

SCRTD  
METRO RAIL PROJECT  
SAFETY CERTIFICATION PROGRAM  
CRITERIA CONFORMANCE CERTIFICATION

CONTRACT A630

TRACTION POWER EQUIPMENT

**MTA LIBRARY**

29301267

TABLE OF CONTENTS

<u>SECTION</u>	<u>NO. OF PAGES</u>
INTRODUCTION	2
CRITERIA CONFORMANCE VERIFICATION CERTIFICATE	1
I. <u>DESIGN REVIEW CHECKLISTS</u>	
FIRE/LIFE SAFETY -- TRAINWAY FACILITIES	2
SYSTEM SAFETY	3
RELIABILITY	5
MAINTAINABILITY	5
QUALITY ASSURANCE	5
CONFIGURATION MANAGEMENT	6
II. <u>DESIGN REVIEW COMMENTS</u>	
Systems and Construction Safety -- L. Boyden - 100%	2
R. Frias -- 100% - 11/30/87	2
Safety, Assurance & Security -- M. Ingran - 5/07/85	2
Safety, Assurance & Security -- J. Graham - 5/06/85	2
Safety, Assurance & Security -- J. Yen - 6/13/85	1
Safety, Assurance & Security -- M. Ingram - 6/06/85	2
Rolf Jensen & Associates -- D. Fiedler - 6/12/85	2
III. <u>RELATED CORRESPONDANCE</u>	
DCC # 85-03666	1
DCC # 85-04474	1
DCC # 85-04580	1
DCC # 85-05796	3
DCC # 87-04157	1
DCC # 87-04232	1
DCC # 88-00772	1
DCC # 88-01566	1
DCC # 88-03266	8
IV. <u>ADDENDA</u>	
A630-1 (Bid)	1
A630-2 (Bid)	1
A630-3 (Bid)	2
A630-4 (Bid)	1
A630-5 (Bid)	1
A630-1 (Re-bid)	1

MTA LIBRARY

# MTA LIBRARY

## 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%, and 100% levels. The 100% design review for this document was held in November 1987. The contract was originally advertised for bid in January 1988. A total of five addenda's were issued against the January 1988 bid document. The contract was advertised for re-bid in July of 1988. One additional addenda has been issued against this re-bid version. 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.

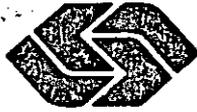
Design review checklists for the Fire/Life Safety, System Safety, Security and System Assurance design criteria were updated in December 1986 to reflect the significant revisions made through the Change Request process. A vertical bar in the Req. I.D. column of the checklist was used to indicate only 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 updated checklists were applied to the conformed document to verify that compliance with applicable design criteria was maintained.

The scope of this contract encompasses the manufacture, testing, delivery and supervision of installation of MOS-1 traction power and auxiliary power electrical equipment, including LRT equipment (funded by the Los Angeles County Transportation Commission) at the 7th/Flower substation. The traction power equipment includes high-voltage ac switchgear assemblies. In MOS-1, the operating requirements defined by SCRTD Design Directives DD-003 and DD-004 require only one ac-to-dc conversion assembly; provisions are made to add a second unit in the future. Auxiliary power electrical equipment in each substation includes redundant power Transformers and 480 V switchgear. Both of the redundant units must be provided in MOS-1 as part of the dual independent feeds required by the System Design Criteria and Standards for emergency lighting and ventilation. The contract covers MOS-1 and includes a small amount of equipment for interfacing with the LRT at the 7th/Flower

Station. Participation and technical assistance is required during installation and testing.

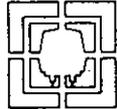
The comments included in this package represent the result of the 100% and Legal/Technical design review. The checklists included are the updated checklists applied to the re-bid document. Checklist references to specific drawing numbers or specification sections are based on the conformed contract documents. Only those portions of the checklists containing design criteria requirements directly applicable to this contract, including those for Fire/Life Safety, System Safety, Reliability, Maintainability, Quality Assurance, and Configuration Management are included in this document. 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 issued, 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 A630 Traction Power Equipment

REVIEWING DISCIPLINE MRTC Safety, Assurance & Security

EXCEPTIONS NOTED: NONE

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. N. Brown Date 4/14/89  
Manager - MRTC Safety, Assurance & Security

Signature f. Mahabadi Date 4/14/89  
Manager - MRTC System Division





# SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

## METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: TRACTION POWER SUBSTATION EQUIPMENT

GROUP: MRTC-SAFETY, ASSURANCE & SECURITY

DATE: 11/11/88

REVIEWER: R. HARVEY

DISCIPLINE: FIRE/LIFE SAFETY - TRAINWAY FACILITIES

REVIEW REFERENCE: METRO RAIL PROJECT SYSTEM DESIGN

CONTRACT No.: A630

CRITERIA-AND STANDARDS - VOL. 1, SECTION 2.3

REVIEW LEVEL: 100%

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
2.3.3.3	Warning signs shall be posted on the access to the trainway at stations, on fences of barriers adjacent to the trainway, or at other locations where nonemployees may attempt to trespass.  The warning sign shall clearly state the hazard in letter, size, and colors as required by NFPA 70 and CAL/OSHA regulations.			See Contract A680  ↓
2.3.3.4	Wiring, materials, and all electrical installations including traction power or traction power control shall conform to the NEC. Facility wiring shall meet the additional requirements established in 2.2 for station facilities.	X		See Technical Provision Sec. 2, ¶2.11.3, Sec. 3, ¶3.1.2, ¶Sec. 4 ¶4.1.2, Sec. 5, ¶5.1.2, Sec. 6, ¶6.1.2, Sec. 7 ¶7.1.2, Sec. 8, ¶8.1.2
2.3.3.5	The contact rail shall be located opposite the safety walkway and the station platform.			N/A to this Contract Contracts See Facilities Contracts
2.3.4	<u>EMERGENCY EGRESS AND ACCESS FOR UNDERGROUND TRAINWAYS</u>			↓
2.3.4.1	<u>Areas of Safe Refuge</u>  Emergency egress means of evacuating patrons from transit vehicles in tunnels and through tunnels to reach areas of safe refuge shall be provided.			
2.3.4.1.4	A trainway safe area of refuge shall meet the following requirements:			

# MTA LIBRARY

## TABLE OF CONTENTS

<u>SECTION</u>	<u>NO. OF PAGES</u>
INTRODUCTION	2
CRITERIA CONFORMANCE VERIFICATION CERTIFICATE	1
I. <u>DESIGN REVIEW CHECKLISTS</u>	
FIRE/LIFE SAFETY -- TRAINWAY FACILITIES	2
SYSTEM SAFETY	4
RELIABILITY	4
MAINTAINABILITY	5
QUALITY ASSURANCE	5
CONFIGURATION MANAGEMENT	6
II. <u>DESIGN REVIEW COMMENTS</u>	
Systems and Construction Safety -- L. Boyden - 100%	2
R. Frias -- 100% - 11/30/87	2
Safety, Assurance & Security -- M. Ingran - 5/07/85	2
Safety, Assurance & Security -- J. Graham - 5/06/85	2
Safety, Assurance & Security -- J. Yen - 6/13/85	1
Safety, Assurance & Security -- M. Ingram - 6/06/85	2
Rolf Jensen & Associates -- D. Fiedler - 6/12/85	2
III. <u>RELATED CORRESPONDANCE</u>	
DCC # 85-03666	1
DCC # 85-04474	1
DCC # 85-04580	1
DCC # 85-05796	3
DCC # 87-04157	1
DCC # 87-04232	1
DCC # 88-00772	1
DCC # 88-01566	1
DCC # 88-03266	8
IV. <u>ADDENDA</u>	
A630-1 (Bid)	1
A630-2 (Bid)	1
A630-3 (Bid)	2
A630-4 (Bid)	1
A630-5 (Bid)	1
A630-1 (Re-bid)	1



# SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

## METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: TRACTION POWER SUBSTATION EQUIPMENT

GROUP: MRTC-SAFETY, ASSURANCE & SECURITY

DATE: 11/11/88

REVIEWER: R. HARVEY

DISCIPLINE: SYSTEM SAFETY

REVIEW REFERENCE: METRO RAIL PROJECT SYSTEM DESIGN

CONTRACT NO.: A630

CRITERIA AND STANDARDS - VOL. 1, SECTION 3.7

REVIEW LEVEL: 100%

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
3.7.3.A	Tunnel fans, lighting, ETS and tele-phones shall be fed from two separate power sources.			See Facilities Con-tracts Electrical Drawings
3.7.4	<u>Contact Rail</u>			
3.7.4.A	The contact rail shall be located opposite the safety walk and the sta-tion platform.			See Line Segment Contracts
3.7.4.B	Patrons and employees shall be alerted to the hazards of the contact rail through signing.			See Contracts A-680 & A760
3.7.4.C	Coverboards shall be installed to re-duce the possibility of patrons and em-ployees inadvertently contacting the contact rail.			See Contract A-615
3.7.5	<u>Traction Power</u>			
3.7.5.A	Electrical grounding and lightning protection shall be provided for all traction power subsystems and gap breaker stations.	X		See TP Section 5, ¶5.2.8
3.7.5.B	The RCC shall have the capability of operating and controlling essential ac/dc switchgear functions.  There shall be alarms and visual indication of status changes and	X		See TP Section 4, Article 4.6



# SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

## METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: TRACTION POWER SUBSTATION EQUIPMENT

GROUP: MRTC-SAFETY, ASSURANCE & SECURITY

DATE: 11/11/88

REVIEWER: R. HARVEY

DISCIPLINE: SYSTEM SAFETY

REVIEW REFERENCE: METRO RAIL PROJECT SYSTEM DESIGN

CONTRACT No.: A630

CRITERIA AND STANDARDS - VOL. 1, SECTION 3.7

REVIEW LEVEL: 100%

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
	abnormal conditions associated with traction power substations and gap breaker stations. .	X		See TP Section 3, Article 3.9
3.7.5.C	Remote control of the Yard traction power substation shall be provided at the Yard Tower.			See Contract A-640
3.7.5.E	The cable connecting the contact rail to the pothead and specified energized hardware shall be covered with suitable insulating material. This material shall be installed so as not to present an electrical or tripping hazard to people on the trackway.			See Contract A-631
3.7.5.F	Key locks shall be provided on all manual ac/dc breaker control cabinets.	X		See TP Section 3, ¶3.6.C.1, ¶3.3.2.D
3.7.5.G	Transformer/rectifier doors shall be provided with power interlock safety switches.			See TP Section 3, ¶3.6.2, Section 4, ¶4.4.5.F
3.7.5.H	All drawout switchgear shall have shutters to protect personnel from accidental contact with live power circuits when the circuit breaker is removed.	X		See TP Section 3, ¶3.3.2.B, Section 5, ¶5.3.3
3.7.5.I	Circuit interrupting devices which do not have load-break capability shall be equipped with interlocks to prevent unsafe operation.	X		See ¶3.2.2.F.2, ¶3.3.2.D, & ¶3.3.5.B & C ¶3.4.4.D, ¶4.4.5.F, ¶5.2.4.A, ¶5.4.1.C, ¶6.3.2
3.7.5.J	High-voltage terminations shall be protected to prevent accidental contact.	X		See TP Section 3, ¶3.2.2.G



# SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

## METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: TRACTION POWER SUBSTATION EQUIPMENT

GROUP: MRTC-SAFETY, ASSURANCE & SECURITY

DATE: 11/11/88

REVIEWER: R. HARVEY

DISCIPLINE: SYSTEM SAFETY

REVIEW REFERENCE: METRO RAIL PROJECT SYSTEM DESIGN

CONTRACT No.: A630

CRITERIA AND STANDARDS - VOL. 1, SECTION 3.7

REVIEW LEVEL: 100%

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
3.7.5.K	Substation monitoring devices for dc equipment enclosed in metal housings shall detect and annunciate the condition when the dc equipment enclosure is grounded or a positive bus is being faulted to the enclosure.			See TP, Section 5, ¶5.4.1.A
3.7.5.L	Rubber matting of high dielectric strength, or an epoxy coating, shall be provided on the floor around the perimeter of dc conversion equipment and switchgear.  The equipment shall be located such that personnel cannot bridge to grounded surfaces.			See Stage II, Facilities Contracts  See Stage II, Facilities Contracts
3.7.5.M	Two means of egress shall be provided from each substation.			See Stage I, Facilities Contracts
3.7.5.N	Traction power zones shall be separated by nonbridgeable gaps.			See Line Segment Contracts
3.7.5.O	Traction power substations shall have ac receptacles isolated to prevent accidental grounding of the dc power when using test equipment.			See Section 3, ¶3.2.2.B.4
3.7.6	<u>Other Design Features</u>			
3.7.6.A	All critical support facilities shall have subsystem status indicators on the RCC mimic board.  An alarm shall sound when an equipment failure occurs.			See Contract A-640 Also see Supervisory Control Requirements for various Sections



SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: TRACTION POWER SUBSTATION EQUIPMENT

GROUP: MRTC-SAFETY, ASSURANCE & SECURITY

DATE: 11/11/88

REVIEWER: R. HARVEY

DISCIPLINE: RELIABILITY

REVIEW REFERENCE: METRO RAIL PROJECT SYSTEM DESIGN

CONTRACT No.: A630

CRITERIA AND STANDARDS - VOL. 1, SECTION 5.2

REVIEW LEVEL: 100%

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
5.2.1.B	<p>Manufacturers of the following system equipment shall be required, by contract, to establish and maintain a Reliability Program and Plan:</p> <p>Program and Plan:</p> <ol style="list-style-type: none"> <li>1. Vehicle</li> <li>2. Train Control</li> <li>3. Fare Collection.</li> </ol> <p>Their plans shall be prepared using the SCRTD System Assurance Program Plan as a guide for style, content, and format.</p>			<p>Reliability Program requirements are not applicable to this equipment Procurement Contract</p>
5.2.2.C	<p>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.</p> <ol style="list-style-type: none"> <li>1. Vehicle</li> <li>2. Train Control</li> <li>3. Fare Collection.</li> </ol>			
5.2.2.D	<p>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:</p> <ol style="list-style-type: none"> <li>1. System definitions and related assumptions</li> </ol>			<p style="text-align: center;">↓</p>





# SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

## METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: TRACTION POWER SUBSTATION EQUIPMENT

GROUP: MRTC-SAFETY, ASSURANCE & SECURITY

DATE: 11/11/88

REVIEWER: R. HARVEY

DISCIPLINE: RELIABILITY

REVIEW REFERENCE: METRO RAIL PROJECT SYSTEM DESIGN

CONTRACT No.: A630

CRITERIA AND STANDARDS - VOL. 1, SECTION 5.2

REVIEW LEVEL: 100%

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
	3. The mathematical verification that the test shall demonstrate the required MTBF, MTBSF, MCBF, and failure rates as specified by contract.			N/A to this Contract
5.2.3.A	Contractors shall be legally bound to ensure that contractual reliability requirements are achieved.			↓
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.			
5.2.4.A	Contractors shall be required to use the format designed by the SCR TD for reporting failures.			
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:			
	<ol style="list-style-type: none"> <li>1. Vehicle Body: 30 years</li> <li>2. Train Control System: 25 years</li> <li>3. Fare Collection System: 25 years</li> <li>4. Tunnels: 100 years</li> <li>5. Trackwork: 30 years.</li> </ol>			



# SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

## METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: TRACTION POWER SUBSTATION EQUIPMENT

GROUP: MRTC-SAFETY, ASSURANCE & SECURITY

DATE: 11/11/88

REVIEWER: R. HARVEY

DISCIPLINE: RELIABILITY

REVIEW REFERENCE: METRO RAIL PROJECT SYSTEM DESIGN

CONTRACT No.: A630

CRITERIA AND STANDARDS - VOL. 1, SECTION 5.2

REVIEW LEVEL: 100%

REQ. ID.	REQUIREMENT	YES	NO	COMMENT
5.2.5.B	<p>The system elements shall be capable of being operated, stored, and maintained at specific performance levels without impairment resulting from the impact of the following environmental parameters throughout the indicated range of values:</p> <ol style="list-style-type: none"> <li>1. Air temperature: Minimum: 20°F Maximum: 110°F Average: 66°F</li> <li>2. Relative humidity: 24 hour range: 45% to 85%</li> <li>3. Rainfall in 24 hours: Maximum re- corded: 6.11"</li> <li>4. Rainfall in 1 hour: Maximum re- corded: 1.87"</li> <li>5. Wind speed: Average: 10 mph Maximum recorded: 49 mph</li> <li>6. Seismic activity: (Reference "DESIGN EARTHQUAKE PARAMETERS" and "DESIGN FAULT PARAMETERS" tables of Criteria)</li> <li>7. Air pollution: <ul style="list-style-type: none"> <li>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></li> <li>o Acid Precipitation: pH of 4.41</li> </ul> </li> </ol>			<p>N/A to this Contract</p> 

# MTA LIBRARY



# SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

## METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: TRACTION POWER SUBSTATION EQUIPMENT

GROUP: MRTC-SAFETY, ASSURANCE & SECURITY

DATE: 11/11/88

REVIEWER: R. HARVEY

DISCIPLINE: RELIABILITY

REVIEW REFERENCE: METRO RAIL PROJECT SYSTEM DESIGN

CONTRACT No.: A630

CRITERIA AND STANDARDS - VOL. 1, SECTION 5.2

REVIEW LEVEL: 100%

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
	<ul style="list-style-type: none"> <li>o Gases and fumes: (Reference "Types" and "Concentrations" table of Criteria)</li> </ul>			



# SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

## METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: TRACTION POWER SUBSTATION EQUIPMENT

GROUP: MRTC-SAFETY, ASSURANCE & SECURITY

DATE: 11/11/88

REVIEWER: R. HARVEY

DISCIPLINE: MAINTAINABILITY

REVIEW REFERENCE: METRO RAIL PROJECT SYSTEM DESIGN

CONTRACT No.: A630

CRITERIA AND STANDARDS - VOL. 1, SECTION 5.3

REVIEW LEVEL: 100%

REQ. ID.	REQUIREMENT	YES	NO	COMMENT
5.3.1.B	<p>Manufacturers of the following system equipment shall be required, by contract, to establish and maintain a Maintainability Program and Plan.</p> <ol style="list-style-type: none"> <li>1. Vehicle</li> <li>2. Train Control</li> <li>3. Communications</li> <li>4. Fare Collection</li> <li>5. Traction Power.</li> </ol> <p>Their plans shall be prepared using the SCRTD System Assurance Plan as a guide for style, content, and format.</p>			<p>Due to the nature of the equipment provided, Maintenance and Training Manuals have sufficient information to assure an adequate Maintenance Program. Therefore a formal system developed by the Contractor is considered unnecessary</p>
5.3.2.A	<p>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:</p> <ol style="list-style-type: none"> <li>1. Maintenance Levels <ol style="list-style-type: none"> <li>a. System repairs done on SCRTD property</li> <li>b. Module and component repairs done on SCRTD property</li> <li>c. Module and component repairs done at the contractor's facilities.</li> </ol> </li> </ol>			





# SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

## METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: TRACTION POWER SUBSTATION EQUIPMENT

GROUP: MRTC-SAFETY, ASSURANCE & SECURITY

DATE: 11/11/88

REVIEWER: R. HARVEY

DISCIPLINE: MAINTAINABILITY

REVIEW REFERENCE: METRO RAIL PROJECT SYSTEM DESIGN

CONTRACT No.: A630

CRITERIA AND STANDARDS - VOL. 1, SECTION 5.3

REVIEW LEVEL: 100%

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
5.3.2.B	<p>A Maintenance Analysis shall be developed and submitted to the SCRTD by the Vehicle, Train Control, and Fare Collection contractors.</p> <p>The Maintenance Analysis shall be submitted iteratively (every 90-180 days) as the design develops.</p> <p>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:</p> <ol style="list-style-type: none"> <li>1. Frequency of task</li> <li>2. Time to perform</li> <li>3. Test equipment, tools, and facilities required</li> <li>4. Crew size and skill level</li> <li>5. Manuals and instructions needed.</li> </ol>			<p>N/A to this Contract</p> 
5.3.4.A	<p>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:</p>			<p>See TP Section 12, Article 12.3.2</p>

**MTA LIBRARY**



# SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

## METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: TRACTION POWER SUBSTATION EQUIPMENT

GROUP: MRTC-SAFETY, ASSURANCE & SECURITY

DATE: 11/11/88

REVIEWER: R. HARVEY

DISCIPLINE: MAINTAINABILITY

REVIEW REFERENCE: METRO RAIL PROJECT SYSTEM DESIGN

CONTRACT No.: A630

CRITERIA AND STANDARDS - VOL. 1, SECTION 5.3

REVIEW LEVEL: 100%

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
5.3.4.B	1. Running Maintenance and Servicing Manuals			
	2. Heavy Repair Maintenance Manuals			
	3. Parts Catalogs			
	4. Test Equipment Maintenance Manuals.			
5.3.4.B	The manuals shall be designed for continuous, long term service in a maintenance shop environment.  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).  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.	X		See TP Section 12, Article 12.3.2.G  ↓
5.3.5.A	Contractors shall be required to provide a comprehensive training program for SCRTD maintenance personnel.	X		See TP Section 12, Article 12.3.3  ↓
	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			



SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: TRACTION POWER SUBSTATION EQUIPMENT

GROUP: MRTC-SAFETY, ASSURANCE & SECURITY

DATE: 11/11/88

REVIEWER: R. HARVEY

DISCIPLINE: MAINTAINABILITY

REVIEW REFERENCE: METRO RAIL PROJECT SYSTEM DESIGN

CONTRACT No.: A630

CRITERIA AND STANDARDS - VOL. 1, SECTION 5.3

REVIEW LEVEL: 100%

REQ. ID.	REQUIREMENT	YES	NO	COMMENT
5.3.6.A	<p>these personnel will not void any of the warranties or guarantees in effect.</p> <p>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.</p> <p><b>MTA LIBRARY</b></p>			<p>N/A to this Contract</p> <p style="text-align: center;">↓</p>



# SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

## METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: TRACTION POWER SUBSTATION EQUIPMENT

GROUP: MRTC-SAFETY, ASSURANCE & SECURITY

DATE: 11/11/88

REVIEWER: R. HARVEY

DISCIPLINE: QUALITY ASSURANCE

REVIEW REFERENCE: METRO RAIL PROJECT SYSTEM DESIGN

CONTRACT No.: A630

CRITERIA AND STANDARDS - VOL. 1, SECTION 5.4

REVIEW LEVEL: 100%

REQ. ID.	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 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		<p>Due to the critical nature, System Assurance requirements have been employes</p> <p>See TP Section 9 Article 9.1</p>
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>	X		See SC Article 4.0 & GC Article 19



# SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

## METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: TRACTION POWER SUBSTATION EQUIPMENT

GROUP: MRTC-SAFETY, ASSURANCE & SECURITY

DATE: 11/11/88

REVIEWER: R. HARVEY

DISCIPLINE: QUALITY ASSURANCE

REVIEW REFERENCE: METRO RAIL PROJECT SYSTEM DESIGN

CONTRACT No.: A630

CRITERIA AND STANDARDS - VOL. 1, SECTION 5.4

REVIEW LEVEL: 100%

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
5.4.3	1. Carbody - 5 years			
	2. Truck-Structural Elements - 5 years			
	3. Traction Motors, except brushes - 5 years			
	4. Gear reducers for propulsion subsystem - 5 years.			
	<b>QUALITY PROGRAM CONTENT</b>			
	A. <u>Receiving Inspection</u>			
	Contractors shall provide for the inspection of all incoming material. Statistical sampling is acceptable.	X		See TP Section 9, Article 9.11
	All material certifications and test reports used as the basis for acceptance by the contractors shall be maintained as quality records.	X		See TP Section 9, Article 9.3
	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 Section 9, Article 9.14
C. <u>Changes to Drawings and Specifications</u>				
Contractors shall ensure that all inspection and acceptance test are	X		See TP Section 9, Article 9.12 &	



# SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

## METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: TRACTION POWER SUBSTATION EQUIPMENT

GROUP: MRTC-SAFETY, ASSURANCE & SECURITY

DATE: 11/11/88

REVIEWER: R. HARVEY

DISCIPLINE: QUALITY ASSURANCE

REVIEW REFERENCE: METRO RAIL PROJECT SYSTEM DESIGN

CONTRACT No.: A630

CRITERIA AND STANDARDS - VOL. 1, SECTION 5.4

REVIEW LEVEL: 100%

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
	based on the latest revision or changes to drawings and specifications.			Section 10, ¶10.5.4.D
	An acceptable configuration management and control system shall be established and maintained.	X		See TP Section 10, Article 10.5
	The responsibility for control of changes shall extend to suppliers.	X		See TP Section 10, ¶10.5.4.B
D.	<u>Identification of Inspection Status</u>			
	Contractors shall maintain a system for identifying the progressive inspection status of components or materials as to their acceptance, rejection or non-inspection.	X		See TP Section 9, Articles 9.10 & 9.15
E.	<u>Shipping Inspection</u>			
	Contractors shall provide for the proper inspection of products to ensure completion of manufacturing and conformance to contract requirements prior to shipment.	X		See TP Section 9, Article 9.13
F.	<u>Quality Assurance Organization</u>			
	The organization of each contractor's QA Program shall be well defined.	X		See TP Section 9, Article 9.2
	QA personnel shall have sufficient, well-defined responsibilities and organizational freedom which encourage the identification and evaluation of quality problems.			



SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: TRACTION POWER SUBSTATION EQUIPMENT

GROUP: MRTC-SAFETY, ASSURANCE & SECURITY

DATE: 11/11/88

REVIEWER: R. HARVEY

DISCIPLINE: QUALITY ASSURANCE

REVIEW REFERENCE: METRO RAIL PROJECT SYSTEM DESIGN

CONTRACT No.: A630

CRITERIA AND STANDARDS - VOL. 1, SECTION 5.4

REVIEW LEVEL: 100%

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
	Contractors shall have a QA Program that can verify compliance with contract requirements.	X		See TP Section 9, Article 9.1
G.	<u>Qualification of Personnel</u>  Contractor personnel performing inspections, test or special processes shall be qualified for such work based on prior experience and training.  Records of personnel qualifications shall be maintained and available for review.	X		See TP Section 9, Article 9.7
H.	<u>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 Section 9, Article 9.10
I.	<u>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 Section 9, Article 9.17

MTA LIBRARY



SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: TRACTION POWER SUBSTATION EQUIPMENT

GROUP: MRTC-SAFETY, ASSURANCE & SECURITY

DATE: 11/11/88

REVIEWER: R. HARVEY

DISCIPLINE: QUALITY ASSURANCE

REVIEW REFERENCE: METRO RAIL PROJECT SYSTEM DESIGN

CONTRACT No.: A630

CRITERIA AND STANDARDS - VOL. 1, SECTION 5.4

REVIEW LEVEL: 100%

REQ. ID.	REQUIREMENT	YES	NO	COMMENT
J.	<u>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 Section 9, Article 9.18
K.	<u>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 Section 9, Article 9.19
	A Material Review Board consisting of appropriate SCRTD, contractor, QA and design personal shall be established.			N/A to this Contract



# SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

## METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: TRACTION POWER SUBSTATION EQUIPMENT

GROUP: MRTC-SAFETY, ASSURANCE & SECURITY

DATE: 11/11/88

REVIEWER: R. HARVEY

DISCIPLINE: CONFIGURATION MANAGEMENT

REVIEW REFERENCE: METRO RAIL PROJECT SYSTEM-DESIGN

CONTRACT NO.: A630

CRITERIA AND STANDARDS - VOL. 1, SECTION 5.6

REVIEW LEVEL: 100%

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
5.6.1.B.1	The following system equipment contractors shall be required to prepare and maintain a Configuration Management Program that complies with the basic requirements of MIL-STD-483-USAF:  <ul style="list-style-type: none"> <li>o Vehicle</li> <li>o Train Control</li> <li>o Communications</li> <li>o Fare Collection</li> <li>o Traction Power.</li> </ul>	X		See TP Section 10, Article 10.5
5.6.1.B.2	The configuration management program shall include the elements of:  <ul style="list-style-type: none"> <li>o Configuration identification, including drawing identification and release</li> <li>o Change control</li> <li>o Configuration accountability.</li> </ul>	X		See TP Section 10, ¶10.5.3 & ¶10.5.4
5.6.1.B.3	Equipment manufacturers shall not be required to modify, expand or replace their existing manufacturing, and change control and reporting systems if they can show, to the satisfaction of the SCRTD, that their existing systems will accomplish the configuration management objectives as defined in contractual documents.	X		See TP Section 10, ¶10.5.4.D
	Drawing numbering shall be in accordance with the system being established by the GC for the Metro Rail Project.	X		See TP Section 10, ¶10.5.5



# SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

## METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: TRACTION POWER SUBSTATION EQUIPMENT

GROUP: MRTC-SAFETY, ASSURANCE & SECURITY

DATE: 11/11/88

REVIEWER: R. HARVEY

DISCIPLINE: CONFIGURATION MANAGEMENT

REVIEW REFERENCE: METRO RAIL PROJECT SYSTEM DESIGN

CONTRACT No.: A630

CRITERIA AND STANDARDS - VOL. 1, SECTION 5.6

REVIEW LEVEL: 100%

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
5.6.1.B.4	<p>Construction contractors, and systems equipment contractors other than those listed in paragraph B.1. above shall demonstrate to the SCRTD that at the time he receives Notice to Proceed he has in place adequate procedures for:</p> <ul style="list-style-type: none"> <li>o Drawing Release and Control</li> <li>o Change Control</li> <li>o Drawing Number and (if required) Part Numbering Identification</li> <li>o Change Status Reporting.</li> </ul>			N/A to this Contract
5.6.1.B.5	Drawing numbering shall be in accordance with the system being established by the GC for the Metro Rail Project.	X		See TP Section 10, ¶10.5.5
5.6.3.A	<p>The contractor's technical documentation shall be capable of defining the approved configuration of system equipment under development, test, production, or operational use.</p> <p>The technical documentation shall identify the configuration to the lowest level necessary to meet production and maintenance requirements.</p> <p>The contractor's release records and documentation shall be capable of determining:</p>	X		See TP Section 10, ¶10.5.3



# SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

## METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: TRACTION POWER SUBSTATION EQUIPMENT

GROUP: MRTC-SAFETY, ASSURANCE & SECURITY

DATE: 11/11/88

REVIEWER: R. HARVEY

DISCIPLINE: CONFIGURATION MANAGEMENT

REVIEW REFERENCE: METRO-RAIL PROJECT SYSTEM DESIGN

CONTRACT No.: A630

CRITERIA AND STANDARDS - VOL. 1, SECTION 5.6

REVIEW LEVEL: 100%

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
	<ol style="list-style-type: none"> <li>The composition of any part number at any level in terms of subordinate part numbers</li> <li>All next assembly part numbers of any part</li> <li>The specification document or drawing number associated with the part number.</li> </ol>	X		See TP Section 10, ¶10.5.3
5.6.3.B	<p>All part numbers used by contractors or subcontractors shall identify a specific item having a specific configuration.</p> <p>All items, beginning with the lowest replaceable or repairable unit, and identified by the same part number, shall have the same physical and functional characteristics, shall be equivalent in performance and durability and shall be interchangeable without alteration to themselves or associated items, other than normal field adjustments.</p>	X		See TP Section 10, ¶10.5.4
5.6.3.C	<p>Contractors shall assure that all engineering change proposals are screened at management levels high enough so that only essential changes are submitted. All potential impacts of the change shall be considered including:</p> <ol style="list-style-type: none"> <li>Safety</li> <li>Reliability</li> <li>Maintainability</li> </ol>	X		See TP Section 10, ¶10.5.7



# SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

## METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: TRACTION POWER SUBSTATION EQUIPMENT

GROUP: MRTC-SAFETY, ASSURANCE & SECURITY

DATE: 11/11/88

REVIEWER: R. HARVEY

DISCIPLINE: CONFIGURATION MANAGEMENT

REVIEW REFERENCE: METRO RAIL PROJECT SYSTEM DESIGN

CONTRACT No.: A630

CRITERIA AND STANDARDS - VOL. 1, SECTION 5.6

REVIEW LEVEL: 100%

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
	4. Human Engineering 5. Scheduling and Cost Impact 6. Test(s) Implications 7. Retrofit Requirements 8. Publications 9. Training 10. Spare Parts.  Engineering changes shall be classified as Class I or Class II, as defined in MIL-STD-480A.  Class I changes shall be processed on a change request form provided by the General Consultant and shall be submitted to the SCRTRD for approval prior to implementation.			
5.6.3.D	Contractors shall maintain records such that the configuration of any item being delivered shall be definable in terms of its component part numbers.	X		See TP Section 10, ¶10.5.4
	A serialization and configuration record shall be maintained for all items delivered by a contractor to the SCRTRD.	X		See TP Section 10, ¶10.5.5.B
5.6.4	The following design reviews and audits shall be conducted jointly by the SCRTRD and the contractors.	X		See TP Section 10, ¶10.5.7
5.6.4.A	A Preliminary Design Review shall be conducted prior to detail design to evaluate the progress and technical adequacy of the selected design approach.	X		See TP Section 10, ¶10.5.7.C



# SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

## METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: TRACTION POWER SUBSTATION EQUIPMENT  
 GROUP: MRTC-SAFETY, ASSURANCE & SECURITY DATE: 11/11/88  
 REVIEWER: R. HARVEY  
 DISCIPLINE: CONFIGURATION MANAGEMENT  
 REVIEW REFERENCE: METRO RAIL PROJECT SYSTEM DESIGN CONTRACT No.: A630  
CRITERIA AND STANDARDS - VOL. 1, SECTION 5.6 REVIEW LEVEL: 100%

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
5.6.4.B	Every contractor shall prepare the requested material for submission to In-Progress, Pre-Final, and Final Design Reviews at design milestones determined by SCRTD.	X		See TP Section 10, ¶10.5.7
5.6.4.C	For major systems equipment as defined in 5.6.1-B, the SCRTD shall conduct a physical configuration audit on the first production unit by formal examination against the production drawings and specifications in order to establish the production baseline.			Due to the use of essentially off-the-shelf items provided by this Contract. A Physical Configuration Audit is considered unnecessary provided satisfactory evidence of qualification tests is submitted prior to NTP.
5.6.4.D	Functional configuration audits shall be conducted on system equipment subjected to qualification testing after successful completion of qualification testing.			N/A to this Contract
	An audit shall also be conducted at the completion of the passenger vehicle performance demonstration testing to verify formally that the vehicle has achieved the performance required by the contract specifications.			N/A to this Contract
5.6.4.E	As configuration baselines are established, the baseline documentation shall be identified and recorded.			N/A to this Contract



SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT

METRO RAIL PROJECT DESIGN REVIEW CHECKLIST

CERTIFIABLE ELEMENT: TRACTION POWER SUBSTATION EQUIPMENT

GROUP: MRTC-SAFETY, ASSURANCE & SECURITY

DATE: 11/11/88

REVIEWER: R. HARVEY

DISCIPLINE: CONFIGURATION MANAGEMENT

REVIEW REFERENCE: METRO RAIL PROJECT SYSTEM DESIGN

CONTRACT No. A630

CRITERIA AND STANDARDS - VOL. 1, SECTION 5.6

REVIEW LEVEL: 100%

REQ. I.D.	REQUIREMENT	YES	NO	COMMENT
	All approved changes to a baseline shall be recorded and maintained and periodically reported to the SCRTD.			See TP Section 10, ¶10.5.4.D
5.6.5	Drawings shall be of appropriate quality and size.			
5.6.5.A	Drawings shall be of a quality where every line, number, and symbol is clearly legible.	X		See TP Section 12, ¶12.3.1
5.6.5.B	Standard drawing size shall be 22" by 34" unless approved by the SCRTD.			
5.6.5.C	Any microfilm provided shall be 35mm silver halide film and shall be processed to archival standards.			

II. DESIGN REVIEW  
COMMENTS



METRO RAIL PROJECT  
REVIEW / COMMENT SHEET

Reviewer L. Boyer/H. Spary File No. \_\_\_\_\_ Date 11/30 1987

Dept. / Section SCS Submittal No. and/or Date \_\_\_\_\_ Sheet 1 of 2

Design Review / Submittal Title A630 TRACTION PINEY SUBSTATION EQUIP

REF NO.	PAGE NO.	DRAWING NO. / DOCUMENT SECT	COMMENT	RESPONSE / ACTION
1	TP 2-1	GENERAL	Hold a 01200 Type Section Meeting PRE AWARD CONTRACT MEETING which should be included which will state that meeting be held to discuss DISTRICT REQUIREMENTS FOR SAFETY, QUALITY/DUPLICATION, DEFENSE AND INSURANCE REQUIREMENTS ETC. Also that SCS will be responsible for equipment and that it will give the NOTIFY SYSTEMS AND CONSTRUCTION	all RM 11-10-88 see TP 10.3.3
2	GP-14	PARA 20	SAFETY OF TESTS AND INSPECTIONS SO THAT ITEMS MAY BE WITNESSED OR AUDITED	to District 11-10-88 see TP 11.1.4.D REF NO. 1
3	GP-17	PARA 25	STIPULATE RESPONSIBILITY OF SYSTEMS SAFETY AND ASSURANCE TO COORDINATE & PERFORM AUDITS	APPLICABLE 1200 TYPE SECTION MEETINGS ARE COVERED IN SECTION TP-10. REFERENCED SUBJECTS WILL BE COVERED AT THE PREBID CONFERENCE (PAGE BR-1) THE CONTRACTING OFFICER (OCPM) WILL ISSUE THE NOTICE TO PROCEED. THE DISTRICT'S REPRESENTATIVE (DAR) WILL BE DESIGNATED AT NTP (PAGE GP-17)
4	GP-20	PARA 28 E	SYSTEMS AND CONSTRUCTION SAFETY DEPARTMENT RESPONSIBILITY TO AUDIT "DAR" should be NOTED	all RM 11-10-88 see TP 11.1.4.C 9.6
5	TP-28	PARA 30.2 A+B	TESTS SHALL BE AUDITED AND WITNESSED AT THE DISCRETION OF DISTRICT SYSTEMS AND CONSTRUCTION SAFETY DEPT AND TEST ENGINEER.	REF NO 2 THRU 12
6	TP-42	PARA 4.8.1 B 4.8.3 + 4.8.4	SAME AS ABOVE	SPECIFIC RESPONSIBILITIES AND COORDINATION WITHIN DISTRICT NEED NOT BE SPECIFIED IN CONTRACT DOCUMENTS. THESE ARE DISTRICT INTERNAL ORGANIZATION MATTERS. ALL COMMUNICATIONS BETWEEN CONTRACTOR AND DISTRICT SHALL BE THROUGH THE DAR.
6	TP-59	PARA 5.4.1	SAME AS ABOVE	

MTA LIBRARY



METRO RAIL PROJECT  
REVIEW / COMMENT SHEET

Reviewer L. Boyer/H. Storey File No. \_\_\_\_\_ Date 11/30 1987

Dept. / Section S+SA Submittal No. and/or Date \_\_\_\_\_ Sheet 2 of 2

Design Review / Submittal Title A 130 TRACTION PINKER SUBSTATION EQUIPMENT

REF NO.	PAGE NO.	DRAWING NO. / DOCUMENT SECT	COMMENT	RESPONSE / ACTION
<del>7</del>	<del>TP-5-19</del>	PARA 5.10.1	QUAL. TESTS SHALL BE WITNESSED BY SYSTEMS AND CONSTRUCTION SAFETY QUALITY AND TEST REPRESENTATIVE. PRODUCTION TESTS SHALL BE ACCEPTED AS ABOVE.	all 11/10/88 see TP 11 A11.1.1
8	TP-6-19	PARA 5.10.2	SAME	↓
9	TP-6-12	PARA 6.10.1 6.10.2 & 6.10.3	SAME	
NOTE THE POTENTIAL FOR SERIOUS ACCIDENT OCCURRING WITH FAULTY HIGH VOLTAGE SWITCH GEOR REQUIRES CAREFUL ATTENTION TO INSPECTION, TEST AND MANUFACTURING DETAIL				
10	TP-7-19	PARA 7.5.1	LOW VOLTAGE TESTS IN GENERAL SHALL RECEIVE AUDIT AND SURVEILLANCE FOR RELIABILITY AND SAFETY	all 11/10/88 See TP 11 A11.1.1
11	TP-8-6	PARA 8.4	SCS AUDITS REQUIRED	↓
12	TP-9-1	PARA 9.1	DEFINE RESPONSIBILITY OF SYSTEMS AND CONSTRUCTION SAFETY DEPARTMENT SYSTEMS ASSURANCE FUNCTION TO AUDIT AND APPROVE QA SYSTEM IN CONJUNCTION WITH DAR.	The contractor submittal Review Procedure developed by BOOZE ALLEN defines the responsibilities of various organizations involved with the Submittal Review Process
	TP-9-1	"	AUDITS OF PROGRAM AS WELL AS SUBMITTAL OF PLAN SHALL BE COORDINATED AND PERFORMED BY SCS IN CONJUNCTION WITH DAR	
	TP-9-1	" Add	"QA program" for approval to GM and Districts SCS Dept.	

REVIEWER R. FRIAS/M. CASSAGNOL FILE NO. \_\_\_\_\_ DATE 11-30-87

DEPT/SECTION QA/QC SUBMITTAL NO. \_\_\_\_\_ AND/OR DATE 11-17-87 SHEET 3 OF 4

DESIGN REVIEW/SUBMITTAL TITLE CONTRACT A-630 TRACTION POWER SUBSTATION EQUIPMENT - LEGAL/TECH. REV.

REF NO.	PAGE NO.	DRAWING NO./DOCUMENT SECT	COMMENT	RESPONSE/ACTION
QA1.	SP-6	11.0	CHANGE "ACCEPTANCE" TO "DELIVERY" IN 2ND PARA.	DISAGREE/SEE DEFINITION IN REVISED GENERAL CONDITIONS
QA2.	GP-2	DEFINITIONS	REVIEW LATEST RTD CHANGE PROCEDURES AND REVISE/AUGMENT AS REQUIRED TO INCLUDE CORRECT DEFINITIONS.	COORDINATED G.P.'S ARE BEING DEVELOPED FOR SYSTEMS CONTRACTS
QA3.	GP-6		IN DEFINITION OF WORK ADD "DESIGN", AFTER DATA.	AS #QA2
QA4.	TP-1-3	1.2.2.E	VERIFY DIMENSIONS STATED DO NOT CONFLICT WITH DIMENSION OF DOORS INDICATED.	VERIFIED (WILL DELETE ART. 1.2.2.E AS REQUIREMENTS COVERED IN ART. 7.1 OF S.P.'S)
QA5.	TP-2-9	2.12	SUGGEST WE HAVE ONLY ONE SET OF ABBREVIATIONS AND DEFINITIONS OR (AS A MINIMUM) ENSURE THAT DEFINITIONS AND ABBREVIATIONS ARE NOT IN CONFLICT WITH THOSE GIVEN IN GENERAL CONDITIONS.	WILL VERIFY AND AVOID DUPLICATION
QA6.	TP-3-27	3.12	CLARIFY MEANING OF "TESTS SHALL BE PERFORMED IN ACCORDANCE WITH THOSE LISTED IN ANSI/IEEE C 37.20." THIS IS A GENERAL STATEMENT WITH ONLY THE CODE CHANGING FOR MOST FACTORY TESTS.	ART. 3.12.1 SPECIFIES TESTS ON SWITCHGEAR ASSEMBLIES" ART. 3.12.2 THRU 3.12.4 SPECIFIES TESTS ON THE MAJOR COMPONENTS.
QA7.	TP-9-3		9.12 & 9.14 CLARIFY. NOT CLEAR WHETHER APPROVAL IS BY CONTRACTOR QA/QC OR THE DISTRICT. IF BY CONTRACTOR QA/QC DISTRICT SHOULD REVIEW AND APPROVE.	SEE ART. 9.1 & 9.6 DEFINITION OF "APPROVAL" GIVEN IN TP-3 ART. 2.12.3
QA8.	TP-9-4	9.19	VERIFY THAT REVIEW/APPROVAL BY A MATERIAL REVIEW BOARD WILL NOT BE REQUIRED FOR DISPOSITION OF NCR'S.	APPROVAL WILL BE BY DISTRICT OR DAR

REVIEWER: R. FRIAS/M. CASSIGNOL FILE NO. DATE: 11-30-97

DEPT SECTION: QAZ/QC SUBMITTAL NO. AND OF DATE: 11-17-97 SHEET: 3 OF 4

DESIGN NUMBER AND TITLE: COMPACT A-632 TRACTIAN PWR SUBSTATION EQUIPMENT - LEG/1/TECH. REV.

REF NO.	PAGE NO.	DRAWING ID BY DRAWING SECT	COMMENT	RESPONSE ACTION
QA1.	SP-5	11.0	CHANGE "ACCEPTANCE" TO "DELIVERY" IN 2ND PARA.	DISAGREE/SEE DEFINITION IN REVISED GENERAL CONDITIONS
QA2.	SP-2	DEFINITIONS	REVIEW LATEST RTO CHANGE PROCEDURES AND REVISE/AUGMENT AS REQUIRED TO INCLUDE CORRECT DEFINITIONS.	COORDINATED S.P.'S ARE BEING DEVELOPED FOR SYSTEMS CONTRACTS
QA3.	SP-6		IN DEFINITION OF WORK ADD "DESIGN", AFTER DATA.	AS # QA2
QA4.	TP-1-3	1.2.2.E	VERIFY DIMENSIONS STATED DO NOT CONFLICT WITH DIMENSION OF DOORS INDICATED.	VERIFIED [WILL DELETE ART. 1.2.2.E AS REQUIREMENT COVERED IN ART. 7.1 OF S.P.'S]
QA5.	TP-2-3	2.12	SUGGEST WE HAVE ONLY ONE SET OF ABBREVIATIONS AND DEFINITIONS OR (AS A MINIMUM) ENSURE THAT DEFINITIONS AND ABBREVIATIONS ARE NOT IN CONFLICT WITH THOSE GIVEN IN GENERAL CONDITIONS.	WILL VERIFY AND AVOID DUPLICATION ALL 11-10-98
QA5.	TP-2-27	3.12	CLARIFY MEANING OF "TESTS SHALL BE PERFORMED IN ACCORDANCE WITH THOSE LISTED IN ANSI/IEEE C 37.20." THIS IS A GENERAL STATEMENT WITH ONLY THE CODE REMAINING FOR FACTORY TESTS.	ART. 3-12.1 SPECIFIES TESTS ON "SWITCHGEAR ASSEMBLIES". ART. 3.12.2 THRU 3.12.4 SPECIFIES TESTS ON THE MAJOR COMPONENTS.
QA7.	TP-9-3		9.12 & 9.14 CLARIFY. NOT CLEAR WHETHER APPROVAL IS BY CONTRACTOR OR DC OF THE DISTRICT. IF BY CONTRACTOR QAZ/QC DISTRICT SHOULD REVIEW AND APPROVE.	SEE ART. 9.1 & 9.6. DEFINITION OF "APPROVAL" GIVEN IN TP-2 ART. 2.12.3
QA8.	TP-9-4	9.19	VERIFY THAT REVIEW/APPROVAL BY A MATERIAL REVIEW BOARD WILL NOT BE REQUIRED FOR DISPOSITION OF NCR'S.	APPROVAL WILL BE BY DISTRICT OR DAR ALL 11-10-98

**MTA LIBRARY**

REVIEWER R. FRIAS/M. CASSAGNOL FILE NO. \_\_\_\_\_ DATE 11-30-87

DEPT/SECTION QA/QC SUBMITTAL NO. 11-17-87 SHEET 4 OF 4  
AND/OR DATE \_\_\_\_\_

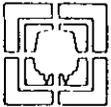
DESIGN REVIEW/SUBMITTAL TITLE CONTRACT A-630 TRACTION POWER SUBSTATION EQUIPMENT -  
LEGAL/TECH. REV.

REF NO.	PAGE NO.	DRAWING NO./ DOCUMENT SECT	COMMENT	RESPONSE/ACTION
QA9.	TP-10-4	10.3	DOES NOT ADDRESS MAINTAINABILITY AND RELIABILITY REQUIREMENTS. VERIFY THIS IS ACCEPTABLE.	VERIFIED. ALL EQUIPT. IS STANDARD LINE PRODUCTION. MARR IS COVERED BY RELEVANT ANSI STANDARDS
QA10.	TP-12-2	12-2	REQUIREMENT FOR CONTRACTOR SYSTEM SUPPORT FOR INSTALLATION AND START UP APPEARS TO BE OPEN-ENDED AND COULD IMPACT BID PRICE OR LEAD TO CLAIM.	COST OF SERVICES UNDER ART. 12.3.4 COVERED IN BID PRICE ITEM 6 (PAGE BF-9)
QA11.	TP-12-5	12.3.2.E	SPECIFY NUMBER OF DRAFT MANUALS TO BE SUBMITTED.	NOT NECESSARY ONE COPY IS ADEQUATE
QA12.	TP-12-9	12.3.3	ADD INFORMATION ON MINIMUM NUMBER OF TRAINEES, EXTENT OF TRAINING TIME, ETC. SO CONTRACTOR CAN MAKE AN INFORMED ASSESSMENT OF COST. ALSO SPECIFY REQUIREMENT FOR APPROVAL OF TRAINING COURSE MATERIALS NOT JUST THE OUTLINE.	WILL REVISE IN ACCORDANCE WITH CONTRACT A630 SECT. 16
QA13.			GENERAL: 1) VERIFY IF WELD PROCEDURE QUALIFICATION AND WELDER CERTIFICATIONS PER WELDING CODES IS REQUIRED. IF REQUIRED ADD TO CDRL. 2) SPECIAL CONDITIONS & GENERAL CONDITIONS DOES NOT CONFORM TO THAT PROVIDED FOR OTHER PROCUREMENT CONTRACTS.	NO. ALL SHOP WELDING SUBJECT TO CONTRACTORS QA AND ART. 4.7 OF T.P.9. COORDINATED G.C.'S ARE BEING DEVELOPED FOR SYSTEMS PROCUREMENT CONTRACTS. SPECIAL PROVISIONS ARE PARTICULAR FOR EACH SYSTEMS CONTRACT.

PROJECT FINAL COMMENT SHEET

DRAWING NO. R. FRIAS/N. 61807/104 PROJECT NO. 11-97-1 DATE OF ISSUE 11-10-98  
 CONTRACT NO. DA/CC PROJECT TITLE CONTRACT A620 - PARTIAL EQUIPMENT SUPPLY FOR THE  
REPLACEMENT OF

REF. NO.	PAGE NO.	DRAWING & DOCUMENT SECT.	COMMENT	ACTION/STATUS
103.	12-10-4	10.3	DOES NOT ADDRESS MAINTAINABILITY & RELIABILITY REQUIREMENTS. VERIFY THIS IS ACCEPTABLE.	VERIFIED. ALL EQUIP. IS STANDARD LINE PRODUCTION. MARR IS COVERED BY RELEVANT ANSI STANDARDS
110.	12-12-2	12-2	REQUIREMENT FOR CONTRACTOR SYSTEM SUPPORT FOR INSTALLATION AND START UP APPEARS TO BE OPEN-ENDED & COULD IMPACT BID PRICE & LEAD TO CLAIM.	COST OF SERVICES UNDER ART. 12.2.4 COVERED IN BID PRICE ITEM 6 (PAGE BF-9)
111.	12-12-5	12.3.2.5	CRUDITY NUMBER OF DRAFT MANUALS TO BE SUBMITTED.	NOT NECESSARY. ONE COPY IS ADEQUATE
112.	12-12-9	12.3.3	TO INFORMING OF MINIMUM NUMBER OF MANHOURS, EQUIP. OF TRAINING TIME, ETC. TO CONTRACTOR CAN MAKE AN INFORMED JUDGEMENT OF COST. ALSO SPECIFY TO BE DONE FOR APPROVAL OF TRAINING. (WHILE MATERIAL IS NOT JUST THE COSTING.	WILL REVISE IN ACCORDANCE WITH CONTRACT A620 SECT. 16
113.			GENERAL: 1) VERIFY IF WELD PROCEDURES QUALIFICATION AND WELDER CERTIFICATIONS PER WELDER CODES IS REQUIRED. IF REQUIRED, ADD TO CORL. 2) SPECIAL CONDITIONS & GENERAL CONDITIONS DOES NOT CONFORM TO THOSE PROVIDED FOR OTHER PROCUREMENT CONTRACTS.	NO. ALL SHOP WELDING SUBJECT TO CONTRACTORS QA AND ART. 9.7 OF T.P.9. COORDINATED G.C.'S ARE BEING DEVELOPED FOR SYSTEMS PROCUREMENT CONTRACTS. SPECIAL PROVISIONS ARE PARTICULAR FOR EACH SYSTEMS CONTRACT



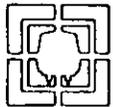
DESIGN REVIEW COMMENTS

**MTA LIBRARY**

REVIEWER M. Ingram FILE NO. WSS0A630 ORGANIZATION S, A95-QA  
DRAFT  
FIND 1 % SUBMITTAL FOR A630 Substation Equipment Specs.

REF. NO.	PAGE NO.	DRAWING NO./ SPEC. SECTION	COMMENTS	RESPONSE	ACTION
1	-	Appendix A	ENSURE Abbreviations and Definitions ARE NORMALIZED with the SCRTD Glossary of Abbreviations and Definitions for the Metro Rail Project. SEE Ref. No. 1 for the A615 COVERBOARD REVIEW.		<i>cel</i> <i>11-11-85</i>
2	TP-11-1	GENERAL	Requirement should be added for written notification to the District 10 days prior to PERFORMANCE OF FACTORY AND FIELD TESTS. Appropriate, corresponding addition should be made to CDRL. This comment was MADE AND AGREED to at the 85% level. SEE A612, PARA. 4.3 for appropriate wording.	See CDRL Item NO. 1103	<i>cel</i> <i>12-2-85</i>
3	TP-11-2 TP-11-4	11.1.4 11.2.5	Comment no. 78, page 13 of typewritten comments on 85% A630 (2-20-85; SDE 7089) has not BEEN RESOLVED as PREVIOUSLY AGREED to. PARA. 4.5.3 of A612 is AN EXAMPLE of satisfactory RESOLUTION of this comment pertaining to information to BE included on test REPORTS.		<i>cel</i> <i>11-11-85</i> <i>RA</i>





**DESIGN REVIEW COMMENTS**

REVIEWER J. Conahan FILE NO. \_\_\_\_\_ ORGANIZATION S.A.S.  
% SUBMITTAL FOR A615, A612, A630

REF. NO.	PAGE NO.	DRAWING NO./ SPEC. SECTION	COMMENTS	RESPONSE	ACTION
1	TP-3-4	A 615	3.5 3rd LINE - VERIFY "12 inches" this appears much.	IS OK	
2	SP-3	A 612	7.0 - Reference Vehicle Specification A650 SP-3.0. DBE/WBE Requirements are specified as DBE 15% WBE 5.2% - if these requirements are the latest from RTD they should be inserted in these specs.	RTD will verify	
3	SP-3	A 615	7.0 SAME COMMENT as #2.		
4	SP-6	A 630	9.0 SAME COMMENT as #2.		Not Safety Related 11/1/88
5	TP-2	A 630	1.2 General Comment: from reading the system Description 1.2A, 1.2.B, 1.2.C and checking Bid		







METRO RAIL TRANSIT CONSULTANTS  
DMJM/PBQD/KE/HWA

CROSS Reference  
See Section III  
Doc #

DATE 6-6-98  
SHEET 1 OF 2

RAA  
11-4-98

DESIGN REVIEW COMMENTS

MTA LIBRARY

REVIEWER M. INGRAM FILE NO. W001A630 P.10 ORGANIZATION SAS

100 % SUBMITTAL FOR Traction Power Procurement - A630  
A612, A615 & A630

REF. NO.	PAGE NO.	DRAWING NO./ SPEC. SECTION	COMMENTS	RESPONSE	ACTION
			COVERBOARD A615		
1	TP-8-2	TABLE TP-8-1	Item No. 6 - TITLE should be Quality Assurance <u>PROGRAM</u> ; REFERENCE PARA. should be S.3.	Will correct	
			CONTACT RAIL A612		
2	TP-8-2	TABLE TP-8-1	Item No. 09 - REF. PARA. should be S.3.	Will correct	
			SUBSTATION EQUIPMENT A630		
3	SP-5	7.3	Line 4 - Exhibit TP-1-1 should be Appendix TP-1-A in order to be consistent with actual term used.	Will correct	Ref to Exhibit deleted RAA 11-11-98
4	TP-9-3	9.15	Title should read IDENTIFICATION <u>OF</u> INSPEC-TION STATUS.	Will correct	RAA 11-11-98
5	TP-11-2 TP-11-4	11.1.5 11.2.6	Calibration certificates should be indicated as a CDRI item. and added to Table TP-13-1	Will indicate	RAA 11-11-98





**SIGN REVIEW COMMENTS**

VIEWER D R FIEDLER FILE NO. \_\_\_\_\_ ORGANIZATION ROLF JENSEN & ASSOC.  
20 % SUBMITTAL FOR A-630 SUBSTATION EQUIPMENT

EF. NO.	PAGE NO.	DRAWING NO./ SPEC. SECTION	COMMENTS	RESPONSE	ACTION
1		P118B	Does not agree with E011A of A130 contract or E014A. (4/85 100%)	DWG E011 will have to be changed	A130 dwgs. O.K. revised. MT 1/17/85
2		P119B	Opening from EIS to TPSS in wall between Calc. 10 & 11 and C&D not shown on A-140 drawing A-111. Also equipment arrangement does not agree with E014, E015, & E038 (85%)	DWG E011 will have to be changed. Equipment arrangement should be deleted from E014, E016, E038	A141 dwgs. O.K. revised. MT 1/17/85
3		P-121A	Location of 34.5 KV Surge Bus #1 may interfere with ladder shown on A-167 drawing A-017. Equipment locations do not agree with E-013	Will change the distance between Bus #1 and the wall to 4'-0"	A167/A167 O.K. rev. MT 1/17/85 revised.
4		P-122B	TPSS location does not agree with station plans A-187.	TPSS location reflects the latest facilities information which takes in account modified crossover box	O.K. MT 1/17/85

III. RELATED  
CORRESPONDENCE





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

Cross Reference  
See section II  
Design Review Comments  
Dated 6-12-85  
RA  
11-4-93

85-04474

RECEIVED

JUN 11 1985

D. C. C.

June 13, 1985

FEDERAL EXPRESS

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

100% DESIGN REVIEW  
A-612 CONTACT RAIL  
A-165 COVERBOARD  
A-630 SUBSTATION EQUIPMENT

Jim:

Our comments on the subject design review packages are enclosed.

Sincerely,

  
David R. Fiedler, P. E.

DRF:pkj - H3275 - Traction Power

Enclosures

cc: Mr. Daniel K. Bloomfield



Cross Reference  
See Section II  
Design Review comments  
Dated 6-13-85  
6-6-85  
6-12-85

# MEMORANDUM

## REVIEW COMMENTS TRANSMITTAL

RECEIVED BY MRTC

DATE: JUNE 14, 1985

JUN 17 1985

TO: I. SHAFIR

SYSTEMS DESIGN DIVISION

FROM: TOM TANKS / Tom

SUBJECT: A-612, 615, 630 TRACTION POWER PROCUREMENT CONTRACT  
100% DESIGN REVIEW

FILE NO: 3400 x 082

In response to your memo of MAY 17, 85 (date) regarding the subject mentioned above, attached are review comments by SAFETY  
ASSURANCE & SECURITY.

If you have any questions, please contact \_\_\_\_\_ (name)

### Attachments

cc:	(w/attachment)	(w/o attachment)
	K. Rummel	
	T. Cook/Dr File	
	DCC	DCC
	J. SANDBERG	Chron
	R. WOOD	Subject
		File



Rolf Jensen &amp; Associates, Inc.

Fire Protection Engineers  
Building Code Consultants

RECEIVED

AUG 27 1985

RECEIVED

AUG 27 1985

D. C. C.

August 21, 1985

Mr. Malcolm Ingram  
Metro Rail Transit Consultants  
548 South Spring Street, 11th Floor  
Los Angeles, California 90013

EXPRESS MAIL

A630 SUBSTATION EQUIPMENT PROCUREMENT  
RESOLUTION OF FINAL DESIGN REVIEW COMMENTS

Malcolm:

We have reviewed the marked-up record copy documents for this contract which were transmitted with the Dale to Beeson memorandum dated August 21, 1985. We have several comments.

The response to our Ref. No. 1 on the specifications was "will add". The reference has not been added to the specifications.

The following items pertain to our comments on the drawings. The Ref. Nos. are the same as those in our comments (June 12, 1985).

<u>Ref. No.</u>	<u>Comment</u>
1	Drawing E-011A of the A-130 package (8/85 100%) has not been revised. Also E-014A does not have the correct equipment arrangement.
2	Drawing A-011 in the A-141 package (7/85 100%) has been corrected. We disagree with the response concerning E-014, -015 and -038. The correct equipment arrangement is needed for conduit routing and for verification that the lighting plan (specifically emergency lighting) matches the equipment arrangement and meets the F/LS criteria.
3	The distance between the Bus #1 and the wall has not been revised. (In addition, the North Arrow still points in the wrong direction.) Drawing E-013 in the A-167 package (7/85 100%) does not agree with P-121A. See Ref. 2 above re: emergency lighting.

Rolf Jensen & Associates, Inc.

Mr. Malcolm Ingram

Page 2 - H3275  
August 26, 1985

<u>Ref. No.</u>	<u>Comment</u>
4	This response can not be verified at this time. The 11/84 issue of A187 package is the latest we have.

If you have questions or need additional information please call.

Sincerely,



David R. Fiedler, P.E.

DRF:jmp - H3275 - Traction Power

cc: Mr. Dan Bloomfield



FLSC 85-5-158/159  
CRIT 85-15

FIRE/LIFE SAFETY  
COMMITTEE

RECEIVED  
SCRTD - TSD  
SYSTEMS DESIGN & ANALYSIS  
JUN 24 1985  
ITEM # 858  
FILE #

June 18, 1985

Mr. William R. Rhine, Director  
Systems Design & Analysis Dept.  
Southern California Rapid  
Transit District  
425 South Main Street  
Los Angeles, CA 90013

Dear Mr. Rhine:

A-612, 615, 630 - Traction Power - Final Design

On May 30, 1985, the Fire/Life Safety Committee (FLSC) received a transmittal from MRTC requesting review of A-612, 615, 630 - Traction Power, Final Design review, dated May 17, 1985.

After review of the above titled documents, the Fire/Life Safety Committee agrees with the proposals and have no adverse comments at this time.

Should you have any questions regarding this matter, please contact the FLSC at 972-3457.

Very truly yours,

*Donald E. Bartlett*

Donald E. Bartlett, Battalion Chief  
Los Angeles City Fire Department

*Richard B. Schiehl*

Richard B. Schiehl, Battalion Chief  
Los Angeles County Fire Department

*Roger W. Wood*

Roger W. Wood, Jr.  
SCRTD, Metro Rail

cc: Mr. Robert Murray  
Mr. James Crawley  
SCRTD, FLSC Permanent Members



# MEMORANDUM

---

November 20, 1987

TO: P. M. Burgess  
FROM: M. Ingram *M. Ingram*  
SUBJECT: Legal/Technical Design Review Comments  
A630 Traction Power Substation Equipment  
Procurement

FILE NO: S440A630X082

---

In response to your memo dated November 16, 1987 MRTC Safety, Assurance, and Security has no comments on the subject document.

MI:djr

cc: J. N. Brown *JB*  
H. J. Chaliff  
T. W. Cook  
A. M. Dale  
G. W. Penney  
DCC (2)  
Chron  
Subject

87-04232

M E M O R A N D U M

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT  
TRANSIT SYSTEMS DEVELOPMENT DEPARTMENT  
SYSTEMS AND CONSTRUCTION SAFETY

\*\*\*\*\*

DATE: November 30, 1987  
TO: P. M. Burgess  
FROM: H. E. Storey *HS*  
SUBJECT: Contract A630, Traction Power  
Substation Equipment, Legal/Technical Review

RECEIVED

DEC 02 1987

D.C.C.

\*\*\*\*\*

The Systems and Construction Safety Department has reviewed the subject contract. Our comments are indicated on the attached Review/Comment Sheets.

Attachment

cc: T. Cook, MRTC  
J. Loo  
B. Hansson

*Cross Reference  
See Section II  
Design Review Comments  
dated 11-30-87  
RA  
11-4-88*

RECEIVED BY MRTC

MAR 01 1988

MEMORANDUM

SYSTEMS DESIGN DIVISION SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT  
TRANSIT SYSTEMS DEVELOPMENT  
RAIL FACILITIES

cc Bart  
Me  
Nick  
Tom Tsuk  
Malcolm

88-0077  
Let me know  
if you hear  
RTD wanting  
action from us  
on this issue  
AL

RECEIVED

FEB 24 1988

MRTC

DATE: February 22, 1988 File: X019.U

TO: Joel Sandberg

FROM: Michael F. Merrick

SUBJECT: Positive-to-Ground Faults

\*\*\*\*\*

The problem of detecting traction power system positive-to-ground faults was discussed during detailed design. A positive short circuit having some resistance may go undetected where the fault current rate of rise is insufficient to trip the breakers. Because of the ungrounded negative return, the only indication of such faults is a steady potential difference between running rails and ground. Eventually, this voltage would be noticed on the strip-chart voltage recordings from the TPSS recorders (inspection frequency not known).

This situation creates a safety hazard. A maintenance worker may ground the track with a tool and cause an arc. This may startle him (adjacent to third rail) or cause damage to equipment.

- o Hole burned in train - WMATA.
- o Possible cause of damage to train control equipment - MARTA.
- o At some level, the voltage is noticeable to patrons boarding trains.

The Toronto Transit Commission has developed and installed a device on its ungrounded trackway which, at a pre-selected trackway voltage, sends an alarm to central control and automatically grounds the trackway. The MRTC Corrosion Consultant is familiar with details of this device. In view of its availability and the high level of trackway electrical isolation that we anticipate due to dry tunnels, further consideration might be given to the installation of a comparable alarm system on Metro Rail

cc: J. Crawley  
B. Hanson  
K. Murthy  
H. Storey

Copy  
A dealer  
9. later  
This is not in G...  
at this time. If RTD  
elect to go this CR's  
D... to give it  
File - C  
2/25

M E M O R A N D U M

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

RECEIVED  
APR 19 1988

\*\*\*\*\*  
DCA

DATE: April 18, 1988  
TO: Michael F. Merrick  
FROM: *Joel J. Sandberg*  
SUBJECT: Positive-to-Ground Faults  
REFERENCE: Your Memorandum of 2/22/88

\*\*\*\*\*

During the final design of the traction power system, we reviewed the availability of equipment to automatically ground the negative return system when the track-to-earth potential exceeds 80 volts. We found no such equipment operating in North America, although the Toronto Transit Commission (TTC) was soliciting proposals. Vendors for traction power equipment expressed unwillingness to develop, furnish and accept liability for such a device and strongly urged us to not include it in our contracts. There were concerns about arbitrarily shorting the negative system to ground when there is a simultaneous positive-to-ground fault. We are instead providing an alarm at Central Control, when the track-to-earth potential is excessive, so that action can be taken to locate and correct the cause of the excessive voltage.

TTC has now apparently successfully developed and installed a solid state device to automatically ground the negative system. To this date, there is no transit system in the U.S. that has also done so. The TTC device is rather inexpensive and could be installed in MOS-1 for less than \$30,000. Space and other provisions have been included in the traction power substations, however, there may be some patent problems to be worked out.

We will continue to check on the availability of the device and plan to include it prior to MOS-1 revenue operation.

Attachment

- cc: W. Rhine
- M. Burgess-MRTC
- A. Dale-MRTC
- B. Hansson
- K. Murthy-MRTC
- G. Penney-MRTC
- H. Storey

RECEIVED BY MRTC

JUL 22 1988

SAFETY & ASSURANCE

88-03266

MEMORANDUM

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

RECEIVED  
JUL 22 1988

\*\*\*\*\*

DATE: July 19, 1988

TO: E. B. Pollan

FROM: T. E. Frawley *Tom Frawley*

SUBJECT: CCB Action Item 667 and O&M Committee Action Item  
24.3, Safety Concerns Re: 3rd Rail Reenergization

\*\*\*\*\*

A meeting of the working group assigned to complete this Action Item was held on Thursday, April 28. Attendees were: Hal Storey, Bo Hansson, Tom Eng and myself. Neil Johnson, who had also volunteered to participate, was unable to attend, but did review, and provide input to, this memo. Les Durrant who was not a member of the working group, subsequently volunteered to review the memo and did provide input thereto.

During the meeting three different interpretations of the issue were identified. Although one interpretation was ultimately agreed to be the one originally intended for consideration, all three interpretations are addressed in this memo to prevent future misunderstanding.

Interpretation I

It was concluded that the original intent of the action item was to consider what if any steps should be taken to prevent accidental electrocution from occurring by touching a contact rail section which is thought to be deenergized because the emergency deenergization switch has been activated but which is being reenergized by a train elsewhere in the section operating in regenerative braking mode. The vehicle specification originally called for a device which would detect contact rail deenergization and prevent the vehicle in regenerative braking mode from reenergizing the contact rail. The deletion of this requirement at the behest of the suppliers caused Hal Storey to raise the issue of a possible resultant safety hazard in his memo to Joel Sandberg of March 4, 1988, copy attached.

The scenario illustrated in Exhibit 1, attached, details the nature of the possible hazard. Train X leaves platform A on Track 1. Shortly thereafter, a person on platform A falls into or otherwise enters upon the trackway B. Meanwhile, train X has

begun braking in anticipation of a stop at platform D, and is in regenerative braking mode. Back on platform A, someone having observed the previously mentioned person in the trackway, then has the presence of mind to go to the end of the platform and to deenergize the contact rail in section C by operating the emergency deenergization switch. This person, possibly with assistance from others, might then enter the trackway and attempt to rescue the fallen person, or take other action, proceeding on the assumption that there is now no danger of electrocution from the contact rail. However, because train X had entered braking mode prior to the emergency deenergization, regenerative braking would have reenergized the contact rail and created a danger of accidental electrocution if someone were to touch the contact rail that was thought to be deenergized.

The working group considered this scenario and because the time spent in regenerative braking is a relatively small portion of the time a train requires to travel between stations, concluded that the probability of the emergency deenergization switch being thrown while there was a train in the given contact rail section and while that train was in regenerative braking mode, was very small. Note that if the deenergization took place prior to the train entering braking mode, regenerative braking would not be possible (only mechanical brakes would be available) and there would be no danger of reenergization. Further, when combined with the probability of persons taking the actions described, the probability of the entire scenario taking place is negligible. Since it was also concluded that nothing could be done to completely preclude the possibility of accidental electrocution of the rescuer or other person's in the trackway in such a scenario, no action is recommended beyond the posting of an appropriate sign adjacent to the emergency deenergization switch. This sign should warn of the possibility of unapparent reenergization of the contact rail, to reduce the likelihood of accidental electrocution.

#### Interpretation II

An unintended interpretation of the action item is the consideration of the hazard present in the case of maintenance personnel working in and around the contact rail while it is deenergized. The working group agreed that procedures must be developed which ensure that a given section actually is, and remains, deenergized during such maintenance. As a preliminary step in developing such procedures, Tom Eng surveyed maintenance personnel at BART, WMATA and MTA (Baltimore) to determine the steps taken by them for this purpose. The working group used this survey information to draft the procedure outline shown on Exhibit 2.

Interpretation III

The third issue of concern is regarding dangerously high voltage in the running rails. As detailed in Memoranda from M. Merrick to J. Sandberg dated 2/22/88 and from J. Sandberg to M. Merrick dated 5/18/88, copies attached, Metro Rail will provide an alarm at the RCC to warn when track-to-earth potential is excessive.

Conclusion

Regarding Interpretation I, and in response to CCB Action Item 667, and O&M Committee Action Item 24.3, the working group has concluded that with the possible exception of a warning sign to be posted at the emergency deenergization switch, no further action is necessary and the group recommends that no further action be taken.

Regarding Interpretation II, when the appropriate time comes, the draft procedure outline produced as a result of the working group's survey and discussion should serve as the starting point for developing procedures to be used for maintenance related contact rail deenergization.

Regarding Interpretation III, the working group is satisfied with the previous resolution described above.

cc:

L. Durrant  
T. Eng - MRTTC  
B. Hanson  
B. Hansson  
N. Johnson - PDCD  
J. Sandberg  
H. Storey

MEMORANDUM

SOUTHERN CALIFORNIA RAPID TRANSIT SYSTEMS DEVELOPMENT SYSTEMS AND CONSTRUCTION

\*\*\*\*\*

DATE: March 4, 1988
TO: Joel J. Sandberg
FROM: Harold E. Storey
SUBJECT: Passenger Vehicle Design Criteria, Volume V, Section 1

\*\*\*\*\*

With approval of Change Request 8-008 concerning a change to criteria-section 1.9.3 "Dynamic Braking and Regeneration," by which the section's second paragraph requirement that "No component or device on the car shall return any power....or cause the power collector devices to be at a potential above zero...." was deleted, a new operating procedure will now have to be developed to protect employees working in the track area.

Please note this requirement and inform the O&M Committee that an operations/maintenance procedure must be developed by which employees are protected against the potential of a de-energized track/third rail becoming energized. Attached for your information is a copy of the SCS Department's Change Technical Evaluation and Notice-of-Action noting the above requirement.

Attachment

cc: W. Rhine
B. Bandy
F/LSC

Called Hal 3-23-88 w/c

Spoke 3-30-88

Have in O&M Com. (see memo B)
need procedure to protect from accident
energized track being left for a requirement.

Memo sent to Storey 4/4/88 inviting
him to lead discussion of issue at
O&M Committee Meeting of 4/7/88.

Ed, (LET pls do)
Please prepare a
brief response memo
to HES assuring him
the necessary procedure
will be developed and
outlining the
process for doing so.
JES

RECEIVED
SCRTD - TSD
SYSTEMS DESIGN & ANALYSIS

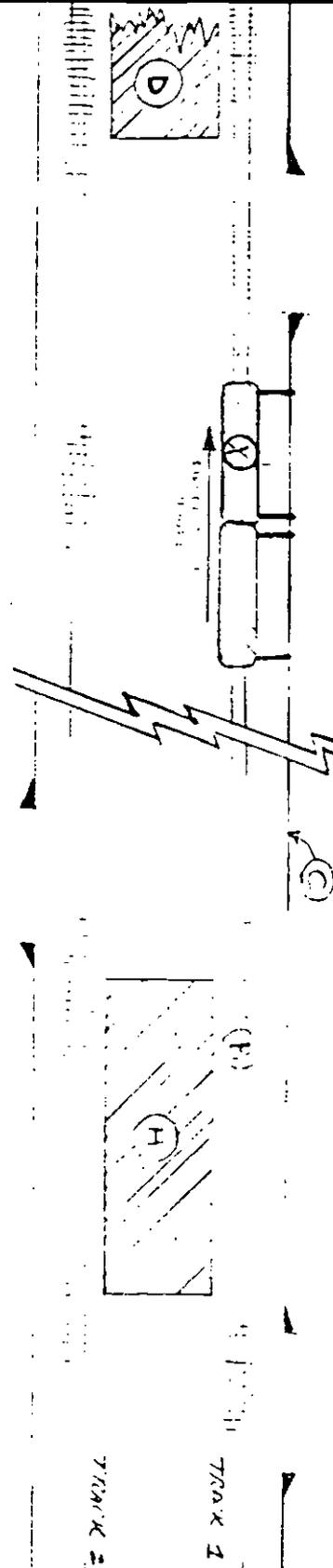
MAR 04 1988

ITEM # 326
FILE #



# Working Notes

Subtask	EXHIBIT 1	Date	12/21/84	Page	1	of	1
Subject	...	Preparer	...				



## EXHIBIT 2

### DRAFT OUTLINE OF CONTACT RAIL DEENERGIZATION/REENERGIZATION

#### SAFETY PROCEDURES

1. Contact RCC and request that the route be blocked and section be deenergized.
2. Confirm by radio that the last train to pass through the section to be deenergized has berthed at the next station platform. (i.e., it is in the next contact rail section.)
3. Pull substation breaker.
4. Apply grounding device between wet standpipe and contact rail. (Typical procedures of grounding the contact rail to a running rail may be unsatisfactory, since MRT running rails are isolated.)
5. If 3rd rail is to be separated, apply second grounding device on other side of break.
6. When repairs are complete, remove the grounding device(s).
7. Reset substation breaker.
8. Contact RCC to reenergize contact rail and open route.

MEMORANDUM

SOUTHERN CALIFORNIA RAPID TRANSIT DISTRICT  
TRANSIT SYSTEMS DEVELOPMENT  
RAIL FACILITIES

\*\*\*\*\*  
 DATE: February 22, 1988 File: X019  
 TO: Joel Sandberg  
 FROM: Michael F. Merrick *M. Merrick* ITEM # 263  
 SUBJECT: Positive-to-Ground Faults FILE # \_\_\_\_\_  
 \*\*\*\*\*

RECEIVED  
 SCRTD - TSD  
 SYSTEMS DESIGN & ANALYSIS  
 FEB 23 1988

The problem of detecting traction power system positive-to-ground faults was discussed during detailed design. A positive short circuit having some resistance may go undetected where the fault current rate of rise is insufficient to trip the breakers. Because of the ungrounded negative return, the only indication of such faults is a steady potential difference between running rails and ground. Eventually, this voltage would be noticed on the strip-chart voltage recordings from the TPSS recorders (inspection frequency not known).

This situation creates a safety hazard. A maintenance worker may ground the track with a tool and cause an arc. This may startle him (adjacent to third rail) or cause damage to equipment.

- o Hole burned in train - WMATA.
- o Possible cause of damage to train control equipment - MARTA.
- o At some level, the voltage is noticeable to patrons boarding trains.

The Toronto Transit Commission has developed and installed a device on its ungrounded trackway which, at a pre-selected trackway voltage, sends an alarm to central control and automatically grounds the trackway. The MRTC Corrosion Consultant is familiar with details of this device. In view of its availability and the high level of trackway electrical isolation that we anticipate due to dry tunnels, further consideration might be given to the installation of a comparable alarm system on Metro Rail

cc: J. Crawley  
 B. Hanson  
 K. Murthy  
 H. Storey

RECEIVED  
 CONTROL

Tom FRAWLEY

M E M O R A N D U M

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

\*\*\*\*\*

DATE: April 18, 1988  
TO: Michael F. Merrick  
FROM: *Joel J. Sandberg*  
SUBJECT: Positive-to-Ground Faults  
REFERENCE: Your Memorandum of 2/22/88

\*\*\*\*\*

During the final design of the traction power system, we reviewed the availability of equipment to automatically ground the negative return system when the track-to-earth potential exceeds 80 volts. We found no such equipment operating in North America, although the Toronto Transit Commission (TTC) was soliciting proposals. Vendors for traction power equipment expressed unwillingness to develop, furnish and accept liability for such a device and strongly urged us to not include it in our contracts. There were concerns about arbitrarily shorting the negative system to ground when there is a simultaneous positive-to-ground fault. We are instead providing an alarm at Central Control, when the track-to-earth potential is excessive, so that action can be taken to locate and correct the cause of the excessive voltage.

TTC has now apparently successfully developed and installed a solid state device to automatically ground the negative system. To this date, there is no transit system in the U.S. that has also done so. The TTC device is rather inexpensive and could be installed in MOS-1 for less than \$30,000. Space and other provisions have been included in the traction power substations, however, there may be some patent problems to be worked out.

We will continue to check on the availability of the device and plan to include it prior to MOS-1 revenue operation.

Attachment

- cc: W. Rhine
- M. Burgess-MRTC
- A. Dale-MRTC
- B. Hansson
- K. Murthy-MRTC
- G. Penney-MRTC
- H. Storey





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

January 1988 Bid

A D D E N D U M

covering

CHANGE IN SPECIFICATIONS AND/OR PLANS

Date Issued: February 2, 1988

Addendum No: A630-1

Addendum Date: February 2, 1988

Bid No: \_\_\_\_\_

Contract: A630: TRACTION POWER-SUBSTATION EQUIPMENT

INTENT

1. This addendum is issued prior to receipt of bids to provide for modifications in Contract Specifications. Acknowledgement of this addendum shall be made and cost of work included or excluded in bidder's proposal.
2. This addendum consists of the following items:

Revisions to the following Specification Sections and the pages included:

- ° Invitation to Bid. Pages BR-1 and BR-2.

Specification 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 Contract Specifications Book intact and continuous. Please place the enclosed pages in your Contract Specifications Book and remove addended pages.

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

A handwritten signature in dark ink, appearing to read "T.L. Johnson", is written over a horizontal line.

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

TLJ/GWP/rl



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

A D D E N D U M

January 1988 Bid

covering

CHANGE IN SPECIFICATIONS AND/OR PLANS

Date Issued: February 12, 1988

Addendum No: A630-2

Addendum Date: February 8, 1988

Bid No: \_\_\_\_\_

Contract: A630: TRACTION POWER SUBSTATION-EQUIPMENT PROCUREMENT

INTENT

1. This addendum is issued prior to receipt of bids to provide for modifications in Contract Drawings and Specifications. Acknowledgement of this addendum shall be made and cost of work included or excluded in bidder's proposal.

2. This addendum consists of the following items:

Revisions to the following Specification Sections and the pages included:

- ° Invitation to Bid. Page BR-1, BR-2, BR-5 and BR-6.

Specification 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 Contract Specifications Book intact and continuous. Please place the enclosed pages in your Contract Specifications Book and remove addended pages.

Issued By: *Maynard Z. Walters*  
 Maynard Z. Walters  
 Director  
 Office of Contracts  
 Procurement and Materiel

MZW/GWP/rl



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

A D D E N D U M

covering

January 1988 Bid

CHANGE IN SPECIFICATIONS AND/OR PLANS

Date Issued: March 8, 1988 Addendum No: A630-3

Addendum Date: March 11, 1988

Bid No: \_\_\_\_\_

Contract: A630: TRACTION POWER SUBSTATION EQUIPMENT

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 bidder's proposal.
2. This addendum consists of the following items:

Revisions to the following Specification Sections and the pages included:

- Table of Contents. Pages i and ii.
- Invitation to Bid. Page BR-1.
- Information for Bidders. Pages BR-4, BR-8, BR-9 and BR-11.
- Instructions for Preparation of Bids. Page BR-21.
- Forms for Bidding. Pages BF-1, BF-7 and BF-37 through BF-64. (Delete Pages BF-65 through BF-76).
- Special Conditions. Pages SC-3, SC-4, SC-5, SC-6 and SC-A-1.
- General Conditions. Pages iii, and 59.
- Exhibit 5. Page GC-5-1. (Delete pages 1 and 2).
- Technical Provisions. Pages TP-1-3, TP-1-4, TP-1-A-6, TP-2-3, TP-3-3, TP-3-4, TP-3-6, TP-4-7, TP-4-10, TP-4-16, TP-4-19, TP-4-23, TP-5-ii, TP-5-3, TP-5-4, TP-5-8, TP-5-19, TP-6-3, TP-6-7, TP-6-9, TP-6-11, TP-7-6, TP-7-9, TP-11-3, and TP-12-4. (Delete pages TP-1-A-7 through TP-1-A-11).

Specification 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.

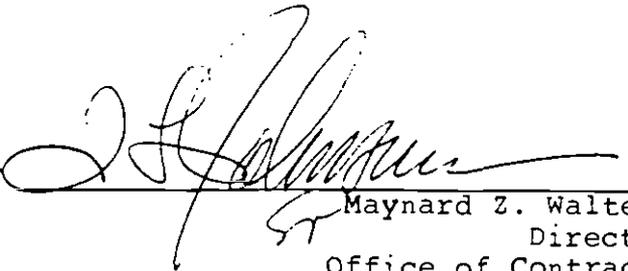
Revised Contract Drawings included as follows:

<u>Drawing Number</u>	<u>Title</u>
P-101, Rev. 1	Index Sheet
P-105, Rev. 1	Mainline, Single Line Diagram
P-109, Rev. 1	Yard and Main Shop, Single Line Diagram, Sheet 2 of 2.

Deleted Contract Drawing:

<u>Drawing Number</u>	<u>Title</u>
P-106, Rev. 0	Mainline. Single Line Diagram, Sheet 2 of 2.

Issued By:



Maynard Z. Walters  
Director  
Office of Contracts  
Procurement and Materiel

MZW/GWP/rl



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

January 1988 Bid

A D D E N D U M

covering

CHANGE IN SPECIFICATIONS AND/OR PLANS

Date Issued: March 31, 1988

Addendum No: A630-4

Addendum Date: March 25, 1988

Bid No: \_\_\_\_\_

Contract: A630: TRACTION POWER SUBSTATION EQUIPMENT

INTENT

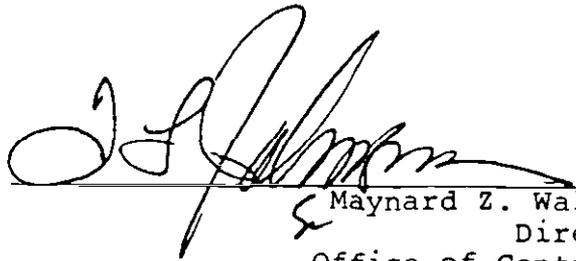
1. This addendum is issued prior to receipt of bids to provide for modifications in the Procurement Specifications Book. Acknowledgement of this addendum shall be made and cost of work included or excluded in bidder's proposal.
2. This addendum consists of the following items:

Revisions to the following Specifications Sections and the pages included:

- Invitation to Bid. Page BR-1.
- Information for Bidders. Pages BR-6, BR-7 and BR-10.
- General Conditions. Pages 6, 32 and 33.

Specification 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 Contract Specifications Book intact and continuous. Please place the enclosed pages in your Procurement Specifications Book and remove addended pages.

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

  
Maynard Z. Walters  
Director  
Office of Contracts  
Procurement and Materiel

MZW/RV/r1



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

January 1988 Bid

A D D E N D U M

covering

CHANGE IN SPECIFICATIONS AND/OR PLANS

Date Issued: April 18, 1988

Addendum No: A630-5

Addendum Date: April 15 1988

Bid No: \_\_\_\_\_

Contract: A630: TRACTION POWER SUBSTATION EQUIPMENT

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 bidder's proposal.
2. This addendum consists of the following items:

Revisions to the following Specifications Sections and the pages included:

- ° Technical Provisions. Pages TP-1-A-1, TP-1-A-2, TP-3-ii, TP-3-24, TP-3-25, TP-3-26 and TP-3-27.

Specification 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.

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

*J. S. Maddala*  
FOR

Maynard Z. Walters  
Director  
Office of Contracts,  
Procurement and Materiel

MZW/GP/rl

15994



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

July 1988 Re-bid

A D D E N D U M

covering

CHANGE IN SPECIFICATIONS AND/OR PLANS

Date Issued: August 10, 1988

Addendum No: A630-1

Addendum Date: August 10, 1988

Bid No: \_\_\_\_\_

Contract: A630: TRACTION POWER SUBSTATION EQUIPMENT

INTENT

1. This addendum is issued prior to receipt of bids to provide for modifications in Contract Drawings and Specifications. Acknowledgement of this addendum shall be made, and cost of work included or excluded, in bidder's proposal.
2. This addendum consists of the following items:

Revisions to the following Specification Sections and the pages included:

- ° Invitation to Bid. Page 1.

The Bid Date August 18, 1988 has been changed to September 1, 1988.

Specification 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 Contract Specifications Book intact and continuous. Please place the enclosed pages in your Contract Specifications Book and remove amended pages.

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

A handwritten signature in black ink, appearing to read "H. G. Hartpence", is written over a horizontal line.

H. G. Hartpence  
Director  
Office of Contracts  
Procurement and Materiel

MZW/RV/ez