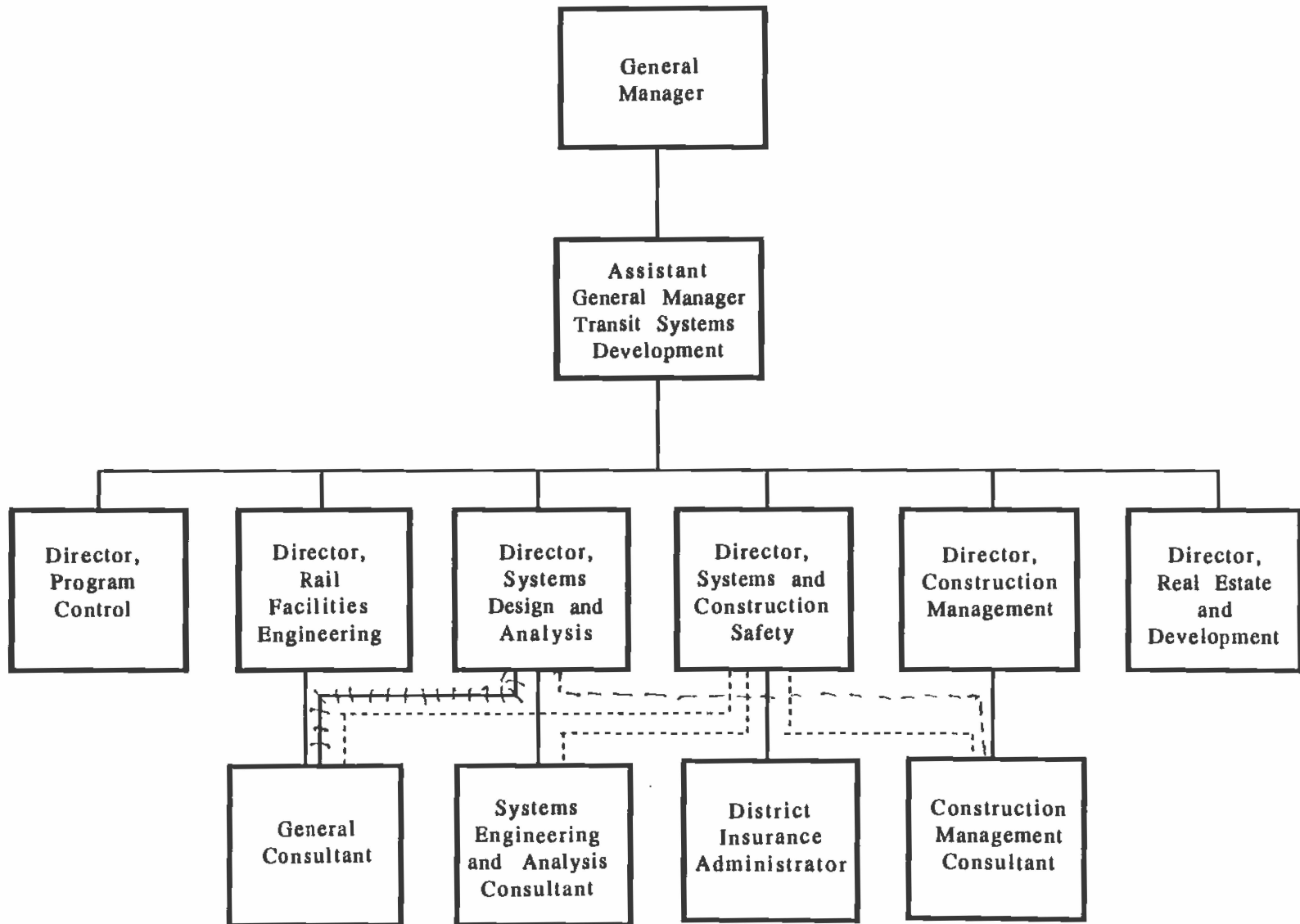


EXHIBIT 2-1
 Metro Rail Core Project Team



NOTE: Dashed line (---) denotes support relationship.

consist of representatives from the TSD Department and its consultants and, as appropriate, from other SCRTD departments and outside agencies.

This project team structure provides clear lines of communication and authority, with project management responsibilities being delegated from the SCRTD Board of Directors through the General Manager to the Assistant General Manager/TSD, and from thence to project team staff.

Project responsibilities are centralized under the Assistant General Manager/TSD, and all design, procurement, and construction activities are managed by designated TSD Directors. Consultant organizations act as extensions of the Director's staff and, like internal TSD staff, are under his direct control. Each consultant organization is headed by a Project Manager, who has overall responsibility for controlling and monitoring his organization's performance and for reporting on that performance to the responsible TSD functional Director, to the TSD Director of Program Control, and to the Assistant General Manager/TSD.

Further management control is exerted at the contract level by the designation, for each procurement and construction contract, of a TSD Project Engineer. Under the direction of the responsible functional TSD Director, the Project Engineer has responsibility for detailed oversight of contract performance. The Project Engineer is responsible for coordinating, reviewing, and approving contractor work procedures; for providing direction and guidance to the consultant organization responsible for managing the contract's accomplishment; for monitoring and reporting on work performance; and for coordinating the activities required to resolve problems.

The project team approach provides the needed skills and staffing levels required by a large and complex project, with coordination and control being exerted through a clear delineation of responsibilities; the establishment of procedures defining how all portions of TSD and its supporting groups and consultants will accomplish and control work activities and document satisfactory performance; and comprehensive program control mechanisms for monitoring cost, schedule, and quality performance. Those controls include formal reporting requirements, including the submission of written progress reports and the conduct of status review meetings. Each TSD Director must submit a monthly progress report to the Assistant General Manager/TSD. All consultant organizations and contractors must also provide formal monthly progress reports, which are reviewed and assessed by TSD Directors. These individual progress reports are reviewed by the Director of Program Control and are used in compiling

monthly and quarterly progress reports on the overall status of the entire project, copies of which are distributed to SCRTD managers and to outside funding agencies for review.

In addition, the Assistant General Manager/TSD holds weekly project status review meetings attended by TSD Directors and the Project Managers of consultant organizations, at which progress is reviewed, problems and corrective actions are identified, and responsibility for implementing such action is assigned. Similarly, each TSD Director holds weekly or biweekly progress review meetings with his staff and consultants.

These reporting requirements ensure the timely dissemination of project information and facilitate project coordination and control. They are basic components of the management process delineated in the following pages of this plan. Implementation of this process is the responsibility of all project team members, under the overall direction of the Assistant General Manager/TSD. Specific responsibilities are identified below.

2.2 METRO RAIL PROJECT TEAM RESPONSIBILITIES

This section describes the roles and responsibilities of each of the major elements of the Metro Rail Project team:

- TSD Department
- Consultants
- Committees.

2.2.1 Transit Systems Development Department

The TSD Department is responsible for all activities related to the design, procurement, construction, and activation of the Metro Rail system, including meeting cost, schedule, and performance objectives. The responsibilities of each office within the TSD Department are discussed in the following paragraphs.

2.2.1.1 Program Control

The Director of Program Control is responsible for developing and maintaining the cost, scheduling, estimating, and related information needed to properly manage the Metro Rail Project, including:

- Design and operation of systems to monitor current status and forecast progress in meeting integrated cost and schedule performance objectives

- Preparation and updating of summary and detailed schedules
- Preparation and updating of baseline budgets and the project Financial Plan
- Preparation of regular and special reports on project status and evaluation of performance
- Review and analysis of construction and procurement expenditures and cost estimates to determine reasonableness and consistency with the Financial Plan
- Identification of potential budget or schedule problems and development of recovery plans
- Development and maintenance of contingency plans for addressing likely problem areas.

In addition, the Director of Program Control is responsible for providing liaison with the Project Management Oversight Consultant and project funding agencies, and for supervising the efforts of the SCRTD's Manager of Configuration Control and Change Control Center and the TSD Document Control Unit.

2.2.1.2 Rail Facilities Engineering

The Director of Rail Facilities Engineering is responsible for managing and coordinating facility engineering, architectural design, and environmental efforts, as follows:

- Preparation of environmental documents relating to the Metro Rail Project, including environmental reports, impact statements, studies, and compliance reports
- Development of architectural criteria, facility designs, and alternative design approaches and schematics
- Development of criteria, standards, drawings, and specifications for civil, structural, and mechanical portions of the project
- Performance of right-of-way engineering and right-of-way certification
- Negotiation of Master Agreements with affected public agencies and private utility companies

and coordination of designs with affected railroads

- Administration of Master Agreements and review and coordination of all utility issues relating to the Metro Rail Project.

The Director is responsible for directing the efforts of the General Consultant and section designers engaged in the design and engineering of Metro Rail facilities and systemwide equipment.

2.2.1.3 Systems Design and Analysis

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

systems procurement, system test, activation.

- Design of all Metro Rail operating systems (passenger vehicles, train control, communications, fare collection, traction power, and auxiliary vehicles)
- Management of contracts for the procurement of Metro Rail systems, which includes responsibilities similar to those identified in Section 2.2.1.4 for construction contracts.
- Determination of system requirements, identification of system interfaces, and monitoring of system design to ensure conformance to criteria and interface requirements
- Development of systems analysis tools
- Evaluation of system alternatives and optimization of system design
- Development of operating strategies, projection of operating statistics, and estimation of costs
- Operations planning duties, including development and updating of the system operating and maintenance plans and management of system testing and activation.

The Director is responsible for directing the efforts of the Systems Engineering and Analysis Consultant; the systems-related design, operations and maintenance planning, and safety and systems assurance work of the General Consultant; and the efforts of the Construction Management Consultant in managing assigned systems procurement contracts.

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2.2.1.4 Construction Management

The Director of Construction Management is responsible for managing all Metro Rail construction contracts and procurement contracts for systemwide equipment, as follows:

- Review of bid documents to ensure feasible, practical, economical, and safe construction
- Participation in the evaluation of construction contract bids to determine responsibility and responsiveness of the apparent low bidders
- Preparation of Notices-to-Proceed to contractors
- Monitoring, coordination, and oversight inspection of assigned procurement and all construction activities
- Monitoring and coordination of the performance of Master Agreement work
- Review of and recommendation for approval of progress and final payments to contractors
- Recommendation for final acceptance of construction contract and assigned procurement contract work
- Participation in testing, start-up, and activation activities.

The Director is responsible for directing the efforts of the Construction Management Consultant for assigned contracts.

2.2.1.5 Systems and Construction Safety

The Director of Systems and Construction Safety is responsible for directing all phases of the Metro Rail safety program, including construction safety on the job site, system safety, fire/life safety, and the insurance requirements of the project. The Director is also responsible for managing the Metro Rail Project's systems assurance and quality assurance programs. The responsibilities of the Director include:

- Establishment of requirements and criteria for safety, fire/life safety, security, reliability, maintainability, and quality assurance, and development of implementation plans

- Organization and coordination of the implementation of the Metro Rail safety and security, systems assurance, and quality assurance programs
- Oversight, guidance, and support of activities required to execute the system safety and security, systems assurance, and quality assurance programs throughout all phases of the Metro Rail Project
- Management of the safety certification program, which is designed to evaluate and document the system's readiness for revenue service from a safety viewpoint
- Supervision of the Metro Rail insurance program, including loss prevention surveys, activities relating to the bond packaging program, and procurement of insurance for contractors and subcontractors
- Review of plans and procedures, design criteria, specifications, technical proposals, drawings, Contract Data Requirements List (CDRL) items, and Change Requests to ensure that safety and systems assurance criteria are incorporated in the design and construction of facilities and equipment
- Review of consultant and contractor quality assurance programs to ensure they meet SCRTD goals and requirements
- Conduct of quality assurance surveillance and audits to verify the effectiveness of the quality assurance activities of SCRTD, consultant, and contractor personnel
- Chairing of and participation on Metro Rail committees dealing with fire/life safety, security, safety certification, and construction safety.

*Consultant
direction*

2.2.1.6 Real Estate and Development

The Director of Real Estate and Development is responsible for all purchase and lease acquisitions in support of certified Metro Rail real property needs, including real estate appraisals, acquisition and

relocation, and development needs. Specific responsibilities include:

- Management of the purchase or lease of real estate
- Management of owned property until construction
- Performance and review of property appraisals
- Initiation and monitoring of condemnation activities
- Selling or leasing of excess real estate
- Development and management of relocation programs
- Negotiation, implementation, and administration of joint development/value capture agreements.

2.2.2 Consultants

The Metro Rail Project is supported by four consulting organizations, as described below.

2.2.2.1 General Consultant (GC)

The GC is responsible for the design of all facilities and systems and the preparation and dissemination of contract documents. The GC provides support during construction/procurement for evaluation and engineering of design changes. The GC on the Metro Rail Project is Metro Rail Transit Consultants, a joint venture of Parsons, Brinckerhoff, Quade & Douglas Inc.; Daniel, Mann, Johnson & Mendenhall; Kaiser Engineers Corporation; and Harry Weese & Associates.

review of contractor submittals, clarification of specifications, and

2.2.2.2 Systems Engineering and Analysis (SE&A) 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.

2.2.2.3 Construction Management (CM) Consultant

The CM Consultant is responsible for the management of all transit facility construction, the procurement of all systemwide equipment, and the procurement of all

systems except passenger vehicles and fare collection equipment. The CM Consultant's scope of work also includes the enforcement of safety and security, quality assurance, and equal opportunity requirements related to construction activities, and the provision of support for system testing and start-up. The CM Consultant is PDCD, a joint venture of the Ralph M. Parsons Company; Dillingham Construction, Inc.; and De Leuw Cather and Company.

2.2.2.4 District Insurance Administrator

A consultant has been retained as District Insurance Administrator for SCRTD's Owner-Controlled Insurance Program (OCIP). The District Insurance Administrator is responsible for procuring insurance for construction contractors and subcontractors (Workers' Compensation and Employer's Liability, Liability and Excess Liability, and All Risk Course of Construction), servicing insurance claims, administering a bond packaging program for eligible subcontractors, and providing loss-prevention services. The District Insurance Administrator on the Metro Rail Project is a joint venture formed by Fred S. James & Company of California, Inc.; Okasaka, Ortiz & Ciocatto Insurance Associates; and Kadowaki Associates International Corporation.

2.2.3 Metro Rail Committees

To ensure supportive interaction among the Metro Rail Project team, other SCRTD organizations, and representatives of outside agencies, several working committees have been established. The committees act as review boards of on-going technical activities; review analyses and reports; and provide a forum for coordinating design, procurement, construction, operations, and maintenance issues.

2.2.3.1 Fire/Life Safety Committee

A permanent Fire/Life Safety Committee (FLSC) has been established to facilitate the interchange of information, develop fire/life safety criteria, and make evaluations and recommendations relative to fire and panic safety. The FLSC is chaired by the TSD Director of Systems and Construction Safety and includes representatives from the GC, the CM and SE&A Consultants, and the:

- City of Los Angeles Fire Department
- Consolidated Fire Protection District of Los Angeles County.

The FLSC was established by a charter signed by the SCRTD, the Board of Fire Commissioners, and the Los Angeles County Fire Chief on September 8, 1983. The FLSC meets on a regularly scheduled basis.

2.2.3.2 Security Subcommittee

A permanent Security Subcommittee to the FLSC has been established to facilitate the exchange of information and make recommendations and evaluations relative to rail system security. The Security Subcommittee is chaired by the TSD Director of Systems and Construction Safety and consists of representatives from the GC, the CM and SE&A Consultants, and the:

- SCRTD Transit Police
- Los Angeles City Police Department
- Los Angeles County Sheriff's Department
- Los Angeles County Coroner/Medical Examiner's Office.

The Security Subcommittee meets on a regularly scheduled basis.

2.2.3.3 Operations and Maintenance Committee

The SCRTD has established a Metro Rail Operations and Maintenance (O&M) Committee. The O&M Committee coordinates the exchange of information and establishes policies relating to operation and maintenance of the Metro Rail system. The O&M Committee is chaired by the TSD Manager of Systems Engineering and Analysis and includes representatives from the TSD Offices of Systems Design and Analysis and Systems and Construction Safety; SCRTD Department of Operations (Rail Transportation); SCRTD Department of Equipment and Facilities (Facilities Maintenance and Operations, Equipment Maintenance); and the GC, and CM and SE&A Consultants.

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The O&M Committee meets on a regularly scheduled basis. The O&M Committee established a Maintenance Integration Working Group, which is charged with working cooperatively with LACTC and its General Engineering Consultant, Transit Consultants of Southern California (Transcal), to integrate maintenance planning activities for the Metro Rail, light rail, and bus systems.

2.2.3.4 Safety Certification Review Team

A critical element of the Metro Rail safety certification program is the requirement for the systematic evaluation of evidence by a team of experienced safety personnel. The safety certification program establishes a Safety Certification Review Team charged with the safety review, evaluation, and approval of all safety-related documentation. The Review Team is chaired by the TSD Director of Systems and Construction Safety and consists of voting representatives from local fire departments and from the TSD Offices of Systems Design and Analysis, Rail Facilities Engineering, and Construction Management; SCRTD Department of Operations (Rail Transportation, Transit Police); and SCRTD Department of Equipment and Facilities (Equipment Maintenance, Facilities Maintenance and Operations).

The Review Team is supported by non-voting representatives from the GC, and CM and SE&A Consultants.

2.2.3.5 Configuration Control Board (CCB)

TSD has established a CCB to authorize changes to Metro Rail baseline documents throughout design and construction. A more detailed description of the role of the CCB and the overall configuration management process is provided in Chapter 8.0.

2.3 RESPONSIBILITIES OF OTHER SCRTD DEPARTMENTS

This section identifies the responsibilities of other SCRTD departments in supporting Metro Rail Project management.

2.3.1 District Secretary

The primary function of the District Secretary is to carry out the processes necessary to ensure that the meetings of the Board of Directors are conducted in a timely fashion and are conducted in accordance with relevant laws and SCRTD rules and regulations. The District Secretary assists Metro Rail Project staff by acting as the official repository for all expired contracts, by providing minutes of Board meetings, and by assisting in the submission of documents to the Board. ?

2.3.2 Personnel

The Personnel Department is responsible for employee recruitment; maintenance of personnel records; and management of employee assistance, wellness, and award programs. For the Metro Rail Project, the Department provides these services in support of the TSD Department.

2.3.3 Department of Management and Budget

The Department of Management and Budget is responsible for grants development and management, budget development and administration, and performance analysis and reporting for the SCRTD. The Department provides these services in support of the TSD Department for the Metro Rail Project.

2.3.4 Legal Department

The Legal Department is responsible for all of the legal affairs of the SCRTD. For the Metro Rail Project, the Department reviews and approves contracts, defends the SCRTD in any lawsuits, assists in contract negotiations and negotiations for property acquisition and joint development along the right-of-way, and manages the Hearing Officer process in appeals to benefit assessments.

2.3.5 Inspector-General

This Department is responsible for conducting all internal and external financial audits for the SCRTD. For the Metro Rail Project, the Department audits all contracts, Change Order proposals, and claims in excess of \$100,000; consultant annual work plan expenditures; force-account and return-cost records; and disposition of SCRTD-furnished equipment.

2.3.6 Department of Controller-Treasurer

This Department is responsible for the fiscal management of the SCRTD, including accounting, cash management, and investments. In addition, the Department is responsible for risk management and for development and maintenance of management information systems. For the Metro Rail Project, the Department assists in managing allocated funds; participates in audits of safety at Metro Rail construction sites; and develops enhancements to the Transit Management Information System and other software.

2.3.7 Department of Operations

The Department of Operations includes Transportation, Scheduling and Operations, and Transit Police. The Department of Operations is responsible for all transit operations and service scheduling. For the Metro Rail Project, the Department reviews operations plans; recruits and trains operations staff; plans for rail activation; and participates in system start-up, check-out, and turn-over.

Within the Department of Operations, the Transit Police Department is responsible for augmenting local law enforcement efforts to provide security and protection for transit patrons. In addition, the Department has the responsibility for the internal security of SCRTD employees, revenues, and property. For the Metro Rail Project, the Transit Police Department participates in security planning efforts.

2.3.8 Department of Planning and Public Affairs

The Department of Planning and Public Affairs comprises Planning, Marketing and Communications, Customer Relations, Government Affairs, and Local Government and Community Affairs. The Department is responsible for overall transit planning and analysis, public and passenger communications, news media relations, and promotional and advertising programs. For the Metro Rail Project, the Department is responsible for news media relations and promotional and advertising programs; preparing ridership forecasts; conducting alternative analyses; and ensuring service integration of the bus, Metro Rail, and light rail systems, including the development of an integrated fare policy. The Department is also responsible for all joint development planning, including the development of station area master plans, the formation of benefit assessment districts, and the maintenance of benefit assessment files. The Department completed evaluating alternative alignments of extensions to MOS-1 for the Congressionally Ordered Re-Engineering (CORE) Study, and is responsible for preparing the Subsequent Environmental Impact Statement/Supplemental Environmental Impact Report (SEIS/SEIR).

In addition, the Department is responsible for handling routine inquiries concerning transit services and for receiving customer complaints. The Department will become involved in the Metro Rail Project during pre-revenue system operations to answer questions concerning service hours, fares, etc.

The Department also has overall responsibility for SCRTD's relations with Federal and state governments and special commissions, and for executing and monitoring all SCRTD policies and instructions regarding community relations, local government affairs, and complaint mitigation and problem resolution. For the Metro Rail Project, the Department is responsible for directing a community relations program applicable to the communities affected by the construction effort.

2.3.9 Department of Equal Opportunity

The Department of Equal Opportunity is responsible for ensuring the compliance of SCRTD programs with appropriate Federal and state employment legislation. For the Metro Rail Project, the Department recommends contract-specific Disadvantaged Business Enterprise/Women's Business Enterprise (DBE/WBE) goals; evaluates bids for compliance with those goals; monitors compliance with DBE/WBE goals, labor standards, and EEO requirements; and maintains a listing of certified disadvantaged and women-owned businesses.

2.3.10 Department of Equipment and Facilities

The Department of Equipment and Facilities encompasses Equipment Maintenance; Facilities Maintenance and Operations; Bus Facilities Engineering; and Contracts, Procurement and Materiel. For the Metro Rail Project, the Department reviews maintenance plans and manuals; recruits and trains maintenance staff; and participates in system start-up, check-out, and turn-over.

Within the Department, the Office of Contracts, Procurement and Materiel (OCPM) is responsible for contract administration, purchasing, and materials management. For the Metro Rail Project, OCPM issues Requests for Proposals, Invitations to Bid, and Addenda; receives and participates in evaluating proposals and bids; issues purchase orders; issues and administers contracts; and is responsible for contract claims evaluation and resolution.

2.4 OUTSIDE ORGANIZATIONS

The successful completion of the Metro Rail Project requires close cooperation between the SCRTD and many outside organizations. The roles of the primary agencies with which the SCRTD must interface are described below.

2.4.1 Urban Mass Transportation Administration

The Urban Mass Transportation Administration (UMTA) is the agency through which Federal funding of the project is channeled. As such, UMTA is responsible for monitoring the progress of the project. To enable UMTA to fulfill that responsibility, the SCRTD provides UMTA with copies of monthly and quarterly status reports describing project accomplishments, problems, funds expended, etc. In addition, the SCRTD holds quarterly project status review meetings which are attended by representatives of UMTA and other funding agencies.

2.4.2 Project Management Oversight Consultant (PMOC)

An independent consultant has been retained by UMTA to provide oversight on SCRTD's management of the Metro Rail Project. The PMOC reports directly to UMTA on project progress and problems, including cost, schedule, and quality issues.

2.4.3 Los Angeles County Transportation Commission (LACTC)

As the transportation planning and policy agency for Los Angeles County, the LACTC has the role of local funding agency for all regional transit projects, including the Metro Rail Project. As such, the LACTC is responsible for ensuring cost-effective utilization of funds allocated to each project. To enable the LACTC to fulfill this function, the SCRTD provides LACTC with copies of monthly and quarterly project status reports. LACTC representatives also attend quarterly project status review meetings held by the SCRTD.

In addition, the LACTC is responsible for developing light rail systems in Los Angeles, the first projects of which are the Long Beach-Los Angeles and Century Freeway light rail lines. The light rail lines will be operated by the SCRTD and will share a common station with Metro Rail MOS-1 at the 7th/Flower Station. The SCRTD has received a work authorization from the LACTC to design and construct the light rail station and tail tracks at 7th/Flower, including procurement of common equipment elements. The two agencies are cooperating to ensure the integration of the light and heavy rail systems through the use of joint technical working groups, the adoption of common design criteria, the review of each other's program documents; and the joint procurement of certain items of equipment (e.g., fare collection equipment).

2.4.4 City of Los Angeles

As a funding agency of the Metro Rail Project, the City of Los Angeles monitors the progress of the project. The SCRTD provides the city government with copies of monthly and quarterly status reports identifying the project's cost and schedule status, areas of concern, and recommended corrective actions. Representatives of the city government attend quarterly project status review meetings held by the SCRTD.

In addition, the SCRTD has entered into a Master Agreement with the City of Los Angeles to provide for the relocation of city facilities impacted by Metro Rail construction and to provide city assistance to the SCRTD in the areas of transportation engineering, fire safety,

and police security. (See Sections 2.4.8, 2.4.12, 2.4.14, and 2.4.16 for a description of city agencies covered under this Master Agreement.)

2.4.5 County of Los Angeles

The SCRTD and the County of Los Angeles have entered into a Master Agreement to provide for the relocation of county facilities impacted by Metro Rail construction in the vicinity of the County Courthouse and within the Los Angeles Flood Control District. The Master Agreement also covers the provision of services by the County Sheriff's Department and the County Coroner/Medical Examiner (see Sections 2.4.14 and 2.4.15).

2.4.6 California Department of Transportation (Caltrans)

Caltrans is responsible for planning, design, construction, operation, and maintenance of state highways in California, and for development and operation of public transportation services. The SCRTD must coordinate with Caltrans with regard to all encroachments of the Metro Rail system upon Caltrans' rights-of-way. The SCRTD has entered into a Master Agreement with Caltrans to facilitate such coordination, which includes incorporating Caltrans' requirements concerning the design and construction of the Metro Rail facilities. Once the design is acceptable, Caltrans issues a permit to construct the facility. Areas of encroachment in MOS-1 include:

- District A-130 Contract, crossing of Santa Ana Freeway and Vignes Street
- District A-141 Contract, crossing of Santa Ana Freeway and Hill Street
- District A-171 Contract, crossing of Harbor Freeway and 7th Street.

In addition, Caltrans is the state agency responsible for disbursing funds allocated to the Metro Rail Project by the California Transportation Commission, and is responsible for monitoring project performance. Consequently, Caltrans is provided with copies of monthly and quarterly progress reports on the project's status, and Caltrans' representatives attend quarterly project status review meetings held by the SCRTD.

2.4.7 California Public Utilities Commission (CPUC)

The California Public Utilities Commission is responsible for safety oversight of rail rapid transit systems in the state. To fulfill that responsibility, the

CPUC monitors the Metro Rail safety program and the certification of the system for revenue service. The SCRTD conducts regular meetings with the CPUC to allow that mission to be accomplished. The CPUC is asked to review and concur with selected safety-related documents.

2.4.8 Los Angeles City and County Fire Departments

The City and County fire departments, under C.A.C. Title 19, have jurisdiction over fire and panic safety. Within the Metro Rail Project, a Fire/Life Safety Committee has been formed to facilitate the interchange of information, make evaluations and recommendations, and set requirements relative to system design, construction, and operation for the purpose of minimizing fire and life safety hazards to the public and SCRTD employees.

2.4.9 Los Angeles City Department of Planning

The Department of Planning is responsible for all land use planning throughout the City of Los Angeles, including the establishment of zoning regulations. The SCRTD and the Department are coordinating as necessary to ensure that land use in the area of Metro Rail facilities is properly integrated with the transit system.

2.4.10 Los Angeles Community Redevelopment Agency (CRA)

The CRA is responsible for master planning within designated redevelopment areas in the City of Los Angeles. Because four of the five MOS-1 stations are located in redevelopment areas, the CRA is responsible for reviewing station design concepts to ensure that they are compatible with redevelopment goals.

2.4.11 Los Angeles Department of Water and Power (LADWP)

The SCRTD and the LADWP have entered into Master Agreements concerning the power and water relocations required for the construction of Metro Rail facilities. LADWP Power Systems is responsible for constructing new ductbanks, pulling and splicing cable, and equipping new substations prior to station construction. LADWP Water Systems is responsible for installing new water mains and laterals and making new service connections prior to station work. The LADWP is also responsible for supplying water and power services to the operational system, and the SCRTD coordinates as necessary with the LADWP to ensure that Metro Rail designs facilitate the provisions of those services.

2.4.12 Los Angeles City Department of Transportation

The Los Angeles-Department of Transportation is responsible for approving and monitoring traffic detourings required by the construction of Metro Rail facilities. During preconstruction, the Los Angeles Department of Transportation developed worksite traffic control plans that outline the traffic detours to be installed during construction. These traffic control plans have been incorporated in MOS-1 contract documents.

2.4.13 Santa Fe Railroad

The SCRTD has entered into a Master Agreement with the Santa Fe Railroad to support construction/reconstruction of the yard and shop area and, as necessary, to facilitate construction at other areas where the Metro Rail Project impacts Santa Fe facilities.

2.4.14 Los Angeles Police Department and Los Angeles County Sheriff's Department

The SCRTD coordinates with these departments regarding the enforcement of noise ordinances and the conduct of construction activities in compliance with variances and permits. Representatives from these departments serve on the Metro Rail Security Subcommittee.

2.4.15 Los Angeles County Coroner/Medical Examiner

The SCRTD is responsible for coordinating with the Los Angeles County Coroner/Medical Examiner (through the Metro Rail Project Archaeologist) if any human remains are encountered during construction. A representative from this office serves on the Metro Rail Security Subcommittee.

2.4.16 Los Angeles City Bureau of Public Works

The City of Los Angeles Bureau of Public Works is responsible for design approval and inspection of work involving rearrangement of city facilities and new facilities to be maintained by the city.

2.4.17 Southern California Gas Company

Under the terms of a Master Agreement with the SCRTD, the Southern California Gas Company is responsible for relocating gas mains and laterals required for Metro Rail construction and constructing new mains, installing new gas meters, and making new service connections.

2.4.18 Pacific Bell

Pacific Bell is responsible for relocating existing facilities as necessitated by Metro Rail construction and building new telephone ductbanks, pulling and splicing cable, and making new building connections as required to supply telephone service to Metro Rail facilities. A Master Agreement has been signed between the SCRTD and Pacific Bell.

2.4.19 Chevron

The SCRTD has entered into a Master Agreement with Chevron to support specific facility rearrangements within the yard and shop area.

2.4.20 Western Union and Communicom

To facilitate the relocation of underground conduits and cables required by Metro Rail construction, the SCRTD has signed Master Agreements with Western Union and with Communicom.

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3.0 DESIGN MANAGEMENT

3.0 DESIGN MANAGEMENT

The design of the MOS-1 segment of the Metro Rail system is virtually complete. Responsibility for the management of design activities is as follows:

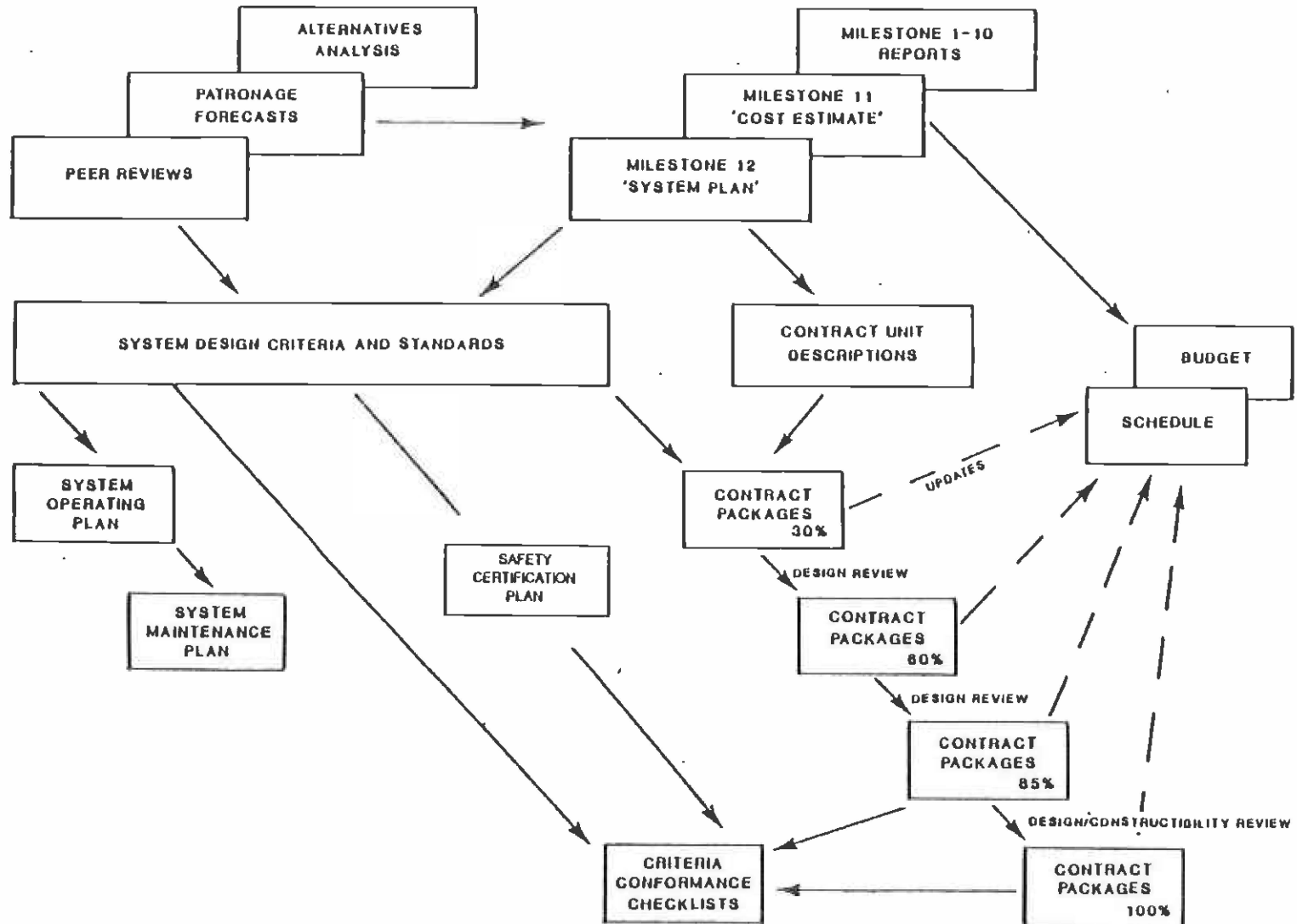
- The TSD Director of Rail Facilities Engineering is responsible for the design of all stations, tunnel segments, yard and shop facilities, and the specification of systemwide equipment, such as elevators, escalators, and ventilation fans. Facilities design documents are prepared by the GC's Facilities Design Section and their section designers.
- The TSD Director of Systems Design and Analysis is responsible for the design and specification of Metro Rail systems, such as passenger vehicles, train control equipment, traction power equipment, fare collection equipment, and communications equipment. In addition, he is responsible for operations and maintenance planning. Systems design documents are prepared by the GC's Systems Design Section. Program planning documents are prepared by the SE&A Consultant.

The design of the MOS-1 system evolved during the preliminary engineering and final design phases. The preliminary engineering phase focused on the establishment of basic design concepts with input from the public, outside agencies, and the transit industry; and on the preparation of environmental impact studies and assessments. The final design phase focused on the preparation of contract packages, design details, interface management, and the plans and procedures necessary for construction and procurement management.

The evolution of the system design is illustrated in Exhibit 3-1 and is briefly described in the following paragraphs.

During preliminary engineering, alternative analyses were conducted of route alignments and station locations. The preferred alignment resulted in ridership estimates used to size system elements (e.g., station platforms, fleet size). In addition, peer reviews were conducted to gain from the experience of other rail transit systems.

EXHIBIT 3-1
Design Management Process



Final Draft Rev. 1
03/89

Finally, the basic design requirements were refined during an extensive public participation process, involving the adoption of 12 milestone reports.

Metro Rail System Design Criteria and Standards were established based on the decisions reached during preliminary engineering. These criteria and standards were used by all design engineers to ensure consistency between SCRTD requirements and the specifications for all MOS-1 elements.

Specifications and contract drawings, consistent with basic design criteria, were developed incrementally, with SCRTD design reviews at the 30, 60, and 85 percent levels of completion. The design reviews included inputs from transit equipment manufacturers and other transit systems. Changes to the baseline budget and schedule resulting from design changes were reflected in updates to the Metro Rail Financial Plan.

Any design changes that were not in conformance with baseline design requirements or the baseline schedule and budget were subjected to SCRTD's formal change control process. Such changes were reviewed by SCRTD staff and consultants to assess the costs, benefits, and consequences of the change. Once a change was approved, the relevant design documents were revised.

In addition to the System Design Criteria and Standards, the design of the Metro Rail system is reflected in the following key baseline documents:

- Standard and directive drawings
- System Operating Plan
- System Maintenance Plan
- Safety Certification Plan
- Design directives
- Contract packages.

Each of these key baseline design documents is described in the following pages of this chapter. Changes to any baseline design document will continue to be subjected to the configuration management controls described in Chapter 8.0.

3.1 SYSTEM DESIGN CRITERIA AND STANDARDS

Design criteria and standards define detailed functional requirements for all elements of Metro Rail and are

the basis on which the design of facilities and system elements has proceeded. The criteria and standards are presented in five volumes:¹

- Volume 1 - Systemwide
- Volume 2 - Civil/Structural
- Volume 3 - Stations
- Volume 4 - Mechanical/Electrical
- Volume 5 - Subsystems.

The systemwide criteria define requirements for contract drawings, fire/life safety, system safety, security, and system assurance.

The civil/structural criteria define requirements for all facilities (tunnels, stations, yard and shops) and functional criteria for certain elements (trackwork, yard and shops).

The station criteria define requirements (primarily architectural) for all Metro Rail stations, including such elements as acoustics, heating, ventilating and air conditioning, landscaping, lighting, parking lots, and station security.

The mechanical/electrical criteria define requirements for elements that include elevators and escalators, electrical systems, plumbing, heating, ventilating and air conditioning, and requirements for corrosion, noise, and vibration control.

The subsystems criteria define requirements for passenger vehicles, train control, communications, traction power, fare collection equipment, and auxiliary vehicles.

The development of the Metro Rail System Design Criteria and Standards has drawn heavily on the experience of other recently constructed rail rapid transit systems, as reflected in the criteria and standards of those systems, to ensure the incorporation of proven design concepts and parameters.

3.2 STANDARD AND DIRECTIVE DRAWINGS

Standard drawings have been prepared that define and describe those elements that will be used repetitively throughout the Metro Rail Project. Directive drawings have been prepared that define the general configuration of facilities for the guidance of section designers.

1 SCRTD Metro Rail Project, System Design Criteria and Standards, 5 vols., 1983 as revised.

3.3 SYSTEM OPERATING PLAN

The System Operating Plan for MOS-1 has been developed in concert with the system design, for the system's operating characteristics both influence and are influenced by the system's design characteristics.² The System Operating Plan (SOP) documents the manner in which design elements will be used to attain requisite operational criteria. The SOP was developed by the Systems Design and Analysis Office, with guidance from the Operations and Maintenance Committee, and received project-wide review to ensure conformance between operational criteria and system design requirements. The SOP is updated periodically throughout the project as more detailed information becomes available.

The SOP describes the MOS-1 system; presents passenger service characteristics and related data; outlines the staff organization and responsibilities for operations; describes the equipment to be used for controlling system operations; describes the normal operating routine; discusses operational problems that may occur and presents mitigation measures; outlines fare collection equipment and practices; discusses the collection and processing of revenue from the MOS-1 system; and outlines the interaction between the Metro Rail operating and maintenance functions. The plan does not provide detailed procedures for operating the system or for responding to emergency situations. Rather, it provides a general overview of operations from which rules and procedures can be prepared.

3.4 SYSTEM MAINTENANCE PLAN

The System Maintenance Plan (SMP) is a companion document to the SOP.³ The SMP addresses the requirements for maintaining Metro Rail facilities and equipment. The Systems Design and Analysis Office was responsible for developing the SMP, with guidance from the Operations and Maintenance Committee. Like the SOP, the SMP received project-wide review to ensure conformance with system design requirements. The SMP is an evolutionary document that is periodically updated as more detailed information becomes available.

2 SCRTD Metro Rail Project, System Operating Plan for MOS-1, Rev. 0, November 1987.

3 SCRTD Metro Rail Project, System Maintenance Plan, Rev. 0, April 1988.

The SMP identifies the SCRTD's policies and objectives for maintenance of the Metro Rail system; describes the facilities required for system maintenance; defines the organization required to manage the Metro Rail maintenance program; outlines the process for managing maintenance work and handling interfaces with other SCRTD functions; and provides the framework for the development of comprehensive maintenance manuals and training programs.

3.5 SAFETY CERTIFICATION PLAN

To verify that all the elements of a safe transit system are present prior to revenue service, the SCRTD has developed a comprehensive safety certification program. The intent of the safety certification program is to ensure that all Metro Rail facilities, equipment, procedures, and training programs are systematically reviewed for compliance with safety requirements and certified by the SCRTD on a timely basis prior to the start of revenue service.

The Safety Certification Plan⁴ describes the process, responsibilities, documentation, and procedures needed for certification. The certification requirements are developed from the following SCRTD documents, which define the safety baseline of the Metro Rail system:

- The Metro Rail System Design Criteria and Standards, which are used as the basis for evaluating whether all safety requirements in the contract specifications comply with the intended design
- The contract specifications, which are used as the basis for evaluating whether the safety features of the end products comply with the specified design
- The Metro Rail Test Program Plan,⁵ which covers both performance and safety tests, and is used as the basis for determining that safety-related tests have been conducted and that all facilities, equipment, and procedures can function safely together in revenue service

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

5 SCRTD Metro Rail Project, Test Program Plan, Rev. 1, September 1988.

- The System Safety and Security Program Plan and System Assurance Program Plan,⁶ which are used as the basis to ensure that safety-related operations and maintenance procedures and training programs are developed, reviewed, approved, and implemented.

3.6 DESIGN DIRECTIVES

Design Directives have been used to document and disseminate policy directions affecting design, new design requirements, or clarifications to existing requirements. The Design Directive process has provided a rapid means for disseminating design information and has not been intended to duplicate or replace the Change Request process (see Chapter 8.0 for a description of Change Requests). All Design Directives will continue to be reviewed and approved by the Assistant General Manager/TSD and the Directors of Rail Facilities Engineering, Systems Design and Analysis, and Program Control.⁷

Four Design Directives have been issued during the preliminary engineering and final design phases:

- DD-001, "Metro Rail Project Design Patronage"
- DD-002, "Accommodation of Patronage Growth, Metro Rail Project"
- DD-003, "Metro Rail Project -- MOS-1 Design Patronage"
- DD-004, "Accommodation of Patronage Reduction, System Reduction -- MOS-1, Metro Rail Project."

3.7 CONTRACT PACKAGES

Contract packages have been developed for all MOS-1 facilities, systems, and systemwide equipment. The design of the facilities, systems, and equipment in each contract package has been based on the design criteria, standards, codes, and design directives established for

6 SCRTD Metro Rail Project, System Safety and Security Program Plan, Draft Rev. 1, June 1988, and System Assurance Program Plan, Draft Rev. 1, May 1988.

7 See MRTC, Metro Rail Project Configuration Management Implementation Plan and Procedures Manual, Procedure No. E.2.2, "Design Directives: Origination, Processing, and Approval," 7 December 1983.

the project. The designs have been subjected to design reviews to ensure their accuracy and compliance with the fundamental requirements. The contract packages have been sized to encourage competition and to allow efficient monitoring by the SCRTD. They correspond to the Metro Rail Contract Unit Descriptions, which include three general types of contracts:⁸

- Facility contracts
- Systems/systemwide equipment contracts
- Master Agreements.

3.7.1 Facility Contracts

Facility contracts include stations, yard and shop facilities, and tunnels. Facility contracts are broken into Stage I and Stage II contracts. Stage I construction generally includes all civil and structural construction plus embedded items for installation of architectural finishes, embedded mechanical items, and electrical conduits, unless specifically included elsewhere. Other items of work include demolition, site clearing, underpinning, dewatering, excavation support systems, decking, instrumentation, excavation, backfill, pavement, sidewalks, curbs and gutters, pavement markings, traffic stripes, signs, traffic signals, maintenance of traffic, fencing, utility rearrangement, concrete, structural steel, reinforcing steel, waterproofing, emergency access exterior doors, ventilation shaft gratings at street level, interior walls, and sleeves through walls for future conduit work.

Stage II construction includes all architectural work, civil site work, landscaping, and mechanical and electrical work except those items embedded in Stage I construction, unless specifically included elsewhere. Other items of work include irrigation systems, benches, topsoil, trees, exterior slab on grade concrete, granite, stainless steel and aluminum assemblies, steel stairs, railing, sprayed-on fire proofing, fillers, gaskets, sealants, doors and frames, finish hardware, glazing, floor and wall tiles, acoustical panels, coatings, painting, identifying devices, telephone enclosures, toilet accessories, and ash and waste receptacles. Also included are all plumbing and mechanical work and all electrical work, including portions of the systems installation work which are identified in the scopes of work of facility contracts.

8 SCRTD Metro Rail Project, Contract Unit Descriptions: Minimum Operable Segment-1, June 1988.

3.7.2 Systems/Systemwide Equipment Contracts

Metro Rail systems include passenger vehicles, train control, traction power, communications, and fare collection equipment. Equipment procured on a systemwide basis includes operational graphics, escalators, elevators, contact and running rail, shop equipment, ventilation equipment, and such items as fire suppression equipment, furniture, and artwork.

Systems/systemwide equipment contracts include a variety of approaches:

- Procurement
- Installation
- Procure and install.

3.7.3 Master Agreements

Master Agreements to support facility rearrangements required by Metro Rail construction, including the relocation of telephone, water, power, gas and oil lines and cable TV conduits, have been executed with local agencies and companies. Exhibit 3-2 lists current Master Agreements.

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EXHIBIT 3-2
Metro Rail Master Agreement Matrix

AGENCY	TYPE OF AGREEMENT	DESIGN-CONTR. RQMNTS		CONSTR-CONTR. RQMNTS		SIGNED AGREEMENT
		UTILITY	SCRTD	UTILITY	CONTRACTOR	
Caltrans	Facilities Rearrangement	Yes	Yes	Yes	Yes	04/23/84
City of Los Angeles	Facilities Rearrangement	Yes	Yes	Yes	Yes	11/11/83
County of Los Angeles	Facilities Rearrangement	Yes	Yes	Yes	Yes	11/28/84
Dept of Water & Power - Water	Facilities Rearrangement	Yes	No	Yes	No	03/14/84
Dept of Water & Power - Power	Facilities Rearrangement	Yes	Yes w/app. of Util.	Yes	UG conds. w/app. Util.	09/17/84
Chevron	Specific Rearrangement	Yes	No	Yes	No	07/01/85
Pacific Bell	Facilities Rearrangement	Yes	Yes	Yes	Yes w/app. of Util.	02/24/84
Santa Fe Railway	Acquisition of First St Yards	Yes	No	Yes	No	04/08/85
Southern Calif. Gas Company	Facilities Rearrangement	Yes	Yes w/app. of Util.	Yes	Yes w/app. of Util.	11/12/84
Western Union Telegraph Co.	Facilities Rearrangement	Yes	Yes	Yes	Yes except cablework	02/24/84
Communicom (Cable TV)	Facilities Rearrangement	Yes	Yes	Yes	Yes except cablework	05/29/84

4.0 REAL ESTATE ACQUISITION AND MANAGEMENT

MTA LIBRARY

4.0 REAL ESTATE ACQUISITION AND MANAGEMENT

Real estate acquisition and management for the Metro Rail Project encompasses two programs: the Metro Rail real estate acquisition program and the Metro Rail joint development program. The acquisition program specifies comprehensive policies and procedures to ensure the timely availability of real estate for construction of Metro Rail, and to ensure the fair, uniform, and equitable treatment of any persons displaced from their homes or businesses as a result of the acquisition of needed real estate. The joint development program has been established to enable the SCRTD to raise a portion of the cost of constructing, operating, and maintaining the Metro Rail system by "capturing" some of the increased property value that will result from the economic activity generated by investments in Metro Rail. The joint development program is also designed to ensure the proper integration of land use with the Metro Rail system.

The TSD Director of Real Estate and Development has principal responsibility for implementing the Metro Rail real estate acquisition and joint development programs, each of which is described in the following sections of this chapter. Final authority for all real estate decisions rests with the SCRTD General Manager and Board of Directors.

4.1 REAL ESTATE ACQUISITION PROGRAM

The acquisition of right-of-way (ROW) is a necessary prerequisite to the start of Metro Rail construction. The process consists of five stages:

- Certification and approval of required real estate
- Appraisal of required interest
- Acquisition, either through settlement or eminent domain (condemnation)
- Relocation of occupants
- Property management, including demolition of improvements.

At the finish of construction, the disposition or development of excess property completes the real estate acquisition and management process.

The basic policies and procedures which regulate the real estate acquisition program for the Metro Rail Project are mandated by the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970. The Department of Transportation, Urban Mass Transportation Administration (UMTA), issued implementing regulations dated March 21, 1985, and subsequently revised April 28, 1986.¹ UMTA's regulations cover the appraisal and acquisition of real property, relocation services, moving payments and replacement housing payments, and other allowable expense payments mandated by the Uniform Act. On September 1, 1982, the SCRTD Board of Directors adopted the Metro Rail Project Milestone 5 Report, which documents SCRTD's policies and procedures for implementing a public real estate program that conforms to the requirements of the Uniform Act.²

On October 13, 1983, the SCRTD Board of Directors adopted a resolution amending the District rules and regulations and establishing a procedure for the expeditious acquisition of real property.³ The Board report accompanying the resolution outlines the general procedures to be followed in acquiring real property. Detailed operating procedures have been developed to implement the general procedures.⁴

The October 1983 Board Action, the adopted Milestone 5 Report, and the Real Estate and Development Operating Procedures establish the basic process for managing the Metro Rail real estate program. Following is a summary of the procedures involved in the real estate acquisition and management process.

1 UMTA, "Land Acquisition and Relocation Assistance Under the UMTA Act of 1964 as Amended," C4530.1, 21 March 1985; and Final Rule, 39 Fed. Reg. 7000-7040, 27 February 1986, effective 28 April 1986.

2 SCRTD Metro Rail Project, Milestone 5 Final Report, Right-of-Way Acquisition and Relocation Policies and Procedures, July 1982.

3 Amendment to Section 8.13, "Real Property," 13 Oct. 1983.

4 SCRTD, Real Estate and Development Detailed Operating Procedures, 1984.

4.1.1 Identification/Certification of Required Real Estate

Identification and certification of real estate required for MOS-1 is complete. Property Identification Plans (PIPs), developed by SCRTD's General Consultant (GC), identify every parcel affected by the Metro Rail alignment.⁵ From the PIPs, preliminary title reports were obtained to ascertain the owner of record and a legal description of the parcel.

Detailed ROW requirements were identified by the GC and recommendations were developed. To support a recommended ROW requirement, the GC prepared a certification package containing detailed property plats and ROW maps, a legal description, and a Property Impact Statement. The recommendation and certification package were submitted to the Director of Rail Facilities Engineering. The Director of Rail Facilities Engineering reviewed the recommendation and certified the ROW requirement to the Director of Real Estate and Development.

The certification of required real estate was based on an analysis of:

- The adopted ROW selection criteria
- Design requirements
- Location of station or line segment
- Construction requirements
- Construction techniques
- Real estate cost and relocation impact.

Any revisions or modifications to the certification are processed in the same manner as the original submittal.

Following receipt of the approved certification package from the Director of Rail Facilities Engineering, the Director of Real Estate and Development must obtain authorization from the SCRTD Board of Directors for acquisition of the required real estate.

4.1.2 Appraisal Program

All offers for acquisition of real estate are based on the fair market value of the property as determined by an appraisal. Generally, two independent appraisals be obtained to establish the amount of just compensation.

5 SCRTD Metro Rail Project, Property Identification Plans, various dates.

The following summarizes the basic process:

- The selection of independent fee appraisers is based on qualifications and experience.
- The property owner is notified in writing of Metro Rail Project requirements and the name(s) of the selected appraiser(s).
- The completed appraisal reports are reviewed by the appraisal staff.
- The amount of just compensation is recommended by the review appraiser. The recommendation is submitted to the Chief Appraiser, the Director of Real Estate and Development, and the Assistant General Manager/TSD for concurrence. The General Manager has final approval of the just-compensation amount.
- Just-compensation amounts over certain limits require approval by UMTA. By letter dated March 21, 1985, UMTA granted the following waivers to its approval requirements:
 - UMTA review and approval is required only for real estate appraisals in excess of \$250,000.
 - UMTA concurrence is required before the commencement of condemnation proceedings only when the offer is in excess of \$250,000.
 - UMTA concurrence is required whenever an administrative settlement for real estate acquisitions exceeds the UMTA-approved just compensation by \$25,000.
 - Only one independent appraisal is required for real estate acquisitions from governmental agencies.
 - Only one SCRTD staff appraisal or one independent appraisal is required to establish fair market value for property disposition.

4.1.3 Acquisition Program

Every reasonable effort is made to acquire real property required for the Metro Rail Project through negotiation. A Real Estate Specialist is assigned to each

parcel and personally contacts each property owner to explain the effect of the acquisition and to make an offer of just compensation. The procedures in general are as follows:

- The Real Estate Specialist personally contacts each property owner to offer the approved amount of just compensation.
- The written offer is accompanied by a summary appraisal indicating the basis for the amount established as just compensation.
- The property owner is given a relocation brochure which explains relocation benefits. Business owners are also informed of their possible right to compensation for loss of goodwill and are provided a copy of the pertinent portion of the California Eminent Domain Law relating to compensation for loss of goodwill.
- A reasonable amount of time is given to the owner to consider the offer and to present information which may not have been considered during the appraisal.
- Once agreement is reached and the proper forms are executed, the transfer of ownership is completed through escrow.
- In those cases where an owner rejects the original offer and it is feasible to increase the offer rather than filing for condemnation, an administrative settlement may be made. The administrative settlement is based on consideration of all pertinent information including: (1) the appraiser's opinion of value; (2) the approved amount of just compensation; (3) recent court awards for similar types of property; (4) the estimate of trial cost; and (5) the opinion of legal counsel.
- If it is determined that a negotiated settlement cannot be reached, the SCRTD Board of Directors is requested to authorize condemnation action. Upon approval by the Board, a condemnation attorney is retained to file the condemnation suit.
- Negotiations continue with the owner and the owner's attorney during the condemnation suit in an effort to reach settlement.

The average time to acquire a parcel through negotiations is 3 to 4 months. The average time to acquire possession of a parcel through condemnation is 5 to 6 months.

4.1.4 Relocation Assistance Program

The Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 provides for certain relocation payments in addition to the amount a person receives as just compensation for property. The Metro Rail relocation program has been designed to conform with the requirements of the Uniform Act. UMTA approved Metro Rail's relocation program report on October 18, 1983.⁶

Two relocation brochures have been developed which outline the relocation benefits available to residential and commercial displaces.⁷ Key requirements of the relocation assistance program include the following:

- SCRTD must use its own facilities, personnel, and services to implement its relocation and acquisition programs.
- SCRTD must present information on and provide opportunity for discussion of relocation services and payments at public hearings; distribute relocation brochures; and provide adequate notice of the relocation.
- A relocation advisory program must be established to provide the maximum assistance possible to all persons required to relocate because of the Metro Rail Project.
- Each displaced person must be provided written and verbal information that fully explains relocation services and eligibility requirements for replacement housing and moving expense payments. Each displaced business must be provided with equivalent information.

6 SCRTD Metro Rail Project, Relocation Analysis Report, September 1983.

7 SCRTD, Real Estate and Development Department, Relocation Benefits: Tenants and Homeowners, and Relocation Benefits: Businesses and Non-Profit Organizations, no date.

- No person eligible for relocation payment and lawfully occupying real property may be required to move from a dwelling or to move his or her business without receiving written notice at least 90 days in advance of the intended vacate date.
- Any applicant for a relocation payment who is aggrieved by SCRTD's determination as to eligibility for payment or the amount of the relocation payment may appeal that determination.
- Within a reasonable time prior to the issuance of a Notice to Vacate, SCRTD must assure itself that decent, safe, and sanitary replacement dwellings are available for displaced persons.

Revisions to the implementing regulation of the Uniform Act effective April 28, 1986, have been incorporated within the Real Estate and Development Detailed Operating Procedures.

4.1.5 Property Management

Properties acquired for the Metro Rail Project are held for construction. Until the parcel is needed for construction, owners and tenants may remain in occupancy, paying rent to SCRTD. Leases entered into by occupants may be terminated upon 30-day notice. This provision ensures the availability of the parcel as required by construction schedules.

4.2 JOINT DEVELOPMENT PROGRAM

Joint development policies and procedures adopted by the Board of Directors include procedures for negotiation with developers, formation of assessment districts, acquisition of land, and the use of land and property rights.⁸

The General Manager carries out negotiations on joint development projects, obtaining authorization from the Board of Directors to complete negotiations and execute final agreements. An interdepartmental team designated by the General Manager defines for Board approval the negotiating position of the SCRTD on each particular joint

8 SCRTD Metro Rail Project, Milestone 6 Final Report, Land Use and Development Policies, January 1983; and SCRTD, Policies and Procedures for Implementing Joint Development, November 1983.

development proposal. The team is responsible for coordinating interdepartmental efforts, formulating negotiating positions, and expediting the development process. The team also coordinates negotiation strategies with affected local agencies. The Real Estate and Development Department has the lead role in preparing and negotiating development agreements and for liaison with local agencies and is supported by other departments, including the Legal Department, Planning and Public Affairs Department, and Equal Opportunity Department.

Once a joint development/value capture agreement has been approved by the Board of Directors, the responsibility for administration and monitoring of the agreement rests with the Director of Real Estate and Development. Any system design, schedule, or budget changes necessary to accommodate the provisions of joint development agreements are subjected to the configuration management controls described in Chapter 8.0.

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5.0 SYSTEMS/SYSTEMWIDE EQUIPMENT PROCUREMENT MANAGEMENT

5.0 SYSTEMS/SYSTEMWIDE EQUIPMENT PROCUREMENT MANAGEMENT

This chapter describes the general process used in the procurement of Metro Rail operating systems and major systemwide equipment. For other equipment purchases, the procurement process is similar, although the extent of some activities may vary according to the complexity and degree of standardization of the equipment. System safety and assurance requirements during the procurement process are described in Chapter 11.0.

The procurement process is governed by procedures established by the SCRTD¹ and by the provisions of UMTA Circular 4220.1A. The following authorities have been established:

- The TSD Director of Systems Design and Analysis is responsible for the technical aspects in the procurement of Metro Rail systems (passenger vehicles, train control, traction power, communications, and fare collection equipment). He is assisted by assigned staff; by the SE&A Consultant in the procurement of passenger vehicles and fare collection equipment; and by the CM Consultant for other system procurements.
- The TSD Director of Construction Management is responsible for the technical aspects in the procurement of systemwide equipment. He is assisted by assigned staff and the CM Consultant.
- The SCRTD Director of Contracts, Procurement and Materiel is responsible for the contractual, pricing, and administrative aspects of all procurements.

For each procurement contract, the appropriate TSD Director appoints a Project Engineer to provide detailed technical management of the contract for the SCRTD, from specification development through contract close-out.

1 Details on procurement procedures are contained in the SCRTD Office of Contracts, Procurement and Materiel, Procedures Manual (no date).

Similarly, the Director of Contracts, Procurement and Materiel designates a Contract Administrator for each procurement, who is responsible for day-to-day management of contractual and administrative matters.

5.1 PRE-MANUFACTURING PHASE

5.1.1 Advertisement

As the design process is completed for each procurement contract, a Bid Certification Checklist is prepared for that contract. This checklist identifies all actions that must be completed before the contract can be advertised and assigns responsibility for accomplishing each action to a specific individual. The checklist is prepared and closely monitored by TSD staff and reviewed at weekly status review meetings. All responsible parties are required to certify by signature that action items have been completed and that the package is ready for advertising.

For each procurement, a list of potential bidders is prepared. This list includes all manufacturers known to have the facilities and experience needed to provide high-quality equipment in compliance with specification requirements. All manufacturers on the list are invited to bid on the procurement. In addition, the availability of bid documents is advertised in such trade publications as Passenger Transport and Mass Transit, in minority and women-owned business trade publications, and in other media, including newspapers published and circulated in minority communities. These advertisements are published before the bid documents are released to potential manufacturers. Formal procedures have been developed defining the steps to be taken in issuing and controlling bid documents.²

Once a contract package is advertised for bid, it becomes a baseline document and is subject to the SCRTD's formal change control process (see Chapter 8.0). Any proposed change to advertised bid documents must be approved by the SCRTD's Configuration Control Board. Approved changes to advertised bid documents are incorporated in formal addenda, which are issued to all recorded holders of the bid documents.

² See MRTC, Metro Rail Project Configuration Management Implementation Plan and Procedures Manual, Procedure E.6, "Contract Services Procedure," 27 May 1986.

The bid documents include a description of the contract scope, the form of contract to be awarded, and the requirements for the technical and the management portions of the proposal. They also describe the process to be used in bidding, proposal evaluation, and award of the contract.

A pre-bid conference is held to brief prospective manufacturers and explain the procurement requirements. Any pertinent changes to bid information resulting from the conference are issued as addenda.

5.1.2 Contractor Selection

The selection of procurement contractors takes place either by a negotiated procurement process or by a one-step competitive procurement process. For negotiated procurements, the SCRTD issues specifications and contract documents that include a description of the factors to be considered in the proposal evaluation. The SCRTD may negotiate with any or all manufacturers and award a contract to the manufacturer whose proposal is considered most advantageous when price, technical features, and other factors are considered, as defined in the bid documents. On the MOS-1 system, passenger vehicles and communications equipment are being acquired through a negotiated procurement process.

For all other systems and equipment (e.g., traction power, automatic train control, elevators, escalators), a one-step competitive procurement process is being used. In this process, proposers simultaneously submit their technical and price proposals to the SCRTD. The evaluation process is specified in advance in an evaluation plan and treats the technical and price proposals separately. The evaluation of technical and price proposals result in an award to the lowest-priced bidder who is fully responsive to the technical requirements and financially responsible.

Proposals for each procurement are evaluated by a team of SCRTD and consultant staff knowledgeable and experienced in the design, manufacture, testing, and operation of the subject equipment. Members of the team are designated by the Contracting Officer, with the approval of the General Manager. Technical representation on the team is recommended by the TSD Director responsible for the procurement. The team includes members with experience in contracts and project management. The team participates in any discussions with proposers, and documents the results of its efforts.

5.1.3 Contract Award

Before a major procurement contract is awarded, a pre-award survey is conducted by cognizant TSD and consultant staff to ensure that the prospective manufacturer has the personnel, facilities, procedures, financial resources, and experience necessary to complete the contract in a satisfactory manner.³ If the SCRTD finds that the prospective manufacturer is satisfactory, a contract is prepared and executed. If not, the SCRTD repeats the pre-award survey process with the next-ranked bidder until a satisfactory manufacturer is identified.

Based on the results of the proposal evaluation and pre-award survey, the SCRTD Director-OCPM prepares a recommendation for the SCRTD Board of Directors to approve and execute the contract. After receipt of performance bonds and insurance certificates, the contract is awarded by the Board of Directors. Any protests of award are handled expeditiously in accordance with SCRTD procedures⁴ and UMTA requirements.

Promptly after contract award, the TSD Director of Systems Design and Analysis or the Director of Construction Management, as appropriate, schedules an initial activities meeting with the contractor. This provides a forum for the SCRTD and the contractor to discuss administrative procedures and other items of mutual interest regarding the terms of the contract and its scope of work. It also provides the SCRTD with the opportunity to reiterate actions that must be accomplished by the contractor prior to the start of work.

The appropriate TSD Director prepares the Notice to Proceed (NTP). The NTP specifies the work start date, total construction time, and interim milestone completion times.

5.2 MANUFACTURING PHASE

Following contract award, the CM Consultant or SE&A Consultant designates a Resident Engineer to manage procurement activities and serve as the primary point of contact with the contractor. Detailed procedures have

3 See, for example, SCRTD Metro Rail Project, Quality Pre-Award Survey Manual, July 1984.

4 SCRTD, Office of Contracts, Procurement and Materiel, Procedures Manual, no date.

been developed by the CM Consultant to guide activities during the manufacturing phase.⁵ The Resident Engineer is supported by other consultant and SCRTD personnel, and must work closely with the TSD Project Engineer in fulfilling his or her responsibilities.

Project Engineers serve as the primary point of contact within SCRTD for contact technical issues, and are responsible for coordinating, reviewing, and approving contractor work procedures and submittals; for providing direction and guidance to the consultant organization responsible for managing the contract's accomplishment; for monitoring work performance; for supporting the change control and claims resolution processes; for coordinating the activities required to resolve problems, and for supporting the contract close-out process.

The primary functions of the Resident Engineer are to ensure that:

- All procurement activities are accomplished in accordance with the contract documents and acceptable engineering and safety practices.
- All procurement activities are completed on schedule and within budget.
- Contract deliverables, changes, and claims are properly documented and promptly submitted for processing.

After the NTP is issued, all correspondence and communications between the SCRTD and the contractor are channeled through the Resident Engineer unless otherwise specified. The Resident Engineer is responsible for maintaining complete contract files.

The Resident Engineer holds regular meetings with the contractor's representative to review work in progress, status of deliverables, problems, safety items, schedules of work, and other items pertinent to contractor performance. The Resident Engineer reviews the contractor's monthly progress reports and submits them, via the appropriate consultant organization, to the SCRTD, together with the minutes of meetings with the contractor.

5 These include Resident Engineer Manual, Inspector Guidelines, Project Controls Procedures Manual, and Contracts and Procurement Manual.

The Resident Engineer ensures that measurement of, and payment for, work performance are in strict conformance with the specifications. The Resident Engineer monitors the contractor's performance against the schedule and budget. Monthly progress estimates are prepared by the Resident Engineer, compared to contractor invoices, and submitted to the appropriate TSD Director and Project Engineer and to Program Control for review, approval, and payment.

5.2.1 Design Control

During the manufacturing cycle, cognizant TSD and consultant staff monitor and control equipment design by:

- Evaluating manufacturers' management plans, schedules, test plans and procedures, quality assurance plans, safety plans, and system assurance plans
- Participating in formal design reviews at the conceptual, preliminary, and final design stages. In addition, the SCRTD evaluates design drawings and mock-ups to ensure compliance with specifications.

To provide the SCRTD with visibility over contractor progress and to ensure that work is consistent with SCRTD requirements, major equipment contractors are required to submit Contract Data Requirements List (CDRL) items. The CDRL items include:

- Program management documents, such as quality assurance and manufacturing plans, schedules, test procedures, and progress reports
- Technical analyses, such as motor characteristic curves; stress analyses; reliability, maintainability, and safety analyses
- Configuration documentation, such as drawings, parts lists, and history books
- Maintenance and training manuals.

All CDRL items are reviewed by cognizant SCRTD and consultant staff in a comprehensive and systematic manner

for compliance with specification requirements, and are approved or rejected.⁶

5.2.2 Fabrication/Assembly Monitoring

During the equipment fabrication and assembly cycle, the quality of components and of the final product are monitored. For major equipment procurements, the CM Consultant or the SE&A Consultant, as appropriate, places a Resident Inspector in the manufacturer's plant to monitor quality levels and schedule adherence. The Resident Inspector must be knowledgeable of the equipment and experienced in quality assurance and manufacturing techniques. He or she must pay close attention to initial production articles so that a high-quality standard is established for the equipment. To support the Resident Inspector, cognizant engineering, quality assurance, and safety personnel periodically visit the manufacturing facility to witness tests and conduct spot checks on product quality. Monitoring follows SCRTD quality assurance and safety certification procedures, the procedures specified in the quality assurance/quality control manuals of SCRTD consultants, and other applicable manuals and plans. (See Chapter 11.0 for further discussion of quality assurance and system safety requirements).

All equipment purchased for the Metro Rail Project must be thoroughly inspected before acceptance, and appropriate acceptance tests must be performed. (See Chapter 9.0.) These inspections and tests are performed by the TSD and consultant staff responsible for the procurement of the equipment. Defects are documented, and corrective actions taken.

5.2.3 Changes and Claims Management

All changes and claims on procurement contracts are managed by the processes outlined in Chapter 8.0 of this plan. Circumstances may arise during the manufacturing process which require an immediate change authorization to avoid unsafe conditions or cessation of work. In such circumstances, the Resident Engineer may authorize an immediate change, with the concurrence of the appropriate TSD Director and consultant project managers. A Change

6 SCRTD Metro Rail Project, Contractor Submittal Review Procedure: Construction/Installation and Procurement Contracts, Rev. 0 (Draft), August 1988

Request is subsequently submitted to the SCRTD for processing.

5.3 CONTRACT CLOSE-OUT

Approximately 90 days before completion of a contract, a Contract Close-Out Review Team is designated to audit project documentation and inspect contract work.⁷ The Review Team is responsible for ensuring that the contract work has been completed, and all required documents have been submitted, in conformance with contract requirements. Any deficiencies must be corrected by the contractor or resolved by the processing of a contract Change Order.

When the Review Team determines that all contract work is fully complete, a Notice of Final Acceptance is issued to advise the contractor that the work is accepted for purposes of final payment and commencement of the contract warranty period. Final payment is made upon approval of the contractor's Final Application for Payment and receipt of an affidavit releasing the SCRTD from any further contract claims or liens.

All consultant project files are consolidated and turned over to the SCRTD. These include a complete set of record documents from the Resident Engineer that reflect as-built conditions.

5.4 WARRANTY ENFORCEMENT

All equipment purchased for the Metro Rail Project is required to have warranty periods consistent with those used in the transit industry. TSD and consultant staff responsible for the procurement monitor the equipment during the warranty period. Failures which occur are analyzed by the manufacturer and, when appropriate, design changes are made. Failed equipment is returned by the Office of Contracts, Procurement and Materiel to the manufacturer for repair or replacement. If the SCRTD performs the warranty work, the associated costs are segregated and the manufacturer must reimburse the SCRTD so that full value is obtained from the warranty provisions of the contracts.⁸

7 SCRTD Metro Rail Project, Contract Close-Out Procedure: Construction/Installation and Procurement Contracts, Rev. 0 (Draft), November 1988.

8 SCRTD Metro Rail Project, Warranty Management Plan, March 1986.

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6.0 CONSTRUCTION MANAGEMENT

6.0 CONSTRUCTION MANAGEMENT

The objectives of construction management on the Metro Rail Project are to complete the system on schedule, within budget, and in accordance with plans and specifications and local, state, and Federal requirements. In addition, a carefully planned construction safety program will be conscientiously carried out by all participants, under the direction of the TSD Director of Systems and Construction Safety.

The TSD Director of Construction Management has overall responsibility for the technical aspects of Metro Rail construction and is supported by assigned staff and the CM Consultant. The SCRTD Director of Contracts, Procurement and Materiel is responsible for the contractual, pricing, and administrative aspects of all construction contracts.

For each construction contract, the TSD Director of Construction Management appoints a Project Engineer to provide detailed technical management of the contract for the SCRTD, from specification development through contract close-out. Similarly, the Director of Contracts, Procurement and Materiel designates a Contract Administrator for each contract, who is responsible for day-to-day management of contractual and administrative matters.

Each phase of the construction management program is outlined in this chapter. Chapter 11.0 describes system assurance and safety certification requirements during the construction phase.

6.1 PRE-CONSTRUCTION PHASE

As the design process is completed for each construction contract, a Bid Certification Checklist is prepared for that contract. This checklist identifies all actions that must be completed before the contract can be advertised and assigns responsibility for accomplishing each action to a specific individual. The checklist is prepared and closely monitored by TSD staff and reviewed at weekly status review meetings. All responsible parties are required to certify by signature that action items have been completed and that the package is ready for advertising.

All construction contracts are competitively bid. The availability of bid documents is advertised in local media, including local minority media, and in national trade publications, such as Engineering News Record and the Dodge Report, as applicable. In addition, an extensive list of potential bidders has been assembled. Notices are sent to potential bidders concurrently with advertising. An Invitation to Bid is distributed to all interested firms.

Once a contract package is advertised for bid, it becomes a baseline document and is subject to the SCRTD's formal change control process (see Chapter 8.0). Any proposed change to advertised bid documents must be approved by the SCRTD Configuration Control Board. Approved changes to advertised bid documents are incorporated in formal addenda, which are issued to all recorded holders of the bid documents.

For each contract, a pre-bid meeting (including appropriate site visits) is chaired by the TSD Director of Construction Management to assist prospective bidders in fully understanding the nature and scope of the work and to clarify technical and administrative requirements. Addenda are issued as necessary after the pre-bid conference.

Bid periods range from 20 to 45 calendar days, depending on the nature and complexity of the contract. Bids are publicly opened at the advertised time and date.

An SCRTD team evaluates the bids. This team is designated by the Contracting Officer with the approval of the SCRTD General Manager and includes cognizant TSD and consultant technical staff, contractual and legal specialists, and representatives of the Equal Opportunity Department. On the basis of the team's evaluation, the Director of Contracts, Procurement and Materiel prepares a recommendation for the SCRTD Board of Directors to approve and execute the contract. After receipt of payment and performance bonds and insurance certificates, the contract is awarded by the Board of Directors. Any protests of award are handled expeditiously in accordance with SCRTD procedures¹ and UMTA requirements.

The TSD Director of Construction Management schedules a pre-construction conference promptly after contract

1 SCRTD, Office of Contracts, Procurement and Materiel, Procedures Manual, no date.

award. This conference provides a forum for the SCRTD and the contractor to discuss administrative procedures and other items of mutual interest regarding the terms of the contract and its scope of work. It also provides the SCRTD with the opportunity to reiterate actions that must be accomplished by the contractor prior to the start of work.

The Director of Construction Management prepares the Notice to Proceed (NTP). The NTP specifies the work start date, total construction time, and interim milestone completion times.

6.2 CONSTRUCTION PHASE

Detailed procedures have been prepared by the CM Consultant for the construction phase.² The CM Consultant places a Resident Engineer at each construction site. The Resident Engineer must be experienced in the construction of transit facilities. He or she serves as the focal point for on-site construction management activities and the primary point of contact with the contractor during the construction phase. The Resident Engineer is supported by other CM Consultant personnel and SCRTD personnel, and must work closely with the TSD Project Engineer in fulfilling his or her responsibilities.

Project Engineers serve as the primary point of contact within the SCRTD for contract technical issues, and are responsible for coordinating, reviewing, and approving contractor work procedures and submittals; for providing direction and guidance to the consultant organization responsible for managing the contract's accomplishment; for monitoring work performance; for supporting the change control and claims resolution processes; for coordinating the activities required to resolve problems; and for supporting the contract close-out process.

The primary functions of the Resident Engineer are to ensure that:

- All construction is accomplished in accordance with the contract documents and acceptable engineering and safety practices.

² These include Construction Operations Procedures Manual, Resident Engineer Manual, Inspector Guidelines, Project Controls Procedures Manual, and Contracts and Procurement Manual.

- All construction is completed on schedule and within budget.
- All changes and claims are properly documented and promptly submitted for processing.

After the NTP is issued, all correspondence and communications between the SCRTD and the contractor are channeled through the Resident Engineer unless otherwise specified. The Resident Engineer is responsible for maintaining complete contract files.

A comprehensive community relations program is being implemented to ensure effective communications between the SCRTD and all affected parties during Metro Rail construction. Participants in the program include personnel from the SCRTD Department of Planning and Public Affairs, TSD Office of Construction Management, and CM Consultant, as well as contractor community relations staff. Briefings are held and newsletters, brochures, and fact sheets are distributed to keep the public and local officials informed of current developments. The SCRTD News Bureau will provide the news media with project updates.³

The Director of Construction Management ensures that agreements signed with unions are followed. The CM Consultant and TSD staff provide liaison with local utility companies and local agencies concerned about traffic problems that may arise.

The Resident Engineer ensures that all contract deliverables (e.g., shop drawings, lists of subcontractors, project schedules, safety plans, quality assurance plans, inspection and test plans, change proposals and claims, progress payment requests) are properly documented and promptly submitted for processing. All contract submittals are reviewed for compliance with specification requirements by cognizant SCRTD and consultant staff in a comprehensive and systematic manner, and are approved or rejected.⁴

The Resident Engineer holds regular monthly job-site meetings with the contractor's representative to review

3 SCRTD, METROfiles, Chapter 6.3, "Community Relations Construction Work Plan," no date.

4 SCRTD Metro Rail Project, Contractor Submittal Review Procedure: Construction/Installation and Procurement Contracts, Rev. 0 (Draft), August 1988.

work in progress, status of deliverables, problems, safety items, schedules of work, and other items pertinent to contractor performance. The Resident Engineer reviews the contractor's monthly progress reports and submits them, via the CM Consultant, to the SCRTD, together with the minutes of the monthly job-site meeting.

The Resident Engineer implements an inspection and testing program to verify that all work performed and all materials furnished are in conformance with contract requirements (see Chapter 9.0). When inspection and testing determine that materials or workmanship do not comply with specifications, the Resident Engineer immediately notifies the contractor in writing of the deficiency and requires corrective action to be taken. Quality surveillance and audits are conducted throughout construction by TSD and CM Consultant personnel (see Chapter 11.0).

The Resident Engineer ensures that measurement of, and payment for, work performance are in strict conformance with the specifications. The Resident Engineer monitors the contractor's performance against the schedule and budget. Monthly progress estimates are prepared by the Resident Engineer, compared to contractor invoices, and submitted to the Directors of Construction Management and Program Control for review, approval, and payment.

All changes during construction are tightly controlled in accordance with established configuration management procedures. Programs have also been established for claims avoidance and expeditious processing and resolution of contractor claims on the Metro Rail Project. (See Chapter 8.0 for a discussion of change and claims control processes.) Circumstances may arise which require immediate authorization of a change to avoid unsafe conditions or cessation of work. In those circumstances, the Resident Engineer may authorize an immediate change, with the concurrence of the TSD Director of Construction Management and the CM Consultant's Deputy Construction Manager for Operations. A Change Request is subsequently submitted to the SCRTD for processing.

6.3 CONTRACT CLOSE-OUT

Approximately 90 days before completion of a contract, a Contract Close-Out Review Team is designated to

audit project documentation and inspect contract work.⁵ The Review Team is responsible for ensuring that the contract work has been completed, and all required documents have been submitted, in conformance with contract requirements. Any deficiencies must be corrected by the contractor or resolved by the processing of a contract Change Order.

When the Review Team determines that all contract work is fully complete, a Notice of Final Acceptance is issued to advise the contractor that the work is accepted for purposes of final payment and commencement of the contract warranty period. Final payment is made upon approval of the contractor's Final Application for Payment and receipt of an affidavit releasing the SCRTD from any further contract claims or liens.

All consultant project files are consolidated and turned over to the SCRTD. These include a complete set of record documents from the Resident Engineer that reflect as-built conditions.

6.4 WARRANTY ENFORCEMENT

All facilities constructed for the Metro Rail Project are required to have warranty periods consistent with industry standards. Failures that occur are analyzed by the contractor and, when appropriate, design changes are made. The contractor is responsible for correcting the failure. If the SCRTD performs the warranty work, the associated costs are segregated and the manufacturer must reimburse the SCRTD so that full value is obtained from the warranty provisions of the contracts.⁶

6.5 CONSTRUCTION SAFETY AND SECURITY

A construction safety and security manual has been developed that is specifically tailored for construction of the Metro Rail Project.⁷ The construction safety and

5 SCRTD Metro Rail Project, Contract Close-Out Procedure: Construction Installation and Procurement Contracts, Rev. 0 (Draft), November 1988.

6 SCRTD Metro Rail Project, Warranty Management Plan, March 1986.

7 Metro Rail Construction Safety and Security Manual, Rev. 2, February 1987.

security manual has been prepared to ensure that contractors, while on work sites and in the conduct of construction contracts, comply with safe practices and the standards set forth in applicable local, state, and Federal codes, orders, and regulations. The manual establishes detailed compliance requirements to be followed by all contractors to protect employees, the public, facilities, and property during construction.

Safety is of primary importance and is the responsibility of personnel at all levels. Primary responsibility for ensuring implementation of, and compliance with, the safety program rests with the TSD Director of Systems and Construction Safety.

The CM Consultant is responsible for day-to-day management of the project's safety and security program; development and approval of project safety plans; and monitoring of the safety of construction activities and compliance with safety requirements. All contractors have full responsibility for developing and implementing a contract-specific safety and security program consistent with the overall project safety and security program. All contractors are required to comply with CAL-OSHA requirements and make CAL-OSHA records and reports available to the CM Consultant.

The Director of Systems and Construction Safety oversees activities to ensure that work is performed safely and the project's safety, security, and sanitary requirements are maintained. Emergency response procedures have been developed as an integral part of the safety and security program.⁸ The District Insurance Administrator coordinates with, and makes recommendations to, the CM Consultant concerning the design and implementation of special safety plans or corrective actions. In the event that methane gas, abandoned oil wells, hazardous wastes, or other extraordinary circumstances are encountered, applicable procedures must be followed. Representatives of the SCRTD, District Insurance Administrator, and other project personnel coordinate to identify and implement measures needed to resolve emergency situations and to ensure employee protection and accident prevention.

The following factors are closely monitored by the Director of Systems and Construction Safety in

8 SCRTD, Emergency Response Plan for the Los Angeles Metro Rail Construction Project, May 1987.

administering and enforcing the safety and security program:

- Acceptable policies, work practices, and standards are implemented to promote the goals of the safety and security program.
- The recommendations of the City Independent Technical Review Committee are implemented.
- Environmental and quality control tests are periodically conducted.
- Standards for an effective pollution control program are maintained.
- Work is accomplished in the safest possible manner to prevent incidents or conditions that could lead to accident/injury.
- Compliance with CAL-OSHA Tunnel Safety Orders is maintained.
- Liaison is maintained with the Los Angeles Police and Fire Departments.
- Loss prevention surveys and activities are implemented.

6.5 CONTINUATION OF WORK AGREEMENT

The SCRTD and the Los Angeles County Building and Construction Trades Council, AFL-CIO, have entered into a Continuation of Work Agreement for the Metro Rail Project.⁹ This Agreement prohibits, during the term of the Metro Rail Project, all work stoppages, strikes, sympathy strikes, lockouts, and other forms of work disruption. The specific intent of the Agreement is to ensure that work on the Metro Rail Project proceeds in an orderly manner and without interruption due to labor disputes.

A Joint Labor Management Oversight Committee has been established consisting of four representatives selected by the SCRTD, including the Contracting Officer or his

9 SCRTD and Los Angeles County Building and Construction Trades Council, AFL-CIO, Continuation of Work Agreement for the Metro Rail Project, June 28, 1984.

designee, and four representatives selected by the Los Angeles County Building and Construction Trades Council, AFL-CIO. The function of the Joint Labor Management Oversight Committee is to monitor the SCRTD's enforcement of compliance by all Metro Rail contractors with applicable Federal and state laws pertaining to wages, hours, benefits, health, and safety. The Committee recommends to the Contracting Officer or designee procedures to enforce compliance with prevailing state and Federal laws.

Any complaints which are made directly to the Joint Labor Management Oversight Committee are referred to the staff of the SCRTD for investigation and processing in accordance with Labor Code Section 1770, et seq., and applicable Federal prevailing law. Such complaints are investigated and processed promptly.

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7.0 PROGRAM CONTROL

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7.0 PROGRAM CONTROL

The Metro Rail Project is managed and controlled in accordance with the established scope of work, the budget, and the schedule. The Assistant General Manager/TSD is responsible for the overall management of the project. He is supported by the Directors of Systems Design and Analysis, Rail Facilities Engineering, and Construction Management, who have the responsibility for completing the various design, procurement, and construction activities on time and within budget. The Director of Program Control is responsible for monitoring progress on the project; maintaining schedules, budgets, and financial plans; and independently assessing and reporting on the status of the project.

A series of program control elements has been established to measure progress on the project. In addition, a program control process has been initiated to collect management information and, when appropriate, to allow corrective action to be taken. Each of these facets of program control is described in this chapter.

7.1 PROGRAM CONTROL ELEMENTS

Three cornerstones are used to measure performance on the project:

- The bid documents, specifications, and annual work programs which define the scope of the work
- The project budget, which estimates the costs to be incurred
- The project schedules, which define when the work is to be completed.

Each of these cornerstones is subject to the configuration control procedures described in Chapter 8.0. These cornerstones are described in this section, as are the automated data systems that are used to monitor and report on project progress.

7.1.1 Scope of the Work

The scope of construction/installation and procurement activities for the MOS-1 system has been defined and refined during the preliminary engineering and final design phases of the project. The scope of these

activities has been segmented into a series of contract packages for which bid documents and specifications have been prepared. Complete descriptions of the various contracts are contained in the Contract Unit Descriptions document,¹ which is maintained and updated by the Program Control Office.

In addition to these contract packages, annual work programs are implemented by the SCRTD and consultant staff. These annual work programs are responsive to the prevailing needs of the project and ensure that all procurement and construction/installation activities are properly controlled and managed. Collectively, contract packages, Master Agreements, and annual work programs define the scope of work for the construction of MOS-1.

7.1.2 Project Budget

A baseline budget for the entire MOS-1 system has been prepared. This budget is based on cost estimates for each procurement and construction/installation contract, and also includes costs associated with consulting services, the SCRTD's internal expenditures, right-of-way acquisition, utility relocation, and insurance for the project. A contingency allowance is also included in the budget.

In conjunction with the project schedule, the budget has been used to develop obligation and cash flow plans. The obligation plan defines the amount of funds required in each year for awarding contracts, for SCRTD personnel and equipment requirements, for real estate acquisition, and so on. The obligation plan must reconcile with the annual availability of funds from outside funding agencies and from benefit assessments. The cash flow plan identifies the amount of obligated funds to be expended in each month. Collectively, the project budget, the obligation plan, and the cash flow plan form the Financial Plan for the Metro Rail Project.²

1 SCRTD Metro Rail Project, Contract Unit Descriptions: Minimum Operable Segment-1, as revised.

2 SCRTD, Metro Rail MOS-1 Financial Plan, updated quarterly.

The Financial Plan is the key summary control document for cost management on the project. The Financial Plan outlines the project's baseline budgets, schedules, obligation plan, and cash flow plan against which cost performance is measured. This plan is distributed to SCRTD management and funding agencies, and appears in the project's quarterly status reports and in the Full Funding Contract between the SCRTD and UMTA. The Financial Plan is monitored daily and updated periodically to reflect revised cost estimates and actual cost history.

Estimates prepared at the 30, 60, 85, and 100 percent levels of design completion provided increasingly refined assessments of the project's cost and formed the basis for development of the Financial Plan. Immediately prior to each contract advertisement, the General Consultant prepares an Engineer's Estimate for the contract. The Engineer's Estimates are used in evaluating the cost proposals of bidders.

As contracts are awarded, Program Control evaluates the successful bids against the baseline budgets and updates the cost estimates in the Financial Plan. After contract award, project changes and claims are analyzed by Program Control, and revised cost estimates are prepared and incorporated within the Financial Plan. In addition, the escalation rate used to prepare cost estimates is analyzed monthly. Trends in the escalation index provide an early warning indicator that triggers revisions to cost estimates.

In addition, the Financial Plan is revised on the basis of Program Control's review of all purchase requisitions, invoices, and progress payments, and analysis of their fiscal and budget impact. Any potential drawdown on the contingency allowance is noted by Program Control personnel in its analysis. The analysis and purchase documents are then submitted to the Assistant General Manager/TSD for review and approval. Information from these documents provides a basis for updating budgets and financial forecasts for the project.

7.1.3 Project Schedule

To adequately plan and control the initiation and completion of events on the Metro Rail Project, detailed schedules have been prepared. The schedule hierarchy for the project contains five levels, 0 through 4 (see Exhibit 7-2). The top level (0) contains the least detail, while the lowest level (4) is the most detailed. A description of the schedule hierarchy follows:

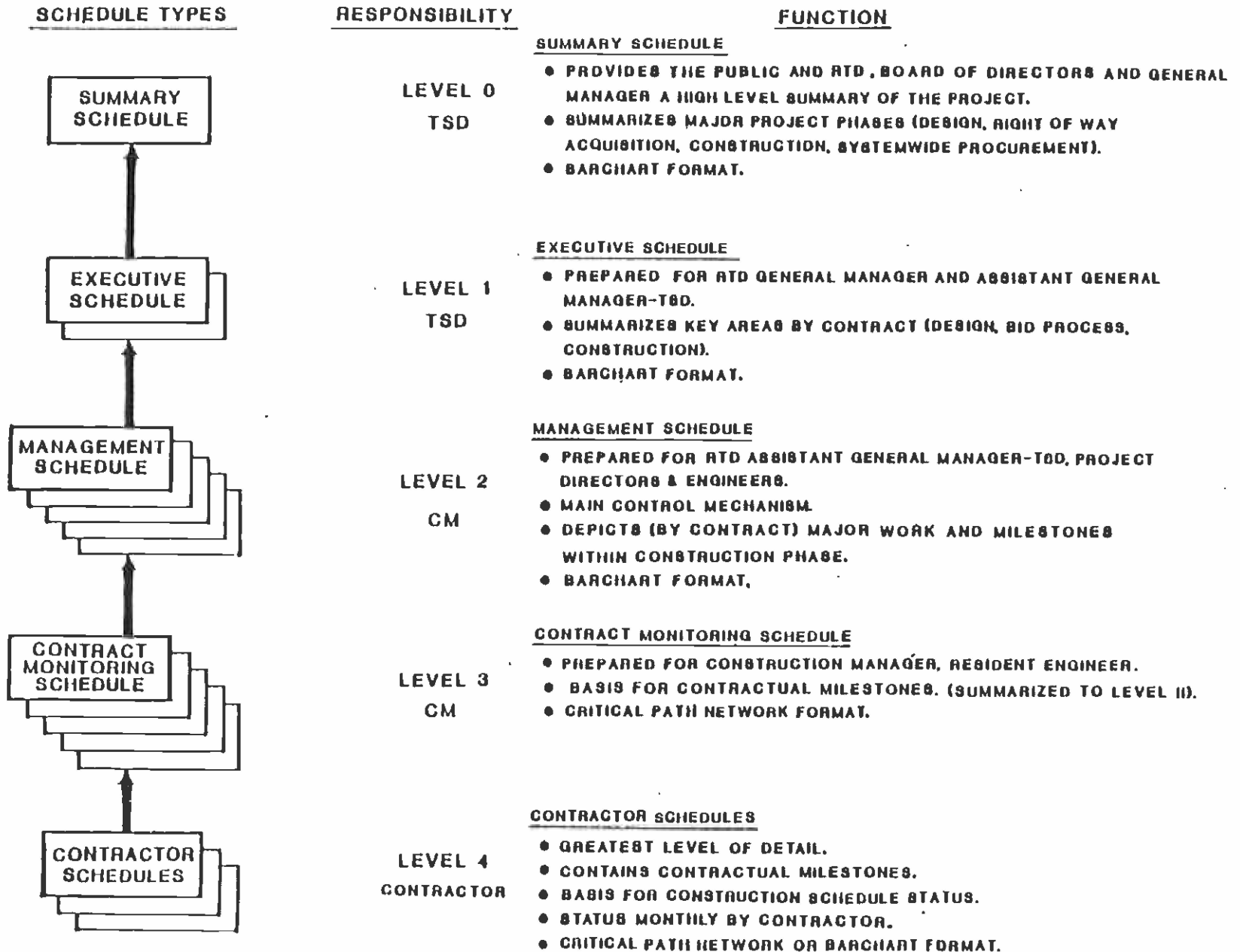
- Level 0 - Summary Schedule. This barchart schedule provides a high-level summary of major project phases but has insufficient detail for monitoring and control. It is used for reporting to the SCRTD Board of Directors and the general public.
- Level 1 - Executive Schedule. This barchart schedule summarizes the key areas by contract and is the source for the schedule information in the Financial Plan.
- Level 2 - Management Schedule. This barchart schedule is the principal control schedule. It defines major contract milestones and provides information on the critical path in the form of a precedence diagram. Any changes that may affect Level 2 milestones must be submitted to the Configuration control Board for review and approval.
- Level 3 - Contract Monitoring Schedule. This schedule is used by TSD and consultant staff to measure, and report on, progress on construction and procurement activities. It is revised following contract award to reflect SCRTD-approved Level 4 schedules.
- Level 4 - Contractor Schedules. These contract-specific schedules show the greatest level of detail. Level 4 schedules are used by each contractor to manage his contract and for reporting progress to the SCRTD and its consultants. The schedules are prepared and maintained by each contractor and submitted to the SCRTD and consultants for approval. Scheduling specifications have been included in the General Conditions of all contract bid documents to ensure standardization among contractor Level 4 schedules.

The CM Consultant is responsible for maintaining and updating the Level 2 and Level 3 schedules. These schedules are updated quarterly by the CM Consultant using the automated Management Scheduling and Control System (MSCS). The schedules are updated to reflect contractor Level 4 monthly schedule submittals identifying tasks started, completed, and in-process, as well as any milestone changes approved by the Configuration Control Board. Revised schedules are distributed to appropriate TSD and consultant personnel, including TSD Directors, Project Engineers, and Resident Engineers.

EXHIBIT 7-2
The Schedule Hierarchy

Final Draft Rev. 1
03/89

7-5



The TSD Program Control Office is responsible for maintaining and publishing the Level 0 and Level 1 schedules. The Level 1 schedule is updated monthly to reflect current project status, and is distributed widely among project participants and oversight agencies. The Program Control Office uses the PRIMAVERA software system to prepare and produce the Level 1 schedule.

7.1.4 Transit Automated Control System

The volume of information generated by the Metro Rail Project is large. Accordingly, an automated program control computer program -- Transit Automated Control System (TRACS) -- is used to store, analyze, and report on cost and progress status. TRACS is designed to:

- Provide all levels of management with timely, accurate, and relevant information
- Provide a mechanism for defining, updating, and monitoring budgets, funding, and contracts
- Improve status reporting and forecasting of project costs by integrating budget, cost, and task progress data in a timely and meaningful way
- Provide a means for tracking the status of procurements, real estate acquisitions, and Change Orders during their processing cycles
- Meet the reporting requirements of funding agencies
- Enhance progress payment methods by utilizing timely and objective progress and "projection to complete" information.

TRACS combines basic project information into a common data base involving 9 subsystems:

- Budgeting: Initiates, updates, and monitors budget information, reflecting contractual obligations, pending Change Orders, contractor progress payments, and material purchases.
- Funding: Initiates, updates, and records the status of project funding, and links funds from each source to the various components of work.
- Task Detailing: Permits the specification of labor and material resources for each task, and links tasks to activities.

- Procurement: Establishes and monitors procurement requisitions from initial request through execution of a purchase order.
- Real Estate: Details and reports on the status of land and easement acquisitions, and tracks right-of-way milestones and parcel availability dates.
- Change Order: Tracks Change Requests through their processing cycle and updates budgets to reflect the impact of approved Change Orders.
- Progress Payment: Records progress payments and compares the work completed against the invoiced amount.
- System Reporting: Generates user-created reports from the TRACS data base through a report generator called IMAGINE.
- System Maintenance: Enables the system administrator to define user access, identify coding parameters, and modify erroneous records.

TRACS is used to support management decisions in the program control process and provides the reports necessary for effective project management. TRACS is particularly useful in supporting the analysis of the expected impacts of Change Orders and providing the most current estimates of project costs.

7.1.5 Project Status Reporting

Project control consists of monitoring events and activities, analyzing data, and taking corrective action when appropriate. Various reports are prepared to assist in this process. During the construction phase, each contractor submits to TSD and its consultants a monthly report providing cost, schedule, and progress information. The monthly report of the passenger vehicle contractor is submitted to TSD by the SE&A Consultant. Data from all other contractors are consolidated by the CM Consultant into a "Monthly Contract Performance Report," which is then submitted to TSD.

The data from these reports, and from internal SCRTD activity reports, are compiled by the TSD Program Control Office and summarized in a Monthly Status Report that is distributed to SCRTD managers, the SCRTD Board of Directors, and outside funding agencies. The Monthly Status Report provides a broad overview of project activities and progress, and includes:

- A status report for activities shown on the Level 1 schedule
- A discussion of major accomplishments since the last report, and identification of actual or anticipated problems that could lead to schedule delays
- An analysis of critical path activities and a discussion of corrective actions being taken
- A discussion of areas of concern, highlighting critical and potentially critical activities
- A financial statement that identifies the cost status of the project.

The Program Control Office also prepares the UMTA Quarterly Review Report, which is formatted to UMTA specifications and is distributed to all funding agencies and senior SCRTD management. The UMTA Quarterly Review Report provides a comprehensive assessment of the project's status. It includes detailed information on the status of project activities, including the status of contract Change Requests and Change Orders; detailed data on contract claims; a description of joint-development/benefit assessment activities; the latest revision to the project's Financial Plan; and responses to issues raised by UMTA's Project Management Oversight Consultant.

In addition, the Program Control Office prepares Committee of the Whole reports for the SCRTD Board of Directors and various special reports requested by SCRTD management or outside funding agencies.

7.2 PROGRAM CONTROL PROCESS

The program control elements previously discussed provide the information necessary to manage, control, and direct the Metro Rail Project. The program control process compares the data in the monthly contractor and consultant reports against the cornerstone budget, schedule, and scope of work documents. It identifies variances between expected and actual events so that action can be taken by TSD management. Each TSD Director has the responsibility and authority for managing work activities and monitoring work progress in his area.

However, the Program Control Office has been given a special, independent "watch dog" role on the project. Acting for the Assistant General Manager/TSD, the Director of Program Control is responsible for independently reviewing cost and schedule performance on all activities and for ensuring that the scope of work is properly managed.

The Program Control Office also maintains the Management Information Center (MIC), wherein all project information is displayed and continuously updated. Weekly project review meetings are held in the MIC. The meetings are chaired by the Assistant General Manager/TSD and involve senior TSD managers and consultant staff. Progress on the project is reviewed, and current problems and issues are addressed. Minutes of each meeting are taken and actions are assigned to resolve outstanding problems and keep the Metro Rail Project on schedule and within budget.

The program control process to be applied to each construction/installation and procurement contract, and to activities conducted by the SCRTD and its consultants, is described below.

7.2.1 Construction/Installation and Procurement Contracts

The program control process uses the bid documents and specifications, the project budget, and the project schedule as the fundamental documents by which the work is defined, from which changes are authorized, and against which progress is measured. To ensure that the project is completed on time and within budget, the process includes control points at which comparisons are made between planned and actual events. Deviations from the project plans are measured and appropriate management action is taken. The control process includes many of the activities described elsewhere in this plan, particularly those involved in procurement and construction management, configuration management, and system safety and assurance (see Chapters 5.0, 6.0, 8.0, and 11.0).

The process begins with the assembly of the drawings, documents, and specifications which define each contract package. For each package, a checklist is prepared describing all the actions which must be completed before the contract can be released for advertising and bidding. The Assistant General Manager/TSD and cognizant TSD Directors review and approve each contract package before it is released for advertising. In addition, a weekly review is conducted on the status of each contract package to ensure its timely completion.

Bids or proposals received for each contract are kept in a secure place, and an evaluation team reviews each bid or proposal for compliance with design requirements. (See Chapters 5.0 and 6.0.) Nonconforming proposals are rejected, and the price quotations for satisfactory proposals are evaluated to determine the lowest responsive and responsible bidders. If the price quotations

significantly exceed the budget, the SCRTD may implement a cost reduction program, change the contract documents and specifications, and readvertise the contract. The decision to implement a cost reduction program depends on the size of the budget variance and the anticipated cost of the cost reduction program and readvertising process. If the price quotations are acceptable, contracts are awarded and real estate acquired, and the project budget, obligation, and cash flow plans are updated. Variances between the awarded contract value and the budget estimate result in an increase or decrease in the budget contingency allowance.

After contract award, the SCRTD and its consultants monitor the performance of the work on each contract. The monitoring process includes inspection of work in process, review of the detailed drawings and design documents for compliance with the contract requirements, and inspection of work. Each contract requires that the contractor submit a monthly report describing:

- Progress of the work
- Problems impacting progress
- Cost and schedule status.

In addition, each contractor submits a progress payment invoice for work that has been completed, including any milestones which have been achieved. The work completed is verified by on-site Resident Inspectors and Engineers. Progress payment invoices must be approved by the Resident Engineer and appropriate consultant manager, and then submitted to the SCRTD for review and approval. The Program Control Office reviews the invoice and performs an accounting breakdown, and then distributes the invoice for approval by the cognizant TSD Project Engineer and Director, the Assistant General Manager/TSD, and the cognizant Contract Administrator. Once all approvals are obtained, payment is issued to the contractor and the financial records of the project are updated by the Program Control Office. If the invoice is not approved, the contractor is required to correct and resubmit it.

If the work is not proceeding on schedule, the SCRTD and its consultants meet with the responsible contractor to discuss the problem. The contractor is asked to explain the reasons for the schedule slippage, and may be directed to implement a schedule recovery plan. If the schedule slippage is attributable to actions or inactions on the part of the contractor, the Contracting Officer informs the contractor, in writing, that the SCRTD is concerned about his performance and the effect of the

slippage on other Metro Rail contracts. In addition, the contractor is reminded of the liquidated damages provisions in the contract. Those provisions are invoked to recover costs incurred by the SCRTD as a result of schedule slippage, if the relevant milestones are not achieved.

In the course of each contract, circumstances may arise which require a change to the contract documents. In such circumstances, a Change Request is prepared for review and approval by the SCRTD's Configuration Control Board (CCB) (see Chapter 8.0). CCB approval results in a change to the contract documents and an update of the project budget, schedule, and obligation and cash flow plans. CCB decisions are communicated to the contractor in writing.

Similarly, circumstances may arise which cause the contractor to file a claim for a contract change. Contract claims are thoroughly evaluated by the SCRTD and its consultants. Claims which are found to have merit by the SCRTD result in a contract change. Those which are denied may result in further dialogue with the contractor and either resolution or litigation.

Finally, when the equipment manufacture or facility construction is complete, the SCRTD and its consultants perform a final inspection of the completed work (see Chapters 5.0 and 6.0).

7.2.2 Work Conducted by SCRTD Departments

Annual work programs are implemented by SCRTD departments to meet the needs of the project. Annual Metro Rail objectives for each SCRTD department are identified during the development of each fiscal-year budget. The costs associated with achieving those objectives are estimated by each department and collated by the Program Control Office. The proposed fiscal-year budget for the Metro Rail Project is reviewed and approved by the Assistant General Manager/TSD and the SCRTD General Manager before being adopted by the Board of Directors. After adoption by the Board, the project budget and Financial Plan are updated.

To provide financial control over the annual work programs, each SCRTD department is required to prepare a monthly report on Metro Rail activities accomplished during the month and to track Metro Rail commitments and

expenditures against budget.³ The reports are reviewed by the Program Control Office, and the Financial Plan is updated accordingly. In addition, all purchase requisitions that charge costs to the Metro Rail Project must be reviewed and approved by the Assistant General Manager/TSD.

7.2.3 Work Conducted by Consultants

Consultants employed on the Metro Rail Project are given a statement of work for each fiscal year. The consultants must submit an annual proposal that is responsive to the statement of work, and a work schedule, staffing plan, and cost estimate. The TSD Director responsible for managing the consultant reviews the annual proposal and, in conjunction with a Contracting Officer's Representative, negotiates the annual cost. Following approval of the annual work program, the consultant conducts the work and submits monthly reports accounting for progress and expenditures. The monthly reports are reviewed by cognizant TSD technical personnel and by the Program Control Office for compliance with the contract scope of services and the consultant's schedule. In addition, monthly meetings are held with each consultant to review progress on their contract and to allow coordination among TSD, consultant, and contractor activities. If the consultant is not performing satisfactorily, verbal and written notices are given by the cognizant TSD Director. Consistent failure to perform may result in the consultant's being directed to remove errant staff members from the Metro Rail Project.

3 SCRTD, TSD Office of Program Control, Memorandum from J. Christiansen, "Metro Rail Project Major Activities Report," File No. 4.2.9, August 5, 1988.

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8.0 CONFIGURATION MANAGEMENT

8.0 CONFIGURATION MANAGEMENT

The SCRTD has established rigorous configuration management procedures to ensure that the Metro Rail Project progresses along its predetermined path and that any change to that path receives proper levels of management and technical review. These procedures were applied during the design phase and will continue throughout all phases of the project.

The configuration management process includes document control procedures, design review procedures, and change control and claims procedures. All are intended to ensure that project objectives are met by exerting control over design progression; by precluding unauthorized changes to established designs, plans, schedules, and/or budgets; by ensuring that the impact of any proposed change is thoroughly assessed and understood before a change is authorized; and by providing clear audit trails of all changes.

Overall responsibility for the configuration management process resides with the SCRTD Configuration Control Board (CCB). The CCB is chaired by the Assistant General Manager/TSD. It includes as members the SCRTD Assistant Director of Contracts, Procurement and Materiel, and the TSD Directors of Rail Facilities Engineering, Systems Design and Analysis, Construction Management, Program Control, and Systems and Construction Safety.

Assistance in configuration management activities is provided by the SCRTD's Change Control Center, located within the TSD Office of Program Control. The Change Control Center is responsible for administering, recording, and controlling the flow of all change-related documents. The Change Control Center is under the direction of the Manager, Configuration Control.

Assistance in the area of document control is provided by the GC and CM Consultant. The GC is responsible for the document control of all contract specifications, addenda, and baseline design documents. Following contract award, the CM consultant is responsible for the receipt and control of contractors' shop and working drawings and all CDRL items, and the tracking of contract changes and claims.

8.1 DOCUMENT RECORD-KEEPING SYSTEM

Configuration accountability and maintenance of historical records of the project's design are an integral part of configuration management. Consequently, an effective document control system is essential.

In addition to maintenance of project files of drawings, documents, and correspondence, the document control function includes maintaining a library of technical documents, codes, standards, specifications, criteria, and other information essential to project development.

The Document Control Center at the GC offices has been specifically assigned the tasks of receipt, storage, and retrieval of various project design documents and the preparation and distribution of reports. The specific responsibilities of the GC's Document Control Center are:

- Design correspondence control
- Design document control
- Drawing control/drawing requests
- Technical library
- Design status reports.

After contracts are awarded, the CM Consultant's automated Document and Material Control System (DMCS) is used to track all contract documents and drawings, including those for the vehicle procurement. DMCS contains seven separate systems. Each system is a variation of the basic DMCS program and is developed to handle a specific document type, such as shop drawings and correspondence. Following is a description of the seven DMCS systems:

- Design Package System enables tracking of the review cycle of constructibility packages, design criteria, standard and directive drawings, and program documents and special studies.
- Correspondence Index System provides for the indexing, cross referencing, and sorting of information by document type (correspondence, interoffice memoranda, meeting minutes, and library reference materials).
- Equipment Status System provides for the status-ing of critical fabrication milestones and the delivery/shipping status of equipment and

materials. Schedule, forecast, and actual dates are provided in the system for each milestone to allow for complete status reporting during all stages of fabrication and delivery.

- Contract Document Index System provides for the indexing of contract documents and document revisions by contract. Upon award of each contract, each document/drawing issued with the contract is entered into the system. As Change Orders are issued and drawings are revised, the data base is updated to show the latest revision level of each document.
- Shop Drawing Review System provides for the tracking of shop drawing submittals through the review and approval cycle and back to the contractor.
- Maintenance System provides for the set-up and changing of contract numbers and their description in DMCS.
- System Information System supplies information about DMCS, such as lists of current users.

Each of the DMCS systems provides several report selections. At the conclusion of the Metro Rail Project, DMCS will provide the SCRTD with organized files for all contract documentation.

The official Metro Rail construction contract files are maintained in the Office of Contracts, Procurement and Materiel (OCPM). Working files for each of these contracts are maintained in the TSD Department and in the designated Resident Engineer's office(s).

8.2 DESIGN CONTROL

Documents containing data and requirements necessary for design, construction, procurement, and operation of the system are defined as baseline documents. Baseline documents are subject to the SCRTD's formal change control process and include:

- Level II Schedule and Financial Plan
- Design Directives
- Standard and Directive Drawings

- System Design Criteria and Standards
- Contract Unit Descriptions Book
- Master General Conditions for Metro Rail Construction/installation and procurement contracts
- Advertised bid documents (general conditions, special conditions, technical provisions, drawings, etc.) for Metro Rail construction/installation or procurement contracts
- Project Management Plan
- System Operating Plan
- System Maintenance Plan
- Safety Program
- Safety Certification Plan
- Construction Insurance Specifications
- Construction Safety and Security Manual
- SCRTD 5-001, Guidelines for the Preparation of Safety and System Assurance Analyses
- Master Agreements

The design of the Metro Rail Project is based on the requirements specified in baseline design documents. The design progresses through sequential phases, each controlled and documented via design reviews, until a final construction or procurement design definition is reached. An effective design review process is essential to the control of design progression and, as such, is an integral part of project configuration management.

Design reviews are conducted to evaluate and compare specification development progress against the baseline requirements and to allow reassessment of these baseline as design matures. The formal design review process ensures that all project participants are given the opportunity to assess conformance to requirements in their areas of interest.

Design review packages consisting of the specifications and drawings are distributed to all program participants. Each reviewer of the contract documents submits

comments using a standard Design Review Comment Sheet. Copies of all design review comments are forwarded to the GC and are sorted. Each comment is individually addressed and resolved. The cognizant design manager ensures that the reviewer concurs with the action taken in response to the reviewer's comment.

Formal design review meetings are held after all comments are compiled. Action item lists are maintained to track all unresolved issues. Each review package, along with comments, responses, actions, and minutes, is then filed by the GC as part of the historical record of the project.

If the design is considered acceptable at the design review milestone and is in full compliance with baseline requirements, formal changes are not required. If a change to a baseline document appears necessary, compliance with the SCRTD's change control process is required.¹ A Change Request must be initiated and submitted to the SCRTD's Change Control Center for processing. The Change Request is distributed for technical evaluation by appropriate SCRTD and consultant staff. Following reconciliation of comments, the Change Request and technical evaluations are then submitted to the CCB for review and authorization or rejection. If the Change Request is authorized by the CCB, the Change Control Center prepares a Notice of Action directing appropriate staff to modify the affected baseline document(s). Modifications are reviewed by SCRTD and, once approved, copies of change pages or change drawings are issued to all recorded holders of the baseline document(s). Design then proceeds in accordance with the revised requirements.

During the design of an individual contract package, unusual circumstances may make it impractical or excessively expensive to comply precisely with a specific requirement of a baseline document. In such a case, the baseline document remains unchanged, but a deviation from or waiver of the specific requirement is sought. A Request for Special Consideration must be initiated and submitted to the SCRTD's Change Control Center for processing. The Request for Special Consideration is distributed for technical evaluation by appropriate SCRTD and consultant staff. Following resolution of comments,

1 SCRTD Metro Rail Project, Change Control Procedure: Design Documents, Rev. 0 (Draft), December 1988.

the Request for Special Consideration and all technical evaluations are submitted to appropriate TSD Directors for review and approval. If the Request for Special Consideration is approved, the CCB is notified and the approved Request for Special Consideration is returned to the GC for implementation.

Once designs become final, contract documents are advertised for bid. At this point the contract documents themselves become baseline documents, and are subject to formal change control. Any change to an advertised contract document must be initiated by a Change Request, evaluated by appropriate SCRTD and consultant staff, and authorized by the CCB. The authorized change is then incorporated in an addendum, which is issued to all holders of the advertised contract documents.

8.3 BID DOCUMENT CONTROL

The GC's Contract Services Section is organized to control and document the sale and distribution of all bid and related documents for the Metro Rail Project. The Contract Services Section is responsible for:

- Establishing a uniform process for the assembly and printing of bid and related documents
- Providing a timely and responsive process for the distribution and sale of all bid and related documents, including advance notice to bidders, bid packages and other information available to bidders, addenda, and information letters
- Providing positive control of the distribution and identification of specific bid document copies
- Establishing historical records and documentation of the assembly, printing, distribution, and sale of bid and related documents
- Operating and maintaining a Plan Room to be open to prospective bidders during the bid phase of the project.

The GC's Contract Services Section is responsible for maintaining all files, logs, lists, and other appropriate records required to document the processing of bid packages and related documents, including records of receipts and disbursements.

Specific procedures have been developed to manage:²

- The assembly of bid document packages
- Final modification of drawings prior to submittal to contract services
- Printing of bid documents
- Development of distribution list for bid documents
- Distribution of advance notice to bidders
- Distribution of bid and related documents
- Sale of bid and related documents
- Transmittal of addenda and information letters
- Plan Room operation.

The GC's Contract Services Section maintains the originals of all contract specifications and of all addenda thereto.

8.4 CONTRACTOR DESIGN CONTROL

To ensure that contractor designs for major systems procurements adhere to all established design criteria and standards, incremental design reviews are conducted by the SCRTD. The following design reviews are prescribed in the contract specifications for major systems and equipment:

- Conceptual design review
- Preliminary design review
- Final design review
- Mock-up review
- First article configuration inspection.

These reviews are conducted to evaluate the progress and technical adequacy of the design and its compatibility with the performance requirements of the contract. Prior to each review, the contractor must submit a data package that includes CDRL and other items required for the

² MRTC, Metro Rail Project Configuration Management Implementation Plan and Procedures Manual, Procedure No. E.6, "Contract Services Procedures," 27 May 1986.

review. Minutes of the review meetings are distributed by the TSD Project Engineer.

- Conceptual Design Review (CDR). The CDR is usually held no later than 60 days after Notice to Proceed. The CDR is conducted at or near SCRTD facilities and is intended to:
 - Identify the contractor's management team
 - Identify subcontractors
 - Include design concepts for major systems hardware proposed by the contractor and subcontractors
 - Acquaint the contractor and subcontractors with SCRTD's operating, maintenance, safety, and system assurance philosophies.

- Preliminary Design Review (PDR). The PDR is conducted prior to detail design to evaluate the progress and technical adequacy of the selected design approach and its compatibility with contractual performance requirements and interfaces. The review is conducted on mutually agreeable dates at the contractor's facilities. Major subsuppliers must also be present.

Design data covering each subsystem must be submitted prior to the PDR at a level of detail consistent with the preliminary stages of design. Each data submittal must contain functional and interface descriptions, applicable engineering calculations, and schematic, layout, and general arrangement drawings. Specific data requirements are identified in each contract specification.

- Final Design Review (FDR). The FDR is conducted incrementally when detail design is essentially complete and production drawings are ready for release. The FDR is intended to confirm that the detail design satisfies design requirements and establishes the exact interface relationships between the system and other items of equipment or facilities that are SCRTD-furnished. The reviews are held on mutually agreeable dates at the contractor's facility.

- Mock-Up Review. When each required mock-up is complete, a design review is held. The purpose of this review is to verify that the hardware represented in each mock-up meets requirements, is safe and maintainable, and includes proper human factors engineering.
- First Article Configuration Inspection (FACI). The FACI takes place at the point of assembly, whether at the subcontractor's or contractor's facility, after completion of acceptance tests on first production hardware. The FACI verifies that production hardware complies with production drawings as agreed upon during the FDR.

Thirty days prior to each FACI, data that include the latest drawings, specifications, and quality documentation required for adequate checkout of the equipment under inspection, and an indentured list of drawings, must be submitted to the SCRTD.

8.5 CONTRACT CHANGE CONTROL

Because any change to contracts may preclude the attainment of project cost, schedule, and/or performance requirements, specific procedures have been developed to evaluate and approve any changes to baseline documents following contract award.³ Because of the potential volume and the minor nature of a large percentage of contract changes, the change control process balances the efficiency of the process with the proper amount of management control. The contract change control process described herein is consistent with SCRTD's procurement procedures.⁴

3 SCRTD Metro Rail Project, Change Control Procedure: Construction/Installation and Procurement Contracts, Rev. 1, March 1988.

4 SCRTD Office of Contracts, Procurement, and Materiel, Procedures Manual; SCRTD Rules and Regulations, Section 8 and 9 (Purchasing and Sales of District Property), 28 July 1983 (as amended); Policy Implementation Procedure - John Dyer to Board of Directors, 4 February 1982; SCRTD Administrative Procedures for Consultant Contract Negotiations, 3 January 1983; all as amended by the Response to Draft Report on the Certification Review of the SCRTD, 6 June 1986.

8.5.1 Types of Changes

There are two classes of proposed changes to Metro Rail contracts:

- Class I: Any proposed change to the baseline that affects financial plans or schedule milestones; that affects the form, fit or functions of Metro Rail equipment, systems, or facilities; or that affects contract General Conditions, Special Conditions, or forms.
- Class II: Changes that are not covered by the Class I definition, including routine schedule changes.

The review and approval process for Class I Change Requests is more stringent than that for Class II changes, as is described in the following pages. The impacts of a proposed change must be carefully assessed before the Change Request is classified as Class I or Class II, since a Class II change for one contract may have Class I impacts on another contract. In such a case, the Change Request must be designated and processed as a Class I change.

In addition, there are three priorities for proposed changes:

- Routine. Sufficient time is available to negotiate cost and schedule adjustments and other impacts and to secure the SCRTD's approval prior to the need date for implementation of the change. Routine changes are not implemented until a Change Order is executed.
- Urgent. A proposed change to a drawing or specification parameter which, if not accomplished expeditiously, may seriously compromise the proper function of facilities or equipment.
- Emergency. Immediate action is necessary to correct a situation which endangers lives or property or which threatens to cause an immediate cessation of work on a contract.

If an emergency change is required, the Resident Engineer orders immediate changes to be made at the work site under the emergency clause of the contract, having first obtained verbal concurrence from the appropriate TSD Director and consultant project managers. As soon as

possible, the Resident Engineer must fully document the circumstances requiring the emergency change on a Change Request. The Change Request is then processed according to Class I or Class II procedures, as appropriate.

Once a Change Request is approved, a Change Order is issued directing the contractor to implement the change. There are two types of Change Orders that may be issued by the SCRTD:

- Bilateral Change: The contractor has prior notice of the change, and the SCRTD and the contractor mutually agree to any cost and schedule adjustments prior to the issuance of a Change Order.
- Unilateral Change: The SCRTD issues a Change Order without prior notice to and /or agreement by the contractor. In general, unilateral Change Orders result because cost and schedule adjustments cannot be negotiated, either because the SCRTD and the contractor cannot reach agreement or because unknown site conditions make it impossible to determine the magnitude of the work. A unilateral Change Order may also be issued when the SCRTD determines that the contractor requires no prior notice of a change (for example, when a change to contract General Conditions has no cost or schedule impacts).

If at all possible, the price of a change is negotiated with the contractor, and a fixed price is determined prior to the issuance of a Change Order. Even when a change is prioritized as emergency or urgent, the SCRTD attempts to negotiate a fixed price.

8.5.2 Class I Change Process

The CCB is responsible for authorizing any Class I Change Request that has a cost impact estimated at \$10,000 or more, or that affects contract General Conditions, Special Conditions, or forms. The CCB has delegated to TSD Project Engineers the authority to authorize other Class I Change Requests (i.e., any Change Request that has an impact of less than \$10,000 and that does not affect contract General or Special Conditions or contract forms). The CCB monitors Project Engineer decisions on Change Requests, and monitors the status of all change actions.

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Contract changes may be initiated by the SCRTD, its consultants, or Metro Rail contractors. A Change Request and Finding-of-Fact Statement must be prepared that identifies the current contract baseline and defines in detail the proposed change, including estimated cost and schedule impacts. The Change Request package is submitted to the SCRTD's Change Control Center for processing.⁵

The Change Control Center distributes the Change Request for technical evaluation by appropriate SCRTD and consultant staff. Following reconciliation of any comments, the Change Request and technical evaluations are submitted to the CCB or the Project Engineer, as appropriate, for review and action. If the Change Request is authorized, the Change Control Center issues a Notice of Action directing appropriate personnel to modify affected baseline documents and take the steps necessary to negotiate and issue a contract Change Order.

A Cost and Schedule Proposal is requested from the contractor to document the contractor's assessment of the cost and schedule adjustments necessitated by the change. The proposal is reviewed by the Permanent Change Order Negotiating Committee to establish a negotiation position. If the contractor's proposed cost adjustment is \$100,000 or more, an audit is conducted by the SCRTD's Office of the Inspector General.

The Negotiating Committee and contractor meet to agree on contract price and/or time adjustments. When negotiations result in mutual agreement, a bilateral Change Order is issued. When agreement cannot be reached, a unilateral Change Order, with a not-to-exceed ceiling price, is issued.

If the Change Order increases or decreases the contract price by \$100,000 or more, or by more than a specified percent (typically 5 percent), the SCRTD Board of Directors must approve the change. SCRTD authorities for executing Change Orders are shown in Exhibit 8-1.

Upon receipt of an executed Change Order, the contractor is obligated to proceed with the work. Unless directed otherwise, receipt of the executed Change Order

5 Contractor-initiated changes are first reviewed by the CM or SE&A Consultant, as appropriate. If the consultant rejects the contractor's proposed change the CCB is notified of that decision.

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EXHIBIT 8-1 Change Order Execution Authority

<u>Change Order Value</u>	<u>Delegated Authority^a Specified Metro Rail Contracts</u>
Less than \$10,000	TSD Project Manager
From \$10,000 to \$24,000	TSD Director of Construction Management or Systems Design and Analysis, as appropriate.
From \$25,000 to \$49,999	AGM-TSD and Assistant Director, OCPM
From \$50,000 to \$99,999	Director - OCPM
From \$100,000 and above or greater than Board-authorized percent	Director - OCPM, after board approval

-
- a If the change affects contract General Conditions, Special Conditions, or forms, no authority is delegated and the Change Order must be signed by the Director - OCPM

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constitutes Notice to Proceed. If the Change Order is a unilateral one and the contractor disagrees with its terms and conditions, he or she must provide written notice of the intent to institute a claim as required by contract General Conditions.

8.5.3 Class II Change Process

Class II changes are routine changes that have no impact on project costs or schedule milestones; no impact on the form, fit or function of Metro Rail equipment, systems, or facilities; and no impact on contract General Conditions, Special Conditions, or forms. Consequently, Class II changes are not subject to the extensive technical evaluation given to Class I changes. In other respects, the procedure for handling Class II changes generally parallels the Class I change procedure, with the cognizant TSD Project Engineer responsible for authorizing any Class II change. The CCB is notified of all Project Engineer decisions on Class II changes.

A Change Request and Finding-of-Fact Statement must be prepared and submitted to the SCRTD's Change Control Center for processing. The Change Control Center transmits the Change Request to the TSD Project Engineer for review and action. If the Project Engineer authorizes the Change Request, the Change Control Center prepares a Notice of Action directing appropriate personnel to modify affected baseline documents. Once documents are modified, a Change Order is prepared and executed for the SCRTD by the Project Engineer.

If a contractor insists that a Class II change has Class I impacts (e.g., cost or schedule), the change must be reprocessed as a Class I change, along with technical evaluation and negotiation of price and schedule adjustments.

8.6 CONTRACT CLAIMS MANAGEMENT

Procedures have been developed to manage contract claims.⁶ A claim is a written demand by a contractor for contract adjustment (money and/or time extension) based on alleged differences in conditions or performance requirements not

6 SCRTD Metro Rail Project, Contract Claims Management Procedure: Construction/Installation and Procurement Contracts, Rev. 0, October 1988.

included in the contract documents. The reason for claims include:

- Alleged defective drawings and/or specifications
- Directed or constructive changes in method or manner of the performance of work
- Alleged differing site conditions
- Changes or defects in SCRTD-furnished equipment, materials, information etc.
- Directed or constructive acceleration of work
- Alleged interferences or delays caused by another Metro Rail contractor or subcontractor.
- Insufficient compensation for unilateral Change Orders.

The SCRTD recognizes that one of the most important factors in claims avoidance is a willingness on the part of the project managers to recognize and promptly respond to legitimate changes under the various construction/installation and procurement contracts. Whenever possible, contract claims are avoided or resolved by means of bilateral contract modifications, precluding disputes and possible litigation. Other important factors in claims avoidance include:

- Thorough familiarization with contract documents, including terms, conditions, drawings, specifications, and standards
- Clear and distinct contract packages
- Thorough and consistent contract administration
- Good communications and professional working relationships with contractors
- Timely response to correspondence and problems
- Proper preparation and maintenance of documentation.

The claims process begins when the contractor submits a written Notice of Claim to the Resident Engineer. The Resident Engineer prepares a Finding-of-Fact Statement and transmits it and the Notice of Claim to the Project Engineer and the Contract Administrator.

The Contract Administrator, Project Engineer, and Resident Engineer review the information and determine whether the contractor's claim has merit. If they find merit, the contractor is notified and a Change Request is prepared and submitted for processing. If not, a Letter of No Merit is issued to the contractor by the Resident Engineer.

Upon receipt of a Letter of No Merit, the contractor may elect to proceed with the claim. The contractor must then submit a Claim Statement to the Resident Engineer. The Resident Engineer prepares a Finding-of-Fact Statement and submits it and the Claim Statement to the CM or SE&A Consultant, as appropriate. Consultant management develops a recommendation as to the action to be taken.

All documents are submitted to the Contract Administrator, who assesses the scope, complexity, and contractual merit of the claim. If necessary, the Contract Administrator designates a Claim Evaluation Team to assess technical aspects. Based on all prior evaluations, the Contract Administrator prepares a finding and recommendation.

The Contracting Officer reviews the finding and recommendation and other documents and determines whether the claim has merit or not. His determination is incorporated in a written Contracting Officer's decision, which is issued to the contractor. If the Contracting Officer's decision is favorable, a Change Request is prepared and submitted for processing.

If the Contracting Officer's decision is adverse, the contractor may pursue the matter as a dispute. If so, the contractor submits a written objection. The Contract Administrator reviews the objection and provides a recommendation to the Contracting Officer. If appropriate, a re-evaluation is conducted by the Claims Evaluation Team.

The Contracting Officer issues his final decision to the contractor. If his decision is favorable, a Change Request is prepared and submitted for processing. If the Contracting Officer's final decision is adverse, the contractor may seek redress in litigation. If a claim may result or has resulted in litigation, the matter may be reviewed and resolved by the SCRTD General Manager or the SCRTD Board of Directors. If a lawsuit is filed, the Contract Administrator prepares a complete file of claim documentation, including all claim documents from the Notice of Claim through the Contracting Officer's final decision. This file is forwarded to the Legal Department for review and use in responding to litigation.

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9.0 TEST MANAGEMENT

9.0 TEST MANAGEMENT

A comprehensive test program is being implemented on the Metro Rail Project to ensure that:

- Equipment, material, facilities, and software conform to contractual requirements
- Equipment, facilities, software, and personnel function effectively together to provide safe and dependable service.

Because testing is a complex and vitally important element in preparing the Metro Rail system for service, the SCRTD has adopted a standardized approach to conduct, monitor, and coordinate the testing of Metro Rail elements. All program participants must work actively and cooperatively toward successful completion of the Metro Rail test program under the overall management of the TSD Director of Systems Design and Analysis.

A detailed Test Program Plan¹ has been prepared for the Metro Rail Project. The plan reflects the process shown in Exhibit 9-1 and governs contractual, materials, system integration, and pre-revenue operations testing. The plan is a certifiable element under the safety certification program, and must be reviewed and approved for safety content by the Safety Certification Review Team (see Chapter 11.0). Similarly, the procedures for, and the results of, all safety-related tests must be reviewed and approved by the Safety Certification Review Team.

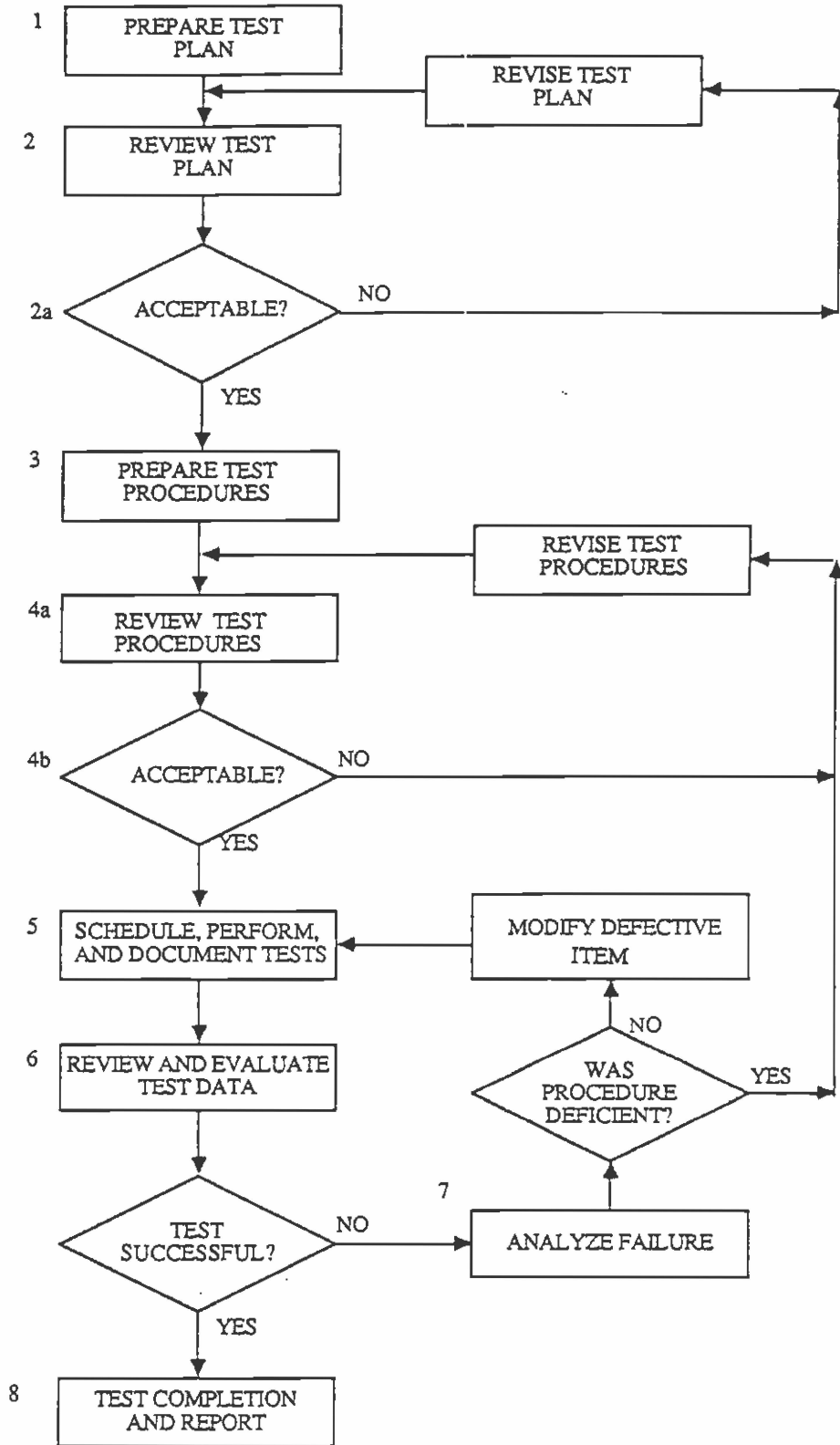
9.1 TEST PLANNING

Test planning was initiated during the final design phase of the Metro Rail Project and continues throughout facilities construction, equipment procurement, and initial system operations. A Test Program Plan (TPP) has been prepared to:

- Establish the process for conducting, monitoring, and coordinating the test program

1 SCRTD Metro Rail Project, Test Program Plan, Rev. 1, September 1988.

EXHIBIT 9-1
 Test Management Process



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- Delineate the test organization and specify its authority and responsibilities
- Describe the administrative requirements of the test program.

The TPP was developed to ensure that management and technical resources are applied in a coherent and organized manner to achieve the Metro Rail test program objectives. The test program includes the following elements:

- Identification and Definition of Test Requirements. Contract specifications define those tests necessary to ensure that material, equipment, facilities, and software provided under the various construction and procurement contracts meet requirements. In addition to contractually required tests, system integration and pre-revenue operations tests must be identified and performed to ensure that necessary compatibility has been achieved among all elements of the system.
- Establishment of Test Program Administration System. Administration of the test program is a major undertaking and is being managed using a computerized system to monitor, control, document, and report on program status. A test numbering system has been established to assist in the administration and retrieval of test documents.
- Development of Testing Sequence and Schedules. Test sequences ensure that tests and prerequisite activities are performed in an orderly and logical sequence, and provide a baseline for the development of monthly test schedules. Test schedules must conform to, and support, the overall project schedule. Any changes to test sequences or schedules that affect Level III schedule milestones are subject to the SCRTD's formal change control process (see Chapter 8.0).

The TSD Director of Systems Design and Analysis has overall responsibility for the Metro Rail test program. Reporting to the Director through the Manager of Systems Engineering and Analysis, the TSD Test Engineer is responsible for coordinating and managing test program activities. In fulfilling his responsibilities, the Test Engineer coordinates with SCRTD and consultant project participants to ensure that all required tests are

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identified and are conducted, verified, and documented in accordance with approved plans and schedules. The Test Engineer prepares monthly reports on the status of the test program, which are distributed to senior managers of the SCRTD and other project participants.

9.2 CONTRACTUAL TESTING

Contractual testing on the Metro Rail Project began during the construction phase and continues through pre-revenue operations. The following categories of contractual tests are conducted on the Metro Rail Project:

- Design Qualification Tests are conducted at the material, component, or subsystem level during contractor engineering to demonstrate compliance with specifications.
- Production Verification/Construction Inspection Tests are conducted at the material, component, assembly or subsystem level during production/construction to ensure the product is in accordance with design and/or workmanship standards.
- Installation Verification Tests are conducted by the contractor at the subsystem or assembly level to ensure proper installation.
- Acceptance Tests are conducted at the subsystem level to verify that performance of all delivered equipment is in compliance with specification.
- Demonstration Tests are conducted during the pre-revenue and revenue operations phases to demonstrate the reliability of system equipment. An Incident Evaluation Committee, chaired by a representative of the SCRTD, will evaluate the relevance of all failures to the reliability demonstration test program and determine the corrective action to be taken.

Contractors are responsible for preparing plans and procedures for tests that they are contractually responsible for performing. In addition, the CM Consultant develops test and inspection plans and procedures, as required, in support of facility construction contracts, and other test/inspection procedures for the designated construction materials testing laboratory.

All test plans and procedures are reviewed by consultant and TSD staff and, following resolution of any comments, are approved by the Test Engineer. Upon approval of procedures, the contractor (or CM Consultant) receives authorization to proceed with the test.

Tests must be conducted and documented in accordance with approved test schedules, plans and procedures, and are monitored by TSD and consultant personnel. Test results are promptly reviewed by TSD and consultant staff, and written approval or rejection by the Test Engineer. Tests are repeated until successful. Modifications that are necessary for successful test completion are subject to the SCRTD's change control process if they affect a specification requirement or have cost or schedule impacts. Completed tests are documented in formal test reports, which are maintained in a master file by the Test Engineer.

9.3 MATERIALS TESTING

Requirements for testing of materials are defined in the contract documents for construction materials and for materials required to fabricate equipment. In addition, testing of products for which fabricators have submitted Material Certificates or Certificates of Compliance may be conducted on a random basis or when the validity of the materials/products or documentation are questionable. Contract-specific inspection and test plans identify the products/materials which most likely require testing.

9.4 SYSTEM INTEGRATION TESTING

System integration testing is performed to demonstrate the ability of various Metro Rail subsystems and facilities to perform together as a system. System integration testing is the responsibility of the SCRTD, and is conducted upon completion of contractual acceptance tests. During system integration tests, contractors are obligated only to ensure that equipment and facilities are maintained at their final-acceptance status.

System integration tests are identified, and plans and procedures are developed, by the Test Engineer with support from consultants and appropriate advice from affected contractors. The test requirements, plans, and procedures are reviewed by TSD and consultant staff, and must be approved by the Manager of Systems Engineering and Analysis and the Director of Systems Design and Analysis.

The Test Engineer has operational responsibility for carrying out system integration tests according to the

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approved plans, procedures, and schedule. The Test Engineer coordinates with SCRTD and consultant personnel to schedule the necessary resources.

Test results are documented and promptly reviewed by TSD and consultant staff. The Test Engineer is responsible for approving test results. Test are repeated until successful. Modifications that are necessary for successful test completion are subject to the SCRTD's change control process if they affect a design parameter or have cost or schedule impacts. Completed tests are documented in formal test reports, which are maintained in a master file by the Test Engineer.

9.5 PRE-REVENUE OPERATIONS

Pre-revenue operations tests begin several months prior to system opening. These tests simulate revenue service to test whether all Metro Rail elements, including personnel, can function safely and efficiently together. Pre-revenue operations test verify the competence of personnel and ensure a smooth transition from construction through testing to revenue service. Pre-revenue operations verify, through documented demonstrations:

- The ability of Metro Rail to coordinate plans, rules, procedures, equipment, facilities, and personnel to sustain reliable and safe normal revenue service
- The ability of Metro Rail and outside agencies to coordinate plans, rules, procedures, equipment, facilities, and personnel to provide safety for employees, passengers, and property during abnormal/emergency operations.

The procedures for identifying, conducting, and documenting pre-revenue operations are the same as those described for system integration tests.

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10.0 VALUE ENGINEERING

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10.0 VALUE ENGINEERING

A value engineering program has been established and implemented on the Metro Rail Project. Value engineering involves an organized and rigorous analysis of system functions and requirements to ensure that functions are provided and requirements met at the lowest capital and life-cycle costs. Value engineering has been applied during the design phase to all aspects of the Metro Rail system, including facilities, equipment, operating strategies, and maintenance planning. The program continues during the construction phase of the project.

The TSD Director of Rail Facilities Engineering and the TSD Director of Systems Design and Analysis are responsible for evaluation and administration of value engineering activities in their respective areas. These directors are supported by qualified consulting firms who provide independent analysis on an as-needed basis.

10.1 VALUE ENGINEERING DURING THE DESIGN PHASE

To achieve maximum benefits, value engineering has been applied throughout the design effort. Typically, the investigations and analyses have been performed at the 60 percent level of final design. At that point, designs and specifications were sufficiently advanced to permit accurate cost analyses of alternative methods, arrangements and materials, particularly for the architectural, civil, and structural elements.

For fixed facilities, four design units were selected for value engineering analysis:

- 7th/Flower Station
- Wilshire/Alvarado Station and tunnel segment
- Civic Center Station and tunnel segment
- 5th/Hill Station and tunnel segment.

These design units are representative of other portions of the MOS-1 system, and the results of the value engineering studies were applied to other MOS-1 units.

Value engineering has also been applied to the design of systems and equipment that will be procured for the

project. For example, there have been investigations of:

- The brakes and coupler arrangements for the passenger vehicle
- The functions to be provided by the Supervisory Control and Data Acquisition System
- The design of the fare collection system.

These investigations of the fixed facilities and equipment have resulted in significant cost savings.

10.2 VALUE ENGINEERING DURING THE CONSTRUCTION PHASE

To achieve cost reductions during the construction phase, each contract contains a cost reduction incentive clause. The clause enables the contractor to share the savings from cost reduction suggestions with the SCRTD. The contractor is required to submit suggestions describing the proposed alternative and estimating the cost savings. The SCRTD evaluates these suggestions to ensure that service life, quality, economy of operation, ease of maintenance, and safety standards are not impaired. If the suggestion has merit, a Change Request is prepared and processed according to the procedures described in Chapter 8.0.

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11.0 SYSTEM SAFETY AND ASSURANCE

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11.0 SYSTEM SAFETY AND ASSURANCE

The primary goal of the Metro Rail Project is to provide safe, dependable, and cost-effective transportation. To attain this goal, the SCRTD has established a comprehensive system safety program, as well as a comprehensive system assurance program.

System safety is the application of operating, technical, and management techniques and principles to the safety aspects of a system throughout its life to reduce hazards to the lowest practical level through the most effective use of available resources. The Metro Rail system safety program focuses on designing and operating the system to protect patrons, employees, and equipment by systematically identifying hazards, and then eliminating or controlling those hazards throughout all phases of the project, from preliminary engineering through revenue operations.¹

A key element of the safety and security program is safety certification, a program designed to ensure that all elements of a safe transit system are in place prior to the start of revenue service.² The process of safety certification specifically involves issuance of Criteria Conformance Certificates and Certificates of Compliance that document satisfactory compliance with a formal list of safety requirements. Certification is required of all Metro Rail facilities, systems, equipment, and safety-related procedures and training programs.

Complementing and reinforcing the system safety program, the system assurance program encompasses the quality assurance, reliability, and maintainability tasks and activities necessary to ensure the Metro Rail system

1 SCRTD Metro Rail Project, System Safety and Security Program Plan, Rev. 1 (Draft), June 1988; and Safety Program, Rev. 1, January 1989.

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

provides dependable service. The requirements of the program are documented in the Metro Rail System Assurance Program Plan.³ Because of the importance of quality assurance measures, a separate Quality Assurance Program Plan has been developed.⁴

The TSD Director of Systems and Construction Safety is responsible for managing all phases of the Metro Rail system safety and assurance programs. He is assisted by assigned TSD staff and consultant personnel. Key elements of the system safety and assurance programs are described in the following paragraphs.

11.1 DESIGN

During the design process, system safety and assurance were addressed through the following activities to ensure that the Metro Rail system achieves its safety, security, dependability, and quality objectives.

11.1.1 Design Criteria Development

Design criteria and standards define detailed functional requirements for all Metro Rail elements. The criteria and standards are presented in five volumes:

- Volume 1 - Systemwide
- Volume 2 - Civil/Structural
- Volume 3 - Stations
- Volume 4 - Mechanical/Electrical
- Volume 5 - Subsystems.

While various safety and dependability-related requirements are incorporated in all volumes of the System Design Criteria and Standards, systemwide requirements in the areas of fire/life safety, system safety, security, and system assurance are centralized within Volume 1.

The development of the design criteria and standards was an evolutionary one, beginning with the identification of general criteria and standards early in the preliminary engineering phase of the project. As the project proceeded, the criteria and standards were refined and specified in more detail. The development process was

3 SCRTD Metro Rail Project, System Assurance Program Plan, Rev. 1 (Draft), May 1988.

4 SCRTD Metro Rail Project, Quality Assurance Program Plan (Draft), August 1987.

subject to a number of checks and balances, including project-wide reviews of design documents to ensure conformance among requirements, and independent reviews of safety and systems assurance content of design documents by system safety and assurance engineers and the Fire/Life Safety Committee.

The criteria and standards specify the requirements to be followed by designers and engineers in the design of facilities and the selection of equipment. Any changes to the criteria and standards are subject to SCRTD's formal change control process (see Chapter 8.0).

11.1.2 Specification Development

Specifications and contract drawings, consistent with basic design criteria, were developed incrementally, with SCRTD design reviews at the 30, 60, 85, and 100 percent levels of completion. The design reviews included inputs from transit equipment manufacturers and other transit systems. System safety and assurance engineers participated in design reviews of all contract packages, to review the safety and dependability aspects of proposed designs and provide input to design engineers. Major procurement contracts include a chapter that clearly delineates contractors' system assurance program requirements, including detailed quality assurance requirements.⁵ Guidelines have been prepared for use by procurement contractors in developing system safety and assurance analyses, and are incorporated by reference in appropriate specifications.⁶

Construction/installation contract specifications include provisions that define the contractor's responsibility for ensuring the quality of work and the authority of the SCRTD and its authorized representatives to inspect and test the contractor's materials and workmanship.

5 See, e.g., SCRTD Metro Rail Project, Procurement Specification Book, Contract No. A650: Passenger Vehicle, Chapter 8, "Technical Provisions," Section 19, "System Assurance Program."

6 SCRTD Metro Rail Project, Guidelines for the Preparation of Safety and System Assurance Analyses, SCRTD 5-001, Rev. 2, March 1987.

11.1.3 Safety Certification

To ensure that all safety, security, and system assurance requirements are properly incorporated within final contract drawings and specifications, Criteria Conformance Checklists were prepared for each contract package. The checklists are used to independently review each contract before it is issued for bid to ensure all safety-related design requirements have been incorporated. The completed checklists are submitted to the Safety Certification Review Team for review as part of the safety certification program. A "Criteria Conformance Certificate" is issued to document the fact that each specification reflects and conforms to the safety requirements contained in the design criteria.

11.1.4 Value Engineering Reviews

During final design, value engineering reviews were conducted on major elements of the Metro Rail system to enhance the cost-effectiveness of the project (see Chapter 10.0). Quality assurance personnel participated in the value engineering analyses to ensure that design changes would not compromise system quality. During the construction phase of the project, quality assurance personnel review any cost-reduction proposals submitted by contractors.

11.1.5 Constructibility/Claims Avoidance Reviews

During final design, constructibility and claims avoidance review were conducted on the tunnels, stations, and other Metro Rail facility plans and specifications to identify potential problems. Drawings and specifications were reviewed by the CM Consultant and TSD quality assurance staff with respect to constructibility and inspectability, and for sensitivity to construction problems and delays.

11.1.6 Configuration Management

The configuration management practices described in Chapter 8.0 have been established to ensure the integrity of all project baseline documents, and to ensure that design changes are made in accordance with established procedures. All design changes are reviewed by system safety and assurance personnel.

11.2 EQUIPMENT PROCUREMENT

Metro Rail Project staff monitor the performance of each manufacturer. Monitoring addresses such issues as technical compliance, schedule adherence, product quality,

and testing. The systems and equipment being procured for the Metro Rail system vary in terms of quantity and complexity. Some items are being specially manufactured, while other items of equipment are standard "off-the-shelf" items. The quality controls applied to each procurement are determined by the cost of the procurement, the complexity of the system or equipment, the degree of standardization, and the quality history of the manufacturer(s).

11.2.1 Pre-Award Survey

Before a major procurement contract is awarded, TSD quality assurance staff, with support from consultants, review the selected manufacturer's quality assurance capabilities. These quality assurance capabilities include quality planning, control, coordination, and audit and analysis activities during the design, procurement, fabrication, assembly, and delivery phases of the contract. The quality pre-award survey is conducted in two steps:⁷

- A review of the manufacturer's quality assurance plans, procedures, and organization
- A verification of the manufacturer's quality history and capabilities through plant visits and interviews with previous customers.

11.2.2 Contractor Design Control

To ensure that contractor designs for major systems adhere to all established design criteria and standards, incremental design reviews are conducted by the SCRTD. The following design reviews are prescribed in the contract specifications for major procurements:

- Conceptual Design Review
- Preliminary Design Review
- Final Design Review
- Mock-Up Review
- First Article Configuration Inspection.

These reviews are conducted to evaluate the progress and technical adequacy of the design and its compatibility with the performance requirements of the contract. Prior to each review, the contractor submits a data package that includes CDRL and other items required for the review.

7 See SCRTD Metro Rail Project, Quality Pre-Award Survey Manual, July 1984.

11.2.3 In-Process Inspections

In-process inspections are conducted to ensure that the manufacturer's quality procedures are acceptable and effective, that the SCRTD's quality standards are enforced, and that the contractor's quality assurance program is being implemented. For major or critical procurements, an on-site Resident Inspector is designated by the CM or SE&A Consultant to monitor the contractor's work, including quality levels. In-process inspections are conducted by the Resident Inspector in accordance with written checklists, and a log book is maintained for each procurement. The inspections are usually performed by an examination of sample parts rather than a widespread inspection of all components. Particular attention is paid to first production articles.

In addition, source inspections are conducted on the major subsystems supplied by subcontractors on each procurement. Inspection results are documented and filed for reference.

11.2.4 Quality Surveillance and Audits

Throughout the duration of a procurement contract, surveillance of contractor and consultant quality assurance activities is provided by consultant and TSD personnel. In addition, for each major procurement, periodic quality audits are performed to verify, by physical examination of hardware and relevant documents, that the manufacturer is conforming to applicable quality procedures and standards. These audits are conducted by TSD and consultant quality assurance personnel, and are independent from the in-process inspection activities of the Resident Inspector.

The audits are conducted in accordance with an overall audit plan and use quality assurance checklists prepared specifically for each procurement.⁸ Written reports are prepared after each audit, and the findings are discussed with the contractor so that corrective action may be taken. Follow-up visits are scheduled as necessary to verify that corrective actions are being implemented.

8 See SCRTD Metro Rail Project, Quality Assurance Review Guidelines, June 1985; and QA/QC Procedures Manual, PDCD, September 1985.

11.2.5 Contractor Analyses

Major systems and equipment contractors are required to prepare and submit subsystem, interface, and operating hazard analyses. In addition, the contractors are required to compile a list of critical/catastrophic items identified as a result of hazard analyses; failure mode, effects, and criticality analyses (FMECA); or other means. Contractors' safety and system assurance submittals, including hazard analyses, must be prepared in accordance with SCRTD requirements currently in effect.

All hazard analyses submitted by contractors are thoroughly reviewed by TSD and consultant staff, and are then tracked to resolution in accordance with established procedures.⁹

11.2.6 Final Inspections

When the systems and equipment procured for the Metro Rail Project have been completely assembled and tested, TSD and consultant staff perform a thorough final inspection of the hardware and any associated software. These final inspections may be performed at the manufacturer's location, at SCRTD facilities, or at both locations. Any identified defects must be corrected by the manufacturer. As required by applicable procurement specifications, contractors must provide drawings showing the as-built configuration of equipment; complete sets of operating and maintenance manuals; and history books for selected equipment. All submittals must be reviewed and approved by the SCRTD.

11.2.7 Safety Certification

To ensure that all safety, security, and system assurance requirements specified in contract documents have been incorporated in the systems and equipment provided to the SCRTD, Specification Conformance Checklists have been prepared for each procurement contract. These checklists are used to ensure that all required safety features have been properly incorporated in the final product. The completed checklists are submitted to the Safety Certification Review Team for review and approval. A "Certificate of Compliance" is issued to document the fact that the system or equipment meets all safety requirements.

9 SCRTD Metro Rail Project, Hazard Resolution Program, November 1986.

11.2.8 Receiving and Storage

The SCRTD Office of Contracts, Procurement and Materiel is responsible for the receipt and storage of all spare parts and material procured for Metro Rail. Receiving inspections are conducted on all incoming material and supplies. Once spare parts are delivered and accepted, the material is securely stored and issued in accordance with SCRTD procurement procedures.

All capital assets procured by the SCRTD are controlled and managed in accordance with UMTA and Office of Management and Budget requirements. The SCRTD's automated materials management system provides the capabilities for receiving, inventory accounting and forecasting, and more advanced materials management functions.

11.3 CONSTRUCTION/INSTALLATION

Metro Rail Project staff monitor all construction and installation activities. Continuing quality assurance reviews and formal audits are conducted to ensure that all construction and installation activities are accomplished in accordance with approved quality assurance/quality control procedures. This monitoring addresses such issues as technical compliance, schedule adherence, product quality, and material testing. A Resident Engineer, supported by the CM Consultant's quality assurance personnel, is assigned to each construction/installation contract to provide on-site quality inspections and liaison between the contractor and the SCRTD.

11.3.1 Inspection and Test Plans

Inspection and test plans for each specific construction/installation contract are developed in accordance with requirements specified in the CM Consultant's quality assurance/quality control manual.¹⁰ These plans are implemented by the Resident Engineer. The Resident Engineer is supported by a Chief Inspector and Inspectors.

11.3.2 In-Process Inspections

Resident Engineers ensure that construction/installation quality control procedures are in place and

¹⁰ See PDCD, Metro Rail Project QA/QC Procedures Manual, September 1985.

effective, and ensure that quality standards are acceptable. The Resident Engineers' responsibilities include:

- Verifying the contractor's material certifications and samples
- Inspecting materials and equipment delivered to the job sites by the contractor or furnished by the SCRTD
- Performing inspections of specially furnished equipment and fabricated construction materials
- Inspecting construction and installation work in progress
- Documenting the results of inspections and tests
- Supervising construction operations and field testing of construction materials
- Directing and supervising the sampling of construction materials, such as soil borings.

When materials or workmanship do not conform with the specifications, the Resident Engineer immediately notifies the contractor in writing to correct the deficiencies.

11.3.3 Quality Surveillance and Audits

Surveillance of all construction/installation quality assurance activities is performed by TSD and CM Consultant quality assurance personnel. Random tests, as described in Section 9.3, are used to verify materials meet with specification requirements. In addition, for each construction/installation contract, periodic quality audits are performed by TSD and consultant staff to verify, by physical examination of hardware and relevant documents, that the contractor is complying with applicable quality procedures and standards.

These audits are independent of the Resident Engineer's activities. They are conducted in accordance with the CM Consultant's quality assurance/quality control manual. An overall audit plan and checklists specifically prepared for each contract are used. Written reports are prepared after each audit, and the findings are discussed with the contractor so that corrective action may be taken. Follow-up surveillance and quality audits are used to confirm that corrective action has been taken and is effective.

11.3.4 Final Inspections

When construction/installation activities, including any necessary documentation, have been completed, TSD and consultant staff perform a thorough final inspection. Any identified defects are documented, and the contractor is required to take corrective action. As required by the applicable specifications, contractors must provide as-built drawings, operating and maintenance manuals, and construction records. All submittals must be reviewed and approved by the SCRTD.

11.3.5 Safety Certification

To ensure that all safety, security, and system assurance requirements specified in contract documents have been incorporated in the fixed facilities provided to the SCRTD, Specification Conformance Checklists have been prepared for each contract. These checklists are used to ensure that all required safety features have been properly incorporated in the final product. The completed checklists are submitted to the Safety Certification Review Team for review and approval. A "Certificate of Compliance" is issued to document the fact that the facility meets all safety requirements.

11.4 INITIAL SYSTEM OPERATIONS

Prior to the start of revenue service operations on the Metro Rail system, all plans, procedures, and training courses required for system operation will be reviewed for safety content by system safety and assurance personnel, and certified under the safety certification program.

The American Public Transit Association (APTA) Rail Safety Review Board will be requested to conduct a safety review of the Metro Rail systems before revenue operations begin. A panel of senior transit industry professionals with requisite expertise in all aspects of rail operations and safety will assess the ability of the Metro Rail system to safely initiate revenue service. The report will be presented to the General Manager for his disposition.

Training will be provided to instill an awareness of potential hazards, hazardous situations, safety practices, and procedures. Training will be provided to operating, maintenance, and supervisory personnel. Training will include procedures for system emergencies and natural disasters to ensure a safe system environment and to enable personnel to respond quickly and effectively.

During the first year of Metro Rail operations, equipment performance or reliability problems are expected to occur. These problems will be identified by operations and maintenance personnel and will require engineering investigations, possible redesigns, and subsequent retrofits by the manufacturer. Applicable warranties will be enforced and revised designs and retrofits will be monitored for conformance to the established Metro Rail criteria and quality control standards.

Reliability demonstration tests will be conducted for critical system equipment, such as the passenger vehicles and communications system. The reliability of the critical equipment will be measured against success/failure criteria. If the equipment fails the test, the contractor will redesign the component until it performs dependably.

During start-up of the system, SCRTD operations personnel will work closely with TSD and consultant staff to ensure a smooth transition to revenue service operations. A System Safety Program Plan--Operations will address safety organizations, tasks, and responsibilities during service operations.

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12.0 MAINTENANCE OF THE PLAN

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This Project Management Plan is a baseline document and is controlled by the procedures outlined in Chapter 8.0. Any changes to the plan must be authorized by the CCB.

As authorized by the CCB, the Plan is updated periodically to ensure that the information it contains accurately reflects current project conditions and status.

Substantive revisions to the plan may be made at the initiative of either the SCRTD or UMTA. At least seven days prior to the quarterly review meetings, either the SCRTD or UMTA will inform the other party in writing of any proposed revisions to the Plan and the reasons for them. The proposed revisions will be discussed at the meeting and mutual agreement reached on their intent and scope. This agreement will be recorded in the minutes of the review meeting and will form the basis for initiating changes to the Plan.

After the agreement is reached, the CCB will review and authorize revisions to the text of the Plan. Changes to the Plan will be made, and the revised Plan will be distributed, according to configuration management procedures.

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13.0 REFERENCE DOCUMENTS

13.0 REFERENCE DOCUMENTS

This chapter provides a listing of key documents which support the Project Management Plan.

13.1 ENVIRONMENTAL REPORTS

- U.S. Department of Transportation, Urban Mass Transportation Administration, in conjunction with SCRTD, Alternatives Analysis/Environmental Impact Statement/Report, April 1980.
- _____, Final Environmental Impact Statement, Los Angeles Rail Rapid Transit Project: Metro Rail, December 1983.
- _____, Environmental Assessment: Los Angeles Rail Rapid Transit Project, Union Station to Wilshire/Alvarado, August 1984.
- _____, Comments and Responses on the Environmental Assessment for the Los Angeles Rail Rapid Transit Project, Union Station to Wilshire/Alvarado, October 1984.
- U.S. Department of Transportation, UMTA, Re-Evaluation of Environmental Record, June 1986.

13.2 MOS-1 DESIGN DOCUMENTS

- SCRTD Metro Rail Project, System Design Criteria and Standards, 1983, as revised.
- _____, Design Directive 003, Metro Rail Project - MOS-1 Design Patronage; and Design Directive 004, Accommodation of Patronage Reduction, System Reduction - MOS-1, Metro Rail Project.
- _____, System Operating Plan for MOS-1, Rev. 0, November 1987.
- _____, System Maintenance Plan, Rev. 0, April 1988.
- _____, Safety Certification Plan, Rev. 1.1, June 1988.

- _____, Contract Unit Descriptions: Minimum Operable Segment-1, June 1988.
- _____, Master General Conditions for Metro Rail construction/installation and procurement contracts.
- _____, Advertised bid documents (general conditions, special conditions, technical provisions, drawings, etc.) for Metro Rail construction/installation or procurement contracts.

13.3 CONFIGURATION MANAGEMENT DOCUMENTS

- SCRTD Metro Rail Project, Change Control Procedure: Design Documents, Rev. 0 (Draft) December 1988.
- _____, Change Control Procedure: Construction/Installation and Procurement Contracts, Rev. 1, March 1988.
- _____, Contract Claims Management Procedure: Construction/Installation and Procurement Contracts, Rev. 0, October 1988.
- MRTC, Metro Rail Project Configuration Management Implementation Plan and Procedures Manual, December 1983.
- PDCD, Project Controls Procedures Manual, March 1987.

13.4 REAL ESTATE DOCUMENTS

- UMTA, Land Acquisition and Relocation Assistance Under the UMTA Act of 1964 as Amended, March 1985.
- _____, Final Rule, 39 Federal Regulations 7000-7040, February 1986.
- SCRTD Metro Rail Project, Milestone 5 Final Report, Right-of-Way Acquisition and Relocation Policies and Procedures, July 1982.
- _____, Property Identification Plans, various dates.

- _____, Relocation Analysis Report, September 1983.
- _____, Milestone 6 Final Report, Land Use and Development Policies, January 1983.
- SCRTD, Real Estate and Development Department, Relocation Benefits: Tenants and Homeowners, no date.
- _____, Relocation Benefits: Businesses and Non-Profit Organizations, no date.
- _____, Detailed Operating Procedures, 1984.
- SCRTD, Policies and Procedures for Implementing Joint Development, November 1983.

13.5 CONTRACT MANAGEMENT DOCUMENTS

- SCRTD, Office of Contracts, Procurement and Materiel, Procedures Manual, no date.
- SCRTD Metro Rail Project, Contractor Submittal Review Procedure: Construction/Installation and Procurement Contracts, Rev. 0 (Draft), August 1988.
- _____, Contract Close-Out Procedure: Construction/Installation and Procurement Contracts, Rev. 0 (Draft), November 1988.
- _____, Warranty Management Plan, March 1986.
- PDCD, Metro Rail Project Contracts and Procurement Manual, Rev. 2, July 1988.
- _____, Metro Rail Project Resident Engineer Manual, Rev. 1, July 1988.
- _____, Inspector Guidelines, Rev. 2, July 1988.

13.6 SYSTEM SAFETY AND ASSURANCE DOCUMENTS

- SCRTD Metro Rail Project, System Safety and Security Program Plan, Rev. 1 (Draft), June 1988.
- _____, Safety Program, Rev. 1, January 1989.
- _____, Safety Certification Plan, Rev. 1.1, June 1988.

- _____, System Assurance Program Plan, Rev. 1 (Draft), May 1988.
- _____, Guidelines for the Preparation of Safety and System Assurance Analyses, SCRTD 5-001, Rev. 2, March 1987.
- _____, Quality Assurance Program Plan (Draft), August 1987.
- _____, Quality Pre-Award Survey Manual, July 1984.
- _____, Quality Assurance Review Guidelines, June 1985.
- PDCD, Metro Rail Project QA/QC Procedures Manual, September 1985.

13.7 CONSTRUCTION DOCUMENTS

- SCRTD, METROfiles, Chapter 6.3, "Community Relations Construction Work Plan," no date.
- _____, Emergency Response Plan for the Los Angeles Metro Rail Construction Project, May 1987.
- PDCD, Construction Operations Procedures Manual, December 1984.
- _____, Metro Rail Construction Safety and Security Manual, Rev. 2, February 1987.
- SCRTD and Los Angeles County Building and Construction Trades Council, AFL-CIO, Continuation of Work Agreement for the Metro Rail Project, June 1984.

13.8 PROGRAM CONTROL DOCUMENTS

- SCRTD, Metro Rail MOS-1 Financial Plan, revised quarterly.
- _____, Metro Rail MOS-1 Executive Schedule, revised quarterly.
- _____, Program Control TRACS System Manual, September 1985.
- PDCD, Project Controls Procedures Manual, March 1987.

13.9 TESTING DOCUMENTS

- SCRTD Metro Rail Project, Test Program Plan,
Rev. 1, September 1988.

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