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SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT
METRO RAIL PROJECT

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PRELIMINARY HAZARD ANALYSIS

DESIGN RESOLUTION UPDATE

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APRIL 1988

Prepared By

Metro Rail Transit Consultants
Safety, Assurance and Security

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TABLE OF CONTENTS

	<u>Pages</u>
INTRODUCTION	i
A. WAYS AND STRUCTURES	1-10
B. STATIONS	11-31
C. YARDS, SHOPS, AND FACILITIES	32-35
D. PASSENGER VEHICLE	36-47
E. AUTOMATIC TRAIN CONTROL SYSTEM	48
F. COMMUNICATION SYSTEM	49-51
G. POWER SYSTEM	52-57
H. FARE COLLECTION SYSTEM	58
I. AUXILIARY VEHICLES	59-61

INTRODUCTION

The Metro Rail Project Safety and System Assurance Program establishes requirements for the development of several hazards analyses to identify potentially hazardous conditions and provide guidance to designers in providing mitigation measures for these potential hazards.

The Preliminary Hazards Analysis was previously developed by Booz Allen & Hamilton as the top system-level analysis to be used as the basis for lower tier safety activities and analyses such as System/Subsystem, Interface, and Operating Hazard Analyses. Hazard Analyses by nature are dynamic documents which must be continuously updated in order to accurately reflect the current status of continuing design development. To this end, Metro Rail Transit Consultants has prepared this supplement to the PHA in order to document the requirements that have been included in facility and systems contract documents to address the resolution of the hazards identified in the PHA.

A. WAYS AND STRUCTURES

BULLET

D. DESIGN RESOLUTION

1 Section 10.11 of Contract A640, "Detection Subsystems," states "Automatic fire detection devices shall be provided throughout station ancillary areas where automatic sprinkler protection is not required . . ."

Section 15375/15376 of facility specifications, "Wet Standpipe System," states provisions for a standpipe system. Contract A785 "Fire Suppression Equipment" states provisions for fire hose and fire extinguishers.

Per Contract A650 Section 8.10, "Fire Extinguisher Provisions," "The District shall install two DFE fire extinguishers in each vehicle."

2 Section 10.11 of Contract A640, "Detection Subsystems," states "Automatic fire detection devices shall be provided throughout station ancillary areas where automatic sprinkler protection is not required . . ."

Section 11.1.1.A of Contract A640, "Gas Monitoring Equipment," states "Gas monitoring equipment shall measure the level of methane gas and hydrogen sulfide gas in the atmospheres of tunnels and passenger station ancillary rooms."

Section 11.1.1.B of Contract A640, "Seismic Event Detection Equipment," states "Seismic event equipment shall detect . . . seismic events."

Section 15375/15376 of facility specifications, "Wet Standpipe System," states provisions for a standpipe system. Contract A785 "Fire Suppression Equipment" states provisions for fire hose and fire extinguishers.

Section 10.7 of Contract A640, "Halon 1301 Fire Suppression Equipment," provides requirements for Halon system to "detect, annunciate and extinguish fires . . ."
Section 15330/15331 of facility specifications, "Fire Protection Sprinkler System," states "Automatic type conforming to NFPA 13 for Ordinary Type Occupancy, Group 1 . . ."

BULLET

D. DESIGN RESOLUTION

Section 10.4 of Contract A640, "Emergency Management Panel," provides for the existence of an EMP.

Section 5.2.3.D.1 of Contract A640, "Public Address Subsystem," states "the PA subsystem shall be fully supervised with failure annunciation . . ."

- 3 Emergency Preparedness Plan to be developed. See SCRTD Metro Rail Project System Safety and Security Program Plan (SS&SPP) paragraph 3.3.2. Placed on C/CIL as open item.

- 4 Drawing SS-094, "Cross Passages - General Plan and Section," shows walkway and cross passage provided in tunnel areas. Also see drawing SS-086, "Walkway Details".

- 5 Section 10.9.1.D of Contract A640 requires "the BLS (Blue Light Station) shall provide access to . . . ETEL/A TEL, FTEL . . ."

Section 10.1.2.C of Contract A640 states "a CP (Command Post) shall be provided at each passenger station public entrance that does not have an EMP and at the access stairways at the ends of the mainline, where indicated . . ."

- 6 A Public Emergency Personnel Training Program and an Employee Training Program will be developed. Reference SCRTD Metro Rail Project System Safety and Security Program Plan, paragraphs 3.3.8, 3.3.16, 3.5.6, and 4.3.3. Placed in C/CIL as open item.

BULLET D. DESIGN RESOLUTION

- 1 Contract A740 "Ventilation Equipment" provides requirements for emergency ventilation fans.
- 2 Drawings SS-132 and SS-133, "Impervious High Density Polyethylene Membrane Details," sheets 1 and 2, show provision of such a liner in cut-and-cover sections. Section 07101 of facility specifications, "Hydrocarbon-Resistant Membrane for Cast-In-Place Concrete," provides requirements for such a liner. Also see drawings SS-088, SS-051 and facility specification Section 07121, "Hydrocarbon-Resistant Coating:."
- 3 Underground trainway facilities have been properly protected from potentially hazardous substances as shown in all facility contracts and approved by the F/LS Committee. Reference DCC #86-04545. A list has been compiled which indicates all known locations of underground hazardous material storage tanks in the proximity of the underground portions of the Metro Rail MOS-1 alignment. See civil plans for Contracts A135, A145A/A145, A146 and A175 for those tanks within 25 ft. of underground Metro Rail structures which must be removed. Uncharted tanks discovered during construction will be removed under provisions of contract general/special conditions. Those storage tanks within 25-100 ft. of Metro Rail underground structures will be protected in accordance with Los Angeles City Ordinance #158570, enforced by Los Angeles City Fire Department through Los Angeles Municipal Code Articles 57.31.10 through 57.31.29 (L.A. City Fire Code).
- 4 Per Section 11.2.1 of Contract A640, "Gas Monitoring equipment shall sample the air in ducts, shafts, and tunnels, as indicated, and shall transmit alarms and gas concentration levels to the SCADA subsystem."

Section 11.1.1.A of Contract A640, "Gas Monitoring Equipment," states "Gas monitoring equipment shall measure the level of methane gas and hydrogen sulfide gas in the atmospheres of tunnels and passenger station ancillary rooms."
- 5 Emergency Preparedness Plan will be developed. See SCRTD Metro Rail Project Ss&SPP, paragraph 3.3.2. Placed on C/CIL as open item.

BULLET D. DESIGN RESOLUTION

- 1 Per Section 10.11 of Contract A640, "Detection Subsystems," "Automatic fire detection devices shall be provided throughout station ancillary areas where automatic sprinkler protection is not required."

Section 11.1.1.A of Contract A640, "Gas Monitoring Equipment," states "Gas monitoring equipment shall measure the level of methane gas and hydrogen sulfide gas in the atmospheres of tunnels and passenger station ancillary rooms."

Section 11.1.1.B of Contract A640, "Seismic Event Detection Equipment," states "Seismic event equipment shall detect . . . seismic events."

Section 15375/15376 of facility specifications, "Wet Standpipe System," states provisions for a standpipe system. Contract A785 "Fire Suppression Equipment" states provisions for fire hose and fire extinguishers.

- 2 Design of underground trainway facilities has provided adequate protection from flammable and combustible liquid intrusion from external sources, and has been approved by the F/LS Committee. See SCRTRD Metro Rail Project SS&SPP, paragraph 3.3.2. Reference DCC #86-04545. A list has been compiled which indicates all known locations of underground hazardous material storage tanks in the proximity of the underground portions of the Metro Rail MOS-1 alignment. See civil plans for Contracts A135, A145A/A145, A146 and A175 for those tanks within 25 ft. of underground Metro Rail structures which must be removed. Uncharted tanks discovered during construction will be removed under provisions of contract general/special conditions. Those storage tanks within 25-100 ft. of Metro Rail underground structures will be protected in accordance with Los Angeles City Ordinance #158570, enforced by Los Angeles City Fire Department through Los Angeles Municipal Code Articles 57.31.10 through 57.31.29 (L.A. City Fire Code).
- 3 Emergency Preparedness Plan will be developed. See SCRTRD Metro Rail Project SS&SPP, paragraph 3.3.2. Placed on C/CIL list.

BULLET D. DESIGN RESOLUTION

- 1 Section 10.8.2.D of Contract A640 "Intrusion Detection Devices," states "All intrusion defection devices shall transmit intrusion alarms via the local processor to the main CA terminal at TPDC. Intrusion alarms shall also be indicated on the INTRUSION DETECTION indicator group of the associated EMP alarm panel."
- 2 Appendix TP-7-A of Contract A640 shows that platform edges will be monitored by CCTV camera coverage. Also, see architectural reflected ceiling plans in facility construction contracts.
- 3 Contract A760 Signage and Graphics will be developed to provide this. Put on C/CIL as open item.
- 4 Design of end-of-platform gates provides for gate swing only into platform side. See drawing AS-006 in station construction contracts.
- 5 Section 10.8.1.A of Contrct A640, "Controlled Access Subsystem," states "The primary means to secure, non-public station areas . . . shall be by a controlled access subsystem."
- 6 Section 10.8.1.A of Contract A640, "Controlled Access Subsystem," states "rolling grille station entrances . . . (shall be secured) by a controlled access subsystem."

BULLET D. DESIGN RESOLUTION

- 1 Structural design complies with applicable local seismic design codes and practices. See Structural Standard and Directive drawings.
- 2 Design complies with all applicable local codes. See Structural Standard and Directive drawings.
- 3 Subsystem Reliability and Maintainability Numerical Requirements Report, warranty general provisions in specifications, and General Requirements in technical provisions Systems Specifications provide such requirements. Reliability Program Plan has been developed. See SCRTD Metro Rail Project SAPP section 4.0.
- 4 System Maintenance Plan (TBD) will contain such information. See SCRTD Metro Rail Project System Assurance Program Plan (SAPP) paragraph 7.1.2. Maintainability Program Plan and training program (TBD) will meet this requirement. See SCRTD Metro Rail Project SAPP section 5.0 and paragraphs 7.1.4, 7.1.5 and 7.1.6. Placed on C/CIL as open item.
- 5 SCRTD Metro Rail Project System Assurance Program Plan Section 6.0, PDCD QA/QC Procedures Manual, and warranty provisions in contract general conditions and various technical provisions cover such requirements.

BULLET D. DESIGN RESOLUTION

- 1 All line facility contracts provide a minimum of 1 foot-candle lighting, consistent with industry practice.
- 2 Contract A795 - Section 16610, "Uninterruptible Power Supplies," states requirements for emergency power at certain station locations for critical functions during power failures.
- 3 Contract A630, drawing P-105, requires lighting to be fed from two substations so that the loss of a single substation or tunnel feeder shall not interrupt the functioning of the lighting system.

BULLET D. DESIGN RESOLUTION

- 1 Section 07100 of facility specifications calls for waterproof membrane. Design of drainage system and sump pumps provides adequate drainage for anticipated likely worst-case scenario of tunnel (train) fire.
- 2 Section 9.2.13 of Contract A640 states "Pairs of District-Furnished sump pumps shall be monitored by the SCADA subsystem."
- 2 Per Drawings SS-119 and SS-134, "Sumps," sump pumps are located adjacent to cross-passages where inspection and maintenance can be performed without interfering with train operations.
- 4 Per Section 10.9.2 of Contract A640, "Emergency Trip Panel," trip stations will be provided at all Blue Light Stations in the Trainway.

HAZARD NO.: 2.2.1

BULLET D. DESIGN RESOLUTION

- 1 See hazard no. 2.1.5, bullet 3.
- 2 System Maintenance Plan (TBD) will provide for proper maintenance procedures. See SCRTD Metro Rail Project SAPP paragraph 7.1.2. Placed on C/CIL as open item.
- 3 SCRTD Metro Rail Project System Assurance Program Plan Section 6.0, PDCD QA/AC Procedures Manual, and warranty provisions in contract general conditions/provisions and special conditions/provisions and various technical provisions cover such requirements.

BULLET D. DESIGN RESOLUTION

- 1 Contract A610 "Trackwork" provides for coverboard installation. Contract A615 "Coverboard Procurement" furnishes coverboard.
- 2 Drawing SS-086, "Walkway Details," shows requirements for a walkway in tunnels. Reference Contracts A141, A146 and A171.
- 3 Standard Operating Procedures and training program (TBD) will ensure safety of employees, passengers and emergency response personnel. See SCRTD Metro Rail project SS&SPP paragraphs 3.3.8, 3.3.12, 3.3.16, 3.5.16 and 4.3.3. Placed on C/CIL as open item.

B. STATIONS

BULLET D. DESIGN RESOLUTION

- 1 Section 15852 of contract A740, "Ventilation Equipment," provides for such fans.
- 2 Per Section 10.11 of contract A640 "Detection Subsystems," Automatic fire detection devices shall be provided throughout station ancillary areas where automatic sprinkler protection is not required . . ."

Section 11.1.1.A of contract A640, "Gas Monitoring Equipment," states "Gas monitoring equipment shall measure the level of methane gas and hydrogen sulfide gas in the atmospheres of tunnels and passenger station ancillary rooms."

Section 11.1.1.B of contract A640, "Seismic Event Detection Equipment," states "Seismic event equipment shall detect . . . seismic events."

Section 15375/15376 of facility specifications, "Wet Standpipe System," states provisions for a standpipe system. Contract A785 "Fire Suppression Equipment" states provisions for fire hose and fire extinguishers.
- 3 Section 10.1.2.B of contract A640, "Emergency Management Panel," states that "An EMP shall be provided at each passenger station . . . An ETEL, two FTEL's, and PA microphone shall be provided at each EMP." Section 3.1.2 of contract A640, "Telephone," states "The telephone subsystem provides emergency telephone (ETEL) . . . and passenger assistance intercom (PAI) functions from passenger station and wayside locations."
- 4 Emergency Preparedness Plan will be developed. See SCRTD Metro Rail Project SS&SPP paragraph 3.3.2. Placed on C/CIL as open item.
- 5 These training programs shall be developed to meet requirements. See SCRTD Metro Rail Project SS&SPP paragraphs 3.3.8, 3.3.16, 3.5.6, 4.3.3 and 4.5.6. Placed on C/CIL as open item.
- 6 Per Section 10.11.D of contract A640, "Spot Type (heat detectors) shall be plug-in models and interchangeable with each other and with spot-type smoke detectors."

BULLET D. DESIGN RESOLUTION

- 1 Section 15850 of contract A745 "Air Handling Equipment" and Section 15865 of contract A740 "Ventilation Equipment" provides for normal and emergency ventilation.

Section 11 of Contract A640, "Gas Monitoring and Seismic Event Detection Subsystem" provides requirement for methane and hydrogen sulfide gas detection equipment throughout the Metro Rail system.
- 2 Section 10.11 of contract A640 states "Automatic fire detection devices shall be provided throughout station ancillary areas where automatic sprinkler protection is not required, including return air plenums and filter-air plenums in HVAC subsystems serving more than one area . . . Automatic fire detection devices shall also be installed in underground passenger vehicle storage areas."

Section 15330/15331 of facility specifications "Fire Protection Sprinkler System" provides for automatic fire protection system. Section 10.7 of contract A640 "Halon 1301 Fire Suppression Equipment" provides for Halon system.

Section 15375/15376 of facility specifications "Wet Standpipe System," provides for a standpipe system.

Contract A785 "Fire Suppression Equipment" provides for fire hose and fire extinguishers.
- 3 Emergency Preparedness Plan will be developed. See SCRTD Metro Rail Project SS&SPP paragraph 3.3.2. Placed on C/CIL as open item.
- 4 A testing program will be developed. See SCRTD Metro Rail Project SS&SPP paragraph 3.3.15. Placed on C/CIL as open item.
- 5 Emergency Preparedness Plan to be developed. See SCRTD Metro Rail Project SS&SPP paragraph 3.3.2. Placed on C/CIL as open item.

BULLET D. DESIGN RESOLUTION

- 1 Section 10.11 of contract A640 states "Automatic fire detection devices shall be provided throughout station ancillary areas where automatic sprinkler protection is not required, including return air plenums and filter-air plenums in HVAC subsystems serving more than one area . . . Automatic fire detection devices shall also be installed in underground passenger vehicle storage areas."
- 2 All station contracts provide for drainage at entrances, mezzanine, platform, and roof areas. Reference mechanical plumbing plans in construction contracts.
- 3 Emergency Preparedness Plan will be developed. See SCRTD Metro Rail Project SS&SPP paragraph 3.3.2. Placed on C/CIL as open item.

BULLET D. DESIGN RESOLUTION

- 1 Same as Hazard No. 2.1.5, bullet 3.
- 2 System Maintenance Plan (TBD) will contain such information. See SCRTD Metro Rail Project SAPP paragraph 7.1.2. Maintainability Program Plan and training program (TBD) will meet this requirement. See SCRTD Metro Rail Project SAPP Section 5.0 and paragraphs 7.1.4, 7.1.5, and 7.1.6. Placed on C/CIL as open item.
- 3 Same as Hazard No. 2.1.5, bullet 5.

BULLET D. DESIGN RESOLUTION

- 1 Section 10.8.1 of contract A640, "Controlled Access Subsystem," requires entrance rolling grilles to be access-controlled with intrusion alarm.
- 2 Section 7 of contract A640, "Closed Circuit Television Subsystem," provides for CCTV system in stations. Also see architectural reflected ceiling plans in station construction contracts for camera locations.

BULLET D. DESIGN RESOLUTION

- 1 Section 7 of contract A640, "Closed Circuit Television Subsystem," provides for CCTV system in stations.
- 2 Section 10.8.1 of contract A640, "Controlled Access Subsystem," provides protection to all ancillary spaces within stations.
- 3 Section 5.1.1.B of contract A640, "Telephone Subsystem," provides for patron assistance intercoms (PAI), ATEL's, and ETEL's.
- 4 Facility design provide for a minimum level of 1 foot-candle lighting in station outdoor areas. See Electrical Site Lighting Plans.
- 5 Facility design provides for lighting in accordance "Table III-12-4 ILLUMINANCE VALUE FOR STATION AREAS" (SDLS Vol. 3 pp. III-12-9) See electrical site lighting plans.
- 6 MOS-1 Operating Plan and System Operating Plan state planned use of roving security personnel and Transit Police.

BULLET D. DESIGN RESOLUTION

- 1 Design of electrical equipment is required to comply with NEC requirements. See facility specification Section 16050.
- 2 Section 10.8.1 of contract A640 provides for a controlled access subsystem for all nonpublic station areas.
- 3 Training programs are necessary for a safe and secure system and will be provided. See SCRTD Metro Rail Project SS&SPP paragraphs 3.3.8, 3.3.16, 3.5.6, 4.3.3 and 4.5.6. Placed on C/CIL as open item.

BULLET D. DESIGN RESOLUTION

- 1 Surface finishes have been selected with consideration of resistance to casual vandalism in all Facility contracts. Reference architectural room finish schedules and facility specifications.
- 2 Surface materials and details have been selected with consideration vandalism deterrence. Reference architectural finish schedules and facility specifications.
- 3 Design of facilities considers dislodgement hazards in all facility contracts. Reference structural and architectural standard plans and detail drawings in station construction contracts.

BULLET D. DESIGN RESOLUTION

- 1 Station walking surfaces are designed for public pedestrian and are non-slip type. Reference facility specification Sections 03346, 09310, 09330, and 09420 and architectural room finish schedule drawing.
- 2 Facility specification Section 02528, "Concrete Curbs, Gutters and sidewalks," and Section 02580, "Pavement Striping and Marking," provide for these requirements.
- 3 Speed limits on SCRTD streets are determined in accordance with industry practice considering local factors.

BULLET D. DESIGN RESOLUTION

- 1 Crosswalks will be installed in accordance with Los Angeles Department of Transportation requirements. Also, reference facility specification Section 02580 and Stage II contracts civil plan drawings.
- 2 In MOS-1, parking will be provided only at Union Station. Stage II design (A136) will address this area of concern. Placed on C/CIL as open item.

BULLET D. DESIGN RESOLUTION

- 1 Handicapped parking will be provided closest to the station in accordance with the requirements of Title 24 of the California Administrative Code.

BULLET D. DESIGN RESOLUTION

- 1 Per facility specification Section 03346, "Unformed Concrete Finishes," non-slip finish is to be provided at platform edges. Also see architectural standard drawing AS-006.
- 2 Standard Operating Procedures (TBD) will call for local supervision to ensure safe occupancy of platforms. See SCRTD Metro Rail Project SS&SPP paragraphs 3.3.12 and 3.5.16. Placed on C/CIL as open item.
- 3 Appendix TP-7-A of contract A640 provides CCTV coverage.
- 4 Voice announcements can be made over the station PA subsystem provided in Section 6 of contract A640.
- 5 Per facility specification Section 03346, "Unformed Concrete Finishes," non-slip finish is to be provided at platform edges. Also see architectural standard drawing AS-006.
- 6 Standard Operating Procedures (TBD) will call for local supervision to ensure safe occupancy of platforms. See SCRTD Metro Rail Project SS&SPP paragraphs 3.3.12 and 3.5.16. Placed on C/CIL as open item.
- 7 Appendix TP-7-A of contract A640 provides CCTV coverage.
- 8 Voice announcements can be made over the station PA subsystem provided in Section 6 of contract A640.
- 9 MOS-1 will not have any fare collection gates. RCC will have control of fare gates if the barrier type replaces the barrier-free fare collection system in the future. See Contract A660.

BULLET D. DESIGN RESOLUTION

- 1 A 24 in. wide platform edge strip contrasting in color and texture from the remainder of platform area is provided. See architectural standard drawing AS-006.
- 2 Per contract A650 Section 9.2.6, train operator can stop train by use of emergency stop button.
- 3 Section 7 of contract A640 provides CCTV coverage of platform. Tracks are not directly covered by CCTV.
- 4 Architectural standard drawing AS-006, shows provision of an underplatform refuge area. See station construction contracts.
- 5 Section 10.9 of contract A640, "Blue Light Station," states that ETEL's will be available as part of Blue Light Stations, which are located at ends of platforms. PAI's are available at mezzanine levels, per contract A640 Section 5.1.1.B.
- 6 It has been previously determined that the use of the passenger vehicle horn and headlights fulfills the need for audio and visual warnings of an approaching train. See correspondence no. DCC 84-07804.
- 7 Architectural standard drawing AS-006 shows platform gate. It will swing only onto platform side.

BULLET D. DESIGN RESOLUTION

- 1 Design of platform, trackwork and vehicle has been coordinated to optimize horizontal vehicle-platform edge gap to a maximum of 3 inches.

BULLET D. DESIGN RESOLUTION

- 1 Station contracts provide for protection against passengers falling to lower level, although obstacles may be thrown to lower level. Placed on CIL list.
- 2 Stage II contracts need to provide this. Placed on CIL list.
- 3 Contract A760 "Signage and Graphics" (TBD) will provide adequate signage to ensure passenger safety and orientation. Placed on C/CIL as open item.

BULLET D. DESIGN RESOLUTION

- 1 An Emergency Preparedness Plan (EPP) will be developed. See SCRTRD Metro Rail Project SS&SPP paragraph 3.3.2. Placed on C/CIL as open item.
- 2 A Public Emergency Personnel Training Program and an Employee Training Program will be developed. See SCRTRD Metro Rail project SS&SPP paragraphs 3.3.8, 3.3.16, 3.5.6, 4.3.3, and 4.5.6. Placed on C/CIL as open item.
- 3 Contract A710 "Escalators" provides emergency stop buttons at upper and lower landings per Section 14310, paragraph 2.1.G.4: "Locate emergency stop buttons at top and bottom landings . . ."
- 4 Contract A710 "Escalators" provides for safety stopping device per Section 14310, paragraph 2.1.G. Contract A640, Section 9.2.14, "Elevators and Escalators," provides SCADA monitoring of these elements.

BULLET D. DESIGN RESOLUTION

- 1 All stations have been designed to handle emergency exiting per Design Criteria Vol. I, Section 2.2.5, and verified by Rolph Jensen and Associates. Reference DCC #84-09939, 84-11618, and 87-02420.
- 2 System Maintenance Plan (TBD) will contain such information. See SCRTD Metro Rail Project SAPP paragraph 7.1.2. Maintainability Program Plan and training program (TBD) will meet this requirement. See SCRTD Metro Rail Project SAPP Section 5.0 and paragraphs 7.1.4, 7.1.5, and 7.1.6. Placed on C/CIL as open item

BULLET D. DESIGN RESOLUTION

- 1 Contract A710 "Escalators" provides emergency stop buttons at upper and lower landings per Section 14310, paragraph 2.2.P.1: "At the upper and lower landing newels mount a fixture which includes a momentary emergency stop button . . . "
- 2 Escalator landings will be monitored by CCTV cameras per A640 Appendix TP-7-A, "CCTV MOS-1 Requirements." Also see architectural reflected ceiling plans for CCTV camera mounting locations.
- 3 Contract A710 "Escalators" provides for safety stopping device per Section 14310, paragraph 2.3. Contract A640, Section 9.2.14, "Elevators and Escalators," provides SCADA monitoring of these elements. Also, Contract A710, Section 14310, paragraph 2.1.G.5, "Step and Skirt Safety Devices," provides "device to remove power from escalator and apply brakes when an article becomes wedged between stop tread at one step and riser of another step while forming a landing."
- 4 Per Contract A710, Section 14310, "Operating Controls," Paragraph 2.2.P.1,2,3 provides for control panel at upper and lower landings. Paragraph 2.2.Q provides for remote status indications at RCC and EMPs and remote control capability at EMPs.

BULLET D. DESIGN RESOLUTION

- 1 Architectural standard drawings AS-004, AS-005, AS-019, and AS-020 show the design of these elements in compliance with F/LS criteria.
- 2 SCRTD Metro Rail project System Assurance Program Plan Section 6.0, PDCD QA/QC Procedures Manual, and warranty provisions in contract general conditions and various technical provisions cover such requirements.

BULLET D. DESIGN RESOLUTION

- 1 All station contracts provide for emergency lighting for stairs and escalators. See electrical lighting plans and panel schedules in station construction contracts and contract A759 drawing E001.
- 2 Escalators and stairs are lit by either ambient lighting or local lighting. See electrical lighting plans in station construction contracts and contract A710.
- 3 System Maintenance Plan (TBD) will contain such information. See SCRTD Metro Rail Project SAPP paragraph 7.1.2. Maintainability Program Plan and training program (TBD) will meet this requirement. See SCRTD Metro Rail Project SAPP Section 5.0 and paragraphs 7.1.4, 7.1.5, and 7.1.6. Placed on C/CIL as open item.

BULLET D. DESIGN RESOLUTION

- 1 Closure plate is provided at all handrails installed in elevated locations (mezzanines). See architectural standard drawing AS-019.

C. YARDS, SHOPS, AND FACILITIES

BULLET D. DESIGN RESOLUTION

- 1 An Emergency Preparedness Plan will be developed. See SCRTD Metro Rail Project SS&SPP paragraph 3.3.2. Placed on C/CIL as open item.
- 2 Per contract A115 "Yard Storage Area" Contract, the following fire protection is provided: Section 10522, "Fire Hose Cabinets and Accessories"; Section 15376, "Wet Standpipe System". Contract A112 "Main Shop": Drawings FP-140 through FP-150 show "Fire Protection Plan" of Main Shop, including sprinklers, systems, fire hose cabinets, standpipes, alarms.
- 3 Contract A112 Drawings M-021, M-022, M-056, and M-057, "Mechanical Schedules," show provision for ventilation systems in Main Shop.
- 4 Standard Operating Procedures for Yard will be developed. See SCRTD Metro Rail Project SS&SPP paragraphs 3.3.12 and 3.5.16. Placed on C/CIL as open item.
- 5 Per contract A115 "Yard Storage Area," a chain link fence and gate detail is shown on Drawing CS-056A. Drawing C-100 of contract A115 shows controlled access point with sliding gates. Also see contract A116.
- 6 Contract A640 Section 4.2.5, "Portables," provides for portable radios for communications.

BULLET D. DESIGN RESOLUTION

- 1 Contract All2 drawing A104 shows location of control tower which overlooks train storage area. See drawing A101 for Yard layout in All2.
- 2 Per contract All5 "Yard Storage Area," a chain link fence and gate detail is shown on Drawing CS-056A. Drawing C-100 of contract All5 shows controlled access point with sliding gates. Also see contract All6.
- 3 Contract All2 drawing A107 shows controlled access to parts and spares area in Main Shop.
- 4 Per contract All5 "Yard Storage Area," a chain link fence and gate detail is shown on Drawing CS-056A. Drawing C-100 of contract All5 shows controlled access point with sliding gates. Also see contract All6.

BULLET D. DESIGN RESOLUTION

- 1 Storage and handling provisions for toxic or flammable substances must be approved by the F/LS Committee. Placed on C/CIL as open item. Standard Operating Procedures (TBD) will provide adequate direction and guidance in Yard Operations. See SCRTD Metro Rail Project SS&SPP paragraphs 3.3.12 and 3.5.16. Placed on C/CIL as open item.

BULLET D. DESIGN RESOLUTION

- 1 Standard Operating Procedures (TBD) will provide direction and guidance for train movements. See SCRTD Metro Rail Project SS&SPP paragraphs 3.3.12 "Develop a Safety Operating Policies Rulebook" and 3.5.16 "Participate in Training Course Program Development."

Safety Organization Participation will assure that Operating Procedures and training courses adequately address hazardous conditions.

BULLET D. DESIGN RESOLUTION

- 1 Standard Operating Procedures (TBD) will provide direction and guidance for shop operations. See SCRTD Metro Rail Project SS&SPP paragraphs 3.3.12 "Develop a Safety Operating Policies Rulebook" and 3.5.16 "Participate in Training Course Program Development."

Safety Organization Participation will assure that Operating Procedures and training courses adequately address hazardous conditions.

D. PASSENGER VEHICLE

BULLET D. DESIGN RESOLUTION

- 1 Emergency Preparedness Plan will be developed. See SCRTD Metro Rail Project SS&SPP paragraph 3.3.2. Placed on C/CIL as open item.
- 2 Contract A650 Section 7.9.1.A states "Doors shall be capable of being manually opened from inside and outside." Section 7.9.1.C states "An emergency-release mechanism shall be provided on both the inside and outside of the door."

Contract Section 10.3.2.A, "Local Operation" of side doors, states "Local key operated switches shall be provided on each side of the vehicle to allow the set of doors at the center of the vehicle, or as otherwise approved, to be closed or opened from the exterior and interior of the vehicle."

Per contract A650, Section 10.3.2.B, "Interior emergency release shall be provided for all side doors, and be an integral part of the door operating mechanism."
- 3 Per contract A650 Section 9.9.3, "HVAC Shutdown," a "two-position switch (shall be provided) to allow train operator to shut down the HVAC subsystems in the event of an emergency."
- 4 Per contract A650 Section 8.10, "Fire Extinguisher Provisions," "The District shall install two DFE fire extinguishers in each vehicle." Per Section 8.10.2, "One will be located in the vehicle cab, the other in the passenger area in a compartment between the backs of double seats."
- 5 Per Contract A650 Section 17.5.1, "Public Address," "A PA shall be installed on a dependent pair basis." Per Section 17.6.1, "Passenger Intercommunications," "at least two remote IC stations shall be provided in the passenger area of each vehicle."

BULLET D. DESIGN RESOLUTION

- 1 Per contract A650 Section 6.3.1, "Construction Material," all "materials shall be mill finished unless otherwise specified. Joining surfaces shall be clean and free from dirt, grease . . ."
- 2 Per contract A650 Section 3.2.2.E, "Maintainability Requirements," "Components most frequently maintained or adjusted shall be most accessible. Provisions for visual inspection of components shall be maximized."

BULLET D. DESIGN RESOLUTION

- 1 Per contract A650 Section 16.3.2, "MTO Mode and Submodes," provisions for manual control are made.
- 2 Contract A650 Section 16.3.2.B provides for EMO when there is an ATP Failure.
- 3 Per contract A620 "Automatic Train Control" Section 8.5.1.E, "Portable ATC Test Equipment," provision is made to test ATC apparatus including receiver coils.
- 4 Per contract A620 Section 8.3.1, "ATP Vehicle Equipment," provisions are made for fail-safe ATP vehicle equipment. Section 15.3 contains reliability requirements and Section 13.12 contains requirements for reliability demonstration tests.

BULLET D. DESIGN RESOLUTION

- 1 Per contract A650 Section 7.8.1, "Glazing": "Windows shall be laminated safety glass . . ."
- 2 Per contract A115 "Yard Storage Area," a chain link fence and gate detail is shown on Drawing CS-056A. Drawing C-100 of contract A115 shows controlled access point with sliding gates. Fencing to be installed under contract A116.
- 3 System Maintenance Plan (TBD) will contain such information. See SCRTD Metro Rail Project SAPP paragraph 7.1.2. Maintainability Program Plan and training program (TBD) will meet this requirement. See SCRTD Metro Rail Project SAPP Section 5.0 and paragraphs 7.1.4, 7.1.5 and 7.1.6. Placed on C/CIL as open item.

BULLET D. DESIGN RESOLUTION

- 1 Per contract A650 Section 8.7, "Elderly and Handicapped Provisions," "Outfittings and Furnishings shall meet requirements of 49 CFR, Part 27 and 49 CFR, Part 609." See contract a650 drawings V-004 and V-006.
- 2 Per contract A650 Section 8.14.1, "Stanchions and Handrails": "Equip each vehicle with handrails and stanchions . . ."
- 3 Per contract A650 Section 8.9.2, "Interior Graphics," signs for "wheelchair location" and "priority seating" will be provided.

BULLET D. DESIGN RESOLUTION

- 1 System Maintenance Plan (TBD) will contain such information Maintainability. See SCRTD Metro Rail Project SAPP paragraph 7.1.2. Program Plan and training program (TBD) will meet this requirement. See SCRTD Metro Rail Project SAPP paragraphs 7.1.4, 7.1.5, and 7.1.6. Placed on C/CIL as open item.
- 2 Per contract A650 Section 15.8.1.A.3, "Emergency Braking," "An emergency brake application shall result from the following conditions as a minimum: Unintentional uncoupling anywhere in a train."

BULLET D. DESIGN RESOLUTION

- 1 Contract A650 Section 17.1.2.A.3, "Communications," provides for "chime or tone annunciation of side door being closed to vehicles of a train, via the PA."
- 2 System Maintenance Plan (TBD) will contain such information. See SCRTD Metro Rail Project SAPP paragraph 7.1.2. Maintainability Program Plan and training program (TBD) will meet this requirement. See SCRTD Metro Rail Project SAPP paragraphs 7.1.4, 7.1.5, and 7.1.6. Placed on C/CIL as open item.
- 3 Per contract A650 Section 10.3.4.D, "Interlocking," "Door detection circuit shall be interlocked with the ATP. Opening of a door leaf beyond the range of the push-back feature while the train is above zero speed will cause activation of the deadman circuit as indicated."
- 4 Per contract A650 Section 17.6, "Passenger Intercommunications", "At least two remote IC stations shall be provided in the passenger area of each vehicle."
- 5 Per A650 Section 10.3.2.B, "Local Operation" (of doors), "Interior emergency release shall be provided for all side doors . . .". Section 10.3.4., "Interlocking," "Door detection circuit shall be interlocked with the ATP. Opening of a door leaf beyond the range of the push-back feature while the train is above zero speed will cause activation of the deadman circuit as indicated."

BULLET D. DESIGN RESOLUTION

- 1 Per contract A650 Section 9.2.10, "Trainline Indicators, "Indicators shall include the following (in the vehicle cab): Service Brake Failure . . . Electric Brake Cutout . . . Friction Brake Cutout.

Per contract A650 Section 9.3.2.A.1, "Annunciators and Indicators," "Annunciators and indicators shall be approved and shall include as a minimum: Electric Brake Failure."

- 2 Maintenance program (TBD) will require necessary inspections and maintenance. Placed on C/CIL as open item.

- 3 Contract A620 Section 3.4.2.A.2.C, "Worst-case Train Model," and Section 3.4.2.B.3, "Safe Braking Distance," states that the development of an ATP block system, use of emergency brakes is assumed due to inadequate service brake application.

- 4 Per contract A650 Section 9.2.10, "Trainline Indicators, "Indicators shall include the following (in the vehicle cab): Service Brake Failure . . . Electric Brake Cutout . . . Friction Brake Cutout.

Per contract A650 Section 9.3.2.A.1, "Annunciators and Indicators", "Annunciators and indicators shall be approved and shall include as a minimum: Electric Brake Failure."

- 5 Contract A650 Section 16.2.1.C, "ATP Functions," provides brake assurance to command emergency braking when service braking does not provide safe deceleration.

- 6 System Maintenance Plan (TBD) will contain such information. See SCRTD Metro Rail Project SAPP paragraph 7.1.2. Maintainability Program Plan and training program (TBD) will meet this requirement. See SCRTD Metro Rail Project SAPP paragraphs 7.1.4, 7.1.5, and 7.1.6. Placed on C/CIL as open item.

BULLET D. DESIGN RESOLUTION

- 1 Contract A650 Section 8.5.2.B, "Transverse seats," states use of "energy absorbing grab-rail and crash pad" for passenger protection. Section 8.14.1, "Stanchions and Handrails," provides for such items.
- 2 Jerk, acceleration, and deceleration values have been selected based on industry practice and passenger comfort levels. See contract A650 Sections 3.7, 3.9, and 3.10.
- 3 Contract A650 Section 16.7, "Unintentional Movement Protection," states "Protection against unintentional movement of a train in ATO and MOT modes and MTO submodes, shall be provided on each dependent pair." Section 16.2.1.B, "ATP Functions," provides for ATP Speed Limit Enforcement.
- 4 Training program (TBD) will teach mandatory safety procedures necessary for safe system operations. See SCRTD Metro Rail Project SS&SPP paragraphs 3.3.8 and 3.5.6. Placed on C/CIL as open item.

BULLET D. DESIGN RESOLUTION

- 1 Contract A650 Section 11.1.1, "Cited References," shows the industry standards that are being followed.
- 2 See SCRTD Metro Rail Project SAPP Section 4.0 for reliability program plan. Quantative reliabiility designr requirements are stated in contract A650 Section 19.3.2. Passenger vehicle warranty requirements are contained in contract A650 Special Provisions Article 5.0 and General Provisions Article 11.0. Contract A650 Sections 19.3 and 21.4.7 identify the reliability data to be submitted by the Contractor. Requirements for system design life and environment are stated in contractA650 Sections 3.1.2.B and 3.5.4, respectively.
- 3 System Maintenance Plan (TBD) will contain such information. See SCRTD Metro Rail Project SAPP paragraph 711.2. Maintainability Program Plan and training program (TBD) will meet this requirement. See SCRTD Metro Rail project SAPP paragraphs 7.1.4, 7.1.5, and 7.1.6. Placed on C/CIL as open item.
- 4 Quality Assurance Program Plan, QA/QC Procedures Manual (PDCD), and warranty section in specifications provide such requirements.

BULLET D. DESIGN RESOLUTION

- 1 Contract A650 Section 7.9.2, "Cab Door," states "Cab door shall be keyed from the passenger-area side, and self-locking in both of the two closed positions." Section 7.8.3, "Cab Side Windows," "Window in right hand side of vehicle shall have standard vehicle key lock for locking in a closed position from inside the cab." Locking of the cab door secures the left hand cab window.

BULLET D. DESIGN RESOLUTION

- 1 Contract A650 Section 9.1.1, "Cited References," states that Human Engineering Design Criteria for Military Systems, Equipment, and Facilities MIL-STD-1472 shall be used as a reference in the design of the cab controls.
- 2 Contract A650 Section 9.9.1, "Lighting Controls," provides for "rotary-action control that varies the illumination intensity of pushbuttons and indicators on the console. The HIGH position shall ensure visibility and legibility, of the illuminated pushbuttons and indicators under the brightest ambient light conditions."
- 3 Contract A640 Section 4, Table TP-4-2, shows that radio channels R.1, R.2 and R.4 are available for communication with RCC.

E. AUTOMATIC TRAIN CONTROL SYSTEM

BULLET D. DESIGN RESOLUTION

- 1 Contract A620 Section 3.2.2, "Safety," states "Assurance that an ATC malfunction affecting safety shall cause the system to revert to a state known to be safe."
- 2 Contract A620 Section 3.3.2,B,C, "Fail-safe Design," states "Self-detecting component or system failures shall command the trains to stop or to run at a safe speed. Component or subsystem failures that are not self-detecting shall not cause unsafe conditions, whether alone or in combination with other failures."
- 3 Contract A620 Sections 3.1.7, 3.2, and 3.3 contain the functional and general design requirements for the ATC system.
- 4 Contract A620 Section 13.13.1, "Maintainability Demonstration Test," provides for testing and maintainability. Section 15.4.5 provides for maintainability
- 5 See SCRTD Metro Rail Project SAPP Sections 5.0 and 7.0 for maintainability and maintenance program requirements. Quantitative design requirements for maintainability are contained in contract A620 Section 15.4. Maintainability data is requiremd to be submitted by contract A620 Sections 13.13 and 15.4. Requirements for manuals are stated in Sections 16.3 and 16.4, and training requirements are stated in Section 16.5. Sections 3.3.6 and 3.3.7 state requirements pertaining to human factors with respect to maintenance.

F. COMMUNICATION SYSTEM

BULLET D. DESIGN RESOLUTION

- 1 Contract A640 Section 18.4.2 states maximum baseline time to repair (MAXMBTTR) for communications subsystems.
- 2 Emergency Preparedness Plan (EPP) will be prepared and distributed. See SCRTD Metro Rail project SS&SPP paragraph 3.3.2. Placed on C/CIL as open item.
- 3 Training program for SCRTD and Emergency Response Agency personnel will be developed. See SCRTD Metro Rail Project SS&SPP paragraphs 3.3.8, 3.3.16, 3.5.6, 4.3.3., and 4.5.6. Placed on C/CIL as open item.
- 4 Requirements for emergency response drills and exercises will be developed. See SCRTD Metro Rail project SS&SPP paragraph 3.3.16. Placed on C/CIL as open item.

BULLET D. DESIGN RESOLUTION

- 1 Contract A640, Section 7.2.2.C, "Cameras," provides for CCTV cameras "housed in weatherproof, vandal-resistant environmental enclosures . . .". Per Section 7.2.3, "Camera Mounts," some cameras shall be "pan-and-tilt mount." Per 7.2.5, "Lenses," cameras shall have zoom capability.
- 2 Administrative procedure to be resolved. Placed on C/CIL as open item.

BULLET D. DESIGN RESOLUTION

- 1 Contract A640 Section 18.4.2 states maximum baseline time to repair (MAXMBTTR) for communications subsystems.
- 2 Requirements for emergency response personnel training will be developed. See SCRTD Metro Rail Project SS&SPP paragraphs 3.3.8, 3.3.16, 3.5.6, 4.3.3, and 4.5.6. Placed on C/CIL as open item.
- 3 See SCRTD Metro Rail Project SAPP Sections 5.0 and 7.0 for maintainability and maintenance program requirements. Quantitative and qualitative design requirements for maintainability are stated in contract A640 Sections 3.3 and 18.4. Maintainability data is required to be submitted by contract A640 Sections 16.12 and 18.4. Requirements for manuals and training are stated in contract A640 Sections 19.3 and 19.5, respectively. Section 3.3 states requirements for human factors with respect to maintenance.

G. POWER SYSTEM

BULLET D. DESIGN RESOLUTION

- 1 Per contract A640 Section 10.8.1.Q, proximity cardreaders will be installed at traction power rooms to prevent unauthorized access. Section 10.8.2.B, "Intrusion Detection Devices," provides for an intrusion alarm at this location.
- 2 Per contract A640 Section 10.8.1.Q, proximity cardreaders will be installed at traction power rooms to prevent unauthorized access. Section 10.8.2.B, "Intrusion Detection Devices," provides for an intrusion alarm at this location.
- 3 Per contract A745 Air Handling Equipment, Section 15850 ventilation equipment is provided for all traction power rooms.
- 4 3-hour rated separation is provided between station public occupancy areas and electrical equipment/transformer areas. See structural and architectural plans in Stage I and II station construction contracts. Also reference Criteria Conformance Verification documents for each station.
- 5 Reference mechanical plumbing/fire protection plans in Stage I and II station construction contracts.
- 6 Reference mechanical HVAC plans in Stage I and II station construction contracts. Also reference Criteria Conformance Verification documents for each station.

BULLET D. DESIGN RESOLUTION

- 1 Per contract A640 Section 10.8.1.Q, proximity cardreaders will be installed at traction power rooms to prevent unauthorized access. Section 10.8.2.B, "Intrusion Detection Devices," provides for an intrusion alarm at this location.

- 2 Per contract A640 Section 10.8.1.Q, proximity cardreaders will be installed at traction power rooms to prevent unauthorized access. Section 10.8.2.B, "Intrusion Detection Devices," provides for an intrusion alarm at this location.

BULLET D. DESIGN RESOLUTION

- 1 An Emergency Preparedness Plan will be developed. See SCRTD Metro Rail Project SS&SPP paragraph 3.3.2. Placed on C/CIL as open item.
- 2 Per contract A630 Section 1.2.2.B, "Substations," the "Standard DWP service configuration consists of two 34.5 kV feeders, distributed from separate buses of a receiving station . . ."
- 3 Per contract A640 Section 4.2.2.A.1, "Coverage," radio channels are provided for train operator communication.

BULLET

D. DESIGN RESOLUTION

- 1 Contract A640 Section 6.2.1 provides for a PA system in stations. Section 5.1.1.B provides for Emergency Telephone Passenger Assistance Intercom. Section 4.2.2 provides radio coverage to "normally accessible areas of passenger stations."

BULLET D. DESIGN RESOLUTION

- 1 See mechanical HVAC plans in Stage II station construction contracts. All battery rooms provided with separate exhaust ventilation systems. Also see mechanical control diagrams. Battery chargers are interlocked with exhaust fans to prevent battery charging in the event of fan failure.

- 2 Contract A640 Section 9.2.9, "ECS Emergency Operating Procedures," states "SCADA subsystem shall monitor the status of the seismic switches, gas monitoring subsystems, and ECS devices in tunnels, the auxiliary power rooms, traction power substations, passenger stations . . ."

BULLET D. DESIGN RESOLUTION

- 1 Per contract A630 Section 5.3, "DC Power Circuit Breakers" provides for circuit breakers.
- 2 Per contract A640 Section 10.9.1, "Blue Light Station," an emergency trip station is provided at all stations and tunnel cross passages.
- 3 Contract A640 Section 9.2.5, "AC Power and Traction Power System Interfaces," states "SCADA subsystem shall monitor and control the ac incoming line circuit breakers, the ac auxiliary power feeder circuit breakers...". Section 9.2.5.B, "Traction Power," states "SCADA subsystem shall include the capability for the train dispatcher to monitor and control the dc main circuit breakers, dc feeder circuit breakers"

H. FARE COLLECTION SYSTEM

BULLET D. DESIGN RESOLUTION

- 1 Per contract H840 (LACTC), fare collection system in MOS-1 will be barrier-free, on trial basis. SCRTD Board of Directors resolution.

Contract A660 sections 5.3.3.B and 5.3.3.C.3 provide for fare gates in barrier system. (if used in the future) to free-wheel upon command.

- 2 Per contract H840 (LACTC), fare collection system will be barrier-free in MOS-1, on trial basis. Per contract A660, number of fare gates (if used beyond MOS-1) has been selected to permit efficient passenger exiting from station. Reference correspondence DCC #84-09939 and 84-11618.

I. AUXILIARY VEHICLES

BULLET D. DESIGN RESOLUTION

- 1 Portable fire extinguishers will be procured under contract A785. Placed on C/CIL as open item.
- 2 Per contract A640 Section 4.2, radio frequencies will be available to all vehicles on mainline and yard trackage.

BULLET D. DESIGN RESOLUTION

- 1 All auxiliary vehicles will be detectable by the ATC system. Contract documents to be developed. Placed on C/CIL as open item.
- 2 Contract A610/A115 drawings show adequate trackage for auxiliary vehicles.

BULLET D. DESIGN RESOLUTION

- 1 ATP protection will be provided for all auxiliary vehicles operating on the mainline. Contract documents to be developed. Placed on C/CIL as open item.
- 2 All auxiliary vehicles will be detectable by the ATC system. Contract documents to be developed. Placed on C/CIL as open item.