

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

SAFETY CERTIFICATION PLAN

WBS 06

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(Draft)

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1.0 INTRODUCTION

1.0 INTRODUCTION

The primary goal of the Metro Rail system is to provide safe, reliable and cost-effective transportation. Toward this end, the Southern California Rapid Transit District (SCRTD) has established a comprehensive safety and system assurance program. The program is documented in the Metro Rail's System Safety and Security and System Assurance Program Plans. The program plans identify the technical and management tasks performed during each project phase to systematically integrate safety, security, reliability, maintainability, quality assurance and maintenance planning into all design, construction/procurement, testing and system start-up activities.

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 concept of the program is explained in the Safety Certification Methodology*. The safety certification program is designed to document that:

- Safety-related design criteria are properly reflected in procurement and construction specifications and directive drawings
- Safety-related requirements in the specifications are incorporated into the final products
- Tests which verify the ability of equipment and personnel to function safely are conducted
- ? Plans, procedures and training programs are developed and thoroughly reviewed prior to revenue service ↑ *Implemented?*
- Responsible program participants certify the above to provide a traceable history of the safety program.

A subsequent activity required by the Safety Certification Methodology is the development of a comprehensive Safety Certification Plan (SCP). The Safety Certification Methodology was prepared to provide an

* Safety Certification Methodology, Booz-Allen & Hamilton, February 1985.

overview of the process of certification. Upon management approval of the general process, a more detailed plan for implementation of the program is required. Therefore, the SCP describes the process, responsibilities, documentation, and procedures needed for certification. The major emphasis of the SCP is to:

- : Finalize the list of certifiable elements
- Establish the Safety Certification Review Team (SCRT) and assign SCRT participants
- Define documentation and procedures for reviewing safety compliance.

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.

1.1 SAFETY OBJECTIVES

The SCRTD's safety objectives for Metro Rail project are to:

- Provide a level of safety for patrons and employees equal to or greater than that of any existing rail rapid transit system in the United States
- Provide a level of safety which complies with all applicable codes, guidelines, regulations, and standards
- Eliminate or control hazards to employees, patrons, and equipment consistent with operational effectiveness ?
- Provide a level of security that will encourage the public to use the system without fear for their personal well-being and without loss of personal or public property. ?

1.2 DEFINITION OF SAFETY CERTIFICATION

Safety certification may be defined as the process of verifying satisfactory compliance with a set of formal safety requirements. Specifically, it involves issuing Criteria Conformance Certificates and Certificates of Compliance that document satisfactory compliance with a formal list of safety requirements. The requirements are developed from four SCRTD documents, which define the

types of

safety baselines of the Metro Rail system. These key baseline documents are:

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

1.3 GOALS

The safety certification program is designed to:

- Provide a formalized approach toward the certification process which is sufficiently documented to verify compliance with safety requirements
- Assure that safety is an integrated part of design, procurement, construction, testing, and operations
- Assure that safety decisions are made by responsible SCRTD management
- Provide an informational tool for periodically reporting to the CPUC and the SCRTD senior management on the status of the certification program
- Assure that any hazards that become apparent during design reviews, audits, inspections or system testing are resolved, either by redesign or by implementation and enforcement of special procedures

- Assure that the SCRTD and outside agencies are prepared to respond to normal, abnormal, and emergency situations.

*List is incomplete:
• Ensure safe system
• Ensure safe operation, preparation for*

1.4 SCOPE

The program scope encompasses safety certification of equipment, facilities, safety-related procedures, and training programs in the following areas:

- System Wide Elements -- Which include the passenger vehicles, train control system, communications (fire and security detection, gas and seismic detection, telephone, radio, public address, etc.), fare collection, traction power, and auxiliary vehicles.
- Fixed Facilities -- Which include stations, tunnel segments, the yard and shop(s), and the Central Control Facility (CCF). Equipment installed in a station such as HVAC equipment, escalators and elevators, lighting, etc., is considered part of the facility, even if procured on a system wide basis. *} poor definition*
- Procedures and Training Programs -- Which include items such as the Emergency Procedures Manual, Transit Police Training Program, Accident/Incident Investigation and Reporting Procedure, the Operators Rulebook, Standard Operating Procedures, etc.

"Safety" is defined to include fire/life safety, operational and system safety, and employee occupational safety during revenue service. Construction employee safety requirements are the responsibility of contractors and are not included in this certification program. *} Inadequate definition*

1.5 RELATIONSHIP OF SAFETY CERTIFICATION TO THE SYSTEM INTEGRATED TEST PROGRAM

Concurrently with the development and implementation of the safety certification program, a system integrated test program is also being developed. While the two programs will be separately managed and the focus of each is different, they must be developed to complement and reinforce each other.

The safety certification program documents that all safety requirements in design criteria and specifications are verified, and that the safety contents of test programs, procedures, and training materials are systematically reviewed.

The integrated test program provides assurance that equipment, facilities, software, and procedures developed by different contractors and departments can function together to provide safe and dependable service.

The two programs overlap and must be coordinated in the area of safety-related tests. The specification conformance checklists, prepared as part of safety certification, will identify contractual requirements for safety tests. The integrated test program will identify non-contractual system-level tests which must be conducted to verify that the Metro Rail can operate as designed.

The evidence collected on safety during integrated testing will be used for certification documentation. In addition, any hazards uncovered during integrated testing will require either system redesign (which will be reflected in the specification conformance checklists), or implementation of special procedures (which must be incorporated into procedures manuals and training). Likewise, during safety reviews of procedures and training materials, as part of certification, requirements may be identified for additional system testing.

1.6 AUTHORITY

California enabling legislation in 1964, under Public Utilities Code Part 3, created the SCRTD. The law included the mandate to develop a rapid transit system. Chapter 5, Article 5, Section 30646 of the Public Utilities Code empowered the CPUC to provide oversight and regulate the safety aspects of the transit property. Under this authority, the CPUC governs the safety appliances and procedures of SCRTD property, monitors the use of appliances from the aspect of safety, and conducts inspections to monitor adherence to the rules and regulations.

Other state and local agencies with some level of responsibility and/or authority over safety-related activities, procedures, and equipment include the California Occupational Safety and Health Administration (Cal/OSHA), under California Administrative Code (C.A.C.) Title 8, and the city and county fire departments. Cal/OSHA has regulatory and enforcement powers over construction activities and operational occupational safety. The fire jurisdictions, under C.A.C. Title 19, have jurisdiction over fire and panic safety. The proposed NFPA 130 (Standards for Fixed Guideway Transit System) is used for guidance only; the Metro Rail Fire/Life Safety Committee has established the Metro Rail fire and life safety criteria, which form the basis for fire/life safety considerations.

Because the Metro Rail program is partially federally funded, all program activities, including safety certification, fall under the purview of the Urban Mass Transportation Administration (UMTA) and are subject to their review. The National Transportation Safety Board (NTSB) has the responsibility and authority to conduct investigations of transportation accidents and to make recommendations.

This Safety Certification Plan establishes a Safety Certification Review Team, charged with the safety review, compliance assessment, and overall administration of the certification program.

1.7 ORGANIZATION OF THE SAFETY CERTIFICATION PLAN

Following the introduction, the SCP is organized as follows:

- Chapter 2 describes how the certification process will function. It provides an overview, schedule, description of the SCRT, documentation, and reporting requirements.
- Chapter 3 presents the procedures for issuance of Criteria Conformance Certificates.
- Chapter 4 presents the procedures for issuance of Certificates of Compliance for systems and facilities.
- Chapter 5 presents the procedures for review and approval of integrated test activities involving safety.
- Chapter 6 presents the procedures for review and approval of procedures and training programs which relate to safety.

2.0 SAFETY CERTIFICATION PROCESS

2.0 SAFETY CERTIFICATION PROCESS

Chapter 2.0 describes how the safety certification process will function. The discussion includes an overview, schedule, documentation and reporting requirements of the certification process.

2.1 OVERVIEW

The certification process is shown in Exhibit 2-1. As is evident in the exhibit, Metro Rail safety certification is a four-phased program designed to verify that:

- The design criteria related to safety are properly incorporated into the appropriate contract specifications and directive drawings
- The safety requirements included in the contract specifications are properly designed into the final end products
- System level safety tests are conducted as part of the integrated test program
- Safety-related operating plans, procedures, and training materials are developed, reviewed, and approved prior to revenue service.

The first task of the certification program is to identify those Metro Rail elements that need to be certified. A list of the certifiable elements of the Metro Rail system (MOS-1 only) is shown in Exhibit 2-2. The elements are identified primarily by contract in the areas of systems and fixed facilities. Plans and procedures have been identified as well as training programs.

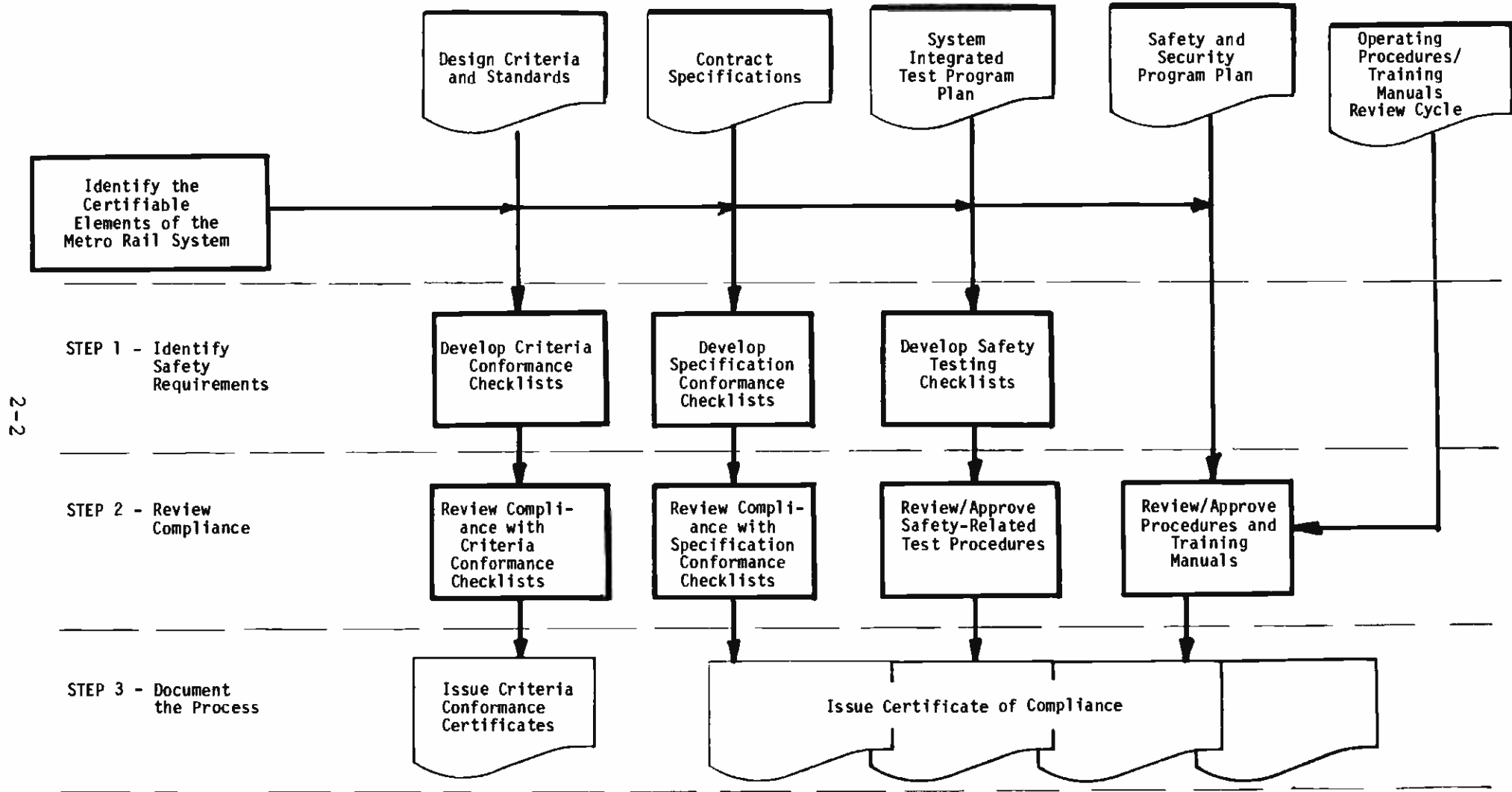
Each of the phases of certification has three basic steps designed to:

- Identify the safety requirements
- Review compliance with the requirements
- Document the review and approval process.

Step 1 - Identify the Safety Requirements.

Checklists for criteria and specification conformance will be developed for each of the system wide and fixed facilities certifiable elements. The Criteria Conformance Checklists will be developed based on the Metro Rail System Design Criteria and Standards, which cover fire/life safety, system safety, security,

EXHIBIT 2-1
Safety Certification Process



2-2

EXHIBIT 2-2
List of Certifiable Elements for MOS-1

SYSTEM WIDE ELEMENTS

1. Passenger Vehicles
2. Automatic Train Control System
3. Communications System - Supervisory, Control and Data Acquisition
4. Communications System - Fire and Security Detection
5. Communications System - Gas and Seismic Detection
6. Communications System - Telephone, Radio, and Public Address
7. Communications System - Closed Circuit Television
8. Communications System - Rail Control Center Equipment
9. Fare Collection System
10. Traction Power
11. Auxilliary Vehicles

FIXED FACILITIES

12. Emergency Response Equipment
13. Yard and Shop
14. Central Control Facility
15. Yard and Shop to Union Station Line
16. Union Station Station
17. Union Station to Civic Center Line
18. Civic Center Station
19. Civic Center to 5th and Hill Line
20. 5th and Hill Station
21. 5th and Hill to 7th and Flower Line
22. 7th and Flower Station
23. 7th and Flower to Wilshire/Alvarado Line
24. Wilshire/Alvarado Station
25. Wilshire/Alvarado Tail Track

SAFETY RELATED PLANS AND PROCEDURES

26. Hazard Identification and Resolution Procedure
27. System Safety Program Plan -- Operations
28. System Safety Organization
29. Standard Operating Procedures
30. Emergency Procedures Manual
31. Security Operating Procedures
32. Operators Rulebook
33. System Integrated Test Plan
34. Safety Test Procedures
35. Accident/Incident Investigation and Reporting Procedure
36. Fire Protection Features Manual
37. Fire and Police Communications System Handbook
38. Continuing Safety Certification and Audit Program

TRAINING PROGRAMS

39. Vehicle Operators Training Program
40. CCF Personnel Training Program
41. Yard and Tower Personnel Training Program
42. Maintenance Personnel Training Program
43. Transit Police Training Program
44. Fire Department Training Program
45. Public Education Program
46. Other Outside Agency Training (DWP, LAPD, LACSD)
47. Emergency Team Training Exercises and Drills

and system assurance. The Specification Conformance Checklists will identify each of the safety requirements included in each specification. The checklists will be used during supplier design reviews, quality and safety audits, inspections and tests, as a tool to identify, collect, and document the approval of evidence that demonstrates safety requirements have been achieved.

The System Integrated Test Program (SITP) Plan will identify the tests that need to be conducted to assure the system can operate safely, as well as perform as specified. The SITP, developed during the construction/acquisition phase of the Metro Rail, is a broad-based program which covers all testing activities from delivery until the beginning of revenue service. The SITP will cover both performance and safety testing. Those tests which relate to safety will be identified in the SITP and will become certification requirements.

Operating procedures and training programs which affect safety are identified in the System Safety and Security Program Plan. However, the specific content of the procedures and training materials is not. The most effective method for assuring that proper content is included is to have a widespread review and comment cycle on each procedures manual and training program. A formal Operating Procedures/Training Materials Review Cycle document will be developed. The formal reviews will usually include input and discussions with OCC supervisors, emergency response personnel (fire and police), maintenance personnel, management, safety staff, and design engineers. Special emphasis will be placed on assuring that those people who will operate, maintain, and police the Metro Rail have a thorough interaction with the engineers who designed the system.

Step 2 - Review Compliance with the Requirements. A Safety Certification Review Team (SCRT) will be assembled by the SCRTD to review and approve compliance with the various checklists. During the final design review process, the Criteria Conformance Checklists will be used to verify that all appropriate design requirements, as identified in the criteria, have been incorporated into the appropriate contract specifications and directive drawings. In a similar fashion, each safety requirement on the Specification Conformance Checklist will require a review and verification that demonstrates its achievement. This evidence will be presented during design reviews, as part of contract deliverables,

during audits and inspections of equipment or facilities. Completion of the certification requirements in the SITP and a thorough review of all safety-related procedures and training programs will also be verified.

Step 3 - Document the Review and Approval Process.

The SCRT is responsible for reviewing the evidence and recommending to Metro Rail senior management that a certifiable element is safe for public use. When the SCRT determines that all safety criteria are properly contained in the contract specifications for a certifiable element, the SCRT will recommend that the element receive a "Criteria Conformance Certificate." The certificate attests to the fact that the specifications reflect and conform with the safety requirements contained in the design criteria. If the SCRT believes that specification language or drawings do not comply with the intent of the design criteria, it has the responsibility of withholding its recommendation that the element receive a "Criteria Conformance Certificate."

Similarly, upon receiving evidence that safety requirements in the contract specifications have been achieved in the end product, that all safety-related testing in the SITP Plan has been accomplished, or that an operating procedures manual or training program has been thoroughly reviewed for its safety contents, the SCRT will recommend that the element receive a "Certificate of Compliance."

2.2 SCHEDULE

A schedule of the major safety certification tasks and their timing is shown in Exhibit 2-3. This schedule is based on the MOS-1 Baseline Schedule, Revision 1, dated July 29, 1985. The schedule will be updated, as required, to reflect any further changes in the schedule.

2.3 SAFETY CERTIFICATION REVIEW TEAM

As evident from the certification program schedule in Exhibit 2-3, the certification related activities will be ongoing until the start of the revenue service. Furthermore, tasks within the certification process will be conducted by various groups within the SCRTD and its consultants. The success of the certification process will largely depend on how closely and effectively the work progress is monitored.

A group of knowledgeable senior personnel will be assembled to function as an SCRT. The SCRT will be responsible for safety review, compliance assessment, and

EXHIBIT 2-3
 Safety Certification Schedule

| PHASE | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 |
|--|------|------|------|------|------|------|
| <u>CRITERIA CONFORMANCE</u> | | | | | | |
| 1. Finalize Criteria Conformance Checklists | | | | | | |
| 2. Review Compliance | | | | | | |
| 3. Issue Conformance Certificates | | | | | | |
| <u>SPECIFICATION CONFORMANCE</u> | | | | | | |
| 1. Finalize Specification Conformance Checklists | | | | | | |
| 2. Review Compliance | | | | | | |
| 3. Issue Certificates of Compliance | | | | | | |
| <u>SYSTEM INTEGRATED TESTING</u> | | | | | | |
| 1. Establish System Integrated Test Program | | | | | | |
| 2. Review and Approve Safety Test Procedures | | | | | | |
| 3. Issue Certificates of Compliance | | | | | | |
| <u>OPERATIONS PLANS AND TRAINING</u> | | | | | | |
| 1. Establish Operating Procedures/ Training Materials Review Cycle | | | | | | |
| 2. Review and Approve Operating Procedures | | | | | | |
| 3. Issue Certificates of Compliance | | | | | | |

2-6

(Engineering Changes)

making recommendations to SCRTD senior management regarding safety certification of system elements. These individuals shall have specific expertise in a safety-related function and represent the following SCRTD Metro Rail organizations:

- Safety and Systems Assurance
- Systems Design and Analysis
- Transit Facilities Engineering
- Construction Management
- Rail Operations
- Rail Maintenance
- Transit Police.

Personnel from the following consultant organizations will provide information, assistance, support, and advice to the SCRT, as required:

- General Consultant
- Construction Manager
- System Engineering and Analysis Consultant

The specific SCRT structure and individuals are shown in Exhibit 2-4. The SCRT will hold meetings to assess the certification work progress. The meetings will be chaired by the SCRT chairman. In the early phases of the certification program, the SCRT will meet on an adhoc basis. Later, after site installation and testing begins, the SCRT will schedule periodic meetings.

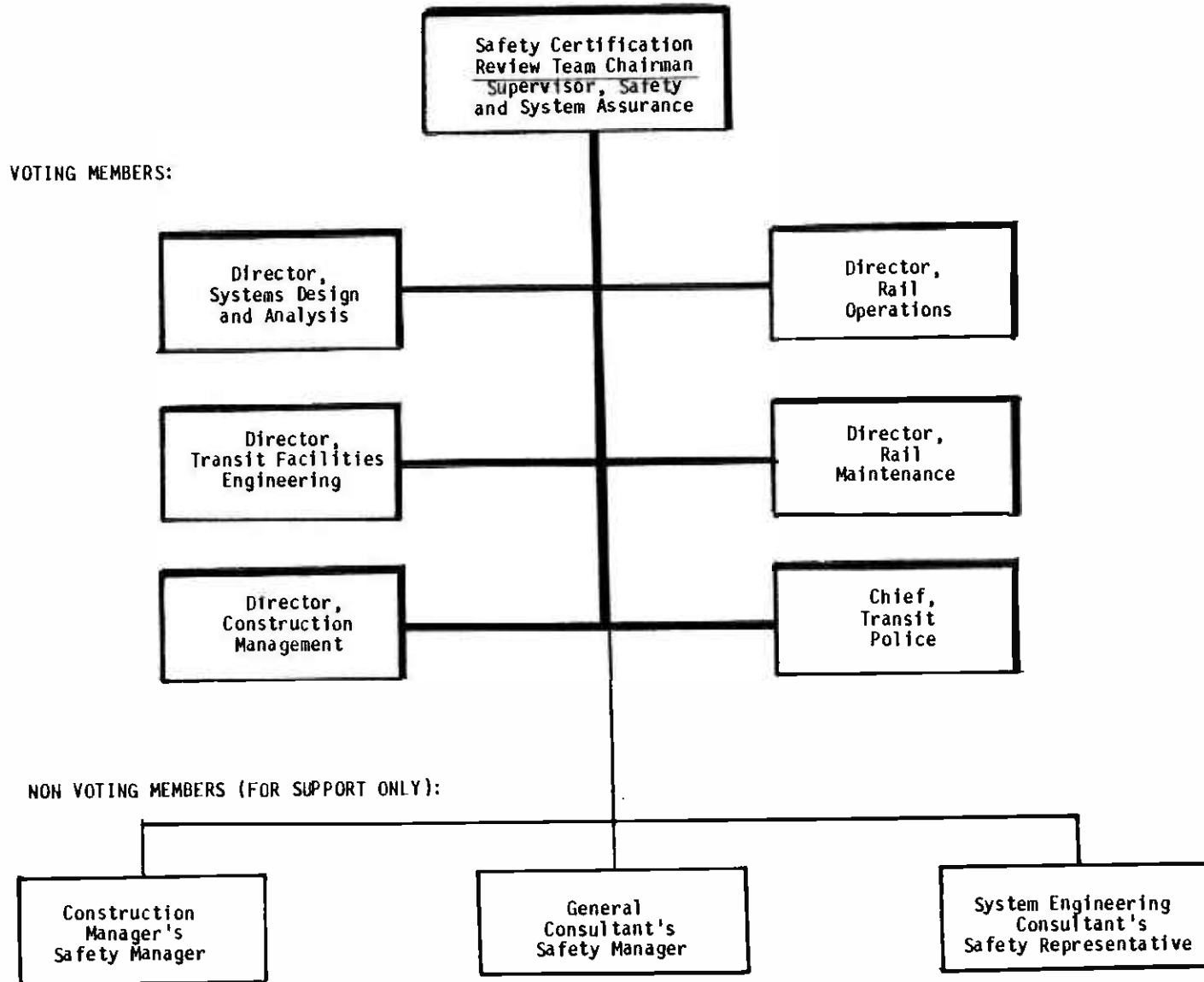
The SCRT meetings will not be working sessions. The SCRT will be held for the purpose of reviewing evidence of compliance, assigning responsibilities for open items to staff or consultants, and approving certification documents. Preparation of all materials for SCRT meetings is the responsibility of the Chairman, who is also responsible for issuing the minutes of each meeting.

2.4 DOCUMENTATION AND REPORTING REQUIREMENTS

The documentation system for safety certification process must provide accountability, timeliness, and accessibility. These elements are described below.

- Accountability - To assure that all checklists and certificates are accurately completed, signed by the appropriate levels of authority, and decisions made by the SCRT are documented.
- Timeliness - To assure that each subsystem and/or component is certified as safe prior to public use. Delays in issuing certificates must be recognized immediately.

EXHIBIT 2-4
Safety Certification Review Team



2-8

- Accessibility - To allow verification that each item has been issued a certificate as well as to provide any other information required to substantiate the certificate.

To satisfy these requirements, a documentation system of safety certification files will be established. The system will include a master file containing systemwide certification program information and a series of individual files containing certifiable element information. Completed files will contain the following documents:

- Master File
 - Program index which will include contents of the Master File and a list of all certifiable element files
 - One current copy of the Safety Certification Plan and a history of any changes or updates thereto
 - Master list of certifiable elements
 - Certificate of Conformance and/or Compliance with attached restrictions, if any, for each element
 - Certification status reports and final report
 - Minutes of SCRT meetings
 - Supporting documentation, as appropriate.
- Certifiable Elements Files
 - Certificate of Conformance and/or Compliance with attached restrictions, if any
 - Recommendations of SCRT
 - Supporting documents from contractors, consultants, department heads and/or local agencies, such as the Fire Department, stating that applicable specification and regulatory requirements have or have not been fulfilled
 - References to storage locations for information from design reviews, audits, etc., pertaining to certifications of the

element involved that is too voluminous for inclusion in the Certifiable Items File.

Documentation for the safety certification program will consist of two types of forms -- a checklist for each element and a form to issue Certificates of Conformance or Compliance. The specific forms are described in the following chapters for each procedure.

Reporting requirements are necessary to periodically inform SCRTD management as to the status of the safety certification program. Quarterly progress reports will be prepared to advise SCRTD management of the following information:

- Certificates completed during the quarter
- Problems encountered
- Changes to the list of certifiable elements
- Certificates expected to be issued in the coming period
- Certification progress to date (schedule to be updated each quarter).

The purpose of the quarterly reports is to encourage the timely review of all safety-related items and to ensure that any problems relating to issuing certificates are promptly resolved. If necessary, later during the project, the progress reports may be issued on a monthly basis.

A final report will be prepared before the Metro Rail begins revenue service. The report will summarize the safety certification status of Metro Rail. The final report will:

- Summarize the safety certification program history, achievements, and problems
- Describe current certification status
- Recommend actions that should be taken to eliminate remaining restrictions
- Provide a recommended schedule for eliminating restrictions.

Chapters 3.0 through 6.0 describe procedures for each of the four phases of the safety certification program.

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3.0 CRITERIA CONFORMANCE CERTIFICATION PROCEDURE

3.0 CRITERIA CONFORMANCE CERTIFICATION PROCEDURE

Chapter 3.0 describes the documentation and procedures for criteria conformance certification.

3.1 PURPOSE

The purpose of this procedure is to provide a uniform methodology for:

- Listing safety related criteria of each systemwide and fixed facilities certifiable element
- Verifying each safety criterion is included in the appropriate contract specification(s) and directive drawing(s).

3.2 DOCUMENTATION

The documentation for the criteria conformance certification process consists of two forms -- A Criteria Conformance Checklist and a Criteria Conformance Certificate. Their formats are shown in Exhibits 3-1 and 3-2.

The Criteria Conformance Checklist contains the following information:

- Certifiable Element - Title of certifiable element from Exhibit 2-2 for which Criteria Conformance Checklist is developed.
- Group - Title of the group within SCRTD or consultant responsible for preparing the checklist.
- Reviewer - Name of the individual preparing the checklist.
- Discipline - Applicable SCRTD safety, fire/life safety, security or system assurance criteria.
- Review Reference - Applicable SCRTD Metro Rail System Design Criteria and Standards volume and section number.
- Date - Actual date of checklist preparation.
- Contract No. - SCRTD contract number(s) for the certifiable element.



SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: _____

GROUP: _____

DATE: _____

REVIEWER: _____

DISCIPLINE: _____

REVIEW REFERENCE: _____

CONTRACT NO.: _____

REVIEW LEVEL: _____

| REQ. I.D. | REQUIREMENT | YES | NO | COMMENT |
|-----------|-------------|-----|----|---------|
| | | | | |



CRITERIA CONFORMANCE CERTIFICATE

**SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT
SAFETY CERTIFICATION PROGRAM**

Completion of this Certificate indicates that the specifications and drawings of the Certifiable Element indicated below comply with all applicable SCRTD safety, fire/life safety, security, and system assurance criteria.

CERTIFIABLE ELEMENT _____ No. _____

CONTRACT SPECIFICATION(S) INCLUDED:

- .
- .
- .
- .

EXCEPTIONS NOTED:

Chairman, Safety Certification Date
Review Team

Director, Systems Design Date
and Analysis or Transit
Facilities Engineering

- Review Level - Checklist preparation completion level of up to 100 percent.
- Req. I.D. - Applicable chapter, paragraph or section reference number from the Review Reference document.
- Requirement - Description of the safety criterion.
- Yes/No - Whether the requirement is or is not included in the contract specification of the certifiable element.
- Comment - Applicable chapter, paragraph or section reference, if the criteria is included in the contract specification(s), or other explanation if the criteria is not included in the contract specification(s).
- Page of - Actual page number out of the total pages of the checklist document.

The Criteria Conformance Certificate contains the following information:

- Certifiable Element - Title of the certifiable element as listed in Exhibit 2-2.
- Contract Specification(s) Included - Titles of the applicable contract specification(s) containing safety criteria related to the certifiable element.
- Exceptions Noted - Explanation regarding the nonconformance or deviations related to the required criteria.
- Signature(s), Dates(s) - Signature and date of signing the certificate by the Chairman, SCRT, and the Director of System Design and Analysis or Transit Facilities Engineering, as applicable.

3.3 PROCEDURE

The following actions describe, in sequential order, the procedure for issuing the Criteria Conformance Certificates:

1. The General Consultant will develop draft Criteria Conformance Checklists for each systemwide and fixed facilities element listed in Exhibit 2-2.

2. The draft checklists will be submitted to the Supervisor, Safety and System Assurance (S&SA).
3. The Supervisor, S&SA will distribute the draft checklists to the following for review and comment:
 - Director, Transit Facilities Engineering, for review by his own staff
 - Director, Systems Design and Analysis, for transmittal to the System Engineering and Analysis Consultant and his own staff
 - Director, Construction Management, for transmittal to the Construction Manager and his own staff.
4. The Supervisor, S&SA will collect and compile the comments from the above organizations.
5. The Supervisor, S&SA will meet with the General Consultant to discuss and resolve the review comments.
6. As required from the review, the General Consultant will finalize the Criteria Conformance Checklists.
7. As the contract specification(s) for each certifiable element are completed, the General Consultant will review the specifications to verify that each safety criterion from the checklist is included in the specifications. The General Consultant will periodically inform the Supervisor, S&SA on the criteria conformance progress and any problems encountered.
8. When the General Consultant has completed an internal review and is satisfied that all safety-related criteria have been incorporated in the appropriate specification, the General Consultant's Manager of Safety, Security, and Assurance will notify the SCRTD's Supervisor of S&SA, and submit the completed Criteria Conformance Checklists to him.
9. The Supervisor, S&SA will determine that the following evidence is available:
 - Finalized checklists

- Preliminary approval from Director, Systems Design and Analysis and/or Director, Transit Facilities Engineering on the completeness and accuracy of the Criteria Conformance Checklist.
10. The Supervisor, S&SA, and his staff will review and audit the checklists against the specifications to assure they are complete and the sections referenced are accurate. When the Supervisor, S&SA is satisfied with the completed checklist(s), he will call a meeting of the SCRT.
 11. The SCRT will convene to review the evidence and will issue its recommendations to either the Director, Systems Design and Analysis, or Director, Transit Facilities Engineering.
 12. The Criteria Conformance Certificate for each certifiable system and fixed facilities element will be signed by the Director, Systems Design and Analysis, or Director, Transit Facilities Engineering.
 13. After the certificate has been signed by either the Director, Systems Design and Analysis, or the Director, Transit Facilities Engineering, the Chairman, SCRT will validate it with his signature.
 14. The original certificate will be filed in the Master File, and one copy in the appropriate certifiable element file, along with the completed checklists and the minutes of the SCRT meeting.

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4.0 SPECIFICATION CONFORMANCE CERTIFICATION PROCEDURE

4.0 SPECIFICATION CONFORMANCE CERTIFICATION PROCEDURE

Chapter 4.0 describes the documentation and procedures for the specification conformance certification.

4.1 PURPOSE

The purpose of this procedure is to provide a uniform methodology for:

- Listing safety requirements from the contract specification documents of each system, and fixed facilities certifiable element.
- Verifying that all contractual safety requirements are satisfactorily achieved.

4.2 DOCUMENTATION

The documentation for the specification conformance certification process consists of two forms -- a Specification Conformance Checklist and a Certificate of Compliance. Their formats are shown in Exhibits 4-1 and 4-2.

The Specification Conformance Checklist contains the following information:

- Contract - Title of the SCRTD contract(s) for the certifiable element.
- Contract No. - SCRTD contract number(s) for the certifiable element.
- Certifiable Element - Title of certifiable element from Exhibit 2-2 for which the specification conformance checklist is developed.
- Subsystem - Name of the applicable subsystem within the certifiable element.
- Revision - Checklist preparation completion or revision level (i.e., draft, final, A, B, C, D, etc).
- Date - Actual date of checklist preparation.
- Prepared by - Name of the individual and his/her organization preparing the checklist.
- Approved by - Name of the individual and his/her organization approving the checklist.

EXHIBIT 4-1
Specification Conformance Checklist

| | | |
|--|--|--|
| CONTRACT: CONTRACT NO.: CERTIFIABLE ELEMENT: SUBSYSTEM: |  RTD Metro Rail Project SAFETY CERTIFICATION PROGRAM SPECIFICATION CONFORMANCE CHECKLIST | REVISION: _____ DATE: _____ PREPARED BY: _____ APPROVED BY: _____ PAGE: _____ OF: _____ |
|--|--|--|

| Item No: | Safety Requirement | Specification Reference | | EVIDENCE | | | | |
|----------|--------------------|-------------------------|-----------|-----------------------------|-------|--------------------|----------|----|
| | | Section—Page | Paragraph | Verification Responsibility | Stage | Document Reference | Verified | |
| | | | | | | | Date | By |
| | | | | | | | | |



CERTIFICATE OF COMPLIANCE

**SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT
SAFETY CERTIFICATION PROGRAM**

Completion of this Certificate indicates that the Certifiable Element indicated below complies with all applicable specification safety requirements and is judged safe for public use/revenue service.

CERTIFIABLE ELEMENT _____

DATE OF CERTIFICATION _____

RESTRICTIONS:

APPROVALS:

Chairman, Safety Certification Date
Review Team

Director, Construction Date
Management

Director, System Date
Design and Analysis or
Transit Facilities Engineering

Assistant General Date
Manager, TSD

- Page of - Actual page number out of the total pages of the checklist document.
- Item No. - Serial number of each safety requirement listed in the checklist.
- Safety Requirement - Description of the safety requirement.
- Specification Reference: Section-page - Applicable section and page reference number of the safety requirement from the contract specification.
- Specification Reference: Paragraph - Applicable paragraph reference number of the safety requirement from the contract specification.
- Evidence: Verification Responsibility - Abbreviation of the name of the individual and/or the organization responsible for verifying the specific safety requirement.
- Evidence: Stage - Description of the contract execution stage such as design, manufacturing, fabrication, assembly, testing, procurement, installation, when the requirement will be verified.
- Evidence: Document Reference - Abbreviated alphanumeric reference number of the document provided by the contractor for the evidence verification.
- Evidence: Verified/Date - Actual date of evidence verification.
- Evidence: Verified/By - Initials of the individual verifying the evidence.

The Certificate of Compliance contains the following information:

- Certifiable Element - Title of the certifiable element as listed in Exhibit 2-2.
- Date of Certification - Date on which compliance of the certifiable element with all applicable specification safety requirements is completed.
- Restrictions - Explanation regarding any temporary nonconformance or deviations related to the certifiable element safety requirements.

- Approvals - Signature and date of signing the certificate by Chairman, Safety Certification Review Team (SCRT); Director Construction Management or the Director, Systems Design and Analysis; and the Assistant General Manager, TSD.

4.3 PROCEDURE

The following actions describe, in sequential order, the procedure for issuing a Certificate of Compliance:

1. The General Consultant will develop draft Specification Conformance Checklists for each system-wide and fixed facilities element listed in Exhibit 2-2. The evidence portion of the checklist forms will be left blank during the development of the checklists.
2. The draft checklists will be submitted to the Supervisor, Safety and System Assurance (S&SA).
3. The Supervisor, S&SA will distribute the draft checklists to the following for review and comment:
 - Director, Transit Facilities Engineering, for review by his own staff
 - Director, Systems Design and Analysis, for transmittal to the System Engineering and Analysis Consultant and his own staff
 - Director, Construction Management, for transmittal to the Construction Manager and his own staff.
4. The Supervisor, S&SA will collect and compile the comments from the above organizations.
5. The Supervisor, S&SA will meet with the General Consultant to discuss and resolve the review comments. At that time, the verification responsibility column for each safety requirement item will be completed by the Supervisor, S&SA.
6. As required from the review, the General Consultant will finalize the Specification Conformance Checklists.
7. As the contract(s) for each certifiable element is executed, the individual(s) with verification responsibility will review each safety requirement for satisfactory completion. The

Supervisor, S&SA will be periodically informed on the specification conformance progress and any problems encountered.

8. The individual with evidence collection responsibility will identify the stage of the project/contract when the information that verifies compliance will be available. If possible, the exact time will be pinpointed (e.g., Final Design Review, First Article Inspection, Mock-Up Review, etc.). The responsible individual will document the reference which incorporates the safety requirements (e.g., subsystem hazard analysis, hazard #103-B, or quality audit #3, checklist #4, etc) along with the document number, if any.
9. After the products are delivered or installed, the Supervisor, S&SA will determine that the following evidence is available:
 - Completed checklists
 - Certifiable Element File containing certification documentation and references to all evidential material.
10. The Supervisor, S&SA, and his staff will review and audit the checklists against the evidential material to assure they are complete and the referenced documents are accurate. When the Supervisor, S&SA is satisfied with the completed checklists, he will call a meeting of the SCRT.
11. The SCRT will convene to review the evidence and will issue its recommendations to the Director, Systems Design and Analysis, and to the Director, Construction Management.
12. The Certificate of Compliance for the subject certifiable system wide and fixed facilities element will be prepared. The Chairman, SCRT, the Director, Systems Design and Analysis, and the Director, Construction Management will sign the Certificate of Compliance and will forward it, along with the SCRT recommendations, to the Assistant General Manager, TSD for his signature.
13. The original certificate will be filed in the Master File, and one copy in the appropriate certifiable element file, along with the completed checklists, the minutes of the SCRT meeting and the recommendation for certification.

5.0 SYSTEM INTEGRATED TEST PROGRAM
CERTIFICATION PROCEDURE

5.0 SYSTEM INTEGRATED TEST PROGRAM CERTIFICATION PROCEDURE

Chapter 5.0 describes the documentation and procedures for assuring all system-level safety tests are conducted as part of the System Integrated Test Program (SITP).

5.1 PURPOSE

The purpose of this procedure is to provide a uniform methodology for:

- Identifying system-level safety-related tests.
- Verifying each safety-related test is successfully completed.

As discussed in Section 1.6, the SITP, while managed separately, complements and reinforces the safety certification program. Tests identified as part of the SITP Plan will primarily be concerned with:

- Performance - to verify that the equipment can function in the Metro Rail operational environment, meets the requirements of the specifications, and can be integrated with other equipment to provide dependable service.
- Safety - to verify that personnel, procedures, and equipment can function safely together in normal, emergency, and abnormal conditions.

Those tests that verify the ability of the system to operate safely are a key element of the certification program. The interfaces between the SITP and safety certification assure that:

- Necessary safety-related tests are identified as part of integrated test planning, and that the SITP Plan procedures document and verify system safety.
- Hazards that become apparent during system integrated testing are reported and resolved, either by system redesign or the imposition of special procedures.

5.2 DOCUMENTATION


The documentation for the SITP consists of two forms -- a System Integrated Test Program Checklist and a

Certificate of Compliance. The format for the SITP Checklist is shown in Exhibit 5-1. The format for the Certificate of Compliance is the same as shown in Exhibit 4-2.

The System Integrated Test Program Checklist is prepared as part of SITP development, and contains the following information:

- Primary Contract - Title of the primary contract for which verification tests will be conducted.
- Contract No. - Contract number for the primary contract.
- Secondary Contracts(s) - Title(s) of other contract(s) with which interfaces of the primary contract will be verified.
- Contract No.(s) - Contract number(s) of the secondary contract(s).
- Revision - Review form preparation completion or revision level (i.e., draft, final, A, B, C, D, etc.).
- Date - Actual date of review form preparation or revision.
- Prepared by - Name of the individual and his/her organization preparing the review form.
- Approved by - Name of the individual and his/her organization approving the review form.
- Page of - Actual page number out of the total pages of the review form document.
- Item No. - Serial number of each test requirement listed in the review form.
- Test Plan Reference - Applicable section and page reference number of the test requirement from the SITP Plan.
- Test Description/Title - Description or title of the test requirement.
- Specification Reference - Applicable section and page reference number of the test requirement from the contract specifications, if any.
- Safety Impact, Yes/No - Identification whether the specific test item is safety-related.

EXHIBIT 5-1
System Integrated Test Program Checklist

| PRIMARY CONTRACT: CONTRACT NO.: <hr/> SECONDARY CONTRACT(S): CONTRACT NO.(S): | |  RTD Metro Rail Project SYSTEM INTEGRATED TEST PROGRAM CHECKLIST | | | REVISION: _____ DATE: _____ PREPARED BY: _____ APPROVED BY: _____ PAGE: _____ OF: _____ | | | | |
|--|---------------------|--|-------------------------|----------------------|--|--------------------------|---------------|----|-----------------------|
| Item No: | Test Plan Reference | Test Description/Title | Specification Reference | Safety Impact Yes/No | EVIDENCE | | | | Comment Accept/Reject |
| | | | | | Verification Responsibility | Test Procedure Reference | Verified Date | By | |
| | | | | | | | | | |

5-3

- Evidence: Verification Responsibility - Abbreviation of the name of the individual and/or the organization responsible for verifying the specific requirement.
- Evidence: Test Procedure Reference - Abbreviated alphanumerical reference number of the test procedure document provided for the evidence verification.
- Evidence: Verified/Date - Actual date of evidence verification.
- Evidence: Verified/By - Initials of the individual verifying the evidence.
- Evidence: Comment, Accept/Reject - An evaluation by the individual with the verification responsibility, whether the completed test is acceptable.

5.3 PROCEDURE

Because it is not practical to issue a separate Certificate of Compliance for every safety-related test in the SITP, only two certificates will be issued:

- Certifiable Element No. 33: System Integrated Test Program Plan - This certificate documents that a comprehensive test plan has been developed which:
 - Provides proper management controls for conduct of the test program and the inclusion and identification of safety tests.
 - Has undergone an extensive technical review to assure all requirements have been included.
- Certifiable Element No. 34: Safety Test Procedures - This certificate documents that test procedures have been developed for each SITP safety test, which:
 - Identify the technical requirements for conducting the test.
 - Provide clear pass/fail criteria and procedures for assuring all open or failed items are resolved prior to revenue service.

The following actions describe, in sequential order, the procedure for issuing a Certificate of Compliance for the SITP Plan and Safety Test Procedures.

1. The System Engineering and Analysis Consultant, under the direction of the Manager, Systems Engineering and Analysis (SEA) will develop a draft SITP Plan. The plan will identify:

- The management process for development of test procedures, identification of test requirements, and establishment of pass/fail criteria
- Necessary test requirements, both contractual and other noncontractual as desired by SCRTD
- Test execution sequence and schedule
- Test documentation requirements.

The test requirements will be summarized on the SITP Checklist shown in Exhibit 5-1.

2. The Manager, SEA will distribute the draft SITP Plan, including the checklists to the following for review and comment:
 - Supervisor, Safety and System Assurance
 - Director, Transit Facilities Engineering
 - Director, Construction Management
 - Director, Systems Design and Analysis
 - Director, Rail Maintenance
 - Director, Rail Operations
 - General Consultant
 - Construction Manager.
3. The Manager, SEA will collect and compile comments from the above organizations.
4. The Manager, SEA will meet with the System Engineering and Analysis Consultant to discuss and resolve the review comments. At that time, the responsibility for each test procedure development and verification will be completed by the Manager, SEA.
5. As required from the review, the System Engineering and Analysis Consultant will finalize the SITP Plan.

6. Upon final revisions to the SITP Plan, the Manager, SEA will request that the SCRT convene to approve the safety content of the SITP Plan.
7. The SCRT will convene to review the SITP Plan and issue its recommendations to the Director, Systems Design and Analysis, and the Director, Construction Management.
8. The Certificate of Compliance for the SITP Plan will be signed by the Chairman, SCRT; the Director, Systems Design and Analysis; and the Director, Construction Management. It will be forwarded, along with the SCRT recommendations, to the Assistant General Manager, TSD for his signature.
9. Test procedures will be written for each test requirement. Respective contractors will develop the test procedure(s) for their contractual test requirements. The Manager, SEA will be responsible for coordinating development of test procedures for noncontractual test requirements.
10. Test procedures will be distributed to the organizations identified in item 2 above. Each organization will provide written reviews and comments on SCRTD forms. As required from the review, each test procedure will be finalized.
11. The SCRT will convene periodically to review progress of development of safety-related system integration tests.
12. When all of the safety-related test procedures are completed, the Manager, SEA will request that the SCRT convene. The Chairman, SCRT will determine that the following evidence is available:
 - Completed review and comment forms on the procedures for all safety-related tests.
 - Approval from the Supervisor, Safety and Systems Analysis on the completeness and accuracy of the procedures.
13. The SCRT will convene to review the evidence and will issue its recommendations to the Director, System Design and Analysis and to the Director, Construction Management.

14. A Certificate of Compliance will be prepared. The Chairman, SCRT; the Director, Systems Design and Analysis; and the Director, Construction Management will sign the Certificate of Compliance and will forward it, along with the SCRT recommendations, to the Assistant General Manager, TSD for his signature.
15. The original certificate will be filed in the Master File, and one copy in the appropriate certifiable element file, along with the safety test procedures, the minutes of the SCRT meeting, and the recommendation for certification.

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6.0 SAFETY AND SECURITY RELATED PROCEDURES
AND TRAINING CERTIFICATION PROCEDURE

6.0 SAFETY AND SECURITY RELATED PROCEDURES AND TRAINING CERTIFICATION PROCEDURE

Chapter 6.0 describes the documentation procedure for certifying that all safety-related operating and maintenance procedures, as well as training program safety content, are thoroughly reviewed prior to revenue service.

6.1 PURPOSE

The purpose of this procedure is to provide a uniform methodology for:

- Identifying operations and maintenance procedures and training programs required to safely operate the Metro Rail
- Reviewing the safety content of the procedures and training programs
- Verifying that each procedure or training program material(s) has successfully completed a comprehensive review cycle.

The contract specifications provide the baseline for the safety requirements for system-wide and fixed facilities elements. The SITP Plan identifies the safety tests that need to be conducted prior to revenue service. The SCRTD's System Safety and Security Program Plan identifies the safety-related plans, procedures, and training activities the SCRTD must develop or perform prior to revenue service, but there are no identified requirements for their specific content.

The most effective method for assuring that proper content is included is to have a widespread review and comment cycle involving engineering, safety, operations, and maintenance personnel. A formal "Operating Procedures and Training Materials Review Cycle" will be established by the SCRTD to review procedures, training manuals, and other documents as they become available in the year or two prior to revenue service. The reviews will usually include input and discussions with RCC supervisors, emergency response personnel (fire and police), maintenance managers, safety staff, and design engineers and consultants. Special emphasis will be placed on assuring that those people who will operate, maintain, and police the Metro Rail have a thorough interaction with the engineers who designed the system. Once a safety-related plan or procedure or training manual has completed the

review cycle, and conflicts are resolved, the procedure or training manual can be certified. A possible review cycle is illustrated in Exhibit 6-1.

6.2 DOCUMENTATION

The documentation for the procedures and training review process consists of two forms -- A Procedure Review Form and a Certificate of Compliance. The format for the Procedure Review Form is shown in Exhibit 6-2. The format for the Certificate of Compliance is the same as shown in Exhibit 4-2.

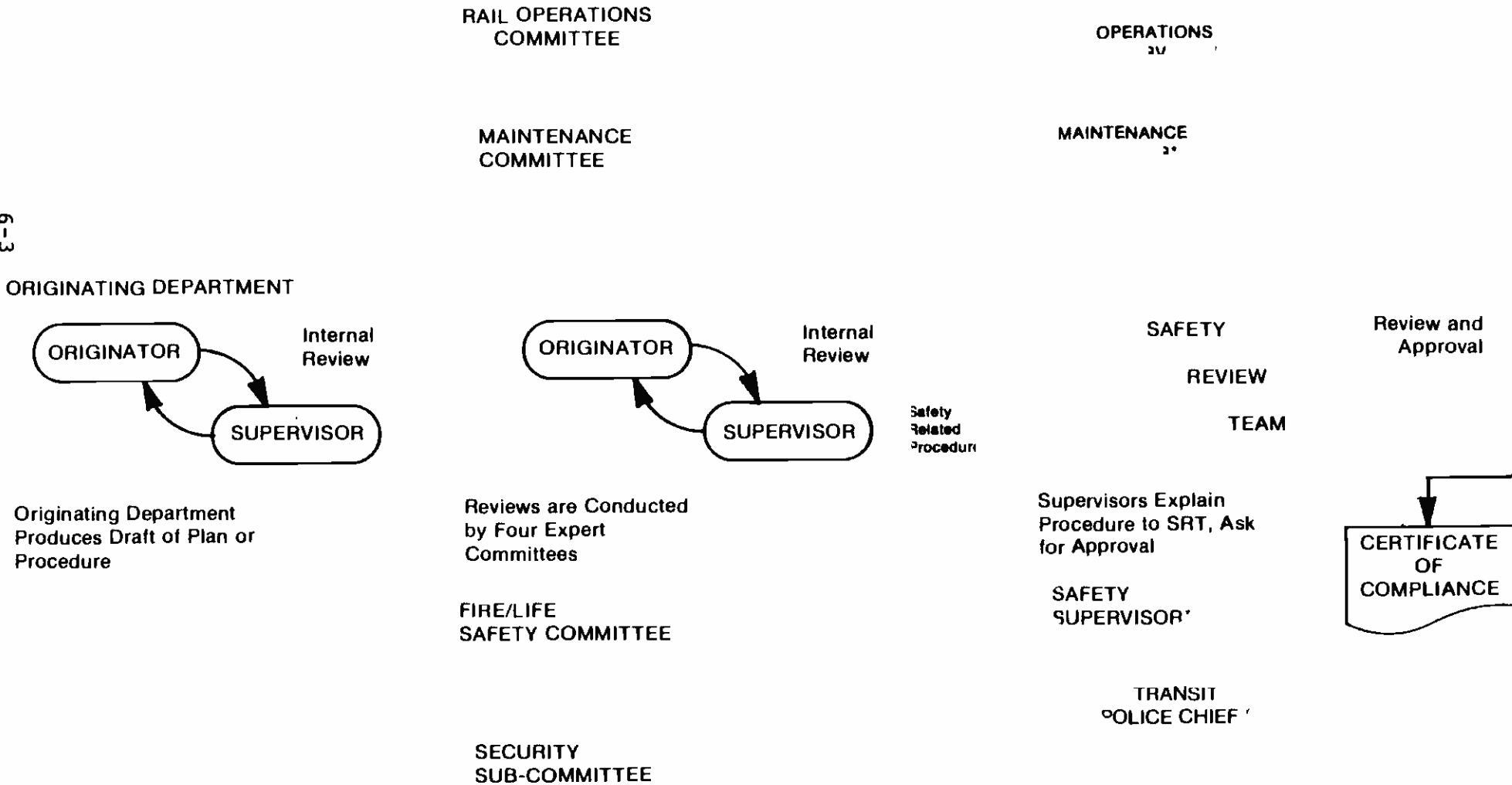
The Procedure/Training Material Review Form will be prepared for each procedure developed for the operation or maintenance of Metro Rail and will contain the following information:

- Manual Title - the title of the document under review (e.g., Emergency Procedures Manual, Standard Operating Procedures Manual, Operators Rulebook, Fire Department Training Course Manual, etc.).
- I.D. No. - the SCRTD document reference number.
- Review Level - documents will be issued 60%, 90%, and 95% reviews.
- Date Out/Date Due - the dates when the manual is sent out for review, and when comments are due back.
- Responsible Department/Section - the organization with responsibility for developing the manual (e.g., System Safety, Facilities Maintenance, Transit Police, General Consultant).
- Safety Content/Certifiable Element - the Supervisor, System and Safety Assurance (S&SA) will initial the blocks to indicate if the manual needs to be reviewed for safety content. If it does, he will indicate the certifiable element's name.
- Review Responsibility - all documents will be reviewed by four expert committees (Rail Operations, Rail Maintenance, Fire/Life Safety, and Security). In addition, space is left for review by other SCRTD departments (Contracts, Procurement and Material, Insurance, Bus Operations, etc.) and outside agencies (DWP, CPUC, Coroner/Medical Examiner office, etc.).

EXHIBIT 6-1
 Operating Procedure and Training Material Review Cycle

**METRO RAIL
 OPERATING PROCEDURE AND TRAINING MATERIAL REVIEW CYCLE**

6-3



*or designate



**SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
 METRO RAIL PROJECT**

PROCEDURE/TRAINING MATERIAL REVIEW CHECKLIST

MANUAL TITLE: _____ DATE OUT: _____

I.D. NO. _____ REVIEW LEVEL: _____ DATE DUE: _____

RESPONSIBLE DEPARTMENT/SECTION: _____

SAFETY CONTENT? NO YES CERTIFIABLE ELEMENT # _____

| REVIEW RESPONSIBILITY | REVIEWED BY: | COMMENTS RECEIVED (DATE) | ACCEPT | RESULTS NOT ACCEPT | ACCEPT W/ CHANGES |
|-----------------------------|--------------|--------------------------|--------|--------------------|-------------------|
| Rail Operations Committee | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| Rail Maintenance Committee | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| Fire/Life Safety & Security | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| Other(s) | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

- Reviewed By - the name of the person(s) requested to review and submit comments.
- Date - the date their comments were received.
- Results/Approval - the general assessment of whether the reviewer found the document acceptable. Results may include:
 - A - acceptable with no comments
 - NA - not acceptable, needs rework
 - AC - acceptable if comments are incorporated.
- Comments Received - whether written comments were provided by the reviewer.

6.3 PROCEDURE

The following actions describe, in sequential order, the procedure for issuing a Certificate of Compliance for operating procedures manuals and training programs.

1. The System Engineering and Analysis Consultant, under the direction of the Manager, SEA¹ will develop a draft "Operating Procedures and Training Materials Review Cycle" document. The document will identify:
 - The management process for development of operating procedures and training programs, identification of course requirements, and testing
 - All necessary procedures needed to provide dependable, safe, and cost-efficient service
 - Procedure content development responsibility and schedule for preparation.
2. The Manager, SEA will distribute the draft document to the following for review and comment:
 - Supervisor, S&SA
 - Director, Transit Facilities Engineering
 - Director, Construction Management
 - Director, Systems Design and Analysis
 - Director, Rail Maintenance

¹ The Director, Rail Operations will assume responsibility from the Manager, SEA for operations planning as the Metro Rail nears revenue service.

- Director, Rail Operations
 - General Consultant
 - Construction Manager.
3. The Manager, SEA will collect and compile comments from the above organizations.
 4. The Manager, SEA will meet with the System Engineering and Analysis Consultant to discuss and resolve the review comments. The Supervisor, S&SA will designate which procedures have safety content and which do not. The Manager, SEA will assign responsibility for the development of each identified procedure.
 5. As required from the review, the System Engineering and Analysis Consultant will finalize the "Operating Procedures and Training Material Review Cycle" document.
 6. Procedures will be written in accordance with the responsibilities assigned.
 7. The SCRTD departments will submit procedures and training materials for review in accordance with the finalized procedure review cycle.
 8. The SCRT will convene periodically to review progress of procedure and training program development.
 9. When all of the reviewers have completed the review of each safety-related manual, the Chairman, SCRT will determine that the following evidence is available:
 - Completed Procedure/Training Review Form for the certifiable element.
 - Approval from the Supervisor, S&SA on the completeness and accuracy of the safety-related procedures in the manual.
 10. The SCRT will convene to review the evidence and will issue its recommendations to the Director, Systems Design and Analysis and to the Director, Construction Management.
 11. A Certificate of Compliance will be prepared. The Chairman, SCRT; the Director, Systems Design and Analysis; and the Director, Construction Management will sign the Certificate of Compliance and will forward it, along with the

SCRT recommendations, to the Assistant General Manager, TSD for his signature.

12. The original certificate will be filed in the Master File, and one copy in the appropriate certifiable element file, along with the appropriate manual, the minutes of the SCRT meeting and the recommendation for certification.

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