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SCRTD  
METRO RAIL PROJECT  
SAFETY CERTIFICATION PROGRAM  
CRITERIA CONFORMANCE CERTIFICATION

CONTRACT A620

AUTOMATIC TRAIN CONTROL

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## INTRODUCTION

This Criteria Conformance Verification package is submitted for review and compliance assessment in accordance with Rev. 1.1 of the SCRTD Metro Rail Project Safety Certification Plan dated June 1988. The purpose of this package is to document the incorporation of safety-related design criteria into the contract drawings and specifications. This activity is part of a multi-phased program to provide a traceable history of the Metro Rail Project Safety Program.

During design progression, MRTC Safety, Assurance & Security personnel, in conjunction with Rolf Jensen & Associates and the Metro Rail Project Fire/Life Safety Committee, have reviewed design documents at the 60%, 85%, 100%, and Legal/Technical levels. The 100% design review for this document was held in October 1985. The Legal/Technical Review was performed in May, 1987. At each review level design review checklists were utilized and appropriate design review comments generated. Subsequent reviews were initiated by determining the resolution status of comments. Unresolved comments were repeated at each review level until resolution was achieved and verified.

Design review checklists for the Fire/Life Safety, System Safety, Security and System Assurance design criteria were updated in December 1986 to reflect the significant revisions made through the Change Request process. A vertical bar in the Req. I.D. column of the checklist was used to indicate only those changes which impacted design. For clarity, editorial revisions and clarifications of intent were not indicated on the checklist; however, all revisions were indicated in the text of the design criteria and pertinent Change Requests.

The scope of this contract encompasses the design, furnishing and installation of the Automatic Train Control (ATC) System for MOS-1. The ATC System is composed of main line and vehicular elements that are procured in quantities proportional to the length of the rail system. The work also includes start-up of the ATC System, including testing, training and making ready for full passenger-carrying operation. The main line elements include equipment along the trackway (including track switch machines), and in equipment rooms at passenger stations. The Yard elements include the Yard Tower controls, signals, track circuits, switch machines, and bungalows to house Yard train control hardware. The vehicular elements include all the necessary carborn equipment to be supplied to the A650 Contractor. Installation includes all train control cables, trackside equipment, and room equipment along the mainline and in the yard. It also includes installation of the communication cables (except the lossy lines) and gas monitoring tubing in the tunnels. Procurement and installation of the conduit and laying of the 34.5 kV tunnel feed cable in the circular tunnel sections are also provided. Contract A620 also includes installation of wayside ATO equipment furnished under Contract A650.

The comments included in this package represent the result of the reviews performed at the 100% and Legal/Technical level. The check-

lists included are the updated checklists applied at the 100% level. Only those portions of checklists containing design criteria requirements directly applicable to this contract, including those for System Safety, Reliability, Maintainability, and Quality Assurance are included in this document.

Design group responses to the comments are included in most cases, as well as resolution verification by MRTC Safety, Assurance, and Security personnel. Supporting correspondence has been included where deemed appropriate.

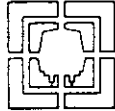
Addenda have been reviewed to determine impact on the Safety Certification Program. Addenda distribution letters, annotated to indicate results of the review, are included.

This verification package, once audited and confirmed by the SCRTD, will become the primary documentation to allow the SCRTD to issue a Criteria Conformance Certification Certificate. Once issued, the Certificate will be appended to this document.



**RTD**  
**Metro Rail Project**

**CRITERIA CONFORMANCE  
 VERIFICATION**



**Metro Rail Transit Consultants**  
**DMJM/PBQD/KE/HWA**

**Safety Certification Program**

**DESIGN REVIEW CONTRACT NUMBER** A620

**REVIEWING DISCIPLINE** MRTC Safety, Assurance & Security

**EXCEPTIONS NOTED:**

Legal/Technical Review Comment Ref. No. 7, by T. J. Tanke, dated May 21, 1987 (See Section II) remains partially unresolved. A review of A620 drawings indicate that signals and associated ladders are mounted opposite the tunnel safetywalk in all cases except at the Wilshire/Alvarado double crossover. A Change Request will be initiated by MRTC Systems Design personnel to provide structural niches required at these two locations. This will prevent signal maintenance ladders from encroaching into safetywalk clearances.

This verifies that the specifications and drawings of the above DESIGN REVIEW PACKAGE comply with the applicable SCRTD DESIGN CRITERIA for safety, fire/life safety, security and system assurance.

Signature J. M. Brown Date 11/15/88  
 Manager - MRTC Safety, Assurance & Security

Signature [Signature] Date 11/16/88  
 Manager - MRTC Systems Division



# SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

## METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: AUTOMATIC TRAIN CONTROL

GROUP: MRTC Safety, Assurance & Security

DATE: 07/29/88

REVIEWER: R. Harvey

DISCIPLINE: SYSTEM SAFETY

REVIEW REFERENCE: SCRTD Metro Rail System Design

CONTRACT No.: A620

Criteria & Standards, Vol. I, Section 3.6,

REVIEW LEVEL: 100%

TRAIN CONTROL, 07/86 Revision 2

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
3.6	<p>TRAIN CONTROL</p> <p>The Automatic Train Control (ATC) system shall ensure, to the maximum extent possible, life safety for all conditions of train operation.</p>	X		See TP Articles 1.4.1 & 3.2.1
3.6.1	<p><u>Automatic Train Protection (ATP)</u></p> <p>The ATP subsystem shall provide fail-safe control and implementation of safety-critical functions.</p> <p>The ATP subsystem shall be continuous.</p> <p>The ATP subsystem shall not be compromised by operation or failure of other systems and subsystems.</p> <p>Failures which affect operation within the ATP subsystem shall be detectable, but shall not compromise safety.</p>	X		See TP Articles 3.2.2, & 3.3.2. and 8.3.1
3.6.1.A	<p><u>Train Detection</u></p> <p>Track circuits shall be designed, configured and applied to ensure detection of stopped and moving passenger trains and maintenance vehicles.</p> <p>Continuous detection of broken rail shall be required to the maximum extent possible.</p>	X		See TP Articles 3.1.7.E and 3.3.2
		X		See TP Articles 3.2.2 & 3.3.1.A
		X		See TP Article 3.2.2.B
		X		See TP Article 3.2.2.B



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## METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: AUTOMATIC TRAIN CONTROL

GROUP: MBTC Safety, Assurance & Security

DATE: 07/29/88

REVIEWER: R. Harvey

DISCIPLINE: SYSTEM SAFETY

REVIEW REFERENCE: SCRTD Metro Rail System Design

CONTRACT No.: A620

Criteria & Standards, Vol. I, Section 3.6,

REVIEW LEVEL: 100%

TRAIN CONTROL, 07/86 Revision 2

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
3.6.1.B	<u>Train Separation</u>			
3.6.1.B.1	Block design and safe braking distances shall be based on worst case conditions for track, grade, vehicle, loading, and braking performance.	X		See TP Articles 3.2.2.D, 3.4.2.A.2 for worst case
3.6.1.B.2	The design shall ensure that trains on the same track maintain a safe following distance to prevent collisions.	X		See TP Article 3.2.2.C
3.6.1.C	<u>Speed Limit Enforcement</u>			
3.6.1.C.1	The ATP design shall ensure that trains normally remain at or below safe speeds determined by block design.	X		See TP Articles 3.2.2.C & 8.3.1.B.3
	Trains shall be given an automatic brake command if the speed limit is exceeded.	X		See TP Articles 3.2.2. & 3.4.2.D, 8.3.1.B.3 & 4 & 8.3.2.F thru G
3.6.1.C.2	Speed limit information shall be transmitted by wayside equipment to equipment on the trains.	X		See TP Articles 3.4.2. 5.2.2.C, 8.3.1, 10.3.2.A & 10.3.2.0.1
	The vehicle speed limit transmission decoding logic shall respond only to transmitted signals whose characteristics match those of a valid speed limit transmission signal.	X		See TP Articles 3.3.2.H 5.2.2.C, 8.3.2.A.3 & 8.3.2.B.4 & 8.3.2.C
	Both transmitted and actual speeds shall be displayed in the cab.	X		See TP Articles 5.2.1, 8.2.1.B.1 & 10.3.2 Also See Contract A650



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DATE: 07/29/88

REVIEWER: R. Harvey

DISCIPLINE: SYSTEM SAFETY

REVIEW REFERENCE: SCRTD Metro Rail System Design

CONTRACT No.: A620

Criteria & Standards, Vol. I, Section 3.6,

REVIEW LEVEL: 100%

TRAIN CONTROL, 07/86 Revision 2

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
	Absence of a valid speed limit transmission shall be interpreted by the vehicle ATC equipment as a zero mi/hr speed limit.	X		See TP Articles 8.3.1.B.5 & 8.3.2.F.2
3.6.1.C.3	Automatic actuation of vehicle propulsion and braking shall be implemented to prevent undesired movement and excess speed.	X		See TP Articles 8.2.2.A 8.3.1.B.3 & 8.3.3.A
3.6.1.C.4	No operation of and failure within the RCC and the SCADA equipment shall compromise the safety assured by the ATP subsystem.	X		See TP Articles 3.2.2 10.8.2.A
3.6.1.C.5	ATP speed enforcement for a fixed restricted speed shall be provided for a submode of manual operation, implemented when no speed limit transmissions are received by the train.	X		See Articles 3.1.7.C & 8.2.2.B.1
3.6.1.D	<u>Route Security</u>			
3.6.1.D.1	Train movements through interlockings shall be protected by ATP.	X		See TP Articles 3.2.2.F & 6.1.2.A
3.6.1.D.2	Trains on crossing/merging of branching routes shall not be permitted to make conflicting moves.	X		See TP Articles 6.1.2.A 6.4.4.A.2 & 6.4.4.C thru D
3.6.1.D.3	The ATP subsystem shall prevent a train that is operating in automatic mode from entering an interlocking whose status is not vitally determined to be safe.	X		See TP Articles 3.3.2, 5.2.2.F.3 & 8.3.1.A





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DATE: 07/29/88

REVIEWER: R. Harvey

DISCIPLINE: SYSTEM SAFETY

REVIEW REFERENCE: SCR TD Metro Rail System Design

CONTRACT No.: A620

Criteria & Standards, Vol. I, Section 3.6,

REVIEW LEVEL: 100%

TRAIN CONTROL, 07/86 Revision 2

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
3.6.1.D.4	The ATP subsystem shall give fail-safe wayside indications of the interlocking status to the train operator.	X		See TP Articles 6.4.1.B, 6.4.3.B & 6.4.5.D
3.6.1.D.5	The ATP subsystem shall prevent opposing moves between interlockings for trains operating in automatic mode.	X		See TP Article 6.4.4. & 6.4.5
	The ATP subsystem shall provide a "STOP" wayside indication to trains operating in manual mode prior to entering.	X		See TP Article 6.4.5.B
3.6.1.E	<u>ATP Cut Out Detection</u>			
	Cut out of the ATP on any passenger vehicle or train shall require an enabling signal from RCC before ATP bypass can be activated.	X		See TP Article 6.4.4.A thru D
	ATP may also be cutout by a sealed switch in the cab.	X		See TP Article 8.2.2.B.3
	When ATP is bypassed, an alarm in the RCC shall be annunciated.	X		See TP Article 6.4.5.C.2, 4.4.4.A & 10.8.2.F
3.6.1.F	<u>Vehicle Door Operation</u>			
	The design shall inhibit manual operation of vehicle side doors by either passengers or employees when the vehicle is in motion.	X		See TP Article 3.1.7.J 3.2.2.E
	The design shall prevent the train from starting until all side doors are closed and latched.	X		See TP Article 3.2.3.A.3



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DATE: 07/29/88

REVIEWER: R. Harvey

DISCIPLINE: SYSTEM SAFETY

REVIEW REFERENCE: SCRTD Metro Rail System Design

CONTRACT No.: A620

Criteria & Standards, Vol. I, Section 3.6,

REVIEW LEVEL: 100%

TRAIN CONTROL, 07/86 Revision 2

REQ. ID.	REQUIREMENT	YES	NO	COMMENT
3.6.1.G	<u>Station Platform</u> The ATP subsystem shall prevent a train in the automatic operating mode from proceeding beyond a station platform if propulsion power is not continuously available for the train to berth at the next downstream station platform.	X		See TP Articles 5.2.2.F, 5.2.2.J & 6.4.5.E
3.6.2	<u>Automatic Train Operation (ATO)</u> The ATO subsystem shall perform berthing verification at all station platforms, regardless of travel direction. Berthing verification shall ensure that the train is wholly within a station platform area and that all doors will open to a platform.	X		See TP Article 8.2.1.C.3 See TP Article 8.2.2.A.2
3.6.3	<u>Automatic Train Supervision (ATS)</u> The ATS subsystem shall not directly affect train safety. The ATS shall meet operational objectives without compromising safety. The ATS subsystem shall include equipment at the RCC for recording alarms and failures/malfunctions, including their time, location and nature, to facilitate proper response to emergency situations.	X		See TP Articles 3.2.1 3.2.2 See TP Article 3.2.1 See Contract A640



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DATE: 07/29/88

REVIEWER: R. Harvey

DISCIPLINE: SYSTEM SAFETY

REVIEW REFERENCE: SCRTD Metro Rail System Design

CONTRACT No.: A620

Criteria & Standards, Vol. I, Section 3.6,

REVIEW LEVEL: 100%

TRAIN CONTROL, 07/86 Revision 2

REQ. ID.	REQUIREMENT	YES	NO	COMMENT
3.6.4	<u>Other Design Features</u>			
3.6.4.A	Signal aspects, indications and terminology shall be consistent throughout the ATC system.			See Typical Circuits for terminology. Also see TP Article 7.3
3.6.4.B	The ATC system at wayside shall have an emergency backup power supply system to support train control in the event of power loss.	X		See Contract A740 & TP Articles 3.3.10.A.2 thru A.4 & A.7 4.3.2.A.1 & B.1, 4.3.3
3.6.4.C	Manual mimic boards and controls shall be located in the local train control rooms.	X		See TP Article 4.4
3.6.4.D	When manual operations of a vehicle without ATP is permitted, adequate operational procedures shall be developed to assure safe operation.	X		See TP Articles 8.2.2.B.3 & 16.3.1.A.1

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## METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: AUTOMATIC TRAIN CONTROL

GROUP: MRTC Safety, Assurance & Security

DATE: 07/29/88

REVIEWER: R. Harvey

DISCIPLINE: RELIABILITY

REVIEW REFERENCE: METRO RAIL PROJECT SYSTEM DESIGN

CONTRACT No.: A620

Criteria & Standards, Vol. I, Section 5.2

REVIEW LEVEL: 100%

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
5.2.1.B	Manufacturers of the following system equipment shall be required, by contract, to establish and maintain a Reliability Program and Plan:  Program and Plan:  1. Vehicle 2. Train Control 3. Fare Collection.  Their plans shall be prepared using the SCRTD System Assurance Program Plan as a guide for style, content, and format.	X		See Articles 15.1.2 & 15.3.3
5.2.2.C	Contractors for the following systems shall be required to prepare and submit a FMECA to identify all critical single point failure modes. The FMECA shall be conducted to the lowest replaceable module.  1. Vehicle 2. Train Control 3. Fare Collection.	X		See Articles 15.1.3 thru 15.1.8
5.2.2.D	Contractor for the Vehicle, Train Control, and Fare Collection systems shall be required to prepare and submit a Reliability Analysis which shall include, as a minimum:  1. System definitions and related assumptions	X		See Article 15.3.3.A



SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

**METRO RAIL PROJECT DESIGN REVIEW CHECKLIST**

CERTIFIABLE ELEMENT: AUTOMATIC TRAIN CONTROL

GROUP: MRTC Safety, Assurance & Security

DATE: 07/29/88

REVIEWER: R. Harvey

DISCIPLINE: RELIABILITY

REVIEW REFERENCE: METRO RAIL PROJECT SYSTEM DESIGN  
Criteria & Standards, Vol. I, Section 5.2

CONTRACT No.: A620

REVIEW LEVEL: 100%

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
	2. Functional flow and reliability block diagrams	X		See Article 15.3.3.A.6
	3. Description of data base and any adjustment factors	X		See Article 15.3.3.B
	4. System and subsystem failure assumptions and predicted MTBF, MTBSF, MCBF, as appropriate	X		See Article 15.3.2
	5. Comparison of reliability predictions with allocations in the Reliability Requirements Report (Criteria R4)	X		See Article 15.3.3
	6. Impact of operating or design changes on predicted values	X		See Articles 15.3.3.C & 15.1.6.D
	7. Definitions of all interfaces, such that every part is identified as being part of a particular subsystem.	X		See Section 10
5.2.2.E	The contractors for Vehicle, Train Control, Fare Collection, and Vehicle Propulsion systems shall be required to develop Reliability Demonstration Test Plans. The Reliability Test Plan shall include:	X		See Article 15.3.5
	1. Criteria to be used by the SCRTD for evaluating the equipment under test	X		See Articles 15.3.5.D & 15.3.5.H
	2. The failure reporting procedures to be used by the Contractor	X		See Articles 15.3.5 & 15.3.5.I
	3. The mathematical verification that the test shall demonstrate the required	X		See Article 15.3.5



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CERTIFIABLE ELEMENT: AUTOMATIC TRAIN CONTROL

GROUP: MRTC Safety, Assurance & Security

DATE: 07/29/88

REVIEWER: R. Harvey

DISCIPLINE: RELIABILITY

REVIEW REFERENCE: METRO RAIL PROJECT SYSTEM DESIGN

CONTRACT No.: A620

Criteria & Standards, Vol. I, Section 5.2

REVIEW LEVEL: 100%

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
	MTBF, MTBSF, MCBF, and failure rates as specified by contract.			
5.2.3.A	Contractors shall be legally bound to ensure that contractual reliability requirements are achieved.	X		See TP Article 15.3
5.2.4	The contractor shall demonstrate the achievement or prove the failure of reliability requirements incorporated into contractor specifications and track system reliability during testing and revenue service.	X		See TP Article 13.12
5.2.4.A	Contractors shall be required to use the format designed by the SCRTD for reporting failures.	X		See TP Article 15.3.3.A & C
5.2.5.A	The system elements, as described below, shall be suitable for a lifetime of use in the Southern California environment, with normal maintenance and overhaul, if required, for the number of years as outlined below:  1. Vehicle Body: 30 years 2. Train Control System: 25 years 3. Fare Collection System: 25 years 4. Tunnels: 100 years 5. Trackwork: 30 years.	X		See SP Article 6.0 and GP Article 19.0, also see General Requirements Section 3
5.2.5.B	The system elements shall be capable of being operated, stored, and maintained at specific performance levels without impairment resulting from the impact of	X		See TP Article 3.3.3



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CERTIFIABLE ELEMENT: AUTOMATIC TRAIN CONTROL

GROUP: MRTC Safety, Assurance & Security

DATE: 07/29/88

REVIEWER: R. Harvey

DISCIPLINE: RELIABILITY

REVIEW REFERENCE: METRO RAIL PROJECT SYSTEM DESIGN  
Criteria & Standards, Vol. I, Section 5.2

CONTRACT No.: A620

REVIEW LEVEL: 100%

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
	the following environmental parameters throughout the indicated range of values:			
	1. Air temperature: Minimum: 20°F Maximum: 110°F Average: 66°F	X		See TP Article 3.3.3.A
	2. Relative humidity: 24 hour range: 45% to 85%	X		See TP Article 3.3.3.A
	3. Rainfall in 24 hours: Maximum re- corded: 6.11"	X		See TP Article 3.3.3.D
	4. Rainfall in 1 hour: Maximum re- corded: 1.87"			
	5. Wind speed: Average: 10 mph Maximum recorded: 49 mph	X		See TP Article 3.3.3.B
	6. Seismic activity: (Reference "DESIGN EARTHQUAKE PARAMETERS" and "DESIGN FAULT PARAMETERS" tables of Criteria)	X		See TP Article 3.3.5
	7. Air pollution: o Dust Particulates: Size: 1 to 200 microns Concentration: (max.) 0.248 mg/m <sup>3</sup> (avg.) 0.142 mg/m <sup>3</sup> o Acid Precipitation: pH of 4.41 o Gases and fumes: (Reference "Types" and "Concentrations" table of Criteria)	X		See TP Article 3.3.3.A.2



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CERTIFIABLE ELEMENT: AUTOMATIC TRAIN CONTROL

GROUP: MRTC Safety, Assurance & Security

DATE: 07/29/88

REVIEWER: R. Harvey

DISCIPLINE: MAINTAINABILITY

REVIEW REFERENCE: METRO RAIL PROJECT SYSTEM DESIGN

CONTRACT No.: A620

Criteria & Standards, Vol. I, Section 5.3

REVIEW LEVEL: 100%

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
5.3.1.B	Manufacturers of the following system equipment shall be required, by contract, to establish and maintain a Maintainability Program and Plan.  1. Vehicle 2. Train Control 3. Communications 4. Fare Collection 5. Traction Power.  Their plans shall be prepared using the SCRTD System Assurance Plan as a guide for style, content, and format.	X		See Article 15.1.2 & 15.4
5.3.2.A	A detailed Maintenance Concept shall be developed and submitted to the SCRTD by the contractors indicated in 5.3.1.B. The Maintenance Concept shall include a description of how the contractor intends to achieve the maintenance requirements identified in their contract. The Maintenance Concept shall cover the following, as a minimum:  1. Maintenance Levels  a. System repairs done on SCRTD property  b. Module and component repairs done on SCRTD property  c. Module and component repairs done at the contractor's facilities.	X		See Article 15.4.4







# SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

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CERTIFIABLE ELEMENT: AUTOMATIC TRAIN CONTROL

GROUP: MRTC Safety, Assurance & Security

DATE: 07/29/88

REVIEWER: R. Harvey

DISCIPLINE: MAINTAINABILITY

REVIEW REFERENCE: METRO RAIL PROJECT SYSTEM DESIGN  
Criteria & Standards, Vol. I, Section 5.3

CONTRACT No.: A620

REVIEW LEVEL: 100%

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
	Train Control, and Fare Collection contractors.			
	The Maintenance Analysis shall be submitted iteratively (every 90-180 days) as the design develops.	X		See TP Article 15.4.5
	The analysis shall describe all the maintenance tasks SCRTD personnel may be required to perform on the system. The analysis shall include for each maintenance task, as a minimum:	X		See TP Article 15.4.5.A
	1. Frequency of task			
	2. Time to perform			
	3. Test equipment, tools, and facilities required			
	4. Crew size and skill level			
	5. Manuals and instructions needed.			
5.3.4.A	All suppliers and contractors shall be required to submit maintenance manuals which contain all the information needed to service, maintain, repair, inspect, adjust, troubleshoot, replace, and overhaul each component or subsystem. Requirements for the maintenance manuals shall include, but not be limited to:	X		See TP Article 16.3.1
	1. Running Maintenance and Servicing Manuals			



# SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

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DATE: 07/29/88

REVIEWER: R. Harvey

DISCIPLINE: MAINTAINABILITY

REVIEW REFERENCE: METRO RAIL PROJECT SYSTEM DESIGN  
Criteria & Standards, Vol. I, Section 5.3

CONTRACT No.: A620

REVIEW LEVEL: 100%

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
5.3.4.B	2. Heavy Repair Maintenance Manuals			
	3. Parts Catalogs			
	4. Test Equipment Maintenance Manuals.			
	The manuals shall be designed for continuous, long term service in a maintenance shop environment.	X		See TP Article 16.3.1.G
	All manuals shall be in either pocket size (3-1/2" x 8" x less than 1" thick) or standard size (8-1/2" wide x 11" high).	X		See TP Article 16.3.1.G
	All manuals shall be prepared in accordance with normal commercial standards, using MIL-M-38784 and MIL-M-15071 as guides for format and technical content, respectively.			↓
5.3.5.A	Contractors shall be required to provide a comprehensive training program for SCRTD maintenance personnel.	X		See TP Articles 15.4.4.D & 16.5.1
	Contractors shall provide the SCRTD with course materials, instructors, training aids, equipment, and all literature required.			↓
	The contractor shall train all SCRTD maintenance personnel to a level of competence such that work performed by these personnel will not void any of the warranties or guarantees in effect.			↓



SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: AUTOMATIC TRAIN CONTROL

GROUP: MRTC Safety, Assurance & Security

DATE: 07/29/88

REVIEWER: R. Harvey

DISCIPLINE: MAINTAINABILITY

REVIEW REFERENCE: METRO RAIL PROJECT SYSTEM DESIGN Criteria & Standards, Vol. I, Section 5.3

CONTRACT NO.: A620

REVIEW LEVEL: 100%

Table with 5 columns: REQ. I.D., REQUIREMENT, YES, NO, COMMENT. Row 1: 5.3.6.A, The contractors shall incorporate qualitative features into all equipment whenever feasible. MIL-STD-1472C shall be used as a guide, along with the design features in the "Maintainability Checklist" provided in paragraph 15.3.6 of UMTA Report No. IT-06-0027-A "Guideline Specification for Urban Rail Cars", March 1973., X, See TP Articles 3.1.1 7 & 3.3.7.8.7



# SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

## METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: AUTOMATIC TRAIN CONTROL

GROUP: MRTC Safety, Assurance & Security

DATE: 08/04/88

REVIEWER: R. Harvey

DISCIPLINE: QUALITY ASSURANCE

REVIEW REFERENCE: SCRTD Metro Rail Project System Design Criteria & Standards, Vol. I, Section 5.4,

CONTRACT No.: A620

REVIEW LEVEL: 100%

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
5.4.1.B	<p>QUALITY ASSURANCE PROGRAM PLAN - CONTRACTORS</p> <p>Manufacturers of the following system elements shall be required by contract to establish and maintain a QA Program and Plan:</p> <ol style="list-style-type: none"> <li>1. Facilities</li> <li>2. Vehicle</li> <li>3. Train Control</li> <li>4. Fare Collection</li> <li>5. Communications</li> <li>6. Escalators</li> <li>7. Elevators</li> <li>8. Auxiliary Vehicles</li> </ol> <p>These plans shall be prepared using the SCRTD System Assurance Program Plan and the SCRTD QA Manual as a guide for style, content, and format.</p>	X		See TP Articles 15.5 & 15.1.2
5.4.2	<p>WARRANTIES</p> <p>A. Warranty provisions shall be included in all contracts, both civil and system.</p> <p>The following additional time warranties shall be included in the vehicle contract:</p> <ol style="list-style-type: none"> <li>1. Carbody - 5 years</li> <li>2. Truck-Structural Elements - 5 years</li> <li>3. Traction Motors, except brushes - 5 years</li> </ol>	X		See SP Article 6.1



# SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

## METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: AUTOMATIC TRAIN CONTROL

GROUP: MRTC Safety, Assurance & Security

DATE: 08/04/88

REVIEWER: R. Harvey

DISCIPLINE: QUALITY ASSURANCE

REVIEW REFERENCE: SCRTD Metro Rail Project System

CONTRACT No.: A620

Design Criteria & Standards, Vol. I, Section 5.4,

REVIEW LEVEL: 100%

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
5.4.3	4. Gear reducers for propulsion subsystem - 5 years.			
	QUALITY PROGRAM CONTENT			
	A. <u>Receiving Inspection</u>			
	Contractors shall provide for the inspection of all incoming material. Statistical sampling is acceptable.	X		See TP Articles 15.5.2.B, 15.5.11, 15.5.15
	All material certifications and test reports used as the basis for acceptance by the contractors shall be maintained as quality records.	X		See TP Articles 15.5.3 & 15.5.5
	B. <u>Statistical Sampling Plans</u>			
	Statistical sampling used in inspection shall be fully documented and based on generally recognized statistical practices, such as MIL-STD-105 or MIL-STD-414.	X		See TP Article 15.5.15
C. <u>Changes to Drawings and Specifications</u>				
Contractors shall ensure that all inspection and acceptance test are based on the latest revision or changes to drawings and specifications.	X		See TP Article 15.5.16	
An acceptable configuration management and control system shall be established and maintained.	X		↓	
The responsibility for control of changes shall extend to suppliers.	X		See TP Articles 15.5.9. C&D and 15.5.16	



# SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

## METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: AUTOMATIC TRAIN CONTROL

GROUP: MRTC Safety, Assurance & Security

DATE: 08/04/88

REVIEWER: R. Harvey

DISCIPLINE: QUALITY ASSURANCE

REVIEW REFERENCE: SCRTD Metro Rail Project System Design Criteria & Standards, Vol. I, Section 5.4,

CONTRACT No.: A620

REVIEW LEVEL: 100%

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
	<p><u>D. Identification of Inspection Status</u></p> <p>Contractors shall maintain a system for identifying the progressive inspection status of components or materials as to their acceptance, rejection or non-inspection.</p>	X		See TP Article 15.5.17
	<p><u>E. Shipping Inspection</u></p> <p>Contractors shall provide for the proper inspection of products to ensure completion of manufacturing and conformance to contract requirements prior to shipment.</p>	X		See TP Article 15.5.13
	<p><u>F. Quality Assurance Organization</u></p> <p>The organization of each contractor's QA Program shall be well defined.</p>	X		See TP Articles 15.5.7 & 15.5.2.A
	<p>QA personnel shall have sufficient, well-defined responsibilities and organizational freedom which encourage the identification and evaluation of quality problems.</p>	X		See TP Article 15.5.2.A
	<p>Contractors shall have a QA Program that can verify compliance with contract requirements.</p>	X		See TP Articles 15.5.2.B & 15.5.1
	<p><u>G. Qualification of Personnel</u></p> <p>Contractor personnel performing inspections, test or special processes shall be qualified for such work based on prior experience and training.</p>	X		See TP Article 15.5.7



# SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

## METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: AUTOMATIC TRAIN CONTROL

GROUP: MRTC Safety, Assurance & Security

DATE: 08/04/88

REVIEWER: R. Harvey

DISCIPLINE: QUALITY ASSURANCE

REVIEW REFERENCE: SCRTD Metro Rail Project System Design Criteria & Standards, Vol. I, Section 5.4,

CONTRACT No.: A620

REVIEW LEVEL: 100%

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
	Records of personnel qualifications shall be maintained and available for review.	X		See TP Articles 15.5.B
	<u>H. In-Process Inspection</u> The contractor shall ensure that all machining, wiring, batching, shaping, and all basic production operations, together with all processing and fabricating, shall be accomplished under controlled conditions.	X		See TP Articles 15.5.10.B & 15.5.12
	<u>I. Handling, Storage and Delivery</u> Contractors shall provide adequate work and inspection instructions for handling, storing, preserving, packing, marking, and shipping to protect the quality of products and to prevent damage, loss, deterioration, or substitution thereof.	X		See TP Article 15.5.19
	<u>J. Corrective Action</u> Contractors shall establish, maintain, and document procedures to ensure that conditions adverse to quality are promptly identified and corrected.	X		See TP Article 15.5.20
	<u>K. Nonconforming Material</u> Contractors shall establish and maintain an effective system for controlling nonconforming material including procedures for identification, segregation, and disposition.	X		See TP Article 15.5.21





# SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

## METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: AUTOMATIC TRAIN CONTROL

GROUP: MRTC Safety, Assurance & Security

DATE: 08/04/88

REVIEWER: R. Harvey

DISCIPLINE: QUALITY ASSURANCE

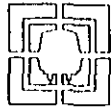
REVIEW REFERENCE: SCRTD Metro Rail Project System Design Criteria & Standards, Vol. I, Section 5.4,

CONTRACT No.: A620

REVIEW LEVEL: 100%

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
	A Material Review Board consisting of appropriate SCRTD, contractor, QA and design personal shall be established.	X		See TP Article 15.5.9.I (for procured material only) No mention of Material Review Board for manufactured material. However the need for a Material Review Board may be implied in TP Article 15.5.21. The Contractor's Quality Assurance Program Plan (QAP-003 ¶4.3.2) addresses Material Review Program Plan.

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**DESIGN REVIEW COMMENTS**

RM  
8-5-88

REVIEWER W. E. PRKE II FILE NO. W540A620 ORGANIZATION SAFETY, ASSURANCE & SECURITY  
100 % SUBMITTAL FOR \_\_\_\_\_

REF. NO.	PAGE NO.	DRAWING NO./ SPEC. SECTION	COMMENTS	RESPONSE	ACTION
1	TP-9-11	9.6.3	Indications should be specified for an MTBF of 1,000,000 hrs. This value represents the state-of-the-art for console indicators. Currently does not agree with specified MTBF for Control Panel (p. TP-15-6)	See Final Review Comments Response # 25	ok RM 8-5-88
2	TP-15-6	15.3.2.B	The value specified for the wayside signal is irresponsibly low. Signal lamps for BRTS were predicted at 0.027 failures per million hours. Train stop signalling for MARTA was predicted at 70,000 hrs between failure.  BURGESS HAS AGREED TO 200,000 HRS	See Final Review Comments Response # 50	ok RM 8-5-88
			Hunt		





Cross Reference  
Section III  
DCC # 85-06550  
8-5-88  
RJA

DATE 10-10-85  
SHEET 1 OF 3

**DESIGN REVIEW COMMENTS**

REVIEWER J. C. LAZZETTA FILE NO. W001A620 A 9.1 ORGANIZATION ROLF JENSEN & ASSOCIATES, INC  
100 % SUBMITTAL FOR A620 - AUTOMATIC TRAIN CONTROL

See SCRTO Automatic  
Train Control Specification  
Final Review comments  
Section III

REF. NO.	PAGE NO.	DRAWING NO./ SPEC. SECTION	COMMENTS	RESPONSE	ACTION
1	TP4-19	TABLE TP4-4	TABLE SHOWS FLAMMABILITY REQ'TS FOR CROSS-LINKED POLYOLEFIN AS "MIL-W-81044" WHAT IS THIS? FL SCRITERIA 2.2.4.1.4, 2.3.3.4 & 2.4-3.7.3(B) REQUIRE ALL WIRE AND CABLE FOR VITAL ATC, POWER CIRCUITS FOR EMERGENCY EQPT, AND VEHICLE POWER CABLES TO PASS IEEE-383 FLAME TEST AND HAVE NO SHORT CIRCUIT FOR 5 MINUTES. THIS SHOULD BE SO INDICATED IN THE TABLE FOR CROSS-LINKED POLYOLEFIN	See Final Review Comments Response # 13	of RA 6-5-88 (see TP Article 4.6)
2	TP4-24	TABLE TP4-7	FLAMMABILITY SHOULD PASS IEEE-383 & HAVE NO SHORT CIRCUIT FOR 5 MINUTES - FL'S CRITERIA 2.2.4.1.4, 2.3.3.4 & 2.4-3.7.3(B)	see Final Review Comments Response # 14	of RA 6-5-88 (see TP Article 4.6)
3	TP4-26	4-7	FL'S CRITERIA 2.5.3.1, REQUIRES ATC BUNGALOWS TO BE PROVIDED WITH AUTOMATIC SPRINKLERS. ADD NEW SECTION 4-7.5 TO SO INDICATE.	see Final Review Comments Response # 15	



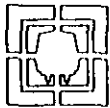
**DESIGN REVIEW COMMENTS**

REVIEWER J. C. LAZZETTA FILE NO. 1001A620 A.9.1 ORGANIZATION ROLF JENSEN & ASSOCIATES, INC  
100 % SUBMITTAL FOR A620 - AUTOMATIC TRAIN CONTROL

REF. NO.	PAGE NO.	DRAWING NO./ SPEC. SECTION	COMMENTS	RESPONSE	ACTION
4	TP9-2	9.2.2.A	F/L'S CRITERIA 2.5-3.1 REQUIRES ATC BUNGALOWS TO BE PROVIDED WITH AUTOMATIC SPRINKLERS.	See Final Review Comments Response # 24	
5	TP11-21	TABLE TP11-2	"VERTICAL FLAME TEST ICEN 5-66-52A" SHOULD READ "FLAME TEST IEEE-383" AND SHOULD INDICATE "PASS AND HAVE NO SHORT CIRCUITS FOR 5 MINUTES"	see Final Review Comments Response # 33	see TP Article 11.7.3.C
6	TP11-25	TABLE TP11-3	ITEM #9 - SMOKE GENERATION - F/L'S CRITERIA SECTIONS 2.4.2.3 & 2.3.3.1.1 REQUIRE A MAX OF 200 AT 4 MIN. POINT FOR BOTH FLAMING & NON-FLAMING MODE - AND NOT 325 AS SHOWN IN TABLE.	See Final Review Comments Response # 36	







**DESIGN REVIEW COMMENTS**

REVIEWER M. INGRAM FILE NO. W001 A620 A.9.1 ORGANIZATION S, AQS-QA  
100 % SUBMITTAL FOR A620 - ATC Dwg's.

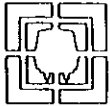
REF. NO.	PAGE NO.	DRAWING NO./ SPEC. SECTION	COMMENTS	RESPONSE	ACTION
1	115	Q 115	MAST MOUNTED AND WALL MOUNTED LADDERS MUST COMPLY WITH SECTION 3277, FIXED LADDERS, OF TITLE 8, SUB-CHAPTER 7, GENERAL INDUSTRIAL SAFETY ORDERS. This comment remains UNRESOLVED from the 85% design review.	See Final Review Comments Response # 83	Ref: DCC 88-03333
2	120	Q-120	There is a Section C cut on the plan, but no Section C on the dwg. Should it be referenced to the Section C on Q-119?  SPECIFICATIONS		ok ref 6-5-88
3	TP-5-3	S.2.1-A.6	Last sentence - Verify reference to Article 2.5.	See Final Review Comments Response # 18	ok ref 6-5-88
4	TP-8.4	8.3.1-A	Verify reference to Article 3.4 for FAIL-SAFE requirements; possibly should be Art. 3.3	See Final Review Comments Responses # 23	ok ref 6-5-88
5	TP-10-7	10.3.2 F-1	"... description of ATC vehicle equipment signals..." required to be furnished, should be added to CDRL.	See Final Review Comments Response # 25	ok ref 6-5-88

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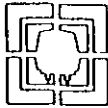




**DESIGN REVIEW COMMENTS**

REVIEWER HARV HUNT FILE NO. W001 A620 ORGANIZATION SAF-A-SEC  
100 % SUBMITTAL FOR HTC - A620

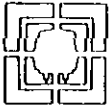
REF. NO.	PAGE NO.	DRAWING NO./ SPEC. SECTION	COMMENTS	RESPONSE	ACTION
1	15-5	15.2.2.A.1.	CHANGE "SYSTEM HAZARD ANALYSIS" TO "INTERFACE HAZARD ANALYSIS" TO <del>MAKE CLOSELY</del> CONFORM TO SCRIP S-001	See Final Review Comment Response # 49	alt 8.5.89 RH
2	17-0	TABLE TP-17-1	ADD CDRL'S FOR THESE ANALYSES	See Final Review	alt 8.5.89 RH
2a			1. INTERFACE HAZARD ANALYSIS ITEM NO. 86 PARAGRAPH 15.2.2.A FORMAT AS SPECIFIED (3 COPIES SCHEDULE/ETC AT FDR & FACI / APPROVAL REQUIRED	Comment Response # 62	
2b			2 SUBSYSTEM HAZARD ANALYSIS ITEM NO 87 PARAGRAPH 15.2.2.A FORMAT AS SPECIFIED (3 COPIES SCHEDULE/ETC AT FDR / APPROVAL REQUIRED	See Final Review Comment Response # 62	alt 8.5.89 RH



**DESIGN REVIEW COMMENTS**

REVIEWER Harv Hunt FILE NO. \_\_\_\_\_ ORGANIZATION SAP-SEC-A  
100 % SUBMITTAL FOR ATC - A620

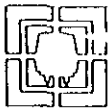
REF. NO.	PAGE NO.	DRAWING NO./ SPEC. SECTION	COMMENTS	RESPONSE	ACTION
2c			3. OPERATING HAZARD ANALYSIS ITEM NO. 88 PARAGRAPH 15.2.2.A FORMAT AS SPECIFIED / 3 COPIES SCHEDULE/ETC AT FDR, AS PART OF TEST PLAN	see Final Review Comment Response # 62	ok RM 8.5.88
2d			<u>AN ALTERNATIVE</u> TO LISTING THESE AS SEPARATE CDRL'S IS TO SPECIFY SUBMITTAL TIME IN PARAGRAPH 15.2.2.A ie 4. INTERFACE HAZARD ANALYSIS - AT FDR & FACI FOR APPROVAL  THEN <del>ADJUST</del> CHANGE CDRL item 85 TO READ CCIL - - - - - ANALYSIS 15.2.2.9 AS SP/3 FDR/FACI/TEST/ APPROVAL REQD	see Ref NOS. 2a, 2b, 2c	ok RM 8.5.88



**DESIGN REVIEW COMMENTS**

REVIEWER Harv Hunt FILE NO. \_\_\_\_\_ ORGANIZATION SAF - A - SUBC  
100 % SUBMITTAL FOR A 620 - ATC

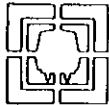
REF. NO.	PAGE NO.	DRAWING NO./ SPEC. SECTION	COMMENTS	RESPONSE	ACTION
3	3-8	3.3.2.L	CHANGE "REFERENCE: ARTICLE 15.2" TO "REFERENCE: ARTICLE 15.3" INCORRECT REF.	See Final Review Response # 5	<u>ok</u> <u>ret</u> 8.5.88
4	16-2	16.3.1.D	ADD AFTER "SAFETY WARNINGS" "AND SAFETY-RELATED CAUTIONS"  THIS WILL ENSURE CAUTION NOTES ARE TOPICALLY LOCATED	Added "included in each applicable topic"	<u>ok</u> <u>ret</u> 8.5.88
5	16-9	16.7	ADD AS 1 <sup>st</sup> SENTENCE "THE USE OF SPECIAL TOOLS SHALL BE MINIMIZED."  THIS IS GOOD DESIGN PRACTICE - TO LIMIT NUMBER OF SPECIAL TOOLS (IE REQUIREING A REED WHEN A PHILIPS WILL DO.)	See Final Review Comment Response # 57	
6	15-10 13-30	15.4.4.G } 13.12.1 }	REWRITE AS FOLLOWS "DETAILED TEST PROCEDURES <del>BASED ON</del> <sup>USING</sup> MILSTD 478A" AS A GUIDE "	See Final Review Comment Response # 51	<u>ok</u> <u>ret</u> 8.5.88



**DESIGN REVIEW COMMENTS**

REVIEWER HARRY HUNT FILE NO. \_\_\_\_\_ ORGANIZATION SAF - SEC - ASSURANCE  
100 % SUBMITTAL FOR A 620 - ATC

REF. NO.	PAGE NO.	DRAWING NO./ SPEC. SECTION	COMMENTS	RESPONSE	ACTION
6 (cont)			MILSTD 472 ESTABLISHES THE SELECTION PROCESS (RANDOM) & HELPS ENSURE AN ADEQUATE, YET SUITABLE DEMO TEST		
7	15-10	15.4.	ADD PARAGRAPH "15.4.6 <u>Interchangeability - Accessibility</u> A. Parts, components, assemblies performing like functions shall be physically and functionally interchangeable. Those which are not functionally interchangeable shall not be physically interchangeable. B. Accessibility to system elements shall comply with <u>SERTD Design Criteria and Standards</u> . THESE ARE CRITICAL TO SYSTEM MAINTAINABILITY	See Final Review Comments Response * 52  SEE 5 of 5 for the right words. MI 11/5/85	10/26-5-85



**DESIGN REVIEW COMMENTS**

REVIEWER H. Hunt / M. Ingram FILE NO. W001 A620 A.9.1 ORGANIZATION S.A.S  
100 % SUBMITTAL FOR A620-ATC

REF. NO.	PAGE NO.	DRAWING NO./ SPEC. SECTION	COMMENTS	RESPONSE	ACTION
7	15-10	15.4	Add Paragraph 15.4.6		
	continued				
			B. Accessibility to system elements shall be provided by using the following techniques:	see TP 3.3.7. B	OK
			1. Panels and openings shall be of sufficient size, quantity and placement to permit ready access from a normal or serviceable work area.		
			2. Self-retaining fasteners shall be used wherever practicable.		
			3. Special access opening tools shall not be required unless considered necessary to permit vandalism.		
			4. Latch hold open devices shall be incorporated, where practicable, as an additional safety factor.		
			5. In equipment cabinets, the components that are most frequently maintained or adjusted shall be the most accessible.		
			6. Devices to facilitate the handling of heavy or less accessible components shall be provided.		
			7. Human factors shall be considered in the design, using MIL-STD		
		Add to CITED REFERENCES	→ 1472C - Human Engineering Design Criteria for Military Systems, Equipment and Facilities.		

Substratum. unguis

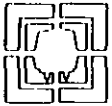




**DESIGN REVIEW COMMENTS**

REVIEWER T. J. TANKE FILE NO. \_\_\_\_\_ ORGANIZATION SYSTEMS  
LEGACY/TECH % SUBMITTAL FOR A 620 - AUTOMATIC TRAIN CONTROL SYSTEM

REF. NO.	PAGE NO.	DRAWING NO./ SPEC. SECTION	COMMENTS	RESPONSE	ACTION
1	3	Q-003D	THIS DRAWING SHOWS A SINGLE CROSSOVER BETWEEN UNION STATION AND THE YARD. I BELIEVE THE CURRENT DESIGN CALLS FOR A DOUBLE CROSSOVER AT THIS LOCATION. SUGGEST COORDINATION WITH TRACKWORK AND STRUCTURES FOR VERIFICATION.	Drawing Revised	sk 5/18/87
2	7	Q-007C	SEE NOTE #1	Drawing Revised	sk 5/18/87
3	8	Q-008D	SEE NOTE #1	Drawing Revised	sk 5/18/87
4	14-40	Q-014D THRU Q-040D	SUGGEST MAKING A NOTE ON THESE DRAWINGS INDICATING TRACK ALIGNMENT HAS NOT BEEN SET PAST WILSHIRE/ALVARADO.	See note #2 Q-007	sk 5/18/87
5	66	Q-066D	SUGGEST VERIFYING ACCESS TO THE ATO EQUIPMENT RACKS LOCATED ADJACENT TO THE FIRST COLUMN NEXT TO THE BATTERY ROOM. THERE DOES NOT SEEM TO BE SUFFICIENT CLEARANCE TO MAINTAIN EQUIPMENT NEXT TO COLUMN.		



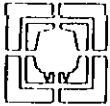
**DESIGN REVIEW COMMENTS**

REVIEWER T.V. TANKE FILE NO. \_\_\_\_\_ ORGANIZATION SYSTEMS

LEGAL % SUBMITTAL FOR A620 - ATC

REF. NO.	PAGE NO.	DRAWING NO./ SPEC. SECTION	COMMENTS	RESPONSE	ACTION
6	69	Q-069	THIS DRAWING SHOWS EQUIPMENT RACKS FOR COMMUNICATIONS (NIC). ALTHOUGH NOT IN THE ATC CONTRACT THE LOCATION OF THE COMMUNICATIONS RACKS BLOCKS THE CAL OSHA REQUIRED 24" WALKWAY AROUND THE RACKS. PLEASE COORDINATE ATC WITH COMMUNICATIONS EQUIPMENT RACKS TO PROVIDE 24" CLEAR WALKING AREA.		<u>24" MIN</u> <u>10-25-87</u>
7	115	Q-115C	THIS DRAWING SHOWS A DETAIL FOR WALL MOUNTED SIGNALS AND ACCESS LADDER. NOTE *7 INDICATES THE SIGNAL MUST BE ADJUSTED FOR WALKWAY AND VEHICLE CLEARANCE. THE DETAIL HOWEVER SHOWS THE LADDER MOUNTED 7" FROM THE WALL. IF THE LADDER IS LOCATED ON A WALKWAY IT CANNOT <del>RECEIVE</del> <sup>PROTRUDE</sup> 7" INTO THE WALKWAY AREA. SUGGEST REVISING NOTE ACCORDINGLY. PERHAPS A NICHE IN THE WALL FOR THE LADDER WILL SOLVE THE PROBLEM. PLEASE COORDINATE WITH TUNNEL & STRUCTURES.		

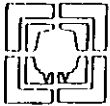




**DESIGN REVIEW COMMENTS**

REVIEWER M. INGRAM FILE NO. S440A620X082 ORGANIZATION MRTC S, A 9 S  
L/T % SUBMITTAL FOR A620 ATC

REF. NO.	PAGE NO.	DRAWING NO./ SPEC. SECTION	COMMENTS	RESPONSE	ACTION
1	SC-4	5.1	CORRECT typo in last line - "includes" s.b. "includes".	Section rewritten	ok RA 8-18-88
2	TP-17-2	Table TP-17-1	Suggest adding to CDRL the procedure for handling & installation of fiber optic cables called out in Spec. Cond. Art. 10.D.	Revised	see CDRL 1011 RA 8-18-88
3	TOC iii	12.13	34.5 KV should be changed to 35 KV to provide consistency with terminology used in TP Sections 1, 12, 13 & 18.	Revised	ok RA 8-18-88
4	TP-1-3	1.4.2-B	Verify consistency with Operating Plan with respect to CROSS-OVERS. System Operating Plan dated October 1986 indicates three double CROSS-OVERS - SEE page 2-3/1 <sup>st</sup> para. and Exhibit 2-2.	Revised	ok RA 8-18-88 See Article 1.3.2.B
5	TP-9-2	9.1.2	ANSI C37.46 - INSERT the word "POWER" BETWEEN "for" AND "FUSES".	Revised	ok RA 8-18-88



**DESIGN REVIEW COMMENTS**

REVIEWER M. Ingram FILE NO. S440A620X082 ORGANIZATION MRTC S.A.S  
41 % SUBMITTAL FOR A620 ATC

REF. NO.	PAGE NO.	DRAWING NO./ SPEC. SECTION	COMMENTS	RESPONSE	ACTION
6	TP-11-1	11.1.1	ANSI C80.4 APPARENTLY HAS BEEN DISCONTINUED. VERIFY AND CITE APPROPRIATE NEW REFERENCE.	Revised	OK PA 8-18-88
7	TP-11-1	11.1.1	ASTM A123 - CORRECT TITLE IS "SPEC. FOR ZINC (HOT-DIP GALVANIZED) COATINGS ON IRON AND STEEL PRODUCTS".	Revised	OK PA 8-18-88
8	TP-11-2	11.1.1	ASTM D149, D570, D638, D695 & D2240 - FOR CONSISTENCY & COMPLETENESS INSERT "TEST METHOD FOR ..." IN FRONT OF THE TITLE OF EACH STANDARD.	Revised	OK PA 8-18-88
9	TP-11-2	11.1.1	ASTM D790 - INSERT "UNREINFORCED AND REINFORCED" BETWEEN "OF" AND "PLASTICS".	Revised	OK PA 8-18-88
10	TP-11-2	11.1.1	ASTM D149 - COMPLETE TITLE BY ADDING "AT COMMERCIAL POWER FREQUENCIES" AFTER "INSULATING MATERIALS".	Revised	OK PA 8-18-88
11	FP-11-4	11.1.1	NEMA ST20 APPARENTLY HAS BEEN DISCONTINUED. VERIFY AND CITE APPROPRIATE NEW REFERENCE.		



S.C.R.T.D. LIBRARY



METRO RAIL PROJECT  
REVIEW / COMMENT SHEET

Reviewer E. POLLAN File No. \_\_\_\_\_ Date 5/29 1987

Dept. / Section TSD/SEA Submittal No. and/or Date May 1987 Sheet 1 of 2

Design Review / Submittal Title Automatic Train Control System - May 1987 legal/tech

REF NO.	PAGE NO.	DRAWING NO. / DOCUMENT SECT	COMMENT	RESPONSE / ACTION
1		Contract Dwg Sheet No 13	Provide two track plans for Wilshire (Anacardo - one for MOS-1 and one for extended system. It looks as if Sheet No. 13 (Dwg Q-013D) is for MOS-1. Need to indicate to contractor how ATC is to change when line is extended.	Not necessary for this contract
2	TP 6-15	6.4.6 F	Call-on Circuits: 1st sentence says to <del>also</del> incorporate "where indicated." However, the call-on signals are not shown on the contract dwgs (see Sheet No. 8, Dwg Q-008D). Refer to Operational Criteria established for A130 Realignment by O&M Committee (see March 18 '87 memo from Rhine to Crandley). <del>Provide</del> Add call-on signals to Dwg Q-008D where they are called for in 3/18 memo.	See Drawing Q-043 which indicates call on signals  all per 5-18-88







METRO RAIL PROJECT  
REVIEW / COMMENT SHEET

Reviewer H.F. Stacey File No. A620 Date 5/27 1987  
 Dept. / Section S&SA Submittal No. and/or Date \_\_\_\_\_ Sheet 1 of 5  
 Design Review / Submittal Title Automatic Train Control, Legal/Teach Sub

REF NO.	PAGE NO.	DRAWING NO. / DOCUMENT SECT	COMMENT	RESPONSE / ACTION
1	TP-3 -9	3.3.3.D	<u>Precipitation: Shouldn't 2nd sentence read: "Meteorological records indicate storms occasionally bring up to 6.1 in. of rain. <del>fall</del> within a 24 hr. period.</u>	Agree with up to and period only RH 5-18-88 ✓
2	TP-3 -9	3.3.3 G	<u>Temperature Variation: Shouldn't sentence <del>read</del> read "---- varying between 60°F and 100°F ambient within ----"</u>	Agree RH 8-18-88 ✓
3	TP-3 -9	3.3.3	<u>First Paragraph Paragraph is confusing as to what following info applies to Room Equipment as stated in the paragraph last sentence. Sentence before states following info is for other than room equipment. Then stated temperatures</u>	Will clarify Paragraph rewritten RH 3-19-88 ✓

are for both outside and in room  
 150°F outside seems high for CA area. Also  
 Delete word "ONLY"



METRO RAIL PROJECT  
REVIEW / COMMENT SHEET

Reviewer H.E. Stracy File No. A620 Date 5/27 1987  
 Dept. / Section S&SA Submittal No. and/or Date \_\_\_\_\_ Sheet 2 of 5  
 Design Review / Submittal Title Automatic Train Control, Lynd/Stock Sub

REF NO.	PAGE NO.	DRAWING NO. / DOCUMENT SECT	COMMENT	RESPONSE / ACTION
4	TP-3 -9	3.3.3.A	<p>If this "A" section applies to outdoor environment it should include reference to "direct sunlight" such as: <u>which is compatible with section F</u></p> <p>--- Ambient Temperature between 25°F and 150°F, <u>in</u> <del>with</del> <u>direct sunlight</u> with 85 percent RH. Note: Ambient Temperatures (Environmental) are taken in <u>shade</u>. Has L.A. recorded a 150°F ambient (shade) Temp? If "A" is for <u>room</u> Temp. then we need to add a section on Temperatures for outdoor <u>wayside equipment</u> standing in <u>direct sunlight</u>, but is realistic with section F "Solar Radiation".</p>	<p>25 to 150 ambient</p>
5	TP-3 -17	3.4.1 G	<p>Shouldn't the ATP at Union Station also allow 6 car trains to complete station stops on either track with trains waiting to <del>enter</del> in next block to enter reverse service? This is similar to a street train situation.</p>	<p>Trains are not stored in next block</p>



METRO RAIL PROJECT  
REVIEW / COMMENT SHEET

Reviewer H.E. Storey File No. A620 Date 5/27 1987

Dept. / Section SSSA Submittal No. and/or Date \_\_\_\_\_ Sheet 3 of 5

Design Review / Submittal Title Automatic Train Control, Legl/Teck Sub

REF NO.	PAGE NO.	DRAWING NO. / DOCUMENT SECT	COMMENT	RESPONSE / ACTION
6	TP-3 -24	3.4.2.F (4)	<p><u>Locate Block Boundary</u></p> <p>Last sentence is within itself contradictory. If boundary cannot be any closer to station platform --</p> <p>This refers some distance before entry to station platform area. However, to then say <u>45 m/hr minus 50 ft</u> refers to <u>50 feet inside platform area</u>. This should read <u>no closer than 45 m/hr plus 50 feet</u> if we wish to slow train to 45 mph before platform entry. If not the word: <u>any closer</u> should be changed to <u>no further within platform area than</u></p>	<p>minus 50' would still be well before platform.</p> <p>see RTD 8-18-88</p>
7	TP-3 -26	3.4.2.H. (1)	<p>The use of the word "safety" is nice, but what safety criteria does it actually refer to? Is it that criteria per the ATP spec section? Safety is intended throughout the entire "Criteria" to "Requirements" specified herein.</p> <p>Dist. J also has Fire/Life Safety Criteria which implies other restrictions.</p>	<p>ATP Safety</p> <p>Will change "Criteria" to "Requirements" specified herein</p> <p>see RTD 8-18-88</p>

METRO RAIL PROJECT  
REVIEW / COMMENT SHEET



Reviewer A.E. Stray File No. A620 Date 5/27 1987  
 Dept. / Section SASA Submittal No. and/or Date \_\_\_\_\_ Sheet 4 of \_\_\_\_\_  
 Design Review / Submittal Title Automatic Train Control, Legal Tech Sub

REF NO.	PAGE NO.	DRAWING NO. / DOCUMENT SECT	COMMENT	RESPONSE / ACTION
8	TPA-3 -27	3.4.2. H .4B	<p>We should state that the definition of <u>closing-in</u> is per <u>code</u> order #127 Appendix TPA-2 to preclude misinterpretation with words <u>closing-up</u>.</p> <p>However, the paragraph reference to "home-signals" and occupied station platforms makes the general idea sound like we mean (per code definition) <u>closing-up</u>.</p>	<p>Closing up                  • is impossible w/ ATP signal limit.                  Correct as is.</p>



METRO RAIL PROJECT  
REVIEW / COMMENT SHEET

Reviewer A.E. Strong File No. A 620 Date 5/27 1987

Dept. / Section SFSA Submittal No. and/or Date \_\_\_\_\_ Sheet 5 of 5

Design Review / Submittal Title Automatic Train Control, Layal Street Sub

REF NO.	PAGE NO.	DRAWING NO. / DOCUMENT SECT	COMMENT	RESPONSE / ACTION
9	TP-13 -8	13.5.3 <u>(A)</u>	This section states to run tests for temp range of 25° F to 20° F which is different than 25° F to 15° requirement stated on page TP-3-9 (3.33A)	Not Necessary to test for design max
10	TP-13 2	13.1.3	<u>Test Manager</u> If this Manager is a Contractor employee he will be unable to perform the coordination efforts required. This section should be rewritten and denote that the District has a Test Plan which includes a District Test Engineer who coordinates all testing.	Contractor employee will be able to coordinate and arrange as specified through the District
11	TP-13 -12	13.6.5	Wayside <del>Test</del> Equipment Tests should include one for testing the Solar Radiation requirement of section 3.33 F page TP-3-10	Not Necessary





# METRO RAIL PROJECT REVIEW / COMMENT SHEET

Reviewer L. Boyler File No. \_\_\_\_\_ Date 5-27 1987

Dept. / Section S-5A Submittal No. and/or Date \_\_\_\_\_ Sheet 1 of 1

Design Review / Submittal Title A 620 AUTOMATIC TRAIN CONTROL Legal/Tech

REF NO.	PAGE NO.	DRAWING NO. / DOCUMENT SECT	COMMENT	RESPONSE / ACTION
1	TR-11-C	FARR 15.3.2 B	2000 hrs MTBF FOR INTERLOCKING TRAIN CONTROL IS AS STATED BEFORE, EXCESSIVELY FREQUENT S/B 8000 MINIMUM! CURRENTLY SYSTEM LOSS WOULD BE INTOLERABLE	2000 hrs already exceeds industry performance data





# MEMORANDUM

---

January 12, 1984

TO : P. M. Burgess  
FROM : D. J. Coury *DJC*  
SUBJECT: SAFE BRAKING DISTANCE MODELS  
FILE : W542A620

---

The attached table was prepared in an attempt to compare safe braking distance models used by other properties. This was done as part of the action item pertaining to safe braking distance that resulted from the Automatic Train Control Design Review meeting. The table compares the various worst case models by showing whether or not they include some of the important features that a typical model might have. The table also gives the brake rate that is used once full braking is established. The distances shown have been calculated as though every property has a 40 mph ATP speed limit for the sake of comparison.

A fail-safe power cut or service brake is assumed if these functions occur when called for without the intervention of the brake assurance function. It is interesting to note that Baltimore and Miami have the same carborne equipment, but different models. The BART Model indicates partial brake assurance which means that a derated value of .9 mphps is used for a given period of time before further action is taken to achieve 1.2 mphps. This represents a partial failure of the service brakes. The brake rate given for BART is for exposed track. BART uses 1.6 mphps for covered track. This table is only a generalized comparison but it is a step towards defining our own worst case model.

DJC/llm  
attachment

cc: C. R. Fisher  
M. S. Patel  
DCC(2)

	Acceleration	Fail Safe power cut	Fail Safe Service Brake	Brake Assurance	Brake Rate (MPHPS)	Stopping Distances (40 MPH)
BART	yes	yes	yes	partial	1.2	1230'
WMATA	yes	yes	yes	NO	1.65 (0-50) 1.24 (70)	1250'
MARTA	yes	yes	yes	NO	1.5	1240'
Boston (1980)	yes	yes	NO	yes	1.75	1450'
Baltimore	yes	yes	NO	yes	1.5	1450'
Miami	yes	NO	NO	yes	1.5	1690'

TABLE OF WORST CASE TRAIN MODELS



# MEMORANDUM

December 18, 1984

TO : P. M. Burgess  
FROM : D. J. Coury *DJC*  
SUBJECT : SAFE BRAKING DISTANCE MODEL  
FILE : W542A620

This memo concerns the current status of the ATC specification as it applies to safe braking distance (SBD). The worst case or SBD model currently specified will result in distances which are neither too conservative nor too risky. The attached graph compares the model with two others which represent the upper and lower bounds of industry practice. The model is however inconsistent and does not accurately represent the equipment specified. But if these inconsistencies were corrected, the resultant distances would remain approximately the same.

The document submitted to the operations committee by Booz Allen & Hamilton entitled "Operational Impacts of the Safe Braking Distance Model", points out the large difference between the safe braking distance and the nominal braking distance. This difference must exist for safety and does not impose unreasonable constraints on operation. MARTA, for example, has a design headway of 83 seconds. The difference cannot be as low as 50 feet to allow automatic operation into a terminal such as Wilshire/Alvarado unless some type of retarder is used along with a certain amount of risk the District must accept for that particular block.

The SBD model as currently specified has certain inconsistencies that should be corrected so that it more accurately reflects a worst case train:

- A. The Booz Allen & Hamilton paper recognizes that something can be done about the acceleration during propulsion runaway, yet the paper does not address the fact that an overspeed condition will result in the opening of the BRK mode change trainline. The equipment is specified to perform this function, but the model reflects no benefit from it.

An overspeed condition occurs whenever there is a reduction in ATP speed limit in MTO or ATO mode. This is a common and frequent occurrence. The response to an overspeed condition is the de-energization of

the vital underspeed relay. Contacts of this relay are shown on the ATC Contract Drawing Q-100. As this drawing shows and as specified in Section 16 of the ATC Specification, the BRK mode change trainline is opened by these contacts in a vital manner. A back contact of the underspeed relay applies energy to the P signal generator in a non-vital manner to cause the fixed service brake rate to be applied.

The SBD model should not include 100% acceleration in propulsion runaway because once the BRK trainline is opened, multiple failures would be required to achieve it.

- B. The brake assurance reaction time is excessive in light of the fact that the jerk limit rate is specified as 2.75 mphpsps. The reaction time is preset to a value that will allow service brakes to build up to the level to which the accelerometer is set (1.6 mphps). With a jerk limit rate of 2.75 mphpsps, minimum reaction time would be the sum of the following times:

Remove tractive effort :  $3 \text{ mphps} / 2.75 \text{ mphpsps} = 1.09 \text{ sec}$   
Transition to brake : .5 sec  
Apply service brakes :  $1.6 \text{ mphps} / 2.75 \text{ mphpsps} = .58 \text{ sec}$

Therefore, the brake assurance reaction time must be greater than 2.17 seconds. The current SBD model uses 3.0 seconds. Since this time should be minimized to reduce propulsion runaway, a preset time of 2.5 seconds is recommended.

- C. As the Booz Allen & Hamilton paper points out, the brake rate used by the SBD model should be equal to or less than the brake assurance accelerometer setting which is specified as 1.6 mphps. The SBD model specified uses a brake rate of 1.9 mphps. It is conceivable for a train to have a delayed service brake that just barely satisfies brake assurance, but exceeds the safe braking distance as specified.

Since the specified rate of 1.6 mphps is based on a possible minimum rate when considering low adhesion, the recommended rate for the SBD model is 1.6 mphps. This rate is more in line with industry practice.

MEMORANDUM TO: P. M. Burgess  
December 18, 1984  
Page Three

Summary:

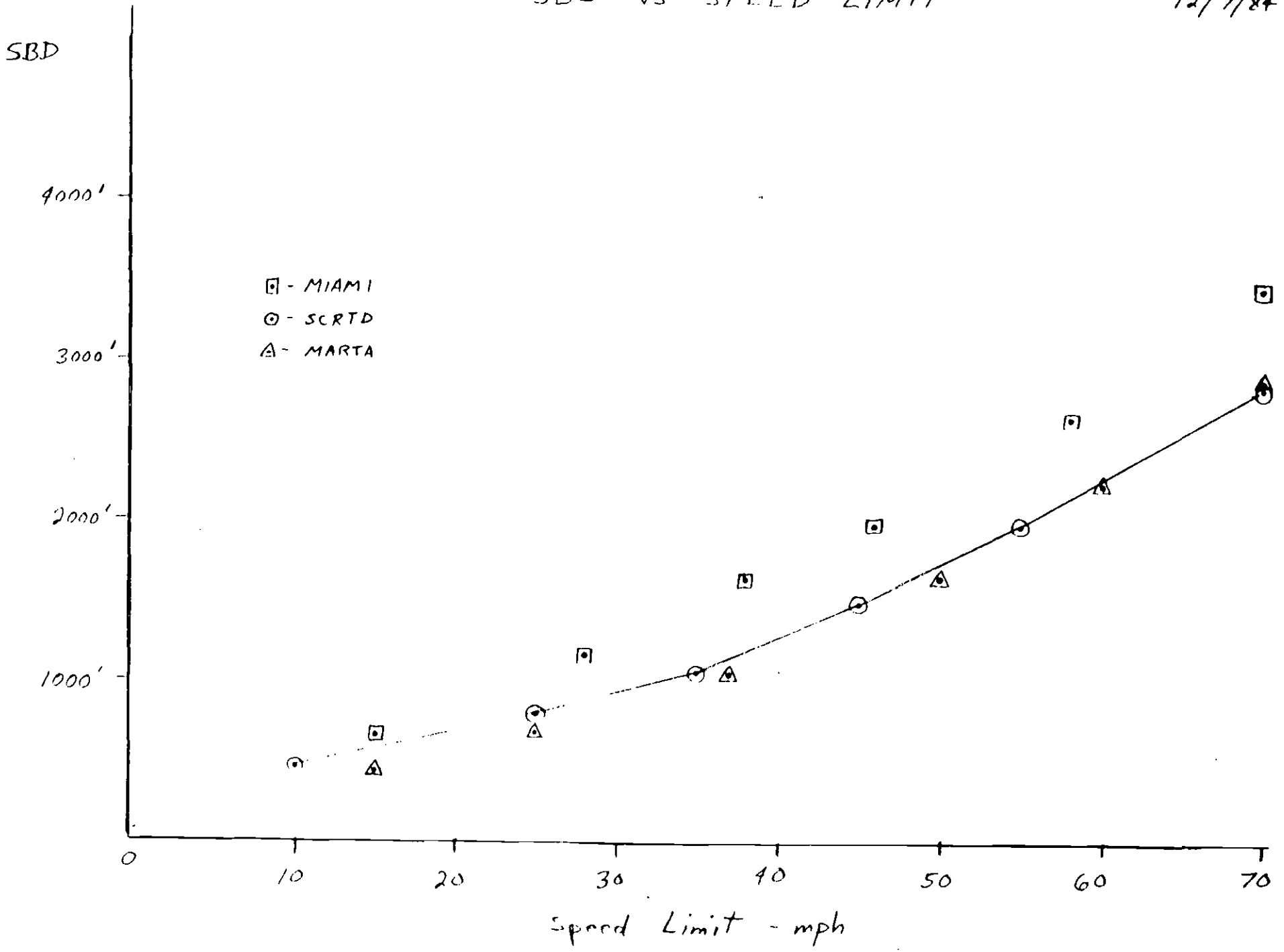
A combination of the recommendations in A, B, and C above will result in approximately the same distances; however, it will increase the slope of the attached graph. Low speed distances would most likely decrease. The SBD model would be more consistent and would better reflect the equipment specified.

DJC/es  
attachment

cc: A. M. Dale  
W. L. Lucci  
M. S. Patel  
R. S. Rodda  
DCC(2)

SBD vs SPEED LIMIT

DJC  
12/7/84







# MEMORANDUM

---

August 15, 1985

TO : Distribution  
FROM : A. M. Dale *AMD*  
SUBJECT : MEETING AGENDA -- PREFINAL DESIGN REVIEW  
CONTRACT A620 - AUTOMATIC TRAIN CONTROL  
FILE : W001A620  
A.9.1

---

DATE : August 23, 1985  
TIME : 9:00 A.M.  
PLACE : MRTC 7th Floor Conference Room

## MEETING AGENDA

Introductory Remarks..... W. J. Rhine  
Summary of Previous Action Items resolutions..... M. S. Patel  
Discussion of Item raised by Attendees.....M. Becher/M. Patel  
Summary of Assigned Action Items..... A. M. Dale

AMD/MSP/es





RECEIVED  
AUG 23 1985  
S.

# MINUTES OF MEETING

---

## AUTOMATIC TRAIN CONTROL PREFINAL DESIGN REVIEW

ATTENDEES: M. C. Becher, SCRTD A. M. Dale  
R. L. Beuermann, SCRTD C. R. Fisher  
L. Boyden, SCRTD M. Ingram  
I. Cohen, SCRTD W. L. Lucci  
F. R. Di Bugnara, SCRTD M. S. Patel  
L. S. Durrant, SCRTD F. Ruddy  
J. Sandberg, SCRTD R. Shirley  
B. Blakesley T. Tanke  
P. M. Burgess G. L. Elliott, BAH  
D. J. Coury W. Robertson, PDCD

PREPARED BY: W. L. Lucci *W. L. Lucci*

DATE & PLACE: August 23, 1985, 9:00AM, 7th Floor Conference Room

FILE: W539A620  
A.9.5

---

### AGENDA

The meeting agenda was distributed via memorandum dated August 15, 1985, copy attached.

### INTRODUCTORY REMARKS

Mr. Becher opened the design review meeting by briefly describing the status of overall ATC design at approximately 85 percent. He reported that design review comments had been discussed with reviewers individually and an in-progress edition of responses publication was distributed to them.

### PREVIOUS ACTION ITEM RESOLUTIONS

Train-to-Wayside Communications (TWC): Mr. Patel reported that all operational functions of the TWC subsystem were transferred from the ATC contract to the communications contract, thereby eliminating any hardware and interface requirements by the ATC contractor. Mr. Becher added that hereafter these functions are implemented as part of the two-way radio subsystem (TWR), wholly contained within the communications contract.

Slow Speed Orders: Mr. Patel reported that, per Mr. Rhine's memorandum dated July 22, 1985, the implementation of slow speed orders by zone from local control panel and RCC has been deleted.

ISSUES RAISED

Mr. Patel opened the meeting to attendees' concerns.

Station Run-Through Speed: Mr. Rutty questioned at-station passenger safety because of air-rush and flying debris with the specified run-through train speed of 45 miles per hour. He had raised the issue previously by comment to lower the specified speed.

Messrs. Durrant, Dale and Patel supported the current ATC specification with the following:

- o Speed is comparable to other operating properties;
- o Slower speed would increase train run times;
- o Implementing slower speed automatically with minimal operational impact would require extra track circuits and thus, extra cost.
- o Station run-through cannot be achieved automatically, therefore, it must be done with the train in manual mode. Train speed in manual mode will be governed by operating rule.

Mr. Tanke suggested an operating rule should be established to govern station run-through speed and the response to Mr. Rutty's comment should state that. All agreed, and the issue was closed. No change to the specification is required.

Vehicle-Mounted Trip Cock: F. Rutty proposed that a means to automatically check the height adjustment of the vehicle-mounted trip cock be incorporated into the ATC specifications. The design would require furnishing and installing of a wayside device by the ATC contractor.

Mr. Becher agreed that such a device may be desirable and further study of information to be provided by Mr. Rutty was in order. This item was assigned as a "business as usual" item.

Systems Assurance: Mr. Rutty observed that no definitive responses had been given to comments pertaining to systems assurance and management and support issues of the specifications.

Mr. Patel responded that a meeting was being planned to include appropriate personnel from SCRTD and MRTC to resolve the issues.

Mr. Dale suggested that date and time be set immediately. The meeting was set for Monday, August 26, 1985 at 9:00AM.

Vehicle Clearance: Mr. Tanke suggested that a statement be added to the response of a comment concerning wayside signal installation in the tunnel areas. The statement should confirm that clearance criteria will be met -- all agreed.

Materials in Tunnels: Mr. Tanke pointed out that the specification requires fiberglass materials for conduit and junction boxes, which do not meet fire/life safety criteria. He suggested that a meeting be set up to resolve if necessary.

Mr. Patel responded by stating the issue would be resolved per SCRTD direction.

Schedule: Mr. Sandberg inquired if the present schedule stands for work remaining on the ATC design package.

Mr. Dale responded affirmatively and that the final submittal date for the ATC package is September 30, 1985.

Action Items: No action items were assigned. The meeting adjourned at 9:40AM.

WLL/llm  
attachment

cc: DCC(2)





# MEMORANDUM

---

September 30, 1985

TO : DISTRIBUTION  
FROM : A. M. Dale *AMD*  
SUBJECT: FINAL DESIGN REVIEW -- AUTOMATIC TRAIN CONTROL  
CONTRACT A620  
FILE : W001A620  
A.9.1

---

Attached are the final specification and contract drawings for the subject contract. There have been no significant changes in the design since the prefinal submittal.

Prefinal design review comments have been incorporated into the documents. Any comments should be submitted to Mahesh Patel (with a copy to T. Cook, Systems Integration) no later than October 30, 1985.

*Patel*  
AMD/MSP/llm  
attachments

*Cross Reference  
Design Review Comments  
10-8-85 Ehu 10-24-85  
RM  
6-5-88*

TRAIN CONTROL (A620)

Design Review Distribution

MRTC

H. Chaliff \*  
H. Kivett \*  
G. Cofer \*  
A. Smithsuvan  
J. Valencia  
  
A. Dale  
N. Brown  
M. Burgess  
D. Coury  
C. Fisher  
B. Lucci  
D. Mohapatra (2 full)  
M. Patel (20)  
A. Sanderson  
  
T. Cook  
T. Tanke (1½/1 full) (2)  
B. Vance  
  
M. Kenney \*  
K. Garms/M. Orr  
  
K. Murthy (2)

\* w/o attachments

cc: DCC (2)  
Chron  
Subject  
Design Review Log

TSD

R. Murray  
J. Strosnider  
  
J. Crawley  
N. Tahir \*  
  
J. Christiansen  
B. Brown  
I. Cohen  
P. Schneider  
  
W. Rhine (full size)  
M. Becher (6)  
D. Gary  
J. Sandberg  
R. Wood (2½/2 full size)

OTHER

L. Elliott (Booz-Allen and Hamilton)  
M. Polacek (PDCD) (5)





Rolf Jensen & Associates, Inc.  
Fire Protection Engineers  
Building Code Consultants

RECEIVED  
OCT 18 1985  
D. C. C.

October 17, 1985

FEDERAL EXPRESS

Mr. Malcolm Ingram  
Metro Rail Transit Consultants  
548 South Spring Street, Eleventh Floor  
Los Angeles, California 90013

A620; AUTOMATIC TRAIN CONTROL  
100% DESIGN REVIEW

Malcolm:

Enclosed are our design review comments in regards to the subject review package. Please note that our five (5) 85% review comments of August 6, 1985 were not included in the document of Prefinal Design Review Comment responses.

Sincerely,

Christopher L. Vollman, P. E.

CLV:pkj - H3275 - Automatic Train Control

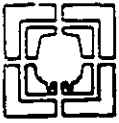
Enclosures

cc: Dan Bloomfield

Cross Reference  
Design Review comments  
Dated 10-10-85  
B.S.-98  
RM







Cross Ref:  
Section II  
Design Review Comments  
dated 10-29-85  
10-8-85  
10-24-85

# TRANSMITTAL

## REVIEW COMMENTS TRANSMITTAL

DATE: 11-4-85  
TO: Mahesh Patel  
FROM: J. N. BROWN *J.N. Brown*  
SUBJECT: 100% Design Review - A620 - Auto. Train Control  
FILE NO.: S400A620X082

In response to A. Dale's memo of 9-30-85 regarding the subject mentioned  
(Originator) (Date)  
above, attached are review comments by Safety, Assurance & Security  
(Department)

If you have any questions, please contact M. Ingram x 7134  
(Name & Extension)

JNB:MI

Attachments

cc:

(w/attachment)	w/o attachment)
T. Cook	DCC
J. Sandberg - RTD	Chron
R. Wood - RTD	Subj
A. Dale	File
M. Ingram	
DCC	

DOC (2)  
Chron  
Subject

See Section II  
Design Review  
Comments Dated  
10-29-85

*RMH*



Cross Reference  
Section II

RM 8-5-88

SCRTD AUTOMATIC TRAIN CONTROL SPECIFICATIONS  
FINAL REVIEW COMMENTS

<u>NO.</u>	<u>FIRM/REVIEWER</u>	<u>DRAWING NO./ SPEC. SECTION</u>	<u>PAGE</u>	<u>COMMENT</u>	<u>RESPONSE</u>	<u>ACTION</u>
1	PDCD	General Provisions		Comments on Systems Contract General Provisions were submitted by PDCD letter CM-MR-965 of October 17, 1985, and are not repeated here.  Constructibility review was confined to verification of incorporation of responses to the 85% review comments. Those responses which have not been accomplished are listed below by reference to the Sequence Number in the MRTC Paragraph Order Document of August 16, 1985; and are referenced to the new page and paragraph or drawing number. The actual comments and responses are not repeated here.	Noted.  As per comments listed.	None.  As per comments listed.
2	Bo Hansson	1.3.4.B	TP-1-2	Change "Traction Power Cabling" to "34.5 kV Power Cables."	Agree - for consistency.	Change wording in Specifications Article 1.3.4.B to "34.5 kV Power Cables."
3	F. Ruty	3.1.5	TP-3-2	Contractor-furnished equipment includes also speed governors mounted on truck.	No, speed sensors are DFE by vehicle contractor.	None.
4	F. Ruty	3.3.2.K	TP-3-7	(Ruty comment #45 on Prefinal.) Safety wiring should be in separate ducts and in distinctive color.	Isolation of safety wiring precautions taken, EMI considerations stated, color coding may be done on vehicle.	None.
✓5	Harv Hunt	3.3.2.L	TP-3-8	Change "Reference: Article 15.2" to "Reference: Article 15.3" incorrect reference.	Agree. <i>HRH</i>	Correct reference to: "Article 15.3" in Specification Article 3.3.2.L.
6	F. Ruty	3.3.3.A	TP-3-8	Temperature does not fall to 25°F and its design for this unrealistic value adds cost.	Considering climatic variations in Southern CA. and design tolerances and margins, we feel that 25°F is very reasonable.	None.

<u>NO.</u>	<u>FIRM/REVIEWER</u>	<u>DRAWING NO. / SPEC. SECTION</u>	<u>PAGE</u>	<u>COMMENT</u>	<u>RESPONSE</u>	<u>ACTION</u>
7	F. Rutty	3.3.3.B	TP-3-8	Are gases NO <sub>x</sub> & SO <sub>x</sub> intended as sums of nitrous and sulphur dioxides/monoxides? Clarify.	Yes, no clarification necessary.	None.
8	F. Rutty	3.4.1.C	TP-3-14	Headway of 90 s (3.4.1) is design target. Will 8-mile/hr speed limit at No. Hollywood prevent 90 s being achieved?	No, tail tracks at No. Hollywood are assumed unoccupied for design headway as stated in Article 3.4.2.C.	None.
9	F. Rutty	3.4.2.A.2.b	TP-3-16	Acceleration may exceed 110% if all* variables are favorable. Train performance should be calculated for these conditions. * Line voltage, wheel diameter, train weights motor characteristic.	These considerations are intrinsically accounted for in the derivation of 110% acceleration parameter.	None.
10	F. Rutty	3.4.2.D.2	TP-3-21	TYPO "...crossovers IS as follows:"	Agree.	Add "is" to Specifications Article 3.4.2.D.2
11	F. Rutty	General		Each interlocking must be capable of being locally manually controlled for loss of control lines and testing.	Agree, each interlocking is; as stated in Articles 4.4 and 7.2.1.H.	None.
12	F. Rutty	3.3.9		Test equipment must have a battery condition indicator.	Test equipment is not being specified here; however, will specify with test equipment.	Incorporate into Article 16.6.3.A.
123	J.C. Iazzetta	Table TP-4-4	TP-4-19	Table shows flammability requirements for cross-linked polyolefin as "MIL-W-81044" What is this? FS Criteria 2.2.4.1.4, 2.3.3.4 & 2.4-3.7.3(B) require all wire and cable for vital ATC, power circuits for emergency equipment, and vehicle power cables to pass IEEE-383 Flame Test and have no short circuit for 5 minutes. This should have so indicated in the table for cross-linked polyolefin.	This is referring to the flammability requirements per the military specifications. <i>all</i>	Change to "Pass", referring to IEEE-383 in Table 4-4.
14	J.C. Iazzetta	Table TP-4-7	TP-4-24	Flammability should pass IEEE-383 and have no short circuit for 5 minutes; FLS Criteria 2.2-4.1.4, 2.3.3.4 & 2.4.3.7.3(B)	Agree, is required per Article 4.6. <i>all</i>	Refer to IEEE 383 requirements in Table 4-7

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✓ 15	J.C. Iazzetta	4.7	TP-4-26	FLS Criteria 2.5.3.1. requires ATC bungalows to be provided with automatic sprinklers. Add new section 4.7.5 to so indicate.	ATC bungalows not structures as defined in FLS Criteria, therefore, sprinklers are not required.	None.
16	James Loo	Specifications	TP-4-27	All fluorescent light in the prewired ATC equipment bungalow shall have radio frequency interference shielding for its lens and the ballast to be equipped with radio interference filter and 3rd harmonic suppressor. Lenses shall be clear lens with radio frequency suppressing grid.	This level of detail not necessary. ATC supplier also furnishes lighting and is responsible for compatibility.	None.
17	W. Robertson	5.2.1.A.1	TP-5-5	Sequence No. 83.	Requirement for AAR conformity is sufficient.	None.
✓ 18	M. Ingram	5.2.1.A.6	TP-5-3	Last sentence: Verify reference to Article 2.5.	Should be Article 3.5. <i>OK JVA</i>	Correct to Article 3.5 in Specifications Article 5.2.1.A.6.
19	Bo Hansson	5.4.3	TP-5-7	Two 750 MCM cables for track connection does not agree with drawing Q-118B, which shows two 500 MCM.	Should be two 500 MCM cables, or two 1,000 MCM cables at substation returns and insulated joints.	Correct drawing Q-118B to specify proper cables, change specification Articles 5.4.3, 5.6.2, 11.7.2.B, and 12.3.1.C.1.
		5.6.1		Exothermic welding may not be available for 750 MCM.	Erico Products, Inc. has indicated that exothermic weldings is available for these cables.	None.
		12.3.1.C.1		Check that two 500 MCM Have sufficient ampacity.	Checked per ATC Action Items 2.2 and 3.4.	None.
20	W. Robertson	6.4.5.D.1.h	TP-6-13	Sequence No. 101.	Timer relay contacts added to "H" circuits, Drawing Q-056, REV.B per audit of prefinal comments.	None.
21	W. Robertson	6.5.1	TP-6-14	Sequence No. 103.	Statements are compatible.	None.
22	W. Robertson	7.3.1.D.11	TP-7-6	Sequence No. 109.	That level of detail not necessary on typical drawing.	None.

<u>NO.</u>	<u>FIRM/REVIEWER</u>	<u>DRAWING NO. / SPEC. SECTION</u>	<u>PAGE</u>	<u>COMMENT</u>	<u>RESPONSE</u>	<u>ACTION</u>
23	M. Ingram	8.3.1.A	TP-8-5	Verify reference to Article 3.4 for failsafe requirements; possibly should be Article 3.3.	Agree. <i>etc</i>	Change reference to Article 3.3 in Specifications Article 8.3.1.A.
24	J.C. Iazetta	9.2.2.A	TP-9-2	FLS Criteria 2-5-3.1 requires ATC bungalows to be provided with automatic sprinklers.	ATC bungalows not structures, as defined in FLS criteria; therefore sprinklers are not required.	None.
25	W.E. Price	9.6.3	TP-9-11	Indications should be specified for an MTBF of 1,000,000 hrs. This value represents the state-of-the-art for console indicators. Currently does not agree with specified MTBF for control panel (P. TP-15-6).	Completed per audit of prefinal comments.	None.
26	W. Robertson	General	TP-10	Sequence No. 157.	Agreed to incorporate statements to interface section identifying contractor's responsibility for installing District-furnished cables, per meeting of 07/23/86.	Add Articles 10.5.3 and 10.8.3 to identify contractor's responsibility to install District-furnished cables.
27	W. Robertson	10.3.1.G.4	TP-10-5	Sequence No. 150.	Quantity will be specified in Bid Forms as a result of proposal process requirement PR 2.0.G.	None.
28	M. Ingram	10.3.2.F.1	TP-10-7	"...description of ATC vehicle equipment signals..." required to be furnished, should be added to CDRL.	Agree.	Add CDRL requirement to Article 10.3.2.F.1 and to CDRL list.
29	Bo Hansson	10.5.2.B.1	TP-10-9	Correct sentence.	Agree.	Correct sentence in Article 10.5.2.B.1 for clarity.
30	W. Robertson	10.5.2.B.1	TP-10-9	Sequence No. 151.	Locations are shown on double line track plans; details will be per reference drawings.	None.
31	W. Robertson	10.8.2.B	TP-10-12	Sequence No. 154.	Agreed to show locations of SCADA interface racks on ATC&C Room layouts per meeting of 07/23/86.	"Business as usual" item - awaiting communications input.

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32	W. Robertson	11.4.3	TP-11-13	Sequence No. 159.	Requirements are compatible; all circuit boards shall be keyed; however, only relays affecting safety need to be keyed.	None.
<i>B3</i>	J.C. Iazzetta	Table TP-11-2	TP-11- <del>24</del> <sup>33</sup>	"Vertical Flame Test ICEA S-66-524" should read "Flame Test IEEE-383" and should indicate "Pass and have no short circuits for 5 minutes."	Agree. <i>ok RIT</i>	Add IEEE-383 requirements to Table 11-2.
<i>B4</i>	M. Ingram	Table TP-11-2	TP-11- <del>24</del> <sup>33</sup>	Notation explanation at bottom of page.	Two asterisks should precede qualification tests. <i>ok RIT</i>	Correct to show two asterisks with qualification tests of Table 11-2.
<i>B5</i>	M. Ingram	Table TP-11-3	TP-11-24	Qualification tests should have two asterisks.	Agree.	Correct to show two asterisks with qualification tests of Table 11-3.
<i>B6</i>	J.C. Iazzetta	Table TP-11-3	TP-11-25	Item #9 - Smoke Generation - FlS Criteria Stations 2.4.2.3 & 2.3.3.1.1. Require a max. of 200 at 4 min. point for both flaming and nonflaming mode and not 325 as shown in Table.	These requirements refer to cover-boards and vehicle materials. Electrical installations are required to meet NEC standards, as specified. Requirements for embedded conduit or enclosed raceways eliminates need for stringent flaming and smoking specifications.	None.
37	A. Smithsuvan	Q-007A-013B & 12.3.1	DWG	Some impedance bonds do not have coordinates and it is assumed that they will be designed by ATC Contractor (at special trackwork and direct fixations). After 2 years of design efforts, why do we still want the Contractor to decide at the locations of impedance bonds, and how can we control the cost?	Impedance bond locations are ultimately a result of the Contractor's block design as approved by the District.	None.
38	W. Robertson	12.3.2.A	TP-12-4	Sequence No. 162.	Determine mechanism and requirements comprising contractor's acceptance of District-installed insulated joints, per meeting of 07/23/86.	Will be completed per Action Item No. 12.1.



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39	W. Robertson	12.3.3.B	TP-12-5	Sequence No. 163.	Not necessary; standard design procedure will be to use reference drawings. Meeting of 07/23/86 revealed inconsistent terminology between "junction device" and "connector" of Article 10.5.2.B.1.	Change "connectors" to "junction devices" in Article 10.5.2.B.1.
40	F. Ruddy	12.7	TP-12-14	(Ruddy comment #166 on Prefinal.) Mechanism for testing tripcock positioning should be provided, wayside, since tripcock is "ultimate" safety device at terminals. Cost is minimal. Mechanism is in form of a "gate"; design info previously supplied to ATC design staff.	Comment withdrawn.	None.
41	A. Smithsuvan	12.10.5 & Section 13	TP-12-12	We will have responsibility problems between Contract A620 and A631, A640 since there are no test requirements for owner-furnished cables. By the time contract A631 & A640 start testing, the complete system A620 has already left the job site and payment has been received. A change order may have to be issued to A640 and to A631 to correct the problems, if any, during the final acceptance test.	ATC Contractor will be responsible for testing DFE cables he installs.	Add testing requirement to Work Scope in Article 1.3.4.B. Add detailed test requirements to Article 13.7.2.F.
42	A. Smithsuvan	12.10.5.B.3	TP-12-13	I think we are inviting problems if cables are not tagged properly for A631 & A640 contracts to identify and terminate.	Most cables will be pre-tagged; those not can easily be identified by color or physical positioning.	None.
43	A. Smithsuvan	12.10.5.B.5	TP-12-13	Raceways for communications cables (including fiber optic) were designed based on maximum pull of 3-90° bend per agreement 2 years ago. Many portions will have more than 1-90° bend, as C. Cole specified. Revise this requirement.	There are no 3-90° bends involved in a comm. cable pull. ATC specification will only provide pull tension criteria.	Delete bend criteria in Article 12.10.5.B.5.
✓44	M. Ingram	13.4.1	TP-13-5	The interim test reports required to be submitted should be added to CDRL.	Agree.	Add CDRL to Article 13.4.1 and to CDRL list.
45	W. Robertson	13.7.2.H.3	TP-13-17	Sequence No. 177.	No conflict exists.	None.

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46	W. Robertson	13.7.2.M	TP-13-20	Sequence No. 178.	These are design parameters, not appropriate for these tests. Pertinent Test Criteria is defined in Article 13.7.2.M and will be proven during qualification testing.	None.
47	M. Ingram	13.11	TP-13-27	Need to indicate CDRL item, to be in concert with CDRL Item No. 63.	Agree.	Add CDRL requirement to Article 13.11.
48	M. Ingram	15.1.8	TP-15-4	To be complete and consistent, add "Quality Assurance Program" to the sub-article heading and the first sentence of 15.1.8.	Agree.	Add "Quality Assurance Program" to heading and first sentence of Article 15.1.8.
49	H. Hunt	15.2.2.A.1	TP-15-5	Change "System Hazard Analysis" to "Interface Hazard Analysis" to conform to SCRTRD 5-001.	Will comply.	<i>all RH 6-5-88</i> Change "System Hazard Analysis" to "Interface Hazard Analysis" in Article 15.2.2.A.1.
50	W.E. Price	15.3.2.B	TP-15-6	The value specified for the wayside signal is irresponsibly low. Signal lamps for BRRTS were predicted at 0.027 failures per million hours. Train stop signalling for MARTA was predicted at 70,000 hrs between failures.	Agree.	Revise wayside signal MTBF in Article 15.3.2.B to recommended value.
51	H. Hunt	15.4.4.G 13.12.1	TP-15-10 TP-13-30	Rewrite as follows: "Detailed Test Procedures using MIL-STD 471A as a guide." MIL-STD 471A establishes the selection process (random) and helps ensure an adequate yet suitable demo test.	Will comply.	<i>all RH 6-5-88</i> Refer to MIL-STD 471A in Article 15.4.4.G.
52	H. Hunt	15.4	TP-15-10	Add paragraph "15.4.6 <u>Interchangeability-Accessibility</u> "  A. Parts, components, and assemblies performing like functions shall be physically and functionally interchangeable. Those which are not functionally interchangeable shall not be physically interchangeable.  B. Accessibility to system elements shall comply with SCRTRD Design Criteria and Standards.  These are critical to system maintainability.	Will comply with "A" in Section 3; "B" withdrawn.	Add as Article 3.3.7.A.  <i>all RH 6-5-88</i>

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53	H. Hunt	15.4	TP-15-10	<p>Add Paragraph 15.4.6.</p> <p>B. Accessibility to system elements shall be provided by using the following techniques:</p> <ol style="list-style-type: none"> <li>1. Panels and openings shall be of sufficient size, quantity and placement to permit ready access from a normal or serviceable work area.</li> <li>2. Self-retaining fasteners shall be used wherever practicable.</li> <li>3. Special access opening tools shall not be required unless considered necessary to prevent vandalism.</li> <li>4. Latch hold open devices shall be incorporated, where practicable, as an additional safety factor.</li> <li>5. In equipment cabinets, the components that are most frequently maintained or adjusted shall be the most accessible.</li> <li>6. Devices to facilitate the handling of heavy or less accessible components shall be provided.</li> <li>7. Human factors shall be considered in the design, using MIL-STD 1472C-Human Engineering Design Criteria for Military Systems, Equipment and Facilities.</li> </ol>	Will comply in Section 3.	Add as Article 3.3.6.B.
54	R. Vance	16.3.1.A	TP-16-2	<p>Suggest the following reductions in manual quantities:</p> <ol style="list-style-type: none"> <li>1. Op Instr - 150 (be consistent with Vehicle)</li> <li>2. Repair &amp; Mtnce - 50</li> <li>3. Spare Parts catalog - 20</li> </ol>	Will research.	Complete per Action Item #4-3.
55	H. Hunt	16.3.1.D	TP-16-2	Add after "...Safety warnings" "...and safety-related cautions..."	Will comply.	Add "...and safety-related cautions..." to Article 16.3.1.D

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56	R. Vance	16.3.1.A.2	TP-16-2	Consider no separate ATC Op Instr. Manual, but incorporate that into Vehicle Operators Manual, since supplier is to install ATC equipment.	No, this manual is system operation not train operation.	Change wording to "System Operation Instruction Manual" in Article 16.3.1.A.2.
57	H. Hunt	16.7	TP-16-9	Add as 1st sentence "the use of special tools shall be minimized."  This is good design practice - to limit number of special tools (i.e. requiring of Reed when a Phillips will do.)	Not necessary, is covered in Section 3.	None.
58	R. Vance	16.6.2	TP-16-8	Delete level from title: "Shop level equipment."	No, will remain for consistency.	None.
59	R. Vance	16.8.2.D	TP-16-10	2nd line, replace "whether" with "including".	Will comply.	Revise Article 16.8.2.D.
60	R. Vance	16.8.2 Table 17-1	TP-16-10 TP-17-9	In intro, spare parts list format is referenced as a CDRL. It should be included in Table 17-1 CDRL's.	Agree. <i>ok, alt</i>	Add spare parts list format to CDRL list.
61	R. Vance	App. B Sect. 16 Table 17-1	SP-B-1 TP-16+ TP-17-9	Delivery dates are inconsistent for manuals and training. For example, draft manual requirements are: at month 30 in Sp. App. B. before system tests in TPs Sec. 16, and 90 days before training in CDRL list. Let's discuss.	Agree. Dates must be made consistent.	Complete per Action Items #4-3 and #4-4.
62	H. Hunt	Table TP-17-1	TP-17-8	Add CDRL's for these analyses:  1. Interface Hazard Analysis Item No. 86 Paragraph 15.2.2.A Format As specified/3 copies schedule/etc. At FDR/approval required  2. Subsystem Hazard Analysis Item No 87 Paragraph 15.2.2.A Format As specified/3 copies Schedule/etc. At FDR/approval required	Will comply. <i>ok alt</i>	Insert these CDRL's to CDRL list; add CDRL requirements to Article 15.2.2.A.

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				<p>3. Operating Hazard Analysis</p> <p>Item No. 88</p> <p>Paragraph 15.2.2.A</p> <p>Format As specified/3 copies</p> <p>Schedule/etc. At FDR, as part of test plan</p> <p><u>An Alternative</u> to listing these as separate CDRL's is to specify submittal time in Paragraph 15.2.2.A, i.e.</p> <p>1. Interface Hazard Analysis - at FDR &amp; FACI for approval</p> <p>Then change CDRL Item 88 to read: CCIL analysis 15.2.2 as SP/3 FDR/FACI/Test/Approval required.</p>		
63	A. Smithsuvan	Criteria Vol. 5 Sec. 2 and Vol 5 Sec. 4		Vol. 5 Sec. 2 does not include cross-bonding of running rail. If they are really part of ATC, a change request should be issued to transfer Par. 4.5.3.C of Section 4 to Section 2 (ATC).	Not necessary. Cross-bonding is a traction power requirement, but connected to ATC equipment.	None.
64	M. Ingram	Exhibit A		Reference Dwgs. - Contract Nos., Drawing Nos, and dwg. titles will require verification upon finalization of facilities contract packages.	Agree.	"Business-as-usual."
65	T. Eng	Q-003B		Delete "east & west" references, since this Dwg. is simply a schematic, not intending to show route orientation.	Will remain to show railroad orientation.	None.
66	T. Eng	Q-004B		Define under impedance bond designation AF ("audio frequency") for uninformed.	Spell out "Audio Frequency."	Change "AF" to Audio Frequency on Drawing Q-004 Rev. B.
67	T. Eng	Q-004B		Consider changing trip stop abbreviation, since it's the same as TS abbreviation for "tangent-to-spiral transition point".	Not necessary, "Train Stop" will have a designation with it; also on track plan. "Tangent-to-Spiral" is alignment.	None.
68	T. Eng	Q-004B		Add under track designation table "IJ - insulated joint," "XO - cross-over" , "EQ TO - equilateral turnout".	Will comply.	Add IJ, XO, and EQ to designations to drawing Q-004, Rev. B.

<u>NO.</u>	<u>FIRM/REVIEWER</u>	<u>DRAWING NO./ SPEC. SECTION</u>	<u>PAGE</u>	<u>COMMENT</u>	<u>RESPONSE</u>	<u>ACTION</u>
69	T. Eng	Q-004B		Under "notes," add to #2, "percent grades represent track gradient for track segment bounded by adjacent PVI locations." Otherwise, the schematic is quite confusing.	Not necessary; contractor should know meaning of symbology.	None.
70	T. Eng	Q-014B to Q-040B		These Dwgs. are missing AR & AL structure information (e.g. twin tunnel subway structure, etc.). Confirm that we do not wish to do so beyond Wilshire/Alvarado.	Confirmed. Trackwork is not designed beyond this point.	None.
71	J.C. Iazzetta	Q-021B Q-022B Q-023B Q-024B		Distances between cross-passages shown on these drawings exceeds the maximum allowed by F/LS Criteria 2.3.4.4	Distances by Special Considerations 84-010 & 84-011, approved 1-4-86. Also see Dwg. SD-064B, Notes 3 & 4.	None.
72	W. Robertson	Q-042B	42	Sequence No. 220.	Agreed to add explanatory sample control line to Drawing per meeting of 07/23/86.	Add explanatory sample control line to Drawing Q-042, Rev. B.
73	A. Smithsuvan	Q-052B	DWG	As agreed by Patel. Facilities will provide transformers inside ATC/C RM. Interface point is at secondary of transformers. Who will provide secondary main breakers (Dwg. shows "District-furnished").	Drawing Q-052, Rev. B corrected per audit of prefinal comments.	None.
74	J. Loo	Q-052B ATC Power Distribution Schematic		Note 10 requires "one 120 V/208 V 3-Phase, 4-wire service circuit breaker for communications load of 100 A". This additional requirement will exceed the 30 kVA made available to each TCR as noted in note 6. Please verify.	Communications load requirements will be reduced to 35 A.	Correct note 10 of Drawing Q-052, Rev. B to indicate a communications load of 35 A.
75	W. Robertson	Q-067B Q-068B Q-069B Q-070B	67 68 69 70	Sequence No. 229: Item a. and c. Item a. and c. Item c.	Item "a" not necessary; Item "c" accommodated for these drawings per audit of prefinal comments. Delete MDF from room layout drawings per meeting of 07/23/86.	Delete MDF from Drawing Q-066, Rev. B.
76	W. Robertson	Q-091B Q-092A Q-093B Q-094A	91 92 93 94	Sequence No. 247.	Note added to these drawings per audit of prefinal comments.	None.

<u>NO.</u>	<u>FIRM/REVIEWER</u>	<u>DRAWING NO./ SPEC. SECTION</u>	<u>PAGE</u>	<u>COMMENT</u>	<u>RESPONSE</u>	<u>ACTION</u>
77	T. Eng	Q-101A		Delete car washer from Dwg., since it is no longer located there.	Will comply.	Relocate car washer to Drawing Q-102, Rev. A.
78	J. Loo	Q-103B		Please be more specific about the load to be provided than mentioned in note 2.	Not necessary, communications design requires 20 A breaker. This is all the ATC contractor needs to provide.	None.
79	B. Hanson	Q-103B		Combine the transformers for the bungalow power by placing them after the transfer switches, or eliminate by connecting directly to 120/208 V sources.	The transformers provide the 120/208 V sources; design will remain for system reliability considerations.	None.
80	A. Smithsuvan	Q-103B	Dwg	Fac. contract will provide conduits, duct banks, and feeder cables to bungalows. Show dotted line at all feeders and breakers to bungalows.	Agree that wiring/cable situation should be clarified.	Add note 3 to drawing Q-103B clarifying wiring/cabling to bungalows.
81	M. Ingram	Q-115	115	Mast-mounted and wall-mounted ladders must comply with Section 3277, fixed ladders, of Title 8, Sub-chapter 7, general industrial safety orders. This comment remains unresolved from the 85% design review.	CAC requirements added to Drawing Q-115, Rev. A per audit of prefinal comments.	None.
82	W. Robertson	Q-118B	118	Sequence No. 277.	Location of track junction boxes will be contractor design; substation return locations are shown on double line track plans.	None.
83	M. Ingram	Q-120	120	There is a Section C cut on the plan, but no Section C on the Dwg. Should it be referenced to the Section C on Q-119?	Yes.	Add Section "C" to Drawing Q-120, Rev. B.
84	A. Smithsuvan	Q-123A	Dwg.	NEC classified 34.5 kV cable as medium voltage class and requires different group of electricians to install (ATC is for 120 V class). The most cost-effective is to combine this 34.5 kV works with traction power contract, which requires same group of electricians to install 34.5 kV switchgears. MOS-1 construction schedule shows that with a good work plan, TPSS contractor can arrange to use same group of electricians for the works at stations and at tunnels.	The ATC contractor will install 34.5 kV cable, but not connect it. Therefore, it does not require a different group.	None.

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85	A. Smithsuan	Q-123A	Dwg.	What is the scope of work for 34.5 kV and communications cables from manhole No. A15 to the Yard area and vent structure? Define more explicitly.	ATC contractor installation of 34.5 kV and comm. cables is required in tunnel sections only. Will verify that scope of this work is explicitly defined in the ATC design package.	None.
86	W. Robertson	Q-124	124	New drawing has been added but installation details are not included. See Sequence No. 285.	Installation details are defined in specifications and reference drawings. Specification Article 12.10.5 was revised per audit of prefinal comments.	None.
87	W. Robertson	General		Sequence No. 286.	This is adequately addressed on Drawing Q-047A. Will add "min." to distance parameter from I.J. to signal, per meeting of 07/23/86.	Add "min." to distance from insulated joints to signal on Drawing Q-047, Rev. A.
88	W. Robertson	General		Sequence No. 287.	Move installation details from Section 5 to Section 12 and add submittal requirements, per meeting of 07/23/86.	Delete Article 5.5.4 and add Speed Limit Transmission Loops Installation Requirements as Article 12.4.
89	W. Robertson	General		Sequence No. 290.	References and definitions concerning installation of DFE material are made throughout the design package.	None.







# MEMORANDUM

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May 26, 1987

TO: P.M. Burgess  
FROM: M. Ingram *M. Ingram*  
SUBJECT: Contract A620 Legal/Technical Review Comments  
FILE No: S440A620X082

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The attached comments from MRTC Safety, Assurance and Security are submitted in response to Alan Dale's memo dated May 13, 1987 on the referenced subject.

We will be pleased to discuss any of these comments with you, as required.

MI:ss

Attachment.

cc: J.N. Brown *MB*  
T.W. Cook (w/attachment)  
A.M. Dale  
M. Ingram (w/attachment)  
W.L. Lucci  
T. Tanke (w/attachment)  
DCC (2)  
Chron  
Subject



M E M O R A N D U M

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT  
TRANSIT SYSTEMS DEVELOPMENT DEPARTMENT  
SYSTEMS DESIGN AND ANALYSIS

\*\*\*\*\*

DATE: May 29, 1987  
TO: M. Becher  
FROM: H. Storey *[Signature]*  
SUBJECT: Contract A620, Automatic Train Control, Legal/  
Technical Review

**RECEIVED**  
JUN 03 1987  
**D.T.C.**

\*\*\*\*\*

The Safety and Systems Assurance Section and the Fire/Life Safety Committee have reviewed the subject contract document. Our comments are indicated on the attached H. Storey (5) and L. Boyden (1) comment sheets.

Attachments

cc: F/LSC  
L. Boyden  
L. Durrant

*Cross Reference  
Section II comments  
Dated 5-27-87  
RMA  
8-5-88*

## INTEROFFICE CORRESPONDENCE

To Distribution

Date March 7, 1988

From M. P. Cassagnol

Phone 6948

Location 1304

SUBJECT ATC Coordination Meeting No. 41

**RECEIVED**

MAR 08 1988

Date: February 24, 1988, 9:30 a.m.  
 Place: MRTC 11th Floor Conference Room  
 File:

Attendees:	R. P. Townley, SCRTD	M. S. Patel, MRTC
	M. P. Cassagnol, PDCD	B. E. Warrensford, SCRTD
	P. M. Burgess, MRTC	M. C. Becher, SCRTD
Absentees:	F. R. DiBugnara, SCRTD	N. C. Johnson, PDCD
	L. S. Durrant, SCRTD	W. Robertson, PDCD
	T. H. Lewis, SCRTD	A. M. Virginkar, BAH
	D. Coury, BAH	

Agenda: The meeting agenda was distributed on February 24, 1988, (copy attached).

1. Review of Action Items (see Action Items List attached).
2. B.E. Warrensford reported that A-620 Contract, Awarded to GRS, had been signed and returned by the Contractor. There were some late changes requiring the Contractor initials. NTP will be forwarded to the Contractor on 2/24/88 with Contract start date of March 1, 1988.
3. Initial Activities Meeting Agenda was discussed. Meeting will be scheduled for 3/21/88 at 9.00 a.m. Meeting will be confirmed and an agenda forwarded at a later date. Agenda will include at a minimum, items specified in Article 14.3.B of the Contract Technical Provisions. Townley during discussion with GRS has reminded the Contractor of initial Submittal Schedule.
4. Scheduling of Quarterly Management Meeting was discussed. It was agreed that meeting site would be alternated between L.A. and the Contractors facilities in Rochester.

5. Townley requested that any comments on GRS Project Manager's Resume and Qualifications be submitted by Feb. 26, 1988. GRS has designated Mr. Kenneth W. Embling to be the Project Manager.
6. Townley reported on status of the two Change Orders to the contract being processed by the RTD.  
  
A620-CR-001 Revision to Project Schedule.  
  
A620-CR-002 Changes to General Provisions Articles: 4, 34, 35 & 80  
  
Change Orders will be issued following NTP.
7. Patel noted that power requirements for communications contract were being revised to indicate an increase from 35 KVA to 45 KVA. Becher noted that Change Request would be triggered by Contract A-640 when detail interface requirements have been determined.
8. Corrosion Control Requirements will need clarification. Patel will transmit Memo of Engineering Documentation Clarification, based on his investigation with Pete Pignatelli, Corrosion Consultant.
9. Format of Conformed Documents was discussed. RTD will review procedure during internal meeting to be scheduled by M.C. Becher.
10. Contract Cross Reference List was discussed. PDCD to request inclusion of missing items.
11. Patel noted there had been reports of back contact of GRS B1 relay welding shut. Becher indicated that this fact should be noted and, if need be, brought up during Product Submittal Review.

ATC Meeting Minutes  
24 Feb 88

-3-

12. Next scheduled ATC Coordination Meeting is scheduled for  
March 8 at 9:30 a.m, PDCD Conference Room 1315.

Attachments:

Action Item List, Cross

CM/MPC/MJM/6948

cc: Attendees  
Absentees  
CM File/MLP  
Doc Control  
Operations







# MEMORANDUM

---

March 28, 1988

TO: M. Patel  
FROM: M. Ingram *M. Ingram*  
SUBJECT: Response to Information Requests  
- A620 Contract

FILE NO: S440A620X052

\*\*\*\*\*  
As a result of your verbal request, the attached data is forwarded for your use in responding to requests for information submitted by the A620 contractor at the March 21, 1988 Initial Activities Meeting. Your request covered three subjects: (1) CAL-OSHA requirements for fixed ladders; (2) State Building Code - Title 24 CAC Earthquake Requirements; and (3) L.A. City Building Code requirements. The three separate attachments are as follows:

- 1) California Administrative Code Title 8 - Industrial Relations; Part I. Department of Industrial Relations; Chapter 4. Division of Industrial Safety; Sub-chapter 7. General Industry Safety Orders; Group 1. General Physical Conditions and Structures; Article 2. Standard Specifications - Excerpt for Section 3277. Fixed Ladders, pp. 432.40 - 432.54, inclusive.
- 2) 1985 Edition of the State Building Code, California Administrative Code Title 24. Part 2. Chapter 2-23. General Design Requirements - Excerpt for Section 2-2312 Earthquake Regulations, pp. 190-216, inclusive.
- 3) City of Los Angeles Building Code 1985 Revised Edition, excerpt for revised Section 2312 Earthquake Regulations, pp. 114-124.2, inclusive; and Uniform Building Code (UBC) 1985 Edition, excerpt for Section 2312 Earthquake Regulations, (UBC) pp. 114-137, inclusive.

M. Patel  
March 28, 1988  
Page 2

Please note the following with respect to attachments 2 and 3. The State Building Code, Title 24 CAC is based collectively on the 1979 and 1982 editions of the Uniform Building Code. The L.A. City Building Code is based on the 1985 edition of the Uniform Building Code, with amendments. In the case of the L. A. City Building Code, the amendments adopted by the City supersede the 1985 UBC and must be complied with. The City amendments are readily identified in the excerpts included in attachment 3.

Please feel free to contact me at extension #7134 should you have any questions.

MI:djr

Attachments

cc: J. N. Brown \*  
P. M. Burgess \*  
H. J. Chaliff \*  
A. M. Dale \*  
DCC (2)  
Chron  
Subject

(\* w/o attachments)



88-03131

BOOZ ALLEN & HAMILTON INC.

SUITE 502 • 523 WEST SIXTH STREET • LOS ANGELES, CALIFORNIA 90014 • TELEPHONE: (213) 620-1900

RECEIVED

JUL 14 1988

July 13, 1988

Mr. Harold E. Storey  
Director, Systems and Construction Safety  
Southern California Rapid Transit District  
600 South Spring Street, 3rd Floor  
Los Angeles, California 90013

Reference: ATP Vehicle Equipment Reliability Data

Dear Mr. Storey:

At a meeting with Leigh Boyden on July 6, 1988, Booz, Allen was asked to search our files to uncover any available documentation on the origin of ATP reliability requirements. Dave Coury was able to retrieve some data from his own files on the ATC Industry Review held during the second half of 1984. The following exhibits are enclosed:

- Exhibit 1 - Responses to RTD letter from Union Switch and Signal (US&S) and Jeumont Schneider. The letter specifically asked for ATP vehicle equipment MTBF.
- Exhibit 2 - Handout (2 pages) from Union Switch and Signal at the industry review meeting in Pittsburgh.
- Exhibit 3 - Page from meeting minutes of industry review meeting with Alsthom Atlantique.

These exhibits tend to indicate that the specified 15,000 hours MTBF is somewhat higher than industry standards. The first page of Exhibit 2 shows US&S calculations of predicted MTBF for ATP vehicle equipment. If we remove door opening protection from the equation, since it does not apply to Metro Rail; the resultant MTBF becomes 6565 hours.

Mr. Hal Storey  
Southern California Rapid Transit District  
July 13, 1988  
Page 2

I hope this information is useful and look forward to providing you with further assistance towards the resolution of this issue. Please feel free to call me or Dave Coury should you have any questions.

Very truly yours,

*Gary M Schulman*  
BOOZ-ALLEN & HAMILTON Inc.

Gary M. Schulman  
Project Manager, Systems Engineering

mh/1653L

Enclosures

cc: w/encs.  
BAH  
D. Coury  
L. Elliott  
J. Wing

MRTC  
N. Brown  
M. Ingram

PDCD  
W. Robertson

SCRTD  
M. Becher  
L. Boyden  
J. Sandberg  
R. Townley

SEP 06 1984

SYSTEMS DESIGN DIVISION

7. MTBF for ATC Vehicle Equipment

The predicted MTBF for ATC vehicle equipment is a function of the system configuration and functions. Typical configurations for recent transit properties have resulted in an approximate value of 5,000 hours for MTBF excluding station stop, speed regulation, and TWC functions.

8. Application of TWC for Vehicle Equipment Monitoring

No comment.

9. Roll Back Protection

The specification requires a mechanical integrity check of the speed sensor. This check can be implemented with an electronic circuit called a positive motion detector. This device requires that a preset minimum speed be attained within a relatively short preset time following release of service brakes. If this circuit is not satisfied, the brakes are reapplied.

Since positive forward acceleration is greater than reverse drift or roll back, the positive motion detector functionally meets the intent of roll back protection. Normally, however, roll back protection is assigned to the motorman. We recommend the latter considering the safety critical aspects at passenger stations.

10. Application of Train Stops

Mechanical and inductive type train stops are available. The electrically driven mechanical stop, of course, is the most common. We support your specified use of the train stop. We favor the mechanical stop based on ease of portable stop arms for area blocking to handle temporary construction sites, blue flag protection, etc.

11. Specified Number of ATP Speed Limits

We have asked in our comments if the TBD speeds will be given in the final spec. If not, how and when will they be determined?

The determination of the TBD speeds results in additional engineering effort to be expended by the Contractor and SCRITD operating personnel to finalize these system parameters.

12. Aspects of Wayside Signals

The determination of types and numbers of wayside aspects is best developed by the Authorities' operating personnel. We have no objection to the form of route signaling specified. We recommend, however, that a book of operating rules and procedures be established prior to the in-service date.

Annex 1.

Comments to RTD letter from June 21, 1984

- Fixed Frequency Chopper, operating at 240 or 360 Hz effect of using multiple discreet chopper frequencies

The above frequencies are usually used by the chopper manufacturers when the power supply includes a multitude of phases, more specifically the 360 Hz frequency. It is also usual to use 3 (or 2) phases which will create in the return circuit a frequency of 1080 Hz. With a single phase used the frequency will reach 600 Hz.

- EMI implications of future use of AC propulsion

Being a chopper manufacturer our ATP system is designed to be protected against chopper frequencies with also the possibility to be immune when the propulsion frequency is 50 or 60 Hz.

- Use of double brake circuits for ATC vehicle equipment.

It is possible to use double brake circuits for the car borne ATC equipment but we will have to inform you that according to our experience such requirement will increase the price reducing in the same time the reliability of the ATC equipment.

- Specified M.T.B.F. for ATC vehicle equipment.

- The classical system : M.T.B.F. = 5000 hours

- Digital system M.T.B.F. = 4500 hours

- Application of T.W.C. for vehicle equipment monitoring

The continuous monitoring of the car borne equipment can be transmitted to the wayside equipment through either continuous transmission or point to point transmission depending on the transmission mode. The transmission of such information is highly recommended and such system will permit an early detection by the Control Center of any degradation occurring on the train. This system can be either included in the communication equipment or in the train control equipment.

- Specified role of protection scheme

The roll back protection is designed on a special movement receiver called p. wheel.

- Application of train stops, and available equipment

Please see annex 1 - 17 comments to 3.1.6 page 2.2

Annex 1.

Comments to RTD letter from June 21, 1984

- Fixed Frequency Chopper, operating at 240 or 360 Hz effect of using multiple discreet chopper frequencies

The use of fixed frequency chopper or multiple frequency chopper is an old concern among the signal companies so far a multitude of design ways has been used to build signal equipment immune to the two kinds of chopper. We believe that the single frequency chopper has a certain advantage over the multiple frequency chopper and its use can simplify the signal equipment requirements.

- EMI implications of future use of AC propulsion

The signal equipment based on Jeumont-Schneider technology is proven to be chopper immune and newly AC propulsion immune.

- Use of double brake circuits for ATC vehicle equipment.

The use of double brake circuits in the design of the ATC vehicle equipment is an expensive way of hiding lack of confidence on modern technology. We believe and proved that the use of different design will produce the same failsafe ATC equipment without the use of the expensive double brake circuits.

- Specified M.T.B.F. for ATC vehicle equipment.

- The Jeumont-Schneider technology based system has a M.T.B.F. of 5000 hours

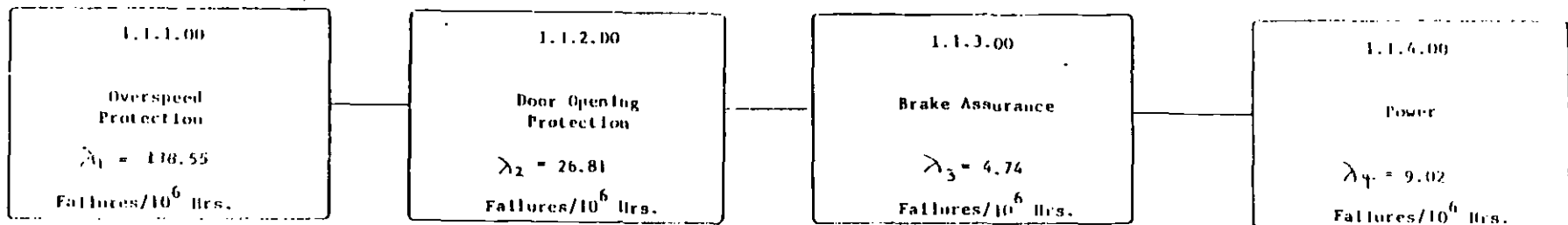
- Application of T.W.C. for vehicle equipment monitoring

We recommend the use of monitoring equipment linked to transmission system to inform the Control Center on the status of the car borne equipment.

- Specified rollback protection scheme

The rollback protection which is an essential element of an ATC system is based on a movement detector called phonic wheel.





Predicted MTBF = 7,210 hrs.

Required MTBF = 8800 hrs.

Predicted MTBF = 37,370 hrs.

Required MTBF = 13,295 hrs.

Predicted MTBF = 210,970 hrs.

Required MTBF = 96,780 hrs.

Predicted MTBF = 110,865

Required MTBF = 41,800 hrs.

$$\lambda_T = \lambda_1 + \lambda_2 + \lambda_3 + \lambda_4 = 179.12 \text{ Failures}/10^6 \text{ hrs.}$$

Predicted MTBF for Vehicle Equipment = 5593 hrs.

Required MTBF for Vehicle Equipment = 4482 hrs.

$$R(t) = e^{-\lambda T^t} \text{ where } t \text{ is undefined}$$

Figure 6-1 Reliability Block Diagram and Model for Train Protection Subsystem, Vehicle Equipment.

# REPORTS ATC/C RELIABILITY DEMO

CONTRACT XC020202

## Vehicle MTBF

Spec Requirement MTBF = 5280 hr

Reference: CORL 62, Reliability Demonstrator Plan, 75

Test 1  
Vehicle MTBF

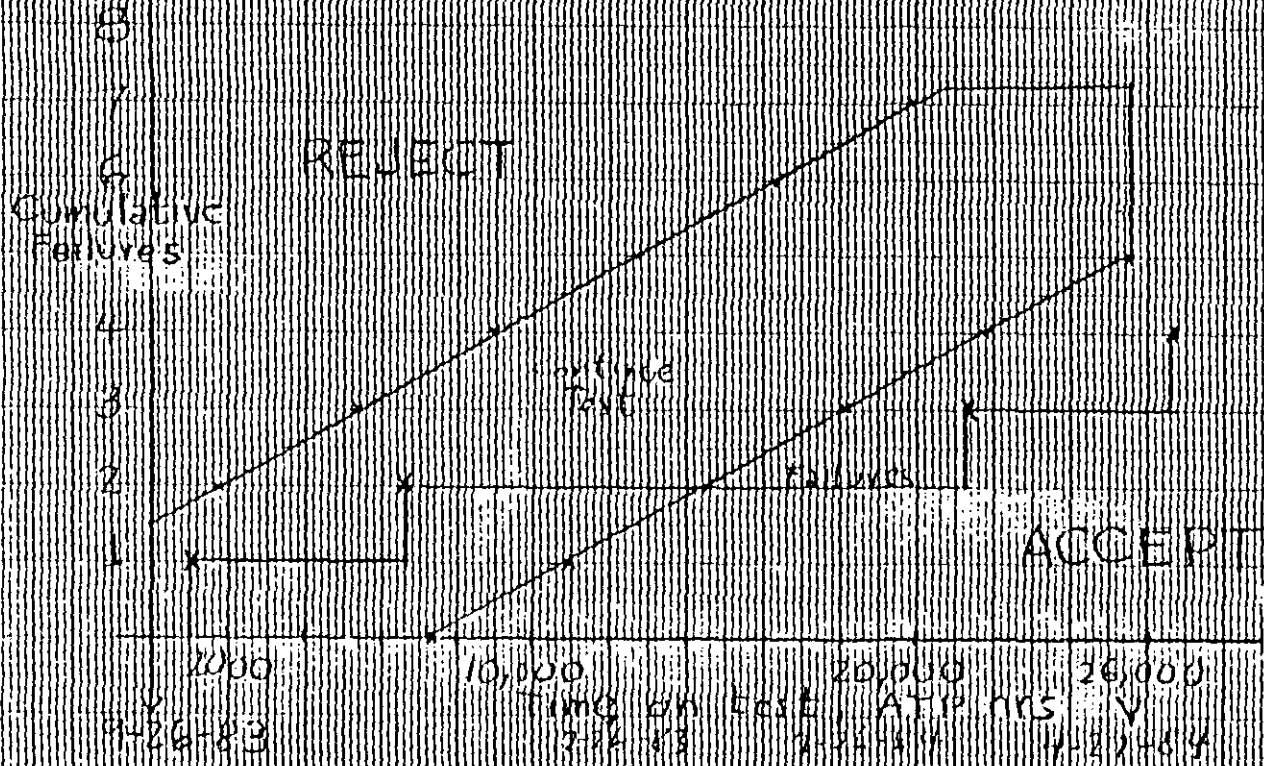


Figure 12

Vehicle ATP Test Results - MTBF

EXHIBIT 2  
PAGE 2

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The ATP antenna is mounted on the truck. Overspeed tolerance is +5%, -0. Rollback and speed sensor integrity is checked by requiring motion within 5 seconds after brake removal.

Modes of operation in Lyons is quite similar to that specified, except the stop and proceed is pushbutton operated.

Testing is done by portable test set. AA also manufactures an elaborate test facility that cycles carborne equipment and locates intermittent problems.

No routine maintenance is needed.

Double brake circuits are not used on the vehicle. Strict requirements on wiring and installation are enforced.

VII. Processor Based Yard Control

Two types of yard control available in France are:

PA1	-	Microprocessor
PRC2	-	Processor

AA does not manufacture either, but would purchase.

IX. ATBF for ATC Equipment

Carborne ATP	-	4,000 hours
Carborne ATO	-	1,500 hours
Track circuit (Lyons)	-	30,000 hours
Interlocking	-	will send
Loop transmission system-	-	2,000 hours (loops are always energized)

Figures are computed based on actual experience.

X. Disadvantaged Business Enterprise (DBE) Participation

SCRTD explained the policy of DBE participation and advised that Westinghouse may call the SCRTD on an informal basis concerning this subject.

SCRTD explained that although the percentage of participation is not yet determined, it will be reasonable.



**PDCD**

600 SOUTH SPRING STREET  
SUITE 1200  
LOS ANGELES, CALIFORNIA 90014  
(213) 489-6950

88-03333

Advised M. Patel RE: CAL/DSHA  
Rung spacing reqmts. on 8/5/88 RECEIVED  
DO NOT DEVIATE. *(ME)* JUL 25 1988

A620-REC-0094

July 25, 1988

General Railway Signal Company  
P.O. Box 20600  
Rochester, N. Y. 14602-0600

Attention: Mr. Kenneth Embling  
Program Manager

Subject: Contract A620- Signal Layout Data & Drawings-CDRL #702  
& 908 - A620-MR-43-0

Reference: GRS Letter A620-CRE-0075 Dated June 15, 1988

Gentlemen: *FILE*

Attached is one reproducible copy of the subject submittal stamped "Approved", with the exception of Drawings 312-125, 45906-393 & 43951-27 which are "Approved as Noted". The following comments apply:

1. Ladder shown for wall mounted signal (GRS Drawing 312-125) does not meet 12 inch maximum space between rungs requirements shown on Drawing A620-Q-115.
2. Split Base Junction Box Drawings (GRS Drawing 45906-393 Sh1 and 43951-27) does not show how it is to be padlocked per Specification requirements 7.3.1.9.

The Engineer has retained a copy for the project files.

*Cross Reference  
Section II  
Design Review comments  
Dated 10-24-85  
comment #1*

Very truly yours,

*(Signature)*  
Michel Cassagnol  
Resident Engineer

Attachment:

cc: S. Louis  
R. Townley  
M. Walters  
SCRID - TSD  
M.S. Patel - MRTC





JUL 29 1988

SAFETY & ASSURANCE

# MEMORANDUM

July 29, 1988

TO: H. E. Storey, SCRTRD-600

FROM: J. N. Brown, MRTC *J. N. Brown*

SUBJECT: Contract A620, Automatic Train Control,  
Reliability Values Placed in the Contract  
Specifications by the General Consultant

REF.: Memorandum - H. E. Storey to J. N. Brown  
dated July 12, 1988 same subject.

FILE NO: W409A620X011

-----

As requested in the referenced letter MRTC has reviewed information available on Train Control reliability in two areas: yard track circuits and vehicle-borne ATP equipment. The results of our review are as follows:

- A. Yard Track Circuits - The specification, paragraph 15.3.2 shows a 20,000 hour MTBF requirement per track circuit in the Yard Control Subsystem. This is to be interpreted as the non-vital storage track circuit. This is in line with GRS's statements as to what they can meet. There is some lack of clarification in that the ATP Subsystem shows Power Frequency Track Circuits with a requirement of a 40,000 hour MTBF "Per Track Circuit". The yard circuit is shown as being singular and did not require the clarifying statement "Per Track Circuit" added. I recommend that GRS be informed of the correct interpretation of the specification.
- B. Vehicle-Borne ATP Equipment - The specification, paragraph 15.3.2 shows a 15,000 hour MTBF requirement per dependent pair. GRS has indicated that a lower number would be more reasonable. The method used to accumulate test hours has a significant impact on test results. In the A620 contract paragraph 13.12.5.A a test day is defined as follows:

"Each test day shall normally consist of 24 hours, which includes nonrevenue service hours".

H. E. Storey  
July 29, 1988  
Page 2

For testing done in Baltimore, only the "B" car's actual operating time was used to calculate MTBF. Testing there was terminated with an achieved MTBF of 6650 hours which was passing. (See US&S Vehicle ATP MTBF chart dated December 1984.)

It is recommended that if GRS does not believe that the specified requirement is reasonable then they should submit a change request to the contract including justification and their proposed reliability test method. GRS should have raised any questions they had on reliability prior to the bid date. A summary of ATC reliability test results from a GRS publication is attached.

In summary we need to see a proposed change request to fully evaluate GRS's concerns.

JNB:djr

cc: L. Boyden, SCRTD-600  
R. Boerwinkle  
A. Dale  
M. Ingram ✓  
M. Patel  
R. Townley, SCRTD-600  
DCC (2)



ATC FAILURE DATA

"Reliability Test Data for ATC Equipment", NFTA Contract 1Z2011,  
Prepared by GRS; January 22, 1985:

	<u>Property</u>	<u>Function</u>	<u>No. of Devices</u>	<u>Total Test Hours (No. of devices X hours)</u>	<u>Total Failures</u>
1. <u>Carborne Equipment</u>	WMATA	ATP	100	94,718	7
11. <u>Yard Track Circuits</u>					
1) <u>Vital Interlocking Track Circuits</u>	MBTA	Switch Control	8	104,832	1
	MARTA	Route Interlocking Switch Control and Train Stop	46	44,160	0
	WMATA	Interlocking Train Circuit	60	169,009	0
2) <u>Signal (Indication) Control Circuits</u>	MBTA	Signal Control	12	157,248	1
	MARTA	Rail Interlocking Signal Control	78	74,880	0
	WMATA	Signal Control	100	580,800	1
3) <u>Power Frequency Track Circuits</u>	MBTA	Interlocking Track Circuit-Train Detection ATP Receivers	14	183,456	0
	MARTA	Interlocking Track Circuit-Train Detection ATP Receivers	113	108,480	0
	WMATA	Interlocking Track Circuit-Train Detection ATP Receivers	51	296,208	0
4) <u>Power Supply, 28V</u>	MBTA	Power Supply	64	838,656	0
	MARTA	Power Supply	45	43,200	0
	WMATA	Power Supply	57	331,056	7

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Certification

A D D E N D U M

covering

CHANGE IN SPECIFICATIONS AND/OR PLANS

Date Issued: July 31, 1987

Addendum No. A620-1

Addendum Date: July 31, 1987

Contract: A620: Automatic Train Control

---

INTENT

1. This addendum is issued prior to receipt of bids to provide for modifications in the Procurement Specifications Book. Acknowledgement of this addendum shall be made and cost of Work included or excluded in Offeror's Bid.
  
2. This addendum consists of the following items:  
  
Revisions to the following parts of the Specifications Book, and the pages including:
  - o Revisions to Table of Contents. Pages i and ii.
  - o Revisions to Bid Requirements. Pages 8, 9, 10, 13, 17, 18, 19, 20, 21, and 22.
  - o Revisions to Bid Forms. Pages 9, 11, 13, 15, 23, 25, 27, 45, and 47.
  - o Revisions to Special Provisions. Pages i, 1, 2, 6, 7, 8, 9, A-1, A-2, and A-3.
  - o Revisions to General Provisions. Pages ii, iii, iv, 8, 16, 18, 19, and 31.
  - o Revisions to Technical Provisions. Pages 1-2, 2-2, 4-12, 9-14, 10-8, 10-13, 11-18, 12-14, 12-15, 12-17, 14-1, 14-3, 14-14, 15-6, 15-7, 15-8, 15-12, 16-2, and 18-11.

Addendum revisions are identified by the Addendum Number in the margins before and after each line modified. Pages changed due to relocation of lines or paragraphs that are not modified by addendum will not have identifying numbers, but are included to keep the Procurement Specifications Book intact and continuous. Please place the enclosed pages in your Procurement Specifications Book, and remove addended pages.

3. Revised Drawings as Follows:

o Contract Drawings Changed:

<u>Drawing Number</u>	<u>Title</u>
Q-031	Double Line Track Plan 775+00 to 805+00
Q-111	YCT ATC Equipment Room Layout
Q-112	Yard Control Room Layout

o Reference Drawings Changed:

<u>Drawing Number</u>	<u>Title</u>
A620/3 Q-302	Reference Drawings Index Sheet 3 of 4
A620/4 Q-303	Reference Drawings Index Sheet 4 of 4

o Reference Drawings Added:

<u>Drawing Number</u>	<u>Title</u>
A620/405 N-036	SCADA/Facilities Electrical Interfaces

Issued By: \_\_\_\_\_



T.L. Johnson  
Assistant Director  
Office of Contracts,  
Procurement and Materiel



Reviewed by MRTC  
Safety, Assurance & Security  
No Adverse Impact on Safety  
Certification

A D D E N D U M

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CHANGE IN SPECIFICATIONS AND/OR PLANS

Date Issued: September 2, 1987

Addendum No. A620-2

Addendum Date: September 2, 1987

Contract: A620: Automatic Train Control

---

INTENT

1. This addendum is issued prior to receipt of bids to provide for modifications in the Procurement Specifications Book. Acknowledgement of this addendum shall be made and cost of Work included or excluded in Offeror's Bid.

2. This addendum consists of the following items:

Revisions to the following parts of the Specifications Book, and the pages including:

- o Revisions to Table of Contents. Pages i and ii.
- o Revisions to Bid Requirements. Page 22.
- o Revisions to Bid Forms. Pages 9, 11, 13, 15, 27, and 29.
- o Revisions to Special Provisions. Pages i, 2, 3, 6, 7, 8, and 9.
- o Revisions to Technical Provisions. Table of Contents Pages ii, iii, v, vi; Pages 2-3, 2-8, 2-15, 3-16, 4-26, 7-5, 7-9, 7-10, 8-i, 8-9 through 8-11, 9-3, 10-19, 10-A-5, 10-A-30, 10-A-58, 10-A-60, 11-i, 11-ii, 11-3, 11-4, 11-8, 11-15 through 11-23, 11-28, 12-ii, 12-8, 12-14, 12-15, 12-16, 13-10, 18-ii, 18-8, 18-10, and 18-11.

Addendum revisions are identified by the Addendum Number in the margins before and after each line modified. Pages changed due to relocation of lines or paragraphs that are not modified by addendum will not have identifying numbers, but are included to keep the Procurement Specifications Book intact and continuous. Please place the enclosed pages in your Procurement Specifications Book, and remove addended pages.

3. Revised Drawings as Follows:

o Contract Drawings Changed:

<u>Drawing Number</u>	<u>Title</u>
Q-003	Line Schematic
Q-004	Symbols and Abbreviations, Track Plans
Q-007	Double Line Track Plan, 84+00 to 103+00, Union Station - Yard Lead Tracks
Q-043	Route and Aspect Chart, Union Station Interlockings
Q-091	Yard Schematic, Sheet 1 of 4
Q-093	Yard Schematic, Sheet 3 of 4
Q-094	Yard Schematic, Sheet 4 of 4
Q-125	Yard Locking Chart, Sheet 1 of 8
Q-136	35 KV Trainway Feeder, Installation Details, Sheet 1 of 2

o Reference Drawings Changed:

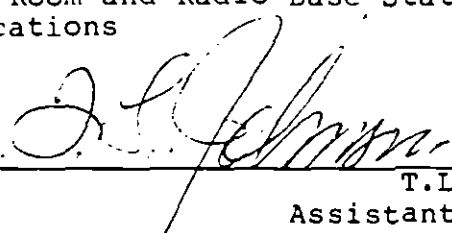
<u>Drawing Number</u>	<u>Title</u>
A620/3 Q-302	Reference Drawings, Index Sheet 3 of 4
A620/4 Q-303	Reference Drawings, Index Sheet 4 of 4
A620/392 N-138	Automatic Train Control, Interfaces

o Reference Drawings Added:

<u>Drawing Number</u>	<u>Title</u>
A620/286 T-147	No. 8 Double Crossover, 18' TC, Ballasted
A620/366 T-111	Yard Track Alignment Schematic, Sheet 1 of 2
A620/367 T-112	Yard Track Alignment Schematic, Sheet 2 of 2
A620/369 T-113	Yard Track Alignment Data, Sheet 1 of 4
A620/370 T-114	Yard Track Alignment Data, Sheet 2 of 4

<u>Drawing Number</u>		<u>Title</u>
A620/371	T-115	Yard Track Alignment Data, Sheet 3 of 4
A620/372	T-116	Yard Track Alignment Data, Sheet 4 of 4
A620/406	N-273	TC&C Room and Radio Base Station Locations

Issued By: \_\_\_\_\_



T.L. Johnson  
Assistant Director  
Office of Contracts,  
Procurement and Materiel